

7MBR20VKA060-50

IGBT Modules

IGBT MODULE (V series)

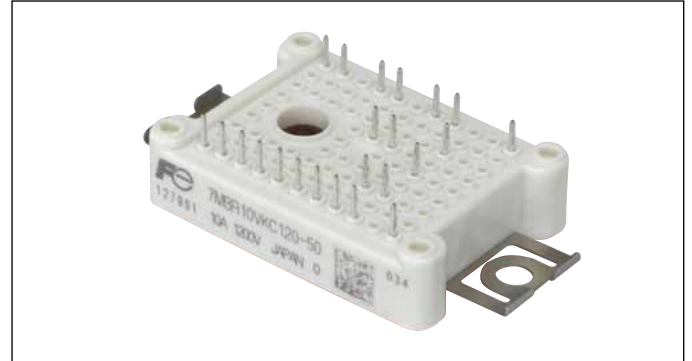
600V / 20A / PIM

■ 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}	± 20	V	
	Collector current	I_c	Continuous $T_c=100^\circ\text{C}$	20	A
		I_{cp}	1ms $T_c=80^\circ\text{C}$	40	
		$-I_c$		20	
	$-I_{c\ pulse}$	1ms	40		
Collector power dissipation	P_c	1 device	100	W	
Brake	Collector-Emitter voltage	V_{CES}	600	V	
	Gate-Emitter voltage	V_{GES}	± 20	V	
	Collector current	I_c	Continuous $T_c=80^\circ\text{C}$	20	A
		I_{cp}	1ms $T_c=80^\circ\text{C}$	40	
	Collector power dissipation	P_c	1 device	100	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	20	A
	Surge current (Non-Repetitive)	I_{FSM}	10ms, $T_j=150^\circ\text{C}$	360	A
	I^2t (Non-Repetitive)	I^2t	half sine wave	660	A^2s
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 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)	-	M4	1.7	Nm

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 : 1.3-1.7 Nm (M4)

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

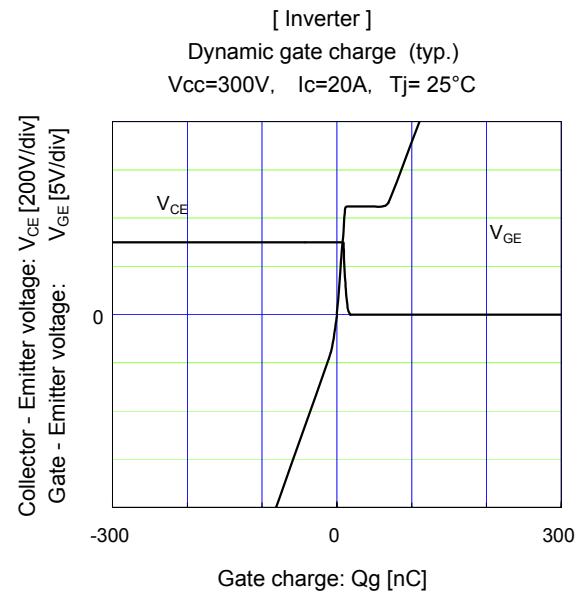
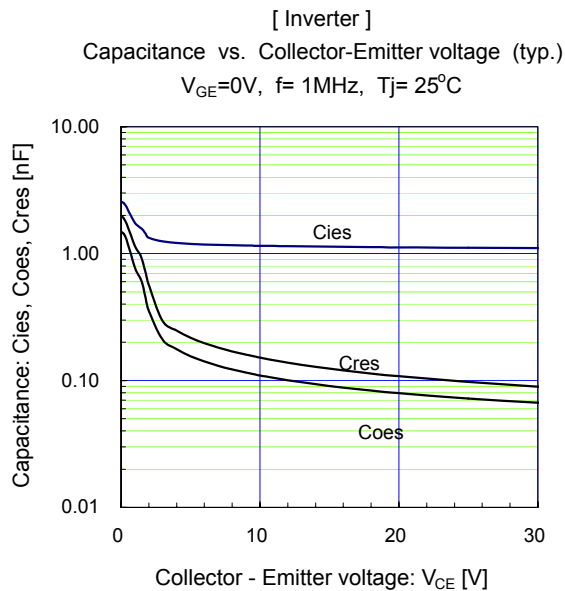
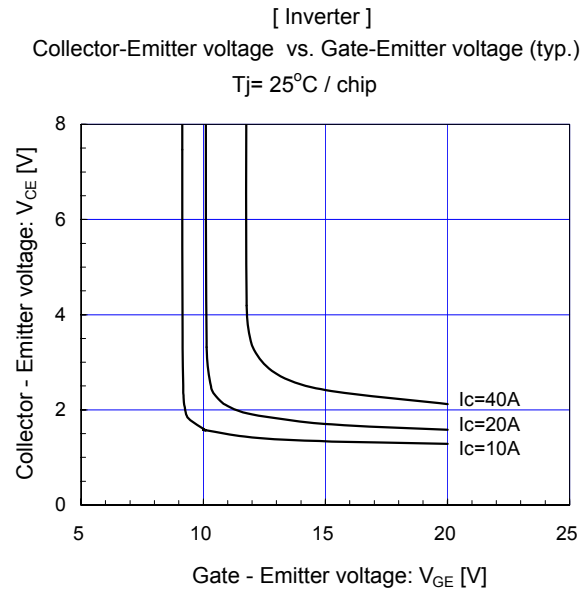
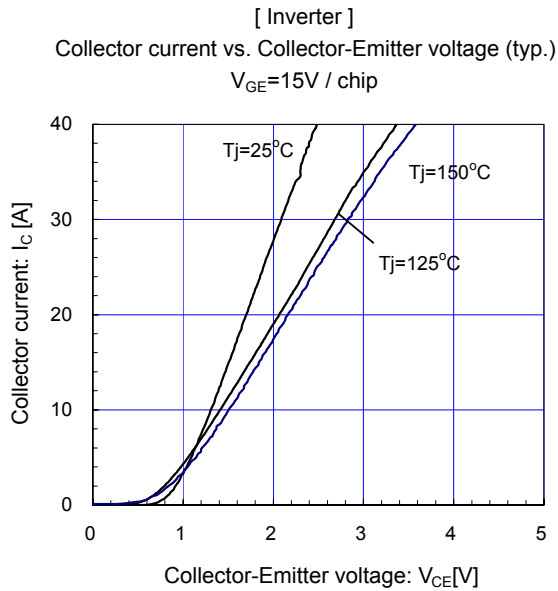
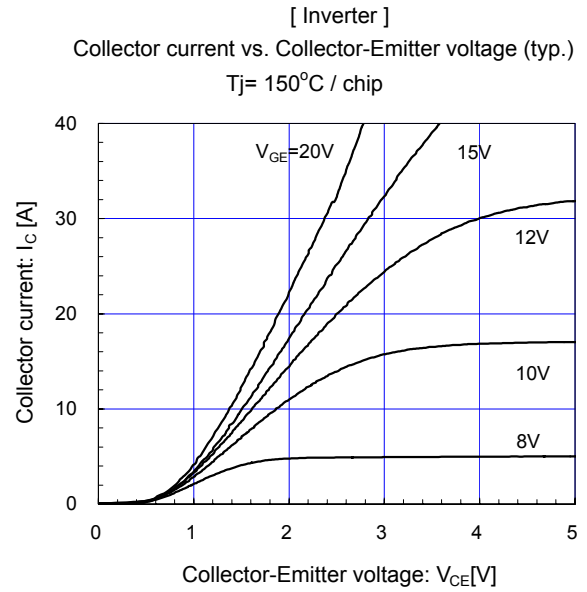
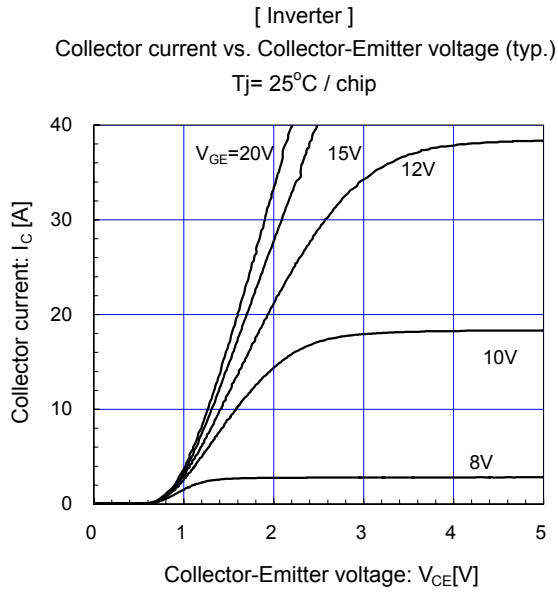
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 600V	-	-	1.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	200	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 20mA	6.2	6.7	7.2	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal)	V _{GE} = 15V I _c = 20A	T _j = 25°C	-	1.95	2.35	V
				T _j = 125°C	-	2.30	-	
				T _j = 150°C	-	2.40	-	
		V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 20A	T _j = 25°C	-	1.70	2.10	
				T _j = 125°C	-	2.05	-	
	T _j = 150°C	-	2.15	-				
	Internal gate resistance	R _{g(int)}	-	-	0	-	Ω	
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	1.2	-	nF	
	Turn-on time	ton	V _{CC} = 300V I _c = 20A V _{GE} = +15 / -15V R _G = 18Ω	-	0.08	1.20	μs	
		tr		-	0.06	0.60		
		tr(i)		-	0.02	-		
	Turn-off time	toff	R _G = 18Ω	-	0.14	1.20	μs	
tf		-		0.02	0.45			
Forward on voltage	V _F (terminal)	I _F = 20A	T _j = 25°C	-	2.00	2.40	V	
			T _j = 125°C	-	1.95	-		
			T _j = 150°C	-	1.95	-		
	V _F (chip)	I _F = 20A	T _j = 25°C	-	1.75	2.15		
			T _j = 125°C	-	1.70	-		
T _j = 150°C	-	1.70	-					
Reverse recovery time	trr	I _F = 20A	-	-	0.35	μs		
Brake	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V V _{CE} = 600V	-	-	1.00	mA	
	Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V V _{GE} = +20 / -20V	-	-	200	nA	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal)	V _{GE} = 15V I _c = 20A	T _j = 25°C	-	1.95	2.35	V
				T _j = 125°C	-	2.30	-	
				T _j = 150°C	-	2.40	-	
		V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 20A	T _j = 25°C	-	1.70	2.10	
				T _j = 125°C	-	2.05	-	
	T _j = 150°C	-	2.15	-				
	Internal gate resistance	R _{g(int)}	-	-	0	-	Ω	
	Turn-on time	ton	V _{CE} = 300V I _c = 20A V _{GE} = +15 / -15V R _G = 18Ω	-	0.08	1.20	μs	
tr		-		0.06	0.60			
Turn-off time	toff	R _G = 18Ω	-	0.14	1.20	μs		
	tf		-	0.02	0.45			
Reverse current	IRRM	V _R = 600V	-	-	1.00	mA		
Converter	Forward on voltage	I _F = 20A	terminal	-	1.30	1.75	V	
			chip	-	1.05	-		
Reverse current	IRRM	V _R = 800V	-	-	1.0	mA		
Thermistor	Resistance	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 _{th(j-c)}	Inverter IGBT	-	-	1.56	°C/W
		Inverter FWD	-	-	1.97	
		Brake IGBT	-	-	1.56	
		Converter Diode	-	-	1.35	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	with Thermal Compound	-	0.05	-	

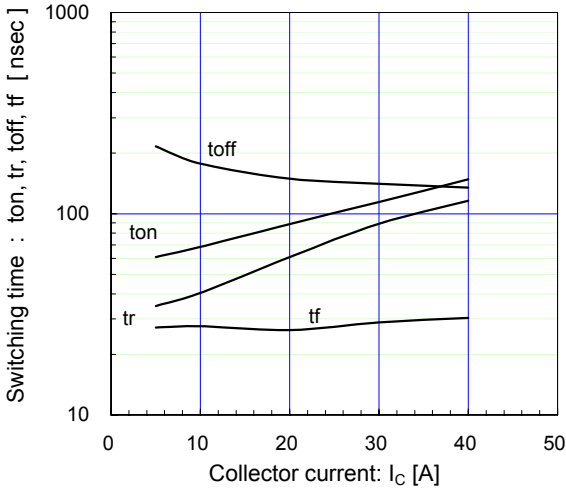
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



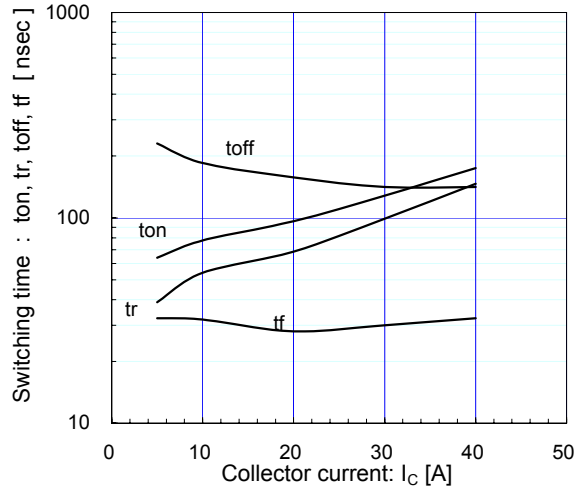
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=18\Omega, T_j=125^\circ C$



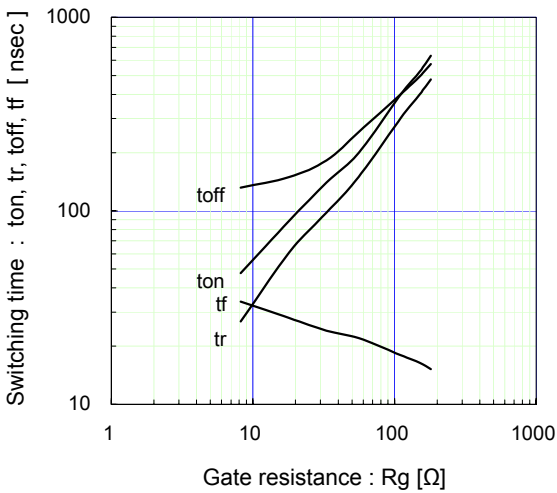
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Switching time vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=18\Omega, T_j=150^\circ C$



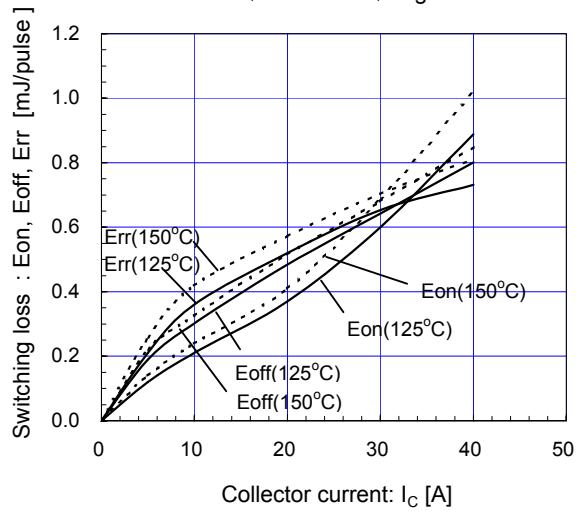
[Inverter]

Switching time vs. gate resistance (typ.)
 $V_{CC}=300V, I_C=20A, V_{GE}=\pm 15V, T_j=125^\circ C$



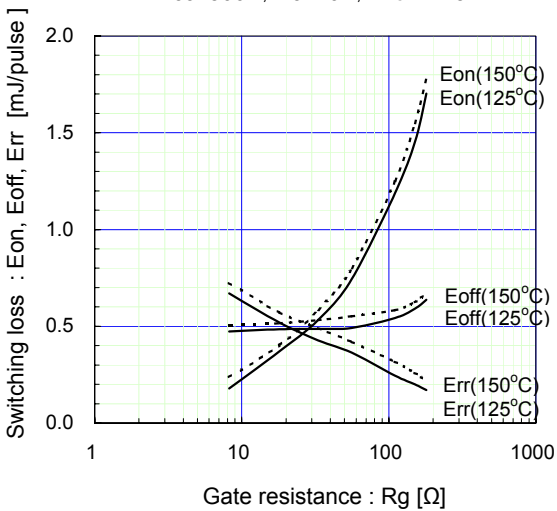
[Inverter]

Switching loss vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=18\Omega$



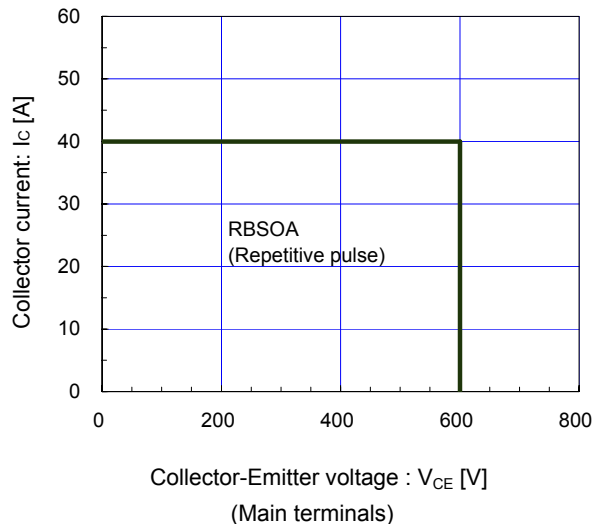
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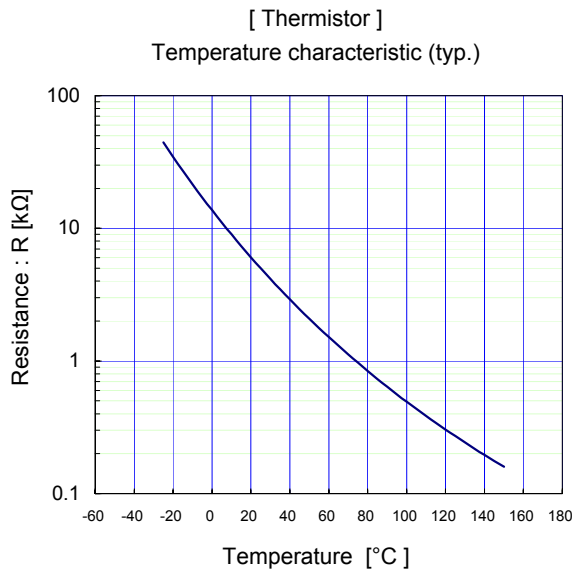
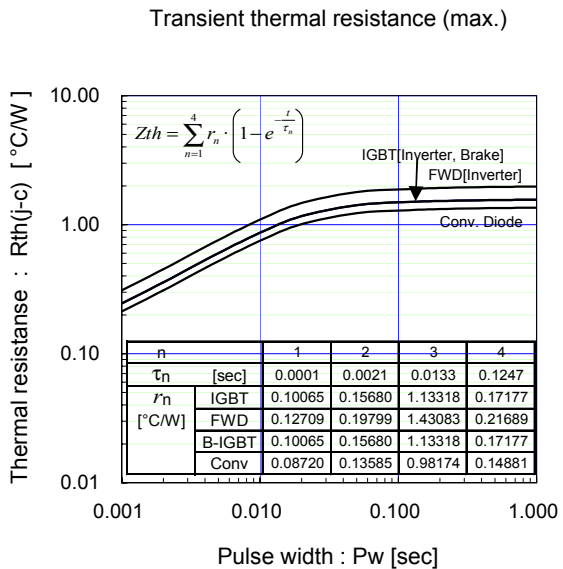
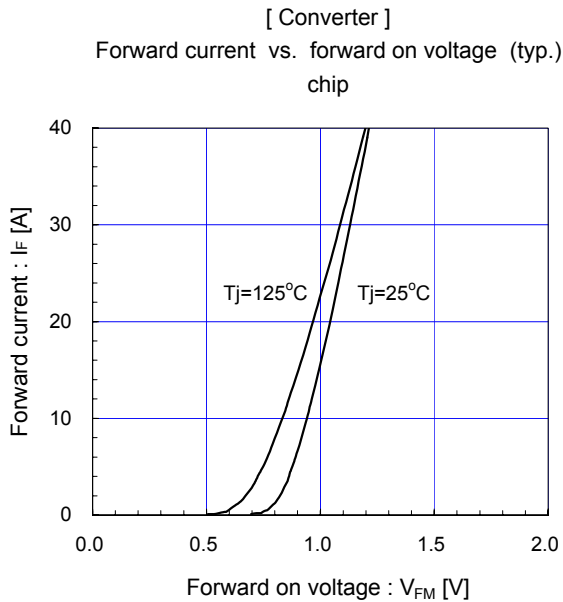
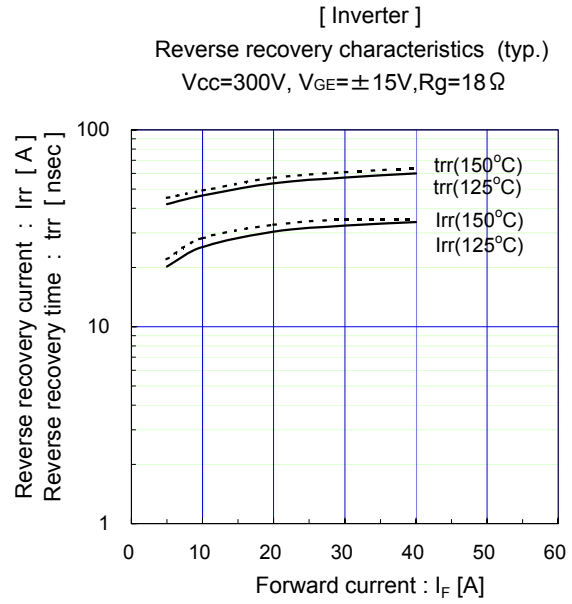
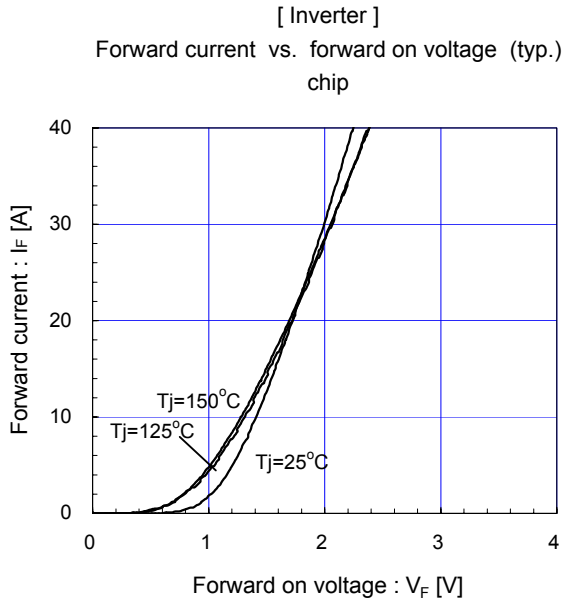
Switching loss vs. gate resistance (typ.)
 $V_{CC}=300V, I_C=20A, V_{GE}=\pm 15V$

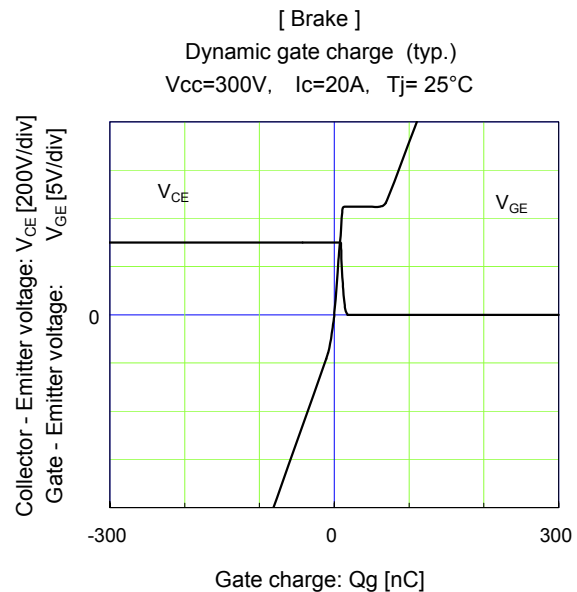
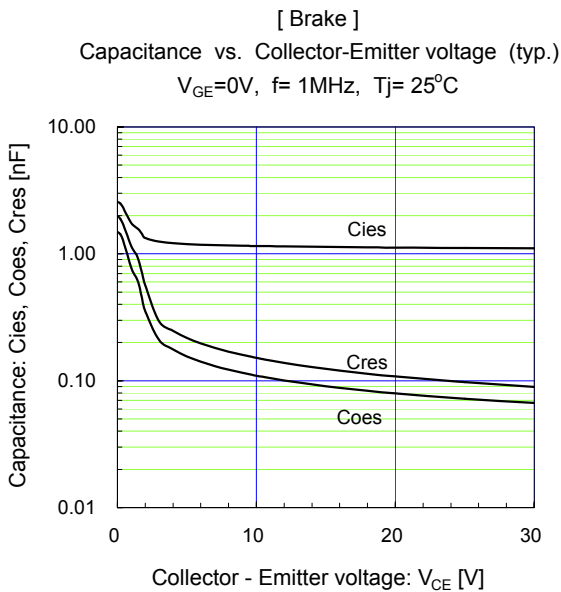
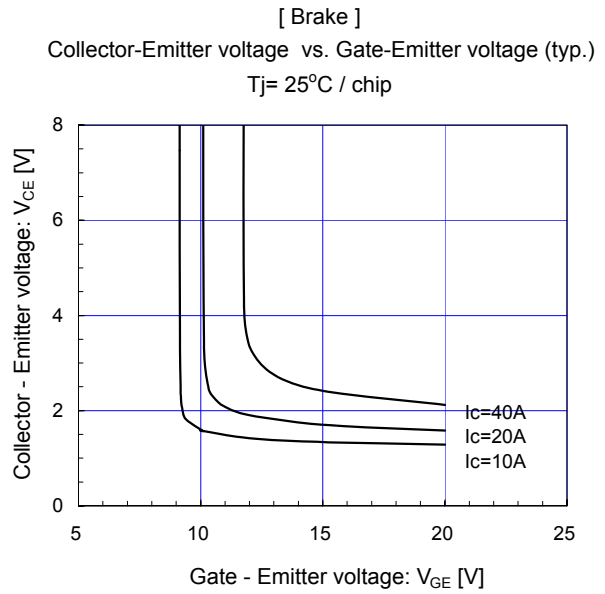
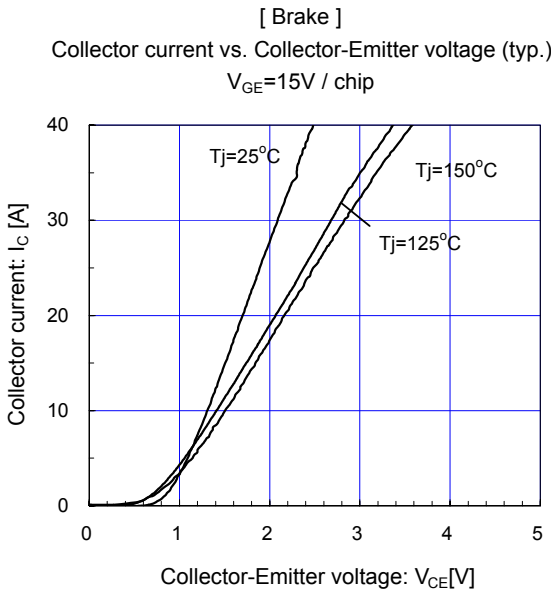
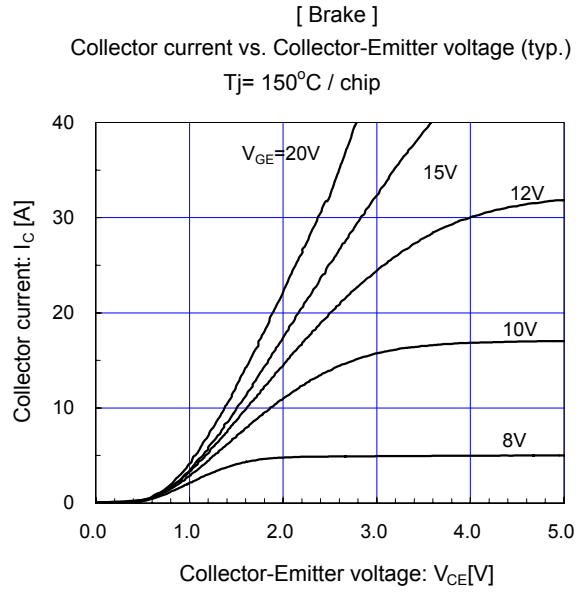
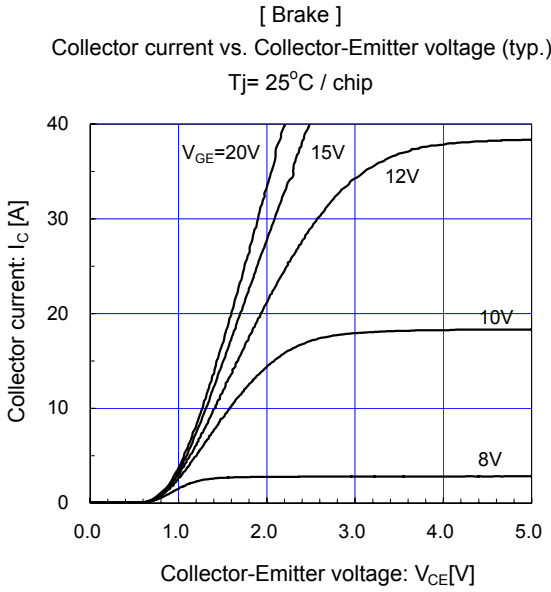


[Inverter]

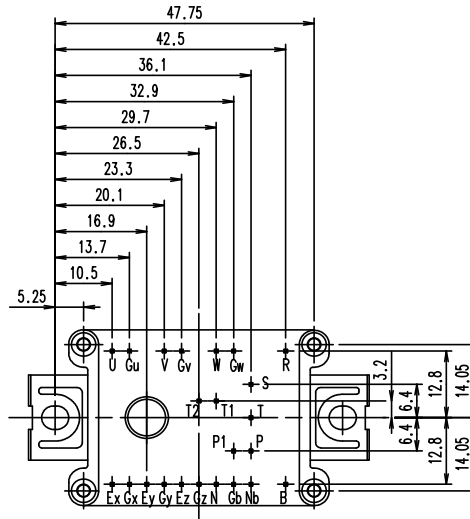
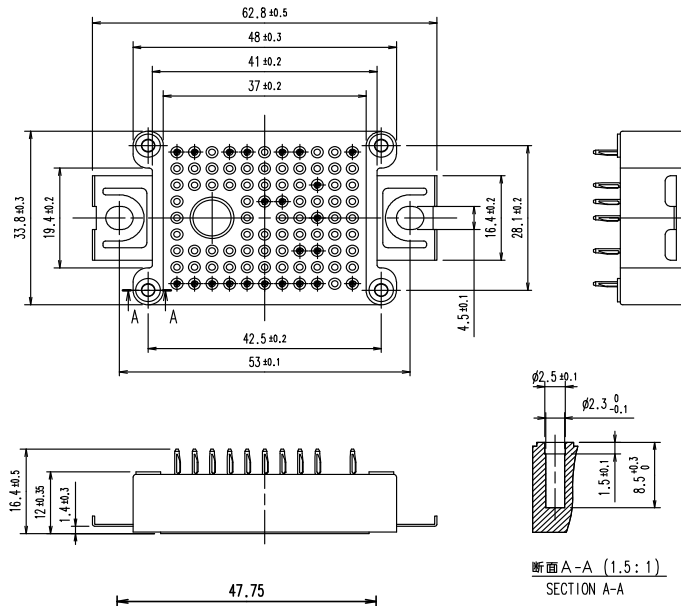
Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_G \geq 18\Omega, T_j=150^\circ C$







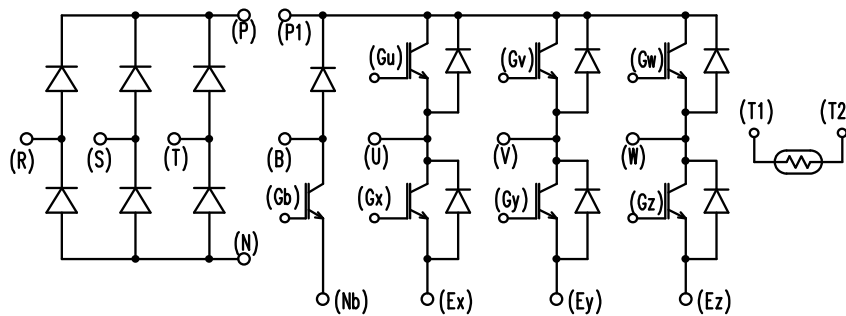
■ Outline drawing (Unit : mm)



Weight: 25g(typ.)

■ Equivalent circuit

[Converter] [Brake] [Inverter] [Thermistor]



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IGBT Modules

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