

SPECIFICATION

Device Name : Power Integrated Module

Type Name : 7MBR20SA060

Spec. No. : MS6M 0470

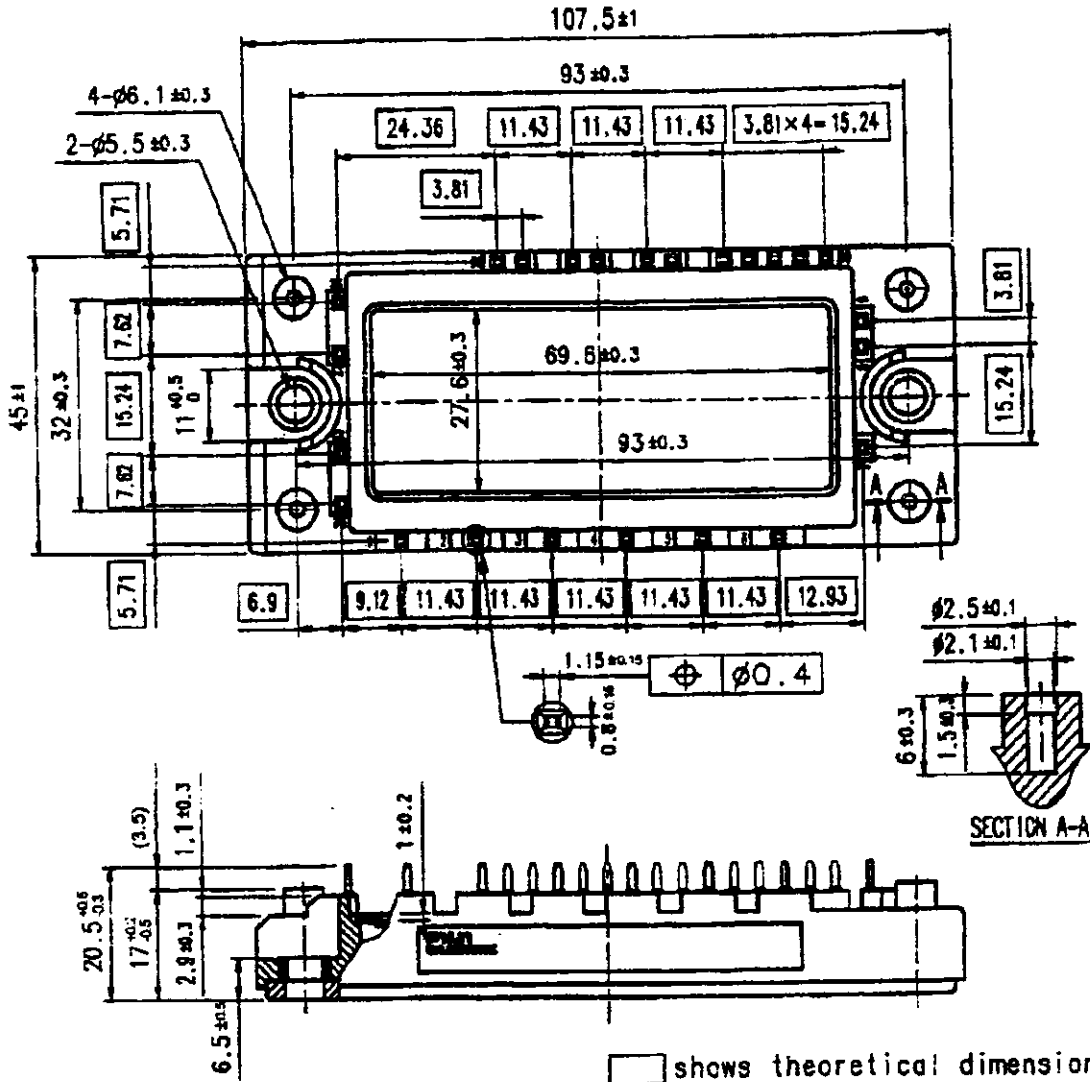
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Matsumoto Factory

| | DATE | NAME | APPROVED | Fuji Electric Co., Ltd. | |
|---------|-------------|-------------|--------------------|-------------------------|--------|
| DRAWN | Jan -25-'00 | T. Satou | <i>T. Miyatake</i> | MS6M 0470 | 1 / 10 |
| CHECKED | Jan -25-'00 | S. Miyatake | | | |

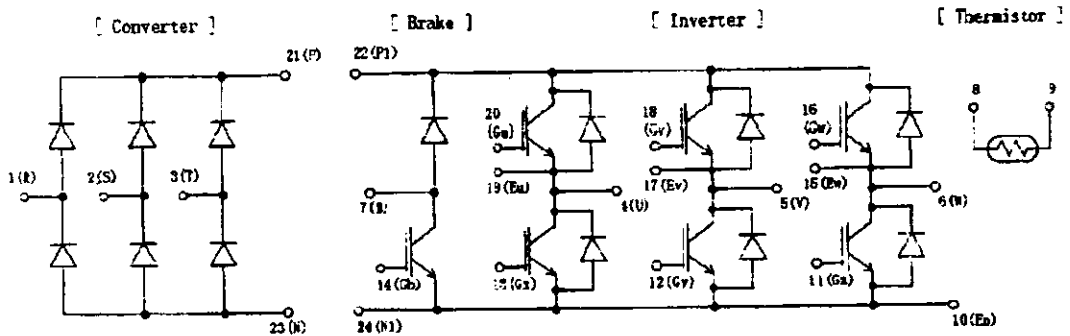
7MBR20SA060

1. Outline Drawing (Unit : mm)



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2. Equivalent circuit



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3. Absolute Maximum Ratings (at Tc= 25°C unless otherwise specified)

| Items | | Symbols | Conditions | Maximum Ratings | Units |
|---------------------------------------|--|------------------|-----------------------------|-----------------|------------------|
| Inverter | Collector-Emitter voltage | V _{CE} | | 600 | V |
| | Gate-Emitter voltage | V _{GE} | | ±20 | V |
| | Collector current | I _c | Continuous | 20 | A |
| | | I _{cp} | 1ms | 40 | A |
| | | -I _c | | 20 | A |
| Collector Power Dissipation | P _c | 1 device | 80 | W | |
| Brake | Collector-Emitter voltage | V _{CE} | | 600 | V |
| | Gate-Emitter voltage | V _{GE} | | ±20 | V |
| | Collector current | I _c | Continuous | 20 | A |
| | | I _{cp} | 1ms | 40 | A |
| | Collector Power Dissipation | P _c | 1 device | 50 | W |
| Converter | Repetitive peak reverse Voltage(Diode) | V _{RRM} | | 600 | V |
| | Repetitive peak reverse Voltage | V _{RRM} | | 800 | V |
| | Average Output Current | I _o | 50Hz/60Hz sine wave | 20 | A |
| | Surge Current (Non-Repetitive) | I _{PSM} | T _j =150°C, 10ms | 210 | A |
| | I ² t (Non-Repetitive) | I ² t | half sine wave | 221 | A ² s |
| Junction temperature | T _j | | 150 | °C | |
| Storage temperature | T _{stg} | | -40~ +125 | °C | |
| Isolation voltage | between terminal and copper base ^{(*)1} | Viso | AC : 1min. | 2500 | V |
| | between thermistor and others ^{(*)2} | | | 2500 | V |
| Mounting Screw Torque ^{(*)3} | | | | 3.5 | N·m |

(*1) All terminals should be connected together when isolation test will be done.

(*2) Terminal 8 and 9 should be connected together. Terminal 1 to 7 and 10 to 24 should be connected together and shorted to copper base.

(*3) Recommendable Value : 2.5~3.5 N·m (M5)

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4. Electrical characteristics (at Tj= 25°C unless otherwise specified)

| Items | Symbols | Conditions | Characteristics | | | Units | | |
|-----------------------|--------------------------------------|------------|------------------------------------|----------|------|-------|-----|---|
| | | | min. | typ. | Max. | | | |
| Inverter | Zero gate voltage Collector current | ICES | VGE = 0 V, VCE = 600 V | | | 1.0 | mA | |
| | Gate-Emitter leakage current | IGES | VCE = 0 V, VGE = ±20 V | | | 200 | nA | |
| | Gate-Emitter threshold voltage | VGE(th) | VCE = 20 V, Ic = 20 mA | 5.5 | 7.8 | 8.5 | V | |
| | Collector-Emitter saturation voltage | VCE(sat) | VGE = 15 V, Ic = 20 A | chip | | 1.8 | | V |
| | | | | terminal | | 1.95 | 2.4 | |
| | Input capacitance | Cies | VGE = 0 V, VCE = 10 V f = 1 MHz | | 3600 | | pF | |
| | Turn-on time | ton | Vcc = 300 V Ic = 20 A | | 0.45 | 1.2 | μs | |
| | | tr | | | 0.25 | 0.6 | | |
| | | tr(1) | VGE = ±15 V | | 0.08 | | | |
| | Turn-off time | toff | RG = 120 Ω | | 0.40 | 1.0 | μs | |
| tf | | | | 0.05 | 0.35 | | | |
| Forward on voltage | VF | IF = 20 A | chip | | 1.8 | | V | |
| | | | terminal | | 1.95 | 2.5 | | |
| Reverse recovery time | trr | IF = 20 A | | | 300 | ns | | |
| Brake | Zero gate voltage Collector current | ICES | VGE = 0 V, VCE = 600 V | | | 1.0 | mA | |
| | Gate-Emitter leakage current | IGES | VCE = 0 V, VGE = ±20 V | | | 200 | nA | |
| | Collector-Emitter saturation voltage | VCE(sat) | VGE = 15 V, Ic = 20 A | chip | | 1.8 | | V |
| | | | | terminal | | 1.95 | 2.4 | |
| | Turn-on time | ton | Vcc = 300 V Ic = 20 A | | 0.45 | 1.2 | μs | |
| | | tr | | | 0.25 | 0.6 | | |
| | | toff | VGE = ±15 V | | 0.40 | 1.0 | | |
| | Turn-off time | toff | RG = 120 Ω | | 0.05 | 0.35 | μs | |
| | | tf | | | 0.05 | 0.35 | | |
| | Reverse current | IRRM | VR = 800 V | | | 1.0 | mA | |
| Converter | Forward on voltage | VF | IF = 20 A | chip | | 1.1 | | V |
| | | | | terminal | | 1.2 | 1.5 | |
| Reverse current | IRRM | VR = 800 V | | | 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 | |

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5. Thermal resistance characteristics

| Items | Symbols | Conditions | Characteristics | | | Units |
|----------------------------------|----------|---------------------------|-----------------|------|------|-------|
| | | | min. | typ. | Max. | |
| Thermal resistance (1 device) | Rth(j-c) | Inverter IGBT | | | 1.56 | °C/W |
| | | Inverter FWD | | | 3.00 | |
| | | Brake IGBT | | | 2.50 | |
| | | Converter Diode | | | 2.00 | |
| Contact Thermal resistance | Rth(c-f) | with Thermal Compound (*) | | 0.05 | °C/W | |

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

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6. Indication on module (モジュール表示)



7. Applicable category (適用範囲)

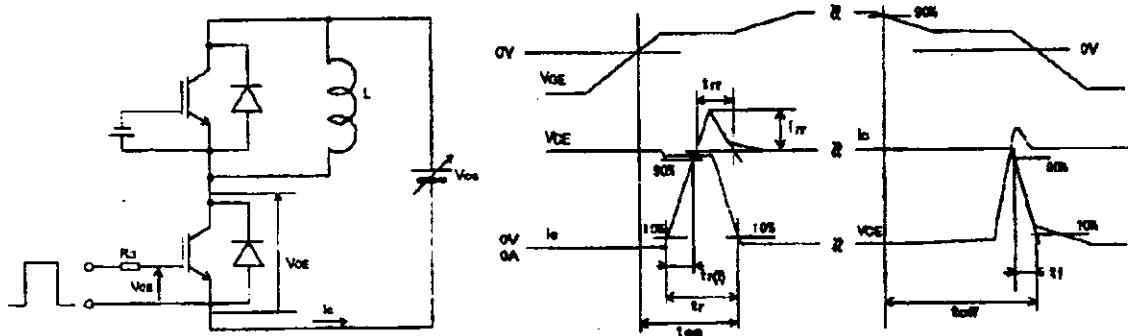
This specification is applied to Power Integrated Module named 7MBR20SA060.
 本納入仕様書は、パワー集積モジュール 7MBR20SA060 に適用する。

8. Storage and transportation notes (保管・運搬上の注意事項)

- The module should be stored at a standard temperature of 5 to 35°C and humidity of 45 to 75%.
 常温・常湿保存が望ましい。(5~35°C, 45~75%)
- Store modules in a place with few temperature changes in order to avoid condensation on the module surface.
 急激な温度変化のなきこと。(モジュール表面が結露しないこと)
- Avoid exposure to corrosive gases and dust.
 腐蝕性ガスの発生場所、塵埃の多い場所は避けること。
- Avoid excessive external force on the module.
 製品に荷重がかからないように十分注意すること。
- Store modules with unprocessed terminals.
 モジュールの端子は未加工の状態で保管すること。
- Do not drop or otherwise shock the modules when transporting.
 製品の運搬時に衝撃を与えたり、落下させたりしないこと。
- Please connect adequate fuse or protector of circuit between three-phase line and this product to prevent the equipment from causing secondary destruction.
 万一の不慮の事故で素子が破壊した場合を考慮し、商用電源と本製品の間に適切な容量のヒューズ又はブレーカーを必ず付けて2次破壊を防いでください。

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9. Definitions of switching time (スイッチング時間の定義)



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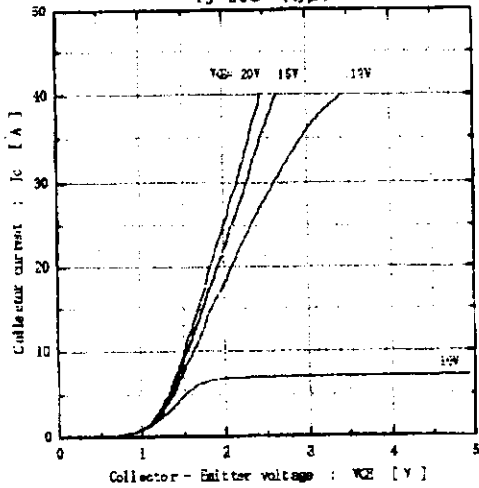
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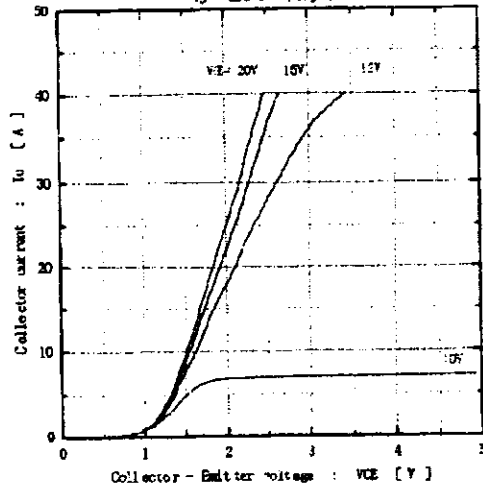
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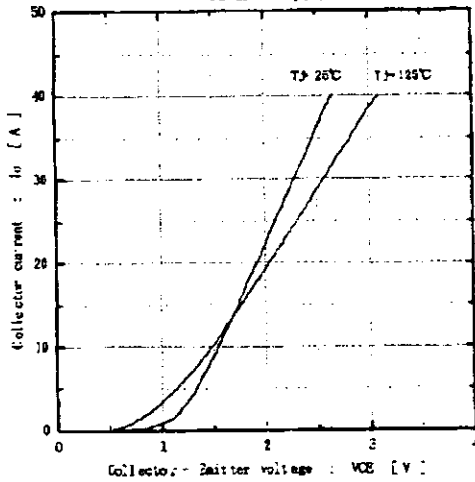
[Inverter]
Collector current vs. Collector-Emitter voltage
 $T_j = 25^\circ\text{C}$ (typ)



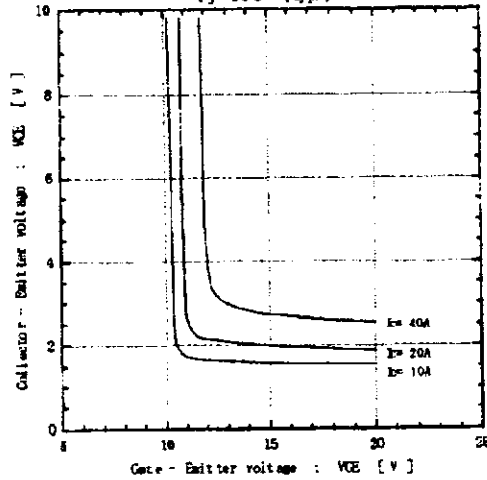
[Inverter]
Collector current vs. Collector-Emitter voltage
 $T_j = 125^\circ\text{C}$ (typ)



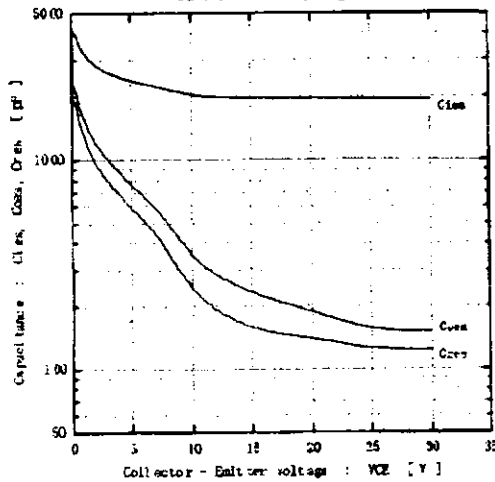
[Inverter]
Collector current vs. Collector-Emitter voltage
 $V_{GE} = 15\text{V}$ (typ)



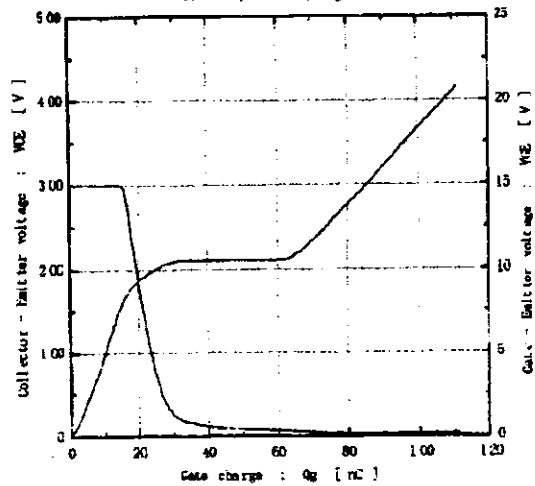
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage
 $T_j = 25^\circ\text{C}$ (typ)



[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.)
 $V_{CC} = 30\text{V}$, $I_c = 20\text{A}$, $T_j = 25^\circ\text{C}$



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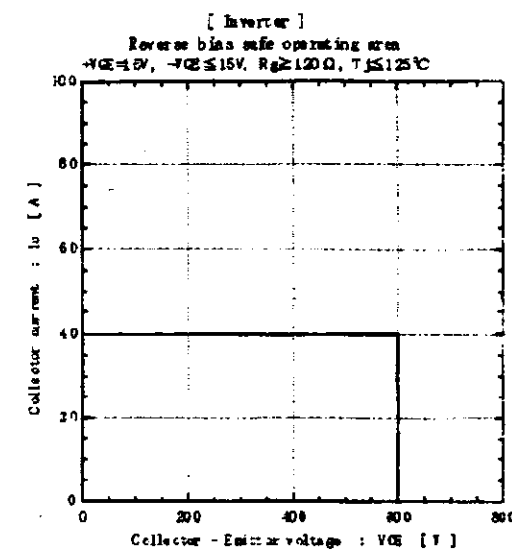
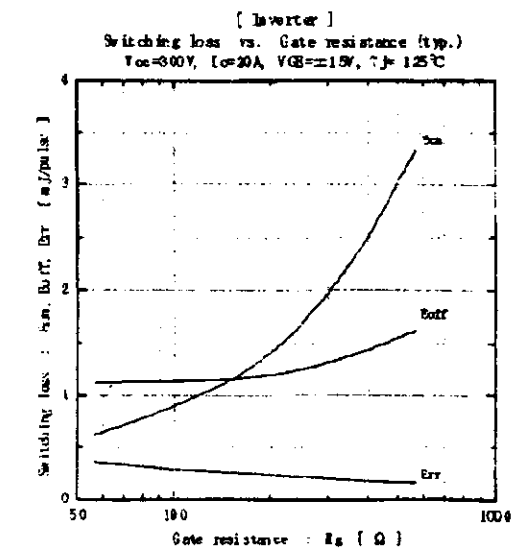
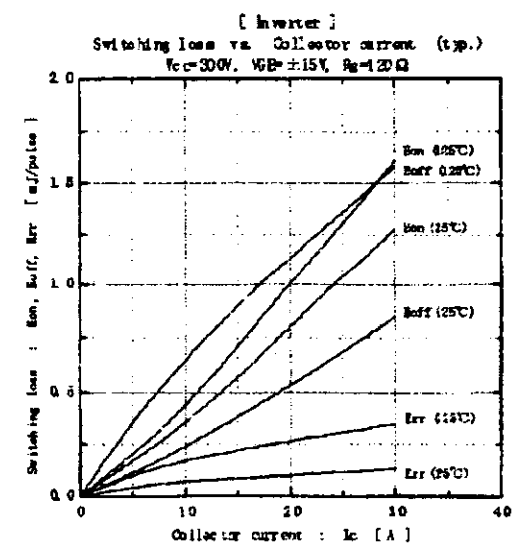
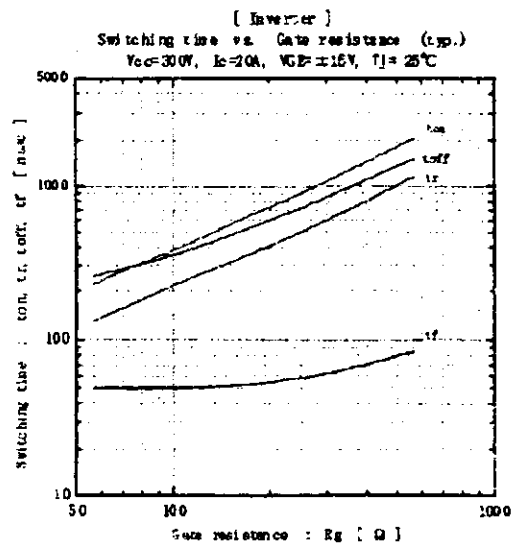
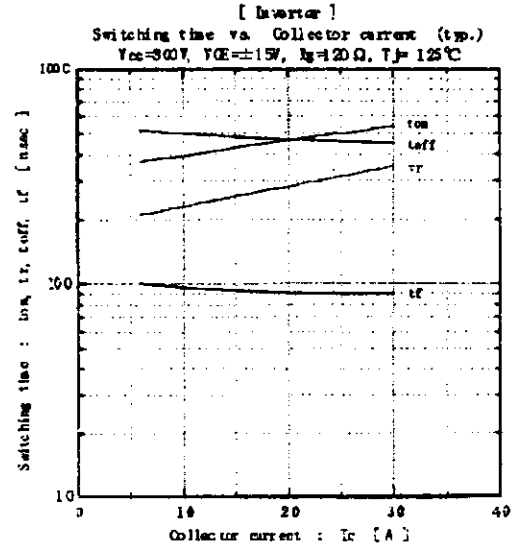
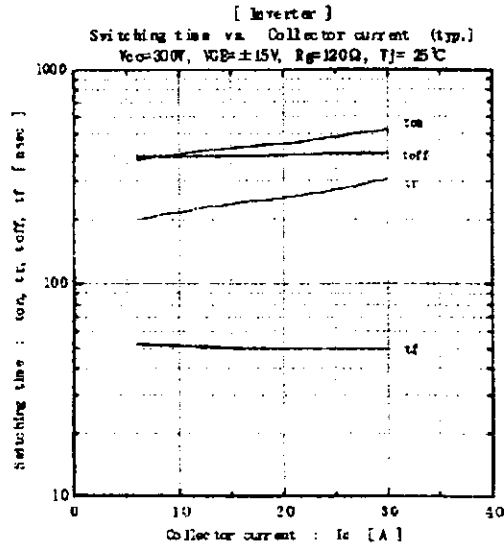
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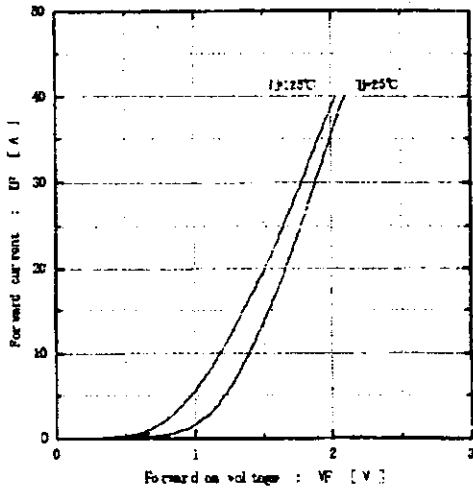
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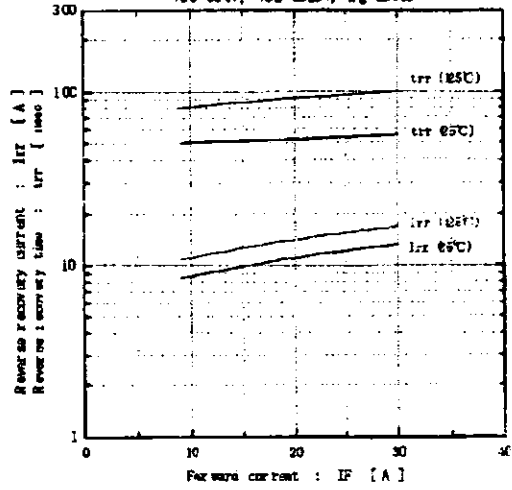
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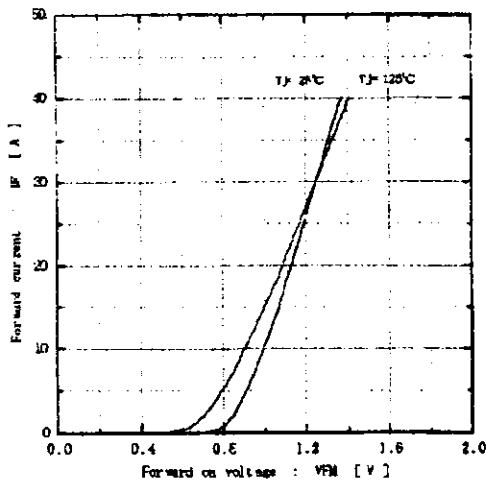
[Inverter]
Forward current vs. Forward on voltage (typ.)



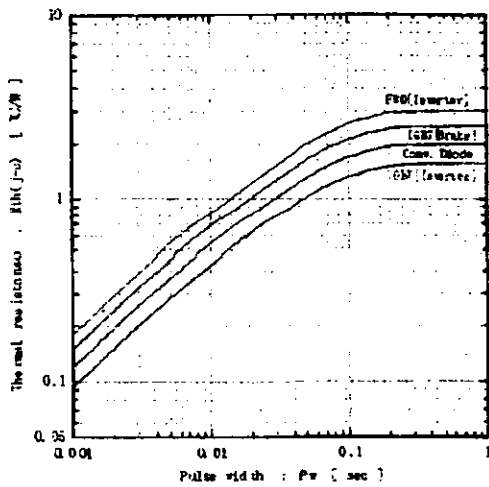
[Inverter]
Reverse recovery characteristics (typ.)
 $V_{FO} = 300V, V_{GR} = \pm 15V, R_g = 12\Omega$



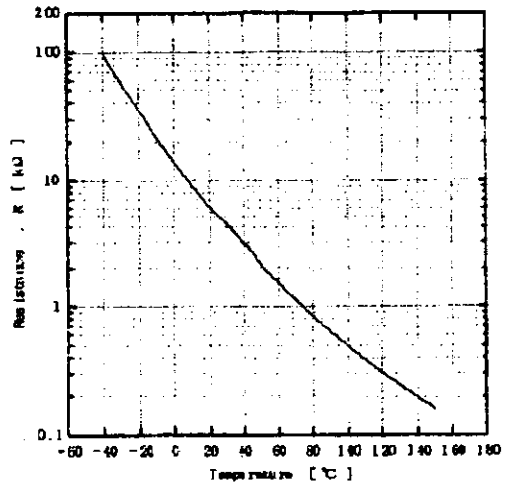
[Converter]
Forward current vs. Forward on voltage (typ.)



Transient thermal resistance



[Thermistor]
Temperature characteristic (typ.)



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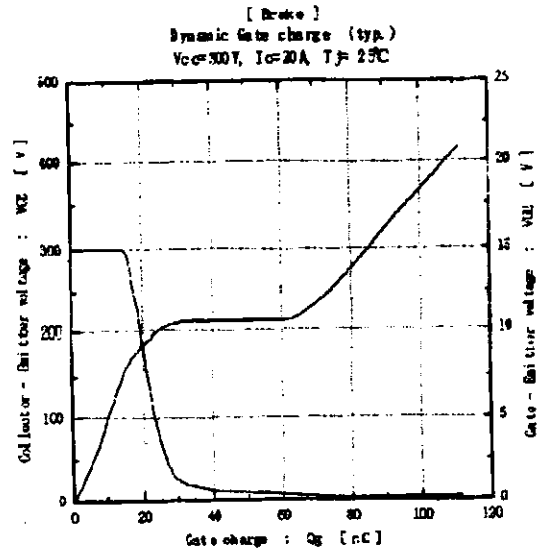
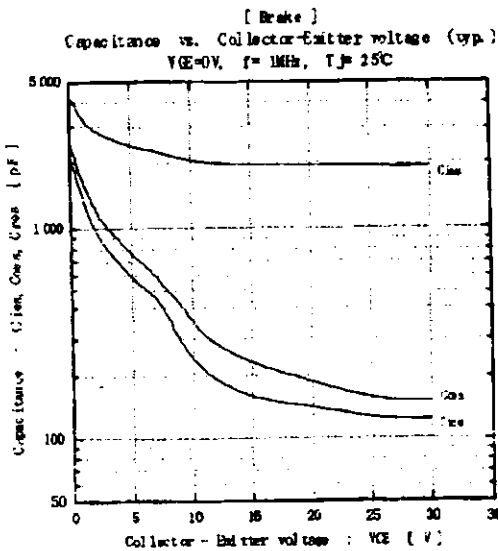
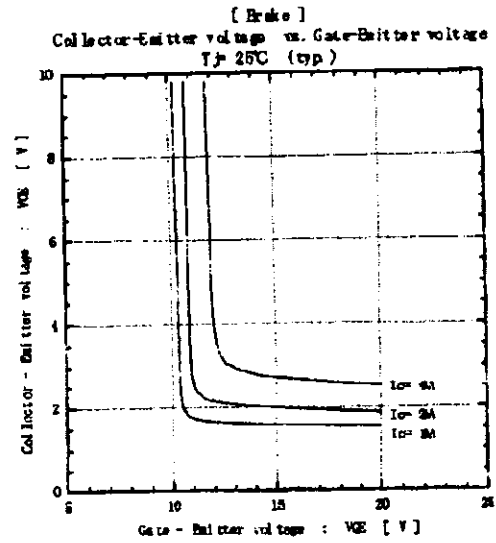
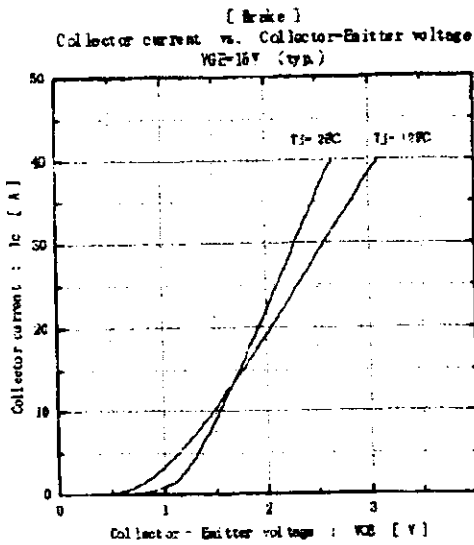
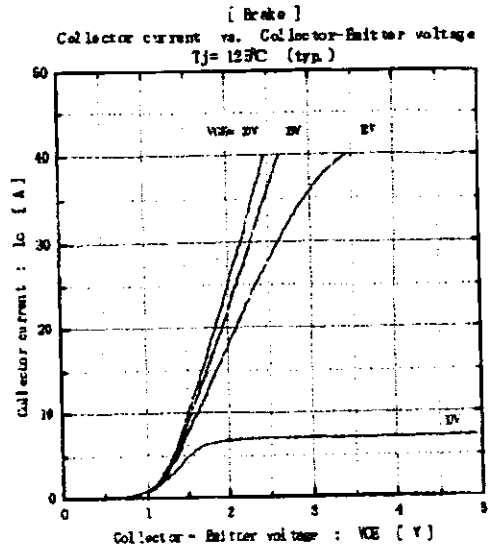
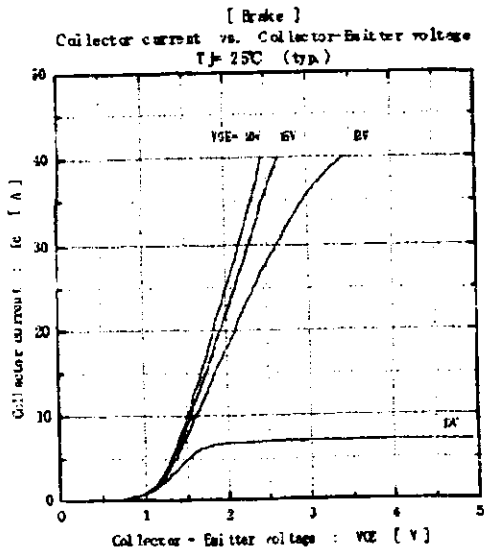
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