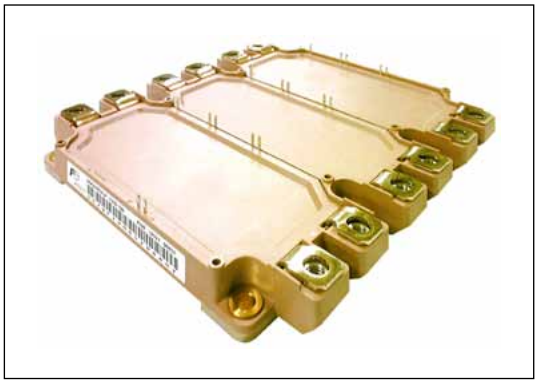
# 6MBI300V-170-50

IGBT Modules

## IGBT MODULE (V series)
## 1700V / 300A / 6 in one package

### Features

Compact Package
P.C.Board Mount
Low $V_{CE}$ (sat)



### 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 |
|---|---|---|---|---|---|---|---|
| Inverter | Collector-Emitter voltage | | $V_{CES}$ | | | 1700 | V |
| | Gate-Emitter voltage | | $V_{GES}$ | | | ±20 | V |
| | Collector current | | $I_C$ | Continuous | $T_C$=25°C | 450 | A |
| | | | | | $T_C$=100°C | 300 | |
| | | | $I_{C\ pulse}$ | 1ms | | 600 | |
| | | | $-I_C$ | | | 300 | |
| | | | $-I_{C\ pulse}$ | 1ms | | 600 | |
| | Collector power dissipation | | $P_C$ | 1 device | | 1665 | 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. | | 3400 | VAC |
| | | Between thermistor and others (*2) | | | | | |
| Screw torque | | Mounting (*3) | - | | | 3.5 | N m |
| | | Terminals (*4) | - | | | 4.5 | |

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 : 2.5-3.5 Nm (M5)
Note *4: Recommendable Value : 3.5-4.5 Nm (M6)

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

| | Items | Symbols | Conditions | | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|---|---|
| Inverter | Zero gate voltage collector current | $I_{CES}$ | $V_{GE}$ = 0V, $V_{CE}$ = 1700V | | - | - | 3.0 | mA |
| | Gate-Emitter leakage current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | - | - | 600 | nA |
| | Gate-Emitter threshold voltage | $V_{GE\ (th)}$ | $V_{CE}$ = 20V, $I_C$ = 300mA | | 6.0 | 6.5 | 7.0 | V |
| | Collector-Emitter saturation voltage | $V_{CE\ (sat)}$ (terminal) | $V_{GE}$ = 15V, $I_C$ = 300A | $T_j$=25°C | - | 2.45 | 2.90 | V |
| | | | | $T_j$=125°C | - | 2.90 | - | |
| | | | | $T_j$=150°C | - | 2.95 | - | |
| | | $V_{CE\ (sat)}$ (chip) | $V_{GE}$ = 15V, $I_C$ = 300A | $T_j$=25°C | - | 2.00 | 2.45 | |
| | | | | $T_j$=125°C | - | 2.45 | - | |
| | | | | $T_j$=150°C | - | 2.50 | - | |
| | Internal gate resistance | $R_{G\ (int)}$ | - | | - | 2.50 | - | Ω |
| | Input capacitance | $C_{ies}$ | $V_{CE}$ = 10V, $V_{GE}$ = 0V, f = 1MHz | | - | 30 | - | nF |
| | Turn-on time | $t_{on}$ | $V_{CC}$ = 900V, $I_C$ = 300A, $V_{GE}$ = ±15V, $R_G$ = 4.7Ω, $L_S$ = 80nH | | - | 900 | - | nsec |
| | | $t_r$ | | | - | 400 | - | |
| | | $t_{r\ (i)}$ | | | - | 100 | - | |
| | Turn-off time | $t_{off}$ | | | - | 1300 | - | |
| | | $t_f$ | | | - | 100 | - | |
| | Forward on voltage | $V_F$ (terminal) | $V_{GE}$ = 0V, $I_F$ = 300A | $T_j$=25°C | - | 2.25 | 2.70 | V |
| | | | | $T_j$=125°C | - | 2.55 | - | |
| | | | | $T_j$=150°C | - | 2.55 | - | |
| | | $V_F$ (chip) | $V_{GE}$ = 0V, $I_F$ = 300A | $T_j$=25°C | - | 1.80 | 2.25 | |
| | | | | $T_j$=125°C | - | 2.10 | - | |
| | | | | $T_j$=150°C | - | 2.10 | - | |
| | Reverse recovery time | $t_{rr}$ | $I_F$ = 300A | | - | 250 | - | nsec |
| Thermistor | Resistance | R | T = 25°C | | - | 5000 | - | Ω |
| | | | T = 100°C | | 465 | 495 | 520 | |
| | B value | B | T = 25 / 50°C | | 3305 | 3375 | 3450 | K |

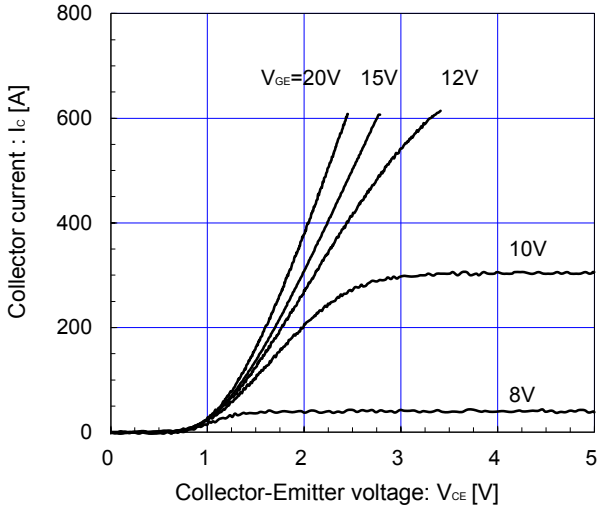
## ● Thermal resistance characteristics

| Items | Symbols | Conditions | Characteristics min. | Characteristics typ. | Characteristics max. | Units |
|---|---|---|---|---|---|---|
| Thermal resistance (1device) | $R_{th(j-c)}$ | Inverter IGBT | - | - | 0.090 | °C/W |
| | | Inverter FWD | - | - | 0.150 | |
| Contact thermal resistance (1device) (*5) | $R_{th(c-f)}$ | with Thermal Compound | - | 0.0167 | - | |

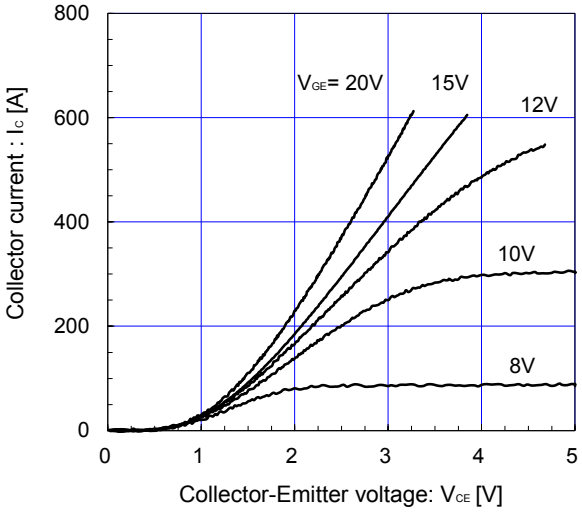
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

## ■ Characteristics (Representative)

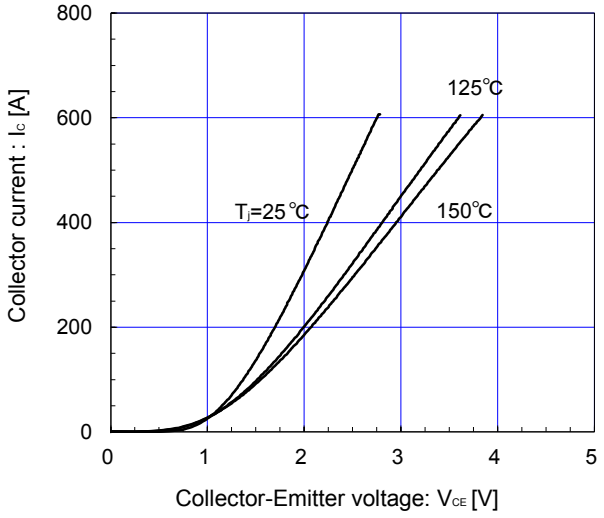
[ Inverter ]
Collector current vs. Collector-Emitter voltage (typ.)
$T_j$= 25°C / chip



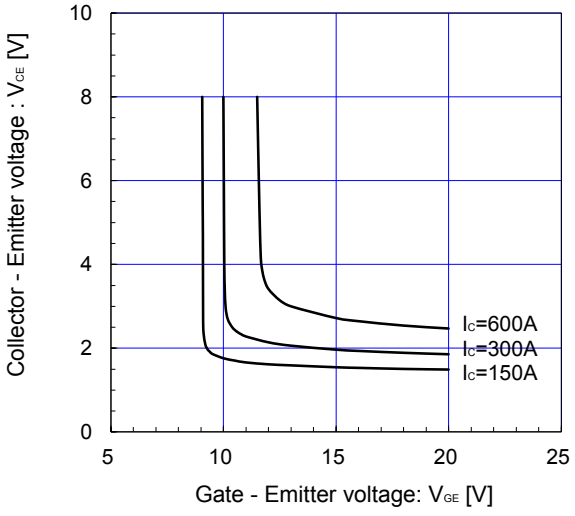

[ Inverter ]
Collector current vs. Collector-Emitter voltage (typ.)
$T_j$= 150°C / chip



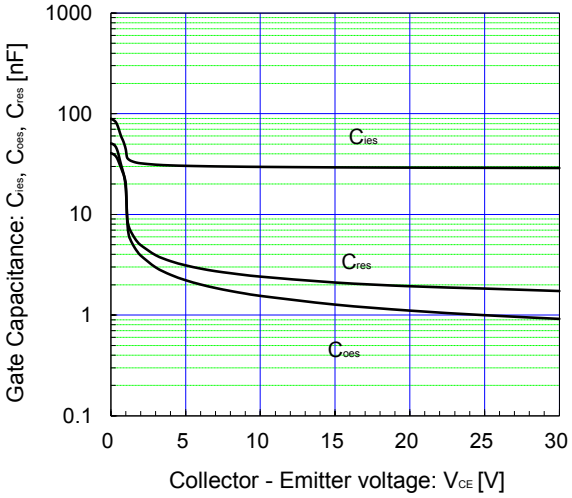

[ Inverter ]
Collector current vs. Collector-Emitter voltage (typ.)
$V_{GE}$=15V / chip



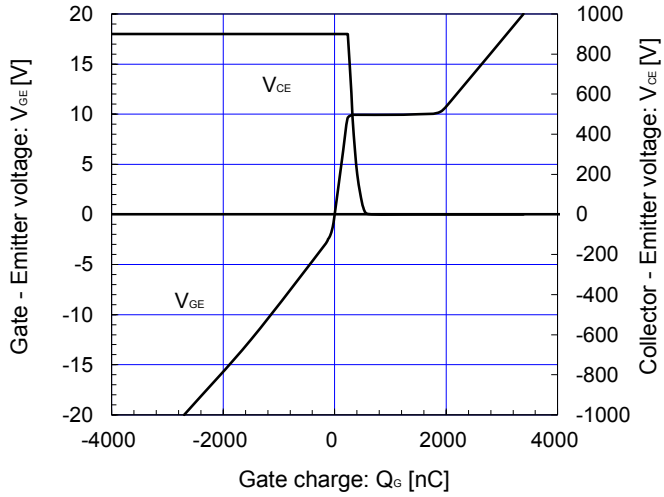

[ Inverter ]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
$T_j$= 25°C / chip



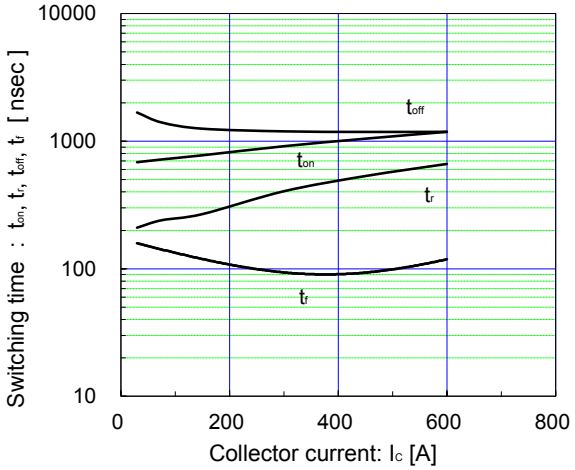

[ Inverter ]
Gate Capacitance vs. Collector-Emitter voltage (typ.)
$V_{GE}$=0V, f= 1MHz, $T_j$= 25°C



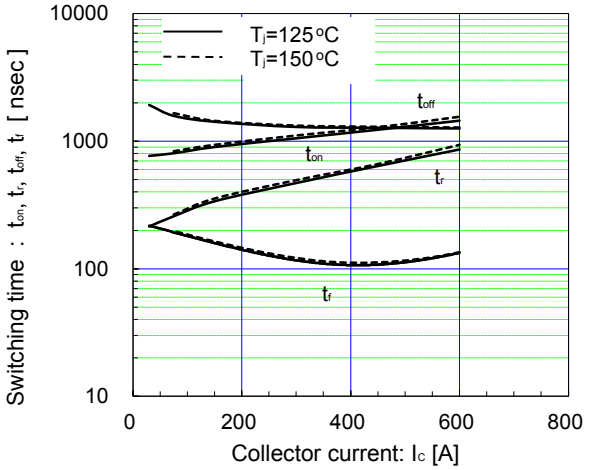

[ Inverter ]
Dynamic gate charge (typ.)
$V_{CC}$=900V, $I_C$=300A, $T_j$= 25°C



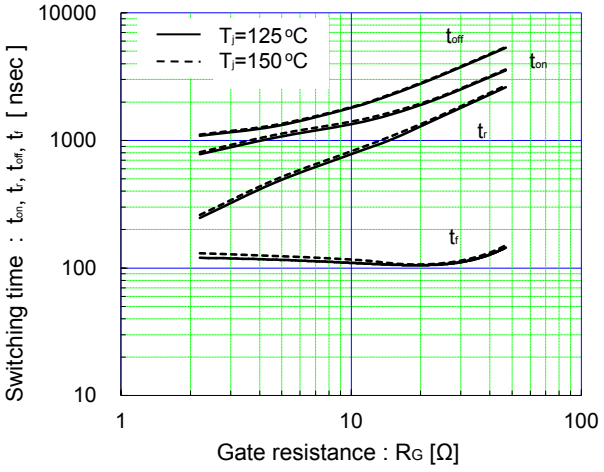
[ Inverter ]
Switching time vs. Collector current (typ.)
$V_{CC}$=900V, $V_{GE}$=±15V, $R_G$=4.7Ω, $T_j$= 25°C



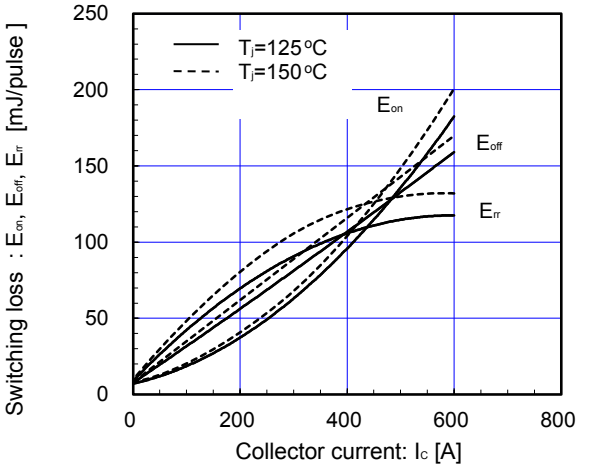

[ Inverter ]
Switching time vs. Collector current (typ.)
$V_{CC}$=900V, $V_{GE}$=±15V, $R_G$=4.7Ω, $T_j$= 125°C, 150°C



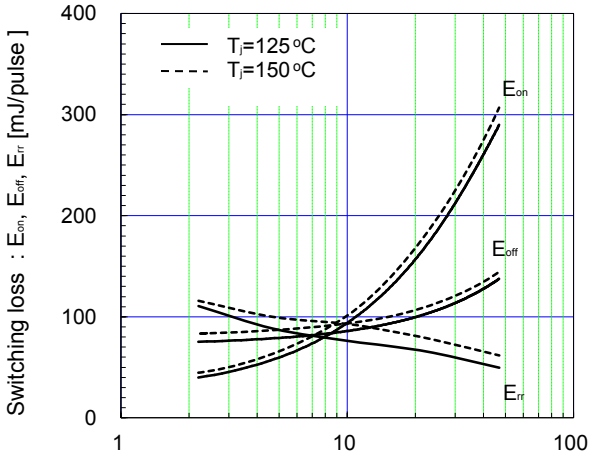

[ Inverter ]
Switching time vs. Gate resistance (typ.)
$V_{CC}$=900V, $I_C$=300A, $V_{GE}$=±15V, $T_j$= 125°C, 150°C



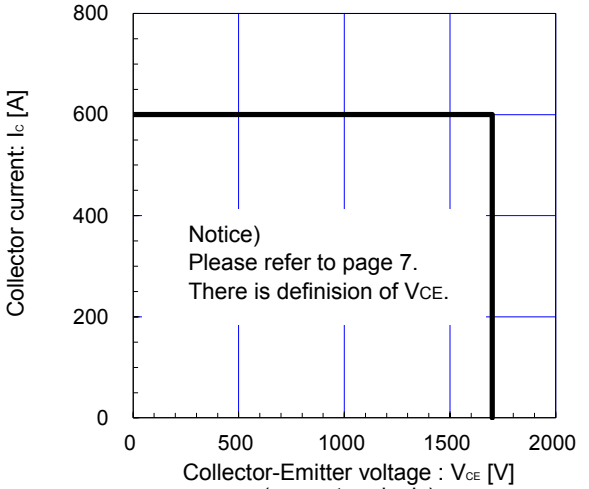

[ Inverter ]
Switching loss vs. Collector current (typ.)
$V_{CC}$=900V, $V_{GE}$=±15V, $R_G$=4.7Ω, $T_j$=125°C, 150°C



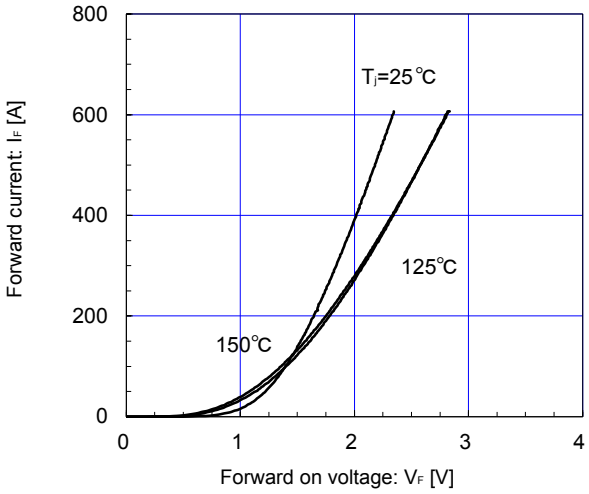

[ Inverter ]
Switching loss vs. Gate resistance (typ.)
$V_{CC}$=900V, $I_C$=300A, $V_{GE}$=±15V, $T_j$=125°C, 150°C



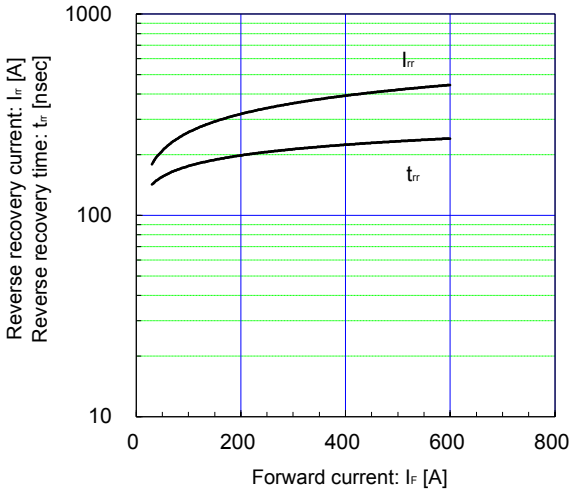

[ Inverter ]
Reverse bias safe operating area (max.)
+$V_{GE}$=15V,-$V_{GE}$ ≤ 15V, $R_G$ ≥ 4.7Ω ,$T_j$ = 150°C



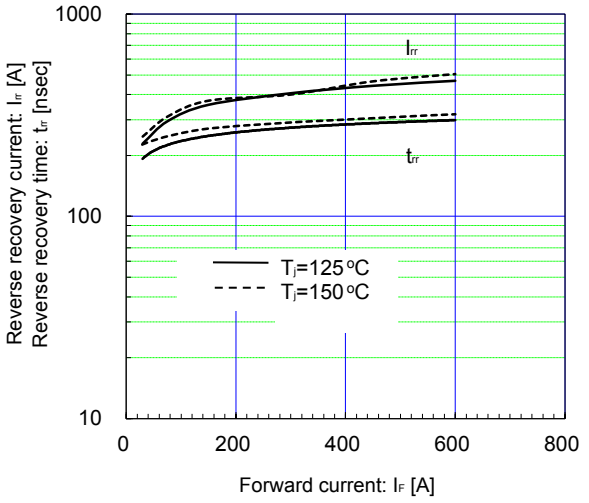
[INVERTER]
Forward Current vs. Forward Voltage (typ.)
chip



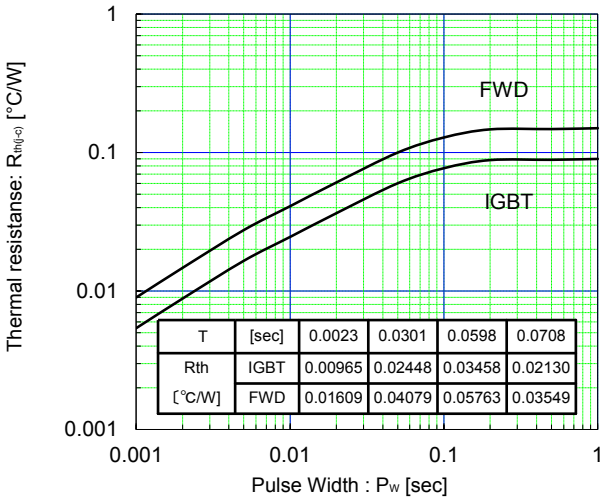

[INVERTER]
Reverse Recovery Characteristics (typ.)
$V_{CC}$=900V, $V_{GE}$=±15V, $R_G$=4.7Ω, $T_j$=25°C




[INVERTER]
Reverse Recovery Characteristics (typ.)
$V_{CC}$=900V, $V_{GE}$=±15V, $R_G$=4.7Ω, $T_j$=125°C, 150°C

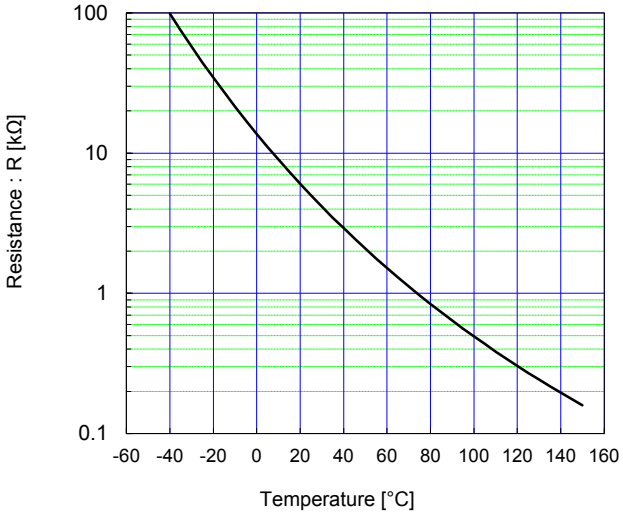



Transient Thermal Resistance (max.)

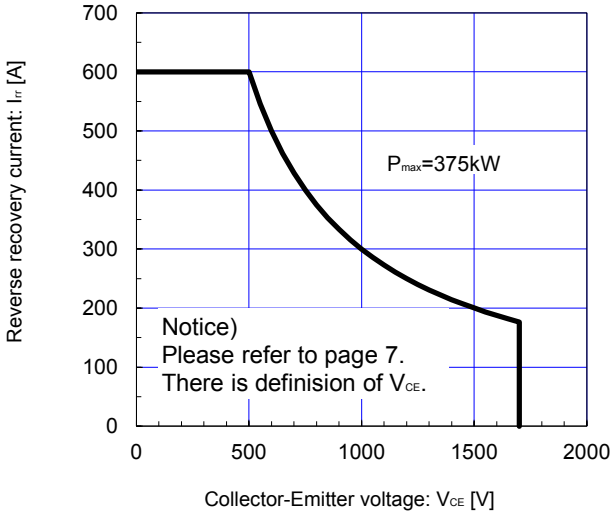



| T | [sec] | 0.0023 | 0.0301 | 0.0598 | 0.0708 |
|---|---|---|---|---|---|
| Rth | IGBT | 0.00965 | 0.02448 | 0.03458 | 0.02130 |
| [℃/W] | FWD | 0.01609 | 0.04079 | 0.05763 | 0.03549 |

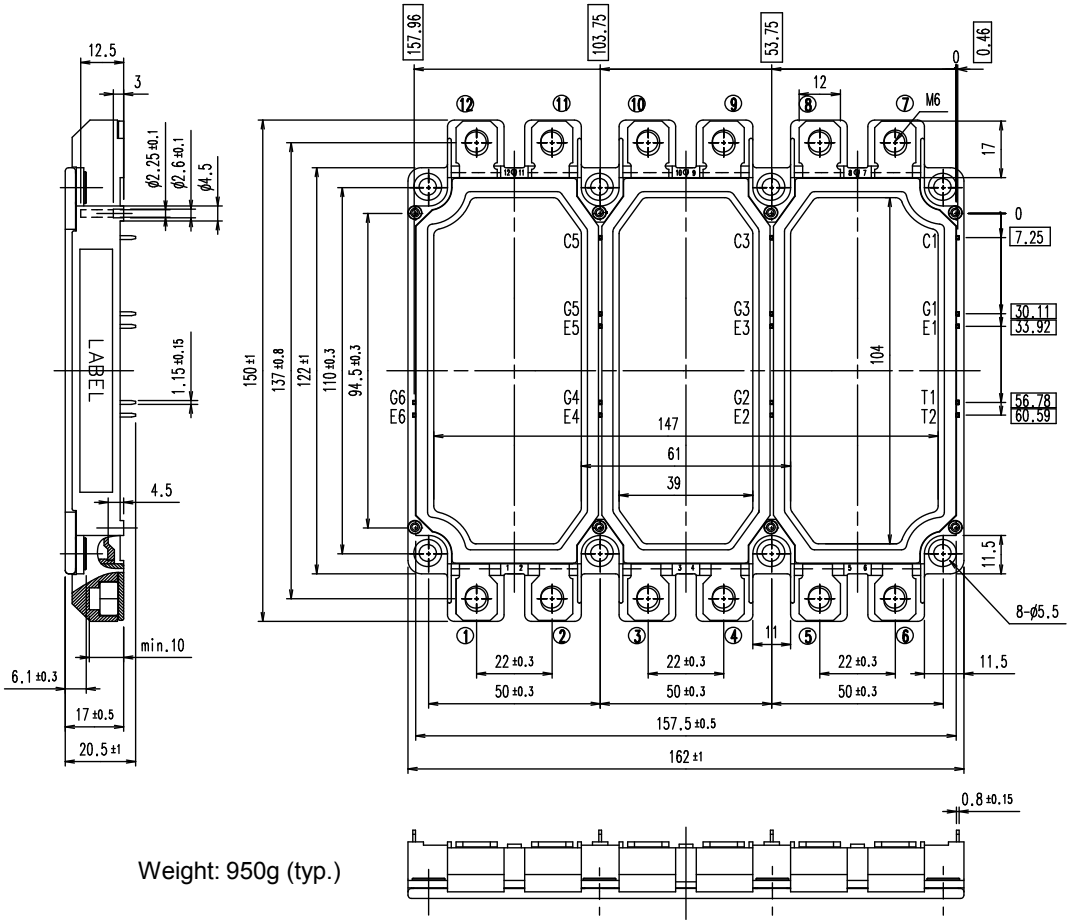
[THERMISTOR]
Temperature characteristic (typ.)




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



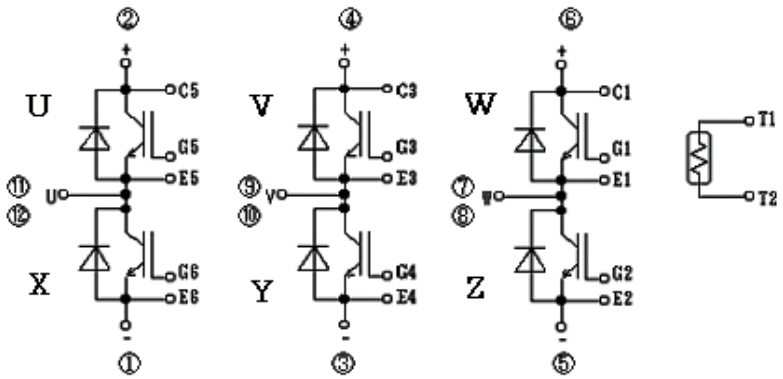
## ■ Outline Drawings, mm



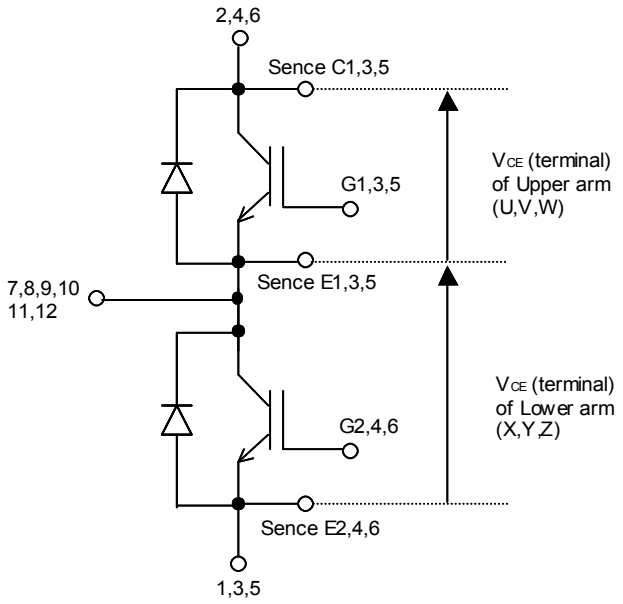

Weight: 950g (typ.)

## ■ Equivalent Circuit

[ Inverter ] [ Thermistor ]



## ■ Definition of switching characteristics




Switching characteristics of $V_{CE}$ is defined between Sense C1,3,5 and Sense E1,3,5 for Upper arm(U,V,W) and Sense E1,3,5 and Sense E2,4,6 for Lower arm(X,Y,Z) .

Please use these terminals whenever measure spike voltage.

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   The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.

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   - OA equipment
   - Communications equipment (terminal devices)
   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

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   - Trunk communications equipment
   - Traffic-signal control equipment
   - Gas leakage detectors with an auto-shut-off feature
   - Emergency equipment for responding to disasters and anti-burglary devices
   - Safety devices
   - Medical equipment

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
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   - Aeronautic equipment
   - Nuclear control equipment
   - Submarine repeater equipment



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富士電機

Innovating Energy Technology

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IGBT Modules

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- 关于本规格书中没有记载的产品信息，应用手册，技术资料等，请参考以下链接。
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| 7 AT-NPC 3-Level 損失シュミレーションソフト | www.fujielectric.co.jp/products/semiconductor/model/igbt/simulation_3level/ |
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| 7 AT-NPC 3-Level Loss Simulation Software | www.fujielectric.com/products/semiconductor/model/igbt/simulation_3level/ |
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