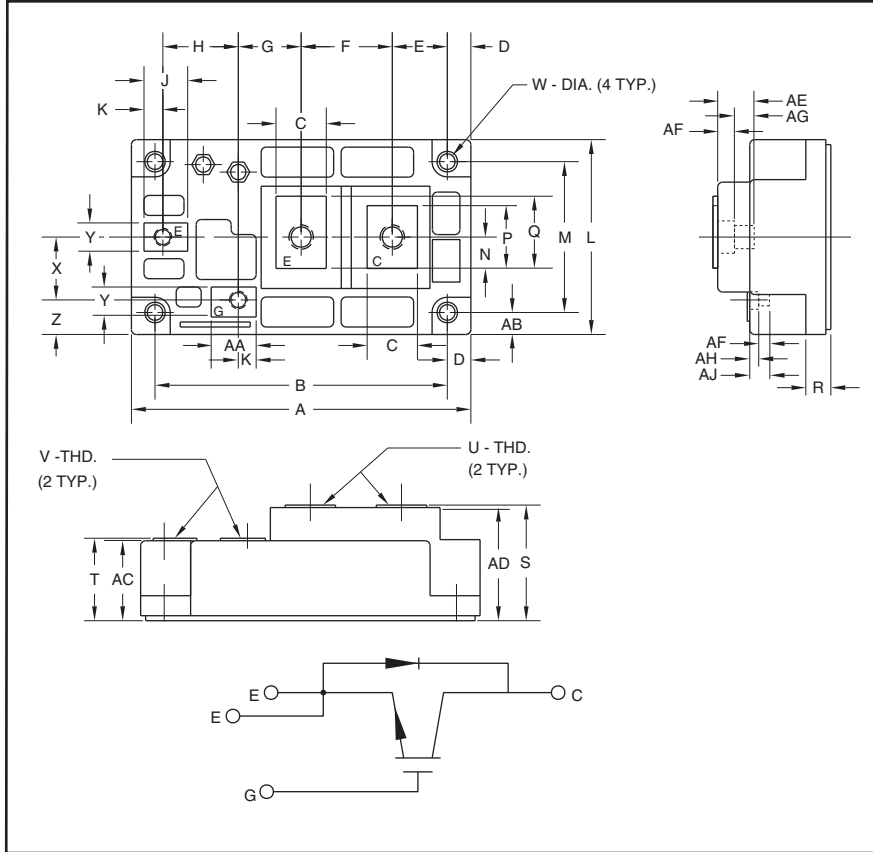


Single IGBTMOD™ A-Series Module 400 Amperes/1200 Volts



Outline Drawing and Circuit Diagram



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.

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

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



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwr.com

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

Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	CM400HA-24A	Units
Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current (DC, $T_C = 87^\circ\text{C}$)* ⁴	I_C	400	Amperes
Peak Collector Current (Pulse, Repetitive)* ²	I_{CM}	800	Amperes
Maximum Collector Dissipation ($T_C = 25^\circ\text{C}$)* ^{2,*4}	P_C	2350	Watts
Emitter Current ($T_C = 25^\circ\text{C}$)	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, $f = 60\text{Hz}$, AC 1 min.)	V_{ISO}	2500	Volts

Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	1.0	mA
Gate Leakage Current	I_{GES}	$\pm V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	1.0	μA
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_C = 40\text{mA}, V_{\text{CE}} = 10\text{V}$	6.0	7.0	8.0	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_C = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 25^\circ\text{C}^{*3}$	—	2.1	3.0	Volts
		$I_C = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 125^\circ\text{C}^{*3}$	—	2.4	—	Volts
Forward Transfer Admittance	$ y_{\text{fs}} $	$I_C = 400\text{A}, V_{\text{CE}} = 10\text{V}^{*3}$	120	—	—	sec
Input Capacitance	C_{ies}		—	—	70	nf
Output Capacitance	C_{oes}	$V_{\text{CE}} = 10\text{V}, V_{\text{GE}} = 0\text{V}$	—	—	6	nf
Reverse Transfer Capacitance	C_{res}		—	—	1.4	nf
Total Gate Charge	Q_G	$V_{\text{CC}} = 600\text{V}, I_C = 400\text{A}, V_{\text{GE}} = 15\text{V}$	—	2000	—	nC
Inductive	Turn-on Delay Time	$t_{\text{d(on)}}$	—	—	550	ns
	Rise Time	t_r	—	—	180	ns
Switch	Turn-off Delay Time	$t_{\text{d(off)}}$	—	—	600	ns
	Fall Time	t_f	—	—	350	ns
Diode Reverse Recovery Time	t_{rr}^{*1}	$I_E = 400\text{A}$	—	—	250	ns
Diode Reverse Recovery Charge	Q_{rr}^{*1}		—	14.7	—	μC
Emitter-Collector Voltage	V_{EC}^{*1}	$I_E = 400\text{A}, V_{\text{GE}} = 0\text{V}^{*3}$	—	—	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 $T_{j(\text{max})}$ 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.

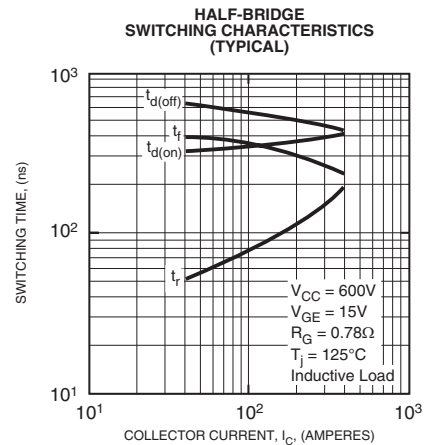
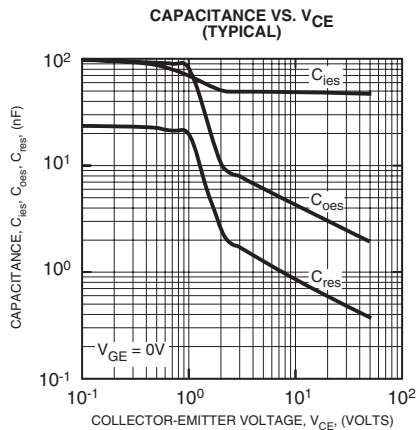
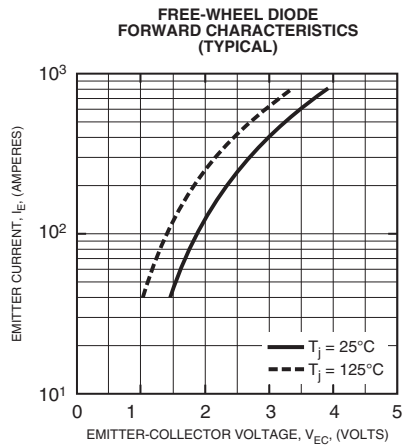
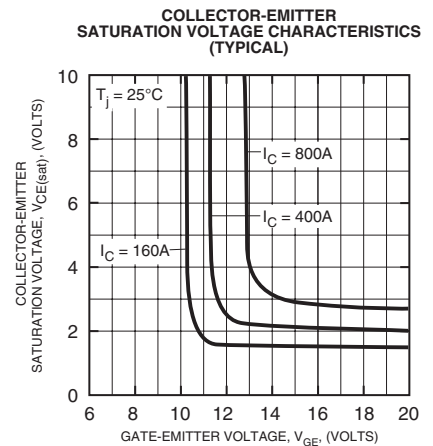
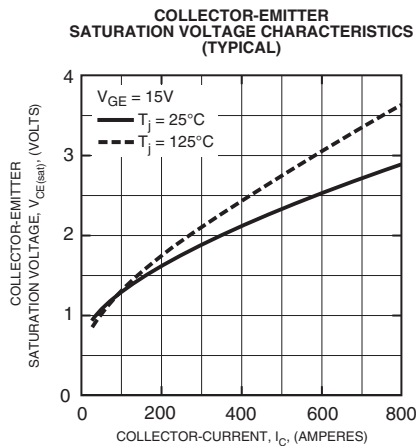
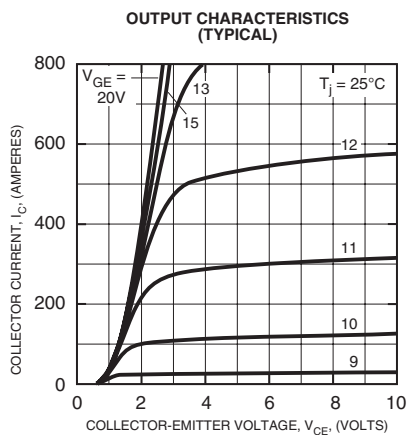
CM400HA-24A
Single IGBTMOD™ A-Series Module
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Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

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

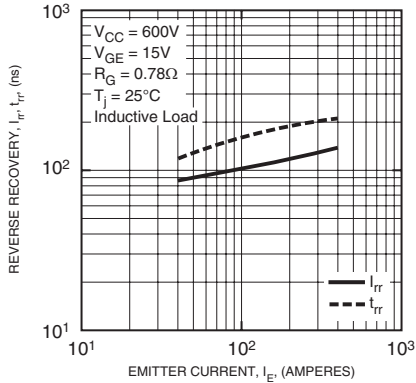
*4 Case temperature (T_C), and heatsink temperature (T_f) measured point is just under the chips.

*5 Typical value is measured by using thermally conductive grease of $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$.

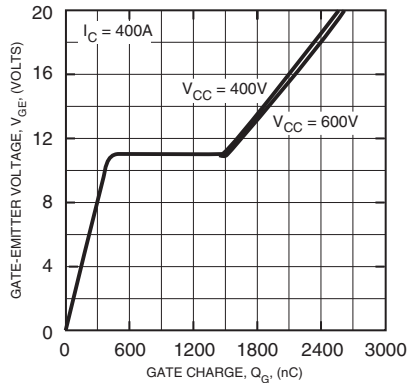


CM400HA-24A
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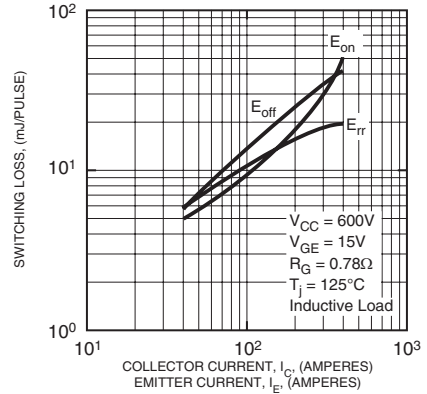
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



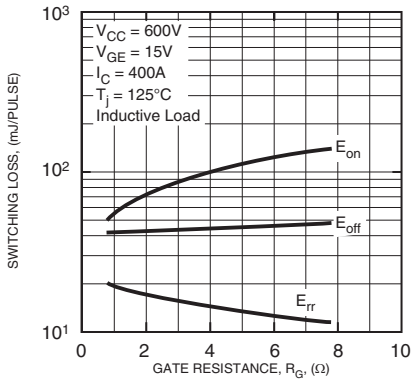
GATE CHARGE VS. V_{GE}



SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)

