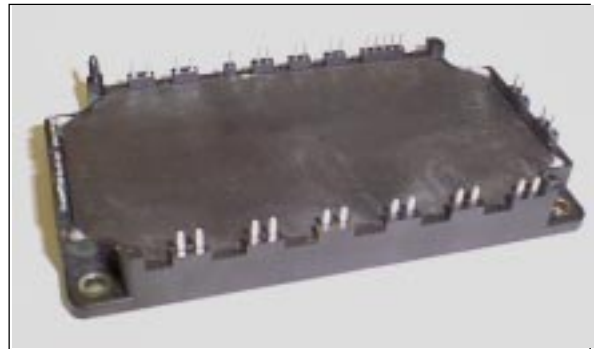


### PIM/Built-in converter with thyristor and brake (S series) 1200V / 50A / PIM



#### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C. Board Mount Module
- 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               | $V_{CES}$     | 1200   | V                             |   |
|   | Gate-Emitter voltage                    | $V_{GES}$     | $\pm 20$   | V                             |   |
|   | Collector current                       | $I_c$         | Continuous   | $T_c=25^\circ\text{C}$<br>75  | A |
|   |   |               |  | $T_c=80^\circ\text{C}$<br>50  |   |
|   |   | $I_{CP}$      | 1ms  | $T_c=25^\circ\text{C}$<br>150 | A |
|   |   |               |  | $T_c=80^\circ\text{C}$<br>100 |   |
|   | $-I_c$                                  |               | 50   | A                             |   |
| Collector power dissipation   | $P_c$                                   | 1 device      | 360  | W                             |   |
| Brake   | Collector-Emitter voltage               | $V_{CES}$     | 1200   | V                             |   |
|   | Gate-Emitter voltage                    | $V_{GES}$     | $\pm 20$   | V                             |   |
|   | Collector current                       | $I_c$         | Continuous   | $T_c=25^\circ\text{C}$<br>35  | A |
|   |   |               |  | $T_c=80^\circ\text{C}$<br>25  |   |
|   |   | $I_{CP}$      | 1ms  | $T_c=25^\circ\text{C}$<br>70  | A |
|   |   |               |  | $T_c=80^\circ\text{C}$<br>50  |   |
| Collector power dissipation   | $P_c$                                   | 1 device      | 180  | W                             |   |
| Repetitive peak reverse voltage(Diode)  | $V_{RRM}$                               |               | 1200   | V                             |   |
| Thyristor   | Repetitive peak off-state voltage       | $V_{DRM}$     | 1600   | V                             |   |
|   | Repetitive peak reverse voltage         | $V_{RRM}$     | 1600   | V                             |   |
|   | Average on-state current                | $I_{T(AV)}$   | 50Hz/60Hz sine wave<br>50                            | A                             |   |
|   | Surge On-state current (Non-Repetitive) | $I_{TSM}$     | $T_j=125^\circ\text{C}$ , 10ms half sine wave<br>530 | A                             |   |
| Junction temperature  | $T_{jw}$                                |               | 125  | $^\circ\text{C}$              |   |
| Converter   | Repetitive peak reverse voltage         | $V_{RRM}$     | 1600   | V                             |   |
|   | Average output current                  | $I_o$         | 50Hz/60Hz sine wave<br>50                            | A                             |   |
|   | Surge current (Non-Repetitive)          | $I_{FSM}$     | $T_j=150^\circ\text{C}$ , 10ms<br>520                | A                             |   |
|   | $I^2t$ (Non-Repetitive)                 | $I^2t$        | half sine wave<br>1352                               | $\text{A}^2\text{s}$          |   |
| Junction temperature (except Thyristor)   | $T_j$                                   |               | +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   |   |               | 1.7 *1   | N·m                           |   |

\*1 Recommendable value : 1.3 to 1.7 N·m (M4)

\*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 26 should be connected together and shorted to copper base.

● Electrical characteristics (Tj=25°C unless otherwise specified)

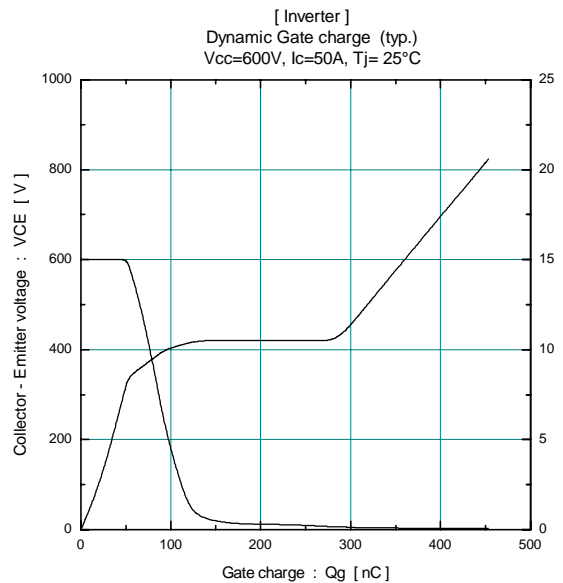
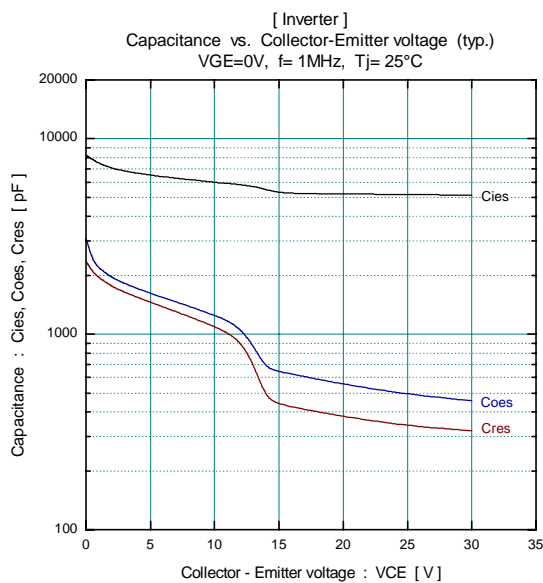
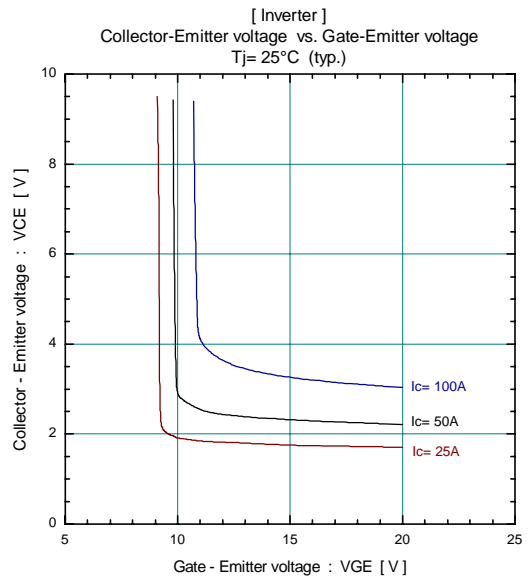
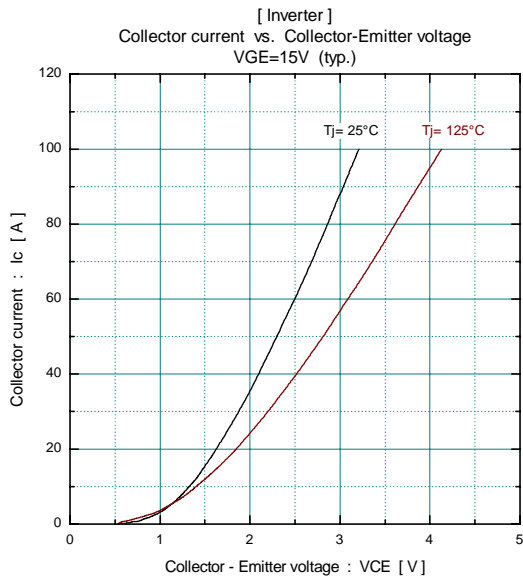
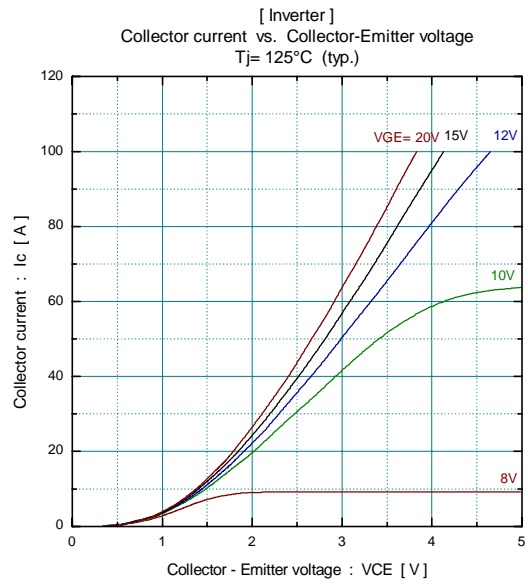
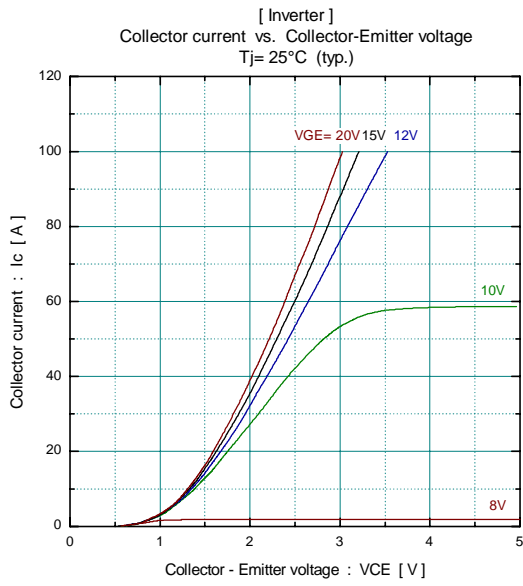
| Item                         | Symbol                               | Condition        | Characteristics         |          |      | Unit |     |   |
|------------------------------|--------------------------------------|------------------|-------------------------|----------|------|------|-----|---|
|                              |                                      |                  | Min.                    | Typ.     | Max. |      |     |   |
| Inverter                     | Zero gate voltage collector current  | ICES             | VCE=1200V, VGE=0V       |          | 250  | μA   |     |   |
|                              | Gate-Emitter leakage current         | IGES             | VCE=0V, VGE=±20V        |          | 200  | nA   |     |   |
|                              | Gate-Emitter threshold voltage       | VGE(th)          | VCE=20V, Ic=50mA        |          | 5.5  | 7.2  | 8.5 | V |
|                              | Collector-Emitter saturation voltage | VCE(sat)         | VGE=15V, Ic=50A         | chip     | 2.1  |      | V   |   |
|                              |                                      |                  |                         | terminal | 2.3  | 2.7  |     |   |
|                              | Input capacitance                    | Cies             | VGE=0V, VCE=10V, f=1MHz |          | 6000 |      | pF  |   |
|                              | Turn-on time                         | ton              | VCC=600V                |          | 0.35 | 1.2  | μs  |   |
|                              |                                      | tr               | Ic=50A                  |          | 0.25 | 0.6  |     |   |
|                              | Turn-off                             | toff             | VGE=±15V                |          | 0.45 | 1.0  |     |   |
|                              |                                      | tf               | RG=24Ω                  |          | 0.08 | 0.3  |     |   |
| Forward on voltage           | VF                                   | IF=50A           | chip                    | 2.3      |      | V    |     |   |
|                              |                                      |                  | terminal                | 2.5      | 3.3  |      |     |   |
| Reverse recovery time of FRD | trr                                  | IF=50A           |                         |          | 350  | ns   |     |   |
| Brake                        | Zero gate voltage collector current  | ICES             | VCEs=1200V, VGE=0V      |          | 250  | μA   |     |   |
|                              | Gate-Emitter leakage current         | IGES             | VCE=0V, VGE=±20V        |          | 200  | nA   |     |   |
|                              | Collector-Emitter saturation voltage | VCE(sat)         | Ic=25A, VGE=15V         | chip     | 2.1  |      | V   |   |
|                              |                                      |                  |                         | terminal | 2.25 | 2.7  |     |   |
|                              | Turn-on time                         | ton              | VCC=600V                |          | 0.35 | 1.2  | μs  |   |
|                              |                                      | tr               | Ic=25A                  |          | 0.25 | 0.6  |     |   |
|                              | Turn-off time                        | toff             | VGE=±15V                |          | 0.45 | 1.0  |     |   |
|                              |                                      | tf               | RG=51Ω                  |          | 0.08 | 0.3  |     |   |
|                              | Reverse current                      | I <sub>RRM</sub> | VR=1200V                |          |      | 250  | μA  |   |
|                              | off-state current                    | IDM              | VDM=1600V               |          |      | 1.0  | mA  |   |
| Thyristor                    | Reverse current                      | I <sub>RRM</sub> | VRM=1600V               |          |      | 1.0  | mA  |   |
|                              | Gate trigger current                 | IGT              | Vd=6V, It=1A            |          |      | 100  | mA  |   |
|                              | Gate trigger voltage                 | VGT              | Vd=6V, It=1A            |          |      | 2.5  | V   |   |
|                              | On-state voltage                     | VTM              | ITM=50A                 | chip     | 1.0  | 1.15 | V   |   |
|                              |                                      |                  |                         | terminal | 1.1  |      |     |   |
| Converter                    | Forward on voltage                   | VFM              | IF=50A                  | chip     | 1.1  |      | V   |   |
|                              |                                      |                  |                         | terminal | 1.2  | 1.5  |     |   |
| Reverse current              | I <sub>RRM</sub>                     | VR=1600V         |                         |          | 250  | μA   |     |   |
| 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   |   |

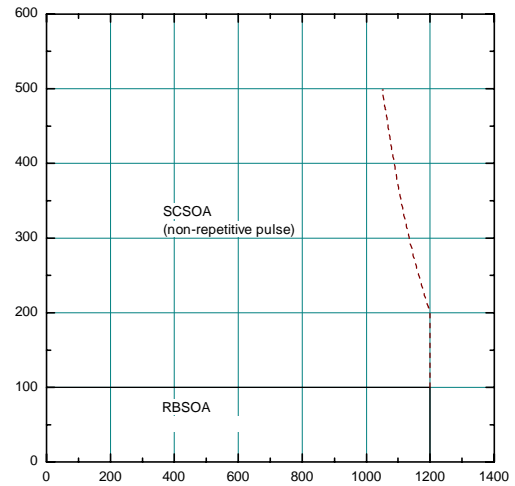
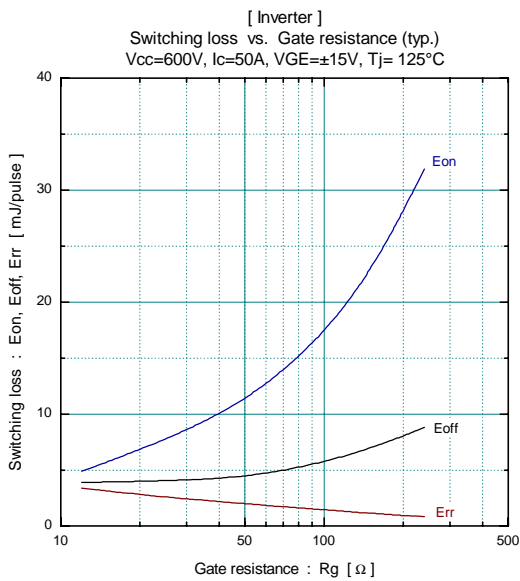
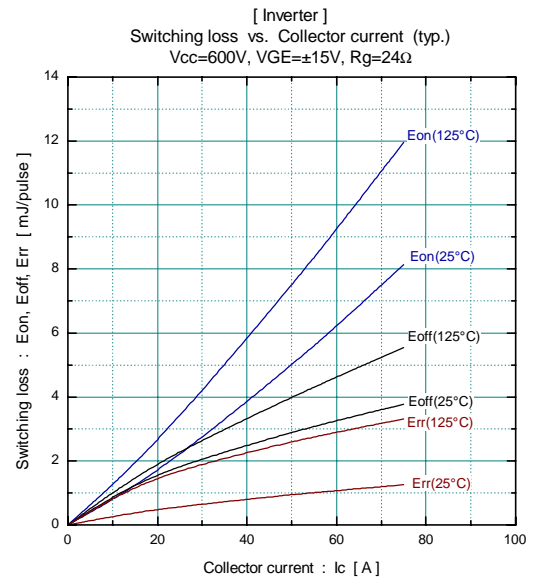
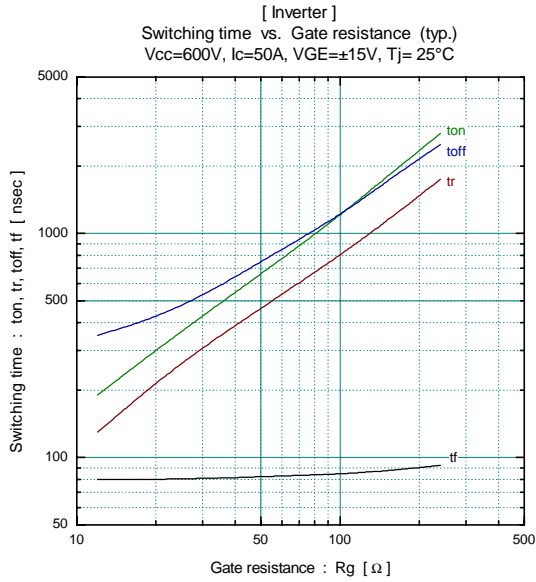
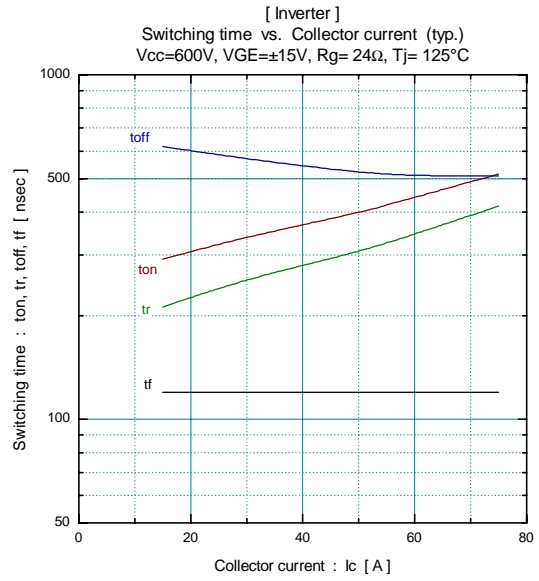
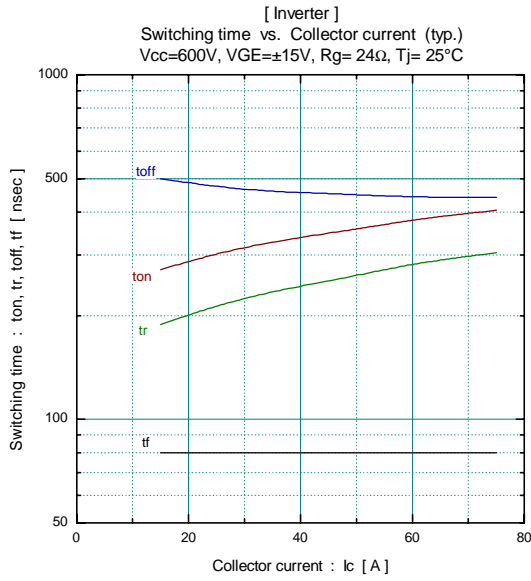
● Thermal resistance Characteristics

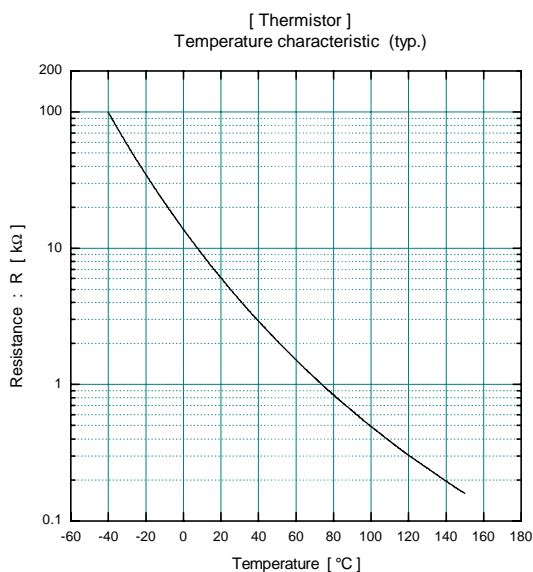
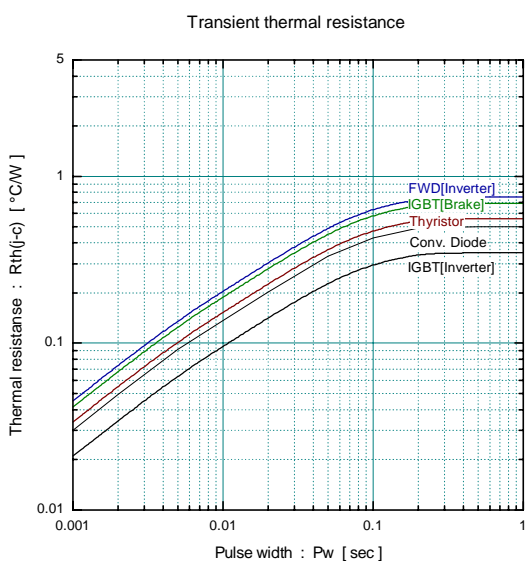
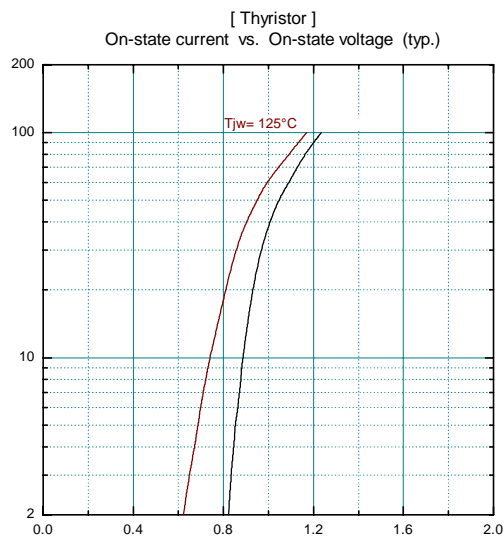
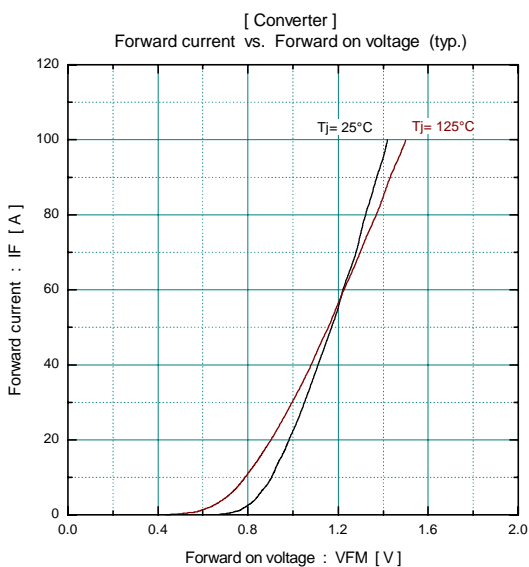
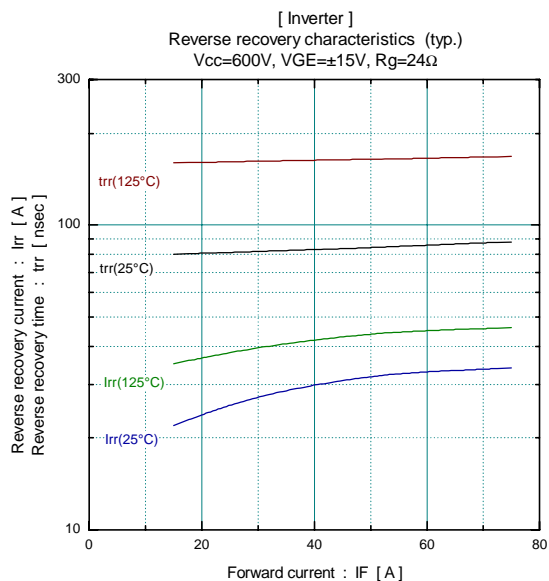
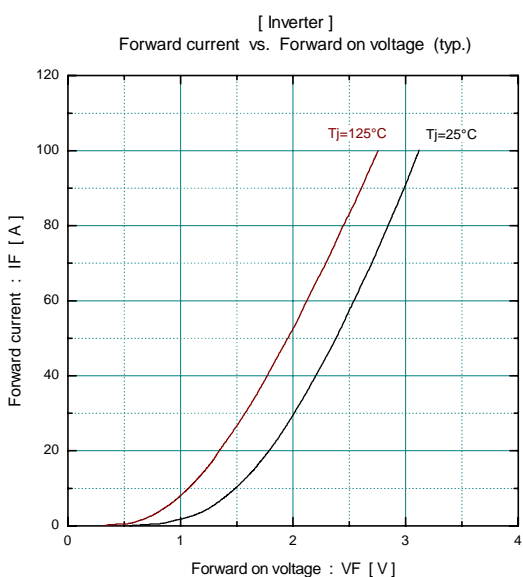
| Item                            | Symbol   | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------|-----------------------|-----------------|------|------|------|
|                                 |          |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | Rth(j-c) | Inverter IGBT         |                 |      | 0.35 | °C/W |
|                                 |          | Inverter FWD          |                 |      | 0.75 |      |
|                                 |          | Brake IGBT            |                 |      | 0.69 |      |
|                                 |          | Thyristor             |                 |      | 0.56 |      |
|                                 |          | Converter Diode       |                 |      | 0.50 |      |
| Contact thermal resistance *    | Rth(c-f) | With thermal compound |                 | 0.05 |      |      |

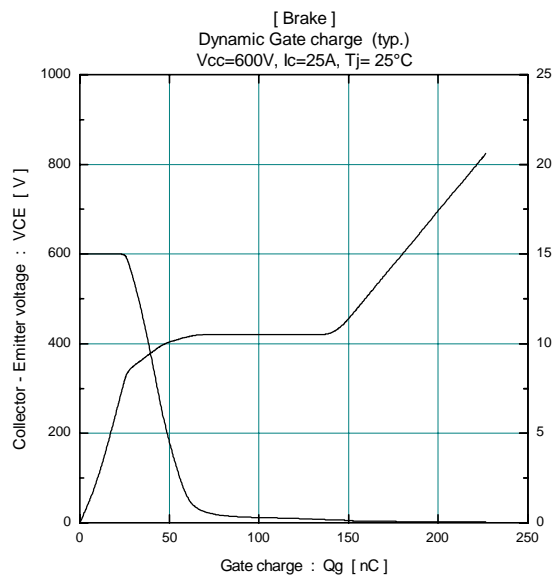
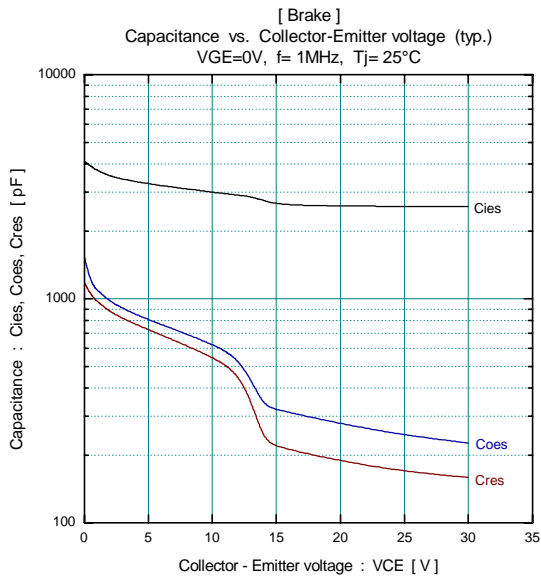
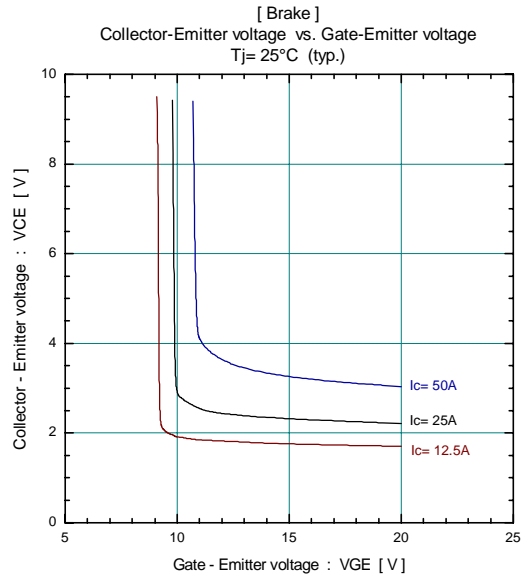
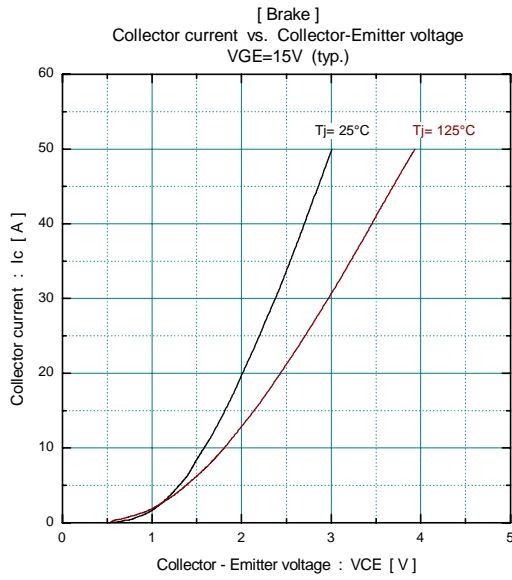
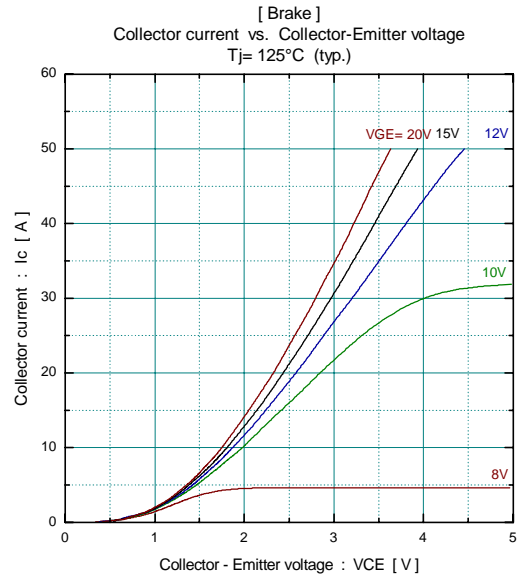
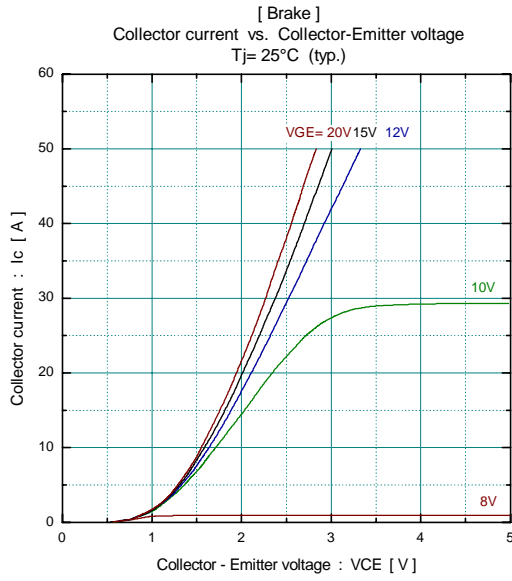
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Characteristics (Representative)

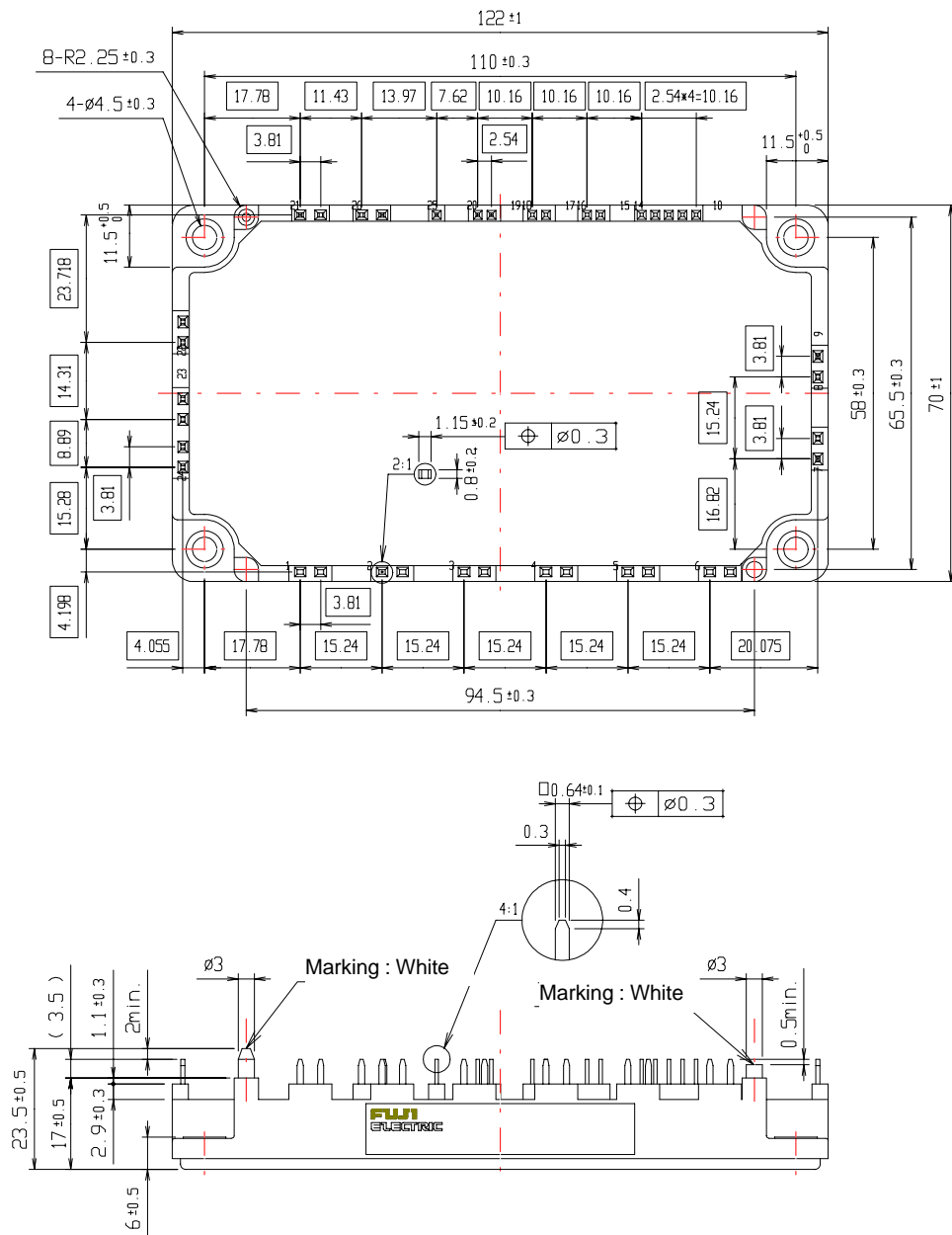








■ Outline Drawings, mm



■ Equivalent Circuit Schematic

