TARGET
SPECIFICATION
(TENTATIVE)

Device Name : IGBT Module

Type Name : 1MBI1200UE-330

Spec. No. : MT5F 21070

a) Nov.-28-'08 VF(terminal), Indication on module

REVISIONS

	DATE	NAME	APPROVED
DRAWN	Nov. 19 '08	K.Haraguchi	S.Igarashi
CHECKED	Nov. 19 '08	T.Koga	

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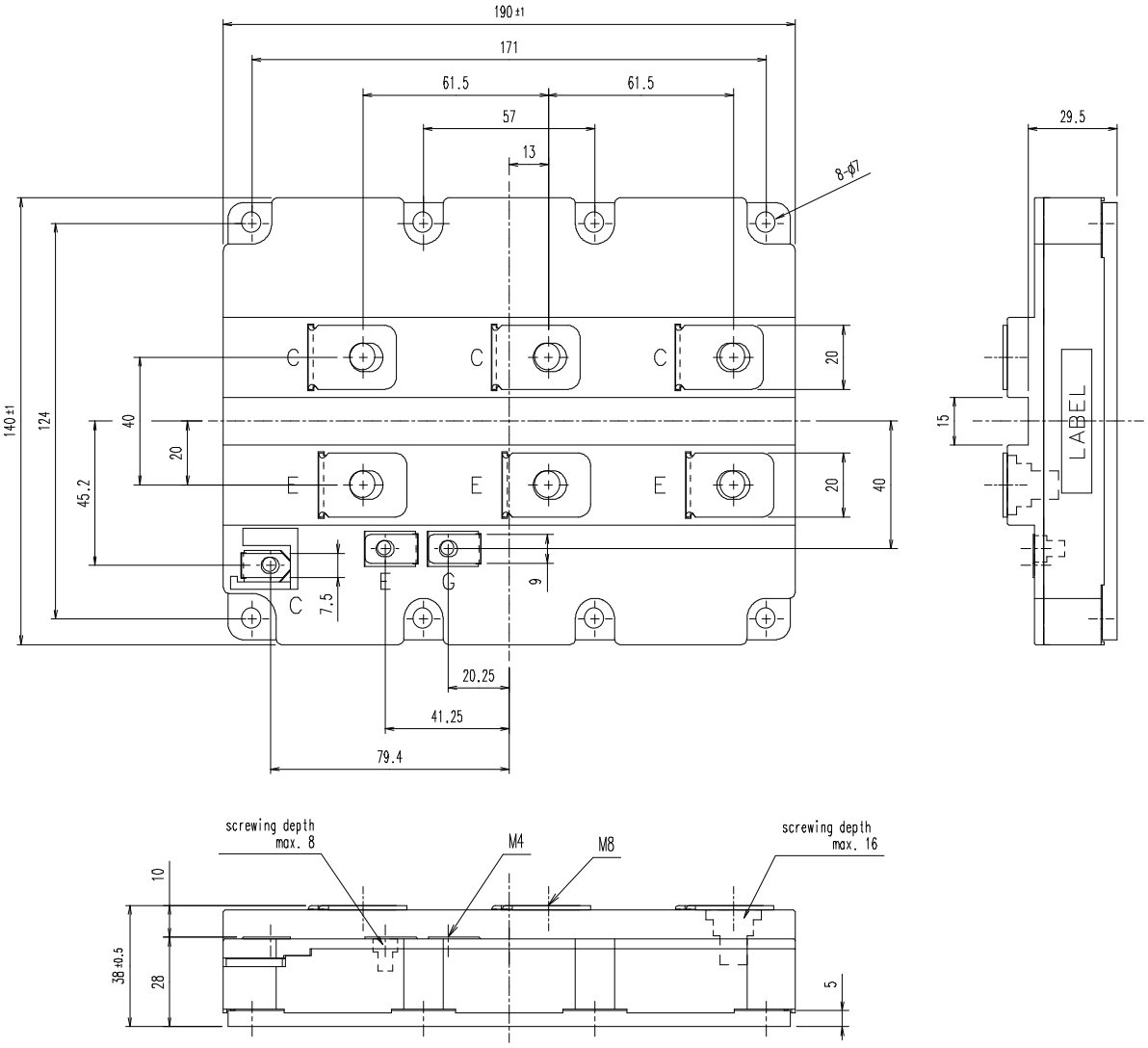
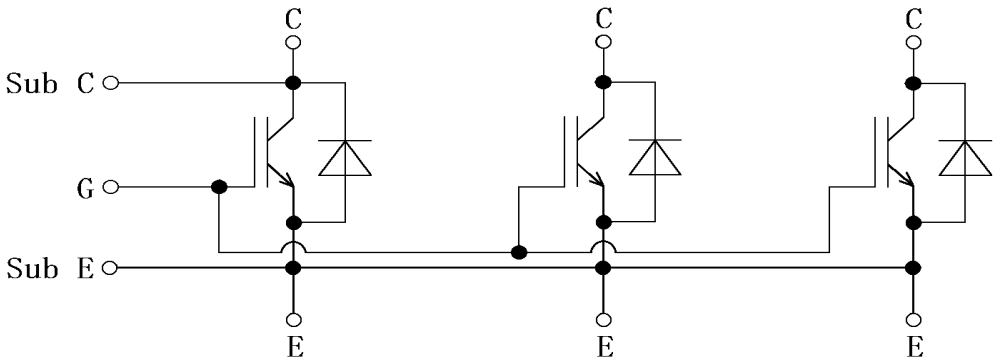
1MBI1200UE-330

1. Outline Drawing (Unit : mm)



2. Equivalent circuit



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3.Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

Items		Symbols	Conditions		Maximum Ratings	Units
Collector-Emitter voltage		VCES			3300	V
Gate-Emitter voltage		VGES			±20	V
Collector current		Ic	Continuous	Tc=25℃	2000	A
				Tc=80℃	1200	
		Icp	1ms	Tc=25℃	4000	
				Tc=80℃	2400	
		-Ic			1200	
		-Ic pulse	1ms		2400	
Collector Power Dissipation		Pc	1 device		14.7	kW
Junction temperature		Tj			150	℃
Storage temperature		Tstg			-40～125	
Isolation voltage	between terminal and base (*1)	Viso	AC: 1min.		6.0	kVAC
Screw Torque (*2)	Mounting	—			5.75	Nm
	Main Terminals				10	
	Sense Terminals				2.1	

(*1) All terminals should be connected together when isolation test will be done.

(*2) Recommendable Value : Mounting 4.25～5.75 Nm (M6)

Main Terminals 8～10 Nm (M8)

Sense Terminals 1.80～2.10 Nm (M4)

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4. Electrical characteristics (at Tj= 25°C unless otherwise specified)

Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Zero gate voltage Collector current	ICES	VCE=3300V VGE=0V		–	–	1.0	mA
Gate-Emitter leakage current	IGES	VCE=0V VGE=±20V		–	–	4800	nA
Gate-Emitter threshold voltage	VGE(th)	VCE=20V Ic=1200mA		5.5	6.5	7.5	V
Collector-Emitter saturation voltage	VCE(sat) (terminal)	Ic=1200A VGE=+15V	Tj= 25°C	–	2.70	3.00	V
			Tj=125°C	–	3.15	3.45	
			Tj=150°C	–	3.25	3.55	
	VCE(sat) (chip)		Tj= 25°C	–	2.60	2.90	
			Tj=125°C	–	3.05	3.35	
			Tj=150°C	–	3.15	3.45	
Input capacitance	Cies	VCE=0V,VCE=10V,f=1MHz		–	240	–	nF
Turn-on time	ton	Vcc=1800V Ic=1200A VGE=±15V RG=1.6Ω	Ls=150nH Tj=150°C	–	2.85	–	μs
	tr			–	1.4	–	
Turn-off time	toff			–	2.5	–	
	tf			–	0.4	–	
Forward on voltage	VF (terminal)	IF=1200A VGE=0V	Tj= 25°C	–	2.80 (a)	3.10 (a)	V
			Tj=125°C	–	2.95	3.25	
			Tj=150°C	–	2.85	3.15	
	VF (chip)		Tj= 25°C	–	2.70	3.00	
			Tj=125°C	–	2.85	3.15	
			Tj=150°C	–	2.75	3.05	
Reverse recovery time	trr	IF=1200A	Tj=150°C	–	0.95	–	
Lead resistance, terminal-chip	R lead			–	0.10	–	mΩ

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5. Thermal resistance characteristics

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Thermal resistance(1device)	Rth(j-c)	IGBT		–	7.1	8.5	℃/kW
		FWD		–	14.6	17.0	
Contact Thermal resistance(1device) (*3)	Rth(c-f)	IGBT		–	6.0	–	
		FWD		–	12.0	–	

(*3) This is the value which is defined mounting on the additional cooling fin with thermal compound(1W/m℃).

6. Indication on module

Display on the module label

- Logo of production
- Type name : 1MBI1200UE-330
- IC, VCES rating 1200A 3300V
- Lot No. (5 digits)
- Place of manufacturing (code)
- Bar code with serial No.

7.Applicable category

This specification is applied to IGBT Module named 1MBI1200UE-330 .

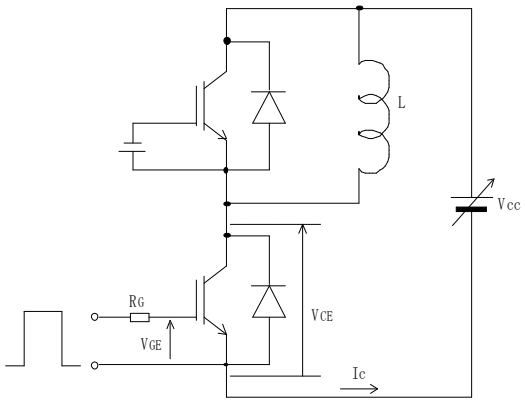
8.Storage and transportation notes

- The module should be stored at a standard temperature of 5 to 35°C and humidity of 45 to 75% .
- Store modules in a place with few temperature changes in order to avoid condensation on the module surface.
- Avoid exposure to corrosive gases and dust.
- Avoid excessive external force on the module.
- Store modules with unprocessed terminals.
- Do not drop or otherwise shock the modules when transporting.

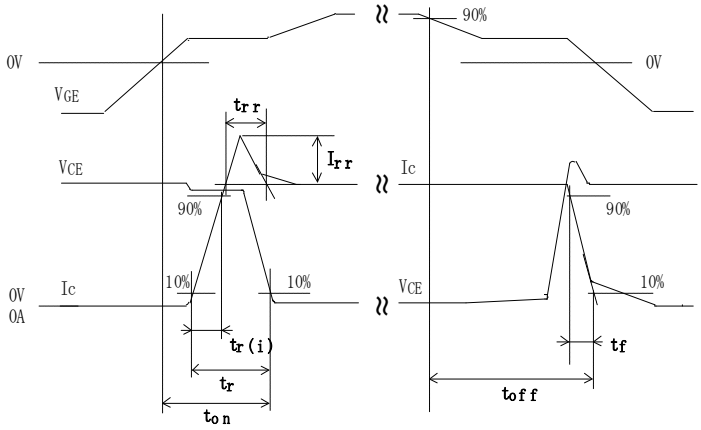
9.Definitions of switching time

*Ls=150nH

Test circuit



Definitions of switching time



10. Packing and Labeling

Display on the packing box

- Logo of production
- Type name
- Lot No
- Products quantity in a packing box

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11.Reliability test results

Reliability Test Items

Test categories		Test items	Test methods and conditions	Reference norms EIAJ ED-4701 (Aug.-2001 edition)	Number of sample	Acceptance number
Mechanical Tests	1	Terminal Strength (Pull test)	Pull force : 40N Test time : 10±1 sec.	Test Method 401 method Ⅰ	5	(0 : 1)
	2	Mounting Strength	Screw torque : 1.8 ~ 2.1 N·m (M4) 4.25 ~ 5.75 N·m (M6) 8.0~ 10.0 N·m (M8) Test time : 10±1 sec.	Test Method 402 method Ⅱ	5	(0 : 1)
	3	Vibration	Range of frequency : 10 ~ 500Hz Sweeping time : 15 min. Acceleration : 100m/s^2 Sweeping direction : Each X,Y,Z axis Test time : 6 hr. (2hr./direction)	Test Method 403 Reference 1 Condition code B	5	(0 : 1)
	4	Shock	Maximum acceleration : 1000m/s^2 Pulse width : 6.0msec. Direction : Each X,Y,Z axis Test time : 3 times/direction	Test Method 404 Condition code B	5	(0 : 1)
Environment Tests	1	High Temperature Storage	Storage temp. : 125 ± 5 °C Test duration : 1000hr.	Test Method 201	5	(0 : 1)
	2	Low Temperature Storage	Storage temp. : -40 ± 5 °C Test duration : 1000hr.	Test Method 202	5	(0 : 1)
	3	Temperature Humidity Storage	Storage temp. : 85 ± 2 °C Relative humidity : 85 ± 5% Test duration : 1000hr.	Test Method 103 Test code C	5	(0 : 1)
	4	Unsaturated Pressurized Vapor	Test temp. : 120 ± 2 °C Test humidity : 85 ± 5% Test duration : 96hr.	Test Method 103 Test code E	5	(0 : 1)
	5	Temperature Cycle	Test temp. : Low temp. -40 ± 5 °C High temp. 125 ± 5 °C RT 5 ~ 35 °C Dwell time : High ~ RT ~ Low ~ RT 1hr. 0.5hr. 1hr. 0.5hr. Number of cycles : 100 cycles	Test Method 105	5	(0 : 1)
	6	Thermal Shock	Test temp. : High temp. 100^{+0}_{-5} °C Low temp. 0^{+5}_{-0} °C Used liquid : Water with ice and boiling water Dipping time : 5 min. par each temp. Transfer time : 10 sec. Number of cycles : 10 cycles	Test Method 307 method Ⅰ Condition code B	5	(0 : 1)

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Reliability Test Items

Test categories		Test items	Test methods and conditions	Reference norms EIAJ ED-4701 (Aug.-2001 edition)	Number of sample	Acceptance number
Endurance Tests	1	High temperature Reverse Bias	Test temp. : Ta = 125 ± 5 °C (Tj ≦ 150 °C) Bias Voltage : VC = 0.8 × VCES Bias Method : Applied DC voltage to C-E VGE = 0V Test duration : 1000hr.	Test Method 101	5	(0 : 1)
	2	High temperature Bias (for gate)	Test temp. : Ta = 125 ± 5 °C (Tj ≦ 150 °C) Bias Voltage : VC = VGE = +20V or -20V Bias Method : Applied DC voltage to G-E VGE = 0V Test duration : 1000hr.	Test Method 101	5	(0 : 1)
	3	Temperature Humidity Bias	Test temp. : 85 ± 2 °C Relative humidity : 85 ± 5% Bias Voltage : VC = 0.8 × VCES Bias Method : Applied DC voltage to C-E VGE = 0V Test duration : 1000hr.	Test Method 102 Condition code C	5	(0 : 1)
	4	Intermitted Operating Life (Power cycle) (for IGBT)	ON time : 2 sec. OFF time : 18 sec. Test temp : Δ Tj = 100 ± 5 deg Tj ≦ 150 °C, Ta = 25 ± 5 °C Number of cycles : 15000cycles	Test Method 106	5	(0 : 1)

Failure Criteria

Items	Characteristics		Symbols	Failure criteria Lower limit	Failure criteria Upper limit	Units	Notes
Electrical characteristic	Leakage current		ICES	-	USL × 2	mA	
			±IGES	-	USL × 2	uA	
	Gate threshold voltage		VGE(th)	LSL × 0.8	USL × 1.2	mA	
	Saturation voltage		VCE(sat)	-	USL × 1.2	V	
	Forward voltage		VF	-	USL × 1.2	V	
	Thermal resistance	IGBT	ΔVGE or ΔVCE	-	USL × 1.2	mV	
		FWD	ΔVF	-	USL × 1.2	mV	
	Isolation voltage		Viso	Broken insulation			
Visual inspection	Visual inspection ┌ Peeling ┤ Plating └ and the others		-	The visual sample		-	

LSL : Lower specified limit.
USL : Upper specified limit.

Note : Each parameter measurement read-outs shall be made after stabilizing the components at room ambient for 2 hours minimum, 24 hours maximum after removal from the tests. And in case of the wetting tests, for example, moisture resistance tests, each component shall be made wipe or dry completely before the measurement.

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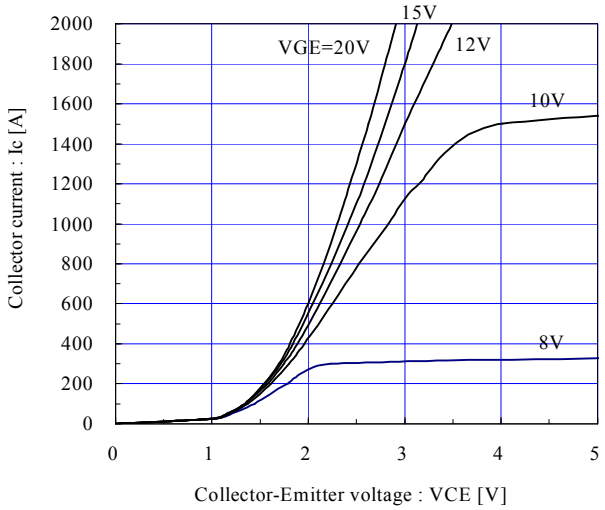
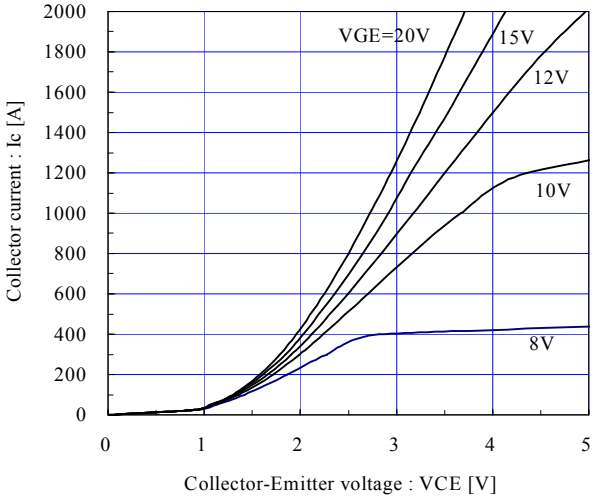
Collector current vs. Collector-Emitter voltage (typ.)

Tj= 25℃ / chip



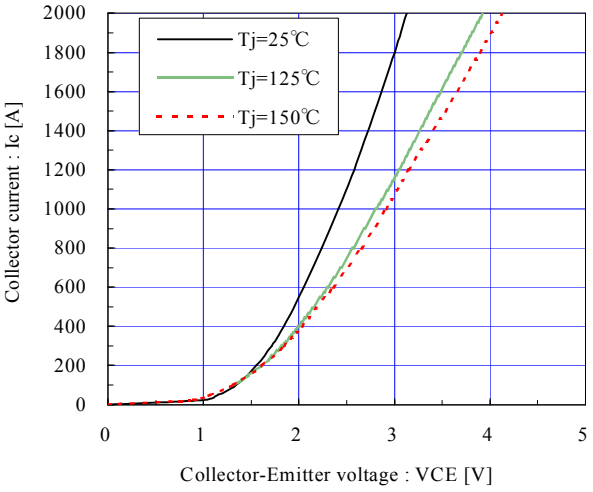
Collector current vs. Collector-Emitter voltage (typ.)

Tj= 150°C / chip



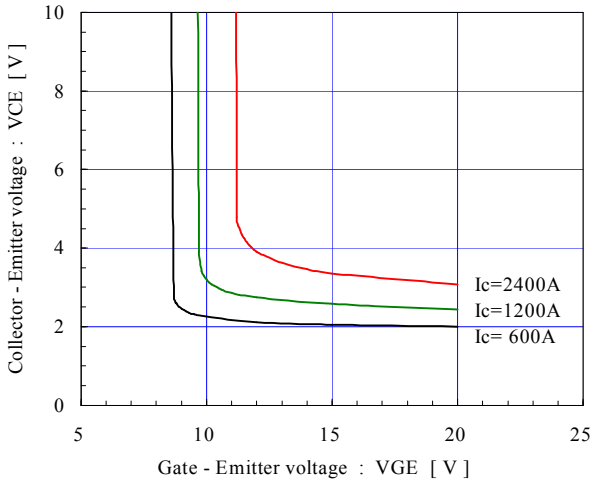
Collector current vs. Collector-Emitter voltage (typ.)

VGE=15V / chip



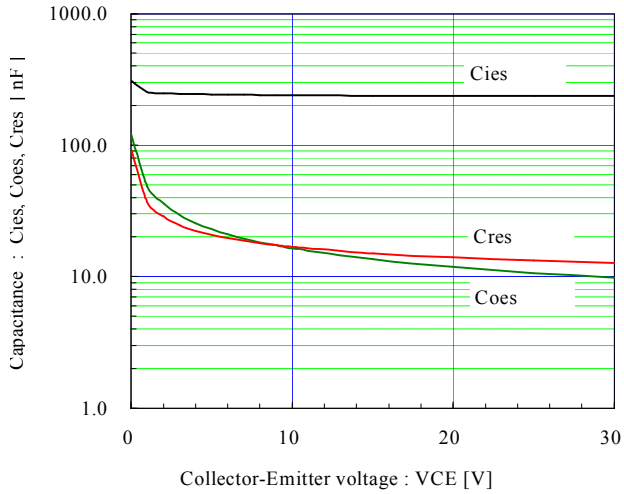
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)

Tj=25°C / chip



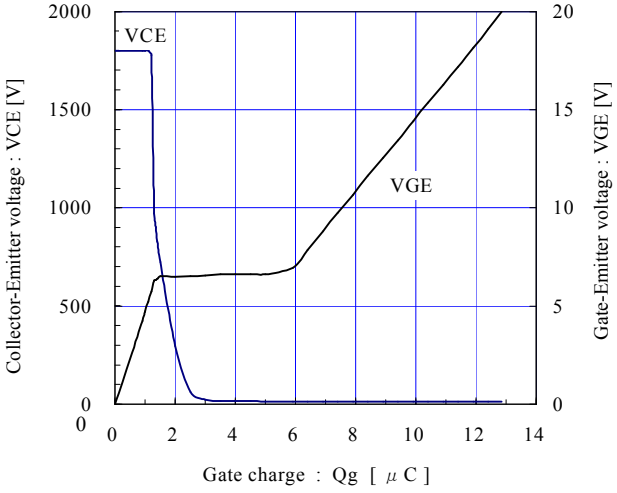
Capacitance vs. Collector-Emitter voltage (typ.)

VGE=0V, f= 1MHz, Tj= 25°C



Dynamic Gate charge (typ.)

Vcc=1800V, Ic=1200A, Tj= 25°C



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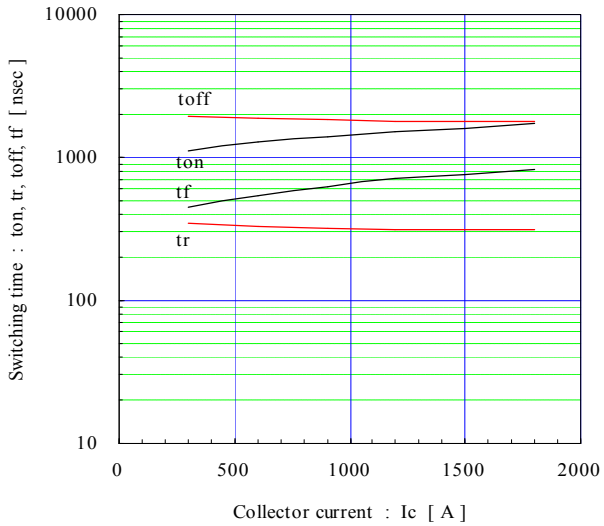
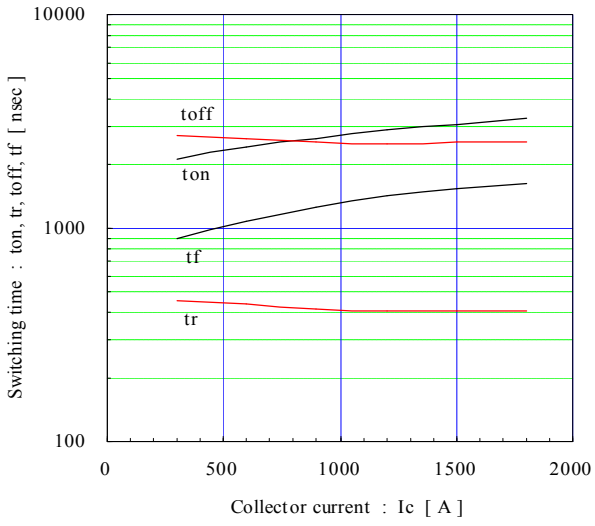
Switching time vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1.6Ω, Tj= 25°C



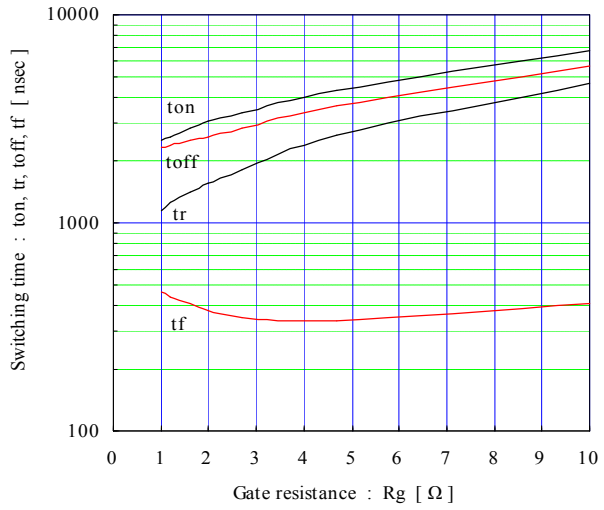
Switching time vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1.6Ω, Tj=150°C



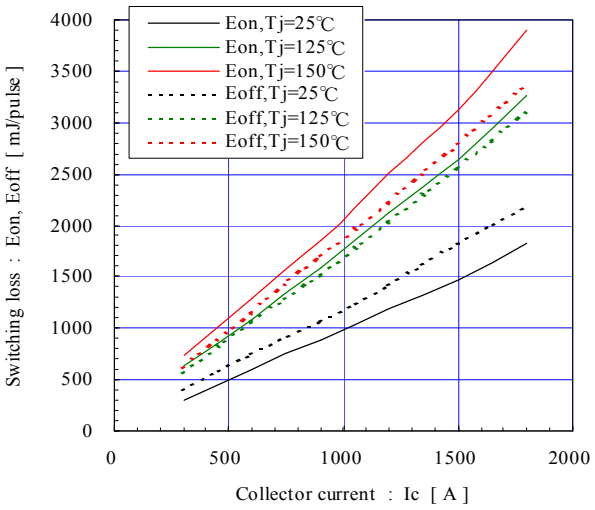
Switching time vs. Gate resistance (typ.)

Vcc=1800V, Ic=1200A, VGE=±15V, Tj= 150°C



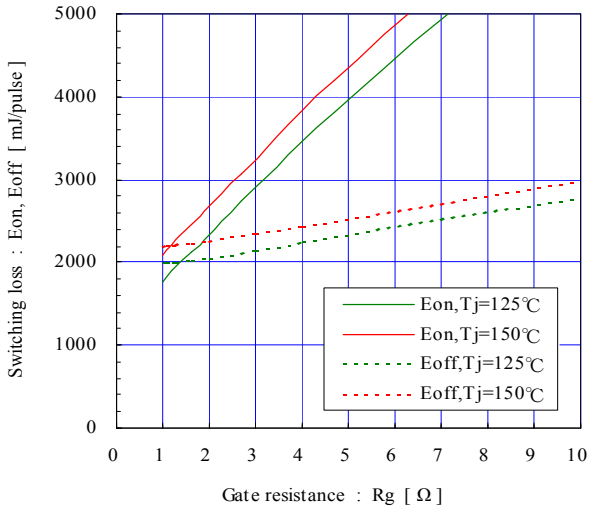
Switching loss vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1.6Ω,Ls=150nH



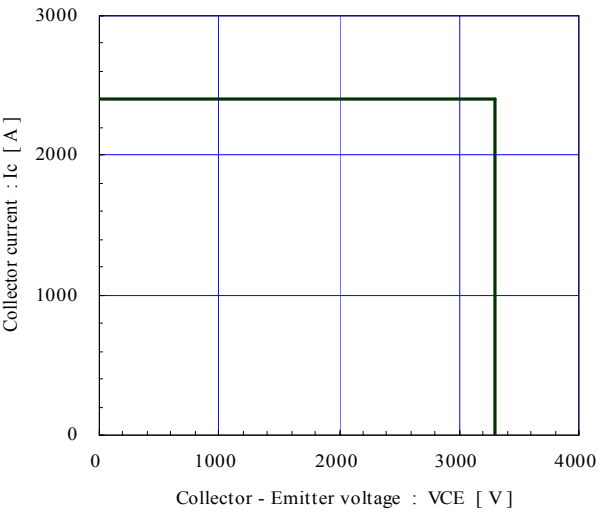
Switching loss vs. Gate resistance (typ.)

Vcc=1800V, Ic=1200A, VGE=±15V, Ls=150nH



Reverse bias safe operating area (max.)

+VGE=AJ51,-VGE≦ 15V, RG≧ 1.6Ω ,Tj=150°C (a)



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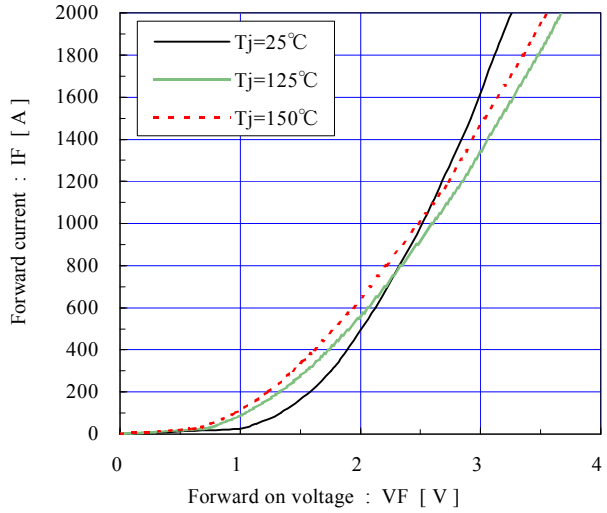
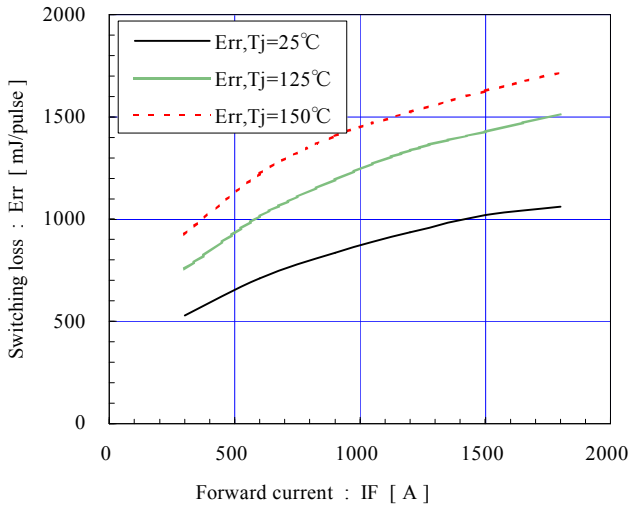
Forward current vs. Forward on voltage (typ.)

chip



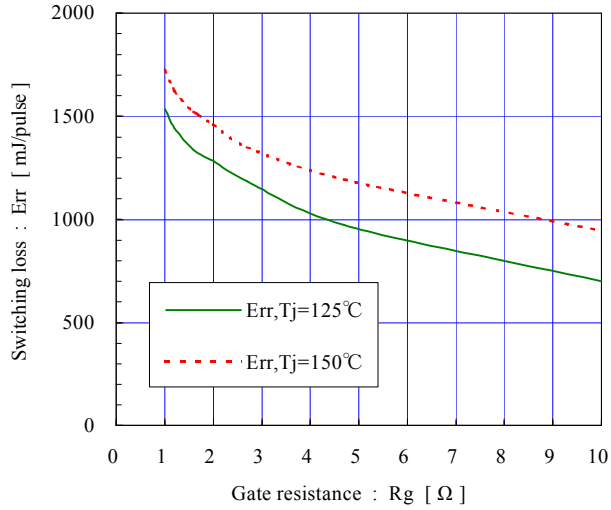
Switching loss vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1.6Ω, Ls=150nH



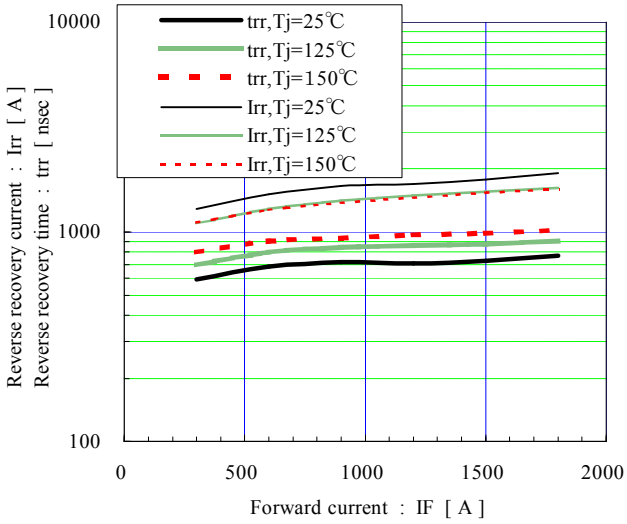
Switching loss vs. Gate resistance (typ.)

Vcc=1800V, IF=1200A, VGE=±15V, Ls=150nH

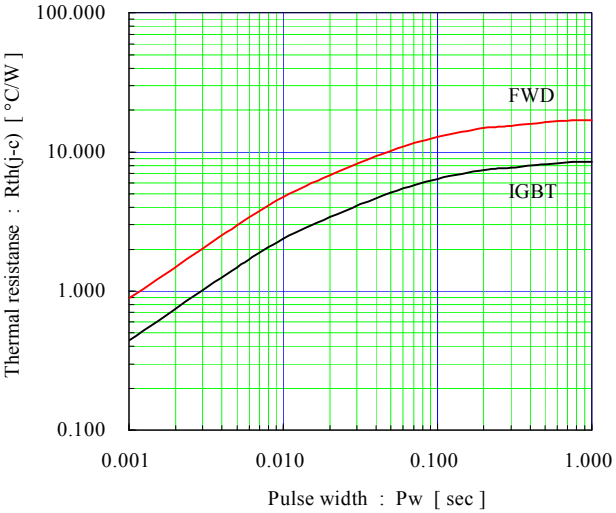


Reverse recovery characteristics (typ.)

Vcc=1800V, VGE=±15V, Rg=1.6Ω



Transient thermal resistance (max.)



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