TARGET
SPECIFICATION
(TENTATIVE)

Device Name	:	IGBT Module
Type Name	:	1MBI1500UE-330-02
Spec. No.	:	MT5F 21160

	DATE	NAME	APPROVED
DRAWN	Dec.-10-'08	K.Haraguchi	S.Igarashi
CHECKED	Dec.-10-'08	T.Koga	

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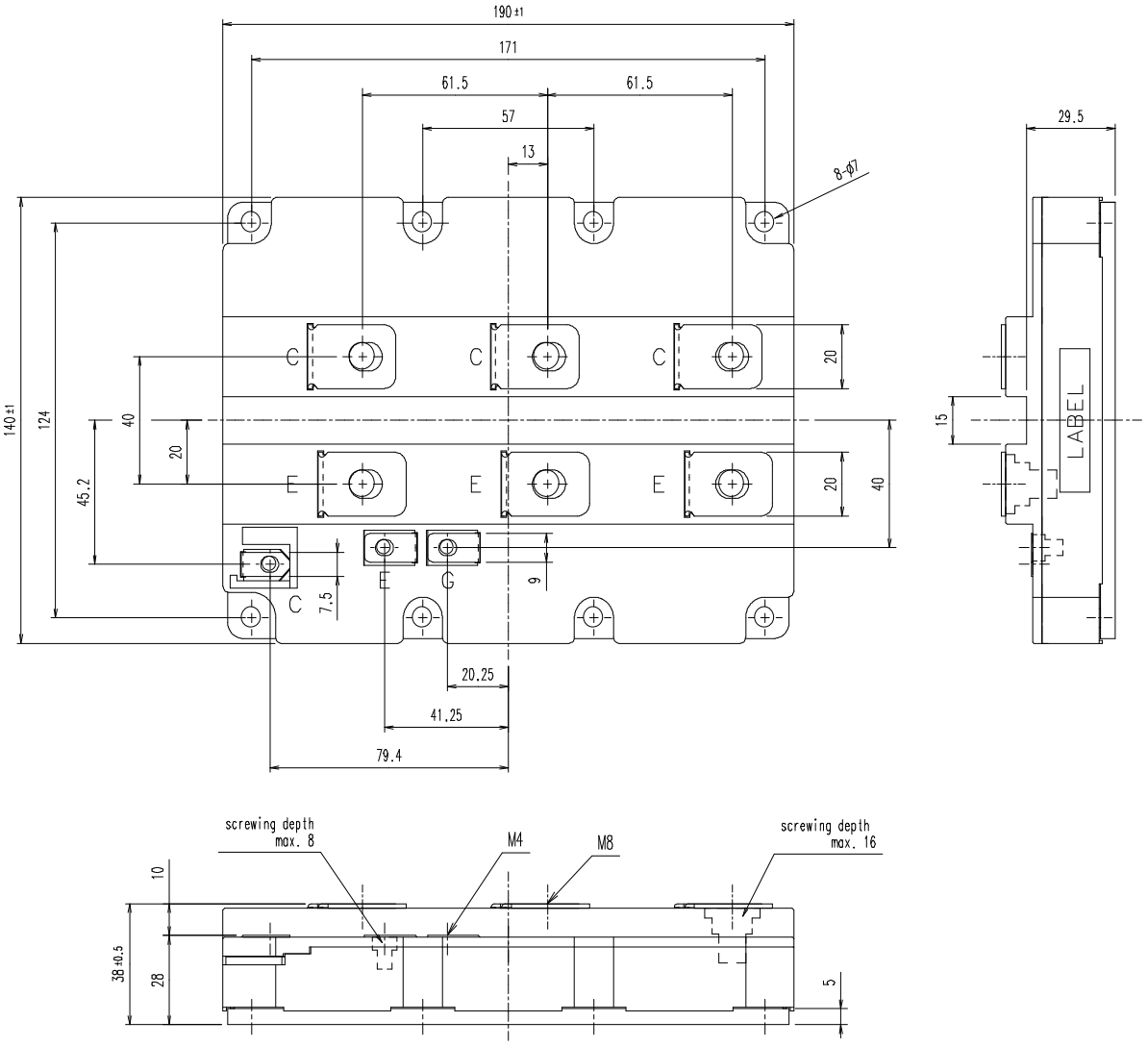
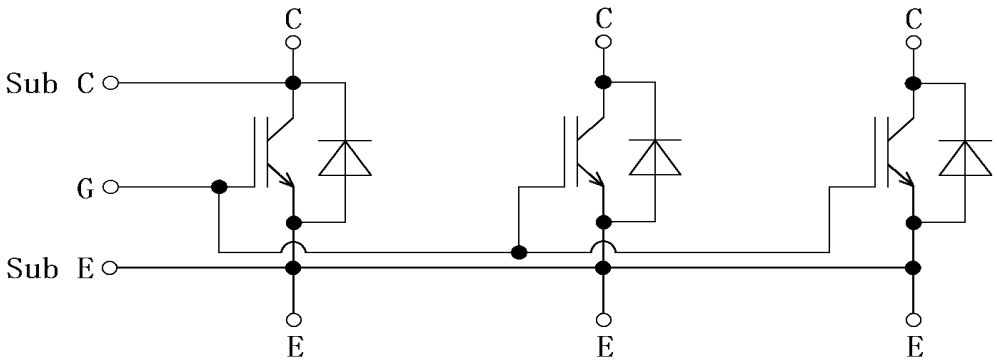
1MBI1500UE-330-02

1. Outline Drawing (Unit : mm)



2. Equivalent circuit



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Items		Symbols	Conditions		Maximum Ratings	Units
Collector-Emitter voltage		VCES	Tj = -40～150℃		3300	V
Gate-Emitter voltage		VGES			±20	V
Collector current		Ic	Continuous	Tc=25℃	3000	A
				Tc=80℃	1500	
		Icp	1ms	Tc=25℃	6000	
				Tc=80℃	3000	
		-Ic			1500	
		-Ic pulse	1ms		3000	
Collector Power Dissipation		Pc	1 device		15.6	kW
Junction temperature		Tj			150	℃
Operating temperature		Tj op	Industrial applications		0～150	
			Traction applications		-40～150	
Storage temperature		Tstg			-40～150	
Isolation voltage *1		Viso	AC : 1min.		6.0	kVAC
Partial discharge Extinction voltage *2		V_{PDoff} (Ve)	AC 50 or 60Hz , Q≦10pC		4.1	kVAC
DC stability for cosmic ray		VCED	Tj=25℃ , 100FIT		2100	VDC
FWD I2t *3		I2t	Tj=125℃	t=100μs	TBD	kA^2s
				t=10ms	700	
				t=100ms	TBD	
Screw Torque(Mounting／M6) *4		—			5.75	Nm
Screw Torque (Terminals)	M8 (Main C,E) *5				10	
	M4 (G,sub C,E) *6				2.1	

*1 All terminals should be connected together when isolation test will be done.
Isolation test of 5.0kVAC, 2min. and 4.3kV,10min. will be done on the Type test.

*2 This characteristics should be measured before isolation test.
V_{PDoff} will be not measured if V_{PDon} > 6.2kV on outgoing test.

*3 Life time > 100 cycles (cycle interval > 1sec.)

*4 Recommendable Value (M6) : 5±15% （4.25～5.75） Nm

*5 Recommendable Value (M8) : 8～10 Nm

*6 Recommendable Value (M4) : 2 -10%,+5% （1.80～2.10） Nm

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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 *1		ICES	VGE= 0V	VCE=3300V	Tj=-40℃	—	—	1	mA
					Tj= 25℃	—	—	1	
					Tj=125℃		6	25	
					Tj=150℃		38	150	
				VCE=2000V	Tj=125℃	—	5	25	
					Tj=150℃	—	30	125	
Gate-Emitter leakage current		IGES	VCE=0V,VGE=±20V			—	—	6000	nA
Gate-Emitter threshold voltage		VGE(th)	VCE=20V,Ic=1500mA			5.5	6.5	7.5	V
Collector-Emitter saturation voltage		VCE(sat) (terminal)	Ic=1500A		Tj= 25℃	—	2.70	TBD	V
					Tj=125℃	—	3.15		
					Tj=150℃	—	3.25		
		VCE(sat) (chip)	VGE=+15V		Tj= 25℃	—	2.60	TBD	
					Tj=125℃	—	3.05		
					Tj=150℃	—	3.15		
Forward on voltage		VF (terminal)	Ic=1500A		Tj= 25℃	—	2.80	TBD	V
					Tj=125℃	—	2.95		
					Tj=150℃	—	2.85		
		VF (chip)	VGE=+15V		Tj= 25℃	—	2.70	TBD	
					Tj=125℃	—	2.85		
					Tj=150℃	—	2.75		
Input capacitance		Cies	VCE=0V,VCE=10V,f=1MHz			—	300	—	nF
Turn-on time		ton	Tj= 25℃		Vcc=1800V	—	—	TBD	ns
		tr			Ic=1500A	—	—	TBD	
		tr(i)			VGE=±15V	—	TBD	—	
Turn-off time		toff			RG=1 Ω	—	—	TBD	
		tf			Ls=150nH	—	—	TBD	
Reverse recovery time		trr				—	—	TBD	
Reverse recovery current		Irp(RM)	Tj=125℃			—	TBD	TBD	A
Reverse recovery charge		Qrr				—	TBD	TBD	μC
Scatter range of reverse charge		ΔQrr				—	—	TBD	
Switching Losses	Turn-on Losses	Eon				—	2.7	—	J
	Turn-off Losses	Eoff				—	2.50	—	
	Reverse recovery Losses	Err				—	1.70	—	
Reverse recovery current		Irp(RM)	Tj=150℃			—	TBD	TBD	A
Reverse recovery charge		Qrr				—	TBD	TBD	μC
Scatter range of reverse charge		ΔQrr				—	—	TBD	
Switching Losses	Turn-on Losses	Eon				—	3.10	—	J
	Turn-off Losses	Eoff				—	2.75	—	
	Reverse recovery Losses	Err				—	1.85	—	
Maximum short circuit current		Icp	Tj=150℃,Vcc=2300V,Pw=10μs VGE=+16/-10V, +RG=1 Ω Ls=150nH,L(load)=20nH~3μH *2			—	TBD	TBD	kA
Internal inductance		Ls C-E	Between main C-E terminals			—	10	TBD	nH

*1 ICES should measured be after in out-going test .

*2 VCEP＜3300V,VGEP＜17V (by using Dynamic clump circuit)

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5. Thermal resistance characteristics *1

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Thermal resistance(1device)	Rth(j-c)	IGBT		–	TBD	8.0	℃/kW
		FWD		–	TBD	15.0	
Contact Thermal resistance(1device)	Rth(c-f)	IGBT		–	6.0	–	
		FWD		–	12.0	–	

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

6. Mechanical Properties

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Clearance distance	–	Terminals-base plate and colector-gate&emitter	19.0	–	–	mm
Creepage distance	–		32.0	–	–	mm
Case material (Comparative tracking Index)	CTI	Insulator group Ⅰ,EN50124-1	600	–	–	–
Air Gap *1	–		–	–	TDB	μm
Mass	–		–	1.5	–	kg
Fire load	–		–	TBD	–	kJ
NFF16-101 Classification	–	Plastic case:I1/F1 Epoxy resin:I1/F1				
Base plate material	–	AlSiC				

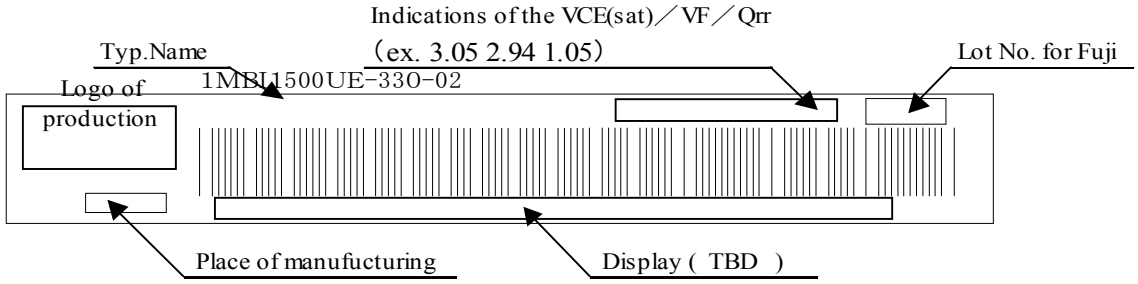
*1 Gap shoule be mesured between baseplate and an ideal plain clamping plate under center of substrate.
Mounting torqe = 4.25Nm (M6)

7. Environmental Conditions

* The module will be operated according to the following environment conditions.

Items	Class	Standerd No.
Climatic Conditions	Class : 5K2 (Tj=-40～150℃)	IEC60721-3-5
Biological conditions	Class : 5B1	
Chemically active substance	Class : 5C2 (no salt mist, no salt water)	
Mechanically active substance	Class : 5S2	
Contaminating fluids	Class : 5F1	
Pollution degree	PD2	pr EN 50124-1

8. Indication on module



For Indications of VCE(sat),VF,Qrr.

- VCE(sat) and VF are measured at terminal and at Tj=150℃. Unit is [V] .
- Qrr is measured at conditions in "4.Electrical characteristics" . Unit is [μC] .

9.Applicable category

This specification is applied to IGBT Module named 1MBI1500UE-330-02 .

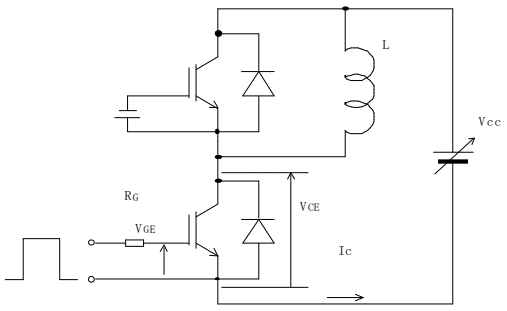
10.Storage and transportation notes

- 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.

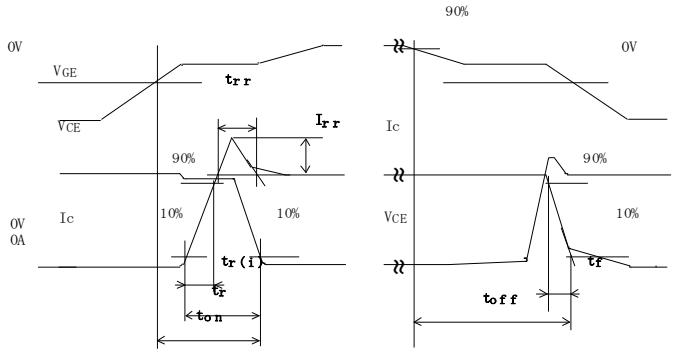
11.Definitions of switching time

*Ls=150nH

Test circuit



Definitions of switching time



12. Packing and Labeling

Display on the packing box

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

13. Type test items

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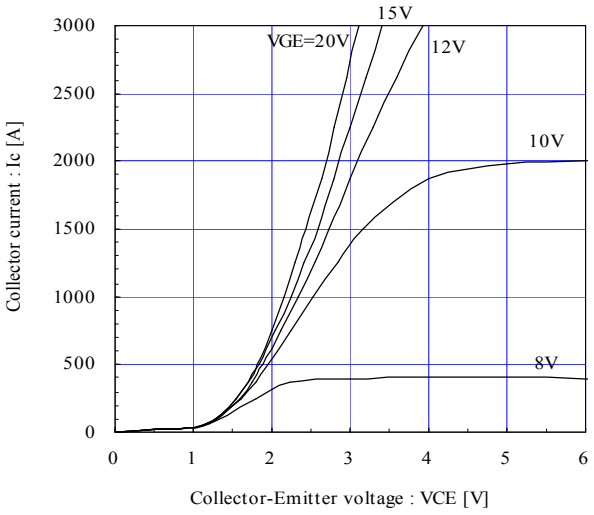
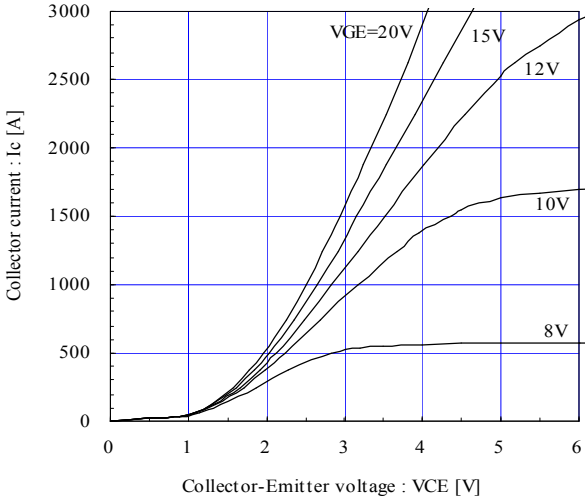
Collector current vs. Collector-Emitter voltage (typ.)

Tj= 25℃ / chip



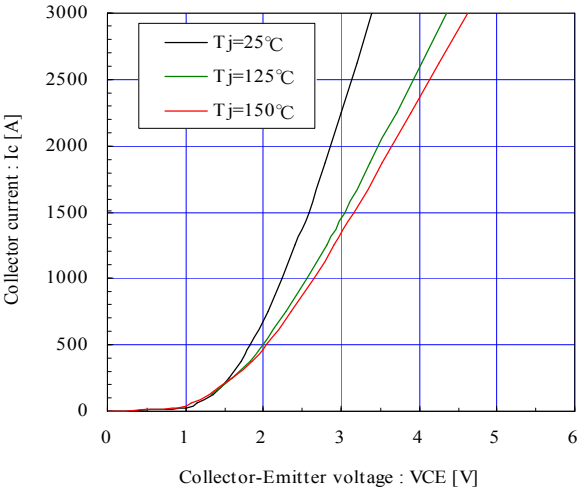
Collector current vs. Collector-Emitter voltage (typ.)

Tj= 150°C / chip



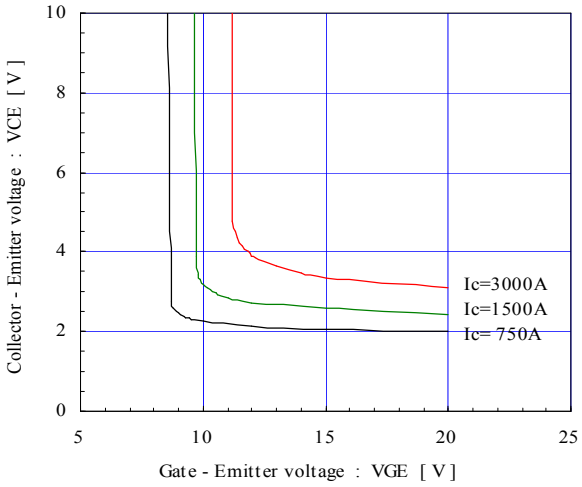
Collector current vs. Collector-Emitter voltage (typ.)

VGE=15V / chip



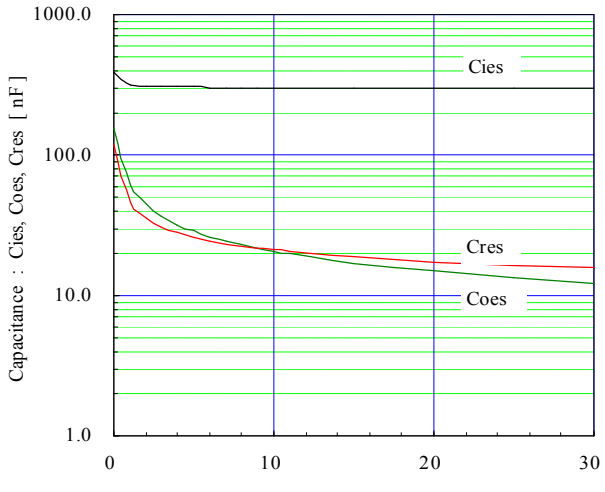
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)

Tj=25°C / chip



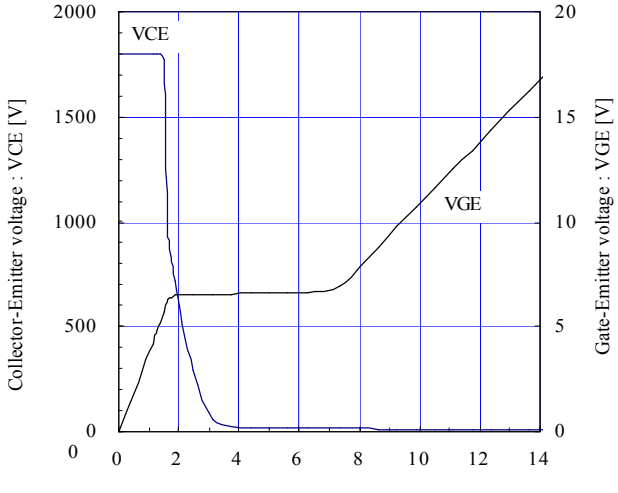
Capacitance vs. Collector-Emitter voltage (typ.)

VGE=0V, f= 1MHz, Tj= 25°C



Dynamic Gate charge (typ.)

Vcc=1800V, Ic=1500A, Tj= 25°C



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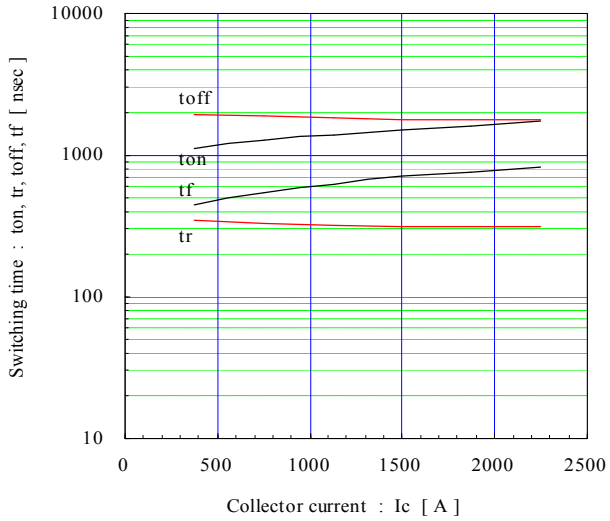
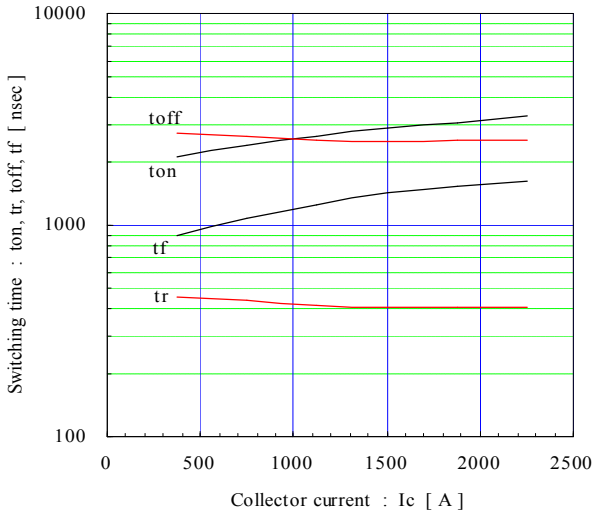
Switching time vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1Ω, Tj= 25°C



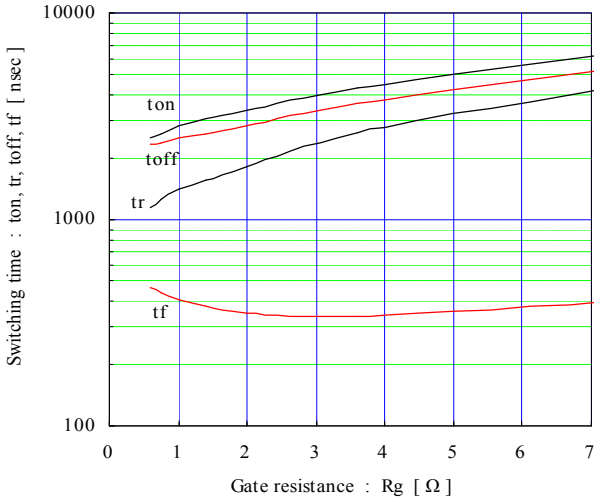
Switching time vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1Ω, Tj=150°C



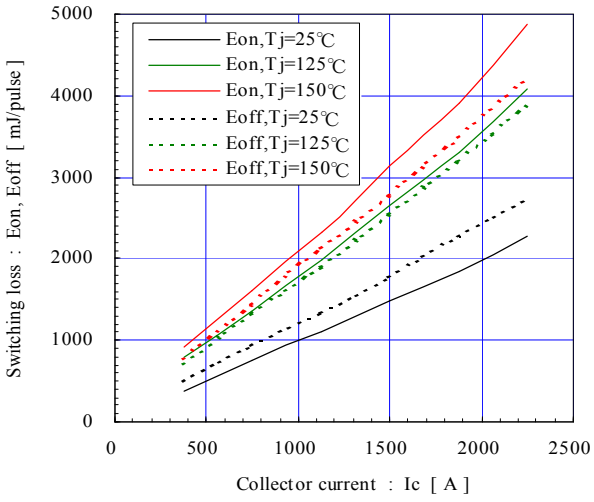
Switching time vs. Gate resistance (typ.)

Vcc=1800V, Ic=1500A, VGE=±15V, Tj= 150°C



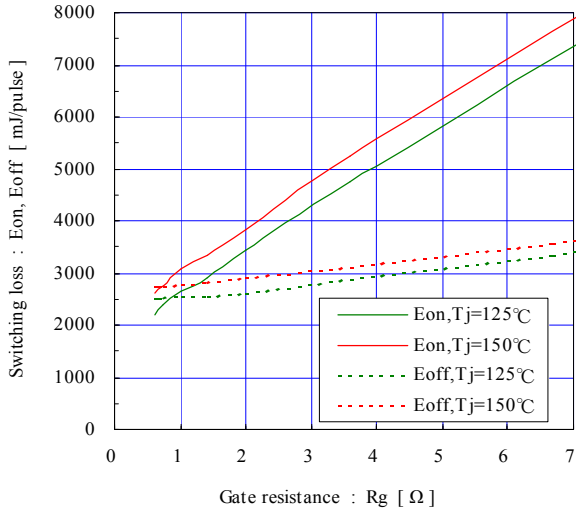
Switching loss vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1Ω,Ls=150nH



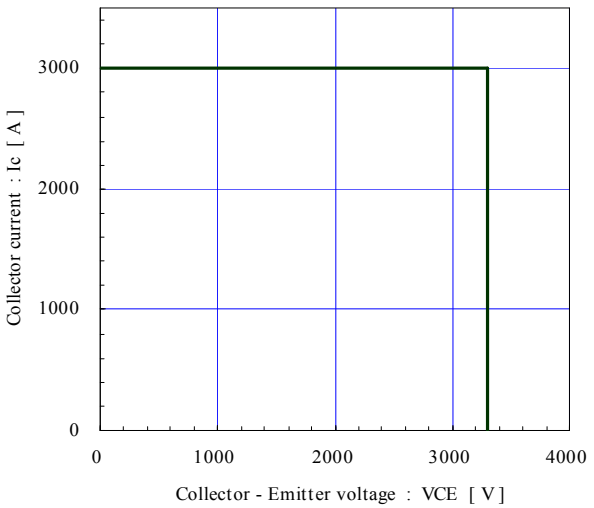
Switching loss vs. Gate resistance (typ.)

Vcc=1800V, Ic=1500A, VGE=±15V, Ls=150nH



Reverse bias safe operating area (max.)

+VGE=15V,-VGE≦ 15V, RG≧ 1Ω ,Tj=150°C



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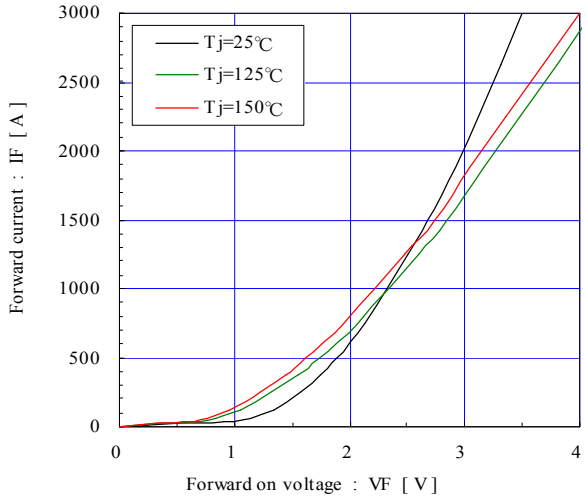
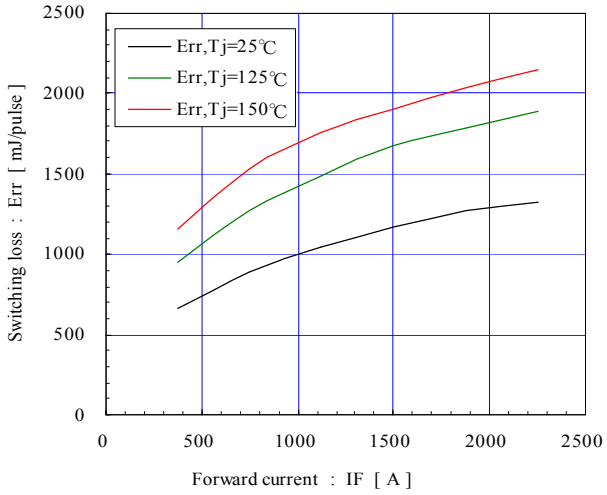
Forward current vs. Forward on voltage (typ.)

chip



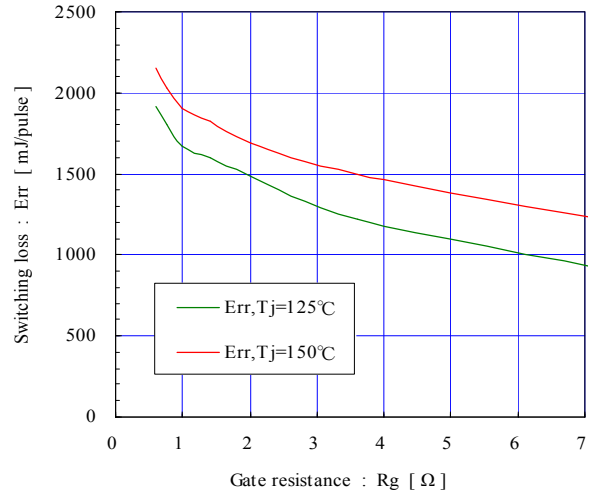
Switching loss vs. Collector current (typ.)

Vcc=1800V, VGE=±15V, Rg=1Ω, Ls=150nH



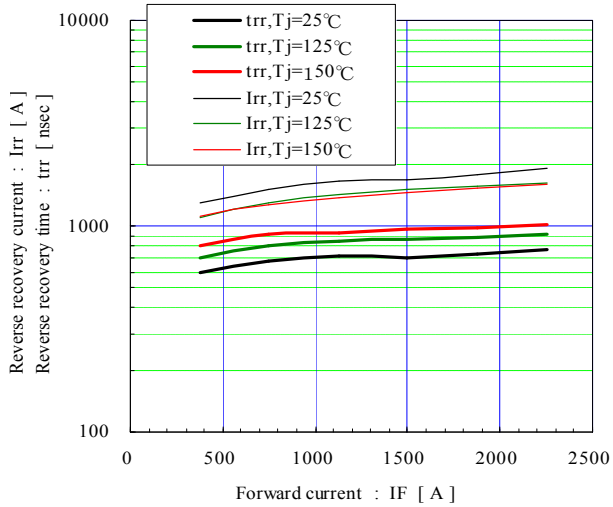
Switching loss vs. Gate resistance (typ.)

Vcc=1800V, IF=1500A, VGE=±15V, Ls=150nH



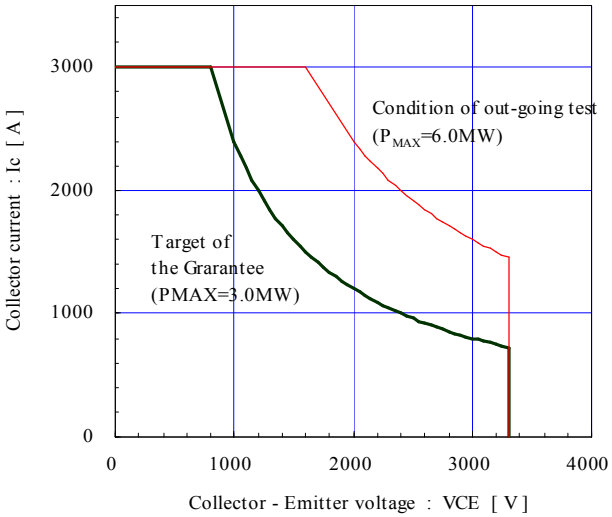
Reverse recovery characteristics (typ.)

Vcc=1800V, VGE=±15V, Rg=1Ω

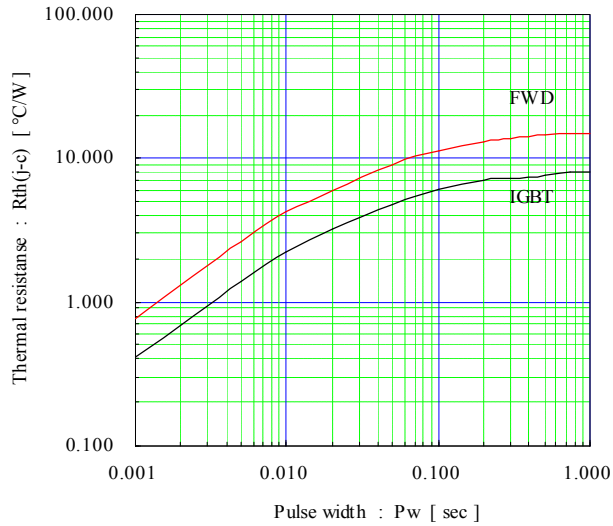


Diode safe operating area (max.)

+VGE=15V,-VGE≦15V, RG≧1Ω ,Tj=150°C



Transient thermal resistance (max.)



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