

# 6MBI225V-120-50

**IGBT Modules**

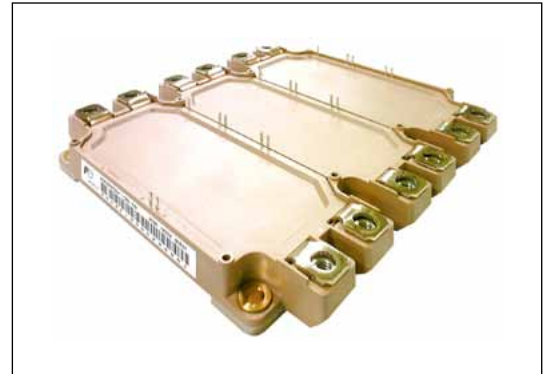
## IGBT MODULE (V series) 1200V / 225A / 6 in one package

### ■ Features

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

### ■ 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 $T_c=25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions	Maximum ratings	Units	
Inverter	Collector-Emitter voltage	$V_{CES}$		1200	V	
	Gate-Emitter voltage	$V_{GES}$		$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=25^\circ\text{C}$	300	A
		$I_{cp}$		$T_c=100^\circ\text{C}$	225	
		$I_{c\ pulse}$	1ms		450	
		$-I_c$			225	
		$-I_{c\ pulse}$	1ms		450	
Collector power dissipation	$P_c$	1 device		1070	W	
Junction temperature		$T_j$		175	$^\circ\text{C}$	
Operation temperature (under switching conditions)		$T_{jop}$		150		
Case temperature		$T_c$		125		
Storage temperature		$T_{stg}$		-40 to +125		
Isolation voltage	between terminal and copper base (*1)	$V_{iso}$	AC : 1min.	2500	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<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> = 1200V	-	-	3.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = ±20V	-	-	600	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 225mA	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 225A	T <sub>j</sub> =25°C	-	2.20	2.65	V
			T <sub>j</sub> =125°C	-	2.55	-	
			T <sub>j</sub> =150°C	-	2.60	-	
	V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 225A	T <sub>j</sub> =25°C	-	1.85	2.30	
			T <sub>j</sub> =125°C	-	2.20	-	
T <sub>j</sub> =150°C	-	2.25	-				
Internal gate resistance	R <sub>G(int)</sub>	-	-	3.33	-	Ω	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	18	-	nF	
Turn-on time	ton	V <sub>CC</sub> = 600V I <sub>c</sub> = 225A	-	550	-	nsec	
	tr		-	180	-		
	tr(i)		V <sub>GE</sub> = ±15V	-	120		-
Turn-off time	toff	R <sub>G</sub> = 1.6Ω LS=80nH	-	1050	-	nsec	
	tf		-	110	-		
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 225A	T <sub>j</sub> =25°C	-	2.05	2.50	V
			T <sub>j</sub> =125°C	-	2.20	-	
			T <sub>j</sub> =150°C	-	2.15	-	
	V <sub>F</sub> (chip)	V <sub>GE</sub> = 0V I <sub>F</sub> = 225A	T <sub>j</sub> =25°C	-	1.70	2.15	
			T <sub>j</sub> =125°C	-	1.85	-	
T <sub>j</sub> =150°C	-	1.80	-				
Reverse recovery time	trr	I <sub>F</sub> = 225A	-	200	-	nsec	
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

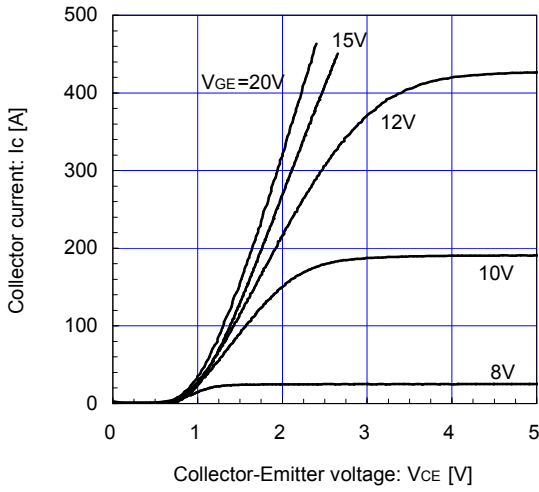
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT	-	-	0.140	°C/W
		Inverter FWD	-	-	0.190	
Contact thermal resistance (1device) (*5)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.0167	-	

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

■ Characteristics (Representative)

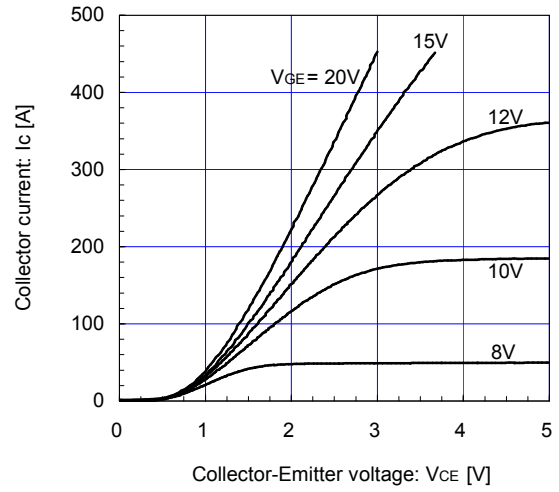
[INVERTER]

Collector current vs. Collector-Emittor voltage (typ.)  
T<sub>j</sub> = 25°C / chip



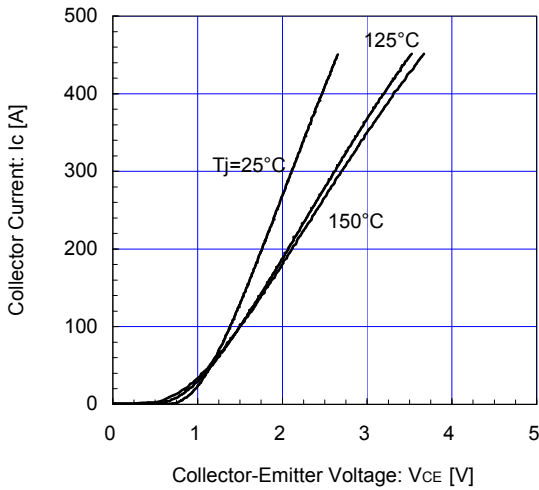
[INVERTER]

Collector current vs. Collector-Emittor voltage (typ.)  
T<sub>j</sub> = 150°C / chip



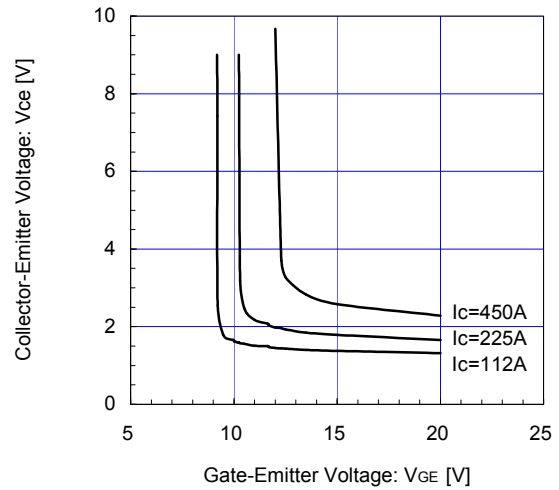
[INVERTER]

Collector current vs. Collector-Emittor voltage (typ.)  
V<sub>GE</sub> = 15V / chip



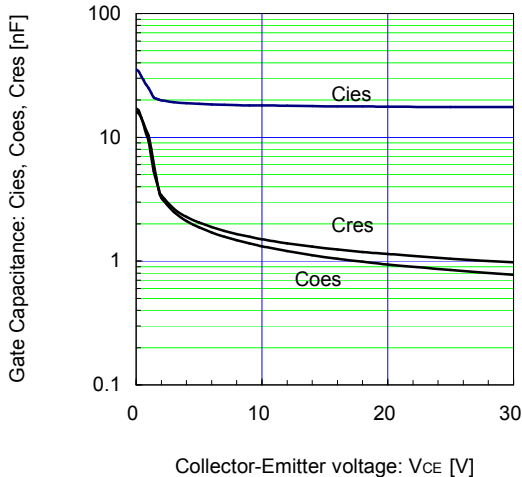
[INVERTER]

Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
T<sub>j</sub> = 25°C / chip



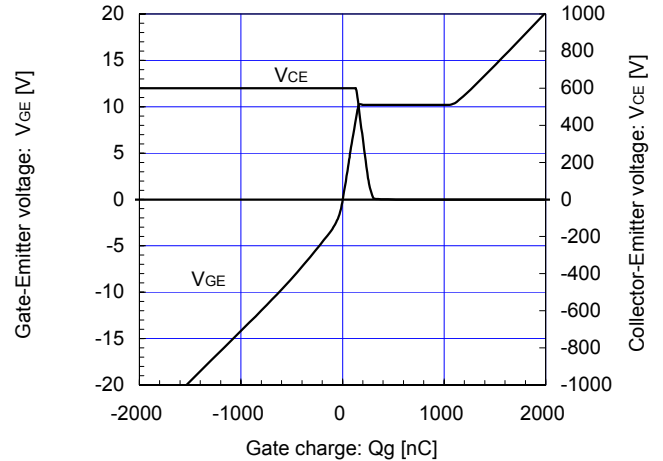
[INVERTER]

Gate Capacitance vs. Collector-Emittor Voltage (typ.)  
V<sub>GE</sub> = 0V, f = 1MHz, T<sub>j</sub> = 25°C



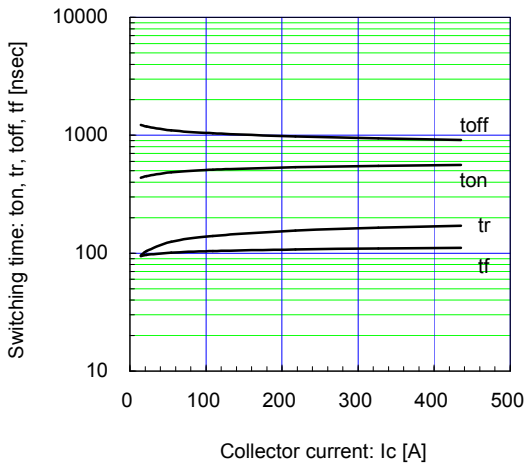
[INVERTER]

Dynamic Gate Charge (typ.)  
V<sub>CC</sub> = 600V, Ic = 225A, T<sub>j</sub> = 25°C



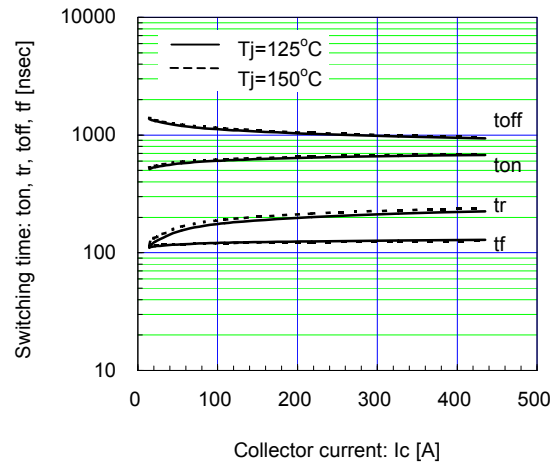
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=1.6\Omega, T_j=25^\circ C$



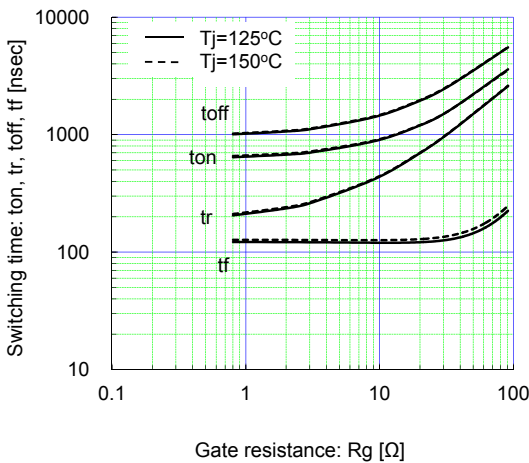
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=1.6\Omega, T_j=125^\circ C, 150^\circ C$



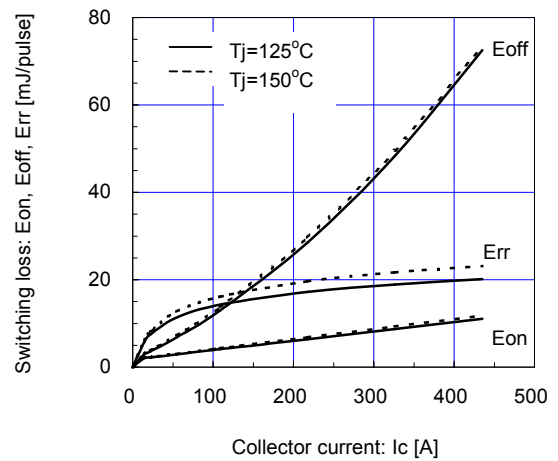
[INVERTER]

Switching time vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=225A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



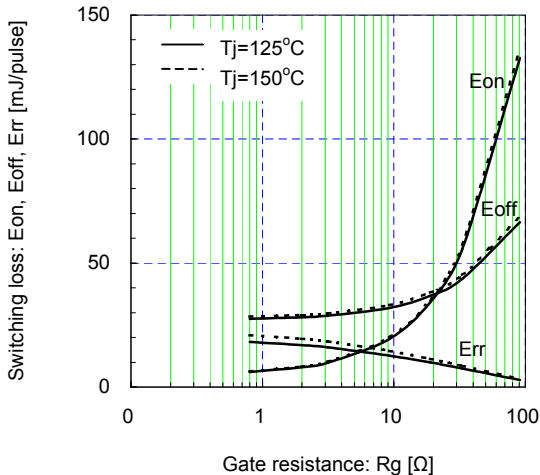
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=1.6\Omega, T_j=125^\circ C, 150^\circ C$



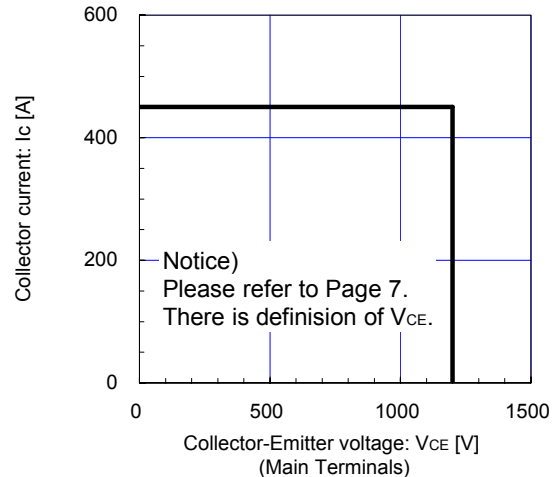
[INVERTER]

Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=225A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



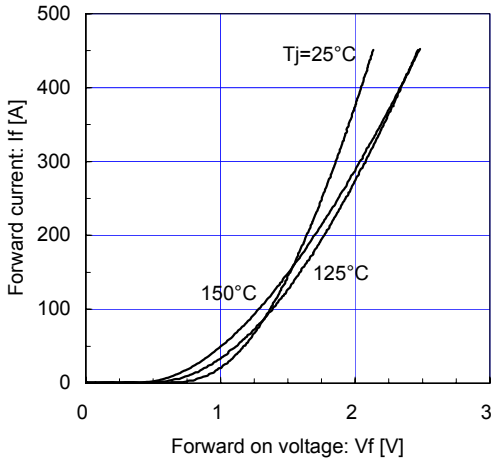
[INVERTER]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}\le 15V, R_g\ge 1.6\Omega, T_j=150^\circ C$



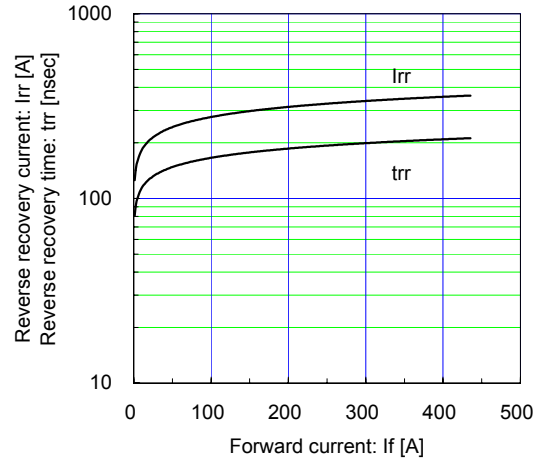
[INVERTER]

Forward Current vs. Forward Voltage (typ.)  
chip



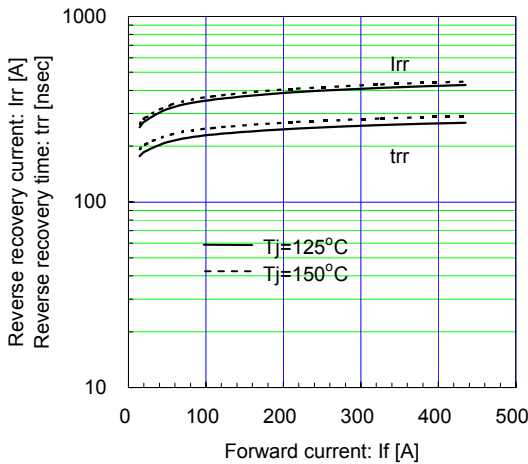
[INVERTER]

Reverse Recovery Characteristics (typ.)  
Vcc=600V, VGE=±15V, Rg=1.6Ω, Tj=25°C

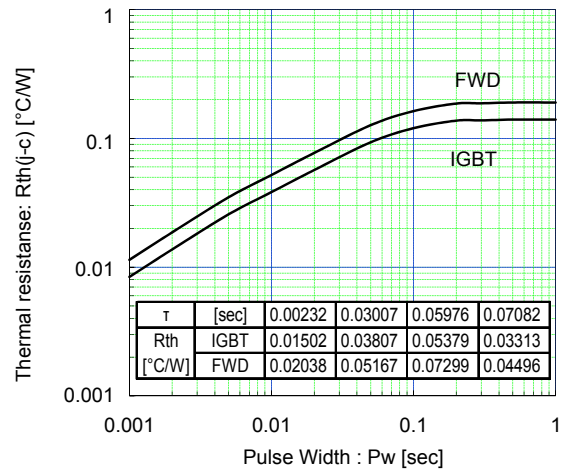


[INVERTER]

Reverse Recovery Characteristics (typ.)  
Vcc=600V, VGE=±15V, Rg=1.6Ω, Tj=125°C, 150°C

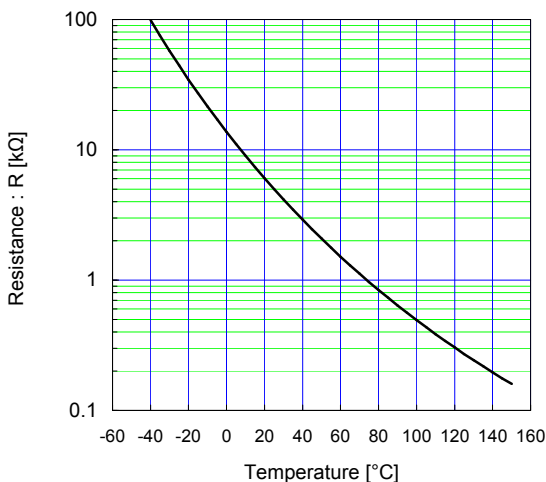


Transient Thermal Resistance (max.)



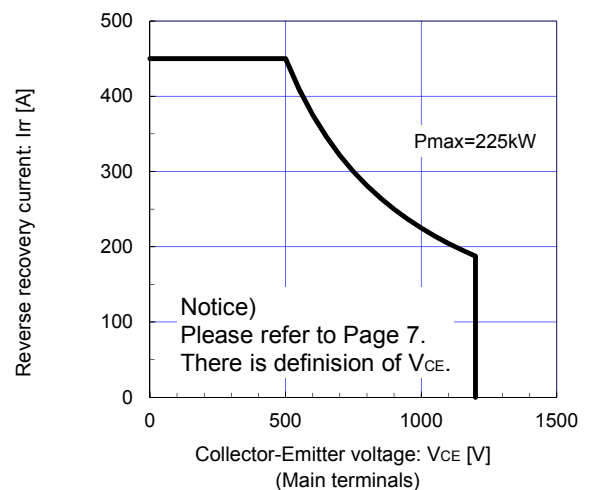
[THERMISTOR]

Temperature characteristic (typ.)

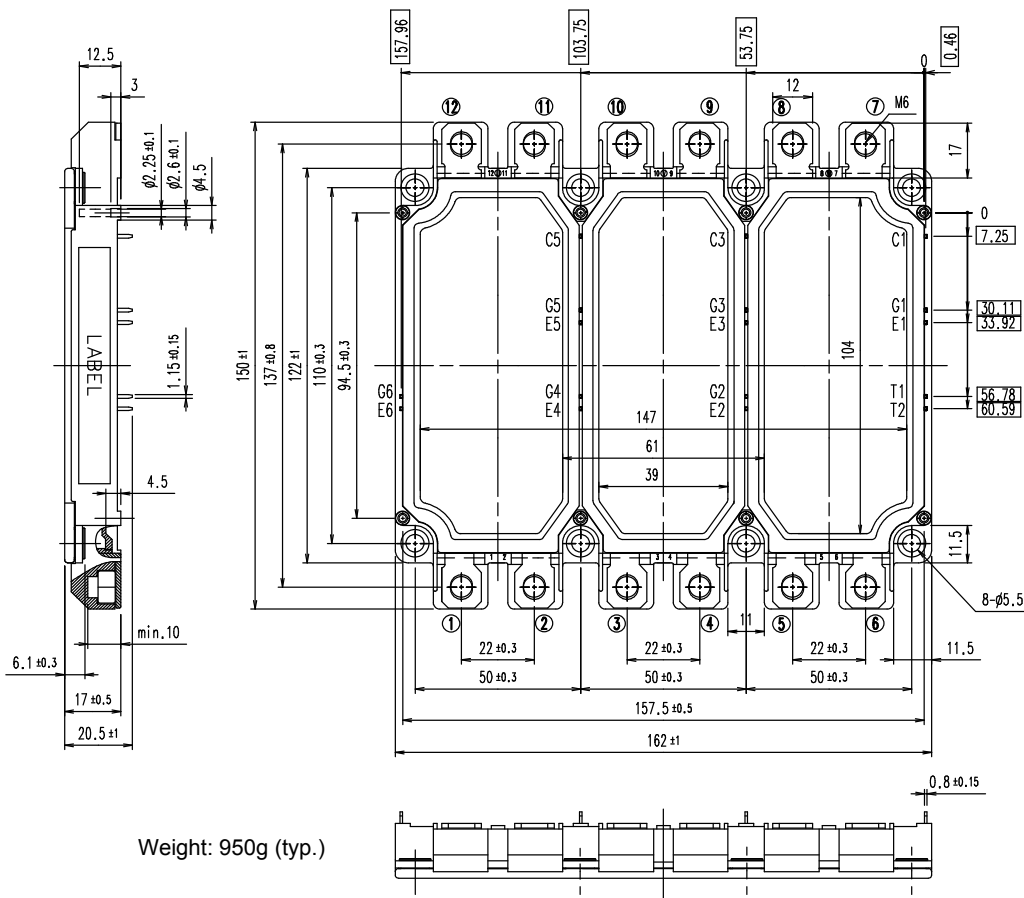


FWD safe operating area (max.)

Tj=150°C



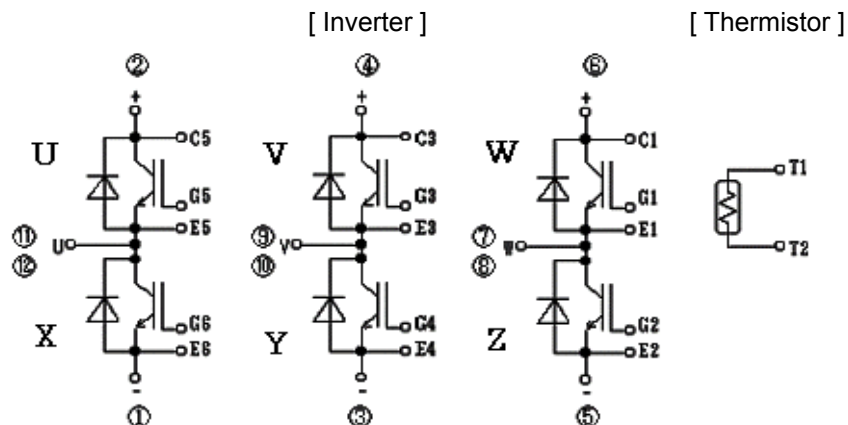
■ Outline Drawings(Unit:mm)



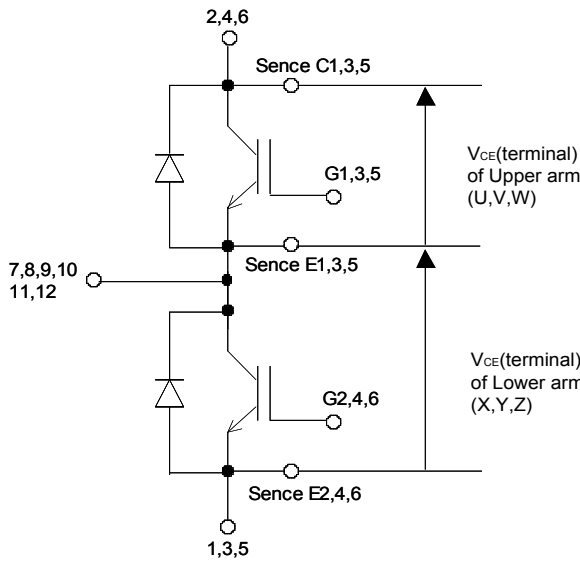
Weight: 950g (typ.)

NOTE)   shows theoretical dimension and tolerance is  $\pm 0.5$  .

■ 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.

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