

## IGBT MODULE ( N series )

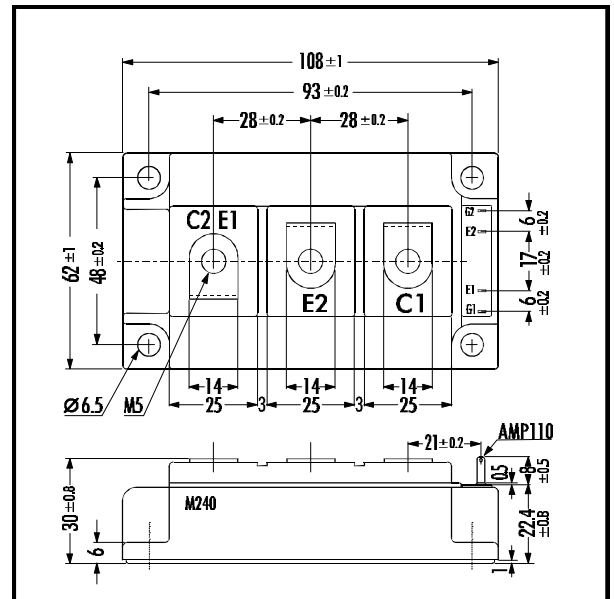
### ■ Features

- 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>        | 100   |
|                           | 1ms              | I <sub>C</sub> PULSE  | 200   |
|                           | Continuous       | -I <sub>C</sub>       | 100   |
|                           | 1ms              | -I <sub>C</sub> PULSE | 200   |
| Max. Power Dissipation    | P <sub>C</sub>   | 780                   | W     |
| Operating Temperature     | T <sub>j</sub>   | +150                  | °C    |
| Storage Temperature       | T <sub>stg</sub> | -40 ~ +125            | °C    |
| Isolation Voltage         | A.C. 1min.       | V <sub>is</sub>       | 2500  |
| Screw Torque              | Mounting *1      | 3.5                   | Nm    |
|                           | Terminals *2     | 4.5                   |       |

Note: \*1:Recommendable Value; 2.5 ~ 3.5 Nm (M5) or (M6)  
\*2:Recommendable Value; 3.5 ~ 4.5 Nm (M6)

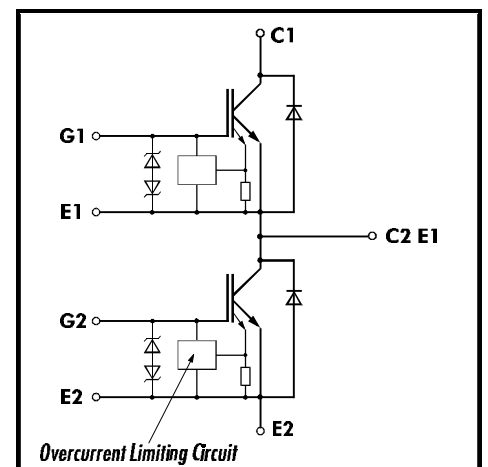
#### • Electrical Characteristics ( at T<sub>j</sub>=25°C )

| 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 |      |       | 2.0  | mA    |
| Gate-Emitter Leakage Current         | I <sub>GES</sub>     | V <sub>CE</sub> =0V V <sub>GE</sub> =± 20V |      |       | 30   | μA    |
| Gate-Emitter Threshold Voltage       | V <sub>GE(th)</sub>  | V <sub>GE</sub> =20V I <sub>C</sub> =100mA | 4.5  |       | 7.5  | V     |
| Collector-Emitter Saturation Voltage | V <sub>CE(sat)</sub> | V <sub>GE</sub> =15V I <sub>C</sub> =100A  |      |       | 3.3  | V     |
| Input capacitance                    | C <sub>ies</sub>     | V <sub>GE</sub> =0V                        |      | 16000 |      | pF    |
| Output capacitance                   | C <sub>oes</sub>     | V <sub>CE</sub> =10V                       |      | 5800  |      |       |
| Reverse Transfer capacitance         | C <sub>res</sub>     | f=1MHz                                     |      | 5160  |      |       |
| Turn-on Time                         | t <sub>ON</sub>      | V <sub>CC</sub> =600V                      |      | 0.65  | 1.2  | μs    |
|                                      | t <sub>r</sub>       | I <sub>C</sub> =100A                       |      | 0.25  | 0.6  |       |
| Turn-off Time                        | t <sub>OFF</sub>     | V <sub>GE</sub> =± 15V                     |      | 0.85  | 1.5  |       |
|                                      | t <sub>f</sub>       | R <sub>G</sub> =9.1Ω                       |      | 0.35  | 0.5  |       |
| Diode Forward On-Voltage             | V <sub>F</sub>       | I <sub>F</sub> =100A V <sub>GE</sub> =0V   |      |       | 3.0  | V     |
| Reverse Recovery Time                | t <sub>rr</sub>      | I <sub>F</sub> =100A                       |      |       | 350  | ns    |

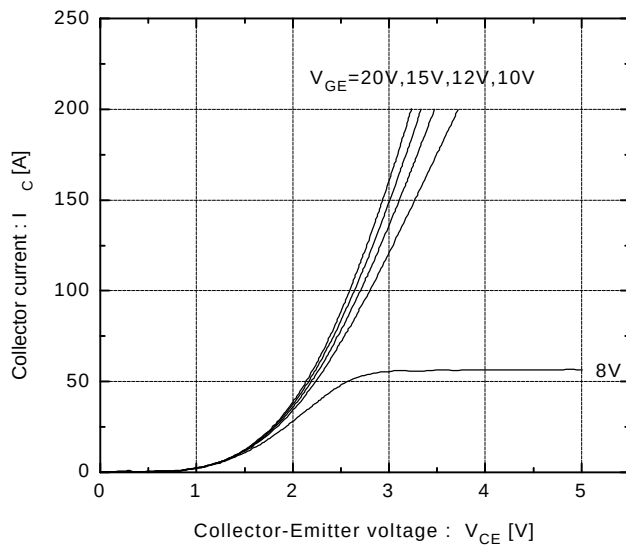
#### • Thermal Characteristics

| Items              | Symbols              | Test Conditions       | Min. | Typ.  | Max. | Units |
|--------------------|----------------------|-----------------------|------|-------|------|-------|
| Thermal Resistance | R <sub>th(j-c)</sub> | IGBT                  |      |       | 0.16 | °C/W  |
|                    | R <sub>th(j-e)</sub> | Diode                 |      |       | 0.43 |       |
|                    | R <sub>th(c-f)</sub> | With Thermal Compound |      | 0.025 |      |       |

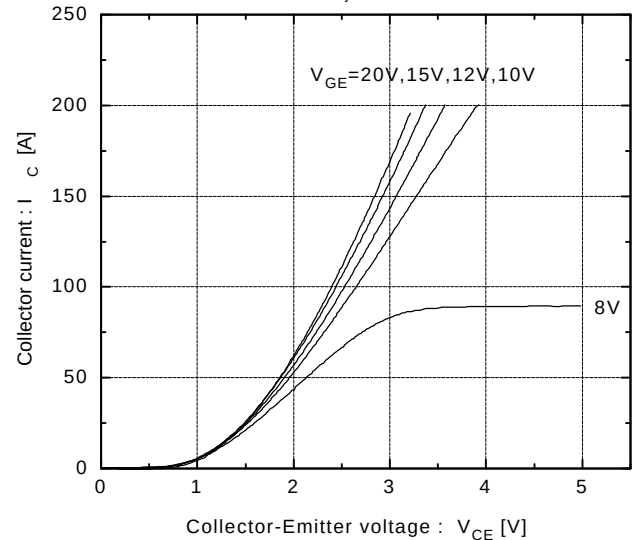
### ■ Equivalent Circuit



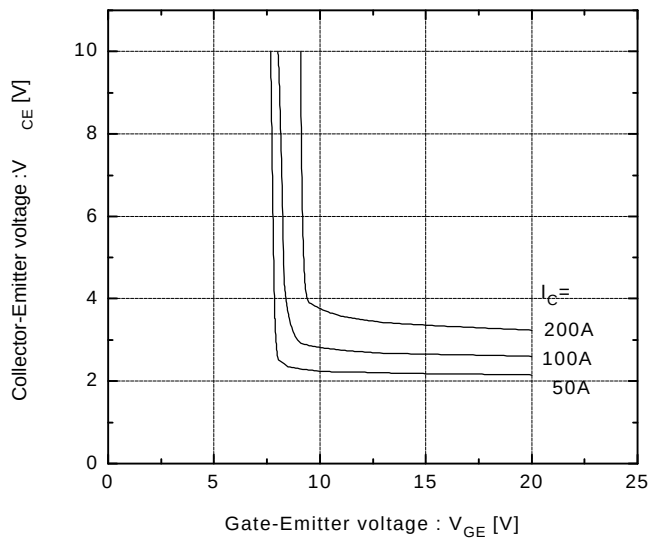
Collector current vs. Collector-Emitter voltage

 $T_J = 25^\circ\text{C}$ 


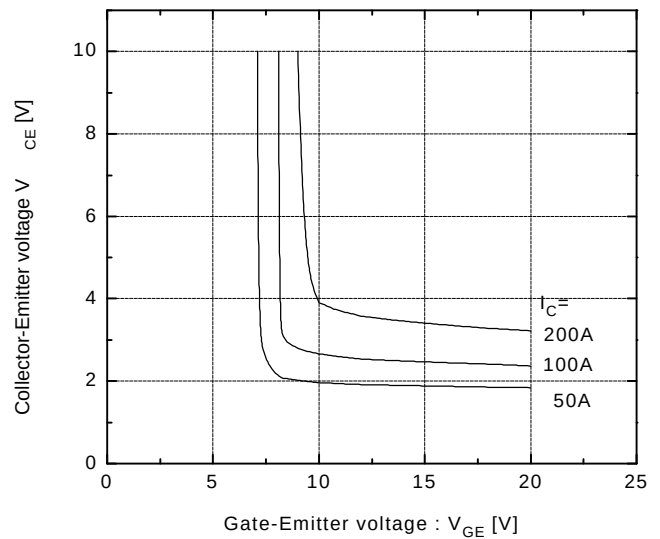
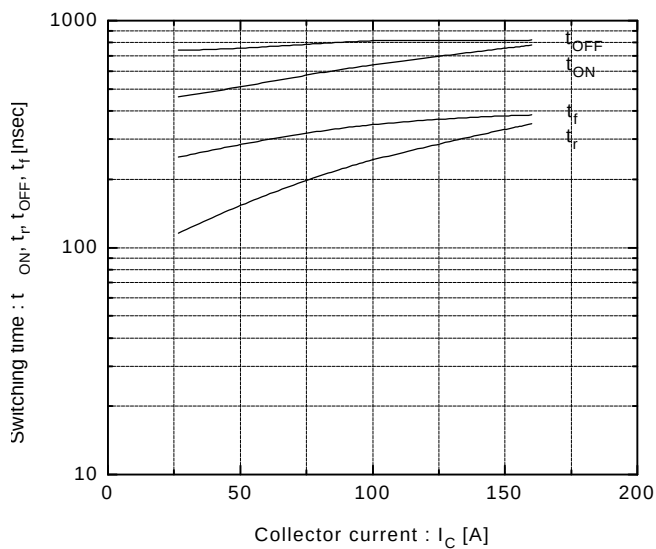
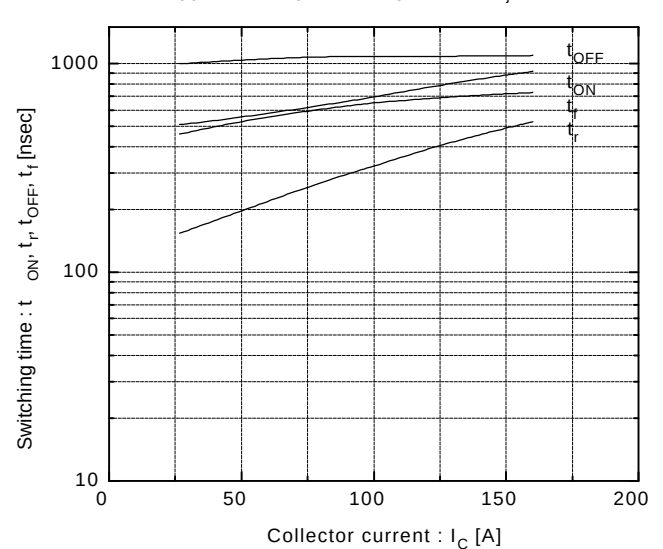
Collector current vs. Collector-Emitter voltage

 $T_J = 125^\circ\text{C}$ 


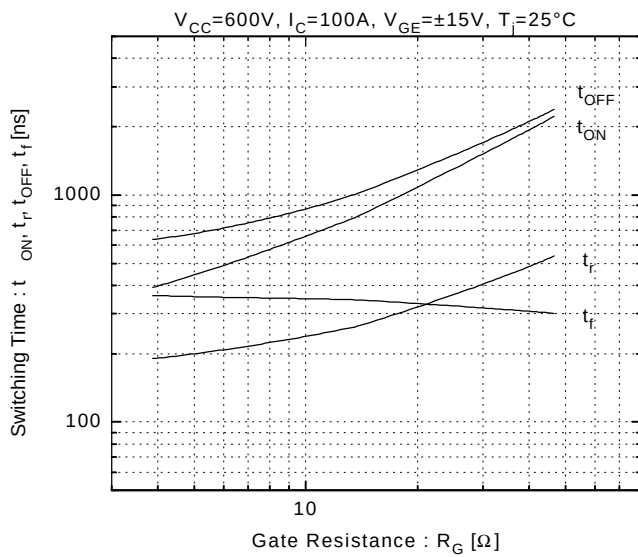
Collector-Emitter vs. Gate-Emitter voltage

 $T_J = 25^\circ\text{C}$ 


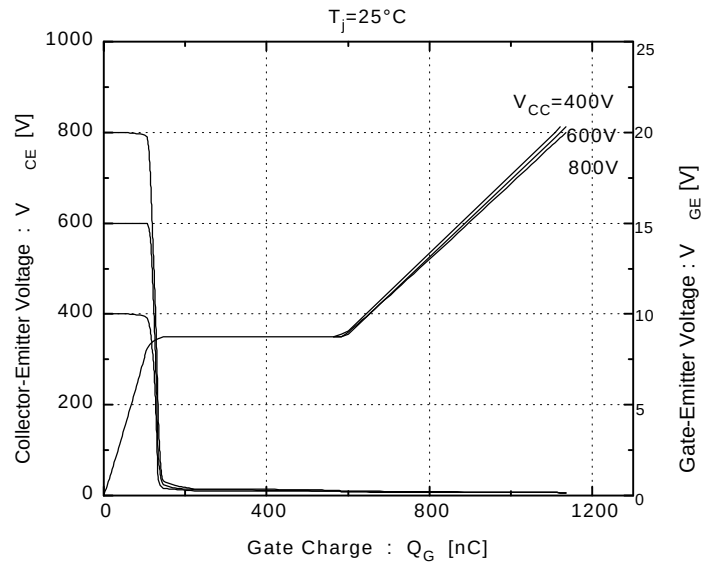
Collector-Emitter vs. Gate-Emitter voltage

 $T_J = 125^\circ\text{C}$ 

 Switching time vs. Collector current  
 $V_{CC} = 600V, R_G = 9.1\Omega, V_{GE} = \pm 15V, T_J = 25^\circ\text{C}$ 

 Switching time vs. Collector current  
 $V_{CC} = 600V, R_G = 9.1\Omega, V_{GE} = \pm 15V, T_J = 125^\circ\text{C}$ 


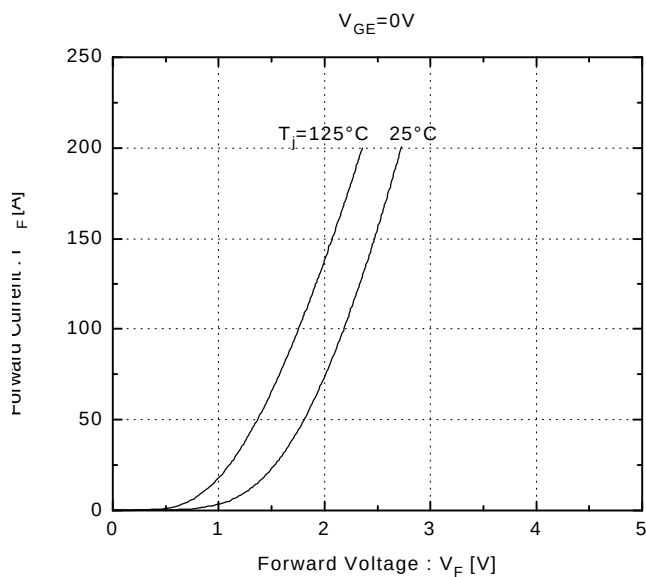
Switching Time vs.  $R_G$



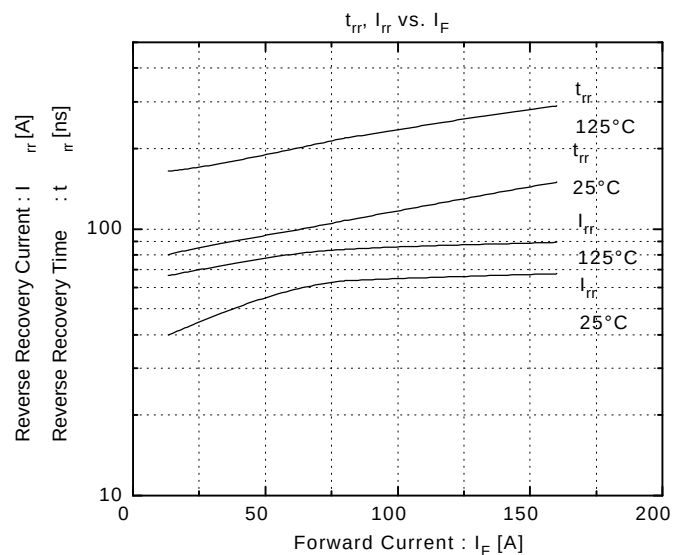
Dynamic Input Characteristics



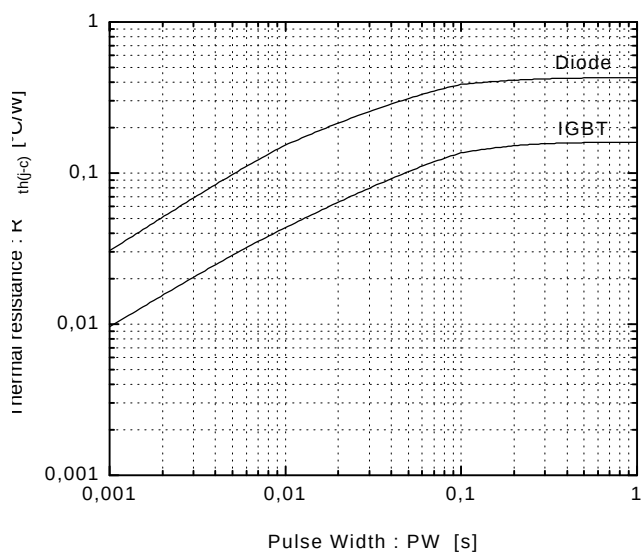
Forward Current vs. Forward Voltage



Reverse Recovery Characteristics

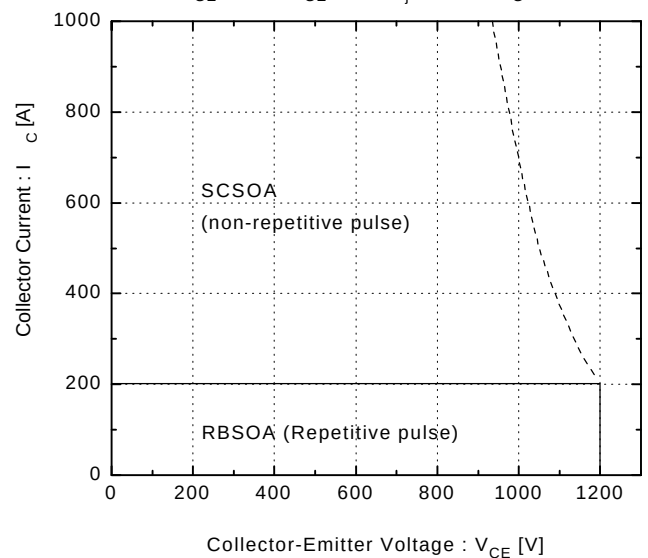


Transient Thermal Resistance

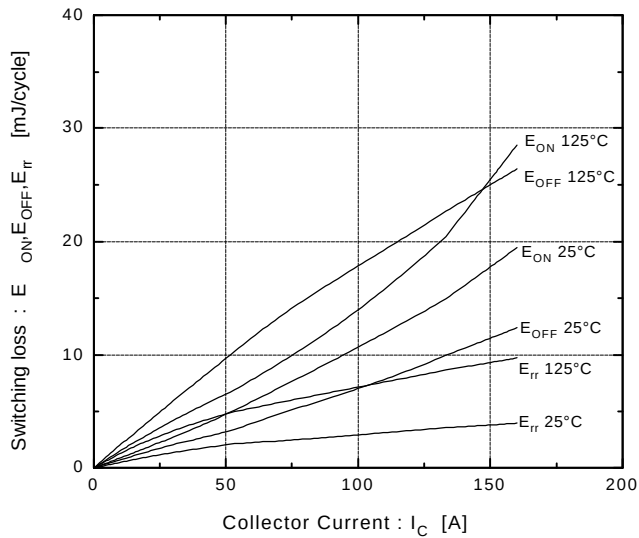


Reversed Biased Safe Operating Area

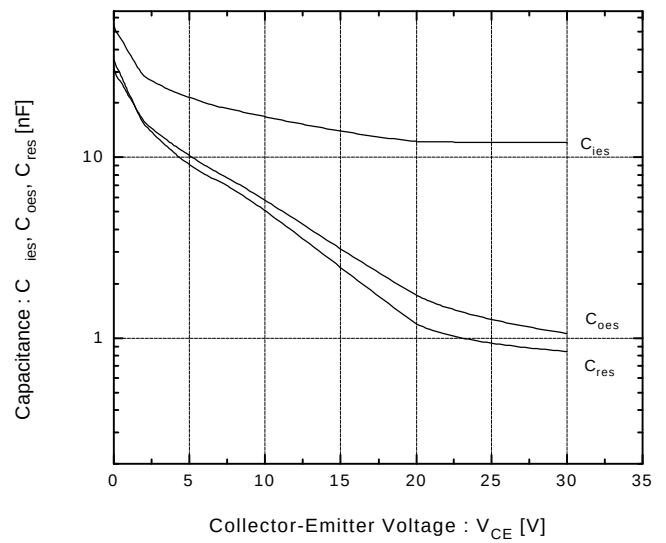
$+V_{GE}=15V, -V_{GE}\leq 15V, T_J\leq 125^\circ C, R_G\geq 9.1\Omega$



Switching loss vs. Collector current

 $V_{CC}=600V$ ,  $R_G=9.1\Omega$ ,  $V_{GE}=\pm 15V$ 


Capacitance vs. Collector-Emitter voltage

 $T_J=25^\circ C$ 

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