

7MBR50VA060-50

IGBT Modules

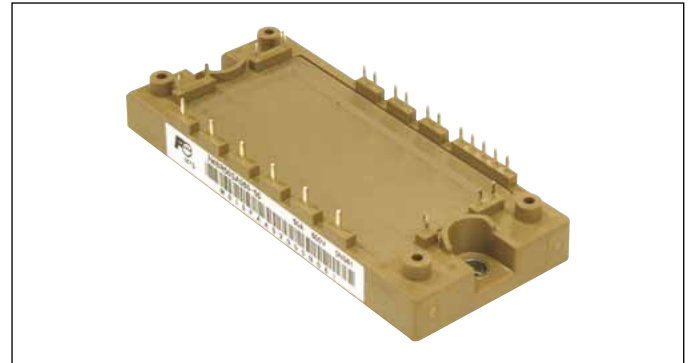
IGBT MODULE (V series) 600V / 50A / PIM

■ 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}		± 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}		± 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	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 ~ +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 $T_j = 25^\circ\text{C}$ unless otherwise specified)

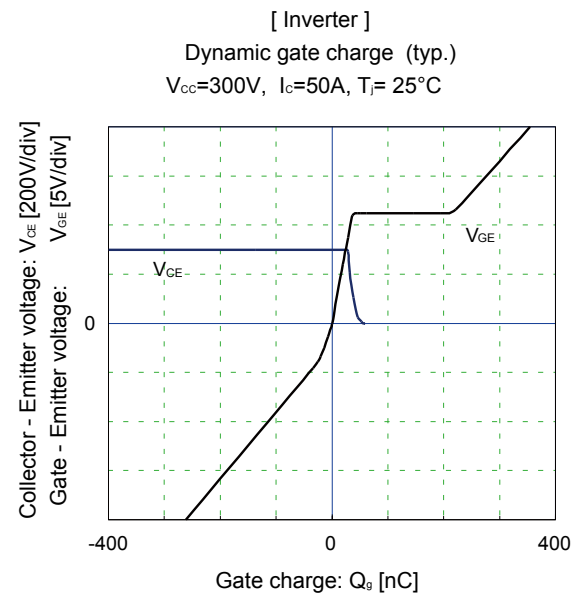
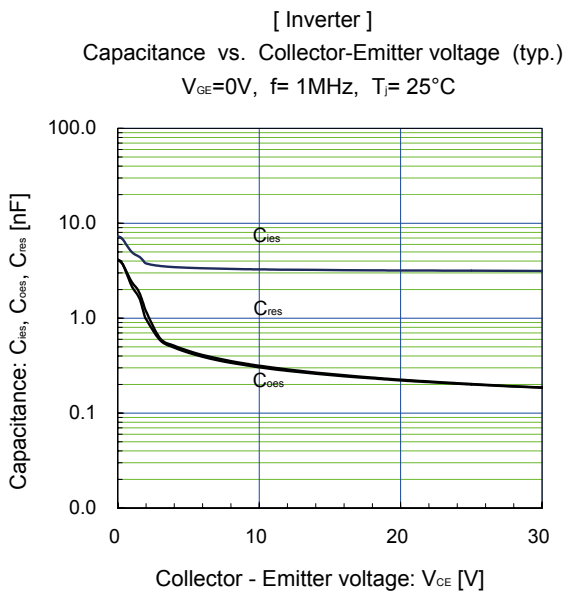
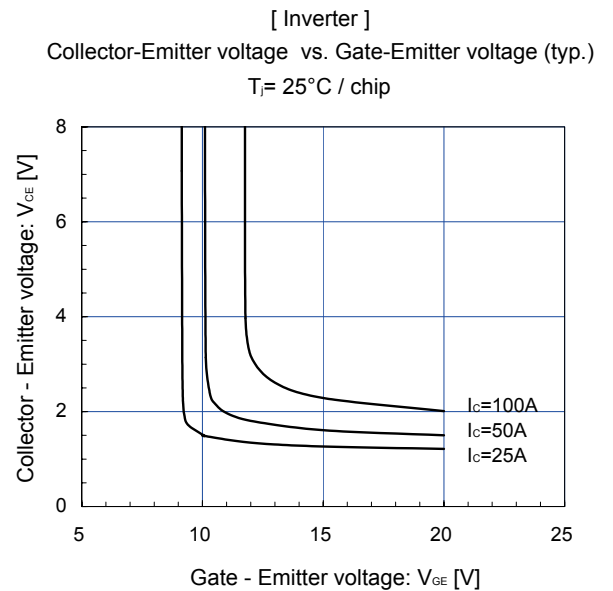
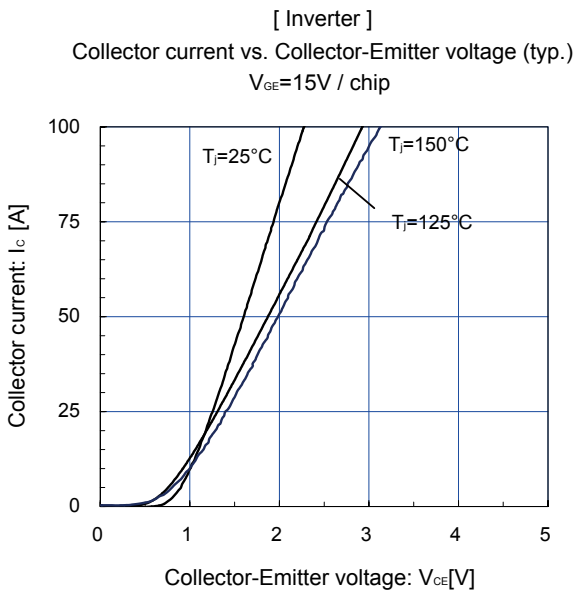
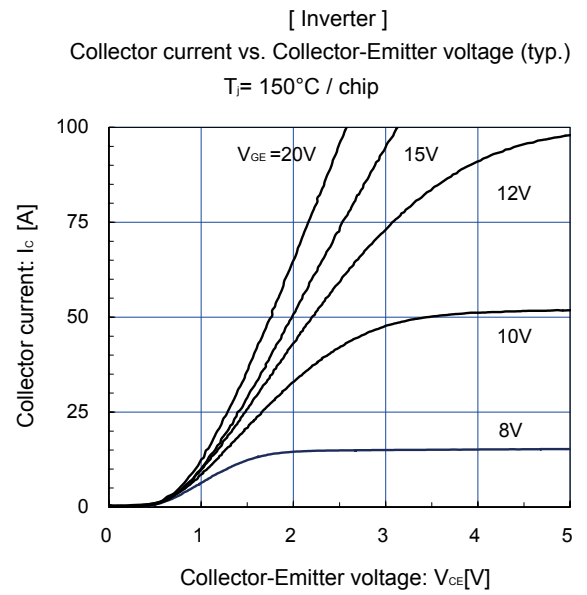
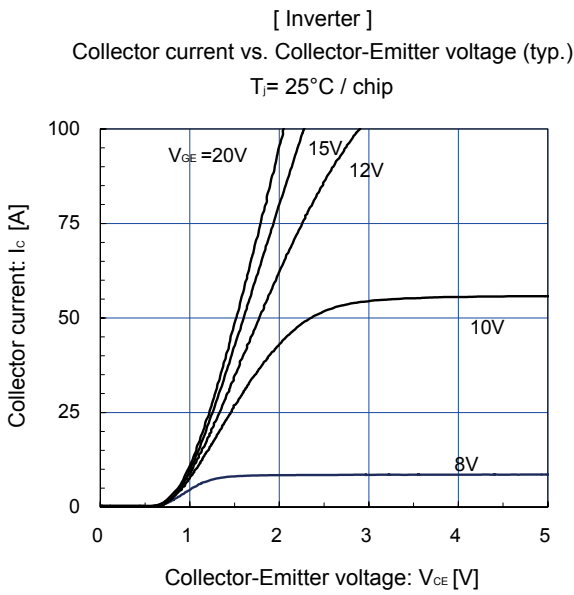
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V, V_{CE} = 600V$	-	-	1.0	mA	
	Gate-Emitter leakage current	I_{GES}	$V_{GE} = 0V, V_{CE} = \pm 20V$	-	-	200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 50mA$	6.2	6.7	7.2	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ\text{C}$	-	1.95	2.40	V
				$T_j = 125^\circ\text{C}$	-	2.25	-	
				$T_j = 150^\circ\text{C}$	-	2.35	-	
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ\text{C}$	-	1.60	2.05	
				$T_j = 125^\circ\text{C}$	-	1.90	-	
	$T_j = 150^\circ\text{C}$	-	2.00	-				
	Internal gate resistance	$R_{g(int)}$	-	-	0	-	Ω	
	Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	3.3	-	nF	
	Turn-on time	t_{on}	$V_{CC} = 300V$ $I_c = 50A$ $V_{GE} = +15 / -15V$ $R_G = 43\Omega$	-	0.36	1.20	μs	
		t_r		-	0.25	0.60		
		$t_{r(i)}$		-	0.07	-		
	Turn-off time	t_{off}	$R_G = 43\Omega$	-	0.52	1.20	μs	
t_f		-		0.03	0.45			
Forward on voltage	V_F (terminal)	$I_F = 50A$	$T_j = 25^\circ\text{C}$	-	1.95	2.40	V	
			$T_j = 125^\circ\text{C}$	-	1.85	-		
			$T_j = 150^\circ\text{C}$	-	1.80	-		
	V_F (chip)	$I_F = 50A$	$T_j = 25^\circ\text{C}$	-	1.60	2.05		
			$T_j = 125^\circ\text{C}$	-	1.50	-		
$T_j = 150^\circ\text{C}$	-	1.45	-					
Reverse recovery time	t_{rr}	$I_F = 50A$	-	-	0.35	μs		
Brake	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 600V$	-	-	1.0	mA	
	Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V$ $V_{GE} = +20 / -20V$	-	-	200	nA	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ\text{C}$	-	1.95	2.40	V
				$T_j = 125^\circ\text{C}$	-	2.25	-	
				$T_j = 150^\circ\text{C}$	-	2.35	-	
		$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_c = 50A$	$T_j = 25^\circ\text{C}$	-	1.60	2.05	
				$T_j = 125^\circ\text{C}$	-	1.90	-	
	$T_j = 150^\circ\text{C}$	-	2.00	-				
	Internal gate resistance	$R_{g(int)}$	-	-	0	-	Ω	
	Turn-on time	t_{on}	$V_{CE} = 300V$ $I_c = 50A$ $V_{GE} = +15 / -15V$ $R_G = 43\Omega$	-	0.36	1.20	μs	
		t_r		-	0.25	0.60		
	Turn-off time	t_{off}	$R_G = 43\Omega$	-	0.52	1.20	μs	
		t_f		-	0.03	0.45		
	Reverse current	I_{RRM}	$V_R = 600V$	-	-	1.00	mA	
	Converter	Forward on voltage	V_{FM} (chip)	terminal	-	1.65	2.10	V
chip				-	1.30	-		
Reverse current	I_{RRM}	$V_R = 800V$	-	-	1.0	mA		
Thermistor	Resistance	R	$T = 25^\circ\text{C}$	-	5000	-	Ω	
			$T = 100^\circ\text{C}$	465	495	520		
	B value	B	$T = 25 / 50^\circ\text{C}$	3305	3375	3450	K	

● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.71	$^\circ\text{C/W}$
		Inverter FWD	-	-	1.15	
		Brake IGBT	-	-	0.71	
		Converter Diode	-	-	1.20	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	with Thermal Compound	-	0.05	-	

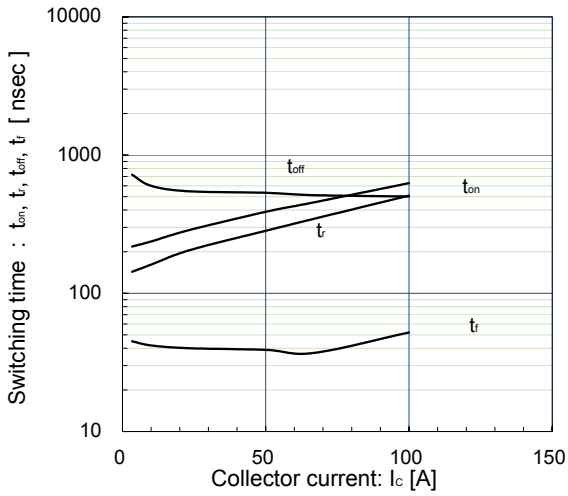
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



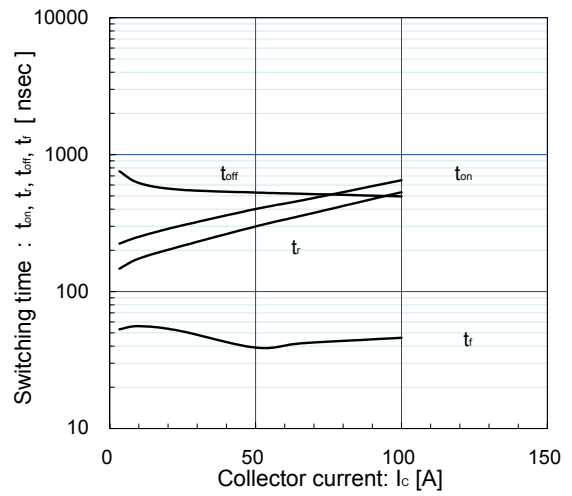
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega, T_J=125^\circ C$



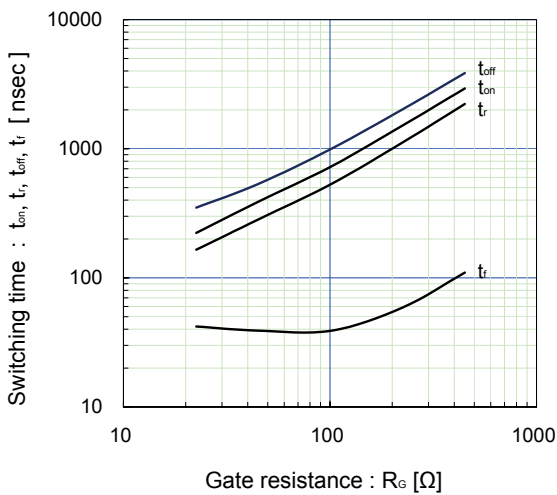
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega, T_J=150^\circ C$



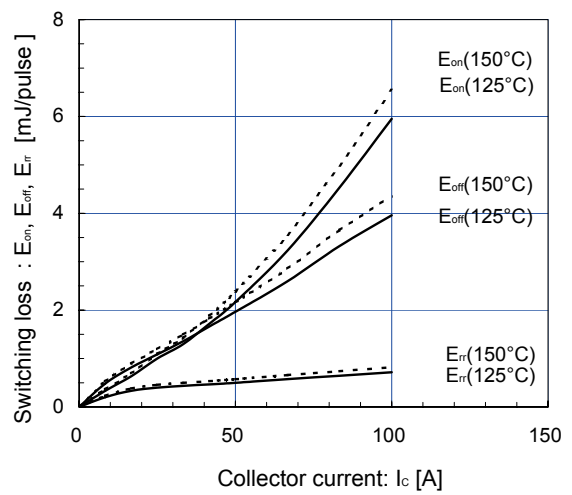
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Switching time vs. gate resistance (typ.)
 $V_{CC}=300V, I_c=50A, V_{GE}=\pm 15V, T_J=125^\circ C$



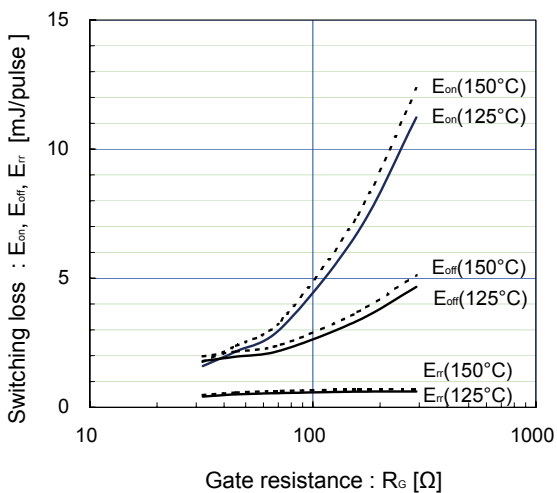
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Switching loss vs. Collector current (typ.)
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=43\Omega$



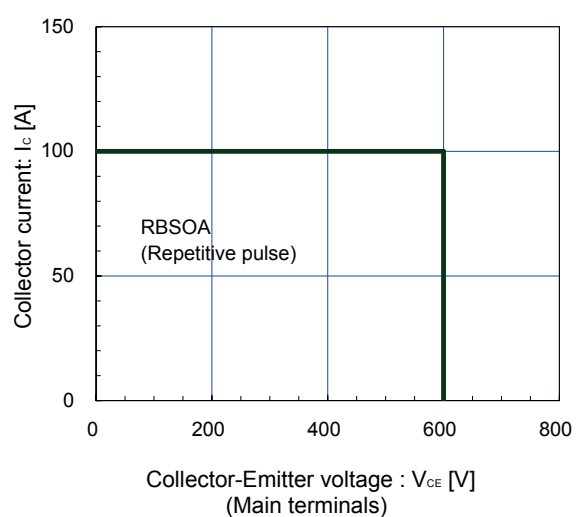
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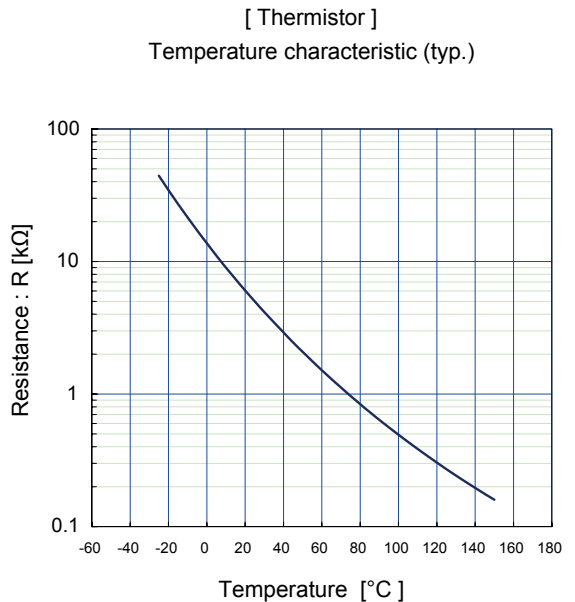
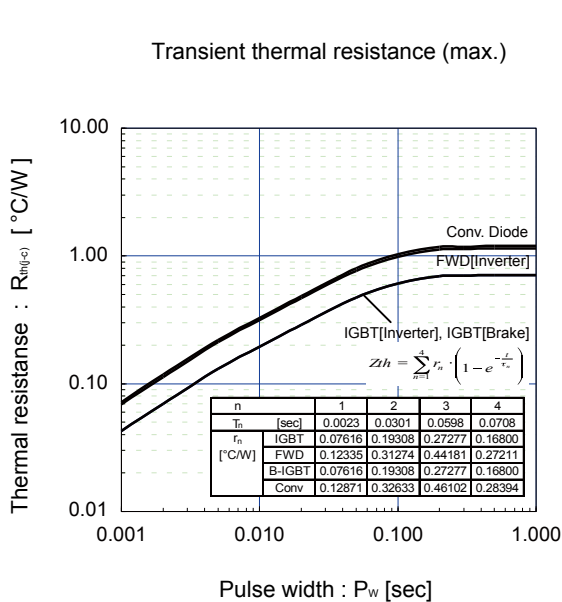
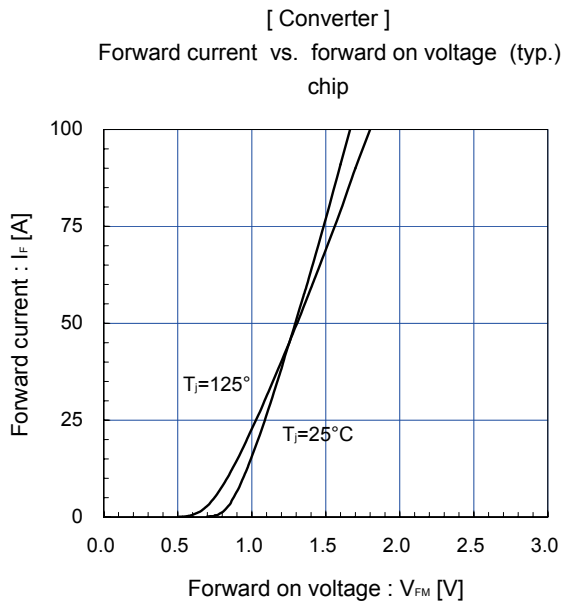
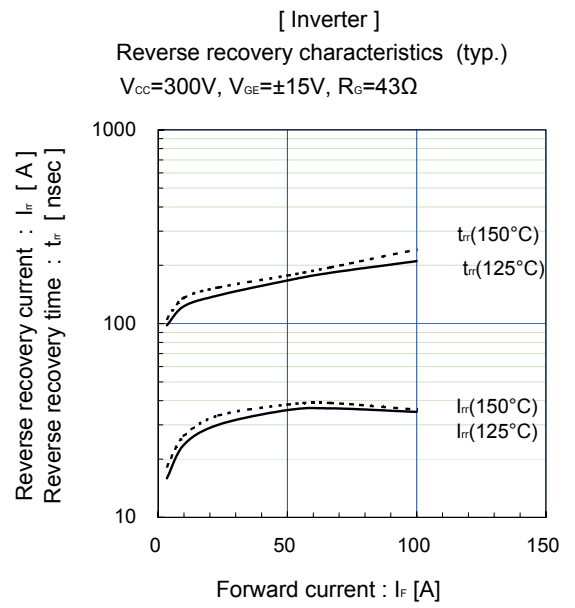
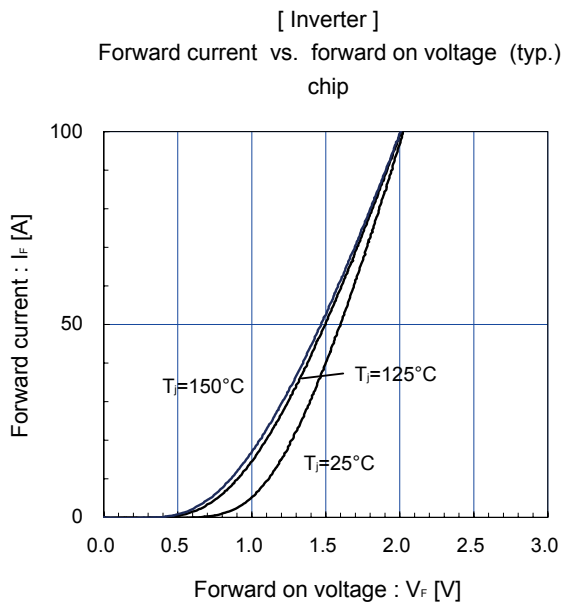
Switching loss vs. gate resistance (typ.)
 $V_{CC}=300V, I_c=50A, V_{GE}=\pm 15V$

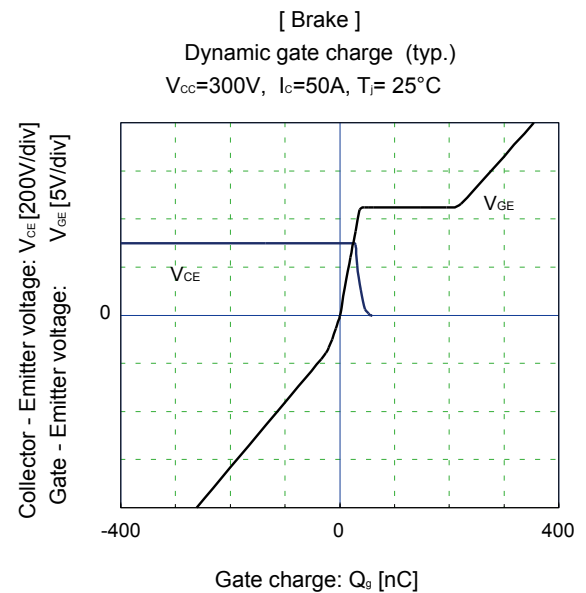
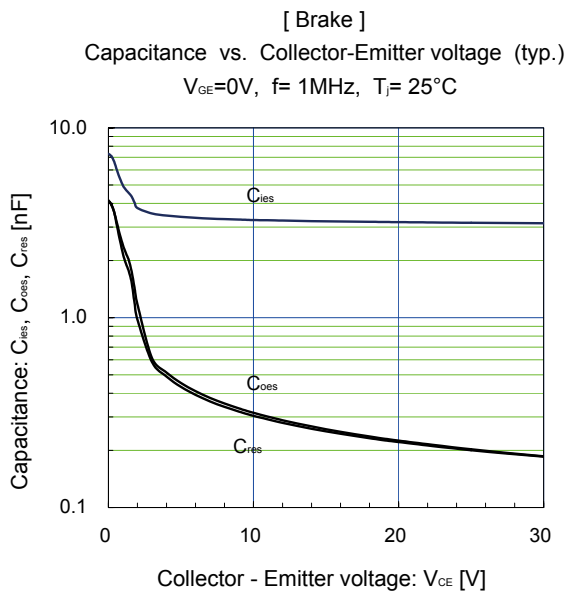
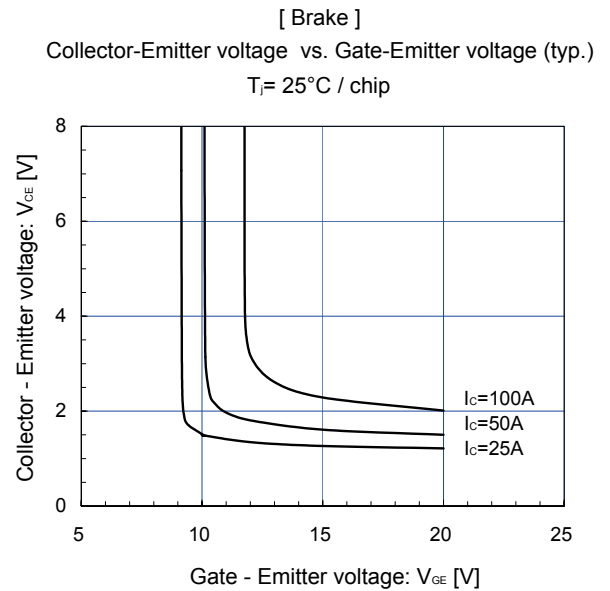
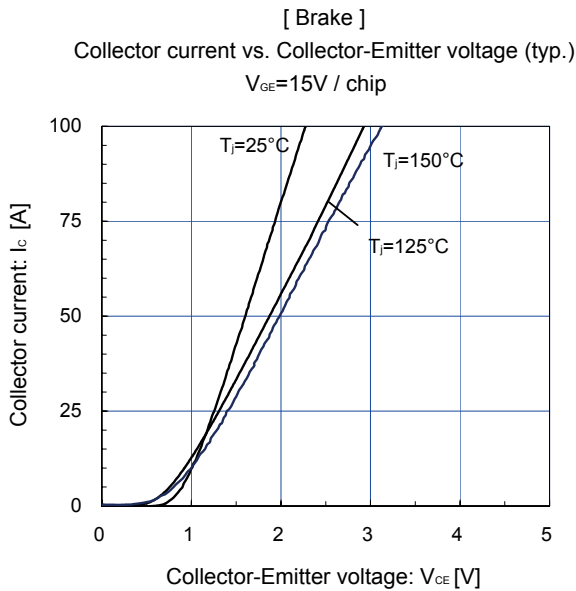
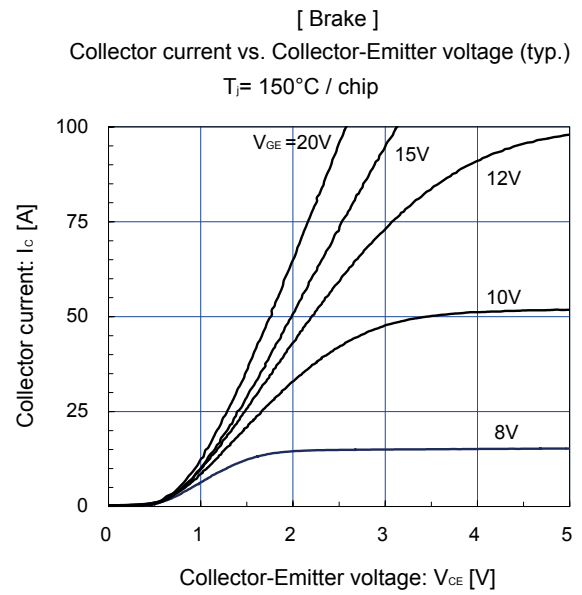
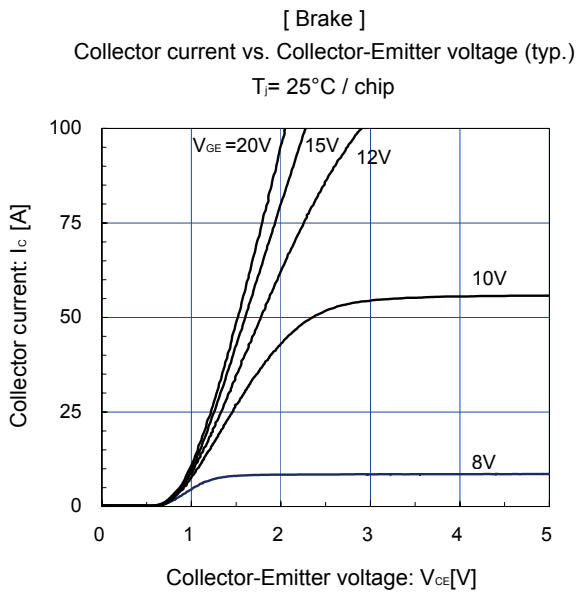


[Inverter]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \le 15V, R_G \ge 43\Omega, T_J=150^\circ C$

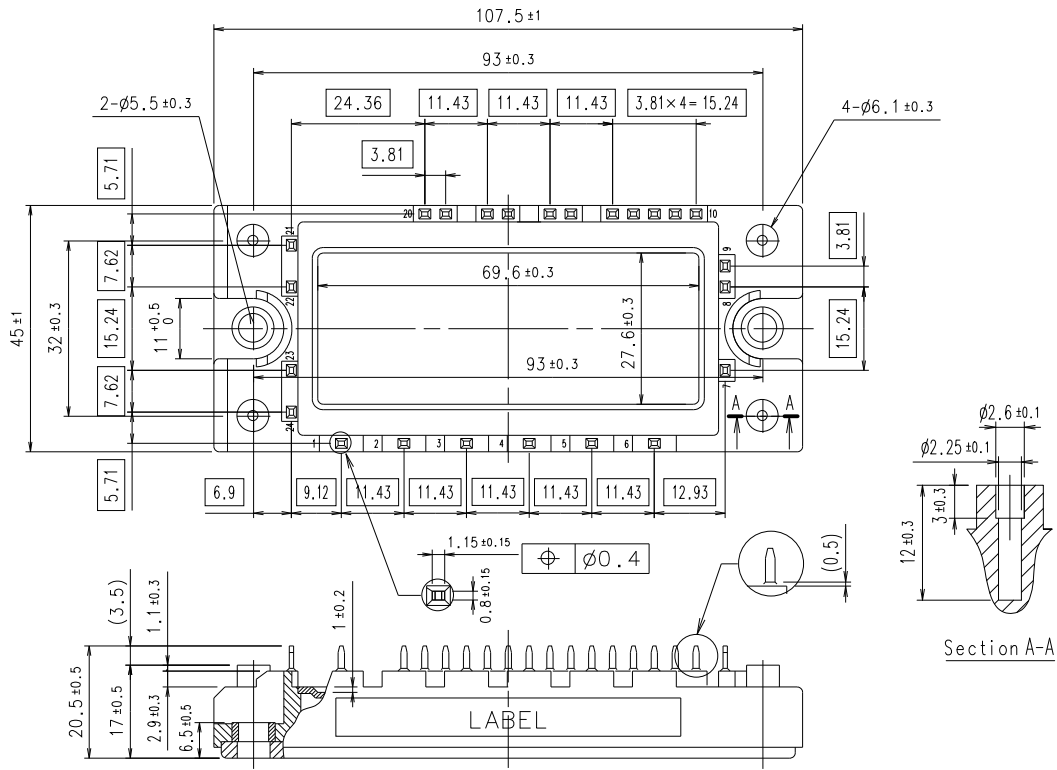






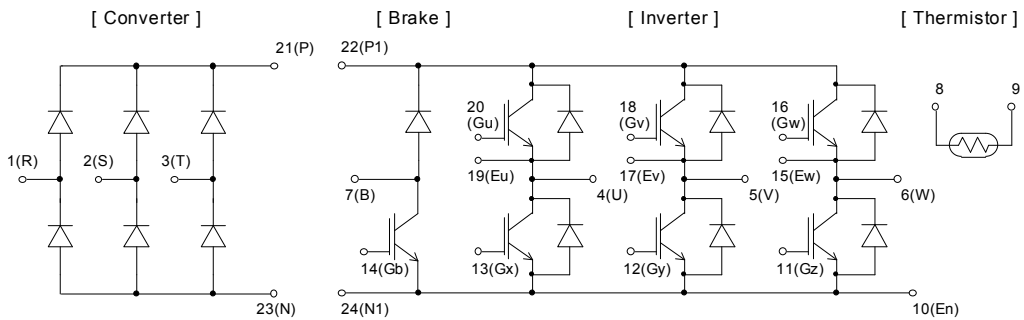
■ Outline Drawings(Unit:mm)

□ shows theoretical dimension.
 () shows reference dimension.



Weight: 180g(typ.)

■ Equivalent Circuit



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