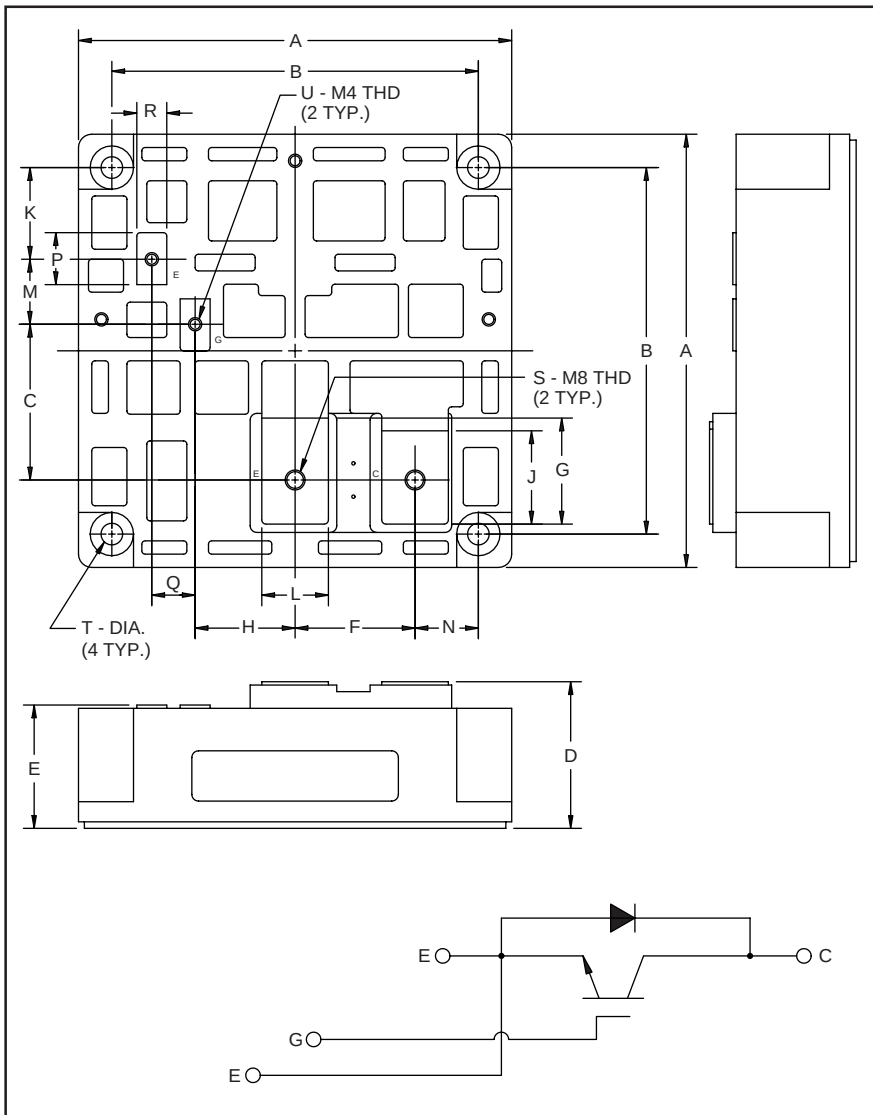


MITSUBISHI IGBT MODULES

# CM1000HA-24H

HIGH POWER SWITCHING USE  
INSULATED TYPE



**Outline Drawing and Circuit Diagram**

| Dimensions | Inches          | Millimeters   |
|------------|-----------------|---------------|
| A          | 5.12            | 130.0         |
| B          | 4.33±0.01       | 110.0±0.25    |
| C          | 1.840           | 46.75         |
| D          | 1.73+0.04/-0.02 | 44.0+1.0/-0.5 |
| E          | 1.46+0.04/-0.02 | 37.0+1.0/-0.5 |
| F          | 1.42            | 36.0          |
| G          | 1.25            | 31.8          |
| H          | 1.18            | 30.0          |
| J          | 1.10            | 28.0          |
| K          | 1.08            | 27.5          |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| L          | 0.79      | 20.0        |
| M          | 0.77      | 19.5        |
| N          | 0.75      | 19.0        |
| P          | 0.61      | 15.6        |
| Q          | 0.51      | 13.0        |
| R          | 0.35      | 9.0         |
| S          | M8 Metric | M8          |
| T          | 0.26 Dia. | Dia. 6.5    |
| U          | M4 Metric | M4          |



**Description:**

Mitsubishi IGBT Modules are designed for use in switching applications. Each module consists of one IGBT 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
- ☐ High Frequency Operation
- ☐ Isolated Baseplate for Easy Heat Sinking

**Applications:**

- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ UPS
- ☐ Welding Power Supplies

**Ordering Information:**

Example: Select the complete part module number you desire from the table below -i.e. CM1000HA-24H is a 1200V ( $V_{CES}$ ), 1000 Ampere Single IGBT Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 1000                      | 24                        |

**CM1000HA-24H****HIGH POWER SWITCHING USE  
INSULATED TYPE****Absolute Maximum Ratings,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

|                                                            | Symbol           | Ratings     | 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 ( $T_C = 25^\circ\text{C}$ )             | $I_C$            | 1000        | Amperes          |
| Peak Collector Current ( $T_j \leq 150^\circ\text{C}$ )    | $I_{\text{CM}}$  | 2000*       | Amperes          |
| Emitter Current** ( $T_C = 25^\circ\text{C}$ )             | $I_E$            | 1000        | Amperes          |
| Peak Emitter Current**                                     | $I_{\text{EM}}$  | 2000*       | Amperes          |
| Maximum Collector Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_C$            | 5800        | Watts            |
| Mounting Torque, M8 Main Terminal                          | —                | 8.83 ~ 10.8 | N · m            |
| Mounting, Torque M6 Mounting                               | —                | 1.96 ~ 2.94 | N · m            |
| Mounting, Torque M4 Terminal                               | —                | 0.98 ~ 1.47 | N · m            |
| Weight                                                     | —                | 1600        | Grams            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)  | $V_{\text{iso}}$ | 2500        | Vrms             |

\*Pulse width and repetition rate should be such that the 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).

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

| Characteristics                      | Symbol               | Test Conditions                                                               | Min. | Typ. | Max.  | Units         |
|--------------------------------------|----------------------|-------------------------------------------------------------------------------|------|------|-------|---------------|
| Collector-Cutoff Current             | $I_{\text{CES}}$     | $V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$                   | —    | —    | 6     | 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       | $V_{\text{GE(th)}}$  | $I_C = 100\text{mA}, V_{\text{CE}} = 10\text{V}$                              | 4.5  | 6.0  | 7.5   | Volts         |
| Collector-Emitter Saturation Voltage | $V_{\text{CE(sat)}}$ | $I_C = 1000\text{A}, V_{\text{GE}} = 15\text{V}$                              | —    | 2.7  | 3.6** | Volts         |
|                                      |                      | $I_C = 1000\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 150^\circ\text{C}$     | —    | 2.4  | —     | Volts         |
| Total Gate Charge                    | $Q_G$                | $V_{\text{CC}} = 600\text{V}, I_C = 1000\text{A}, V_{\text{GE}} = 15\text{V}$ | —    | 5000 | —     | nC            |
| Emitter-Collector Voltage            | $V_{\text{EC}}$      | $I_E = 1000\text{A}, V_{\text{GE}} = 0\text{V}$                               | —    | —    | 3.5   | Volts         |

\*\* Pulse width and repetition rate should be such that device junction temperature rise is negligible.

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

| Characteristics               | Symbol              | Test Conditions                                                                                                       | Min. | Typ. | Max. | Units         |
|-------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| Input Capacitance             | $C_{\text{ies}}$    | $V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$                                                               | —    | —    | 200  | nF            |
| Output Capacitance            | $C_{\text{oes}}$    |                                                                                                                       | —    | —    | 70   | nF            |
| Reverse Transfer Capacitance  | $C_{\text{res}}$    |                                                                                                                       | —    | —    | 40   | nF            |
| Resistive                     | Turn-on Delay Time  | $V_{\text{CC}} = 600\text{V}, I_C = 1000\text{A},$<br>$V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V}, R_G = 3.3\Omega$ | —    | —    | 600  | ns            |
| Load                          | Rise Time           |                                                                                                                       | —    | —    | 1500 | ns            |
| Switching                     | Turn-off Delay Time |                                                                                                                       | —    | —    | 1200 | ns            |
| Time                          | Fall Time           |                                                                                                                       | —    | —    | 350  | ns            |
| Diode Reverse Recovery Time   | $t_{\text{rr}}$     | $I_E = 1000\text{A}, di_E/dt = -2000\text{A}/\mu\text{s}$                                                             | —    | —    | 250  | ns            |
| Diode Reverse Recovery Charge | $Q_{\text{rr}}$     | $I_E = 1000\text{A}, di_E/dt = -2000\text{A}/\mu\text{s}$                                                             | —    | 7.4  | —    | $\mu\text{C}$ |

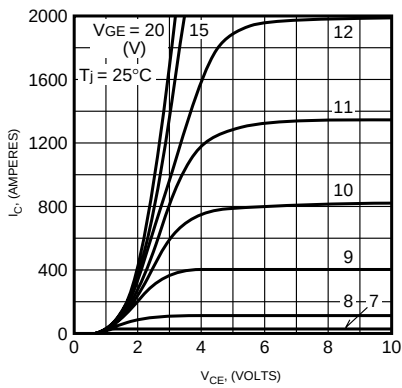
**Thermal and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

| Characteristics                      | Symbol               | Test Conditions                    | Min. | Typ. | Max.  | Units                     |
|--------------------------------------|----------------------|------------------------------------|------|------|-------|---------------------------|
| Thermal Resistance, Junction to Case | $R_{\text{th(j-c)}}$ | Per IGBT                           | —    | —    | 0.022 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Case | $R_{\text{th(j-c)}}$ | Per FWDi                           | —    | —    | 0.050 | $^\circ\text{C}/\text{W}$ |
| Contact Thermal Resistance           | $R_{\text{th(c-f)}}$ | Per Module, Thermal Grease Applied | —    | —    | 0.018 | $^\circ\text{C}/\text{W}$ |

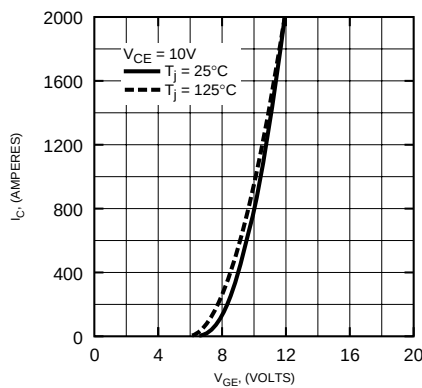
# CM1000HA-24H

HIGH POWER SWITCHING USE  
INSULATED TYPE

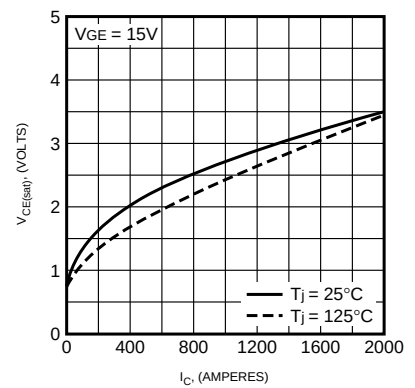
OUTPUT CHARACTERISTICS  
(TYPICAL)



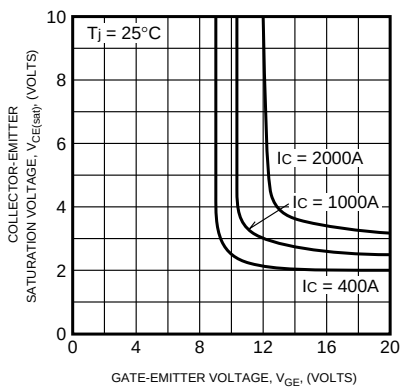
OUTPUT CHARACTERISTICS  
(TYPICAL)



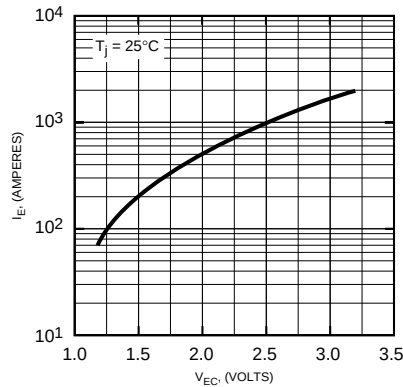
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



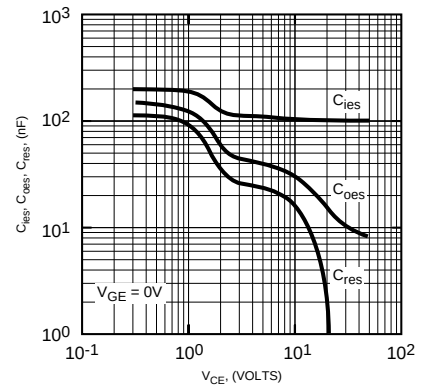
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



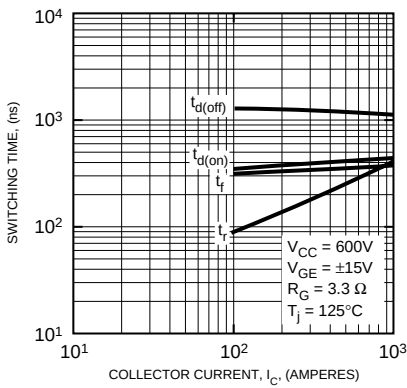
FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



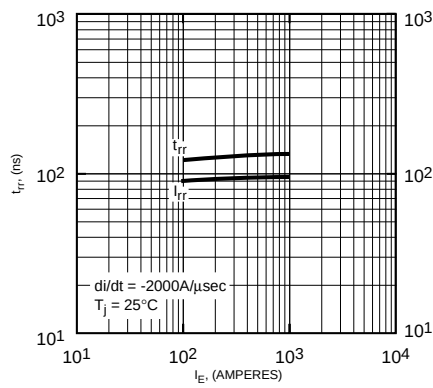
CAPACITANCE VS.  $V_{CE}$   
(TYPICAL)



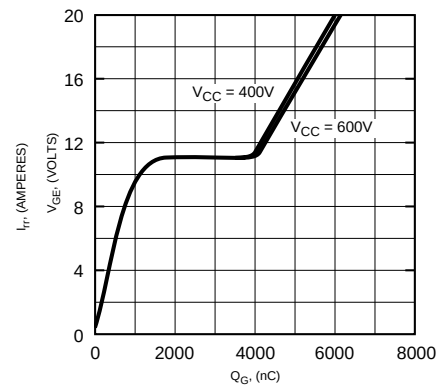
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)



GATE CHARGE,  $V_{GE}$   
(TYPICAL)



# CM1000HA-24H

HIGH POWER SWITCHING USE  
INSULATED TYPE

