

MITSUBISHI IGBT MODULES  
**CM400DY-34A**

HIGH POWER SWITCHING USE

**CM400DY-34A**



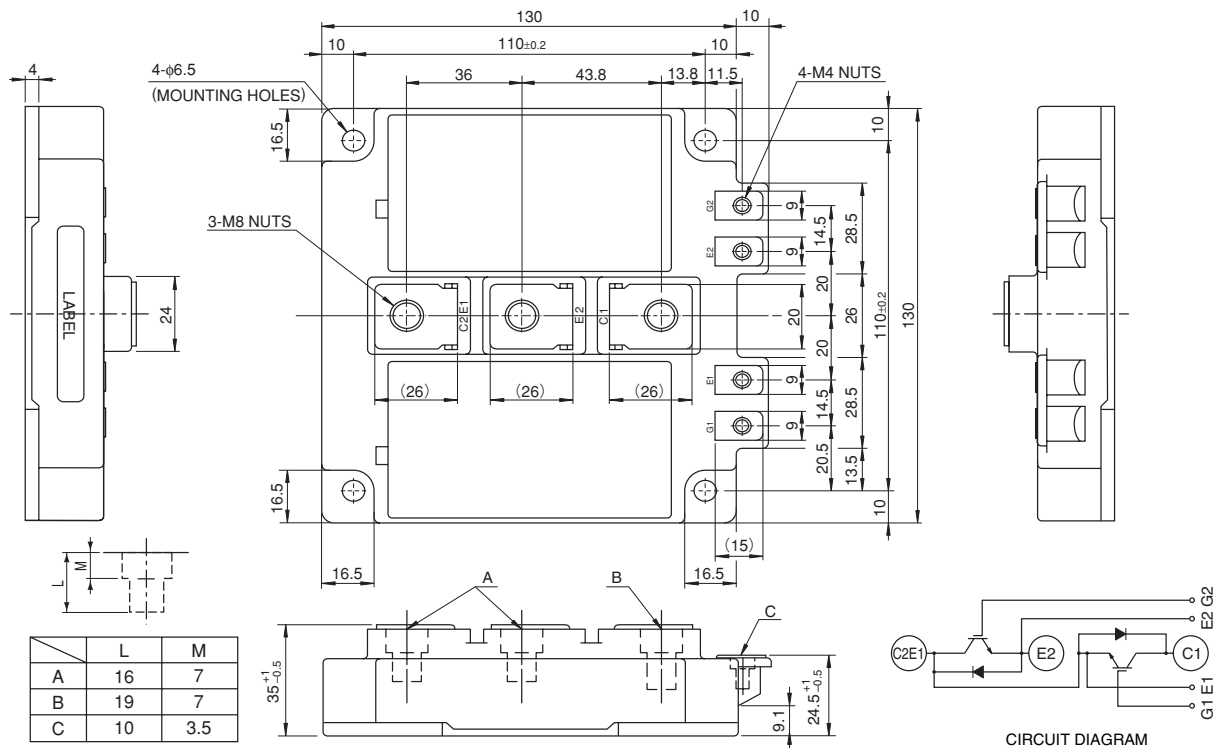
- IC ..... 400A
- VCES ..... 1700V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

General purpose inverters & Servo controls, etc

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



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**ABSOLUTE MAXIMUM RATINGS (T<sub>J</sub> = 25°C, unless otherwise specified)**

| Symbol                   | Parameter                     | Conditions                                     | Ratings    | Unit             |
|--------------------------|-------------------------------|--|------------|------------------|
| V <sub>CE</sub>          | Collector-emitter voltage     | G-E Short                                      | 1700       | V                |
| V <sub>GE</sub>          | Gate-emitter voltage          | C-E Short                                      | ±20        | V                |
| I <sub>C</sub>           | Collector current             | DC, T <sub>C</sub> = 107°C <sup>*1</sup>       | 400        | A                |
| I <sub>CM</sub>          |                               | Pulse  | 800        |                  |
| I <sub>E</sub> (Note 1)  | Emitter current               | Operation                                      | 400        | A                |
| I <sub>EM</sub> (Note 1) |                               | Pulse  | 800        |                  |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>C</sub> = 25°C <sup>*1</sup>            | 3780       | 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             | Terminals to base plate, f = 60Hz, AC 1 minute | 3500       | V <sub>rms</sub> |
| —                        | Torque strength               | Main terminals M8 screw                        | 8.8 ~ 10.8 | N • m            |
| —                        |                               | Mounting M6 screw                              | 3.5 ~ 4.5  |                  |
| —                        |                               | G(E) terminal M4 screw                         | 1.3 ~ 1.7  |                  |
| —                        | Weight                        | Typical value                                  | 1200       | g                |

**ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C, unless otherwise specified)**

| Symbol                   | Parameter                               | Test conditions  | Limits |       |       | Unit |
|--------------------------|---|--|--------|-------|-------|------|
|                          |   |  | Min.   | Typ.  | Max.  |      |
| I <sub>CES</sub>         | Collector cutoff current                | V <sub>CE</sub> = V <sub>CE</sub> , V <sub>GE</sub> = 0V   | —      | —     | 1     | mA   |
| V <sub>GE(th)</sub>      | Gate-emitter threshold voltage          | I <sub>C</sub> = 40mA, V <sub>CE</sub> = 10V   | 5.5    | 7.0   | 8.5   | V    |
| I <sub>GES</sub>         | Gate leakage current                    | ±V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V   | —      | —     | 2.0   | μA   |
| V <sub>CE(sat)</sub>     | Collector to emitter saturation voltage | I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V   | —      | 2.2   | 2.8   | V    |
|                          |   | T <sub>J</sub> = 25°C  | —      | 2.45  | —     |      |
| C <sub>ies</sub>         | Input capacitance                       | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V  | —      | —     | 98.8  | nF   |
| C <sub>oes</sub>         | Output capacitance                      |  | —      | —     | 11.2  |      |
| C <sub>res</sub>         | Reverse transfer capacitance            |  | —      | —     | 2.12  |      |
| Q <sub>G</sub>           | Total gate charge                       | V <sub>CC</sub> = 1000V, I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V  | —      | 2670  | —     | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                      | V <sub>CC</sub> = 1000V, I <sub>C</sub> = 400A<br>V <sub>GE</sub> = ±15V<br>R <sub>G</sub> = 1.2Ω, Inductive load<br>I <sub>E</sub> = 400A | —      | —     | 950   | ns   |
| t <sub>r</sub>           | Turn-on rise time                       |  | —      | —     | 300   |      |
| t <sub>d(off)</sub>      | Turn-off delay time                     |  | —      | —     | 1000  |      |
| t <sub>f</sub>           | Turn-off fall time                      |  | —      | —     | 350   |      |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                   |  | —      | —     | 450   |      |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge                 |  | —      | 40    | —     | μC   |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage               | I <sub>E</sub> = 400A, V <sub>GE</sub> = 0V  | —      | —     | 3.0   | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance                      | IGBT part (1/2 module) <sup>*1</sup>   | —      | —     | 0.033 | K/W  |
| R <sub>th(j-c)R</sub>    |   | FWDi part (1/2 module) <sup>*1</sup>   | —      | —     | 0.055 |      |
| R <sub>th(c-f)</sub>     | Contact thermal resistance              | Case to heat sink, Thermal compound applied (1/2 module) <sup>*1,*2</sup>  | —      | 0.019 | —     |      |
| R <sub>G</sub>           | External gate resistance                |  | 1.2    | —     | 12    | Ω    |

\*1 : Case temperature (T<sub>C</sub>), heat sink temperature (T<sub>H</sub>) measured point is just under the chips.

\*2 : Typical value is measured by using thermally conductive grease of λ = 0.9[W/(m • K)].

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

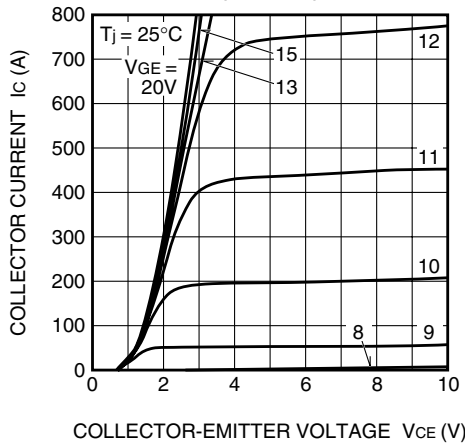
2. Pulse width and repetition rate should be such that the device junction temperature (T<sub>J</sub>) does not exceed T<sub>Jmax</sub> rating.

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

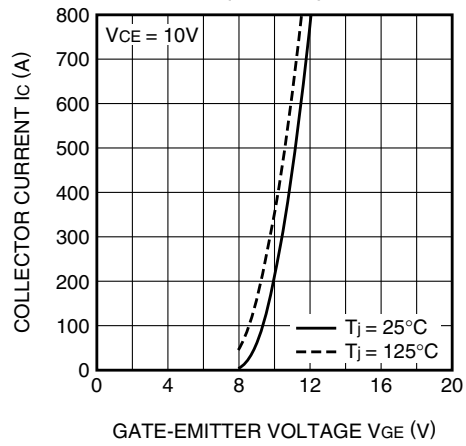
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

PERFORMANCE CURVES

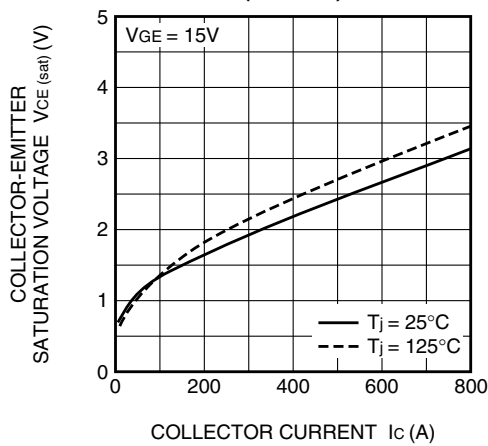
OUTPUT CHARACTERISTICS (TYPICAL)



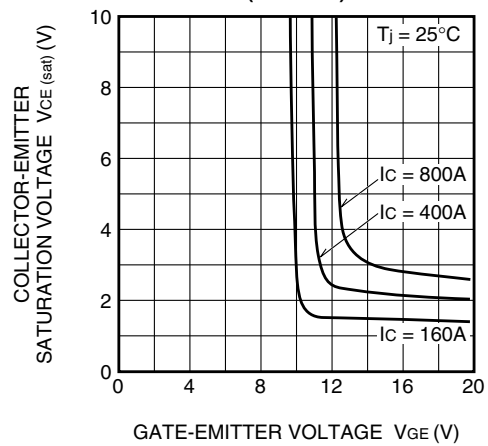
TRANSFER CHARACTERISTICS (TYPICAL)



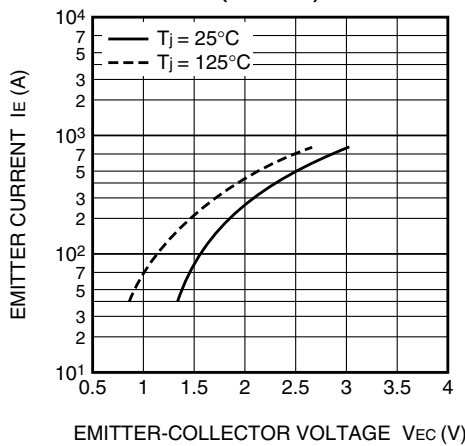
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



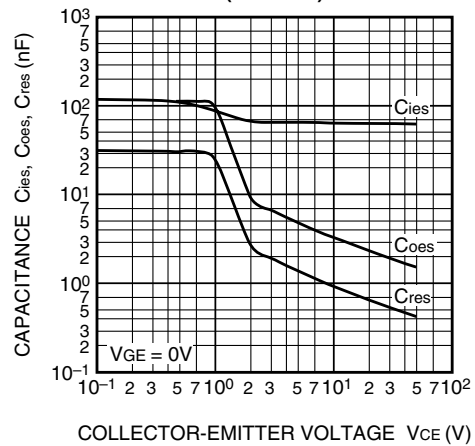
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



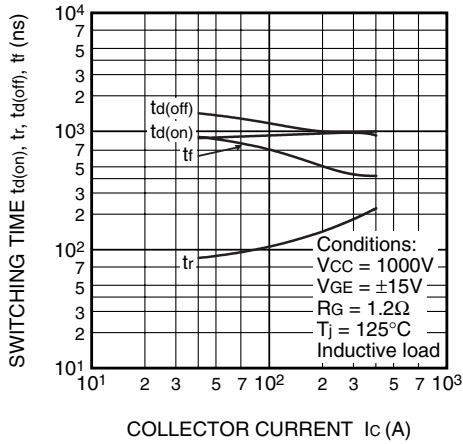
CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)



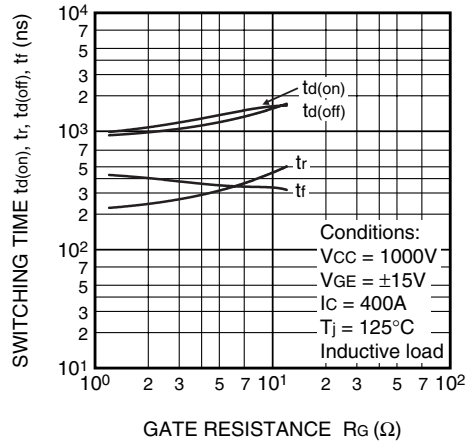
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## HIGH POWER SWITCHING USE

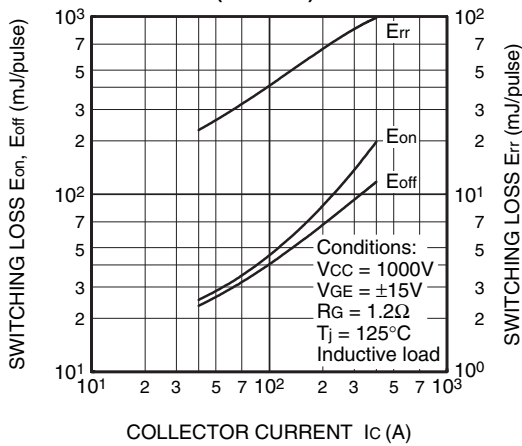
**HALF-BRIDGE SWITCHING CHARACTERISTICS**  
SWITCHING TIME vs. COLLECTOR CURRENT (TYPICAL)



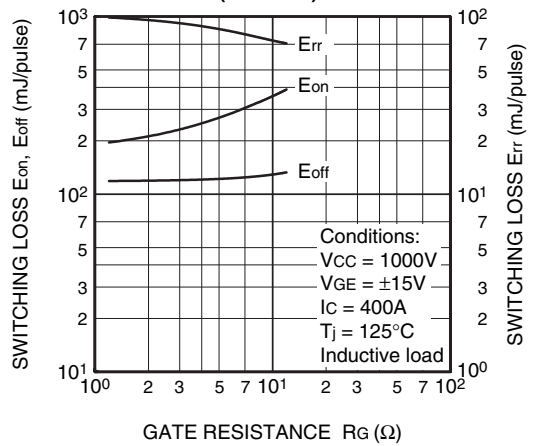
**HALF-BRIDGE SWITCHING CHARACTERISTICS**  
SWITCHING TIME vs. GATE RESISTANCE (TYPICAL)



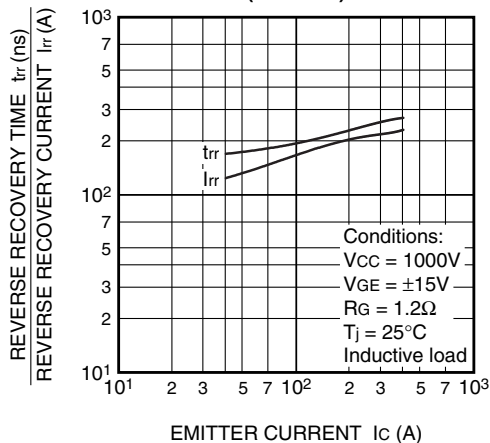
**SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)**



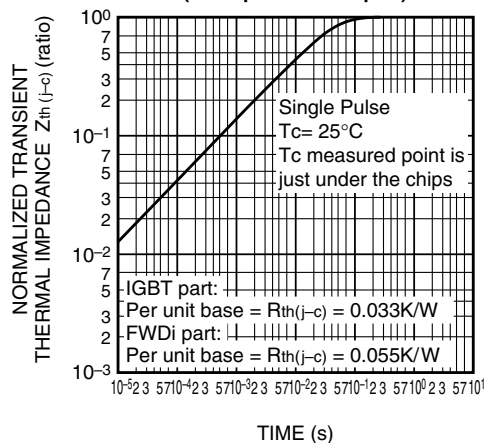
**SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)**



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



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



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