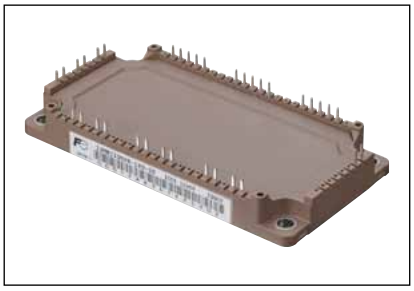
12MBI100VN-120-50

IGBT Modules

IGBT MODULE (V series)
1200V / 100A / IGBT, RB-IGBT 12 in one package



Features
Higher Efficiency
Optimized A (T-type) -3 level circuit
Low inductance module structure
Featuring Reverse Blocking IGBT (RB-IGBT)

Applications
Inverter for Motor Drive
Uninterruptible Power Supply
Power conditioner

Maximum Ratings and Characteristics
● Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

Items			Symbols	Conditions		Maximum ratings	Units
T1, T2	Collector-Emitter voltage		V_{CES}			1200	V
	Gate-Emitter voltage		V_{GES}			±20	V
	Collector current	IGBT	I_C	Continuous	T_C=80°C	100	A
			I_{cp}	1ms	T_C=80°C	200	
		FWD	$-I_C$			100	
			$-I_{C\ pulse}$	1ms		200	
	Collector power dissipation		P_C	1 device		430	W
T3, T4	Collector-Emitter voltage		V_{CES}			600	V
	Repetitive peak reverse voltage		V_{RRM}			600	V
	Gate-Emitter voltage		V_{GES}			±20	V
	Collector current		I_C	Continuous	T_C=80°C	100	A
			I_{cp}	1ms	T_C=80°C	200	
	Collector power dissipation		P_C	1 device		400	W
Junction temperature			T_j			150	°C
Case temperature			T_C			125	
Storage temperature			T_{stg}			-40 ~ +125	
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)		V_{iso}	AC : 1min.		2500	VAC
	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)

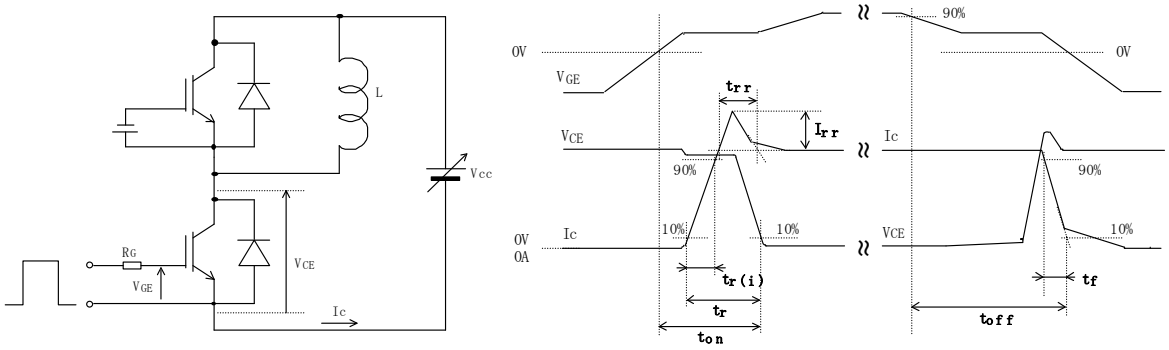
Items		Symbols	Conditions		Characteristics min.	typ.	max.	Units
T1, T2	Zero gate voltage collector current	I_{CES}	V_{GE} = 0V, V_{CE} = 1200V		-	-	1.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V		-	-	200	nA
	Gate-Emitter threshold voltage	$V_{GE\ (th)}$	V_{CE} = 20V, I_C = 100mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 100A	T_j= 25°C	-	1.75	2.20	V
				T_j=125°C	-	2.05	-	
		$V_{CE\ (sat)}$ (P-U, V, W / U, V, W-N terminal)	V_{GE} = 15V, I_C = 100A	T_j= 25°C	-	2.60	3.05	
				T_j=125°C	-	2.90	-	
	Internal gate resistance	$R_{g(int)}$	-		-	7.5	-	Ω
	Input capacitance	C_{ies}	V_{CE} = 10V, V_{GE} =0V, f = 1MHz		-	9.1	-	nF
	Turn-on time	t_{on}	SW mode : A, V_{CC} = 600V, I_C = 100A, V_{GE} = ±15V, R_G = 1.6Ω		-	0.39	1.20	μs
		t_r			-	0.09	0.60	
		$t_{r\ (i)}$			-	0.03	-	
	Turn-off time	t_{off}			-	0.53	1.00	
		t_f			-	0.06	0.30	
	Forward on voltage	V_F (chip)	I_F = 100A	T_j= 25°C	-	1.70	2.15	V
				T_j=125°C	-	1.85	-	
		V_F (P-U, V, W / U, V, W-N terminal)	I_F = 100A	T_j= 25°C	-	2.55	3.00	
				T_j=125°C	-	2.70	-	
	Reverse recovery time	t_{rr}	SW mode : A, V_{CC} = 600V, I_F = 100A, V_{GE} = ±15V, R_G = 1.6Ω		-	-	0.35	μs
			SW mode : B, V_{CC} = 300V, I_F = 100A, V_{GE} = ±15V, R_G = 3.3Ω (T3,T4)		-	-	0.35	
T3, T4	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 = 100mA		5.5	6.5	7.5	V
	Collector-Emitter saturation voltage	$V_{CE\ (sat)}$ (chip)	V_{GE} = 15V, I_C = 100A	T_j= 25°C	-	2.45	2.80	V
				T_j=125°C	-	2.60	-	
		$V_{CE\ (sat)}$ (M-U, V, W terminal)	V_{GE} = 15V, I_C = 100A	T_j= 25°C	-	3.30	3.65	
				T_j=125°C	-	3.45	-	
	Internal gate resistance	$R_{g(int)}$	-		-	8.8	-	Ω
	Input capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V, f = 1MHz		-	6.5	-	nF
	Turn-on time	t_{on}	SW mode : B, V_{CC} = 300V, I_C = 100A, V_{GE} = ±15V, R_G = 3.3Ω		-	0.24	1.20	μs
		t_r			-	0.10	0.60	
		$t_{r\ (i)}$			-	0.04	-	
	Turn-off time	t_{off}			-	0.20	1.00	
		t_f			-	0.03	0.30	
	Reverse recovery time	t_{rr}	SW mode : C, V_{CC} = 300V, I_C = 100A, V_{GE} = ±15V, R_G = 1.6Ω (T1,T2)		-	-	0.35	μs
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

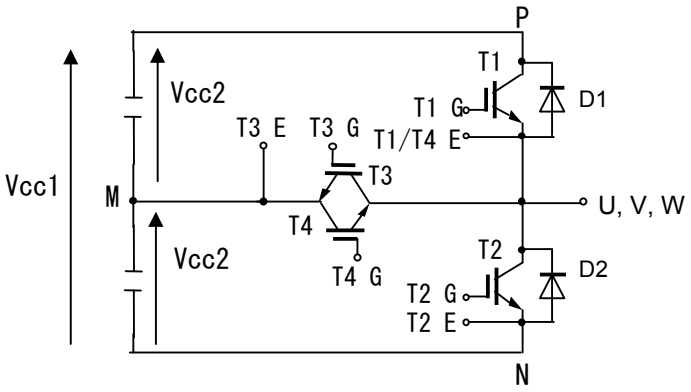
Items	Symbols	Conditions		Characteristics min.	typ.	max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	T1, T2 IGBT		-	-	0.29	°C/W
		T1, T2 FWD		-	-	0.44	
		T3, T4 RB-IGBT		-	-	0.31	
Contact thermal resistance (1device) (*4)	$R_{th(c-f)}$	T1, T2	with Thermal Compound	-	0.05	-	
		T3, T4					

Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound (thermal conductivity = 1W/m ·k).

■ Definitions of switching time



Definitions of switching mode



		State of switching device			
SW mode	Load L	T1	T2	T3	T4
A	U−N	**SW**	OFF	OFF	OFF
	P−U	OFF	**SW**	OFF	OFF
B	P−U	OFF	OFF	**SW**	**ON**
	U−N	OFF	OFF	**ON**	**SW**
C	M−U	**SW**	OFF	OFF	**ON**
	M−U	OFF	**SW**	**ON**	OFF

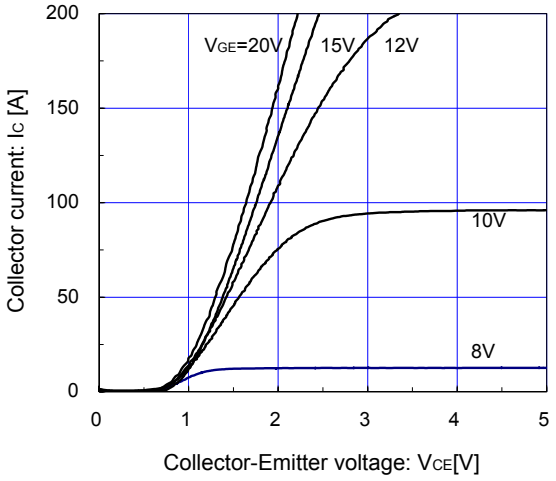
SW: Connect to drive circuit and input gate signal.
ON: Bias voltate of gate +15V.
OFF: Reverse bias voltage of gate -15V.

Vcc2=Vcc1/2

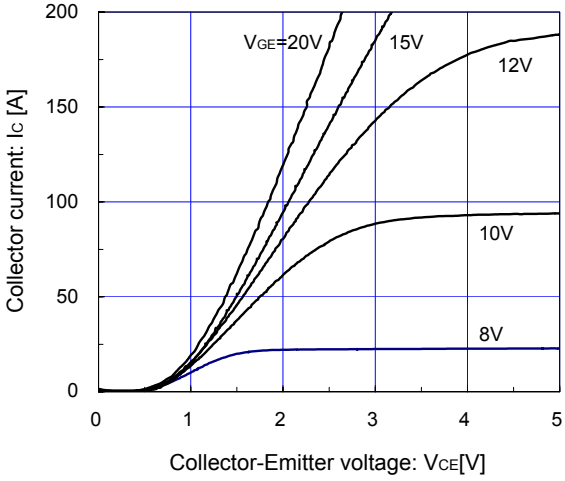
Vcc= { Vcc1 (A mode)
Vcc2 (B mode)
Vcc2 (C mode)

■ Characteristics (Representative)

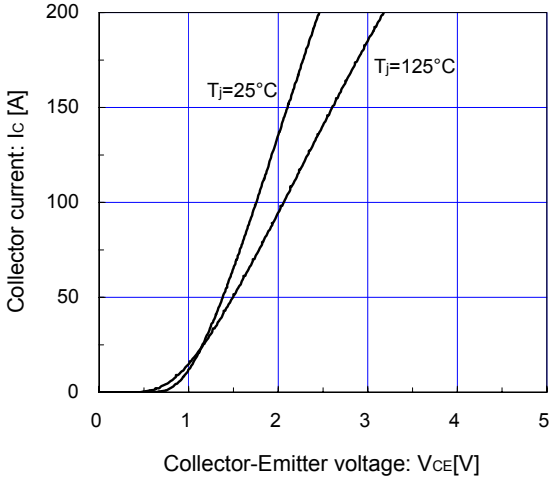
[T1, T2]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 25ºC / chip



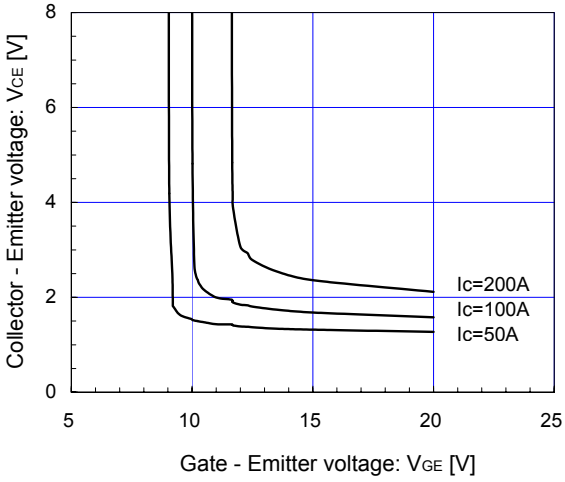
[T1, T2]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 125ºC / chip



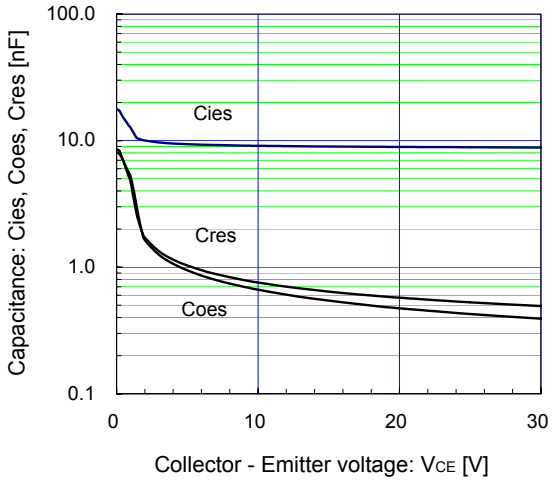
[T1, T2]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}=15V / chip



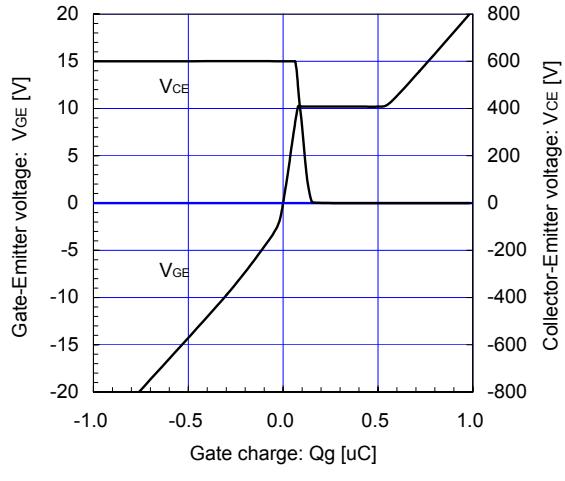
[T1, T2]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j= 25ºC / chip



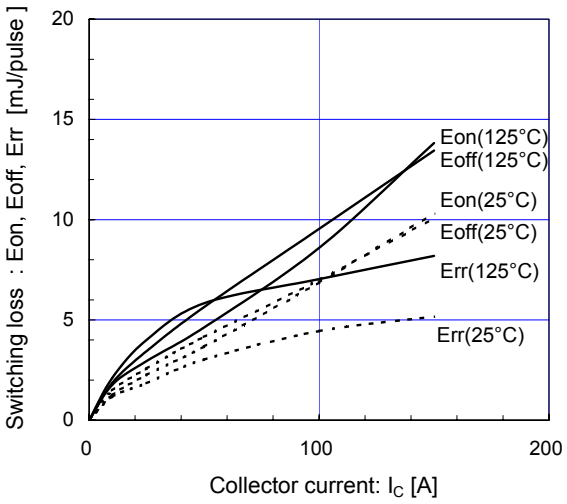
[T1, T2]
Capacitance vs. Collector-Emitter voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25ºC



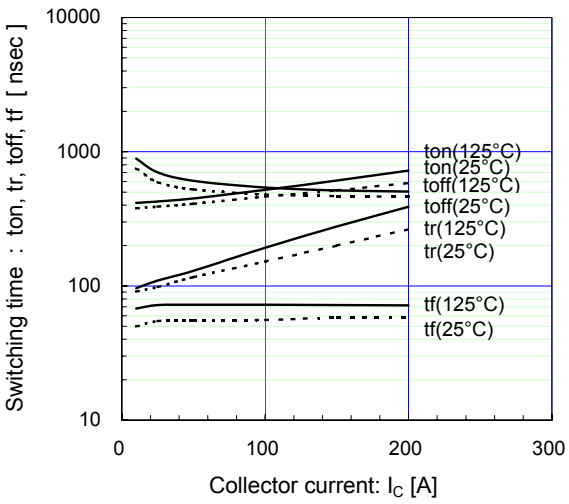
[T1, T2]
Dynamic gate charge (typ.)
Vcc=600V, Ic=100A, T_j=25ºC



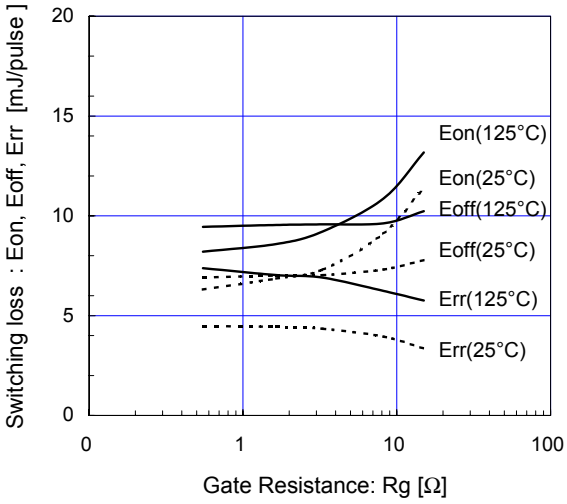
[SW mode A]
Switching loss vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=1.6Ω



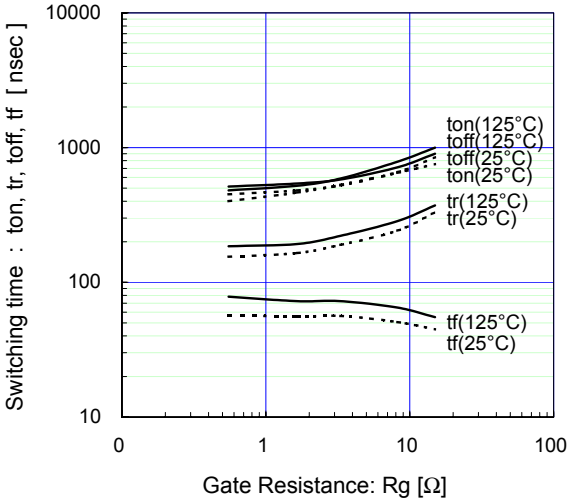
[SW mode A]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=1.6Ω



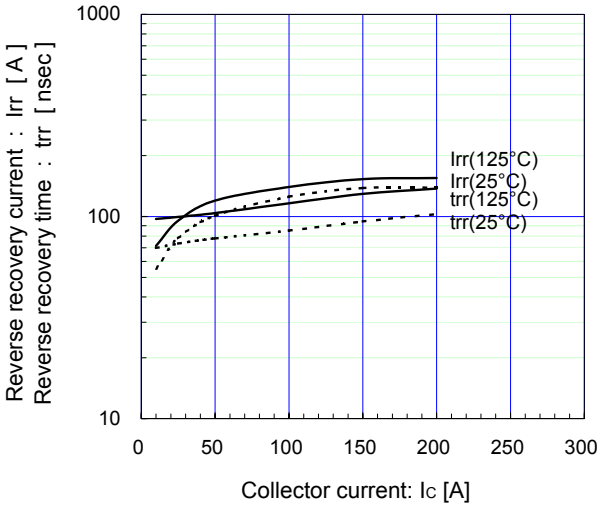
[SW mode A]
Switching loss vs. Gate resistanse (typ.)
Vcc=600V, Ic=100A, V_{GE}=±15V, T_j=125℃



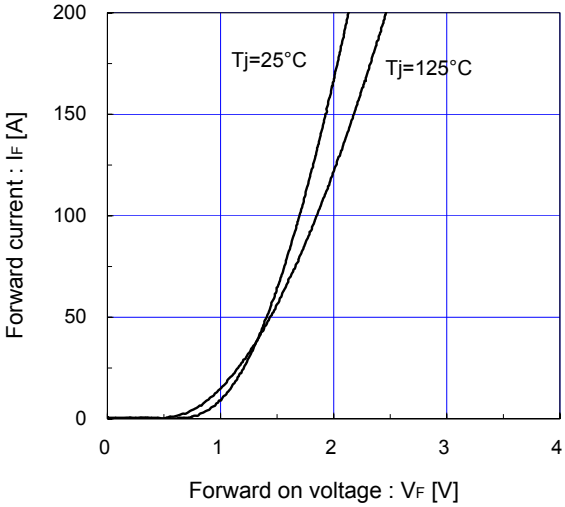
[SW mode A]
Switching time vs. Gate resistanse (typ.)
Vcc=600V, Ic=100A, V_{GE}=±15V



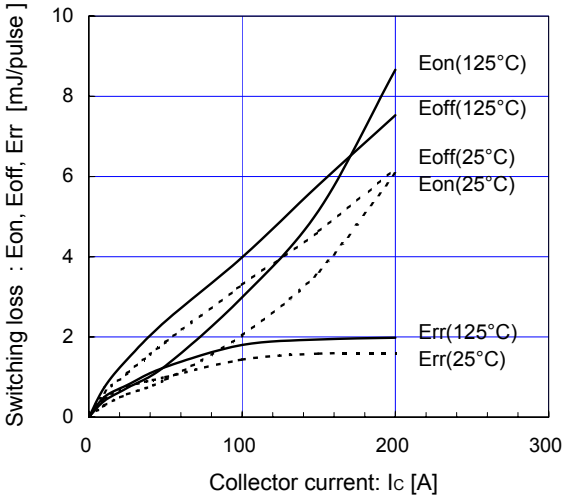
[SW mode A]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=1.6Ω



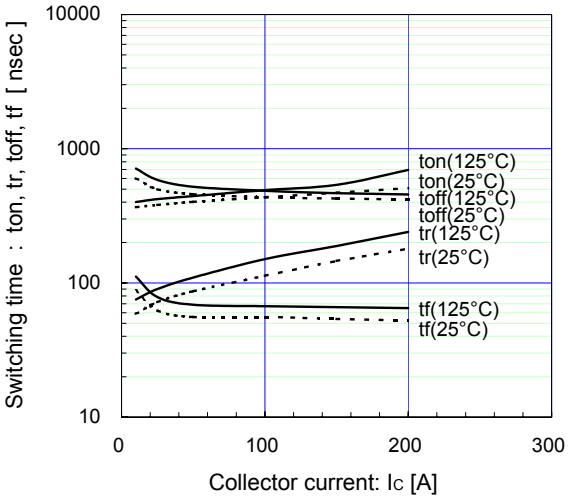
[T1, T2]
Forward current vs. forward on voltage (typ.)
chip



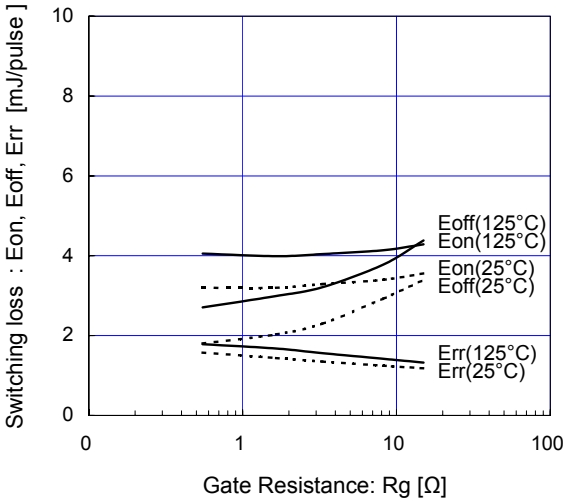
[SW mode C]
Switching loss vs. Collector current (typ.)
Vcc=300V, VGE=±15V, Rg=1.6Ω



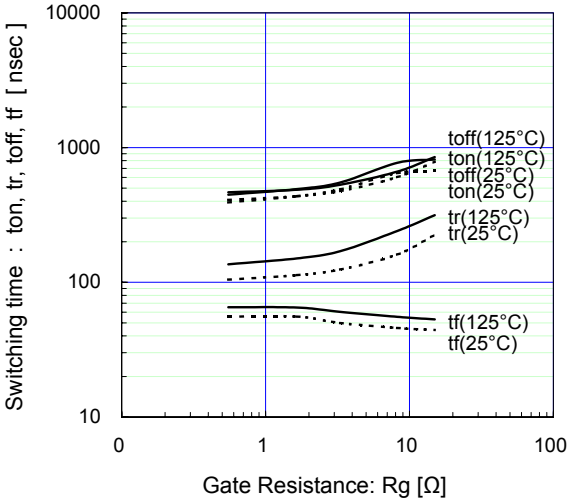
[SW mode C]
Switching time vs. Collector current (typ.)
Vcc=300V, VGE=±15V, Rg=1.6Ω



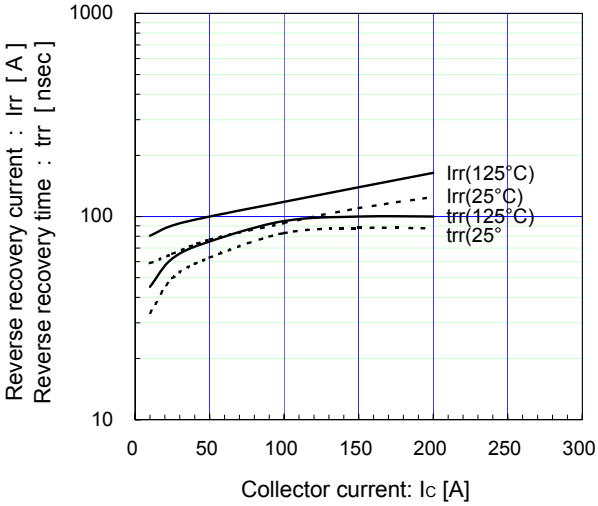
[SW mode C]
Switching loss vs. Gate resistanse (typ.)
Vcc=300V, Ic=100A, VGE=±15V



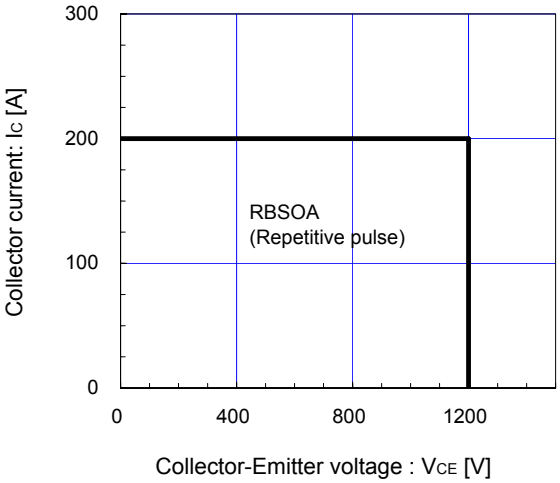
[SW mode C]
Switching time vs. Gate resistanse (typ.)
Vcc=300V, Ic=100A, VGE=±15V



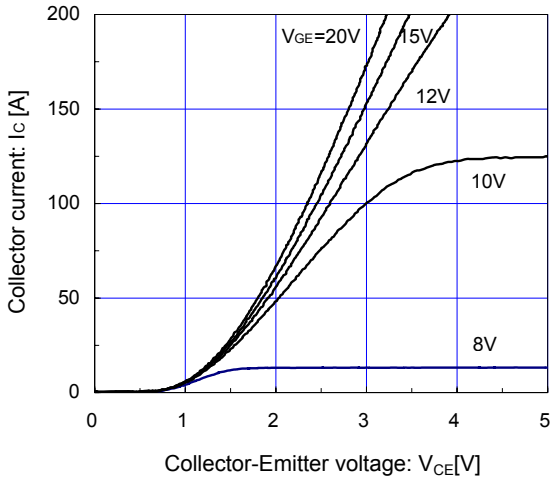
[SW mode C]
Switching time vs. Collector current (typ.)
Vcc=300V, VGE=±15V, Rg=1.6Ω



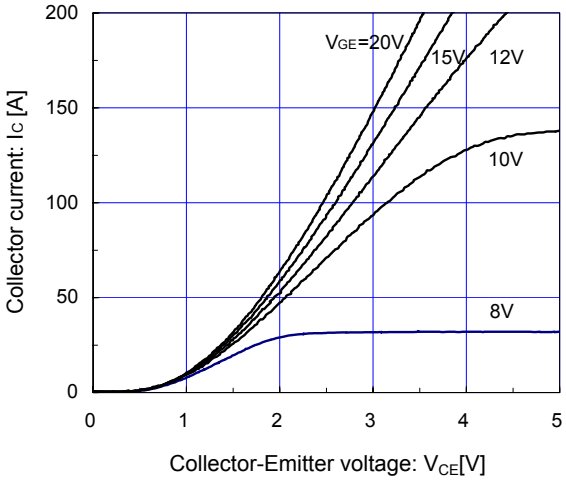
[T1, T2]
Reverse bias safe operating area (max.)
VGE=15V,-VGE ≦ 15V, Rg ≧1.6Ω ,Tj = 125ºC



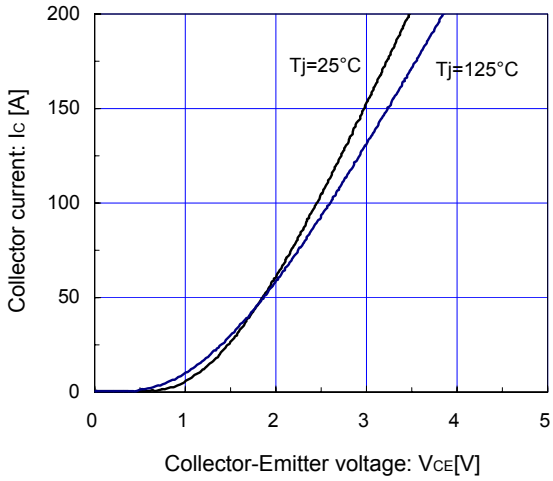
[T3, T4 (RB-IGBT)]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 25ºC / chip



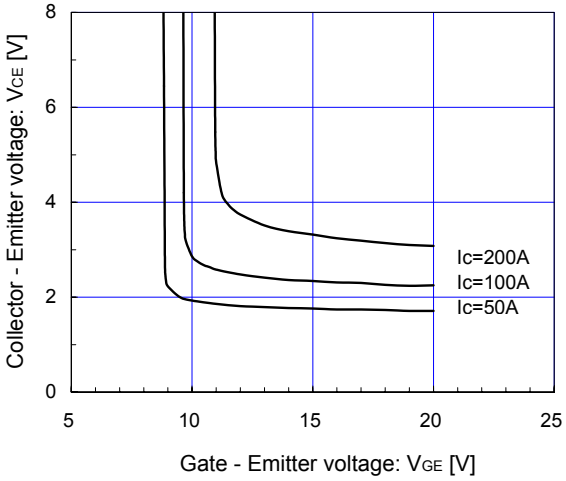
[T3, T4 (RB-IGBT)]
Collector current vs. Collector-Emitter voltage (typ.)
T_j= 125ºC / chip



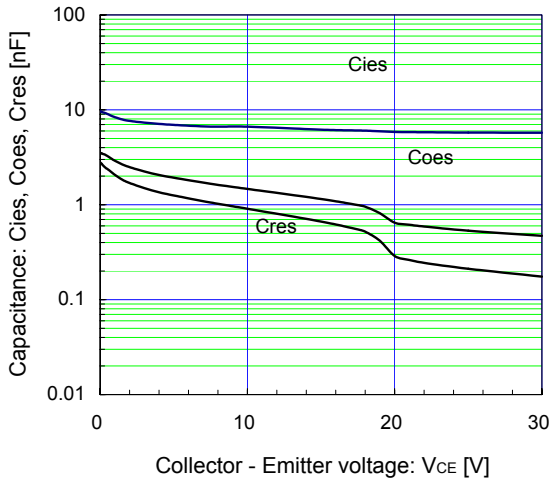
[T3, T4 (RB-IGBT)]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}=15V / chip



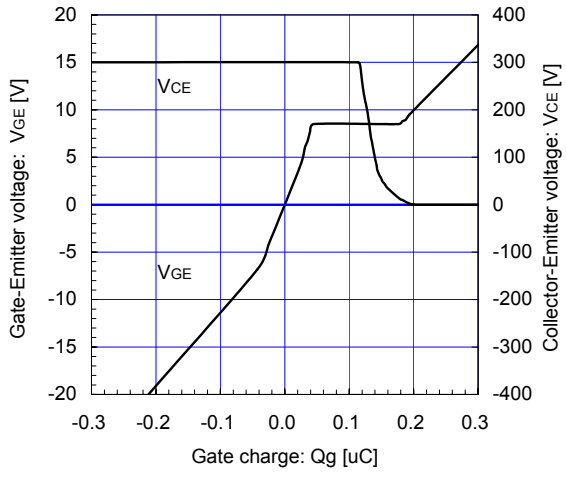
[T3, T4 (RB-IGBT)]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j= 25ºC / chip



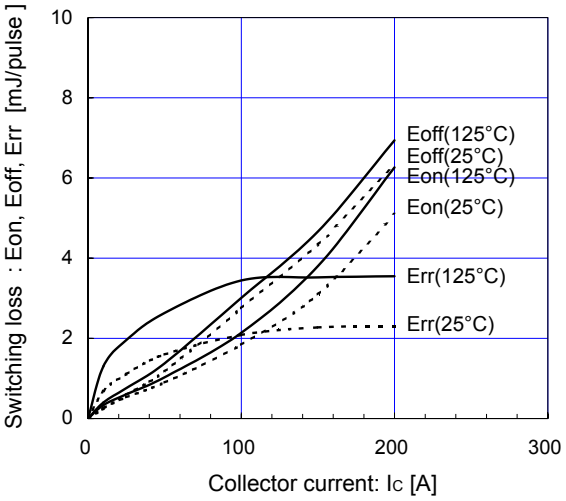
[T3, T4 (RB-IGBT)]
Capacitance vs. Collector-Emitter voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25ºC



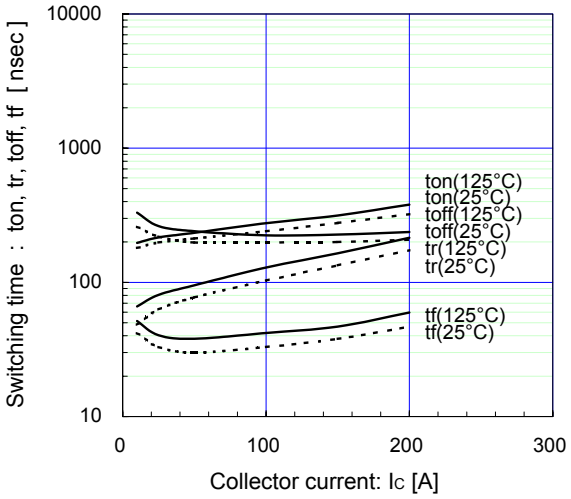
[T3, T4 (RB-IGBT)]
Dynamic gate charge (typ.)
Vcc=300V, Ic=100A, T_j=25ºC



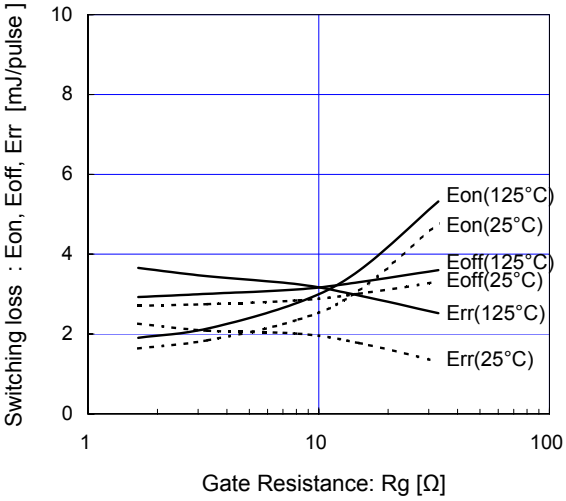
[SW mode B]
Switching loss vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=3.3Ω



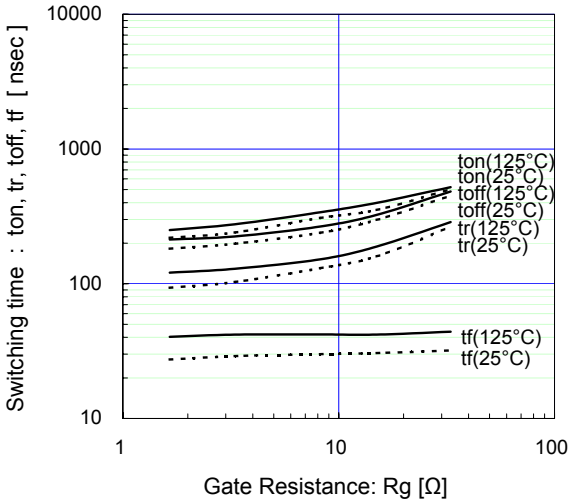
[SW mode B]
Switching time vs. Collector current (typ.)
Vcc=300V, V_{GE}=±15V, Rg=3.3Ω



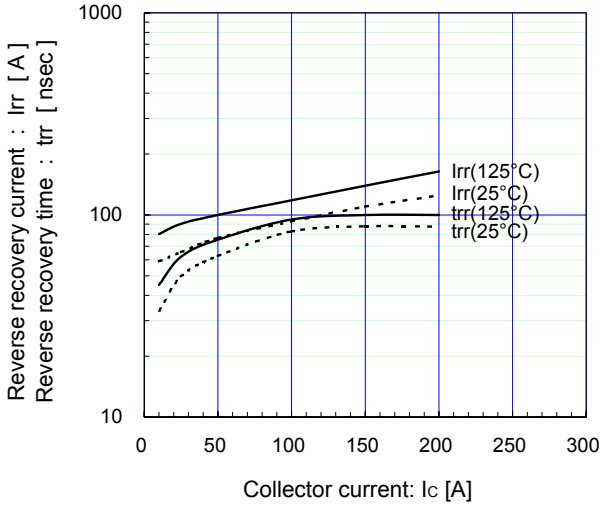
[SW mode B]
Switching loss vs. Gate resistanse (typ.)
Vcc=300V, Ic=100A, V_{GE}=±15V



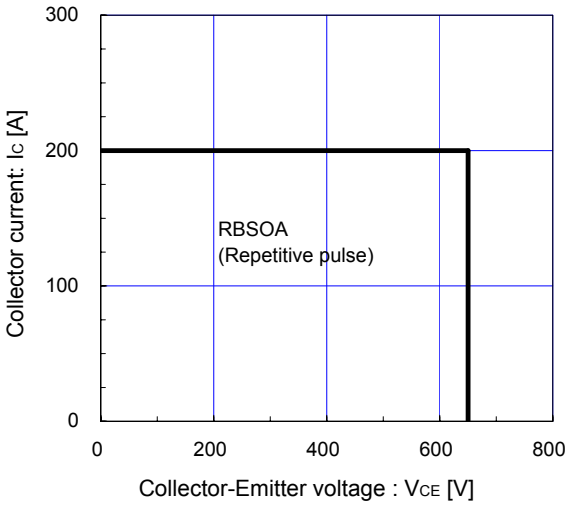
[SW mode B]
Switching time vs. Gate resistanse (typ.)
Vcc=600V, Ic=100A, V_{GE}=±15V



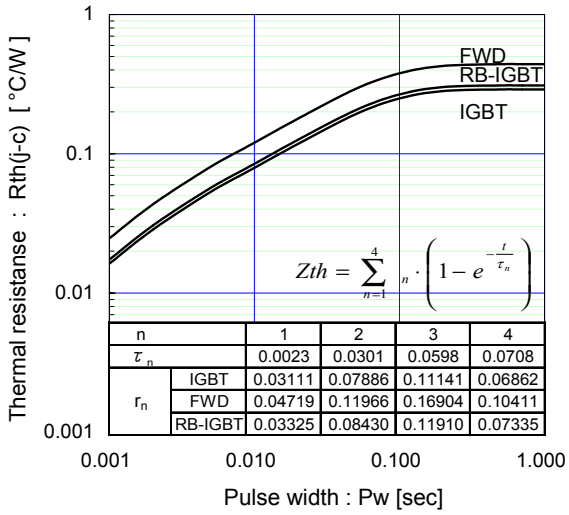
[SW mode B]
Switching time vs. Collector current (typ.)
Vcc=600V, V_{GE}=±15V, Rg=3.3Ω



[T3, T4]
Reverse bias safe operating area (max.)
V_{GE}=15V,-V_{GE} ≦ 15V, Rg ≧3.3Ω ,Tj = 125ºC

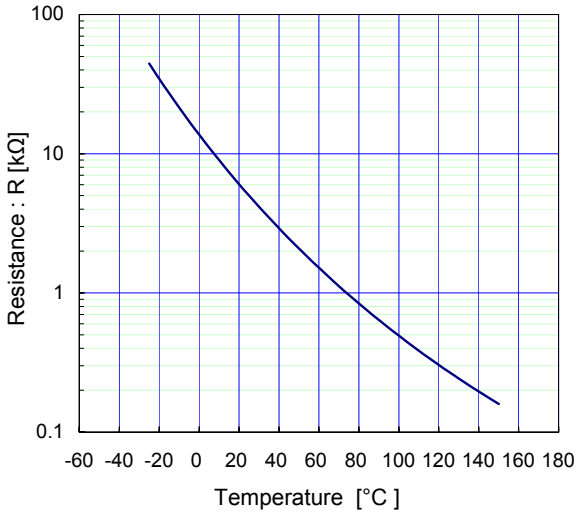


Transient thermal resistance (max.)

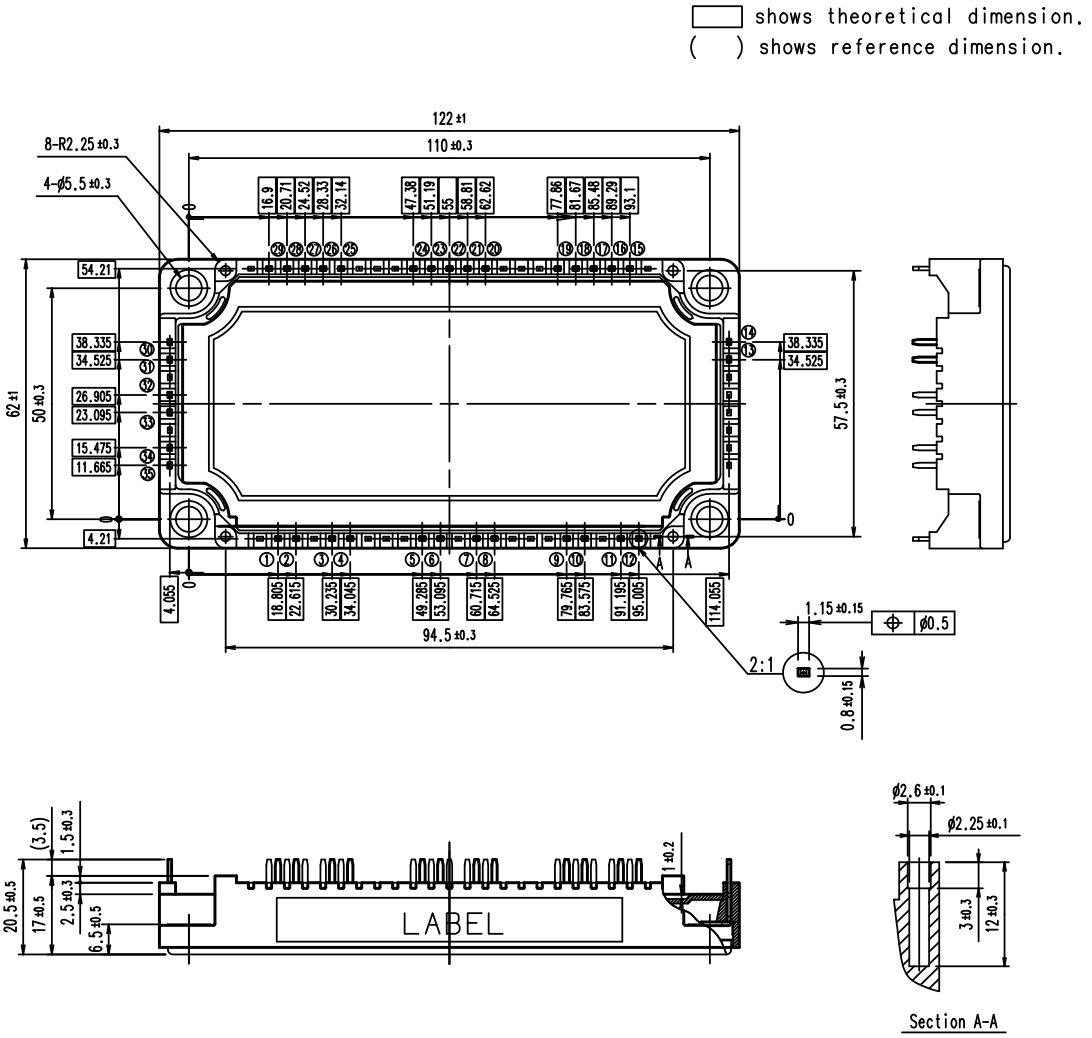


n		1	2	3	4
τ_n		0.0023	0.0301	0.0598	0.0708
r_n	IGBT	0.03111	0.07886	0.11141	0.06862
	FWD	0.04719	0.11966	0.16904	0.10411
	RB-IGBT	0.03325	0.08430	0.11910	0.07335

[Thermistor]
Temperature characteristic (typ.)

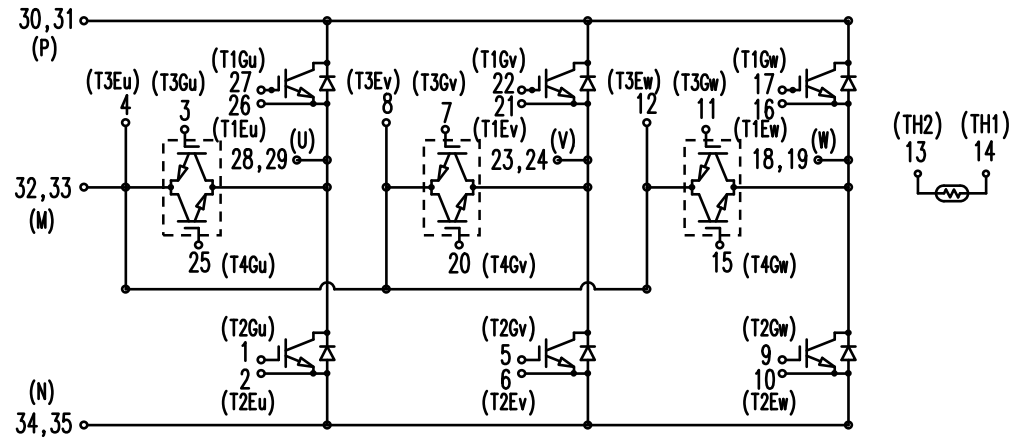


■ Outline Drawings, mm



Weight: 302g (typ.)

■ Equivalent Circuit Schematic



: RB-IGBT (Reverse Blocking IGBT)

WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of September 2013.
The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sur 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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• 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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