

2MBI650VXA-170EA-50

IGBT Modules

IGBT MODULE (V series) 1700V / 650A / 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 | I _c | Continuous | Tc=25°C 900 | A |
| | | | | Tc=100°C 650 | |
| | | I _c pulse | 1ms | 1300 | |
| | | -I _c | | 930 | |
| Collector power dissipation | P _c | -I _c pulse | 1ms | 1860 | |
| | | 1 device | | 4150 | |
| Junction temperature | T _j | | 175 | °C | |
| Operating junction temperature (under switching conditions) | T _{jop} | | 150 | | |
| Case temperature | T _c | | 150 | | |
| Storage temperature | T _{stg} | | -40 ~ +150 | | |
| Isolation voltage | V _{iso} | between terminal and copper base (*1) | 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 | | | Units | |
|--------------------------------------|--------------------------------------|---|-----------------|------|------|-------|---|
| | | | min. | typ. | max. | | |
| Zero gate voltage collector current | I _{CEs} | V _{GE} = 0V, V _{CE} = 1700V | - | - | 4.0 | mA | |
| Gate-Emitter leakage current | I _{GES} | V _{CE} = 0V, V _{GE} = ±20V | - | - | 800 | nA | |
| Gate-Emitter threshold voltage | V _{GE(th)} | V _{CE} = 20V, I _c = 650mA | 6.0 | 6.5 | 7.0 | V | |
| Collector-Emitter saturation voltage | V _{CE(sat)} (terminal) (*4) | V _{GE} = 15V I _c = 650A | Tj=25°C | - | 2.10 | 2.55 | V |
| | | | Tj=125°C | - | 2.50 | - | |
| | | | Tj=150°C | - | 2.60 | - | |
| | Tj=25°C | | - | 2.00 | 2.45 | | |
| | Tj=125°C | | - | 2.40 | - | | |
| | Tj=150°C | | - | 2.50 | - | | |
| Internal gate resistance | R _{g(int)} | - | - | 3.00 | - | Ω | |
| Input capacitance | C _{ies} | V _{CE} = 10V, V _{GE} = 0V, f = 1MHz | - | 63 | - | nF | |
| Turn-on time | ton | V _{CC} = 900V | - | 1700 | - | nsec | |
| | tr | I _c = 650A | - | 500 | - | | |
| | tr (i) | V _{GE} = ±15V | - | 150 | - | | |
| Turn-off time | toff | R _G = +1.8/-1.8Ω | - | 1600 | - | nsec | |
| | tf | L _s =70nH | - | 110 | - | | |
| Forward on voltage | V _F (terminal) (*4) | V _{GE} = 0V I _F = 650A | Tj=25°C | - | 1.75 | 2.20 | V |
| | | | Tj=125°C | - | 1.90 | - | |
| | | | Tj=150°C | - | 1.85 | - | |
| | Tj=25°C | | - | 1.65 | 2.10 | | |
| | Tj=125°C | | - | 1.80 | - | | |
| | Tj=150°C | | - | 1.75 | - | | |
| Reverse recovery time | trr | I _F = 650A | - | 300 | - | nsec | |
| Thermistor | Resistance | R | T=25°C | - | 5000 | Ω | |
| | B value | B | T=100°C | 465 | 495 | 520 | |
| | | | 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

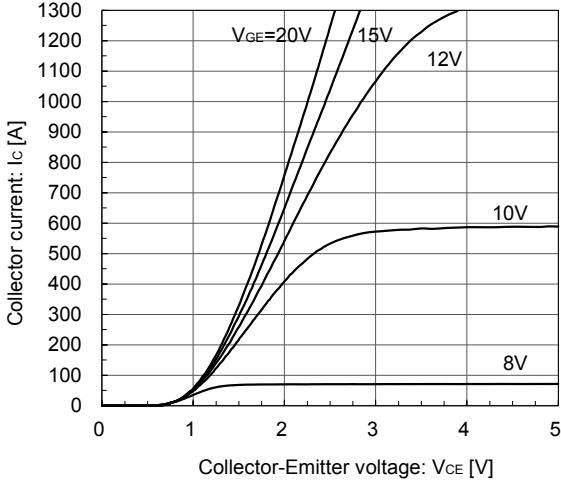
| Items | Symbols | Conditions | Characteristics | | | Units |
|---|----------------------|-----------------------|-----------------|--------|-------|-------|
| | | | min. | typ. | max. | |
| Thermal resistance (1device) | R _{th(j-c)} | Inverter IGBT | - | - | 0.036 | °C/W |
| | | Inverter FWD | - | - | 0.048 | |
| Contact thermal resistance (1device) (*5) | R _{th(c-f)} | with Thermal Compound | - | 0.0125 | - | |

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

■ Characteristics (Representative)

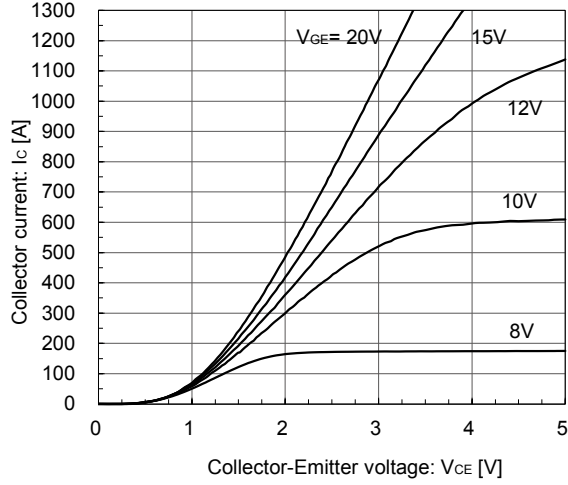
[INVERTER]

Collector current vs. Collector-Emitter voltage (typ.)
T_j= 25°C / chip



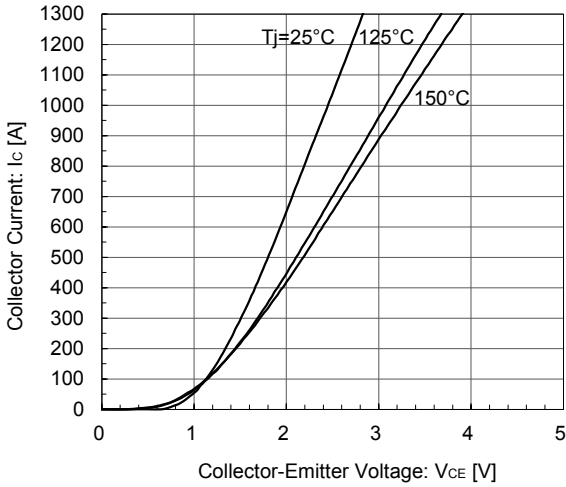
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Collector current vs. Collector-Emitter voltage (typ.)
T_j= 150°C / chip



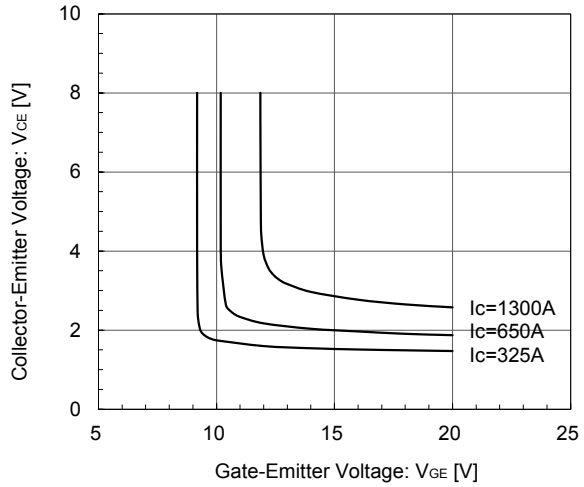
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Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}= 15V / chip



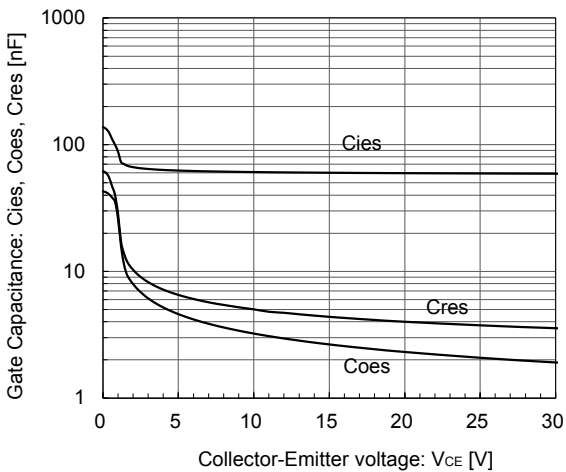
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Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j= 25°C / chip



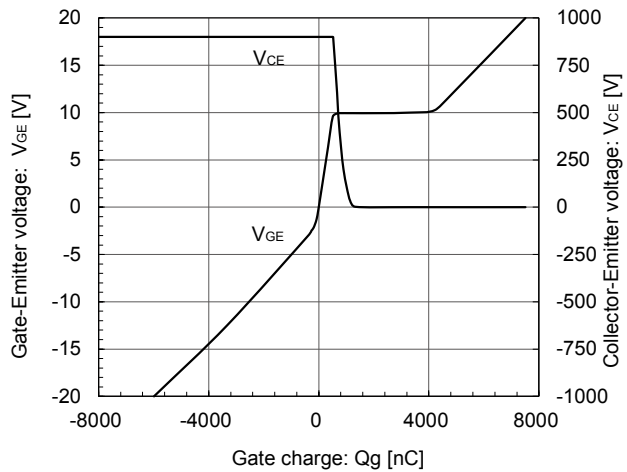
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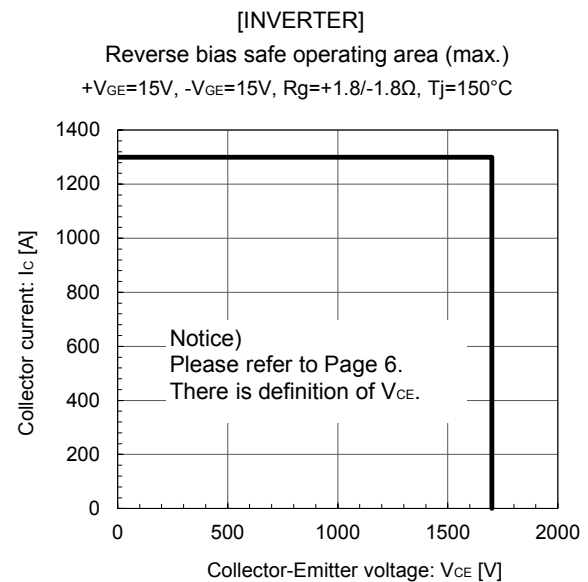
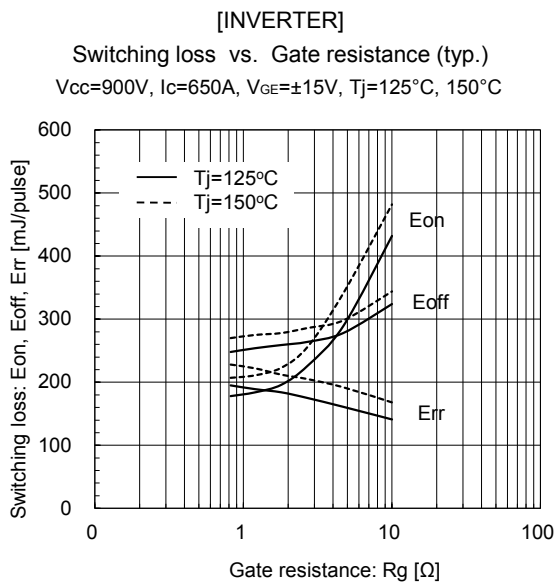
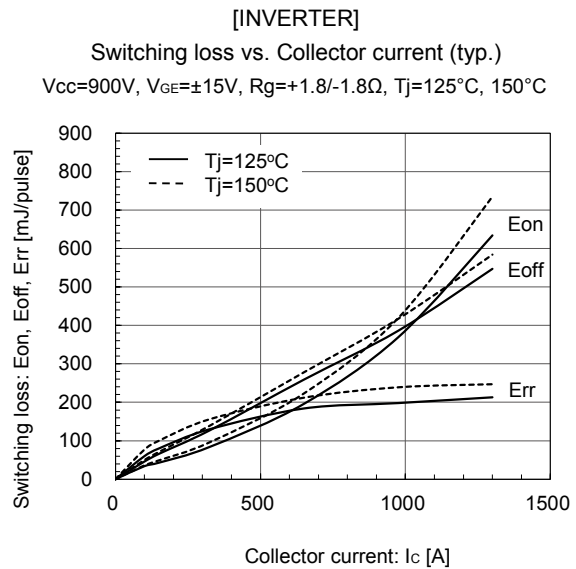
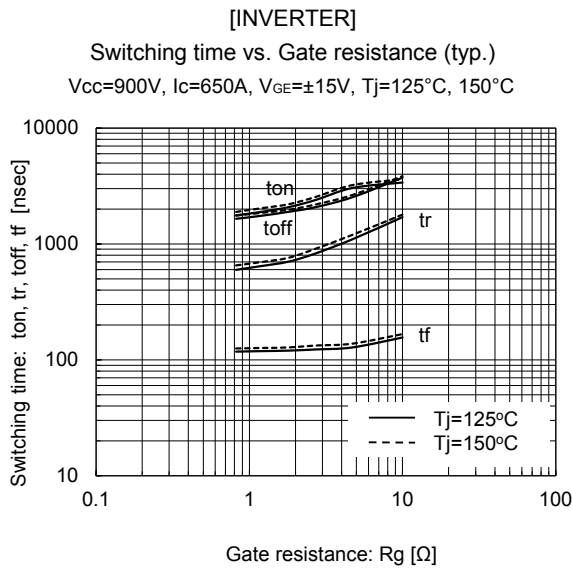
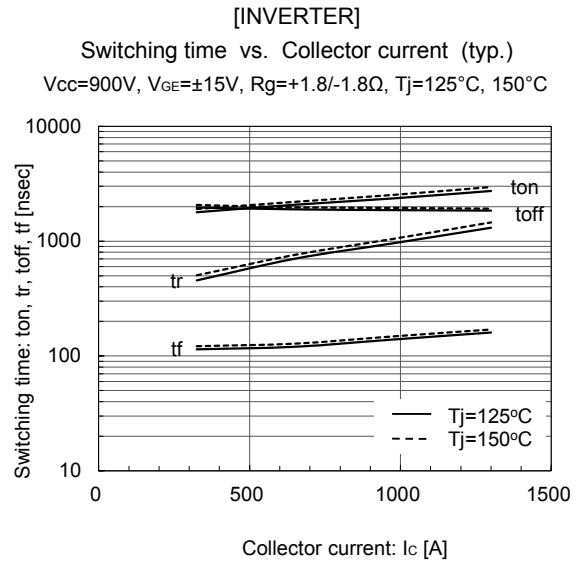
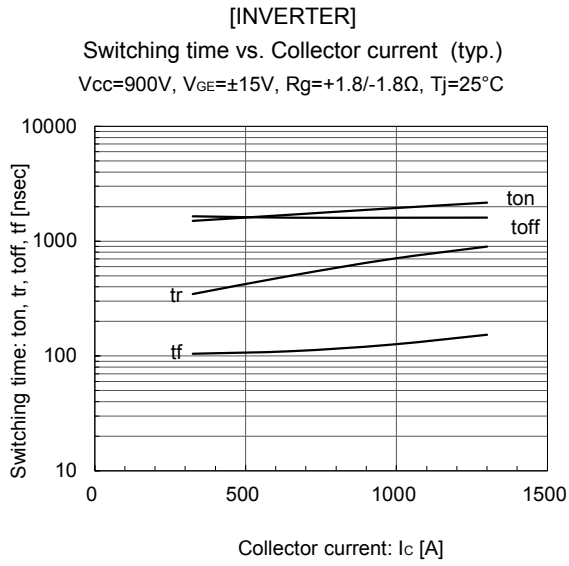
Gate Capacitance vs. Collector-Emitter Voltage (typ.)
V_{GE}= 0V, f= 1MHz, T_j= 25°C



[INVERTER]

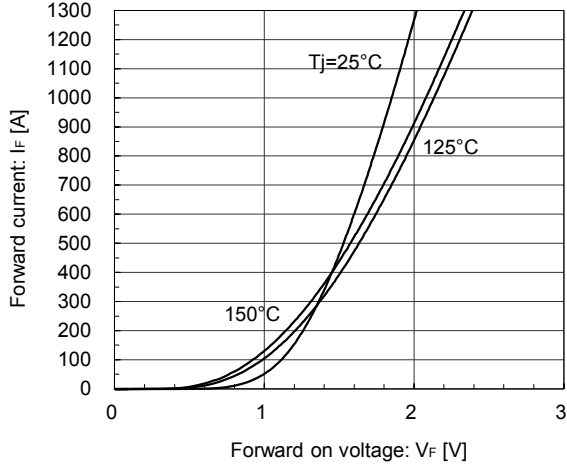
Dynamic Gate Charge (typ.)
V_{CC}=900V, I_c=650A, T_j= 25°C





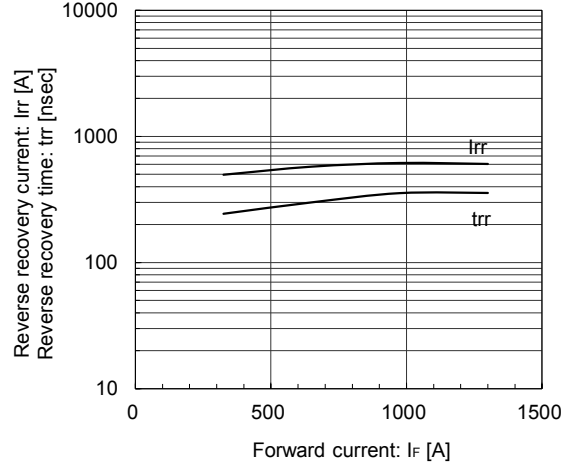
[INVERTER]

Forward Current vs. Forward Voltage (typ.)
chip



[INVERTER]

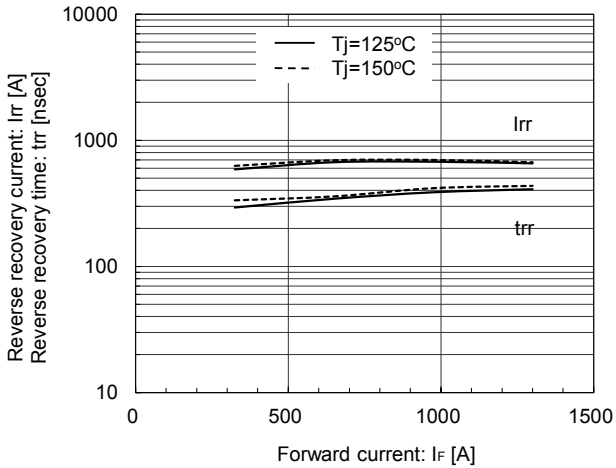
Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_g=+1.8/-1.8Ω, T_j=25°C



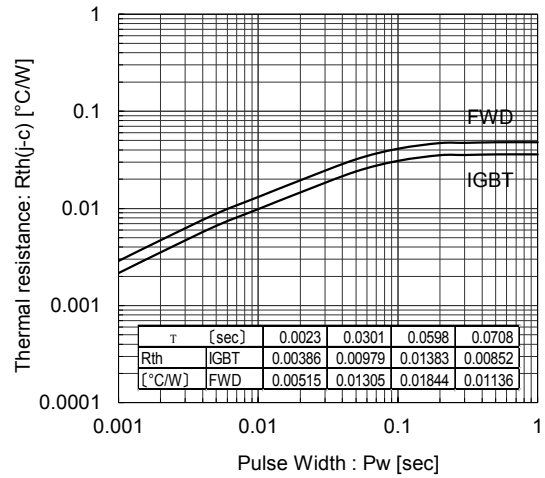
[INVERTER]

Reverse Recovery Characteristics (typ.)

V_{CC}=900V, V_{GE}=±15V, R_g=+1.8/-1.8Ω, T_j=125°C, 150°C

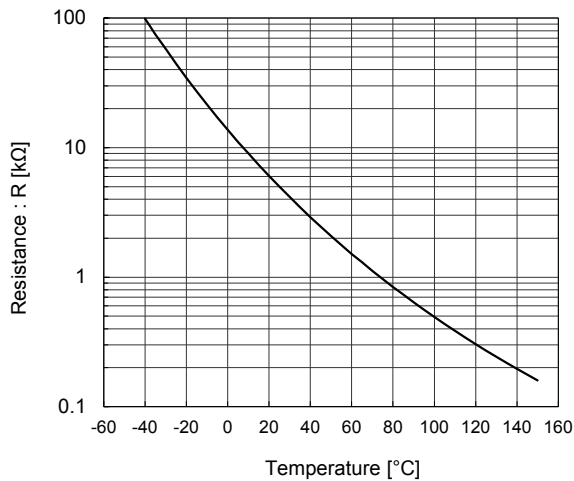


Transient Thermal Resistance (max.)



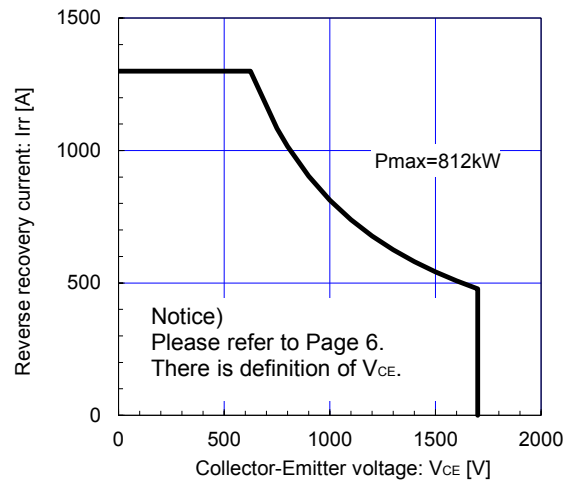
[THERMISTOR]

Temperature characteristic (typ.)

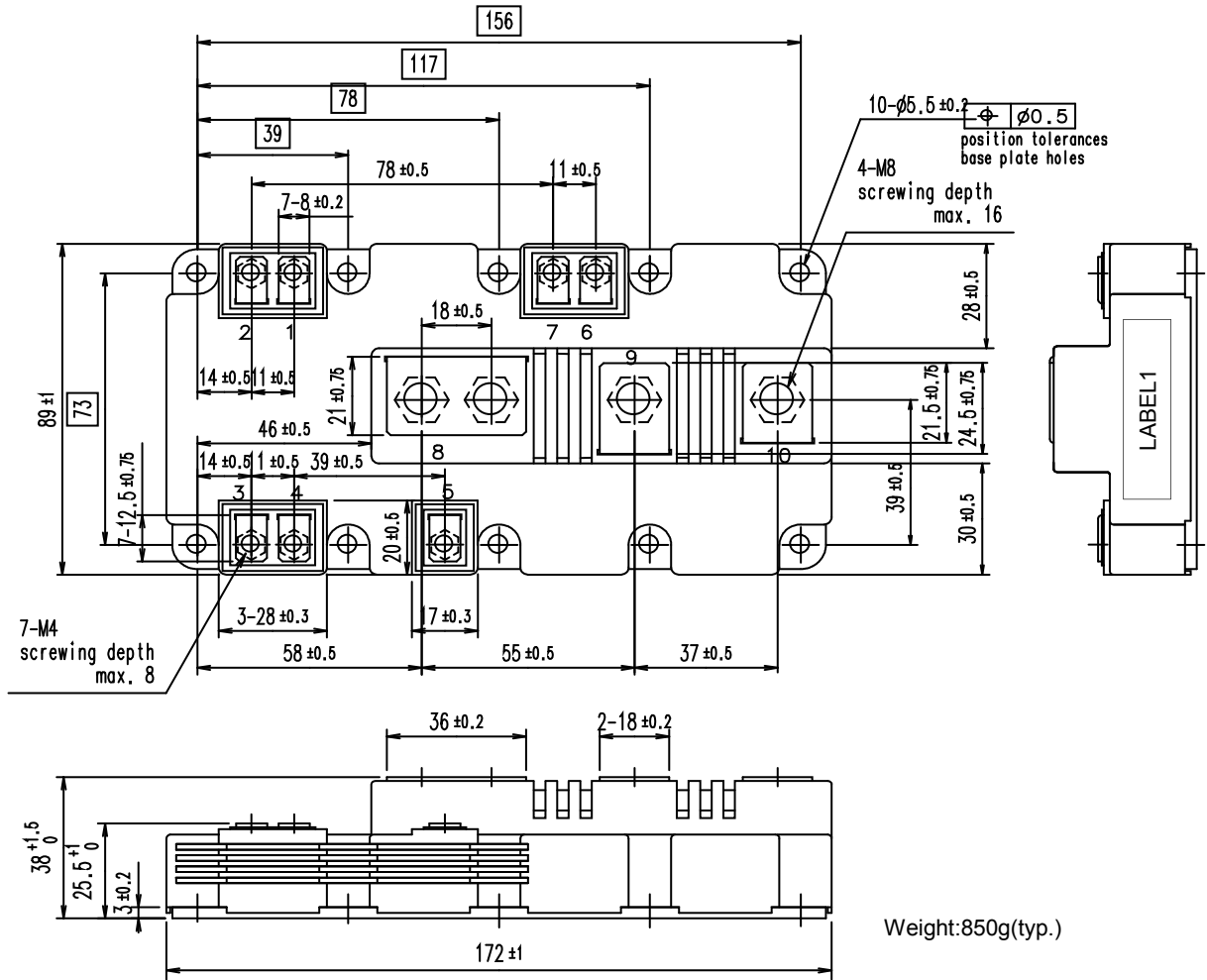


FWD safe operating area (max.)

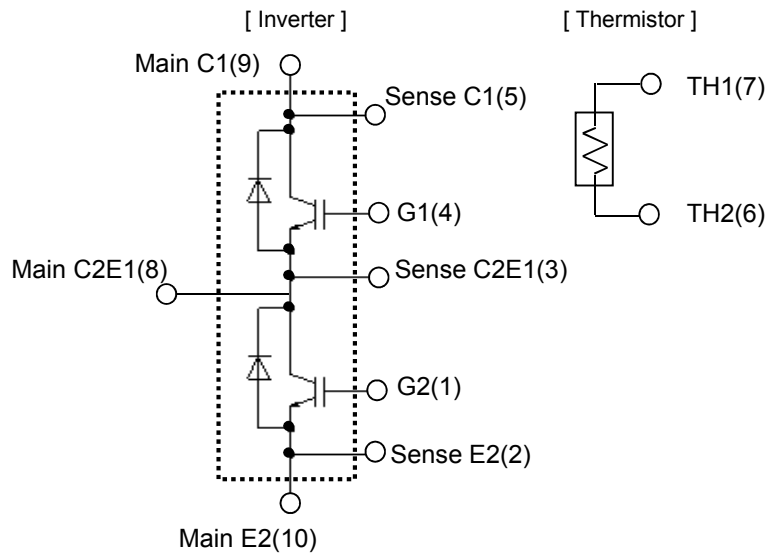
T_j=150°C



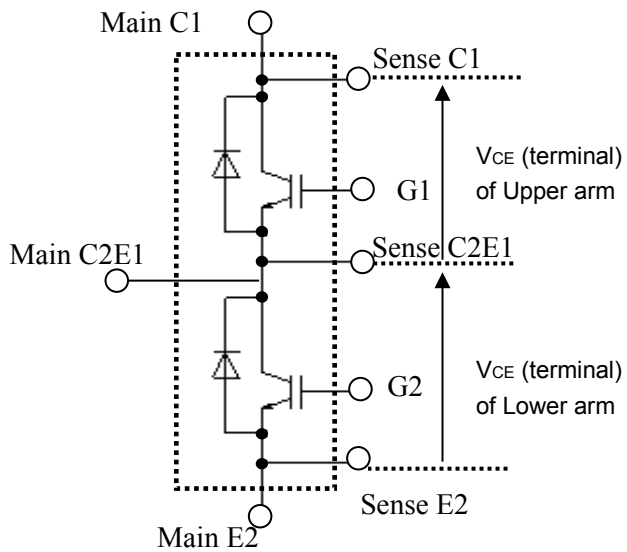
■ Outline Drawings (Unit: mm)



■ 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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