

MITSUBISHI IGBT MODULES

# CM900DU-24NF

HIGH POWER SWITCHING USE

## CM900DU-24NF



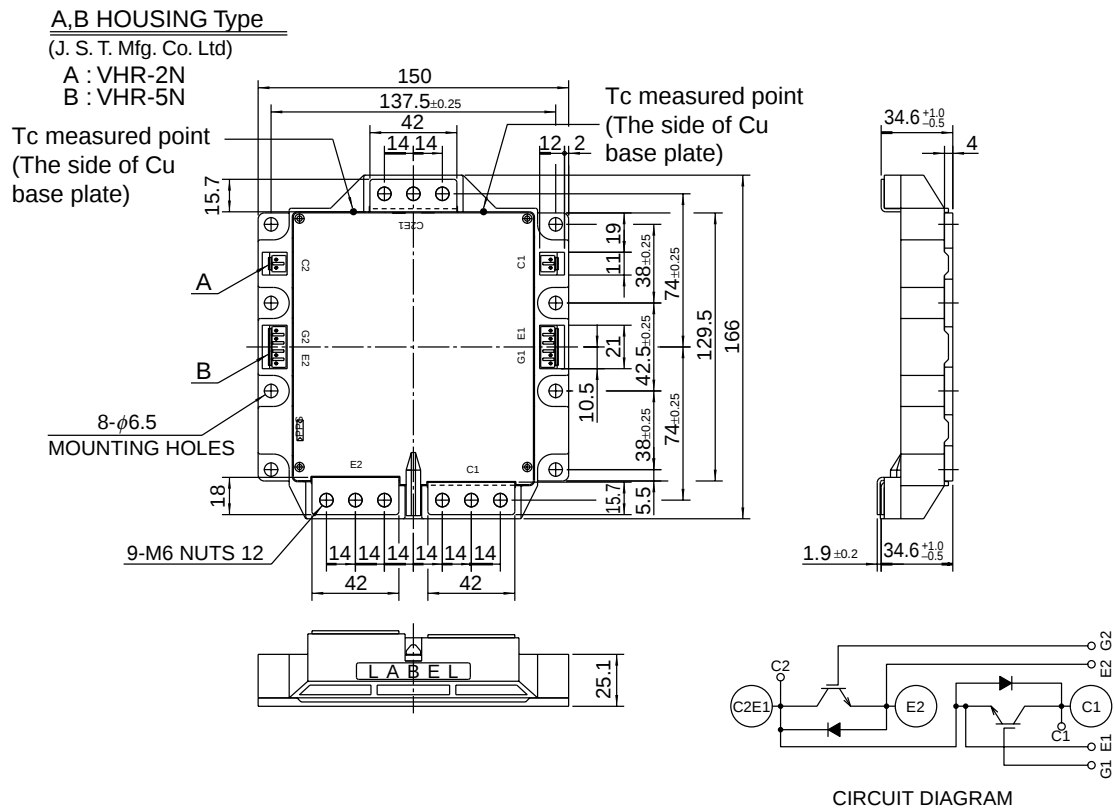
- Ic .....900A
- VCES ..... 1200V
- Insulated Type
- 2-elements in a pack

## APPLICATION

UPS & General purpose inverters, etc

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Mar. 2003

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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             | T <sub>c</sub> = 25°C                  | 900        | A     |
| I <sub>CM</sub>          |                               | Pulse (Note 2)                         | 1800       |       |
| I <sub>E</sub> (Note 1)  | Emitter current               | T <sub>c</sub> = 25°C                  | 900        | A     |
| I <sub>EM</sub> (Note 1) |                               | Pulse (Note 2)                         | 1800       |       |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>c</sub> = 25°C                  | 2550       | 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  | N • m |
| —                        | Weight                        | Typical value                          | 1400       | 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> = 90mA, V <sub>CE</sub> = 10V                                                                                                             | 6      | 7     | 8       | V    |
| I <sub>GES</sub>         | Gate leakage current                 | V <sub>GE</sub> = V <sub>CES</sub> , V <sub>CE</sub> = 0V                                                                                                | —      | —     | 0.5     | μA   |
| V <sub>CE(sat)</sub>     | Collector-emitter saturation voltage | T <sub>j</sub> = 25°C                                                                                                                                    | —      | 1.8   | 2.5     | V    |
|                          |                                      | T <sub>j</sub> = 125°C                                                                                                                                   | —      | 2.0   | —       |      |
| R <sub>(lead)</sub>      | Module lead resistance               | I <sub>C</sub> = 900A, terminal-chip                                                                                                                     | —      | 0.143 | —       | mΩ   |
| C <sub>ies</sub>         | Input capacitance                    | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V                                                                                                            | —      | —     | 140     | nF   |
| C <sub>oes</sub>         | Output capacitance                   |                                                                                                                                                          | —      | —     | 16      |      |
| C <sub>res</sub>         | Reverse transfer capacitance         |                                                                                                                                                          | —      | —     | 3       |      |
| Q <sub>G</sub>           | Total gate charge                    | V <sub>CC</sub> = 600V, I <sub>C</sub> = 900A, V <sub>GE</sub> = 15V                                                                                     | —      | 4800  | —       | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                   | V <sub>CC</sub> = 600V, I <sub>C</sub> = 900A<br>V <sub>GE1</sub> = V <sub>GE2</sub> = 15V<br>R <sub>G</sub> = 0.35Ω, Inductive load switching operation | —      | —     | 600     | ns   |
| t <sub>r</sub>           | Turn-on rise time                    |                                                                                                                                                          | —      | —     | 200     |      |
| t <sub>d(off)</sub>      | Turn-off delay time                  |                                                                                                                                                          | —      | —     | 800     |      |
| t <sub>f</sub>           | Turn-off fall time                   |                                                                                                                                                          | —      | —     | 300     |      |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                |                                                                                                                                                          | —      | —     | 500     |      |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge              | I <sub>E</sub> = 900A                                                                                                                                    | —      | 50    | —       | μC   |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage            | I <sub>E</sub> = 900A, V <sub>GE</sub> = 0V                                                                                                              | —      | —     | 3.4     | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance*1                 | IGBT part (1/2 module)                                                                                                                                   | —      | —     | 0.049   | °C/W |
| R <sub>th(j-c)R</sub>    |                                      | FWDi part (1/2 module)                                                                                                                                   | —      | —     | 0.078   |      |
| R <sub>th(c-f)</sub>     | Contact thermal resistance           | Case to fin, Thermal compound applied*2 (1/2 module)                                                                                                     | —      | 0.016 | —       |      |
| R <sub>th(j-c')Q</sub>   | Thermal resistance                   | T <sub>c</sub> measured point is just under the chips (IGBT part)                                                                                        | —      | —     | 0.021*3 |      |
| R <sub>th(j-c')R</sub>   |                                      | T <sub>c</sub> measured point is just under the chips (FWDi part)                                                                                        | —      | —     | 0.034*3 |      |
| R <sub>G</sub>           | External gate resistance             |                                                                                                                                                          | 0.35   | —     | 2.2     | Ω    |

Note 1. 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. (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.

\*1 : T<sub>c</sub> measured point is indicated in OUTLINE DRAWING.

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

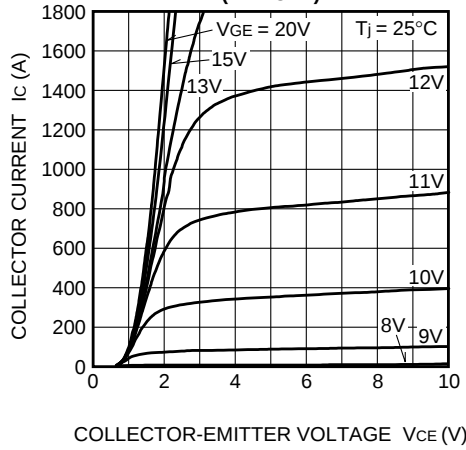
\*3 : If you use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

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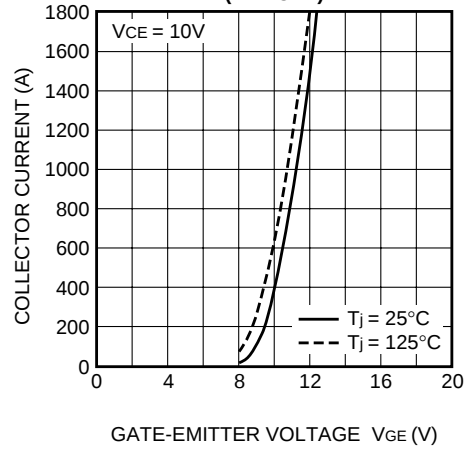
HIGH POWER SWITCHING USE

## PERFORMANCE CURVES

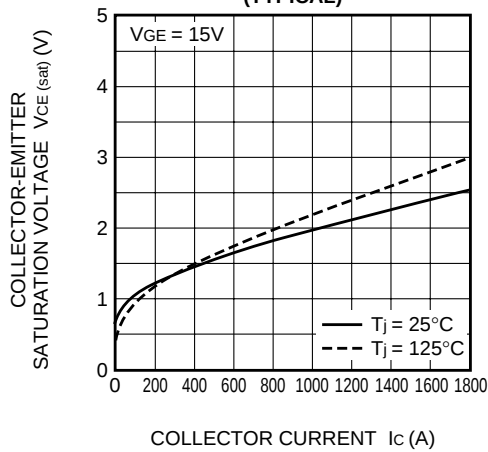
OUTPUT CHARACTERISTICS  
(TYPICAL)



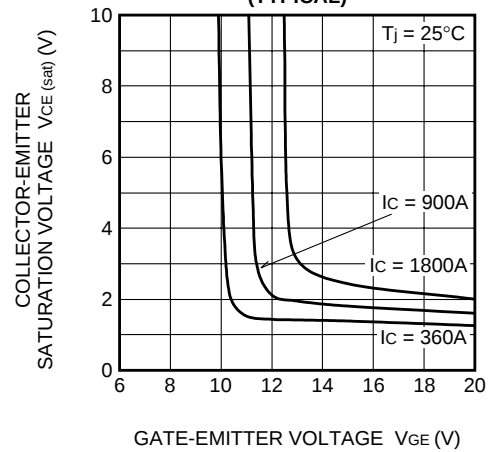
TRANSFER CHARACTERISTICS  
(TYPICAL)



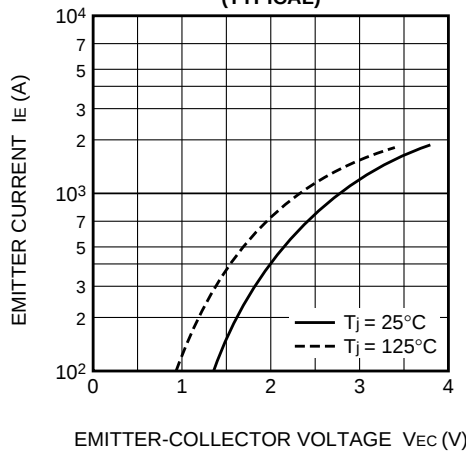
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



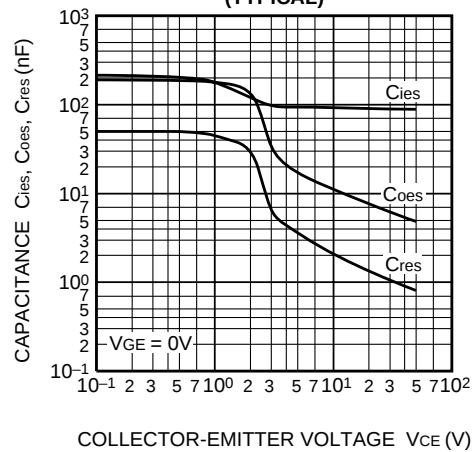
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



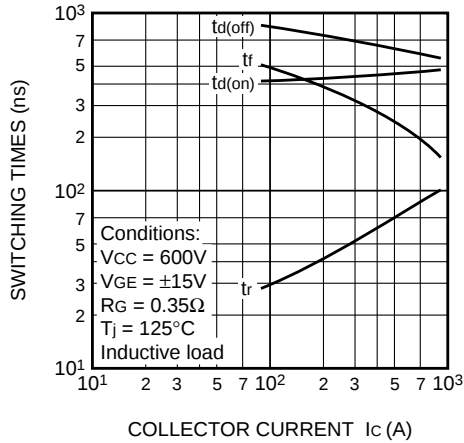
CAPACITANCE- $V_{ce}$   
CHARACTERISTICS  
(TYPICAL)



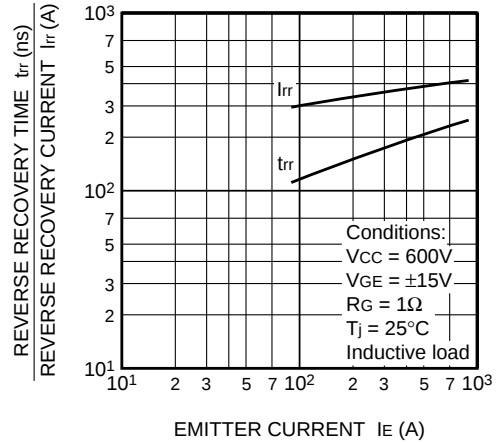
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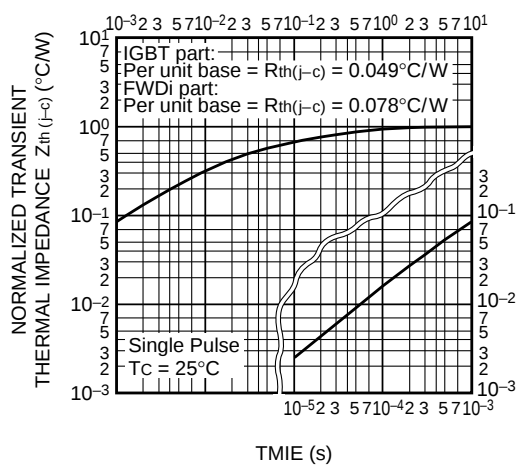
**HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)**



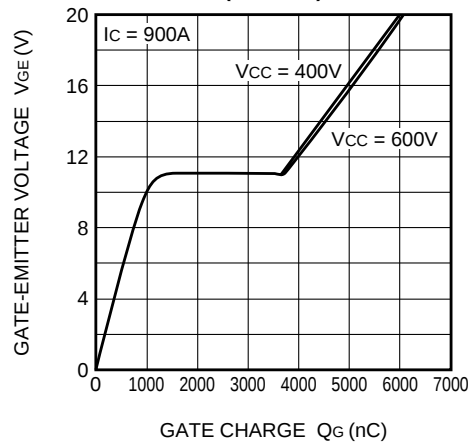
**REVERSE RECOVERY CHARACTERISTICS  
OF FREE-WHEEL DIODE  
(TYPICAL)**



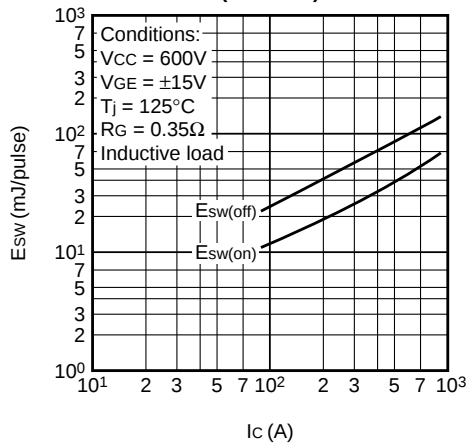
**TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(IGBT part & FWDi part)**



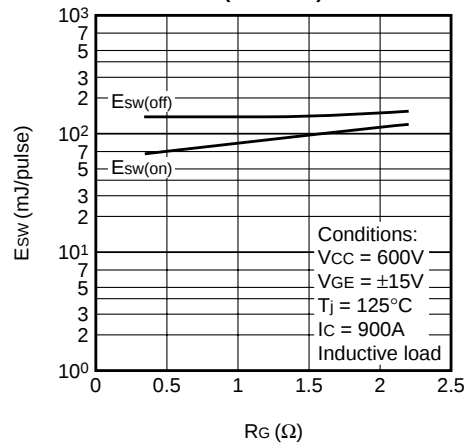
**GATE CHARGE  
CHARACTERISTICS  
(TYPICAL)**



**$I_c$ -Esw  
(TYPICAL)**



**$R_G$ -Esw  
(TYPICAL)**



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