

# SPECIFICATION

Device Name : IGBT MODULE

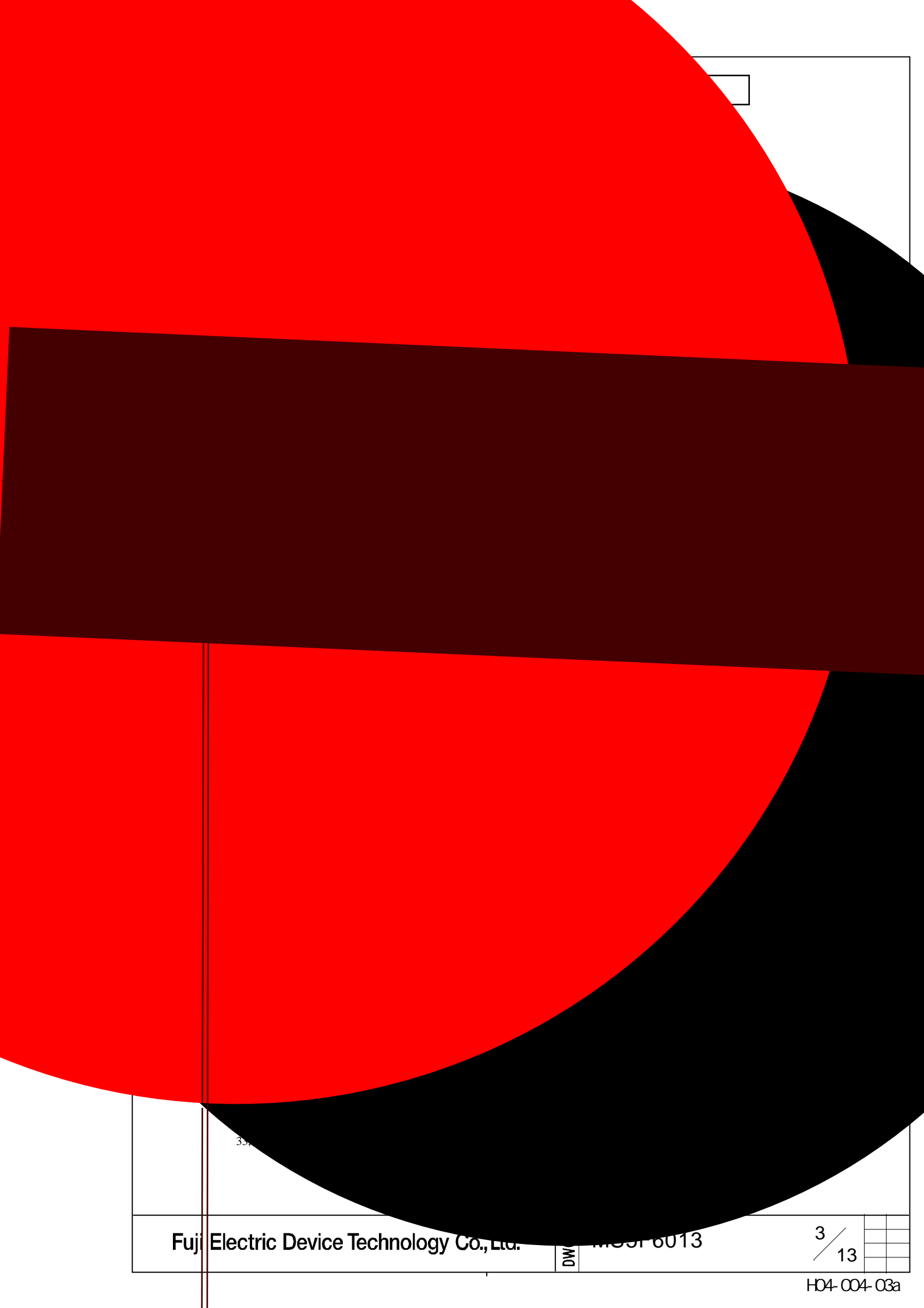
Type Name : 6MBI150U4B-120

Spec. No. : MS5F 6013

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|         | DATE          | NAME        | APPROVED | Fuji Electric Device Technology Co., Ltd. |          |     |
|---------|---------------|-------------|----------|---|----------|-----|
| DRAWN   | Jan- 18 - '05 | S.Miyashita | Y.Seki   | DWG.NO.                                   | MS5F6013 | 1 / |
| CHECKED | Jan. 18 - '05 | T.Miyasaka  |          |   |          | 13  |
| CHECKED | - -           | K.Yamada    |          |   |          |     |





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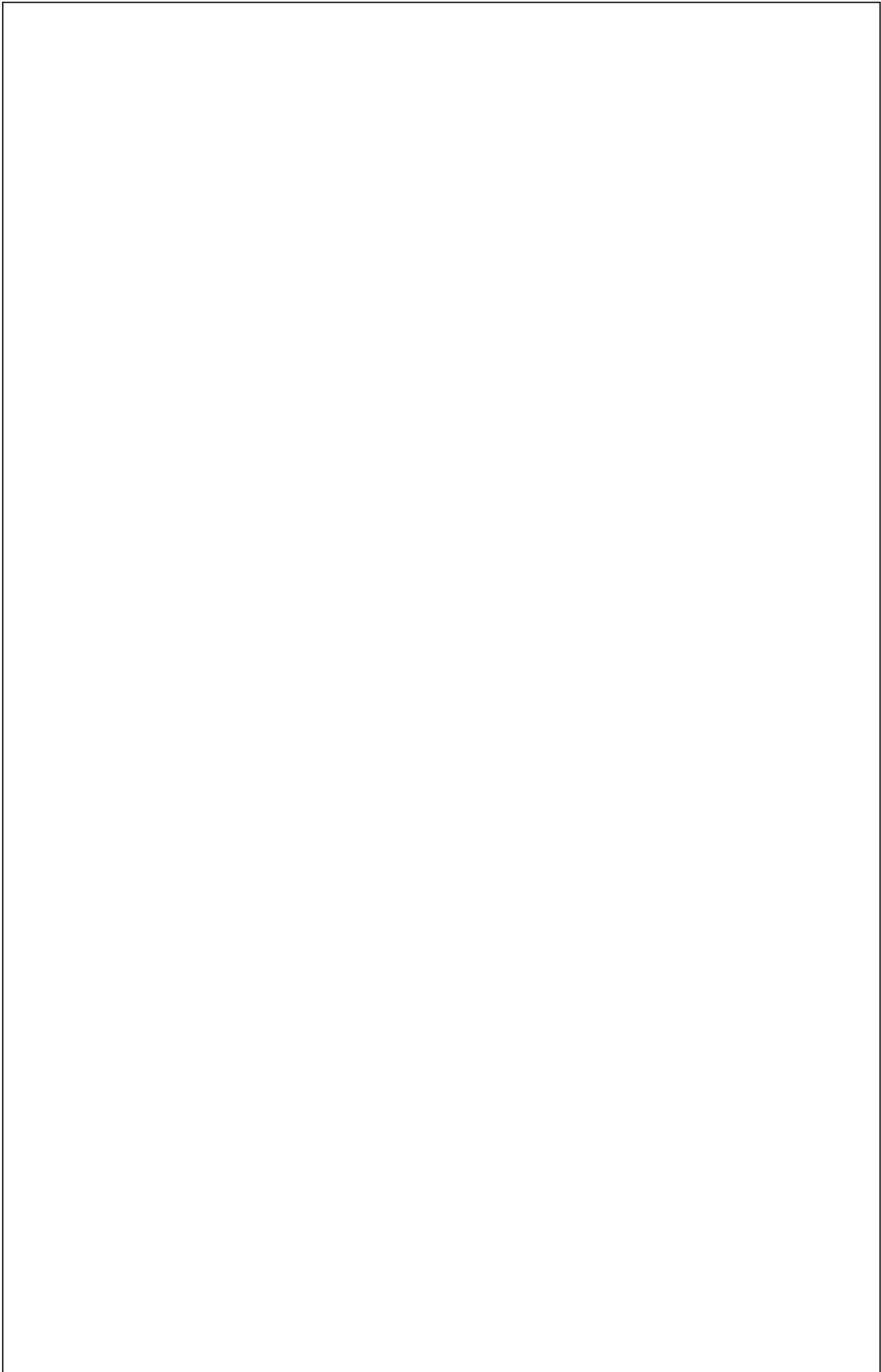
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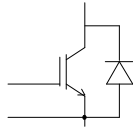
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## 11. Reliability test results

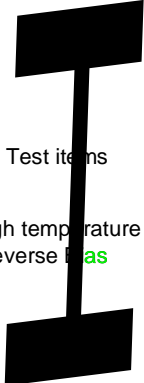
### Reliability Test Items

| Test categories | Test items                       | Test methods and conditions   | Reference norms<br>EIAJ ED-4701<br>(Aug.-2001 edition) | Number of sample | Acceptance number |
|-----------------|----------------------------------|---|--|------------------|-------------------|
| 1               | Terminal Strength<br>(Pull test) | Pull force : 20N  | Test Method 401<br>Method                              | 5                | (0 : 1)           |
|                 |                                  | Test time : 10±1 sec.   |  |                  |                   |
| 2               | Mounting Strength                | Screw torque : 2.5 ~ 3.5 N m (M5)   | Test Method 402<br>method                              | 5                | (0 : 1)           |
|                 |                                  | Test time : 10±1 sec.   |  |                  |                   |
| 3               | Vibration                        | Range of frequency : 10 ~ 500Hz<br>Sweeping time : 15 min.<br>Acceleration : 100m/s <sup>2</sup><br>Sweeping direction : Each X,Y,Z axis<br>Test time : 6 hr. (2hr./direction)  | Test Method 403<br>Reference 1<br>Condition code B     | 5                | (0 : 1)           |
| 4               | Shock                            | Maximum acceleration : 5000m/s <sup>2</sup><br>Pulse width : 1.0msec.<br>Direction : Each X,Y,Z axis<br>Test time : 3 times/direction   | Test Method 404<br>Condition code B                    | 5                | (0 : 1)           |
| 5               | Solderability                    | Solder temp. : 235±5<br>Immersion time : 5±0.5sec.<br>Test time : 1 time<br>Each terminal should be immersed in solder within 1~1.5mm from the body.  | Test Method 303<br>Condition code A                    | 5                | (0 : 1)           |
| 6               | Resistance to Soldering Heat     | Solder temp. : 260±5<br>Immersion time : 10±1sec.<br>Test time : 1 time<br>Each terminal should be immersed in solder within 1~1.5mm from the body.   | Test Method 302<br>Condition code A                    | 5                | (0 : 1)           |
| 1               | High Temperature Storage         | Storage temp. : 125±5<br>Test duration : 1000hr.  | Test Method 201  | 5                | (0 : 1)           |
| 2               | Low Temperature Storage          | Storage temp. : -40±5<br>Test duration : 1000hr.  | Test Method 202  | 5                | (0 : 1)           |
| 3               | Temperature Humidity Storage     | Storage temp. : 85±2<br>Relative humidity : 85±5%<br>Test duration : 1000hr.  | Test Method 103<br>Test code C                         | 5                | (0 : 1)           |
| 4               | Unsaturated Pressurized Vapor    | Test temp. : 120 °C<br>Test humidity : 85±5%<br>Test duration : 96hr.   | Test Method 103<br>Test code E                         | 5                | (0 : 1)           |
| 5               | Temperature Cycle                | Test temp. : Low temp. -40 °C 5<br>High temp. 125 °C 5<br>RT 5 ~ 35<br>Dwell time : High ~ RT ~ Low ~ RT<br>1hr. 0.5hr. 1hr. 0.5hr.<br>Number of cycles : 100 cycles  | Test Method 105  | 5                | (0 : 1)           |
| 6               | Thermal Shock                    | Test temp. : High temp. 100 <sup>+0</sup> <sub>-5</sub><br>Low temp. 0 <sup>+5</sup> <sub>-0</sub><br>Used liquid : Water with ice and boiling water<br>Dipping time : 5 min. per each temp.<br>Transfer time : 10 sec.<br>Number of cycles : 10 cycles/1*9 <sup>TM</sup> lw: | Test Method 307<br>method<br>Condition code A          | 5                | (0 : 1)           |

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## Reliability Test

| Test categories | Test items                    | Test methods and conditions  | Acceptance number |
|-----------------|-------------------------------|--|-------------------|
| 1               | High temperature Reverse bias | Test temp. : $T_a = 125$<br>$(T_j = 150 = \bar{A})$<br>Bias Voltage : $V_C = 0.8 \times V_{CES}$<br>Bias Method : Applied DC voltage to C-E<br>$V_{GE} = 0V$ | (0 : 1)           |
| 2               | High temperature              | Test duration : 1000hr.  | 01                |

# Reliability Test Results

| Test categories | Test items | Reference norms<br>EIAJ ED-4701<br>(Aug.-2001 edition) | Number of test sample |
|-----------------|------------|--|-----------------------|
|-----------------|------------|--|-----------------------|

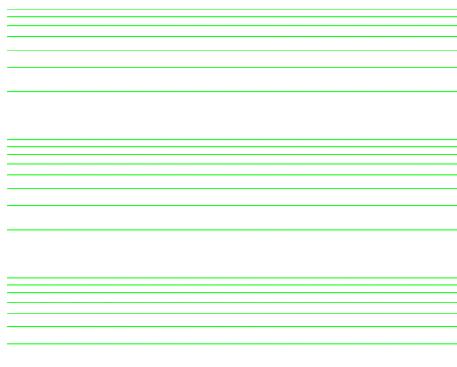
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Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_G=2.2, T_j=25^\circ C$



Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_G=2.2, T_j=125^\circ C$

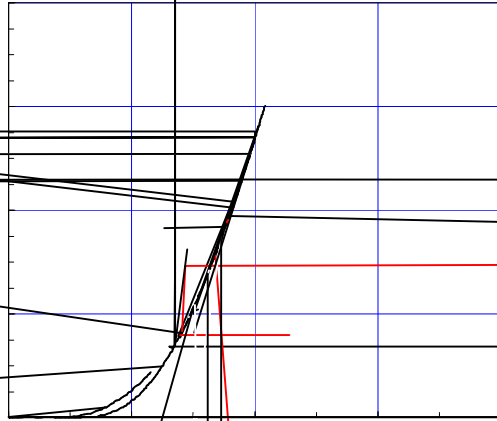
Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=150A, V_{GE}=\pm 15V, T_j=25^\circ C$

Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V, V_{GE}=\pm 15V, R_G=2.2$

Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=150A, V_{GE}=\pm 15V, T_j=125^\circ C$

Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE} \leq 15V, R_G \geq 2.2, T_j \leq 125^\circ C$

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



Reverse recovery characteristics (typ.)  
V<sub>cc</sub>=600V, V<sub>GE</sub>=±15V, R<sub>G</sub>=2.2

[ Thermistor ]  
Temperature characteristic (typ.)

Transient thermal resistance (max.)

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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. If Printed Circuit Board is not suitable, the main pin terminals may have higher temperature than Tstg. Also the pin terminals shall be used within Tstg.
- 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.
- 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.
- 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.
- 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-T

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## Warnings

- 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.
- In case of insufficient -VGE, erroneous turn-on of IGBT may occur. t B-

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