

## IGBT MODULE ( N series )

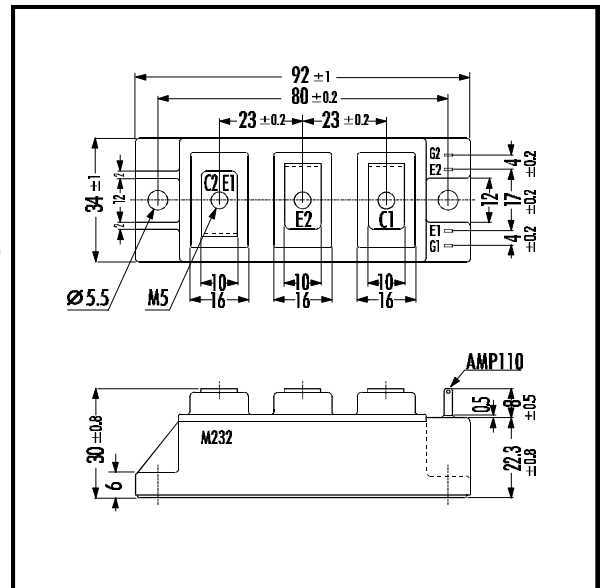
### ■ Features

- Square RBSOA
- Low Saturation Voltage
- Less Total Power Dissipation
- Improved FWD Characteristic
- Minimized Internal Stray Inductance
- Overcurrent Limiting Function (4-5 Times Rated Current)

### ■ Applications

- High Power Switching
- A.C. Motor Controls
- D.C. Motor Controls
- Uninterruptible Power Supply

### ■ Outline Drawing



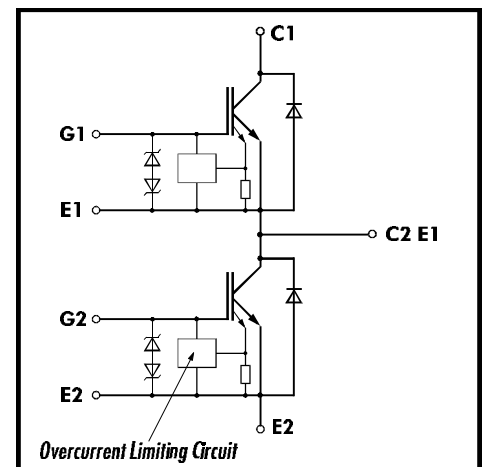
### ■ Maximum Ratings and Characteristics

#### • Absolute Maximum Ratings ( T<sub>c</sub>=25°C )

| Items                     | Symbols          | Ratings               | Units |
|---------------------------|------------------|-----------------------|-------|
| Collector-Emitter Voltage | V <sub>CES</sub> | 1200                  | V     |
| Gate -Emitter Voltage     | V <sub>GES</sub> | ± 20                  | V     |
| Collector Current         | Continuous       | I <sub>C</sub>        | 75    |
|                           | 1ms              | I <sub>C PULSE</sub>  | 150   |
|                           | Continuous       | -I <sub>C</sub>       | 75    |
|                           | 1ms              | -I <sub>C PULSE</sub> | 150   |
| Max. Power Dissipation    | P <sub>C</sub>   | 600                   | W     |
| Operating Temperature     | T <sub>i</sub>   | +150                  | °C    |
| Storage Temperature       | T <sub>stg</sub> | -40 ~ +125            | °C    |
| Isolation Voltage         | V <sub>is</sub>  | 2500                  | V     |
| Screw Torque              | Mounting *1      | 3.5                   | Nm    |
|                           | Terminals *2     | 3.5                   |       |

Note: \*1:Recommendable Value; 2.5 - 3.5 Nm (M5)

### ■ Equivalent Circuit



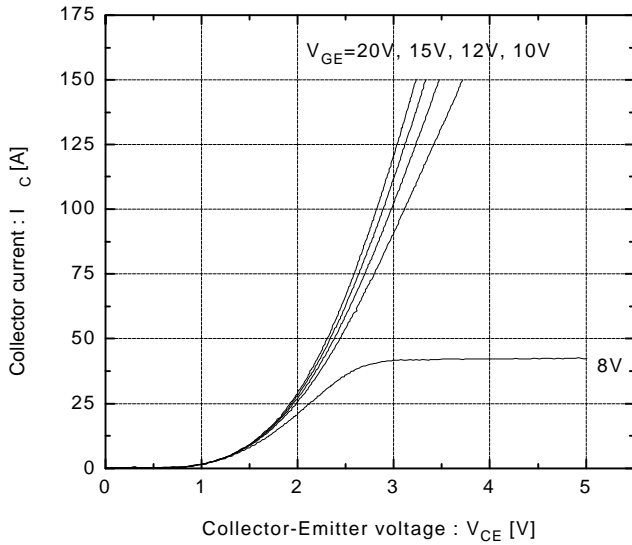
#### • Electrical Characteristics ( at T<sub>J</sub>=25°C )

| Items                                | Symbols              | Test Conditions                                       | Min. | Typ.  | Max. | Units |
|--------------------------------------|----------------------|---|------|-------|------|-------|
| Zero Gate Voltage Collector Current  | I <sub>CES</sub>     | V <sub>GE</sub> =0V V <sub>CE</sub> =1200V            |      |       | 1.0  | mA    |
| Gate-Emitter Leakage Current         | I <sub>GES</sub>     | V <sub>CE</sub> =0V V <sub>GE</sub> =± 20V            |      |       | 15   | μA    |
| Gate-Emitter Threshold Voltage       | V <sub>GE(th)</sub>  | V <sub>GE</sub> =20V I <sub>C</sub> =75mA             | 4.5  |       | 7.5  | V     |
| Collector-Emitter Saturation Voltage | V <sub>CE(sat)</sub> | V <sub>GE</sub> =15V I <sub>C</sub> =75A              |      |       | 3.3  | V     |
| Input capacitance                    | C <sub>ies</sub>     | V <sub>GE</sub> =0V<br>V <sub>CE</sub> =10V<br>f=1MHz |      | 12000 |      | pF    |
| Output capacitance                   | C <sub>oes</sub>     |   |      | 4350  |      |       |
| Reverse Transfer capacitance         | C <sub>res</sub>     |   |      | 3870  |      |       |
| Turn-on Time                         | t <sub>ON</sub>      | V <sub>CC</sub> =600V<br>I <sub>C</sub> =75A          |      | 0.65  | 1.2  | μs    |
|                                      | t <sub>r</sub>       |   |      | 0.25  | 0.6  |       |
| Turn-off Time                        | t <sub>OFF</sub>     | V <sub>GE</sub> =± 15V<br>R <sub>G</sub> =16Ω         |      | 0.85  | 1.5  |       |
|                                      | t <sub>f</sub>       |   |      | 0.35  | 0.5  |       |
| Diode Forward On-Voltage             | V <sub>F</sub>       | I <sub>F</sub> =75A V <sub>GE</sub> =0V               |      |       | 3.0  | V     |
| Reverse Recovery Time                | t <sub>rr</sub>      | I <sub>F</sub> =75A                                   |      |       | 350  | ns    |

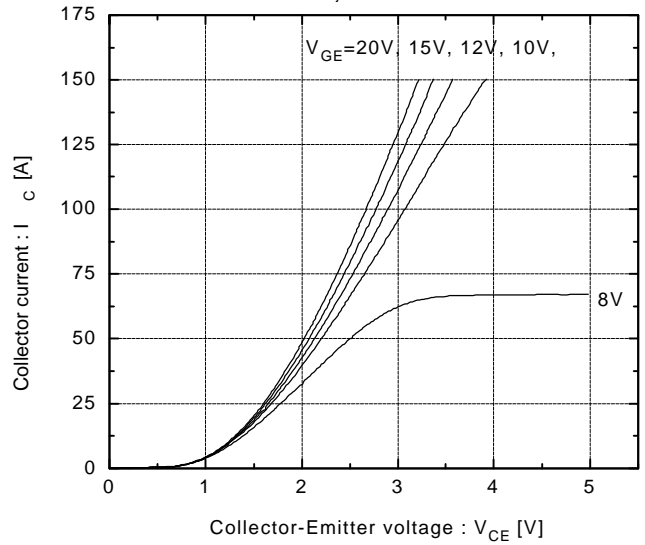
#### • Thermal Characteristics

| Items              | Symbols              | Test Conditions       | Min. | Typ. | Max. | Units |
|--------------------|----------------------|-----------------------|------|------|------|-------|
| Thermal Resistance | R <sub>th(j-c)</sub> | IGBT                  |      |      | 0.21 | °C/W  |
|                    | R <sub>th(f-c)</sub> | Diode                 |      |      | 0.47 |       |
|                    | R <sub>th(c-f)</sub> | With Thermal Compound |      | 0.05 |      |       |

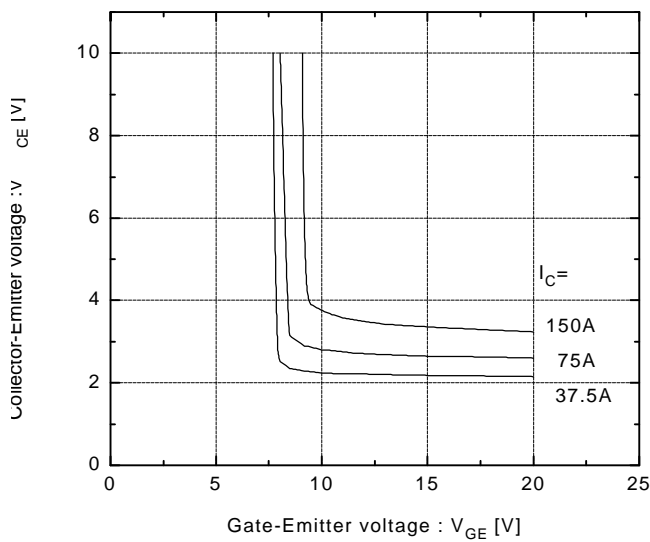
Collector current vs. Collector-Emmitter voltage  
 $T_j=25^\circ\text{C}$



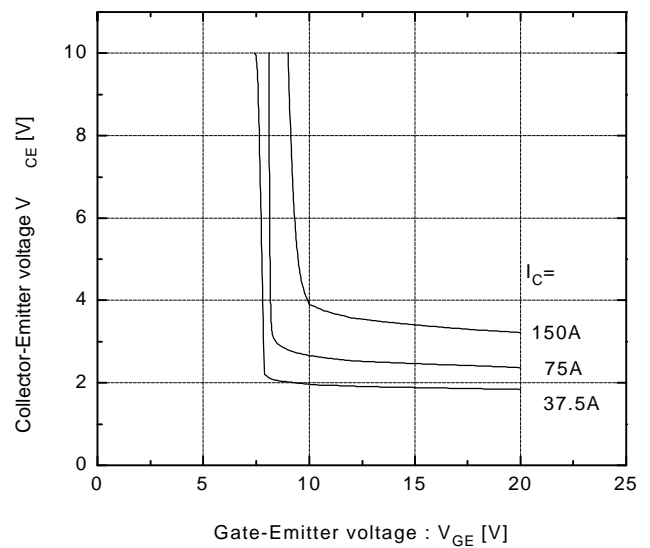
Collector current vs. Collector-Emmitter voltage  
 $T_j=125^\circ\text{C}$



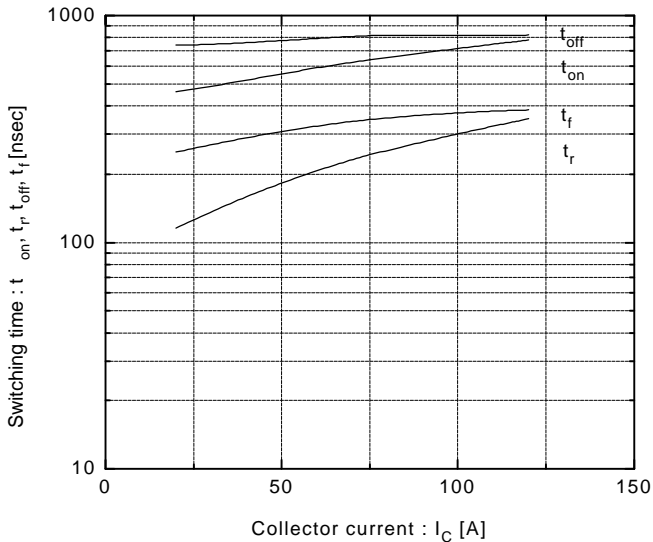
Collector-Emmitter vs. Gate-Emmitter voltage  
 $T_j=25^\circ\text{C}$



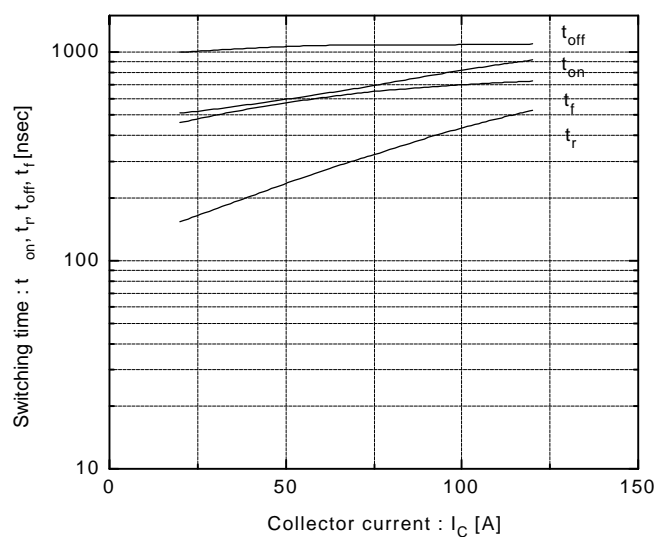
Collector-Emmitter vs. Gate-Emmitter voltage  
 $T_j=125^\circ\text{C}$



Switching time vs. Collector current  
 $V_{CC}=600\text{V}, R_G=16\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$

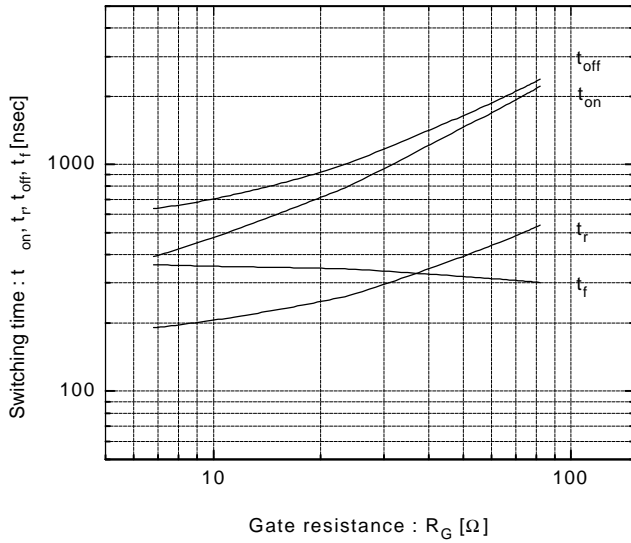


Switching time vs. Collector current  
 $V_{CC}=600\text{V}, R_G=16\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$



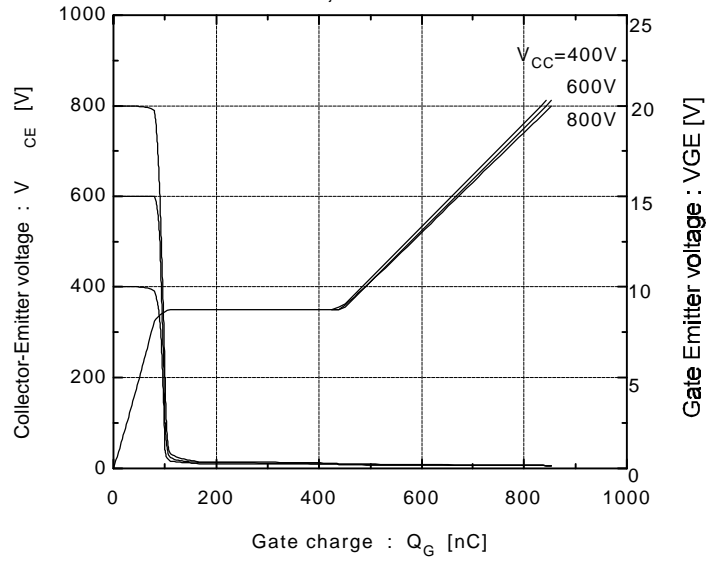
Switching time vs.  $R_G$

$V_{CC}=600V, I_C=75A, V_{GE}=\pm 15V, T_J=25^\circ C$



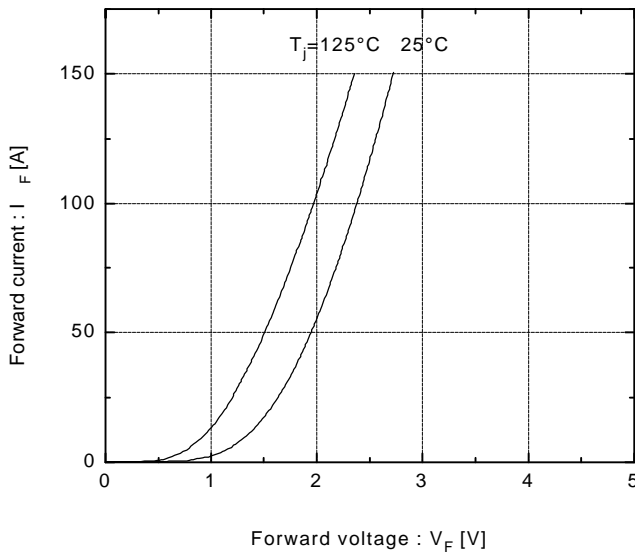
Dynamic input characteristics

$T_J=25^\circ C$



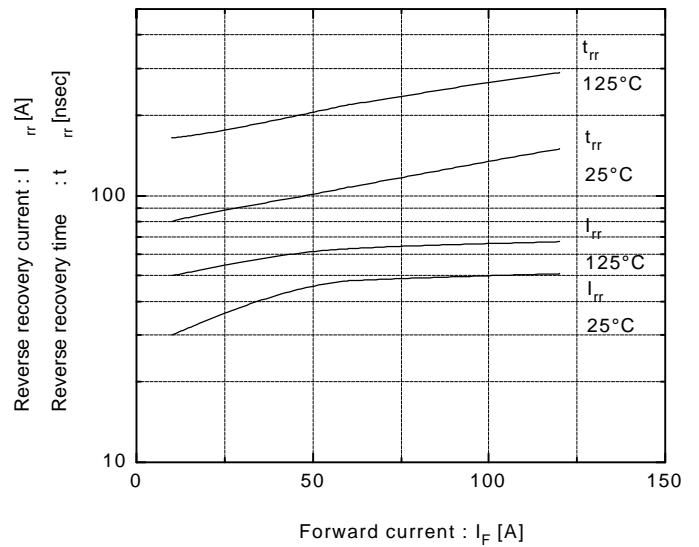
Forward current vs. Forward voltage

$V_{GE}=0V$

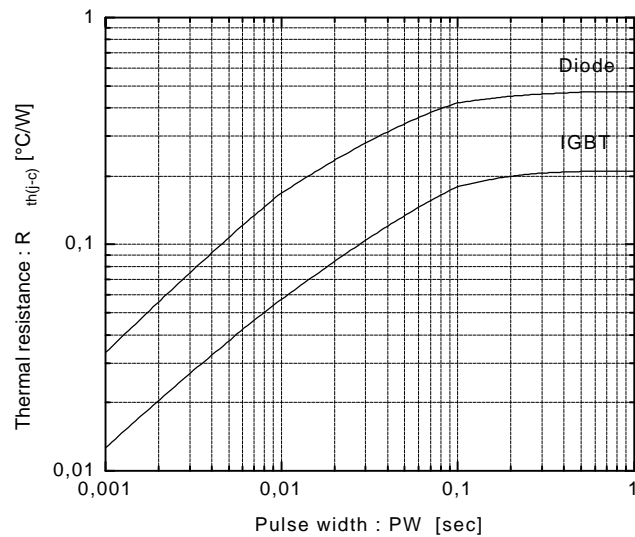


Reverse recovery characteristics

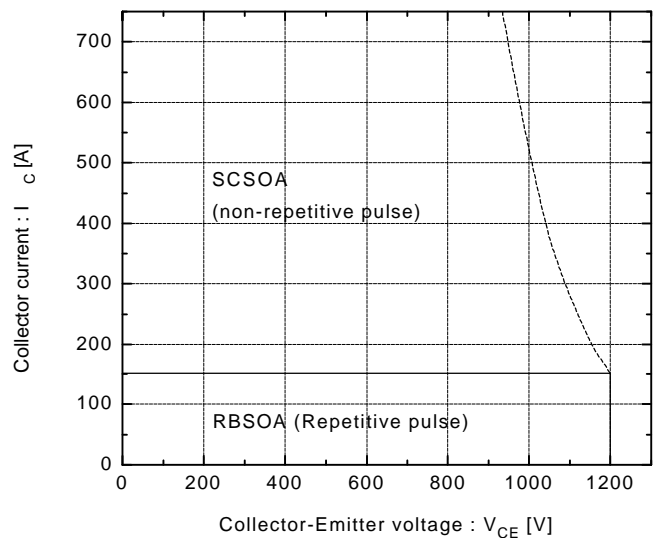
$t_{rr}, I_{rr}$  vs.  $I_F$



Transient thermal resistance

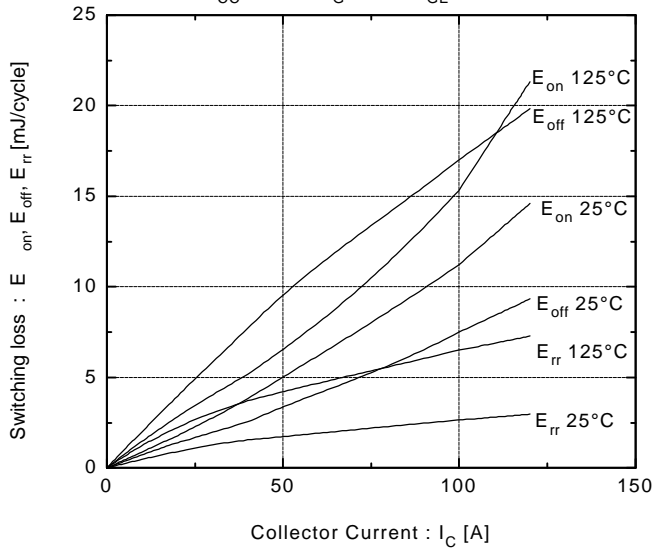


Reversed biased safe operating area  
 $+V_{GE}=15V, -V_{GE}\le 15V, T_J\le 125^\circ C, R_G\ge 16\Omega$



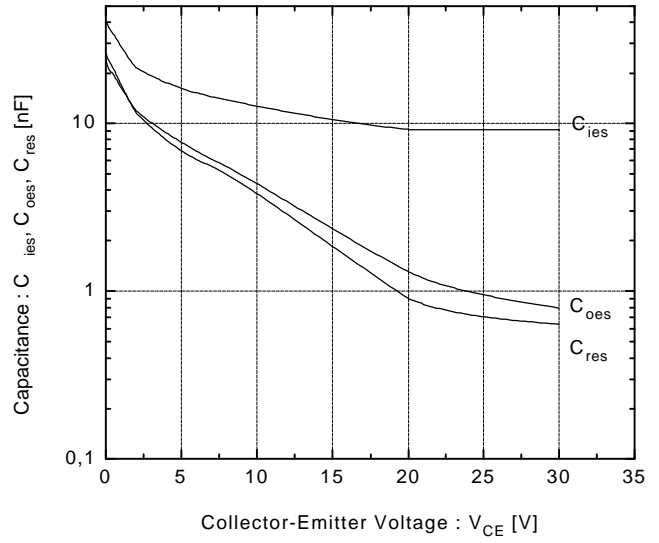
Switching loss vs. Collector current

$V_{CC}=600V, R_G=16\Omega, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage

$T_j=25^\circ C$



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