

# PIM/Built-in converter with thyristor and brake (S series) 1200V / 25A / 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 <sub>CES</sub>                | 1200                                       |                      | V    |     |
|                                                                                           | Gate-Emitter voltage                    | V <sub>GES</sub>                | ±20                                        |                      | V    |     |
|                                                                                           | Collector current                       | I <sub>C</sub>                  | Continuous                                 | T <sub>C</sub> =25°C | 35   | A   |
|                                                                                           |                                         |                                 |                                            | T <sub>C</sub> =80°C | 25   |     |
|                                                                                           |                                         | I <sub>CP</sub>                 | 1ms                                        | T <sub>C</sub> =25°C | 70   | A   |
|                                                                                           |                                         |                                 |                                            | T <sub>C</sub> =80°C | 50   |     |
|                                                                                           |                                         | -I <sub>C</sub>                 |                                            | 25                   | A    |     |
| Collector power dissipation                                                               | P <sub>C</sub>                          | 1 device                        |                                            | 180                  | W    |     |
| Brake                                                                                     | Collector-Emitter voltage               | V <sub>CES</sub>                | 1200                                       |                      | V    |     |
|                                                                                           | Gate-Emitter voltage                    | V <sub>GES</sub>                | ±20                                        |                      | V    |     |
|                                                                                           | Collector current                       | I <sub>C</sub>                  | Continuous                                 | T <sub>C</sub> =25°C | 25   | A   |
|                                                                                           |                                         |                                 |                                            | T <sub>C</sub> =80°C | 15   |     |
|                                                                                           |                                         | I <sub>CP</sub>                 | 1ms                                        | T <sub>C</sub> =25°C | 50   | A   |
|                                                                                           |                                         |                                 |                                            | T <sub>C</sub> =80°C | 30   |     |
|                                                                                           | Collector power dissipation             | P <sub>C</sub>                  | 1 device                                   |                      | 110  | W   |
| Repetitive peak reverse voltage(Diode)                                                    | V <sub>RRM</sub>                        | 1200                            |                                            | V                    |      |     |
| Thyristor                                                                                 | Repetitive peak off-state voltage       | V <sub>DRM</sub>                | 1600                                       |                      | V    |     |
|                                                                                           | Repetitive peak reverse voltage         | V <sub>RRM</sub>                | 1600                                       |                      | V    |     |
|                                                                                           | Average on-state current                | I <sub>T(AV)</sub>              | 50Hz/60Hz sine wave                        |                      | 25   | A   |
|                                                                                           | Surge On-state current (Non-Repetitive) | I <sub>TSM</sub>                | T <sub>j</sub> =125°C, 10ms half sine wave |                      | 290  | A   |
|                                                                                           | Junction temperature                    | T <sub>jw</sub>                 | 125                                        |                      | °C   |     |
|                                                                                           | Converter                               | Repetitive peak reverse voltage | V <sub>RRM</sub>                           | 1600                 |      | V   |
| Average output current                                                                    |                                         | I <sub>O</sub>                  | 50Hz/60Hz sine wave                        |                      | 25   | A   |
| Surge current (Non-Repetitive)                                                            |                                         | I <sub>FSM</sub>                | T <sub>j</sub> =150°C, 10ms                |                      | 260  | A   |
| I <sup>2</sup> t (Non-Repetitive)                                                         |                                         | I <sup>2</sup> t                | half sine wave                             |                      | 338  | A²s |
| Junction temperature (except Thyristor)                                                   |                                         | T <sub>j</sub>                  | +150                                       |                      | °C   |     |
| Storage temperature                                                                       |                                         | T <sub>slg</sub>                | -40 to +125                                |                      | °C   |     |
| Isolation between terminal and copper base *2<br>voltage between thermistor and others *3 |                                         | V <sub>iso</sub>                | 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)

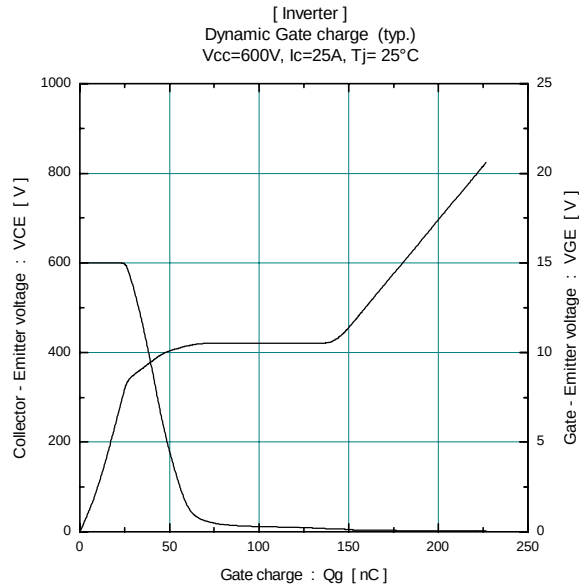
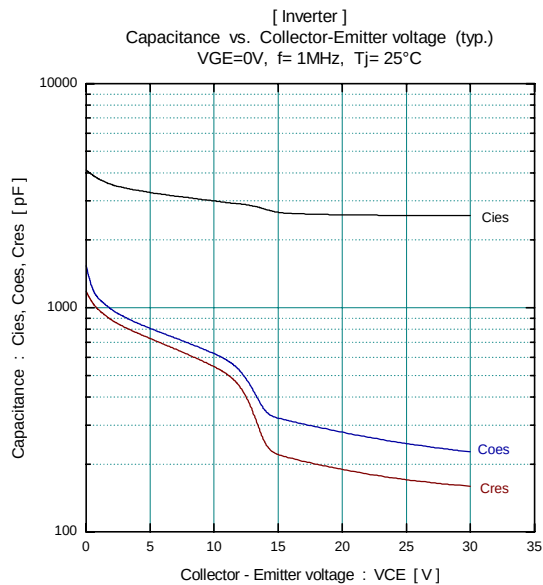
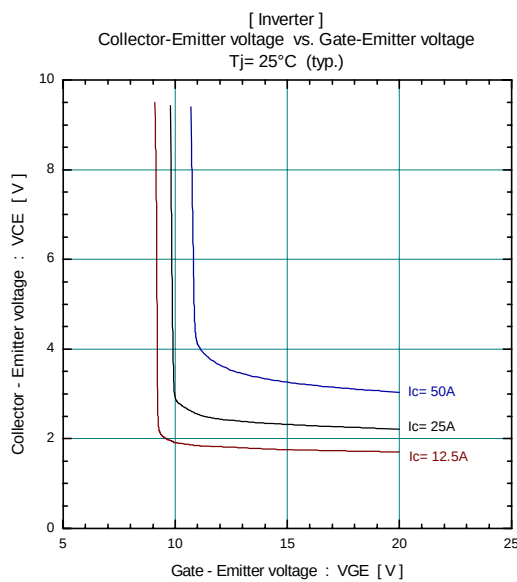
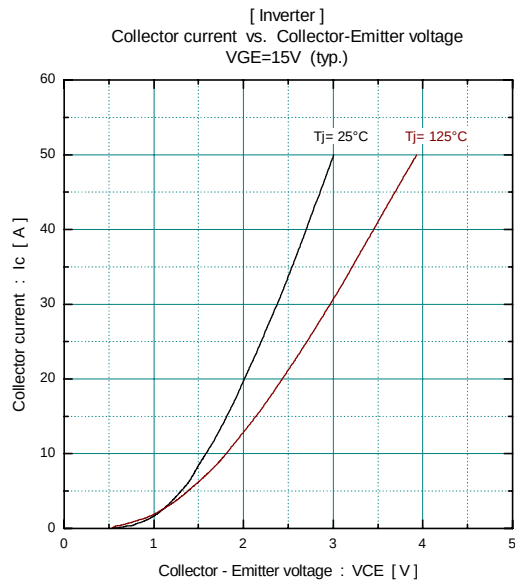
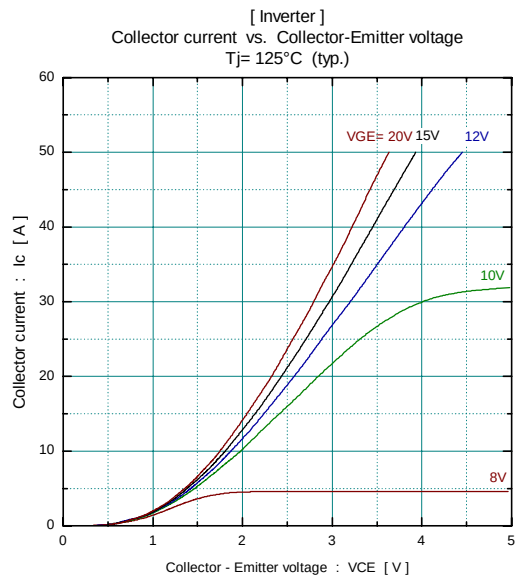
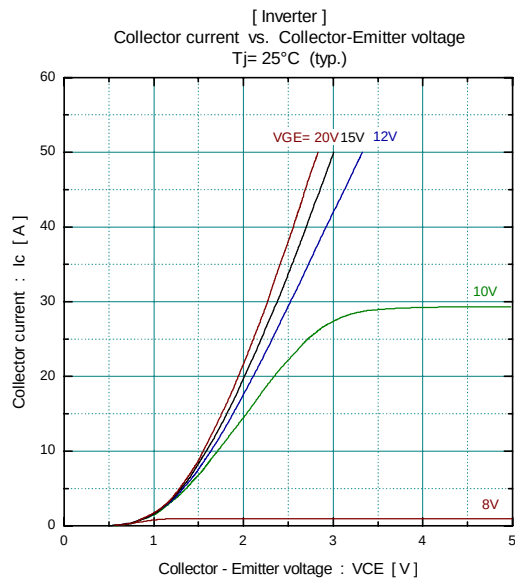
| Item      |                                      | Symbol   | Condition                                | Characteristics |      |      | Unit |
|-----------|--------------------------------------|----------|------------------------------------------|-----------------|------|------|------|
|           |                                      |          |                                          | Min.            | Typ. | Max. |      |
| Inverter  | Zero gate voltage collector current  | ICES     | VCE=1200V, VGE=0V                        |                 |      | 100  | μA   |
|           | Gate-Emitter leakage current         | IGES     | VCE=0V, VGE=±20V                         |                 |      | 200  | nA   |
|           | Gate-Emitter threshold voltage       | VGE(th)  | VCE=20V, IC=25mA                         | 5.5             | 7.2  | 8.5  | V    |
|           | Collector-Emitter saturation voltage | VCE(sat) | VGE=15V, IC=25A                          | chip            | 2.1  |      | V    |
|           |                                      |          |                                          | terminal        | 2.2  | 2.6  |      |
|           | Input capacitance                    | Cies     | VGE=0V, VCE=10V, f=1MHz                  |                 | 3000 |      | pF   |
|           | Turn-on time                         | ton      | VCC=600V<br>IC=25A<br>VGE=±15V<br>RG=51Ω |                 | 0.35 | 1.2  | μs   |
|           |                                      | tr       |                                          |                 | 0.25 | 0.6  |      |
|           | Turn-off                             | toff     |                                          |                 | 0.45 | 1.0  |      |
|           |                                      | tr       |                                          |                 | 0.08 | 0.3  |      |
|           | Forward on voltage                   | VF       | IF=25A                                   | chip            | 2.3  |      | V    |
|           |                                      |          |                                          | terminal        | 2.4  | 3.2  |      |
| Brake     | Reverse recovery time of FRD         | trr      | IF=25A                                   |                 |      | 350  | ns   |
|           | Zero gate voltage collector current  | ICES     | VCES=1200V, VGE=0V                       |                 |      | 100  | μA   |
|           | Gate-Emitter leakage current         | IGES     | VCE=0V, VGE=±20V                         |                 |      | 200  | nA   |
|           | Collector-Emitter saturation voltage | VCE(sat) | IC=15A, VGE=15V                          | chip            | 2.1  |      | V    |
|           |                                      |          |                                          | terminal        | 2.2  | 2.6  |      |
|           | Turn-on time                         | ton      | VCC=600V<br>IC=15A<br>VGE=±15V<br>RG=82Ω |                 | 0.35 | 1.2  | μs   |
|           |                                      | tr       |                                          |                 | 0.25 | 0.6  |      |
|           | Turn-off time                        | toff     |                                          |                 | 0.45 | 1.0  |      |
|           |                                      | tr       |                                          |                 | 0.08 | 0.3  |      |
|           | Reverse current                      | IRRM     | VR=1200V                                 |                 |      | 100  | μA   |
|           | off-state current                    | IDM      | VDM=1600V                                |                 |      | 1.0  | mA   |
| Thyristor | Reverse current                      | IRRM     | 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=25A                                  | chip            | 1.05 | 1.15 | V    |
|           |                                      |          |                                          | terminal        | 1.1  |      |      |
| Converter | Forward on voltage                   | VFM      | IF=25A                                   | chip            | 1.1  |      | V    |
|           |                                      |          |                                          | terminal        | 1.2  | 1.5  |      |
| Thyristor | Reverse current                      | IRRM     | VR=1600V                                 |                 |      | 100  | μA   |
|           | Resistance                           | R        | T=25°C                                   |                 | 5000 |      | Ω    |
|           |                                      |          | T=100°C                                  | 465             | 495  | 520  |      |
|           | B value                              | B        | T=25/50°C                                | 3305            | 3375 | 3450 |      |

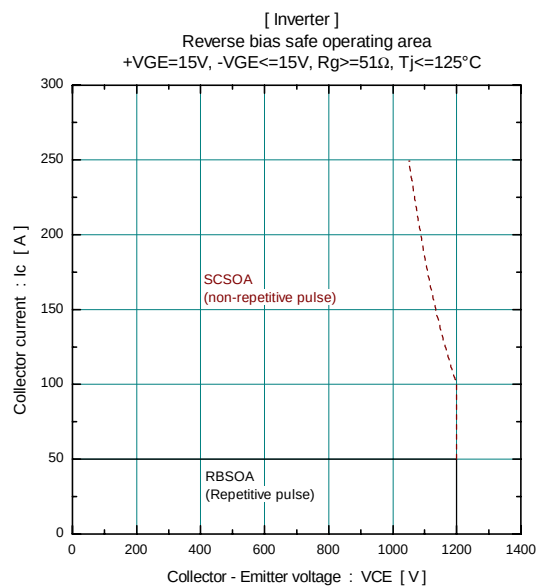
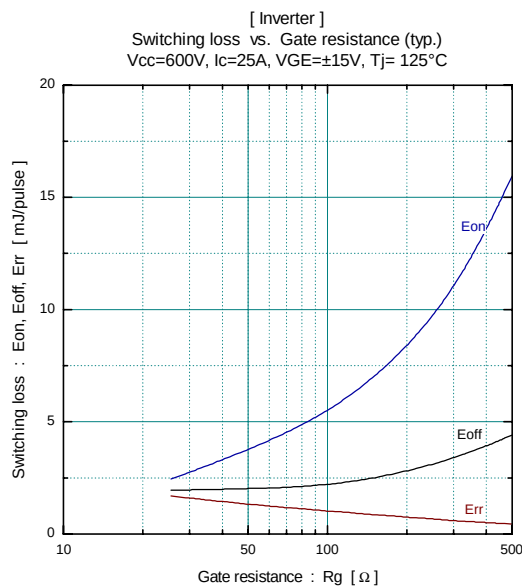
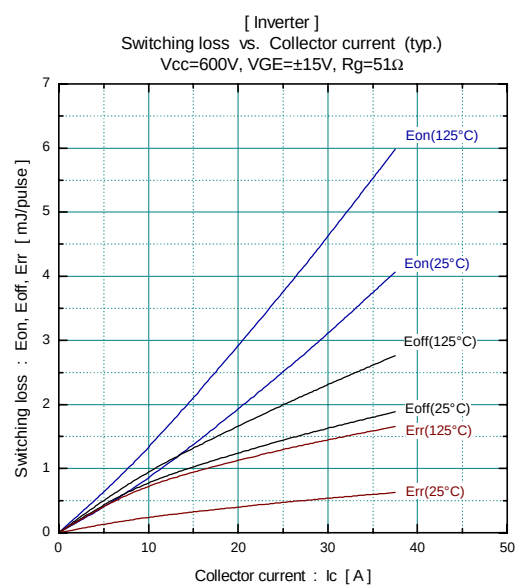
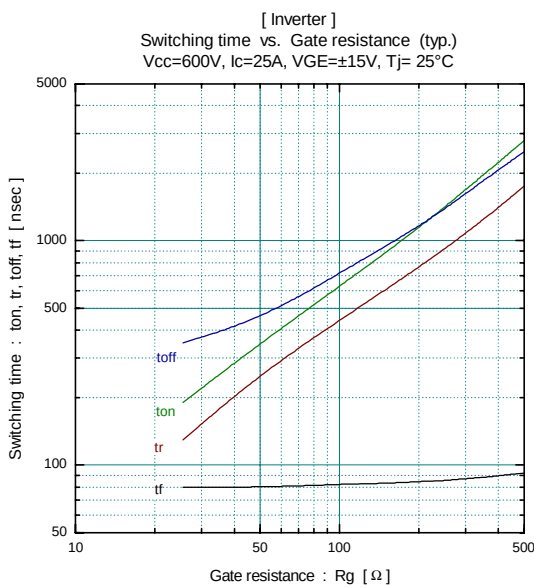
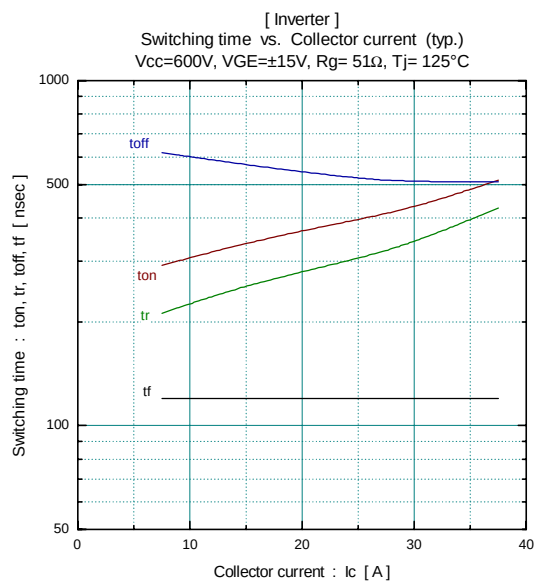
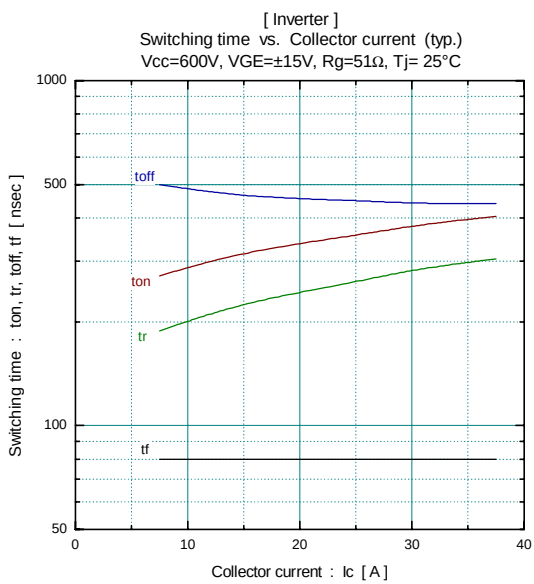
● Thermal resistance Characteristics

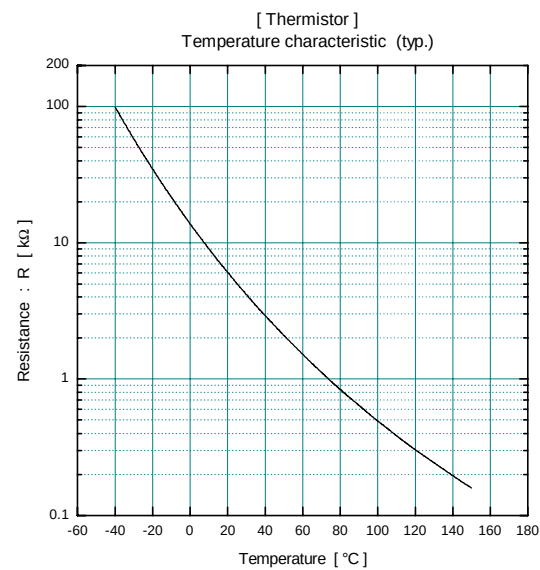
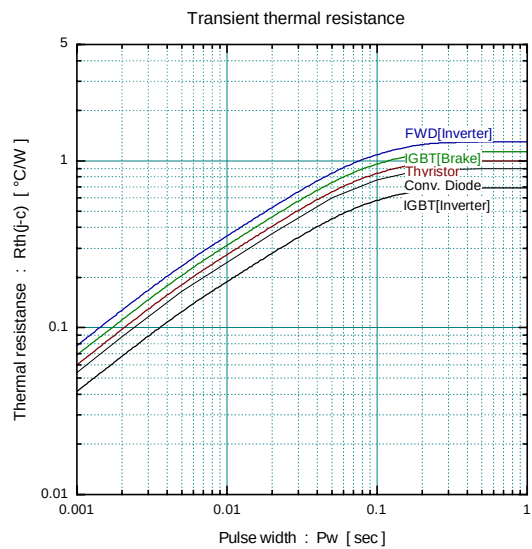
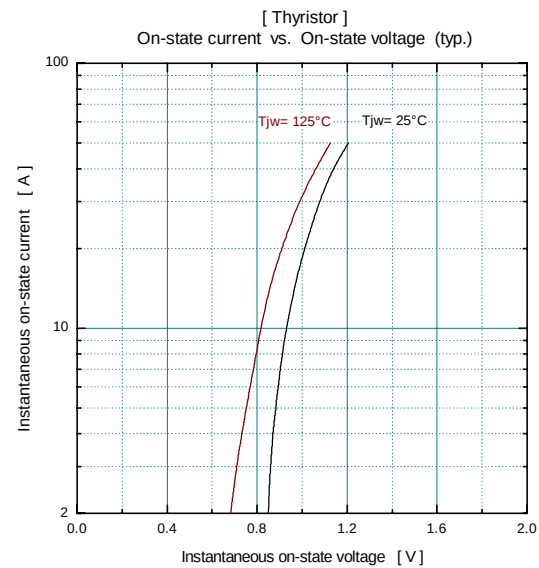
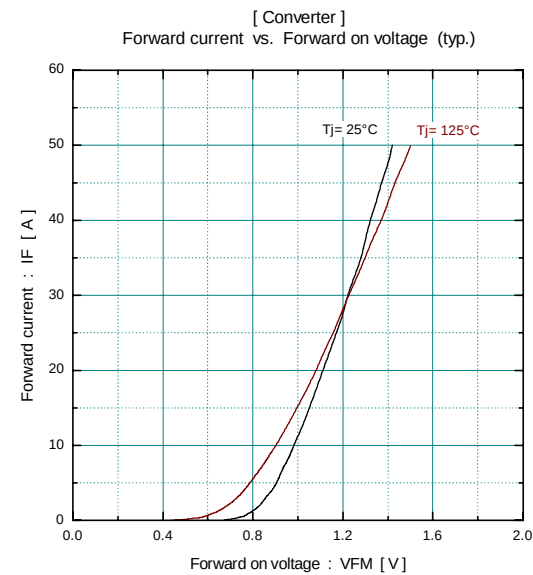
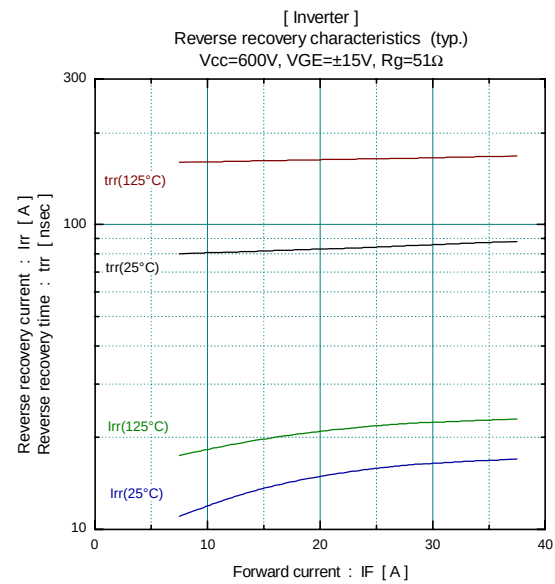
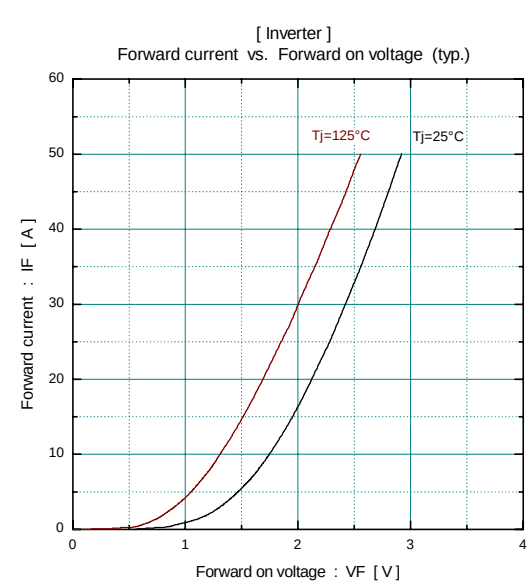
| Item                            |  | Symbol   | Condition             | Characteristics |      |      | Unit |
|---------------------------------|--|----------|-----------------------|-----------------|------|------|------|
|                                 |  |          |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) |  | Rth(j-c) | Inverter IGBT         |                 |      | 0.69 | °C/W |
|                                 |  |          | Inverter FWD          |                 |      | 1.30 |      |
|                                 |  |          | Brake IGBT            |                 |      | 1.14 |      |
|                                 |  |          | Thyristor             |                 |      | 1.00 |      |
|                                 |  |          | Converter Diode       |                 |      | 0.90 |      |
| Contact thermal resistance *    |  | Rth(c-f) | With thermal compound |                 | 0.05 |      |      |

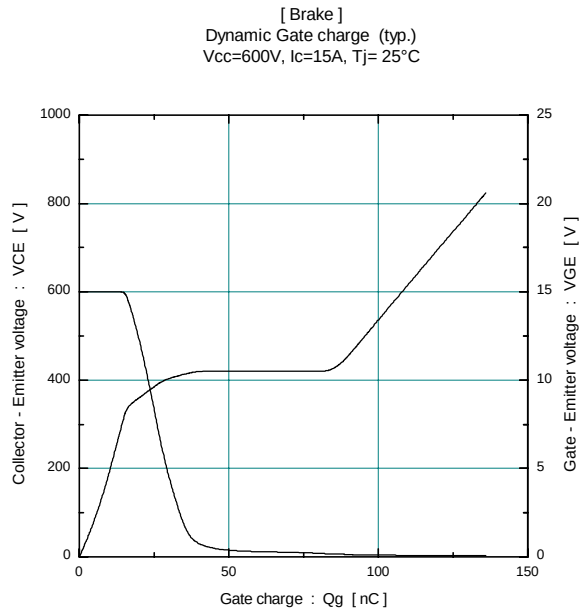
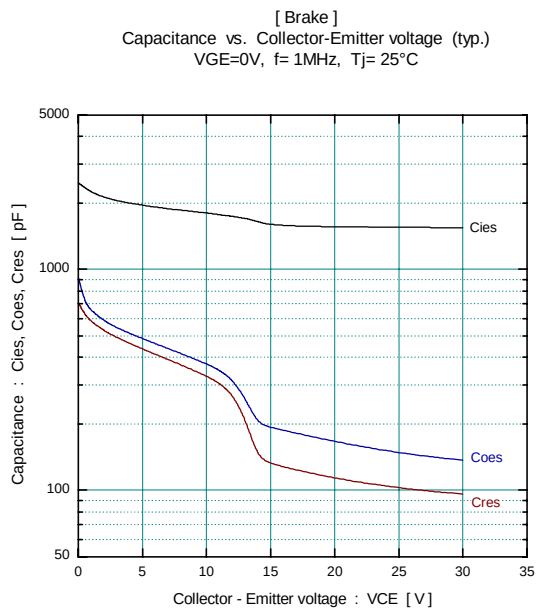
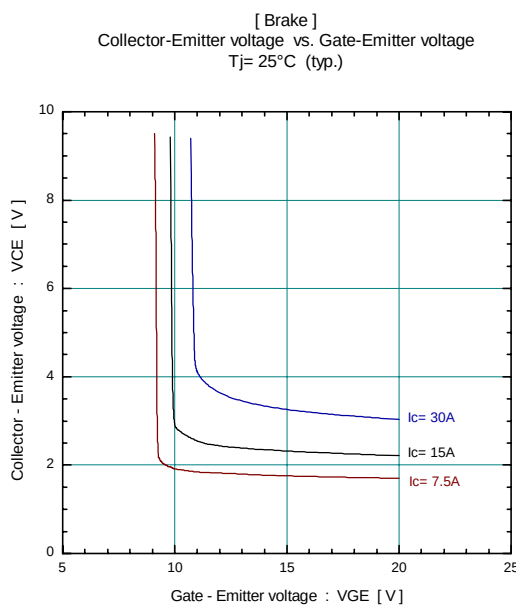
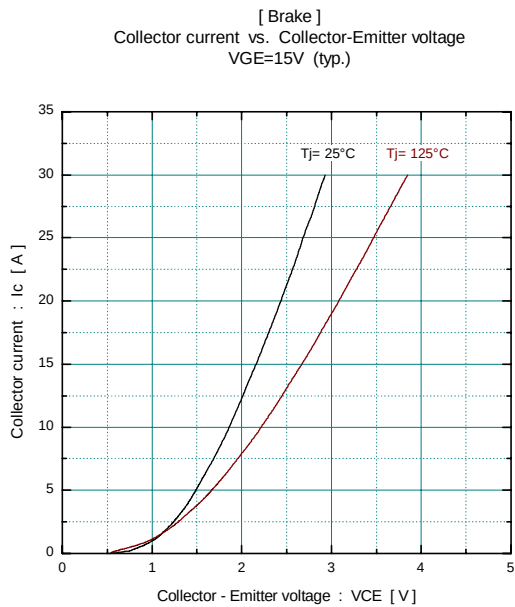
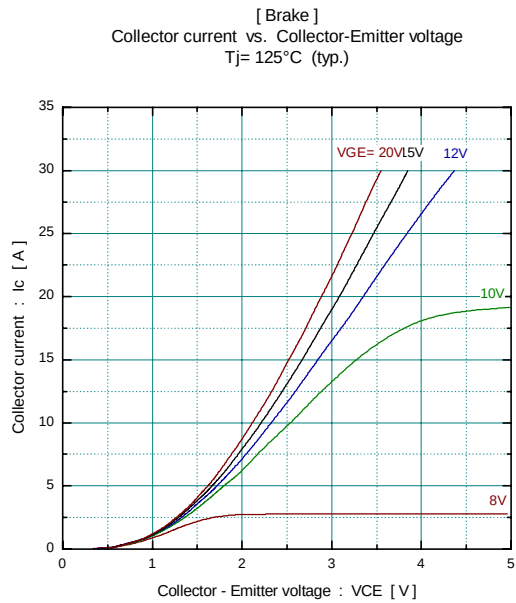
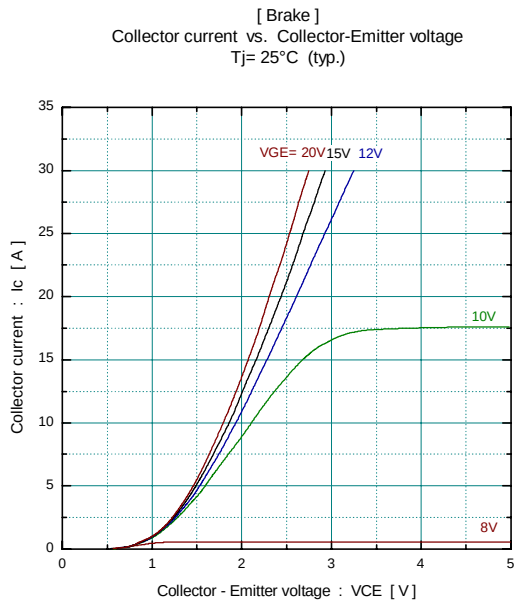
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Characteristics (Representative)

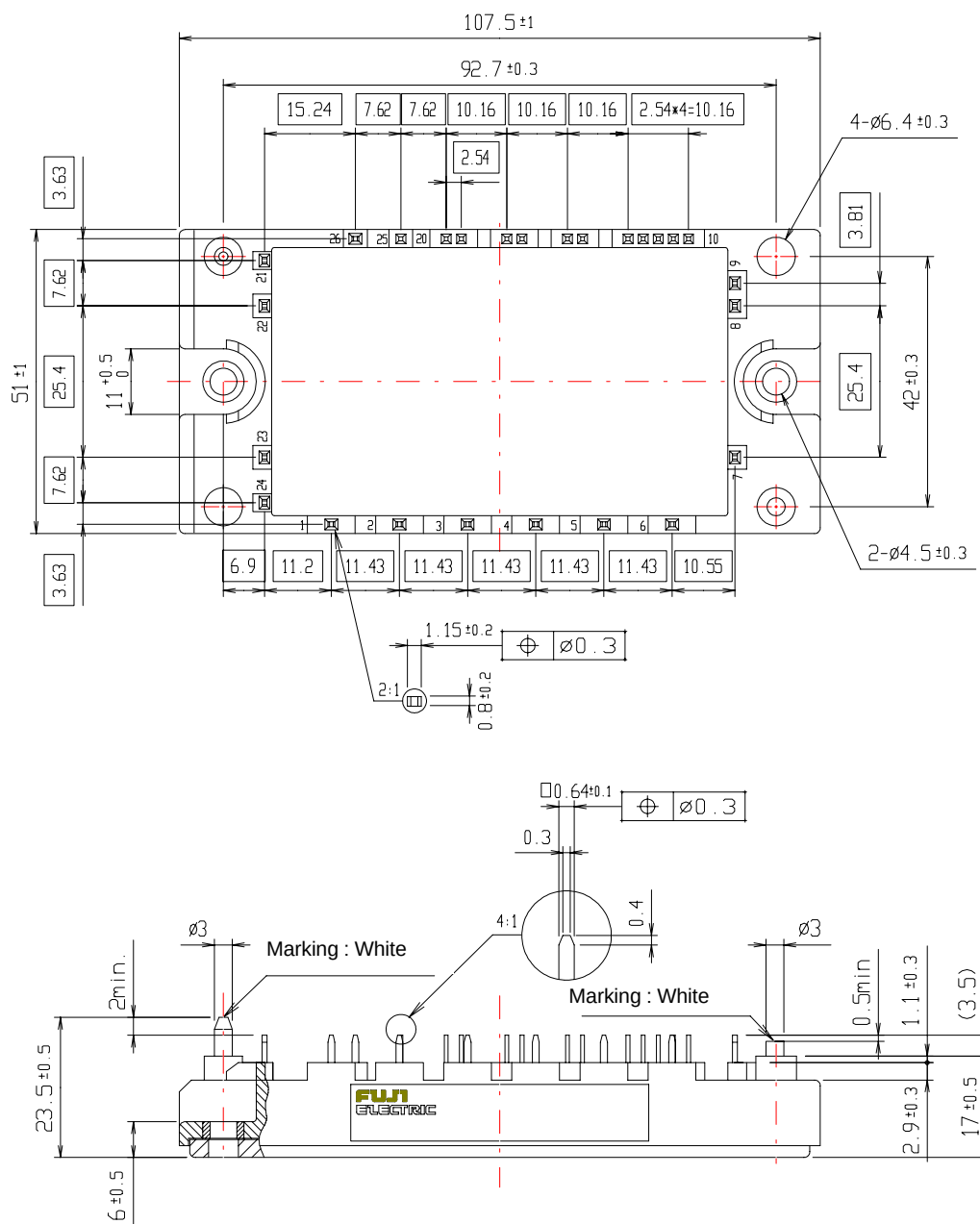








## Outline Drawings, mm



## Equivalent Circuit Schematic

