

## IGBT MODULE ( N series )

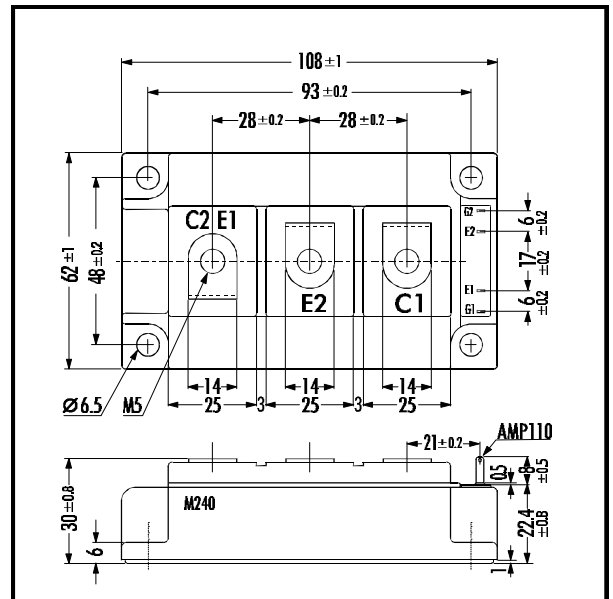
### ■ Features

- 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 ( $T_c=25^{\circ}\text{C}$ )

| Items                     | Symbols      | Ratings                | Units              |
|---------------------------|--------------|------------------------|--------------------|
| Collector-Emitter Voltage | $V_{CES}$    | 1200                   | V                  |
| Gate -Emitter Voltage     | $V_{GES}$    | $\pm 20$               | V                  |
| Collector Current         | Continuous   | $I_C$                  | 100                |
|                           | 1ms          | $I_{C \text{ PULSE}}$  | 200                |
|                           | Continuous   | $-I_C$                 | 100                |
|                           | 1ms          | $-I_{C \text{ PULSE}}$ | 200                |
| Max. Power Dissipation    | $P_C$        | 780                    | W                  |
| Operating Temperature     | $T_j$        | +150                   | $^{\circ}\text{C}$ |
| Storage Temperature       | $T_{stg}$    | -40 ~ +125             | $^{\circ}\text{C}$ |
| Isolation Voltage         | A.C. 1min.   | $V_{is}$               | 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)

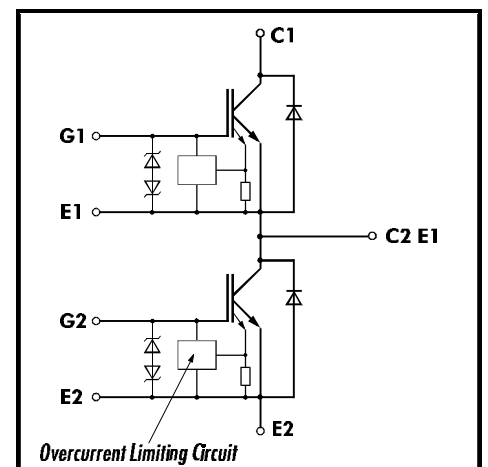
#### • Electrical Characteristics ( at $T_j=25^{\circ}\text{C}$ )

| Items                                | Symbols       | Test Conditions                 | Min. | Typ.  | Max. | Units         |
|--------------------------------------|---------------|---------------------------------|------|-------|------|---------------|
| Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{GE}=0V$ $V_{CE}=1200V$      |      |       | 2.0  | mA            |
| Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0V$ $V_{GE}=\pm 20V$    |      |       | 30   | $\mu\text{A}$ |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $V_{GE}=20V$ $I_C=100\text{mA}$ | 4.5  |       | 7.5  | V             |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V$ $I_C=100A$         |      |       | 3.3  | V             |
| Input capacitance                    | $C_{ies}$     | $V_{GE}=0V$                     |      | 16000 |      | pF            |
| Output capacitance                   | $C_{oes}$     | $V_{CE}=10V$                    |      | 5800  |      |               |
| Reverse Transfer capacitance         | $C_{res}$     | $f=1\text{MHz}$                 |      | 5160  |      |               |
| Turn-on Time                         | $t_{ON}$      | $V_{CC}=600V$                   |      | 0.65  | 1.2  | $\mu\text{s}$ |
|                                      | $t_r$         | $I_C=100A$                      |      | 0.25  | 0.6  |               |
| Turn-off Time                        | $t_{OFF}$     | $V_{GE}=\pm 15V$                |      | 0.85  | 1.5  |               |
|                                      | $t_f$         | $R_G=9.1\Omega$                 |      | 0.35  | 0.5  |               |
| Diode Forward On-Voltage             | $V_F$         | $I_F=100A$ $V_{GE}=0V$          |      |       | 3.0  | V             |
| Reverse Recovery Time                | $t_{rr}$      | $I_F=100A$                      |      |       | 350  | ns            |

#### • Thermal Characteristics

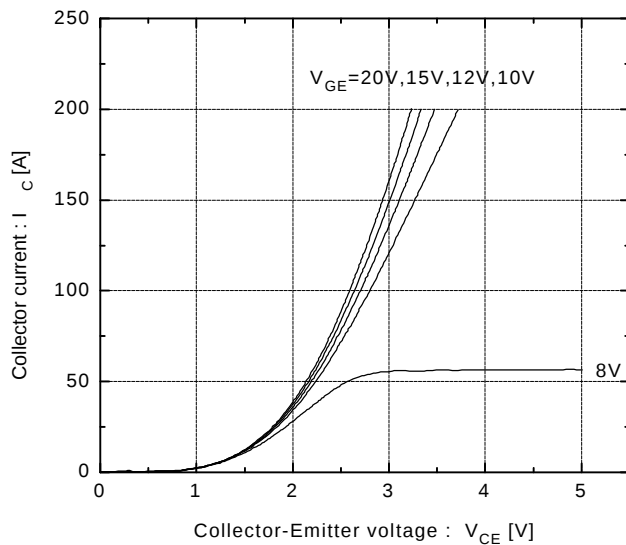
| Items              | Symbols       | Test Conditions       | Min. | Typ.  | Max. | Units                |
|--------------------|---------------|-----------------------|------|-------|------|----------------------|
| Thermal Resistance | $R_{th(j-c)}$ | IGBT                  |      |       | 0.16 | $^{\circ}\text{C/W}$ |
|                    | $R_{th(j-e)}$ | Diode                 |      |       | 0.43 |                      |
|                    | $R_{th(c-f)}$ | With Thermal Compound |      | 0.025 |      |                      |

### ■ Equivalent Circuit



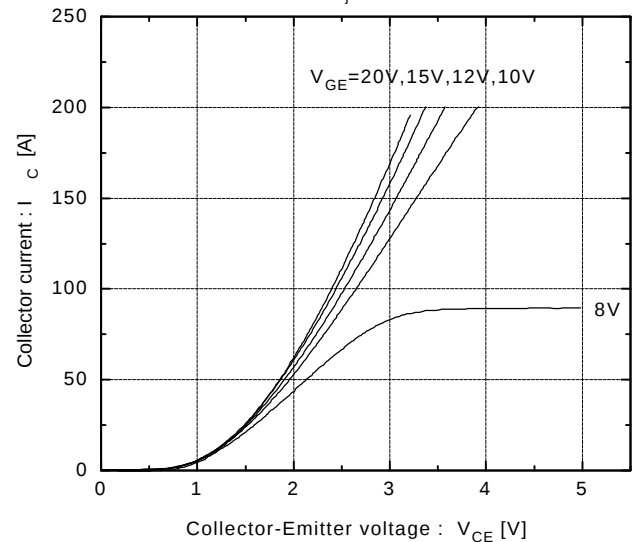
Collector current vs. Collector-Emitter voltage

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



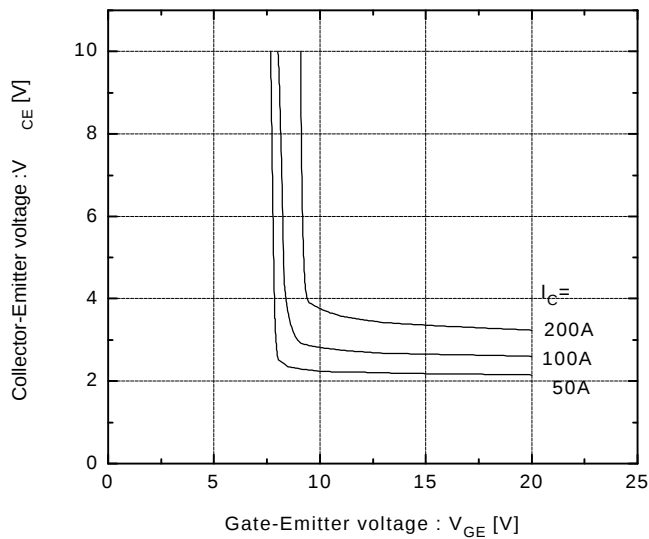
Collector current vs. Collector-Emitter voltage

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



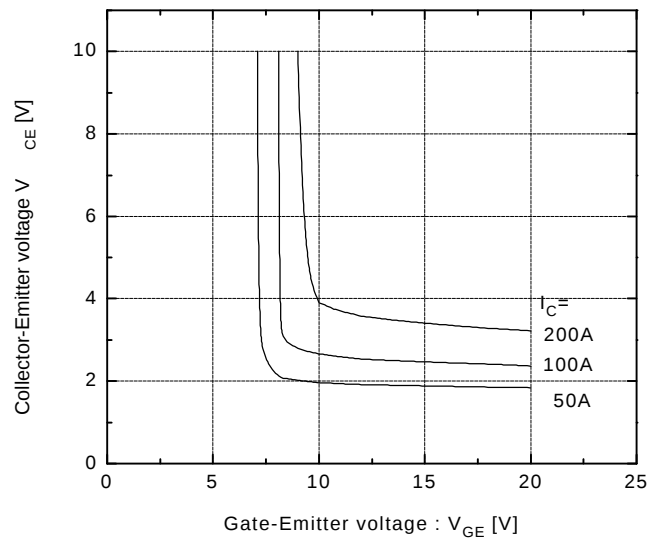
Collector-Emitter vs. Gate-Emitter voltage

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

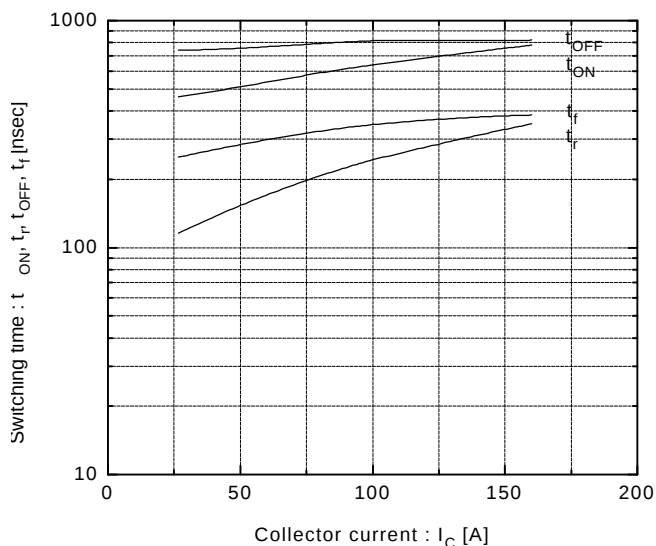


Collector-Emitter vs. Gate-Emitter voltage

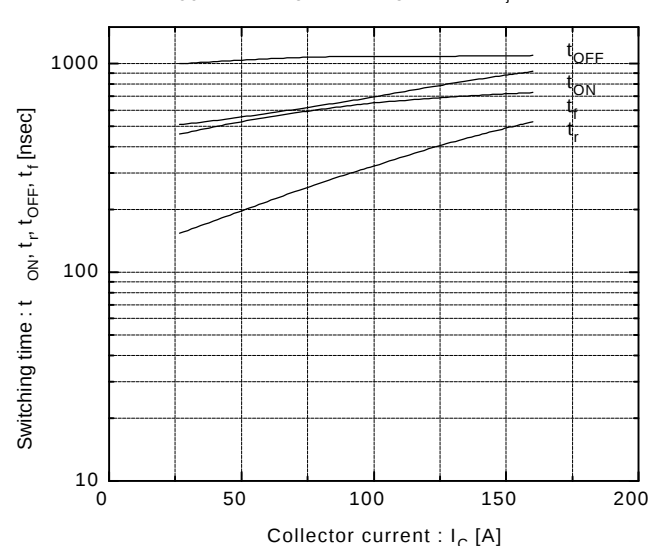
$T_J=125^\circ\text{C}$



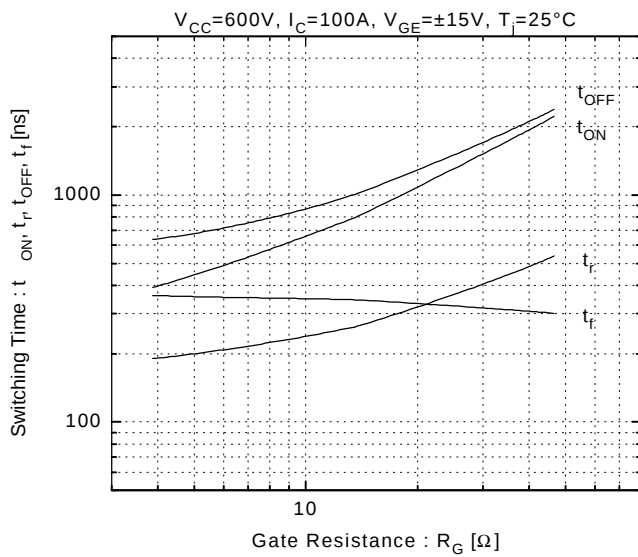
Switching time vs. Collector current  
 $V_{CC}=600V, R_G=9.1\Omega, V_{GE}=\pm 15V, T_J=25^\circ\text{C}$



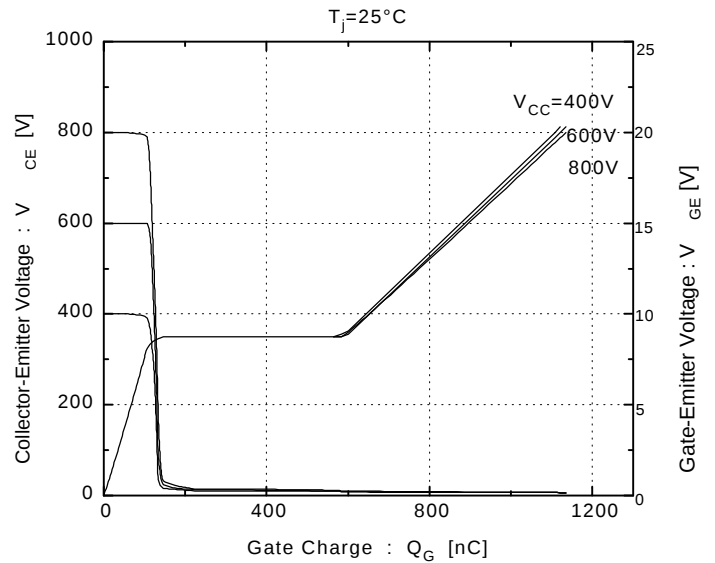
Switching time vs. Collector current  
 $V_{CC}=600V, R_G=9.1\Omega, V_{GE}=\pm 15V, T_J=125^\circ\text{C}$



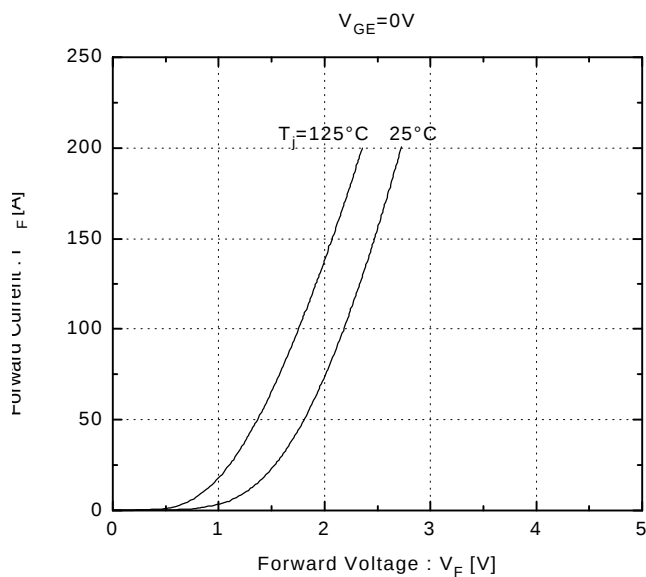
Switching Time vs.  $R_G$



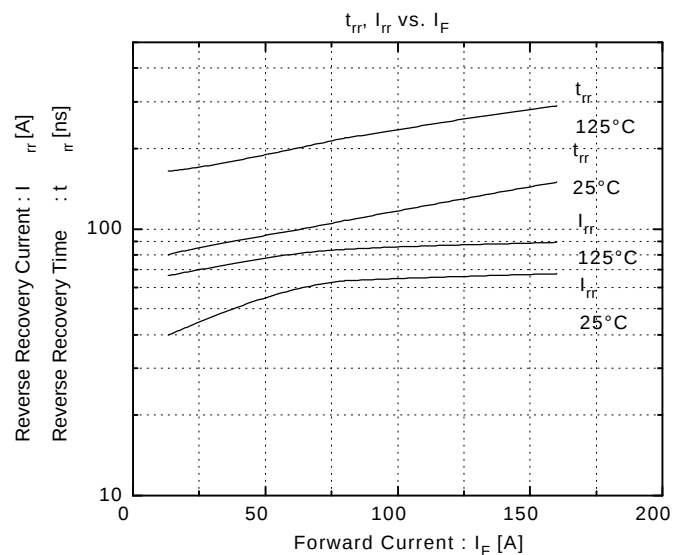
Dynamic Input Characteristics



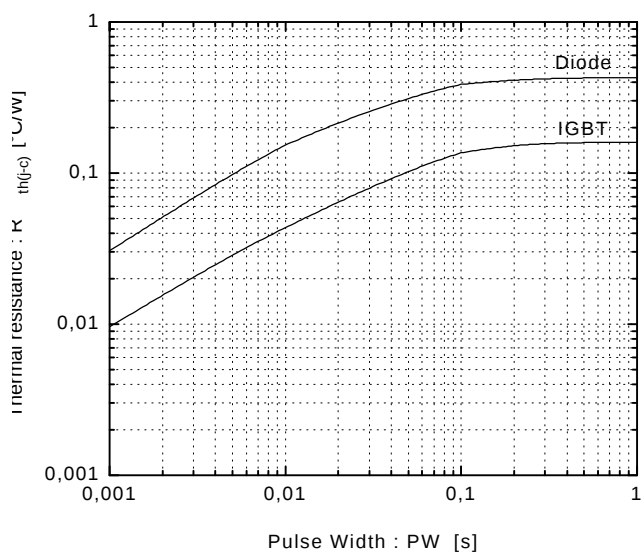
Forward Current vs. Forward Voltage



Reverse Recovery Characteristics

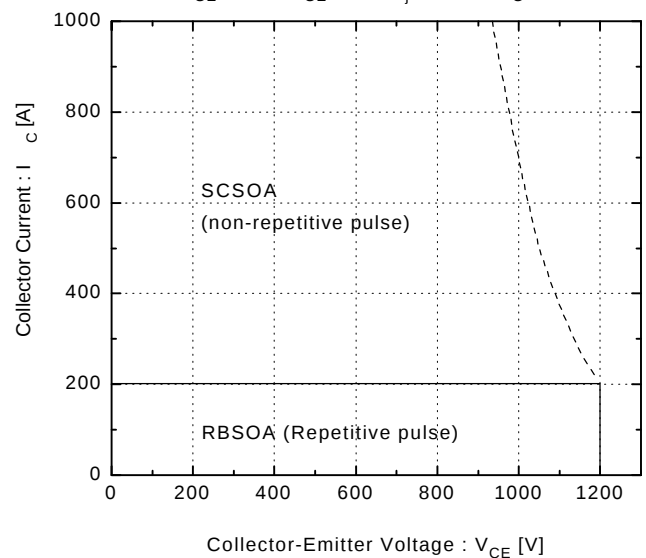


Transient Thermal Resistance

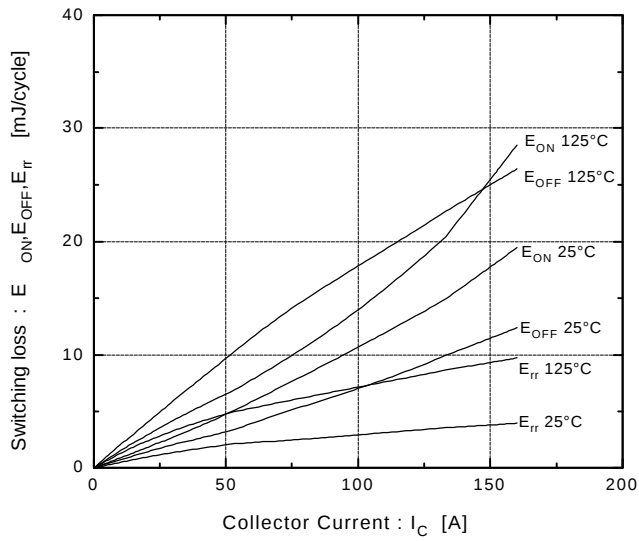


Reversed Biased Safe Operating Area

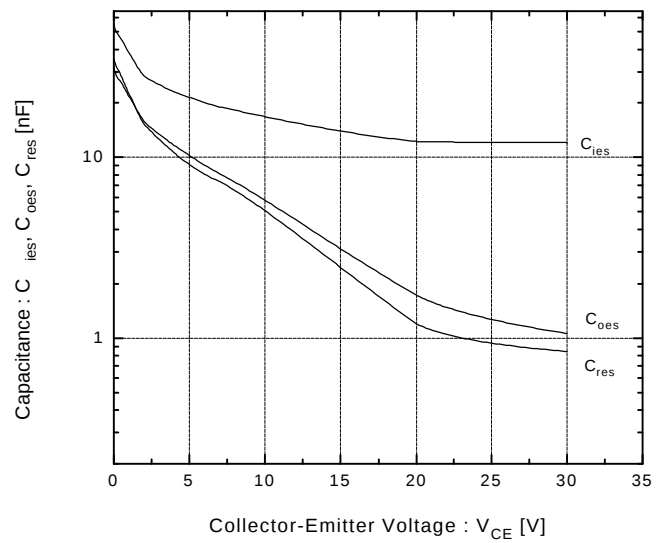
$+V_{GE}=15V, -V_{GE}\leq 15V, T_J\leq 125^\circ C, R_G\geq 9.1\Omega$



Switching loss vs. Collector current

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


Capacitance vs. Collector-Emitter voltage

 $T_J=25^\circ C$ 

**Fuji Electric GmbH**

Lyoner Straße 26

D-60528 Frankfurt/M

Tel.: 069 - 66 90 29 - 0

Fax.: 069 - 66 90 29 - 56

**Fuji Electric (UK) Ltd.**

 Commonwealth House  
 2 Chalkhill Road Hammersmith

London W6 8DW, UK

Tel.: 0181 - 233 11 30

Fax.: 0181 - 233 11 60