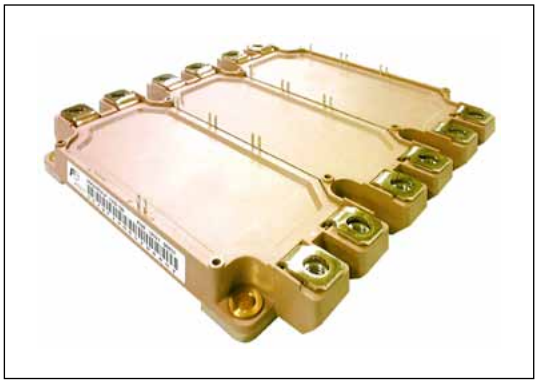
6MBI450V-170-50

IGBT Modules

IGBT MODULE (V series)
1700V / 450A / 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	600	A
				T_C=100°C	450	
		$I_{C\ pulse}$	1ms		900	
		$-I_C$			450	
		$-I_{C\ pulse}$	1ms		900	
	Collector power dissipation	P_C	1 device		2500	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 = 450mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE\ (sat)}$ (terminal)	V_{GE} = 15V, I_C = 450A	T_j=25°C	-	2.65	3.10	V
				T_j=125°C	-	3.10	-	
				T_j=150°C	-	3.15	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 450A	T_j=25°C	-	2.00	2.45	
				T_j=125°C	-	2.45	-	
				T_j=150°C	-	2.50	-	
	Internal gate resistance	$R_{G\ (int)}$	-		-	1.67	-	Ω
	Input capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz		-	40	-	nF
	Turn-on time	t_{on}	V_{CC} = 900V, I_C = 450A, V_{GE} = ±15V, R_G = 3.3Ω, 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 = 450A	T_j=25°C	-	2.45	2.90	V
				T_j=125°C	-	2.75	-	
				T_j=150°C	-	2.70	-	
		V_F (chip)	V_{GE} = 0V, I_F = 450A	T_j=25°C	-	1.80	2.25	
				T_j=125°C	-	2.10	-	
				T_j=150°C	-	2.05	-	
	Reverse recovery time	t_{rr}	I_F = 450A		-	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

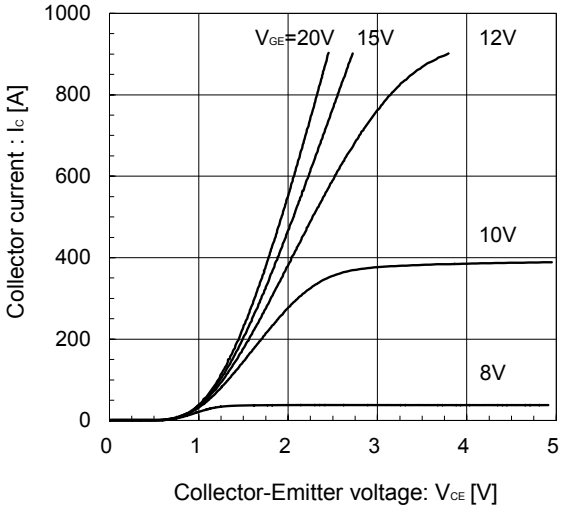
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.06	°C/W
		Inverter FWD	-	-	0.10	
Contact thermal resistance (1device) (*5)	$R_{th(c-f)}$	with Thermal Compound	-	0.0167	-	

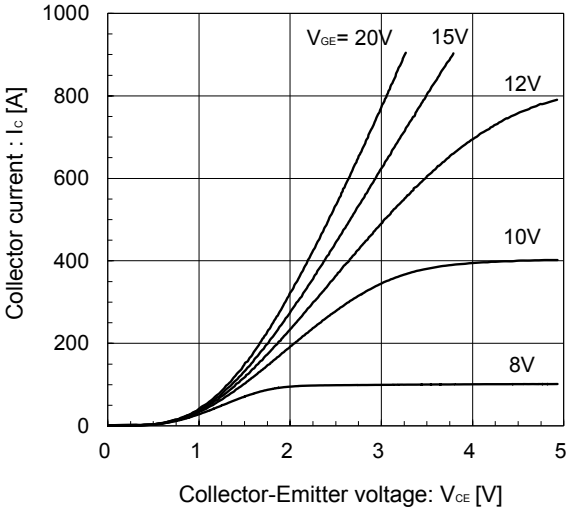
Note *5: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

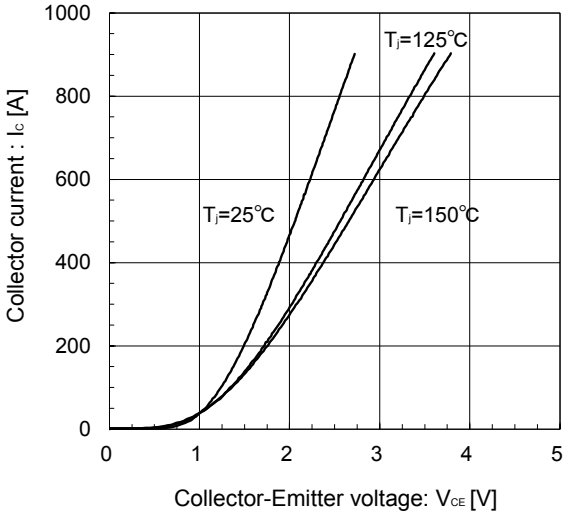
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 25°C / chip



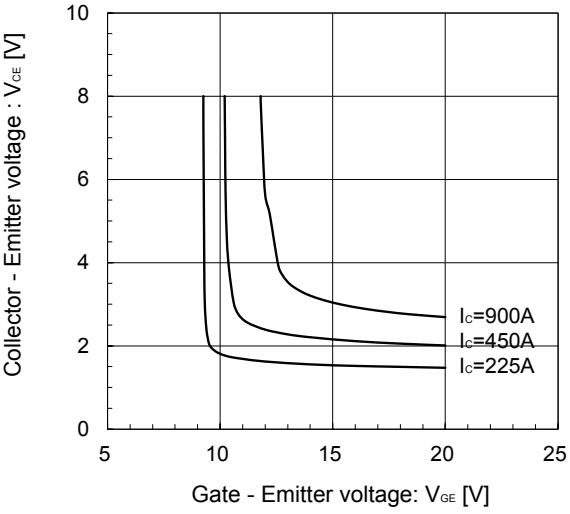
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 150°C / chip



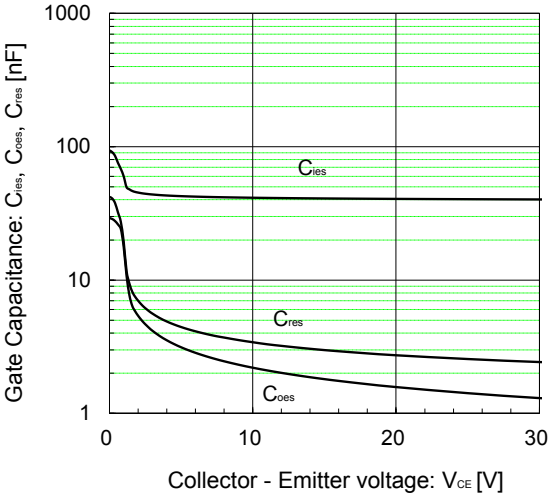
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}=15V / chip



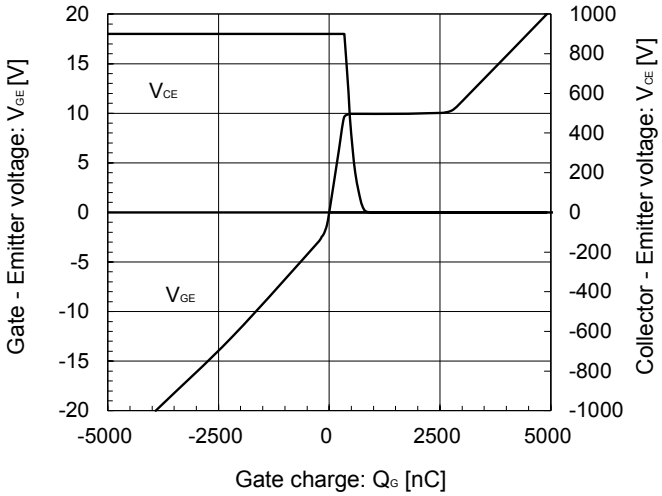
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j= 25°C / chip



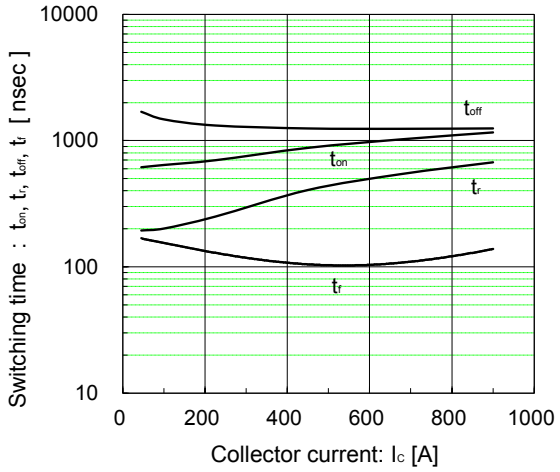
[Inverter]
Gate Capacitance vs. Collector-Emitter voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25°C



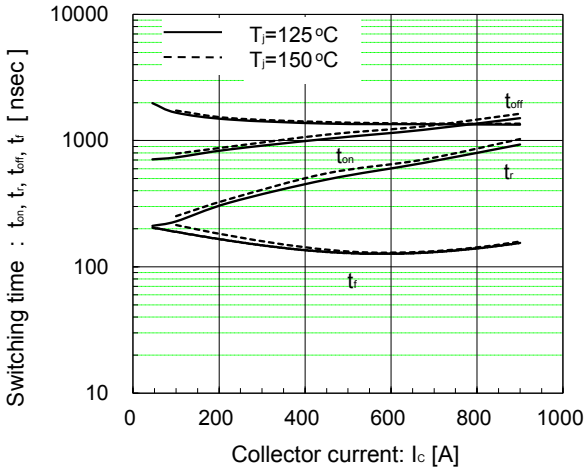
[Inverter]
Dynamic gate charge (typ.)
V_{CC}=900V, I_C=450A, T_j= 25°C



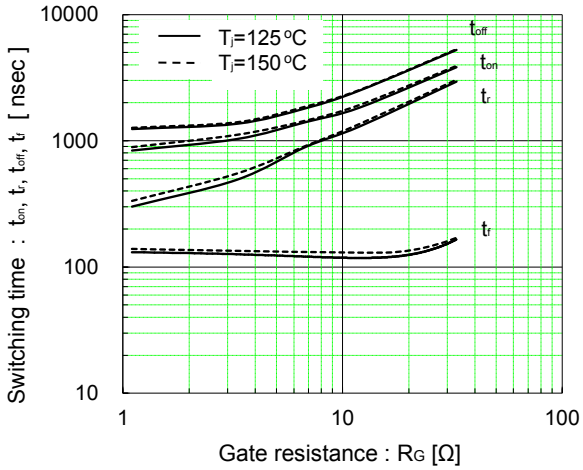
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_j= 25°C



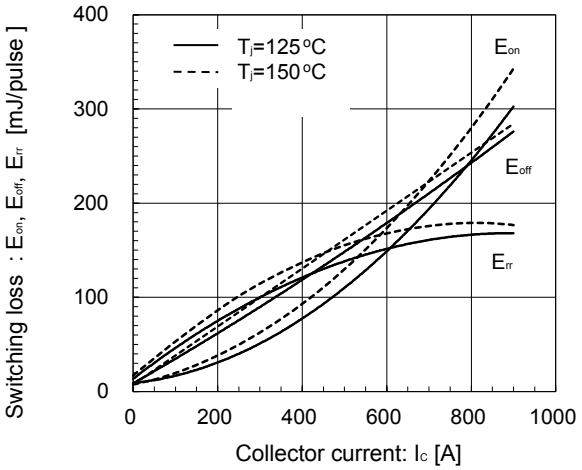
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_j= 125°C, 150°C



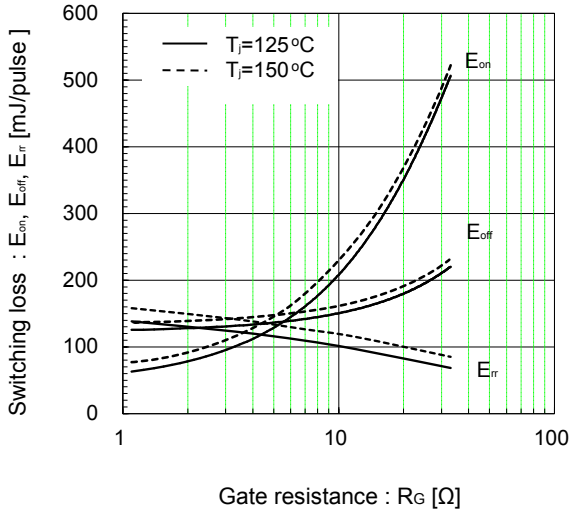
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC}=900V, I_C=450A, V_{GE}=±15V, T_j= 125°C, 150°C



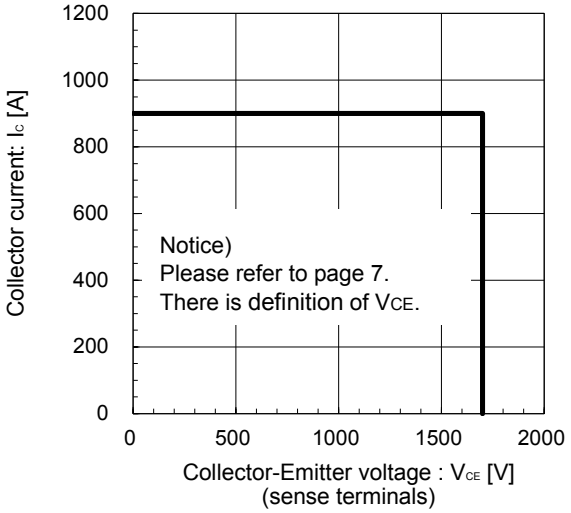
[Inverter]
Switching loss vs. Collector current (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_j=125°C, 150°C



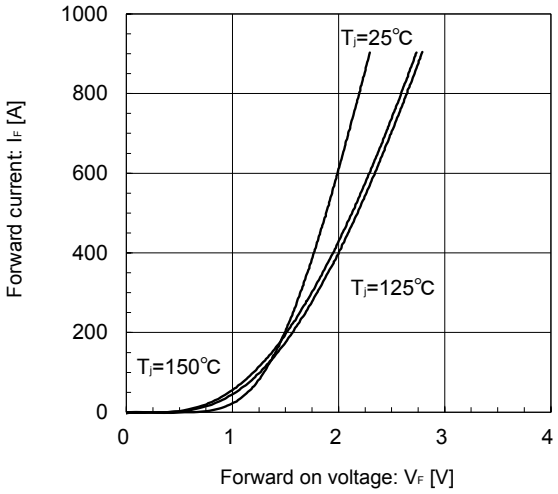
[Inverter]
Switching loss vs. Gate resistance (typ.)
V_{CC}=900V, I_C=450A, V_{GE}=±15V, T_j=125°C, 150°C



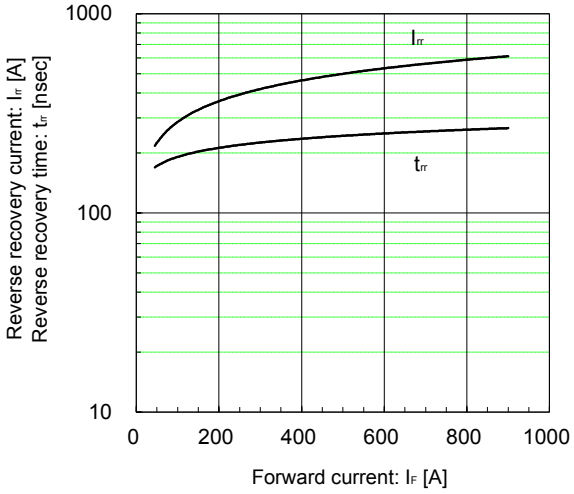
[Inverter]
Reverse bias safe operating area (max.)
$+V_{GE}$=15V,$-V_{GE}$ ≤ 15V, R_G ≥ 3.3Ω ,T_j = 150°C



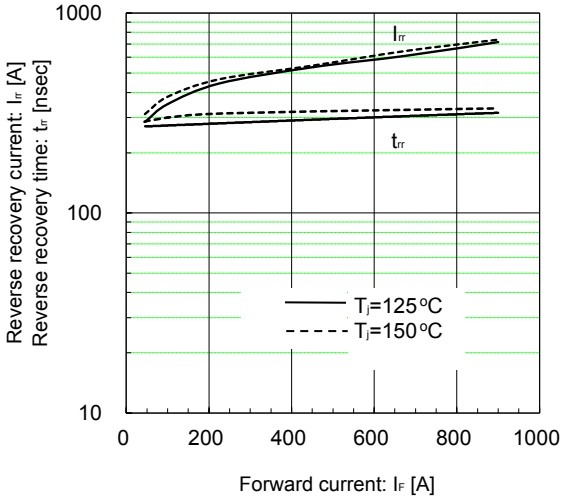
[INVERTER]
Forward Current vs. Forward Voltage (typ.)
chip



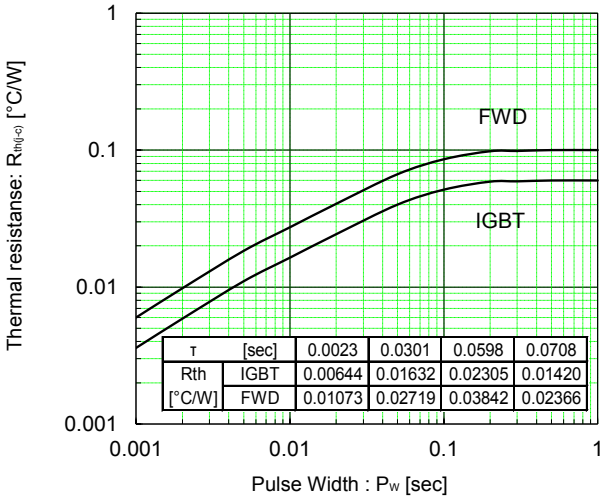
[INVERTER]
Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_j=25°C



[INVERTER]
Reverse Recovery Characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_G=3.3Ω, T_j=125°C, 150°C

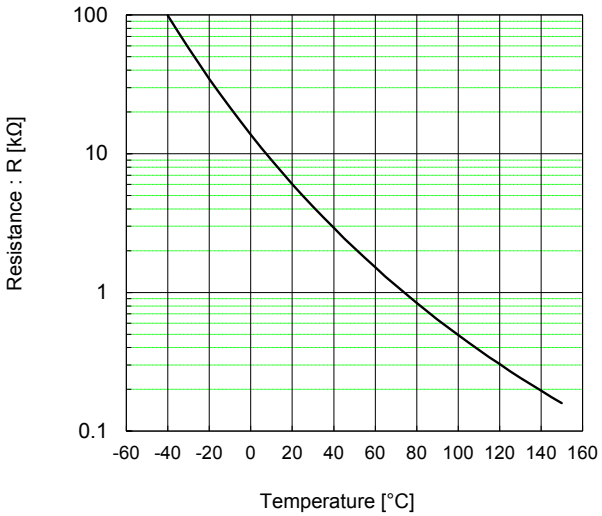


Transient Thermal Resistance (max.)

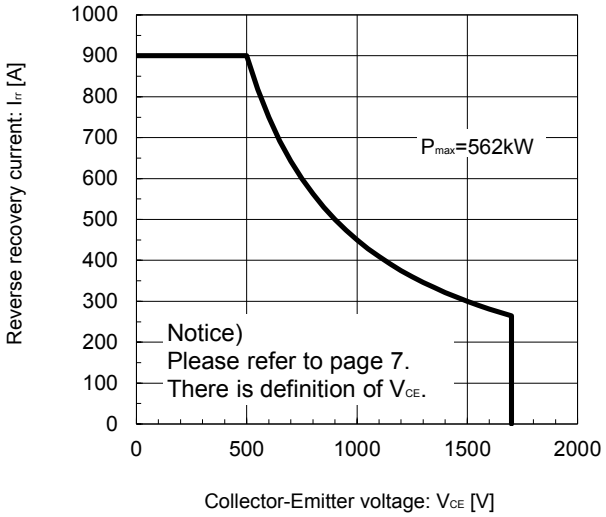


τ	[sec]	0.0023	0.0301	0.0598	0.0708
Rth	IGBT	0.00644	0.01632	0.02305	0.01420
[°C/W]	FWD	0.01073	0.02719	0.03842	0.02366

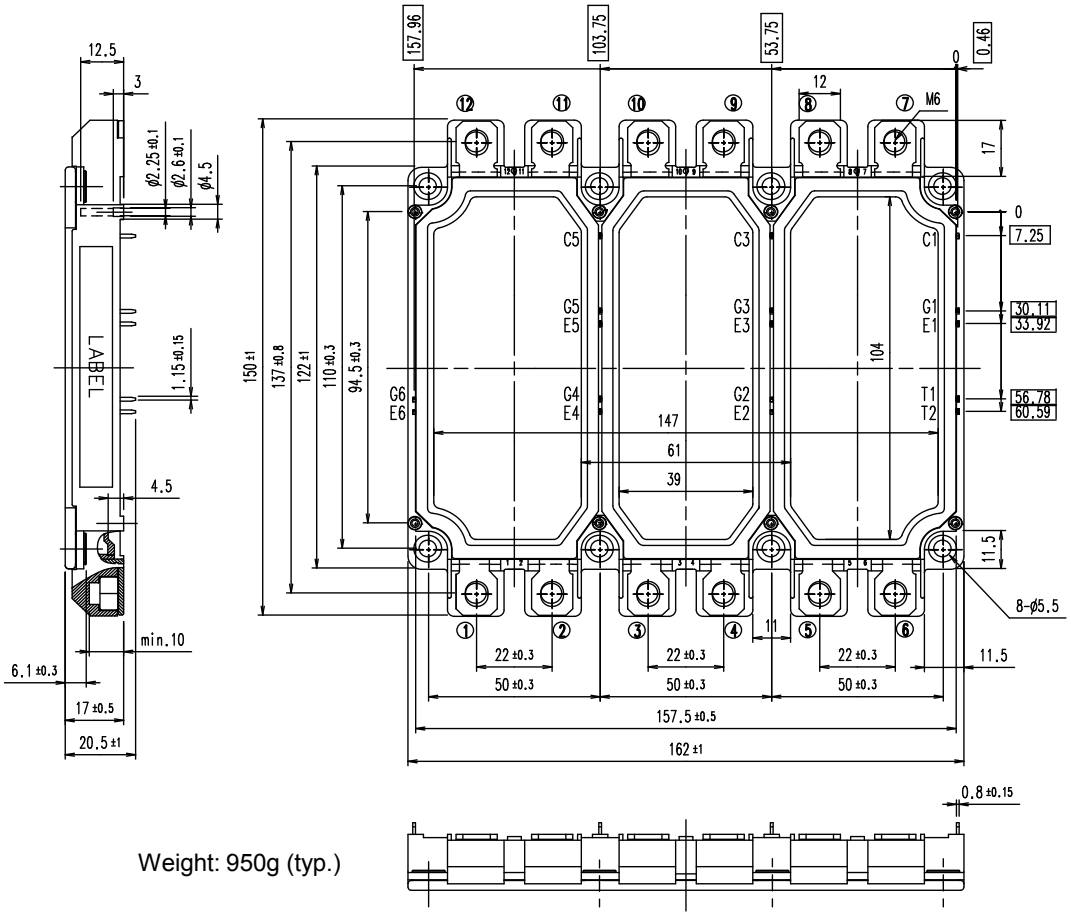
[THERMISTOR]
Temperature characteristic (typ.)



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

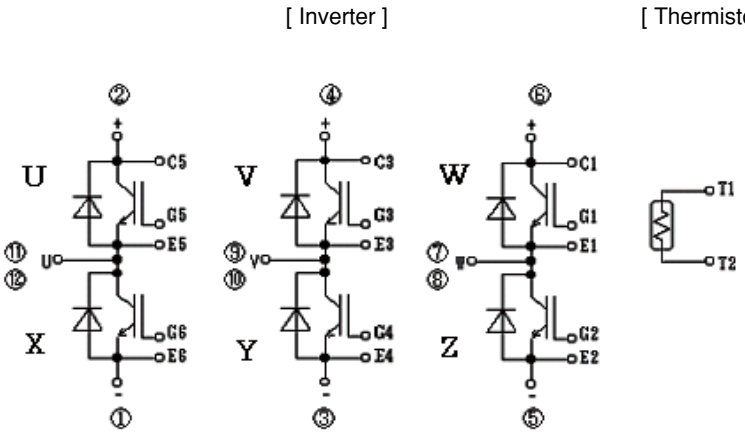


■ Outline Drawings, mm

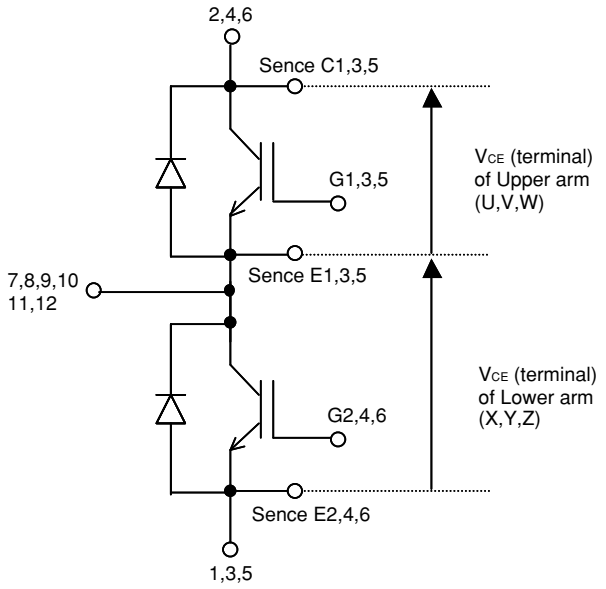


Weight: 950g (typ.)

■ Equivalent Circuit



■ 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.

WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of March 2015.
   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.

2. All applications described in this Catalog exemplify the use of Fuji's products for your reference only. No right or license, either express or implied, under any patent, copyright, trade secret or other intellectual property right owned by Fuji Electric Co., Ltd. is (or shall be deemed) granted. Fuji Electric Co., Ltd. makes no representation or warranty, whether express or implied, relating to the infringement or alleged infringement of other's intellectual property rights which may arise from the use of the applications described herein.

3. Although Fuji Electric Co., Ltd. is enhancing product quality and reliability, a small percentage of semiconductor products may become faulty. When using Fuji Electric semiconductor products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing a physical injury, fire, or other problem if any of the products become faulty. It is recommended to make your design fail-safe, flame retardant, and free of malfunction.

4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
   - Computers
   - OA equipment
   - Communications equipment (terminal devices)
   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
   - Transportation equipment (mounted on cars and ships)
   - 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).
   - Space equipment
   - Aeronautic equipment
   - Nuclear control equipment
   - Submarine repeater equipment

8. If you have any question about any portion in this Catalog, ask Fuji Electric Co., Ltd. or its sales agents before using the product.
   Neither Fuji Electric Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.