

MITSUBISHI HVIGBT MODULES

# CM1200HC-50H

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

HIGH POWER SWITCHING USE  
INSULATED TYPE

## CM1200HC-50H



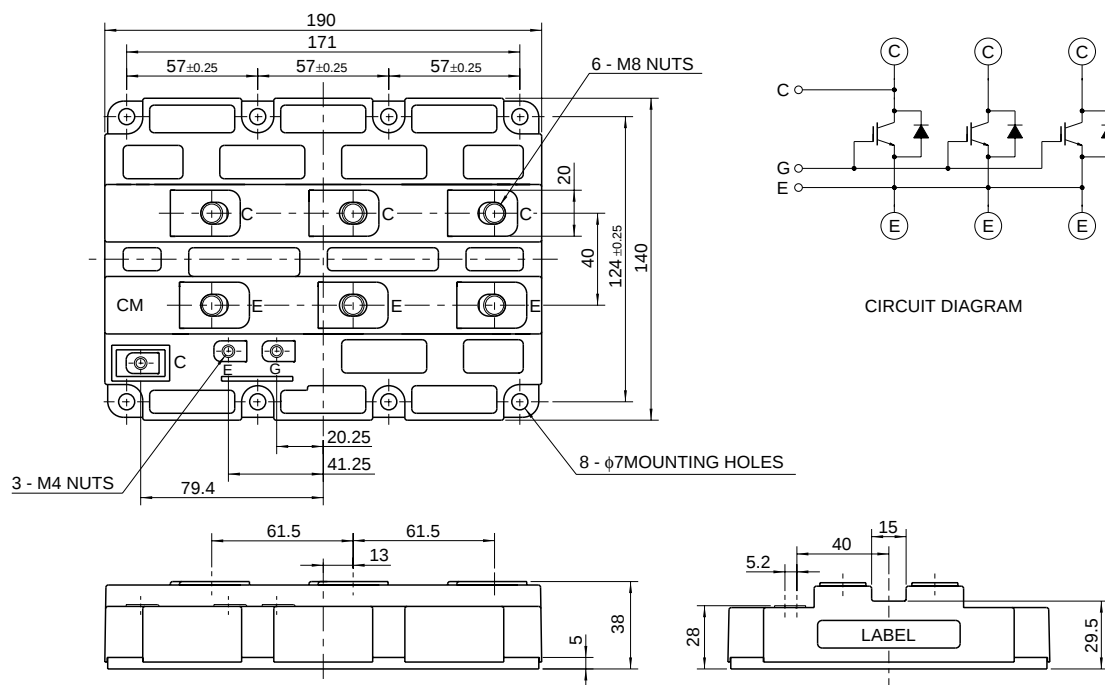
- IC..... 1200A
- VCES ..... 2500V
- Insulated Type
- 1-element in a pack
- AISiC base plate

## APPLICATION

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

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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Mar. 2003

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## MAXIMUM RATINGS (Tj = 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             | DC, T <sub>C</sub> = 105°C                                 | 1200         | A    |
| I <sub>CM</sub>          |                               | Pulse (Note 1)                                             | 2400         | A    |
| I <sub>E</sub> (Note 2)  | Emitter current               |                                                            | 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                           | 14700        | 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                                              | 1.5          | kg   |

## ELECTRICAL CHARACTERISTICS (Tj = 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</sub> (on)      | 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</sub> (off)     | 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                                            | —      | —     | 0.0085 | K/W  |
| R <sub>th(j-c)R</sub>    |                                      | Junction to case, FWDi part                                            | —      | —     | 0.017  | 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.

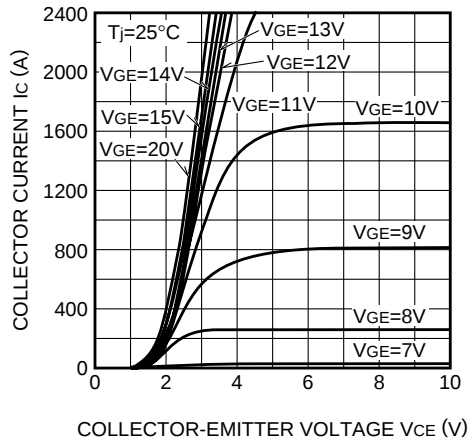
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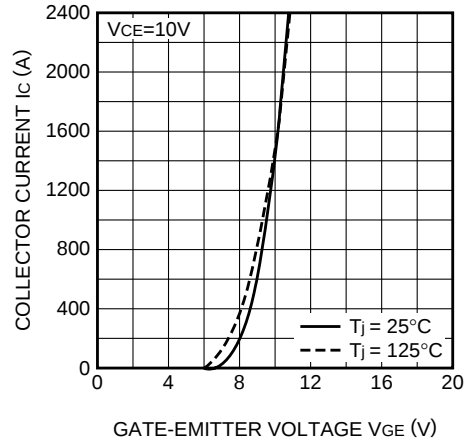
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## PERFORMANCE CURVES

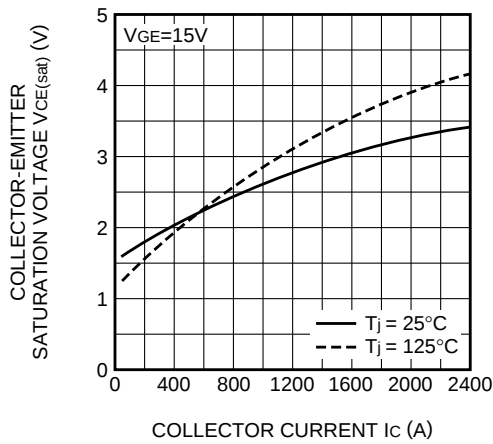
OUTPUT CHARACTERISTICS  
(TYPICAL)



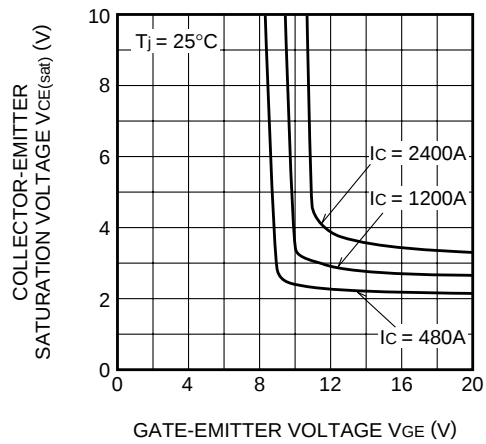
TRANSFER CHARACTERISTICS  
(TYPICAL)



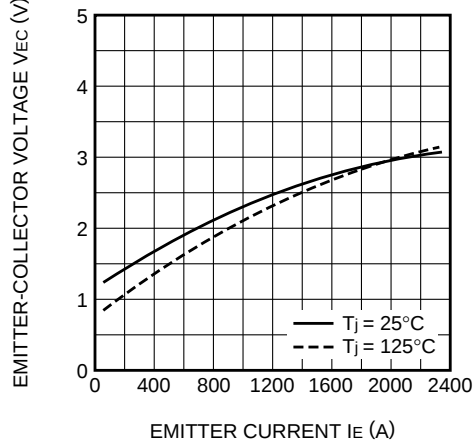
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



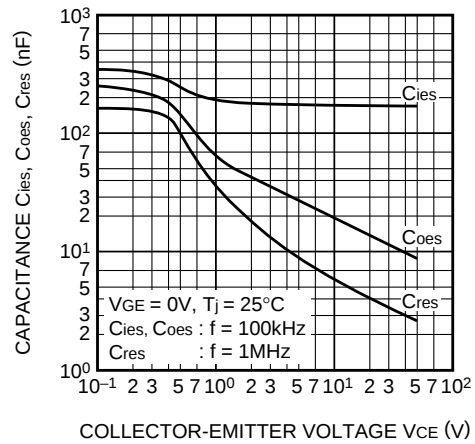
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



CAPACITANCE CHARACTERISTICS  
(TYPICAL)



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