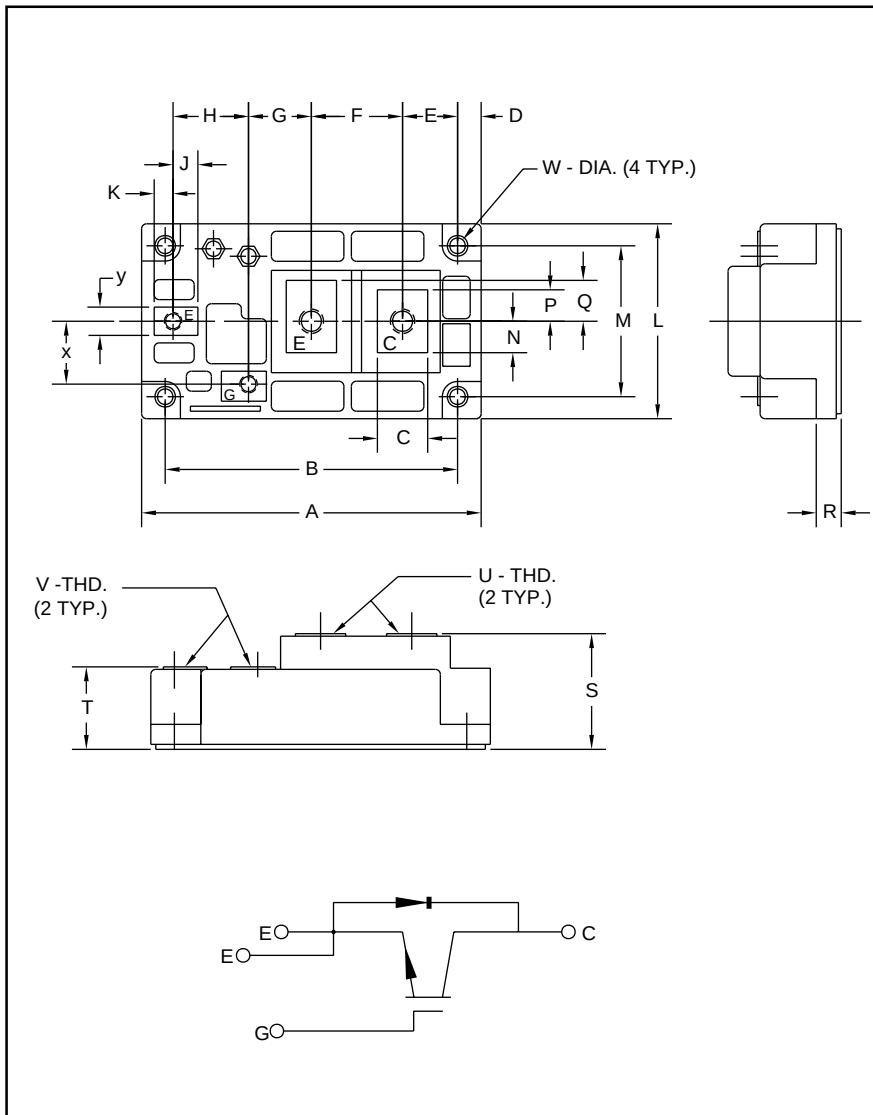


**MITSUBISHI IGBT MODULES**  
**CM600HA-5F**  
**HIGH POWER SWITCHING USE**  
**INSULATED TYPE**



**Outline Drawing and Circuit Diagram**

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| A          | 4.25   | 108.0       |
| B          | 3.66   | 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          | 0.31   | 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 <sup>+1.0</sup> <sub>-0.5</sub> |
| T          | 1.02      | 25.8 <sup>+1.0</sup> <sub>-0.5</sub> |
| U          | M6 Metric | M6                                   |
| V          | M4 Metric | M4                                   |
| W          | 0.26      | Dia. 6.5                             |
| X          | 0.79      | 20.0                                 |
| Y          | 0.35      | 9.0                                  |



**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 Diodes
- ☐ High Frequency Operation
- ☐ Isolated Baseplate for Easy Heat Sinking

**Applications:**

- ☐ UPS
- ☐ Forklift

**Ordering Information:**

Example: Select the complete nine digit module part number you desire from the table below - i.e. CM600HA-5F is a 250V ( $V_{CES}$ ), 600 Ampere Single IGBT Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 600                       | 5                         |

## CM600HA-5F

HIGH POWER SWITCHING USE  
INSULATED TYPEAbsolute Maximum Ratings,  $T_j = 25^\circ\text{C}$  unless otherwise specified

| Ratings                                                    | Symbol           | CM600HA-5F  | 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)                      | $V_{\text{CES}}$ | 250         | Volts            |
| Gate-Emitter Voltage (C-E Short)                           | $V_{\text{GES}}$ | $\pm 20$    | Volts            |
| Collector Current ( $T_C = 25^\circ\text{C}$ )             | $I_C$            | 600         | Amperes          |
| Peak Collector Current ( $T_j \leq 150^\circ\text{C}$ )    | $I_{\text{CM}}$  | 1200        | Amperes          |
| Emitter Current** ( $T_C = 25^\circ\text{C}$ )             | $I_E$            | 600         | Amperes          |
| Peak Emitter Current**                                     | $I_{\text{EM}}$  | 1200        | Amperes          |
| Maximum Collector Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_C$            | 960         | Watts            |
| Mounting Torque, M6 Main Terminal                          | —                | 1.96 ~ 2.94 | N · m            |
| Mounting Torque, M6 Mounting                               | —                | 1.96 ~ 2.94 | N · m            |
| Mounting Torque, M4 Terminal                               | —                | 0.98 ~ 1.47 | N · m            |
| Weight                                                     | —                | 400         | 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             | $I_{\text{CES}}$     | $V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$                  | —    | —    | 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       | $V_{\text{GE(th)}}$  | $I_C = 60\text{mA}, V_{\text{CE}} = 10\text{V}$                              | 3.0  | 4.0  | 5.0   | Volts         |
| Collector-Emitter Saturation Voltage | $V_{\text{CE(sat)}}$ | $I_C = 600\text{A}, V_{\text{GE}} = 10\text{V},$                             | —    | 1.2  | 1.7** | Volts         |
|                                      |                      | $I_C = 600\text{A}, V_{\text{GE}} = 10\text{V}, T_j = 150^\circ\text{C}$     | —    | 1.1  | —     | Volts         |
| Total Gate Charge                    | $Q_G$                | $V_{\text{CC}} = 100\text{V}, I_C = 600\text{A}, V_{\text{GE}} = 10\text{V}$ | —    | 2200 | —     | nC            |
| Emitter-Collector Voltage            | $V_{\text{EC}}$      | $I_E = 600\text{A}, V_{\text{GE}} = 0\text{V}$                               | —    | —    | 2.0   | 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             | $C_{\text{ies}}$    | $V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$  | —    | —    | 165  | nF            |
| Output Capacitance            | $C_{\text{oes}}$    |                                                          | —    | —    | 7.5  | nF            |
| Reverse Transfer Capacitance  | $C_{\text{res}}$    |                                                          | —    | —    | 5.6  | nF            |
| Resistive                     | Turn-on Delay Time  | $t_{\text{d(on)}}$                                       | —    | —    | 1000 | ns            |
| Load                          | Rise Time           | $t_r$                                                    | —    | —    | 4000 | ns            |
| Switching                     | Turn-off Delay Time | $t_{\text{d(off)}}$                                      | —    | —    | 1000 | ns            |
| Times                         | Fall Time           | $t_f$                                                    | —    | —    | 500  | ns            |
| Diode Reverse Recovery Time   | $t_{\text{rr}}$     | $I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$ | —    | —    | 300  | ns            |
| Diode Reverse Recovery Charge | $Q_{\text{rr}}$     | $I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$ | —    | 9.5  | —    | $\mu\text{C}$ |

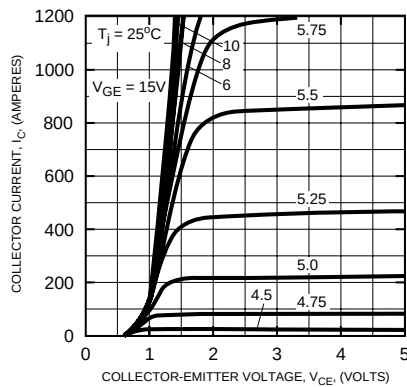
Thermal and Mechanical Electrical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified

| Characteristics                      | Symbol               | Test Conditions                    | Min. | Typ. | Max.  | Units                     |
|--------------------------------------|----------------------|------------------------------------|------|------|-------|---------------------------|
| Thermal Resistance, Junction to Case | $R_{\text{th(j-c)}}$ | Per IGBT                           | —    | —    | 0.13  | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Case | $R_{\text{th(j-c)}}$ | Free Wheel Diode                   | —    | —    | 0.19  | $^\circ\text{C}/\text{W}$ |
| Contact Thermal Resistance           | $R_{\text{th(c-f)}}$ | Per Module, Thermal Grease Applied | —    | —    | 0.040 | $^\circ\text{C}/\text{W}$ |

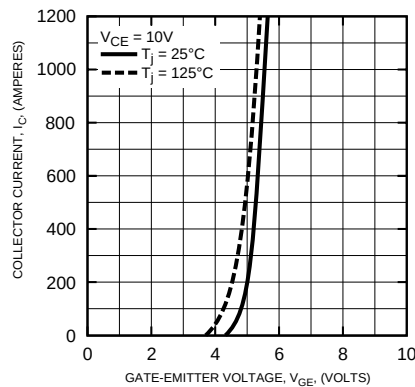
# CM600HA-5F

HIGH POWER SWITCHING USE  
INSULATED TYPE

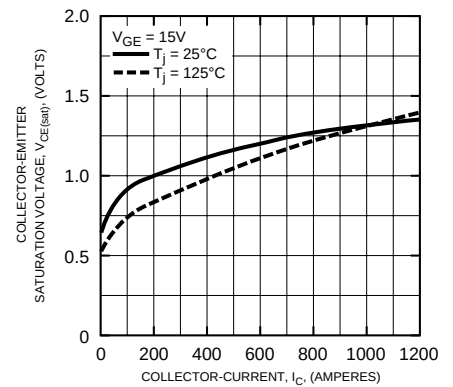
OUTPUT CHARACTERISTICS  
(TYPICAL)



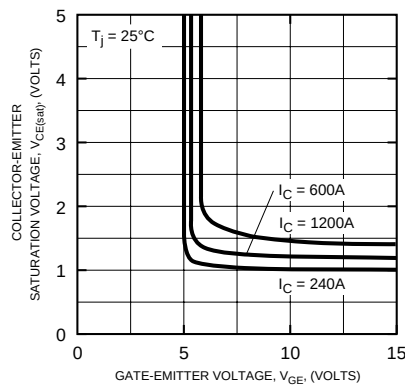
TRANSFER CHARACTERISTICS  
(TYPICAL)



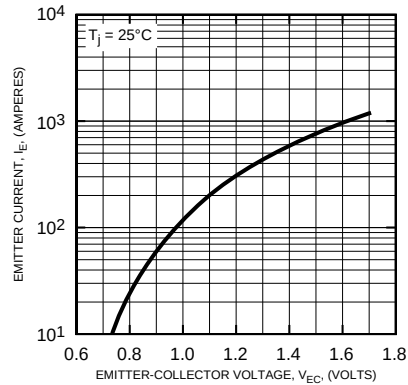
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



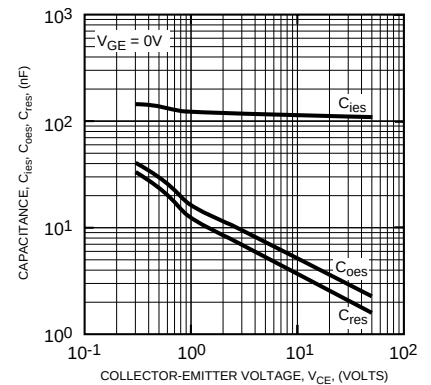
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



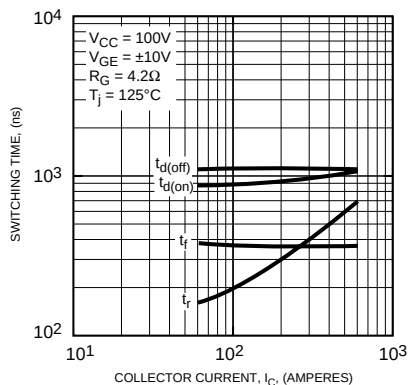
FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



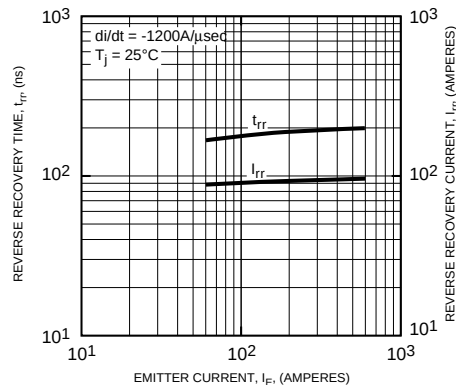
CAPACITANCE VS.  $V_{CE}$   
(TYPICAL)



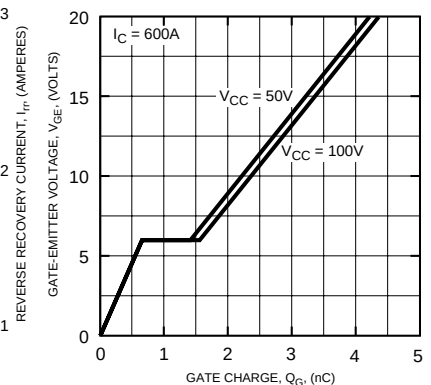
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)



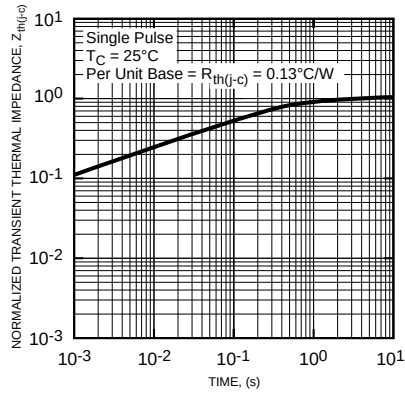
GATE CHARGE,  $V_{GE}$



# CM600HA-5F

HIGH POWER SWITCHING USE  
INSULATED TYPE

TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(IGBT)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(FWD)

