

MITSUBISHI IGBT MODULES  
**CM75RL-12NF**

HIGH POWER SWITCHING USE

**CM75RL-12NF**



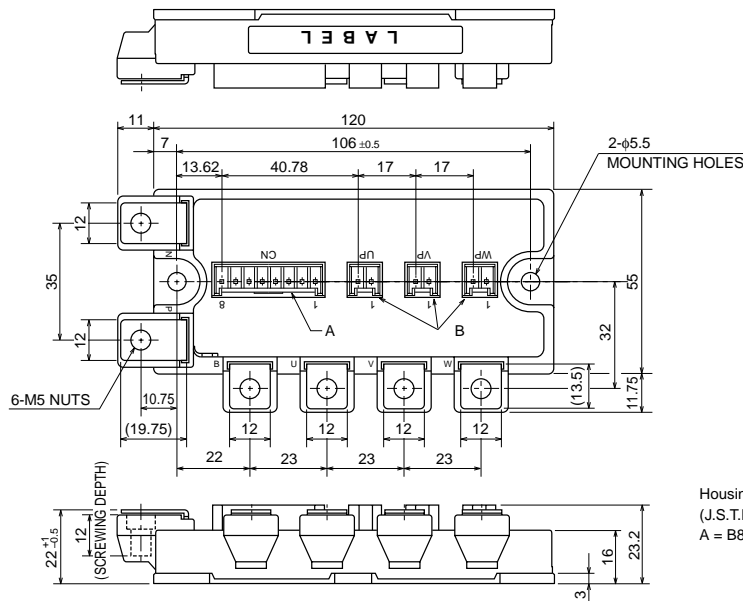
- IC ..... 75A
- VCES ..... 600V
- Insulated Type
- 7-elements in a pack

**APPLICATION**

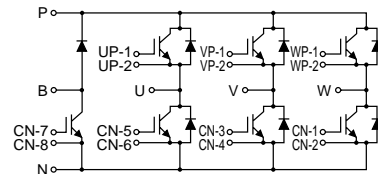
AC drive inverters & Servo controls, etc

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



Housing Type of A and B  
 (J.S.T.Mfg.Co.Ltd)  
 A = B8P-VH-FB-B, B = B2P-VH-FB-B



CIRCUIT DIAGRAM

## CM75RL-12NF

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**ABSOLUTE MAXIMUM RATINGS (T<sub>j</sub> = 25°C)**  
**INVERTER PART**

| Symbol                   | Parameter                     | Conditions                               | Ratings | Unit |
|--------------------------|-------------------------------|--|---------|------|
| V <sub>CES</sub>         | Collector-emitter voltage     | G-E Short                                | 600     | V    |
| V <sub>GES</sub>         | Gate-emitter voltage          | C-E Short                                | ±20     | V    |
| I <sub>C</sub>           | Collector current             | DC, T <sub>c</sub> = 102°C <sup>*1</sup> | 75      | A    |
| I <sub>CM</sub>          |                               | Pulse (Note 2)                           | 150     | A    |
| I <sub>E</sub> (Note 1)  | Emitter current               |  | 75      | A    |
| I <sub>EM</sub> (Note 1) |                               | Pulse (Note 2)                           | 150     | A    |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>c</sub> = 25°C                    | 430     | W    |

**BRAKE PART**

| Symbol                  | Parameter                       | Conditions                               | Ratings | Unit |
|-------------------------|---------------------------------|--|---------|------|
| V <sub>CES</sub>        | Collector-emitter voltage       | G-E Short                                | 600     | V    |
| V <sub>GES</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> | 50      | A    |
| I <sub>CM</sub>         |                                 | Pulse (Note 2)                           | 100     | A    |
| P <sub>C</sub> (Note 3) | Maximum collector dissipation   | T <sub>c</sub> = 25°C                    | 320     | W    |
| V <sub>RRM</sub>        | Repetitive peak reverse voltage | Clamp diode part                         | 600     | V    |
| I <sub>FM</sub>         | Forward current                 | Clamp diode part                         | 50      | A    |

**(COMMON RATING)**

| Symbol           | Parameter            | Conditions                             | Ratings    | Unit  |
|------------------|----------------------|--|------------|-------|
| 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 M5                       | 2.5 ~ 3.5  | N • m |
| —                |                      | Mounting holes M5                      | 2.5 ~ 3.5  | N • m |
| —                | Weight               | Typical value                          | 350        | g     |

**ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C)**  
**INVERTER PART**

| 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 = 7.5mA, VCE = 10V  | 6      | 7     | 8    | V    |
| IGES                     | Gate leakage current                 | VGE = VGES, VCE = 0V   | —      | —     | 0.5  | μA   |
| VCE(sat)                 | Collector-emitter saturation voltage | IC = 75A, VGE = 15V  | —      | 1.7   | 2.2  | V    |
|                          |                                      | T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C  | —      | 1.7   | —    |      |
| Cies                     | Input capacitance                    | VCE = 10V<br>VGE = 0V  | —      | —     | 11.3 | nF   |
| Coes                     | Output capacitance                   |  | —      | —     | 1.4  | nF   |
| Cres                     | Reverse transfer capacitance         |  | —      | —     | 0.45 | nF   |
| QG                       | Total gate charge                    | VCC = 300V, IC = 75A, VGE = 15V  | —      | 300   | —    | nC   |
| td(on)                   | Turn-on delay time                   | VCC = 300V, IC = 75A<br>VGE1 = VGE2 = 15V<br>RG = 8.3Ω, Inductive load switching operation<br>IE = 75A | —      | —     | 120  | ns   |
| tr                       | Turn-on rise time                    |  | —      | —     | 100  | ns   |
| td(off)                  | Turn-off delay time                  |  | —      | —     | 300  | ns   |
| tf                       | Turn-off fall time                   |  | —      | —     | 300  | ns   |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                |  | —      | —     | 100  | ns   |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge              |  | —      | 1.2   | —    | μC   |
| VEC(Note 1)              | Emitter-collector voltage            | IE = 75A, VGE = 0V   | —      | —     | 2.8  | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance                   | IGBT part (1/6 module) <sup>*1</sup>   | —      | —     | 0.29 | °C/W |
| R <sub>th(j-c)R</sub>    |                                      | FWDi part (1/6 module) <sup>*1</sup>   | —      | —     | 0.51 | °C/W |
| R <sub>th(c-f)</sub>     | Contact thermal resistance           | Case to fin, Thermal compound Applied (1/6 module) <sup>*2</sup>                                       | —      | 0.085 | —    | °C/W |
| RG                       | External gate resistance             |  | 8.3    | —     | 83   | Ω    |

**BRAKE PART**

| 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 = 5.0mA                                      | 6      | 7    | 8    | V    |
| IGES                  | Gate leakage current                 | VGE = VGES, VCE = 0V                            | —      | —    | 0.5  | μA   |
| VCE(sat)              | Collector-emitter saturation voltage | IC = 50A, VGE = 15V                             | —      | 1.7  | 2.2  | V    |
|                       |                                      | T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C | —      | 1.7  | —    |      |
| Cies                  | Input capacitance                    | VCE = 10V<br>VGE = 0V                           | —      | —    | 7.5  | nF   |
| Coes                  | Output capacitance                   |   | —      | —    | 1.0  | nF   |
| Cres                  | Reverse transfer capacitance         |   | —      | —    | 0.3  | nF   |
| QG                    | Total gate charge                    | VCC = 300V, IC = 50A, VGE = 15V                 | —      | 200  | —    | nC   |
| VFM                   | Forward voltage drop                 | IF = 50A  | —      | —    | 2.8  | V    |
| R <sub>th(j-c)Q</sub> | Thermal resistance                   | IGBT part <sup>*1</sup>                         | —      | —    | 0.39 | °C/W |
| R <sub>th(j-c)R</sub> |                                      | Clamp diode part <sup>*1</sup>                  | —      | —    | 0.70 | °C/W |
| RG                    | External gate resistance             |   | 13     | —    | 130  | Ω    |

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

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

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

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. (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.

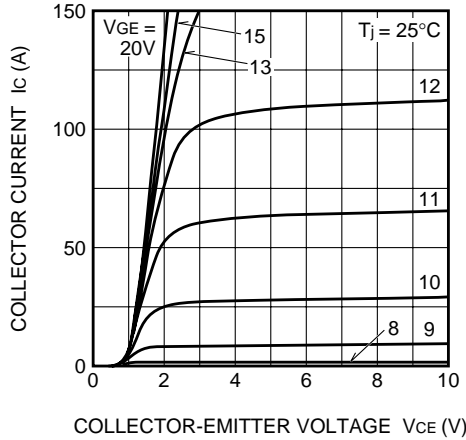
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

# CM75RL-12NF

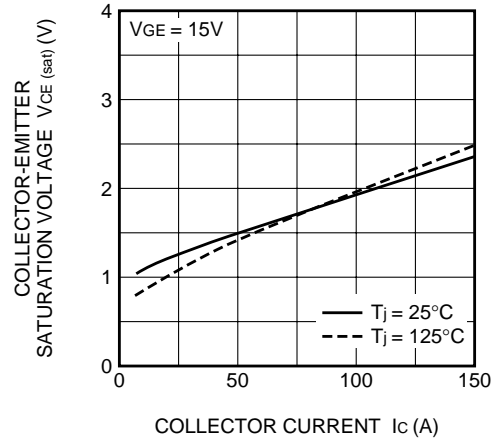
HIGH POWER SWITCHING USE

## PERFORMANCE CURVES

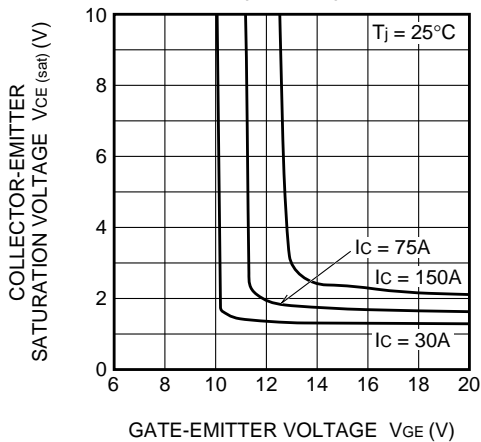
**OUTPUT CHARACTERISTICS (TYPICAL)**



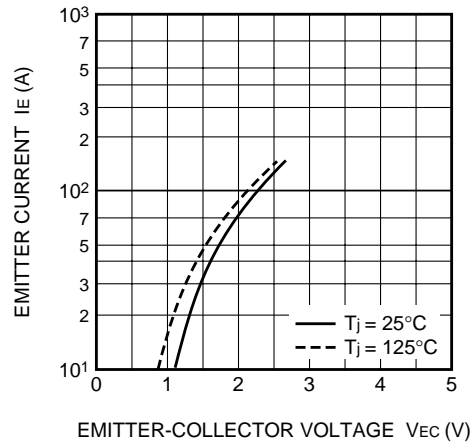
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



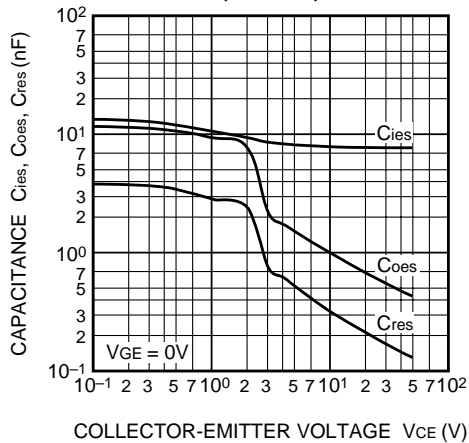
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



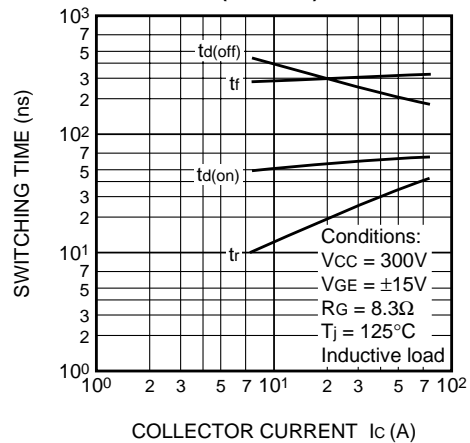
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



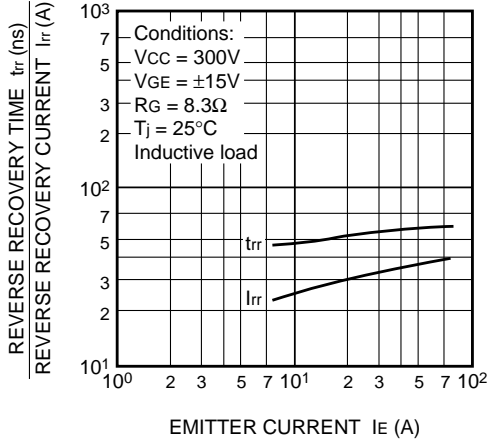
**CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)**



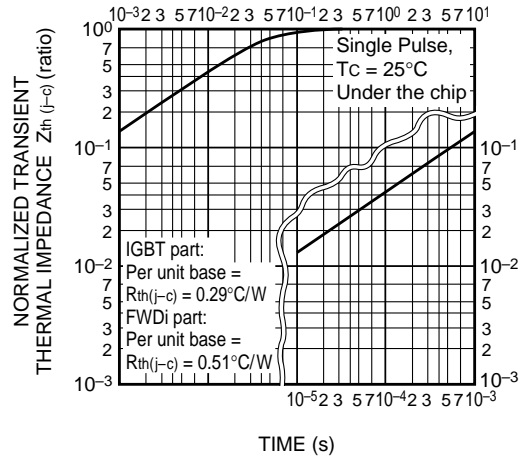
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



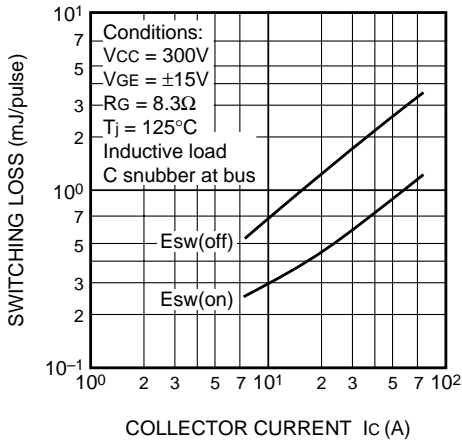
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



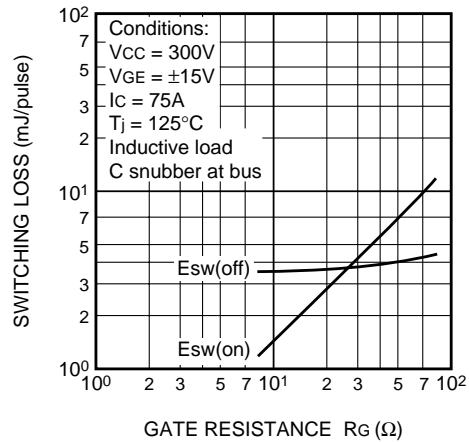
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



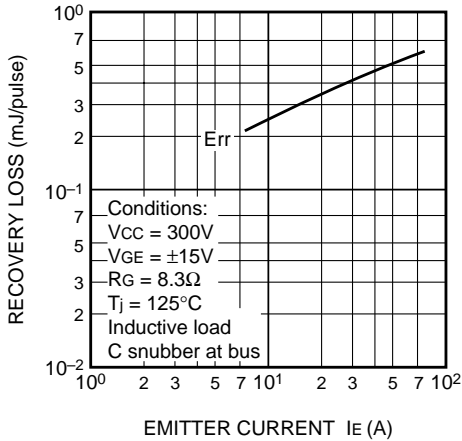
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)



RECOVERY LOSS vs. IE (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)

