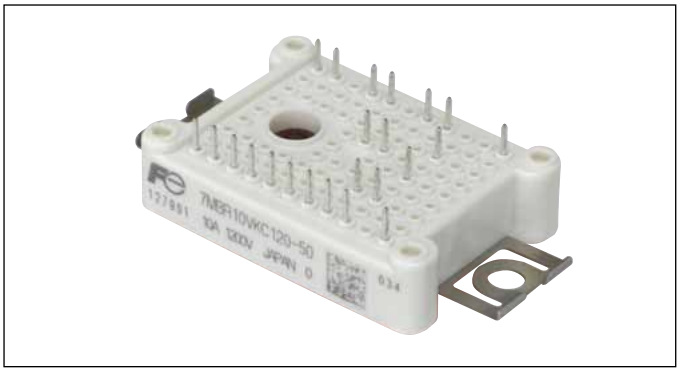
7MBR10VKC060-50

IGBT Modules

IGBT MODULE (V series)
600V / 10A / 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}			600	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_c	Continuous	T_C=100°C	10	A
		I_{cp}	1ms	T_C=80°C	20	
		$-I_c$			10	
		$-I_{c\ pulse}$	1ms		20	
	Collector power dissipation	P_C	1 device		70	W
Brake	Collector-Emitter voltage	V_{CES}			600	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_C	Continuous	T_C=80°C	10	A
		I_{CP}	1ms	T_C=80°C	20	
	Collector power dissipation	P_C	1 device		70	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		10	A
	Surge current (Non-Repetitive)	I_{FSM}	10ms, T_j=150°C half sine wave		360	A
	I^2t (Non-Repetitive)	I^2t			660	A^2s
Junction temperature		T_j	Inverter, Brake		175	˚C
			Converter		150	
Operating junciton 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)	-	M4		1.7	Nm

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 : 1.3-1.7 Nm (M4)

● 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} = 600V		-	-	1.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	200	nA
	Gate-Emitter threshold voltage	$V_{GE\ (th)}$	V_{CE} = 20V, I_C = 10mA		6.2	6.7	7.2	V
	Collector-Emitter saturation voltage	$V_{CE\ (sat)}$ (terminal)	V_{GE} = 15V, I_C = 10A	Tj=25°C	-	1.80	2.20	V
				Tj=125°C	-	2.20	-	
				Tj=150°C	-	2.30	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 10A	Tj=25°C	-	1.70	2.10	
				Tj=125°C	-	2.10	-	
				Tj=150°C	-	2.20	-	
	Internal gate resistance	$Rg_{(int)}$	-		-	0	-	Ω
	Input capacitance	Cies	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz		-	0.7	-	nF
	Turn-on time	ton	V_{CC} = 600V, I_C = 10A, V_{GE} = +15 / -15V, R_G = 27Ω		-	0.08	1.20	μs
		tr			-	0.06	0.60	
		tr (i)			-	0.02	-	
	Turn-off time	toff			-	0.14	1.20	
		tf			-	0.02	0.45	
	Forward on voltage	V_F (terminal)	I_F = 10A	Tj=25°C	-	1.85	2.25	V
				Tj=125°C	-	1.80	-	
				Tj=150°C	-	1.80	-	
		V_F (chip)	I_F = 10A	Tj=25°C	-	1.75	2.15	
				Tj=125°C	-	1.70	-	
				Tj=150°C	-	1.70	-	
	Reverse recovery time	trr	I_F = 10A		-	-	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 = 10A	Tj=25°C	-	1.80	2.20	V
				Tj=125°C	-	2.20	-	
				Tj=150°C	-	2.30	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 10A	Tj=25°C	-	1.70	2.10	
				Tj=125°C	-	2.10	-	
				Tj=150°C	-	2.20	-	
	Internal gate resistance	$Rg_{(int)}$	-		-	0	-	Ω
	Turn-on time	ton	V_{CE} = 600V, I_C = 10A, V_{GE} = +15 / -15V, R_G = 27Ω		-	0.08	1.20	μs
		tr			-	0.06	0.60	
	Turn-off time	toff			-	0.14	1.20	
		tf			-	0.02	0.45	
	Reverse current	IRRM	V_R = 600V		-	-	1.0	mA
Converter	Forward on voltage	V_{FM}	I_F = 10A	terminal	-	1.05	1.50	V
				chip	-	0.95	-	
	Reverse current	IRRM	V_R = 800V		-	-	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

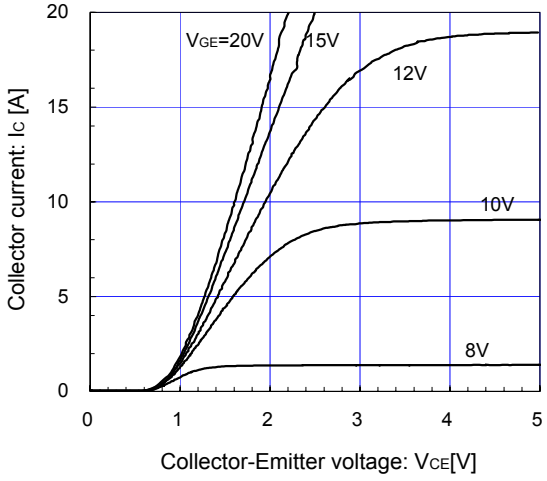
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	2.15	˚C/W
		Inverter FWD	-	-	2.96	
		Brake IGBT	-	-	2.15	
		Converter Diode	-	-	1.35	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	with Thermal Compound	-	0.05	-	

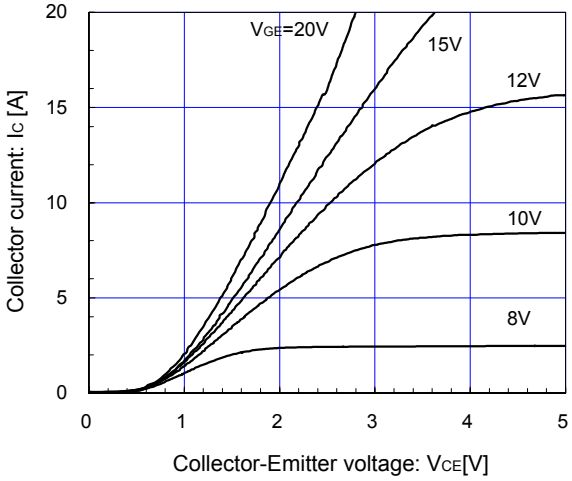
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

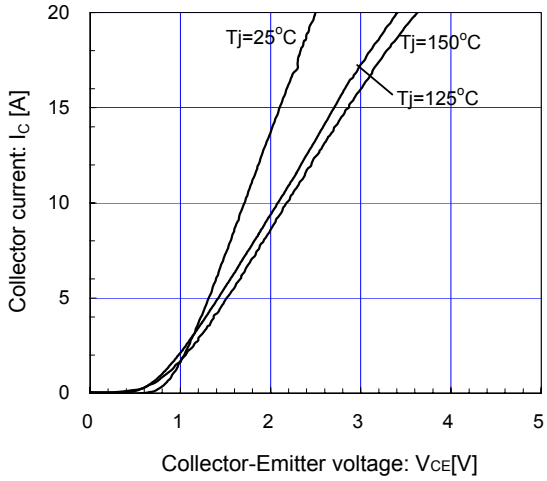
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



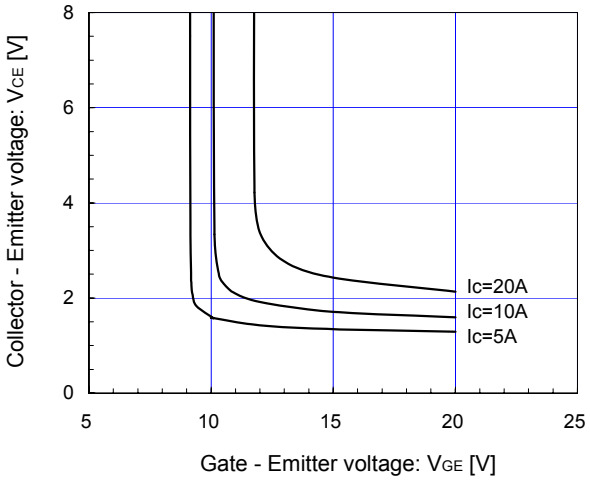
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



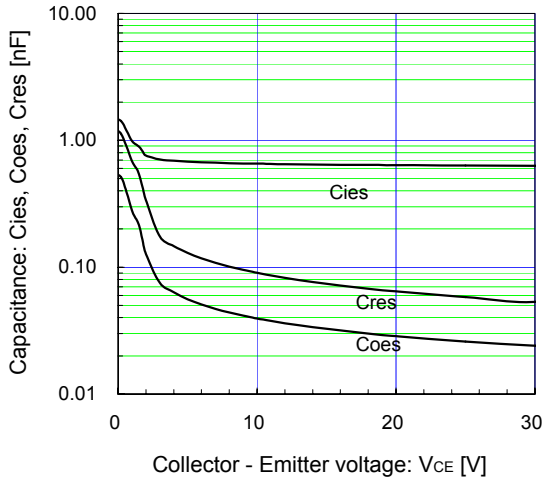
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



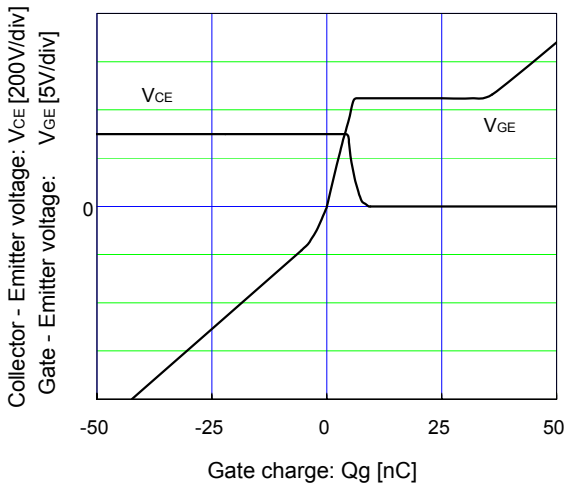
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



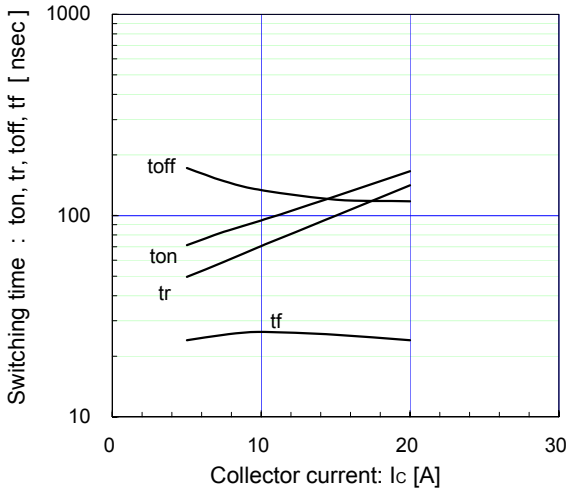
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



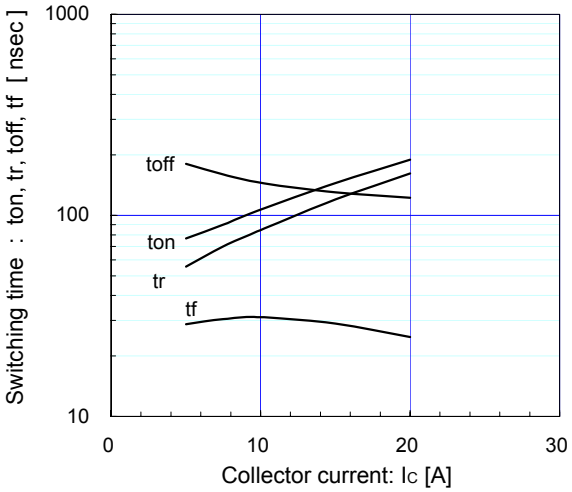
[Inverter]
Dynamic gate charge (typ.)
Vcc=300V, Ic=10A, Tj= 25°C



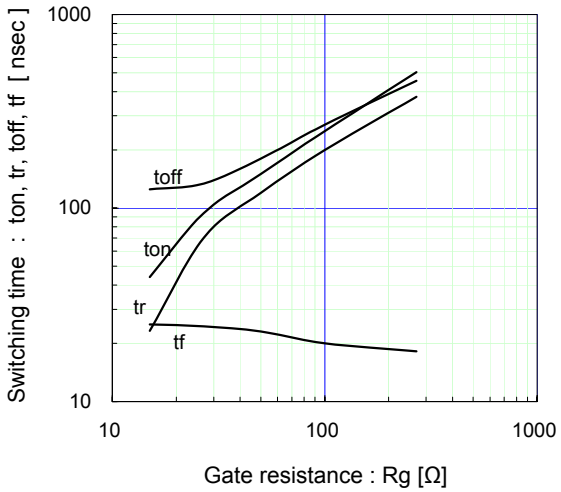
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=27Ω, Tj= 125°C



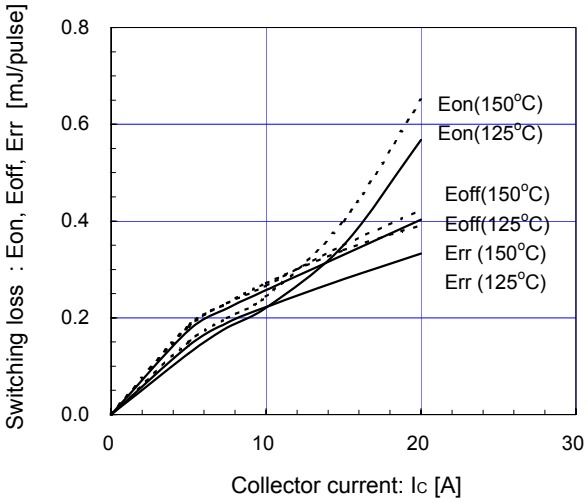
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=27Ω, Tj= 150°C



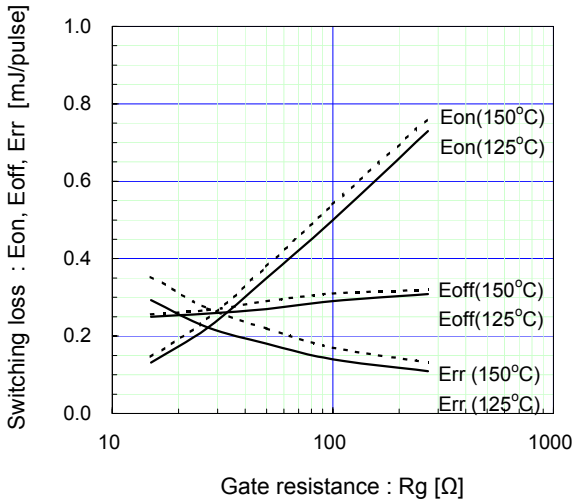
[Inverter]
Switching time vs. gate resistance (typ.)
Vcc=300V, Ic=10A, V_{GE}=±15V, Tj= 125°C



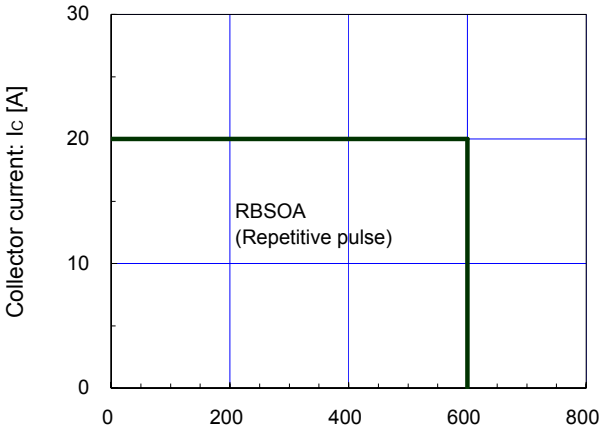
[Inverter]
Switching loss vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=27Ω



[Inverter]
Switching loss vs. gate resistance (typ.)
Vcc=300V, Ic=10A, V_{GE}=±15V

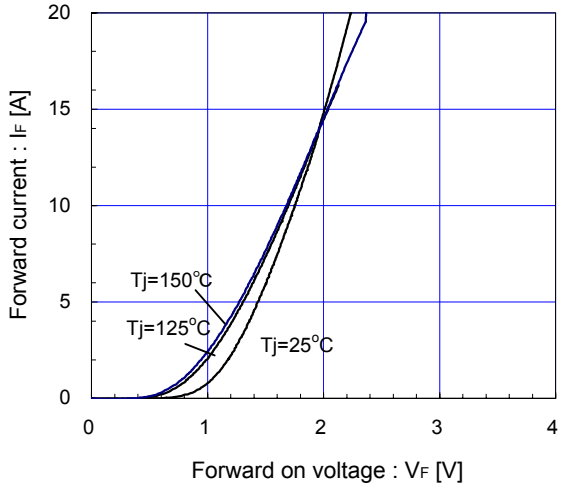


[Inverter]
Reverse bias safe operating area (max.)
+V_{GE}=15V,-V_{GE} <= 15V, R_G >= 27Ω ,Tj = 150°C

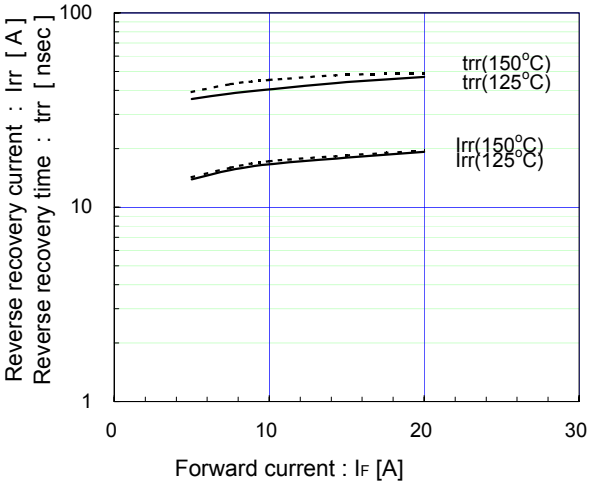


(Main terminals)

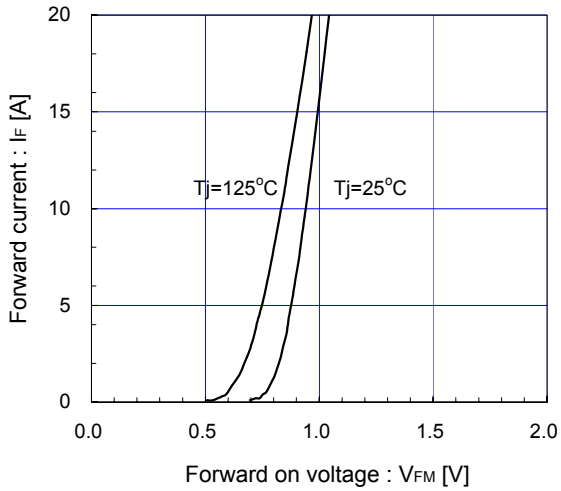
[Inverter]
Forward current vs. forward on voltage (typ.)
chip



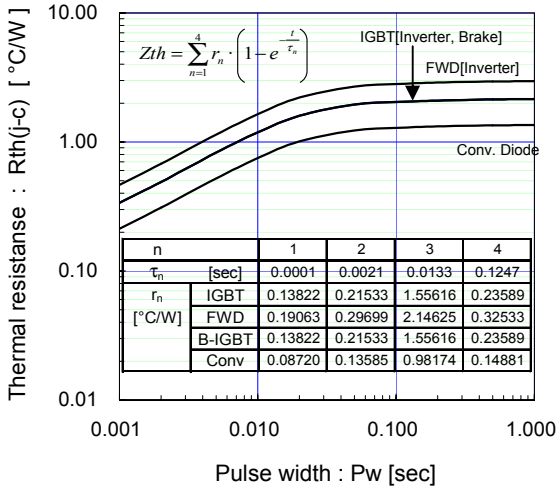
[Inverter]
Reverse recovery characteristics (typ.)
Vcc=300V, VGE=±15V, Rg=27Ω



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

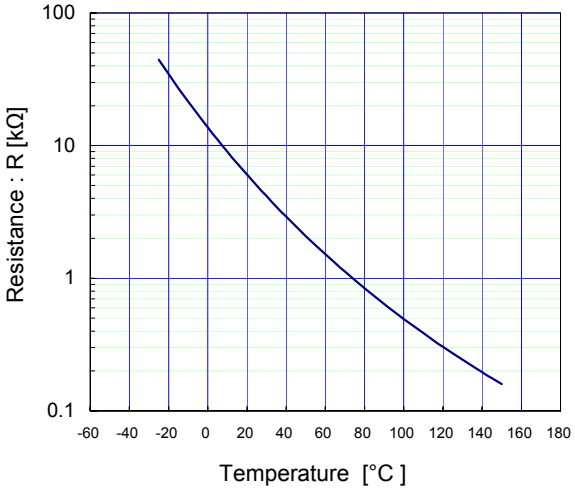


Transient thermal resistance (max.)

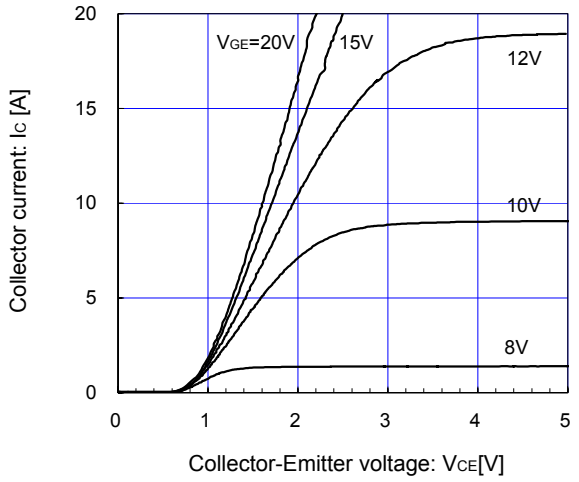


n		1	2	3	4
τ_n	[sec]	0.0001	0.0021	0.0133	0.1247
r_n [°C/W]	IGBT	0.13822	0.21533	1.55616	0.23589
	FWD	0.19063	0.29699	2.14625	0.32533
	B-IGBT	0.13822	0.21533	1.55616	0.23589
	Conv	0.08720	0.13585	0.98174	0.14881

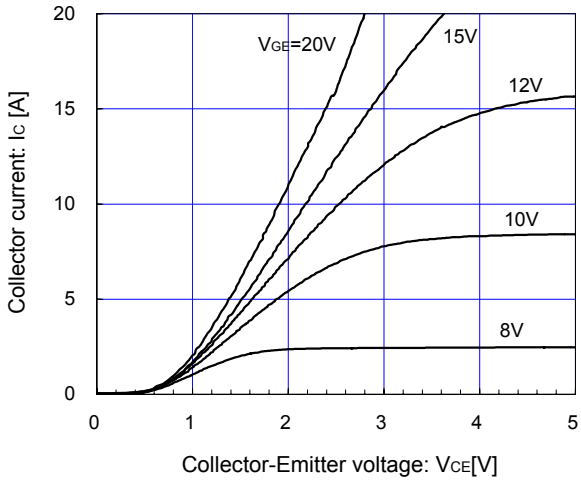
[Thermistor]
Temperature characteristic (typ.)



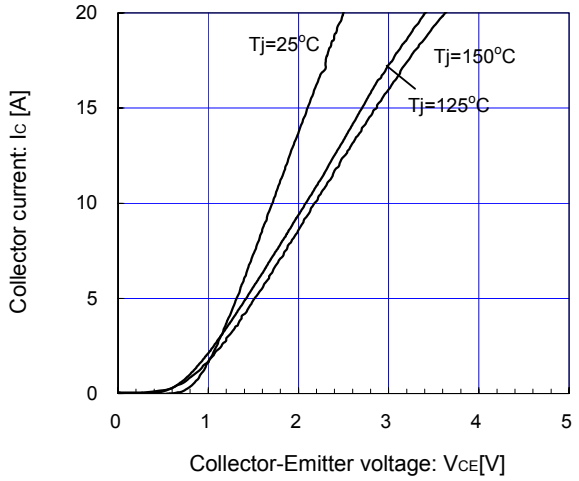
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



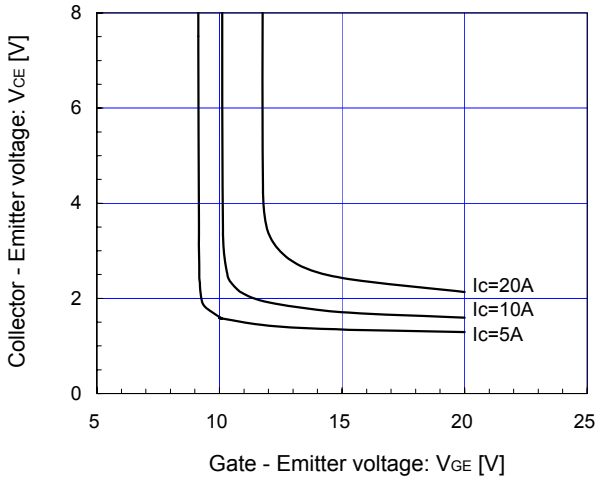
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



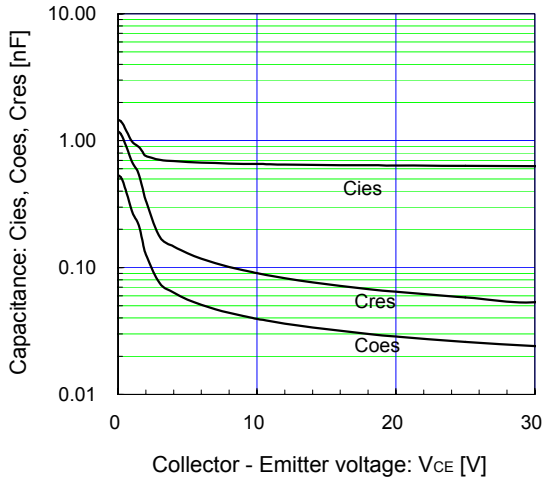
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



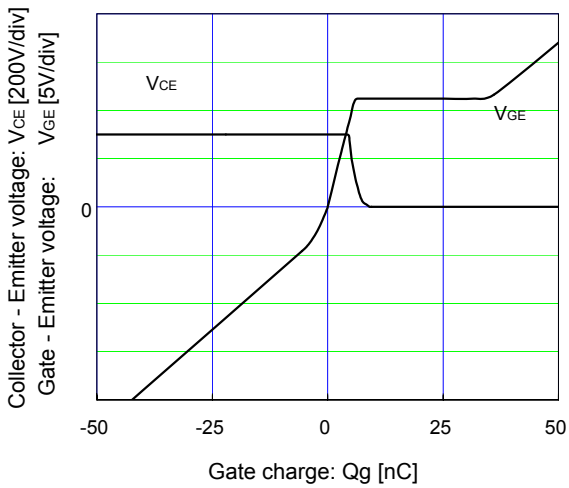
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



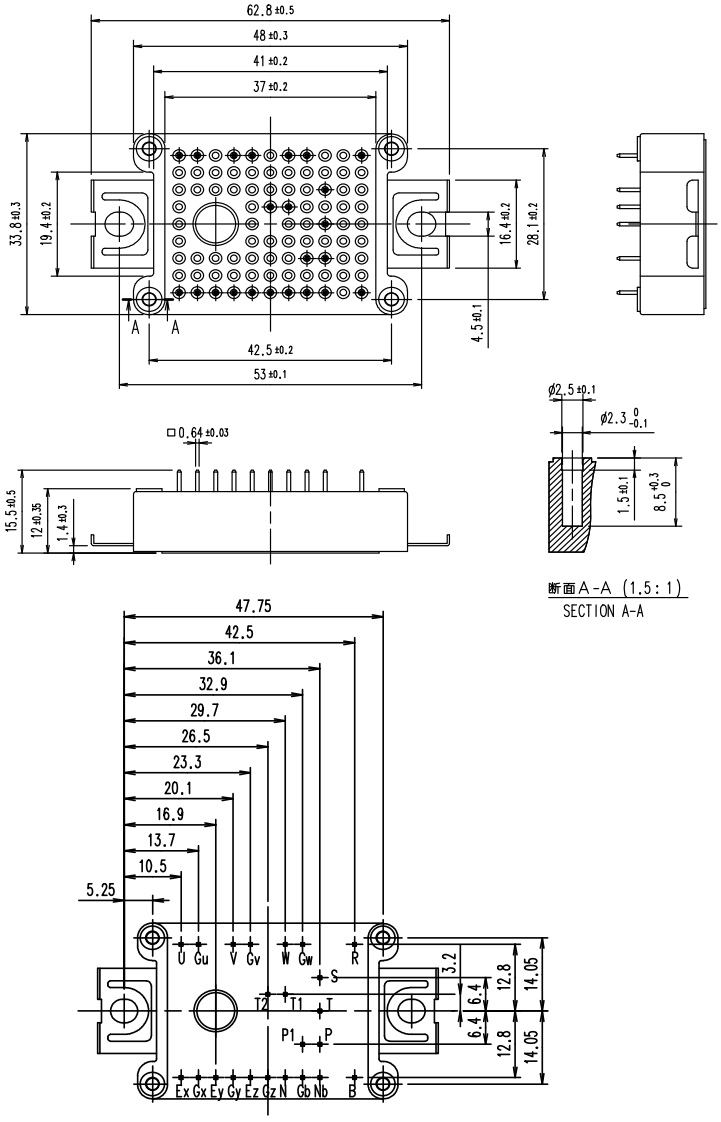
[Brake]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



[Brake]
Dynamic gate charge (typ.)
Vcc=300V, Ic=10A, Tj= 25°C



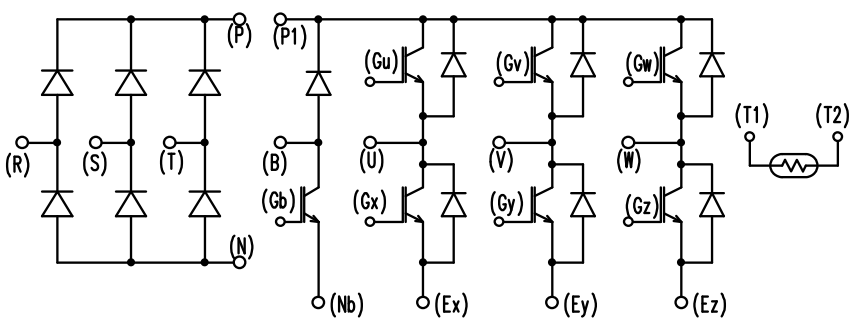
■ Outline Drawings, mm



Weight: 25g(typ.)

■ Equivalent Circuit Schematic

[Converter] [Brake] [Inverter] [Thermistor]



WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of November 2013.
   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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4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
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   - OA equipment
   - Communications equipment (terminal devices)
   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
   - Transportation equipment (mounted on cars and ships)
   - Trunk communications equipment
   - 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

6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
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   - Aeronautic equipment
   - Nuclear control equipment
   - Submarine repeater equipment

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富士電機

Innovating Energy Technology

Technical Information

IGBT Modules

- Please refer to URLs below for futher information about products, application manuals and technical documents.
- 关于本规格书中没有记载的产品信息，应用手册，技术资料等，请参考以下链接。
- 本データシートに記載されていない製品情報，アプリケーションマニュアル，技術資料は以下の URL をご参照下さい。

FUJI ELECTRIC Power Semiconductor WEB site

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3 Application Manuals	www.fujielectric.com/products/semiconductor/model/igbt/application/
4 Technical Documents	www.fujielectric.com/products/semiconductor/model/igbt/technical/
5 Mounting Instructions	www.fujielectric.com/products/semiconductor/model/igbt/mounting/
6 IGBT Loss Simulation Software	www.fujielectric.com/products/semiconductor/model/igbt/simulation/
7 AT-NPC 3-Level Loss Simulation Software	www.fujielectric.com/products/semiconductor/model/igbt/simulation_3level/
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