

7MBR100VR120-50

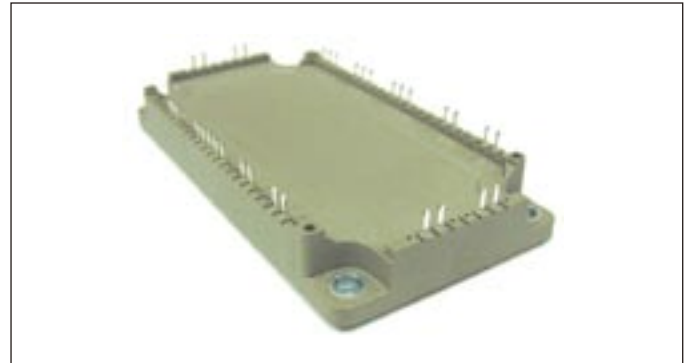
IGBT MODULE (V series) 1200V / 50A / PIM

■ 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}			1200	V
	Gate-Emitter voltage	V_{GES}			± 20	V
	Collector current	I_c	Continuous	$T_c=80^\circ\text{C}$	100	A
		I_{cp}	1ms	$T_c=80^\circ\text{C}$	200	
		$-I_c$			100	
		$-I_c$ pulse	1ms			
Collector power dissipation	P_c	1 device		520	W	
Brake	Collector-Emitter voltage	V_{CES}			1200	V
	Gate-Emitter voltage	V_{GES}			± 20	V
	Collector current	I_c	Continuous	$T_c=80^\circ\text{C}$	75	A
		I_{cp}	1ms	$T_c=80^\circ\text{C}$	150	
	Collector power dissipation	P_c	1 device		385	W
Repetitive peak reverse voltage (Diode)	V_{RRM}			1200	V	
Converter	Repetitive peak reverse voltage	V_{RRM}			1600	V
	Average output current	I_o	50Hz/60Hz, sine wave		100	A
	Surge current (Non-Repetitive)	I_{FSM}	10ms, $T_j=150^\circ\text{C}$		520	A
	I^2t (Non-Repetitive)	I^2t	half sine wave		1352	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)	-	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°C unless otherwise specified)

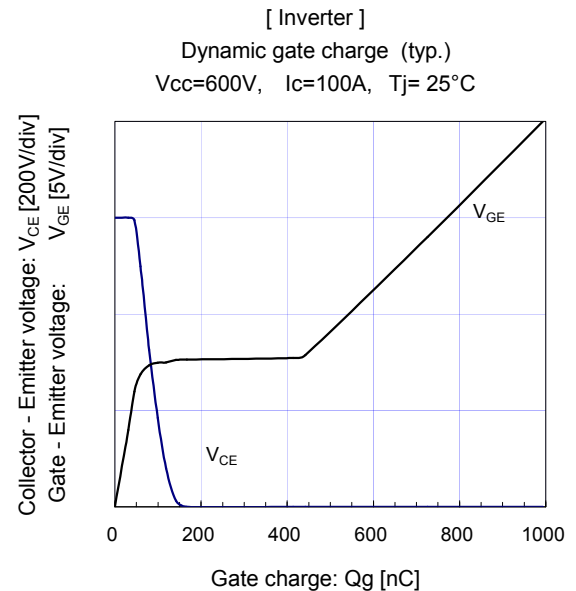
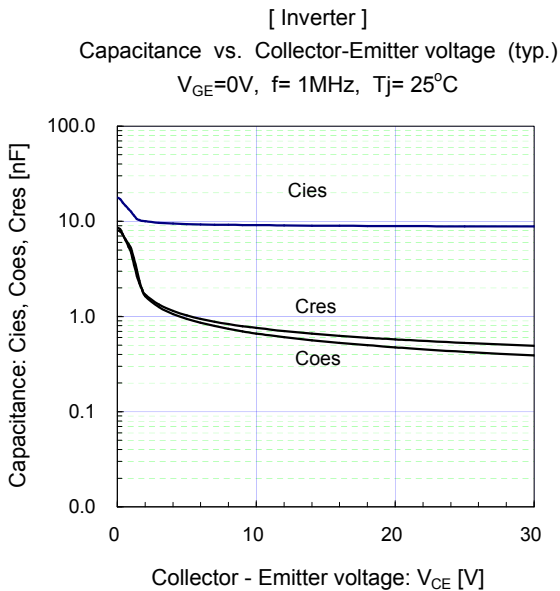
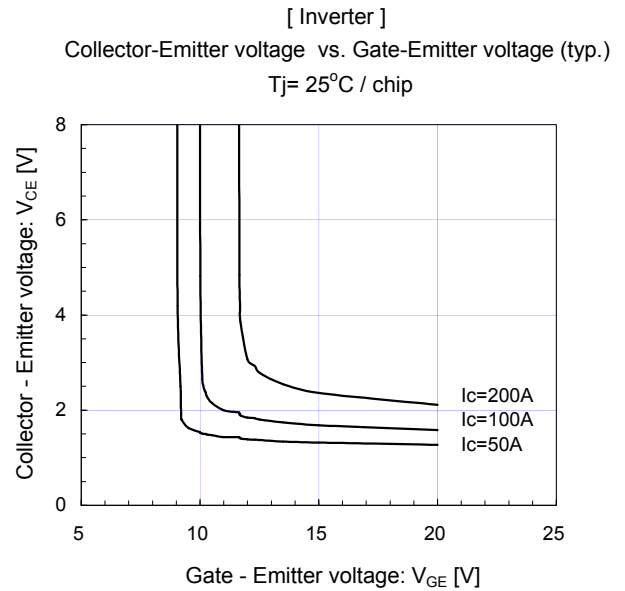
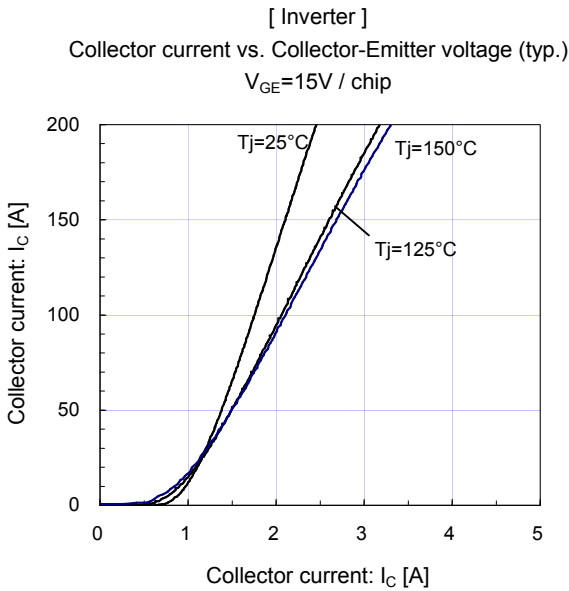
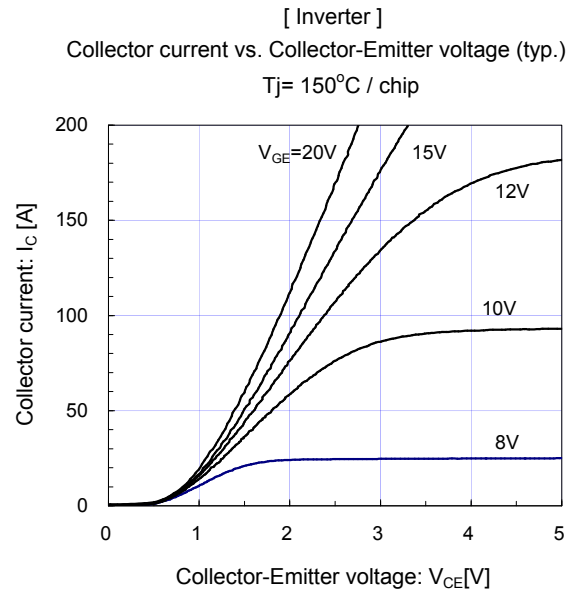
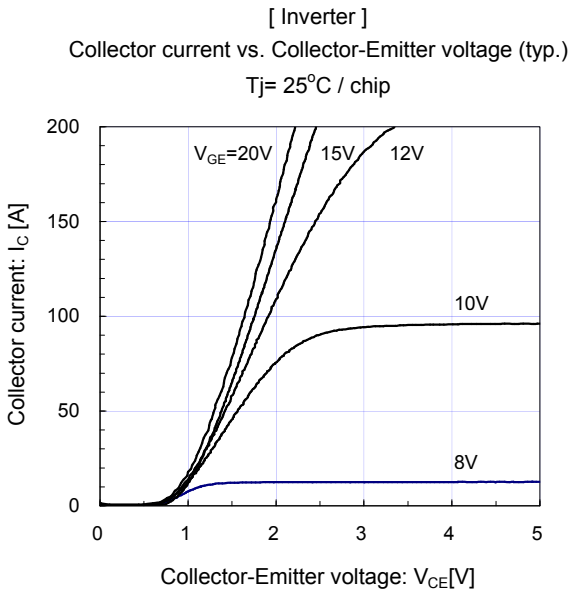
Items	Symbols	Conditions	Characteristics			Units		
			min.	typ.	max.			
Inverter	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 1200V	-	-	1.0	mA	
	Gate-Emitter leakage current	I _{GES}	V _{GE} = 0V, V _{GE} = ±20V	-	-	200	nA	
	Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 100mA	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal)	V _{GE} = 15V I _c = 100A	T _j = 25°C	-	2.25	2.70	V
				T _j = 125°C	-	2.55	-	
				T _j = 150°C	-	2.60	-	
		V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 100A	T _j = 25°C	-	1.75	2.20	
				T _j = 125°C	-	2.05	-	
	T _j = 150°C	-	2.10	-				
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	9.1	-	nF	
	Turn-on time	ton	V _{CC} = 600V I _c = 100A V _{GE} = +15 / -15V R _G = 1.6Ω	-	0.39	1.20	μs	
		tr		-	0.09	0.60		
		tr(i)		-	0.03	-		
	Turn-off time	toff	R _G = 1.6Ω	-	0.53	1.00	μs	
		tf		-	0.06	0.30		
Forward on voltage	V _F (terminal)	I _F = 100A	T _j = 25°C	-	2.20	2.65	V	
			T _j = 125°C	-	2.35	-		
			T _j = 150°C	-	2.30	-		
	V _F (chip)	I _F = 100A	T _j = 25°C	-	1.70	2.15		
			T _j = 125°C	-	1.85	-		
T _j = 150°C	-	1.80	-					
Reverse recovery time	trr	I _F = 100A	-	-	0.1	μs		
Brake	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V V _{CE} = 1200V	-	-	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 = 75A	T _j = 25°C	-	2.25	2.70	V
				T _j = 125°C	-	2.60	-	
				T _j = 150°C	-	2.65	-	
		V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 75A	T _j = 25°C	-	1.85	2.30	
				T _j = 125°C	-	2.20	-	
	T _j = 150°C	-	2.25	-				
	Turn-on time	ton	V _{CE} = 600V I _c = 75A	-	0.39	1.20	μs	
		tr		-	0.09	0.60		
Turn-off time	toff	V _{GE} = +15 / -15V R _G = 2.2Ω	-	0.53	1.00	μs		
	tf		-	0.06	0.30			
Reverse current	IRRM	V _R = 1200V	-	-	1.00	mA		
Converter	Forward on voltage	V _{FM} (chip)	terminal	-	2.00	2.35	V	
			chip	-	1.50	-		
Reverse current	IRRM	V _R = 1600V	-	-	1.0	mA		
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)	R _{th(j-c)}	Inverter IGBT	-	-	0.29	°C/W
		Inverter FWD	-	-	0.44	
		Brake IGBT	-	-	0.39	
		Converter Diode	-	-	0.43	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	with Thermal Compound	-	0.05	-	

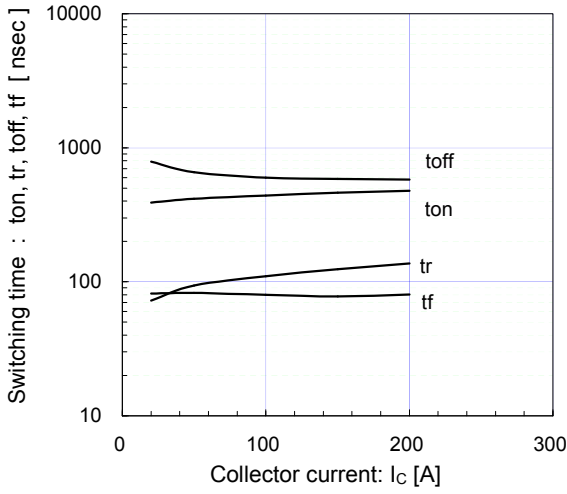
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



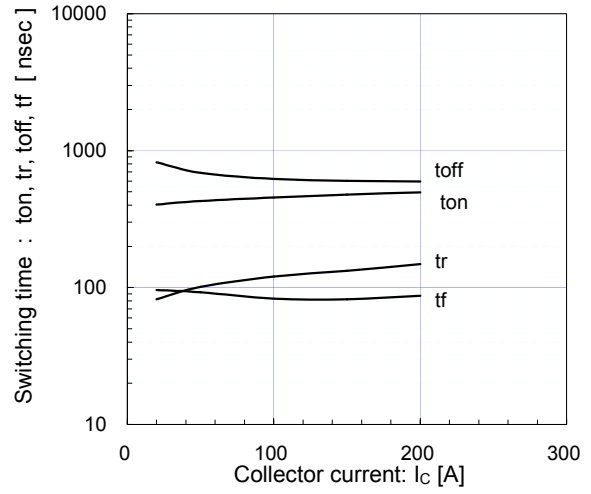
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=1.6\Omega, T_j=125^\circ C$



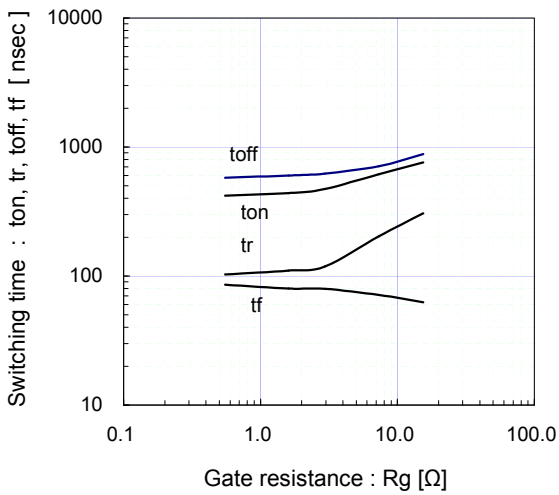
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Switching time vs. Collector current (typ.)
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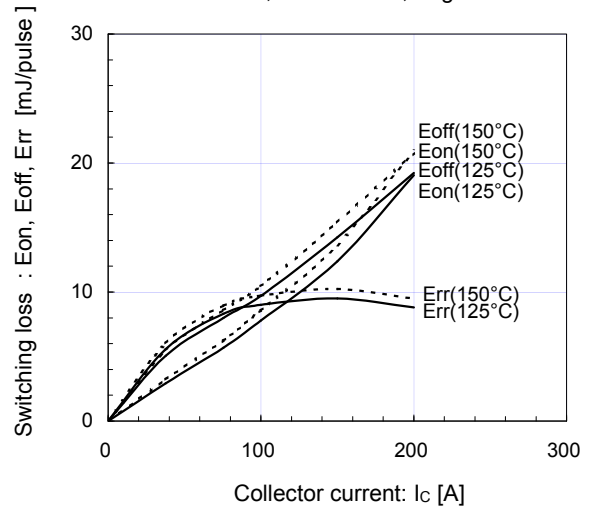
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Switching time vs. gate resistance (typ.)
 $V_{cc}=600V, I_c=100A, V_{GE}=\pm 15V, T_j=125^\circ C$



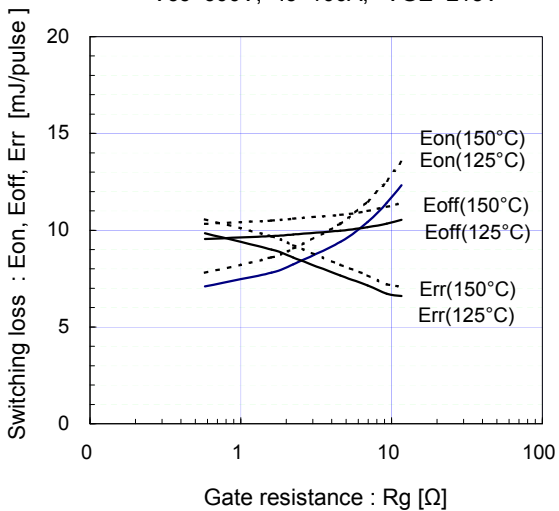
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Switching loss vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=1.6\Omega$



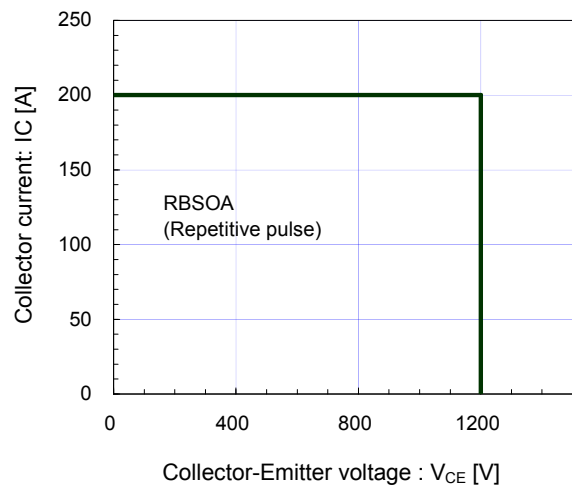
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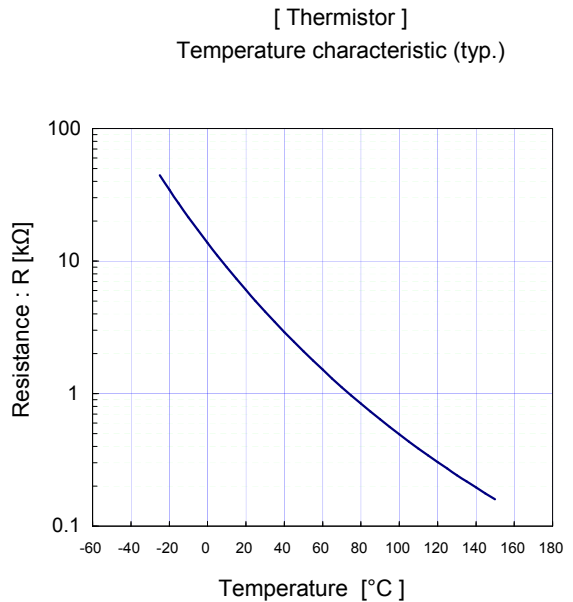
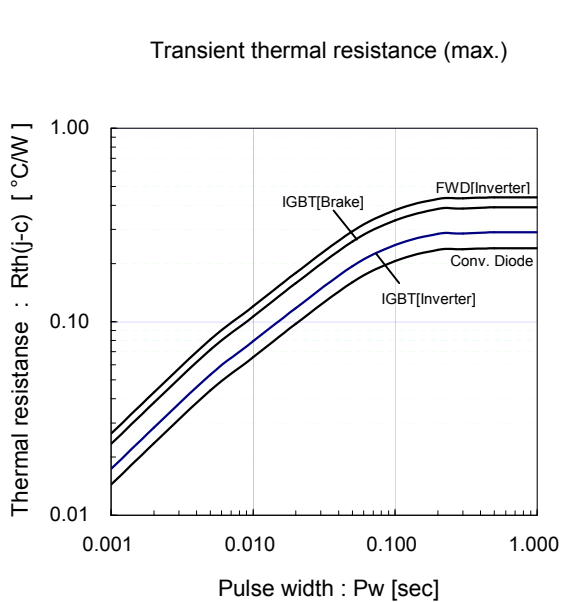
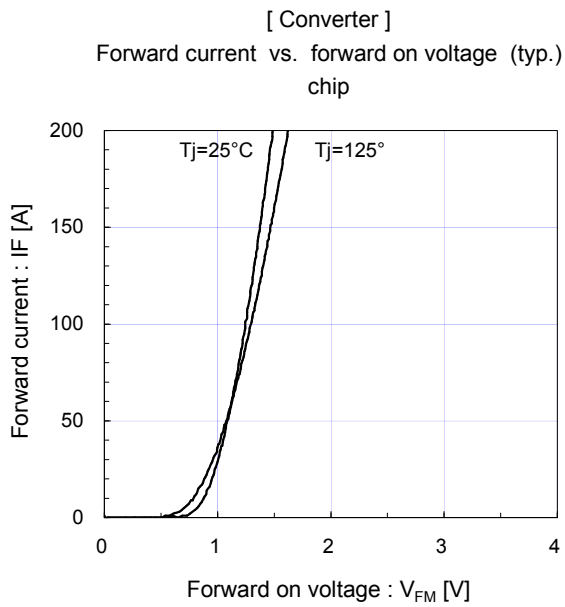
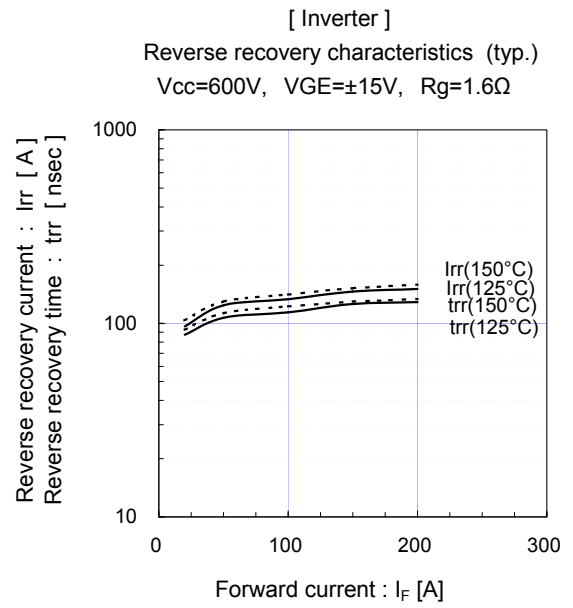
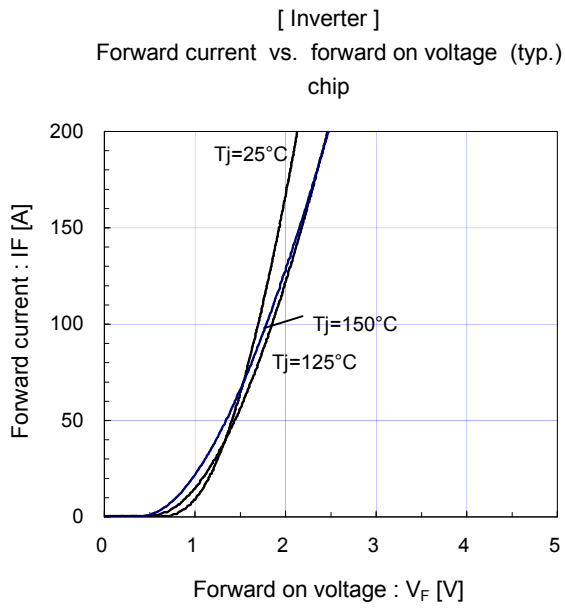
Switching loss vs. gate resistance (typ.)
 $V_{cc}=600V, I_c=100A, V_{GE}=\pm 15V$



[Inverter]

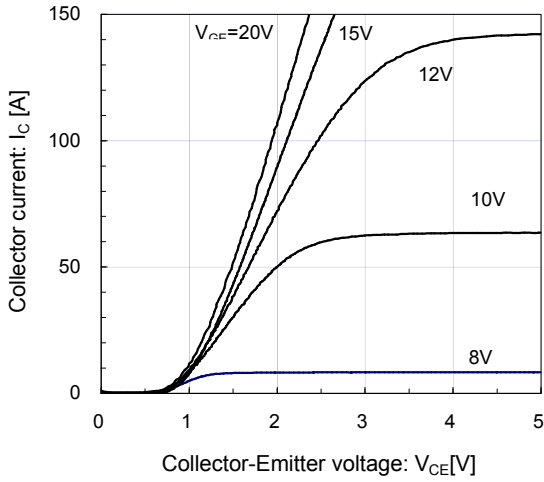
Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_g \geq 1.6\Omega, T_j \leq 125^\circ C$





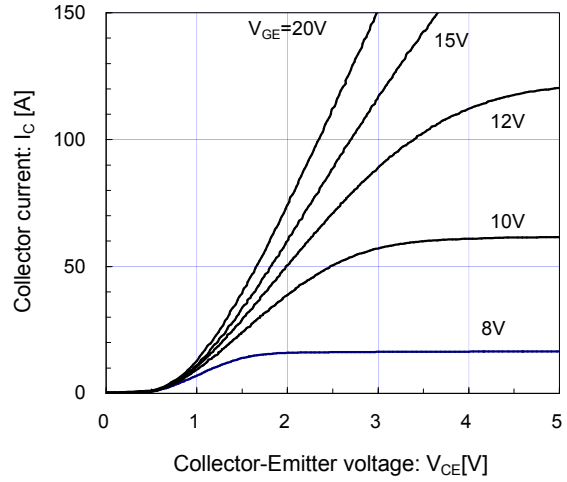
[Brake]

Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



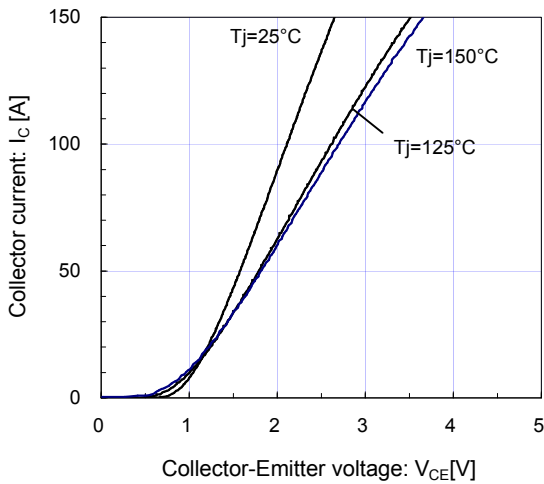
[Brake]

Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



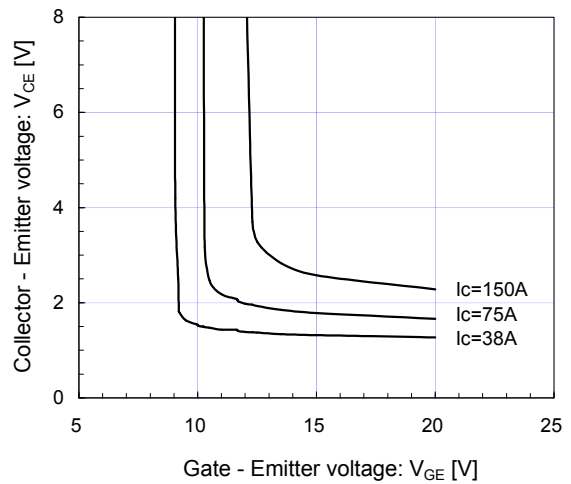
[Brake]

Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



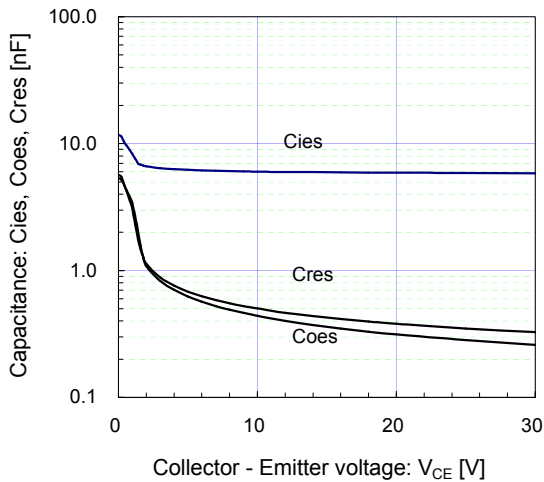
[Brake]

Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



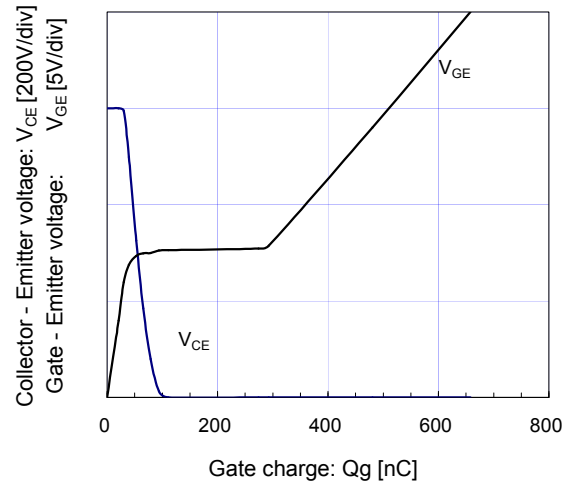
[Brake]

Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



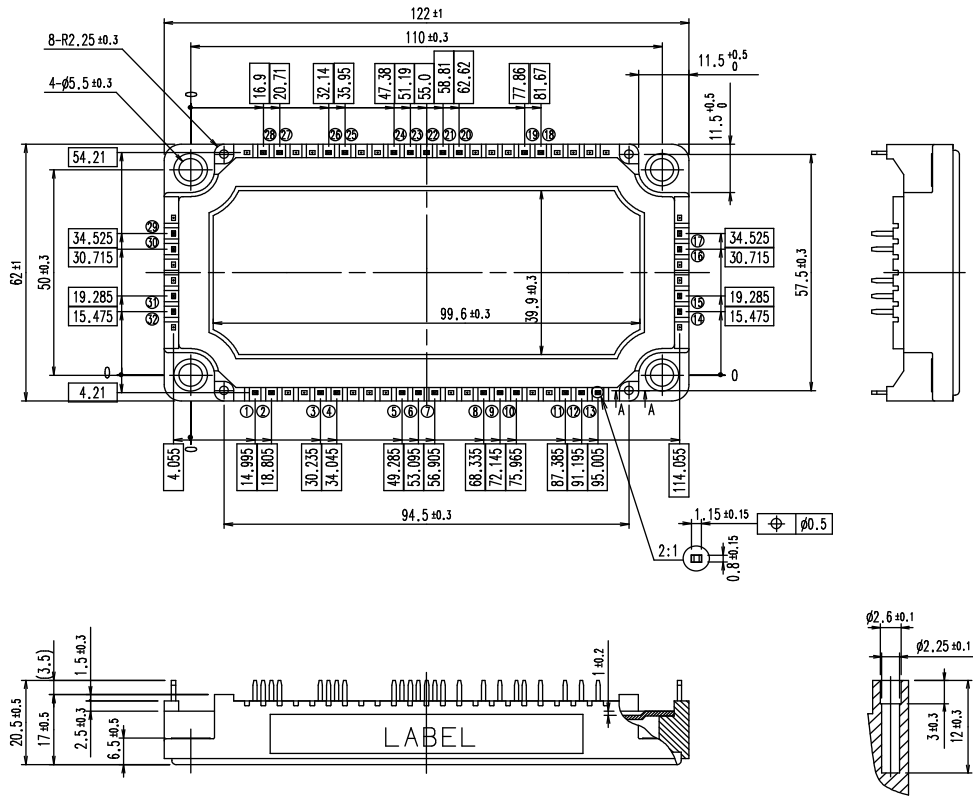
[Brake]

Dynamic gate charge (typ.)
Vcc=600V, Ic=100A, Tj= 25°C



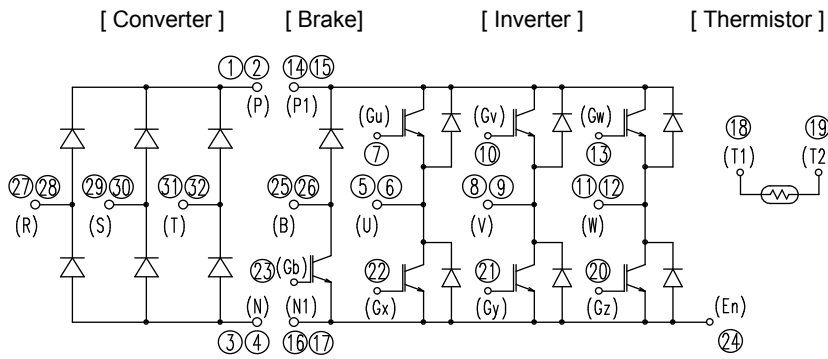
Outline Drawings, mm

□ shows theoretical dimension.
 () shows reference dimension.



Section A-A

Equivalent Circuit Schematic



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