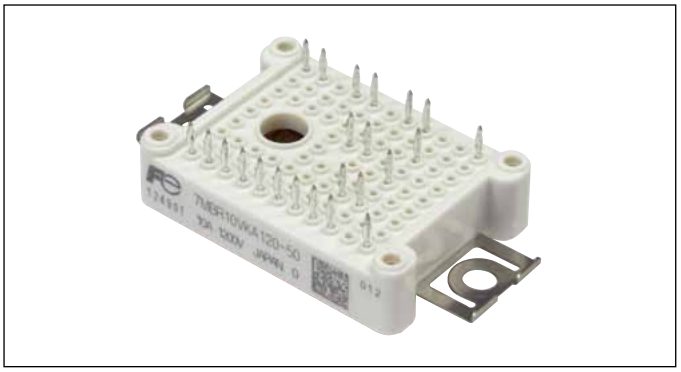
7MBR15VKA060-50

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	15	A
		I_{cp}	1ms	T_C=80°C	30	
		$-I_c$			15	
		$-I_{c\ pulse}$	1ms		30	
	Collector power dissipation	P_C	1 device		85	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	15	A
		I_{CP}	1ms	T_C=80°C	30	
	Collector power dissipation	P_C	1 device		85	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		15	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 = 15mA		6.2	6.7	7.2	V
	Collector-Emitter saturation voltage	$V_{CE\ (sat)}$ (terminal)	V_{GE} = 15V, I_C = 15A	Tj=25°C	-	1.95	2.35	V
				Tj=125°C	-	2.35	-	
				Tj=150°C	-	2.45	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 15A	Tj=25°C	-	1.75	2.15	
				Tj=125°C	-	2.15	-	
				Tj=150°C	-	2.25	-	
	Internal gate resistance	$Rg_{(int)}$	-			0	-	Ω
	Input capacitance	Cies	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz		-	0.9	-	nF
	Turn-on time	ton	V_{CC} = 300V, I_C = 15A, V_{GE} = +15 / -15V, R_G = 22Ω		-	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 = 15A	Tj=25°C	-	1.95	2.35	V
				Tj=125°C	-	1.90	-	
				Tj=150°C	-	1.90	-	
		V_F (chip)	I_F = 15A	Tj=25°C	-	1.75	2.15	
				Tj=125°C	-	1.70	-	
				Tj=150°C	-	1.70	-	
	Reverse recovery time	trr	I_F = 15A		-	-	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 = 15A	Tj=25°C	-	1.95	2.35	V
				Tj=125°C	-	2.35	-	
				Tj=150°C	-	2.45	-	
		$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 15A	Tj=25°C	-	1.75	2.15	
				Tj=125°C	-	2.15	-	
				Tj=150°C	-	2.25	-	
	Internal gate resistance	$Rg_{(int)}$	-			0	-	Ω
	Turn-on time	ton	V_{CE} = 300V, I_C = 15A, V_{GE} = +15 / -15V, R_G = 22Ω		-	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		-	-	1.00	mA
Converter	Forward on voltage	V_{FM}	I_F = 15A	terminal	-	1.20	1.65	V
				chip	-	1.00	-	
	Reverse current	IRRM	V_R = 800V		-	-	1.00	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

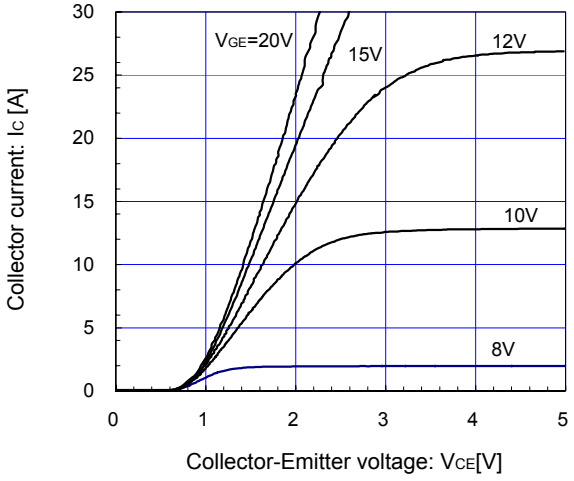
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	1.80	˚C/W
		Inverter FWD	-	-	2.31	
		Brake IGBT	-	-	1.80	
		Converter Diode	-	-	1.35	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	Inverter IGBT	-	0.78	-	
		Inverter FWD	-	0.91	-	
		Brake IGBT	-	0.82	-	
		Converter Diode	-	0.77	-	

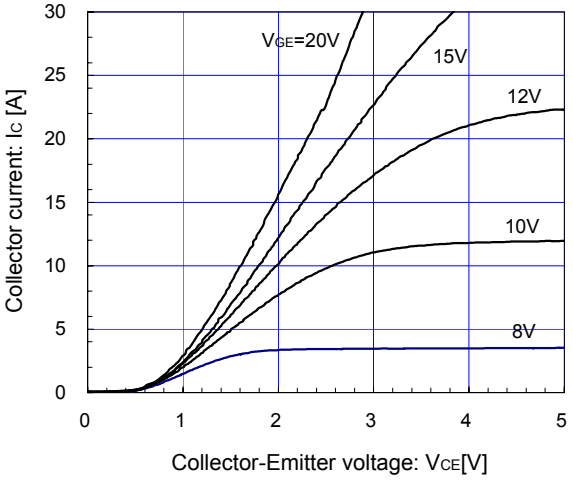
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

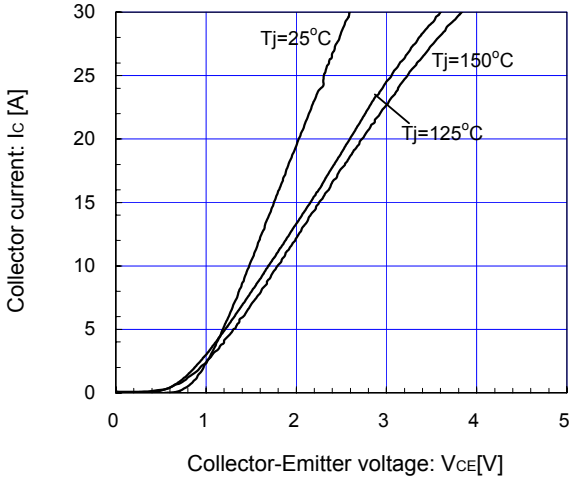
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



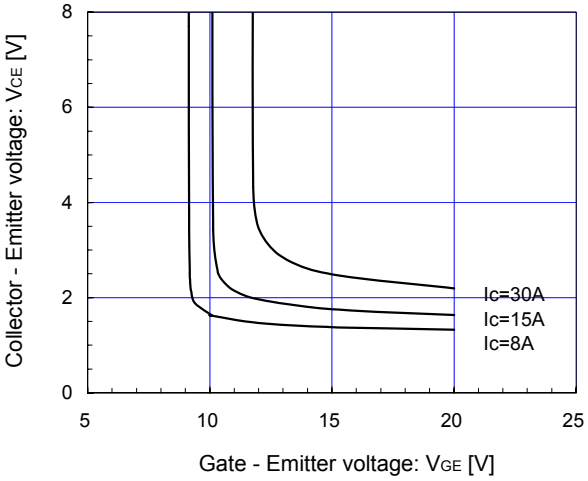
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



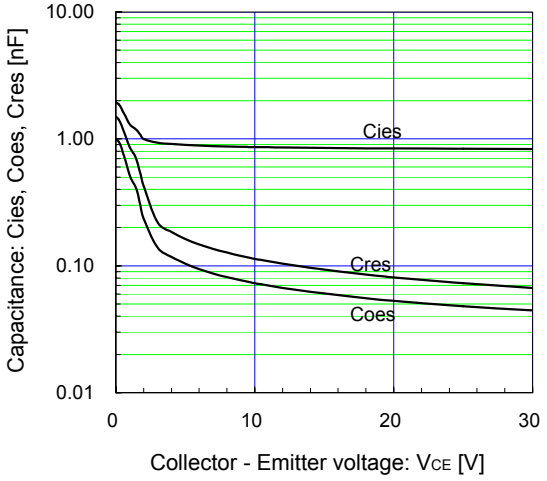
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



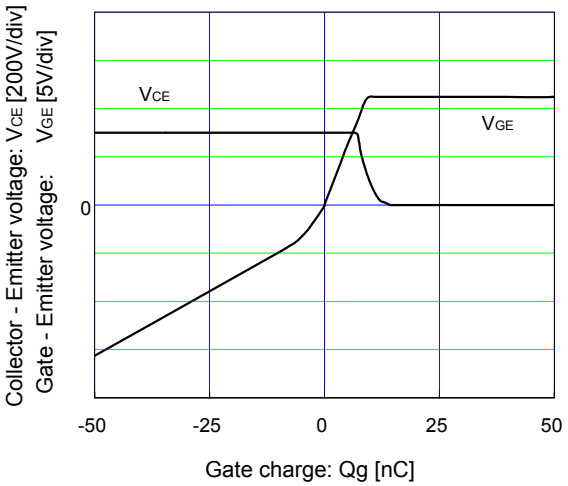
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



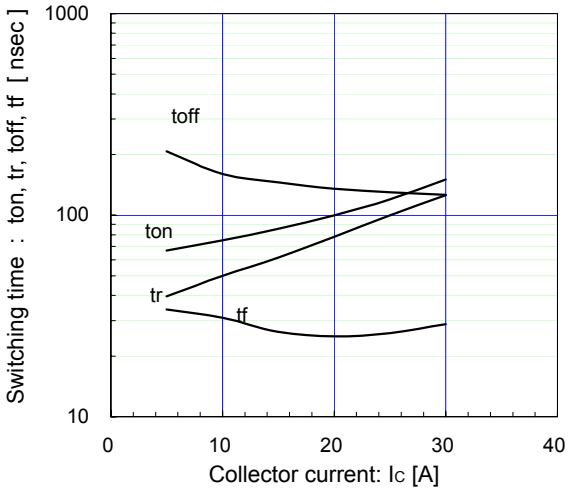
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



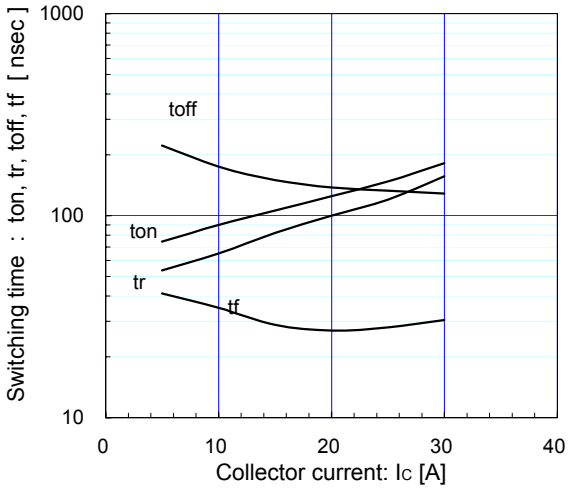
[Inverter]
Dynamic gate charge (typ.)
Vcc=300V, Ic=15A, Tj= 25°C



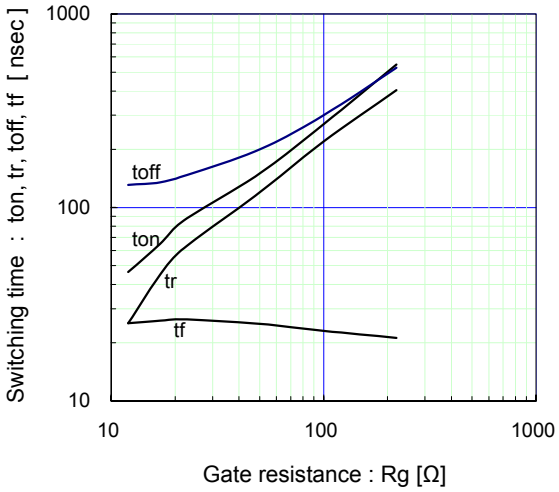
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=22Ω, Tj= 125°C



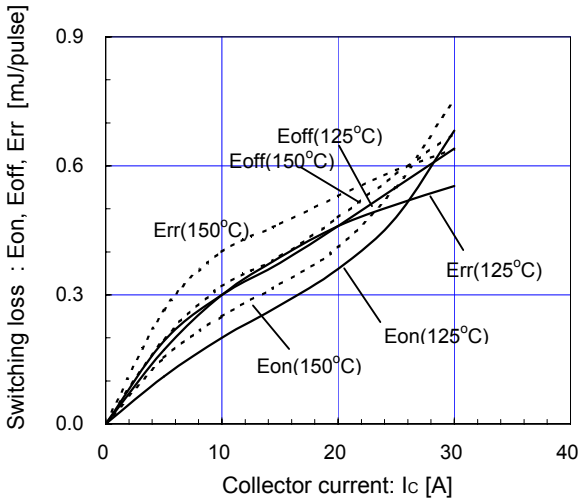
[Inverter]
Switching time vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=22Ω, Tj= 150°C



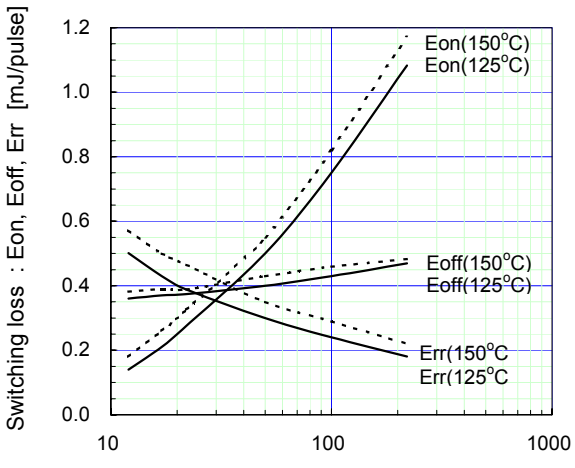
[Inverter]
Switching time vs. gate resistance (typ.)
Vcc=300V, Ic=15A, V_{GE}=±15V, Tj= 125°C



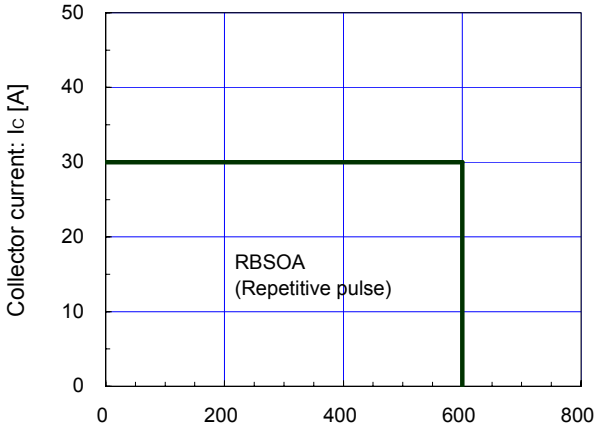
[Inverter]
Switching loss vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=22Ω



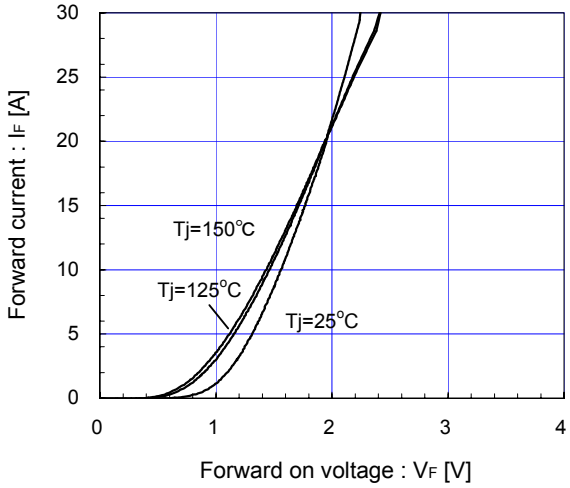
[Inverter]
Switching loss vs. gate resistance (typ.)
Vcc=300V, Ic=15A, V_{GE}=±15V



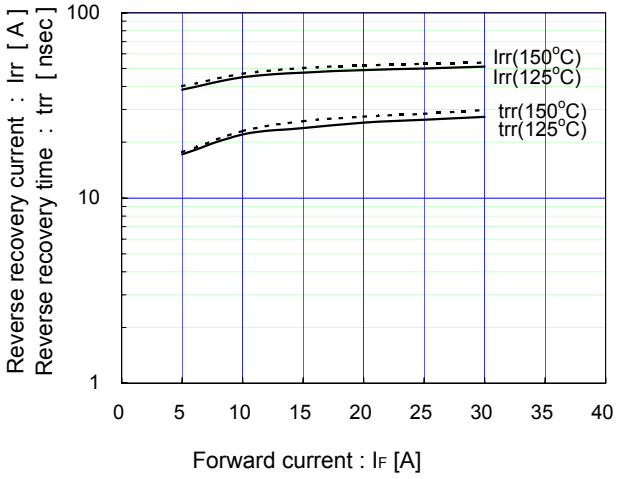
[Inverter]
Reverse bias safe operating area (max.)
+V_{GE}=15V,-V_{GE} <= 15V, R_G >= 22Ω ,Tj = 150°C



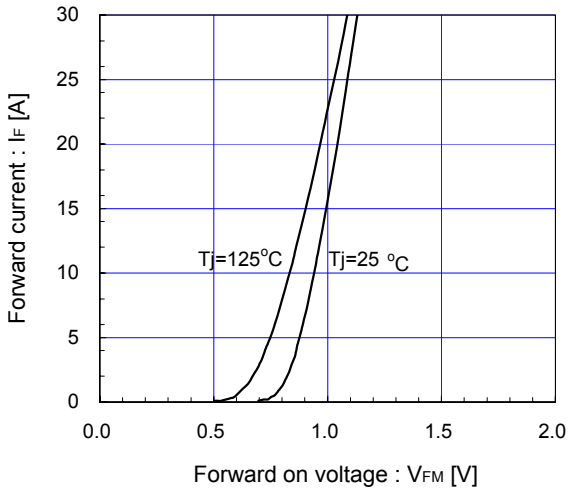
[Inverter]
Forward current vs. forward on voltage (typ.)
chip



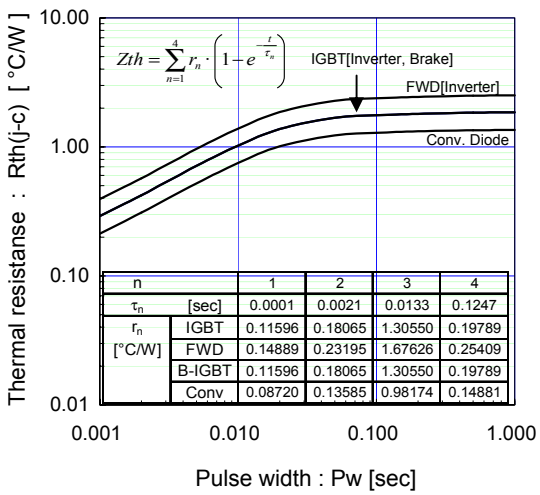
[Inverter]
Reverse recovery characteristics (typ.)
Vcc=300V, VGE=±15V, Rg=22Ω



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

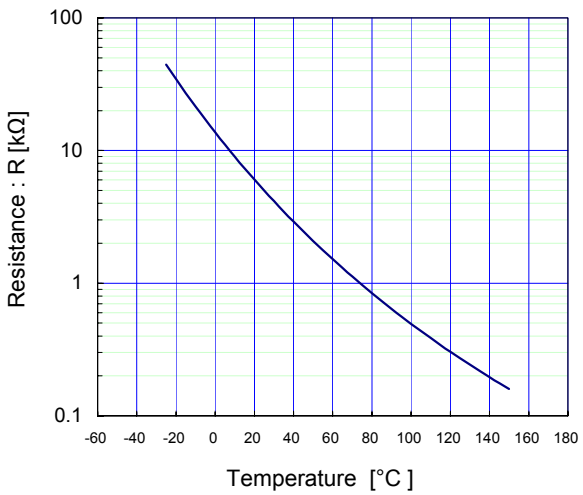


Transient thermal resistance (max.)

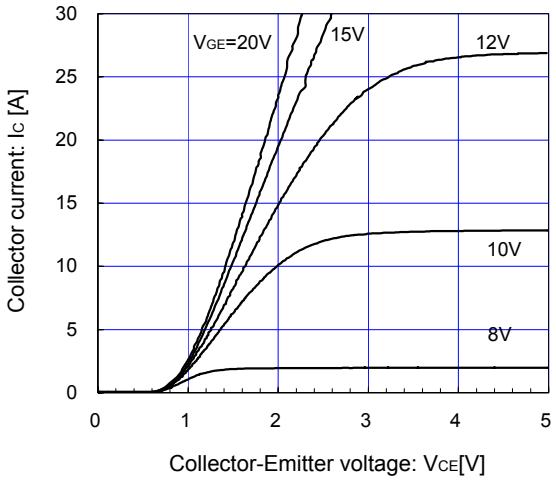


n		1	2	3	4
τ_n	[sec]	0.0001	0.0021	0.0133	0.1247
r_n [°C/W]	IGBT	0.11596	0.18065	1.30550	0.19789
	FWD	0.14889	0.23195	1.67626	0.25409
	B-IGBT	0.11596	0.18065	1.30550	0.19789
	Conv	0.08720	0.13585	0.98174	0.14881

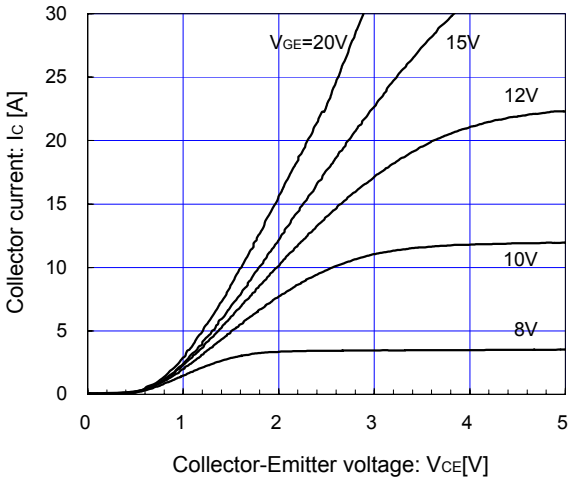
[Thermistor]
Temperature characteristic (typ.)



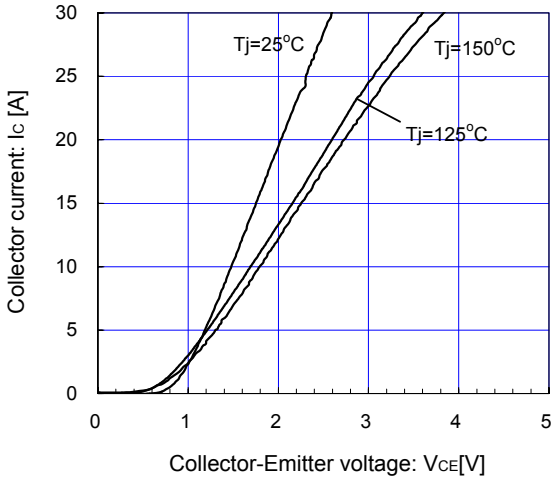
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 25°C / chip



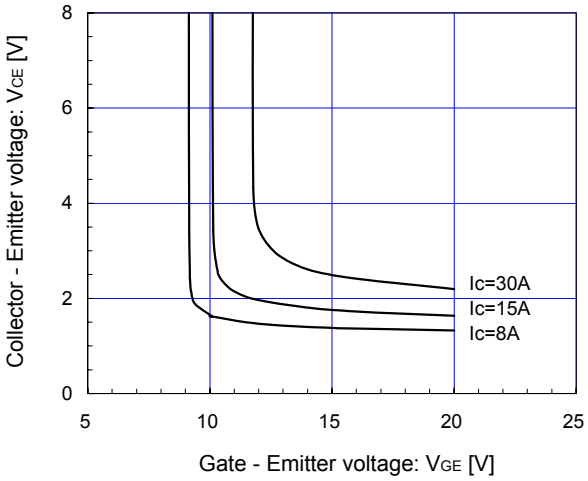
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



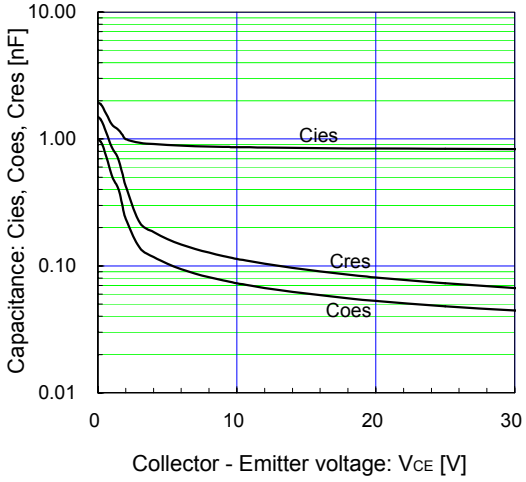
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



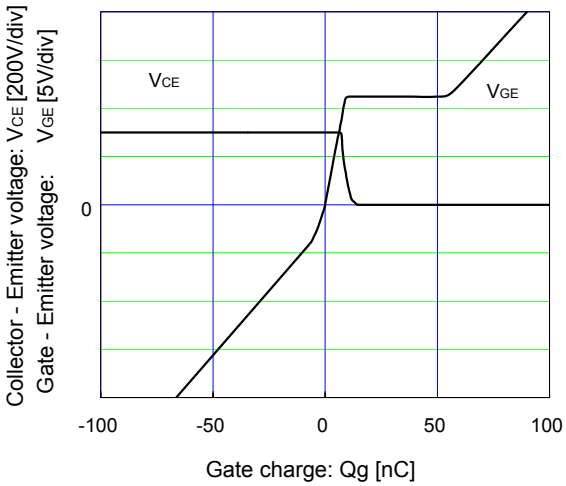
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj= 25°C / chip



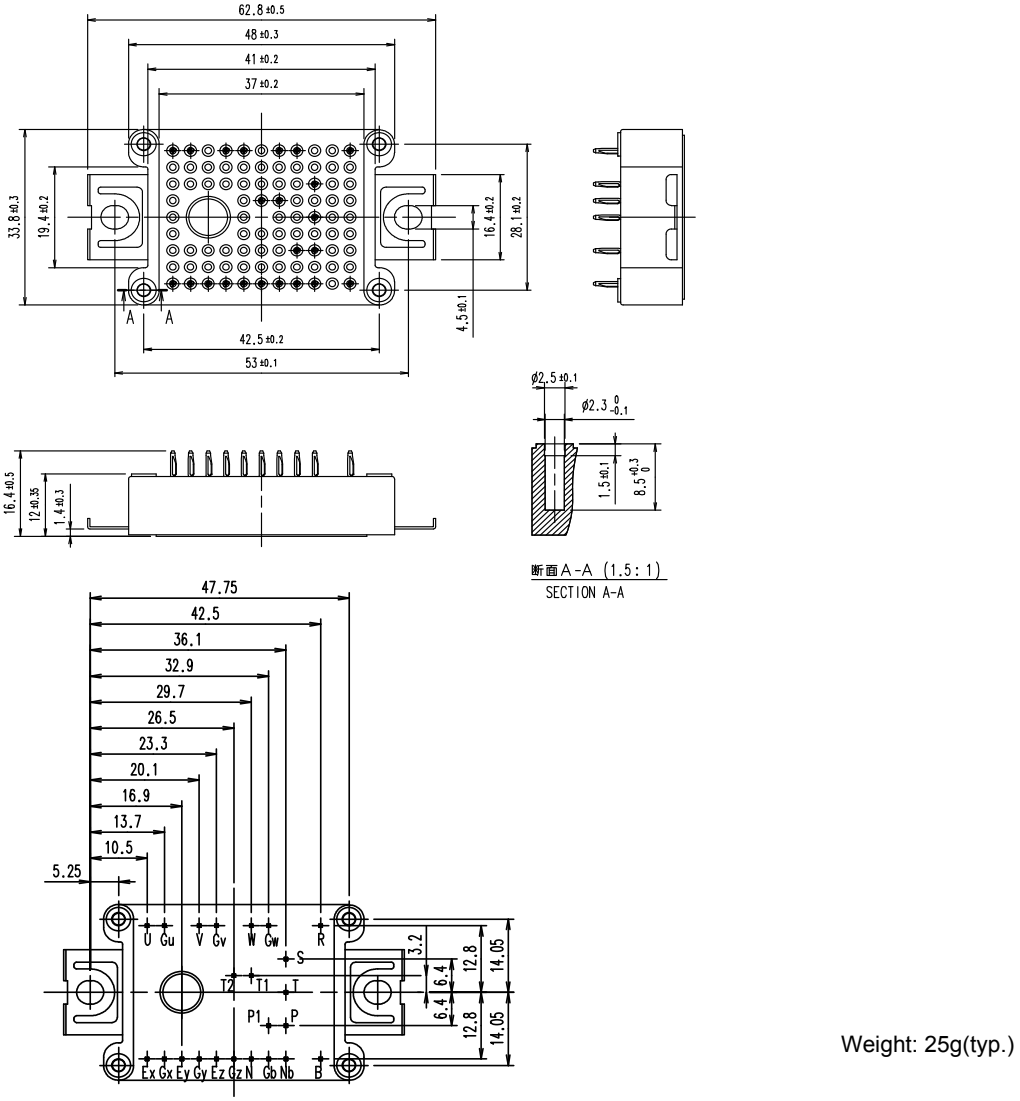
[Brake]
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25oC



[Brake]
Dynamic gate charge (typ.)
Vcc=300V, Ic=15A, Tj= 25°C



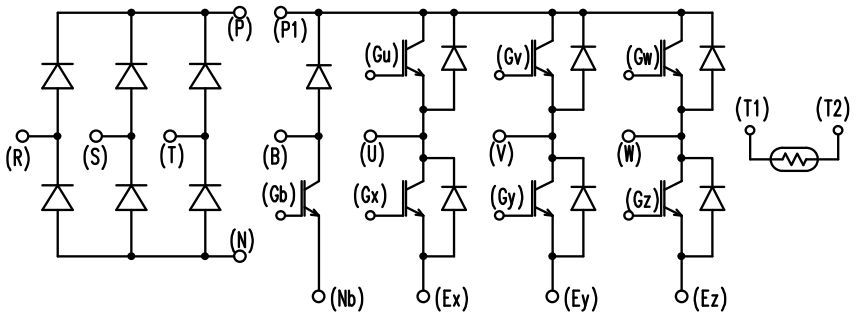
■ Outline Drawings, mm



Weight: 25g(typ.)

■ Equivalent Circuit Schematic

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



WARNING

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   - Communications equipment (terminal devices)
   - Measurement equipment
   - Machine tools
   - Audiovisual equipment
   - Electrical home appliances
   - Personal equipment
   - Industrial robots etc.

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   - 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

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   - Nuclear control equipment
   - Submarine repeater equipment

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富士電機 Innovating Energy Technology

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IGBT Modules

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6 IGBT 損失シミュレーションソフト	www.fujielectric.co.jp/products/semiconductor/model/igbt/simulation/
7 富士電機技報	www.fujielectric.co.jp/products/semiconductor/journal/
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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 Fuji Electric Journal	www.fujielectric.com/products/semiconductor/journal/
8 Contact	www.fujielectric.com/products/semiconductor/contact/
9 Revised and discontinued product information	www.fujielectric.com/products/semiconductor/discontinued/

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