

# 2MBI300VE-120-50

IGBT Modules

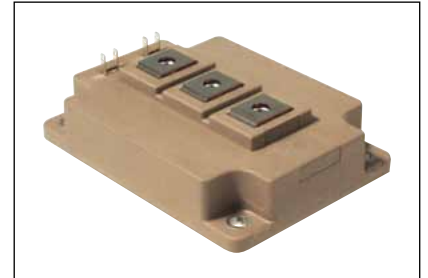
## IGBT MODULE (V series) 1200V / 300A / 2 in one package

### ■ 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 |
|---|-----------------------|------------|-----------------------|-------|
| Collector-Emitter voltage                                   | V <sub>CEs</sub>      |            | 1200                  | V     |
| Gate-Emitter voltage  | V <sub>GES</sub>      |            | ±20                   | V     |
| Inverter<br>Collector current                               | I <sub>c</sub>        | Continuous | T <sub>c</sub> =100°C | 300   |
|   |                       |            | T <sub>c</sub> =25°C  | 360   |
|   | I <sub>c</sub> pulse  | 1ms        | 600                   |       |
|   | -I <sub>c</sub>       |            | 300                   |       |
|   | -I <sub>c</sub> pulse | 1ms        | 600                   |       |
| Collector power dissipation                                 | P <sub>c</sub>        | 1 device   | 2200                  | W     |
| Junction temperature  | T <sub>j</sub>        |            | 175                   | °C    |
| Operating junction temperature (under switching conditions) | T <sub>jsp</sub>      |            | 150                   |       |
| Case temperature  | T <sub>c</sub>        |            | 125                   |       |
| Storage temperature   | T <sub>stg</sub>      |            | -40 ~ +125            |       |
| Isolation voltage   | V <sub>iso</sub>      | AC : 1min. | 2500                  | VAC   |
| Screw torque  | Mounting (*2)         |            | 6.0                   | N m   |
|   | Terminals (*3)        |            | 5.0                   |       |

Note \*1: All terminals should be connected together during the test.

Note \*2: Recommendable Value : 3.0-6.0 Nm (M5 or M6)

Note \*3: Recommendable Value : 2.5-5.0 Nm (M6)

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

| Items  | Symbols                            | Conditions  | Characteristics       |      |      | Units |   |
|--|------------------------------------|---|-----------------------|------|------|-------|---|
|  |                                    |   | min.                  | typ. | max. |       |   |
| Zero gate voltage collector current              | I <sub>CEs</sub>                   | V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V         | -                     | -    | 2.0  | mA    |   |
| Gate-Emitter leakage current                     | I <sub>GES</sub>                   | V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V          | -                     | -    | 800  | nA    |   |
| Gate-Emitter threshold voltage                   | V <sub>GE(th)</sub>                | V <sub>CE</sub> = 20V, I <sub>c</sub> = 300mA         | 6.0                   | 6.5  | 7.0  | V     |   |
| Inverter<br>Collector-Emitter saturation voltage | V <sub>CE(sat)</sub><br>(terminal) | V <sub>GE</sub> = 15V<br>I <sub>c</sub> = 300A        | T <sub>j</sub> =25°C  | -    | 2.05 | 2.60  | V |
|  |                                    |   | T <sub>j</sub> =125°C | -    | 2.40 | -     |   |
|  | T <sub>j</sub> =150°C              |   | -                     | 2.45 | -    |       |   |
|  | T <sub>j</sub> =25°C               |   | -                     | 1.85 | 2.15 |       |   |
|  | T <sub>j</sub> =125°C              |   | -                     | 2.20 | -    |       |   |
| V <sub>CE(sat)</sub><br>(chip)                   | T <sub>j</sub> =150°C              | -   | 2.25                  | -    |      |       |   |
| Input capacitance                                | C <sub>ies</sub>                   | V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz | -                     | 24   | -    | nF    |   |
| Inverter<br>Turn-on time                         | ton                                | V <sub>CC</sub> = 600V L <sub>s</sub> = 30nH          | -                     | 0.60 | -    | μs    |   |
|  | tr                                 | I <sub>c</sub> = 300A                                 | -                     | 0.20 | -    |       |   |
|  | tr (i)                             | V <sub>GE</sub> = ±15V                                | -                     | 0.05 | -    |       |   |
| Turn-off time                                    | toff                               | R <sub>θ</sub> = 1.8Ω                                 | -                     | 0.80 | -    | μs    |   |
|  | tf                                 | T <sub>j</sub> = 150°C                                | -                     | 0.08 | -    |       |   |
| Forward on voltage                               | V <sub>F</sub><br>(terminal)       | V <sub>GE</sub> = 0V<br>I <sub>F</sub> = 300A         | T <sub>j</sub> =25°C  | -    | 1.85 | 2.40  | V |
|  |                                    |   | T <sub>j</sub> =125°C | -    | 2.00 | -     |   |
|  | T <sub>j</sub> =150°C              |   | -                     | 1.95 | -    |       |   |
|  | T <sub>j</sub> =25°C               |   | -                     | 1.70 | 2.15 |       |   |
|  | T <sub>j</sub> =125°C              |   | -                     | 1.85 | -    |       |   |
| V <sub>F</sub><br>(chip)                         | T <sub>j</sub> =150°C              | -   | 1.80                  | -    |      |       |   |
| Reverse recovery time                            | trr                                | I <sub>F</sub> = 300A                                 | -                     | 0.15 | -    | μs    |   |

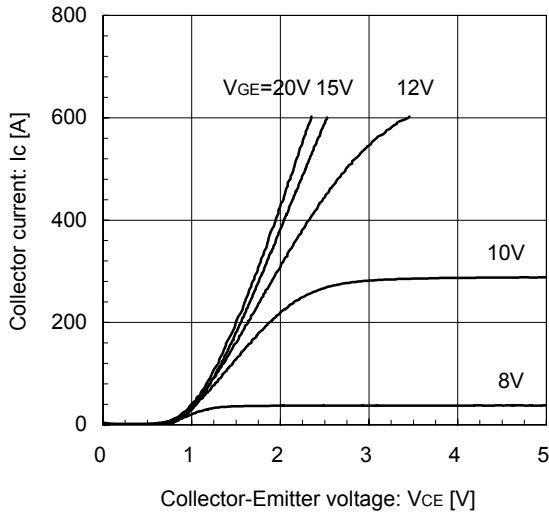
#### ● Thermal resistance characteristics

| Items                                     | Symbols              | Conditions            | Characteristics |        |       | Units |
|---|----------------------|-----------------------|-----------------|--------|-------|-------|
|   |                      |                       | min.            | typ.   | max.  |       |
| Thermal resistance (1device)              | R <sub>th(j-c)</sub> | IGBT<br>FWD           | -               | -      | 0.068 | °C/W  |
| Contact thermal resistance (1device) (*4) | R <sub>th(c-f)</sub> | with Thermal Compound | -               | 0.0125 | -     |       |

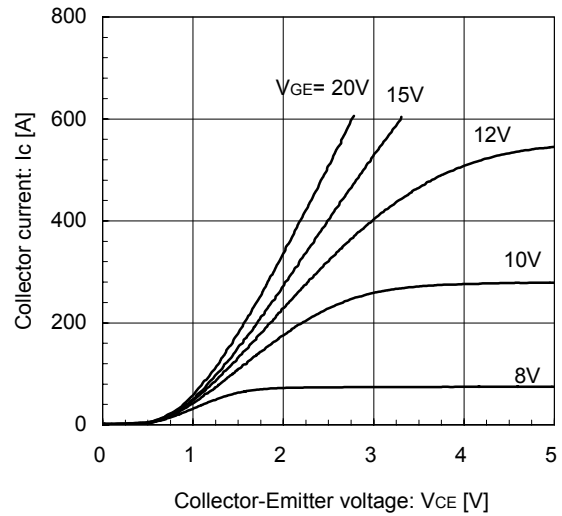
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

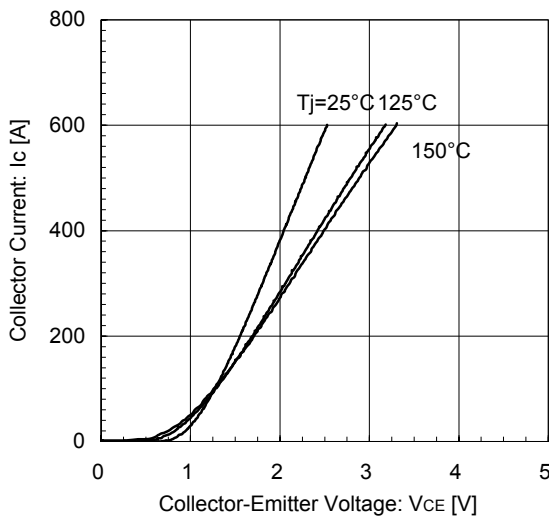
Collector current vs. Collector-Emittor voltage (typ.)  
T<sub>j</sub> = 25°C / chip



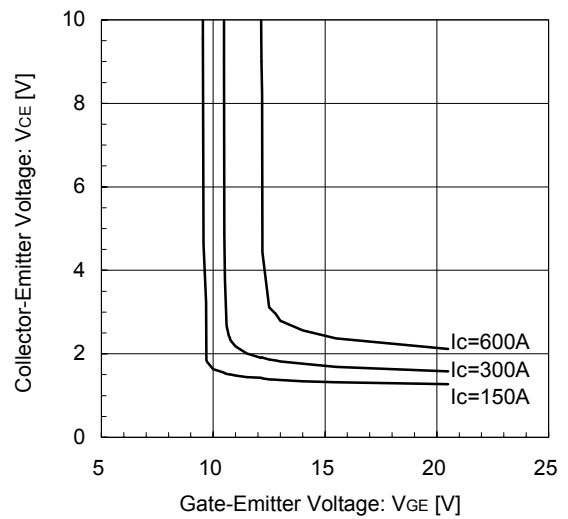
Collector current vs. Collector-Emittor voltage (typ.)  
T<sub>j</sub> = 150°C / chip



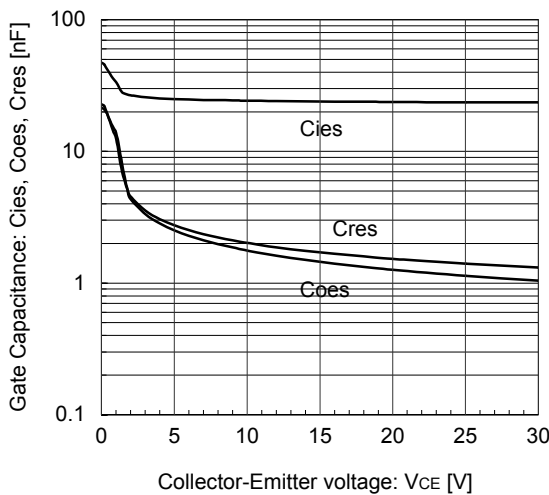
Collector current vs. Collector-Emittor voltage (typ.)  
V<sub>GE</sub> = 15V / chip



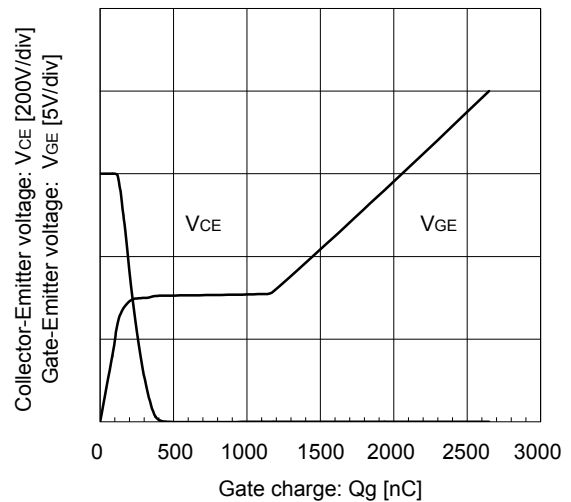
Collector-Emittor voltage vs. Gate-Emittor voltage  
T<sub>j</sub> = 25°C / chip



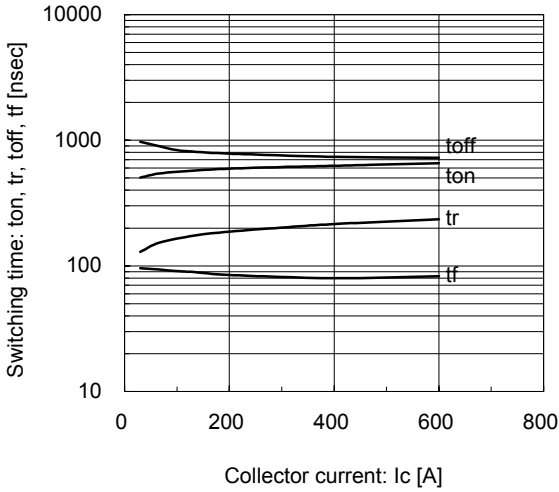
Gate Capacitance vs. Collector-Emittor Voltage  
V<sub>GE</sub> = 0V, f = 1MHz, T<sub>j</sub> = 25°C



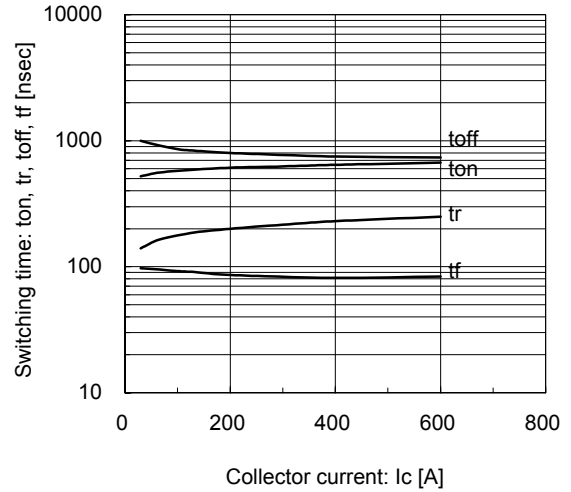
Dynamic Gate Charge (typ.)  
V<sub>CC</sub> = 600V, I<sub>c</sub> = 300A, T<sub>j</sub> = 25°C



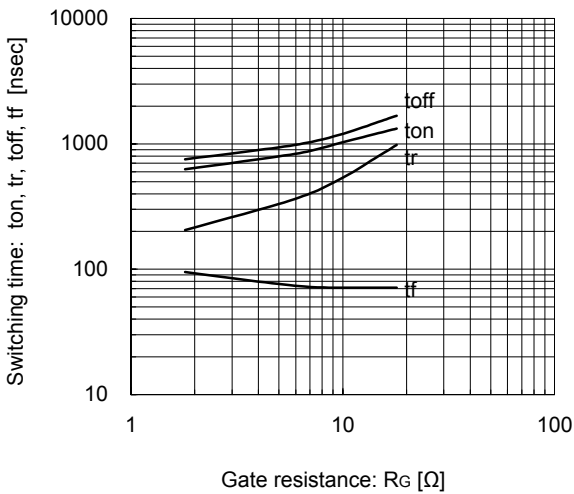
Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=125^\circ C$



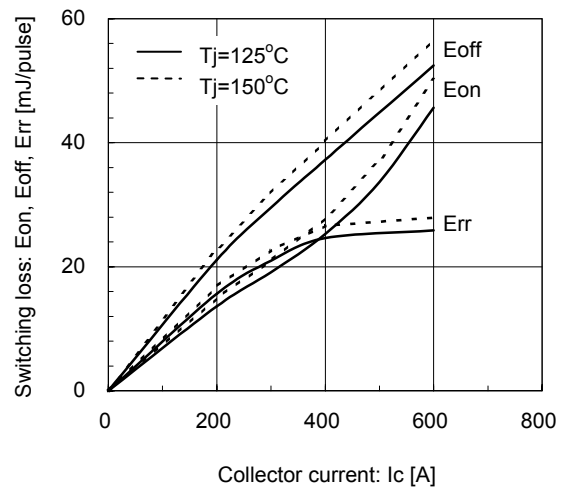
Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=150^\circ C$



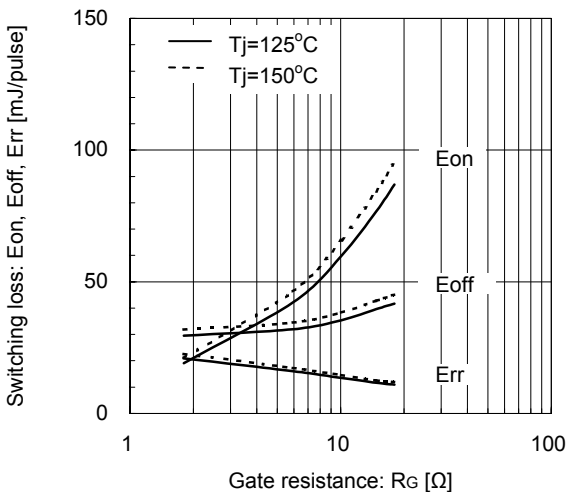
Switching time vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_C=300A, V_{GE}=\pm 15V, T_J=125^\circ C$



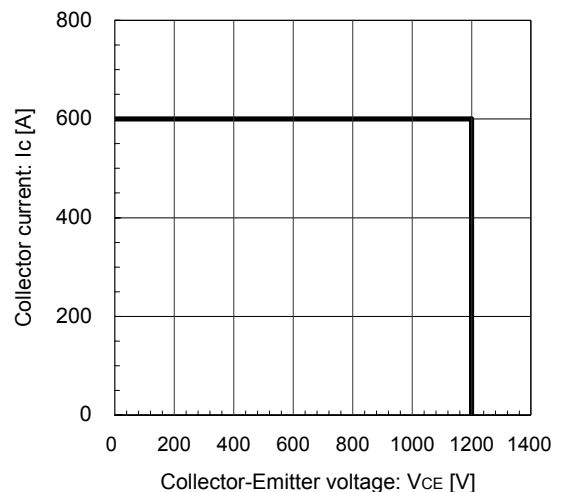
Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=125^\circ C, 150^\circ C$



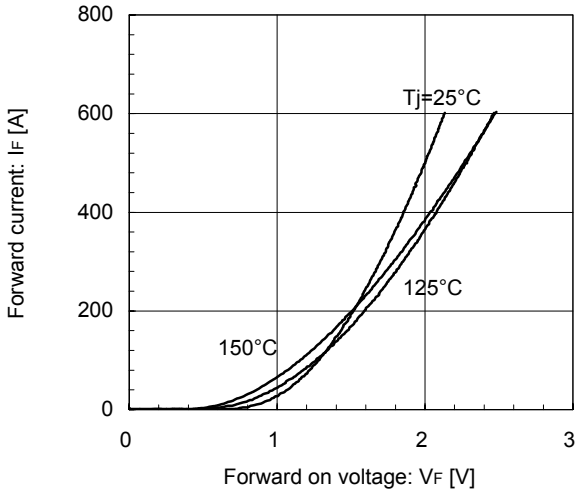
Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_C=300A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



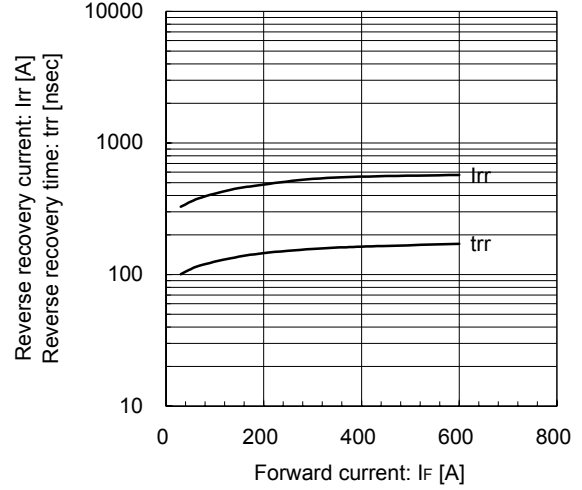
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_G=1.8\Omega, T_J=150^\circ C$



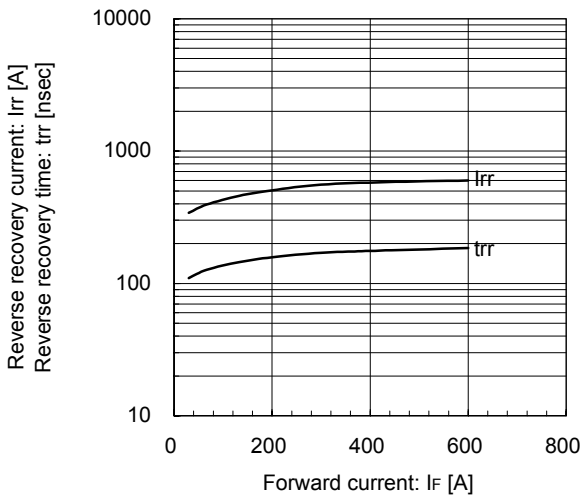
Forward Current vs. Forward Voltage (typ.)  
chip



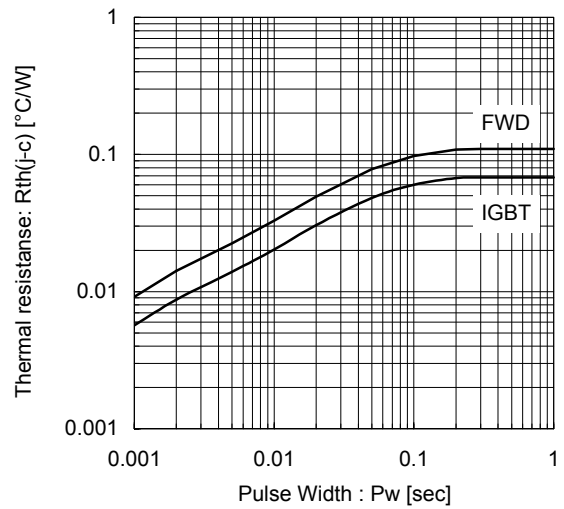
Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=600V, V<sub>GE</sub>=±15V, R<sub>G</sub>=1.8Ω, T<sub>J</sub>=125°C



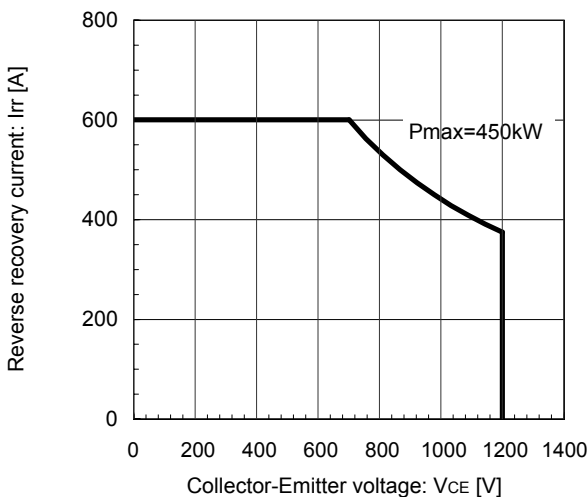
Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=600V, V<sub>GE</sub>=±15V, R<sub>G</sub>=1.8Ω, T<sub>J</sub>=150°C



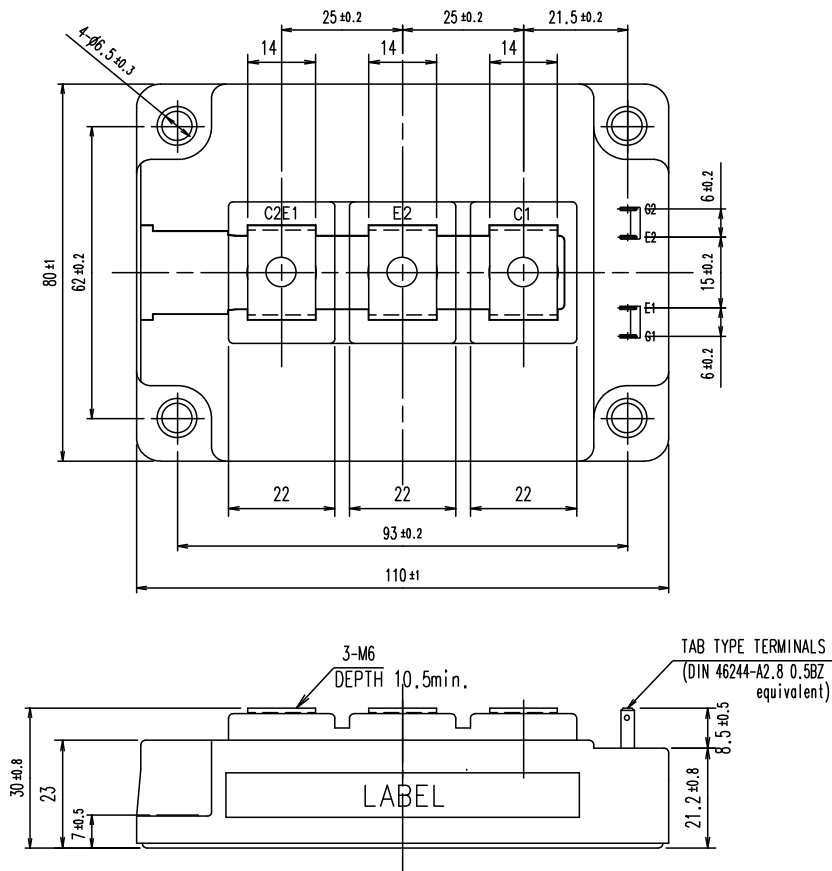
Transient Thermal Resistance (max.)



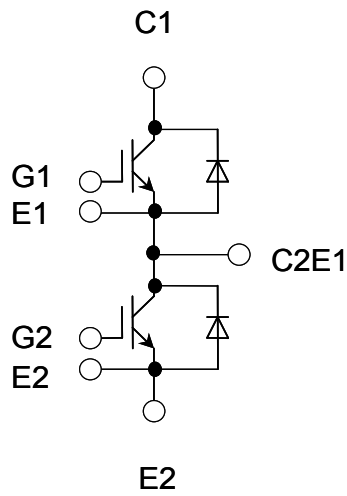
FWD safe operating area (max.)  
T<sub>J</sub>=150°C



■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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