

7MBR35VM120-50

IGBT MODULE (V series)

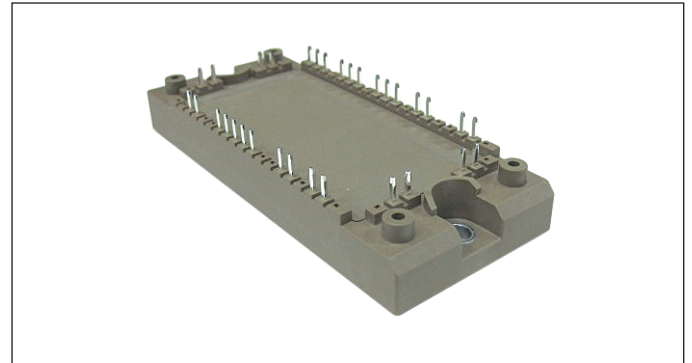
1200V / 35A / PIM

■ 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	$T_c=80^\circ\text{C}$	35	A
		I_{cp}	1ms	$T_c=80^\circ\text{C}$	70	
		$-I_c$			35	
		$-I_c$ pulse	1ms		70	
Collector power dissipation	P_c	1 device		210	W	
Brake	Collector-Emitter voltage	V_{CES}		1200	V	
	Gate-Emitter voltage	V_{GES}		± 20	V	
	Collector current	I_c	Continuous	$T_c=80^\circ\text{C}$	25	A
		I_{cp}	1ms	$T_c=80^\circ\text{C}$	50	
	Collector power dissipation	P_c	1 device		170	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	35	A	
	Surge current (Non-Repetitive)	I_{FSM}	10ms, $T_j=150^\circ\text{C}$	260	A	
	I^2t (Non-Repetitive)	I^2t	half sine wave	338	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 = 35mA	6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	V _{CE(sat)} (terminal)	V _{GE} = 15V I _c = 35A	T _j = 25°C	-	2.15	2.60	V
				T _j = 125°C	-	2.50	-	
				T _j = 150°C	-	2.55	-	
		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	-				
	Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	2.9	-	nF	
	Turn-on time	ton	V _{CC} = 600V I _c = 35A V _{GE} = +15 / -15V R _G = 27Ω	-	0.39	1.20	μs	
		tr		-	0.09	0.60		
		tr(i)		-	0.03	-		
	Turn-off time	toff	R _G = 27Ω	-	0.53	1.00	μs	
		tf		-	0.06	0.30		
Forward on voltage	V _F (terminal)	I _F = 35A	T _j = 25°C	-	2.00	2.45	V	
			T _j = 125°C	-	2.15	-		
			T _j = 150°C	-	2.10	-		
	V _F (chip)	I _F = 35A	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 = 35A	-	-	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 = 25A	T _j = 25°C	-	2.05	2.50	V
				T _j = 125°C	-	2.40	-	
				T _j = 150°C	-	2.45	-	
		V _{CE(sat)} (chip)	V _{GE} = 15V I _c = 25A	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 = 25A	-	0.39	1.20	μs	
		tr		-	0.09	0.60		
Turn-off time	toff	V _{GE} = +15 / -15V R _G = 39Ω	-	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)	I _F = 35A	terminal	-	1.65	2.10	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		

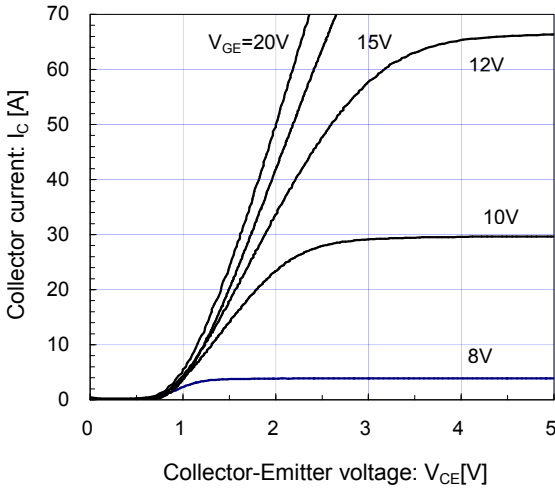
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	Inverter IGBT	-	-	0.72	°C/W
		Inverter FWD	-	-	0.91	
		Brake IGBT	-	-	0.89	
		Converter Diode	-	-	0.88	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	with Thermal Compound	-	0.05	-	

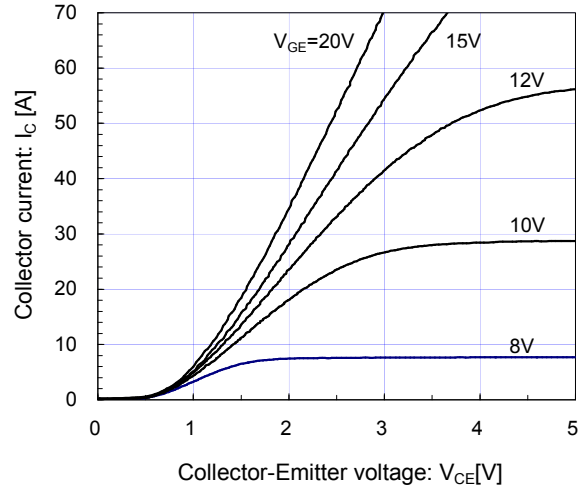
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

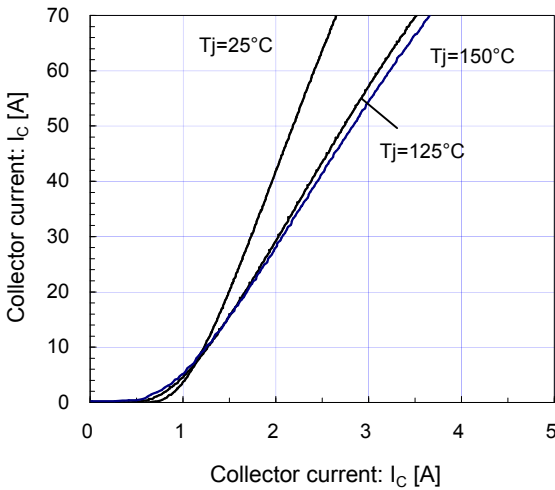
[Inverter]
 Collector current vs. Collector-Emittor voltage (typ.)
 $T_j = 25^\circ\text{C} / \text{chip}$



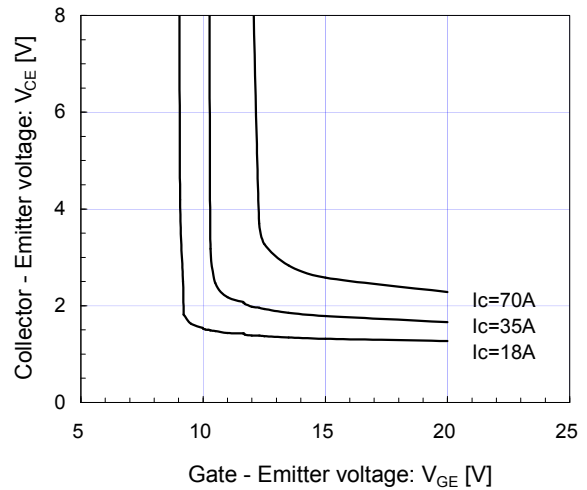
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 Collector current vs. Collector-Emittor voltage (typ.)
 $T_j = 150^\circ\text{C} / \text{chip}$



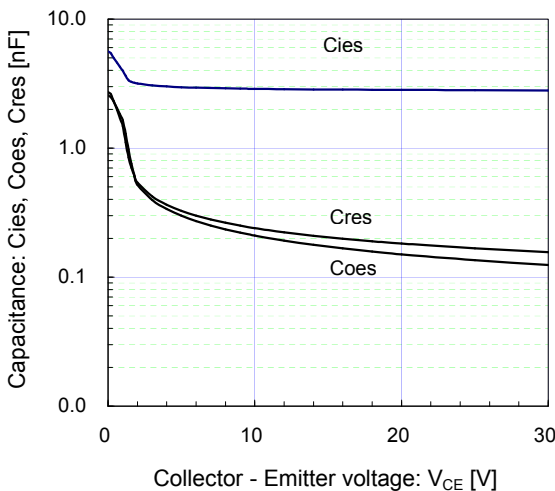
[Inverter]
 Collector current vs. Collector-Emittor voltage (typ.)
 $V_{GE} = 15\text{V} / \text{chip}$



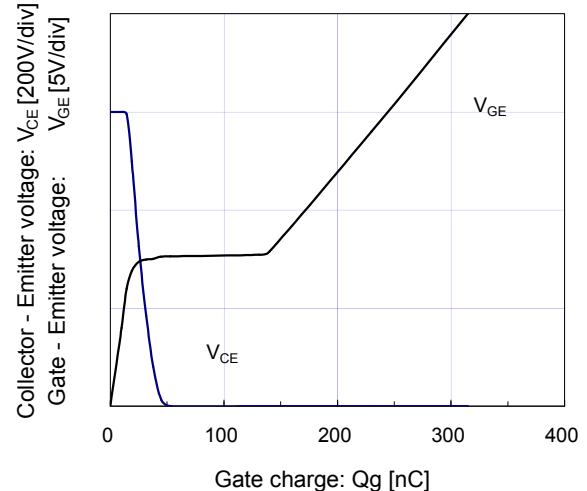
[Inverter]
 Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
 $T_j = 25^\circ\text{C} / \text{chip}$



[Inverter]
 Capacitance vs. Collector-Emittor voltage (typ.)
 $V_{GE} = 0\text{V}, f = 1\text{MHz}, T_j = 25^\circ\text{C}$

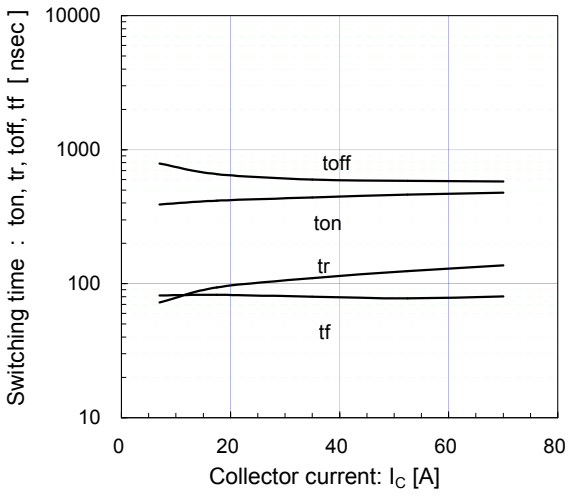


[Inverter]
 Dynamic gate charge (typ.)
 $V_{CC} = 600\text{V}, I_c = 35\text{A}, T_j = 25^\circ\text{C}$



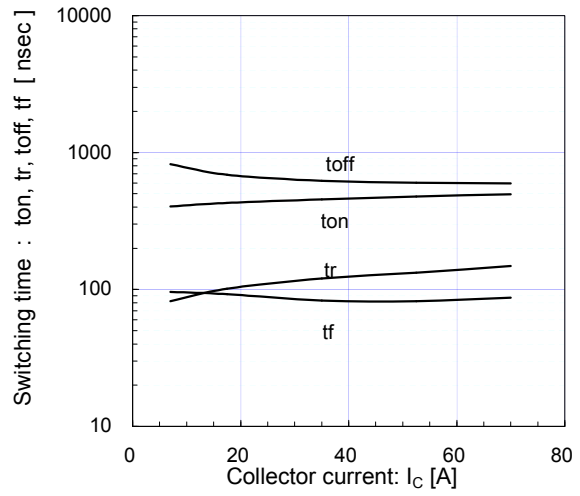
[Inverter]

Switching time vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=27\Omega, T_j=125^\circ C$



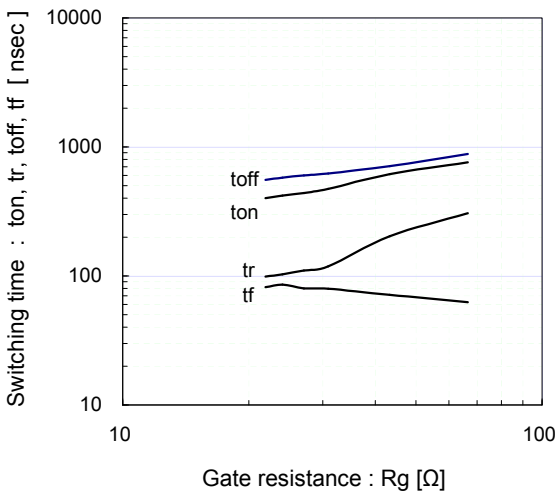
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Switching time vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=27\Omega, T_j=150^\circ C$



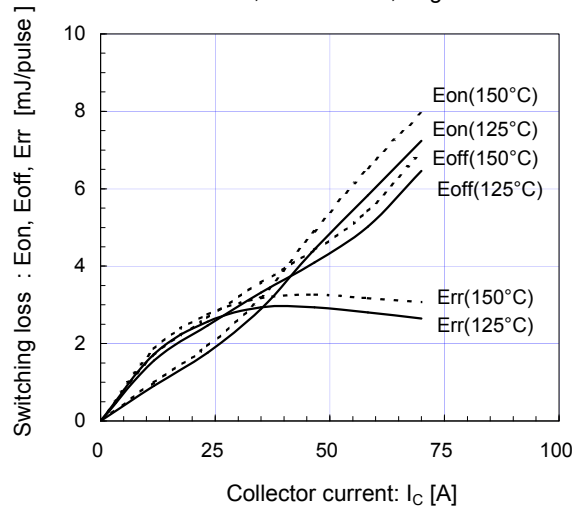
[Inverter]

Switching time vs. gate resistance (typ.)
 $V_{cc}=600V, I_c=35A, V_{GE}=\pm 15V, T_j=125^\circ C$



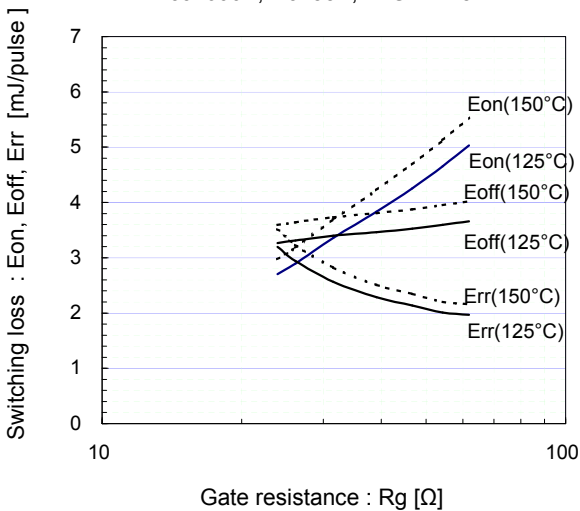
[Inverter] a

Switching loss vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_g=27\Omega$



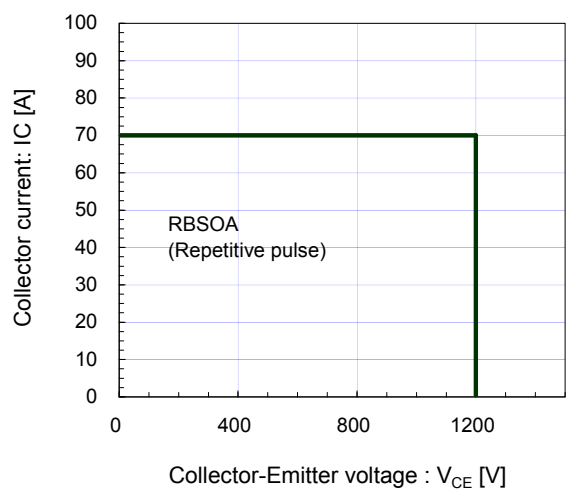
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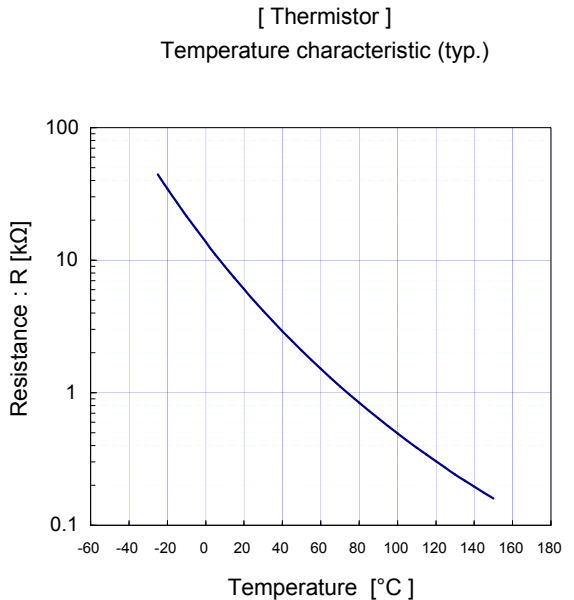
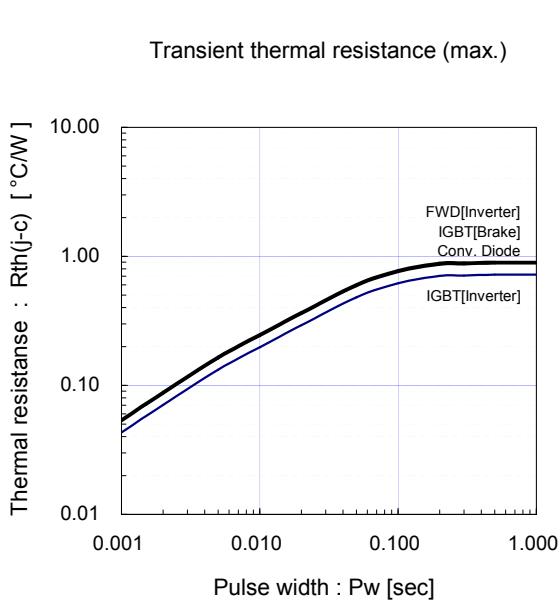
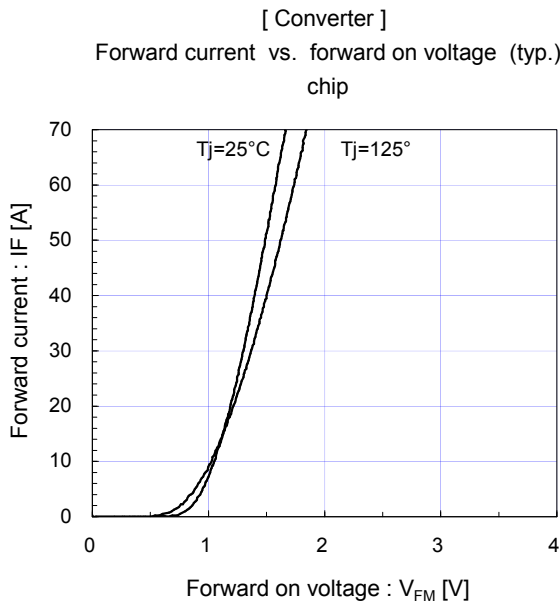
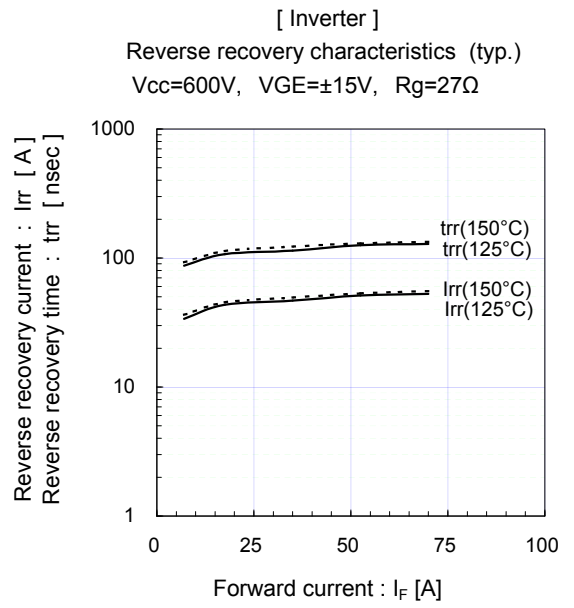
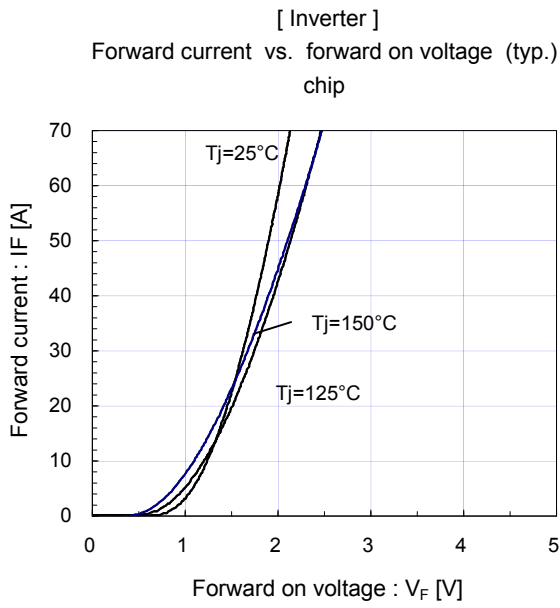
Switching loss vs. gate resistance (typ.)
 $V_{cc}=600V, I_c=35A, V_{GE}=\pm 15V$



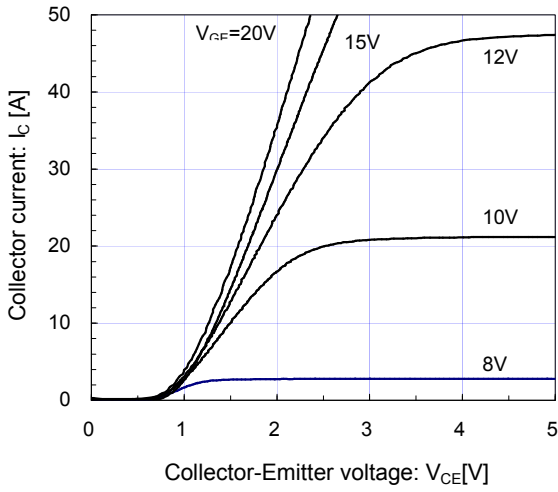
[Inverter]

Reverse bias safe operating area (max.)
 $+V_{GE}=15V, -V_{GE} \le 15V, R_g \ge 27\Omega, T_j \le 125^\circ C$

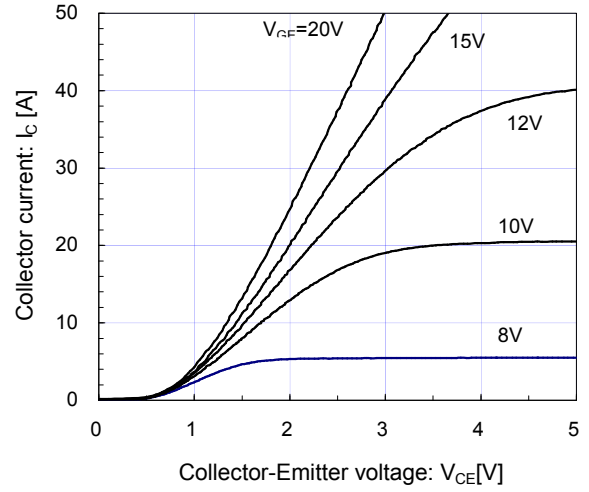




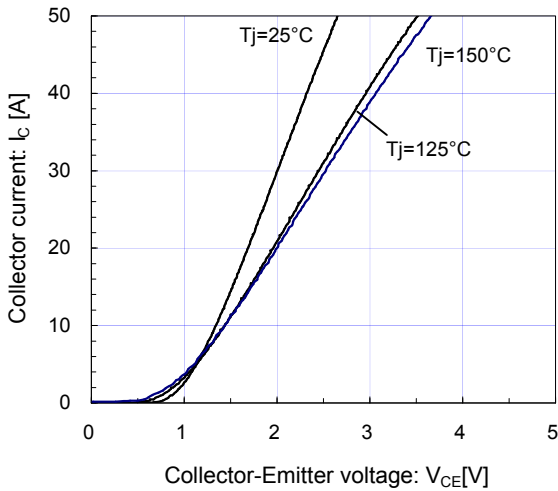
[Brake]
 Collector current vs. Collector-Emmitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



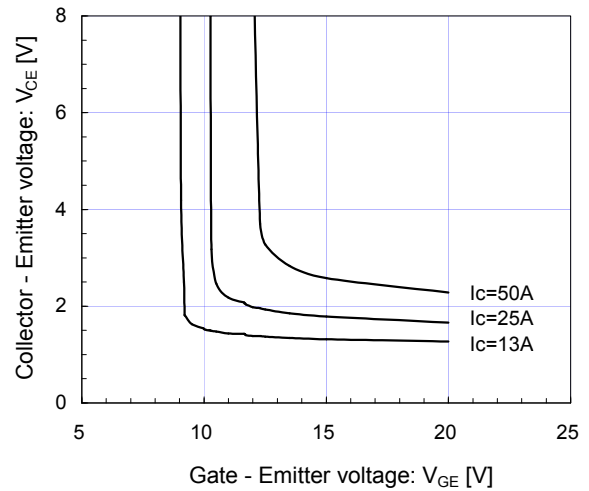
[Brake]
 Collector current vs. Collector-Emmitter voltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



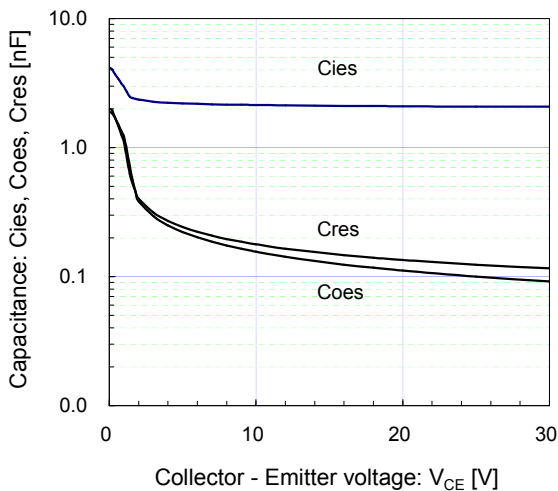
[Brake]
 Collector current vs. Collector-Emmitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



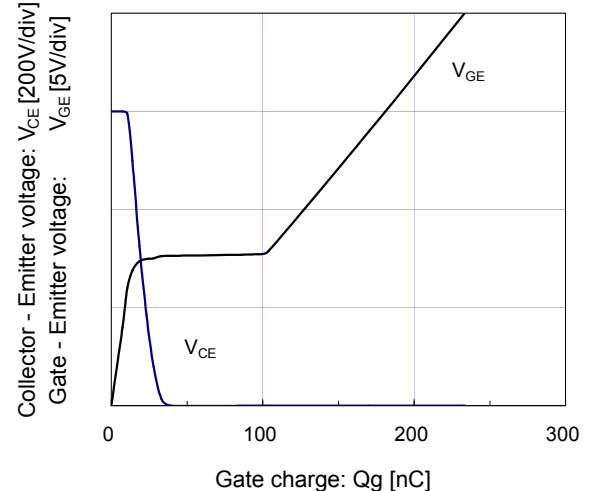
[Brake]
 Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



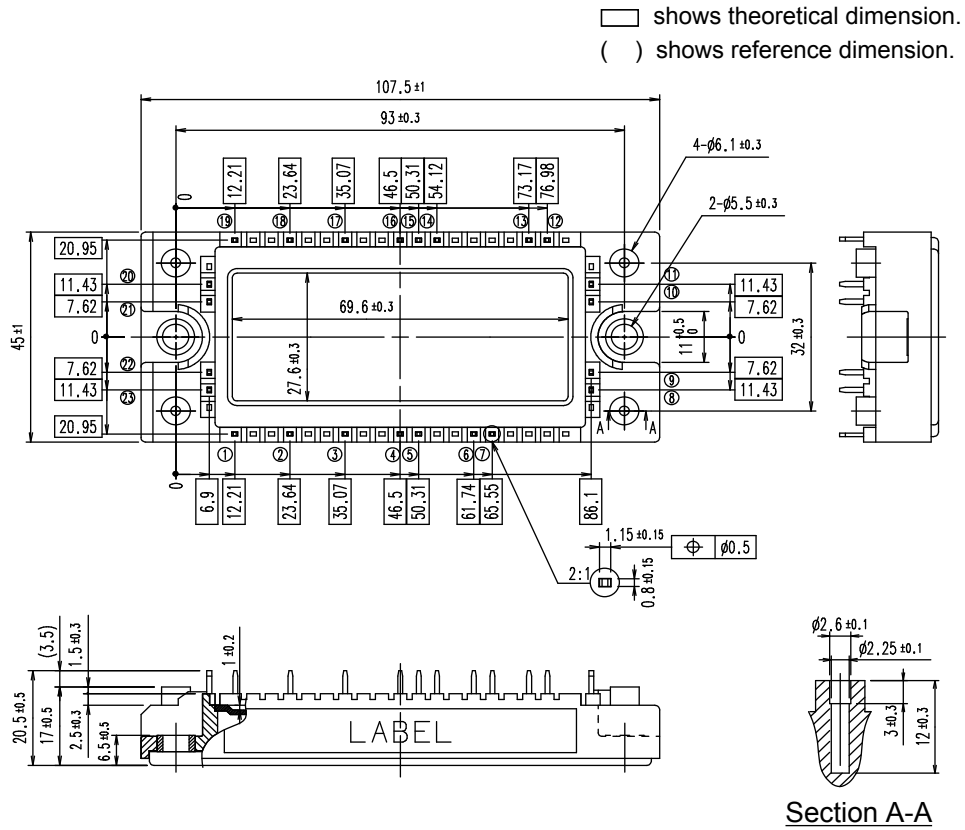
[Brake]
 Capacitance vs. Collector-Emmitter voltage (typ.)
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



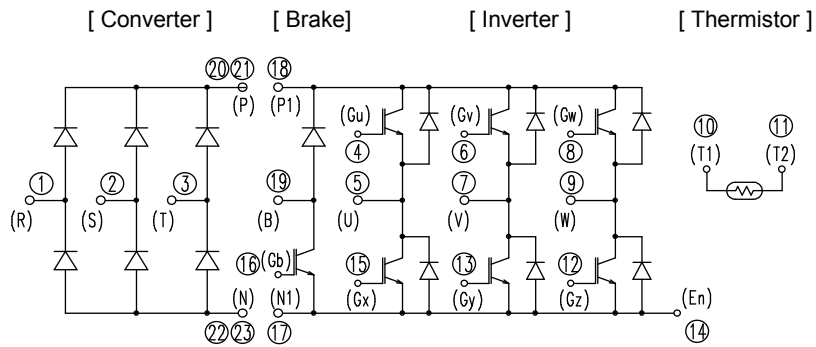
[Brake]
 Dynamic gate charge (typ.)
 $V_{CC} = 600\text{V}$, $I_c = 35\text{A}$, $T_j = 25^\circ\text{C}$



■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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