

# 6MBI100VB-120-50

IGBT Modules

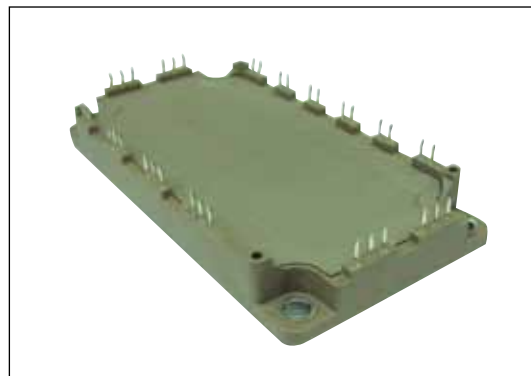
## IGBT MODULE (V series) 1200V / 100A / 6 in one package

### ■ Features

- Compact Package
- P.C.Board Mount
- Low  $V_{CE(sat)}$

### ■ 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 $T_c=25^{\circ}\text{C}$ unless otherwise specified)

| Items                                                       |                                                                             | Symbols      | Conditions |                          | Maximum ratings | Units              |
|-------------------------------------------------------------|-----------------------------------------------------------------------------|--------------|------------|--------------------------|-----------------|--------------------|
| Inverter                                                    | Collector-Emitter voltage                                                   | $V_{CES}$    |            |                          | 1200            | V                  |
|                                                             | Gate-Emitter voltage                                                        | $V_{GES}$    |            |                          | $\pm 20$        | V                  |
|                                                             | Collector current                                                           | $I_c$        | Continuous | $T_c=80^{\circ}\text{C}$ | 100             | A                  |
|                                                             |                                                                             | $I_c$ pulse  | 1ms        | $T_c=80^{\circ}\text{C}$ | 200             |                    |
|                                                             |                                                                             | $-I_c$       |            |                          | 100             |                    |
|                                                             |                                                                             | $-I_c$ pulse | 1ms        |                          |                 | 200                |
|                                                             | Collector power dissipation                                                 | $P_c$        | 1 device   |                          | 520             | W                  |
| Junction temperature                                        |                                                                             | $T_j$        |            |                          | 175             | $^{\circ}\text{C}$ |
| Operating junction temperature (under switching conditions) |                                                                             | $T_{jop}$    |            |                          | 150             |                    |
| Case temperature                                            |                                                                             | $T_c$        |            |                          | 125             |                    |
| Storage temperature                                         |                                                                             | $T_{stg}$    |            |                          | $-40 \sim +125$ |                    |
| Isolation voltage                                           | Between terminal and copper base (*1)<br>Between thermistor and others (*2) | $V_{iso}$    | AC : 1min. |                          | 2500            | VAC                |
| Screw torque                                                | Mounting (*3)                                                               | -            | M5         |                          | 3.5             | N m                |

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)

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

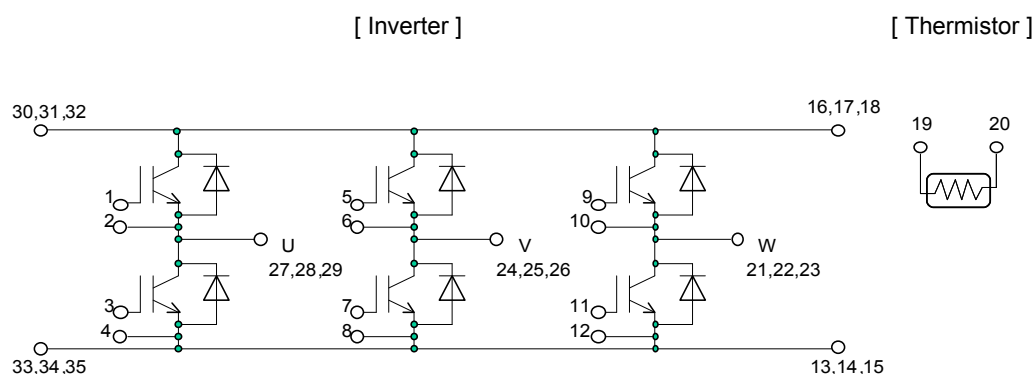
| Items                 |                                      | Symbols                             | Conditions                                                                                               |                       | Characteristics |      |      | Units |
|-----------------------|--------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------|-----------------|------|------|-------|
|                       |                                      |                                     |                                                                                                          |                       | min.            | typ. | max. |       |
| Inverter              | Zero gate voltage collector current  | I <sub>CES</sub>                    | V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V                                                            |                       | -               | -    | 1.0  | mA    |
|                       | Gate-Emitter leakage current         | I <sub>GES</sub>                    | V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V                                                             |                       | -               | -    | 200  | nA    |
|                       | Gate-Emitter threshold voltage       | V <sub>GE (th)</sub>                | V <sub>CE</sub> = 20V, I <sub>C</sub> = 100mA                                                            |                       | 6.0             | 6.5  | 7.0  | V     |
|                       | Collector-Emitter saturation voltage | V <sub>CE (sat)</sub><br>(terminal) | V <sub>GE</sub> = 15V<br>I <sub>C</sub> = 100A                                                           | T <sub>J</sub> =25°C  | -               | 2.30 | 2.75 | V     |
|                       |                                      |                                     |                                                                                                          | T <sub>J</sub> =125°C | -               | 2.60 | -    |       |
|                       |                                      |                                     |                                                                                                          | T <sub>J</sub> =150°C | -               | 2.65 | -    |       |
|                       |                                      | V <sub>CE (sat)</sub><br>(chip)     | V <sub>GE</sub> = 15V<br>I <sub>C</sub> = 100A                                                           | T <sub>J</sub> =25°C  | -               | 1.75 | 2.20 |       |
|                       |                                      |                                     |                                                                                                          | T <sub>J</sub> =125°C | -               | 2.05 | -    |       |
|                       |                                      |                                     |                                                                                                          | T <sub>J</sub> =150°C | -               | 2.10 | -    |       |
|                       | Input capacitance                    | C <sub>ies</sub>                    | V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz                                                    |                       | -               | 9.1  | -    | nF    |
|                       | Turn-on time                         | ton                                 | V <sub>CC</sub> = 600V<br>I <sub>C</sub> = 100A<br>V <sub>GE</sub> = +15 / -15V<br>R <sub>G</sub> = 1.6Ω |                       | -               | 0.39 | 1.20 | μs    |
|                       |                                      | tr                                  |                                                                                                          |                       | -               | 0.09 | 0.60 |       |
|                       |                                      | tr (i)                              |                                                                                                          |                       | -               | 0.03 | -    |       |
|                       | Turn-off time                        | toff                                |                                                                                                          |                       | -               | 0.53 | 1.00 |       |
|                       |                                      | tf                                  |                                                                                                          |                       | -               | 0.06 | 0.30 |       |
| Forward on voltage    | V <sub>F</sub><br>(terminal)         | I <sub>F</sub> = 100A               | T <sub>J</sub> =25°C                                                                                     | -                     | 2.25            | 2.70 | V    |       |
|                       |                                      |                                     | T <sub>J</sub> =125°C                                                                                    | -                     | 2.40            | -    |      |       |
|                       |                                      |                                     | T <sub>J</sub> =150°C                                                                                    | -                     | 2.35            | -    |      |       |
|                       | V <sub>F</sub><br>(chip)             | I <sub>F</sub> = 100A               | T <sub>J</sub> =25°C                                                                                     | -                     | 1.70            | 2.15 |      |       |
|                       |                                      |                                     | T <sub>J</sub> =125°C                                                                                    | -                     | 1.85            | -    |      |       |
|                       |                                      |                                     | T <sub>J</sub> =150°C                                                                                    | -                     | 1.80            | -    |      |       |
| Reverse recovery time | trr                                  | I <sub>F</sub> = 100A               |                                                                                                          | -                     | -               | 0.35 | μs   |       |
| 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

| Items                                     | Symbols  | Conditions            | Characteristics |      |      | Units |
|-------------------------------------------|----------|-----------------------|-----------------|------|------|-------|
|                                           |          |                       | min.            | typ. | max. |       |
| Thermal resistance (1device)              | Rth(j-c) | Inverter IGBT         | -               | -    | 0.29 | °C/W  |
|                                           |          | Inverter FWD          | -               | -    | 0.44 |       |
| Contact thermal resistance (1device) (*4) | Rth(c-f) | with Thermal Compound | -               | 0.05 | -    |       |

Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

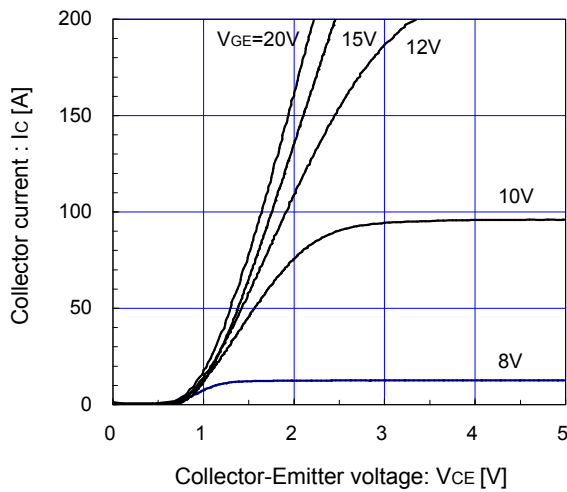
### ■ Equivalent Circuit Schematic



## ■ Characteristics (Representative)

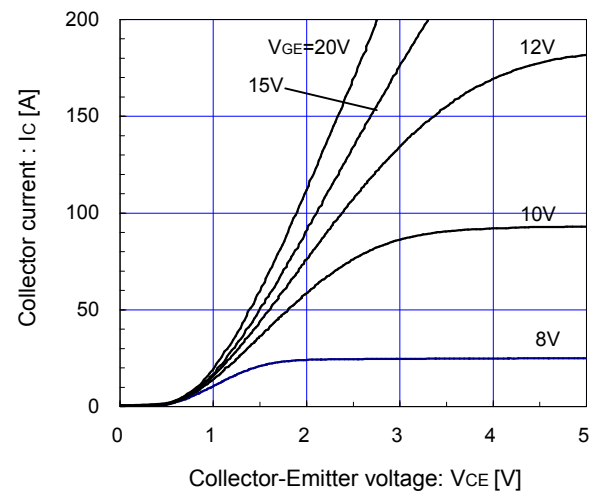
[ Inverter ]

Collector current vs. Collector-Emitter voltage (typ.)

 $T_j = 25^\circ\text{C}$  / chip

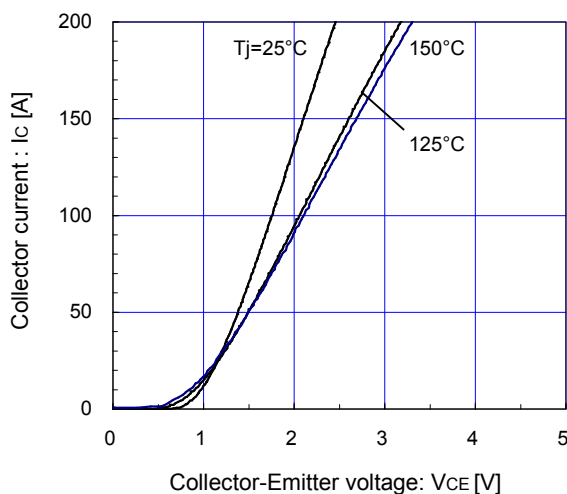
[ Inverter ]

Collector current vs. Collector-Emitter voltage (typ.)

 $T_j = 150^\circ\text{C}$  / chip

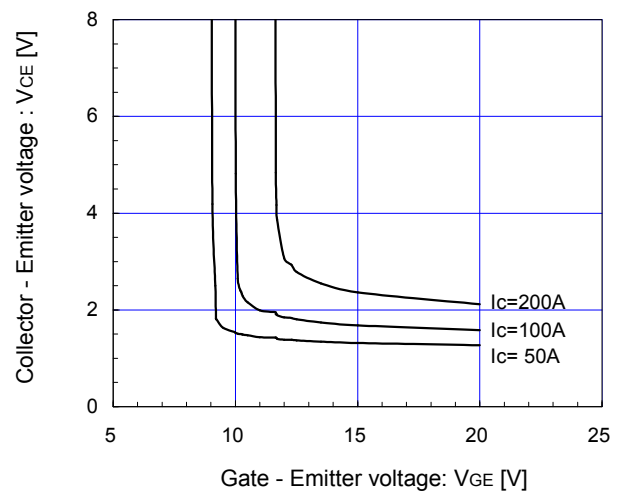
[ Inverter ]

Collector current vs. Collector-Emitter voltage (typ.)

 $V_{GE} = 15\text{V}$  / chip

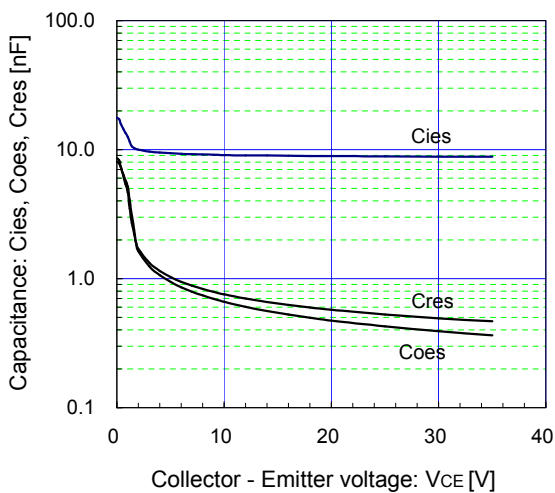
[ Inverter ]

Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)

 $T_j = 25^\circ\text{C}$  / chip

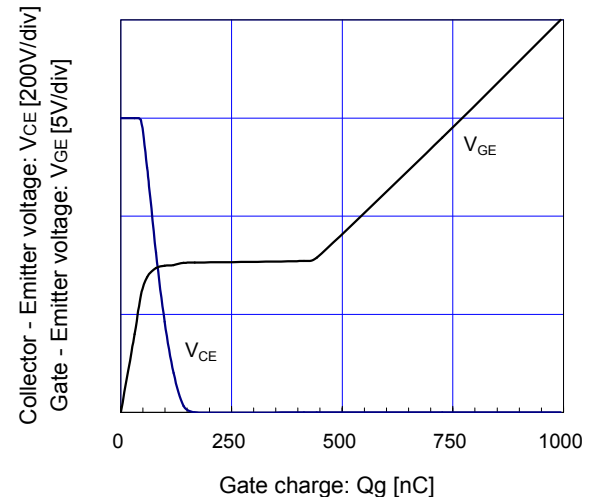
[ Inverter ]

Capacitance vs. Collector-Emitter voltage (typ.)

 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$ 

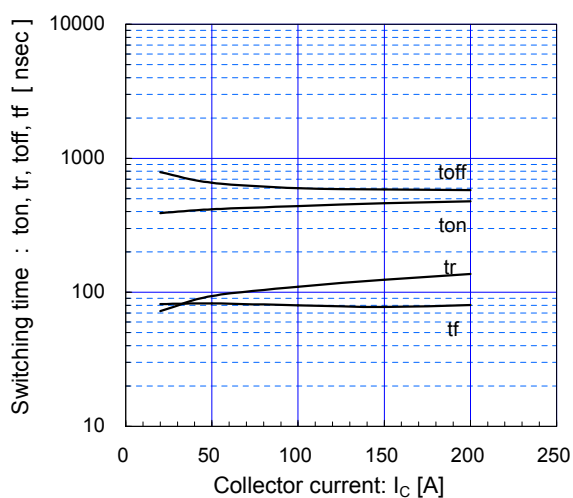
[ Inverter ]

Dynamic gate charge (typ.)

 $V_{CC} = 600\text{V}$ ,  $I_c = 100\text{A}$ ,  $T_j = 25^\circ\text{C}$ 

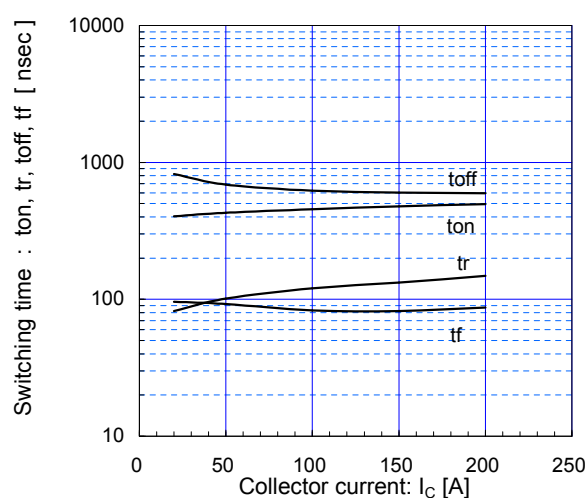
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_G=1.6\Omega$ ,  $T_J=125^\circ C$



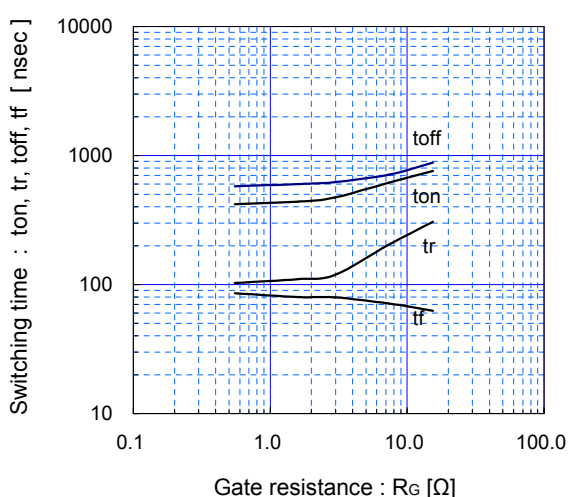
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_G=1.6\Omega$ ,  $T_J=150^\circ C$



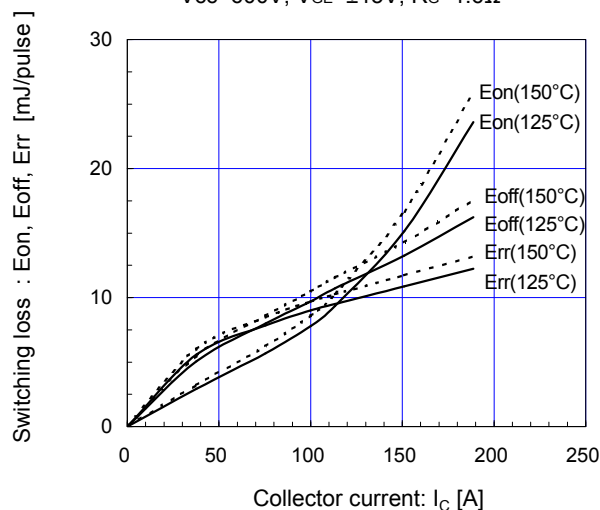
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{CC}=600V$ ,  $I_C=100A$ ,  $V_{GE}=\pm 15V$ ,  $T_J=125^\circ C$



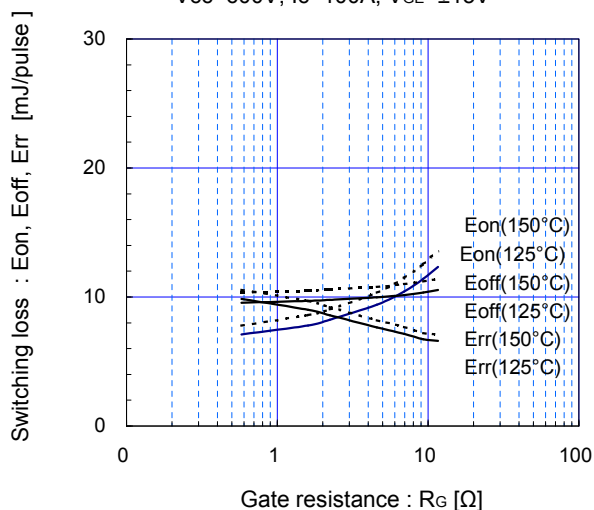
[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_G=1.6\Omega$



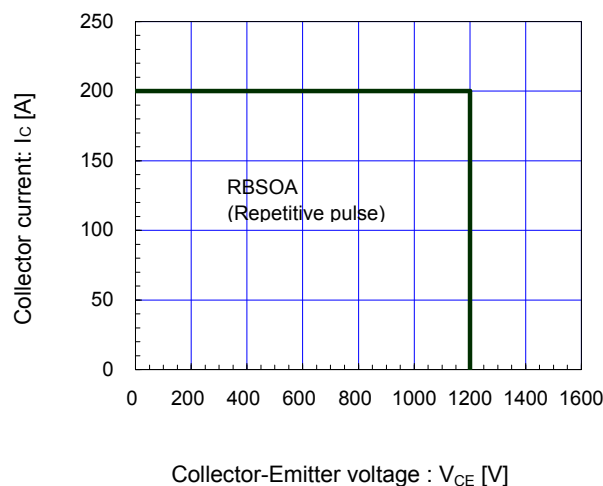
[ Inverter ]

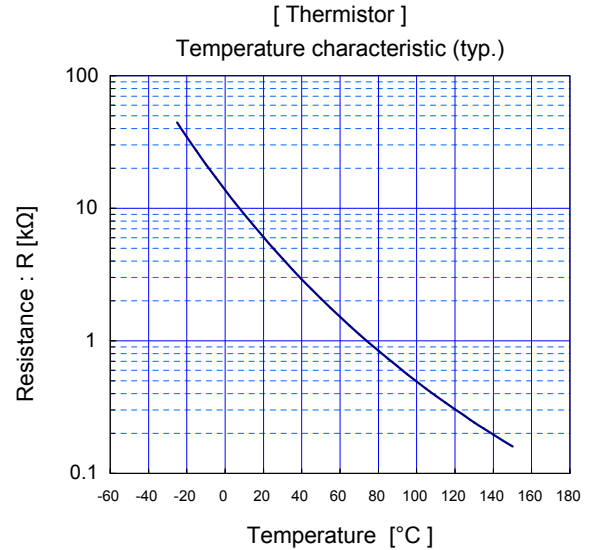
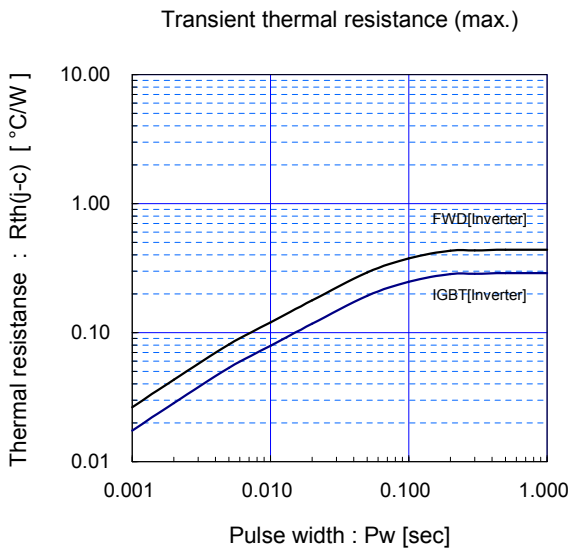
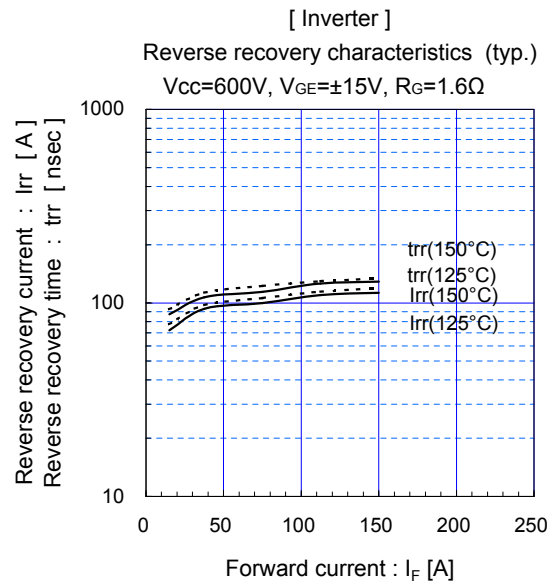
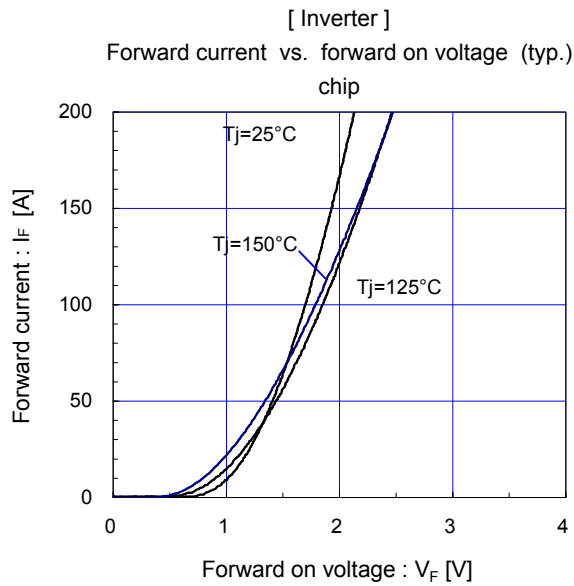
Switching loss vs. gate resistance (typ.)  
 $V_{CC}=600V$ ,  $I_C=100A$ ,  $V_{GE}=\pm 15V$



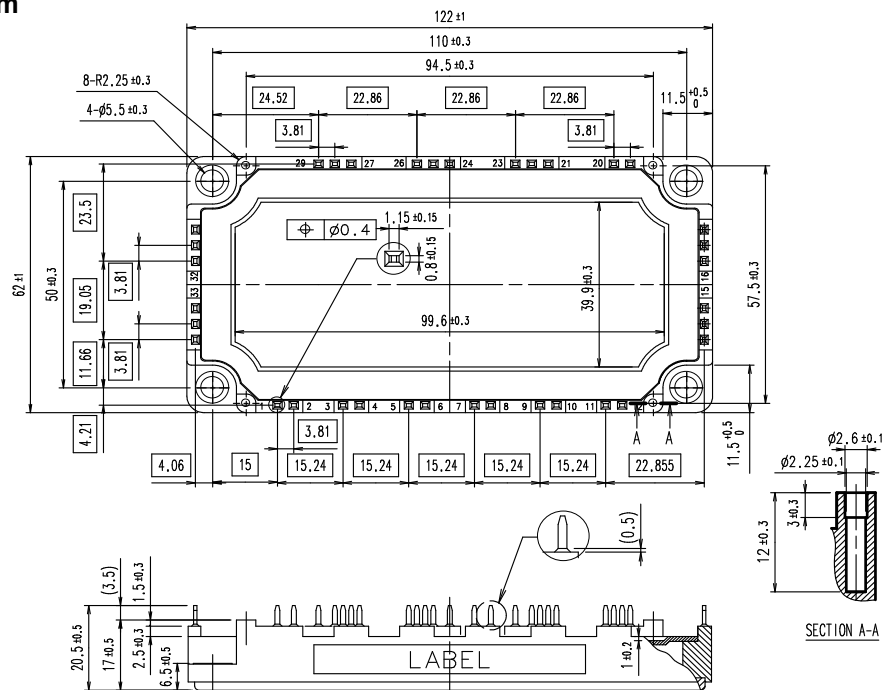
[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V$ ,  $-V_{GE} \leq 15V$ ,  $R_G \geq 1.6\Omega$ ,  $T_J \leq 125^\circ C$





## Outline Drawings, mm



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|                 |                         |                                               |                          |
|-----------------|-------------------------|-----------------------------------------------|--------------------------|
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| • Machine tools | • Audiovisual equipment | • Electrical home appliances                  | • Personal equipment     |
|                 |                         |                                               | • Industrial robots etc. |
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|                                                                             |                                                       |
|-----------------------------------------------------------------------------|-------------------------------------------------------|
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| • Medical equipment                                                         |                                                       |
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|                                |                        |                             |
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