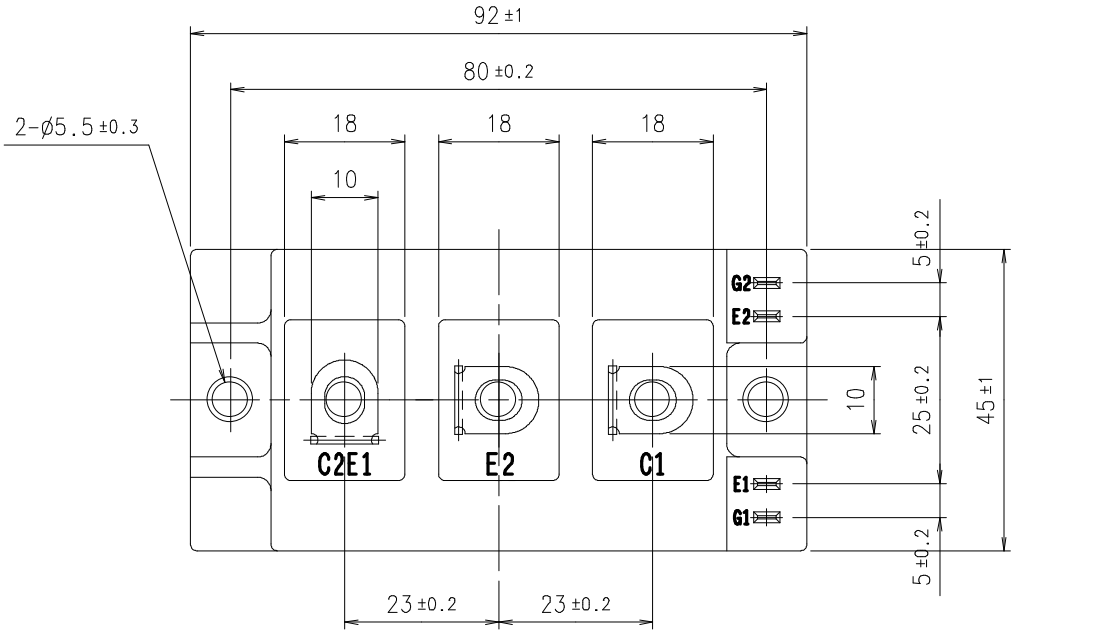
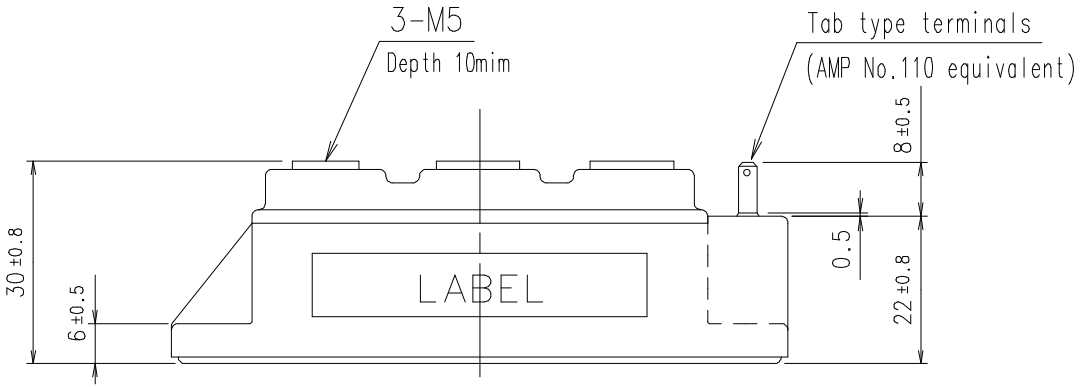
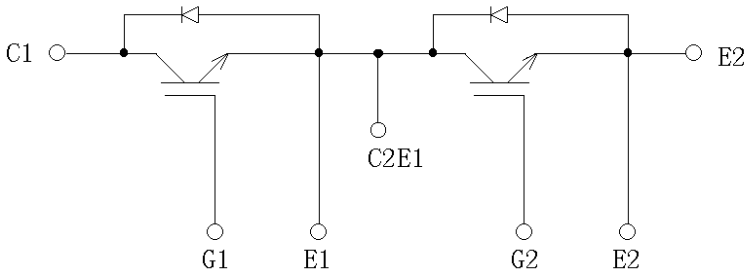
1. Outline Drawing (Unit : mm)





2. Equivalent circuit



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

Items		Symbols	Conditions		Maximum Ratings	Units
Collector-Emitter voltage		VCES			1200	V
Gate-Emitter voltage		VGES			±20	V
Collector current		Ic	Continuous	Tc=25°C	300	A
				Tc=80°C	200	
		Icp	1ms	Tc=25°C	600	
				Tc=80°C	400	
		-Ic			200	
		-Ic pulse	1ms		400	
Collector Power Dissipation		Pc	1 device		1040	W
Junction temperature		Tj			+150	°C
Storage temperature		Tstg			-40 to +125	
Isolation voltage	between terminal and copper base (*1)	Viso	AC : 1min.		2500	VAC
Screw Torque	Mounting (*2)	-			3.5	N m
	Terminals (*2)					

(*1) All terminals should be connected together when isolation test will be done.
(*2) Recommendable Value : 2.5 to 3.5 Nm (M5)

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=1200V VGE=0V		-	-	2.0	mA
Gate-Emitter leakage current	IGES	VCE=0V VGE=±20V		-	-	400	nA
Gate-Emitter threshold voltage	VGE(th)	VCE=20V Ic=200mA		4.5	6.5	8.5	V
Collector-Emitter saturation voltage	VCE(sat) (terminal)	Ic=200A VGE=15V	Tj=25°C	-	2.10	2.25	V
			Tj=125°C	-	2.30	-	
	VCE(sat) (chip)		Tj=25°C	-	1.90	2.05	
			Tj=125°C	-	2.10	-	
Input capacitance	Cies	VCE=10V,VGE=0V,f=1MHz		-	22	-	nF
Turn-on time	ton	Vcc=600V Ic=200A VGE=±15V RG=3.0Ω		-	0.32	1.20	us
	tr			-	0.10	0.60	
	tr(i)			-	0.03	-	
Turn-off time	toff			-	0.41	1.00	
	tf			-	0.07	0.30	
Forward on voltage	VF (terminal)	IF=200A VGE=0V	Tj=25°C	-	1.85	2.00	V
			Tj=125°C	-	1.95	-	
	VF (chip)		Tj=25°C	-	1.65	1.80	
			Tj=125°C	-	1.75	-	
Reverse recovery time	trr	IF=200A		-	-	0.35	us
Lead resistance, terminal-chip (*3)	R lead			-	0.97	-	mΩ

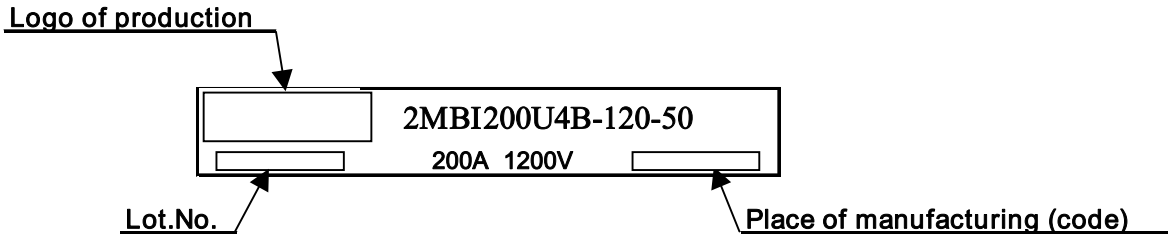
(*3) Biggest internal terminal resistance among arm.

5. Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	Rth(j-c)	IGBT	-	-	0.12	°C/W
		FWD	-	-	0.20	
Contact Thermal resistance (1 device) (*4)	Rth(c-f)	with Thermal Compound	-	0.025	-	

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

6. Indication on module



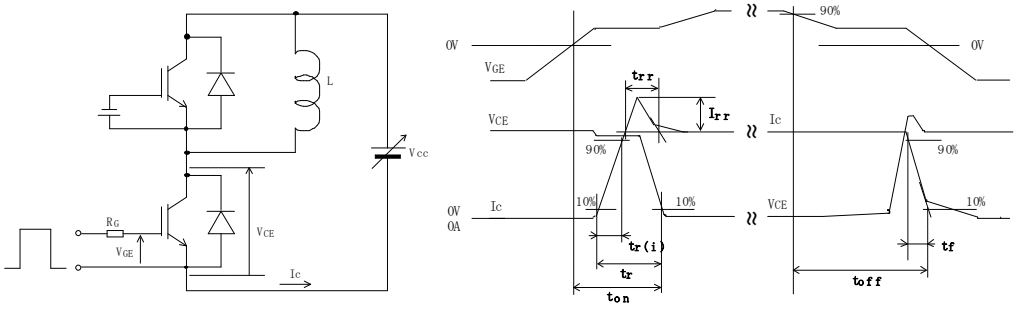
7. Applicable category

This specification is applied to IGBT-Module named 2MBI200U4B-120-50.

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.

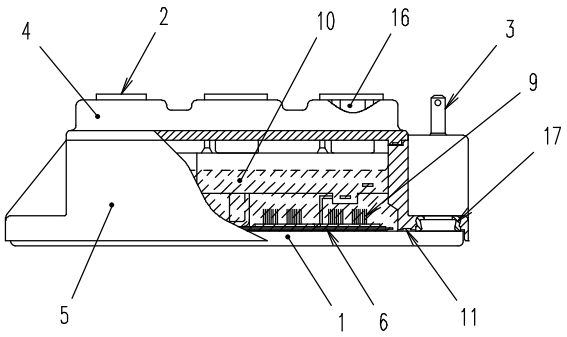
9. Definitions of switching time



10. Packing and Labeling

Display on the packing box
- Logo of production
- Type name
- Lot No.
- Products quantity in a packing box

11. List of material （材料リスト）



(Total weight of soldering material(typ) : 6.3 g)

No.	Parts	Material (main)	Ref.
1	Base Plate	Cu	Ni plating
2	Main terminal	Cu	Ni plating
3	Sub terminal	Cu or Brass	Ni plating
4	Cover	PPS resin	UL 94V-0
5	Case	PPS resin	UL 94V-0
6	Isolation substrate	Al_2O_3 + Cu	
7	IGBT chip	Silicon	(Not drawn in above)
8	FWD chip	Silicon	(Not drawn in above)
9	Wiring	Aluminum	
10	Silicone Gel	Silicone resin	
11	Adhesive	Silicone resin	
12	Solder (Under chip)	Sn/Ag base	(Not drawn in above)
13	Solder (Under Isolation substrate)	Sn/Ag base	(Not drawn in above)
14	Solder (Between terminal and Isolation substrate)	Sn/Ag base	(Not drawn in above)
15	Label	Paper	(Not drawn in above)
16	Nut	Fe	Trivalent Chromate treatment
17	Ring	Brass	

12. RoHS Directive Compliance（RoHS 指令適用について）

本IGBTモジュールは富士電機デバイステクノロジーが発行しているRoHSに関する資料MS5F6209を適用する。
日本語版(MS5F6212)は参考資料とする。

The document (MS5F6209) about RoHS that Fuji Electric Device Technology issued is applied to this IGBT Module. The Japanese Edition(MS5F6212) is made into a reference grade.

13. 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 : 2.5 ~ 3.5 N·m (M5) 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 : 5000m/s^2 Pulse width : 1.0msec. 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 ℃ Test duration : 1000hr.	Test Method 201	5	(0 : 1)
	2	Low Temperature Storage	Storage temp. : -40±5 ℃ Test duration : 1000hr.	Test Method 202	5	(0 : 1)
	3	Temperature Humidity Storage	Storage temp. : 85±2 ℃ Relative humidity : 85±5% Test duration : 1000hr.	Test Method 103 Test code C	5	(0 : 1)
	4	Unsaturated Pressurized Vapor	Test temp. : 120±2 ℃ 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 ℃ High temp. 125 ±5 ℃ RT 5 ~ 35 ℃ 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} ℃ Low temp. 0^{+5}_{-0} ℃ 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 A	5	(0 : 1)

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 ℃ (Tj ≦ 150 ℃) 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 ℃ (Tj ≦ 150 ℃) Bias Voltage : VC = VGE = +20V or -20V Bias Method : Applied DC voltage to G-E VCE = 0V Test duration : 1000hr.	Test Method 101	5	(0 : 1)
	3	Temperature Humidity Bias	Test temp. : 85±2 ℃ 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 ℃, Ta=25±5 ℃ Number of cycles : 15000 cycles	Test Method 106	5	(0 : 1)

Failure Criteria

Item	Characteristic		Symbol	Failure criteria		Unit	Note
				Lower limit	Upper limit		
Electrical characteristic	Leakage current		ICES	-	USL×2	mA	
			±IGES	-	USL×2	μA	
	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	Δ VGE or Δ VCE	-	USL×1.2	mV	
		FWD	Δ VF	-	USL×1.2	mV	
	Isolation voltage		Viso	Broken insulation		-	
Visual inspection	Visual inspection Peeling Plating and the others		-	The visual sample		-	

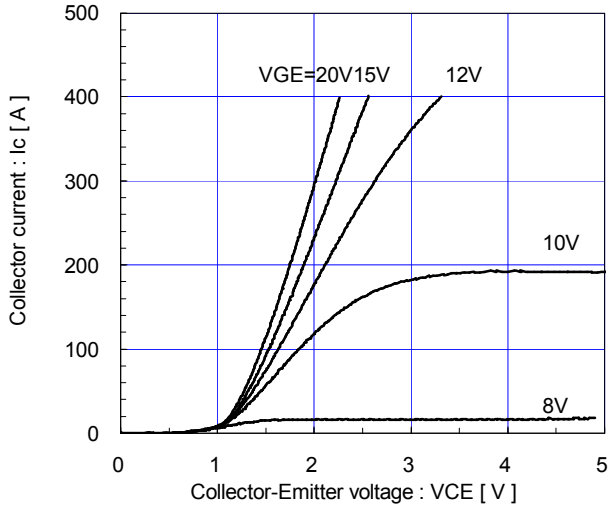
LSL : Lower specified limit.
USL : Upper specified limit.

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.

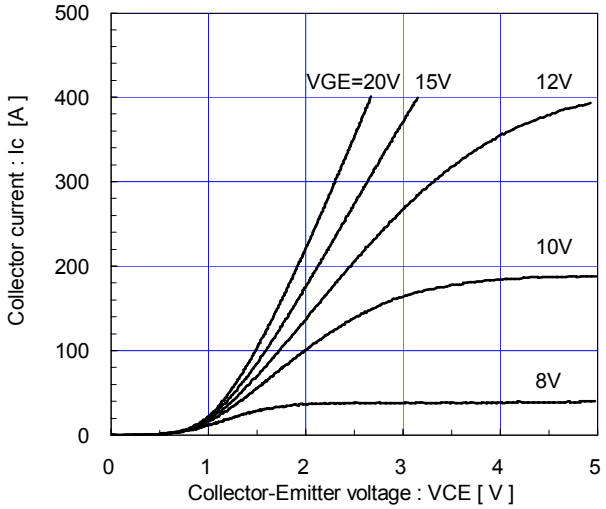
Reliability Test Results

Test categories		Test items	Reference norms EIAJ ED-4701 (Aug.-2001 edition)	Number of test sample	Number of failure sample
Mechanical Tests	1	Terminal Strength (Pull test)	Test Method 401 Method Ⅰ	5	0
	2	Mounting Strength	Test Method 402 method Ⅱ	5	0
	3	Vibration	Test Method 403 Condition code B	5	0
	4	Shock	Test Method 404 Condition code B	5	0
Environment Tests	1	High Temperature Storage	Test Method 201	5	0
	2	Low Temperature Storage	Test Method 202	5	0
	3	Temperature Humidity Storage	Test Method 103 Test code C	5	0
	4	Unsaturated Pressurized Vapor	Test Method 103 Test code E	5	0
	5	Temperature Cycle	Test Method 105	5	ⓐ 0
	6	Thermal Shock	Test Method 307 method Ⅰ Condition code A	5	0
Endurance Tests	1	High temperature Reverse Bias	Test Method 101	5	0
	2	High temperature Bias (for gate)	Test Method 101	5	0
	3	Temperature Humidity Bias	Test Method 102 Condition code C	5	0
	4	Intermitted Operating Life (Power cycling) (for IGBT)	Test Method 106	5	0

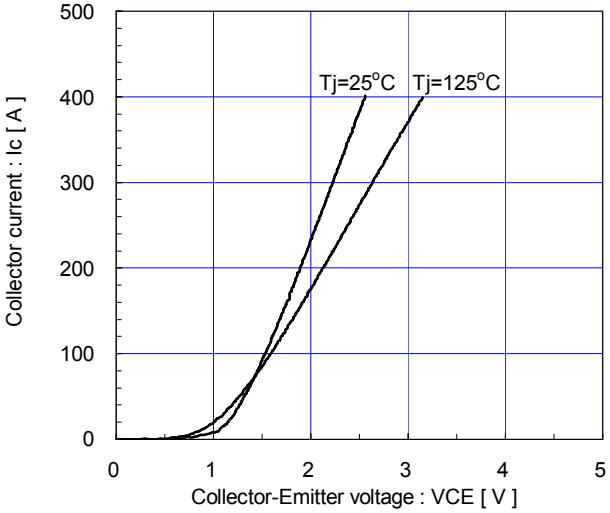
Collector current vs. Collector-Emitter voltage (typ.)
Tj=25°C / chip



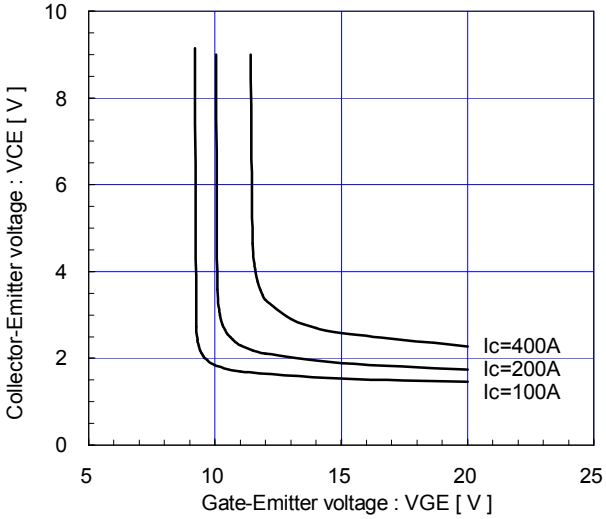
Collector current vs. Collector-Emitter voltage (typ.)
Tj=125°C / chip



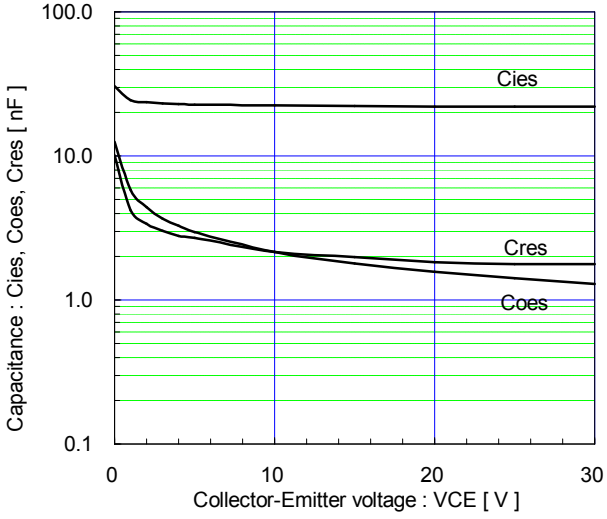
Collector current vs. Collector-Emitter voltage (typ.)
VGE=15V / chip



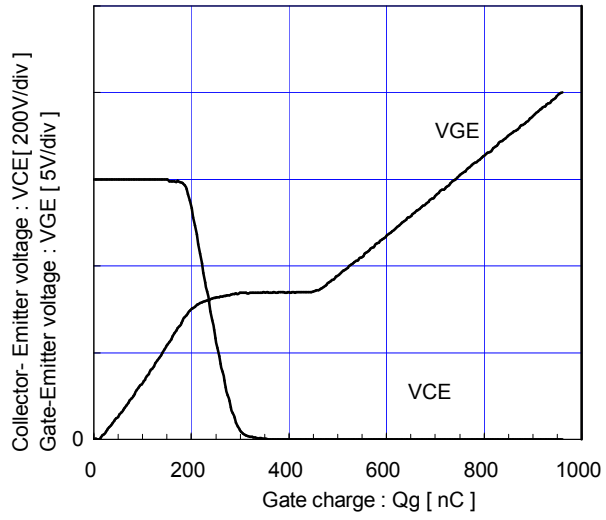
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
Tj=25°C / chip



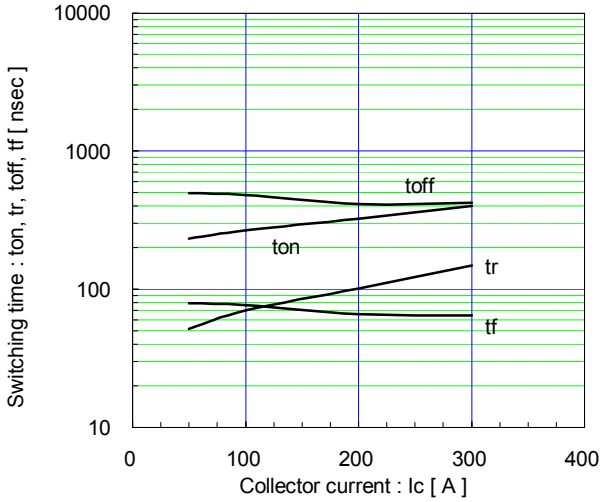
Capacitance vs. Collector-Emitter voltage (typ.)
VGE=0V, f=1MHz, Tj=25°C



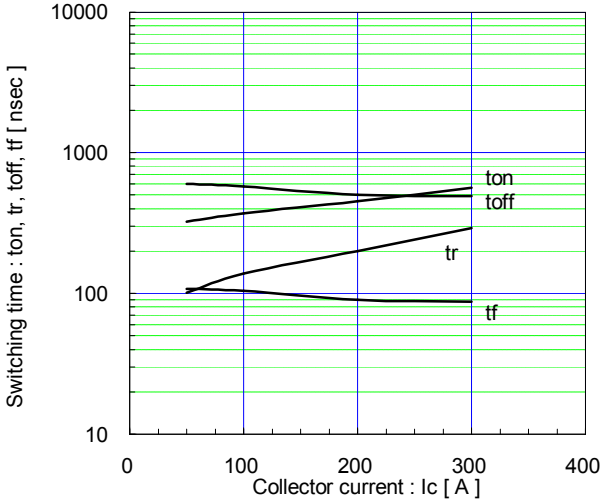
Dynamic Gate charge (typ.)
Vcc=600V, Ic=200A, Tj=25°C



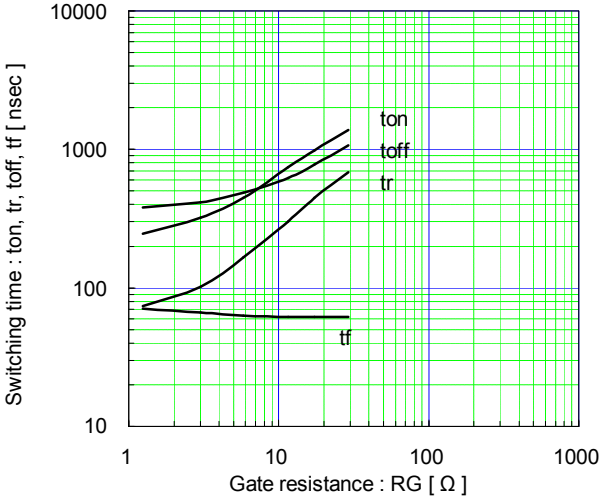
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, RG=3.0Ω, Tj=25°C



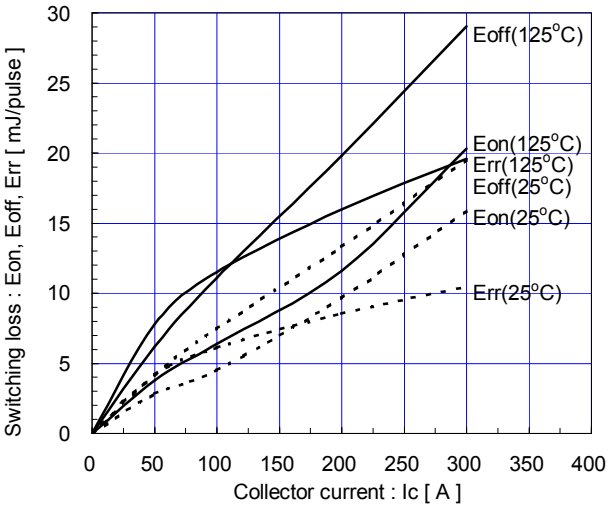
Switching time vs. Collector current (typ.)
Vcc=600V, VGE=±15V, RG=3.0Ω, Tj=125°C



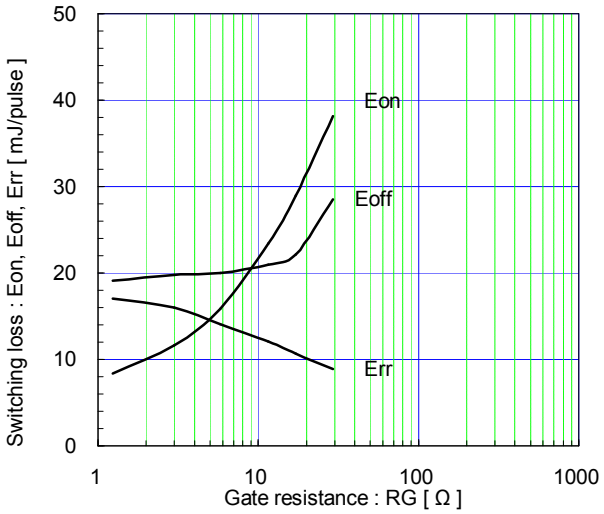
Switching time vs. Gate resistance (typ.)
Vcc=600V, Ic=200A, VGE=±15V, Tj=25°C



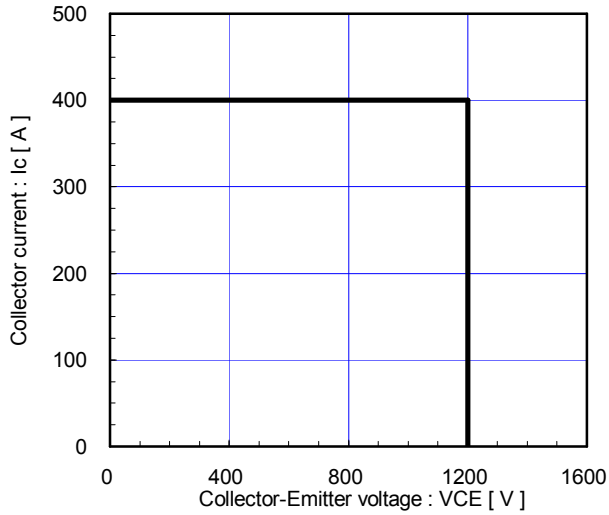
Switching loss vs. Collector current (typ.)
Vcc=600V, VGE=±15V, RG=3.0Ω



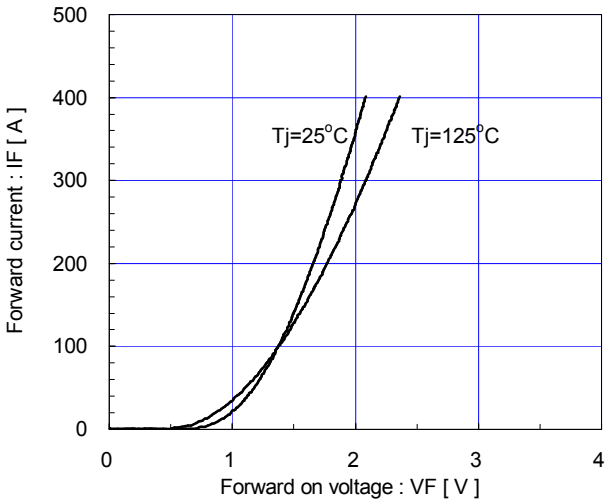
Switching loss vs. Gate resistance (typ.)
Vcc=600V, Ic=200A, VGE=±15V, Tj=125°C



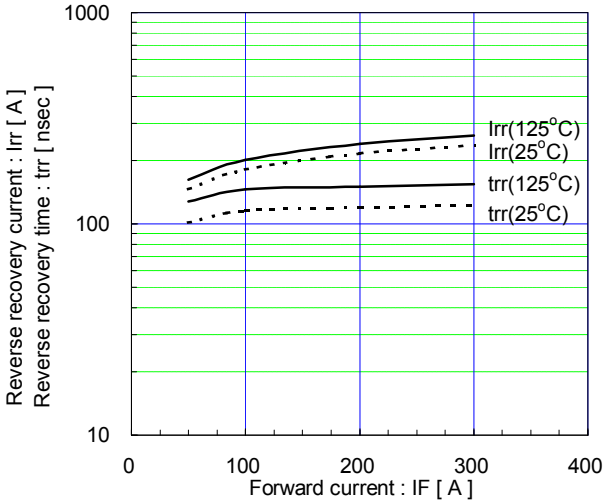
Reverse bias safe operating area (max.)
+VGE=15V, -VGE <= 15V, RG >= 3.0Ω, Tj <= 125°C



Forward current vs. Forward on voltage (typ.)
chip



Reverse recovery characteristics (typ.)
Vcc=600V, VGE=±15V, RG=3.0Ω



Transient thermal resistance (max.)