

# 7MBR150VN120-50

**IGBT Modules**

## IGBT MODULE (V series)

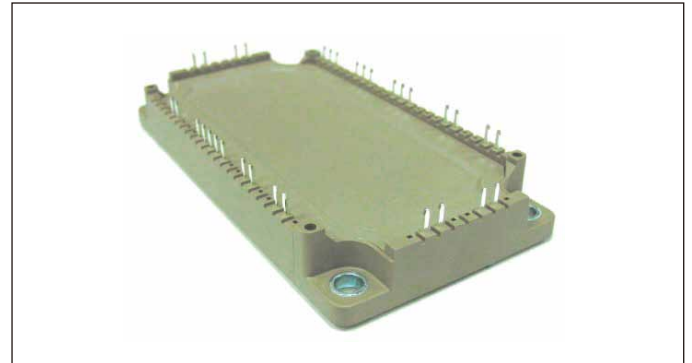
### 1200V / 150A / PIM

#### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant product

#### ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply



#### ■ 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                    | $T_c=100^\circ\text{C}$ | 150              | A                    |
|   |   | $I_{cp}$        | 1ms                           | $T_c=80^\circ\text{C}$  | 300              |                      |
|   |   | $-I_c$          |                               |                         | 150              |                      |
| $-I_c$ pulse  |   | 1ms             |                               |                         | 300              |                      |
| Collector power dissipation                                 | $P_c$   | 1 device        |                               | 885                     | W                |                      |
| Brake   | 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                    |
|   |   | $I_{cp}$        | 1ms                           | $T_c=80^\circ\text{C}$  | 200              |                      |
|   | Collector power dissipation   | $P_c$           | 1 device                      |                         | 520              | W                    |
| Repetitive peak reverse voltage (Diode)                     | $V_{RRM}$   |                 |                               | 1200                    | V                |                      |
| Converter   | Repetitive peak reverse voltage   | $V_{RRM}$       |                               |                         | 1600             | V                    |
|   | Average output current  | $I_o$           | 50Hz/60Hz, sine wave          |                         | 150              | A                    |
|   | Surge current (Non-Repetitive)  | $I_{FSM}$       | 10ms, $T_j=150^\circ\text{C}$ |                         | 780              | A                    |
|   | $I^2t$ (Non-Repetitive)   | $I^2t$          | half sine wave                |                         | 3000             | $\text{A}^2\text{s}$ |
| Junction temperature  | $T_j$   | Inverter, Brake |                               | 175                     | $^\circ\text{C}$ |                      |
|   |   | Converter       |                               | 150                     |                  |                      |
| Operating junction temperature (under switching conditions) | $T_{jop}$   | Inverter, Brake |                               | 150                     |                  |                      |
|   |   | Converter       |                               | 150                     |                  |                      |
| Case temperature  | $T_c$   |                 |                               | 125                     |                  |                      |
| Storage temperature   | $T_{stg}$   |                 |                               | -40 to +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 T<sub>j</sub> = 25°C unless otherwise specified)

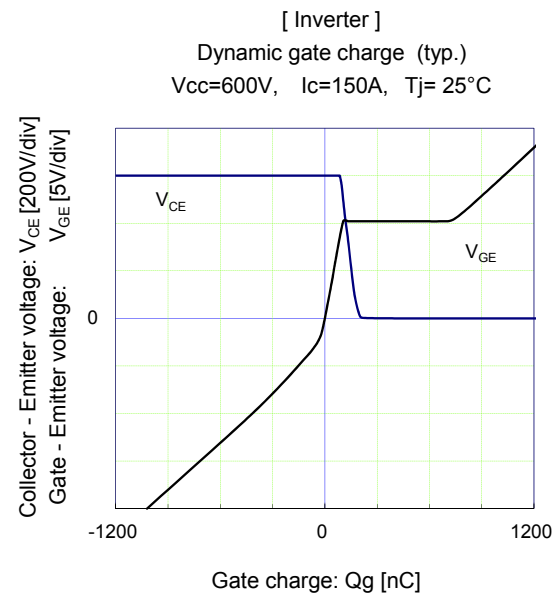
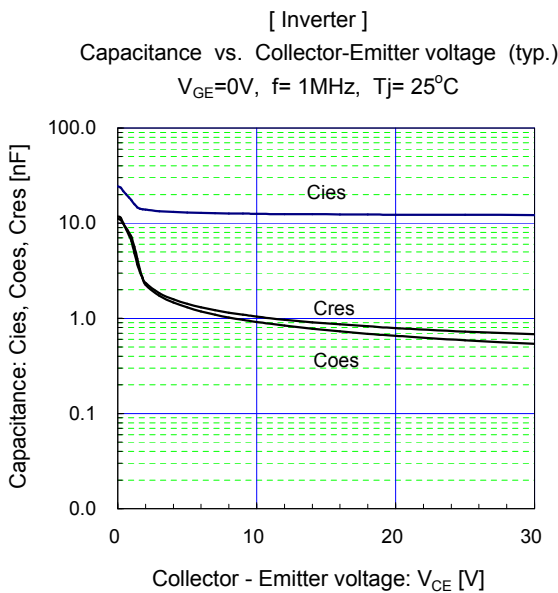
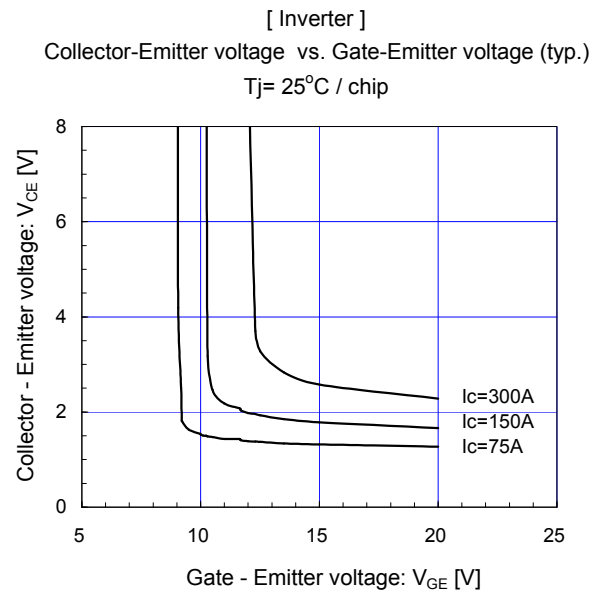
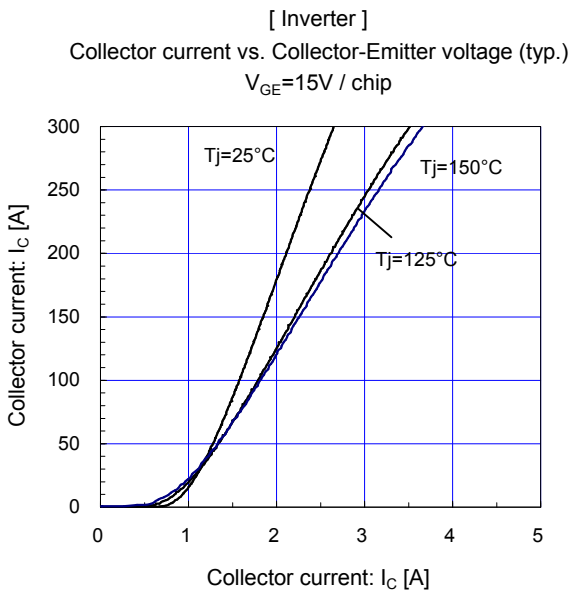
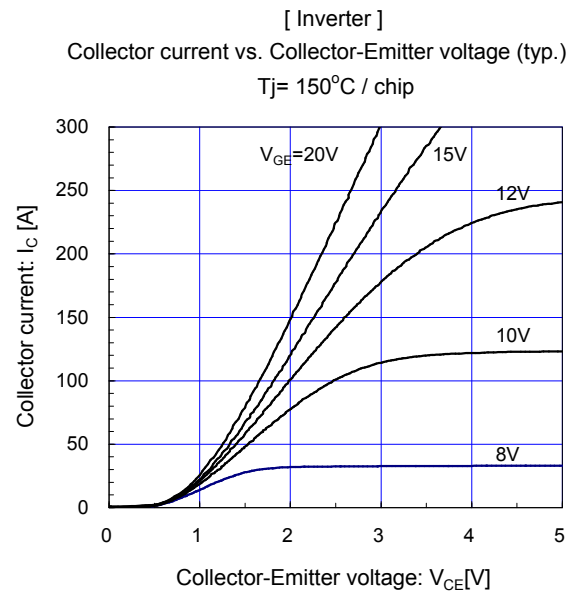
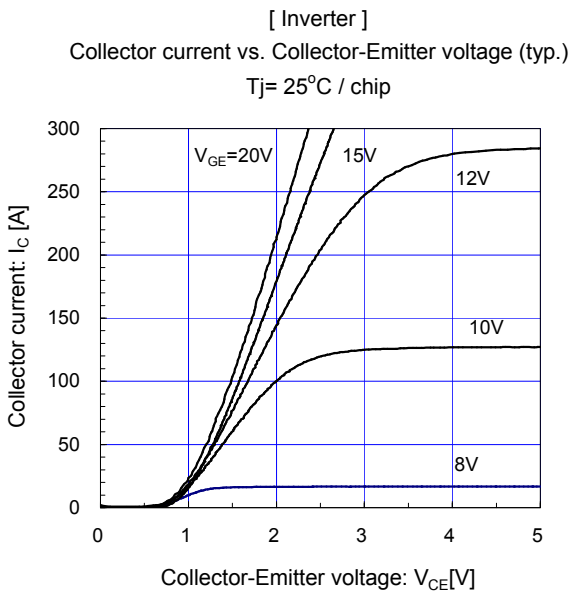
| Items                  | Symbols                              | Conditions                         | Characteristics  |                        |      | Units |      |   |
|------------------------|--------------------------------------|------------------------------------|--|------------------------|------|-------|------|---|
|                        |                                      |                                    | 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>GE</sub> = 0V, V <sub>CE</sub> = ±20V   | -                      | -    | 200   | nA   |   |
|                        | Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>                | V <sub>CE</sub> = 20V, I <sub>c</sub> = 150mA  | 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> = 150A   | T <sub>j</sub> = 25°C  | -    | 2.45  | 2.90 | V |
|                        |                                      |                                    |  | T <sub>j</sub> = 125°C | -    | 2.80  | -    |   |
|                        |                                      |                                    |  | T <sub>j</sub> = 150°C | -    | 2.85  | -    |   |
|                        |                                      | V <sub>CE(sat)</sub><br>(chip)     | V <sub>GE</sub> = 15V<br>I <sub>c</sub> = 150A   | T <sub>j</sub> = 25°C  | -    | 1.85  | 2.30 |   |
|                        |                                      |                                    |  | T <sub>j</sub> = 125°C | -    | 2.20  | -    |   |
|                        | T <sub>j</sub> = 150°C               | -                                  | 2.25   | -                      |      |       |      |   |
|                        | Internal gate resistance             | R <sub>g(int)</sub>                | -  | -                      | 5    | -     | Ω    |   |
|                        | Input capacitance                    | C <sub>ies</sub>                   | V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz  | -                      | 12.5 | -     | nF   |   |
|                        | Turn-on time                         | ton                                | V <sub>CC</sub> = 600V<br>I <sub>c</sub> = 150A<br>V <sub>GE</sub> = +15 / -15V<br>R <sub>G</sub> = 1.8Ω | -                      | 0.39 | 1.20  | μs   |   |
|                        |                                      | tr                                 |  | -                      | 0.09 | 0.60  |      |   |
|                        |                                      | tr(i)                              |  | -                      | 0.03 | -     |      |   |
|                        | Turn-off time                        | toff                               | R <sub>G</sub> = 1.8Ω  | -                      | 0.53 | 1.00  | μs   |   |
| tf                     |                                      | -                                  |  | 0.06                   | 0.30 |       |      |   |
| Forward on voltage     | V <sub>F</sub><br>(terminal)         | I <sub>F</sub> = 150A              | T <sub>j</sub> = 25°C  | -                      | 2.50 | 2.95  | V    |   |
|                        |                                      |                                    | T <sub>j</sub> = 125°C   | -                      | 2.80 | -     |      |   |
|                        |                                      |                                    | T <sub>j</sub> = 150°C   | -                      | 2.75 | -     |      |   |
|                        | V <sub>F</sub><br>(chip)             | I <sub>F</sub> = 150A              | T <sub>j</sub> = 25°C  | -                      | 1.90 | 2.35  |      |   |
|                        |                                      |                                    | T <sub>j</sub> = 125°C   | -                      | 2.20 | -     |      |   |
| T <sub>j</sub> = 150°C | -                                    | 2.15                               | -  |                        |      |       |      |   |
| Reverse recovery time  | trr                                  | I <sub>F</sub> = 150A              | -  | -                      | 0.35 | μs    |      |   |
| Brake                  | Zero gate voltage collector current  | I <sub>CES</sub>                   | V <sub>GE</sub> = 0V<br>V <sub>CE</sub> = 1200V  | -                      | -    | 1.0   | mA   |   |
|                        | Gate-Emitter leakage current         | I <sub>GES</sub>                   | V <sub>CE</sub> = 0V<br>V <sub>GE</sub> = +20 / -20V   | -                      | -    | 200   | nA   |   |
|                        | 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  | -    | 2.15  | 2.60 | V |
|                        |                                      |                                    |  | T <sub>j</sub> = 125°C | -    | 2.45  | -    |   |
|                        |                                      |                                    |  | T <sub>j</sub> = 150°C | -    | 2.50  | -    |   |
|                        |                                      | 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   | -                      |      |       |      |   |
|                        | Internal gate resistance             | R <sub>g(int)</sub>                | -  | -                      | 7.5  | -     | Ω    |   |
|                        | Turn-on time                         | ton                                | V <sub>CE</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 |       |      |   |
| Turn-off time          | toff                                 | R <sub>G</sub> = 1.6Ω              | -  | 0.53                   | 1.00 | μs    |      |   |
|                        | tf                                   |                                    | -  | 0.06                   | 0.30 |       |      |   |
| Reverse current        | IRRM                                 | V <sub>R</sub> = 1200V             | -  | -                      | 1.00 | mA    |      |   |
| Converter              | Forward on voltage                   | I <sub>F</sub> = 150A              | terminal   | -                      | 2.00 | 2.45  | V    |   |
|                        |                                      |                                    | chip   | -                      | 1.40 | -     |      |   |
| Reverse current        | IRRM                                 | V <sub>R</sub> = 1600V             | -  | -                      | 1.0  | mA    |      |   |
| Thermistor             | Resistance                           | 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)              | R <sub>th(j-c)</sub> | Inverter IGBT         | -               | -    | 0.17 | °C/W  |
|   |                      | Inverter FWD          | -               | -    | 0.31 |       |
|   |                      | Brake IGBT            | -               | -    | 0.29 |       |
|   |                      | Converter Diode       | -               | -    | 0.24 |       |
| Contact thermal resistance (1device) (*4) | R <sub>th(c-f)</sub> | with Thermal Compound | -               | 0.05 | -    |       |

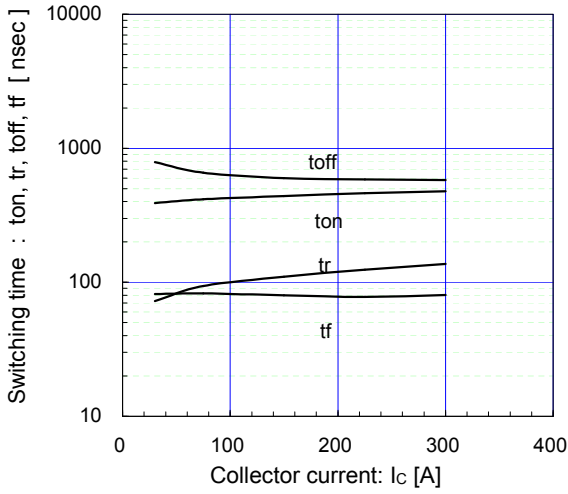
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



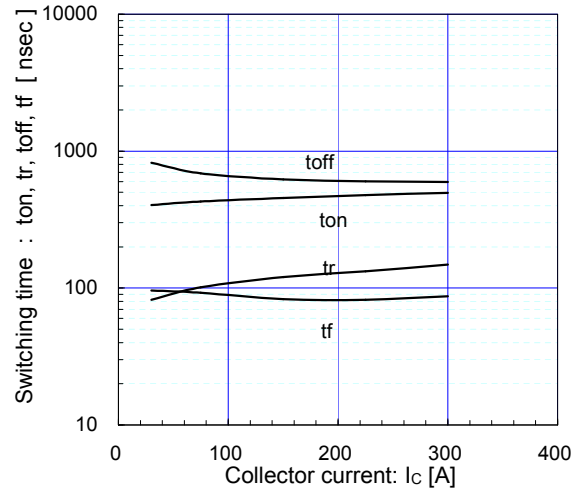
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=1.8\Omega, T_j=125^\circ C$



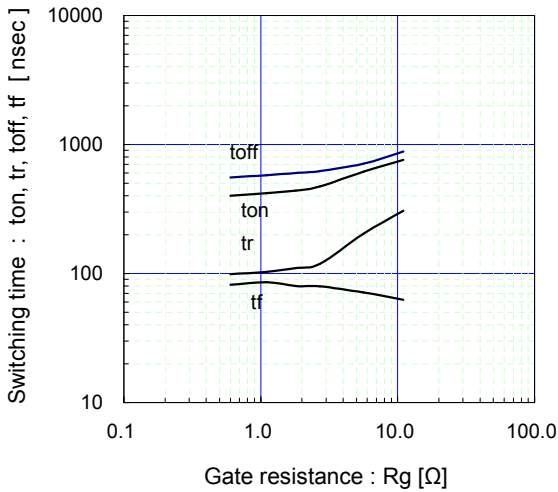
[ Inverter ]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=1.8\Omega, T_j=150^\circ C$



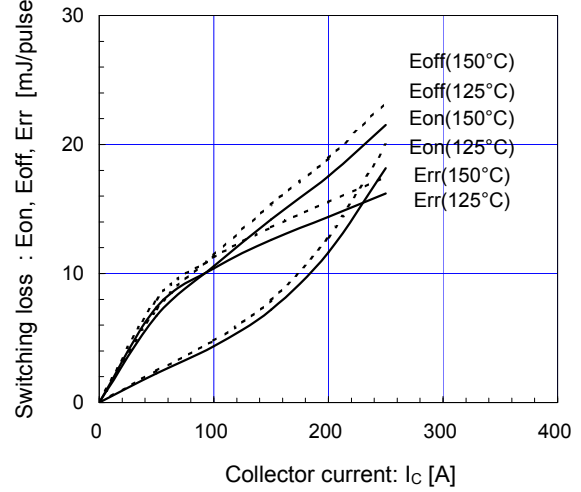
[ Inverter ]

Switching time vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=150A, V_{GE}=\pm 15V, T_j=125^\circ C$



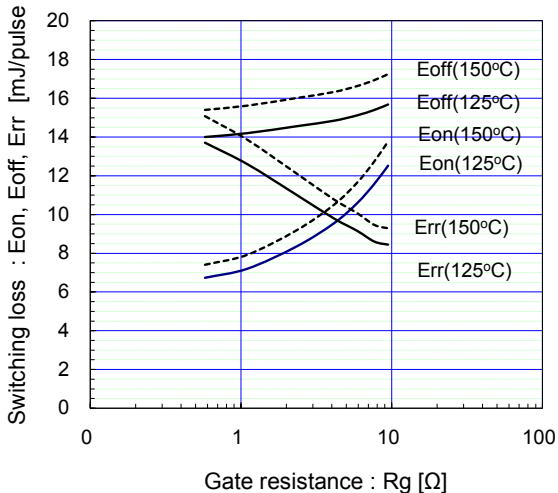
[ Inverter ]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=1.8\Omega$



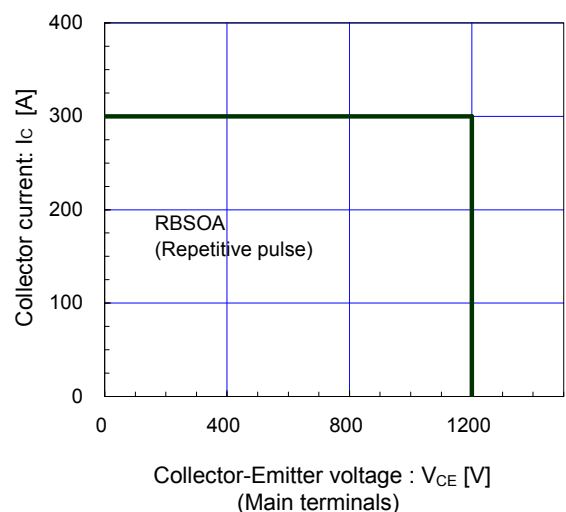
[ Inverter ]

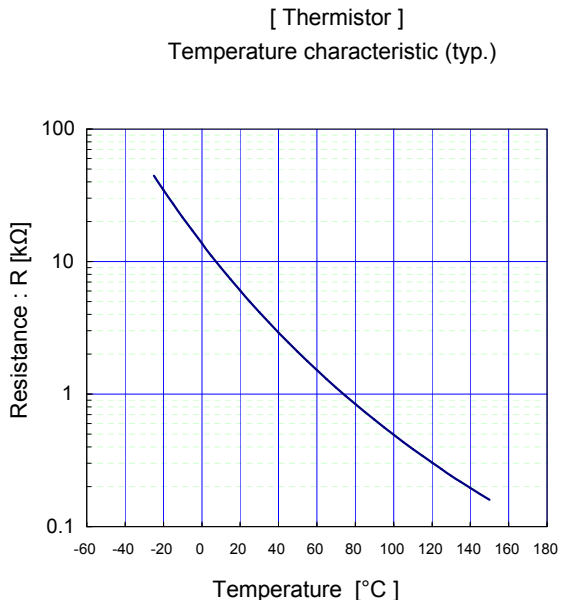
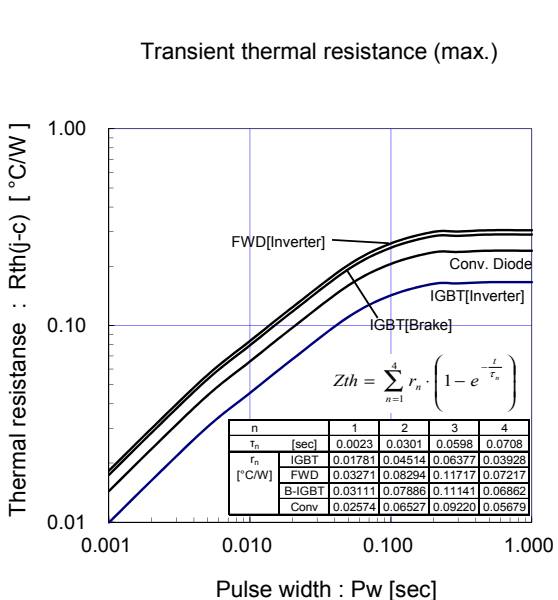
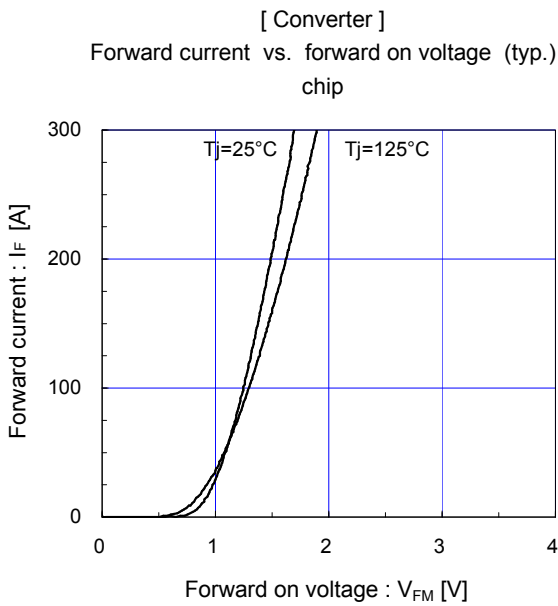
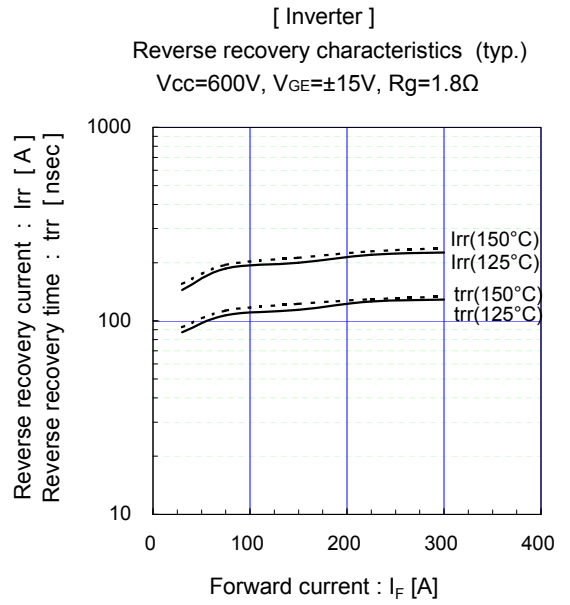
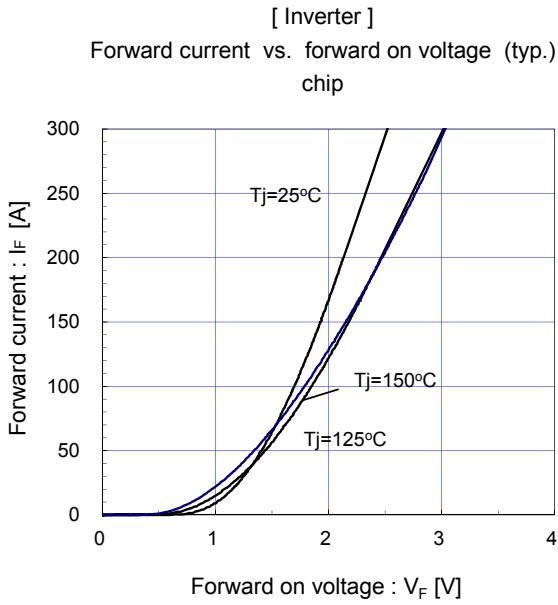
Switching loss vs. gate resistance (typ.)  
 $V_{CC}=600V, I_c=150A, V_{GE}=\pm 15V$

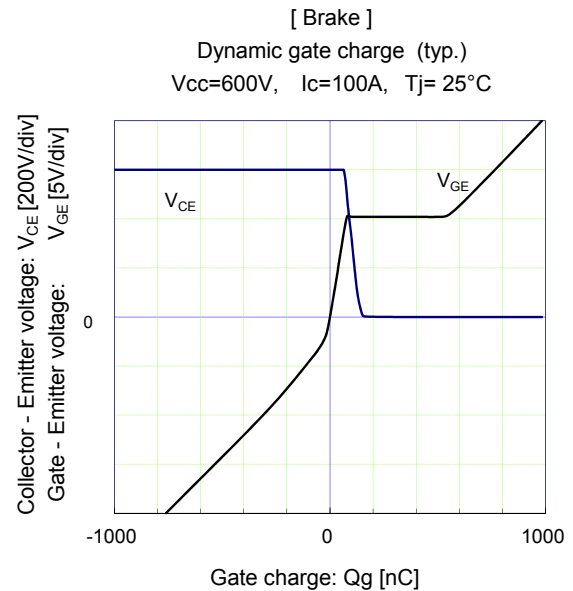
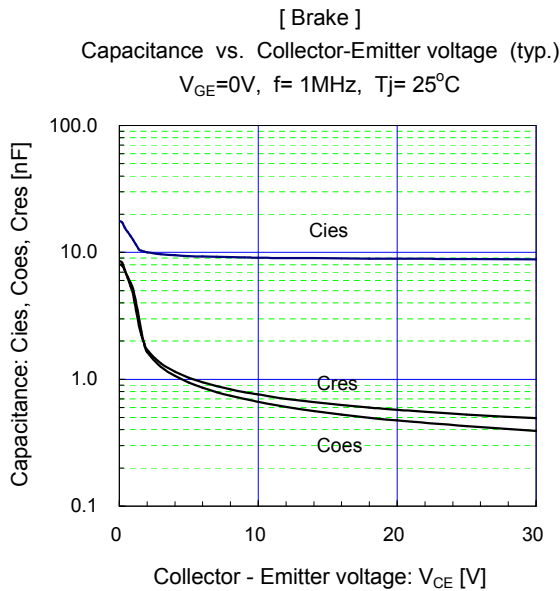
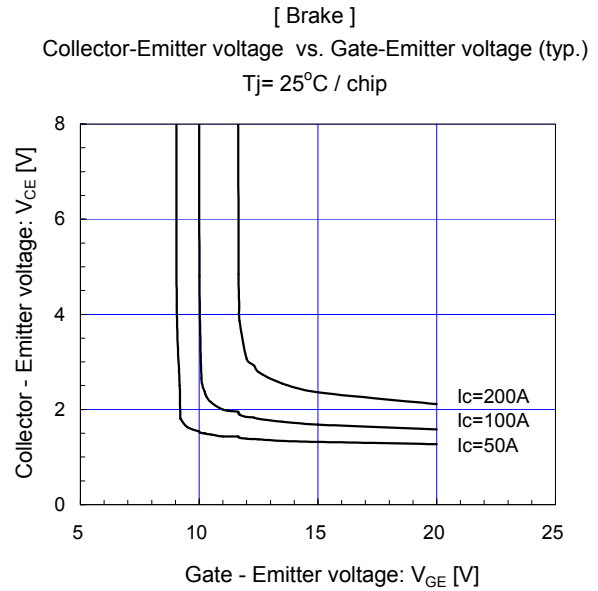
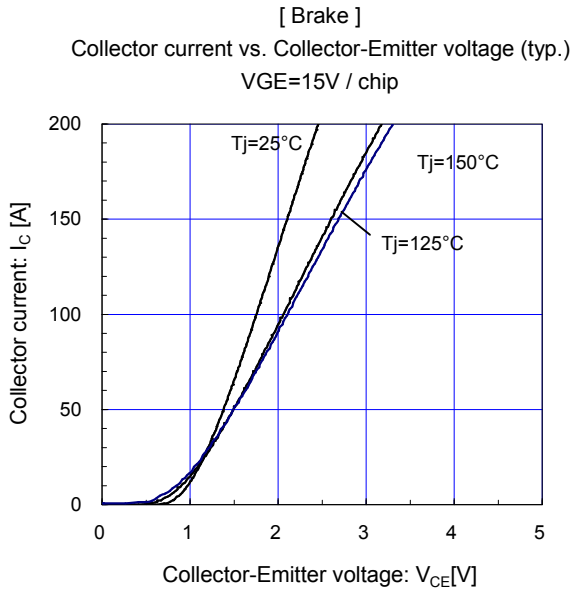
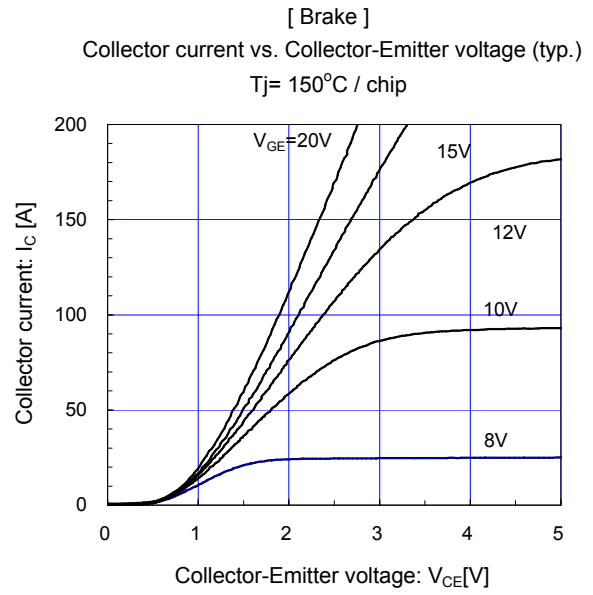
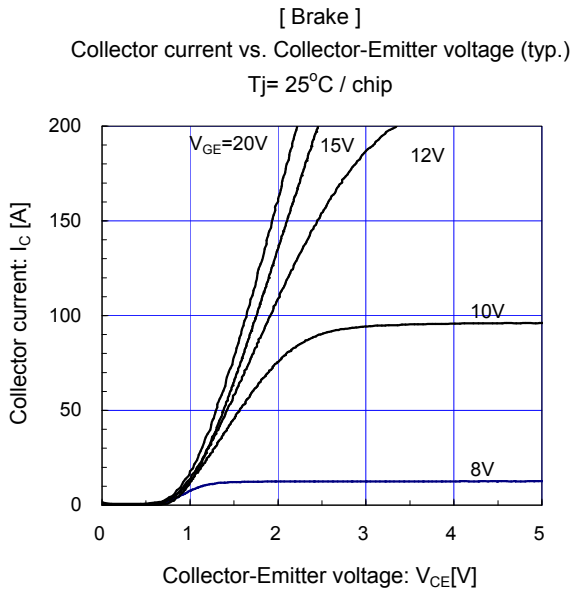


[ Inverter ]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_g \geq 1.8\Omega, T_j=150^\circ C$

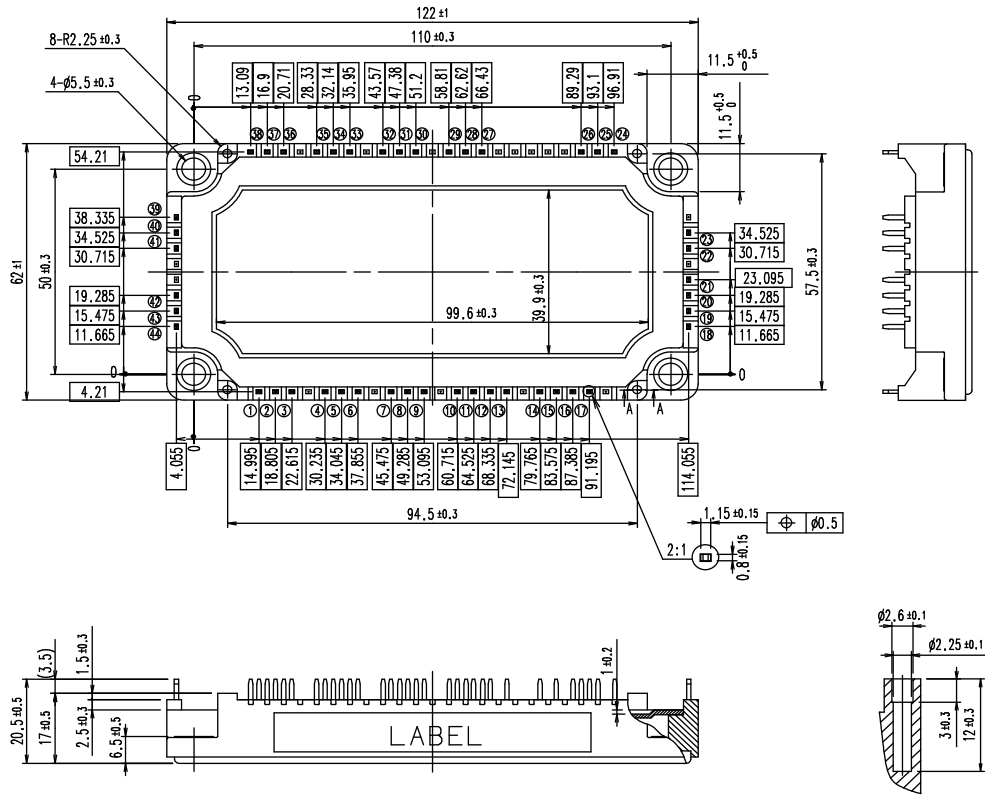






Outline Drawings (Unit: mm)

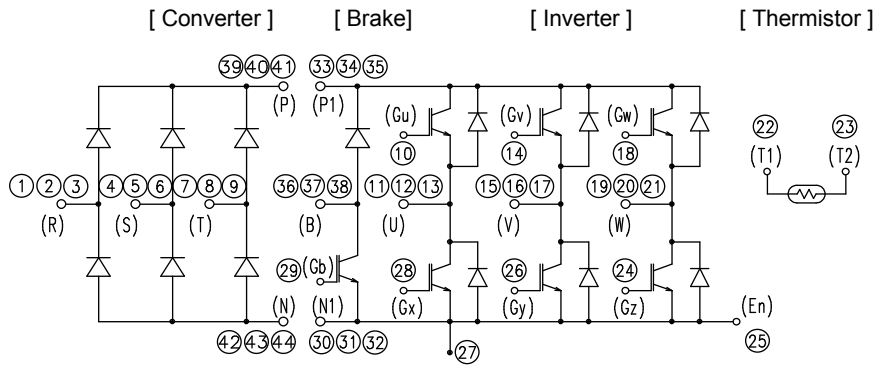
□ shows theoretical dimension.  
 ( ) shows reference dimension.



Section A-A

Weight: 310g(typ.)

Equivalent Circuit



**WARNING**

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  - Measurement equipment
  - Machine tools
  - Audiovisual equipment
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**IGBT Modules**

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| 6 IGBT 損失シミュレーションソフト           | <a href="http://www.fujielectric.co.jp/products/semiconductor/model/igbt/simulation/">www.fujielectric.co.jp/products/semiconductor/model/igbt/simulation/</a>               |
| 7 AT-NPC 3-Level 損失シミュレーションソフト | <a href="http://www.fujielectric.co.jp/products/semiconductor/model/igbt/simulation_3level/">www.fujielectric.co.jp/products/semiconductor/model/igbt/simulation_3level/</a> |
| 8 富士電機技報                       | <a href="http://www.fujielectric.co.jp/products/semiconductor/journal/">www.fujielectric.co.jp/products/semiconductor/journal/</a>   |
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| 1 Semiconductors General Catalog                | <a href="http://www.fujielectric.com/products/semiconductor/catalog/">www.fujielectric.com/products/semiconductor/catalog/</a>   |
| 2 Product Information                           | <a href="http://www.fujielectric.com/products/semiconductor/model/">www.fujielectric.com/products/semiconductor/model/</a>   |
| 3 Application Manuals                           | <a href="http://www.fujielectric.com/products/semiconductor/model/igbt/application/">www.fujielectric.com/products/semiconductor/model/igbt/application/</a>             |
| 4 Technical Documents                           | <a href="http://www.fujielectric.com/products/semiconductor/model/igbt/technical/">www.fujielectric.com/products/semiconductor/model/igbt/technical/</a>                 |
| 5 Mounting Instructions                         | <a href="http://www.fujielectric.com/products/semiconductor/model/igbt/mounting/">www.fujielectric.com/products/semiconductor/model/igbt/mounting/</a>                   |
| 6 IGBT Loss Simulation Software                 | <a href="http://www.fujielectric.com/products/semiconductor/model/igbt/simulation/">www.fujielectric.com/products/semiconductor/model/igbt/simulation/</a>               |
| 7 AT-NPC 3-Level Loss Simulation Software       | <a href="http://www.fujielectric.com/products/semiconductor/model/igbt/simulation_3level/">www.fujielectric.com/products/semiconductor/model/igbt/simulation_3level/</a> |
| 8 Fuji Electric Journal                         | <a href="http://www.fujielectric.com/products/semiconductor/journal/">www.fujielectric.com/products/semiconductor/journal/</a>   |
| 9 Contact                                       | <a href="http://www.fujielectric.com/products/semiconductor/contact/">www.fujielectric.com/products/semiconductor/contact/</a>   |
| 10 Revised and discontinued product information | <a href="http://www.fujielectric.com/products/semiconductor/discontinued/">www.fujielectric.com/products/semiconductor/discontinued/</a>                                 |

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| 1 半导体综合目录               | <a href="http://www.fujielectric.com.cn/products/semiconductor/catalog/">www.fujielectric.com.cn/products/semiconductor/catalog/</a>   |
| 2 产品信息                  | <a href="http://www.fujielectric.com.cn/products/semiconductor/model/">www.fujielectric.com.cn/products/semiconductor/model/</a>   |
| 3 应用手册                  | <a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/application/">www.fujielectric.com.cn/products/semiconductor/model/igbt/application/</a>             |
| 4 技术资料                  | <a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/technical/">www.fujielectric.com.cn/products/semiconductor/model/igbt/technical/</a>                 |
| 5 安装说明书                 | <a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/mounting/">www.fujielectric.com.cn/products/semiconductor/model/igbt/mounting/</a>                   |
| 6 IGBT 损耗模拟软件           | <a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation/">www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation/</a>               |
| 7 AT-NPC 3-Level 损耗模拟软件 | <a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation_3level/">www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation_3level/</a> |
| 8 富士电机技报                | <a href="http://www.fujielectric.com.cn/products/semiconductor/journal/">www.fujielectric.com.cn/products/semiconductor/journal/</a>   |
| 9 产品咨询                  | <a href="http://www.fujielectric.com.cn/products/semiconductor/contact/">www.fujielectric.com.cn/products/semiconductor/contact/</a>   |
| 10 产品更改和停产信息            | <a href="http://www.fujielectric.com.cn/products/semiconductor/discontinued/">www.fujielectric.com.cn/products/semiconductor/discontinued/</a>                                 |