

# 7MBR50VA060-50

IGBT Modules

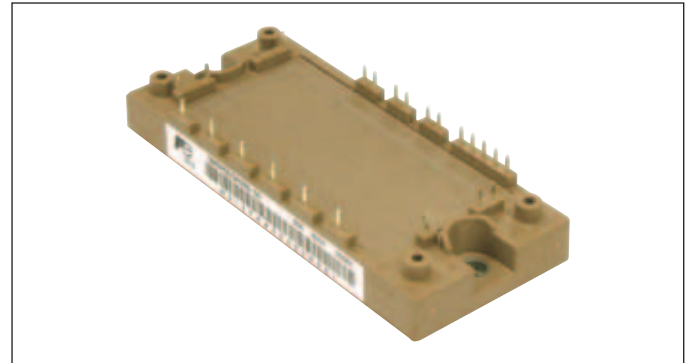
## IGBT MODULE (V series) 600V / 50A / PIM

### ■ Features

- Low  $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant product

### ■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply



### ■ 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	$V_{CES}$		600	V	
	Gate-Emitter voltage	$V_{GES}$		$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=80^\circ\text{C}$	50	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	100	
		$-I_c$			50	
$-I_{c\ pulse}$		1ms		100		
Collector power dissipation	$P_c$	1 device		200	W	
Brake	Collector-Emitter voltage	$V_{CES}$		600	V	
	Gate-Emitter voltage	$V_{GES}$		$\pm 20$	V	
	Collector current	$I_c$	Continuous	$T_c=80^\circ\text{C}$	50	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	100	
	Collector power dissipation	$P_c$	1 device		200	W
Repetitive peak reverse voltage (Diode)	$V_{RRM}$			600	V	
Converter	Repetitive peak reverse voltage	$V_{RRM}$		800	V	
	Average output current	$I_o$	50Hz/60Hz, sine wave	50	A	
	Surge current (Non-Repetitive)	$I_{FSM}$	10ms, $T_j=150^\circ\text{C}$	210	A	
	$I^2t$ (Non-Repetitive)	$I^2t$	half sine wave	221	$\text{A}^2\text{s}$	
Junction temperature	$T_j$	Inverter, Brake		175	$^\circ\text{C}$	
		Converter		150		
Operating junction temperature (under switching conditions)	$T_{jop}$	Inverter, Brake		150		
		Converter		150		
Case temperature	$T_c$			125		
Storage temperature	$T_{stg}$			-40 ~ +125		
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	$V_{iso}$	AC : 1min.	2500	VAC	
Screw torque	Mounting (*3)	-	M5	3.5	N m	

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)

● Electrical characteristics (at T<sub>j</sub>= 25°C unless otherwise specified)

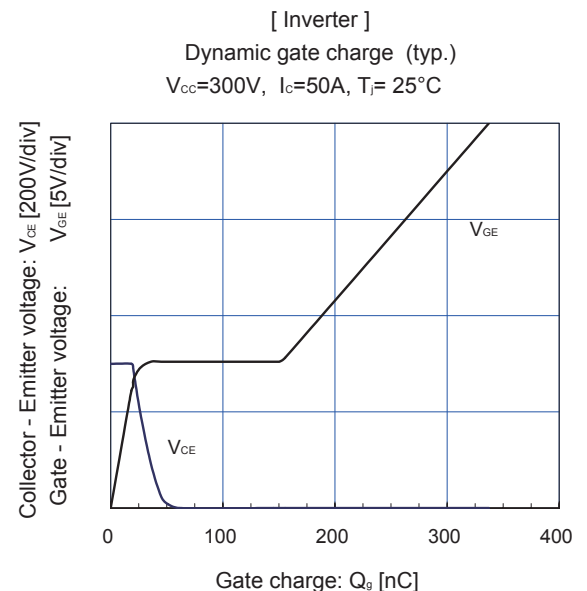
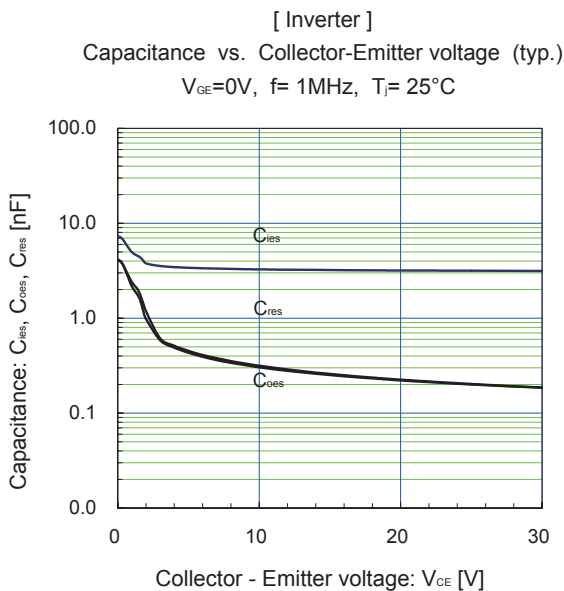
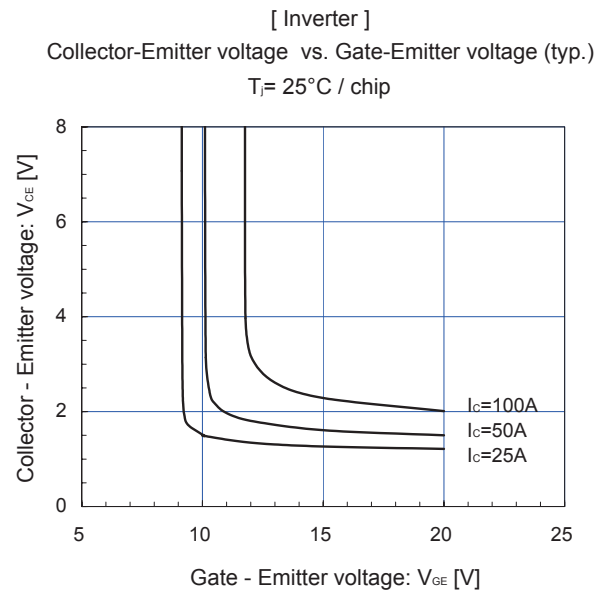
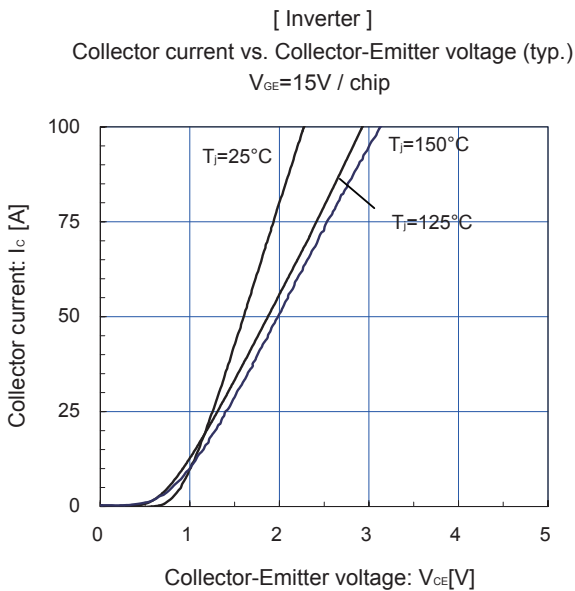
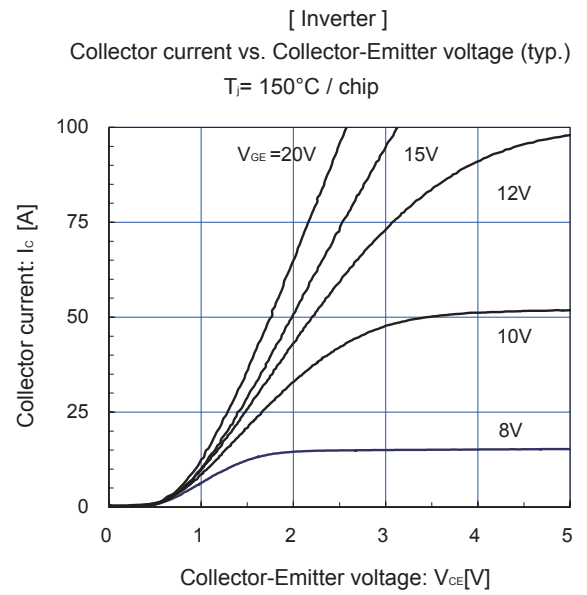
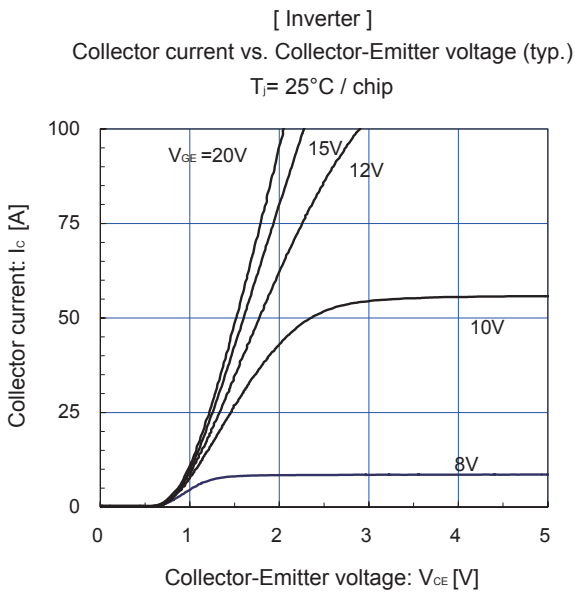
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V	-	-	1.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>GE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	200	nA	
	Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 50mA	6.2	6.7	7.2	V	
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>j</sub> =25°C	-	1.95	2.40	V
				T <sub>j</sub> =125°C	-	2.25	-	
				T <sub>j</sub> =150°C	-	2.35	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>j</sub> =25°C	-	1.60	2.05	
				T <sub>j</sub> =125°C	-	1.90	-	
	Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	T <sub>j</sub> =25°C	-	3.3	-	nF
				T <sub>j</sub> =150°C	-	3.3	-	
	Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 300V I <sub>c</sub> = 50A V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 43Ω	T <sub>j</sub> =25°C	-	0.36	1.20	μs
		t <sub>r</sub>		T <sub>j</sub> =125°C	-	0.25	0.60	
		t <sub>r(i)</sub>		T <sub>j</sub> =150°C	-	0.07	-	
	Turn-off time	t <sub>off</sub>	V <sub>CC</sub> = 300V I <sub>c</sub> = 50A V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 43Ω	T <sub>j</sub> =25°C	-	0.52	1.20	μs
		t <sub>r</sub>		T <sub>j</sub> =125°C	-	0.03	0.45	
Forward on voltage	V <sub>F</sub> (terminal)	I <sub>F</sub> = 50A	T <sub>j</sub> =25°C	-	1.95	2.40	V	
			T <sub>j</sub> =125°C	-	1.85	-		
			T <sub>j</sub> =150°C	-	1.80	-		
	V <sub>F</sub> (chip)	I <sub>F</sub> = 50A	T <sub>j</sub> =25°C	-	1.60	2.05		
			T <sub>j</sub> =125°C	-	1.50	-		
T <sub>j</sub> =150°C	-	1.45	-					
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 50A	-	-	0.35	μs		
Brake	Zero gate voltage collector current	I <sub>CES</sub>	V <sub>GE</sub> = 0V V <sub>CE</sub> = 600V	-	-	1.0	mA	
	Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V V <sub>GE</sub> = +20 / -20V	-	-	200	nA	
	Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>j</sub> =25°C	-	1.95	2.40	V
				T <sub>j</sub> =125°C	-	2.25	-	
				T <sub>j</sub> =150°C	-	2.35	-	
		V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 50A	T <sub>j</sub> =25°C	-	1.60	2.05	
				T <sub>j</sub> =125°C	-	1.90	-	
	T <sub>j</sub> =150°C	-	2.00	-				
	Turn-on time	t <sub>on</sub>	V <sub>CE</sub> = 300V I <sub>c</sub> = 50A V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 43Ω	T <sub>j</sub> =25°C	-	0.36	1.20	μs
		t <sub>r</sub>		T <sub>j</sub> =125°C	-	0.25	0.60	
Turn-off time	t <sub>off</sub>	V <sub>CE</sub> = 300V I <sub>c</sub> = 50A V <sub>GE</sub> = +15 / -15V R <sub>G</sub> = 43Ω	T <sub>j</sub> =25°C	-	0.52	1.20	μs	
	t <sub>r</sub>		T <sub>j</sub> =125°C	-	0.03	0.45		
Reverse current	I <sub>RRM</sub>	V <sub>R</sub> = 600V	-	-	1.00	mA		
Converter	V <sub>FM</sub> (chip)	I <sub>F</sub> = 50A	terminal	-	1.65	2.10	V	
			chip	-	1.30	-		
Reverse current	I <sub>RRM</sub>	V <sub>R</sub> = 800V	-	-	1.0	mA		
Thermistor	R	T = 25°C	-	5000	-	Ω		
		T = 100°C	465	495	520			
B value	B	T = 25 / 50°C	3305	3375	3450	K		

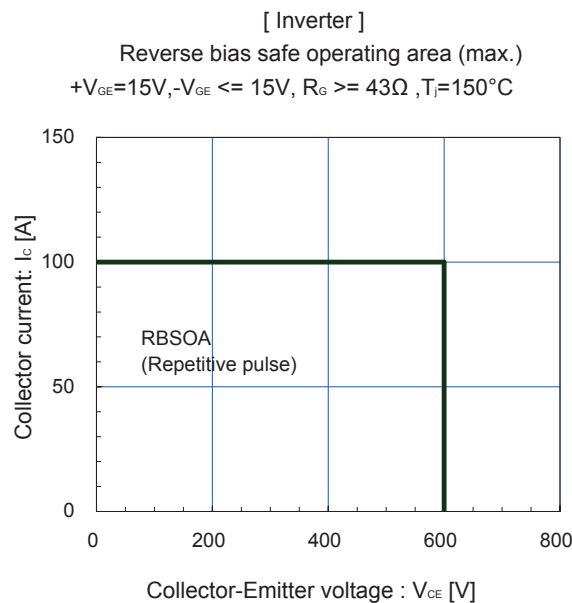
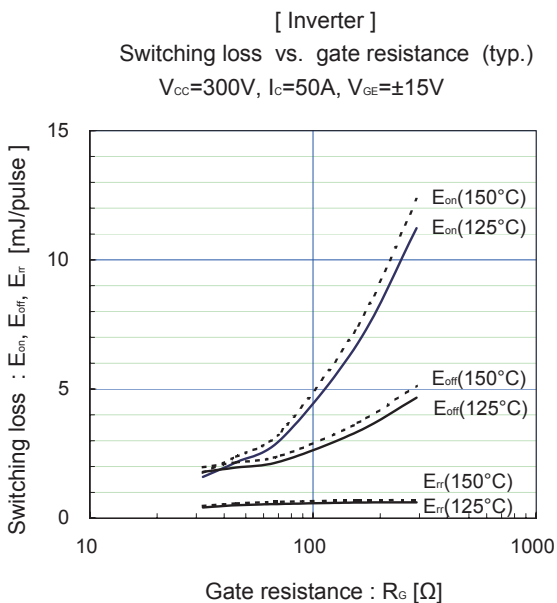
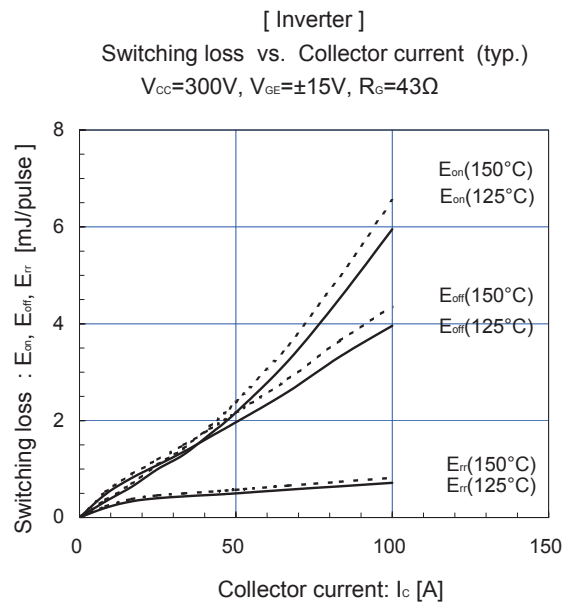
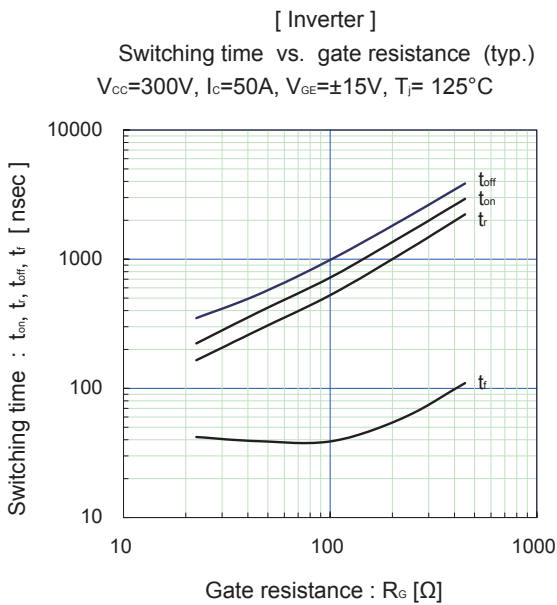
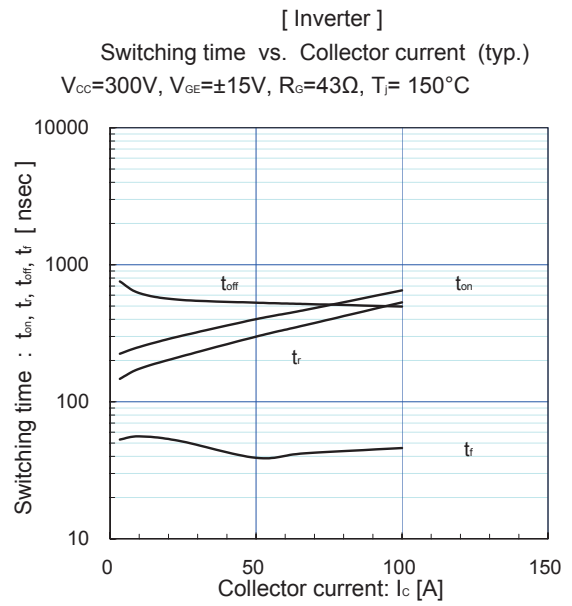
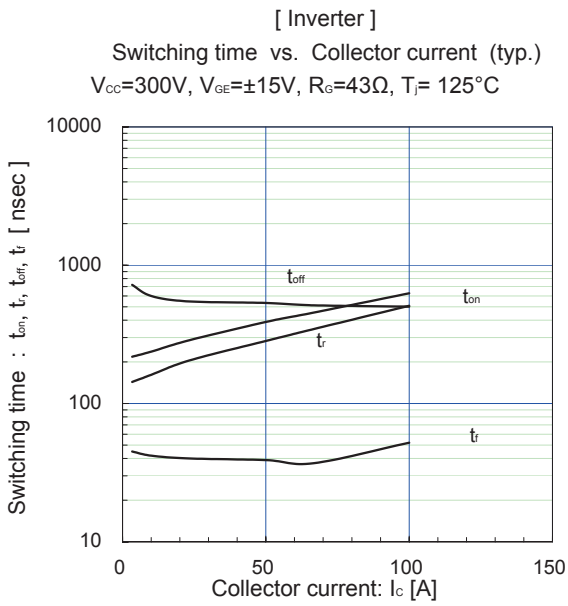
● Thermal resistance characteristics

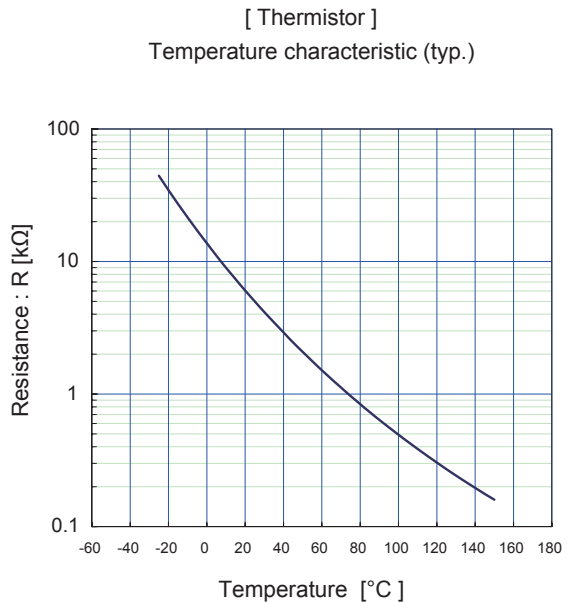
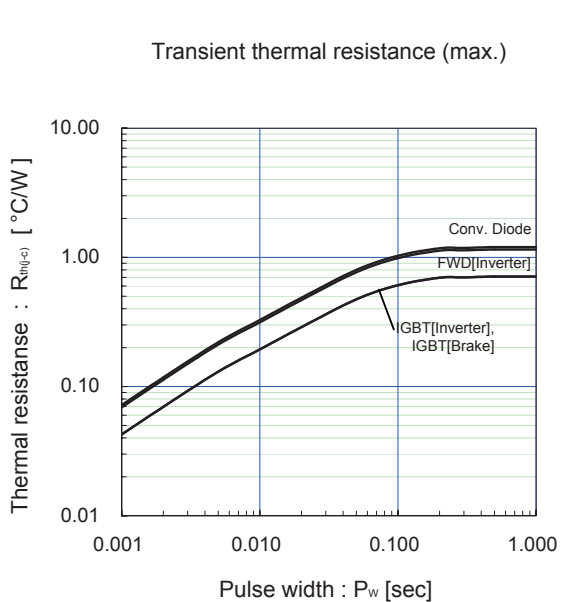
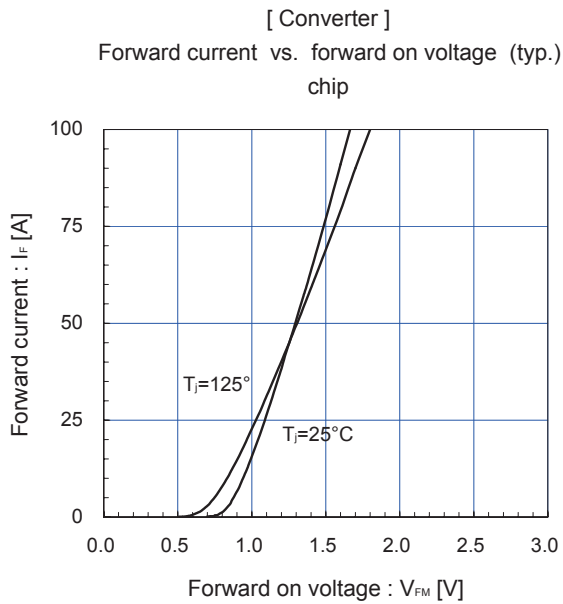
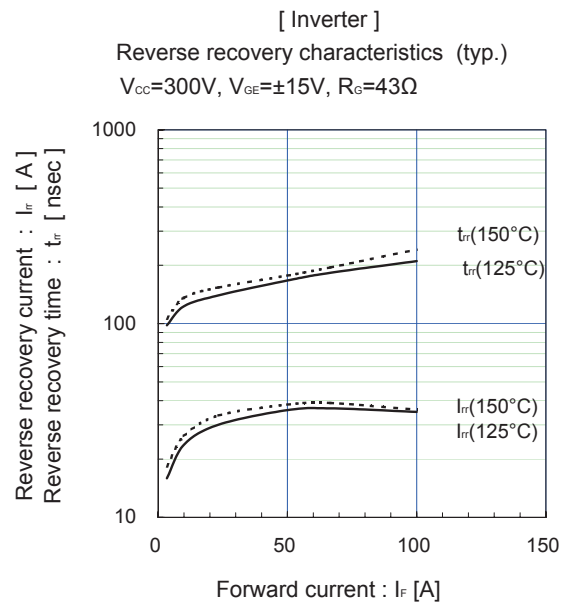
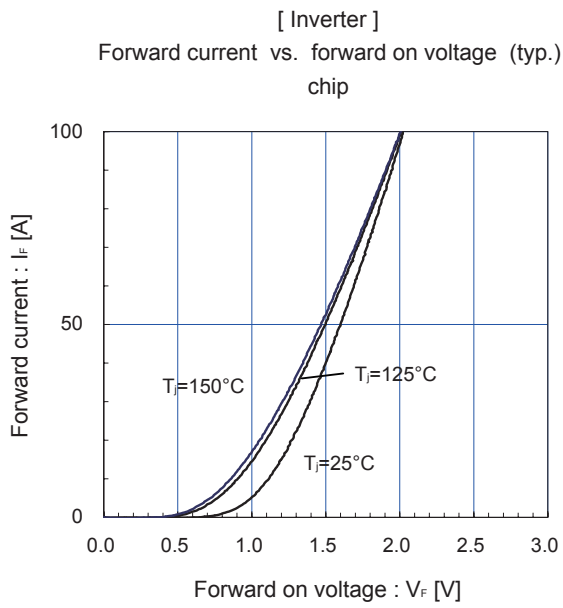
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	Inverter IGBT	-	-	0.71	°C/W
		Inverter FWD	-	-	1.15	
		Brake IGBT	-	-	0.71	
		Converter Diode	-	-	1.20	
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.05	-	

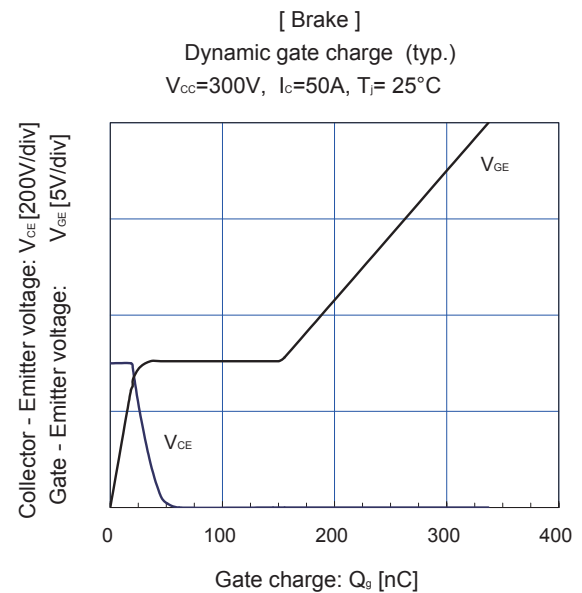
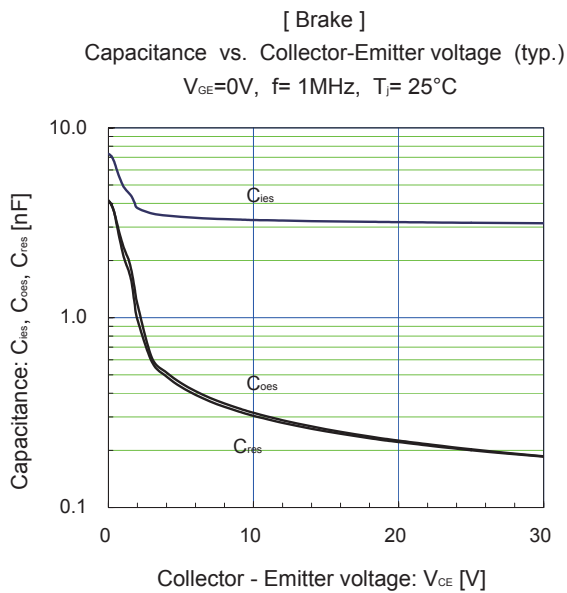
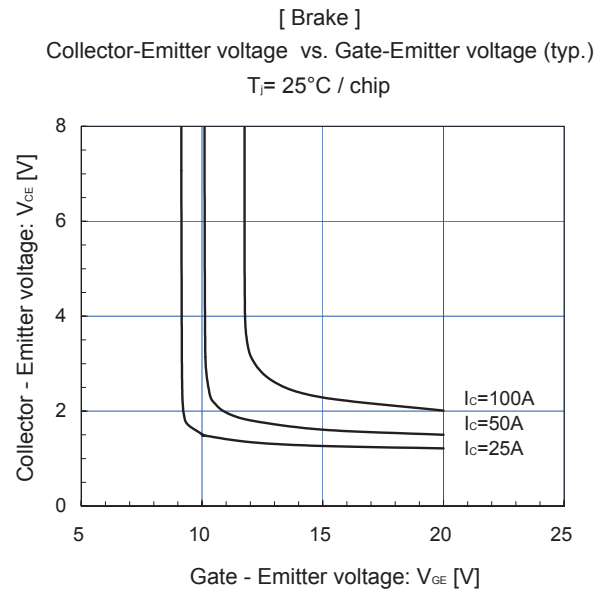
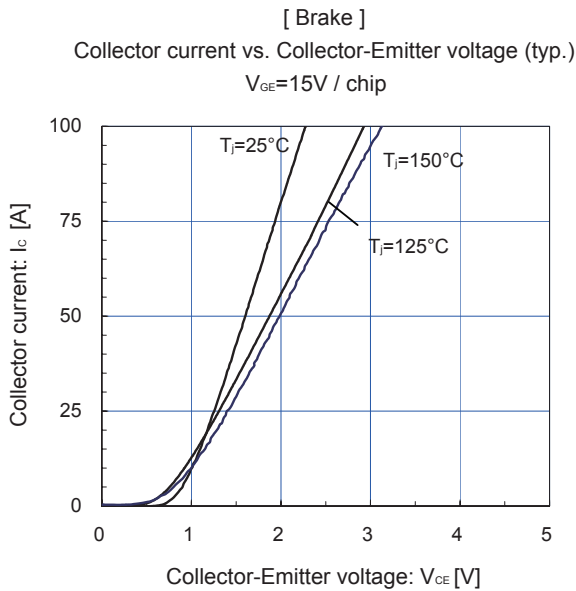
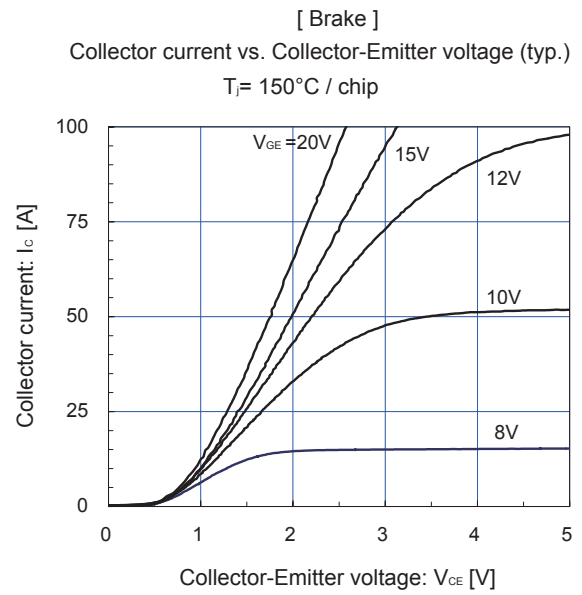
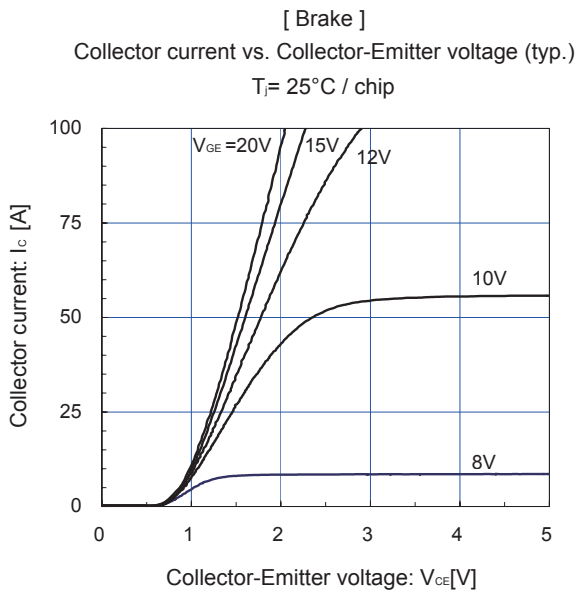
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

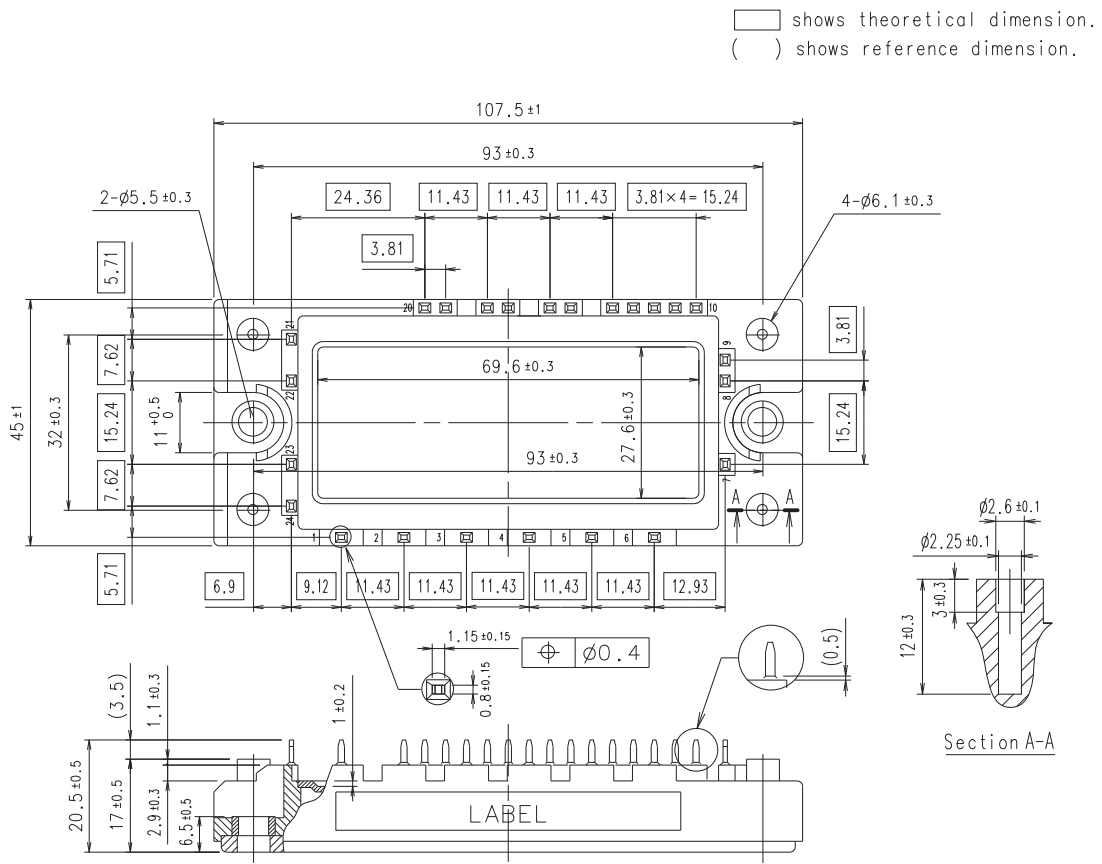




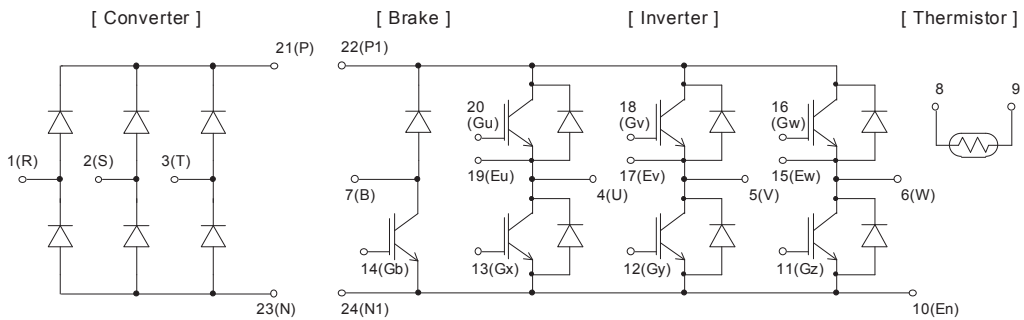




■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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