

### IGBT MODULE (S series) 1400V / 35A / PIM



#### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C. Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit

#### ■ Applications

- Inverter for Motoe Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply

#### ■ Maximum ratings and characteristics

● Absolute maximum ratings ( $T_c=25^\circ\text{C}$  unless without specified)

| Item                            | Symbol                              | Condition | Rating                         | Unit                   |                      |   |
|---------------------------------|-------------------------------------|-----------|--------------------------------|------------------------|----------------------|---|
| Inverter                        | Collector-Emitter voltage           | $V_{CES}$ | 1400                           | V                      |                      |   |
|                                 | Gate-Emitter voltage                | $V_{GES}$ | $\pm 20$                       | V                      |                      |   |
|                                 | Collector current                   | $I_C$     | Continuous                     | $T_c=25^\circ\text{C}$ | 50                   | A |
|                                 |                                     |           |                                | $T_c=75^\circ\text{C}$ | 35                   |   |
|                                 |                                     | $I_{CP}$  | 1ms                            | $T_c=25^\circ\text{C}$ | 100                  | A |
|                                 |                                     |           |                                | $T_c=75^\circ\text{C}$ | 70                   |   |
|                                 | $-I_C$                              |           | 35                             | A                      |                      |   |
| Collector power dissipation     | $P_C$                               | 1 device  | 240                            | W                      |                      |   |
| Brake                           | Collector-Emitter voltage           | $V_{CES}$ | 1400                           | V                      |                      |   |
|                                 | Gate-Emitter voltage                | $V_{GES}$ | $\pm 20$                       | V                      |                      |   |
|                                 | Collector current                   | $I_C$     | Continuous                     | $T_c=25^\circ\text{C}$ | 35                   | A |
|                                 |                                     |           |                                | $T_c=75^\circ\text{C}$ | 25                   |   |
|                                 |                                     | $I_{CP}$  | 1ms                            | $T_c=25^\circ\text{C}$ | 70                   | A |
|                                 |                                     |           |                                | $T_c=75^\circ\text{C}$ | 50                   |   |
| Collector power dissipation     | $P_C$                               | 1 device  | 180                            | W                      |                      |   |
| Repetitive peak reverse voltage | $V_{RRM}$                           |           | 1400                           | V                      |                      |   |
| Converter                       | Repetitive peak reverse voltage     | $V_{RRM}$ | 1600                           | V                      |                      |   |
|                                 | Average output current              | $I_O$     | 50Hz/60Hz sine wave            | 35                     | A                    |   |
|                                 | Surge current (Non-Repetitive)      | $I_{FSM}$ | $T_j=150^\circ\text{C}$ , 10ms | 360                    | A                    |   |
|                                 | $I^2t$ (Non-Repetitive)             | $I^2t$    | half sine wave                 | 648                    | $\text{A}^2\text{s}$ |   |
| Operating junction temperature  | $T_j$                               |           | +150                           | $^\circ\text{C}$       |                      |   |
| Storage temperature             | $T_{stg}$                           |           | -40 to +125                    | $^\circ\text{C}$       |                      |   |
| Isolation voltage               | between terminal and copper base *2 | $V_{iso}$ | AC : 1 minute                  | AC 2500                | V                    |   |
|                                 | between thermistor and others *3    |           |                                | AC 2500                |                      |   |
| Mounting screw torque           |                                     |           | 3.5 *1                         | N·m                    |                      |   |

\*1 Recommendable value : 2.5 to 3.5 N·m (M5)

\*2 All terminals should be connected together when isolation test will be done.

\*3 Terminal 8 and 9 should be connected together. Terminal 1 to 7 and 10 to 24 should be connected together and shorted to copper base.

## ● Electrical characteristics (T<sub>j</sub>=25°C unless otherwise specified)

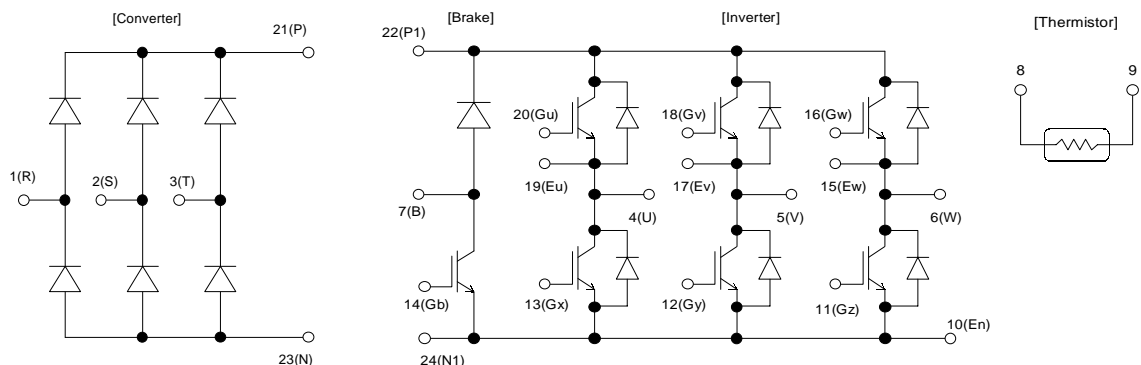
| Item                         | Symbol                               | Condition            | Characteristics   |          |      | Unit |     |   |
|------------------------------|--------------------------------------|----------------------|---|----------|------|------|-----|---|
|                              |                                      |                      | Min.  | Typ.     | Max. |      |     |   |
| Inverter                     | Zero gate voltage collector current  | ICES                 | V <sub>CE</sub> =1400V, V <sub>GE</sub> =0V                           |          | 1.0  | mA   |     |   |
|                              | Gate-Emitter leakage current         | IGES                 | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V                            |          | 0.2  | μA   |     |   |
|                              | Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>  | V <sub>CE</sub> =20V, I <sub>c</sub> =35mA                            |          | 5.5  | 7.2  | 8.5 | V |
|                              | Collector-Emitter saturation voltage | V <sub>CE(sat)</sub> | V <sub>GE</sub> =15V, I <sub>c</sub> =35A                             | chip     | 2.2  |      | V   |   |
|                              |                                      |                      |   | terminal | 2.35 | 2.7  |     |   |
|                              | Input capacitance                    | C <sub>ies</sub>     | V <sub>GE</sub> =0V, V <sub>CE</sub> =10V, f=1MHz                     |          | 4200 |      | pF  |   |
|                              | Turn-on time                         | t <sub>on</sub>      | V <sub>CC</sub> =800V<br>I <sub>c</sub> =35A<br>V <sub>GE</sub> =±15V |          | 0.35 | 1.2  | μs  |   |
|                              |                                      |                      |   |          | 0.25 | 0.6  |     |   |
|                              |                                      |                      |   |          | 0.1  |      |     |   |
|                              | Turn-off                             | t <sub>off</sub>     | R <sub>G</sub> =33Ω   |          | 0.45 | 1.0  |     |   |
|                              |                                      |                      |   | 0.08     | 0.3  |      |     |   |
| Forward on voltage           | V <sub>F</sub>                       | I <sub>F</sub> =35A  | chip  | 2.4      |      | V    |     |   |
|                              |                                      |                      | terminal  | 2.55     | 3.4  |      |     |   |
| Reverse recovery time of FRD | t <sub>rr</sub>                      | I <sub>F</sub> =35A  |   |          | 0.35 | μs   |     |   |
| Brake                        | Zero gate voltage collector current  | ICES                 | V <sub>CE(s)</sub> =1400V, V <sub>GE</sub> =0V                        |          | 1.0  | mA   |     |   |
|                              | Gate-Emitter leakage current         | IGES                 | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V                            |          | 0.2  | μA   |     |   |
|                              | Collector-Emitter saturation voltage | V <sub>CE(sat)</sub> | I <sub>c</sub> =25A, V <sub>GE</sub> =15V                             | chip     | 2.2  |      | V   |   |
|                              |                                      |                      |   | terminal | 2.35 | 2.8  |     |   |
|                              | Turn-on time                         | t <sub>on</sub>      | V <sub>CC</sub> =800V<br>I <sub>c</sub> =25A<br>V <sub>GE</sub> =±15V |          | 0.35 | 1.2  | μs  |   |
|                              |                                      |                      |   |          | 0.25 | 0.6  |     |   |
|                              | Turn-off time                        | t <sub>off</sub>     | R <sub>G</sub> =51Ω   |          | 0.45 | 1.0  |     |   |
|                              |                                      |                      |   |          | 0.08 | 0.3  |     |   |
|                              | Reverse current                      | I <sub>RRM</sub>     | V <sub>R</sub> =1400V   |          |      | 1.0  | mA  |   |
|                              | Forward on voltage                   | V <sub>FM</sub>      | I <sub>F</sub> =35A   | chip     | 1.1  |      | V   |   |
| terminal                     |                                      |                      |   | 1.2      | 1.5  |      |     |   |
| Resistance                   | R                                    | T=25°C               |   |          | 5000 | Ω    |     |   |
| B value                      | B                                    | T=100°C              |   | 465      | 495  | 520  |     |   |
|                              |                                      | T=25/50°C            |   | 3305     | 3375 | 3450 | K   |   |

## ● Thermal resistance Characteristics

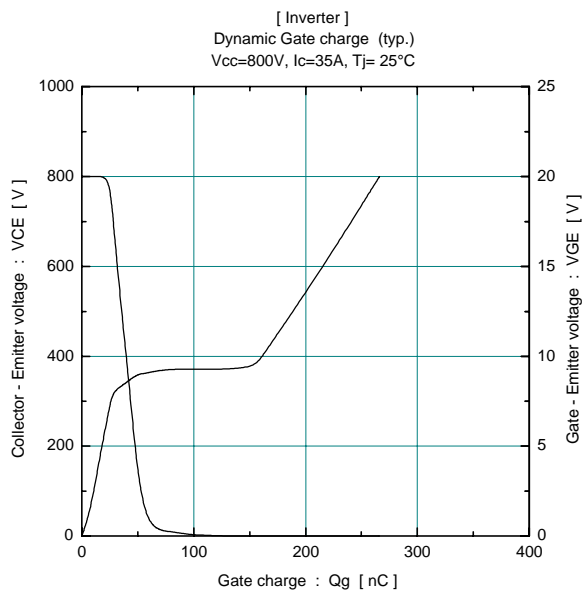
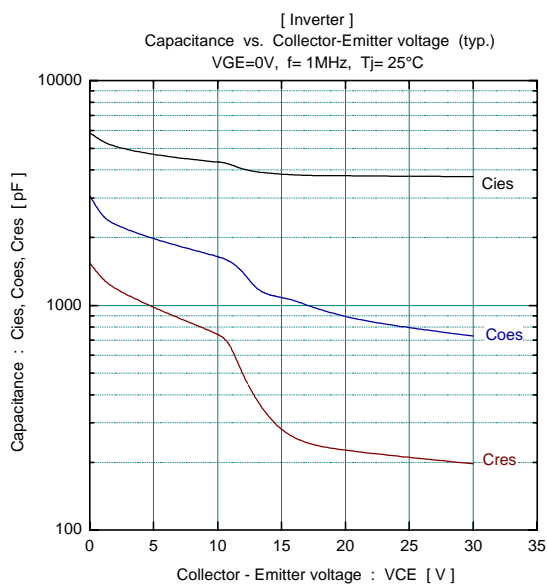
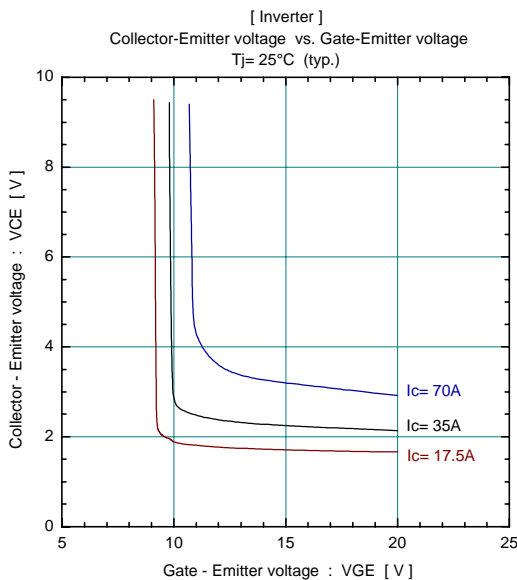
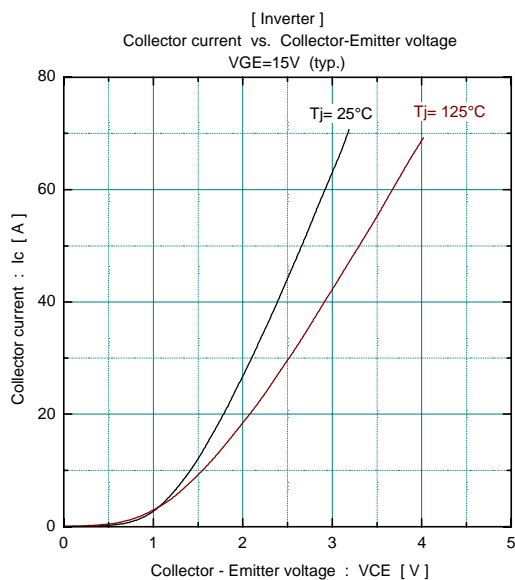
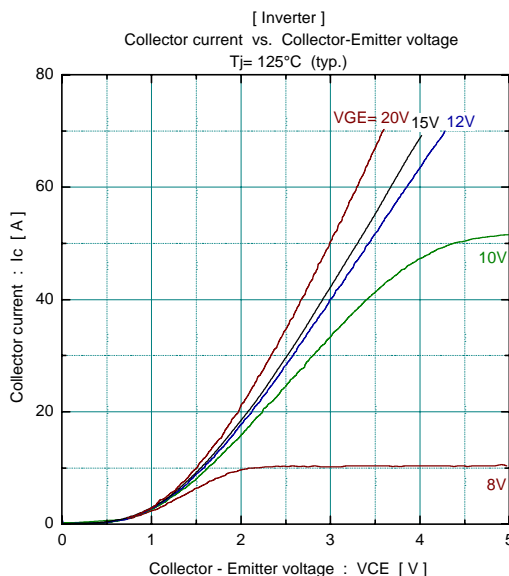
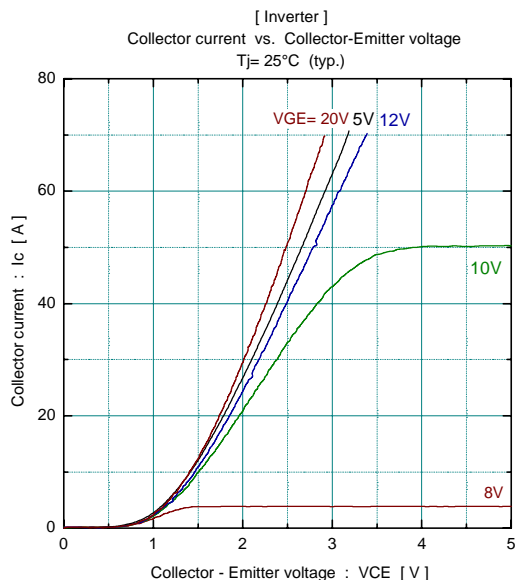
| Item                            | Symbol               | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------------------|-----------------------|-----------------|------|------|------|
|                                 |                      |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | R <sub>th(j-c)</sub> | Inverter IGBT         |                 |      | 0.52 | °C/W |
|                                 |                      | Inverter FWD          |                 |      | 0.90 |      |
|                                 |                      | Brake IGBT            |                 |      | 0.69 |      |
|                                 |                      | Converter Diode       |                 |      | 0.75 |      |
| Contact thermal resistance *    | R <sub>th(c-f)</sub> | With thermal compound |                 | 0.05 |      |      |

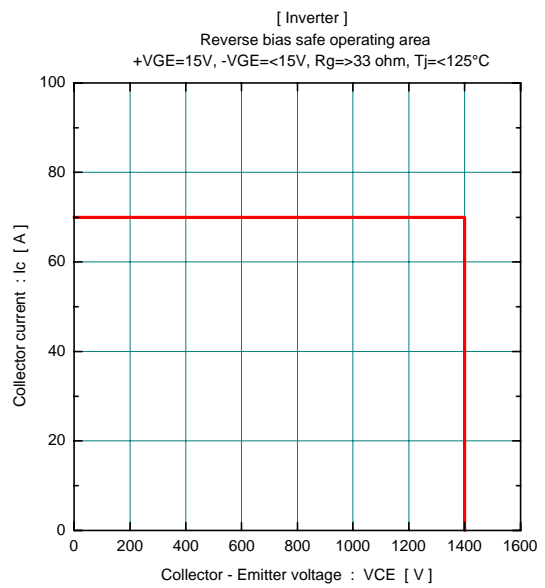
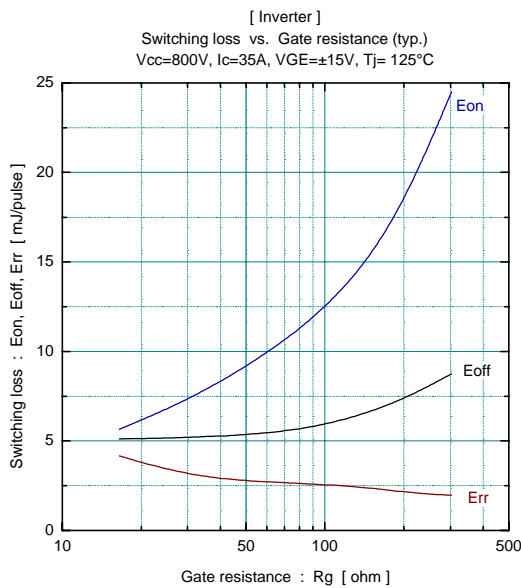
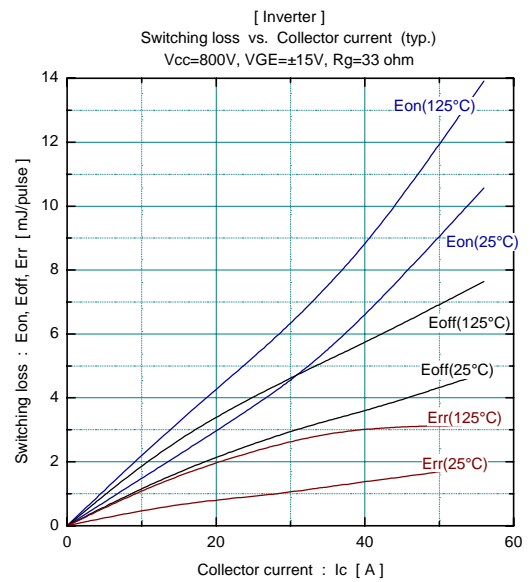
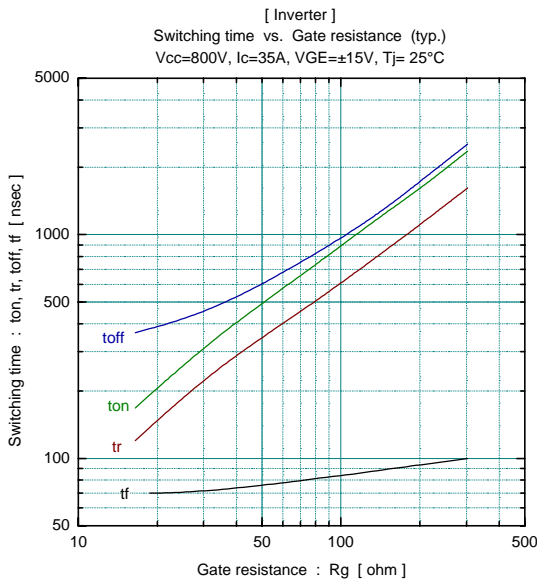
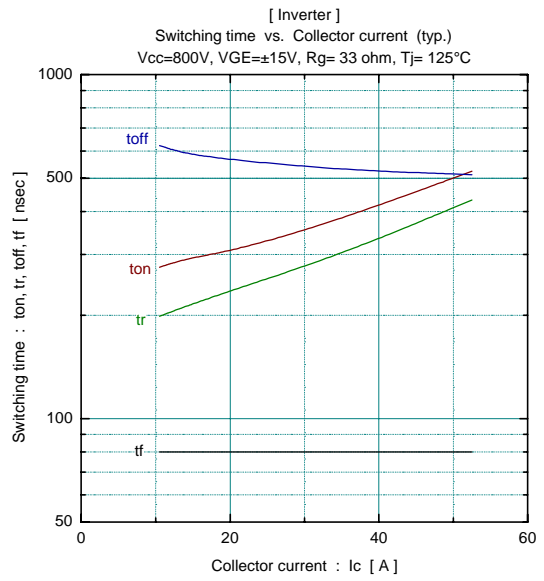
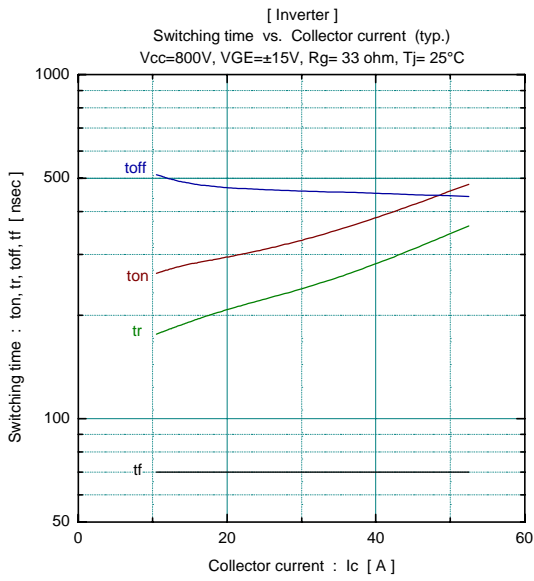
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

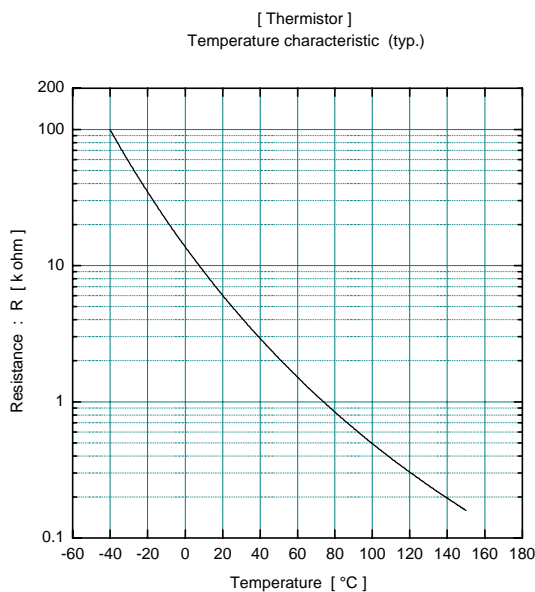
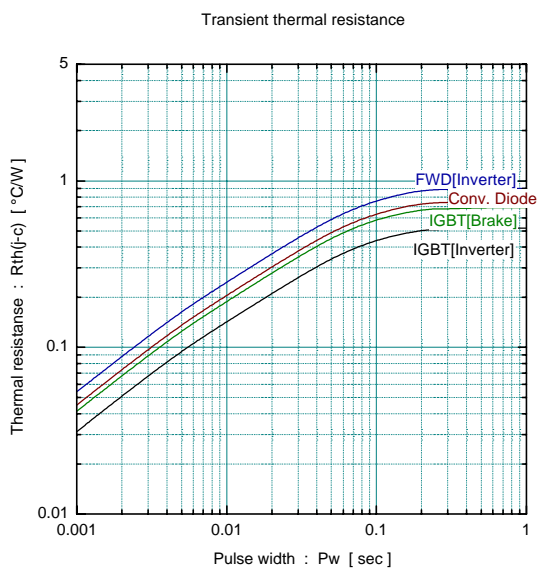
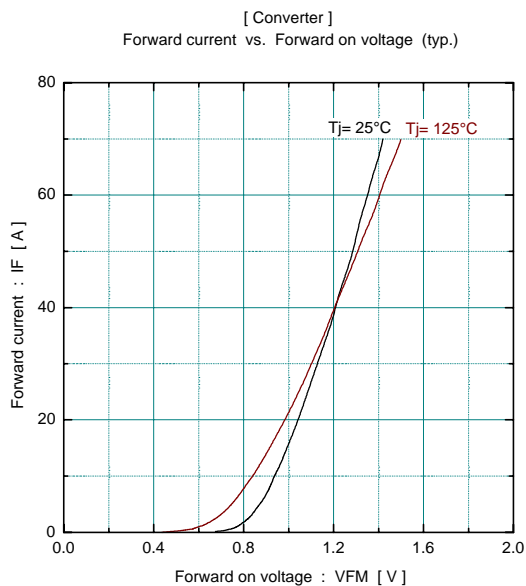
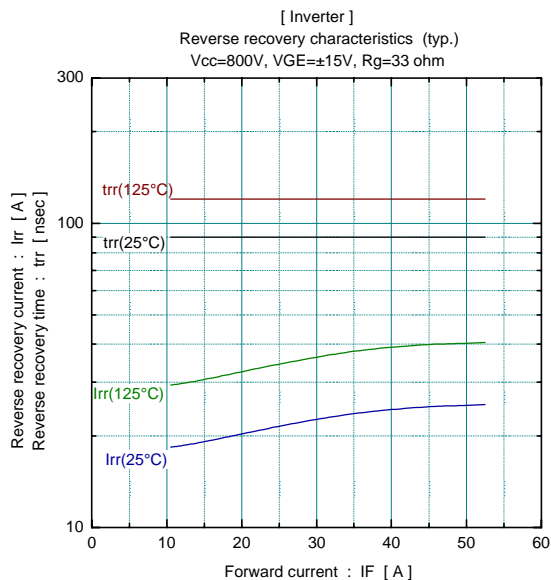
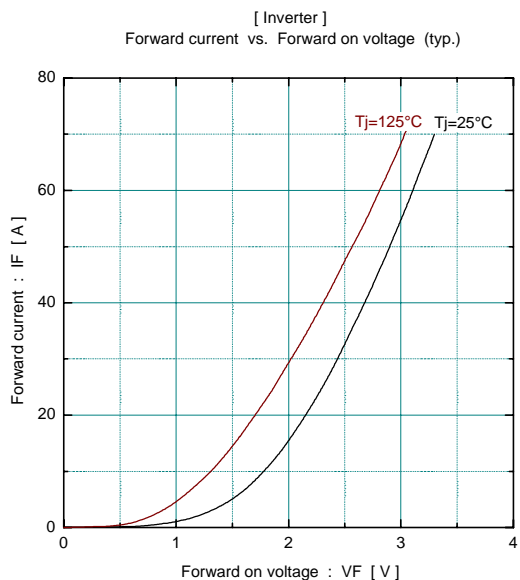
## ■ Equivalent Circuit Schematic

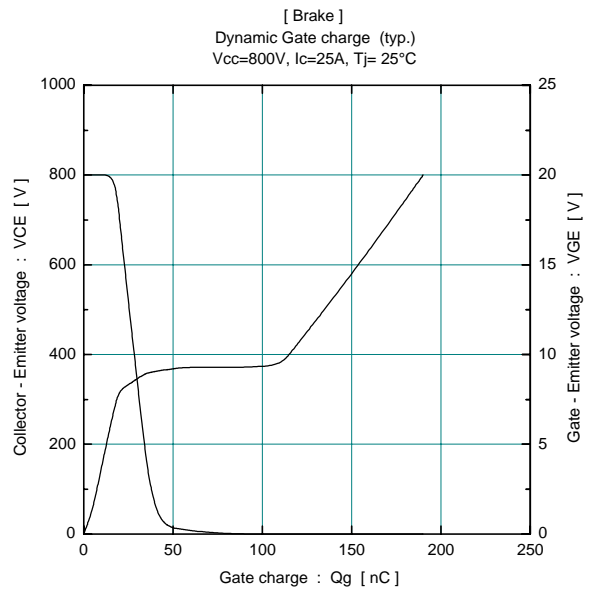
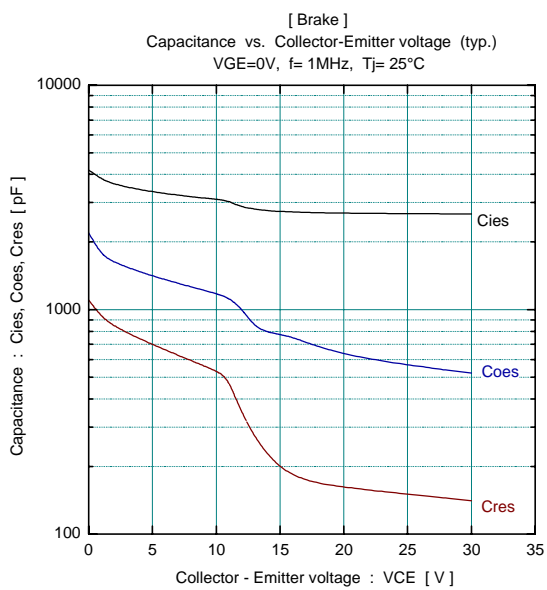
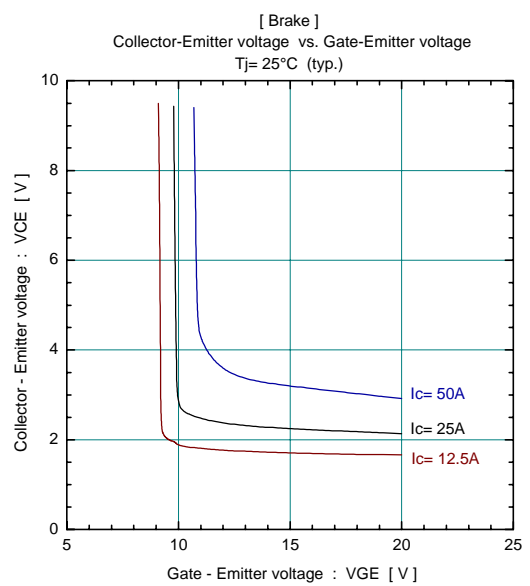
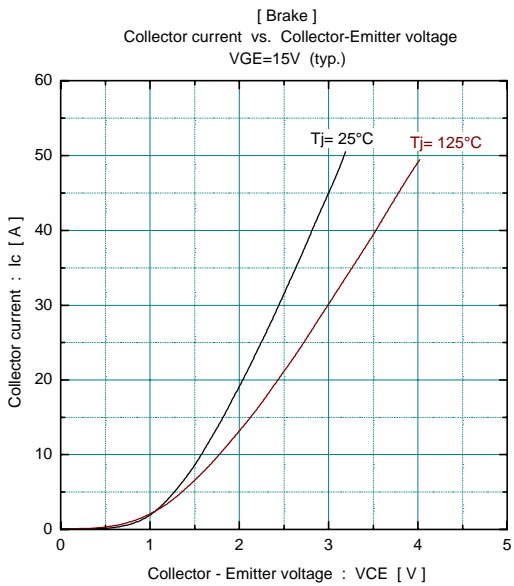
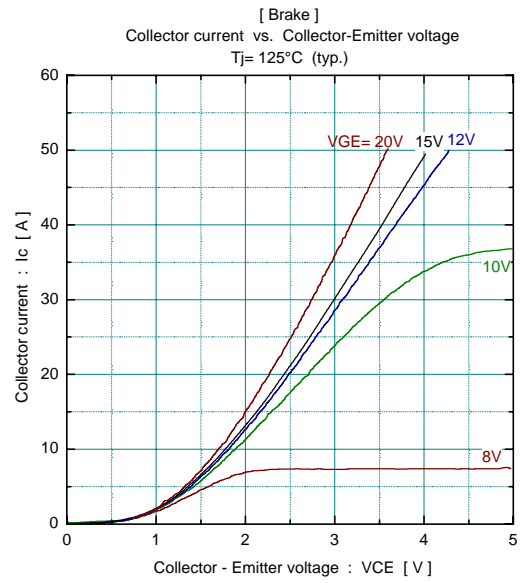
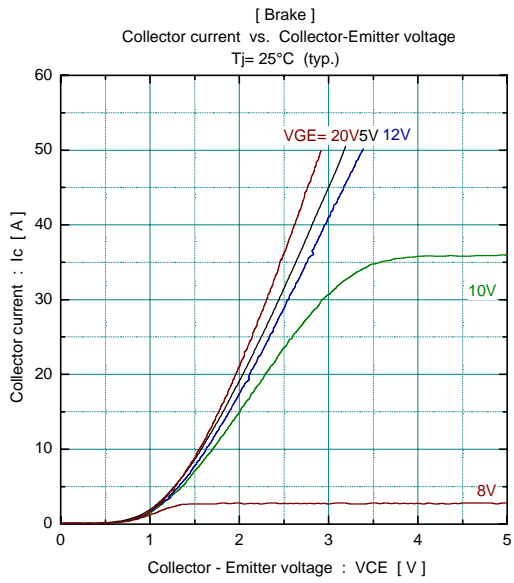


■ Characteristics (Representative)









■ Outline Drawings, mm

