

# 2MBI300VN-120-50

IGBT Modules

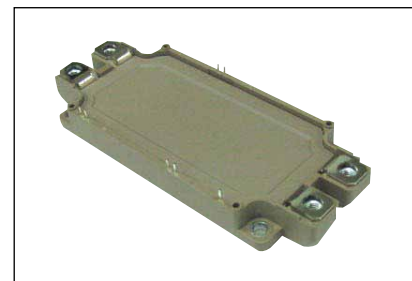
## IGBT MODULE (V series) 1200V / 300A / 2 in one package

### 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 Tc=25°C unless otherwise specified)

Items		Symbols	Conditions		Maximum ratings	Units
Inverter	Collector-Emitter voltage	V <sub>CES</sub>			1200	V
	Gate-Emitter voltage	V <sub>GES</sub>			±20	V
	Collector current	I <sub>c</sub>	Continuous	T <sub>c</sub> =25°C	450	A
				T <sub>c</sub> =100°C	300	
		I <sub>c</sub> pulse	1ms		600	
		-I <sub>c</sub>			300	
		-I <sub>c</sub> pulse	1ms		600	
	Collector power dissipation	P <sub>c</sub>	1 device		1595	W
Junction temperature		T <sub>j</sub>			175	°C
Operating junction temperature (under switching conditions)		T <sub>jop</sub>			150	
Case temperature		T <sub>c</sub>			125	
Storage temperature		T <sub>stg</sub>			-40 to +125	
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	V <sub>iso</sub>	AC : 1min.		2500	VAC
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.	
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>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	-	2.20	2.65	V
				T <sub>j</sub> =125°C	-	2.50	-	
				T <sub>j</sub> =150°C	-	2.55	-	
		V <sub>CE (sat)</sub> (chip)		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>	-		-	2.5	-	Ω
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz		-	27	-	nF
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V		-	550	-	nsec
		t <sub>r</sub>	I <sub>c</sub> = 300A		-	180	-	
		t <sub>r (i)</sub>	V <sub>GE</sub> = ±15V		-	120	-	
	Turn-off time	t <sub>off</sub>	R <sub>G</sub> = 0.93Ω		-	1050	-	nsec
		t <sub>f</sub>	L <sub>S</sub> = 80nH		-	110	-	
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 300A	T <sub>j</sub> =25°C	-	2.15	2.60	V	
			T <sub>j</sub> =125°C	-	2.30	-		
			T <sub>j</sub> =150°C	-	2.25	-		
	V <sub>F</sub> (chip)		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> = 300A		-	200	-	nsec	
Thermistor	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

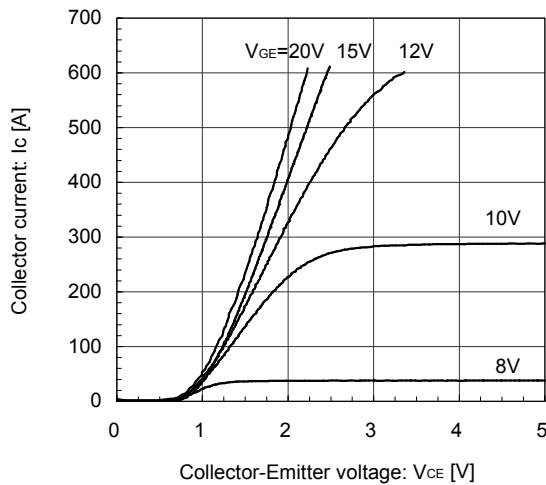
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	Rth(j-c)	Inverter IGBT	-	-	0.094	°C/W
		Inverter FWD	-	-	0.150	
Contact thermal resistance (1device) (*5)	Rth(c-f)	with Thermal Compound	-	0.0167	-	

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

## ■ Characteristics (Representative)

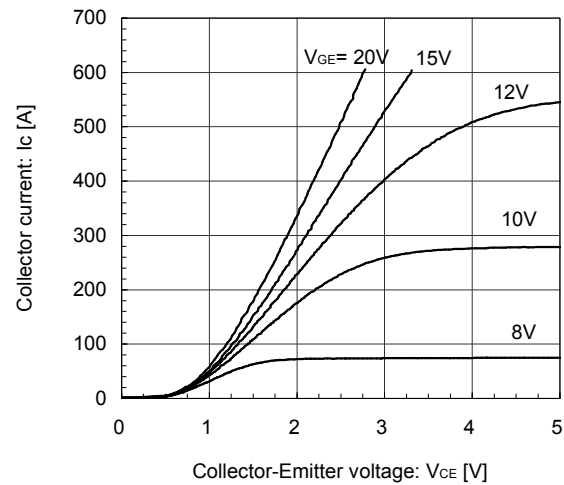
[INVERTER]

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



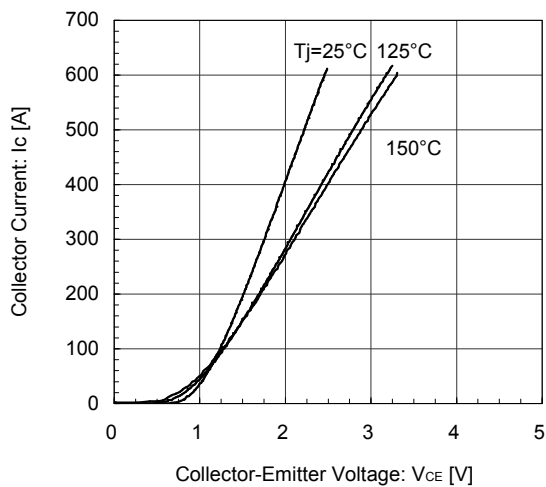
[INVERTER]

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



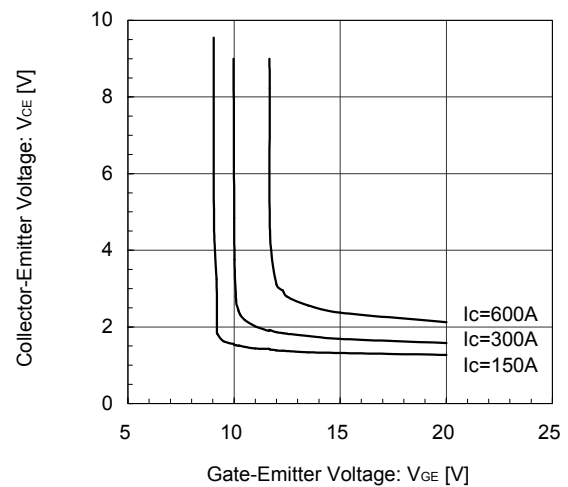
[INVERTER]

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



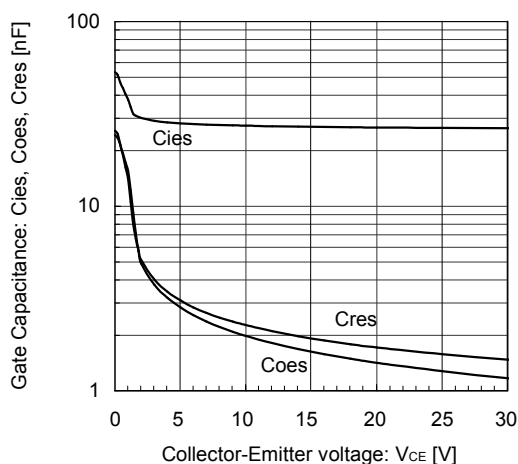
[INVERTER]

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



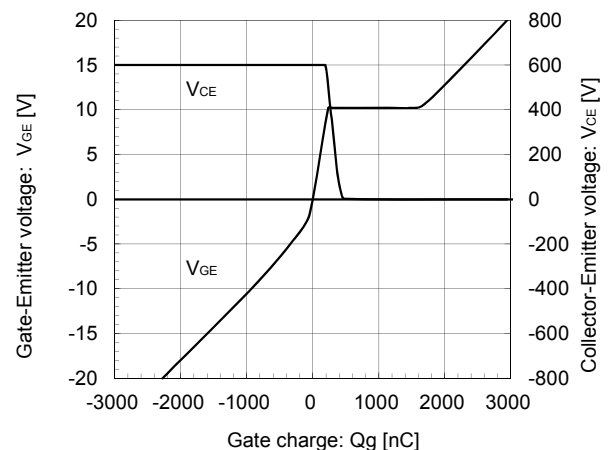
[INVERTER]

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



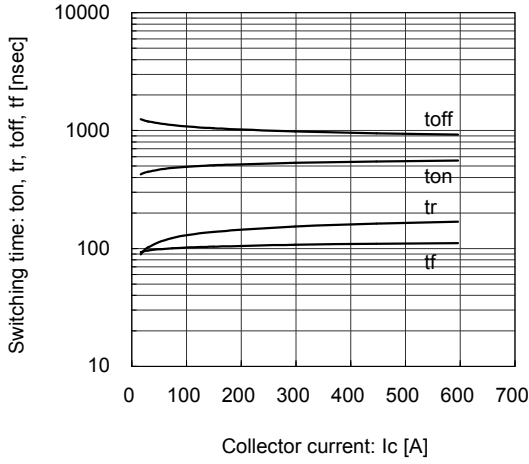
[INVERTER]

Dynamic Gate Charge (typ.)  
 $V_{CC} = 600\text{V}$ ,  $I_C = 300\text{A}$ ,  $T_j = 25^\circ\text{C}$



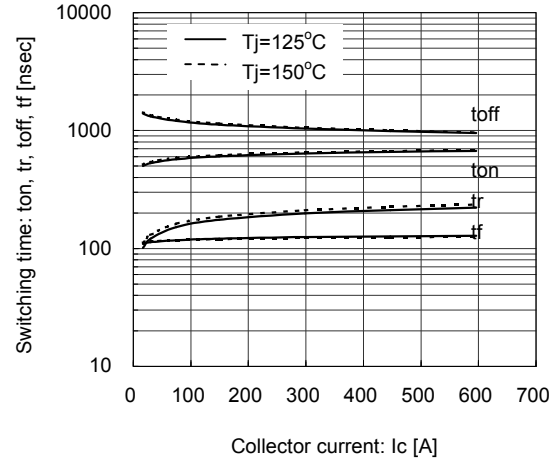
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.93\Omega$ ,  $T_j=25^\circ C$



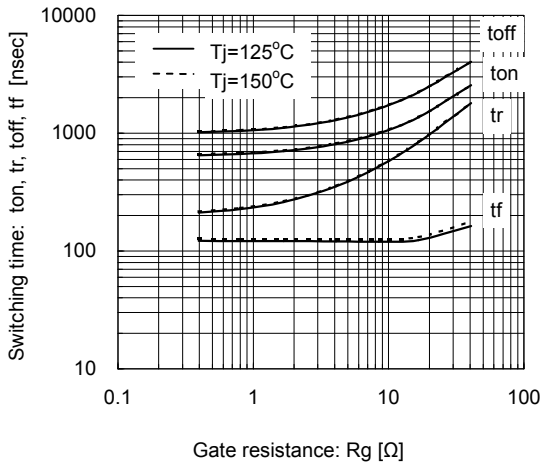
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.93\Omega$ ,  $T_j=125^\circ C, 150^\circ C$



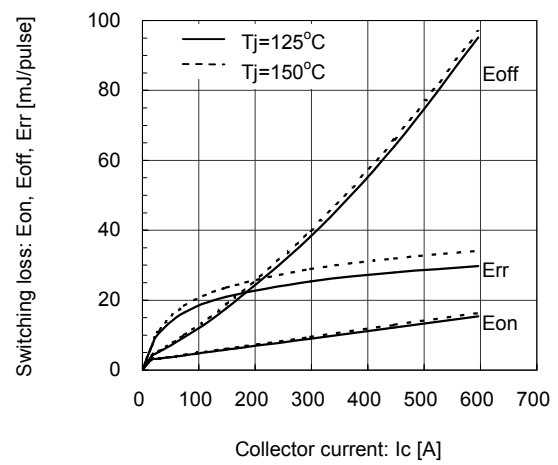
[INVERTER]

Switching time vs. Gate resistance (typ.)  
 $V_{CC}=600V$ ,  $I_c=300A$ ,  $V_{GE}=\pm 15V$ ,  $T_j=125^\circ C, 150^\circ C$



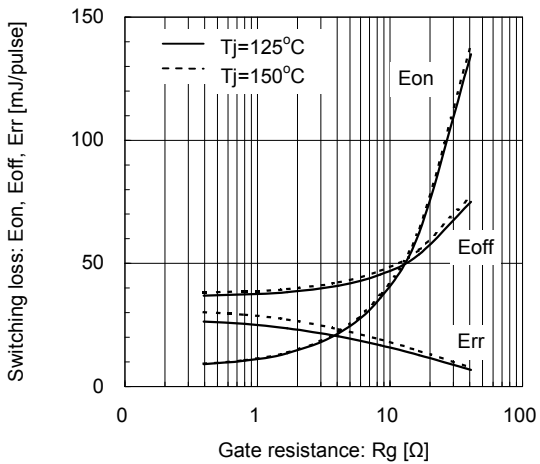
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.93\Omega$ ,  $T_j=125^\circ C, 150^\circ C$



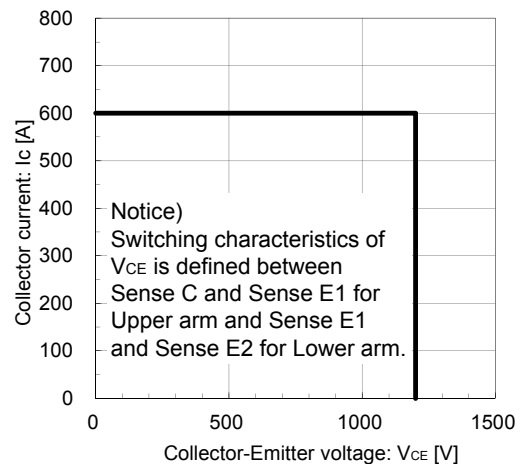
[INVERTER]

Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=600V$ ,  $I_c=300A$ ,  $V_{GE}=\pm 15V$ ,  $T_j=125^\circ C, 150^\circ C$

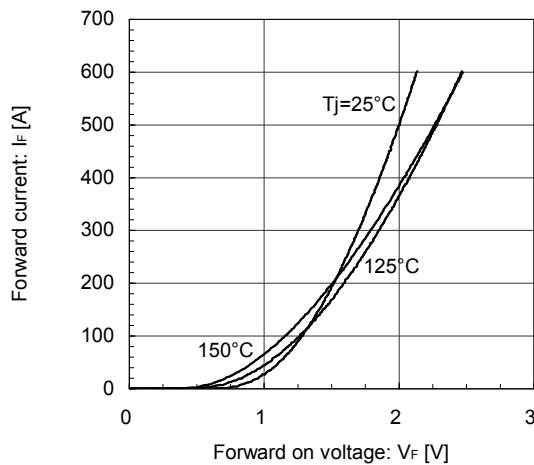


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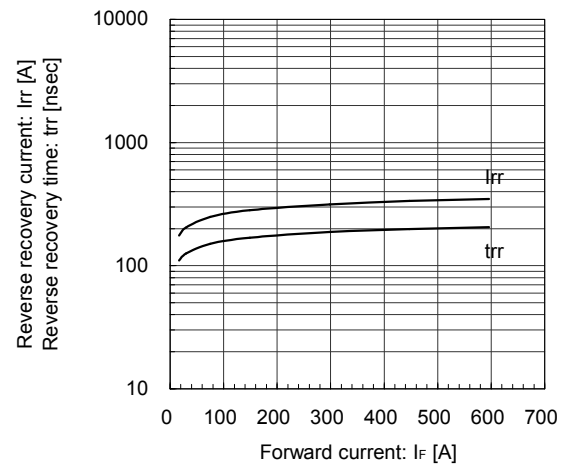
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V$ ,  $-V_{GE}=15V$ ,  $R_g=0.93\Omega$ ,  $T_j=150^\circ C$



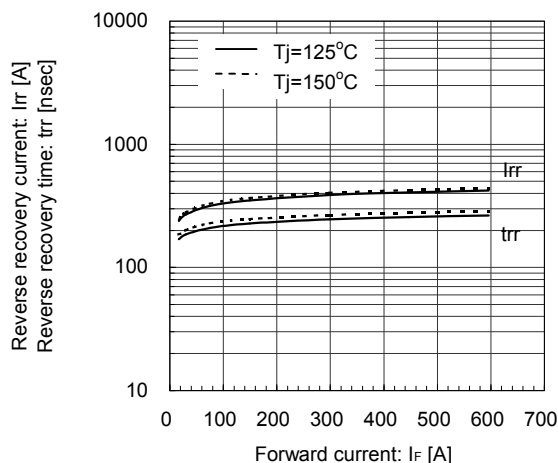
## [INVERTER]

Forward Current vs. Forward Voltage (typ.)  
chip

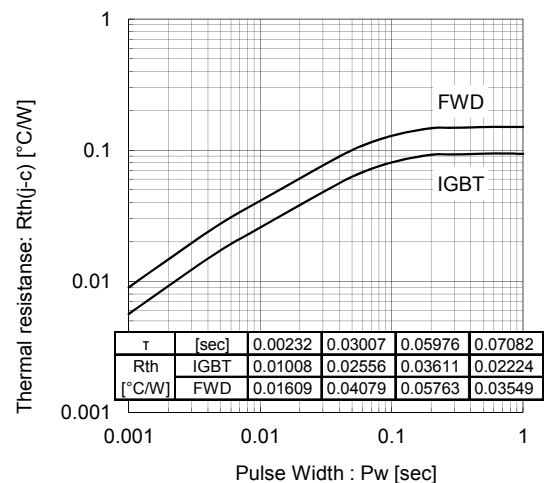
## [INVERTER]

Reverse Recovery Characteristics (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.93\Omega$ ,  $T_J=25^\circ C$ 

## [INVERTER]

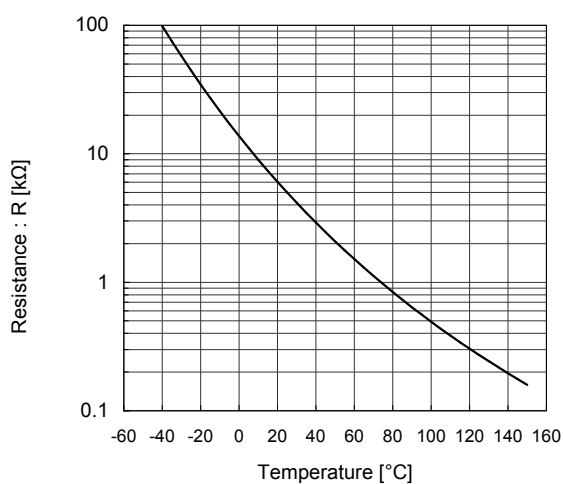
Reverse Recovery Characteristics (typ.)  
 $V_{CC}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.93\Omega$ ,  $T_J=125^\circ C$ ,  $150^\circ C$ 

Transient Thermal Resistance (max.)

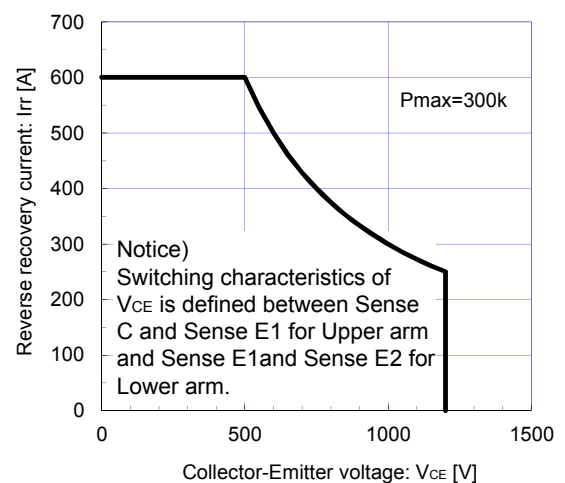


## [THERMISTOR]

Temperature characteristic (typ.)

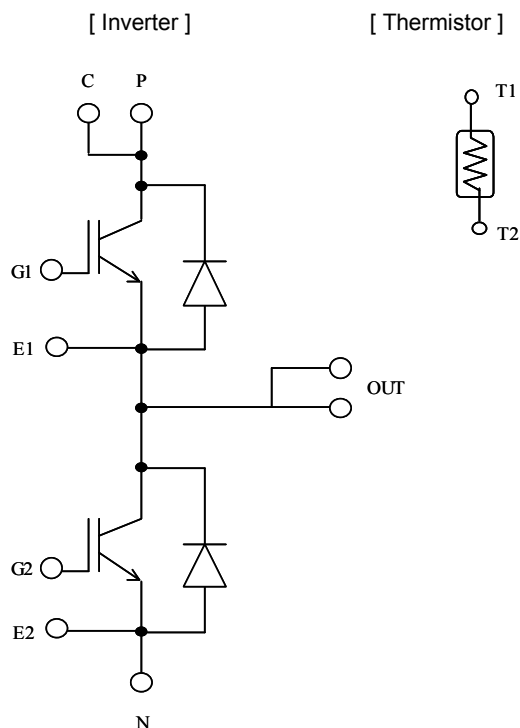


FWD safe operating area (max.)

 $T_J=150^\circ C$ 



### ■ Equivalent Circuit



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