

# SPECIFICATION

Device Name : IGBT MODULE

Type Name : 6MBI450U4-120

Fuji Electric Device Technology Co., Ltd.

This specification shall be read in conjunction with the specification of the device without exception.

This specification and the information herein shall be used in any way without the written consent of Fuji Electric Device Technology Co., Ltd.

This specification is for the device only. It does not include the information for the device assembly.

	DATE	NAME	APPROVED	
DRAWN	- -			Fuji Electric Device Technology Co., Ltd.
CHECKED	- -			
CHECKED	- -			

DWG.NO.		
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# Revised Records

Date	Classification	Ind.	Content	Applied date	Drawn	Checked	Checked	Approved
Jan.-20-'05	Enactment	—	—————	Issued date	—	T.Miyasaka	K.Yamada	Y.Seki
Oct.-25-'05	Revision	a	Revised characteristics VCE(sat) (P4/14)		S.Miyashita	O.Ikawa	K.Yamada	T.Miyasaka

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MS5F6020




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

	Symbols	Conditions	Maximum Ratings	Units
Collector-Emitter voltage	VCES		1200	V
			±20	
	VGES		600	
			450	
	Icp	1ms	Tc=80°C	
Tc=25°C			900	
Tc=80°C			450	
Collector Power Dissipation	-Ic pulse	1ms	900	
	Pc	1 device	2080	
Storage temperature	Tstg		+150	
			-40 to +125	
Screw				
Torque	-			

(\*2) Two thermistor terminals should be connected together, each other terminals should be connected together

### 4. Electrical ch

		Units
		mA
	IGES	nA
VCE(sat) (terminal)	Ic=450A	
VCE(sat) (chip)		
	Tj=125°C	
	Tj=25°C	
	Tj=125°C	

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**6.Recommend way of module mounting to Heat sink Clamping**

- (1) Initial : 1/3 specified torque, sequence (1) (2) (3) (4) (5) (6) (7) (8)
- (2) Final Full specified torque (3.5 Nm),sequence(4) (3) (2) (1) (8) (7) (6) (5)

**Logo of production**

**Lot.No.**

**Place of manufacturing (code)**

- 
- modum
- 
- 
- Store modules with unprocessed terminals.
- Do not drop or otherwise shock the modules when transporting.

**Fuji Electric Device Technology Co.,Ltd.**

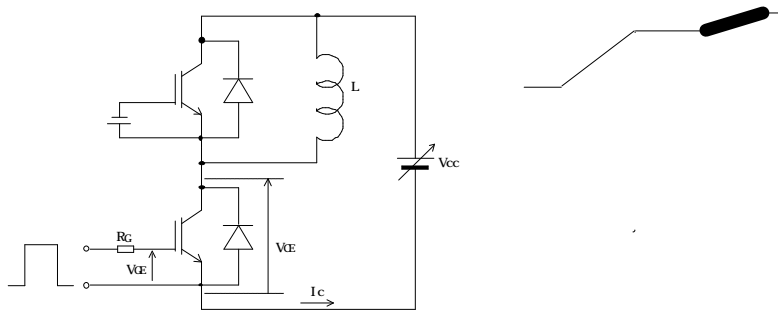
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## 12. Reliability test results

### Reliability Test Items

Test categories	Test items	Test methods and conditions	Reference norms EIAJ ED-4701 (Aug.-2001 edition)	Number of sample	Acceptance number
1	Terminal Strength (Pull test)	Pull force : 20N (Control terminal) 40N (Main terminal) Test time : 10±1 sec.	Test Method 401 Method	5	(0 : 1)
2	Mounting Strength	Screw torque : 2.5 ~ 3.5 N m (M5) 3.5 ~ 4.5 N m (M6) Test time : 10±1 sec.	Test Method 402 method	5	(0 : 1)
3	Vibration	Range of frequency : 10 ~ 500Hz Sweeping time : 15 min. Acceleration : 100m/s <sup>2</sup> 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 <sup>2</sup> Pulse width : 1.0msec. Direction : Each X,Y,Z axis Test time : 3 times/direction	Test Method 404 Condition code B	5	(0 : 1)
5	Solderability	Solder temp. : 235±5 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	(0 : 1)
6	Resistance to Soldering Heat	Solder temp. : 260±5 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	(0 : 1)
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.			

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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. : $T_a = 125 \pm 5$ ( $T_j = 150$ ) Bias Voltage : $V_C = 0.8 \times V_{CES}$ Bias Method : Applied DC voltage to C-E $V_{GE} = 0V$ Test duration : 1000hr.	Test Method 101	5	(0 : 1)
	2 High temperature Bias (for gate)	Test temp. : $T_a = 125 \pm 5$ ( $T_j = 150$ ) Bias Voltage : $V_C = V_{GE} = +20V$ or $-20V$ Bias Method : Applied DC voltage to G-E $V_{CE} = 0V$ Test duration : 1000hr.	Test Method 101	5	(0 : 1)
	3 Temperature Humidity Bias	Test temp. : $85 \pm 2$ °C Relative humidity : $85 \pm 5\%$ Bias Voltage : $V_C = 0.8 \times V_{CES}$ Bias Method : Applied DC voltage to C-E $V_{GE} = 0V$ 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. : $\Delta T_j = 100 \pm 5$ deg $T_j = 150$ , $T_a = 25 \pm 5$ 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	-	USLx2	mA		
		$\pm IGES$	-	USLx2	$\mu A$		
	Gate threshold voltage	$V_{GE(th)}$	LSLx0.8	USLx1.2	mA		
	Saturation voltage	$V_{CE(sat)}$	-	USLx1.2	V		
	Forward voltage	VF	-	USLx1.2	V		
	Thermal resistance	IGBT	$\Delta V_{GE}$	-	USLx1.2	mV	
			or $\Delta V_{CE}$				
	FWD	$\Delta V_F$	-	USLx1.2	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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## 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	5	0
	2 Mounting Strength	Test Method 402 method	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	*
	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 Condition code A	5	0
Endurance Tests	1 High temperature Reverse Bias	Test Method 101	5	*
	2 High temperature Bias ( for gate )	Test Method 101	5	0
	3 Temperature Humidity Bias	Test Method 102 Condition code C	5	*
	4 Intermitted Operating Life (Power cycling) ( for IGBT )	Test Method 106	5	0

\* under confirmation

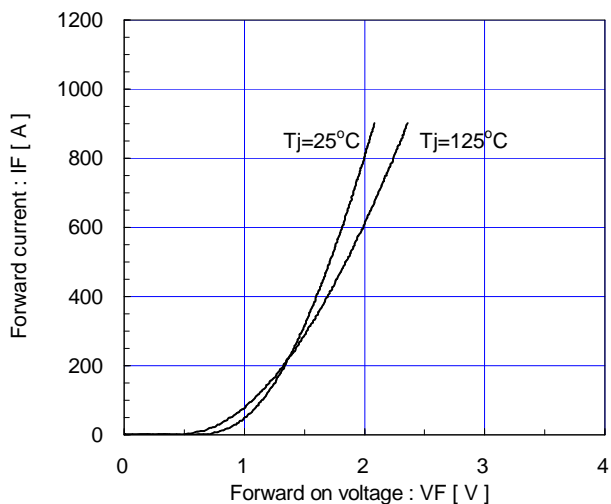
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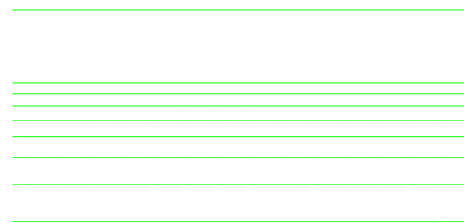


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Forward current vs. Forward on voltage (typ.)  
chip



Reverse recovery characteristics (typ.)  
Vcc=600V, VGE=±15V, RG=1.1



Transient thermal resistance (max.)

[ Thermistor ]  
Temperature characteristic (typ.)

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### 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.
- Connect adequate fuse or protector of circuit between the product and this power source to prevent the equipment from causing secondary destruction, such as fire, its smoke, or explosion.
- Use this product after realizing enough working on environment and considering of product reliability life. This product may be broken before target life of the system in case of using beyond the product's reliability life.
- If the product had been used in the environment with organic matter, and corrosive gas (hydrogen sulfide, sulfurous acid gas), the product's performance and appearance can not be ensured easily.
- Use this product within the power cycle curve (Technical Note No. : MT5F12959). Power capability is classified to delta-Tj mode which is stated as above and delta-Tc mode. Delta-Tc mode is to rise and down of junction temperature (Tj) and depends on cooling capacity.

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### Cautions

- Fuji Electric Device Technology 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 Device Technology semiconductor products, take some measures to keep safety such as redundant design, spread-fire-preventive design, and malfunction-protective design.
- The application examples described in this specification only explain typical ones that used the Fuji Electric Device Technology products. This specification never ensure to enforce the industrial property and other rights, nor license the enforcement rights.
- The product

