

### IGBT MODULE (S series) 600V / 50A / PIM



#### ■ Features

- Low  $V_{CE(sat)}$
- Compact package
- P.C. board mount
- Converter diode bridge, Dynamic brake circuit

#### ■ Applications

- Inverter for motor 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       | $V_{CES}$     | 600                              | V                  |                      |
|   | Gate-Emitter voltage            | $V_{GES}$     | $\pm 20$                         | V                  |                      |
|   | Collector current               | $I_c$         | Continuous                       | 50                 | A                    |
|   |                                 | $I_{cP}$      | 1ms                              | 100                | A                    |
|   |                                 | $-I_c$        |                                  | 50                 | A                    |
| Collector power dissipation   | $P_c$                           | 1 device      | 200                              | W                  |                      |
| Brake   | Collector-Emitter voltage       | $V_{CES}$     | 600                              | V                  |                      |
|   | Gate-Emitter voltage            | $V_{GES}$     | $\pm 20$                         | V                  |                      |
|   | Collector current               | $I_c$         | Continuous                       | 30                 | A                    |
|   |                                 | $I_{cP}$      | 1ms                              | 60                 | A                    |
|   | Collector power dissipation     | $P_c$         | 1 device                         | 120                | W                    |
| Converter   | Repetitive peak reverse voltage | $V_{RRM}$     | 600                              | V                  |                      |
|   | Repetitive peak reverse voltage | $V_{RRM}$     | 800                              | V                  |                      |
|   | Average output current          | $I_o$         | 50Hz/60Hz sine wave              | 50                 | A                    |
|   | Surge current (Non-Repetitive)  | $I_{FSM}$     | $T_j=150^{\circ}\text{C}$ , 10ms | 350                | A                    |
|   | $I^2t$ (Non-Repetitive)         | $I^2t$        | half sine wave                   | 613                | $\text{A}^2\text{s}$ |
| Operating junction temperature  | $T_j$                           |               | +150                             | $^{\circ}\text{C}$ |                      |
| Storage temperature   | $T_{stg}$                       |               | -40 to +125                      | $^{\circ}\text{C}$ |                      |
| Isolation between terminal and copper base *2<br>voltage between thermistor and others *3 | $V_{iso}$                       | AC : 1 minute | AC 2500                          | V                  |                      |
|   |                                 |               | AC 2500                          | V                  |                      |
| 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 (Tj=25°C unless otherwise specified)

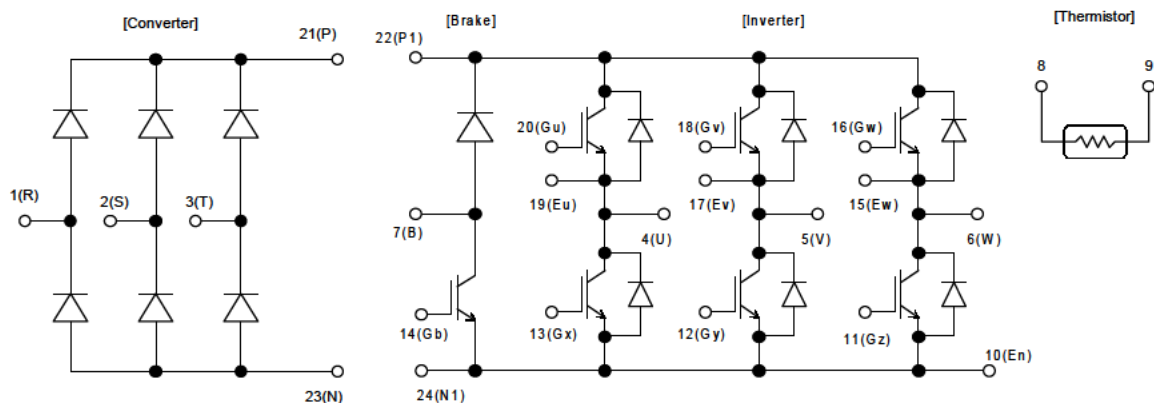
| Item                                 | Symbol                               | Condition        | Characteristics         |          |          | Unit   |       |      |      |     |
|--------------------------------------|--------------------------------------|------------------|-------------------------|----------|----------|--------|-------|------|------|-----|
|                                      |                                      |                  | Min.                    | Typ.     | Max.     |        |       |      |      |     |
| Inverter                             | Zero gate voltage collector current  | ICES             | VCE=600V, VGE=0V        |          | 1.0      | mA     |       |      |      |     |
|                                      | Gate-Emitter leakage current         | IGES             | VCE=0V, VGE=±20V        |          | 0.2      | µA     |       |      |      |     |
|                                      | Gate-Emitter threshold voltage       | VGE(th)          | VCE=20V, Ic=50mA        |          | 5.5      | 7.8    | 8.5   | V    |      |     |
|                                      | Collector-Emitter saturation voltage | VCE(sat)         | VGE=15V, Ic=50A         | chip     | 1.8      |        | V     |      |      |     |
|                                      |                                      |                  |                         | terminal | 1.95     | 2.4    |       |      |      |     |
|                                      | Input capacitance                    | Cies             | VGE=0V, VCE=10V, f=1MHz |          | 5000     |        | pF    |      |      |     |
|                                      | Turn-on time                         | ton              | Ic=50A                  | VCC=300V | VGE=±15V | RG=51Ω | 0.45  | 1.2  | µs   |     |
|                                      |                                      |                  |                         |          |          |        | tr    | 0.25 |      | 0.6 |
|                                      |                                      |                  |                         |          |          |        | tr(i) | 0.08 |      |     |
|                                      | Turn-off                             | toff             | Ic=50A                  | VCC=300V | VGE=±15V | RG=51Ω | 0.40  | 1.0  | µs   |     |
| tr                                   |                                      |                  |                         |          |          |        | 0.05  | 0.35 |      |     |
| Forward on voltage                   | VF                                   | IF=50A           | chip                    | 1.75     |          | V      |       |      |      |     |
|                                      |                                      |                  | terminal                | 1.9      | 2.6      |        |       |      |      |     |
| Reverse recovery time of FRD         | trr                                  | IF=50A           |                         |          | 0.3      | µs     |       |      |      |     |
| Zero gate voltage collector current  | ICES                                 | VCE=600V, VGE=0V |                         | 1.0      | mA       |        |       |      |      |     |
| Gate-Emitter leakage current         | IGES                                 | VCE=0V, VGE=±20V |                         | 0.2      | µA       |        |       |      |      |     |
| Collector-Emitter saturation voltage | VCE(sat)                             | Ic=30A, VGE=15V  | chip                    | 1.8      |          | V      |       |      |      |     |
|                                      |                                      |                  | terminal                | 1.95     | 2.4      |        |       |      |      |     |
| Turn-on time                         | ton                                  | Ic=30A           | VCC=300V                | VGE=±15V | RG=82Ω   | 0.45   | 1.2   | µs   |      |     |
|                                      |                                      |                  |                         |          |          | tr     | 0.25  |      | 0.6  |     |
|                                      |                                      |                  |                         |          |          | tr     | 0.05  |      | 0.35 |     |
| Turn-off time                        | toff                                 | Ic=30A           | VCC=300V                | VGE=±15V | RG=82Ω   | 0.40   | 1.0   | µs   |      |     |
|                                      |                                      |                  |                         |          |          | tr     | 0.05  |      | 0.35 |     |
| Reverse current                      | I <sub>RRM</sub>                     | VR=600V          |                         |          | 1.0      | mA     |       |      |      |     |
| Forward on voltage                   | VFM                                  | IF=50A           | chip                    | 1.1      |          | V      |       |      |      |     |
|                                      |                                      |                  | terminal                | 1.2      | 1.5      |        |       |      |      |     |
| Reverse current                      | I <sub>RRM</sub>                     | VR=800V          |                         |          | 1.0      | mA     |       |      |      |     |
| Thermistor                           | Resistance                           | R                | T=25°C                  | 5000     |          | Ω      |       |      |      |     |
|                                      |                                      |                  | T=100°C                 | 465      | 495      |        | 520   |      |      |     |
|                                      | B value                              | B                | T=25/50°C               | 3305     | 3375     | 3450   | K     |      |      |     |

● Thermal resistance Characteristics

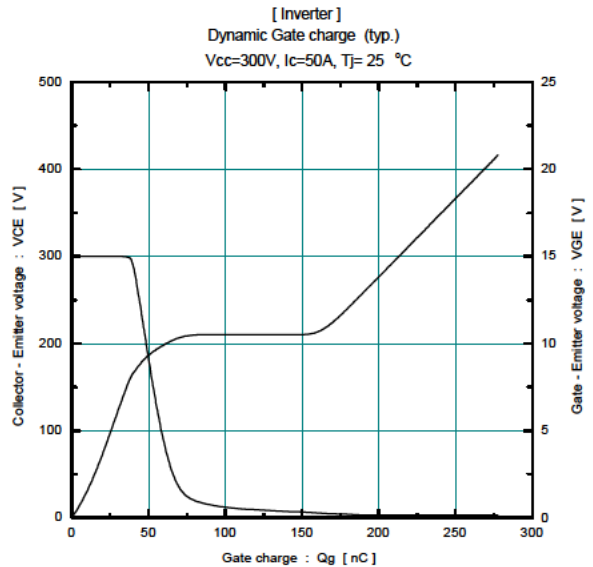
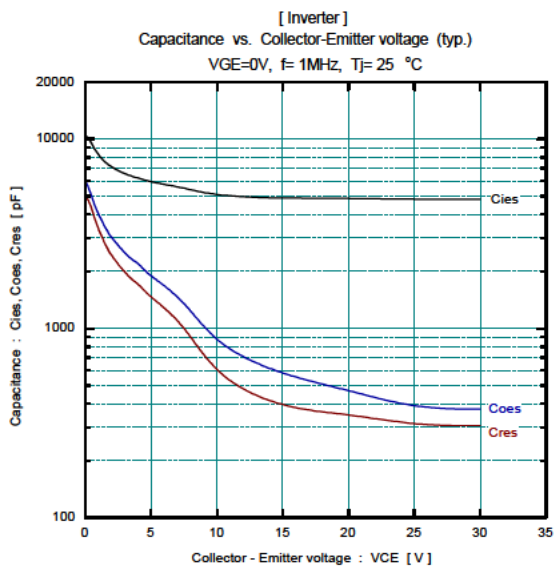
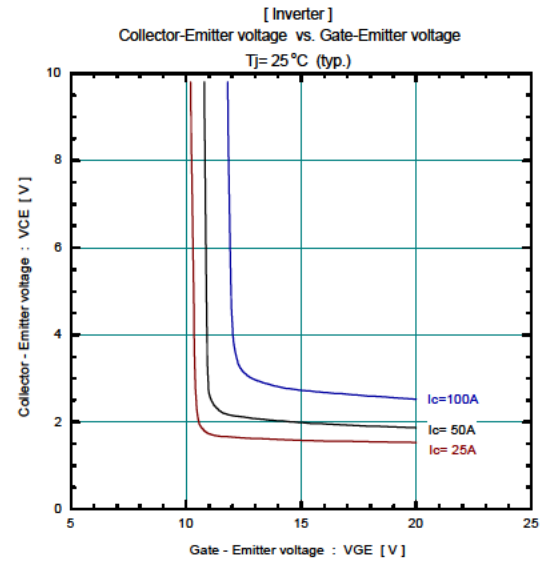
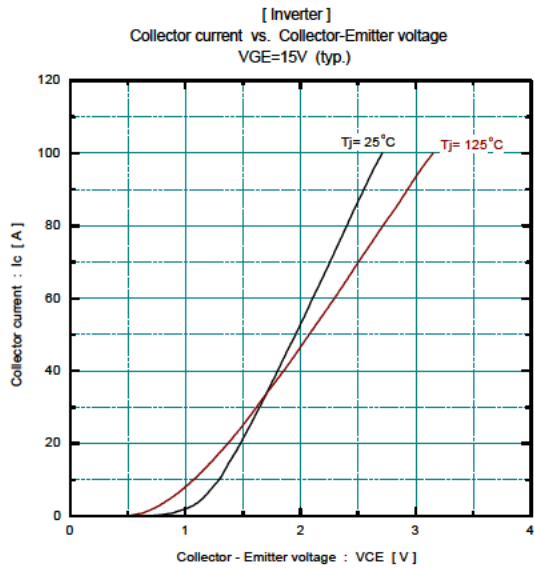
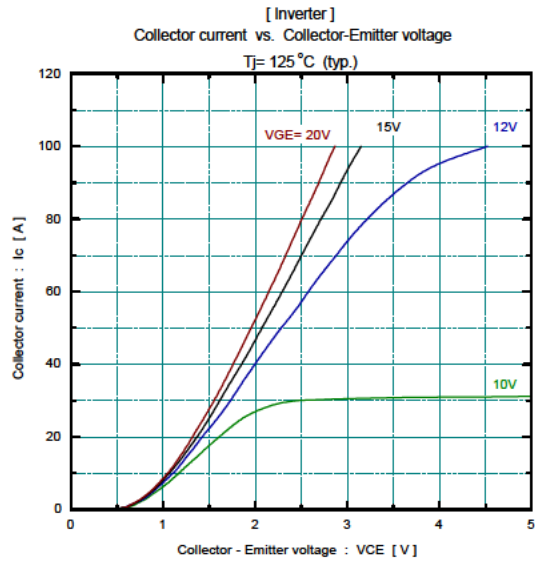
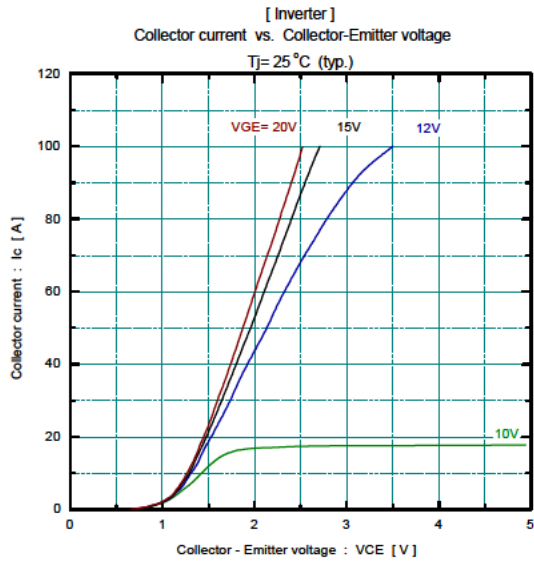
| Item                            | Symbol   | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------|-----------------------|-----------------|------|------|------|
|                                 |          |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | Rth(j-c) | Inverter IGBT         |                 |      | 0.63 | °C/W |
|                                 |          | Inverter FWD          |                 |      | 1.33 |      |
|                                 |          | Brake IGBT            |                 |      | 1.04 |      |
|                                 |          | Converter Diode       |                 |      | 0.90 |      |
| Contact thermal resistance *    | Rth(c-f) | With thermal compound |                 | 0.05 |      |      |

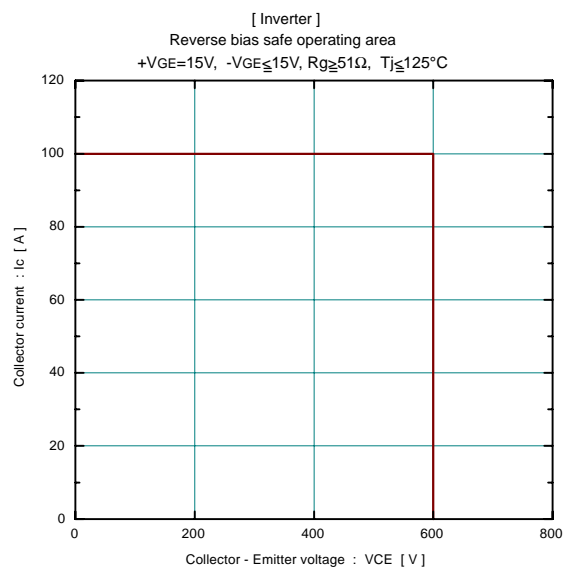
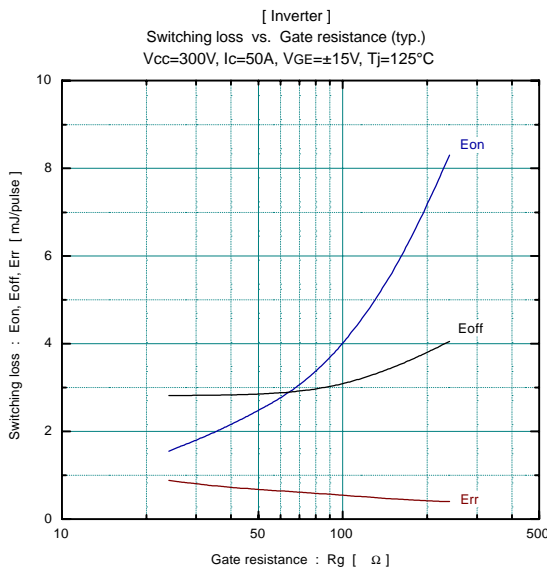
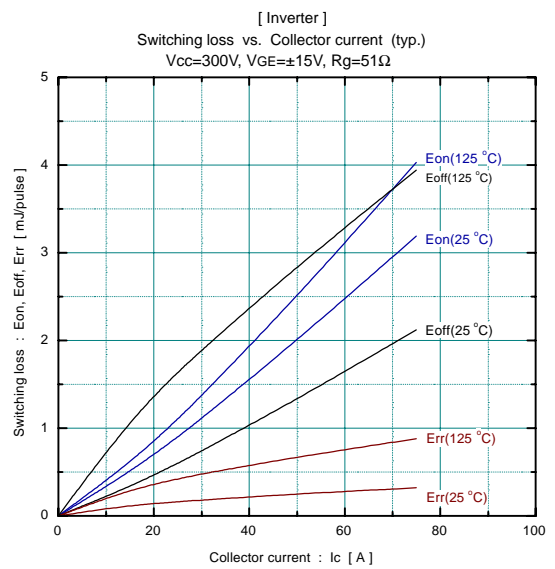
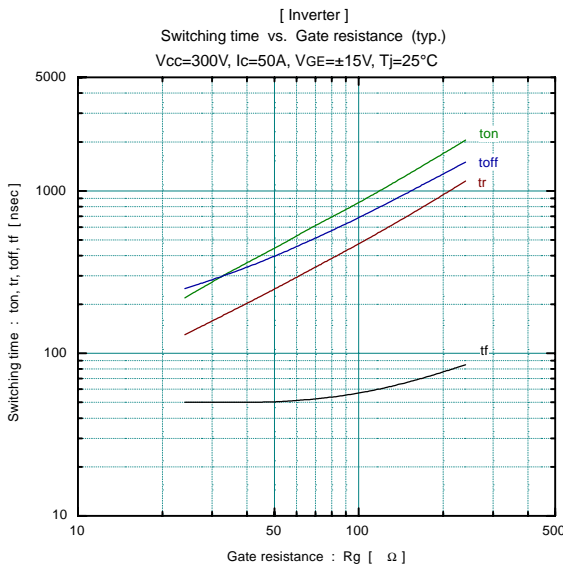
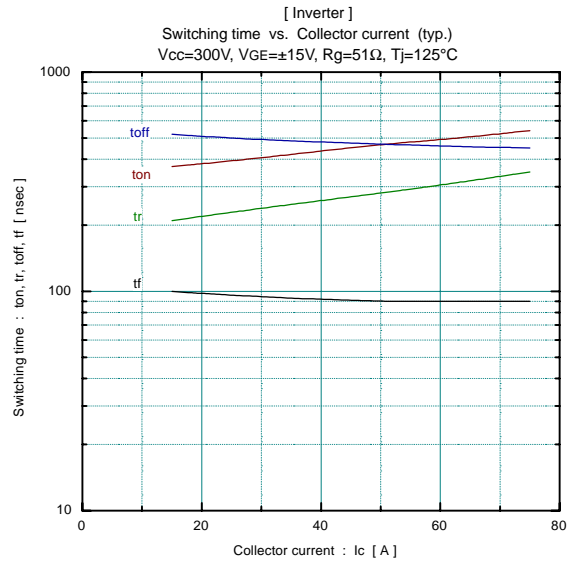
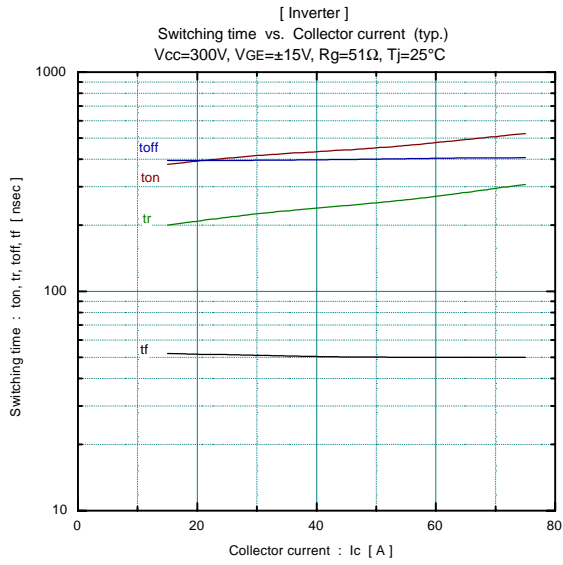
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

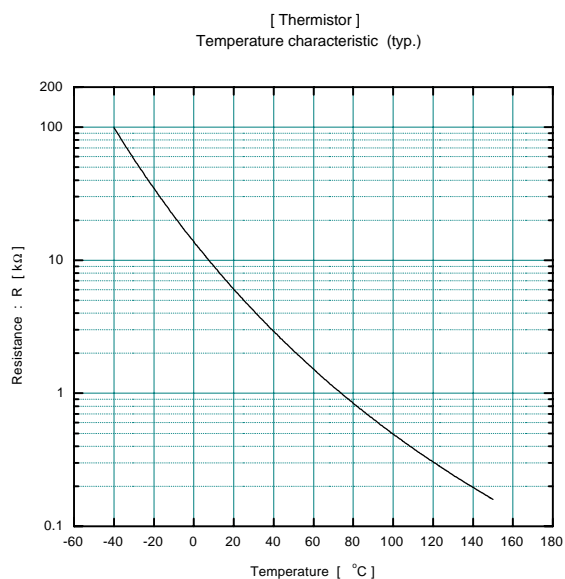
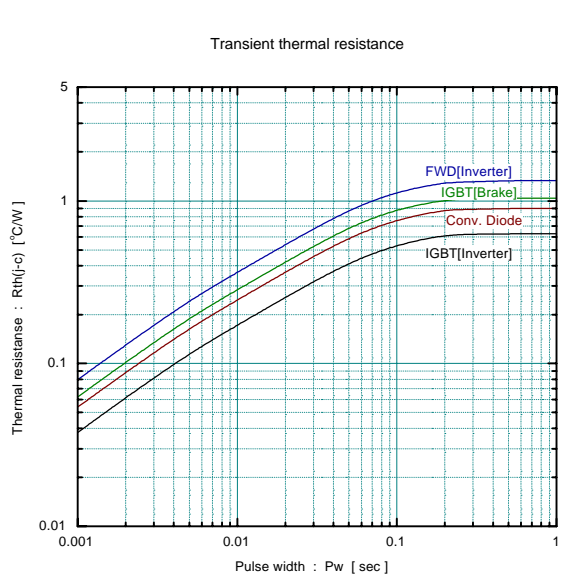
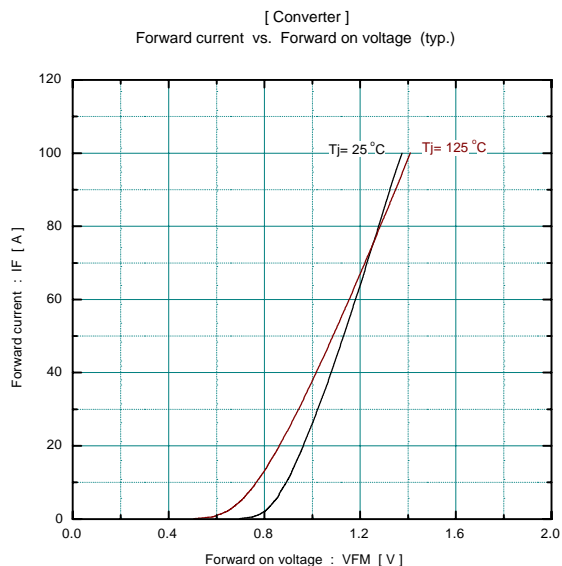
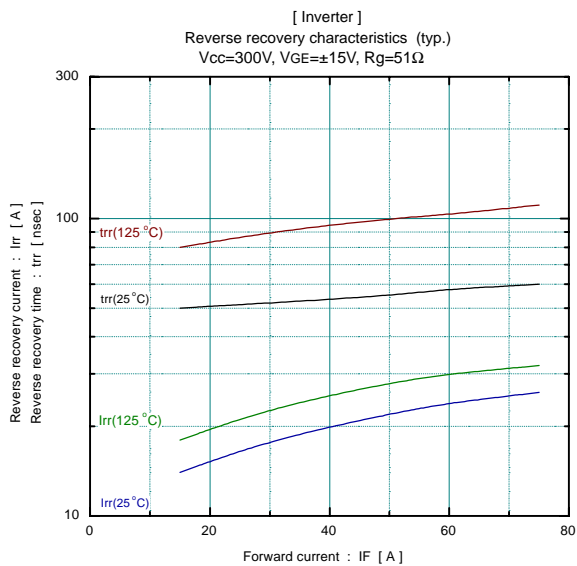
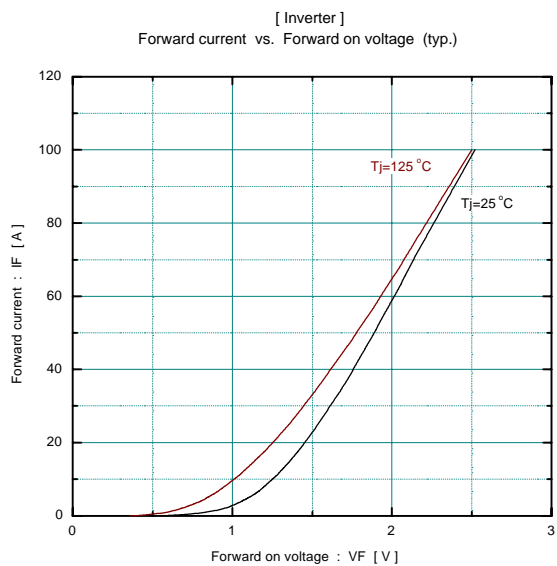
■ Equivalent Circuit Schematic

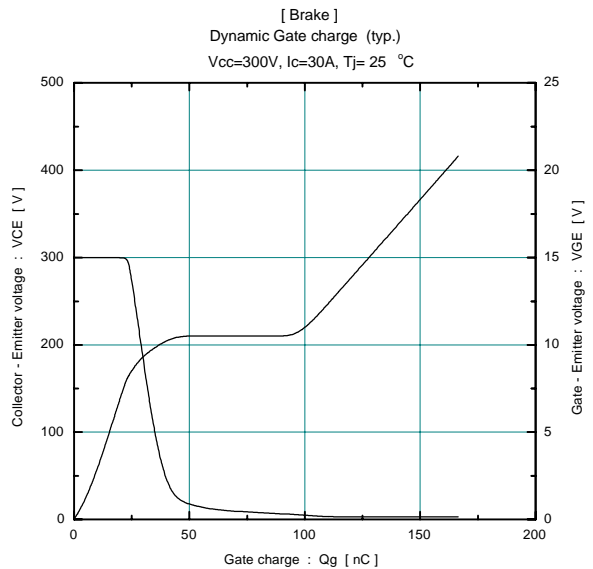
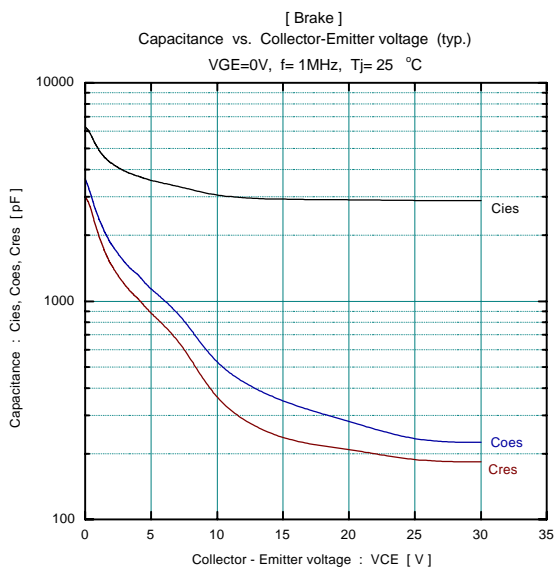
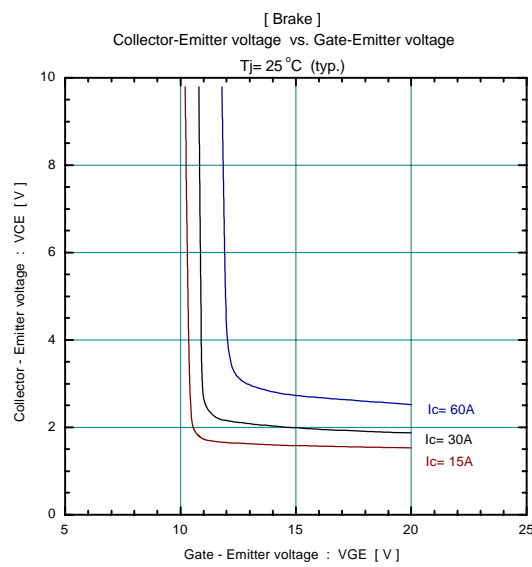
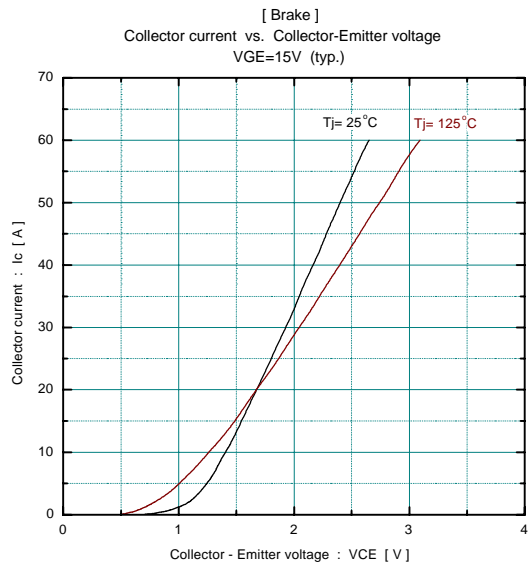
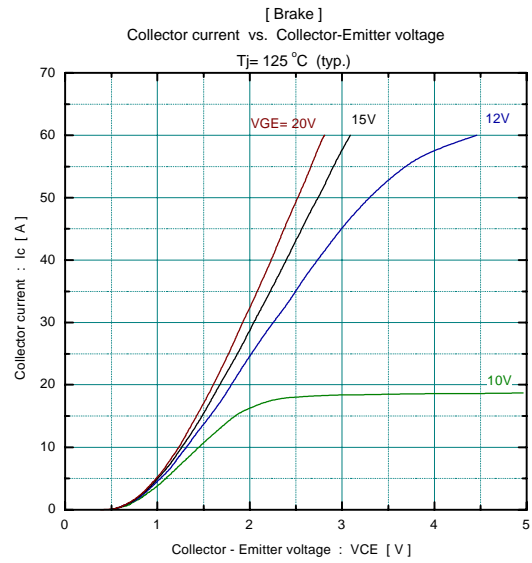
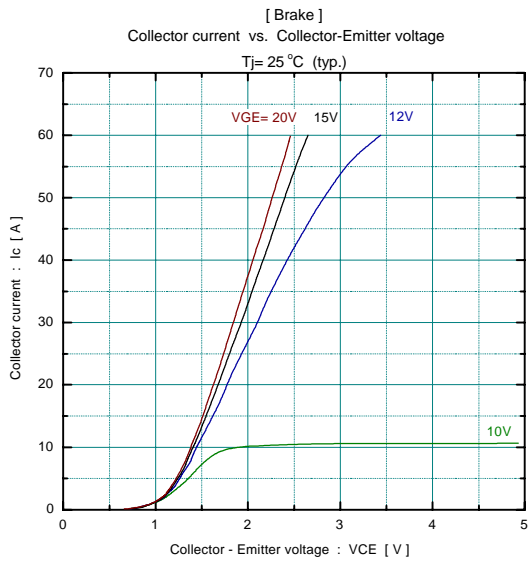


■ Characteristics (Representative)

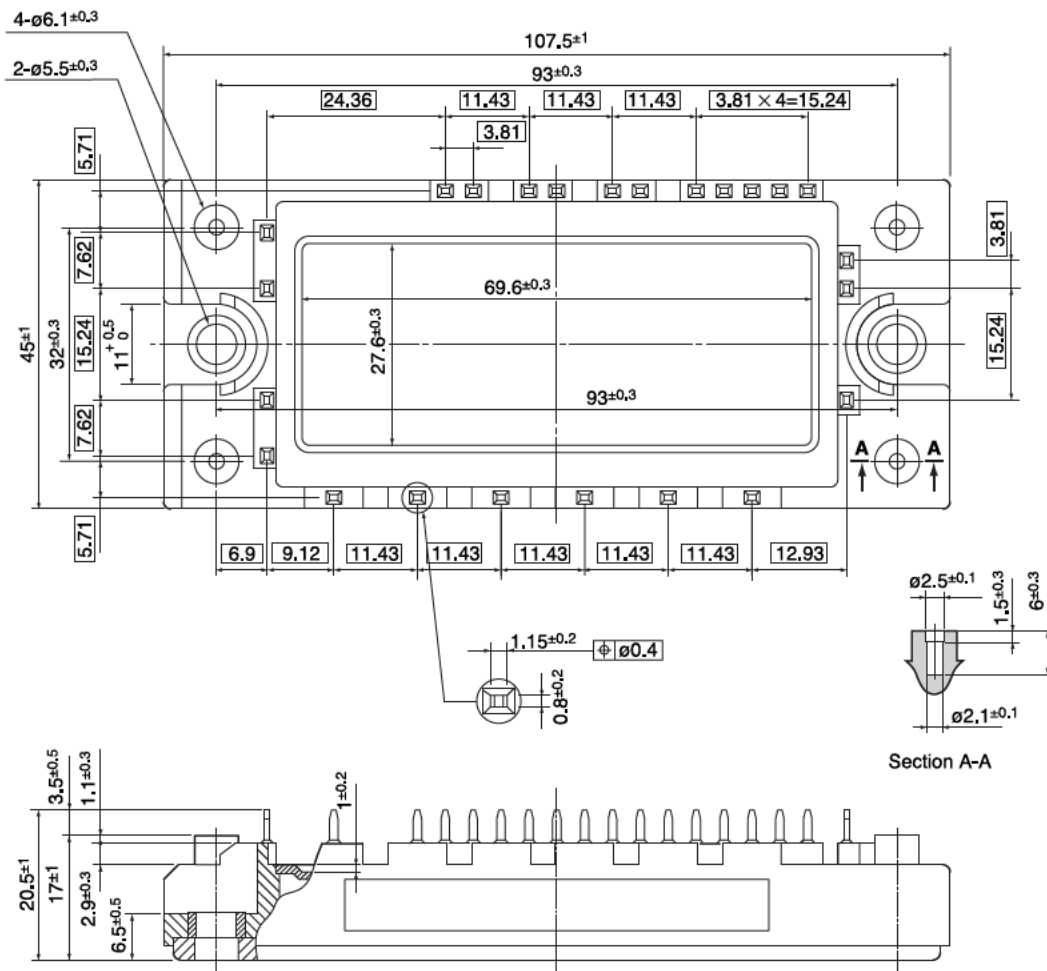








■ Outline Drawings, mm



□ Shows theory dimensions