

# 2MBI300VN-170-50

IGBT Modules

## IGBT MODULE (V series) 1700V / 300A / 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 T<sub>c</sub>=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units	
Inverter	Collector-Emitter voltage	V <sub>CEs</sub>	1700	V	
	Gate-Emitter voltage	V <sub>GES</sub>	±20	V	
	Collector current	I <sub>c</sub>	Continuous	T <sub>c</sub> =25°C T <sub>c</sub> =100°C	450 300
			I <sub>c pulse</sub>	1ms	600
		-I <sub>c</sub>		300	
		-I <sub>c pulse</sub>	1ms	600	
Collector power dissipation	P <sub>c</sub>	1 device	1665	W	
Junction temperature	T <sub>j</sub>		175		
Operating junction temperature (under switching conditions)	T <sub>top</sub>		150	°C	
Storage temperature	T <sub>stg</sub>		-40 ~ 125		
Isolation voltage	between terminal and copper base (*1)	V <sub>iso</sub>	AC : 1min.	3400	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> = 1700V	-	-	3.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</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> = 300mA	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> = 300A	T <sub>j</sub> =25°C	-	2.45	2.90	V
			T <sub>j</sub> =125°C	-	2.90	-	
			T <sub>j</sub> =150°C	-	2.95	-	
	V <sub>CE(sat)</sub> (chip)		T <sub>j</sub> =25°C	-	2.00	2.45	
			T <sub>j</sub> =125°C	-	2.45	-	
			T <sub>j</sub> =150°C	-	2.50	-	
Internal gate resistance	R <sub>G(int)</sub>	-	-	2.5	-	Ω	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	30	-	nF	
Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 900V	-	900	-	nsec	
	t <sub>r</sub>	I <sub>c</sub> = 300A	-	400	-		
	t <sub>r(i)</sub>	V <sub>GE</sub> = ±15V	-	100	-		
	Turn-off time	t <sub>off</sub>	R <sub>G</sub> = 4.7Ω	-	1300		-
t <sub>r</sub>		L <sub>s</sub> = 80nH	-	100	-		
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 300A	T <sub>j</sub> =25°C	-	2.25	2.70	V
			T <sub>j</sub> =125°C	-	2.55	-	
			T <sub>j</sub> =150°C	-	2.55	-	
	V <sub>F</sub> (chip)		T <sub>j</sub> =25°C	-	1.80	2.25	
			T <sub>j</sub> =125°C	-	2.10	-	
			T <sub>j</sub> =150°C	-	2.10	-	
Reverse recovery time	t <sub>r</sub>	I <sub>F</sub> = 300A	-	250	-	nsec	
Thermistor	Resistance	R	T = 25°C	-	5000	-	Ω
	B value	B	T = 100°C	465	495	520	
			T = 25/50°C	3305	3375	3450	K

#### ● Thermal resistance characteristics

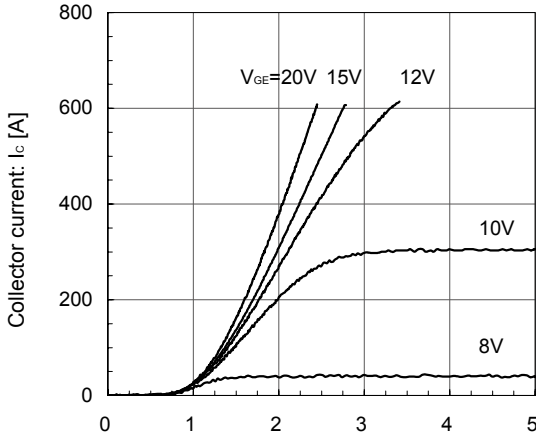
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	R <sub>th(j-c)</sub>	Inverter IGBT Inverter FWD	-	-	0.09	°C/W
Contact thermal resistance (1device) (*5)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.0167	-	

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

■ Characteristics (Representative)

[INVERTER]

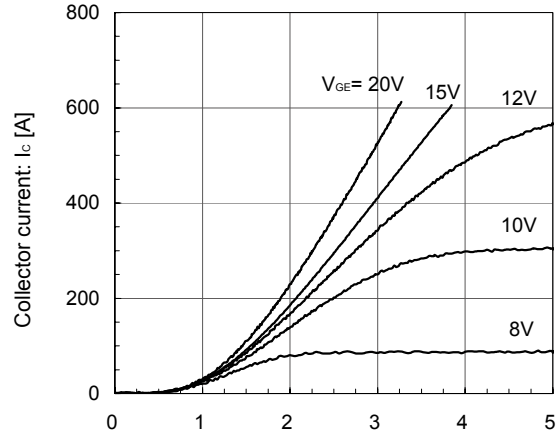
Collector current vs. Collector-Emittor voltage (typ.)  
 $T_J = 25^\circ\text{C}$  / chip



Collector-Emittor voltage:  $V_{CE}$  [V]

[INVERTER]

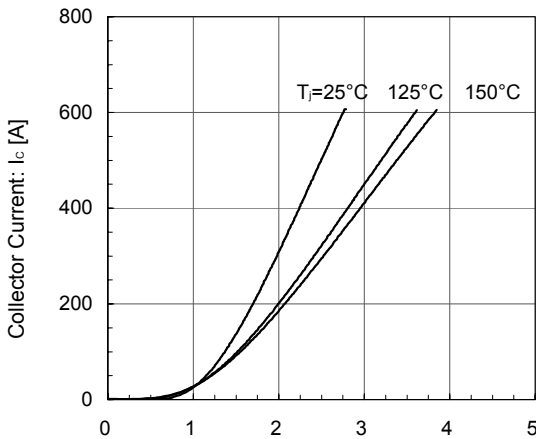
Collector current vs. Collector-Emittor voltage (typ.)  
 $T_J = 150^\circ\text{C}$  / chip



Collector-Emittor voltage:  $V_{CE}$  [V]

[INVERTER]

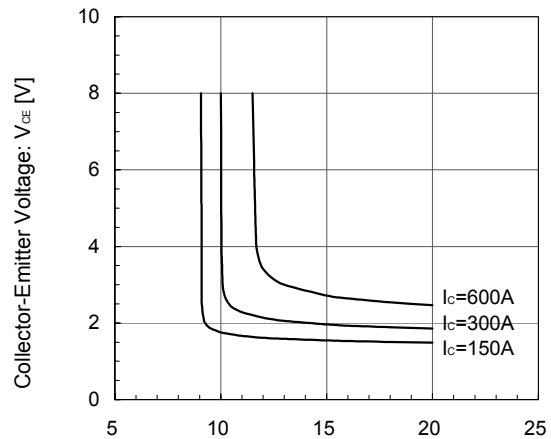
Collector current vs. Collector-Emittor voltage (typ.)  
 $V_{GE} = 15\text{V}$  / chip



Collector-Emittor Voltage:  $V_{CE}$  [V]

[INVERTER]

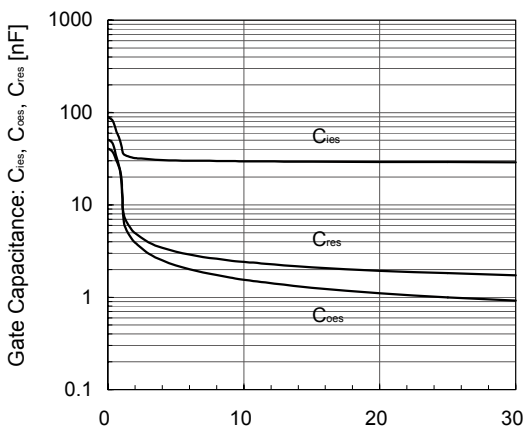
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)  
 $T_J = 25^\circ\text{C}$  / chip



Gate-Emittor Voltage:  $V_{GE}$  [V]

[INVERTER]

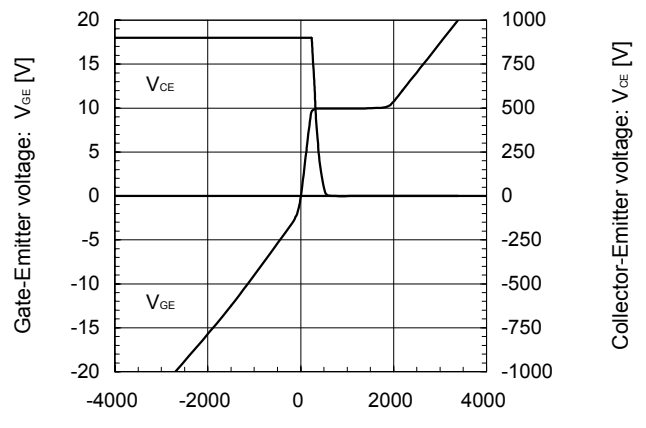
Gate Capacitance vs. Collector-Emittor Voltage (typ.)  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_J = 25^\circ\text{C}$



Collector-Emittor voltage:  $V_{CE}$  [V]

[INVERTER]

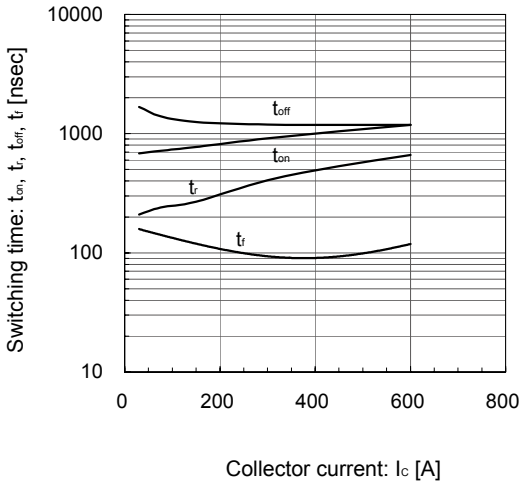
Dynamic Gate Charge (typ.)  
 $V_{CC} = 900\text{V}$ ,  $I_c = 300\text{A}$ ,  $T_J = 25^\circ\text{C}$



Gate charge:  $Q_g$  [ $\mu\text{C}$ ]

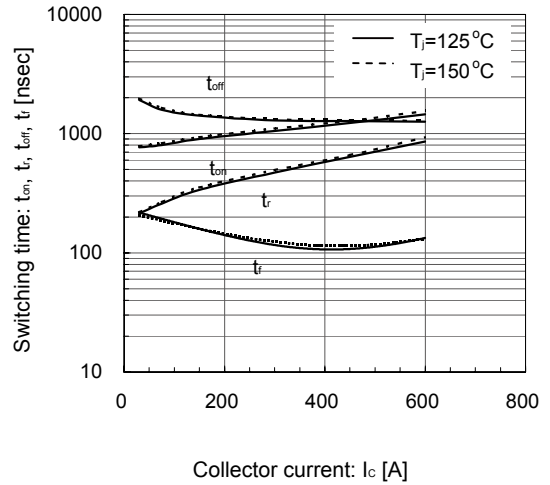
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=4.7\Omega, T_J=25^\circ C$



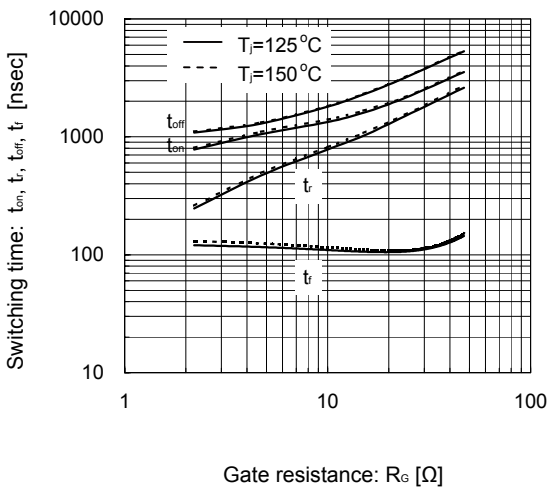
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=4.7\Omega, T_J=125^\circ C, 150^\circ C$



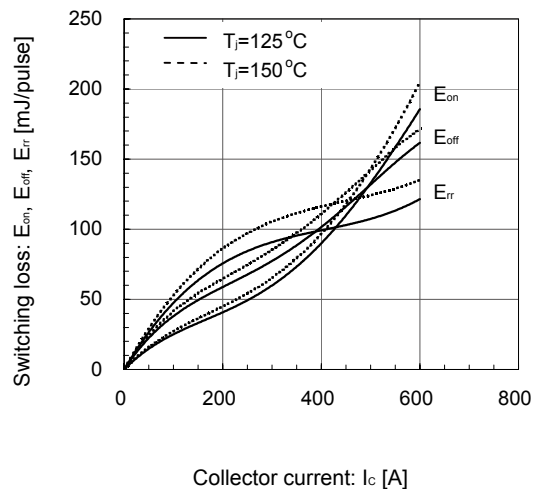
[INVERTER]

Switching time vs. Gate resistance (typ.)  
 $V_{CC}=900V, I_c=300A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



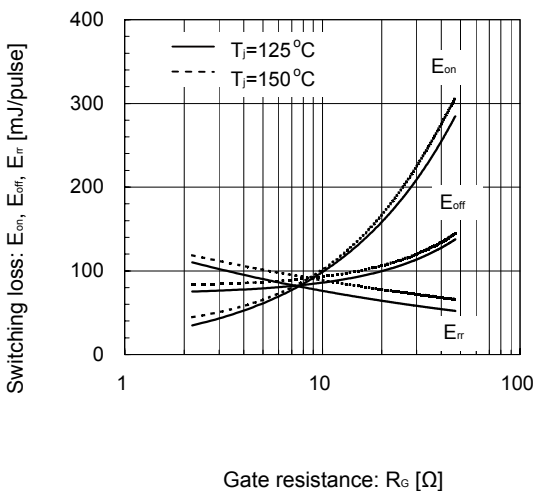
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=4.7\Omega, T_J=125^\circ C, 150^\circ C$



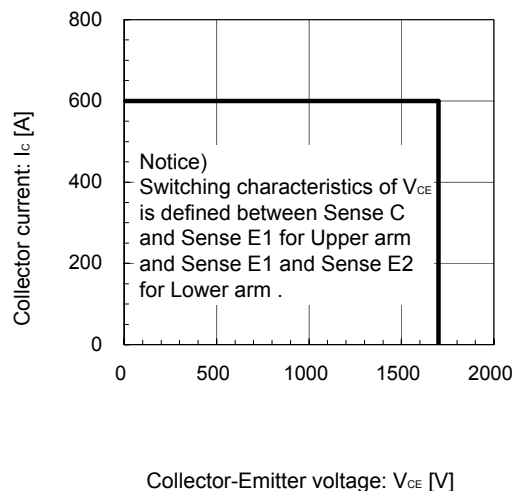
[INVERTER]

Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=900V, I_c=300A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



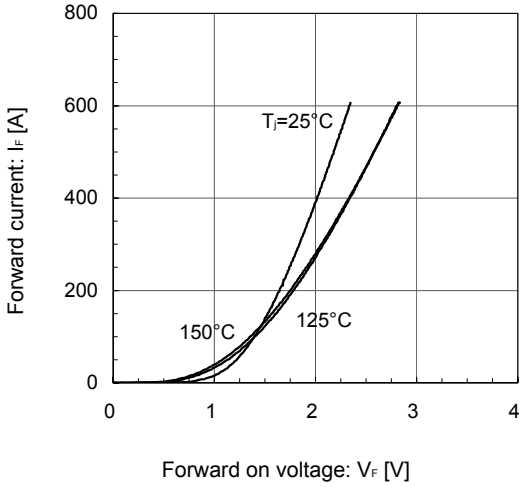
[INVERTER]

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_G=4.7\Omega, T_J=150^\circ C$



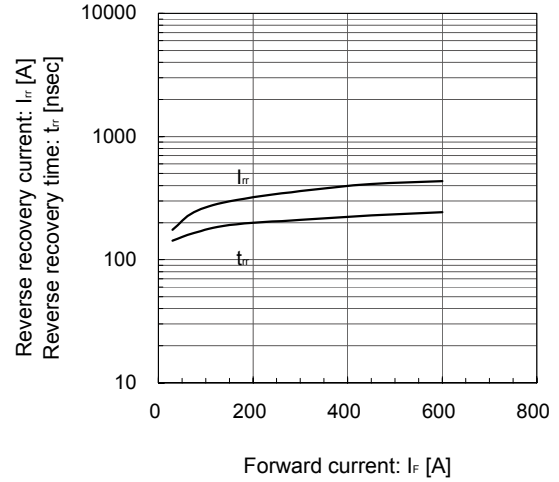
[INVERTER]

Forward Current vs. Forward Voltage (typ.) chip



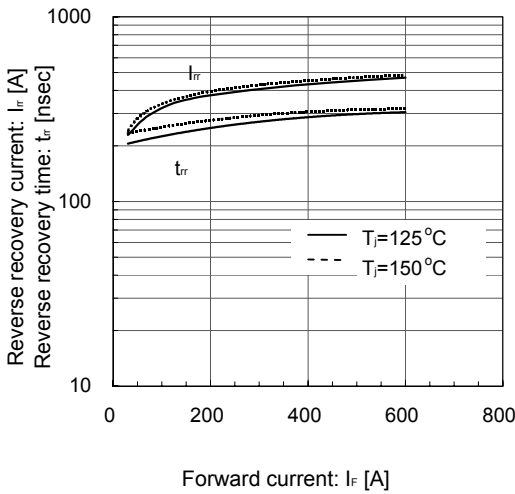
[INVERTER]

Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=900V, V<sub>GE</sub>=±15V, R<sub>G</sub>=4.7Ω, T<sub>J</sub>=25°C

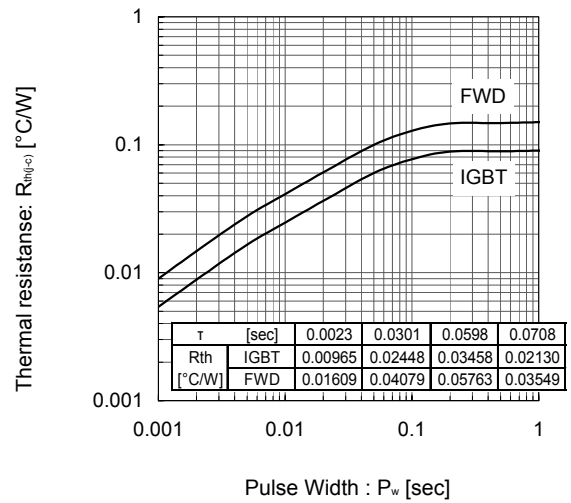


[INVERTER]

Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=900V, V<sub>GE</sub>=±15V, R<sub>G</sub>=4.7Ω, T<sub>J</sub>=125°C, 150°C

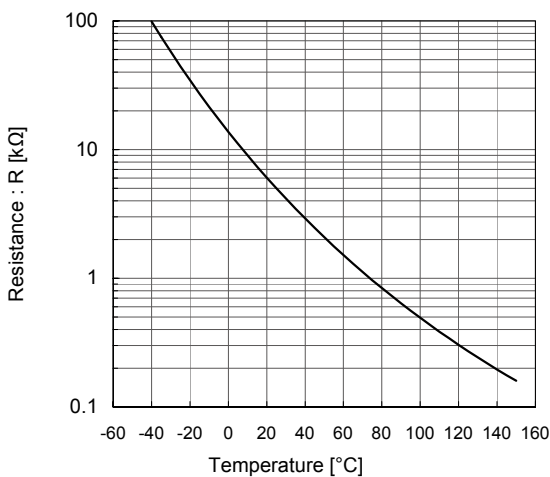


Transient Thermal Resistance (max.)

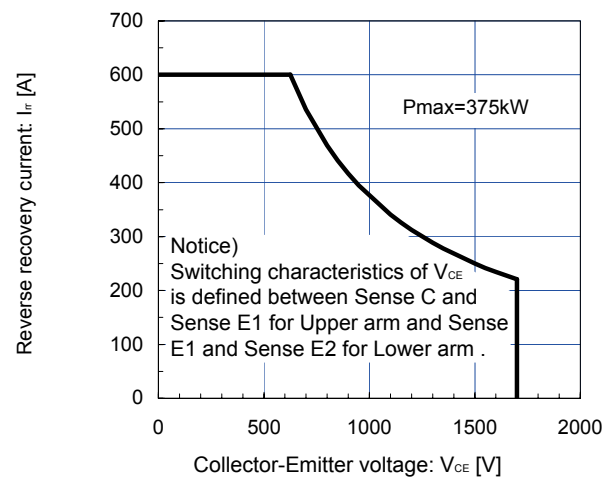


[THERMISTOR]

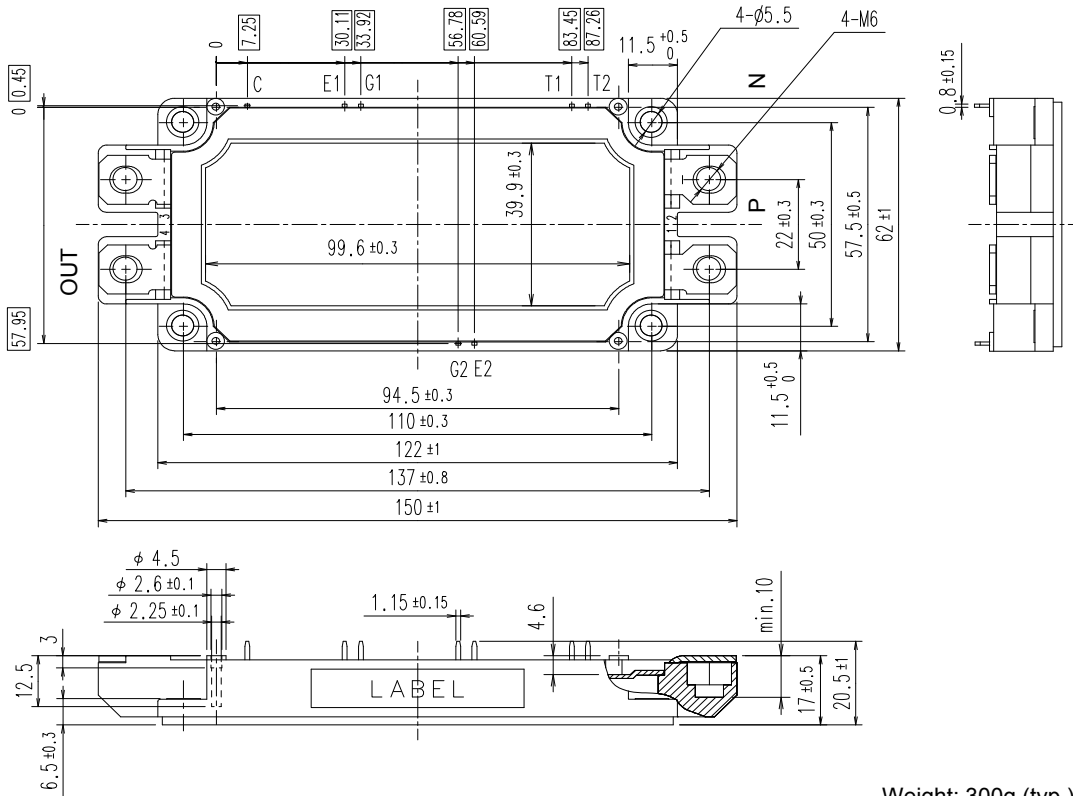
Temperature characteristic (typ.)



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



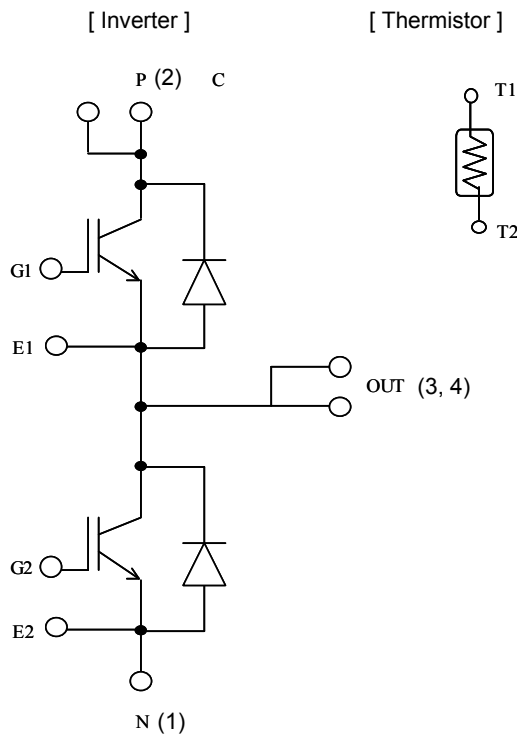
Outline Drawings, mm



Weight: 300g (typ.)

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

Equivalent Circuit Schematic



**WARNING**

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