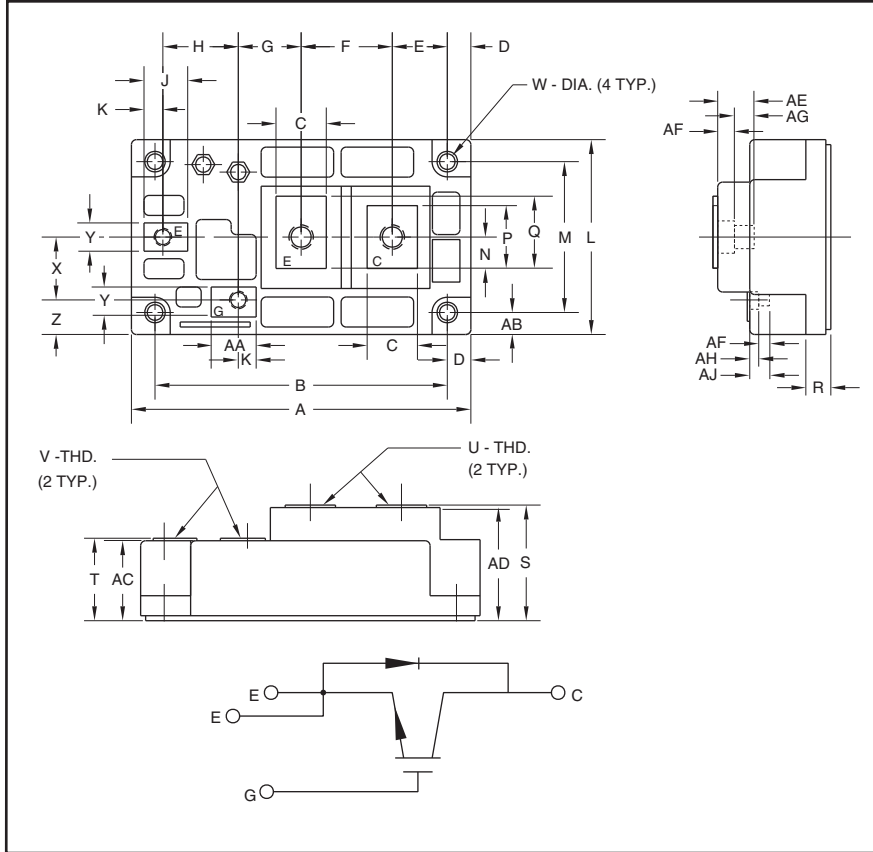


### Single IGBTMOD™ A-Series Module 400 Amperes/1200 Volts



#### 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

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



**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)	$V_{GES}$	$\pm 20$	Volts
Collector Current (DC, $T_C = 87^\circ\text{C}$ )* <sup>4</sup>	$I_C$	400	Amperes
Peak Collector Current (Pulse, Repetitive)* <sup>2</sup>	$I_{CM}$	800	Amperes
Maximum Collector Dissipation ( $T_C = 25^\circ\text{C}$ )* <sup>2,*4</sup>	$P_C$	2350	Watts
Emitter Current ( $T_C = 25^\circ\text{C}$ )	$I_E^{*1}$	400	Amperes
Peak Emitter Current (Pulse, Repetitive)* <sup>2</sup>	$I_{EM}^{*1}$	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	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0\text{V}$	—	—	1.0	mA
Gate Leakage Current	$I_{GES}$	$\pm V_{GE} = V_{GES}, V_{CE} = 0\text{V}$	—	—	1.0	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 40\text{mA}, V_{CE} = 10\text{V}$	6.0	7.0	8.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 400\text{A}, V_{GE} = 15\text{V}, T_j = 25^\circ\text{C}^{*3}$	—	2.1	3.0	Volts
		$I_C = 400\text{A}, V_{GE} = 15\text{V}, T_j = 125^\circ\text{C}^{*3}$	—	2.4	—	Volts
Forward Transfer Admittance	$ y_{fs} $	$I_C = 400\text{A}, V_{CE} = 10\text{V}^{*3}$	120	—	—	sec
Input Capacitance	$C_{ies}$		—	—	70	nf
Output Capacitance	$C_{oes}$	$V_{CE} = 10\text{V}, V_{GE} = 0\text{V}$	—	—	6	nf
Reverse Transfer Capacitance	$C_{res}$		—	—	1.4	nf
Total Gate Charge	$Q_G$	$V_{CC} = 600\text{V}, I_C = 400\text{A}, V_{GE} = 15\text{V}$	—	2000	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$	—	—	550	ns
	Rise Time	$t_r$	—	—	180	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	—	—	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	—	$\mu\text{C}$
Emitter-Collector Voltage	$V_{EC}^{*1}$	$I_E = 400\text{A}, V_{GE} = 0\text{V}^{*3}$	—	—	3.8	Volts
External Gate Resistance	$R_G$		0.78	—	10	$\Omega$

\*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.

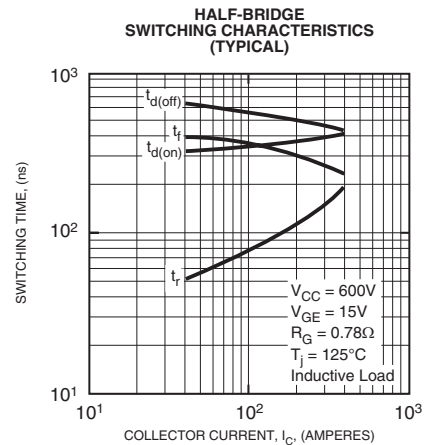
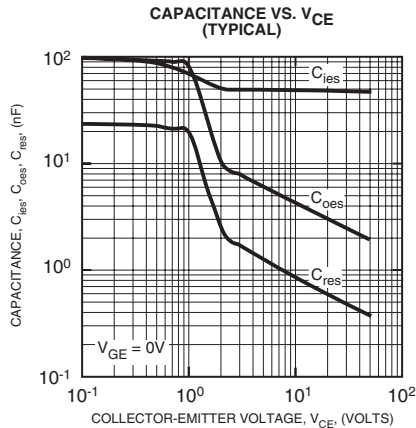
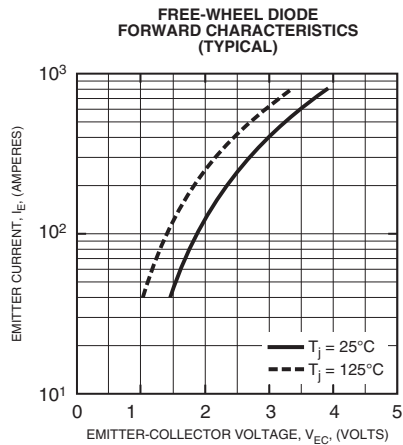
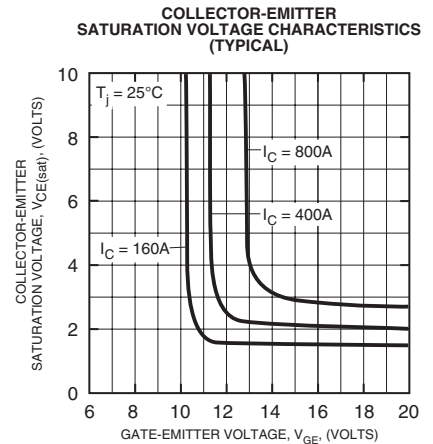
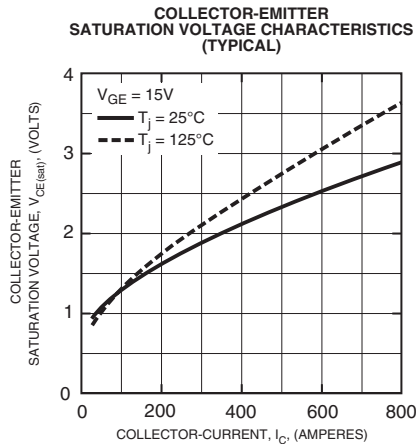
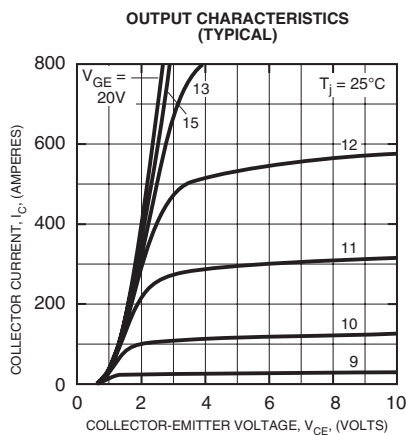
**CM400HA-24A**  
**Single IGBTMOD™ A-Series Module**  
 400 Amperes/1200 Volts

**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	—	$^\circ\text{C/W}$

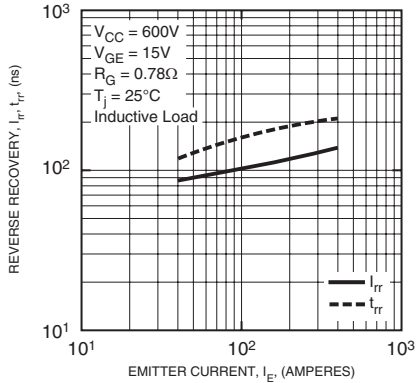
\*4 Case temperature ( $T_C$ ), and heatsink temperature ( $T_f$ ) measured point is just under the chips.

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

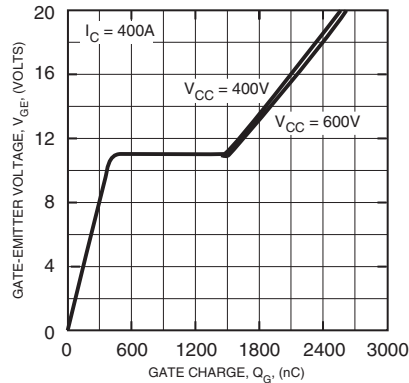


**CM400HA-24A**  
**Single IGBTMOD™ A-Series Module**  
 400 Amperes/1200 Volts

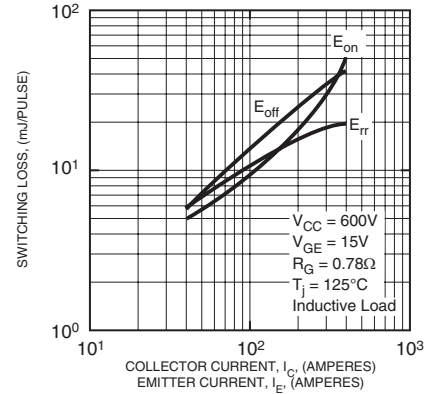
**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



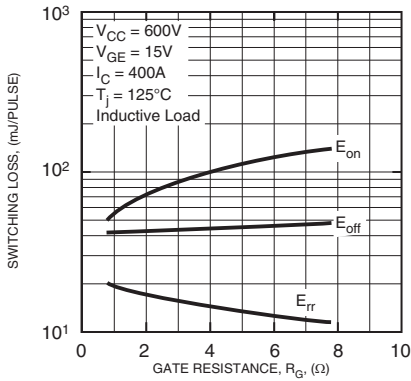
**GATE CHARGE VS.  $V_{GE}$**



**SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)**



**SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)**

