



# 7MBP25VFN120-50

**IGBT Modules**
**■ Absolute Maximum Ratings**
 $T_c=25^{\circ}\text{C}$ ,  $V_{cc}=15\text{V}$  unless otherwise specified.

| Items                           |                   | Symbol                   | Min. | Max.         | Units              |
|---------------------------------|-------------------|--------------------------|------|--------------|--------------------|
| Collector-Emitter Voltage *1    |                   | $V_{CES}$                | 0    | 1200         | V                  |
| Short Circuit Voltage           |                   | $V_{sc}$                 | 400  | 800          | V                  |
| Inverter                        | Collector Current | DC                       | -    | 25           | A                  |
|                                 |                   | 1ms                      | -    | 50           | A                  |
|                                 |                   | Duty=100% *2             | -    | 25           | A                  |
| Collector Power Dissipation     |                   | 1 device *3              | -    | 271          | W                  |
| Brake                           | Collector Current | DC                       | -    | 15           | A                  |
|                                 |                   | 1ms                      | -    | 30           | A                  |
|                                 |                   | Forward Current of Diode | -    | 15           | A                  |
| Collector Power Dissipation     |                   | 1 device *3              | -    | 189          | W                  |
| Supply Voltage of Pre-Driver *4 |                   | $V_{CC}$                 | -0.5 | 20           | V                  |
| Input Signal Voltage *5         |                   | $V_{in}$                 | -0.5 | $V_{cc}+0.5$ | V                  |
| Alarm Signal Voltage *6         |                   | $V_{ALM}$                | -0.5 | $V_{cc}$     | V                  |
| Alarm Signal Current *7         |                   | $I_{ALM}$                | -    | 20           | mA                 |
| Junction Temperature            |                   | $T_j$                    | -    | 150          | $^{\circ}\text{C}$ |
| Operating Case Temperature      |                   | $T_{opr}$                | -20  | 110          | $^{\circ}\text{C}$ |
| Storage Temperature             |                   | $T_{stg}$                | -40  | 125          | $^{\circ}\text{C}$ |
| Solder Temperature *8           |                   | $T_{sol}$                | -    | 260          | $^{\circ}\text{C}$ |
| Isolating Voltage *9            |                   | $V_{iso}$                | -    | AC2500       | Vrms               |
| Screw Torque                    |                   | Mounting (M4)            | -    | 1.7          | Nm                 |

**Notes**

\*1:  $V_{CES}$  shall be applied to the input voltage between terminal P-(U,V, W,B) and (U,V, W,B)-N.

\*2:  $Duty=125^{\circ}\text{C}/R_{th(j-c)D}/(I_F \times V_F \text{ Max.}) \times 100$

\*3:  $PC=125^{\circ}\text{C}/R_{th(j-c)Q}$  (Inverter & Brake)

\*4:  $V_{CC}$  shall be applied to the input voltage between terminal No.4 and 1, 8 and 5, 12 and 9,14 and 13.

\*5:  $V_{in}$  shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9,15~18 and 13.

\*6:  $V_{ALM}$  shall be applied to the voltage between terminal No.2 and 1, 6 and 5, 10 and 9,19 and 13.

\*7:  $I_{ALM}$  shall be applied to the input current to terminal No.2,6,10 and 19.

\*8: Immersion time  $10 \pm 1\text{sec}$ . 1time

\*9: Terminal to base, 50/60Hz sine wave 1min. All terminals should be connected together during the test.

**■ Electrical Characteristics ( $T_j=25^{\circ}\text{C}$ ,  $V_{CC}=15\text{V}$  unless otherwise specified.)**
**● Main circuit**

| Item                   |                                       | Symbol   | Conditions              | Min.     | Typ. | Max. | Units         |   |
|------------------------|---------------------------------------|--|-------------------------|----------|------|------|---------------|---|
| Inverter               | Collector Current at off signal input | $I_{CES}$  | $V_{CE} = 1200\text{V}$ | -        | -    | 1.0  | mA            |   |
|                        | Collector-Emitter saturation voltage  | $V_{CE(sat)}$                                      | $I_C = 25\text{A}$      | Terminal | -    | -    | 2.20          | V |
|                        |                                       |  |                         | Chip     | -    | 1.7  | -             | V |
| Forward voltage of FWD | $V_F$                                 | $I_F = 25\text{A}$                                 | Terminal                | -        | -    | 2.65 | V             |   |
|                        |                                       |  | Chip                    | -        | 2.1  | -    | V             |   |
| Brake                  | Collector Current at off signal input | $I_{CES}$  | $V_{CE} = 1200\text{V}$ | -        | -    | 1.0  | mA            |   |
|                        | Collector-Emitter saturation voltage  | $V_{CE(sat)}$                                      | $I_C = 15\text{A}$      | Terminal | -    | -    | 2.2           | V |
|                        |                                       |  |                         | Chip     | -    | 1.7  | -             | V |
| Forward voltage of FWD | $V_F$                                 | $I_F = 15\text{A}$                                 | Terminal                | -        | -    | 2.65 | V             |   |
|                        |                                       |  | Chip                    | -        | 2.1  | -    | V             |   |
| Switching time         | $t_{on}$                              | $V_{DC} = 600\text{V}$ , $T_j=125^{\circ}\text{C}$ |                         | 1.1      | -    | -    | $\mu\text{s}$ |   |
|                        | $t_{off}$                             | $I_C = 25\text{A}$                                 |                         | -        | -    | 2.1  | $\mu\text{s}$ |   |
|                        | $t_{rr}$                              | $V_{DC} = 600\text{V}$<br>$I_F = 25\text{A}$       |                         | -        | -    | 0.3  | $\mu\text{s}$ |   |

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● **Control circuit**

| Item   | Symbol                 | Conditions   | Min. | Typ. | Max. | Units |   |
|--|------------------------|--|------|------|------|-------|---|
| Supply current of P-side pre-driver (per one unit) | I <sub>ccp</sub>       | Switching Frequency = 0-15kHz<br>T <sub>c</sub> =-20~110°C | -    | -    | 10   | mA    |   |
| Supply current of N-side pre-driver                | I <sub>ccn</sub>       |  | -    | -    | 36   | mA    |   |
| Input signal threshold voltage                     | V <sub>inth(on)</sub>  | V <sub>in</sub> -GND                                       | ON   | 1.2  | 1.4  | 1.6   | V |
|  | V <sub>inth(off)</sub> |  | OFF  | 1.5  | 1.7  | 1.9   | V |

● **Protection Circuit**

| Item   | Symbol                 | Conditions   | Min. | Typ. | Max. | Units |
|--|------------------------|--|------|------|------|-------|
| Over Current Protection Level                        | I <sub>oc</sub>        | T <sub>j</sub> =125°C<br>Resistance Load                     | 50   | -    | -    | A     |
|  |                        |  | 30   | -    | -    | -     |
| Over Current Protection Delay time                   | t <sub>dOC</sub>       | T <sub>j</sub> =125°C  | -    | 5    | -    | μs    |
| Short Circuit Protection Delay time                  | t <sub>sc</sub>        | T <sub>j</sub> =125°C  | -    | 2    | 3    | μs    |
| IGBT Chips Over Heating Protection Temperature Level | T <sub>jOH</sub>       | Surface of IGBT Chips  | 150  | -    | -    | °C    |
| Over Heating Protection Hysteresis                   | T <sub>jH</sub>        |  | -    | 20   | -    | °C    |
| Under Voltage Protection Level                       | V <sub>UV</sub>        |  | 11.0 | -    | 12.5 | V     |
| Under Voltage Protection Hysteresis                  | V <sub>H</sub>         |  | 0.2  | 0.5  | -    | V     |
| Alarm Signal Hold Time                               | t <sub>ALM(OC)</sub>   | ALM-GND<br>T <sub>c</sub> =-20~110°C<br>V <sub>cc</sub> ≥10V | 1.0  | 2.0  | 2.4  | ms    |
|  | t <sub>ALM(UV)</sub>   |  | 2.5  | 4.0  | 4.9  | ms    |
|  | t <sub>ALM(TjOH)</sub> |  | 5.0  | 8.0  | 11.0 | ms    |
| Resistance for current limit                         | R <sub>ALM</sub>       |  | 960  | 1265 | 1570 | Ω     |

■ **Thermal Characteristics (T<sub>c</sub> = 25°C)**

| Item   | Symbol               | Min. | Typ. | Max. | Units |      |
|--|----------------------|------|------|------|-------|------|
| Junction to Case Thermal Resistance*10       | Inverter             | IGBT | -    | -    | 0.46  | °C/W |
|  |                      | FWD  | -    | -    | 0.8   | °C/W |
|  | Brake                | IGBT | -    | -    | 0.66  | °C/W |
|  |                      | FWD  | -    | -    | 1.07  | °C/W |
| Case to Fin Thermal Resistance with Compound | R <sub>th(c-f)</sub> | -    | 0.05 | -    | °C/W  |      |

\*10: For 1device , the measurement point of the case is just under the chip.

■ **Noise Immunity (V<sub>DC</sub>=600V, V<sub>CC</sub>=15V)**

| Item                          | Conditions   | Min. | Typ. | Max. | Units |
|-------------------------------|--|------|------|------|-------|
| Common mode rectangular noise | Pulse width 1μs,polarity ±,10min.<br>Judge: no over-current, no miss operating | ±2.0 | -    | -    | kV    |

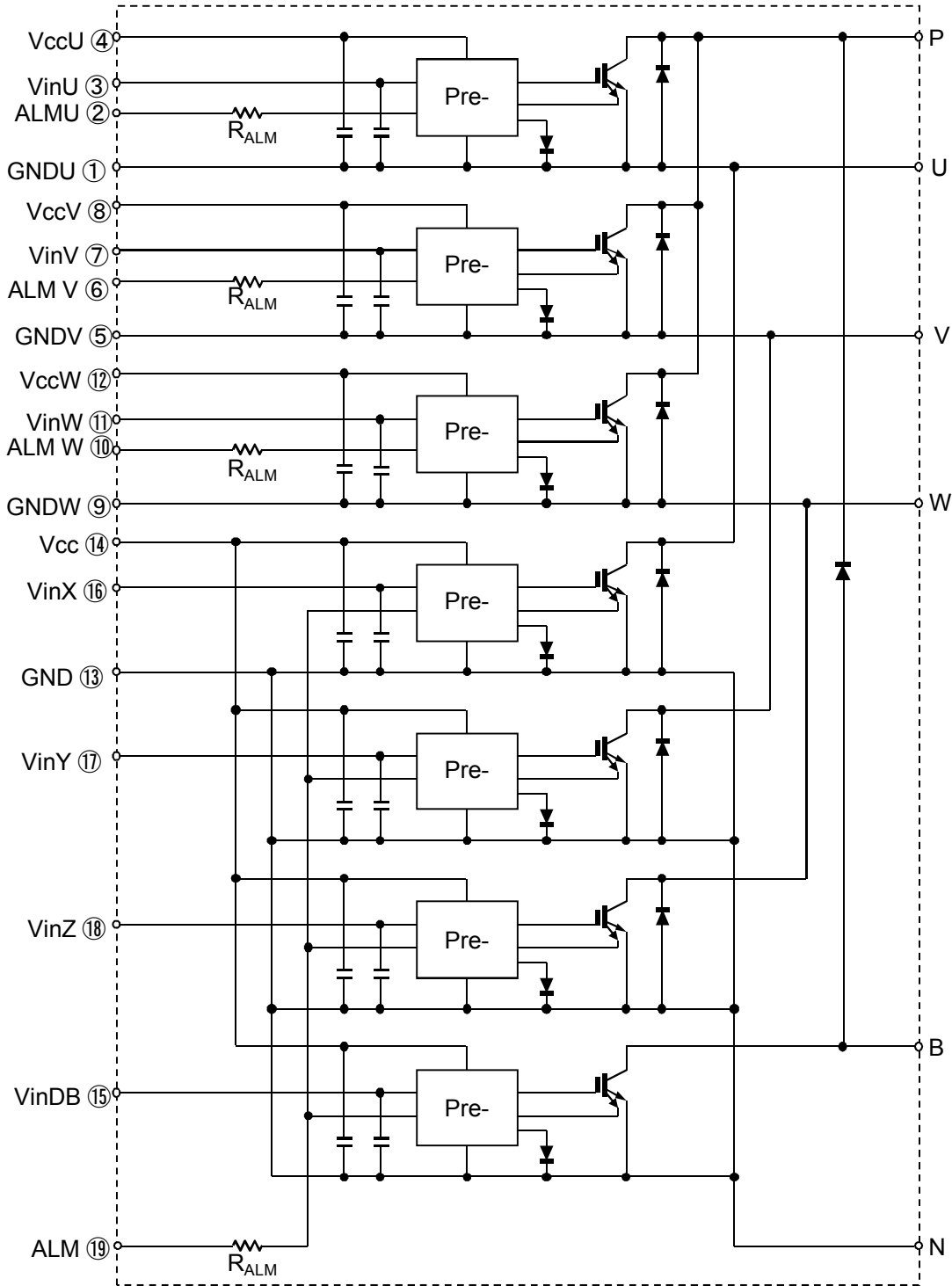
■ **Recommended Operating Conditions**

| Item   | Symbol            | Min. | Typ. | Max. | Units |
|--|-------------------|------|------|------|-------|
| DC Bus Voltage   | V <sub>DC</sub>   | -    | -    | 800  | V     |
| Power Supply Voltage of Pre-Driver                     | V <sub>CC</sub>   | 13.5 | 15.0 | 16.5 | V     |
| Switching frequency of IPM                             | f <sub>sw</sub>   | -    | -    | 20   | kHz   |
| Arm shoot through blocking time for IPM's input signal | t <sub>dead</sub> | 1.0  | -    | -    | μs    |
| Screw Torque (M4)                                      | -                 | 1.3  | -    | 1.7  | Nm    |

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## ■ Block Diagram



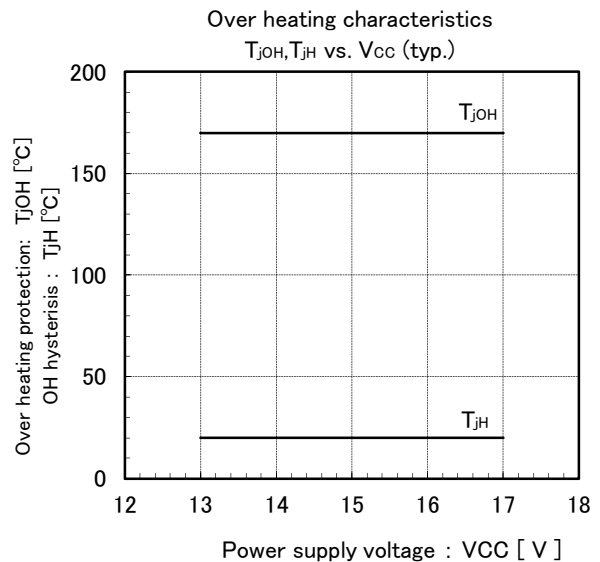
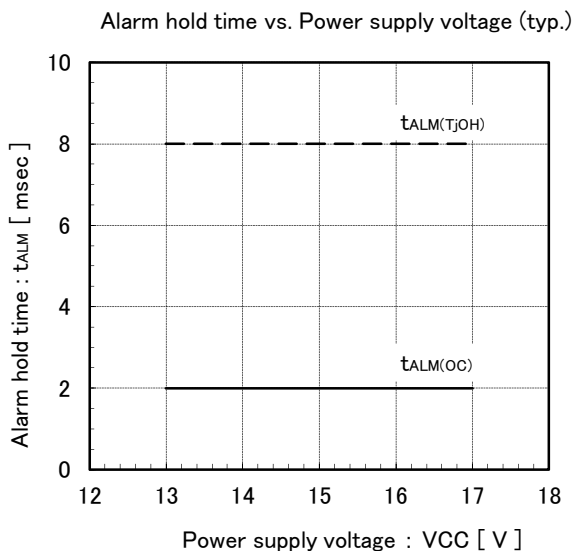
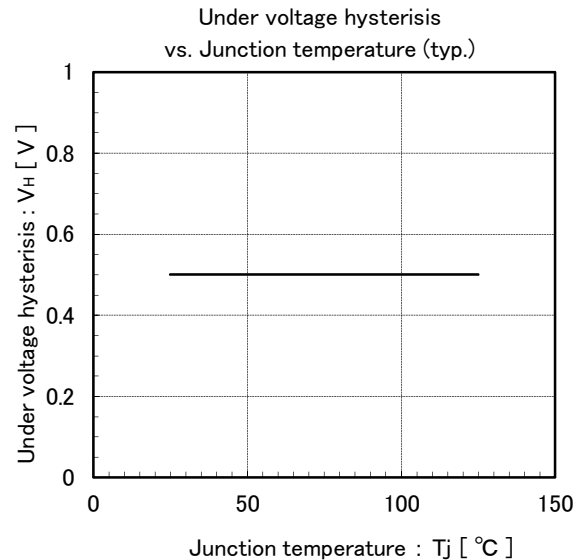
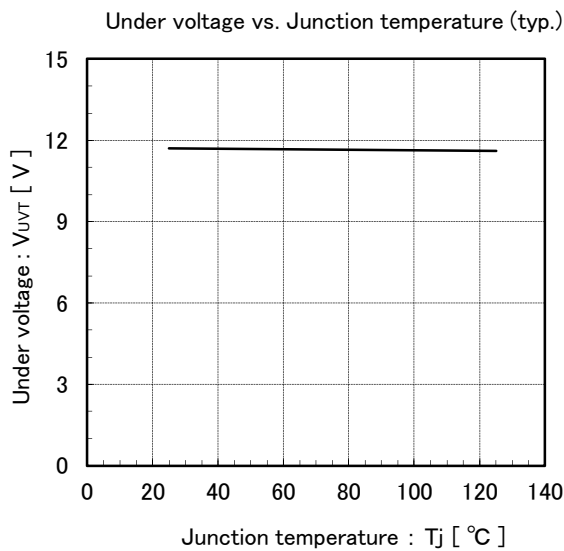
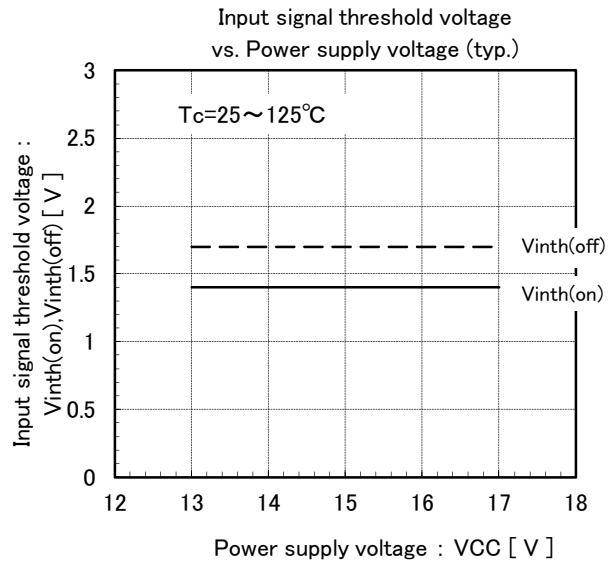
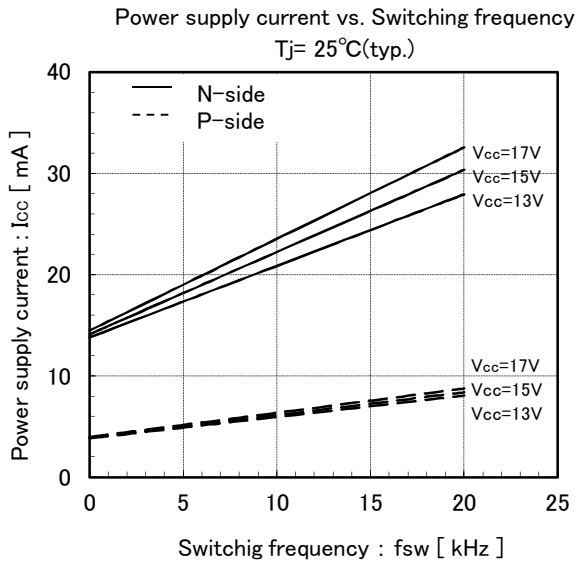
Pre-drivers include following functions

1. Amplifier for driver
2. Short circuit protection
3. Under voltage lockout circuit
4. Over current protection
5. IGBT chip over heating protection

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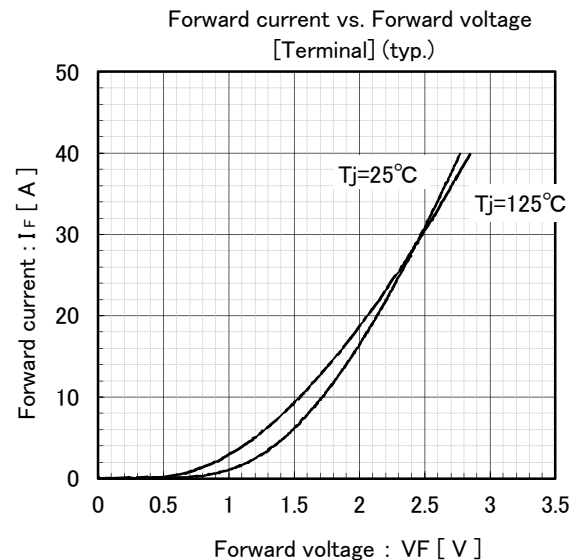
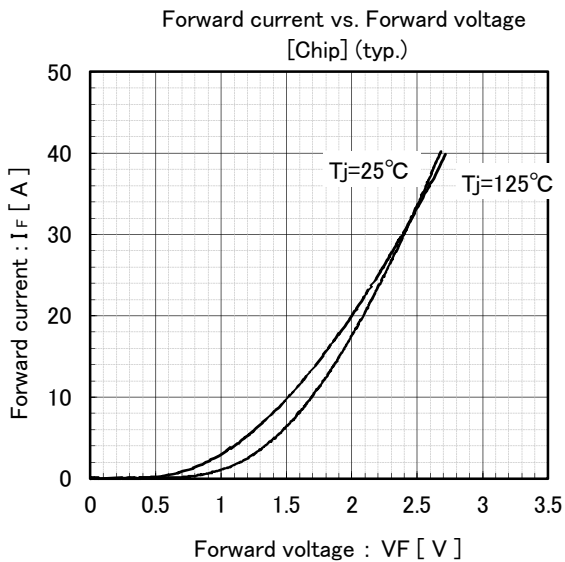
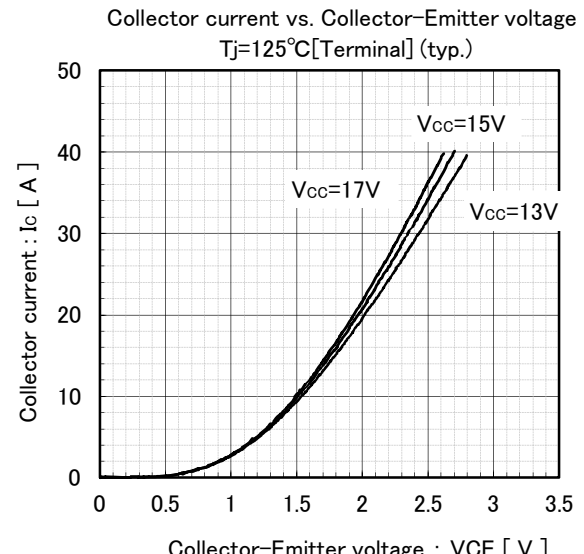
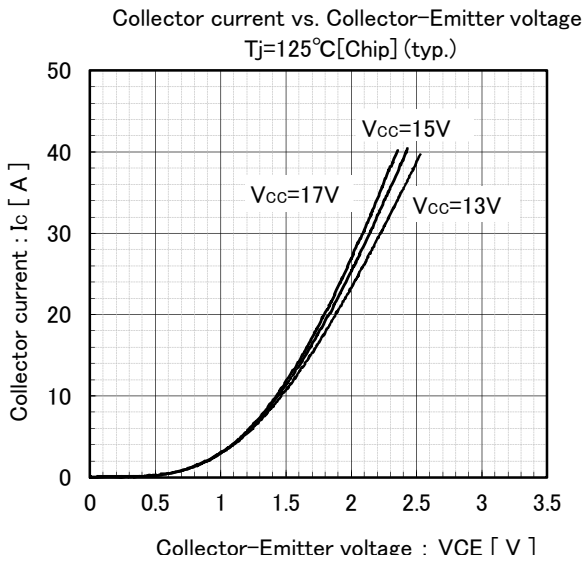
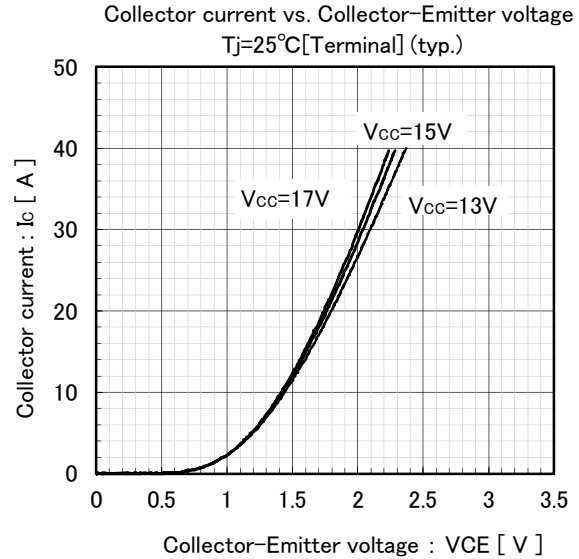
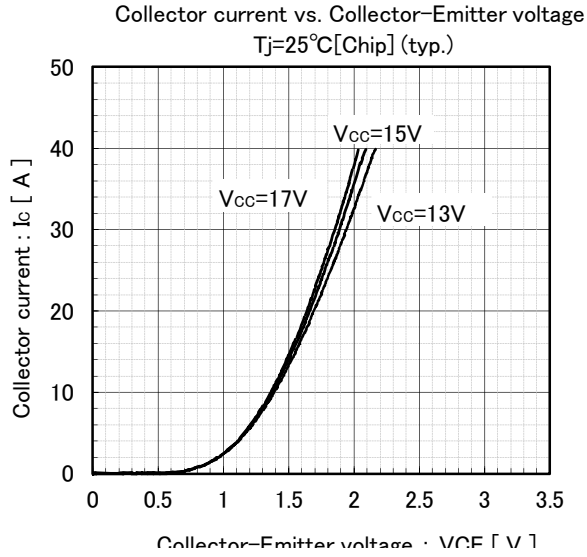
■ Characteristics (Representative)  
● Control Circuit



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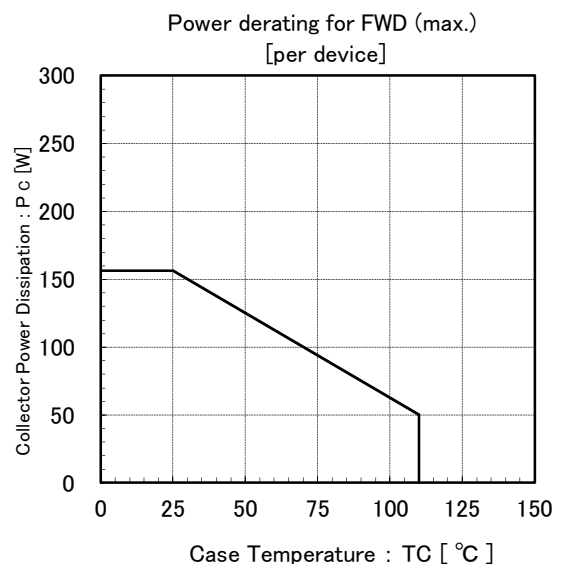
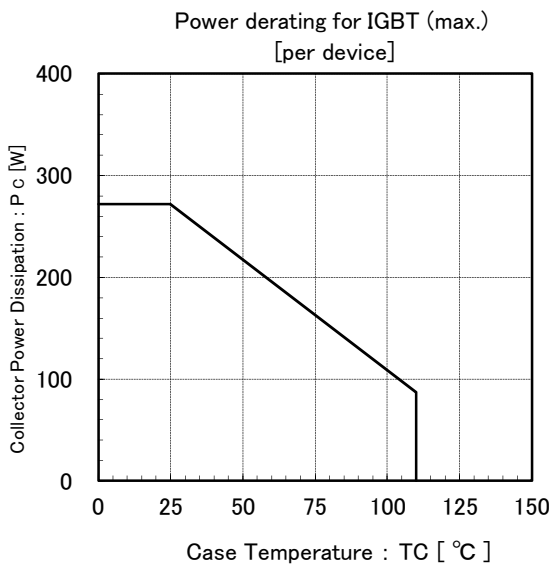
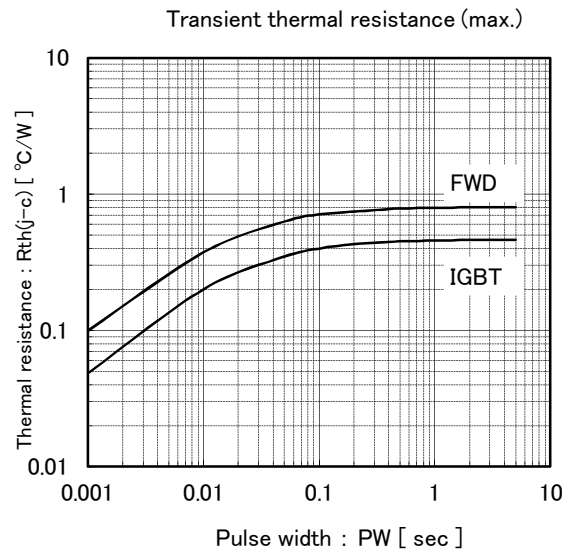
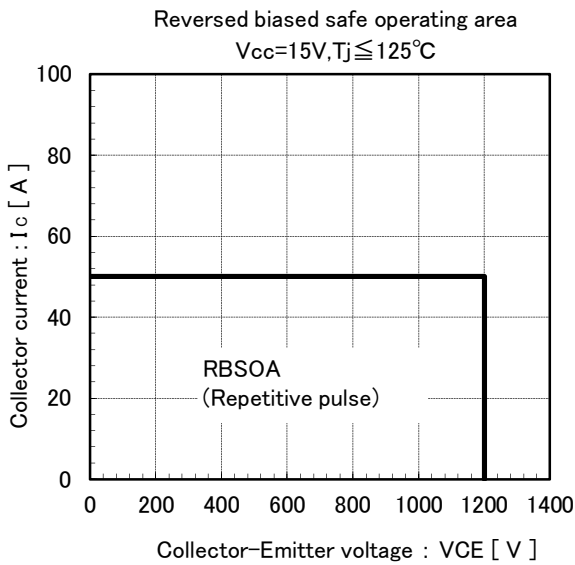
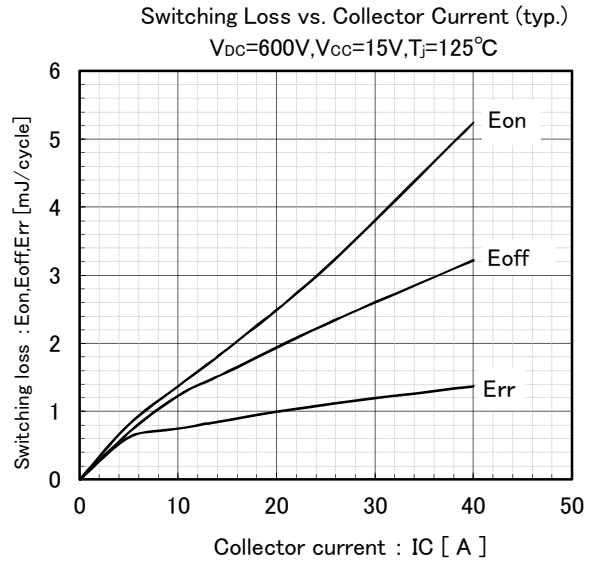
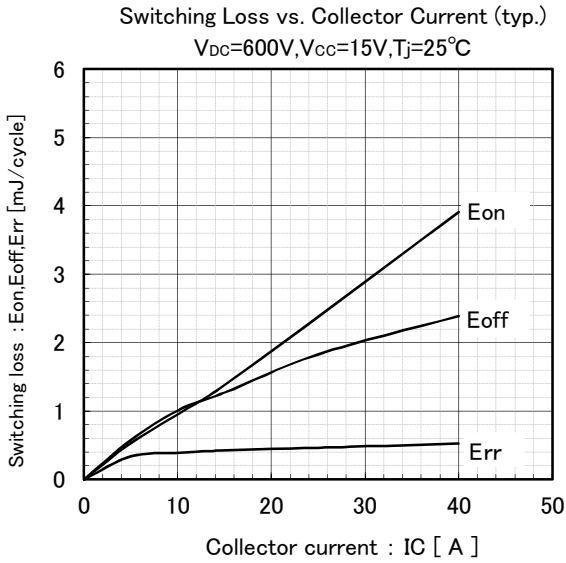
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● Inverter



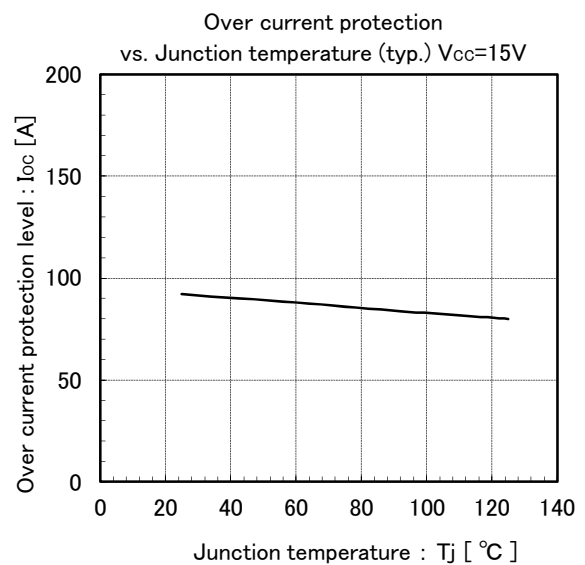
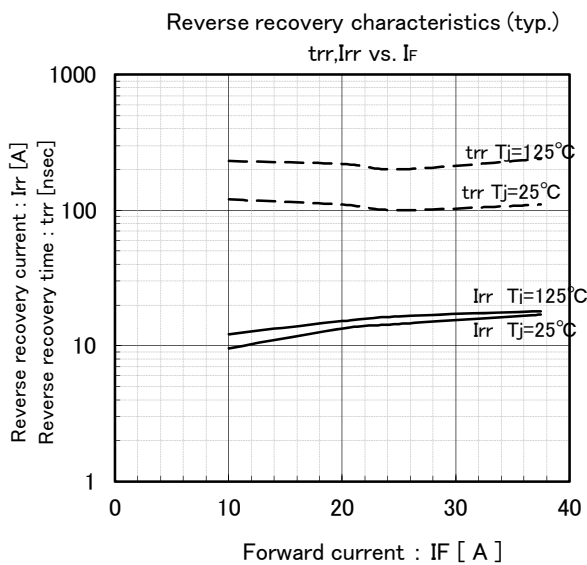
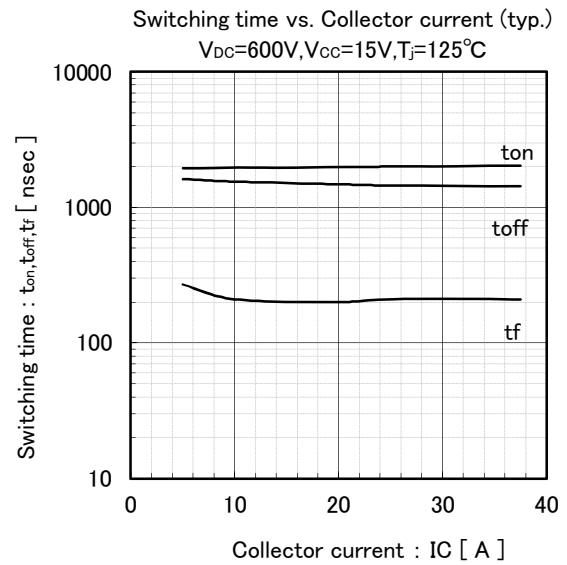
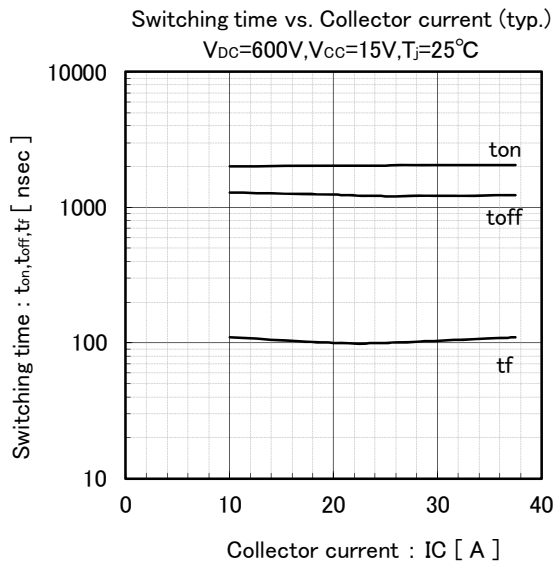
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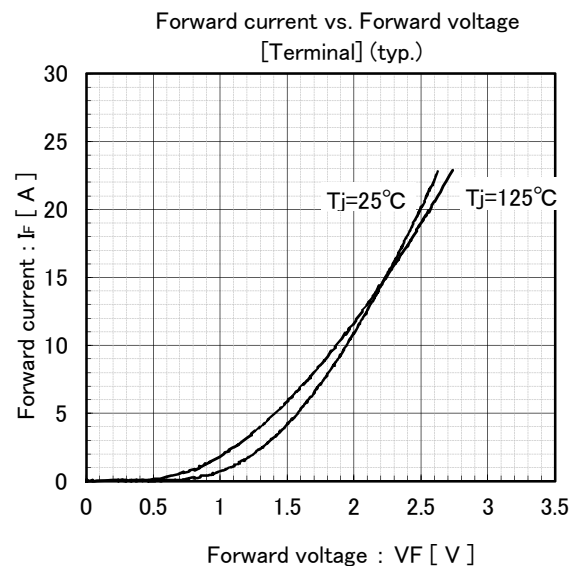
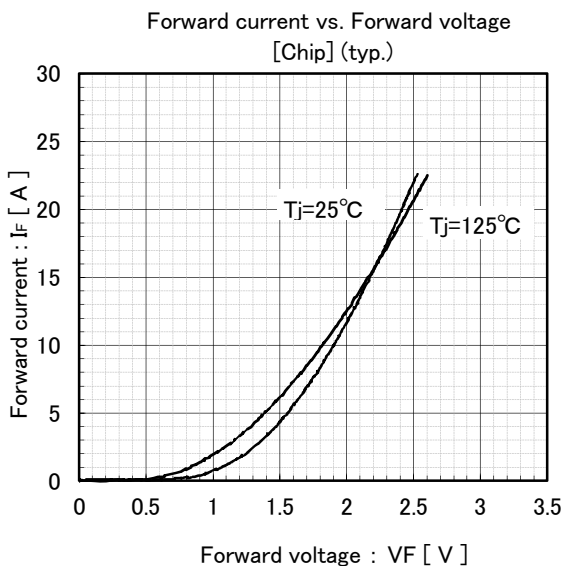
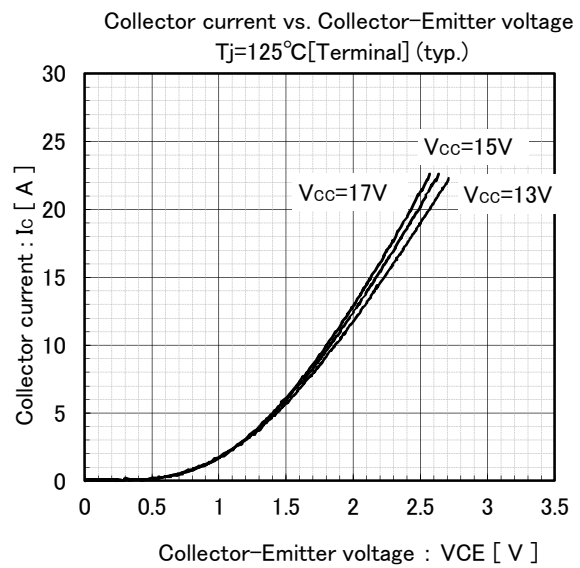
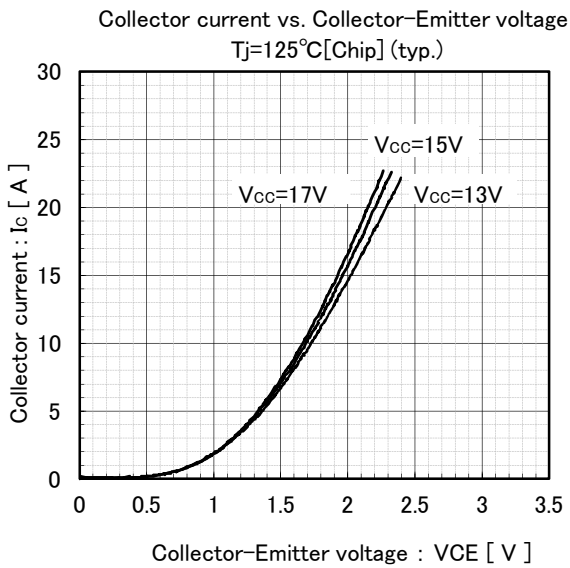
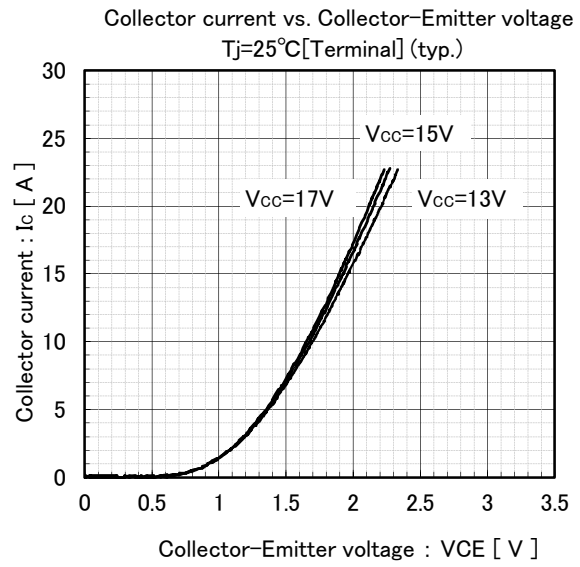
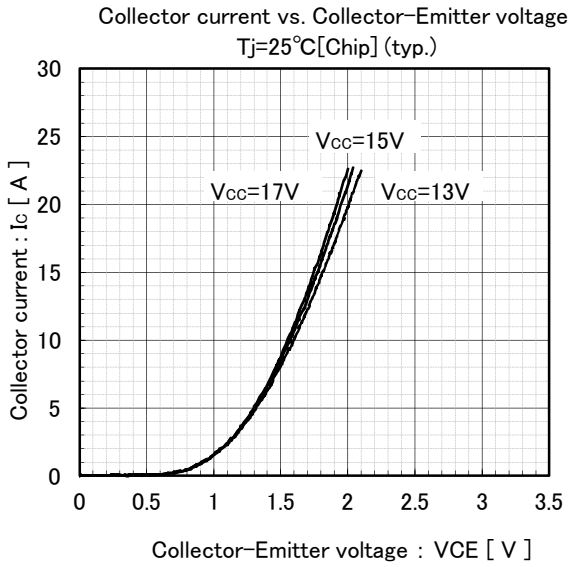




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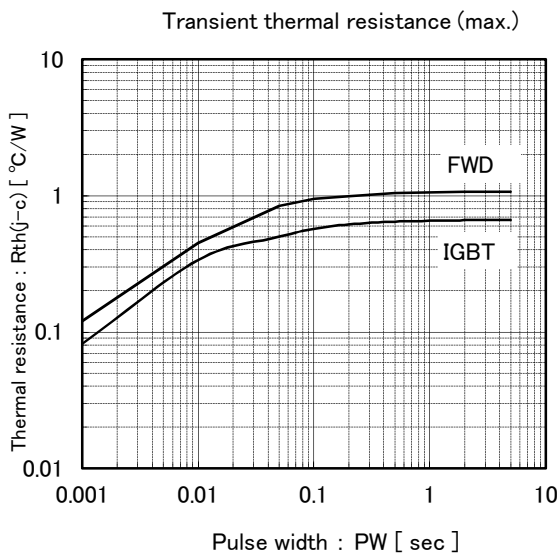
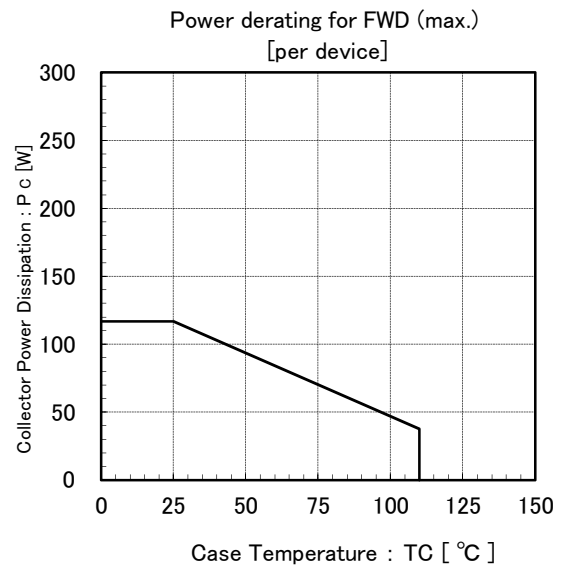
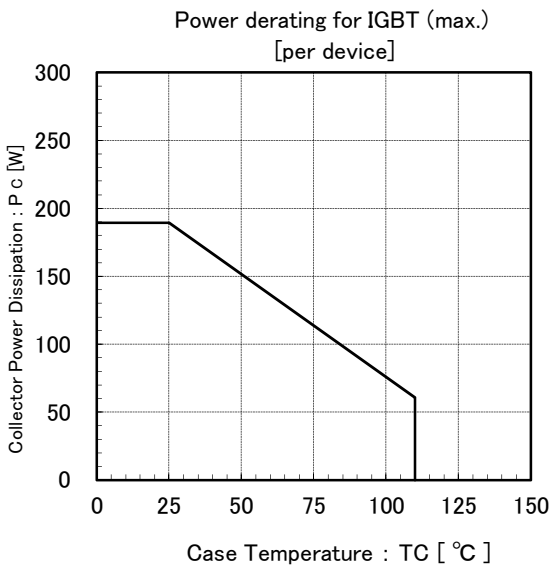
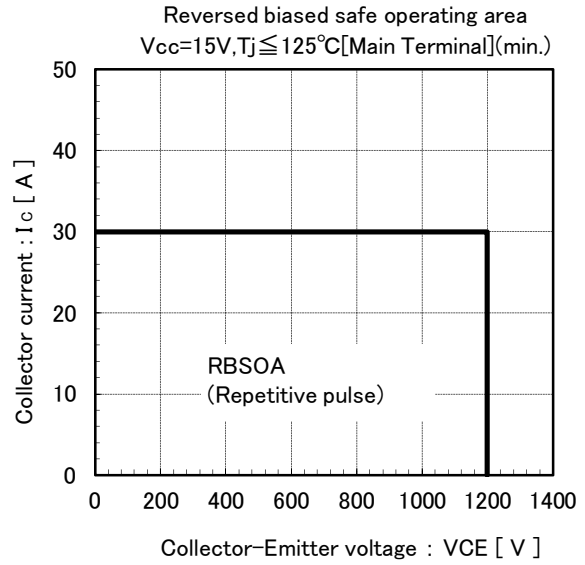
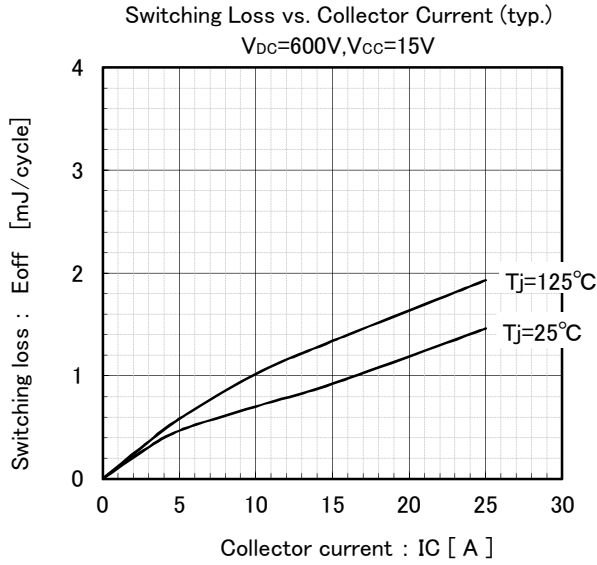
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■ Brake



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| 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>                                 |