

# 2MBI225VJ-120-50

IGBT Modules

## IGBT MODULE (V series) 1200V / 225A / 2 in one package

### ■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

### ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines



### ■ Maximum Ratings and Characteristics

#### ● Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

| Items   | Symbols                               | Conditions           | Maximum ratings    | Units |     |
|---|---------------------------------------|----------------------|--------------------|-------|-----|
| Inverter  | Collector-Emitter voltage             | V <sub>CEs</sub>     | 1200               | V     |     |
|   | Gate-Emitter voltage                  | V <sub>GES</sub>     | ±20                | V     |     |
|   | Collector current                     | I <sub>c</sub>       | Continuous Tc=80°C | 225   | A   |
|   |                                       | I <sub>c</sub> pulse | 1ms Tc=80°C        | 450   |     |
|   |                                       | -I <sub>c</sub>      |                    | 225   |     |
|   | -I <sub>c</sub> pulse                 | 1ms                  | 450                |       |     |
| Collector power dissipation                                 | P <sub>c</sub>                        | 1 device             | 1070               | W     |     |
| Junction temperature  | T <sub>j</sub>                        |                      | 175                | °C    |     |
| Operating junction temperature (under switching conditions) | T <sub>jop</sub>                      |                      | 150                |       |     |
| Case temperature  | T <sub>c</sub>                        |                      | 125                |       |     |
| Storage temperature   | T <sub>stg</sub>                      |                      | -40 to +125        |       |     |
| Isolation voltage   | between terminal and copper base (*1) | V <sub>iso</sub>     | AC : 1min.         | 2500  | VAC |
|   | between thermistor and others (*2)    |                      |                    |       |     |
| Screw torque  | Mounting (*3)                         |                      | 3.5                | N m   |     |
|   | Terminals (*4)                        |                      | 4.5                |       |     |
|   | PC-Board (*5)                         |                      | 0.6                |       |     |

Note \*1: All terminals should be connected together during the test.

Note \*2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

Note \*3: Recommendable value : 2.5-3.5 Nm (M5) Note \*4: Recommendable value : 3.5-4.5 Nm (M6)

Note \*5: Recommendable value : 0.4-0.6 Nm (M2.5)

#### ● Electrical characteristics (at Tj= 25°C unless otherwise specified)

| Items                                | Symbols                         | Conditions   | Characteristics |      |      | Units |   |
|--------------------------------------|---------------------------------|--|-----------------|------|------|-------|---|
|                                      |                                 |  | min.            | typ. | max. |       |   |
| Zero gate voltage collector current  | I <sub>CEs</sub>                | V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V  | -               | -    | 3.0  | mA    |   |
| Gate-Emitter leakage current         | I <sub>GES</sub>                | V <sub>GE</sub> = 0V, V <sub>GE</sub> = ±20V   | -               | -    | 600  | nA    |   |
| Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>             | V <sub>CE</sub> = 20V, I <sub>c</sub> = 225mA  | 6.0             | 6.5  | 7.0  | V     |   |
| Collector-Emitter saturation voltage | V <sub>CE(sat)</sub> (terminal) | V <sub>GE</sub> = 15V<br>I <sub>c</sub> = 225A   | Tj=25°C         | -    | 2.20 | 2.65  | V |
|                                      |                                 |  | Tj=125°C        | -    | 2.55 | -     |   |
|                                      |                                 |  | Tj=150°C        | -    | 2.60 | -     |   |
|                                      | V <sub>CE(sat)</sub> (chip)     |  | Tj=25°C         | -    | 1.85 | 2.30  |   |
|                                      |                                 |  | Tj=125°C        | -    | 2.20 | -     |   |
|                                      |                                 |  | Tj=150°C        | -    | 2.25 | -     |   |
| Input capacitance                    | C <sub>ies</sub>                | V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz  | -               | 18   | -    | nF    |   |
| Turn-on time                         | t <sub>on</sub>                 | V <sub>CC</sub> = 600V<br>I <sub>c</sub> = 225A<br>V <sub>GE</sub> = ±15V<br>R <sub>G</sub> = 1.6Ω | -               | 550  | 1200 | nsec  |   |
|                                      | t <sub>r</sub>                  |  | -               | 180  | 600  |       |   |
|                                      | t <sub>r(i)</sub>               |  | -               | 120  | -    |       |   |
| Turn-off time                        | t <sub>off</sub>                | R <sub>G</sub> = 1.6Ω  | -               | 1050 | 2000 | nsec  |   |
|                                      | t <sub>f</sub>                  |  | -               | 110  | 350  |       |   |
|                                      |                                 |  | -               | 110  | 350  |       |   |
| Forward on voltage                   | V <sub>F</sub> (terminal)       | V <sub>GE</sub> = 0V<br>I <sub>F</sub> = 225A  | Tj=25°C         | -    | 2.05 | 2.50  | V |
|                                      |                                 |  | Tj=125°C        | -    | 2.20 | -     |   |
|                                      |                                 |  | Tj=150°C        | -    | 2.15 | -     |   |
|                                      | V <sub>F</sub> (chip)           |  | Tj=25°C         | -    | 1.70 | 2.15  |   |
|                                      |                                 |  | Tj=125°C        | -    | 1.85 | -     |   |
|                                      |                                 |  | Tj=150°C        | -    | 1.80 | -     |   |
| Reverse recovery time                | t <sub>rr</sub>                 | I <sub>F</sub> = 225A  | -               | 200  | 600  | nsec  |   |
| Thermistor                           | Resistance                      | R  | T=25°C          | -    | 5000 | -     | Ω |
|                                      |                                 |  | T=100°C         | 465  | 495  | 520   |   |
|                                      |                                 |  | T=25/50°C       | 3305 | 3375 | 3450  |   |
| B value                              | B                               | T=25/50°C  |                 |      |      | K     |   |

#### ● Thermal resistance characteristics

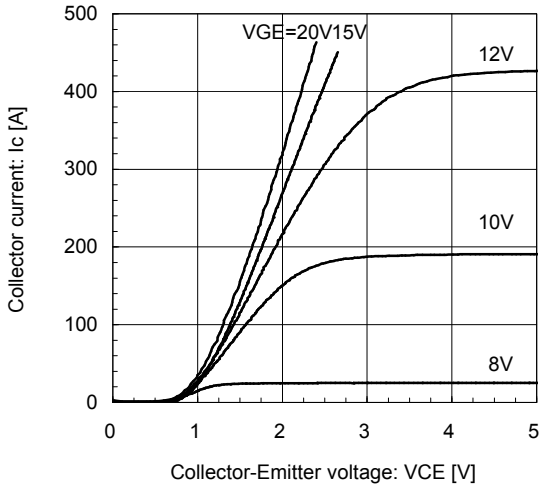
| Items                                     | Symbols              | Conditions            | Characteristics |        |      | Units |
|---|----------------------|-----------------------|-----------------|--------|------|-------|
|   |                      |                       | min.            | typ.   | max. |       |
| Thermal resistance (1device)              | R <sub>th(j-c)</sub> | Inverter IGBT         | -               | -      | 0.14 | °C/W  |
|   |                      | Inverter FWD          | -               | -      | 0.19 |       |
| Contact thermal resistance (1device) (*6) | R <sub>th(c-f)</sub> | with Thermal Compound | -               | 0.0167 | -    |       |

Note \*6: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

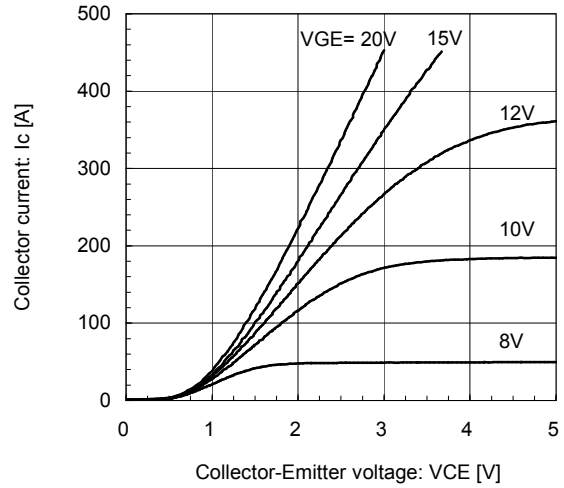
[INVERTER]

Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 25°C / chip



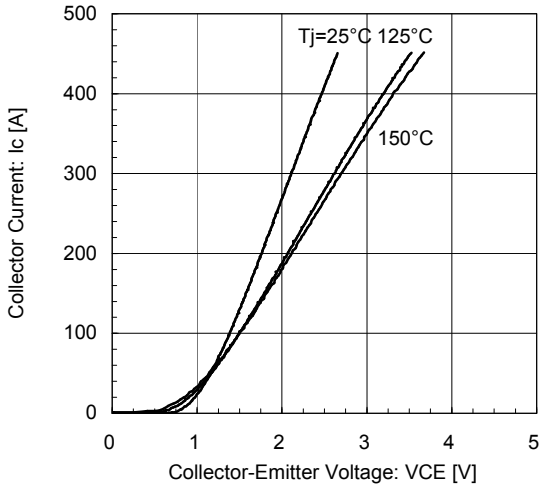
[INVERTER]

Collector current vs. Collector-Emittor voltage (typ.)  
Tj= 150°C / chip



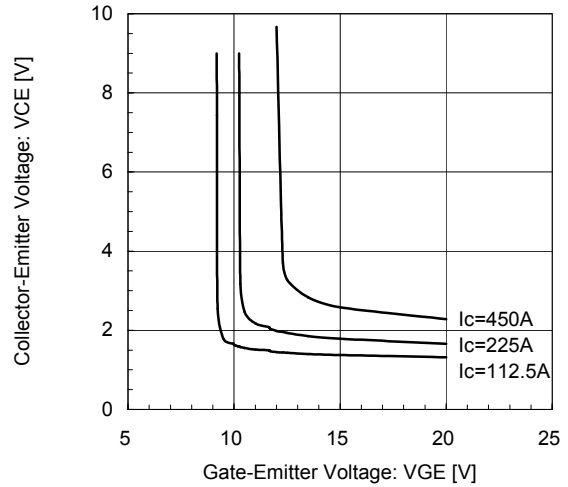
[INVERTER]

Collector current vs. Collector-Emittor voltage (typ.)  
Vge= 15V / chip



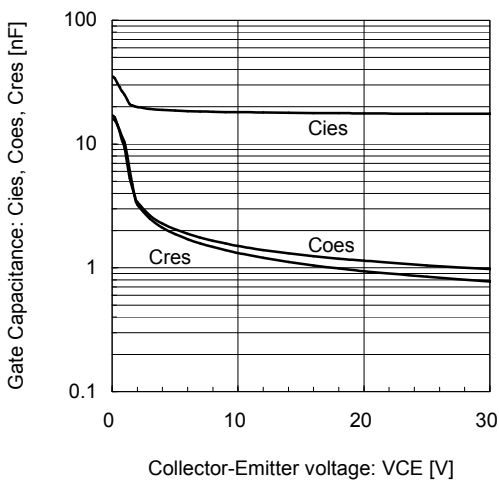
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Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
Tj= 25°C / chip



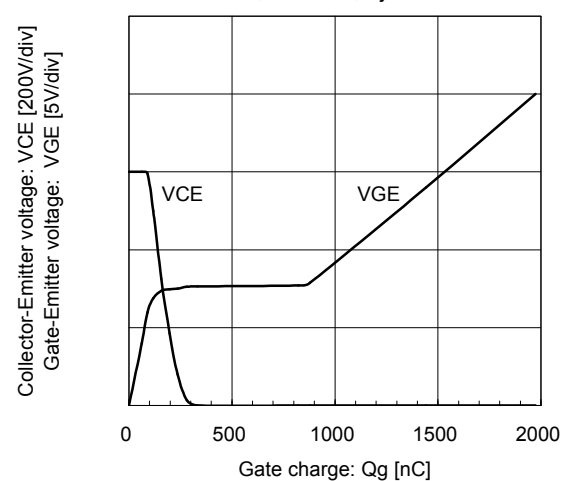
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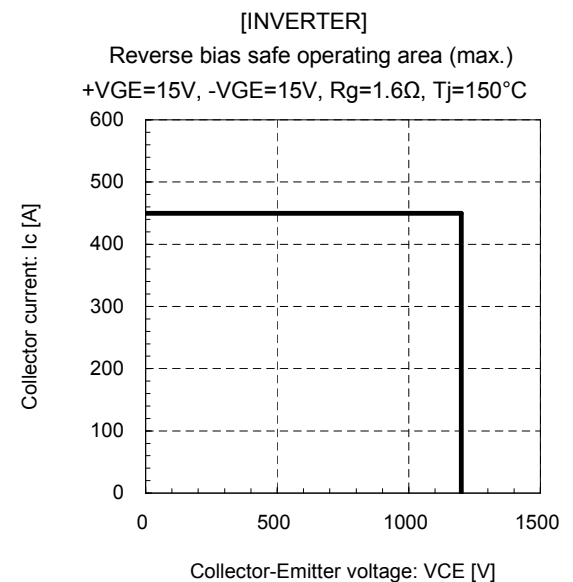
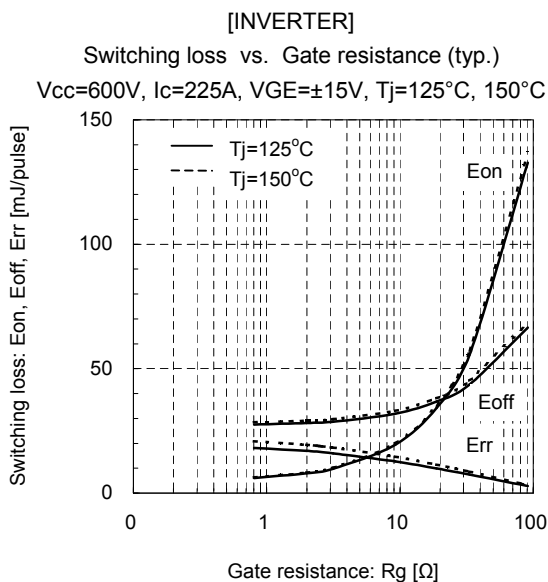
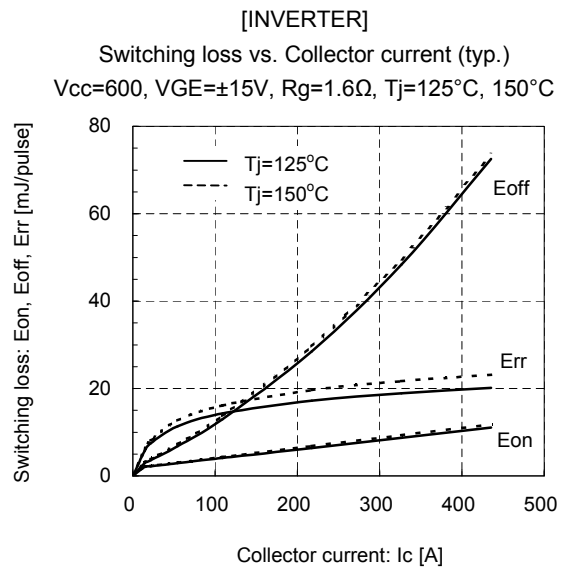
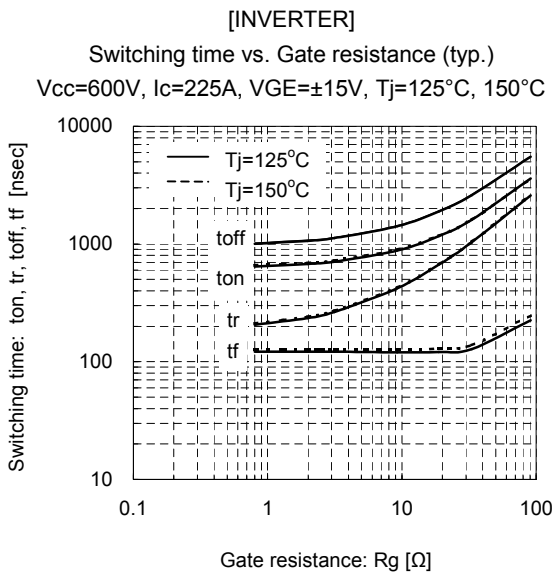
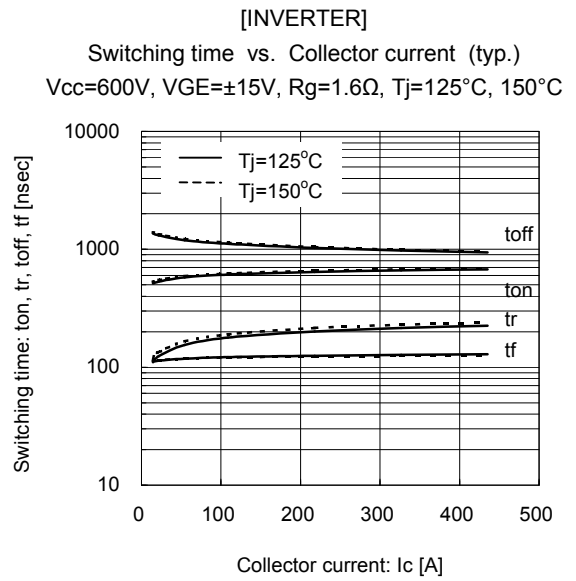
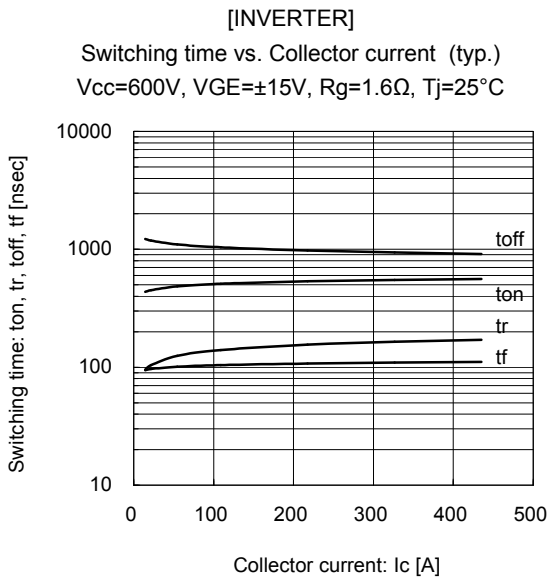
Gate Capacitance vs. Collector-Emittor Voltage (typ.)  
VGE= 0V, f= 1MHz, Tj= 25°C



[INVERTER]

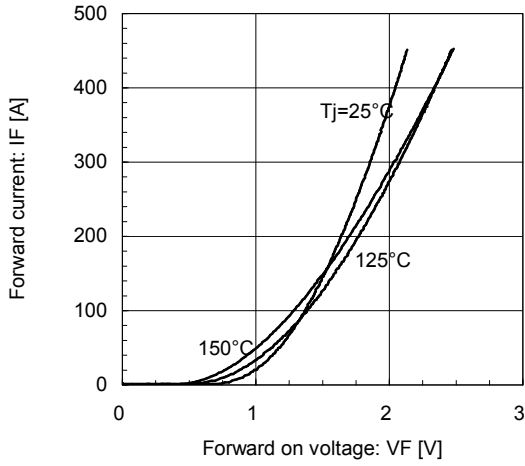
Dynamic Gate Charge (typ.)  
Vcc=600V, Ic=225A, Tj= 25°C





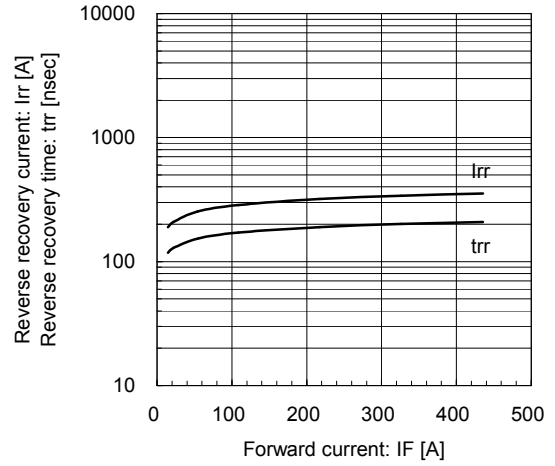
[INVERTER]

Forward Current vs. Forward Voltage (typ.)  
chip



[INVERTER]

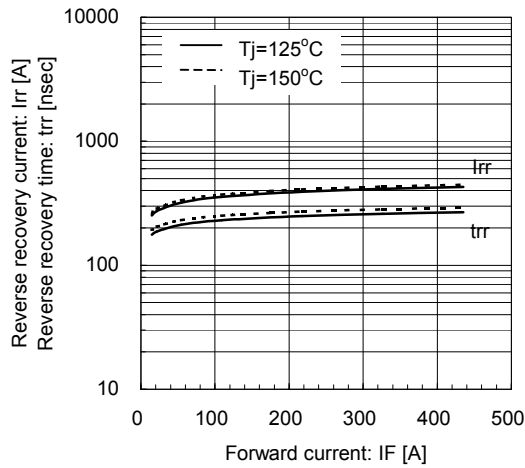
Reverse Recovery Characteristics (typ.)  
Vcc=600V, VGE=±15V, Rg=1.6Ω, Tj=25°C



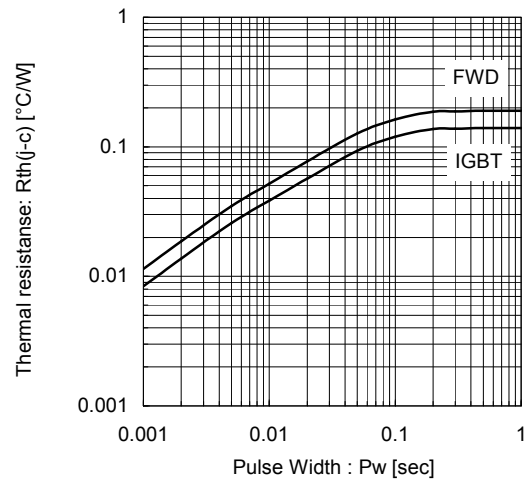
[INVERTER]

Reverse Recovery Characteristics (typ.)

Vcc=600V, VGE=±15V, Rg=1.6Ω, Tj=125°C, 150°C

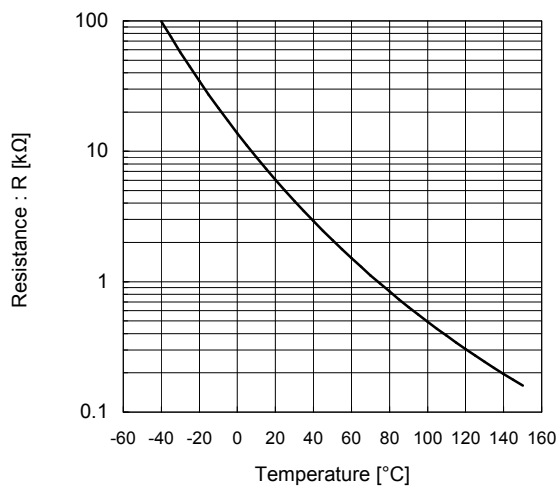


Transient Thermal Resistance (max.)

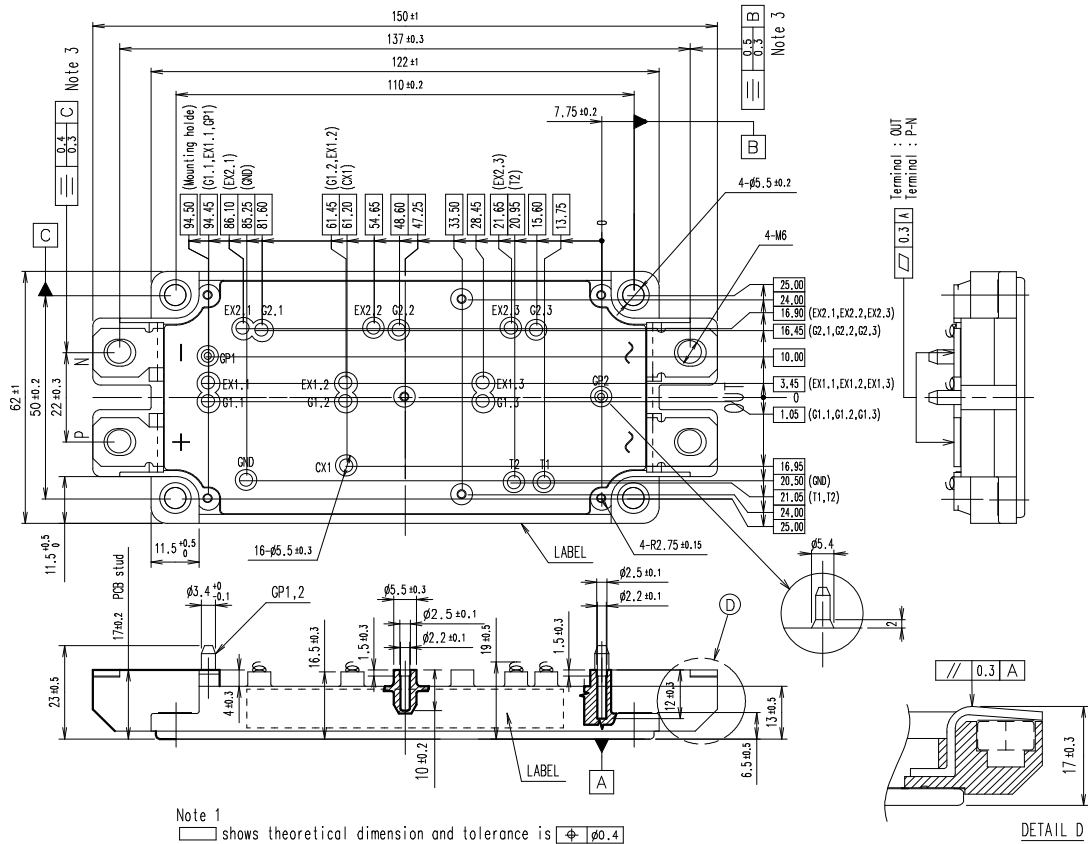


[THERMISTOR]

Temperature characteristic (typ.)



Outline Drawings, mm

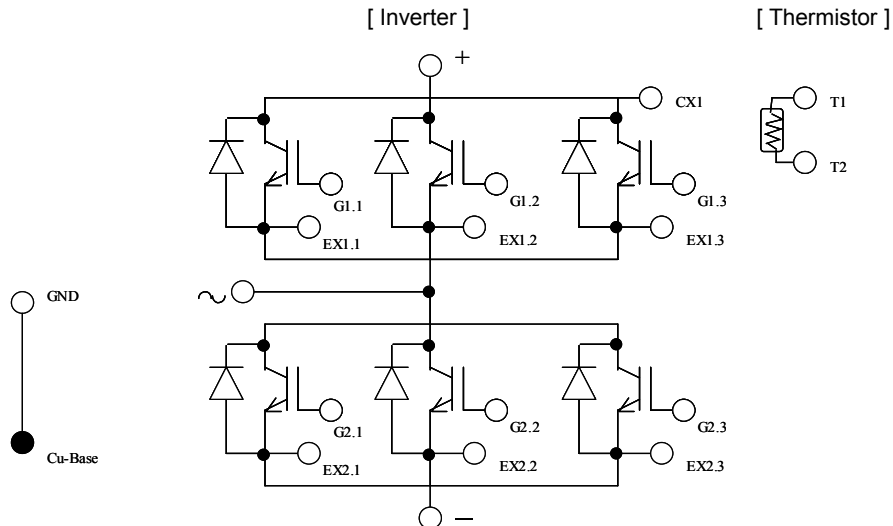


Note 1  
 shows theoretical dimension and tolerance is  $\phi \pm 0.4$

Note 2  
 Rule for PCB  
 · Guide pin hole :  $\phi 4.0 \pm 0.1$   
 · Guide pin distance :  $94.45 \pm 0.1$   
 · Spring contact pad :  $\phi 3.8 \pm 0.2$   
 · Position tol.pad :  $\phi \pm 0.4$

Note 3  
  
 Upper value : Terminal hole center  
 Lower value : Nut center  
 (Including margin of the nut position.)

Equivalent Circuit Schematic



**WARNING**

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