

### IGBT MODULE (S series) 1200V / 10A / 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 <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 | 15                 | A                |
|                                 |                                     |                              |                             | T <sub>C</sub> =80°C | 10                 |                  |
|                                 |                                     | I <sub>CP</sub>              | 1ms                         | T <sub>C</sub> =25°C | 30                 | A                |
|                                 |                                     |                              |                             | T <sub>C</sub> =80°C | 20                 |                  |
|                                 |                                     | -I <sub>C</sub>              |                             | 10                   | A                  |                  |
| Collector power dissipation     | P <sub>C</sub>                      | 1 device                     |                             | 75                   | 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 | 15                 | A                |
|                                 |                                     |                              |                             | T <sub>C</sub> =80°C | 10                 |                  |
|                                 |                                     | I <sub>CP</sub>              | 1ms                         | T <sub>C</sub> =25°C | 30                 | A                |
|                                 |                                     |                              |                             | T <sub>C</sub> =80°C | 20                 |                  |
|                                 | Collector power dissipation         | P <sub>C</sub>               | 1 device                    |                      | 75                 | W                |
| Repetitive peak reverse voltage | V <sub>R<sub>RRM</sub></sub>        |                              |                             | 1200                 | V                  |                  |
| Converter                       | Repetitive peak reverse voltage     | V <sub>R<sub>RRM</sub></sub> |                             |                      | 1600               | V                |
|                                 | Average output current              | I <sub>O</sub>               | 50Hz/60Hz sine wave         |                      | 10                 | A                |
|                                 | Surge current (Non-Repetitive)      | I <sub>FSM</sub>             | T <sub>J</sub> =150°C, 10ms |                      | 105                | A                |
|                                 | I <sup>2</sup> t (Non-Repetitive)   | I <sup>2</sup> t             | half sine wave              |                      | 55                 | A <sup>2</sup> s |
| Operating junction temperature  |                                     | T <sub>J</sub>               |                             |                      | +150               | °C               |
| Storage temperature             |                                     | T <sub>stg</sub>             |                             |                      | -40 to +125        | °C               |
| Isolation voltage               | between terminal and copper base *2 | V <sub>iso</sub>             | AC : 1 minute               |                      | AC 2500            | V                |
|                                 | between thermistor and others *3    |                              |                             |                      | AC 2500            |                  |
| Mounting screw torque           |                                     |                              |                             |                      | 3.5 * <sub>1</sub> | 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)

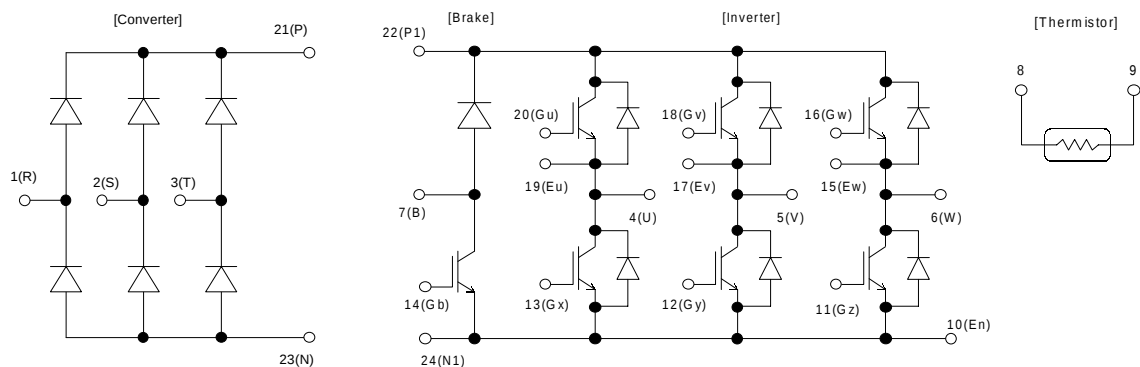
| Item       |                                      | Symbol               | Condition                                         | Characteristics |      |      | Unit |
|------------|--------------------------------------|----------------------|---------------------------------------------------|-----------------|------|------|------|
|            |                                      |                      |                                                   | Min.            | Typ. | Max. |      |
| Inverter   | Zero gate voltage collector current  | I <sub>CES</sub>     | V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V       |                 |      | 1.0  | mA   |
|            | Gate-Emitter leakage current         | I <sub>GES</sub>     | 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> =10mA        | 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> =10A chip    |                 | 2.1  |      | V    |
|            |                                      |                      | terminal                                          |                 | 2.15 | 2.6  |      |
|            | Input capacitance                    | C <sub>ies</sub>     | V <sub>GE</sub> =0V, V <sub>CE</sub> =10V, f=1MHz |                 | 1200 |      | pF   |
|            | Turn-on time                         | t <sub>on</sub>      | V <sub>CC</sub> =600V                             |                 | 0.35 | 1.2  | μs   |
|            |                                      | t <sub>r</sub>       | I <sub>C</sub> =10A                               |                 | 0.25 | 0.6  |      |
|            |                                      | t <sub>r(i)</sub>    | V <sub>GE</sub> =±15V                             |                 | 0.1  |      |      |
|            | Turn-off                             | t <sub>off</sub>     | R <sub>G</sub> =120Ω                              |                 | 0.45 | 1.0  |      |
|            |                                      | t <sub>f</sub>       |                                                   |                 | 0.08 | 0.3  |      |
| Brake      | Forward on voltage                   | V <sub>F</sub>       | I <sub>F</sub> =10A chip                          |                 | 2.3  |      | V    |
|            | Reverse recovery time of FRD         | t <sub>rr</sub>      | I <sub>F</sub> =10A terminal                      |                 | 2.35 | 3.2  |      |
|            |                                      |                      |                                                   |                 |      |      |      |
|            | Zero gate voltage collector current  | I <sub>CES</sub>     | V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V       |                 |      | 1.0  | mA   |
|            | Gate-Emitter leakage current         | I <sub>GES</sub>     | 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> =10A, V <sub>GE</sub> =15V chip    |                 | 2.1  |      | V    |
|            |                                      |                      | terminal                                          |                 | 2.2  | 2.6  |      |
|            | Turn-on time                         | t <sub>on</sub>      | V <sub>CC</sub> =600V                             |                 | 0.35 | 1.2  | μs   |
|            |                                      | t <sub>r</sub>       | I <sub>C</sub> =10A                               |                 | 0.25 | 0.6  |      |
|            |                                      | t <sub>off</sub>     | V <sub>GE</sub> =±15V                             |                 | 0.45 | 1.0  |      |
| Converter  | Turn-off time                        | t <sub>f</sub>       | R <sub>G</sub> =120 Ω                             |                 | 0.08 | 0.3  |      |
|            |                                      |                      |                                                   |                 |      |      |      |
|            | Reverse current                      | I <sub>RRM</sub>     | V <sub>R</sub> =1200V                             |                 |      | 1.0  | mA   |
|            | Forward on voltage                   | V <sub>FM</sub>      | I <sub>F</sub> =10A chip                          |                 | 1.1  |      | V    |
|            |                                      |                      | terminal                                          |                 | 1.2  | 1.5  |      |
|            | Reverse current                      | I <sub>RRM</sub>     | V <sub>R</sub> =1600V                             |                 |      | 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

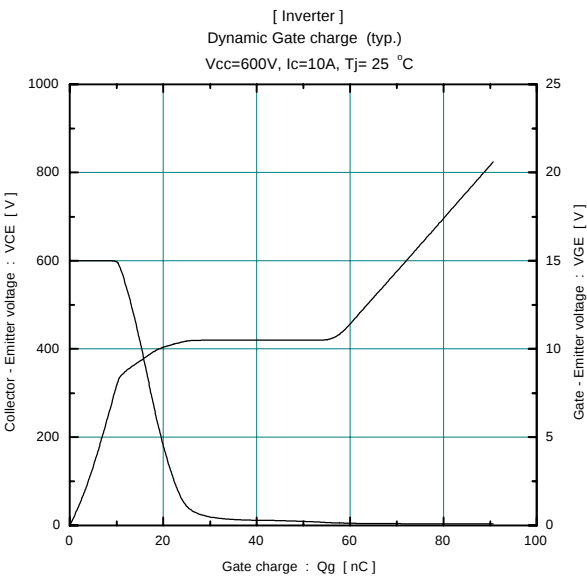
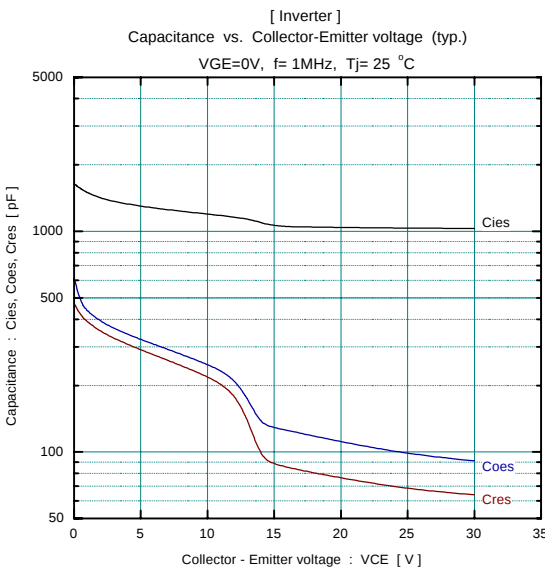
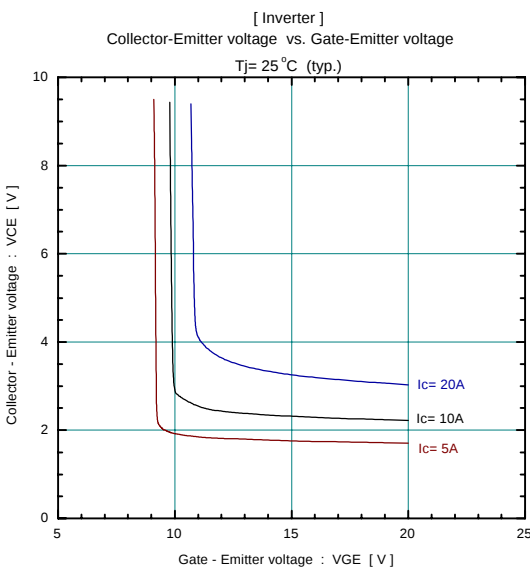
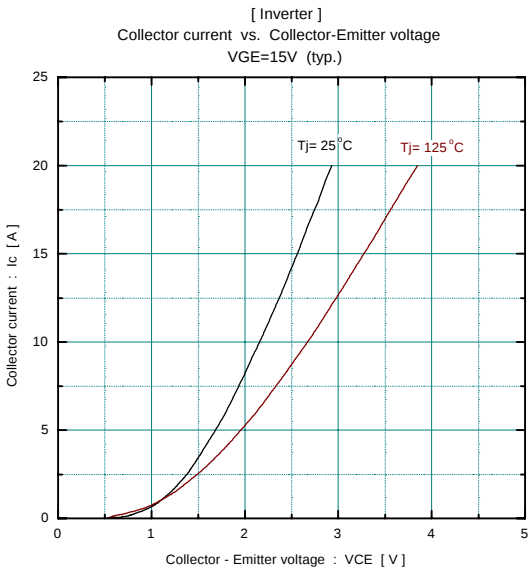
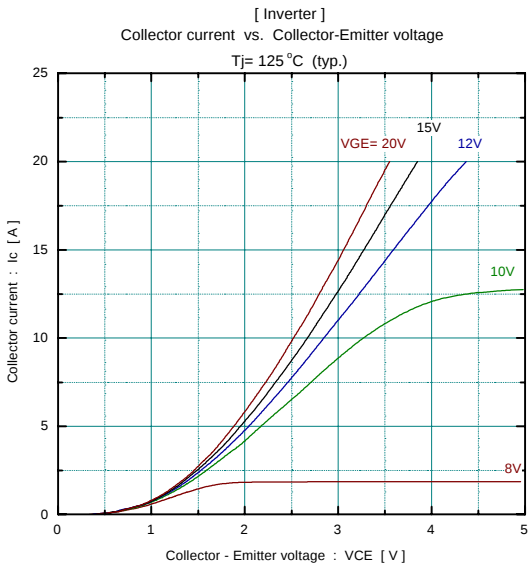
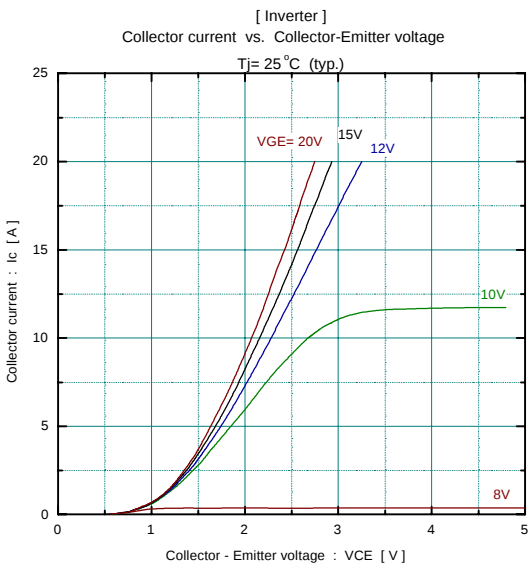
| Item                            | Symbol               | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------------------|-----------------------|-----------------|------|------|------|
|                                 |                      |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | R <sub>th(j-c)</sub> | Inverter IGBT         |                 |      | 1.67 | °C/W |
|                                 |                      | Inverter FWD          |                 |      | 2.78 |      |
|                                 |                      | Brake IGBT            |                 |      | 1.67 |      |
|                                 |                      | Converter Diode       |                 |      | 1.85 |      |
| Contact thermal resistance *    | R <sub>th(c-f)</sub> | With thermal compound |                 | 0.05 |      |      |

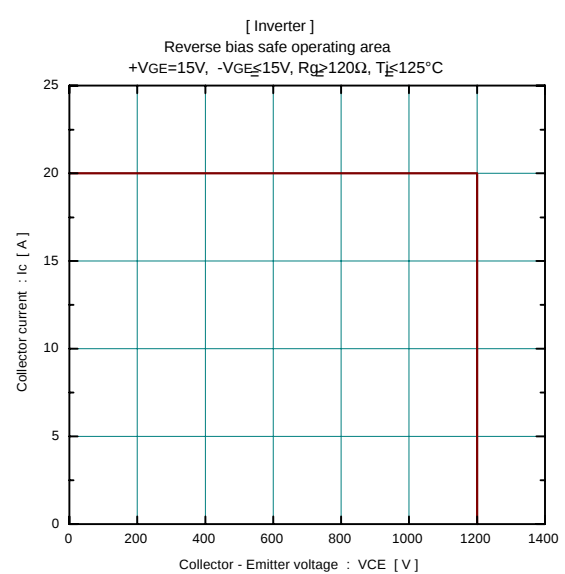
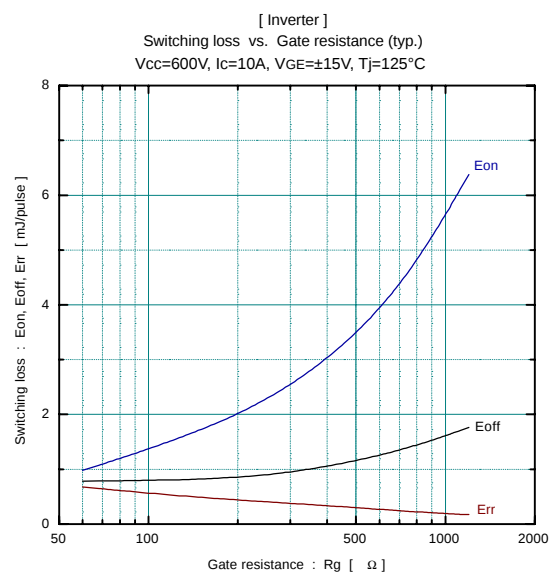
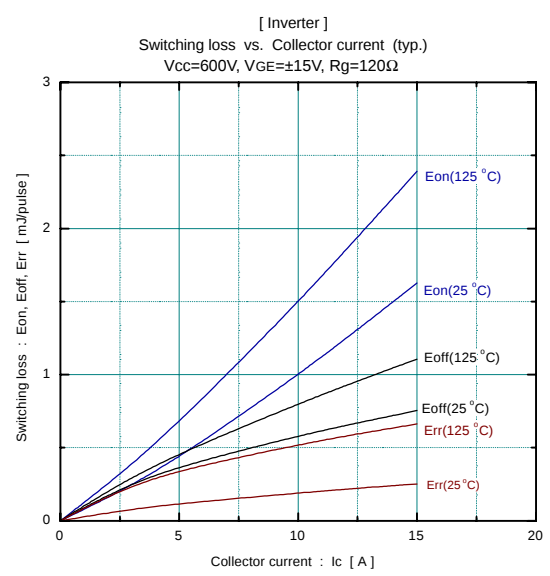
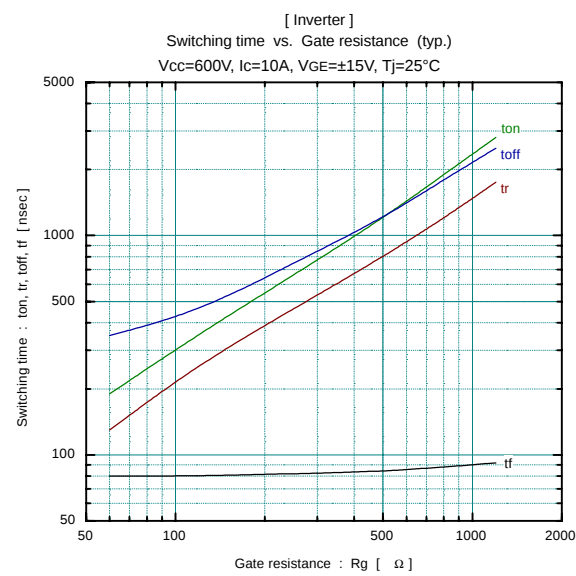
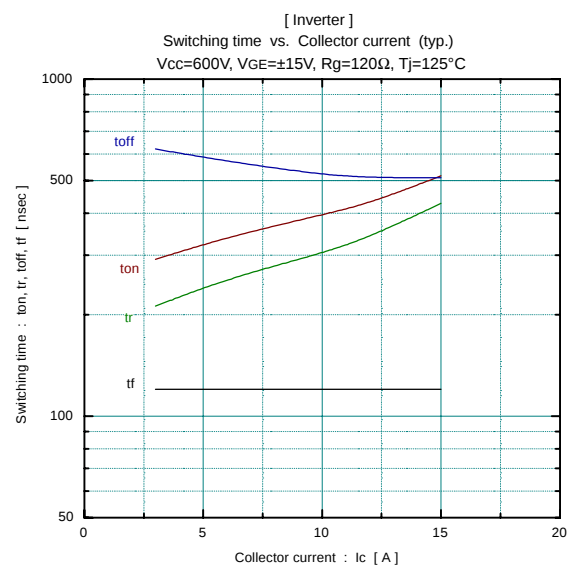
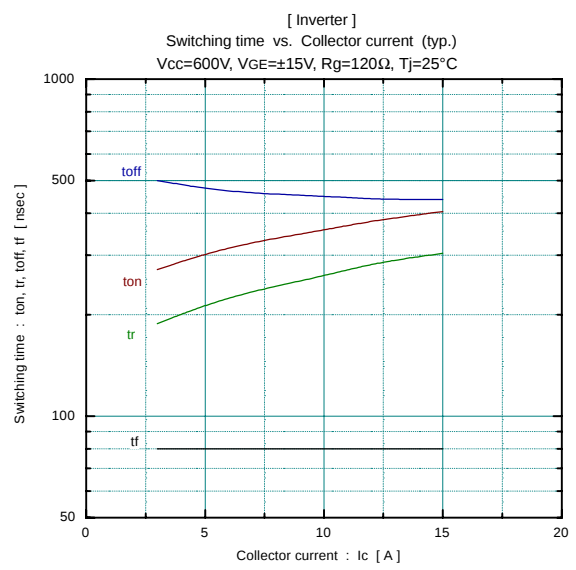
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

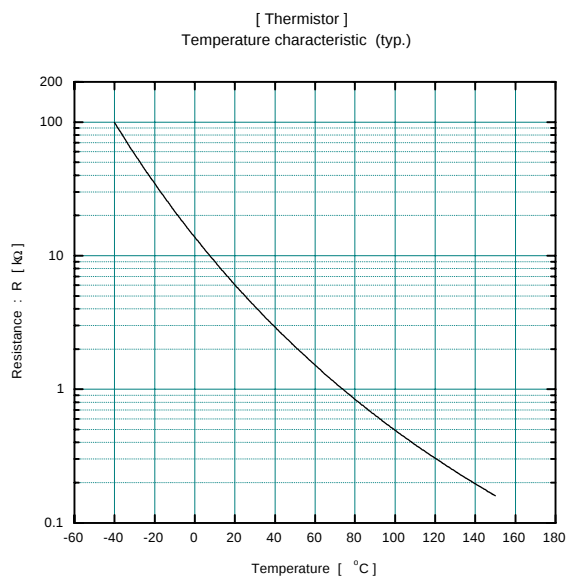
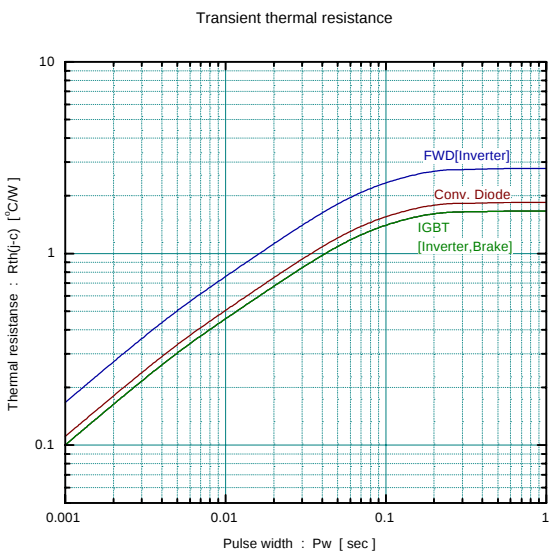
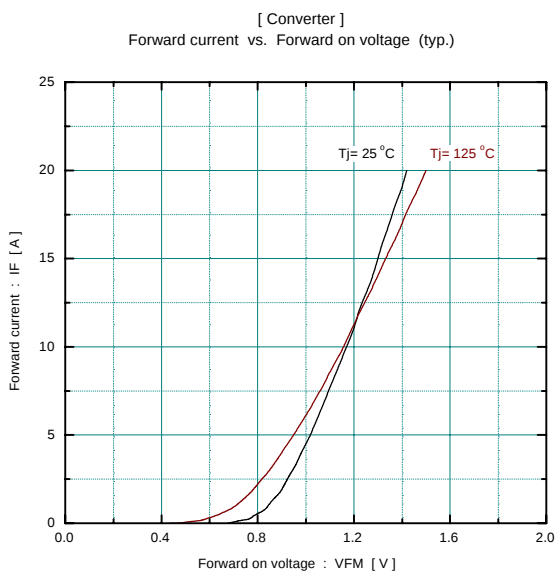
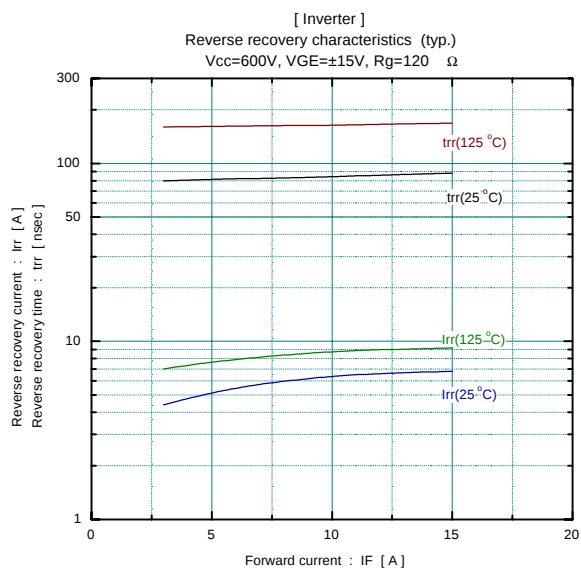
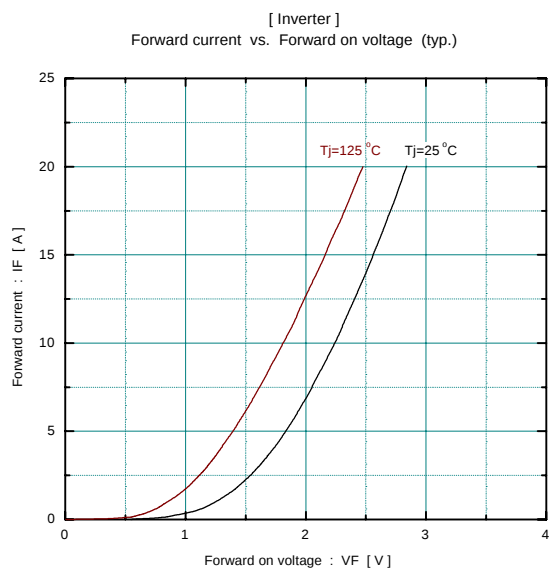
■ Equivalent Circuit Schematic

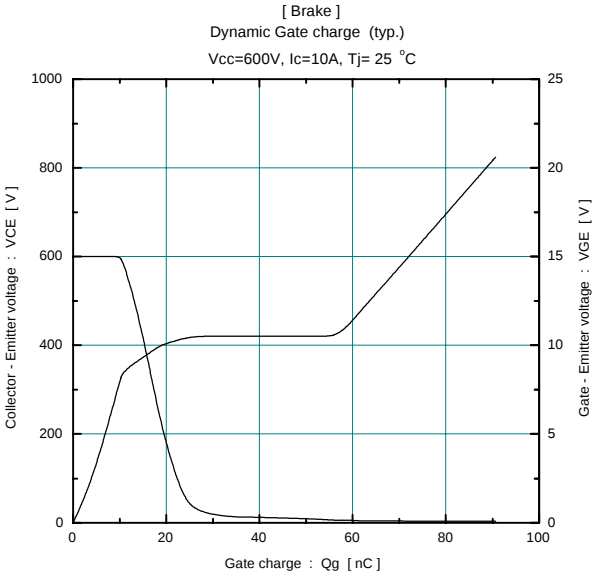
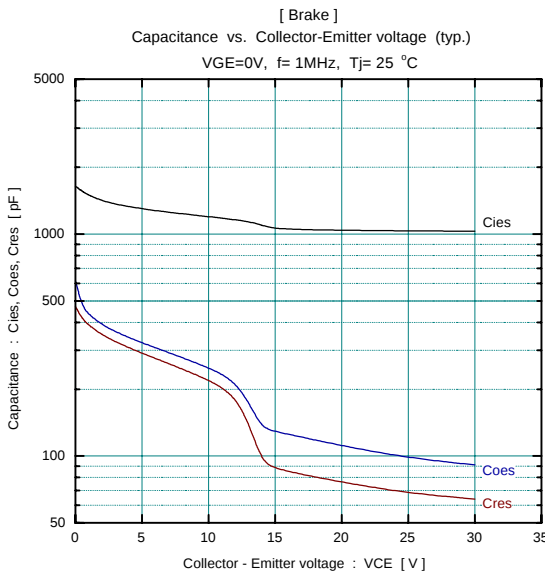
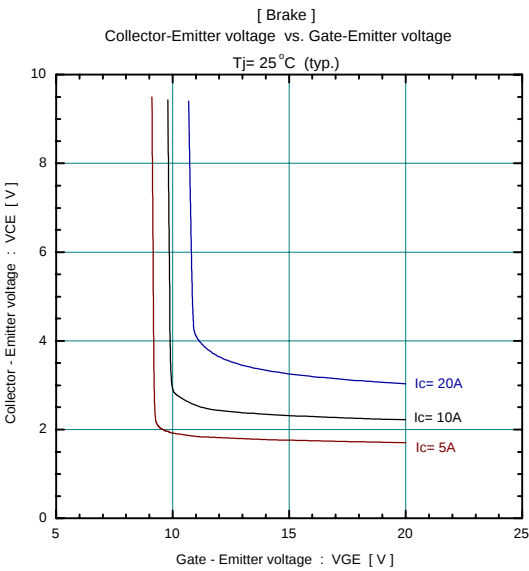
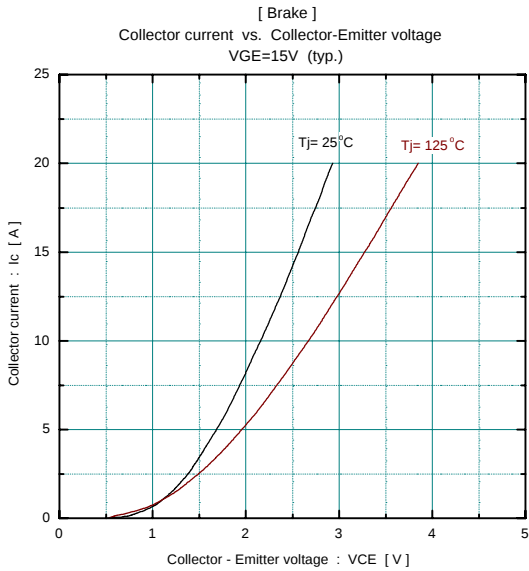
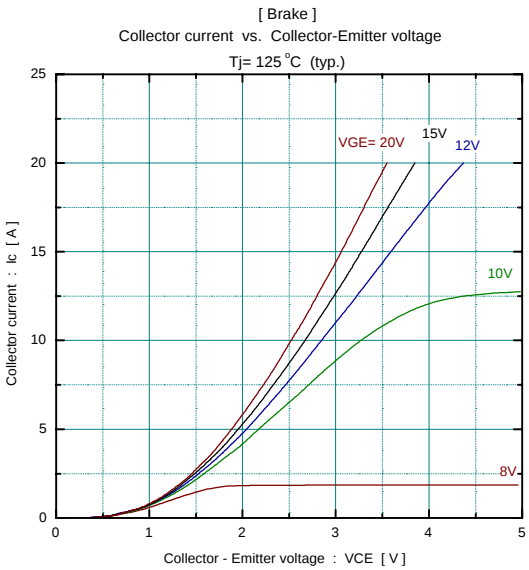
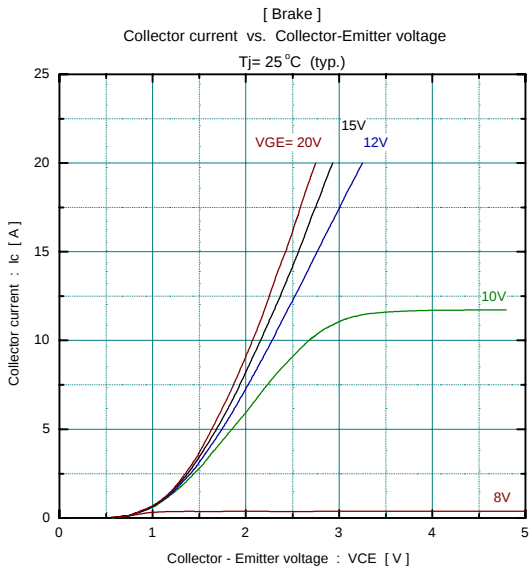


■ Characteristics (Representative)









■ Outline Drawings, mm

