

MITSUBISHI IGBT MODULES

# CM600DY-24A

HIGH POWER SWITCHING USE

## CM600DY-24A



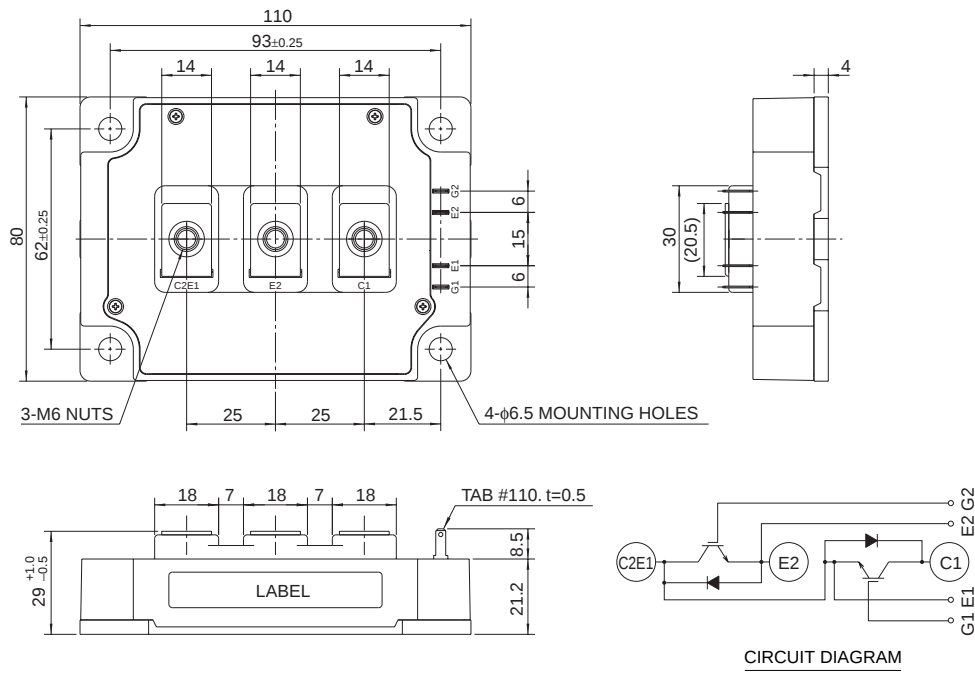
- Ic .....600A
- VCES ..... 1200V
- Insulated Type
- 2-elements in a pack

## APPLICATION

AC drive inverters & Servo controls, etc

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Mar. 2004



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ABSOLUTE 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             | DC, T <sub>c</sub> = 78°C*1            | 600        | A     |
| I <sub>CM</sub>          |                               | Pulse (Note 2)                         | 1200       |       |
| I <sub>E</sub> (Note 1)  | Emitter current               |                                        | 600        | A     |
| I <sub>EM</sub> (Note 1) |                               | Pulse (Note 2)                         | 1200       |       |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>c</sub> = 25°C*1                | 3670       | 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     |
| —                        | Torque strength               | Main terminal M6                       | 3.5 ~ 4.5  | N • m |
| —                        |                               | Mounting holes M6                      | 3.5 ~ 4.5  |       |
| —                        | Weight                        | Typical value                          | 580        | 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> = 60mA, V <sub>CE</sub> = 10V                                                                                                             | 6      | 7     | 8     | 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<br>T <sub>j</sub> = 125°C                                                                                                          | —      | 2.1   | 3.0   | V    |
|                          |                                      | I <sub>C</sub> = 600A, V <sub>GE</sub> = 15V                                                                                                             |        | 2.4   | —     |      |
| C <sub>ies</sub>         | Input capacitance                    | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V                                                                                                            | —      | —     | 94    | nF   |
| C <sub>oes</sub>         | Output capacitance                   |                                                                                                                                                          | —      | —     | 8     |      |
| C <sub>res</sub>         | Reverse transfer capacitance         |                                                                                                                                                          | —      | —     | 1.8   |      |
| Q <sub>G</sub>           | Total gate charge                    | V <sub>CC</sub> = 600V, I <sub>C</sub> = 600A, V <sub>GE</sub> = 15V                                                                                     | —      | 2700  | —     | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                   | V <sub>CC</sub> = 600V, I <sub>C</sub> = 600A<br>V <sub>GE1</sub> = V <sub>GE2</sub> = 15V<br>R <sub>G</sub> = 0.52Ω, Inductive load switching operation | —      | —     | 660   | ns   |
| t <sub>r</sub>           | Turn-on rise time                    |                                                                                                                                                          | —      | —     | 190   |      |
| t <sub>d(off)</sub>      | Turn-off delay time                  |                                                                                                                                                          | —      | —     | 700   |      |
| t <sub>f</sub>           | Turn-off fall time                   |                                                                                                                                                          | —      | —     | 350   |      |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                |                                                                                                                                                          | —      | —     | 250   | ns   |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge              | I <sub>E</sub> = 600A                                                                                                                                    | —      | 19    | —     | μC   |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage            | I <sub>E</sub> = 600A, V <sub>GE</sub> = 0V                                                                                                              | —      | —     | 3.8   | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance                   | IGBT part (1/2 module)*1                                                                                                                                 | —      | —     | 0.034 | °C/W |
| R <sub>th(j-c)R</sub>    |                                      | FWDi part (1/2 module)*1                                                                                                                                 | —      | —     | 0.062 |      |
| R <sub>th(c-f)</sub>     | Contact thermal resistance           | Case to fin, Thermal compound Applied (1/2 module)*2                                                                                                     | —      | 0.018 | —     |      |
| R <sub>G</sub>           | External gate resistance             |                                                                                                                                                          | 0.52   | —     | 7.8   | Ω    |

\*1 : T<sub>c</sub>, T<sub>f</sub> measured point is just under the chips.

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

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.

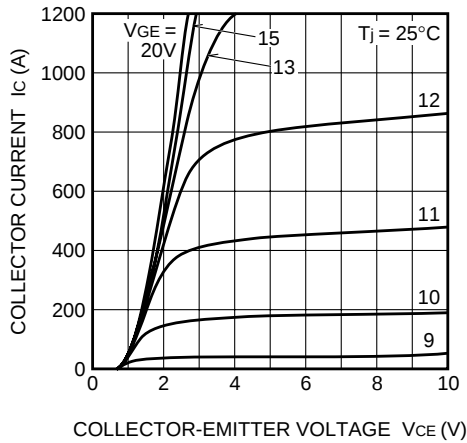
3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

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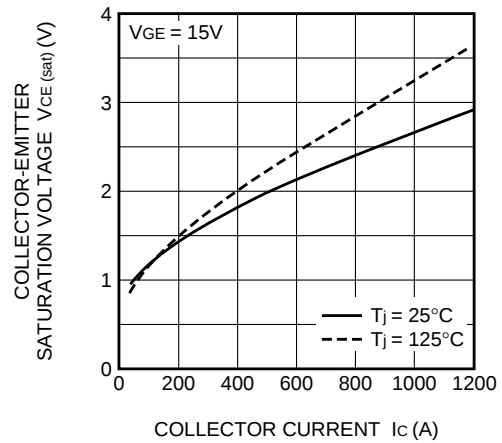
HIGH POWER SWITCHING USE

## PERFORMANCE CURVES

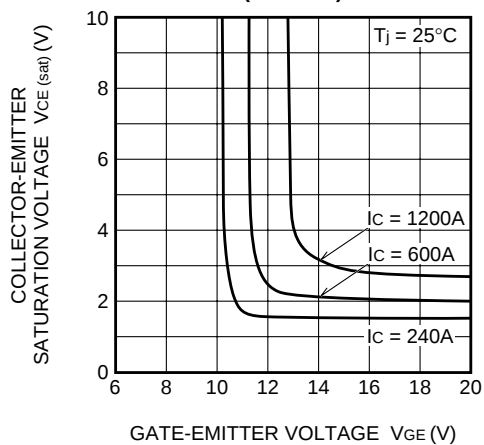
OUTPUT CHARACTERISTICS  
(TYPICAL)



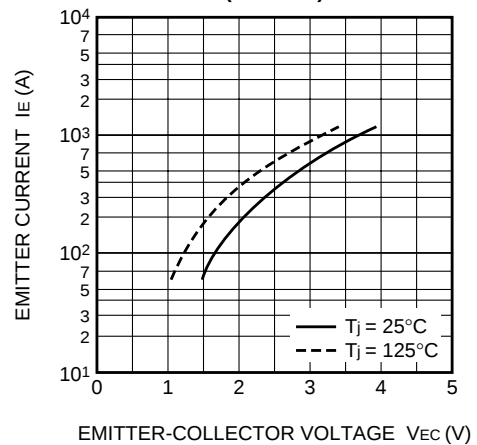
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



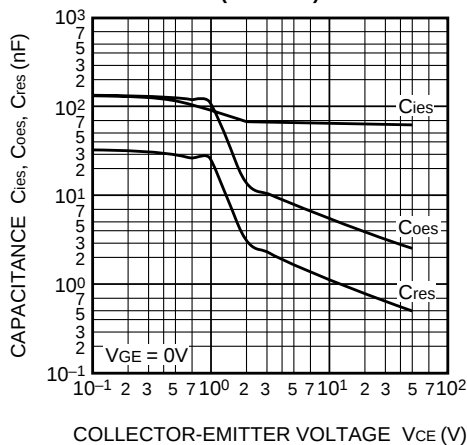
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



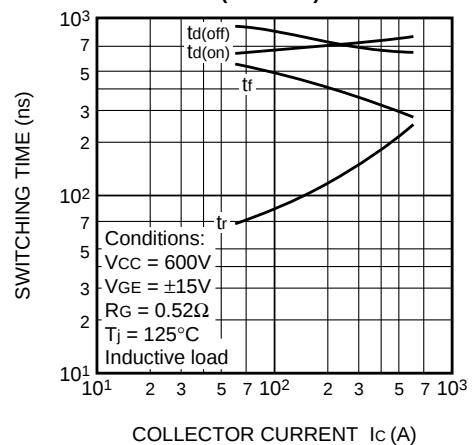
FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



CAPACITANCE- $V_{CE}$   
CHARACTERISTICS  
(TYPICAL)



HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)



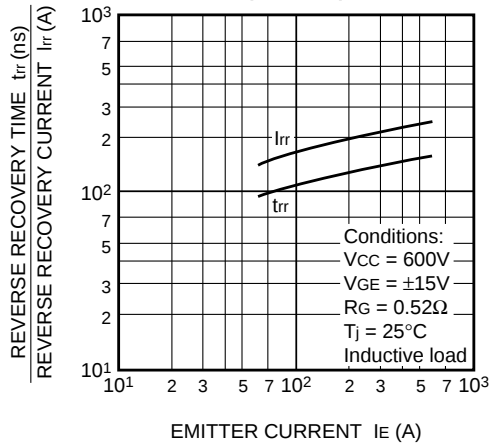
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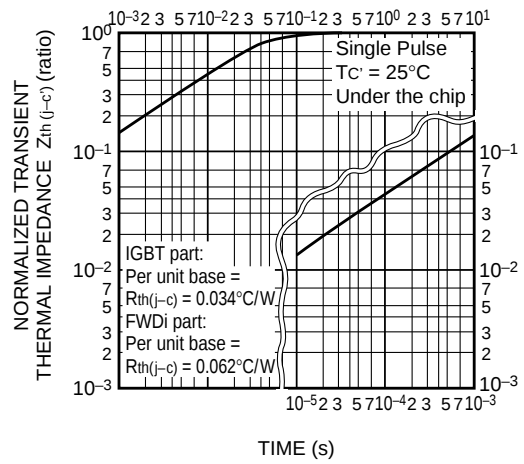
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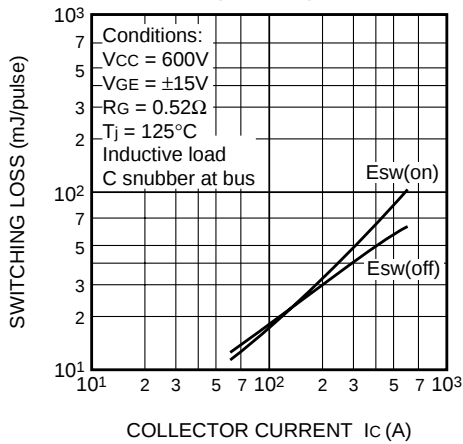
REVERSE RECOVERY CHARACTERISTICS  
OF FREE-WHEEL DIODE  
(TYPICAL)



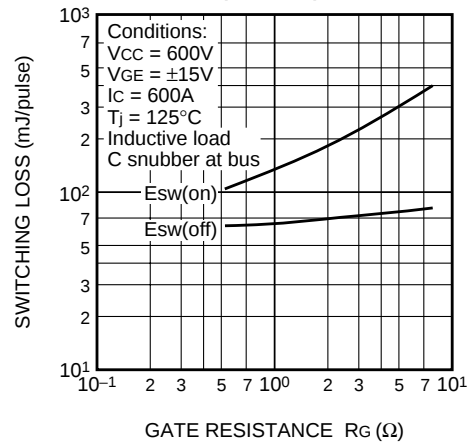
TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(IGBT part & FWDi part)



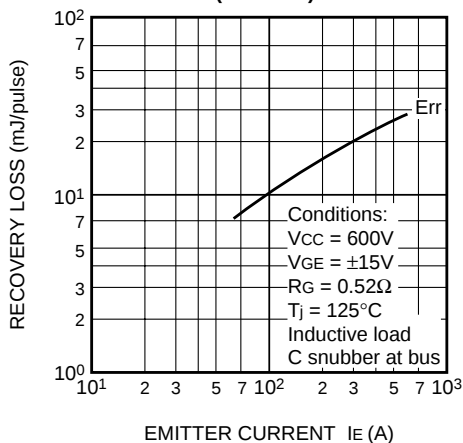
SWITCHING LOSS vs.  
COLLECTOR CURRENT  
(TYPICAL)



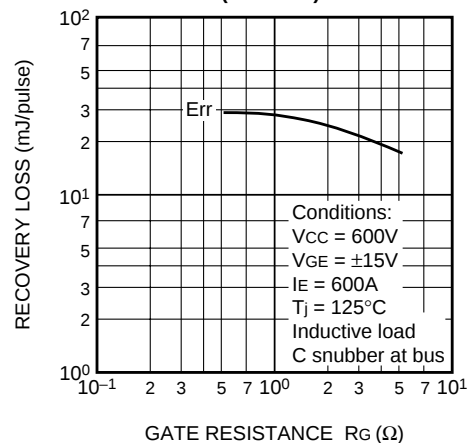
SWITCHING LOSS vs.  
GATE RESISTANCE  
(TYPICAL)



RECOVERY LOSS vs. IE  
(TYPICAL)

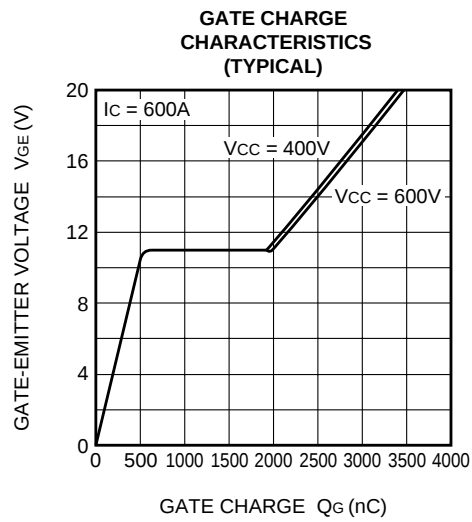


RECOVERY LOSS vs.  
GATE RESISTANCE  
(TYPICAL)



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