

MITSUBISHI IGBT MODULES

# CM300DU-24NFH

HIGH POWER SWITCHING USE

## CM300DU-24NFH



- IC ..... 300A
- VCES ..... 1200V
- Insulated Type
- 2-elements in a pack

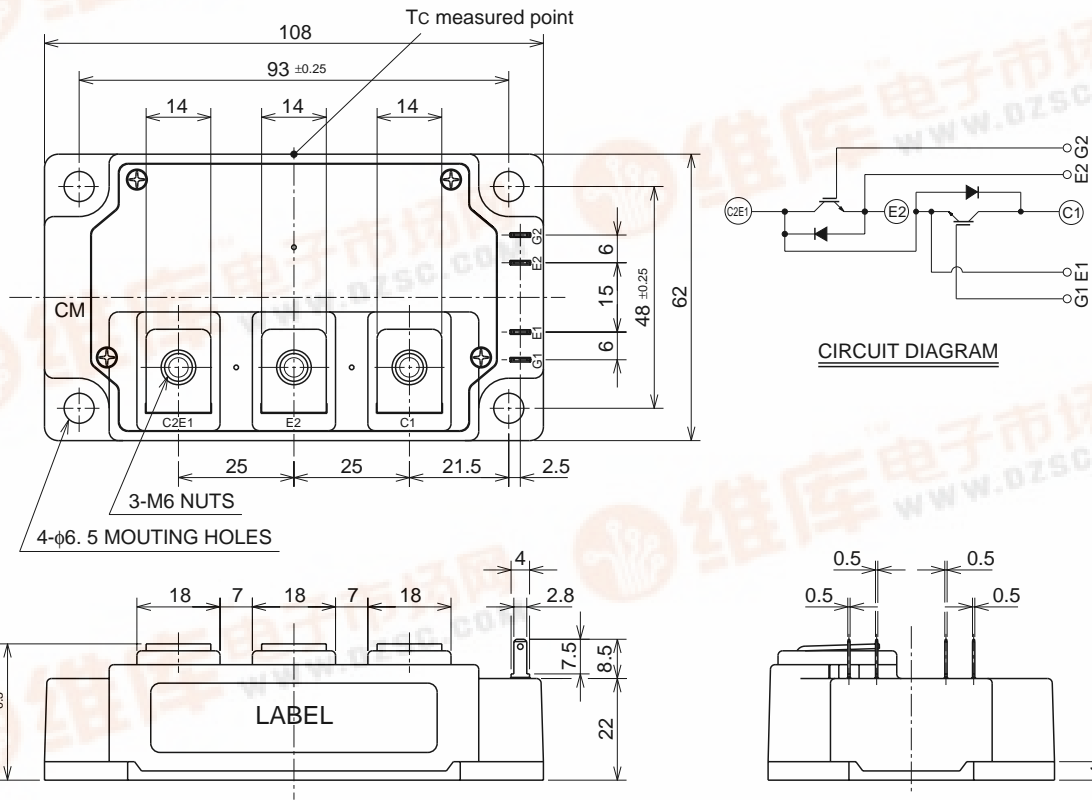
## APPLICATION

High frequency switching use (30kHz to 60kHz).

Gradient amplifier, Induction heating, power supply, etc.

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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

| Symbol                   | Parameter                     | Conditions                             | Ratings    | Unit  |
|--------------------------|-------------------------------|--|------------|-------|
| V <sub>CES</sub>         | Collector-emitter voltage     | G-E Short                              | 1200       | V     |
| V <sub>GES</sub>         | Gate-emitter voltage          | C-E Short                              | ±20        | V     |
| I <sub>C</sub>           | Collector current             | Operation (Note 2)                     | 300        | A     |
| I <sub>CM</sub>          |                               | Pulse (Note 2)                         | 600        | A     |
| I <sub>E</sub> (Note 1)  | Emitter current               | Operation (Note 2)                     | 300        | A     |
| I <sub>EM</sub> (Note 1) |                               | Pulse (Note 2)                         | 600        | A     |
| PC (Note 3)              | Maximum collector dissipation | T <sub>C</sub> = 25°C                  | 1130       | W     |
| PC' (Note 3)             | Maximum collector dissipation | T <sub>C</sub> ' = 25°C <sup>4</sup>   | 1900       | 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             | Main Terminal to base plate, AC 1 min. | 2500       | V     |
| —                        | Mounting torque               | Main Terminal M6                       | 3.5 ~ 4.5  | N • m |
| —                        |                               | Mounting holes M6                      | 3.5 ~ 4.5  | N • m |
| —                        | Weight                        | Typical value                          | 400        | g     |

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

| Symbol                   | Parameter                                     | Test 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  | —      | —    | 1       | mA   |
| V <sub>GE(th)</sub>      | Gate-emitter threshold voltage                | I <sub>C</sub> = 30mA, V <sub>CE</sub> = 10V   | 4.5    | 6    | 7.5     | V    |
| I <sub>GES</sub>         | Gate leakage current                          | V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V  | —      | —    | 1       | μA   |
| V <sub>CE(sat)</sub>     | Collector-emitter saturation voltage (Note 4) | T <sub>j</sub> = 25°C  | —      | 5.0  | 6.5     | V    |
|                          |   | T <sub>j</sub> = 125°C   |        |      |         |      |
| C <sub>ies</sub>         | Input capacitance                             | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V  | —      | —    | 47      | nF   |
| C <sub>oes</sub>         | Output capacitance                            |  | —      | —    | 4       | nF   |
| C <sub>res</sub>         | Reverse transfer capacitance                  |  | —      | —    | 0.9     | nF   |
| Q <sub>G</sub>           | Total gate charge                             | V <sub>CC</sub> = 600V, I <sub>C</sub> = 300A, V <sub>GE</sub> = 15V   | —      | 1360 | —       | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                            | V <sub>CC</sub> = 600V, I <sub>C</sub> = 300A<br>V <sub>GE1</sub> = V <sub>GE2</sub> = 15V<br>R <sub>G</sub> = 1Ω, Inductive load switching operation<br>I <sub>E</sub> = 300A | —      | —    | 300     | ns   |
| t <sub>r</sub>           | Turn-on rise time                             |  | —      | —    | 80      | ns   |
| t <sub>d(off)</sub>      | Turn-off delay time                           |  | —      | —    | 500     | ns   |
| t <sub>f</sub>           | Turn-off fall time                            |  | —      | —    | 150     | ns   |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                         |  | —      | —    | 250     | ns   |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge                       | —  | 13     | —    | μC      |      |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage                     | I <sub>E</sub> = 300A, V <sub>GE</sub> = 0V  | —      | —    | 3.5     | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance*1                          | IGBT part (1/2 module)   | —      | —    | 0.11    | °C/W |
| R <sub>th(j-c)R</sub>    |   | FWDi part (1/2 module)   | —      | —    | 0.18    | °C/W |
| R <sub>th(c-f)</sub>     | Contact thermal resistance                    | Case to fin, Thermal compound Applied*2 (1/2 module)   | —      | 0.04 | —       | °C/W |
| R <sub>th(j-c)Q</sub>    | Thermal resistance*4                          | IGBT part (1/2 module)   | —      | —    | 0.066*3 | °C/W |
| R <sub>th(j-c)R</sub>    |   | FWDi part (1/2 module)   | —      | —    | 0.1*3   | °C/W |
| R <sub>G</sub>           | External gate resistance                      |  | 1      | —    | 10      | Ω    |

\*1 : T<sub>C</sub> measured point is shown in page OUTLINE DRAWING.

\*2 : Typical value is measured by using Shin-etsu Silicone "G-746".

\*3 : If you use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

\*4 : T<sub>C</sub>' measured point is just under the chips.

Note 1. I<sub>E</sub>, V<sub>EC</sub>, t<sub>rr</sub> & Q<sub>rr</sub> represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWDi).

2. 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.

3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

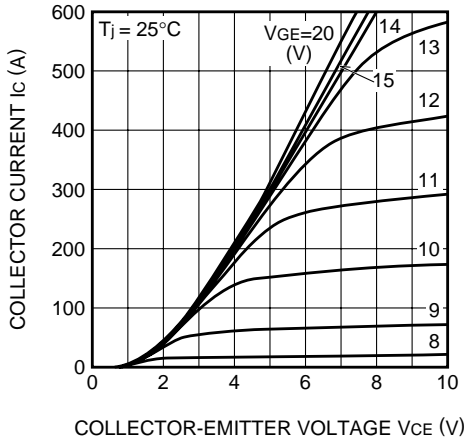
4. No short circuit capability is designed.

# CM300DU-24NFH

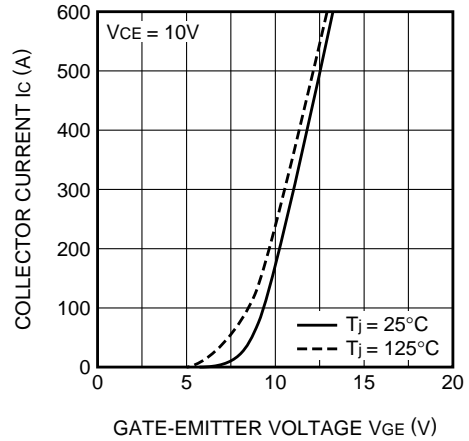
HIGH POWER SWITCHING USE

## PERFORMANCE CURVES

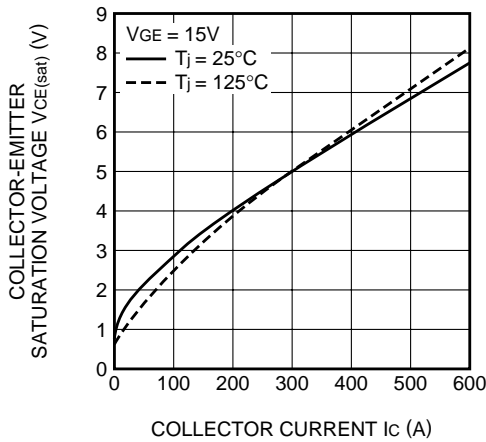
**OUTPUT CHARACTERISTICS (TYPICAL)**



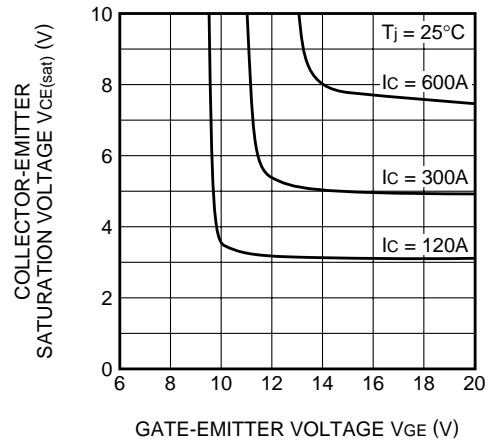
**TRANSFER CHARACTERISTICS (TYPICAL)**



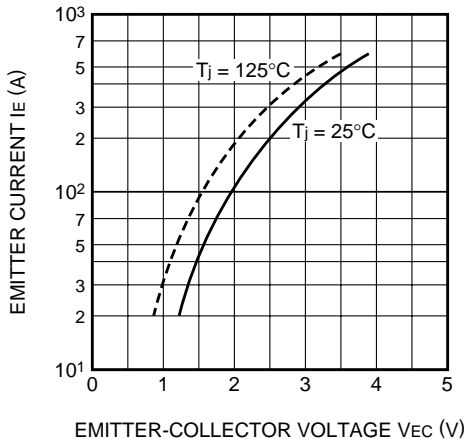
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



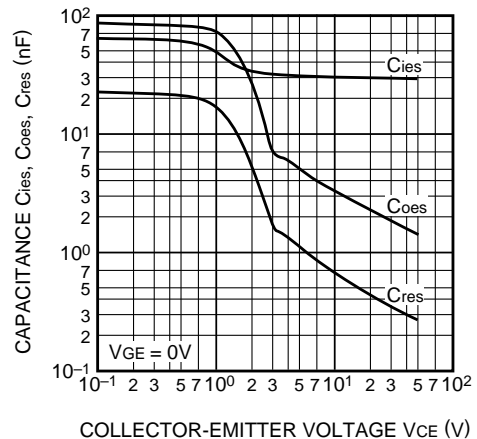
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



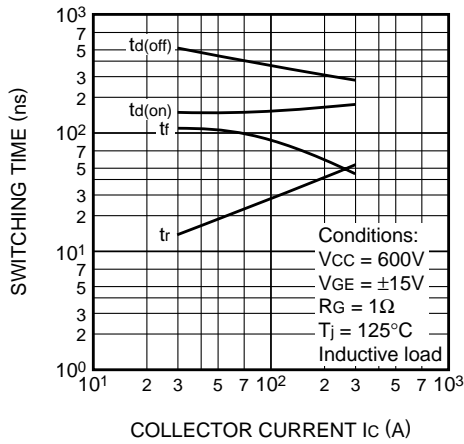
**CAPACITANCE CHARACTERISTICS (TYPICAL)**



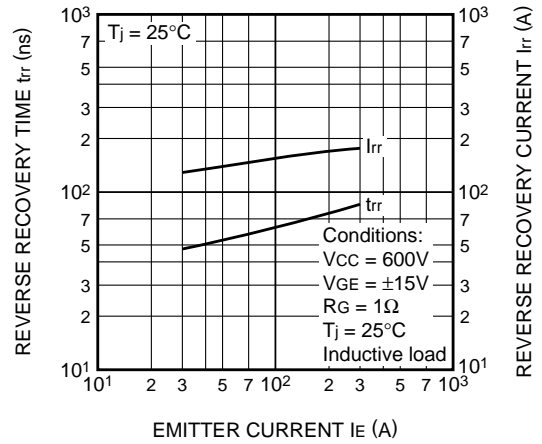
CM300DU-24NFH

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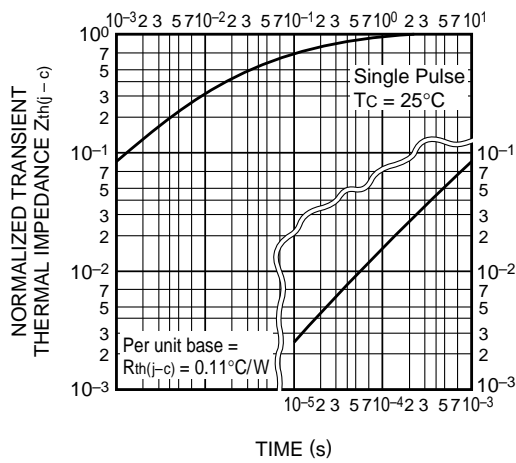
HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



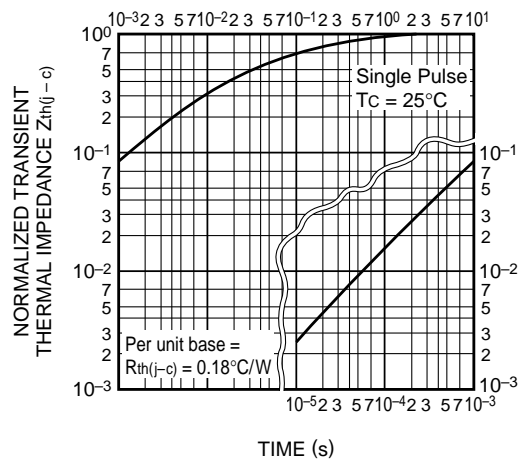
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)

