

Product Catalog 2014

Selection Guide



What's Inside

- 4 **Fiber Optic Solutions for Networking**
- 14 **Optical Components for Broadband Networking and Communication Applications**
- 18 **Industrial Fiber Optic Components, Cabeling Accessories**
- 30 **LED Solutions**
- 136 **Motion Sensing and Control Products**
- 198 **Optoisolation and Optical Sensor Products**
- 256 **Wireless Semiconductor Products
System Application Block Diagrams and
Product Suggestions**



Our Broad Product Portfolio

Optoelectronics

Avago Technologies is the world's leading supplier of optoelectronic products. We pioneered the ambient light photo sensors that trigger and optimize backlighting in mobile devices, and our groundbreaking optical navigation sensors created a whole new product category, optical mice. More recently, we pioneered the award-winning technology for RGB (red, green, blue) LED backlighting of LCD televisions, using a closed-loop color management system. TVs can now display 100% of the color spectrum for completely natural color without degradation or deviation over the lifetime of the display.

Wireless Technologies

Avago best-of-class FBAR duplexer technology paved the way for miniature PCS mobile flip phones by shrinking one of the largest components on the phone board. We also greatly extended the battery life of mobile handsets with our CoolPAM™ power amplifiers. Our newest breakthrough is the integration of duplexers, filters and amplifiers into front-end modules. This is enabling handset makers to reduce phone board size dramatically while increasing battery life—making room for new features like camera phones, MP3 players and GPS, without any reduction in talk time.

Fiber Optics and Networking Components

Avago Technologies is one of the world's leading suppliers of fiber optic transceivers—we ship more than two million a month—and our portfolio of products (for local area, storage and metro networks) is the broadest in the industry. We are also at the forefront of fiber optic technologies for the industrial and automotive markets. We sped up operations on the factory floor with the first low-cost transmitters and receivers optimized for 16 MBd SERCOS robotic technology. And we're boosting the performance of in-car infotainment systems with our MOST optical components, which extend network signal quality and operating-temperature range well beyond competitive products.

Motion Sensing and Control Solutions

Avago offers "one-stop shopping" with its encoders, decoders and controllers. We offer the industry's smallest form factors, widest range of resolutions and highest level of integration to reduce the numbers of components needed and shorten time-to-market.

Design, Manufacturing and Marketing Centers

San Jose, California (worldwide headquarters)
Boeblingen, Germany
Regensburg, Germany
Fort Collins, Colorado
Penang, Malaysia
Seoul, Korea
Shanghai, China
Singapore
Tokyo, Japan
Turin, Italy



Parallel Optic Solutions

- 6 40 GbE QSFP Transceivers & Optical Cables
- 6 4-Channel Transceivers
- 7 12-Channel Receivers, Optical Cables & Transmitters

Ethernet Solutions

- 8 Fast Ethernet Transmitters & Receivers
- 8 Fast Ethernet Transceivers
- 8 650nm Industrial Fast Ethernet Transceiver
- 9 Gigabit Ethernet Transceivers
- 9 SFPProbe Gigabit Ethernet Transceivers for PacketPortal
- 9 10 Gigabit Ethernet Transceivers & Optical Cables
- 10 10 Gigabit Ethernet Transceivers & Optical Cables
- 10 40 Gigabit Ethernet Transceivers & Optical Cables

Storage Solutions

- 10 ESCON/SBICON Storage Transceivers
- 10 1 Gigabit Storage Transceivers
- 10 2 Gigabit Storage Transceivers
- 11 4 Gigabit Storage Transceivers
- 11 8 Gigabit Storage Transceivers
- 11 10 Gigabit Storage Transceivers
- 11 16 Gigabit Storage Transceivers

Base Station Solutions

- 12 OBSAI/CPRI Optical Transceivers

Metro Network Solutions

- 12 OC-3/SONET/SDH Transceivers
- 12 OC-12/SONET/SDH Transceivers
- 13 OC-48/SONET/SDH Transceivers
- 13 OC-192/SONET/SDH Transceivers

Industrial Networking Solutions

- 13 Fiber Optic Transmitters & Receivers
- 13 Fiber Optic Transceivers

Fiber Optic Solutions for Networking



As the world's leading provider of fiber optic components, Avago Technologies offers the broad portfolio of transceivers on the market today. Avago's fiber optic solutions provide comprehensive coverage, superior performance and lowest total cost of ownership for the fast-growing number of applications in the automotive, enterprise, high performance computing, industrial control, metro and storage markets.

Avago's 1–14Gbps VCSEL-based products are widely adopted throughout the wired infrastructure industry in applications ranging from Ethernet, Fibre Channel, InfiniBand, and proprietary-system interconnects. Avago is maintaining its leadership in these areas with the development of 25Gbps VCSEL technology for the next generation of VCSEL-based solutions. We are also continuing our investments in single-mode laser technology by extending our existing 8–14 Gbps technology to 25 Gbps and beyond. We are pursuing a novel fabrication technology that will reduce the cost, power and complexity of edge emitters as well as new low-cost packaging technologies.

Through the years Avago has built a strong reputation for uncompromising product quality and reliability, responsiveness to customer needs and technical innovation. Its patented manufacturing capabilities, along with its worldwide sales and support staff, offer outstanding flexibility in satisfying customer needs. Coupled with its key component multi-sourcing, capacity and strong supply chain, Avago offers the industry's best assurance of supply. Whether in China, Europe or the United States, Avago provides unmatched service and delivery of lot sizes, ranging from one to over a million, to its customers around the globe.

RoHS-Compliant Fiber Optic Transceivers

Elimination of hazardous materials from products, and in turn the environment, has become a global initiative. In answer to this demand, Avago Technologies offers a broad portfolio of Restriction of Hazardous Substances (RoHS)-compliant fiber optic transceiver solutions. These environmentally friendly transceivers offer the same functionality, performance, quality, and reliability that are characteristic of Avago Technologies' world-leading fiber-optic components. The use of new non-lead based processes and materials in solder finishes and printed circuit board (PCB) assembly make them fully compliant with the requirements of the RoHS directive. Rigorous testing procedures ensure the performance integrity of Avago Technologies' portfolio of fiber optic transceivers; regardless of the materials and processes employed.

Parallel Optic Solutions

40 GbE QSFP Transceivers and Active Optical Cables

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
40GbE, SR4 transceiver module; 850nm VCSEL	AFBR-79EQxZ	QSFP+	Multi-mode	100m OM3 150m OM4	3.3V	0 to 70°C	MTP	Pluggable
40GbE/4x10GbE, iSR4 transceiver module; 850nm VCSEL	AFBR-79EixZ	QSFP+	Multi-mode	100m OM3 150m OM4	3.3V	0 to 70°C	MTP	Pluggable
40GbE/4x10GbE, transceiver eSR4 module; 850nm VCSEL	AFBR-79EEExZ	QSFP+	Multi-mode	300m OM3 400m OM4	3.3V	0 to 70°C	MTP	Pluggable
40GbE/4xQDR AOC; 850nm VCSEL	AFBR-7QERxxZ	QSFP+	Multi-mode	1-20m	3.3V	0 to 70°C	QSFP+	Pluggable

4-Channel Parallel Optic Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Infiniband 4ch @ 2.7 Gb/s per channel 850nm VCSEL	HFBR-7924xxWZ	POP 4	Multi-mode	300m	3.3V	0 to 70°C	MTP	Pluggable
Proprietary / Xaui 4ch @ 2.7 Gb/s per channel 850nm VCSEL	HFBR-7934xxWZ	POP 4	Multi-mode	150m	3.3V	0 to 70°C	MTP	Pluggable

Parallel Optic Solutions

12-Channel Parallel Optic Tranceivers and Active Optical Cables

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Proprietary 12ch TXCR @12.5 Gbps per channel 850nm VCSEL	AFBR-83CDZ	CXP	Mutli-mode	50m	3.3V/2.5V	0 to 70°C	MTP/MPO	Pluggable - Edge mount
Proprietary 12ch AOC @12.5 Gbps per channel 850nm VCSEL	AFBR-83CDxxZ	CXP	Mutli-mode	50m	3.3V/2.5V	0 to 70°C	MTP/MPO	Pluggable - Edge mount
Proprietary 12ch TXCR @10 Gbps per channel 850nm VCSEL	AFBR-83PDZ	CXP	Mutli-mode	100m	3.3V/2.5V	0 to 70°C	MTP/MPO	Pluggable - Edge mount
Proprietary 12ch AOC @10 Gbps per channel 850nm VCSEL	AFBR-83PDxxZ	CXP	Mutli-mode	100m	3.3V/2.5V	0 to 70°C	MTP/MPO	Pluggable - Edge mount

12-Channel Parallel Optic Transmitters and Receivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Proprietary/Ethernet 12ch @10 Gbps per channel 850nm VCSEL	AFBR-811vxyZ	MiniPOD™	Mutli-mode	100m	3.3V/2.5V	0 to 70°C	PRIZM™	Pluggable Socket
	AFBR-821vxyZ	MiniPOD™	Mutli-mode	100m	3.3V/2.5V	0 to 70°C	PRIZM™	Pluggable Socket
Proprietary/Ethernet 12ch @10 Gbps per channel 850nm VCSEL	AFBR-77xxxxZ	MicroPOD™	Mutli-mode	100m	3.3V/2.5V	0 to 70°C	PRIZM™	µLGA
	AFBR-78xxxxZ	MicroPOD™	Mutli-mode	100m	3.3V/2.5V	0 to 70°C	PRIZM™	µLGA
Infiniband/Proprietary 12ch @ 10 Gb/s per channel 850nm VCSEL	AFBR-810BxxZ	PPOD	Mutli-mode	50m	3.3V	0 to 80°C	MTP	Pluggable Socket
	AFBR-820BxxZ	PPOD	Mutli-mode	50m	3.3V	0 to 80°C	MTP	Pluggable Socket
Proprietary/Xaui 12ch @ 6.25 Gb/s per channel 850nm VCSEL	AFBR-776BxxZ	PPOD	Mutli-mode	100m	3.3V	0 to 80°C	MTP	Pluggable Socket
	AFBR-786BxxZ	PPOD	Mutli-mode	100m	3.3V	0 to 80°C	MTP	Pluggable Socket
Infiniband 12ch @ 5 Gb/s per channel 850nm VCSEL	AFBR-775BxxZ	PPOD	Mutli-mode	100m	3.3V	0 to 80°C	MTP	Pluggable Socket
	AFBR-785BxxZ	PPOD	Mutli-mode	100m	3.3V	0 to 80°C	MTP	Pluggable Socket
Infiniband/Proprietary 12ch @ 2.7 Gb/s per channel 850nm VCSEL	HFBR-779BxxWZ	SNAP 12	Mutli-mode	100m	3.3V	0 to 70°C	MTP	Pluggable Socket
	HFBR-789BxxZ	SNAP 12	Mutli-mode	100m	3.3V	0 to 70°C	MTP	Pluggable Socket
Infiniband 12ch @ 2.5 Gb/s per channel 850nm VCSEL	HFBR-772BxxWZ	SNAP 12	Mutli-mode	300m	3.3V	0 to 70°C	MTP	Pluggable Socket
	HFBR-782BxxZ	SNAP 12	Mutli-mode	300m	3.3V	0 to 70°C	MTP	Pluggable Socket
Infiniband 12ch @ 2.5 Gb/s per channel 850nm VCSEL	AFBR-732BxxWZ	SNAP 12	Mutli-mode	50m	3.3V	0 to 70°C	MTP	Pluggable Socket
	AFBR-742BxxZ	SNAP 12	Mutli-mode	50m	3.3V	0 to 70°C	MTP	Pluggable Socket

Ethernet Solutions

Fast Ethernet Transmitters and Receivers

	Part Number		Voltage	Package	Case Temp	Connector	Module Type
	Transmitter	Receiver					
125 MBd Fast Ethernet/FDDI 820nm LED (Multi-Mode) (≤2.7km)	HFBR-14X4Z	HFBR-24XXZ	5V	Simplex	-40 to +85°C	ST	2x4
						SMA	2x4
						SC	2x4
						FC	2x4
125 MBd Fast Ethernet/FDDI 1300 nm LED (Multi-Mode) (≤2km)	HFBR-1115TZ	HFBR-2115TZ	5V	Simplex	0 to +70°C	ST	2x8

* For new designs, Avago Technologies recommends using the RoHS parts. Legacy parts will undergo obsolescence

Fast Ethernet Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Ethernet 100 Mb/s 1310nm LED	AFBR-5903xZ	SFF	Mutli-mode	2km	3.3V	Various	MTRJ	2x5
	HFBR-57E0xxZ	SFP	Mutli-mode	2km	3.3V	Various	LC	Pluggable
	HFBR-5961xxZ	SFF	Mutli-mode	2km	3.3V	Various	LC	2x5
	HFBR-5963xxZ	SFF	Mutli-mode	2km	3.3V	Various	LC	2x5
Ethernet 100 Mb/s 1310nm FP Laser	AFCT-5179xZ	1x9	Single-mode	10km	3.3/5V	Various	SC	1x9
	AFCT-5971xxZ	SFF	Single-mode	10km	3.3V	Various	LC	2x5
SONET/SDH 155 Mb/s 1310nm LED	HFBR-57E0xxZ	SFP	Multi-mode	2km	3.3V	Various	LC	Pluggable
Fast Ethernet 100 Mb/s 1300nm LED (DMI)	HFBR-57E5APZ	SFP	Multi-mode	2km	3.3V	-40 to +85°C	LC	Pluggable

650nm Industrial Fast Ethernet Transceiver

Temp	Standard RoHS Part Number	Voltage	Package	Data Rate	Reach		Connector	Module Type
					POF	HCS		
-25 to +85°C	AFBR-5978Z (with DMI)	3.3V	Duplex	125 MBd	50m	100m	SC-RJ**	2x6

** AFBR-5978Z is compatible with the SC-RJ Connecting System from Reichle & De-Massari AG, Switzerland

Ethernet Solutions

Gigabit Ethernet Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Ethernet 1 Gb/s	ABCU-573xxZ	SFP	Copper	100m	3.3V	-5 to 70°C	RJ-45	Pluggable
	ABCU-574xxZ	SFP	Copper	100m	3.3V	-5 to 70°C	RJ-45	Pluggable
	ABCU-573xAxZ	SFP	Copper	100m	3.3V	-40 to 85°C	RJ-45	Pluggable
	ABCU-574xAxZ	SFP	Copper	100m	3.3V	-40 to 85°C	RJ-45	Pluggable
Ethernet 1 Gb/s 850nm VCSEL	AFBR-53D5xZ	1x9	Multi-mode	550m	5V	0 to 70°C	SC	1x9
	AFBR-5601Z	GBIC	Multi-mode	550m	5V	0 to 70°C	SC	Pluggable
	AFBR-5710xxZ	SFP	Multi-mode	550m	3.3V	Various	LC	Pluggable
	AFBR-5715xxZ	SFP	Multi-mode	550m	3.3V	Various	LC	Pluggable
	HFBR-53A5VxMZ	1x9	Multi-mode	550m	3.3V	0 to 70°C	SC	1x9
	HFBR-5911LZ	SFF	Multi-mode	550m	3.3V	0 to 70°C	LC	2x5
	HFBR-5912EZ	SFF	Multi-mode	550m	3.3V	0 to 70°C	MTRJ	2x5
Ethernet/Fibre Channel 1 Gb/s 850nm VCSEL	AFBR-5701xxZ	SFP	Multi-mode	550m	3.3V	Various	LC	Pluggable
	AFBR-5705xxZ	SFP	Multi-mode	550m	3.3V	Various	LC	Pluggable
Ethernet/Fibre Channel 2.125 Gb/s 850nm VCSEL	AFBR-57M5APZ	SFP	Multi-mode	550m	3.3V	-10 to 85°C	LC	Pluggable
Ethernet 1 Gb/s 1310nm FP Laser	AFCT-5611Z	GBIC	Single-mode	10km	5V	0 to 70°C	SC	Pluggable
	AFCT-5710xxZ	SFP	Single-mode	10km	3.3V	Various	LC	Pluggable
	AFCT-5715xxZ	SFP	Single-mode	10km	3.3V	Various	LC	Pluggable
Ethernet/Fibre Channel 1 Gb/s 1310nm FP Laser	AFCT-5701xxZ	SFP	Single-mode	10km	3.3V	Various	LC	Pluggable
	AFCT-5705xxZ	SFP	Single-mode	10km	3.3V	Various	LC	Pluggable

SFPProbe Gigabit Ethernet Transceivers for PacketPortal

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Ethernet 1 Gb/s 850nm VCSEL	AFBR-5725PZ	iSFP	Multi-mode	550m	3.3V	0 to 85°C	LC	Pluggable
Ethernet 1 Gb/s 1310nm FP Laser	AFCT-5725PZ	iSFP	Single-mode	10km	3.3V	0 to 85°C	LC	Pluggable

10 Gigabit Ethernet Transceivers and Active Optical Cables

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Ethernet/FCoE 10 Gb/s 850nm VCSEL	AFBR-703SNZ	mini-SFP+ (mSFP)	Multi-mode	300m	3.3V	0 to 70°C	LC	Pluggable
10GbE/FCoE SR Transceiver; 850 nm VCSEL	AFBR-709xSxxZ	SFP+	Multi-mode	300m OM3 400m OM4	3.3V	Various	LC	Pluggable
10/1GbE SR Transceiver; 850 nm VCSEL	AFBR-709xDxxZ	SFP+	Multi-mode	300m OM3 400m OM4	3.3V	Various	LC	Pluggable
10GbE/FCoE USR Transceiver; 850 nm VCSEL	AFBR-708xSxxZ	SFP+	Multi-mode	100m OM3 150m OM4	3.3V	0-70 oC	LC	Pluggable
10GbE LRM Transceiver; 1310 nm FP Laser	AFBR-707xSxxZ	SFP+	Multi-mode	220m OM1	3.3V	0-70°C	LC	Pluggable
10GbE/FCoE LR Transceiver; 1310 nm DFB	AFCT-701xSxxZ	SFP+	Single-mode	10Km	3.3V	Various	LC	Pluggable

Ethernet Solutions

10 Gigabit Ethernet Transceivers and Active Optical Cables

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
10GbE SR Transceiver; 850 nm VCSEL	AFBR-720XPDZ	XFP	Multi-mode	300m OM3 400m OM4	3.3V	0-70°C	LC	Pluggable
10GbE LR Transceiver; 1310 nm DFB	AFCT-721XPDZ	XFP	Single-mode	10Km	3.3V	-5-70°C	LC	Pluggable
9.95Gb/s SONET / SDH Transceiver; 1310 nm DFB	AFCT-711XPDZ	XFP	Single-mode	10Km	3.3V	-5-70°C	LC	Pluggable
1-10GbE SFP+ AOC; 850nm VCSEL	AFBR-7CERxxZ	SFP+	Multi-mode	1-20m	3.3V	0 to 70°C	SFP+	Pluggable
1-10G QSFP+ to 4 SFP+ Octopus AOC	AFBR-7IERxxZ	QSFP+/ SFP+	Multi-mode	1-20m	3.3V	0 to 70°C	QSFP+/ SFP+	Pluggable

40 GbE QSFP Transceivers and Active Optical Cables

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
40GbE, SR4 Transceiver module; 850nm VCSEL	AFBR-79EQxZ	QSFP+	Multi-mode	100m OM3 150m OM4	3.3V	0 to 70°C	MTP	Pluggable
40GbE/4x10GbE, iSR4 Transceiver module; 850nm VCSEL	AFBR-79EixZ	QSFP+	Multi-mode	100m OM3 150m OM4	3.3V	0 to 70°C	MTP	Pluggable
40GbE/4x10GbE, Transceiver eSR4 module; 850nm VCSEL	AFBR-79EEzZ	QSFP+	Multi-mode	300m OM3 400m OM4	3.3V	0 to 70°C	MTP	Pluggable
40GbE/4xQDR AOC; 850nm VCSEL	AFBR-7QERxxZ	QSFP+	Multi-mode	1-20m	3.3V	0 to 70°C	QSFP+	Pluggable

Storage Solutions

ESCON/SBCON Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
ESCON/SBCON 200 Mb/s 1310nm LED	AFBR-5930Z	SFF	Multi-mode	2km	3.3V	0 to 70°C	MT-RJ	2x5
	HFBR-5320Z	ESCON	Multi-mode	2km	5V	0 to 70°C	ESCON	4x7
	HFBR-5984LZ	SFF	Multi-mode	2km	3.3V	0 to 70°C	LC	2x5

1 Gigabit Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Fibre Channel 1.06 Gb/s 850nm VCSEL	AFBR-53B3EZ	1x9	Multi-mode	500m	5V	0 to 70°C	SC	1x9
	AFBR-53D3EZ	1x9	Multi-mode	500m	5V	0 to 70°C	SC	1x9
	HFBR-53A3VFMZ	1x9	Multi-mode	500m	3.3V	0 to 70°C	SC	1x9

2 Gigabit Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Fibre Channel 2.125/1.06 Gb/s 850nm VCSEL	AFBR-57M5APZ	SFP	Multi-mode	300m at 2.125 GBd	3.3V	-10 to 85°C	LC	Pluggable
Fibre Channel 2.125/1.06 Gb/s 850nm VCSEL	AFBR-5921ALZ	SFF	Multi-mode	300m at 2.125 GBd	3.3V	-10 to 85°C	LC	2x5
	AFBR-59M5LZ	SFF	Multi-mode	300m at 2.125 GBd	3.3V	-10 to 85°C	LC	2x6
Fibre Channel 2.125/1.06 Gb/s 1310nm FP Laser	AFCT-57M5ATPZ	SFP	Single-mode	300m at 2.125 GBd	3.3V	-10 to 85°C	LC	Pluggable

Storage Solutions

4 Gigabit Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Fibre Channel 4.25/2.125/1.06 Gb/s 850nm VCSEL	AFBR-57R5AxZ	SFP	Multi-mode	150m at 4.25 GbD	3.3V	-10 to 85°C	LC	Pluggable
	AFBR-57R6AxZ	SFP	Multi-mode	150m at 4.25 GbD	3.3V	-10 to 85°C	LC	Pluggable
	AFBR-59R5xLZ	SFF	Multi-mode	150m at 4.25 GbD	3.3V	Various	LC	2x7
Fibre Channel 4.25/2.125/1.06 Gb/s 1310nm Various	AFCT-57R5xxPZ	SFP	Single-mode	4km, 10km and 30km at 4.25 Gb/s	3.3V	-10 to 85°C	LC	Pluggable

8 Gigabit Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Fibre Channel 8.5/4.25/2.125Gb/s 850nm VCSEL	AFBR-57D9AMZ	SFP+	Multi-mode	150m OM3 180m OM4	3.3V	-10 to 85 oC	LC	Pluggable
Fibre Channel 8.5/4.25/2.125 Gb/s 850nm VCSEL	AFBR-54D7APZ	mini-SFP+ (mSFP)	Multi-mode	150m at 8.5 GbD	3.3V	-10 to 85°C	LC	Pluggable
Fibre Channel 8.5/4.25/2.125 Gb/s 1310nm DFB Laser	AFCT-57D5AxPZ	SFP+	Single-mode	10km and 25km	3.3V	-10 to 85°C	LC	Pluggable

10 Gigabit Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Ethernet/FCoE 10 Gb/s 850nm VCSEL	AFBR-709xFxxZ	SFP+	Multi-mode	300m	3.3V	Various	LC	Pluggable
Ethernet/FCoE 10 Gb/s 1310nm DFB Laser	AFCT-701xSxDZ	SFP+	Single-mode	10km	3.3V	Various	LC	Pluggable
Ethernet 10 Gb/s 1310nm DFB Laser	AFCT-721XPdZ	XFP	Single-mode	10km	3.3V	-5 to 70°C	LC	Pluggable

16 Gigabit Storage Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Fibre Channel 14.025/8.5/4.25 Gb/s 850nm VCSEL	AFBR-57F5MZ	SFP+	Multi-mode	100m OM3 125m OM4	3.3V	0 to 70°C	LC	Pluggable
Fibre Channel 14.025/8.5/4.25 Gb/s 1310 DFB Laser	AFCT-57F5TMZ	SFP+	Single-mode	10km	3.3V	0-70°C	LC	Pluggable
4 x14G proprietary link	AFBR-79F4DZ	QSFP+	Multi-mode	50m OM3 75m OM4	3.3V	0-70°C	MPO	Pluggable
4 x14G proprietary link (Non-DMI)	AFBR-79F4Z	QSFP+	Multi-mode	50m OM3 75m OM4	3.3V	0-70°C	MPO	Pluggable

Base Station Solutions

OBSAI/CPRI Optical Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Base Station 3.072/2.4576 Gb/s 850nm VCSEL	AFBR-57J5APZ	SFP	Multi-mode	500m	3.3V	-40 to 85°C	LC	Pluggable
Base Station 7.37/6.14 Gb/s 850nm VCSEL	AFBR-57J9APZ	SFP	Multi-mode	300m	3.3V	-40 to 85°C	LC	Pluggable
Base Station 3.072/2.4576 Gb/s 1310nm DFB Laser	AFCT-57J5ATPZ	SFP	Single-mode	20km	3.3V	-40 to 85°C	LC	Pluggable
	AFCT-57J5ANPZ	SFP	Single-mode	40km	3.3V	-40 to 85°C	LC	Pluggable
Base Station 3.072/2.4576 Gb/s 1310nm FP Laser	AFCT-57J5APZ	SFP	Single-mode	8km	3.3V	-40 to 85°C	LC	Pluggable
Base Station 7.37/6.14 Gb/s 1310nm DFB Laser	AFCT-57J7ATPZ	SFP	Single-mode	20km	3.3V	-40 to 85°C	LC	Pluggable

Metro Network Solutions

OC-3/SONET/SDH Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
SONET/SDH 155 Mb/s 1310nm LED	AFBR-5805xxZ	1x9	Multi-mode	2km	5V	Various	SC	1x9
	AFBR-5905xZ	SFF	Multi-mode	2km	5V	Various	MTRJC	2x5
	HFBR-57E0xxZ	SFP	Multi-mode	2km	3.3V	Various	LC	Pluggable
	HFBR-5961xLZ	SFF	Multi-mode	2km	3.3V	Various	LC	2x5
	HFBR-5963xLZ	SFF	Multi-mode	2km	3.3V	Various	LC	2x5
SONET/SDH 155 Mb/s 1310nm LED	AFCT-5760xxxZ	SFP	Single-mode	2km, 15km and 40km	3.3V	Various	LC	Pluggable
	AFCT-5765xxxZ	SFP	Single-mode	2km, 15km and 40km	3.3V	Various	LC	Pluggable
SONET/SDH 155 Mb/s 1310nm FP Laser	AFCT-5805xZ	1x9	Single-mode	15km	3.3/5V	Various	SC	1x9
SONET/SDH 155 Mb/s 1310nm FP Laser	AFCT-5815xZ	1x9	Single-mode	40km	3.3/5V	Various	SC	1x9
SONET/SDH 155 Mb/s 1310nm FP Laser	AFCT-5961xxxZ	SFF	Single-mode	40km	3.3V	Various	LC	2x5
	AFCT-5962xxxZ	SFF	Single-mode	40km	3.3V	Various	LC	2x10
	AFCT-5963xxxZ	SFF	Single-mode	40km	3.3V	Various	LC	2x5
	AFCT-5964xxxZ	SFF	Single-mode	40km	3.3V	Various	LC	2x10

OC-12/SONET/SDH Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
SONET/SDH 622 Mb/s 1310nm LED	HFBR-5208MZ	1x9	Multi-mode	500m	5V	Various	SC	1x9

Metro Network Solutions

OC-48/SONET/SDH Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
Sonet/SDH 2.488	AFCT-5943LZ	SFF	Single-mode	2km	3.3V	-0 to 70°C	LC	2x5 SFF
Sonet/SDH 2.488	AFCT-5943ALZ	SFF	Single-mode	2km	3.3V	-40 to 85°C	LC	2x5 SFF
Sonet/SDH 2.488	AFCT-5944LZ	SFF	Single-mode	2km	3.3V	-0 to 70°C	LC	2x10 SFF
Sonet/SDH 2.488	AFCT-5944ALZ	SFF	Single-mode	2km	3.3V	-40 to 85°C	LC	2x10 SFF

OC-192/SONET/SDH Transceivers

	Part Number	Package	Media Type	Reach	Voltage	Case Temp	Connector	Module Type
SONET/SDH 9.95 Gb/s 1310nm DFB Laser	AFCT-711XPDZ	XFP	Single-mode	10km	3.3V	-5 to 70°C	LC	Pluggable

15 Introduction

16 Component Descriptions

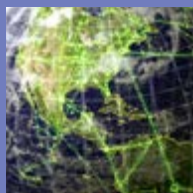
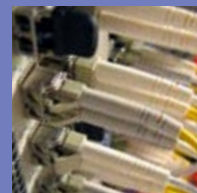
Product Selection Guide

17 Components on Board

17 TO-Can based Components

17 Photonic IC Components

17 TOSA/ROSA



Optical Components for Broadband Networking and Communication Applications



Avago Technologies is a global technology leader in Indium Phosphide (InP) based optical components. Our products enable applications in the Fiber-To-The-Home (FTTH), Broadband Internet Access, Datacenter and Enterprise Networking, and Metro and Long Haul Data Communications as well as other emerging end applications like defense and aerospace, high performance computing, and medical. Avago optical components are organized into four product groups: Components on Board, TO-Can Based Components, Photonic IC Components, and TOSA/ROSA.



Components on Board

Designed for GEAPON and GPON FTTH “triple play” (data, voice and video) applications these solutions are either deployed in Optical Networking Units (ONUs) at the customer premise or in Op the central office, featuring duplex operation over a single fiber. Avago offer solutions suitable for both the IEEE 802.3ah GEAPON and the ITU/FSAN GPON G.984.5 network standards and for all variations of fiber penetration, from fiber to the node to fiber to the residential home. In addition, Avago has introduced a line of next generation PON ONU and OLT solution in support of the emerging 10G/1G and 10G/10G EPON versions compliant with IEEE 802.3av, as well as 10G/2.5G XG-PON1 versions compliant with ITU G.987.



TO-Can based Components

Avago provides a broad array of InP-based lasers and detectors packaged in TO-cans as technology enablers for TOSA/ ROSA and BOSA/TRISA. Avago has been a long-time industry leader in the design, fabrication and quality assurance of high-performance laser and detector chips with over 1 trillion (10⁹) service hours (<1 FIT) since 2005, providing an unsurpassed record for ultra-high reliability. Avago offers TO-can products suitable for the GPON and 10GEAPON, CWDM/DWDM Wireless Backhaul and Metro market segments. The TO-can portfolio includes uncooled Fabry Perot and uncooled / cooled DFBs as well as APDs.



Photonic IC Components

Avago’s in-house InP and Silica-on Silicon (SoS) technology platforms and diverse toolbox of device elements enable the efficient design and the scalable high volume fabrication for a broad variety of optical ASICs. Whether by single chip (monolithic) integration or by multi-chip (hybrid) assemblies, Avago has achieved highest levels of integration using both InP and SoS together with our highly automated, sub-micron precision assembly platforms. The high level of integration enables us to provide solutions that have significantly smaller size, higher reliability and lower power consumption compared to traditional discrete components. Our current product offering includes 40G and 100G PM-QPSK receivers for the long haul market segment, as well as 10x10G Transmit/ Receive Optical Subassemblies (TOSA/ ROSA) for the metro market. Avago has also introduced 4x10G TOSA/ROSA for the 40G-LR4 LAN/Datacenter market and is introducing 4x25G TOSA/ ROSAs for 100G-LR4 applications in compliance with the IEEE-802.bc specifications.

TOSA/ROSA

With class-leading electro-optic performance and exceptionally low power consumption, Avago’s 10G and 2.5G TOSAs are designed for integration into SFP+, XFP, SFP and other transceiver and transponder modules, as well as optical line cards addressing Metropolitan Network applications. 10G APD and PIN ROSAs with high sensitivity have also been developed for use in XFP and SFP+ for >11Gb/s (FEC) rates. Furthermore, the TOSA portfolio is broadened through Avago’s 1.3 μm uncooled 10G Fabry-Perot (FP) and Direct Modulated (DML) lasers for wide-temperature Time-Division-Multiplexing (TDM) and Coarse-wavelength-Division-Multiplexing (CWDM) applications in Access, Metro and LAN/Datacenter applications. 10G Tunable TOSAs for Metro applications and narrow line width Micro-ITLAs (Micro Integrable Tunable Laser Assemblies) for Long-Haul and Coherent transmission applications complete the TOSA/ ROSA product offering.



Selection Guide

	Part Number	Product Description	Max Data Rate (Gbps)	Wavelength (nm)	
				Tx (DFB/EML/FP)	Rx (APD/PIN)
Components on Board	BX-1112	GPON ONU BOSA	2.5	1310 (DFB)	1490 (APD)
	BX-1442	GPON ONU TRISA	2.5	1310 (DFB)	1490 (ADP), 1550 (PIN)
	BX-2112	GPON OLT BOSA	2.5	1490 (DFB)	1310 (APD)
	BT-1112	EPON ONU BOSA (asymmetrical)	10	1310 (DFB)	1577 (APD)
	BT-1212	EPON ONU BOSA (symmetrical)	10	1270 (DFB)	1577 (APD)
	BT-2442	EPON ONU TRISA	10	1490 (DFB), 1577 (EML)	1310 (APD)
TO-Can Based Components	TO293Bx	1.3 μm DFB Chip for Uncooled Applications	2.5	1310 (DFB)	n/a
	TO293Bxxx	1.3 μm DFB Chip for Uncooled Applications (CWDM)	2.5	1310 (DFB)	n/a
	TO295J	1.5 μm DFB Chip for Uncooled Applications	2.5	1550 (DFB)	n/a
	TO295Jxxx	1.5 μm DFB Chip for Uncooled Applications (CWDM)	2.5	1550 (DFB)	n/a
	TO295J149	1.49 μm DFB Chip for FTTx Applications	2.5	1490 (DFB)	n/a
	TO295155	1.5 μm DFB Chip for Uncooled Applications	2.5	1550 (DFB)	n/a
	TO124NLV	APD-TIA	2.5	n/a	1270-1610nm (APD)
	TO293BxxxH	1.3 μm DFB Chip for 20km Wide-Temperature Uncooled Applications (CWDM)	6	1310 (DFB)	n/a
	TO295JxxxH	1.5 μm DFB Chip for 20km Wide-Temperature Uncooled Applications (CWDM)	6	1550 (DFB)	n/a
	TC293BxxxH	1.3 μm DFB Chip for 20km Cooled Applications CWDM/DWDM	6	1310 (DFB)	n/a
	TC295JxxxH	1.5 μm DFB Chip for 20km Cooled Applications (CWDM/DWDM)	6	1550 (DFB)	n/a
	TO299K	1.3 μm FP Chip for 2km Wide-Temperature Uncooled Applications	10	1310 (FP)	n/a
	TO293K	1.3 μm DFB Chip for 20km Wide-Temperature Uncooled Applications	10	1310 (DFB)	n/a
	TO293B1xxT	1.3 μm DFB Chip for 20km Wide-Temperature Uncooled Applications (CWDM)	10	1310 (DFB)	n/a
	TO295JxxxT	1.5 μm DFB Chip for 20km Wide-Temperature Uncooled Applications (CWDM)	10	1550 (DFB)	n/a
	TC293BxxxT	1.3 μm DFB Chip for 20km Cooled Applications (CWDM/DWDM)	10	1310 (DFB)	n/a
	TC294Yxx	1.5 μm EML Chip for 40km Cooled Applications (DWDM)	10	1550 (EML)	n/a
	TC295JxxxT	1.5 μm DFB Chip for 20km Cooled Applications (CWDM/DWDM)	10	1550 (DFB)	n/a
TO124EAT	APD-TIA	10	n/a	1270-1610nm (APD)	
Photonic IC Components	TC294Yxx	Integrated Coherent Receiver (OIF Compatible)	40	n/a	1550 (PIN)
	TC295JxxxT	Integrated Coherent Receiver (OIF Compatible)	100	n/a	1550 (PIN)
	TO124EAT	10x10G DWDM EML Transmit Optical Subassembly (CFP Compatible)	100	1550 (EML)	n/a
	RPIC-41010	10x10G DWDM PIN or APD Receive Optical Subassembly (CFP Compatible)	100	n/a	1550 (APD or PIN)
	TPIC-10410	4x10G 40GBASE-LR4 Transmit Optical Subassembly (QSFP+ Compatible)	40	1310 (DFB)	n/a
	RPIC-10410	4x10G 40GBASE-LR4 Receive Optical Subassembly (QSFP+ Compatible)	40	n/a	1310 (PIN)
	R4X25PL	4x25G 100GBASE-LR4 Transmit Optical Subassembly	100	1310 (EML)	n/a
	T4X25EL	4x25G 100GBASE-LR4 Receive Optical Subassembly	100	n/a	1310 (PIN)
TOSA/ROSA	1610	1.5 μm Cooled DFB MSA TOSA, 120km, TDM, DWDM & CWDM	2.5	1550 (DFB)	n/a
	1611	1.5 μm Cooled DFB MSA TOSA, 200km, TDM, DWDM & CWDM	2.5	1550 (DFB)	n/a
	1608	1.5 μm Cooled DFB MSA TOSA, 80km, DWDM	4.25	1550 (DFB)	n/a
	1625	1.5 μm Cooled EML XMD MSA TOSA, 40km, TDM & C/DWDM, Standard & Extended Temperature (-40/+90°C)	10	1550 (EML)	n/a
	1626	1.5 μm Cooled EML XMD MSA TOSA, 80km, TDM & C/DWDM, Standard & Extended Temperature (-40/+90°C)	10	1550 (EML)	n/a
	1655	1.5 μm Cooled EML XMD MSA TOSA, 40km, TDM & DWDM, Standard & Extended Temperature (-40/+90°C), Extra-low PTEC	10	1550 (EML)	n/a
	1656	1.5 μm Cooled EML XMD MSA TOSA, 80km, TDM & DWDM, Standard & Extended Temperature (-40/+90°C), Extra-low PTEC	10	1550 (EML)	n/a
	1640	PIN ROSA with Limiting or Linear TIA	10	n/a	1310 or 1550 (PIN)
	1641	APD ROSA with Limiting or Linear TIA	10	n/a	1310 or 1550 (APD)
	TX293K	1.3 μm Uncooled XMD DFB TOSA for Wide-Temperature Uncooled Applications	10	1310 (DFB)	n/a
	TX293-CWDM	1.3 μm Uncooled XMD DFB CWDM TOSA for Wide-Temperature Uncooled Applications	10	1310 (DFB)	n/a
	TX299K	1.3 μm Uncooled XMD Fabry Perot TOSA for Wide-Temperature Uncooled Applications	10	1310 (FP)	n/a
	1715	C-Band Tunable 10Gb/s TOSA	10	DBR/ MZM	n/a
	uITLA	Micro Integrable Tunable Laser Assembly (micro-ITLA)	CW	ECL	n/a

- 19 Introduction
- 20 Fundamentals
- 21 Industrial Fiber Optic Transceiver**
 - 650nm Industrial Fiber Optic Components**
 - 22 Fieldbus (SMA/ST Connectors)
 - 23 Versatile Link Package/Connector
 - 24 Connectorless
- 25 Miniature Link 820nm/850nm/1300nm Industrial Fiber Optic Components**
 - Plastic Optical Fiber Cables**
 - 27 Plastic Optical Fiber Specifications: HFBR-C/E/RXXYYZ
 - POF and HCS Connectors and Accessories**
 - 29 Plastic Optical Fiber Connectors
 - 29 Plastic Optical Fiber Accessories



Fiber Optic Components for Industrial, Automation, Power Generation/ Distribution, Transportation, Gaming and Medical Applications



Avago Technologies is the world's leading provider of fiber optic transmitters, receivers, and transceivers. Avago offers unmatched quality with high-volume, cost-effective manufacturing techniques. Industry leaders and small firms alike turn to Avago for their fiber optic needs.

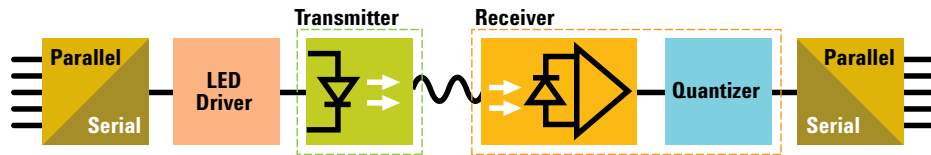
The SFH-series (Connectorless) has 650nm fiber-optic components with the capability to work with unconnectorized POF (plastic optical fiber) for ease of installation. The Versatile Link Package contains 650nm discrete components that feature snap-in connector parts. The SMA/ST Package is an extremely robust industrial-grade family with SMA or ST ports suitable for use in Fieldbus applications. The Miniature Link family which provides greater link-lengths, is available with 820nm and 1300nm technology. These are discrete components that can use SMA, ST, SC, or FC connectors.

Fundamentals of Digital Fiber Optic Links

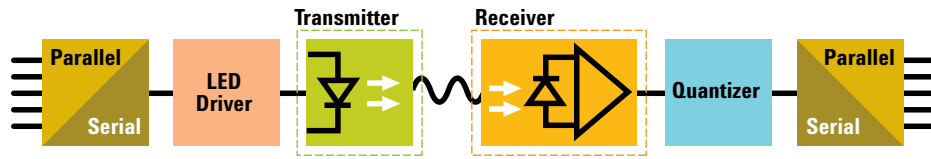
All the optical transmitters from these families include an LED without driver circuitry. Cost effective driver ICs are available from many suppliers, and we offer application notes that will demonstrate easy integration of these ICs into a transmitter circuit.

The optical receivers from DC up to 50 MBd include a photodiode, preamp, and quantizer circuit (shown in the block diagram below). These receivers have TTL outputs (dc coupled) and can be used with arbitrary timing (no duty factor restriction). Typical applications are RS232, RS485, SERCOS, INTERBUS-S and PROFIBUS protocols.

Typical link block diagram from DC to 50 MBd.



Typical link block diagram from 1 MBd to 160 MBd.



The receivers for data rates from 1 MBd to 160 MBd include a photodiode, pre-amp and analog outputs. They have to be ac coupled to a comparator or quantizer circuitry to provide digital logic levels (i.e. ECL, TTL). The ac coupling requires encoding of the serial data (i.e. Manchester, 4B/5B, scrambled coding), but provide better sensitivity than DC coupled receivers.

Plastic Optical Fiber (POF) Components

Avago Technologies is committed to the advancement of fiber optics technologies and recognizes the importance of optical data transmission for today's growing data networking needs. Plastic Optical Fiber (POF) enables low-cost applications with the advantages of optical data transmission; suitable for automotive, industrial and consumer markets.

Industrial Fiber Optic Transceiver

Providing a comprehensive line of high-performance fiber optic transceivers, Avago's products reliably support a wide range of industrial data networking standards and speeds.

Applications

- Factory automation at Fast Ethernet speeds
- Fast Ethernet networking
- IPTV connection high-speed gateway to set-top box
- Home networking
- Industrial applications

Industrial Fiber Optic Transceiver

Connector Configuration	Data Rate	Reach	Fiber	Supply Voltage	Part Numbers	DMI	Evaluation Board	
	SFF/LC	Fast Ethernet (10/100 Mbps)	2000m	Multi-mode	3.3V	HFBR-5963LZ AFBR-59E4APZ	No	
	SFF/MT-RJ	Fast Ethernet (10/100 Mbps)	2000m	Multi-mode	3.3V	AFBR-5903AZ	No	
	SFP/LC	Fast Ethernet (10/100 Mbps)	2000m	Multi-mode	3.3V	HFBR-57E0APZ HFBR-57E5APZ	No Yes	
	1x9/SC	Fast Ethernet (10/100 Mbps)	2000m	Multi-mode	3.3V/5V	AFBR-5803ATQZ	No	
	1x9/ST	Fast Ethernet (10/100 Mbps)	2000m	Multi-mode	3.3V/5V	AFBR-5803ATQZ	No	
	Versatile Link	Fast Ethernet (10/100 Mbps)	50m	POF	3.3V	AFBR-5972Z	No	AFBR-0544Z
	SC-RJ Profinet®	Fast Ethernet (10/100 Mbps)	50/100m	POF/HCS®	3.3V	AFBR-5978Z	Yes	AFBR-0978Z



650nm Industrial Fiber Optic Components

Components listed here are compatible with both plastic (1 mm core diameter) and HCS® (hard clad silica) optical fibers. Plastic fiber (1mm core diameter), often specified in cost-effective solutions will see implementations in frequency conversion, power electronics control and industrial fieldbuses. HCS is typically used for higher data rates and link length. Connectorization schemes include Connectorless, ST, SMA and Versatile Link.

Applications

- Factory automation
- Industrial networking and fieldbuses
- Audio visual links and datalinks, up to 160 Mbd
- High-voltage conversion
- IGBT, GTO, IGCT power electronics
- High-voltage isolation
- Gaming
- Human machine interfaces



Fieldbus (SMA/ST Connectors)

Connector Configuration	Data Rate	Reach		Supply Voltage	Part Numbers		Application Notes	Evaluation Board
		POF	HCS®		Transmitter	Receiver		
	DC-2MBd	50m	400m	5V	HFBR-1505CZ	HFBR-2505CZ		HFBR-0538Z
		50m	300m	5V	HFBR-1505CFZ	HFBR-2505CFZ		
		20m		5V	HFBR-1602Z	HFBR-2602Z		
		20m		5V	HFBR-1604Z	HFBR-2602Z		
	DC-10MBd	40m	200m	5V	HFBR-1505AZ	HFBR-2505AZ	AN1080	HFBR-0540Z
		40m	100m	5V	HFBR-1505AFZ	HFBR-2505AFZ		
	DC-16MBd	45m	200m	5V	HFBR-1506AMZ	HFBR-2506AMZ	AN5006	HFBR-0541Z
		45m	100m	5V	HFBR-1506AFZ	HFBR-2506AFZ		
	2MBd - 16MBd	45m		3.3V/5V	HFBR-1506AFZ	HFBR-2555AFZ		
		DC-10MBd	40m	200m	5V	HFBR-1515BZ	HFBR-2515BZ	AN1080
40m			100m	5V	HFBR-1515BFZ	HFBR-2515BFZ		

Versatile Link Package/Connector

Connector Configuration	Data Rate	Reach		Supply Voltage	Part Number		Application Notes	Evaluation Board	
		POF	HCS®		Transmitter	Receiver			
	Horizontal	DC-40kBd	110m		5V	HFBR-1523Z	HFBR-2523Z	AN1035	HFBR-0503Z
		DC-1MBd	10m		5V	HFBR-1524Z	HFBR-2524Z	AN5374	
			45m		5V	HFBR-1522Z	HFBR-2522Z	AN1035	HFBR-0502Z
			45m		5V	HFBR-1522ETZ	HFBR-2522ETZ		
		DC-5MBd	20m		5V	HFBR-1521Z	HFBR-2521Z	AN1035	HFBR-0501Z
			20m		5V		HFBR-2521ETZ		
		DC-10MBd	40m	200m	3.3V/5V	AFBR-1529Z	AFBR-2529Z		
		DC-50MBd	50m		3.3V/5V	AFBR-1624Z	AFBR-2624Z		AFBR-0546Z AFBR-0548Z
			50m		3.3V/5V	AFBR-1629Z	AFBR-2529Z		AFBR-0547Z
		125MBd	30m	100m	5V	HFBR-1527Z	HFBR-2526Z	AN1121 AN1123 AN1066	HFBR-0527xZ
			30m	100m	5V	HFBR-1527ETZ	HFBR-2526ETZ		
160MBd	50m	50m	5V	HFBR-1527Z	HFBR-2526Z				
	50m	50m	5V	HFBR-1527ETZ	HFBR-2526ETZ				
	Vertical	DC-40kBd	110m		5V	HFBR-1533Z	HFBR-2533Z	AN1035	HFBR-0503Z
		DC-1MBd	10m		5V	HFBR-1534Z	HFBR-2534Z	AN5374	
			45m		5V	HFBR-1532Z	HFBR-2532Z	AN1035	HFBR-0502Z
		DC-5MBd	20m		5V	HFBR-1531Z	HFBR-2531Z	AN1035	HFBR-0501Z
			20m		5V	HFBR-1531ETZ	HFBR-2531ETZ	AN1035	
		125MBd	30m	100m	5V	HFBR-1537Z	HFBR-2536Z	AN1066	HFBR-0527xZ
160MBd	50m	50m	5V	AN1123					
	Tilted	DC-1MBd	45m		5V	HFBR-1542ETZ	HFBR-2542ETZ	AN1035	HFBR-0502Z
		DC-5MBd	20m		5V	HFBR-1541ETZ	HFBR-2541ETZ	AN1035	HFBR-0501Z
		DC-50MBd	50m		3.3V/5V	AFBR-1644Z	AFBR-2644Z		AFBR-0546Z AFBR-0548Z
	FO Short Link	DC-10MBd	24.96mm Creepage & Clearance		5V	HFBR-3810Z & HFBR-3810MSZ			HFBR-0543Z

Connectorless

Connector Configuration	Data Rate	Reach		Supply Voltage	Part Numbers		Application Notes	Evaluation Board	
		POF	HCS [®]		Transmitter	Receiver			
	V-Housing	DC-5MBd	20m		5V	SP000063858 (SFH757V)	SP000063855 (SFH551/1-1V)	AN5341 AN5342	
		100MBd	20m		5V	SP000063858 (SFH757V)	SP000063852 (SFH250V)		
	LL-Housing	DC-5MBd	20m		5V	SP000063871 (SFH757)	SP000063860 (SFH551/1-1)	AN5341 AN5342	
		100MBd	20m		5V	SP000063871 (SFH757)	SP000063866 (SFH250)		

Miniature Link 820nm/850nm/1300nm Industrial Fiber Optic Components

These cost-effective components with long link-length capabilities can be used to build high-performance ethernet transceivers. Typical applications include FDDI, Token Ring, FOIRL, 10Base-FL and 100Base-SX. Glass fiber specified in this selection guide are multimode fiber both 62.5/125 μm and 50/125 μm multi-mode glass fiber can be used.



Applications

- LAN applications, such as 10Base-FL
- FDDI, Token Ring, 100base-SX
- Audio video links and industrial datalinks
- Wind turbine control system and farm networking
- Hydro and solar power generation plants
- Media and fiber converters
- Railway control systems
- Locomotive in-car and car-to-car communications
- Motorway infrastructures

Miniature Link 820nm/850nm/1300nm Industrial Fiber Optic Components

Connector Configuration	Data Reach	Reach	Voltage	Standard RoHS Part Number		Evaluation Board
				Transmitter	Receiver	
ST, SMA, FC	DC-5 MBd	1500m	5V	HFBR-14X2Z	HFBR-24X2Z	HFBR-0410Z
ST, SC, SMA	20 MBd	2700m	5V	HFBR-14X4Z	HFBR-24X6Z	HFBR-0416Z
	32 MBd	2200m				
	55 MBd	1400m				
	125 MBd	700m				
	155 MBd	600m				
ST, SC, SMA	160 MBd	500m	3.3V/5V	HFBR-14X4Z HFBR-1712TZ	AFBR-24X9XZ	
	20 MBd	3000m				
	32 MBd	2200m				
	40 MBd	1500m				
ST	50 MBd	1000m	5V	HFBR-1312TZ	HFBR-2316TZ	HFBR-0310Z
	20 MBd	5000m				
	32 MBd	3200m				
	55 MBd	3200m				
	125 MBd	2800m				
	155 MBd	2700m				
ST	160 MBd	2000m	5V	HFBR-1712TZ	HFBR-24XXZ	HFBR-0542Z
	DC-5 MBd	4000m				
	20 MBd	2700m				
	32 MBd	2200m				
	55 MBd	1400m				
	125 MBd	700m				
	155 MBd	600m				
160 MBd	500m					

Plastic Optical Fiber Cables

The HFBR-C/E/RXXYYZ series of plastic fiber optic cables are constructed of a single step index fiber, sheathed in a black polyethylene jacket. The duplex fiber consists of two simplex fibers joined with a zipcord web. Standard attenuation and extra low loss POF cables are identical except for attenuation specifications. Polyethylene jackets on all plastic fiber cables comply with ULVW-1 flame retardant specification (UL file #E89328). Cables are available in unconnectorized or connectorized options.

Compatible with our Versatile Link family of connectors and fiber optic components, we offer 1mm diameter (outer diameter 2.2 mm) POF in two grades: Standard POF with 0.22 dB/m typical attenuation or High Performance Extra Low Loss POF with 0.19 dB/m typical attenuation.

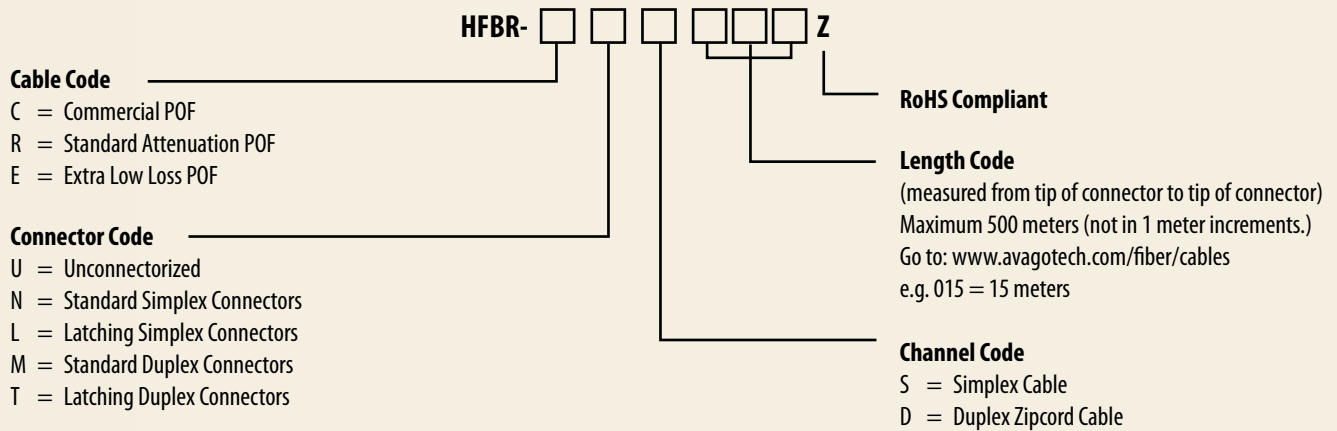
Applications

- Industrial data links for factory automation and plant control
- Intra-system links: board-to-board or rack-to-rack
- Telecommunications switching systems
- Computer-to-peripheral data links,
- PC bus extension
- Proprietary LANs
- Digitized video
- Medical instruments
- Reduction of lightning and voltage transient susceptibility
- High-voltage isolation
- Power electronics
- Gaming equipment
- Data communications



Plastic Optical Fiber Specifications: HFBR-C/E/RXXYYZ

Parameter		Symbol	Min.	Typ.	Max	Unit	Condition
Cable Attenuation Source: 660nm LED, 0.5 NA (HFBR-15xxZ) Length: 50m	Commercial Grade cable, type "C"	α_0	0.15	0.22	0.27	dB/m	T _A =0°C to +70°C
	Standard cable type "R"		0.15	0.22	0.27		T _A =-40°C to +85°C
	Extra low loss type "E"		0.15	0.19	0.23		T _A =-40°C to +85°C
Reference Attenuation Source: 650nm, 0.5 NA (monochrometer) Length: 50m	Commercial Grade cable, type "C"	α_R	0.12	0.19	0.24	dB/m	T _A =0°C to +70°C
	Standard cable type "R"		0.12	0.19	0.24		T _A =-40°C to +85°C
	Extra low loss type "E"		0.12	0.16	0.19		T _A =-40°C to +85°C
Numerical Aperture		NA	0.46	0.47	0.50		>2meters
Diameter, Core and Cladding	DC	0.94	1.00	1.06	mm		





POF and HCS Connectors and Accessories

Crimp Style

The HFBR-4501Z, HFBR-4503Z and HFBR-4506Z connector styles are available for termination of plastic optical fiber: simplex, simplex latching, duplex and duplex latching. All connectors provide a snap-in action when mated to Versatile Link components. Simplex connectors are color coded to facilitate identification of transmitter and receiver connections. Duplex connectors are keyed so that proper orientation is ensured during insertion. The connectors are made of a flame retardant VALOX UL94 V-0 material (UL file # E121562).

Crimpless Style

The HFBR-453XZ series connectors are an enhanced version of the HFBR-4501Z and HFBR-4503Z connectors for plastic optical fiber, compatible with Avago's Versatile Link series transmitters and receivers. This design uses a simple, snap-together concept, which eliminates the need for crimping. User labor and tool cost are reduced together with the yield loss due to installation error. The HFBR-453XZ series connectors are available in two-styles: latching and non-latching. For a duplex connector, two nonlatching simplex connectors can be snapped together. The connectors are made of a rugged, flame resistant plastic which is good for industrial and other harsh environments. The HFBR-453XZ series connectors are for use with plastic optical fiber only.

Plastic Optical Fiber Connectors

Part Number	Description
HFBR-4501Z/4511Z	Gray/blue simplex connector with crimp ring
HFBR-4503Z/4513Z	Gray/blue simplex latching connector with crimp ring
HFBR-4505Z/4515Z	Gray/blue mating adapter for two simplex non-latching POF connectors
HFBR-4506Z/4516Z	Parchment/gray duplex connector with crimp ring
HFBR-4531Z/4532Z	Black crimpless simplex non-latching/latching connector
HFBR-4533Z/4535Z	Blue/gray crimpless simplex non-latching connector
AFBR-4526Z	Black crimpless latching connector (mating transceiver: AFBR-5972Z)

Plastic Optical Fiber Accessories

Part Number	Description
HFBR-4522Z	500 HFBR-0500 products port plugs
HFBR-4525Z	1000 simplex crimp rings
HFBR-4526Z	500 duplex crimp rings
HFBR-4593Z	Polishing kit (one polishing tool, two pieces 600 grit abrasive paper and two pieces 3µm pink lapping film)
AFBR-4594Z	Polishing kit for AFBR-4526Z (One polishing tool, two pieces 600 grit abrasive paper, and two pieces 3µm pink lapping film)
HFBR-4597Z	Crimping tool 4.5 - 5.5mm for simplex/duplex crimp rings



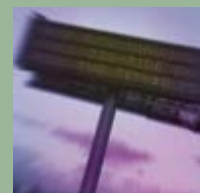
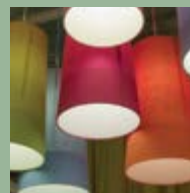
LED Solutions

High Brightness LEDs

- 32 High Brightness Through-hole Lamps
- 42 High Brightness Surface Mount Lamps
- 44 Surface Mount PLCC LEDs
- 60 Mini PLCC-2 Surface Mount LEDs
- 63 Envisium™ Surface Mount Power PLCC-4 LEDs
- 67 High Power LEDs
- 72 Moonstone™ High Power LEDs

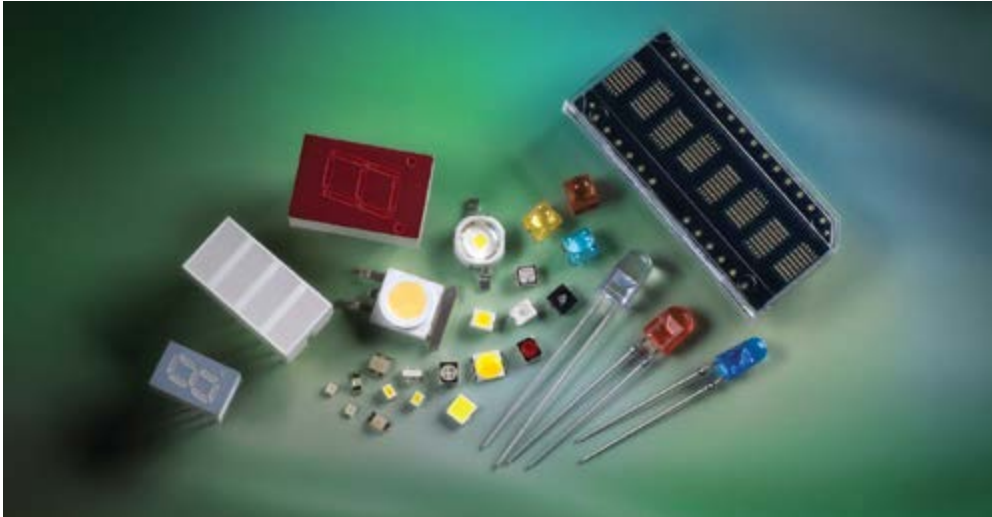
LED Indicators and Displays

- 75 Standard Through-hole Lamps
- 80 Subminiature Lamps
- 84 Surface Mount ChipLEDs
- 92 Auto Focus Auxiliary Flash LEDs
- 95 Seven-Segment Displays
- 125 Light Bars and Bar Graph Arrays
- 129 Smart Displays



LED Solutions

High Brightness LEDs, Indicators and Displays



Avago Technologies offers “one-stop shopping” with its wide array of LED (Light Emitting Diodes) Solutions. With our large manufacturing base and many years of experience from our HP and Agilent days, we are one of the largest producers of visible LEDs in the world and ships billions of products annually.

Avago employs the latest in material and process technology to produce superior LEDs. Our highly acclaimed AlInGaP (aluminium indium gallium phosphide) LED material offers high brightness and stable light output over thousands of hours with excellent mean-time-before-failure (MTBF). With our cutting edge LED technology, our solution also offers dazzling blue and green colors with InGaN (indium gallium nitride) material, and very cost-effective GaP (gallium phosphide) based technology, perfect for low to moderate light output. Avago’s LEDs create brilliant lights with rich life-like colors for our customers’ applications which are longer lasting and at a globally competitive price. They are suitable for almost any applications that customers need today with wide selection of viewing and package options.

Key products range from high brightness and high power LEDs, surface mount lamps, PLCC surface mount LEDs, to standard brightness through-hole lamps, chip LEDs, flash LEDs and various LED displays. These LED Solutions address a wide range of markets, including electronic sign and signal, automotive, solid-state lighting, consumer electronics, home and mobile appliances.

For virtually all established and emerging applications, Avago Technologies has the right LED Solutions to meet your design requirements.

High Brightness LEDs



High Brightness Through-hole Lamps

Description

Avago Technologies offers two types of technology based LEDs AllnGaP and InGaN which are suitable for high brightness needs. Through Hole LEDs are offered in 4 mm and 5 mm package.

These devices are casted using advance optical grade epoxy, which provides superior high temperature performance and excellent moisture resistance.

These High Brightness Through Hole LEDs are suitable for application in traffic management, solar powered variable message signs and commercial outdoor advertising video displays.

Features and Benefits

- Excellent product quality and reliability
- Wide range of products
- Competitive pricing
- Wide operating temperature range
- Low power consumption
 - High efficiency, low drive currents and low driving voltages required.
- Colors available for AllnGaP LED lamps:
Red (626nm), Red Orange (615nm), Orange (605nm) and Amber (590nm)
- Colors available for InGaN LED lamps:
Blue (470nm), Green (525nm).
- Packaging options
 - Bulk
 - Ammopack

Typical Applications

- Electronic Signs and Signals
 - Traffic Signal
 - Variable Message Sign
 - Pedestrian Signal
 - Work Zone Warning Lights
- Solar Powered Sign
- Commercial Outdoor Advertising
 - Full Color Sign
 - Mono Color Sign

High Brightness LEDs

High Brightness 5mm Round LED Lamp

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle (°)	Standoff (Yes/NO)	Luminous Intensity (mcd) @ 20 mA		Package Drawing
					Min.	Max.	
5 mm Round LED Lamps							
8° Viewing Angle							
HLMP-EG08-X1000	Red	626	8	No	7200	21000	A
HLMP-EG10-X1000	Red	626	8	Yes	7200	21000	B
HLMP-EH08-Y2000	Red-Orange	615	8	No	9300	27000	A
HLMP-EH10-Y2000	Red-Orange	615	8	Yes	9300	27000	B
HLMP-EJ08-X1000	Orange	605	8	No	7200	21000	A
HLMP-EJ10-X1000	Orange	605	8	Yes	7200	21000	B
HLMP-EL08-X1000	Amber	590	8	No	7200	21000	A
HLMP-EL10-X1000	Amber	590	8	Yes	7200	21000	B
5mm Round LED Lamps							
15° Viewing Angle							
HLMP-EG1G-Y10DD	Red	626	15	No	9300	21000	A
HLMP-EG1H-Y10DD	Red	626	15	Yes	9300	21000	B
HLMP-EG1A-Z10DD	Red	626	15	No	12000	21000	A
HLMP-EG1B-Z10DD	Red	626	15	Yes	12000	21000	B
HLMP-EH1A-Z10DD	Red-Orange	615	15	No	12000	21000	A
HLMP-EH1B-Z10DD	Red-Orange	615	15	Yes	12000	21000	B
HLMP-EL1G-Y10DD	Amber	590	15	No	9300	21000	A
HLMP-EL1H-Y10DD	Amber	590	15	Yes	9300	21000	B
HLMP-EL1A-Z1KDD	Amber	590	15	No	12000	21000	A
HLMP-EL1B-Z1KDD	Amber	590	15	Yes	12000	21000	B
HLMP-CB1G-WY0DD	Blue	470	15	No	5500	12000	C
HLMP-CB1H-WY0DD	Blue	470	15	Yes	5500	12000	D
HLMP-CB1A-XY0DD	Blue	470	15	No	7200	12000	C
HLMP-CB1A-XYBDD	Blue	470	15	No	7200	12000	C
HLMP-CB1A-XYCDD	Blue	470	15	No	7200	12000	C
HLMP-CB1B-XY0DD	Blue	470	15	Yes	7200	12000	D
HLMP-CB1B-XYBDD	Blue	470	15	Yes	7200	12000	D
HLMP-CB1B-XYCDD	Blue	470	15	Yes	7200	12000	D
HLMP-CM1G-350DD	Green	525	15	No	27000	59000	C
HLMP-CM1H-350DD	Green	525	15	Yes	27000	59000	D
HLMP-CM1A-560DD	Green	525	15	No	45000	76000	C
HLMP-CM1B-560DD	Green	525	15	Yes	45000	76000	D
HLMP-CE13-24CDD	Cyan	505	15	No	21000	45000	A
HLMP-CE13-24QDD	Cyan	505	15	No	21000	45000	A
HLMP-CE14-24CDD	Cyan	505	15	Yes	21000	45000	B
HLMP-CE14-24QDD	Cyan	505	15	Yes	21000	45000	B

High Brightness LEDs

High Brightness 5mm Round LED Lamp

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle (°)	Standoff (Yes/NO)	Luminous Intensity (mcd) @ 20 mA		Package Drawing
					Min.	Max.	
23° Viewing Angle							
HLMP-EG2G-XZ0DD	Red	626	23	No	7200	16000	A
HLMP-EG2H-XZ0DD	Red	626	23	Yes	7200	16000	B
HLMP-EG2A-XY0DD	Red	626	23	No	7200	12000	A
HLMP-EG2B-XY0DD	Red	626	23	Yes	7200	12000	B
HLMP-EH2A-XY0DD	Red-Orange	615	23	No	7200	12000	A
HLMP-EH2B-XY0DD	Red-Orange	615	23	Yes	7200	12000	B
HLMP-EL2G-WY0DD	Amber	590	23	No	5500	12000	A
HLMP-EL2H-WY0DD	Amber	590	23	Yes	5500	12000	B
HLMP-EL2A-XYKDD	Amber	590	23	No	7200	12000	A
HLMP-EL2B-XYKDD	Amber	590	23	Yes	7200	12000	B
HLMP-CB2G-UW0DD	Blue	470	23	No	3200	7200	C
HLMP-CB2H-UW0DD	Blue	470	23	Yes	3200	7200	D
HLMP-CB2A-VW0DD	Blue	470	23	No	4200	7200	C
HLMP-CB2A-VWBDD	Blue	470	23	No	4200	7200	C
HLMP-CB2A-VWCDD	Blue	470	23	No	4200	7200	C
HLMP-CB2B-VW0DD	Blue	470	23	Yes	4200	7200	D
HLMP-CB2B-VWBDD	Blue	470	23	Yes	4200	7200	D
HLMP-CB2B-VWCDD	Blue	470	23	Yes	4200	7200	D
HLMP-CM2G-130DD	Green	525	23	No	16000	35000	C
HLMP-CM2H-130DD	Green	525	23	Yes	16000	35000	D
HLMP-CM2A-230DD	Green	525	23	No	21000	35000	C
HLMP-CM2B-230DD	Green	525	23	Yes	21000	35000	D
HLMP-CE22-Y1CDD	Cyan	505	23	No	9300	21000	A
HLMP-CE22-Y1QDD	Cyan	505	23	No	9300	21000	A
HLMP-CE25-Y1CDD	Cyan	505	23	Yes	9300	21000	B
HLMP-CE25-Y1QDD	Cyan	505	23	Yes	9300	21000	B

High Brightness LEDs

High Brightness 5mm Round LED Lamp

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle (°)	Standoff (Yes/NO)	Luminous Intensity (mcd) @ 20 mA		Package Drawing
					Min.	Max.	
30° Viewing Angle							
HLMP-EG3G-VX0DD	Red	626	30	No	4200	9300	A
HLMP-EG3H-VX0DD	Red	626	30	Yes	4200	9300	B
HLMP-EG3A-WX0DD	Red	626	30	No	5500	9300	A
HLMP-EG3B-WX0DD	Red	626	30	Yes	5500	9300	B
HLMP-EH3A-WX0DD	Red-Orange	615	30	No	5500	9300	A
HLMP-EH3B-WX0DD	Red-Orange	615	30	Yes	5500	9300	B
HLMP-EL3G-VX0DD	Amber	590	30	No	4200	9300	A
HLMP-EL3H-VX0DD	Amber	590	30	Yes	4200	9300	B
HLMP-EL3A-WXKDD	Amber	590	30	No	5500	9300	A
HLMP-EL3B-WXKDD	Amber	590	30	Yes	5500	9300	B
HLMP-CB3G-TV0DD	Blue	470	30	No	2500	5500	C
HLMP-CB3H-TV0DD	Blue	470	30	Yes	2500	5500	D
HLMP-CB3A-UV0DD	Blue	470	30	No	3200	5500	C
HLMP-CB3A-UVBDD	Blue	470	30	No	3200	5500	C
HLMP-CB3A-UVCDD	Blue	470	30	No	3200	5500	C
HLMP-CB3B-UV0DD	Blue	470	30	Yes	3200	5500	D
HLMP-CB3B-UVBDD	Blue	470	30	Yes	3200	5500	D
HLMP-CB3B-UVCDD	Blue	470	30	Yes	3200	5500	D
HLMP-CM3G-Y10DD	Green	525	30	No	9300	21000	C
HLMP-CM3H-Y10DD	Green	525	30	Yes	9300	21000	D
HLMP-CM3A-Z10DD	Green	525	30	No	12000	21000	C
HLMP-CM3A-Z1BDD	Green	525	30	No	12000	21000	C
HLMP-CM3A-Z1CDD	Green	525	30	No	12000	21000	C
HLMP-CM3B-Z10DD	Green	525	30	Yes	12000	21000	D
HLMP-CM3B-Z1BDD	Green	525	30	Yes	12000	21000	D
HLMP-CM3B-Z1CDD	Green	525	30	Yes	12000	21000	D
HLMP-CE34-XZCDD	Cyan	505	30	No	7200	16000	A
HLMP-CE34-XZQDD	Cyan	505	30	No	7200	16000	A
HLMP-CE35-XZCDD	Cyan	505	30	Yes	7200	16000	B
HLMP-CE35-XZQDD	Cyan	505	30	Yes	7200	16000	B

High Brightness LEDs

High Brightness Oval LED Lamp

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle (°)	Standoff (Yes/NO)	Luminous Intensity (mcd) @ 20 mA		Lead Frame Orientation	Package Drawing	Remarks
					Min.	Max.			
4 mm Standard Oval LED Lamp									
50° x 100° Viewing Angle									
HLMP-LG65-WX0DD	Red	626	50x100	Yes	1380	1990	Parallel	E	For full color sign application
HLMP-LM65-Z30DD	Green	525	50x100	Yes	2400	5040	Parallel	E	
HLMP-LM65-23BDD	Green	525	50x100	Yes	3500	5040	Parallel	E	
HLMP-LB65-RU0DD	Blue	470	50x100	Yes	550	1150	Parallel	E	
HLMP-LB65-STBDD	Blue	470	50x100	Yes	660	960	Parallel	E	
HLMP-LH65-XY0DD	Red Orange	615	50x100	Yes	1660	2400	Parallel	E	For mono color sign application
HLMP-LL65-XYKDD	Amber	590	50x100	Yes	1660	2400	Parallel	E	
4mm Standard Oval LED Lamp									
40° x 100° Viewing Angle									
HLMP-LG75-XY0DD	Red	626	40x100	Yes	1660	2400	Parallel	E	For full color sign application
HLMP-LG73-XZ0DD	Red	626	40x100	Yes	1660	2900	Parallel	E	
HLMP-LM75-34CDD	Green	530	40x100	Yes	4200	6050	Parallel	E	For full color sign application
HLMP-LM73-35PDD	Green	530	40x100	Yes	4200	7260	Parallel	E	
HLMP-LB75-VWBDD	Blue	470	40x100	Yes	1150	1660	Parallel	E	For full color sign application
HLMP-LB72-UWPDD	Blue	470	40x100	Yes	960	1660	Parallel	E	
4 mm Super Oval LED Lamp									
60° x 120° Viewing Angle									
HLMP-SL20-MP0DD	Amber	590	60x120	Yes	520	1150	Perpendicular	F	For mono color sign application
HLMP-RL20-MP0DD	Amber	590	60x120	Yes	520	1150	Parallel	G	
5 mm Standard Oval LED Lamps									
40° x 100° Viewing Angle									
HLMP-HG64-WX0DD	Red	626	40x100	No	1380	1990	Parallel	H	For full color sign application
HLMP-HG65-WX0DD	Red	626	40x100	Yes	1380	1990	Parallel	I	
HLMP-HM64-34BDD	Green	525	40x100	No	4200	6050	Parallel	H	
HLMP-HM65-34BDD	Green	525	40x100	Yes	4200	6050	Parallel	I	
HLMP-HB64-STBDD	Blue	470	40x100	No	660	960	Parallel	H	
HLMP-HB65-STBDD	Blue	470	40x100	Yes	660	960	Parallel	I	
HLMP-HG74-XY0DD	Red	626	40x100	No	1660	2400	Parallel	H	
HLMP-HG75-XY0DD	Red	626	40x100	Yes	1660	2400	Parallel	I	
HLMP-HM74-34CDD	Green	530	40x100	No	4200	6050	Parallel	H	
HLMP-HM75-34CDD	Green	530	40x100	Yes	4200	6050	Parallel	I	
HLMP-HB74-UVCDD	Blue	470	40x100	No	960	1380	Parallel	H	
HLMP-HB75-UVCDD	Blue	470	40x100	Yes	960	1380	Parallel	I	
HLMP-HB75-VWCDD	Blue	470	40x100	Yes	1150	1660	Parallel	I	

High Brightness LEDs

High Brightness Oval LED Lamp

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle (°)	Standoff (Yes/NO)	Luminous Intensity (mcd) @ 20 mA		Lead Frame Orientation	Package Drawing	Remarks	
					Min.	Max.				
HLMP-HH64-WX0DD	Red Orange	615	40x100	No	1380	1990	Parallel	H	For mono color sign application	
HLMP-HH65-WX0DD	Red Orange	615	40x100	Yes	1380	1990	Parallel	I		
HLMP-HL64-XYKDD	Amber	590	40x100	No	1660	2400	Parallel	H		
HLMP-HL64-XYLDD	Amber	590	40x100	No	1660	2400	Parallel	H		
HLMP-HL65-XYKDD	Amber	590	40x100	No	1660	2400	Parallel	I		
HLMP-HL65-XYLDD	Amber	590	40x100	No	1660	2400	Parallel	I		
5 mm Mini Oval LED Lamps										
30° x 70° Viewing Angle										
HLMP-AG64-Z10DD	Red	626	30x70	No	2400	3500	Parallel	J	For full color sign application	
HLMP-AG65-Z10DD	Red	626	30x70	Yes	2400	3500	Parallel	K		
HLMP-AM64-460DD	Green	525	30x70	No	5040	8710	Parallel	J		
HLMP-AM65-460DD	Green	525	30x70	Yes	5040	8710	Parallel	K		
HLMP-AG74-120DD	Red	626	30x70	No	2900	4200	Parallel	J		
HLMP-AG75-120DD	Red	626	30x70	Yes	2900	4200	Parallel	K		
HLMP-AM74-45CDD	Green	530	30x70	No	5040	7260	Parallel	J		
HLMP-AM75-45CDD	Green	530	30x70	Yes	5040	7260	Parallel	K		
HLMP-AB74-WXBDD	Blue	470	30x70	No	1380	1990	Parallel	J		
HLMP-AB75-WXBDD	Blue	470	30x70	Yes	1380	1990	Parallel	K		
HLMP-AH64-Z10DD	Red Orange	615	30x70	No	2400	3500	Parallel	J		For mono color sign application
HLMP-AH65-Z10DD	Red Orange	615	30x70	Yes	2400	3500	Parallel	K		
HLMP-AJ64-YZ0DD	Orange	605	30x70	No	1990	2400	Parallel	J		
HLMP-AJ65-YZ0DD	Orange	605	30x70	Yes	1990	2400	Parallel	K		
HLMP-AL64-23KDD	Amber	590	30x70	No	3500	5040	Parallel	J		
HLMP-AL65-23KDD	Amber	590	30x70	Yes	3500	5040	Parallel	K		

High Brightness LEDs

High Brightness Lamps

High Brightness LED Lamps 1.3:1 Intensity Bin Limits (mcd at 20mA)

Bin ID	Min.	Max.
D	65	85
E	85	110
F	110	140
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000
1	16000	21000
2	21000	27000
3	27000	35000
4	35000	45000
5	45000	59000
6	59000	76000

Tolerance for each bin limit is $\pm 15\%$

High Brightness LED Lamps 1.2:1 Intensity Bin Limits (mcd at 20mA)

Bin ID	Min.	Max.
P	380	460
Q	460	550
R	550	660
S	660	800
T	800	960
U	960	1150
V	1150	1380
W	1380	1660
X	1660	1990
Y	1990	2400
Z	2400	2900
1	2900	3500
2	3500	4200
3	4200	5040
4	5040	6050
5	6050	7260
6	7260	8710
7	8710	10460
8	10460	12560
9	12560	15100

Tolerance for each bin limit is $\pm 15\%$

Color Bin Structure

Bin ID	Wavelength (nm)		Remark
	Min.	Max.	
Red			
--	618.0	630.0	Type 1
--	620.0	630.0	Type 2
Red Orange *1			
--	612.0	619.0	Type 1
--	612.0	621.7	Type 2
Orange *1			
1	600.0	604.0	Type 1
2	604.0	608.0	
3	608.0	612.0	
2	599.5	604.5	Type 2
4	604.5	610.5	
Amber			
1	584.5	587.0	
2	587.0	589.5	
4	589.5	592.0	
6	592.0	594.5	
Green *1			
1	520.0	524.0	Type 1
2	524.0	528.0	Type 1
3	528.0	532.0	Type 1
4	532.0	536.0	Type 1
5	536.0	540.0	Type 1
1	519.0	523.0	Type 2
2	523.0	527.0	Type 2
3	527.0	531.0	Type 2
4	531.0	535.0	Type 2
5	535.0	539.0	Type 2
Blue			
1	460.0	464.0	
2	464.0	468.0	
3	468.0	472.0	
4	472.0	476.0	
5	476.0	480.0	

Note 1: There are 2 types of color bin limits. Please refer to individual datasheet for details.

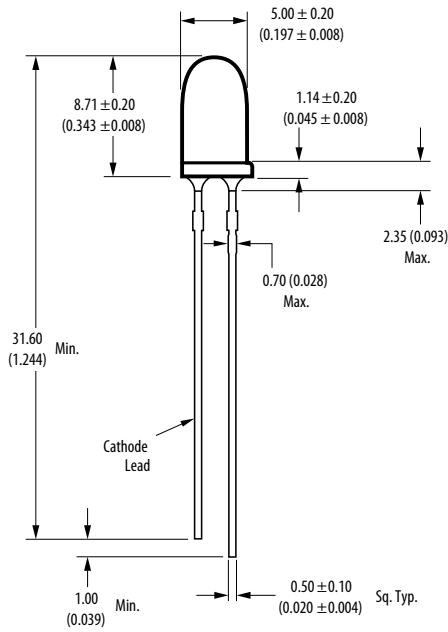
Tolerance for each bin limit is $\pm 0.5\text{nm}$

High Brightness LEDs

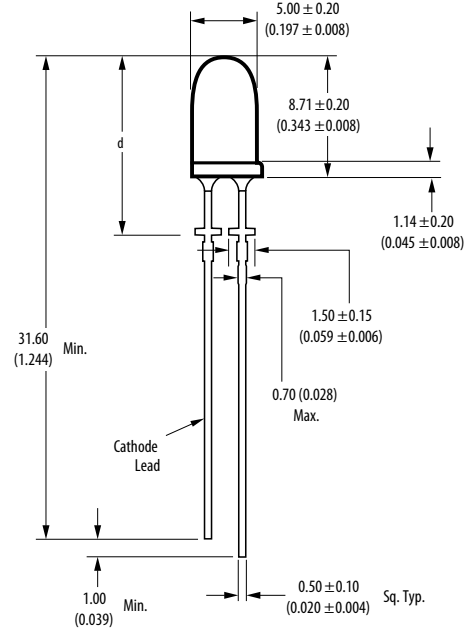
High Brightness Lamps Package Drawing

5 mm Round LED Lamp

A: Non-standoff



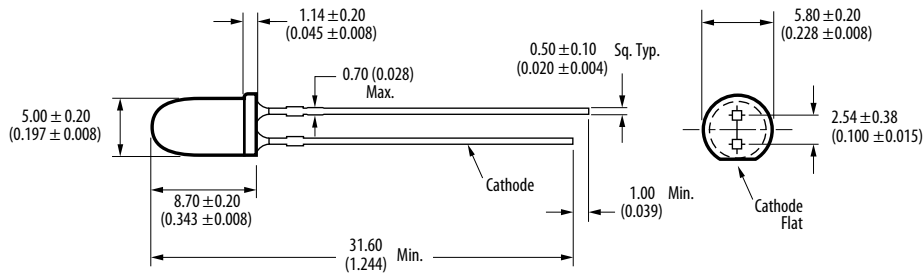
B: Standoff



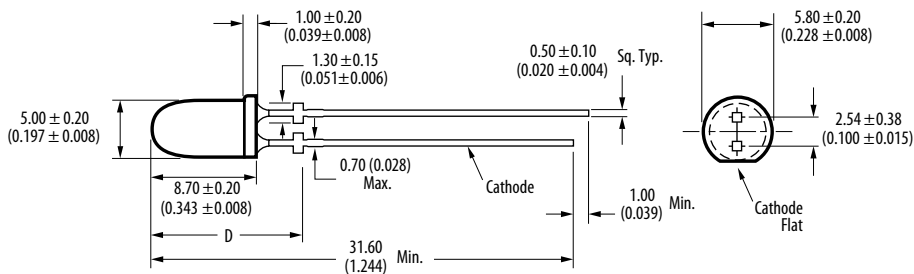
Note:
Please refer to individual datasheet for dimension D.

5 mm Round LED Lamp

C: Non-standoff



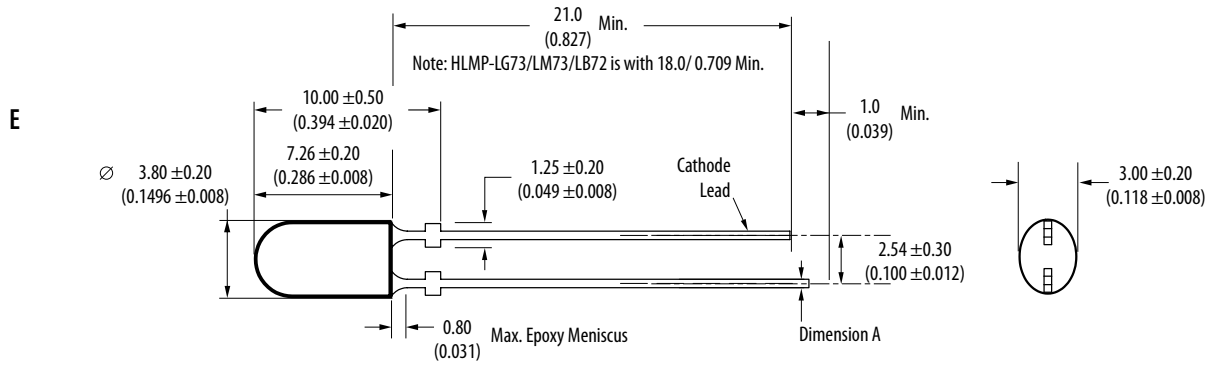
D: Standoff



Note:
Please refer to individual datasheet for dimension D.

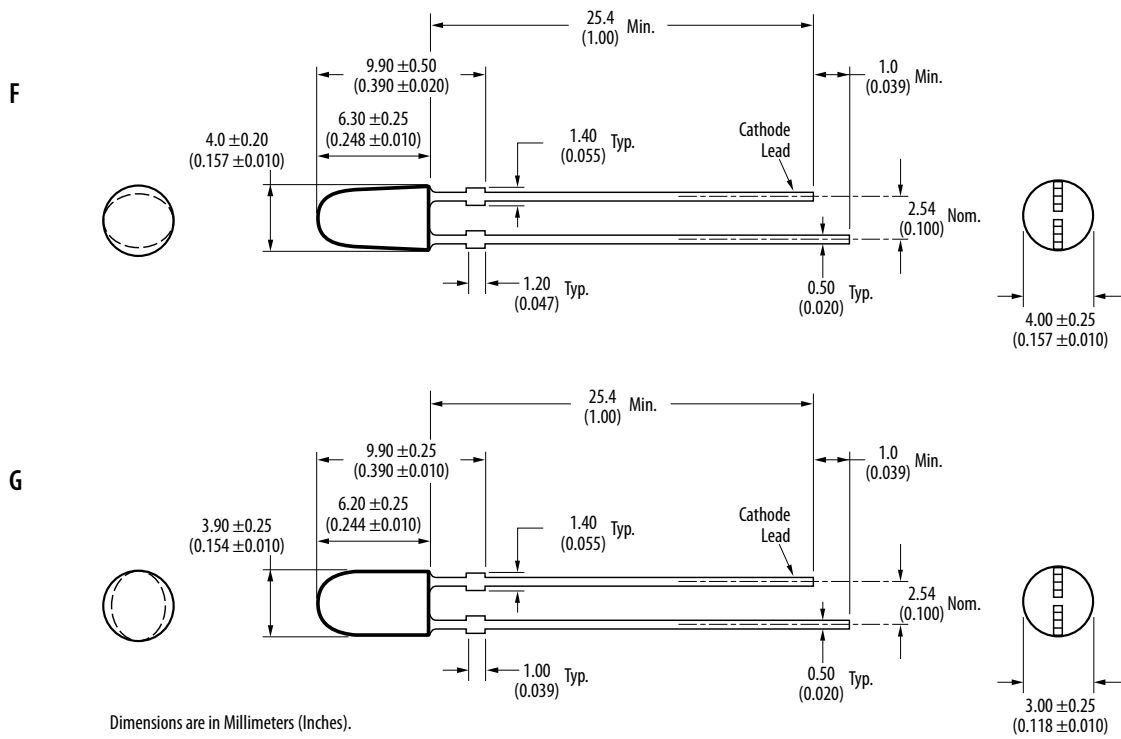
High Brightness LEDs

4 mm Standard Oval LED Lamp 50° x 100° Viewing Angle



Note:
Please refer to individual datasheet for dimension A.

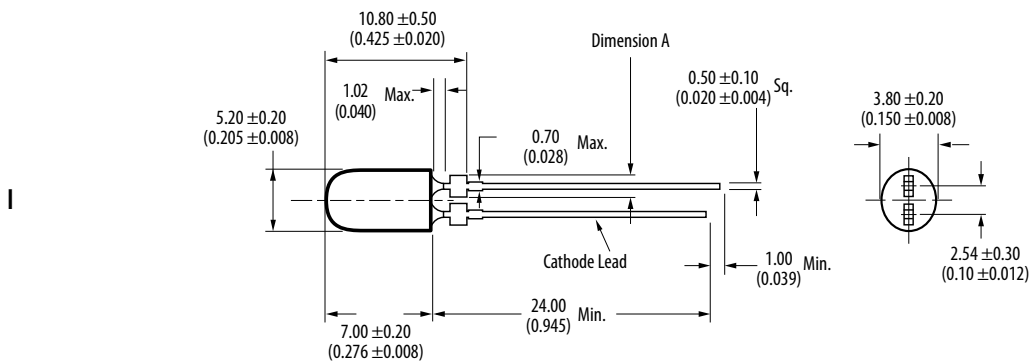
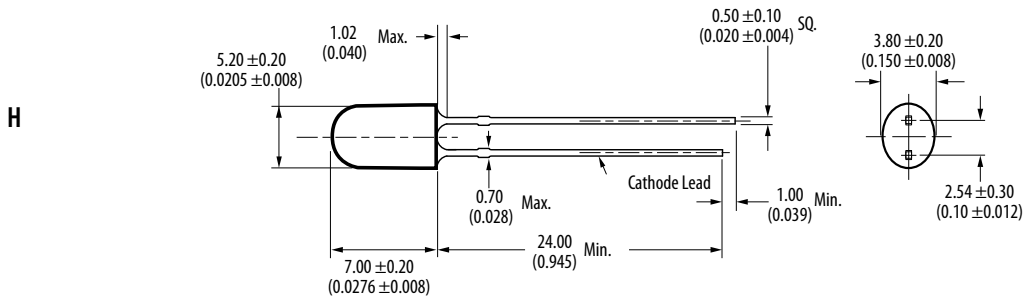
4 mm Super Oval LED Lamp 60° x 120° Viewing Angle



Dimensions are in Millimeters (Inches).

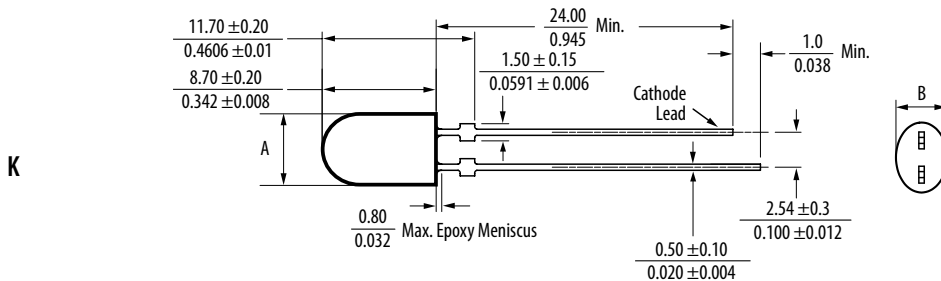
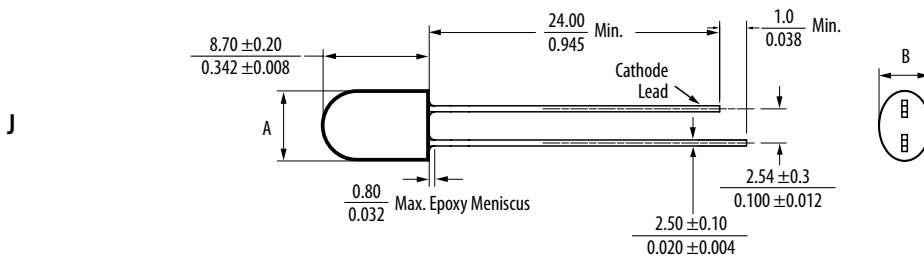
High Brightness LEDs

5 mm Standard Oval LED Lamp 40° x 100° Viewing Angle



Note:
Please refer to individual datasheet for dimension A.

5mm Mini Oval LED Lamp 30° x 70° Viewing Angle



Note:
For all package drawings above, the dimension are in millimeters (inches).
Please refer to individual datasheet for Dimension A and B.

High Brightness LEDs



High Brightness SMT Lamps

Description

Avago Technologies offers industry's first Surface Mount High Brightness Round and Oval LED lamps for Electronic Sign Application. These SMT lamps are compatible with industrial reflow soldering processes and made with advanced optical grade epoxy to provide superior performance in outdoor application.

Features and Benefits

- Compact form factor with well defined spatial radiation pattern
- High Brightness AlInGaP and InGaN material available in Red, Amber, Green and Blue
- Moisture sensitivity level (MSL) 2A
- Compatible with industrial reflow soldering process
- Lens features: Tinted for SMT Round
 - Tinted and diffused for SMT Oval

Typical Applications

- Electronic Signs and signals
 - Traffic Signal
 - Variable Message Signs
 - Full Color Signs
 - Mono Color Signs

High Brightness SMT Round and Oval Lamps

Part Number	Color	Typ. Dominant Wavelength (nm)	Typ. Viewing Angle (°)	Lens Tinted	Lens Diffused	Luminous Intensity (mcd) @ 20 mA		Package Drawing
						Min.	Max.	
SMT Round Lamps								
30° Viewing Angle								
ALMD-EG3D-VX002	Red	626	30	Yes	No	4200	9300	A
ALMD-EL3D-VX002	Amber	590	30	Yes	No	4200	9300	
ALMD-CM3D-XZ002	Green	525	30	Yes	No	7200	16000	
ALMD-CB3D-SU002	Blue	470	30	Yes	No	1900	5500	
SMT Oval Lamps								
40 × 100° Viewing Angle								
ALMD-LG36-WZ002	Red	626	40 x 100	Yes	Yes	1380	2900	B
ALMD-LL36-WZ002	Amber	590	40 x 100	Yes	Yes	1380	2900	
ALMD-LM36-14002	Green	525	40 x 100	Yes	Yes	2900	6050	
ALMD-LB36-SV002	Blue	470	40 x 100	Yes	Yes	660	1380	

High Brightness LEDs

High Brightness SMT Round Lamps 1.3:1 Intensity Bin Limits (mcd at 20mA)

Bin ID	Min.	Max.
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000

Tolerance of each bin limit is $\pm 15\%$

High Brightness SMT Oval Lamps 1.2:1 Intensity Bin Limits (mcd at 20mA)

Bin ID	Min.	Max.
R	550	660
S	660	800
T	800	960
U	960	1150
V	1150	1380
W	1380	1660
X	1660	1990
Y	1990	2400
Z	2400	2900
1	2900	3500
2	3500	4200
3	4200	5040
4	5040	6050

Tolerance of each bin limit is $\pm 15\%$

Color Bin Structure

Bin ID	Wavelength (nm)	
	Min.	Max.
Red	618.0	630.0

Tolerance for each bin limits is $\pm 0.05\text{nm}$

Bin ID	Wavelength (nm)	
	Min.	Max.
Amber		
1	584.5	587.0
2	587.0	589.5
4	589.5	592.0
6	592.5	594.0

Tolerance for each bin limits is $\pm 0.05\text{nm}$

Bin ID	Wavelength (nm)	
	Min.	Max.
Blue		
1	460.0	464.0
2	464.0	468.0
3	468.0	472.0
4	472.0	476.0
5	476.0	480.0

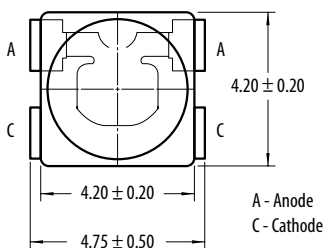
Tolerance for each bin limits is $\pm 0.05\text{nm}$

Bin ID	Wavelength (nm)	
	Min.	Max.
Green		
1	519.0	523.0
2	523.0	527.0
3	527.0	531.0
4	531.0	535.0
5	535.0	539.0

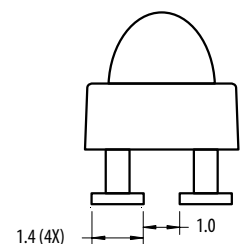
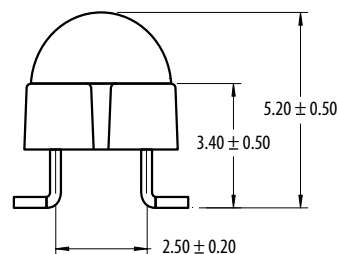
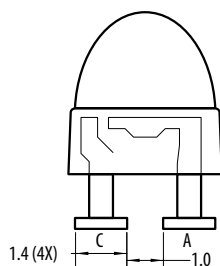
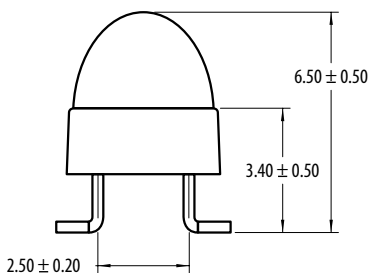
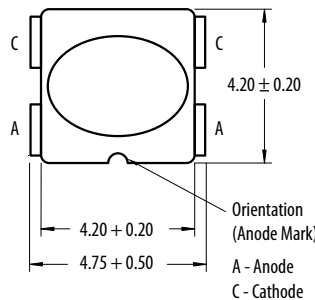
Tolerance for each bin limits is $\pm 0.05\text{nm}$

High Brightness SMT Lamps Package Drawing

Package Drawing A



Package Drawing B



Notes:

1. All dimensions in millimeters (inches).
2. Tolerance is $\pm 0.20\text{mm}$ unless other specified.

High Brightness LEDs



Surface Mount PLCC LEDs

Description

This surface-mount LED comes in PLCC standard package dimension. It has a substrate made up of a molded plastic reflector sitting on top of a bent lead frame. The die is attached within the reflector cavity and the cavity is encapsulated by an Avago Technologies proprietary epoxy or silicone material.

The PLCC SMT LED products with a viewing angle of 120° is ideal for instruments/switch/icon backlighting. With additional lens in 30° and 50° variants, these products are especially fitting to applications for traffic lights, CHMSL and displays. Its external reflector makes easy coupling with light pipe/light guide for an even-larger area backlighting. The package design coupled with careful selection of component materials allow these products to perform with high reliability in a larger temperature range -40°C to 100°C. The high reliability feature is crucial to Automotive Interior and Indoor ESS.

The surface-mount LED is designed to be compatible with industrial reflow soldering process.

Features and Benefits

- Industry Standard PLCC SMT package
 - No change in existing board layout, drop-in replacement for the existing PLCC SMT LEDs
- High brightness using AlInGaP and InGaN dice technologies
- Available in various colors
 - Red, Red Orange, Orange, Amber, Yellow
 - Green, Emerald Green, Green, Blue and White
 - Bi-colors in various combinations
 - Tri-colors in Red, Green and Blue
- Available in viewing angle of 30°, 50° and 120°
 - Well-suited for backlighting applications
- High volume, high reliability
 - Cost-effective solution
- Black surface and black body options to enhance contrast for display application

Target Markets and Applications

- Interior automotive
 - Instrument panel backlighting
 - Central console backlighting
 - Cabin backlighting
- Exterior automotive
 - Turn signals
 - Side repeater lamps
 - CHMSLs (center high-mounted stop light)
 - Rear combination lamps
 - Puddle lights
- Electronic Signs and Signals
 - Interior full color sign
 - Variable message sign
- Office Automation, Electrical Appliances, Industrial Equipment
 - Front panel backlighting
 - Push button backlighting
 - Display backlighting

High Brightness LEDs

PLCC Surface Mount LEDs PLCC-2

Part Number	Color	Typ. Dominant Wavelength λ_D (nm)	Viewing Angle $2\theta_{1/2}$ (°)	Min. I_V (mcd)	Max. I_V (mcd)	Typ. V_F (V)	Test Current (mA)
HSMS-A100-J00J1	Red	626	120	4.5	–	2.2	20
HSMH-A100-L00J1	Red	637	120	11.2	–	1.9	20
HSMC-A100-Q00J1	Red	626	120	71.5	–	1.9	20
HSMC-A101-S40J1	Red	626	120	180	450	1.9	20
HSMJ-A100-Q00J1	Red Orange	615	120	71.5	–	1.9	20
HSMJ-A101-S00J1	Red Orange	615	120	180	–	1.9	20
HSMD-A100-J00J1	Orange	602	120	4.4	–	2.2	20
HSML-A100-Q00J1	Orange	605	120	71.5	–	1.9	20
HSMY-A100-J00J1	Amber	585	120	4.5	–	2.2	20
HSMA-A100-Q00J1	Amber	590	120	71.5	–	1.9	20
HSMG-A100-J02J1	Yellow Green	569	120	4.5	–	2.2	20
HSME-A100-M02J1	Yellow Green	569	120	18	–	1.9	20
HSMG-A100-H01J1	Emerald Green	560	120	2.8	–	2.2	20
HSME-A100-L01J1	Emerald Green	560	120	11.2	–	1.9	20
HSMM-A100-U4P1	Green	525	120	450	1125	3.4	20
HSMM-A100-S00J1	Green	525	120	180	–	3.4	20

Notes:

1. The luminous intensity I_V is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. The dominant wavelength, λ_D , is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

PLCC-2 White

Part Number	Color	Chromaticity Coordinates		Viewing Angle	I_V @ 20 mA		V_F @ 20 mA
		x	y	$2\theta_{1/2}$ (°)	Min. (mcd)	Typ. (mcd)	Typ. (V)
HSMW-A100-U40J1	InGaN White	0.31	0.31	120	140	–	3.3

Notes:

1. The luminous intensity I_V is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represents the perceived color of the device.
3. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

PLCC-2 White (ASMT-UWB1)

Part Number	Color	CCT (K)	Viewing Angle	Luminous Intensity (mcd)			Test Current (mA)
			$2\theta_{1/2}$ (°)	Min	Typ	Max	
ASMT-UWB1-NX302	InGaN White	4500 ~ 8000	120	1800	2300	3550	20
ASMT-UWB1-NX312	InGaN White	2700 ~ 4000	120	1800	2300	3550	20
ASMT-UWB1-NX3A2	InGaN White	8000	120	1800	2300	3550	20
ASMT-UWB1-NX3B2	InGaN White	6500	120	1800	2300	3550	20
ASMT-UWB1-NX3C2	InGaN White	5700	120	1800	2300	3550	20
ASMT-UWB1-NX3D2	InGaN White	5000	120	1800	2300	3550	20
ASMT-UWB1-NX3E2	InGaN White	4500	120	1800	2300	3550	20
ASMT-UWB1-NX3F2	InGaN White	4000	120	1800	2300	3550	20
ASMT-UWB1-NX3G2	InGaN White	3500	120	1800	2300	3550	20
ASMT-UWB1-NX3H2	InGaN White	3000	120	1800	2300	3550	20
ASMT-UWB1-NX3J2	InGaN White	2700	120	1800	2300	3550	20

Tolerance $\pm 12\%$

High Brightness LEDs

PLCC Surface Mount LEDs

Power PLCC-4

Part Number	Color	Typ. Dominant Wavelength $\lambda_b^{[1]}$ (nm)	Viewing Angle $2\theta_{1/2}^{[2]}$ (°)	Min. I_v (mcd)	Max. I_v (mcd)	Typ. V_F (V)	Test Current (mA)
HSMC-A401-U80M1	Red	626	120	560	1400	2.2	50
HSMA-A401-U80M1	Amber	590	120	560	1400	2.2	50
HSMA-A401-V30M1	Amber	590	120	715	1400	2.2	50
HSML-A401-U40M1	Orange	605	120	450	1125	2.2	50
HSMJ-A401-U40M1	Red Orange	615	120	450	1125	2.2	50
HSME-A401-P4PM1	Emerald Green	567	120	45	112.5	2.2	50
HSMM-A400-U4QM2	Green	525	120	450	1125	3.8	30
HSMN-A400-S4QM2	Blue	470	120	180	450	3.8	30
HSMN-A400-S8PM2	Blue	470	120	224	560	3.8	30

Notes:

1. The dominant wavelength, λ_b , is derived from the CIE Chromaticity Diagram and represents the color of the device.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. The luminous intensity, I_v , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.

Power PLCC-4 White

Part Number	Color	Chromaticity Coordinates		Viewing Angle $2\theta_{1/2}$ (°)	I_v @ 30 mA			VF @ 30 mA Typ. (V)
		x	y		Min. (mcd)	Typ. (mcd)	Max. (mcd)	
HSMW-A400-U00M2	InGaN White	0.31	0.31	120	450.00	700.00	–	3.8
ASMT-SWBM-NU803	InGaN White	0.318	0.318	120	560.00	1100.00	1400.00	3.5

Notes:

1. The luminous intensity I_v is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. I_v Tolerance = $\pm 12\%$.
3. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represent the perceived color of the device.
4. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is $1/2$ the peak intensity.

Power PLCC-4 with Lens

Part Number	Color	Dominant Wavelength $\lambda_b^{[1]}$ (nm)	Viewing Angle $2\theta_{1/2}$ (°)	Min. I_v (mcd)	Max. I_v (mcd)	Typ. V_F (V)	Test Current (mA)
HSMC-A431-Y80M1	AllInGaP Red	626	30	3550	9000	2.2	50
HSMC-A431-X90M1	AllInGaP Red	626	30	2240	7150	2.2	50
HSMC-A461-V00M1	AllInGaP Red	626	50	715	–	2.2	50
HSMJ-A430-W50M1	AllInGaP Red Orange	615	30	1125	3550	2.2	50
HSMJ-A431-X90M1	AllInGaP Red Orange	615	30	2240	7150	2.2	50
HSMJ-A461-W40M1	AllInGaP Red Orange	615	50	1125	2850	2.2	50
HSML-A431-X90M1	AllInGaP Orange	605	30	2240	7150	2.2	50
HSML-A461-W40M1	AllInGaP Orange	605	50	1125	2850	2.2	50
HSMA-A431-Y00M1	AllInGaP Amber	590	30	2850	–	2.2	50
HSMA-A431-Z50M1	AllInGaP Amber	590	30	4500	14000	2.2	50
HSMA-A461-X83M1	AllInGaP Amber	590	50	2240	5600	2.2	50
HSMM-A430-X90M2	InGaN Green	525	30	2240	4500	3.9	30
HSMN-A430-V50M2	InGaN Blue	470	30	715	1400	3.9	30

Notes:

1. The luminous intensity, I_v , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. I_v tolerance $\pm 12\%$.
3. The dominant wavelength, λ_b , is derived from the CIE Chromaticity Diagram and represents the color of the device.
4. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is $1/2$ the peak intensity.

High Brightness LEDs

PLCC Surface Mount LEDs

Bicolor PLCC-4

Part Number	Color	Min. I _v @ 20mA		Typ. I _v (mcd) @ 20mA
		Bin ID	mcd	
HSMF-A201-A00J1	GaP Red	K2	8	16
	GaP Yellow Green	L1	10	20
HSMF-A202-A00J1	GaP Red	K2	8	16
	GaP Yellow	K1	6.3	12
HSMF-A203-A00J1	GaP Red	K2	8	16
	GaP Emerald Green	J1	4	8
HSMF-A204-A00J1	GaP Orange	K2	8	16
	GaP Yellow Green	L1	10	20
HSMF-A205-A00J1	GaP Orange	K2	8	16
	GaP Emerald Green	J1	4	8
HSMF-A206-A00J1	GaP Yellow	K2	8	16
	GaP Yellow Green	L1	10	20
HSMF-A211-A00J1	AlGaAs Red	L2	12.5	25
	GaP Yellow Green	L1	10	20
HSMF-A212-A00J1	AlGaAs Red	L2	12.5	25
	GaP Yellow	K1	6.3	12
HSMF-A222-A00J1	AllnGaP Red	P1	40	80
	AllnGaP Amberi	P1	40	80
HSMF-A226-A00J1	AllnGaP Amber	P2	50	100
	AllnGaP Yellow Green	M2	20	60

Super 0.25W Power PLCC-4

Part Number	Color	CCT (K)	Viewing Angle (°)	Min Flux (lm)	Max Flux (lm)	Forward Voltage (V _f) I _f =80mA	Test Current (mA)
ASMT-UWBG-NAC08	Cool White	4000 ~ 8000	120	18.1	35.2	3.4	80
ASMT-UWBG-NACA8	Cool White	8000	120	18.1	35.2	3.4	80
ASMT-UWBG-NACB8	Cool White	6500	120	18.1	35.2	3.4	80
ASMT-UWBG-NACC8	Cool White	5700	120	18.1	35.2	3.4	80
ASMT-UWBG-NACD8	Cool White	5000	120	18.1	35.2	3.4	80
ASMT-UWBG-NACE8	Cool White	4500	120	18.1	35.2	3.4	80
ASMT-UWBG-NACF8	Cool White	4000	120	18.1	35.2	3.4	80
ASMT-UWBH-NBD08	Cool White	4000 ~ 8000	120	23.5	39.8	3.4	80
ASMT-UWBH-NBDA8	Cool White	8000	120	23.5	39.8	3.4	80
ASMT-UWBH-NBDB8	Cool White	6500	120	23.5	39.8	3.4	80
ASMT-UWBH-NBDC8	Cool White	5700	120	23.5	39.8	3.4	80
ASMT-UWBH-NBDD8	Cool White	5000	120	23.5	39.8	3.4	80
ASMT-UWBH-NBDE8	Cool White	4500	120	23.5	39.8	3.4	80
ASMT-UWBH-NBDF8	Cool White	4000	120	23.5	39.8	3.4	80
ASMT-UYBG-NAC18	Warm White	2700 ~ 3500	120	18.1	35.2	3.4	80
ASMT-UYBG-NACG8	Warm White	3500	120	18.1	35.2	3.4	80
ASMT-UYBG-NACH8	Warm White	3000	120	18.1	35.2	3.4	80
ASMT-UYBG-NACJ8	Warm White	2700	120	18.1	35.2	3.4	80

High Brightness LEDs

Super 0.25W Power PLCC-4

Part Number	Color	CCT (K)	Viewing Angle (°)	Min Flux (lm)	Max Flux (lm)	Forward Voltage (Vf) If=80mA	Test Current (mA)
ASMT-UYBH-NAC18	Warm White	2700 ~ 3500	120	18.1	35.2	3.2	80
ASMT-UYBH-NACG8	Warm White	3500	120	18.1	35.2	3.2	80
ASMT-UYBH-NACH8	Warm White	3000	120	18.1	35.2	3.2	80
ASMT-UYBH-NACJ8	Warm White	2700	120	18.1	35.2	3.2	80

Tolerance ±12%

Super 0.5W Power PLCC-4

Part Number	Color	Dominant Wavelength λ_D ^[1] (nm)	Viewing Angle $2\theta_{1/2}$ ^[2] (°)	Min. Flux (lm)	Max. Flux (lm)	Forward Voltage (V _f) I _f =150mA	Test Current (mA)
ASMT-QABD-AEFOE	Amber	593.1	120	11.5	25.5	2.5	150
ASMT-QHBD-AFHOE	Red Orange	616.1	120	11.5	25.5	2.5	150
ASMT-QRBD-AEFOE	Red	621.1	120	11.5	25.5	2.5	150
ASMT-QBB3-NBDOE	Blue	460	120	5.5	11.5	3.5	150
ASMT-QGBE-NFHOE	Green	522	120	15.0	33.0	3.6	150

Notes:

1. The dominant wavelength, λ_D , is derived from the CIE Chromaticity diagram and represents the color of the device.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. Φ_v is the total luminous flux output as measured with an integrating sphere at mono pulse conditions.
4. Tolerance = ±12%.

PLCC Surface Mount LEDs

Super 0.5W White Power PLCC-4

Part Number	Color	CCT (K)	Viewing Angle $2\theta_{1/2}$ ^[2] (°)	Min. Flux (lm)	Max. Flux (lm)	Forward Voltage (V _f) I _f =150mA	Test Current (mA)
ASMT-QWBF-NKLOE	Cool White	4500-1000	120	43	73	3.3	150
ASMT-QYBF-NJKOE	Warm White	2500-4800	120	33	56	3.3	150

Notes:

1. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
2. Φ_v is the total luminous flux output as measured with an integrating sphere at mono pulse conditions.
3. Tolerance = ±12%.

High Brightness LEDs

TheiaLED Super 0.5W White Power PLCC-4

Part number	Color	CCT (K)	Viewing Angle (°)	Min Flux (lm)	Max Flux (lm)	Forward Voltage (V _f) I _f =150mA	Test Current (mA)	CRI
ASMT-QWBG-NFH0E	Cool White	4000 ~ 8000	120	45.7	62	3.2	150	85
ASMT-QWBG-NFHAE	Cool White	8000	120	45.7	62	3.2	150	85
ASMT-QWBG-NFHBE	Cool White	6500	120	45.7	62	3.2	150	85
ASMT-QWBG-NFHCE	Cool White	5700	120	45.7	62	3.2	150	85
ASMT-QWBG-NFHDE	Cool White	5000	120	45.7	62	3.2	150	85
ASMT-QWBG-NFHEE	Cool White	4500	120	45.7	62	3.2	150	85
ASMT-QWBG-NFHFE	Cool White	4000	120	45.7	62	3.2	150	85
ASMT-QWBH-NGJOE	Cool White	4000 ~ 8000	120	51.7	67.2	3.2	150	75
ASMT-QWBH-NGJAE	Cool White	8000	120	51.7	67.2	3.2	150	75
ASMT-QWBH-NGJBE	Cool White	6500	120	51.7	67.2	3.2	150	75
ASMT-QWBH-NGJCE	Cool White	5700	120	51.7	67.2	3.2	150	75
ASMT-QWBH-NGJDE	Cool White	5000	120	51.7	67.2	3.2	150	75
ASMT-QWBH-NGJEE	Cool White	4500	120	51.7	67.2	3.2	150	75
ASMT-QWBH-NGJFE	Cool White	4000	120	51.7	67.2	3.2	150	75
ASMT-QYBG-NEG1E	Warm White	2700 ~ 3500	120	39.8	56.8	3.2	150	85
ASMT-QYBG-NEGGE	Warm White	3500	120	39.8	56.8	3.2	150	85
ASMT-QYBG-NEGHE	Warm White	3000	120	39.8	56.8	3.2	150	85
ASMT-QYBG-NEGJE	Warm White	2700	120	39.8	56.8	3.2	150	85
ASMT-QYBH-NEG1E	Warm White	2700 ~ 3500	120	39.8	56.8	3.2	150	75
ASMT-QYBH-NEGGE	Warm White	3500	120	39.8	56.8	3.2	150	75
ASMT-QYBH-NEGHE	Warm White	3000	120	39.8	56.8	3.2	150	75
ASMT-QYBH-NEGJE	Warm White	2700	120	39.8	56.8	3.2	150	75

Tolerance ±12%

High Brightness LEDs

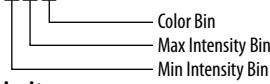
High Brightness Tricolor PLCC4 & PLCC6 tricolor

Part Number	Color	Package	Package Dimension	Viewing Angle (°)	Dominant Wavelength (nm)	Min Intensity (mcd) @ 20mA		Typ IV @ 20mA	Features
						Bin	mcd		
ASMB-BTE1-0B332	Red	PLCC-4	3.5x 2.8x 1.9	110	622	450	900	630	Black Body White Reflector
	Green				529	1125	2240	1500	
	Blue				469	285	560	350	
ASMB-MTB0-0A302	Red	PLCC-4	3.5x 2.8x 1.9	115	625	470	780	540	Black Surface
	Green				525	1380	2280	1600	
	Blue				470	270	450	350	
ASMB-MTB1-0A302	Red	PLCC-4	3.5x 2.8x 1.9	115	625	470	780	540	Black Surface
	Green				525	1380	2280	1600	
	Blue				470	270	450	350	
ASMT-YTB2-0BB02	Red	PLCC-6	3.4 x 2.8 x 1.8	120	626	U2	560	745	Black Surface
	Green				525	W1	1125	1600	
	Blue				470	T1	285	380	
ASMT-YTB7-0AA02	Red	PLCC-6	3.4 x 2.8 x 1.8	120	622	560	1125	650	Black Surface
	Green				530	1400	2850	1900	
	Blue				470	285	560	384	
ASMT-YTC2-0AA02	Red	PLCC-6	3.4 x 2.8 x 1.8t	120	626	T2	355	450	Black Body
	Green				525	U1	450	560	
	Blue				470	R2	140	180	
ASMT-YTC7-0AA02	Red	PLCC-6	3.4 x 2.8 x 1.8	110	622	224	450	330	Black Body
	Green				530	560	840	1125	
	Blue				470	112.5	224	160	
ASMT-YTD2-0BB02	Red	PLCC-6	3.4 x 2.8 x 1.8	120	626	U2	560	745	White Surface
	Green				525	W1	1125	1600	
	Blue				470	T1	285	380	
ASMT-YTD7-0AA02	Red	PLCC-6	3.4 x 2.8 x 1.8	120	622	560	1125	650	White Surface
	Green				530	1400	2850	1900	
	Blue				470	285	560	384	

High Brightness LEDs

PLCC-2 (ASMT-UWB1)

ASMT-UWB1-N X₂ X₃ X₄ 2



Color Bin Limits

Individual reel will contain parts from one sub bin only.

Sub Bin	Chromaticity Coordinates
1A	x 0.2950 0.2920 0.2984 0.3009 y 0.2970 0.3060 0.3133 0.3042
1B	x 0.2920 0.2895 0.2962 0.2984 y 0.3060 0.3135 0.3220 0.3133
1C	x 0.2984 0.2962 0.3028 0.3048 y 0.3133 0.3220 0.3304 0.3207
1D	x 0.2984 0.3048 0.3068 0.3009 y 0.3060 0.3135 0.3220 0.3133
2A	x 0.3048 0.3130 0.3144 0.3068 y 0.3207 0.3290 0.3186 0.3113
2B	x 0.3028 0.3115 0.3130 0.3048 y 0.3304 0.3391 0.3290 0.3207
2C	x 0.3115 0.3205 0.3213 0.3130 y 0.3391 0.3481 0.3373 0.3290
2D	x 0.3130 0.3213 0.3221 0.3144 y 0.3290 0.3373 0.3261 0.3186
3A	x 0.3215 0.3290 0.3290 0.3222 y 0.3350 0.3417 0.3300 0.3243
3B	x 0.3207 0.3290 0.3290 0.3215 y 0.3462 0.3538 0.3417 0.3350
3C	x 0.3290 0.3376 0.3371 0.3290 y 0.3538 0.3616 0.3490 0.3417
3D	x 0.3290 0.3371 0.3366 0.3290 y 0.3417 0.3490 0.3369 0.3300
4A	x 0.3371 0.3451 0.3440 0.3366 y 0.3490 0.3554 0.3427 0.3369
4B	x 0.3376 0.3463 0.3451 0.3371 y 0.3616 0.3687 0.3554 0.3490
4C	x 0.3463 0.3551 0.3533 0.3451 y 0.3687 0.3760 0.3620 0.3554
4D	x 0.3451 0.3533 0.3515 0.3440 y 0.3554 0.3620 0.3487 0.3427
5A	x 0.3530 0.3615 0.3590 0.3512 y 0.3597 0.3659 0.3521 0.3465
5B	x 0.3548 0.3641 0.3615 0.3530 y 0.3736 0.3804 0.3659 0.3597
5C	x 0.3641 0.3736 0.3702 0.3615 y 0.3804 0.3874 0.3722 0.3659
5D	x 0.3615 0.3702 0.3670 0.3590 y 0.3659 0.3722 0.3578 0.3521

Intensity Bin Limits

Bin ID	Min. (mcd)	Max. (mcd)
X1	1800	2240
X2	2240	2850
Y1	2850	3550
Y2	3550	4500
Z1	4500	5600
Z2	5600	7150

Tolerance of each bin it = ± 12%

6A	x 0.3670 0.3702 0.3825 0.3783 y 0.3578 0.3722 0.3798 0.3646
6B	x 0.3702 0.3736 0.3869 0.3825 y 0.3722 0.3874 0.3958 0.3798
6C	x 0.3825 0.3869 0.4006 0.3950 y 0.3798 0.3958 0.4044 0.3875
6D	x 0.3783 0.3825 0.3950 0.3898 y 0.3646 0.3798 0.3875 0.3716
7A	x 0.3889 0.3941 0.4080 0.4017 y 0.3690 0.3848 0.3916 0.3751
7B	x 0.3941 0.3996 0.4146 0.4080 y 0.3848 0.4015 0.4089 0.3916
7C	x 0.4080 0.4146 0.4299 0.4221 y 0.3916 0.4089 0.4165 0.3984
7D	x 0.4017 0.4080 0.4221 0.4147 y 0.3751 0.3916 0.3984 0.3814
8A	x 0.4147 0.4221 0.4342 0.4259 y 0.3814 0.3984 0.4028 0.3853
8B	x 0.4221 0.4299 0.4430 0.4342 y 0.3984 0.4165 0.4212 0.4028
8C	x 0.4342 0.4430 0.4562 0.4465 y 0.4028 0.4212 0.4260 0.4071
8D	x 0.4259 0.4342 0.4465 0.4373 y 0.3853 0.4028 0.4071 0.3893
9A	x 0.4373 0.4465 0.4582 0.4483 y 0.3893 0.4071 0.4099 0.3919
9B	x 0.4465 0.4562 0.4687 0.4582 y 0.4071 0.4260 0.4289 0.4099
9C	x 0.4582 0.4687 0.4813 0.4700 y 0.4099 0.4289 0.4319 0.4126
9D	x 0.4483 0.4582 0.4700 0.4593 y 0.3919 0.4099 0.4126 0.3944

Intensity Bin Select (X₂X₃)

Individual reel will contain parts from one half bin only.

X ₂	Minimum Iv Bin
X ₃	Maximum Iv Bin
0	Full Distribution
3	3 half bins starting from X ₂ 1
4	4 half bins starting from X ₂ 1
5	5 half bins starting from X ₂ 1
7	3 half bins starting from X ₂ 2
8	4 half bins starting from X ₂ 2
9	5 half bins starting from X ₂ 2

Color Bin Limits

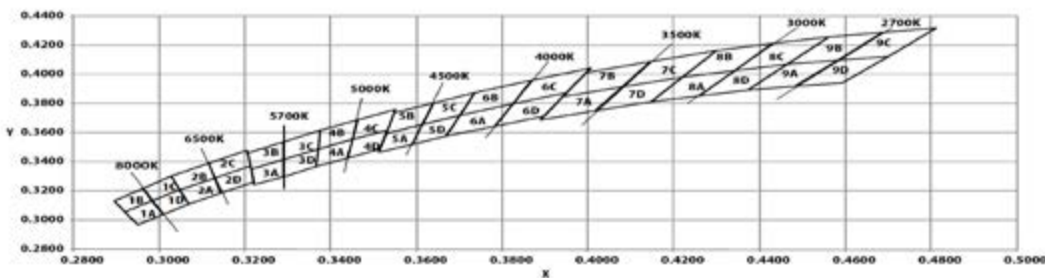
Individual reel will contain parts from one sub bin only.

Bin	Sub Bin
A	1A, 1B, 1C, 1D
B	2A, 2B, 2C, 2D
C	3A, 3B, 3C, 3D
D	4A, 4B, 4C, 4D
E	5A, 5B, 5C, 5D
F	6A, 6B, 6C, 6D
G	7A, 7B, 7C, 7D
H	8A, 8B, 8C, 8D
J	9A, 9B, 9C, 9D
K	1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D
L	2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D
M	3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D
N	4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D
P	5A, 5B, 5C, 5D, 6A, 6B, 6C, 6D
R	7A, 7B, 7C, 7D, 8A, 8B, 8C, 8D
S	8A, 8B, 8C, 8D, 9A, 9B, 9C, 9D
0	1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D
1	6A, 6B, 6C, 6D, 7A, 7B, 7C, 7D, 8A, 8B, 8C, 8D, 9A, 9B, 9C, 9D

Forward Voltage Bin

Bin	Min (V)	Max (V)
F05	2.80	3.00
F06	3.00	3.20
F07	3.20i	3.40
F08	3.40	3.60

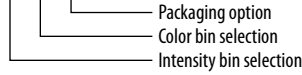
Tolerance ± 0.1V



High Brightness LEDs

PLCC2, Power PLCC-4, Bicolor PLCC-4 and Tricolor PLCC-4

HSMW-Axxx-X₁-X₂-X₃-X₄-X₅



Intensity Bin Select (X₁X₂)

Individual reel will contain parts from 1 half bin only. Single color (see data sheet for bicolor and tricolor).

X ₁	Minimum Iv Bin
X ₂	Number of half Bins
0	Full Distribution
2	2 half bins starting from X ₅ 1
3	3 half bins starting from X ₅ 1
4	4 half bins starting from X ₅ 1
5	5 half bins starting from X ₅ 1
6	2 half bins starting from X ₅ 2
7	3 half bins starting from X ₅ 2
8	4 half bins starting from X ₅ 2
9	5 half bins starting from X ₅ 2

Color Bin Selection (X₃)

Individual reel will contain parts from 1 full bin only. Single color (see data sheet for bicolor and tricolor).

X ₃	
0	Full Distribution
Z	A and B only
Y	B and C only
W	C and D only
V	D and E only
U	E and F only
T	F and G only
S	G and H only
Q	A, B and C only
P	B, C and D only
N	C, D and E only
M	D, E and F only
L	E, F and G only
K	F, G and H only
1	A, B, C and D only
2	E, F, G and H only
3	B, C, D and E only
4	C, D, E and F only
5	A, B, C, D and E only
6	B, C, D, E and F only

Color Bin Limits for HSMW-Axxx

Bin ID	Limits (Chromaticity Coordinates)
A	X 0.352 0.365 0.365 0.352
	Y 0.377 0.395 0.360 0.341
B	X 0.340 0.352 0.352 0.340
	Y 0.360 0.377 0.341 0.325
C	X 0.327 0.340 0.340 0.327
	Y 0.342 0.360 0.325 0.306
D	X 0.315 0.327 0.327 0.315
	Y 0.325 0.342 0.306 0.290
E	X 0.302 0.315 0.315 0.302
	Y 0.307 0.325 0.290 0.271
F	X 0.290 0.302 0.302 0.290
	Y 0.290 0.307 0.271 0.255

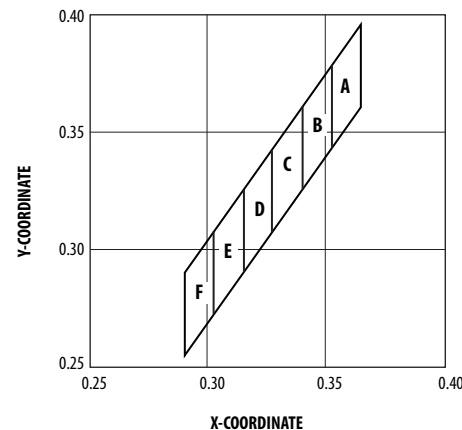
Tolerance of each bin limit = ± 0.02

Intensity Bin Limits

Bin ID	Intensity (mcd)	
	Min.	Max.
J1	4.50	5.60
J2	5.60	7.20
K1	7.20	9.00
K2	9.00	11.20
L1	11.20	14.00
L2	14.00	18.00
M1	18.00	22.40
M2	22.40	28.50
N1	28.50	35.50
N2	35.50	45.00
P1	45.00	56.00
P2	56.00	71.50
Q1	71.50	90.00
Q2	90.00	112.50
R1	112.50	140.00
R2	140.00	180.00
S1	180.00	224.00
S2	224.00	285.00
T1	285.00	355.00
T2	355.00	450.00
U1	450.00	560.00
U2	560.00	715.00
V1	715.00	900.00
V2	900.00	1125.00
W1	1125.00	1400.00
W2	1400.00	1800.00
X1	1800.00	2240.00
X2	2240.00	2850.00
Y1	2850.00	3550.00
Y2	3550.00	4500.00
Z1	4500.00	5600.00
Z2	5600.00	7150.00
11	7150.00	9000.00
12	9000.00	11250.00
21	11250.00	14000.00
22	14000.00	18000.00

Tolerance of each bin limit = ± 12%

Color Coordinates Chart for HSMW-Axxx



Color Bin Limits

Color/Bin	Wavelength (nm)	
	Min.	Max.
Blue		
A	460.0	465.0
B	465.0	470.0
C	470.0	475.0
D	475.0	480.0
Cyan		
A	490.0	495.0
B	495.0	500.0
C	500.0	505.0
D	505.0	510.0
Green		
A	515.0	520.0
B	520.0	525.0
C	525.0	530.0
D	530.0	535.0
Yellow Green/Emerald Green		
A	552.5	555.5
B	555.5	558.5
C	558.5	561.5
D	561.5	564.5
E	564.5	567.5
F	567.5	570.5
G	570.5	573.5
H	573.5	576.5
Amber		
A	582.0	584.5
B	584.5	587.0
C	587.0	589.5
D	589.5	592.0
E	592.0	594.5
F	594.5	597.0
Orange		
A	597.0	600.0
B	600.0	603.0
C	603.0	606.0
D	606.0	609.0
E	609.0	612.0
Red Orange		
A	611.0	616.0
B	616.0	620.0
Red		
Full Distribution	620i	635

Tolerance of each bin limit = ± 1nm

Tricolor/Power PLCC-4

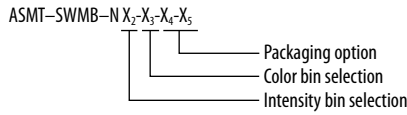
1	Cathode (Color 1)
2	Common Anode
3	Cathode (Color 3)
4	Cathode (Color 2)

Bicolor PLCC-4

1	Cathode (Color 1)
2	Anode (Color 1)
3	Cathode (Color 2)
4	Anode (Color 2)

High Brightness LEDs

PLCC Surface Mount LEDs



Intensity Bin Selection (X₂X₃)

Individual reel will contain parts from one half bin only.

X ₂	Minimum I _v Bin
X ₃	Number of half bins
0	Full Distribution
2	2 half bins starting from X ₂ 1
3	3 half bins starting from X ₂ 1
4	4 half bins starting from X ₂ 1
5	5 half bins starting from X ₂ 1
6	2 half bins starting from X ₂ 2
7	3 half bins starting from X ₂ 2
8	4 half bins starting from X ₂ 2
9	5 half bins starting from X ₂ 2

Intensity Bin Limits

Bin ID	Min. (mcd)	Max. (mcd)
N1	28.50	35.50
N2	35.50	45.00
P1	45.00	56.00
P2	56.00	71.50
Q1	71.50	90.00
Q2	90.00	112.50
R1	112.50	140.00
R2	140.00	180.00
S1	180.00	224.00
S2	224.00	285.00
T1	285.00	355.00
T2	355.00	450.00
U1	450.00	560.00
U2	560.00	715.00
V1	715.00	900.00
V2	900.00	1125.00
W1	1125.00	1400.00
W2	1400.00	1800.00

Tolerance of each bin limit = ± 12%

Long Life PLCC-4 ASMT-SWBM

Packaging Option (X₄X₅)

X ₄ X ₅	Test Current	Package Type	Reel Size
M1	50 mA	Top Mount	7/13 Inch
M2	30 mA	Top Mount	7/13 Inch
J1	20 mA	Top Mount	7 Inch
J4	20 mA	Top Mount	13 Inch
H1	20 mA	Reverse Mount	7 Inch
H4	20 mA	Reverse Mount	13 Inch

Color Bin Selection (X₄)

Individual reel will contain parts from one full bin only.

X ₄	Color Bin Selection
0	Full Distribution
A	1 and 2 only
B	2 and 3 only
C	3 and 4 only
D	4 and 5 only
E	5 and 6 only
F	6 and 7 only
G	1, 2 and 3 only
H	2, 3 and 4 only
J	3, 4 and 5 only
K	4, 5 and 6 only
L	5, 6 and 7 only
M	1, 2, 3 and 4 only
N	2, 3, 4 and 5 only
P	3, 4, 5 and 6 only
Q	4, 5, 6 and 7 only
R	1, 2, 3, 4 and 5 only
S	2, 3, 4, 5 and 6 only
T	3, 4, 5, 6, and 7 only
U	1, 2, 3, 4, 5 and 6 only
V	2, 3, 4, 5, 6 and 7 only
Z	Special Color Bin

Packaging Option (X₅)

X ₅	Test Current	Package Type	Reel Size
3	30 mA	Top Mount	7 inch

V_F Bin Limits

Bin ID	Min.	Max.
S3	3.20	3.80
S4	3.80	4.35

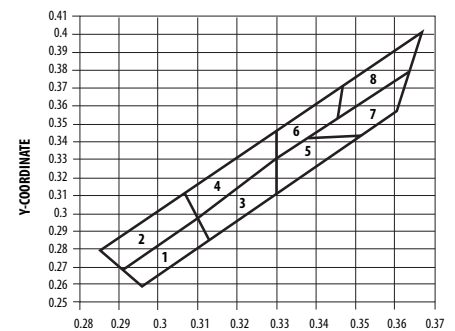
Tolerance of each bin limit = ± 0.1V

Color Bin Limits

Bin ID	Limits (Chromaticity Coordinates)				
1	x	0.296	0.291	0.310	0.313
	y	0.259	0.268	0.297	0.284
2	x	0.291	0.285	0.307	0.310
	y	0.268	0.279	0.312	0.297
3	x	0.313	0.310	0.330	0.330
	y	0.284	0.297	0.330	0.310
4	x	0.310	0.307	0.330	0.330
	y	0.297	0.312	0.347	0.330
5	x	0.330	0.330	0.338	0.352
	y	0.310	0.330	0.342	0.344
6	x	0.330	0.330	0.347	0.345
	y	0.330	0.347	0.371	0.352
7	x	0.352	0.338	0.364	0.360
	y	0.344	0.342	0.380	0.357
8	x	0.345	0.347	0.367	0.364
	y	0.352	0.371	0.401	0.380

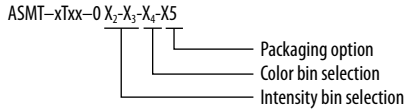
Tolerance of each bin limit = ± 0.02

Color Coordinates Chart for ASMT-SWBM



High Brightness LEDs

High Brightness Tricolor PLCC-4 and PLCC-6



Intensity Bin Selection (X₂X₃) For ASMT-QTB4

Individual reel will contain parts from one half bin only.

X ₂	Min Iv Bin (Minimum Intensity Bin)		
	Red	Green	Blue
0	0	0	0
A	U1	V2	S2

X ₃	Number of Half Bin from X ₂		
	Red	Green	Blue
0	0	0	0
A	4	4	4

Note: 0 represents no maximum bin limit.

For ASMT-QTC4

X ₂	Min Iv Bin (Minimum Intensity Bin)		
	Red	Green	Blue
0	0	0	0
E	T1	T2	R1

X ₃	Number of Half Bin from X ₂		
	Red	Green	Blue
0	0	0	0
A	4	4	4

For ASMT-YTB2/YTD2

Individual reel will contain parts from one half bin only.

X ₂	Min Iv Bin (Minimum Intensity Bin)		
	Red	Green	Blue
B	U2	W1	T1

X ₃	Number of Half Bin from X ₂		
	Red	Green	Blue
B	3	3	3

For ASMT-YTC2

Individual reel will contain parts from one half bin only.

X ₂	Min Iv Bin (Minimum Intensity Bin)		
	Red	Green	Blue
A	T2	U1	R2

X ₃	Number of Half Bin from X ₂		
	Red	Green	Blue
A	3	3	3

Color Bin Selection (X₄) for ASMT-QTB4/QTC4

Individual reel will contain parts from one full bin only.

X ₄	Color Bin Combinations		
	Red	Green	Blue
0	Full Distribution	A,B,C	A,B,C,D

Intensity Bin Limits

Bin ID	Min (mcd)	Max (mcd)
R1	112.5	140
R2	140	180
S1	180	224
S2	224	285
T1	285	355
T2	355	450
U1	450	560
U2	560	715
V1	715	900
V2	900	1125
W1	1125	1400
W2	1400	1800
X1	1800	2240

Tolerance of each bin limit = ± 12%

Color Bin Selection (X₄) for ASMT-YTB2/YTC2/YTD2

Individual reel will contain parts from one full bin only.

X ₄	Color Bin Combinations		
	Red	Green	Blue
0	Full Distribution	A, B, C	A, B, C, D, E

Packaging Option (X₅)

Please refer to respective datasheet for related information.

Color Bin Limits for ASMT-YTB2/YTC2/YTD2

Red	Min (nm)	Max (nm)
Full Distribution	618	628

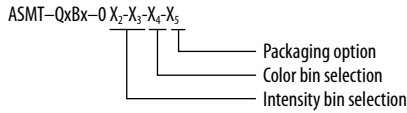
Green	Min (nm)	Max (nm)
A	525	531
B	528	534
C	531	537

Blue	Min (nm)	Max (nm)
A	465	469
B	467	471
C	469	473
D	471	475
E	470	475

Tolerance of each bin limit = ± 1 nm

High Brightness LEDs

Super 0.5W Power PLCC-4



Flux Bin Selection (X₂X₃)

Individual reel will contain parts from one bin only

X ₂	Min Flux Bin
X ₃	Max Flux Bin

Flux Bin Limits

Bin ID	Min. (lm)	Max. (lm)
0	3.40	4.30
A	4.30	5.50
B	5.50	7.00
C	7.00	9.00
D	9.00	11.50
E	11.50	15.00
F	15.00	19.50
G	19.50	25.50
H	25.50	33.00
J	33.00	43.00
K	43.00	56.00
L	56.00	73.00

Tolerance of each bin limit = ± 12%

V_F Binning for AllInGaP Devices (ASMT-QAxx/QHxx/QRxx)

Bin ID	Min.	Max.
2D	2.35	2.50
2E	2.50	2.65
2F	2.65	2.80
2G	2.80	2.95
2H	2.95	3.10
2J	3.10	3.25
2K	3.25	3.40
2L	3.40	3.55
2M	3.55	3.70
2N	3.70	3.85

Tolerance of each bin limit = ± 0.1V

Color Bin Selection (X₄)

Individual reel will contain parts from one full bin only.

X ₄	
0	Full Distribution
A	1 and 2 only
B	2 and 3 only
C	3 and 4 only
D	4 and 5 only
E	5 and 6 only
G	1, 2 and 3 only
H	2, 3 and 4 only
J	3, 4 and 5 only
K	4, 5 and 6 only
M	1, 2, 3 and 4 only
N	2, 3, 4 and 5 only
P	3, 4, 5 and 6 only
R	1, 2, 3, 4 and 5 only
S	2, 3, 4, 5 and 6 only
Z	Special Color Bin

V_F Bin Limits for InGaN Devices (ASMT-QBxx/QGxx)

Bin ID	Min.	Max.
S5	3.20	3.50
S6	3.50	3.80
S7	3.80	4.10

Tolerance of each bin limit = ± 0.1V

Color Bin Limits

Color/Bin	Wavelength (nm)	
	Min.	Max.
Blue		
1	460.0	465.0
2	465.0	470.0
8	450.0	455.0
9	455.0	460.0
Green		
1	515.0	520.0
2	520.0	525.0
3	525.0	530.0
4	530.0	535.0
Amber		
2	583.0	586.0
3	586.0	589.0
4	589.0	592.0
5	592.0	595.0
6	595.0	598.0
Red Orange		
1	611.0	616.0
2	616.0	620.0
3	620.0	625.0
Red		
Full Distribution	620.0	635.0

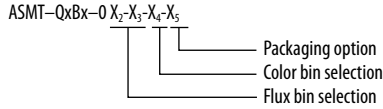
Tolerance of each bin limit = ±1nm

Packaging Option (X₅)

X ₅	Test Current)	Package Type	Reel Size
E	150 mA	Top Mount	7 inch

High Brightness LEDs

Super 0.5W White Power PLCC-4



Flux Bin Selection (X₂X₃)

Individual reel will contain parts from one bin only

X ₂	Min Flux Bin
X ₃	Min Flux Bin

Flux Bin Limits

Bin ID	Min. (lm)	Max. (lm)
O	3.40	4.30
A	4.30	5.50
B	5.50	7.00
C	7.00	9.00
D	9.00	11.50
E	11.50	15.00
F	15.00	19.50
G	19.50	25.50
H	25.50	33.00
J	33.00	43.00
K	43.00	56.00
L	56.00	73.00

Tolerance of each bin limit = ± 12%

Color Bin Selection (X₄) for ASMT-QWBx

Individual reel will contain parts from one sub bin only.

X ₄	
O	Full Distribution
A	5K and 5L only
B	6K and 6L only
C	7K and 7L only
D	8K and 8L only
E	5K and 6K only
F	5L and 6L only
G	6K and 7K only
H	6L and 7L only
J	7K and 8K only
K	7L and 8L only
L	5K, 5L, 6K and 6L only
M	6K, 6L, 7K and 7L only
N	7K, 7L, 8K and 8L only
Z	Special binning

Color Bin Limits for ASMT-QWBx

Bin ID	Sub Bin ID	Limits (Chromaticity Coordinates)				
5K	5Ka	x	0.296	0.304	0.302	0.294
		y	0.259	0.270	0.276	0.264
	5Kb	x	0.294	0.302	0.300	0.291
		y	0.264	0.276	0.281	0.268
	5Kc	x	0.304	0.313	0.312	0.302
		y	0.270	0.284	0.291	0.276
	5Kd	x	0.302	0.312	0.310	0.300
		y	0.276	0.291	0.297	0.281
5L	5La	x	0.291	0.300	0.298	0.288
		y	0.268	0.281	0.288	0.274
	5Lb	x	0.288	0.298	0.295	0.285
		y	0.274	0.288	0.294	0.279
	5Lc	x	0.300	0.310	0.309	0.298
		y	0.281	0.297	0.305	0.288
	5Ld	x	0.298	0.309	0.307	0.295
		y	0.288	0.305	0.312	0.294
6K	6Ka	x	0.313	0.322	0.321	0.312
		y	0.284	0.297	0.305	0.291
	6Kb	x	0.312	0.321	0.320	0.310
		y	0.291	0.305	0.314	0.297
	6Kc	x	0.322	0.330	0.330	0.321
		y	0.297	0.310	0.320	0.305
	6Kd	x	0.321	0.330	0.330	0.320
		y	0.305	0.320	0.330	0.314

Tolerance of each bin limit = ± 0.02

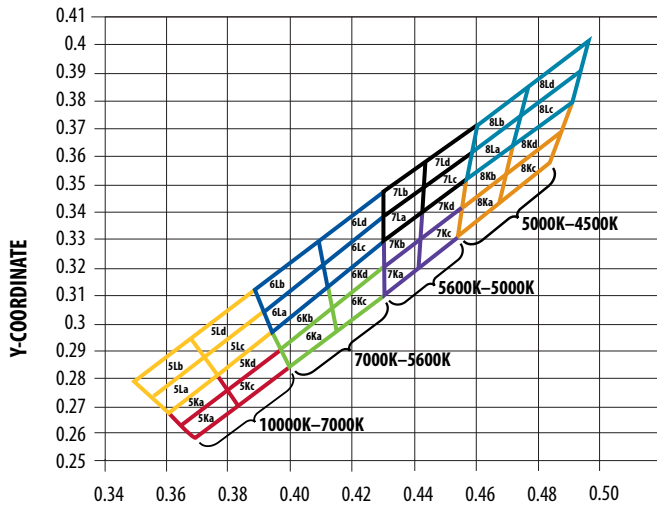
Color Bin Limits cont.

Bin ID	Sub Bin ID	Limits (Chromaticity Coordinates)				
6L	6La	x	0.310	0.320	0.319	0.309
		y	0.297	0.314	0.322	0.305
	6Lb	x	0.309	0.319	0.318	0.307
		y	0.305	0.322	0.329	0.312
	6Lc	x	0.320	0.330	0.330	0.319
		y	0.314	0.330	0.339	0.322
	6Ld	x	0.319	0.330	0.330	0.318
		y	0.322	0.339	0.347	0.329
7K	7Ka	x	0.330	0.336	0.337	0.330
		y	0.310	0.320	0.330	0.320
	7Kb	x	0.330	0.337	0.337	0.330
		y	0.320	0.330	0.341	0.330
	7Kc	x	0.336	0.343	0.344	0.337
		y	0.320	0.331	0.341	0.330
	7Kd	x	0.337	0.344	0.345	0.337
		y	0.330	0.341	0.352	0.341
7L	7La	x	0.330	0.337	0.337	0.330
		y	0.330	0.341	0.349	0.339
	7Lb	x	0.330	0.337	0.338	0.330
		y	0.339	0.349	0.358	0.347
	7Lc	x	0.337	0.345	0.346	0.337
		y	0.341	0.352	0.362	0.349
	7Ld	x	0.337	0.346	0.347	0.338
		y	0.349	0.362	0.371	0.358
8K	8Ka	x	0.343	0.351	0.352	0.344
		y	0.331	0.343	0.354	0.341
	8Kb	x	0.344	0.352	0.354	0.345
		y	0.341	0.354	0.364	0.352
	8Kc	x	0.351	0.360	0.362	0.352
		y	0.343	0.357	0.369	0.354
	8Kd	x	0.352	0.362	0.364	0.354
		y	0.354	0.369	0.380	0.364
8L	8La	x	0.345	0.354	0.355	0.346
		y	0.352	0.364	0.375	0.362
	8Lb	x	0.346	0.355	0.356	0.347
		y	0.362	0.375	0.385	0.371
	8Lc	x	0.354	0.364	0.366	0.355
		y	0.364	0.380	0.391	0.375
	8Ld	x	0.355	0.366	0.367	0.356
		y	0.375	0.391	0.401	0.385

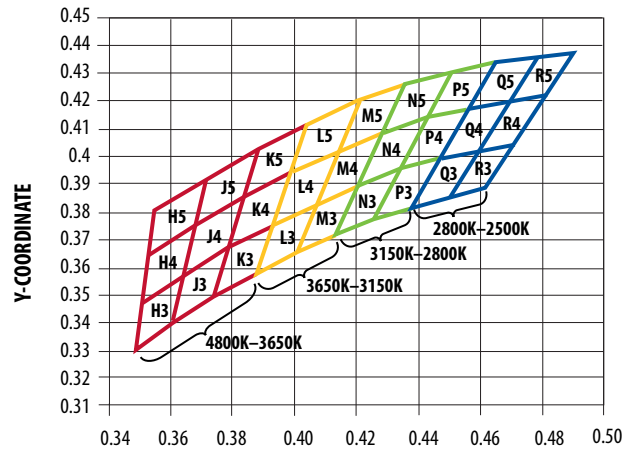
Tolerance of each bin limit = ± 0.02

High Brightness LEDs

Color Coordinates Chart for ASMT-QWBx



Color Coordinates Chart for ASMT-QYBx



Color Bin Selection (X₄) for ASMT-QYBx

Individual reel will contain parts from one sub bin only.

X ₄	
0	Full Distribution
A	H, J and K only
B	H, J, K, L and M only
C	L and M only
D	L, M, N and P only
E	N and P only
F	N, P, Q and R only
G	Q and R only
Z	Special Color Bin

Color Bin Limits for ASMT-QYBx

Bin ID	Sub Bin ID	Limits (Chromaticity Coordinates)				
L	L3	x	0.387	0.400	0.407	0.393
		y	0.358	0.366	0.384	0.376
	L4	x	0.393	0.407	0.414	0.399
		y	0.376	0.384	0.402	0.395
	L5	x	0.399	0.414	0.421	0.405
		y	0.395	0.402	0.420	0.412
M	M3	x	0.400	0.413	0.421	0.407
		y	0.366	0.372	0.390	0.384
	M4	x	0.407	0.421	0.429	0.414
		y	0.384	0.390	0.409	0.402
	M5	x	0.414	0.429	0.436	0.421
		y	0.402	0.409	0.426	0.420
N	N3	x	0.413	0.425	0.434	0.421
		y	0.372	0.378	0.396	0.390
	N4	x	0.421	0.434	0.443	0.429
		y	0.390	0.396	0.414	0.409
	N5	x	0.429	0.443	0.451	0.436
		y	0.409	0.414	0.430	0.426
P	P3	x	0.425	0.438	0.447	0.434
		y	0.378	0.382	0.400	0.396
	P4	x	0.434	0.447	0.456	0.443
		y	0.396	0.400	0.417	0.414
	P5	x	0.443	0.456	0.465	0.451
		y	0.414	0.417	0.434	0.430
Q	Q3	x	0.438	0.450	0.460	0.447
		y	0.382	0.386	0.403	0.400
	Q4	x	0.447	0.460	0.470	0.456
		y	0.400	0.403	0.420	0.417
	Q5	x	0.456	0.470	0.479	0.465
		y	0.417	0.420	0.436	0.434

Color Bin Limits for ASMT-QYBx

Bin ID	Sub Bin ID	Limits (Chromaticity Coordinates)				
R	R3	x	0.450	0.462	0.472	0.460
		y	0.386	0.389	0.405	0.403
	R4	x	0.460	0.472	0.482	0.470
		y	0.403	0.405	0.422	0.420
	R5	x	0.470	0.482	0.491	0.479
		y	0.420	0.422	0.437	0.436

Tolerance of each bin limit = ± 0.02

Packaging Option (X₅)

X ₅	Test Current	Package Type	Reel Size
E	150 mA	Top Mount	7 inch

Color Bin Limits for ASMT-QWBx

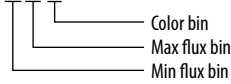
Bin ID	Sub Bin ID	Limits (Chromaticity Coordinates)				
H	H3	x	0.348	0.360	0.364	0.350
		y	0.332	0.341	0.358	0.348
	H4	x	0.350	0.364	0.367	0.352
		y	0.348	0.358	0.376	0.365
	H5	x	0.352	0.367	0.371	0.354
		y	0.365	0.376	0.392	0.381
J	J3	x	0.360	0.373	0.378	0.364
		y	0.341	0.350	0.368	0.358
	J4	x	0.364	0.378	0.383	0.367
		y	0.358	0.368	0.386	0.376
	J5	x	0.367	0.383	0.388	0.371
		y	0.376	0.386	0.403	0.392
K	K3	x	0.373	0.387	0.393	0.378
		y	0.350	0.358	0.376	0.368
	K4	x	0.378	0.393	0.399	0.383
		y	0.368	0.376	0.395	0.386
	K5	x	0.383	0.399	0.405	0.388
		y	0.386	0.395	0.412	0.403

High Brightness LEDs

Super 0.25W and 0.5W Power PLCC4 Cool White and Warm White Luminous Flux Bin and Color Bin (ASMT-UWBx/UYBx/QWBx/QYBx)

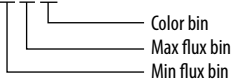
Super 0.25W Power PLCC4 Cool White

ASMT-UWBx-N X₂-X₃-X₄-8



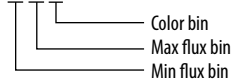
Super 0.25W Power PLCC4 Warm White

ASMT-UYBx-N X₂-X₃-X₄-8



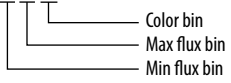
Super 0.5W Power PLCC4 Cool White (ASMT-QWBx)

ASMT-QWBx-N X₂-X₃-X₄-E



Super 0.5W Power PLCC4 Warm White (ASMT-QYBx)

ASMT-QYBx-N X₂-X₃-X₄-E



Color Bin (X₄)

Individual reel will contain parts from one sub bin only.

Sub Bin	Chromaticity Coordinates
	0.2950 0.2920 0.2984 0.3009
1A	x 0.2950 0.2920 0.2984 0.3009 y 0.2970 0.3060 0.3133 0.3042
1B	x 0.2920 0.2895 0.2962 0.2984 y 0.3060 0.3135 0.3220 0.3133
1C	x 0.2984 0.2962 0.3028 0.3048 y 0.3133 0.3220 0.3304 0.3207
1D	x 0.2984 0.3048 0.3068 0.3009 y 0.3133 0.3207 0.3113 0.3042
2A	x 0.3048 0.3130 0.3144 0.3068 y 0.3207 0.3290 0.3186 0.3113
2B	x 0.3028 0.3115 0.3130 0.3048 y 0.3304 0.3391 0.3290 0.3207
2C	x 0.3115 0.3205 0.3213 0.3130 y 0.3391 0.3481 0.3373 0.3290
2D	x 0.3130 0.3213 0.3221 0.3144 y 0.3290 0.3373 0.3261 0.3186
3A	x 0.3215 0.3290 0.3290 0.3222 y 0.3350 0.3417 0.3300 0.3243
3B	x 0.3207 0.3290 0.3290 0.3215 y 0.3462 0.3538 0.3417 0.3350
3C	x 0.3290 0.3376 0.3371 0.3290 y 0.3538 0.3616 0.3490 0.3417
3D	x 0.3290 0.3371 0.3366 0.3290 y 0.3417 0.3490 0.3369 0.3300
4A	x 0.3371 0.3451 0.3440 0.3366 y 0.3490 0.3554 0.3427 0.3369
4B	x 0.3376 0.3463 0.3451 0.3371 y 0.3616 0.3687 0.3554 0.3490
4C	x 0.3463 0.3551 0.3533 0.3451 y 0.3687 0.3760 0.3620 0.3554
4D	x 0.3451 0.3533 0.3515 0.3440 y 0.3554 0.3620 0.3487 0.3427
5A	x 0.3530 0.3615 0.3590 0.3512

Flux Bin Selection (X₂X₃)

Individual reel will contain parts from one bin only

X ₂	Min Flux Bin
X ₃	Min Flux Bin

Flux Bin Limits

Bin ID	Min. (lm)	Max. (lm)
A	18.1	23.5
B	23.5	30.6
C	30.6	35.2
D	35.2	39.8
E	39.8	45.7
F	45.7	51.7
G	51.7	56.8
H	56.8	62
J	62	67.2
K	67.2	73.9

Tolerance of each bin limit = ± 12%.

Color Bin (X₄)

Individual reel will contain parts from one sub bin only.

X ₄	Sub Bin
A	1A, 1B, 1C, 1D
B	2A, 2B, 2C, 2D
C	3A, 3B, 3C, 3D
D	4A, 4B, 4C, 4D
E	5A, 5B, 5C, 5D
F	6A, 6B, 6C, 6D
G	7A, 7B, 7C, 7D
H	8A, 8B, 8C, 8D
J	9A, 9B, 9C, 9D
K	1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D
L	2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D
M	3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D
N	4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D
P	5A, 5B, 5C, 5D, 6A, 6B, 6C, 6D
R	7A, 7B, 7C, 7D, 8A, 8B, 8C, 8D
S	8A, 8B, 8C, 8D, 9A, 9B, 9C, 9D
0	1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D, 6A, 6B, 6C, 6D
1	7A, 7B, 7C, 7D, 8A, 8B, 8C, 8D, 9A, 9B, 9C, 9D

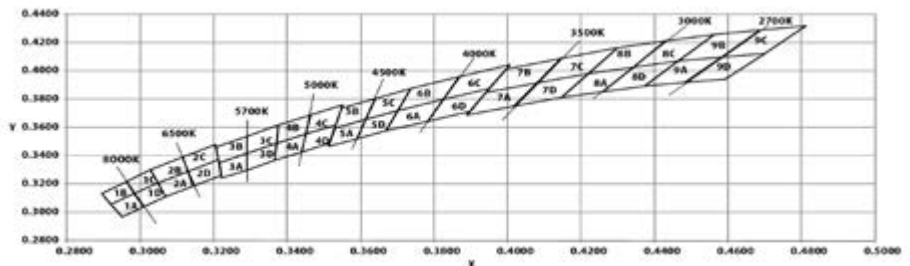
	y	0.3597	0.3659	0.3521	0.3465
5B	x	0.3548	0.3641	0.3615	0.3530
	y	0.3736	0.3804	0.3659	0.3597
5C	x	0.3641	0.3736	0.3702	0.3615
	y	0.3804	0.3874	0.3722	0.3659
5D	x	0.3615	0.3702	0.3670	0.3590
	y	0.3659	0.3722	0.3578	0.3521
6A	x	0.3670	0.3702	0.3825	0.3783
	y	0.3578	0.3722	0.3798	0.3646
6B	x	0.3702	0.3736	0.3869	0.3825
	y	0.3722	0.3874	0.3958	0.3798
6C	x	0.3825	0.3869	0.4006	0.3950
	y	0.3798	0.3958	0.4044	0.3875
6D	x	0.3783	0.3825	0.3950	0.3898
	y	0.3646	0.3798	0.3875	0.3716
7A	x	0.3889	0.3941	0.4080	0.4017
	y	0.3690	0.3848	0.3916	0.3751
7B	x	0.3941	0.3996	0.4146	0.4080
	y	0.3848	0.4015	0.4089	0.3916
7C	x	0.4080	0.4146	0.4299	0.4221
	y	0.3916	0.4089	0.4165	0.3984
7D	x	0.4017	0.4080	0.4221	0.4147
	y	0.3751	0.3916	0.3984	0.3814
8A	x	0.4147	0.4221	0.4342	0.4259
	y	0.3814	0.3984	0.4028	0.3853
8B	x	0.4221	0.4299	0.4430	0.4342
	y	0.3984	0.4165	0.4212	0.4028

8C	x	0.4342	0.4430	0.4562	0.4465
	y	0.4028	0.4212	0.4260	0.4071
8D	x	0.4259	0.4342	0.4465	0.4373
	y	0.3853	0.4028	0.4071	0.3893
9A	x	0.4373	0.4465	0.4582	0.4483
	y	0.3893	0.4071	0.4099	0.3919
9B	x	0.4465	0.4562	0.4687	0.4582
	y	0.4071	0.4260	0.4289	0.4099
9C	x	0.4582	0.4687	0.4813	0.4700
	y	0.4099	0.4289	0.4319	0.4126
9D	x	0.4483	0.4582	0.4700	0.4593
	y	0.3919	0.4099	0.4126	0.3944

Forward Voltage Bin

Bin	Min (V)	Max (V)
F05	2.80	3.00
F06	3.00	3.20
F07	3.20	3.40
F08	3.40	3.60

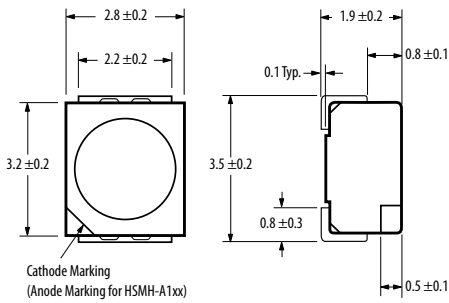
Tolerance ± 0.1V



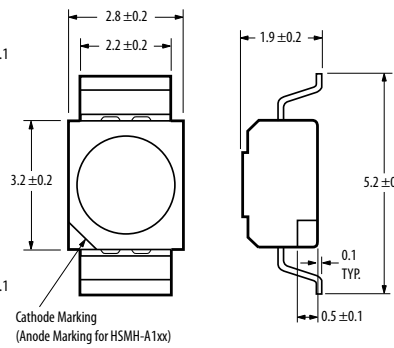
High Brightness LEDs

Package Dimensions

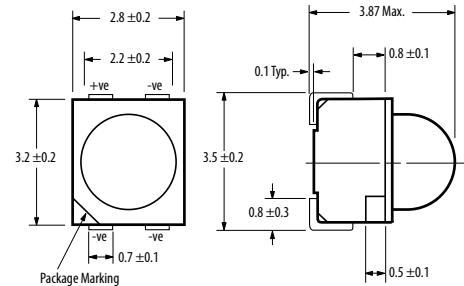
PLCC-2 Top Mount



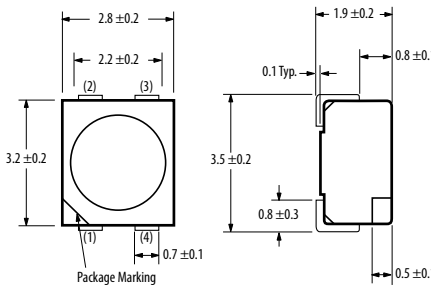
PLCC-2 Reverse Mount



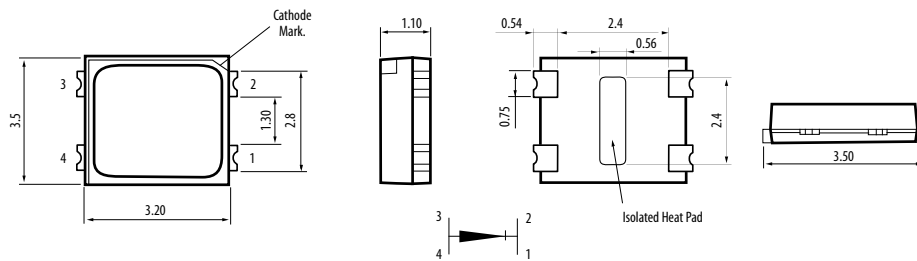
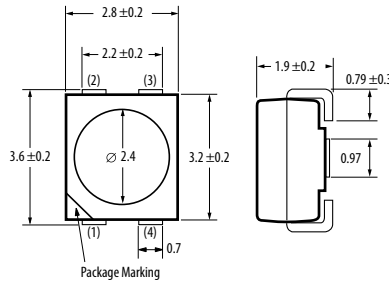
Power PLCC-4 with Lens



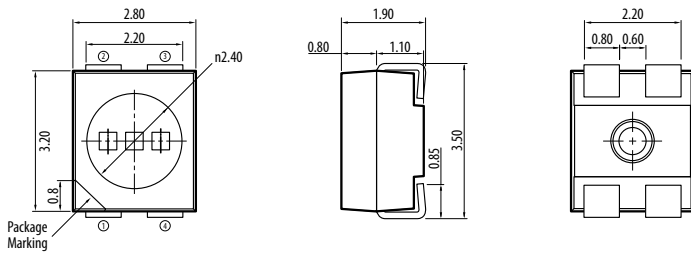
BiColor/TriColor PLCC4/Power PLCC-4



Super 0.5W Power PLCC-4

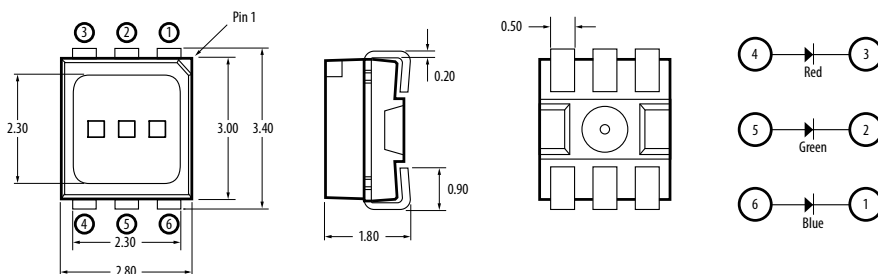


High Brightness Tricolor PLCC-4



Note:
Refer to respective product datasheet for pin configuration.

High Brightness Tricolor PLCC-6 ASMT-YTB2/YTC2/YTD2/YTB7/YTC7/YTD7



Note:
Diagram represents the overall package dimension for ASMT-YTB2/YTC2/YTD2/YTB7/YTC7/YTD7. ASMTYTC2/YTC7 is black body, while ASMT-YTD2/YTD7 is white surface.

High Brightness LEDs



Mini PLCC-2 Surface Mount LEDs

Description

Avago Technologies' ASMT-TxBM-Nxxxx Mini PLCC-2 SMT LEDs are designed specifically for use in Automotive Interior applications. They have a wide viewing angle of 110 degree making them ideally suited for instrument cluster panel, push button, HVAC and ambient decorative lighting applications in automotive interiors.

The LEDs are packed in EIA-compliant tape and reel to facilitate easy pick and place assembly. Every reel will be shipped in single intensity and color bin, to provide close uniformity.

Features and Benefits

- Industry standard Mini PLCC-2
- High reliability LED package
- High brightness using InGaN dice technologies
- High optical efficiency
- Wide viewing angle at 110°
- Available is 8mm carrier tape on 7-inch reel
- Stable and consistent performance with minimum degradation
- JEDEC MSL 2

Target Markets Applications

- Interior automotive
- Instrument panel backlighting
- Central console backlighting
- Navigation and audio system backlighting
- Push button backlighting
- Ambient illumination
- Car puddle lighting

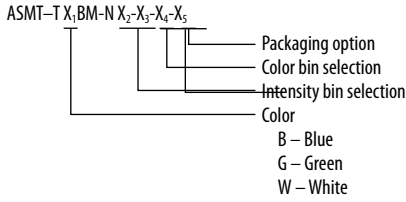
1W High Power LEDs

Part Number	Color	Color Temperature	Intensity Bin (Luminous Intensity @ 20mA)	Luminous Intensity @ 20mA (typ)	Max.Current	Viewing Angle	Packaging
ASMT-TWBM-NT902	Cool White	4500 - 8000K	T2 (355 - 450 mcd) U1 (450 - 560 mcd) U2 (560 - 715 mcd) V1 (715 - 900 mcd) V2 (900 - 1125 mcd)	650	20mA	120°	Reel
ASMT-TBBM-NP902	Blue	Not Applicable	P2 (56 - 71.5 mcd) Q1 (71.5 - 90 mcd) Q2 (90 - 112.5 mcd) R1 (112.5 - 140 mcd) R2 (140 - 180 mcd)	100	20mA	120°	Reel
ASMT-TGBM-NT502	Green	Not Applicable	T1 (285 - 355 mcd) T2 (355 - 450 mcd) U1 (450 - 560 mcd) U2 (560 - 715 mcd) V1 (715 - 900 mcd)	480	20mA	120°	Reel

Notes

1. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is $\frac{1}{2}$ the peak intensity.
2. Φ_V is the total luminous flux output as measured with an integrating sphere at mono pulse conditions.
3. Tolerance = $\pm 12\%$.

High Brightness LEDs



Part Numbering System

Device Color (X₁)

B	Blue
G	Green

Intensity Bin Select (X₂X₃)

Individual reel will contain parts from one half bin only

X ₂	Min IV Bin
X ₃	Number of half bins
0	Full Distribution
2	2 half bins starting from X21
3	3 half bins starting from X21
4	4 half bins starting from X21
5	5 half bins starting from X21
6	2 half bins starting from X22
7	3 half bins starting from X22
8	4 half bins starting from X22
9	5 half bins starting from X22

Device Color (X₁)

W	White
---	-------

Intensity Bin Select (X₂X₃)

Individual reel will contain parts from one half bin only

X ₂	Min IV Bin
X ₃	Number of half bins
0	Full Distribution
2	2 half bins starting from X21
3	3 half bins starting from X21
4	4 half bins starting from X21
5	5 half bins starting from X21
6	2 half bins starting from X22
7	3 half bins starting from X22
8	4 half bins starting from X22
9	5 half bins starting from X22

Intensity Bin Limits

Bin ID	Min (mcd)	Max (mcd)
P1	45.0	56.0
P2	56.0	71.5
Q1	71.5	90.0
Q2	90.0	112.5
R1	112.5	140.0
R2	140.0	180.0
S1	180.0	224.0
S2	224.0	285.0
T1	285.0	355.0
T2	355.0	450.0
U1	450.0	560.0
U2	560.0	715.0
V1	715.0	900.0
V2	900.0	1125.0

Tolerance of each bin limit = ± 12%

Intensity Bin Limits

Bin ID	Min (mcd)	Max (mcd)
T1	285.0	355.0
T2	355.0	450.0
U1	450.0	560.0
U2	560.0	715.0
V1	715.0	900.0
V2	900.0	1125.0
W1	1125.0	1400.00
W2	1400.00	1800.00

Bin ID	Min (mcd)	Max (mcd)
X1	1800.00	2240.00
X2	2240.00	2850.00

Tolerance of each bin limit = ± 12%

Color Bin Select (X₄)

Individual reel will contain parts from one half bin only

X4	
0	Full Distribution
A	1 and 2 only
B	2 and 3 only
C	3 and 4 only
G	1, 2 and 3 only
H	2, 3 and 4 only
Z	Special binning

Packaging Option (X₅)

Option	Test Current	Package Type	Reel Size
2	20mA	Top Mount	7 inch

Color Bin Limits

Blue	Min. (nm)	Max. (nm)
1	460.0	465.0
2	465.0	470.0
3	470.0	475.0
4	475.0	480.0

Green	Min. (nm)	Max. (nm)
1	515.0	520.0
2	520.0	525.0
3	525.0	530.0
4	530.0	535.0

Tolerance of each bin limit = ± 1%

Color Bin Select (X₄)

Individual reel will contain parts from one half bin only

X ₄	
0	Full Distribution
A	5K and 5L only
B	6K and 6L only
C	7K and 7L only
D	8K and 8L only
E	5K and 6K only
F	5L and 6L only
G	6K and 7K only
H	6L and 7L only
J	7K and 8K only
K	7L and 8L only
L	5K, 5L, 6K and 6L only
M	6K, 6L, 7K and 7L only
N	7K, 7L, 8K and 8L only
Z	Special binning

Color Bin Limits

Blue	Min. (nm)	Max. (nm)
1	460.0	465.0
2	465.0	470.0
3	470.0	475.0
4	475.0	480.0

Green	Min. (nm)	Max. (nm)
1	515.0	520.0
2	520.0	525.0
3	525.0	530.0
4	530.0	535.0

Tolerance of each bin limit = ± 1%

Packaging Option (X₅)

Option	Test Current	Package Type	Reel Size
2	20mA	Top Mount	7 inch

High Brightness LEDs

Color Bin (X_d)

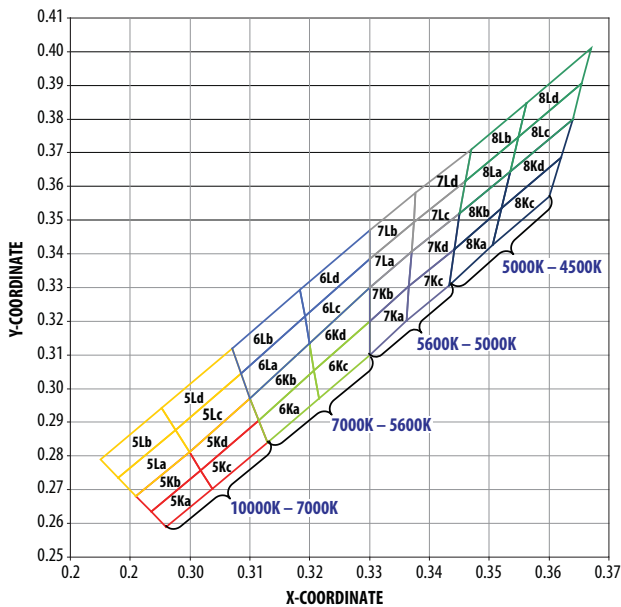
Individual reel will contain parts from one sub bin only.

Bin ID	Sub Bin ID		Limits (Chromaticity Coordinates)				
5K	5Ka	x	0.296	0.304	0.302	0.294	
		y	0.259	0.270	0.276	0.264	
	5Kb	x	0.294	0.302	0.300	0.291	
		y	0.264	0.276	0.281	0.268	
	5Kc	x	0.304	0.313	0.312	0.302	
		y	0.270	0.284	0.291	0.276	
	5Kd	x	0.302	0.312	0.310	0.300	
		y	0.276	0.291	0.297	0.281	
5L	5La	x	0.291	0.300	0.298	0.288	
		y	0.268	0.281	0.288	0.274	
	5Lb	x	0.288	0.298	0.295	0.285	
		y	0.274	0.288	0.294	0.279	
	5Lc	x	0.300	0.310	0.309	0.298	
		y	0.281	0.297	0.305	0.288	
	5Ld	x	0.298	0.309	0.307	0.295	
		y	0.288	0.305	0.312	0.294	
	6K	6Ka	x	0.313	0.322	0.321	0.312
			y	0.284	0.297	0.305	0.291
		6Kb	x	0.312	0.321	0.320	0.310
			y	0.291	0.305	0.314	0.297
6Kc		x	0.322	0.330	0.330	0.321	
		y	0.297	0.310	0.320	0.305	
6Kd		x	0.321	0.330	0.330	0.320	
		y	0.305	0.320	0.330	0.314	
6L	6La	x	0.310	0.320	0.319	0.309	
		y	0.297	0.314	0.322	0.305	
	6Lb	x	0.309	0.319	0.318	0.307	
		y	0.305	0.322	0.329	0.312	
	6Lc	x	0.320	0.330	0.330	0.319	
		y	0.314	0.330	0.339	0.322	
	6Ld	x	0.319	0.330	0.330	0.318	
		y	0.322	0.339	0.347	0.329	

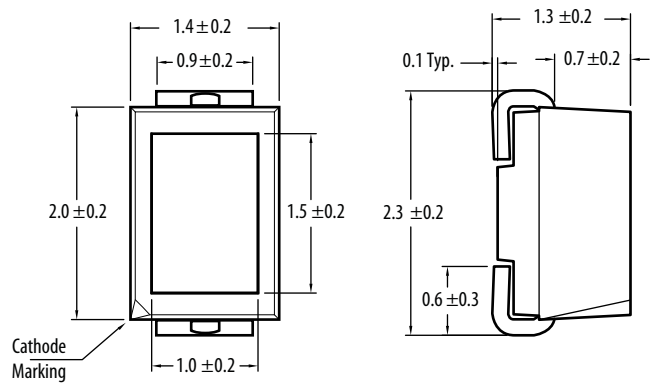
Bin ID	Sub Bin ID		Limits (Chromaticity Coordinates)			
7K	7Ka	x	0.330	0.336	0.337	0.330
		y	0.310	0.320	0.330	0.320
	7Kb	x	0.330	0.337	0.337	0.330
		y	0.320	0.330	0.341	0.330
	7Kc	x	0.336	0.343	0.344	0.337
		y	0.320	0.331	0.341	0.330
	7Kd	x	0.337	0.344	0.345	0.337
		y	0.330	0.341	0.352	0.341
7L	7La	x	0.330	0.337	0.337	0.330
		y	0.330	0.341	0.349	0.339
	7Lb	x	0.330	0.337	0.338	0.330
		y	0.339	0.349	0.358	0.347
	7Lc	x	0.337	0.345	0.346	0.337
		y	0.341	0.352	0.362	0.349
	7Ld	x	0.337	0.346	0.347	0.338
		y	0.349	0.362	0.371	0.358
8K	8Ka	x	0.343	0.351	0.352	0.344
		y	0.331	0.343	0.354	0.341
	8Kb	x	0.344	0.352	0.354	0.345
		y	0.341	0.354	0.364	0.352
	8Kc	x	0.351	0.360	0.362	0.352
		y	0.343	0.357	0.369	0.354
	8Kd	x	0.352	0.362	0.364	0.354
		y	0.354	0.369	0.380	0.364
8L	8La	x	0.345	0.354	0.355	0.346
		y	0.352	0.364	0.375	0.362
	8Lb	x	0.346	0.355	0.356	0.347
		y	0.362	0.375	0.385	0.371
	8Lc	x	0.354	0.364	0.366	0.355
		y	0.364	0.380	0.391	0.375
	8Ld	x	0.355	0.366	0.367	0.356
		y	0.375	0.391	0.401	0.385

Tolerance of each bin limit = ±0.02

Color Coordinates Chart



Package Dimensions



Notes:

1. All dimensions in millimeters.
2. Terminal Finish: Ag plating.
3. Encapsulation material: Silicone resin.



Envisium™ Power PLCC-4 Surface Mount LEDs

Description

Envisium™ is the premier class of mid-Power LEDs using TS AllnGaP chip technology. Envisium™ LEDs offer unparalleled performance, engineering and design flexibility.

Envisium™ Power PLCC-4 SMT LEDs, available in red, red-orange and amber, fill the need for mid-power illumination capabilities between Avago Technologies' conventional PLCC-4 products, and the Super 0.5W Power PLCC-4. The Power PLCC-4 package can be driven at high current due to its superior design, and is able to dissipate the heat more efficiently than conventional PLCC-2 SMT LEDs. It also offers much higher quality and reliability and superior mechanical characteristics to reduce tombstoning, prevent delamination and improve pick-and-place assembly.

The reliability and performance characteristics of these mid-power LEDs, such as their -40°C to +100°C operating temperature range, make them uniquely suitable for use in harsh conditions such as automotive applications, and in electronic signs and signals. To facilitate easy pick and place assembly, the LEDs are packed in EIA-compliant tape and reel. Every reel is shipped in single intensity and color bin (except for red) to provide close uniformity.

These LEDs are compatible with both IR solder reflow and through-the-wave (TTW) soldering processes.

Features and Benefits

- Industry Standard PLCC-4 (plastic leaded chip carrier) form factor
- High reliability Power PLCC-4 package
- High brightness with optimum flux performance using TS AllnGaP dice technologies
- Available in red, red orange and amber colors
- High optical efficiency
- Higher ambient temperature at the same current possible compared to PLCC-2
- Super wide 120-degree viewing angle
- Well-suited for backlighting applications
- Supplied in EIA-standard 8 mm carrier tape on 7 inch reel
- Compatible with both IR and TTW soldering processes

Applications

- Interior automotive
 - Instrument panel backlighting
 - Central console backlighting
 - Navigation and audio system lighting
 - Push button backlighting
- Exterior automotive
 - Turn signals
 - Side repeater lamps
 - CHMSLs (center high-mounted stop light)
 - Rear combination lamps
 - Puddle lights
- Electronic signs and signals
 - Channel lettering
 - Contour lighting
 - Indoor variable message signs
- Office automation, home appliances, industrial equipment
 - Front panel backlighting
 - Push button backlighting
 - Display backlighting

High Brightness LEDs

Envisium 0.25W Power PLCC-4 Surface Mount LED

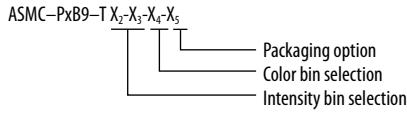
Part Number	Color	Typ. Dominant Wavelength λ_D (nm) ¹	Typ. Viewing Angle $2\theta_{1/2}$ (°) ²	Intensity Bin	Min. IV (mcd)	Max. IV (mcd)	Total Flux Φ_V (lm) ^{4,5} Typ.	Typ. VF (V)	Test Current (mA)
ASMC-PRB9-TV005	AllnGaP Red	630.0	120	V1	630.00	1000.00	2600.00	2.8	50
		630.0	120	V2	790.00	1260.00	3300.00	2.8	50
		630.0	120	W1	1000.00	1600.00	–	2.8	50
ASMC-PHB9-TW005	AllnGaP Red Orange	617.0	120	W1	1000.00	1600.00	4300.00	2.8	50
		617.0	120	W2	1200.00	2020.00	5000.00	2.8	50
		617.0	120	X1	1580.00	2500.00	–	2.8	50
ASMC-PAB9-TV005	AllnGaP Amber	592.0	120	V1	630.00	1000.00	3000.00	2.8	50
		592.0	120	V2	790.00	1260.00	3800.00	2.8	50
		592.0	120	W1	1000.00	1600.00	–	2.8	50

Notes:

1. The dominant wavelength, λ_D , is derived from the CIE Chromaticity Diagram and represents the color of the device.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. The luminous intensity, I_v , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
4. Φ is the total luminous flux output as measured with an integrating sphere at mono pulse conditions.

High Brightness LEDs

Envisium 0.25W Power PLCC-4



Color Bin Selection (X₄)

An individual reel will contain parts from one bin only

X ₄	
0	Full Distribution
A	1 and 2 only
B	2 and 3 only
C	3 and 4 only
D	4 and 5 only
E	5 and 6 only
G	1, 2 and 3 only
H	2, 3 and 4 only
J	3, 4 and 5 only
K	4, 5 and 6 only
M	1, 2, 3 and 4 only
N	2, 3, 4 and 5 only
P	3, 4, 5 and 6 only
R	1, 2, 3, 4 and 5 only
S	2, 3, 4, 5 and 6 only

Intensity Bin Selection (X₂X₃)

X ₂	Min. I _v Bin
X ₃	Number of half bins
0	Full Distribution
2	2 half bins starting from X ₂ 1
3	3 half bins starting from X ₂ 1
4	4 half bins starting from X ₂ 1
5	5 half bins starting from X ₂ 1
6	2 half bins starting from X ₂ 2
7	3 half bins starting from X ₂ 2
8	4 half bins starting from X ₂ 2
9	5 half bins starting from X ₂ 2

Intensity Bin Limits

Bin ID	Min. (mcd)	Max. (mcd)
V1	715.00	900.00
V2	900.00	1125.00
W1	1125.00	1400.00
W2	1400.00	1800.00
X1	1800.00	2240.00
X2	2240.00	2850.00

Tolerance of each bin limit = ± 12%

Color Bin Limits

Amber/ Yellow	Min. (nm)	Max. (nm)
1	582.0	584.5
2	584.5	587.0
3	587.0	589.5
4	589.5	592.0
5	592.0	594.5
6	594.5	597.0

Red Orange	Min. (nm)	Max. (nm)
1	611.0	616.0
2	616.0	620.0

Red	Min. (nm)	Max. (nm)
Full Distribution		

Tolerance of each bin limit = ±1 nm

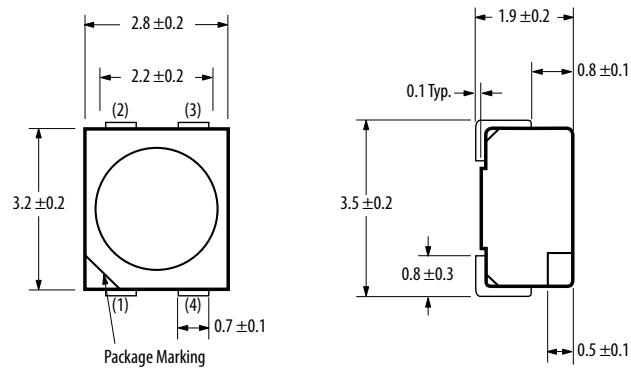
Packaging Option (X₅)

X ₅	Test Current	Package Type	Reel Size
5	50 mA	Top Mount	7 inch

High Brightness LEDs

Package Dimensions

Envisium 0.25W Power PLCC-4



Note:
All dimensions in millimeters.

Envisium Power PLCC-4	
1	Cathode
2	Anode
3	Cathode
4	Cathode

High Brightness LEDs

High Power LEDs



Description

Avago High Power and Mini High Power LED is a high performance, energy efficient device which can handle high thermal and high driving current. The White High Power LED is available in a wide range of color. For white color, the color temperature ranges from 2700K to 10000K.

The low profile package design and ultra small footprint is suitable for a wide variety of applications especially where space and height is a constraint.

The package is compatible with reflow soldering process. It is packed in EIA-compliant tape and reel option.

Features and Benefits

- Available in full range of colors: Red, Red Orange, Amber, Green, Blue, Royal Blue, Cyan, Cool White, Neutral White and Warm White
- Energy efficient
- Compatible with reflow soldering process
- High current operation
- Long operation life
- Wide viewing angle
- Silicone encapsulation
- Non-ESD sensitive (threshold > 16kV)

Typical Applications

- Sign backlight
- Safety, exit and emergency sign lightings
- Specialty lighting such as task lighting and reading lights
- Retail display
- Commercial lighting
- Accent or marker lightings, strip or step lightings
- Portable lightings, bicycle head lamp, torch lights.
- Decorative lighting
- Architectural lighting
- Street lighting
- Tunnel lighting
- Contour lighting
- Traffic signal

High Brightness LEDs

1W High Power LEDs

Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-AW00-NUV00	Cool White	4500 - 10,000K (1)	U(87.4-99.6lm); V(99.6-113.6lm)	90lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AW00-NUWK1	Cool White	5650 - 7000K	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	95lm	-	350mA	140	Yes	Tube and Reel ⁽²⁾
ASMT-AN00-NUV01	Neutral White	3500 - 4500K	U(87.4-99.6lm); V(99.6-113.6lm)	90lm	-	350mA	140	Yes	Tube and Reel ⁽²⁾
ASMT-AN00-NUVJ1	Neutral White	3500 - 4100K	U(87.4-99.6lm); V(99.6-113.6lm)	90lm	-	350mA	140	Yes	Tube and Reel ⁽²⁾
ASMT-AY00-NTU00	Warm White	2700 - 3500K ⁽¹⁾	T(67.2-87.4lm); U(87.4-99.6lm)	80lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AY00-NTV00	Warm White	2700 - 3500K ⁽¹⁾	T(67.2-87.4lm); U(87.4-99.6lm); V(99.6-113.6lm)	85lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AL00-NNP00	Royal Blue	440-460nm ^(3,4)	N(275-355mW); P(355-435mW)	350mW	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AB00-NMP00	Blue	460-480nm ⁽³⁾	M(13.9-18.1lm); N(18.1-23.5lm); P(23.5-30.6lm)	18lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AC00-NST00	Cyan	490-520nm ⁽³⁾	S(51.7-67.2lm); T(67.2-87.4lm)	58lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AC00-NSU00	Cyan	490-520nm ⁽³⁾	S(51.7-67.2lm); T(67.2-87.4lm) U(87.4-99.6lm)	75lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AG00-NST00	Green	515-535nm ⁽³⁾	S(51.7-67.2lm); T(67.2-87.4lm)	65lm	-	350mA	140	Yes	Tube ⁽²⁾
ASMT-AA00-ARS00	Amber	587-597nm ⁽³⁾	R(39.8-51.7lm); S(51.7-67.2lm)	50lm	-	350mA	140	No	Tube ⁽²⁾
ASMT-AH00-ARS00	Red-Orange	610-620nm	R(39.8-51.7lm); S(51.7-67.2lm)	50lm	-	350mA	140	No	Tube ⁽²⁾
ASMT-AR00-ARS00	Red	620-635nm	R(39.8-51.7lm); S(51.7-67.2lm)	50lm	-	350mA	140	No	Tube ⁽²⁾
ASMT-AR00-AST00	Red	620-635nm	S(51.7-67.2lm); T(67.2-87.4lm)	65lm	-	350mA	140	No	Tube ⁽²⁾

Notes

1. Narrow Color Temperature selections are available on request.
2. All above listed LEDs are also available in Reel packing.
3. Narrow color bin selections for blue, green, amber, royal-blue, and cyan are available on request.
4. For royal-blue, the wavelength shown in the above table is peak wavelength.

3W High Power LEDs

Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-AW31-NVW00	Cool White	4500-10000K	V(99.6-113.6lm); W(113.6-129.5lm)	115	196	700mA	140	Yes	Tube ⁽²⁾
ASMT-AN31-NVW00	Neutral White	3500-4500K	V(99.6-113.6lm); W(113.6-129.5lm)	115	196	700mA	140	Yes	Tube ⁽²⁾
ASMT-AY31-NTU00	Warm White	2,700 - 3,500K ⁽¹⁾	T(67.2-87.4lm); U(87.4-99.6lm)	80lm	140lm	700mA	140	Yes	Tube ⁽²⁾
ASMT-AB31-NNP00	Blue	455-475nm	N(18.1-23.5lm); P(23.5-30.6lm)	23	39	700mA	140	Yes	Tube ⁽²⁾
ASMT-AL31-NPQ00	Royal Blue	440-460nm ^(3,4)	P(355-435lm); Q(435-515lm)	460mW	782mW	700mA	140	Yes	Tube ⁽²⁾
ASMT-AG31-NTU00	Green	515-535nm ⁽³⁾	T(67.2-87.4lm); U(87.4-99.6lm)	78lm	125lm	700mA	140	Yes	Tube ⁽²⁾
ASMT-AA30-ARS00	Amber	587-597nm ⁽³⁾	R(39.8-51.7lm); S(51.7-67.2lm)	50lm	94lm	700mA	140	No	Tube ⁽²⁾
ASMT-AH30-ARS00	Red-Orange	610-620nm	R(39.8-51.7lm); S(51.7-67.2lm)	50lm	94lm	700mA	140	No	Tube ⁽²⁾
ASMT-AR30-ARS00	Red	620-635nm	R(39.8-51.7lm); S(51.7-67.2lm)	50lm	94lm	700mA	140	No	Tube ⁽²⁾
ASMT-AR30-AST00	Red	620-635nm	S(51.7-67.2lm); T(67.2-87.4lm)	60lm	112lm	700mA	140	Yes	Tube ⁽²⁾

Notes

1. Narrow Color Temperature selections are available on request.
2. All above listed LEDs are also available in Reel packing.
3. Narrow color bin selections for blue, green, amber and royal-blue are available on request.
4. For royal-blue, the wavelength shown in the above table is peak wavelength.

High Brightness LEDs

1W Mini High Power LEDs

Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-JW11-NUW01	Cool White	4500 - 10,000K ⁽¹⁾	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	106lm	-	350mA	140	Yes	Tape & Reel
ASMT-JN11-NUW01	Neutral White	3500 - 4500K ⁽¹⁾	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	106lm	-	350mA	140	Yes	Tape & Reel
ASMT-JY11-NTV01	Warm White	2700 - 3500K ⁽¹⁾	T(67.2-87.4lm); U(87.4-99.6lm); V(99.6-113.6lm)	87lm	-	350mA	140	Yes	Tape & Reel
ASMT-JL11-NMP01	Royal Blue	440-460nm ^(2,3)	M(225-275mW); N(275-355mW); P(355-435mW)	350mW	-	350mA	165	Yes	Tape & Reel
ASMT-JL11-NNQ01	Royal Blue	440-460nm ^(2,3)	N(275-355mW); P(355-435mW); Q(435-515mW)	355mW	-	350mA	165	Yes	Tape & Reel
ASMT-JB11-NMP01	Blue	455-475nm ⁽²⁾	M(13.9-18.1lm); N(18.1-23.5lm); P(23.5-30.6lm)	18lm	-	350mA	165	Yes	Tape & Reel
ASMT-JB11-NNQ01	Blue	455-475nm ⁽²⁾	N(275-355mW); P(355-435mW); Q(435-515mW)	24lm	-	350mA	165	Yes	Tape & Reel
ASMT-JC11-NST01	Cyan	490-520nm ⁽²⁾	S(51.7-67.2lm); T(67.2-87.4lm)	58lm	-	350mA	165	Yes	Tape & Reel
ASMT-JG11-NST01	Green	515-535nm ⁽²⁾	S(51.7-67.2lm); T(67.2-87.4lm)	70lm	-	350mA	165	Yes	Tape & Reel
ASMT-JA10-ARS01	Amber	587-597nm ⁽²⁾	R(39.8-51.7lm); S(51.7-67.2lm)	48lm	-	350mA	165	No	Tape & Reel
ASMT-JH10-ARS01	Red-Orange	610-620nm	R(39.8-51.7lm); S(51.7-67.2lm)	48lm	-	350mA	165	No	Tape & Reel
ASMT-JR10-AST01	Red	620-635nm	S(51.7-67.2lm); T(67.2-87.4lm)	60lm	-	350mA	165	Yes	Tape & Reel

Notes

1. Narrow Color Temperature selections are available on request.
2. Narrow color bin selections for blue, green, amber, royal-blue, and cyan are available on request.
3. For royal-blue, the wavelength shown in the above table is peak wavelength.

High Brightness LEDs

3W Mini High Power LEDs

Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-JW32-NVW01	Cool White	4500-10000K	V(99.6-113.6lm); W(113.6-129.5lm)	110	187	700mA	140	Yes	Tape & Reel
ASMT-JW32-NWX01	Cool White	4500-10000K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JW32-NWXH1	Cool White	4500-5650K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JW32-NWXJ1	Cool White	5000-6300K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JW32-NWXK1	Cool White	5650-7000K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JN32-NVW01	Neutral White	3500-4500K	V(99.6-113.6lm); W(113.6-129.5lm)	110	187	700mA	140	Yes	Tape & Reel
ASMT-JN32-NWX01	Neutral White	3500-4500K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JN32-NWXG1	Neutral White	3500-4100K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JN32-NWXH1	Neutral White	3800-4500K	W(113.6-129.5lm); X(129.5-147.7lm)	125	213	700mA	140	Yes	Tape & Reel
ASMT-JY32-NUW01	Warm White	2700-3500K	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	105	179	700mA	140	Yes	Tape & Reel
ASMT-JY32-NUWH1	Warm White	2700-3050K	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	105	179	700mA	140	Yes	Tape & Reel
ASMT-JY32-NUWJ1	Warm White	2850-3250K	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	105	179	700mA	140	Yes	Tape & Reel
ASMT-JY32-NUWK1	Warm White	3050-3500K	U(87.4-99.6lm); V(99.6-113.6lm); W(113.6-129.5lm)	105	179	700mA	140	Yes	Tape & Reel
ASMT-JL31-NPR01	Royal Blue	440-460nm ⁽³⁾	P(355-435lm); Q(435-515lm); R(515-595mW)	450mW	765mW	700mA	165	Yes	Tape & Reel
ASMT-JG31-NTU01	Green	515-535nm ⁽²⁾	T(67.2-87.4lm); U(87.4-99.6lm)	78lm	125lm	700mA	165	Yes	Tape & Reel
ASMT-JA30-ARS01	Amber	587-597nm ⁽²⁾	R(39.8-51.7lm); S(51.7-67.2lm)	48lm	86lm	700mA	165	No	Tape & Reel
ASMT-JH30-ARS01	Red-Orange	610-620nm	R(39.8-51.7lm); S(51.7-67.2lm)	48lm	86lm	700mA	165	No	Tape & Reel
ASMT-JR30-AST01	Red	620-635nm	S(51.7-67.2lm); T(67.2-87.4lm)	58lm	104lm	700mA	165	Yes	Tape & Reel
ASMT-JD30-ALN01	Deep Red	650-670nm ⁽³⁾	L(175-225mW); N(275-355mW)	240mW	480mW	700mA	165	Yes	Tape & Reel

Notes

1. Narrow Color Temperature selections are available on request.
2. Narrow color bin selections for blue, green, amber and royal-blue are available on request.
3. For royal-blue and deep red, the wavelength shown in the above table is peak wavelength.

High CRI 3W Mini High Power LEDs

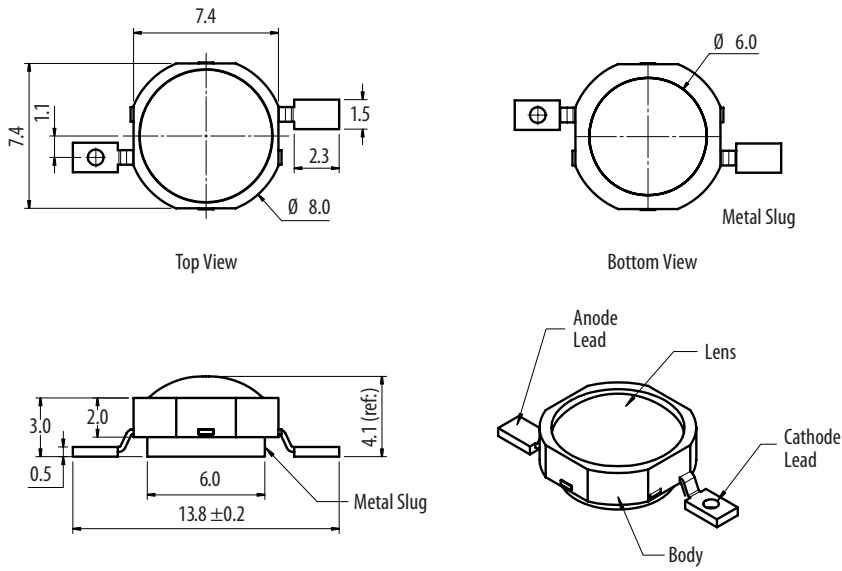
Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-JW33-NUV01	Cool White	4500-10000K	U(87.4-99.6lm); V(99.6-113.6lm)	100	178	700mA	140	Yes	Tape & Reel
ASMT-JN33-NUV01	Neutral White	3500-4500K	U(87.4-99.6lm); V(99.6-113.6lm)	100	178	700mA	140	Yes	Tape & Reel
ASMT-JY33-NRS01	Warm White	2700-3500K	R(39.8-51.7lm); S(51.7-67.2)	60	107	700mA	140	Yes	Tape & Reel

Notes

1. Narrow Color Temperature selections are available on request.

High Brightness LEDs

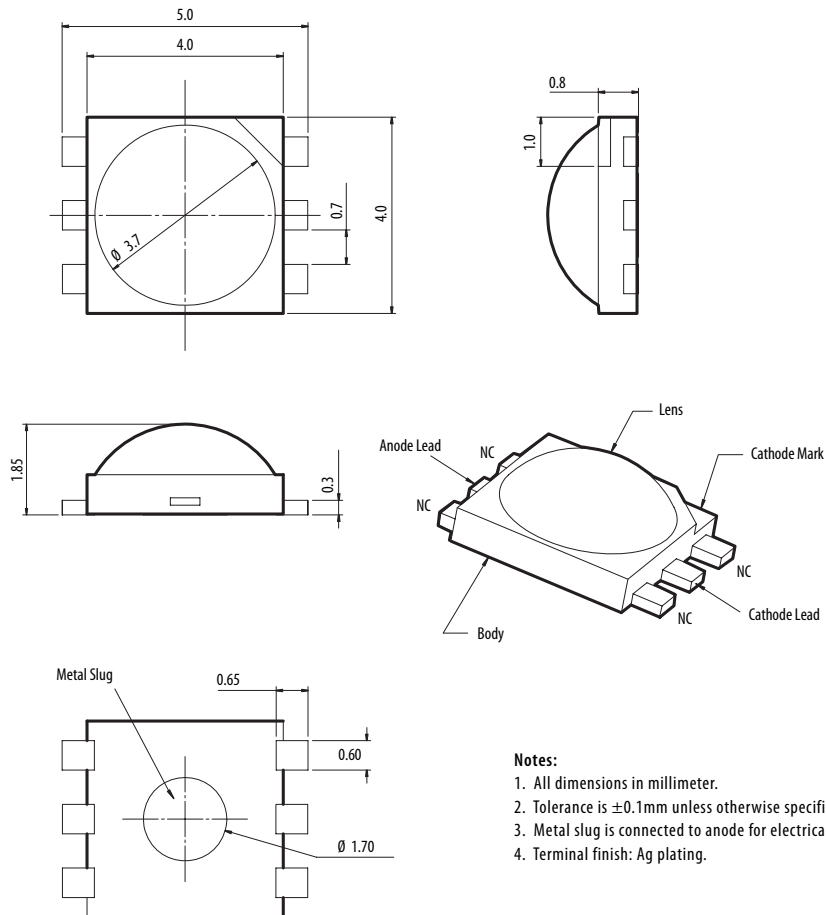
1W & 3W High Power LED



Notes:

1. All dimensions in millimeter.
2. Tolerance is ± 0.1 mm unless otherwise specified.
3. Metal slug is connected to anode for electrically non-isolated package.
4. Terminal finish: Ag plating.

1W & 3W Mini High Power LED



Notes:

1. All dimensions in millimeter.
2. Tolerance is ± 0.1 mm unless otherwise specified.
3. Metal slug is connected to anode for electrically non-isolated package.
4. Terminal finish: Ag plating.

High Brightness LEDs

Moonstone™ High Power LEDs



Description

High Power LED is a high-performance, energy-efficient device that can handle high-thermal and high-driving current. The exposed pad design has excellent heat transfer from the package to the motherboard. The low-profile package design is suitable for a wide variety of applications, especially where height is a constraint. The package is compatible with the SMT reflow soldering process. This will give more freedom and flexibility to the light source designer.



Features and Benefits

- Available in White, Blue, Green, Red and Amber color
- Energy efficient
- Exposed pad for excellent heat transfer
- Suitable for SMT process
- High-current operation
- Long operation life
- Wide viewing angle
- Silicone encapsulation
- Available in emitter and module

Typical Applications

- Portable (flashlight, bicycle headlight)
- Reading light
- Architectural lighting
- Garden lighting
- Decorative lighting
- Street lighting
- Retail lighting
- Contour lighting
- Sign backlighting

Specifications

- InGaN: 3.2V (typ) at 350 mA
3.6 V (typ) at 700 mA
- AllnGaP: 2.1 V (typ) at 350 mA
- Viewing angle of 120° and 110°

High Brightness LEDs

1W Moonstone™ High Power LEDs

Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 500mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-MW06-NMN00	Cool White	4,000 - 10,000K	M(95-110lm); N (110-125lm)	105	144	500mA	110	Yes	Tube
ASMT-MWB6-NMN00	Cool White	4,000 - 10,000K	M(95-110lm); N (110-125lm)	100	137	500mA	110	Yes	Tube
ASMT-MW04-NMN00	Cool White	4,000 - 10,000K	M (95-110lm); N (110-125lm)	105	–	350mA	110	Yes	Tube ⁽²⁾
ASMT-MWB4-NLM00	Cool White	4,000 - 10,000K	M (95-110lm); N (110-125lm)	95	–	350mA	110	Yes	Tube ⁽²⁾
ASMT-MY06-NMN00	Warm White	2,600K-4,000K	M (95-110lm); N (110-125lm)	100	137	500mA	110	Yes	Tube ⁽²⁾
ASMT-MYB6-NMN00	Warm White	2,600K-4,000K	M (95-110lm); N (110-125lm);	98	134	500mA	110	Yes	Tube ⁽²⁾
ASMT-MY04-NLM00	Warm White	2,600K-4,000K	L (73-95lm); M (95-110lm)	100	–	350mA	110	Yes	Tube ⁽²⁾
ASMT-MYB4-NLM00	Warm White	2,600K-4,000K	L (73-95lm); M (95-110lm)	90	–	350mA	110	Yes	Tube ⁽²⁾
ASMT-MB00-NDF00	Blue	455-475nm ⁽³⁾	D(11.5-15lm); E(15-19.5lm); F(19.5-25.5lm)	15	–	350mA	120	Yes	Tube ⁽²⁾
ASMT-MG00-NJK00	Green	515-535nm ⁽³⁾	J(43-56lm); K(56-73lm)	60	–	350mA	120	Yes	Tube ⁽²⁾
ASMT-MA00-AGH00	Amber	582-594.5nm ⁽³⁾	G(25.5-33lm); H(33-43lm)	35	–	350mA	120	No	Tube ⁽²⁾
ASMT-MR00-AGH00	Red	620-635nm	G(25.5-33lm); H(33-43lm)	35	–	350mA	120	No	Tube ⁽²⁾
ASMT-MR00-AHJ00	Red	620-635nm	H(33-43lm); J(43-56lm)	40	–	350mA	120	No	Tube ⁽²⁾

Notes

1. Narrow Color Temperature selections are available on request.
2. All above listed LEDs are also available in Reel packing.
3. Narrow color bin selections for blue, green and amber are available on request.

High Brightness LEDs

3W Moonstone™ High Power LEDs

Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 350mA (typ)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-MW22-NNP00	Cool White	4000-10000K	N(110-125lm); P(125-140lm)	120	205	700mA	110	Yes	Tube
ASMT-MWE2-NNP00	Cool White	4000-10000K	N(110-125lm); P(125-140lm)	115	196	700mA	110	Yes	Tube

Notes

1. Narrow Color Temperature selections are available on request.
2. All above listed LEDs are also available in Reel packing.

3W RGB Tri-Color Moonstone™ High Power LED

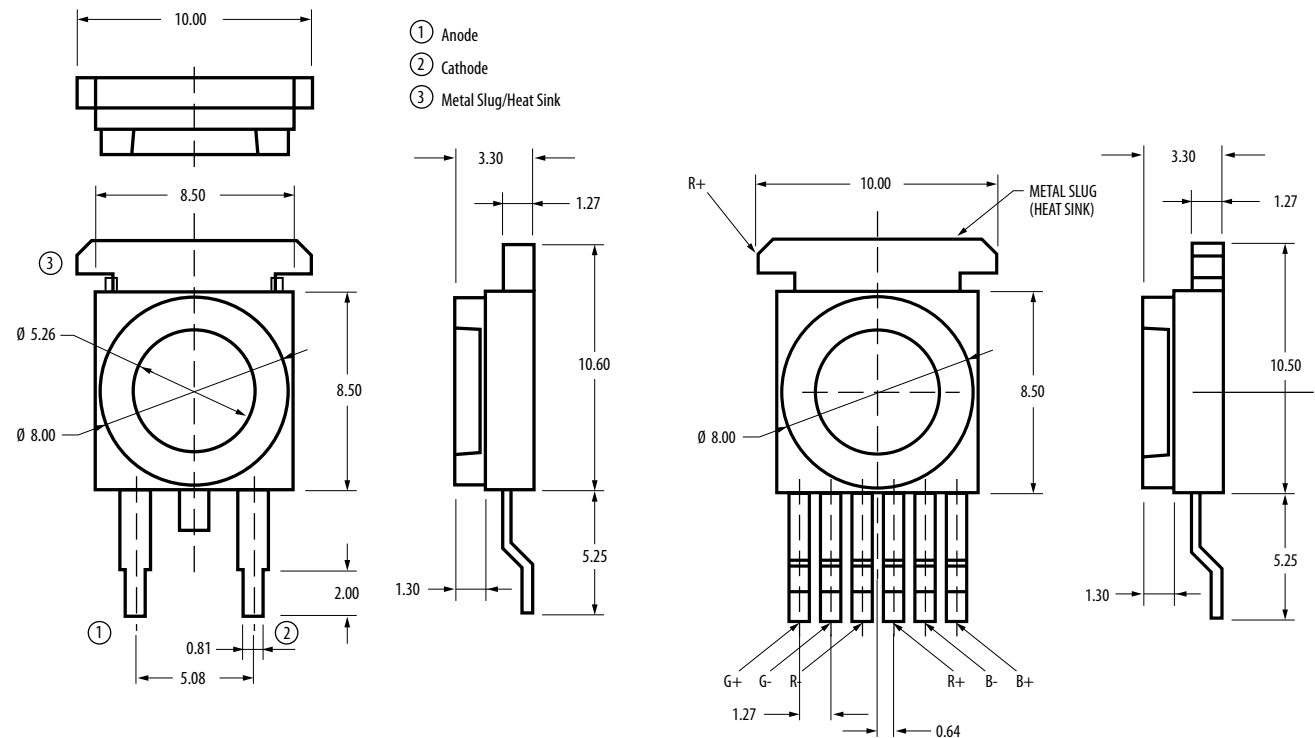
Part Number	Color	Color Temperature (K)/ Wavelength (nm)	Flux Bin (Luminous Flux/Radiometric Power @ 350mA)	Luminous Flux (lm) @ 700mA (typ)	Max. Current	Viewing Angle	Electrically Isolated Metal Slug	Packaging
ASMT-MT00-00001	Red	620-635nm	H(33-43lm); J(43-56lm)	40	350mA	120	No	Tape and Reel
	Green	515 - 535nm ⁽¹⁾	J(43-56lm); K(56-73lm); L(73-95lm)	55	350mA	120	Yes	
	Blue	455 - 475nm ⁽¹⁾	D(11.5-15lm); E(15-19.5lm); F(19.5-25.5lm)	13	350mA	120	Yes	

Notes

1. Narrow Color Temperature selections are available on request.

Package Dimensions

Moonstone LED Emitters



Notes:

1. All Dimensions in millimeters.
2. Tolerance is ± 0.1 mm unless otherwise specified.
3. Metal slug is connected to anode for electrically non-isolated option.

Notes:

1. All dimensions in millimeters.
2. Tolerance is ± 0.1 mm unless otherwise specified.
3. Metal slug is connected to the anode of Red.



Standard Through-hole Lamps

Description

Avago Technologies offers four types of technology-based LEDs. GaP and AlGaAs based technologies are suitable for low to moderate light output requirements. AllnGaP and InGaN product offering are suitable for high brightness needs. Through-hole LEDs are offered in a variety of packages such as 3 mm, 5 mm, rectangular, bicolor, integrated resistors in standard and low current options.

These devices are molded from advanced optical grade epoxy, which provide superior high temperature performance and excellent moisture resistance.

Through-hole LEDs are suitable for all applications requiring backlighting and status indication. Consumer electronics and automotive interiors use LEDs to add value to their products. Low power consumption, high reliability and a broad range of colors and packages are just a few reasons why.

Features and Benefits

- Excellent product quality and reliability
- Wide range of products
- Competitive pricing
- Wide operating temperature range
 - With minor electrical/optical changes
- Lower power consumption
 - High efficiency, low drive currents and low driving voltages required
- Thin, light weight and robust packaging
 - Excellent performance even under vibration and mechanical shock
- Different material technologies available in standard GaP LED lamps
 - Choice of colors (560 nm – 626 nm): Green, Yellow, Amber, Orange and Red
 - Red color using AlGaAs technology.
 - Five colors available with high luminous intensity in AllnGaP LED lamps
 - Amber (590 nm), Red (626 nm), Deep Red (635 nm), Orange (605 nm) and Red-Orange (615 nm)
 - Two colors available with high luminous intensity in InGaN LED lamps
 - Blue (470 nm) and Green (527 nm)
 - Several packaging options
 - Different sizes with a clear or diffused lens, several lead configurations and different spatial radiation patterns available in bulk, ammo-pack, right angle housing and tape and reel

Typical Applications

- Consumer
 - Ovens, washers, etc.
 - Audio, hi-fi and electrical appliances
 - Gaming and vending machines
 - Electronic toys and games
- Industrial
 - Sensors
 - Instruments
 - Measurement equipment
- Automotive and Other
 - Automotive interior
 - Exercise equipment
 - Medical equipment
 - Front panel industrial equipment

LED Indicators and Displays

Standard Through-hole LED Lamps

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
3 mm (T1) LED Lamps — Standard Current								
HLMP-1301-G0002	GaP Red	626	60°	Tinted, Diffused	8.6	11	1.9	10
HLMP-1321	GaP Red	626	45°	Tinted, Non-diffused	8.6	30	1.9	10
HLMP-1340	GaP Red	626	45°	Micro-tinted, Non-diffused	35.2	55	1.9	20
HLMP-1401-E0000	GaP Yellow	585	60°	Tinted, Diffused	5.7	-	2	10
HLMP-1440	GaP Yellow	585	45°	Micro-tinted, Non-diffused	23.5	45	2.1	20
HLMP-1503	GaP Green	569	60°	Tinted, Diffused	4.2	8.5	2.1	10
HLMP-1521	GaP Green	569	45°	Tinted, Non-diffused	6.7	22	2.1	10
HLMP-1540	GaP Green	569	45°	Untinted, Non-diffused	27.3	45	2.2	20
HLMP-K101	AlGaAs Red	637	60°	Tinted, Diffused	22	45	1.8	20
HLMP-K105	AlGaAs Red	637	45°	Untinted, Non-diffused	35.2	65	1.8	20
HLMP-K640	GaP Green	560	45°	Untinted, Non-diffused	4.2	21	2.2	20
HLMP-Y601-J0000	AllnGaP Red	627	45	Untinted, Non-diffused	240	680	2.2	20
HLMP-Y651-G0000	AllnGaP Deep Red	638	45	Untinted, Non-diffused	140	300	2.2	20
HLMP-Y701-G0000	AllnGaP Amber	592	45	Untinted, Non-diffused	140	400	2.2	20
HLMP-Y802-F0000	AllnGaP Green	572	45	Tinted, Non-diffused	110	240	2.4	20
HLMP-Y901-J0000	AllnGaP Yellow Orange	605	45	Untinted, Non-diffused	240	680	2	20
HLMP-Y951-K0000	AllnGaP Red Orange	615	45	Untinted, Non-diffused	310	680	2	20
HLMP-KA45-E0000	InGaN Blue	464	50	Untinted, Non-diffused	85	480	3.5	20
3 mm (T1) LED Lamps — Autoinsertable								
HLMP-NG05	AllnGaP Red	626	45°	Micro-tinted, Non-diffused	90.2	435	1.90	20
HLMP-NG07	AllnGaP Red	626	60°	Micro-tinted, Non-diffused	90.2	435	1.90	20
HLMP-NL06	AllnGaP Amber	590	60°	Micro-tinted, Non-diffused	96.2	450	2.02	20
HLMP-NS30-J0000	InGaN Blue	470	30°	Untinted, Non-diffused	240	550	3.6	20
HLMP-NM31-R0000	InGaN Green	529	30°	Untinted, Non-diffused	1500	2800	3.3	20
3 mm (T1) 5V, 12V Integrated Resistor LED Lamps								
HLMP-1621 ^[1]	GaP Yellow	585	60°	Tinted, Diffused	2.2	8	8	—
HLMP-1640-B00A2 ^[2]	GaP Green	569	60°	Tinted, Diffused	1.6	8	8	—

Notes: 1. Operating Voltage = 12V. 2. Operating Voltage = 5V.

5 mm (T1 3/4) LED Lamps — Standard Current								
HLMP-3301	GaP Red	626	60°	Tinted, Diffused	5.4	7	1.9	10
HLMP-3401	GaP Yellow	585	60°	Tinted, Diffused	5.7	8	2	10
HLMP-3507	GaP Green	569	60°	Tinted, Diffused	4.2	5.2	2.1	10
HLMP-3950	GaP Green	569	24°	Micro-tinted, Non-diffused	111.7	265	2.2	20
HLMP-C008-U0000	AllnGaP Red	626	8°	Untinted, Non-diffused	2900	6000	1.9	20
HLMP-C025-P0000	AllnGaP Red	626	25°	Untinted, Non-diffused	500	1000	1.9	20
HLMP-C208-S0000	AllnGaP Amber	590	8°	Untinted, Non-diffused	2600	3000	1.9	20
HLMP-C225-O0000	AllnGaP Amber	590	25°	Untinted, Non-diffused	450	800	1.9	20
HLMP-C608-R0000	AllnGaP Red	635	8°	Untinted, Non-diffused	1000	2000	1.9	20
HLMP-C625-P0000	AllnGaP Red	635	25°	Untinted, Non-diffused	500	700	1.9	20
HLMP-DB25-B0000	GaN Blue	462	25°	Untinted, Non-diffused	40	100	4	20
HLMP-DM25-J0000	InGaN Green	527	25°	Untinted, Non-diffused	240	970	3.8	20
HLMP-DS25-F0000	InGaN Blue	470	25°	Untinted, Non-diffused	110	260	3.6	20
5 mm (T1 3/4) LED Lamps — Low Current								
HLMP-4700	GaP Red	626	50°	Tinted, Diffused	1.3	2.3	1.7	2
HLMP-4719	GaP Yellow	585	50°	Tinted, Diffused	0.9	2.1	1.8	2
HLMP-4740	GaP Green	569	50°	Tinted, Diffused	1	2.3	1.9	2
HLMP-D150	AlGaAs Red	637	65°	Tinted, Diffused	1.3	3	1.6	1

LED Indicators and Displays

Standard Through-hole Lamps

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
2 mm x 5 mm Rectangular LED Lamps								
HLMP-S201	GaP Red	626	110°	Tinted, Diffused	3.4	7.5	1.9	20
HLMP-S301	GaP Yellow	585	110°	Tinted, Diffused	2.2	4	2.1	20
HLMP-S501	GaP Green	569	110°	Tinted, Diffused	4.2	8	2.2	20
2mm x 5mm Bicolor Rectangular LED Lamps								
HLMP-0800	GaP Green	570	100°	Untinted, Diffused	2.6	–	2.2	20
	GaP Red	626	100°	Untinted, Diffused	2.1	–	1.9	20
HLMP-0805	GaP Green	570	100°	Untinted, Diffused	2.6	–	2.2	20
	GaP Yellow	585	100°	Untinted, Diffused	1.4	–	2.1	20
5 mm (T1 3/4) LED Lamps — Bicolor								
HLMP-4000	GaP Green	570	65°	Untinted, Diffused	4.2	–	2.2	10
	GaP Red	626	65°	Untinted, Diffused	2.1	–	1.9	10
HLMP-4015	GaP Green	570	65°	Untinted, Non-Diffused	20	–	2.2	20
	GaP Yellow	585	65°	Untinted, Non-Diffused	20	–	2.6	20

Intensity Bin Limits

Bin ID	Intensity (mcd)	
	Min.	Max.
Red / Orange		
A	0.6	0.9
B	0.9	1.5
C	1.5	2.4
D	2.4	3.8
E	3.8	6.1
F	6.1	9.7
G	9.7	15.5
H	15.5	24.8
I	24.8	39.6
J	39.6	63.4
K	63.4	101.5
L	101.5	162.4
M	162.4	234.6
N	234.6	340.0
O	340	540
P	540	850
Q	850	1200
R	1200	1700
S	1700	2400
T	2400	3400
U	3400	4900
V	4900	7100
W	7100	10200
X	10200	14800
Y	14800	21400
Z	21400	30900

Tolerance: ±18%

Bin ID	Intensity (mcd)	
	Min.	Max.
Yellow / Amber		
A	1.0	1.6
B	1.6	2.5
C	2.5	4.0
D	4.0	6.5
E	6.5	10.3
F	10.3	16.6
G	16.6	26.5
H	26.5	42.3
I	42.3	67.7
J	67.7	108.2
K	108.2	173.2
L	173.2	250.0
M	250	360
N	360	510
O	510	800
P	800	1250
Q	1250	1800
R	1800	2900
S	2900	4700
T	4700	7200
U	7200	11700
V	11700	18000
W	18000	27000

Tolerance: ±18%

Bin ID	Intensity (mcd)	
	Min.	Max.
Green / Emerald Green *		
A	1.1	1.8
B	1.8	2.9
C	2.9	4.7
D	4.7	7.6
E	7.6	12.0
F	12.0	19.1
G	19.1	30.7
H	30.7	49.1
I	49.1	78.5
J	78.5	125.7
K	125.7	201.1
L	201.1	289.0
M	289	417
N	417	680
O	680	1100
P	1100	1800
Q	1800	2700
R	2700	4300
S	4300	6800
T	6800	10800
U	10800	16000
V	16000	25000
W	25000	40000

* Except InGaN Green





Tolerance: ±18%

Bin ID	Intensity (mcd)	
	Min.	Max.
InGaN Green / Blue		
A	30	40
B	40	50
C	50	65
D	65	85
E	85	110
F	110	140
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000




Tolerance: ±15%

LED Indicators and Displays

Color Bin Limits

Bin ID	Intensity (mcd)	
	Min.	Max.
Orange 		
2	599.0	602.5
3	601.5	605.0
4	603.8	608.2
5	606.8	611.2
Yellow 		
1	582.0	584.5
3	584.5	587.0
2	587.0	589.5
4	589.5	592.0
5	592.0	593.0
Amber 		
3	584.5	587.0
2	587.0	589.5
4	589.5	592.0
6	592.0	594.5
7	594.5	597.0
Emerald Green 		
1	582.0	584.5
3	584.5	587.0
2	587.0	589.5
4	589.5	592.0
5	592.0	593.0

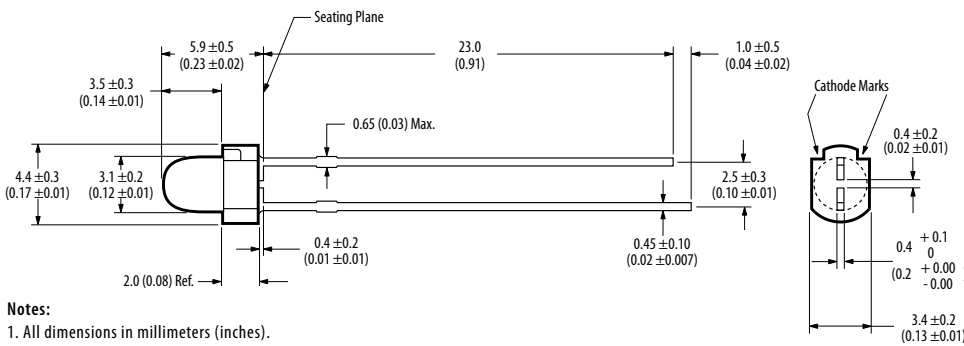
Tolerance: ±0.5nm

Bin ID	Intensity (mcd)	
	Min.	Max.
Green (except InGaN Green) 		
6	561.5	564.5
5	564.5	567.5
4	567.5	570.5
3	570.5	573.5
2	573.5	576.5
Yellow 		
1	520.0	524.0
3	524.0	528.0
2	528.0	532.0
4	532.0	536.0
5	536.0	540.0
Blue 		
1	460.0	464.0
2	464.0	468.0
3	468.0	472.0
4	472.0	476.0
5	476.0	480.0

Tolerance: ±0.5nm

LED Indicators and Displays

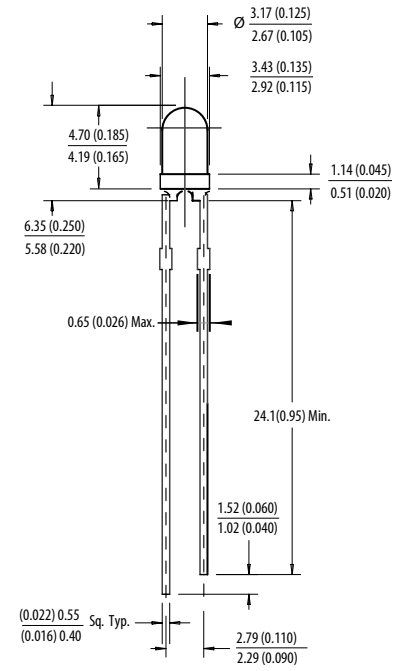
3 mm (T1) LED Lamps – Autoinsertable Package



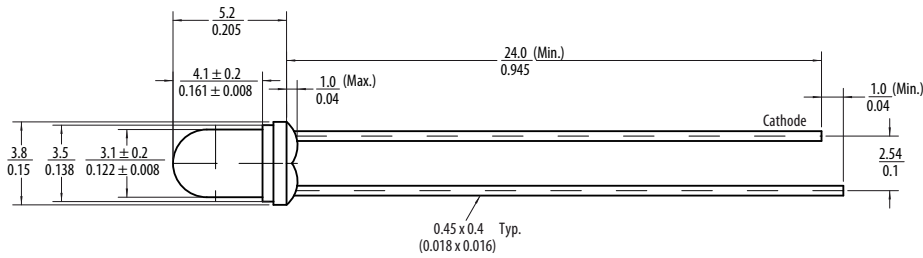
Notes:

1. All dimensions in millimeters (inches).
2. Leads are mild steel. Solder coated.
3. Epoxy Meniscus of 0.8 mm (0.03 in.) maximum may extend to the leads.

3 mm (T1) LED Lamps Package



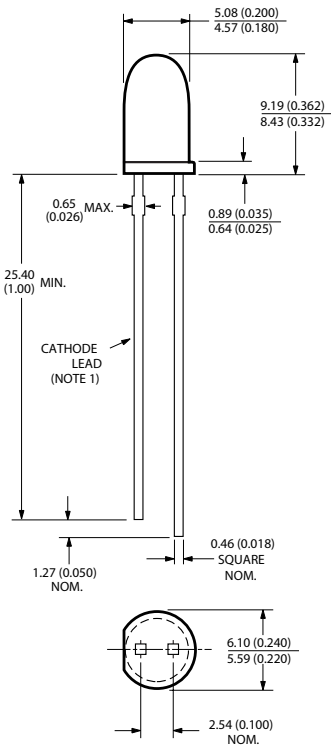
3 mm (T1) AlInGaP LED Lamps Package



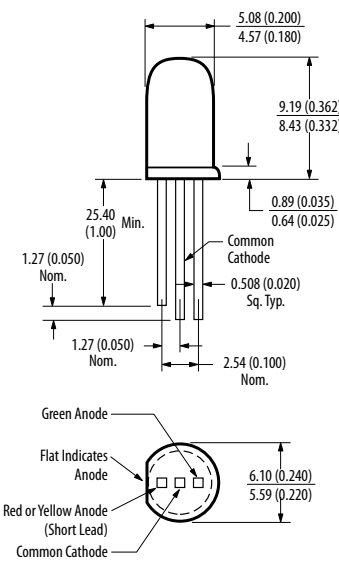
Notes:

1. All dimensions in millimeters (inches).
2. Tolerance is ±0.25mm (.010) unless otherwise stated.
3. Lead spacing is measured where the leads emerge from the package.

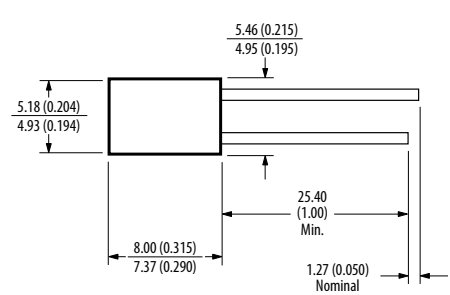
5 mm (T1 3/4) LED Lamps Package



5 mm (T1-3/4) LED Lamps - Bicolor



2 x 5 mm Rectangular LED Lamps Package



Subminiature Lamps



Description

Avago Technologies' Subminiature Lamps are designed for modern printed circuit (PC) boards, replacing through-hole mounted components for many traditional functions with smaller components, sized for closer placement.

Subminiature Lamp components are available in several lead configurations and can be used for top mount, reverse mount, and through-hole applications. The lead configurations are 'Gull Wing'–011 option, 'Yoke Bend'–021 option and 'Z Bend'–031 option. A variety of packages are available, such as flat top, dome and rectangular in standard or low current options.

Besides this, PCB based subminiature lamps are available as well. These lamps come in un-tinted, non-diffused package to cater for various product themes and ease handling applications. The small size, narrow footprint and high brightness make these LEDs excellent for backlighting, status indication and panel illumination applications.

Features and Benefits

- Excellent product quality
- Wide range of product offering
- Competitive pricing
- Can be used with surface mount or through-hole applications
- High reliability
 - No replacement for life of equipment
- Wide operating temperature range
 - Minor electrical/optical changes
- Lower power consumption
 - High efficiency, low drive currents required, low driving voltages
- Thin, light-weight and robust packaging
 - Excellent performance even under vibration and mechanical shock
- Different thin material technologies available
 - Several colors available in GaP
 - Choice of colors (560 – 626 nm): Green, Yellow, Amber, Orange, Red and Deep Red
- Three colors available in AlnGaP
 - Amber (590 nm), Red (626 nm) and Orange (605 nm)
- Two colors available in InGaN
 - Blue (472 nm), Green (526 nm)
- Several lead configuration options
 - Gull-wing, Yoke-bend and Z-bend
- Several Packaging options
 - Different sizes and spatial radiation patterns available in bulk, right angle housing, and tape and reel

Typical Applications

- Industrial and Communication
 - Front panel and symbol indicator
 - Keypad and push button backlighting
- Consumer
 - CD player, hi-fi audio and electrical appliances
 - Keypad and push button backlighting
- Automotive
 - Dashboard panel and symbol backlighting
 - Car radio indicators

LED Indicators and Displays

Domed Subminiature Lamps

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
HLMP-Q106-R00xx	TS AlGaAs Red	644	15°	Untinted, Non-diffused	100	400	1.9	20
HLMA-QG00-S00xx	AllnGaP Red	626	15°	Untinted, Non-diffused	160	500	1.9	20
HLMT-QG00-T00xx	AllnGaP Red	622	15°	Untinted, Non-diffused	250	1000	2	20
HLMP-6300-F00xx	GaP Red	626	90°	Tinted, Diffused	1	10	1.8	10
HLMA-QH00-S00xx	AllnGaP Red-Orange	615	15°	Untinted, Non-diffused	160	500	1.9	20
HLMT-QH00-T00xx	AllnGaP Red-Orange	615	15°	Untinted, Non-diffused	250	500	2	20
HLMT-QH00-XY0xx	AllnGaP Red-Orange	615	15°	Untinted, Non-diffused	1600	3300	2	20
HLMA-QJ00-S00xx	AllnGaP Orange	605	15°	Untinted, Non-diffused	160	500	1.9	20
HLMA-QL00-S00xx	AllnGaP Amber	590	15°	Untinted, Non-diffused	160	500	1.9	20
HLMT-QL00-Txxxx	AllnGaP Amber	590	15°	Untinted, Non-diffused	250	–	2	20
HLMP-6400-F00xx	GaP Yellow	585	90°	Tinted, Diffused	1	9	2	10
HLMP-6500-F00xx	GaP Green	569	90°	Tinted, Diffused	1	7	2.1	10
HLMP-6505-L00xx	GaP Green	569	28°	Untinted, Non-diffused	10	40	2.1	10
HLMP-QB00-S00xx	InGaN Blue	468	20°	Untinted, Non-diffused	–	160	290	3.7
HLMP-QM00-S00xx	InGaN Green	525	20°	Untinted, Non-diffused	–	160	690	3.7
Domed Subminiature Lamps — Low Current								
HLMP-Q150-F00xx	AlGaAs Red	637	90°	Tinted, Diffused	1	1.8	1.8	1.6
HLMP-7000-D00xx	GaP Red	626	90°	Tinted, Diffused	0.4	1	1.4	1.8
HLMP-7019-D00xx	GaP Yellow	585	90°	Tinted, Diffused	0.4	0.6	1.6	2
HLMP-7040-D00xx	GaP Green	569	90°	Tinted, Diffused	0.4	0.6	1.4	2.1

Domed Subminiature Lamps — Resistor

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
HLMP-6600-G00xx	GaP Red	626	90°	Tinted, Diffused	1.6	5	9.6	5
HLMP-6620-F00xx	GaP Red	626	90°	Tinted, Diffused	1	2	3.5	5
HLMP-6720-F00xx	GaP Yellow	585	90°	Tinted, Diffused	0.9	2	3.5	5
HLMP-6800-G00xx	GaP Green	569	90°	Tinted, Diffused	1.6	5	9.6	5
HLMP-6820-F00xx	GaP Green	569	90°	Tinted, Diffused	1	2	3.5	5
Flat Top Subminiature Lamps								
HLMP-P105-L00xx	AlGaAs Red	637	125°	Untinted, Non-diffused	10	30	1.8	20
HLMA-PG00-N00xx	AllnGaP Red	626	125°	Untinted, Non-diffused	25	75	1.9	20
HLMT-PG00-P00xx	AllnGaP Red	622	125°	Untinted, Non-diffused	40	150	2	20
HLMP-P205-F00xx	GaP Red	626	125°	Untinted, Non-diffused	1	8	1.8	10
HLMA-PH00-N00xx	AllnGaP Red-Orange	615	125°	Untinted, Non-diffused	25	75	1.9	20
HLMT-PH00-P00xx	AllnGaP Red Orange	615	125°	Untinted, Non-diffused	40	120	2	20
HLMA-PJ00-N00xx	AllnGaP Orange	605	125°	Untinted, Non-diffused	25	75	2	20
HLMA-PL00-N00xx	AllnGaP Amber	590	125°	Untinted, Non-diffused	25	75	1.9	20
HLMT-PL00-POWxx	AllnGaP Amber	590	125°	Untinted, Non-diffused	40	150	2.4	20
HLMP-P505-G00xx	GaP Green	569	125°	Untinted, Non-diffused	1.6	6.5	2.1	10
HLMP-P605-F00xx	GaP Emerald Green	560	125°	Untinted, Non-diffused	1	1.5	2.2	10
HLMP-PB00-N00xx	InGaN Blue	468	90°	Untinted, Non-diffused	25	60	3.7	20
HLMP-PM00-N00xx	InGaN Green	528	90°	Untinted, Non-diffused	25	200	3.7	20
PCB Based Subminiature Lamps								
ASMT-BA20-AS000	AllnGaP Amber	590	15°	Untinted, Non-diffused	180	750	2.0	20
ASMT-BG20-AS000	AllnGaP Green	569	15°	Untinted, Non-diffused	180	650	2.0	20
ASMT-BR20-AS000	AllnGaP Red	626	15°	Untinted, Non-diffused	180	650	2.0	20
ASMT-BB20-NS000	InGaN Blue	468	15°	Untinted, Non-diffused	180	650	3.2	20

Note: "xx" at the end of the part number refers to the mechanical option number. Refer to table on the next page.

LED Indicators and Displays

Subminiature Lamps are also available in the following options:






Mechanical Option Number	Description
10	Right Angle
11	Tape and Reel, 1500 lamps per reel
12	Gull Wing, Bulk Packaging
21	Yoke Lead, Tape and Reel, 1500 lamps per reel
22	Yoke Lead, Bulk Packaging
31	Z-Bend, Tape and Reel, 1500 lamps per reel
32	Z-Bend, Bulk Packaging



Intensity Bin Limits

Bin ID	Intensity (mcd)	
	Min.	Max.
A	0.10	0.20
B	0.16	0.32
C	0.25	0.50
D	0.40	0.80
E	0.63	1.25
F	1.0	2.0
G	1.6	3.2
H	2.5	5.0
J	4.0	8.0
K	6.3	12.5
L	10	20
M	16	32
N	25	50
P	40	80.0
Q	63	125
R	100	200
S	160	320
T	250	500
U	400	800
V	630	1250
W	1000	2000
X	1600	3200
Y	2500	5000

Tolerance: $\pm 18\%$

Color Bin Limits

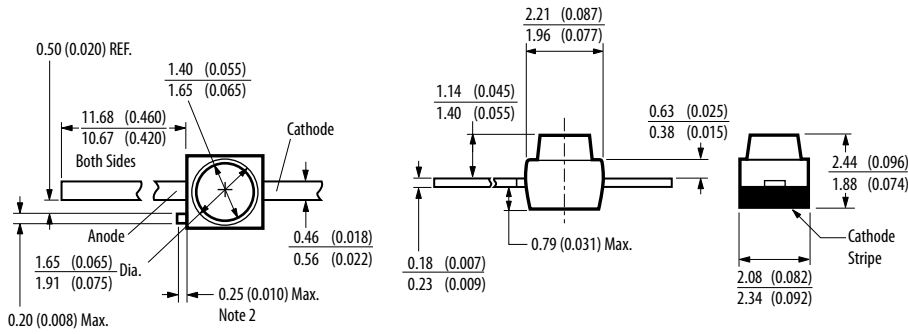
Bin ID	Intensity (mcd)	
	Min.	Max.
Red Orange 		
1	617.5	625.0
2	621.0	628.5
3	624.5	632.0
Orange 		
1	596.5	600.0
2	599.0	602.5
3	601.5	604.0
4	603.8	608.2
5	606.8	611.2
6	609.8	614.2
7	612.8	617.2
8	615.8	620.2
Yellow 		
1	581.5	585.0
3	584.0	587.5
2	586.5	590.0
4	589.0	592.5
5	591.5	593.5
6	591.5	595.0
7	594.0	597.5
Green (except InGaN Green) 		
4	567	571
3	570	574
2	573	577
Emerald Green 		
9	552.0	556.0
8	555.0	559.0
7	558.0	562.0
6	561.0	565.0

Bin ID	Intensity (mcd)	
	Min.	Max.
InGaN Green 		
0	Full distribution	
1	520.0	530.0
2	530.0	540.0
3	520.0	525.5
4	525.0	530.0
5	530.0	535.0
6	535.0	540.0
InGaN Blue 		
0	Full distribution	
1	460.0	464.0
2	464.0	468.0
3	468.0	472.0
4	472.0	476.0
5	476.0	480.0
6	480.0	484.0

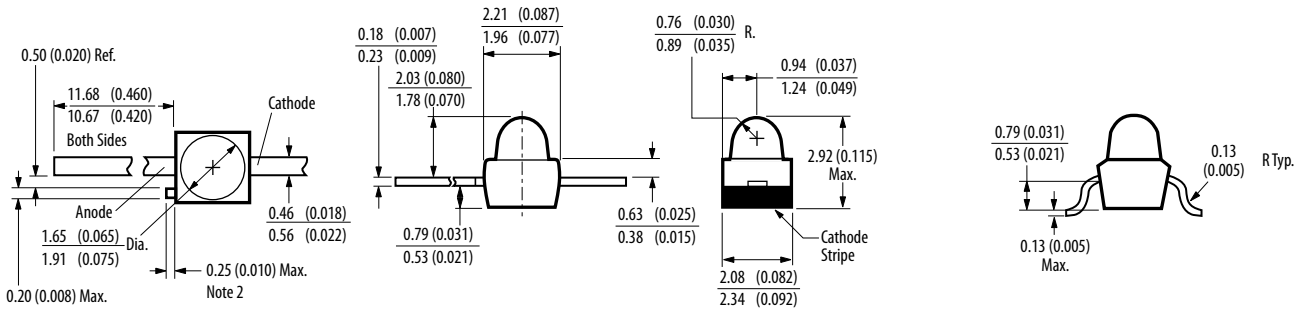
Tolerance = $\pm 1\text{nm}$

LED Indicators and Displays

Surface Mount Subminiature LED Lamps Package Dimensions



Flat Top Subminiature Lamps

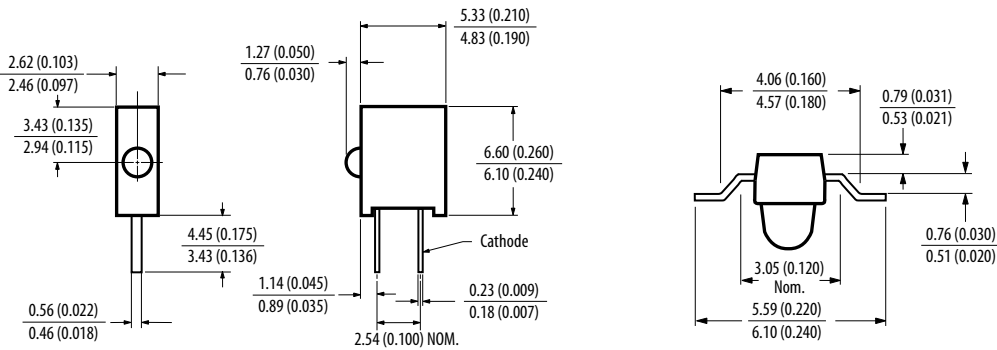


Notes:

1. All dimensions in millimeters (inches).
2. Protruding support tab is connected to Cathode Lead.

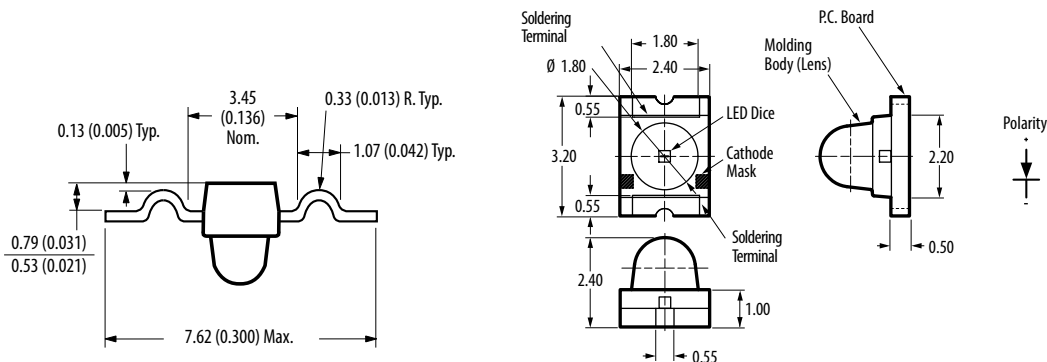
Domed Subminiature Lamps

Option 011, 012



Option 010

Option 031, 032



Option 021, 022

PCB Based Subminiature Lamps



Surface Mount ChipLEDs

Description

For applications that require small size, high efficiency and low power consumption, Avago Technologies offers an extensive range of high quality ChipLEDs to meet demands for virtually any surface mount lighting requirement.

Avago Technologies' ChipLEDs are available in standard and high-brightness colors, using Avago Technologies' proven AlGaAs, AlInGaP and InGaN processes to give you the broadest range of colors from a single supplier.

Avago's ChipLEDs use the industry standard footprint, with top-mount, reverse-mount and right-angle-mount packaging options. They also have the lowest profile in the industry and are positioned to support high volume, cost-effective solutions.

ChipLED products are used in a variety of applications including LCD and push button backlighting for cellular phones, white goods and appliances, industrial measurement and control systems, and for symbol lighting and status indication in computer peripherals and consumer goods.

Low power consumption, small size and easy assembly make the ChipLED ideal for backlighting handsets as well as backlighting industrial displays.

Features and Benefits

- Small size
 - Saves PC board space
- Wide viewing angle
 - Well-suited for backlighting applications
- Intensity and color bin uniformity
 - Can be closely mounted without any intensity variations
- Available in multiple colors
 - Amber, Red, AlGaAs Red, Green, Orange, Yellow, InGaN Blue, InGaN Green, bicolor and tricolor combinations
- Variety of packages and mounting options
 - Top, reverse and right angle auto mountable
- Industry standard footprint
 - No change in existing board layout
- High volume, high reliability
 - Cost-effective solution

Typical Applications

- Telecommunications
 - Keypad and LCD backlighting for mobile phones, pagers and cordless phones
- Industrial
 - Status and symbol indicator
 - Keypad and LCD backlighting
- Consumer
 - White goods and appliances
- Computer Peripherals
 - Status indicator
- Indoor Full/Mono color sign
- Automotive interior

LED Indicators and Displays

Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
Top Mount 1206 Industrial Footprint with 1.1 mm Height (C150)								
3.2 x 1.6 x 1.1 mm (L x W x H)								
HSMH-C150	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMD-C150	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C150	GaP Green	572	170°	Diffused	4.5	15	2.2	20
HSMS-C150	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C150	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMQ-C150	InGaN Green	527	140°	Diffused	45	145	3.4	20
HSMR-C150	InGaN Blue	473	140°	Diffused	18	55	3.4	20
HSME-C150	AS AllnGaP Green	572	170°	Diffused	18	50	2.1	20

Quantity: 3,000 per 7 inch reel

Top Mount 0805 Industrial Footprint with 0.8 mm Height (C170)								
2.0 x 1.25 x 0.8 mm (L x W x H)								
HSMH-C170	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMD-C170	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C170	GaP Green	572	170°	Diffused	4.5	15	2.2	20
HSMS-C170	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C170	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMA-C170	AS AllnGaP Amber	592	170°	Diffused	28.5	90	1.9	20
HSMC-C170	AS AllnGaP Red	626	170°	Diffused	28.5	90	1.9	20
HSML-C170	AS AllnGaP Orange	605	170°	Diffused	28.5	90	1.9	20
HSMZ-C170	AS AllnGaP Red	631	170°	Diffused	45	165	2.2	20
HSMN-C170	InGaN Green	525	170°	Diffused	45	120	3.3	20
HSMQ-C170	InGaN Blue	470	170°	Diffused	11.2	35	3.3	20
HSMR-C170	InGaN Blue	473	140°	Diffused	18	55	3.4	20
HSME-C170	AS AllnGaP Green	572	170°	Diffused	18	50	2.1	20

Quantity: 4,000 per 7 inch reel

Top Mount 0603 Industrial Footprint with 0.8 mm Height (C190)								
1.6 x 0.8 x 0.8 mm (L x W x H)								
HSMH-C190	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMD-C190	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C190	GaP Green	572	170°	Diffused	4.5	5	2.2	20
HSMS-C190	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C190	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMA-C190	AS AllnGaP Amber	592	170°	Diffused	28.5	90	1.9	20
HSMC-C190	AS AllnGaP Red	626	170°	Diffused	28.5	90	1.9	20
HSML-C190	AS AllnGaP Orange	605	170°	Diffused	28.5	90	1.9	20
HSMZ-C190	AS AllnGaP Red	631	170°	Diffused	45	165	2.2	20
HSMN-C190	InGaN Green	525	170°	Diffused	45	120	3.3	20
HSMQ-C190	InGaN Blue	470	170°	Diffused	11.2	35	3.3	20
HSMR-C190	InGaN Blue	473	140°	Diffused	18	55	3.4	20
HSME-C190	AS AllnGaP Green	572	170°	Diffused	18	50	2.1	20

Quantity: 4,000 per 7 inch reel

LED Indicators and Displays

Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
Top Mount 0603 Industrial Footprint with 0.6 mm Height (C191)								
1.6 x 0.8 x 0.6 mm (L x W x H)								
HSMH-C191	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMD-C191	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C191	GaP Green	572	170°	Diffused	4.5	5	2.2	20
HSMS-C191	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C191	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMA-C191	AS AllnGaP Amber	592	170°	Diffused	28.5	90	1.9	20i
HSMC-C191	AS AllnGaP Red	626	170°	Diffused	28.5	90	1.9	20
HSML-C191	AS AllnGaP Orange	605	170°	Diffused	28.5	90	1.9	20
HSMN-C191	InGaN Blue	470	170°	Diffused	11.2	35	3.3	20
HSMQ-C191	InGaN Green	527	140°	Diffused	45	145	3.4	20
HSMR-C191	InGaN Blue	473	140°	Diffused	18	55	3.4	20
HSME-C191	AS AllnGaP Green	572	170°	Diffused	18	50	2.1	20

Quantity: 4,000 per 7 inch reel

Top Mount 0805 Industrial Footprint with 0.4 mm Height (C177)								
2.0 x 1.25 x 0.4 mm (L x W x H)								
HSMD-C177	GaP Orange	604	130°	Diffused	2.8	8	2.2	20
HSMG-C177	GaP Green	572	130°	Diffused	4.5	5	2.2	20
HSMS-C177	GaP Red	626	130°	Diffused	2.8	10	2.1	20
HSMA-C177	AS AllnGaP Amber	592	130°	Diffused	28.5	90	1.9	20
HSMC-C177	AS AllnGaP Red	626	130°	Diffused	28.5	90	1.9	20
HSML-C177	AS AllnGaP Orange	605	130°	Diffused	28.5	90	1.9	20
HSME-C177	AS AllnGaP Green	572	130°	Diffused	18	50	2.1	20

Quantity: 4,000 per 7 inch reel

Top Mount 0603 Industrial Footprint with 0.4 mm Height (C197)								
1.6 x 0.8 x 0.4 mm (L x W x H)								
HSMD-C197	GaP Orange	604	130°	Diffused	2.8	8	2.2	20
HSMG-C197	GaP Green	572	130°	Diffused	4.5	5	2.2	20
HSMS-C197	GaP Red	626	130°	Diffused	2.8	10	2.1	20
HSMY-C197	GaP Yellow	586	130°	Diffused	2.8	8	2.1	20
HSMA-C197	AS AllnGaP Amber	592	130°	Diffused	28.5	90	1.9	20
HSMC-C197	AS AllnGaP Red	626	130°	Diffused	28.5	90	1.9	20
HSML-C197	AS AllnGaP Orange	605	130°	Diffused	28.5	90	1.9	20
HSME-C197	AS AllnGaP Green	572	130°	Diffused	18	50	2.1	20

Quantity: 4,000 per 7 inch reel

Top Mount 0402 Industrial Footprint with 0.4 mm Height (C280)								
1.0 x 0.5 x 0.4 mm (L x W x H)								
HSMA-C280	AS AllnGaP Amber	592	130°	Diffused	28.5	90	1.9	20
HSMC-C280	AS AllnGaP Red	626	130°	Diffused	28.5	90	1.9	20
HSMG-C280	GaP Green	572	130°	Diffused	4.5	15	2.2	20
HSMS-C280	GaP Red	626	130°	Diffused	2.8	10	2.1	20
HSMY-C280	GaP Yellow	586	130°	Diffused	2.8	8	2.1	20

Quantity: 4,000 per 7 inch reel

LED Indicators and Displays

Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
Top Mount 0603 Industrial Footprint with 0.35 mm Height (C130)								
1.6 x 0.8 x 0.35 mm (L x W x H)								
HSMA-C130	AllInGaP Amber	592	110°	Diffused	28.5	87	2	20
HSMC-C130	AllInGaP Red	626	110°	Diffused	28.5	131	1.9	20
HSME-C130	AllInGaP Green	572	110°	Diffused	18	54	1.9	20
HSML-C130	AllInGaP Orange	605	110°	Diffused	28.5	139	1.9	20
HSMR-C130	InGaN Blue	473	145°	Diffused	18	55	3.4	20

Quantity: 4,000 per 7 inch reel

Right Angle 1 mm Height (C110)								
3.2 x 1.5 x 1.0 mm (L x W x H)								
HSMH-C110	AS AlGaAs Red	639	130°	Non-diffused	7.2	17	1.8	20
HSMC-C110	GaP Orange	604	130°	Non-diffused	2.8	8	2.2	20
HSMG-C110	GaP Green	572	130°	Non-diffused	4.5	15	2.2	20
HSMS-C110	GaP Red	626	130°	Non-diffused	2.8	10	2.1	20
HSMY-C110	GaP Yellow	586	130°	Non-diffused	2.8	8	2.1	20
HSMA-C110	AS AllInGaP Amber	592	130°	Non-diffused	28.5	95	1.9	20
HSMC-C110	AS AllInGaP Red	626	130°	Non-diffused	28.5	95	1.9	20
HSML-C110	AS AllInGaP Orange	605	130°	Non-diffused	28.5	95	1.9	20
HSMZ-C110	AS AllInGaP Red	631	130°	Non-diffused	45	170	2.2	20
HSMG-C110	InGaN Green	525	130°	Non-diffused	45	126	3.3	20
HSMN-C110	InGaN Blue	470	130°	Non-diffused	11.2	39	3.3	20
HSMQ-C110	InGaN Green	527	130°	Non-diffused	45	150	3.4	20
HSMR-C110	InGaN Blue	473	130°	Non-diffused	18	60	3.4	20
HSME-C110	AS AllInGaP Green	572	130°	Non-diffused	18	52	2.1	20

Quantity: 3,000 per 7 inch reel

LED Indicators and Displays

Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
Right Angle 0.6 mm Height (C120)								
1.6 x 1.0 x 0.6 mm (L x W x H)								
HSMH-C120	AS AlGaAs	639	155°	Non-diffused	7.2	17	1.8	20
HSMD-C120	GaP Orange	604	155°	Non-diffused	2.8	8	2.2	20
HSMG-C120	GaP Green	572	155°	Non-diffused	4.5	15	2.2	20
HSMA-C120	AS AllnGaP Amber	592	155°	Non-diffused	28.5	90	1.9	20
HSMC-C120	AS AllnGaP Red	626	155°	Non-diffused	28.5	90	1.9	20
HSML-C120	AS AllnGaP Orange	605	155°	Non-diffused	28.5	90	1.9	20
HSMM-C120	InGaN Green	525	155°	Non-diffused	45	120	3.4	20
HSMN-C120	InGaN Blue	470	155°	Non-diffused	11.2	30	3.4	20
HSMQ-C120	InGaN Green	527	155°	Non-diffused	45	145	3.4	20
HSMR-C120	InGaN Blue	473	155°	Non-diffused	18	55	3.4	20
HSME-C120	AS AllnGaP Green	572	155°	Non-diffused	18	52	2.1	20

Quantity: 4,000 per 7 inch reel

Right Angle 0.4 mm Height (Cx00)								
1.6 x 1.0 x 0.4 mm (L x W x H)								
ASMT-CA00	AllnGaP Amber	592	150°	Non-diffused	28.5	90	1.9	20
ASMT-CB00	InGaN Blue	473	150°	Non-diffused	7.2	18	2.85	5
ASMT-CW00	InGaN White	Chromaticity Coordinates Bin A1-D2	170°	Diffused	18	35	2.85	5

Quantity: 4,000 per 7 inch reel

Reverse Mount (C265)								
3.4 x 1.25 x 1.1 mm (L x W x H)								
HSMA-C265	AS AllnGaP Amber	592	150°	Non-diffused	28.5	75	1.9	20
HSMC-C265	AS AllnGaP Red	626	150°	Non-diffused	28.5	75	1.9	20
HSME-C265	AS AllnGaP Green	572	170°	Non-diffused	18	50	2.1	20
HSML-C265	AS AllnGaP Orange	605	150°	Non-diffused	28.5	75	1.9	20
HSMG-C265	GaP Green	572	170°	Non-diffused	4.5	15	2.2	20
HSMH-C265	AS AlGaAs Red	639	170°	Non-diffused	7.2	17	1.8	20

Quantity: 3,000 per 7 inch reel

LED Indicators and Displays

Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
Bicolor Top Mount 1210 Industrial Footprint (C15x)								
3.2 x 2.7 x 1.1 mm (L x W x H)								
HSMF-C153	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMF-C155	GaP Green	572	170°	Diffused	4.5	15	2.2	20
	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMF-C156	GaP Green	572	170°	Diffused	4.5	15	2.2	20
	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMF-C157	GaP Green	572	170°	Diffused	4.5	15	2.2	20
	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMF-C158	AllnGaP Green	572	170°	Diffused	28.5	45	2.1	20
	AllnGaP Amber	626	170°	Diffused	28.5	55	1.9	20

Quantity: 3,000 per 7 inch reel

Bicolor Top Mount 0603 Industrial Footprint (C16x)								
1.6 x 0.8 x 0.5 mm (L x W x H)								
HSMF-C162	AllnGaP Amber	592	120°	Diffused	28.5	90	1.9	20
	AllnGaP Red	626	120°	Diffused	28.5	90	1.9	20
HSMF-C163	InGaN Green	525	120°	Diffused	18	45	3.4	10
	AllnGaP Red	626	120°	Diffused	11.2	35	1.8	10
HSMF-C164	InGaN Blue	470	120°	Diffused	2.8	10	3.4	10
	AllnGaP Red	626	120°	Diffused	11.2	35	1.8	10
HSMF-C165	GaP Green	572	120°	Diffused	4.5	15	2.2	20
	GaP Red	626	120°	Diffused	2.8	10	2.1	20
HSMF-C166	GaP Green	572	120°	Diffused	4.5	15	2.2	20
	GaP Yellow	586	120°	Diffused	2.8	8	2.1	20
HSMF-C167	GaP Green	572	120°	Diffused	4.5	15	2.2	20
	GaP Orange	604	120°	Diffused	2.8	8	2.2	20
HSMF-C169	InGaN Blue	470	120°	Diffused	2.8	10	3.4	10
	AllnGaP Amber	592	120°	Diffused	11.2	35	1.8	10

Quantity: 3,000 per 7 inch reel

Tricolor Top Mount 1210 Industrial Footprint (C118)								
3.2 x 2.7 x 1.1 mm (L x W x H)								
HSMF-C118	GaP Green	525	130°	Diffused	45	120	3.5	20
	AllnGaP Red	626	135°	Diffused	28.5	90	1.9	20
	InGaN Blue	470	125°	Diffused	11.2	40	3.5	20

Quantity: 3,000 per 7 inch reel

Tricolor Right Angle with 1.0 mm Height (C11x)								
2.5 x 1.0 x 1.0 mm (L x W x H)								
HSMF-C113	AllnGaP Red	626	120°	Diffused	28.5	80	1.9	20
	AllnGaP Green	572	125°	Diffused	18	50	2	20
	InGaN Blue	470	125°	Diffused	28.5	60	3.4	20
HSMF-C115	AllnGaP Red	626	120°	Diffused	28.5	80	1.9	20
	InGaN Green	525	125°	Diffused	71.5	170	3.4	20
	InGaN Blue	470	125°	Diffused	28.5	60	3.4	20

Quantity: 3,000 per 7 inch reel

LED Indicators and Displays

Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
Tricolor Top Mount with 0.35mm Height (C114)								
1.6 x 1.5 x 0.35 mm (L x W x H)								
HSMF-C114	AllInGaP Red	626	140°	Diffused	28.5	85	1.9	20
	InGaN Green	525	145°	Diffused	45	180	3.4	20
	InGaN Blue	470	145°	Diffused	28.5	70	3.4	20

Quantity: 4,000 per 7 inch reel

Leadframe-based (ASMT-Rx45)								
1.6 x 0.8 x 0.45 mm (L x W x H)								
ASMT-RR45	AllInGaP Red	622	145°	Diffused	50	120	2	20
ASMT-RF45	AllInGaP Yellow Green	573	145°	Diffused	30	60	2	20
ASMT-RA45	AllInGaP Amber	591	145°	Diffused	40	90	2	20

Standard Intensity Bin Limits

Bin ID	Intensity (mcd)	
	Min.	Max.
A	0.11	0.18
B	0.18	0.29
C	0.29	0.45
D	0.45	0.72
E	0.72	1.10
F	1.10	1.80
G	1.80	2.80
H	2.80	4.50
J	4.50	7.20
K	7.20	11.20
L	11.20	18.00
M	18.00	28.50
N	28.50	45.00
P	45.00	71.50
Q	71.50	112.50
R	112.50	180.00
S	180.00	285.00
T	285.00	450.00
U	450.00	715.00
V	715.00	1125.00
W	1125.00	1800.00
X	1800.00	2850.00
Y	2850.00	4500.00

Tolerance: ±15%

Color Bin Limits

Package	Color Bin	Wavelength (nm)	
		Min.	Max.
GaN/InGaN Blue	A	460.0	465.0
	B	465.0	470.0
	C	470.0	475.0
	D	475.0	480.0
InGaN Green	A	515.0	520.0
	B	520.0	525.0
	C	525.0	530.0
	D	530.0	535.0
Orange	A	597.0	600.0
	B	600.0	603.0
	C	603.0	606.0
	D	606.0	609.0
	E	609.0	612.0
	F	612.0	615.0
Red	Full Distribution		
AlGaAs Red	Full Distribution		

Tolerance: ± 1.0 nm

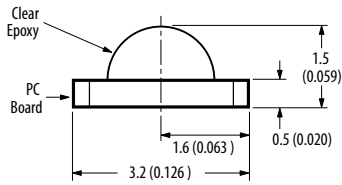
Package	Color Bin	Wavelength (nm)	
		Min.	Max.
Green	A	561.5	564.5
	B	564.5	567.5
	C	567.5	570.5
	D	570.5	573.5
	E	573.5	576.5
Yellow	A	582.0	584.5
	B	584.5	587.0
	C	587.0	589.5
	D	589.5	592.0
	E	592.0	594.5
	F	594.5	597.0
Amber	A	582.0	584.5
	B	584.5	587.0
	C	587.0	589.5
	D	589.5	592.0
	E	592.0	594.5
	F	594.5	597.0

Tolerance: ± 1.0 nm

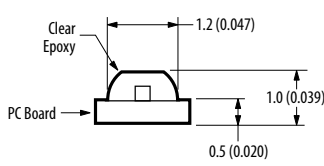
LED Indicators and Displays

Surface Mount ChipLEDs

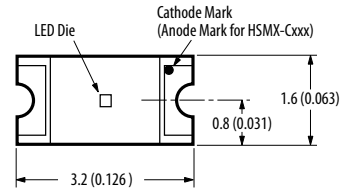
Package Dimensions



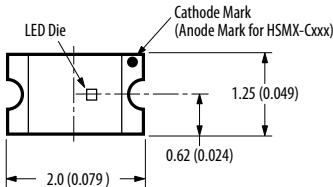
HSMx-C110



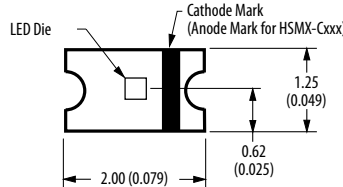
HSMx-C120/ASMT-Cx00



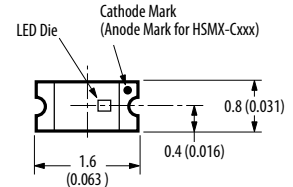
HSMx-C150



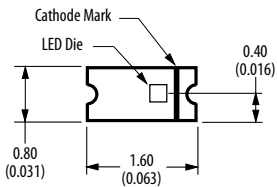
HSMx-C170



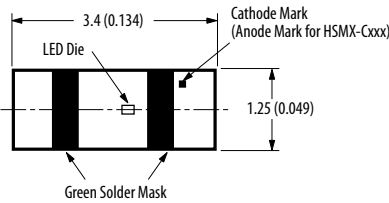
HSMx-C177



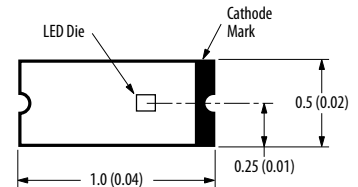
HSMx-C190/C191/C130



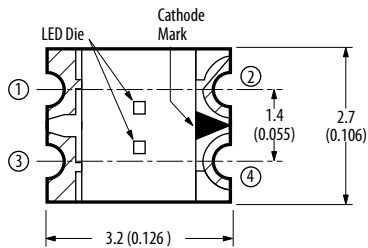
HSMx-C197



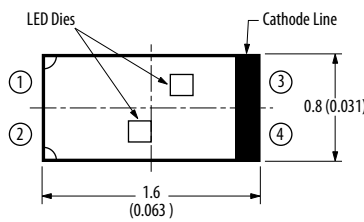
HSMx-C265



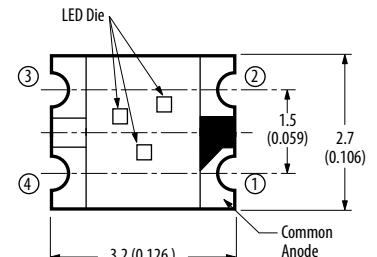
HSMx-C280



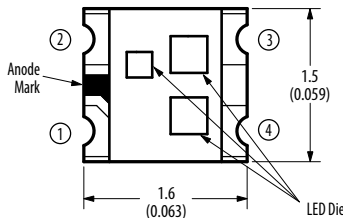
HSMF-C15x



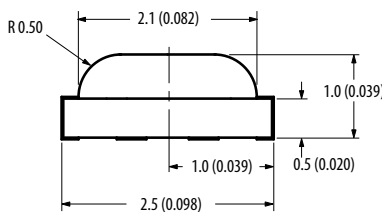
HSMF-C16x



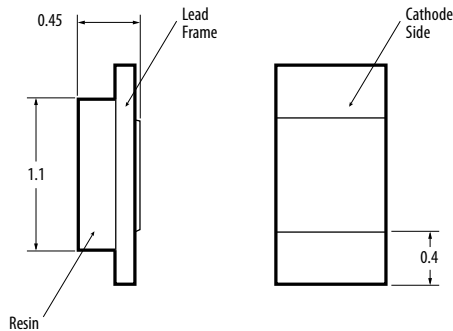
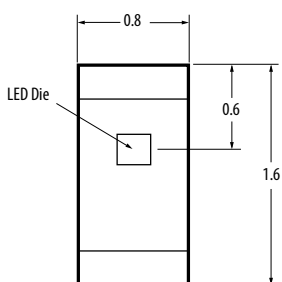
HSMF-C118



HSMF-C114



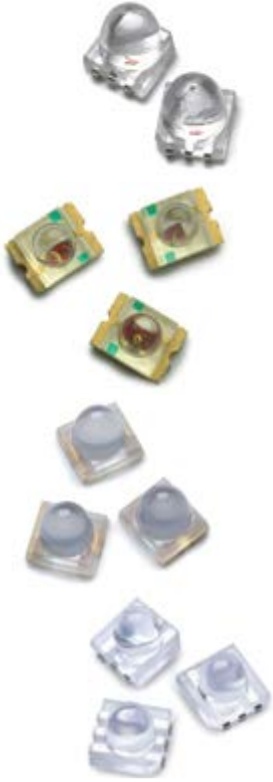
HSMF-C113/C115



ASMT-RX45

- Notes:**
1. All dimensions in millimeters (inches).
 2. Tolerance is $\pm 0.1\text{mm}$ (± 0.004 in.) unless otherwise specified.

Auto Focus Auxiliary Flash LED



Description

Avago Technologies offer Auto Focus Auxiliary Flash LEDs in the standard, low profile and miniature package. These are surface mount dome lamps that use an untinted, non-diffused lens to provide a high luminous intensity within a narrow radiation pattern.

These narrow angle SMT lamp packages are designed for applications which require long distance illumination and narrow beam pattern such as auxiliary flash for auto-focus function in digital still camera. The miniature and low profile package are also suitable for applications that have constraints in design area. These devices are compatible with Pb-free reflow soldering process.

The standard Auto Focus Auxiliary Flash LEDs are available in 530nm Green and 605nm Orange. The miniature package is available in 605nm Orange.

Features and Benefits

- Smooth, Consistent Narrow Radiation Pattern
- Viewing angle optimized for auto focus function
- > 3m illumination distance
- Low profile package: 12° viewing angle for Orange; 14° viewing angle for Green
- Miniature package: 18° View Angle
- Standard package: Small footprint with 4.8L x 4.8W x 5.33H mm
- Low profile package: 3.6L x 3.2W x 3.4H mm package dimension
- Good Intensity Output
- Compatible with 2x Solder Reflow
- Clear, Non-diffused Epoxy
- Allows easy assembly and PCB space saving.
- Compatible with reflow soldering
- IEC/EN 60825-1 Eye Safety Class 1
- RoHS compliant

Application

- Digital Still Camera

LED Indicators and Displays

Standard Auto Focus Auxiliary Flash LED

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity			Vf Typ. (V)	Test Current (mA)	Device Height
					Min. (cd)	Typ. (cd)	Max. I _v (cd)			
ASMT-FJ60-AFJ00	AllInGaP Orange	605	10°	Clear	–	29	–	2.1	20	4.35mm
ASMT-FJ10-ADH00	AllInGaP Orange	605	8°	Clear	9	22	–	2	20	5.33mm
ASMT-FG10-NFJ00	InGaN Green	530	6°	Clear	18	40	56	3.3	20	5.33mm
ASMT-FJ70-AFJ00	AllInGaP Orange	605	12°	Clear	15	25	56	2.1	20	3.40mm
ASMT-FG70-NFJ00	InGaN Green	525	14°	Clear	15	22	56	3.3	20	3.40mm

Miniature Auto Focus Auxiliary Flash LED

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity			Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)	Max. I _v (cd)		
ASMT-FJ30-AB000	AllInGaP Orange	605	18°	Clear	5.5	9	–	2	20

Iv Bin Category

Bin ID	Intensity (cd)	
	Min.	Max.
B	5.5	7.0
C	7.0	9.0
D	9.0	11.5
E	11.5	15.0
F	15.0	19.5
F+ **	18.0	19.5
G	19.5	25.5
H	25.5	33.0
I	33.0	43.0
J	43.0	56.0

Iv Tolerance = ±15%

** For ASMT-FG10-NFJ00 only

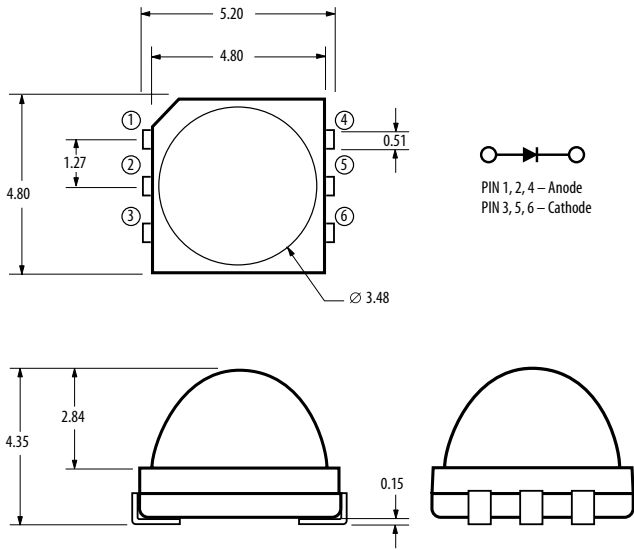
Color Bin Category

Bin ID	Wavelength (nm)	
	Min.	Max.
Orange (ASMT-FJ10-xxxxx)		
A	600	604
B	604	608
C	608	612
Orange (ASMT-FJ30-xxxxx)		
1	597	600
2	600	603
3	603	606
4v	606	609
5	609	612
Green		
A	515	520
B	520	525
C	525	530
D	530	535

Tolerance = ±1nm

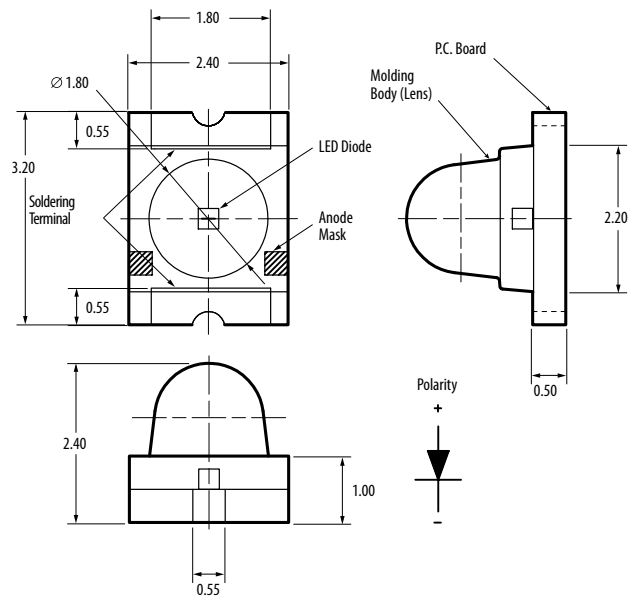
LED Indicators and Displays

Standard Auto Focus Auxiliary Flash LED with 4.35mm Height Package Dimensions

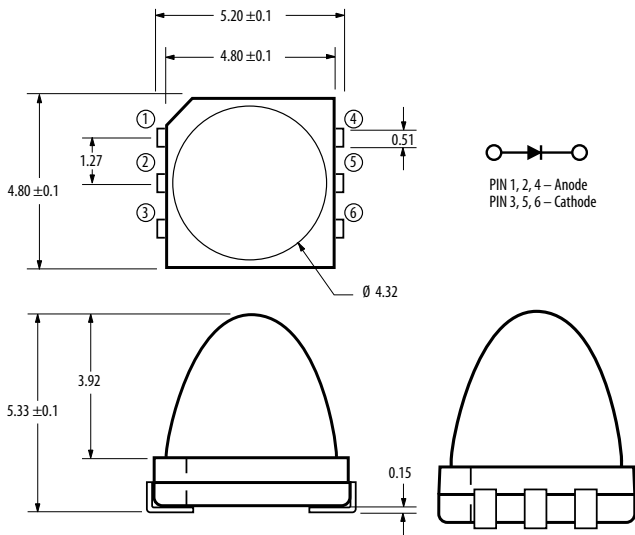


- Notes:**
1. All dimensions in millimeters.
 2. Tolerance is ± 0.1 mm unless otherwise specified.

Miniature Auto Focus Auxiliary Flash LED Package Dimensions



Standard Auto Focus Auxiliary Flash LED with 5.33 Height Package Dimensions



- Notes:**
1. All dimensions in millimeters.
 2. Tolerance is ± 0.1 mm unless otherwise specified.

Seven-Segment Displays

Description

Avago Technologies offers a full range of seven-segment displays from low cost, standard brightness displays to high ambient light displays that produce up to 78 mcd per segment. Dual and single digit displays are available in assorted character heights and colors. They are divided into two platforms to address different market requirements in both industrial and consumer markets. Displays for industrial markets are designed for high-reliability applications and feature extremely durable packaging for high temperature environments. Consumer applications are designed for cost-sensitive, general-purpose display applications.

Product Features and Benefits

- Semiconductor (LED) light source
 - Cost-effective solutions
 - Flexibility for designers
 - Light weight
- Lower power consumption
 - Electrical power savings
 - Low heat generation
 - Low current devices available
- Mechanically rugged
 - No wire filaments
 - No moving parts
 - Not sensitive to mechanical shock and vibration
- Essentially monochromatic light
 - No color filter required
 - Maximum use of visible light
- Easy for the eye to discern against distracting backgrounds in sunlight and adverse weather conditions
- High light output
- Industry standard size and pinout
- Categorized for luminous intensity (yellow and green categorized for color)

Industrial Applications: High Performance Seven-segment Display Package

Industrial grade products provide high peak current, automated IV/color binning and the availability of intensity and color selection. Ideal for high reliability applications such as temperature controllers, this package is extremely durable in high temperature environments with better heat dissipation through a mild steel leadframe.

Key benefits for the leadframe platform

- Heat dissipation from the package is faster than other PCB display products
- Brightness (Iv) degradation reduced over time
- Lead stability and consistency
- Solder coated leads result in better solderability
- Typical epoxy Tg is 140°C resulting in improved temperature cycling reliability

Consumer Applications: Standard Seven-segment Display Package

Designed for the cost-competitive general purpose commercial LED display applications, this package is built with a PCB substrate using ultrasonic stitch-to-stitch bonding with aluminum wire.

Key benefits for the PCB platform

- Competitive prices

- Avago Technologies quality, reliability and technical support
- Typical epoxy Tg is 100–120°C, suitable for applications that do not experience extreme temperatures and temperature cycling

Avago Technologies is committed to support the market by offering display performance and features that are specific to the designer's application requirements.

Typical Industrial Applications

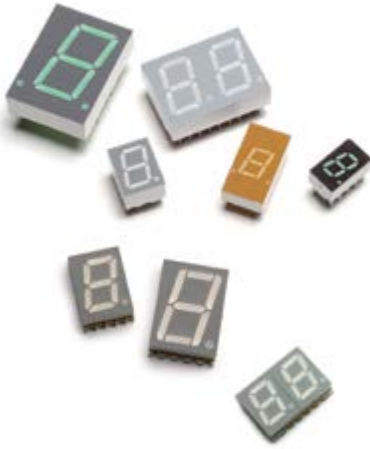
HighPerformance Seven-segment Displays:

- Temperature controllers
- Test and measurement instrumentation
- Power converters
- Home appliance displays
- Automotive and avionic instrumentation
- Fuel pump displays
- Digital panel meters

Typical Consumer Applications










Standard Seven-segment Displays:

- Cable set-top boxes
- Electronics displays
- Gaming machines
- Point of sale terminals
- Answering machines
- Exercise equipment





LED Indicators and Displays




Through-hole Seven-Segment Displays—Leadframe Platform




Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
7.6 mm (0.3") Micro Bright Displays (right decimal point)								
GaP Red 626 nm 								
HDSP-7501	Grey	Common Anode	360	980	5	2	20	C,D
HDSP-A211	Black	Common Anode	360	980	5	2	20	
HDSP-7503	Grey	Common Cathode	360	980	5	2	20	C,D
HDSP-A213	Black	Common Cathode	360	980	5	2	20	C,D
GaP Orange 600 nm 								
HDSP-A401	Grey	Common Anode	354	720	5	2	20	
HDSP-A403	Grey	Common Cathode	354	720	5	2	20	
HDSP-A413	Black	Common Cathode	354	720	5	2	20	
GaP Yellow 586 nm 								
HDSP-7401	Grey	Common Anode	225	480	5	2.2	20	D,E
HDSP-7403	Grey	Common Cathode	225	480	5	2.2	20	D,E
High Performance Green 571 nm 								
HDSP-7801	Grey	Common Anode	860	3000	10	2.1	10	J,K
HDSP-A511	Black	Common Anode	860	3000	10	2.1	10	J,K
HDSP-7803	Grey	Common Cathode	860	3000	10	2.1	10	
HDSP-A513	Black	Common Cathode	860	3000	10	2.1	10	
GaP AlGaAs Red 637 nm 								
HDSP-A151	Grey	Common Anode	690	1400	20	1.8	20	
HDSP-A153	Grey	Common Cathode	690	1400	20	1.8	20	
7.6 mm (0.3") Micro Bright Low Current Displays (right decimal point)								
GaP AlGaAs Red 637 nm 								
HDSP-A101	Grey	Common Anode	315	600	1	1.6	1	F,G
HDSP-A103	Grey	Common Cathode	315	600	1	1.6	1	F,G
HDSP-A113	Black	Common Cathode	315	600	1	1.6	1	
GaP Red 626 nm 								
HDSP-7511	Grey	Common Anode	160	270	2	1.6	2	C,D
HDSP-7513	Grey	Common Cathode	160	270	2	1.6	2	C,D
GaP Yellow 585 nm 								
HDSP-A801	Grey	Common Anode	250	420	4	1.7	4	
HDSP-A803	Grey	Common Cathode	250	420	4	1.7	4	
GaP Green 571 nm 								
HDSP-A901	Grey	Common Anode	250	475	4	1.9	4	
HDSP-A903	Grey	Common Cathode	250	475	4	1.9	4	

LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)
			Min.	Typ.			
7.6 mm (0.3") Micro Bright Overflow Displays (right decimal point)							
GaP Red 626 nm 							
HDSP-7507	Grey	Common Anode	360	980	5	2	20
HDSP-7508	Grey	Common Cathode	360	980	5	2	20
HDSP-7517	Grey	Common Anode	160	270	2	1.6	2
GaP Green 571 nm 							
HDSP-7807	Grey	Common Anode	860	3000	10	2.1	10
HDSP-7808	Grey	Common Cathode	860	3000	10	2.1	10






Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)
			Min.	Typ.			
AlGaAs Red 637 nm (right hand decimal) 							
HDSP-A107	Grey	Common Anode	135	600	1	1.6	1
HDSP-A108	Grey	Common Cathode	135	600	1	1.6	1
HDSP-A113	Black	Common Cathod	315	600	1	1.6	1
GaP Yellow 586 nm 							
HDSP-A807	Grey	Common Anode	250	420	4	1.7	4
GaP Green 571 nm 							
HDSP-A907	Grey	Common Anode	250	475	5	1.9	4
HDSP-A908	Grey	Common Cathode	250	475	5	1.9	4

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
7.6 mm (0.3") Single Digit Displays									
GaP Red 626 nm 									
5082-7610	Red	Common Anode	340	800	5	2.1	20	C,D	Left
5082-7611	Red	Common Anode	340	800	5	2.1	20		Right
5082-7613	Red	Common Cathode	340	800	5	2.1	20	C,D	Right
GaP Yellow 586 nm 									
5082-7620	Yellow	Common Anode	205	620	5	2.2	20		Left
5082-7621	Yellow	Common Anode	205	620	5	2.2	20		Right
5082-7623	Yellow	Common Cathode	205	620	5	2.2	20		Right
GaP Green 571 nm 									
HDSP-3600	Green	Common Anode	860	2700	10	2.1	10		Left
HDSP-3601	Green	Common Anode	860	2700	10	2.1	10		Right
HDSP-3603	Green	Common Cathode	860	2700	10	2.1	10		Right

LED Solutions

LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
8 mm (0.31") Micro Bright Displays (right decimal point)								
AlGaAs Red 637 nm 								
HDSP-U101	Grey	Common Anode	315	600	1	1.8	20	
HDSP-U111	Black	Common Anode	315	600	1	1.8	20	
HDSP-U103	Grey	Common Cathode	315	600	1	1.8	20	
HDSP-U113	Black	Common Cathode	315	600	1	1.8	20	F,G
GaP Red 626 nm 								
HDSP-U201	Grey	Common Anode	360	980	5	2	20	
HDSP-U211	Black	Common Anode	360	980	5	2	20	C,D
HDSP-U203	Grey	Common Cathode	360	980	5	2	20	C,D
HDSP-U213	Black	Common Cathode	360	980	5	2	20	C,D
GaP Orange 600 nm 								
HDSP-U401	Grey	Common Anode	360	980	5	2	20	
HDSP-U411	Black	Common Anode	360	980	5	2	20	
HDSP-U403	Grey	Common Cathode	360	980	5	2	20	
HDSP-U413	Black	Common Cathode	360	980	5	2	20	
GaP Yellow 586 nm 								
HDSP-U301	Grey	Common Anode	225	480	5	2.2	20	
HDSP-U311	Black	Common Anode	225	480	5	2.2	20	
HDSP-U303	Grey	Common Cathode	225	480	5	2.2	20	
HDSP-U313	Black	Common Cathode	225	480	5	2.2	20	
GaP Green 571 nm 								
HDSP-U501	Grey	Common Anode	860	3000	10	2.1	10	
HDSP-U511	Black	Common Anode	860	3000	10	2.1	10	K,L
HDSP-U503	Grey	Common Cathode	860	3000	10	2.1	10	K,L
HDSP-U513	Black	Common Cathode	860	3000	10	2.1	10	K,L






LED Indicators and Displays




Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
10 mm (0.4") Single Digit Displays (right decimal point)								
AlGaAs Red 637 nm								
HDSP-F111	Black	Common Anode	330	650	1	1.6	1	
HDSP-F101	Grey	Common Anode	330	650	1	1.6	1	E,F
HDSP-F113	Black	Common Cathode	330	650	1	1.6	1	
HDSP-F103	Grey	Common Cathode	330	650	1	1.8	1	E,F
HDSP-F151	Grey	Common Anode	7500	15000	20	1.8	20	
HDSP-F153	Grey	Common Cathode	7500	15000	20	1.8	20	
HDSP-F161	Black	Common Anode	7500	15000	20	1.8	20	
GaP Red 626 nm								
HDSP-F211	Black	Common Anode	420	1200	5	2	20	D,E
HDSP-F201	Grey	Common Anode	420	1200	5	2	20	D,E
HDSP-F213	Black	Common Cathode	420	1200	5	2	20	D,E
HDSP-F203	Grey	Common Cathode	420	1200	5	2	20	D,E
GaP Orange 603 nm								
HDSP-F401	Grey	Common Anode	420	1200	5	2	20	
HDSP-F413	Black	Common Cathode	420	1200	5	2	20	
HDSP-F403	Grey	Common Cathode	420	1200	5	2	20	
GaP Yellow 586 nm								
HDSP-F301	Grey	Common Anode	290	800	5	2.2	20	D,E
HDSP-F303	Grey	Common Cathode	290	800	5	2.2	20	D,E
GaP Green 571 nm								
HDSP-F511	Black	Common Anode	1030	3500	10	2.1	10	I,J
HDSP-F501	Grey	Common Anode	1030	3500	10	2.1	10	J,K
HDSP-F513	Black	Common Cathode	1030	3500	10	2.1	10	I,J
HDSP-F503	Grey	Common Cathode	1030	3500	10	2.1	10	J,K
10 mm (0.4") Overflow Displays (right decimal point)								
AlGaAs Red 637 nm								
HDSP-F107	Grey	Common Anode	330	650	1	1.6	1	
HDSP-F108	Grey	Common Cathode	330	650	1	1.6	1	
HDSP-F157	Grey	Common Anode	7500	15000	20	1.8	20	
HDSP-F158	Grey	Common Cathode	7500	15000	20	1.8	20	
GaP Red 626 nm								
HDSP-F207	Grey	Common Anode	420	1200	5	2	20	
HDSP-F208	Grey	Common Cathode	420	1200	5	2	20	

LED Indicators and Displays






Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
10 mm (0.4") Slim Font Single Digit Displays								
AlGaAs Red 637 nm 								
HDSP-315H	Grey	Common Anode	180	650	1	1.8	1	Right
HDSP-316H	Grey	Common Cathode	180	650	1	1.8	1	Right
GaP Red 626 nm 								
HDSP-315E	Grey	Common Anode	450	2600	10	1.9	10	Right
HDSP-316E	Grey	Common Cathode	450	2600	10	1.9	10	Right
GaP Red 626 nm — Low Current 								
HDSP-315L	Grey	Common Anode	180	370	2	2.1	2	Right
HDSP-316L	Grey	Common Cathode	180	370	2	2.1	2	Right
GaP Yellow 586 nm 								
HDSP-315Y	Grey	Common Anode	450	1800	10	2	10	Right
HDSP-316Y	Grey	Common Cathode	450	1800	10	2	10	Right
GaP Green 571 nm 								
HDSP-315G	Grey	Common Anode	450	5000	10	2.1	10	Right
HDSP-316G	Grey	Common Cathode	450	5000	10	2.1	10	Right

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
10 mm (0.4") Slim Font Single Digit Displays									
GaP Red 626 nm — Low Current 									
5082-7656	Red	–	340	1115	5	2.1	20		Right
GaP Yellow 586 nm 									
5082-7666	Yellow	–	290	835	5	2.2	20		Right
GaP Green 571 nm 									
HDSP-4606	Grey	–	1030	4000	10	2.1	10	I,J	Right







LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
10.9 mm (0.43") Single Digit Displays									
AlGaAs Red 637 nm 									
HDSP-E101	Grey	Common Anode	390	650	1	1.6	1	E,F	Right
HDSP-E103	Grey	Common Cathode	390	650	1	1.6	1		Right
HDSP-E151	Grey	Common Anode	8500	15000	20	1.8	20		Right
HDSP-E153	Grey	Common Cathode	8500	15000	20	1.8	20		Right
GaP Red 626 nm 									
5082-7650	Red	Common Anode	340	1115	5	2.1	20	D,E	Left
5082-7651	Red	Common Anode	340	1115	5	2.1	20	D,E	Right
5082-7653	Red	Common Cathode	340	1115	5	2.1	20	D,E	Right
GaP Red 626 nm — Low Current 									
HDSP-3351	Red	Common Anode	200	300	2	1.6	2		Right
HDSP-3353	Red	Common Cathode	200	300	2	1.6	2		Right
GaP Yellow 586 nm 									
5082-7661	Yellow	Common Anode	290	835	5	2.2	20		Right
5082-7663	Yellow	Common Cathode	290	835	5	2.2	20		Right
GaP Green 571 nm 									
HDSP-4600	Grey	Common Anode	1030	4000	10	2.1	10		Left
HDSP-4601	Grey	Common Anode	1030	4000	10	2.1	10		Right
HDSP-4603	Grey	Common Cathode	1030	4000	10	2.1	10	I,J	Right
10.9mm (0.43") Overflow Displays									
HDSP-3356	Red	Universal	200	300	2	1.6	2		Right





LED Indicators and Displays





Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
14.2 mm (0.56") Single Digit Displays (right decimal point)								
AlGaAs Red 637 nm 								
HDSP-H111	Black	Common Anode	400	700	1	1.6	1	D,E
HDSP-H101	Grey	Common Anode	400	700	1	1.6	1	D,E
HDSP-H113	Black	Common Cathode	400	700	1	1.6	1	
HDSP-H103	Grey	Common Cathode	400	700	1	1.6	1	D,E
HDSP-H151	Grey	Common Anode	9100	16000	20	1.8	20	
HDSP-H153	Grey	Common Cathode	9100	16000	20	1.8	20	
GaP Red 626 nm 								
HDSP-H211	Black	Common Anode	900	2800	10	2	20	G,H
HDSP-5501	Grey	Common Anode	900	2800	10	2.1	20	G,H
HDSP-H213	Black	Common Cathode	900	2800	10	2	20	G,H
HDSP-5503	Grey	Common Cathode	900	2800	10	2.1	20	G,H
GaP Red 626 nm — Low Current 								
HDSP-5551	Grey	Common Anode	270	370	2	1.6	2	
HDSP-5553	Grey	Common Cathode	270	370	2	1.6	2	B,C
GaP Orange 600 nm 								
HDSP-H413	Black	Common Cathode	1190	2000	10	2	20	
GaP Yellow 586 nm 								
HDSP-5701	Grey	Common Anode	600	1800	10	2.1	20	F,G
HDSP-5703	Grey	Common Cathode	600	1800	10	2.1	20	F,G
GaP Green 571 nm 								
HDSP-H511	Black	Common Anode	900	2500	10	2.1	10	G,H
HDSP-5601	Grey	Common Anode	900	2500	10	2.1	10	G,H
HDSP-H513	Black	Common Cathode	900	2500	10	2.1	10	G,H
HDSP-5603	Grey	Common Cathode	900	2500	10	2.1	10	G,H
14.2 mm (0.56") Overflow Displays (right decimal point)								
AlGaAs Red 637 nm 								
HDSP-H107	Grey	Common Anode	400	700	1	1.6	1	
HDSP-H108	Grey	Common Cathode	400	700	1	1.6	1	
HDSP-H157	Grey	Common Anode	9100	16000	20	1.8	20	
HDSP-H158	Grey	Common Cathode	9100	16000	20	1.8	20	
GaP Red 626 nm 								
HDSP-5507	Grey	Common Anode	900	2800	10	2.1	20	G,H
HDSP-5508	Grey	Common Cathode	900	2800	10	2.1	20	G,H
GaP Red 626 nm — Low Current 								
HDSP-5557	Grey	Common Anode	270	370	2	1.6	2	
HDSP-5558	Grey	Common Cathode	270	370	2	1.6	2	
GaP Green 571 nm 								
HDSP-5607	Grey	Common Anode	900	2500	10	2.1	10	
HDSP-5608	Grey	Common Cathode	900	2500	10	2.1	10	

LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

Part Number	Face Color	Pin Configuration	Intensity (μ d)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
14.2 mm (0.56") Dual Digit Displays (right decimal point)								
AlGaAs Red 637 nm 								
HDSP-K121	Grey	Common Anode	400	700	1	1.6	1	
HDSP-K123	Grey	Common Cathode	400	700	1	1.6	1	
AlGaAs Red 637 nm – Low Current								
HDSP-K111	Black	Common Anode	400	700	1	1.6	1	
HDSP-K113	Black	Common Cathode	400	700	1	1.6	1	
GaP Red 626 nm 								
HDSP-5521	Grey	Common Anode	900	2800	10	2.1	20	
HDSP-5523	Grey	Common Cathode	900	2800	10	2.1	20	
HDSP-K211	Black	Common Anode	900	2800	10	2.0	20	
HDSP-K213	Black	Common Anode	900	2800	10	2.0	20	
GaP Yellow 586 nm 								
HDSP-5721	Grey	Common Anode	600	1800	10	2.1	10	
HDSP-5723	Grey	Common Cathode	600	1800	10	2.1	10	
GaP Green 571 nm 								
HDSP-5621	Grey	Common Anode	900	2500	10	2.1	10	
HDSP-5623	Grey	Common Cathode	900	2500	10	2.1	10	
HDSP-K511	Black	Common Anode	900	2500	10	2.1	10	
HDSP-K513	Black	Common Cathode	900	2500	10	2.1	10	

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
20 mm (0.8") Single Digit Displays									
AlGaAs Red 637 nm 									
HDSP-N101	Grey	Common Anode	270	590	1	1.6	1		Right
HDSP-N103	Grey	Common Cathode	270	590	1	1.6	1		Right
HDSP-N105	Grey	Common Cathode	270	590	1	1.6	1		Left
HDSP-N150	Grey	Common Anode	6000	14000	20	1.8	20		Left
HDSP-N151	Grey	Common Anode	6000	14000	20	1.8	20		Right
HDSP-N153	Grey	Common Cathode	6000	14000	20	1.8	20		Right
GaP Red 626 nm 									
HDSP-3900	Grey	Common Anode	3350	48000	20	2.6	100		Left
HDSP-3901	Grey	Common Anode	3350	7000 Peak (1/5 df)		2.6	100	E,F	Right
HDSP-3903	Grey	Common Cathode	3350	7000		2.6	100	E,F	Right
HDSP-3905	Grey	Common Cathode	3350	7000		2.6	100		Left
GaP Yellow 586 nm 									
HDSP-4201	Grey	Common Anode	2200	7000		2.6	100		Right
HDSP-4203	Grey	Common Cathode	2200	7000		2.6	100		Right
GaP Green 571 nm 									
HDSP-8601	Grey	Common Anode	680	1500	10	2.1	10	E,F	Right
HDSP-8603	Grey	Common Cathode	680	1500	10	2.1	10	E,F	Right




LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
7.62 mm (0.3") Single Digit Display								
GaP Red 620 nm								
HDSP-333E	Grey	Common Cathode	800	1800	10	2.05	20	Right
GaP Green 573 nm								
HDSP-333G	Grey	Common Cathode	800	2000	10	2.25	20	Right
AlGaAs Red 643 nm								
HDSP-333A	Grey	Common Cathode	2001	4200	10	1.85	20	Right
9.1mm (0.36") Single Digit Display								
AlGaAs Red 643nm								
HDSP-C3A1	Grey	Common Anode	–	7500	10	1.85	20	Right
HDSP-C3A3	Grey	Common Cathode	–	7500	10	1.85	20	Right
GaAsP Red 626nm								
HDSP-C3E1	Grey	Common Anode	–	1100	10	2.0	20	Right
HDSP-C3E3	Grey	Common Cathode	–	1100	10	2.0	20	Right
GaAsP Orange								
HDSP-C3L1	Grey	Common Anode	–	900	10	2.15	20	Right
HDSP-C3L3	Grey	Common Cathode	–	900	10	2.15	20	Right
GaAsP Yellow								
HDSP-C3Y1	Grey	Common Anode	–	750	10	2.15	20	Right
HDSP-C3Y3	Grey	Common Cathode	–	750	10	2.15	20	Right
GaP Green								
HDSP-C3G1	Grey	Common Anode	-	1900	10	2.25	20	Right
HDSP-C3G3	Grey	Common Cathode	-	1900	10	2.25	20	Right
10 mm (0.4") Slim Font Single Digit Display								
GaP Red 625 nm								
HDSP-301E	Grey	Common Anode	1100	1100	10	1.90	20	Right
HDSP-303E	Grey	Common Cathode	1100	1100	10	1.90	20	Right
GaP Green 573 nm								
HDSP-301G	Grey	Common Anode	1800	2800	10	2.25	20	Right
HDSP-303G	Grey	Common Cathode	1800	2800	10	2.25	20	Right
AlGaAs Red 643 nm								
HDSP-301A	Grey	Common Anode	280	450	1	1.80	20	Right
HDSP-303A	Grey	Common Cathode	280	450	1	1.80	20	Right
GaP Yellow 590 nm								
HDSP-301Y	Grey	Common Anode	1100	1800	10	2.15	20	Right
HDSP-303Y	Grey	Common Cathode	1100	1800	10	2.15	20	Right


LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		I _v Test Current (mA)	V _f Typ. (V)	V _f Test Current (mA)	Decimal Point
			Min.	Typ.				
10.16 mm (0.4") Single Digit Display								
GaP Red 620 nm 								
HDSP-311E	Grey	Common Anode	1250	3200	10	2.05	20	Right
HDSP-313E	Grey	Common Cathode	1250	3200	10	2.05	20	Right
GaP Green 573 nm 								
HDSP-311G	Grey	Common Anode	1250	3200	10	2.25	20	Right
HDSP-313G	Grey	Common Cathode	1250	3200	10	2.25	20	Right
AlGaAs Red 643 nm 								
HDSP-311A	Grey	Common Anode	3200	7500	10	1.85	20	Right
HDSP-313A	Grey	Common Cathode	3200	7500	10	1.85	20	Right
GaP Yellow 590 nm 								
HDSP-311Y	Grey	Common Anode	800	1500	10	2.15	20	Right
HDSP-313Y	Grey	Common Cathode	800	1500	10	2.15	20	Right
10.16 mm (0.4") Dual Digit Display								
GaP Red 620 nm 								
HDSP-G01E	Grey	Common Anode	1250	2600	10	2.05	20	–
HDSP-G03E	Grey	Common Cathode	1250	2600	10	2.05	20	–
GaP Green 573 nm 								
HDSP-G01G	Grey	Common Anode	1250	3200	10	2.25	20	–
HDSP-G03G	Grey	Common Cathode	1250	3200	10	2.25	20	–
AlGaAs Red 643nm 								
HDSP-G01A	Grey	Common Anode	3200	6500	10	1.85	20	–
HDSP-G03A	Grey	Common Cathode	3200	6500	10	1.85	20	–
GaP Yellow 590 nm 								
HDSP-G01Y	Grey	Common Anode	800	1500	10	2.15	20	–
HDSP-G03Y	Grey	Common Cathode	800	1500	10	2.15	20	–

LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
0.56" Slim Font Single Digit Display								
GaP Red 625 nm 								
HDSP-561E	Grey	Common Anode	1100	1800	10	1.90	20	Right
HDSP-563E	Grey	Common Cathode	1100	1800	10	1.90	20	Right
GaP Green 573 nm 								
HDSP-561G	Grey	Common Anode	1800	2800	10	2.25	20	Right
HDSP-563G	Grey	Common Cathode	1800	2800	10	2.25	20	Right
AlGaAs Red 643 nm 								
HDSP-561A	Grey	Common Anode	280	450	1	2.1	20	Right
HDSP-563A	Grey	Common Cathode	280	450	1	2.1	20	Right
GaP Yellow 590 nm 								
HDSP-561Y	Grey	Common Anode	1800	2800	10	1.80	20	Right
HDSP-563Y	Grey	Common Cathode	1800	2800	10	1.80	20	Right
13.1mm (0.52") Single Digit Display								
AlGaAs Red 643nm 								
HDSP-C5A1	Grey	Common Anode	–	16000	10	1.85	20	Right
HDSP-C5A3	Grey	Common Cathode	–	16000	10	1.85	20	Right
GaAsP Red 626nm 								
HDSP-C5E1	Grey	Common Anode	–	4000	10	2.0	20	Right
HDSP-C5E3	Grey	Common Cathode	–	4000	10	2.0	20	Right
GaAsP Orange 								
HDSP-C5L1	Grey	Common Anode	–	4000	10	2.15	20	Right
HDSP-C5L3	Grey	Common Cathode	–	4000	10	2.15	20	Right
GaAsP Yellow 								
HDSP-C5Y1	Grey	Common Anode	–	3000	10	2.15	20	Right
HDSP-C5Y3	Grey	Common Cathode	–	3000	10	2.15	20	Right
GaP Green 								
HDSP-C5G1	Grey	Common Anode	–	6000	10	2.25	20	Right
HDSP-C5G3	Grey	Common Cathode	–	6000	10	2.25	20	Right








LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
14.22 mm (0.56") Single Digit Display								
GaP Red 620 nm 								
HDSP-511E	Grey	Common Anode	2001	4100	10	2.05	20	Right
HDSP-513E	Grey	Common Cathode	2001	4100	10	2.05	20	Right
GaP Green 573 nm 								
HDSP-511G	Grey	Common Anode	2001	4100	10	2.25	20	Right
HDSP-513G	Grey	Common Cathode	2001	4100	10	2.25	20	Right
AlGaAs Red 643 nm 								
HDSP-511A	Grey	Common Anode	3201	6500	10	1.85	20	Right
HDSP-513A	Grey	Common Cathode	3201	6500	10	1.85	20	Right
GaP Yellow 590 nm 								
HDSP-511Y	Grey	Common Anode	1251	2600	10	2.15	20	Right
HDSP-513Y	Grey	Common Cathode	1251	2600	10	2.15	20	Right
14.2 mm (0.56") Dual Digit Displays								
GaP Yellow 587 nm 								
HDSP-521Y	Grey	Common Anode	1520	2300	10	2.1	20	Right
HDSP-523Y	Grey	Common Cathode	1520	2300	10	2.1	20	Right
GaP Red 626 nm 								
HDSP-521E	Grey	Common Anode	2280	4000	10	2.1	20	Right
HDSP-523E	Grey	Common Cathode	2280	4000	10	2.1	20	Right
GaP Green 571 nm 								
HDSP-521G	Grey	Common Anode	2280	3500	10	2.1	10	Right
HDSP-523G	Grey	Common Cathode	2280	3500	10	2.1	10	Right
AlGaAs Red 643 nm 								
HDSP-521A	Grey	Common Anode	–	6500	10	1.85	20	Right
HDSP-523A	Grey	Common Cathode	–	6500	10	1.85	20	Right











LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
20 mm (0.8") Single Digit Display								
GaP Red 626 nm 								
HDSP-815E	Grey	Common Anode	2300	4800	20	2.1	20	Right
HDSP-816E	Grey	Common Cathode	2300	4800	20	2.1	20	Right
GaP Green 571 nm 								
HDSP-815G	Grey	Common Anode	1500	3300	20	2.1	20	Right
HDSP-816G	Grey	Common Cathode	1500	3300	20	2.1	20	Right
20mm (0.8") Single Digit Display								
AlGaAs Red 643nm 								
HDSP-C8A1	Grey	Common Anode	–	18200	10	1.85	20	Right
HDSP-C8A3	Grey	Common Cathode	–	18200	10	1.85	20	Right
GaAsP Red 626nm 								
HDSP-C8E1	Grey	Common Anode	–	4800	10	2.0	20	Right
HDSP-C8E3	Grey	Common Cathode	–	4800	10	2.0	20	Right
GaAsP Orange 								
HDSP-C8L1	Grey	Common Anode	–	4500	10	2.15	20	Right
HDSP-C8L3	Grey	Common Cathode	–	4500	10	2.15	20	Right
GaAsP Yellow 								
HDSP-C8Y1	Grey	Common Anode	–	3800	10	2.15	20	Right
HDSP-C8Y3	Grey	Common Cathode	–	3800	10	2.15	20	Right
GaP Green 								
HDSP-C8G1	Grey	Common Anode	–	5000	10	2.25	20	Right
HDSP-C8G3	Grey	Common Cathode	–	5000	10	2.25	20	Right











LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (μcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
25.4mm (1.0") Single Digit Display								
AlGaAs Red 643nm 								
HDSP-C1A1	Grey	Common Anode	–	42000	10	3.7	20	Right
HDSP-C1A3	Grey	Common Cathode	–	42000	10	3.7	20	Right
GaAsP Red 626nm 								
HDSP-C1E1	Grey	Common Anode	–	12000	10	4.0	20	Right
HDSP-C1E3	Grey	Common Cathode	–	12000	10	4.0	20	Right
GaAsP Orange 								
HDSP-C1L1	Grey	Common Anode	–	12100	10	4.3	20	Right
HDSP-C1L3	Grey	Common Cathode	–	12100	10	4.3	20	Right
GaAsP Yellow 								
HDSP-C1Y1	Grey	Common Anode	–	6900	10	4.3	20	Right
HDSP-C1Y3	Grey	Common Cathode	–	6900	10	4.3	20	Right
GaP Green 								
HDSP-C1G1	Grey	Common Anode	–	16000	10	4.5	20	Right
HDSP-C1G3	Grey	Common Cathode	–	16000	10	4.5	20	Right
56.80mm (2.3") Single Digit Display								
AlGaAs Red 643nm 								
HDSP-C2A1	Grey	Common Anode	–	78000	10	7.4	20	Right
HDSP-C2A3	Grey	Common Cathode	–	78000	10	7.4	20	Right
GaAsP Red 626nm 								
HDSP-C2E1	Grey	Common Anode	–	20000	10	8.0	20	Right
HDSP-C2E3	Grey	Common Cathode	–	20000	10	8.0	20	Right
GaAsP Orange 								
HDSP-C2L1	Grey	Common Anode	–	20000	10	8.6	20	Right
HDSP-C2L3	Grey	Common Cathode	–	20000	10	8.6	20	Right
GaAsP Yellow 								
HDSP-C2Y1	Grey	Common Anode	–	12000	10	8.6	20	Right
HDSP-C2Y3	Grey	Common Cathode	–	12000	10	8.6	20	Right
GaP Green 								
HDSP-C2G1	Grey	Common Anode	–	28000	10	9.0	20	Right
HDSP-C2G3	Grey	Common Cathode	–	28000	10	9.0	20	Right





LED Indicators and Displays

Surface Mount Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (mcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
7.0mm (0.28") Single Digit SMT Display								
AllInGaP Red 624 nm 								
HDSM-281C	Grey	Common Anode	3.4	7.5	10	2	20	Upper and Lower
HDSM-283C	Grey	Common Cathode	3.4	7.5	10	2	20	Upper and Lower
AllInGaP Green 571 nm 								
HDSM-281H	Grey	Common Anode	3.4	6	10	2.1	20	Upper and Lower
HDSM-283H	Grey	Common Cathode	3.4	6	10	2.1	20	Upper and Lower
AllInGaP Yellow 589 nm 								
HDSM-281F	Grey	Common Anode	3.4	8	10	2.1	20	Upper and Lower
HDSM-283F	Grey	Common Cathode	3.4	8	10	2.1	20	Upper and Lower
AllInGaP Orange 605 nm 								
HDSM-281L	Grey	Common Anode	3.4	8.5	10	2.1	20	Upper and Lower
HDSM-283L	Grey	Common Cathode	3.4	8.5	10	2.1	20	Upper and Lower
InGaN Blue 470nm 								
HDSM-281B	Grey	Common Anode	3.4	6	10	3.3	20	Upper and Lower
HDSM-283B	Grey	Common Cathode	3.4	6	10	3.3	20	Upper and Lower
7.0 mm (0.28") Dual Digit SMT Display								
AllInGaP Red 624 nm 								
HDSM-291C	Grey	Common Anode	3.4	7.5	10	2	20	Upper and Lower
HDSM-293C	Grey	Common Cathode	3.4	7.5	10	2	20	Upper and Lower
AllInGaP Green 571 nm 								
HDSM-291H	Grey	Common Anode	3.4	6	10	2.1	20	Upper and Lower
HDSM-293H	Grey	Common Cathode	3.4	6	10	2.1	20	Upper and Lower
AllInGaP Yellow 589 nm 								
HDSM-291F	Grey	Common Anode	3.4	8	10	2.1	20	Upper and Lower
HDSM-293F	Grey	Common Cathode	3.4	8	10	2.1	20	Upper and Lower
AllInGaP Orange 605 nm 								
HDSM-291L	Grey	Common Anode	3.4	8.5	10	2.1	20	Upper and Lower
HDSM-293L	Grey	Common Cathode	3.4	8.5	10	2.1	20	Upper and Lower
InGaN Blue 470nm 								
HDSM-291B	Grey	Common Anode	3.4	6	10	3.3	20	Upper and Lower
HDSM-293B	Grey	Common Cathode	3.4	6	10	3.3	20	Upper and Lower









LED Indicators and Displays

Surface Mount Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (mcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
10 mm (0.39") Single Digit SMT Display								
AllInGaP Red 624 nm 								
HDSM-431C	Grey	Common Anode	8.6	14.3	10	2	20	Right
HDSM-433C	Grey	Common Cathode	8.6	14.3	10	2	20	Right
AllInGaP Green 571 nm 								
HDSM-431H	Grey	Common Anode	5.4	9	10	2.1	20	Right
HDSM-433H	Grey	Common Cathode	5.4	9	10	2.1	20	Right
AllInGaP Yellow 589 nm 								
HDSM-431F	Grey	Common Anode	8.6	15	10	2.1	20	Right
HDSM-433F	Grey	Common Cathode	8.6	15	10	2.1	20	Right
AllInGaP Orange 605 nm 								
HDSM-431L	Grey	Common Anode	8.6	16	10	2.1	20	Right
HDSM-433L	Grey	Common Cathode	8.6	16	10	2.1	20	Right
InGaN Blue 470nm 								
HDSM-431B	Grey	Common Anode	5.4	11.2	10	3.3	20	Right
HDSM-433B	Grey	Common Cathode	5.4	11.2	10	3.3	20	Right
InGaN White 								
HDSM-431W	Grey	Common Anode	24	40	5	2.95	5	Right
HDSM-433W	Grey	Common Cathode	24	40	5	2.95	5	Right
10 mm (0.39") Dual Digit SMT Display								
AllInGaP Red 624 nm 								
HDSM-441C	Grey	Common Anode	8.6	14.3	10	2	20	Right
HDSM-443C	Grey	Common Cathode	8.6	14.3	10	2	20	Right
AllInGaP Green 571 nm 								
HDSM-441H	Grey	Common Anode	5.4	9	10	2.1	20	Right
HDSM-443H	Grey	Common Cathode	5.4	9	10	2.1	20	Right
AllInGaP Yellow 589 nm 								
HDSM-441F	Grey	Common Anode	8.6	15	10	2.1	20	Right
HDSM-443F	Grey	Common Cathode	8.6	15	10	2.1	20	Right
AllInGaP Orange 605 nm 								
HDSM-441L	Grey	Common Anode	8.6	16	10	2.1	20	Right
HDSM-443L	Grey	Common Cathode	8.6	16	10	2.1	20	Right
InGaN Blue 470nm 								
HDSM-441B	Grey	Common Anode	5.4	11.2	10	3.3	20	Right
HDSM-443B	Grey	Common Cathode	5.4	11.2	10	3.3	20	Right
InGaN White 								
HDSM-441W	Grey	Common Anode	24	40	5	2.95	5	Right
HDSM-443W	Grey	Common Cathode	24	40	5	2.95	5	Right

LED Indicators and Displays




Surface Mount Seven-Segment Displays—PCB Platform

Part Number	Face Color	Pin Configuration	Intensity (mcd)		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
14.22 mm (0.56") Single Digit SMT Display								
AllInGaP Red 624 nm 								
HDSM-531C	Grey	Common Anode	8.6	16	10	2	20	Right
HDSM-533C	Grey	Common Cathode	8.6	16	10	2	20	Right
AllInGaP Green 571 nm 								
HDSM-531H	Grey	Common Anode	5.4	10.5	10	2.1	20	Right
HDSM-533H	Grey	Common Cathode	5.4	10.5	10	2.1	20	Right
AllInGaP Yellow 589 nm 								
HDSM-531F	Grey	Common Anode	8.6	20	10	2.1	20	Right
HDSM-533F	Grey	Common Cathode	8.6	20	10	2.1	20	Right
AllInGaP Orange 605 nm 								
HDSM-531L	Grey	Common Anode	8.6	19.5	10	2.1	20	Right
HDSM-533L	Grey	Common Cathode	8.6	19.5	10	2.1	20	Right
InGaN Blue 470nm 								
HDSM-531B	Grey	Common Anode	5.4	13.5	10	3.3	20	Right
HDSM-533B	Grey	Common Cathode	5.4	13.5	10	3.3	20	Right
InGaN White 								
HDSM-531W	Grey	Common Anode	28	44	5	2.95	5	Right
HDSM-533W	Grey	Common Cathode	28	44	5	2.95	5	Right
14.22mm (0.56") Dual Digit SMT Display								
AllInGaP Red 624 nm 								
HDSM-541C	Grey	Common Anode	8.6	16	10	2	20	Right
HDSM-543C	Grey	Common Cathode	8.6	16	10	2	20	Right
AllInGaP Green 571 nm 								
HDSM-541H	Grey	Common Anode	5.4	10.5	10	2.1	20	Right
HDSM-543H	Grey	Common Cathode	5.4	10.5	10	2.1	20	Right
AllInGaP Yellow 589 nm 								
HDSM-541F	Grey	Common Anode	8.6	20	10	2.1	20	Right
HDSM-543F	Grey	Common Cathode	8.6	20	10	2.1	20	Right
AllInGaP Orange 605 nm 								
HDSM-541L	Grey	Common Anode	8.6	19.5	10	2.1	20	Right
HDSM-543L	Grey	Common Cathode	8.6	19.5	10	2.1	20	Right
InGaN Blue 470nm 								
HDSM-541B	Grey	Common Anode	5.4	13.5	10	3.3	20	Right
HDSM-543B	Grey	Common Cathode	5.4	13.5	10	3.3	20	Right
InGaN White 								
HDSM-541W	Grey	Common Anode	28	44	5	2.95	5	Right
HDSM-543W	Grey	Common Cathode	28	44	5	2.95	5	Right





LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform Luminous Intensity Categories (Typ.)





7.62 mm (0.3") Single Digit

Bin ID	Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-33xE		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200
GaP Green 		
HDSP-33xG		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200
AlGaAs Red 		
HDSP-33xA		
I	2.001	3.200
J	3.201	5.050
K	5.051	8.000





10.16 mm (0.4") Single Digit

Bin ID	Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-31xE		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
GaP Green 		
HDSP-31xG		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
AlGaAs Red 		
HDSP-31xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650
GaP Yellow 		
HDSP-31xY		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200





13 mm (0.56") Slim Font Single Digit

Bin ID	Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-56xE		
I	1.100	2.200
K	1.800	3.600
GaP Green 		
HDSP-56xG		
K	1.800	3.600
L	2.800	5.600
AlGaAs Red 		
HDSP-56xA		
F	0.280	0.560
G	0.450	0.900
GaP Yellow 		
HDSP-56xY		
I	1.100	2.200
K	1.800	3.600

10 mm (0.4") Slim Font Single Digit

Bin ID	Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-30xE		
I	1.100	2.200
K	1.800	3.600
GaP Green 		
HDSP-30xG		
K	1.800	3.600
L	2.800	5.600
AlGaAs Red 		
HDSP-30xA		
F	0.280	0.560
G	0.450	0.900
GaP Yellow 		
HDSP-30xY		
I	1.100	2.200
K	1.800	3.600





10.16 mm (0.4"D) Dual Digit

Bin ID	Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-G0xE		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
GaP Green 		
HDSP-G0xG		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
AlGaAs Red 		
HDSP-G0xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650
GaP Yellow 		
HDSP-G0xY		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200





LED Indicators and Displays

Through-hole Seven-Segment Displays—PCB Platform



14.22 mm (0.56") Single Digit

Bin ID	Customer Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-51xE		
I	2.001	3.200
J	3.201	5.050
K	5.051	8.000
GaP Green 		
HDSP-51xG		
I	2.001	3.200
J	3.201	5.050
K	5.051	8.000
AlGaAs Red 		
HDSP-51xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650
GaP Yellow 		
HDSP-51xY		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050

0.56" Dual Digit

Bin ID	Customer Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-52xE		
G	2.28	3.42
H	3.42	5.13
I	5.13	7.69
GaP Yellow 		
HDSP-52xY		
F	1.52	2.28
G	2.28	3.42
H	3.42	5.13
GaP Green 		
HDSP-52xG		
G	2.28	3.42
H	3.42	5.13
AlGaAs Red 		
HDSP-52xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650




0.8" Single Digit

Bin ID	Customer Iv in mcd	
	Min.	Max.
GaP Red 		
HDSP-81xE		
N	4.78	8.34
P	6.82	11.86
Q	9.7	16.61
GaP Green 		
HDSP-81xG		
P	6.82	11.86
Q	9.7	16.61
R	13.6	23.74




LED Indicators and Displays

Surface Mount Seven-Segment Displays





10mm (0.28") Single Digit SMT Display

Bin ID	Iv in mcd	
	Min.	Max.
AllInGaP Green  HDSM-281H HDSM-283H		
L	3.401	5.400
M	5.401	8.600
AllInGaP Red/Orange/Yellow  HDSM-281C/281L/281F HDSM-283C/283L/283F		
L	3.401	5.400
M	5.401	8.600
N	8.601	13.700
InGaN Blue  HDSM-281B HDSM-283B		
L	3.401	5.400
M	5.401	8.600
N	8.601	13.700

10mm (0.28") Dual Digit SMT Display

Bin ID	Iv in mcd	
	Min.	Max.
AllInGaP Green  HDSM-291H HDSM-293H		
L	3.401	5.400
M	5.401	8.600
GAllInGaP Red/Orange/Yellow  HDSM-291C/291L/291F HDSM-293C/293L/293F		
L	3.401	5.400
M	5.401	8.600
N	8.601	13.700
InGaN Blue  HDSM-291B HDSM-293B		
L	3.401	5.400
M	5.401	8.600
N	8.601	13.700





10mm (0.39") Single Digit SMT Display

Bin ID	Iv in mcd	
	Min.	Max.
AllInGaP Green  HDSM-431H HDSM-433H		
M	5.401	8.600
N	8.601	13.700
P	13.701	21.800
AllInGaP Red/Yellow  HDSM-431C/431F HDSM-433C/433F		
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700
AllInGaP Orange  HDSM-431L HDSM-433L		
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700
R	34.701	55.200
InGaN Blue  HDSM-431B HDSM-433B		
M	5.401	8.600
N	8.601	13.700
P	13.701	21.800





LED Indicators and Displays

Surface Mount Seven-Segment Displays Luminous Intensity Categories (Typ.)





10mm (0.39") Dual Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
AllInGaP Green  HDSM-441H HDSM-443H		
M	5.401	8.600
N	8.601	13.700
P	13.701	21.800
AllInGaP Red/Yellow  HHDSM-441C/441F HDSM-443C/443F		
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700
AllInGaP Orange  HDSM-441L HDSM-443L		
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700
R	34.701	55.200
InGaN Blue  HDSM-441B HDSM-443B		
M	5.401	8.600
N	8.601	13.700
P	13.701	21.800

14.22mm (0.56") Single Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
AllInGaP Green  HDSM-531H HDSM-533H		
M	5.401	8.600
N	8.601	13.700
AllInGaP Red  HDSM-531C HDSM-533C		
N	8.601	13.700
P	13.701	21.800
AllInGaP Orange/Yellow  HDSM-531L/531F HDSM-533L/533F		
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700
InGaN Blue  HDSM-531B HDSM-533B		
M	5.401	8.600
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700

14.22mm (0.56") Dual Digit

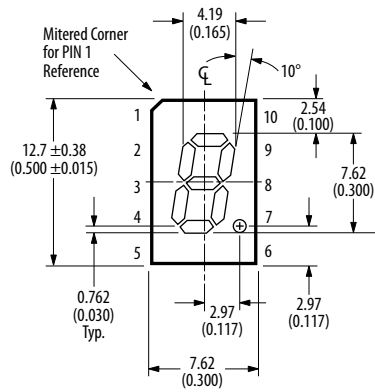
Bin ID	Customer lv in mcd	
	Min.	Max.
AllInGaP Green  HDSM-541H HDSM-543H		
M	5.401	8.600
N	8.601	13.700
AllInGaP Red  HDSM-541C HDSM-543C		
N	8.601	13.700
P	13.701	21.800
AllInGaP Orange/Yellow  HHDSM-541L/541F HDSM-543L/543F		
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700
InGaN Blue  HDSM-541B HDSM-543B		
M	5.401	8.600
N	8.601	13.700
P	13.701	21.800
Q	21.801	34.700

LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

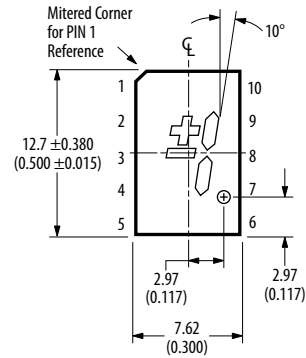
7.6 mm (0.3") Micro Bright Displays Package Dimension

Part Number		
HDSP-	A151	A211
	7501	A213
	A401	A511
	A411	A513
	7401	
	7801	
	A153	
	7503	
	A403	
	A413	
	7403	
	7803	



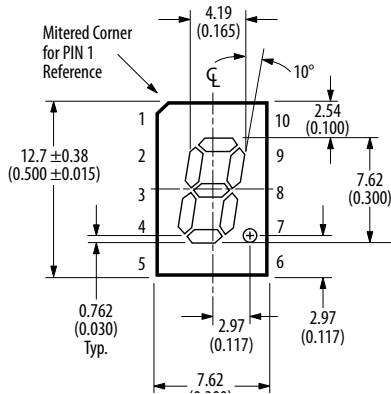
7.6 mm (0.3") Micro Bright Overflow Displays (Right Decimal Point) Package Dimension

Part Number	
HDSP-	7507
	A407
	7407
	7807
	7508
	A408
	7408
	7808



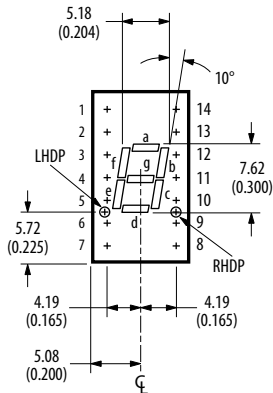
7.6 mm (0.3") Micro Bright Low Current Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	A101	A111
	7511	A113
	A801	
	A901	
	A103	
	7513	
	A803	
	A903	



7.6 mm (0.3") Single Digit Displays Package Dimension

Part Number	
5082-	7610
	7611
	7613
	7620
	7621
	7623
	3600
	3601
	3603



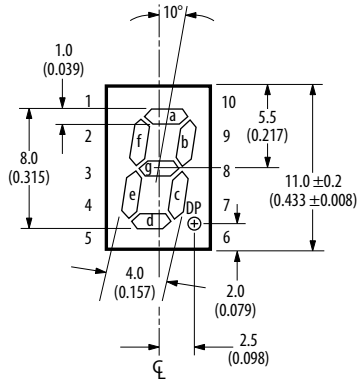
Note:
1. Dimensions in millimeters (inches).

LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

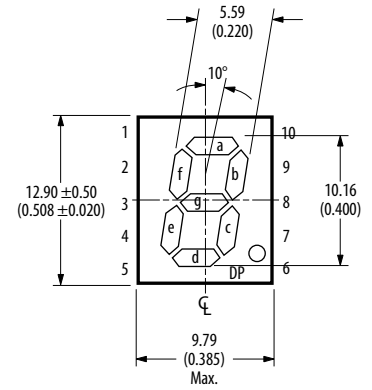
8 mm (0.31") Micro Bright Displays Package Dimension

Part Number	
HDSP-	Uxxx



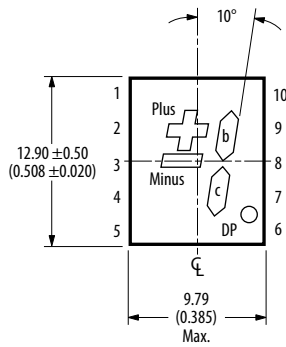
10 mm (0.4") Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	F111	F113
	F211	F213
	F511	F513
	F101	F103
	F201	F203
	F401	F403
	F411	F413
	F301	F303
	F501	F503
	F511	F513



10 mm (0.4") Overflow Displays (Right Decimal Point) Package Dimension

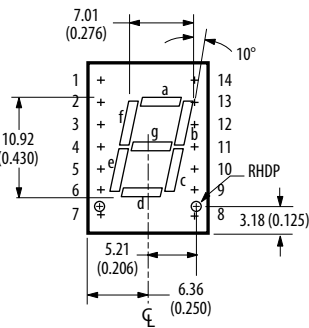
Part Number		
HDSP-	F107	F108
	F207	F208
	F407	F408
	F307	F308
	F507	F508



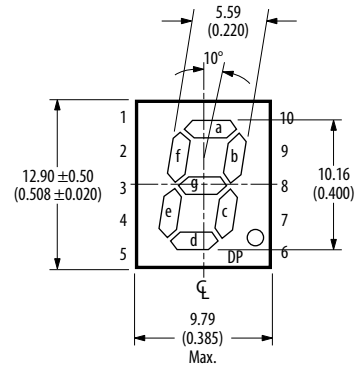
Note:
1. Dimensions in millimeters (inches).

10.9 mm (0.43") Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	E101	E103
	3351	3353
5082-	7651	7653
	7661	7663
	4601	4603

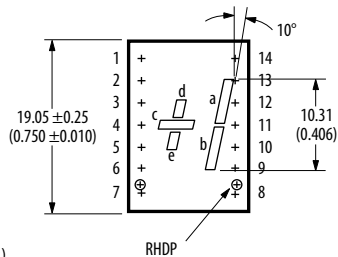


Part Number	
5802-	7650
	7660
	4600

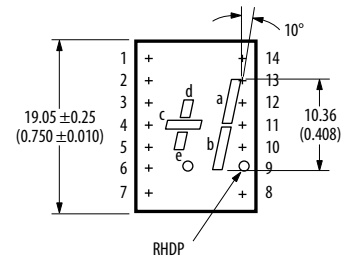


10.9 mm (0.43") Overflow Displays Package Dimension

Part Number		
HDSP-	4606	
5082-	7656	7666



Part Number	
HDSP-	3356



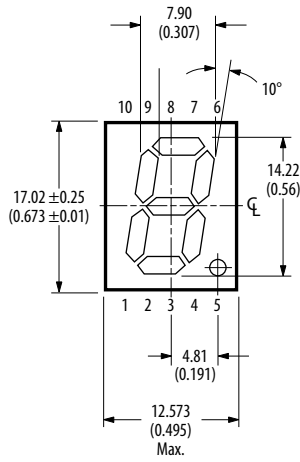
Note:
1. Dimensions in millimeters (inches).

LED Indicators and Displays

Through-hole Seven-Segment Displays—Leadframe Platform

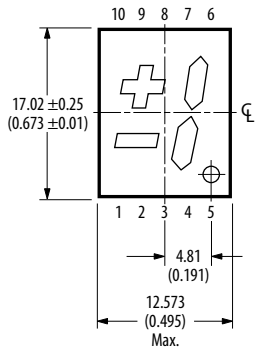
14.2 mm (0.56") Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	H111	H211
	H411	H511
	H113	H213
	H413	H513
	H101	H103
	H401	H403
	5551	5553
	5501	5503
	5701	5703
	5601	5603



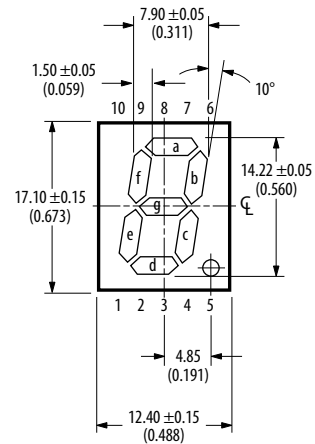
14.2 mm (0.56") Overflow Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	H107	H108
	H407	H408
	5557	5558
	5507	5508
	5707	5708
	5607	5608



14.22 mm (0.56") Single Digit Displays Package Dimension

Part Number		
HDSP-	51xE	51xG
	51xA	51xY



Note:

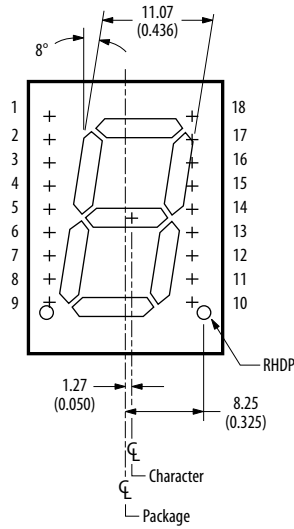
1. Dimensions in millimeters (inches).

LED Indicators and Displays

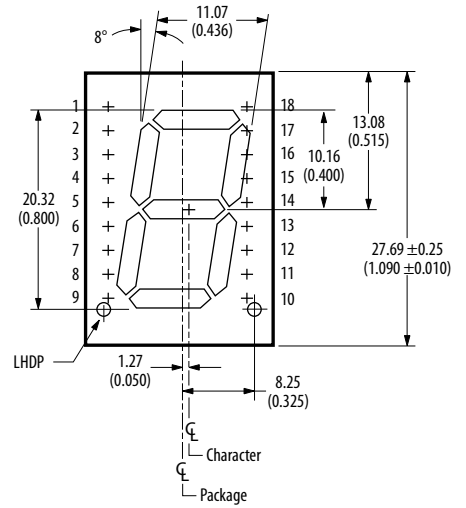
Through-hole Seven-Segment Displays—Leadframe Platform

20 mm (0.8") Single Digit Displays Package Dimension

Part Number		
HDSP-	3901	3903
	4201	4203
	8601	8603
	N101	N103
	N401	N403



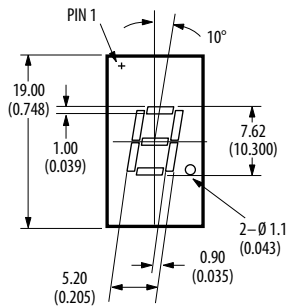
Part Number		
HDSP-		N105
	3900	3905
	4200	4205
	8600	8605



Through-hole Seven Segment Displays—PCB Platform

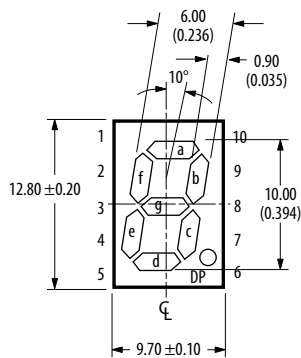
7.62 mm (0.3") Single Digit Displays Package Dimension

Part Number	
5802-	333E
	333G
	333A



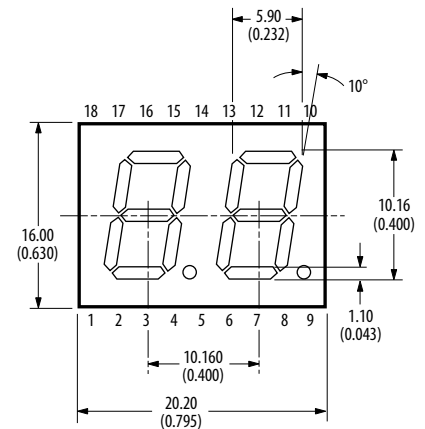
10 mm (0.4") Slim Font Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	315E	316E
	315L	316L
	315Y	316Y
	315G	316G
	30xE	30xG
	30xA	30xY



10.16 mm (0.4") Dual Digit Displays Package Dimension

Part Number		
HDSP-	G0xE	G0xG
	G0xA	G0xY



Note:

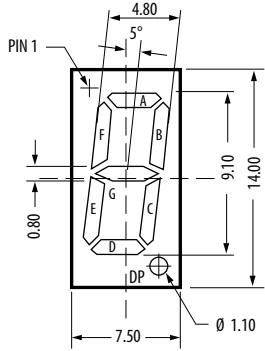
1. Dimensions in millimeters (inches).

LED Indicators and Displays

Through-hole Seven Segment Displays—PCB Platform

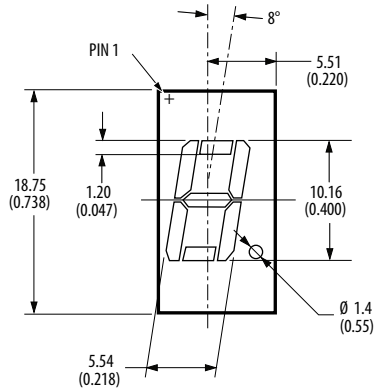
9.1mm (0.36") Single Digit Displays Package Dimension

Part Number	
HDSP-	C3A1
	C3A3
	C3E1
	C3E3
	C3L1
	C3L3
	C3Y1
	C3Y3
	C3G1
	C3G3

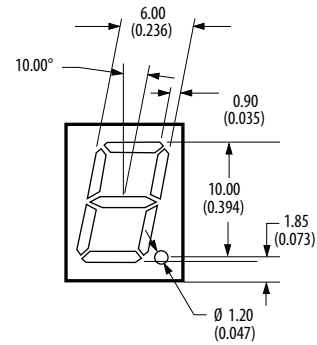


10.16 mm (0.4") Single Digit Displays Package Dimension

Part Number	
HDSP-	311E
	311G
	311A
	311Y

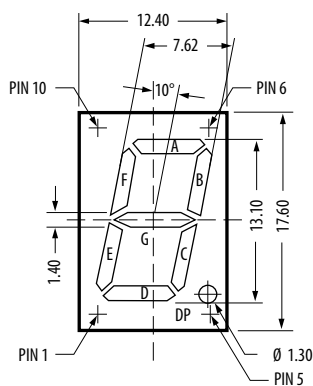


Part Number	
HDSP-	313E
	313G
	313A
	313Y



13.1mm (0.52") Single Digit Displays Package Dimension

Part Number	
HDSP-	CSA1
	CSA3
	CSE1
	CSE3
	CSL1
	C3L3
	C3Y1
	C3Y3
	C3G1
	C3G3



Note:

1. Dimensions in millimeters (inches).

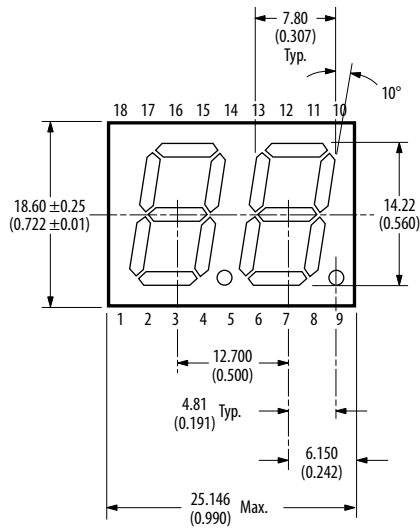
LED Indicators and Displays

Through-hole Seven Segment Displays—PCB Platform

14.2 mm (0.56") Dual Digit Displays

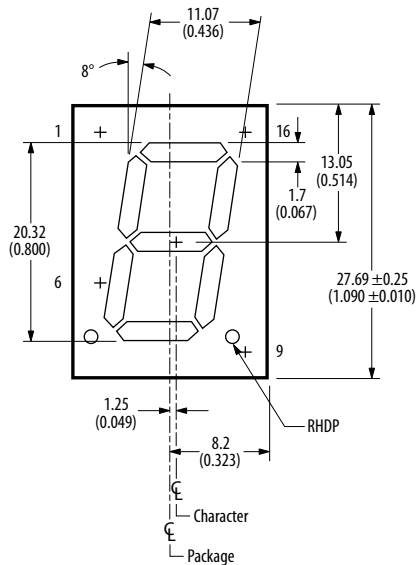
Package Dimension

Part Number		
HDSP-	52xA	52xE
	52xG	52xY

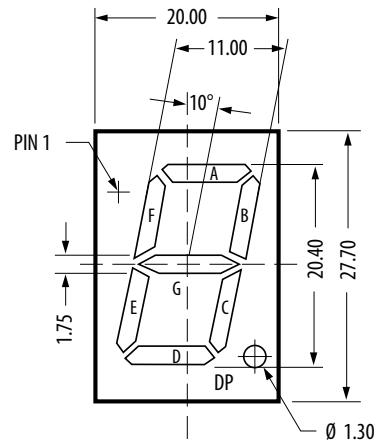


20 mm (0.8") Single Digit Displays Package Dimension

Part Number		
HDSP-	81xE	81xG



Part Number	
HDSP-	C8A1
	C8A3
	C8E1
	C8E3
	C8L1
	C8L3
	C8Y1
	C8Y3
	C8G1
	C8G3



Note:

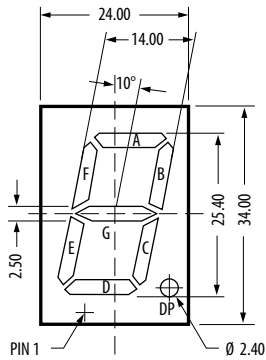
1. Dimensions in millimeters (inches).

LED Indicators and Displays

Through-hole Seven Segment Displays—PCB Platform

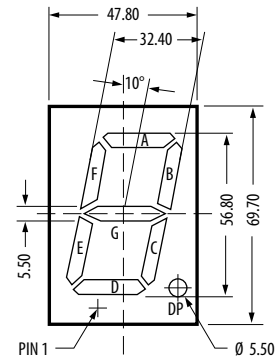
25.4mm (1.0") Single Digit Displays Package Dimension

Part Number	
HDSP-	C1A1
	C1A3
	C1E1
	C1E3
	C1L1
	C1L3
	C1Y1
	C1Y3
	C1G1
	C1G3



56.80mm (2.3") Single Digit Displays Package Dimension

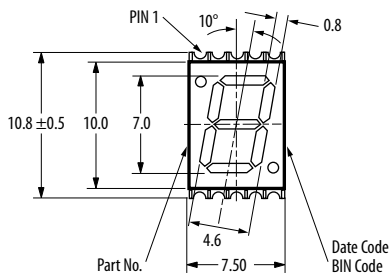
Part Number	
HDSP-	C2A1
	C2A3
	C2E1
	C2E3
	C2L1
	C2L3
	C2Y1
	C2Y3
	C2G1
	C2G3



Surface Mount Seven Segment Displays —PCB Platform

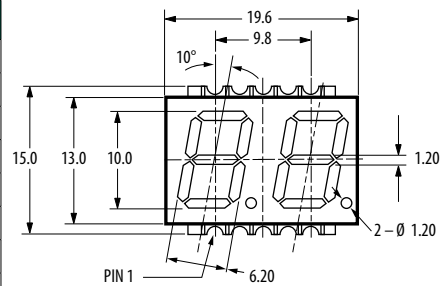
7.0mm (0.28") Single Digit SMT Display Package Dimension

Part Number	
HDSM-	281C
	281B
	283B
	283C
	281H
	283H
	281F
	283F
	281L
	283L



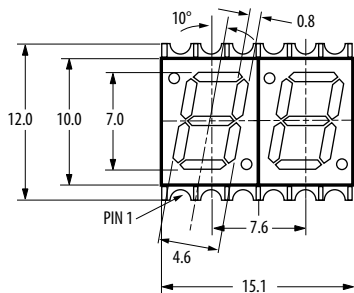
10.0mm (0.39") Dual Digit SMT Display Package Dimension

Part Number	
HDSM-	441C
	441B
	443B
	441W
	443W
	443C
	441H
	443H
	441F
	443F
	441L
	443L



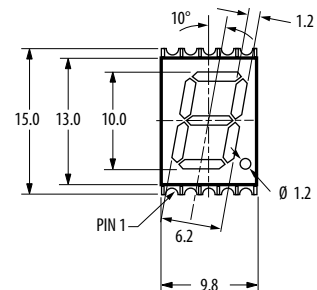
7.0mm (0.28") Dual Digit SMT Display Package Dimension

Part Number	
HDSM-	291C
	291B
	293B
	293C
	291H
	293H
	291F
	293F
	291L
	293L



10mm (0.39") Single Digit SMT Display Package Dimension

Part Number	
HDSM	431C
	431B
	433B
	431W
	433W
	433C
	431H
	433H
	431F
	433F
	431L
	433L



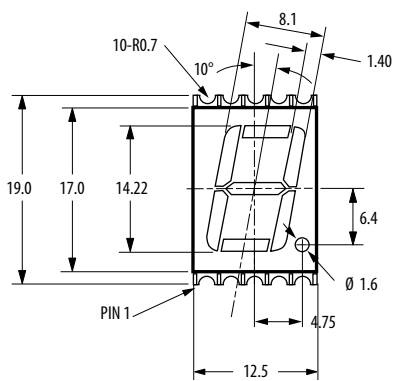
Note:
1. Dimensions in millimeters (inches).

LED Indicators and Displays

Surface Mount Seven Segment Displays — PCB Platform

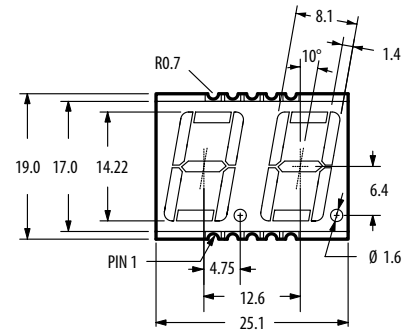
14.22mm (0.56") Single Digit SMT Display Package Dimension

Part Number	
HDSM	531C
	531B
	533B
	531W
	533W
	533C
	531H
	533H
	531F
	533F
	531L
	533L



14.22mm (0.56") Dual Digit SMT Display Package Dimension

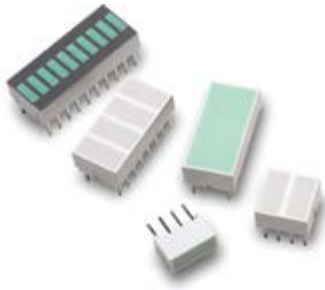
Part Number	
HDSM-	541C
	541B
	543B
	541W
	543W
	543C
	541H
	543H
	541F
	543F
	541L
	543L



Note:

1. Dimensions in millimeters (inches).

Light Bars and Bar Graph Arrays



Description — Light Bars

Light Bars are Avago Technologies' innovative solution to fixed message annunciation. They are used as annunciators that serve three customer functions: status indication, backlighting fixed messages and analog level indications (arrays). The Light Bars provide exceptional brightness at very low drive current for those applications where portability and battery backup are vital. These rectangular light sources are configured in single-in-line and dual-in-line packages that contain either single or segmented light emitting areas. They are also X-Y stackable.

Features & Benefits

- Large, bright, uniform light emitting surface
- Yellow and green categorized for dominant wavelength
- Low heat dissipation
- Choices of colors — Red, Green, Yellow
- Various package sizes are X-Y stackable
- Industry standard SIP and DIP packages

Typical Applications

- Business machines
 - Point of sale bar code scanner
 - Electronic typewriters
 - Fax machines
 - Electronic scales
 - Postal meters
- Instrumentation
 - Process control system
 - Medical equipment
 - Machine control systems
 - Meters and status indicators
- Telecommunications
 - PBX systems
 - Modems
 - Central switching systems
 - Diagnostic equipment
 - Short wave radios
- Transportation
 - Automotive dashboards
 - Truck and bus controls
 - Airport passenger metal detectors
 - Ticket vending machines
- Consumer
 - Appliance front panel
 - Hi-Fi/stereo equipment
 - Alarm system

Description — 10-Element Bar Graph Arrays

Avago Technologies' 10-Element Bar Graph Arrays serve a market need for analog level indication. LED reliability, light emitting viewability make them suitable in place of mechanical meters. They are designed to display information in easily recognizable bar graph form. The packages are end stackable and are therefore capable of displaying long strings of information. The bar graph arrays are precision matched for both intensity and wavelength, saving you the time and trouble of matching individual parts. The prealigned bar graph elements locked in a single package eliminates the task of matching and aligning individual LEDs during manufacturing, along with the risk of visually substandard front panels resulting from misaligned indicators. Each device offers easy-to-handle packages that are compatible with standard DIP sockets.

Features & Benefits

- Exclusive package interlock
 - Facilitate end stacking alignment
- Large segment size
 - Wide viewing angle
- Available in Red, Green, Yellow and multicolor
- Wide variety of applications
- Categorized and packaged for luminous intensity
 - Greater uniformity of light output
- Matched LEDs for uniform appearance

Typical Applications

- Instrumentation
 - Meters
 - Channel indicators
 - Status indicators
- Process control
 - Level indicators
- Appliances
 - Status of indication
 - Mode of operation
- Transportation
 - Tachometers
 - Fuel gauges
- Consumer products
 - VU meters (stereos)
 - Radio channel scanners
 - Burglar alarms

LED Indicators and Displays

Light Bars

Shape	Size/# Light Emitting	Part Number	Color	Chip (nm) Typ.	Vf (V) Typ.	Vf (V) at If = mA	Iv at If = mA	Iv Min. (mcd)	Iv Typ. (mcd)	2 Intensity Bin Selection
0.4SIP	0.35" x 0.15" 1 area	HLCP-A100	AlGaAs Red	637	1.8	20	3	3	7.5	B, C
0.4SIP	0.35" x 0.15" 1 area	HLMP-2300	GaP Red	626	2	20	20	6	23	E, F
0.4SIP	0.35" x 0.15" 1 area	HLMP-2400	GaP Yellow	585	2.1	20	20	6	20	E, F
0.4SIP	0.35" x 0.15" 1 area	HLMP-2500	GaP Green	572	2.2	20	20	5	25	F, G
0.8SIP	0.75" x 0.15" 1 area	HLCP-B100	AlGaAs Red	637	1.8	20	3	6	15	B, C
0.8SIP	0.75" x 0.15" 1 area	HLMP-2350	GaP Red	626	2	20	20	13	45	E, F
0.8SIP	0.75" x 0.15" 1 area	HLMP-2450	GaP Yellow	585	2.1	20	20	13	38	E, F
0.8SIP	0.75" x 0.15" 1 area	HLMP-2550	GaP Green	572	2.2	20	20	11	50	F, G
0.4DIP	0.35" x 0.35" 1 area	HLCP-C100	AlGaAs Red	637	1.8	20	3	6	15	–
0.4DIP	0.35" x 0.35" 1 area	HLMP-2655	GaP Red	626	2	20	20	13	45	E, F
0.4DIP	0.35" x 0.35" 1 area	HLMP-2755	GaP Yellow	585	2.1	20	20	13	38	E, F
0.4DIP	0.35" x 0.35" 1 area	HLMP-2855	GaP Green	572	2.2	20	20	11	50	F, G
0.4DIP	0.35" x 0.15" 2 areas	HLCP-D100	AlGaAs Red	637	1.8	20	3	3	7.5	B, C
0.4DIP	0.35" x 0.15" 2 areas	HLMP-2600	GaP Red	626	2	20	20	6	23	E, F
0.4DIP	0.35" x 0.15" 2 areas	HLMP-2700	GaP Yellow	585	2.1	20	20	6	20	E, F
0.4DIP	0.35" x 0.15" 2 areas	HLMP-2800	GaP Green	572	2.1	20	20	5	25	–
0.8DIP	0.35" x 0.15" 4 areas	HLCP-E100	AlGaAs Red	637	1.8	20	3	3	7.5	B, C
0.8DIP	0.35" x 0.15" 4 areas	HLMP-2620	GaP Red	626	2	20	20	6	23	E, F
0.8DIP	0.35" x 0.15" 4 areas	HLMP-2720	GaP Yellow	585	2.1	20	20	6	20	E, F
0.8DIP	0.35" x 0.15" 4 areas	HLMP-2820	GaP Green	572	2.2	20	20	5	25	F, G
0.8DIP	0.15" x 0.75" 2 areas	HLCP-F100	AlGaAs Red	637	1.8	20	3	6	15	–
0.8DIP	0.15" x 0.75" 2 areas	HLMP-2635	GaP Red	626	2	20	20	13	45	–
0.8DIP	0.15" x 0.75" 2 areas	HLMP-2735	GaP Yellow	585	2.1	20	20	13	38	–
0.8DIP	0.15" x 0.75" 2 areas	HLMP-2835	GaP Green	572	2.2	20	20	11	50	–
0.8DIP	0.35" x 0.35" 2 areas	HLCP-G100	AlGaAs Red	637	1.8	20	3	6	15	–
0.8DIP	0.35" x 0.35" 2 areas	HLMP-2670	GaP Red	626	2	20	20	13	45	–
0.8DIP	0.35" x 0.35" 2 areas	HLMP-2770	GaP Yellow	585	2.1	20	20	13	38	–
0.8DIP	0.35" x 0.35" 2 areas	HLMP-2870	GaP Green	572	2.2	20	20	11	50	F, G
0.8DIP	0.35" x 0.75" 1 areas	HLCP-H100	AlGaAs Red	637	1.8	20	3	12	30	B, C
0.8DIP	0.35" x 0.75" 1 areas	HLMP-2685	GaP Red	626	2	20	20	22	80	–
0.8DIP	0.35" x 0.75" 1 areas	HLMP-2785	GaP Yellow	585	2.1	20	20	26	70	E, F
0.8DIP	0.35" x 0.75" 1 areas	HLMP-2885	GaP Green	572	2.2	20	20	22	100	F, G

LED Indicators and Displays

Bicolor Light Bars

Shape	Size/# Light Emitting	Part Number	Color	Chip (nm) Typ.	Vf (V) Typ.	Vf (V) at If = mA	Iv at If = mA	Iv Min. (mcd)	Iv Typ. (mcd)	2 Intensity Bin Selection
0.4DIP	0.35" x 0.35" 1 area	HLMP-2950	GaP Red	626	2	20	20	13	45	–
			GaP Yellow	585	2.1	20	20	13	38	–
0.4DIP	0.35" x 0.35" 1 area	HLMP-2965	GaP Red	626	2	20	20	19	45	–
			GaP Green	572	2.2	20	20	25	50	–

Bar Graph Arrays

10 Element	HLCP-J100	AlGaAs Red	637	1.6	1	1	600	1000	–
	HDSP-4830	GaP Red	626	2.1	20	10	900	3500	G, H
	HDSP-4840	GaP Yellow	585	2.2	20	10	600	1900	F, G
	HDSP-4850	GaP Green	572	2.1	10	10	600	1900	H, I
Multicolor LA	HDSP-4832	GaP Red	626	2.1	20	10	600	3500	–
		GaP Yellow	585	2.2	20	10	600	1900	–
		GaP Green	572	2.1	10	10	600	1900	–
	HDSP-4836	GaP Red	626	2.1	20	10	600	3500	–
		GaP Yellow	585	2.2	20	10	600	1900	–
		GaP Green	572	2.1	10	10	600	1900	–
		GaP Yellow	585	2.2	20	10	600	1900	–
		GaP Red	626	2.1	20	10	600	3500	–

Luminous Intensity Categories

LED Light Bars

Bin ID	Customer Iv in mcd	
	Min.	Max.
AlGaAs Red ■ HLCP-A100 / D100 / E100 GaP Red ■ HLMP-2300 / 2600 / 2620		
B	4.5	8.2
C	6.8	12.1
D	10.1	18.5
E	15.3	27.8
F	22.8	45.5
AlGaAs Red ■ HLCP-B100 / C100 / F100 / G100 GaP Red ■ HLMP-2350 / 2635 / 2655 / 2670		
B	9.0	16.0
C	13.1	24.0
D	19.7	36.1
E	29.6	54.2
F	44.9	88.8
AlGaAs Red ■ HLCP-H100 GaP Red ■ HLMP-2685		
B	18.0	27.1
C	22.0	40.8
D	33.3	61.1
E	50.0	91.8
F	75.1	150.0

Bin ID	Customer Iv in mcd	
	Min.	Max.
GaP Yellow ■ HLMP-2400 / 2700 / 2720		
E	13.8	25.3
F	20.7	41.4
HLMP-2450 / 2735 / 2755 / 2770		
E	27.0	50.0
F	40.5	81.0
HLMP-2785		
E	54.0	99.0
F	81.0	162.0
GaP Green ■ HLMP-2500 / 2800 / 2820		
F	18.9	37.8
G	30.6	61.2
HLMP-2550 / 2835 / 2855 / 2870		
F	38.1	76.2
G	61.6	123.2
HLMP-2885		
F	75.1	150.3
G	121.1	242.2

Bicolor Light Bars

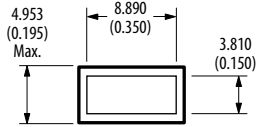
Bin ID	Customer Iv in mcd	
	Min.	Max.
HLMP-2950/GaP Red ■		
D	17.00	31.00
E	25.40	46.50
F	38.10	76.20
GaP Yellow ■		
D	18.00	33.00
E	27.00	50.00
F	40.50	81.00
HLMP-2965/GaP Red ■		
F	44.90	88.80
G	71.90	143.80
GaP Green ■		
F	38.10	76.20
G	61.60	123.20

Bar Graph Arrays

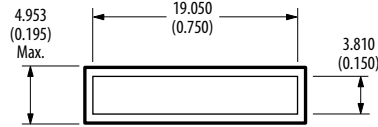
Bin ID	Customer Iv in mcd	
	Min.	Max.
AlGaAs Red / HLCP-J100 ■ GaP Red/GaP Yellow/GaP Green ■ ■ ■ HDSP-4830 / 4840 / 4850		
D	0.61	1.11
E	0.91	1.67
F	1.37	2.51
G	2.05	3.76
H	3.08	5.64
I	4.62	8.64

LED Indicators and Displays

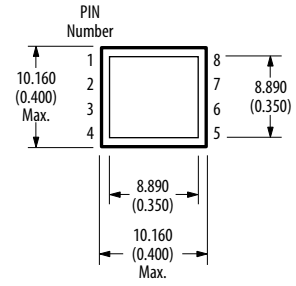
LED Light Bar and Bar Graph Array Package Dimension Drawings



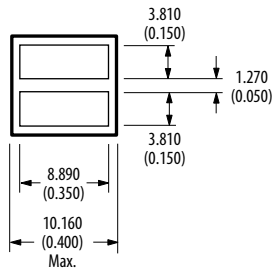
HLCP-A100
HLMP-2300/2400/2500



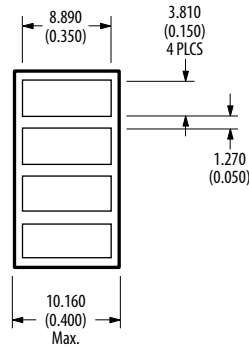
HLCP-B100
HLMP-2x50



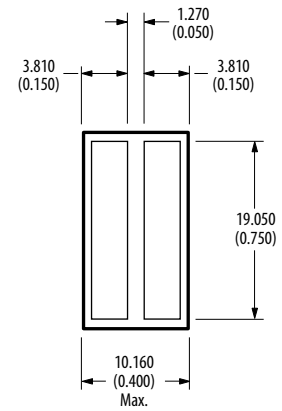
HLCP-C100
HLMP-2x55



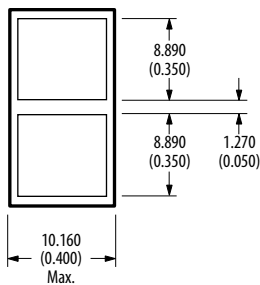
HLCP-D100
HLMP-2600/2700/2800



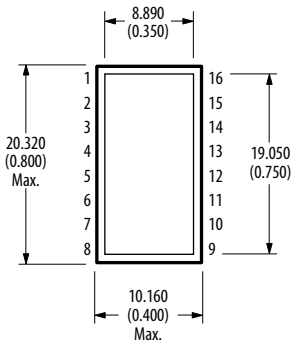
HLCP-E100
HLMP-2x20



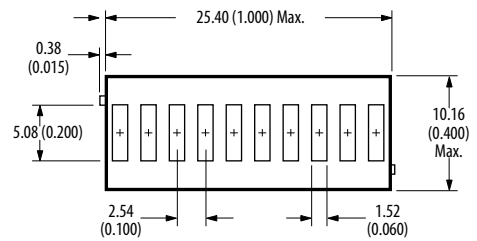
HLCP-F100
HLMP-2x35



HLCP-G100
HLMP-2x70



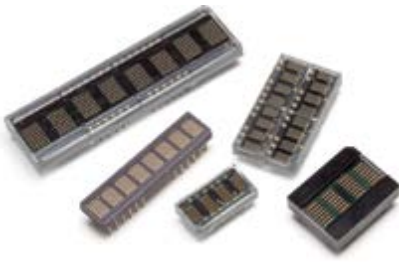
HLCP-H100
HLMP-2x85



HLCP-J100
HDSP-48x0

Note:
1. Dimensions in millimeters (inches).

Smart Displays



Description

Avago Technologies offers high quality Smart Displays to meet a wide range of applications and requirements. The Smart Displays are available in both serial and parallel interface and have an ASIC driver that greatly simplifies design efforts. The Smart Displays are LED technology-based and are extremely reliable with a long life expectancy. They are resistant to extreme weather conditions, and to mechanical vibration and shock, making them suitable for industrial applications where maintenance resources are scarce. They are also suitable for the consumer market where the need for aesthetics and product differentiation provides a competitive advantage to our customers' end products. Avago Technologies' Smart Display products are positioned to support high volume and cost-effective solutions.

Features and Benefits

- Robust design for high reliability, longer life and hot and cold temperature operating capability
 - Ideally suited for outdoor, industrial and automotive applications
- Alphanumeric characters and custom icons for messaging
 - Useful for conveying operating modes, status, warning and error codes
- Ability to flash or blink
 - Catch user's attention
- ASIC LED driver
 - Simplified design interfacing reduces design cycle time
- Emissive display with brightness control
 - Ability to modify brightness for subdued light environment and total darkness
- Aesthetically pleasing
 - Distinctive display allows product differentiation

Typical Applications

- Industrial Equipment
 - Industrial ovens, reliability test equipment, analytical instruments, process control equipment, test and measuring instruments, temperature controllers, programmable logic controllers, security systems
- Networking
 - Telecommunication equipment, answering machines, telephones, base stations, PBX modems, network cards
- Outdoor Signs
 - Petrol pump meters
- Consumer
 - Audio/video equipment, audio mixers, set top boxes, amplifiers, musical instruments, gaming machines, currency/coin counters, security systems
- Consumer "White Goods"
 - Displays for washing machine digital panels, cookers, freezers and dishwashers
- Medical Equipment
 - Hospital monitoring systems
- Transportation
 - Displays, radar detectors, avionics displays
- Computers and Peripherals
 - CPU speed indicator, printer front panels, fax machines, copy machines, power supply equipment, cash registers

LED Indicators and Displays

Plastic Package, Serial Interface, 5 x 7 Dot Matrix Display with Custom Font Programmable

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HCMS-2901	4	Yellow	Serial	3.7	64	132
HCMS-2902	4	Red	Serial	3.7	64	132
HCMS-2903	4	Green	Serial	3.7	114	132
HCMS-2904	4	Orange	Serial	3.7	64	132
HCMS-2905	4	AlGaAs Red	Serial	3.7	230	145
HCMS-2911	8	Yellow	Serial	3.7	64	264
HCMS-2912	8	Red	Serial	3.7	64	264
HCMS-2913	8	Green	Serial	3.7	114	264
HCMS-2914	8	Orange	Serial	3.7	64	264
HCMS-2915	8	AlGaAs Red	Serial	3.7	230	290
HCMS-2819	8	Blue	Serial	3.7	170	264
HCMS-2921	16	Yellow	Serial	3.7	64	528
HCMS-2922	16	Red	Serial	3.7	64	528
HCMS-2923	16	Green	Serial	3.7	114	528
HCMS-2924	16	Orange	Serial	3.7	64	528
HCMS-2925	16	AlGaAs Red	Serial	3.7	230	580
HCMS-2961	4	Yellow	Serial	4.6	64	132
HCMS-2962	4	Red	Serial	4.6	64	132
HCMS-2963	4	Green	Serial	4.6	114	132
HCMS-2964	4	Orange	Serial	4.6	64	132
HCMS-2965	4	AlGaAs Red	Serial	4.6	230	145
HCMS-2971	8	Yellow	Serial	4.6	64	264
HCMS-2972	8	Red	Serial	4.6	64	264
HCMS-2973	8	Green	Serial	4.6	114	264
HCMS-2974	8	Orange	Serial	4.6	64	264
HCMS-2975	8	AlGaAs Red	Serial	4.6	230	290
HCMS-3901	4	Yellow	Serial	3.7	148	132
HCMS-3902	4	Red	Serial	3.7	64	132
HCMS-3903	4	Green	Serial	3.7	252	132
HCMS-3904	4	Orange	Serial	3.7	64	132
HCMS-3906	4	Red	Serial	3.7	1150	132
HCMS-3907	4	Green	Serial	3.7	500	132
HCMS-3911	8	Yellow	Serial	3.7	148	264
HCMS-3912	8	Red	Serial	3.7	64	264
HCMS-3913	8	Green	Serial	3.7	252	264
HCMS-3914	8	Orange	Serial	3.7	64	264
HCMS-3916	8	Red	Serial	3.7	1150	264
HCMS-3917	8	Green	Serial	3.7	500	264
HCMS-3961	4	Yellow	Serial	4.6	148	132
HCMS-3962	4	Red	Serial	4.6	64	132
HCMS-3963	4	Green	Serial	4.6	252	132
HCMS-3964	4	Orange	Serial	4.6	64	132
HCMS-3966	4	Red	Serial	4.6	1150	132
HCMS-3967	4	Green	Serial	4.6	500	132
HCMS-3971	8	Yellow	Serial	4.6	148	264
HCMS-3972	8	Red	Serial	4.6	64	264
HCMS-3973	8	Green	Serial	4.6	252	264
HCMS-3974	8	Orange	Serial	4.6	64	264
HCMS-3976	8	Red	Serial	4.6	1150	264
HCMS-3977	8	Green	Serial	4.6	500	264

Notes:

Typical values at $T^A = 25^{\circ}\text{C}$.

Luminous intensity for one pixel at $V^{\text{LED}} = 5.0\text{V}$, 50% peak pixel current, 100% pulse width.

Supply current at $V^{\text{LED}} = 5.0\text{V}$, 100% peak pixel current, 100% pulse width, 20 pixels per digit at all digit locations.

LED Indicators and Displays

Plastic Package, Serial Interface, 5 x 7 Dot Matrix Display with Custom Font Programmable

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HDLY-1414	4	Yellow	Parallel	3.6	3.7	110
HDLO-1414	4	Red	Parallel	3.6	3.5	110
HDLG-1414	4	Green	Parallel	3.6	5.6	110
HDLA-1414	4	Orange	Parallel	3.6	3.5	110
HDLU-1414	4	AlGaAs Red	Parallel	3.6	3.1	34
HDLS-1414	4	AlGaAs Red	Parallel	3.6	12.7	125
HDLY-2416	4	Yellow	Parallel	5.1	3.7	110
HDLO-2416	4	Red	Parallel	5.1	3.5	110
HDLG-2416	4	Green	Parallel	5.1	5.6	110
HDLA-2416	4	Orange	Parallel	5.1	3.5	110
HDLU-2416	4	AlGaAs Red	Parallel	5.1	3.1	34
HDLS-2416	4	AlGaAs Red	Parallel	5.1	12.7	125
HDLY-3416	4	Yellow	Parallel	6.9	3.7	110
HDLO-3416	4	Red	Parallel	6.9	3.5	110
HDLG-3416	4	Green	Parallel	6.9	5.6	110
HDLA-3416	4	Orange	Parallel	6.9	3.5	110

Plastic Package, Parallel Interface, 8 Character, 5 x 7 Dot Matrix Display with 128 Character ASCII Decoder

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HDSP-2530	8	Orange	Parallel	4.6	7.5	300
HDSP-2531	8	Yellow	Parallel	4.6	7.	300
HDSP-2532	8	Red	Parallel	4.6	7.5	300
HDSP-2533	8	Green	Parallel	4.6	7.5	300
HDSP-2534	8	AlGaAs Red	Parallel	4.6	15	330
HDSP-2110	8	Orange	Parallel	4.8	7.5	300
HDSP-2111	8	Yellow	Parallel	4.8	7.5	300
HDSP-2112	8	Red	Parallel	4.8	7.5	300
HDSP-2113	8	Green	Parallel	4.8	7.5	300
HDSP-2107	8	AlGaAs Red	Parallel	4.8	15	330
HDSP-2500	8	Orange	Parallel	7.0	7.5	300
HDSP-2501	8	Yellow	Parallel	7.0	7.5	300
HDSP-2502	8	Red	Parallel	7.0	7.5	300
HDSP-2503	8	Green	Parallel	7.0	7.5	300
HDSP-2504	8	AlGaAs Red	Parallel	7.0	1.5	330

Notes:

Typical values at $V_{DD} = 5.0V$, $T_A = 25^\circ C$.

Luminous intensity at 100% full brightness, character average with “#” (20 pixels) displayed.

Supply current at 100% brightness, with all character locations displaying “#” (20 pixels).

LED Indicators and Displays

Glass/Ceramic Package, Parallel Interface, 8 Character, 5 x 7 Dot Matrix with 128 Character ASCII Decoder

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HDSP-2131	8	Yellow	Parallel	4.8	7.5	300
HDSP-2132	8	Red	Parallel	4.8	7.5	300
HDSP-2133	8	Green	Parallel	4.8	7.5	300
HDSP-2179	8	Orange	Parallel	4.8	7.5	300

Notes:

Typical values at $V_{DD} = 5.0V$, $T_A = 25^\circ C$.

Luminous intensity at 100% full brightness, character average with “#” (20 pixels) displayed.

Supply current at 100% brightness, with all character locations displaying “#” (20 pixels).

Glass/Ceramic Package, 4 x 7 Hexadecimal Display with Built-in BCD Decoder/Driver

Part Number	Description/Decimal Point	Color	Operation Temperature (°C)	Character Height (mm)	Luminous Intensity Typ. (μcd)	Supply Current Typ. (mA)
HDSP-0760	Numeric, RHDP	HER	-55 to 85	7.4	140	78
HDSP-0761	Numeric, LHDP	HER	-55 to 85	7.4	140	78
HDSP-0762	Hexadecimal	HER	-55 to 85	7.4	140	78
HDSP-0770	Numeric, RHDP	HER	-55 to 85	7.4	620	120
HDSP-0771	Numeric, LHDP	HER	-55 to 85	7.4	620	120
HDSP-0772	Hexadecimal	HER	-55 to 85	7.4	620	120
HDSP-0781	Numeric, RHDP	HER	-55 to 100	7.4	140	78
HDSP-0782	Numeric, LHDPi	HER	-55 to 100	7.4	140	78
HDSP-0784	Hexadecimal	HER	-55 to 100	7.4	140	78
HDSP-0791	Numeric, RHDP	HER	-55 to 100	7.4	620	120
HDSP-0792	Numeric, LHDP	HER	-55 to 100	7.4	620	120
HDSP-0794	Hexadecimal	HER	-55 to 100	7.4	620	120
HDSP-0860	Numeric, RHDP	Yellow	-55 to 85	7.4	490	120
HDSP-0861	Numeric, LHDP	Yellow	-55 to 85	7.4	490	120
HDSP-0862	Hexadecimal	Yellow	-55 to 85	7.4	490	120
HDSP-0881	Numeric, RHDP	Yellow	-55 to 100	7.4	490	120
HDSP-0884	Hexadecimal	Yellow	-55 to 100	7.4	490	120
HDSP-0960	Numeric, RHDP	Green	-55 to 85	7.4	1100	120
HDSP-0961	Numeric, LHDP	Green	-55 to 85	7.4	1100	120
HDSP-0962	Hexadecimal	Green	-55 to 85	7.4	1100	120
HDSP-0981	Numeric, RHDP	Green	-55 to 100	7.4	1100	120
HDSP-0984	Hexadecimal	Green	-55 to 100	7.4	1100	120

Notes:

Typical values at $V_{DD} = 5.0V$, $T_A = 25^\circ C$.

Luminous intensity per LED (Digit Average).

Supply current with “5” or “B” character displayed.

Glass/Ceramic Package Over Range ± with Built-in BCD Decoder/Driver

Part Number	Description/Decimal Point	Color	Operation Temperature (°C)	Character Height (mm)	Luminous Intensity Typ. (μcd)	Supply Current Typ. (mA)
HDSP-0763	Overrange ± 1	HER	-55 to 85	7.4	140	11.2
HDSP-0863	Overrange ± 1	Yellow	-55 to 85	7.4	490	32
HDSP-0963	Overrange ± 1	Green	-55 to 85	7.4	1100	32
HDPS-0783	Overrange ± 1	HER	-55 to 100	7.4	140	11.2
HDPS-0883	Overrange ± 1	Yellow	-55 to 100	7.4	490	32
HPDS-0983	Overrange ± 1	Green	-55 to 100	7.4	1100	32

Notes:

Typical values at $V_{DD} = 5.0V$, $T_A = 25^\circ C$.

Luminous intensity per LED (Digit Average).

Glass/Ceramic Package, Serial Interface, 4 character, 5 x 7 Dot Matrix with 128 Character ASCII Decoder

Part Number	Character	COLOR	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HCMS-2351	4	Yellow	Serial	4.9	3400	6.2
HCMS-2353	4	Green	Serial	4.9	3000	6.2

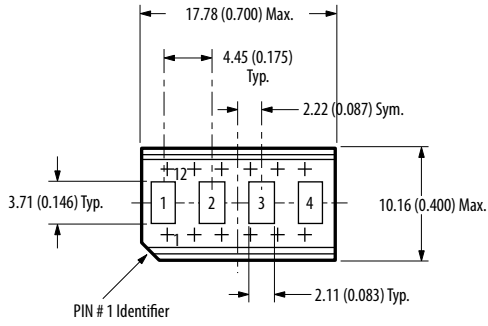
Notes:

Typical values at $V_{DD} = 5.0V$, $T_A = 25^\circ C$.

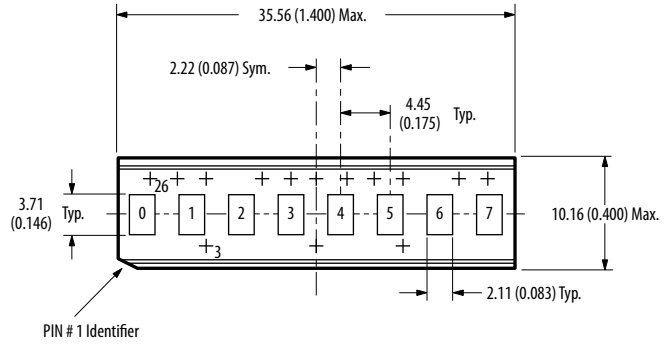
Luminous intensity (peak) per LED (Digit Average).

LED Indicators and Displays

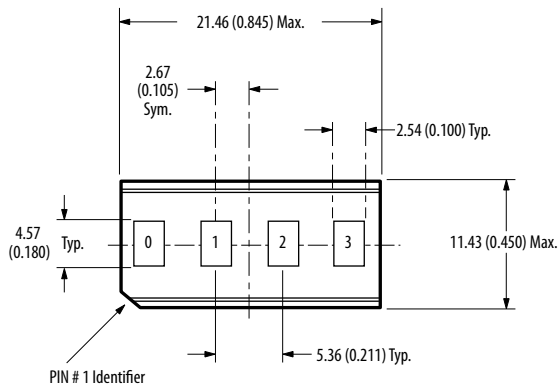
LED Dot Matrix Smart Displays Package Dimension Drawings



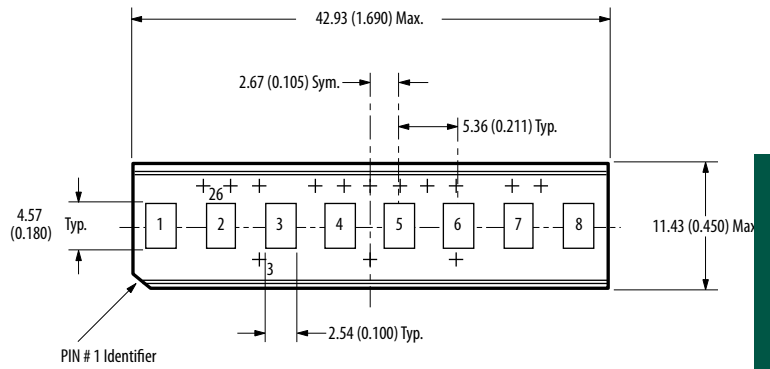
HCMS-290x/HCMS-390x



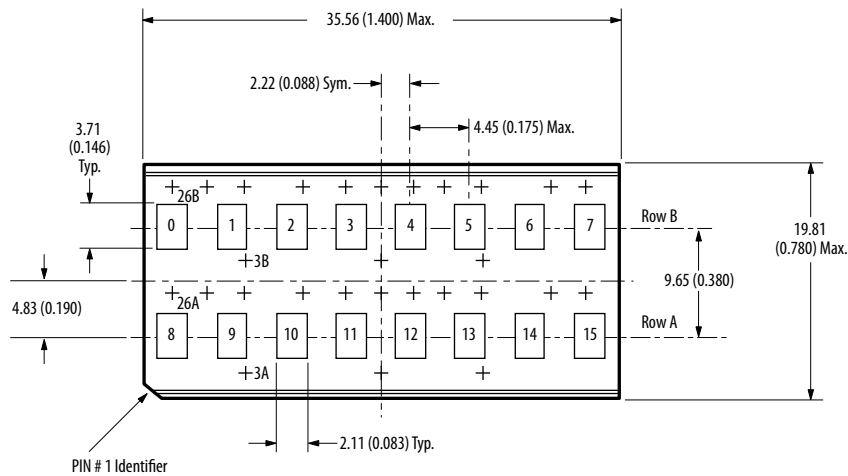
HCMS-291x/HCMS-391x



HCMS-296x/HCMS-396x



HCMS-297x/HCMS-397x

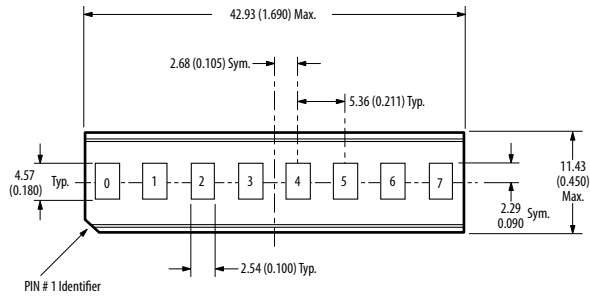


HCMS-292x

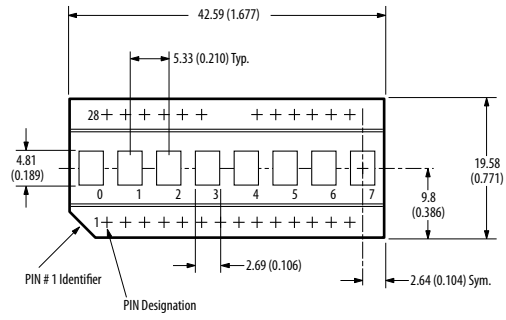
Note:
1. Dimensions in millimeters (inches).

LED Indicators and Displays

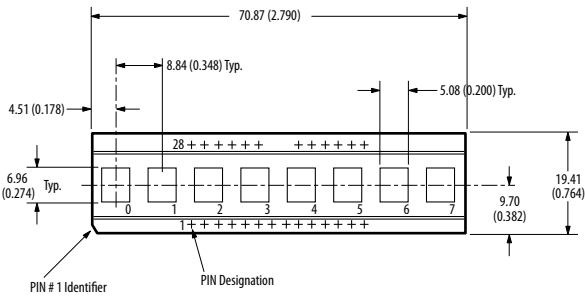
LED Dot Matrix Smart Displays Package Dimension Drawings



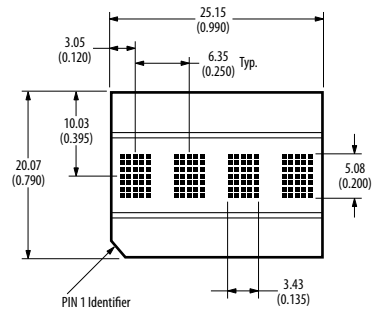
HDSP-253x



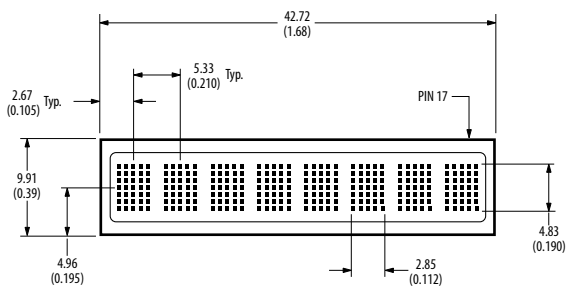
HDSP-2107, -211x



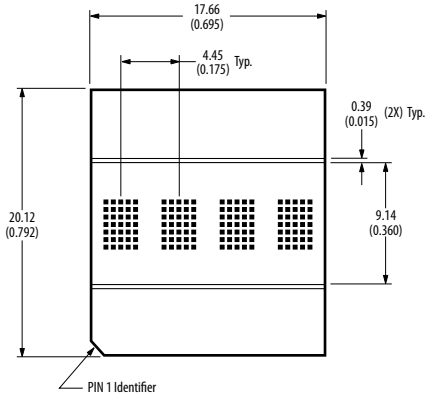
HDSP-250x



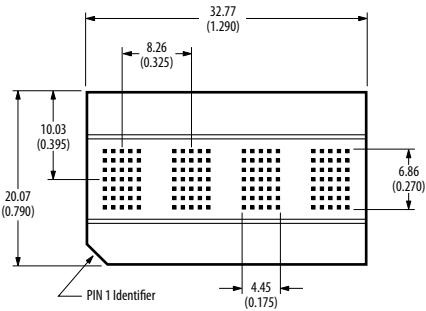
HDLx-2416



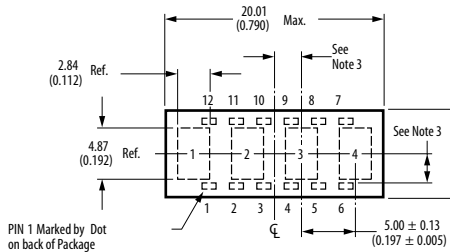
HDSP-213x, -2179



HDLx-1414

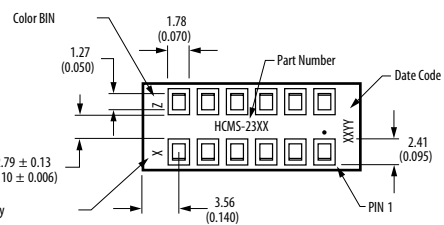


HDLx-3416



Luminous Intensity Category

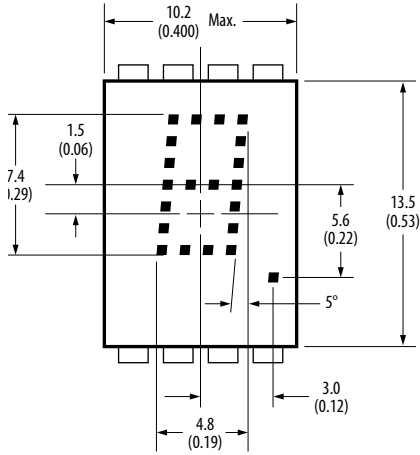
HDLx-3416



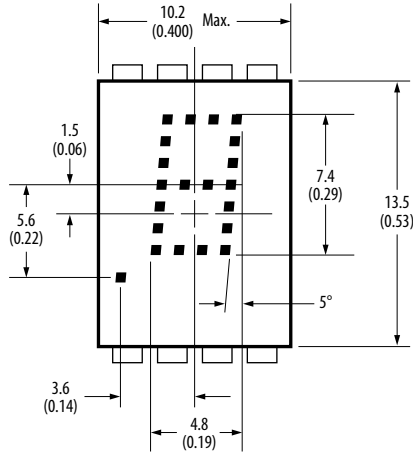
LED Indicators and Displays

LED Dot Matrix Smart Displays Package Dimension Drawings

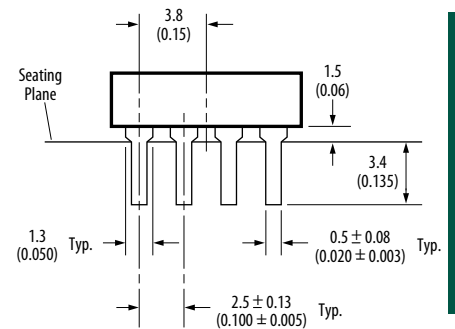
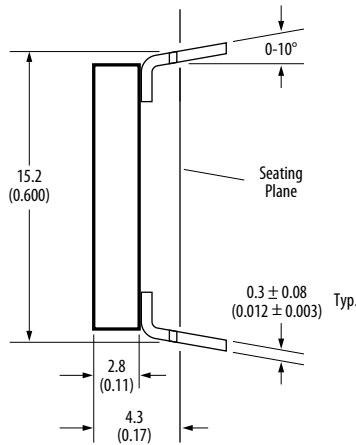
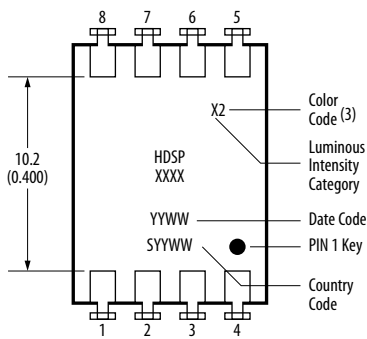
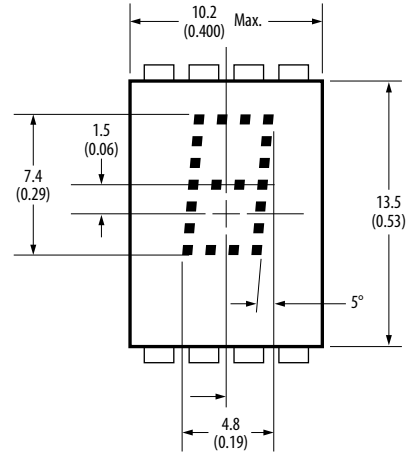
HDSP-0x81, HDSP-0791
HDSP-0x60, HDSP-0770



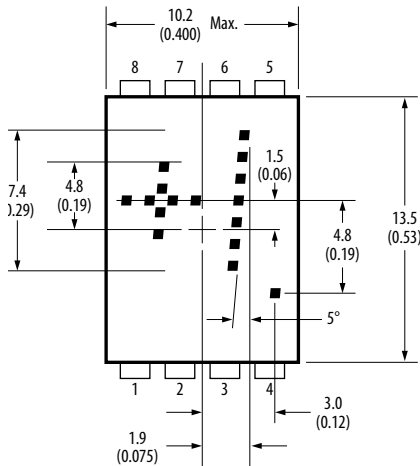
HDSP-0x82, HDSP-0792
HDSP-0x61, HDSP-0771



HDSP-0x84, HDSP-0794
HDSP-0x63



HDSP-0x83
HDSP-0x62, 0772



Notes:

1. Dimensions in millimeters (inches).
2. Digit center line is $\pm 0.38\text{MM}$ (± 0.015 inch) from package center line.
3. Unless otherwise specified, the tolerance on all dimensions is $\pm 0.38\text{MM}$ (± 0.015 inch).

137 Introduction
139 Product Overview

Incremental Optical Encoders

142 Transmissive Module
152 Transmissive Housed
159 Reflective Module
164 Reflective Housed

Absolute Optical Encoders

168 Single-Turn Module
171 Multi-Turn Module

Integrated Circuits

172 Decoder
174 Absolute
175 Line Driver

Codewheels

176 Transmissive
176 Reflective

181 Applications Reference

185 Definition of Key Terms

191 Quick Guide

197 Discover More



Motion Sensing and Control Products



Avago Technologies is the industry-leading supplier of motion control encoders. Avago offers “one-stop shopping” with its extensive portfolio of encoders, decoders and controllers. We offer the industry’s smallest form factors, widest range of resolutions, and highest level of integration to reduce the number of components needed and shorten time-to-market.

Introduction

Motion control, in broad definition, means converting mechanical movement from codewheel/codestrip into equivalent electrical signals to move an object in an accurate and precise manner.

High accuracy, ease of use, low cost and global support...these words are rarely spoken in the same breath to describe anything. With Avago’s broad range of encoders, this is now a reality.

Avago started out designing and selling classical optical encoders and has progressed to designing and manufacturing ultra miniature optical encoders and magnetic encoders. With these technologies, Avago has enabled designers to miniaturize their design with full confidence of excellent performance. Avago is changing the landscape of rotary and linear motion control.

Encoder accuracy, large range of Counts Per Revolution (CPR) options, low cost and high reliability have been key customer requirements. With Avago’s range of encoders, these criteria are met and exceeded. Also, as Avago’s encoders are optics based, they are immune to RF interference.

For almost all closed-loop feedback systems, the encoder’s role as positioning sensor is crucial in providing the direct measurement for position and movement within the system. Avago provides a whole range of encoders capable of meeting these stringent needs.

Industrial Automation

- Wafer Handling Machines
- Industrial Sewing Machines
- Robotics
- CAD/CAM Dial Boxes
- Vending Machines

Motor Manufacturers

- DC Motors
- Stepper Motors
- Servo Motors

Medical

- Blood Analyzers
- Lab Sample Handling Equipment
- Surgical Robotics

Office Automation

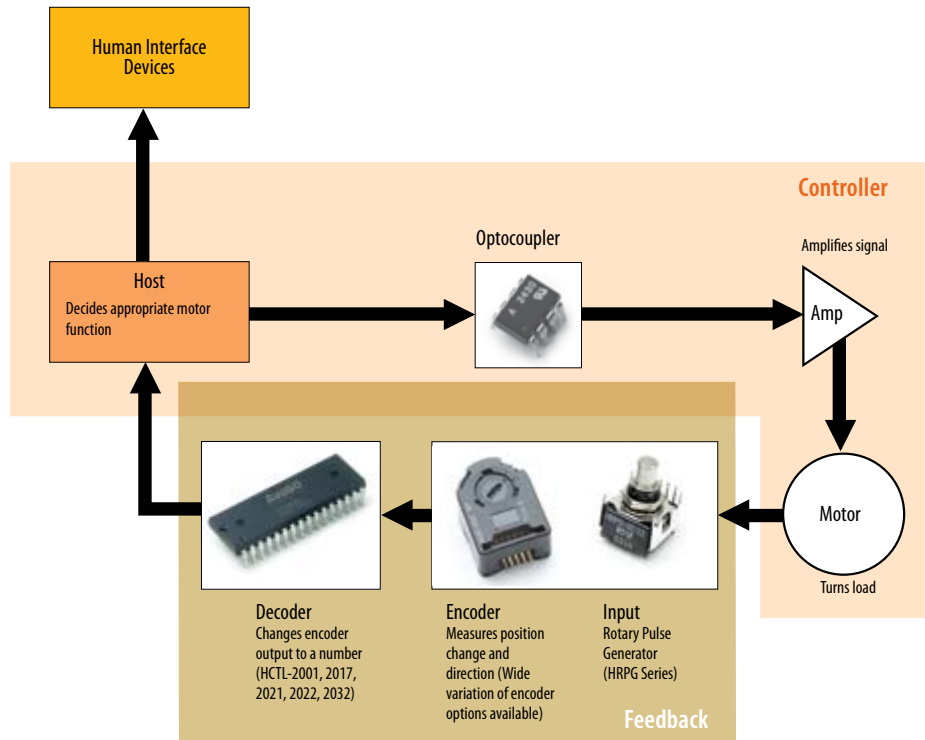
- Printers
- Copiers
- Tape Drives
- Plotters

Consumer

- Cameras
- Card Readers
- Motor Control

Instruments

- Audio & Visual Boards



Applications

Avago's products meet the stringent requirements, in a wide range of applications from printers, copiers and scanners to servo and stepper motors, and robotic arms and wafer-handling machines.

Value Propositions

Customer Reach

Worldwide distribution/channels, with Technical Response Centers, supported by experienced Field Application Engineers

State-of-the-Art-Technology

Innovative designs by a vast pool of experienced software, hardware and IC designers to deliver the ultimate performance product

High Quality Services

ISO Certified, continuous process improvement, field support from all regions and quality management of supply chain

Our Commitment

Our worldwide support team will work with you to meet your requirements and put your designs in motion.

	Features	Benefits
Reliability	Longer lifespan for encoders due to elimination of mechanical parts.	Low maintenance cost.
Size	Integrated encoder solution comes in different packages (e.g. chip-size and SOIC packages vs. industrial-grade robust housing) and mountings that can be catered to customer's specific needs.	Small form factor. High performance in small package. Well suited for space-constrained applications.
Reduced Switching Glitch	Optical technology promotes quiet switching as no switching transients are generated without electrical contacts.	Accurate and precise motion sensing.
High Resolution	<ul style="list-style-type: none"> Up to 80,000 counts per revolution (incremental) Up to 65,536 positional data per revolution (absolute) Up to 1 million or more positional data per revolution for customized solutions. Technology is not limited to quasi absolute/absolute. 	Accurate and precise motion sensing.
Surface Mount	Smaller package delivers the same functionality as standard DIP.	Lower assembly cost. Easier, faster handling, improved solderability.
Cost-Effective, High Performance	Newest encoder module features reduced component and package sizes. Delivers higher performance, easier installation through patented alignment plug and play tool.	Reduced design cycles. Small form factor. Reduced cost.





Motion Control Products Overview

		Optical Encoder			
		Module	Housed		
Incremental	Transmissive				
	Reflective				
Absolute	Opticmageal Encoder		Magnetic		
	Module		Housed		IC
	Transmissive				
Accessories	Codewheel/Codestrip		Integrated Circuit		
	Metal/Mylar/Glass		Decoder/Counter/Line Driver		

Note: Avago Technologies encoders are not recommended for use in safety critical applications such as ABS braking systems, power steering, life support systems and critical care medical equipment. Contact your sales representative for further clarification.

Motion Sensing & Control Products

What's Hot

Avago's Encoders	Importance	Key Applications	Value Propositions	Benefits
<p>Ultra-precision 17-Bit Absolute Single Turn Encoder</p>  <p>AEAT-9000</p>	<p>Designed to allow design engineers to achieve superior positioning performance in terms of speed and accuracy performance.</p> <p>The modular package enables the encoder to be directly integrated to the motor unlike conventional encoders.</p> <p>Cost savings and better performance of the overall system.</p>	<p>Rotary applications up to 17 bits/360° absolute position</p> <p>Integration into servo motors</p> <p>Industrial and maritime valve control</p> <p>High precision test and measurement machines</p> <p>Industrial and factory automation equipments</p> <p>Textile, woodworking & packaging machineries</p> <p>Nacelle & blades control in wind turbine</p>	<p>17-bit absolute single turn output (131072 absolute positions over 360°)</p> <p>2 channel true differential Sine/Cosine outputs with 2048 cycles per revolution</p> <p>2048 CPRA/B channel incremental analog output</p> <p>Interface output will be SSI (2wire SSI/3wire SSI) with RS485 line transceiver or single ended option</p>	<p>Absolute encoder that consists of a read head module and a high-precision code disc.</p> <p>The modular design allows for better flexibility to system designers to easily design-in the encoder feedback system.</p>
<p>Quad Differential Line Driver</p>  <p>AEIC-7272-S16 AEIC-7273-S16 AEIC-2631-S16 AELT-5000-S16</p>	<p>These line drivers are pin compatible with 26LS31 in applications .</p> <p>Minimize standby power dissipation in high voltage applications</p>	<p>Encoders</p> <p>Industrial controls</p>	<p>Supply (Bias) Voltage up to 30 V</p> <p>Operation to 800 KHz</p> <p>Operation up to 2Mhz (for AELT-5000)</p> <p>CMOS and TTL Compatible Inputs</p> <p>Optional single supply operation for moderate power applications</p> <p>High Impedance Buffered Inputs with hysteresis</p> <p>Tri-State outputs</p>	<p>Assures highly reliable by a two-fold scheme of current limiting and thermal shutdown.</p> <p>Internal clamp diodes allow trouble-free operation when driving cable lengths exceeding 100m.</p> <p>Split supplies are provided to minimize standby power dissipation in high voltage applications.</p>
<p>Programmable 16-bits Magnetic Encoder</p>  <p>AEAT-66xx</p>	<p>Programmable absolute output and simultaneous incremental output</p> <p>Flexibility in magnet range selection</p> <p>Meet the market standard for harsh environment, EMI application</p>	<p>Table/chair positioning</p> <p>Valve control</p> <p>Robotics</p> <p>Flow meter</p> <p>Industrial Actuator</p> <p>Amusement equipment</p> <p>Textile equipment</p>	<p>Up to 16 bits of resolution</p> <p>5V or 3.3V operation</p> <p>Simultaneous absolute and incremental output up to 1024 CPR</p> <p>Incremental ABI or UVW, and PWM output modes</p> <p>Power-down mode to reduce</p>	<p>Programmable features</p> <p>Miniature size and low power supply</p> <p>All in one integrated solutions</p> <p>One step alignment</p> <p>Highest resolution up to 16bits</p>
<p>3 Channel Reflective Optical Encoder, up to 304LPI</p>  <p>AEDR-850x</p>	<p>World smallest 3-channel reflective encoder with build in interpolator 1x, 2x, 4x</p> <p>Compact size SMT encoder</p> <p>Meet the market demand for compact & cost effective feedback solution</p> <p>Proven solution based on Avago's reflective technologies</p>	<p>Medical devices/ & equipments</p> <p>Piezomotors feedback</p> <p>Surveillance camera</p> <p>Miniature motor</p> <p>Test & measurement equipments</p>	<p>3-channel (A,B,I) with build in interpolator 1x, 2x, 4x</p> <p>294 to 304 LPI</p> <p>Miniature size</p> <p>Temp : -20°C to 85°C</p> <p>High operating frequency 55kHz</p> <p>Index gating</p>	<p>Miniature size – ability to fit the miniature motor design</p> <p>No need for separate component to generate index signal</p> <p>Based CPR resolution can be interpolated by the end user</p> <p>Suitable for various gating requirement</p> <p>Higher RPM performance with increased operating frequency</p>

What's Hot

Avago's Encoders	Key Applications	Value Propositions	Benefits
<p>Miniature Three Channel Housed Encoder</p>  <p>AEDx-8xxx</p>	<p>Pick and place machines Servo motor, DC motor, stepper motor Factory automation Miniature motor with diameter as small as 20mm Packaging machines</p>	<p>Miniature size (20mm diameter) High temperature (up to 100°C) High resolution (200, 400 & 500CPR) RS-422 Line Driver Output Integrated IP 40 Low cost Easy assembly</p>	<p>Improves motor control High operating temperature (up to 100°C) Product robustness (IP 40) RS 422 allows long distance application Enable high precision closed-loop stepper motor Improves power efficiency for closed-loop DC Stepper Motor Control System Save assembly time and cost</p>
<p>Six Channel Encoders</p>  <p>AEDT-9340 (high temperature encoder) AEDB-9340 (codewheel included)</p>	<p>Servo motor CNC machines Industrial sewing machines Textile machines Sewing machines</p>	<p>High resolution Low cost Easy assembly — alignment free housed encoder High speed > 250KHz High robustness to noise (EMI) & ESD</p>	<p>6-channel encoder enables single module solution for Brushless Motor Save assembly time and cost Enable miniature housed encoder for space constraint application High frequency response enables high speed application Customized housed / kits solutions available under sub-system solutions</p>
<p>Magnetic Encoders</p>  <p>AEAT-6010/12 (Absolute) AEAT-601B (Incremental)</p>	<p>Servo motor, DC motor, stepper motor Valve & pump control Factory automation Textile machines Packaging machines</p>	<p>Miniature size (23mm diameter) Wide operating temperature range (-40 to 125°C) Incremental resolutions (32, 64, 128 & 256CPR) Absolute resolutions (10 & 12 bits) Easy assembly with bearing-less housing Non-contact Hall Effect sensing technology</p>	<p>Improves motor control High operating temperature (up to 125°C) Product robustness against contamination Cost effective feedback solution for Servo Motors Save assembly time and cost</p>
<p>Mid-Size 1000CPR, 1024CPR, Three Channel Housed Encoders</p>  <p>HEDM-554x-Bxxx HEDS-8907-001 (Rubber Cover)</p>	<p>Servo motor, DC motor, stepper motor Valve & pump control Factory automation Textile machines Packaging machines</p>	<p>Retain same form & fit for easy design-in Wide operating temperature range (-40 to 85°C) Extended resolution up to 1000 CPR with Index Low cost Easy assembly with bearing-less housing Simple dust protection</p>	<p>Improves motor control High operating temperature (up to 85°C) Increase product robustness against contamination Cost effective feedback solution for Servo Motors Save assembly time and cost</p>

Incremental Optical Encoders

Transmissive Module

HEDS-90xx/91xx/9200, HEDL-90xx/91xx Series, HEDT-90xx/91xx Series



Description

HEDS-9000/9040/9100/9140 Series

- High-performance two/three channel rotary encoder
- Consists of a lensed (LED) source and a detector IC enclosed in a small C-shaped plastic package
- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array
- The single 5-V output supply input are accessed through five 0.025 inch square pins located on 0.1 inch centers
- HEDS-9000 resolution: from 500 to 2048 CPR when used with appropriate codewheel
- HEDS-9040 is designed for use with a HEDx-614x codewheel which has an optical radius of 23.36 mm (0.920 inch)
- HEDS-9100 resolution: from 50 to 1024 CPR when used with appropriate codewheel
- HEDS-9140 is designed for use with the HEDS-5140 codewheel which has an optical radius of 11.00 mm (0.433 inch)

HEDS-9200 Series

- Same features as listed above
- Detects linear position when operated in conjunction with a codestrip

HEDL-90xx/91xx Series

- Differential outputs
- Utilizes an industry-standard line driver IC, 26C31, which provides complementary outputs for each encoder channel
- Offers enhanced performance when the encoders are used in noisy environments, or when required to drive long distances
- Suggested line receivers are 26C32 and 26C33
- Quadrature signals are accessed through a cable and 10-pin female connector, which is manufactured by FCI, part number: 66900-310
- Mating connectors manufactured by FCI; straight type part number: 71912-010, right angle type part number: 71913-010

HEDT-90xx/91xx Series

- High performance
- Low cost
- Operates to 125°C
- Ideal for high volume automotive applications

HEDT-9040/9140 Series

- High temperature
- Three channels (two channel quadrature output plus a third channel index output)
- Operates up to 140°C

Features

- High performance
- High resolution
- Low cost
- Easy to mount
- No signal adjustment required
- Small size
- -40°C to 100°C operating temperature (up to 140°C for high temperature version)
- Two and three channel quadrature output
- TTL compatible output
- Single 5-V supply
- Count frequency of 100 KHz

Applications

Ideal for high-volume applications:

- Printers
- Plotters
- Tape drives
- Factory automation equipment

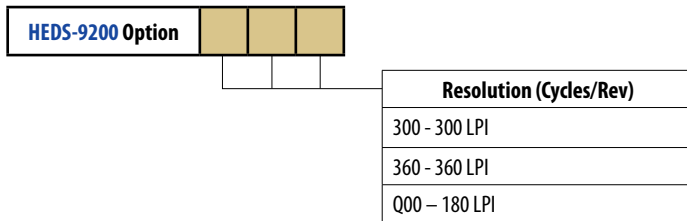
Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

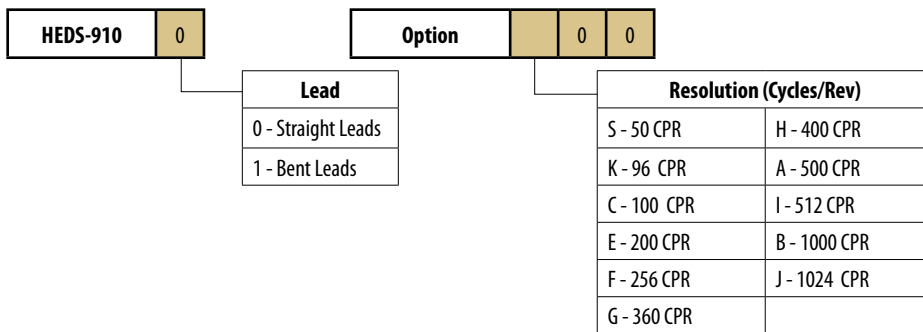
Ordering Information

Two Channel Linear Encoders Module – HEDS-9200 Series



Two Channel Incremental Encoders – HEDS-910x series

Note: To be used with 11mm optical radius codewheel



Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9100	•	•	•		•	•	•	•	•	•	•	•		
HEDS-9101	•		•		•		•							

Refer to codewheel ordering information for recommended usage

Three Channel Incremental Encoders – HEDS-914x series

Note: To be used with 11mm optical radius codewheel

HEDS-914 0

Option 0 0

Assembly tool: HEDS-8905

Lead
0 - Straight Leads
1 - Bent Leads

Resolution (Cycles/Rev)	
S - 50 CPR	H - 400 CPR
C - 100 CPR	A - 500 CPR
E - 200 CPR	I - 512 CPR
F - 256 CPR	B - 1000 CPR
G - 360 CPR	

Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9140	•	•	•		•	•	•	•	•			•		
HEDS-9141	•				•	•	•						•	

Refer to codewheel ordering information for recommended usage

Two Channel Incremental Encoders – HEDS-900x series

Note: To be used with 23.36mm optical radius codewheel

HEDS-9000 Option 0 0

Resolution (Cycles/Rev)	
A - 500 CPR	B - 1000 CPR
J - 1024 CPR	T - 2000 CPR
U - 2048 CPR	

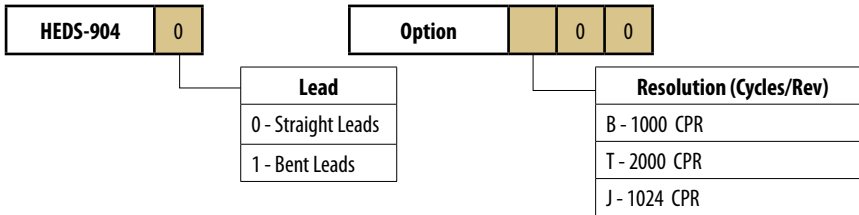
Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9000	•	•								•			•	•

Refer to codewheel ordering information for recommended usage

Ordering Information

Three Channel Incremental Encoders – HEDS-904x series

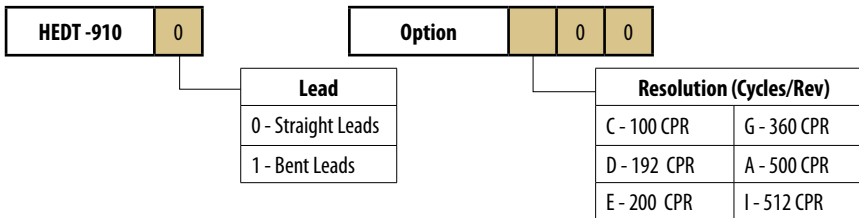
Note: To be used with 23.36mm optical radius codewheel



Available Options														
Part Number	Options													
	A	B	C	D	E	F	G	H	I	J	K	S	T	U
HEDS-9040		•								•			•	
HEDS-9041		•												

Refer to codewheel ordering information for recommended usage

High Temp 125°C Two Channel Optical Incremental Encoder Modules – HEDT-9000/9100 series

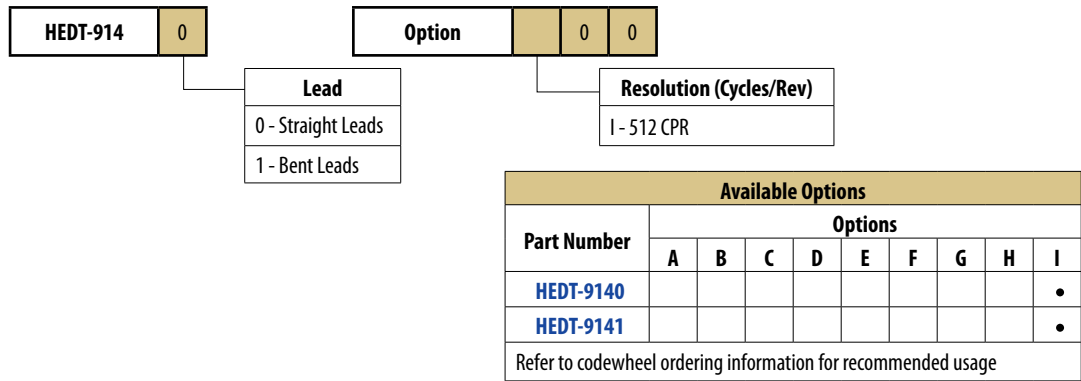


Available Options						
Part Number	Options					
	A	C	D	E	G	I
HEDT-9001	•					
HEDT-9100	•	•		•	•	•
HEDT-9101	•	•		•	•	•

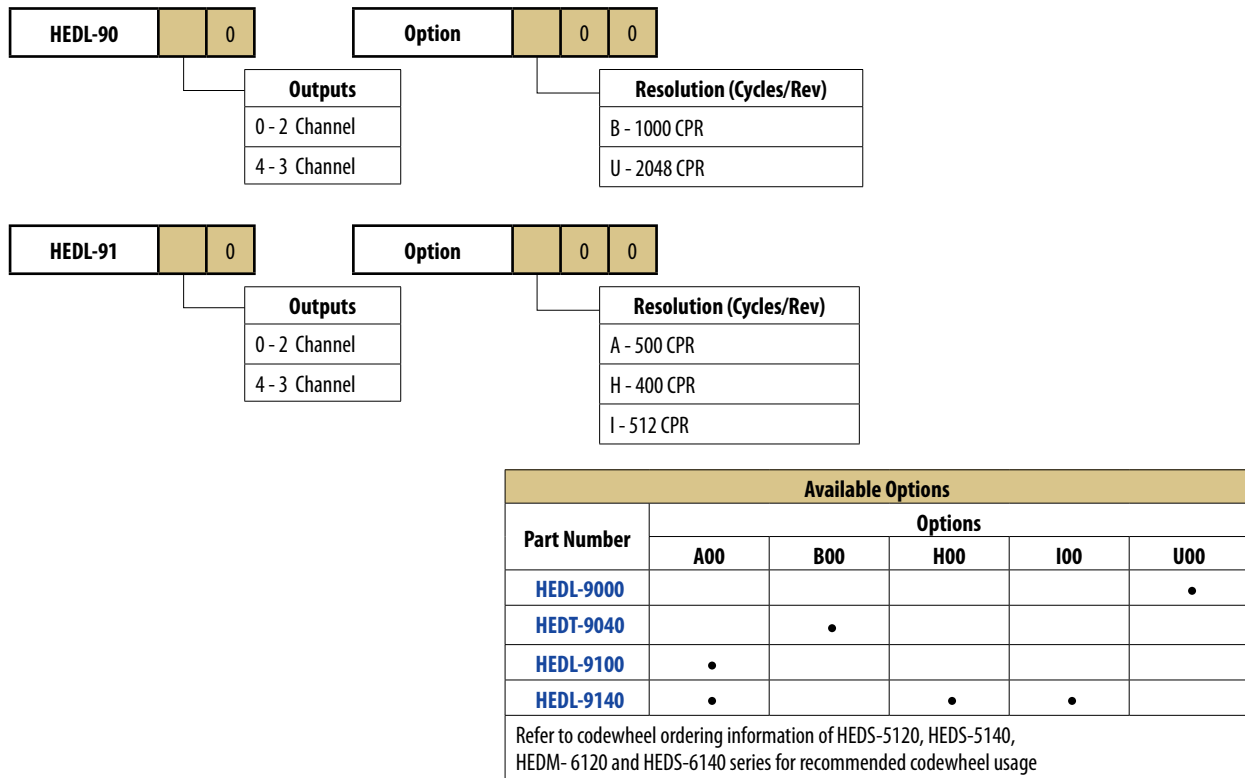
Refer to codewheel ordering information for recommended usage

Ordering Information

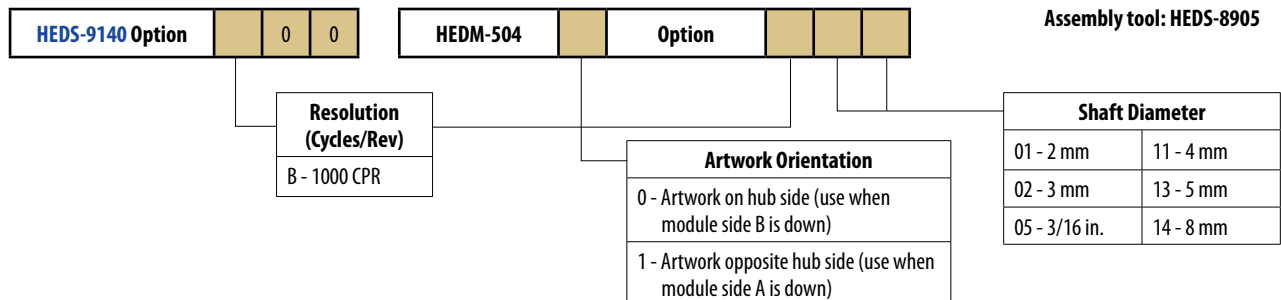
High Temp 140°C Three Channel Optical Incremental Encoder Modules – HEDT-9040/9140 series



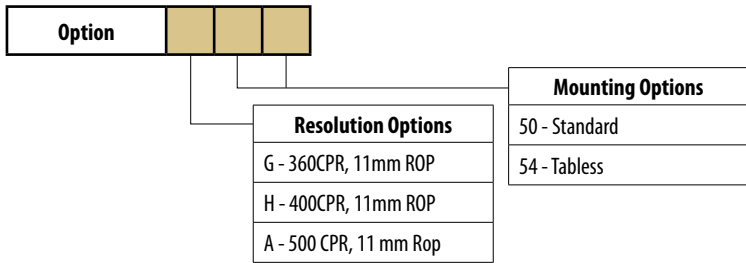
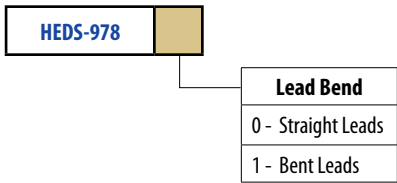
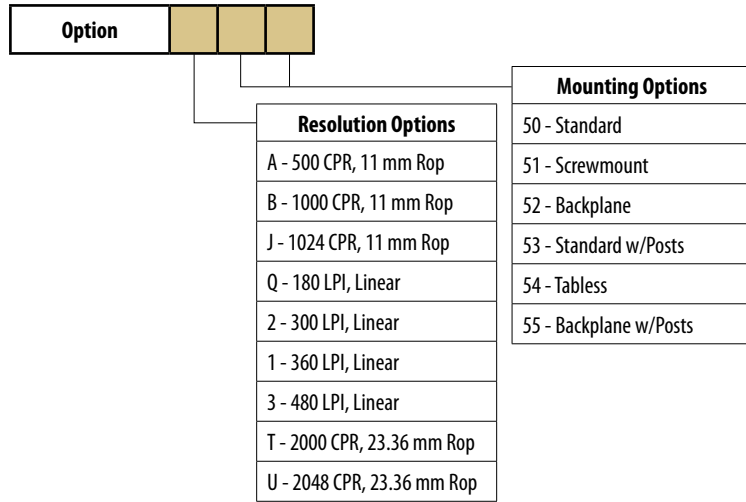
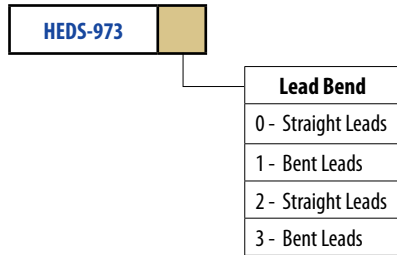
HEDL-900xx/91xx Series



Three Channel Encoder Modules and Codewheels, 11.000 Optical Radius – HEDS-9140-B00 Option



Ordering Information



Available Options							
Part Number		Options					
		50	51	52	53	54	55
HEDS-9780	A	•					
	G	•				•	
	H	•				•	
HEDS-9781		50	51	52	53	54	55
	A	•					
	G					•	
	H						

Note: Contact factory for codewheel and codestrip information.

Incremental Optical Encoders

Transmissive Module

HEDS-971x Series



Description

- High performance
- Detects rotary position when operates in conjunction with a codewheel
- Consists of a lensed (LED) source and a detector IC enclosed in a small C-shaped plastic package
- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array
- Two channel analog output
- 5.5V and 3.3V options available
- Four solder plated leads located on 2.54 mm (0.1 inch) centers
- Designed for use with an appropriate optical radius codewheel. (Refer to factory for further details)

Features

- Small size
- Wide resolution range
- No signal adjustment required
- Single 5 V supply
- Two channel analog output
- 15° C to 45° C operating temperature
- Multiple mounting options
- Wave solderable
- RoHS compliant

Applications

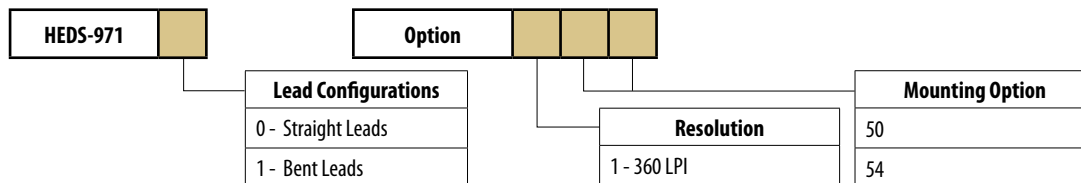
- Printers
- Plotters
- Copiers
- Office automation equipment

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



Note: Contact factory for codewheel and codestrip information.

Incremental Optical Encoders

Transmissive Module

AEDS/AEDB/AEDT-9140 Series



Description

- Three channels
- Low cost
- Detects rotary position when used with a codewheel
- Consists of a lensed (LED) source and detector IC enclosed in a small plastic package
- Extremely tolerant to mounting misalignment due to a highly collimated light source and unique photodetector array
- Two channel quadrature output, plus a third channel index output. (The index output is a 90 electrical degree high, true index pulse, which is generated once for each full rotation of the codewheel)
- Designed for use with a codewheel with an optical radius of 11.00 mm (0.433 inch)

- Quadrature signals and index pulse are accessed through five 0.46 mm square pins located on 1.27 mm (pitch) centers

Features

- Two channel quadrature output with index pulse
- Resolution from 100 CPR up to 512 CPR
- Low cost
- Easy to mount
- No signal adjustment required
- Small size
- TTL compatible output
- Single 5 V supply output

For AEDT-9140 Series:

- Same features as listed above
- -40°C to 115°C operating temperature

For AEDB-9140 Series:

- Same features as listed above
- Bundled with matching codewheel

Applications

Ideal for high-volume applications, like:

- Printers
- Plotters
- Tape drives
- Industrial equipment
- Factory automation equipment

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Three Channel Encoder Modules with Codewheel, 11 mm Optical Radius

AEDB-9140 Option		Resolutions (Cycle/Rev)		Shaft Diameter*		Available Options											
Part Number	CPR	Shaft Diameter Options															
		02	04	05	06	11	12	13	14								
C	100 CPR																
E	200 CPR																
F	256 CPR																
G	360 CPR																
H	400 CPR																
A	500 CPR																
BOB	1000 CPR																

AEDS-9140 Option		Resolutions (Cycle/Rev)		AEDT-9140 Option		Resolutions Option		Codewheels Optical Radius	
C	100 CPR	H	400 CPR	C	100 CPR	H	400 CPR	00	11.00 mm
E	200 CPR	A	500 CPR	E	200 CPR	A	500 CPR	0B	11.68 mm
F	256 CPR	I	512 CPR	F	256 CPR	I	512 CPR		
G	360 CPR	BOB	1000 CPR	G	360 CPR	B	1000 CPR		

Note: BOB = 11.68 mm codewheel optical radius.

Incremental Optical Encoders

Transmissive Module

AEDS/AEDB/AEDT-9340 Series



Description

- 6-channel optical incremental encoder modules with codewheel
- When used with a codewheel, these modules detect rotary position
- Each module consists of a collimated LED source and detector IC enclosed within a small plastic package
- Modules are extremely tolerant to mounting misalignment
- Ungated index output is a positive index pulse (360 electrical degrees high) that is generated once for each full rotation of the codewheel
- Designed for use with a codewheel that has an optical radius of:
 - 15 mm (0.590 inch) for 1250/2500 CPR
 - 12.3 mm (0.484 inch) for 1024/2048 CPR
 - 12 mm (0.472 inch) for 1000/2000 CPR
- Replaces conventional incremental encoder with Hall Switches

- The quadrature, index, commutation signals and power supplied to the encoder are accessed through eight 0.46 mm square male connector pins located on 1.27 mm (pitch)
- With our encoder, the system will be more compact, have reduced alignment time with use of alignment jig, thus making assembly process much easier for housed encoder integration
- Superior switching accuracy due to much lower hysteresis when compared to a Hall Switches
- The commutation signals can be generated for Brushless DC motor of different rotor pole-pairs by simply changing with matching pole-pair codewheel

- TTL compatible
- Single 5 V supply
- Integrated feedback device for Brushless DC Motor

For AEDT-9340 Series:

- Same features as listed above
- -40°C to 115°C operating temperature

For AEDB-9340 Series:

- Same features as listed above
- Bundled with matching codewheel

Applications

- Servo motors
- Stepper motors
- Pick and place machines
- Die bonders
- Robotics
- Machine tools
- Textiles
- Factory automation

Package Dimensions

- Refer to product datasheet for package dimensions

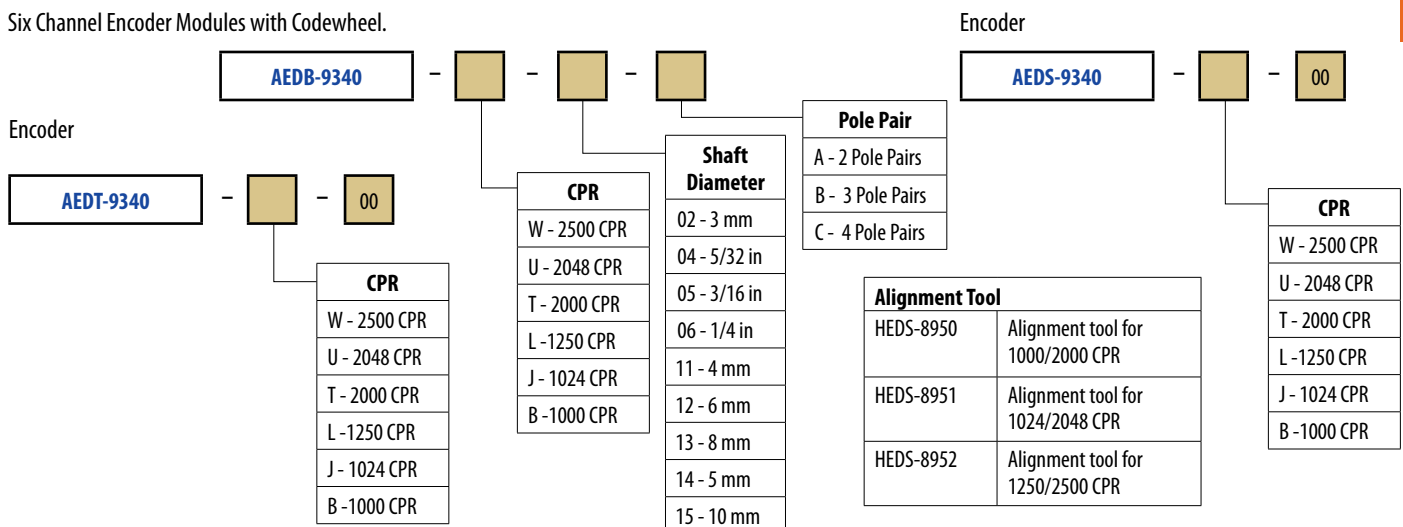
Note: Please contact sales/factory to confirm up to date option availability

Features

- Two-channel quadrature output with ungated index pulse (A, B, I)
- Three-channel integrated commutation output (U, V, W)
- Up to 2500 Cycles Per Revolution (CPR)
- Easy assembly with alignment jig
- Designed to fit into circular shaped housing
- Up to 200 kHz frequency response

Ordering Information

Six Channel Encoder Modules with Codewheel.



Incremental Optical Encoders

Transmissive Housed

AEDx-8xxx Series



Description

- Option of two-channel or three-channel optical incremental encoder kit with codewheel integrated in a protective housing
- Encoder kit consists of a collimated LED source and a detector IC enclosed within a small plastic package
- Two-channel quadrature outputs (A,B) plus a third channel index output (I)
- Designed for use with motors with shaft diameters of 2mm and up to 5mm
- Enables the servo system to be more compact
- Optional alignment jig enables easier assembly process for servo motor integration
- RoHS compliant

Features

- 3-channel differential output (A,B) with ungated, gated-90° and gated-180° index pulse (I)
- 2-channel differential output available
- Up to 500 Cycles Per Revolution (CPR)
- Up to 30000 rpm motor speed
- -40°C to 100°C operating temperature
- Single 5 V supply
- Integrated RS-422 line driver
- Quick and easy assembly

Applications

The AEDx-8xxx provides motion detection for DC servo motor and closed loop stepper motor feedback system in the following applications:

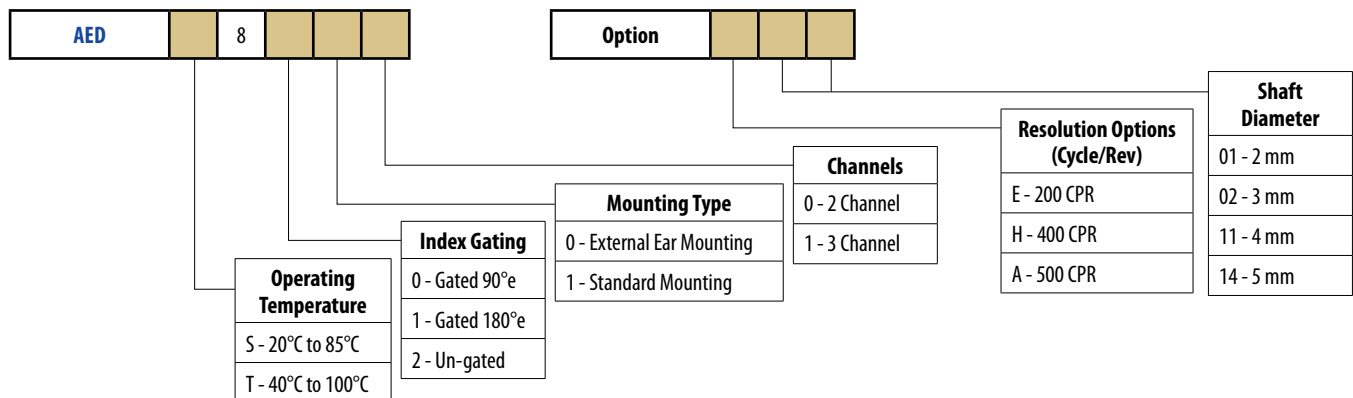
- Pick and place machines
- Semiconductor equipment
- Factory automation equipment

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



Connector Ordering Information

1. HEDS-8911-152 - Connector for AEDS-8xxx Series
2. HEDT-8912-152 - Connector for AEDT-8xxx Series

Alignment Tool Ordering Information

1. HEDS-8938-011 - Alignment tool for AEDx-8x11 Series (4mm shaft diameter option)
2. HEDS-8938-014 - Alignment tool for AEDx-8x14 Series (5mm shaft diameter option)

HEDS-8910	0	Alignment Tool
------------------	---	-----------------------

(Included with each order of HEDM-550x/560x two channel encoders and HEDM-554x three channel encoders)

Incremental Optical Encoders

Transmissive Housed



HEDL-5xxx, HEDS-550x/554x, HEDS-560x/564x, HEDM-550x/560x Series

Description

HEDS-550X/HEDM-550X/HEDS-560X and HEDS-554X/HEDS-564X Series

- High-performance, two and three channel incremental optical encoders
- High reliability, high resolution, easy assembly
- Contains a lensed (LED) source or emitter, an integrated circuit with detectors and output circuitry, and a codewheel which rotates between the emitter and detector IC
- HEDS-550X/HEDM-550X/HEDS-560X output is two square waves in quadrature
- HEDS-554X/HEDS-564X output has a third channel index output in addition to the two channel quadrature
- The index output is a 90 electrical degree, high true index pulse which is generated once for each full rotation of the codewheel
- Features quick and easy motor mounting

HEDM-55XX/56XX Series

- Features same as listed above
- Comes with film codewheels

HEDS-56XX and HEDM-56XX Series

- Features same as listed above
- Features mounting ears HEDL-55XX Series
- Features differential output
- Utilizes an industry-standard line driver IC (26C31), which provides complementary output for each encoder channel, offering enhanced performance when the encoders are used in a noisy environment, or when required to drive long distances
- Suggested line receivers: 26C32 and 26C33
- Quadrature signals are accessed through a cable and 10-pin female connector, manufactured by FCI, part number: 66900-310. Mating connectors are made by FCI; for straight type part number: 71912-010, right angle type part number: 71913-010

Features

- Two channel quadrature output with optional index pulse
- Quick and easy assembly
- No signal adjustment required
- External mounting ears available
- Low cost
- Resolutions up to 1,024 CPR
- Small size
- Up to 100°C operating temperature
- TTL compatible
- Single 5 V supply
- Count frequency of 100 KHz

Applications

Ideal for high-volume applications, including:

- Printers
- Plotters
- Tape drives
- Positioning tables and automatic handlers

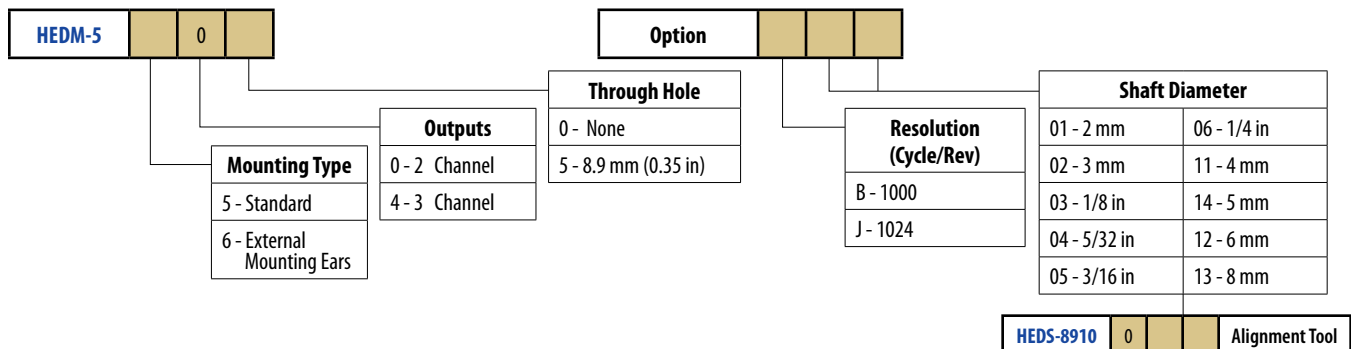
Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

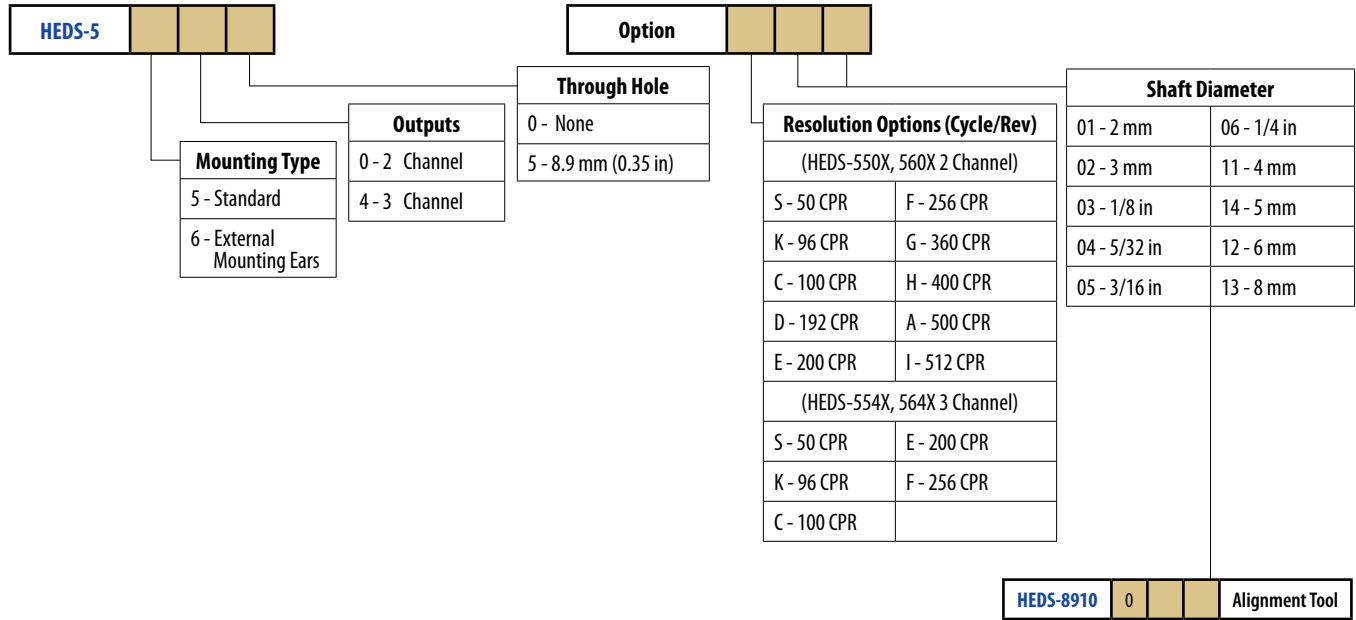
Mid-Sized Housed Encoders with Film Codewheels – HEDM-550x/560x series



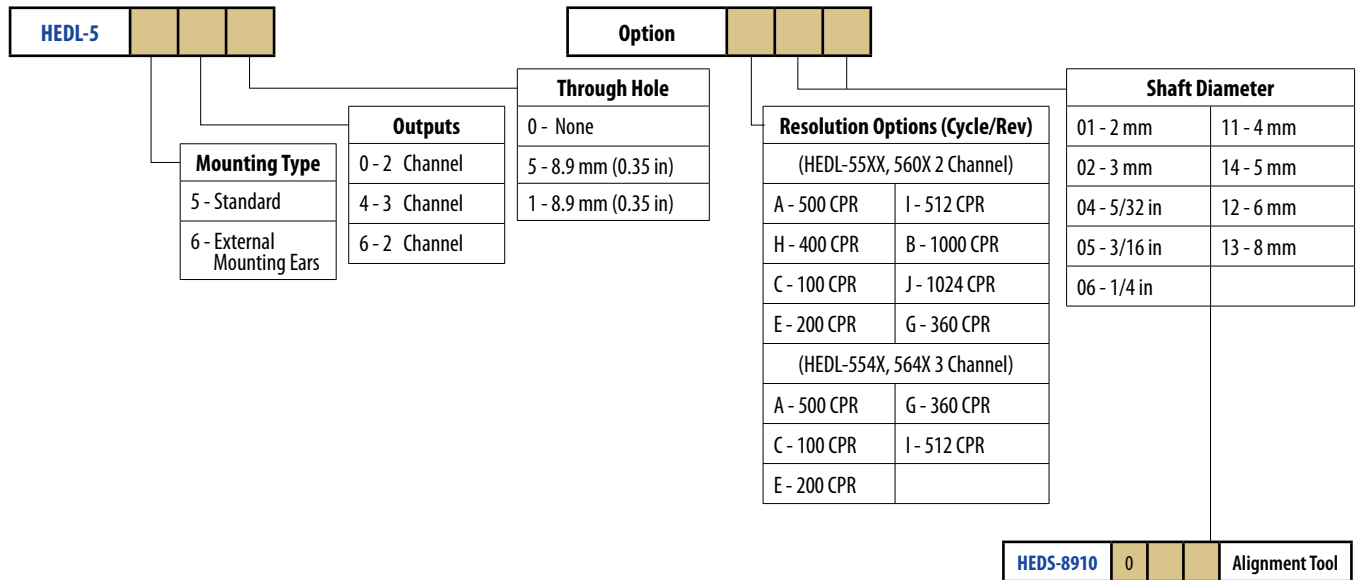
(Included with each order of HEDM-550x/560x two channel encoders and HEDM-554x three channel encoders)

Ordering Information

Mid-Sized Housed Encoders with Metal Codewheels – HEDS-550x/554x/564x Series



Mid-Sized Housed Encoders with Line Drivers – HEDL-5xxx series



Available Options

Available Options											
Part Number		Options									
		01	02	03	04	05	06	11	12	13	14
HEDL-5540	A	•	•			•	•	•	•	•	•
	C		•			•			•		
	E						•	•			
	G							•			
	I	•					•	•		•	
HEDL-5640	A						•		•	•	
HEDL-5645	A						•			•	
	G						•				
HEDL-5500	A		•				•				
	E						•				
	G					•			•		
	H						•				
	I				•						
HEDL-5505	A						•				
	I									•	
HEDL-5560	B		•					•		•	•
HEDL-5561	J						•				•
HEDL-5600	A						•				
	H						•				
HEDL-5605	A						•				
	C										•
HEDM-5500	B	•	•				•	•	•	•	•
	J		•				•		•	•	•
HEDM-5505	B				•						
	J			•			•			•	
HEDM-5540	B	•	•			•		•		•	•
HEDM-5545	B									•	
HEDM-5600	B						•			•	
	J						•				
HEDM-5605	B						•			•	
	J						•				
HEDS-5500	A	•	•	•	•	•	•	•	•		•
	C	•	•	•	•	•	•	•	•	•	•
	E		•		•	•	•	•	•		•
	F	•	•		•	•	•	•	•		•
	G		•			•	•	•	•		•
	H					•	•		•		•
	I	•	•	•	•	•	•	•	•	•	•
	K				•	•	•	•	•		
S										•	

Available Options

Available Options											
Part Number		Options									
		01	02	03	04	05	06	11	12	13	14
HEDS-5505	A				•		•			•	•
	C				•		•		•		•
	E				•		•				•
	F				•		•				•
	G				•		•				
	H						•				•
	I				•		•			•	
	K				•						
HEDS-5540	A	•	•	•	•	•	•	•	•	•	•
	C	•	•				•	•	•	•	•
	E						•	•	•		
	F	•						•			•
	G						•				
	H						•				•
	I	•	•				•	•	•	•	•
HEDS-5545	A						•		•		•
	C								•		
	H						•				•
	I						•				
HEDS-5600	A						•		•	•	•
	C						•		•		•
	E						•				
	G						•			•	
	H						•		•		
	I	•						•			
HEDS-5605	A						•			•	
	C						•				
	E						•				
	F									•	
	G						•				
	H						•				•
	I						•				
HEDS-5640	A						•		•	•	
	E						•		•		
	F						•				
	H						•				
HEDS-5645	A						•		•	•	
	C									•	
	E									•	
	F									•	
	G									•	
	H						•		•		•
	I									•	

Incremental Optical Encoders

Reflective Module

AEDR-83xx Series



Description

- New generation encoder
- SMT and leadless package, ideal for applications with critical space constraints
- More accurate real-time position indicator
- Single-channel and two-channel motion sensing at a very low cost
- Uses reflective technology to sense rotary or linear position
- Consists of an LED light source and a photodetector IC in a single package
- Provides either single channel or two channel square wave outputs in quadrature for count and direction information
- TTL-compatible outputs correspond to the alternating reflective/non-reflective patterns of the codewheel or codestrip
- High codewheel/strip gap tolerance & tolerant to angular misalignment

- Can be used over a range of codewheel and codestrip resolutions
- RoHS compliant
- Very low power consumption

Features

- Size: 5.12 mm (L) x 3.96 mm (W) x 1.63 mm (H)
 - Resolutions of 36, 75, 150, 180 and 212 LPI
 - 30 kHz, maximum operating frequency (60kHz for 212LPI)
 - Rotary and linear motion sensing
 - -20°C through 85°C absolute operating temperature
 - One or two channel quadrature output for positioning and homing capabilities
 - Single 5 V supply (3.3 V available for 212LPI)
- For AEDR-8311:**
- Suitable for indexing function
 - -20°C to 85°C operating temperature

Applications

Ideal for high-volume applications:

- Printers
- Copiers
- Card readers
- Scanners
- Cameras
- Motor solutions
- Medical equipment
- Wafer handling machines
- Vending machines
- Low servo systems
- ATM machines
- Textile machines
- Industrial sewing machines
- Consumer product applications

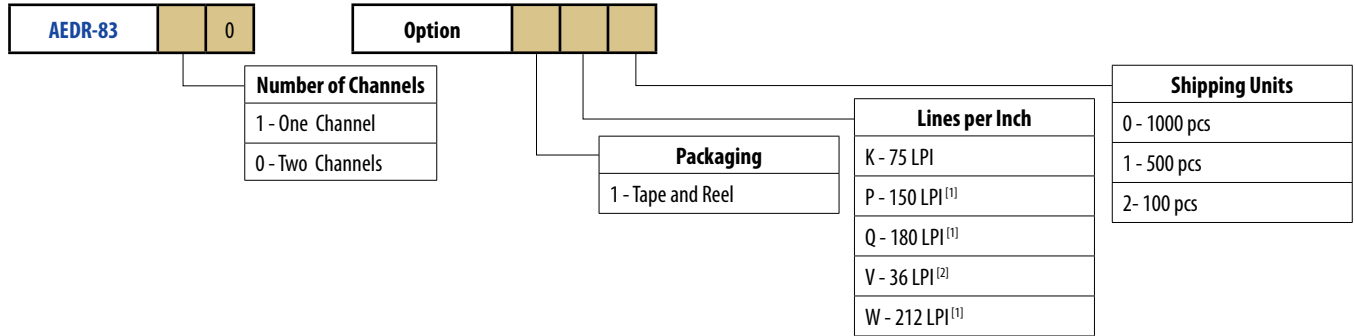
Package Dimensions

- Refer to product datasheet for package dimensions

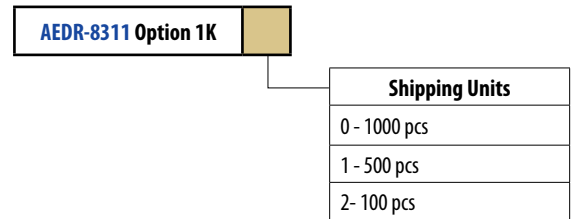
Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Pure Optical Leadless Array Optical Reflective Encoders – AEDR-8300



Summary of Product Availability					
Resolution Options	One Channel	Two Channel	Packaging Quantity		
			1000	500	100
36LPI	•	NA	•	•	•
75LPI	•	•	•	•	•
150LPI	NA	•	•	•	•
180LPI	NA	•	•	•	•
212LPI	NA	•	•	•	•



Note:

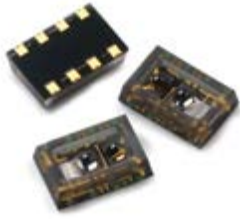
1. 150LPI, 180LPI and 212LPI resolutions are only available in two channel options.
2. 36LPI resolution is only available in one channel option.
3. Encoders are packed in tape quantities of 100, 500 or 1000 pieces.

4. Contact factory for matching codewheel unit or codewheel design.
5. Contact factory for higher resolution and 3 channel encoder solutions.

Incremental Optical Encoders

Reflective Module

AEDR-8320 Series



Description

- New generation encoder
- SMT and leadless package, ideal for applications with space constraints
- More accurate real-time position indicator
- Two-channel motion sensing at a very low cost
- Uses reflective technology to sense rotary or linear position
- Consist of an LED light source and a photodetector IC in a single package
- Can be used over a range of codewheel and codestrip resolutions
- Very low power consumption

Features

- Size: 6.50mm (L) x 4.20mm (W) x 1.69mm (H)
- Resolution: 180 LPI
- 30kHz, maximum operating frequency
- Rotary and linear motion sensing
- -40°C through 85°C absolute operating temperature
- Analog output
- As an example, 7840CPR can be achieved with interpolation factor of 16x where codewheel Rop is at 11mm
- Single 5V supply
- RoHS compliant

Applications

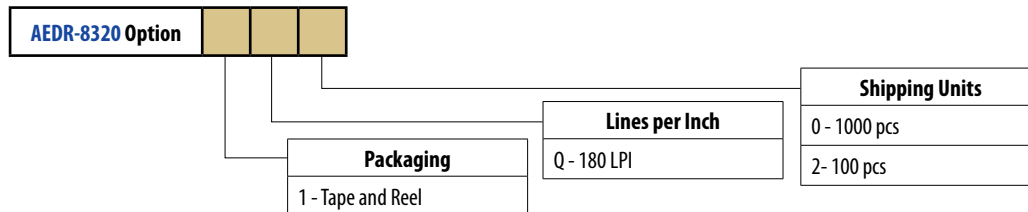
- Printers
- Copiers
- CD/DVD writers
- Card readers
- Pick and place machines
- Security cameras
- Motors
- XY table
- Housed encoders

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



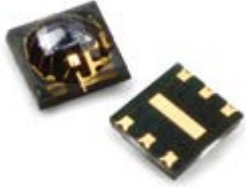
Note:

1. Encoders are packed in quantities of 1000 and 100 pieces.
2. Contact factory for matching codewheel unit or codewheel design.

Incremental Optical Encoders

Reflective Module

AEDR-8400 Series



Description

- Small optical encoder
- Houses an LED light source and a photo-detecting circuitry in a single package
- Offers two-channel quadrature digital outputs
- Outputs can be interfaced directly with most of the signal processing circuitries
- Provides great design in flexibility and easy integration into existing systems
- Very low power consumption

Features

- Size: 3.00 mm (L) x 3.28 mm (W) x 1.262 mm (H)
- Encoding resolution:
2 Encoding resolutions options:
254 (lines/inch) or 10 (lines/mm)
318 (lines/inch) or 12.5 (lines/mm)
- Reflective technology
- Surface mount leadless package
- -20°C to 85°C absolute operating temperature
- Rotary or linear motion sensing
- Two channel quadrature digital outputs for direction sensing
- TTL compatible output
- Single 2.8 V supply
- 15 KHz operating frequency
- Very low power consumption

Applications

Ideal for high volume applications:

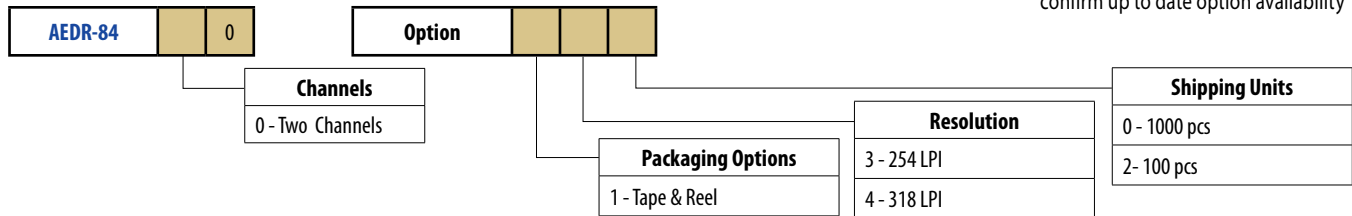
- Printers
- Copiers
- Card readers
- Scanners
- Digital Still Cameras
- Camcorders
- Camera Phones
- Projectors
- Consumer Product Applications

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



Note:

1. Encoders are packed in quantities of 1000 and 100 pieces.
2. Contact factory for matching codewheel unit or codewheel design.
3. Contact factory for higher resolution and 3 channel encoder solutions.

Incremental Optical Encoders

Reflective Module



AEDR-850x Series

Description

- Smallest 3 channel (A,B and I) optical reflective encoder with digital output
- Enable higher operating CPR. Example, if 1X is 1000CPR, then 2X(2000CPR) and 4X(4000 CPR)
- Enable high resolution encoding possibilities. Example, 1000 CPR@13.3 Rop at 304LPI
- Fits into any application where small size and tight space is a concern
- TTL compatible
- RoHs Compliance

Features

- Surface mount leadless package - 3.95 mm (L) x 3.4 mm (W) x 0.9562 mm (H)
- 3 channels; two channel quadrature digital outputs for direction sensing and a 3rd channel, Index digital output
- -20 to 85°C operating temperature
- + 5 Vdc Operating voltage
- Encoding resolution: 294 to 304 Line Per Inch (LPI)
- Interpolation factor 1X, 2X and 4X built in; selectable via external pin-outs (SEL 2x & SEL 4X).

Applications

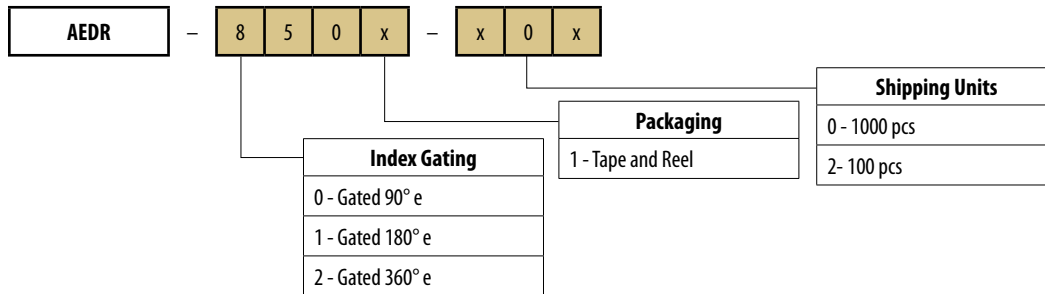
- Close Loop Stepper Motor
- Miniature motors
- Printers
- Copiers
- Card readers
- Scanners
- Projectors
- Portable Medical Equipment (i.e. Insulin Pump)
- Optometric Equipment

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



Incremental Optical Encoders

Reflective Housed

HEDR-542x Series



Description

- High performance
- Cost-effective
- Two channels
- High reliability, high resolution and easy assembly
- Uses reflective technology to sense rotary position
- Consists of an LED light source and photodetector IC in a single SO-8 surface mount package
- HEDR-542X output - two square waves in quadrature
- Quick and easy motor mounting

Features

- Two channel quadrature output
- Quick and easy assembly
- Cost-effective
- Ideal for small motor systems
- Resolutions at 200 CPR
- 0°C to 85°C operating temperature
- Right angle connector available
- Hub available in either a set screw configuration or a press-fit/adhesive mount configuration
- External mounting ears available

Applications

- Wafer handling machines
- Vending machines
- Motor manufacturing applications

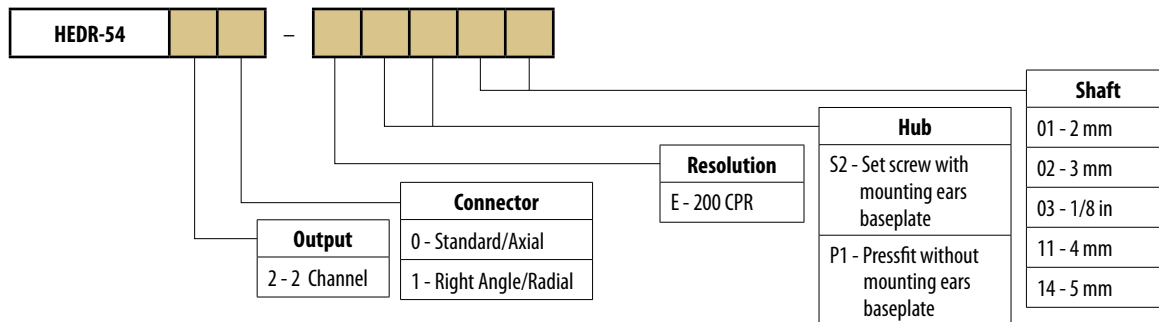
Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Mid-Sized Housed Encoders – HEDR-54XX Series



Note: Pressfit options will only have 2 mm, 3 mm and 4 mm shaft sizes available.
For kit encoders, refer to factory.

Available Options					
Part Number	Options				
	01	02	03	11	14
HEDR-5420ES2	•	•	•	•	•
HEDR-5421EP1				•	

Incremental Optical Encoders

Reflective Housed

HRPG Series (Rotary Pulse Generators)



Description

- Family of miniature panel-mount optical encoders and digital potentiometers
- Can be mounted on a front panel and used as a rotary, data-entry device
- Multiple configuration options accommodate a variety of different applications
- Available options include: detents or smooth, multiple terminations, versatile mounting capabilities, and different shaft configurations
- Uses optical reflective technology
- Single IC detector circuit makes the part less sensitive to temperature and other environmental variations

Features

- Miniature size
- Smooth turning and detented options
- Multiple mounting bracket options
- Quadrature digital output
- Small footprint for versatile mounting
- TTL compatible output
- Up to 120CPR
- 5 V operation
- 0°C to 70°C operating temperature
- Up to 300RPM rotation speed

Applications

- Front panel instruments
- Audio/visual boards
- Other devices requiring digital output from a turning knob

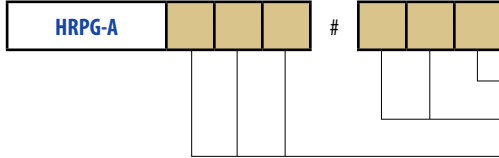
Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Miniature Panel Mount Optical Encoders – HRPG Series



Available Options				
Part Number		Options		
		C	F	R
HRPG-AD32	11	•		•
	13	•	•	•
	14	•	•	•
	16	•	•	•
	17	•		
	19		•	•
	51	•	•	
	53	•	•	•
	54	•		•
	56	•		•
	57		•	
59	•	•	•	
HRPG-AS16	11			•
	14	•		
	17		•	
	51	•		
	53			•
54		•		
HRPG-AS32	11			•
	13		•	•
	14	•		•
	53	•		•
	56	•	•	
59	•			
HRPG-ASCA	11	•	•	•
	13	•		•
	14	•	•	•
	16	•	•	•
	17	•	•	•
	19	•	•	•
	51			•
	53	•	•	
	54	•	•	•
	56	•	•	•
	57		•	
59	•	•		
HRPG-AD16	16	•	•	•
	51			•
	54		•	•
	56	•	•	
	59		•	

Shaft Feel/Resolution
S16 - Smooth 16 CPR
D16 - Detented 16 CPR
S32 - Smooth 32 CPR
D32 - Detented 32 CPR
SCA - Smooth 120 CPR

Mechanical Configuration
11 - 0.3 in. long, 0.25 in. dia.
13 - 0.3 in. long, 0.25 in. dia. D-cut
14 - 0.5 in. long, 0.25 in. dia.
15 - 0.5 in. long, 0.25 in. dia. D-cut
17 - 0.8 in. long, 0.25 in. dia.
19 - 0.8 in. long, 0.25 in. dia. D-cut
51 - 7.6 mm long, 6 mm dia.
53 - 7.6 mm long, 6 mm dia. D-cut
54 - 12.7 mm long, 6 mm dia.
56 - 12.7 mm long, 6 mm dia. D-cut
57 - 20.3 mm long, 6 mm dia.
59 - 20.3 mm long, 6 mm dia. D-cut

Termination
F - Pins Front with Bracket
R - Pins Rear with Bracket
C - Cable Connector with Strain Relief

Note: For kit encoders, refer to factory.

Incremental Magnetic Encoders

Magnetic Housed

AEAT-601B Series



Description

- Miniature package
- Ideal for space constraint applications
- Non-contact magnetic sensing technology
- Specifically designed to serve the industrial market with wide temperature ranges and requiring high accuracy
- Easy assemble process

Features

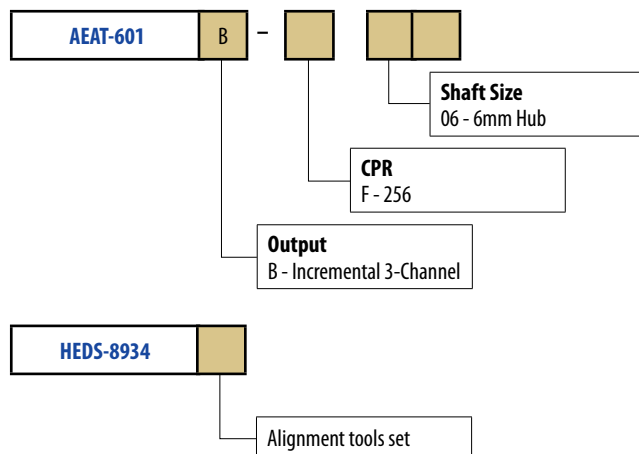
- 23mm diameter X 19mm height package
- Resolution ranges of up to 256 CPR
- Quadrature A, B and Index output (I)
- Wide operating temperature range from -40°C through 125°C
- Single +5V supply
- Bare wires output
- RoHS compliant
- Fit standard 6 mm customer solid shaft

Applications

- Stepper motor feedback
- Textiles
- Rotary positional feedback

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



*Note: Contact factory for customized PCB level solution or other CPR options of 32, 64, 128 or 1024CPR.

Absolute Magnetic Encoders

Magnetic Housed

AEAT-60xx Series (Single-Turn Housed)



Description

- 10 & 12 bit absolute encoder module
- Feedback device which generates a unique binary "word" for each encoder shaft position
- Encoder design provides positional information instantly upon power-up, unlike incremental encoders that require codewheel movement to obtain such information
- Plug and play features eliminates the need for multiple alignment adjustment, making installation very simple

Features

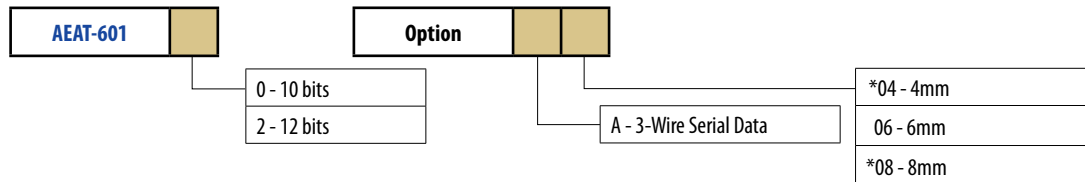
- 10 or 12 bits resolution
- Contactless sensing technologies
- Wide temperature range from -40° to 125°C
- Absolute angular position detection
- Serial Interface output for absolute position data (binary format)
- Code monotony error = ± 1 LSB
- Single 5V supply
- Easy assembly, no signal adjustment required
- RoHS compliant

Applications

- Flow meter
- Angular detection
- Knob control
- Rotary encoder

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



*Note: Contact factory for these shaft size options.

Absolute Optical Encoders

Transmissive Module



AEAT-7000 Series (Single-Turn Module)

Description

- 13-bit absolute encoder module
- Feedback device which generates a unique binary 'word' for each encoder shaft position
- Encoder design provides positional information instantly upon power up, unlike incremental encoders that require codewheel movement to obtain such information
- Ideal for space-constrained applications
- Easy alignment and installation
- Contains 13 signal photodiode channels and 1 monitor photodiode channel - each accompanied by precision amplifiers and additional circuitry
- The integrated chip, together with a highly collimated light source and precision codewheel, outputs up to 13 bits of positional information to the user via a serial synchronous interface

Features

- Miniature size, consists of 2 components only
- -40°C to 85°C standard operating temperature
- Quick and easy assembly
- Cost effective
- 11 digital tracks plus 2 sin/cos tracks to generate precise 13 bit gray code
- Ultra-fast, 1 μ s cycle for serial data output word equals 16 MHz
- On-chip interpolation and code correction to compensate for mounting tolerance
- Internally built-in monitor track for tracking the light level

Applications

- Semiconductor automation machines
- Industrial sewing machine
- Robotics
- Automotive (body plant robot cells for assembly and welding)
- Machine tools

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Standard Single-Turn Encoder Module
1. AEAT-7000-1GSD0 (13-bit resolution)

Note: Contact factory for higher resolution absolute encoder solutions.

Absolute Optical Encoders Transmissive Module

AEAT-9000 Series



Description

- AEAT-9000 series are high resolution single turn optical absolute encoders
- The 17-bit AEAT-9000 encoder code disc consists of 13 pairs of differential absolute tracks and 2 pairs of sinusoidal tracks to perform 4 bits interpolation
- The encoder incorporates photo detectors for electrical alignment on the radial and tilt
- AEAT-9000 also comes with 2 channel incremental output with the basic of 2048 counts per rotation

Features

- 17-bit absolute single turn output (131072 absolute positions over 360°)
- 2 channel true differential Sine/ Cosine outputs with 2048 cycles per revolution
- 2048 CPR A/B channel incremental analog output
- Interface output will be SSI (2 wire SSI/3 wire SSI) with RS485 line transceiver or single ended option
- On-chip interpolation and code correction compensate for mounting tolerance
- Electrical alignment output for tilt and locate

Applications

- Rotary applications up to 17 bits/360° absolute position
- Integration into servo motors
- Industrial and maritime valve control
- High precision test and measurement machines
- Industrial and factory automation equipments
- Textile, woodworking & packaging machineries
- Nacelle & blades control in wind turbine

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

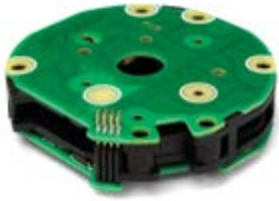
Ordering Information

Part Number	Description
AEAT-9000-1GSH0	Module only, with line transceiver and OpAmp
AEAT-9000-1GSH1	Module only, without line transceiver and OpAmp
HEDS-8949	Alignment Kit
HEDG-9000-H13	Code wheel with hub
HEDG-9000-H14	Code wheel without hub

Absolute Optical Encoders

Transmissive Module

AEAT-84AD/AEAT-86AD Series (Multi-Turn Module)



Description

- Optoelectronic-mechanical unit
- Provides multiturn capabilities when used with the AEAT-7000 single-turn absolute encoder
- When used together with AEAT-7000 or AEAT-6010/6012, the designer gains a complete multiturn absolute encoder with a total resolution of up to 31 bits (contact factory for OEM integrated solution with up to 17-bit single-turn and 14-bit multi-turn)
- Enables the designer to count the number of rotations that the motor shaft has gone through
- Ideal for space constrained applications
- The plug and play feature eliminates the need for multiple alignment adjustments, making installation very simple
- Consists of an IR-LED circuit board, a phototransistor (PT) circuit board, and either 6 (12 bits) or 7 (14 bits) code wheels, arranged in between the PCBs. This construction enables AEAx-8xAD to provide absolute multiturn positioning information without battery backup

Features

- 12-bit and 14-bit resolution within small form factor
- -40°C to 125°C maximum operating temperature
- Gearing system can tolerate up to 12,000 rpm of speed, making it ideal for fast spinning applications like servo motors
- Integrator chip (built-in option available – AEAT-86AD)

Applications

- Robotics
- Machine tools
- Industrial sewing machines
- Semiconductor automation machines
- Packaging machines

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Standard Multiturn Encoder Module
1. AEAT-84AD-LBSCO (12-bit, high temp)
2. AEAT-84AD-LBSFO (14-bit, high temp)

Integrated Multiturn Encoder Module
1. AEAT-86AD-LASCO (12-bit, high temp, binary code)
2. AEAT-86AD-LASFO (14-bit, high temp, binary code)
3. AEAT-86AD-LCSCO (12-bit, high temp, Gray code)
4. AEAT-86AD-LCSFO (14-bit, high temp, Gray code)

Integrated Circuits

Decoder

HCTL-2001/2017/2021 Series



Description

- CMOS ICs that performs the quadrature decoder, counter, and bus interface function
- Improve system performance in digital closed loop motion control systems and digital data input systems
- Consist of a quadrature decoder logic, a binary up/down state counter, and an 8-bit bus interface
- Allows reliable operation in noisy environments
- HCTL-2001 contains a 12-bit counter
- HCTL-2017/2021 contains a 16-bit counter and provides TLL/CMOS compatible tri-state output buffers
- Operation is specified for a temperature range from -40°C to 85°C at clock frequencies up to 14MHz

Features

- Interfaces encoder to microprocessor
- 14 MHz clock operation
- High noise immunity: Schmitt Trigger Inputs and digital noise filter
- 16-bit binary up/down counter
- Latched outputs
- 8-bit tri-state interface
- 8, 12 or 16-bit operating modes
- Quadrature decoder output signals, up/down and count
- Cascade output signals, up/down and count
- Substantially reduced system software
- 5V operation (VDD-VSS)
- TTL/CMOS compatible I/O
- Operating temperature: -40°C to 85°C
- 16-Pin PDIP, 20-Pin PDIP, 20-Pin PLCC

Applications

- Interface quadrature incremental encoders to microprocessors
- Interface digital potentiometers to digital data input buses

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Part Number	Description	Package
HCTL-2001-A00	14 MHz clock operation. 12-bit counter.	PDIP-16
HCTL-2017-A00	14 MHz clock operation. 16-bit counter.	PDIP-16
HCTL-2017-PLC	14 MHz clock operation. 16-bit counter.	PLCC-20
HCTL-2021-A00	14 MHz clock operation. 16-bit counter. Quadrature decoder output signals. Cascade output signals.	PDIP-20
HCTL-2021-PLC	14 MHz clock operation. 16-bit counter. Quadrature decoder output signals. Cascade output signals.	PLCC-20

Integrated Circuits

Decoder

HCTL-2022/2032 Series



Description

- CMOS ICs that perform quadrature decoding, bus interfacing and counter functions
- Designed to improve system performance in digital, closed-loop motion control systems and digital data input systems. ICs interface the encoder to the microprocessor
- HCTL-2022 comes in a 20-pin PDIP (Plastic Dual In-Line Package)
- HCTL-2032 comes in a 32-pin PDIP
- HCTL-2032-SC comes in a 32-pin SOIC
- HCTL-2032/2032-SC are not pin-to-pin compatible with the HCTL-2000 series, but it is backward compatible in terms of functionality with some added enhancements
- HCTL-2032 IC supports single or dual-axis support. Cost savings realized due to decrease in on-board components
- HCTL-2022 is similar to the HCTL-2032 with only single-axis control
- Large counter allows the IC to operate without the support of extra memory, further reducing the number of supporting components needed on board and decreasing cost
- Features allow deeper penetration into the industrial automation market, such as the servo motor market

- Key advantages over competitors:
 - HCTL-2022/2032 operates at a wider range of temperatures, making it suitable for deeper penetration into the industrial automation market
 - Cascaded output signals allow design flexibility
 - A 32-bit counter size allows the product to operate without the need of external counters, reducing the component count on the PCB and therefore cost
 - Higher frequencies let the HCTL-2022/2032 operate with a wider range of encoders
- Latched output, allowing stable output to microcontroller
- 8, 16, 24, or 32-bit operating modes
- Cascade-able output signals, up/down and count, trigger an external decoder or counter in case of an underflow/overflow situation
- Substantially reduced system software
- Comes with hardware built-in counters. Generally no external counters are required

Features

- Operates up to 33 MHz
- 32-bit binary up/down counter
- -40°C to 100°C operating temperature
- Programmable count modes (1x, 2x or 4x)
- Index channel support provides the ability to reset latched output when necessary
- High noise immunity. The Schmitt Trigger Input and Digital Noise Filter rejects noise on incoming quadrature signals

Applications

- Machine tools
- Servo motors
- Sewing machines
- Robotics
- Measurement equipment
- Printers and printing machines
- Automobile service equipment

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



32	SC	32-SOIC Package
22	Blank	20-PDIP Package
32	SCT	32-SOIC Tape and Reel

Integrated Circuits

Absolute (with Incremental Options) Magnetic Encoder



AEAT-6600-T16

Description

- AEAT-6600 angular magnetic encoder IC is a contact less magnetic rotary encoder for accurate angular measurement over a full turn of 360 degrees.
- It is a system-on-chip, combining integrated Hall elements, analog front end and digital signal processing in a single device.
- Absolute 10-bits to 16-bits resolution
- Incremental output resolutions 8 CPR to 1024 CPR

Features

- Absolute encoder – Programmable 10, 12, 14 to 16 bits of resolution
- Support Incremental – Programmable from 8 CPR up to 1024 CPR
- 5 V or 3.3 V operation
- 3-wire or 2-wire SSI interface mode for absolute output
- Incremental ABI or UVW, and PWM output modes
- User-programmable zero position, direction & index pulse width
- Power-down mode to reduce current consumption

Applications

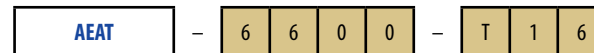
- Contactless rotary position sensing
- Robotics
- Motor feedback
- Valve controls
- Front panel rotary switches
- Joystick position sensor

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information



Programming Kit
HEDS-8937

Integrated Circuits

Line Driver



AEIC-7272/AEIC-7273/AEIC-2631 Series, AELT-5000

Description

- Designed to meet industrial standards for encoder applications, including industrial standard line driver packaging (SOIC package), support RS422A, high temp operating range and support up to 30V operating voltage.
- Come with the current limiting and thermal shutdown features and assures highly reliable operation in harsh environments.
- Optimal solutions for the industrial encoder interface, sensor interface, PLC controllers and servo

Features

- Supply Voltage Range
5V (AELT-5000)
4.75 V – 30 V (AEIC-2631),
3.5V – 30V (AEIC-7272/7273)
- Operation to 800 KHz
- Operation to 2Mhz for AELT-5000
- CMOS and TTL compatible inputs
- Support RS422A
- High impedance buffered inputs with hysteresis
- Outputs short circuit protected
- Outputs Protected by Thermal Shut-Down

Applications

- Industrial encoder interfacing
- Industrial sensor interfacing
- Proximity switches
- Industrial controllers PLC
- Light barriers
- MR sensor systems

Package Dimensions

- Refer to product datasheet for package dimensions

Note: Please contact sales/factory to confirm up to date option availability

Ordering Information

Part Number	Description	Package
AEIC-7272-S16	Quad Differential , Tristate Output	SOIC-16 in Tube
AEIC-7272-S16TR	Quad Differential , Tristate Output	SOIC-16 in Tape Reel
AEIC-7273-S16	Quad Differential , Open Collector	SOIC-16 in Tube
AEIC-7273-S16TR	Quad Differential , Open Collector	SOIC-16 in Tape Reel
AEIC-2631-S16	Quad Differential , No Enable , Upto 30V	SOIC-16 in Tube
AEIC-2631-S16TR	Quad Differential , No Enable , Upto 30V	SOIC-16 in Tape Reel
AELT-5000-S16	Quad Differential , No Enable , 5V	SOIC-16 in Tube
AELT-5000-S16TR	Quad Differential , No Enable , 5V	SOIC-16 in Tape Reel

Codewheels

Transmissive

HEDS-51x0/61x0, HEDG-512x/612x, HEDM-512x/61xx Series



Description

- Wide range of codewheels for use with HEDS-90XX/91XX series encoder modules
- Designed for many environments, applications and budgets
- Available in glass, film and metal
- Resolutions from 96 to 1024 CPR on an 11-mm optical radius, and 500 to 2048 CPR on a 23.36-mm optical radius
- Each of the three codewheel materials offers certain advantages

HEDS-51X0/61X0 Series

- Metal codewheels are the most versatile
- Temperature rating up to 100°C
- HEDS-51X0 offers resolution up to 512 CPR
- HEDS-61X0 offers resolution from 500 to 1024 CPR
- 2 and 3 channels output

HEDM-504X/512X/61XX Series

- Film codewheels offer higher resolution
- HEDM-504x offers resolution of 1000 CPR
- HEDM-512X offers resolutions of 1000 and 1024 CPR
- HEDM-61XX offers 2000 and 2048 CPR
- 70°C operating temperature
- 2 and 3 channels output

HEDG-512X/612X Series

- Glass codewheels combine the best of film and metal
- Operating temperature 100°C
- HEDG-512X offers resolution of 1000 and 1024 CPR
- HEDG-612X offers resolution of 2000 and 2048 CPR

Features

- Codewheels available in glass, film and metal
- Available in two standard diameters (11 mm and 23.36 mm optical radius)
- Cost effective
- For use with HEDS-90XX/91XX series two and three channel encoders

Applications

- Printers
- Plotters
- Tape drivers
- Industry automation equipment
- Factory automation equipment

Note: Please contact sales/factory to confirm up to date option availability

Reflective

Customized. Consult factory for these special parts.

Ordering Information

Metal Codewheels

HEDS-9100 Option modules

	0	0
--	---	---

HEDS-5120 Option codewheels

--	--

**Rop = 11 mm,
2 Channels**

Assembly Tools

Centering HEDS-8905	Gap-Setting HEDS-8901
-------------------------------	---------------------------------

		01	02	03	04	05	06	08	09	10	11	12	13	14	
HEDS-5120	A	•	•	•	•	•	•				•	•		•	
	C		•				•				•	•	•	•	
	D					•									
	E						•					•			
	F					•									
	G		•	•		•	•					•			•
	H		•			•	•					•	•	•	•
	I		•		•		•					•	•	•	
	K		•												•

		Resolution (Cycles/Rev)	
		K - 96 CPR	
		C - 100 CPR	
		D - 192 CPR	
		E - 200 CPR	
		F - 256 CPR	
		G - 360 CPR	
		H - 400 CPR	
		A - 500 CPR	
		I - 512 CPR	

		Shaft Diameter	
		01 - 2 mm	
		02 - 3 mm	
		03 - 1/8 in.	
		04 - 5/32 in.	
		05 - 3/16 in.	
		06 - 1/4 in.	
		11 - 4 mm	
		14 - 5 mm	
		12 - 6 mm	
		13 - 8 mm	

HEDS-9140 Option modules

	0	0
--	---	---

HEDS-5140 Option codewheels

--	--

**Rop = 11 mm,
3 Channels**

Assembly Tools

Centering HEDS-8905	Gap-Setting HEDS-8905
-------------------------------	---------------------------------

		01	02	03	04	05	06	08	09	10	11	12	13	14	
HEDS-5140	A		•		•	•	•				•	•	•	•	
	C				•		•					•	•		
	E						•				•	•		•	
	F				•							•		•	
	G						•					•		•	
	I		•		•		•					•	•	•	•
	H						•								•

		Resolution (Cycles/Rev)	
		C - 100 CPR	
		E - 200 CPR	
		F - 256 CPR	
		G - 360 CPR	
		A - 500 CPR	
		I - 512 CPR	

		Shaft Diameter	
		02 - 3 mm	
		03 - 1/8 in.	
		04 - 5/32 in.	
		05 - 3/16 in.	
		06 - 1/4 in.	
		11 - 4 mm	
		14 - 5 mm	
		12 - 6 mm	
		13 - 8 mm	

Ordering Information

HEDS-9000 Option modules [] [0] [0]

HEDS-6100 Option codewheels [] [] []

Rop = 23.36 mm, 2 Channels

Resolution (Cycles/Rev)
 A - 500 CPR
 B - 1000 CPR

Shaft Diameter
 06 - 1/4 in.
 08 - 3/8 in.
 09 - 1/2 in.
 10 - 5/8 in.
 11 - 4 mm
 12 - 6 mm
 13 - 8 mm

Assembly Tools
Centering HEDS-8906
Gap-Setting HEDS-8901

		01	02	03	04	05	06	08	09	10	11	12	13	14
HEDS-6100	A								•			•	•	
	B						•	•	•	•				

HEDS-9040 Option modules [] [0] [0]

HEDS-6140 Option codewheels [] [] []

Rop = 23.36 mm, 3 Channels

Resolution (Cycles/Rev)
 B - 1000 CPR
 J - 1024 CPR

Shaft Diameter
 06 - 1/4 in.
 08 - 3/8 in.
 09 - 1/2 in.
 10 - 5/8 in.
 11 - 4 mm
 12 - 6 mm
 13 - 8 mm

Assembly Tools
Centering HEDS-8906
Gap-Setting HEDS-8906

		01	02	03	04	05	06	08	09	10	11	12	13	14
HEDS-6140	B						•	•	•	•	•	•	•	
	J						•		•			•	•	

Note: For the lower resolution, two channel encoders, (11 mm ≤ 512 CPR; 23.36 mm ≤ 1024 CPR) the centering tool and gap-setting shim are not necessary, but sometimes helpful in an assembly process.

Film Codewheels

HEDS-9100 modules Option [] [0] [0]

HEDM-512 codewheels Option [] [] [] []

Rop = 11 mm, 2 Channels

Resolution (Cycles/Rev)
 B - 1000 CPR
 J - 1024 CPR

Artwork Orientation
 0 - Artwork on hub side (use when module side B is down)
 1 - Artwork opposite hub side (use when module side A is down)

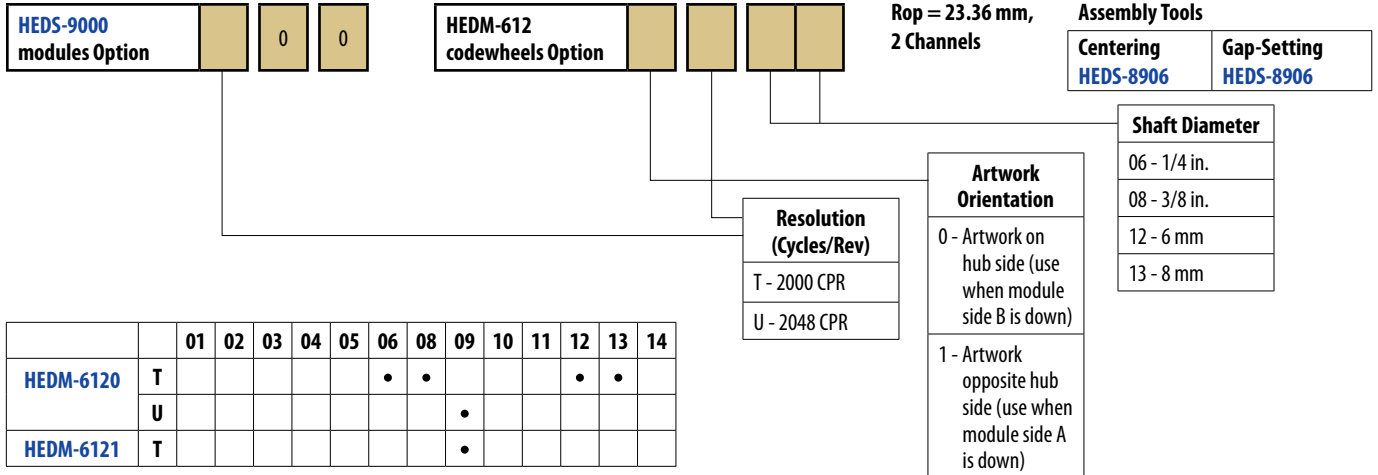
Shaft Diameter
 02 - 3 mm
 06 - 1/4 in.
 11 - 4 mm
 12 - 6 mm

Assembly Tools
Centering HEDS-8905
Gap-Setting HEDS-8901

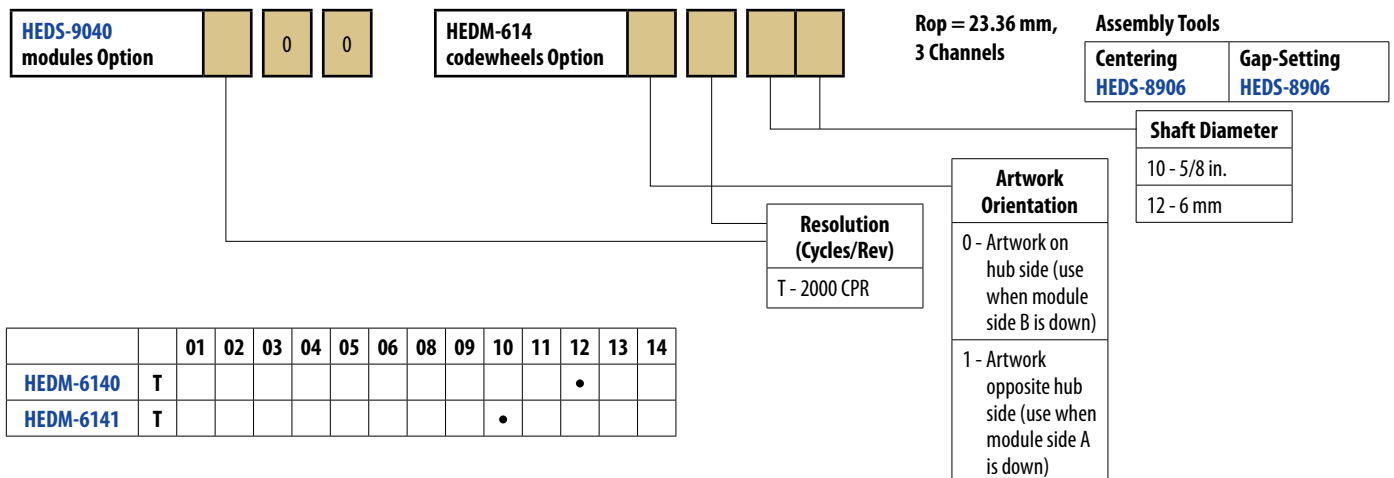
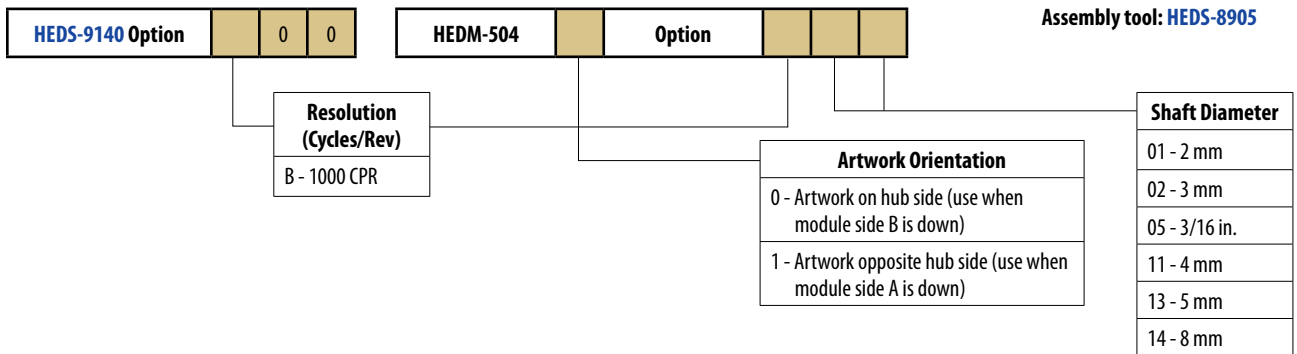
		01	02	03	04	05	06	08	09	10	11	12	13	14
HEDM-5120	B		•				•				•	•		
	J						•				•			
HEDM-5121	B					•	•							
	J													

Ordering Information

Film Codewheels

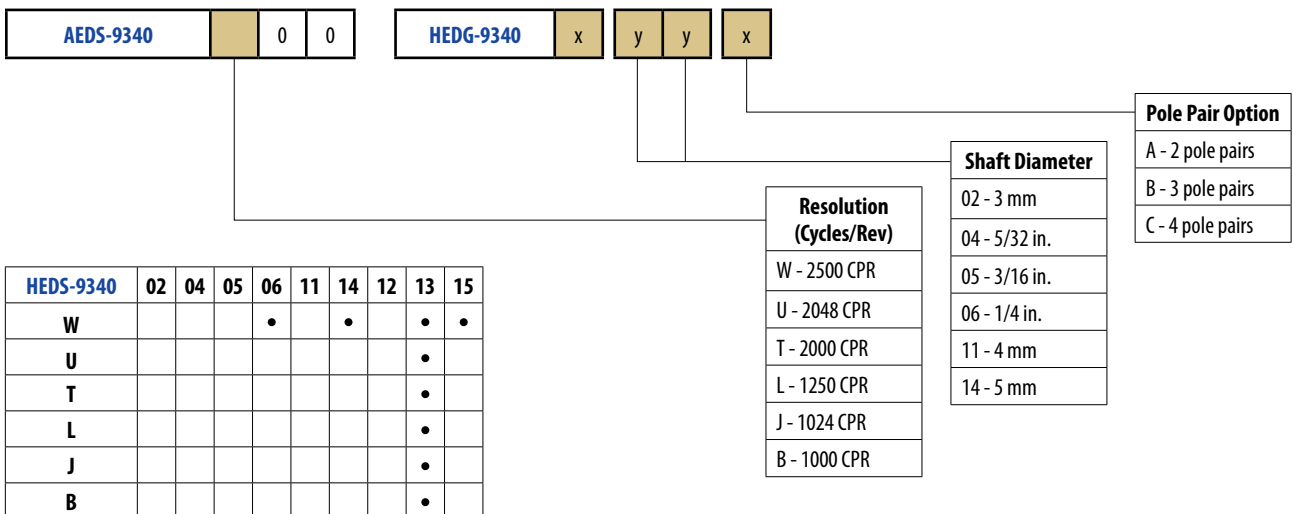
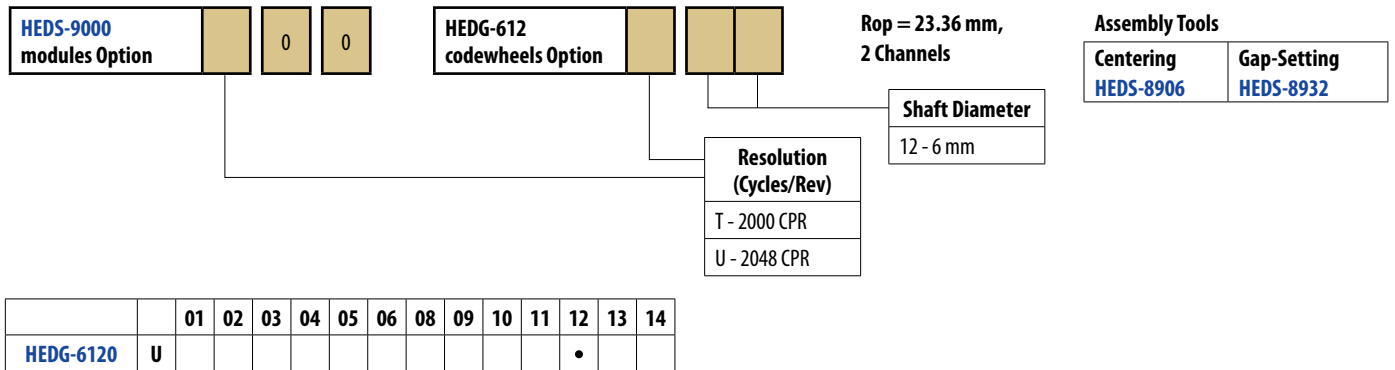
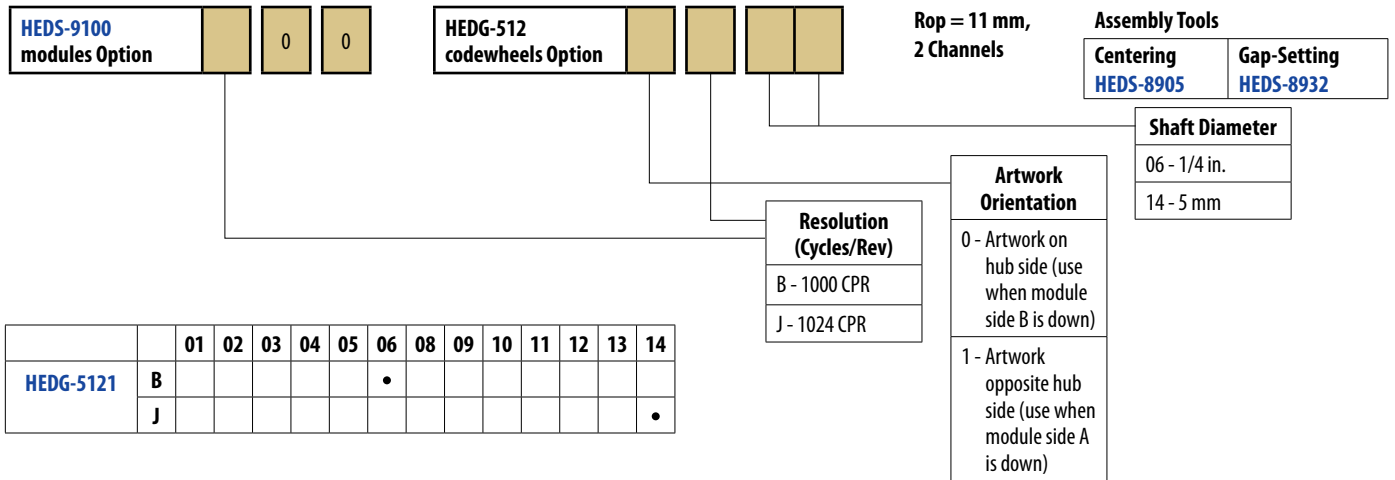


Three Channel Encoder Modules and Codewheels, 11.000 Optical Radius



Ordering Information

Glass Codewheels



Applications Reference

Incremental Optical Encoders			
Transmissive Modules			
			
Products	HEDS-9xxx	HEDS-97xx	AEDx-9140
Office Automation			
Printers/All-in-One Machines	•	•	•
Copiers	•	•	•
Tape Drives	•	•	•
Plotters	•	•	•
Scanners		•	
CD/DVD Writers			
Fax Machines		•	
Consumer			
Card Readers	•	•	
Appliance Front Panels			
Camera Phones			
Set-top Boxes			
TV Projectors			
Industrial Automation			
Wafer Handling Machines	•	•	•
Industrial Sewing Machines	•	•	•
Robotics	•		•
CAD/CAM Dial Boxes			
Wire Bonders			
Vending Machines		•	•
Seat Control and Alignment	•		•
Industrial Fans			
A/C Ventilation Blades			
Tool Changer (Machine Tools)		•	•
Robotics (Automotive)			
Dispensing Pump		•	
Elevator	•		
Pump & Valve			
Medical			
Blood Analyzers	•	•	•
Lab Sample Handling Equip.			
Surgical Robotics			
CAT Scan Machines			
Sport & Healthcare Equipments			
Motor Manufacturers			
Elevators	•		•
Instrumentation			
Audio Video			
Front Panel Combo Knobs			
Other			
ATM Machines		•	•

Applications Reference

	Transmissive Modules			
	Transmissive Modules	Transmissive Housed		
				
Products	AEDx-9340	AEDx-8xxx	HEDR-5xxx	HEDx-5xxx
Office Automation				
Printers/All-in-One Machines				
Copiers				•
Tape Drives				
Plotters				•
Scanners	•			
CD/DVD Writers				
Fax Machines				
Consumer				
Card Readers				
Appliance Front Panels				
Camera Phones				
Set-top Boxes				
TV Projectors				
Industrial Automation				
Wafer Handling Machines	•		•	•
Industrial Sewing Machines	•		•	•
Robotics	•		•	•
CAD/CAM Dial Boxes				•
Wire Bonders			•	•
Vending Machines			•	•
Seat Control and Alignment				•
Industrial Fans	•		•	•
A/C Ventilation Blades			•	
Tool Changer (Machine Tools)	•		•	
Robotics (Automotive)	•		•	
Dispensing Pump				
Elevator	•			
Pump & Valve				
Medical				
Blood Analyzers			•	•
Lab Sample Handling Equip.			•	
Surgical Robotics			•	•
CAT Scan Machines			•	
Sport & Healthcare Equipments	•			•
Motor Manufacturers				
	•	•		•
Instrumentation				
Audio Video				
Front Panel Combo Knobs				
Other				
ATM Machines				

Applications Reference

Incremental Optical Encoders						
Reflective Modules					Reflective Housed	
					Rotary Pulse Generators	
						
Products	AEDR-83xx	AEDR-8320	AEDR-8400	AEDR-850x	HEDR-542x	HRPG-Axxx
Office Automation						
Printers/All-in-One Machines	•	•	•	•		
Copiers	•	•	•	•		•
Tape Drives	•		•	•		
Plotters	•	•	•	•	•	•
Scanners	•		•	•		
CD/DVD Writers	•		•	•		
Fax Machines	•	•	•	•		
Industrial Automation						
Wafer Handling Machines						
Industrial Sewing Machines	•	•	•	•		
Robotics					•	
CAD/CAM Dial Boxes						
Wire Bonders						
Vending Machines	•	•	•	•	•	
Seat Control and Alignment	•	•	•	•		
Industrial Fans	•	•	•	•	•	
A/C Ventilation Blades	•	•	•	•	•	
Tool Changer (Machine Tools)						
Robotics (Automotive)						
Dispensing Pump						
Elevator						
Pump & Valve						
Medical						
Blood Analyzers						•
Lab Sample Handling Equip.						
Surgical Robotics						
CAT Scan Machines						
Sport & Healthcare Equipments						
Motor Manufacturers						
Elevators	•	•	•	•		•
Consumer						
Card Readers	•	•	•	•		•
Appliance Front Panels		•				•
Camera Phones	•		•	•		
Set-top Boxes	•	•	•	•		
TV Projectors	•		•	•		
Instrumentation						
Audio Video		•				•
Front Panel Combo Knobs		•				•
Other						
ATM Machines	•	•	•	•		

Applications Reference

	Absolute Encoders					Integrated Circuits	
	Transmissive Modules					Decoders	Line Drivers
		Magnetic Encoders 					
Products	AEAT-7000	AEAT-60xx	AEAT-6600-T16	AEAT-9000	AEAx-8xAD	HTCL-20xx	AEIC-7272/7273/2631-S16 AELT-5000
Office Automation							
Printers/All-in-One Machines						•	
Copiers						•	
Tape Drives						•	
Plotters						•	
Scanners						•	
CD/DVD Writers						•	
Fax Machines						•	
Industrial Automation							
Wafer Handling Machines	•	•	•	•	•	•	•
Industrial Sewing Machines	•	•	•	•	•	•	•
Robotics	•			•	•	•	
CAD/CAM Dial Boxes		•	•				•
Wire Bonders	•	•	•	•	•	•	•
Vending Machines		•	•				•
Seat Control and Alignment	•	•	•	•	•	•	•
Industrial Fans		•	•				•
A/C Ventilation Blades		•	•				•
Tool Changer (Machine Tools)	•	•	•	•	•	•	•
Robotics (Automotive)	•	•	•	•	•	•	•
Dispensing Pump		•	•				•
Elevator							
Pump & Valve	•	•	•	•	•	•	•
Medical							
Blood Analyzers	•			•			
Lab Sample Handling Equip.	•			•			
Surgical Robotics	•			•	•		
CAT Scan Machines	•	•	•	•	•		•
Sport & Healthcare Equipments		•	•				•
Motor Manufacturers							
Elevators	•	•		•	•	•	•
Consumer							
Card Readers							
Appliance Front Panels							
Camera Phones							
Set-top Boxes							
TV Projectors							
Instrumentation							
Audio Video	•	•	•	•			•
Front Panel Combo Knobs	•	•	•	•		•	•
Other							
ATM Machines		•	•				•

Definition of Key Terms

Product Technology	Description
Absolute Encoder	A type of encoder which generates a unique code for each position, unlike an incremental encoder, which only generate pulses proportional to position. An absolute encoder has the distinctive feature of being able to provide positional information instantly upon power up.
Absolute Multi-Turn Encoder	In addition to the Absolute Single-Turn Encoder, this type of Absolute Multi-Turn Encoder provides shaft revolution detection, usually through means of an integrated gear, in which the code representation for each revolution is unique. Combined with Absolute Single-Turn Encoder, it provides unique positional information beyond one revolution.
Absolute Single-Turn Encoder	A type of absolute encoder whereby each measurable angular position provides unique positional information, within one revolution, without the need of counter and homing operation, upon power up.
Codewheel and Codestrip	Codewheel and codestrip are patterned discs or strips that translate a mechanical position into a representative electrical signal when used with an optical encoder. A codewheel is used for rotary motion while a codestrip is used for side-to-side motion. In a transmissive encoder, the bars block light and the windows allow light to pass through. In a reflective encoder, the bars absorb light while the windows reflect light.
Controller IC	A PID Motor Controller IC commands the motor operation by taking the feedback signal from the encoder output. It frees the host processor for other tasks by performing all the time intensive functions of digital motion control.
Decoder/Counter IC	Interfaces the encoder to the microprocessor. A decoder and counter IC converts the incremental signal from the encoder to a binary number.
Housed Encoder	An enclosed encoder with protective housing that normally has a defined IP rating.
Incremental Encoder	A type of encoder that provides relative position, whereby the feedback signal is always referenced to a start or home position. On an incremental encoder, each mechanical position is not uniquely defined. The current position sensed is only incremental from the last position sensed.
Linear Encoder	A type of incremental encoder that provides high resolution linear incremental positioning information. The linear encoder is a good alternative to designers who need to measure linear movement in high resolution.
Module Encoder	A basic encoder unit that integrates the detector and emitter in a single unit.
Optical Encoder	Sensors that use light to sense the speed, angle and direction of a rotary shaft.
Reflective Encoder	Consists of an emitter and detector, each positioned on the same side of the codewheel/codestrip.
Rotary Encoder	Also known as a shaft encoder. A type of incremental encoder that converts angular position of a shaft or axle to a digital code. Rotary encoders can also be used to measure linear motion, with the use of a ballscrew systems, to translate linear motion into rotary motion.
Transmissive Encoder	Consists of an emitter and detector, each positioned at opposite sides of the codewheel/codestrip.
Magnetic Encoder	Contactless magnetic sensing absolute rotary encoders suitable for dusty and high temperature environment.

Definition of Key Terms

Detector sets

Single Detector

- It looks at only the window or bar
- Defects at individual windows or bars cause error

Multiple Photodetectors

- It looks at many windows or bars
- Minimizes error due to defects at individual windows or bars
- Increases detected signal strength

Avago encoders employ multiple detector sets. Each set consists of differential outputs with push/pull circuitry. See diagram 2 below. An explanation on the operation of the differential signaling is described in the next item.

Diagram 1: Single and Multiple detector elements

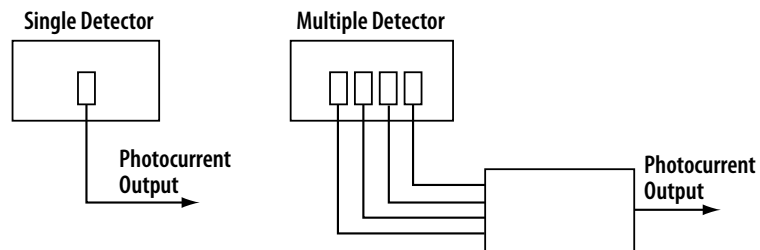
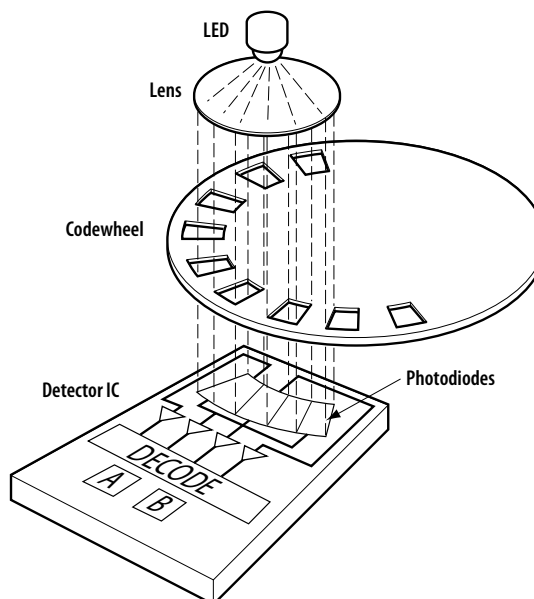


Diagram 2: Multiple detector elements



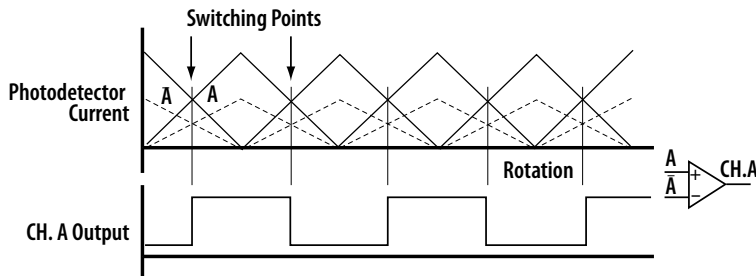
Definition of Key Terms

Differential Signaling

Why use differential signaling?

- Insensitive to variations in light
- Hysteresis in comparators prevents oscillation
- Switching points remain the same, independent of light level
- Negates effect of light level variation

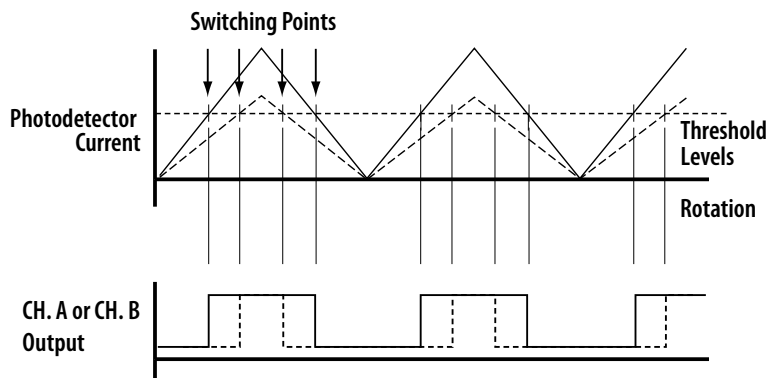
Diagram 3: Differential Detector output



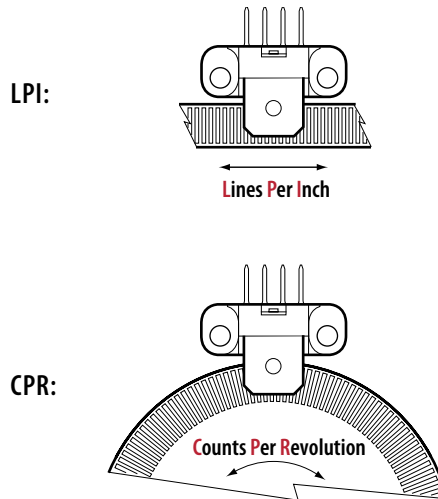
How does differential signaling work?

- Signals for A and its complement A(bar) are sent to comparator
- When A receives more light than A(bar), then Ch. A is high
- Otherwise, if A(bar) receives more light than A, then Ch. A is low

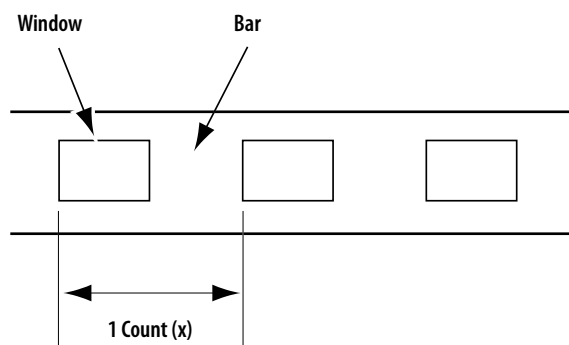
Diagram 4: Single channel detector output



Definition of Key Terms



LPI Formula



LPmm can be used instead of LPI (Lines Per Inch). LPmm means the number of 'Lines Per mm'. The method of calculation for LPmm is the same as LPI. The only difference is that the 'mm' replaces 'Inch' as the standard measurement of length.

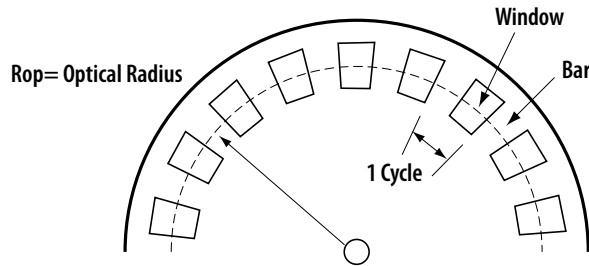
The formula for LPI and LPmm is as follows:

$$\text{LPI} = \frac{1}{x \text{ (Inch)}} \qquad \text{LPmm} = \frac{1}{x \text{ (mm)}}$$

Where x = length of Window and Bar pair length

Definition of Key Terms

CPR Formula



1 Cycle = the mechanical rotation that corresponds to one pair of Window and Bar.

CPR = Number of Window and Bar pairs over full rotation

Converting CPR to LPI and LPmm

$$\text{Count Density} = \frac{\text{Number of Window and Bar pair}}{\text{Arc Length}} = \frac{\text{CPR (count over full rotation)}}{2\pi Rop \text{ (Arc length over full rotation)}}$$
$$\text{LPI} = \frac{\text{CPR}}{2\pi Rop(\text{Inch})} \quad \text{LPmm} = \frac{\text{CPR}}{2\pi Rop(\text{mm})}$$

Calculation for Customized Resolution

Assuming you would like to use an Encoder with a known CPR and Rop for a custom CPR resolution, the LPI or LPmm must match for the encoder to operate properly.

The formulas described on the previous page can be used to calculate the new codewheel dimension. To retain the same LPI or LPmm, increase the CPR, then the Rop will increase accordingly. If the CPR is decreased, the Rop will also decrease accordingly.

For example, for the case of HEDS-9000-Txx. This is a 2000CPR at 23.36mm Rop encoder. Assuming we want to use a customized codewheel with a CPR of 4000CPR with this 2000CPR encoder.

Definition of Key Terms

The table below simplifies the problem statement. The encoder and custom codewheel LPI must match in order for the encoder to operate properly. The new CPR is known and the only unknown is the Rop of the custom Codewheel to ensure that the new codewheel, LPmm matches that of the encoder specifications. We have to identify what is the new Codewheel Rop.

	Encoder Specification	Custom CW Specification
CPR	2000	4000
Rop	23.36 mm	Unknown (x)
LPmm	13.6245	

First, calculate the LPmm of the encoder:

$$LPmm = \frac{CPR}{2\pi Rop(mm)}$$

$$LPmm = (2000)/(2\pi * 23.36) \quad \pi = 3.142$$

$$LPmm = 13.6245$$

The new 4000CPR codewheel must also match this 13.6245LPmm. Next, find the appropriate Rop for 4000CPR:

$$LPmm = \frac{CPR}{2\pi Rop(mm)}$$

$$13.6245 = 4000/(2\pi * x)$$







$$Rop(mm) = 46.72 \text{ mm}$$

The new Codewheel for 4000CPR must have a Rop of 46.72mm to be used with a 2000CPR 23.36mm encoder.


	Encoder Specification	Custom CW Specification
CPR	2000	4000
Rop	23.36 mm	46.72 mm
LPmm	13.6245	

Important: The LPI or LPmm for the codewheel and the encoder must match for the encoder to operate properly.







Quick Guide - Encoder Module^{1,2}

Product Type	Encoder - Module ^{1,2}						
General Encoder Type Form Function Type/Size	Symbol	Rotary Encoder					
		Optical Incremental					
		Reflective					
Product Part Number		AEDR-8000 AEDR-8010 AEDR-8100	AEDR-83xx	AEDR-8300-1Wx	AEDR-8320 (Analog Output)	AEDR-8400	AEDR-850x
Product Picture							
Fit							
Bore / Shaft Diameter ³ (mm)		-	-	-	-	-	-
SMT		50-6	50-6	50-6	50-8	50-6	-
Modular		Yes	Yes	Yes	Yes	Yes	Yes
Overall Dimension ⁵ (mm)		6.2x4.4x3.2/2.7 ¹¹ (WxLxH)	4x5.1x1.6 ¹¹ (WxLxH)	-	-	-	3.4x3.95x0.9562 (WxLxH)
Lead free		Yes	Yes	Yes	Yes	Yes	Yes
Resolution							
Ranges: (Cycle per Revolution) ^{6,7}		-	-	-	-	-	-
(Line per Inch)		75, 150, 180	36 to 180	212	180	254, 318	304
Currently available option (Cycle per Revolution) ²		-	-	-	-	-	-
(Line per Inch) ⁸		75, 150, 180	36, 75, 150, 180	212	180	254, 318	304
Codewheel / Codestrip ⁹	CW						
Optical Radius(mm)	Rop	11	11	11	11	11	-
Part number ¹⁰		HEDR-5120	HEDR-5120	HEDR-5120	-	HEDR-5120	-
Enclosure Type							
Ingress Protection Rating		-	-	-	-	-	-
Output							
TTL Compatible		Yes	Yes	Yes	-	Yes	Yes
Transmission		-	-	-	-	-	-
No of Channels		2	2	2	2	2	3
Absolute Maximum Ratings							
Storage Temperature (°C) ¹³	T _s	-40 to 85	-40 to 85	-40 to 85	-40 to 85	-40 to 85	-20 to 85
Operating Temperature (°C) ¹³	T _A	-20 to 85	-20 to 85	-20 to 85	-10 to 70	-20 to 85	-20 to 85
Supply Voltage (V)	V _{cc}	-0.5 to 7	-0.5 to 7	-0.5 to 7	-0.5 to 7	-0.5 to 7	4.5 to 5.5
Output Voltage (V)	V _o	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	V _{cc} + 0.4	-0.5 to V _{cc}	0 to V _{cc}
Recommended Operating Condition							
Temperature (°C) ¹³	T	0 to 80	0 to 85	-20 to 85	-10 to 70	-20 to 85	-20 to 85
Supply Voltage (V)	V _{cc}	5.0	5.0	3.3 / 5.0	5.0	2.8	5.0
Count Frequency (kHz) ¹⁴	f	30	15 / 30	60	20	15	55
Accessories and Tools							
Alignment Tools		-	-	-	-	-	-
Gapping Tools		-	-	-	-	-	-







Quick Guide - Encoder Module^{1,2}

Product Type		Encoder - Module ^{1,2}					
General Encoder Type Form Function Type/Size	Symbol	Rotary Encoder					
		Optical Incremental					
		Transmissive					
		Digital Output					
		Product Part Number					
Product Part Number		HEDS-90xx HEDS-91xx HEDS-92xx	HEDB-9xxx	HEDT-900x HEDT-910x	HEDT-904x HEDT-914x	AEDB-9140	AEDT-9140
Product Picture							
Fit							
Bore / Shaft Diameter ³ (mm)		up to 8		up to 8	up to 8	up to 8	up to 8
SMT		-		-	-	-	-
Modular		Yes		Yes	Yes	Yes	Yes
Overall Dimension ⁵ (mm)		26.7x20.8x10.2 ¹¹ (WxLxH)		26.7x20.8x10.2 ¹¹ (WxLxH)	26.7x20.8x10.2 ¹¹ (WxLxH)	22x10x15 ¹¹ (WxLxH)	22x10x15 ¹¹ (WxLxH)
Lead free		Yes	Yes	Yes	Yes	Yes	Yes
Resolution							
Ranges: (Cycle per Revolution) ^{6,7}		up to 2048	up to 1024	up to 1024	up to 512	up to 500	up to 1000
(Line per Inch)		up to 360	-	-	-	-	-
Currently available option (Cycle per Revolution) ²		50, 96, 100, 200, 256, 360, 400, 500, 512, 1000, 1024, 2000, 2048	96, 100, 200, 256, 360, 400, 500, 512, 1000, 1024	100, 200, 360, 400, 500, 1000, 1024	512	100, 200, 256, 360, 400, 500	100, 200, 256, 360, 400, 500, 1000
(Line per Inch) ⁸		180, 300, 360	-	-	-	-	-
Codewheel / Codestrip ⁹		CW					
Optical Radius(mm)	Rop	11, 23.36	11, 23.36	11, 23.36	11, 23.36	11	11
Part number ¹⁰		HEDS-51xx/61xx HEDG-51xx/61xx HEDM-51xx/61xx	Codewheel included	HEDS-5120/6100 HEDG-5120/6100	HEDS-5140/5145 HEDS-6140/6145	Codewheel included	
Enclosure Type							
Ingress Protection Rating		-	-	-	-	-	-
Output							
TTL Compatible		Yes	Yes	Yes	Yes	Yes	Yes
Transmission		-	-	-	-	-	-
No of Channels		3	3	2	3	3	3
Absolute Maximum Ratings							
Storage Temperature (°C) ¹³	T _s	-40 to 100	-40 to 100	-40 to 125	-40 to 140	-10 to 85	-40 to 115
Operating Temperature (°C) ¹³	T _a	-40 to 100	-40 to 100	-40 to 125	-40 to 140	-10 to 85	-40 to 115
Supply Voltage (V)	V _{cc}	-0.5 to 7V	-0.5 to 7V	-0.5 to 7V	-0.5 to 7V	-0.5 to 7V	-0.5 to 7V
Output Voltage (V)	V _o	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}
Recommended Operating Condition							
Temperature (°C) ¹³	T	-40 to 100	-40 to 100	-40 to 125	-40 to 140	-10 to 85	-40 to 115
Supply Voltage (V)	V _{cc}	5.0	5.0	5.0	5.0	5.0	5.0
Count Frequency (kHz) ¹⁴	f	100	100	100	50	100	100
Accessories and Tools							
Alignment Tools		HEDS-8905 HEDS-8906	-	-	HEDS-8905	-	
Gapping Tools		HEDS-8901 HEDS-8910 HEDS-8932	-	-	-	-	


Quick Guide - Encoder Module^{1,2}

Product Type		Encoder - Module ^{1,2}					
General Encoder Type Form Function Type/Size	Symbol	Rotary Encoder					
		Optical Incremental					
		Transmissive					
		Digital Output			Analog Output		
Product Part Number		AEDB-9340	AEDT-9340	HEDL-90xx HEDL-91xx	HEDS-97xx HEDS-973x HEDS-974x HEDS-978x	HEDS-9202	HEDS-971x
Product Picture							
Fit							
Bore / Shaft Diameter ³ (mm)		up to 12	up to 12	up to 8	Refer to factory	up to 8	Refer to factory
SMT				-		-	-
Modular				Yes	Yes	Yes	Yes
Overall Dimension ⁵ (mm)			(WxLxH)	26.7x20.8x10.2 ¹¹ (WxLxH)	20.2x12.6x10.8 ¹¹ (WxLxH)	26.7x20.8x10.2 ¹¹ (WxLxH)	20.2x12.6x10.8 ¹¹ (WxLxH)
Lead free		Yes	Yes	-	-	Yes	Yes
Resolution							
Ranges: (Cycle per Revolution) ^{6,7}		up to 2500	up to 2500	up to 2048	96 to 2048	-	-
(Line per Inch)				-	120 to 480	200	200, 360
Currently available option (Cycle per Revolution) ²		1000, 1024, 1250, 2000, 2048, 2500	1000, 1024, 1250, 2000, 2048, 2500	500, 512, 1000, 2048	96, 100, 192, 200, 256, 360, 400, 500, 1000, 1024, 2000, 2048	-	-
(Line per Inch) ⁸		-	-	346 ⁸	120, 127, 150, 180, 300, 360	200	200, 360
Codewheel / Codestrip ⁹	CW						
Optical Radius(mm)	Rop	15, 12.3, 12	15, 12.3, 12	11, 23.36	-	-	-
Part number ¹⁰		Codewheel included		HEDS-51xx/61xx HEDG-51xx/61xx HEDM-51xx/61xx	Refer to factory	Refer to factory	Refer to factory
Enclosure Type							
Ingress Protection Rating		-	-	-	-	-	-
Output							
TTL Compatible		Yes	Yes	Yes	Yes	Yes	Yes
Transmission		-	-	-	-	-	-
No of Channels		6	6	3	2	2	2
Absolute Maximum Ratings							
Storage Temperature (°C) ¹³	T _s	-40 to 105	-40 to 115	-40 to 70 or 100	-40 to 70 or 85	-40 to 100	-40 to 85
Operating Temperature (°C) ¹³	T _a	-40 to 105	-40 to 115	0 to 70 or 100	-40 to 70 or 85	-10 to 100	0 to 85
Supply Voltage (V)	V _{cc}	-0.5 to 7V	-0.5 to 7V	-0.5 to 7V	-0.5 to 7	-0.5 to 7	-0.5 to 7
Output Voltage (V)	V _o	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-	-
Recommended Operating Condition							
Temperature (°C) ¹³	T	-10 to 85	-40 to 115	0 to 70 or 100	25	25	15 to 45
Supply Voltage (V)	V _{cc}	5.0	5.0	5.0	5.0	5	5.0
Count Frequency (kHz) ¹⁴	f	150	200	100	20, 40, 80	120	40
Accessories and Tools							
Alignment Tools		HEDS-8950 HEDS-8951	HEDS-8950 HEDS-8951	-	-	-	-
Gapping Tools		HEDS-8952	HEDS-8952	-	-	-	-

Quick Guide - Encoder Housed^{1,2}

Product Type		Encoder - Housed ^{1,2}					
General Encoder Type Form Function Type/Size	Symbol	Optical Rotary Encoder					
		Incremental					
		Mid Size	Miniature Size		Panel Mount		
Digital Potentiometer							
Product Part Number		HEDL-55xx HEDM-55xx HEDS-55xx HEDL-56xx HEDM-56xx HEDS-56xx	AEDS-8xxx AEDT-8xxx	HEDR-54xx	HRPG-Axxx	AEAT-601B-F06	AEAT-6600-T16
Product Picture							
Fit							
Bore / Shaft Diameter ³ (mm)		up to 8	up to 5mm	2,3,4,5 & 1/8"	0.25"/ 6 mm	6	
SMT		-	-	-	-	-	
Modular		-	-	-	-	-	
Overall Dimension ⁵ (mm)		41.7x52.1x18.3 (WxLxH)	20mmx18mm (OD x H)	23x17.9 (ØxH)	21x17.5 (WxH)	23	5x4.4 (WxH)
Resolution							
Ranges: (Cycle per Revolution) ^{6,7}		up to 1024	up to 500	200	up to 120	256	up to 1024
(Line per Inch)		-	-	-	-	-	-
Currently available option (Cycle per Revolution) ²		50, 96, 100, 192, 200, 256, 360, 400, 500, 512 1000, 1024	200, 400, 500	200	16, 32, 120	32, 64, 128, 256, 1024	8, 16, 32, 64, 128, 256, 512, 1024
(Line per Inch) ⁸		-	-	-	-	256	-
Enclosure Type							
Ingress Protection Rating		IP20	IP40	IP20	IP20	IP20	
Output							
TTL Compatible			RS-422 line driver			-	
Transmission		-	-	-	-	-	
No of Channels			3			3	3
Absolute Maximum Ratings							
Storage Temperature (°C) ¹³	T _s	-40 to 70 or 100	-20 to 85 or -40 to 100	-40 to 85	-40 to 85	-40 to 125	-40 to 125
Operating Temperature (°C) ¹³	T _A	-40 to 70 or 100	-20 to 85 or -40 to 100	-10 to 85	0 to 70	-40 to 125	-40 to 125
Supply Voltage (V)	V _{cc}	-0.5 to 7	-0.5 to 7	-0.5 to 7	-0.5 to 7	-0.3 to 7	3.3 or 5
Output Voltage (V)	V _o	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.5 to V _{cc}	-0.3 to V _{cc} +0.3	
Recommended Operating Condition							
Temperature (°C) ¹³	T	-40 to 70 or 100	-20 to 85 or -40 to 100	-10 to 85	0 to 70	-40 to 125	-40 to 125
Supply Voltage (V)	V _{cc}	5.0	4.5 to 5.5	5.0	4.5 to 5.5	4.5 to 5.5	3.3 or 5
Count Frequency (kHz) ¹⁴	f	100	up to 200	16		30	120KHz
Accessories and Tools							
Alignment Tools		HEDS-8910	HEDS-8938	HEDR-5900	-	HEDS-8934	HEDS-8937
Gapping Tools		-		-	-	HEDS-8934	

Quick Guide - Integrated Circuits^{1,2}

Product Type		Integrated Circuits ^{1,2}		
General Encoder Type Form Function Type/Size	Symbol	Decoder		
		Quadrature Decoder / Counter Interface IC		
Product Part Number		HCTL-2032 - SC HCTL - 2022	HCTL-2001-A00 HCTL-2017-A00/PLC HCTL-2021-A00/PLC	AEIC-7272/7273/2631-S16 AELT-5000
Product Picture				
Package Type		32 pin - PDIP 32 pin - SOICC 20 pin - PDIP	16 pin - PDIP 20 pin - PDIP 20 pin - PLCC	16pin - SOIC
Number of Axes		1, 2	1	
Coordination between multiple HTCL-1100		-	-	
Power Dissipation (mw)	PD	-	-	
Binary Counter		8-bit, 16-bit, 24-bit, 32-bit	8-bit, 12-bit, 16-bit	
Motor Type/Encoder Input Type		Quadrature Output Incremental Frequency 5.5 MHz (Max) ¹⁵	Quadrature Output Incremental Frequency 2.3 MHz (Max) ¹⁵	Quadrature Output 800KHz
Functions				
Features		<ul style="list-style-type: none"> - 33 MHz clock operation - Programmable count mode / (1x,2x or 4x decode) - High noise immunity - Substantially reduced system software - Cascade output signal - Schmitt Trigger inputs and digital noise filter - TTL compatible I/O - Latched outputs - Index channel support - Single or dual axis support 	<ul style="list-style-type: none"> - 14 MHz clock operation - 4x Decoding - High noise immunity - Substantially reduced system software - Cascade output signal (HCTL-2021 Only) - Schmitt Trigger inputs and digital noise filter - TTL compatible I/O - Latched outputs - Index channel support - Single axis 	<ul style="list-style-type: none"> - Operation to 800 KHz - CMOS and TTL Compatible Inputs - Optional single supply operation for moderate power applications - High Impedance Buffered Inputs with hysteresis - Tri-State outputs
Absolute Maximum Rating				
Storage Temperature (°C)	T _S	-55 to 150	-55 to 150	
Operating Temperature (°C)	T _A	-40 to 100	-40 to 85	-55 to 125 (AEIC-7272/7273-S16) -40 to 125 (AEIC-2631-S16)
Supply Voltage (V)	V _{DD}	-0.3 to 6.0	-0.3 to 6.0	4.75 to 30 (AEIC-2631-S16) 3.5 to 30 (AEIC-7272/7273-S16)
Input Voltage (V)	V _{IN}	-0.3 to V _{DD} +0.3	-0.3 to V _{DD} +0.3	
Maximum Operating Clock Frequency	f _{CLK}	33 MHz	14 MHz	800kHz
Recommended Operating Condition				
Temperature (°C)	T	25	25	25
Supply Voltage (V)	V _{DD}	4.5 to 5.5	4.5 to 5.5	4.75 to 30 (AEIC-2631-S16) 3.5 to 30 (AEIC-7272/7273-S16)
Supply Current	I _{DD}	1µA	1µA	

Quick Guide - Encoder Module^{1,2}

Product Type		Encoder - Module ^{1,2}				
General Encoder Type Form Function Type/Size	Symbol	Rotary Encoder				
		Absolute				
		Single-Turn				
Product Part Number		AEAT-7000	AEAT-9000	AEAT-60xx	AEAT-84AD	AEAT-86AD
Product Picture						
Fit						
Bore / Shaft Diameter ³ (mm)		8		6	Pineon Gear Module 0.3 ⁴	Pineon Gear Module 0.3 ⁴
SMT		-		-	-	-
Modular		Yes	Yes	Yes	Yes	Yes
Overall Dimension ⁵ (mm)		56x23 (ØxH)		23x23 (ØxH)	55x12.2 (ØxH)	55x13.3 (ØxH)
Lead free		Yes	Yes	Yes	-	-
Resolution						
Ranges: (Cycle per Revolution) ^{6,7}		up to 13 bits	up to 17 bits	10, 12 bits	12, 14 bits	12, 14 bits
(Line per Inch)		-			-	-
Currently available option (Cycle per Revolution) ²		13 bits	17 bits	10, 12 bits Binary/ Gray Serial	12, 14 bits Multiplexed	12, 14 bits Binary/ Gray Serial
(Line per Inch) ⁸		-		-	-	-
Codewheel / Codestrip⁹ CW						
Optical Radius(mm)	Rop	Ø43 mm ⁵		-	-	-
Part number ¹⁰		Codewheel included	HEDG-9000-H13 HEDG-9000-H14 Refer to factory for more information	-	-	-
Enclosure Type						
Ingress Protection Rating		-		-	-	-
Output Refer to datasheet Refer to datasheet Refer to datasheet Refer to datasheet						
TTL Compatible		-		-	-	-
Transmission		Serial		Serial	-	-
No of Channels		2		-		
Absolute Maximum Ratings						
Storage Temperature (°C) ¹³	Ts	-40 to 100	-40 to 85	-40 to 125	-40 to 125	-40 to 125
Operating Temperature (°C) ¹³	Ta	-40 to 100	-40 to 115	-40 to 125	-40 to 125	-40 to 125
Supply Voltage (V)	Vcc	-0.3 to +6.0	4.5 to 5.5	5.0	-0.3 to +6.0	-0.3 to +6.0
Output Voltage (V)	Vo	-0.3 to VD+0.3	-0.3 to VD+0.3	-	-0.5 to + Vcc +0.5	-0.5 to + Vcc +0.5
Recommended OperatingCondition						
Temperature (°C) ¹³	T	-40 to 85	-40 to 115	-40 to 125	-40 to 125	-40 to 125
Supply Voltage (V)	Vcc	5.0	5.0	+4.5 / +5.5	5.0	5.0
Count Frequency (kHz) ¹⁴	f	16MHz ¹⁵		-	-	-
Accessories and Tools						
Alignment Tools		HEDS-8933 Refer to factory	HEDS-8949	HEDS-8934	-	-
Gapping Tools		-			-	-

Notes:

1. This is an overview of product range and specifications. For further product details and a complete list of distributors, please visit our web site at <http://www.avagotech.com/motioncontrol>
2. Data subject to change. Please refer to the latest datasheets available in our website.
3. Refer to factory for different product shaft or bore diameter sizes (this refers to the inner diameter of the bore, unless specified otherwise).
4. AEAT-8xAD series uses mechanical pinion gear for its mechanical linkage. Please refer to factory for further details.
5. Data shown is an approximation of the actual dimensions. (W = width, L=length, H= height, Ø = diameter).
6. All given resolution is *before* full 4X multiplication or quadrature decode. For example, 2048 CPR (cycle per revolution) can be further decoded to 8192 PPR (pulse per revolution).
7. The resolution shown is typically based on CPR (Cycle Per Revolution), unless specified otherwise .
8. For linear encoder option.
9. As some modular encoders can be used as both rotary and linear encoder, these encoders may be coupled with codewheel or codestrip dependent on application.
10. As there are diversified design of matching codewheels or codestrips, please refer to factory for further details. General information can be found in HEDS-51X0/61X0 series two and three channel codewheels.
11. Dimensions shown are referring to encoder module size only, excluding the codewheel size.
12. Two channels of analog / digital output are available.
13. The temperature range shown may vary as it is dependent on selected options and type of codewheels.
14. The count frequency may vary according to different part numbers and options. The specified value indicates the maximum count frequency allowed.
15. This refers to the response frequency of the encoder.

Customized Solutions

Avago Technologies can provide you with the right solution for your applications. If you don't see the exact encoder you need, visit our website and use our "Request Customization" form to tell us exactly what you need.

Our technical experts will contact you shortly to discuss your requirements.

Discover More

Useful and In-Depth Product Details:

- Block Diagrams
- Datasheets
- Application Notes
- White Papers

Motion Control Encoders Information:

- How-To's
- Assembly Processes
- Applications
- Flash/ Video Clips
- Webinars

Sales Collaterals:

- Selection Guide
- Design Guide

Avago's Website is Constantly Updated with:

- New Products
- Technical Literatures
- Tradeshows
- Press Releases

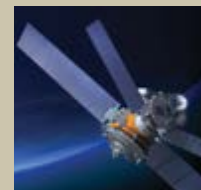
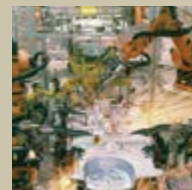
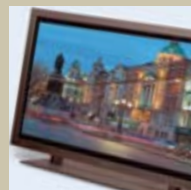
Stay up-to-date on the latest products and technologies by subscribing to Avago's electronic monthly newsletter, and receive information about new literature, applications, design tools, seminars and events. To sign up, go to: http://www.avagotech.com/pages/contact/newsletter_signup/.

For additional product information, visit www.avagotech.com/motioncontrol.

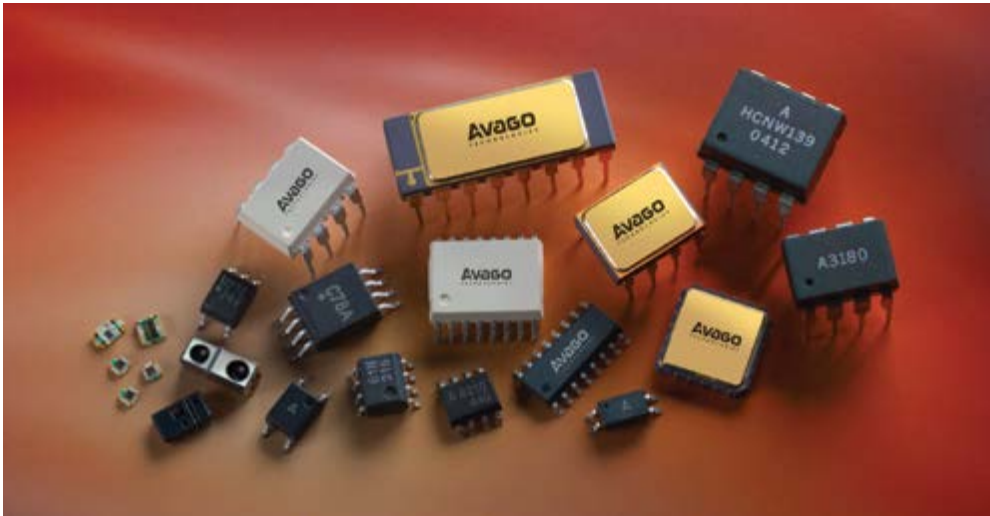
Optoisolation Products

- 201 Quick Guide to Direct Upgrades
- 206 Product Selection Trees
- 209 Multi-Channel & Bi-Directional Digital Optocoupler
- 210 High Speed Digital CMOS Logic Gate Optocoupler
- 212 20 MBd Logic Gate Optocoupler
- 213 10 MBd Logic Gate/CMOS Optocoupler
- 216 8 MBd Logic Gate Optocoupler
- 217 5 MBd Logic Gate Optocoupler
- 219 1 MBd Transistor Output Optocoupler
- 220 100 kBd Darlington Transistor Output Optocoupler
- 221 R²Coupler™ (High Temperature, Automotive Grade)
- 226 Digital Isolator
- 227 Miniature Analog Isolation Amplifier
- 230 Integrated Gate Drive Optocoupler
- 234 Intelligent Power Module Interface Optocoupler
- 237 Isolated Line Receiver
- 238 Isolated 20 mA Current Loop Transmitter/Receiver
- 239 Isolated Voltage/Current Detector
- 240 High Linearity Analog Optocoupler
- 241 Wideband Analog/Video Optocoupler
- 242 Powerline Communication Interface
- 243 Hermetic High Performance Optocoupler
- 247 **Package Drawings**
- 253 **Function vs Application Matrix**

- Optical Sensors**
- 255 Proximity and Ambient Light Sensors



Optoisolation and Optical Sensor Products

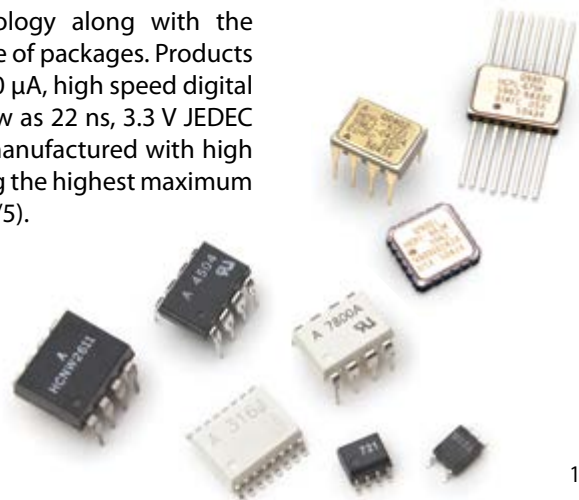


Avago Technologies optocouplers can be used in an array of isolation applications ranging from power supply and motor control circuits to data communications and digital logic interface circuits.

The primary purpose of an optocoupler is to provide both electrical insulation and signal isolation. The popularity of Avago Technologies optocouplers is due to cost effective innovations in these areas.

Optocouplers eliminate the effects of electrical noise caused by crosstalk, power glitches and electrical interference. They provide high voltage isolation allowing safe interface between high and low voltages in electrical circuits. They are also used for shifting logic levels. Avago Technologies' key products include optocouplers with phototransistor output, digital and analog output, high speed and high gain performance, drivers for isolated gate transistors and intelligent power modules, smart current sensors, solid state relay (Photo MOSFET) and other application specific devices.

Avago Technologies offers the industry's best isolation technology along with the industry's leading CMR performance of up to 40 kV/ μ s in a broad line of packages. Products include the lowest power dissipation with input current as low as 40 μ A, high speed digital optocouplers operating at up to 50 MBd, propagation delays as low as 22 ns, 3.3 V JEDEC compatible optocouplers. Avago Technologies' optocouplers are manufactured with high quality and reliability and have worldwide safety approvals including the highest maximum insulation voltage (VIORM) at 2262 V (per IEC/EN/DIN EN 60747-5-2/5).



Avago Technologies offers a broad range of isolation products that provide performance features and benefits that are unmatched in the industry for industrial, computing, consumer, communication, medical, military and aerospace markets.

Applications for Avago Technologies' Isolation Products

Industrial

The widest portfolio of optocouplers to meet the extensive requirements of applications in factory automation.

- Automated test equipment
- Battery operated vehicle
- Fieldbus
- Industrial communications
- Industrial networking
- Motor control
- PLC input/output isolation
- Power distribution systems
- Power generation
- Renewable energy power generation
- Robotics
- Switching panel
- Switching power supplies
- Test and measurement equipment

Automotive

Avago Technologies automotive R²Coupler™ are AEC-Q100 qualified with applications in:

- Automotive and shipboard system CANBus interface isolation
- Motor inverter drives
- DC-DC converters/inverters for battery chargers
- Battery/inverter voltage monitoring
- Status/fault signal feedback isolation interface
- Heating, ventilation and air-conditioning

Medical

Avago Technologies offers optocouplers with high linearity and high resolution for severe isolation requirements to:

- Defibrillators
- ECG/EKG
- Endoscopes
- Magnetic resonance imaging
- Patient monitoring

Computers and Office Equipment

Avago Technologies' optocouplers with CMOS compatibility and high speed are used to provide interface isolation for:

- Isolated input/output module
- Isolated USB hub
- Printers and plotters

Communications

Avago Technologies provides high speed optocouplers in both single and dual surface-mount packages which are used in:

- Automated metering reading
- Digital cross connect
- Distributed power architecture
- ISDN
- Modems
- PBX and central office
- Power line communication
- Power over ethernet

- Telephone switching equipment
- Telephone terminal equipment
- Wireless base station

Consumer Electronics

Avago Technologies offers lower solution costs with highly integrated optocouplers for many consumer applications, such as:

- Air conditioning
- Alarm systems
- Audio and video equipment
- Electronic gaming
- Fitness equipment
- Induction cookers
- Plasma displays
- Washing machines

Military and Aerospace

Avago Technologies' high reliability hermetic optocouplers are suitable for military, aerospace and harsh industrial applications such as:

- Switching power supplies /UPS
- Motor control
- Field bus
- Inverters
- Power distribution
- Communications

Quick Guide to Direct Upgrades

Upgrade Part	Feature	Benefit
High Voltage Insulation		
Improved Isolation/Insulation Ability to protect surrounding circuitry against physical damage resulting from differential voltages.	ACNV family offers highest available working voltage ratings with regulatory approval per IEC/EN/DIN EN 60747-5-2/5 of 2262 V peak.	Meets international safety regulations and standards. Provides better isolation and overall safety performance.
Noise Isolation		
High CMR Common-mode transient rejection or signal isolation of data through suppression of noise transients.	Offers guaranteed CMR performance up to 50 kV/μs which is the highest available in the market.	Improves system performance, and reliability. More robust systems and better data integrity meet EMI and ESD requirements.
Power Consumption		
Drive Current, I_f Low Drive Current, LED drive current.	Offers the lowest I_f (as low as 40 μA) devices in the market and broadest HCMOS compatibility.	Eliminates additional LED drive circuitry. Improves system efficiency and reduces power consumption and LED degradation.
Lower Power Supply Lower power supply (3.3V)	Lower the power consumption and meets JEDEC low voltage requirements.	Up to 50% energy saving.
Flexible Supply Voltages (3.3V/5V)	Support a combination of two different supply voltages at the input and output.	Built-in internal level shifter , eliminate the need of extra power supply. 3.3V or 5V. 3.3V helps to improve the overall power consumption.
Temperature		
Temperature The DC, speed performance and the reliability information is ensured at the specific temperature range.	Support up to -55°C to 125°C temperature range.	Allow extreme temperature operation.
Speed Benefits		
Propagation Delay, tp Describes how quickly a logic signal can propagate through the system.	High speed digital optocouplers to meet wide range of applications with tp as low as 22 ns .	Increase switching efficiency and better speed performance.
Upgrade Pulse Width Distortion, PWD PWD is the difference between t _{PHL} and t _{PLH} and often determines the maximum data rate capability of a transmission system.	The lowest PWD offered by optocoupler is 2 ns .	To ensure signal data integrity over long bus line.
Packages for Space Savings		
Multi-Channels, Bi-directional Features	Integrated dual, triple, quad with bi-directional channels offers in small S08 and S016 package.	The integrated bi-directional channels help in space savings and ease of designs.
Surface Mount Device SMD permits more component density than DIP.	Smaller package to deliver the same functionality as standard DIP. True surface mount technology and standard footprint.	Lower assembly cost , easier and faster handling as well as better solderability.
8mm Clearance/Creepage (C/C) Packages	The package is 50% smaller than conventional DIP package. It can withstand high isolation voltages and meet regulatory requirements such as IEC/UL/CSA standards.	Provides space savings . Allows high voltage surge protection. Meets many IEC/UL/CSA equipment standards that call for clearance and creepage of 8mm .
Smaller S05 Package	Smaller S05 package (as compared to existing S0-8 package)	Provides greater than 40% space savings .

Upgrade Parts

Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
High Speed Family (>12.5MBd)			
ACPL-072L HCPL-0710/0720/0721	ACSL-7210 ACPL-077L	<ul style="list-style-type: none"> Better noise rejection (CMR) performance Dual supply voltages (3.3V/5V) Wide temperature (-40°C to 105°C) Compactness - Bi-directional dual-channel, low profile height 2mm (ACSL-7210) 	Drop-in replacement (A CPL-077L) Smaller footprint (ACSL-7210)
HCPL-7710/7720/7721	ACPL-772L	<ul style="list-style-type: none"> Dual supply voltages (3.3V/5V) Wide temperature (-40°C to 105°C) Lower PWD (<6ns) 	Drop-in replacement
HCPL-0708 HCPL-0738	ACPL-071L ACPL-074L	<ul style="list-style-type: none"> Dual supply voltages (3.3V/5V) Better timing specs (<40ns) Wide temperature (-40°C to 105°C) 	Drop-in replacement
HCPL-0708	ACPL-M75L	<ul style="list-style-type: none"> Dual supply voltages (3.3V/5V) Better timing specs (<40ns) Wide temperature (-40°C to 105°C) 	Smaller footprint
HCPL-2400 HCPL-2430	ACPL-W70L ACPL-K73L	<ul style="list-style-type: none"> Dual supply voltages (3.3V/5V) Better timing specs (<40ns) Wide temperature (-40°C to 105°C) Higher working insulation and isolation voltages 	Smaller footprint

10MBd Family

ACPL-M60L HCPL-M600/M601/M611	ACPL-M61L	<ul style="list-style-type: none"> Up to 80% power consumption saving Ultra low forward current (IF) to allow direct drive from microcontroller Wider temperature range (-40°C to 105°C) CMOS output to eliminate pull-up resistor Wider supply voltage (2.7V to 5.5V) 	Pin to Pin (SO-5 package) (no pull-up resistor is required)	
HCPL-060L/061A/061N HCPL-0600/0601/0611			Smaller footprint (SO-5 vs SO-8)	
HCPL-063A/063L/063N/0630 HCPL-0631/0661	ACPL-064L	<ul style="list-style-type: none"> Part specific: Higher working insulation voltage 1140Vpk, isolation 5000Vrms with smaller footprint (ACPL-W61L/K64L) Open-drain output (ACPL-M62L) Enable pin included (ACPL-061L/C61L/ACNW261L) 	Pin to Pin (SO-8 package) (no pull-up resistor is required)	
ACPL-W60L/W611/P611 HCPL-260L/2601/2611/261A/261N	ACPL-W61L		Pin to Pin (stretched SO-6 package) (no pull-up resistor is required) Smaller footprint (stretched SO-8 vs 300mil DIP-8)	
ACPL-K63L HCPL-263A/263L/263N/2630/2631 HCPL-4661	ACPL-K64L	<ul style="list-style-type: none"> Part specific: Higher working insulation voltage 1140Vpk, isolation 5000Vrms with smaller footprint (ACPL-W61L/K64L) Open-drain output (ACPL-M62L) Enable pin included (ACPL-061L/C61L/ACNW261L) 	Pin to Pin (stretched SO-8 package) (no pull-up resistor is required) Smaller footprint (stretched SO-8 vs 300mil DIP-8)	
ACPL-M60L HCPL-M600/M601/M611	ACPL-M62L		Pin to Pin (SO5 package)	
HCPL-060L/061A/061N HCPL-0600/0601/0611			Smaller footprint (SO-5 vs SO-8)	
HCPL-060L/061A/061N HCPL-0600/0601/0611	ACPL-061L		Pin to Pin (SO-8 package) (no pull-up resistor is required)	
ACPL-W60L/W611/P611 6N137, HCPL-260L/2601/2611 HCPL-261A/261N	ACPL-C61L		Smaller footprint (no pull-up resistor is required)	
HCNW137/2601/2611	ACNW261L		Pin to Pin (400mil DIP-8 package) (no pull-up resistor is required)	
HCPL-0600/01/11/1A/1N HCPL-M600/01/11 HCPL-2601/11/1A/1N HCPL-260L/3L HCPL-0630/31/3A/3N/61 HCPL-2630/31/3A/3N HCPL-4661 HCPL-7601/11	ACSL-6210/6300/6310/6400/6410/6420		<ul style="list-style-type: none"> Multi-channel, bidirectional Wide temperature (-40°C to 100°C) Flexible supply voltages (3.3V/5V) 	Smaller footprint
HCPL-M611	ACPL-M61U R2Coupler™		<ul style="list-style-type: none"> Wide temperature (-40°C to 125°C) Low LED input drive current IF=10mA 	Drop-in replacement

Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
----------------	---------------	------------------	-----------------------

1MBd Family

HCPL-050L/0500/0501	ACPL-M50L	<ul style="list-style-type: none"> • 80% power consumption saving • Low forward current (IF > 3mA min) • High CTR ratio >90% min @ IF=3mA • Wide temperature range (-40°C to 105°C) • Wide supply voltage (2.7V to 24V) • Excellent CMR performance 15kV/μs @ Vcm 1500V • Part specific (For ACPL-W50L/K54L): Offer higher working insulation voltage 1140 V_{peak} isolation voltage, 5000Vrms 	Smaller footprint
HCPL-053L/0530/0531	ACPL-054L		Drop-in replacement
6N135, 6N136 HCPL-250L/2502/2503	ACPL-W50L		Smaller footprint
HCPL-253L/2530/2531/2533	ACPL-K54L		Smaller footprint

5MBd Family

HCPL-0201/0211	ACPL-M21L ACPL-021L	<ul style="list-style-type: none"> • Low Forward Current (IF@1.6mA min), allowing direct drive from microcontroller without an input buffer • Low Supply Current (IDD@1.1mA max) • Low Supply Voltages (VDD @ 2.7 – 5.5V), with support to go lower to 2.5V • S05 package to reduce PCB board space and cost • Min CMR at 25kV/μs @ Vcm 1000V to preserve data integrity under noisy environment • Wide Temperature range up to 105 °C for robust temperature environments 	Smaller footprint Drop-in replacement
HCPL-2231/2232	ACPL-024L ACPL-K24L ^		Smaller footprint
HCPL-2200/2201/2202/2211/2212/2219	ACPL-W21L ^		

Miniature Analog Isolation Amplifier

HCPL-7860 HCPL-786J	ACPL-C797	<ul style="list-style-type: none"> • Wide operating temperature (-40 to +105°C) • More accurate clock (10 MHz ± 10%) • Input offset voltage (0.3 mV typ) • Offset drift (1.5 μV/°C typ) • 3V to 5.5V wide supply range for digital interface 	Smaller footprint
HCPL-7800A/7800/7840	ACPL-C79B/C79A/C790	<ul style="list-style-type: none"> • ±0.5%/±1%/±3% gain accuracy • 30% smaller package size • 8 mm Creepage and Clearance • 1414 V_{peak} working insulation voltage 	Smaller footprint Higher isolation
	ACPL-C78A/C780/C784	<ul style="list-style-type: none"> • 30% smaller package size • 8 mm Creepage and Clearance • 1414 V_{peak} working insulation voltage 	Smaller footprint Higher isolation
	ACPL-C87B/C87A/C870	<ul style="list-style-type: none"> • ±0.5%/±1%/±3% gain accuracy • 0 – 2V Input Range for Voltage Sensing • 1Gohm input impedance • 8 mm Creepage and Clearance • 1414V_{peak} working insulation voltage 	Optimised for Voltage Sensing. Smaller Footprint Higher Insulation
HCPL-7520	HCPL-7510	<ul style="list-style-type: none"> • ±3% gain accuracy 	Drop-in replacement

Upgrade Parts

Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
Highly Integrated Smart Gate Drive Optocoupler			
HCPL-316J	ACPL-302J [^]	<ul style="list-style-type: none"> Integrated DC-DC Controller for floating power supply Rail-to-Rail output voltage DESAT and UVLO detection with isolated fault feedback Integrated Active Miller Clamp 	Pin layout change
	ACPL-337J [^] ACPL-336J [^]	<ul style="list-style-type: none"> Up to 4A maximum peak output current Rail-to-Rail output voltage DESAT and UVLO detection with isolated fault feedback Integrated LED Driver Integrated Active Miller Clamp 	Pin layout change
	ACPL-339J	<ul style="list-style-type: none"> Scalable & Efficient gate drive design Dual Rail-to-Rail output to drive external MOSFET buffer Active timing control to prevent cross conduction in MOSFET buffer DESAT and UVLO detection with isolated fault feedback 	Pin layout change
	ACPL-330J ACPL-331J ACPL-332J ACPL-333J	<ul style="list-style-type: none"> Integrated Active Miller Clamp Lower Propagation Delay (<250ns) Low PWD (<100ns) Direct LED drive without Buffer 	Pin layout change

Basic Gate Drive Optocoupler

HCPL-3120 HCPL-3180 HCPL-3150	ACPL-312U R ² Coupler™	<ul style="list-style-type: none"> Extended operating temperature -40°C to 125°C 	Drop-in replacement
	ACPL-P346 ACPL-W346	<ul style="list-style-type: none"> Power & SiC MOSFET Gate Drive Rail-to-Rail output voltage Low Propagation Delay (<120ns) Very High CMR (50kV/μs) 	Smaller footprint
	ACPL-P341 ACPL-W341 ACPL-P343 ACPL-W343	<ul style="list-style-type: none"> Up to 4A maximum peak output current Rail-to-Rail output voltage Low Propagation Delay (<200ns) 50% smaller package size 	Smaller footprint
	ACPL-H342 ACPL-K342	<ul style="list-style-type: none"> Rail-to-Rail output voltage Integrated Active Miller Clamp Lower Propagation Delay Anti-Cross conduction Very High CMR (40kV/μs) 	Smaller footprint
HCPL-3120 HCPL-J312 HCNW3120	ACPL-3130 ACPL-J313 ACNW3130	<ul style="list-style-type: none"> Very High CMR (40kV/μs) 	Drop-in replacement
	ACNW3410 [^]	<ul style="list-style-type: none"> Rail-to-Rail output voltage Low Propagation Delay Very High CMR 	Drop-in replacement
	ACNV3130	<ul style="list-style-type: none"> 13mm Creepage and 13mm Clearance High Working Voltage $V_{IORM} 2262V_{PEAK}$ High Insulation Voltage $V_{ISO} 7500V_{RMS}$ High CMR 40kV/μs 	Larger footprint to achieve higher creepage and clearance
HCPL-3140 HCPL-0314 HCPL-J314	ACPL-P314 ACPL-W314	<ul style="list-style-type: none"> Low Propagation Delay 	Smaller footprint
	ACPL-P345 ACPL-W345 ACPL-P340 ACPL-W340	<ul style="list-style-type: none"> 1A maximum peak output current Rail-to-Rail output voltage Low Propagation Delay (ACPL-x345 MOSFET Drive <120ns, ACPL-x340 IGBT Drive <200ns) 50% smaller package size 	Smaller footprint
HCPL-3020 HCPL-0302	ACPL-P302 ACPL-W302	<ul style="list-style-type: none"> 50% smaller package size 8mm Creepage and Clearance (ACPL-W302) 	Smaller footprint
HCPL-3120 / HCPL-J312 / HCNW3120 + External Transistor Stage for Higher Current Output	ACNW3190	<ul style="list-style-type: none"> 5A maximum peak output current Wide temperature (-40°C to 100°C) 	Pin layout change

Note: [^] - Advance information, subject to change without notice.

Existing Parts	Upgrade Parts	Upgrade Features	Footprint Information
----------------	---------------	------------------	-----------------------

Intelligent Power Module Interface Optocoupler

HCPL-4502 HCPL-4503	ACPL-K453	<ul style="list-style-type: none"> • 8mm Creepage and Clearance • 50% smaller package size 	Smaller footprint
HCPL-4504	ACPL-W454	<ul style="list-style-type: none"> • 8mm Creepage and Clearance • 50% smaller package size 	Smaller footprint
	ACPL-P454	<ul style="list-style-type: none"> • 8mm Creepage • 50% smaller package size 	Smaller footprint
HCPL-4506	ACPL-W456	<ul style="list-style-type: none"> • 8mm Creepage and Clearance • 50% smaller package size 	Smaller footprint
	ACPL-P456	<ul style="list-style-type: none"> • 8mm Creepage • 50% smaller package size 	Smaller footprint
ACPL-4800 ACPL-P480 ACPL-W480	ACPL-W484 ACPL-W483	<ul style="list-style-type: none"> • Higher CMR 30kV/μs • 10MBd speed • Totem-pole output, positive logic (W484) inverting logic (W483) • 8mm Creepage and Clearance • 50% smaller package size 	Smaller footprint Faster speed
	ACPL-P484 ACPL-P483	<ul style="list-style-type: none"> • Higher CMR 30kV/μs • 10MBd speed • Totem-pole output, positive logic (P484) inverting logic (P483) • 8mm Creepage • 50% smaller package size 	Smaller footprint Faster speed
HCPL-M452/3/4/6	ACPL-M484	<ul style="list-style-type: none"> • Higher CMR 30kV/μs • 10MBd speed • Totem-pole output, positive logic 	Faster speed
HCPL-4502/03/04/06 HCPL-0452/53/54/66	ACPL-W484	<ul style="list-style-type: none"> • 8mm Creepage and Clearance • Higher CMR 30kV/μs • 10MBd speed • Totem-pole output, positive logic 	Faster speed
HCNW4502/03/04/06	ACNV4506	<ul style="list-style-type: none"> • 13mm Creepage and Clearance • Higher Working Voltage V_{iorm} 2262Vpk • Higher CMR 30kV/μs • Totem-pole output, positive logic 	Higher Working Voltage
HCPL-M452/53/54	ACPL-M43U	<ul style="list-style-type: none"> • Wide temperature (-40°C to 125°C) • Low LED input drive current IF 10mA 	Drop-in replacement
HCPL-M456	ACPL-M46U	<ul style="list-style-type: none"> • Wide temperature (-40°C to 125°C) 	Drop-in replacement

Note:

Drop-in replacement means no PCB board redesign is required,

Pin-to-Pin means the footprint is same but requires minimum PCB board redesign (eg. Removing of external resistor)

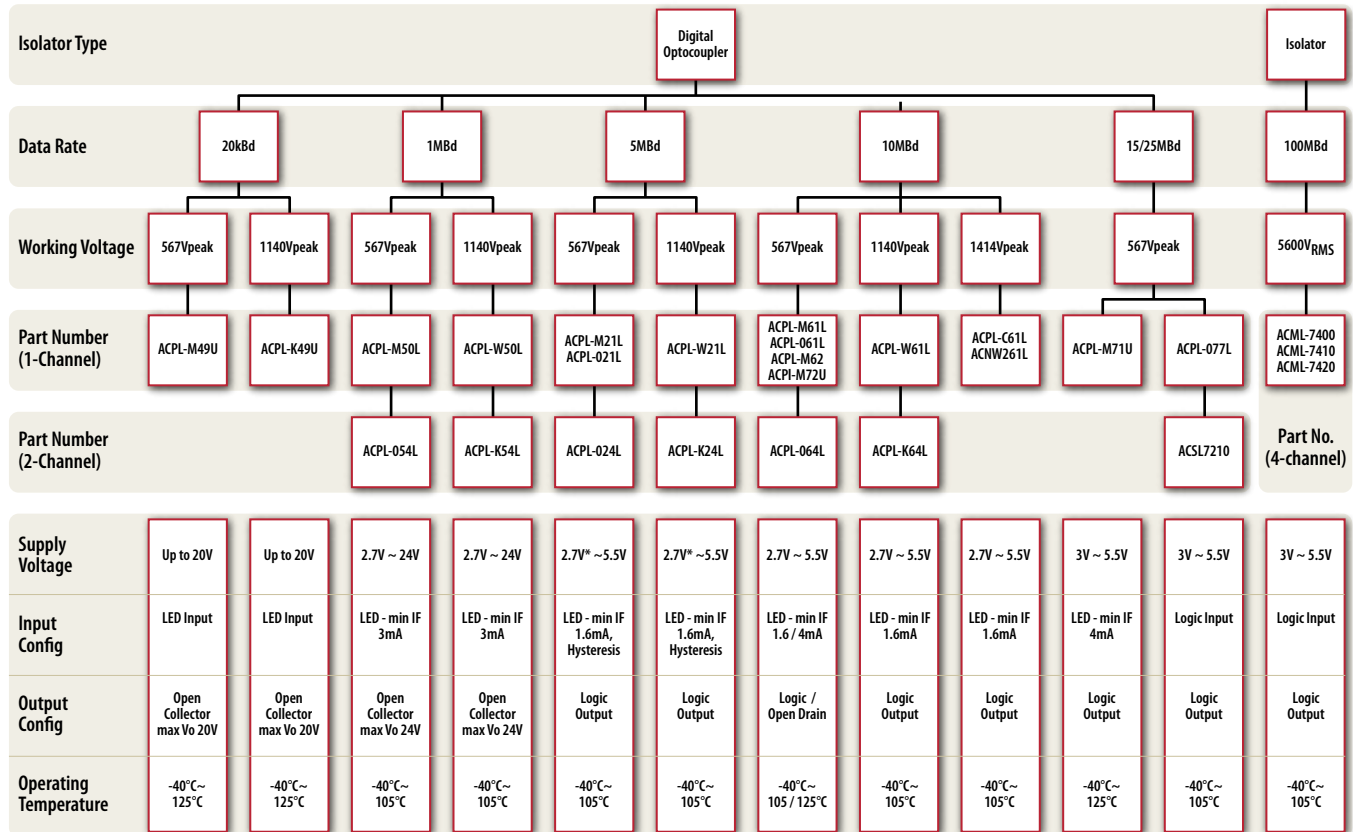
* Lower speed

^ Advanced information, may subject to changes.

Optoisolation and Optical Sensor Products

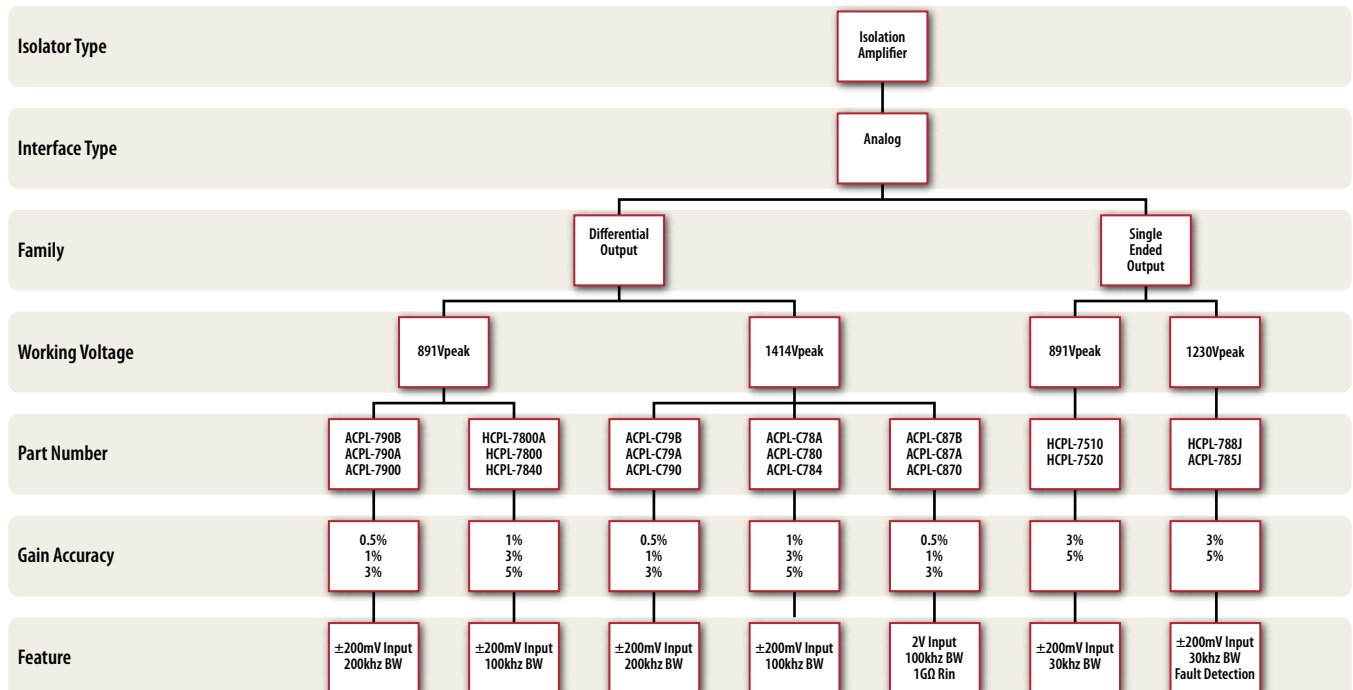
Product Selection Trees

Digital Optocoupler NPI Product Tree



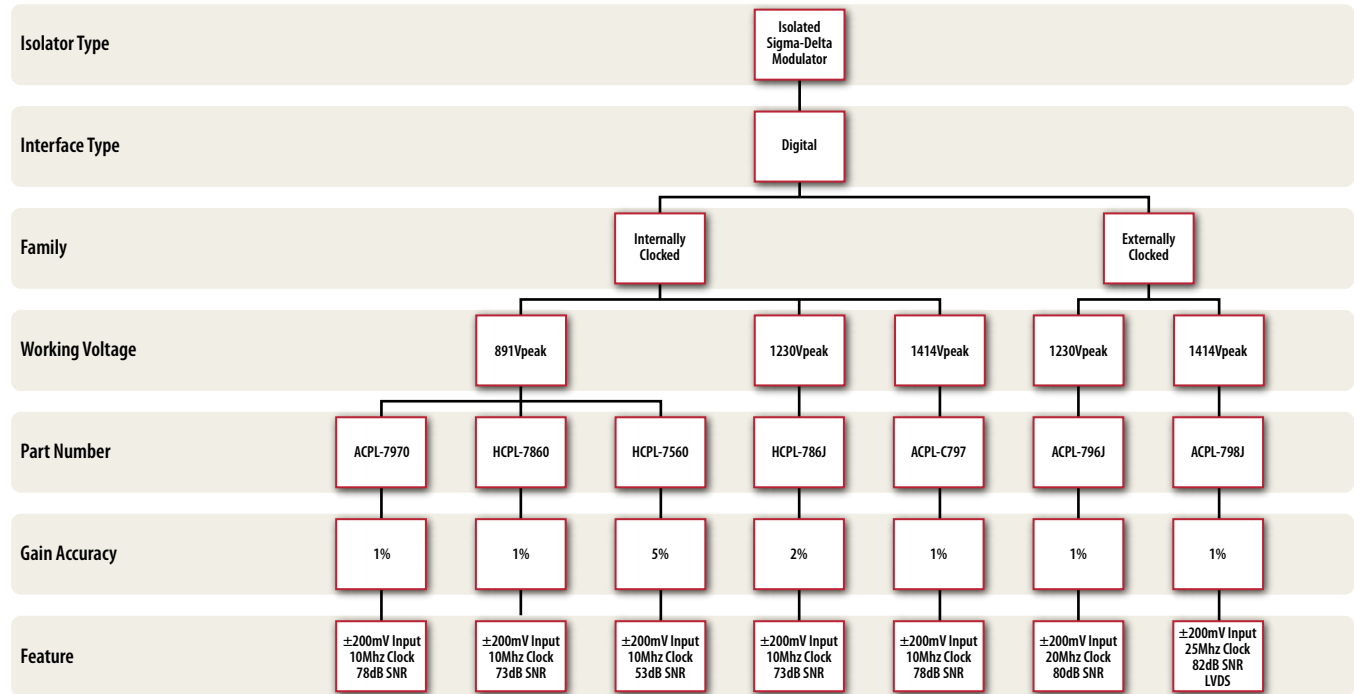
* - 2.5V option available

Isolation Amplifier Product Tree

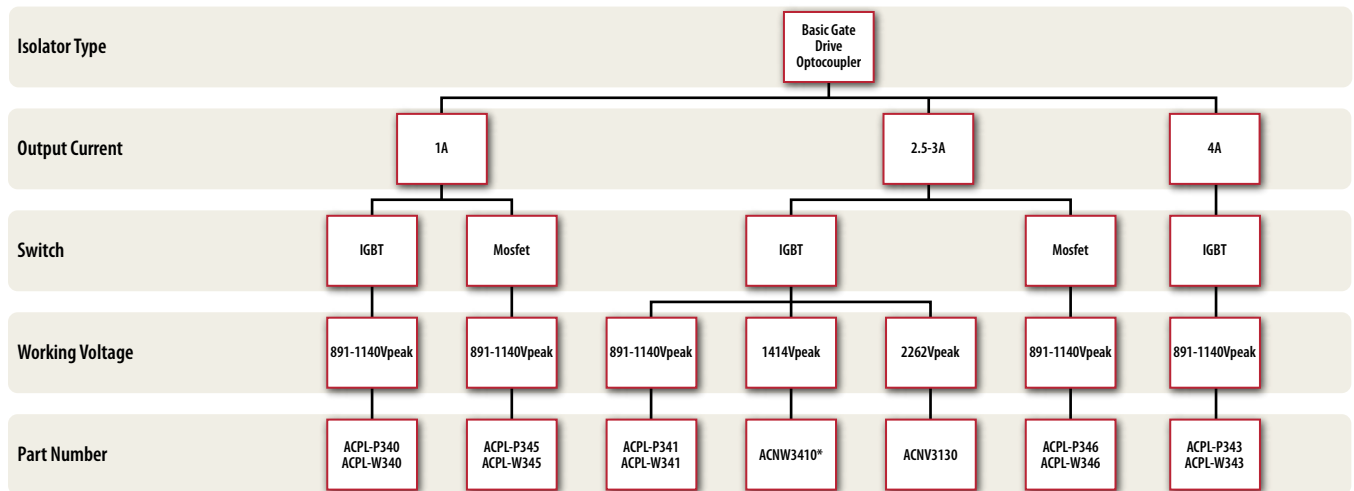


Optoisolation and Optical Sensor Products

Isolated Sigma-Delta Modulator Product Tree



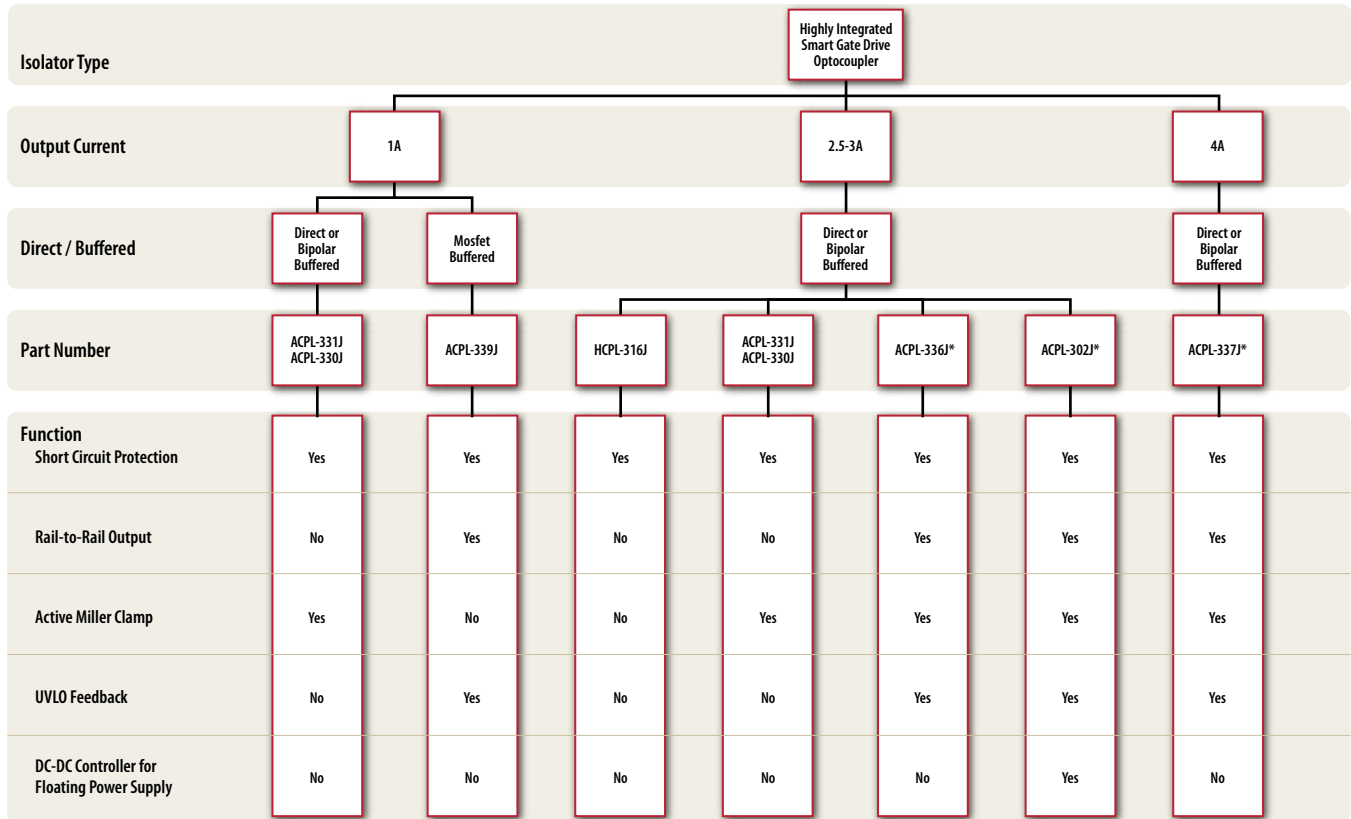
Gate Drive Optocoupler NPI Product Tree



Note: * - Advanced information, may be subject to changes.

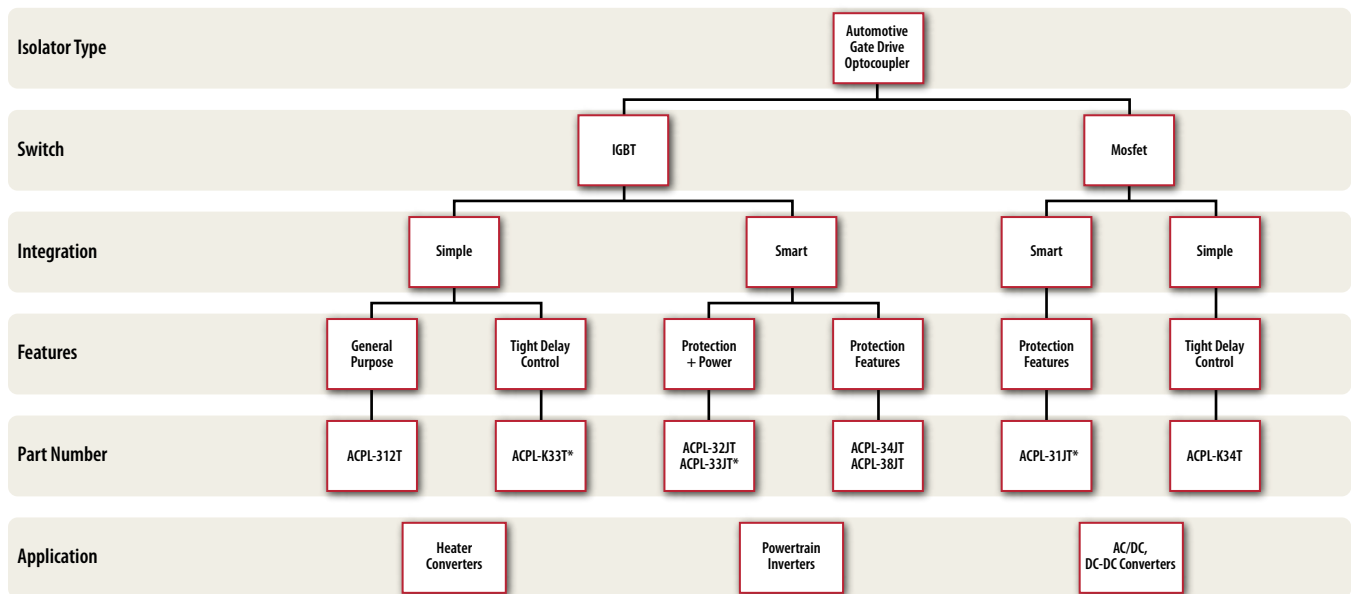
Optoisolation and Optical Sensor Products

Gate Drive Optocoupler NPI Product Tree



Note: * - Advanced information, may be subject to changes.

Automotive Gate Drive Optocoupler NPI Product Tree



Note: * - Advanced information, may be subject to changes.

Optoisolation and Optical Sensor Products



Applications

- Full duplex communication
- Isolated line receiver
- Computer-peripheral interfaces
- Microprocessor system interfaces
- Digital isolation for A/D and D/A conversion
- Switching power supply
- Instrument input/output isolation
- Ground loop elimination
- Pulse transformer replacement

Multi-Channel Bi-Directional Digital Optocoupler

Description

The ACSL-6xx0 series are optoisolated, multi-channel and bidirectional, high-speed optocouplers. Integration of multiple optocouplers in monolithic form is achieved through patented process technology. These devices provide full duplex and bidirectional isolated data transfer and communication capability in compact surface mount packages. They are available in a 15Mbd speed option, wide supply voltage range and wide temperature range.

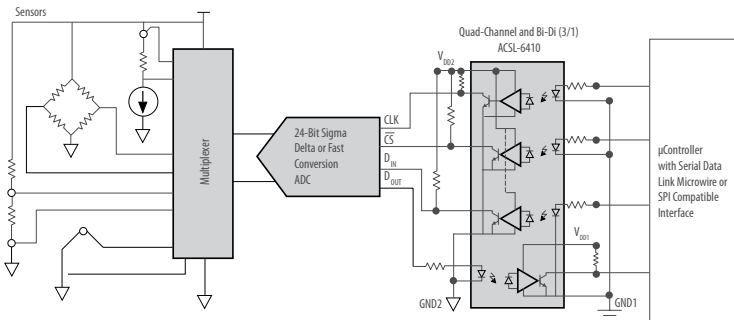
The isolated data acquisition system is ideal for digitizing the output of the sensors that operate in hostile environment. The ADC is a 24-bit sigma delta or fast conversion type, converts the analog voltage to a digital number. The digital number represents

the input voltage in discrete steps with finite resolution. The quad-channel and bi-directional, ACSL-6410, provides high CMR of 10kV/μs and electrical isolation of 2500Vrms between the host system and the data acquisition circuitry and sensors. The power supply is also isolated, usually via a transformer to isolate the AC line voltage from the DC voltages generated to power the data acquisition system.

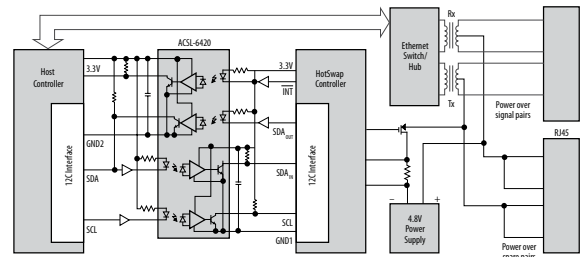
Benefits

- Higher integration - multi-channel provides small and thin packages for space savings; bi-directional channel facilitates pcb routing
- Wide voltage supply and temperature - provides design flexibility

Typical Block Diagram



Typical Power over Ethernet Diagram



Multi-Channel Bi-Directional Digital Optocoupler Product Selection

Part No.	Package	Channel	Forward Direction	Reverse Direction	I _{F(on)} mA Min.	t _{PLH} ns Max.	t _{PLH} ns Max.	P _{WD} ns Max.	t _{PSK} ns Max.	V _{CC} V Min.	V _{CC} V Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak	
												CMR V/μs (Min.)	V _{CM} V			
ACSL-7210	NEW	S08	2	1	1	—	40	40	8	20	3	5.5	25000	1000	3750	567*
ACSL-6210E		S08	2	1	1	7	100	100	35	40	3	5.5	10000	1000	2500	567*
ACSL-6400		S016	4	4	0	7	100	100	35	40	3	5.5	10000	1000	2500	567*
ACSL-6410		S016	4	3	1	7	100	100	35	40	3	5.5	10000	1000	2500	567*
ACSL-6420		S016	4	2	2	7	100	100	35	40	3	5.5	10000	1000	2500	567*
ACSL-6310		S016	3	2	1	7	100	100	35	40	3	5.5	10000	1000	2500	567*
ACSL-6300		S016	3	3	0	7	100	100	35	40	3	5.5	10000	1000	2500	567*

Notes: * - with IEC/EN/DIN EN 60747-5-2/5 Option 060.

Optoisolation and Optical Sensor Products



Applications

- AC plasma display panel level shifting
- CAN Bus
- CC_Link
- Microprocessor system interface
- Multiplexed data transmission
- Switching power supply

High Speed Digital CMOS Logic Gate Optocoupler

Description

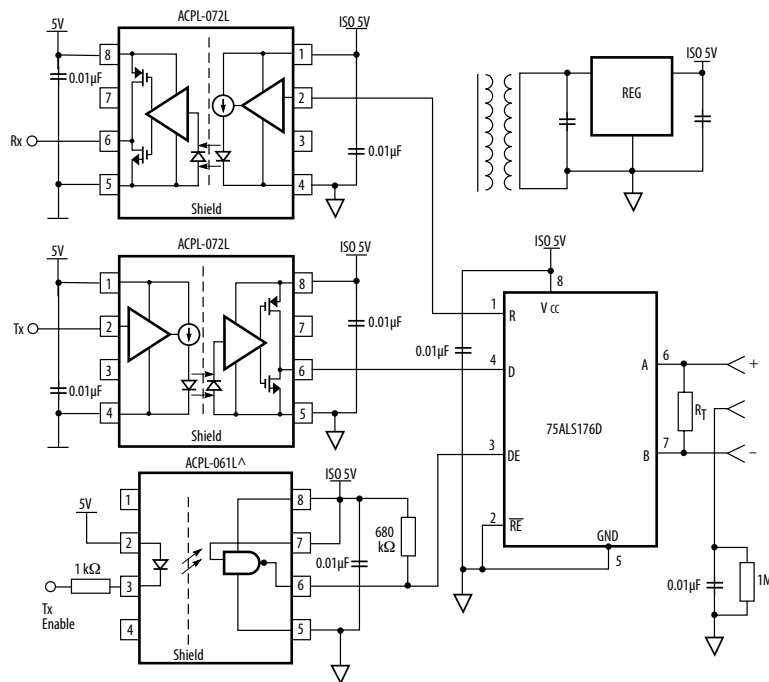
These optocouplers use the latest CMOS IC technology to achieve outstanding performance with very low power consumption. Serial fieldbuses are used today primarily as the communication system for the exchange of information between automation system and distributed field devices. PROFIBUS is the leading open fieldbus system and it has worldwide acceptance. PROFIBUS is essentially a twisted wire pair serial link that is very similar to RS 485. Profibus speed standard is either lower speed (1.5 MBd) or higher speed (12 MBd).

In this isolated multipoint transmission application circuit, two different optoisolators are utilized (HCPL-0721 and HCPL-061N). The benefits include low input drive current that maximizes LED lifetime/reliability and optimizes speed for Profibus and RS-485 applications.

Benefits

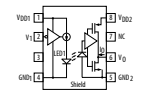
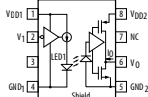
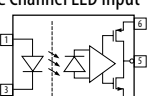
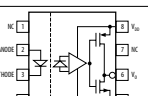
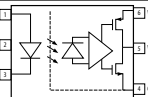
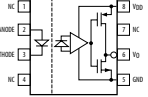
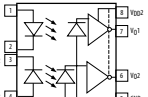
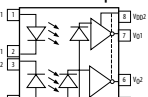
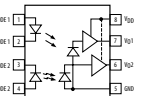
- High speed (up to 50 MBd)
- 3.3V/5V dual supply voltage available
- Wide temperature operation -40°C to 100°C (HCPL-x710)
- Low PWD (2ns) & low tp (22ns) to meet DeviceNet and Profibus application
- Buffer input and CMOS output to eliminate any pull-up resistor
- 5 kV isolation voltage (HCPL-77xx)
- Dual channel device is available to save space(HCPL-0738)
- Certified with reinforced insulation under IEC/EN/DIN EN 60747-5-2

Typical Profibus Block Diagram



Optoisolation and Optical Sensor Products

High Speed Digital CMOS Optocoupler Product Selection

Device	Part No.	Package	V _{DD} V	I _{F(on)} mA Min.	Max Data Rate MBd Min.	t _{PLH} ns Max.	t _{PHL} ns Max.	PWD ns Max.	t _{PSK} ns Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
										CMR V/μs (Min.)	V _{CM} V		
 Single Channel CMOS Input	ACPL-077L NEW	S08	3.3/5	—	25	40	40	6	20	35000	1000	3750	567*
	ACPL-072L	S08	3.3/5	—	25	40	40	6	20	10000	1000	3750	567*
	ACPL-772L	300 mil DIP8	3.3/5	—	25	40	40	6	20	10000	1000	3750/5000#	630*
 Single Channel LED Input	HCPL-0710	S08	5	—	12.5	40	40	8	20	10000	1000	3750	567*
	HCPL-0720	S08	5	—	25	40	40	8	20	10000	1000	3750	567*
	HCPL-0721	S08	5	—	25	40	40	6	20	10000	1000	3750	567*
	HCPL-0723	S08	5	—	50	22	22	2	16	10000	1000	3750	567*
	HCPL-7710	300 mil DIP8	5	—	12.5	40	40	8	20	10000	1000	3750/5000#	630*
	HCPL-7720	300 mil DIP8	5	—	25	40	40	8	20	10000	1000	3750/5000#	630*
	HCPL-7721	300 mil DIP8	5	—	25	40	40	6	20	10000	1000	3750/5000#	630*
 Single Channel LED Input	ACPL-M75L	S05	3.3/5	4	15	55	55	25	40	10000	1000	3750	567*
	ACPL-M71U NEW	S05	3.3/5	4	15	35	35	12	15	15000	1000	3750	567*
 Single Channel LED Input	ACPL-071L	S08	3.3/5	9	15	40	40	25	30	10000	1000	3750	567*
 Single Channel LED Input	ACPL-W70L	Stretched S06	3.3/5	4	15	55	55	25	40	10000	1000	5000	1140*
 Single Channel LED Input	HCPL-0708	S08	5	10	15	60	60	30	40	10000	1000	3750	567*
 Dual Channel Bi-direct MOS Input	ACSL-7210 NEW	S08	3.3/5	—	25	40	40	8	20	25000	1000	3750	567*
 Dual Channel LED Input	ACPL-074L	S08	3.3/5	9	15	40	40	25	30	10000	1000	3750	567*
	HCPL-0738	S08	5	10	15	60	60	30	40	10000	1000	3750	567*
 Dual Channel LED Input	ACPL-K73L	Stretched S08	3.3/5	4	15	55	55	25	40	10000	1000	5000	1140*

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, # - with UL5000VRMS/1 minute Option 020

Optoisolation and Optical Sensor Products



20 Mbd Logic Gate Optocoupler

Applications

- Computer-peripheral interface
- High speed disk drive I/O
- Isolated bus driver (networking applications)
- Isolation of higher speed logic system
- Switching noise elimination

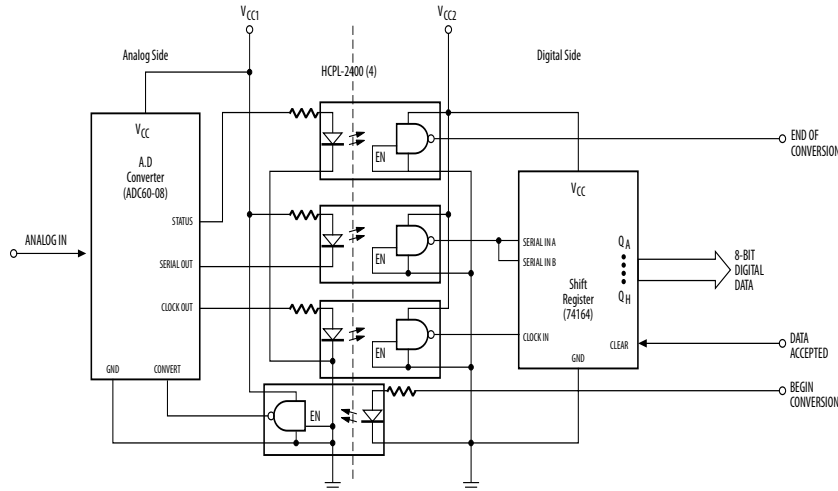
Description

These optocouplers have high data rate capability and low input current requirements. In analog-to-digital converters, designers should isolate the two portions of a circuit so that interference generated by digital switching and clock signals are not coupled to the analog section. The below figure demonstrates the ability of optocouplers to achieve isolation in a high speed parallel interface data communication application. Optocouplers reduce the channel distortion and thereby maximize the reliability of the circuit.

Benefits

- Totem pole & tri state output (with enable pin for HCPL-2400) to eliminate output pull-up resistors
- Certified with reinforced insulation under IEC/EN/DIN EN 60747-5-2/5, approved with $V_{iorm}=630V_{peak}$ (option 060)
- DIP8 package (for min. 7mm creepage/clearance need) with 5kV V_{iso} protection (option 020)
- 2-channel for higher integration and space saving (HCPL-2430)

Typical Block Diagram



20 Mbd Logic Gate Optocoupler Product Selection

Device	Part No.	Package	$I_{F(on)}$ mA Min.	t_{PLH} ns Max.	t_{PLH} ns Max.	PWD ns Max.	t_{PSK} ns Max.	CMR - V/ μ s@ V_{CM}		V_{ISO} V_{RMS} Min.	V_{IORM} V peak
								CMR V/ μ s (Min.)	V_{CM} V		
Single Channel 	HCPL-2400	300 mil DIP8	4	60	60	25	35	1000	300	3750	630*
Dual Channel 	HCPL-2430	300 mil DIP8	4	60	60	25	35	1000	300	3750	630*

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060

Optoisolation and Optical Sensor Products



10 MBd Logic Gate/ CMOS Optocoupler

Description

This isolated RS-422 circuit uses two high-speed optocouplers that can switch up to 10 MBd signals. An isolated power supply V_{CC2} is required to power the DS 75176A driver/receiver integrated circuit.

The main benefit is preventing common-mode transients from interfering with the signal.

Avago's new range of 3.3 V/5 V optocouplers are the first commercially available optocouplers designed to meet the JEDEC

specification for 3.3 V LVTTTL/LVCMOS logic, thereby simplifying the implementation of isolation in systems utilizing 3.3 V logic circuits.

A typical Power over Ethernet power source equipment (PSE) block diagram uses two 15 MBd 3.3 V optocouplers to isolate between the 13 W 48 V power supply and the inter-integrated chip (I2C) control bus.

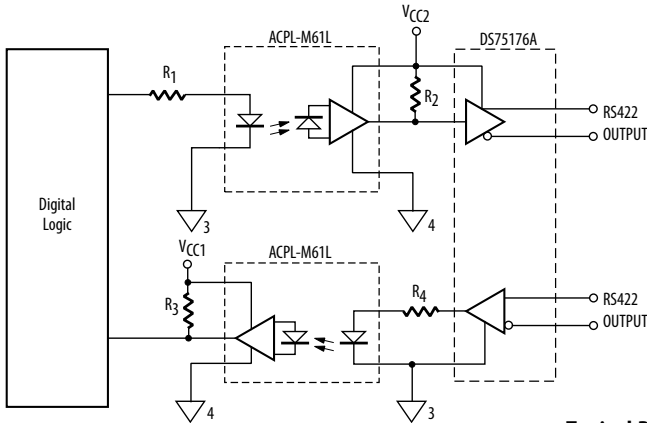
Benefits

- Provides high data rate transmission. It also offer high CMR for signal isolation from common mode transient noises

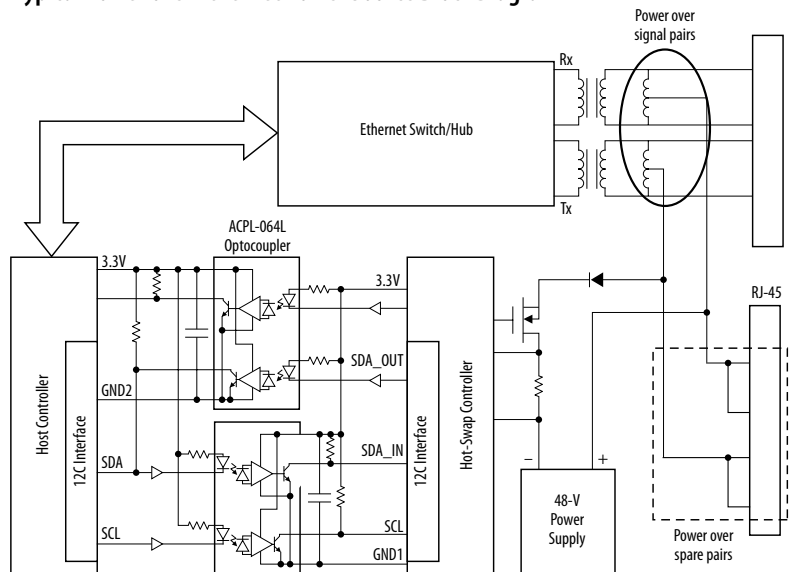
Applications

- Computer-peripheral interface
- Instrument input/output isolation
- Isolated line receiver
- Microprocessor system interface
- Switching power supply

Typical RS-422 Interface Block Diagram

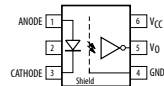
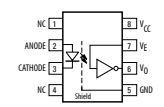
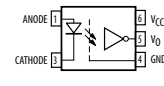
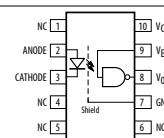
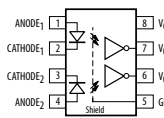


Typical Power over Ethernet Power Source Block Diagram



Optoisolation and Optical Sensor Products

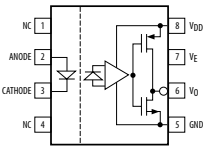
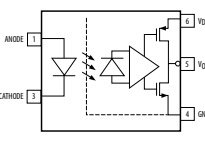
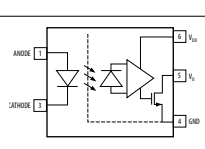
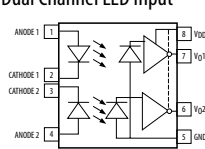
10 Mbd Logic Gate Optocoupler Product Selection

Device	Part No.	Package	VDD V	I _{F(on)} mA Min.	t _{PLH} ns Max.	t _{PHL} ns Max.	PWD ns Max.	t _{PSK} ns Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
									CMR V/μs (Min.)	V _{CM} V		
 <p>Single Channel</p>	ACPL-W60L	Stretched SO6	3.3/5	5	90	75	25	40	15000	1000	5000	1140*
	ACPL-P611	Stretched SO6	5	5	100	100	35	40	10000	1000	5000	891*
	ACPL-W611	Stretched SO6	5	5	100	100	35	40	10000	1000	5000	1140*
	6N137	300 mil DIP8	5	5	100	100	35	40	1000	10	3750/5000#	630*
	HCNW137	400 mil DIP8	5	5	100	100	40	40	5000	1000	5000	1414
	HCNW2601	400 mil DIP8	5	5	100	100	40	40	10000	1000	5000	1414
	HCNW2611	400 mil DIP8	5	5	100	100	40	40	15000	1000	5000	1414
	HCPL-060L	S08	3.3/5	5	90	75	25	40	15000	1000	3750	567*
	HCPL-260L	300 mil DIP8	3.3/5	5	90	75	25	40	15000	1000	3750/5000#	630*
	HCPL-061A	S08	5	3	100	100	45	60	1000	50	3750	567*
	HCPL-061N	S08	5	3	100	100	45	60	1000	1000	3750	567*
	HCPL-0600	S08	5	5	100	100	35	40	5000	1000	3750	567*
	HCPL-0601	S08	5	5	100	100	35	40	10000	1000	3750	567*
	HCPL-0611	S08	5	5	100	100	35	40	15000	1000	3750	567*
	HCPL-2601	300 mil DIP8	5	5	100	100	35	40	10000	1000	3750/5000#	630*
	HCPL-2611	300 mil DIP8	5	5	100	100	35	40	15000	1000	3750/5000#	630*
	HCPL-261A	300 mil DIP8	5	3	100	100	45	60	1000	50	3750/5000#	630*
HCPL-261N	300 mil DIP8	5	3	100	100	45	60	1000	1000	3750/5000#	630*	
	ACPL-M60L	S05	3.3/5	5	90	75	25	40	15000	1000	3750	567*
	ACPL-M61U	S05	5	5	100	100	35	40	15000	1000	3750	-
	HCPL-M600	S05	5	5	100	100	35	40	-	-	3750	-
	HCPL-M601	S05	5	5	100	100	35	40	5000	50	3750	-
	HCPL-M611	S05	5	5	100	100	35	40	10000	1000	3750	-
	ACNV2601	NEW 500 mil DIP10	5	5	100	100	40	40	20000	1500	7500	2262
	ACNV260E	NEW 500 mil DIP10	5	5	100	100	40	40	20000	1500	5000	ATEX (375V)
 <p>Dual Channel</p>	ACPL-K63L	Stretched SO8	3.3/5	5	90	75	25	40	15000	1000	5000	1140*
	HCPL-063A	S08	5	3	100	100	45	60	1000	50	3750	567*
	HCPL-063L	S08	3.3/5	5	90	75	25	40	15000	1000	3750	567*
	HCPL-063N	S08	5	3	100	100	45	60	1000	1000	3750	567*
	HCPL-0630	S08	5	5	100	100	35	40	5000	1000	3750	567*
	HCPL-0631	S08	5	5	100	100	35	40	10000	1000	3750	567*
	HCPL-0661	S08	5	5	100	100	35	40	15000	1000	3750	567*
	HCPL-263A	300 mil DIP8	5	3	100	100	45	60	1000	50	3750/5000#	630*
	HCPL-263L	300 mil DIP8	3.3/5	5	90	75	25	40	15000	1000	3750/5000#	630*
	HCPL-263N	300 mil DIP8	5	3	100	100	45	60	1000	1000	3750/5000#	630*
	HCPL-2630	300 mil DIP8	5	5	100	100	35	40	5000	1000	3750/5000#	630*
	HCPL-2631	300 mil DIP8	5	5	100	100	35	40	10000	1000	3750/5000#	630*
	HCPL-4661	300 mil DIP8	5	5	100	100	35	40	15000	1000	3750/5000#	630*

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, # - with UL 5000VRMS/1 minute Option 020

Optoisolation and Optical Sensor Products

3.3V/5V Family (10 MBd CMOS Optocoupler)

Device	Part No.	Package	VDD V	I _{F(on)} mA Min.	Max. Data Rate MBd Min.	t _{PLH} ns Max.	t _{PHL} ns Max.	PWD ns Max.	t _{PSK} ns Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
										CMR V/μs (Min.)	V _{CM} V		
Single Channel LED Input 	ACPL-061L	NEW S08	3.3/5	1.6	10	80	80	30	30	20000	1000	3750	567*
	ACPL-C61L	NEW Stretched S08	3.3/5	3.0	10	90	90	30	30	20000	1000	5000	1414*
	ACNW261L	NEW 400 mil DIP8	3.3/5	4.0	10	95	95	40	30	20000	1000	5000	1414*
	ACPL-W61L	NEW Stretched S06	3.3/5	1.6	10	80	80	30	30	20000	1000	5000	1140*
	ACPL-M61L	NEW S05	3.3/5	1.6	10	80	80	30	30	20000	1000	3750	567*
	ACPL-M72U	NEW S05	3.3/5	4.0	10	100	100	50	60	25000	1000	3750	567*
	ACPL-M62L	NEW S05	3.3/5	2.0	10	80	80	30	30	20000	1000	3750	567*
Dual Channel LED Input 	ACPL-064L	NEW S08	3.3/5	1.6	10	80	80	30	30	20000	1000	3750	567*
	ACPL-K64L	NEW Stretched S08	3.3/5	1.6	10	80	80	30	30	20000	1000	5000	1140*

Notes: * - with IEC/DIN EN 60747-5-5 Option 060, † - with UL 5000V_{RMS}/1 minute Option 020

Optoisolation and Optical Sensor Products



8 MBd Logic Gate Optocoupler

Description

The circuit shows a CMOS interface circuit for 8 MBd applications. Over the temperature range a CMOS CD4050 Hex Buffer can source about 0.7 mA (minimum), which is sufficient to drive the HCPL-2300 optocoupler. The 20 pF capacitor allows peaking currents to assist the LED in turning on and off quickly.

These optocouplers utilize a simple interface requiring low power consumption.

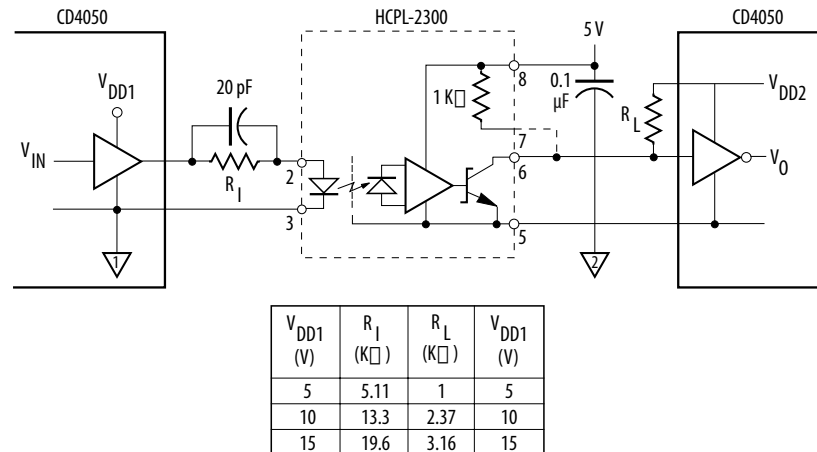
Benefits

- Offers low power consumption

Applications

- Computer-peripheral interface
- Digital isolation for A/D, D/A conversion
- High speed, long distance isolated line receiver
- Level shifting
- RS 232C interface

Typical CMOS Interface Block Diagram



8 MBd Logic Gate Optocoupler Product Selection

Device	Part No.	Package	$I_{F(on)}$ mA Min.	t_{PLH} μ s Max.	t_{PHL} μ s Max.	CMR - V/ μ s@ V_{CM}		V_{ISO} V_{RMS} Min.	V_{IORM} V peak
						CMR V/ μ s (Min.)	V_{CM} V		
	HCPL-0300	S08	0.5	0.16	0.2	100	50	3750	—
	HCPL-2300	300 mil DIP8	0.5	0.16	0.2	100	50	3750	630*

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060

Optoisolation and Optical Sensor Products



5 MBd Logic Gate/CMOS Optocoupler

Description

The circuit shown in the typical TTL interface block diagram is an interface between two TTL gates using an active output (totem pole) optocoupler, the HCPL-2201. A series switching circuit drives the optocoupler LED. The active output HCPL-2201 can be directly connected to a TTL gate, and no pull-up resistor is required. The HCPL-2201 can sink enough current to handle up to 16 LSTTL or 4 TTL loads.

Typically, the 5 MBd logic gate optocoupler is used in the Isolated High-Low Gate Drive interface block diagram as shown below.

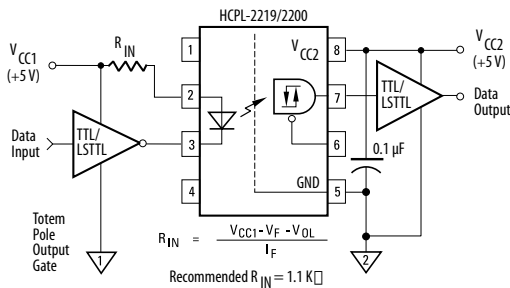
Benefits

- Pull up resistor not required at the optocoupler output
- Low power on the optocoupler input circuit
- Wide operating supply voltages up to 20V
- Built-in Schmitt Triggers for better signal integrity and accuracy in a noisy network/ circuits.

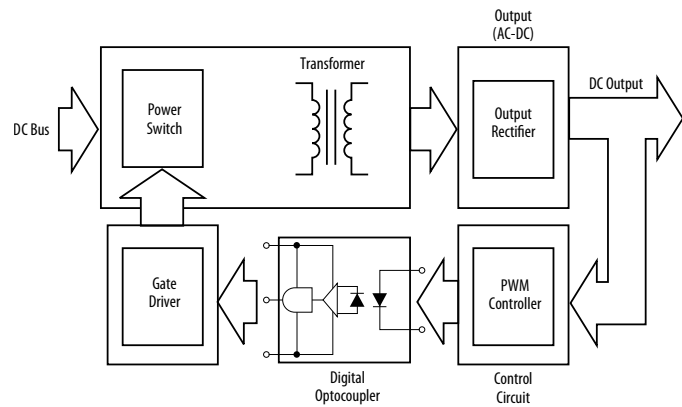
Applications

- Computer-peripheral interface
- Ground loop
- High speed line receiver
- Microprocessor system interface
- Pulse transformer replacement

Typical TTL Interface Block Diagram



Isolated High-Low Gate Drive Interface Block Diagram



Optoisolation and Optical Sensor Products

5 MBd Logic Gate Optocoupler Product Selection

Device	Part No.	Package	$I_{F(on)}$ mA Min.	t_{PLH} μ s Max.	t_{PHL} μ s Max.	CMR - V/ μ s@ V_{CM}		V_{ISO} V_{RMS} Min.	V_{IORM} V peak
						CMR V/ μ s (Min.)	V_{CM} V		
Single Channel 	HCNW2201	400 mil DIP8	1.6	0.3	0.3	1000	50	5000	1414
	HCNW2211	400 mil DIP8	1.6	0.3	0.3	10000	1000	5000	1414
	HCPL-0201	S08	1.6	0.3	0.3	1000	50	3750	567*
	HCPL-0211	S08	1.6	0.3	0.3	10000	1000	3750	567*
	HCPL-2201	300 mil DIP8	1.6	0.3	0.3	1000	50	3750	630*
	HCPL-2211	300 mil DIP8	1.6	0.3	0.3	10000	1000	3750	630*
	HCPL-2219	300 mil DIP8	1.6	0.3	0.3	2500	400	3750	630*
	HCPL-2200	300 mil DIP8	1.6	0.3	0.3	1000	50	3750	630*
	HCPL-2202	300 mil DIP8	1.6	0.3	0.3	1000	50	3750	630*
	HCPL-2212	300 mil DIP8	1.6	0.3	0.3	10000	1000	3750	630*
Dual Channel 	HCPL-2231	300 mil DIP8	1.8	0.3	0.3	1000	50	3750	–
	HCPL-2232	300 mil DIP8	1.8	0.3	0.3	10000	1000	3750	–

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060

5 MBd CMOS Optocoupler Product Selection

Device	Part No.	Package	$I_{F(on)}$ mA Min.	t_{PLH} μ s Max.	t_{PHL} μ s Max.	CMR - V/ μ s@ V_{CM}		V_{ISO} V_{RMS} Min.	V_{IORM} V peak
						CMR V/ μ s (Min.)	V_{CM} V		
Single Channel 	ACPL-M21L NEW	S05	1.6	0.25	0.25	25000	1000	3750	567*
	ACPL-W21L NEW	Stretched S06	1.6	0.25	0.25	25000	1000	5000	1140*
Dual Channel 	ACPL-024L NEW	S08	1.6	0.25	0.25	25000	1000	3750	567*
	ACPL-K24L NEW	Stretched S08	1.6	0.25	0.25	25000	1000	5000	1140*
	ACPL-021L NEW	S08	1.6	0.25	0.25	25000	1000	3750	567*

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, ^ - Advanced Information, may subject to changes.

Optoisolation and Optical Sensor Products



1 Mbd Transistor Output Optocoupler

Description

The circuit in the level shifting/TTL interface block diagram shows how a 0 to 5 V logic signal can be level shifted to a -15 to 0 V signal. This circuit can safely be used for level shifting up to ± 800 V. The circuit uses an open collector output logic gate, the 74LS405, to drive the LED of the 6N135/6 optocoupler. The 6N135/6 also has an open-collector output. The designer chooses R_{IN} to agree with the equation shown in the schematic. This equation sets the value of

the optocoupler LED forward current. The output of the 6N135/6 requires a pull-up resistor, R_L . The current-transfer ratio (CTR) of the optocoupler determines the maximum amount of current the optocoupler output can sink while maintaining the output voltage (between pins 5 and 6) of 0.5 V or less.

The benefit of the application is that it reduces the transient immunity problem and it is a convenient way of replacing the pulse transformer for high-voltage level shifting.

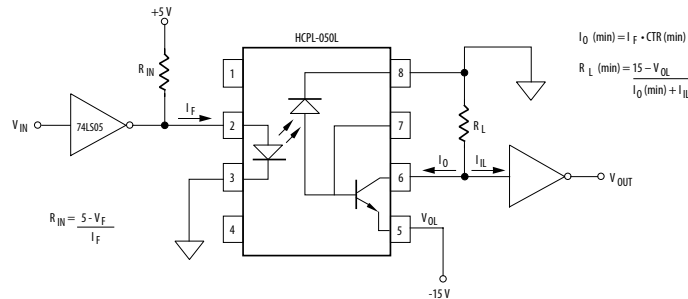
Benefits

- Allow level shifting capability
- High current transfer ratio

Applications

- Analog signal ground isolation
- High speed logic ground isolation
- Line receivers
- Replace pulse transformers
- Replace slow phototransistor isolators

Typical Level Shifting/TTL Interface Block Diagram



1 Mbd Transistor Output Optocoupler Product Selection

Device	Part No.	Package	V _{DD} V	Max VDD V	I _{F(on)} mA Min.	CTR			t _{PLH} μs Max.	t _{PHL} μs Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{NORM} V peak
						% Min.	% Max.	IF mA			CMR V/μs (Min.)	V _{CM} V		
Single Channel	ACPL-M50L	S05	3.3/5	24	3	80	200	3	1.0	1.0	15000	1000	3750	567*
	ACPL-W50L	Stretched S06	3.3/5	24	3	53	200	3	1.0	1.0	15000	1000	5000	1140*
	6N135	300 mil DIP8	5	15	16	7	50	16	2.0	2.0	1000	10	3750/5000 [†]	630*
	6N136	300 mil DIP8	5	15	16	19	50	16	1.0	1.0	1000	10	3750/5000 [†]	630*
	HCNW135	400 mil DIP8	5	15	16	5	—	16	2.0	2.0	1000	10	5000	1414
	HCNW136	400 mil DIP8	5	15	16	19	50	16	1.0	1.0	1000	10	5000	1414
	HCPL-050L	S08	3.3/5	15	16	15	50	16	1.0	1.0	1000	10	3750	567*
	HCPL-0500	S08	5	15	16	7	50	16	2.0	2.0	1000	10	3750	567*
	HCPL-0501	S08	5	15	16	19	50	16	1.0	1.0	1000	10	3750	567*
	HCPL-250L	300 mil DIP8	3.3/5	15	16	15	50	16	1.0	1.0	1000	10	3750/5000 [†]	630*
	HCPL-2502	300 mil DIP8	5	15	16	15	22	16	0.8	0.8	—	—	3750/5000 [†]	—
	HCPL-2503	300 mil DIP8	5	15	8	15	—	8	2.5	1.5	—	—	3750/5000 [†]	—
Dual Channel	ACPL-054L	S08	3.3/5	24	3	53	200	3	1.0	1.0	15000	1000	3750	567*
	ACPL-K54L	Stretched S08	3.3/5	24	3	53	200	3	1.0	1.0	15000	1000	5000	1140*
	HCPL-053L	S08	3.3/5	15	16	15	50	16	1.0	1.0	1000	10	3750	567*
	HCPL-0530	S08	5	15	16	7	50	16	2.0	2.0	1000	10	3750	—
	HCPL-0531	S08	5	15	16	19	50	16	1.0	1.0	1000	10	3750	—
	HCPL-253L	300 mil DIP8	3.3/5	15	16	15	50	16	1.0	1.0	1000	10	3750/5000 [†]	630*
	HCPL-2530	300 mil DIP8	5	15	16	7	50	16	2.0	2.0	1000	10	3750/5000 [†]	—
	HCPL-2531	300 mil DIP8	5	15	16	19	50	16	1.0	1.0	1000	10	3750/5000 [†]	—
	HCPL-2533	300 mil DIP8	5	15	8	15	—	8	2.5	1.5	—	—	3750	—

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, † - with UL 5000V_{RMS}/1 minute Option 020, ^ - Advanced information, may subject to changes.

Optoisolation and Optical Sensor Products



100 kBd Darlington Transistor Output Optocoupler

Description

This differentially driven circuit can use up to eight 6N138 optocouplers along the 90 m line. All stations are isolated. The first station would draw approximately 2.7 mA current, and the last station 1.8 mA of LED drive current. The output grounds of the optocoupler may be electrically separate.

The benefit of the application is its simple, low-cost, multidrop circuit for low signaling rates.

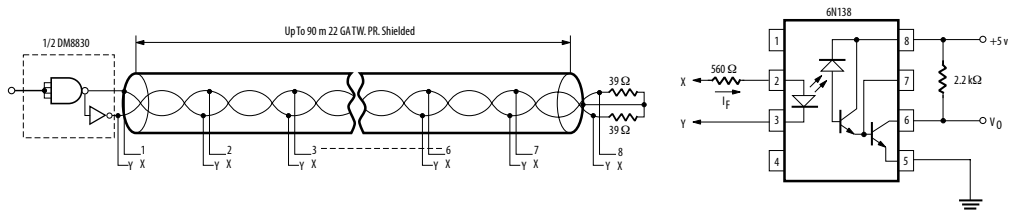
Benefits

- High CTR with low input current
- Low power consumption

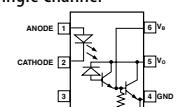
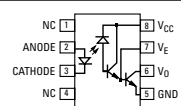
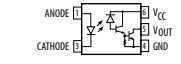
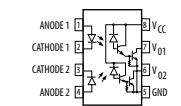
Applications

- Digital logic ground isolation
- FIA RS-232C line receiver
- Low power systems and ground isolation
- Telephone ring detector

Typical Multidrop Line Receiver Block Diagram



100 kBd Darlington Transistor Output Optocoupler Product Selection

Device	Part No.	Package	VDD V	I _{F(on)} mA Min.	CTR			t _{PLH} µs Max.	t _{PHL} µs Max.	CMR - V/µs@VCM		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
					% Min.	% Max.	I _F mA			CMR V/µs (Min.)	V _{CM} V		
 Single Channel	4N45	300 mil DIP6	5	0.5	200	1000	10	500	50	—	—	3750	630
	4N46	300 mil DIP6	5	0.5	200	1000	10	500	50	—	—	3750	630
 6N138, 6N139, HCNW138, HCNW139, HCPL-070A, HCPL-070L, HCPL-0700, HCPL-0701, HCPL-270L, HCPL-4701	6N138	300 mil DIP8	5	0.5	300	2600	1.6	50	15	1000	10	3750/5000 [#]	—
	6N139	300 mil DIP8	5	0.5	400	5000	0.5	90	2	1000	10	3750/5000 [#]	630*
	HCNW138	400 mil DIP8	5	0.5	300	—	1.6	70	11	1000	10	5000	1414
	HCNW139	400 mil DIP8	5	0.5	400	—	0.5	11	11	1000	10	5000	1414
	HCPL-070A	S08	5	0.04	800	25000	0.04	25	60	1000	10	3750	567*
	HCPL-070L	S08	3.3/5	0.5	400	5000	0.5	90	30	1000	10	3750	567*
	HCPL-0700	S08	5	0.5	300	2600	1.6	50	15	1000	10	3750	567*
	HCPL-0701	S08	5	0.5	400	5000	0.5	10	2	1000	10	3750	567*
	HCPL-270L	300 mil DIP8	3.3/5	0.5	400	5000	0.5	90	30	1000	10	3750/5000 [#]	630*
	HCPL-4701	300 mil DIP8	5	0.04	800	25000	0.04	90	25	1000	10	3750/5000 [#]	630*
 HCPL-M700, HCPL-M701	HCPL-M700	S05	5	0.5	300	2600	1.6	35	20	1000	10	3750	—
	HCPL-M701	S05	5	0.5	400	3500	0.5	10	2	1000	10	3750	—
 Dual Channel	HCPL-073A	S08	5	0.04	800	25000	0.04	130	25	1000	10	3750	—
	HCPL-073L	S08	3.3/5	0.5	400	5000	0.5	90	30	1000	10	3750	567*
	HCPL-0730	S08	5	0.5	400	5000	0.5	35	20	1000	10	3750	—
	HCPL-0731	S08	5	0.5	400	5000	0.5	35	20	1000	10	3750	—
	HCPL-273L	300 mil DIP8	3.3/5	0.5	400	5000	0.5	90	30	1000	10	3750/5000 [#]	630*
	HCPL-2730	300 mil DIP8	5	0.5	400	5000	0.5	35	20	1000	10	3750/5000 [#]	—
	HCPL-2731	300 mil DIP8	5	0.5	400	5000	0.5	60	20	1000	10	3750/5000 [#]	—
	HCPL-4731	300 mil DIP8	5	0.04	800	25000	0.04	90	25	1000	10	3750/5000 [#]	—

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, # - with UL 5000V_{RMS}/1 minute Option 020

Optoisolation and Optical Sensor Products



Applications

- Automotive IPM and gate driver for inverters, DC-DC converter and on-board chargers
- Automotive bus voltage and current/voltage sensing in inverters, converters and on-board chargers
- Automotive CANbus, UART, LIN and other digital communications
- Isolated wake-up and status control and feedback
- Analog feedback in AC-DC and DC-DC converters
- Low power digital isolation in battery management systems

R²Coupler™ (High Temperature, Automotive Grade)

Description

Proven Quality and Reliability Track Record

Avago Technologies' R²Coupler isolation products are designed to meet the stringent requirements for the automotive market. Building upon 35 years of optocoupler expertise, the automotive parts are manufactured in a TS 16949 certified manufacturing facility and are PPAP supported. Robustness is demonstrated through qualification in accordance to AEC-Q100 Grade 1 guidelines. Avago optocouplers have been used extensively in long life and mission critical isolation applications such as locomotive transportation, aerospace, military and industrial automation. Since the introduction of R²Coupler products in 2006, these automotive grade products have seen wide adoption by many automotive suppliers with millions of units operating in the field.

Technology Leader

Avago Technologies is the first supplier to introduce 125°C plastic optocouplers for automotive applications, with the largest portfolio of optocouplers ranging from IGBT gate drivers, isolation amplifier, high speed and low power digital isolation and analog feedback isolation. Advanced LED technology enabled the best-in-class performance over lifetime and at high temperature. These optocouplers maintain their very high voltage ratings with robust and reliable galvanic isolation technology

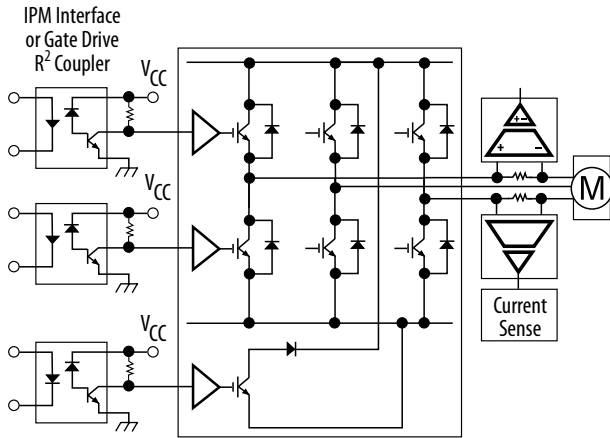
with international component safety certifications (UL1577, IEC 60747-5-5, CSA Component Notice 5). Optocouplers demonstrate superior EMI and common mode noise immunity.

Benefits

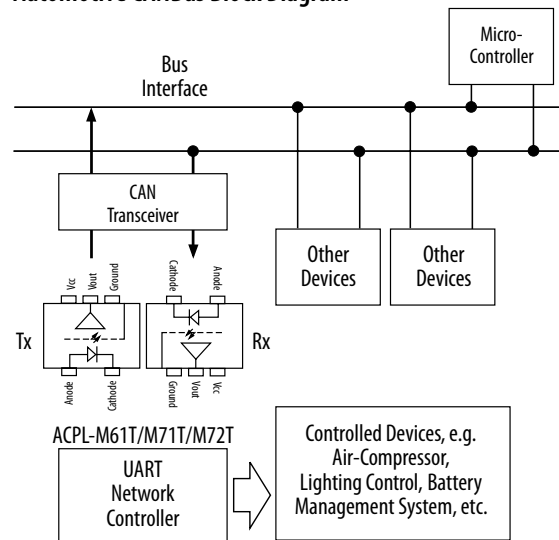
- Qualified to AEC-Q100 Grade 1 guidelines
- TS 16949 manufacturing facility with PPAP support
- Wide operating temperature (-40°C to 125°C)
- High CMR (30 kV/μs at VCM=1kV)
- Reinforced Reliability suitable for automotive applications
- Low input LED drive current
- Worldwide Safety Approval (UL1577, IEC60747-5-5, CSA)

Optoisolation and Optical Sensor Products

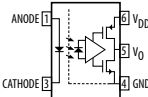
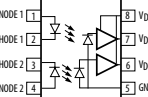
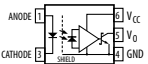
Typical Intelligent Power Module/Electric Motor Inverter Block Diagram



Automotive CANBus Block Diagram

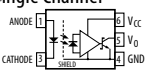

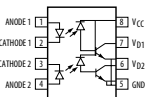


Automotive 10MBd Logic Gate Optocoupler

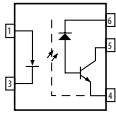
Device	Part No.	Package	V _{ISO} (1min) V _{RMS}	V _{IORM} V peak	Operating Temperature °C	V _{CC} V	I _{LED} mA	I _{DD} mA	t _{PLH} Max. ns	t _{PHL} Max. ns	PWD Max.	t _{PSK} Max.	CMR dV/dt kV/μs	V _{CM} V
 Single Channel	ACPL-M71T	S05	4000	560	-40 to 125	3.0 to 5.5	4 to 15	1.5	35	35	12	15	15	1000
	ACPL-K71T	SS08	5000	1140	-40 to 125	3.0 to 5.5	4 to 15	1.5	35	35	12	15	15	1000
	ACPL-M72T	S05	4000	560	-40 to 125	3.0 to 5.5	4 to 15	1.5	100	100	50	60	25	1000
	ACPL-K72T	SS08	5000	1140	-40 to 125	3.0 to 5.5	4 to 15	1.5	100	100	50	60	25	1000
 Dual Channel LED Input	ACPL-K74T	SS08	5000	1140	-40 to 125	3.0 to 5.5	4 to 15	1.5	35	35	12	15	15	1000
	ACPL-K75T	SS08	5000	1140	-40 to 125	3.0 to 5.5	4 to 15	1.5	100	100	50	60	25	1000
 ACPL-M61T	ACPL-M61T	S05	4000	560	-40 to 125	4.5 to 5.5	5 to 15	13	100	100	35	40	15	1000

Optoisolation and Optical Sensor Products

Automotive ≤ 1 Mbd Transistor Output Optocoupler

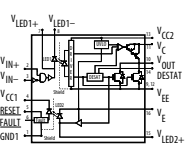
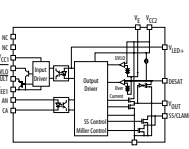
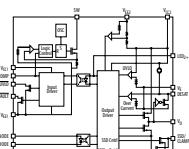
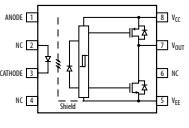
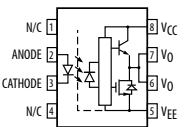
Device	Part No.	Package	V_{ISO} V_{RMS}	V_{IORM} V peak	Operating Temperature $^{\circ}C$	V_{CC} V	I _{LED} mA	CTR Min. %	CTR Typ. %	t_{PHL} Max. μs	t_{PHL} Max. μs	PWD Max. μs	t_{PSX} Max. μs	CMR dV/dt kV/ μs	CMR V_{CM} V
Single Channel 	ACPL-M46T	S05	4000	560	-40 to 125	4.5 to 30	10 to 20	44	90	0.55	0.55	0.45	0.45	15	1500
	ACPL-M43T	S05	4000	560	-40 to 125	20	5 to 15	20	45	1	1	0.45	0.5	15	1500
	ACPL-K43T	SS08	5000	1140	-40 to 125	20	0.8 to 15	24	65	1	1	0.45	0.5	15	1500
	ACPL-M49T	S06	4000	560	-40 to 125	20	4 to 10	20	58	100	100	0.45	0.5	15	1500
	ACPL-K49T	SS08	5000	1140	-40 to 125	20	4 to 10	24	58	100	100	0.45	0.5	15	1500
Dual Channel 	ACPL-K44T	SS08	5000	1140	-40 to 125	20	0.8 to 15	20	65	1	1	0.45	0.5	15	1500

Automotive Analog Optocoupler

Device	Part No.	Package	V_{ISO} V_{RMS}	V_{IORM} V peak	Operating Temperature $^{\circ}C$	V_{CC} V	I _{LED} mA	CTR Min. %	(TA = 25 $^{\circ}C$)		BW Typ. kHz	CMR dV/dt kV/ μs	CMR V_{CM} V
									Typ. %	Min. %			
	ACPL-M43T	S05	4000	560	-40 to 125	20	5 to 15	20	45	32	1000	15	1500
	ACPL-K43T	SS08	5000	1140	-40 to 125	20	0.8 to 15	24	65	32	1000	15	1500
	ACPL-M49T	S05	4000	560	-40 to 125	20	4 to 10	20	45	32	–	15	1500
	ACPL-K49T	SS08	5000	1140	-40 to 125	20	4 to 10	24	58	32	–	15	1500

Optoisolation and Optical Sensor Products

Automotive Gate Drive Optocoupler

Device	Part No.	Features	Package	V_{ISO} V_{RMS}	V_{IORM} V_{peak}	Operating Temperature °C	V_{CC} V	I _{LED} Typ. mA	I _{o_peak} Max. A	I _{CC} Max. mA	t _{PHL} Max. ns	t _{PHL} Max. ns	PWD Max. ns	t _{PSK} Max. ns	CMR dV/dt kV/μs	CMR V _{CM} V
	ACPL-38JT	Desat, UVLO, Fault Feedback	S016	5000	1230	-40 to 125	15 to 30	Buffered	2.5	5	500	500	300	350	15	1500
	ACPL-34JT	Rail-to-Rail, Desat, UVLO, Fault Feedback, Miller Clamp	S016	5000	1230	-40 to 125	15 to 25	10 to 16	2.5	13.9	280	250	-100 to 100	-150 to 150	30	1500
	ACPL-344JT [^]	Desat and UVLO with separate Fault Feedback, Rail-to-Rail, Miller Clamp/Soft Shutdown	S016	5000	1230	-40 to 125	15 to 25	10 to 16	2.5	13.6	250	250	-40 to 140	-160 to 60	30	1500
	ACPL-32JT	DC-DC Flyback Controller, Desat and UVLO with separate Fault Feedback, Rail-to-Rail, Miller Clamp/Soft Shutdown	S016	5000	1230	-40 to 125	20 ±10%	10 to 16	2.5	13.6	250	250	-40 to 140	-160 to 60	30	1500
	ACPL-K34T	200kHz, tight dead time control	SS08	5000	1140	-40 to 125	10 to 20	10 to 13	2.5	3.9	110	110	-40 to 40	-50 to 40	35	1500
	ACPL-K33T [^]	200kHz, tight dead time control	SS08	5000	1140	-40 to 125	10 to 20	10 to 13	2.5	3.9	110	110	-40 to 40	-50 to 40	35	1500
	ACPL-312T	UVLO	DIP8	3750	630	-40 to 125	15 to 30	7 to 16	2.5	5	500	500	300	350	15	1500

Note: [^] - Advanced information, may subject to changes.

Optoisolation and Optical Sensor Products

Automotive Miniature Analog Isolation Amplifier

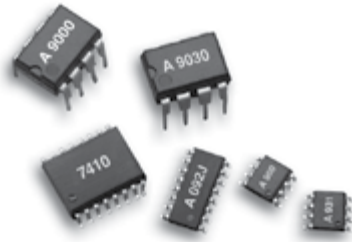
Device	Part No.	Features	Package	V_{ISO} V_{RMS}	V_{IORM} V peak	Operating Temperature °C	V_{DD} V	Input Range Typ. V	Gain Typ. V/V	Gain Tol Max. %	NonL Max. %	Off-set Max. mV	BW Typ. kHz	CMR dV/dt kV/μs	CMR V_{CM} V
	ACPL-782T	2% Gain Accuracy	DIP8	4000	891	-40 to 125	4.5 to 5.5	±0.2	8	2	0.35	4	100	10	1000
	ACPL-C87AT	DC Voltage Sensing, Shut-down Control	SS08	5000	1414	-40 to 125	4.5 to 5.5	0 to 2	1	1	0.35	20	100	15	1000
	ACPL-C87BT		SS08	5000	1414	-40 to 125	4.5 to 5.5	0 to 2	1	0.5	0.35	20	100	15	1000

Extended Temperature R²Coupler

Device	Part No.	Package	Operating Temperature °C	IOUT A (MAX)	IF mA	CTR		t_{PLH} μs Max.	t_{PHL} μs Max.	PWD ns Max.	t_{PSK} ns Max.	CMR - V/μs@ V_{CM}		V_{ISO} V_{RMS} Min.	V_{IORM} V peak
						% Min.	% Max.					CMR V/μs (Min.)	V_{CM} V		
	ACPL-M71U NEW	S05	-40 to 125	NA	4	NA	NA	0.035	0.035	12	15	15000	1000	3750	567*
	ACPL-M72U NEW	S05	-40 to 125	NA	4	NA	NA	0.1	0.1	50	60	25000	1000	3720	567*
	ACPL-M43U	S05	-40 to 125	NA	10	32	80	1.0	1.0	850	NA	15000	1500	3750	567
	ACPL-M46U	S05	-40 to 125	NA	10	44	90	0.4	0.6	450.0	NA	15000	1500	3750	567
	ACPL-M61U	S05	-40 to 125	NA	5	NA	NA	0.1	0.1	35	40	15000	1000	3750	567
	ACPL-M49U	S05	-40 to 125	NA	10	32	80	20	20	NA	NA	15000	1500	3750	567*
	ACPL-K49U	Stretched S05	-40 to 125	NA	10	32	100	20	20	NA	NA	15000	1500	5000	1140*
	ACPL-312U	DIP6	-40 to 125	2.5	7	N/A	N/A	0.5	0.5	300	350 (P _{DD})	25000	1500	3750	630

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, # - with UL 5000V_{RMS}/1 minute Option 020

Optoisolation and Optical Sensor Products



Digital Isolator

Description

The ACML-74xx series of CMOS digital isolators utilizes magnetic coupling through thick insulation to provide high speed, high insulation performance yet consuming low power at high data rates.

The HCPL-90xx/-09xx series CMOS digital isolators integrated with giant magneto-resistive (GMR) technology enable high speed performance and excellent transient immunity specifications.

Applications

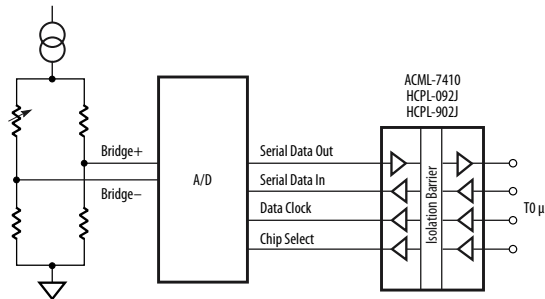
- Digital fieldbus isolation
- Multiplexed data transmission
- Computer peripheral interface
- High speed digital systems
- Isolated data interfaces
- Logic level shifting

All devices operate at 3.3 V or 5 V supply voltages, boasting low power consumption. They are able to withstand high common mode voltages, 25kV/μs at V_{cm}=1000V, and meet UL 1577 and IEC 60950-1, IEC 61010-1 and IEC 60601-1 safety ratings.

Benefits

- High insulation: UL1577 (5.6kVrms 1 min rating) and IEC 60950-1 and IEC 61010-1 working voltage (up to 1132Vpeak)
- High speed (100MBd), low PWD (3ns) and low T_p (18ns)
- Wide temperature operation (-40°C to 105°C)
- Buffer input and CMOS output (eliminate input/output resistors)
- Multi-channel (1, 2 & 4-ch)
- Low power consumption

Typical Isolated A/D Conversion Block Diagram



Digital Isolator ACML-74XX, HCPL-09XX AND HCPL-90XX Product Selection

Device	Part No.	Channel	Package	Max. Data Rate MBd Min.	t _{PLH} & t _{PHL} (V _{CC} =5.0V) ns Max.	t _{PLH} & t _{PHL} (V _{CC} =3.3V) ns Max.	PWD ns Max.	t _{PSK} ns Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.
									CMR V/μs (Min.)	V _{CM} V	
	HCPL-0900	Single	S08	100	15	18	3	6	15000	1000	2500
	HCPL-9000	Single	300 mil DIP8	100	15	18	3	6	15000	1000	2500
	HCPL-0930	Dual	S08	100	15	18	3	6	15000	1000	2500
	HCPL-9030	Dual	300 mil DIP8	100	15	18	3	6	15000	1000	2500
	HCPL-0931	Dual, Bi-Dir	S08	100	15	18	3	6	15000	1000	2500
	HCPL-9031	Dual, Bi-Dir	300 mil DIP8	100	15	18	3	6	15000	1000	2500
	ACML-7400 NEW	Quad	S016 Wide Body	100	32	36	2	5	25000	1000	5600
	HCPL-090J	Quad	S016 Narrow Body	100	15	18	3	6	15000	1000	2500
	HCPL-900J	Quad	S016 Wide Body	100	15	18	3	6	15000	1000	2500
	ACML-7420 NEW	Quad, 2/2, Bi-dir	S016 Wide Body	100	32	36	2	5	25000	1000	5600
	HCPL-091J	Quad, 2/2 Bi-dir	S016 Narrow Body	100	15	18	3	6	15000	1000	2500
	HCPL-901J	Quad, 2/2 Bi-dir	S016 Wide Body	100	15	18	3	6	15000	1000	2500
	ACML-7410 NEW	Quad, 3/1, Bi-dir	S016 Wide Body	100	32	36	2	5	25000	1000	5600
	HCPL-092J	Quad, 3/1 Bi-dir	S016 Narrow Body	100	15	18	3	6	15000	1000	2500
	HCPL-902J	Quad, 3/1 Bi-dir	S016 Wide Body	100	15	18	3	6	15000	1000	2500

Optoisolation and Optical Sensor Products



Miniature Analog Isolation Amplifier

Description

Using advanced Sigma-Delta Modulator technology, Avago Technologie's Miniature Analog Isolation Amplifiers provide accurate measurements of phase current and bus voltage in motor drives, power inverters and voltage signals in general isolation circuits. With built-in safety insulation and high CMR (common mode rejection) performance, these miniature isolation amplifiers offers a competitive price/performance alternative to traditional hall effect current sensors.

The ACPL-C79B/C79A/C790 isolation amplifiers feature high gain accuracy, low temperature drift of $-50\text{ppm}/^\circ\text{C}$, 3.3V/5V output supply operation and a wide -40 to $+105^\circ\text{C}$ operating temperature range. These features are delivered in a SSO-8 package that has a footprint 30% smaller than the standard DIP-8 package. The series is implemented with a fully differential circuit with gain

accuracy of $\pm 0.5\%$ (ACPL-C79B), $\pm 1\%$ (ACPL-C79A), and $\pm 3\%$ (ACPL-C790). With a 200kHz bandwidth and $1.6\mu\text{s}$ response time, the ACPL-C79x captures transients during short circuit and overload conditions.

The ACPL-C87B/C87A/C870 family are optical isolation amplifiers designed specifically for voltage sensing. Its 2V input range and high 1 G Ω input impedance, makes it well suited for isolated voltage sensing.

The ACPL-C797 offers a digital sigma-delta bitstream output interface option with its 10Mhz internally clocked sigma-delta modulator capable of up to 78dB SNR performance (signal to noise ratio). An 20Mhz externally clocked version is available as ACPL-796J, allowing channel to channel synchronization.

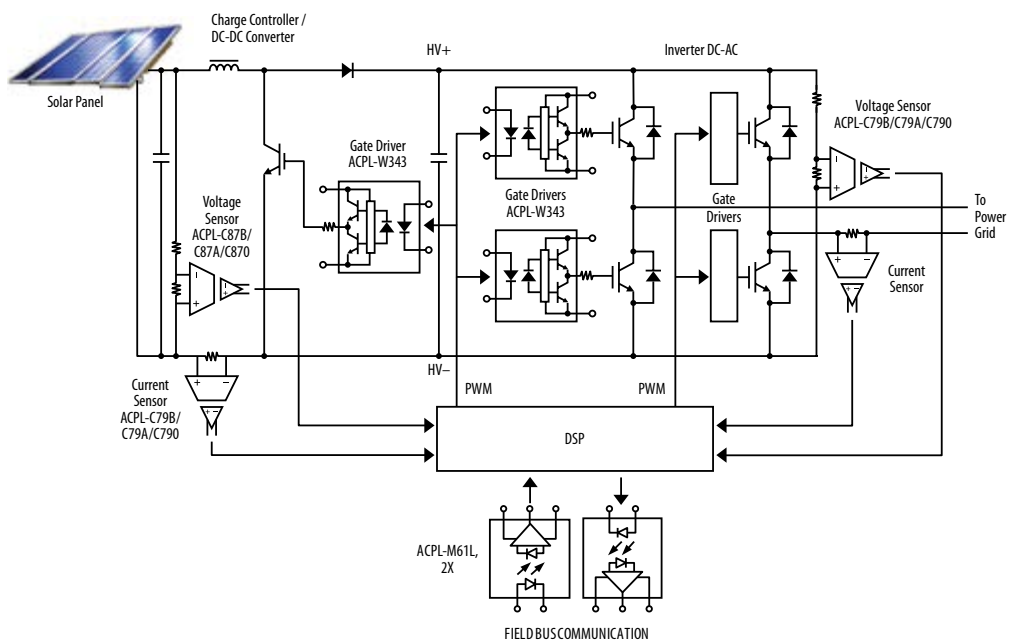
Benefits

- Compact package suitable for high volume production process
- Cost-effective solution
- Reinforced insulation

Applications

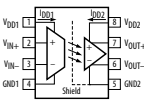
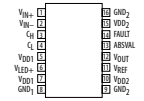
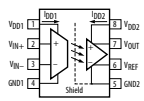
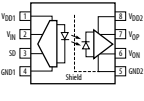
- Motor phase and rail current sensing
- Data acquisition systems
- Inverter current sensing
- General purpose current sensing and monitoring
- DC bus voltage sensing

Example Application: Block diagram of a micro-inverter with simplified DC-DC-AC topology.



Optoisolation and Optical Sensor Products

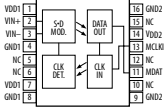
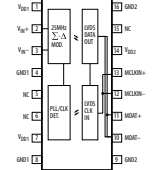
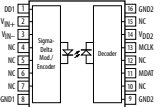
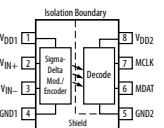
Miniature Isolation Amplifier

Device	Part No.	Features	Package	Operating Temperature °C	Gain Error at 25°C % Typ.	Non-linearity % Typ.	Bandwidth kHz Typ.	V _{DD2} V	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
									CMR V/μs (Typ.)	V _{CM} V		
	ACPL-C78A	±200mV Inputs, Differential Outputs	SS08	-40 to +85	±1	0.0037	100	4.5 - 5.5	15000	1000	5000	1414
	ACPL-C780	±200mV Inputs, Differential Outputs	SS08	-40 to +85	±3	0.0037	100	4.5 - 5.5	15000	1000	5000	1414
	ACPL-C784	±200mV Inputs, Differential Outputs	SS08	-40 to +85	±5	0.0037	100	4.5 - 5.5	15000	1000	5000	1414
	ACPL-C79B	±200mV Inputs, Differential Outputs	SS08	-40 to +105	±0.5	0.05	200	3 - 5.5	15000	1000	5000	1414
	ACPL-C79A	±200mV Inputs, Differential Outputs	SS08	-40 to +105	±1	0.05	200	3 - 5.5	15000	1000	5000	1414
	ACPL-C790	±200mV Inputs, Differential Outputs	SS08	-40 to +105	±3	0.05	200	3 - 5.5	15000	1000	5000	1414
	ACPL-790B	±200mV Inputs, Differential Outputs	DIP8	-40 to +105	±0.5	0.05	200	3 - 5.5	15000	1000	5000	891
	ACPL-790A	±200mV Inputs, Differential Outputs	DIP8	-40 to +105	±1	0.05	200	3 - 5.5	15000	1000	5000	891
	ACPL-7900	±200mV Inputs, Differential Outputs	DIP8	-40 to +105	±3	0.05	200	3 - 5.5	15000	1000	5000	891
	HCPL-7800A	±200mV Inputs, Differential Outputs	DIP8	-40 to +85	±1	0.0037	100	4.5 - 5.5	15000	1000	3750	891
	HCPL-7800	±200mV Inputs, Differential Outputs	DIP8	-40 to +85	±3	0.0037	100	4.5 - 5.5	15000	1000	3750	891
	HCPL-7840	±200mV Inputs, Differential Outputs	DIP8	-40 to +85	±5	0.0037	100	4.5 - 5.5	15000	1000	3750	891*
	HCPL-788J	±200mV Inputs, Onboard Fault Detection	S016	-40 to +85	±3	0.06	30	4.5 - 5.5	25000	1000	5000	1230
	ACPL-785J	±200mV Inputs, Onboard Fault Detection	S016	-40 to +85	±5	0.06	30	4.5 - 5.5	25000	1000	5000	1230*
	HCPL-7510	±200mV Inputs, Single-ended Outputs	DIP8	-40 to +85	±3	0.06	100	4.5 - 5.5	15000	1000	3750	891*
	HCPL-7520	±200mV Inputs, Single-ended Outputs	DIP8	-40 to +85	±5	0.06	100	4.5 - 5.5	15000	1000	3750	891*
	ACPL-C870 NEW	0-2V High Impedance Inputs, Differential Outputs	SS08	-40 to +105	±3	0.04	100	3.3	15000	1000	5000	1414
	ACPL-C87A NEW	0-2V High Impedance Inputs, Differential Outputs	SS08	-40 to +105	±1	0.04	100	3.3	15000	1000	5000	1414
	ACPL-C87B NEW	0-2V High Impedance Inputs, Differential Outputs	SS08	-40 to +105	±0.5	0.04	100	3.3	15000	1000	5000	1414

Notes: * - with IEC/EN/DIN EN 60747-5-2/5 Option 060, ^ - Advanced Information.

Optoisolation and Optical Sensor Products

Optically Isolated Sigma-Delta Modulator

Device	Part No.	Features	Pack- age	Operating Tempera- ture °C	Gain Error at 25°C % Typ.	INL LSB Typ.	ENOB Bits Typ.	V _{DD2} V	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
									CMR V/μs (Typ.)	V _{CM} V		
	ACPL-796J	External Clocked, 5 - 20MHz	S016	-40 to +105	±1	3	12	3 - 5.5	25000	1000	5000	1230*
	ACPL-798J NEW	External Clocked, 5 - 25MHz	S016	-40 to +105	±1	3	12	3.3 - 5.5	25000	1000	5000	1414
	HCPL-786J	Internally Clocked, 10MHz	S016	-40 to +85	±2	3	11	4.5 - 5.5	20000	1000	5000	1230
	ACPL-C797	Internally Clocked, 10MHz	SS08	-40 to +105	±1	3	12	3 - 5.5	25000	1000	5000	1414
	ACPL-7970	Internally Clocked, 10MHz	DIP8	-40 to +105	±1	3	12	3 - 5.5	25000	1000	5000	891
	HCPL-7860	Internally Clocked, 10MHz	DIP8	-40 to +85	±1 (Matching)	3	11	4.5 - 5.5	20000	1000	3750	891
	HCPL-7560	Internally Clocked, 10MHz	DIP8	-40 to +85	±5	64	8	4.5 - 5.5	20000	1000	3750	891*

Notes: * - with IEC/EN/DIN EN 60747-5-2/5 Option 060, " - VDD

Optoisolation and Optical Sensor Products



Integrated Gate Drive Optocoupler

Description

In typical motor drive and renewable energy power conversion systems, there are several signals between the power devices and the micro-controller that need isolation and additional customized functions such as gate drive and current/voltage sensing. Avago Technologies' gate drive and isolation amplifier products provide low cost, high performance solutions for such applications.

High performance motor drives require precision timing for turning on and off the power devices on the inverter while renewable energy inverter needs to be reliable and efficient when converting DC-link voltage to usable AC power output. The microcontroller that controls these functions needs to be isolated from the high voltage inverter side. Avago Technologies offers a variety of optocouplers that have built-in gate drive capability. These gate drive optocouplers come in wide range of output current from 0.4A to 5A, and selected parts with integrated protection features such as Active Miller Clamp, under voltage

lockout, fault and UVLO status feedback and desaturation detection. Beside protection features, Avago has also integrated DC-DC controller for floating power supply and LED driver to make design more compact and affordable.

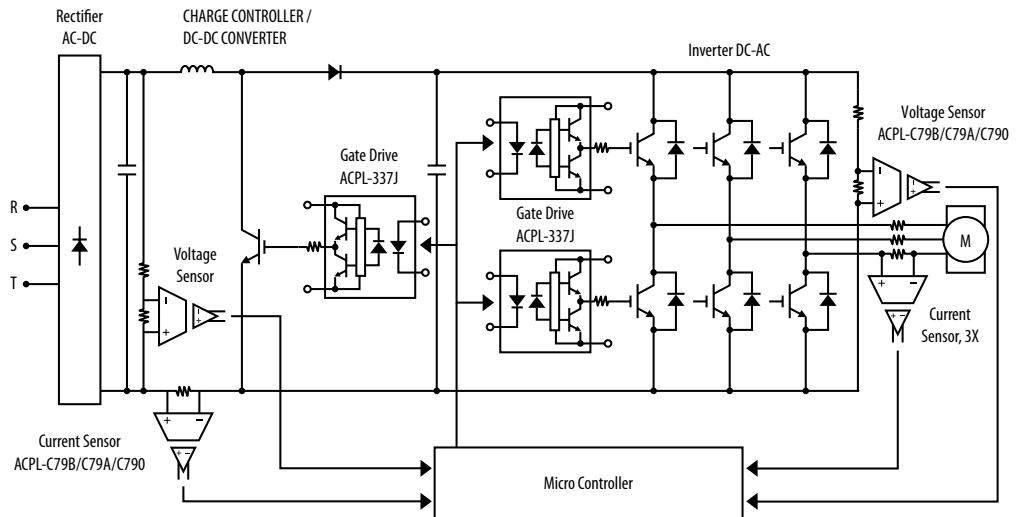
Benefits

- Rail-to-rail output voltage for reliable IGBTs drive
- Integrated fault protection, feedback, Active Miller Clamp, DC-DC controller and LED driver to reduce component count and solution cost
- Short propagation delay for faster switching
- Fast IGBT switching for improved efficiency
- Low power consumption for bootstrap operation
- High common mode transient rejection ensures reliable operation under noisy environment
- Direct drive of high power IGBTs
- Reinforced insulation

Applications

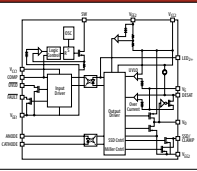
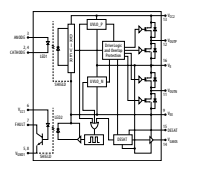
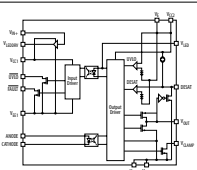
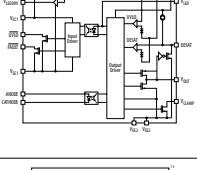
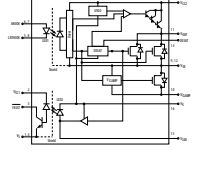
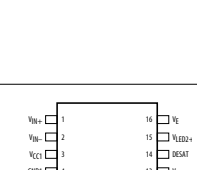
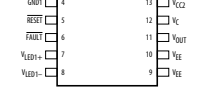
- Isolated IGBT/MOSFET gate drive
- AC and brushless DC motor drives
- Renewable energy inverters
- Industrial inverters
- Switching power supplies
- Uninterruptible power supplies (UPS)

Typical Motor Drive Block Diagram



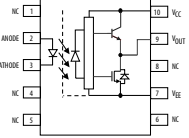
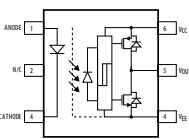
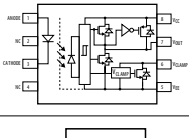
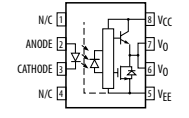
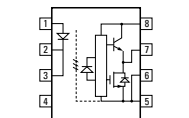
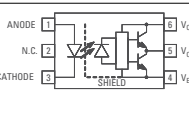
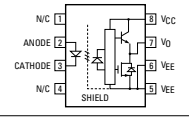
Optoisolation and Optical Sensor Products

Highly Integrated Smart Gate Drive Optocoupler

Device	Part No.	Package	I _{F(on)} mA Min.	I _{OUT} A Min.	I _{OUT} A Max.	t _{PLH} μs Max.	t _{PHL} μs Max.	PDD μs Max.	V _{CC} V Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
										CMR V/μs (Min.)	V _{CM} V		
	ACPL-302J NEW	S016	10	–	2.5	0.25	0.25	0.16	–	30000	1500	5000	1230
	ACPL-339J NEW	S016	6	1.0	–	0.30	0.30	0.2	–	25000	1500	5000	1414
	ACPL-337J NEW	S016	9	3.0	4.0	0.25	0.28	0.15	–	35000	1500	5000	1414
	ACPL-336J NEW	S016	9	2.0	2.5	0.25	0.28	0.15	–	35000	1500	5000	1414
	ACPL-333J ACPL-332J	S016	8	2.0	2.5	0.25	0.25	0.15	30	50000	1500	5000	1230
	ACPL-331J ACPL-330J	S016	8	1.0	1.5	0.25	0.25	0.15	30	50000	1500	5000	1230
	HCPL-316J	S016	–	2.0	2.5	0.5	0.5	0.3	30	15000	1500	5000	1230

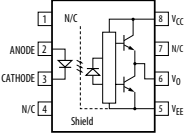
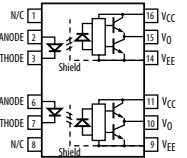
Optoisolation and Optical Sensor Products

Basic Gate Drive Optocoupler

Device	Part No.	Package	I _{F(ON)} mA Min.	I _{OUT} A Min.	I _{OUT} A Max.	t _{PLH} μs Max.	t _{PHL} μs Max.	PDD μs Max.	V _{CC} V Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{ORM} V peak
										CMR V/μs (Min.)	V _{CM} V		
	ACNV3130	NEW 500 mil DIP	12	2.0	2.5	0.50	0.50	0.35	30	40000	1500	7500	2262
	ACNW3410	NEW 400 mil DIP	7	2.5	3.0	0.21	0.21	0.1	30	50000	2000	5000	1414
	ACPL-P346	NEW Stretched S06	7	2.0	2.5	0.12	0.12	50	20	50000	1500	3750	891*
	ACPL-W346	NEW Stretched S06	7	2.0	2.5	0.12	0.12	50	20	50000	1500	5000	1140*
	ACPL-P345	NEW Stretched S06	7	0.8	1.0	0.12	0.12	50	20	50000	1500	3750	891*
	ACPL-W345	NEW Stretched S06	7	0.8	1.0	0.12	0.12	50	20	50000	1500	5000	1140*
	ACPL-P343	NEW Stretched S06	7	3.0	4.0	0.20	0.20	0.1	30	35000	1500	3750	891*
	ACPL-W343	NEW Stretched S06	7	3.0	4.0	0.20	0.20	0.1	30	35000	1500	5000	1140*
	ACPL-P341	NEW Stretched S06	7	2.5	3.0	0.20	0.20	0.1	30	35000	1500	3750	891*
	ACPL-W341	NEW Stretched S06	7	2.5	3.0	0.20	0.20	0.1	30	35000	1500	5000	1140*
	ACPL-P340	NEW Stretched S06	7	0.8	1.0	0.20	0.20	0.1	30	35000	1500	3750	891*
	ACPL-H342	NEW Stretched S08	7	2.0	2.5	0.35	0.25	-0.2	30	40000	1500	3750	891*
	ACPL-K342	NEW Stretched S08	7	2.0	2.5	0.35	0.25	-0.2	30	40000	1500	5000	1140*
	ACPL-312U	300 MIL DIP	7	2.0	2.5	0.5	0.5	0.35	30	25000	1500	3750	630
	ACPL-H312	Stretched S08	7	2.0	2.5	0.5	0.5	0.35	30	15000	1500	3750	891*
	ACPL-K312	Stretched S08	7	2.0	2.5	0.5	0.5	0.35	30	15000	1500	5000	1140*
	ACPL-P302	Stretched S06	7	0.2	0.4	0.7	0.7	0.5	30	10000	1000	3750	891*
	ACPL-P314	Stretched S06	8	0.4	0.6	0.7	0.7	0.5	30	25000	1000	3750	891*
	ACPL-W302E	Stretched S06	7	0.2	0.4	0.7	0.7	0.5	30	10000	1000	5000	1140*
	ACPL-W314	Stretched S06	8	0.4	0.6	0.7	0.7	0.5	30	25000	1000	5000	1140*
	ACNW3190-000E	400 mil DIP8	10	4.0	5.0	0.5	0.5	0.3	30	15000	1500	5000	1414

Optoisolation and Optical Sensor Products

Integrated Gate Drive Optocoupler Product Selection

Device	Part No.	Package	I _{F(om)} mA Min.	I _{OUT} A Min.	I _{OUT} A Max.	t _{PLH} μs Max.	t _{PHL} μs Max.	PDD μs Max.	V _{CC} V Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
										CMR V/μs (Min.)	V _{CM} V		
	ACNW3130	400 mil DIP8	10	2.0	2.5	0.5	0.5	0.35	30	40000	1500	5000	1414
	ACPL-3130	300 mil DIP8	7	2.0	2.5	0.5	0.5	0.35	30	40000	1500	3750	630*
	ACPL-J313	300 mil DIP8	7	2.0	2.5	0.5	0.5	0.35	30	40000	1500	3750	1230
	ACPL-T350	300 mil DIP8	7	2.0	2.5	0.5	0.5	0.35	30	15000	1500	3750	630*
	HCNW3120	400 mil DIP8	10	2.0	2.5	0.5	0.5	0.3	30	25000	1500	5000	1414
	HCPL-J312	300 mil DIP8	7	2.0	2.5	0.5	0.5	0.35	30	25000	1500	3750	1230
	HCPL-J314	300 mil DIP8	8	0.4	0.6	0.7	0.7	0.5	30	25000	1500	3750	891
	HCPL-T250	300 mil DIP8	7	0.5	1.5	0.5	0.5	—	30	5000	600	3750	630*
	HCPL-T251	300 mil DIP8	8	0.1	0.4	1.0	1.0	—	30	10000	600	3750	—
	HCPL-0302	S08	7	0.2	0.4	0.7	0.7	0.5	30	10000	1000	3750	566*
	HCPL-0314	S08	8	0.4	0.6	0.7	0.7	0.5	30	25000	1000	3750	566*
	HCPL-3020	300 mil DIP8	7	0.2	0.4	0.7	0.7	0.5	30	10000	1000	3750	630*
	HCPL-3120	300 mil DIP8	7	2.0	2.5	0.5	0.5	0.35	30	25000	1500	3750	630*
	HCPL-3140	300 mil DIP8	8	0.4	0.6	0.7	0.7	0.5	30	25000	1000	3750	630*
	HCPL-3150	300 mil DIP8	7	0.5	0.6	0.5	0.5	0.35	30	15000	1500	3750	630*
	HCPL-3180	300 mil DIP8	10	2.0	2.5	0.2	0.2	0.09	20	10000	1500	3750	630*
Dual Channel 	HCPL-314J	S016	8	0.4	0.6	0.7	0.7	0.5	30	25000	1500	5000	1230
	HCPL-315J	S016	7	0.5	0.6	0.5	0.5	0.35	30	15000	1500	5000	1230

Notes: * - with IEC/EN/DIN EN 60747-5-2/5 Option 060, ^ - Advanced Information, may subject to changes.

Optoisolation and Optical Sensor Products



Intelligent Power Module Interface Optocoupler

Description

The ACNV/HCNW/HCPL-45xx and ACPL-M/P/W484 series optocouplers are designed for Intelligent Power Module (IPM) drive applications such as inverters and motor control systems. These high speed optocouplers have high CMR performance that helps to reject common mode noise in such high voltage systems. The output of ACNV/HCNW/HCPL-45xx devices is conventional open-collector; the output of ACPL-M/P/W484 devices came with totem pole output stage eliminates the necessity of using the pull-up resistor and allows direct drive to the IPM. ACNV45xx devices allow very high working voltage for use in Renewable Energy Supply system.

Applications

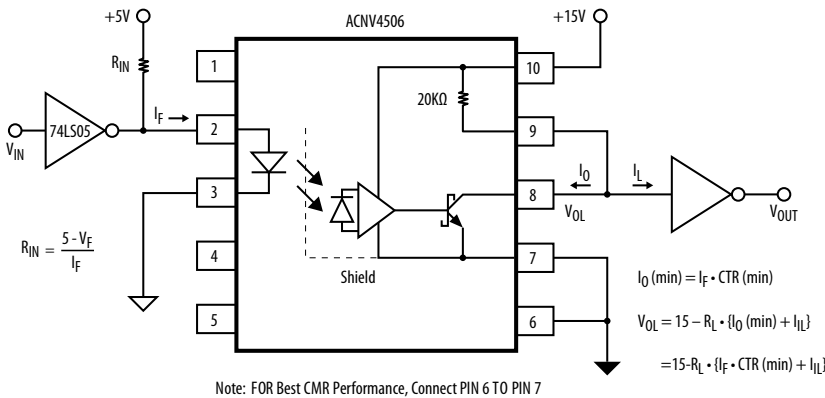
- Intelligent power module
- Inverter/Motor control
- Power switch design
- General purpose digital isolation

In addition to Intelligent Power Module drive, the ACNV/HCNW/HCPL-45xx and ACPL-M/P/W484 series optocouplers can be used in general purpose isolation applications like high speed logic ground isolation, isolated line receivers, and microprocessor system interfaces.

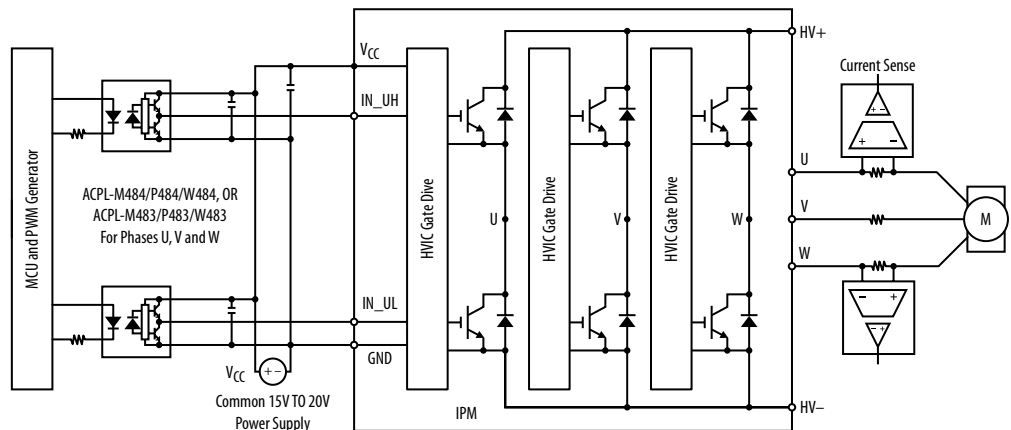
Benefits

- Short propagation delay for faster switching
- Fast IGBT switching for improved efficiency
- High Common Mode Transient Rejection ensures reliable operation under noisy environment
- Wide operating temperature range
- Reinforced insulation

Typical Level Shifting/TTL Interface Block Diagram

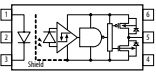
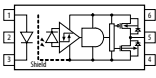
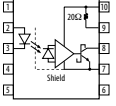
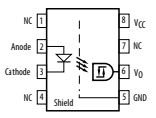

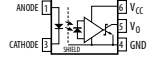
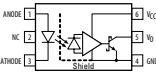
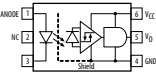
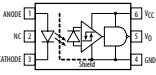
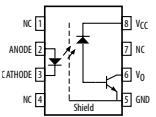
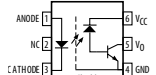


Intelligent Power Module (IPM) Based Inverter Block Diagram



Optoisolation and Optical Sensor Products

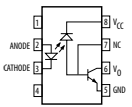
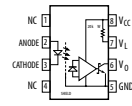
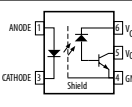
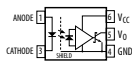
Intelligent Power Module Interface Optocoupler Product Selection

Device	Part No.	Package	I _{F(on)} mA Min.	CTR			t _{PLH} μs Max.	t _{PHL} μs Max.	P _{DD} μs Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
				% Min.	% Max.	IF mA				CMR V/μs (Min.)	V _{CM} V		
	ACPL-M483	S05	4	-	-	-	0.12	0.12	0.10	30000	1000	3750	567*
	ACPL-P483	Stretched S06	4	-	-	-	0.12	0.12	0.10	30000	1000	3750	891*
	ACPL-W483	Stretched S06	4	-	-	-	0.12	0.12	0.10	30000	1000	5000	1140*
	ACPL-M484	S05	4	-	-	-	0.12	0.15	0.13	30000	1000	3750	567*
	ACPL-P484	Stretched S06	4	-	-	-	0.12	0.15	0.13	30000	1000	3750	891*
	ACPL-W484	Stretched S06	4	-	-	-	0.12	0.15	0.13	30000	1000	5000	1140*
	ACNV4506	500 mil DIP10	10	44	-	10	0.55	0.40	0.50	30000	1500	7500	2262*
	ACPL-4800	300 mil DIP8	6	-	-	-	0.35	0.35	0.25	30000	1000	3750	630*
	ACPL-M43U	S05	10	32	80	10	1	1	0.9	15000	1000	3750	567*
	ACPL-M46U	S05	10	44	90	10	0.4	0.55	0.45	15000	1000	3750	567*
	ACPL-P456	Stretched S06	10	44	>90	10	0.55	0.45	0.45	15000	1500	3750	891*
	ACPL-W456	Stretched S06	10	44	>90	10	0.55	0.45	0.45	15000	1500	5000	1140*
	ACPL-P480	Stretched S06	6	-	-	-	0.35	0.35	0.25	20000	1000	3750	891*
	ACPL-W480	Stretched S06	6	-	-	-	0.35	0.35	0.25	20000	1000	5000	1140
	ACPL-P481	Stretched S06	6	-	-	-	0.35	0.35	0.25	20000	1000	3750	891*
	ACPL-W481	Stretched S06	6	-	-	-	0.35	0.35	0.25	20000	1000	5000	1140*
	ACPL-K453	Stretched S08	16	19	50	16	1.00	1.00	1.00	15000	1500	5000	1140*
	ACPL-P454	Stretched S06	12	26	65	12	1.14	1.00	1.30	15000	1500	3750	891*
	ACPL-W454	Stretched S06	12	26	65	12	1.14	1.00	1.30	15000	1500	5000	1140*

Notes: * - with IEC/EN/DIN EN 60747-5-2/5 Option 060, # - with UL 5000VRMS/1 minute Option 020, ^ - Advanced information, may subject to changes.

Optoisolation and Optical Sensor Products

Intelligent Power Module Interface Optocoupler Product Selection

Device	Part No.	Package	I _{F(on)} mA Min.	CTR			t _{PLH} μs Max.	t _{PHL} μs Max.	P _{DD} μs Max.	CMR - V/μs@V _{CM}		V _{ISO} V _{RMS} Min.	V _{IORM} V peak
				% Min.	% Max.	IF mA				CMR V/μs (Min.)	V _{CM} V		
	HCNW4502	400 mil DIP8	16	19	50	16	1.0	1.0	—	1000	10	5000	1414
	HCNW4503	400 mil DIP8	16	19	50	16	1.0	1.0	—	15000	1500	5000	1414
	HCNW4504	400 mil DIP8	12	25	65	12	1.4	1.0	1.3	15000	1500	5000	1414
	HCPL-0452	S08	16	19	50	16	1.0	1.0	—	1000	10	3750	560*
	HCPL-0453	S08	16	19	50	16	1.0	1.0	1.0	15000	1500	3750	560*
	HCPL-0454	S08	12	26	65	12	1.4	1.0	—	15000	1500	3750	560*
	HCPL-4502	300 mil DIP8	16	19	50	16	1.0	1.0	—	1000	10	3750/5000 [#]	630*
	HCPL-4503	300 mil DIP8	16	19	50	16	1.0	1.0	1.0	15000	1500	3750/5000 [#]	630*
	HCPL-4504	300 mil DIP8	12	26	65	12	1.4	1.0	1.3	15000	1500	3750/5000 [#]	630*
HCPL-J454	300 mil DIP8	12	21	65	12	0.7	0.5	1.3	15000	1500	3750	891	
	HCNW4506	400 mil DIP8	10	44	>90	10	0.55	0.40	—	15000	1500	5000	1414
	HCPL-0466	S08	10	44	>90	10	0.55	0.48	0.45	15000	1500	3750	560*
	HCPL-4506	300 mil DIP8	10	44	>90	10	0.55	0.40	0.45	15000	1500	3750/5000 [#]	630*
	HCPL-J456	300 mil DIP8	10	44	>90	10	0.55	0.40	0.45	15000	1500	3750	891
	HCPL-M452	S05	16	20	50	16	1.0	1.0	—	1000	10	3750	567*
	HCPL-M453	S05	16	20	50	16	1.0	1.0	1.0	15000	1500	3750	567*
	HCPL-M454	S05	12	26	65	12	1.4	1.0	1.3	15000	1500	3750	560*
	HCPL-M456	S05	10	44	>90	10	0.55	0.40	0.45	15000	1500	3750	560*
Dual Channel	HCPL-0534	S08	16	19	50	16	1.0	1.0	—	15000	1500	3750	560*
	HCPL-4534	300 mil DIP8	16	19	50	16	1.0	1.0	—	15000	1500	3750/5000 [#]	630*

Notes: * - with IEC/DIN EN 60747-5-2/5 Option 060, # - with UL 5000VRMS/1 minute Option 020, ^ - Advanced information, may subject to changes.

Optoisolation and Optical Sensor Products



Isolated Line Receiver

Description

The HCPL-2602/12 have input current regulators and integrated high gain photo detectors. The input regulator serves as a line terminator for line receiver applications. The higher LED threshold voltage provides improved immunity to differential noise and the rejection internally shielded detector provides better common-mode rejection with no sacrifice in speed.

The diagram below illustrates an unbalanced line receiver using the integrated voltage-clamp input optocoupler, HCPL-2602. TTL data is converted to a differential signal via the differential line driver, and transmitted over twisted-pair wire. The Schottky diode helps to improve the turn-on and turn-off delays.

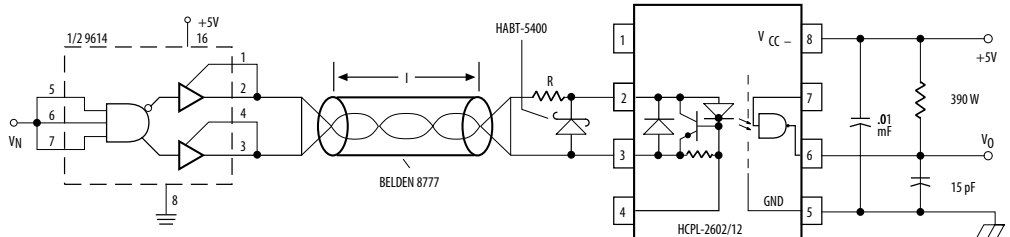
Benefits

- Line termination included – no extra circuitry required

Applications

- Isolated line receiver
- Computer-peripheral interface
- Microprocessor system interface
- Digital isolation for a/d, d/a conversion
- Current sensing
- Instrument Input/Output isolation
- Ground loop elimination
- Pulse transformer replacement
- Power transistor isolation in motor drives

Typical Block Diagram



Line Receiver Product Selection

Device	Part No.	Package	Output Collector Output mA Max.	t_{PLH} μs Max.	t_{PHL} μs Max.	CMR - V/ μs @VCM		V_{ISO} V_{RMS} Min.
						CMR V/ μs (Min.)	V_{CM} V	
	HCPL-2602	300 mil DIP8	50	100	100	1000	50	3750
	HCPL-2612	300 mil DIP8	50	100	100	3500	300	3750
40 ns max propagation delay skew (part to part) Line termination circuitry included								

Optoisolation and Optical Sensor Products



Isolated 20 mA Current Loop Transmitter/Receiver

Description

Data transmission between electronic equipment which are physically separated by a distance of more than a few feet can be achieved by using the HCPL-4100 (transmitter) and the HCPL-4200 (receiver) optocouplers. These devices include specialized circuits for 20 mA digital current loop applications, and are designed to easily interface TTL and CMOS logic systems to current loop systems.

20 mA current loop systems conventionally signal a logic high state by transmitting 20 mA of loop current, and signal a logic low

state by allowing no more than few milli-amperes of loop current. Optical coupling loops break ground loops and provide very high immunity to common mode interference. These devices are simple to use in a data transmission system for industrial applications and maintain integrity.

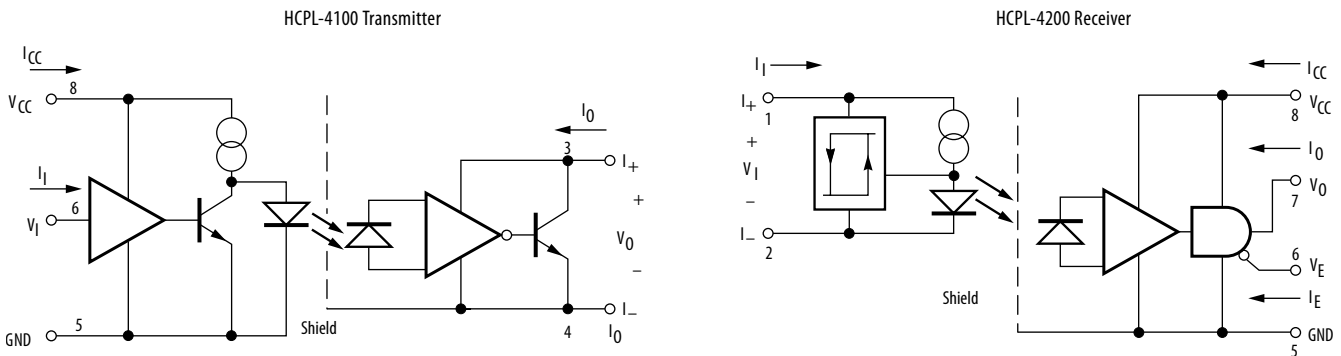
Benefits

- Direct control of the 20 mA current loop
- High noise immunity

Applications

- Isolated 20 mA current loop transmitter in:
 - Industrial control equipment
 - Computer peripherals
 - Data communications equipment

Typical Block Diagram



20 mA Current Loop Transmitter/Receiver Product Selection

Device	Part No.	Package	Data Rate kBd @ (meters)	t_{PLH} μs Max.	t_{PHL} μs Max.	CMR - V/ μs @VCM		V_{ISO} V_{RMS} Min.
						CMR V/ μs (Min.)	V_{CM} V	
Transmitter 	HCPL-4100	300 mil DIP8	20 (400)	1.6	1.0	1000	50	3750
CMOS compatible data input for HCPL-4100								
Receiver 	HCPL-4200	300 mil DIP8	20 (1400)	1.6	1.0	1000	50	3750
CMOS compatible data input for HCPL-4200								

Optoisolation and Optical Sensor Products



Isolated Voltage/Current Detector

Description

In the implementation of an interface from an electrically noisy environment into logic systems, it is often desirable to establish some current or voltage switching point or input switching threshold – the HCPL-3700 optocoupler provides such a solution. This device combines an AC or DC voltage and/or current detection function with high sensing input buffer ICs which permit control of threshold levels over a wide range like sensing industrial control systems, and ring detection in telephone system microprocessor interfacing.

The HCPL-0370/3700/3760 threshold-sensing optocoupler can be used for sensing the AC/DC power on/off condition. At the

optocoupler input, only a pair of series resistors $R_X/2$ are required to limit the current. The AC signal can be filtered with a capacitor at either the input or the output of the optocoupler. The value of R_X determines the threshold sensing voltage.

HCPL-0370/3700/3760's low threshold current reduces power dissipation and its built-in diode bridge and hysteresis circuit reduces the number of external components used.

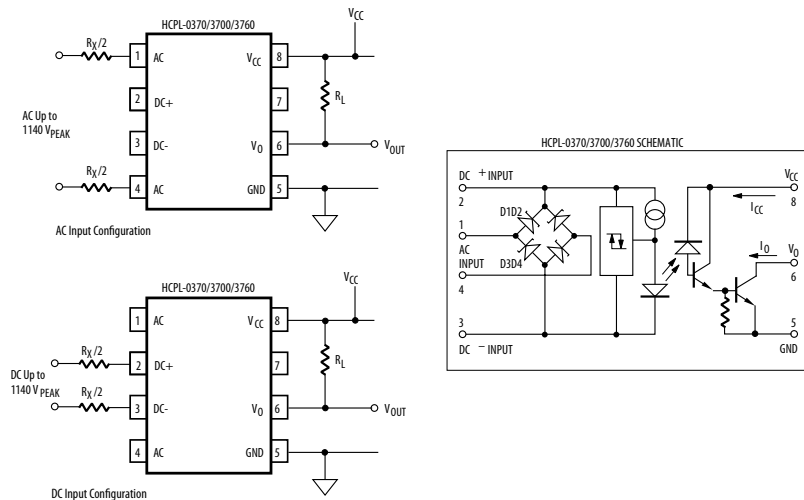
Benefits

- Low threshold current reduces power dissipation
- Hysteresis circuit reduces external components and PCB size

Applications

- Limit switch sensing
- AC/DC voltage and current detector
- Relay contact monitor
- Relay coil voltage monitor
- User configurable voltage/current limit detection
- Microprocessor interfacing

Typical Block Diagram



Isolated Voltage/Current Detector

Device	Part No.	Package	Input Threshold Current		Hysteresis mA typ	t_{PLH} μ s Max.	t_{PHL} μ s Max.	CMR - V/ μ s@ V_{CM}		V_{ISO} V_{RMS} Min.	V_{IORM} V_{PEAK}
			mA					CMR V/ μ s (Min.)	V_{CM} V		
			Min.	Max.							
	ACPL-K370	NEW Stretched S08	1.96	3.11	1.2	40	15	600	140	3750/5000#	1140*
	ACPL-K376	NEW Stretched S08	0.87	1.56	0.6	40	15	600	140	3750/5000#	1140*
	HCPL-0370	S08	1.96	3.11	1.2	40	15	600	140	3750	567*
	HCPL-3700	300 mil DIP8	1.96	3.11	1.2	40	15	600	140	3750	630*
	HCPL-3760	300 mil DIP8	0.87	1.56	0.6	40	15	600	140	3750	630*

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, # - with UL 5000VRMS/1 minute Option 020, ^ - Advanced information, may subject to changes.

Optoisolation and Optical Sensor Products



High Linearity Analog Optocoupler

Description

Avago Technologies' Analog Isolation Applications with Linear Optocouplers HCNR200/1 constitute the basic optical coupling building blocks for high linearity isolation applications. The HCNR200/1 comprises of a high performance LED and two closely matched photodiodes. The output photodiode produces a photo current that is linearly related to the light output of the LED. These high speed, low cost isolation amplifiers are highly suitable for the use in the feedback path of switched mode power supplies, motor speed and position measurement. Very high linearity and excellent low transfer gain variation are the advantages of using HCNR200/1.

This circuit can be used in applications where high bandwidth, low-cost, and stable gain are required.

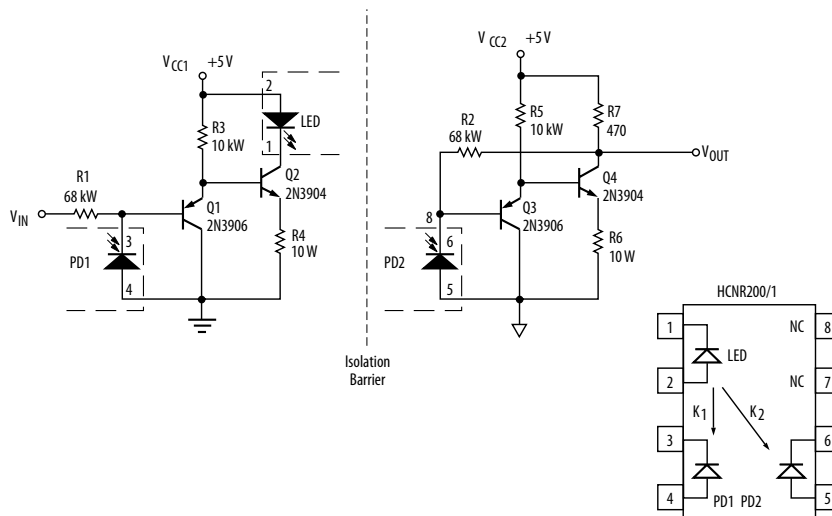
Benefits

- Simple and low cost
- Flexible design with the LED and both Photodiodes accessible to the designer
- Reinforced insulation

Applications

- Industrial process control:
 - Transducer isolator
 - Isolator for thermocouples
 - 4 mA to 20 mA loop isolation
- Low cost analog isolation
- Telecom: modem, PBX
- Switching power supply feedback loop and feedforward
- Monitor motor supply voltage
- Medical

Typical Block Diagram



High Linearity Analog Optocoupler Product Selection

Device	Part No.	Package	Transfer Gain % Max.	DC Non-Linearity % Max.	CTR		V_{ISO} V_{RMS} Min.	V_{IORM} V peak
					% Min.	% Max.		
	HCNR200	400 mil DIP8	+/-15	0.25	0.25	0.75	5000	1414*
	HCNR201	400 mil DIP8	+/-5	0.05	0.36	0.72	5000	1414*
-65 ppm/°C gain temperature coefficient 1.5 MHz bandwidth								

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 050

Optoisolation and Optical Sensor Products



Wideband Analog/Video Optocoupler

Description

The HCPL-4562 and HCNW 4562 are recommended for very high bandwidth (up to 15 MHz) AC analog designs such as coupling audio or video signals.

This circuit, with the HCPL-4562 wideband analog/video optocoupler, is optimized for video signal coupling. The peaked response of the detector circuit helps extend the frequency range over which the gain is relatively constant. The number of gain stages, the overall circuit topology, and the DC bias point are all chosen to maximize the bandwidth.

HCPL-4562 provides simple and cost effective solutions for coupling audio and video signals.

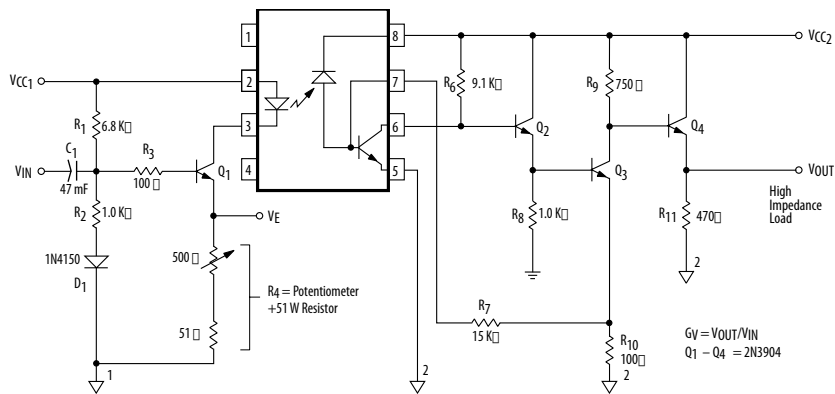
Benefits

- Optimized for video signal coupling
- Simple design for audio and video coupling
- Cost effective
- Reinforced insulation

Applications

- Video isolation for the following standards/formats:
 - NTSC, PAL, SECAM, S-VHS, ANALOG RGB
- Low drive current feedback
- Element in switching power supplies: ISDN networks
- A/D converter signal isolation
- Analog signal ground isolation
- High voltage insulation

Typical Block Diagram



Wideband Analog/Video Optocoupler Product Selection

Device	Part No.	Package	Bandwidth MHz typ	DC Non-Linearity % Max.	CTR % typ	IMRR dB typ	V _{ISO} V _{RMS} Min.	V _{IORM} V peak
	HCNW4562	400 mil DIP8	9	0.15	52	119	5000	1414
	HCPL-4562	300 mil DIP8	17	0.25	45	122	3750/5000 [#]	630*
0.3% / °C gain temperature coefficient								

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060

- with UL 5000VRMS/1 minute Option 020

Optoisolation and Optical Sensor Products



Powerline Communication Interface

Description

The HCPL-0810 / 8100 and ACPL-0820 are designed for narrow band powerline communication (PLC) analog front end interfacing applications. Compact in size, suitable for FCC Part 15 and EN50065-1 compliant design, this family can interface many common PLM transceivers to the powerline, thus simplifying the powerline modem (PLM) implementations.

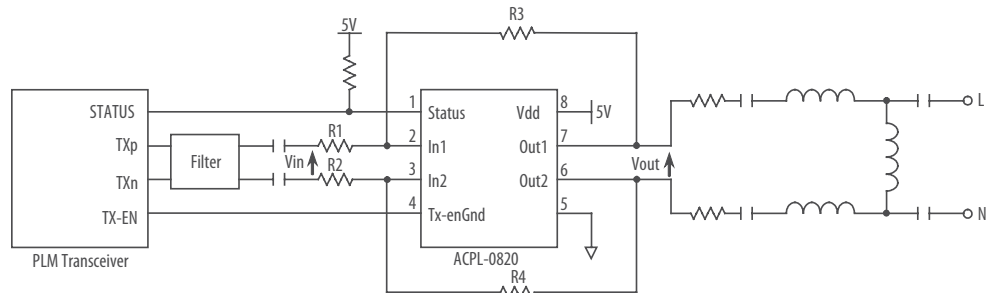
Benefits

- Compact integrated solution
- Low power consumption
- Integrated safety features such as over-temperature shutdown
- Suitable for FCC Part 15 and EN50065-1 compliant design

Applications

- Automatic meter reading (AMR)
- Powerline modem
- Home automation/control
- Security and surveillance
- General purpose isolated transceiver
- Internet appliances

Typical Power Line Modem Using ACPL-0820



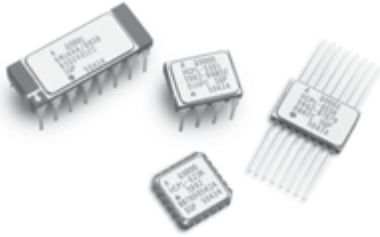
Gain of Amp1 = - R3/R1, Gain of Amp2 = - R4/R2, R1=R2, R3=R4, Overall Differential Output $V_{out} = (R3/R1) \cdot V_{in}$

Power Line Communication Interface Product Selection

Part No.	Package	Signal Path	Bandwidth MHz Typ.	GBWP MHz Typ.	I_0 A _{PP} Typ.	Harmonic Distortion dBc, Max.		Isolation	VCC V Typ.	V_{ISO} V _{RMS} Min.	V_{IORM} V peak
						HD2	HD3				
ACPL-0820	S08	Tx only	—	3.0	1.5	-60	-65	No	5	—	—

Notes: * - with IEC/EN/DIN EN 60747-5-5 Option 060, " - VDD

Optoisolation and Optical Sensor Products



Hermetic High Performance Optocouplers

Isolating one portion of an electrical circuit from another is the primary function of an optocoupler. These devices isolate different voltage levels between the input and output source. Avago Technologies' optocouplers are ideally suited for isolating highly sensitive portions of a circuit from the effects of transmitted common mode signals; offering a variety of input and output characteristics that enable their use in high speed, high performance applications. Avago Technologies' hermetic optocouplers excel in designs for harsh environments that require an exceptionally strong, rugged enclosure.

For design ease, we offer most functions in 8- and 16-Pin DIPs, 20 terminal LCCC's and 16-Pin Flat Packs with various lead configurations for thru-hole or surface mount, with either single, dual or quad channels. These products are capable of operation and storage over the full military temperature range of -55°C to +125°C and can be purchased as either commercial product or with full MIL-PRF-38534 Class Level E, H or K. In line with regulations and our customers needs, we do not offer unleaded solder on our solder dipped devices. All devices are manufactured and tested on a MIL-PRF-38534 certified line and are included in the DLA (Defense Logistics Agency) Qualified Products Database Supplemental Information Sheets QPDSIS-38534 as Hybrid Microcircuits.

Avago Technologies has supplied high reliability hermetic optocoupler products since 1975 for use in state-of-the-art applications. To meet the requirements of high reliability, products must be designed with rugged capabilities. They must be able to withstand

severe levels of environmental stress and exposure without failure over extended periods of time. We have accomplished this objective in designing optocouplers that have proven their merits in numerous advanced space and defense programs in the international marketplace. Avago Technologies' continuity and support of the industry has remained stable, with zero product obsolescence. We are committed to continued process and performance upgrades, backed up with diligent notification to our customers of any changes made using the GIDEP system.

Statistical Process Control and extensive reliability monitoring (life testing of hundreds of thousands of hours) are standard processes for hermetic optocouplers. Control charts are utilized at each critical step of the process and reviewed by product engineering to assure expected quality and reliability.

Avago Technologies is a champion of DLA's QPDSIS and SMD (Standard Microcircuit Drawing) programs. We support standardization, which results in cost-effectiveness and a streamlined acquisition process. As such Avago Technologies offers all Class E, H and K products under SMD numbers. Each Hi-Rel device is dual marked with the DLA SMD and Avago Technologies' part numbers.

Our Screening and Quality Conformance Inspection is outlined on the following page. Custom programs may include full Group A, B, C, and D inspection if required.

Benefits

- Long term commitment - zero obsolescence
- Recognized for high quality, reliability, and customer support
- Certified and qualified to Classes E, H and K of MIL-PRF-38534
- -55°C to +125°C operating temperature range
- All products available on DLA SMD's
- General purpose and application specific products available

Applications

Military, aerospace and harsh industrial applications such as:

- Switching power supplies/UPS
- Motor control
- Field bus
- Inverters
- Power distribution
- Communications

Optoisolation and Optical Sensor Products

Screening per MIL-PRF-38534

Procedure	Method	Conditions	Class H	Class K
Nondestruct bond pull	2023		N/A	100%
Internal visual	2017		100%	100%
Temperature cycle	1010	Condition C, -65°C to +125°C, 10 cycles	100%	100%
Constant acceleration	2001	5Kg's, Y1 and Y2	100%	100%
Visual inspection		Internal requirements	100%	100%
PIND*	2020	Condition A	N/A	N/A*
Serialization			N/A	100%
Pre-Burn-In Elec. Test		Group A, subgroup 1 (except I ₁₋₀) (DC @ +25°C)	100%	100%
Burn-In	1015	Condition B, +125°C, 160 hours Condition B, +125°C, 320 hours	100%	100%
Interim Elec. Test		Group A, subgroup 1 (except I ₁₋₀) (DC @ +25°C)	N/A	100%
Post Burn-In Elec. Test		Group A, subgroup 1, (DC @ +25°C), 10% PDA Group A, subgroup 1, (DC @ +25°C), 2% PDA	100%	100%
Final Elec. Test		Group A, subgroup 2 (DC @ +125°C) Group A, subgroup 3 (DC @ -55°C) Group A, subgroup 9 (AC @ +25°C) Group A, subgroup 10 (AC @ +125°C) Group A, subgroup 11 (AC @ -55°C)	100% 100% 100% 100% 100%	100% 100% 100% 100% 100%
Fine Leak	1014	Condition A	100%	100%
Gross Leak	1014	Condition C	100%	100%
Radiographics	2012		N/A	100%
External visual	2009		100%	100%

* PIND and RGA (Internal Water Vapor Content) testing (Group C) is no longer required on Avago Technologies optocouplers due to the construction of the devices. DLA approved this test elimination in 2002.

Quality Conformance Inspection

Group A Testing

Group A testing is satisfied per the in-line verification testing requirements of MIL-PRF-38534 for Class H devices utilizing Option 1.

Group A testing is performed per in-line sample testing requirements of MIL-PRF-38534 for Class E and K devices utilizing Option 2.

Group B Testing

Group B testing is satisfied by performing in-line process monitors as required by MIL-PRF-38534 for Class H devices utilizing Option 1.

Group B testing is satisfied by performing end of line sampling as required by MIL-PRF-38534 for Class E and K devices utilizing Option 2.

Group C Testing

Group C testing is performed on first inspection lots and as required to evaluate or qualify changes per the requirements of MIL-PRF-38534.

Group D Testing

Group D testing is not performed. Note that Group D requirements are satisfied during incoming inspection element evaluation.

Please be advised that Class E, H and K devices have very similar Screening and Quality Conformance Inspection requirements as shown above. Class E and K devices, however, have substantially more stringent element evaluation and assembly criteria. The quality and reliability of these devices must be built in, not tested out.

Optoisolation and Optical Sensor Products

Hermetically Sealed High Speed Logic Gate Optocouplers

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class K	DLA SMD Class K *	Package				No. of Channels	Typical Data Rate	Common Mode @ VCM=50V	Input Current	With-stand Test Voltage	Supply Voltage
						8 pin DIP	16 pin DIP	16 pin FP	20 pad LCCC						
	HCPL-5200	HCPL-5201	5962-8876801	HCPL-520K	5962-8876802K	•				1	5MBd	1000V/μs	2-8 mA	1500 Vdc	20V
	HCPL-5230	HCPL-5231	5962-8876901	HCPL-523K	5962-8876904K	•				2	5MBd	1000V/μs	2-8 mA	1500 Vdc	20V
	HCPL-6230	HCPL-6231	5962-8876902	HCPL-623K	5962-8876905K				•	2	5MBd	1000V/μs	2-8 mA	1500 Vdc	20V
	HCPL-6250	HCPL-6251	5962-8876903	HCPL-625K	5962-8876906K			•		4	5MBd	1000V/μs	2-8 mA	1500 Vdc	20V
	HCPL-5400	HCPL-5401	5962-8957001	HCPL-540K	5962-8957002K	•				1	20MBd	500V/μs	6-10 mA	1500 Vdc	5.25V
	HCPL-5430	HCPL-5431	5962-8957101	HCPL-543K	5962-8957103K	•				2	20MBd	500V/μs	6-10 mA	1500 Vdc	5.25V
	HCPL-6430	HCPL-6431	5962-8957102	HCPL-643K	5962-8957104K				•	2	20MBd	500V/μs	6-10 mA	1500 Vdc	5.25V
	6N134	6N134/883B	8102801	HCPL-268K	5962-9800101K		•			2	10MBd	1000V/μs	10-20 mA	1500 Vdc	5.5V
	HCPL-5600	HCPL-5601	5962-9085501H	HCPL-560K	5962-9085501K	•				1	10MBd	1000V/μs	10-20 mA	1500 Vdc	5.5V
	HCPL-5630	HCPL-5631	8102802	HCPL-563K	5962-9800102K	•				2	10MBd	1000V/μs	10-20 mA	1500 Vdc	5.5V
	HCPL-5650	HCPL-5651	8102805			•				2	10MBd	1000V/μs	10-20 mA	2500 Vdc	5.5V
	HCPL-6630	HCPL-6631	8102803	HCPL-663K	5962-9800103K				•	2	10MBd	1000V/μs	10-20 mA	1500 Vdc	5.5V
	HCPL-6650	HCPL-6651	8102804	HCPL-665K	5962-9800104K				•	4	10MBd	1000V/μs	10-20 mA	1500 Vdc	5.5V
	ACPL-2670L	ACPL-2672L	5962-0824203H	ACPL-268KL	5962-0824203K		•			2	10MBd	1000V/μs	10-20 mA	1500 Vdc	3.3V
	ACPL-5600L	ACPL-5601L	5962-0824201H	ACPL-560KL	5962-0824201K	•				1	10MBd	1000V/μs	10-20 mA	1500 Vdc	3.3V
ACPL-5630L	ACPL-5631L	5962-0824202H	ACPL-563KL	5962-0824202K	•				2	10MBd	1000V/μs	10-20 mA	1500 Vdc	3.3V	
	HCPL-1930	HCPL-1931	5962-8957201	HCPL-193K	5962-8957202K		•			2	10MBd	1000V/μs	12.5-60 mA	1500 Vdc	5.5V

*DLA SMD number does not include extensions for lead form and finish

Hermetically Sealed High Speed Transistor Optocouplers

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class K	DLA SMD Class K *	Package				No. of Channels	Typical Data Rate	Current Transfer Ratio	Input Current	With-stand Test Voltage	Supply Voltage
						8 pin DIP	16 pin DIP	16 pin FP	20 pad LCCC						
	4N55	4N55/883B	5962-8767901	HCPL-257K	5962-8767905K		•			2	700 KBd	9% min	12-20 mA	1500 Vdc	18V
	HCPL-5500	HCPL-5501	5962-9085401H	HCPL-550K	5962-9085401K	•				1	700 KBd	9% min	12-20 mA	1500 Vdc	18V
	HCPL-5530	HCPL-5531	5962-8767902	HCPL-553K	5962-8767906K	•				2	700 KBd	9% min	12-20 mA	1500 Vdc	18V
	HCPL-6530	HCPL-6531	5962-8767903	HCPL-653K	5962-8767907K				•	2	700 KBd	9% min	12-20 mA	1500 Vdc	18V
	HCPL-6550	HCPL-6551	5962-8767904	HCPL-655K	5962-8767908K				•	4	700 KBd	9% min	12-20 mA	1500 Vdc	18V

*DLA SMD number does not include extensions for lead form and finish

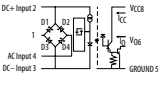
Hermetically Sealed High Gain Optocouplers

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class K	DLA SMD Class K *	Package				No. of Channels	Typical Data Rate	Current Transfer Ratio	Input Current	With-stand Test Voltage	Supply Voltage Range
						8 pin DIP	16 pin DIP	16 pin FP	20 pad LCCC						
	6N140A	6N140A/883B	8302401	HCPL-177K	5962-9800201K		•			4	100 KBd	300% min	0.5-5 mA	1500 Vdc	18V
	HCPL-5700	HCPL-5701	5962-8981001	HCPL-570K	5962-8981002K	•				1	100 KBd	300% min	0.5-5 mA	1500 Vdc	18V
	HCPL-5730	HCPL-5731	5962-8978501	HCPL-573K	5962-8978503K	•				2	100 KBd	300% min	0.5-5 mA	1500 Vdc	18V
	HCPL-6730	HCPL-6731	5962-8978502	HCPL-673K	5962-8978504K				•	2	100 KBd	300% min	0.5-5 mA	1500 Vdc	18V
	HCPL-6750	HCPL-6751	8302401	HCPL-675K	5962-9800201K				•	4	100 KBd	300% min	0.5-5 mA	1500 Vdc	18V
	ACPL-1770L	ACPL-1772L	5962-0822703H	ACPL-177KL	5962-0822703K		•			4	100 KBd	300% min	0.5-5 mA	1500 Vdc	3.3V
	ACPL-5700L	ACPL-5701L	5962-0822701H	ACPL-570KL	5962-0822701K	•				1	100 KBd	300% min	0.5-5 mA	1500 Vdc	3.3V
	ACPL-5730L	ACPL-5731L	5962-0822702H	ACPL-573KL	5962-0822702K	•				2	100 KBd	300% min	0.5-5 mA	1500 Vdc	3.3V

*DLA SMD number does not include extensions for lead form and finish

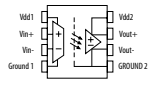
Optoisolation and Optical Sensor Products

Hermetically Sealed AC/DC to Logic Interface Optocouplers

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class K	DLA SMD Class K *	8 pin DIP	No. of Channels	Typical Data Rate	Input Threshold Current	Output Current	Withstand Test Voltage
	HCPL-5760	HCPL-5761	5962-8947701	HCPL-576K	5962-8947702K	•	1	100 KHz	2.5 mA TH+	2.6 mA	1500 Vdc

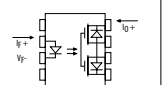
*DLA SMD number does not include extensions for lead form and finish

Hermetically Sealed Power MOSFET

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class E	DLA SMD Class E *	Package 8 pin DIP	No. of Channels	Output Withstand Voltage	Output On-Resistance	Maximum Load Current	Maximum Off-State Leakage	Input Current	Input/Output Insulation
	HSSR-7110	HSSR-7111	5962-9314001H	HSSR-711E	5962-9314001E	•	1	90V	1.0 Ohm	0.8 A ac 1.6 A dc	10 µA	10-20mA	1500 Vdc
		HSSR-7112	5962-9314002H			•	1	90V	1.0 Ohm	0.8 A ac 1.6 A dc	10 µA	5-20mA	1500 Vdc

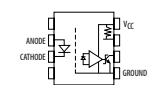
*DLA SMD number does not include extensions for lead form and finish

Hermetically Sealed Analog Isolation Amplifier

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class E	DLA SMD Class E *	Package 8 pin DIP	No. of Channels	Gain Tolerance (Max. %)	Non-Linearity (Max. %)	Prop Delay µs (Max.)	CMR V/µs (Min.)	Bandwidth Khz (typ.)	Offset mV (typ.)
	HCPL-7850	HCPL-7851	5962-9755701H	ACPL-785E	5962-9755701E	•	1	5	0.1	11	5000	100	0.6

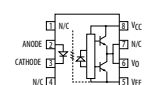
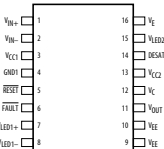
*DLA SMD number does not include extensions for lead form and finish

Hermetically Sealed Intelligent Power Module and Gate Drive Interface

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Class K	DLA SMD Class K *	Package 8 pin DIP	No. of Channels	Typical Data Rate	Current Transfer Ratio	Input Current	Common Mode @ V _{CM} =1000V	Withstand Test Voltage
	HCPL-5300	HCPL-5301	5962-9685201H	HCPL-530K	5962-9685201K	•	1	2MBd	30 % Min.	10-20 mA	10kV/µs	1500 Vdc

*DLA SMD number does not include extensions for lead form and finish

Hermetically Sealed Gate Drive Optocoupler

Single Channel Schematic	Commercial Part Number	Class H	DLA SMD Class H *	Package 8 pin DIP	Package 16 pin DIP	No. of Channels	Peak Output Current	UVLO+	UVLO-	Input Current	Common Mode @ V _{CM} =1000V	Withstand Test Voltage
	HCPL-5120	HCPL-5121	5962-0420401H	•		1	2.0 A	13.5V Max.	9.5V Min.	10-18 mA	10kV/µs	1500 Vdc
		HCPL-5150	5962-0420501H	•		1	0.5 A	13.5V Max.	9.5V Min.	10-18 mA	10kV/µs	1500 Vdc
	ACPL-5160	ACPL-5161	5962-1223601H			1	2.0 A	13.5V Max.	11.2V Typ.	•	9kV/µs	1500 Vdc
2.0 A Highly Integrated Gate Drive Optocoupler with over-current Protection and Fault Feedback CMOS compatible Under Voltage Lock-Out Protection (UVLO) with Hysteresis												

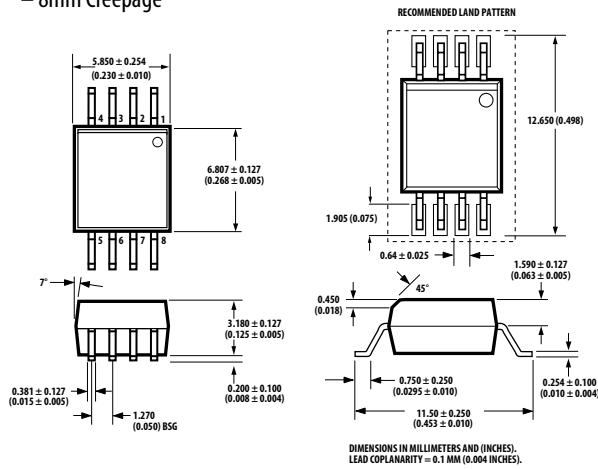
*DLA SMD number does not include extensions for lead form and finish

Optoisolation and Optical Sensor Products

Optocoupler Package Dimensions

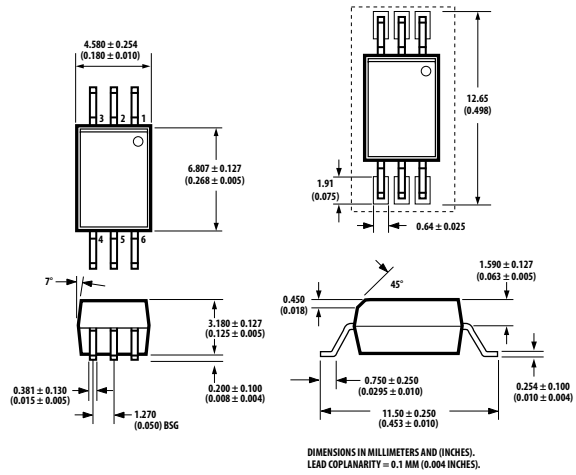
ACPL-Cxxx, ACPL-Kxxx

- Stretched S08
- 8mm Clearance
- 8mm Creepage



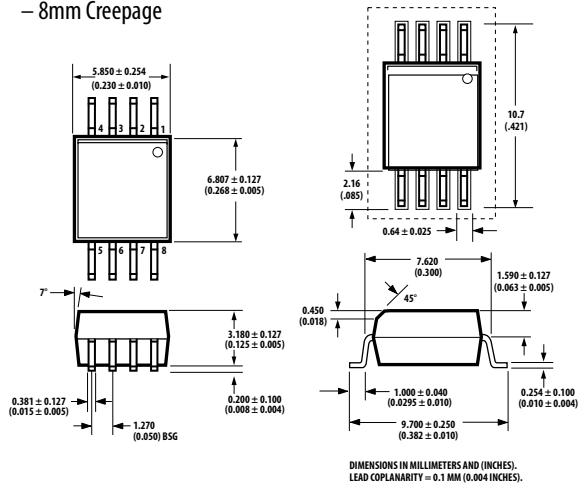
ACPL-Wxxx

- Stretched S06
- 8mm Clearance
- 8mm Creepage



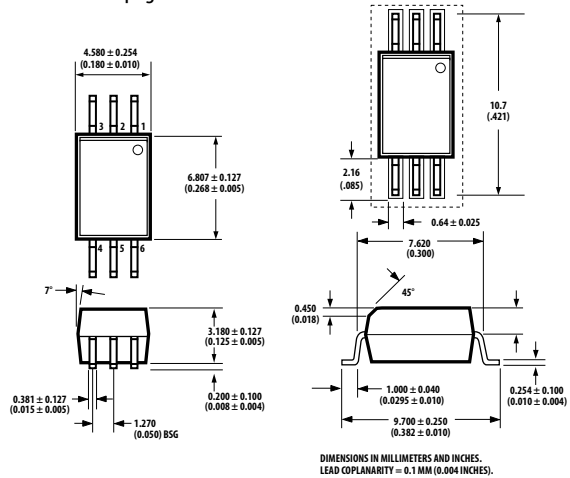
ACPL-Hxxx

- Stretched S08
- 7mm Clearance
- 8mm Creepage



ACPL-Pxxx

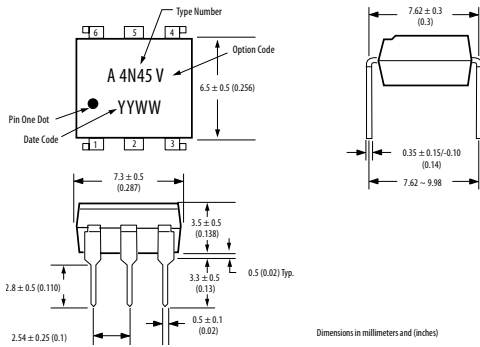
- Stretched S06
- 7mm Clearance
- 8mm Creepage



Optoisolation and Optical Sensor Products

Optocoupler Package Dimensions

300 mil 6 pin DIP

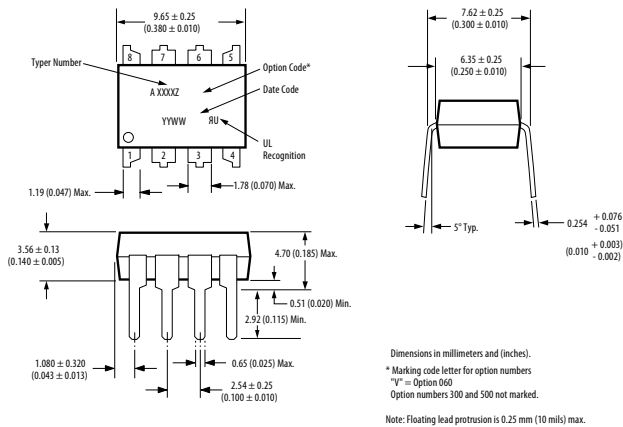


Options Available

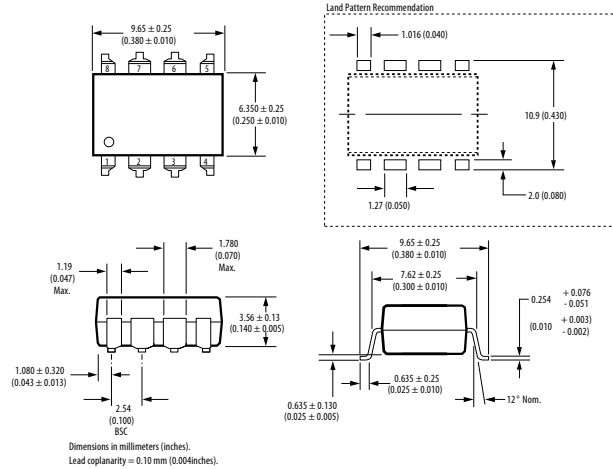
- 020 = UL 5000 V_{rms}/1 Minute Option
- 060 = IEC/EN/DIN EN 60747-5-2/5 Approved Part Option
- 300 = Gull Wing Surface Mount Option
- 500 = Tape & Reel Packaging Option
- xxxE = Lead Free Option

Remarks: The notation '#/' is used for existing products, while (new) products launched since 15th July 01 will use '-/'

300 mil 8 pin DIP



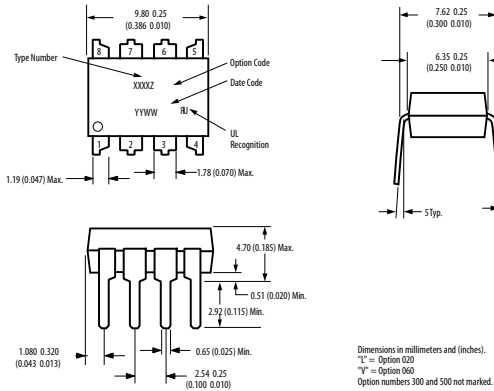
300 mil 8 pin DIP Gullwing Option 300 SMD



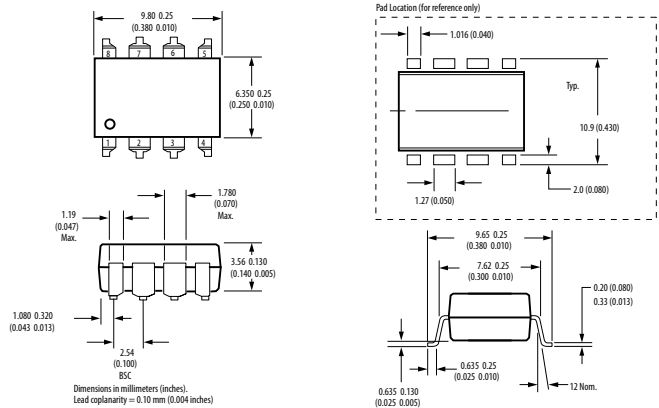
Optoisolation and Optical Sensor Products

Optocoupler Package Dimensions

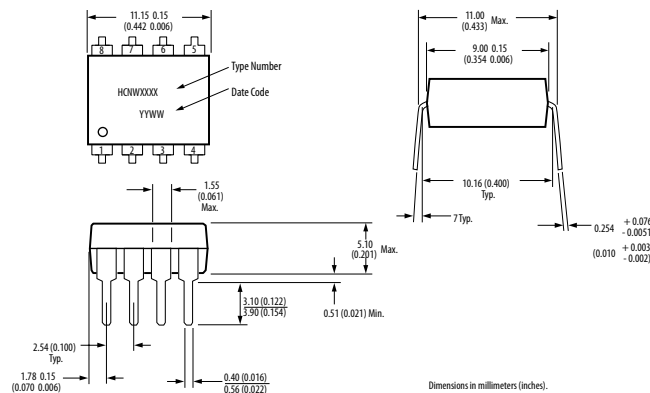
300 mil 8 pin DIP (white)



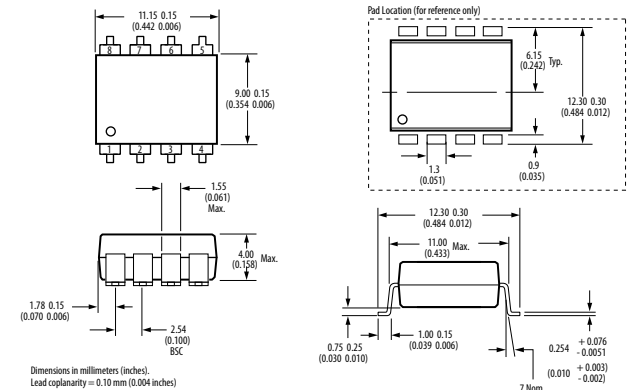
300 mil 8 pin DIP (white) Gullwing Option 300 SMD



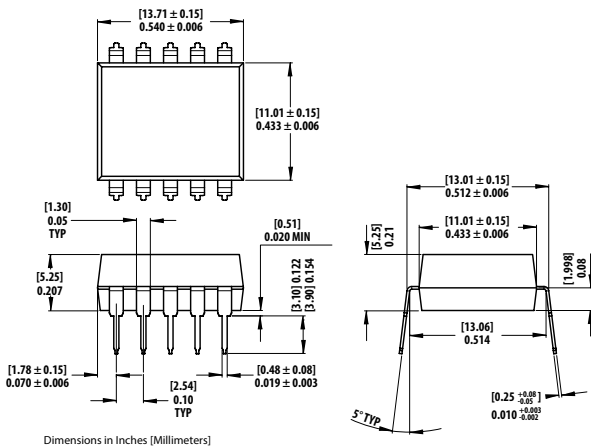
400 mil 8 pin DIP



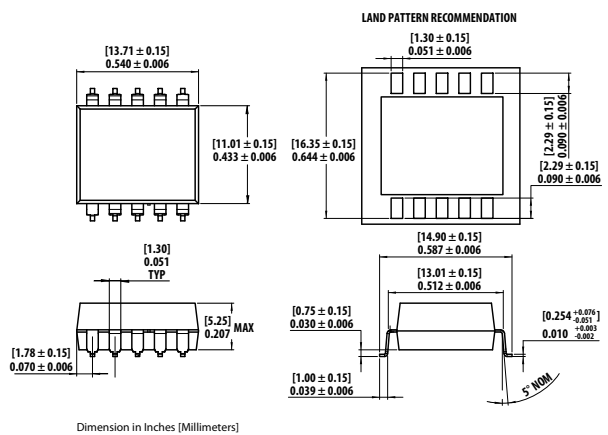
400 mil 8 pin DIP Gull Wing Option 300 SMD



500 mil 10 pin DIP



500 mil 10 pin DIP Gull Wing Option 300/500 SMD

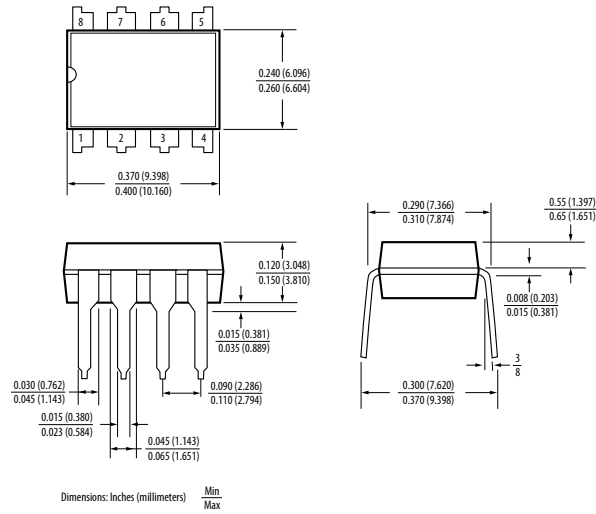


Optoisolation
Solutions

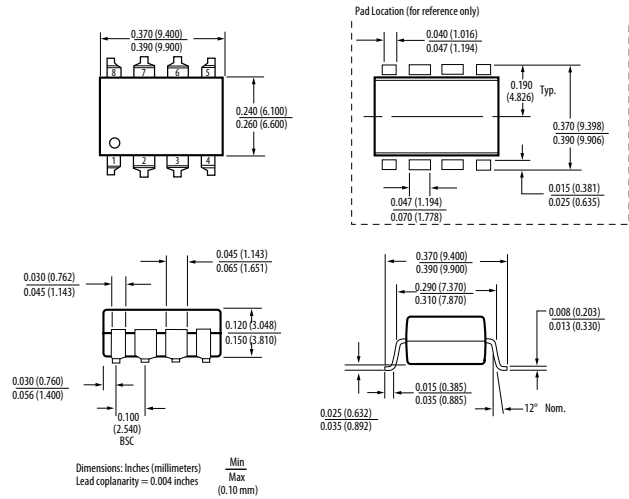
Optoisolation and Optical Sensor Products

Digital Isolator Package Dimensions (Exclude ACML series)

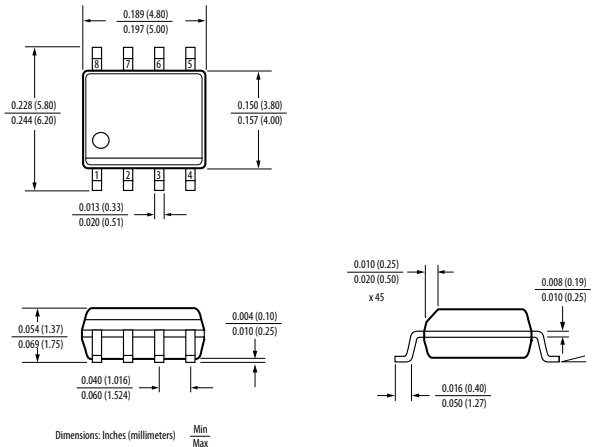
300 mil 8 pin DIP



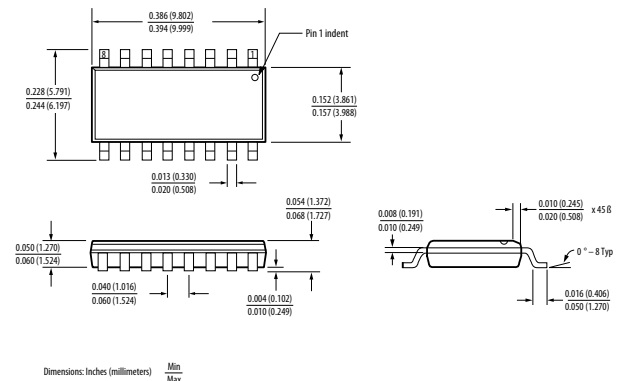
300 mil 8 pin Gull Wing Option 300 SMD



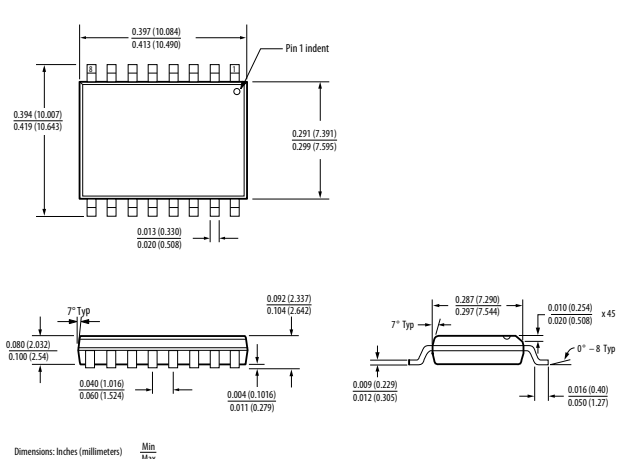
S08 SMD



Narrowbody SOIC 16 pin



Widebody SOIC 16 pin



Options Available

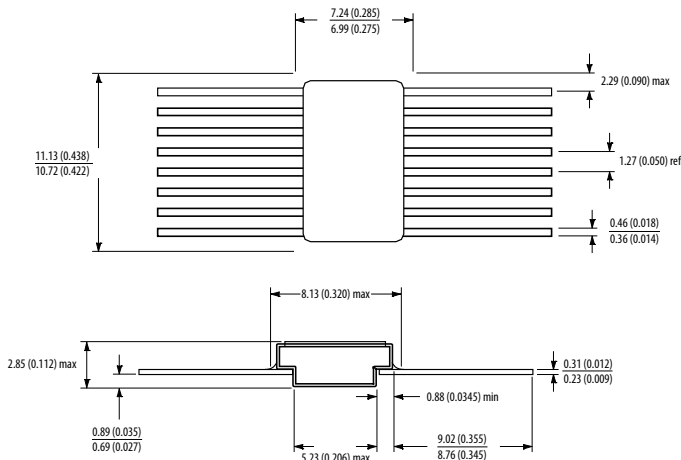
- 300 = Lead Bend SMD Option (300 mil 8 pin DIP)
- 500 = Tape and Reel Packaging Option
- xxxE = Lead Free Option

Remarks: The notation '#' is used for existing products, while (new) products launched since 15th July 01 will use '-'.

Optoisolation and Optical Sensor Products

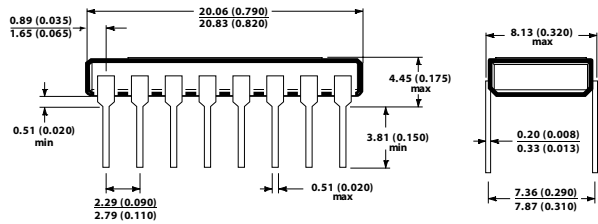
Hermetic Optocoupler Package Dimensions

16 pin Flat Pack (4 Channel)



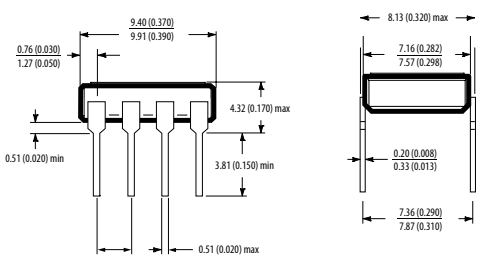
Note: Dimensions in millimeters (inches).

16 pin DIP Through Hole (2 or 4 Channel)



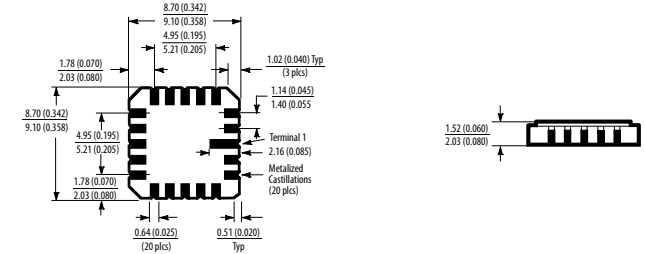
Note: Dimensions in millimeters (inches)

8 pin DIP Through Hole (1 or 2 Channel)



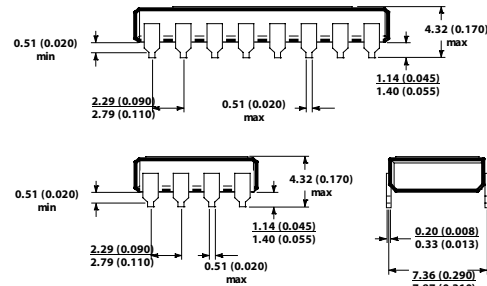
Note: Dimensions in millimeters (inches).

20 Terminal LCCC Surface Mount (2 Channel)



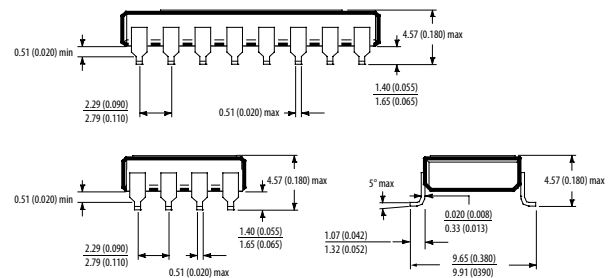
Note: Dimensions in millimeters (inches).
Solder thickness 0.127 (0.005) max.

Option 100, Surface Mount Butt Joint, available on 8 and 16 pin DIP's



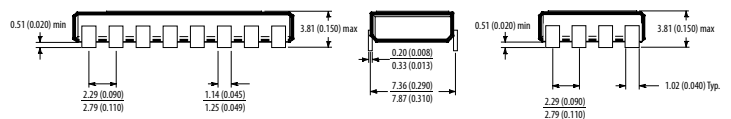
Note: Dimensions in millimeters (inches)

Option 300, Surface Mount Gull Wing, available on 8 and 16 pin DIP's



Note: Dimensions in millimeters (inches).

Option 600, Surface Mount Short Butt Joint, available on 8 and 16 pin DIP's



Note: Dimensions in millimeters (inches).

Optoisolation and Optical Sensor Products

Function vs Application Matrix

Function		Digital Isolation						Analog Isolation							
Market	Application	Power Device Drive		Data Communication			A-D Isolation		Voltage Monitor	Current Sensing	Voltage Sensing	Signal Amp	Signal Switching	Powerline Comm	Power Supply Feedback
		Inverter	IPM	Field Bus	RS422/485	Others	ADC/DAC	V-F Converter							
Industrial	Automated Test Equipment			8	1, 6	2, 3, 4, 5, 11, (18)		2, 6, (18)	13						
	Board CPU			8, 16	1, 6, 16	2, 3, 4, 5, 11, 16, (18)	6, 16, (18)	2, 6, 16, (18)							
	Elevator	9	20			2			13	10	10, 14, 15				
	FFT/Data Logger					2		6, 7, 16, (18)							
	Industrial Induction Cooking	9	20			2				10	10, 14, 15				
	Industrial Networking			7, 8, (18)	1, 6, (18)	2, 3, 4, 5, 11, (18)									
	Instrument			8, 16	1, 6, 16	2, 3, 4, 5, 11, 16, (18)	6, 16, (18)						16		2
	Motor Control	9, 16	16, 20	7, 8, 16	6, 16	2, 3, 4, 5, 11, 16, (18)	6, 16, (18)	2, 6, 16, (18)	13, 16	10, 16	10, 14, 15, 16		16		2
	NC/Robot	9	20	7, 8	6	2, 3, 4, 5, 11, (18)	6, (18)		13	10	10, 14, 15				
	On-board Power Supply					16, 2	6, 16, (18)								2
	Panel Switches			8	1, 6	2, 3, 4, 5, 11, (18)	6, (18)								
	PLC			7, 8, (18)	1, 6, (18)	2, 3, 4, 5, 12, (18)	6, (18)	2, 6, (18)	13						
	Power Distribution System	9, 16	16, 20	8, 16		2, 3, 4, 5, 12, 16, (18)			13, 16				16		2
	Process Meter			7, 8, (18)	1, 6, (18)	2, 12, (18)	6, (18)	2, 6, (18)	13		14, 15				
	Remote Meter Reading													19	
	Servo Driver	9, 16	16, 20	7, 8, 16	6, 16	2, 3, 4, 5, 11, 16, (18)	6, 16, (18)		13, 16	10, 16	10, 14, 15, 16				2
	Sewing Machine	9	20			2			13	10	10, 14, 15				2
	Solar Generator	9	20	8		2			13	10	10, 14, 15				2
	Switching Power Supply	9, 16	16, 20			2				10, 16	10, 14, 15, 16				2
	Test & Measurement Equipment			7, 8, (18)	1, 6, (18)	2, 3, 4, 5, 11, (18)	6, (18)		13						
Thermo Counter/Recorder			8, 16	6, 16	2, 3, 4, 5, 11, 16, (18)	6, 16, (18)	2, 6, 16, (18)								
Welding	9	20						13	10	10, 14, 15					
Medical	Defibrillator	9													
	Electrocardiograph (ECG/EKG)					6, 7 (18)	6, 7 (18)		10	10, 14	10				
	Endoscopes					6, 7 (18)	6, 7 (18)				10				
	Esophagus Photoplethysmography (PPG)					6, 7 (18)	6, 7 (18)				10				
	Magnetic Resonance Imaging (MRI)	9				6, 7 (18)	6, 7 (18)		10		10				
	Patient Monitoring			7, 8		6, 7 (18)	6, 7 (18)				10				
	X-Ray	9				6, 7 (18)	6, 7 (18)		10						

Note: Number in bracket () indicates non-optical isolation product

- | | | | |
|---|---|--|--|
| 1. 3.3V Digital Optocoupler Family | 6. 10 MBd Logic Gate Optocoupler | 12. Isolated 20 mA Current Loop Transmitter/Receiver | 18. Digital Isolator |
| 2. 1 MBd Transistor Output Optocoupler | 7. 20 MBd Logic Gate Optocoupler | 13. AC/DC to Logic Interface | 19. Powerline Communication Interface |
| 3. 100 kBd Darlington Transistor Output Optocoupler | 8. High Speed Digital CMOS Logic Gate Optocoupler | 14. High Linearity Analog Optocoupler | 20. Intelligent Power Module Interface Optocoupler |
| 4. 5 MBd Logic Gate Optocoupler | 9. Integrated Gate Drive Optocoupler | 15. Wideband Analog/Video Optocoupler | |
| 5. 8 MBd Logic Gate Optocoupler | 10. Miniature Analog Isolation Amplifier | 16. Hermetic High Performance Optocoupler | |
| | 11. Isolated Line Receiver | 17. Automotive Optocoupler | |

Optoisolation and Optical Sensor Products

Function vs Application Matrix Continued

Function		Digital Isolation							Analog Isolation						
Market	Application	Power Device Drive		Data Communication			A-D Isolation		Voltage Monitor	Current Sensing	Voltage Sensing	Signal Amp	Signal Switching	Powerline Comm	Power Supply Feedback
		Inverter	IPM	Field Bus	RS422/485	Others	ADC/DAC	V-F Converter							
Automotive	Inverter	9, 17	20, 17		2, 6, 17	2, 17		2, 17			10, 17				
	AC-DC / DC-DC Converter	9, 17			2, 6, 17			2, 17		10, 17	10, 17				2, 17
	Charger	9, 17	20, 17		2, 6, 17			2, 17		10, 17	10, 17				2, 17
	Battery Management				2, 6, 17	2, 17	2, 6, 17				10, 17				
	Oil Pump	9, 17	20, 17		2, 6, 17										
	Heater	9, 17			2, 6, 17										
	Aircon	9, 17	20, 17		2, 6, 17	2, 17				10, 17	10, 17				
Computing and Office Automation	ECR, POS				2, 4, 5, 6	2, 6, 7, 8, (18)									2
	Isolated I/O				2, 4, 5, 6	2, 6, 7, 8, (18)									
	Isolated USB				2, 4, 5, 6	2, 6, 7, 8, (18)									
	Network				2, 4, 5, 6	2, 6, 7, 8, (18)									
	UPS	9	20			2, 8			13	10	10, 14, 15				2
Consumer	Air Conditioning	9	20			2				10					2
	Electronic Gaming				6	2, 6, (18)									2
	Fitness Equipment	9	20						13	10		10			2
	Induction Heating Cookers	9	20												
	Musical (MIDI)					2, 6, (18)									
	Plasma Displays					2, 6, 8, 9									
	Refrigerator	9	20			2									2
Washing Machines	9	20			2									2	
Communications	ISDN				1, 2, 3	2, 7, 8			13						2
	PBX and Central Office				1, 2, 3	2, 3			13						2
	Power Line Communication													19	
	Power-Over-Ethernet (PoE)				7, 8	1, 6									
	Telephone Switching Equipment					2, 6, 7, 8, (18)									2
	Telephone Terminal Equipment					2, 6, 7, 8, (18)									2
	Wireless Base Station					2, 6, 7, 8, (18)									2
Military/ Aerospace/Harsh Industrial		16	16	16	16	16	16	16	16	16	16	16	16	16	16

Note: Number in bracket () indicates non-optical isolation product

- | | | | |
|---|---|--|--|
| 1. 3.3V Digital Optocoupler Family | 6. 10 MBd Logic Gate Optocoupler | 12. Isolated 20 mA Current Loop Transmitter/Receiver | 18. Digital Isolator |
| 2. 1 MBd Transistor Output Optocoupler | 7. 20 MBd Logic Gate Optocoupler | 13. AC/DC to Logic Interface | 19. Powerline Communication Interface |
| 3. 100 kBd Darlington Transistor Output Optocoupler | 8. High Speed Digital CMOS Logic Gate Optocoupler | 14. High Linearity Analog Optocoupler | 20. Intelligent Power Module Interface Optocoupler |
| 4. 5 MBd Logic Gate Optocoupler | 9. Integrated Gate Drive Optocoupler | 15. Wideband Analog/Video Optocoupler | |
| 5. 8 MBd Logic Gate Optocoupler | 10. Miniature Analog Isolation Amplifier | 16. Hermetic High Performance Optocoupler | |
| | 11. Isolated Line Receiver | 17. Automotive Optocoupler | |

Optoisolation and Optical Sensor Products



Optical Sensors

Proximity Sensors

Avago Technologies offers a full range of Optical Proximity Sensors to meet the requirements of today's industrial and consumer applications. The basic construction of an optical proximity sensor consists of an IR LED and a photo-diode. The LED and the photodiode of an Avago's proximity sensor are housed in a specially designed metal-shield to ensure excellent optical isolation. The result is a small size device with low optical cross-talk and excellent power efficiency.

Avago proximity sensors are offered in a variety of options in terms of features, packages and level of integration. Product offerings range from discrete to fully integration modules and choice of analog or digital output. These devices offer engineers the widest selection of features and the design flexibility to meet a variety of performance applications.

Ambient Light Sensor

Avago Technologies offers a series of Ambient Light Sensors that provide precise light detection for a wide range of ambient brightness. These devices are designed with close-to-human-eye spectral response that mimic human eyes perception and hence provide consistent performance under different light sources such as sunlight, fluorescent and incandescent. These Sensors are packaged in miniature chipLED lead-free, RoHS compliance surface mount package and especially suited for mobile phones and portable devices. It is commonly use in mobile phone to enable auto LCD backlight adjustment and key pad lighting depending on the surrounding ambient brightness to achieve optimum viewing comfort and save battery power.

Integrated Ambient Light and Proximity Sensor

Part Number	Size (LxWxH) (mm)	Supply Voltage (V)	ALS Dynamic Range	Max. Detection Distance	PS Output	ALS Output
APDS-9900	3.94 x 2.36 x 1.35	2.5 to 3.6	0.01 to 10k lux	Near zero to 100mm	I2C Digital count output	I2C Digital count output

Optical Proximity Sensor

Part Number	Size (LxWxH) (mm)	Supply Voltage (V)	Max. Detection Distance	PS Output
HSDL-9100	7.10 x 2.75 x 2.7		Near zero to 100mm	Analog
APDS-9190	3.94 x 2.36 x 1.35	2.5 to 3.6	Near zero to 100mm	I2C Digital count output

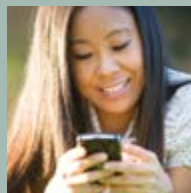
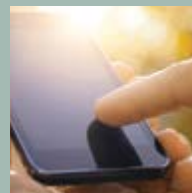
Proximity Sensing Conditioning IC

Part Number	Size	Supply Voltage (V)	Max. Detection Distance	PS Output
APDS-9700	QFN 2 mm x 2 mm	2.4 to 3.6	Near zero to 60mm	Analog (with HI/LO digital o/p)
APDS-9702	QFN 2 mm x 2 mm	2.4 to 3.6	Near zero to 60mm	Analog (with HI/LO digital o/p)

Ambient Light Sensor

Part Number	Size (LxWxH) (mm)	Package	Supply Voltage (V)	Typical Output Current @ 100 Lux (uA)
APDS-9002	2.0 x 1.25 x 0.8	4 pin - ChipLED	2.4 to 5.5	250
APDS-9004	3.2 x 1.6 x 1.1	4 pin - ChipLED Reverse mounting	2.4 to 5.5	230
APDS-9005	1.60 x 1.5 x 0.55	6 pin - ChipLED	1.8 to 5.5	40
APDS-9006	3.2 x 1.6 x 1.1	4 pin - ChipLED Reverse mounting	2.4 to 5.5	40
APDS-9007	2.4 x 2.0 x 0.8 x	6 pin - ChipLED	2.0 to 3.6	30 uA at 1Klux (Logarithmic output)
APDS-9008	1.60 x 1.5 x 0.55	6 pin - ChipLED	1.6 to 5.5	40
APDS-9300	2.6 x 2.2 x 0.55	6 pin - ChipLED	2.4 to 3.0	I2C Digital count output
APDS-9301	2.6 x 2.2 x 0.55	6 pin - ChipLED	2.7 to 3.6	I2C Digital count output
APDS-9303	2.6 x 2.2 x 0.55	6 pin - ChipLED	2.7 to 3.6	SMBus Digital count output

- 258 Accelerating Progress in Wireless Communications**
- 259 FBAR Duplexers**
- 259 FBAR Quadplexers**
- 259 FBAR Filters**
- 259 GPS & GLONASS Front-End-Modules**
- 260 Power Amplifier Modules and PA-Duplexer Front End Modules**
- 261 Power Amplifiers**
- 262 System Block Diagrams and Suggested Products**



Wireless Semiconductor Products System Application Block Diagrams and Product Suggestions



Mobile communications are changing the way industries and individuals manage their lives, homes, offices and businesses. Avago Technologies is at the forefront of the wireless revolution, offering a broad range of mobile connectivity and wireless solutions, and is the partner of choice for leading wireless manufacturers and service providers around the globe. Avago products add value to every stage in the wireless production cycle.

Accelerating Progress in Wireless Communications

Mobile communications are changing the way industries and individuals manage their lives, homes, offices and businesses. Avago Technologies is at the forefront of the wireless revolution, offering a broad range of mobile connectivity and wireless solutions, and is the partner of choice for leading wireless manufacturers and service providers around the globe. Avago products add value to every stage in the wireless production cycle.



Avago Technologies' tiny RFICs have helped lead to smaller wireless products with increased battery life.

RF Component Solutions

Avago Technologies RF component innovations have been instrumental in driving the wireless revolution. Avago CoolPAM™ power amplifiers, Film Bulk Acoustic Resonator (FBAR) filters, and Enhancement-mode pHEMT low noise amplifiers have set new benchmarks for performance, size and battery life. Avago products combine innovative technology, three decades of microwave and RF design experience, and expertise in system, protocol and regulatory understanding to create solutions that can help customers meet the most demanding technical specifications and the most difficult regulatory tests around the world.

Manufacturing Technologies

- Film Bulk Acoustic Resonator
- Gallium Arsenide Heterojunction Bipolar Transistor
- Pseudomorphic High Electron Mobility Transistor
- Enhancement Mode Pseudomorphic High Electron Mobility Transistor
- Silicon

Product Offerings

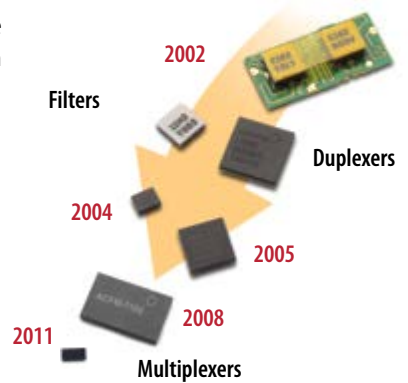
- Filters, Duplexers, and Multiplexers
- Power Amplifier Modules for many standards, including GSM, CDMA, W-CDMA, TD-SCDMA, and LTE
- Low Noise Amplifiers
- Front End Modules including Power Amplifier – Duplexers and Filter-LNAs
- RFICs
- Schottky and PIN Diodes
- Field Effect and Bipolar Transistors
- Millimeter Wave MMICs



Film Bulk Acoustic Resonator (FBAR) Filters, Duplexers, Multiplexers and GPS Front-end Modules

Today's smartphones face many challenges, including support for difficult LTE frequency bands and the need for coexistence between multiple radio systems. The exceptional performance of Avago FBAR filtering technology helps designers meet these challenges by providing low loss filtering with steep rejection characteristics. Microcap wafer-to-wafer bonding technology enables flexible, miniature packaging, including true chip-scale WaferCap filters. FBAR filters are also combined with EpHEMT LNAs to create a line of high performance modules that support demanding GPS and GLONASS applications.

Avago Technologies created a new filter technology with FBAR that helps designers solve tough filtering problems.



Features

- Steep roll-off
- Low insertion loss
- High Isolation
- Superior Out-of-Band Rejection
- Excellent power handling
- Low temperature coefficient

Benefits

- Supports more efficient use of spectrum
- Extends battery life
- Supports coexistence of simultaneously operating radio systems
- Meets stringent 2nd Harmonic LTE requirements
- Improves phones sensitivity, enhancing data rate and network performance
- Can support multiple standards

FBAR Duplexer

UMTS Band 1	UMTS Band 2 / CDMA PCS	UMTS/LTE Band 3	LTE/UMTS Band 4/CDMA AWS-1	LTE Band 7	LTE B25/BC14	UMTS Band 8
ACMD-7614 ACMD-7617	ACMD-4102, ACMD-4502, ACMD-6102, ACMD-7407, ACMD-7409, ACMD-7410, ACMD-7411	ACMD-6003, ACMD-6103	ACMD-4104, ACMD-7609	ACMD-6007 ACMD-6207 ACMD-6307	ACMD-4202 ACMD-6025 ACMD-6125	ACMD-7606 ACMD-7610

FBAR Multiplexer

Part No.	Standard	Package Size
ACFM-7109	CDMA PCS & Cellular Quadplexer	3.0x5.0x1.05 mm
ACFM-7110	CDMA PCS & Cellular Quadplexer	3.0x5.0x1.05 mm
ACFM-7107	CDMA PCS & Cellular Quadplexer	4.0x7.0x1.2 mm
ACFM-7325	Extended PCS & Cellular (BC10/BC14) Quadplexer	4.0x7.0x1.2 mm
ACFM-7425	PCS & Extended Cellular (BC10/B25) Quadplexer	4.0x7.0x1.2 mm

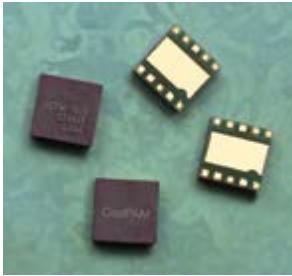
FBAR Filters

Part No.	Standard	Passband	Package Size
ACPF-7005	CDMA PCS+BC14/B25	1850-1915 MHz	1.6 x 2.0 x 1.1mm
ACPF-7024	ISM/WLAN/BT	2401-2482 MHz	1.6 x 2.0 x 0.95 mm
ACPF-7025	B41	2496-2690 MHz	2.5 x 2.5 x 1.0 mm
ACPF-7041	LTE B41	2496-2690 MHz	2.0 x 2.0 x 0.9 mm
ACPF-7124	ISM/WLAN/BT	2401-2482 MHz	1.1 x 1.4 x 0.8 mm
ACPF-7224	ISM/WLAN/BT	2401-2482 MHz	1.1 x 1.4 x 0.8 mm
ACPF-7324	ISM/WLAN/BT	2401-2482 MHz	0.66 x 0.92 x 0.25 mm
ACPF-8025/8125	LTE B25 Rx Diversity	1930-1995 MHz	1.1 x 1.4 x 0.8 mm
ACPF-8040	LTE B40	2300-2400 MHz	2.0 x 1.6 x 0.95 mm
ACPF-9002	WLAN	2403-2493 MHz	0.6 x 0.81 x 0.25 mm
ACFF-1024	WiFi	2401-2482 MHz	1.1 x 1.4 x 0.8 mm

GNSS Front-End-Modules

Part No.	Passband	Configuration	Package Size
AGPS-C003 (GPS, GLONASS+Cellular)	1565-1606 MHz	Diplexer	2.0x2.0x0.95 mm
ALM-GN001 (GPS, GLONASS)	1565-1606 MHz	Filter-LNA	2.3x1.7x0.9 mm
ALM-2712 (GPS)	1574.42-1576.42 MHz	Filter-LNA-Filter	3.0x2.5x1.0 mm
ALM-1712 (GPS)	1574.42-1576.42 MHz	Filter-LNA-Filter	4.5x2.2x1.1 mm
ALM-1812 (GPS)	1574.42-1576.42 MHz	Filter-LNA-Filter	4.5x2.2x1.1 mm
ALM-1612 (GPS)	1574.42-1576.42 MHz	LNA-Filter	3.3x2.1x1.0 mm
ALM-2412 (GPS)	1574.42-1576.42 MHz	LNA-Filter	3.3x2.1x1.1 mm

Power Amplifier Modules and PA-Duplexer Front End Modules



Avago Technologies CoolPAM and FEM technologies offer superior performance.

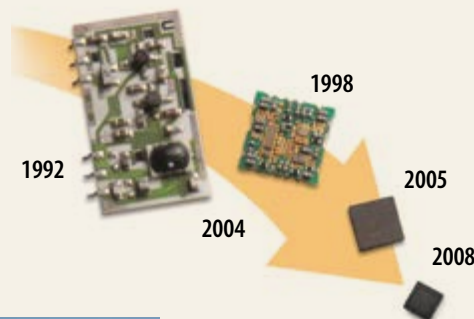
Battery life is one of the most important issues facing designers of next-generation mobile handsets. Not only is it inconvenient to frequently recharge the battery, but lower power consumption in the power amplifier frees more energy for other features like large displays. Avago has developed a technology called CoolPAM™ that helps to optimize battery life by only turning on as much of the power amplifier as is needed, thus greatly enhancing efficiency. Avago has over 15 years of design and manufacturing expertise in power products, and offers power amplifier modules for many different applications. Additionally, Avago has combined its industry-leading FBAR and CoolPAM. technologies to offer a range of integrated modules. By combine multiple “best in class” technologies and optimizing partitioning and device interfaces, these devices can provide superior electrical performance, allowing designers get their products to market faster, with less risk and higher yields.

Features

- High Efficiency
- Integrated high directivity coupling
- Support for multiple standards, including CDMA, W-CDMA, GSM/EDGE, LTE, and TD-SCDMA
- Support for most major bands in a common footprint

Benefits

- Extends battery life
- Excellent power control
- Supports complex 3G and 4G architectures
- Can support multiple standards



Avago Technologies has more than 15 years of design and manufacturing expertise in power products resulting in smaller size and higher efficiency.



Power Amplifiers

Classification	Part No.	Bands	Control	Signal	Package Size	C: CDMA U: UMTS L: LTE T: TD-SCDMA
Single Band PA	ACPM-9013	B13	GPIO	APT	2 x 2.5mm	L
	ACPM-9017	B17	GPIO	APT	2 x 2.5mm	L
	ACPM-9020	B20	GPIO	APT	2 x 2.5mm	L
	ACPM-9040	B40	GPIO	APT	2 x 2.5mm	L
	ACPM-9041	B41	GPIO	APT	2 x 2.5mm	L
	ACPM-9307	B7	MIPI	APT	2 x 2.5mm	L
	ACPM-9311	B11	MIPI	APT	2 x 2.5mm	L
	ACPM-9313	B13	MIPI	APT	2 x 2.5mm	L
	ACPM-9317	B17	MIPI	APT	2 x 2.5mm	L
	ACPM-9320	B20	MIPI	APT	2 x 2.5mm	L
	ACPM-9328	B28	MIPI	APT	2 x 2.5mm	L
	ACPM-9330	B30	MIPI	APT	2 x 2.5mm	L
	ACPM-9340	B40	MIPI	APT	2 x 2.5mm	L
	ACPM-9341	B41	MIPI	APT	2 x 2.5mm	L
	ACPM-9407	B7	MIPI	ET	2 x 2.5mm	L
	ACPM-9411	B11	MIPI	ET	2 x 2.5mm	L
	ACPM-9412	B12	MIPI	ET	2 x 2.5mm	L
	ACPM-9413	B13	MIPI	ET/APT	2 x 2.5mm	L
	ACPM-9417	B17	MIPI	ET	2 x 2.5mm	L
	ACPM-9420	B20	MIPI	ET	2 x 2.5mm	L
ACPM-9428	B28	MIPI	ET	2 x 2.5mm	L	
ACPM-9430	B30	MIPI	ET	2 x 2.5mm	L	
Dual band PA	ACPM-9081	B1/B8 (SiDo)	GPIO	APT	3 x 4mm	C/U
	ACPM-9052	B2/B5 (SiDo)	GPIO	APT	3 x 4mm	C/U
	ACPM-920502	B2/B5	GPIO	APT	3 x 4mm	C/U/L
	ACPM-920417	B4/B17	GPIO	APT	3 x 4mm	U/L
	ACPM-920413	B4/B13	GPIO	APT	3 x 4mm	U/L
	ACPM-920720	B7/B20	GPIO	APT	3 x 4mm	L
	ACPM-924140	B40/B41	GPIO	APT	3 x 4mm	L
Multi mode Multi band PA	ACPM-7500	B1/B2/B3(4)/B5/B8	GPIO	APT	5 x 7mm	C/U/L
	ACPM-7700	B1/B2/B3(4)/B5/B8	MIPI	APT	5 x 7mm	C/U/L
	ACPM-7717	B1/B2/B3/B4(B34,39)/B5/B8/B17(B20)	MIPI	APT	5 x 7mm	C/U/L/T
	ACPM-7600	B1/B2/B3/B4/B5/B8	MIPI	ET/APT	5 x 7mm	C/U/L
	ACPM-7620	B1/B2/B3/B4/B5/B8/B20	MIPI	ET/APT	5 x 7mm	C/U/L
	ACPM-7617	B1/B2/B3/B4/B5/B8/B17	MIPI	ET	5 x 7mm	C/U/L
PAD	AFEM-7613	B13	APT	APT	3 x 5.5mm	L
	AFEM-7007	B7	MIPI	ET	4 x 2.5mm	L
CMOS PA	AJAV-6101	B1	GPIO	APT	3 x 3mm	U
	AJAV-6781	B1/B8	GPIO	APT	3 x 4.2mm	U

System Block Diagrams and Suggested Products

Wireless Infrastructure

- Basestation Radio Card 263
- Basestation Low Noise Amplifier (LNA) 266
- Basestation Tower Mounted Amplifier (TMA) 266
- Basestation Multi-carrier Power Amplifier (MCPA)..... 267
- Microwave Link (Point-Point/Point-Multipoint) 268
- Small Cell Front End 272
- DBS Satellite TV System..... 274
- Mobile DAB/SDARS/DMB Digital Receivers 275
- GPS/GLONASS Receivers..... 276
- 2-6 GHz Systems (including 802.11 a/b/g and 802.16a) 277

VSAT

- C-band..... 280
- Ku-band 282
- Ka-band..... 282

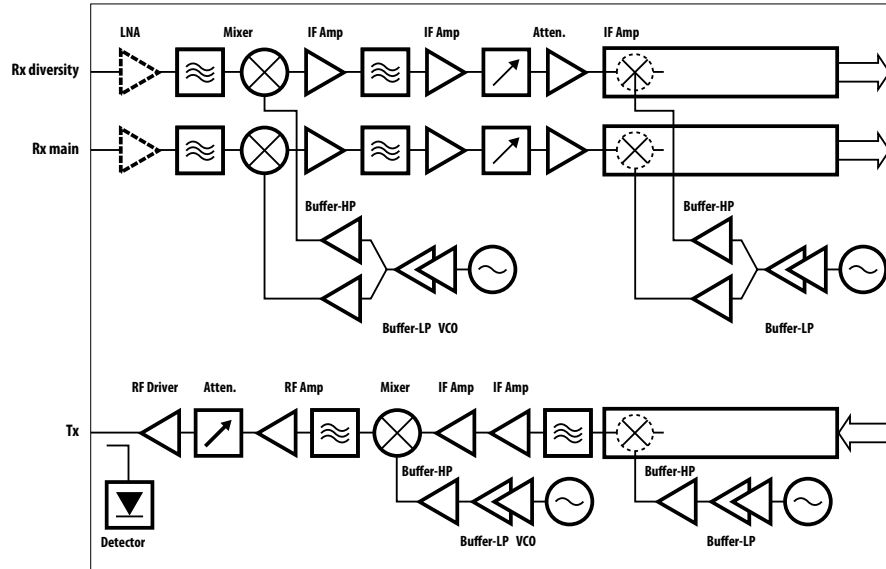
RFID

- RFID 900 MHz Reader..... 284

Product Selection Guides

- RFICs (GaAs and Silicon) 285
- Transistors (FET and Bipolar) 291
- Diodes (PIN and Schottky) 292
- Millimeter Wave MMICs..... 298
- Microwave Radio Link Application Circuit 302

Basestation Radiocard



Radiocard Suggested Components

Application	Part Number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB ¹ @ 2GHz	P1dB/dBm ¹ @ 2GHz	OIP3/dBm @ 2GHz	NF/dB ² @ 2GHz	Device Type and Package (mm)
LNA	MGA-13116	5/55	0.4 - 1.5	38	23.3	41.4	0.51	QFN 4x4x0.85
	MGA-13216	5/53	1.5 - 2.5	35.8	23.6	40.5	0.61	QFN 4x4x0.85
	MGA-13316 ⁶	5/53	2.2 - 4.0	34.3	23.5	41.8	0.76	QFN 4x4x0.85
	MGA-14516	5/45	1.4 - 2.7	31.7	—	23.5	0.66	QFN 4x4x0.85
	MGA-16116 ¹¹	4.8/61	0.45-1.45	18.4	21.2	21.2 (IIP3)	0.27	QFN 4x4x0.85
	MGA-16216 ¹²	4.8/52.5	1.44-2.35	18.4	19.5	19.5 (IIP3)	0.32	QFN 4x4x0.85
	MGA-16316 ¹³	4.8/53.3	1.95-4.0	18.2	18.7	15.5 (IIP3)	0.45	QFN 4x4x0.85
	MGA-53543	5/54	0.4 - 6	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343
	MGA-53589	5/52	0.05 - 3.0	15.8	18.2	37	1.7	SOT-89
	MGA-631P8 ⁵	4/60	0.4 - 1.5	17.5	18.0	33.1	0.53	E-pHEMT MMIC, LPCC 2x2
	MGA-632P8 ⁵	4/60	1.4 - 3	17.6	19.2	34.8	0.62	E-pHEMT MMIC, LPCC 2x2
	MGA-633P8	5/54	0.45 - 2	18	—	37	0.37	QFN 2x2x0.75
	MGA-634P8	5/48	1.5 - 2.3	17.4	22	36	0.37	QFN 2x2x0.75
	MGA-635P8	5/56	2.3 - 4.0	18	21.9	35.9	0.56	QFN 2x2x0.75
	MGA-636P8	4.8/105	0.45 - 1.5	18.5	23	41.5	0.5	QFN 2x2x0.75
	MGA-637P8	4.8/70	1.5 - 2.5	17.5	22	41.5	0.6	QFN 2x2x0.75
	MGA-638P8	4.8/90	2.5 - 4	17.5	22	39.5	0.8	QFN 2x2x0.75
	ATF-58143	3/30	0.45 - 6	16.5	19	30.5	0.5	E-pHEMT FET, SOT343
	ATF-54143	3/60	0.45 - 6	16.6	20	36.2	0.5	E-pHEMT FET, SOT343
	ALM-12124	5/227.7	1.880 - 2.025	39	23.5	36.5	0.85	MCOB 8.0x8.0x1.2
ALM-12224	5/228.7	2.30 - 2.40	36.8	22.7	38.5	0.99	MCOB 8.0x8.0x1.2	

Notes:

- Gain and P1dB performance for discrete FETs when matched for best IP3.
- NFmin figures for discrete FETs.
- High reverse isolation: 50dB typical.

- Current adjustable: 20-60mA.
- Both MGA-631P8 and MGA-632P8 come with integrated active bias circuit. MGA-631P8 data tested at 900MHz.
- MGA-30116, ALM-31122 and ALM-32120 data tested at 900MHz.
- MGA-30316, ALM-31322 and ALM-32320 data tested at 3.5GHz.

- MGA-13316 data tested at 2.5GHz
- ALM-12124 data tested at 2018MHz
- ALM-12224 data tested at 2400MHz
- MGA-16116 data tested at 900 MHz
- MGA-16216 data tested at 1950 MHz
- MGA-16316 data tested at 2.6 GHz

Basestation Radiocard

Radiocard Suggested Components

Application	Part Number	Typ. Bias V/mA	Frequency Range/GHz	Gain/dB ¹ @ 2GHz	P1dB/dBm ¹ @ 2GHz	OIP3/dBm @ 2GHz	NF/dB ² @ 2GHz	Device Type and Package (mm)
RF Amplifier	MGA-30116 ⁶	5/202.8	0.75 - 1	17	–	44.1	2	QFN 3x3
	MGA-30216	5/206	1.7 - 2.7	14.2	–	45.3	2.8	QFN 3x3
	MGA-30316 ⁷	5/198	3.3 - 3.9	12.8	–	44.4	2.7	QFN 3x3
	MGA-30489	5/97	0.25 - 3.0	13.3	23.3	39	3	SOT-89
	MGA-30689	5/104	0.04 - 2.6	14.6	22.5	40	3.3	SOT-89
	MGA-30789	5/100	2 - 6	11.7	–	41.8	3.3	SMT 4.5x4.1x1.5
	MGA-30889	5/65	0.04 - 2.6	15.5	–	38	1.9	SMT 4.5x4.1x1.5
	MGA-30989	5/51	2 - 6	12	–	36.8	2	SMT 4.5x4.1x1.5
	MGA-31189	5/111	0.05 - 2	21	24	42	3	SOT-89
	MGA-31289	5/124	1.5 - 3	18.7	24	41.8	3	SOT-89
	MGA-31389	5/73	0.05 - 2	21.3	22.2	38.6	2	SOT-89
	MGA-31489	5/69	1.5 - 3	19.5	21.9	37.3	1.9	SOT-89
	MGA-31589	5/146	0.45 - 1.5	20.4	27.2	45.3	1.9	SOT-89
	MGA-31689	5/168	1.5 - 3	18.1	27.6	44.9	1.9	SOT-89
	MGA-31716	5/58	2	20.2	21.2	41	1.9	QFN 3x3
	MGA-31816	5/59	1.5 - 4.0	19.5	20.5	40.5	1.6	QFN 3x3
	MGA-53543	5/54	0.4 - 6	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343
	MGA-53589	5/52	0.05 - 3.0	15.8	18.2	37	1.7	SOT-89
	MGA-545P8	3.3/127	0.05 - 7	18.6	21.7	34	2.7	E-pHEMT MMIC, LPCC
	MGA-61563 ⁴	3/41	0.5 - 6	15.5	15.1	31.7	1	E-pHEMT MMIC, SOT363
	ATF-52189	4.5/200	0.05 - 6	16	27	42	1.21	E-pHEMT FET, SOT89
	ATF-521P8	4.5/200	0.05 - 6	17	26.5	42	0.96	E-pHEMT FET, LPCC
	ATF-53189	4/135	0.05 - 6	15.5	23	40	0.62	E-pHEMT FET, SOT89
	ATF-531P8	4/135	0.05 - 6	20	24.5	38	0.6	E-pHEMT FET, LPCC
ADA-4789	4.1/180	DC - 2.5	16.3	16.9	29	4.5	Si MMIC, SOT89	
Variable Gain Amplifier	ALM-80110 ⁸	5/110	0.4 - 1.6	(-27) to 13.6	23.3	40.3	4.8	MCOB 5.0x5.0x1.1
	ALM-80210	5/110	1.6 - 2.6	(-25.5) to 9.8	23.6	40.8	5.3	MCOB 5.0x5.0x1.1
	ALM-81224	5/383	1.45 - 2.75	23.8	27.4	44	2	MCOB 6.0x6.0x1.0
RF Driver	MGA-30489	5/97	0.25 - 3.0	13.3	23.3	39	3	SOT-89
	MGA-30689	5/104	0.04 - 2.6	14.6	22.5	40	3.3	SOT-89
	MGA-30789	5/100	2 - 6	11.7	–	41.8	3.3	SMT 4.5x4.1x1.5
	MGA-30889	5/65	0.04 - 2.6	15.5	–	38	1.9	SMT 4.5x4.1x1.5
	MGA-30989	5/51	2 - 6	12	–	36.8	2	SMT 4.5x4.1x1.5
	MGA-31189	5/111	0.05 - 2	21	24	42	3	SOT-89
	MGA-31289	5/124	1.5 - 3	18.7	24	41.8	3	SOT-89
	MGA-31389	5/73	0.05 - 2	21.3	22.2	38.6	2	SOT-89
	MGA-31489	5/69	1.5 - 3	19.5	21.9	37.3	1.9	SOT-89
	MGA-31589	5/146	0.45 - 1.5	20.4	27.2	45.3	1.9	SOT-89
	MGA-31689	5/168	1.5 - 3	18.1	27.6	44.9	1.9	SOT-89
	MGA-31716	5/58	2	20.2	21.2	41	1.9	QFN 3x3
	MGA-31816	5/59	1.5 - 4.0	19.5	20.5	40.5	1.6	QFN 3x3
	MGA-53589	5/52	0.05 - 3.0	15.8	18.2	37	1.7	SOT-89
	ATF-50189	4.5/280	0.05 - 6	15.5	29	45	1.1	E-pHEMT FET, SOT89
	ATF-501P8	4.5/280	0.05 - 6	14.7	28	45	–	E-pHEMT FET, LPCC
	ATF-511P8	4.5/200	0.05 - 6	14.8	30	41.7	1.4	E-pHEMT FET, LPCC
	ALM-31122 ⁶	5/394	0.7 - 1	15.6	–	47.6	2	MCOB 5.0x6.0x1.1
	ALM-31222	5/415	1.7 - 2.7	14.9	–	47.9	2.7	MCOB 5.0x6.0x1.1
	ALM-31322 ⁷	5/413	3.3 - 3.9	13.2	–	47.7	2.8	MCOB 5.0x6.0x1.1
	ALM-32120 ⁶	5/800	0.7 - 1.0	14	–	52	2.5	MCOB 7.0x10.0x1.1
	ALM-32220	5/800	1.7 - 2.7	14.8	–	50	3.5	MCOB 7.0x10.0x1.1
	ALM-32320 ⁷	5/800	3.3 - 3.9	12.5	–	50	2.5	MCOB 7.0x10.0x1.1

Notes:

1. Gain and P1dB performance for discrete FETs when matched for best IP3.
 2. NFmin figures for discrete FETs.

3. High reverse isolation: 50dB typical.
 4. Current adjustable: 20-60mA.
 5. Both MGA-631P8 and MGA-632P8 come with integrated active bias circuit. MGA-631P8 data tested at 900MHz.
 6. MGA-30116, ALM-31122 and ALM-32120 data tested at 900MHz.

7. MGA-30316, ALM-31322 and ALM-32320 data tested at 3.5GHz.
 8. ALM-80110 data tested at 900MHz

Basestation Radiocard

Radiocard Suggested Components

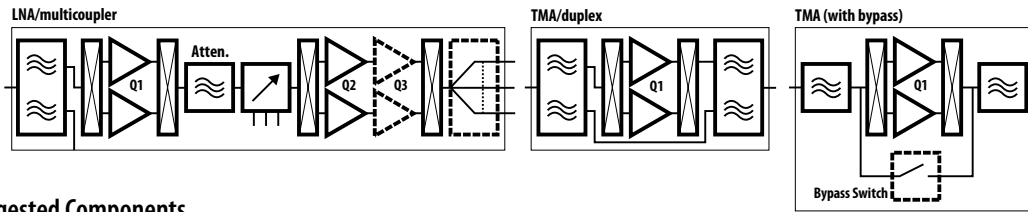
Application	Part Number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB ¹ @2GHz	P1dB/dBm ¹ @2GHz	OIP3/dBm @2GHz	NF/dB ² @2GHz	Device Type and Package (mm)
Mixer	IAM-92516	5/26	0.4 - 3.5	6 (CL)	9	27 (IIP3)	12.5	E-pHEMT MMIC, LPCC(3x3)
Buffer-High Power	MGA-565P8 ³	5/67	0.1 - 3.5	21.8	20 (Psat)	–	–	E-pHEMT MMIC, LPCC
	ABA-54563	5/79	DC - 3.4	23	16.1	27.3	4.4	Si MMIC, SOT363
Buffer-Low Power	ABA-31563	3/14	DC - 3	21.5	2.2	13.1	3.8	Si MMIC, SOT363
	ABA-51563	5/18	DC - 3.5	21.5	1.8	11.4	3.7	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.5	9.8	19.9	3.3	Si MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	12.7	22.9	3.5	Si MMIC, SOT363
	AVT-50663	5/36	DC - 6000	15.3	12.5	25	4	SOT-363 (SC70)
	AVT-51663	5/37	DC - 6000	19.6	12.9	25.1	3.2	SOT-363 (SC70)
	AVT-52663	5/45	DC - 6000	15.3	12.7	27	4	SOT-363 (SC70)
	AVT-53663	5/48	DC - 6000	19.6	15.1	26.5	3.2	SOT-363 (SC70)
	AVT-54689	5/48	0.05 - 6	17.1	17.4	29.6	4.1	SOT-89
	AVT-55689	5/75	0.05 - 6	17.2	19.5	32.5	4.3	SOT-89

Application	Part Number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB ¹ @500MHz	P1dB/dBm ¹ @500MHz	OIP3/dBm @500MHz	NF/dB ² @500MHz	Device Type and Package (mm)
IF Amplifier	MGA-30489	5/97	0.25 - 3.0	18.8	22.7	37	3.3	SOT-89
	MGA-30689	5/104	0.04 - 2.6	14.4	22.2	44	3.0	SOT-89
	MGA-30789	5/100	2 - 6	11.7	–	41.8	3.3	SMT 4.5x4.1x1.5
	MGA-30889	5/65	0.04 - 2.6	15.5	–	38	1.9	SMT 4.5x4.1x1.5
	MGA-30989	5/51	2 - 6	12	–	36.8	2	SMT 4.5x4.1x1.5
	MGA-31189	5/111	0.05 - 2	21	24	42	3	SOT-89
	MGA-31289	5/124	1.5 - 3	18.7	24	41.8	3	SOT-89
	MGA-31389	5/73	0.05 - 2	21.3	22.2	38.6	2	SOT-89
	MGA-31489	5/69	1.5 - 3	19.5	21.9	37.3	1.9	SOT-89
	MGA-31589	5/146	0.45 - 1.5	20.4	27.2	45.3	1.9	SOT-89
	MGA-31689	5/168	1.5 - 3	18.1	27.6	44.9	1.9	SOT-89
	MGA-62563 ⁴	3/55	0.1 - 3	22	18	35	0.8	E-pHEMT MMIC, SOT363
	MGA-545P8	3.3/135	0.1 - 7	22	19	36	2	E-pHEMT MMIC, LPCC
	ADA-4789	4.1/80	DC - 2.5	17	18.8	35	4.2	Si MMIC, SOT89
	ADA-4743	(3.8)/60	DC - 2.5	16.5	17.1	34	4.2	Si MMIC, SOT343
	ADA-4643	(3.5)/35	DC - 2.5	17.3	14	29	4	Si MMIC, SOT343
	ADA-4543	(3.4)/15	DC - 2.5	15.5	2.4	15	3.7	Si MMIC, SOT343
	ABA-54563	5/81	DC - 3	23	18	32	3	Si MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	15	27.5	2.9	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.8	12.5	28	2.7	Si MMIC, SOT363
Detector - Schottky Diodes	HSMS-282x	Ct max = 1pF @0V						SOT323/363/23/143
	HSMS-286x	Ct max = 0.3pF @0V						SOT323/363/23/143
Attenuator - PIN Diodes	HSMP-381x	Very low distortion, Ct typ. = 0.2pF @0V, see AN1048 & AN5262 pi-attenuator design						SOT323/23/25
	HSMP-386x	Lower current, low cost, Ct typ. = 0.2pF @0V, see AN1048 pi-attenuator design						SOT323/363/23/25
Attenuator - Module	ALM-38140	Low distortion, high dynamic range attenuator module						MCOB 3.8x3.8x1.0

Notes:

1. Gain and P1dB performance for discrete FETs when matched for best IP3.
2. NFmin figures for discrete FETs.
3. High reverse isolation: 50dB typical.
4. Current adjustable: 20-60mA.
5. Both MGA-631P8 and MGA-632P8 come with integrated active bias circuit. MGA-631P8 data tested at 900MHz.
6. MGA-30116, ALM-31122 and ALM-32120 data tested at 900MHz.
7. MGA-30316, ALM-31322 and ALM-32320 data tested at 3.5GHz.

Basestation Low Noise Amplifier (LNA) Basestation Tower Mounted Amplifiers (TMA)



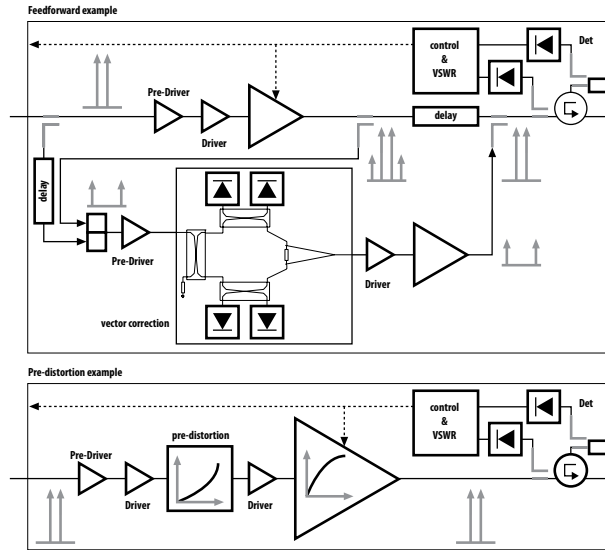
LNA & TMA Suggested Components

Application	Part Number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB ¹ @ 2GHz	P1dB/dBm ¹ @ 2GHz	OIP3/dBm @ 2GHz	NF/dB ² @ 2GHz	Device Type and Package (mm)
Q1	MGA-13116	5/55	0.4 - 1.5	38	23.3	41.4	0.51	QFN 4x4x0.85
	MGA-13216	5/53	1.5 - 2.5	35.8	23.6	40.5	0.61	QFN 4x4x0.85
	MGA-13316	5/53	2.2 - 4.0	34.3	23.5	41.8	0.76	QFN 4x4x0.85
	MGA-14516	5/45	1.4 - 2.7	31.7	-	23.5	0.66	QFN 4x4x0.85
	MGA-16116 ⁷	4.8/61	0.45-1.45	18.4	21.2	21.2 (IIP3)	0.27	QFN 4x4x0.85
	MGA-16216 ⁸	4.8/52.5	1.44-2.35	18.4	19.5	19.5 (IIP3)	0.32	QFN 4x4x0.85
	MGA-16316 ⁹	4.8/53.3	1.95-4.0	18.2	18.7	15.5 (IIP3)	0.45	QFN 4x4x0.85
	MGA-631P8 ³	4/60	0.4 - 1.5	17.5	18.0	33.1	0.53	E-pHEMT MMIC, LPCC 2x2
	MGA-632P8 ³	4/60	1.4 - 3	17.6	19.2	34.8	0.62	E-pHEMT MMIC, LPCC 2x2
	MGA-633P8	5/54	0.45 - 2	18	-	37	0.37	QFN 2x2x0.75
	MGA-634P8	5/48	1.5 - 2.3	17.4	22	36	0.37	QFN 2x2x0.75
	MGA-635P8	5/56	2.3 - 4.0	18	21.9	35.9	0.56	QFN 2x2x0.75
	ALM-11036	5/92	0.776 - 0.87	15.6	4	37.6	0.78	SMT 7x10
	ALM-11136	5/92	0.87 - 0.915	15.4	4.5	38.2	0.76	SMT 7x10
	ALM-11236	5/99	1.71 - 1.85	15.9	3.5	32.3	0.67	SMT 7x10
	ALM-11336	5/100	1.85 - 1.98	15.3	3.8	35.5	0.72	SMT 7x10
	ATF-58143	3/30	0.45 - 6	16.5	19	30.5	0.5	E-pHEMT FET, SOT343
	ATF-54143	3/60	0.45 - 6	16.6	20	36.2	0.5	E-pHEMT FET, SOT343
	ATF-55143	2.7/10	0.45 - 6	17.7	14	24.2	0.6	E-pHEMT FET, SOT343
	ATF-53189	4/135	0.05 - 6	15.5	23	40	0.62	E-pHEMT FET, SOT89
ATF-531P8	4/135	0.05 - 6	20	24.5	38	0.6	E-pHEMT FET, LPCC	
Q2/Q3	MGA-30116 ⁴	5/202.8	0.75 - 1	17	-	44.1	2	QFN 3x3
	MGA-30216	5/206	1.7 - 2.7	14.2	-	45.3	2.8	QFN 3x3
	MGA-30316 ⁵	5/198	3.3 - 3.9	12.8	-	44.4	2.7	QFN 3x3
	MGA-31716	5/58	2	20.2	21.2	41	1.9	QFN 3x3
	MGA-31816	5/59	1.5-4.0	19.5	20.5	40.5	1.6	QFN 3x3
	MGA-53543	5/54	0.4 - 6	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343
	MGA-53589	5/52	0.05 - 3.0	15.8	18.2	37	1.7	SOT-89
	MGA-636P8	4.8/105	0.45 - 1.5	18.5	23	41.5	0.5	QFN 2x2x0.75
	MGA-637P8	4.8/70	1.5 - 2.5	17.5	22	41.5	0.6	QFN 2x2x0.75
	MGA-638P8	4.8/90	2.5 - 4	17.5	22	39.5	0.8	QFN 2x2x0.75
	ATF-50189	4.5/280	0.05 - 6	15.5	29	45	1.1	E-pHEMT FET, SOT89
	ATF-501P8	4.5/280	0.05 - 6	14.7	28	45	-	E-pHEMT FET, LPCC
	ATF-511P8	4.5/200	0.05 - 6	14.8	30	41.7	1.4	E-pHEMT FET, LPCC
	ATF-52189	4.5/200	0.05 - 6	16	27	42	1.21	E-pHEMT FET, SOT89
	ATF-521P8	4.5/200	0.05 - 6	17	26.5	42	0.96	E-pHEMT FET, LPCC
	ATF-53189	4/135	0.05 - 6	15.5	23	40	0.62	E-pHEMT FET, SOT89
	ATF-531P8	4/135	0.05 - 6	20	24.5	38	0.6	E-pHEMT FET, LPCC
	Bypass Switch - PIN Diodes	HSMP-389x	General purpose switch, Ct typ. = 0.4pF @0V					
HSMP-489x		Low inductance, shunt, Ct typ. = 0.4pF @0V						SOT323/23
HSMP-386x		Higher linearity switch, Ct typ. = 0.2pF @0V						SOT323/363/23/25
Attenuator - PIN Diodes	HSMP-381x	Very low distortion, Ct typ. = 0.2pF @0V, see AN1048 & AN5262 pi-attenuator design						SOT323/23/25
	HSMP-386x	Lower current, low cost, Ct typ. = 0.2pF @0V, see AN1048 pi-attenuator design						SOT323/363/23/25
Attenuator-Module	ALM-38140	Low distortion, high dynamic range attenuator module						MCOB 3.8x3.8x1.0

Notes:

- Gain and P1dB performance for discrete FETs when matched for best IP3.
- NFmin figures for discrete FETs.
- Both MGA-631P8 and MGA-632P8 come with integrated active bias circuit. MGA-631P8 data tested at 900MHz.
- MGA-30116 data tested at 900MHz.
- MGA-30316 data tested at 3.5GHz.
- MGA-16116 data tested at 900 MHz
- MGA-16216 data tested at 1950 MHz
- MGA-16316 data tested at 2.6 GHz

Basestation Multi-carrier Power Amplifier (MCPA)



MCPA Suggested Components

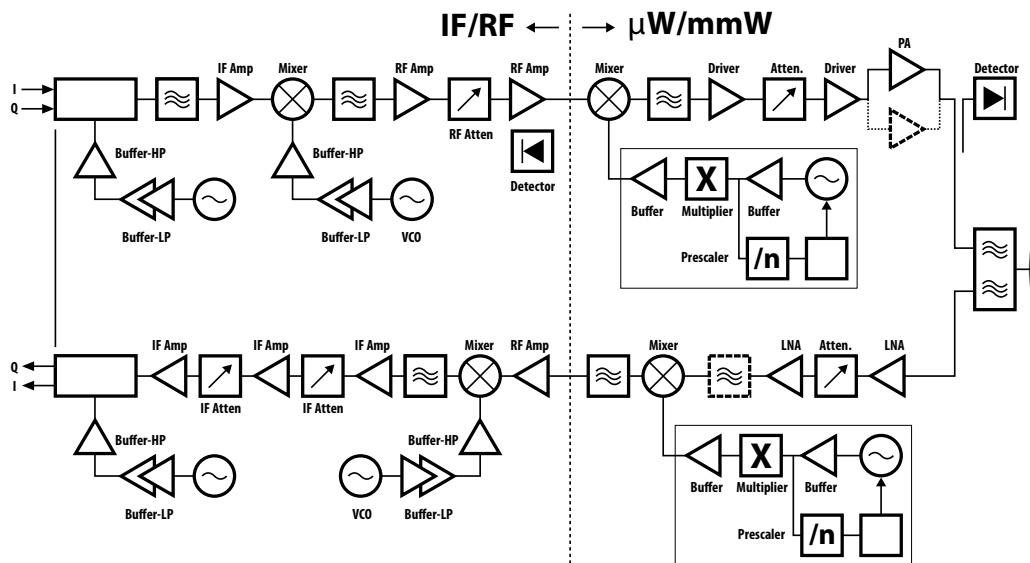
Application	Part Number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB ¹ @ 2GHz	P1dB/dBm ¹ @ 2GHz	OIP3/dBm @ 2GHz	NF/dB ² @ 2GHz	Device Type and Package (mm)
Pre-Driver	MGA-30116 ³	5/202.8	0.75 - 1	17	–	44.1	2	QFN 3x3
	MGA-30216	5/206	1.7 - 2.7	14.2	–	45.3	2.8	QFN 3x3
	MGA-30316 ⁴	5/198	3.3 - 3.9	12.8	–	44.4	2.7	QFN 3x3
	MGA-30489	5/97	0.25 - 3.0	13.3	23.3	39	3	SOT-89
	MGA-30689	5/104	0.04 - 2.6	14.6	22.5	40	3.3	SOT-89
	MGA-30789	5/100	2 - 6	11.7	–	41.8	3.3	SMT 4.5x4.1x1.5
	MGA-30889	5/65	0.04 - 2.6	15.5	–	38	1.9	SMT 4.5x4.1x1.5
	MGA-30989	5/51	2 - 6	12	–	36.8	2	SMT 4.5x4.1x1.5
	MGA-31189	5/111	0.05 - 2	21	24	42	3	SOT-89
	MGA-31289	5/124	1.5 - 3	18.7	24	41.8	3	SOT-89
	MGA-31389	5/73	0.05 - 2	21.3	22.2	38.6	2	SOT-89
	MGA-31489	5/69	1.5 - 3	19.5	21.9	37.3	1.9	SOT-89
	MGA-31589	5/146	0.45 - 1.5	20.4	27.2	45.3	1.9	SOT-89
	MGA-31689	5/168	1.5 - 3	18.1	27.6	44.9	1.9	SOT-89
	MGA-31716	5/58	2	20.2	21.2	41	1.9	QFN 3x3
	MGA-31816	5/59	1.5 - 4.0	19.5	20.5	40.5	1.6	QFN 3x3
	MGA-53543	5/54	0.4 - 6	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343
	MGA-53589	5/52	0.05 - 3.0	15.8	18.2	37	1.7	SOT-89
	MGA-545P8	3.3/127	0.05 - 7	18.6	21.7	34	2.7	E-pHEMT MMIC, LPCC
	ATF-52189	4.5/200	0.05 - 6	16	27	42	1.21	E-pHEMT FET, SOT89
	ATF-521P8	4.5/200	0.05 - 6	17	26.5	42	0.96	E-pHEMT FET, LPCC
	ATF-53189	4/135	0.05 - 6	15.5	23	40	0.62	E-pHEMT FET, SOT89
	ATF-531P8	4/135	0.05 - 6	20	24.5	38	0.6	E-pHEMT FET, LPCC
ADA-4789	4.1/80	DC - 2.5	16.3	16.9	29	4.5	Si MMIC, SOT89	
Driver	ATF-50189	4.5/280	0.05 - 6	15.5	29	45	1.1	E-pHEMT FET, SOT89
	ATF-501P8	4.5/280	0.05 - 6	14.7	28	45	–	E-pHEMT FET, LPCC
	ATF-511P8	4.5/200	0.05 - 6	14.8	30	41.7	1.4	E-pHEMT FET, LPCC
	ALM-31122 ³	5/394	0.7 - 1	15.6	–	47.6	2	MCOB 5.0x6.0x1.1
	ALM-31222	5/415	1.7 - 2.7	14.9	–	47.9	2.7	MCOB 5.0x6.0x1.1
	ALM-31322 ⁴	5/413	3.3 - 3.9	13.2	–	47.7	2.8	MCOB 5.0x6.0x1.1
	ALM-32120 ³	5/800	0.7 - 1.0	14	–	52	2.5	MCOB 7.0x10.0x1.1
	ALM-32220	5/800	1.7 - 2.7	14.8	–	50	3.5	MCOB 7.0x10.0x1.1
	ALM-32320 ⁴	5/800	3.3 - 3.9	12.5	–	50	2.5	MCOB 7.0x10.0x1.1
	ALM-81224	5/383	1.45 - 2.75	23.8	27.4	44	2	MCOB 6.0x6.0x1.0
Detector - Schottky Diodes	HSMS-282x	Ct max = 1pF @0V						SOT323/363/23/143
	HSMS-286x	Ct max = 0.3pF @0V						SOT323/363/23/143
Vector Correction - PIN Diodes	HSMP-481x	Low inductance, shunt, very low distortion, Ct typ. = 0.2pF @0V						SOT323/23
	HSMP-381x	Very low distortion, Ct typ. = 0.2pF @0V						SOT323/23/25

Notes:

- Gain and P1dB performance for discrete FETs when matched for best IP3.
- NFmin figures for discrete FETs.

- MGA-30116, ALM-31122 and ALM-32120 data tested at 900MHz.
- MGA-30316, ALM-31322 and ALM-32320 data tested at 3.5GHz.

Microwave Link (Point-to-Point/Point-to-Multipoint)



Microwave Link MMICs Suggested Components

Application	Part Number	Bias V/mA	Freq. Range GHz	Typical Performance				Package (mm)
				Gain dB	P1dB dBm	OIP3 dBm	NF dB	
Power Amplifiers	AMGP-6432	6/700	28 - 31	20	33	40 @ 30 GHz	—	SM 5x5
	AMGP-6434	6/1400	28 - 31	20	35.5	42 @ 30 GHz	—	SM 5x5
	AMMP-6408	5/650	6 - 18	18	28	38	4.5	SM 5x5
	AMMC-6408	5/650	6 - 18	19	29	38	4.3	chip
	AMMC-6425	5/900 - 0.6	18 - 28	18.5	28.5	38	—	chip
	AMMC-6431	5/0.65	25-33	19	28.5	38	—	chip
Driver/Buffer Amps1	AMMC-6442	5/0.7	37-40	23	30	18	—	chip
	AMMP-5618	5/107	6 - 20	13	19	30	4.4	SM 5x5
	AMMC-5618	5/107	6 - 20	14.5	19.5	26	4.4	chip
	AMMP-5620	5/95	6 - 20	17.5	15	22.5	5.1	SM 5x5
	AMMC-5620	5/95	6 - 20	19	15	23.5	4.2	chip
	AMMC-5040	4.5/300 - 0.45	20 - 45	25	19.5	30	—	chip
	AMMP-6333	5/230	18-33	22	23	30	—	SM 5x5
Low Noise Amplifiers	AMMC-6333	5/230	18-33	22	23	30	—	chip
	AMMC-6345	5/480 - 0.7	20 - 45	20	24	32	—	chip
	VMMK-1225	2/20	0.5 - 26	11	8	23	1	SM
	VMMK-1218	3/20	0.5 - 18	10.7	12	12	0.81	SM 1x0.5
	AMMP-6220	3/55	6 - 20	22	10	20	2.5	SM 5x5
	AMMC-6220	3/55	6 - 20	23	9	19	2	chip
	AMMP-6222	4/120	7 - 21	24	15.5	29	2.3	SM 5x5
	AMMC-6222	4/120	7 - 21	25	16	29	2.1	chip
	AMMP-6232	4/138	18 - 32	23	18	29	3	SM 5x5
AMMC-6232	4/138	18 - 32	24	19	29	2.8	chip	
Travelling Wave Amplifiers	AMMP-6233	3/65	18 - 32	23	8	19	2.6	SM 5x5
	AMMC-6241	3/60	26 - 43	20	10	20	2.7	chip
	AMMP-5024	7/200	(30k) - 40	15	22	30	4.4	SM 5x5
	AMMC-5024	7/200 - 3	(30k) - 40	16	22.5	30	4.6	chip
	AMMC-5025	5/100	(30k) - 80	8	15	20	—	chip
AMMC-5026	7/150 - 1	2 - 35	10.5	24	31	3.6	chip	

Notes:

1. Also see Low Noise Amplifiers.

Wireless Infrastructure

Microwave Link (Point-to-Point/Point-to-Multipoint)

Microwave Link MMICs Suggested Components

Application	Part Number	Freq. Range (GHz)	Typical Performance					Package (mm)
			In/Output RL (dB)	Control Range (dB)	Min. IL (dB)	Control Voltage (V)	IIP3 (dBm)	
Variable Attenuator	AMMC-6630	5 - 45	10/10	20	3.5 @ 25GHz	0 to +1V	+23 @ 25GHz	Chip
	AMMC-6640	DC - 50	12/12	20	4 @ 50GHz	0 to +1.2V	+27 @ 10 dB/30GHz	Chip
	AMMC-6650	DC - 40	15/15	22	3.1 @ 40GHz	0 to +1.5V	+7 @ 22GHz	Chip
	AMMP-6630	5 - 30	10/10	20	3.5 @ 25GHz	0 to +1V	+23 @ 25GHz	SM 5x5
	AMMP-6640	DC - 40	10/10	20	4.4 @ 30GHz	0 to +1.2V	+27 @ 10 dB/30GHz	SM 5x5
	AMMP-6650	DC - 30	12/12	22	2.1 @ 30GHz	0 to +1.5V	+7 @ 22GHz	SM 5x5

Application	Part Number	Input Freq. (GHz)	Typical Performance					Package (mm)
			Output Freq. (GHz)	IP1dB (dBm)	Pout (dBm)	Fo (dBc)	3Fo (dBc)	
Multiplier	AMMP-6125	5 - 12	10 - 24	0	22	20	20	SM 5x5
	AMMP-6120	4 - 12	8 - 24	2	15	25	20	SM 5x5

Application	Part Number	RF Freq./IF (GHz)	Typical Performance					Package (mm)
			Im Rej (dB)	RF/IF RL. (dB)	Conversion Gain (dB)	LO/RF Isolation (dB)	IIP3 (dBm)	
Mixer/Converter	AMMP-6522	7 - 20/DC - 3.5	15	12/12	-13	-	-2 @ 16 GHz	SM 5x5
	AMMP-6530	5 - 30/DC - 5	15	5/10	-5 @ 20 GHz	25	24 @ 23 GHz	SM 5x5
	AMMP-6532	20 - 32/1 - 5	15	9/-	-13	-	-2 @ 26 GHz	SM 5x5
	AMMP-6545	18 - 40/DC - 3.5	-	-	-11 @ 36GHz	30	12	SM 5x5
	AMMP-6546	18 - 40/DC - 3.5	-	-	-11 @ 35GHz	30	16 @ 30 GHz	SM 5x5
	AMMC-6530	5 - 30/DC - 5	15	5/10	-5 @ 20 GHz	25	24 @ 23 GHz	Chip
	AMMC-6545	18 - 45/DC - 3.5	-	-	-9 @ 30GHz	33	18	Chip

Microwave Link (Point-to-Point/Point-to-Multipoint)

Microwave/Millimeter Wave Diode Suggested Components

Application	Part Number	Description	Package
Detector - Schottky diodes	HSCH-5310/5330	Si single, Ct=0.1pF, med. barrier/low barrier	Beamlead
	HSCH-5312/5332	Si single Ct=0.15pF, med. barrier/low barrier	Beamlead
Mixers - Schottky diodes	HSCH-5310/5330	Si single, Ct=0.1pF, med. barrier/low barrier	Beamlead
	HSCH-5312/5332	Si single Ct=0.15pF, med. barrier/low barrier	Beamlead
Multiplier - Schottky diodes	HSCH-5310/5330	Si single, Ct=0.1pF, med. barrier/low barrier	Beamlead
	HSCH-5312/5332	Si single Ct=0.15pF, med. barrier/low barrier	Beamlead
Attenuator - PIN diodes	HPND-4005	Si single, Ct=17fF, t=100ns	Beamlead
Switch - PIN diodes	HPND-4005	Si single, Ct=17fF, t=100ns	Beamlead
	HPND-4028	Si single. Ct=45fF, t=36ns	Beamlead

Microwave Link - IF Component Suggestions

Application	Part Number	Typ. Bias V/mA	Frequency Range/GHz	Gain (dB) @ 2GHz	P1dB (dBm) @ 2GHz	OIP3 (dBm) @ 2GHz	NF (dB) @ 2GHz	Device Type and Package (mm)	
RF Amplifier	MGA-30489	5/97	0.25 - 3.0	13.3	23.3	39	3	SOT-89	
	MGA-30689	5/104	0.04 - 2.6	14.6	22.5	40	3.3	SOT-89	
	MGA-30789	5/100	2 - 6	11.7	–	41.8	3.3	SMT 4.5x4.1x1.5	
	MGA-30889	5/65	0.04 - 2.6	15.5	–	38	1.9	SMT 4.5x4.1x1.5	
	MGA-30989	5/51	2 - 6	12	–	36.8	2	SMT 4.5x4.1x1.5	
	MGA-31189	5/111	0.05 - 2	21	24	42	3	SOT-89	
	MGA-31289	5/124	1.5 - 3	18.7	24	41.8	3	SOT-89	
	MGA-31389	5/73	0.05 - 2	21.3	22.2	38.6	2	SOT-89	
	MGA-31489	5/69	1.5 - 3	19.5	21.9	37.3	1.9	SOT-89	
	MGA-31589	5/146	0.45 - 1.5	20.4	27.2	45.3	1.9	SOT-89	
	MGA-31689	5/168	1.5 - 3	18.1	27.6	44.9	1.9	SOT-89	
	MGA-53543	5/54	0.4 - 6	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343	
	MGA-53589	5/52	0.05 - 3.0	15.8	18.2	37	1.7	SOT-89	
	MGA-545P8	3.3/127	0.05 - 7	18.6	21.7	34	2.7	E-pHEMT MMIC, LPCC	
	MGA-61563 ¹	3/41.6	0.1 - 6	15.5	15.1	31.7	1	E-pHEMT MMIC, SOT363	
	Mixer	ABA-53563	5/35	DC - 3.5	21.5	12.7	22.9	3.5	Si MMIC, SOT363
ABA-54563		5/81	DC - 3	22.5	16	26	4.2	Si MMIC, SOT363	
ADA-4789		4.1/80	DC - 2.5	16.3	16.9	29	4.5	Si MMIC, SOT89	
Buffer-High Power		IAM-92516	5/26	0.4 - 3.5	6 (CL)	9	27 (IIP3)	12.5	E-pHEMT MMIC, LPCC(3x3)
		MGA-565P8 ²	5/67	0.1 - 3.5	21.8	20 (Psat)	–	–	E-pHEMT MMIC, LPCC
Buffer-Low Power		ABA-54563	5/81	DC - 3	22.5	16	27.3	4.4	Si MMIC, SOT363
		ABA-31563	3/14	DC - 3	21.5	2.2	13.1	3.8	Si MMIC, SOT363
		ABA-51563	5/18	DC - 3.5	21.5	1.8	11.4	3.7	Si MMIC, SOT363
		ABA-52563	5/35	DC - 3.5	21.5	9.8	19.9	3.3	Si MMIC, SOT363
		ABA-53563	5/35	DC - 3.5	21.5	12.7	22.9	3.5	Si MMIC, SOT363
		AVT-50663	5/36	DC - 6000	15.3	12.5	25	4	SOT-363 (SC70)
		AVT-51663	5/37	DC - 6000	19.6	12.9	25.1	3.2	SOT-363 (SC70)
		AVT-52663	5/45	DC - 6000	15.3	12.7	27	4	SOT-363 (SC70)
		AVT-53663	5/48	DC - 6000	19.6	15.1	26.5	3.2	SOT-363 (SC70)
		AVT-54689	5/48	0.05 - 6	17.1	17.4	29.6	4.1	SOT-89
AVT-55689		5/75	0.05 - 6	17.2	19.5	32.5	4.3	SOT-89	

Notes:

1. Current Adjustable: 20-60mA.
2. High Reverse Isolation: 50dB typical.

Wireless Infrastructure

Microwave Link (Point-to-Point/Point-to-Multipoint)

Microwave Link - IF Component Suggestions

Application	Part Number	Features	Device Type and Package
Detector - Schottky Diodes	HSMS-282x	Ct max = 1pF @0V	SOT323/363/23/143
	HSMS-286x	Ct max = 0.3pF @0V	SOT323/363/23/143
RF Attenuator - PIN Diodes	HSMP-381x	Very low distortion, Ct typ. = 0.2pF @0V, see AN1048 & AN5262 pi-attenuator design	SOT323/23/25/SOD-323
	HSMP-386x	Lower current, low cost, Ct typ. = 0.2pF @0V, see AN1048 pi-attenuator design	SOT323/363/23/25/SOD-323
Attenuator - Module	ALM-38140	Low distortion, high dynamic range attenuator module	MCOB 3.8x3.8x1.0mm

Application	Part Number	Typ. Bias V/mA	Frequency Range/GHz	Gain (dB) @ 500MHz	P1dB (dBm) @ 500MHz	OIP3 (dBm) @ 500MHz	NF (dB) @ 500MHz	Device Type and Package
IF Amplifier	MGA-62563 ¹	3/55	0.1 - 3	22	18	35	0.8	E-pHEMT MMIC, SOT363
	MGA-545P8	3.3/135	0.1 - 7	22	19	36	2	E-pHEMT MMIC, LPCC
	MGA-30489	5/97	0.25 - 3.0	18.8	22.7	37	3.3	SOT-89
	MGA-30689	5/104	0.04 - 2.6	14.4	22.2	44	3.0	SOT-89
	MGA-30889	5/65	0.04 - 2.6	15.5	–	38	1.9	SMT 4.5x4.1x1.5
	MGA-31189	5/111	0.05 - 2	21	24	42	3	SOT-89
	MGA-31389	5/73	0.05 - 2	21.3	22.2	38.6	2	SOT-89
	MGA-31716	5/58	2	20.2	21.2	41	1.9	QFN 3x3
	ADA-4789	4.1/80	DC - 2.5	17	18.8	35	4.2	Si MMIC, SOT89
	ADA-4743	(3.8)/60	DC - 2.5	16.5	17.1	34	4.2	Si MMIC, SOT343
	ADA-4643	(3.5)/35	DC - 2.5	17.3	14	29	4	Si MMIC, SOT343
	ADA-4543	(3.4)/15	DC - 2.5	15.5	2.4	15	3.7	Si MMIC, SOT343
	ABA-54563	5/81	DC - 3	23	18	32	3	Si MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	15	27.5	2.9	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.8	12.5	28	2.7	Si MMIC, SOT363
	AVT-50663	5/36	DC - 6000	15.3	12.5	25	4	SOT-363 (SC70)
	AVT-51663	5/37	DC - 6000	19.6	12.9	25.1	3.2	SOT-363 (SC70)
	AVT-52663	5/45	DC - 6000	15.3	12.7	27	4	SOT-363 (SC70)
	AVT-53663	5/48	DC - 6000	19.6	15.1	26.5	3.2	SOT-363 (SC70)
	AVT-54689	5/48	0.05 - 6	17.1	17.4	29.6	4.1	SOT-89
AVT-55689	5/75	0.05 - 6	17.2	19.5	32.5	4.3	SOT-89	

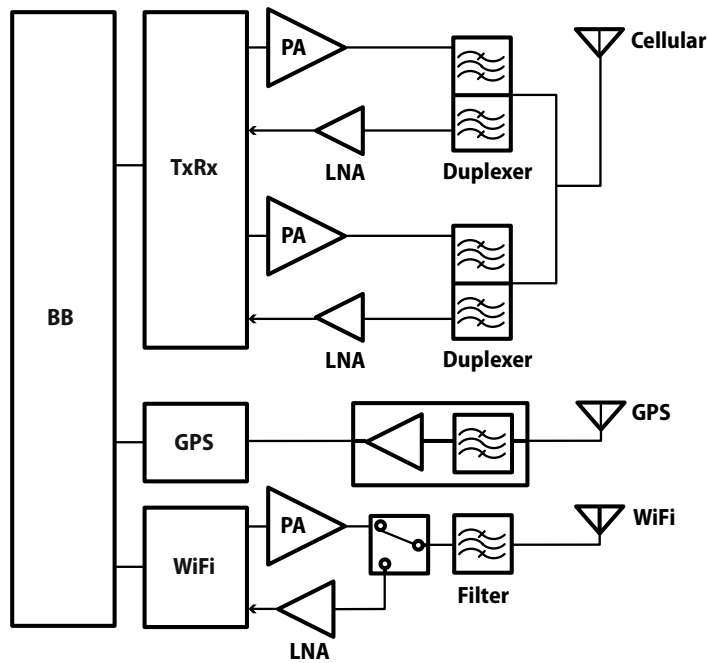
Application	Part Number	Features	Package
Attenuator - PIN Diodes	HSMP-381x	Very low distortion, Ct typ. = 0.2pF @0V, see AN1048 & AN5262 pi-attenuator design	SOT323/23/25
	HSMP-386x	Lower current, low cost, Ct typ. = 0.2pF @0V, see AN1048 pi-attenuator design	SOT323/363/23/25
Attenuator - Module	ALM-38140	Low distortion, high dynamic range attenuator module	MCOB 3.8x3.8x1.0mm

Notes:

1. Current Adjustable: 20-60mA

Wireless Infrastructure

Small Cell Front End



Small Cell Front End Suggested Components

Application	Part Number	Freq. Range MHz	Typical Performance					Voltage (V)	Current (mA)	Operating Range
			Gain dB	P1dB dBm	I/O RL	OIP3 dBm	NF dB			
Low Noise Amplifiers	MGA-62563	500	22.0	18.0	>10.0	35.0	0.8	3.00	60	50-3000
		1000	20.0	17.6	>10.0	33.5	0.9	3.00	60	50-3000
		2000	15.5	17.7	>10.0	33.0	1.2	3.00	60	50-3000
	MGA-683P8	900	17.6	21.9	>10.0	34.7	0.6	5.00	45	400-1500
MGA-684P8	1900	17.1	21.3	>10.0	31.0	0.78	5.00	34	1500-4000	

Application	Part Number	Freq. Range GHz	Test Freq. (GHz)	Vdd (V)	Idq (mA)	Gain (dB)	P1dB (dB)	Pout @ 2.5% EVM	Band	Package (mm)
LTE/UMTS/CDMA Power Amplifiers	MGA-43228	2.3 - 2.5	2.4	5	1023	38.5	36	29.1	40, WLAN 2.4G	QFN 5x5
	MGA-43328	2.5 - 2.7	2.6	5	1017	37.4	36	29.3	7, 38, 41	QFN 5x5
	MGA-43428	851-894 MHz	0.88	5	800	>30	36	27dBm@ 50dBc ACLR	5, 26	MCOB 5x5
	MGA-43528	1.93-1.995	1.96	5	1000	>30	35		2, 25, 36	MCOB 5x5
	MGA-43628	2.0 - 2.2	2.14	5	1000	>30	35		1, 4	MCOB 5x5
	MGA-43728	2.62-2.69	2.65	5	755	38.3	36	27.3dBm @48dBc ACLR	7	MCOB 5x5
	MGA-43828	0.925-0.960	0.94	5	730	32.8	36	27.5dBm @50dBc ACLR	8	MCOB 5x5
	MGA-43003	1.805-1.88	1.842	5	360	41.7	36	27dBm @48dBc ACLR	3, 9, 39	MCOB 5x5
	MGA-43013	728-756 MHz	0.746	5	380	34	36	27 dBm @48dBc ACLR	12, 13, 17	MCOB 5x5
	MGA-43040	2.3-2.4	2.35	5	380	42	35	27 dBm @48dBc ACLR	30, 40	MCOB 5x5
Carrier Grade WiFi	MGA-43024	2401-2473 MHz	2.442	5	450	40.8	34	26.8	2.4GHz	MCOB 5x5

Small Cell Front End

Small Cell Front End Suggested Components

Application	Part Number	Typ. Bias V/ mA	NF/dB	Gain/dB	IIP3/dBm	Device Type and Package (mm)
GPS Low Noise Amplifiers	ALM-2506	2.85/8	0.8	14.3	4.7	Amp, MCOB 2x2x1.1
	MGA-231T6	2.85/6	0.9	18.5	2.0	Amp, UTSLP 2x1.3x0.4
	MGA-24106	2.7/3.3	0.97	17.9	-2.0	Amp, μ DFN 1.5x1.3x0.5
	MGA-310G	2.7/8	0.82	15.2	1.8	GNSS Amp, UQFN 1.1x1.1x0.5
	MGA-61563	3.0/9	1.18	16	-3	Amp, SOT-363
	MGA-635T6	2.85/4.9	0.86	14.6	3.5	Amp, UTSLP 2x1.3x0.4
	*ATF-55143	2.0/10	0.6	17.4	-0.6	E-pHEMT FET, SOT343
	AGPS-L001	2.7/5	0.75	17	2.4	GNSS Amp, MCOB 2x2.5x1

Note: *Refer to Application Note 1376.

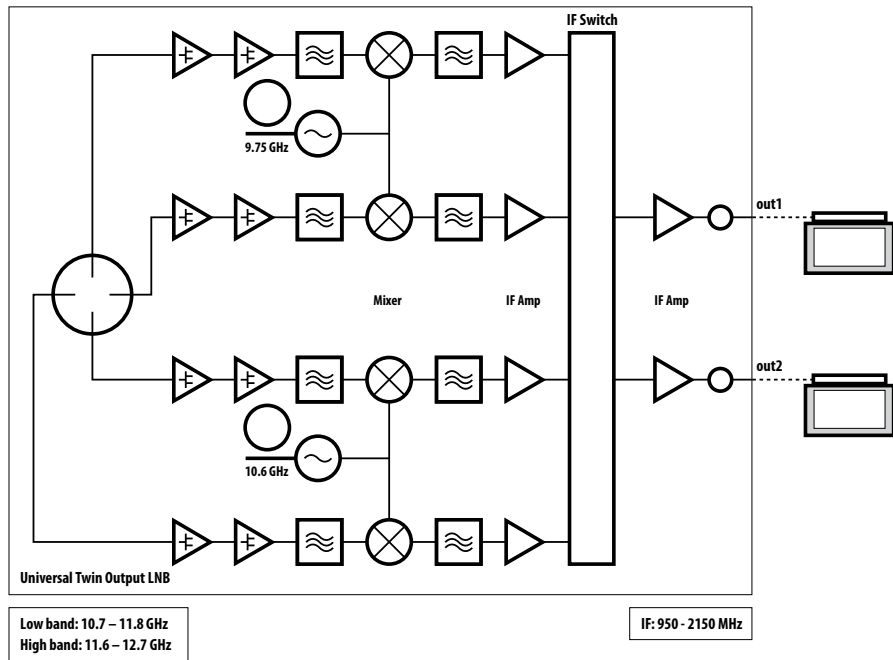
Application	Part Number	Typ. Bias V/ mA	NF/dB	Gain/dB	IIP3/dBm	Cell-Band Rejection/dBc	PCS-Band Rejection/dBc	Device Type and Package (mm)
GPS/GNSS Low Noise Amplifiers/ Filter Modules	ALM-1612	2.7/6	0.95	18.2	2	69	67	LNA/F, MCOB 3.3x2.1x1
	ALM-2412	2.85/9	0.85	13.5	6.1	63	65	LNA/F, MCOB 3.3x2.1x1.1
	ALM-1712	2.7/8	1.65	12.8	3	104	92.6	F/LNA/F, MCOB 4.5x2.2x1.0
	ALM-1812	2.8/6	1.9	18.5	2	95	90	F/LNA/F, MCOB 4.5x2.2x1.0
	ALM-2712	2.7/7.5	12.6	14.2	2	–	–	F/LNA/F, MCOB 3x2.5x1
	ALM-GN001	2.7/5	1.6	16.5	1	53	45	F/LNA, DFN 2.3x1.7x0.85
	ALM-3012	2.7/7.5	0.85	17	0.5	50	50	LNA/F, MCOB 2x2.5x1

Note: F = FBAR Filter.

FBAR Filter

Application	Part Number	Band	Pass Band (MHz)	Typical Insertion Loss (dB)
Small Cell and Carrier Grade WiFi	ACFF-1024	2.4GHz ISM	2401-2482	1.5 dB
	ACMD-7614	1	1920-1980, 2110-2170	1.4, 1.6
	ACMD-6x02, 74xx	2	1850-1910, 1930-1990	1.4, 1.4
	ACMD-6x03	3	1710-1785, 1805-1880	1.5, 1.6
	ACMD-7609	4	1710-1755, 2110-2155	1.3, 1.3
	ACMD-6xx7	7	2500-2570, 2620-2690	1.8, 1.6
	ACMD-7610	8	880-915, 925-960	2.2, 2.2
	ACMD-6x25	25	1850-48-1909.52, 1930.48-1989.52	1.4, 1.5
	ACPF-8x40	40	2300-2400	2
	ACPF-7x41	41	2500-2700	2.4

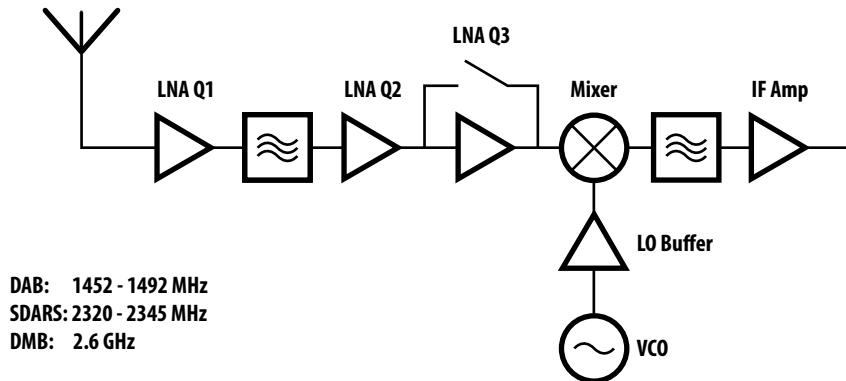
DBS Satellite TV System



DBS Satellite TV System Suggested Components

Application	Part number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB @ 2GHz	P1dB/dBm @ 2GHz	OIP3/dBm @ 2GHz	NF/dB @ 2GHz	Device Type and Package
IF Amplifier	ABA-31563	3/14	DC - 3	21.5	2.2	13.1	3.8	Si MMIC, SOT363
	ABA-51563	5/18	DC - 3.5	21.5	1.8	11.4	3.7	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.5	9.8	19.9	3.3	Si MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	12.7	22.9	3.5	Si MMIC, SOT363
	ABA-54563	5/79	DC - 3.4	23	16.1	27.8	4.4	Si MMIC, SOT363
	AVT-50663	5/36	DC - 6000	15.3	12.5	25	4	SOT-363 (SC70)
	AVT-51663	5/37	DC - 6000	19.6	12.9	25.1	3.2	SOT-363 (SC70)
	AVT-52663	5/45	DC - 6000	15.3	12.7	27	4	SOT-363 (SC70)
	AVT-53663	5/48	DC - 6000	19.6	15.1	26.5	3.2	SOT-363 (SC70)
	AVT-54689	5/48	0.05 - 6	17.1	17.4	29.6	4.1	SOT-89
	AVT-55689	5/75	0.05 - 6	17.2	19.5	32.5	4.3	SOT-89
	MGA-61563	3/41	0.1 - 6	15.5	15.1	31.7	1.0	E-pHEMT MMIC, SOT363
IF Switch	HSMP-386x	Higher linearity switch, Ct typ = 0.2pF @0V						SOT323/363/23/25
	HSMP-389x	General purpose switch, Ct typ. = 0.4pF @0V						SOT323/363/23/143
	HMPS-389x	General purpose switch, Ct typ. = 0.4pF @0V						Minipak
Mixer - Schottky Diodes	HSMS-8202	Ct max = 0.26pF @0V						SOT23
		RD max = 14W @ IF=5Ma						

Mobile DAB/SDARS/DMB-S Digital Receivers



Mobile DAB/SDARS/DMB-S Digital Receivers Suggested Components

Application	Part number	Typ. Bias V/ mA	Gain/dB ¹			OIP3/dBm			NF/dB ²			Device Type and Package (mm)
			DAB	SDARS	DMB-S	DAB	SDARS	DMB-S	DAB	SDARS	DMB-S	
LNA Q1/Q2	ATF-55143	2.7/10	20.0	17.0	16.0	23.0	24.0	24.0	0.3	0.45	0.5	E-pHEMT FET, SOT343
	ATF-551M4	2.7/10	20.0	16.5	16.0	23.0	24.2	24.2	0.3	0.45	0.5	E-pHEMT FET, MiniPak
	MGA-635T6	2.85/4.9	14.6	12.0	–	3.5	4.5	–	0.86	0.96	–	E-pHEMT, UTSLP 2x1.3x0.4
LNA Q3	MGA-645T6	3/7	–	15.0	14.2	–	7	7.8	–	1.1	1.15	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-71543 ³	3/10 ⁴	16.5	15.2	14.6	19.5	18.2	17.6	0.7	0.8	0.85	GaAs MMIC, SOT343
	MGA-72543 ³	3/20 ⁴	14.3	13.2	12.8	24.8	23.7	23.3	1.4	1.45	1.45	GaAs MMIC, SOT343
	MGA-725M4 ³	3/20 ⁴	16.6	15.3	14.6	26.5	25.2	24.5	1.2	1.3	1.3	GaAs MMIC, MiniPak

Notes:

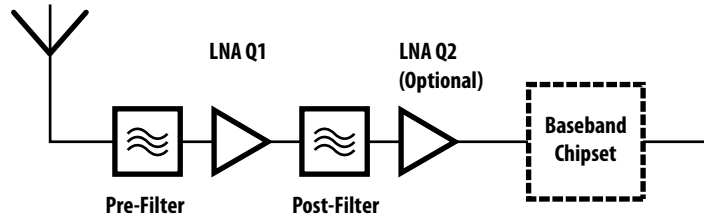
- Gain for discrete FETs when matched for best IP3.
- NFmin figures for LNA parts.
- LNA bypass switch included.
- Current adjustable to set linearity performance

Application	Part number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB @ 2GHz	P1dB/dBm @ 2GHz	OIP3/dBm @ 2GHz	NF/dB @ 2GHz	Device Type and Package
LO Buffer	ABA-31563	3/14.5	DC - 3	21	2	13	3.8	Si MMIC, SOT363

DMB-T/ISDB-T Receivers Suggested Components

Application	Part number	Typ. Bias V/mA	Gain/dB @ 500MHz	OIP3/dBm @ 500MHz	NF/dB @ 500MHz	Device Type and Package (mm)
LNA Q1/Q2	MGA-685T6	3.0/10	18.9	18.7	0.93	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-68563	3.0/10	19.7	20.0	1.0	E-pHEMT MMIC, SOT363
LNA Q3	MGA-785T6	3.0/10	15.7	16.8	1.5	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-725M4	3.0/9	14	16.5	1.7	GaAs MMIC, MiniPak

GPS/GLONASS Receivers



Mobile GPS Receivers Suggested Components

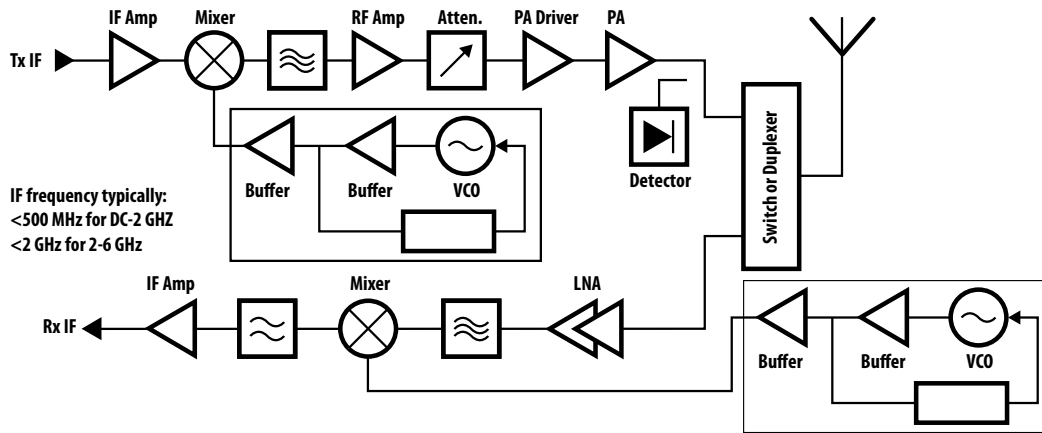
Application	Part Number	Typ. Bias V/ mA	NF/dB	Gain/dB	IIP3/dBm	Device Type and Package (mm)
LNA Q1/Q2	ALM-2506	2.85/8	0.8	14.3	4.7	E-pHEMTF, MCOB 2x2x1.1
	MGA-231T6	2.85/6	0.9	18.5	2.0	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-24106	2.7/3.3	0.97	17.9	-2.0	uDFN 1.5x1.3x0.5
	MGA-310G	2.7/8	0.82	15.2	1.8	E-pHEMT MMIC, UQFN 1.1x1.1x0.5
	MGA-61563	3.0/9	1.18	16	-3	E-pHEMT MMIC, SOT-363
	MGA-635T6	2.85/4.9	0.86	14.6	3.5	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-665P8	3.0/21	1.22	20.8	-0.5	E-pHEMT MMIC, LPCC 2x2
	*ATF-55143	2.0/10	0.6	17.4	-0.6	E-pHEMT FET, SOT343
AGPS-L001	2.7/5	0.75	17	2.4	MCOB 2x2.5x1	

Note:

*Refer to Application Note 1376.

Application	Part Number	Typ. Bias V/ mA	NF/dB	Gain/dB	IIP3/dBm	Cell-Band Rejection/dBc	PCS-Band Rejection/dBc	Device Type and Package (mm)
LNA Q1 with Inte- grated Post Filter	ALM-1612	2.7/6	0.95	18.2	2.	69	67	MCOB 3.3x2.1x1
	ALM-2412	2.85/9	0.85	13.5	6.1	63	65	MCOB 3.3x2.1x1.1
LNA Q1 with Integrated Pre and Post Filters	ALM-1712	2.7/8	1.65	12.8	3	104	92.6	E-pHEMT & FBAR, MCOB 4.5x2.2x1.0
	ALM-1812	2.8/6	1.9	18.5	2	95	90	E-pHEMT & FBAR, MCOB 4.5x2.2x1.0
	ALM-2712	2.7/7.5	12.6	14.2	2	–	–	MCOB 3x2.5x1
LNA Q1 with Inte- grated Pre Filter	ALM-GN001	2.7/5	1.6	16.5	1	53	45	E-pHEMT & FBAR, DFN 2.3x1.7x0.85
	ALM-3012	2.7/7.5	0.85	17	0.5	50	50	MCOB 2x2.5x1

2-6 GHz Systems (including 802.11 a/b/g and 802.16)



2-6 GHz Systems Suggested Components

Application	Part Number	Typical Performance					Package (mm)
		Test Bias V/mA	Test Freq. GHz	Gain ¹ dB	Linear Pout dBm	EVM %	
PA	MGA-22003	–	2.5	35	–	–	Small Size 3x3x1
	MGA-23003	–	3.5	35	–	–	Small Size 3x3x1
	MGA-25203	–	5.4	30	–	–	Small Size 3x3x1
	MGA-412P8	3.3/95	2.452	25.5	19	3.0	E-pHEMT MMIC, LPCC
	MGA-425P8 ²	3.3/58	5.25	16.0	12	3.0	E-pHEMT MMIC, LPCC
	MGA-43228	5/500	2.4	38.5	29.2	2.5	QFN 5x5x0.85
	MGA-43328	5/470	2.6	37.3	29.3	2.5	QFN 5x5x0.85
	MGA-545P8	3.3/127	5.825	11.5	16	5.6	E-pHEMT MMIC, LPCC
	ALM-31222	5/415	2	14.9	–	–	MCOB 5.0x6.0x1.1
	ALM-31322	5/413	3.5	13.2	–	–	MCOB 5.0x6.0x1.1
	ALM-32220	5/800	2	14.8	–	–	MCOB 7.0x10.0x1.1
	ALM-32320	5/800	3.5	12	–	–	MCOB 7.0x10.0x1.1

Application	Part Number	Typical Performance						Package (mm)
		Test Bias V/mA	Test Freq. GHz	Gain ¹ dB	P1dB ¹ dBm	OIP3 dBm	NF dB	
PA Driver	MGA-30216	5/206	2	14.2	–	45.3	2.8	QFN 3x3
	MGA-30316	5/198	3.5	12.8	–	44.4	2.7	QFN 3x3
	MGA-53543	5/54	1.9	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343
	ATF-501P8	4.5/280	2	15	29	45.5	1	E-pHEMT FET, LPCC
	ATF-511P8	4.5/200	2	14.8	30	41.7	1.4	E-pHEMT FET, LPCC
	ATF-521P8	4.5/200	2	17	26.5	42	1.5	E-pHEMT FET, LPCC
	ATF-531P8	4/135	2	20	24.5	38	0.6	E-pHEMT FET, LPCC
	ATF-541M4	3/60	2	17.5	21.4	35.8	0.5	E-pHEMT FET, MiniPak
	ATF-54143	3/60	2	16.6	20.4	36.2	0.5	E-pHEMT FET, SOT343
WiFi	AFEM-S105		5.1 - 5.9	EVM <-32.5dB at 15dBm, <-35dB at 12dBm			Small Size 3.2x3.2x0.6	
	AFEM-S106		5.1 - 5.9	EVM <-32.5dB at 15dBm, <-35dB at 12dBm			Small Size 3.2x3.2x0.6	

Note:

- Gain and P1dB performance for discrete FETs when matched for best IP3.
- Current adjustable: 10 - 80mA.

Wireless Infrastructure

2-6 GHz Systems (including 802.11 a/b/g and 802.16)

2-6 GHz Systems Suggested Components

Application	Part Number	Typical Performance						Package
		Test Bias V/ mA	Test Freq. GHz	Gain1 dB	P1dB ¹ dBm	OIP3 dBm	NF dB	
RF Amplifier	MGA-61563 ³	3/41	2	15.5	15.1	31.7	1	E-pHEMT MMIC, SOT363
Buffer Amplifier	ABA-31563	3/14	2	21.5	2.2	13.1	3.8	Si MMIC, SOT363
	ABA-51563	5/18	2	21.5	1.8	11.4	3.7	Si MMIC, SOT363
	ABA-52563	5/35	2	21.5	9.8	19.9	3.3	Si MMIC, SOT363
	ABA-53563	5/46	2	21.5	12.7	22.9	3.5	Si MMIC, SOT363
	ABA-54563	5/79	2	23	16.1	27.8	4.4	Si MMIC, SOT363
	MGA-565P8 ⁴	5/67	2	21.8	20 (Psat)			E-pHEMT MMIC, LPCC
	MGA-61563 ³	3/41	2	15.5	15.1	31.7	1	E-pHEMT MMIC, SOT363

Notes:

1. Gain and P1dB performance for discrete FETs when matched for best IP3.
2. Current adjustable: 10 - 80mA.
3. Current adjustable 10 - 60mA.
4. High reverse isolation: 50dB typical.

Application	Part Number	Test Bias	Test Freq.	Gain ¹	P1dB ¹	OIP3	NF	Package (mm)
Low Noise Amplifiers	MGA-14516	5.0/45	1.95	31.7	23.5	38	0.68	QFN 4x4x0.85
	MGA-61563 ²	3/41	2	15.5	15.1	31.7	1	E-pHEMT MMIC, SOT363
	MGA-632P8	4/60	1.95	17.6	18.3	35.4	0.6	LPCC 2x2
	MGA-645T6	3/7	2.4	15	9.0	22	1.1	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-655T6	3/10	3.5	14.7	12.0	20.2	1.17	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-665P8	3/20.5	5.25	16	11.4	18.2	1.45	E-pHEMT MMIC, LPCC
	MGA-675T6	3.0/10	5.5	17.8	(-10) IP1dB	(-3) IIP3	1.75	E-pHEMT, UTSLP 2x1.3x0.4
	MGA-64606	3/7	2.4	15.3	-3.0 (IP1dB)	20.3	0.95	UTSLP 2.0x1.3
	MGA-65606	3/7	3.5	15.3	-2.4 (IP1dB)	21	1.05	UTSLP 2.0x1.3
	MGA-71543 ³	2.4/10	2.01	15.9	7.4	18.9	1.1	pHEMT MMIC, SOT343
	MGA-85563	3/15	2	19	0.9	11.5	1.85	pHEMT MMIC, SOT363
	MGA-87563	3/4.5	2	14	-2	8	1.8	pHEMT MMIC, SOT363
	ATF-36163	1.5	12	10	5		1.2	pHEMT FET, SOT363
	ATF-551M4	2.7/10	2	17.5	14.6	24.1	0.5	E-pHEMT FET, MiniPak
	ATF-55143	2.7/10	2	17.7	14.4	24.2	0.6	E-pHEMT FET, SOT343
	ALM-2812	3.3/15	2.45	16.7	(-5.8) IP1dB	6.1 IIP3	0.8	MCOB 3x3x1.1
			5.5	23.2	(-12.8) IP1dB	(-2.1) IIP3	1.4	MCOB 3x3x1.1
	VMMK-1218	3/20	10	10.7	12	12	0.7	SM 1x0.5
VMMK-1225	2/20	12	11	8	23	0.9	SM 1x0.5	

Notes

1. Gain and P1dB performance for discrete FETs when matched for best IP3
2. Current adjustable 10 - 60mA
3. Source grounded configuration

Wireless Infrastructure

2-6 GHz Systems (including 802.11 a/b/g and 802.16)

2-6 GHz Systems Suggested Components

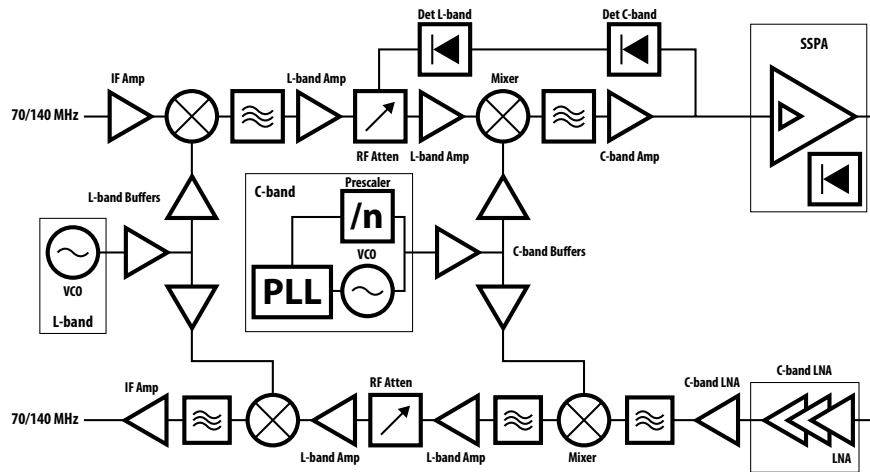
Application	Part Number	Ct max @0V	Package
Detector	HMP5-282x	1pF	Schottky, MiniPak
	HSMS-282x	1pF	Schottky, SOT323/363/23/143
	HSMS-286x	0.3pF	Schottky, SOT323/363/23/143
Switch	HMPP-389x	0.35pF	PIN, MiniPak
	HSMP-389x/489x	0.4pF	SOT323/363/23/143
	HMPP-386x	0.2pF	PIN, MiniPak
	HSMP-386x	0.2pF	SOT323/363/23/25

Application	Part Number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB @ 2GHz	P1dB/dBm @ 2GHz	OIP3/dBm @ 2GHz	NF/dB @ 2GHz	Device Type and Package
IF Amplifier	MGA-62563 ¹	3/55	0.1 - 3	22	18	35	0.8	E-pHEMT MMIC, SOT363
	MGA-545P8	3.3/135	0.1 - 7	22	19	36	2	E-pHEMT MMIC, LPCC
	ADA-4789	4.1/80	DC - 2.5	16.3	16.9	29	4.5	Si MMIC, SOT89
	ADA-4743	(3.8)/60	DC - 2.5	16.5	17.1	34	4.2	Si MMIC, SOT343
	ADA-4643	(3.5)/35	DC - 2.5	17.3	14	29	4	Si MMIC, SOT343
	ADA-4543	(3.4)/15	DC - 2.5	15.5	2.4	15	3.7	Si MMIC, SOT343
	ABA-54563	5/81	DC - 3	23	18	32	3	Si MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	15	27.5	2.9	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.8	12.5	28	2.7	Si MMIC, SOT363
	AVT-50663	5/36	DC - 6000	15.3	12.5	25	4	SOT-363 (SC70)
	AVT-51663	5/37	DC - 6000	19.6	12.9	25.1	3.2	SOT-363 (SC70)
	AVT-52663	5/45	DC - 6000	15.3	12.7	27	4	SOT-363 (SC70)
	AVT-53663	5/48	DC - 6000	19.6	15.1	26.5	3.2	SOT-363 (SC70)

Notes

1. Current adjustable 20 - 60mA

C-Band



Tx/GHz: 5.880-6.425, 5.725-6.275, 6.725-7.025, 6.425-6.725
 Rx/GHz: 3.625-4.200, 3.400-3.950, 4.500-4.800, 3.400-3.700

VSAT Suggested Components

Application	Part number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB @ 500MHz	P1dB/dBm @ 500MHz	OIP3/dBm @ 500MHz	NF/dB @ 500MHz	Device Type and Package
IF Amplifier	MGA-62563 ¹	3/55	0.1 - 3	22	18	34.8	0.8	E-pHEMT MMIC, SOT363
	MGA-545P8	3.3/135	0.1 - 7	22	19	36	2	E-pHEMT MMIC, LPCC
	ADA-4789	4.1/80	DC - 2.5	17	18.8	35	4.2	Si MMIC, SOT89
	ADA-4743	(3.8)/60	DC - 2.5	16.6	17.1	34	4.2	Si MMIC, SOT343
	ABA-53563	5/46	DC - 3.5	21.5	15	27.5	2.9	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.8	12.5	28	2.7	Si MMIC, SOT363

Application	Part number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB @ 2GHz	P1dB/dBm @ 2GHz	OIP3/dBm @ 2GHz	NF/dB @ 2GHz	Device Type and Package
L-band Amplifier	MGA-53543	5/54	0.4 - 6	15.4	18.6	39.1	1.5	E-pHEMT MMIC, SOT343
L-band Buffer - Low Power	MGA-61563 ¹	3/41.6	0.1 - 6	15.5	15.1	31.7	1	E-pHEMT MMIC, SOT363
	MGA-82563	3/84	0.1 - 6	13.2	17.3	31	2.2	GaAs MMIC, SOT363
	MGA-81563	3/42	0.1 - 6	12.4	14.8	27	2.8	GaAs MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	12.7	22.9	3.5	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.5	9.8	19.9	3.3	Si MMIC, SOT363
	ABA-51563	5/18	DC - 3.5	21.5	1.8	11.4	3.7	Si MMIC, SOT363
L-band Buffer-High Power	MGA-85563 ³	3/15 to 30	0.8 - 6	19	1 to 8	12 to 17	1.9	GaAs MMIC, SOT363
	MGA-565P8 ²	5/67	0.1 - 3.5	21.8	20 (P _{sat})	—	—	E-pHEMT MMIC, LPCC
	MGA-82563	3/84	0.1 - 6	13.2	17.3	31	2.2	GaAs MMIC, SOT363

Notes:

1. Current adjustable 10-60mA.
2. High reverse isolation: 50dB typical.
3. Reverse Isolation 40dB typical.

C-Band

VSAT Suggested Components

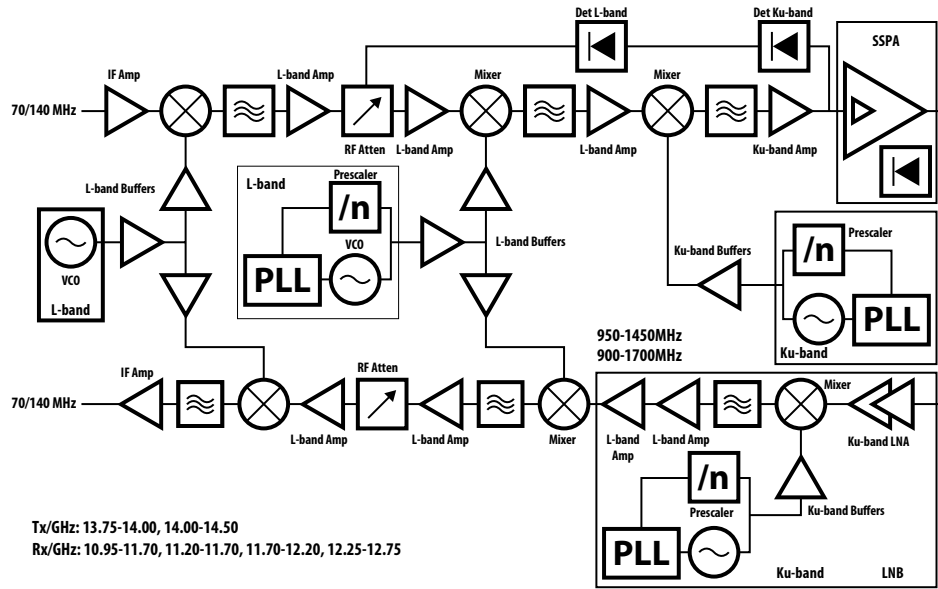
Application	Part Number	Description	Package
L-band/C-band Detector - Schottky Diodes	HSMS-282x	Ct max = 1pF @0V	SOT323/363/23/143
	HSMS-286x	Ct max = 0.3pF @0V	SOT323/363/23/143
RF Attenuator - PIN Diodes	HSMP-381x	Very low distortion, Ct typ. = 0.2pF @0V, see AN1048 pi-attenuator design	SOT323/23/25/SOD-323
	HSMP-386x	Lower current, low cost, Ct typ. = 0.2pF @0V, see AN1048 pi-attenuator design	SOT323/363/23/25/SOD-323
RF Attenuator - Module	ALM-38140	Low distortion, high dynamic range attenuator module	MCOB 3.8x3.8x1.0mm

Application	Part number	Typ. Bias V/ mA	Frequency Range/ GHz	Gain/dB ¹ @ 5GHz	P1 dB/dBm ¹ @ 5GHz	OIP3/dBm @ 5GHz	NF/dB ² @ 5GHz	Device Type and Package
C-band LNA	ATF-36163	1.5/10	1.5 - 18	15	5	–	0.61	PHEMT FET, SOT363
	ATF-551M4	2.7/10	0.5 - 6	12	14.5	24.5	0.75	E-pHEMT FET, MiniPak
	ATF-55143	2.7/10	0.5 - 6	12	13.5	24	0.9	E-pHEMT FET, SOT343
C-band Amplifier C-band Buffer	MGA-545P8	3.3/135	0.1 - 6	12	21	34	3.6	E-pHEMT MMIC, LPCC
	MGA-82563	3/84	0.1 - 6	9.5	17	31	2.6	GaAs MMIC, SOT363
	MGA-81563	3/42	0.1 - 6	10.5	14.5	27	3.2	GaAs MMIC, SOT363
	MGA-85563	3/15 to 30	0.8 - 6	16	1 to 8	12 to 18	1.6	GaAs MMIC, SOT363
	ATF-541M4	3/60	0.5 - 8	11	19.5	37.5	1.02	E-pHEMT FET, MiniPak
	ATF-54143	3/60	0.5 - 6	11	18	36	0.93	E-pHEMT FET, SOT343
	ATF-521P8	4.5/200	0.5 - 6	10	27	39	1.75	E-pHEMT FET, LPCC

Notes:

1. Gain and P1dB performance for discrete FETs when matched for best IP3
2. NFmin figures for discrete FETs

Ku-Band



VSAT Suggested Components

Application	Part number	Typ. Bias V/ mA	Frequency Range/ GHz	Gain/dB ¹ @ 12GHz	P1dB/dBm ¹ @ 12GHz	OIP3/dBm @ 12GHz	NF/dB ² @ 12GHz	Device Type and Package (mm)
Ku-band LNA	ATF-36163	1.5/10	1.5 - 18	9.4	5	-	1	PHEMT FET, SOT363
	AMMP-6220	3/60	6 - 20	23	10	23	2.2	SM 5x5
	VMMK-1225	2/20	0.5 - 26	11	8	23	0.9	SM 1x0.5
	VMMK-1218	3/20	0.5 - 18	10.7	12	12	0.7	SM 1x0.5
Ku-band Amplifier	AMMP-5618	5/107	6 - 20	13	19	30	4.4	SM 5x5
Ku-band Buffer	AMMP-6408	5/650	6 - 18	18	28	38	4.5	SM 5x5
Ku-band Mixer (IRM)	AMMP-6530	-1/0	5 - 30	-10	8	18	10	SM 5x5

Notes:

1. Gain and P1dB performance for discrete FETs when matched for best noise.
2. NFmin figures for discrete FETs.

Ku-Band

VSAT Suggested Components

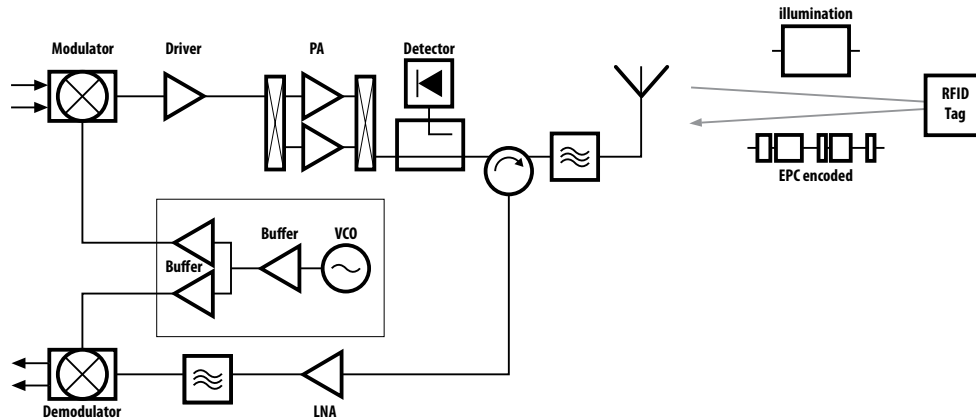
Application	Part Number	Description	Package
Ku-band Detector - Schottky diodes	HSMS-286x	Ct max = 0.3pF @0V	SOT323/363/23/143
	HSCH-5310/5330	Si single, Ct=0.1pF, med. barrier/low barrier	beamlead
	HSCH-5312/5332	Si single Ct=0.15pF, med. barrier/low barrier	beamlead
Ku-band Mixer - Schottky diodes	HSMS-8202	Si series pair, Ct=0.26pF, low-cost	SOT23
	HSCH-5312/5332	Si single Ct=0.15pF, med. barrier/low barrier	beamlead

Ka-Band

VSAT/Block Converter

Application	Part number	Typ. Bias (V/mA)	Frequency Range/(GHz)	Gain/(dB) @ 30 GHz	P1dB/(dBm) @ 30 GHz	OIP3/(dBm) @ 30 GHz	NF/(dB) @ 30 GHz	Device Type and Package (mm)
Ka-band LNA/ Driver	AMMP-6232	4/135	18 - 32	22	18	28.5	3.1	SM 5x5
	AMMP-6233	3/65	18 - 32	21	8	21	2.8	SM 5x5
	AMMP-6333	5/230	18 - 33	22	24.5	30	–	SM 5x5
Ka-Band Power Amplifier	AMMP-6430	5/650	27 - 34	20	28	34	7.8	SM 5x5
	AMGP-6432	6/700	28 - 31	20	33	40	–	SM 5x5
	AMGP-6434	6/1400	28 - 31	20	35.5	42	–	SM 5x5
Ka-Band Mixer	AMMP-6545	–	RF: 18 - 40/ IF: DC - 3.5	-8	–	12 (IIP3)	–	SM 5x5
	AMMP-6546	–	RF: 18 - 40/ IF: DC - 3.5	-10	–	12 (IIP3)	–	SM 5x5
Ka-Band VVA	AMMP-6630	–	5 - 30	-3.5	–	25 (IIP3)	–	SM 5x5
Ka-Band Multiplier	AMMP-6125	3.5/5V @ 100/110	10 - 24	22	22 (Pout)	–	–	SM 5x5
	AMMP-6120	5/112	8 - 24	13	18 (Pout)	–	–	SM 5x5
Ka-Detector	VMMK-3313	1.5/0.15	15 - 33	–	–	–	–	SM 1x0.5x0.25

RFID 900 MHz Reader



RFID 900MHz Reader Suggested Components

Application	Part number	Typ. Bias V/ mA	Frequency Range/GHz	Gain/dB ¹ @ 0.9GHz	P1dB/dBm ¹ @ 0.9GHz	OIP3/dBm @ 0.9GHz	NF/dB ² @ 0.9GHz	Device Type and Package (mm)
LNA	MGA-53543	5/54	0.4 - 6	17.4	19.3	39.7	1.3	E-pHEMT MMIC, SOT343
	MGA-72543 ³	3/20	0.1 - 6	14.8	12	23	1.35	E-pHEMT MMIC, SOT343
	ATF-54143	3/60	0.45 - 6	23.4	18.4	35.5	0.3	E-pHEMT FET, SOT343
	ATF-58143	3/30	0.45 - 6	23.1	18.1	28.6	0.3	E-pHEMT FET, SOT343
Driver Amplifier	MGA-53543	5/54	0.4 - 6	17.4	19.3	39.7	1.3	E-pHEMT MMIC, SOT343
	MGA-545P8	3.3/127	0.05 - 7	22.4	21.5	34	2.6	E-pHEMT MMIC, LPCC
	MGA-61563 ⁴	3/41	0.1 - 6	19.3	15.4	30.5	0.9	E-pHEMT MMIC, SOT363
	ATF-52189	4.5/200	0.05 - 6	16.5	27.2	42	1	E-pHEMT FET, SOT89
	ATF-521P8	4.5/200	0.05 - 6	17.2	26.5	42.5	0.7	E-pHEMT FET, LPCC
	ATF-53189	4/135	0.05 - 6	17.2	21.7	42	0.41	E-pHEMT FET, SOT89
	ATF-531P8	4/135	0.05 - 6	25	23	37	0.26	E-pHEMT FET, LPCC
	ADA-4789	4.1/80	DC - 2.5	16.9	18.8	33.2	4.3	Si MMIC, SOT89
ADA-4743	3.8/60	DC - 2.5	16.5	17.1	32.6	4.2	Si MMIC, SOT343	
Power Amplifier	ATF-50189	4.5/280	0.05 - 6	21.5	28.5	44	1	E-pHEMT FET, SOT89
	ATF-501P8	4.5/280	0.05 - 6	16.6	27.3	42	1	E-pHEMT FET, LPCC
	ATF-511P8	4.5/200	0.05 - 6	17.8	29.6	43	1.2	E-pHEMT FET, LPCC
Mixer	IAM-92516	5/26	0.4 - 3.5	6.5 (CL)	16 (IP1dB)	29.3 (IIP3)	7.1	E-pHEMT MMIC, LPCC(3x3)
Buffer-High Power	MGA-565P8 ³	5/67	0.1 - 3.5	28	22 (Psat)	—	—	E-pHEMT MMIC, LPCC
	ABA-54563	5/79	DC - 3.4	23	18	34	4.2	Si MMIC, SOT363
Buffer-Low Power	ABA-31563	3/14	DC - 3.5	21.3	3	15	3.8	Si MMIC, SOT363
	ABA-51563	5/18	DC - 3.5	21	3.5	15	3.4	Si MMIC, SOT363
	ABA-52563	5/35	DC - 3.5	21.3	12	26	2.9	Si MMIC, SOT363
	ABA-53563	5/46	DC - 3.5	21.5	14.5	26.5	3.1	Si MMIC, SOT363
Detector	HSMS-282x	Ct max = 1pF @0V						SOT323/363/23/143

Notes:

1. Gain and P1dB performance for discrete FETs when matched for best IP3.
2. NFmin figures for discrete FETs.
3. High reverse isolation: 50dB typical.
4. Current adjustable: 20-60mA.
5. Includes integral bypass function. Current adjustable between 5 – 60mA.

Product Selection Guides

RFICs (GaAs and Silicon)

GaAs RFICs

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idq (mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package
GaAs Fixed Gain Amplifiers	MGA-52543	0.4 - 6	1.9	5	53	1.9	14.2	+17.4	+32	SOT-343 (SC-70)
	MGA-53543	0.4 - 6	1.9	5	54	1.5	15.4	+18.6	+39	SOT-343 (SC-70)
	MGA-53589	0.05 - 6	1.9	5	52	1.66	15.8	+18.5	+37	SOT-89
	MGA-81563	0.1 - 6	2.0	3	42	2.8	12.4	+14.8	+27	SOT-363 (SC-70)
	MGA-82563	0.1 - 6	2.0	3	84	2.2	13.2	+17.3	+31	SOT-363 (SC-70)
	MGA-85563	0.8 - 6	2.0	3	15 to 30	1.9	18.0	+1 to +8	+12 to +17	SOT-363 (SC-70)
	MGA-86563	0.5 - 6	2.0	5	14	1.5	22.7	+4.1	+15	SOT-363 (SC-70)
	MGA-87563	0.5 - 4	2.0	3	4.5	1.6	14.0	-2	+8	SOT-363 (SC-70)

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idsat (mA)	PAE (%)	Gain (dB)	PSAT (dBm)	OIP3 (dBm)	Package (mm)
GaAs Medium Power Amplifiers	MGA-30789	2 - 6	3.5	5	100		11.7	–	41.8	SOT-89
	MGA-30889	0.04 - 2.6	0.9	5	65		15.5	–	38	SOT-89
	MGA-30989	2 - 6	3.5	5	51		12	–	36.8	SOT-89
	MGA-412P8	2.4 - 2.5	2.4	3.3	95	NA	25.5	+25.3	38	LPCC 2X2
	MGA-425P8	2 - 10	5.25	3.3	65	47.0	16.0	+20.3	32.9	LPCC 2x2
	MGA-545P8	0.05 - 7	5.825	3.3	92	46.0	11.5	+22	+34	LPCC 2x2
	MGA-83563	0.5 - 6	2.4	3	152	37.0	22.0	+22	+29	SOT-363 (SC-70)

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idq (mA)	NF (dB)	Gain (dB)	OP1dB (dBm)	OIP3 (dBm)	Package (mm)
GaAs Match-Pair Dual LNA	MGA-16116	0.45-1.45	0.9	4.8	61	0.27	18.4	21.2	21.2 (IIP3)	QFN 4x4x0.85
	MGA-16216	1.44-2.35	1.95	4.8	52.5	0.32	18.4	19.5	19.5 (IIP3)	QFN 4x4x0.85
	MGA-16316	1.95-4.0	2.6	4.8	53.3	0.45	18.2	18.7	15.5 (IIP3)	QFN 4x4x0.85

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idq (mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
GaAs Smart Bias Amplifier	MGA-61563	0.1 - 6	2	3	41	1.2	16.6	+15.8	+28.5	SOT-363 (SC-70)
	MGA-62563	0.1 - 3	0.5	3	60	0.9	22.0	+17.8	+32.9	SOT-363 (SC-70)
	MGA-685T6	0.1 - 1.5	0.5	3	10	0.9	18.9	17.3	+18.7	UTSLP 2.0x1.3x0.4
	MGA-68563	0.1 - 1.5	0.5	3	11	1	19.7	17.5	20.7	SOT-363

RFICs (GaAs and Silicon)

GaAs RFICs

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idq (mA)	NF (dB)	Gain (dB)	PAE (%)	OIP3 (dBm)	Package (mm)
GaAs High Linearity Amplifier	ALM-31122	0.7 - 1	0.9	5	394	2	15.6	52.5	47.6	MCOB 5.0x6.0x1.1
	ALM-31222	1.7 - 2.7	2	5	415	2.7	14.9	52.6	47.9	MCOB 5.0x6.0x1.1
	ALM-31322	3.3 - 3.9	3.5	5	413	2.8	13.2	51.5	47.7	MCOB 5.0x6.0x1.1
	ALM-32120	0.7 - 1.0	0.9	5	800	2.5	14	47	52	MCOB 7.0x10.0x1.1
	ALM-32220	1.7 - 2.7	2	5	800	3.5	14.8	47.5	50	MCOB 7.0x10.0x1.1
	ALM-32320	3.3 - 3.9	3.5	5	800	2.5	12	43	49	MCOB 7.0x10.0x1.1
	MGA-30116	0.75 - 1	0.9	5	202.8	2	17	47	44.1	QFN 3x3
	MGA-30216	1.7 - 2.7	2	5	206	2.8	14.2	48.9	45.3	QFN 3x3
	MGA-30316	3.3 - 3.9	3.5	5	198	2.7	12.8	51.3	44.4	QFN 3x3
	MGA-30489	0.25 - 3.0	1.9	5	97	3	13.3	–	39	SOT-89
	MGA-30689	0.04 - 2.6	1.95	5	104	3.3	14.6	–	40	SOT-89
	MGA-31189	0.05 - 2	0.9	5	111	3	21	42.5	42	SOT-89
	MGA-31289	1.5 - 3	1.9	5	124	2	18.7	36.4	41.8	SOT-89
	MGA-31389	0.05 - 2	0.9	5	73	2	21.3	41.2	38.6	SOT-89
	MGA-31489	1.5 - 3	1.9	5	69	1.9	19.5	39.1	37.3	SOT-89
	MGA-31589	0.45 - 1.5	0.9	5	146	1.9	20.4	45	45.3	SOT-89
	MGA-31689	1.5 - 3	1.9	5	168	1.9	18.1	48	44.9	SOT-89
	MGA-31716	DC - 2	0.9	5	58	1.9	20.2	43.9	41	QFN 3x3
MGA-31816	1.5 - 4.0	1.9	5	59	1.6	19.5	38.2	40.5	QFN 3x3	

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idsat (mA)	Isolation (dB)	Gain (dB)	Psat (dBm)	Package (mm)
GaAs LO Buffer Amplifier	MGA-565P8	0.1 - 3	2	5	67	50.0	21.8	+20	LPCC2x2

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vd/Id (V/mA)	Switch Insertion Loss (dB)	NF (dB)	Gain (dB)	P1dB (dBm @ mA)	IIP3 (dBm @mA)	Package (mm)
GaAs Amplifier with Bypass Switch	MGA-645T6	1.7 - 3	2.4	3/7	4.5	1.1	15.0	+9 @ 7	+7 @ 7	UTSLP 2.0x1.3x0.4
	MGA-64606	1.5 - 3	2.4	3/7	4.5	0.95	15.3	-3.0(IP1dB)	+5@7	UTSLP 2.0x1.3
	MGA-655T6	2.5 - 4	3.5	3/10	4.2	1.17	14.7	+12 @ 10	+5.5 @ 10	UTSLP 2.0x1.3x0.4
	MGA-65606	2.5 - 4	3.5	3/7	4.2	1.05	15.3	-2.4(IP1dB)	+5.7@7	UTSLP 2.0x1.3
	MGA-71543	0.1 - 6	2	2.7/10	5.6	0.8	15.4	+7.4 @ 10	+3 @ 10	SOT-343 (SC-70)
	MGA-72543	0.1 - 6	2	2.7/20	2.5	1.4	13.6	+11.2 @ 20	+10.5 @ 20	SOT-343 (SC-70)
	MGA-725M4	0.1 - 6	2	2.7/20	1.6	1.3	15.7	+13.1 @ 20	+9.9 @ 20	MiniPak Package
	MGA-785T6	0.1 - 1.5	0.6	3/10	2.6	1.5	15.7	3.2 @ 10	+1.10 @ 10	UTSLP 2.0x1.3x0.4

RFICs (GaAs and Silicon)

GaAs RFICs

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vd (V)	Id (mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
GaAs LNA with Power Down	MGA-665P8	0.5 - 6	5.25	3	21	1.5	16.5	11.1	15.4	LPCC2x2
GaAs LNA Module	MGA-13116	0.4 - 1.5	0.9	5	55	0.51	38	23.3	41.4	QFN 4x4x0.85
	MGA-13216	1.5 - 2.5	1.95	5	53	0.61	35.8	23.6	40.5	QFN 4x4x0.85
	MGA-13316	2.2 - 4.0	2.5	5	53	0.76	34.3	23.5	41.8	QFN 4x4x0.85
	MGA-14516	1.4 - 2.7	1.95	5	45	0.66	31.7	23.5	38	QFN 4x4x0.85
	MGA-231T6	0.9 - 3.5	1.575	2.7	6	0.9	18.5	(-8) IP1dB	2 (IIP3)	E-pHEMT, UTSLP 2x1.3x.04
	MGA-24106	0.9 - 3.5	1.575	2.7	3.3	0.97	17.9	-9.7 (IP1dB)	-2.0 (IIP3)	uDFN 1.5x1.3x0.5
	MGA-631P8	0.4 - 1.5	0.9	4	60	0.5	17.5	18	32.8	LPCC2x2
	MGA-632P8	1.4 - 3	1.95	4	60	0.6	17.6	18.3	35.4	LPCC2x2
	MGA-633P8	0.45 - 2	0.9	5	54	0.37	18	22	37	QFN 2x2x0.75
	MGA-634P8	1.5 - 2.3	1.9	5	48	0.44	17.4		36	QFN 2x2x0.75
	MGA-635P8	2.3 - 4	2.5	5	56	0.56	18	21.9	35.9	QFN 2x2x0.75
	MGA-636P8	0.45 - 1.5	0.7	4.8	105	0.5	18.5	23	41.5	QFN 2x2x0.75
	MGA-637P8	1.5 - 2.5	1.7	4.8	70	0.6	17.5	22	41.5	QFN 2x2x0.75
	MGA-638P8	2.5 - 4	2.5	4.8	90	0.8	17.5	22	39.5	QFN 2x2x0.75
	MGA-635T6	0.9 - 2.4	1.575	2.85	4.9	0.86	14.6	1 (IP1dB)	3.5 (IIP3)	UTSLP 2.0x1.3x0.4
	MGA-675T6	4.9 - 6.0	5.5	2.7	5	0.9	16.3	NA	14.7	UTSLP
	ALM-11036	0.776 - 0.87	0.849	5	92	0.78	15.6	4	37.6	SMT 7x10
	ALM-11136	0.87 - 0.915	0.915	5	92	0.76	15.4	4.5	38.2	SMT 7x10
	ALM-11236	1.71 - 1.85	1.785	5	99	0.67	15.9	3.5	32.3	SMT 7x10
	ALM-11336	1.85 - 1.98	1.98	5	100	0.72	15.3	3.8	35.5	SMT 7x10
ALM-2506	0.9 - 2.5	1.575	2.85	8	0.8	14.3	1.9 (IP1dB)	4.7 (IIP3)	MCOB 2x2x1.1	

Component	Part Number	Test Freq. (GHz)	Vd/Id (V/mA)	NF (dB)	Gain (dB)	IP1dB (dBm)	IIP3 (dBm)	Cell-Band Rejection	PCS-Band Rejection	Package (mm)
GPS LNA/Filter Module	ALM-1612	1.575	2.7/6	0.95	18.2	-8	2	69	67	MCOB 3.3x2.1x1.0
	ALM-1912	1.575	2.7/6	1.62	19.3	-8	1.5	>57	>53	MCOB 2.9x2x1
	ALM-2412	1.575	2.85/9	0.85	13.5	2.2	6.1	63	65	MCOB 3.3x2.1x1.1
GPS Filter/LNA/Filter Module	ALM-1712	1.575	2.7/8	1.65	12.8	3	3	104	92.6	E-pHEMT & FBAR, MCOB 4.5x2.2x1.0
	ALM-1812	1.575	2.8/6	1.9	18.5	-8	2	95	90	E-pHEMT & FBAR, MCOB 4.5x2.2x1.0
	ALM-2712	1.575	2.7/7.5	12.6	14.2	5	2	-	-	MCOB 3x2.5x1

RFICs (GaAs and Silicon)

GaAs RFICs

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vd (V)	Id (mA)	NF (dB)	Gain (dB)	OIP3 (dBm)	P1dB (dBm)	Package (mm)
Variable Gain Amplifier	ALM-80110	0.4 - 1.6	0.9	5	110	4.8	(-27) to 13.6	40.3	23.3	MCOB 5.0x5.0x1.1
	ALM-80210	1.6 - 2.6	1.9	5	110	5.3	(-25.5) to 9.8	40.8	23.6	MCOB 5.0x5.0x1.1
	ALM-81224	1.45 - 2.75	2.14	5	383	2	23.8	44	27.4	MCOB 6.0x6.0x1.0

	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Voltage (Vdg)	Current (mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
Mixers-Downconverter	IAM-92516	0.4 - 3.5	1.9	5	26	12.5	-6.0	9	27 (IIP3)	LPCC 3x3

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idq (mA)	Gain (dB)	P1dB (dB)	Pout @ 2.5% EVM	Atten (dB)	Package (mm)
GaAs Power Amplifier Module	MGA-43228	2.3 - 2.5	2.4	5	1023	38.5	36	29.1	23.8	QFN 5x5
	MGA-43328	2.5 - 2.7	2.6	5	1017	37.4	36	29.3	24.5	QFN 5x5
	MGA-43428	851-894MHz	0.88	5	800	>30	36	27dBm@50dBc ACLR	-	MCOB 5x5
	MGA-43528	1.93 - 1.995	1.96	5	1000	>30	35	27dBm@50dBc ACLR	-	MCOB 5x5
	MGA-43628	2.0 - 2.2	2.14	5	1000	>30	35	27dBm@50dBc ACLR	-	MCOB 5x5
	MGA-43728	2.62-2.69	2.65	5	755	38.3	36	27.3dBm@48dBc ACLR	-	MCOB 5x5
	MGA-43828	0.925-0.960	0.94	5	730	32.8	36	27.5dBm@50dBc ACLR	-	MCOB 5x5
	MGA-43003	1.805-1.88	1.842	5	360	41.7	36	27dBm@48dBc ACLR	-	MCOB 5x5
	MGA-43040	2.3-2.4	2.35	5	350	42	35	27 dBm@48dBc ACLR	-	MCOB 5x5
	MGA-43013	728-756 MHz	0.746	5	380	34	36	27 dBm@48dBc ACLR	-	MCOB 5x5
Carrier Grade WiFi	MGA-43024	2401-2473MHz	2.442	5	450	40.8	34	26.8	-	MCOB 5x5

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	BCTRL	Gain (dB)	PAE of 19%	IP1dB (dBm)	Package (mm)	
WiFi Amplifier Module	MGA-22003	2.3 - 2.7	2.5	2.8	35	19	31	Small Size 3x3x1	
	MGA-23003	3.3 - 3.8	3.5	2.8	35	18	31	Small Size 3x3x1	
	MGA-25203	5.1 - 5.9	5.4	2.8	30	13	30	Small Size 3x3x1	
	AFEM-5105	5.1 - 5.9	EVM <-32.5dB at 15dBm, <-35dB at 12dBm						Small Size 3.2x3.2x0.6
	AFEM-5106	5.1 - 5.9	EVM <-32.5dB at 15dBm, <-35dB at 12dBm						Small Size 3.2x3.2x0.6

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd (V)	Idq (mA)	NF (dB)	Gain (dB)	IIP3 (dBm)	IP1dB (dBm)	Package (mm)
WiFi Dual Band LNA Module	ALM-2812	2.4 - 2.5	2.45	3.3	15	0.8	16.7	6.1	5.8	MCOB 3.0x3.0x1.1
		4.9 - 6.0	5.5	3.3	23.4	1.4	23.2	2.2	12.8	MCOB 3.0x3.0x1.1

RFICs (GaAs and Silicon)

InGaP HBT

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vd (V)	Id (mA)	Gain (dB)	NF (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
Gain Block	AVT-50663	DC - 6000	2	5	36	15.3	4	12.5	25	SOT-363 (SC70)
	AVT-51663	DC - 6000	2	5	37	19.6	3.2	12.9	25.1	SOT-363 (SC70)
	AVT-52663	DC - 6000	2	5	45	15.3	4	12.7	27	SOT-363 (SC70)
	AVT-53663	DC - 6000	2	5	48	19.6	3.2	15.1	26.5	SOT-363 (SC70)
	AVT-54689	0.05 - 6	2	5	58	17.1	4.1	17.4	29.6	SOT-89
	AVT-55689	0.05 - 6	2	5	75	17.2	4.3	19.5	32.5	SOT-89

Silicon RFICs

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Voltage (Vdg)	Current (mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package
Silicon Broadband Amplifiers	ABA-31563	DC - 3.5	2.0	3	14.5	3.8	21.0	+2.0	13.0	SOT-363 (SC-70)
	ABA-51563	DC - 3.5	2.0	5	18	3.7	21.5	+1.8	11.4	SOT-363 (SC-70)
	ABA-52563	DC - 3.5	2.0	5	35	3.3	21.5	+9.8	19.9	SOT-363 (SC-70)
	ABA-53563	DC - 3.5	2.0	5	46	3.5	21.5	+12.7	22.9	SOT-363 (SC-70)
	ABA-54563	DC - 3	2.0	5	79	4.4	23.0	+16.1	27.8	SOT-363 (SC-70)
Silicon Darlington Amplifiers	ADA-4543	DC - 2.5	0.9	3.4	15	3.7	15.1	+1.9	15.0	SOT-343 (SC-70)
	ADA-4643	DC - 2.5	0.9	3.5	35	4.0	17.0	+13.4	28.3	SOT-343 (SC-70)
	ADA-4743	DC - 2.5	0.9	3.8	60	4.2	16.5	+17.1	32.6	SOT-343 (SC-70)
	ADA-4789	DC - 2.5	0.9	3.8	60	4.2	16.5	+17.1	32.6	SOT-89

RFICs (GaAs and Silicon)

Minituraized Surface Mouted Package RF Component “0402 Size RF Component”

Component	Part Number	Freq. Range (GHz)	Vd (V)/ Idq (mA)	NF (dB)	Gain (dB)	OIP3 (dBm)	P1dB (dBm)	Package (mm)
Low Noise E-PHEMT	VMMK-1218	0.5 - 18	3/20	0.8 @ 10 GHz	10.7 @ 12 GHz	22@10 GHz	12 @ 10 GHz	SM 1x0.5x0.25
	VMMK-1225	0.5 - 26	2/20	1 @ 12 GHz	11 @ 12 GHz	23 @ 12 GHz	8 @ 12 GHz	SM 1x0.5x0.25

Component	Part Number	Freq. Range (GHz)	Biasing Condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
Low Noise Amplifier	VMMK-2103	0.5 - 6	5/23	2.1	14	0 (IP1dB)	8 (IIP3)	SM 1x0.5x0.25
	VMMK-2203	1 - 10	5/25	2	16.5	5	14	SM 1x0.5x0.25
	VMMK-2303	0.5 - 6	1.8/21	2	14	9	22	SM 1x0.5x0.25
	VMMK-2403	2 - 4	3/37	1.7	16	16.5	28	SM 1x0.5x0.25
	VMMK-3603	1 - 6	5/36	1.5	16.8	12	25	SM 1x0.5x0.25
	VMMK-3803	3 - 11	3/20	1.5	20	7	0.9 (IIP3)	SM 1x0.5x0.25

Component	Part Number	Freq. Range (GHz)	Biasing Condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
Gain Block/ Driver Amplifier	VMMK-2503	1 - 12	5/65	3.4	13.5	17	27	SM 1x0.5x0.25

Component	Part Number	Freq. Range (GHz)	Biasing Condition (V @ mA)	Control Range (dB)	Max. Gain (dB)	Control Voltage (V)	IIP3 (dBm)	Package (mm)
Variable Gain Amplifier	VMMK-3503	0.5 - 18	5/58	23	12	0.65 - 1.8	9 @ 6 GHz	SM 1x0.5x0.25

Component	Part Number	Freq. Range (GHz)	Biasing Condition (V @ mA)	In/Out R.L (dB)	Insertion loss (dB)	Dynamic Range (dB)	Directivity (dB)	Package (mm)
Power Detector	VMMK-3113	2 - 6	1.5V@ 0.15mA	20	0.2 - 0.35	35	15	SM 1x0.5x0.25
	VMMK-3213	6 - 18	1.5V@ 0.15mA	20	0.15 - 0.5	35	15	SM 1x0.5x0.25
	VMMK-3313	15 - 33	1.5V@ 0.15mA	20	0.25 - 0.7	35	15	SM 1x0.5x0.25
	VMMK-3413	25 - 45	1.5V@ 0.15mA	20	0.4 - 0.8	35	10	SM 1x0.5x0.25

Transistors

Transistors

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Voltage (V)	NF (dB)	Gain (dB)	P1dB (dBm)	S21E (dB)	OIP3 (dBm)	Package
Silicon Bipolar Transistor	AT-30511	DC - 5	0.9	2.7	1.1	16.0	+7.0	17.9	17.0	SOT-143
	AT-30533	DC - 5	0.9	2.7	1.1	13.0	+7.0	15.2	17.0	SOT-23
	AT-31011	DC - 5	0.9	2.7	0.9	13.0	+9.0	19.1	20.0	SOT-143
	AT-31033	DC - 5	0.9	2.7	0.9	11.0	+9.0	15.8	20.0	SOT-23
	AT-32011	DC - 5	0.9	2.7	1.0	14.0	+13.0	18.9	24.0	SOT-143
	AT-32032	DC - 6	0.9	2.7	1.0	15.0	+13.0	11.5	23.0	SOT-323
	AT-32033	DC - 5	0.9	2.7	1.0	12.5	+13.0	15.1	24.0	SOT-23
	AT-32063	DC - 5	0.9	2.7	1.1	14.5	+12.0	17.0	24.0	SOT-363 (SC-70)

Component	Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vdd / Idq (V)	NF (dB)	Ga (dB)	P1dB (dBm)	OIP3 (dBm)	Gate Width (um)	Package (mm)
Single Voltage Low Noise GaAs E-pHEMTs	ATF-501P8	.05 - 6	2	4.5/280	1.8	14.6	+28	+47	6400	LPCC 2x2
	ATF-50189	.05 - 6	2	4.5/280	1.1	15.5	+29.1	+45.3	6400	SOT-89
	ATF-511P8	.05 - 6	2	4.5/200	1.4	14.8	+30	+42	6400	LPCC 2x2
	ATF-521P8	05 - 6	2	4.5/200	1.5	17.0	+26.5	+42	3200	LPCC 2x2
	ATF-52189	05 - 6	2	4.5/200	1.5	16.0	+27.0	+42	3200	SOT-89
	ATF-531P8	05 - 6	2	4.0/135	0.6	20.0	+24.5	+38	1600	LPCC 2x2
	ATF-53189	05 - 6	2	4.0/135	0.85	15.5	+23.0	+40	1600	SOT-89
	ATF-54143	.45 - 6	2	3.0/60	0.5	16.6	+20.4	+36	800	SOT-343 (SC-70)
	ATF-541M4	.45 - 10	2	3.0/60	0.5	17.5	+21.4	+36	800	MiniPak Package
	ATF-55143	.45 - 6	2	2.7/10	0.6	17.7	+14.4	+24	400	SOT-343 (SC-70)
	ATF-551M4	.45 - 10	2	2.7/10	0.5	17.5	+14.6	+24	400	MiniPak Package
	ATF-58143	.45 - 6	2	3.0/30	0.5	16.5	+19	+30.5	800	SOT-343 (SC-70)
Low Noise GaAs pHEMTs	ATF-33143	.45 - 6	2	4.0/80	0.5	15.0	+22	+33.5	1600	SOT-343 (SC-70)
	ATF-331M4	.45 - 6	2	4.0/80	0.6	15.0	+19	+31	1600	MiniPak Package
	ATF-34143	.45 - 6	2	4.0/60	0.5	17.5	+20	+31.5	800	SOT-343 (SC-70)
	ATF-35143	.45 - 6	2	2.0/15	0.4	18.0	+11	+21	400	SOT-343 (SC-70)
	ATF-38143	.45 - 6	2	2.0/10	0.4	16.0	+12	+22	800	SOT-343 (SC-70)
	ATF-36163	1.5 - 18	12	1.5	1.2	10.0	+5	-	200	SOT-363 (SC-70)
	VMMK-1218	0.5 - 18	-	3/20	0.7	10.7	12	12	-	SM 1x0.5
	VMMK-1225	0.5 - 26	-	2/20	0.9	11	8	23	-	SM 1x0.5

Diodes — PIN

MiniPak

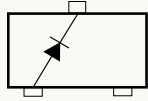
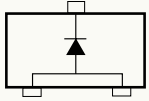
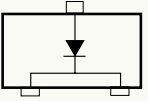
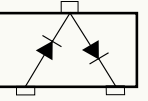
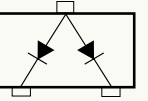
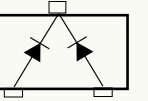
	Single	Anti-parallel	Parallel	Shunt Switch
Configuration	<p>(0)</p>	<p>(2)</p>	<p>(5)</p>	<p>(T)</p>
PIN	HMPP-3860	HMPP-3862	HMPP-3865	
	HMPP-3890	HMPP-3892	HMPP-3895	HMPP-389T

3 Lead Diodes SOT-323 (SC-70)

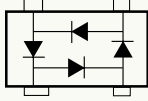
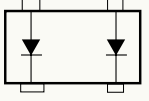
	Single	Dual Anode	Dual Cathode	Series Pair	Common Anode	Common Cathode
Configuration						
PIN	HSMP-381B		HSMP-481B	HSMP-381C	HSMP-381E	HSMP-381F
	HSMP-386B			HSMP-386C	HSMP-386E	HSMP-386F
	HSMP-389B	HSMP-489B		HSMP-389C	HSMP-389E	HSMP-389F
		HSMP-482B				

Diodes — PIN

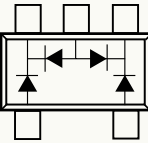
3 Lead Diodes SOT-23

	Single	Dual Anode	Dual Cathode	Series Pair	Common Anode	Common Cathode
Configuration						
PIN	HSMP-3810		HSMP-4810	HSMP-3812	HSMP-3813	HSMP-3814
	HSMP-3860			HSMP-3862	HSMP-3863	HSMP-3864
	HSMP-3890	HSMP-4890		HSMP-3892	HSMP-3893	HSMP-3894
	HSMP-3820	HSMP-4820		HSMP-3822	HSMP-3823	HSMP-3824
	HSMP-3830			HSMP-3832	HSMP-3833	HSMP-3834
				ASML-5822		
				ASML-5829		

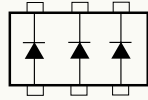
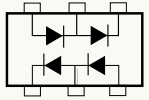
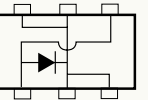
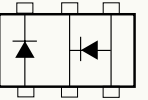
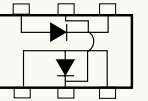
4 Lead Diodes SOT-143

	Ring Quad	Unconnected Pair
Configuration		
PIN	HSMP-386D	HSMP-3895
	HSMP-389D	

5 Lead Diodes SOT-25

	Pi Quad
Configuration	
PIN	HSMP-3816
	HSMP-3866

6 Lead Diodes SOT-363 (SC-70)

	Unconnected Trio	Dual Mode Switch	Low Inductance	Series Shunt Pair	High Frequency Series Shunt Pair
Configuration					
PIN	HSMP-386L				
	HSMP-389L	HSMP-389R	HSMP-389T	HSMP-389U	HSMP-389V

Diodes — PIN

PIN Diodes

Application	Part Number	C_i (pF) (max/typ)	R_S (Ω) (max)	V_{BR} (V) (min)	T_r (nS) (typ)	Lifetime (nS) (typ)
Low Distortion Attenuator	HSMP-381x	0.35/0.27	3.0	100	300	1500
Low Distortion/Low Inductance Attenuator	HSMP-481x	0.40/0.35	3.0	100	300	1500
Low Resistance Limiter	HSMP-382x	0.8/0.6	0.6	50	7	70
Low Inductance Limiter	HSMP-482x	1.0/0.75	0.6	50	7	70
Low Current Switch/ Attenuator	HSMP-383x	0.3/0.2	1.5	200	80	500
Low Current Switch/ Attenuator	HMPP/HSMP-386x	- / 0.2	1.5 typ	50	80	500
Low Resistance Switch	HMPP/HSMP-389x	0.30/0.20	2.5	50	–	200
Low Resistance/Low Inductance Switch	HSMP-489X	0.38/0.33	2.5	50	–	200

Beam Lead PIN Diodes

Part Number	C_i (pF)	R_S (Ω)	V_{BR} (V)	T_r (nS)	Lifetime (nS)	Configuration	Package
HPND-4005	0.017	4.7	120	n/a	100	Single	Beam Lead
HPND-4028	0.045	2.3	60	3	36	Single	Beam Lead

Component	Part Number	Freq. Range (MHz)	IIP3 (dBm)	IP1dB (dBm)	Dynamic Range (dB)	IL (dB)	VSWR (dB)	Package (mm)
50MHz – 4GHz PIN Diode Variable Attenuator Module	ALM-38140	50 - 1000	50	28.8	38	2.8	1.4	3.8x3.8x1.0 MCOB
		1000 - 2000	48.9	35.6	36	3.2	1.4	

Component	Part Number	Freq. Range (MHz)	IIP3 (dBm)	IP1dB (dBm)	ISO (dB)	IL (dB)	RL (dB)	Package
PIN Diode Diversity Switch	HSMP-386D	900	56.8	47.4	25.4	0.35	27.0	SOT-143
	HSMP-389D	900	55.4	46.3	25.7	0.36	28.0	

Component	Part Number	Freq. Range (MHz)	OP1dB (dBm)	IL (dB)	RL (dB)	Package
Schottky Assisted PIN Diode Low Power Limiter	ASML-5822	900	2.85	0.85	10.9	SOT-323
	ASML-5829	900	6.05	0.33	15.6	

Diodes — Schottky Diode

MiniPak

	Single	Anti-parallel	Parallel
Configuration	<p>(0)</p>	<p>(2)</p>	<p>(5)</p>
Schottky	HMPS-2820	HMPS-2822	HMPS-2825

3 Lead Diodes SOT-323 (SC-70)

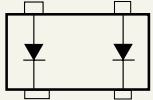
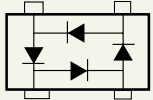
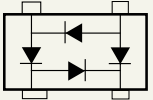
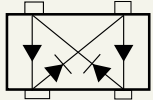
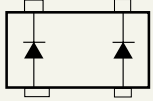
	Single	Series Pair	Common Anode	Common Cathode
Configuration				
Schottky	HSMS-270B HSMS-280B HSMS-281B HSMS-282B HSMS-285B HSMS-286B	HSMS-270C HSMS-280C HSMS-281C HSMS-282C HSMS-285C HSMS-286C	HSMS-280E HSMS-281E HSMS-282E	HSMS-280F HSMS-281F HSMS-282F

3 Lead Diodes SOT-23

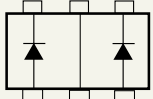
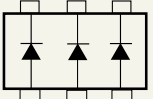
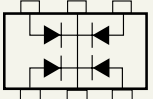
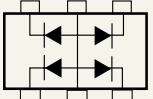
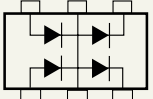
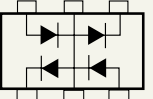
	Single	Series Pair	Common Anode	Common Cathode
Configuration				
Schottky	HSMS-2700 HSMS-2800 HSMS-2810 HSMS-2820 HSMS-2860 HSMS-2850 HSMS-8101	HSMS-2702 HSMS-2802 HSMS-2812 HSMS-2822 HSMS-2862 HSMS-2852 HSMS-8202	HSMS-2803 HSMS-2813 HSMS-2823 HSMS-2863	HSMS-2804 HSMS-2814 HSMS-2824 HSMS-2864

Diodes — Schottky Diode

4 Lead Diodes SOT-143

	Unconnected Pair	Ring Quad	Bridge Quad	Crossover Quad
Configuration				
Schottky	HSMS-2805		HSMS-2808	
	HSMS-2815	HSMS-2817	HSMS-2818	
	HSMS-2825	HSMS-2827	HSMS-2828	HSMS-2829
	HSMS-2865			
		HSMS-8207		HSMS-8209
				
	HSMS-2855			

6 Lead Diodes SOT-363 (SC-70)

	High Isolation Unconnected Pair	Unconnected Trio	Common Cathode Quad	Common Anode Quad	Bridge Quad	Ring Quad
Configuration						
Schottky	HSMS-280K	HSMS-280L	HSMS-280M	HSMS-280N	HSMS-280P	HSMS-280R
	HSMS-281K	HSMS-281L				
	HSMS-282K	HSMS-282L	HSMS-282M	HSMS-282N	HSMS-282P	HSMS-282R
		HSMS-285L			HSMS-285P	
	HSMS-286K	HSMS-286L			HSMS-286P	HSMS-286R

Diodes — Schottky Diode

Schottky-Barrier Diodes

Application	Part Number	V_{BR} (V) (min)	V_F (mV) (max) $I_F = 1$ mA	$V_F @ I_F$ (V @ mA) (max)	C_t (pF) (typ)	R_D (Ω) (typ)	Volt. Sens. (Y) (mV/mW)			R_v (K Ω) (typ)
							900 MHz	2.45 GHz	5.8 GHz	
General Purpose Detector	HMPS/HSMS-282x	15	340	0.7 @ 30	1.0	12.0	–	–	–	–
High Current Clipping/ Clamping	HSMS-270x	15	–	550 @ 100	6.7	0.65	–	–	–	–
Lowest flicker noise	HSMS-281x	20	400	1.0 @ 35	1.2	15.0	–	–	–	–
High V_{BR}	HSMS-280x	70	400	1.0 @ 35	2.0	35	–	–	–	–
Zero bias detector	HSMS-285x	–	250	0.15 @ 0.1	0.3	–	40	30	22	8
High frequency up to 14 GHz	HSMS-286x	4	350	0.25 @ 0.1	0.3	–	50	35	25	5
Mixer	HSMS-8x0x	4	350	0.25 @ 0.1	0.26	11.0	–	35	25	5

Beam Lead Schottky Diodes

Part Number	V_{BR} (V)	V_F (mV)	C_t (pF)	R_D (Ω)	Configuration	Package
HSCH-5310	4	500	0.1	20.0	Medium Barrier	Beam-Lead
HSCH-5312	4	500	0.15	16.0	Medium Barrier	Beam-Lead
HSCH-5314	4	500	0.15	16.0	Medium Barrier	Beam-Lead
HSCH-5330	4	375	0.1	20.0	Low Barrier	Beam-Lead
HSCH-5332	4	375	0.15	16.0	Series Pair	Beam-Lead
HSCH-5340	4	375	0.1	20.0	Low Barrier	Beam-Lead

Millimeter Wave MMICs Selection Guide

	Frequency Bands / GHz															
	<6	6	7	8	10	11	13	15	18	20	23	26	28	32	38	>38
Power Amplifiers																
AMMP-6408																
AMMC-6408																
AMMP-6421																
AMMC-6425																
AMMC-6440																
AMMP-6441																
AMMC-6442																
AMMP-6442																
AMGP-6432																
AMGP-6434																
Driver/Buffer Amps																
AMMP-5618																
AMMC-5618																
AMMP-5620																
AMMC-5620																
AMMC-6333																
AMMP-6333																
AMMC-5040																
AMMC-6345																
Low Noise Amplifiers																
AMMP-6220																
AMMC-6220																
AMMP-6222																
AMMC-6222																
AMMC/AMMP-6232																
AMMP-6233																
AMMC-6241																
VMMK-1218																
VMMK-1225																
Travelling Wave Amplifiers																
AMMP-5024																
AMMC-5024																
AMMC-5026																
AMMC-5025																

Millimeter Wave MMICs Selection Guide

	Frequency Bands / GHz															
	<6	6	7	8	10	11	13	15	18	20	23	26	28	32	38	>38
Attenuators																
AMMC-6630																
AMMP-6630																
AMMC-6640																
AMMP-6640																
AMMC-6650																
AMMP-6650																
Mixers																
AMMP-6530 IRM																
AMMC-6530 IRM																
AMMP-6522																
AMMC-6522																
AMMP-6545 Sub Harmonic																
AMMC-6545 Sub Harmonic																
AMMP-6546 Sub Harmonic																
AMMP-6548 Sub Harmonic																
Doublers																
AMMP-6120																
AMMC-6120																
AMMP-6125																
AMMC-6140																
Multipliers																
AMMC-5040																
Switches																
AMMC-2008 SPDT																

Millimeter Wave MMICs Selection Guide

Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
GaAs MMIC Low Noise Amplifier	AMMC-5024	30Khz - 40	4V @ 160	3.7	17.5	17.3	22.5	Chip
	AMMC-5026	2 - 35	7V @ 150	3.6	10.0	+24	31	Chip
	AMMC-6220	6 - 20	3V @ 55	1.8	23.0	9	19	Chip
	AMMC-6222	7-21	4V @ 120	2.4	25.0	16	29	Chip
	AMMC-6232	18 - 32	4V @ 135	2.8	27.0	18	29	Chip
	AMMC-6241	26 - 43	3V @ 60	2.7	20.0	10	20	Chip
	AMMP-6220	6 - 20	3V @ 55	1.9	23.0	10	21	SM 5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	15.5	29	SM 5x5
	AMMP-6232	18 - 32	4V @ 138	3.0	23	18	29	SM 5x5
	AMMP-6233	18 - 32	3V @ 65	2.6	23	8	19	SM 5x5
	VMMK-1218	0.5 - 18	3/20	0.7	10.7	12	12	SM 1x0.5
	VMMK-1225	0.5 - 26	2/20	0.9	11	8	23	SM 1x0.5
GaAs MMIC Broadband Medium Power Amplifiers	AMMC-5025	30Khz - 80	5V @ 100	–	8	15	20	Chip
	AMMC-5040	20 - 45	4.5V @ 300	8	24	22	23	Chip
	AMMC-5618	6 - 20	5V @ 107	4.4	14.5	+19.5	26	Chip
	AMMC-5620	6 - 20	5V @ 95	4.2	19	+15	23.5	Chip
	AMMC-6333	18 - 33	5V@230mA	5	20	23	30	Chip
	AMMC-6345	20 - 45	5V @ 480	9.0	20.0	24	32	Chip
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19.5	30	SM 5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	15	22.5	SM 5x5
	AMMP-6333	18 - 33	5V@230mA	5.5	20	23	30	SMT 5X5

Component	Part Number	Freq. Range (GHz)	Biasing Condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
GaAs MMIC Power Amplifiers	AMMC-6408	6 - 18	5V@650mA	4.3	19	29	38	Chip
	AMMP-6408	6 - 18	5V @ 650	4.5	18.0	28	38	SM 5x5
	AMMC-6425	18 - 28	5V @ 900 mA	9	20	28	38	Chip
	AMMC-6431	25 - 33	5V @ 650 mA	8.5	19	28.5	37	Chip
	AMMC-6442	37 - 40	5V @ 700 mA	7.5	23	30	36.5	Chip
	AMMP-6442	37 - 40	5V @ 700 mA	8	23	30	36	SM 5x5
	AMGP-6432	28 - 31	6V @ 700 mA	–	20	33	40 @ 30 GHz	SM 5x5
	AMGP-6434	28 - 31	6V @ 1400 mA	–	20	35.5	42 @ 30 GHz	SM 5x5

Millimeter Wave MMICs Selection Guide

Component	Part Number	Freq. Range (GHz)	In/Output RL (dB)	Control Range (dB)	Min. IL (dB)	Control Voltage (V)	IIP3 (dBm)	Package (mm)
GaAs MMIC Variable Attenuators	AMMC-6630	5 - 45	10/10	20	3.5 @ 25 GHz	0 to +1V	+23 @ 25 GHz	Chip
	AMMC-6640	DC - 50	12/12	20	4 @ 50 GHz	0 to +1.2V	+27 @ 10dB/30 GHz	Chip
	AMMC-6650	DC - 40	15/15	22	3.1 @ 40 GHz	0 to +1.5V	+7 @ 22 GHz	Chip
	AMMP-6630	5 - 30	10/10	20	3.5 @ 25 GHz	0 to +1V	+23 @ 25 GHz	SM 5x5
	AMMP-6640	DC-40	10/10	20	4.4 @ 30 GHz	0 to +1.2V	+27 @ 10dB/30 GHz	SM 5x5
	AMMP-6650	DC-30	12/12	22	2.1 @ 30 GHz	0 to +1.5V	+7 @ 22 GHz	SM 5x5

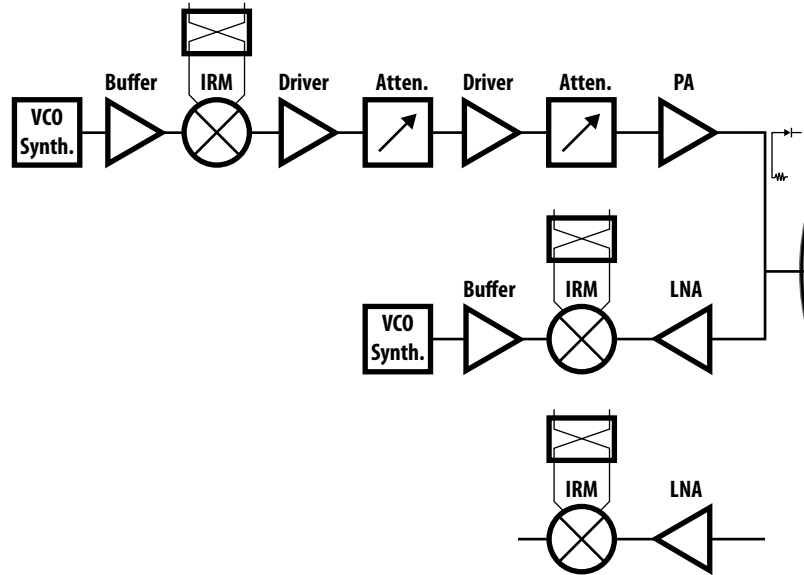
Component	Part Number	Freq. Range (GHz)	Insertion Loss (dBm)	Isolation (dB)	Input P1dB (dBm)	Control Input (Vdc)	Package
GaAs MMIC SPDT Switch	AMMC-2008	DC - 50	2.3	25	14	0 / -5	Chip

Component	Part Number	RF Freq. (GHz)	IF Freq. (GHz)	Conversion Gain (dB)	LO/RF Iso (dB)	IIP3 (dBm)	Image Reject (dB)	Package (mm)
GaAs MMIC Mixers/Converter	AMMC-6530	5 - 30	DC - 5	-10	22	18	15	Chip
	AMMP-6522	7 - 20	DC - 3.5	13		-4	15	SM 5x5
	AMMP-6530	5 - 30	DC - 5	-8	22	18	15	SM 5x5
	AMMP-6545	18 - 45	DC - 3.5	-11	30	11	-	SM 5x5
	AMMP-6522	7 - 20	DC - 3.5	-13	-	-2 @ 16 GHz	15	SM 5x5
	AMMP-6530	5 - 30	DC - 5	-5 @ 20 GHz	25	24 @ 23 GHz	15	SM 5x5
	AMMP-6532	20 - 32	1 - 5	-13	-	-2 @ 26 GHz	15	SM 5x5
	AMMP-6545	18 - 40	DC - 3.5	-11 @ 36GHz	30	12	-	SM 5x5
	AMMP-6546	18 - 40	DC - 3.5	-11 @ 35GHz	30	16 @ 30 GHz	-	SM 5x5
	AMMC-6530	5 - 30	DC - 5	-5 @ 20 GHz	25	24 @ 23 GHz	15	Chip
	AMMC-6545	18 - 45	DC - 3.5	-9 @ 30GHz	33	18	-	Chip

Component	Part Number	Input Freq. (GHz)	Output Freq. (GHz)	IP1dB (dBm)	Pout (dBm)	Fo (dBc)	3Fo (dBc)	Package (mm)
GaAs MMIC Doublers	AMMC-6120	4 - 12	8 - 24	2.0	15	25	25	Chip
	AMMC-6140	10 - 20	20 - 40	5.0	-1	30	25	Chip
	AMMP-6130	15	30	3.0	21	60	50	SM 5x5
	AMMP-6120	4 - 12	8 - 24	2.0	15	25	25	SM 5x5
	AMMP-6125	5 - 12	10 - 24	0	22	20	20	SM 5x5

Microwave Radio Link Application Circuit

Microwave Link Packaged Suggested Solution 7-8 GHz

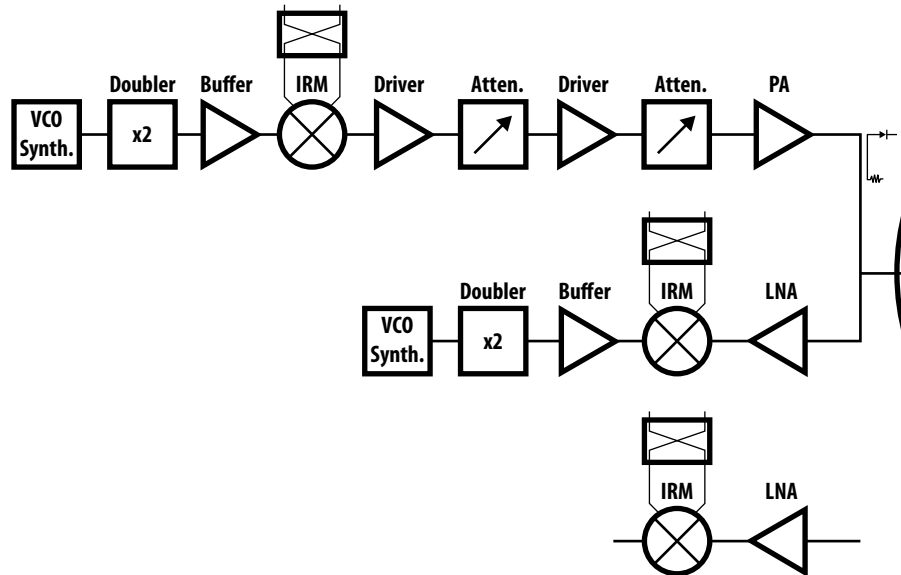


Microwave Link Packaged Suggested Solution 7-8 GHz

Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	VMMK-3213	6 - 18	1.5V@0.15	–	–	–	–	1x0.5x0.25

Microwave Radio Link Application Circuit

Microwave Link Packaged Suggested Solution 10-18 GHz



Microwave Link Packaged Suggested Solution 10-11 GHz

Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6120	8 - 24	5V @ 112	–	–	–	–	5x5
	AMMP-6125	10 - 24	3.5V/5V @ 260	–	–	–	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	VMMK-3213	6 - 18	1.5V@0.15	–	–	–	–	1x0.5x0.25

Microwave Link Packaged Suggested Solution 13-15 GHz

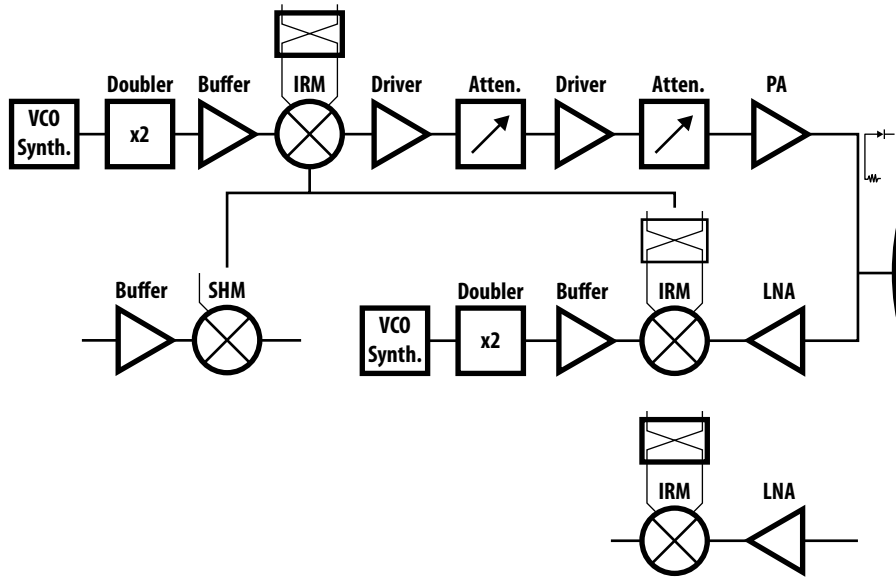
Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6120	8 - 24	5V @ 112	–	–	–	–	5x5
	AMMP-6125	10 - 24	3.5V/5V @ 260	–	–	–	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	VMMK-3213	6 - 18	1.5V@0.15	–	–	–	–	1x0.5x0.25

Microwave Link Packaged Suggested Solution 18 GHz

Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6120	8 - 24	5V @ 112	–	–	–	–	5x5
	AMMP-6125	10 - 24	3.5V/5V @ 260	–	–	–	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	AMMP-6232	18 - 32	4V @ 135	3.0	23	+18.0	–	5x5
	AMMP-6233	18 - 32	3V @ 65	2.6	23	+8.0	–	5x5
	VMMK-3313	15 - 33	1.5V@0.15	–	–	–	–	1x0.5x0.25

Microwave Radio Link Application Circuit

Microwave Link Packaged Suggested Solution 23-26 GHz



Microwave Link Packaged Suggested Solution 23 GHz

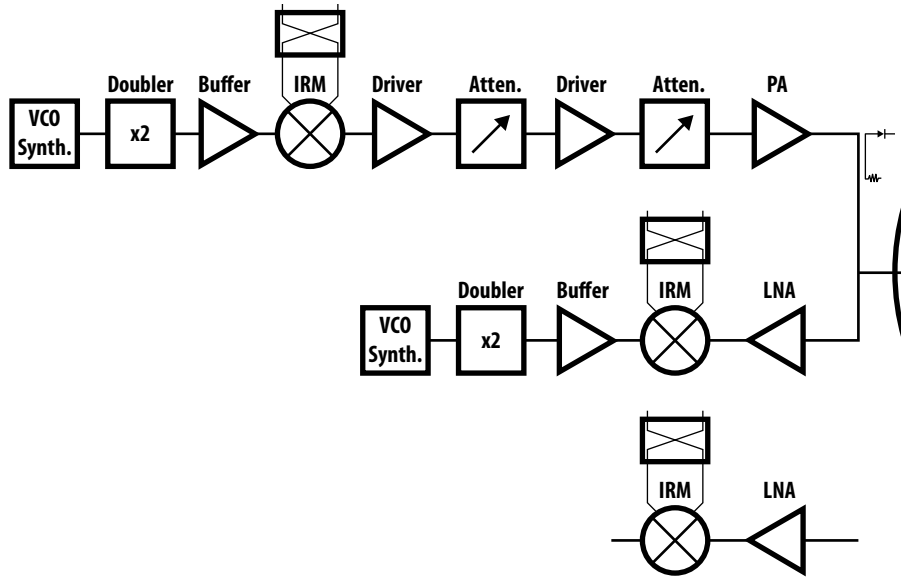
Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6120	8 - 24	5V @ 112	–	–	–	–	5x5
	AMMP-6125	10 - 24	3.5V/5V @ 260	–	–	–	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	AMMP-6232	18 - 32	4V @ 135	3.0	23	+18.0	–	5x5
	AMMP-6233	18 - 32	3V @ 65	2.6	23	+8.0	–	5x5
	AMMP-6333	18 - 33	5V @ 230mA	5.5	20	23	30	5x5
	VMMK-3313	15 - 33	1.5V @ 0.15	–	–	–	–	1x0.5x0.25

Microwave Link Packaged Suggested Solution 26 GHz

Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	AMMP-6232	18 - 32	4V @ 135	3.0	23	+18.0	–	5x5
	AMMP-6233	18 - 32	3V @ 65	2.6	23	+8.0	–	5x5
	AMMP-6333	18 - 33	5V @ 230mA	5.5	20	23	30	5x5
	VMMK-3313	15 - 33	1.5V @ 0.15	–	–	–	–	1x0.5x0.25

Microwave Radio Link Application Circuit

Microwave Link Packaged Suggested Solution 28-32 GHz



Microwave Link Packaged Suggested Solution 28 GHz

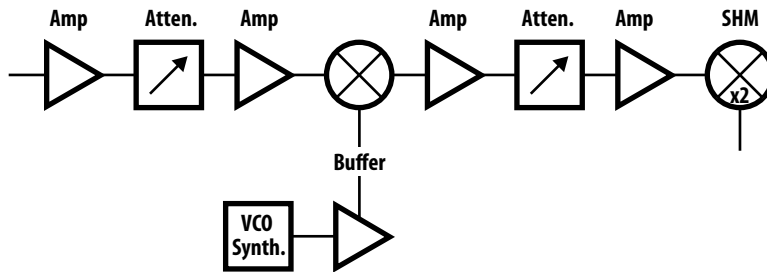
Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	AMMP-6232	18 - 32	4V @ 135	3.0	23	+18.0	–	5x5
	AMMP-6425	18 - 28	5V @ 650	–	22	+28.0	–	5X5
	AMMP-6233	18 - 32	3V @ 65	2.6	23	+8.0	–	5x5
	AMMP-6333	18 - 33	5V@230mA	5.5	20	23	30	5X5
	VMMK-3313	15 - 33	1.5V@0.15	–	–	–	–	1x0.5x0.25

Microwave Link Packaged Suggested Solution 32 GHz

Component	Part Number	Freq. Range (GHz)	Bias condition (V @ mA)	NF (dB)	Gain (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
	AMMP-5618	6 - 20	5V @ 107	4.4	14.5	+19	–	5x5
	AMMP-5620	6 - 20	5V @ 95	5.1	17.5	+15	–	5x5
	AMMP-6220	6 - 20	3V @ 55	2.5	22	+10.0	–	5x5
	AMMP-6222	7 - 21	4V @ 120	2.3	24	+15.5	–	5x5
	AMMP-6232	18 - 32	4V @ 135	3.0	23	+18.0	–	5x5
	AMMP-6233	18 - 32	3V @ 65	2.6	23	+8.0	–	5x5
	AMMP-6333	18 - 33	5V@230mA	5.5	20	23	30	5X5
	VMMK-3413	25 - 45	1.5V@0.15	–	–	–	–	1x0.5x0.25

Microwave Radio Link Application Circuit

IF 1st and 2nd Stage Radio Link Suggested Solution



IF 1st and 2nd Stage Radio Link Suggested Solution

Part Number	Freq. Range (GHz)	Test Freq. (GHz)	Vd (V)	Id (mA)	Gain (dB)	NF (dB)	P1dB (dBm)	OIP3 (dBm)	Package (mm)
ABA-53563	DC - 3.5	2	5	46	21.5	3.5	12.7	22.9	SOT-363 (SC70)
ABA-54563	DC - 3	2	5	79	23	4.4	16.1	27.8	SOT-363 (SC70)
ADA-4789	DC - 2.5	0.9	3.8	60	16.5	4.2	17.1	32.6	SOT-89
ATF-54143	0.45 - 6	2	3	60	16.6	0.5	20.4	36	SOT-363 (SC70)
ATF-541M4	0.45 - 10	2	3	60	17.5	0.5	21.4	36	MiniPak Package
AVT-50663	DC-6000	2	5	36	15.3	4	12.5	25	SOT-363 (SC70)
AVT-52663	DC-6000	2	5	45	15.3	4	12.7	27	SOT-363 (SC70)
AVT-53663	DC-6000	2	5	48	19.5	3.2	15.1	26.5	SOT-363 (SC70)
MGA-30489	0.25 - 3.0	1.9	5	97	13.3	3	-	39	SOT-89
MGA-30689	0.04 - 2.6	1.95	5	104	14.6	3.3	-	40	SOT-89
MGA-30889	0.04 - 2.6	0.9	5	65	15.5	-	-	38	SMT 4.5x4.1x1.5
MGA-565P8	0.1 - 3	2	5	67	21.8	-	-	-	LPCC2x2
MGA-62563	0.1 - 3	0.5	3	60	22	0.9	17.8	32.9	SOT-363 (SC70)
VMMK-2403	1.5 - 4.0	3	3	38	15	1.8	16.5	29	1x0.5x0.25
VMMK-2503	1.0 - 1.2	6	5	65	14	3.3	17	27	1x0.5x0.25

Microwave Radio Link Application Circuit

IF 1st and 2nd Stage Radio Link Suggested Solution

Part Number	Freq. Range (GHz)	IIP3 (dBm)	IP1dB (dBm)	Dynamic Range (dB)	IL (dB)	VSWR (dB)	Package (mm)
ALM-38140	50 - 1000	50	28.8	38	2.8	1.4	3.8x3.8x1.0 MCOB
	1000 - 2000	48.9	35.6	36	3.2	1.4	

Part Number	Freq. Range (GHz)	Test Freq. (GHz)	IIP3 (dBm)	Attenuation (dB)	Insertion Loss (dB)	Return Loss (dB)	Package (mm)
HSMP-3816	0.3 - 4	1	45	38	-3	-22	SOT - 25
HSMP-3866	0.3 - 4	1	30	36	-2.5	-18	SOT - 25

Your Imagination. Our Innovation



Avago Technologies is a leading designer, developer and global supplier of a broad range of analog, mixed signal and optoelectronics components and subsystems with a focus in III-V compound semiconductor design and processing. Backed by an extensive portfolio of intellectual property, Avago products serve three primary target markets: wireless communications, wired infrastructure, and industrial and other. Avago has a global employee presence and heritage of technical innovation dating back 50 years to its Hewlett-Packard roots.

Avago products serve three diverse end markets

Wireless Communications serving the smartphone/handset and Base Station infrastructure markets with leading-edge products that include:

- Power Amplifiers
- Front End Modules
- Film Bulk Acoustic Resonator (FBAR) Filters
- GPS/GLONASS LNAs
- LED Backlighting, Screen Illumination
- Ambient Light and Proximity Sensors

Wired Infrastructure for switches/routers, data centers, supercomputers and storage/servers with products that include:

- 168Gb Parallel Optic Arrays
- 28Gb SerDes ASICs in 28nm
- Storage Fibre Channel Transceivers
- QSFP+/SFP+ Ethernet Transceivers

Industrial and Other for alternative energy power generation, electronic sign and signals, automated manufacturing, automotive lighting, GPS/GLONASS navigation, motor inverter system, battery charging and management, infotainment systems and vehicle safety systems with products that include:

- Inverters
- Isolation and Digital Optocouplers
- Motion Control Optical & Magnetic Encoders
- Polymer Optical Fiber
- Indicator and Display LEDs



For product information and a complete list of distributors, please visit our website:

www.avagotech.com

Avago, Avago Technologies, and the A logo are trademarks of Avago Technologies in the United States and other countries.
Data subject to change. Copyright © 2014 Avago Technologies
AV00-0265EN 05/07/14

AVAGO
TECHNOLOGIES