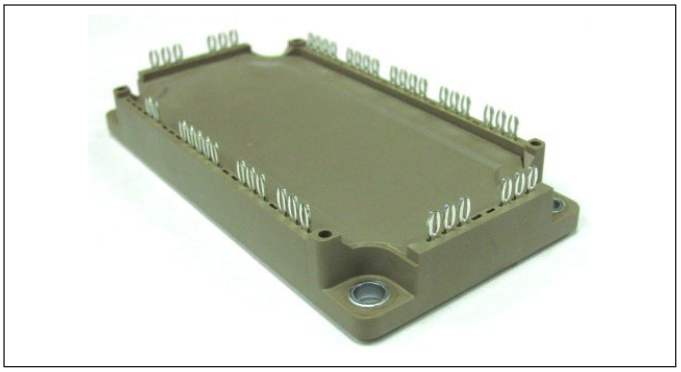
7MBR50VZ120-50

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 Tc=25°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	Ic	Continuous	Tc=100°C	50	A
		Icp	1ms	Tc=80°C	100	
		-Ic			50	
		-Ic pulse	1ms		100	
	Collector power dissipation	Pc	1 device		280	W
Brake	Collector-Emitter voltage	V_{CES}			1200	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Continuous	Tc=80°C	35	A
		I_{CP}	1ms	Tc=80°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, Tj=150°C half sine wave		360	A
	I^2t (Non-Repetitive)	I^2t			648	A^2s
Junction temperature		Tj	Inverter, Brake		175	°C
			Converter		150	
Operating junciton temperature (under switching conditions)		Tjop	Inverter, Brake		150	
			Converter		150	
Case temperature		Tc			125	
Storage temperature		Tstg			-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 Tj= 25°C unless otherwise specified)

Items		Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
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	Tj=25°C	-	2.15	2.60	V
				Tj=125°C	-	2.50	-	
				Tj=150°C	-	2.55	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 50A	Tj=25°C	-	1.85	2.30	
				Tj=125°C	-	2.20	-	
				Tj=150°C	-	2.25	-	
	Internal gate resistance	Rg(int)	-		-	4	-	Ω
	Input capacitance	Cies	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, R_G = 15Ω		-	0.39	1.20	μs
		tr			-	0.09	0.60	
		tr (i)			-	0.03	-	
	Turn-off time	toff			-	0.53	1.00	
		tf			-	0.06	0.30	
	Forward on voltage	V_F (terminal)	I_F = 50A	Tj=25°C	-	2.00	2.45	V
				Tj=125°C	-	2.15	-	
				Tj=150°C	-	2.10	-	
		V_F (chip)	I_F = 50A	Tj=25°C	-	1.70	2.15	
				Tj=125°C	-	1.85	-	
				Tj=150°C	-	1.80	-	
	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	Tj=25°C	-	2.10	2.55	V
				Tj=125°C	-	2.45	-	
				Tj=150°C	-	2.50	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 35A	Tj=25°C	-	1.85	2.30	
				Tj=125°C	-	2.20	-	
				Tj=150°C	-	2.25	-	
	Internal gate resistance	Rg(int)	-		-	0	-	Ω
	Turn-on time	ton	V_{CE} = 600V, I_C = 35A, V_{GE} = +15 / -15V, R_G = 27Ω		-	0.39	1.20	μs
		tr			-	0.09	0.60	
	Turn-off time	toff			-	0.53	1.00	
		tf			-	0.06	0.30	
	Reverse current	I_{RRM}	V_R = 1200V		-	-	1.00	mA
Converter	Forward on voltage	V_{FM} (chip)	I_F = 50A	terminal	-	1.65	2.10	V
				chip	-	1.35	-	
	Reverse current	I_{RRM}	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

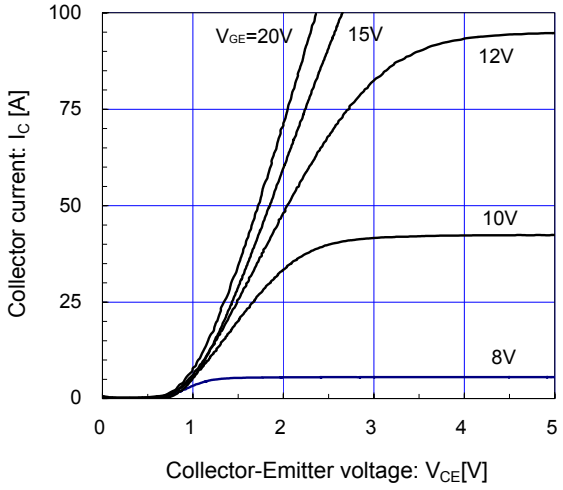
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance (1device)	Rth(j-c)	Inverter IGBT	-	-	0.54	°C/W
		Inverter FWD	-	-	0.73	
		Brake IGBT	-	-	0.72	
		Converter Diode	-	-	0.54	
Contact thermal resistance (1device) (*4)	Rth(c-f)	with Thermal Compound	-	0.05	-	

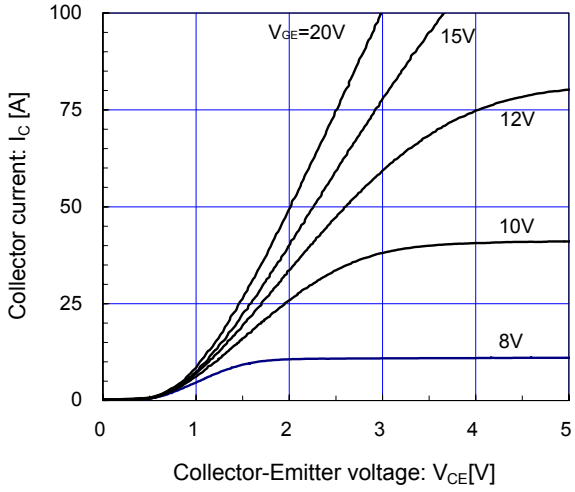
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

Characteristics (Representative)

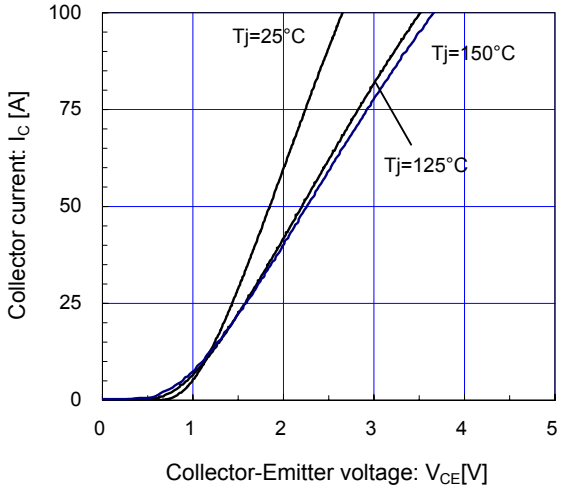
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



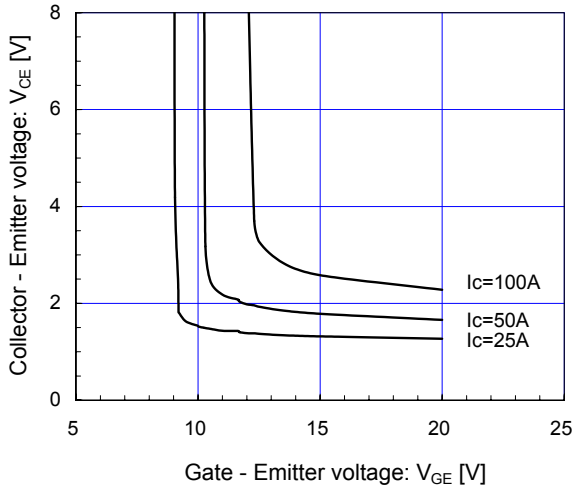
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



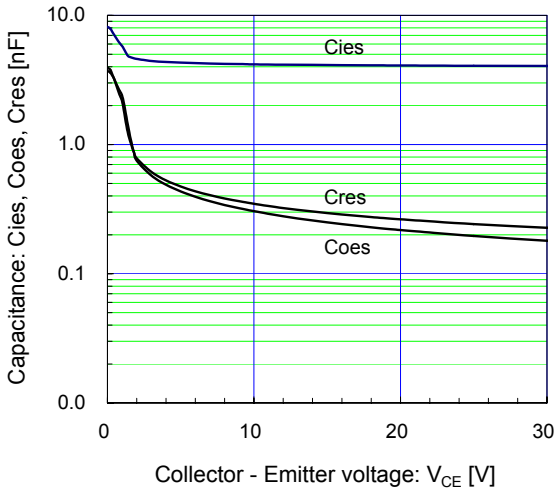
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}=15V / chip



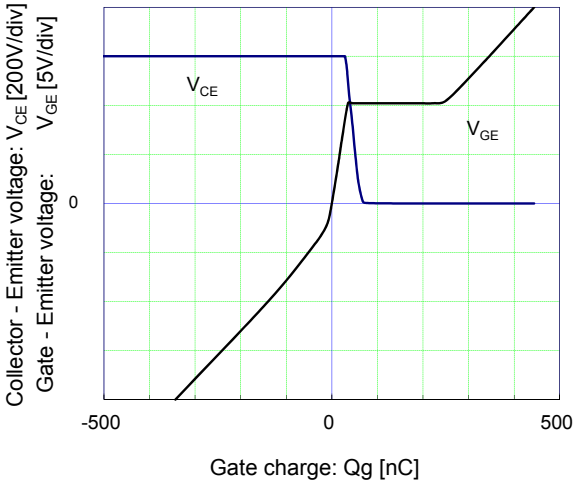
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



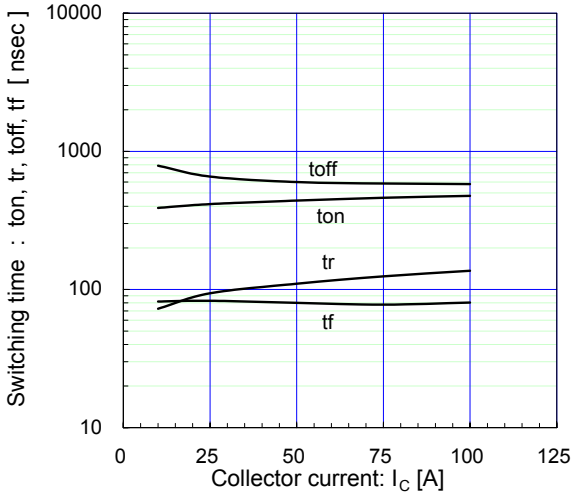
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
V_{GE}=0V, f= 1MHz, Tj= 25°C



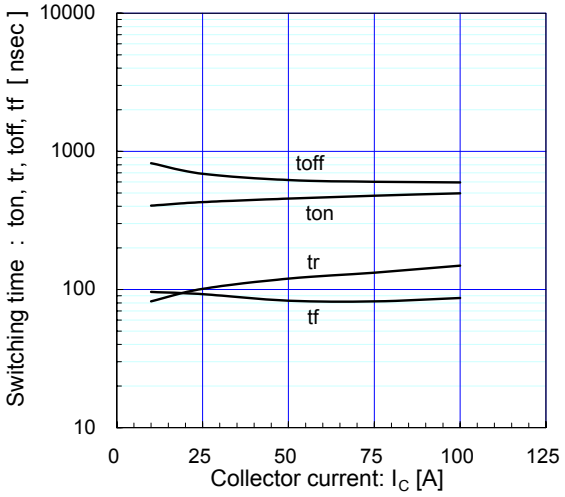
[Inverter]
Dynamic gate charge (typ.)
Vcc=600V, Ic=50A, Tj= 25°C



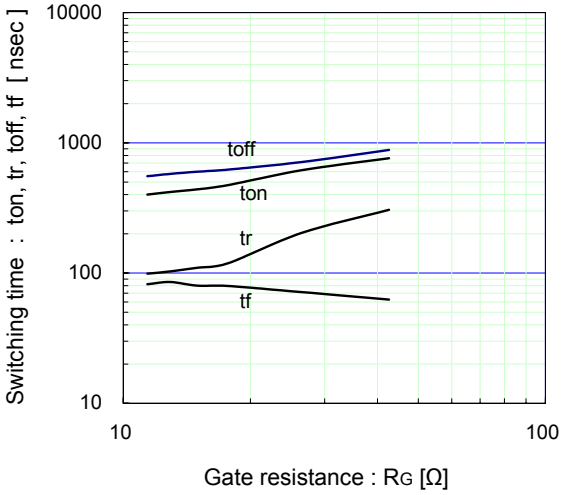
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, R_G=15Ω, Tj= 125°C



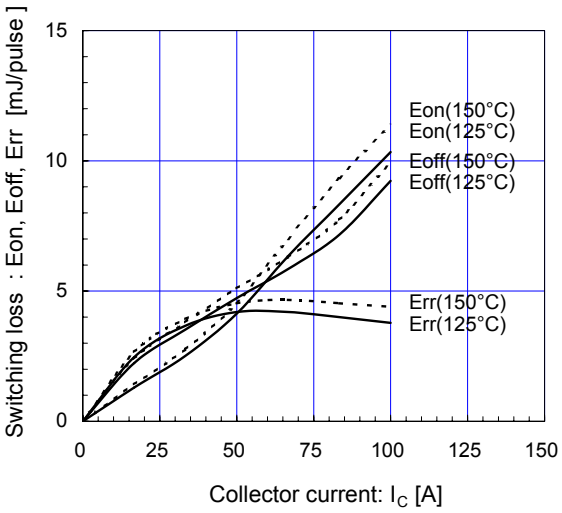
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, R_G=15Ω, Tj= 150°C



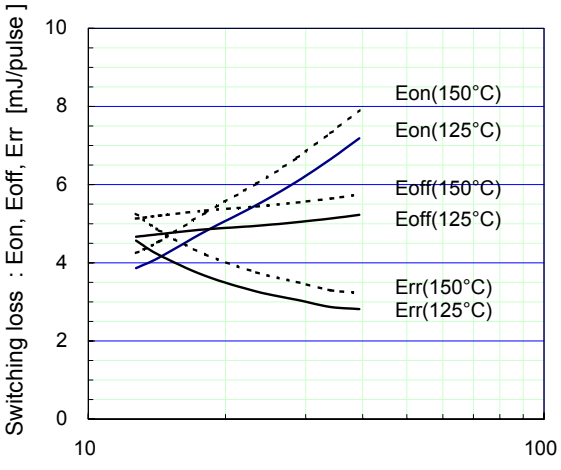
[Inverter]
Switching time vs. gate resistance (typ.)
Vcc=600V, Ic=50A, V_{GE}=±15V, Tj= 125°C



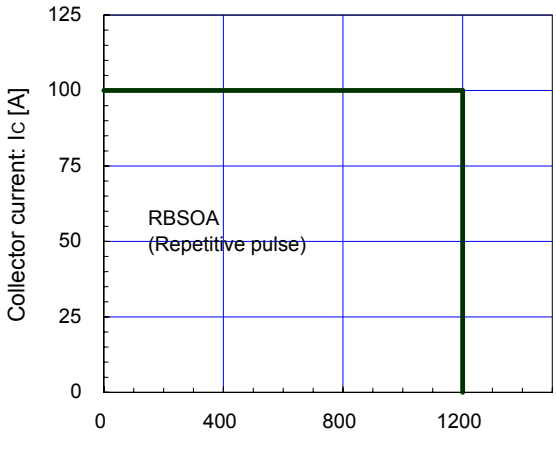
[Inverter]
Switching loss vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, R_G=15Ω



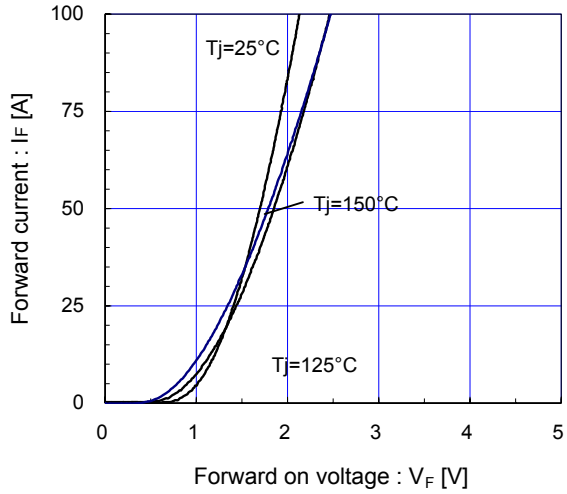
[Inverter]
Switching loss vs. gate resistance (typ.)
Vcc=600V, Ic=50A, V_{GE}=±15V



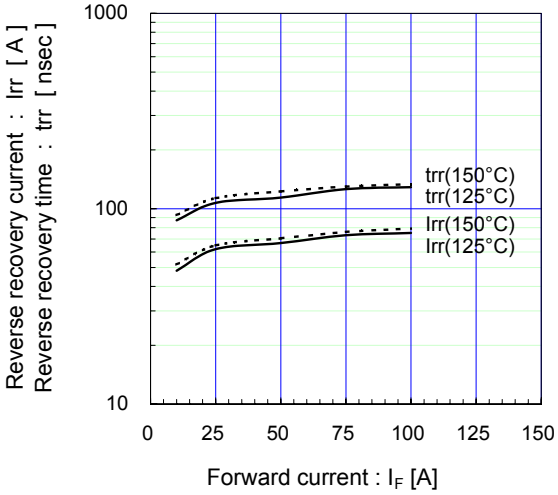
[Inverter]
Reverse bias safe operating area (max.)
+V_{GE}=15V, -V_{GE} <= 15V, R_G >= 15Ω, Tj =150°C



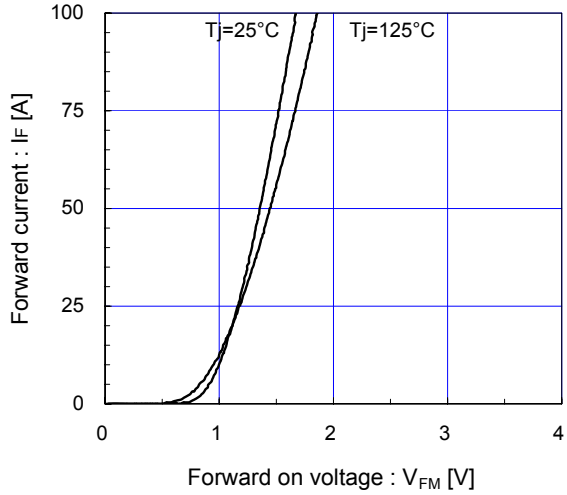
[Inverter]
Forward current vs. forward on voltage (typ.)
chip



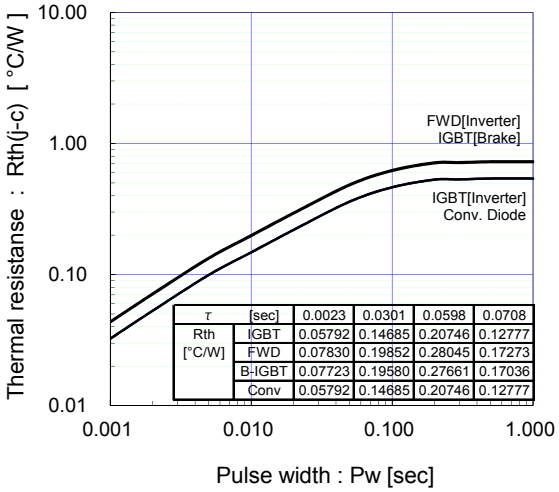
[Inverter]
Reverse recovery characteristics (typ.)
Vcc=600V, VGE=±15V, Rg=15Ω



[Converter]
Forward current vs. forward on voltage (typ.)
chip

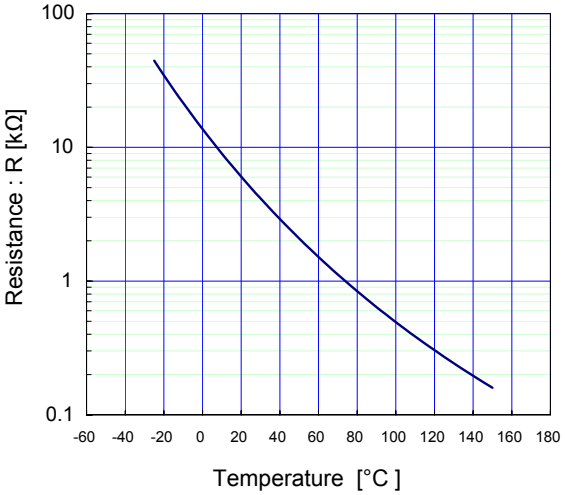


Transient thermal resistance (max.)

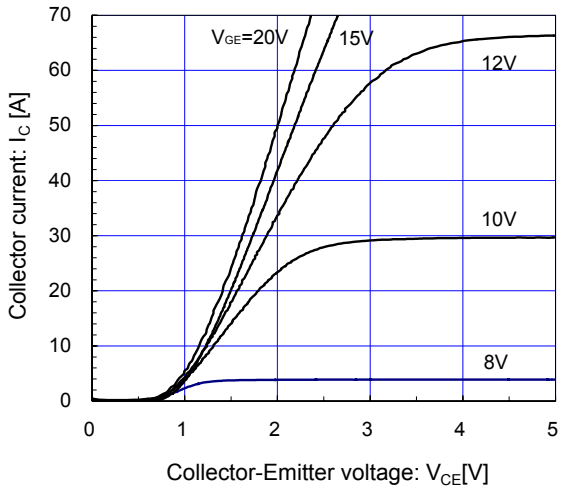


τ	[sec]	0.0023	0.0301	0.0598	0.0708
Rth [°C/W]	IGBT	0.05792	0.14685	0.20746	0.12777
	FWD	0.07830	0.19852	0.28045	0.17273
	B-IGBT	0.07723	0.19580	0.27661	0.17036
	Conv	0.05792	0.14685	0.20746	0.12777

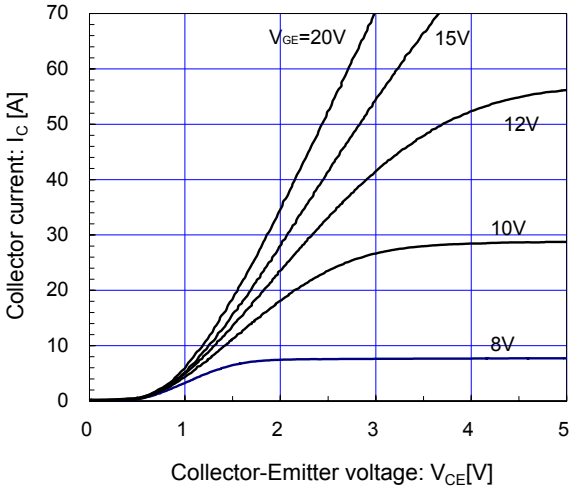
[Thermistor]
Temperature characteristic (typ.)



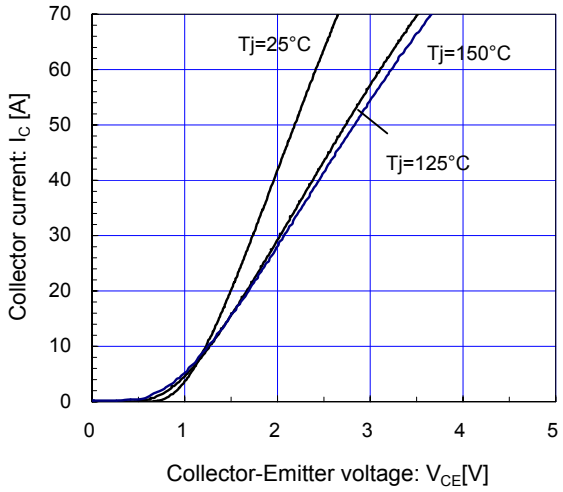
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



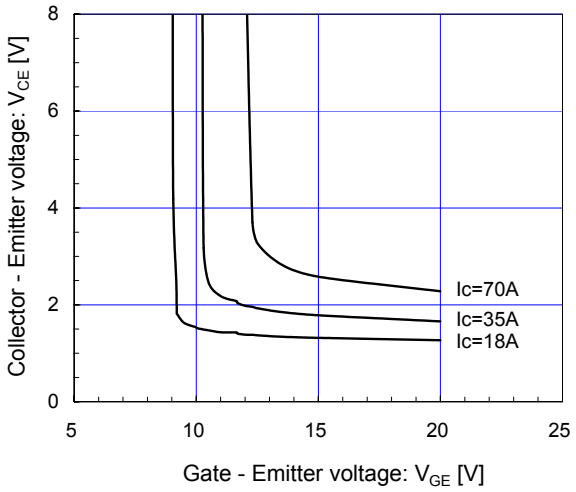
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



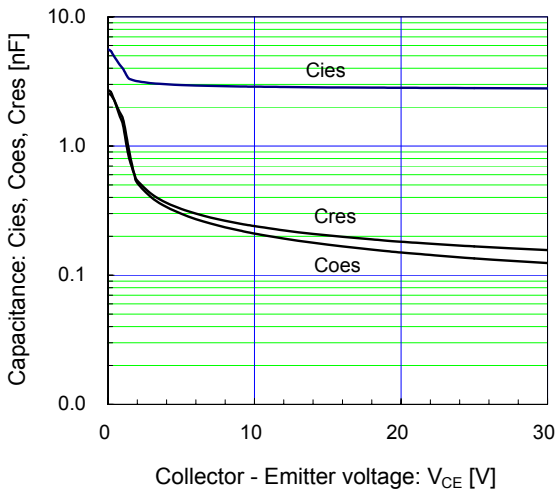
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



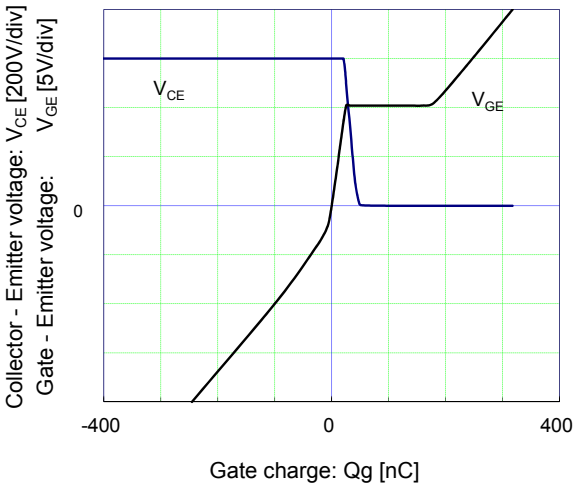
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



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

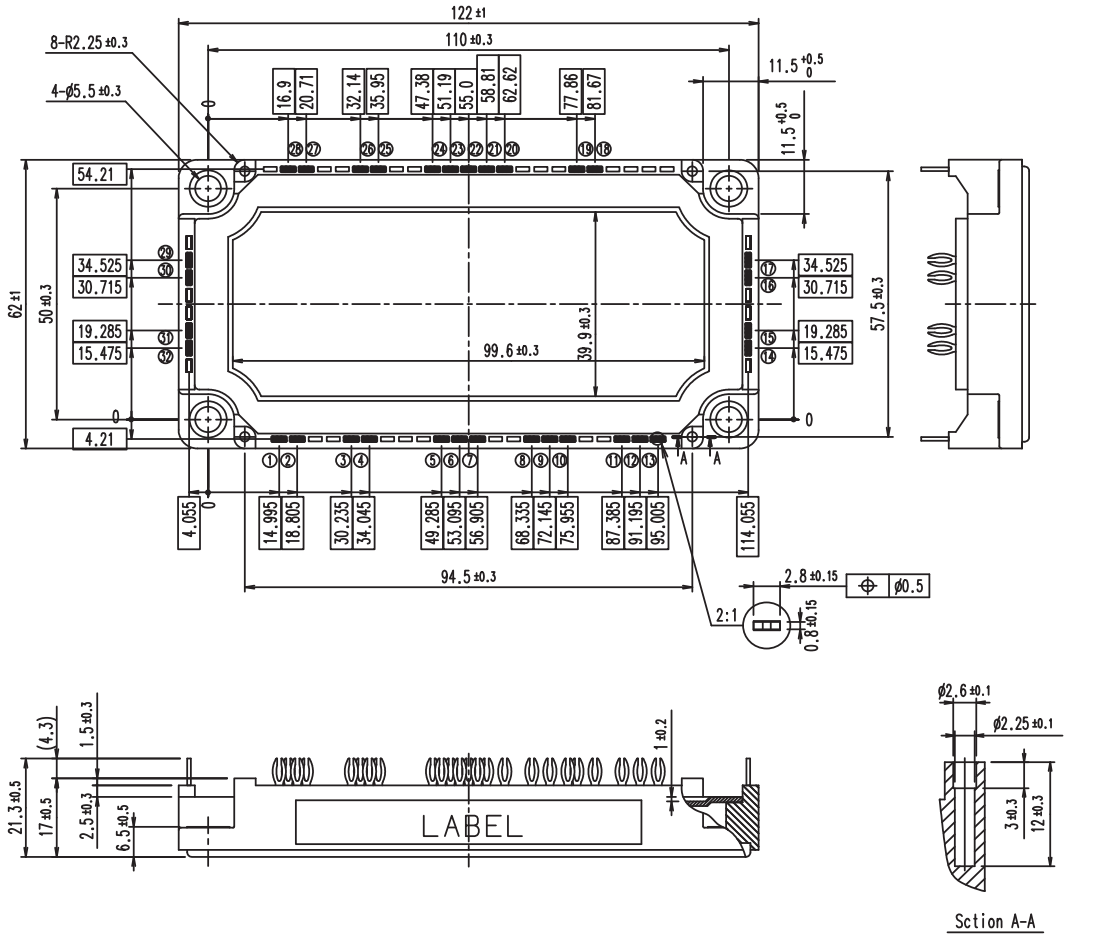


[Brake]
Dynamic gate charge (typ.)
Vcc=600V, Ic=35A, Tj= 25°C



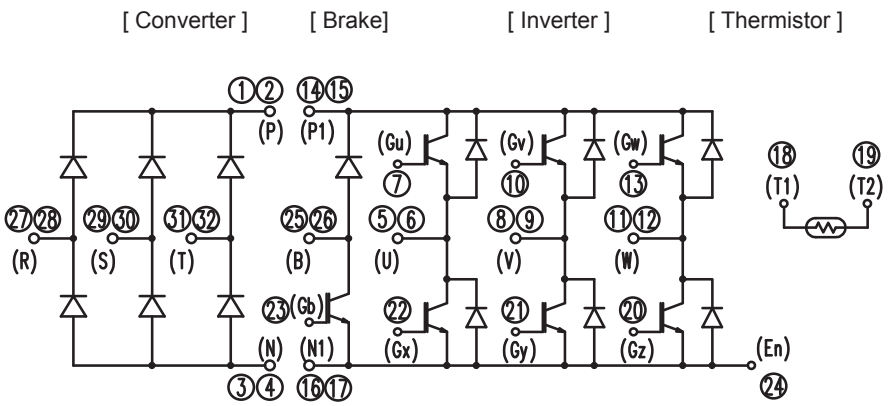
■ Outline Drawings (Unit: mm)

shows theoretical dimension.
( ) shows reference dimension.



Weight: 310g (typ.)

■ Equivalent Circuit



WARNING

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The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.

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• Machine tools • Audiovisual equipment • Electrical home appliances • Personal equipment • Industrial robots etc.

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• Traffic-signal control equipment • Gas leakage detectors with an auto-shut-off feature
• Emergency equipment for responding to disasters and anti-burglary devices • Safety devices
• Medical equipment

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• Submarine repeater equipment

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