

# SPECIFICATION

Device Name : Power Integrated Module

Type Name : 7 M B R 5 0 S B 1 4 0

Spec. No. : M S 6 M 0 4 7 4

Fuji Electric Co., Ltd.  
Matsumoto Factory

|         | DATE          | NAME         | APPROVED    | Fuji Electric Co., Ltd. |                 |        |
|---------|---------------|--------------|-------------|-------------------------|-----------------|--------|
| DRAWN   | Nov. -10- '99 | T. Kikuyoshi |             | DWG. NO.                | M S 6 M 0 4 7 5 | 1 / 10 |
| CHECKED | Nov. -10- '99 | S. Miyata    | T. Miyasaka |                         |                 |        |

H04-004-07

# Revised Records

[illegible]

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**DWG NO.**

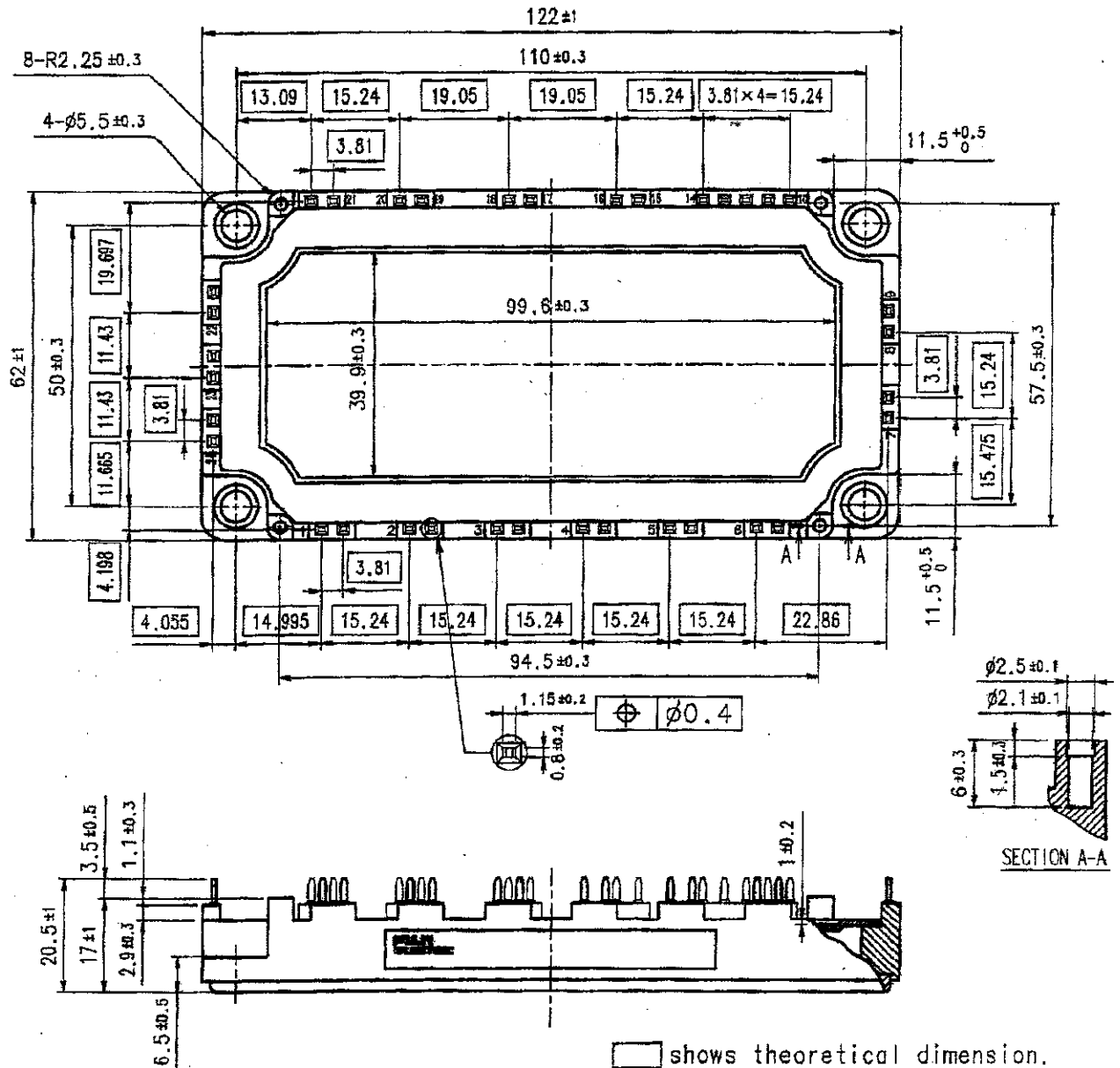
MS 6M 0475

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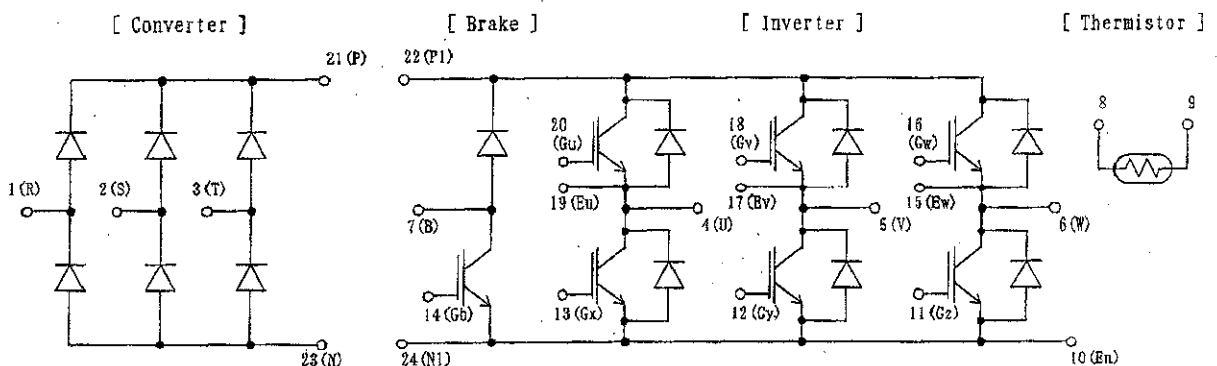
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# 7MBR50SB140

## 1. Outline Drawing (Unit : mm)



## 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                        | VCES             |                        |         | 1400            | V                |
|                                       | Gate-Emitter voltage                             | VGES             |                        |         | ±20             | V                |
|                                       | Collector current                                | Ic               | Continuous             | Tc=25°C | 75              | A                |
|                                       |                                                  |                  |                        | Tc=75°C | 50              |                  |
|                                       |                                                  | Icp              | 1ms                    | Tc=25°C | 150             | A                |
|                                       |                                                  |                  |                        | Tc=75°C | 100             |                  |
|                                       | Collector Power Dissipation                      | Pc               | 1 device               |         | 360             | W                |
| Brake                                 | Collector-Emitter voltage                        | VCES             |                        |         | 1400            | V                |
|                                       | Gate-Emitter voltage                             | VGES             |                        |         | ±20             | V                |
|                                       | Collector current                                | Ic               | Continuous             | Tc=25°C | 35              | A                |
|                                       |                                                  |                  |                        | Tc=75°C | 25              |                  |
|                                       |                                                  | Icp              | 1ms                    | Tc=25°C | 70              | A                |
|                                       |                                                  |                  |                        | Tc=75°C | 50              |                  |
|                                       | Collector Power Dissipation                      | Pc               | 1 device               |         | 180             | W                |
| Converter                             | Repetitive peak reverse Voltage(Diode)           | VRRM             |                        |         | 1400            | V                |
|                                       | Repetitive peak reverse Voltage                  | VRRM             |                        |         | 1600            | V                |
|                                       | Average Output Current                           | Io               | 50Hz/60Hz<br>sine wave |         | 50              | A                |
|                                       | Surge Current (Non-Repetitive)                   | IFSM             | Tj=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 |
| Junction temperature                  |                                                  | Tj               |                        |         | 150             | °C               |
| Storage temperature                   |                                                  | Tstg             |                        |         | -40~+125        | °C               |
| Isolation voltage                     | between terminal and copper base <sup>(*)1</sup> | Viso             | AC : 1min.             |         | 2500            | V                |
|                                       | between thermistor and others <sup>(*)2</sup>    |                  |                        |         | 2500            | V                |
| Mounting Screw Torque <sup>(*)3</sup> |                                                  |                  |                        |         | 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)

4. Electrical characteristics (at  $T_J = 25^\circ\text{C}$  unless otherwise specified)

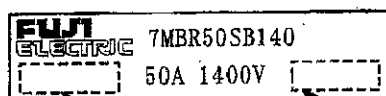
|            | Items                                | Symbols       | Conditions                                                        | Characteristics |             |      | Units         |
|------------|--------------------------------------|---------------|-------------------------------------------------------------------|-----------------|-------------|------|---------------|
|            |                                      |               |                                                                   | min.            | typ.        | Max. |               |
| Inverter   | Zero gate voltage Collector current  | ICCS          | $V_{CE} = 0\text{ V}, V_{CE} = 1400\text{ V}$                     |                 |             | 1.0  | mA            |
|            | Gate-Emitter leakage current         | IGES          | $V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$                   |                 |             | 200  | nA            |
|            | Gate-Emitter threshold voltage       | $V_{GE(th)}$  | $V_{CE} = 20\text{ V}, I_c = 50\text{ mA}$                        | 5.5             | 7.2         | 8.5  | V             |
|            | Collector-Emitter saturation voltage | $V_{CE(sat)}$ | $V_{GE} = 15\text{ V}, I_c = 50\text{ A}$<br>chip terminal        |                 | 2.2<br>2.4  |      | V             |
|            | Input capacitance                    | Cies          | $V_{GE} = 0\text{ V}, V_{CE} = 10\text{ V}$<br>$f = 1\text{ MHz}$ |                 | 6000        |      | pF            |
|            | Turn-on time                         | $t_{on}$      | $V_{cc} = 800\text{ V}$                                           |                 | 0.35        | 1.2  | $\mu\text{s}$ |
|            |                                      | $t_r$         | $I_c = 50\text{ A}$                                               |                 | 0.25        | 0.6  |               |
|            |                                      | $t_{r(1)}$    | $V_{GE} = \pm 15\text{ V}$                                        |                 | 0.1         |      |               |
|            | Turn-off time                        | $t_{off}$     | $R_G = 24\ \Omega$                                                |                 | 0.45        | 1.0  |               |
|            |                                      | $t_f$         |                                                                   |                 | 0.08        | 0.3  |               |
|            | Forward on voltage                   | $V_F$         | $I_F = 50\text{ A}$<br>chip terminal                              |                 | 2.4<br>2.6  |      | V             |
|            | Reverse recovery time                | $t_{rr}$      | $I_F = 50\text{ A}$                                               |                 |             | 350  | ns            |
| Brake      | Zero gate voltage Collector current  | ICCS          | $V_{GE} = 0\text{ V}, V_{CE} = 1400\text{ V}$                     |                 |             | 1.0  | mA            |
|            | Gate-Emitter leakage current         | IGES          | $V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$                   |                 |             | 200  | nA            |
|            | Collector-Emitter saturation voltage | $V_{CE(sat)}$ | $V_{GE} = 15\text{ V}, I_c = 25\text{ A}$<br>chip terminal        |                 | 2.2<br>2.35 |      | V             |
|            | Turn-on time                         | $t_{on}$      | $V_{cc} = 800\text{ V}$                                           |                 | 0.35        | 1.2  | $\mu\text{s}$ |
|            |                                      | $t_r$         | $I_c = 25\text{ A}$                                               |                 | 0.25        | 0.6  |               |
|            | Turn-off time                        | $t_{off}$     | $V_{GE} = \pm 15\text{ V}$                                        |                 | 0.45        | 1.0  |               |
|            |                                      | $t_f$         | $R_G = 51\ \Omega$                                                |                 | 0.08        | 0.3  |               |
|            | Reverse current                      | IRRM          | $V_R = 1400\text{ V}$                                             |                 |             | 1.0  | mA            |
| Converter  | Forward on voltage                   | $V_{FM}$      | $I_F = 50\text{ A}$<br>chip terminal                              |                 | 1.1<br>1.2  |      | V             |
|            | Reverse current                      | IRRM          | $V_R = 1600\text{ V}$                                             |                 |             | 1.0  | mA            |
| Thermistor | Resistance                           | R             | $T = 25^\circ\text{C}$                                            |                 | 5000        |      | $\Omega$      |
|            |                                      |               | $T = 100^\circ\text{C}$                                           | 465             | 495         | 520  |               |
|            | B value                              | B             | $T = 25/50^\circ\text{C}$                                         | 3305            | 3375        | 3450 | K             |

## 5. Thermal resistance characteristics

| Items                            | Symbols       | Conditions                | Characteristics |      |      | Units              |
|----------------------------------|---------------|---------------------------|-----------------|------|------|--------------------|
|                                  |               |                           | min.            | typ. | Max. |                    |
| Thermal resistance<br>(1 device) | $R_{th(j-c)}$ | Inverter IGBT             |                 |      | 0.35 | $^\circ\text{C/W}$ |
|                                  |               | Inverter FWD              |                 |      | 0.75 |                    |
|                                  |               | Brake IGBT                |                 |      | 0.69 |                    |
|                                  |               | Converter Diode           |                 |      | 0.50 |                    |
| Contact Thermal resistance       | $R_{th(c-f)}$ | with Thermal Compound (*) |                 | 0.05 |      | $^\circ\text{C/W}$ |

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

## 6. Indication on module (モジュール表示)



Lot No.

Place of manufacturing (code)

## 7. Applicable category (適用範囲)

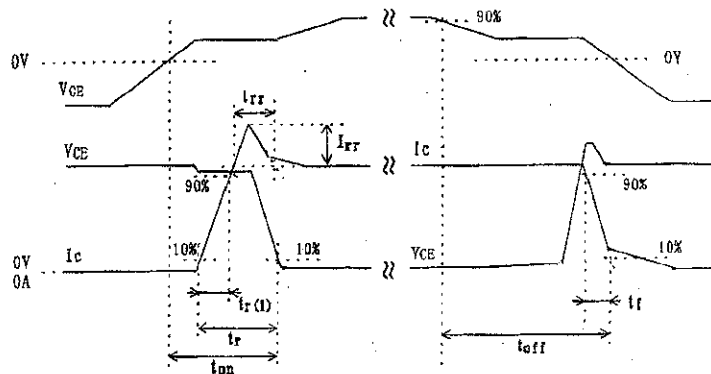
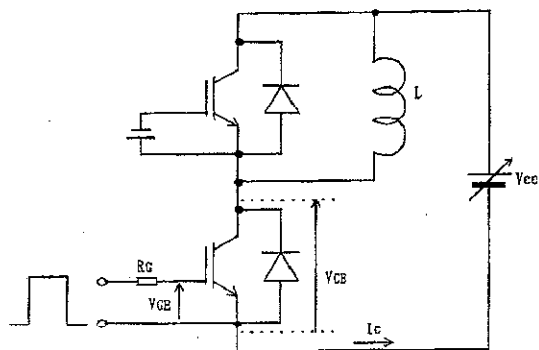
This specification is applied to Power Integrated Module named 7MBR50SB140.

本納入仕様書は パワー集積モジュール 7MBR50SB140 に適用する。

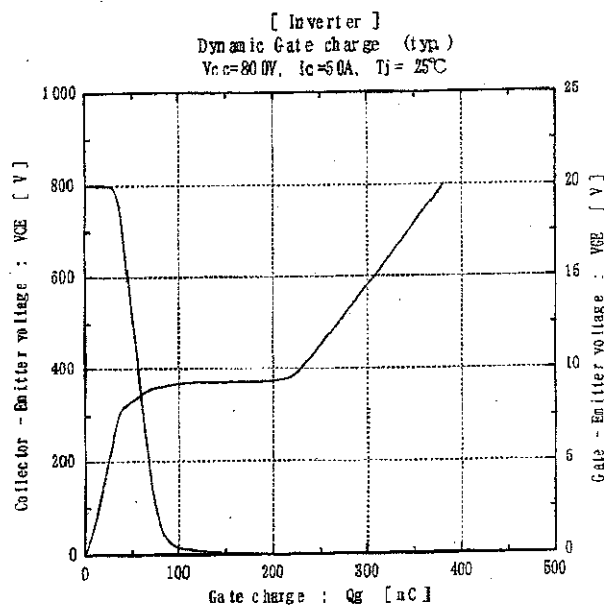
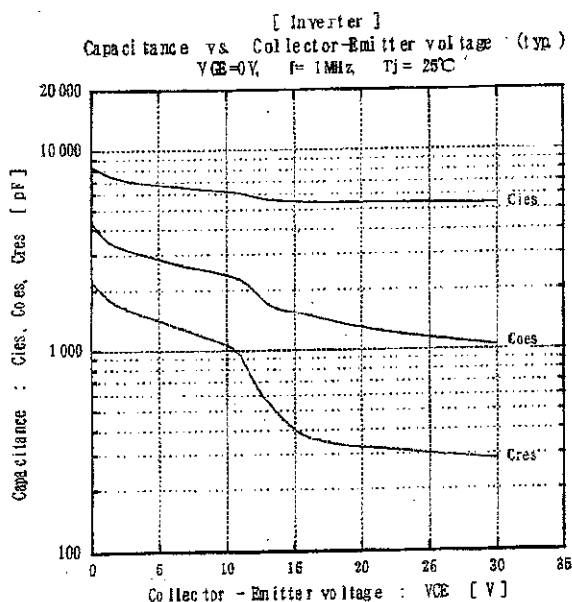
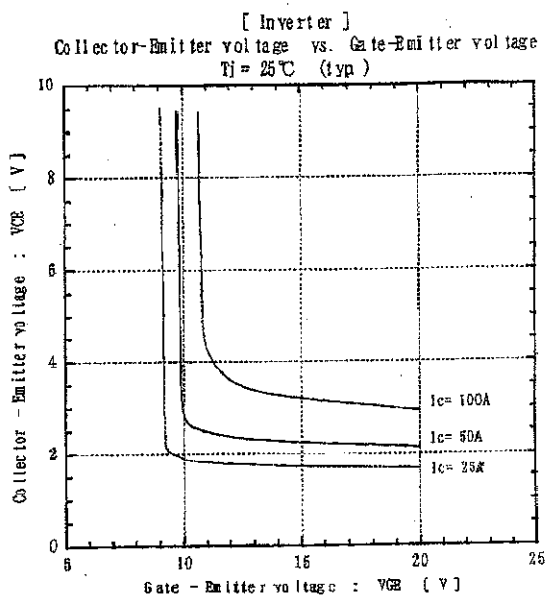
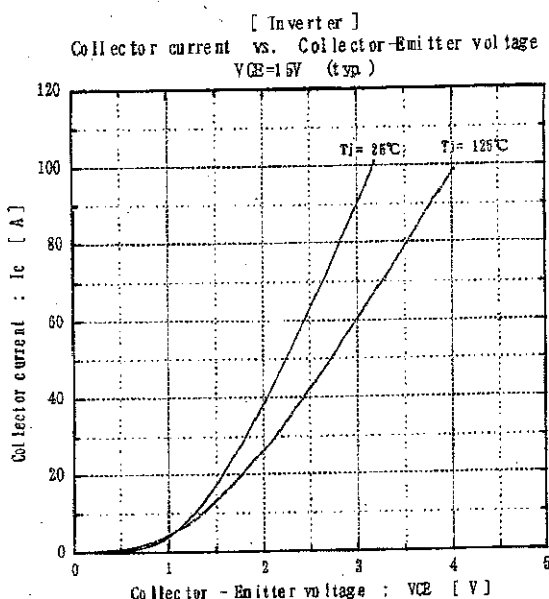
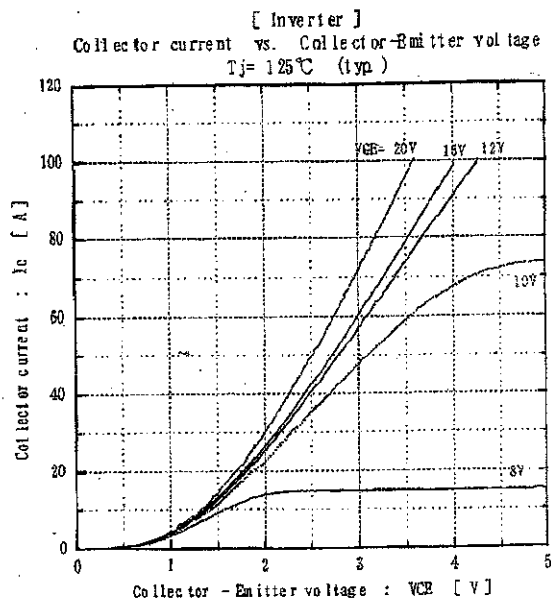
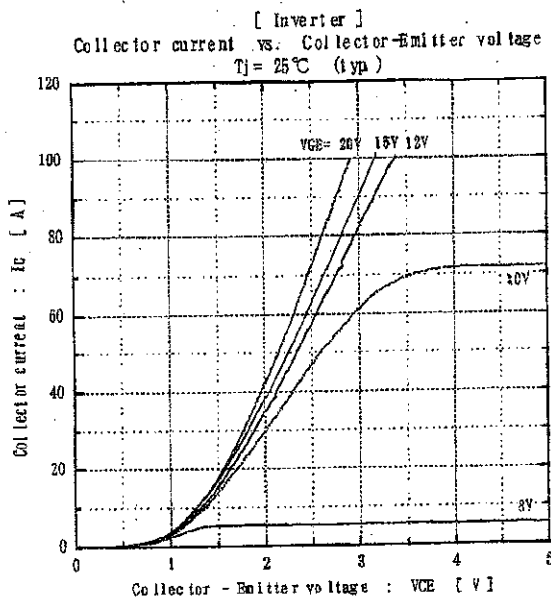
## 8. Storage and transportation notes (保管・運搬上の注意事項)

- 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。

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



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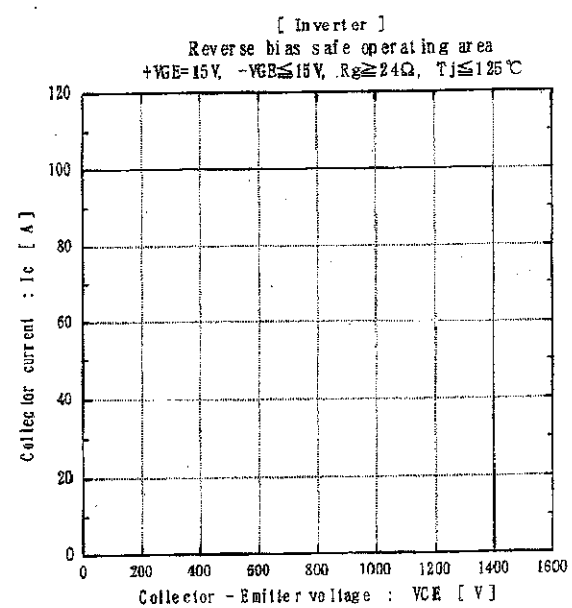
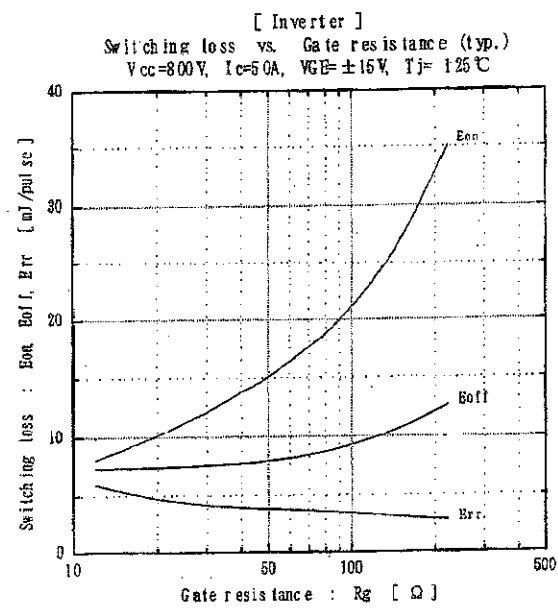
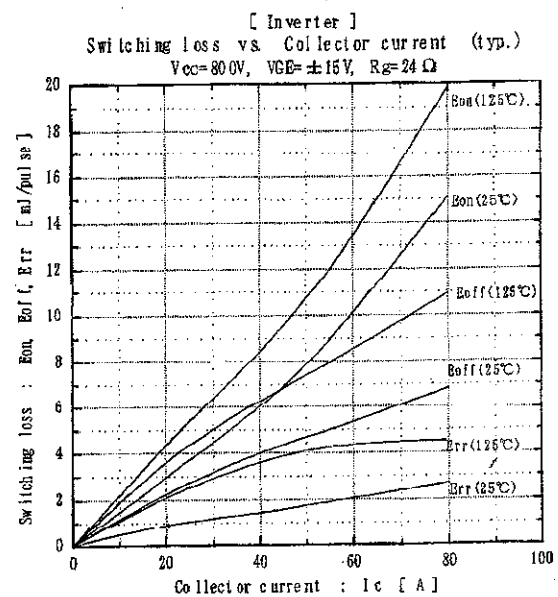
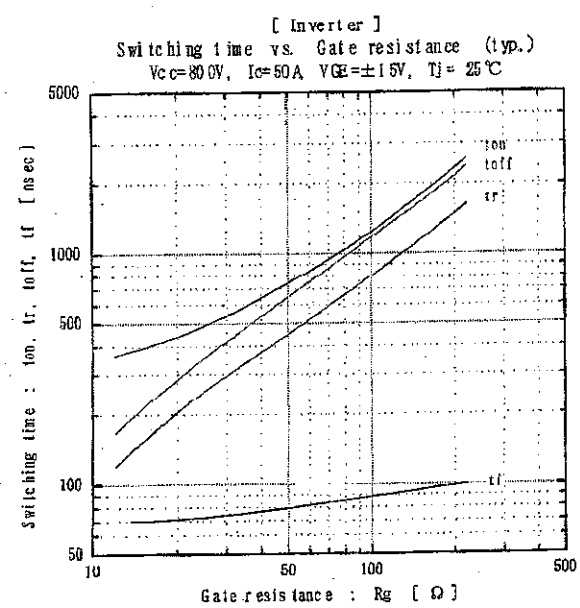
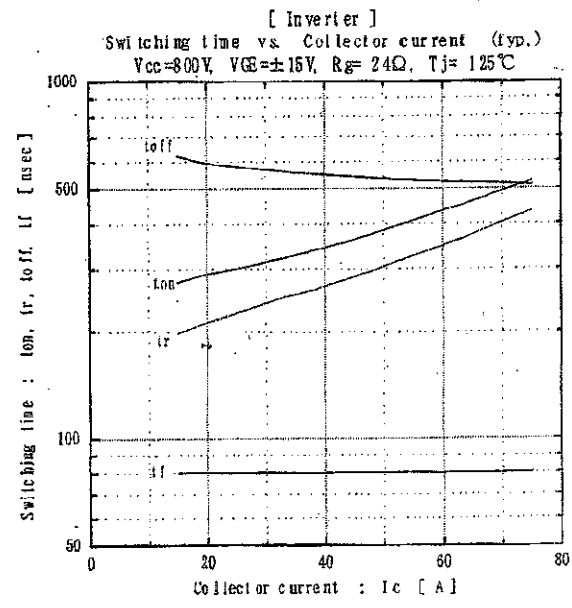
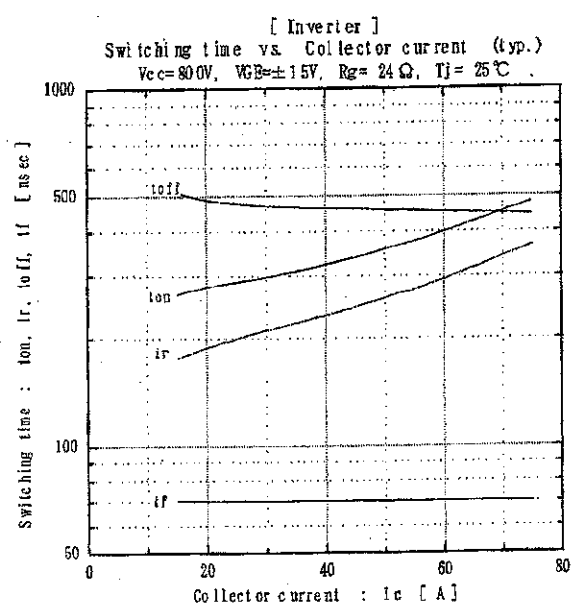
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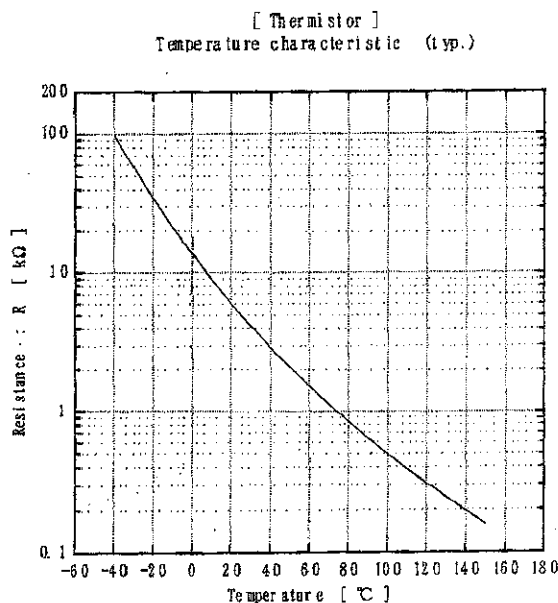
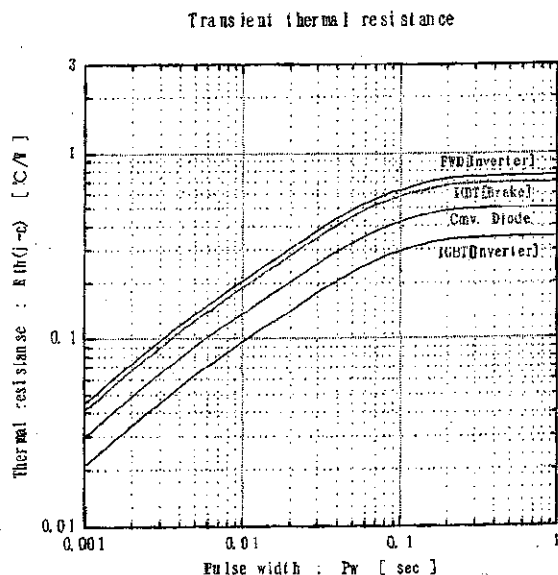
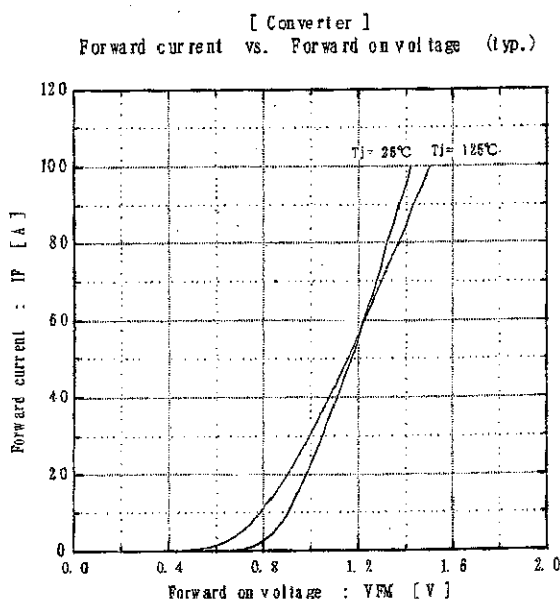
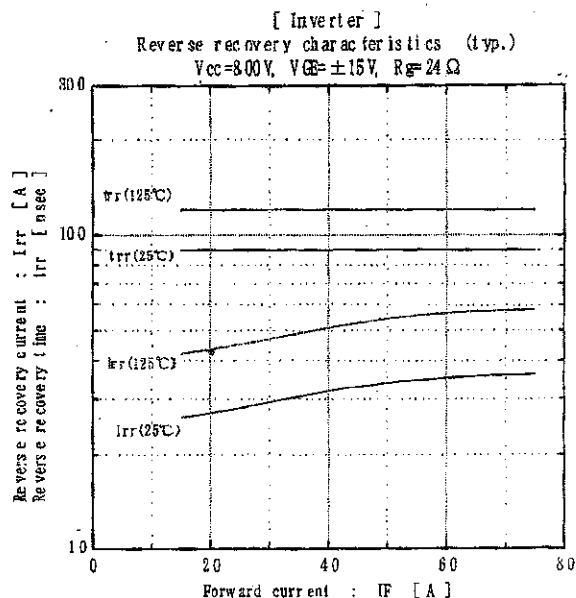
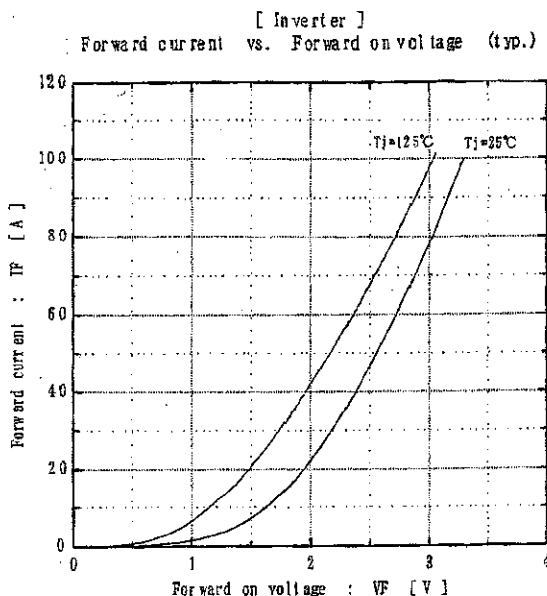
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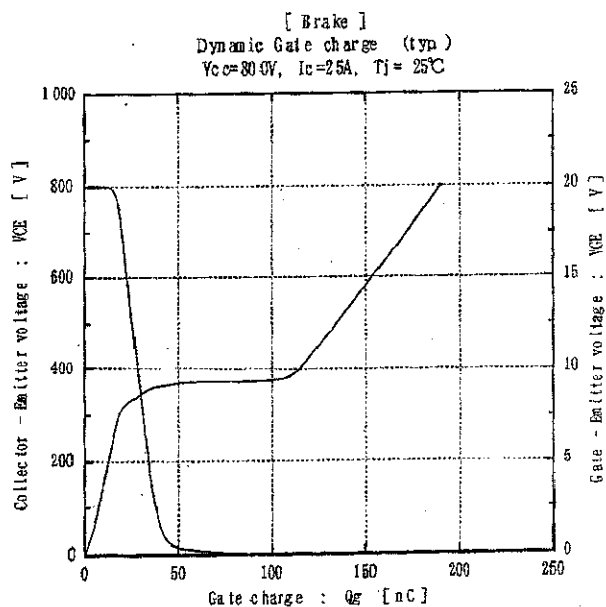
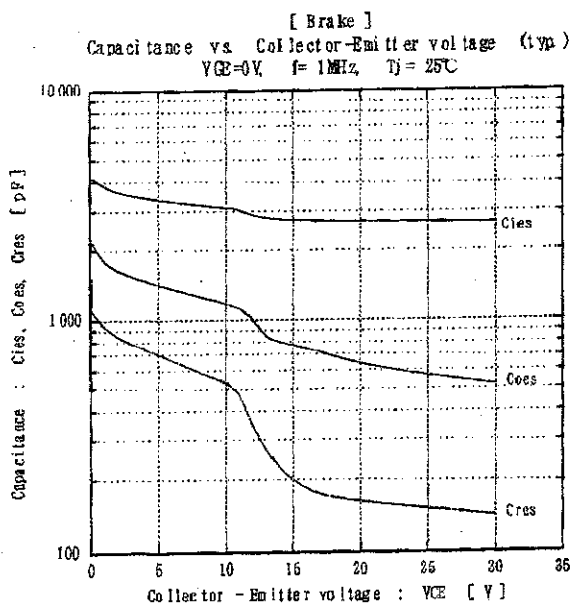
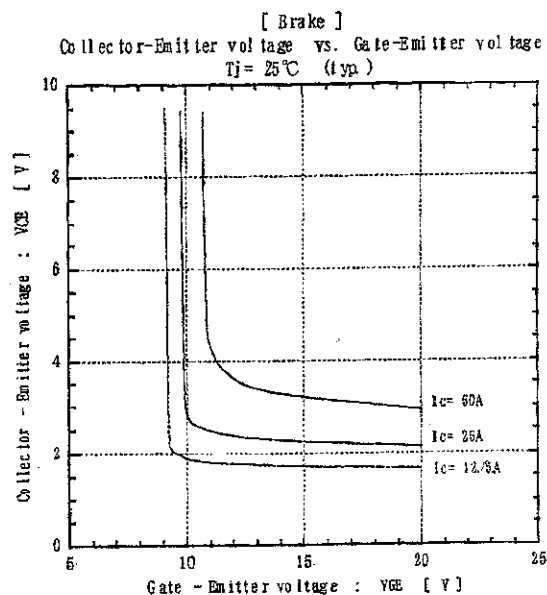
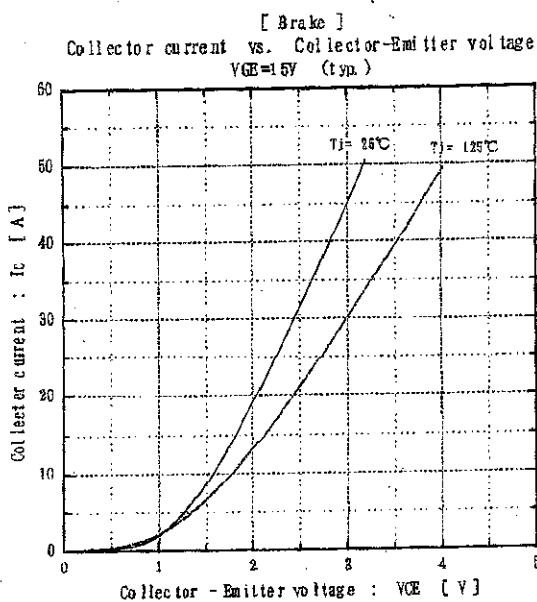
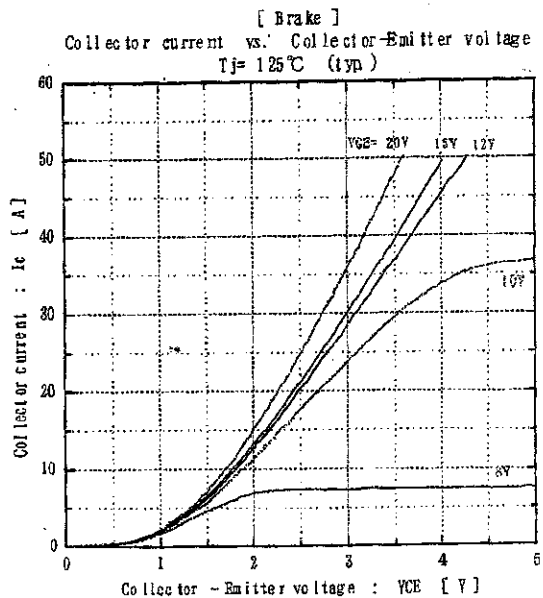
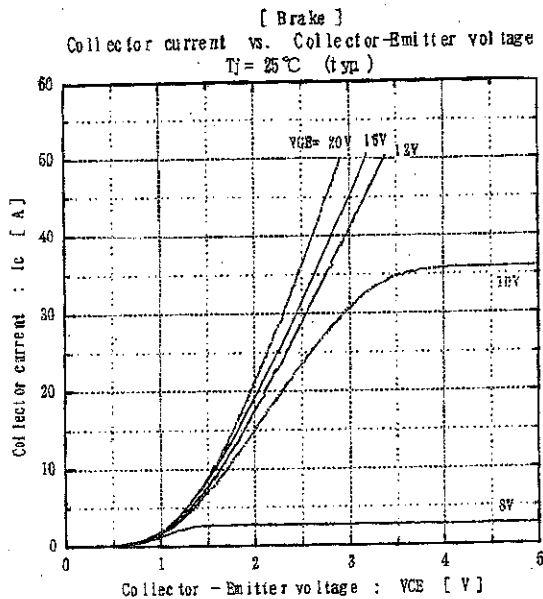
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