

# 2MBI150VA-060-50

**IGBT Modules**

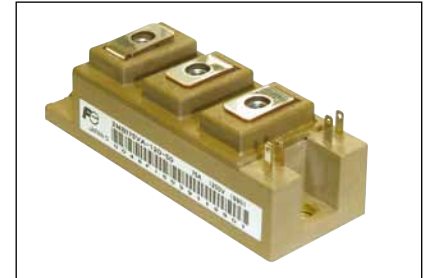
## IGBT MODULE (V series) 600V / 150A / 2 in one package

### ■ 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 T<sub>c</sub>=25°C unless otherwise specified)

| Items   | Symbols               | Conditions                       | Maximum ratings | Units |
|---|-----------------------|----------------------------------|-----------------|-------|
| Collector-Emitter voltage                                   | V <sub>CEs</sub>      |                                  | 600             | V     |
| Gate-Emitter voltage  | V <sub>GES</sub>      |                                  | ±20             | V     |
| Collector current   | I <sub>c</sub>        | Continuous T <sub>c</sub> =100°C | 150             | A     |
|   | I <sub>c pulse</sub>  | 1ms                              | 300             |       |
|   | -I <sub>c</sub>       |                                  | 150             |       |
|   | -I <sub>c pulse</sub> | 1ms                              | 300             |       |
| Collector power dissipation                                 | P <sub>c</sub>        | 1 device                         | 650             | W     |
| Junction temperature  | T <sub>j</sub>        |                                  | 175             | °C    |
| Operating junction temperature (under switching conditions) | T <sub>jop</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            |       |
| Screw torque  | Mounting (*2)         |                                  | 5.0             | N m   |
|   | Terminals (*3)        |                                  | 5.0             |       |

Note \*1: All terminals should be connected together when isolation test will be done.

Note \*2: Recommendable Value : 3.0-5.0 Nm (M5 or M6)

Note \*3: Recommendable Value : 2.5-3.5 Nm (M5)

#### ● Electrical characteristics (at T<sub>j</sub>= 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> = 600V          | -                     | -    | 1.0  | mA    |   |
| Gate-Emitter leakage current         | I <sub>GES</sub>                   | V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V          | -                     | -    | 200  | nA    |   |
| Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>                | V <sub>CE</sub> = 20V, I <sub>c</sub> = 150mA         | 6.2                   | 6.7  | 7.2  | V     |   |
| Collector-Emitter saturation voltage | V <sub>CE(sat)</sub><br>(terminal) | V <sub>GE</sub> = 15V<br>I <sub>c</sub> = 150A        | T <sub>j</sub> =25°C  | -    | 1.75 | 2.20  | V |
|                                      |                                    |   | T <sub>j</sub> =125°C | -    | 2.05 | -     |   |
|                                      |                                    |   | T <sub>j</sub> =150°C | -    | 2.25 | -     |   |
|                                      | V <sub>CE(sat)</sub><br>(chip)     | V <sub>GE</sub> = 15V<br>I <sub>c</sub> = 150A        | T <sub>j</sub> =25°C  | -    | 1.60 | 2.05  |   |
|                                      |                                    |   | T <sub>j</sub> =125°C | -    | 1.90 | -     |   |
|                                      |                                    |   | T <sub>j</sub> =150°C | -    | 2.00 | -     |   |
| Internal gate resistance             | R <sub>G(int)</sub>                | -   | -                     | 6    | -    | Ω     |   |
| Input capacitance                    | C <sub>ies</sub>                   | V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz | -                     | 9.7  | -    | nF    |   |
| Turn-on time                         | t <sub>on</sub>                    | V <sub>CC</sub> = 300V L <sub>s</sub> = 30nH          | -                     | 650  | -    | nsec  |   |
|                                      | t <sub>r</sub>                     | I <sub>c</sub> = 150A                                 | -                     | 300  | -    |       |   |
|                                      | t <sub>r(0)</sub>                  | V <sub>GE</sub> = ±15V                                | -                     | 100  | -    |       |   |
| Turn-off time                        | t <sub>off</sub>                   | R <sub>G</sub> = 9Ω                                   | -                     | 600  | -    |       |   |
|                                      | t <sub>r</sub>                     | T <sub>j</sub> = 150°C                                | -                     | 40   | -    |       |   |
|                                      |                                    |   |                       |      |      |       |   |
| Forward on voltage                   | V <sub>F</sub><br>(terminal)       | V <sub>GE</sub> = 0V<br>I <sub>F</sub> = 150A         | T <sub>j</sub> =25°C  | -    | 1.70 | 2.15  | V |
|                                      |                                    |   | T <sub>j</sub> =125°C | -    | 1.60 | -     |   |
|                                      |                                    |   | T <sub>j</sub> =150°C | -    | 1.57 | -     |   |
|                                      | V <sub>F</sub><br>(chip)           | V <sub>GE</sub> = 0V<br>I <sub>F</sub> = 150A         | T <sub>j</sub> =25°C  | -    | 1.60 | 2.05  |   |
|                                      |                                    |   | T <sub>j</sub> =125°C | -    | 1.50 | -     |   |
|                                      |                                    |   | T <sub>j</sub> =150°C | -    | 1.47 | -     |   |
| Reverse recovery time                | t <sub>rr</sub>                    | I <sub>F</sub> = 150A                                 | -                     | 200  | -    | nsec  |   |

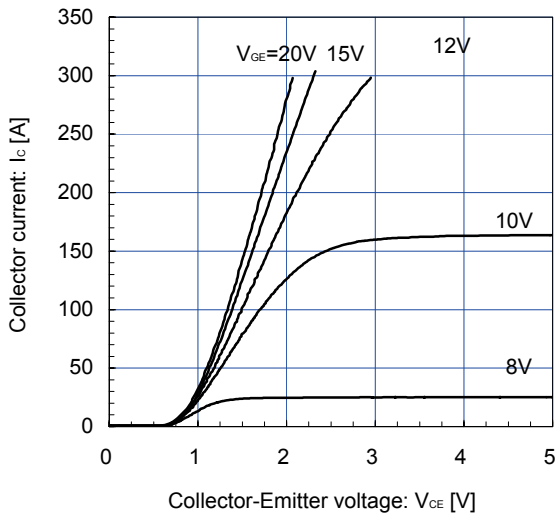
#### ● Thermal resistance characteristics

| Items                                     | Symbols              | Conditions            | Characteristics |       |      | Units |
|---|----------------------|-----------------------|-----------------|-------|------|-------|
|   |                      |                       | min.            | typ.  | max. |       |
| Thermal resistance (1device)              | R <sub>th(j-c)</sub> | IGBT                  | -               | -     | 0.31 | °C/W  |
|   |                      | FWD                   | -               | -     | 0.60 |       |
| Contact thermal resistance (1device) (*4) | R <sub>th(c-f)</sub> | with Thermal Compound | -               | 0.050 | -    |       |

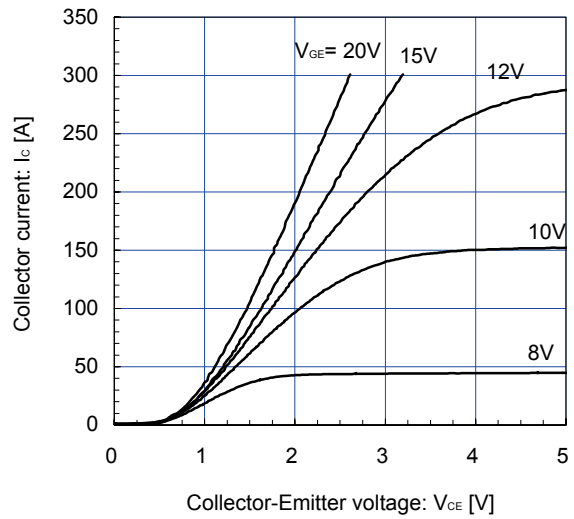
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

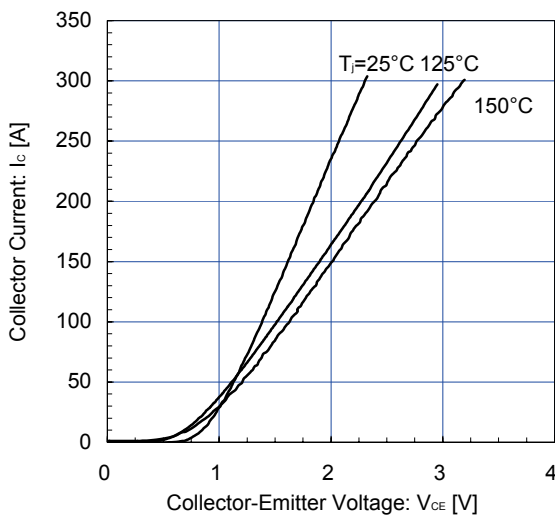
Collector current vs. Collector-Emittter voltage (typ.)  
 $T_J = 25^\circ\text{C}$  / chip



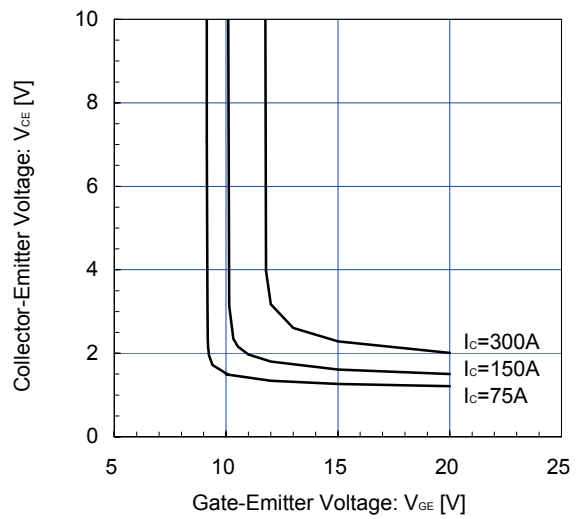
Collector current vs. Collector-Emittter voltage (typ.)  
 $T_J = 150^\circ\text{C}$  / chip



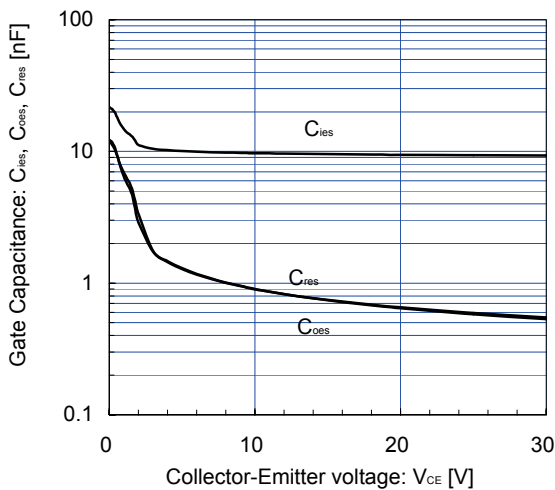
Collector current vs. Collector-Emittter voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



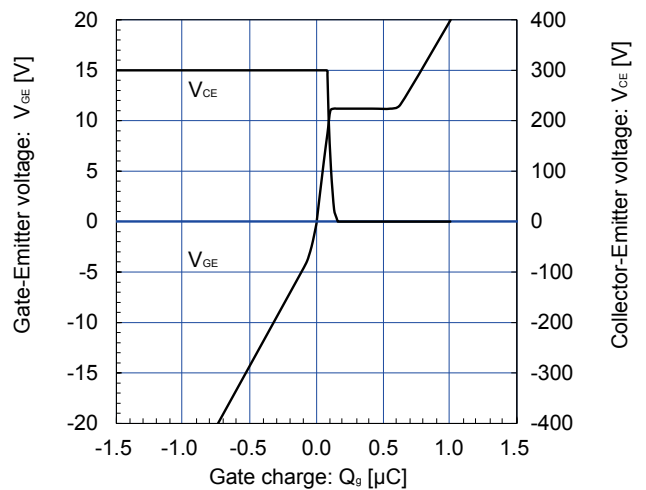
Collector-Emittter voltage vs. Gate-Emittter voltage  
 $T_J = 25^\circ\text{C}$  / chip



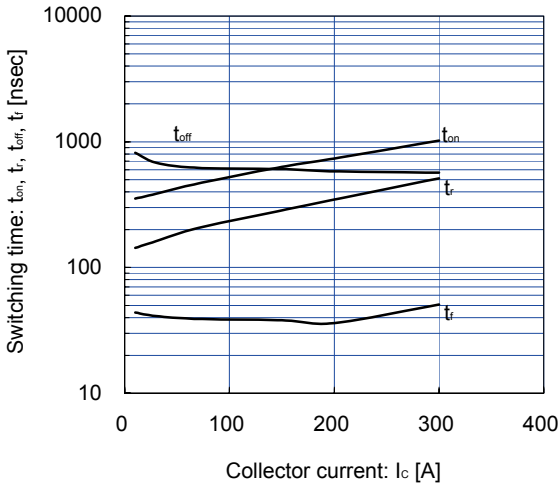
Gate Capacitance vs. Collector-Emittter Voltage  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_J = 25^\circ\text{C}$



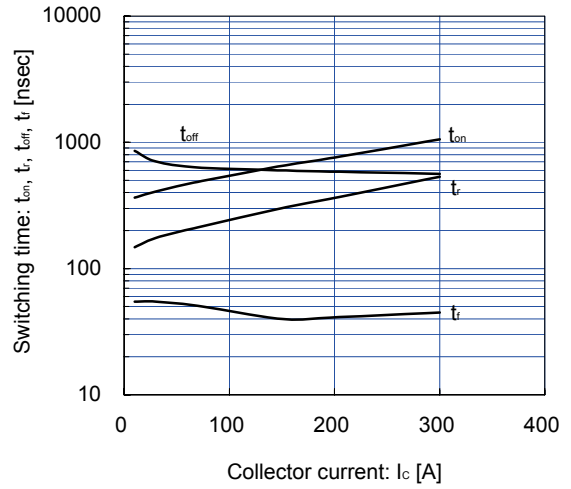
Dynamic Gate Charge (typ.)  
 $V_{CC} = 300\text{V}$ ,  $I_C = 150\text{A}$ ,  $T_J = 25^\circ\text{C}$



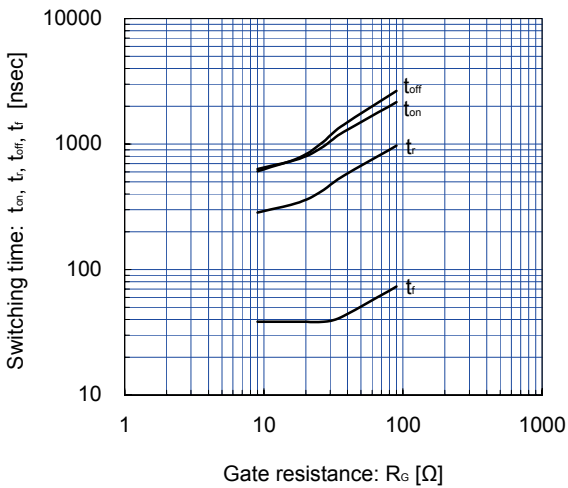
Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=9\Omega, T_J=125^\circ C$



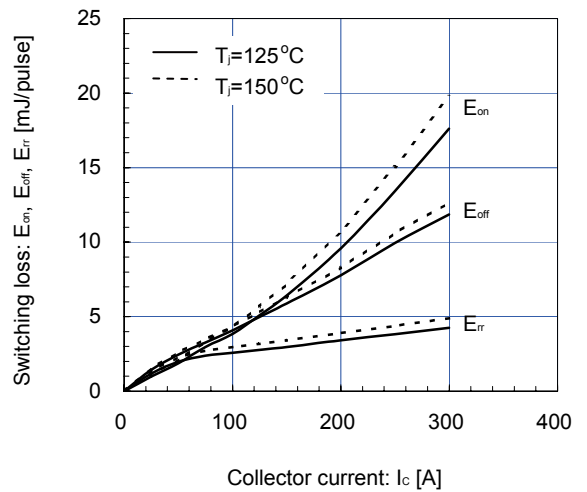
Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=9\Omega, T_J=150^\circ C$



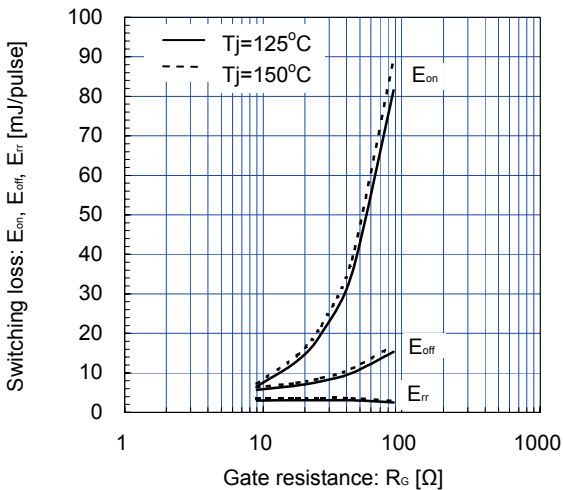
Switching time vs. Gate resistance (typ.)  
 $V_{CC}=300V, I_c=150A, V_{GE}=\pm 15V, T_J=125^\circ C$



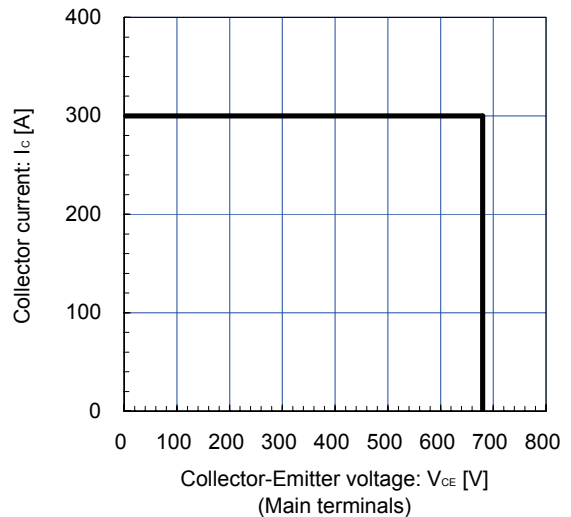
Switching loss vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=9\Omega, T_J=125, 150^\circ C$



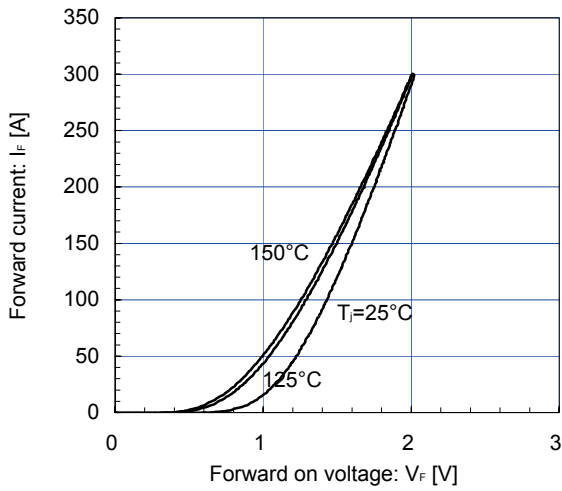
Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=300V, I_c=150A, V_{GE}=\pm 15V, T_J=125, 150^\circ C$



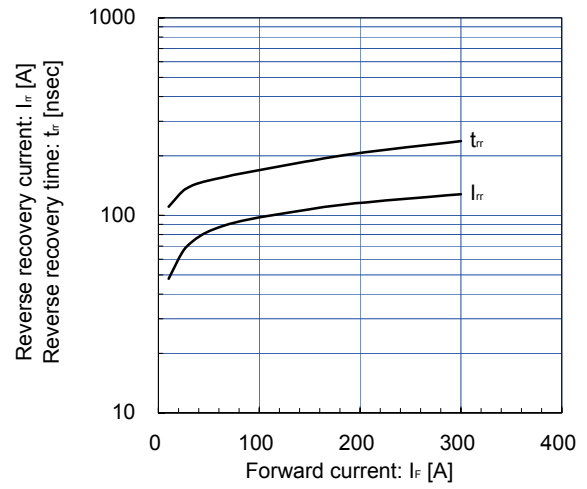
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_G=9\Omega, T_J=150^\circ C$



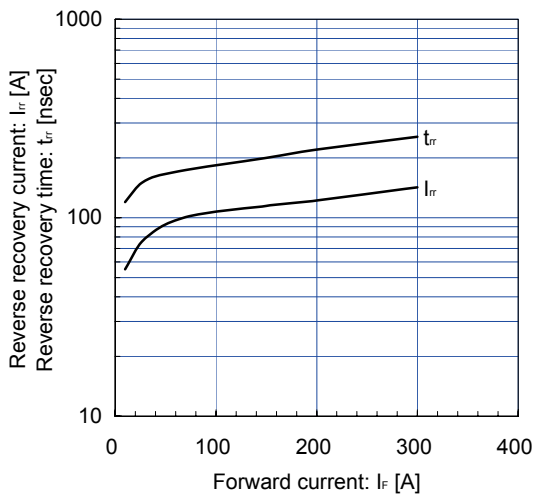
Forward Current vs. Forward Voltage (typ.)  
chip



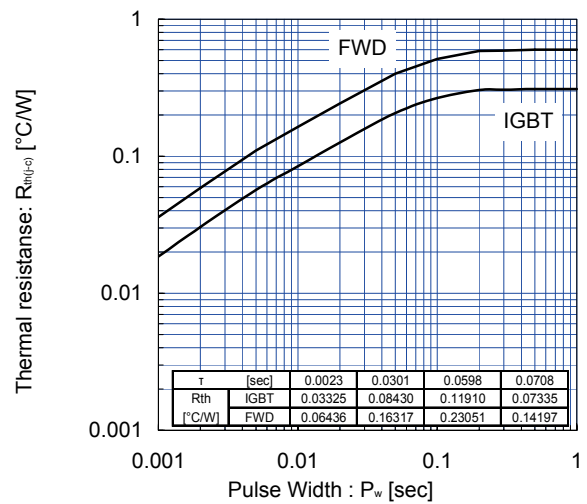
Reverse Recovery Characteristics (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=9\Omega, T_j=125^\circ C$



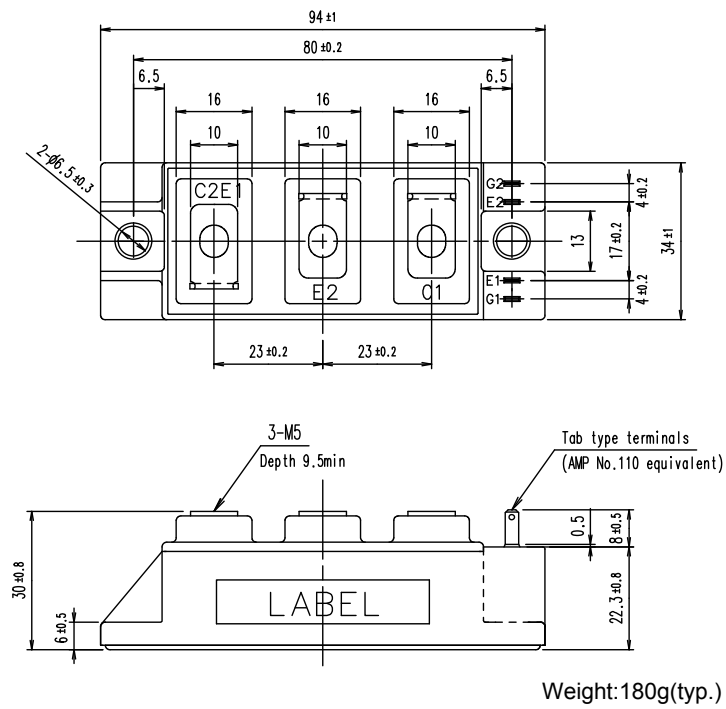
Reverse Recovery Characteristics (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=9\Omega, T_j=150^\circ C$



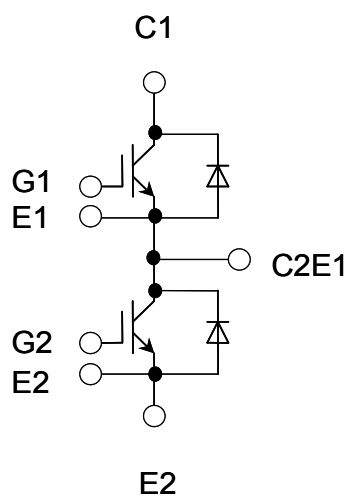
Transient Thermal Resistance (max.)



■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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