

## IGBT MODULE ( S-Series )

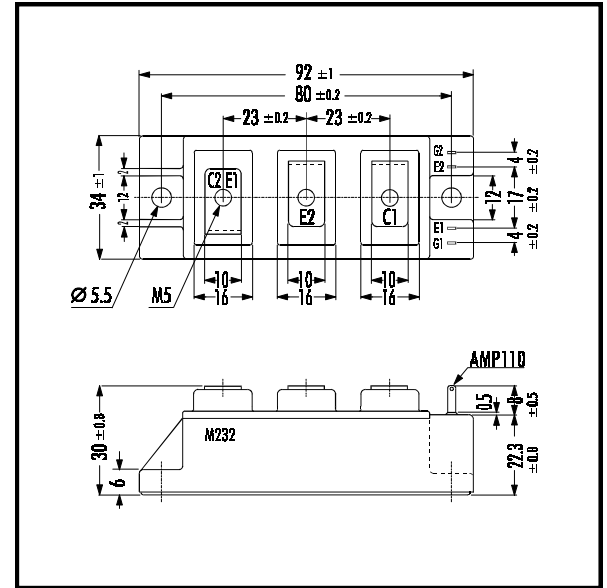
### ■ Features

- NPT-Technology
- Square SC SOA at  $10 \times I_C$
- High Short Circuit Withstand-Capability
- Small Temperature Dependence of the Turn-Off Switching Loss
- Low Losses And Soft Switching

### ■ Applications

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

## ■ Outline Drawing



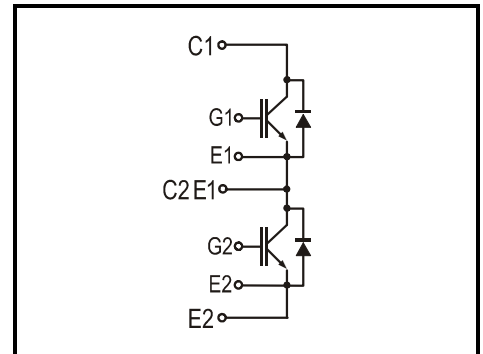
## ■ Maximum Ratings and Characteristics

### • Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ )

| Items                     | Symbols      | Ratings        | Units            |   |
|---------------------------|--------------|----------------|------------------|---|
| Collector-Emitter Voltage | $V_{CES}$    | 1200           | V                |   |
| Gate -Emitter Voltage     | $V_{GES}$    | $\pm 20$       |                  |   |
| Collector Current         | Continuous   | $I_C$          | 100 / 75         |   |
|                           | 1ms          | $I_{C PULSE}$  | 200 / 150        |   |
|                           | Continuous   | $-I_C$         | 75               |   |
|                           | 1ms          | $-I_{C PULSE}$ | 150              |   |
| Max. Power Dissipation    | $P_C$        | 600            | W                |   |
| Operating Temperature     | $T_j$        | +150           | $^\circ\text{C}$ |   |
| Storage Temperature       | $T_{stg}$    | -40 ~ +125     |                  |   |
| Isolation Voltage *1      | A.C. 1min.   | $V_{is}$       | 2500             | V |
| Screw Torque              | Mounting *2  | 3.5            | Nm               |   |
|                           | Terminals *2 | 3.5            |                  |   |

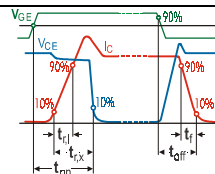
Note: 1\*: All Terminals should be connected together when isolation test will be done.  
2\*: Recommendable Value, 2.5 - 3.5 Nm (M5)

## ■ Equivalent Circuit



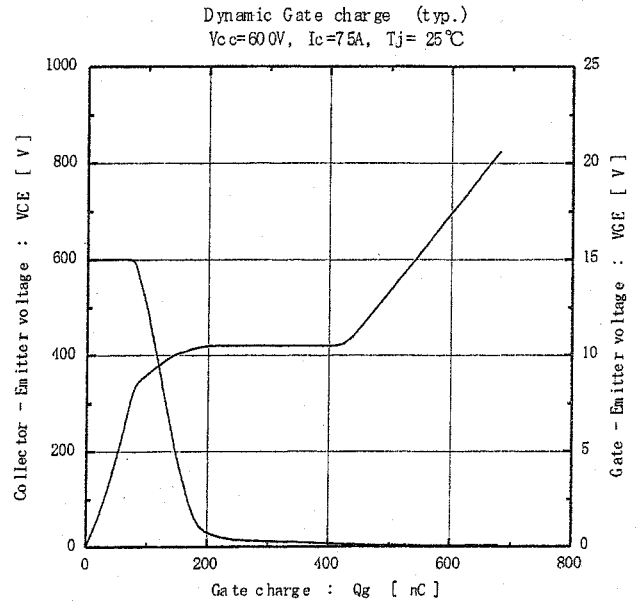
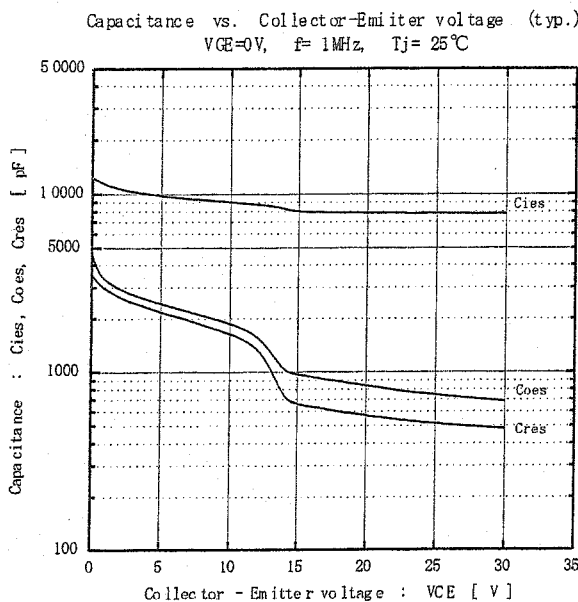
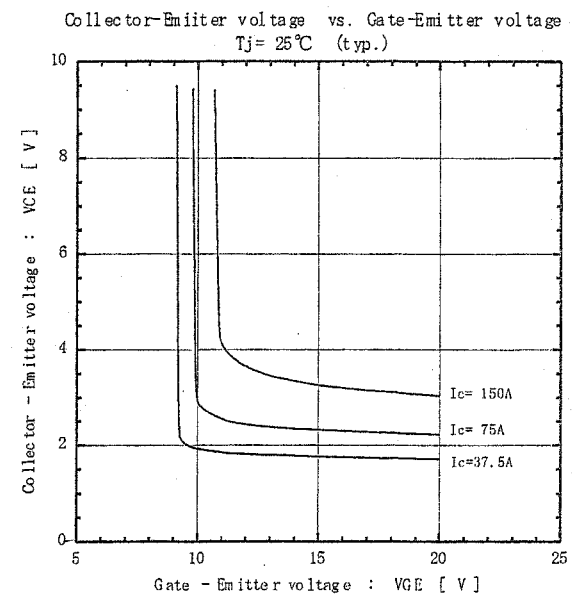
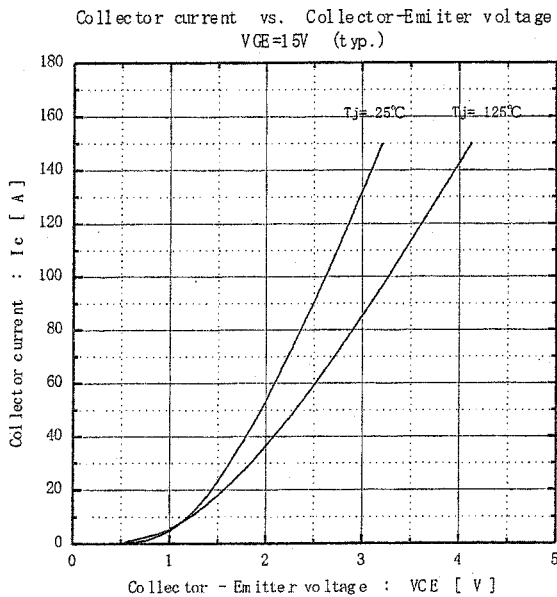
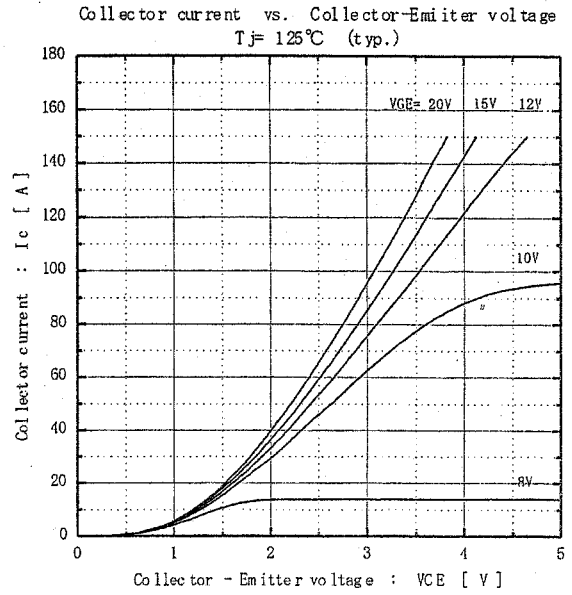
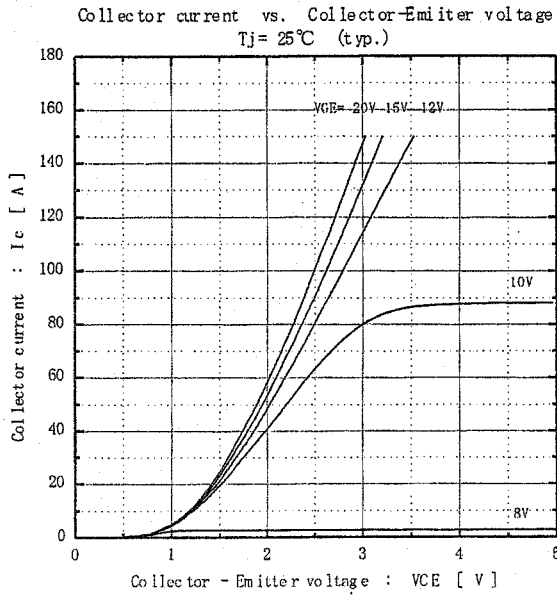
### • Electrical Characteristics ( at $T_j=25^\circ\text{C}$ )

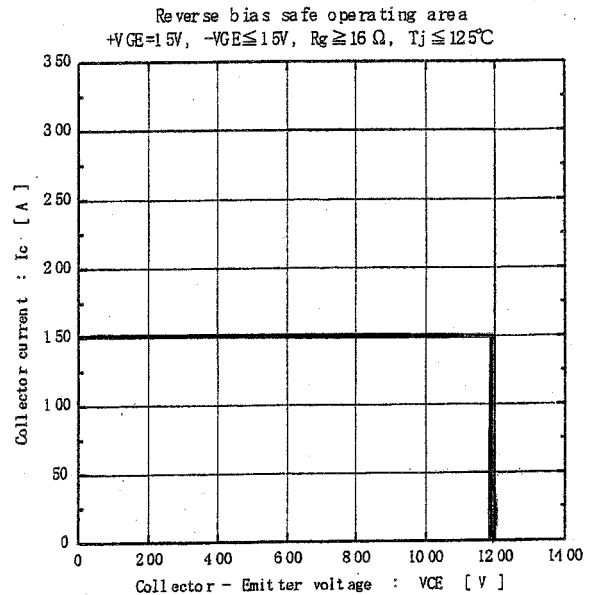
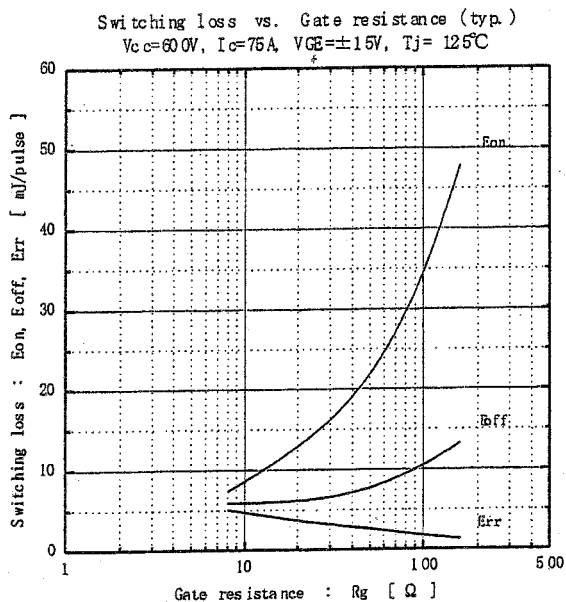
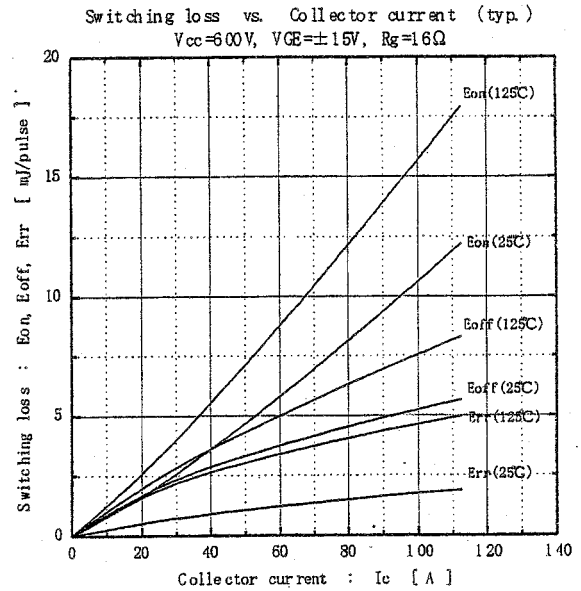
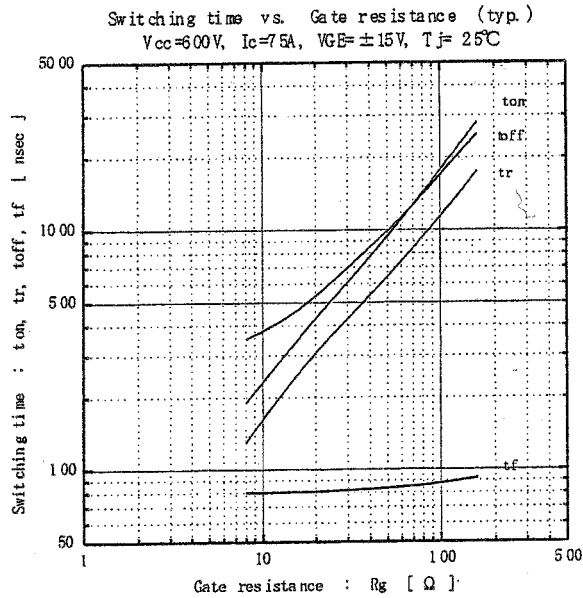
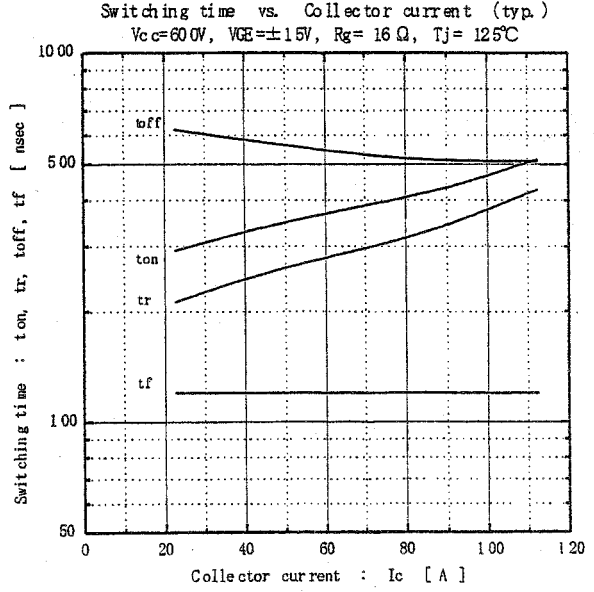
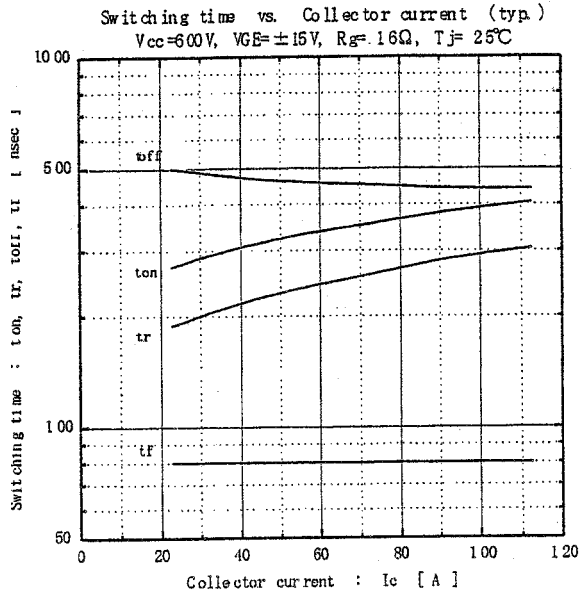
| Items                                | Symbols       | Test Conditions              | Min.                      | Typ.  | Max. | Units         |
|--------------------------------------|---------------|------------------------------|---------------------------|-------|------|---------------|
| Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{GE}=0V$ $V_{CE}=1200V$   |                           |       | 1.0  | mA            |
| Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0V$ $V_{GE}=\pm 20V$ |                           |       | 200  | nA            |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $V_{GE}=20V$ $I_C=75mA$      | 5.5                       | 7.2   | 8.5  | V             |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V$ $I_C=75A$       | $T_j = 25^\circ\text{C}$  | 2.3   | 2.6  |               |
|                                      |               |                              | $T_j = 125^\circ\text{C}$ | 2.8   |      |               |
| Input Capacitance                    | $C_{ies}$     | $V_{GE}=0V$                  |                           | 9'000 |      | pF            |
| Output Capacitance                   | $C_{oes}$     | $V_{CE}=10V$                 |                           | 1'875 |      |               |
| Reverse Transfer Capacitance         | $C_{res}$     | $f=1MHz$                     |                           | 1'650 |      |               |
| Turn-on Time                         | $t_{ON}$      | $V_{CC} = 600V$              |                           | 0.35  | 1.2  | $\mu\text{s}$ |
|                                      | $t_{r,x}$     | $I_C = 75A$                  |                           | 0.25  | 0.6  |               |
|                                      | $t_{r,i}$     | $V_{GE} = \pm 15V$           |                           | 0.10  |      |               |
| Turn-off Time                        | $t_{OFF}$     | $R_G = 16\Omega$             |                           | 0.45  | 1.0  | $\mu\text{s}$ |
|                                      | $t_f$         | Inductive Load               |                           | 0.08  | 0.3  |               |
| Diode Forward On-Voltage             | $V_F$         | $I_F=75A$ ; $V_{GE}=0V$      | $T_j = 25^\circ\text{C}$  | 2.3   | 3.0  | V             |
|                                      |               |                              | $T_j = 125^\circ\text{C}$ | 2.0   |      |               |
| Reverse Recovery Time                | $t_{rr}$      | $I_F=75A$                    |                           |       | 350  | ns            |



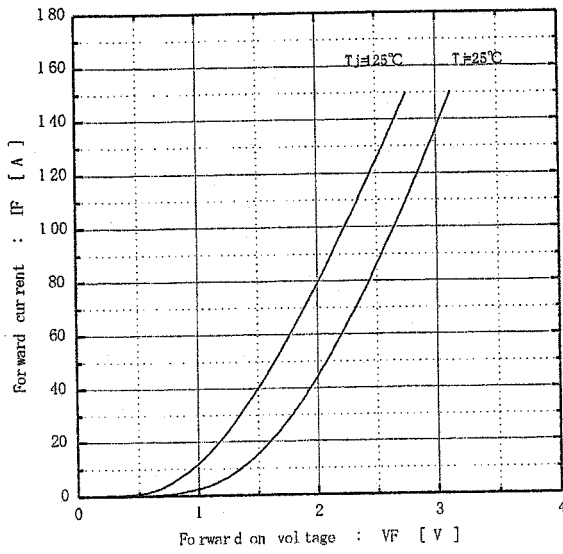
### • Thermal Characteristics

| Items              | Symbols       | Test Conditions       | Min. | Typ. | Max. | Units              |
|--------------------|---------------|-----------------------|------|------|------|--------------------|
| Thermal Resistance | $R_{th(j-c)}$ | IGBT                  |      |      | 0.21 | $^\circ\text{C/W}$ |
|                    | $R_{th(j-c)}$ | Diode                 |      |      | 0.47 |                    |
|                    | $R_{th(c-f)}$ | With Thermal Compound |      | 0.05 |      |                    |

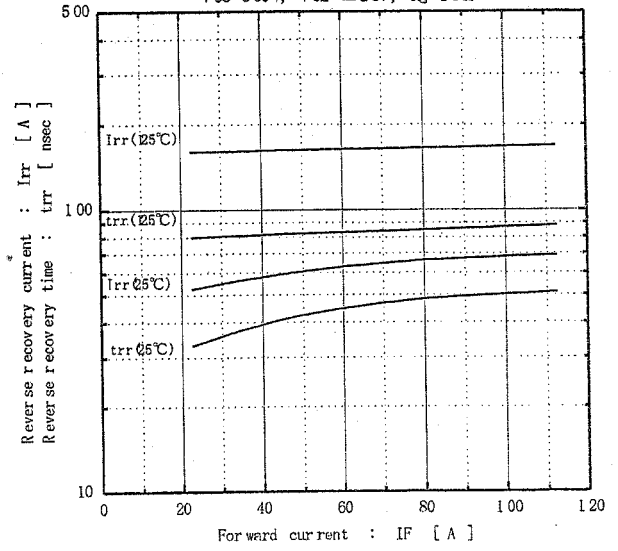




Forward current vs. Forward on voltage (typ.)



Reverse recovery characteristics (typ.)  
Vcc=600V, VGE=±15V, Rg=16Ω



Transient thermal resistance

