

MITSUBISHI IGBT MODULES  
**CM400DU-24NFH**

HIGH POWER SWITCHING USE

**CM400DU-24NFH**



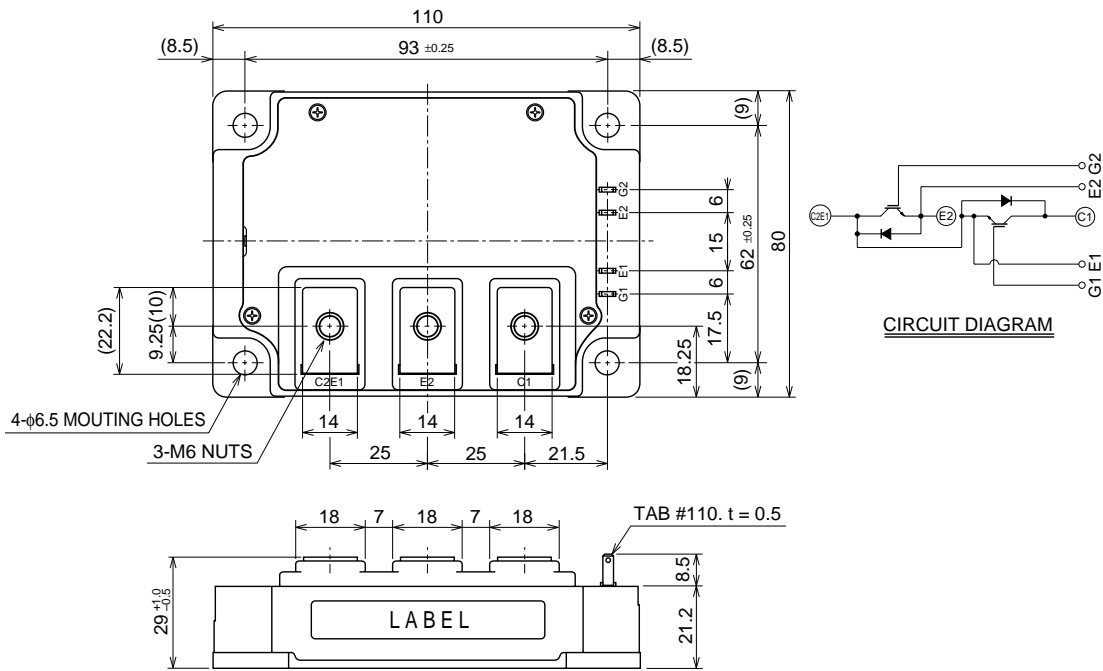
- IC ..... 400A
- VCES ..... 1200V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

High frequency switching use (30kHz to 60kHz).  
 Gradient amplifier, Induction heating, power supply, etc.

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



Aug.2004



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**MAXIMUM RATINGS (Tj = 25°C)**

| Symbol       | Parameter                     | Conditions                             | Ratings    | Unit  |
|--------------|-------------------------------|--|------------|-------|
| VCES         | Collector-emitter voltage     | G-E Short                              | 1200       | V     |
| VGES         | Gate-emitter voltage          | C-E Short                              | ±20        | V     |
| IC           | Collector current             | Operation (Note 2)                     | 400        | A     |
| ICM          |                               | Pulse (Note 2)                         | 800        | A     |
| IE (Note 1)  | Emitter current               | Operation (Note 2)                     | 400        | A     |
| IEM (Note 1) |                               | Pulse (Note 2)                         | 800        | A     |
| PC (Note 3)  | Maximum collector dissipation | Tc = 25°C                              | 1040       | W     |
| PC' (Note 3) | Maximum collector dissipation | Tc' = 25°C <sup>*4</sup>               | 2450       | W     |
| Tj           | Junction temperature          |  | -40 ~ +150 | °C    |
| Tstg         | Storage temperature           |  | -40 ~ +125 | °C    |
| Viso         | 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                          | 580        | g     |

**ELECTRICAL CHARACTERISTICS (Tj = 25°C)**

| Symbol                   | Parameter                                     | Test conditions   | Limits     |      |                     | Unit |   |
|--------------------------|---|---|------------|------|---------------------|------|---|
|                          |   |   | Min.       | Typ. | Max.                |      |   |
| ICES                     | Collector cutoff current                      | VCE = VCES, VGE = 0V  | —          | —    | 1                   | mA   |   |
| VGE(th)                  | Gate-emitter threshold voltage                | IC = 40mA, VCE = 10V  | 4.5        | 6    | 7.5                 | V    |   |
| IGES                     | Gate leakage current                          | VGE = VGES, VCE = 0V  | —          | —    | 1.4                 | µA   |   |
| VCE(sat)                 | Collector-emitter saturation voltage (Note 4) | IC = 400A, VGE = 15V  | Tj = 25°C  | —    | 5.0                 | 6.5  | V |
|                          |   |   | Tj = 125°C | —    | 5.0                 | —    |   |
| Cies                     | Input capacitance                             | VCE = 10V<br>VGE = 0V   | —          | —    | 63                  | nF   |   |
| Coes                     | Output capacitance                            |   | —          | —    | 5.3                 | nF   |   |
| Cres                     | Reverse transfer capacitance                  |   | —          | —    | 1.2                 | nF   |   |
| QG                       | Total gate charge                             | VCC = 600V, IC = 400A, VGE = 15V  | —          | 1800 | —                   | nC   |   |
| td(on)                   | Turn-on delay time                            | VCC = 600V, IC = 400A<br>VGE1 = VGE2 = 15V<br>RG = 0.78Ω, Inductive load switching operation<br>IE = 400A | —          | —    | 300                 | ns   |   |
| tr                       | Turn-on rise time                             |   | —          | —    | 100                 | ns   |   |
| td(off)                  | Turn-off delay time                           |   | —          | —    | 500                 | ns   |   |
| tr                       | 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                       |   | —          | 16   | —                   | µC   |   |
| VEC(Note 1)              | Emitter-collector voltage                     | IE = 400A, VGE = 0V   | —          | —    | 3.5                 | V    |   |
| Rth(j-c)Q                | Thermal resistance*1                          | IGBT part (1/2 module)  | —          | —    | 0.12                | °C/W |   |
| Rth(j-c)R                |   | FWDi part (1/2 module)  | —          | —    | 0.23                | °C/W |   |
| Rth(c-f)                 | Contact thermal resistance                    | Case to fin, Thermal compound Applied*2 (1/2 module)  | —          | 0.02 | —                   | °C/W |   |
| Rth(j-c)Q                | Thermal resistance*4                          | IGBT part (1/2 module)  | —          | —    | 0.051 <sup>*3</sup> | °C/W |   |
| Rth(j-c)R                |   | FWDi part (1/2 module)  | —          | —    | 0.093 <sup>*3</sup> | °C/W |   |
| RG                       | External gate resistance                      |   | 0.78       | —    | 7.8                 | Ω    |   |

\*1 : Tc 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, Rth(f-a) should be measured just under the chips.

\*4 : Tc' measured point is just under the chips.

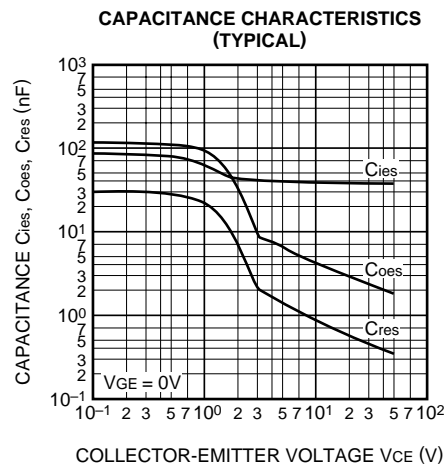
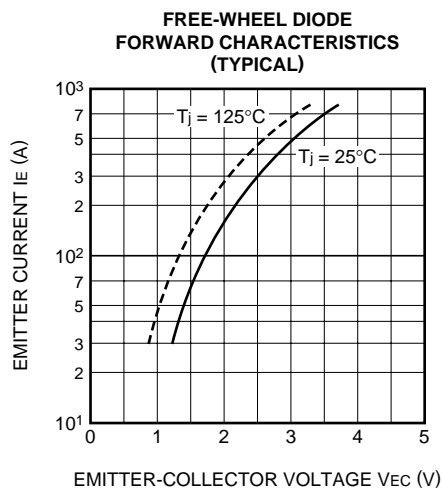
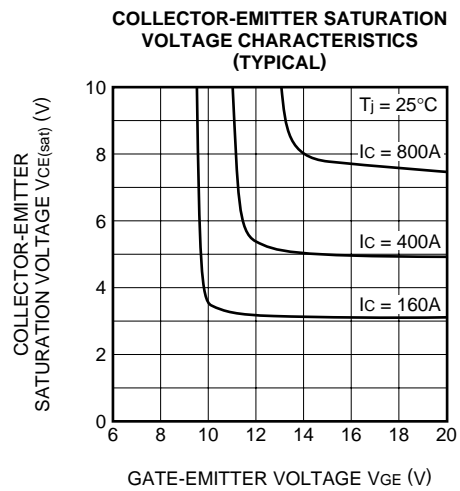
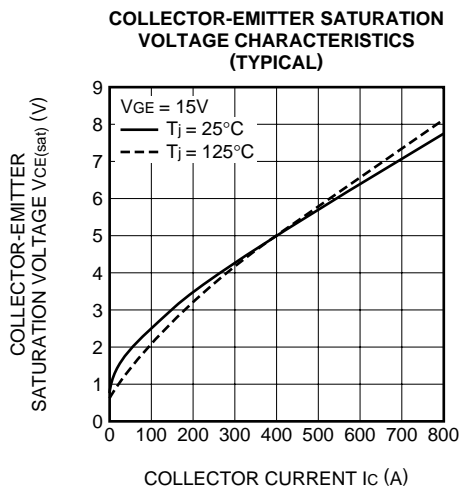
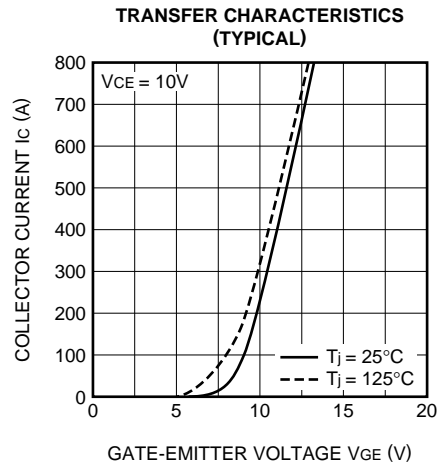
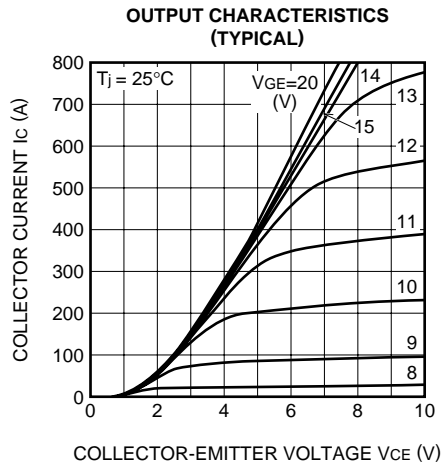
Note 1. IE, VEC, t<sub>rr</sub> & Q<sub>rr</sub> represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWDi).

2. Pulse width and repetition rate should be such that the device junction temp. (Tj) does not exceed Tjmax rating.

3. Junction temperature (Tj) should not increase beyond 150°C.

4. No short circuit capability is designed.

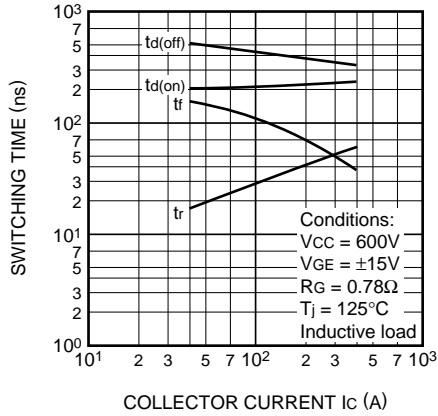
PERFORMANCE CURVES



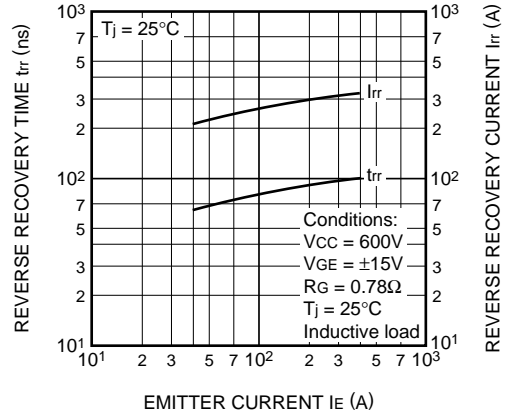
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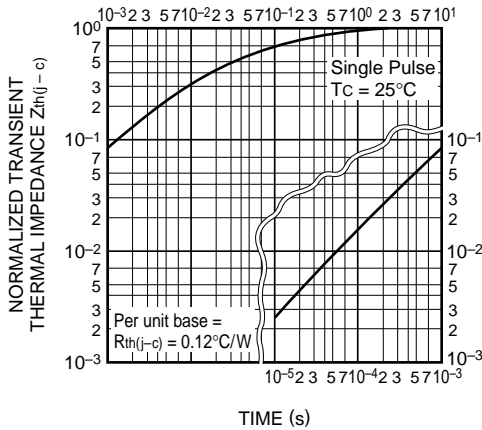
HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)



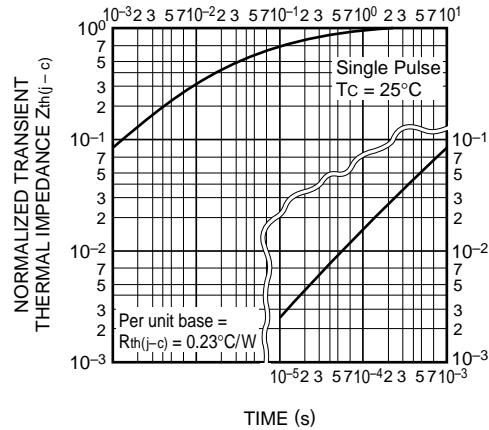
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)

