# 2MBI1000VXB-170EA-50

IGBT Modules

## IGBT MODULE (V series)
## 1700V / 1000A / 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 | $V_{CES}$ | | | 1700 | V |
| | Gate-Emitter voltage | $V_{GES}$ | | | ±20 | V |
| | Collector current | Ic | Continuous | Tc=25°C | 1400 | A |
| | | | | Tc=100°C | 1000 | |
| | | Ic pulse | 1ms | | 2000 | |
| | | -Ic | | | 1400 | |
| | | -Ic pulse | 1ms | | 2800 | |
| | Collector power dissipation | Pc | 1 device | | 6250 | W |
| Junction temperature | | Tj | | | 175 | °C |
| Operating junction temperature (under switching conditions) | | $T_{jop}$ | | | 150 | |
| Case temperature | | $T_C$ | | | 150 | |
| Storage temperature | | $T_{stg}$ | | | -40 ~ +150 | |
| Isolation voltage | between terminal and copper base (*1) | $V_{iso}$ | AC : 1min. | | 4000 | VAC |
| | between thermistor and others (*2) | | | | | |
| Screw torque (*3) | Mounting | - | M5 | | 6.0 | N m |
| | Main Terminals | | M8 | | 10.0 | |
| | Sense Terminals | | M4 | | 2.1 | |

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 : Mounting 3.0 ~ 6.0 Nm (M5) Recommendable Value : Main Terminals 8.0 ~ 10.0 Nm (M8)
Recommendable Value : Sense Terminals 1.8 ~ 2.1 Nm (M4)

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

| Items | | Symbols | Conditions | | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|---|---|
| Inverter | Zero gate voltage collector current | $I_{CES}$ | $V_{GE}$ = 0V, $V_{CE}$ = 1700V | | - | - | 6.0 | mA |
| | Gate-Emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | - | - | 1200 | nA |
| | Gate-Emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}$ = 20V, $I_C$ = 1000mA | | 6.0 | 6.5 | 7.0 | V |
| | Collector-Emitter saturation voltage | $V_{CE(sat)}$ (terminal) (*4) | $V_{GE}$ = 15V, $I_C$ = 1000A | Tj=25°C | - | 2.10 | 2.55 | V |
| | | | | Tj=125°C | - | 2.50 | - | |
| | | | | Tj=150°C | - | 2.60 | - | |
| | | $V_{CE(sat)}$ (chip) | | Tj=25°C | - | 2.00 | 2.45 | |
| | | | | Tj=125°C | - | 2.40 | - | |
| | | | | Tj=150°C | - | 2.50 | - | |
| | Internal gate resistance | $R_{g(int)}$ | | | - | 2.00 | - | Ω |
| | Input capacitance | Cies | $V_{CE}$ = 10V, $V_{GE}$ = 0V, f = 1MHz | | - | 94 | - | nF |
| | Turn-on time | ton | $V_{CC}$ = 900V, $I_C$ = 1000A, $V_{GE}$ = ±15V, $R_G$ = +1.2/-1.2Ω, Ls=60nH | | - | 1700 | - | nsec |
| | | tr | | | - | 500 | - | |
| | | tr (i) | | | - | 150 | - | |
| | Turn-off time | toff | | | - | 1600 | - | |
| | | tf | | | - | 110 | - | |
| | Forward on voltage | $V_F$ (terminal) (*4) | $V_{GE}$ = 0V, $I_F$ = 1000A | Tj=25°C | - | 1.75 | 2.20 | V |
| | | | | Tj=125°C | - | 1.90 | - | |
| | | | | Tj=150°C | - | 1.85 | - | |
| | | $V_F$ (chip) | | Tj=25°C | - | 1.65 | 2.10 | |
| | | | | Tj=125°C | - | 1.80 | - | |
| | | | | Tj=150°C | - | 1.75 | - | |
| | Reverse recovery time | trr | $I_F$ = 1000A | | - | 300 | - | nsec |
| 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 |

Note *4: Please refer to page 6 , there is definition of on-state voltage at terminal.

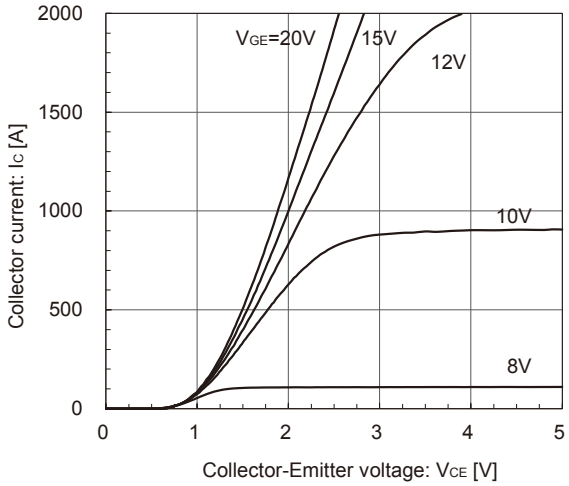
● **Thermal resistance characteristics**

| Items | Symbols | Conditions | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|
| Thermal resistance (1device) | Rth(j-c) | Inverter IGBT | - | - | 0.024 | °C/W |
| | | Inverter FWD | - | - | 0.032 | |
| Contact thermal resistance (1device) (*5) | Rth(c-f) | with Thermal Compound | - | 0.0083 | - | |

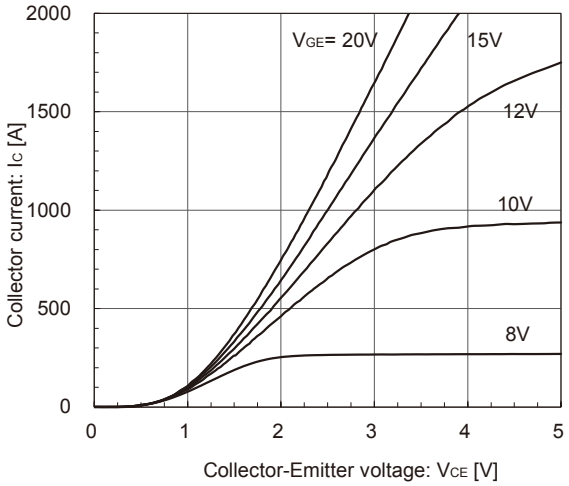
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

## ■ Characteristics (Representative)

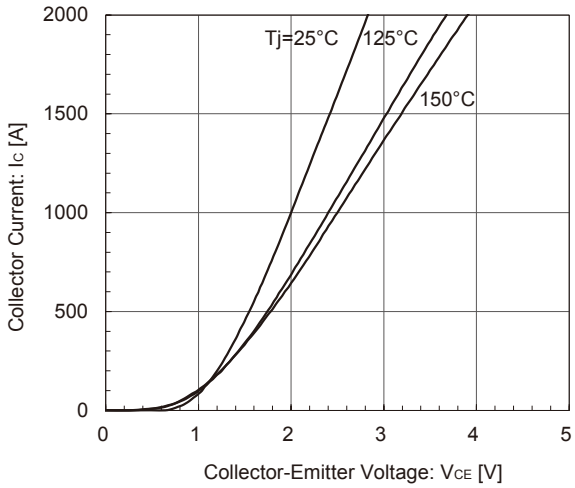
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



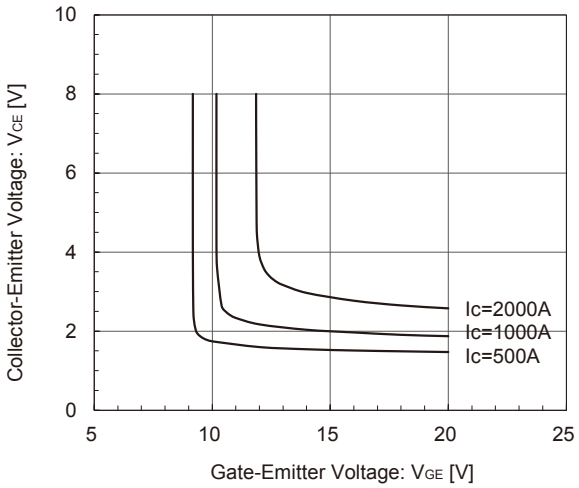

[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



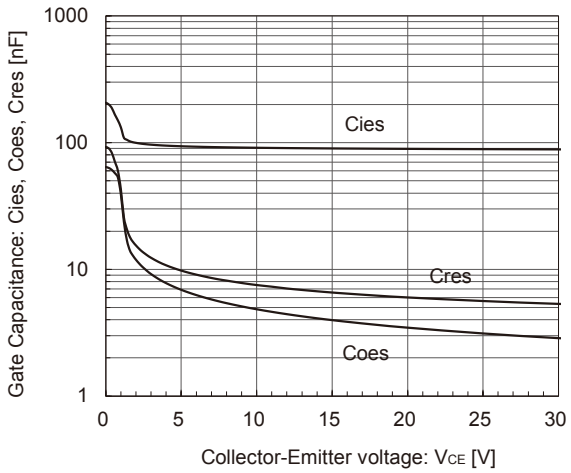

[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
VGE= 15V / chip



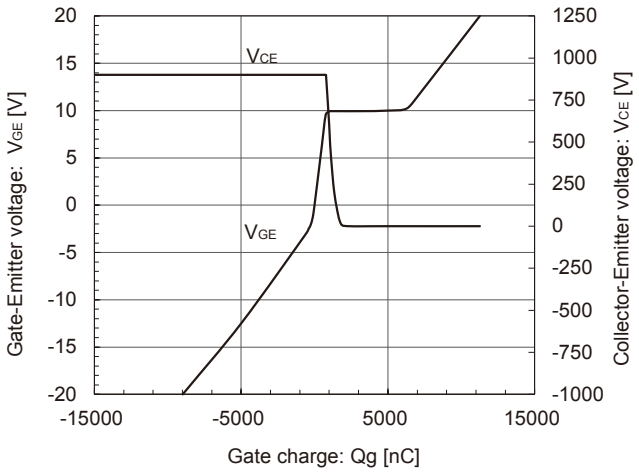

[INVERTER]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



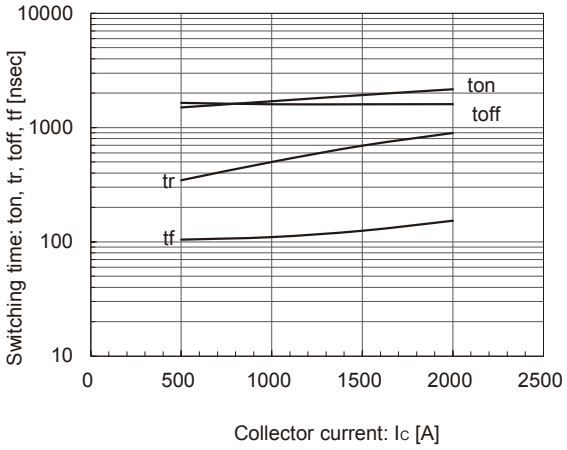

[INVERTER]
Gate Capacitance vs. Collector-Emitter Voltage (typ.)
VGE= 0V, $f$= 1MHz, Tj= 25°C



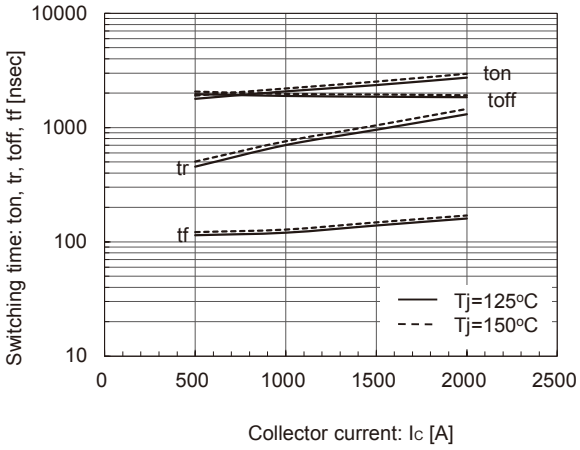

[INVERTER]
Dynamic Gate Charge (typ.)
Vcc=900V, Ic=1000A, Tj= 25°C



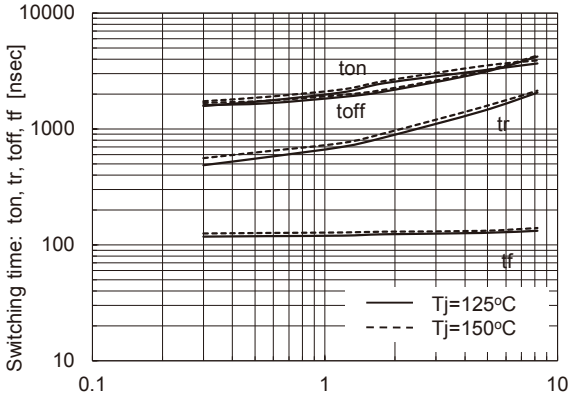
[INVERTER]
Switching time vs. Collector current (typ.)
Vcc=900V, $V_{GE}$=±15V, Rg=+1.2/-1.2Ω, Tj=25°C



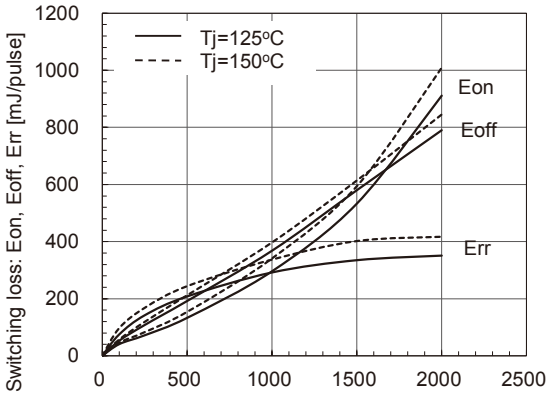

[INVERTER]
Switching time vs. Collector current (typ.)
Vcc=900V, $V_{GE}$=±15V, Rg=+1.2/-1.2Ω, Tj=125°C, 150°C



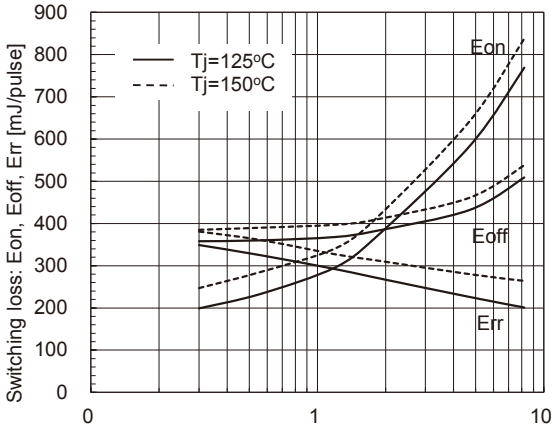

[INVERTER]
Switching time vs. Gate resistance (typ.)(b)
Vcc=900V, Ic=1000A, $V_{GE}$=±15V, Tj=125°C, 150°C



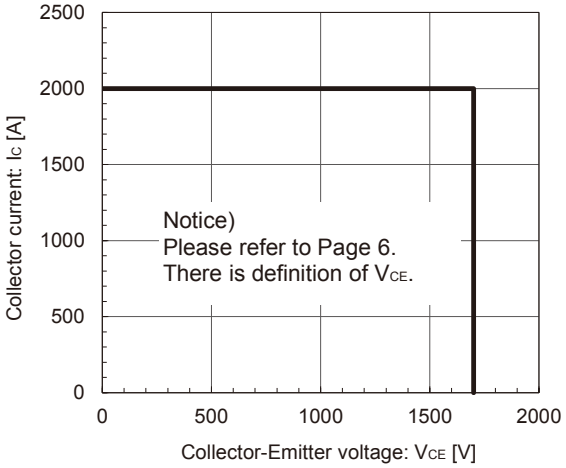

[INVERTER]
Switching loss vs. Collector current (typ.)
Vcc=900V, $V_{GE}$=±15V, Rg=+1.2/-1.2Ω, Tj=125°C, 150°C




[INVERTER]
Switching loss vs. Gate resistance (typ.)
Vcc=900V, Ic=1000A, $V_{GE}$=±15V, Tj=125°C, 150°C

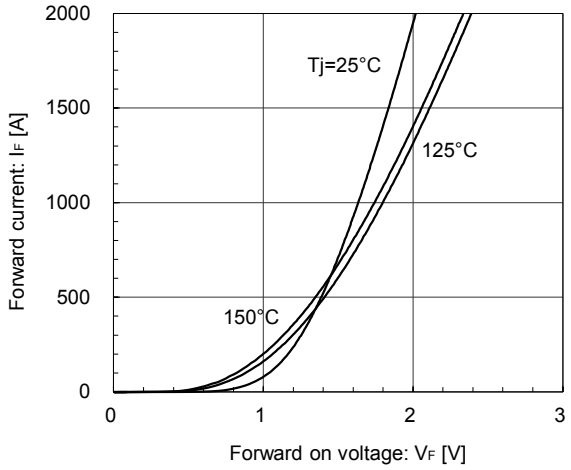



[INVERTER]
Reverse bias safe operating area (max.)
+$V_{GE}$=15V, -$V_{GE}$=15V, Rg=+1.2/-1.2Ω, Tj=150°C



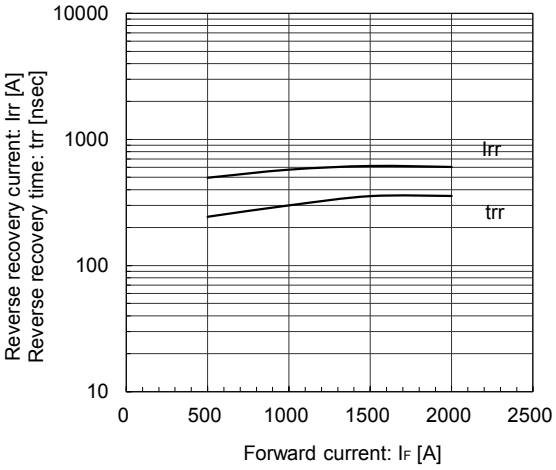
[INVERTER]

Forward Current vs. Forward Voltage (typ.)
chip



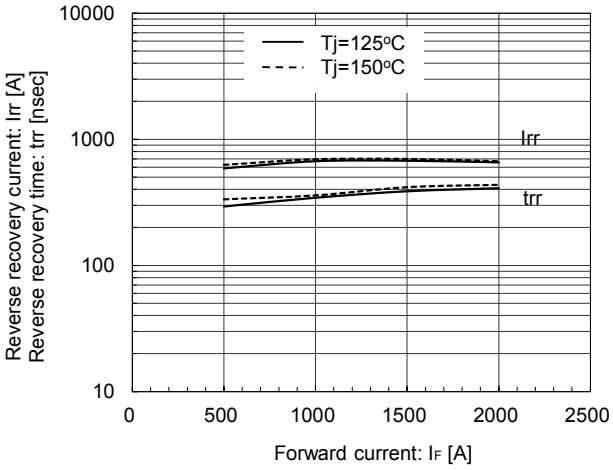

[INVERTER]

Reverse Recovery Characteristics (typ.)
Vcc=900V, VGE=±15V, Rg=+1.2/-1.2Ω, Tj=25°C

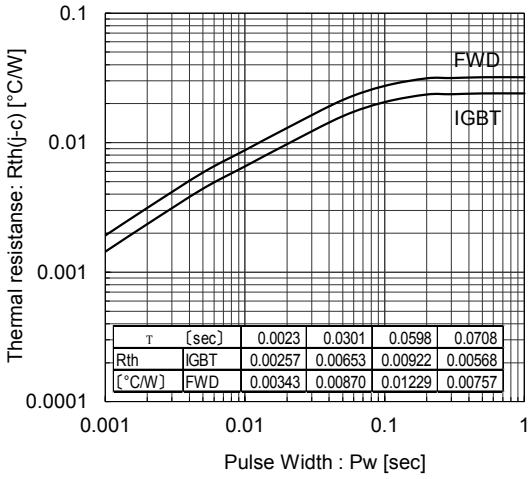



[INVERTER]

Reverse Recovery Characteristics (typ.)
Vcc=900V, VGE=±15V, Rg=+1.2/-1.2Ω, Tj=125°C, 150°C



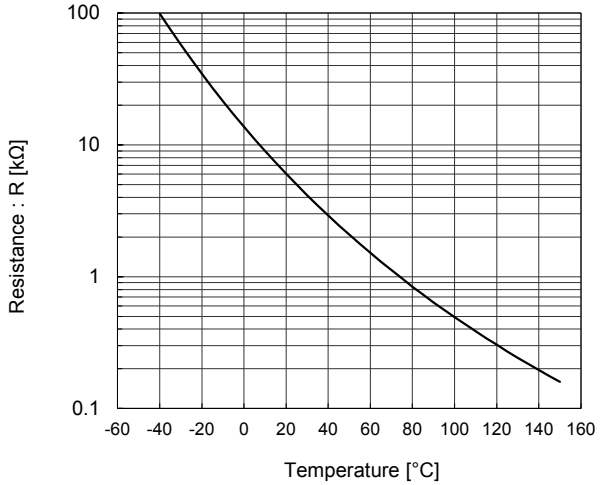

Transient Thermal Resistance (max.)




| T | [sec] | 0.0023 | 0.0301 | 0.0598 | 0.0708 |
|---|---|---|---|---|---|
| Rth | IGBT | 0.00257 | 0.00653 | 0.00922 | 0.00568 |
| [°C/W] | FWD | 0.00343 | 0.00870 | 0.01229 | 0.00757 |

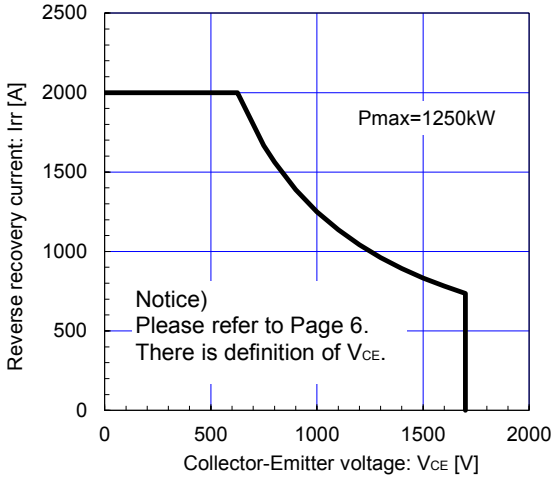
[THERMISTOR]

Temperature characteristic (typ.)

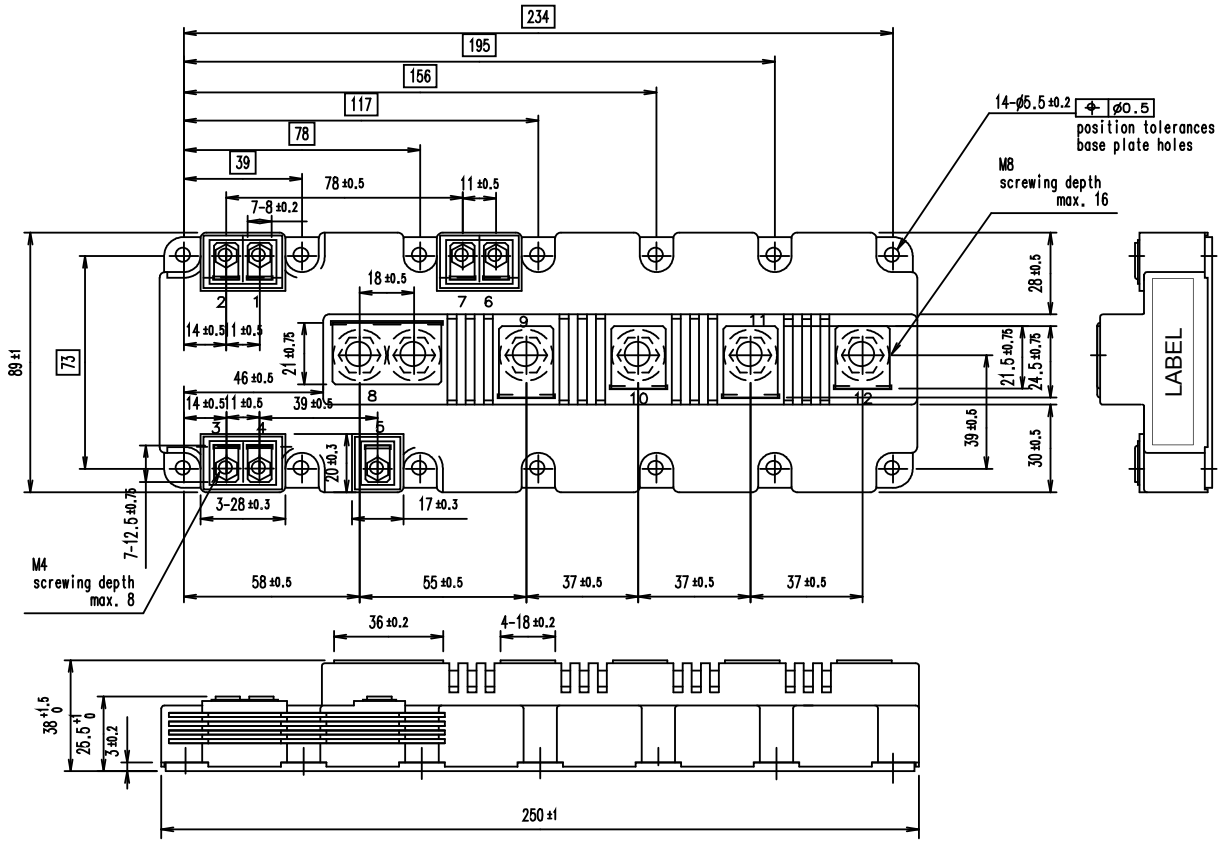



FWD safe operating area (max.)

Tj=150°C

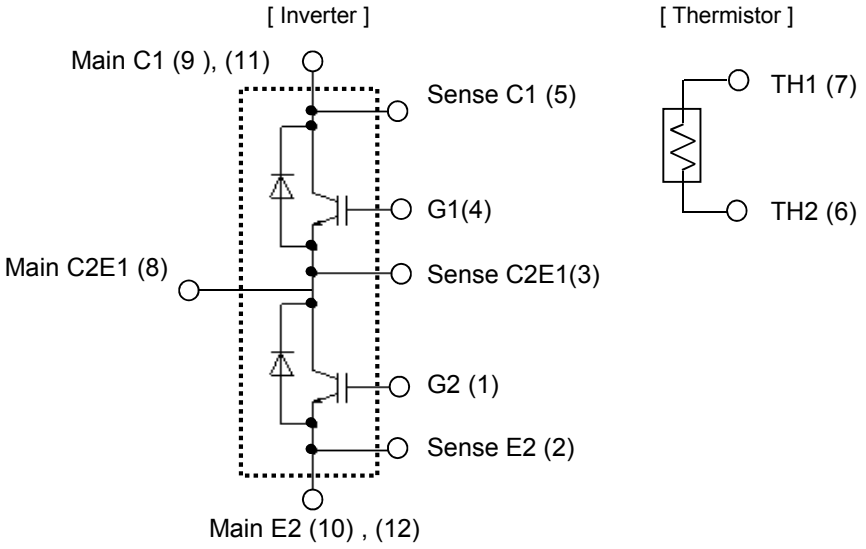


## ■ Outline Drawings (Unit: mm)

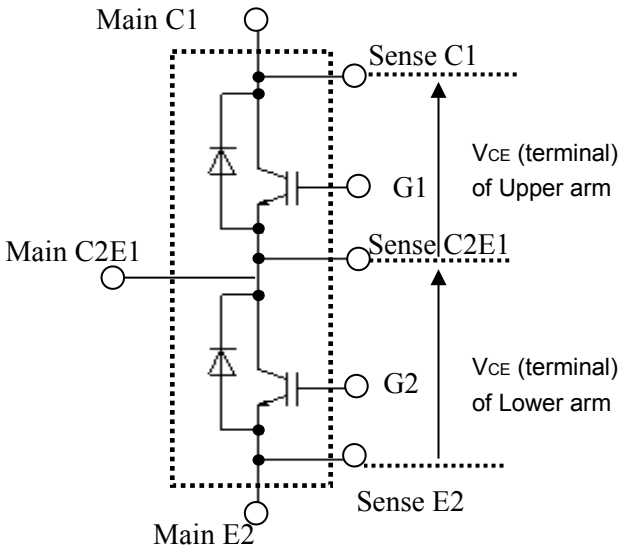



Weight:1250g(typ.)

## ■ Equivalent Circuit



## ■ Definition of on-state voltage at terminal and switching characteristics




Fuji defined $V_{CE}$ value of terminal by using Sense C1 and Sense C2E1 for Upper arm and Sense C2E1 and Sense E2 for Lower arm .

Switching characteristics of $V_{CE}$ also is defined between Sense C1 and Sense C2E1 for Upper arm and Sense C2E1 and Sense E2 for Lower arm .

Please use these terminals whenever measure spike voltage and on-state voltage .

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- Communications equipment (terminal devices)
- Measurement equipment
- Machine tools
- Audiovisual equipment
- Electrical home appliances
- Personal equipment
- Industrial robots etc.

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- Traffic-signal control equipment
- Gas leakage detectors with an auto-shut-off feature
- Emergency equipment for responding to disasters and anti-burglary devices
- Safety devices
- Medical equipment

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- Submarine repeater equipment



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