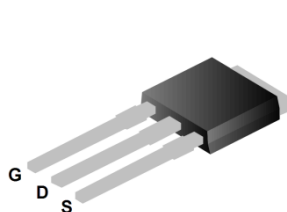
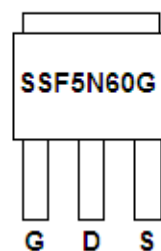


**Main Product Characteristics:**

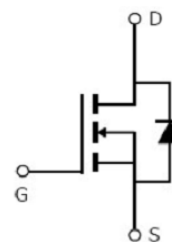
|              |              |
|--------------|--------------|
| $V_{DSS}$    | 600V         |
| $R_{DS(on)}$ | 1.88Ω (typ.) |
| $I_D$        | 5A           |



TO-251



Marking and pin Assignment



Schematic diagram

**Features and Benefits:**

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature


**Description:**

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

**Absolute max Rating:**

| Symbol             | Parameter   | Max.         | Units |
|--------------------|---|--------------|-------|
| $I_D$ @ TC = 25°C  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>①</sup> | 5            | A     |
| $I_D$ @ TC = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V <sup>①</sup> | 3.1          |       |
| $I_{DM}$           | Pulsed Drain Current <sup>②</sup>                     | 20           |       |
| $P_D$ @TC = 25°C   | Power Dissipation <sup>③</sup>                        | 125          | W     |
|                    | Linear Derating Factor                                | 1.00         | W/°C  |
| $V_{DS}$           | Drain-Source Voltage                                  | 600          | V     |
| $V_{GS}$           | Gate-to-Source Voltage                                | ± 30         | V     |
| $E_{AS}$           | Single Pulse Avalanche Energy @ L=27.5mH              | 209          | mJ    |
| $I_{AS}$           | Avalanche Current @ L=27.5mH                          | 3.9          | A     |
| $T_J$ $T_{STG}$    | Operating Junction and Storage Temperature Range      | -55 to + 150 | °C    |

## Thermal Resistance

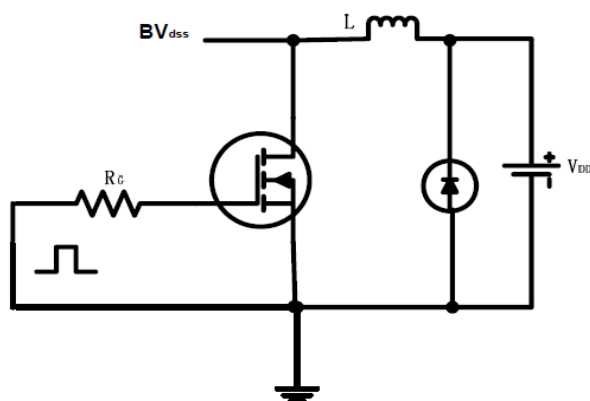
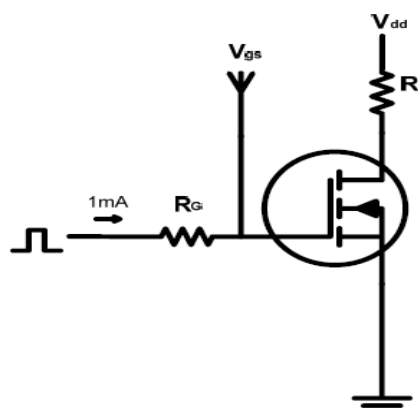
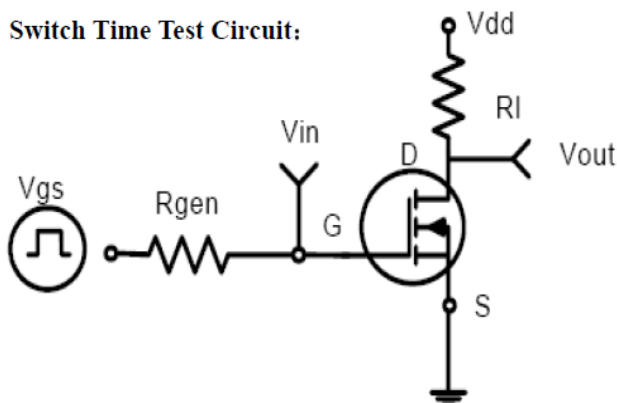
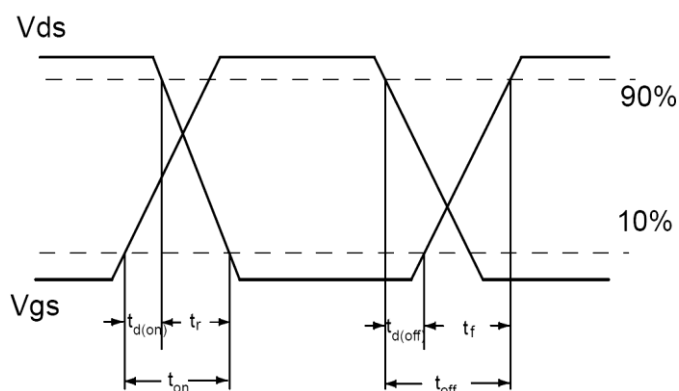
| Symbol          | Characterizes                                     | Typ. | Max. | Units |
|-----------------|---|------|------|-------|
| $R_{\theta JC}$ | Junction-to-case <sup>③</sup>                     | —    | 1.00 | °C/W  |
| $R_{\theta JA}$ | Junction-to-ambient ( $t \leq 10s$ ) <sup>④</sup> | —    | 110  | °C/W  |

## Electrical Characterizes @ $T_A=25^\circ C$ unless otherwise specified

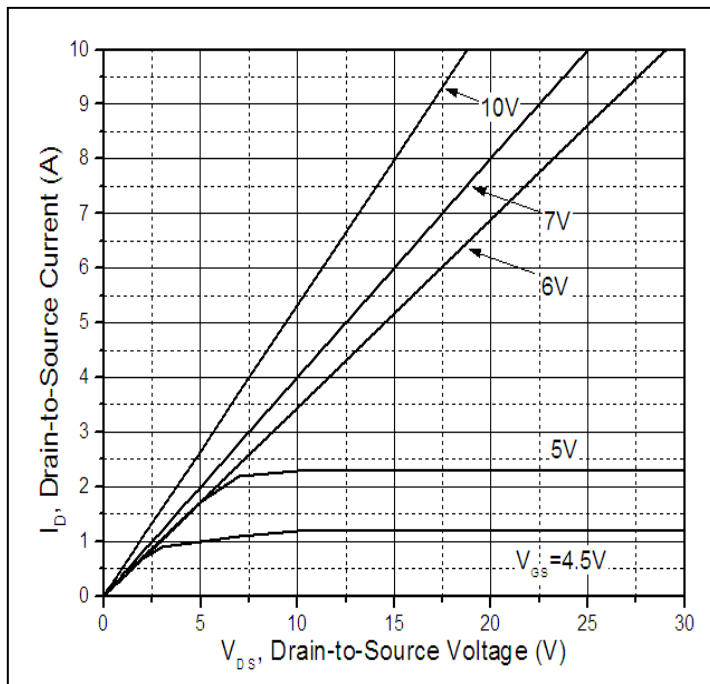
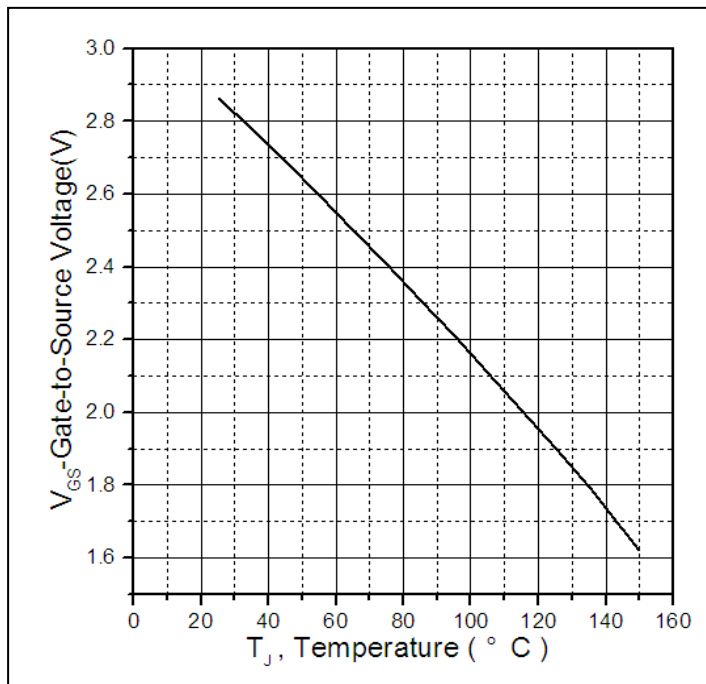
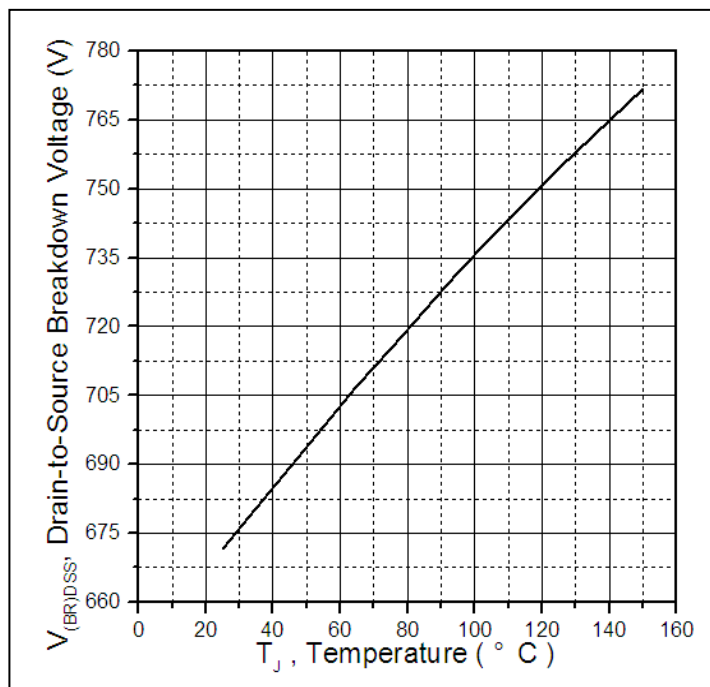
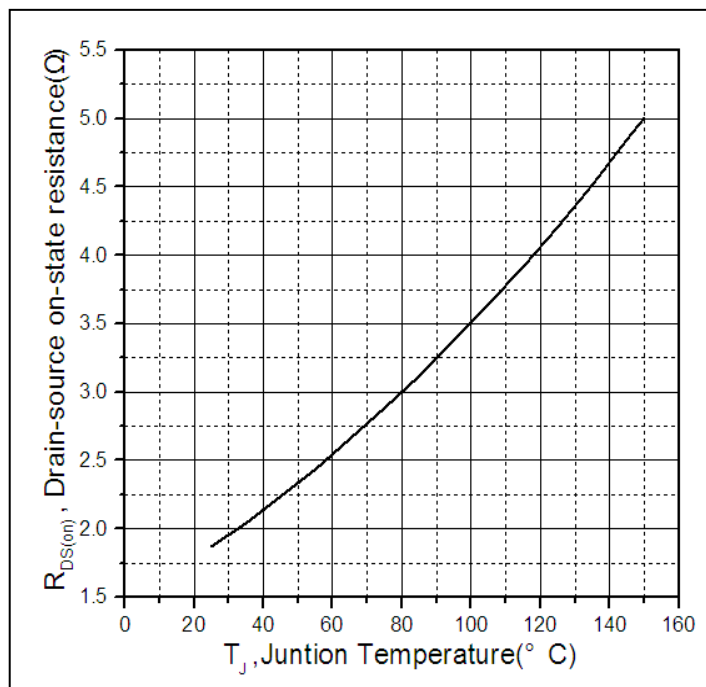
| Symbol        | Parameter                            | Min. | Typ.  | Max. | Units    | Conditions  |
|---------------|--------------------------------------|------|-------|------|----------|---|
| $V_{(BR)DSS}$ | Drain-to-Source breakdown voltage    | 600  | —     | —    | V        | $V_{GS} = 0V, I_D = 250\mu A$                           |
| $R_{DS(on)}$  | Static Drain-to-Source on-resistance | —    | 1.88  | 2.15 | $\Omega$ | $V_{GS}=10V, I_D = 2A$                                  |
|               |                                      | —    | 4.21  | —    |          | $T_J = 125^\circ C$                                     |
| $V_{GS(th)}$  | Gate threshold voltage               | 2    | —     | 4    | V        | $V_{DS} = V_{GS}, I_D = 250\mu A$                       |
|               |                                      | —    | 1.90  | —    |          | $T_J = 125^\circ C$                                     |
| $I_{DSS}$     | Drain-to-Source leakage current      | —    | —     | 1    | $\mu A$  | $V_{DS} = 600V, V_{GS} = 0V$                            |
|               |                                      | —    | —     | 50   |          | $T_J = 125^\circ C$                                     |
| $I_{GSS}$     | Gate-to-Source forward leakage       | —    | —     | 100  | nA       | $V_{GS} = 30V$  |
|               |                                      | —    | —     | -100 |          | $V_{GS} = -30V$   |
| $Q_g$         | Total gate charge                    | —    | 10.26 | —    | nC       | $I_D = 4A,$<br>$V_{DS}=300V,$<br>$V_{GS} = 10V$         |
| $Q_{gs}$      | Gate-to-Source charge                | —    | 3.64  | —    |          |   |
| $Q_{gd}$      | Gate-to-Drain("Miller") charge       | —    | 2.94  | —    |          |   |
| $t_{d(on)}$   | Turn-on delay time                   | —    | 10.8  | —    | ns       | $V_{GS}=10V, V_{DS}=300V,$<br>$R_{GEN}=5\Omega, I_D=4A$ |
| $t_r$         | Rise time                            | —    | 6.8   | —    |          |   |
| $t_{d(off)}$  | Turn-Off delay time                  | —    | 15.2  | —    |          |   |
| $t_f$         | Fall time                            | —    | 6.8   | —    |          |   |
| $C_{iss}$     | Input capacitance                    | —    | 506.1 | —    | pF       | $V_{GS} = 0V$   |
| $C_{oss}$     | Output capacitance                   | —    | 66.65 | —    |          | $V_{DS} = 25V$  |
| $C_{rss}$     | Reverse transfer capacitance         | —    | 1.99  | —    |          | $f = 1MHz$  |

## Source-Drain Ratings and Characteristics

| Symbol   | Parameter                                 | Min. | Typ. | Max. | Units | Conditions  |
|----------|---|------|------|------|-------|---|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —    | —    | 5    | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode)     | —    | —    | 20   | A     |   |
| $V_{SD}$ | Diode Forward Voltage                     | —    | 0.87 | 1.4  | V     | $I_S=4A, V_{GS}=0V$   |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 441  | —    | ns    | $T_J = 25^\circ C, I_F = 4A,$   |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 1964 | —    | nC    | $di/dt = 100A/\mu s$  |

**Test circuits and Waveforms**
**EAS test circuits:**

**Gate charge test circuit:**

**Switch Time Test Circuit:**

**Switch Waveforms:**

**Notes:**

- ① The maximum current rating is limited by bond-wires.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation PD is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$
- ⑤ These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)} = 150^\circ\text{C}$ .

**Typical electrical and thermal characteristics**

**Figure 1: Typical Output Characteristics**

**Figure 2. Gate to source cut-off voltage**

**Figure 3. Drain-to-Source Breakdown Voltage vs. Case Temperature**

**Figure 4: Normalized On-Resistance Vs. Case Temperature**

Typical electrical and thermal characteristics

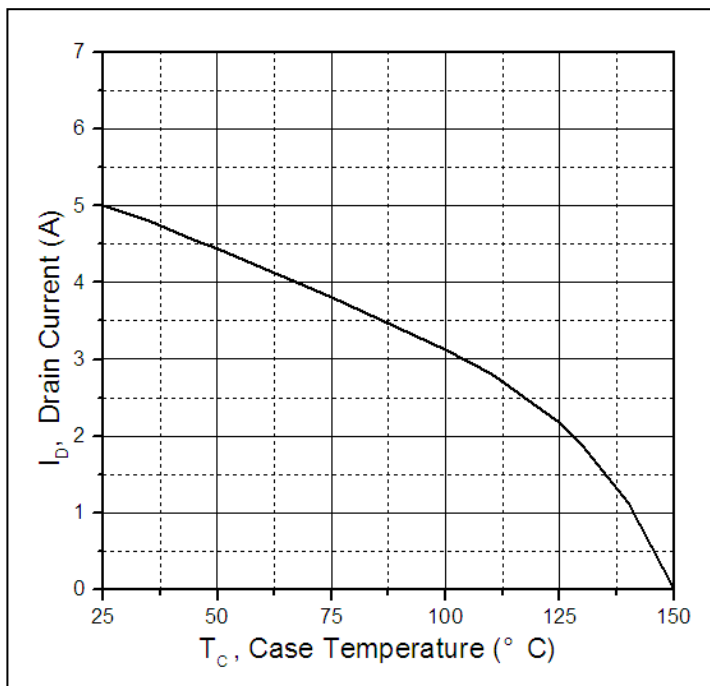


Figure 5. Maximum Drain Current Vs. Case Temperature

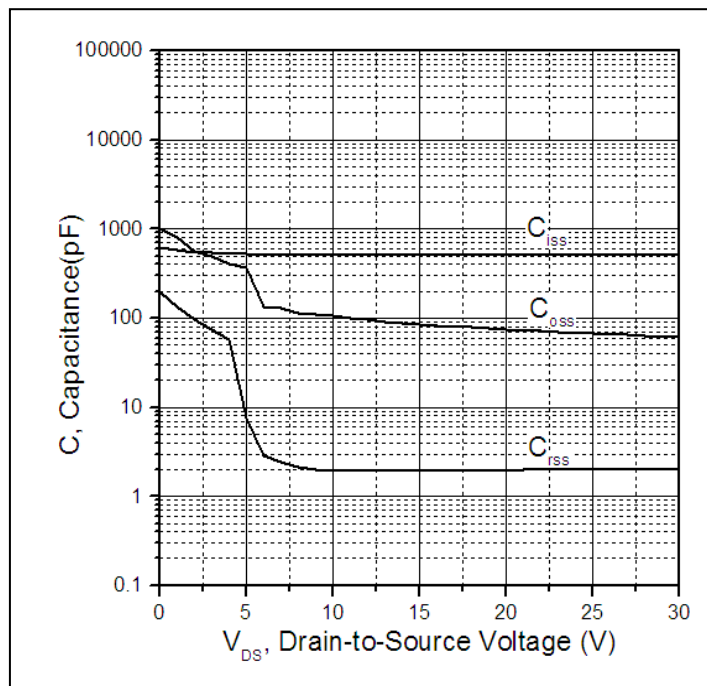


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

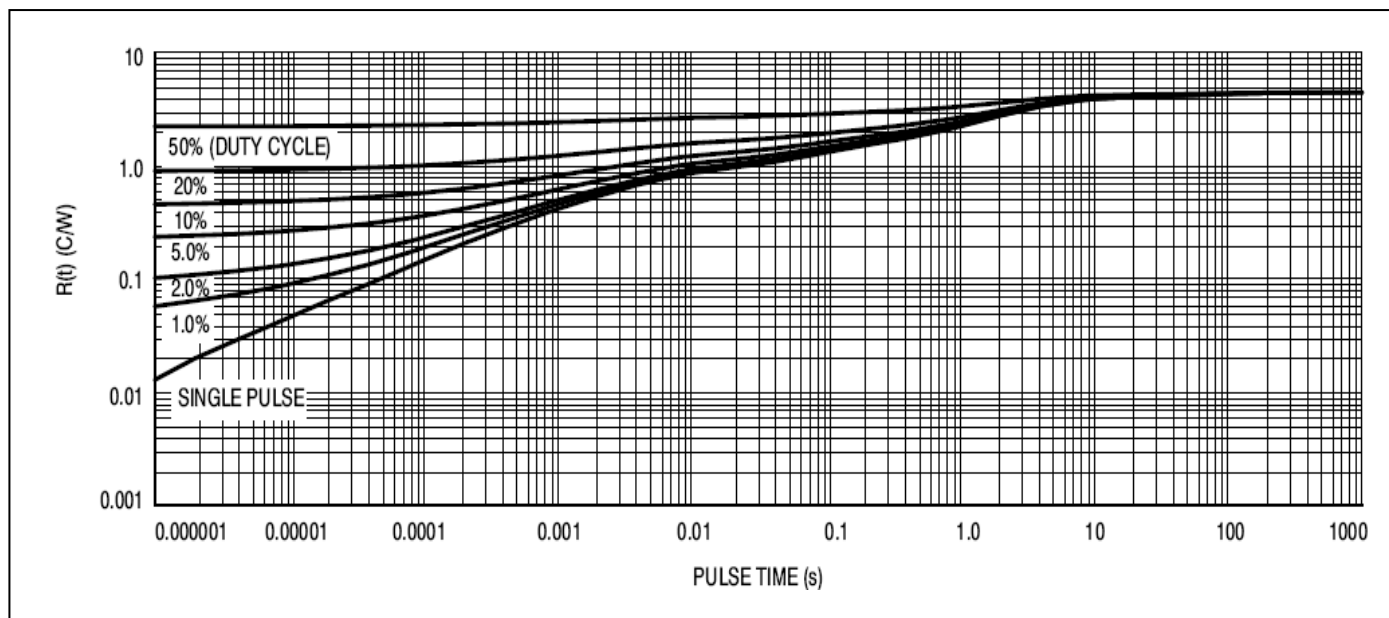
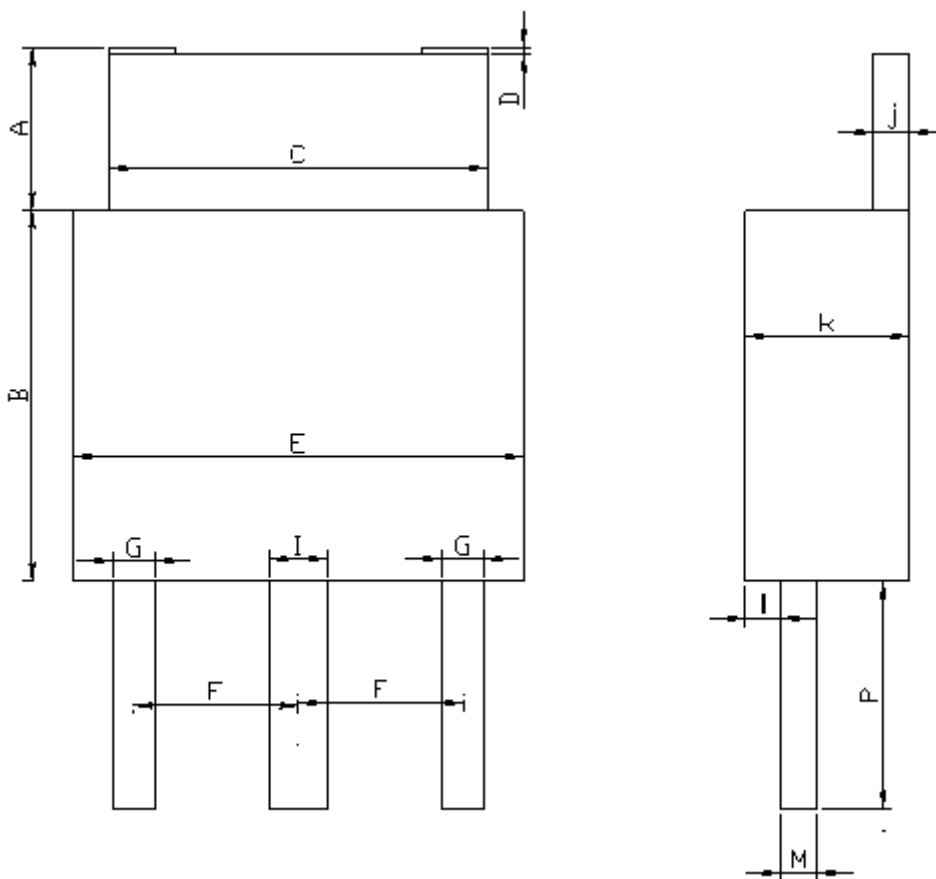


Figure 7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

**Mechanical Data:**

TO-251 PACKAGE OUTLINE DIMENSION



Unit: mm

|                    |                   |                   |                    |
|--------------------|-------------------|-------------------|--------------------|
| A: $0.9 \pm 0.5$   | B: $5.85 \pm 0.5$ | C: $5.3 \pm 0.5$  | D: $0.1 \pm 0.02$  |
| E: $6.3 \pm 0.5$   | F: $2.3 \pm 0.1$  | G: $0.7 \pm 0.1$  | I: $0.8 \pm 0.1$   |
| J: $0.508 \pm 0.1$ | K: $2.3 \pm 0.25$ | L: $0.8 \pm 0.25$ | M: $0.508 \pm 0.1$ |
| P: $8.5 \pm 0.5$   |                   |                   |                    |

**Ordering and Marking Information**
**Device Marking: SSF5N60G**

**Package (Available)**  
**TO-251 (IPAK)**  
**Operating Temperature Range**  
**C : -55 to 150 °C**

**Devices per Unit**

| Package Type | Units/Tube | Tubes/Inner Box | Units/Inner Box | Inner Boxes/Carton Box | Units/Carton Box |
|--------------|------------|-----------------|-----------------|------------------------|------------------|
| TO-251       | 80         | 60              | 4800            | 5                      | 24000            |

**Reliability Test Program**

| Test Item                           | Conditions  | Duration                             | Sample Size         |
|-------------------------------------|---|--------------------------------------|---------------------|
| High Temperature Reverse Bias(HTRB) | $T_j=125^{\circ}\text{C}$ to $150^{\circ}\text{C}$ @<br>80% of Max<br>$V_{DSS}/V_{CES}/V_R$ | 168 hours<br>500 hours<br>1000 hours | 3 lots x 77 devices |
| High Temperature Gate Bias(HTGB)    | $T_j=150^{\circ}\text{C}$ @ 100% of<br>Max $V_{GSS}$  | 168 hours<br>500 hours<br>1000 hours | 3 lots x 77 devices |

**ATTENTION:**

- Any and all Silikron products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your Silikron representative nearest you before using any Silikron products described or contained herein in such applications.
- Silikron assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all Silikron products described or contained herein.
- Specifications of any and all Silikron products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- Silikron Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all Silikron products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of Silikron Semiconductor CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. Silikron believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the Silikron product that you intend to use.
- This catalog provides information as of Dec, 2008. Specifications and information herein are subject to change without notice.

**Customer Service****Worldwide Sales and Service:**

Sales@silikron.com

**Technical Support:**

Technical@silikron.com

**Suzhou Silikron Semiconductor Corp.**

11A, 428 Xinglong Street, Suzhou Industrial Park, P.R.China

**TEL:** (86-512) 62560688

**FAX:** (86-512) 65160705

**E-mail:** Sales@silikron.com