SPECIFICATION

Device name: IGBT Module
(RoHS compliant product)

Type name: 4MBI300VG-120R-50

Spec. no. : MS5F7769

	DATE	NAME	APPROVED
DRAWN	Mar.-8-'11	K. Komatsu	
CHECKED	Mar-8-'11	S. Ozawa	O. Ikawa
CHECKED	Mar-8th-'11	M. Kosaka	

REVISIONS

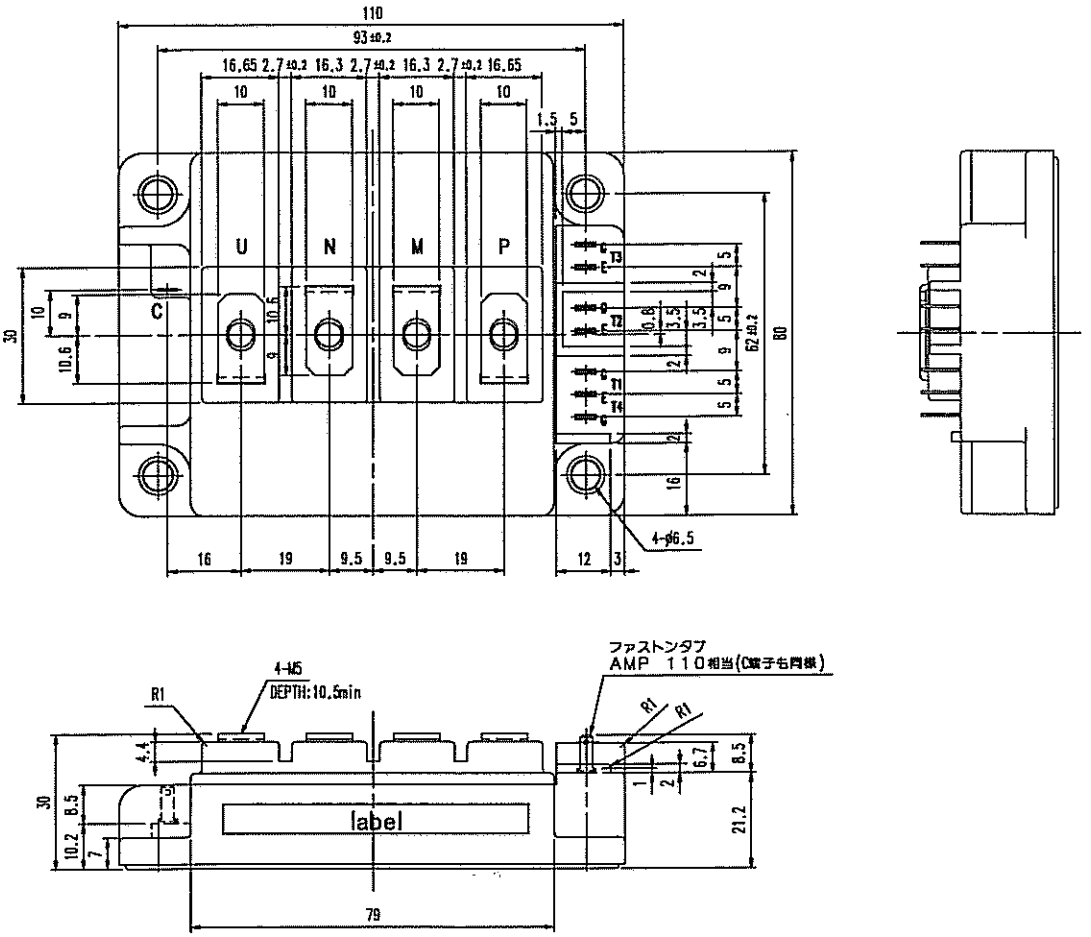
Fuji Electric Systems Co., Ltd.

DWG.No. MS5F7769 1 / 20

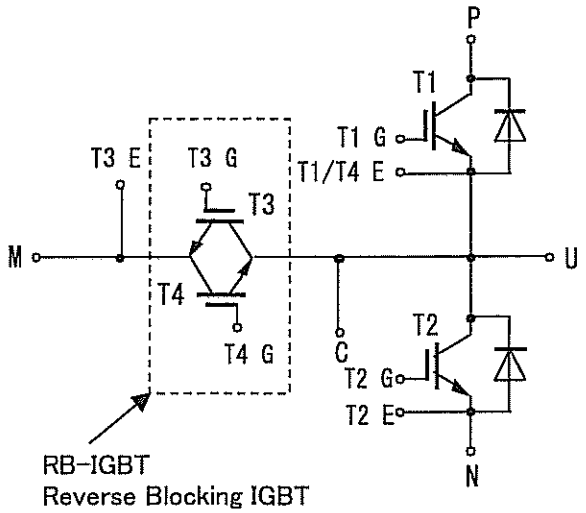
Revised Records

Date	Classifi - cation	Ind.	Content	Applied date	Drawn	Checked	Checked	Approved
Mar.-8-'11	enactment	-	-	Issued date	-	S.Ogawa	M.Kosaka	O.Ikawa

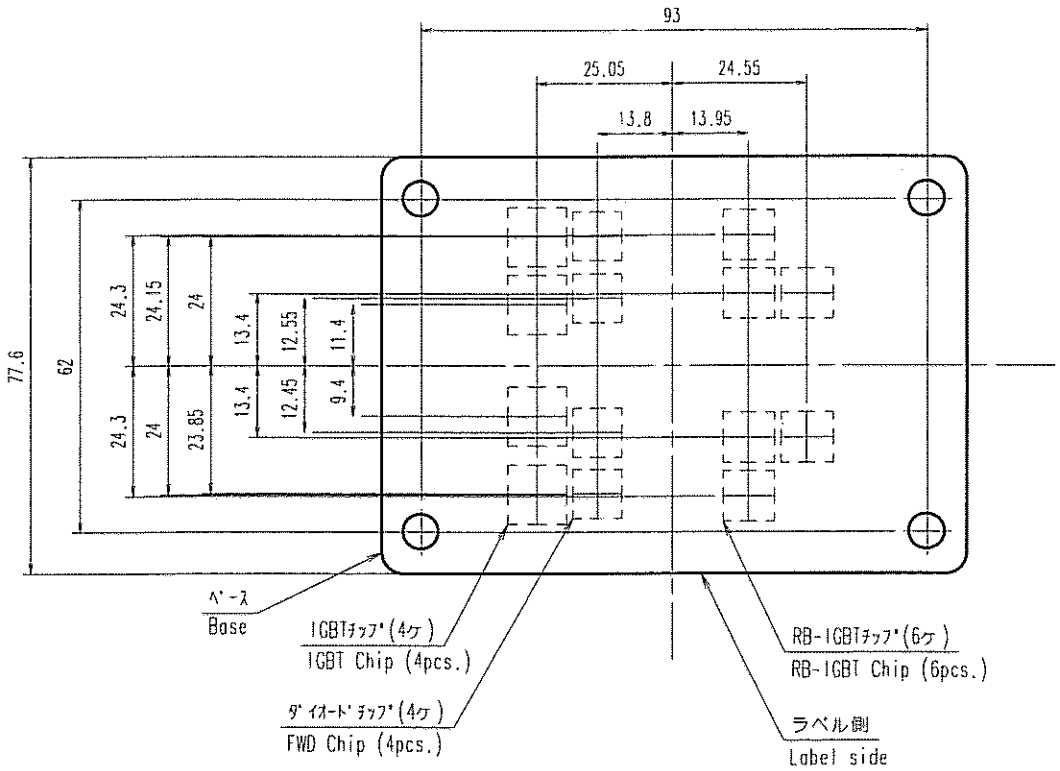
1. Outline drawing (Unit : mm)



2. Equivalent circuit



3. Chip layout drawing (Unit : mm)



[Chip layout from Cu base of module]

4. 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	Ic	Continuous	Tc=80°C	300	A
			Icp	1ms	Tc=80°C	600	
		FWD	-Ic			300	
			-Ic pulse	1ms		600	
	Collector power dissipation		Pc	1 device		1250	W
T3, T4	Collector-Emitter voltage		V_{CES}			600	V
	Gate-Emitter voltage		V_{GES}			±20	V
	Collector current		I_C	Continuous	Tc=80°C	300	A
			I_{CP}	1ms	Tc=80°C	600	
	Collector power dissipation		P_C	1 device		1250	W
Junction temperature			Tj			150	°C
Case temperature			Tc			125	
Storage temperature			Tstg			-40～+125	
Isolation voltage	between terminal and copper base (*1)		V_{iso}	AC : 1min.		2500	VAC
Screw torque	Mounting (*2)		-	M5 or M6		3.5	N m
	Terminal (*3)		-	M5		3.5	N m

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

(*2) Recommendable value : 2.5-3.5 Nm (M5 or M6)

(*3) Recommendable value : 2.5-3.5 Nm (M5)

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

	Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
T1, T2	Zero gate voltage collector current	I_{CES}	V_{GE} = 0V V_{CE}= 1200V		-	-	2.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{GE} = 0V V_{GE}= ±20V		-	-	400	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20V I_C = 300mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	V_{GE}= 15V I_C = 300A	Tj= 25°C Tj=125°C	- -	1.85 2.20	2.10 -	V
		$V_{CE(sat)}$ (terminal)	V_{GE}= 15V I_C = 300A	Tj= 25°C Tj=125°C	- -	2.05 2.40	2.35 -	
	Input capacitance	Cies	V_{CE}=10V,V_{GE}=0V,f=1MHz		-	25.2	-	nF
	Turn-on time	ton	SW mode : A		-	1.10	1.90	µs
		tr	V_{CC} = 800V		-	0.70	1.25	
		tr (i)	I_C = 300A		-	0.14	-	
	Turn-off time	toff	V_{GE}= ±15V		-	0.62	1.10	
		tf	R_G = +10/-1Ω		-	0.09	0.35	
	Forward on voltage	V_F (chip)	I_F = 300A	Tj= 25°C Tj=125°C	- -	1.70 1.85	1.95 -	V
		V_F (terminal)	I_F = 300A	Tj= 25°C Tj=125°C	- -	1.95 2.10	2.25 -	
	Reverse recovery time	trr	SW mode : A V_{CC}= 800V V_{GE}= ±15V	I_F = 300A R_G = +10/-1Ω	-	-	0.35	µs
T3, T4	Zero gate voltage collector current	I_{CES}	V_{GE} = 0V V_{CE}= 600V		-	-	3.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE} = 0V V_{GE}= ±20V		-	-	600	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20V I_C = 300mA		5.5	6.5	7.5	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	V_{GE}= 15V I_C = 300A	Tj= 25°C Tj=125°C	- -	2.45 2.60	2.80 -	V
		$V_{CE(sat)}$ (chip)	V_{GE}= 15V I_C = 300A	Tj= 25°C Tj=125°C	- -	2.55 2.70	2.95 -	
	Input capacitance	Cies	V_{CE}=10V,V_{GE}=0V,f=1MHz		-	19.5	-	nF
	Turn-on time	ton	SW mode : B		-	0.45	1.05	µs
		tr	V_{CC}= 400V		-	0.27	0.53	
		tr (i)	I_C = 300A		-	0.12	-	
	Turn-off time	toff	V_{GE}= ±15V		-	1.32	3.00	
		tf	R_G = +8.2/-39Ω		-	0.11	0.35	
	Reverse recovery time	trr	SW mode : C V_{CC}= 400V V_{GE}= ±15V	I_C = 300A R_G = +10/-1Ω	-	-	0.30	µs
Internal inductance		L	P-N		-	40	-	nH
			P-M		-	33	-	
			M-N		-	33	-	

6. Thermal resistance characteristics

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Thermal resistance(1device)	Rth(j-c)	T1, T2 IGBT		-	-	0.10	°C/W
		T1, T2 FWD		-	-	0.16	
		T3, T4 RB-IGBT		-	-	0.10	
Contact thermal resistance (1device) (*4)	Rth(c-f)	T1, T2	with Thermal Compound	-	0.025	-	
		T3, T4		-	0.017	-	

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

7. Indication on module（モジュール表示）

Display on the module label

- Logo of production
- Type name: 4MBI300VG-120R-50
- I_C, V_{CES} rating : 300A 1200V
- Lot No (5 digits)
- Place of manufacturing (code)
- Bar code

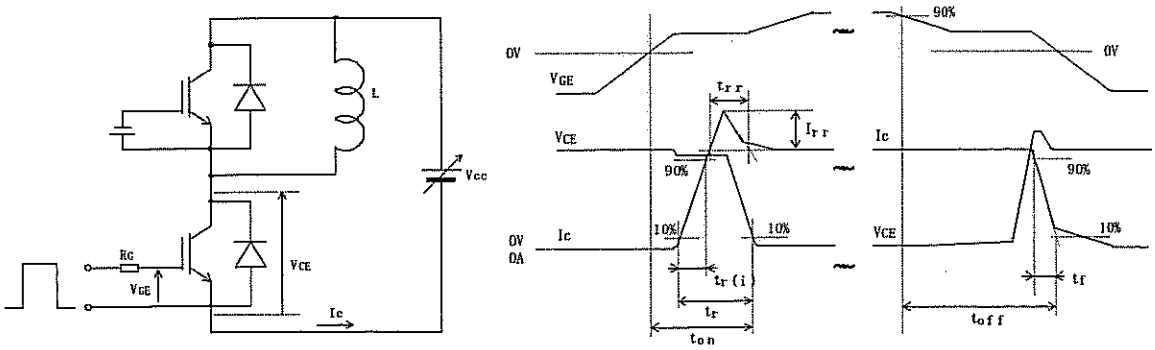
8. Applicable category（適用範囲）

This specification is applied to Power Integrated Module named 4MBI300VG-120R-50.
本納入仕様書はパワー集積モジュール4MBI300VG-120R-50に適用すること。

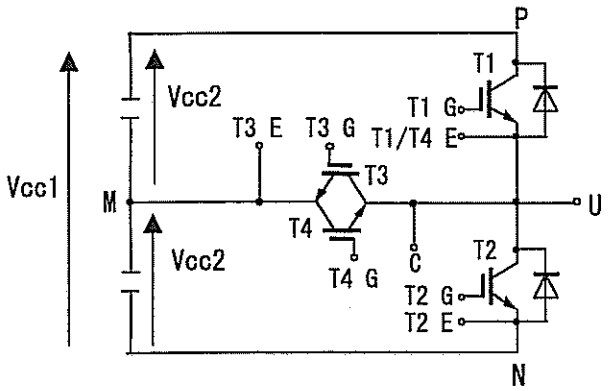
9. Storage and transportation notes（保管・運搬上の注意事項）

- The module should be stored at a standard temperature of 5 to 35°C and humidity of 45 to 75% .
  Be careful to solderability of the terminals if the module has passed over one year from manufacturing date, under the above storage condition.
  常温・常湿保存が望ましい。(5～35°C, 45～75%)
  本保存条件下で、正常から1年以上経過した場合は端子半田付け性に十分注意すること。
- Store modules in a place with few temperature changes in order to avoid condensation on the module surface.
  急激な温度変化のなきこと。(モジュール表面が結露しないこと)
- Avoid exposure to corrosive gases and dust.
  腐食性ガスの発生場所、塵埃の多い場所は避けること。
- Avoid excessive external force on the module.
  製品に荷重がかからないように十分注意すること。
- Store modules with unprocessed terminals.
  モジュールの端子は未加工の状態で保管すること。
- Do not drop or otherwise shock the modules when transporting.
  製品の運搬時に衝撃を与えたり、落下させたりしないこと。

10. Definitions of switching time（スイッチング時間の定義）



Definitions of switching mode（スイッチングモードの定義）



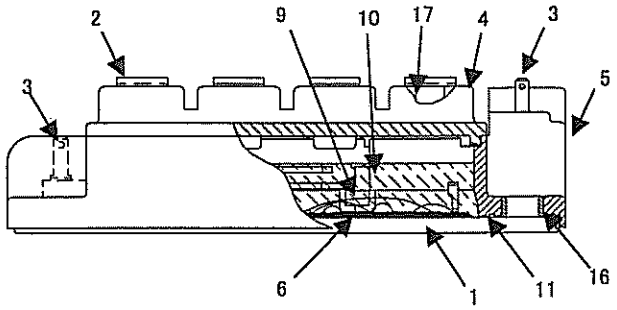
SW mode	Load L	T1	T2	T3	T4
A	U-N	SW	OFF	OFF	OFF
	P-U	OFF	SW	OFF	OFF
B	P-U	OFF	OFF	SW	ON
	U-N	OFF	OFF	ON	SW
C	M-U	SW	OFF	OFF	ON
	M-U	OFF	SW	ON	OFF

SW: Connect to drive circuit and input gate signal
ON: Bias voltage of gate +15V
OFF: Reverse bias voltage of gate -15V
Vcc2=Vcc1/2

11. Packing and labeling（梱包仕様）

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

12. List of materials (材料リスト)



No.	Parts	Material (main)	Ref.
1	Base Plate	Cu	Ni plating
2	Main terminal	Cu	Ni plating
3	Sub terminal	Brass	Ni plating
4	Cover	PPS resin	UL 94V-0
5	Case	PPS resin	UL 94V-0
6	Isoration substrate	Al2O3 + Cu	
7	IGBT Chip	Si	(Not drawn in above)
8	FWD Chip	Si	(Not drawn in above)
9	Wiring	Aluminium	
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/Sb base	(Not drawn in above)
14	Solder (Between terminal and isolation substrate)	Sn/Ag base	(Not drawn in above)
15	Label	PET	(Not drawn in above)
16	Nut	Fe	Trivalent chromate treatment
17	Ring	Fe	Trivalent chromate treatment

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 accelerat : 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. : Applied DC voltage to C-E, and E-C for RB-IGBT 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 C-E Bias	Test temp.T1, T2 : Tj = 125°C (-0 °C/+5 °C) T3, T4 : Tj = 125°C (-0 °C/+5 °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 E-C Bias (for RB-IGBT)	Test temp.T3, T4 : Tj = 125°C (-0 °C/+5 °C) Bias Voltage : VC = 0.8×VCES Bias Method : Applied DC voltage to E-C VGE = +15V Test duration : 1000hr.	Fuji internal standard	5	(0 : 1)
	3	High temperature Bias (for gate)	Test temp.T1, T2 : Tj = 125°C (-0 °C/+5 °C) T3, T4 : Tj = 125°C (-0 °C/+5 °C) 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)
	4	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, and E-C for RB-IGBT VGE = 0V Test duration : 1000hr.	Test Method 102 Condition code C	5	(0 : 1)
	5	Intermitted Operating Life (Power cycle) (for IGBT and	ON time : 2 sec. OFF time : 18 sec. Test temp. ΔTj : 100±5 deg Tj ≦ 125 °C, Ta=25±5 °C 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 com

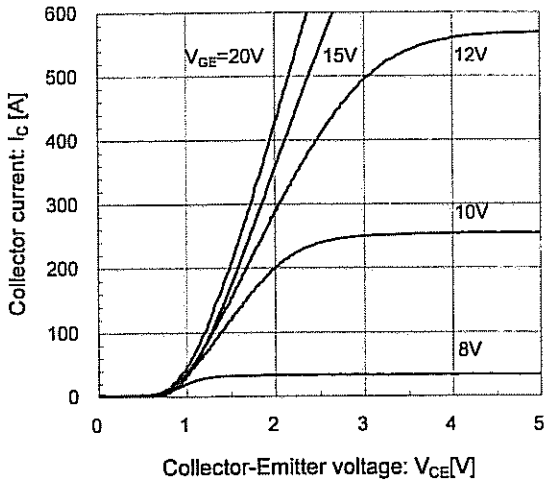
Reliability Test Results

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 C-E Bias	Test Method 101	5	0
	2	High temperature E-C Bias (for RB-IGBT)	Fuji internal standard	5	0
	3	High temperature Bias (for gate)	Test Method 101	5	0
	4	Temperature Humidity Bias	Test Method 102 Condition code C	5	0
	5	Intermitted Operating Life (Power cycling) (for IGBT)	Test Method 106	5	0

[T1, T2]

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

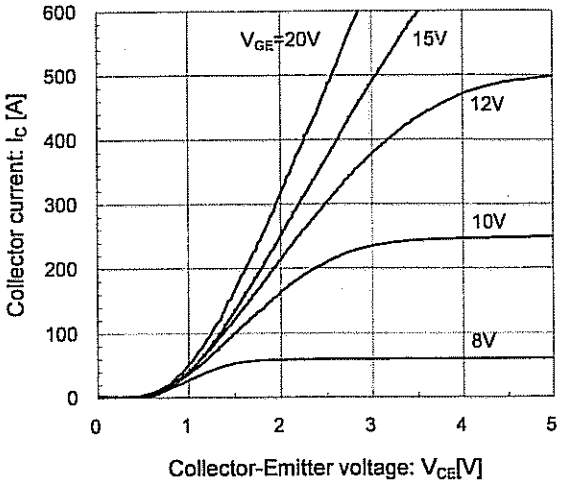
Tj= 25°C / chip



[T1, T2]

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

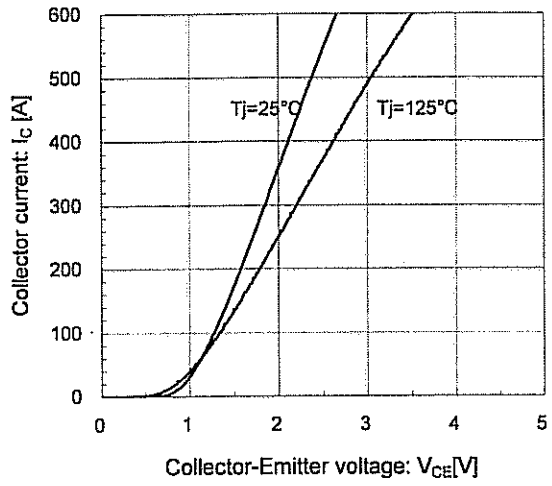
Tj= 125°C / chip



[T1, T2]

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

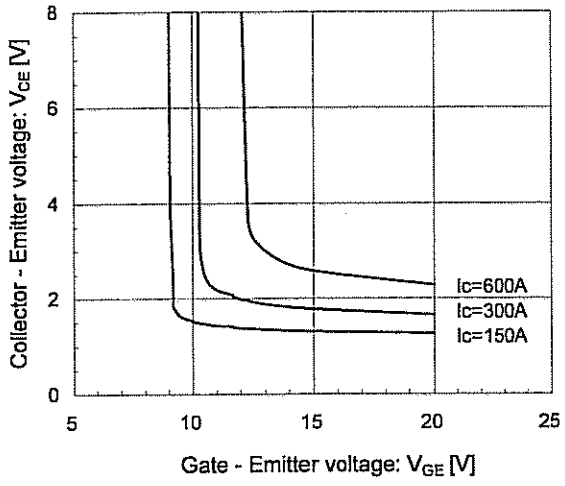
V_{GE}=15V / chip



[T1, T2]

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

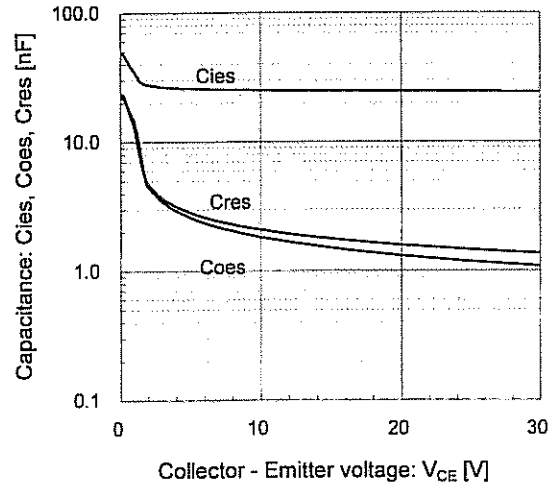
Tj= 25°C / chip



[T1, T2]

Capacitance vs. Collector-Emitter voltage (typ.)

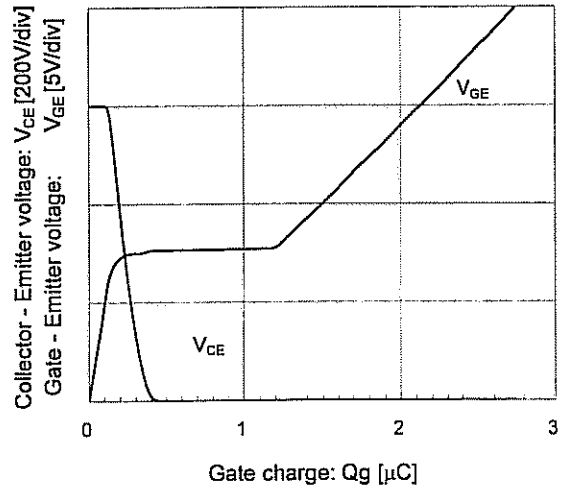
V_{GE}=0V, f= 1MHz, Tj= 25°C



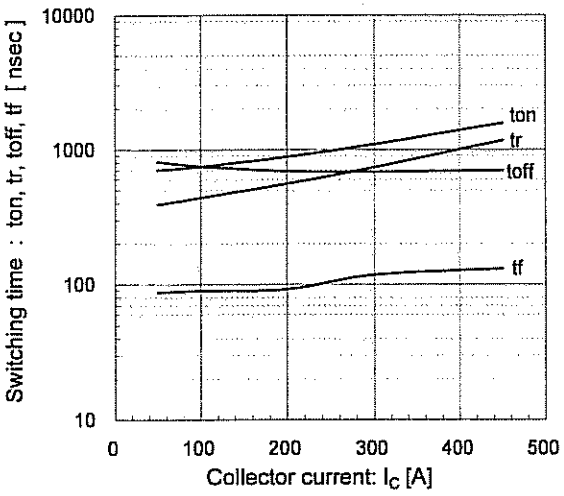
[T1, T2]

Dynamic gate charge (typ.)

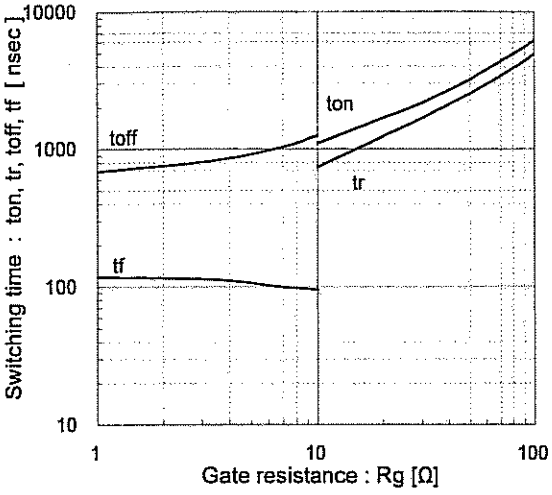
Vcc=600V, Ic=300A, Tj=25°C



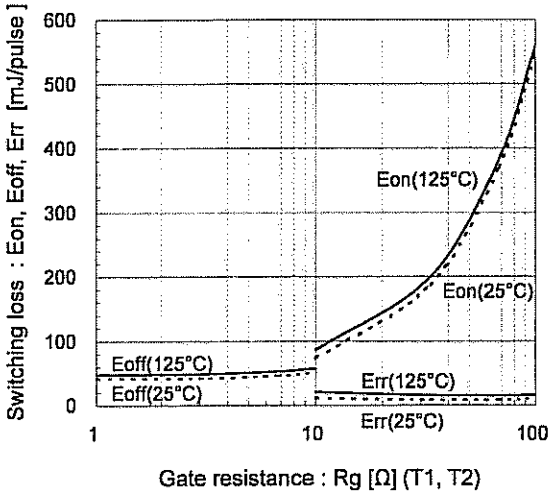
[SW mode A]
Switching time vs. Collector current (typ.)
Vcc=800V, VGE=±15V, RG=+10/-1Ω, Tj=125°C (T1, T2)



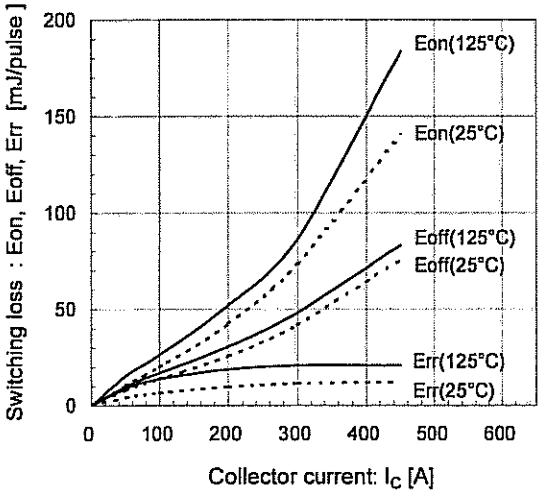
[SW mode A]
Switching time vs. Collector current (typ.)
Vcc=800V, Ic=300A, VGE=±15V, Tj=125°C



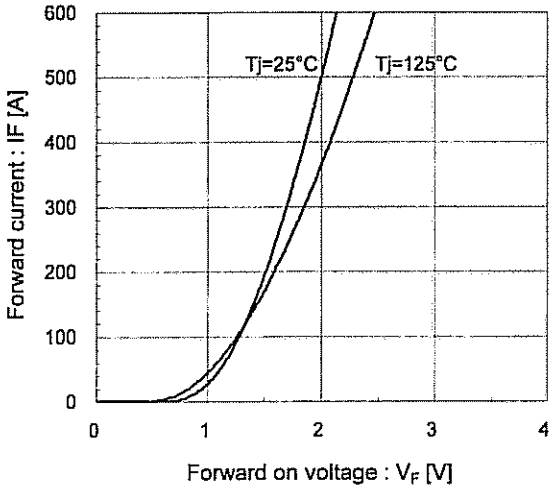
[SW mode A]
Switching loss vs. gate resistance (typ.)
Vcc=800V, Ic=300A, VGE=±15V



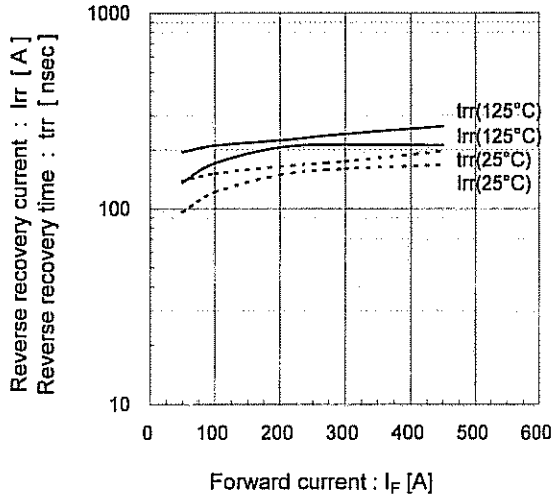
[SW mode A]
Switching loss vs. Collector current (typ.)
Vcc=800V, VGE=±15V, RG=+10/-1Ω (T1, T2)



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



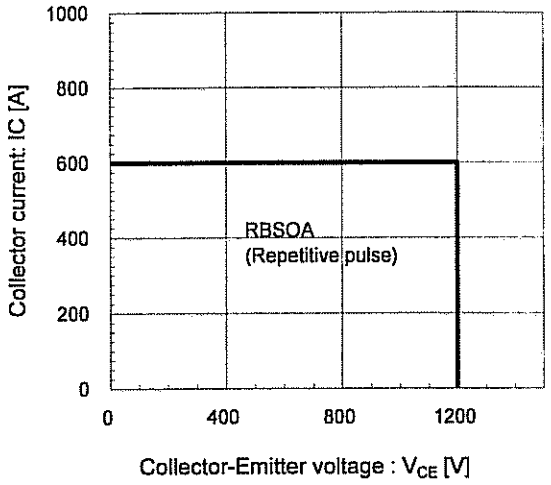
[T1, T2]
Reverse recovery characteristics (typ.)
Vcc=800V, VGE=±15V, RG=+10/-1Ω(T1, T2)



Reverse bias safe operating area (max.)

VGE=15V,-VGE ≦ 15V, RG ≧+10/-1Ω, Tj ≦ 125°C, Ls=46nH (T1, T2)

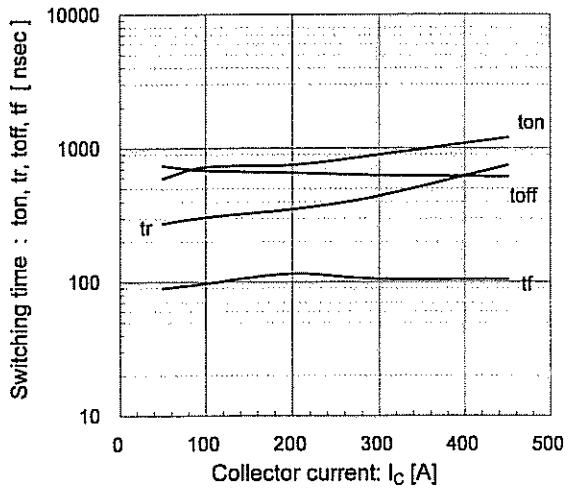
T1, T2 (Terminal)



[SW mode C]

Switching time vs. Collector current (typ.)

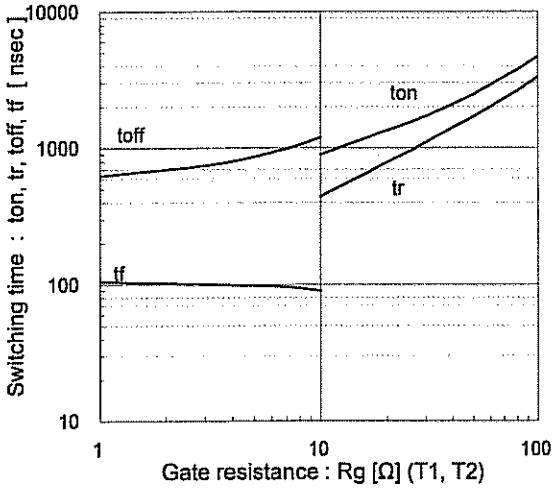
Vcc=400V, VGE=±15V, RG=+10/-1Ω, Tj=125°C (T1, T2)



[SW mode C]

Switching time vs. Collector current (typ.)

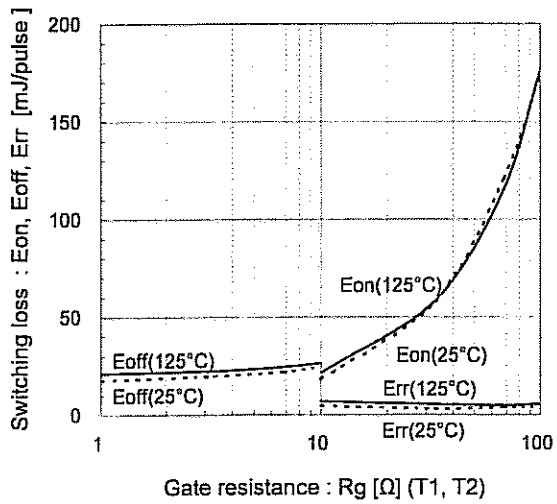
Vcc=400V, Ic=300A, VGE=±15V, Tj=125°C



[SW mode C]

Switching loss vs. gate resistance (typ.)

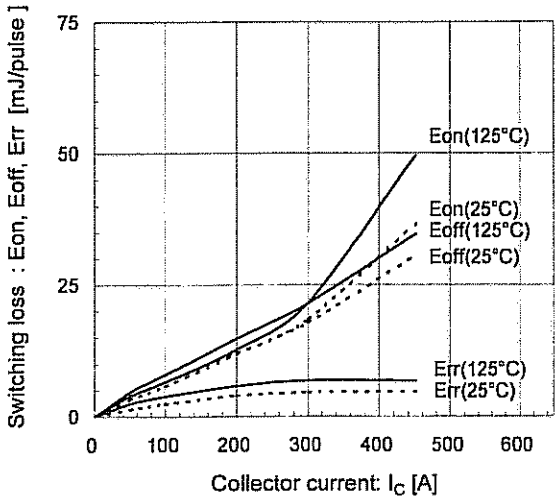
Vcc=400V, Ic=300A, VGE=±15V



[SW mode C]

Switching loss vs. Collector current (typ.)

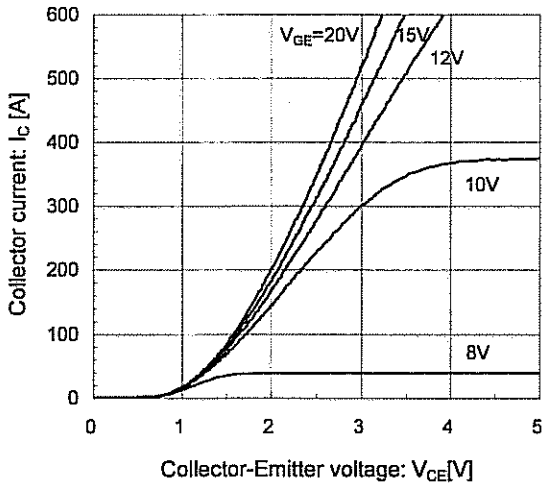
Vcc=400V, VGE=±15V, RG=+10/-1Ω (T1, T2)



[T3, T4]

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

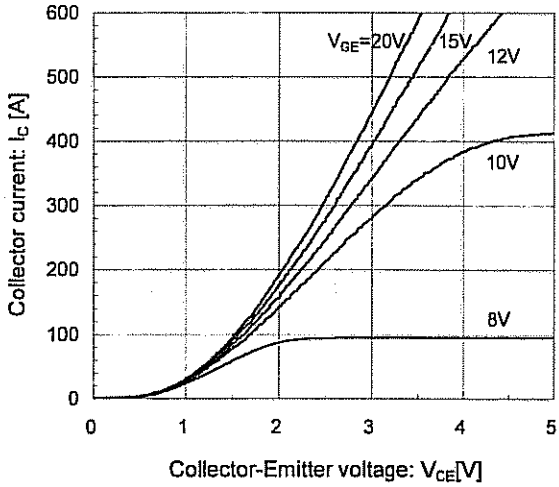
Tj= 25°C / chip



[T3, T4]

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

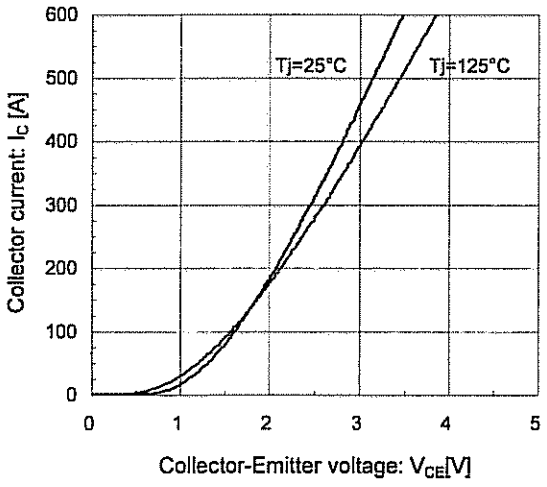
Tj= 125°C / chip



[T3, T4]

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

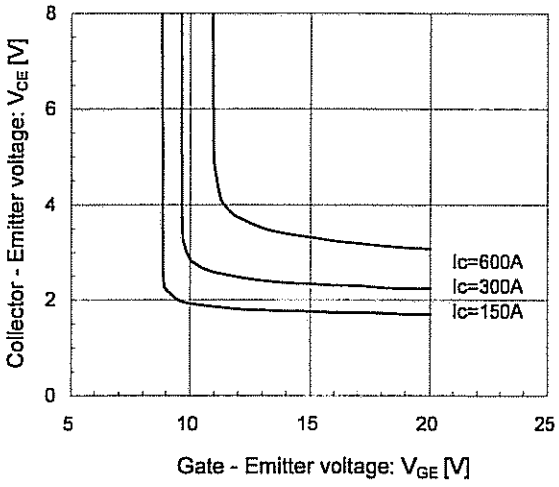
V_{GE}=15V / chip



[T3, T4]

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

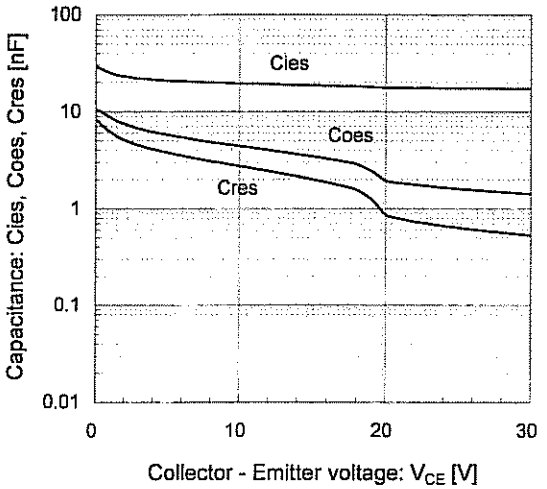
Tj= 25°C / chip



[T3, T4]

Capacitance vs. Collector-Emitter voltage (typ.)

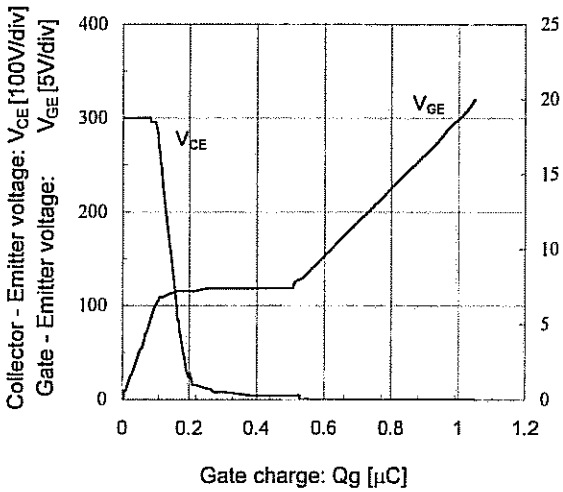
V_{GE}=0V, f= 1MHz, Tj= 25°C



[T3, T4]

Dynamic gate charge (typ.)

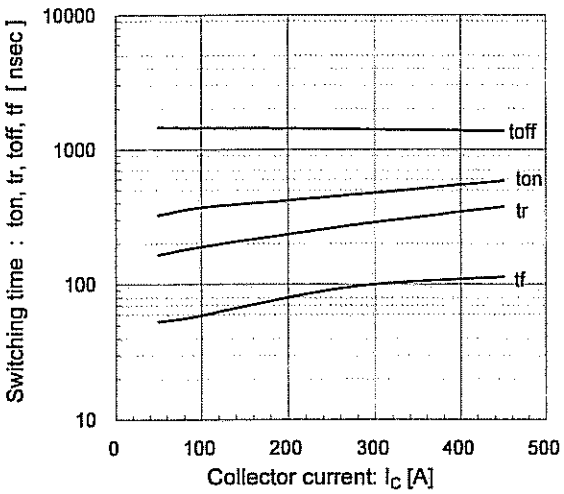
Vcc=300V, Ic=300A, Tj=25°C



[SW mode B]

Switching time vs. Collector current (typ.)

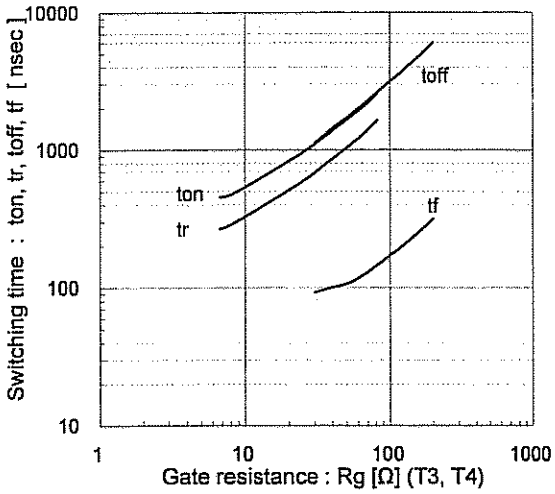
Vcc=400V, VGE=±15V, RG=+8.2/-39Ω, Tj=125°C (T3, T4)



[SW mode B]

Switching time vs. Collector current (typ.)

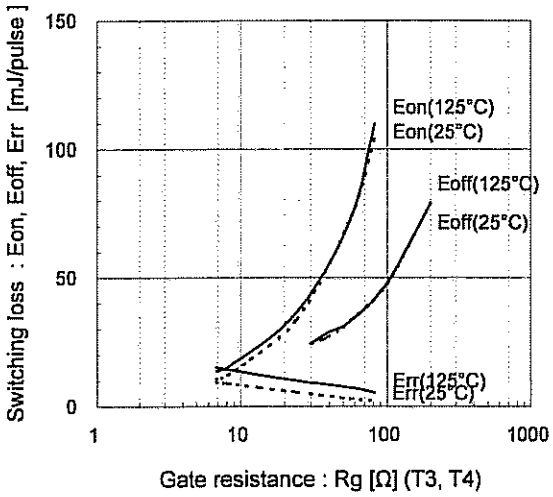
Vcc=400V, Ic=300A, VGE=±15V, Tj=125°C



[SW mode B]

Switching loss vs. gate resistance (typ.)

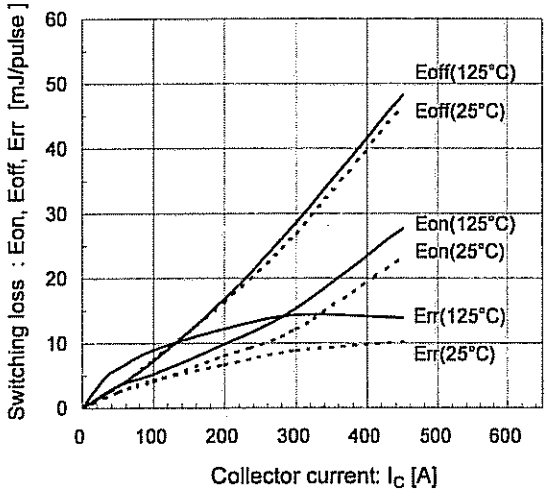
Vcc=400V, Ic=300A, VGE=±15V



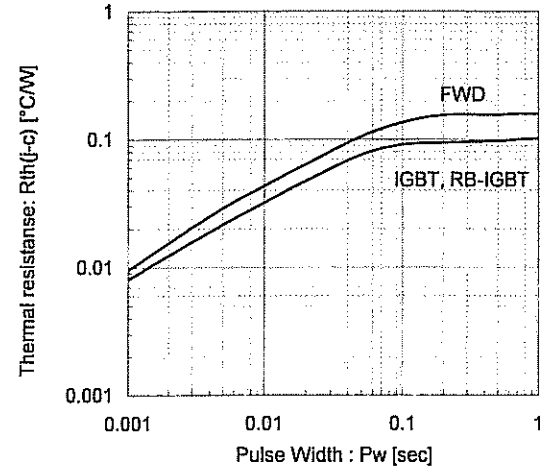
[SW mode B]

Switching loss vs. Collector current (typ.)

Vcc=400V, VGE=±15V, RG=+8.2/-39Ω (T3, T4)



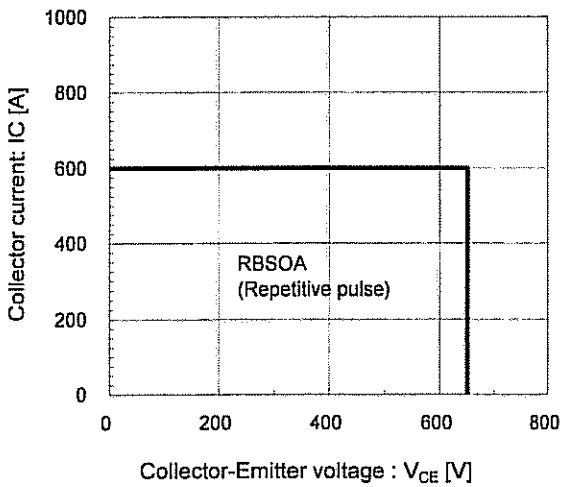
Transient Thermal Resistance (max.)



Reverse bias safe operating area (max.)

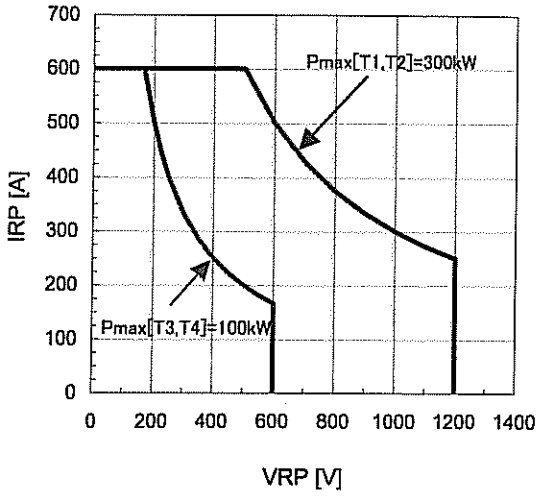
VGE=15V,-VGE ≦ 15V, RG ≧+8.2/-39Ω, Tj ≦ 125°C, Ls=46nH (T3, T4)

T3, T4 (Terminal)



Reverse recovery withstand capability for FWD, RB-IGBT

Tj=125°C



Warnings

- This product shall be used within its abusolute maximum rating (voltage, current, and temperature.)
this product may be broken in case of using beyond the ratings.
製品の絶対最大定格(電圧、電流、温度等)の範囲内でご使用下さい。
絶対最大定格を超えて使用すると、素子が破壊する場合があります。

- When reverse voltage is applied to C-E of RB-IGBT without forward gate bias voltage (+VGE),
the reverse leakage current at C-E will be large. In order to reduce the reverse leakage current, +VGE should be
applied to G-E of RB-IGBT when reverse voltage is being applied to C-E. (Recommended value : +VGE=15V)
RB-IGBTのC-E間に逆電圧が印加される場合、RB-IGBTのG-E間に順バイアス電圧が印加されていないと、C-E間逆漏れ電流が大きくなります。この逆漏れ電流を小さくするために、RB-IGBTのC-E間に逆電圧が印加される場合には、G-E間に+VGEを印加して下さい。
(推奨値:+VGE=15V)

- Connect adequate fuse or protector of circuit between three-phase line and this product to prevent the equipment
from causing secondary destruction, such as fire, its spreading, or explosion.
万一の不慮の事故で素子が破壊した場合を考慮し、商用電源と本製品の間に適切な容量のヒューズ又はブレーカーを必ず付けて火災, 爆発, 延焼等の2次破壊を防いでください。

- Use this product after realizing enough working on environment and considering of product's reliability life.
This product may be broken before target life of the system in case of using beyond the product's reliability life.
製品の使用環境を十分に把握し、製品の信頼性寿命が満足できるか検討の上、本製品を適用して下さい。製品の信頼性寿命を超えて使用した場合、装置の目標寿命より前に素子が破壊する場合があります。

- When electric power is connected to equipments, rush current will be flown through rectifying diode to charge
DC capacitor. Guaranteed value of the rush current is specified as I^2t (non-repetitive), however frequent rush
current through the diode might make it's power cycle destruction occur because of the repetitive power.
In application which has such frequent rush current, well consideration to product life time (i.e. suppressing
the rush current) is necessary.
電源投入時に整流用ダイオードには、コンデンサーを充電する為の突入電流が流れます。この突入電流に対する保証値はI^2t(非繰返し)として表記されていますが、この突入電流が頻繁に流れるとI^2t破壊とは別に整流用ダイオードの繰返し負荷によるパワーサイクル耐量破壊を起こす可能性があります。突入電流が頻繁に流れるようなアプリケーションでは、突入電流値を抑えるなど、製品寿命に十分留意してご使用下さい。

- If the product had been used in the environment with acid, organic matter, and corrosive gas (hydrogen sulfide,
sulfurous acid gas), the product's performance and appearance can not be ensured easily.
酸・有機物・腐食性ガス(硫化水素, 亜硫酸ガス等)を含む環境下で使用された場合、製品機能・外観等の保証はできません。

- Use this product within the power cycle curve (Technical Rep.No. : MT5F12959). Power cycle capability is
classified to delta-Tj mode which is stated as above and delta-Tc mode. Delta-Tc mode is due to rise and down
of case temperature (Tc), and depends on cooling design of equipment which use this product. In application
which has such frequent rise and down of Tc, well consideration of product life time is necessary.
本製品は、パワーサイクル寿命カーブ以下で使用下さい(技術資料No.: MT5F12959)。パワーサイクル耐量にはこのΔTjによる場合の他に、ΔTcによる場合があります。これはケース温度(Tc)の上昇下降による熱ストレスであり、本製品をご使用する際の放熱設計に依存します。ケース温度の上昇下降が頻繁に起こる場合は、製品寿命に十分留意してご使用下さい。

- Never add mechanical stress to deform the main or control terminal. The deformed terminal may cause poor
contact problem.
主端子及び制御端子に応力を与えて変形させないで下さい。 端子の変形により、接触不良などを引き起こす場合があります。

- Use this product with keeping the cooling fin's flatness between screw holes within 50um at 100mm and the
roughness within 10um. Also keep the tightening torque within the limits of this specification. Too large convex
of cooling fin may cause isolation breakdown and this may lead to a critical accident. On the other hand, too
large concave of cooling fin makes gap between this product and the fin bigger, then, thermal conductivity will
be worse and over heat destruction may occur.
冷却フィンはネジ取り付け位置間で平坦度を100mmで50um以下、表面の粗さは10um以下にして下さい。 過大な凸反りがあったりすると本製品が絶縁破壊を起こし、重大事故に発展する場合があります。また、過大な凹反りやゆがみ等があると、本製品と冷却フィンの間に空隙が生じて放熱が悪くなり、熱破壊に繋がることがあります。

- In case of mounting this product on cooling fin, use thermal compound to secure thermal conductivity. If the
thermal compound amount was not enough or its applying method was not suitable, its spreading will not be
enough, then, thermal conductivity will be worse and thermal run away destruction may occur.
Confirm spreading state of the thermal compound when its applying to this product.
(Spreading state of the thermal compound can be confirmed by removing this product after mounting.)
素子を冷却フィンに取り付ける際には、熱伝導を確保するためのコンパウンド等をご使用ください。又、塗布量が不足したり、塗布方法が不適だったりすると、コンパウンドが十分に素子全体に広がらず、放熱悪化による熱破壊に繋がる事があります。
コンパウンドを塗布する際には、製品全面にコンパウンドが広がっている事を確認してください。
(実装した後に素子を取りはずすとコンパウンドの広がり具合を確認する事が出来ます。)

Warnings

- It shall be confirmed that IGBT's operating locus of the turn-off voltage and current are within the RBSOA specification. Please measured surge voltage measurement probe attached directly to the main terminal device. This product may be broken if the locus is out of the RBSOA.
ターンオフ電圧・電流の動作軌跡がRBSOA仕様内にあることを確認して下さい。サージ電圧測定は素子の主端子に直接プローブを接続して測定して下さい。RBSOAの範囲を超えて使用すると素子が破壊する可能性があります。

- If excessive static electricity is applied to the control terminals, the devices may be broken. Implement some countermeasures against static electricity.
制御端子に過大な静電気が印加された場合、素子が破壊する場合があります。取り扱い時は静電気対策を実施して下さい。

- Never add the excessive mechanical stress to the main or control terminals when the product is applied to equipments. The module structure may be broken.
素子を装置に実装する際に、主端子や制御端子に過大な応力を与えないで下さい。端子構造が破壊する可能性があります。

- In case of insufficient -VGE, erroneous turn-on of IGBT may occur. -VGE shall be set enough value to prevent this malfunction. (Recommended value : -VGE = 15V)
逆バイアスゲート電圧-VGEが不足しますと誤点弧を起こす可能性があります。誤点弧を起こさない為に-VGEは十分な値で設定して下さい。（推奨値 : -VGE = 15V)

- In case of higher turn-on dv/dt of IGBT, erroneous turn-on of opposite arm IGBT may occur. Use this product in the most suitable drive conditions, such as +VGE, -VGE, RG, CGE to prevent the malfunction.
ターンオン dv/dt が高いと対向アームのIGBTが誤点弧を起こす可能性があります。誤点弧を起こさない為の最適なドライブ条件(+VGE, -VGE, RG, CGE)でご使用下さい。

- This product may be broken by avalanche in case of VCE beyond maximum rating VCES is applied between C-E terminals. Use this product within its maximum voltage.
VCESを超えた電圧が印加された場合、アバランシェを起こして素子破壊する場合があります。VCEは必ず最大定格の範囲内でご使用下さい。

- Incase of soldering this product at excessive heat condition, the package of this product may be deteriorated. Please handle with care for soldering process.
製品を過大な温度で半田付けした場合、パッケージの劣化を引起す可能性があります。半田付けプロセスに注意してご使用ください。

Cautions

- Fuji Electric Systems is constantly making every endeavor to improve the product quality and reliability. However, semiconductor products may rarely happen to fail or malfunction. To prevent accidents causing injury or death, damage to property like by fire, and other social damage resulted from a failure or malfunction of the Fuji Electric Systems semiconductor products, take some measures to keep safety such as redundant design, spread-fire-preventive design, and malfunction-protective design.
富士電機システムズは絶えず製品の品質と信頼性の向上に努めています。しかし、半導体製品は故障が発生したり、誤動作する場合があります。富士電機システムズ製半導体製品の故障または誤動作が、結果として人身事故・火災等による財産に対する損害や社会的な損害を起こさないように冗長設計・延焼防止設計・誤動作防止設計など安全確保のための手段を講じて下さい。

- The application examples described in this specification only explain typical ones that used the Fuji Electric Systems products. This specification never ensure to enforce the industrial property and other rights, nor license the enforcement rights.
本仕様書に記載してある応用例は、富士電機システムズ製品を使用した代表的な応用例を説明するものであり、本仕様書によって工業所有権、その他権利の実施に対する保障または実施権の許諾を行うものではありません。

- The product described in this specification is not designed nor made for being applied to the equipment or systems used under life-threatening situations. When you consider applying the product of this specification to particular used, such as vehicle-mounted units, shipboard equipment, aerospace equipment, medical devices, atomic control systems and submarine relaying equipment or systems, please apply after confirmation of this product to be satisfied about system construction and required reliability.
本仕様書に記載された製品は、人命にかかわるような状況下で使用される機器あるいはシステムに用いられることを目的として設計・製造されたものではありません。本仕様書の製品を車両機器、船舶、航空宇宙、医療機器、原子力制御、海底中継機器あるいはシステムなど、特殊用途へのご利用をご検討の際は、システム構成及び要求品質に満足することをご確認の上、ご利用下さい。

If there is any unclear matter in this specification, please contact Fuji Electric Systems Co.,Ltd.