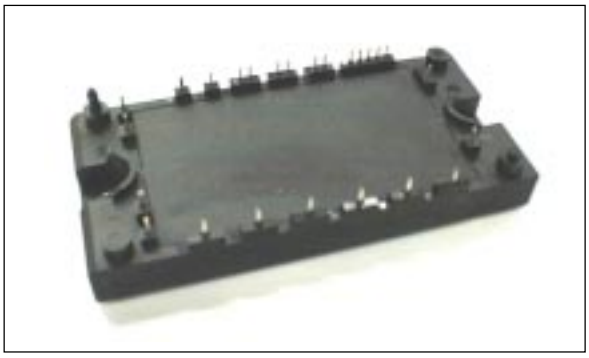
# 7MBR30SC060

**IGBT Modules**

## PIM/Built-in converter with thyristor and brake (S series)
## 600V / 30A / 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 (Tc=25°C unless without specified)**

| Item | | Symbol | Condition | Rating | Unit |
|---|---|---|---|---|---|
| Inverter | Collector-Emitter voltage | $V_{CES}$ | | 600 | V |
| | Gate-Emitter voltage | $V_{GES}$ | | ±20 | V |
| | Collector current | $I_C$ | Continuous | 30 | A |
| | | $I_{CP}$ | 1ms | 60 | A |
| | | -$I_C$ | | 30 | A |
| | Collector power disspation | $P_C$ | 1 device | 120 | W |
| Brake | Collector-Emitter voltage | $V_{CES}$ | | 600 | V |
| | Gate-Emitter voltage | $V_{GES}$ | | ±20 | V |
| | Collector current | $I_C$ | Continuous | 20 | A |
| | | $I_{CP}$ | 1ms | 40 | A |
| | Collector power disspation | $P_C$ | 1 device | 80 | 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 | 30 | A |
| | Surge 0n-state current (Non-Repetitive) | $I_{TSM}$ | Tj=125°C, 10ms half sine wave | 275 | A |
| | Junction temperature | $T_{jw}$ | | 125 | ℃ |
| Converter | Repetitive peak reverse voltage | $V_{RRM}$ | | 800 | V |
| | Average output current | $I_O$ | 50Hz/60Hz sine wave | 30 | A |
| | Surge current (Non-Repetitive) | $I_{FSM}$ | Tj=150°C, 10ms | 210 | A |
| | $I^2t$ (Non-Repetitive) | $I^2t$ | half sine wave | 221 | $A^2s$ |
| Junction temperature (except Thyristor) | | $T_j$ | | +150 | ℃ |
| Storage temperature | | $T_{stg}$ | | -40 to +125 | ℃ |
| 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 (Tj=25°C unless otherwise specified)

| Item | | Symbol | Condition | | Characteristics Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Inverter | Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$=600V, $V_{GE}$=0V | | | | 75 | μA |
| | Gate-Emitter leakage current | $I_{GES}$ | $V_{CE}$=0V, $V_{GE}$=±20V | | | | 200 | nA |
| | Gate-Emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}$=20V, $I_C$=30mA | | 5.5 | 7.8 | 8.5 | V |
| | Collector-Emitter saturation voltage | $V_{CE(sat)}$ | $V_{GE}$=15V, Ic=30A | chip | | 1.8 | | V |
| | | | | terminal | | 1.95 | 2.4 | |
| | Input capacitance | Cies | $V_{GE}$=0V, $V_{CE}$=10V, f=1MHz | | | 3000 | | pF |
| | Turn-on time | $t_{on}$ | $V_{CC}$=300V | | | 0.45 | 1.2 | μs |
| | | $t_r$ | $I_C$=30A | | | 0.25 | 0.6 | |
| | Turn-off | $t_{off}$ | $V_{GE}$=±15V | | | 0.40 | 1.0 | |
| | | $t_f$ | $R_G$=82Ω | | | 0.05 | 0.35 | |
| | Forward on voltage | $V_F$ | $I_F$=30A | chip | | 1.8 | | V |
| | | | | terminal | | 1.95 | 2.6 | |
| | Reverse recovery time of FRD | $t_{rr}$ | $I_F$=30A | | | | 300 | ns |
| Brake | Zero gate voltage collector current | $I_{CES}$ | $V_{CES}$=600V, $V_{GE}$=0V | | | | 75 | μA |
| | Gate-Emitter leakage current | $I_{GES}$ | $V_{CE}$=0V, $V_{GE}$=±20V | | | | 200 | nA |
| | Collector-Emitter saturation voltage | $V_{CE(sat)}$ | $I_C$=20A, $V_{GE}$=15V | chip | | 1.8 | | V |
| | | | | terminal | | 1.95 | 2.4 | |
| | Turn-on time | $t_{on}$ | $V_{CC}$=300V | | | 0.45 | 1.2 | μs |
| | | $t_r$ | $I_C$=20A | | | 0.25 | 0.6 | |
| | Turn-off time | $t_{off}$ | $V_{GE}$=±15V | | | 0.40 | 1.0 | |
| | | $t_f$ | $R_G$=120Ω | | | 0.05 | 0.35 | |
| | Reverse current | $I_{RRM}$ | $V_R$=600V | | | | 75 | μA |
| | off-state current | $I_{DM}$ | $V_{DM}$=800V | | | | 1.0 | mA |
| Thyristor | Reverse current | $I_{RRM}$ | $V_{RM}$=800V | | | | 1.0 | mA |
| | Gate trigger current | $I_{GT}$ | $V_D$=6V, $I_T$=1A | | | | 100 | mA |
| | Gate trigger voltage | $V_{GT}$ | $V_D$=6V, $I_T$=1A | | | | 2.5 | V |
| | On-state voltage | $V_{TM}$ | $I_{TM}$=30A | chip | | 1.0 | 1.2 | V |
| | | | | terminal | | 1.1 | | |
| Converter | Forward on voltage | $V_{FM}$ | $I_F$=30A | chip | | 1.1 | | V |
| | | | | terminal | | 1.2 | 1.5 | |
| | Reverse current | $I_{RRM}$ | $V_R$=800V | | | | 75 | 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 |



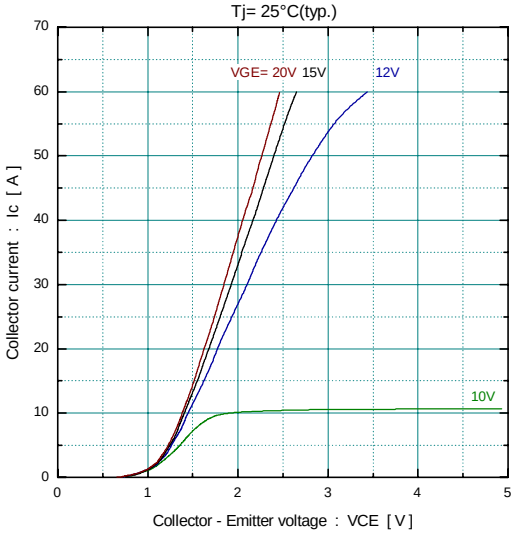
## ● Thermal resistance Characteristics

| Item | Symbol | Condition | Characteristics Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Thermal resistance ( 1 device ) | Rth(j-c) | Inverter IGBT | | | 1.04 | °C/W |
| | | Inverter FWD | | | 2.00 | |
| | | Brake IGBT | | | 1.56 | |
| | | Thyristor | | | 1.00 | |
| | | Converter Diode | | | 1.33 | |
| Contact thermal resistance * | Rth(c-f) | With thermal compound | | 0.05 | | |

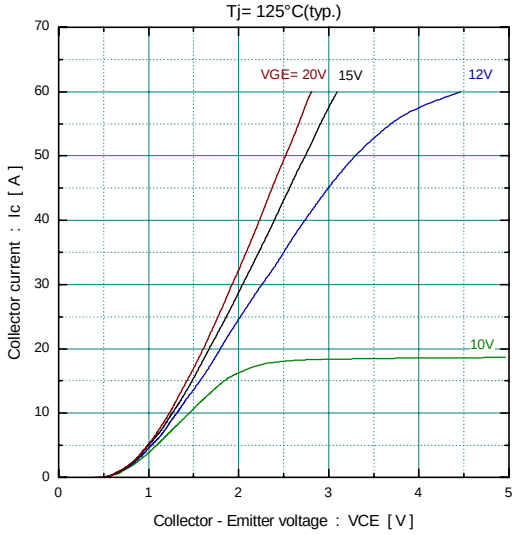
* This is the value which is defined mounting on the additional cooling fin with thermal compound

## ■ Characteristics (Representative)

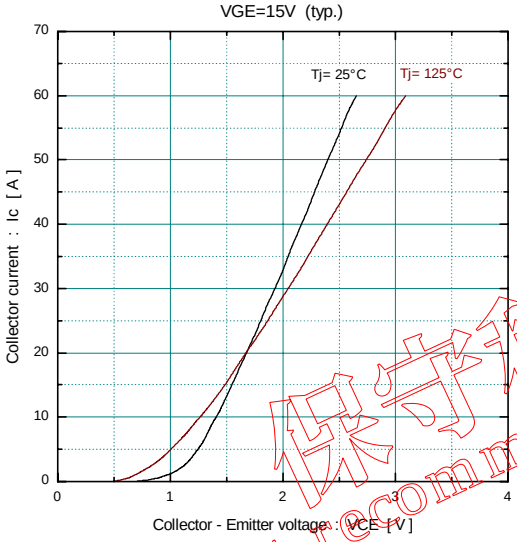
[ Inverter ]
Collector current vs. Collector-Emitter voltage
Tj= 25°C(typ.)



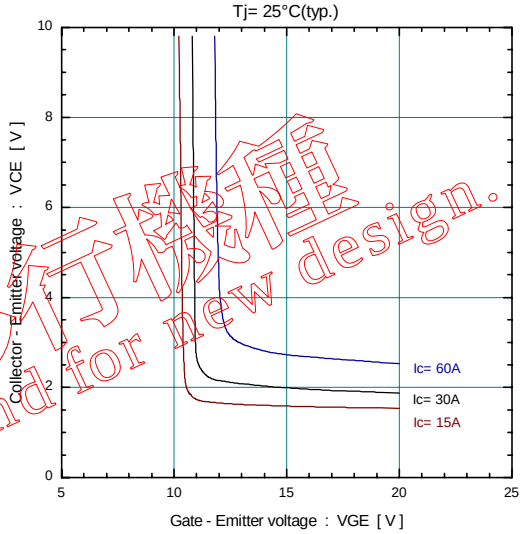

[ Inverter ]
Collector current vs. Collector-Emitter voltage
Tj= 125°C(typ.)




[ Inverter ]
Collector current vs. Collector-Emitter voltage
VGE=15V (typ.)

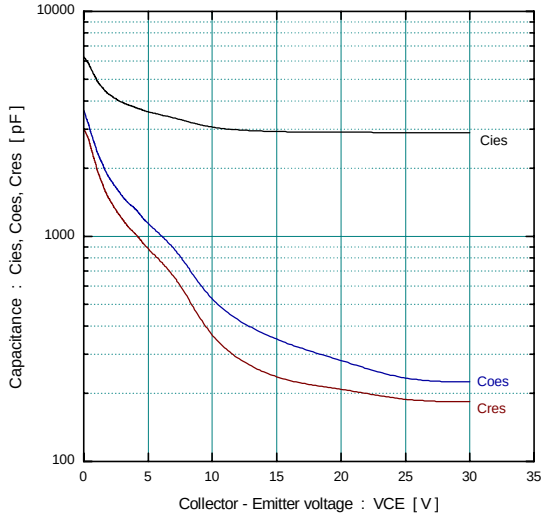



[ Inverter ]
Collector-Emitter voltage vs. Gate-Emitter voltage
Tj= 25°C(typ.)

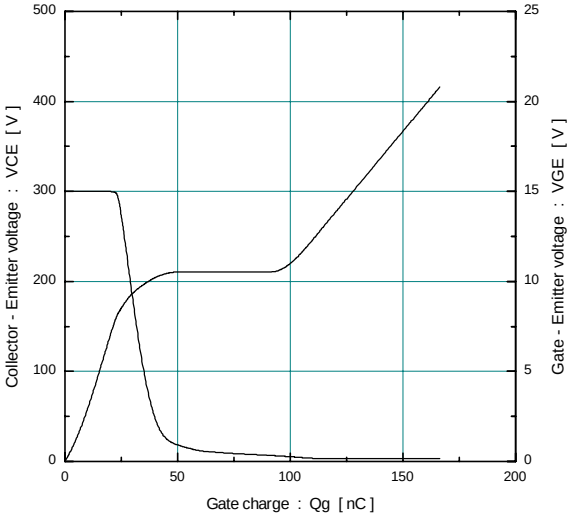




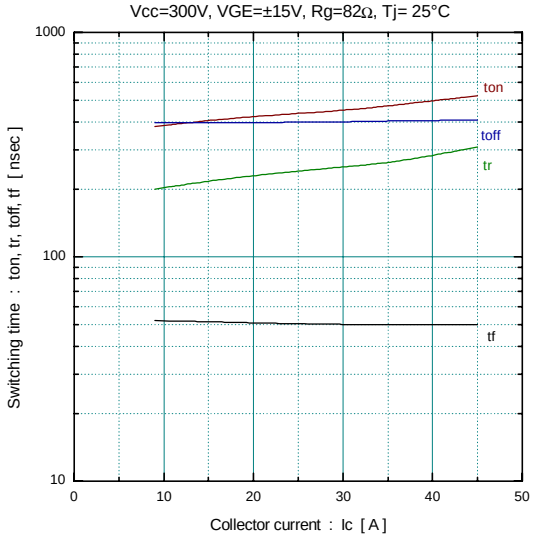

[ Inverter ]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



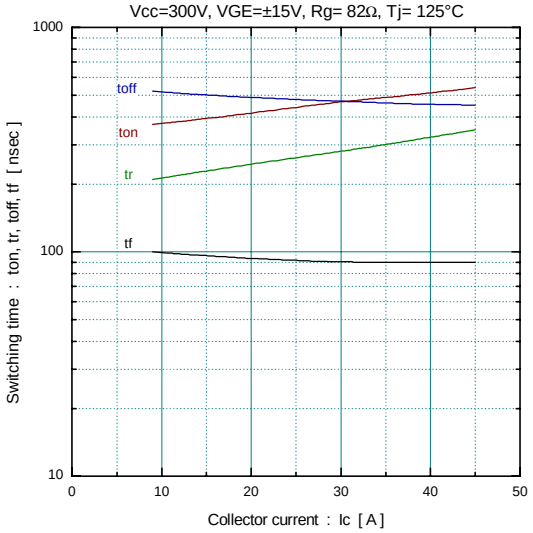

[ Inverter ]
Dynamic Gate charge (typ.)
Vcc=300V, Ic=30A, Tj= 25°C



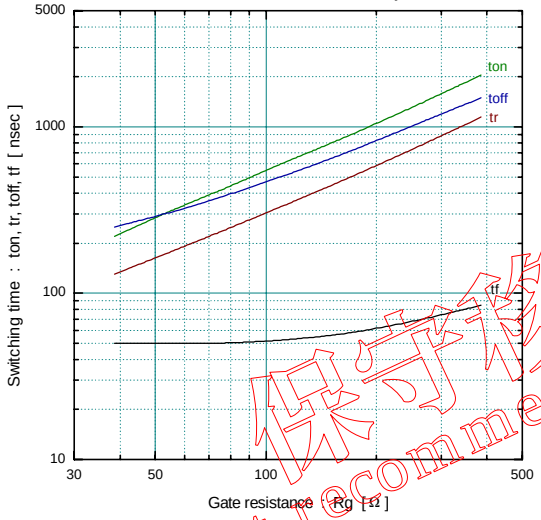
[ Inverter ]
Switching time vs. Collector current (typ.)
Vcc=300V, VGE=±15V, Rg=82Ω, Tj= 25°C



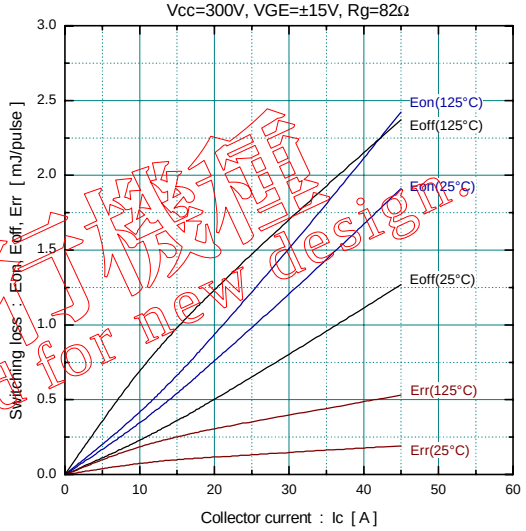

[ Inverter ]
Switching time vs. Collector current (typ.)
Vcc=300V, VGE=±15V, Rg= 82Ω, Tj= 125°C




[ Inverter ]
Switching time vs. Gate resistance (typ.)
Vcc=300V, Ic=30A, VGE=±15V, Tj= 25°C

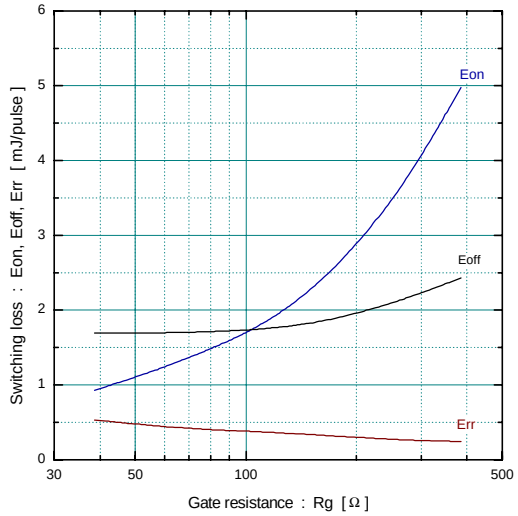



[ Inverter ]
Switching loss vs. Collector current (typ.)
Vcc=300V, VGE=±15V, Rg=82Ω

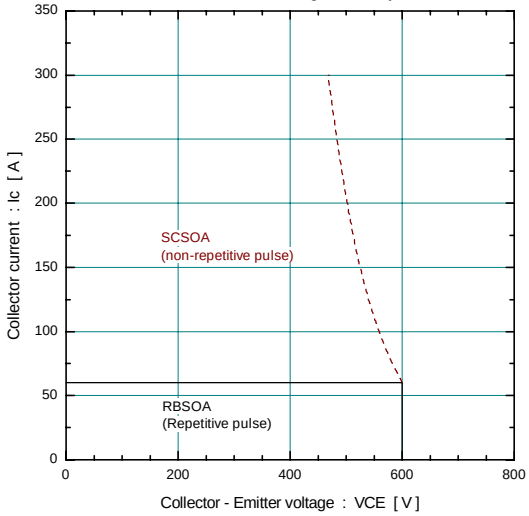




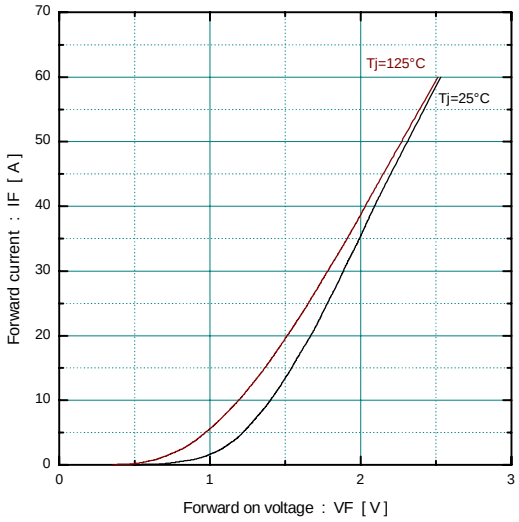

[ Inverter ]
Switching loss vs. Gate resistance (typ.)
Vcc=300V, Ic=30A, VGE=±15V, Tj= 125°C



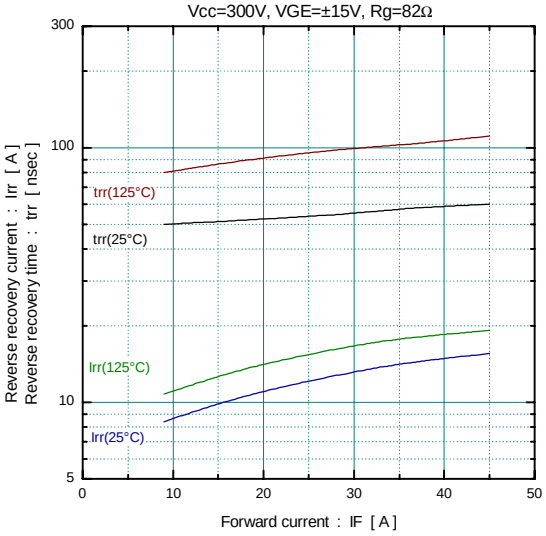

[ Inverter ]
Reverse bias safe operating area
+VGE=15V, -VGE<=15V, Rg>=82Ω, Tj<=125°C



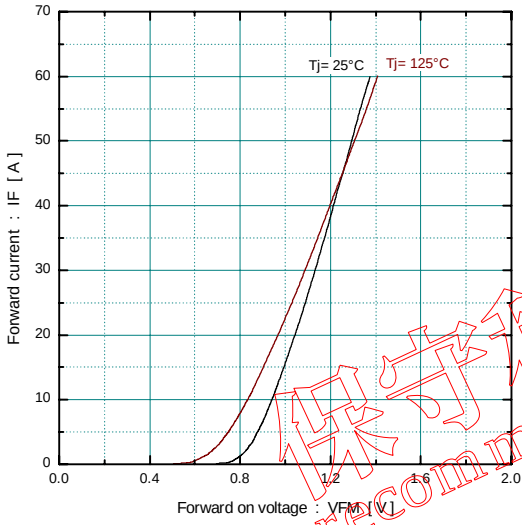
[ Inverter ]
Forward current vs. Forward on voltage (typ.)



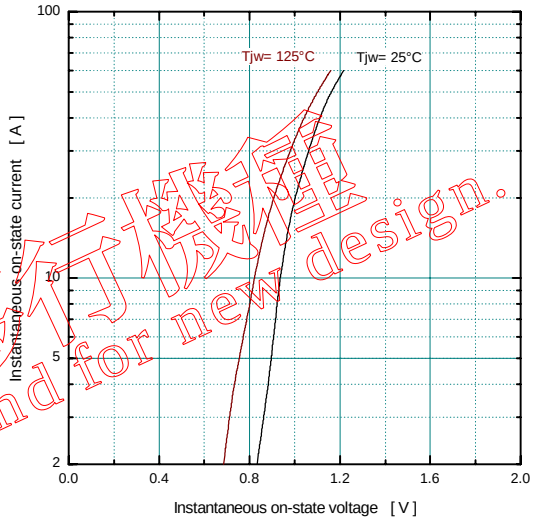

[ Inverter ]
Reverse recovery characteristics (typ.)
Vcc=300V, VGE=±15V, Rg=82Ω




[ Converter ]
Forward current vs. Forward on voltage (typ.)

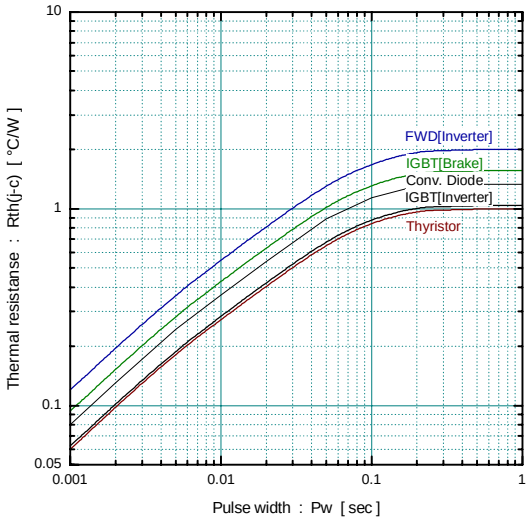



[ Thyristor ]
On-state current vs. On-state voltage (typ.)

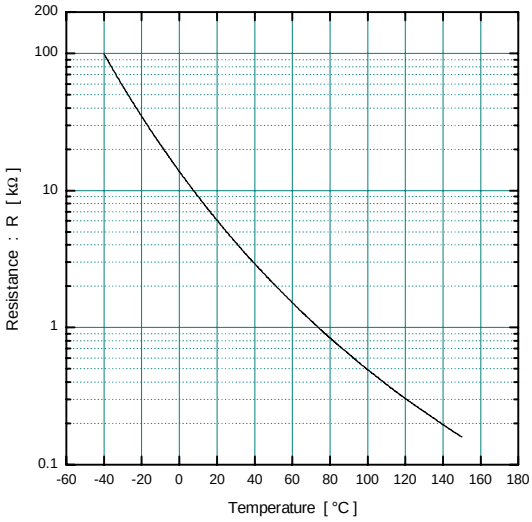




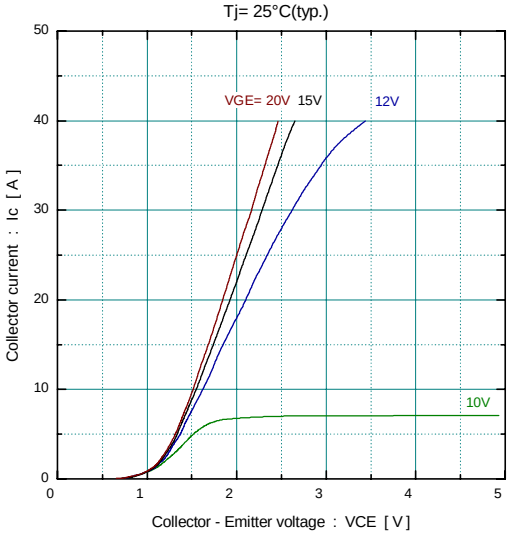

Transient thermal resistance



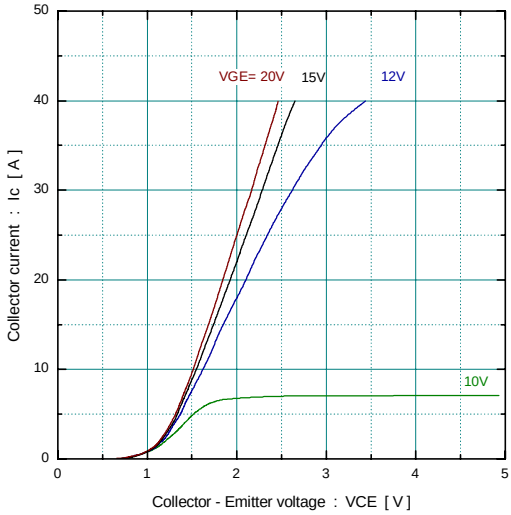

[ Thermistor ]
Temperature characteristic (typ.)



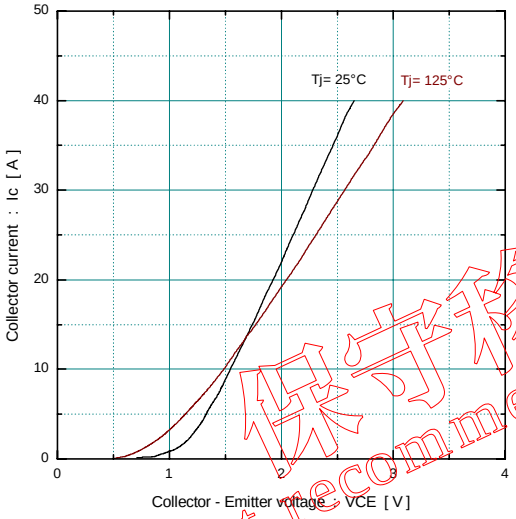
[ Brake ]
Collector current vs. Collector-Emitter voltage
Tj= 25°C(typ.)



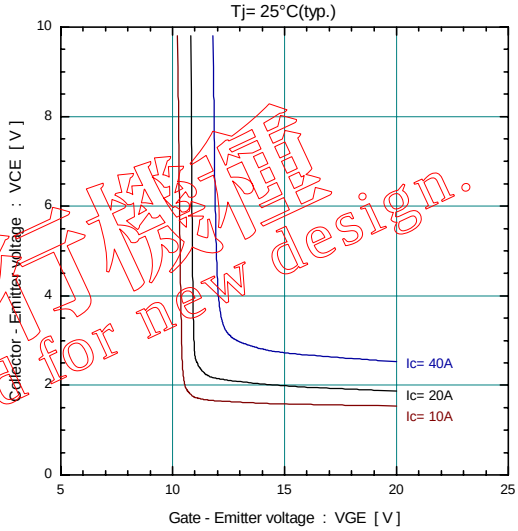

[ Brake ]
Collector current vs. Collector-Emitter voltage
Tj= 125°C(typ.)




[ Brake ]
Collector current vs. Collector-Emitter voltage
VGE=15V (typ.)

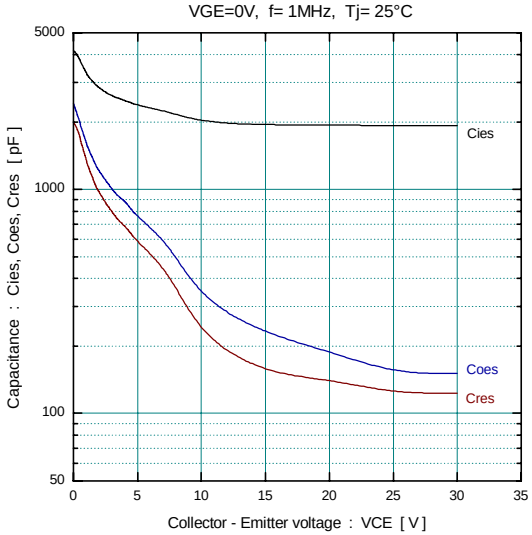



[ Brake ]
Collector-Emitter voltage vs. Gate-Emitter voltage
Tj= 25°C(typ.)

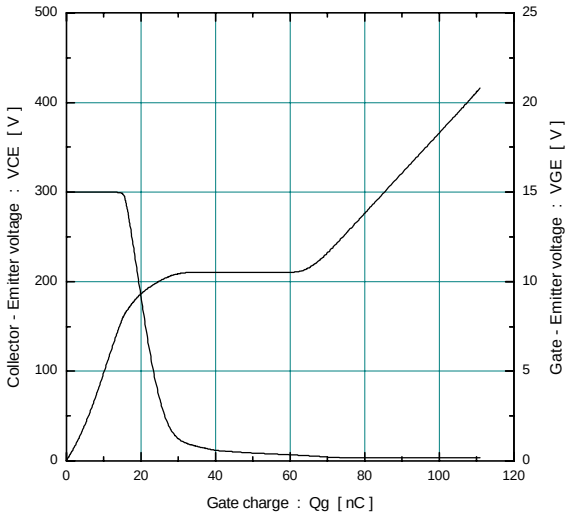




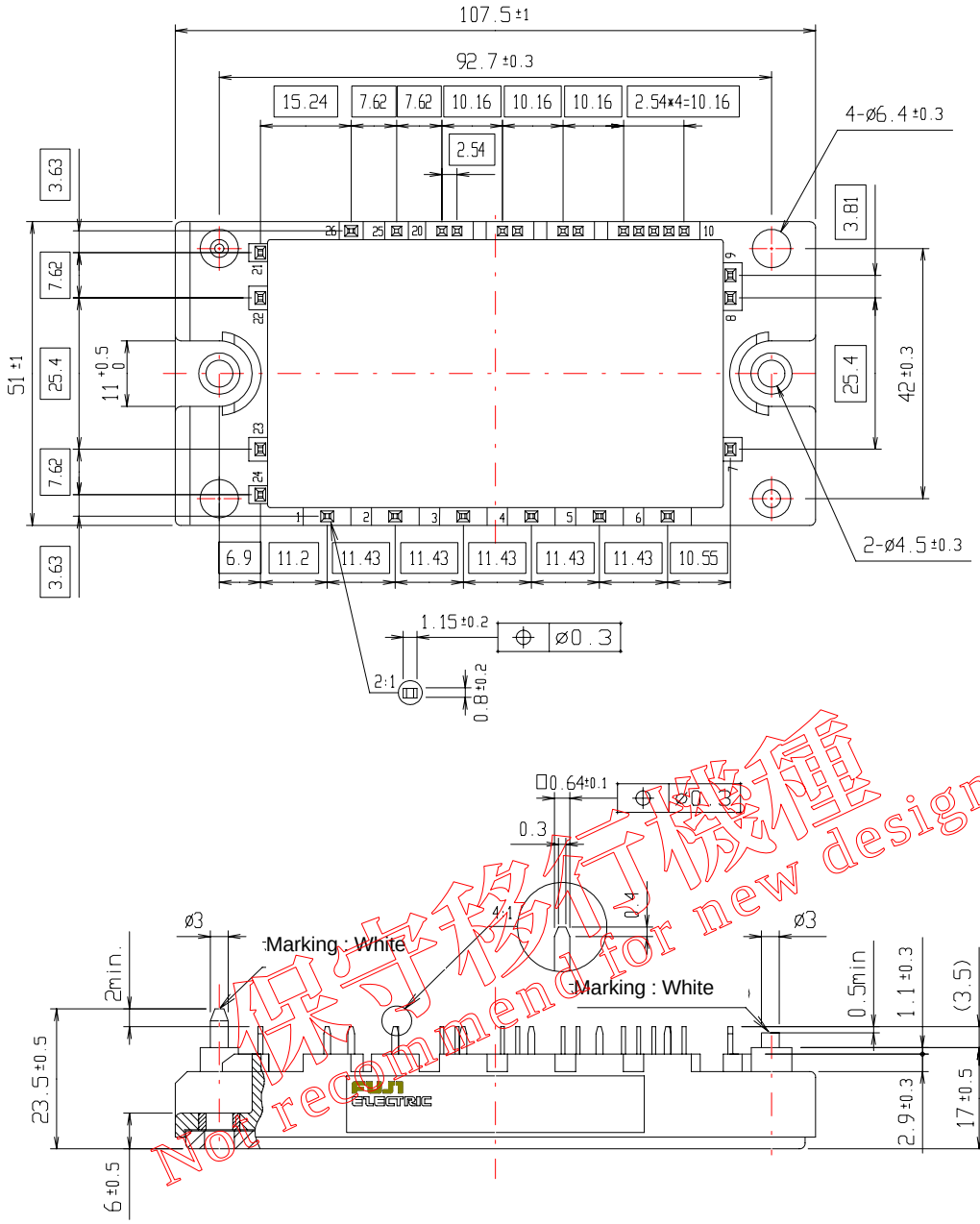

[ Brake ]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C




[ Brake ]
Dynamic Gate charge (typ.)
Vcc=300V, Ic=20A, Tj= 25°C



## ■ Outline Drawings, mm






## ■ Equivalent Circuit Schematic