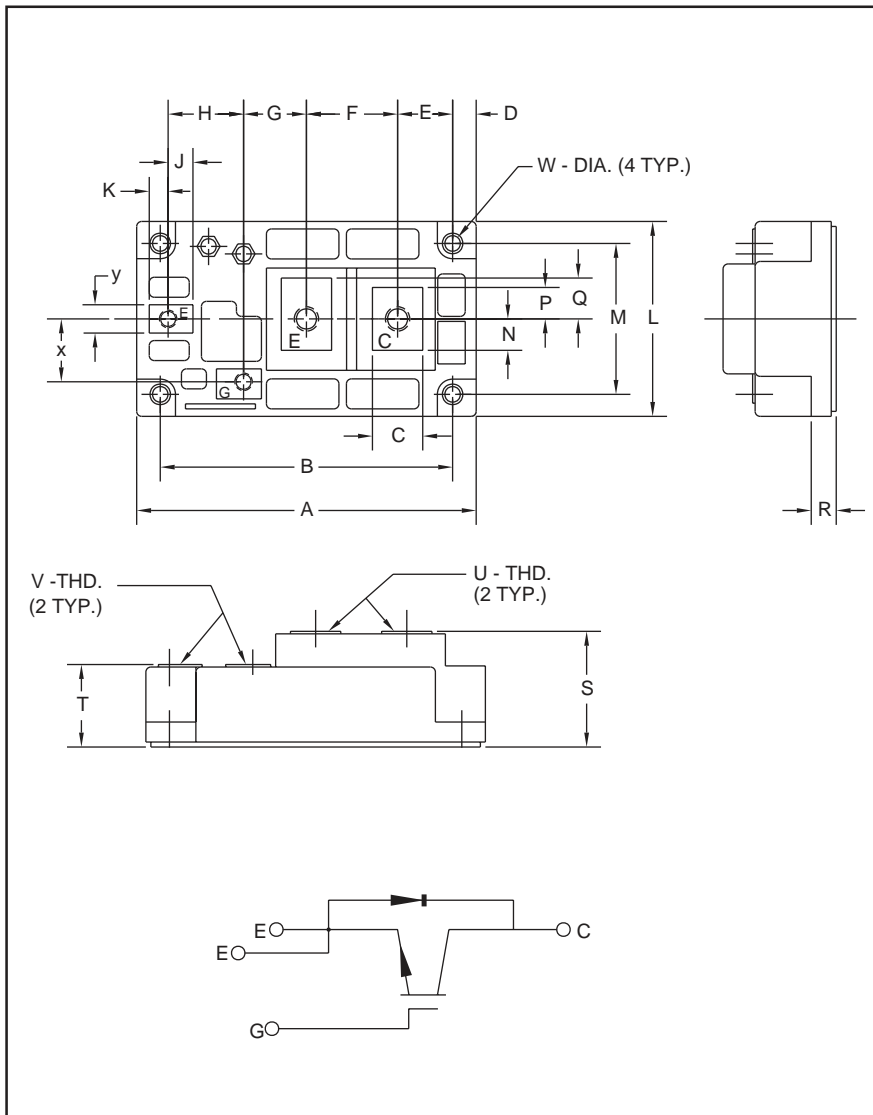


MITSUBISHI IGBT MODULES
CM600HA-5F
 HIGH POWER SWITCHING USE
 INSULATED TYPE



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 Amperes | V_{CES} Volts (x 50) |
|------|---------------------------|---------------------------|
| CM | 600 | 5 |

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 ^{+1.0} _{-0.5} |
| T | 1.02 | 25.8 ^{+1.0} _{-0.5} |
| U | M6 Metric | M6 |
| V | M4 Metric | M4 |
| W | 0.26 | Dia. 6.5 |
| X | 0.79 | 20.0 |
| Y | 0.35 | 9.0 |

CM600HA-5F

HIGH POWER SWITCHING USE
INSULATED TYPEAbsolute 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_{stg} | -40 to 125 | $^\circ\text{C}$ |
| Collector-Emitter Voltage (G-E Short) | V_{CES} | 250 | Volts |
| Gate-Emitter Voltage (C-E Short) | V_{GES} | ± 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_{CM} | 1200 | Amperes |
| Emitter Current** ($T_C = 25^\circ\text{C}$) | I_E | 600 | Amperes |
| Peak Emitter Current** | I_{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_{iso} | 2500 | V _{rms} |

*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_{CES} | $V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$ | — | — | 1.0 | mA |
| Gate Leakage Current | I_{GES} | $V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$ | — | — | 0.5 | μA |
| 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_{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_{ies} | | — | — | 165 | nF |
| Output Capacitance | C_{oes} | $V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$ | — | — | 7.5 | nF |
| Reverse Transfer Capacitance | C_{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 | $t_{\text{d(off)}}$ | $V_{\text{GE1}} = V_{\text{GE2}} = 10\text{V}, R_G = 4.2\Omega,$ | — | — | 1000 |
| | | | | | | |
| Diode Reverse Recovery Time | t_{rr} | $I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$ | — | — | 300 | ns |
| Diode Reverse Recovery Charge | Q_{rr} | $I_E = 600\text{A}, di_E/dt = -1200\text{A}/\mu\text{s}$ | — | 9.5 | — | μC |

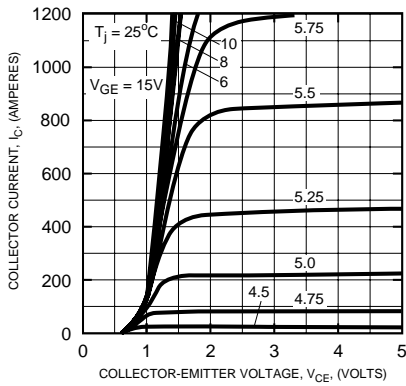
Thermal and Mechanical Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

| 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 | $^\circ\text{C}/\text{W}$ |

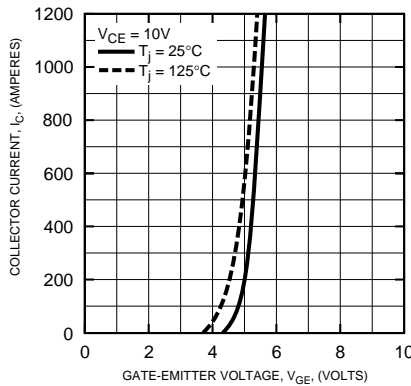
CM600HA-5F

HIGH POWER SWITCHING USE
INSULATED TYPE

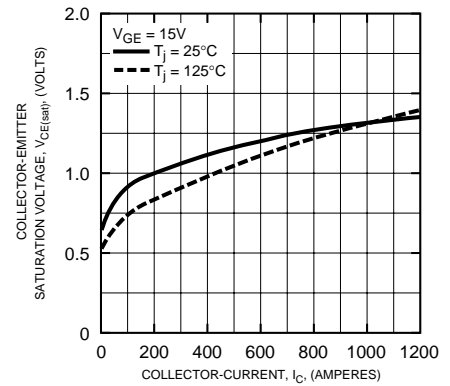
OUTPUT CHARACTERISTICS
(TYPICAL)



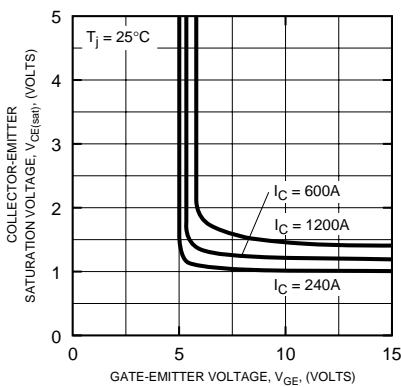
TRANSFER CHARACTERISTICS
(TYPICAL)



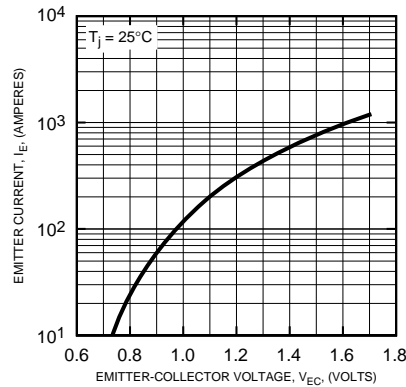
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



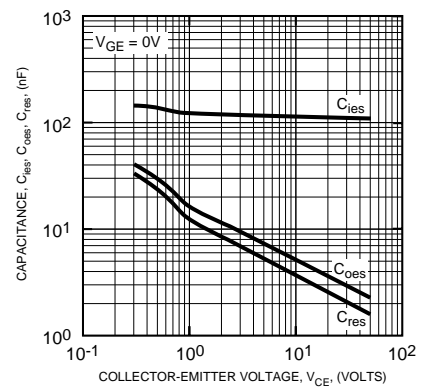
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



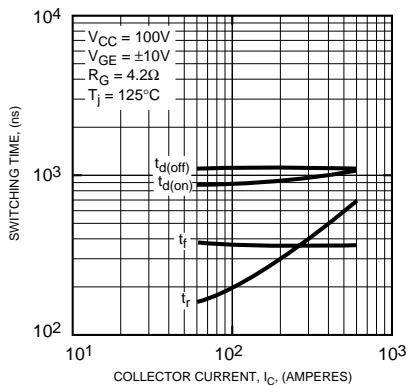
FREE-WHEEL DIODE FORWARD CHARACTERISTICS
(TYPICAL)



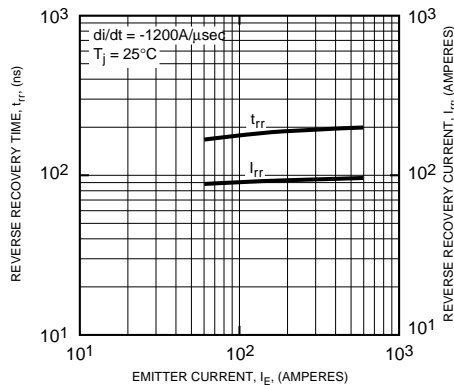
CAPACITANCE VS. V_{CE}
(TYPICAL)



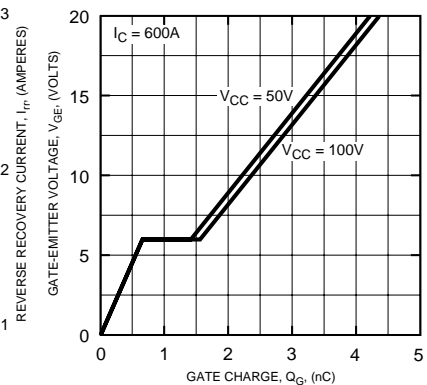
HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)



REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)



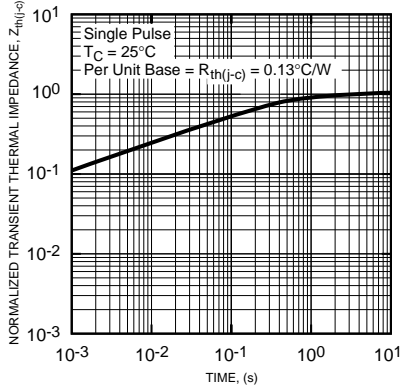
GATE CHARGE, V_{GE}



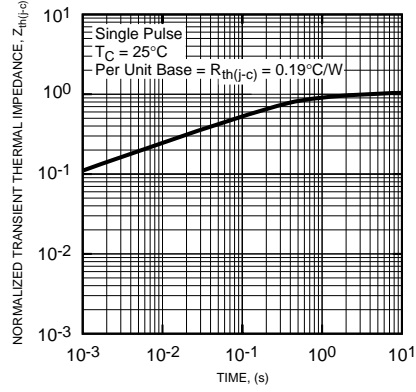
CM600HA-5F

HIGH POWER SWITCHING USE
INSULATED TYPE

TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWD)



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