

# 2MBI450VJ-120-50

**IGBT Modules**

## IGBT MODULE (V series) 1200V / 450A / 2 in one package

### ■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

### ■ 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 Tc=25°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	Tc=25°C 600	A
				Tc=100°C 450	
		$I_{c\ pulse}$	1ms	900	
		$-I_c$		450	
	$-I_{c\ pulse}$	1ms	900		
Collector power dissipation	$P_c$	1 device	2270	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 to +125		
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	$V_{iso}$	AC : 1min.	2500	VAC
Screw torque	Mounting (*3)			3.5	N m
	Terminals (*4)			4.5	
	PC-Board (*5)			0.6	

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)

Note \*5: Recommendable value : 0.4-0.6 Nm (M2.5)

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	3.0	mA	
Gate-Emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	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)	$V_{GE} = 15V$ $I_c = 450A$	Tj=25°C	-	2.25	2.70	V
			Tj=125°C	-	2.55	-	
			Tj=150°C	-	2.60	-	
	Tj=25°C		-	1.75	2.20		
	Tj=125°C		-	2.05	-		
	Tj=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	$t_{on}$	$V_{CC} = 600V$	-	550	-	nsec	
	$t_r$	$I_c = 450A$	-	180	-		
	$t_r(i)$	$V_{GE} = \pm 15V$	-	120	-		
	$t_{off}$	$R_g = 0.52\Omega$	-	1050	-		
Turn-off time	$t_f$	$L_s = 80nH$	-	110	-	nsec	
Forward on voltage	$V_F$ (terminal)	$V_{GE} = 0V$ $I_F = 450A$	Tj=25°C	-	2.20	2.65	V
			Tj=125°C	-	2.35	-	
			Tj=150°C	-	2.30	-	
	Tj=25°C		-	1.70	2.15		
	Tj=125°C		-	1.85	-		
	Tj=150°C		-	1.80	-		
Reverse recovery time	$t_{rr}$	$I_F = 450A$	-	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

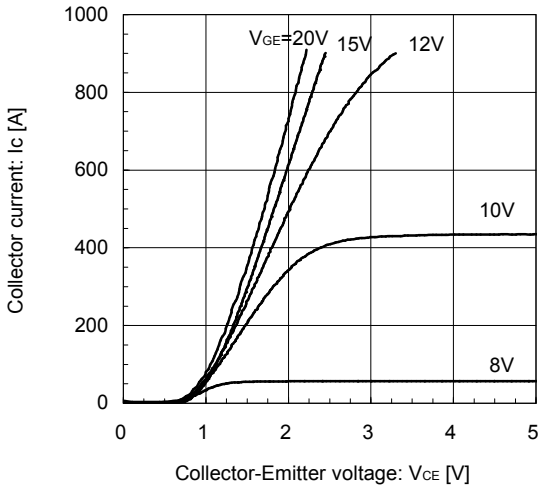
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	Rth(j-c)	Inverter IGBT	-	-	0.066	°C/W
		Inverter FWD	-	-	0.100	
Contact thermal resistance (1device) (*6)	Rth(c-f)	with Thermal Compound	-	0.0167	-	

Note \*6: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

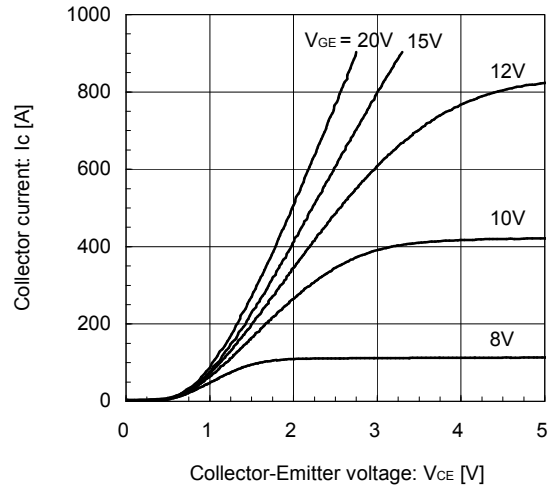
[INVERTER]

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



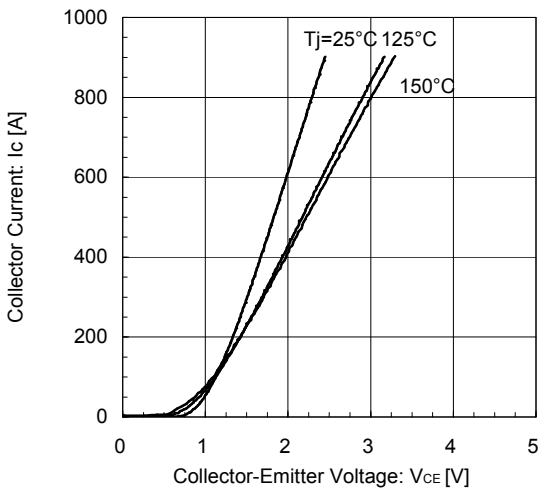
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Collector current vs. Collector-Emmitter voltage (typ.)  
Tj= 150°C / chip



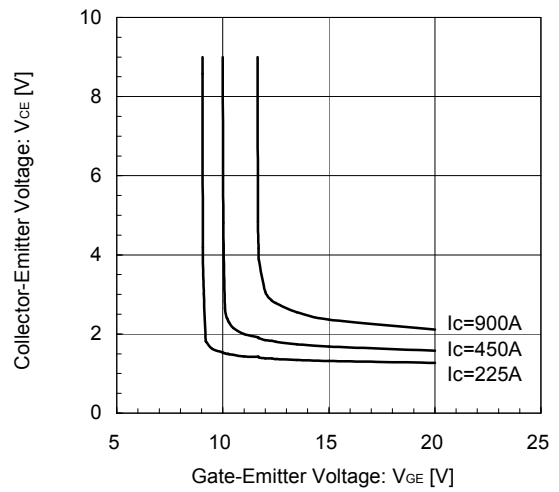
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Collector current vs. Collector-Emmitter voltage (typ.)  
VGE = 15V / chip



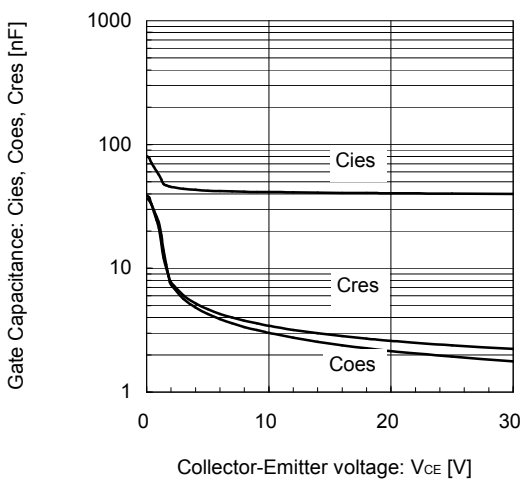
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Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)  
Tj= 25°C / chip



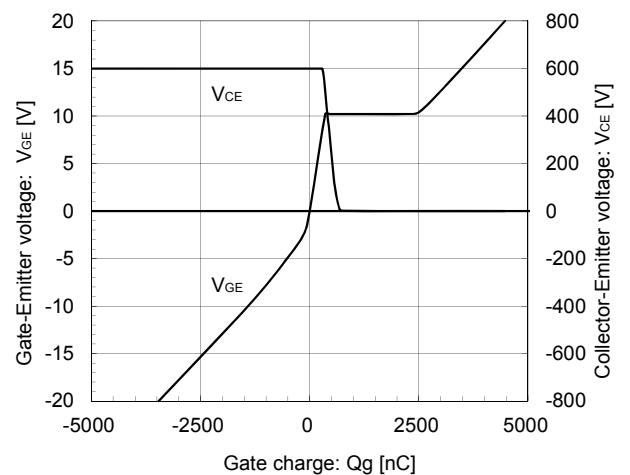
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Gate Capacitance vs. Collector-Emmitter Voltage (typ.)  
VGE=0V, f=1MHz, Tj=25°C



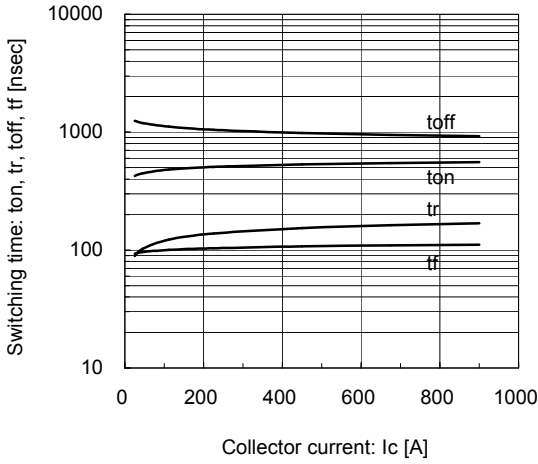
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Dynamic Gate Charge (typ.)  
Vcc=600V, Ic=450A, Tj= 25°C



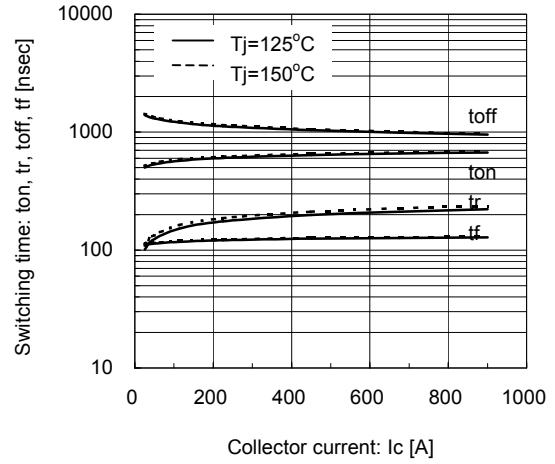
[INVERTER]

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



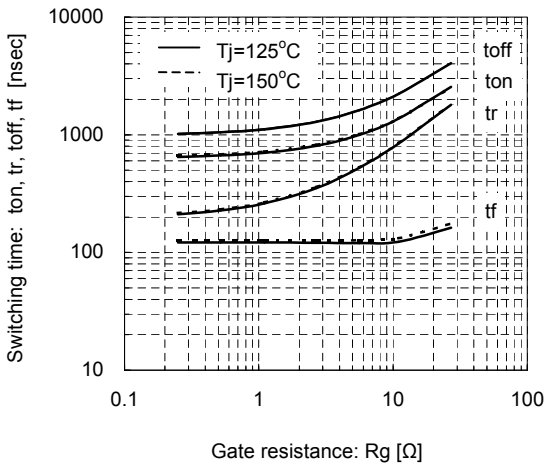
[INVERTER]

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



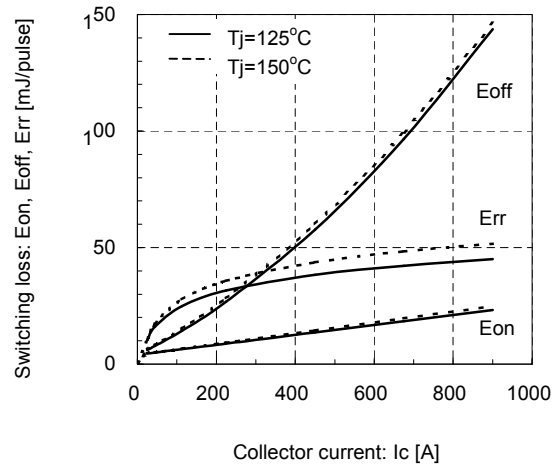
[INVERTER]

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



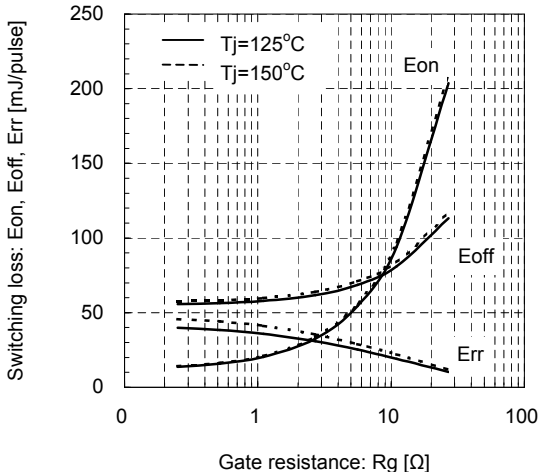
[INVERTER]

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



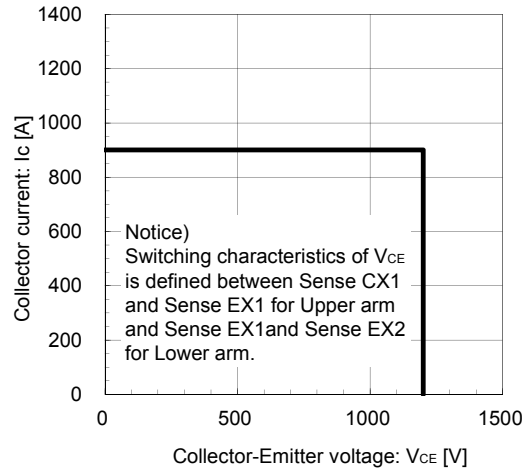
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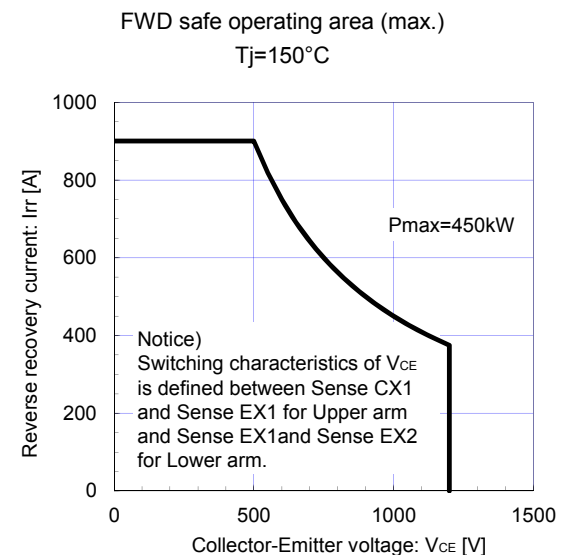
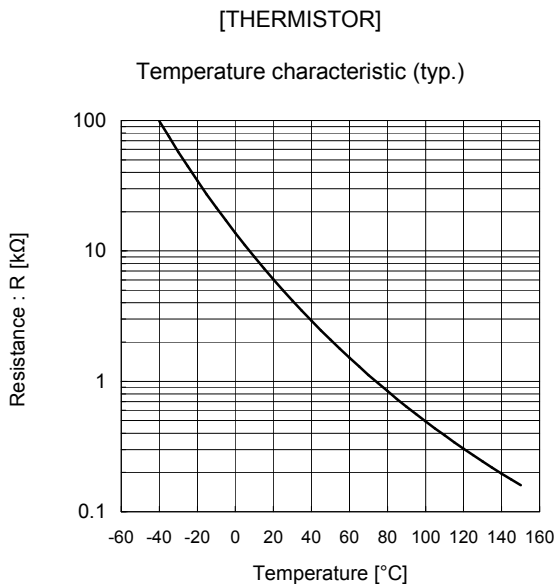
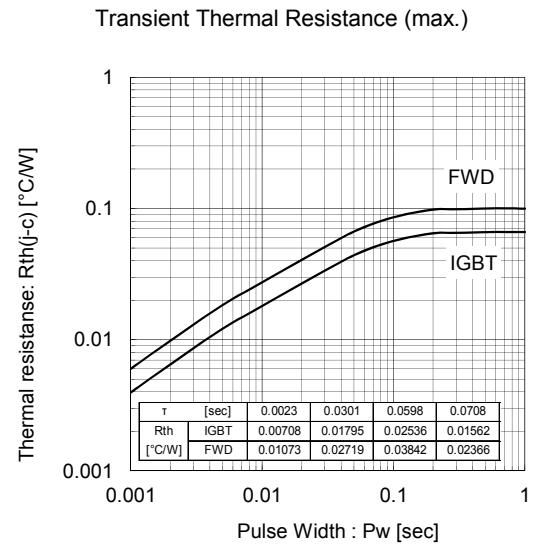
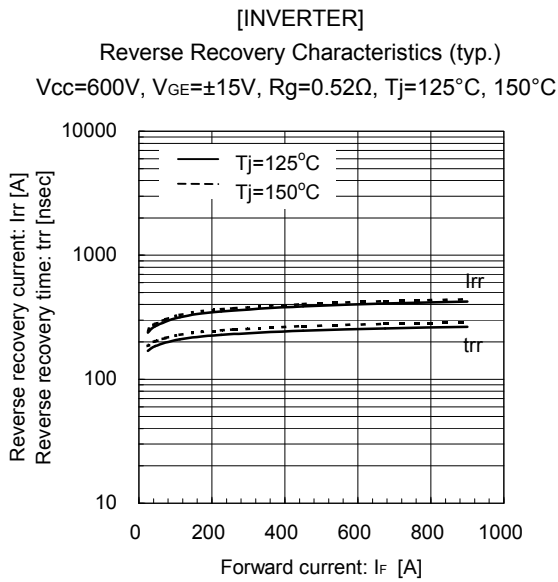
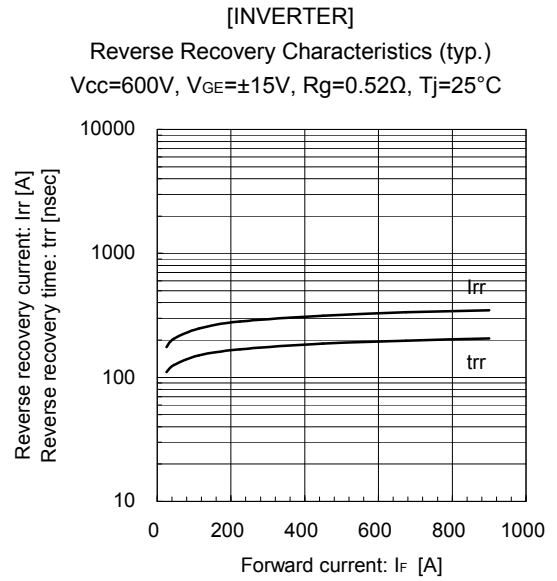
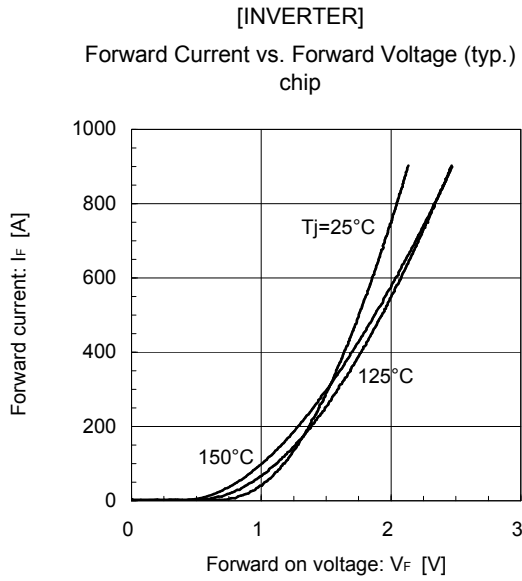
Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V, I_c=450A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



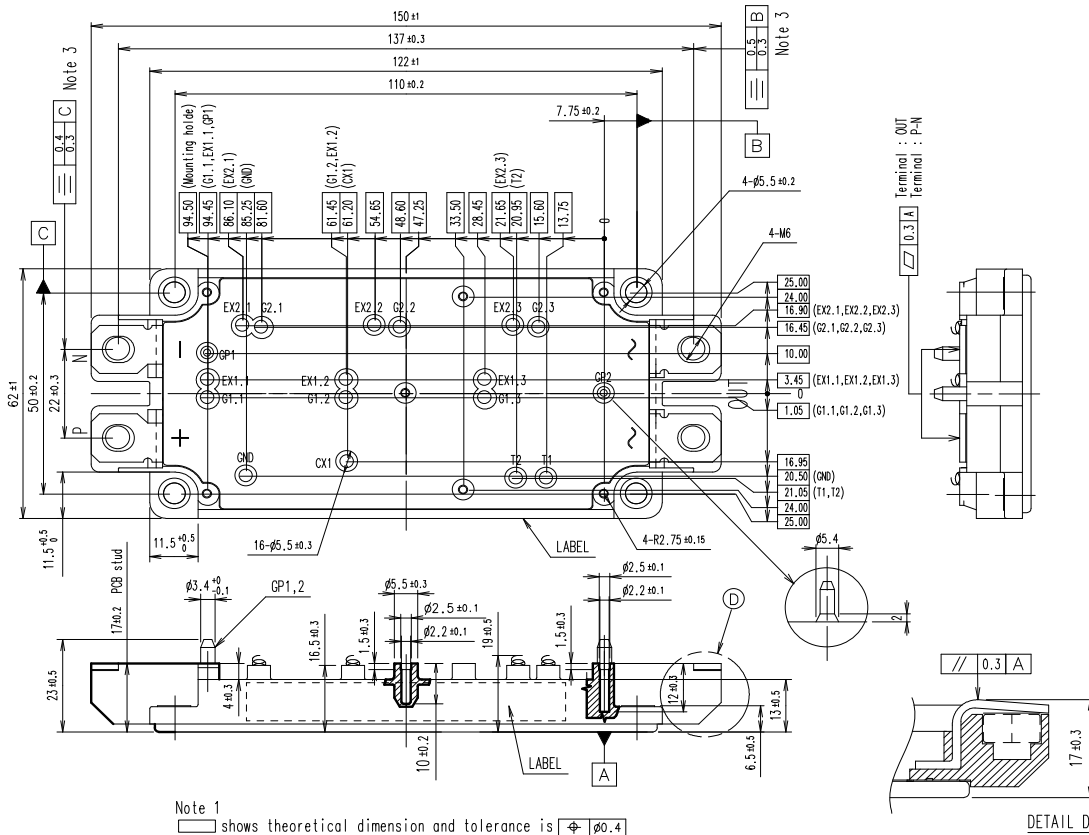
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Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_g=0.52\Omega, T_j=150^\circ C$





Outline Drawings (Unit : mm)



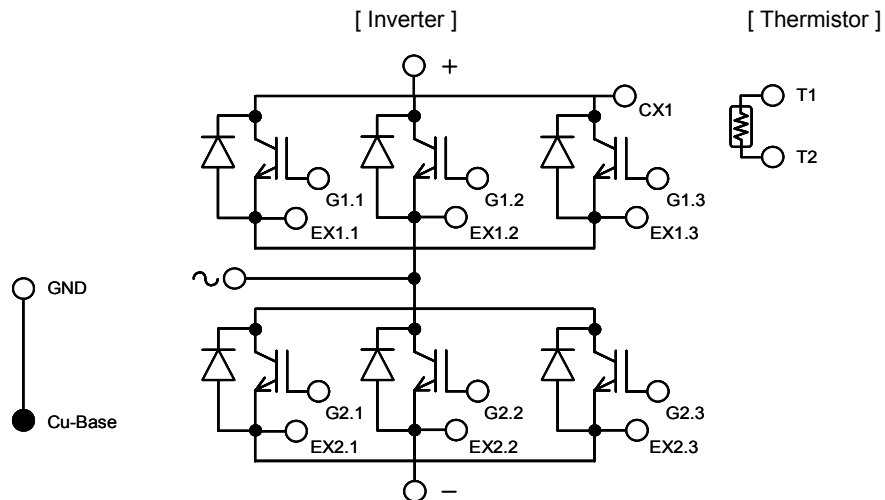
Note 1  
 [Symbol] shows theoretical dimension and tolerance is  $\pm 0.4$

Note 2  
 Rule for PCB  
 · Guide pin hole :  $\phi 4.0 \pm 0.1$   
 · Guide pin distance :  $94.45 \pm 0.1$   
 · Spring contact pad :  $\phi 3.8 \pm 0.2$   
 · Position tol. pad :  $\pm 0.4$

Weight: 300g (typ.)

Note 3  
 [Symbol] [Symbol] [Symbol]  
 Upper value : Terminal hole center  
 Lower value : Nut center  
 (Including margin of the nut position.)

Equivalent circuit



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