

### IGBT MODULE (U 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 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>      |                             | 600         | V                |
|                                | Gate-Emitter voltage                | V <sub>GES</sub>      |                             | ±20         | V                |
|                                | Collector current                   | I <sub>C</sub>        | Continuous                  | 100         | A                |
|                                |                                     | I <sub>CP</sub>       | 1ms                         | 200         | A                |
|                                |                                     | -I <sub>C</sub>       |                             | 100         | A                |
|                                |                                     | -I <sub>C</sub> pulse | 1ms                         | 200         |                  |
|                                | Collector power dissipation         | P <sub>C</sub>        | 1 device                    | 378         | W                |
| Brake                          | Collector-Emitter voltage           | V <sub>CES</sub>      |                             | 600         | V                |
|                                | Gate-Emitter voltage                | V <sub>GES</sub>      |                             | ±20         | V                |
|                                | Collector current                   | I <sub>C</sub>        | Continuous                  | 50          | A                |
|                                |                                     | I <sub>CP</sub>       | 1ms                         | 100         | A                |
|                                | Collector power dissipation         | P <sub>C</sub>        | 1 device                    | 187         | W                |
|                                | Repetitive peak reverse voltage     | V <sub>RRM</sub>      |                             | 600         | V                |
| Converter                      | Repetitive peak reverse voltage     | V <sub>RRM</sub>      |                             | 800         | V                |
|                                | Average output current              | I <sub>O</sub>        | 50Hz/60Hz sine wave         | 100         | A                |
|                                | Surge current (Non-Repetitive)      | I <sub>FSM</sub>      | T <sub>J</sub> =150°C, 10ms | 700         | A                |
|                                | I <sup>2</sup> t (Non-Repetitive)   | I <sup>2</sup> t      | half sine wave              | 2450        | A <sup>2</sup> s |
| Operating junction temperature |                                     | T <sub>J</sub>        |                             | +150        | °C               |
| Storage temperature            |                                     | T <sub>slg</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 (Tj=25°C unless otherwise specified)

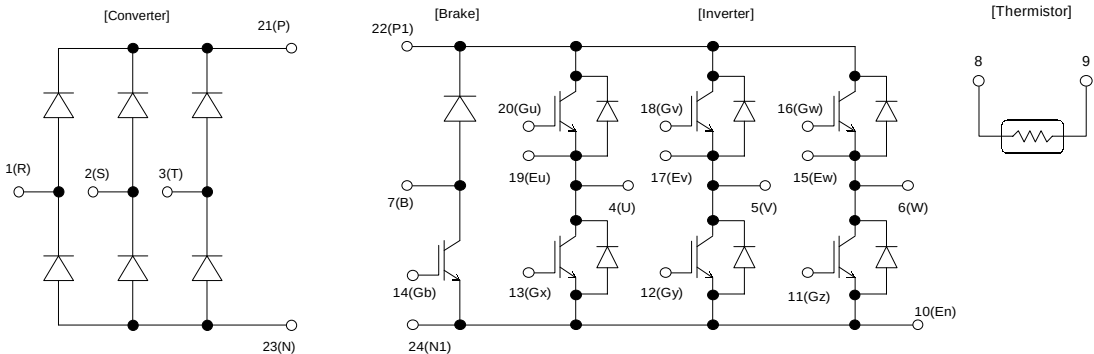
| Item       |                                      | Symbol                 | Condition                       |          | Characteristics |      |      | Unit |
|------------|--------------------------------------|------------------------|---------------------------------|----------|-----------------|------|------|------|
|            |                                      |                        |                                 |          | Min.            | Typ. | Max. |      |
| Inverter   | Zero gate voltage collector current  | ICES                   | VCE=600V, VGE=0V                |          |                 |      | 1.0  | mA   |
|            | Gate-Emitter leakage current         | IGES                   | VCE=0V, VGE=±20V                |          |                 |      | 200  | nA   |
|            | Gate-Emitter threshold voltage       | VGE(th)                | VCE=20V, IC=100mA               |          | 6.2             | 6.7  | 7.7  | V    |
|            | Collector-Emitter saturation voltage | VCE(sat)<br>(terminal) | VGE=15V<br>IC=100A              | Tj=25°C  |                 | 2.30 | 2.60 | V    |
|            |                                      |                        |                                 | Tj=125°C |                 | 2.50 |      |      |
|            |                                      | VCE(sat)<br>(chip)     |                                 | Tj=25°C  |                 | 1.85 |      |      |
|            |                                      |                        |                                 | Tj=125°C |                 | 2.00 |      |      |
|            | Input capacitance                    | Cies                   | VGE=0V, VCE=10V, f=1MHz         |          |                 | 8.4  |      | nF   |
|            | Turn-on time                         | ton                    | VCC=300V<br>IC=100A<br>VGE=±15V |          |                 | 0.51 | 1.20 | μs   |
|            |                                      | tr                     |                                 |          |                 | 0.22 | 0.60 |      |
|            |                                      | tr(i)                  |                                 |          |                 | 0.16 |      |      |
|            | Turn-off time                        | toff                   | RG=33Ω                          |          |                 | 0.58 | 1.20 |      |
|            |                                      | tr                     |                                 |          |                 | 0.07 | 0.45 |      |
|            | Forward on voltage                   | VF<br>(terminal)       | VGE=0V<br>IF=100A               | Tj=25°C  |                 | 2.10 | 2.40 | V    |
|            |                                      |                        |                                 | Tj=125°C |                 | 2.40 |      |      |
|            |                                      | VF<br>(chip)           |                                 | Tj=25°C  |                 | 1.60 |      |      |
|            |                                      |                        |                                 | Tj=125°C |                 | 1.65 |      |      |
|            | Reverse recovery time                | trr                    | IF=100A                         |          |                 |      | 0.35 | μs   |
| Brake      | Zero gate voltage collector current  | ICES                   | VCE=600V, VGE=0V                |          |                 |      | 1.0  | mA   |
|            | Gate-Emitter leakage current         | IGES                   | VCE=0V, VGE=±20V                |          |                 |      | 200  | nA   |
|            | Collector-Emitter saturation voltage | VCE(sat)<br>(terminal) | IC=50A<br>VGE=15V               | Tj=25°C  |                 | 2.10 | 2.40 | V    |
|            |                                      |                        |                                 | Tj=125°C |                 | 2.40 |      |      |
|            |                                      | VCE(sat)<br>(chip)     |                                 | Tj=25°C  |                 | 1.85 |      |      |
|            |                                      |                        |                                 | Tj=125°C |                 | 2.15 |      |      |
|            | Turn-on time                         | ton                    | VCC=300V<br>IC=50A<br>VGE=±15V  |          |                 | 0.42 | 1.20 | μs   |
|            |                                      | tr                     |                                 |          |                 | 0.24 | 0.60 |      |
|            | Turn-off time                        | toff                   | RG=68Ω                          |          |                 | 0.42 | 1.20 |      |
|            |                                      | tr                     |                                 |          |                 | 0.03 | 0.45 |      |
|            | Reverse current                      | IRRM                   | VR=600V                         |          |                 |      | 1.0  | mA   |
| Converter  | Forward on voltage                   | VFM                    | IF=100A                         | terminal | 1.20            | 1.50 | V    |      |
|            |                                      |                        | VGE=0V                          | chip     |                 | 1.10 |      |      |
|            | Reverse current                      | IRRM                   | VR=800V                         |          |                 |      | 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

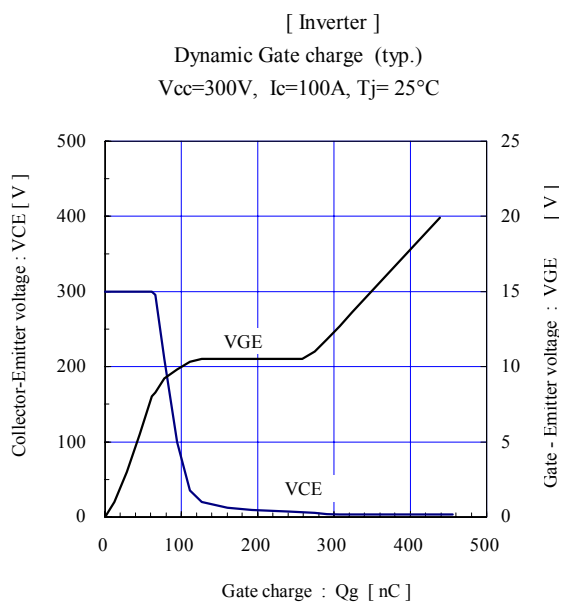
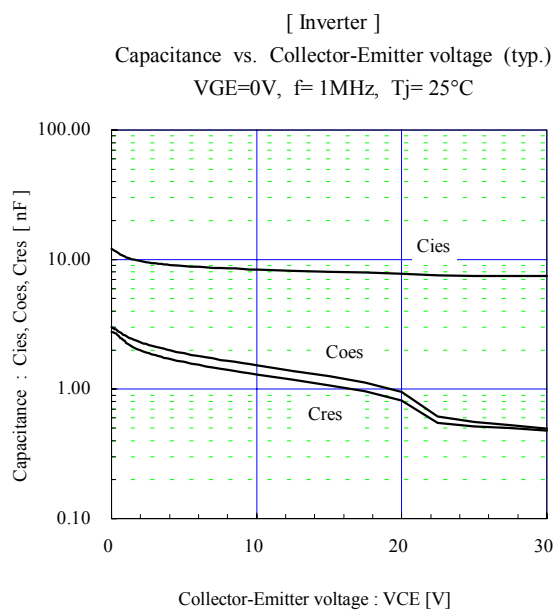
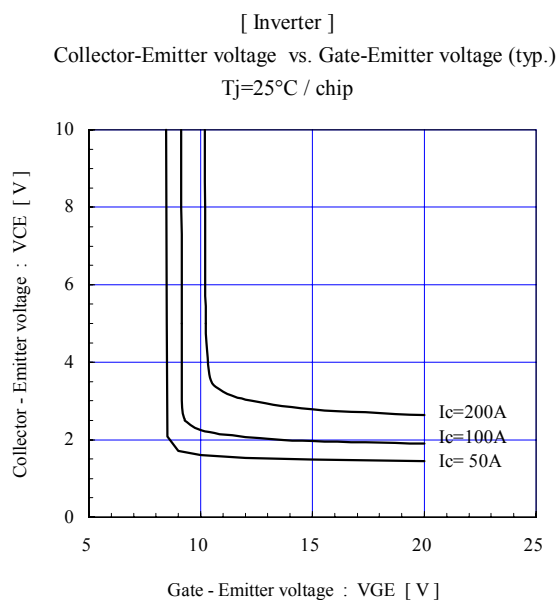
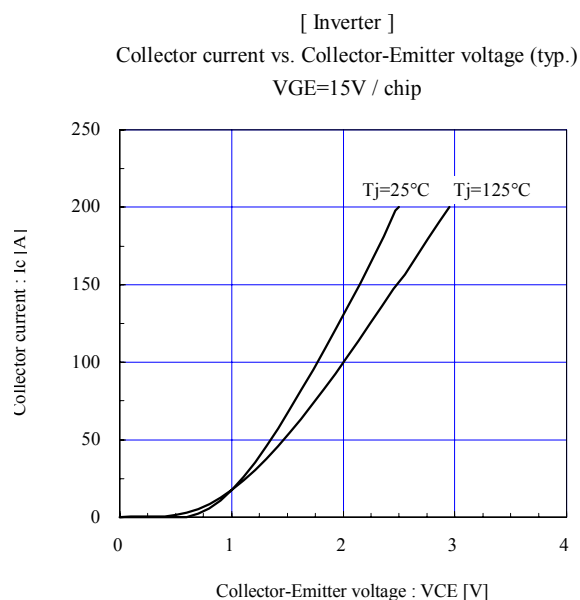
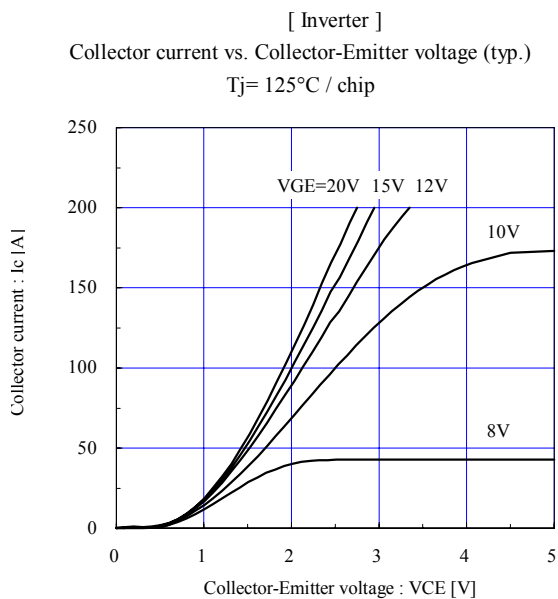
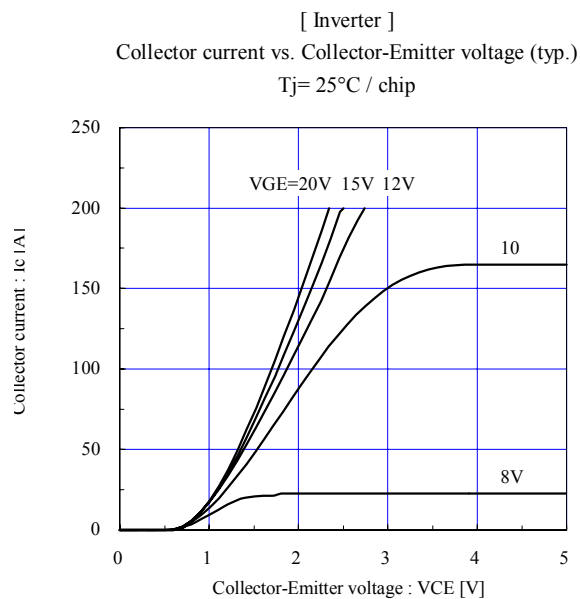
| Item                            |  | Symbol   | Condition             | Characteristics |      |      | Unit |
|---------------------------------|--|----------|-----------------------|-----------------|------|------|------|
|                                 |  |          |                       | Min.            | Typ. | Max. |      |
| Thermal resistance ( 1 device ) |  | Rth(j-c) | Inverter IGBT         |                 |      | 0.33 | °C/W |
|                                 |  |          | Inverter FWD          |                 |      | 0.67 |      |
|                                 |  |          | Brake IGBT            |                 |      | 0.67 |      |
|                                 |  |          | Converter Diode       |                 |      | 0.47 |      |
| Contact thermal resistance *    |  | Rth(c-f) | With thermal compound |                 | 0.05 |      |      |

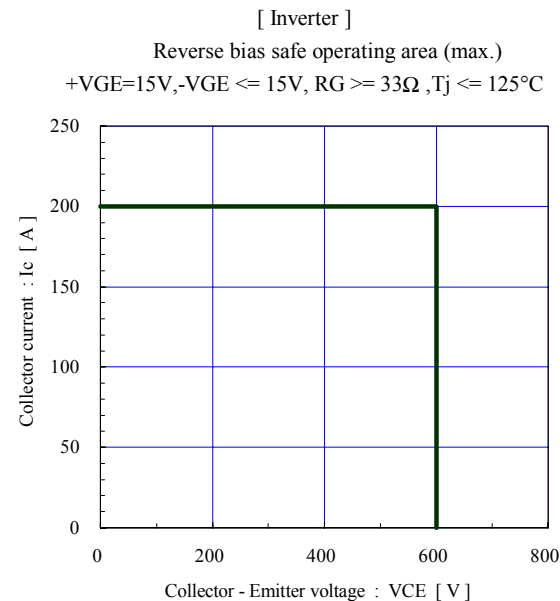
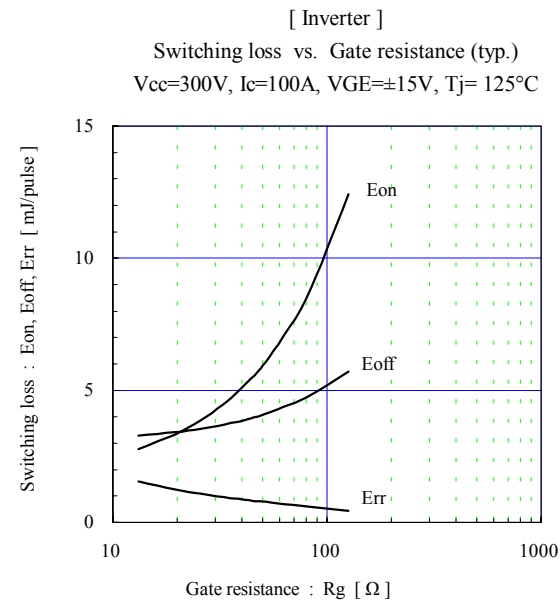
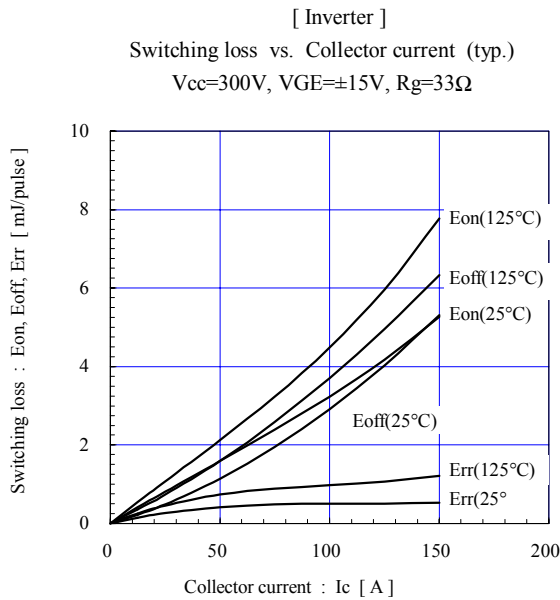
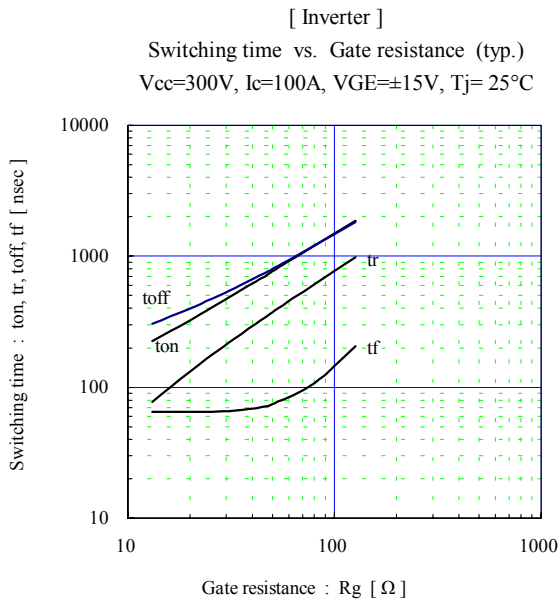
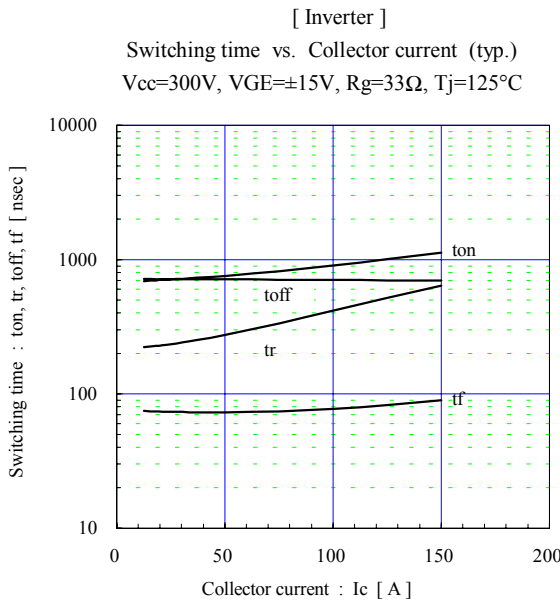
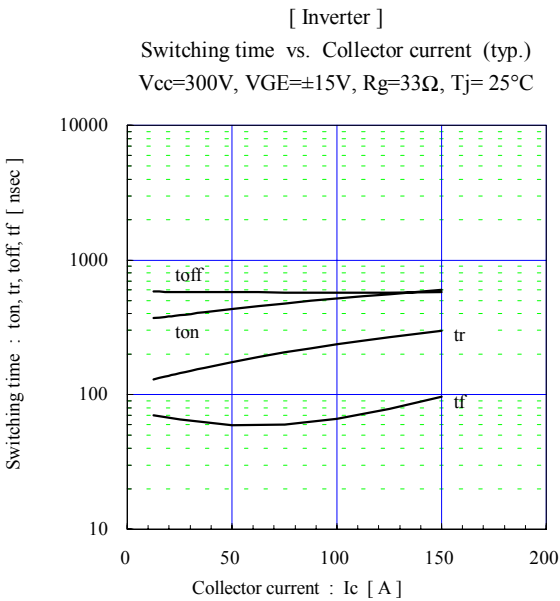
\* This is the value which is defined mounting on the additional cooling fin with thermal compound

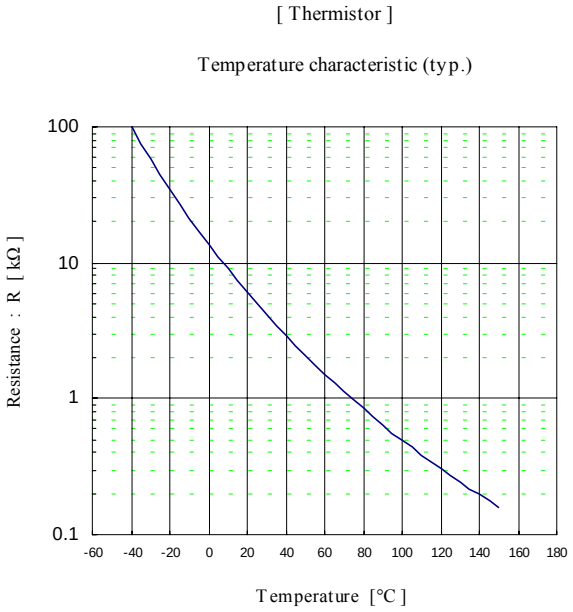
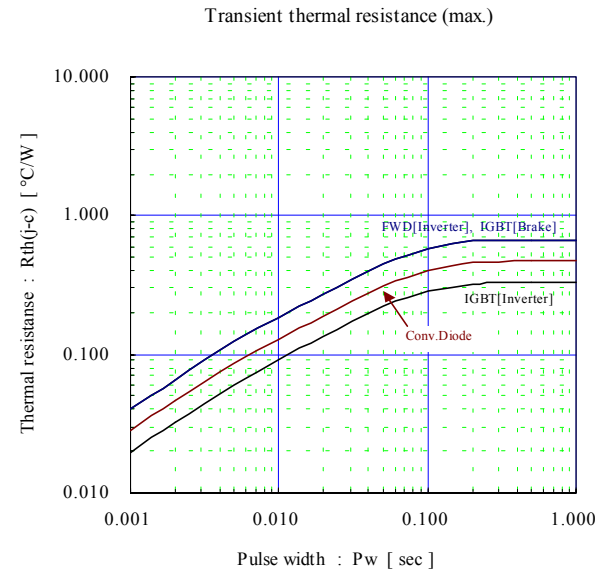
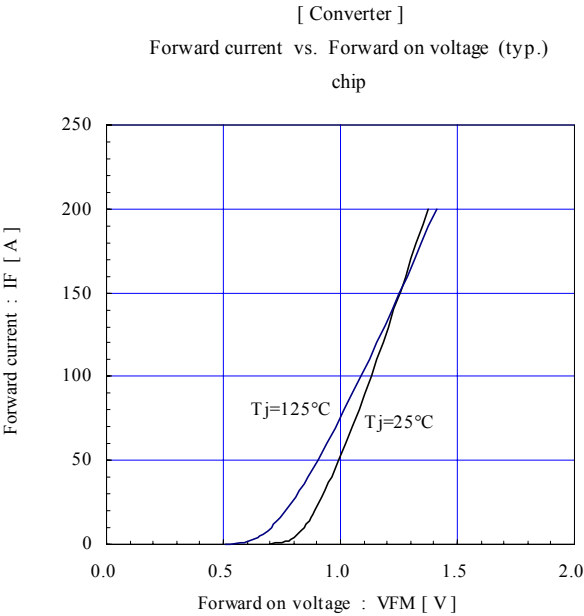
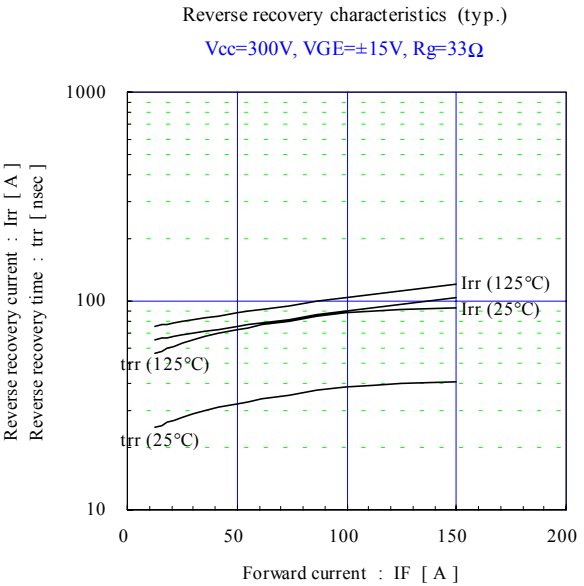
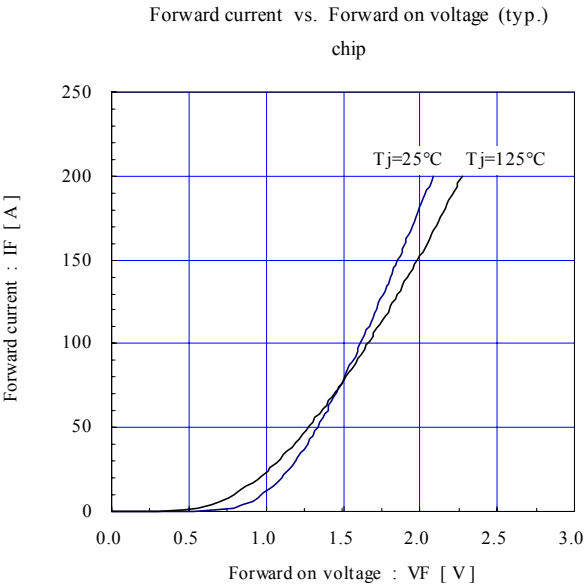
■ Equivalent Circuit Schematic



## ■ Characteristics (Representative)

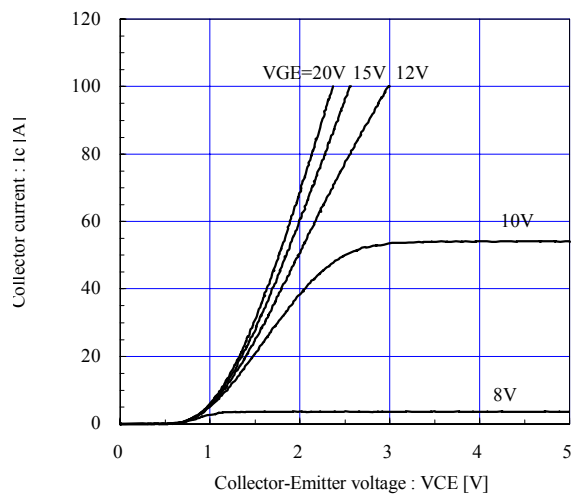






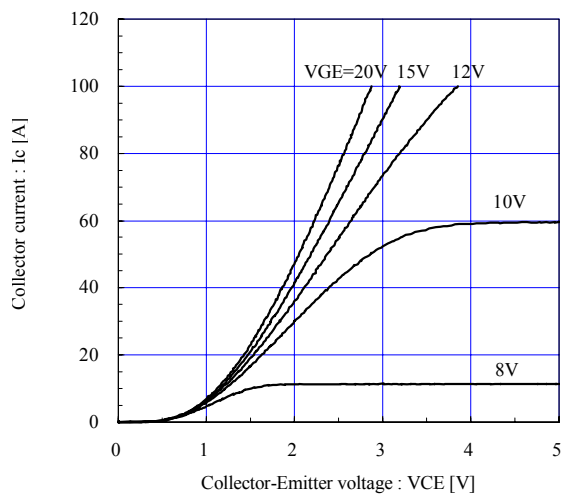
[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)

 $T_j = 25^\circ\text{C}$  / chip

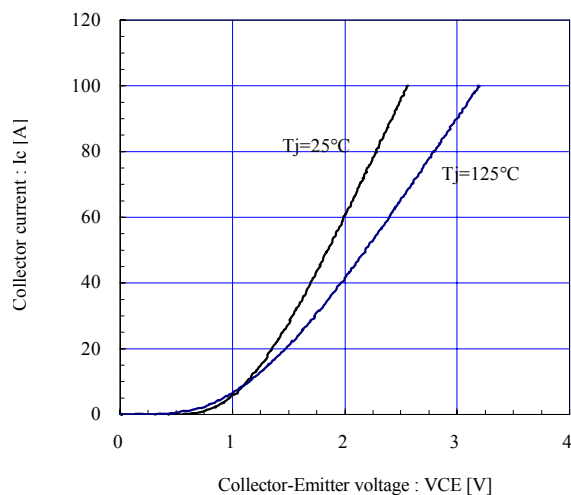
[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)

 $T_j = 125^\circ\text{C}$  / chip

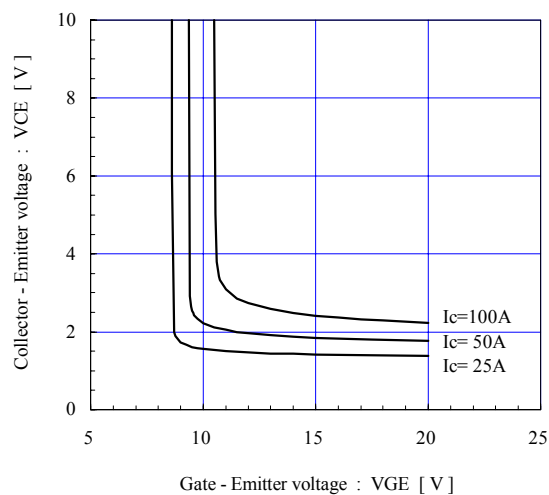
[ Brake ]

Collector current vs. Collector-Emittor voltage (typ.)

 $V_{GE} = 15\text{V}$  / chip

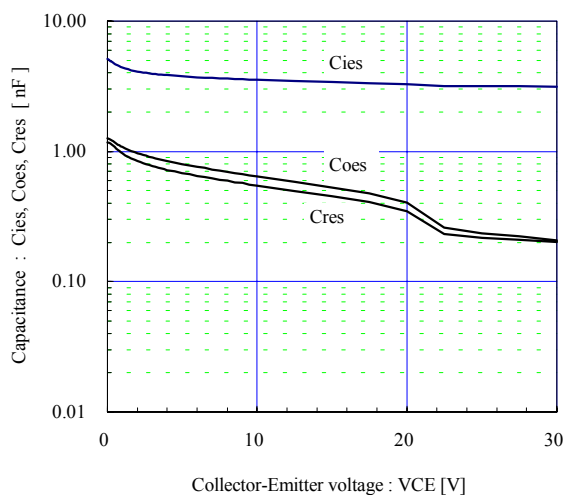
[ Brake ]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)

 $T_j = 25^\circ\text{C}$  / chip

[ Brake ]

Capacitance vs. Collector-Emittor voltage (typ.)

 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$ 

[ Brake ]

Dynamic Gate charge (typ.)

 $V_{cc} = 300\text{V}$ ,  $I_c = 50\text{A}$ ,  $T_j = 25^\circ\text{C}$ 