MC100E210

5V ECL Dual 1:4, 1:5 Differential Fanout Buffer

The MC100E210 is a low voltage, low skew dual differential ECL fanout buffer designed with clock distribution in mind. The device features two fanout buffers, a 1:4 and a 1:5 buffer, on a single chip. The device features fully differential clock paths to minimize both device and system skew. The dual buffer allows for the fanout of two signals through a single chip, thus reducing the skew between the two fundamental signals from a part−to−part skew down to an output−to−output skew. This capability reduces the skew by a factor of 4 as compared to using two LVE111's to accomplish the same task.

The lowest TPD delay time results from terminating only one output pair, and the greatest TPD delay time results from terminating all the output pairs. This shift is about 10−20 pS in TPD. The skew between any two output pairs within a device is typically about 25 nS. If other output pairs are not terminated, the lowest TPD delay time results from both output pairs and the skew is typically 25 nS. When all outputs are terminated, the greatest TPD (delay time) occurs and all outputs display about the same 10−20 pS increase in TPD, so the relative skew between any two output pairs remains about 25 nS.

For more information on using PECL, designers should refer to Application Note AN1406/D.

The V_{BB} pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to V_{BB} as a switching reference voltage. V_{BB} may also rebias AC coupled inputs. When used, decouple V_{BB} and V_{CC} via a 0.01 μF capacitor and limit current sourcing or sinking to 0.5 mA. When not used, V_{BB} should be left open.

Features

- Dual Differential Fanout Buffers
- 200 ps Part−to−Part Skew
- 50 ps Typical Output−to−Output Skew
- Low Voltage ECL/PECL Compatible
- The 100 Series Contains Temperature Compensation
- 28−lead PLCC Packaging
- PECL Mode Operating Range: V_{CC} = 4.2 V to 5.7 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = −4.2 V to −5.7 V
- Internal Input 75 KΩ Pulldown Resistors
- Q Output will Default LOW with Inputs Open or at V_{EE}
- ESD Protection: Human Body Model; >2 KV,
  Machine Model; >200 V
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level 3
  For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V−0 @ 0.125 in,
  Oxygen Index: 28 to 34
- Transistor Count = 179 devices
- These are Pb−Free Devices

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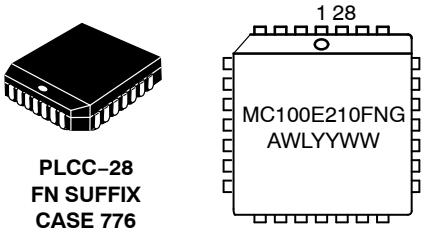
MARKING DIAGRAM



PLCC−28
FN SUFFIX
CASE 776

A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week
G = Pb−Free Package

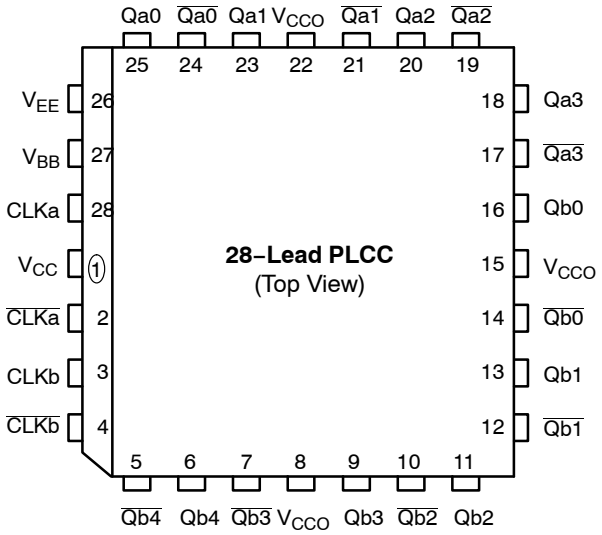
*For additional information, see Application Note AND8002/D

ORDERING INFORMATION

Device	Package	Shipping†
MC100E210FNG	PLCC−28 (Pb−Free)	37 Units / Rail
MC100E210FNR2G	PLCC−28 (Pb−Free)	500 Tape & Reel

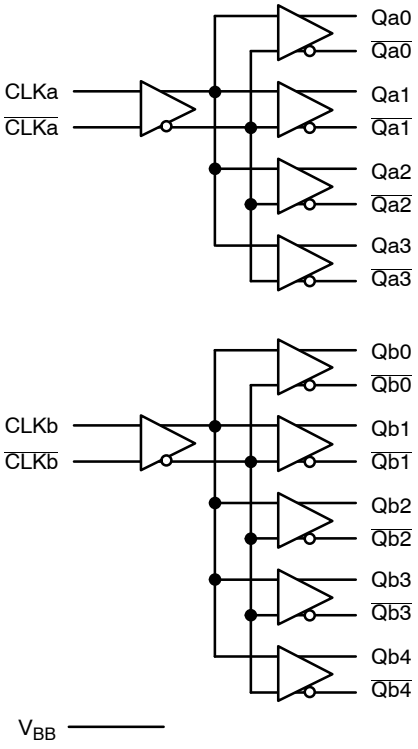
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

LOGIC DIAGRAM AND PINOUT ASSIGNMENT



Warning: All V_{CC}, V_{CCO}, and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

LOGIC SYMBOL



PIN DESCRIPTION

PIN	FUNCTION
CLKa, CLKb	ECL Differential Input Pairs
$\overline{\text{CLKa}}$, $\overline{\text{CLKb}}$	ECL Differential Input Pairs
Qa0:3, Qb0:4	ECL Differential Outputs
$\overline{\text{Qa0:3}}$, $\overline{\text{Qb0:4}}$	ECL Differential Outputs
V_{BB}	Reference Output Voltage
V_{CC}, V_{CCO}	Positive Supply
V_{EE}	Negative Supply

MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Mode Power Supply	V_{EE} = 0 V		8	V
V_{EE}	NECL Mode Power Supply	V_{CC} = 0 V		–8	V
V_I	PECL Mode Input Voltage NECL Mode Input Voltage	V_{EE} = 0 V V_{CC} = 0 V	$V_I \leq V_{CC}$ $V_I \geq V_{EE}$	6 –6	V V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
I_{BB}	V_{BB} Sink/Source			± 0.5	mA
T_A	Operating Temperature Range			0 to +85	°C
T_{stg}	Storage Temperature Range			–65 to +150	°C
θ_{JA}	Thermal Resistance (Junction–to–Ambient)	0 LFPM 500 LFPM	28 PLCC 28 PLCC	63.5 43.5	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction–to–Case)	Standard Board	28 PLCC	22 to 26	°C/W
V_{EE}	PECL Operating Range NECL Operating Range			4.2 to 5.7 –5.7 to –4.2	V V
T_{sol}	Wave Solder	<2 to 3 sec @ 248°C		265	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

PECL DC CHARACTERISTICS V_{CCx}= 5.0 V; V_{EE}= 0.0 V (Note 1)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current			55			55			65	mA
V_{OH}	Output HIGH Voltage (Note 2)	3915	3995	4120	3975	4050	4120	3975	4050	4120	mV
V_{OL}	Output LOW Voltage (Note 2)	3170	3305	3445	3190	3255	3380	3190	3260	3380	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	3835	3975	4120	3835	3975	4120	3835	3975	4120	mV
V_{IL}	Input LOW Voltage (Single−Ended)	3190	3355	3525	3190	3355	3525	3190	3355	3525	mV
V_{BB}	Output Voltage Reference	3.62		3.74	3.62		3.74	3.62		3.74	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential) (Note 3)	2.7		4.6	2.7		4.6	2.7		4.6	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5	0.3		0.5	0.25		0.5	0.2		μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.8 V.
2. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2 volts.
3. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.

NECL DC CHARACTERISTICS V_{CCx}= 0.0 V; V_{EE}= −5.0 V (Note 4)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{EE}	Power Supply Current			55			55			65	mA
V_{OH}	Output HIGH Voltage (Note 5)	−1085	−1005	−880	−1025	−950	−880	−1025	−950	−880	mV
V_{OL}	Output LOW Voltage (Note 5)	−1830	−1695	−1555	−1810	−1745	−1620	−1810	−1740	−1620	mV
V_{IH}	Input HIGH Voltage (Single−Ended)	−1165	−1025	−880	−1165	−1025	−880	−1165	−1025	−880	mV
V_{IL}	Input LOW Voltage (Single−Ended)	−1810	−1645	−1475	−1810	−1645	−1475	−1810	−1645	−1475	mV
V_{BB}	Output Voltage Reference	−1.38		−1.26	−1.38		−1.26	−1.38		−1.26	V
V_{IHCMR}	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 6)	−2.3		−0.4	−2.3		−0.4	−2.3		−0.4	V
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5	0.3		0.5	0.25		0.5	0.2		μA

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained.

4. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.8 V.
5. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2 volts.
6. V_{IHCMR} min varies 1:1 with V_{EE}, max varies 1:1 with V_{CC}.

AC CHARACTERISTICS V_{CCx}= 5.0 V; V_{EE}= 0.0 V or V_{CCx}= 0.0 V; V_{EE}= −5.0 V (Note 7)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{MAX}	Maximum Toggle Frequency		700			700			700		MHz
t_{PLH} t_{PHL}	Propagation Delay to Output IN (differential) (Note 8) IN (single−ended) (Note 9)	 475 400		 675 700	 500 450		 700 750	 500 450		 700 750	ps
t_{skew}	Within−Device Skew Qa to Qb Qa to Qa,Qb to Qb Part−to−Part Skew (Differential) (Note 10)		 50 50	 75 75 200		 50 30	 75 50 200		 50 30	 75 50 200	ps
t_{JITTER}	Random Clock Jitter (RMS)		< 1			< 1			< 1		ps
V_{PP}	Input Voltage Swing (Differential Configuration) (Note 11)	500			500			500			mV
t_r / t_f	Output Rise/Fall Time (20%−80%)	200		600	200		600	200		600	ps

7. V_{EE} can vary −0.46 V / +0.8 V.
8. The differential propagation delay is defined as the delay from the crossing points of the differential input signals to the crossing point of the differential output signals.
9. The single-ended propagation delay is defined as the delay from the 50% point of the input signal to the 50% point of the output signal.
10. The within−device skew is defined as the worst case difference between any two similar delay paths within a single device.
11. V_{PP}(min) is defined as the minimum input differential voltage which will cause no increase in the propagation delay. The V_{PP}(min) is AC limited for the E210 as a differential input as low as 50 mV will still produce full ECL levels at the output.

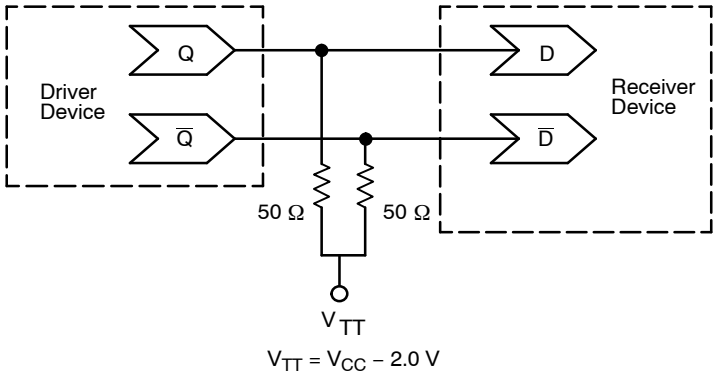


Figure 1. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020 − Termination of ECL Logic Devices.)

Resource Reference of Application Notes

AN1404 − ECLinPS Circuit Performance at Non−Standard V_{IH} Levels

AN1405 − ECL Clock Distribution Techniques

AN1406 − Designing with PECL (ECL at +5.0 V)

AN1503 − ECLinPS I/O SPICE Modeling Kit

AN1504 − Metastability and the ECLinPS Family

AN1568 − Interfacing Between LVDS and ECL

AN1596 − ECLinPS Lite Translator ELT Family SPICE I/O Model Kit

AN1650 − Using Wire−OR Ties in ECLinPS Designs

AN1672 − The ECL Translator Guide

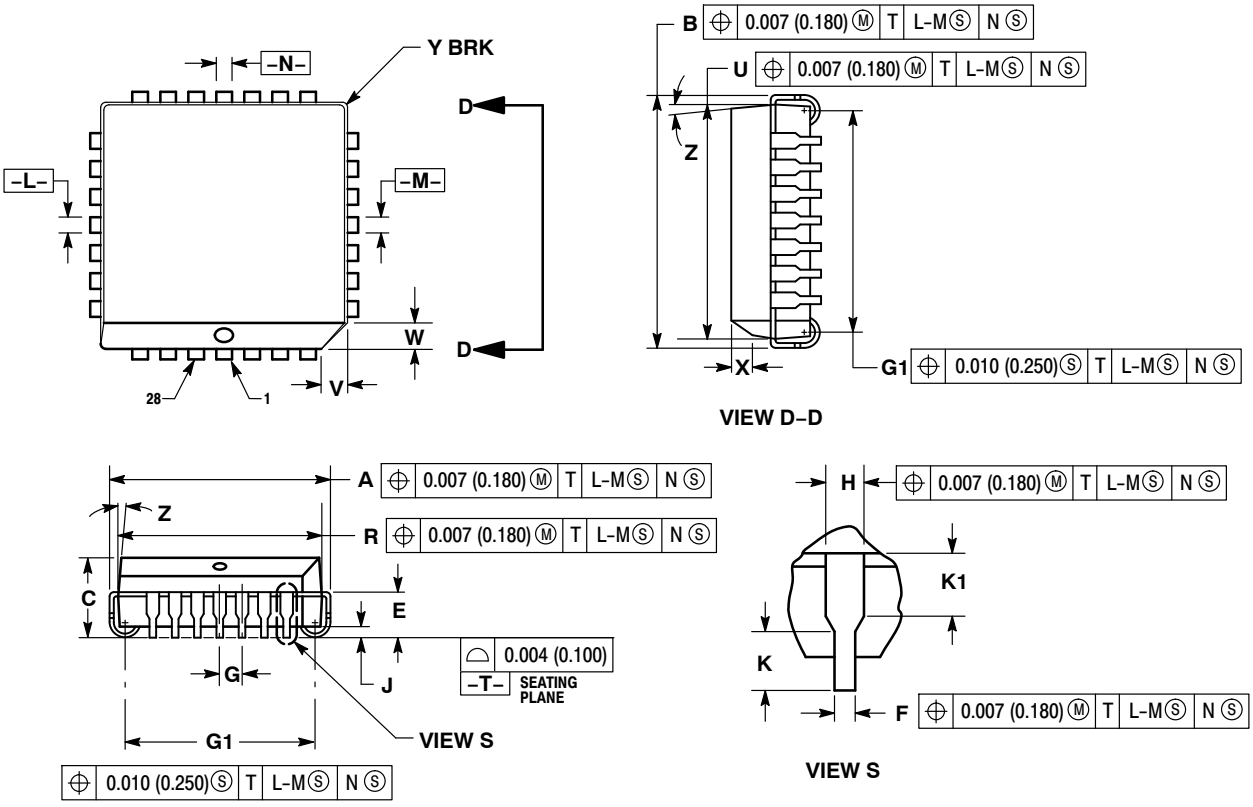
AND8001 − Odd Number Counters Design

AND8002 − Marking and Date Codes

AND8020 − Termination of ECL Logic Devices

PACKAGE DIMENSIONS

PLCC−28
FN SUFFIX
CASE 776−02
ISSUE F



NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.
6. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.485	0.495	12.32	12.57
B	0.485	0.495	12.32	12.57
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.021	0.33	0.53
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.450	0.456	11.43	11.58
U	0.450	0.456	11.43	11.58
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	---	0.020	---	0.50
Z	2°	10°	2°	10°
G1	0.410	0.430	10.42	10.92
K1	0.040	---	1.02	---

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