

# SPECIFICATION

DEVICE NAME : IGBT  
 TYPE NAME : 1MBH10D-120  
 SPEC. No. : MS5F 4091  
 DATE : July-15-1997

Fuji Electric Co., Ltd.  
Matsumoto Factory

|         | DATE       | NAME        | APPROVED |   |
|---------|------------|-------------|----------|---|
| DRAWN   | July 15-97 | T. Sawada   |          | <b>Fuji Electric Co., Ltd.</b><br><br><b>MS5F4091</b> |
| CHECKED | July-15-97 | T. Igarashi |          |   |
|         |            |             |          | i/14  |

# Revised Records

| Date             | Classi-<br>fication | Ind. | Content | Applied<br>date | Drawn | Checked | Approved           |
|------------------|---------------------|------|---------|-----------------|-------|---------|--------------------|
| July-<br>15-1997 | enactment           | —    | —————   | Issued<br>date  | —     |         | <i>[Signature]</i> |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |
|                  |                     |      |         |                 |       |         |                    |

This material and the information herein is the property of Fuji Electric Co. Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

▪ Scope

This specification is applied to Fuji discrete IGBT 1MBH10D-120  
supplied for Rockwell Automation Co.,Ltd.

▪ Construction

1. Package dimension  
There is a package dimension in 4/14 page .
2. Outview  
There are no remarkable flaws on a product .
3. Indication
  - ① Trademark
  - ② Type Name
  - ③ Lot No.

▪ Ratings and Characteristics

1. There are some ratings and characteristics tables in 4/14 page and 5/14 page .
2. There are some performance curves in from 6/14 page to 14/14 page .

▪ Packing

Packing style follows our packing specification MS5Q0026 .

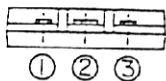
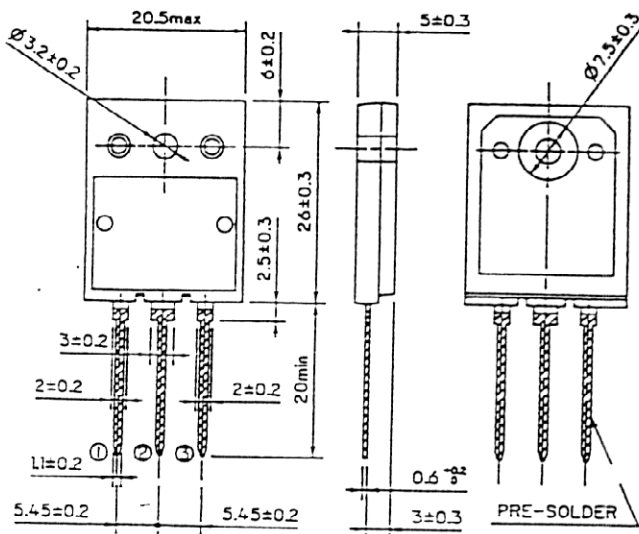
This material and the information herein is the property of Fuji Electric Co.,Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |

Ratings and characteristics of Fuji IGBT

1MBH10D-120

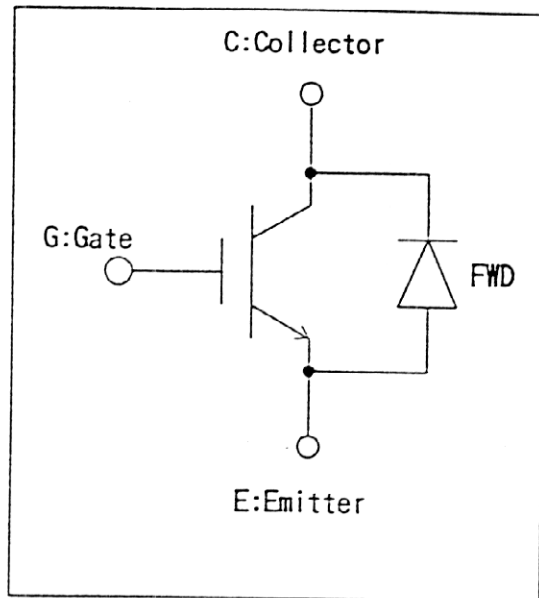
1. Outline Drawing



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER

2. Equivalent circuit



3. Absolute maximum ratings ( Tc=25°C )

| Items                       |     | Symbols   | Ratings    | Units  |
|-----------------------------|-----|-----------|------------|--------|
| Collector-Emitter Voltage   |     | $V_{CES}$ | 1200       | V      |
| Gate-Emitter Voltage        |     | $V_{GES}$ | ±22        | V      |
| Collector Current           | DC  | Tc=25 °C  | 18         | A      |
|                             |     | Tc=105°C  | 10         | A      |
|                             | 1ms | Tc=25 °C  | 48         | A      |
| IGBT Max. Power Dissipation |     | $P_c$     | 155        | W      |
| FWD Max. Power Dissipation  |     | $P_c$     | 105        | W      |
| Operating Temperature       |     | $T_j$     | + 150      | °C     |
| Storage Temperature         |     | $T_{stg}$ | -40 ~ +150 | °C     |
| Mounting Screw Torque       |     | —         | 70         | N · cm |

Fuji Electric Co.,Ltd

DWG.NO.

MS5 F4091

4/14

4. Electrical Characteristics ( at Tc=25°C unless otherwise specified )

| Items                                   | Symbols          | Characteristics |      |      | Conditions   | Unit    |  |
|---|------------------|-----------------|------|------|--|---------|--|
|   |                  | min.            | typ. | max. |  |         |  |
| Zero gate voltage<br>Collector Current  | $I_{CES}$        |                 |      | 1.0  | $V_{GE} = 0V$<br>$V_{CE} = 1200V$  | mA      |  |
| Gate-Emitter<br>leakage Current         | $I_{GES}$        |                 |      | 20   | $V_{CE} = 0V$<br>$V_{GE} = \pm 22V$  | $\mu A$ |  |
| Gate-Emitter<br>Threshold Voltage       | $V_{GE(th)}$     | 5.5             |      | 8.5  | $V_{CE} = 20V$<br>$I_C = 10mA$   | V       |  |
| Collector-Emitter<br>Saturation Voltage | $V_{CE(sat)}$    |                 |      | 3.5  | $V_{GE} = 15V$<br>$I_C = 10A$  | V       |  |
| Input capacitance                       | $C_{ies}$        |                 | 1200 |      | $V_{GE} = 0V$  | pF      |  |
| Output capacitance                      | $C_{oes}$        |                 | 250  |      | $V_{CE} = 10V$   |         |  |
| Reverse transfer<br>capacitance         | $C_{res}$        |                 | 80   |      | $f = 1MHz$   |         |  |
| Switching<br>Time                       | Turn-on<br>time  | $t_{on}$        |      | 1.2  | $V_{CC} = 600V$<br>$I_C = 10A$<br>$V_{GE} = \pm 15V$<br>$R_G = 160\Omega$<br>(Half Bridge) | $\mu s$ |  |
|   |                  | $t_r$           |      | 0.6  |  |         |  |
|   | Turn-off<br>time | $t_{off}$       |      | 1.5  |  |         |  |
|   |                  | $t_f$           |      | 0.5  |  |         |  |
|   | Turn-on<br>time  | $t_{on}$        |      | 0.16 |  |         | $V_{CC} = 600V$<br>$I_C = 10A$<br>$V_{GE} = +15V$<br>$R_G = 16\Omega$<br>(Half Bridge) |
|   |                  | $t_r$           |      | 0.11 |  |         |  |
| Turn-off<br>time                        | $t_{off}$        |                 | 0.30 |      |  |         |  |
|   | $t_f$            |                 | 0.50 |      |  |         |  |
| FWD forward voltage drop                | $V_F$            |                 |      | 3.0  | $I_F = 10A$  | V       |  |
| Reverse recovery time                   | $t_{rr}$         |                 |      | 0.35 | $I_F = 10A, V_{GE} = -10V$<br>$V_R = 200V$<br>$di/dt = 100A/\mu s$                         | $\mu s$ |  |

5. Thermal resistance characteristics

| Items              | Symbols       | Characteristics |      |      | Conditions | Unit          |
|--------------------|---------------|-----------------|------|------|------------|---------------|
|                    |               | min.            | typ. | max. |            |               |
| Thermal resistance | $R_{th(j-c)}$ |                 |      | 0.80 | IGBT       | $^{\circ}C/W$ |
|                    | $R_{th(j-c)}$ |                 |      | 1.19 | FWD        |               |

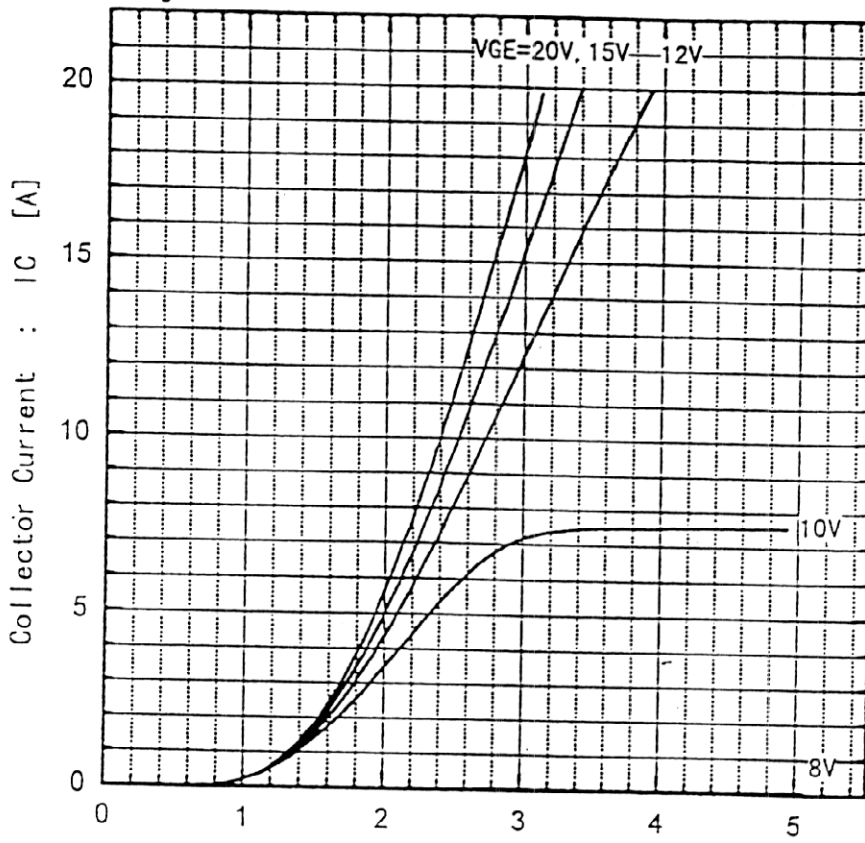
Fuji Electric Co., Ltd.

DWG.NO.

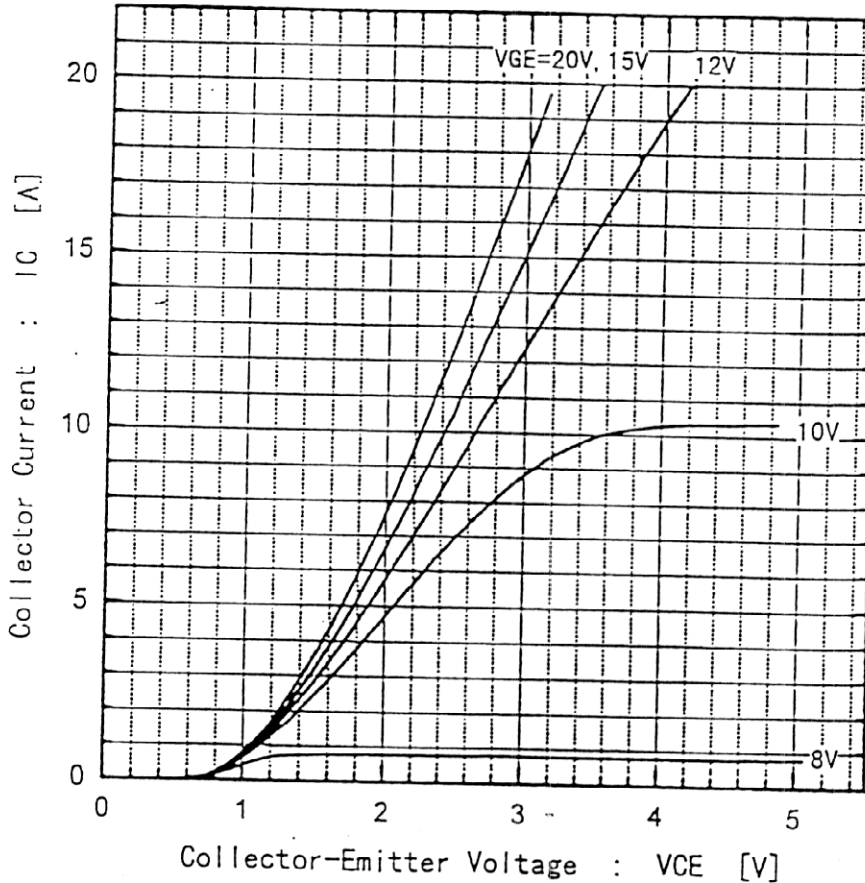
MS5F4091

5/14

Collector Current vs. Collector-Emitter Voltage  
 $T_j=25^\circ\text{C}$



Collector Current vs. Collector-Emitter Voltage  
 $T_j=125^\circ\text{C}$



Fuji Electric Co., Ltd.

DWG. NO.

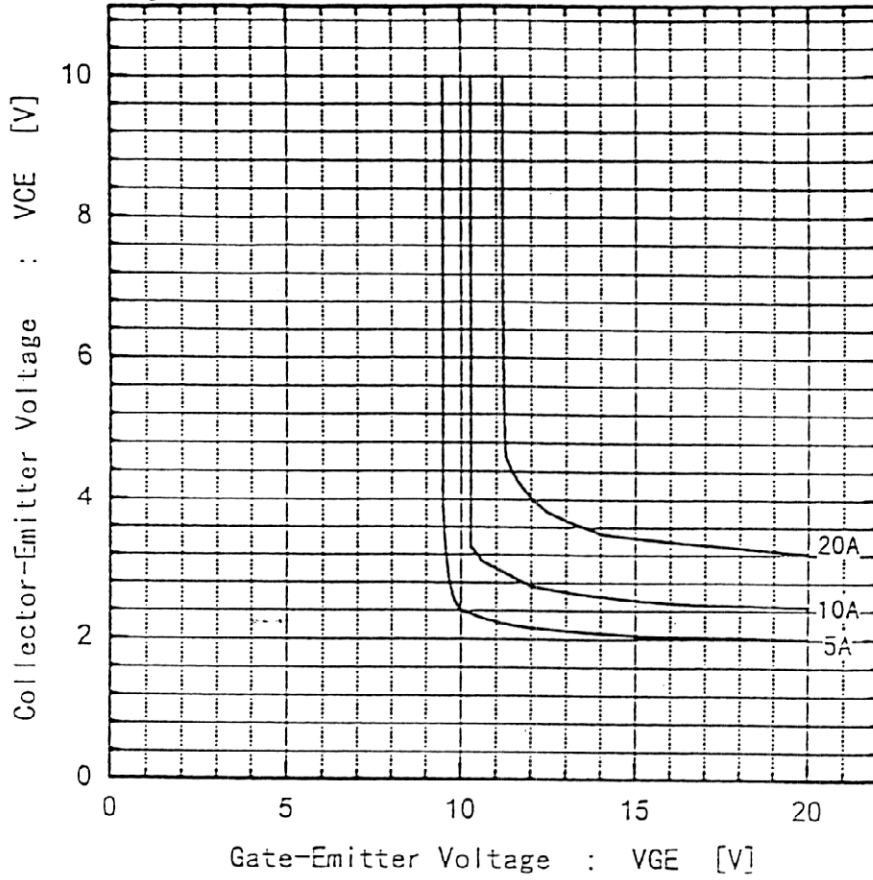
**MS5 F 4091**

6/14

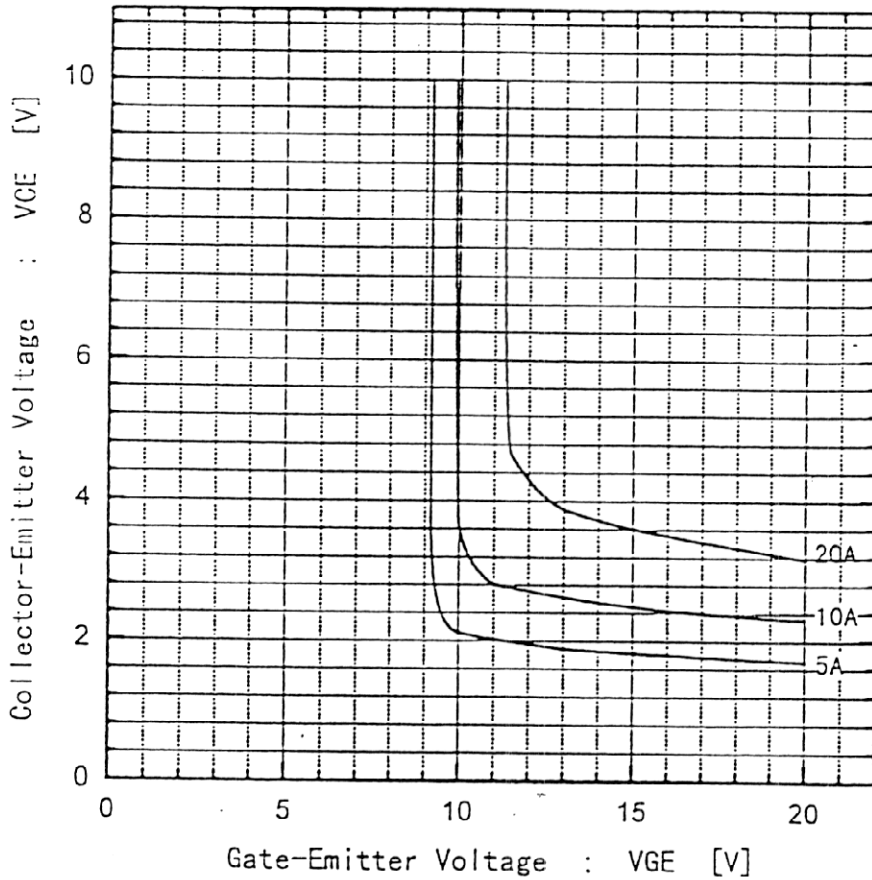
This material and the information herein is the property of Fuji Electric Co., Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

This material and the information herein is the property of Fuji Electric Co. Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

Collector-Emitter Voltage vs Gate-Emitter Voltage  
 $T_j=25^\circ\text{C}$



Collector-Emitter Voltage vs Gate-Emitter Voltage  
 $T_j=125^\circ\text{C}$



Fuji Electric Co., Ltd.

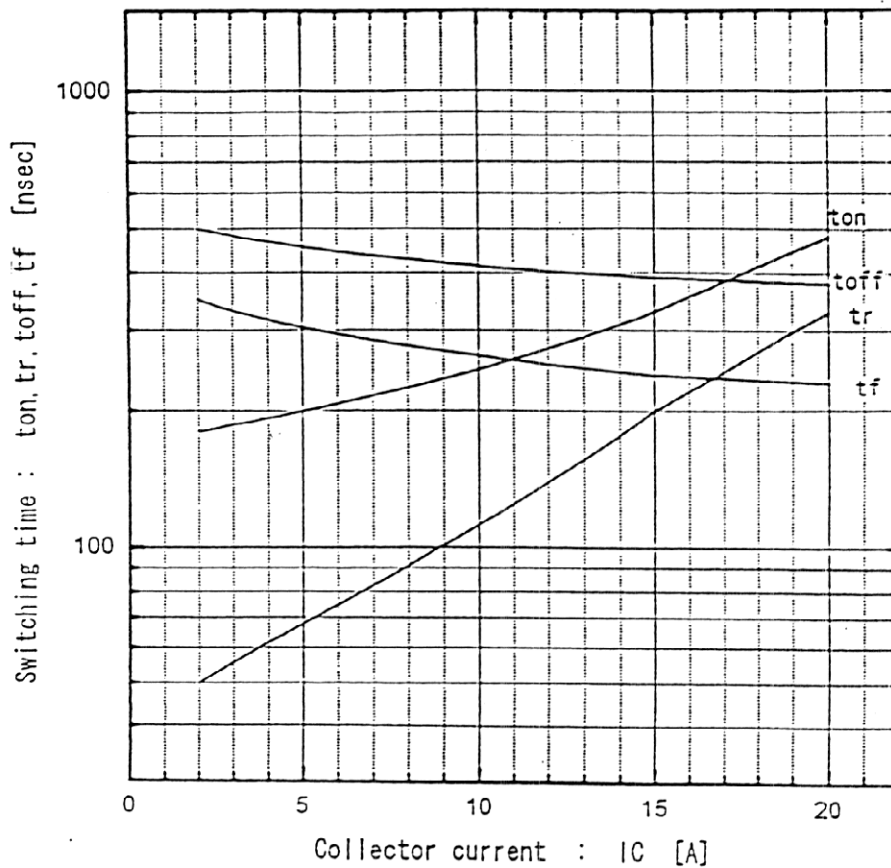
DWG. NO.

MS5F4091

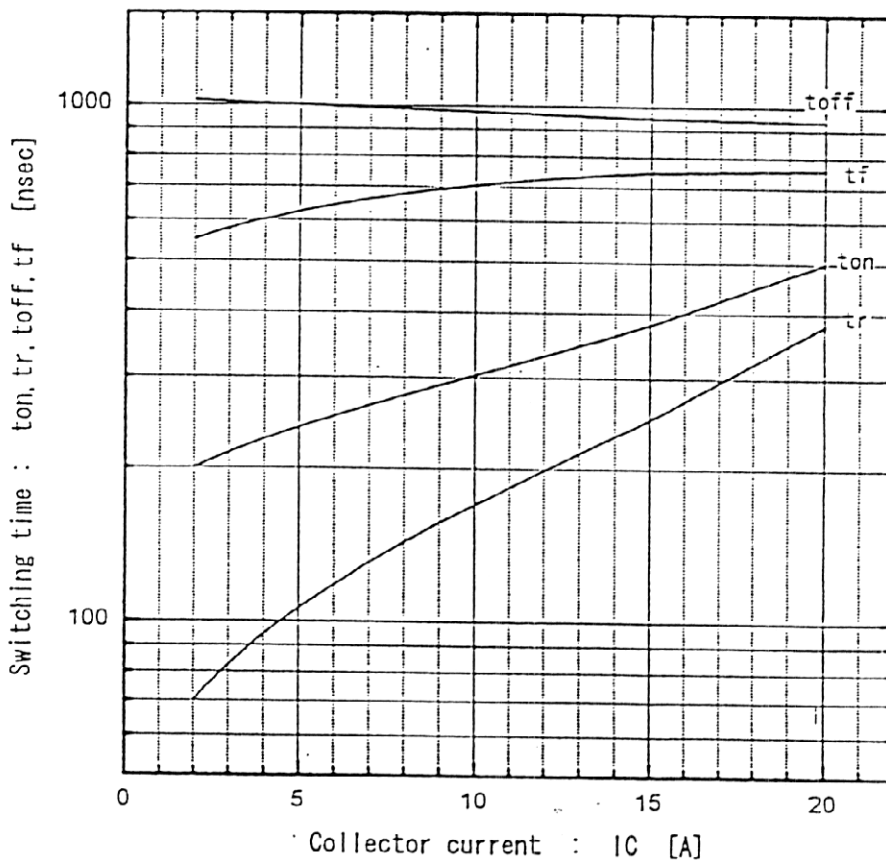
7/14

This material and the information herein is the property of Fuji Electric Co., Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

Switching time vs. Collector current  
 $V_{CC}=600V$ ,  $R_G=16\Omega$ ,  $V_{GE}=\pm 15V$ ,  $T_j=25^\circ C$



Switching time vs. Collector current  
 $V_{CC}=500V$ ,  $R_G=16\Omega$ ,  $V_{GE}=\pm 15V$ ,  $T_j=25^\circ C$



Fuji Electric Co., Ltd.

DWG. NO.

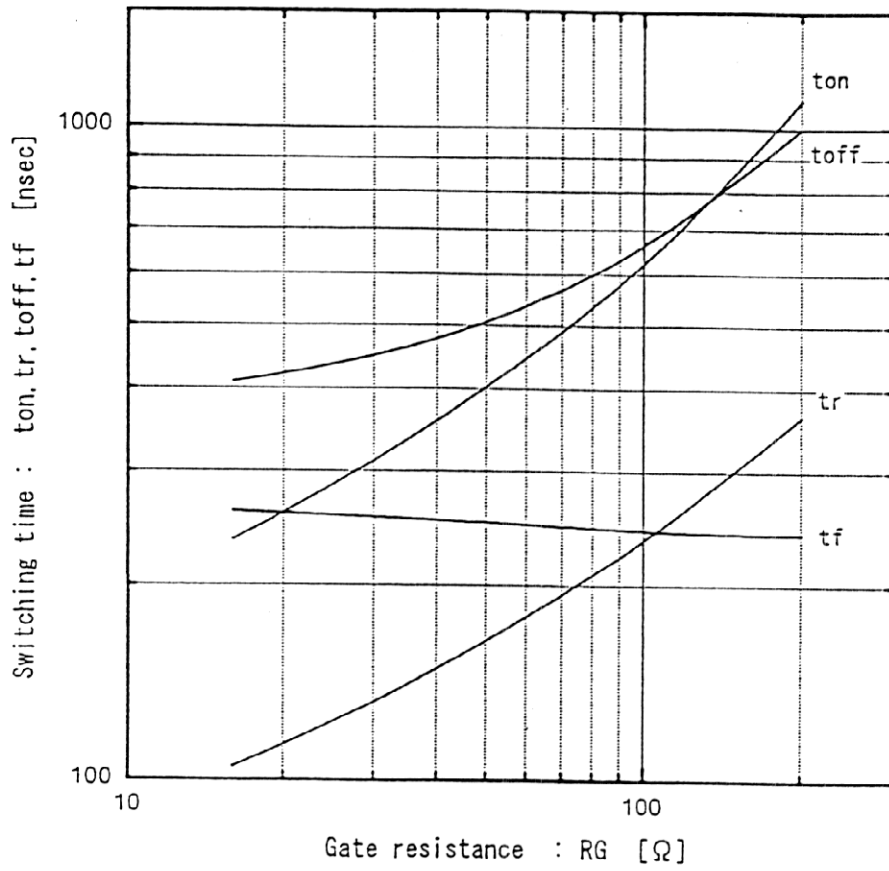
MS5 F 4091

9/14

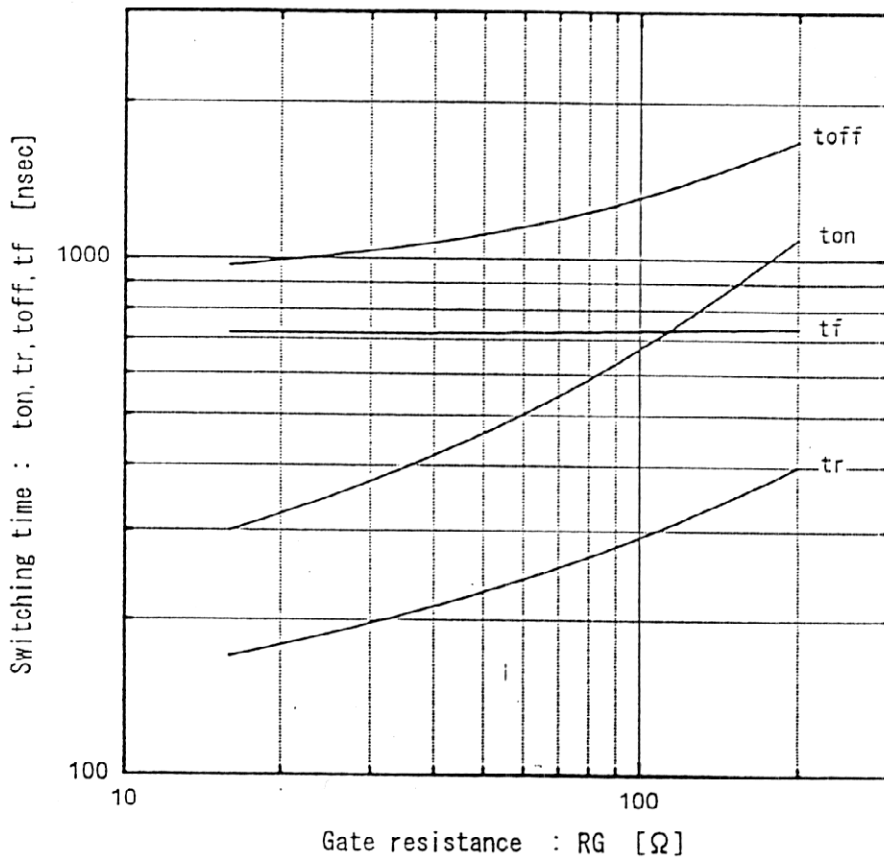


This material and the information herein is the property of Fuji Electric Co., Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

Switching time vs.  $R_G$   
 $V_{CC}=600V, I_C=10A, V_{GE}=\pm 15V, T_j=25^\circ C$



Switching time vs.  $R_G$   
 $V_{CC}=600V, I_C=10A, V_{GE}=\pm 15V, T_j=125^\circ C$



Fuji Electric Co., Ltd.

DWG. NO.

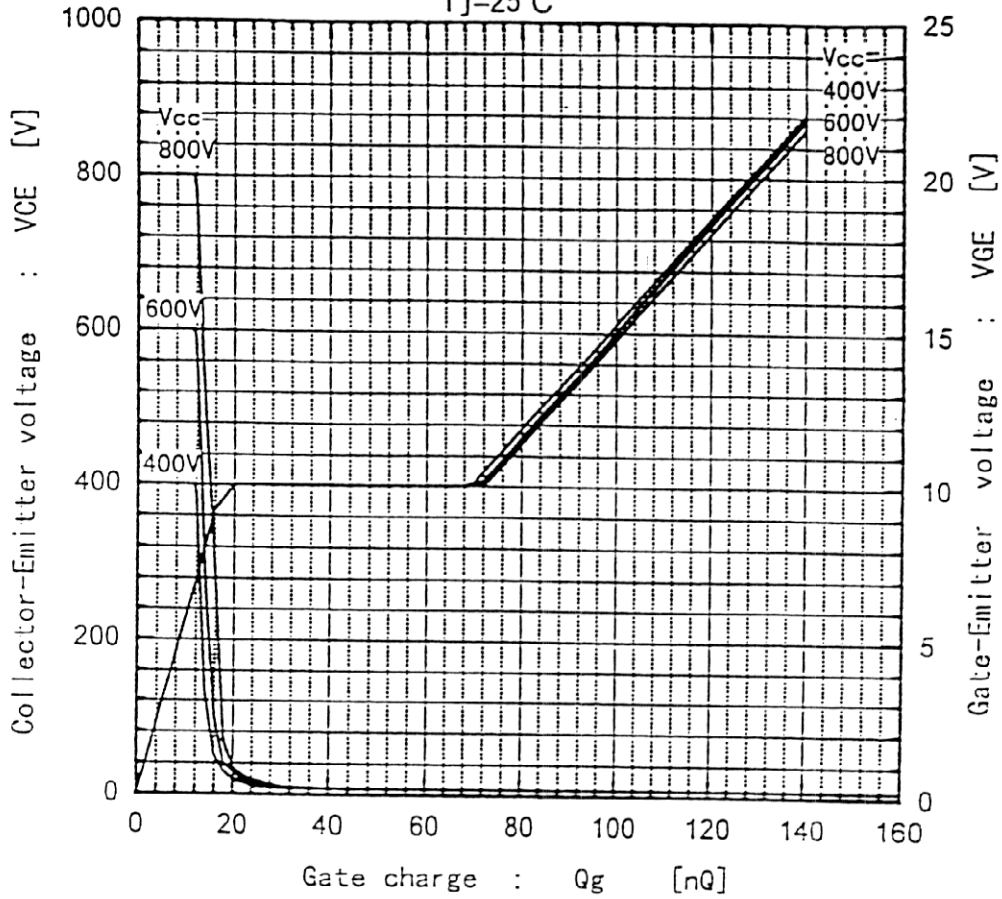
MS5 F 4091

9/14

This material and the information herein is the property of Fuji Electric Co., Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

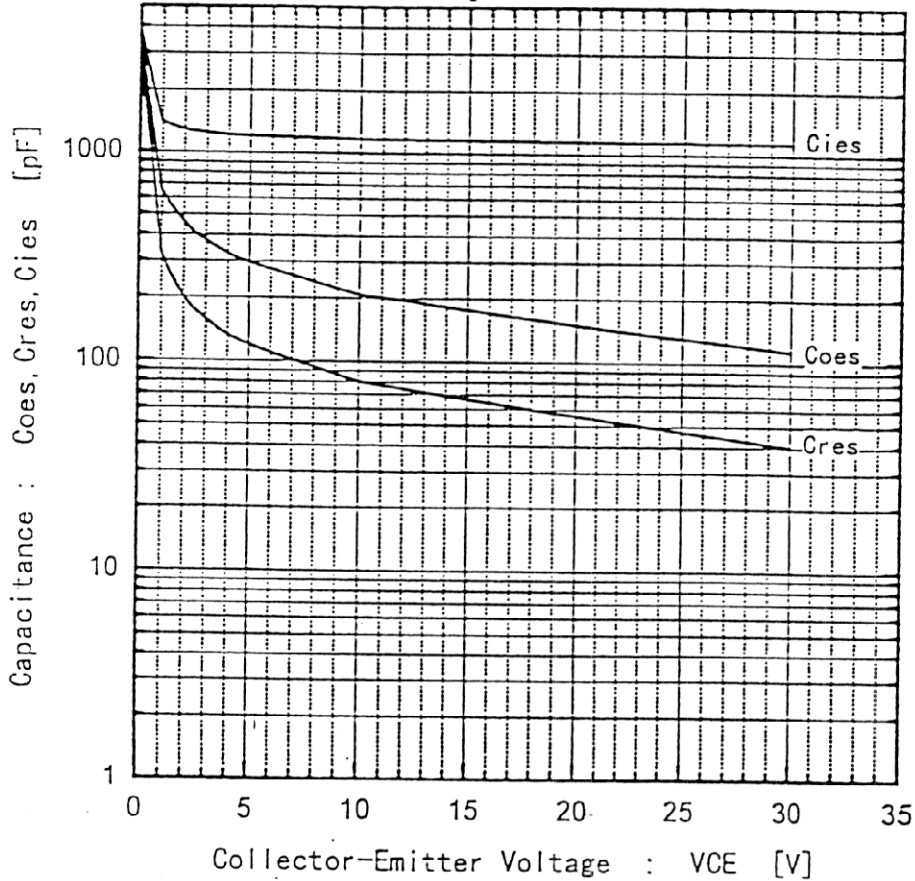
Dynamic input characteristics

$T_j=25^\circ\text{C}$



Capacitance vs. Collector-Emitter voltage

$T_j=25^\circ\text{C}$



Fuji Electric Co., Ltd.

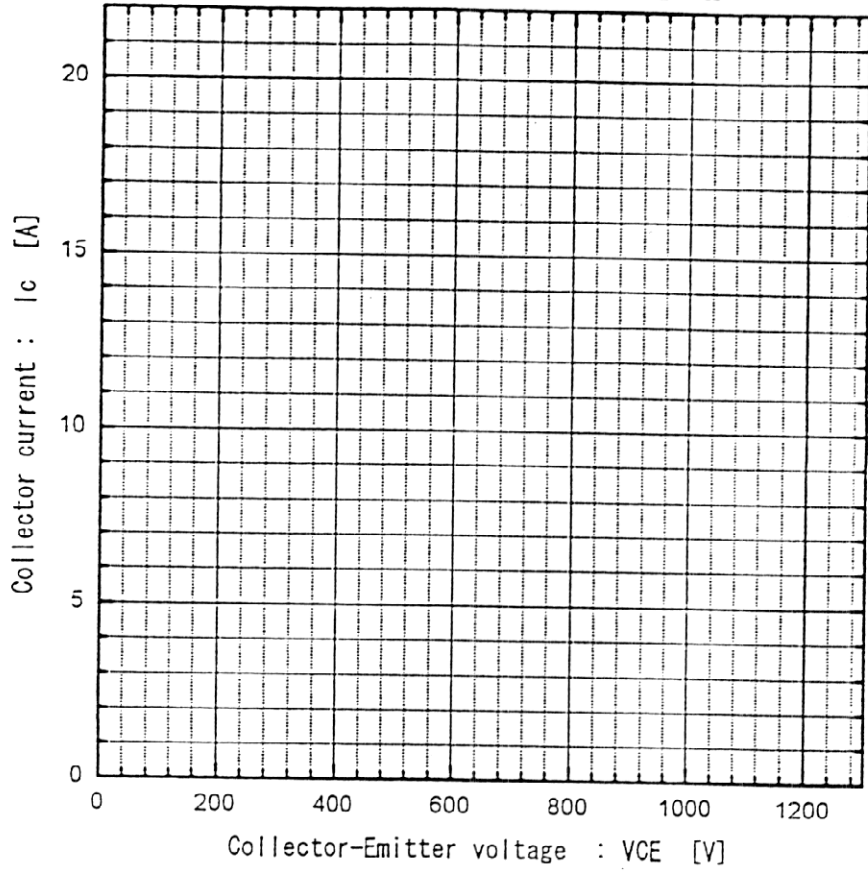
DWG. NO.

MS5F4091

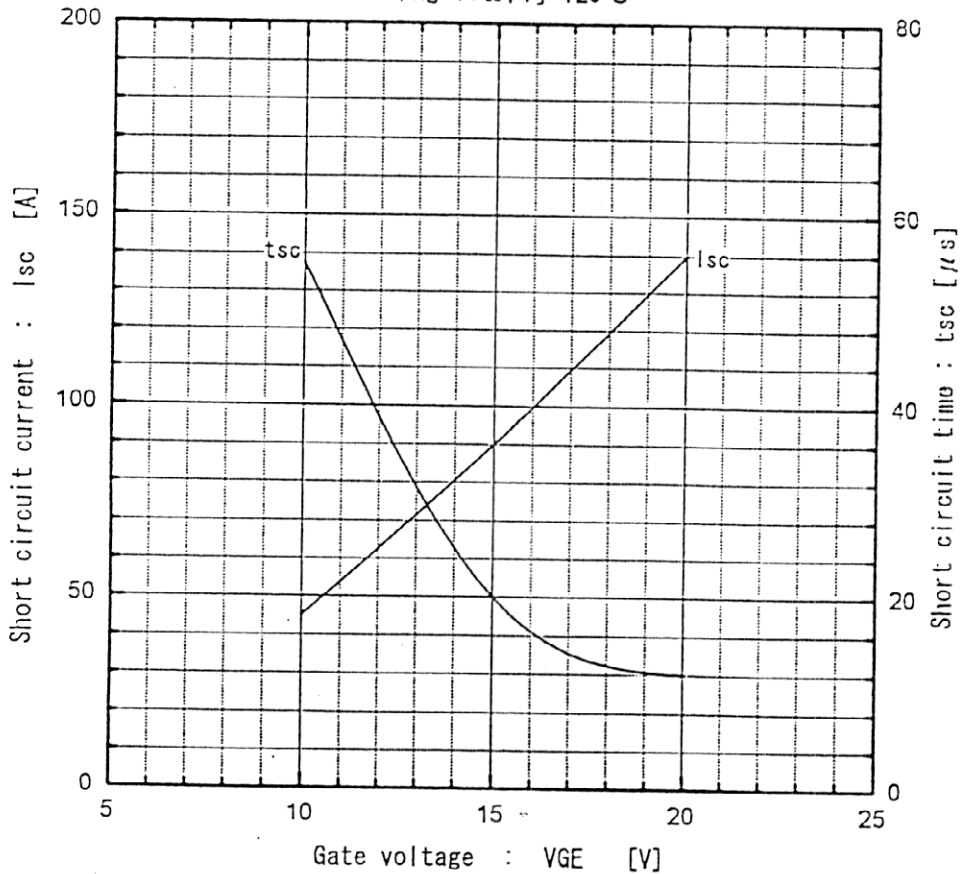
10/14

This material and the information herein is the property of Fuji Electric Co., Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

Reverse Biased Safe Operating Area  
 $+V_{GE}=15V, -V_{GE} \leq 15V, T_j \leq 125^\circ C, R_G \geq 16\Omega$



Typical short circuit capability  
 $V_{CC}=800V, R_G=16\Omega, T_j=125^\circ C$



Fuji Electric Co., Ltd.

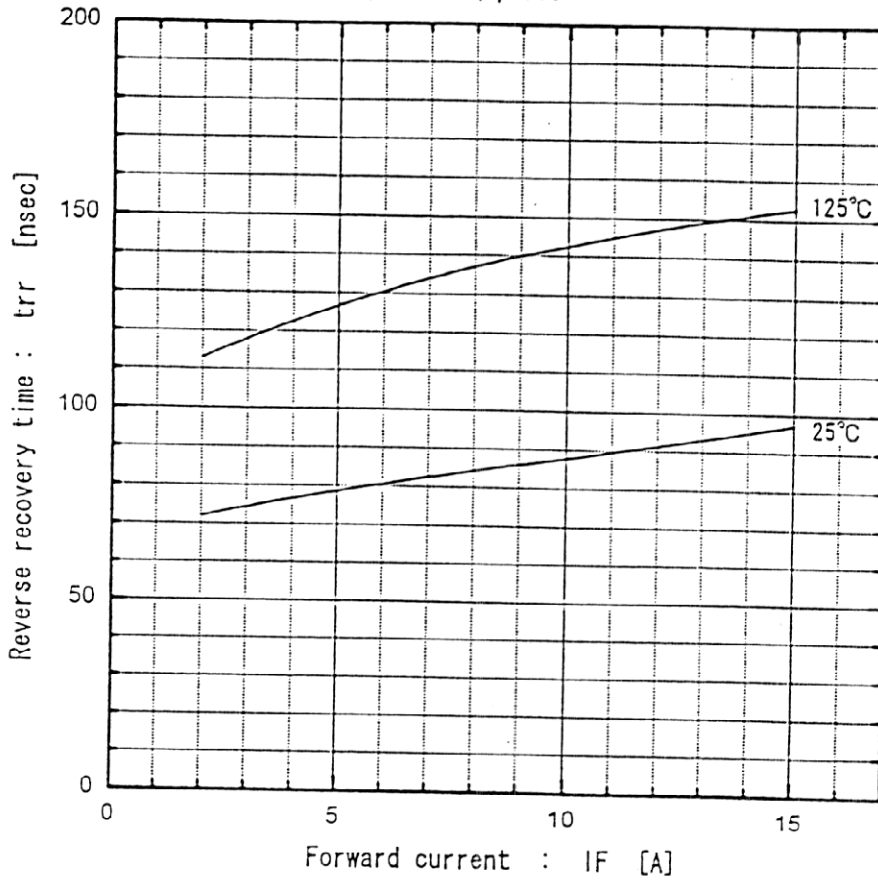
DWG. NO.

MS5 F 4091

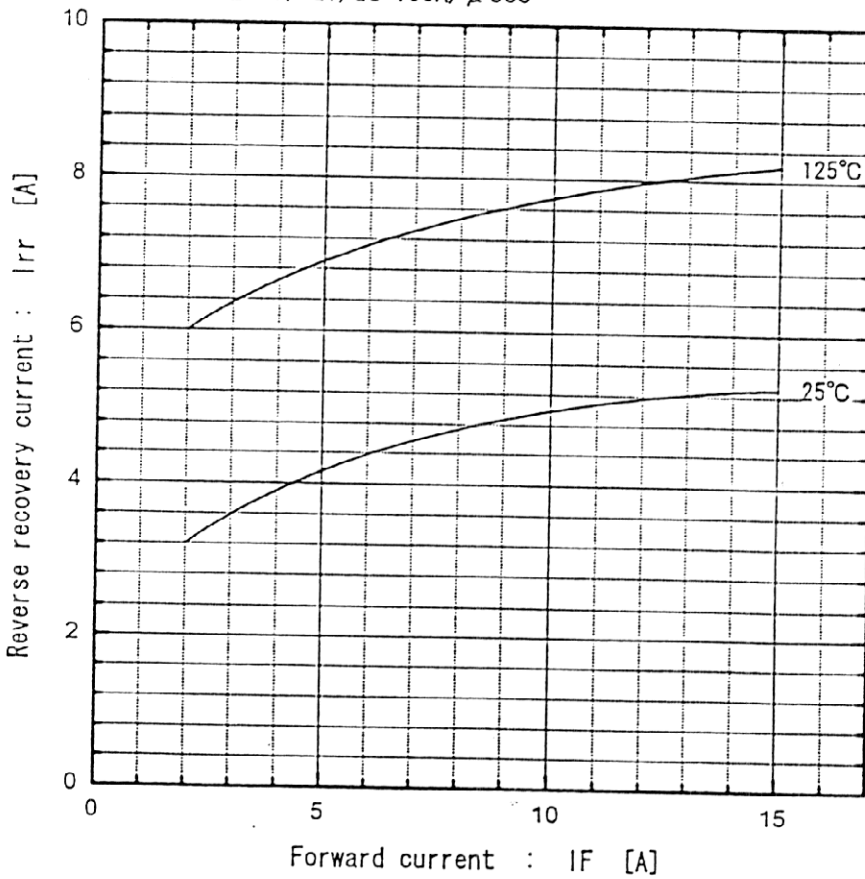


This material and the information herein is the property of Fuji Electric Co. Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

Reverse recovery time vs. Forward current  
VR=200V, -di/dt=100A/ $\mu$  sec



Reverse recovery current vs. Forward current  
VR=200V, -di/dt=100A/ $\mu$  sec



Fuji Electric Co., Ltd

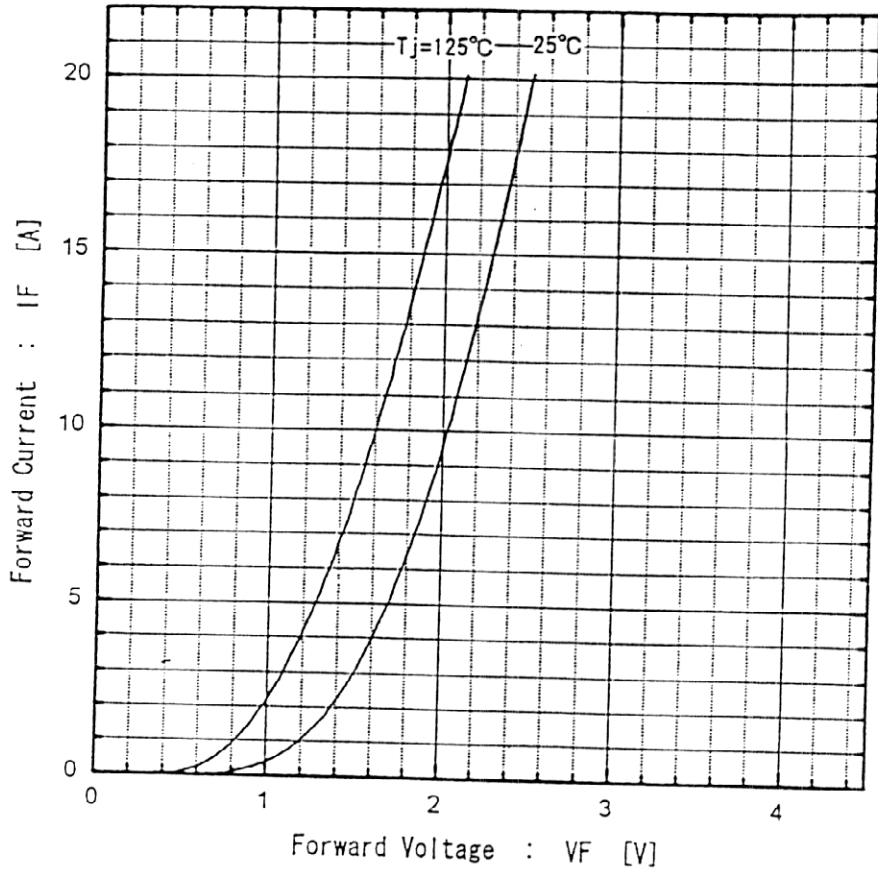
DWG. NO.

MS5 F 4091

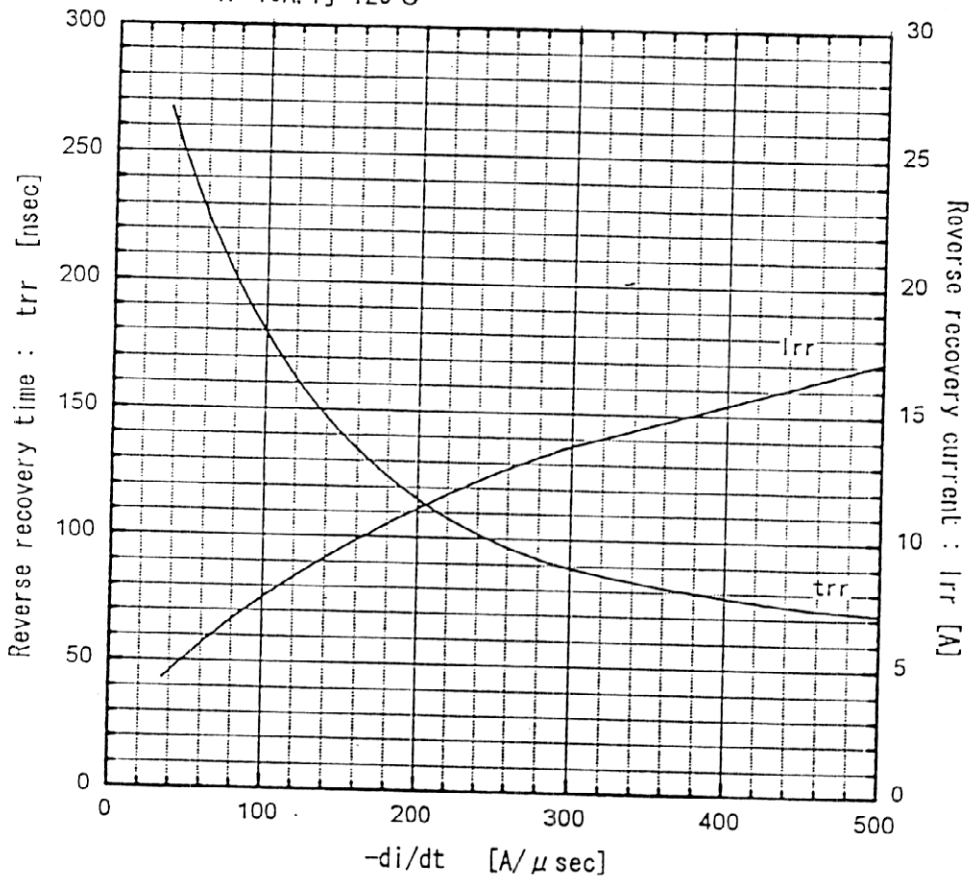
13/A

H04-004-03

Forward voltage vs. Forward current



Reverse recovery characteristics vs.  $-di/dt$   
IF=10A, Tj=125°C



This material and the information herein is the property of Fuji Electric Co. Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

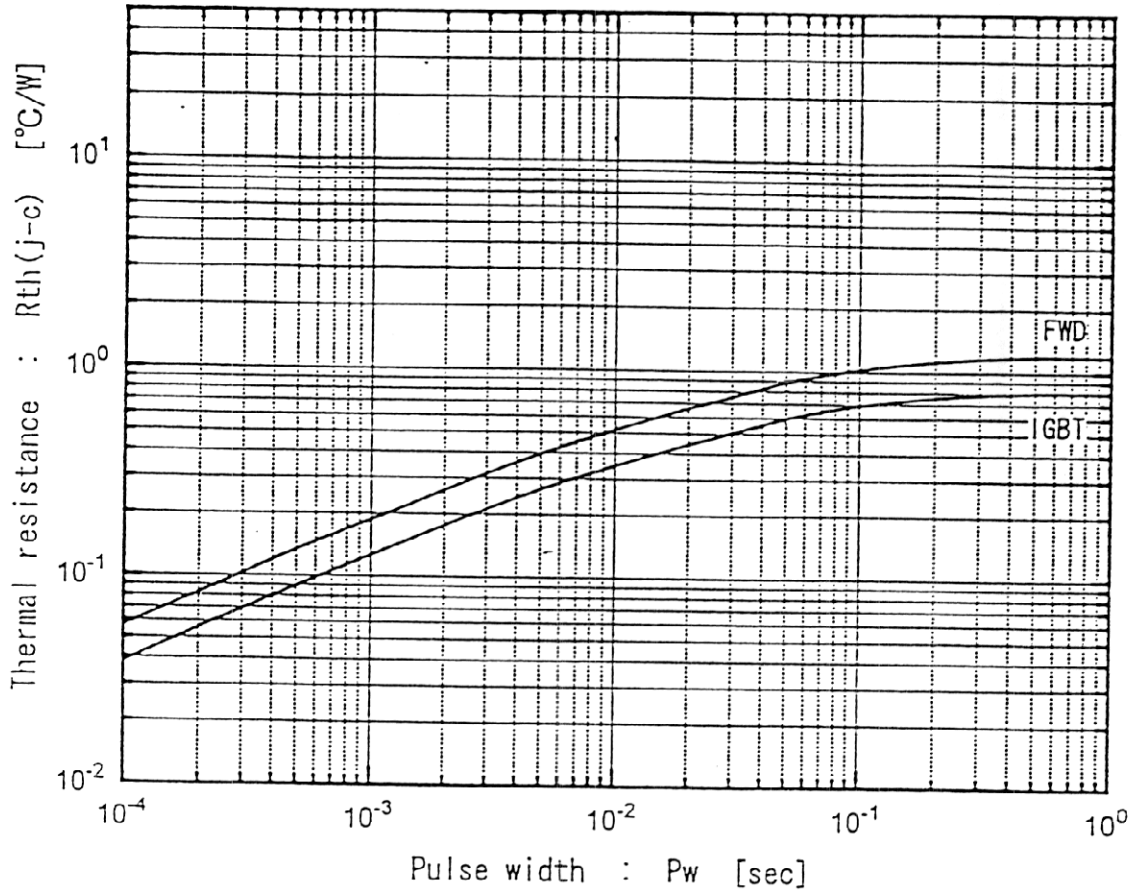
Fuji Electric Co., Ltd.

DWG. NO.

MS5 F 4091

13/14

### Transient thermal resistance



This material and the information herein is the property of Fuji Electric Co., Ltd. They shall be neither reproduced, copied, lent, or disclosed in any way whatsoever for the use of any third party nor used for the manufacturing purposes without the express written consent of Fuji Electric Co., Ltd.

Fuji Electric Co., Ltd.

DWG. NO.

**MS5 F 4091**

14/14

H04-004-03