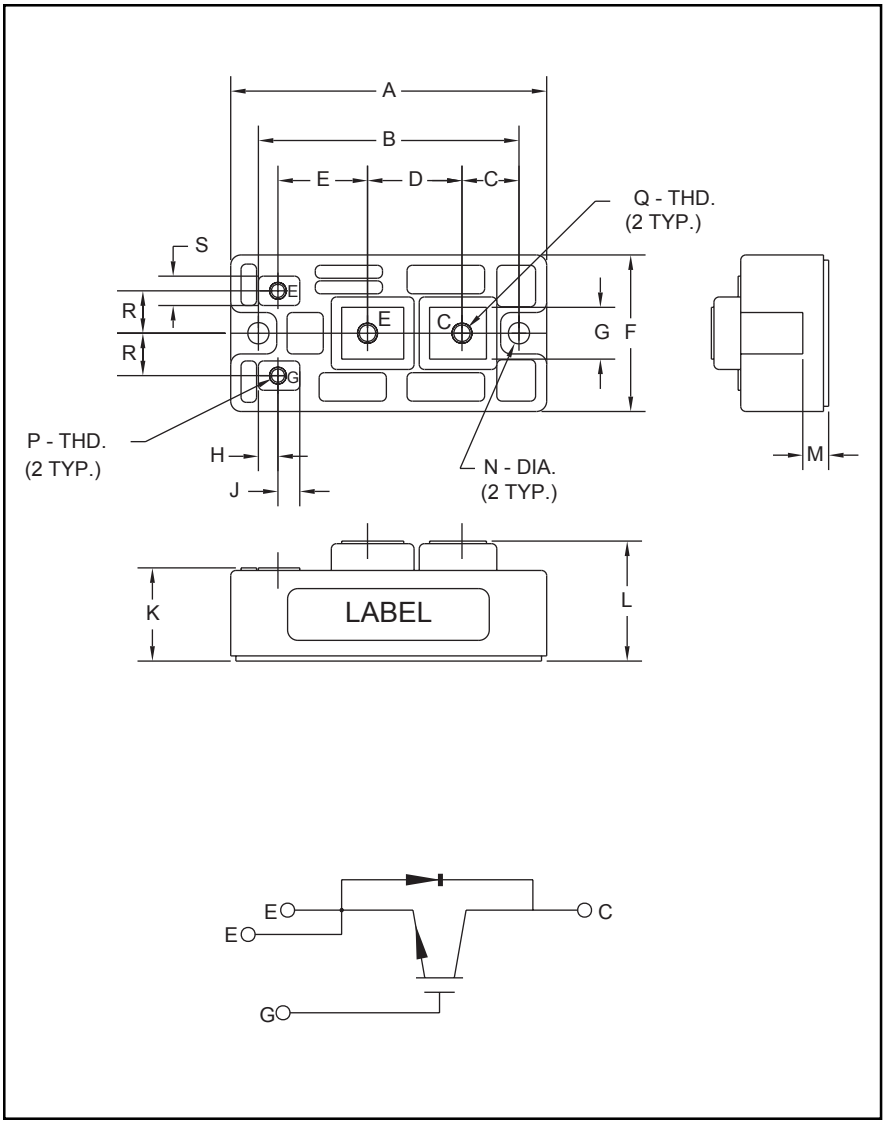
Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Trench Gate Design Single IGBTMOD™
450 Amperes/250 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	3.82	97.0
B	3.15	80.0
C	0.69	17.5
D	1.14	29.0
E	1.04	26.5
F	1.89	48.0
G	0.63	16.0
H	0.24	6.0
J	0.26	6.7

Dimensions	Inches	Millimeters
K	1.14	29.0
L	1.42	36.0
M	0.28	7.0
N	0.26	6.5
P	M4 Metric	M4
Q	M6 Metric	M6
R	0.51	13.0
S	0.35	9.0

Description:
Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor in a single configuration, with a reverse connected super-fast recovery free-wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:
- ☐ Low Drive Power
- ☐ Low $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diodes
- ☐ High Frequency Operation (20-25 kHz)
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ DC Chopper
- ☐ UPS
- ☐ Forklift

Ordering Information:
Example: Select the complete nine digit module part number you desire from the table below - i.e. CM450HA-5F is a 250V (V_{CES}), 450 Ampere Single IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	450	5

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Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Characteristics	Symbol	CM450HA-5F	Units
Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Collector-Emitter Voltage (G-E Short)	V_{CES}	250	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current	I_C	450	Amperes
Peak Collector Current	I_{CM}	900*	Amperes
Diode Forward Current	I_{FM}	450	Amperes
Diode Forward Surge Current	I_{FM}	900*	Amperes
Power Dissipation	P_d	735	Watts
Maximum Mounting Torque, M6 Terminal Screws	—	26	in-lb
Maximum Mounting Torque, M6 Mounting Screws	—	26	in-lb
Maximum Mounting Torque, M4 (G, E) Terminal Screws	—	13	in-lb
Module Weight (Typical)	—	270	Grams
V Isolation Voltage	V_{RMS}	2500	Volts

Static Electrical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 45mA, V_{CE} = 10V	3.0	4.0	5.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 450A, V_{GE} = 10V,	—	1.2	1.7	Volts
		I_C = 450A, V_{GE} = 10V, T_j = 150°C	—	1.1	—	Volts
Total Gate Charge	Q_G	V_{CC} = 50V, I_C = 450A, V_{GS} = 15V	—	1760	—	nC
Diode Forward Voltage	V_{FM}	I_E = 450A, V_{GS} = 0V	—	—	2.0	Volts

Dynamic Electrical Characteristics, T_j = 25°C unless otherwise specified

Characteristics		Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance		C_{IES}	V_{GE} = 0V, V_{CE} = 10V	—	—	132	nF
Output Capacitance		C_{OES}		—	—	6	nF
Reverse Transfer Capacitance		C_{RES}		—	—	4.5	nF
Resistive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 50V, I_C = 450A, $V_{GE1} = V_{GE2}$ = 10V, R_G = 5.6Ω Resistive Load	—	—	1200	ns
Load	Rise Time	t_r		—	—	2700	ns
Switching	Turn-off Delay Time	$t_{d(off)}$		—	—	900	ns
Times	Fall Time	t_F		—	—	500	ns
Diode Reverse Recovery Time		t_{rr}	I_E = 450A, di_E/dt = -900A/ms	—	—	300	ns
Diode Reverse Recovery Charge		Q_{rr}	I_E = 450A, di_E/dt = -900A/ms	—	7.6	—	µC

Thermal and Mechanical Electrical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per IGBT	—	—	0.17	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$	Per Free Wheel Diode	—	—	0.23	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	—	—	0.090	°C/W

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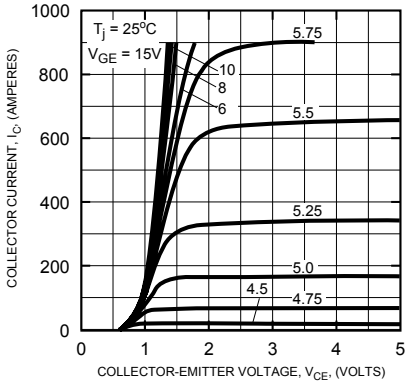
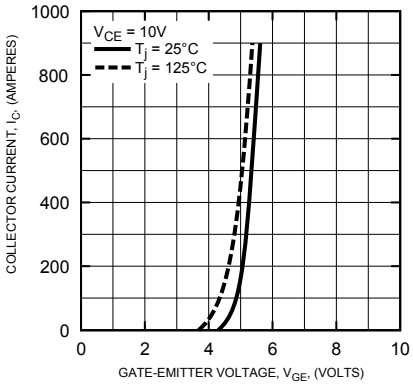
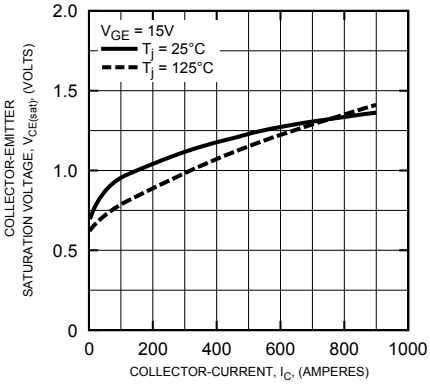
OUTPUT CHARACTERISTICS (TYPICAL)



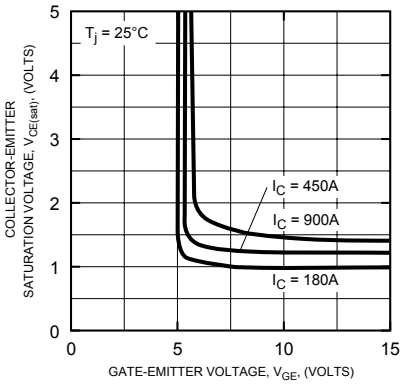
TRANSFER CHARACTERISTICS (TYPICAL)



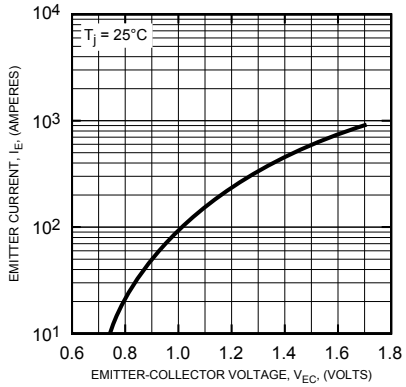
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



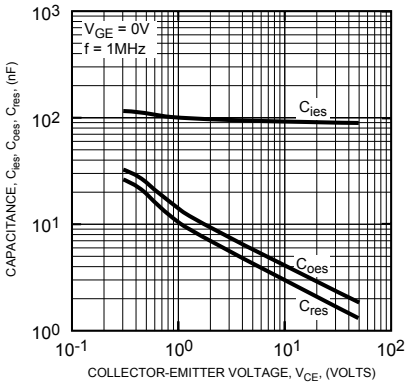
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



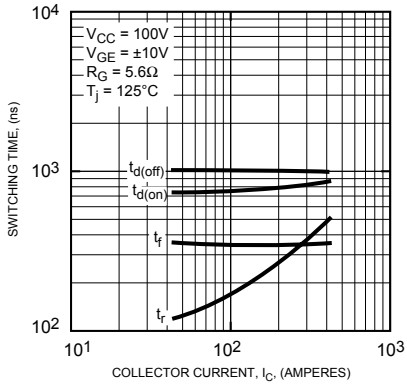
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



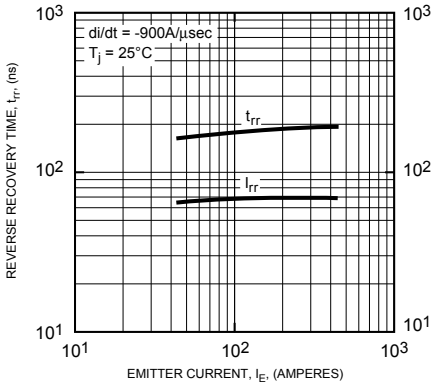
CAPACITANCE VS. V_{CE} (TYPICAL)



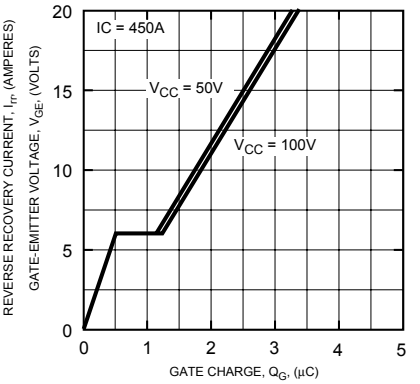
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



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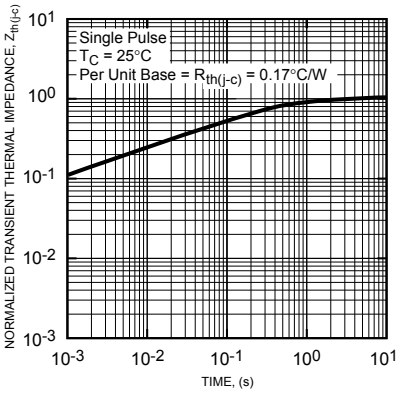
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)