

6MBI450V-120-50

IGBT Modules

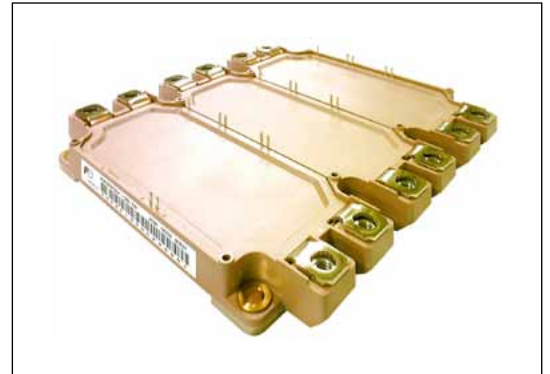
IGBT MODULE (V series) 1200V / 450A / 6 in one package

■ 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}		± 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_{top}		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_j = 25°C unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	I _{CEs}	V _{GE} = 0V, V _{CE} = 1200V	-	-	3.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{GE} = 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	-	2.30	2.75	V
				T _j = 125°C	-	2.60	-	
				T _j = 150°C	-	2.65	-	
		V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 450A	T _j = 25°C	-	1.75	2.20	
				T _j = 125°C	-	2.05	-	
	T _j = 150°C	-	2.10	-				
	Internal gate resistance	R _{G(int)}	-	-	1.67	-	Ω	
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	41	-	nF	
	Turn-on time	t _{on}	V _{CC} = 600V I _c = 450A V _{GE} = ±15V	-	550	-	nsec	
		t _r		-	180	-		
		t _{r(l)}		-	120	-		
	Turn-off time	t _{off}	R _G = 0.52Ω L _S = 80nH	-	1050	-	nsec	
t _r		-		110	-			
Forward on voltage	V _F (terminal)	V _{GE} = 0V I _F = 450A	T _j = 25°C	-	2.25	2.70	V	
			T _j = 125°C	-	2.40	-		
			T _j = 150°C	-	2.35	-		
	V _F (chip)	V _{GE} = 0V I _F = 450A	T _j = 25°C	-	1.70	2.15		
			T _j = 125°C	-	1.85	-		
T _j = 150°C	-	1.80	-					
Reverse recovery time	t _{rr}	I _F = 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

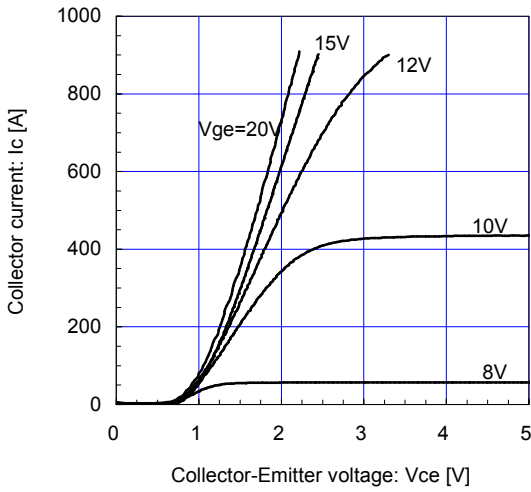
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	Inverter IGBT	-	-	0.066	°C/W
		Inverter FWD	-	-	0.100	
Contact thermal resistance (1device) (*5)	R _{th(c-f)}	with Thermal Compound	-	0.0167	-	

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

■ Characteristics (Representative)

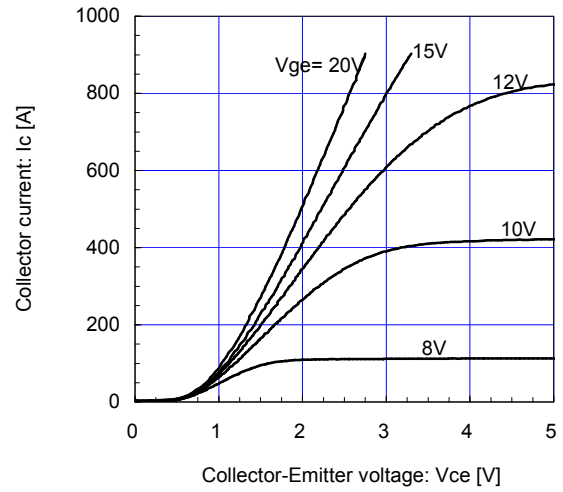
[INVERTER]

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



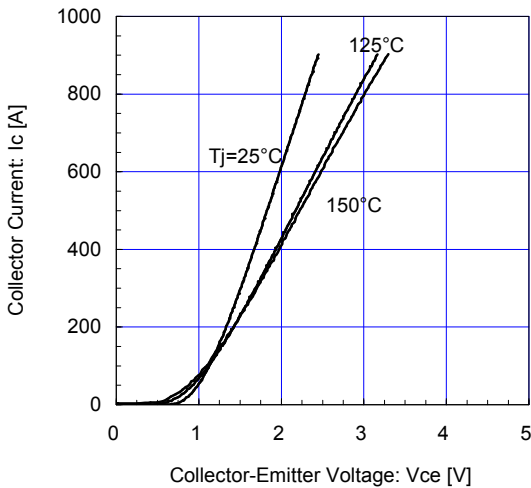
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Collector current vs. Collector-Emittor voltage (typ.)
Tj= 150°C / chip



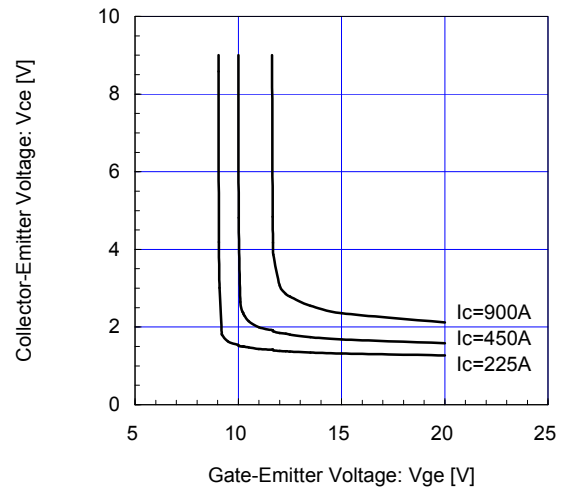
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Collector current vs. Collector-Emittor voltage (typ.)
Vge= 15V / chip



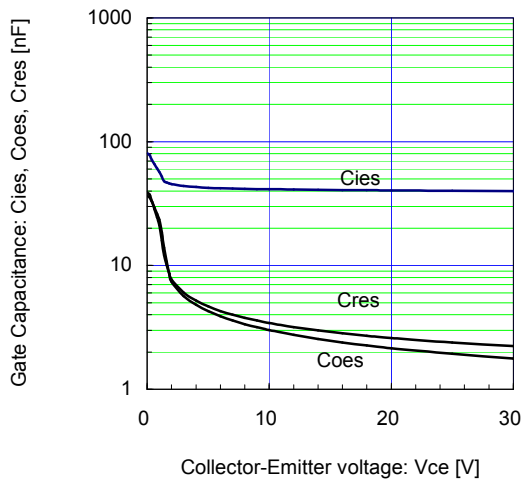
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Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
Tj= 25°C / chip



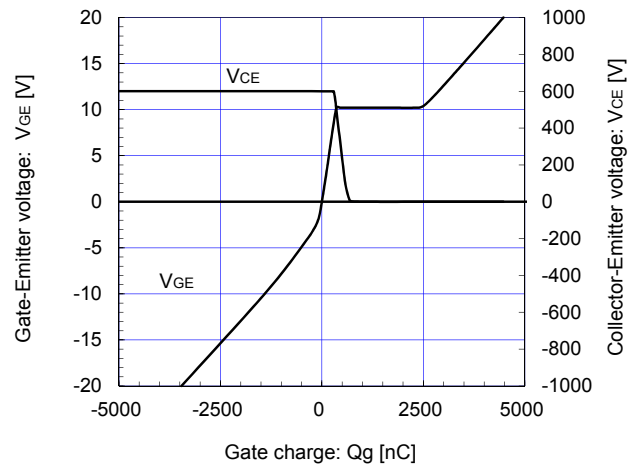
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Gate Capacitance vs. Collector-Emittor Voltage (typ.)
Vge= 0V, f= 1MHz, Tj= 25°C



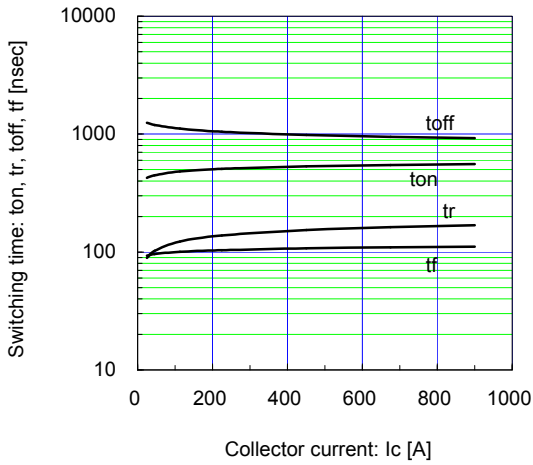
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Dynamic Gate Charge (typ.)
Vcc=600V, Ic=450A, Tj= 25°C



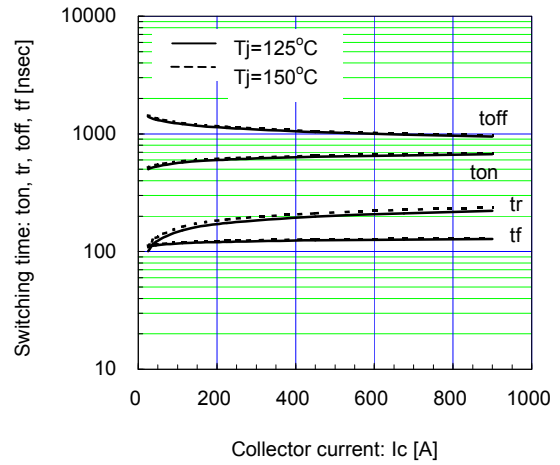
[INVERTER]

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



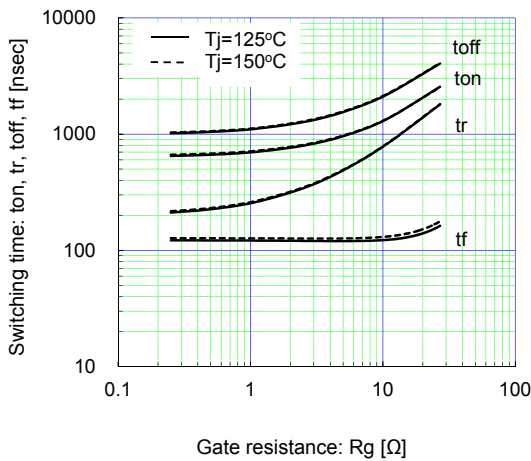
[INVERTER]

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



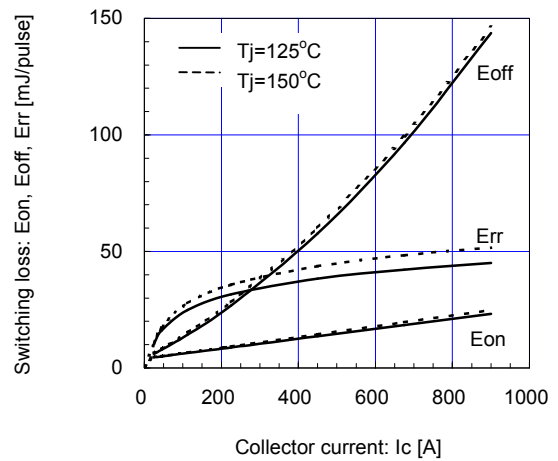
[INVERTER]

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



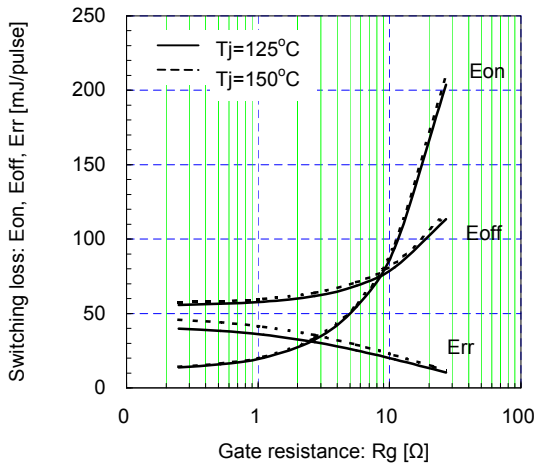
[INVERTER]

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



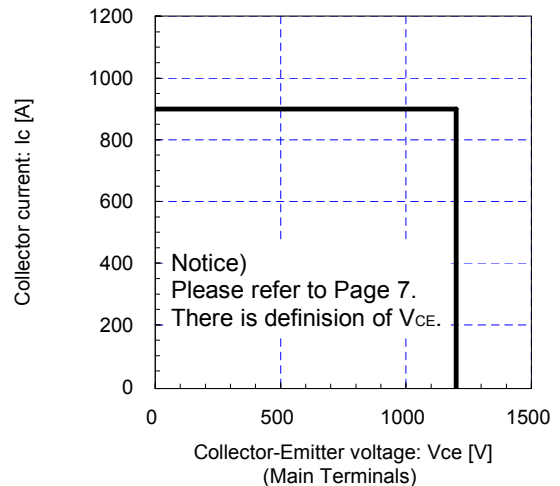
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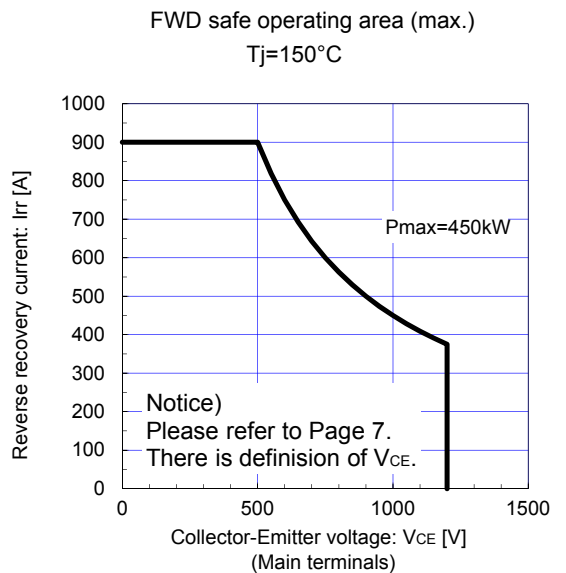
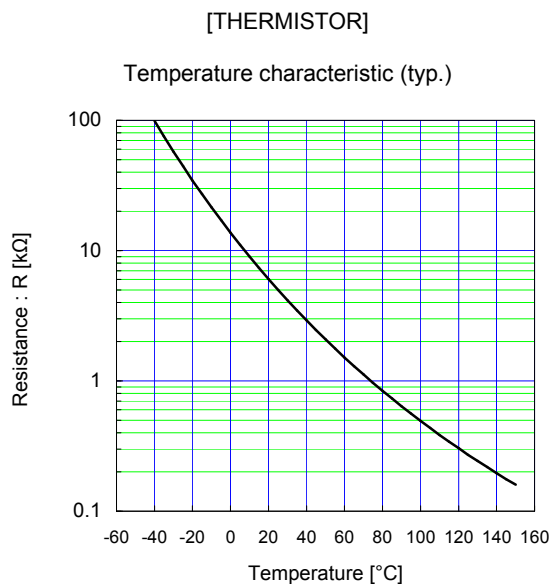
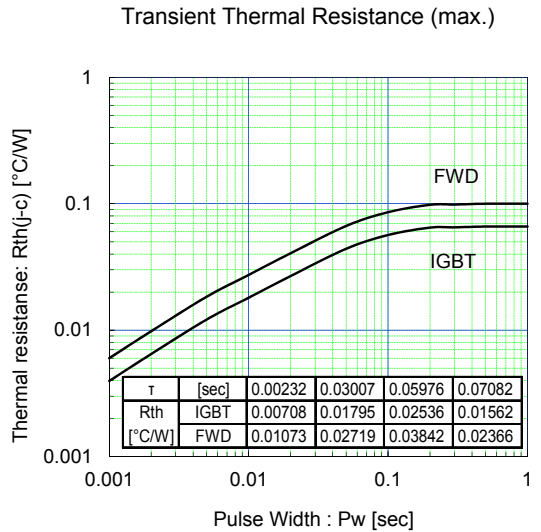
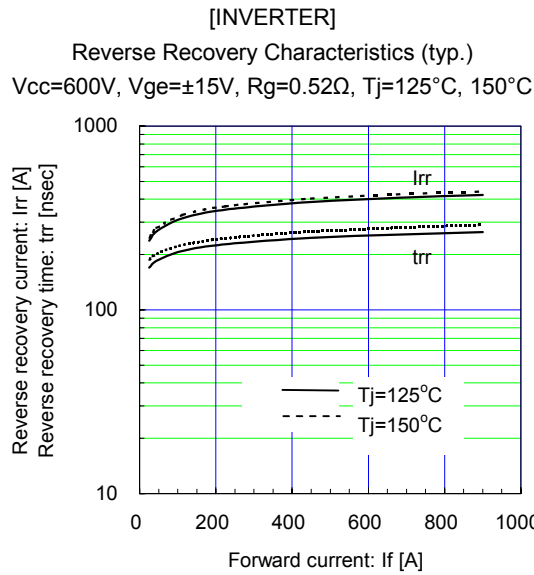
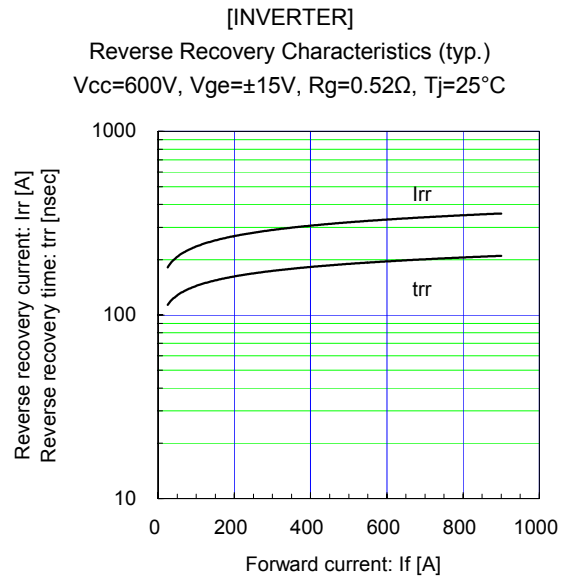
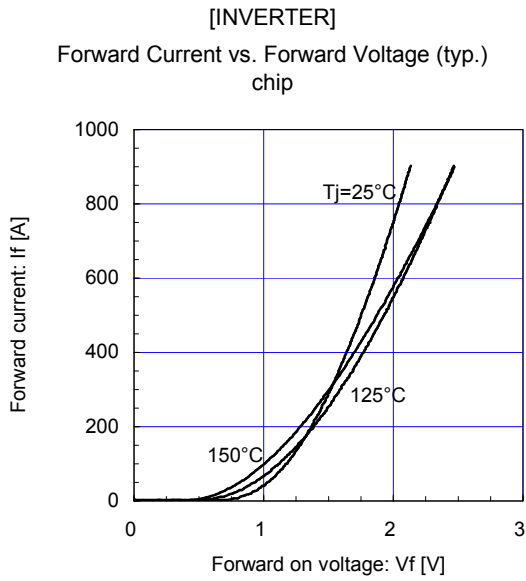
Switching loss vs. Gate resistance (typ.)
 $V_{cc}=600V, I_c=450A, V_{ge}=\pm 15V, T_j=125^\circ C, 150^\circ C$



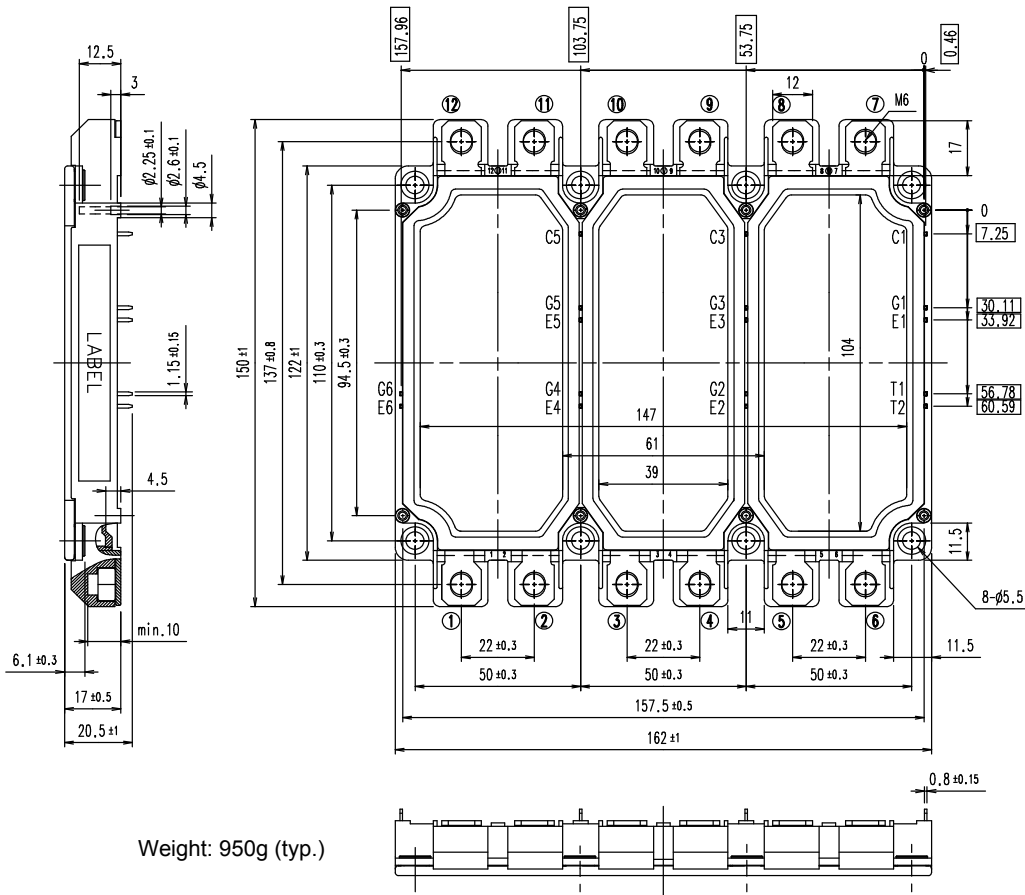
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Reverse bias safe operating area (max.)
 $+V_{ge}=15V, -V_{ge}\le 15V, R_g\ge 0.52\Omega, T_j=150^\circ C$



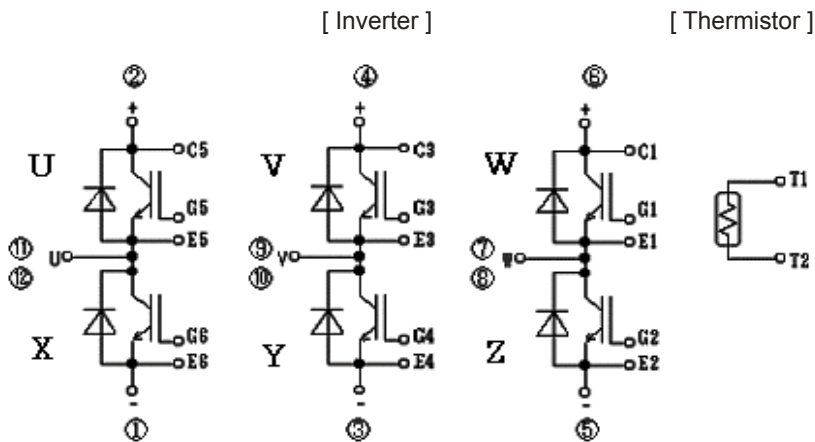


■ Outline Drawings(Unit:mm)

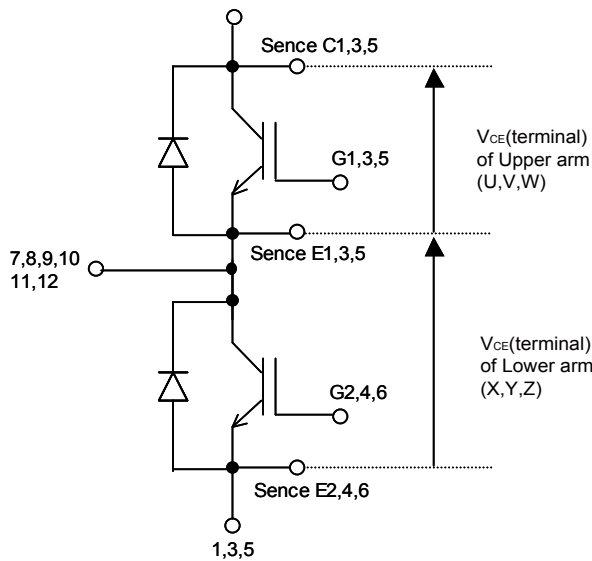


NOTE) shows theoretical dimension and tolerance is $\begin{matrix} \oplus \\ \ominus \end{matrix} \phi 0.5$.

■ 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.

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IGBT Modules

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