Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
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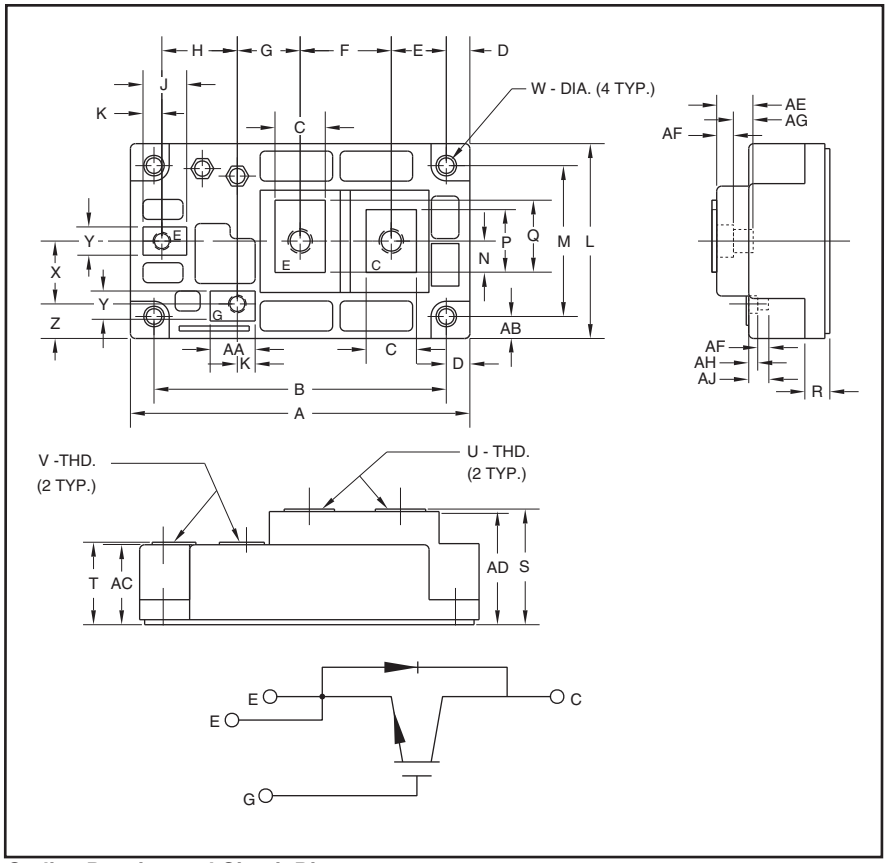
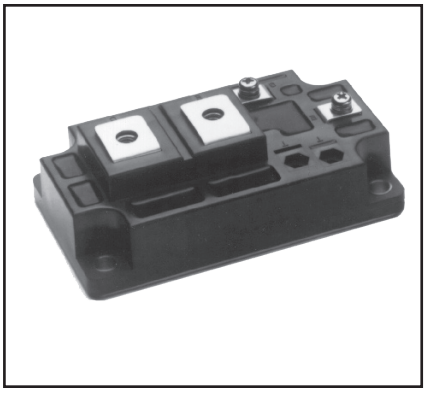
Single IGBTMOD™ A-Series Module
400 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.25	108.0
B	3.66±0.01	93.0±0.25
C	0.63	16.0
D	0.30	7.5
E	0.69	17.5
F	1.14	29.0
G	0.79	20.0
H	0.94	24.0
J	0.55	13.9
K	0.24	6.0
L	2.44	62.0
M	1.89±0.01	48.0±0.25
N	0.39	10.0
P	0.79	20.0
Q	0.91	23.0
R	0.33	8.5
S	1.42+0.04/-0.02	36.0+1/-0.5

Dimensions	Inches	Millimeters
T	1.02+0.04/-0.02	25.8+1/-0.5
U	M6 Metric	M6
V	M4 Metric	M4
W	0.256 Dia.	6.5 Dia.
X	0.79	20.0
Y	0.35	9.0
Z	0.43	11.0
AA	0.53	13.55
AB	0.28	7.0
AC	0.98	25.0
AD	1.38	35.0
AE	0.45	11.5
AF	0.2	5.0
AG	0.26	6.5
AH	0.13	3.2
AJ	0.32	8.2



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 Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

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

Ordering Information:
Example: Select the complete part module number you desire from the table below -i.e. CM400HA-24A is a 1200V (V_{CES}), 400 Ampere Single IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	400	24

CM400HA-24A
Single IGBTMOD™ A-Series Module
400 Amperes/1200 Volts

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

Ratings	Symbol	CM400HA-24A	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}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (DC, T_C = 87°C)*4	I_C	400	Amperes
Peak Collector Current (Pulse, Repetitive)*2	I_{CM}	800	Amperes
Maximum Collector Dissipation (T_C = 25°C)*2,*4	P_C	2350	Watts
Emitter Current (T_C = 25°C)	I_E*1	400	Amperes
Peak Emitter Current (Pulse, Repetitive)*2	I_{EM}*1	800	Amperes
Mounting Torque, M6 Main Terminal	—	26	in-lb
Mounting Torque, M6 Mounting	—	26	in-lb
Mounting Torque, M4 G(E) Terminal	—	13	in-lb
Weight	—	480	Grams
Isolation Voltage (Main Terminal to Baseplate, f = 60Hz, AC 1 min.)	V_{ISO}	2500	Volts

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}	$\pm V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	1.0	µA
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	I_C = 40mA, V_{CE} = 10V	6.0	7.0	8.0	Volts
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	I_C = 400A, V_{GE} = 15V, T_j = 25°C*3	—	2.1	3.0	Volts
			I_C = 400A, V_{GE} = 15V, T_j = 125°C*3	—	2.4	—	Volts
Forward Transfer Admittance		$\|\gamma_{fs}\|$	I_C = 400A, V_{CE} = 10V*3	120	—	—	sec
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	70	nf
Output Capacitance		C_{oes}		—	—	6	nf
Reverse Transfer Capacitance		C_{res}		—	—	1.4	nf
Total Gate Charge		Q_G	V_{CC} = 600V, I_C = 400A, V_{GE} = 15V	—	2000	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 400A, V_{GE} = ±15V, R_G = 0.78Ω, Inductive Load	—	—	550	ns
Load	Rise Time	t_r		—	—	180	ns
Switch	Turn-off Delay Time	$t_{d(off)}$		—	—	600	ns
Time	Fall Time	t_f		—	—	350	ns
Diode Reverse Recovery Time		t_{rr}*1	I_E = 400A	—	—	250	ns
Diode Reverse Recovery Charge		Q_{rr}*1		—	14.7	—	µC
Emitter-Collector Voltage		V_{EC}*1	I_E = 400A, V_{GE} = 0V*3	—	—	3.8	Volts
External Gate Resistance		R_G		0.78	—	10	Ω

*1 Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
*2 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
*3 Pulse width and repetition rate should be such as to cause negligible temperature rise.
*4 Case temperature (T_C), and heatsink temperature (T_f) measured point is just under the chips.

CM400HA-24A
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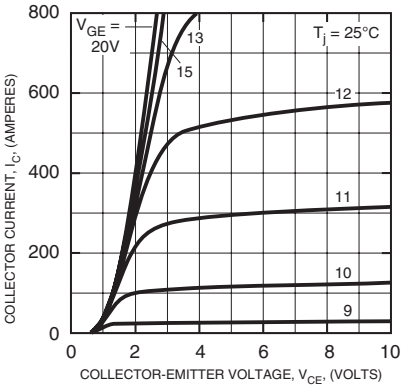
Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

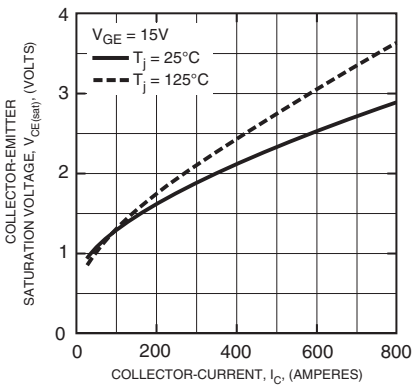
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}Q$	Per IGBT*4	—	—	0.053	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}D$	Per FWDi*4	—	—	0.080	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Heatsink, Thermal Grease Applied*4,*5	—	0.02	—	°C/W

*4 Case temperature (T_C), and heatsink temperature (T_f) measured point is just under the chips.
*5 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

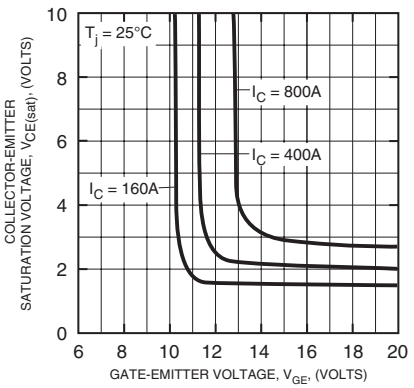
OUTPUT CHARACTERISTICS (TYPICAL)



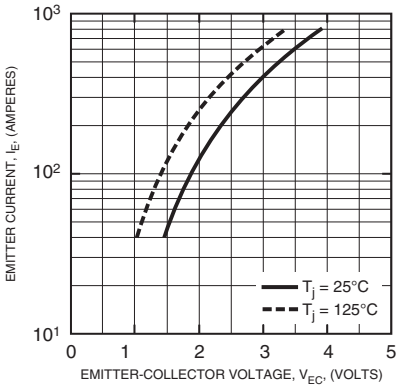
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



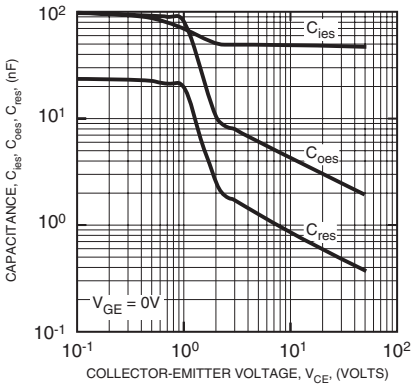
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



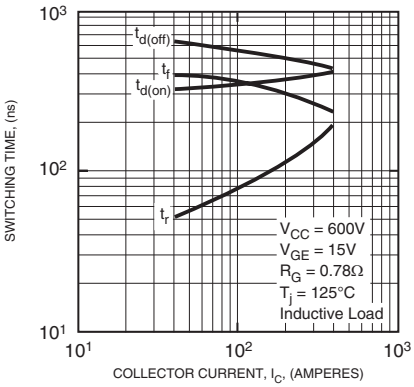
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE VS. V_{CE} (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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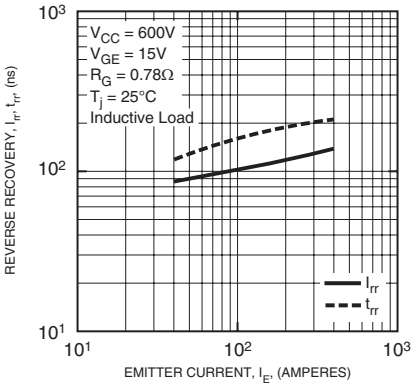
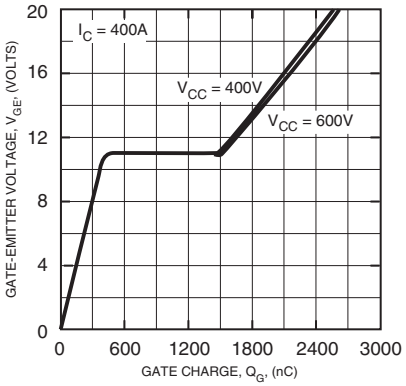
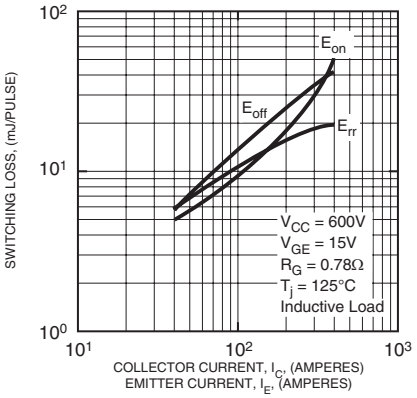
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



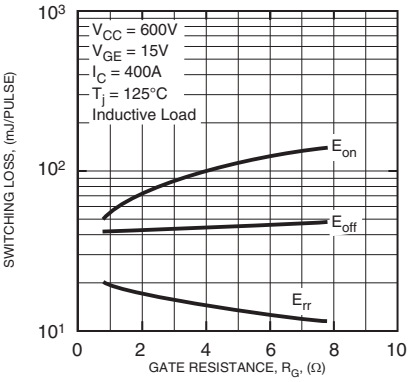
GATE CHARGE VS. V_{GE}



SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)