

# 2MBI600VN-120-50

**IGBT Modules**

## IGBT MODULE (V series) 1200V / 600A / 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	$V_{GES}$	$\pm 20$	V	
	Collector current	$I_c$	Continuous	Tc=25°C	750
				Tc=100°C	600
		$I_c$ pulse	1ms	1200	A
		-Ic		600	
	-Ic pulse	1ms	1200		
Collector power dissipation	$P_c$	1 device	3750	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)	$V_{iso}$	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 : Mounting : 2.5-3.5 Nm (M5) Note \*4: Recommendable value : Terminals : 3.5-4.5 Nm (M6)

#### ● 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	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 600mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 600A$	Tj=25°C	-	2.65	3.10	V
			Tj=125°C	-	3.00	-	
			Tj=150°C	-	3.05	-	
	$V_{CE(sat)}$ (chip)		Tj=25°C	-	1.85	2.30	
			Tj=125°C	-	2.20	-	
			Tj=150°C	-	2.25	-	
Internal gate resistance	$R_g(int)$	-	-	1.25	-	Ω	
Input capacitance	$C_{ies}$	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	48	-	nF	
Turn-on time	$t_{on}$	$V_{CC} = 600V$	-	550	-	nsec	
	$t_r$	$I_c = 600A$	-	180	-		
	$t_r(i)$	$V_{GE} = \pm 15V$	-	120	-		
	Turn-off time	$t_{off}$	$R_g = 0.62\Omega$	-	1050		-
$t_f$		$L_s = 80nH$	-	110	-		
Forward on voltage	$V_F$ (terminal)	$V_{GE} = 0V$ $I_F = 600A$	Tj=25°C	-	2.50	3.00	V
			Tj=125°C	-	2.65	-	
			Tj=150°C	-	2.60	-	
	$V_F$ (chip)		Tj=25°C	-	1.70	2.15	
			Tj=125°C	-	1.85	-	
			Tj=150°C	-	1.80	-	
Reverse recovery time	$t_{rr}$	$I_F = 600A$	-	200	-	nsec	
Thermistor	Resistance	$R$	T=25°C	-	5000	-	Ω
			T=100°C	465	495	520	
			T=25/50°C	3305	3375	3450	
B value	B	T=25/50°C				K	

● Thermal resistance characteristics

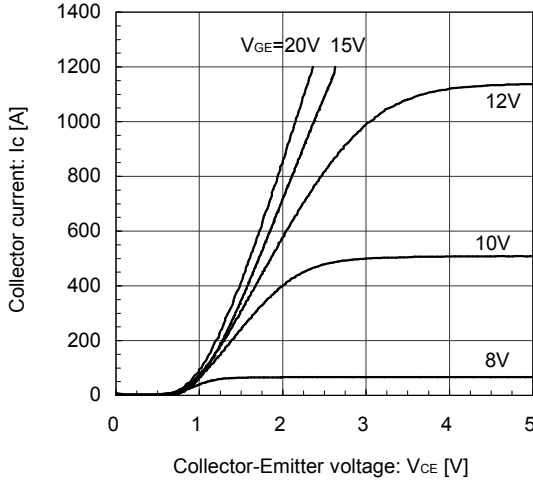
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	Rth(j-c)	Inverter IGBT	-	-	0.04	°C/W
		Inverter FWD	-	-	0.06	
Contact thermal resistance (1device) (*5)	Rth(c-f)	with Thermal Compound	-	0.0167	-	

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

■ Characteristics (Representative)

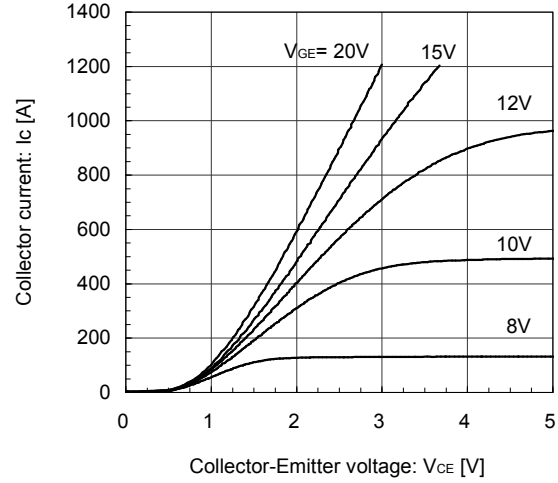
[INVERTER]

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



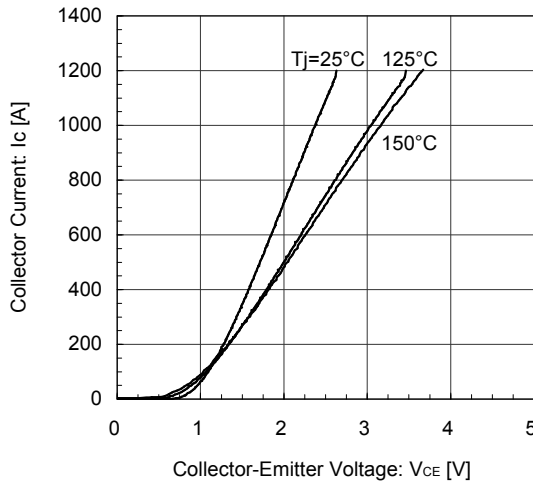
[INVERTER]

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



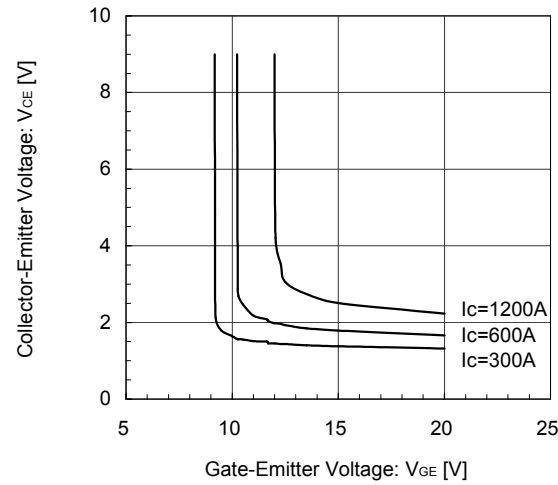
[INVERTER]

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



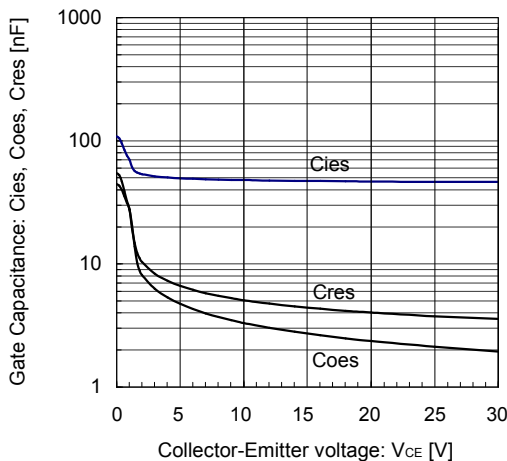
[INVERTER]

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



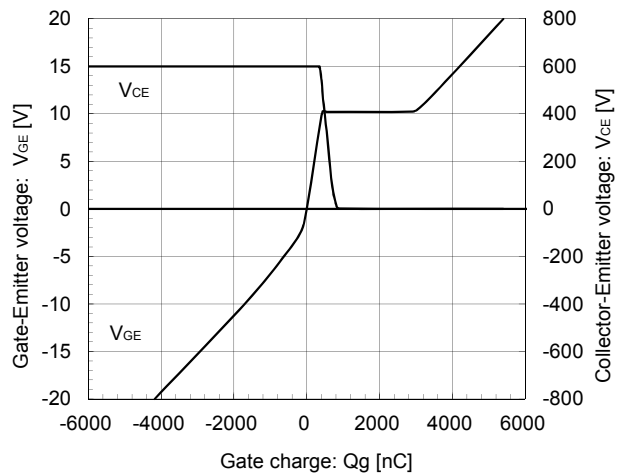
[INVERTER]

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



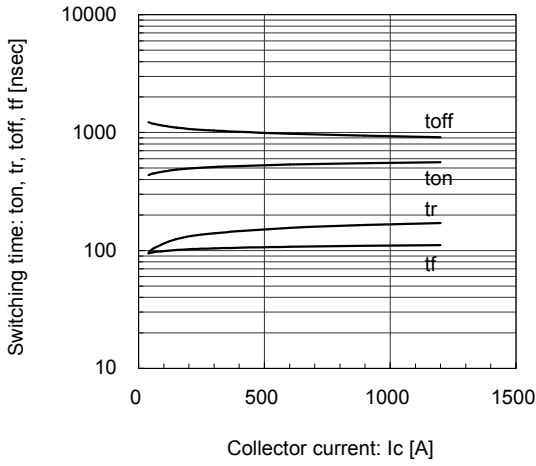
[INVERTER]

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



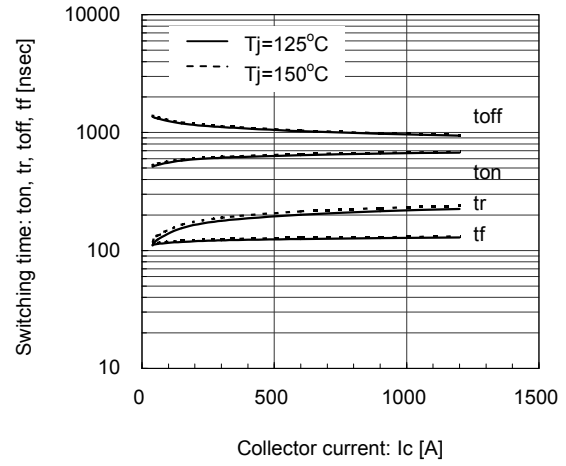
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=0.62\Omega, T_j=25^\circ C$



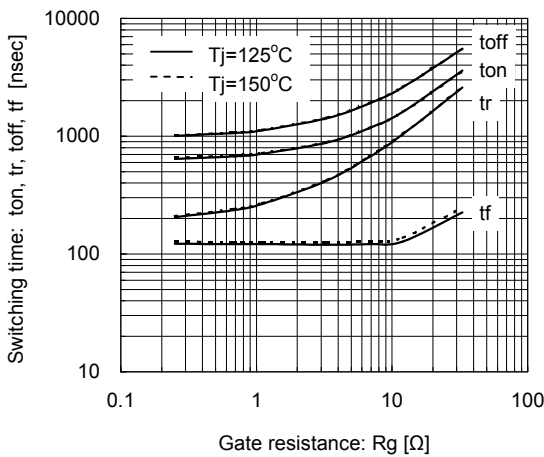
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=0.62\Omega, T_j=125^\circ C, 150^\circ C$



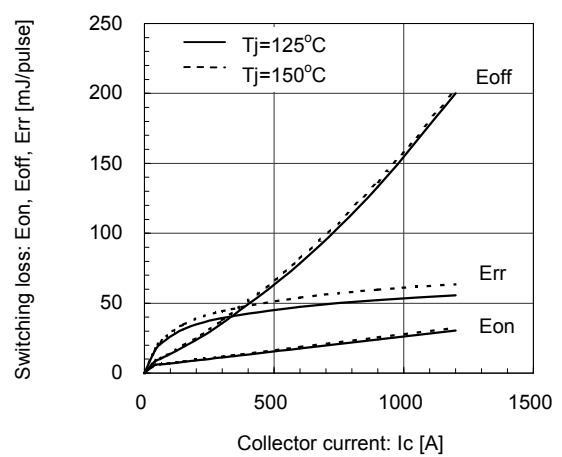
[INVERTER]

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



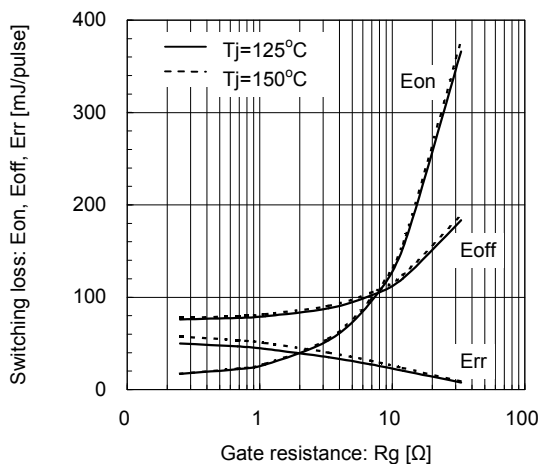
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V, V_{GE}=\pm 15V, R_g=0.62\Omega, T_j=125^\circ C, 150^\circ C$



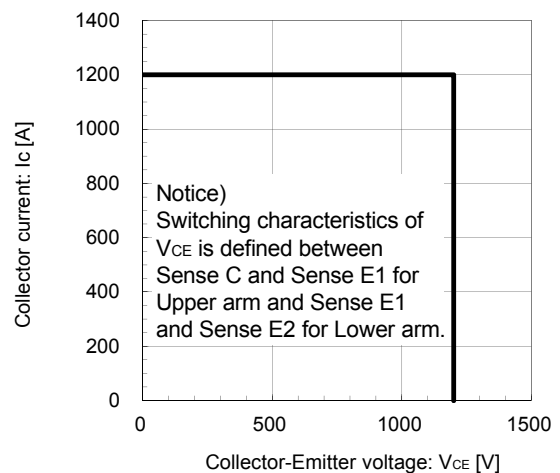
[INVERTER]

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



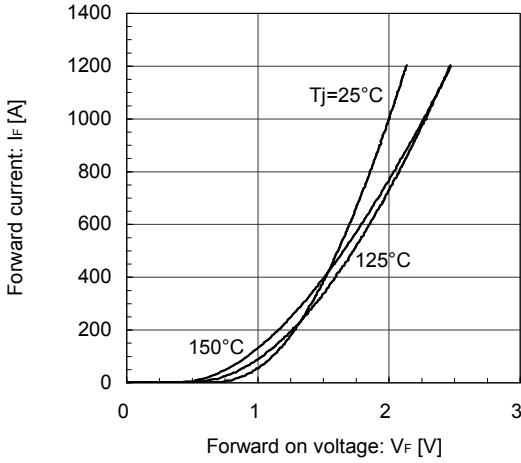
[INVERTER]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_g=0.62\Omega, T_j=150^\circ C$



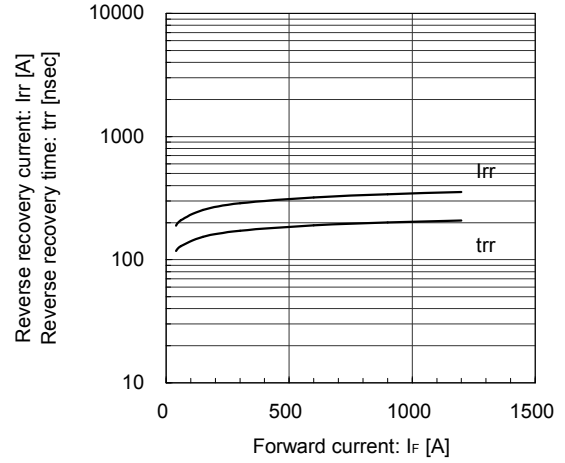
[INVERTER]

Forward Current vs. Forward Voltage (typ.)  
chip



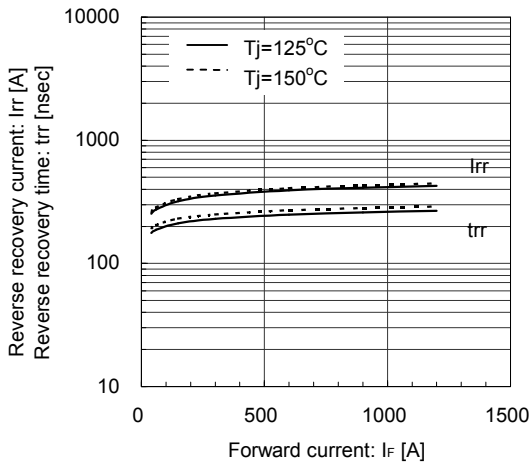
[INVERTER]

Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=600V, V<sub>GE</sub>=±15V, R<sub>G</sub>=0.62Ω, T<sub>J</sub>=25°C

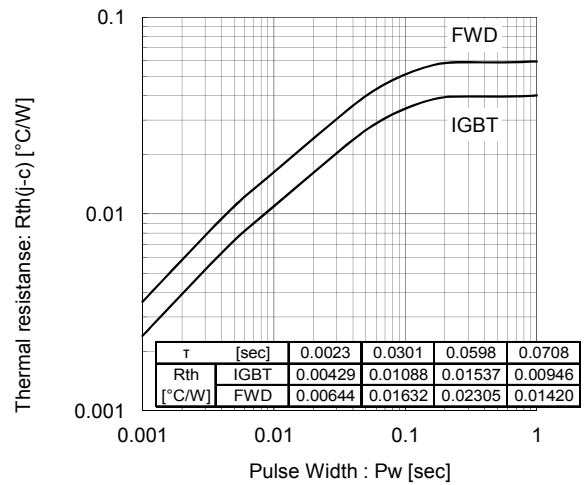


[INVERTER]

Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=600V, V<sub>GE</sub>=±15V, R<sub>G</sub>=0.62Ω, T<sub>J</sub>=125°C, 150°C

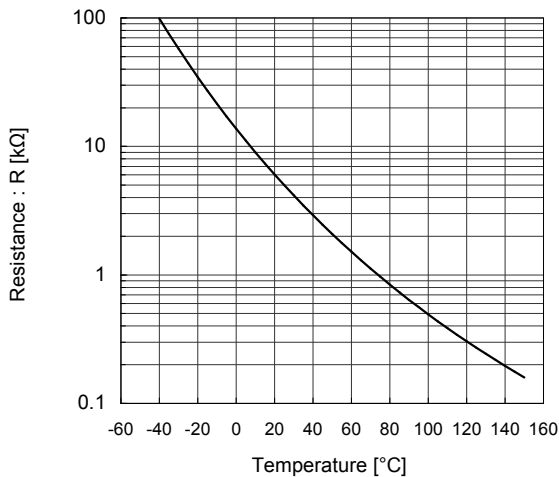


Transient Thermal Resistance (max.)

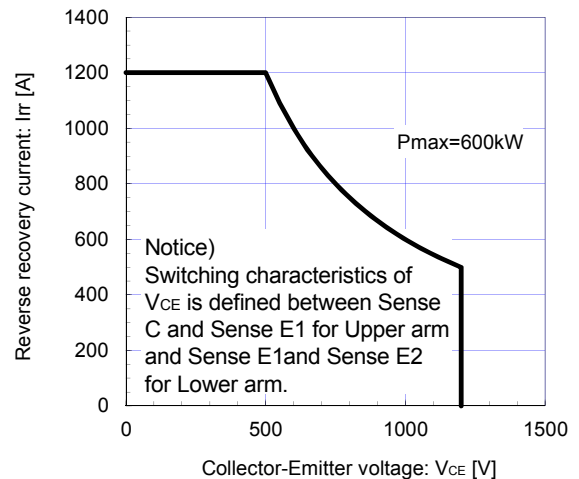


[THERMISTOR]

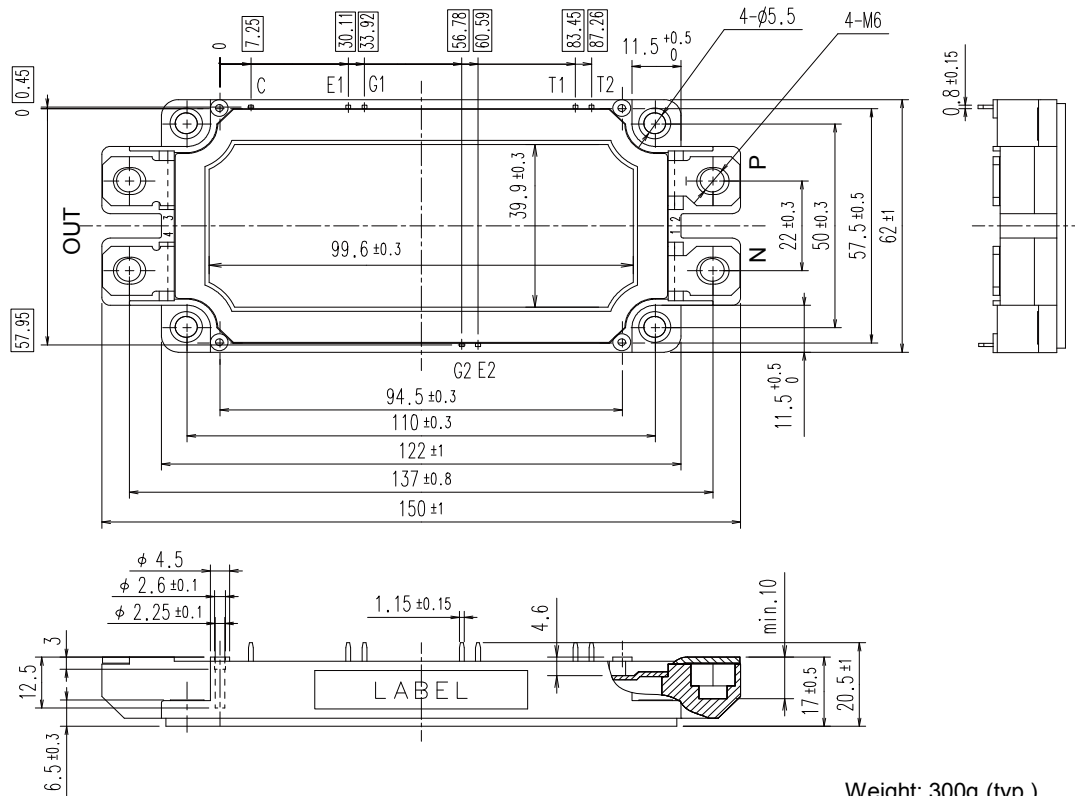
Temperature characteristic (typ.)



FWD safe operating area (max.)  
T<sub>J</sub>=150°C

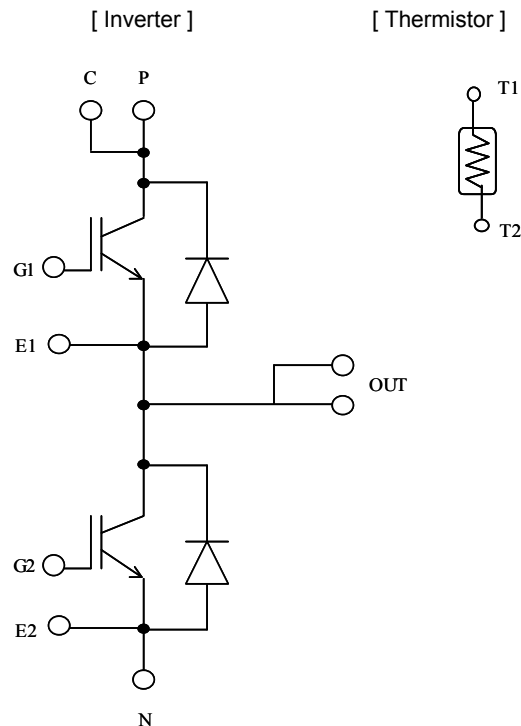


■ Outline Drawings (Unit : mm)



NOTE)      shows theoretical demension and tolerance is  $\phi \pm 0.5$

■ Equivalent Circuit



## WARNING

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