

1MBI3600VD-120P

IGBT Modules

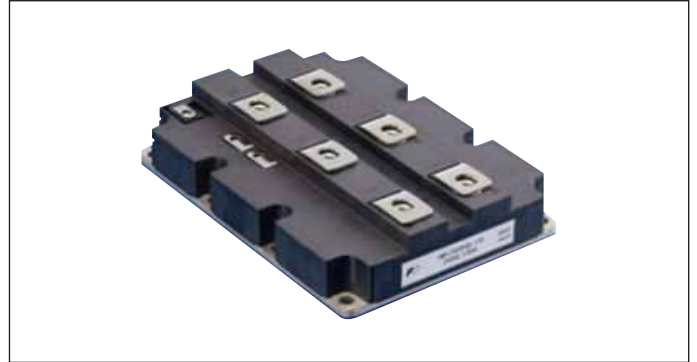
IGBT MODULE (V series) 3600V / 1200A / 1 in one package

■ 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_{CES} | | 1200 | V | |
| Gate-Emitter voltage | V_{GES} | | ±20 | V | |
| Collector current | I_c | Continuous | $T_c=25^\circ\text{C}$ | 4800 | A |
| | | | $T_c=100^\circ\text{C}$ | 3600 | |
| | I_{cp} | 1ms | $T_c=100^\circ\text{C}$ | 7200 | |
| | $-I_c$ | | | 3600 | |
| | $-I_{c\ pulse}$ | 1ms | | 7200 | |
| Collector power dissipation | P_c | 1 device | 20540 | W | |
| Junction temperature | T_j | | 175 | °C | |
| Operating junction temperature (under switching conditions) | T_{jop} | | 150 | | |
| Storage temperature | T_{stg} | | -40 ~ +150 | | |
| Isolation voltage | Between terminal and copper base *1 | V_{iso} | AC : 1min. | 4000 | VAC |
| Screw torque *2 | Mounting | M6 | | 5.75 | Nm |
| | Main Terminals | M8 | | 10 | |
| | Sense Terminals | M4 | | 2.5 | |

(*1) All terminals should be connected together when isolation test will be done.

(*2) Recommendable Value :Mounting 4.25~5.75 Nm (M6) , Main Terminals 8~10 Nm (M8) , Sense Terminals 1.7~2.5 Nm (M4)

● Electrical characteristics (at T_j = 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} = 1200V | - | - | 1.0 | mA | |
| Gate-Emitter leakage current | I _{GES} | V _{CE} = 0V, V _{GE} = ±20V | - | - | 4800 | nA | |
| Gate-Emitter threshold voltage | V _{GE(th)} | V _{CE} = 20V, I _c = 3600mA | 6.0 | 6.5 | 7.0 | V | |
| Collector-Emitter saturation voltage | V _{CE(sat)} (main terminal) | V _{GE} = 15V I _c = 3600A | T _j = 25°C | - | 2.02 | 2.31 | V |
| | | | T _j = 125°C | - | 2.32 | - | |
| | | | T _j = 150°C | - | 2.42 | - | |
| | V _{CE(sat)} (chip) | | T _j = 25°C | - | 1.70 | 1.95 | |
| | | | T _j = 125°C | - | 2.00 | - | |
| | | | T _j = 150°C | - | 2.10 | - | |
| Internal gate resistance | Int R _g | | - | 0.63 | - | Ω | |
| Input capacitance | C _{ies} | V _{CE} = 10V, V _{GE} = 0V, f = 1MHz | - | 312 | - | nF | |
| Turn-on | t _{on} | V _{CC} = 600V, I _c = 3600A | - | 2.98 | - | μs | |
| | t _r | L _m = 46nH, V _{GE} = ±15V, T _j = 125°C | - | 0.88 | - | | |
| Turn-off | t _{off} | R _{gon} = 1.2 Ω | - | 2.15 | - | | |
| | t _f | R _{goff} = 0.22 Ω | - | 0.27 | - | | |
| Forward on voltage | V _F (main terminal) | V _{GE} = 0V I _F = 3600A | T _j = 25°C | - | 2.02 | 2.31 | V |
| | | | T _j = 125°C | - | 2.17 | - | |
| | | | T _j = 150°C | - | 2.12 | - | |
| | V _F (chip) | | T _j = 25°C | - | 1.70 | 1.95 | |
| | | | T _j = 125°C | - | 1.85 | - | |
| | | | T _j = 150°C | - | 1.80 | - | |
| Reverse recovery time | t _{rr} | I _F = 3600A, T _j = 125°C | - | 0.46 | - | μs | |
| Lead resistance, terminal-chip | R _{lead} | | - | 0.089 | - | mΩ | |

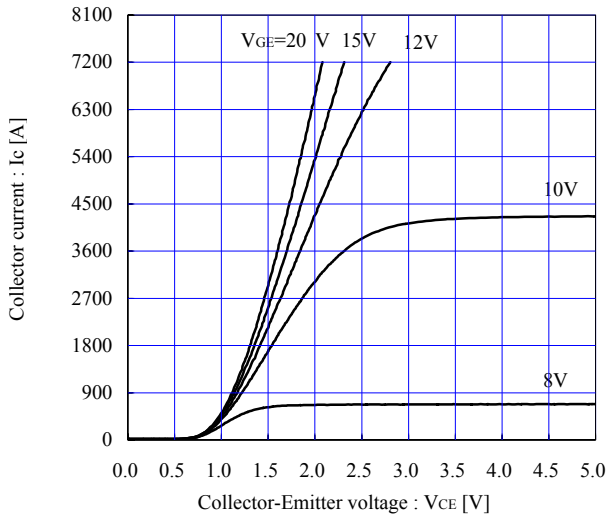
● Thermal resistance characteristics

| Items | Symbols | Conditions | Characteristics | | | Units |
|----------------------------|----------------------|--------------------------|-----------------|--------|--------|-------|
| | | | min. | typ. | max. | |
| Thermal resistance | R _{th(j-c)} | IGBT | - | - | 0.0073 | °C/W |
| | | FWD | - | - | 0.0122 | |
| Contact Thermal resistance | R _{th(c-f)} | with Thermal Compound(*) | - | 0.0040 | - | |

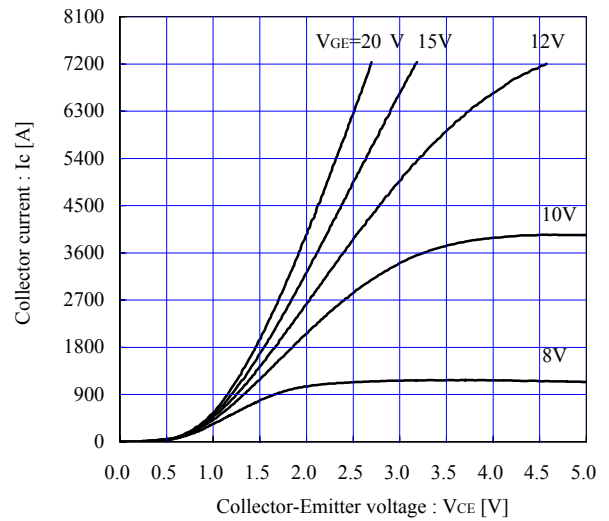
* This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

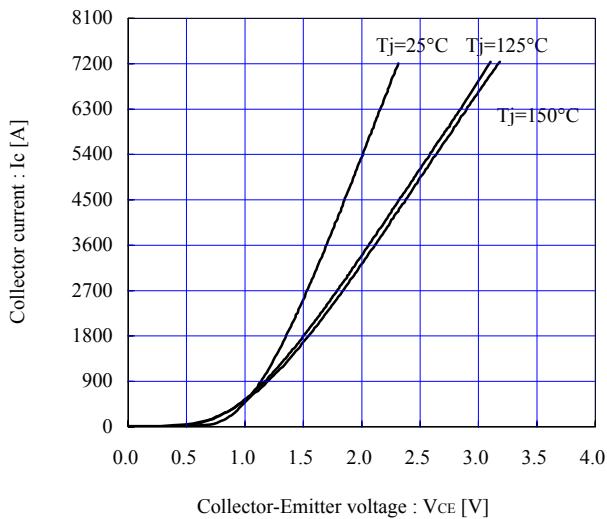
Collector current vs. Collector-Emittor voltage (typ.)
T_j=25°C, chip



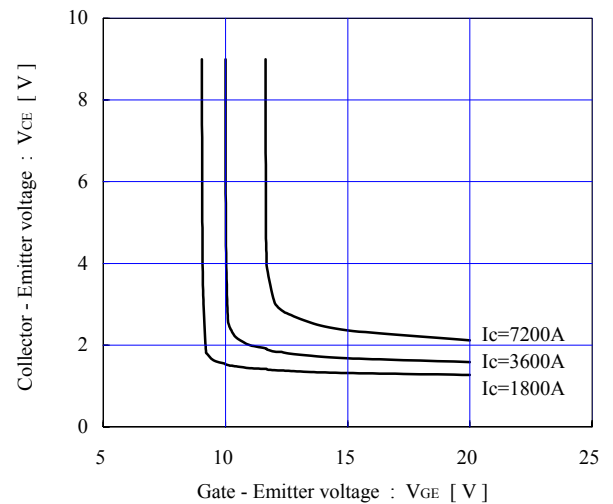
Collector current vs. Collector-Emittor voltage (typ.)
T_j= 150°C, chip



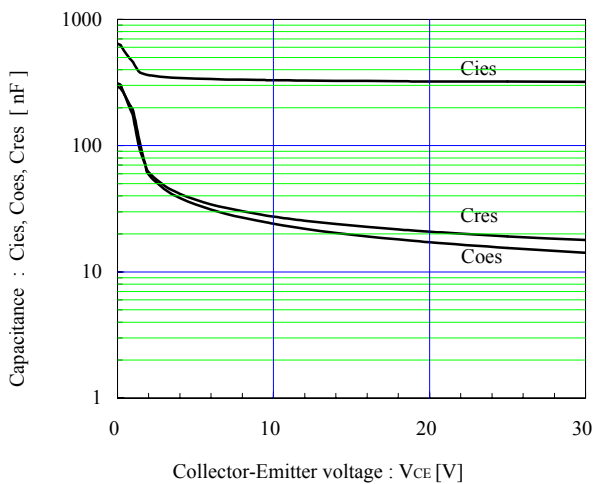
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
V_{GE}=+15V, chip



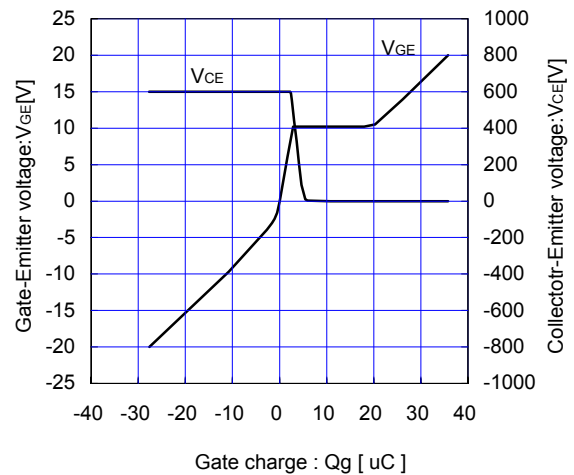
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
T_j=25°C, chip



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

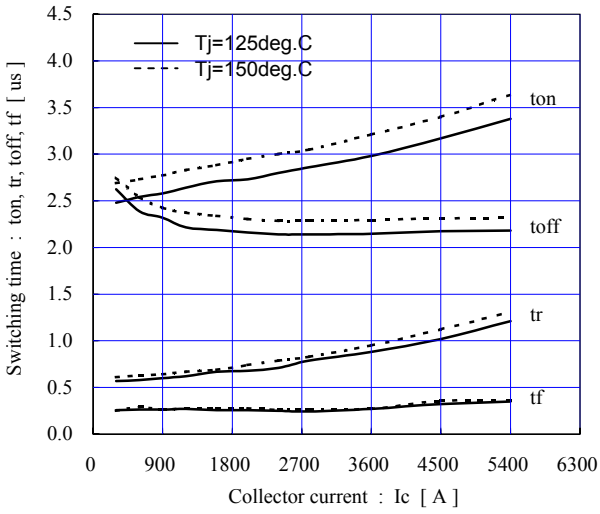


Dynamic Gate charge (typ.)
T_j= 25°C



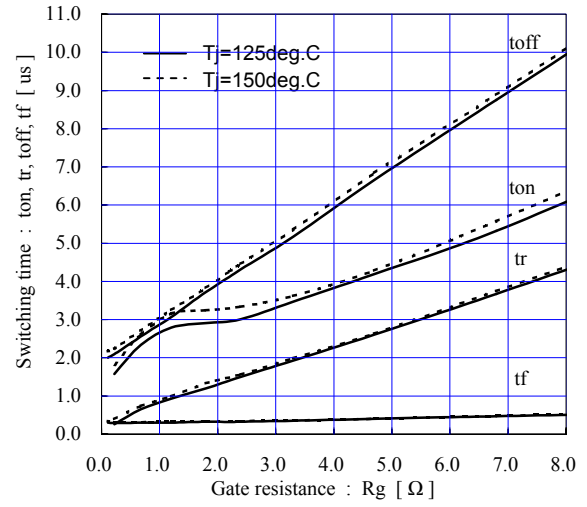
Switching time vs. Collector current (typ.)

$V_{cc}=600V, V_{GE}=\pm 15V, R_{gon}=1.2 \Omega, R_{goff}=0.22\Omega$



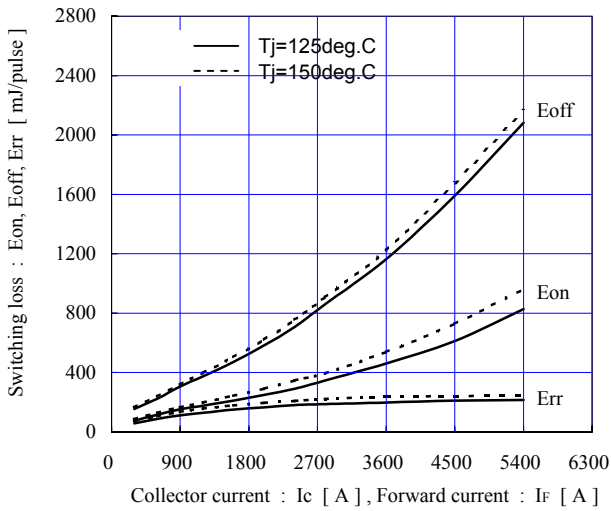
Switching time vs. Gate resistance (typ.)

$V_{cc}=600V, I_c=3600A, V_{GE}=\pm 15V$



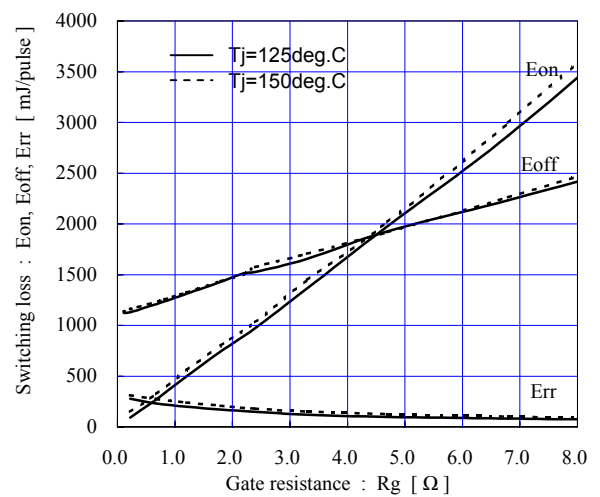
Switching loss vs. Collector current (typ.)

$V_{cc}=600V, V_{GE}=\pm 15V, R_{gon}=1.2 \Omega, R_{goff}=0.22 \Omega$



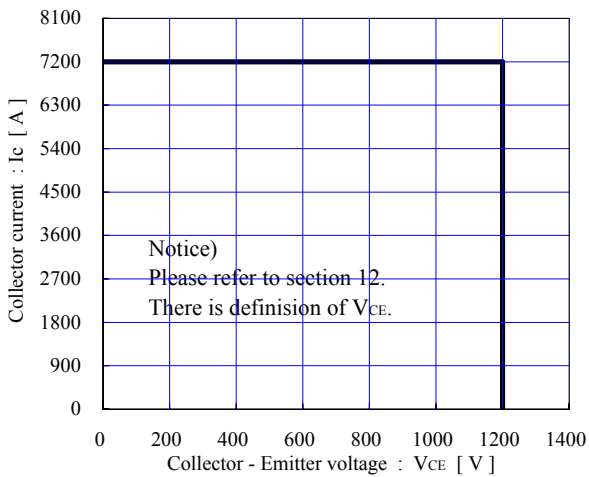
Switching loss vs. Gate resistance (typ.)

$V_{cc}=600V, I_c=3600A, V_{GE}=\pm 15V$

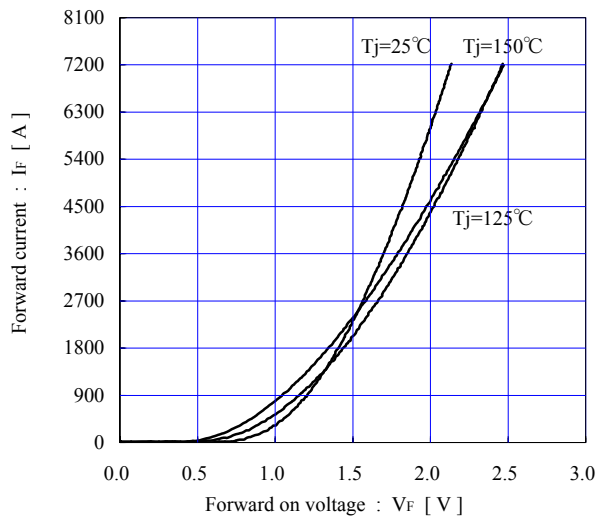


Reverse bias safe operating area (max.)

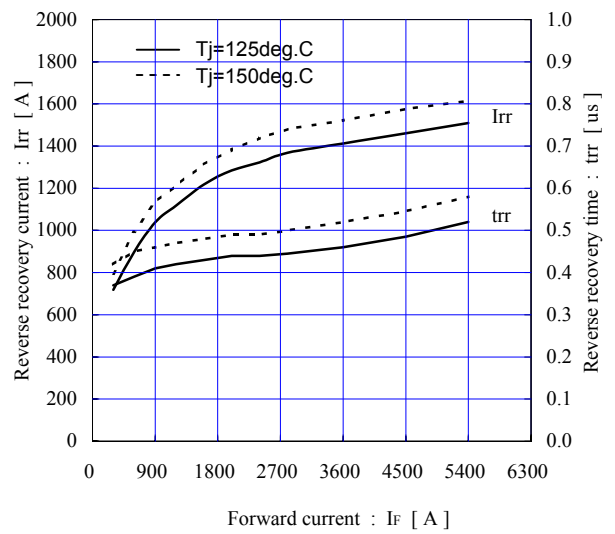
$\pm V_{GE}=15V, T_j = 150^{\circ}C$



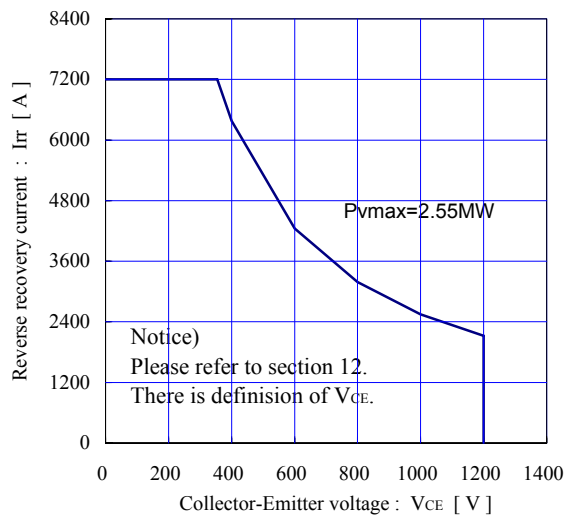
Forward current vs. Forward on voltage (typ.)
chip



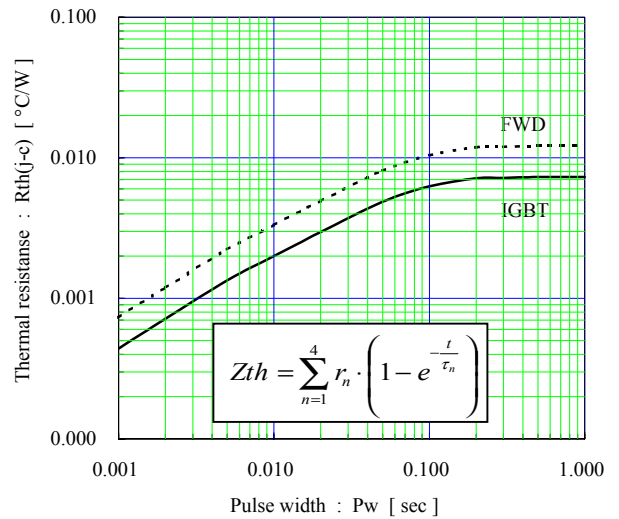
Reverse recovery characteristics (typ.)
Vcc=600V, VGE=±15V, Rgon=1.2Ω



FWD safe operating area (max.)
Tj=150°C

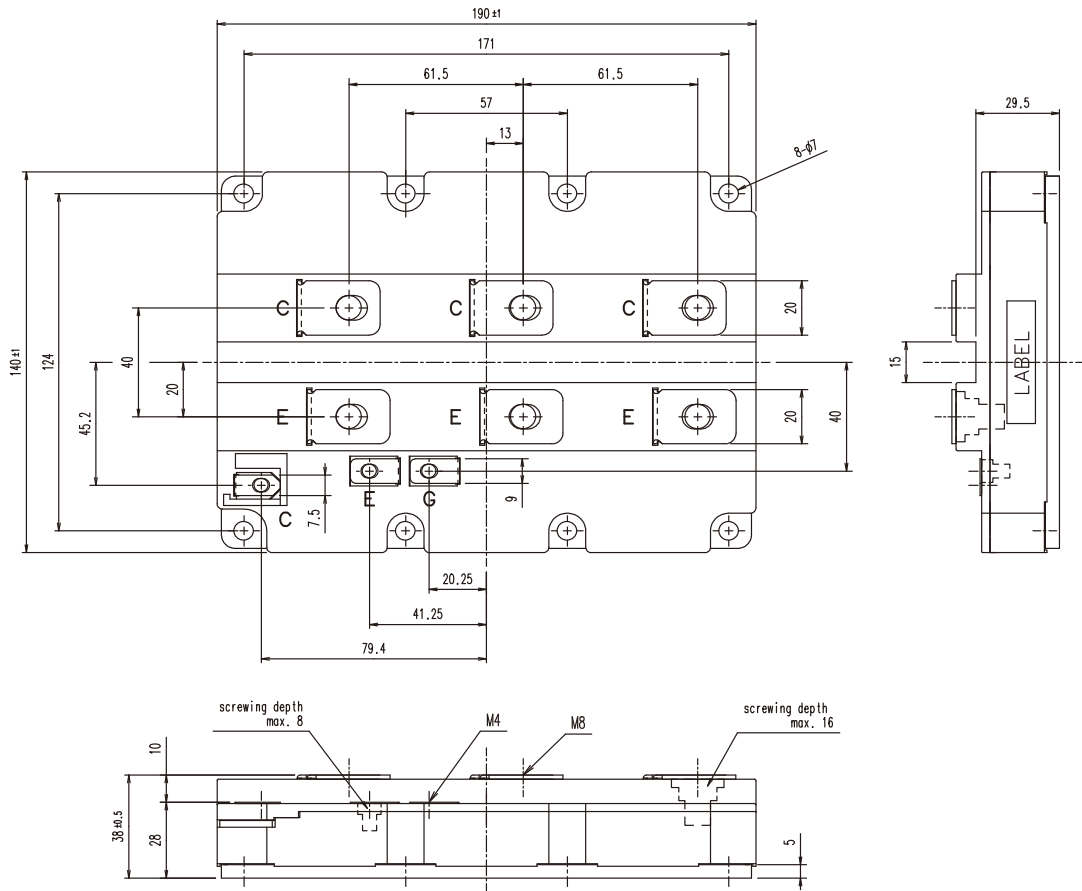


Transient thermal resistance (max.)

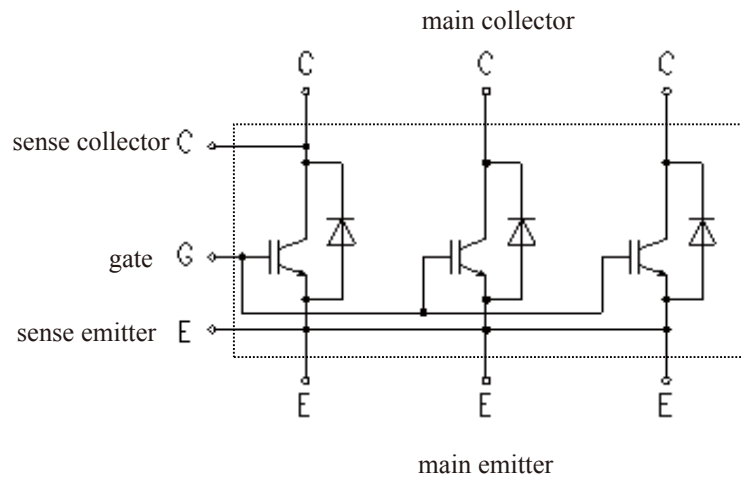


| | IGBT | FWD |
|----|---------|---------|
| r1 | 0.00081 | 0.00134 |
| r2 | 0.00282 | 0.00467 |
| r3 | 0.00202 | 0.00335 |
| r4 | 0.00165 | 0.00279 |
| τ1 | 0.0024 | 0.0023 |
| τ2 | 0.0354 | 0.0351 |
| τ3 | 0.0643 | 0.0660 |
| τ4 | 0.0728 | 0.0707 |

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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