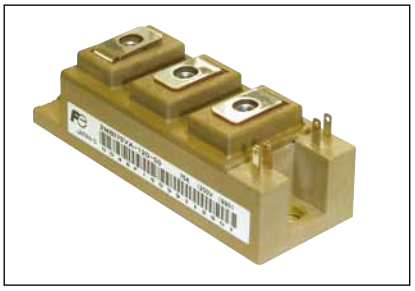
# 2MBI150VA-060-50

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 $T_c$=25°C unless otherwise specified)**

| Items | | Symbols | Conditions | | Maximum ratings | Units |
|---|---|---|---|---|---|---|
| Collector-Emitter voltage | | $V_{CES}$ | | | 600 | V |
| Gate-Emitter voltage | | $V_{GES}$ | | | ±20 | V |
| Collector current | | $I_C$ | Continuous | $T_C$=100°C | 150 | A |
| | | $I_{C\ pulse}$ | 1ms | | 300 | |
| | | -$I_C$ | | | 150 | |
| | | -$I_{C\ pulse}$ | 1ms | | 300 | |
| Collector power dissipation | | $P_C$ | 1 device | | 650 | W |
| Junction temperature | | $T_j$ | | | 175 | °C |
| Operating junction temperature (under switching conditions) | | $T_{jop}$ | | | 150 | |
| Case temperature | | $T_C$ | | | 125 | |
| Storage temperature | | $T_{stg}$ | | | -40 ~ 125 | |
| Isolation voltage | between terminal and copper base (*1) | $V_{iso}$ | AC : 1min. | | 2500 | VAC |
| 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 $T_j$= 25°C unless otherwise specified)**

| Items | Symbols | Conditions | | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|---|
| Zero gate voltage collector current | $I_{CES}$ | $V_{GE}$ = 0V, $V_{CE}$ = 600V | | - | - | 1.0 | mA |
| Gate-Emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | - | - | 200 | nA |
| Gate-Emitter threshold voltage | $V_{GE\ (th)}$ | $V_{CE}$ = 20V, $I_C$ = 150mA | | 6.2 | 6.7 | 7.2 | V |
| Collector-Emitter saturation voltage | $V_{CE\ (sat)}$ (terminal) | $V_{GE}$ = 15V, $I_C$ = 150A | $T_j$=25°C | - | 1.75 | 2.20 | V |
| | | | $T_j$=125°C | - | 2.05 | - | |
| | | | $T_j$=150°C | | 2.25 | | |
| | $V_{CE\ (sat)}$ (chip) | $V_{GE}$ = 15V, $I_C$ = 150A | $T_j$=25°C | - | 1.60 | 2.05 | |
| | | | $T_j$=125°C | - | 1.90 | - | |
| | | | $T_j$=150°C | | 2.00 | | |
| Internal gate resistance | $R_{G\ (int)}$ | - | | - | 6 | - | Ω |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 10V, $V_{GE}$ = 0V, f = 1MHz | | - | 9.7 | - | nF |
| Turn-on time | $t_{on}$ | $V_{CC}$ = 300V, $L_S$ = 30nH, $I_C$ = 150A, $V_{GE}$ = ±15V, $R_G$ = 9Ω, $T_j$ = 150°C | | - | 650 | - | nsec |
| | $t_r$ | | | - | 300 | - | |
| | $t_{r\ (i)}$ | | | - | 100 | - | |
| Turn-off time | $t_{off}$ | | | - | 600 | - | |
| | $t_f$ | | | - | 40 | - | |
| Forward on voltage | $V_F$ (terminal) | $V_{GE}$ = 0V, $I_F$ = 150A | $T_j$=25°C | - | 1.70 | 2.15 | V |
| | | | $T_j$=125°C | - | 1.60 | - | |
| | | | $T_j$=150°C | | 1.57 | | |
| | $V_F$ (chip) | $V_{GE}$ = 0V, $I_F$ = 150A | $T_j$=25°C | - | 1.60 | 2.05 | |
| | | | $T_j$=125°C | - | 1.50 | - | |
| | | | $T_j$=150°C | | 1.47 | | |
| Reverse recovery time | $t_{rr}$ | $I_F$ = 150A | | - | 200 | - | nsec |

● **Thermal resistance characteristics**

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

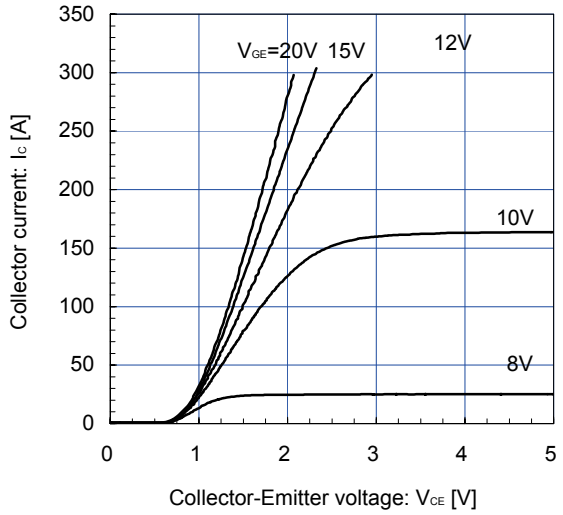
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.



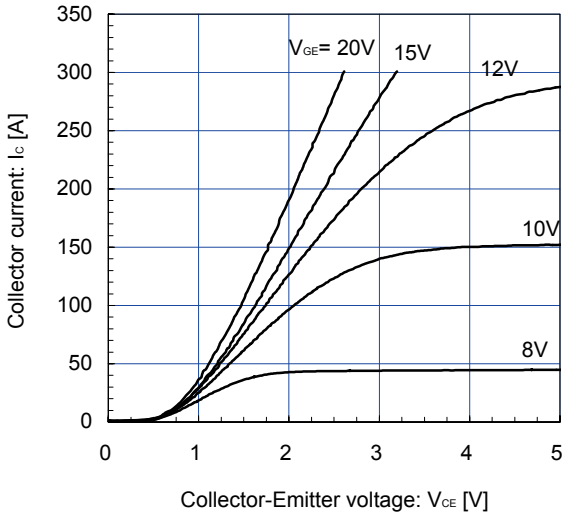
7909b
APRIL 2014

## ■ Characteristics (Representative)

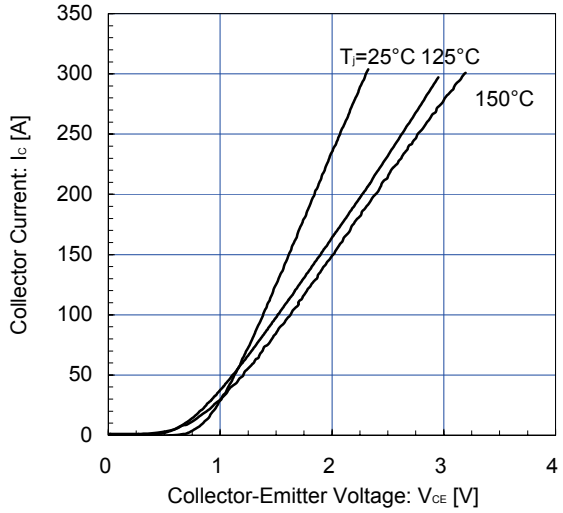
Collector current vs. Collector-Emitter voltage (typ.)
$T_j$= 25°C / chip



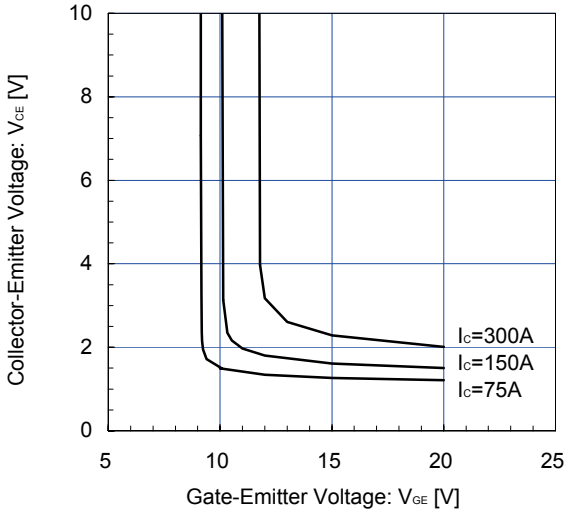

Collector current vs. Collector-Emitter voltage (typ.)
$T_j$= 150°C / chip



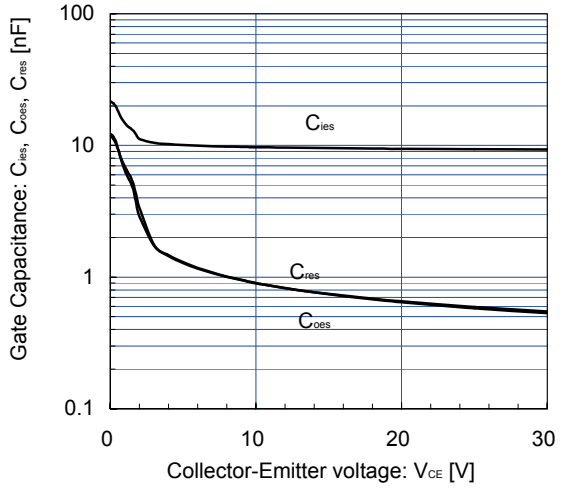

Collector current vs. Collector-Emitter voltage (typ.)
$V_{GE}$= 15V / chip



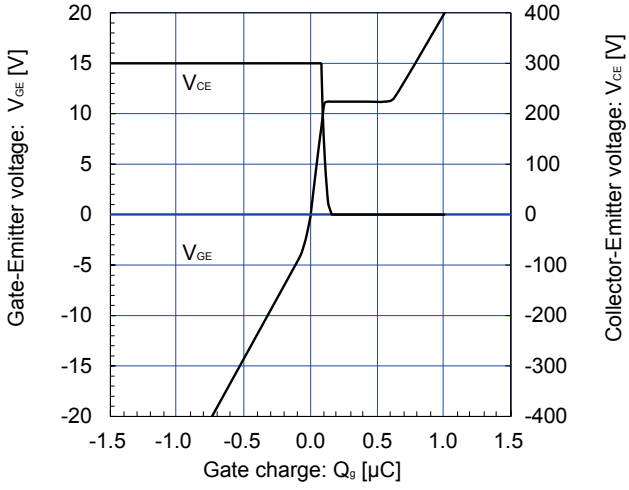

Collector-Emitter voltage vs. Gate-Emitter voltage
$T_j$= 25°C / chip



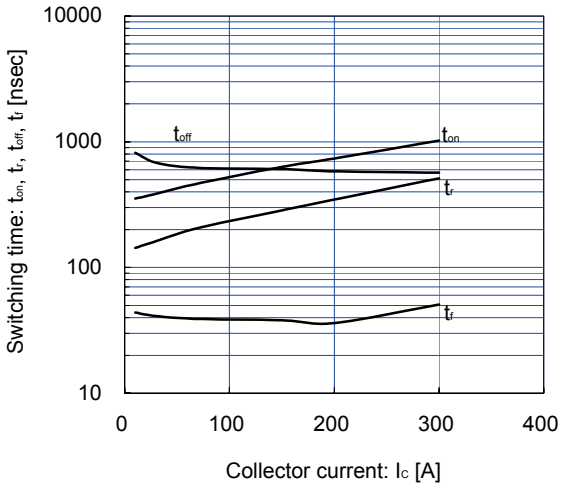

Gate Capacitance vs. Collector-Emitter Voltage
$V_{GE}$= 0V, $f$= 1MHz, $T_j$= 25°C



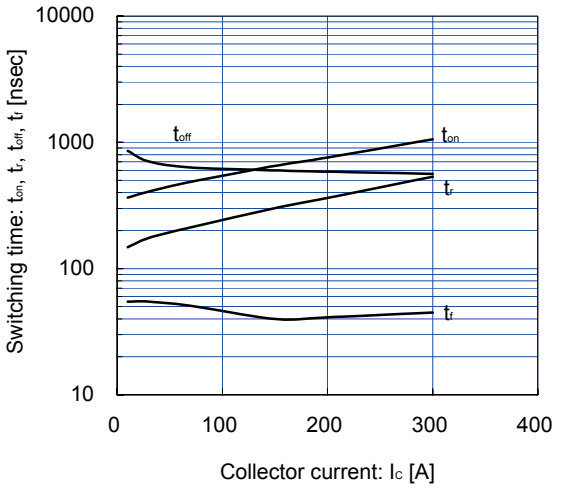

Dynamic Gate Charge (typ.)
$V_{CC}$=300V, $I_C$=150A, $T_j$= 25°C



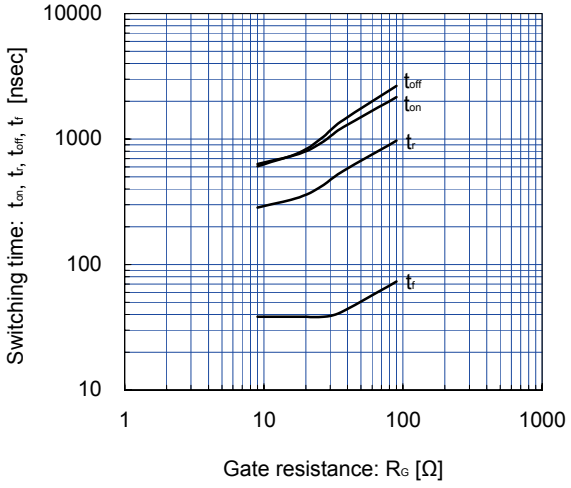
Switching time vs. Collector current (typ.)
$V_{CC}$=300V, $V_{GE}$=±15V, $R_G$=9Ω, $T_j$=125°C



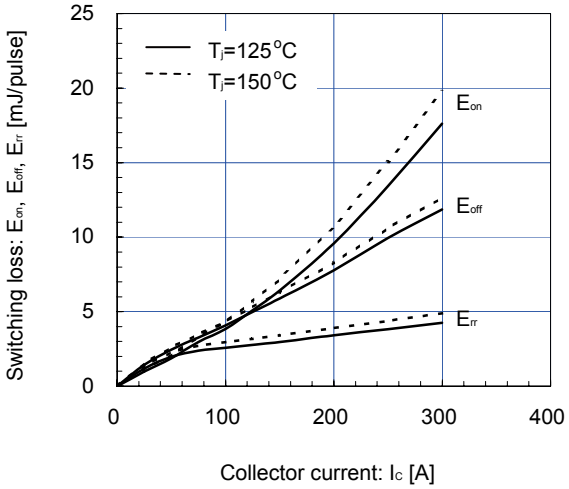

Switching time vs. Collector current (typ.)
$V_{CC}$=300V, $V_{GE}$=±15V, $R_G$=9Ω, $T_j$=150°C



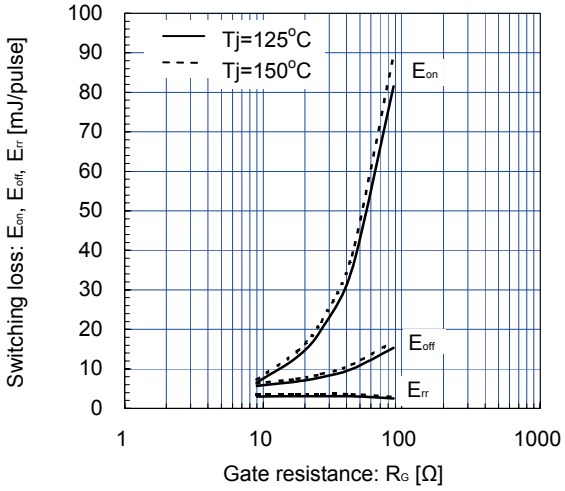

Switching time vs. Gate resistance (typ.)
$V_{CC}$=300V, $I_C$=150A, $V_{GE}$=±15V, $T_j$=125°C



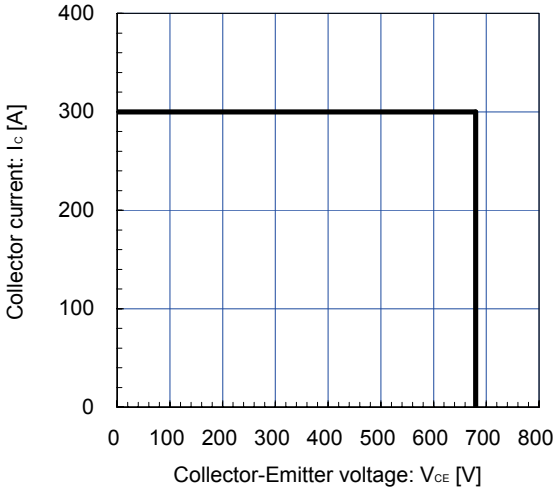

Switching loss vs. Collector current (typ.)
$V_{CC}$=300V, $V_{GE}$=±15V, $R_G$=9Ω, $T_j$=125, 150°C



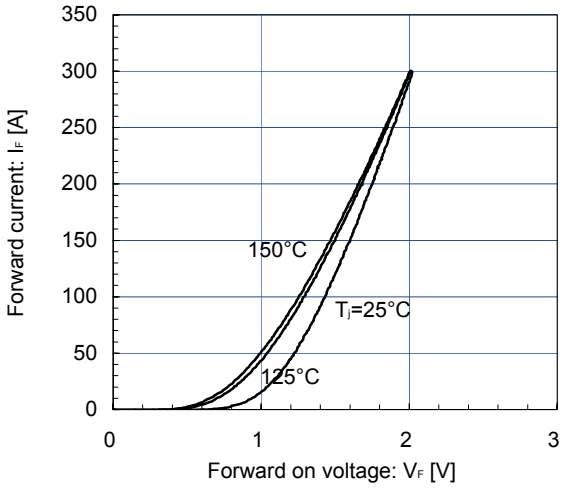

Switching loss vs. Gate resistance (typ.)
$V_{CC}$=300V, $I_C$=150A, $V_{GE}$=±15V, $T_j$=125, 150°C



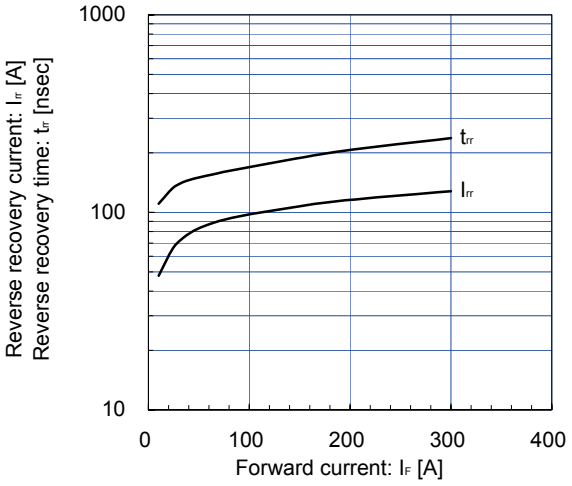

Reverse bias safe operating area (max.)
+$V_{GE}$=15V, -$V_{GE}$=15V, $R_G$=9Ω, $T_j$=150°C



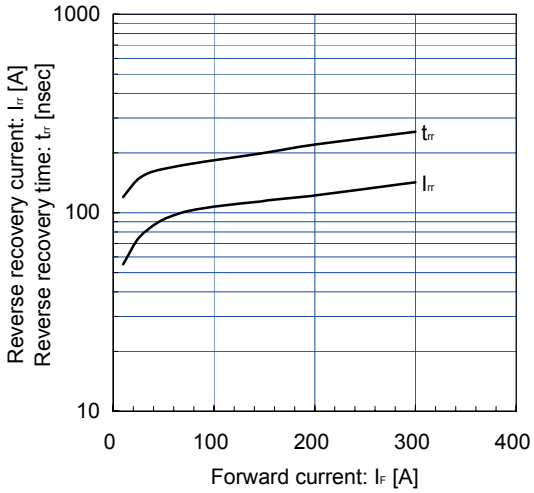
Forward Current vs. Forward Voltage (typ.)
chip



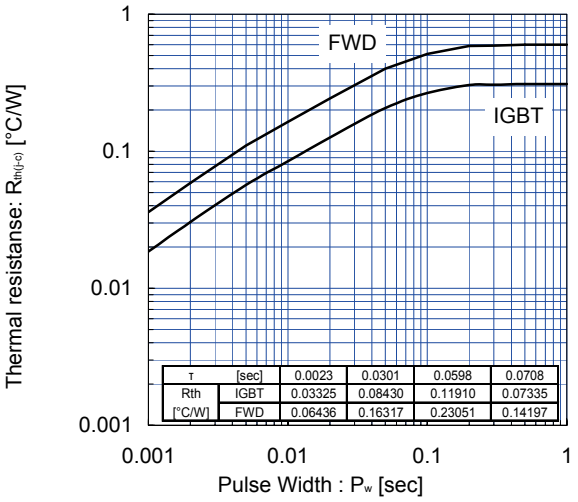

Reverse Recovery Characteristics (typ.)
$V_{CC}$=300V, $V_{GE}$=±15V, $R_G$=9Ω, $T_j$=125°C




Reverse Recovery Characteristics (typ.)
$V_{CC}$=300V, $V_{GE}$=±15V, $R_G$=9Ω, $T_j$=150°C

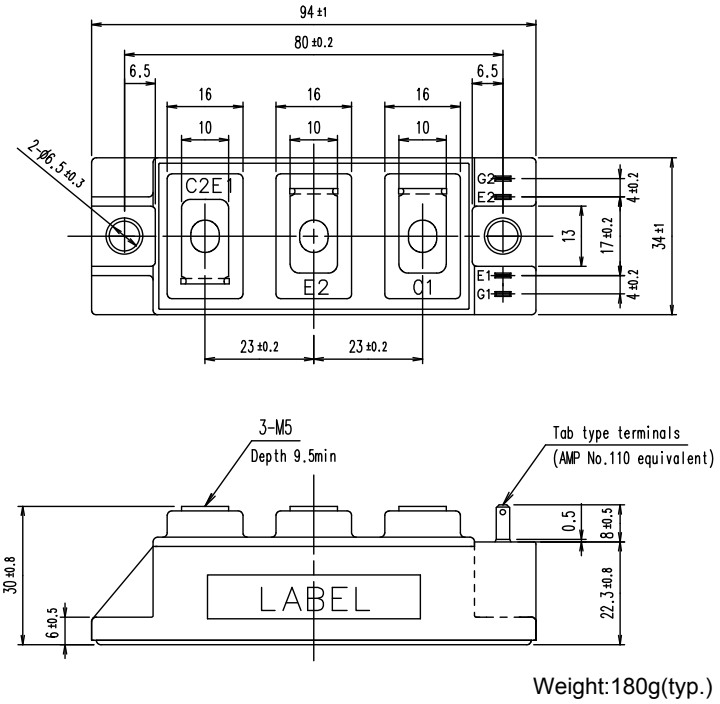



Transient Thermal Resistance (max.)



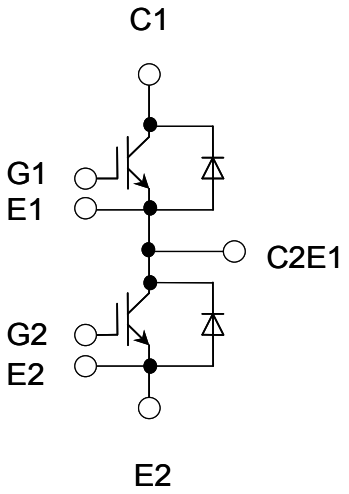

| τ | [sec] | 0.0023 | 0.0301 | 0.0598 | 0.0708 |
|---|---|---|---|---|---|
| Rth | IGBT | 0.03325 | 0.08430 | 0.11910 | 0.07335 |
| [°C/W] | FWD | 0.06436 | 0.16317 | 0.23051 | 0.14197 |

## ■ Outline Drawings, mm




Weight:180g(typ.)

## ■ Equivalent Circuit Schematic



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