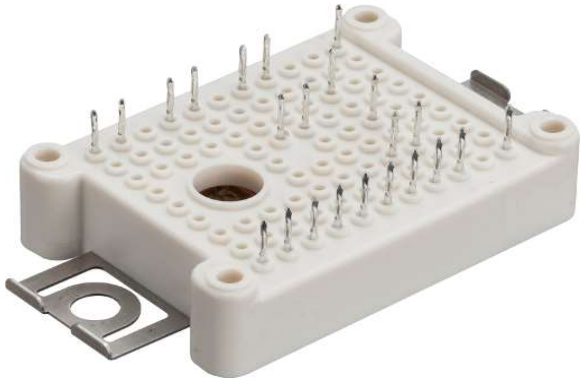
7MBR20VKA060-50

IGBT Modules

Power Module (V series)
600V / 20A / PIM



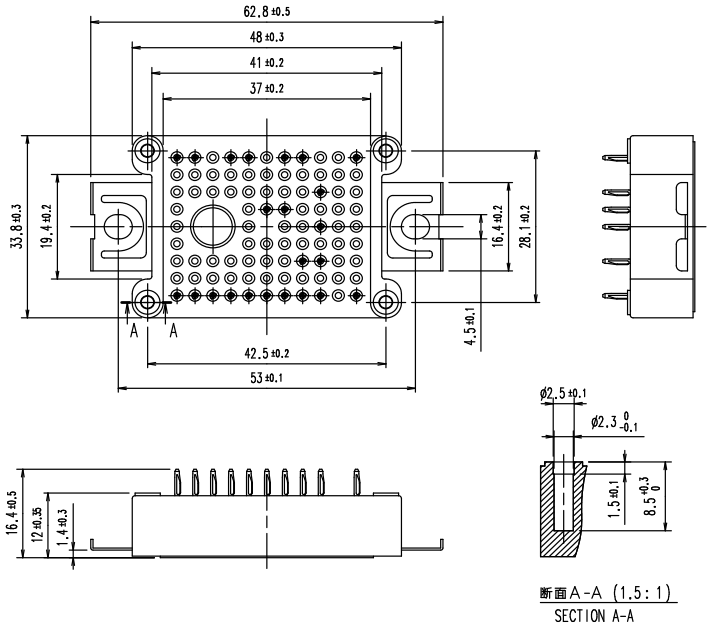
■ Features

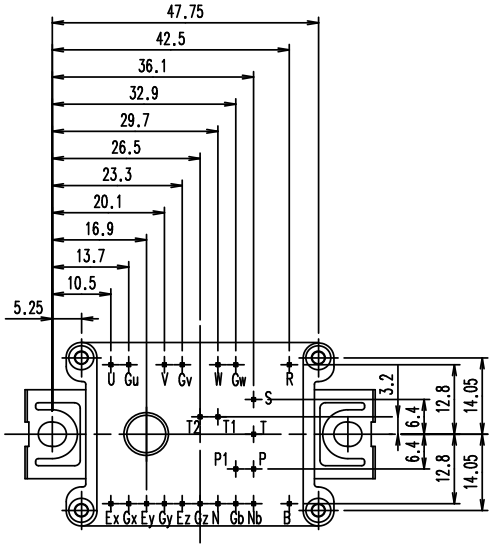
Low $V_{CE(sat)}$
Compact Package
P.C.Board Mount Module
Conveter Diode Bridge Dynamic Brake Circuit
RoHS compliant product

■ Applications

Inverter for Motor Drives
AC and DC Servo Drive Amplifier
Uninterruptible Power Supply

■ Outline drawing (Unit : mm)



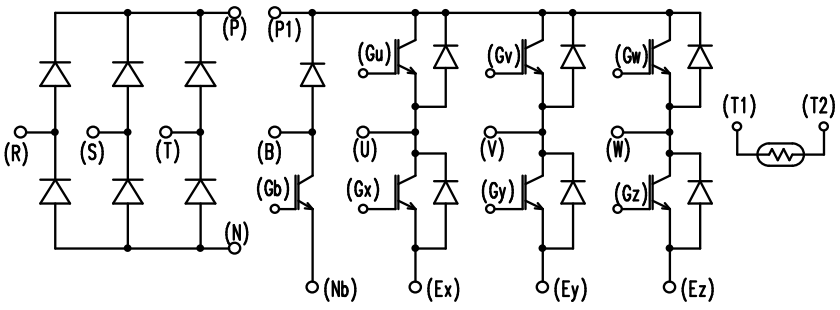


ALL DIMENSION IN THE LEFT FIGURE ARE REFERENCE
PIN POSITION TO DESIGNED CENTER OF MODULE ⌖ ø0.7
PIN-GRID SPACING 3.2mm

Weight: 25g (typ.)

■ Equivalent Circuit

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



FM6M1540c
2021/06

7MBR20VKA060-50

■ Absolute Maximum ratings (at T_c= 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	20	A
			I_{CP}	1ms	T_C=80°C	40	
			$-I_C$			20	
			$-I_C$ pulse	1ms		40	
	Collector power disspation		P_C	1 device		100	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	20	A
				1ms	T_C=80°C	40	
	Collector power disspation		P_C	1 device		100	
	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		20	A
	Surge current	(Non-Repetitive)	I_{FSM}	10ms, T_j=150°C		360	A
	I^2t	(Non-Repetitive)	I^2t	half sine wave		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～+125	
Isolation voltage	between terminal and copper base (*1) between temperature and others (*2)		V_{iso}	AC : 1min.		2500	VAC
Screw torque	Mounting	(*3)	-	M4		1.7	N m

(*1) All terminals should be connected together during the test.

(*2) Two thermister terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

(*3) Recommendable value : 1.3-1.7 Nm (M4)

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■ Electrical characteristics (at T_j= 25°C unless otherwise specified)

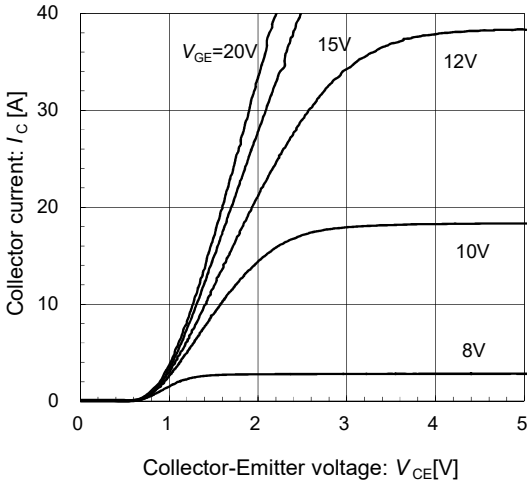
	Items	Symbols	Conditions		Characteristics min.	typ.	max.	Units
Inverter	Zero gate voltage collector current	I_{CES}	V_{GE} = 0V, V_{CE}= 600V		-	-	1.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE}= ±20V		-	-	200	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20V, I_C = 20mA		6.2	6.7	7.2	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE}= 15V, I_C = 20A	T_j= 25°C	-	1.95	2.35	V
				T_j=125°C	-	2.30	-	
				T_j=150°C	-	2.40	-	
		$V_{CE(sat)}$ (chip)	V_{GE}= 15V, I_C = 20A	T_j= 25°C	-	1.70	2.10	
				T_j=125°C	-	2.05	-	
				T_j=150°C	-	2.15	-	
	Internal gate resistance	$R_{g(int)}$	-		-	0	-	Ω
	Input capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V, f= 1MHz		-	1.2	-	nF
	Turn-on time	t_{on}	V_{CC} = 300V, I_C = 20A, V_{GE}= ±15V, R_G = 18 Ω		-	0.08	1.20	μs
		t_r			-	0.06	0.60	
		$t_{r(i)}$			-	0.02	-	
	Turn-off time	t_{off}			-	0.14	1.20	
		t_f			-	0.02	0.45	
	Forward on voltage	V_F (terminal)	I_F = 20A	T_j= 25°C	-	2.00	2.40	V
				T_j=125°C	-	1.95	-	
				T_j=150°C	-	1.95	-	
		V_F (chip)	I_F = 20A	T_j= 25°C	-	1.75	2.15	
				T_j=125°C	-	1.70	-	
				T_j=150°C	-	1.70	-	
	Reverse recovery time	t_{rr}	I_F = 20A		-	-	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}= ±20V		-	-	200	nA
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE}= 15V, I_C = 20A	T_j= 25°C	-	1.95	2.35	V
				T_j=125°C	-	2.30	-	
				T_j=150°C	-	2.40	-	
		$V_{CE(sat)}$ (chip)	V_{GE}= 15V, I_C = 20A	T_j= 25°C	-	1.70	2.10	
				T_j=125°C	-	2.05	-	
				T_j=150°C	-	2.15	-	
	Internal gate resistance	$R_{g(int)}$	-		-	0	-	Ω
	Turn-on time	t_{on}	V_{CE}= 300V, I_C = 20A, V_{GE}= +15/-15V, R_G = 18 Ω		-	0.08	1.20	μs
		t_r			-	0.06	0.60	
	Turn-off time	t_{off}			-	0.14	1.20	
		t_f			-	0.02	0.45	
	Reverse current	I_{RRM}	V_R= 600V		-	-	1.00	mA
Converter	Forward on voltage	V_{FM}	I_F = 20A	terminal	-	1.30	1.75	V
				chip	-	1.05	-	
	Reverse current	I_{RRM}	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

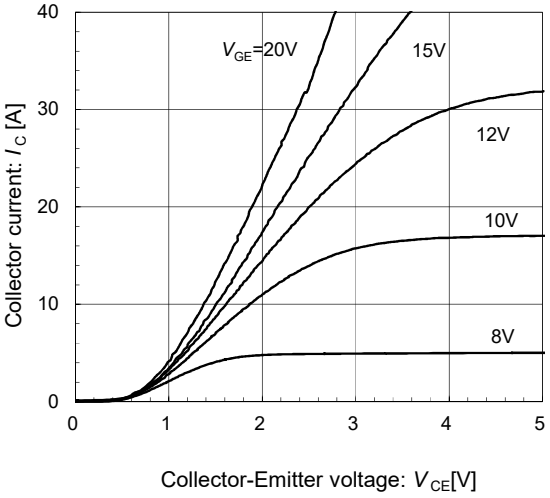
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	1.56	°C/W
		Inverter FWD	-	-	1.97	
		Brake IGBT	-	-	1.56	
		Converter Diode	-	-	1.35	
Contact thermal resistance(*4) (1device)	$R_{th(c-f)}$	Inverter IGBT	-	0.75	-	
		Inverter FWD	-	0.88	-	
		Brake IGBT	-	0.79	-	
		Converter Diode	-	0.77	-	

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

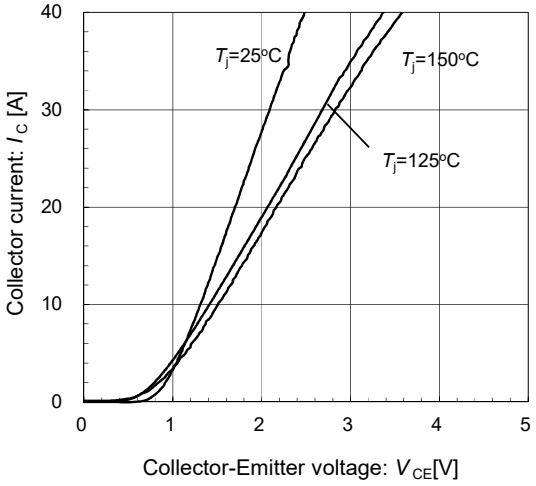
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 25°C / chip



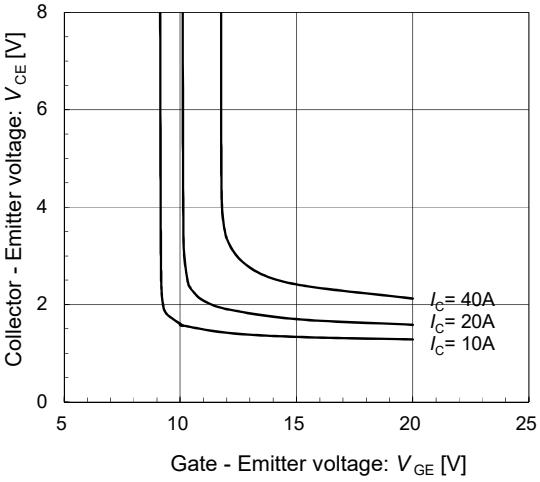
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 150°C / chip



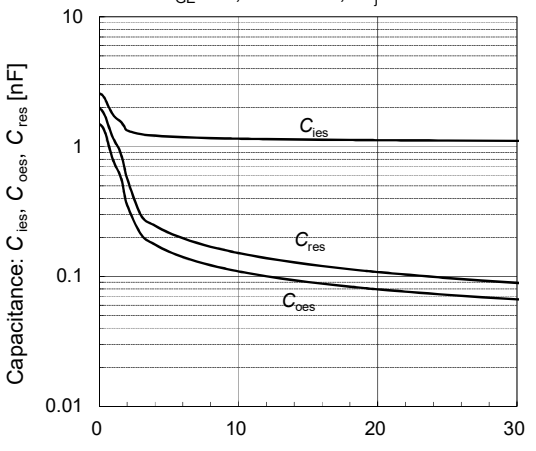
[Inverter]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}=15V / chip



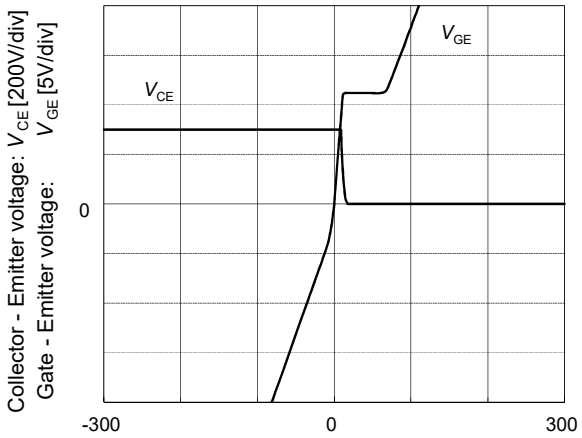
[Inverter]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j= 25°C / chip



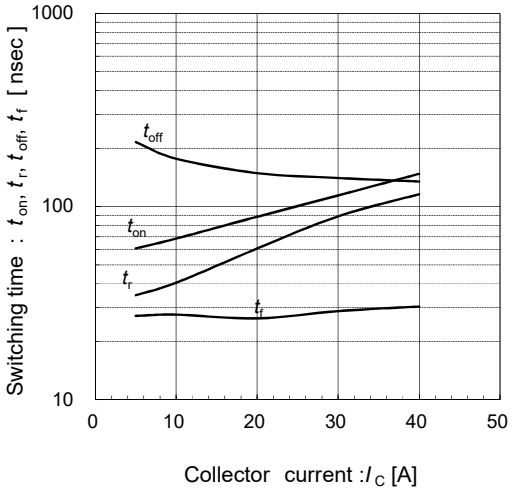
[Inverter]
Capacitance vs. Collector-Emitter voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25°C



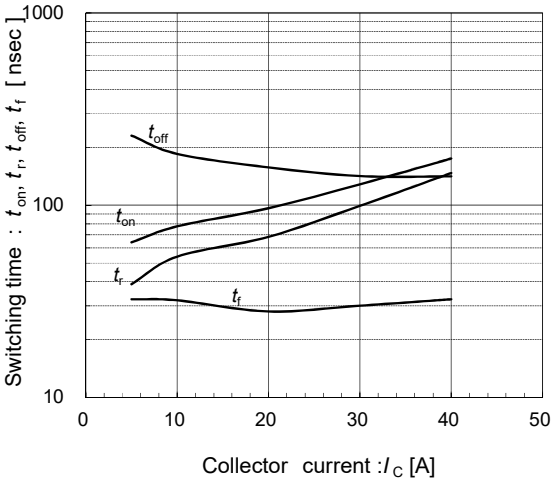
[Inverter]
Dynamic gate charge (typ.)
V_{CC}=300V , I_C=20A , T_j=25°C



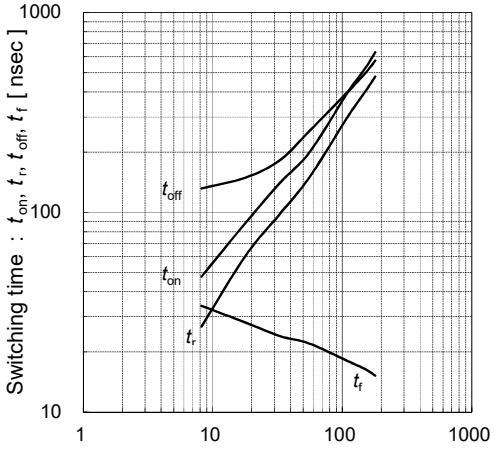
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC}=300V, V_{GE}=±15V, R_G=18Ω, T_j= 125°C



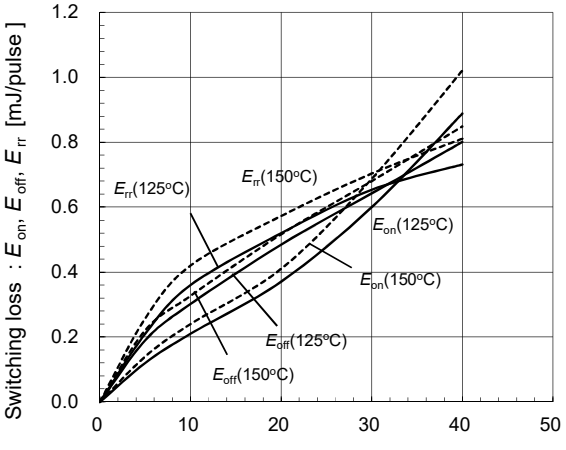
[Inverter]
Switching time vs. Collector current (typ.)
V_{CC}=300V, V_{GE}=±15V, R_G=18Ω, T_j= 150°C



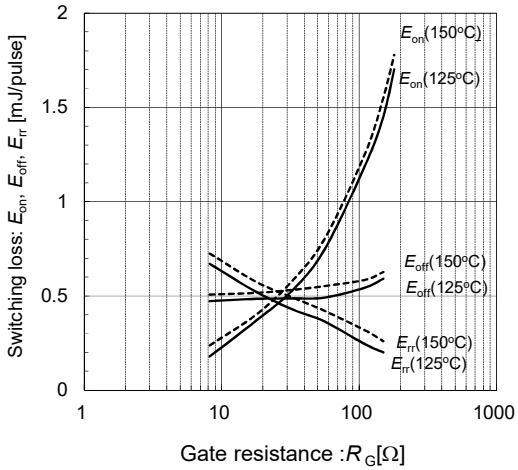
[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC}=300V, I_C=20A, V_{GE}=±15V, T_j= 125°C



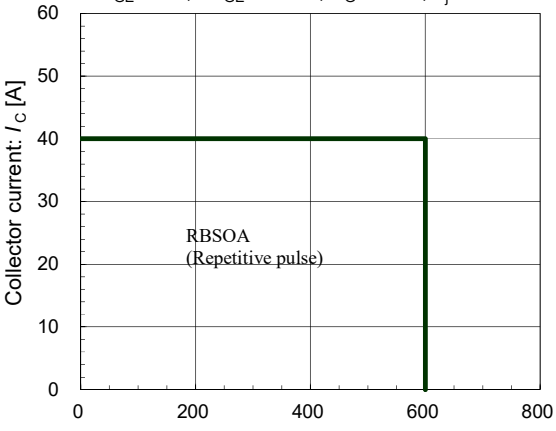
[Inverter]
Switching loss vs. Collector current (typ.)
V_{CC}=300V, V_{GE}=±15V, R_G=18Ω



[Inverter]
Switching time vs. Gate resistance (typ.)
V_{CC}=300V, I_C=20A, V_{GE}=±15V



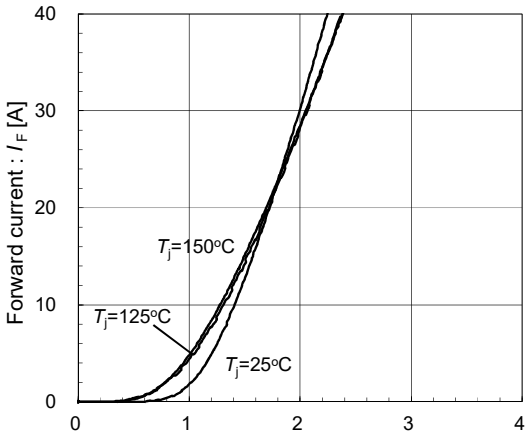
[Inverter]
Reverse bias safe operating area (max.)
+V_{GE}=15V, -V_{GE}<= 15V, R_G>=18Ω, T_j=150°C



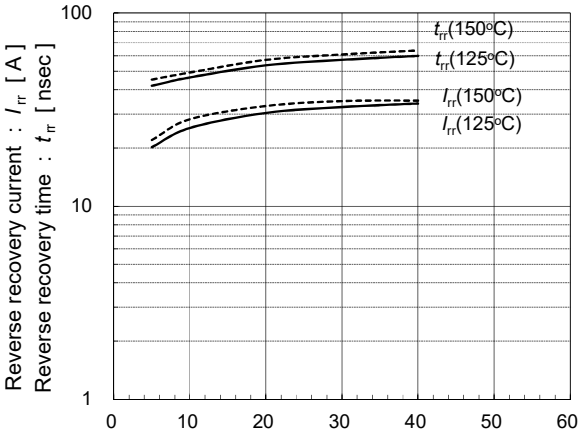
(Main terminals)

7MBR20VKA060-50

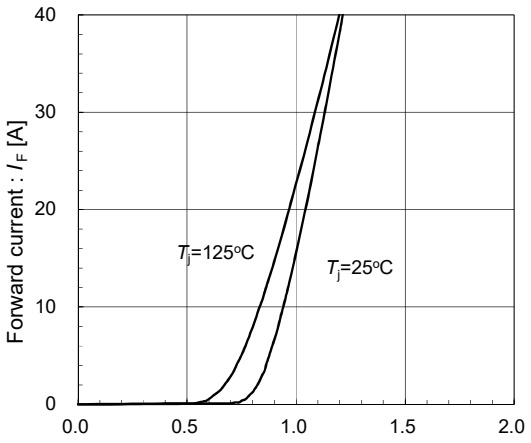
[Inverter]
Forward current vs. forward on voltage (typ.)
chip



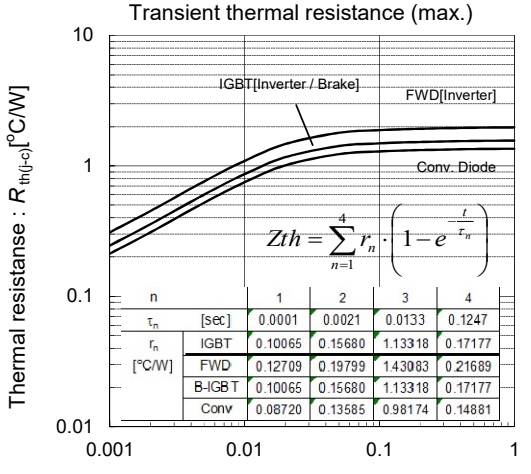
[Inverter]
Reverse recovery characteristics (typ.)
V_{CC}=300V, V_{GE}=±15V, R_G=18Ω



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

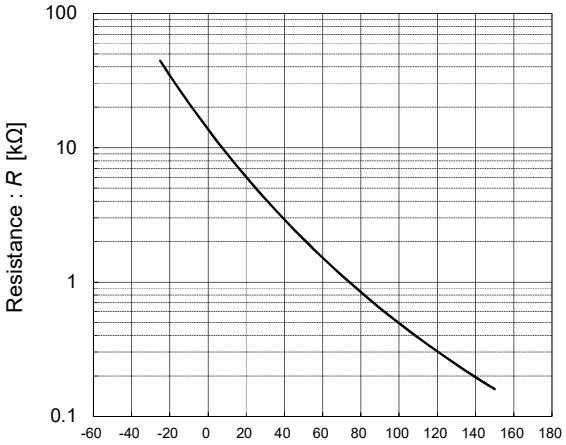


Transient thermal resistance (max.)

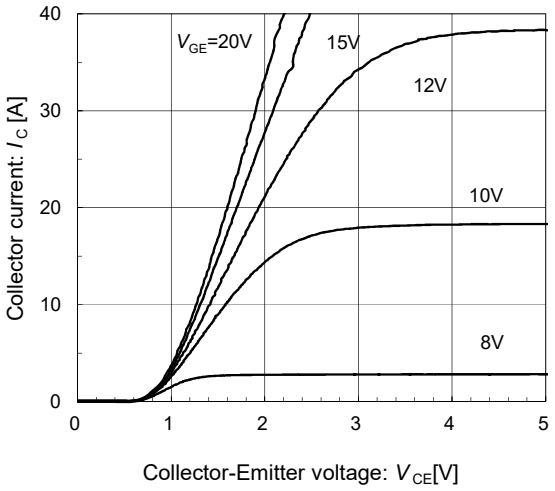


n		1	2	3	4
τ_n	[sec]	0.0001	0.0021	0.0133	0.1247
r_n [°C/W]	IGBT	0.10065	0.15680	1.13318	0.17177
	FWD	0.12709	0.19799	1.43083	0.21689
	B-IGBT	0.10065	0.15680	1.13318	0.17177
	Conv	0.08720	0.13585	0.98174	0.14881

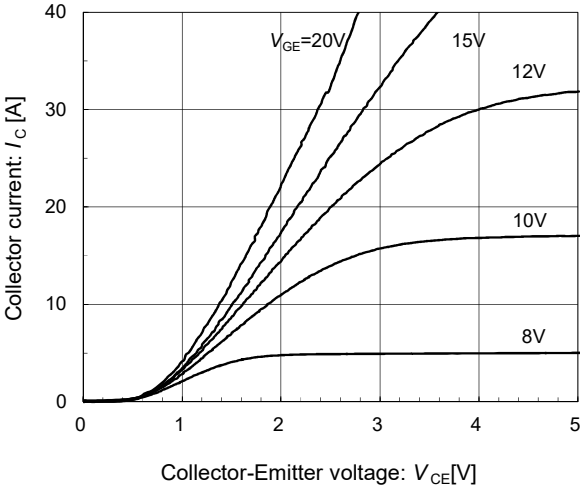
[Thermistor]
Temperature characteristic(typ.)



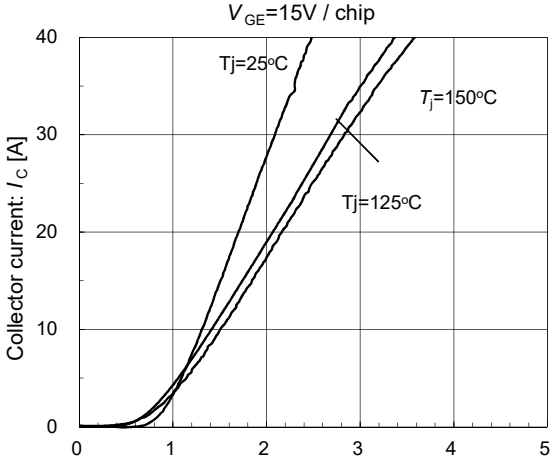
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 25°C / chip



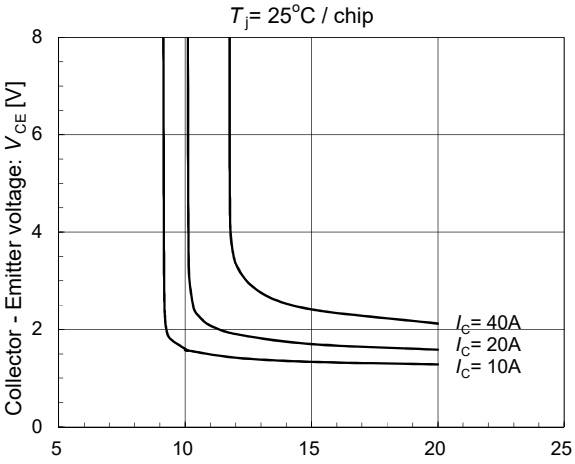
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 150°C / chip



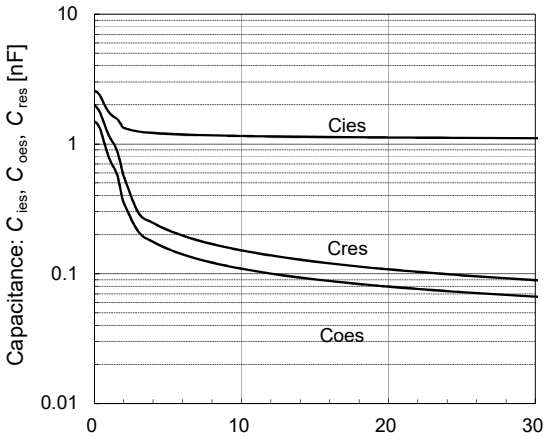
[Brake]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}=15V / chip



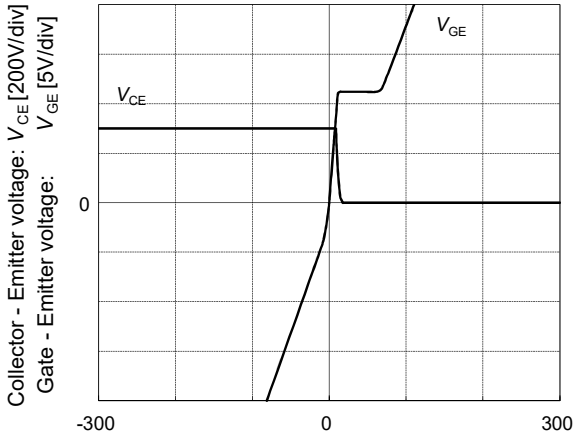
[Brake]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j= 25°C / chip



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



[Brake]
Dynamic gate charge (typ.)
V_{CC}=300V , I_C=20A , T_j=25°C



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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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富士電機 Innovating Energy Technology

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IGBT Modules

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