

### Description

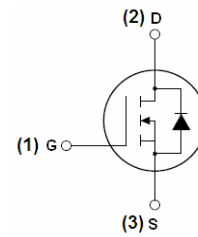
The RST1805IA uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

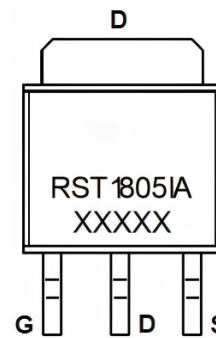
- $V_{DS} = 185V, I_D = 5A$   
 $R_{DS(ON)} < 450m\Omega @ V_{GS}=10V$  (Typ:390m $\Omega$ )  
 $R_{DS(ON)} < 500m\Omega @ V_{GS}=4.5V$  (Typ:400m $\Omega$ )
- High density cell design for ultra low  $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

### Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



Marking and pin assignment



TO-251 top view

### Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| RST1805IA      | RST1805IA | TO-251         | -         | -          | -        |

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                        | Symbol         | Limit      | Unit             |
|--------------------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | 185        | V                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$   | V                |
| Drain Current-Continuous                         | $I_D$          | 5          | A                |
| Drain Current-Pulsed <sup>(Note 1)</sup>         | $I_{DM}$       | 20         | A                |
| Maximum Power Dissipation                        | $P_D$          | 30         | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | $^\circ\text{C}$ |

### Thermal Characteristic

|                                                             |                 |      |                    |
|-------------------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup> | $R_{\theta JA}$ | 4.17 | $^\circ\text{C/W}$ |
|-------------------------------------------------------------|-----------------|------|--------------------|

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

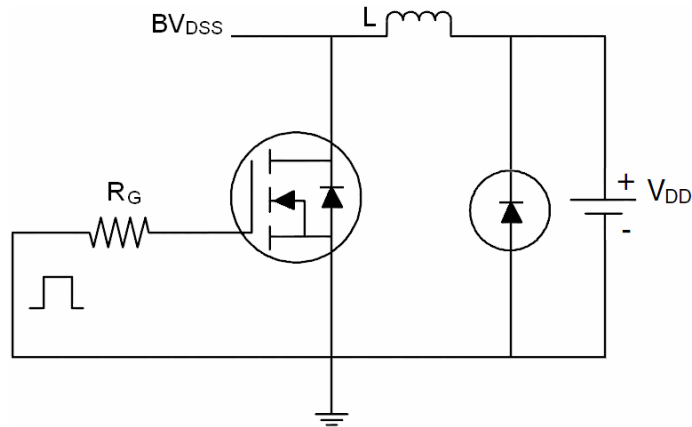
| Parameter                                     | Symbol              | Condition                                                                                | Min | Typ | Max  | Unit |
|-----------------------------------------------|---------------------|------------------------------------------------------------------------------------------|-----|-----|------|------|
| Off Characteristics                           |                     |                                                                                          |     |     |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                                | 185 | -   | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =185V, V <sub>GS</sub> =0V                                               | -   | -   | 1    | μA   |
| Gate-Body Leakage Current                     | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                               | -   | -   | ±100 | nA   |
| On Characteristics <sup>(Note 3)</sup>        |                     |                                                                                          |     |     |      |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                 | 1.2 | 1.7 | 2.5  | V    |
| Drain-Source On-State Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =2A                                                 | -   | 390 | 450  | mΩ   |
|                                               |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A                                                | -   | 400 | 500  | mΩ   |
| Forward Transconductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =2A                                                  | -   | 8   | -    | S    |
| Dynamic Characteristics <sup>(Note4)</sup>    |                     |                                                                                          |     |     |      |      |
| Input Capacitance                             | C <sub>ISS</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                   | -   | 563 | -    | PF   |
| Output Capacitance                            | C <sub>OSS</sub>    |                                                                                          | -   | 35  | -    | PF   |
| Reverse Transfer Capacitance                  | C <sub>RSS</sub>    |                                                                                          | -   | 10  | -    | PF   |
| Switching Characteristics <sup>(Note 4)</sup> |                     |                                                                                          |     |     |      |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>  | V <sub>DD</sub> =100V, R <sub>L</sub> =15Ω<br>V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω | -   | 10  | -    | nS   |
| Turn-on Rise Time                             | t <sub>r</sub>      |                                                                                          | -   | 12  | -    | nS   |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |                                                                                          | -   | 15  | -    | nS   |
| Turn-Off Fall Time                            | t <sub>f</sub>      |                                                                                          | -   | 15  | -    | nS   |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> =100V, I <sub>D</sub> =2A,<br>V <sub>GS</sub> =10V                       | -   | 12  |      | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                          | -   | 2.5 | -    | nC   |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                          | -   | 3.8 | -    | nC   |
| Drain-Source Diode Characteristics            |                     |                                                                                          |     |     |      |      |
| Diode Forward Voltage <sup>(Note 3)</sup>     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =2A                                                  | -   | -   | 1.2  | V    |
| Diode Forward Current <sup>(Note 2)</sup>     | I <sub>S</sub>      |                                                                                          | -   | -   | 5    | A    |

**Notes:**

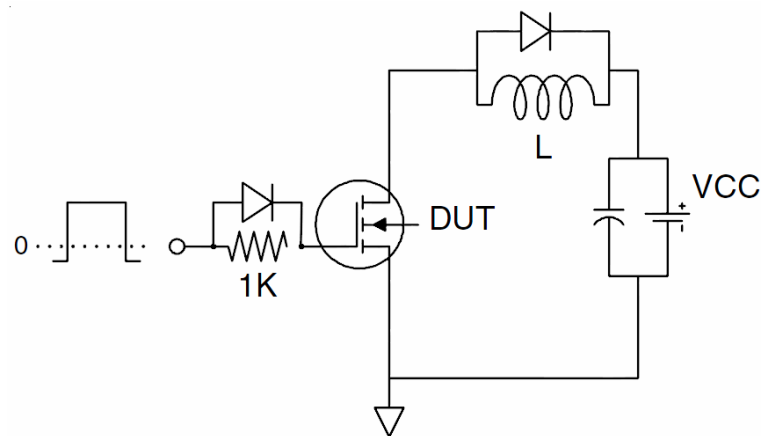
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

### Test Circuit

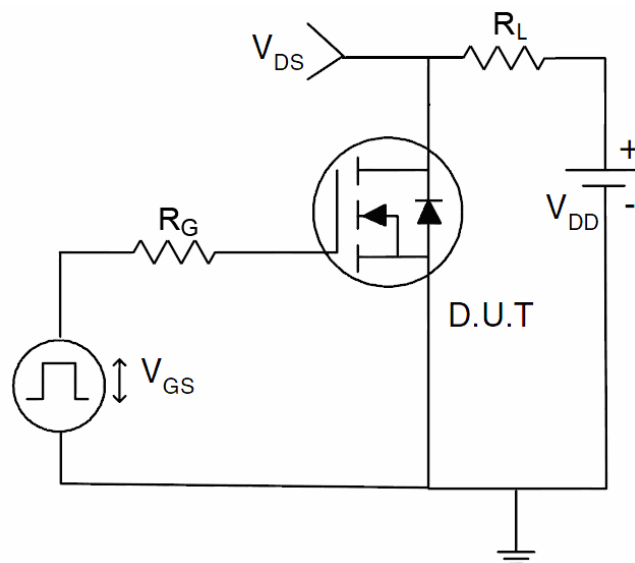
#### 1) $E_{AS}$ test circuit

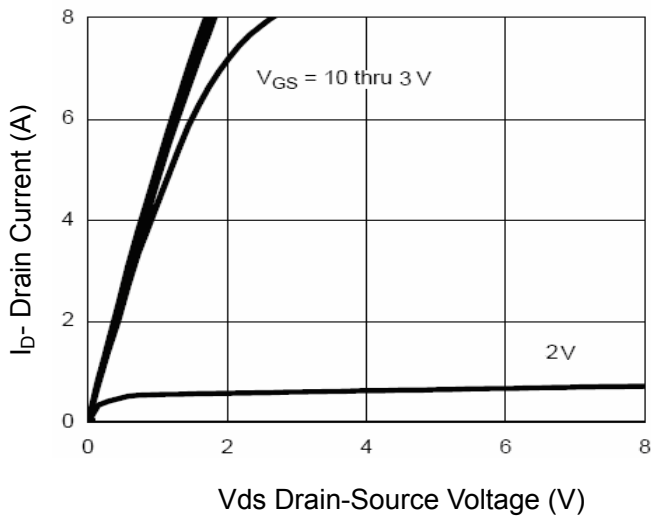
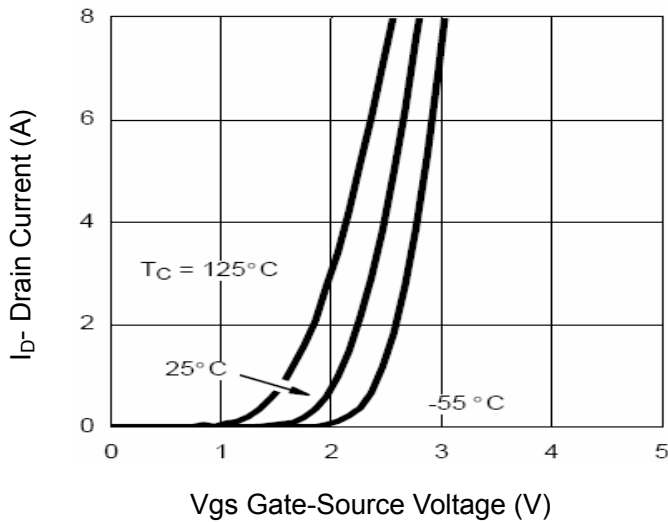
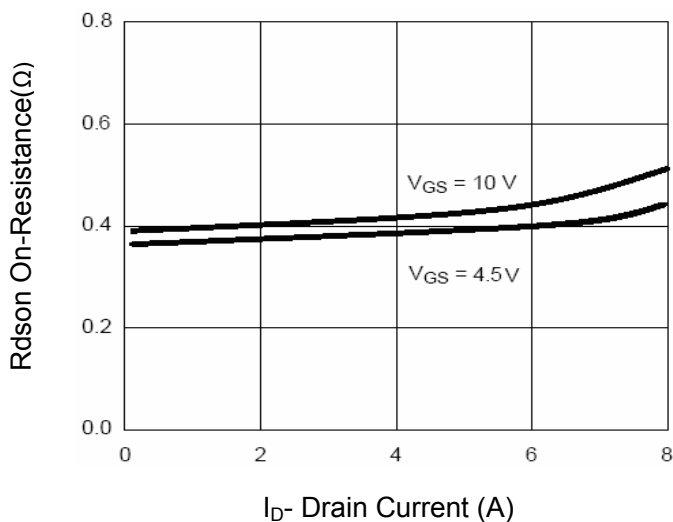
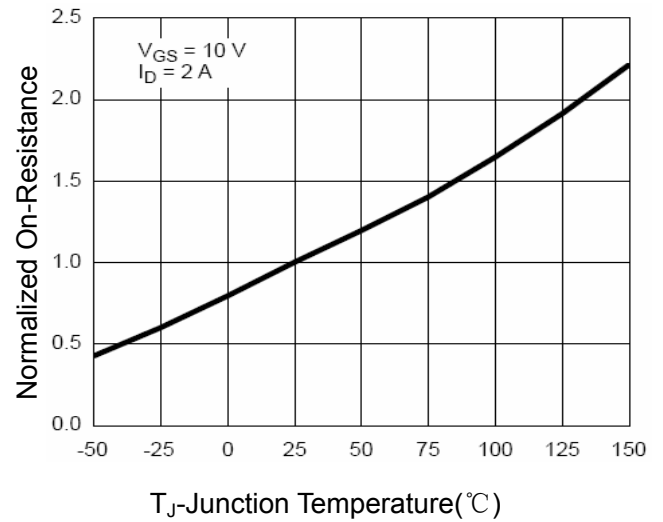
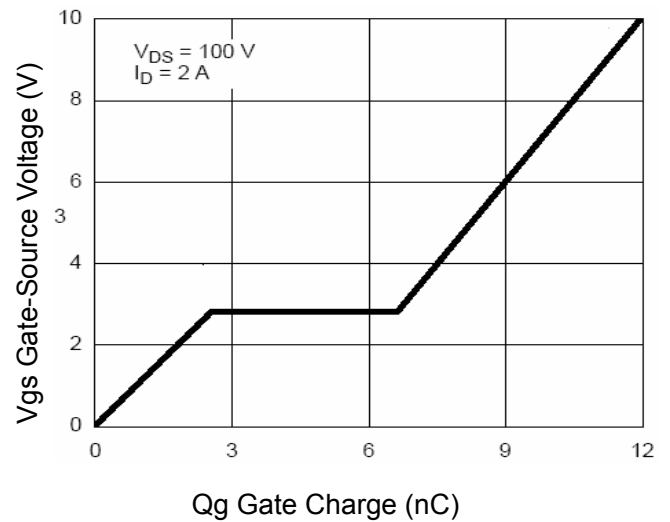
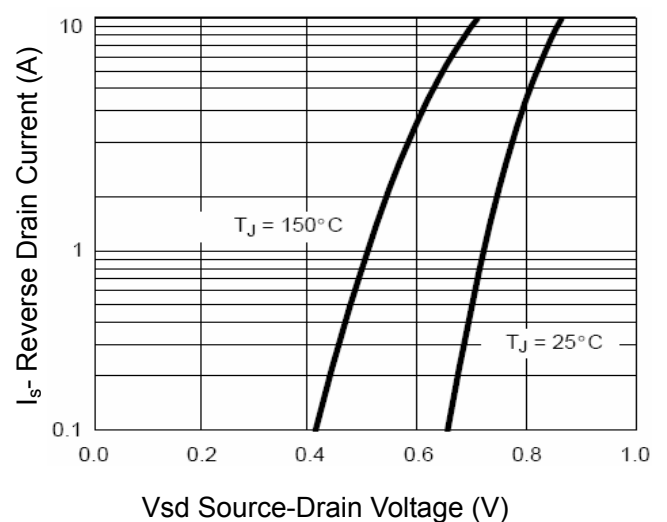


#### 2) Gate charge test circuit



#### 3) Switch Time Test Circuit



**Typical Electrical and Thermal Characteristics (Curves)**

**Figure 1 Output Characteristics**

**Figure 2 Transfer Characteristics**

**Figure 3  $R_{DS(on)}$ - Drain Current**

**Figure 4  $R_{DS(on)}$ -Junction Temperature**

**Figure 5 Gate Charge**

**Figure 6 Source- Drain Diode Forward**

Pb Free Product

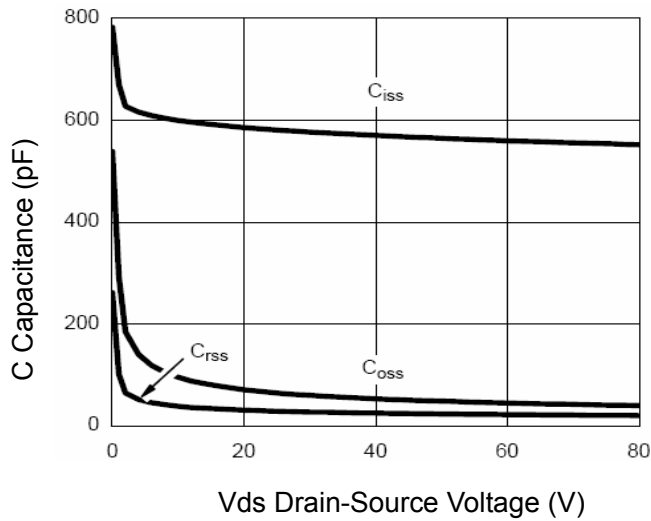


Figure 7 Capacitance vs Vds

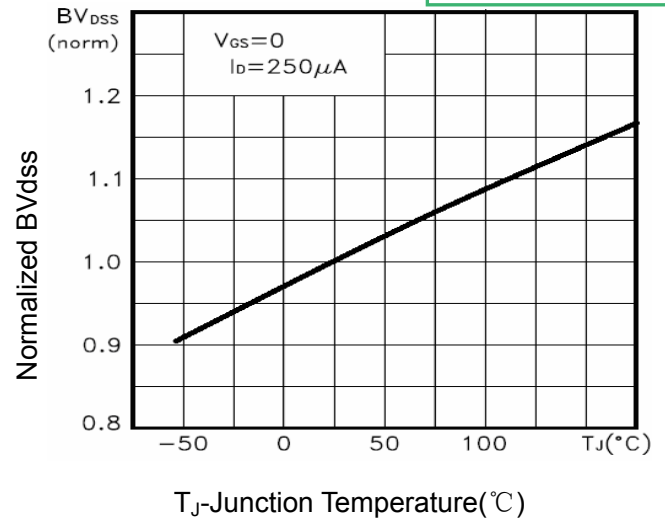


Figure 9  $BV_{DSS}$  vs Junction Temperature

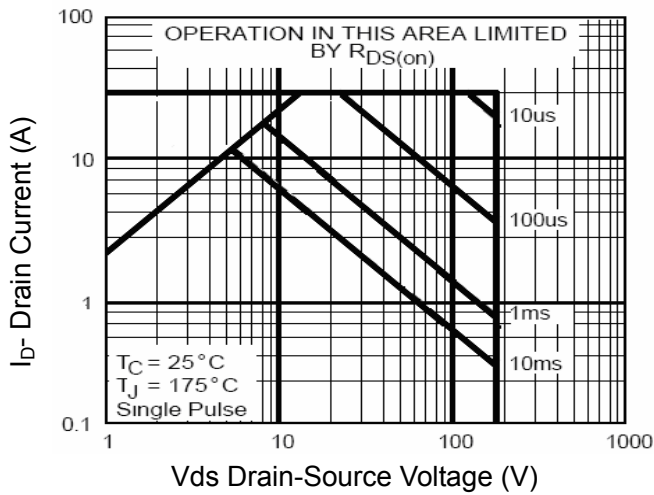


Figure 8 Safe Operation Area

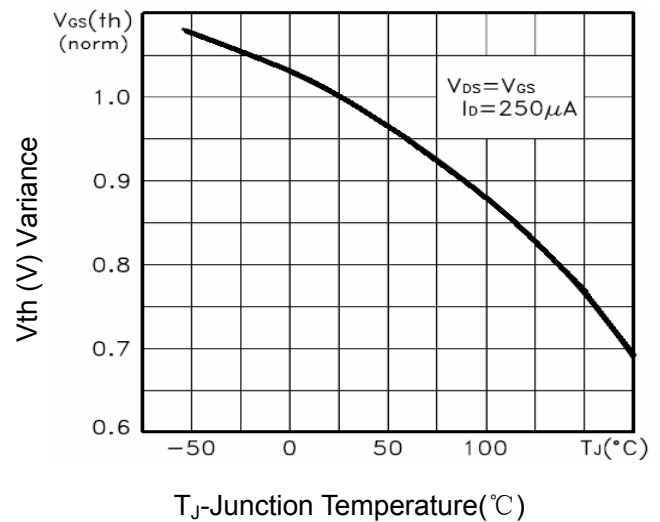


Figure 10  $V_{GS(th)}$  vs Junction Temperature

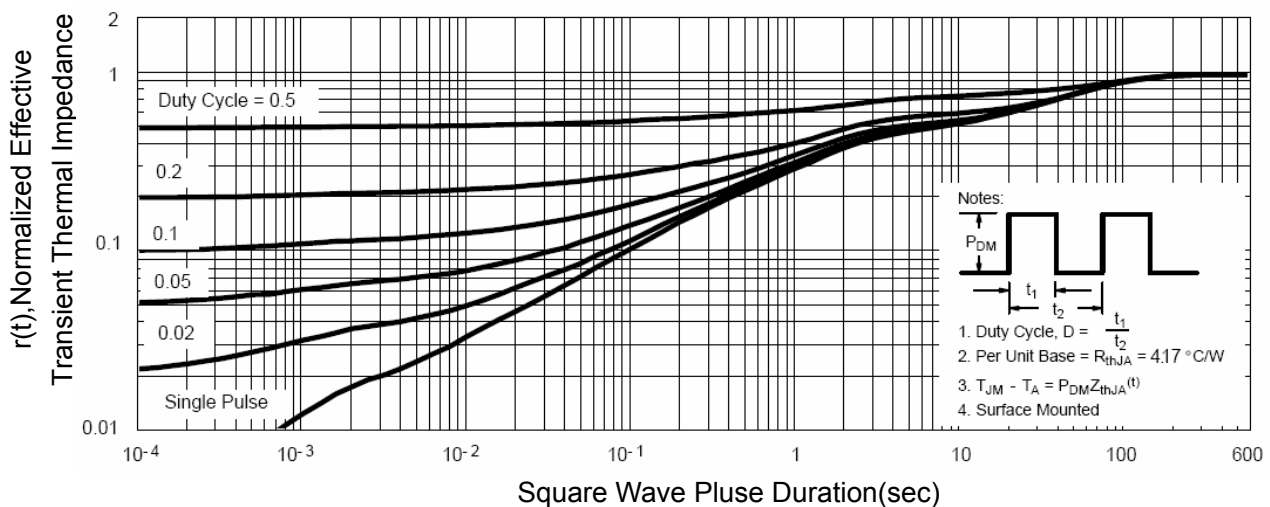
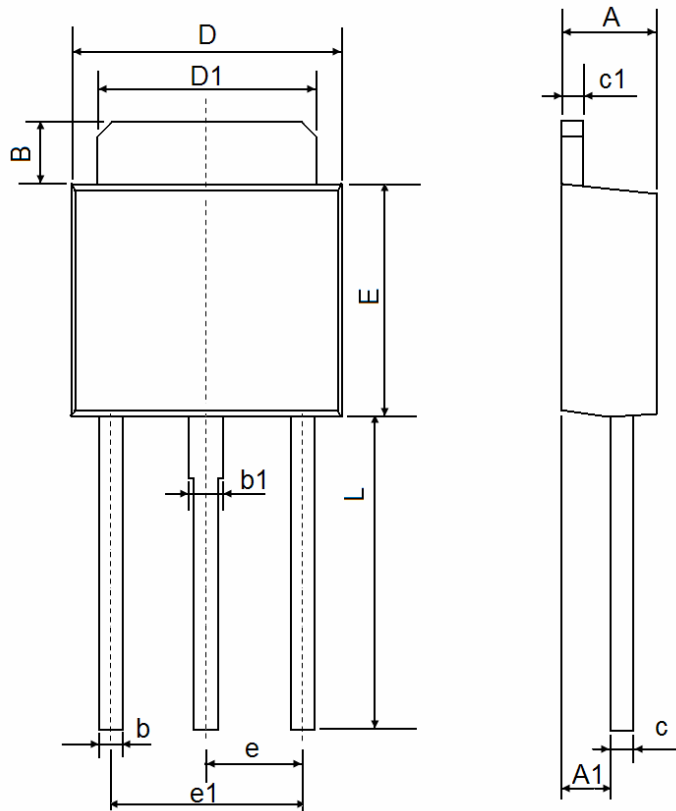


Figure 11 Normalized Maximum Transient Thermal Impedance

**TO-251 Package Information**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 2.200                     | 2.400 | 0.087                | 0.094 |
| A1     | 1.050                     | 1.350 | 0.042                | 0.054 |
| B      | 1.350                     | 1.650 | 0.053                | 0.065 |
| b      | 0.500                     | 0.700 | 0.020                | 0.028 |
| b1     | 0.700                     | 0.900 | 0.028                | 0.035 |
| c      | 0.430                     | 0.580 | 0.017                | 0.023 |
| c1     | 0.430                     | 0.580 | 0.017                | 0.023 |
| D      | 6.350                     | 6.650 | 0.250                | 0.262 |
| D1     | 5.200                     | 5.400 | 0.205                | 0.213 |
| E      | 5.400                     | 5.700 | 0.213                | 0.224 |
| e      | 2.300 TYP                 |       | 0.091 TYP            |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 7.500                     | 7.900 | 0.295                | 0.311 |