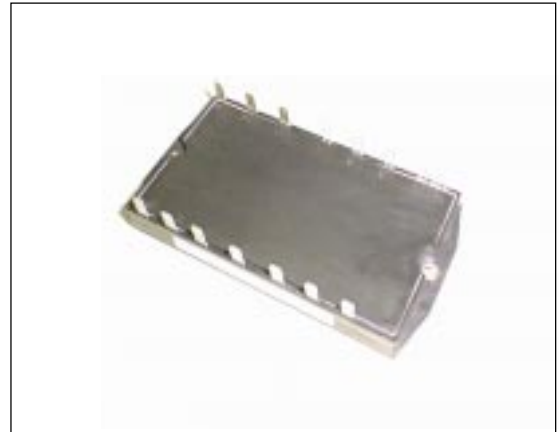


IGBT MODULE

1200V / 15A / PIM



■ Features

- High Speed Switching
- Voltage Drive
- Low Inductance Module Structure
- 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 (Tc=25°C unless without specified)

| Item | Symbol | Condition | Rating | Unit | |
|--------------------------------|-------------------------------------|--------------------|-----------------------------|------|------------------|
| Inverter | Collector-Emitter voltage | V _{CEs} | 1200 | V | |
| | Gate-Emitter voltage | V _{GEs} | ±20 | V | |
| | Collector current | I _C | Continuous | 15 | A |
| | | I _{CP} | 1ms | 30 | A |
| | | -I _C | | 15 | A |
| Collector power dissipation | P _C | 1 device | 120 | W | |
| Brake | Collector-Emitter voltage | V _{CEs} | 1200 | V | |
| | Gate-Emitter voltage | V _{GEs} | ±20 | V | |
| | Collector current | I _C | Continuous | 10 | A |
| | | I _{CP} | 1ms | 20 | A |
| | | P _C | 1 device | 88 | W |
| | Repetitive peak reverse voltage | V _{RRM} | | 1200 | V |
| | Average forward current | I _{F(AV)} | | 1 | A |
| Surge current | I _{FSM} | 10ms | 50 | A | |
| Converter | Repetitive peak reverse voltage | V _{RRM} | | 1600 | V |
| | Non-Repetitive peak reverse voltage | V _{RSM} | | 1700 | V |
| | Average output current | I _O | 50Hz/60Hz sine wave | 25 | A |
| | Surge current (Non-Repetitive) | I _{FSM} | T _J =150°C, 10ms | 320 | A |
| | I ² t (Non-Repetitive) | | T _J =150°C, 10ms | 512 | A ² s |
| Operating junction temperature | T _J | | +150 | °C | |
| Storage temperature | T _{stg} | | -40 to +125 | °C | |
| Isolation voltage | V _{iso} | AC : 1 minute | AC 2500 | V | |
| Mounting screw torque | | | 1.7 * ₁ | N·m | |

*₁ Recommendable value : 1.3 to 1.7 N·m (M4)

● Electrical characteristics (Tj=25°C unless without specified)

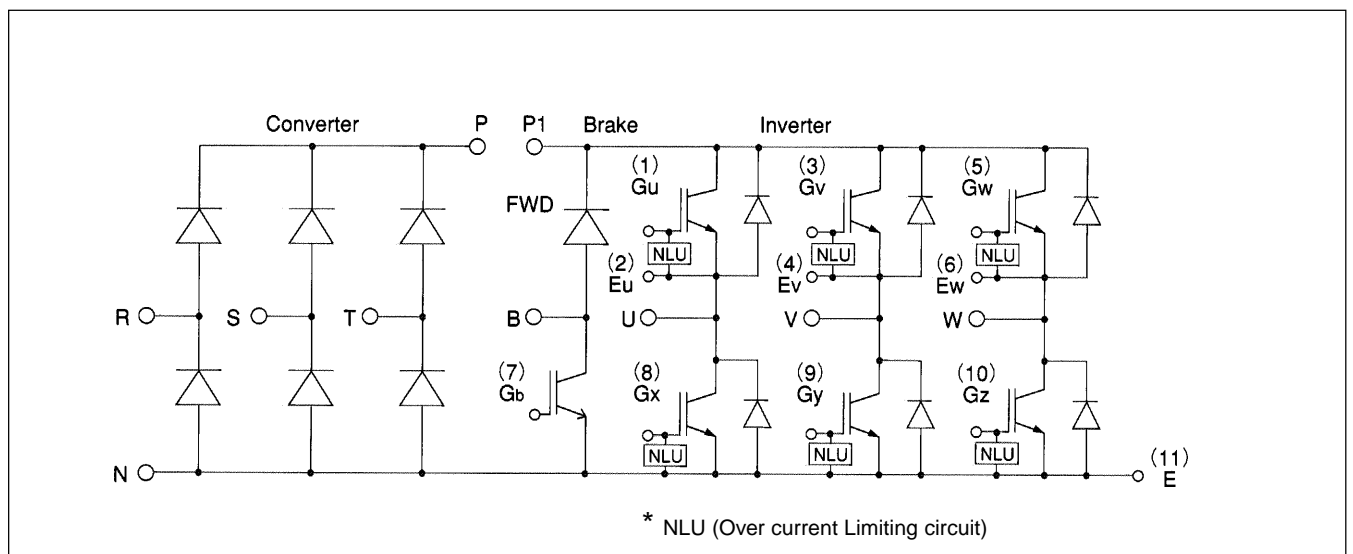
| Item | Symbol | Condition | Characteristics | | | Unit | |
|------------------------------|--------------------------------------|------------|-------------------------|------|------|------|----|
| | | | Min. | Typ. | Max. | | |
| Inverter (IGBT) | Zero gate voltage collector current | ICES | VCE=1200V, VGE=0V | | | 1.0 | mA |
| | Gate-Emitter leakage current | IGES | VCE=0V, VGE=±20V | | | 20 | µA |
| | Gate-Emitter threshold voltage | VGE(th) | VCE=20V, IC=15mA | | | 4.5 | V |
| | Collector-Emitter saturation voltage | VCE(sat) | VGE=15V, IC=15A | | | 3.3 | V |
| | Collector-Emitter voltage | -VCE | -IC=15A | | | 3.0 | V |
| | Input capacitance | Cies | VGE=0V, VCE=10V, f=1MHz | | | 2400 | pF |
| | Switching time | ton | VCC=600V | | | 1.2 | µs |
| | | tr | IC=15A | | | 0.6 | µs |
| | | toff | VGE=±15V | | | 1.5 | µs |
| | | tf | RG=82 ohm | | | 0.5 | µs |
| Reverse recovery time of FRD | trr | IF=15A | | | 0.35 | µs | |
| Brake (IGBT) | Zero gate voltage collector current | ICES | VCE=1200V, VGE=0V | | | 1.0 | mA |
| | Gate-Emitter leakage current | IGES | VCE=0V, VGE=±20V | | | 0.1 | µA |
| | Collector-Emitter saturation voltage | VCE(sat) | IC=10A, VGE=15V | | | 3.3 | V |
| | Switching time | ton | VCC=600V | | | 0.8 | µs |
| | | tr | IC=10A | | | 0.6 | µs |
| | | toff | VGE=±15V | | | 1.5 | µs |
| tf | | RG=120 ohm | | | 0.5 | µs | |
| Brake (FWD) | Reverse current | IRRM | VR=1200V | | | 1 | mA |
| | Reverse recovery time | trr | | | | 0.6 | µs |
| Converter | Forward voltage | VFM | IF=25A | | | 1.4 | V |
| | Reverse current | IRRM | VR=1600V | | | 1.0 | mA |

● Thermal Characteristics

| Item | Symbol | Condition | Characteristics | | | Unit |
|---------------------------------|----------|-----------------------|-----------------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Thermal resistance (1 device) | Rth(j-c) | Inverter IGBT | | | 1.04 | °C/W |
| | | Inverter FRD | | | 2.78 | |
| | | Brake IGBT | | | 1.43 | |
| | | Converter Diode | | | 3.40 | |
| 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

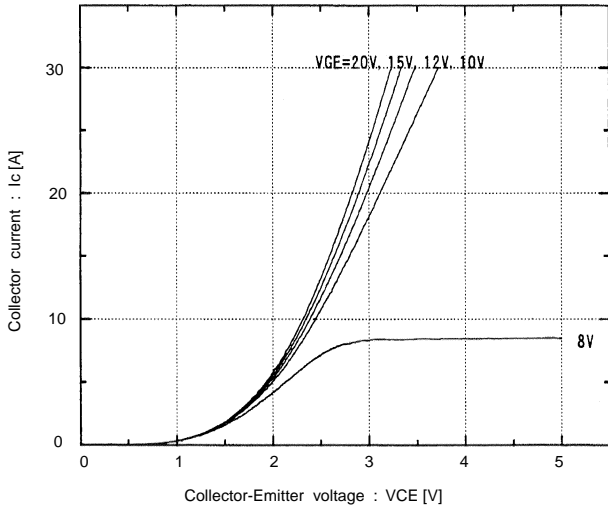
■ Equivalent Circuit Schematic



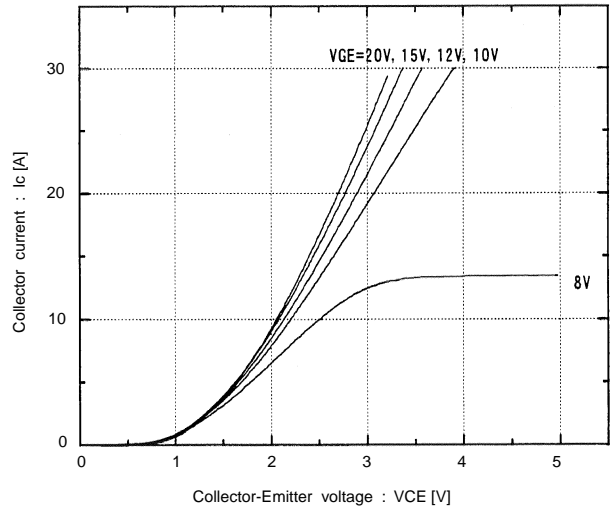
■ Characteristics (Representative)

● Inverter

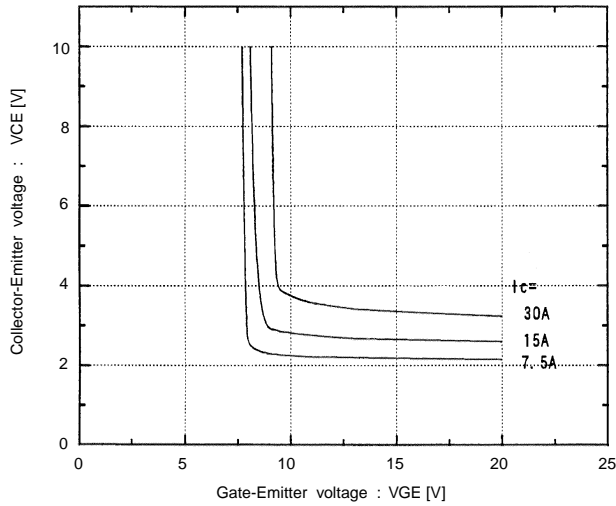
Collector current vs. Collector-Emitter voltage
T_j=25°C



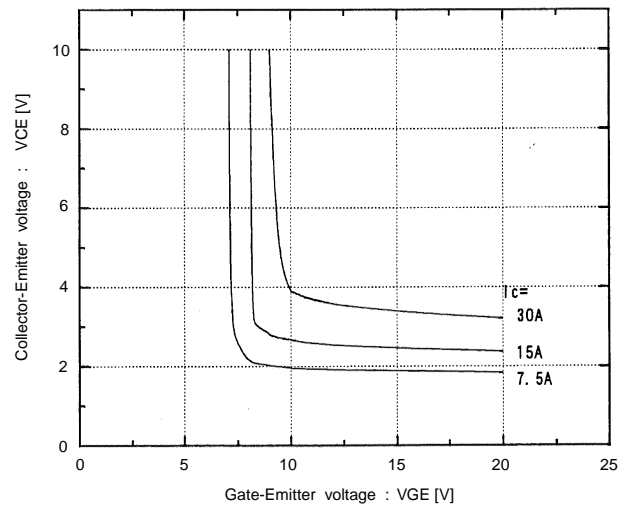
Collector current vs. Collector-Emitter voltage
T_j=125°C



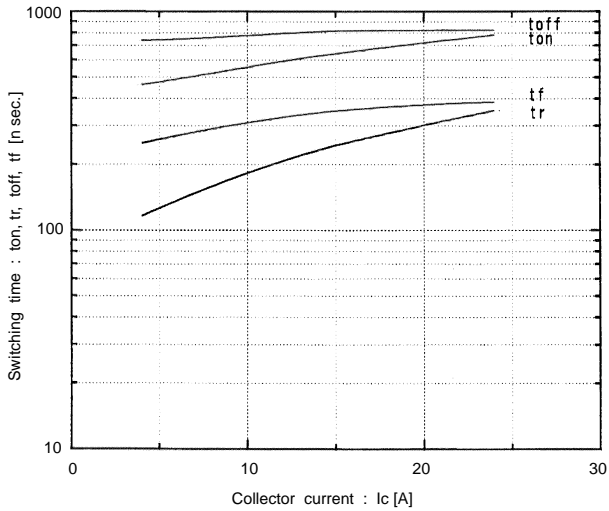
Collector-Emitter vs. Gate-Emitter voltage
T_j=25°C



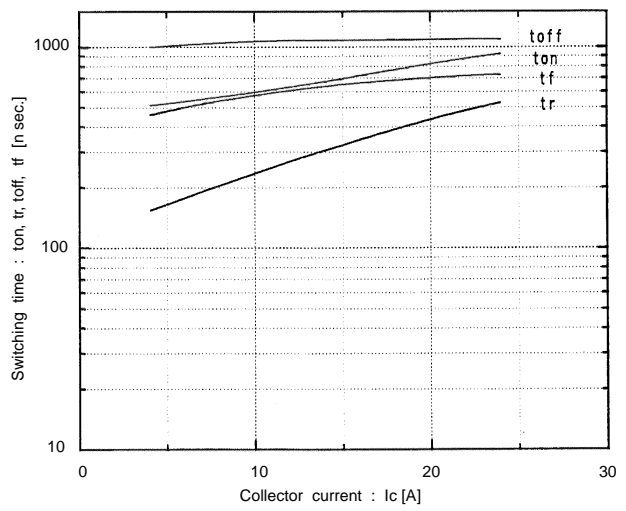
Collector-Emitter vs. Gate-Emitter voltage
T_j=125°C



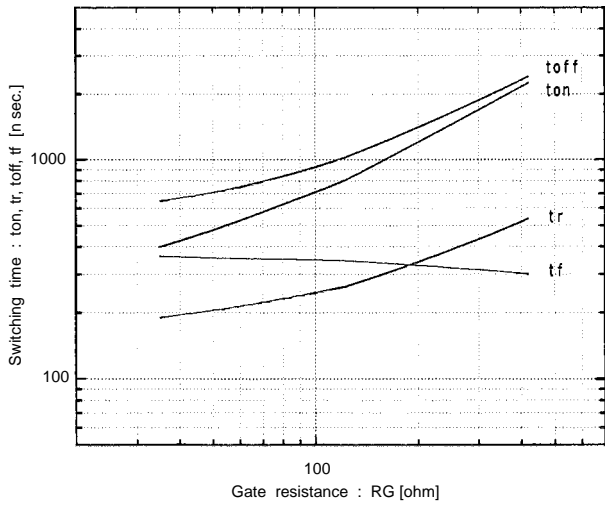
Switching time vs. Collector current
V_{cc}=600V, R_G=82 ohm, V_{GE}=±15V, T_j=25°C



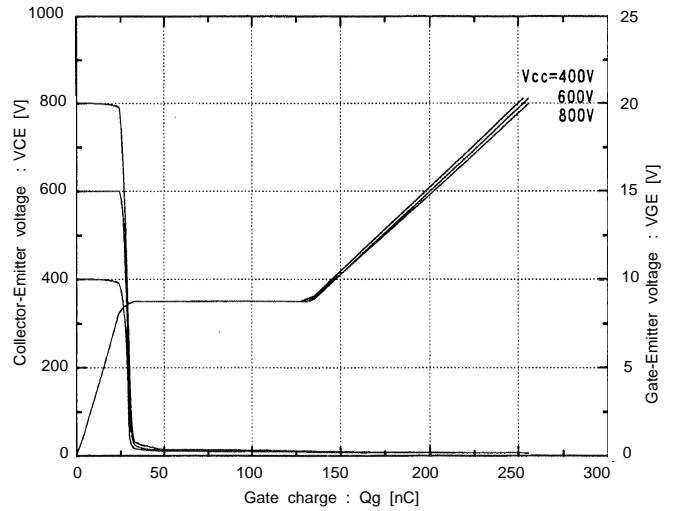
Switching time vs. Collector current
V_{cc}=600V, R_G=82 ohm, V_{GE}=±15V, T_j=125°C



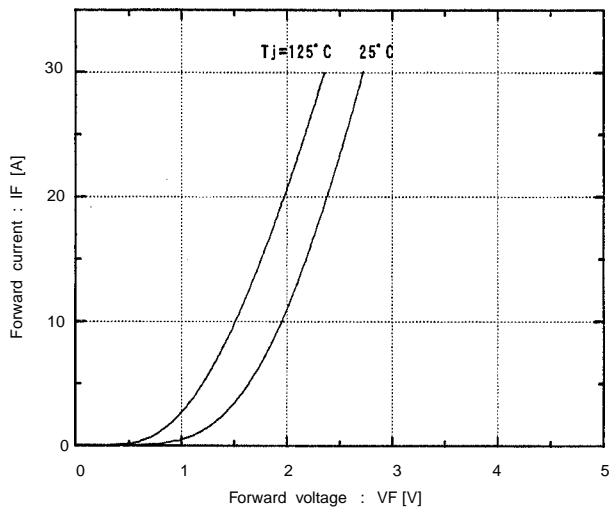
Switching time vs. RG
 $V_{cc}=600V, I_c=15A, V_{GE}=\pm 15V, T_j=25^\circ C$



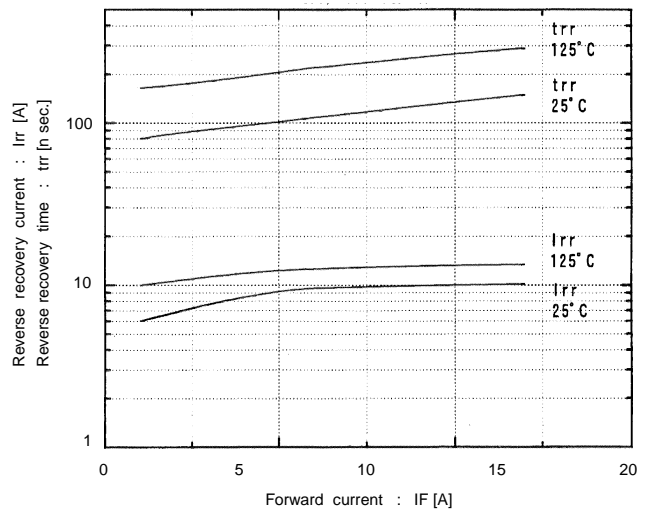
Dynamic input characteristics
 $T_j=25^\circ C$



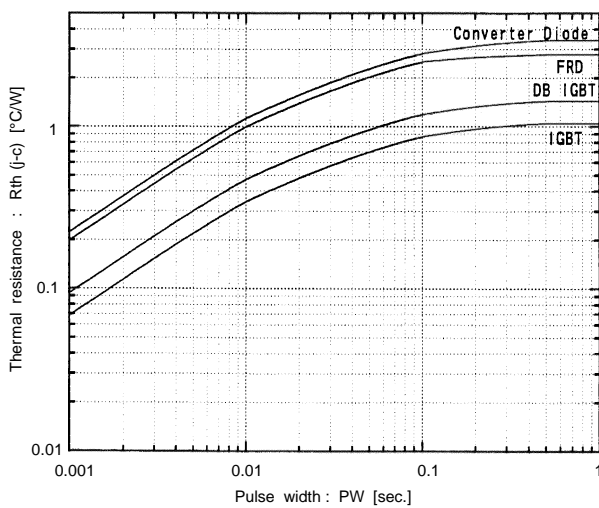
Forward current vs. Forward voltage
 $V_{GE}=0V$



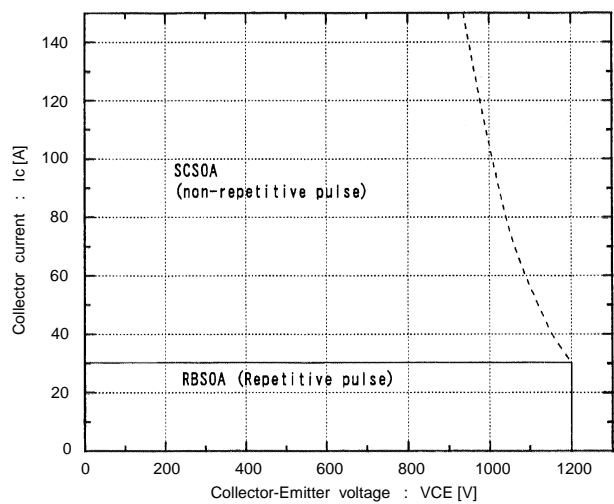
Reverse recovery characteristics
 t_{rr}, I_{rr} , vs. I_F



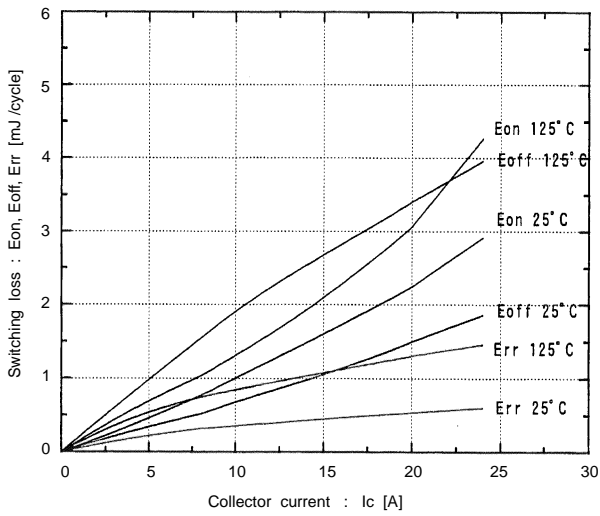
Transient thermal resistance



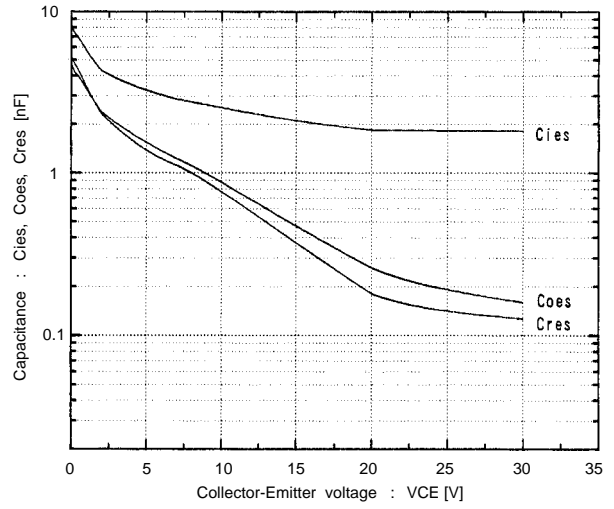
Reversed biased safe operating area
 $+V_{GE}=15V, -V_{GE} \le 15V, T_j \le 125^\circ C, R_G \ge 82 \text{ ohm}$



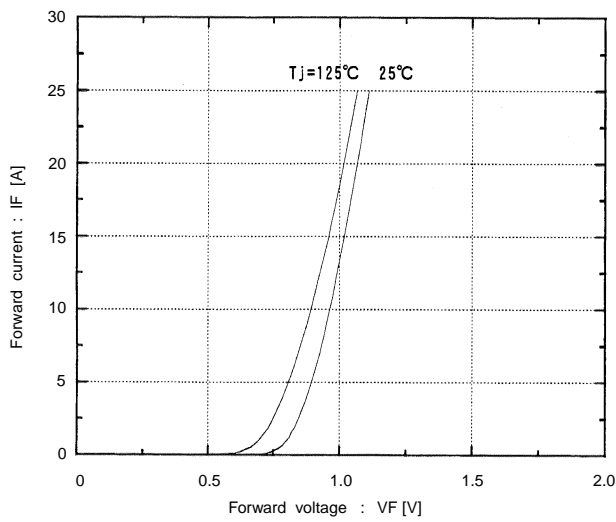
Switching loss vs. Collector current
 $V_{cc}=600V$, $R_G=82\text{ ohm}$, $V_{GE}=\pm 15V$



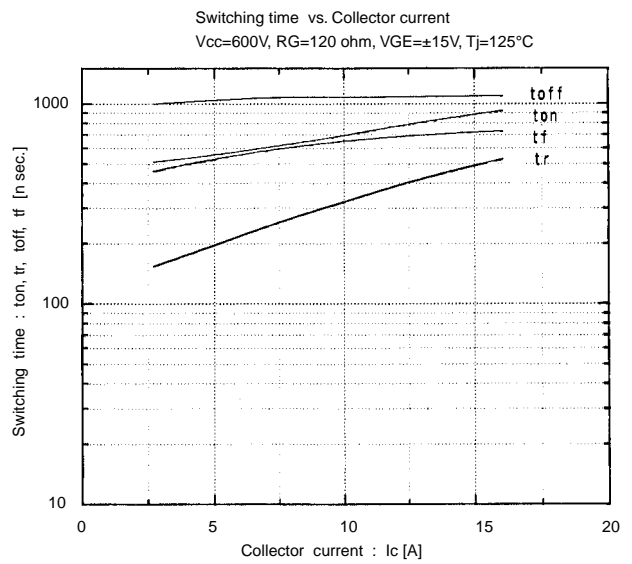
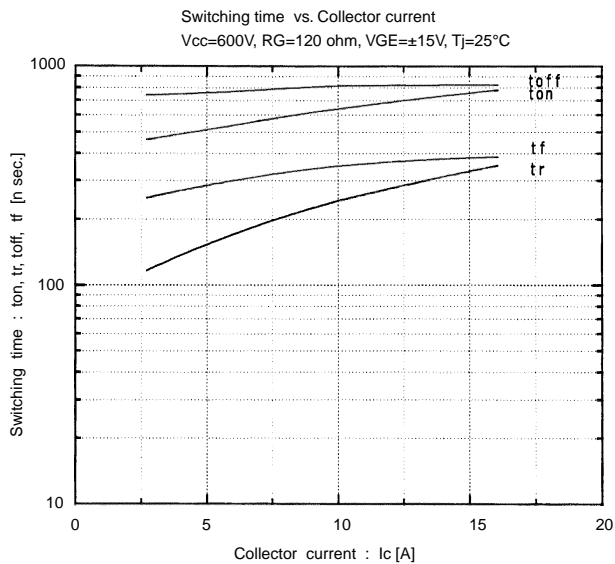
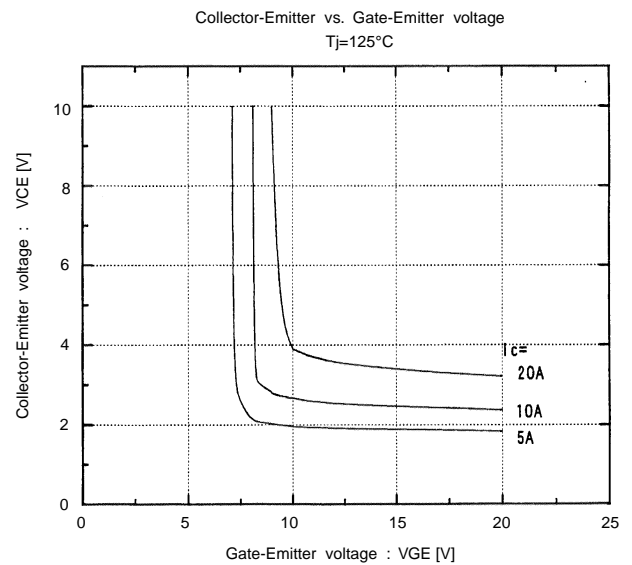
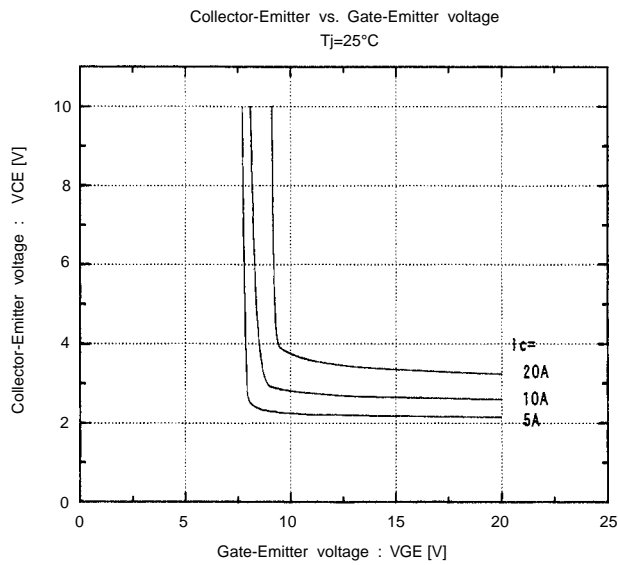
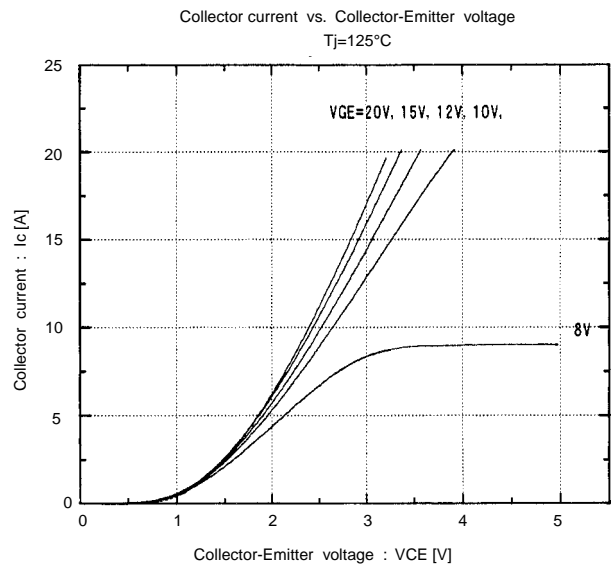
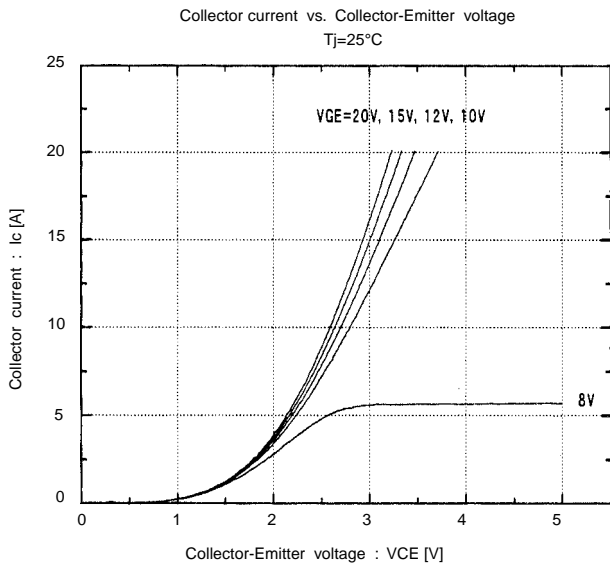
Capacitance vs. Collector-Emitter voltage
 $T_j=25^\circ\text{C}$



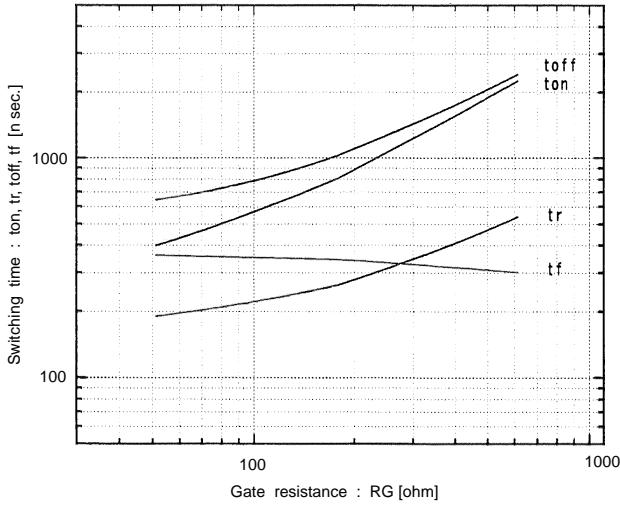
Converter Diode
 Forward current vs. Forward voltage



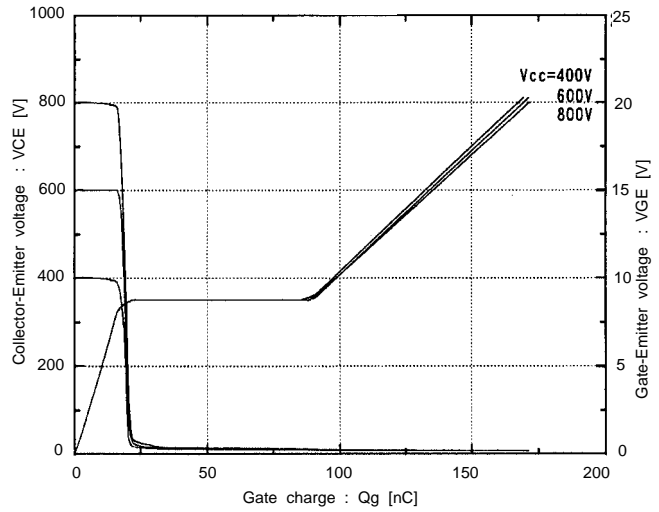
● Brake



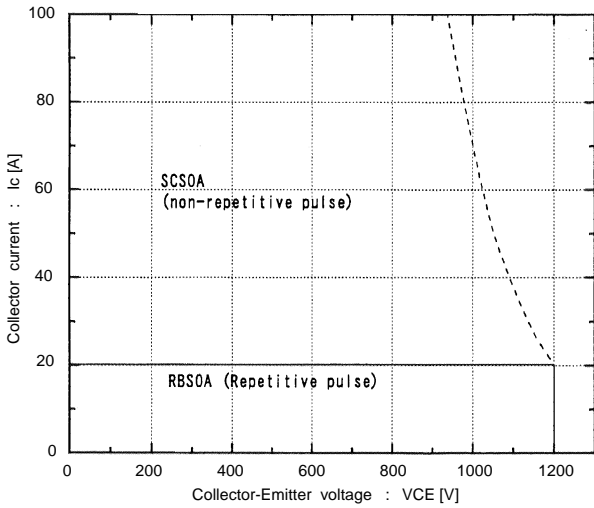
Switching time vs. R_G
 $V_{CC}=600V, I_c=10A, V_{GE}=\pm 15V, T_j=25^\circ C$



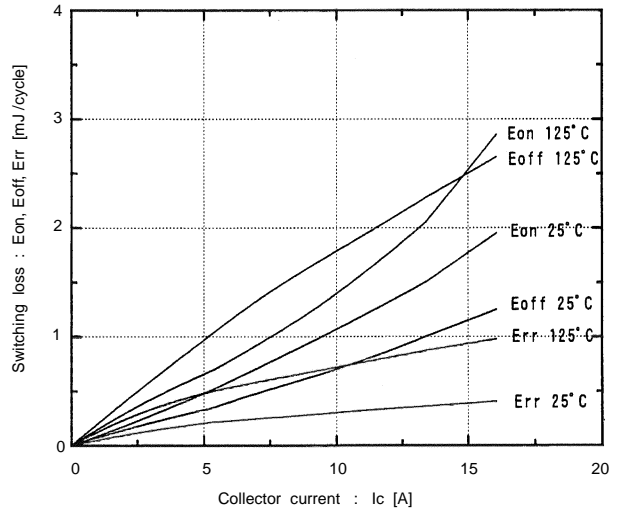
Dynamic input characteristics
 $T_j=25^\circ C$



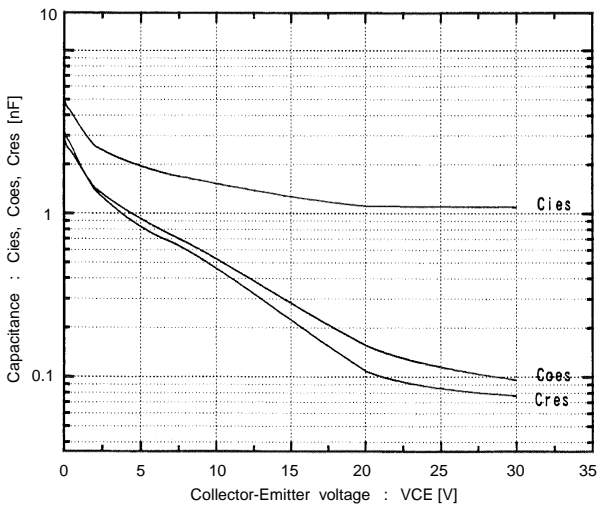
Reversed biased safe operating area
 $+V_{GE}=15V, -V_{GE} \leq 15V, T_j \leq 125^\circ C, R_G \geq 120 \text{ ohm}$



Switching loss vs. Collector current
 $V_{CC}=600V, R_G=120 \text{ ohm}, V_{GE}=\pm 15V$



Capacitance vs. Collector-Emitter voltage
 $T_j=25^\circ C$



■ Outline Drawings, mm

