

7MBR50VM120-50

IGBT Modules

IGBT MODULE (V series)

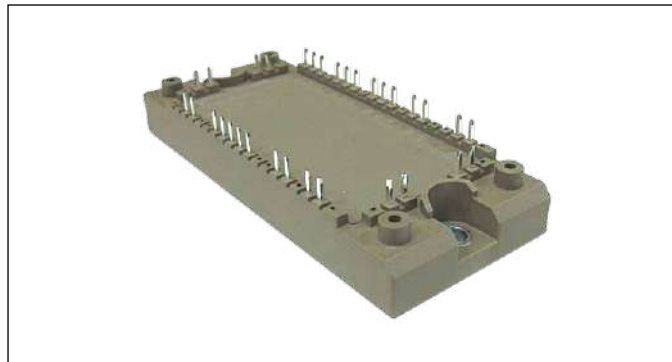
1200V / 50A / PIM

■ 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 $T_c=100^\circ\text{C}$	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	280	W
Brake	Collector-Emitter voltage	V_{CES}		1200	V
	Gate-Emitter voltage	V_{GES}		± 20	V
	Collector current	I_c	Continuous $T_c=80^\circ\text{C}$	35	A
		I_{cp}	1ms $T_c=80^\circ\text{C}$	70	
	Collector power dissipation	P_c	1 device	210	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	50	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	648	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)

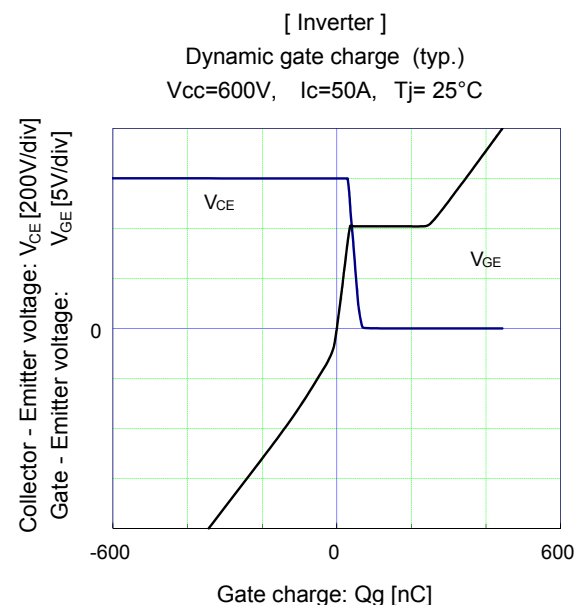
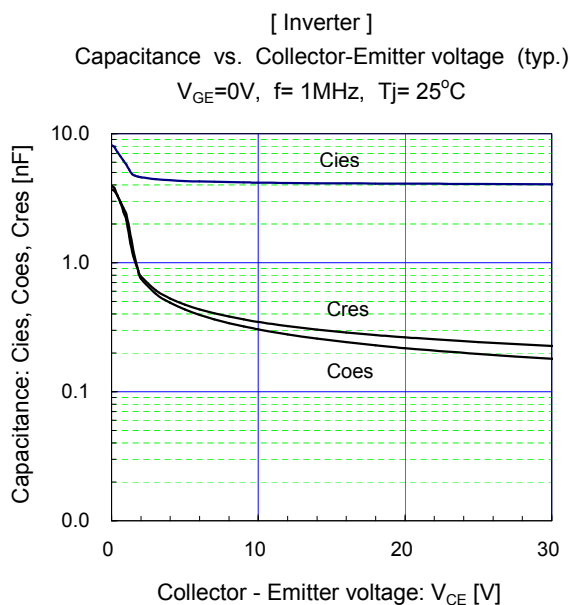
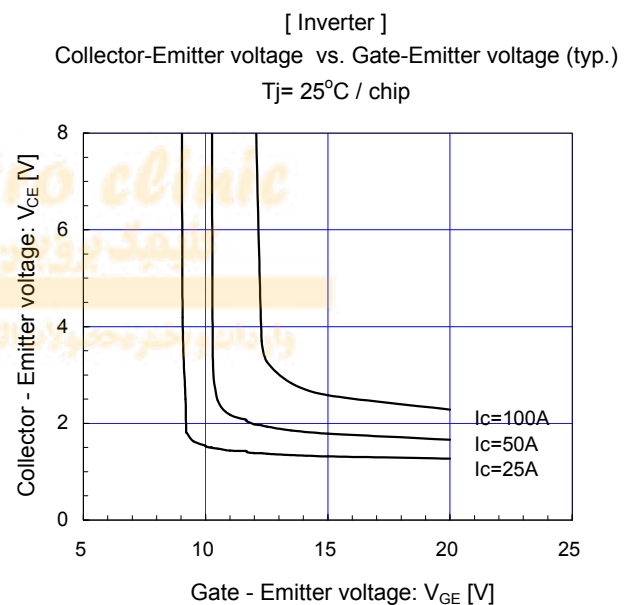
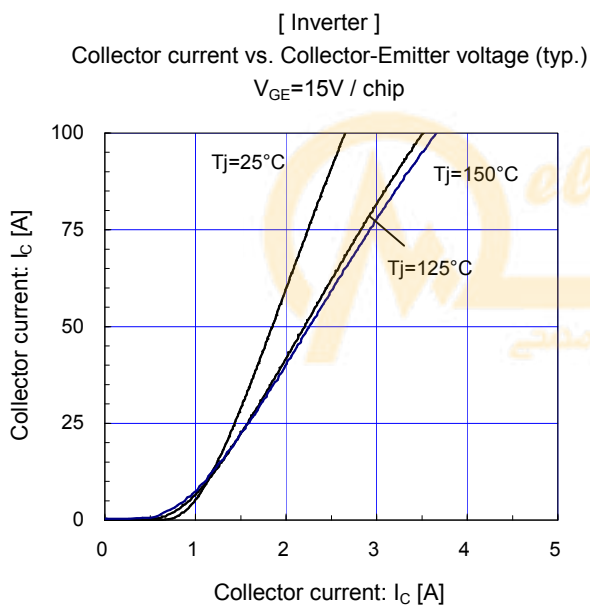
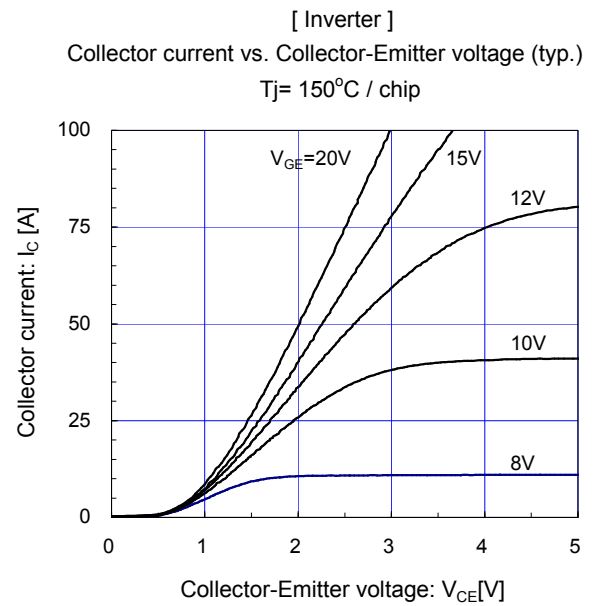
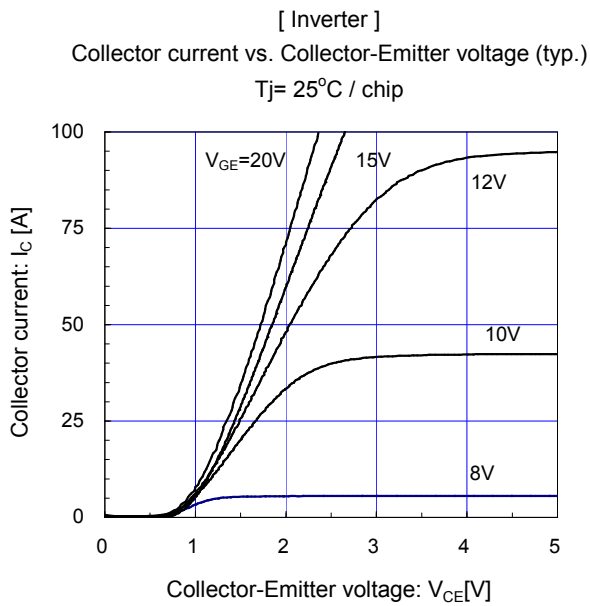
Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 1200V		-	-	1.0	mA
	Gate-Emitter leakage current	I _{GES}	V _{GE} = 0V, V _{GE} = ±20V		-	-	200	nA
	Gate-Emitter threshold voltage	V _{GE (th)}	V _{CE} = 20V, I _C = 50mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	V _{CE (sat)} (terminal)	V _{GE} = 15V I _C = 50A	T _J =25°C	-	2.20	2.65	V
				T _J =125°C	-	2.55	-	
				T _J =150°C	-	2.60	-	
		V _{CE (sat)} (chip)	V _{GE} = 15V I _C = 50A	T _J =25°C	-	1.85	2.30	
				T _J =125°C	-	2.20	-	
	T _J =150°C	-	2.25	-				
	Internal gate resistance	R _{g(int)}	-		-	4	-	Ω
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz		-	4.2	-	nF
	Turn-on time	ton	V _{CC} = 600V I _C = 50A V _{GE} = +15 / -15V		-	0.39	1.20	μs
		tr			-	0.09	0.60	
		tr (i)			-	0.03	-	
	Turn-off time	toff	R _G = 15Ω		-	0.53	1.00	
tf		-			0.06	0.30		
Forward on voltage	V _F (terminal)	I _F = 50A	T _J =25°C	-	2.25	2.70	V	
			T _J =125°C	-	2.50	-		
			T _J =150°C	-	2.45	-		
	V _F (chip)	I _F = 50A	T _J =25°C	-	1.90	2.35		
			T _J =125°C	-	2.15	-		
T _J =150°C	-	2.10	-					
Reverse recovery time	trr	I _F = 50A		-	-	0.35	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 = 35A	T _J =25°C	-	2.10	2.55	V
				T _J =125°C	-	2.45	-	
				T _J =150°C	-	2.50	-	
		V _{CE (sat)} (chip)	V _{GE} = 15V I _C = 35A	T _J =25°C	-	1.85	2.30	
				T _J =125°C	-	2.20	-	
	T _J =150°C	-	2.25	-				
	Internal gate resistance	R _{g(int)}	-		-	0	-	Ω
	Turn-on time	ton	V _{CE} = 600V I _C = 35A		-	0.39	1.20	μs
		tr			-	0.09	0.60	
	Turn-off time	toff	V _{GE} = +15 / -15V R _G = 27Ω		-	0.53	1.00	
tf		-			0.06	0.30		
Reverse current	IRRM	V _R = 1200V		-	-	1.00	mA	
Converter	Forward on voltage	V _{FM} (chip)	I _F = 50A	terminal	-	1.70	2.15	V
				chip	-	1.35	-	
	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	-	-	0.54	°C/W
		Inverter FWD	-	-	0.91	
		Brake IGBT	-	-	0.72	
		Converter Diode	-	-	0.54	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	with Thermal Compound	-	0.05	-	

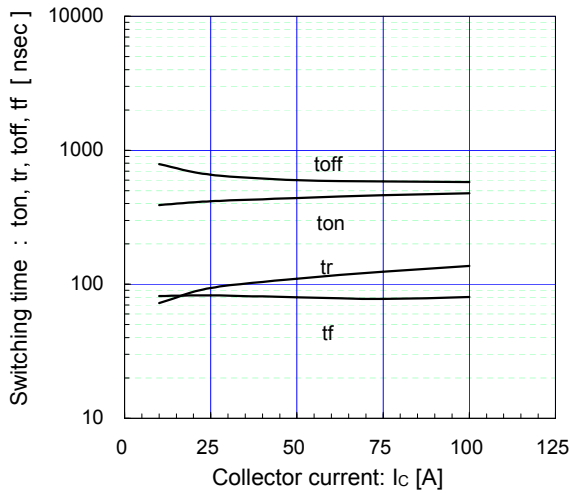
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)



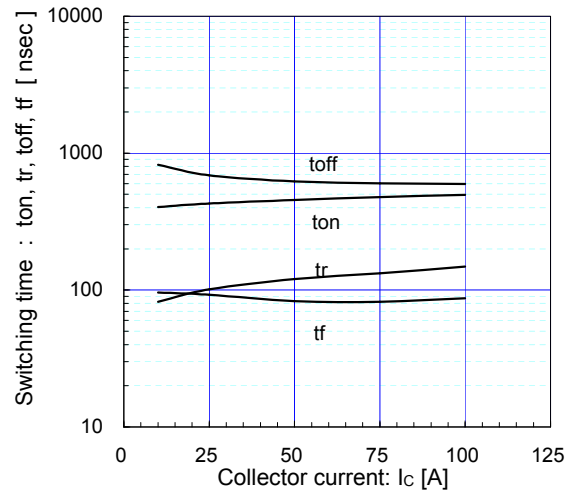
[Inverter]

Switching time vs. Collector current (typ.)
V_{CC}=600V, V_{GE}=±15V, R_g=15Ω, T_j=125°C



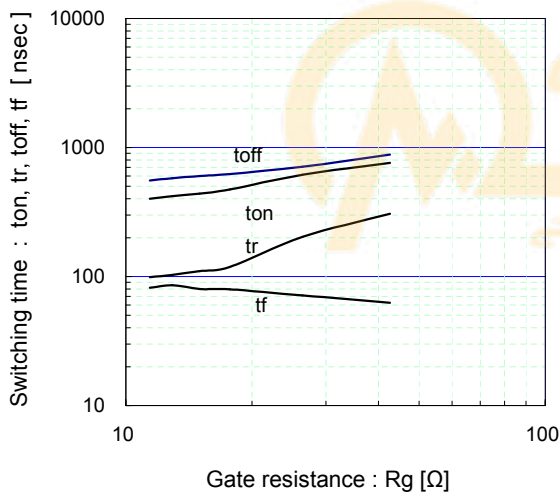
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Switching time vs. Collector current (typ.)
V_{CC}=600V, V_{GE}=±15V, R_g=15Ω, T_j=150°C



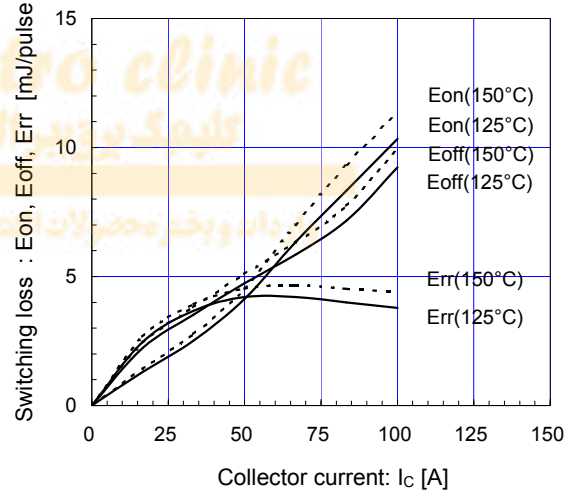
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Switching time vs. gate resistance (typ.)
V_{CC}=600V, Ic=50A, V_{GE}=±15V, T_j=125°C



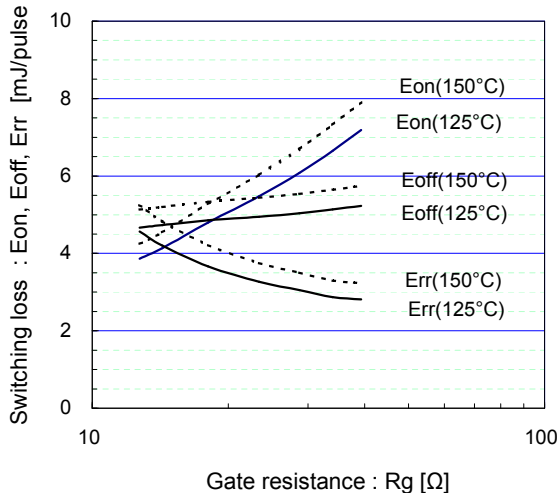
[Inverter] a

Switching loss vs. Collector current (typ.)
V_{CC}=600V, V_{GE}=±15V, R_g=15Ω



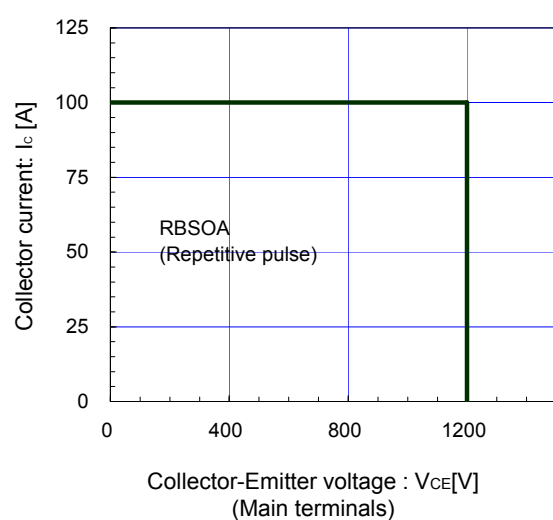
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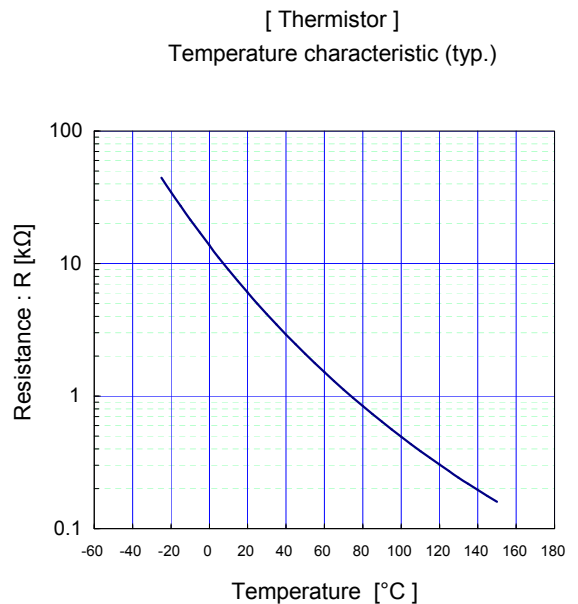
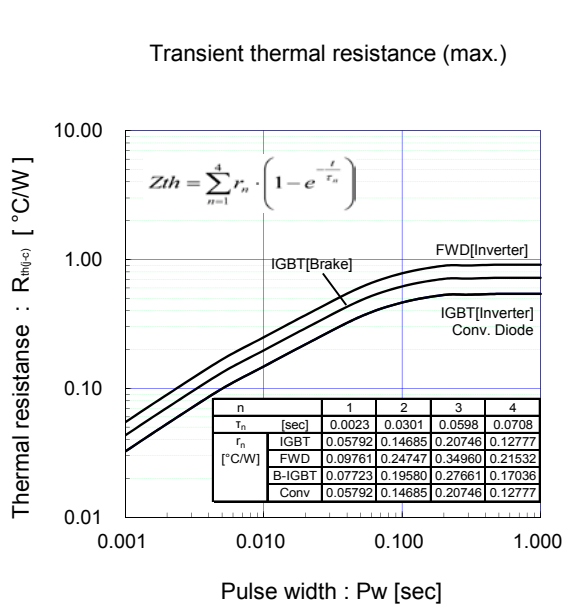
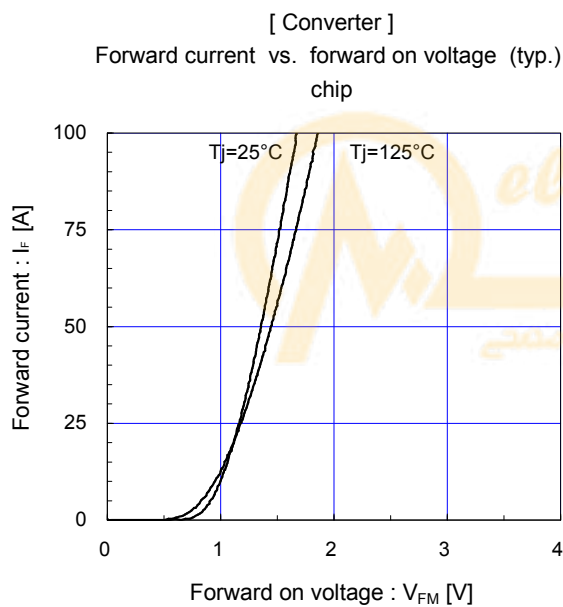
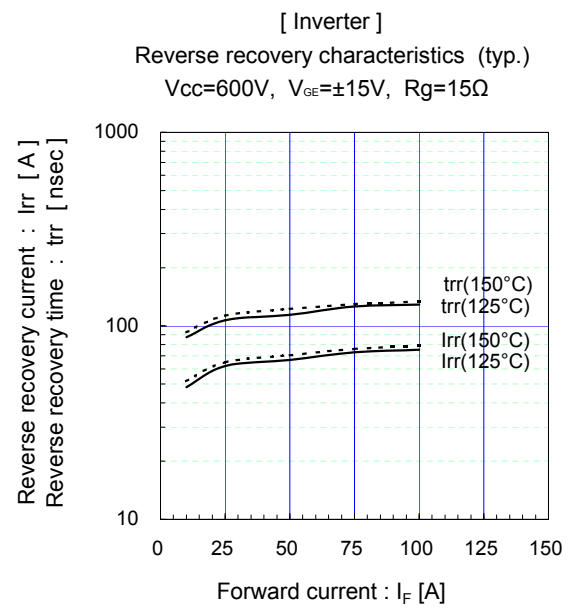
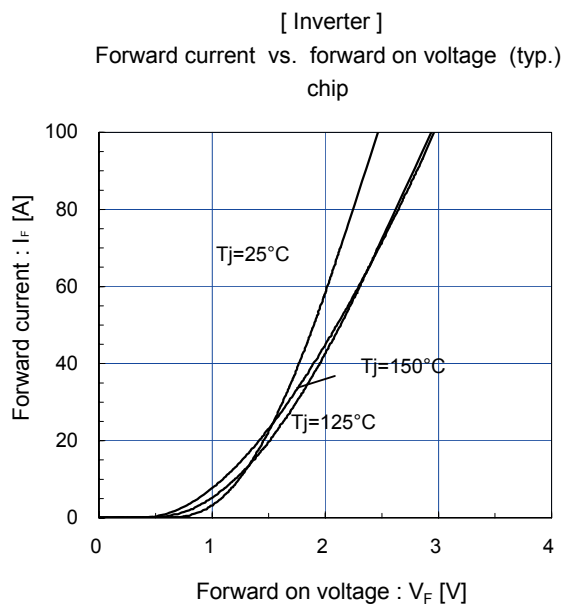
Switching loss vs. gate resistance (typ.)
V_{CC}=600V, Ic=50A, V_{GE}=±15V



[Inverter]

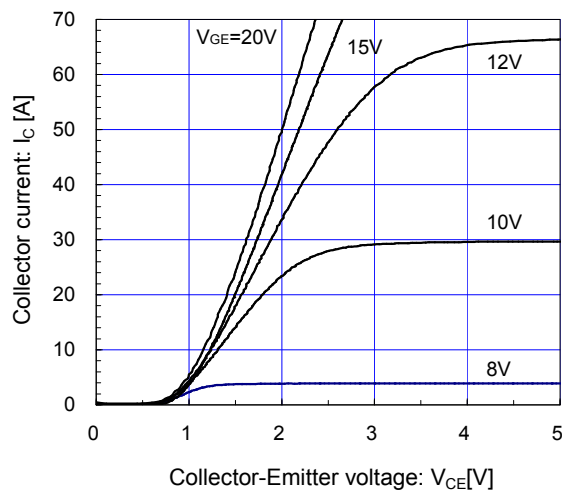
Reverse bias safe operating area (max.)
+V_{GE}=15V, -V_{GE} ≤ 15V, R_g ≥ 15Ω, T_j = 150°C





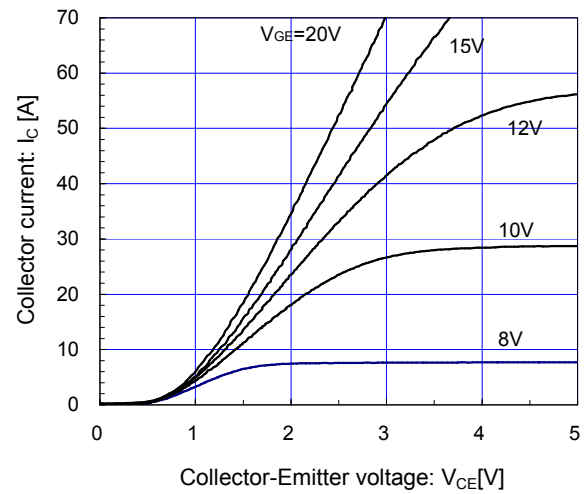
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)

 $T_j = 25^\circ\text{C}$ / chip

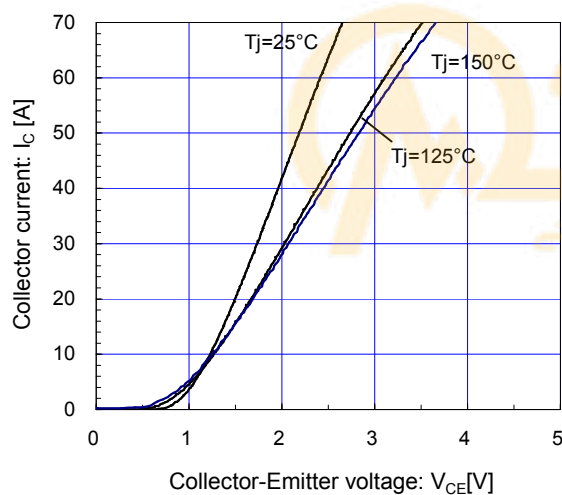
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Collector current vs. Collector-Emittor voltage (typ.)

 $T_j = 150^\circ\text{C}$ / chip

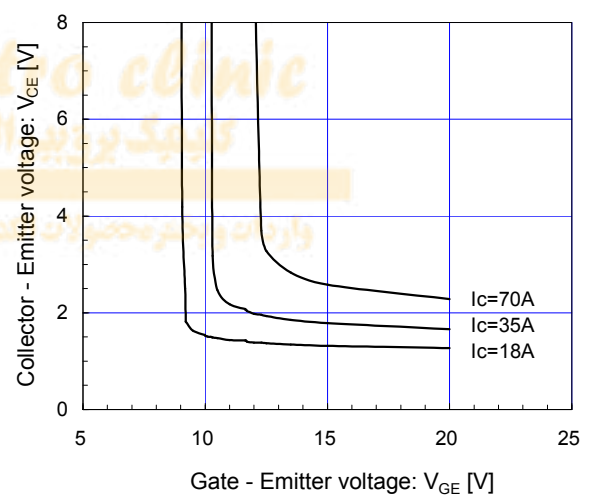
[Brake]

Collector current vs. Collector-Emittor voltage (typ.)

 $V_{GE} = 15\text{V}$ / chip

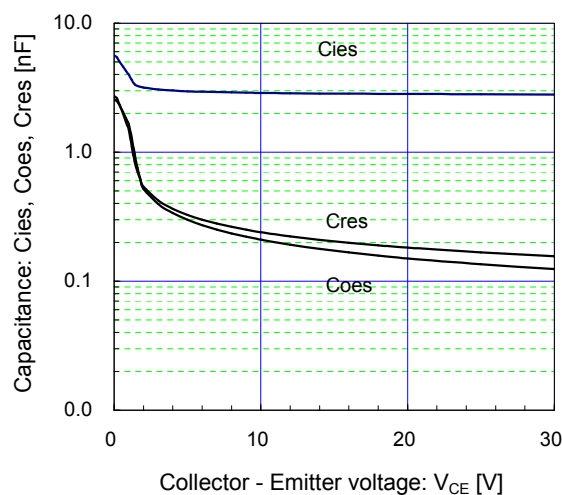
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Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)

 $T_j = 25^\circ\text{C}$ / chip

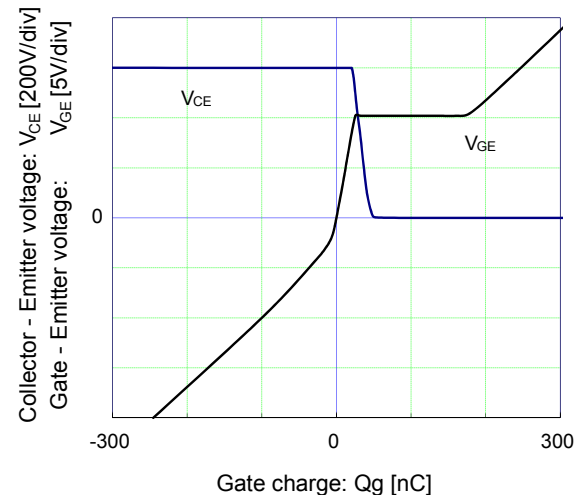
[Brake]

Capacitance vs. Collector-Emittor voltage (typ.)

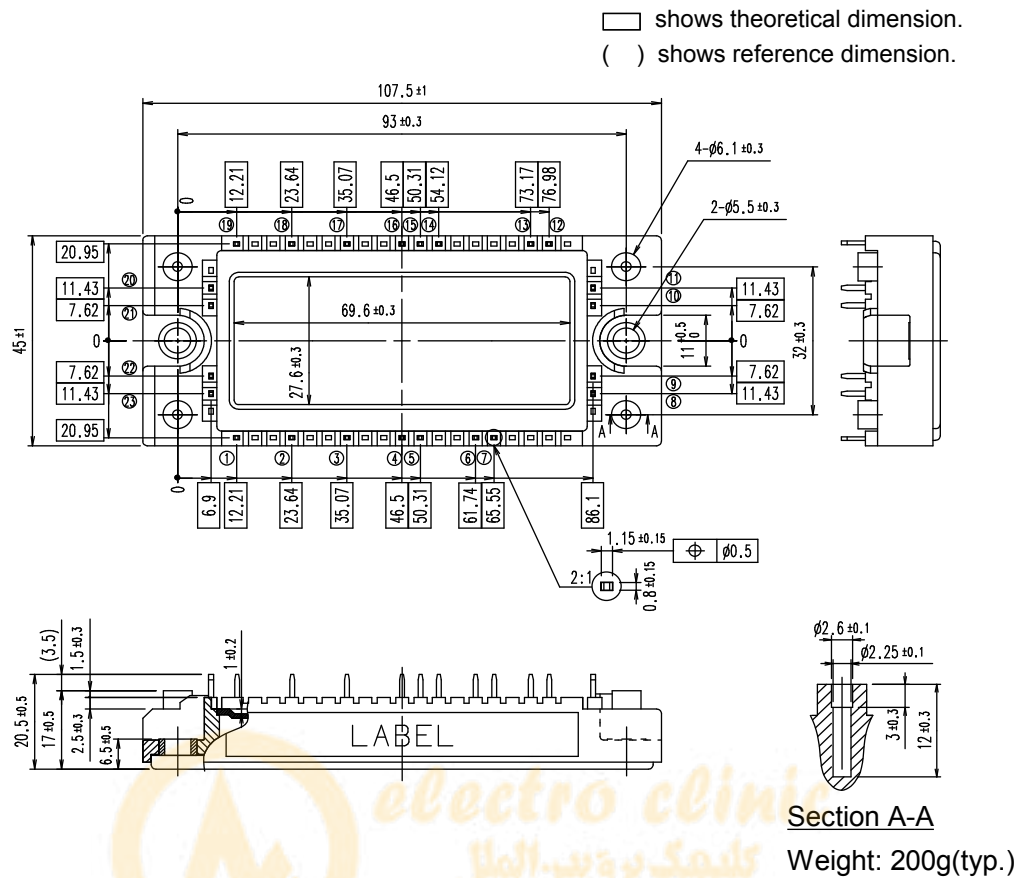
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$ 

[Brake]

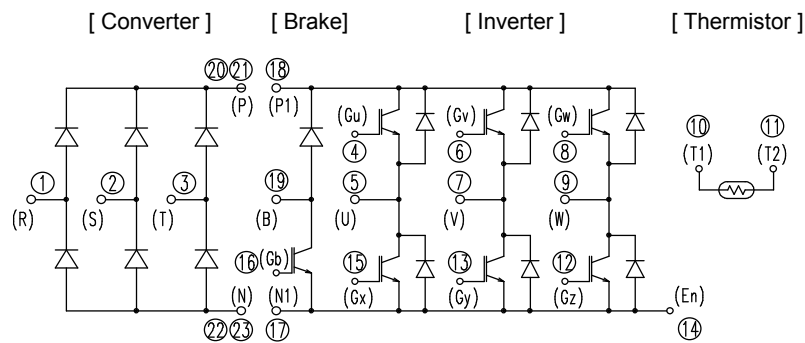
Dynamic gate charge (typ.)

 $V_{CC} = 600\text{V}$, $I_c = 35\text{A}$, $T_j = 25^\circ\text{C}$ 

■ Outline Drawing (Unit:mm)



■ Equivalent Circuit



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IGBT Modules

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