

# 6MBI450V-120-50

**IGBT Modules**

## IGBT MODULE (V series) 1200V / 450A / 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	$T_c=25^\circ\text{C}$	600	A
				$T_c=100^\circ\text{C}$	450	
		$I_{c\ pulse}$	1ms	900		
		$-I_c$		450		
		$-I_{c\ pulse}$	1ms	900		
Collector power dissipation	$P_c$	1 device	2250	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.			
Inverter	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>GE</sub> = ±20V	-	-	600	nA	
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 450mA	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> = 450A	T <sub>j</sub> = 25°C	-	2.30	2.75	V
				T <sub>j</sub> = 125°C	-	2.60	-	
				T <sub>j</sub> = 150°C	-	2.65	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 450A	T <sub>j</sub> = 25°C	-	1.75	2.20	
				T <sub>j</sub> = 125°C	-	2.05	-	
	T <sub>j</sub> = 150°C	-	2.10	-				
	Internal gate resistance	R <sub>G(int)</sub>	-	-	1.67	-	Ω	
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	41	-	nF	
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V I <sub>c</sub> = 450A V <sub>GE</sub> = ±15V	-	550	-	nsec	
		t <sub>r</sub>		-	180	-		
		t <sub>r(l)</sub>		-	120	-		
Turn-off time	t <sub>off</sub>	R <sub>G</sub> = 0.52Ω L <sub>S</sub> = 80nH	-	1050	-	nsec		
	t <sub>r</sub>		-	110	-			
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 450A	T <sub>j</sub> = 25°C	-	2.25	2.70	V	
			T <sub>j</sub> = 125°C	-	2.40	-		
			T <sub>j</sub> = 150°C	-	2.35	-		
	V <sub>F</sub> (chip)	V <sub>GE</sub> = 0V I <sub>F</sub> = 450A	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	t <sub>rr</sub>	I <sub>F</sub> = 450A	-	200	-	nsec		
Thermistor	Resistance	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

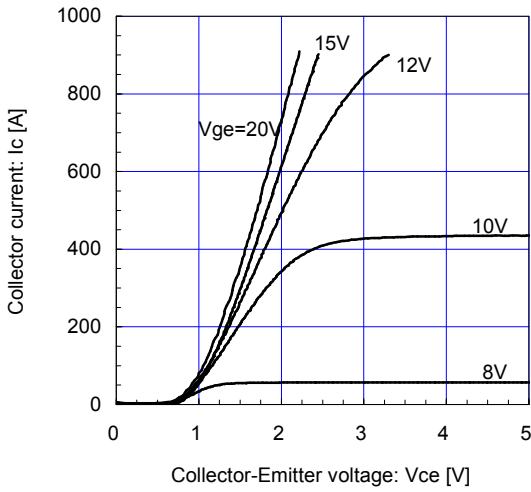
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT	-	-	0.066	°C/W
		Inverter FWD	-	-	0.100	
Contact thermal resistance (1device) (*5)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.0167	-	

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

■ Characteristics (Representative)

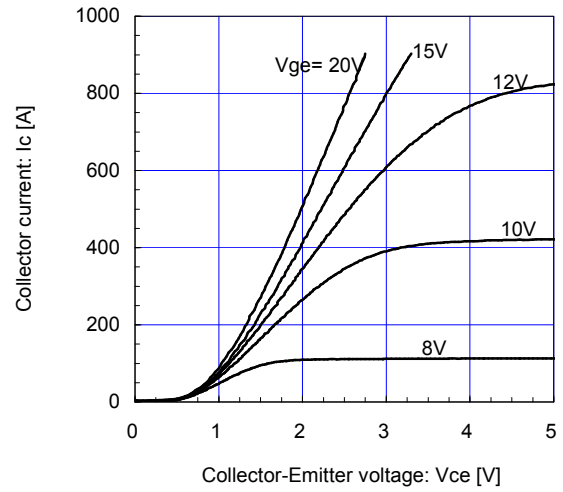
[INVERTER]

Collector current vs. Collector-Emmitter voltage (typ.)  
Tj= 25°C / chip



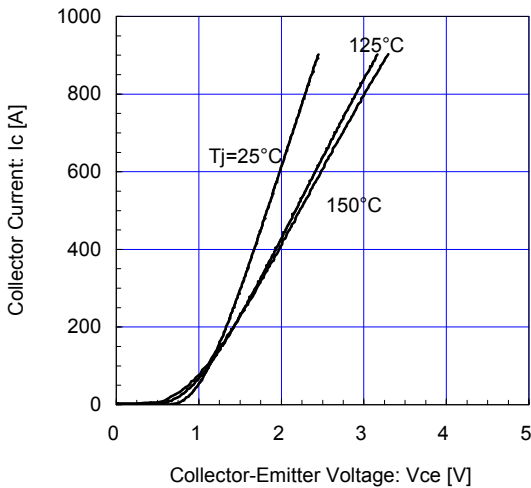
[INVERTER]

Collector current vs. Collector-Emmitter voltage (typ.)  
Tj= 150°C / chip



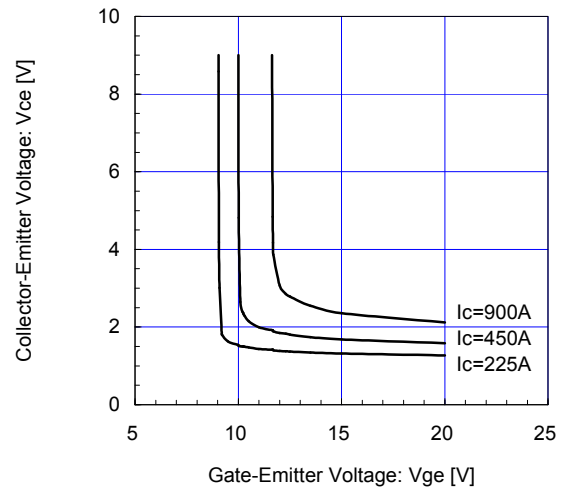
[INVERTER]

Collector current vs. Collector-Emmitter voltage (typ.)  
Vge= 15V / chip



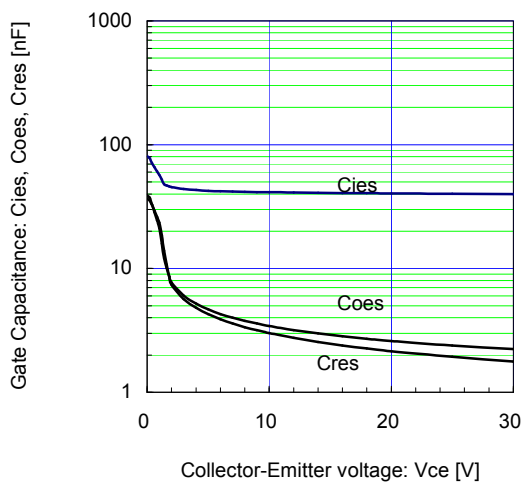
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Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)  
Tj= 25°C / chip



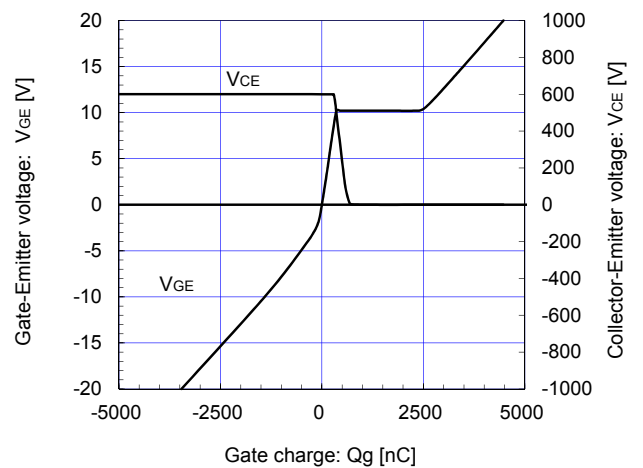
[INVERTER]

Gate Capacitance vs. Collector-Emmitter Voltage (typ.)  
Vge= 0V, f= 1MHz, Tj= 25°C



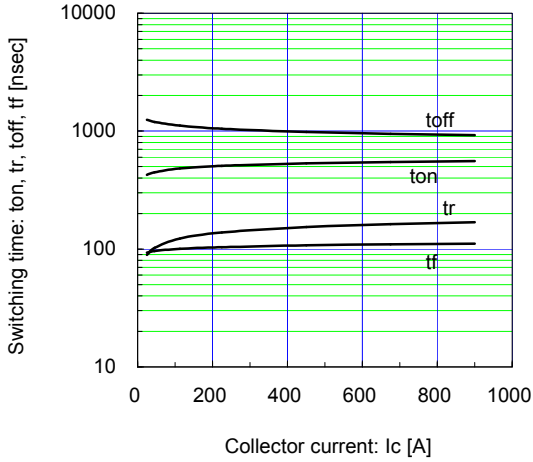
[INVERTER]

Dynamic Gate Charge (typ.)  
Vcc=600V, Ic=450A, Tj= 25°C



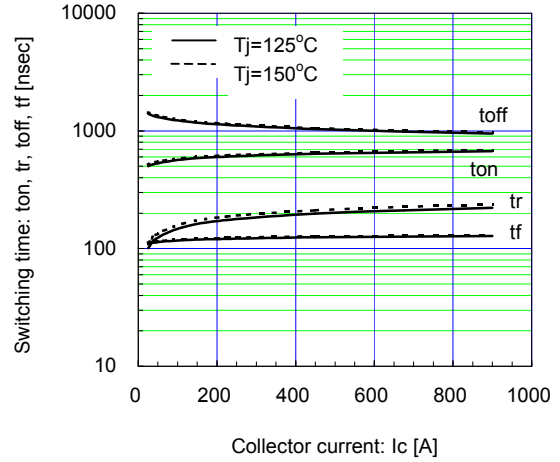
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=25^\circ C$



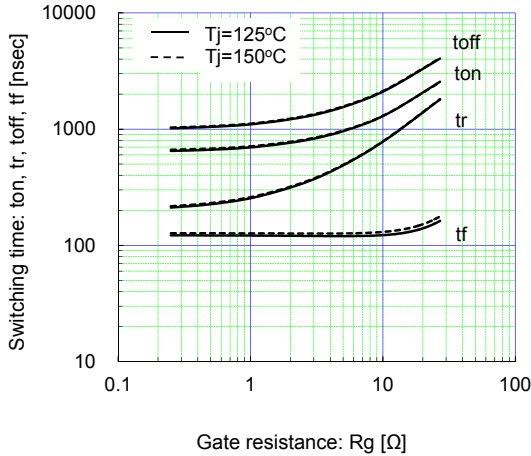
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=125^\circ C, 150^\circ C$



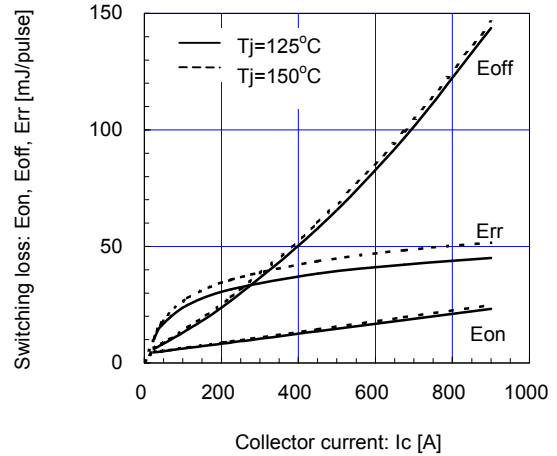
[INVERTER]

Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=450A, V_{ge}=\pm 15V, T_j=125^\circ C, 150^\circ C$



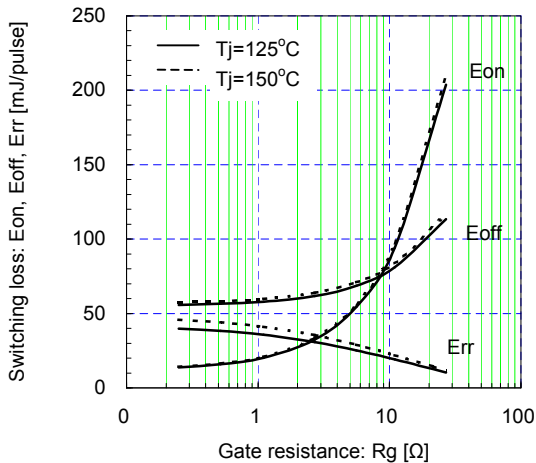
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=125^\circ C, 150^\circ C$



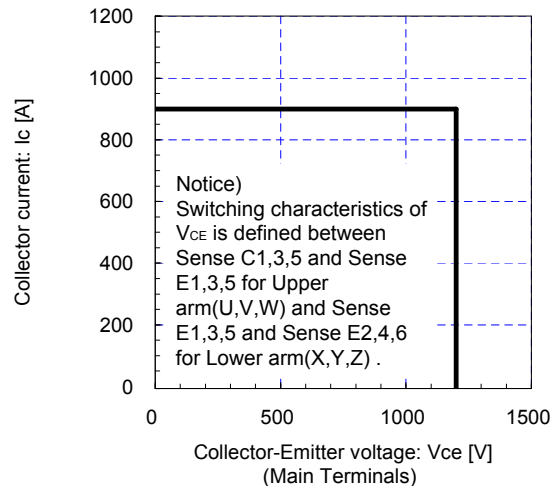
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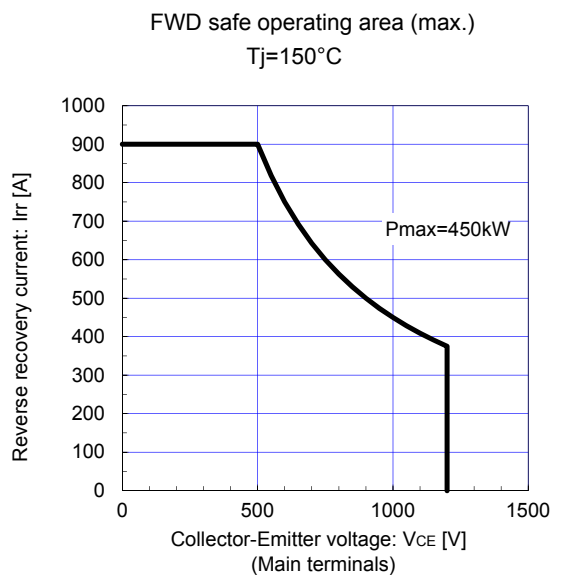
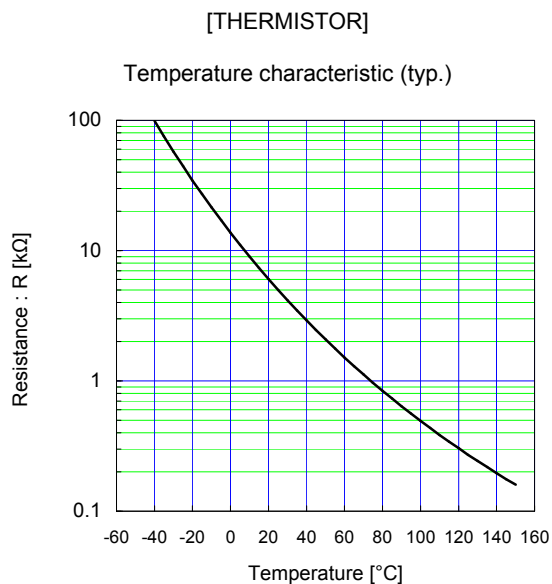
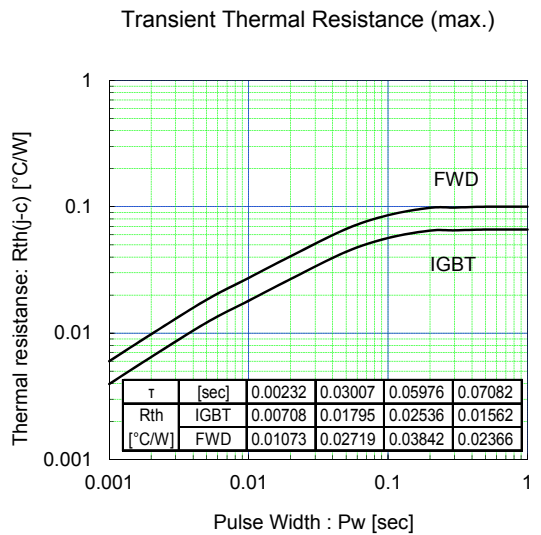
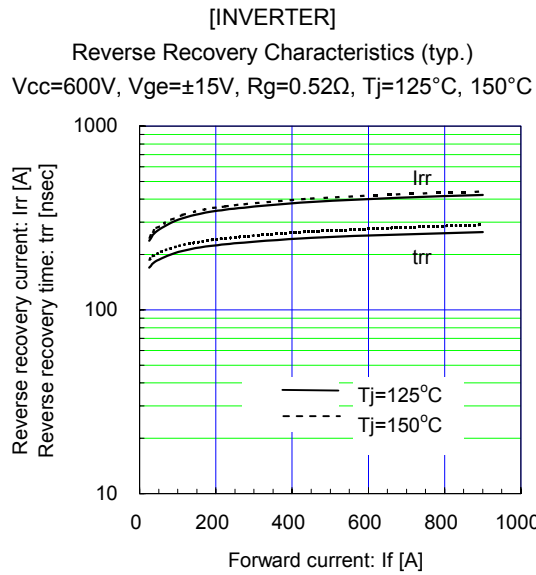
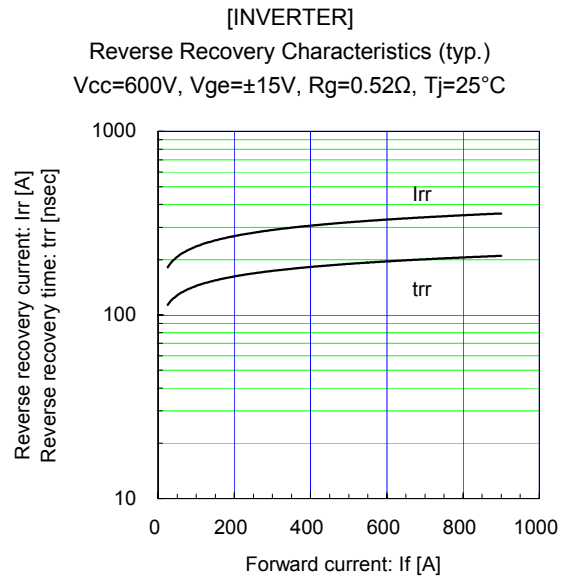
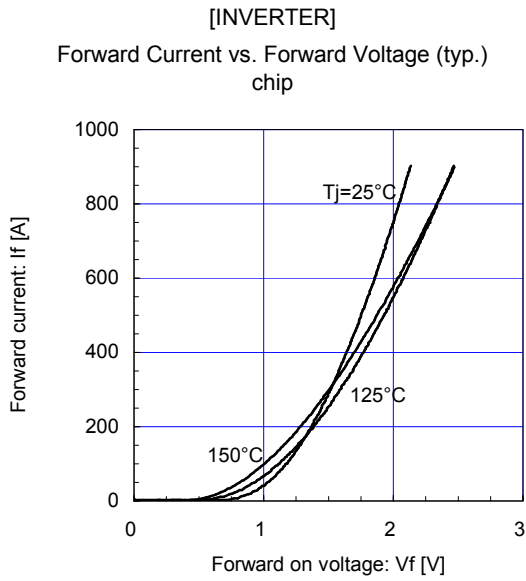
Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=450A, V_{ge}=\pm 15V, T_j=125^\circ C, 150^\circ C$



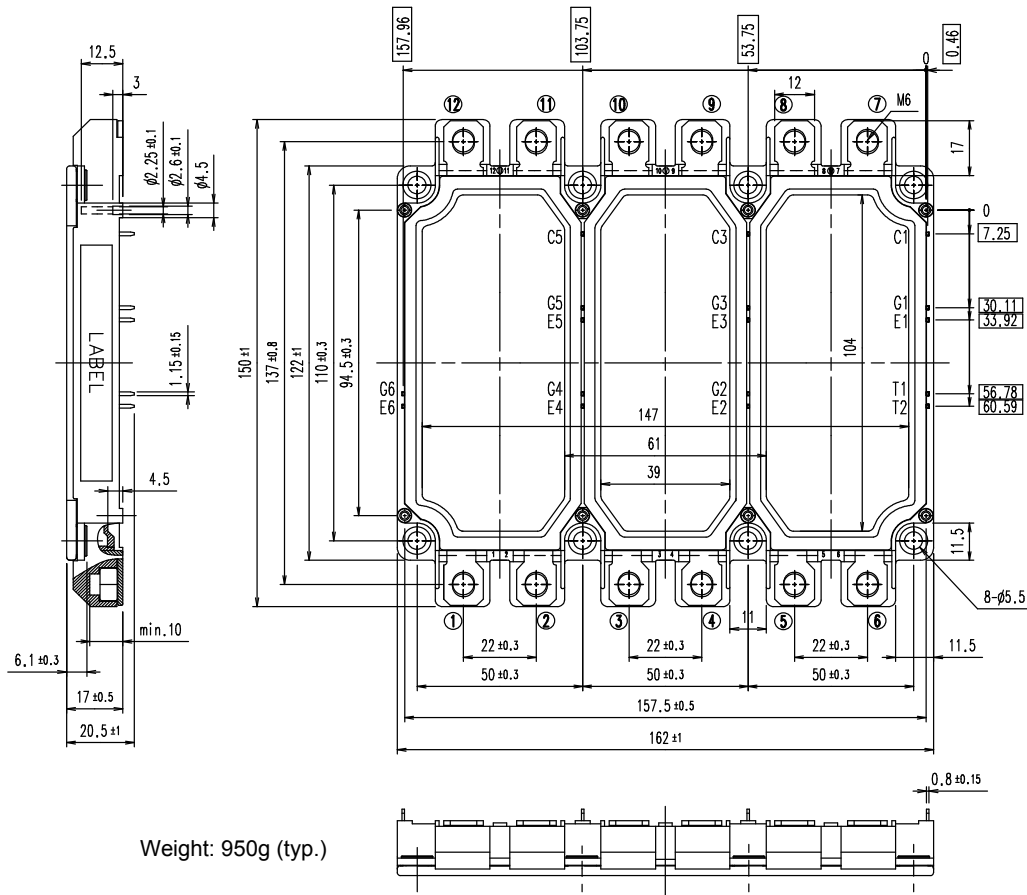
[INVERTER]

Reverse bias safe operating area (max.)  
 $+V_{ge}=15V, -V_{ge}\le 15V, R_g\ge 0.52\Omega, T_j=150^\circ C$



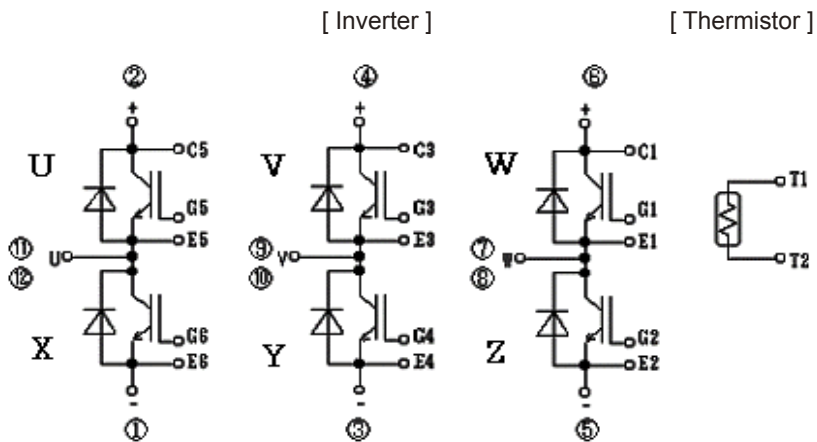


■ Outline Drawings(Unit:mm)

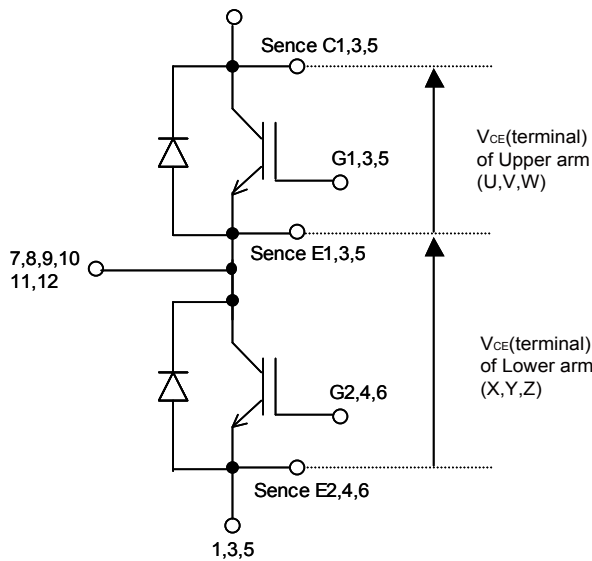


NOTE)   shows theoretical dimension and tolerance is  $\begin{matrix} \oplus \\ \ominus \end{matrix} \phi 0.5$ .

■ 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.

**WARNING**

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