

SPECIFICATION

Device Name : IGBT Module

Type Name : 4MBI100T-060

Spec. No. : MS5F 5431

This is provided by Fuji Electric Co., Ltd. the property of
Fuji Electric Co., Ltd. and shall be treated as confidential except
for the purpose of the use of the product for the use of any
information or other information without the consent of Fuji Electric Co., Ltd.

Fuji Electric Co., Ltd.
Matsumoto Factory

	DATE	NAME	APPROVED	Fuji Electric Co., Ltd.			
DRAWN	Apr. 23 - '03	S.Ogawa	T.Fujihira	DWG NO	MS5F 5431	1 / 14	
CHECKED	Apr. - 23 - '03	T.Miyasaka					
	Apr. - 23 - '03	K.Yamada					

Revised Records

[illegible]

This is a novel and very exciting area, and the number of people working in it will only continue to increase, and expect that a significant number of new publications by the community will be forthcoming.

Fuji Electric Co., Ltd.

D'WG. NO.

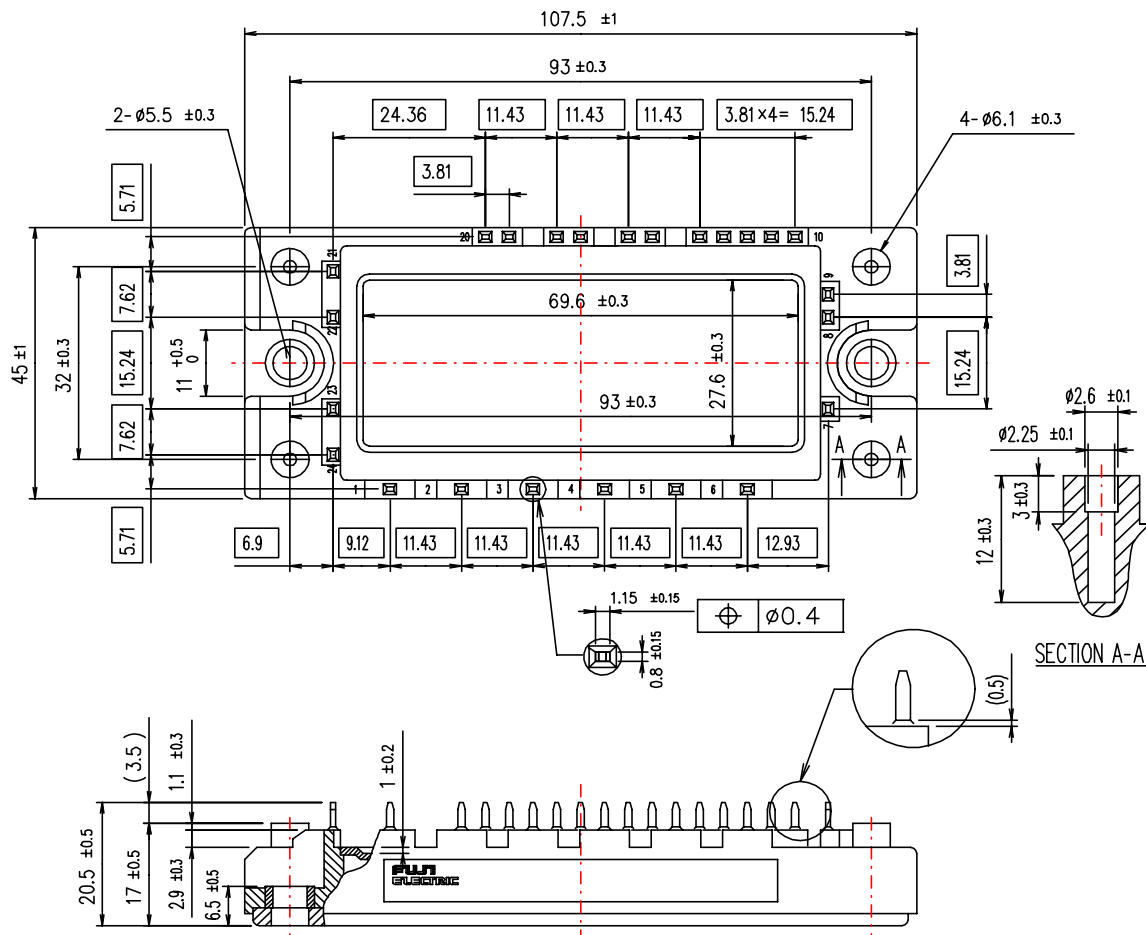
MS5F 5431

$$\frac{2}{14}$$

H04-004-06

4MBI100T-060

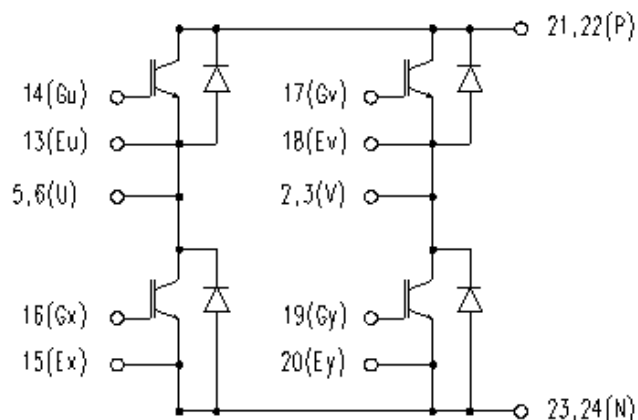
1. Outline Drawing (Unit : mm)



□ shows theoretical dimension.

() shows reference dimension.

2. Equivalent circuit



This is preliminary data and should not be used for the production of products. It is subject to change without notice. Please refer to the latest data sheet for the final specifications.

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

Items	Symbols	Conditions	Maximum Ratings	Units
Collector-Emitter voltage	VCES	Ic=1mA	600	V
Gate-Emitter voltage	VGES		±20	V
Collector current	Ic	Duty=100 %	100	A
	Ic pulse	1ms	200	
	IF	Duty=50 %	100	
	IF pulse	1ms	200	
Collector Power Dissipation	Pc	1 device	310	W
Junction temperature	Tj		150	°C
Storage temperature	Tstg		-40~ +125	°C
Isolation voltage ^(*1)	Viso	AC : 1min.	2500	V
Screw Torque	Mounting ^(*2)		3.5	N·m

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

(*2) Recommendable Value : Mounting 2.5~3.5 N·m (M5)

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

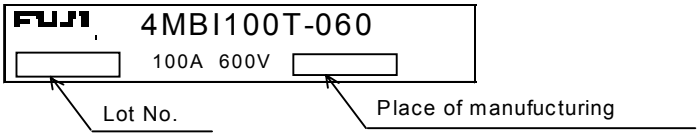
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	Max.	
Zero gate voltage Collector current	ICES	VGE = 0 V, VCE = 600 V	-	-	1.0	mA
Gate-Emitter leakage current	IGES	VCE = 0 V, VGE = ±20 V	-	-	200	nA
Gate-Emitter threshold voltage	VGE(th)	VCE = 20 V, Ic = 100 mA	6.2	6.7	7.7	V
Collector-Emitter saturation voltage	VCE(sat)	VGE = 15 V	-	1.8	2.2	V
		Ic = 100 A		2.1	2.5	
Input capacitance	Cies	VGE = 0 V	-	8500	-	pF
Output capacitance	Coes	VCE = 10 V	-	1500	-	
Reverse transfer capacitance	Cres	f = 1 MHz	-	1300	-	
Turn-on time	ton	Vcc = 300 V	-	0.4	1.2	μs
	tr	Ic = 100 A	-	0.25	0.6	
	tr(i)	VGE = ±15 V	-	0.1	-	
Turn-off time	toff	RG = 33 Ω	-	0.4	1.2	
	tf		-	0.04	0.45	
Forward on voltage	VF	IF = 100 A	-	1.7	2.2	V
			-	2.0	2.5	
Reverse recovery time	trr	IF = 100 A	-	-	0.3	μs
Allowable avalanche energy during short circuit cutting off (Non-repetitive)	PAV	Ic > 200A , Tj = 125°C	55	-	-	mJ

5. Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	Max.	
Thermal resistance (1 device)	Rth(j-c)	IGBT	-	-	0.400	°C/W
		FWD	-	-	1.02	
Contact Thermal resistance	Rth(c-f)	With thermal compound *	-	0.05	-	

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

6. Indication on module



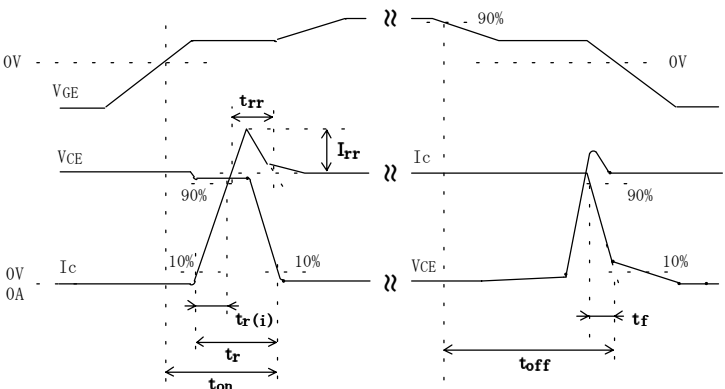
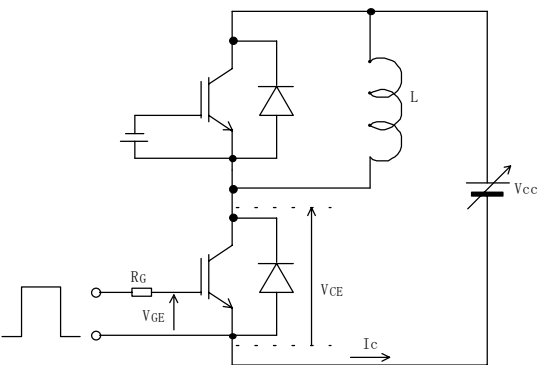
7. Applicable category

This specification is applied to IGBT Module named 4MBI100T-060

8. Storage and transportation notes

- The module should be stored at a standard temperature of 5 to 35C 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 tranporting.

9. Definitions of switching time



This is presented by a vectoring operation, the procedure of which is outlined below. It may exhibit some resemblance to vectoring procedures in our publications, but the use of any vectoring operation is suggested by subjecting our results without the process, with no current of a Helicity Control.



12. Packing and Labeling

A 3D perspective diagram of a rectangular packing box. A label is affixed to the front face of the box. A leader line points from the text 'Display' to the label. Another leader line points from the text 'Packing box' to the top surface of the box.

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

Fuji Electric Co., Ltd.

OW'S NO.

$$\frac{6}{14}$$

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 : 20N Test time : 10±1 sec.	Test Method 401 Method I	5	(1 : 0)
	2 Mounting Strength	Screw torque : 2.5 ~ 3.5 N·m (M5) Test time : 10±1 sec.	Test Method 402 method II	5	(1 : 0)
	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	(1 : 0)
	4 Shock	Maximum acceleratic : 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	(1 : 0)
	5 Solderability	Solder temp. : 235±5 °C Immersion time : 5±0.5sec. Test time : 1 time Each terminal should be Immersed in solder within 1~1.5mm from the body.	Test Method 303 Condition code A	5	(1 : 0)
	6 Resistance to Soldering Heat	Solder temp. : 260±5 °C Immersion time : 10±1sec. Test time : 1 time Each terminal should be Immersed in solder within 1~1.5mm from the body.	Test Method 302 Condition code A	5	(1 : 0)
Environment Tests	1 High Temperature Storage	Storage temp. : 125±5 °C Test duration : 1000hr.	Test Method 201	5	(1 : 0)
	2 Low Temperature Storage	Storage temp. : -40±5 °C Test duration : 1000hr.	Test Method 202	5	(1 : 0)
	3 Temperature Humidity Storage	Storage temp. : 85±2 °C Relative humidity : 85±5% Test duration : 1000hr.	Test Method 103 Test code C	5	(1 : 0)
	4 Unsaturated Pressure Cooker	Test temp. : 120±2 °C Atmospheric pressur : 1.7 × 10 ⁵ Pa Test humidity : 85±5% Test duration : 96hr.	Test Method 103 Test code E	5	(1 : 0)
	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	(1 : 0)
	6 Thermal Shock	Test temp. : High temp. 100⁺⁰ °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 A	5	(1 : 0)

This compound is a crystalline solid; the product of the reaction of 1 and 2, could be more significant regard to the use of the compound in the synthesis of the polymer, which is a subject of future work.

This compound is a crystalline solid; the product of the reaction of 1 and 2, could be more significant regard to the use of the compound in the synthesis of the polymer, which is a subject of future work.

This compound is a crystalline solid; the product of the reaction of 1 and 2, could be more significant regard to the use of the compound in the synthesis of the polymer, which is a subject of future work.

This compound is a crystalline solid; the product of the reaction of 1,1'-oxybis(2-methyl-2-propyl-2-imidazolidinone) with 1,2-ethanediol could be the more significant compound obtained in our study.

This compound is a crystalline solid; the product of the reaction of 1,1'-oxybis(2-methyl-2-propyl-2-imidazolidinone) with 1,2-ethanediol could be the more significant compound obtained in our study.

This compound is a crystalline solid; the product of the reaction of 1,1'-oxybis(2-methyl-2-propyl-2-imidazolidinone) with 1,2-ethanediol could be the more significant compound obtained in our study.

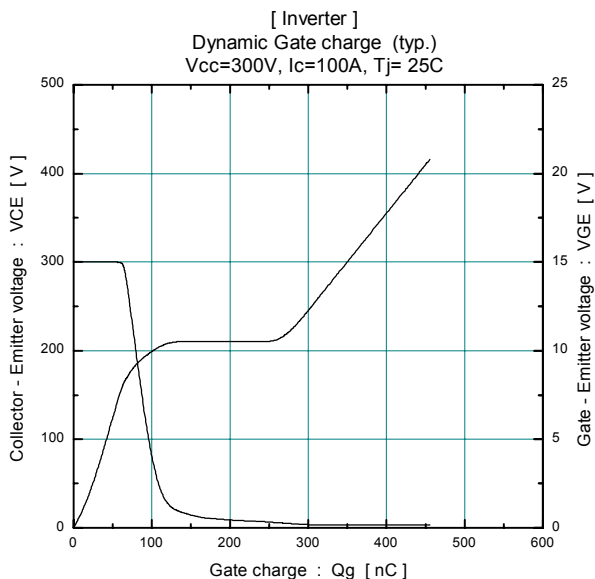
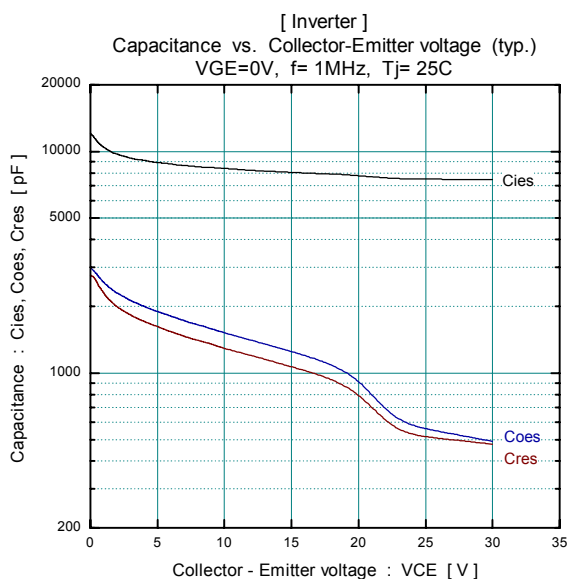
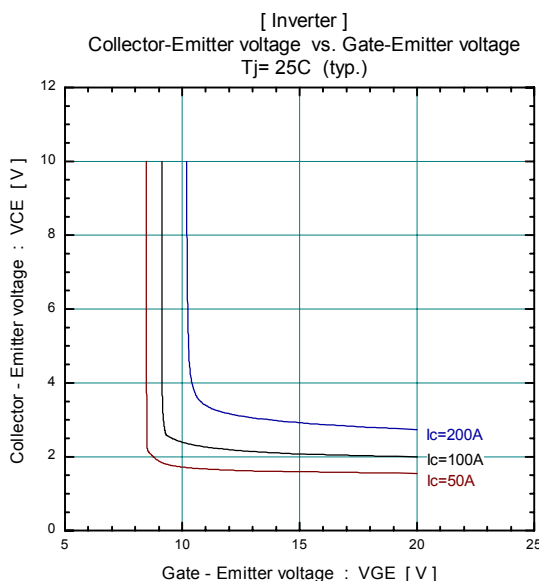
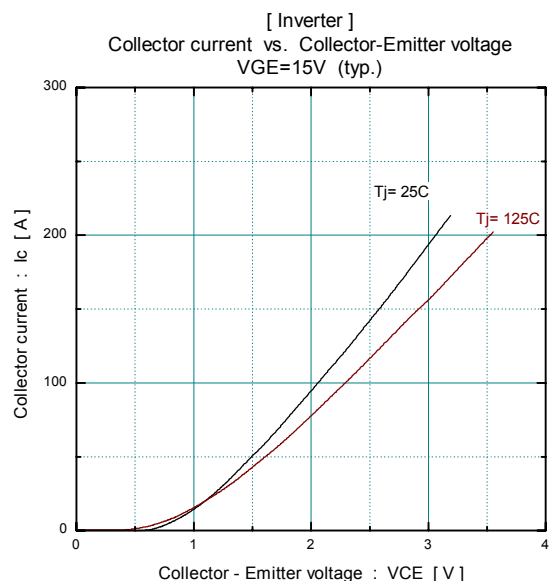
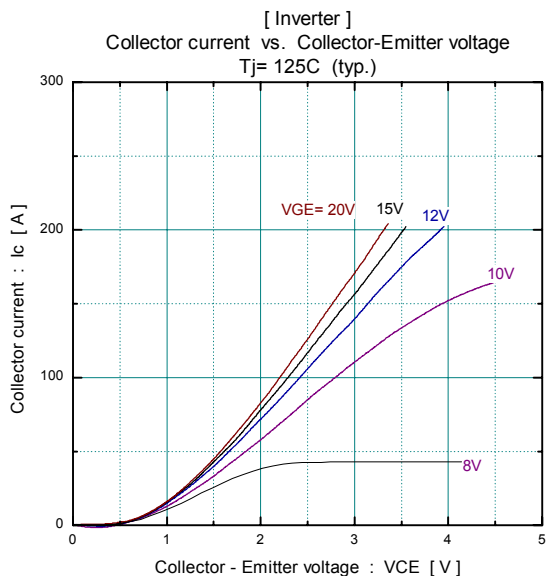
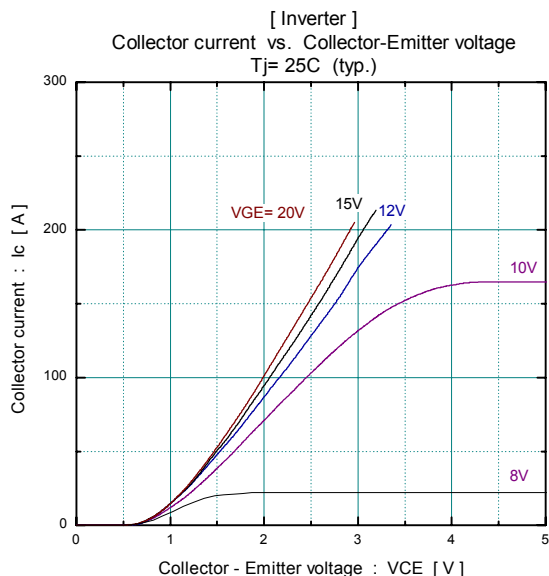
This compound is a crystalline solid; the product of the reaction of 1,1'-oxybis(2-methyl-2-propyl-2-imidazolidinone) with 1,2-ethanediol could be the more significant compound obtained in our study.

Reliability Test Results

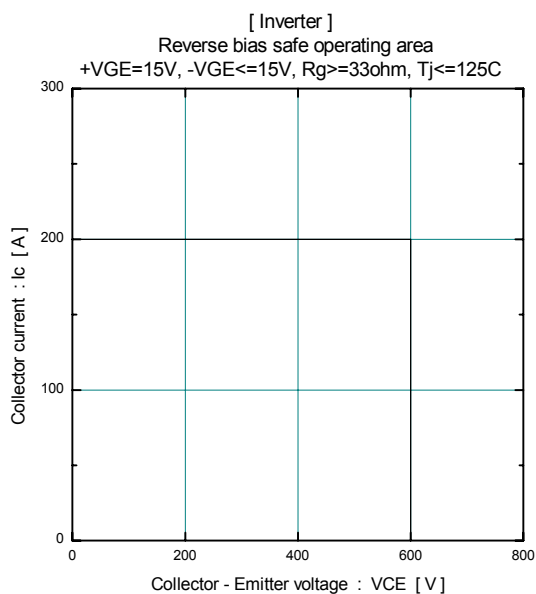
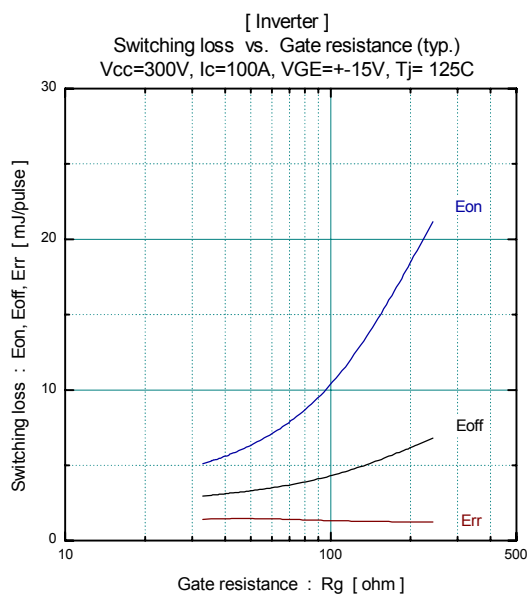
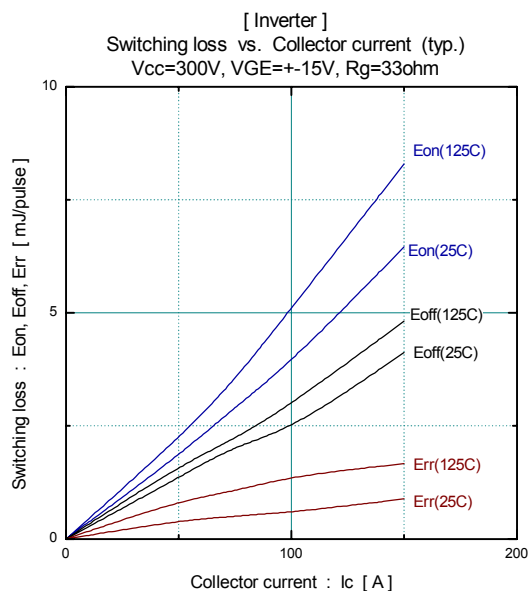
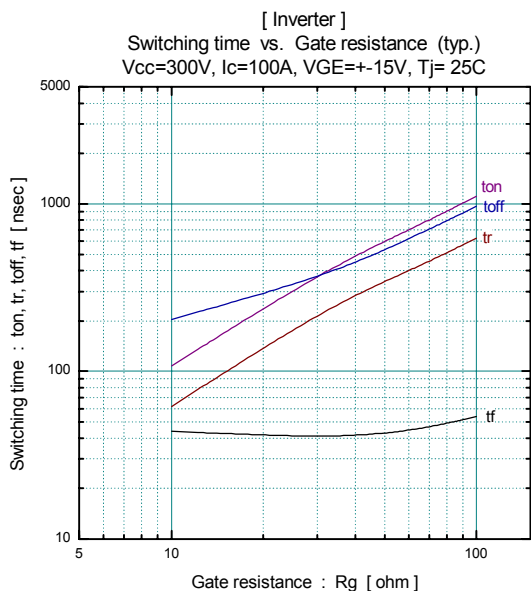
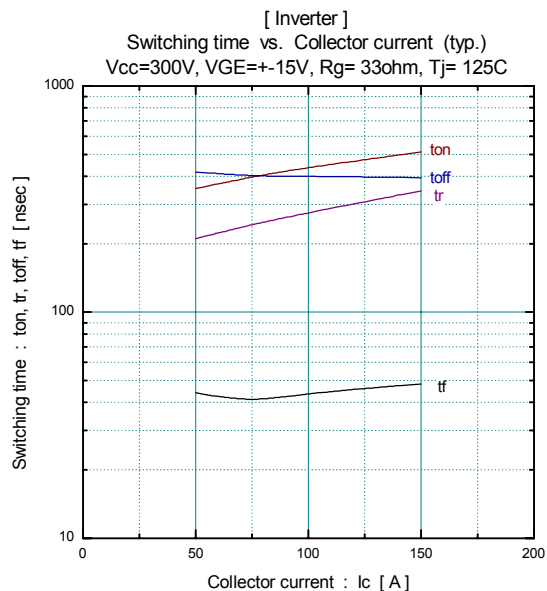
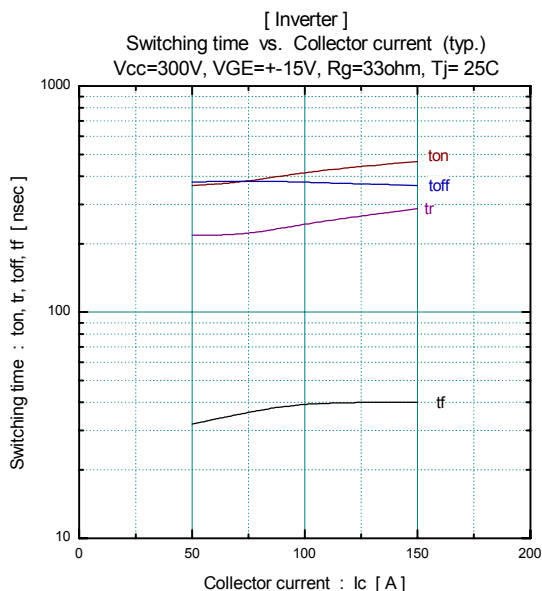
Test categories	Test items	Reference norms EIAJ ED-4701 (Aug.-2001 edition)	Number of test sample	Number of failure sample
Mechanical Tests	1 Terminal Strength (Pull test)	Test Method 401 Method I	5	0
	2 Mounting Strength	Test Method 402 method II	5	0
	3 Vibration	Test Method 403 Condition code B	5	0
	4 Shock	Test Method 404 Condition code B	5	0
	5 Solderability	Test Method 303 Condition code A	5	0
	6 Resistance to Soldering Heat	Test Method 302 Condition code A	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 Pressure Cooker	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 Intermittent Operating Life (Power cycling) (for IGBT)	Test Method 106	5	0

This is preliminary data. The number of samples tested is 5 for each test item. The number of samples tested is 5 for each test item. The number of samples tested is 5 for each test item.

This is preliminary data and is not for production use. The product of this data can not be used for production use. The product of this data can not be used for production use. The product of this data can not be used for production use.

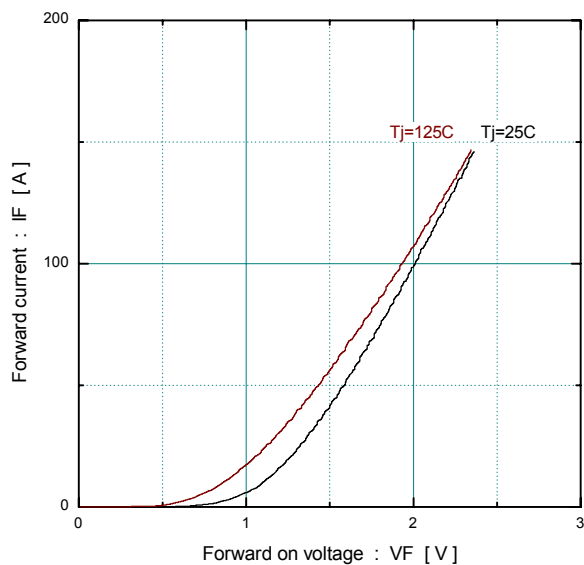


This is preliminary data and is not for production use. The product is not guaranteed to meet the specifications in this document. The product is not guaranteed to meet the specifications in this document. The product is not guaranteed to meet the specifications in this document.

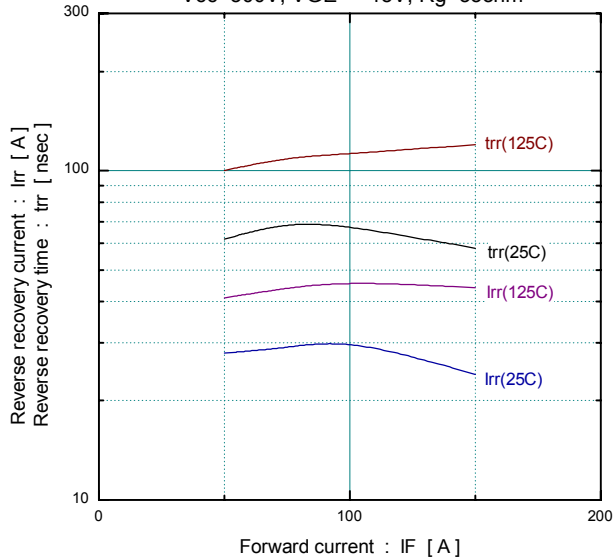


This is preliminary data and is not for production. The product of this data can not be used for mass production. The product of this data can not be used for mass production. The product of this data can not be used for mass production.

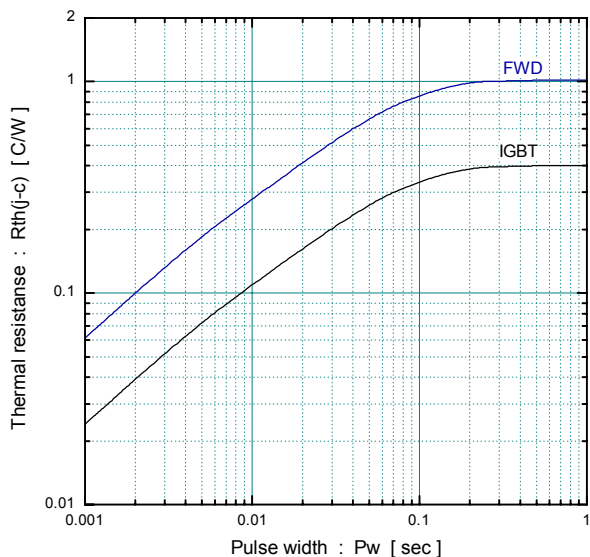
[Inverter]
Forward current vs. Forward on voltage (typ.)



[Inverter]
Reverse recovery characteristics (typ.)
Vcc=300V, VGE=+-15V, Rg=33ohm



Transient thermal resistance



Warnings

- This product shall be used within its absolute 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)の範囲内で御使用下さい。
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。
- Connect adequate fuse or protector of circuit between three-phase line and this product to prevent the equipment from causing secondary destruction.
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。
- 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・外観などの保証は致しかねます。
- Use this product within the power cycle curve (Technical Rep.No. : MT6M3947)
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.: MT6M3947)
- 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 100um at 100mm and the roughness within 10um. Also keep the tightening torque within the limits of this specification.
Improper handling may cause isolation breakdown and this may lead to a critical accident.
冷却フィンにネジ取り付け位置間で平坦度を100mmで100um以下、表面の粗さは10um以下にして下さい。 誤った取り扱いをすると絶縁破壊を起こし、重大事故に発展する場合があります。
- It shall be confirmed that IGBT's operating locus of the turn-off voltage and current are within the RBSOA specification. 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。
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 to prevent the malfunction.
ターンオン dv/dt が高いと対抗アームの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等)でご使用下さい。

This is presented by a vectoring operation, the procedure of which is outlined below. It may exhibit some resemblance to vectoring procedures in our publications, but the use of any vectoring operation is suggested by subjecting our results without the process, with no current of the electric field.

- 富士電機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。

- 本仕様書に記載してある応用例は、富士電機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。

- 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 Co.,Ltd.