

### IGBT MODULE (U series) 1200V / 75A / PIM



#### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C. Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit

#### ■ Applications

- Inverter for Motoe Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply

#### ■ Maximum ratings and characteristics

● Absolute maximum ratings ( $T_c=25^{\circ}\text{C}$  unless otherwise 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 | 75          | A                |
|                                |                                     |                              |                             | T <sub>C</sub> =80°C | 50          |                  |
|                                |                                     | I <sub>CP</sub>              | 1ms                         | T <sub>C</sub> =25°C | 150         |                  |
|                                |                                     |                              |                             | T <sub>C</sub> =80°C | 100         |                  |
|                                |                                     | -I <sub>C</sub>              |                             |                      | 75          |                  |
|                                | -I <sub>C</sub> pulse               | 1ms                          | 150                         |                      |             |                  |
| Collector power dissipation    | P <sub>C</sub>                      | 1 device                     |                             | 275                  | 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 | 35          | A                |
|                                |                                     |                              |                             | T <sub>C</sub> =80°C | 25          |                  |
|                                |                                     | I <sub>CP</sub>              | 1ms                         | T <sub>C</sub> =25°C | 70          |                  |
|                                |                                     |                              |                             | T <sub>C</sub> =80°C | 50          |                  |
|                                | Collector power dissipation         | P <sub>C</sub>               | 1 device                    |                      | 160         | 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         |                      | 75          | A                |
|                                | Surge current (Non-Repetitive)      | I <sub>FSM</sub>             | T <sub>J</sub> =150°C, 10ms |                      | 520         | A                |
|                                | I <sup>2</sup> t (Non-Repetitive)   | I <sup>2</sup> t             | half sine wave              |                      | 1352        | 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     | V                |
| Mounting screw torque          |                                     |                              |                             |                      | 3.5 *1      | 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 Two thermistor terminals should be connected together, each other terminals should be connected together and shorted to base plate when isolation test will be done.

● Electrical characteristics (T<sub>j</sub>=25°C unless otherwise specified)

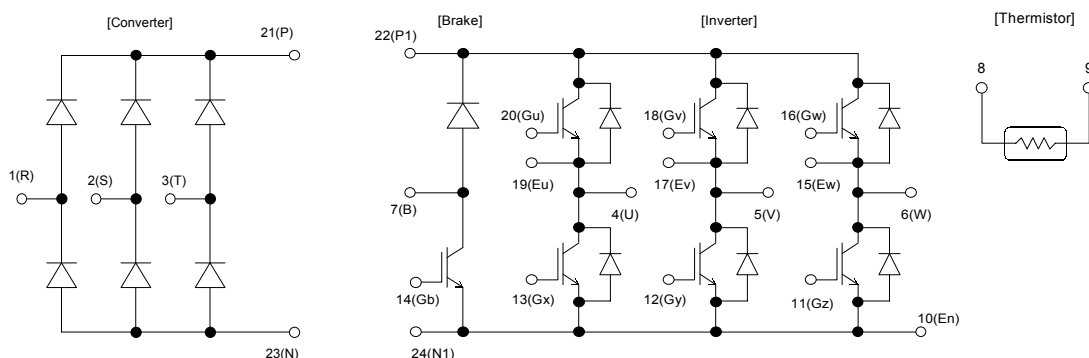
| Item       | Symbol                               | Condition                                                            | Characteristics                                   |                       |      | Unit |
|------------|--------------------------------------|----------------------------------------------------------------------|---------------------------------------------------|-----------------------|------|------|
|            |                                      |                                                                      | Min.                                              | Typ.                  | Max. |      |
| Inverter   | Zero gate voltage collector current  | ICES                                                                 | V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V       |                       | 1.0  | mA   |
|            | Gate-Emitter leakage current         | IGES                                                                 | 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> =75mA        |                       | 8.5  | V    |
|            | Collector-Emitter saturation voltage | V <sub>CE(sat)</sub><br>(terminal)<br>V <sub>CE(sat)</sub><br>(chip) | V <sub>GE</sub> =15V<br>I <sub>C</sub> =75A       | T <sub>j</sub> =25°C  | 2.80 | V    |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =125°C | -    |      |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =25°C  | 2.45 |      |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =125°C | -    |      |
|            | Input capacitance                    | C <sub>ies</sub>                                                     | V <sub>GE</sub> =0V, V <sub>CE</sub> =10V, f=1MHz |                       | 6    | nF   |
|            | Turn-on time                         | t <sub>on</sub>                                                      | V <sub>CC</sub> =600V                             |                       | 1.20 | μs   |
|            |                                      | t <sub>r</sub>                                                       | I <sub>C</sub> =75A                               |                       | 0.60 |      |
|            |                                      | t <sub>r(i)</sub>                                                    | V <sub>GE</sub> =±15V                             |                       | -    |      |
|            | Turn-off time                        | t <sub>off</sub>                                                     | R <sub>G</sub> = 22 Ω                             |                       | 1.00 | μs   |
|            |                                      | t <sub>f</sub>                                                       |                                                   |                       | 0.30 |      |
|            | Forward on voltage                   | V <sub>F</sub><br>(terminal)<br>V <sub>F</sub><br>(chip)             | V <sub>GE</sub> = 0 V<br>I <sub>F</sub> =75A      | T <sub>j</sub> =25°C  | 2.50 | V    |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =125°C | -    |      |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =25°C  | 2.15 |      |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =125°C | -    |      |
| Brake      | Reverse recovery time                | t <sub>rr</sub>                                                      | I <sub>F</sub> =75A                               |                       | 0.35 | μs   |
|            | Zero gate voltage collector current  | ICES                                                                 | V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V       |                       | 1.0  | mA   |
|            | Gate-Emitter leakage current         | IGES                                                                 | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V        |                       | 200  | nA   |
|            | Collector-Emitter saturation voltage | V <sub>CE(sat)</sub><br>(terminal)<br>V <sub>CE(sat)</sub><br>(chip) | I <sub>C</sub> =35A<br>V <sub>GE</sub> =15V       | T <sub>j</sub> =25°C  | 2.75 | V    |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =125°C | -    |      |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =25°C  | 2.40 |      |
|            |                                      |                                                                      |                                                   | T <sub>j</sub> =125°C | -    |      |
|            | Turn-on time                         | t <sub>on</sub>                                                      | V <sub>CC</sub> =600V                             |                       | 1.20 | μs   |
|            |                                      | t <sub>r</sub>                                                       | I <sub>C</sub> =35A                               |                       | 0.60 |      |
|            |                                      | t <sub>r(i)</sub>                                                    | V <sub>GE</sub> =±15V                             |                       | -    |      |
|            | Turn-off time                        | t <sub>off</sub>                                                     | R <sub>G</sub> = 43 Ω                             |                       | 1.00 | μs   |
|            |                                      | t <sub>f</sub>                                                       |                                                   |                       | 0.30 |      |
|            | Reverse current                      | I <sub>RRM</sub>                                                     | V <sub>R</sub> =1200V                             |                       | 1.0  | mA   |
| Converter  | Forward on voltage                   | V <sub>FM</sub>                                                      | I <sub>F</sub> =75A                               | terminal              | 1.75 | V    |
|            |                                      |                                                                      | V <sub>GE</sub> =0V                               | chip                  | -    |      |
|            | 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  |      |
|            | B value                              | B                                                                    | T=25/50°C                                         |                       | 3305 | K    |

● Thermal resistance Characteristics

| Item                            | Symbol               | Condition             | Characteristics |      |      | Unit |
|---------------------------------|----------------------|-----------------------|-----------------|------|------|------|
|                                 |                      |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) | R <sub>th(j-c)</sub> | Inverter IGBT         | -               | -    | 0.45 | °C/W |
|                                 |                      | Inverter FWD          | -               | -    | 0.73 |      |
|                                 |                      | Brake IGBT            | -               | -    | 0.76 |      |
|                                 |                      | Converter Diode       | -               | -    | 0.50 |      |
|                                 |                      | With thermal compound | -               | 0.05 | -    |      |
| Contact thermal resistance *    | R <sub>th(c-f)</sub> | With thermal compound | -               | 0.05 | -    |      |

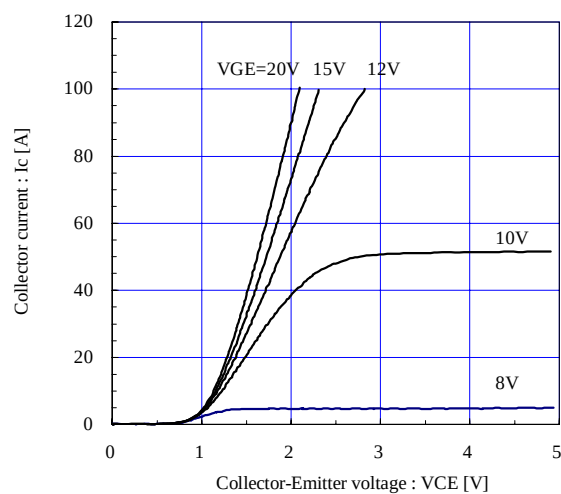
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

■ Equivalent Circuit Schematic

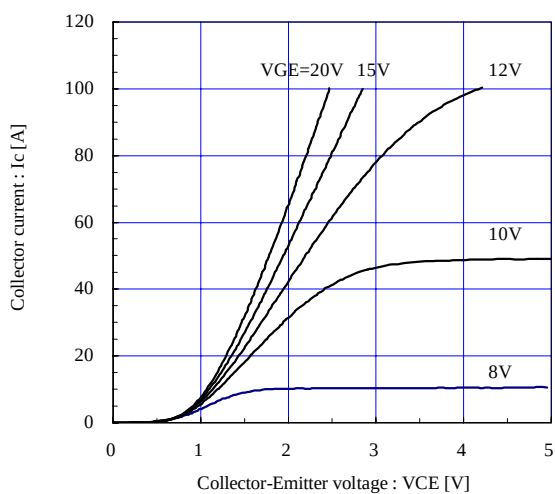


## ■ Characteristics (Representative)

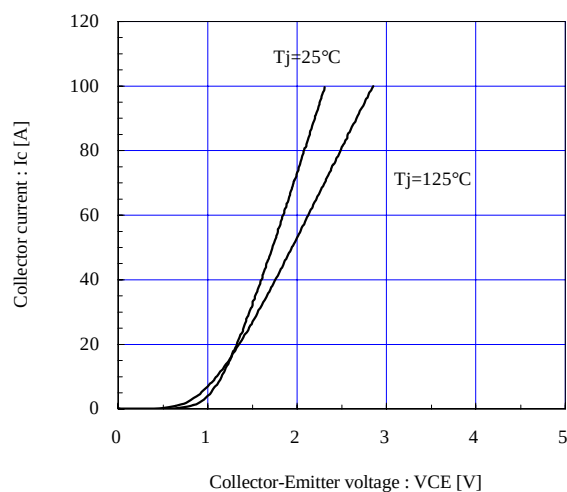
[ Inverter ]  
Collector current vs. Collector-Emitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip



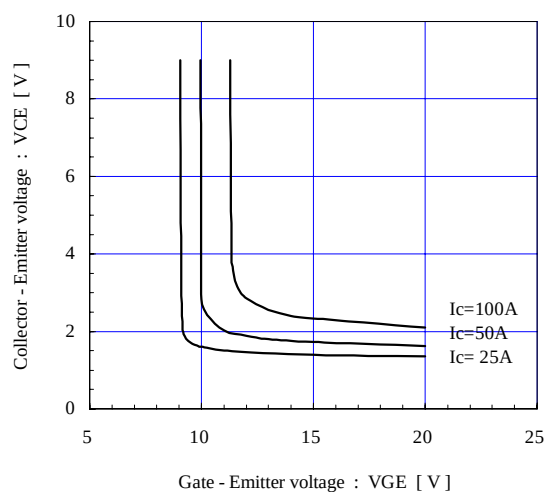
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Collector current vs. Collector-Emitter voltage (typ.)  
 $T_j = 125^\circ\text{C}$  / chip



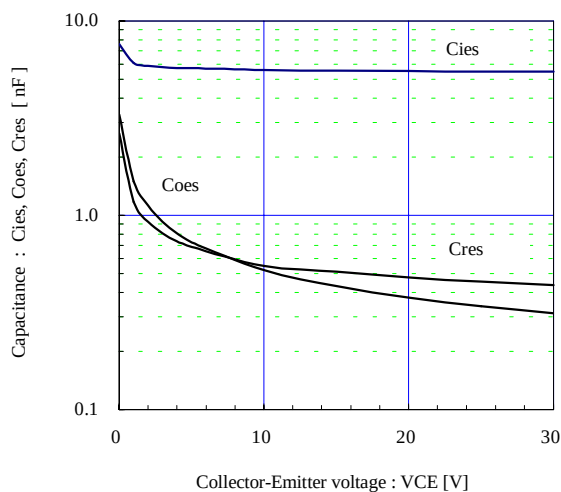
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Collector current vs. Collector-Emitter voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



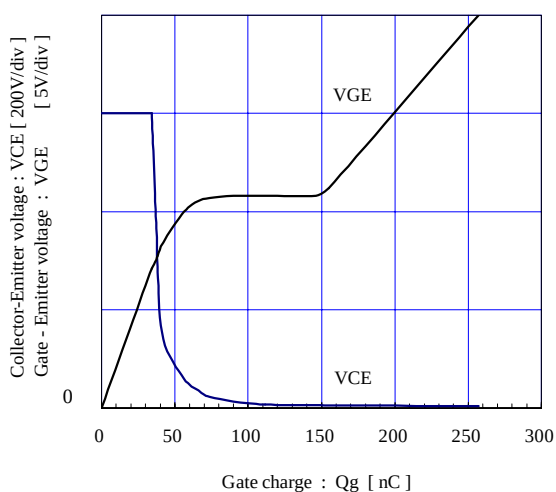
[ Inverter ]  
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)  
 $T_j = 25^\circ\text{C}$  / chip

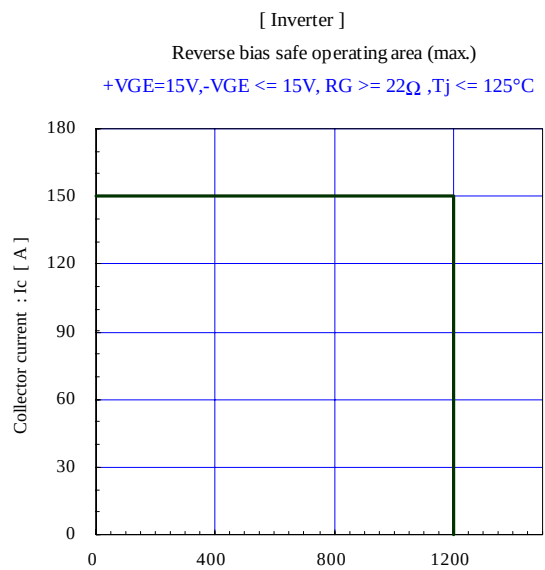
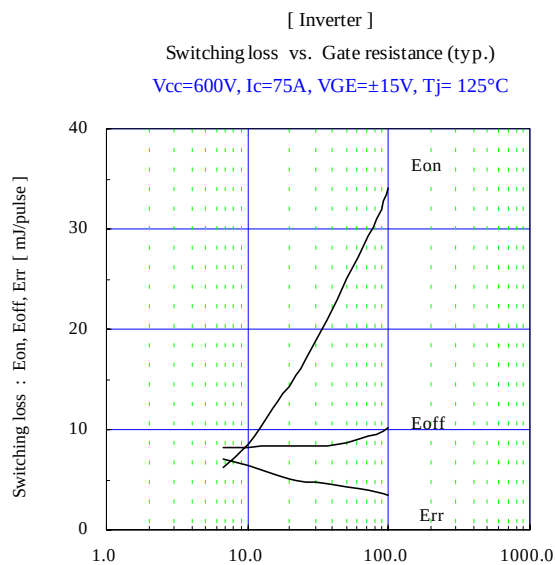
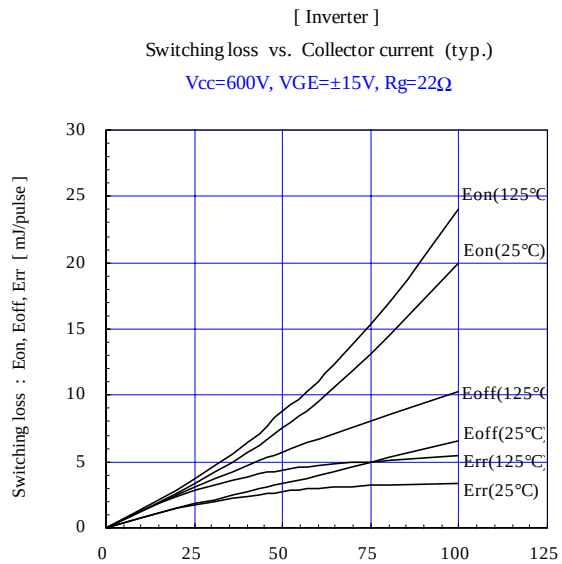
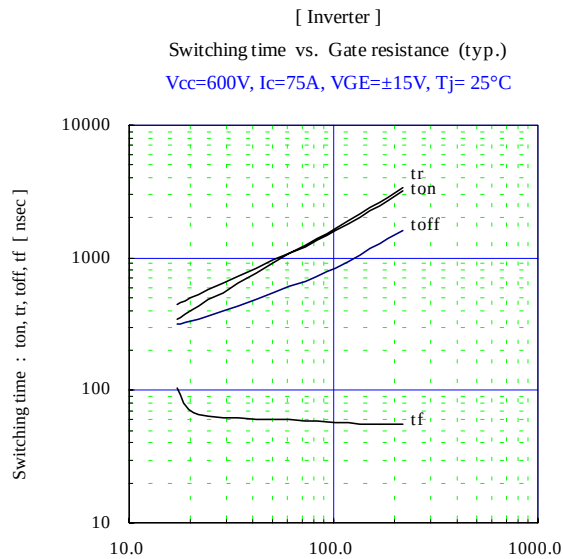
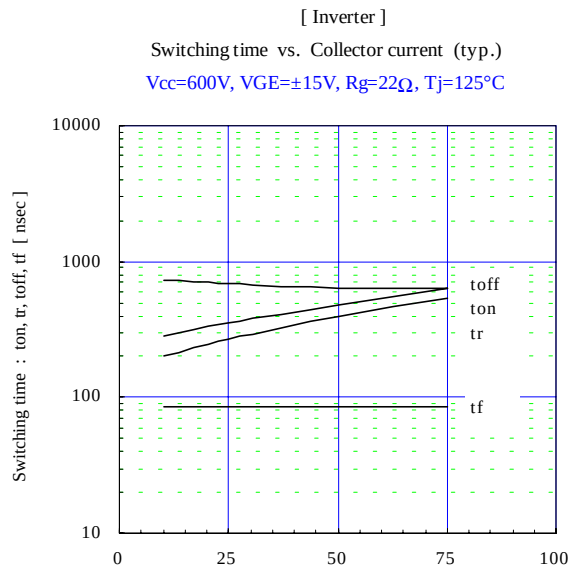
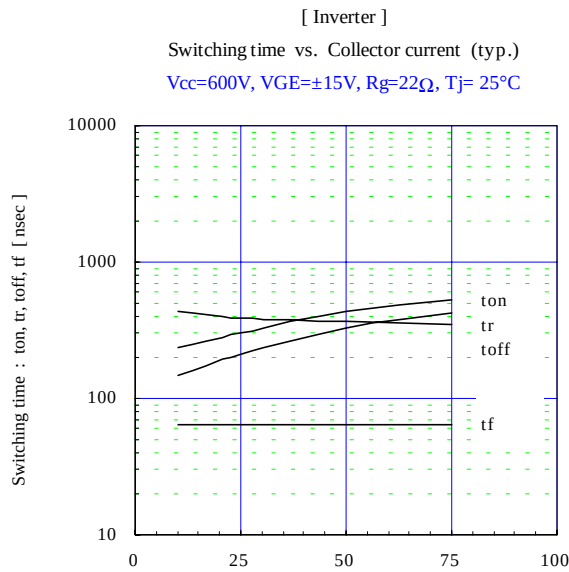


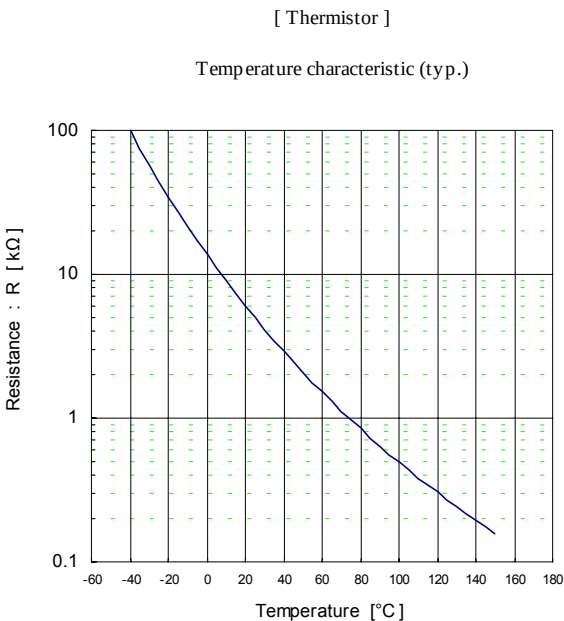
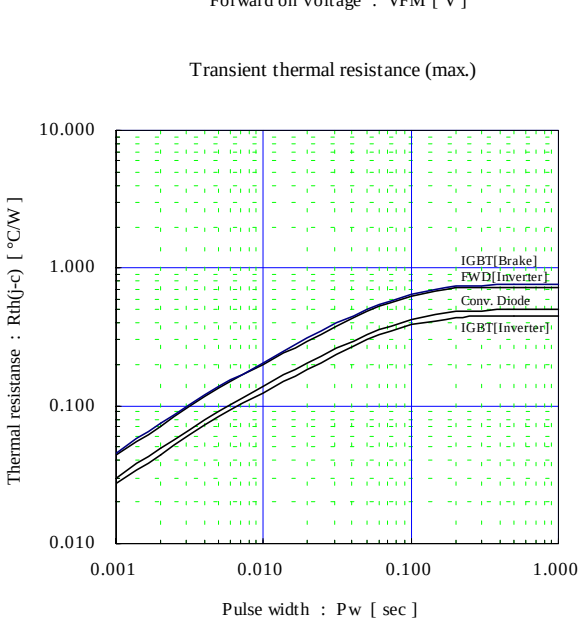
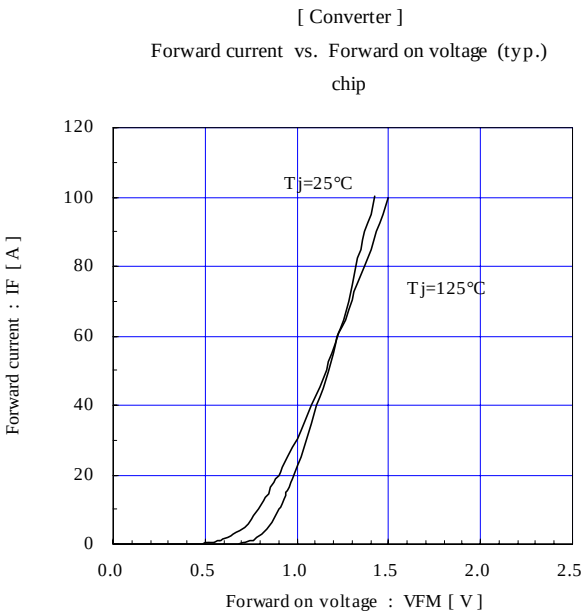
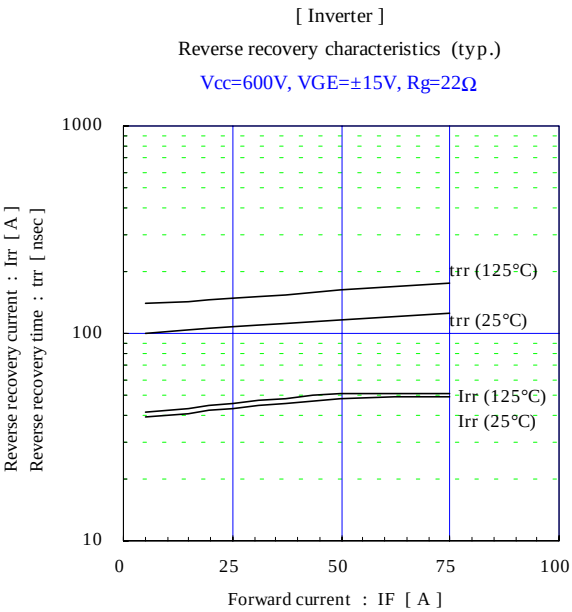
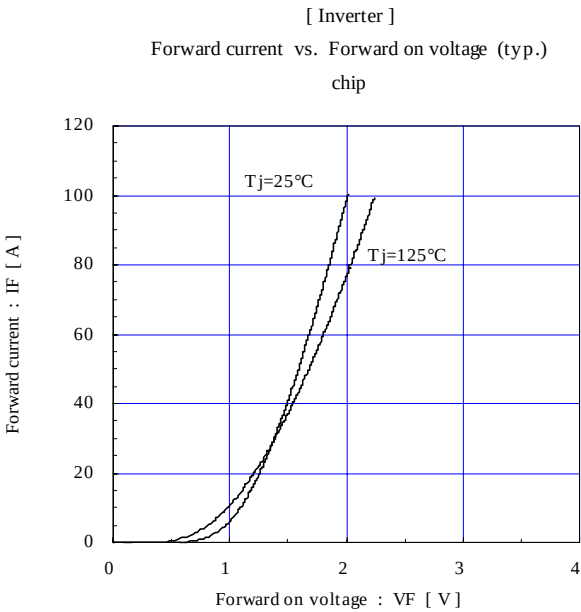
[ Inverter ]  
Capacitance vs. Collector-Emitter voltage (typ.)  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$

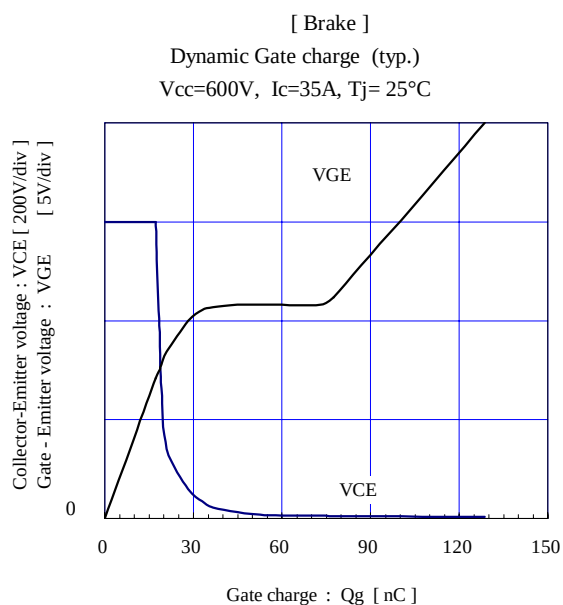
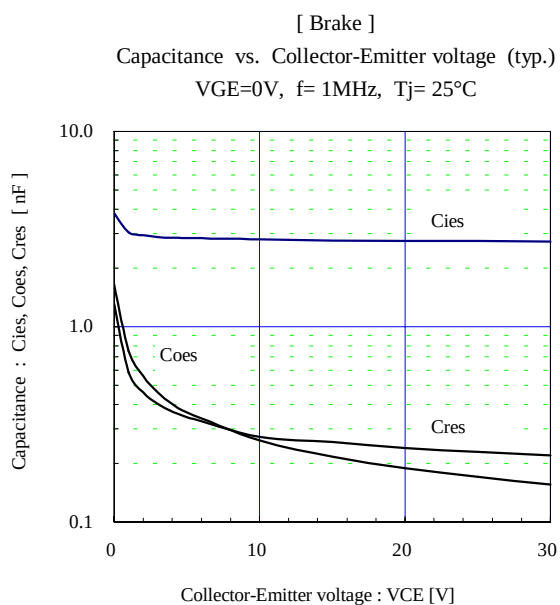
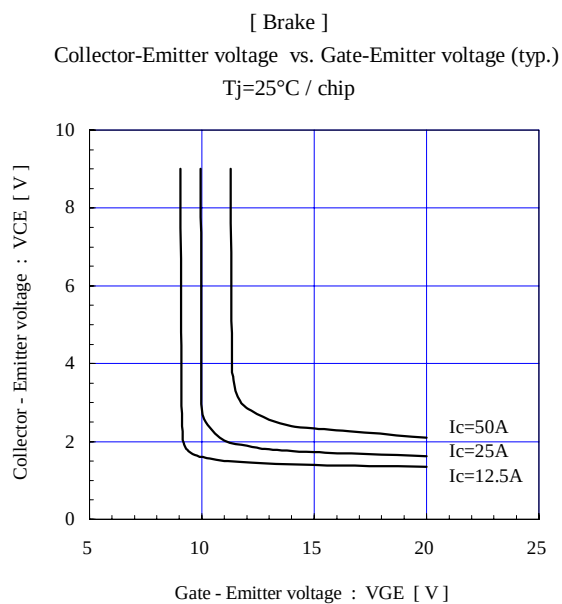
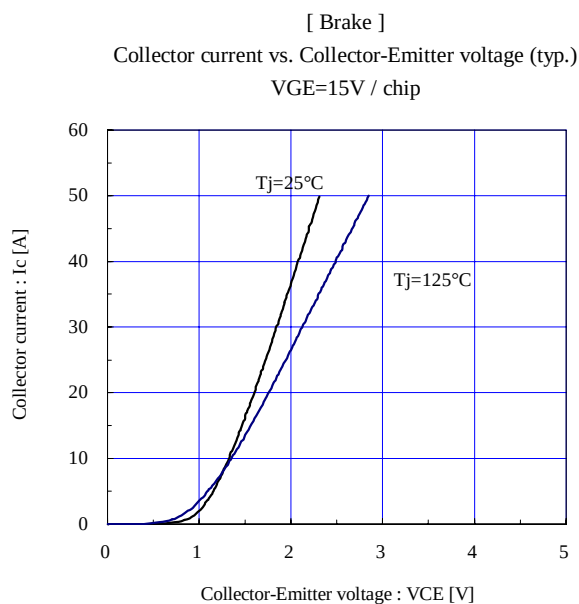
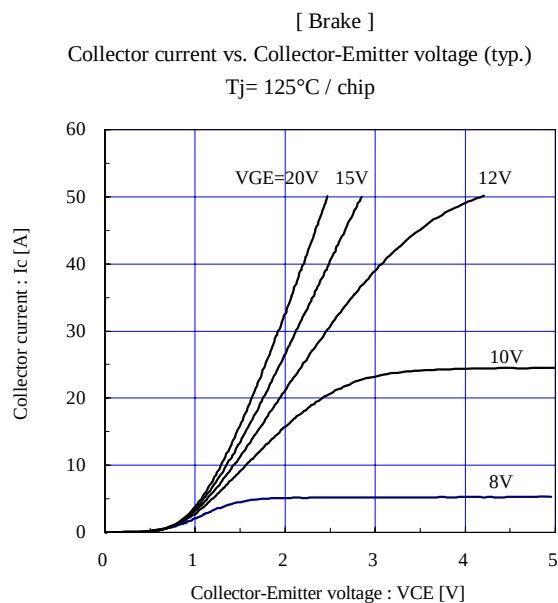
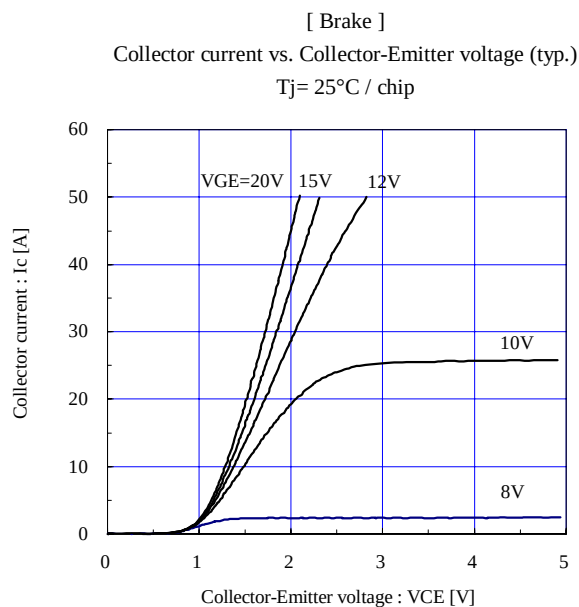


[ Inverter ]  
Dynamic Gate charge (typ.)  
 $V_{cc} = 600\text{V}$ ,  $I_c = 75\text{A}$ ,  $T_j = 25^\circ\text{C}$









### ■ Outline Drawings, mm

