

6MBP200VEA120-50

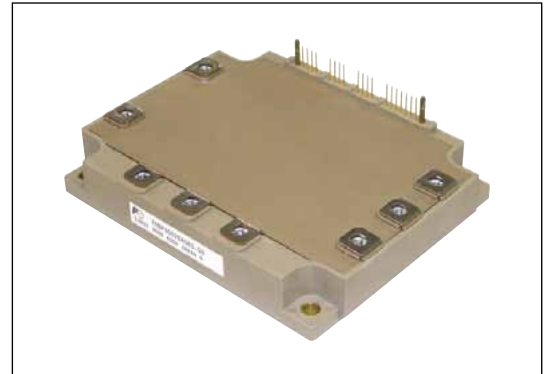
IGBT Modules

IGBT MODULE (V series)

1200V / 200A / IPM

■ Features

- Temperature protection provided by directly detecting the junction temperature of the IGBTs
- Low power loss and soft switching
- High performance and high reliability IGBT with overheating protection
- Higher reliability because of a big decrease in number of parts in built-in control circuit



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings (T_c=25°C, V_{cc}=15V 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 | I _c | - | 200 | A |
| | | 1ms | I _{CP} | - | 400 | A |
| | | Duty=100% (*2) | -I _c | - | 200 | A |
| Collector Power Dissipation | 1 device (*3) | P _c | - | 961 | W | |
| Brake | Collector Current | DC | I _c | - | - | A |
| | | 1ms | I _{CP} | - | - | A |
| | Forward Current of Diode | | I _F | - | - | A |
| | Collector Power Dissipation | 1 device (*3) | P _c | - | - | 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 | °C | | |
| Operating Case Temperature | T _{opr} | -20 | 110 | °C | | |
| Storage Temperature | T _{stg} | -40 | 125 | °C | | |
| Solder Temperature (*8) | T _{sol} | - | 260 | °C | | |
| Isolating Voltage (*9) | V _{iso} | - | AC2500 | Vrms | | |
| Screw Torque | Terminal (M5) | - | - | - | | |
| | Mounting (M5) | - | - | 3.5 | Nm | |

Note *1: V_{CEs} shall be applied to the input voltage between all Collector and Emitter.

[P1-(U,V,W,B) , P2-(U,V,W,B) , (U,V,W,B)-N1 , (U,V,W,B)-N2]

Note *2: Duty=125°C/R_{th(j-c)}D/(I_F×V_F Max.)×100

Note *3: P_c=125°C/R_{th(j-c)} (Inverter & Brake)

Note *4: V_{CC} shall be applied to the input voltage between terminal No.3 and 1, 7 and 5, 11 and 9, 14 and 13.

Note *5: V_{in} shall be applied to the input voltage between terminal No.2 and 1, 6 and 5, 10 and 9, 15~18 and 13.

Note *6: V_{ALM} shall be applied to the voltage between terminal No.4 and 1, 8 and 5, 12 and 9, 19 and 13.

Note *7: I_{ALM} shall be applied to the input current to terminal No.4, 8, 12 and 19.

Note *8: Immersion time 10±1sec. 1 time

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

● Electrical Characteristics (T_J=25°C, V_{cc}=15V unless otherwise specified)

| Items | | Symbol | Conditions | Min. | Typ. | Max. | Units | |
|--|--|--|---|---|------|------|-------|----|
| Inverter | Collector Current at off signal input | I _{CEs} | V _{CE} =1200V | - | - | 1.0 | mA | |
| | Collector-Emitter saturation voltage (*10) | V _{CE(sat)} | I _c =200A | Terminal | - | - | 2.30 | V |
| | | | | Chip | - | 1.70 | - | V |
| | Forward voltage of FWD (*10) | V _F | I _F =200A | Terminal | - | - | 2.75 | V |
| Chip | | | | - | 2.10 | - | V | |
| Brake | Collector Current at off signal input | I _{CEs} | - | - | - | - | mA | |
| | Collector-Emitter saturation voltage (*10) | V _{CE(sat)} | - | - | - | - | V | |
| | | | | - | - | - | V | |
| Forward voltage of FWD (*10) | V _F | - | - | - | - | V | | |
| | | | - | - | - | V | | |
| Switching time | t _{on} | V _{DC} =600V, T _J =125°C, I _c =200A | | 1.1 | - | - | μs | |
| | t _{off} | | | - | - | 2.1 | μs | |
| | t _{rr} | | | V _{DC} =600V, I _F =200A | - | - | 0.3 | μs |
| Supply current of P-side pre-driver (per one unit) | | I _{ccp} | Switching Frequency= 0-15kHz T _c =-20~110°C | - | - | 42 | mA | |
| Supply current of N-side pre-driver | | I _{ccn} | | - | - | 126 | mA | |
| Input signal threshold voltage | | V _{in(th)(on)} | V _{in} -GND | ON | 1.2 | 1.4 | 1.6 | V |
| | | V _{in(th)(off)} | | OFF | 1.5 | 1.7 | 1.9 | V |
| Over Current Protection Level | Inverter | I _{oc} | T _J =125°C | 300 | - | - | A | |
| | Brake | | | - | - | - | A | |
| Over Current Protection Delay time | | t _{dOC} | T _J =125°C | - | 5 | - | μs | |
| Short Circuit Protection Delay time | | t _{sc} | T _J =125°C | - | 2 | 3 | μs | |
| IGBT Chips Over Heating Protection Temperature Level | | T _{JOH} | Surface of IGBT Chips | 150 | - | - | °C | |
| Over Heating Protection Hysteresis | | T _{JH} | | - | 20 | - | °C | |
| Under Voltage Protection Level | | V _{UV} | | 11.0 | - | 12.5 | V | |
| Under Voltage Protection Hysteresis | | V _H | | 0.2 | 0.5 | - | V | |
| Alarm Signal Hold Time | | t _{ALM(OC)} | ALM-GND T _c =-20~110°C | V _{cc} ≥10V | 1.0 | 2.0 | 2.4 | ms |
| | | t _{ALM(UV)} | | | 2.5 | 4.0 | 4.9 | ms |
| | | t _{ALM(TJOH)} | | | 5.0 | 8.0 | 11.0 | ms |
| Resistance for current limit | | R _{ALM} | | 960 | 1265 | 1570 | Ω | |

Note *10: The Max value is a case where it measures from P2-(U,V,W,B) , (U,V,W,B)-N2.

● Thermal Characteristics (T_c = 25°C)

| Items | | | Symbol | Min. | Typ. | Max. | Units |
|--|----------|------|-----------------------|------|------|-------|-------|
| Junction to Case Thermal Resistance (*11) | Inverter | IGBT | R _{th(j-c)Q} | - | - | 0.130 | °C/W |
| | | FWD | R _{th(j-c)D} | - | - | 0.195 | °C/W |
| | Brake | IGBT | R _{th(j-c)Q} | - | - | - | °C/W |
| | | FWD | R _{th(j-c)D} | - | - | - | °C/W |
| Case to Fin Thermal Resistance with Compound | | | R _{th(c-f)} | - | 0.05 | - | °C/W |

Note *11: For 1device, the measurement point of the case is just under the chip.

● Noise Immunity (V_{DC}=600V, V_{cc}=15V)

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

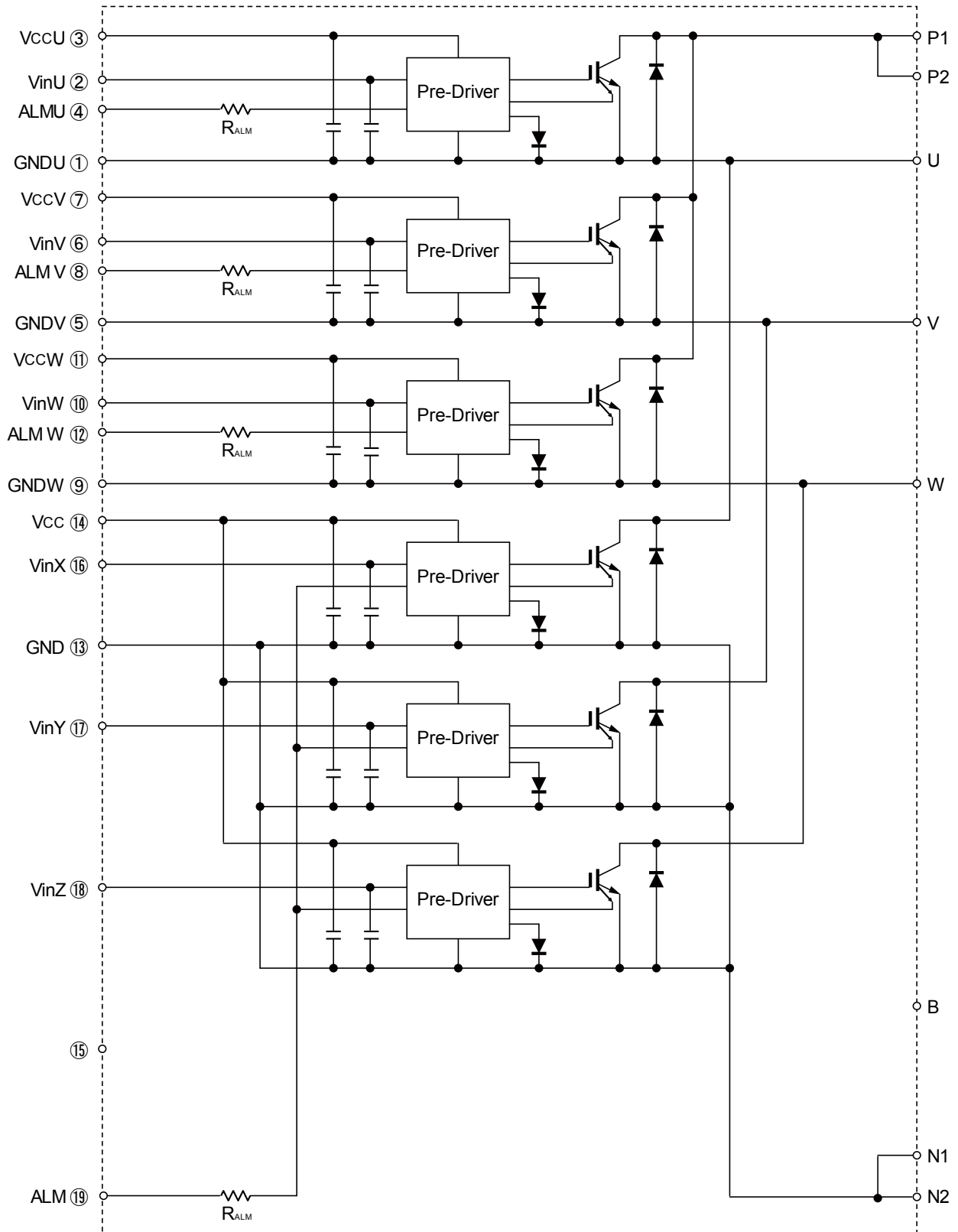
● Recommended Operating Conditions

| Items | Symbol | Min. | Typ. | Max. | Units |
|--|-------------------|------|------|------|-------|
| DC Bus Voltage | V _{DC} | - | - | 800 | V |
| Power Supply Voltage of Pre-Driver | V _{CC} | 13.5 | 15.0 | 16.5 | V |
| Switching frequency of IPM | f _{sw} | - | - | 20 | kHz |
| Arm shoot through blocking time for IPM's input signal | t _{dead} | 1.0 | - | - | μs |
| Screw Torque (M5) | - | 2.5 | - | 3.5 | Nm |

● Weight

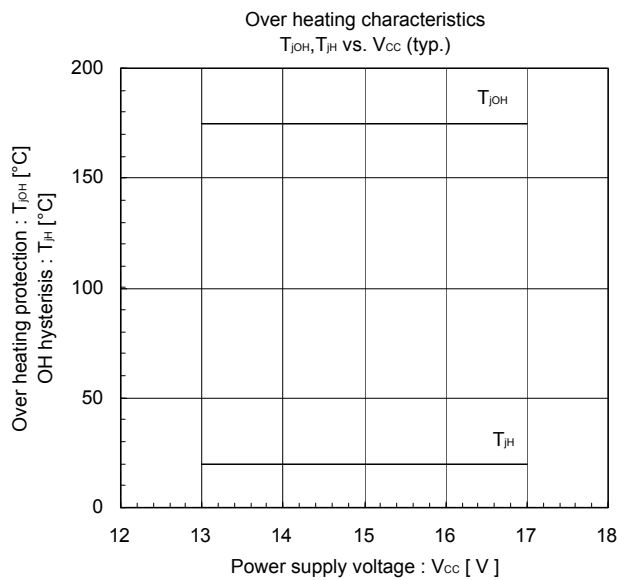
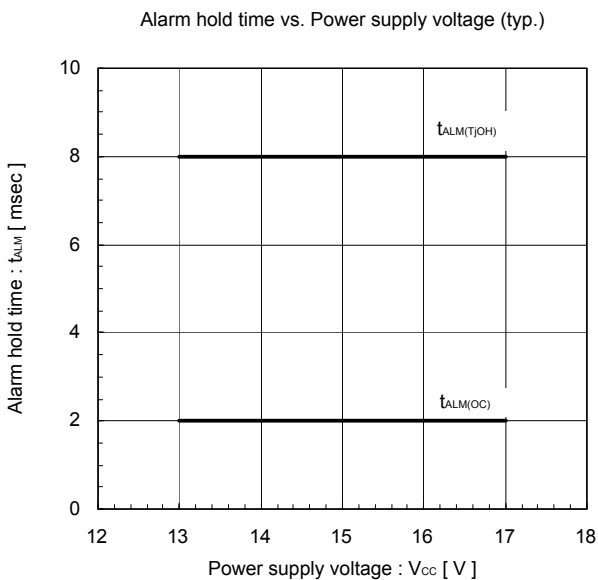
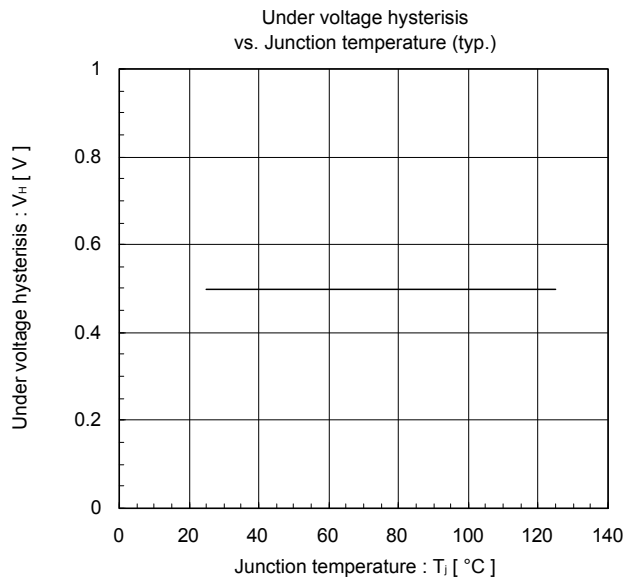
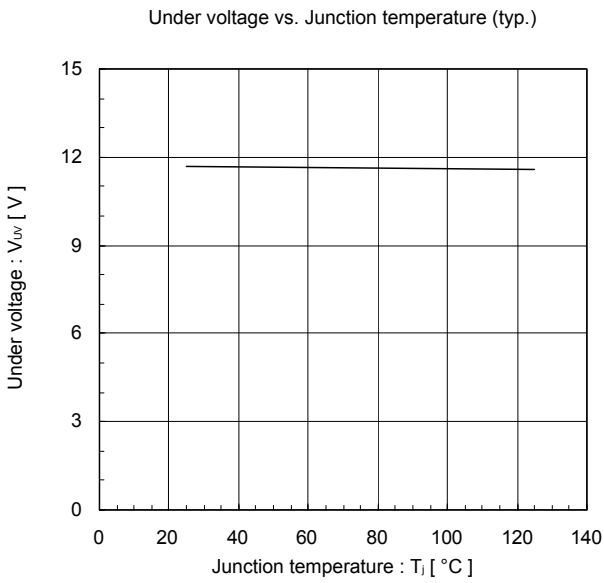
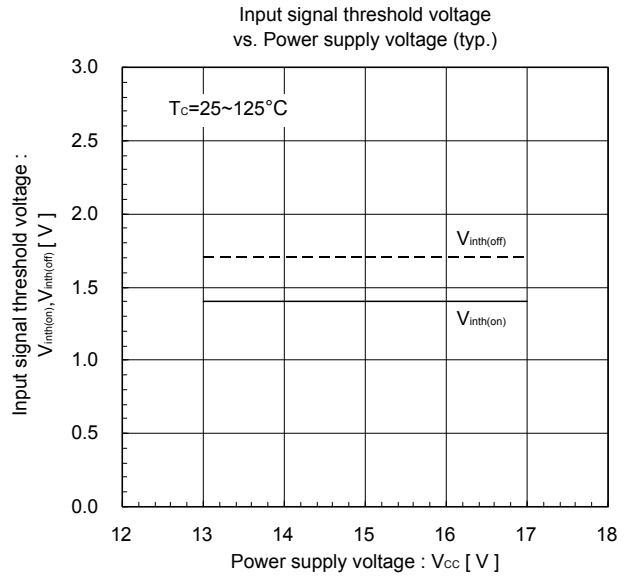
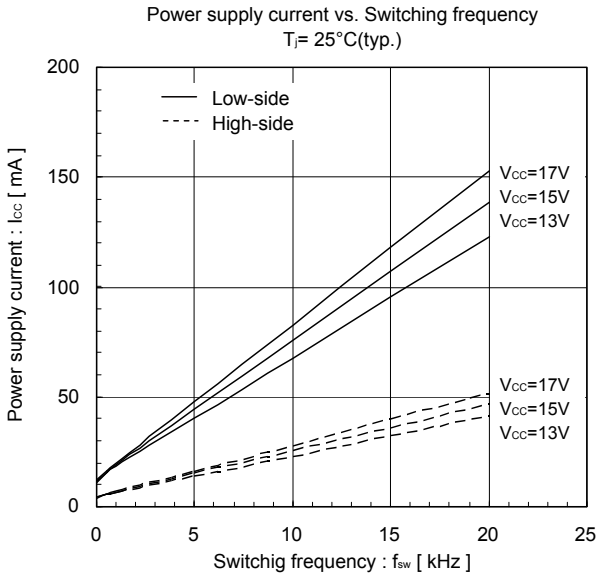
| Items | Symbol | Min. | Typ. | Max. | Units |
|--------|----------------|------|------|------|-------|
| Weight | W _t | - | 980 | - | g |

■ Block Diagram



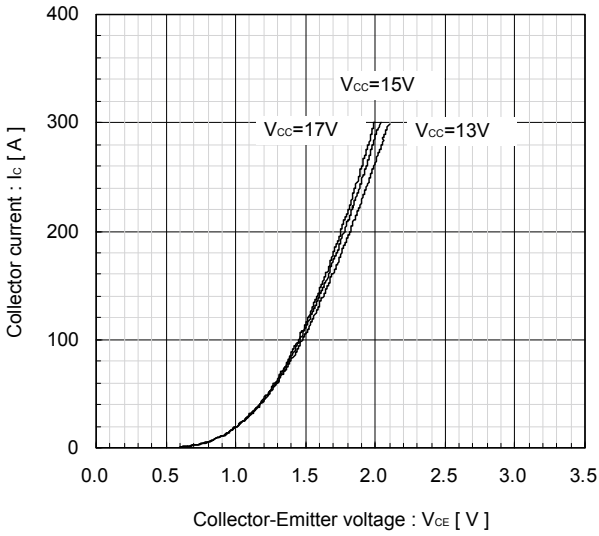
- Pre-drivers include following functions
1. Amplifier for driver
 2. Short circuit protection
 3. Under voltage lockout circuit
 4. Over current protection
 5. IGBT chip over heating protection

■ Characteristics (Representative)

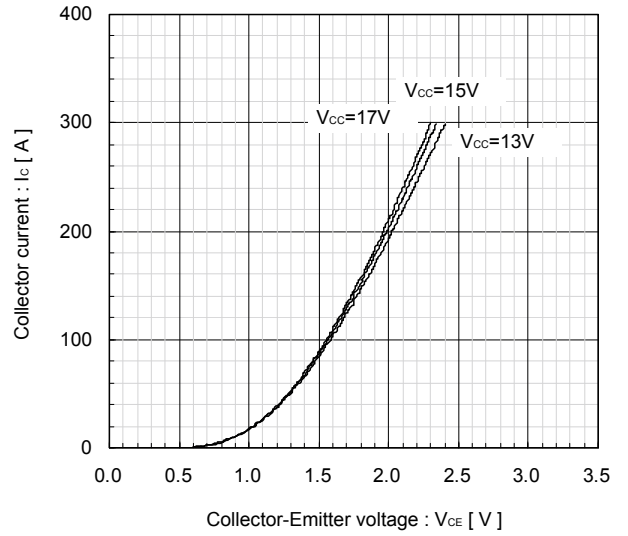


Inverter

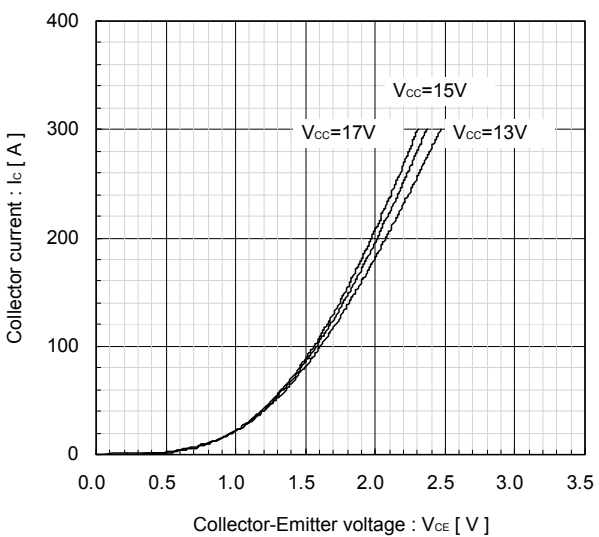
Collector current vs. Collector-Emitter voltage
 $T_J=25^\circ\text{C}$ [Chip] (typ.)



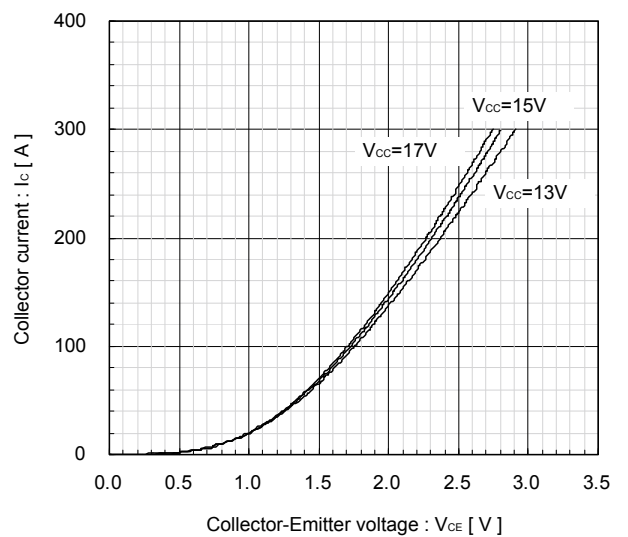
Collector current vs. Collector-Emitter voltage
 $T_J=25^\circ\text{C}$ [Terminal] (typ.)



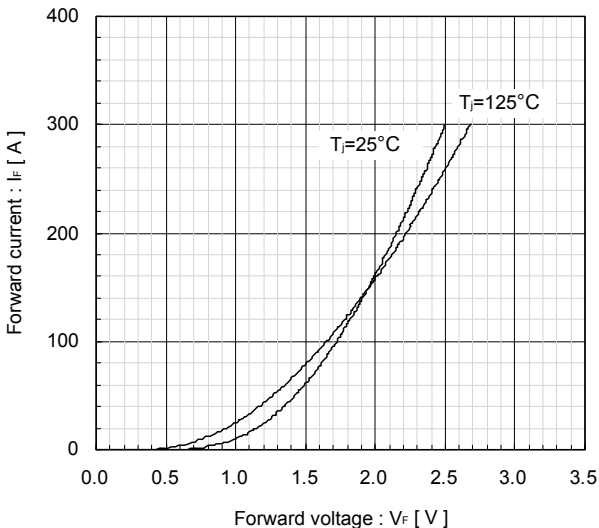
Collector current vs. Collector-Emitter voltage
 $T_J=125^\circ\text{C}$ [Chip] (typ.)



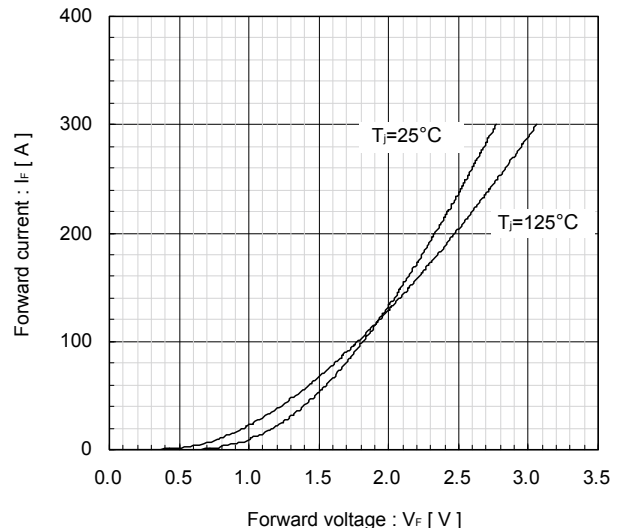
Collector current vs. Collector-Emitter voltage
 $T_J=125^\circ\text{C}$ [Terminal] (typ.)



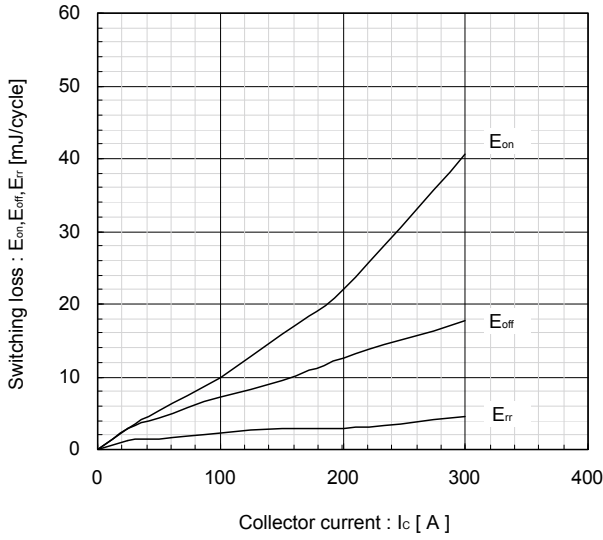
Forward current vs. Forward voltage
 [Chip] (typ.)



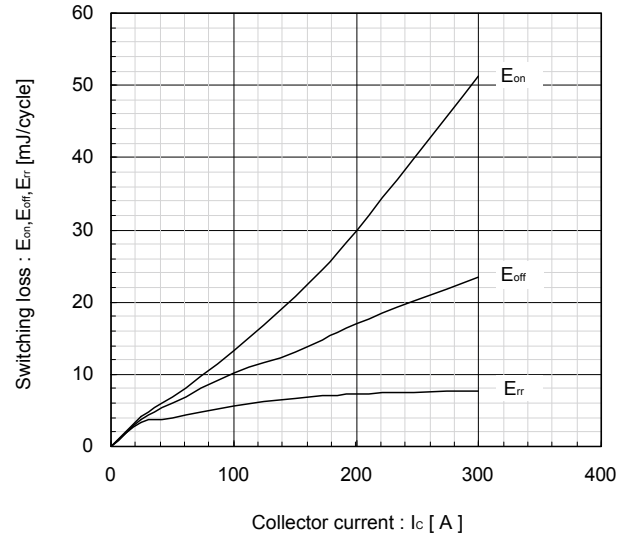
Forward current vs. Forward voltage
 [Terminal] (typ.)



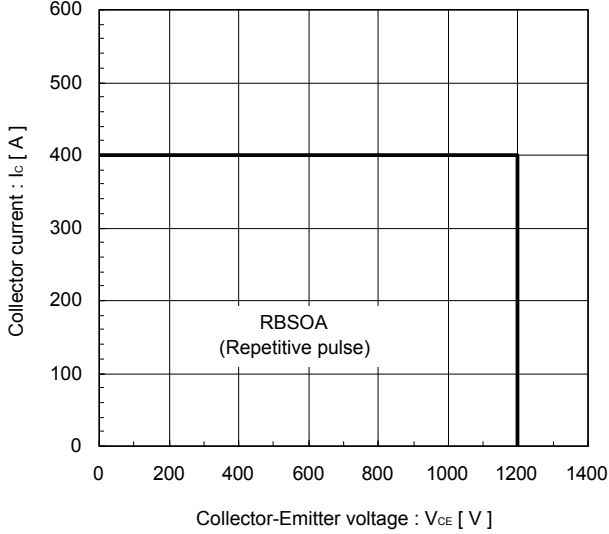
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_j=25^\circ C$



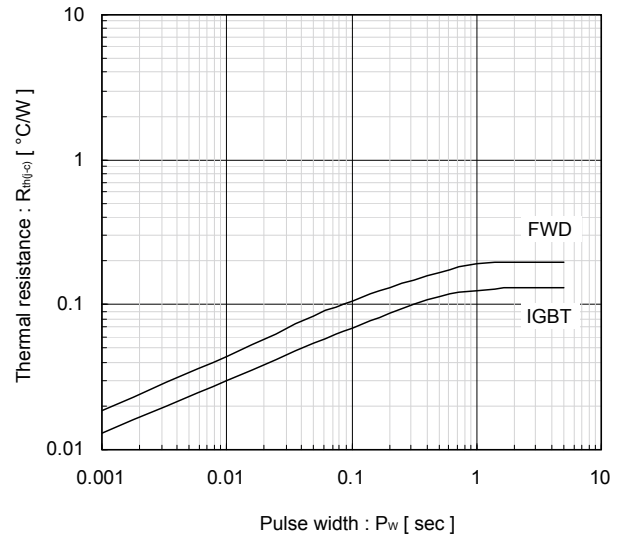
Switching Loss vs. Collector Current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_j=125^\circ C$



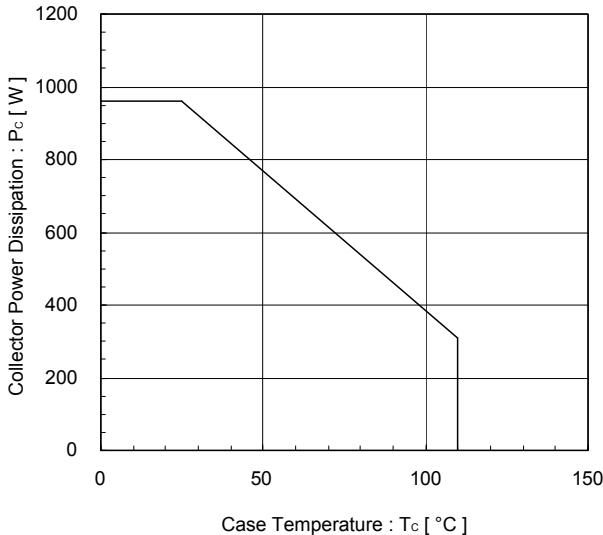
Reversed biased safe operating area
 $V_{CC}=15V, T_j \le 125^\circ C$ [Main Terminal] (min.)



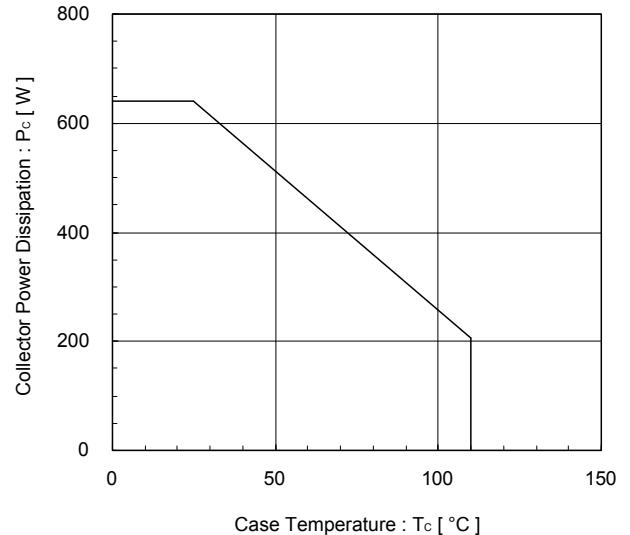
Transient thermal resistance (max.)



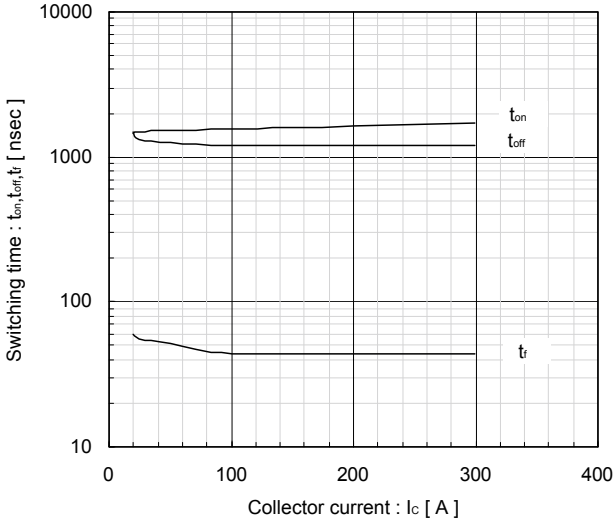
Power derating for IGBT (max.)
 [per device]



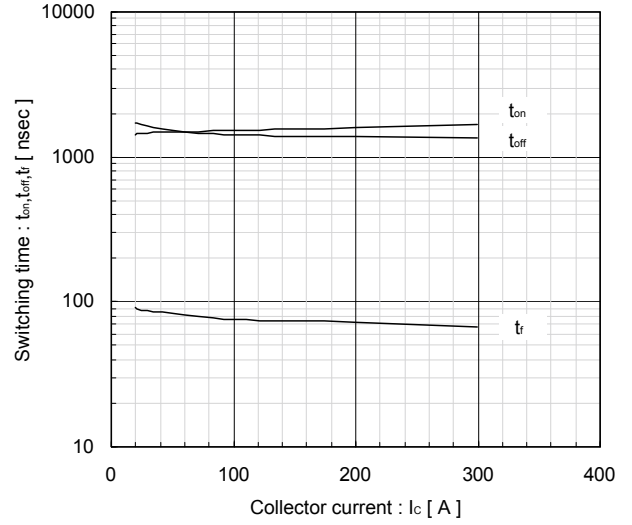
Power derating for FWD (max.)
 [per device]



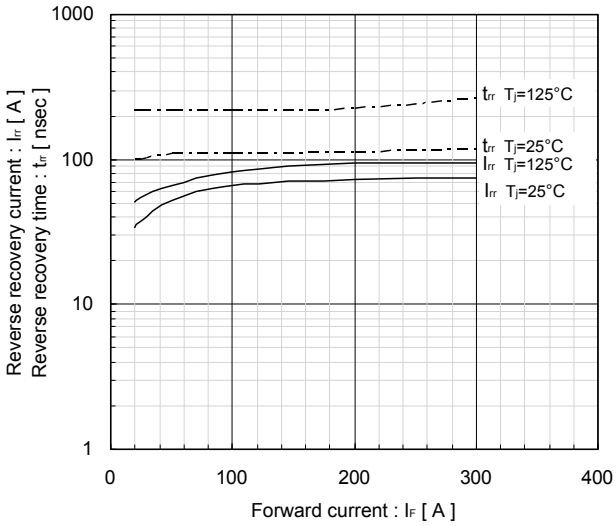
Switching time vs. Collector current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=25^\circ C$



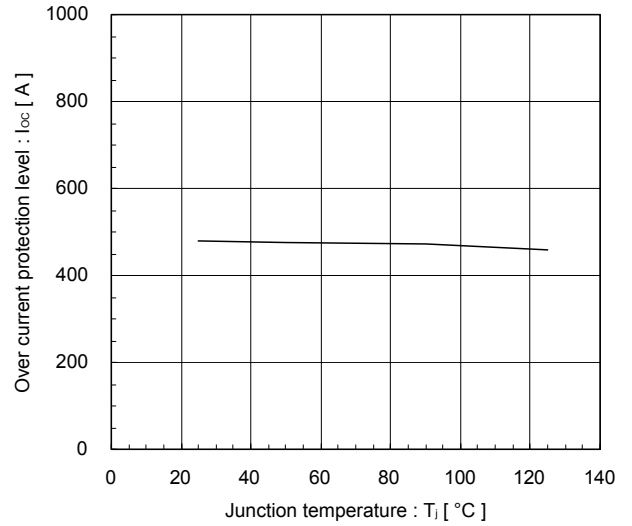
Switching time vs. Collector current (typ.)
 $V_{DC}=600V, V_{CC}=15V, T_J=125^\circ C$



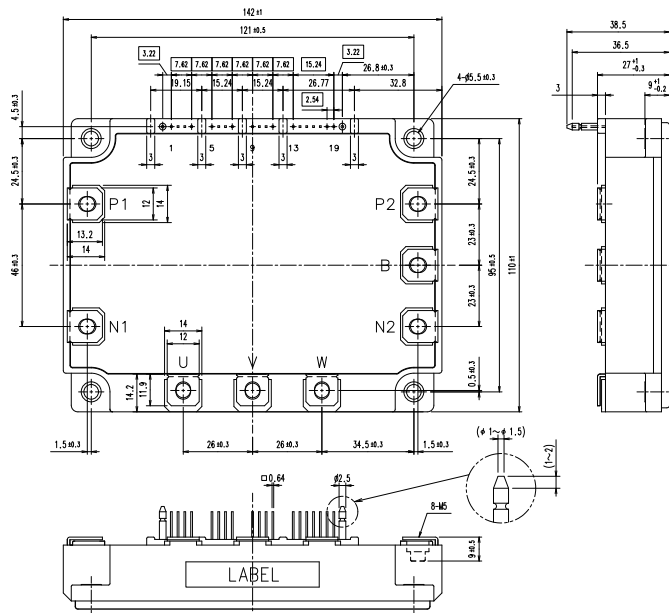
Reverse recovery characteristics (typ.)
 t_{rr}, I_{rr} vs. I_F



Over current protection vs. Junction temperature (typ.)
 $V_{CC}=15V$



■ Outline Drawings, mm



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