

### PIM/Built-in converter with thyristor and brake (S series) 600V / 100A / 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                     | $V_{CES}$                                               | 600         | V                    |
|           | Gate-Emitter voltage                          | $V_{GES}$                                               | $\pm 20$    | V                    |
|           | Collector current                             | $I_c$ Continuous                                        | 100         | A                    |
|           |                                               | $I_{CP}$ 1ms                                            | 200         | A                    |
|           |                                               | $-I_c$                                                  | 100         | A                    |
|           | Collector power dissipation                   | $P_c$ 1 device                                          | 400         | W                    |
| Brake     | 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                    |
|           |                                               | $P_c$ 1 device                                          | 200         | W                    |
|           | Repetitive peak reverse voltage(Diode)        | $V_{RRM}$                                               | 600         | V                    |
| Thyristor | Repetitive peak off-state voltage             | $V_{DRM}$                                               | 800         | V                    |
|           | Repetitive peak reverse voltage               | $V_{RRM}$                                               | 800         | V                    |
|           | Average on-state current                      | $I_{T(AV)}$ 50Hz/60Hz sine wave                         | 100         | A                    |
|           | Surge On-state current (Non-Repetitive)       | $I_{TSM}$ $T_j=125^\circ\text{C}$ , 10ms half sine wave | 1050        | A                    |
|           | Junction temperature                          | $T_{jw}$                                                | 125         | $^\circ\text{C}$     |
| Converter | Repetitive peak reverse voltage               | $V_{RRM}$                                               | 800         | V                    |
|           | Average output current                        | $I_o$ 50Hz/60Hz sine wave                               | 100         | A                    |
|           | Surge current (Non-Repetitive)                | $I_{FSM}$ $T_j=150^\circ\text{C}$ , 10ms                | 700         | A                    |
|           | $I^2t$ (Non-Repetitive)                       | $I^2t$ half sine wave                                   | 2450        | $\text{A}^2\text{s}$ |
|           | 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 | $V_{iso}$ AC : 1 minute                                 | AC 2500     | V                    |
|           | voltage between thermistor and others *3      |                                                         | 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 (T<sub>j</sub>=25°C unless otherwise specified)

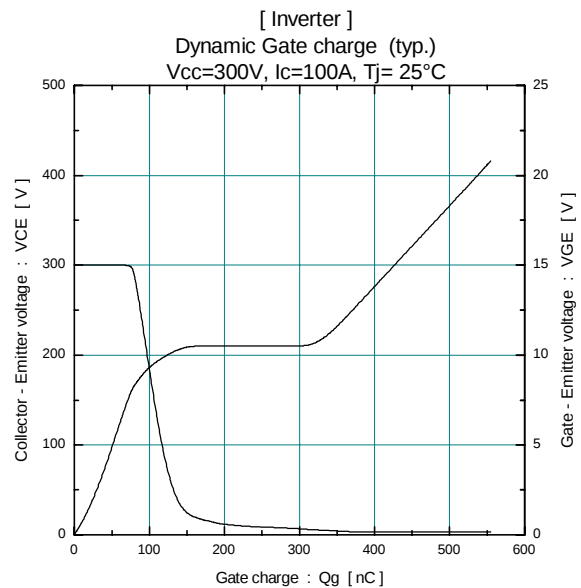
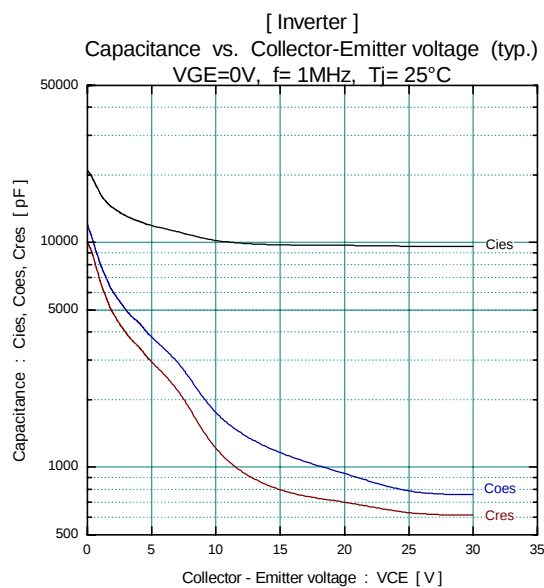
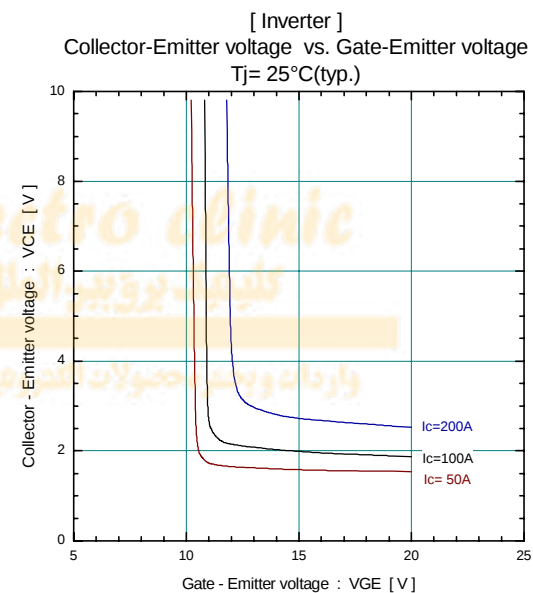
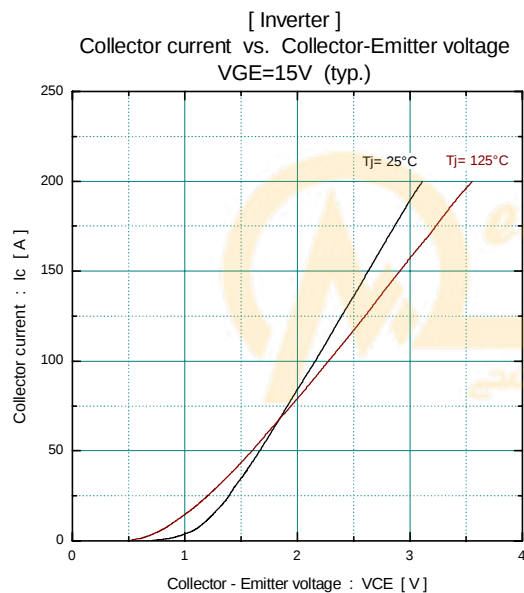
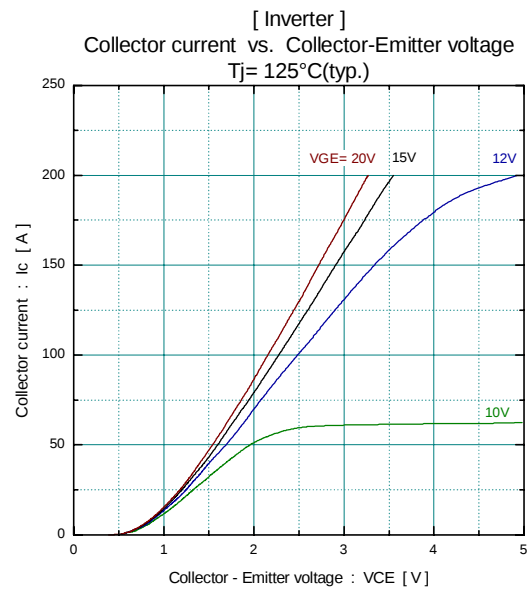
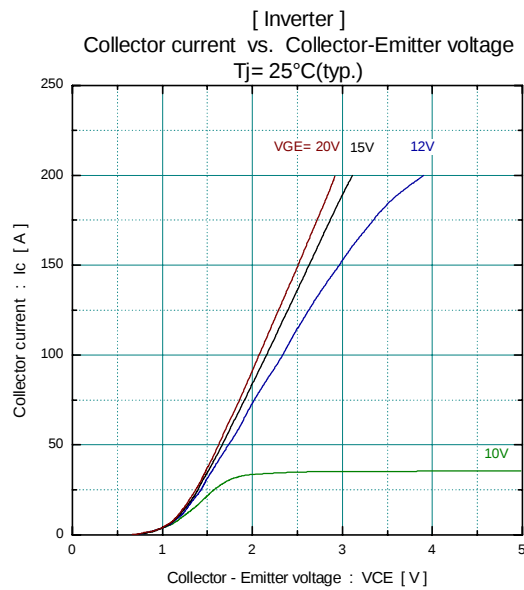
| Item       |                                      | Symbol               | Condition                                         | Characteristics |       |      | Unit |
|------------|--------------------------------------|----------------------|---------------------------------------------------|-----------------|-------|------|------|
|            |                                      |                      |                                                   | Min.            | Typ.  | Max. |      |
| Inverter   | Zero gate voltage collector current  | I <sub>CES</sub>     | V <sub>CE</sub> =600V, V <sub>GE</sub> =0V        |                 |       | 250  | μA   |
|            | Gate-Emitter leakage current         | I <sub>GES</sub>     | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V        |                 |       | 200  | nA   |
|            | Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>  | V <sub>CE</sub> =20V, I <sub>C</sub> =100mA       | 5.5             | 7.8   | 8.5  | V    |
|            | Collector-Emitter saturation voltage | V <sub>CE(sat)</sub> | V <sub>GE</sub> =15V, I <sub>C</sub> =100A chip   |                 | 1.8   |      | V    |
|            |                                      |                      | terminal                                          |                 | 2.15  | 2.6  |      |
|            | Input capacitance                    | C <sub>ies</sub>     | V <sub>GE</sub> =0V, V <sub>CE</sub> =10V, f=1MHz |                 | 10000 |      | pF   |
|            | Turn-on time                         | t <sub>on</sub>      | V <sub>CC</sub> =300V                             |                 | 0.45  | 1.2  | μs   |
|            |                                      | t <sub>r</sub>       | I <sub>C</sub> =100A                              |                 | 0.25  | 0.6  |      |
|            | Turn-off                             | t <sub>off</sub>     | V <sub>GE</sub> =±15V                             |                 | 0.40  | 1.0  |      |
|            |                                      | t <sub>f</sub>       | R <sub>G</sub> =24Ω                               |                 | 0.05  | 0.35 |      |
| Brake      | Forward on voltage                   | V <sub>F</sub>       | I <sub>F</sub> =100A chip                         |                 | 1.6   |      | V    |
|            |                                      |                      | terminal                                          |                 | 1.95  | 2.7  |      |
|            | Reverse recovery time of FRD         | t <sub>rr</sub>      | I <sub>F</sub> =100A                              |                 |       | 300  | ns   |
|            | Zero gate voltage collector current  | I <sub>CES</sub>     | V <sub>CE</sub> =600V, V <sub>GE</sub> =0V        |                 |       | 250  | μA   |
|            | Gate-Emitter leakage current         | I <sub>GES</sub>     | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V        |                 |       | 200  | nA   |
|            | Collector-Emitter saturation voltage | V <sub>CE(sat)</sub> | I <sub>C</sub> =50A, V <sub>GE</sub> =15V chip    |                 | 1.8   |      | V    |
|            |                                      |                      | terminal                                          |                 | 2.05  | 2.6  |      |
|            | Turn-on time                         | t <sub>on</sub>      | V <sub>CC</sub> =300V                             |                 | 0.45  | 1.2  | μs   |
|            |                                      | t <sub>r</sub>       | I <sub>C</sub> =50A                               |                 | 0.25  | 0.6  |      |
|            | Turn-off time                        | t <sub>off</sub>     | V <sub>GE</sub> =±15V                             |                 | 0.40  | 1.0  |      |
|            |                                      | t <sub>f</sub>       | R <sub>G</sub> =51Ω                               |                 | 0.05  | 0.35 |      |
| Thyristor  | Reverse current                      | I <sub>RRM</sub>     | V <sub>R</sub> =600V                              |                 |       | 250  | μA   |
|            | off-state current                    | I <sub>DM</sub>      | V <sub>DM</sub> =800V                             |                 |       | 1.0  | mA   |
|            | Reverse current                      | I <sub>RRM</sub>     | V <sub>RM</sub> =800V                             |                 |       | 1.0  | mA   |
|            | Gate trigger current                 | I <sub>GT</sub>      | V <sub>D</sub> =6V, I <sub>T</sub> =1A            |                 |       | 100  | mA   |
|            | Gate trigger voltage                 | V <sub>GT</sub>      | V <sub>D</sub> =6V, I <sub>T</sub> =1A            |                 |       | 2.5  | V    |
|            | On-state voltage                     | V <sub>TM</sub>      | I <sub>TM</sub> =100A chip                        |                 | 1.0   | 1.15 | V    |
|            |                                      |                      | terminal                                          |                 | 1.15  |      |      |
|            | Forward on voltage                   | V <sub>FM</sub>      | I <sub>F</sub> =100A chip                         |                 | 1.1   |      | V    |
|            |                                      |                      | terminal                                          |                 | 1.2   | 1.5  |      |
|            | Reverse current                      | I <sub>RRM</sub>     | V <sub>R</sub> =800V                              |                 |       | 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    |

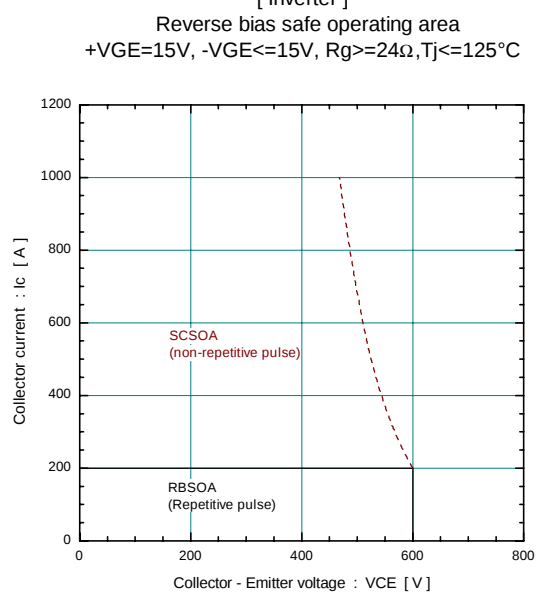
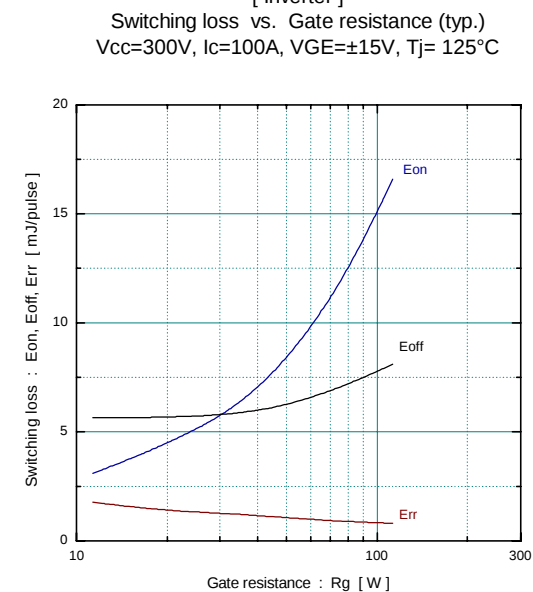
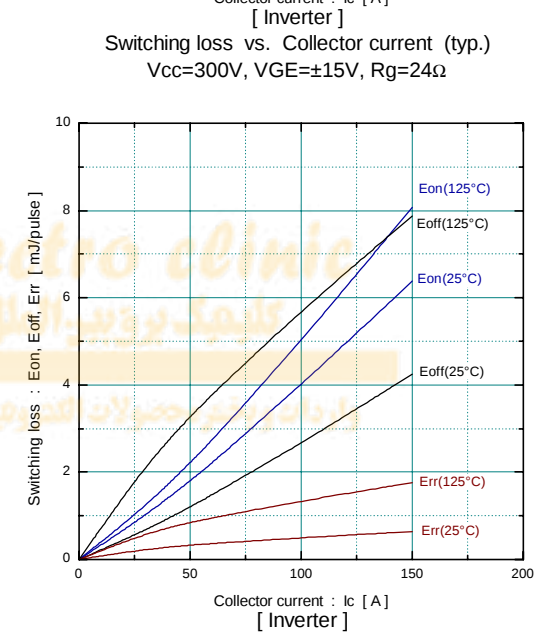
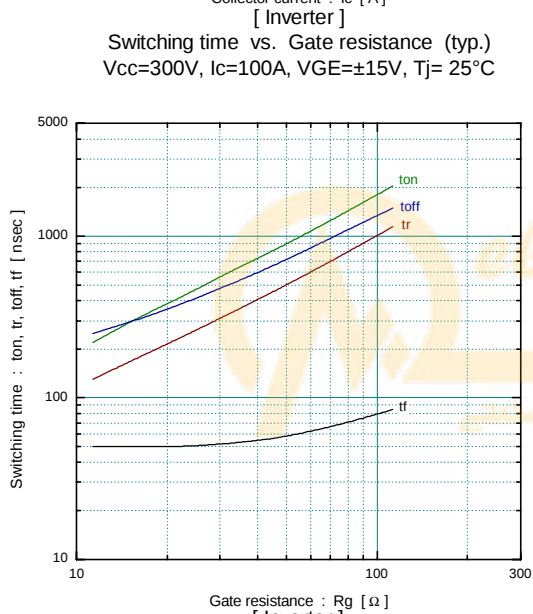
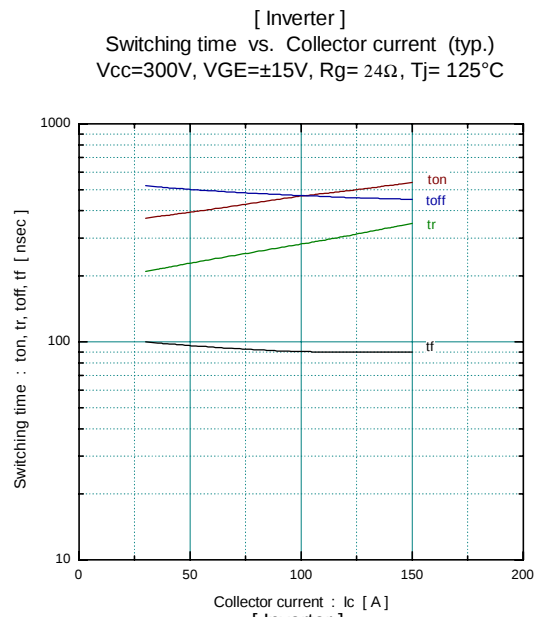
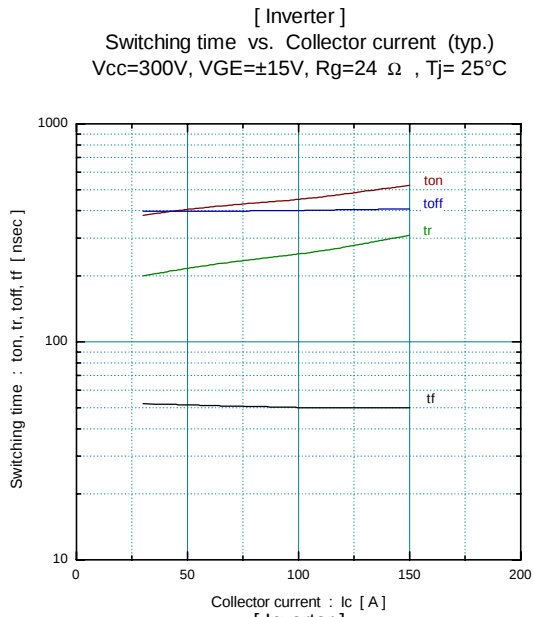
● Thermal resistance Characteristics

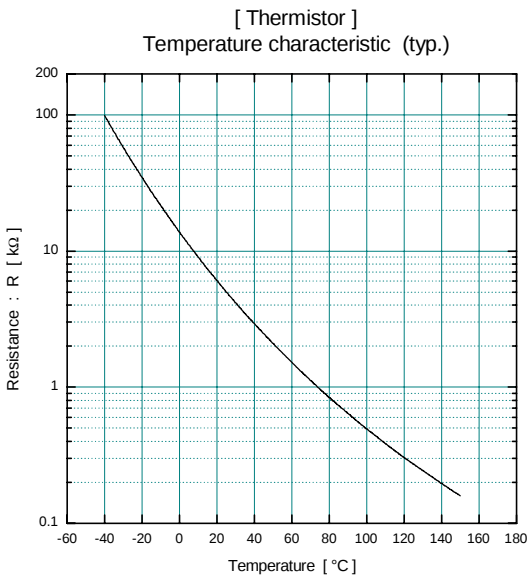
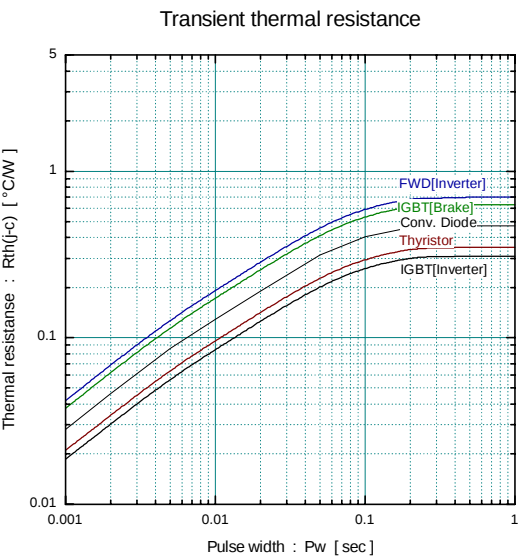
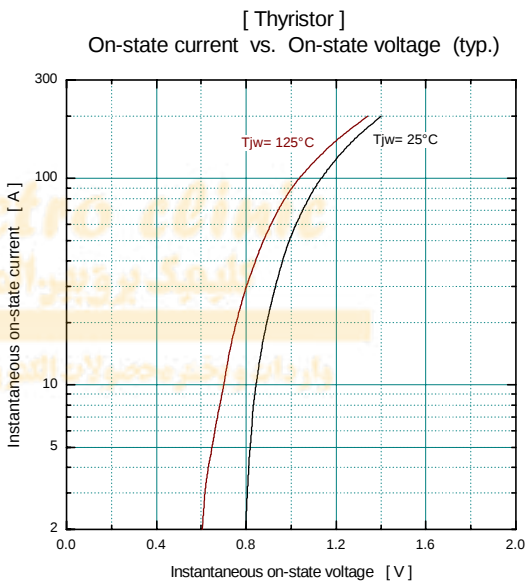
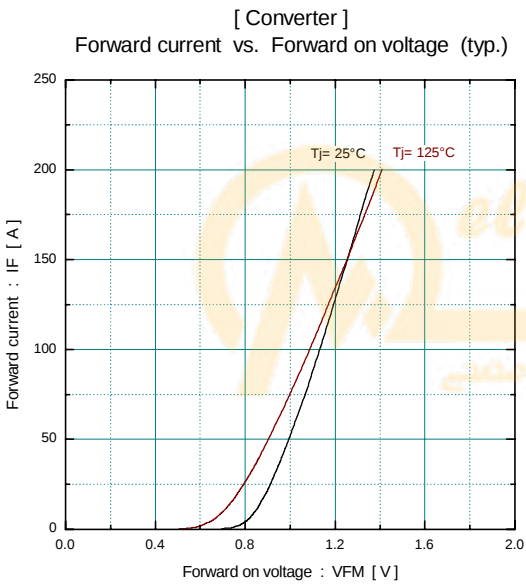
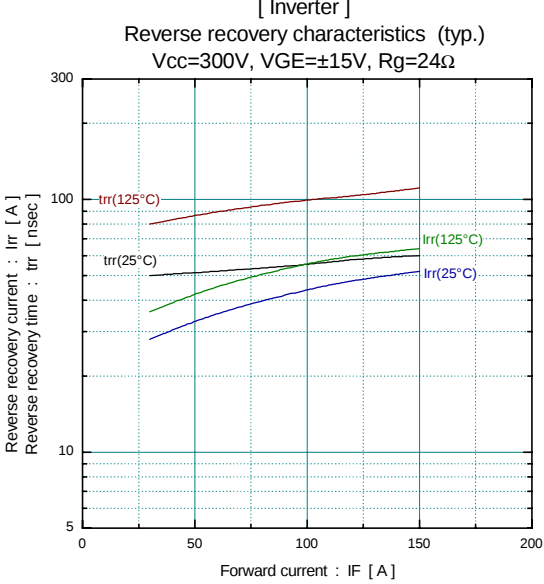
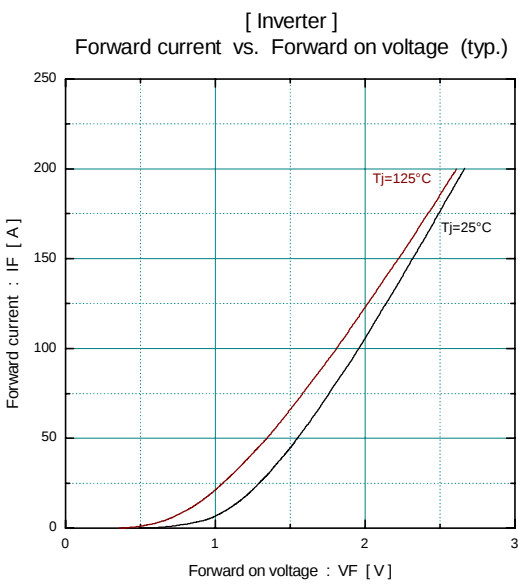
| Item                            |  | Symbol               | Condition             | Characteristics |      |      | Unit |
|---------------------------------|--|----------------------|-----------------------|-----------------|------|------|------|
|                                 |  |                      |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) |  | R <sub>th(j-c)</sub> | Inverter IGBT         |                 |      | 0.31 | °C/W |
|                                 |  |                      | Inverter FWD          |                 |      | 0.70 |      |
|                                 |  |                      | Brake IGBT            |                 |      | 0.63 |      |
|                                 |  |                      | Thyristor             |                 |      | 0.35 |      |
|                                 |  |                      | Converter Diode       |                 |      | 0.47 |      |
| Contact thermal resistance *    |  | R <sub>th(c-f)</sub> | With thermal compound |                 | 0.05 |      |      |

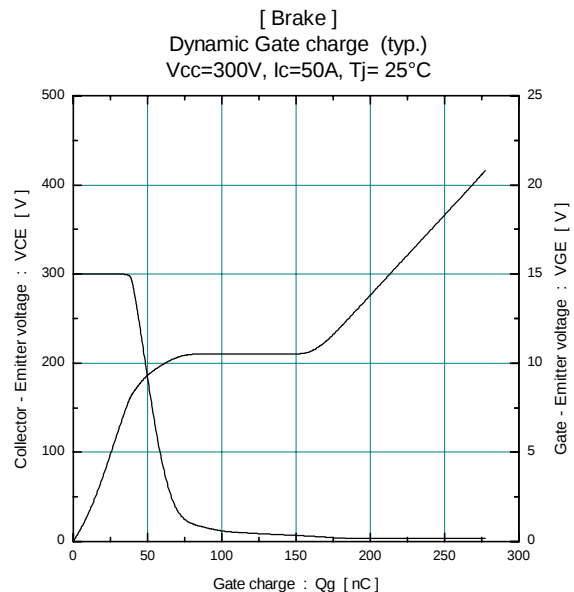
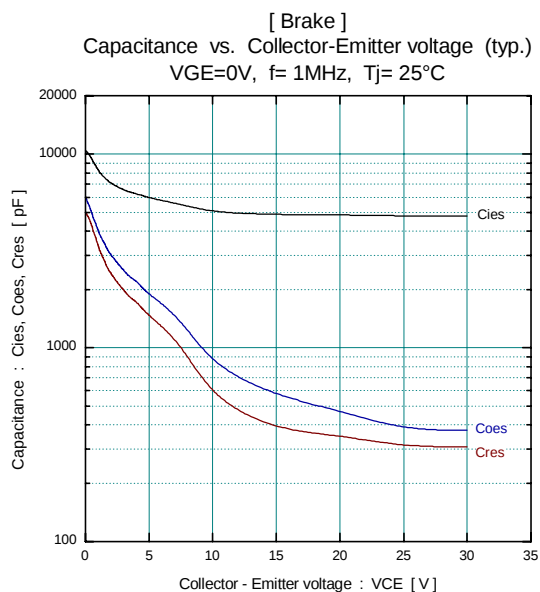
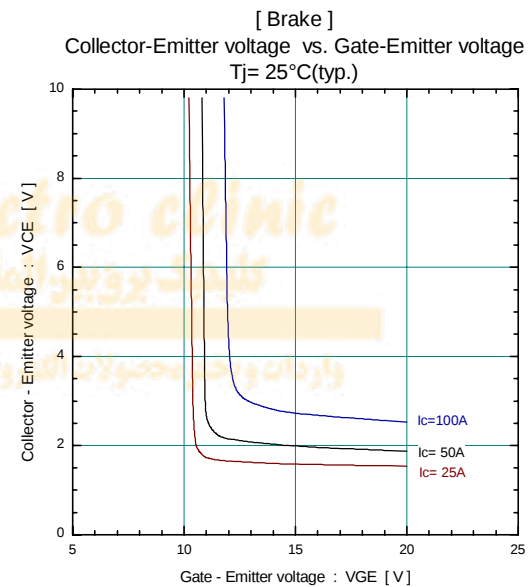
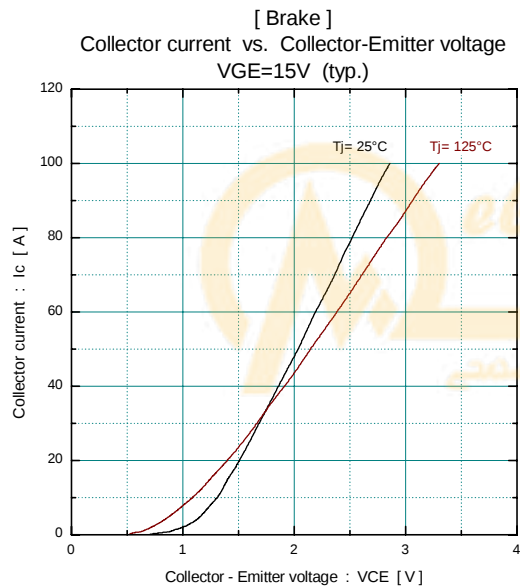
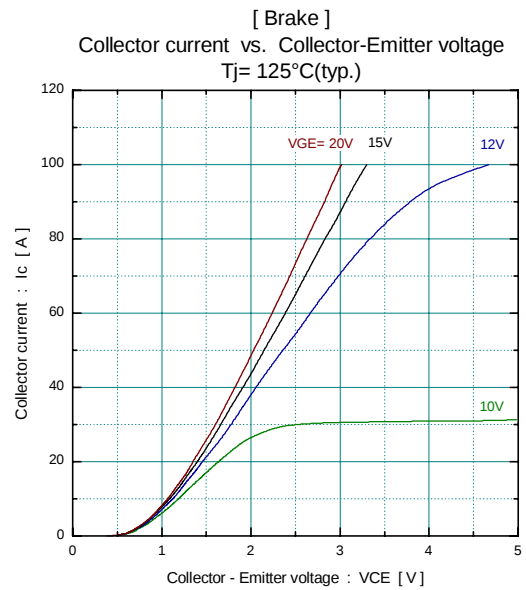
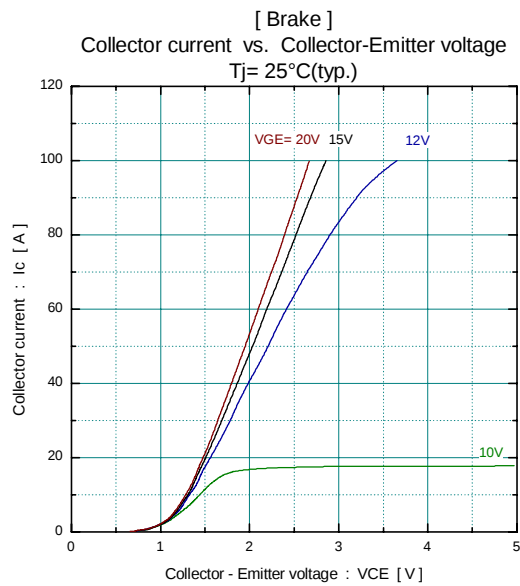
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

## ■ Characteristics (Representative)

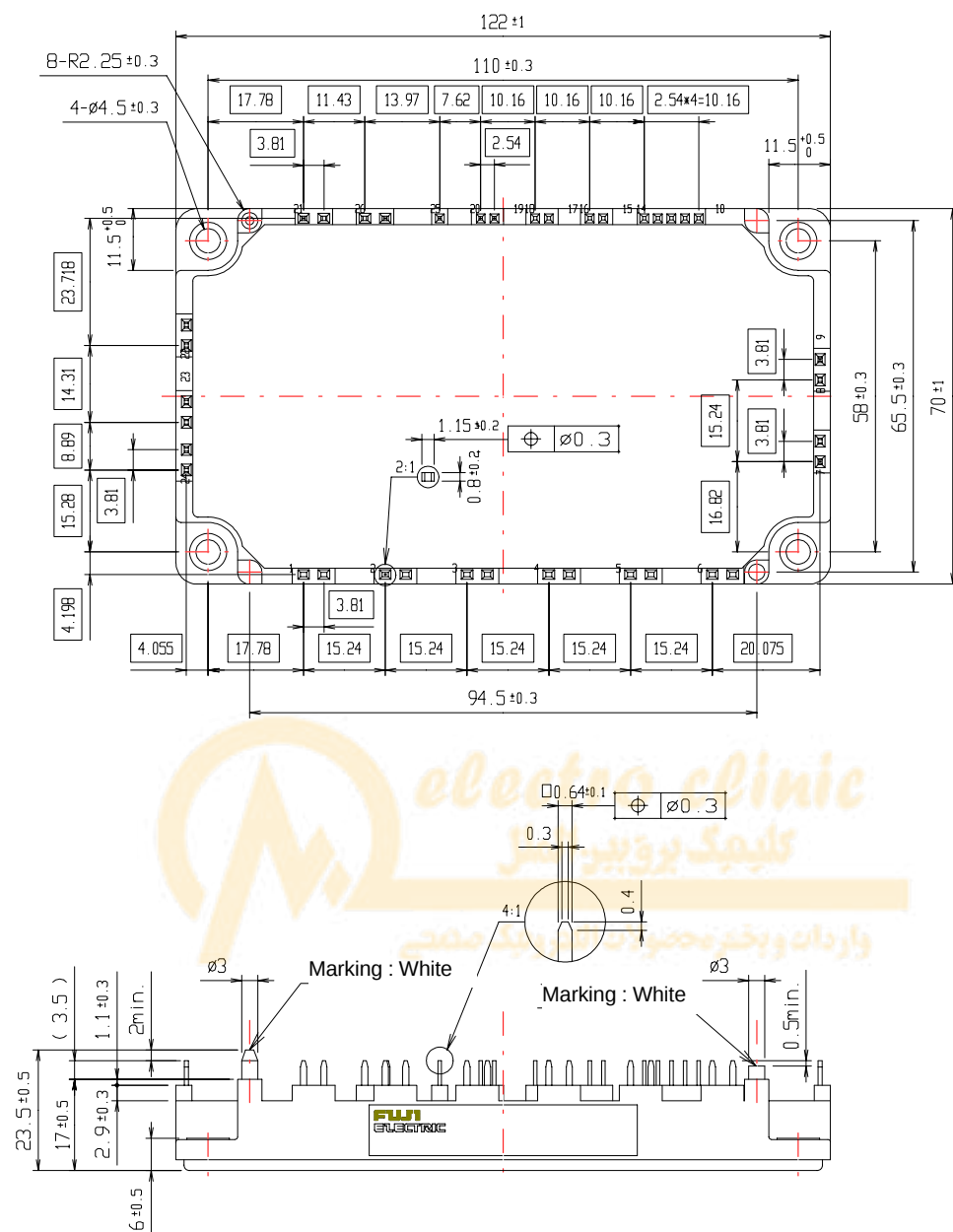








### ■ Outline Drawings, mm



### ■ Equivalent Circuit Schematic

