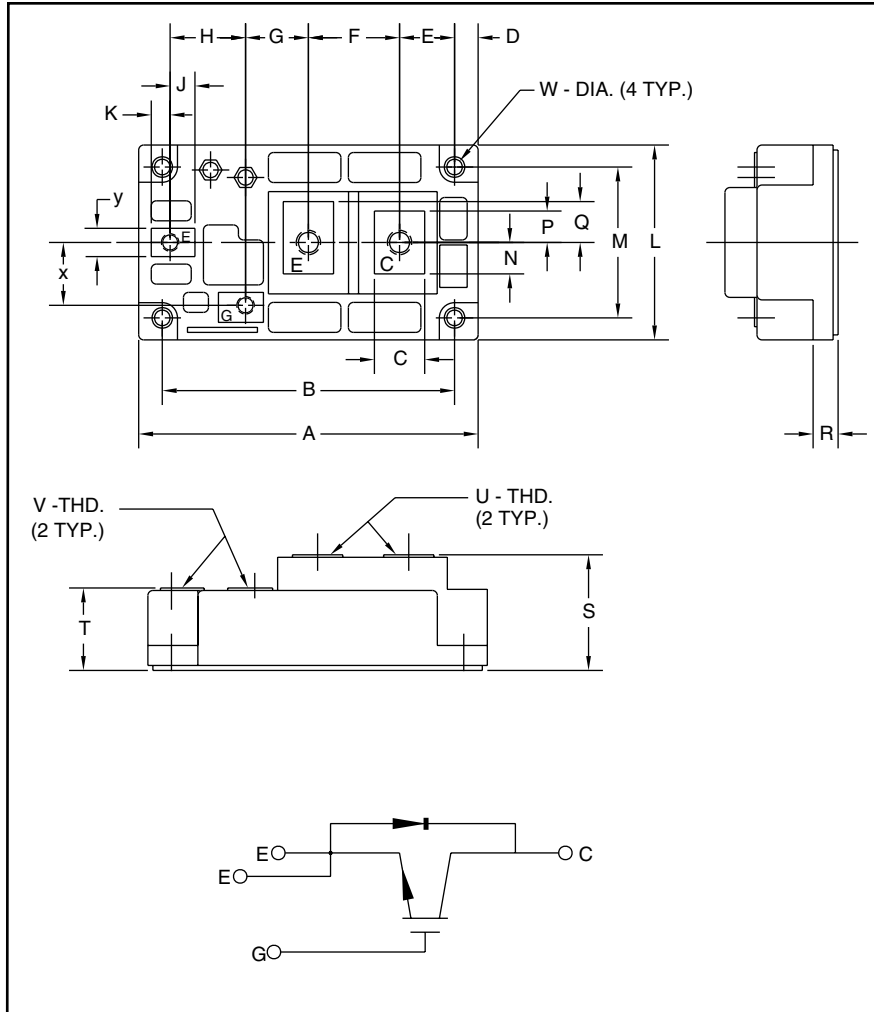


### Single IGBTMOD™ A-Series Module 400 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| A          | 4.25   | 108.0       |
| B          | 3.66   | 93.0        |
| 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          | 0.31   | 7.9         |
| K          | 0.24   | 6.0         |
| L          | 2.44   | 62.0        |
| M          | 1.89   | 48.0        |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| N          | 0.39      | 10.0        |
| P          | 0.39      | 10.0        |
| Q          | 0.51      | 13.0        |
| R          | 0.33      | 8.5         |
| S          | 1.42      | 36.0        |
| T          | 1.02      | 25.8        |
| U          | M6 Metric | M6          |
| V          | M4 Metric | M4          |
| W          | 0.256     | 6.5         |
| X          | 0.79      | 20.0        |
| Y          | 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 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<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 400                       | 24                        |

**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                                                                         | $T_{\text{stg}}$ | -40 to 125  | $^\circ\text{C}$ |
| Collector-Emitter Voltage (G-E Short)                                                       | $V_{\text{CES}}$ | 1200        | Volts            |
| Gate-Emitter Voltage (C-E Short)                                                            | $V_{\text{GES}}$ | $\pm 20$    | Volts            |
| Collector Current (DC, $T_C = 87^\circ\text{C}^*$ )                                         | $I_C$            | 400         | Amperes          |
| Peak Collector Current                                                                      | $I_{\text{CM}}$  | 800**       | Amperes          |
| Emitter Current*** ( $T_C = 25^\circ\text{C}$ )                                             | $I_E$            | 400         | Amperes          |
| Peak Emitter Current***                                                                     | $I_{\text{EM}}$  | 800**       | Amperes          |
| Maximum Collector Dissipation ( $T_C = 25^\circ\text{C}^*$ , $T_j \leq 150^\circ\text{C}$ ) | $P_C$            | 2350        | Watts            |
| Mounting Torque, M6 Main Terminal                                                           | —                | 40          | in-lb            |
| Mounting Torque, M6 Mounting                                                                | —                | 40          | in-lb            |
| Mounting Torque, M4 G(E) Terminal                                                           | —                | 15          | in-lb            |
| Weight                                                                                      | —                | 480         | Grams            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)                                   | $V_{\text{ISO}}$ | 2500        | Volts            |

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

| Characteristics                      | Symbol               | Test Conditions                                                                    | Min. | Typ. | Max. | Units         |
|--------------------------------------|----------------------|------------------------------------------------------------------------------------|------|------|------|---------------|
| Collector-Cutoff Current             | $I_{\text{CES}}$     | $V_{\text{CE}} = V_{\text{CES}}$ , $V_{\text{GE}} = 0\text{V}$                     | —    | —    | 1.0  | mA            |
| Gate Leakage Current                 | $I_{\text{GES}}$     | $V_{\text{GE}} = V_{\text{GES}}$ , $V_{\text{CE}} = 0\text{V}$                     | —    | —    | 0.5  | $\mu\text{A}$ |
| 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 | $V_{\text{CE(sat)}}$ | $I_C = 400\text{A}$ , $V_{\text{GE}} = 15\text{V}$ , $T_j = 25^\circ\text{C}$      | —    | 2.1  | 3.0  | Volts         |
|                                      |                      | $I_C = 400\text{A}$ , $V_{\text{GE}} = 15\text{V}$ , $T_j = 125^\circ\text{C}$     | —    | 2.4  | —    | Volts         |
| Total Gate Charge                    | $Q_G$                | $V_{\text{CC}} = 600\text{V}$ , $I_C = 400\text{A}$ , $V_{\text{GE}} = 15\text{V}$ | —    | 2000 | —    | nC            |
| Emitter-Collector Voltage**          | $V_{\text{EC}}$      | $I_E = 400\text{A}$ , $V_{\text{GE}} = 0\text{V}$                                  | —    | —    | 3.8  | Volts         |

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

| Characteristics                  | Symbol              | Test Conditions                                                                                                                                  | Min. | Typ. | Max. | Units         |
|----------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| Input Capacitance                | $C_{\text{ies}}$    | $V_{\text{CE}} = 10\text{V}$ , $V_{\text{GE}} = 0\text{V}$                                                                                       | —    | —    | 70   | nF            |
| Output Capacitance               | $C_{\text{oes}}$    |                                                                                                                                                  | —    | —    | 6    | nF            |
| Reverse Transfer Capacitance     | $C_{\text{res}}$    |                                                                                                                                                  | —    | —    | 1.4  | nF            |
| Inductive                        | Turn-on Delay Time  | $V_{\text{CC}} = 600\text{V}$ , $I_C = 400\text{A}$ ,<br>$V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V}$ , $R_G = 0.78\Omega$ ,<br>Inductive Load | —    | —    | 550  | ns            |
|                                  | Rise Time           |                                                                                                                                                  | —    | —    | 180  | ns            |
| Switch                           | Turn-off Delay Time |                                                                                                                                                  | —    | —    | 600  | ns            |
| Time                             | Fall Time           |                                                                                                                                                  | —    | —    | 350  | ns            |
| Diode Reverse Recovery Time***   | $t_{\text{rr}}$     | Switching Operation,                                                                                                                             | —    | —    | 250  | ns            |
| Diode Reverse Recovery Charge*** | $Q_{\text{rr}}$     | $I_E = 400\text{A}$                                                                                                                              | —    | 14.7 | —    | $\mu\text{C}$ |

\* $T_C$ ,  $T_f$  measured point is just under the chips.

\*\*Pulse width and repetition rate should be such that device junction temperature ( $T_j$ ) does not exceed  $T_{j(\text{max})}$  rating.

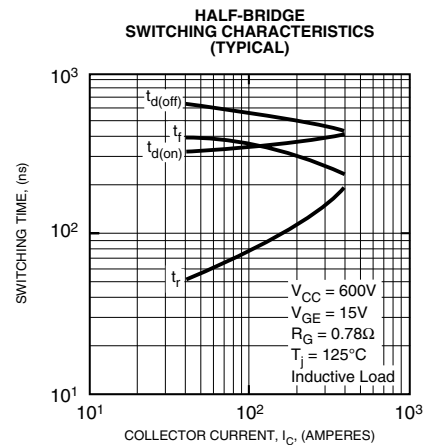
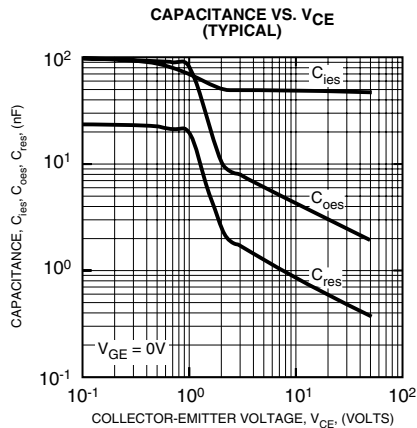
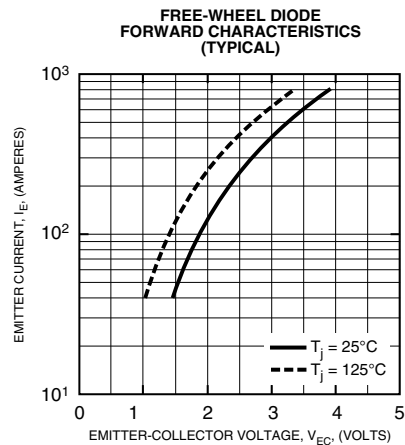
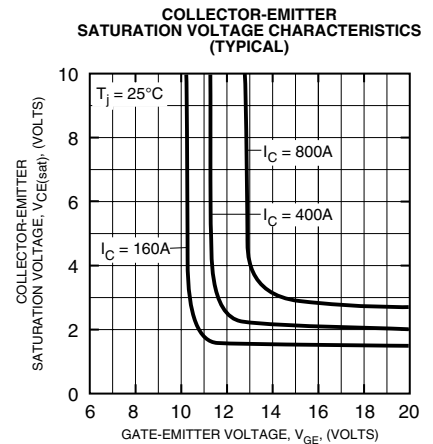
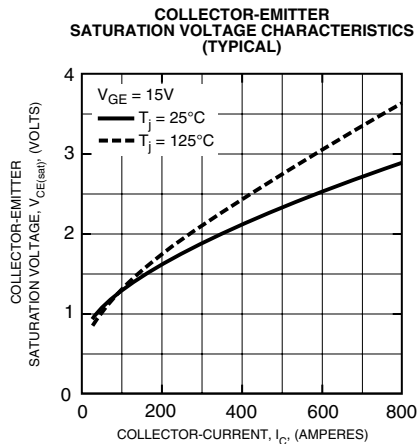
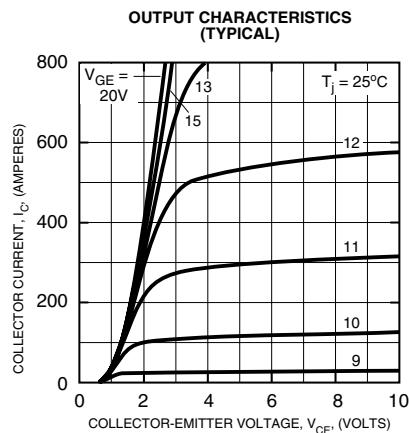
\*\*\*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

**CM400HA-24A**  
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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               | —    | —    | 0.053 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case* | $R_{th(j-c)D}$ | Per FWDi               | —    | —    | 0.085 | $^\circ\text{C/W}$ |
| Contact Thermal Resistance            | $R_{th(c-f)}$  | Thermal Grease Applied | —    | 0.02 | —     | $^\circ\text{C/W}$ |
| External Gate Resistance              | $R_G$          |                        | 0.78 | —    | 10    | $\Omega$           |

\* $T_C$ ,  $T_f$  measured point is just under the chips.

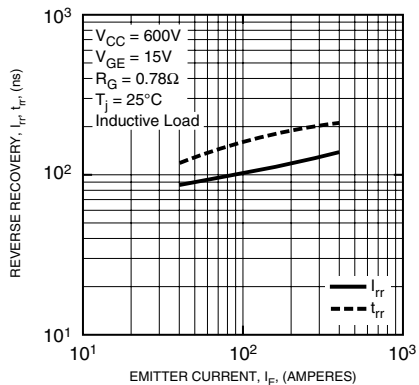


## CM400HA-24A

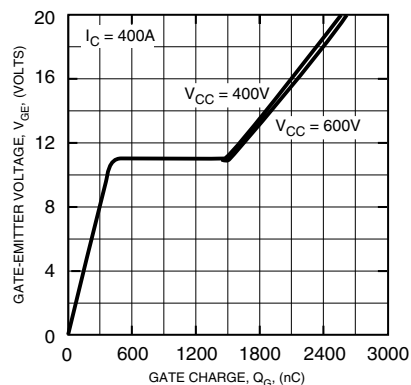
### Single IGBTMOD™ A-Series Module

400 Amperes/1200 Volts

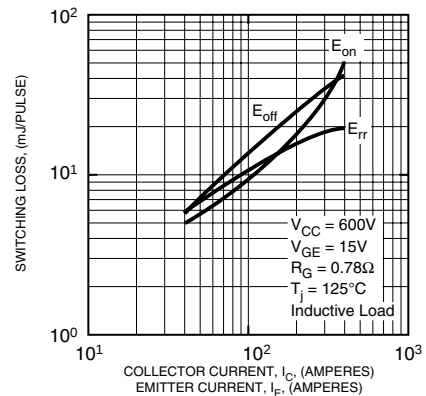
REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)



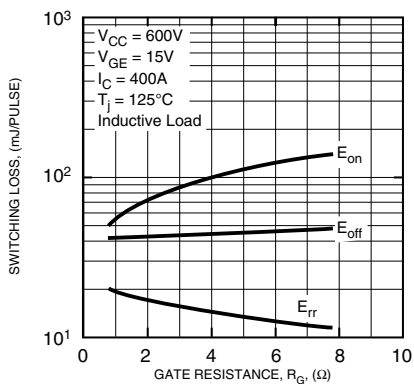
GATE CHARGE VS.  $V_{GE}$



SWITCHING LOSS VS. COLLECTOR CURRENT  
(TYPICAL)



SWITCHING LOSS VS. GATE RESISTANCE  
(TYPICAL)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(IGBT & FWDI)

