

### 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               | $V_{CES}$     | 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 |                      |
|   | $-I_c$                                  |               | 25  | A                            |                      |
| Collector power dissipation                   | $P_c$                                   | 1 device      | 180   | 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>25 | A                    |
|   |   |               |   | $T_c=80^\circ\text{C}$<br>15 |                      |
|   |   | $I_{CP}$      | 1ms   | $T_c=25^\circ\text{C}$<br>50 | A                    |
|   |   |               |   | $T_c=80^\circ\text{C}$<br>30 |                      |
| Collector power dissipation                   | $P_c$                                   | 1 device      | 110   | W                            |                      |
| Thyristor                                     | Repetitive peak reverse voltage(Diode)  | $V_{RRM}$     | 1200  | V                            |                      |
|   | 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                           | 25                           | A                    |
|   | Surge On-state current (Non-Repetitive) | $I_{TSM}$     | $T_j=125^\circ\text{C}$ , 10ms half sine wave | 290                          | 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                           | 25                           | A                    |
|   | Surge current (Non-Repetitive)          | $I_{FSM}$     | $T_j=150^\circ\text{C}$ , 10ms                | 260                          | A                    |
|   | $I_{\rho t}$ (Non-Repetitive)           | $I_{\rho t}$  | half sine wave                                | 338                          | $\text{A}^2\text{s}$ |
| 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                            |                      |
|   |   |               | 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 (Tj=25°C unless otherwise specified)

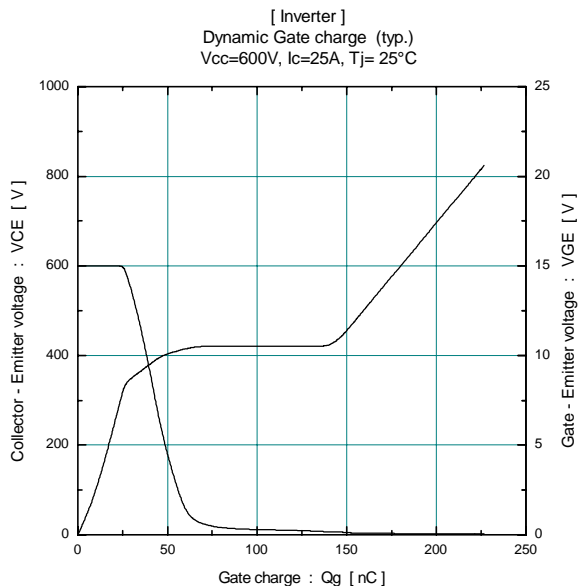
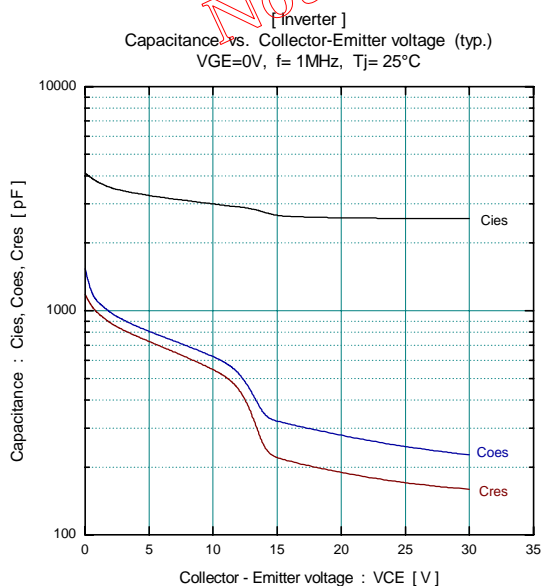
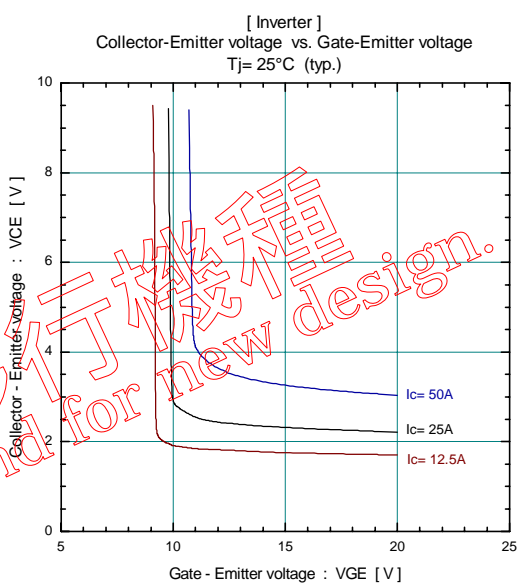
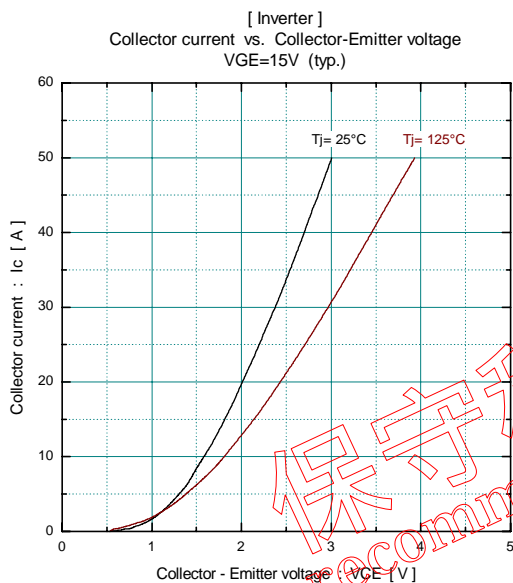
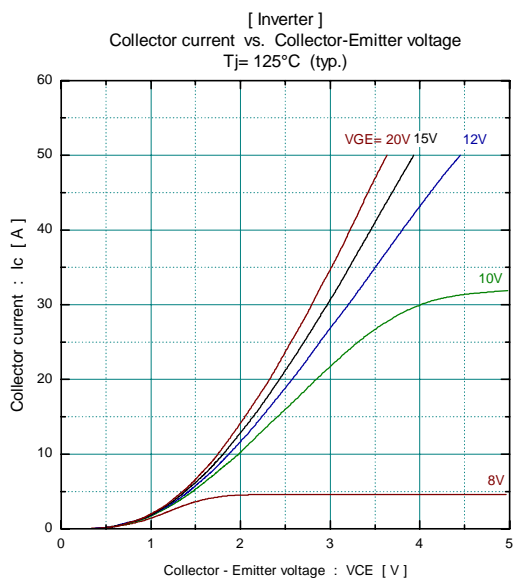
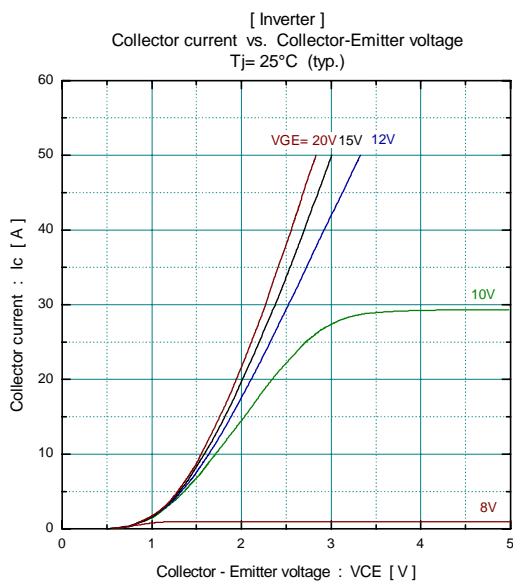
| Item                         | Symbol                               | Condition | Characteristics         |                 |      | Unit     |     |      |
|------------------------------|--------------------------------------|-----------|-------------------------|-----------------|------|----------|-----|------|
|                              |                                      |           | 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                |                 | 0.35 | 1.2      | μs  |      |
|                              |                                      | tr        | Ic=25A                  |                 | 0.25 | 0.6      |     |      |
|                              | Turn-off                             | toff      | VGE=±15V                |                 | 0.45 | 1.0      |     |      |
|                              |                                      | tf        | RG=51Ω                  |                 | 0.08 | 0.3      |     |      |
| Forward on voltage           | VF                                   | IF=25A    | chip                    | 2.3             |      | V        |     |      |
|                              |                                      |           | terminal                | 2.4             | 3.2  |          |     |      |
| Reverse recovery time of FRD | trr                                  | IF=25A    |                         |                 | 350  | ns       |     |      |
| Brake                        | 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                |                 | 0.35 | 1.2      | μs  |      |
|                              |                                      | tr        | Ic=15A                  |                 | 0.25 | 0.6      |     |      |
|                              | Turn-off time                        | toff      | VGE=±15V                |                 | 0.45 | 1.0      |     |      |
|                              |                                      | tf        | RG=82Ω                  |                 | 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      |     |      |
|                              |                                      |           |                         | Reverse current | IRRM | VR=1600V |     |      |
| Thermistor                   | Resistance                           | R         | T=25°C                  |                 | 5000 |          | Ω   |      |
|                              |                                      |           | T=100°C                 |                 | 465  | 495      |     | 520  |
|                              |                                      |           | T=25/50°C               |                 | 3305 | 3375     |     | 3450 |
| B value                      | B                                    | T=25/50°C |                         | 3305            | 3375 | 3450     | K   |      |

● Thermal resistance Characteristics

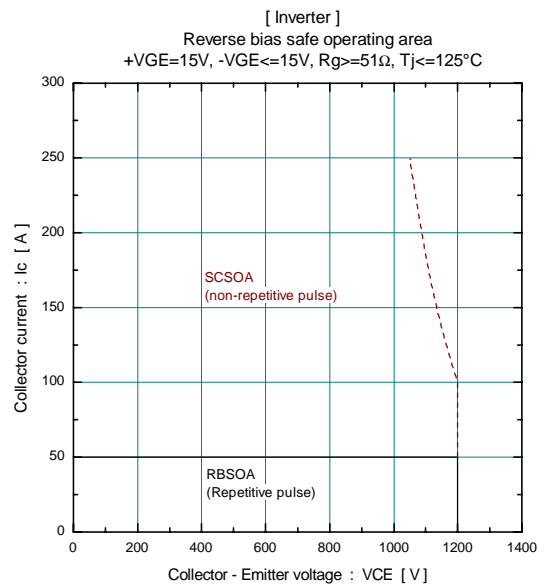
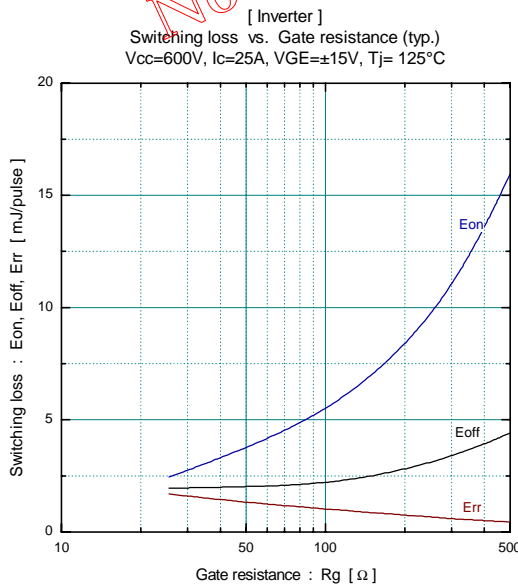
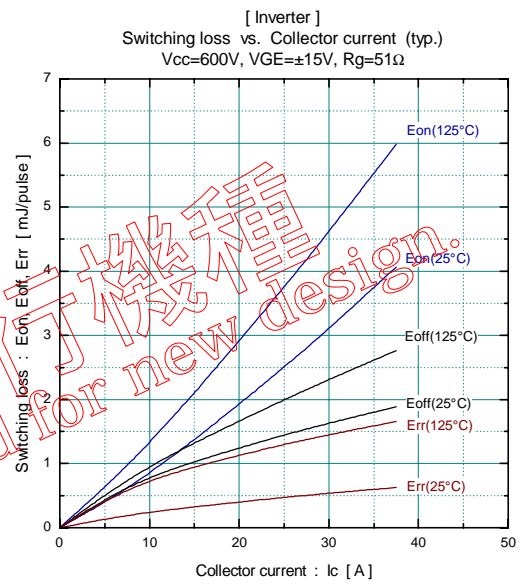
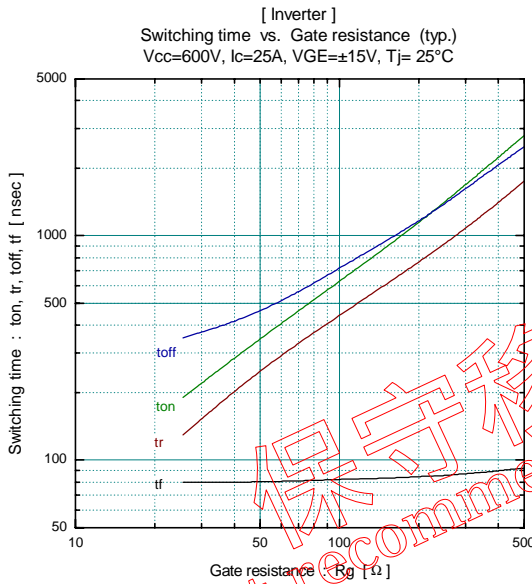
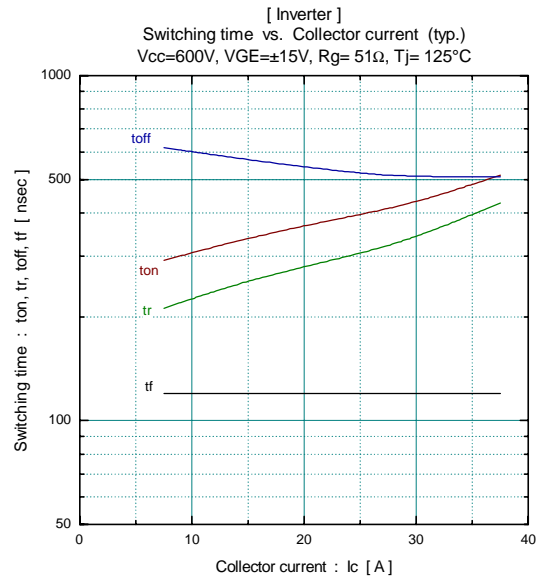
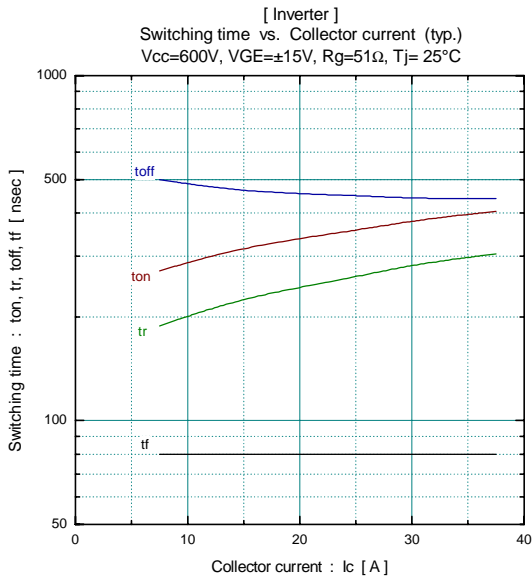
| Item                            | Symbol   | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------|-----------------------|-----------------|------|------|------|
|                                 |          |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | Rth(j-c) | Inverter IGBT         |                 |      | 0.69 | °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 |      |      |

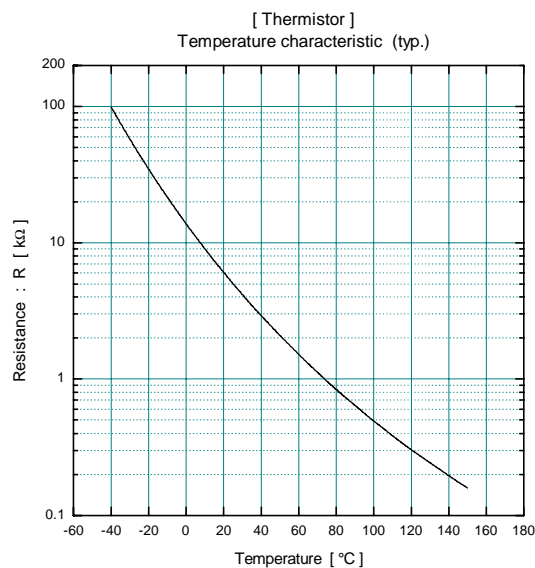
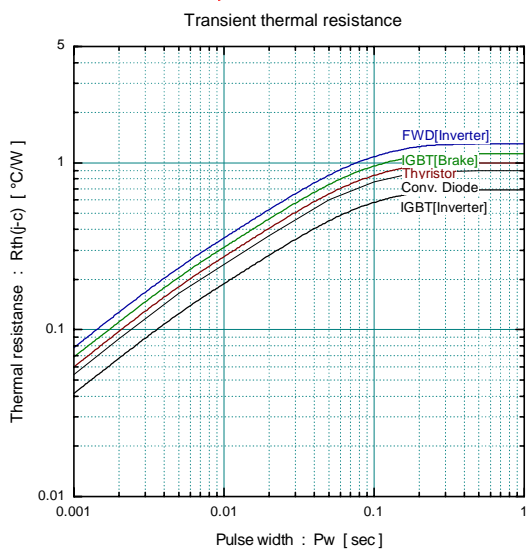
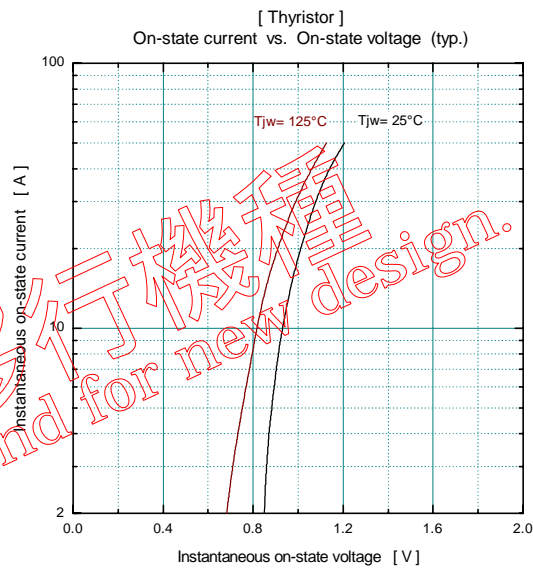
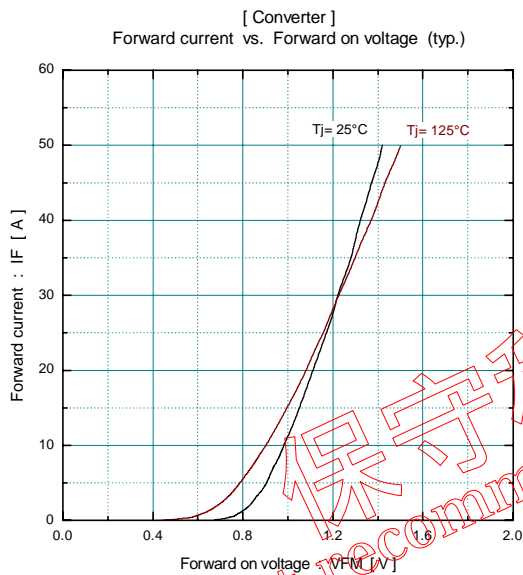
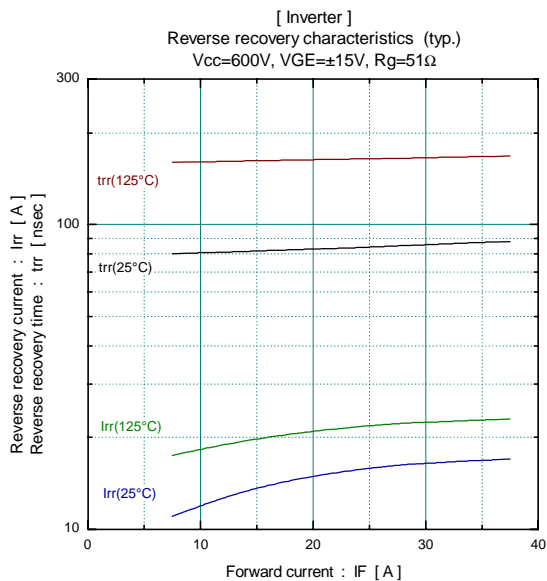
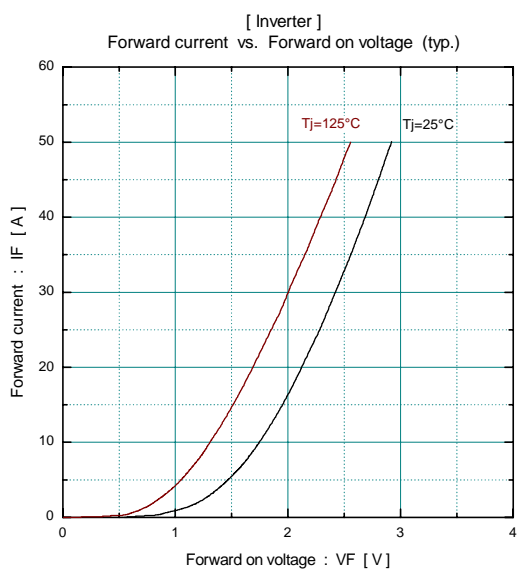
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Characteristics (Representative)



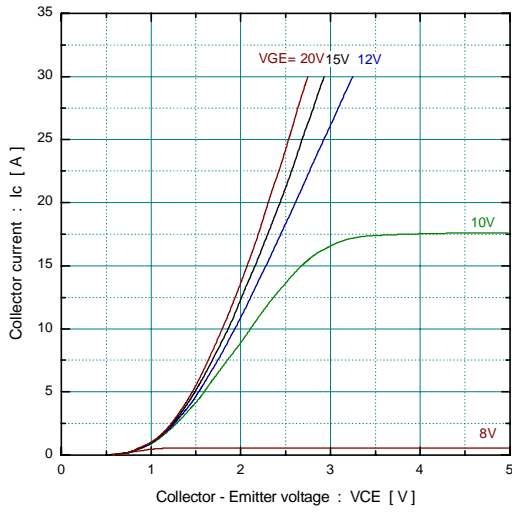
保守移行機種  
Not recommend for new design.



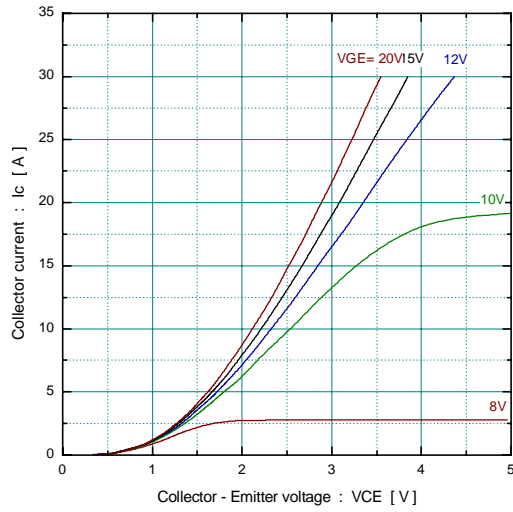


保守移行機種  
Not recommend for new design.

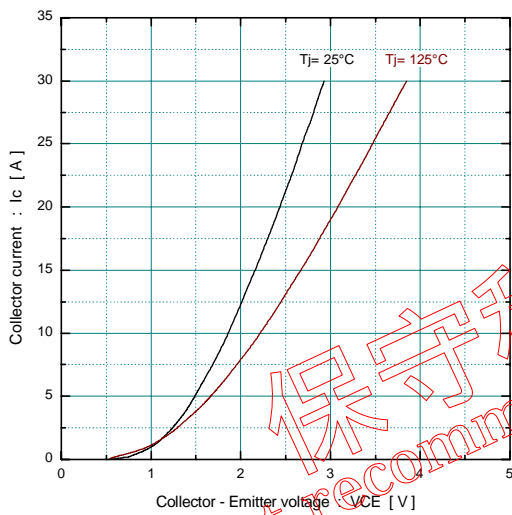
[ Brake ]  
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>= 25°C (typ.)



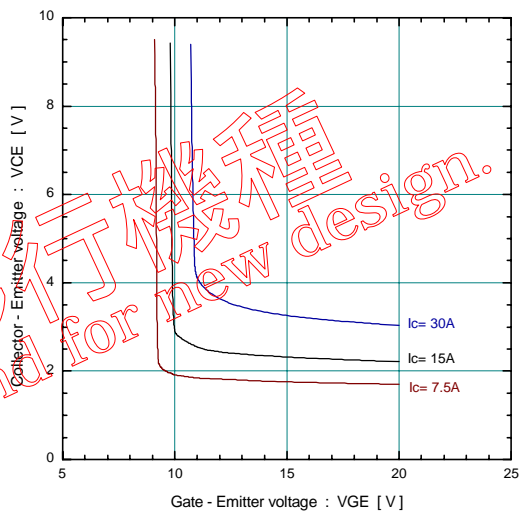
[ Brake ]  
Collector current vs. Collector-Emitter voltage  
T<sub>j</sub>= 125°C (typ.)



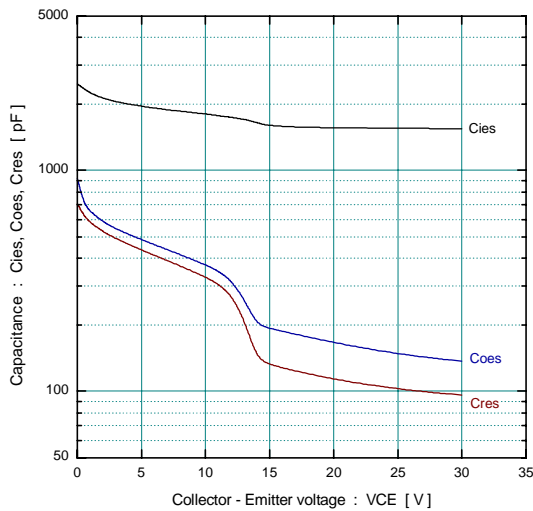
[ Brake ]  
Collector current vs. Collector-Emitter voltage  
V<sub>GE</sub>=15V (typ.)



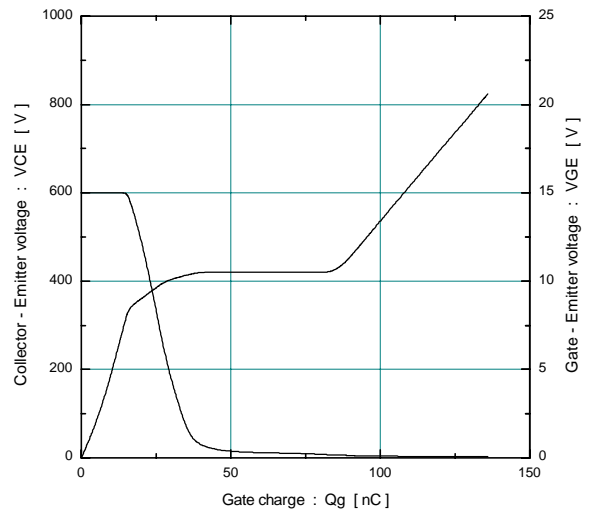
[ Brake ]  
Collector-Emitter voltage vs. Gate-Emitter voltage  
T<sub>j</sub>= 25°C (typ.)



[ Brake ]  
Capacitance vs. Collector-Emitter voltage (typ.)  
V<sub>GE</sub>=0V, f= 1MHz, T<sub>j</sub>= 25°C

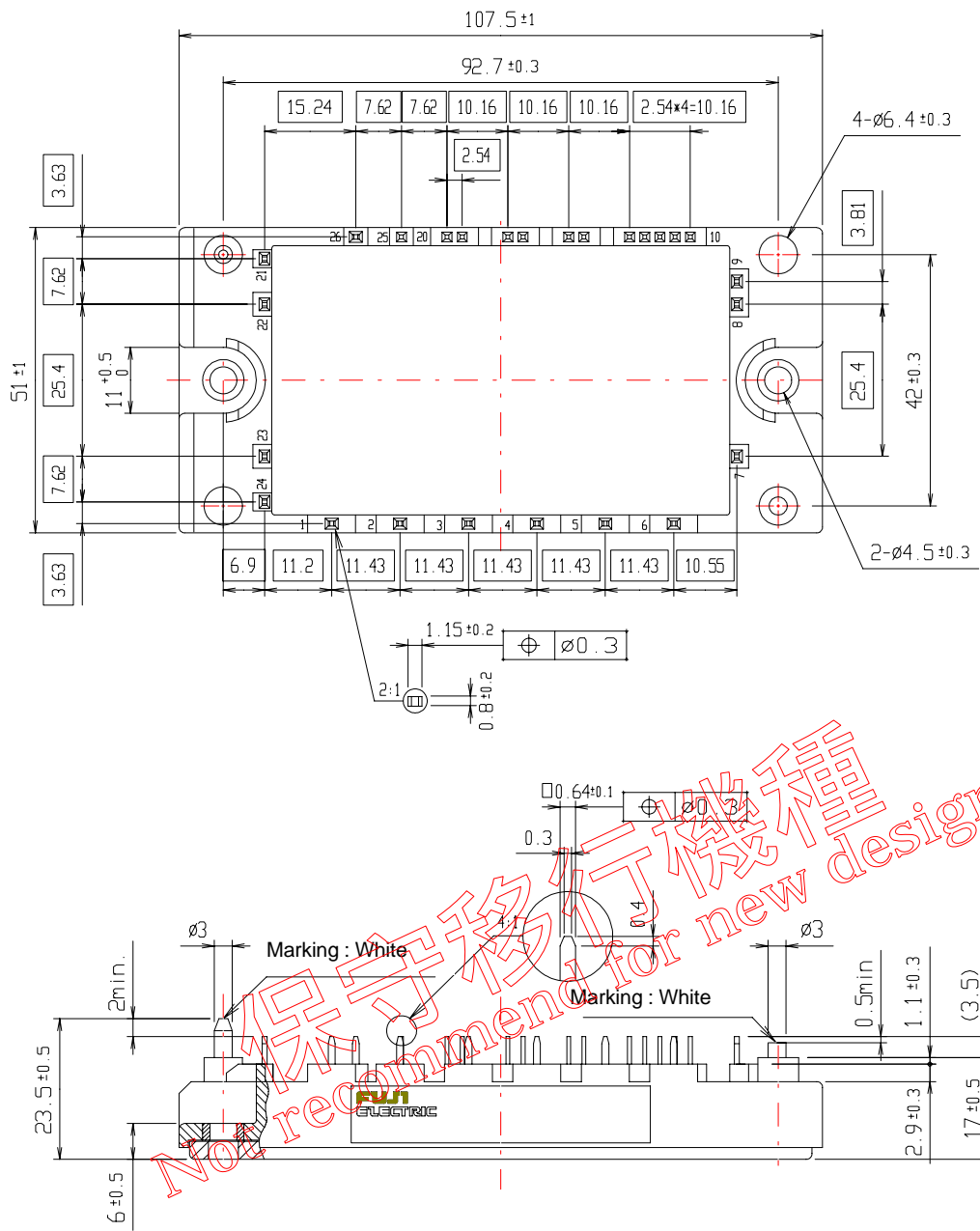


[ Brake ]  
Dynamic Gate charge (typ.)  
V<sub>CC</sub>=600V, I<sub>c</sub>=15A, T<sub>j</sub>= 25°C



保守移行機種  
Not recommend for new design.

Outline Drawings, mm



Equivalent Circuit Schematic

