

**PRELIMINARY**  
 Notice: This is not a final specification.  
 Some parametric limits are subject to change.

# MITSUBISHI HVIGBT MODULES CM1200HB-50H

2nd-Version HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

**HIGH POWER SWITCHING USE  
 INSULATED TYPE**

## CM1200HB-50H



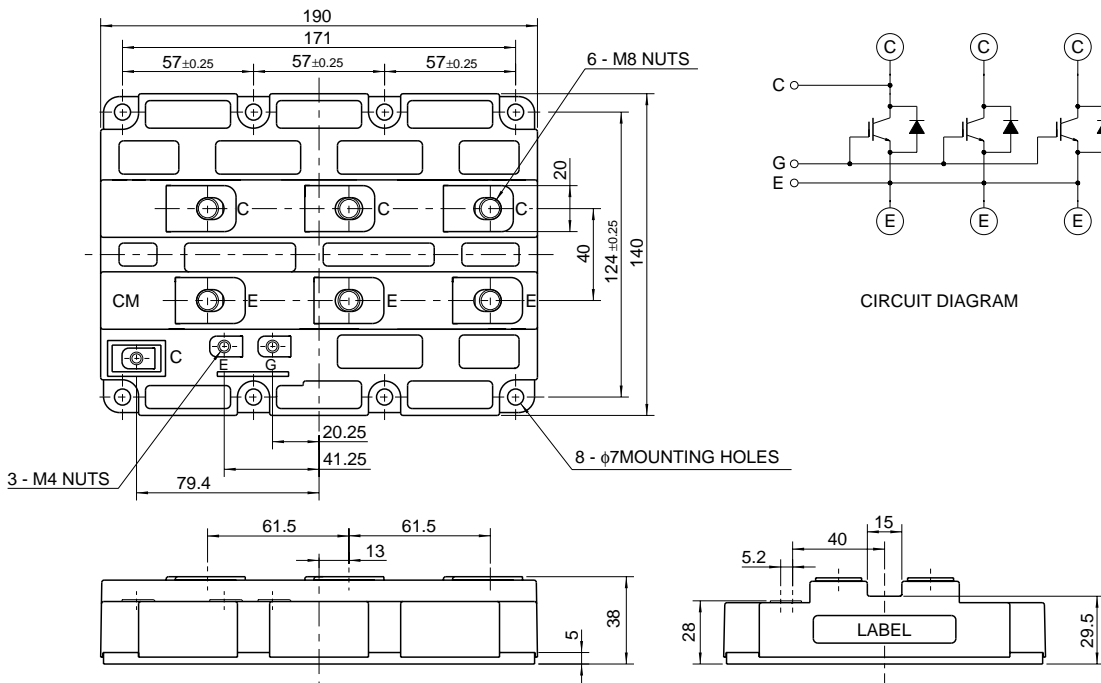
- IC ..... 1200A
- VCES ..... 2500V
- Insulated Type
- 1-element in a pack

## APPLICATION

Inverters, Converters, DC choppers, Induction heating, DC to DC converters.

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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Mar. 2001

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**MAXIMUM RATINGS (T<sub>j</sub> = 25°C)**

| Symbol                   | Item                          | Conditions   | Ratings      | Unit |
|--------------------------|-------------------------------|--|--------------|------|
| V <sub>CEs</sub>         | Collector-emitter voltage     | V <sub>GE</sub> = 0V                                       | 2500         | V    |
| V <sub>GES</sub>         | Gate-emitter voltage          | V <sub>CE</sub> = 0V                                       | ±20          | V    |
| I <sub>C</sub>           | Collector current             | T <sub>C</sub> = 25°C                                      | 1200         | A    |
| I <sub>CM</sub>          |                               | Pulse (Note 1)   | 2400         | A    |
| I <sub>E</sub> (Note 2)  | Emitter current               | T <sub>C</sub> = 25°C                                      | 1200         | A    |
| I <sub>EM</sub> (Note 2) |                               | Pulse (Note 1)   | 2400         | A    |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>C</sub> = 25°C, IGBT part                           | 15600        | W    |
| T <sub>j</sub>           | Junction temperature          | —  | -40 ~ +150   | °C   |
| T <sub>stg</sub>         | Storage temperature           | —  | -40 ~ +125   | °C   |
| V <sub>iso</sub>         | Isolation voltage             | Charged part to base plate, rms, sinusoidal, AC 60Hz 1min. | 6000         | V    |
| —                        | Mounting torque               | Main terminals screw M8                                    | 6.67 ~ 13.00 | N·m  |
|                          |                               | Mounting screw M6  | 2.84 ~ 6.00  | N·m  |
|                          |                               | Auxiliary terminals screw M4                               | 0.88 ~ 2.00  | N·m  |
| —                        | Mass                          | Typical value  | 2.2          | kg   |

**ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C)**

| Symbol                   | Item                                 | Conditions   | Limits |       |       | Unit |
|--------------------------|--------------------------------------|--|--------|-------|-------|------|
|                          |                                      |  | Min    | Typ   | Max   |      |
| I <sub>CEs</sub>         | Collector cutoff current             | V <sub>CE</sub> = V <sub>CEs</sub> , V <sub>GE</sub> = 0V              | —      | —     | 15    | mA   |
| V <sub>GE(th)</sub>      | Gate-emitter threshold voltage       | I <sub>C</sub> = 120mA, V <sub>CE</sub> = 10V                          | 4.5    | 6.0   | 7.5   | V    |
| I <sub>GES</sub>         | Gate-leakage current                 | V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V              | —      | —     | 0.5   | μA   |
| V <sub>CE(sat)</sub>     | Collector-emitter saturation voltage | T <sub>j</sub> = 25°C  | —      | 2.80  | 3.64  | V    |
|                          |                                      | T <sub>j</sub> = 125°C   | —      | 3.15  | —     |      |
| C <sub>ies</sub>         | Input capacitance                    | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V                          | —      | 180   | —     | nF   |
| C <sub>oes</sub>         | Output capacitance                   |  | —      | 19.8  | —     | nF   |
| C <sub>res</sub>         | Reverse transfer capacitance         |  | —      | 6.0   | —     | nF   |
| Q <sub>G</sub>           | Total gate charge                    | V <sub>CC</sub> = 1250V, I <sub>C</sub> = 1200A, V <sub>GE</sub> = 15V | —      | 8.1   | —     | μC   |
| t <sub>d(on)</sub>       | Turn-on delay time                   | V <sub>CC</sub> = 1250V, I <sub>C</sub> = 1200A                        | —      | —     | 1.60  | μs   |
| t <sub>r</sub>           | Turn-on rise time                    | V <sub>GE1</sub> = V <sub>GE2</sub> = 15V                              | —      | —     | 2.00  | μs   |
| t <sub>d(off)</sub>      | Turn-off delay time                  | R <sub>G</sub> = 1.6Ω  | —      | —     | 2.50  | μs   |
| t <sub>f</sub>           | Turn-off fall time                   | Resistive load switching operation                                     | —      | —     | 1.00  | μs   |
| V <sub>EC</sub> (Note 2) | Emitter-collector voltage            | I <sub>E</sub> = 1200A, V <sub>GE</sub> = 0V                           | —      | 2.50  | 3.25  | V    |
| t <sub>rr</sub> (Note 2) | Reverse recovery time                | I <sub>E</sub> = 1200A,  | —      | —     | 1.20  | μs   |
| Q <sub>rr</sub> (Note 2) | Reverse recovery charge              | die / dt = -2400A / μs (Note 1)  | —      | 350   | —     | μC   |
| R <sub>th(j-c)Q</sub>    | Thermal resistance                   | Junction to case, IGBT part  | —      | —     | 0.008 | K/W  |
| R <sub>th(j-c)R</sub>    |                                      | Junction to case, FWDi part  | —      | —     | 0.016 | K/W  |
| R <sub>th(c-f)</sub>     | Contact thermal resistance           | Case to fin, conductive grease applied                                 | —      | 0.006 | —     | K/W  |

- Note 1. Pulse width and repetition rate should be such that the device junction temp. (T<sub>j</sub>) does not exceed T<sub>jmax</sub> rating.  
 2. I<sub>E</sub>, V<sub>EC</sub>, t<sub>rr</sub>, Q<sub>rr</sub> & die/dt represent characteristics of the anti-parallel, emitter to collector free-wheel diode.  
 3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.  
 4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

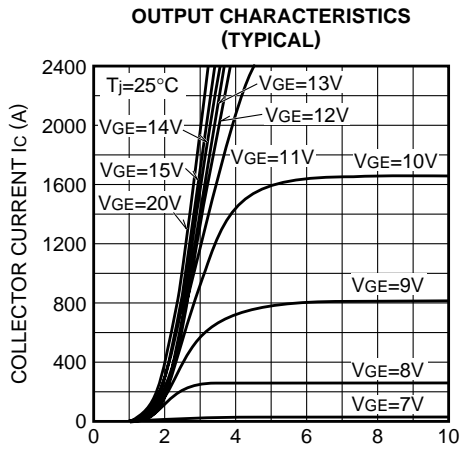
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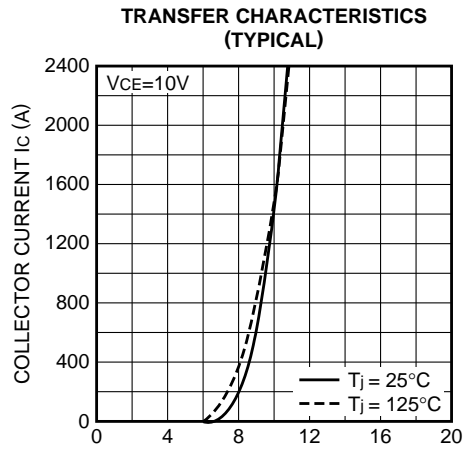
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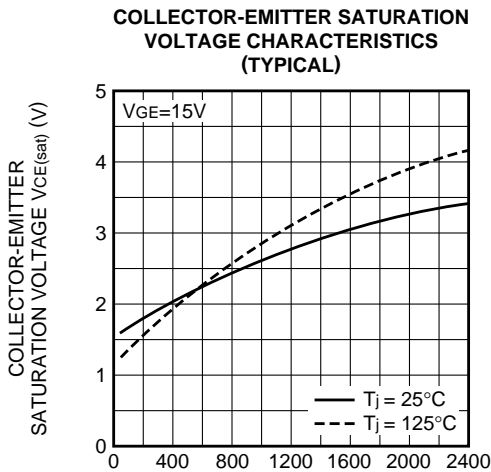
**PERFORMANCE CURVES**



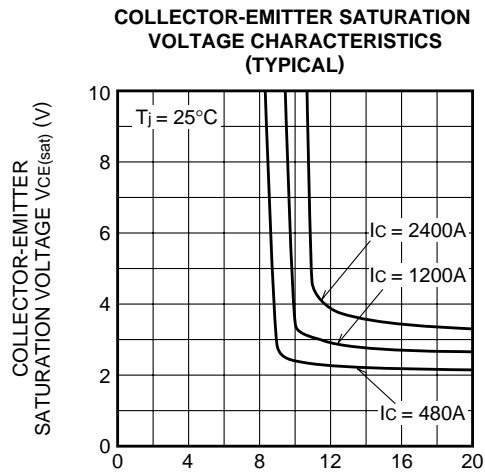
COLLECTOR-EMITTER SATURATION VOLTAGE  $V_{ce(sat)}$  (V)



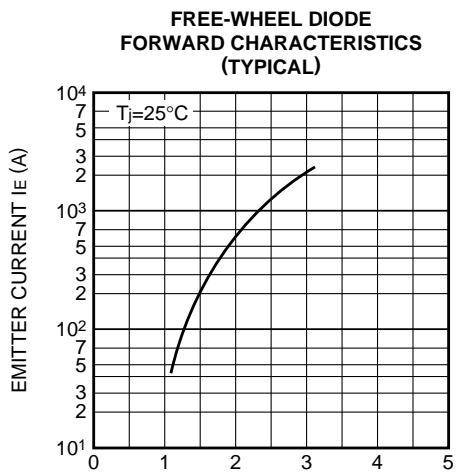
GATE-EMITTER VOLTAGE  $V_{GE}$  (V)



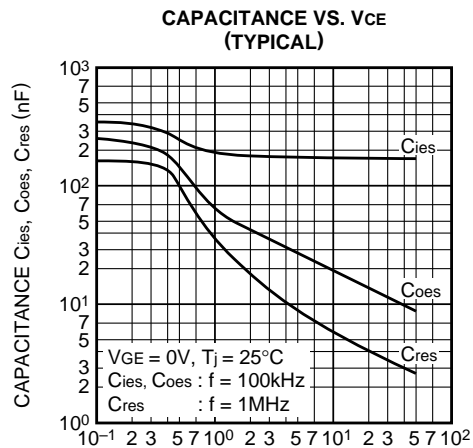
COLLECTOR CURRENT  $I_c$  (A)



GATE-EMITTER VOLTAGE  $V_{GE}$  (V)



EMITTER-COLLECTOR VOLTAGE  $V_{ec}$  (V)



COLLECTOR-EMITTER VOLTAGE  $V_{CE}$  (V)

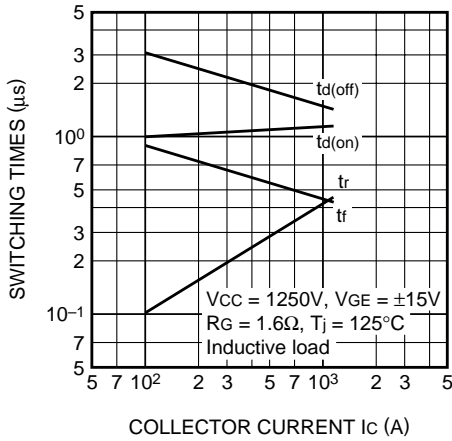
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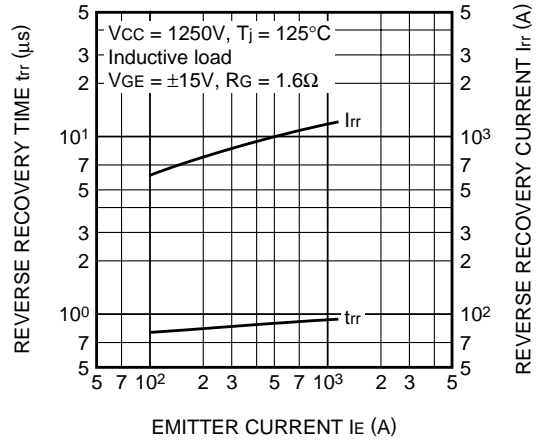
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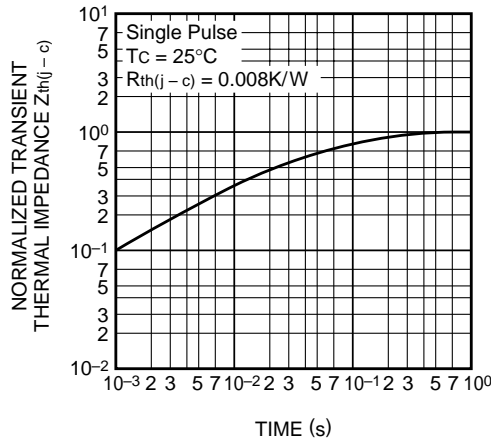
**HALF-BRIDGE  
 SWITCHING CHARACTERISTICS  
 (TYPICAL)**



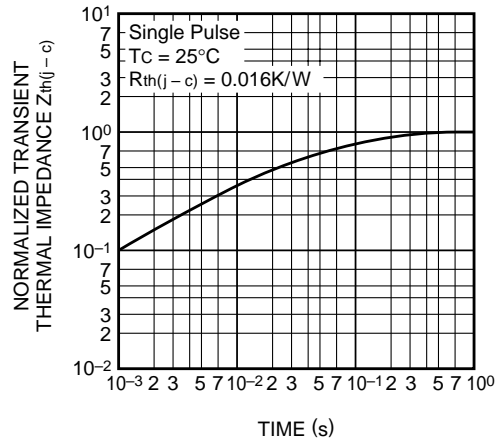
**REVERSE RECOVERY CHARACTERISTICS  
 OF FREE-WHEEL DIODE  
 (TYPICAL)**



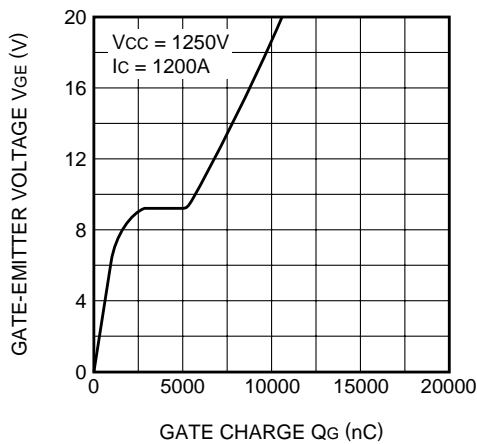
**TRANSIENT THERMAL  
 IMPEDANCE CHARACTERISTICS  
 (IGBT part)**



**TRANSIENT THERMAL  
 IMPEDANCE CHARACTERISTICS  
 (FWDi part)**



**V<sub>GE</sub> - GATE CHARGE  
 (TYPICAL)**





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