

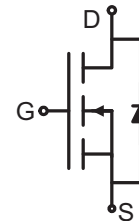
## N-Channel Enhancement Mode Power MOSFET

### Description

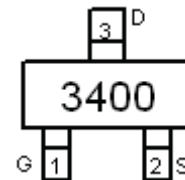
The RM3400 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

- $V_{DS} = 30V, I_D = 5.8A$   
 $R_{DS(ON)} < 59m\Omega @ V_{GS}=2.5V$   
 $R_{DS(ON)} < 45m\Omega @ V_{GS}=4.5V$   
 $R_{DS(ON)} < 41m\Omega @ V_{GS}=10V$
- High power and current handing capability
- Lead free product is acquired
- Surface mount package
- PWM applications
- Load switch
- Power management
- P/N suffix V means AEC-Q101 qualified, e.g:RM3400V
- Halogen-free



Schematic diagram



Marking and pin assignment



SOT-23 top view

### Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity   |
|----------------|--------|----------------|-----------|------------|------------|
| 3400           | RM3400 | SOT-23         | Ø180mm    | 8 mm       | 3000 units |

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

| Parameter                                        | Symbol         | Limit      | Unit             |
|--------------------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | 30         | V                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 12$   | V                |
| Drain Current-Continuous                         | $I_D$          | 5.8        | A                |
| Drain Current-Pulsed <sup>(Note 1)</sup>         | $I_{DM}$       | 30         | A                |
| Maximum Power Dissipation                        | $P_D$          | 1.4        | 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> | $R_{\theta JA}$ | 89 | $^\circ\text{C/W}$ |
|-------------------------------------------------------------|-----------------|----|--------------------|

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

| Parameter                       | Symbol     | Condition                 | Min | Typ | Max | Unit    |
|---------------------------------|------------|---------------------------|-----|-----|-----|---------|
| <b>Off Characteristics</b>      |            |                           |     |     |     |         |
| Drain-Source Breakdown Voltage  | $BV_{DSS}$ | $V_{GS}=0V, I_D=250\mu A$ | 30  | 33  | -   | V       |
| Zero Gate Voltage Drain Current | $I_{DSS}$  | $V_{DS}=30V, V_{GS}=0V$   | -   | -   | 1   | $\mu A$ |

|                                           |                     |                                                                                         |     |     |      |    |
|-------------------------------------------|---------------------|-----------------------------------------------------------------------------------------|-----|-----|------|----|
| Gate-Body Leakage Current                 | I <sub>GSS</sub>    | V <sub>GS</sub> =±12V,V <sub>DS</sub> =0V                                               | -   | -   | ±100 | nA |
| <b>On Characteristics</b> (Note 3)        |                     |                                                                                         |     |     |      |    |
| Gate Threshold Voltage                    | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA                                 | 0.7 | 0.9 | 1.4  | V  |
| Drain-Source On-State Resistance          | R <sub>DS(ON)</sub> | V <sub>GS</sub> =2.5V, I <sub>D</sub> =4A                                               | -   | 45  | 59   | mΩ |
|                                           |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A                                               | -   | 31  | 45   | mΩ |
|                                           |                     | V <sub>GS</sub> =10V, I <sub>D</sub> =5.8A                                              | -   | 28  | 41   | mΩ |
| Forward Transconductance                  | g <sub>FS</sub>     | V <sub>DS</sub> =5V,I <sub>D</sub> =5A                                                  | 10  | -   | -    | S  |
| <b>Dynamic Characteristics</b> (Note4)    |                     |                                                                                         |     |     |      |    |
| Input Capacitance                         | C <sub>ISS</sub>    | V <sub>DS</sub> =15V,V <sub>GS</sub> =0V,<br>F=1.0MHz                                   | -   | 820 | -    | PF |
| Output Capacitance                        | C <sub>OSS</sub>    |                                                                                         | -   | 99  | -    | PF |
| Reverse Transfer Capacitance              | C <sub>RSS</sub>    |                                                                                         | -   | 77  | -    | PF |
| <b>Switching Characteristics</b> (Note 4) |                     |                                                                                         |     |     |      |    |
| Turn-on Delay Time                        | t <sub>d(on)</sub>  | V <sub>DD</sub> =15V, R <sub>L</sub> =2.7Ω<br>V <sub>GS</sub> =10V,R <sub>GEN</sub> =3Ω | -   | 3.3 | -    | nS |
| Turn-on Rise Time                         | t <sub>r</sub>      |                                                                                         | -   | 4.8 | -    | nS |
| Turn-Off Delay Time                       | t <sub>d(off)</sub> |                                                                                         | -   | 26  | -    | nS |
| Turn-Off Fall Time                        | t <sub>f</sub>      |                                                                                         | -   | 4   | -    | nS |
| Total Gate Charge                         | Q <sub>g</sub>      | V <sub>DS</sub> =15V,I <sub>D</sub> =5.8A,<br>V <sub>GS</sub> =4.5V                     | -   | 9.5 | -    | nC |
| Gate-Source Charge                        | Q <sub>gs</sub>     |                                                                                         | -   | 1.5 | -    | nC |
| Gate-Drain Charge                         | Q <sub>gd</sub>     |                                                                                         | -   | 3   | -    | nC |
| <b>Drain-Source Diode Characteristics</b> |                     |                                                                                         |     |     |      |    |
| Diode Forward Voltage (Note 3)            | V <sub>SD</sub>     | V <sub>GS</sub> =0V,I <sub>S</sub> =5.8A                                                | -   | -   | 1.2  | V  |
| Diode Forward Current (Note 2)            | I <sub>S</sub>      |                                                                                         | -   | -   | 5.8  | 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

## RATING AND CHARACTERISTICS CURVES (RM3400)

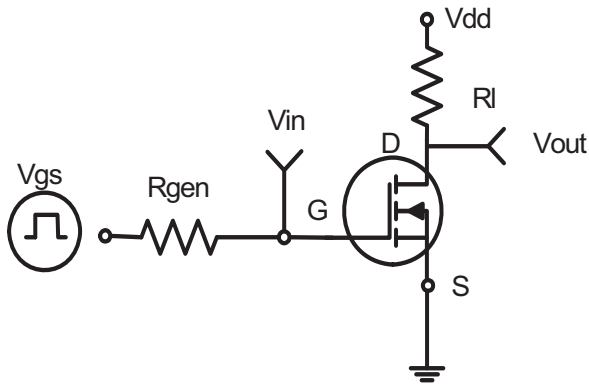


Figure 1: Switching Test Circuit

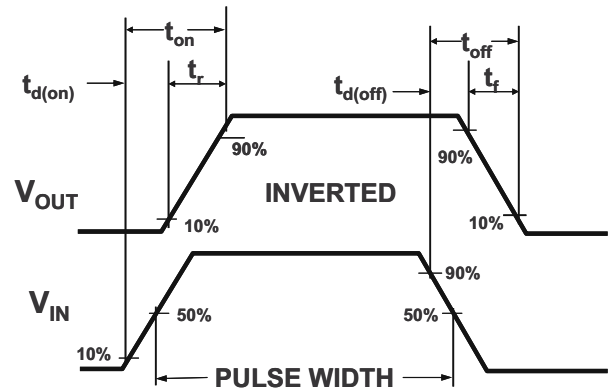


Figure 2: Switching Waveforms

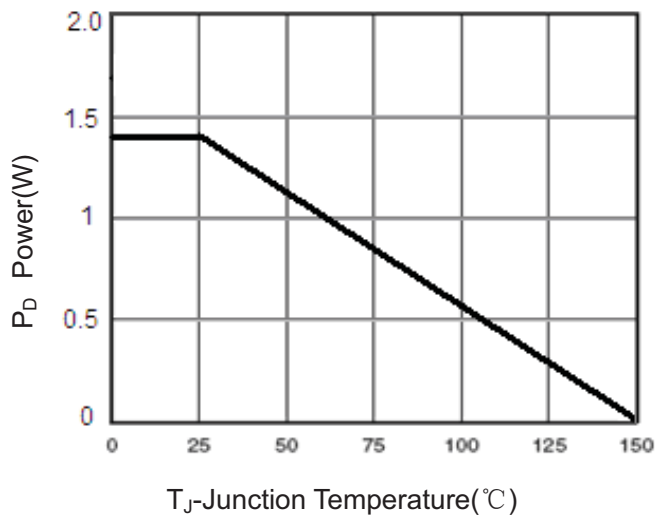


Figure 3 Power Dissipation

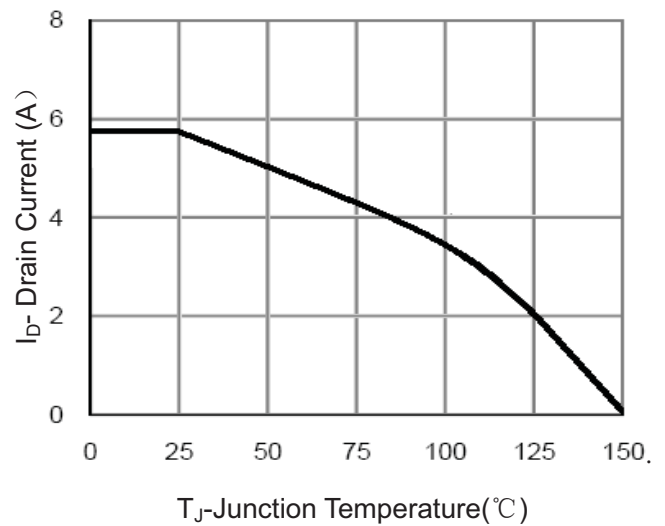


Figure 4 Drain Current

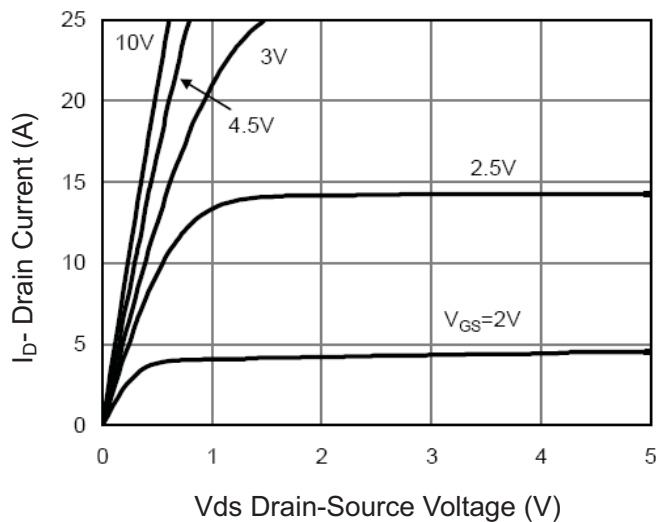


Figure 5 Output Characteristics

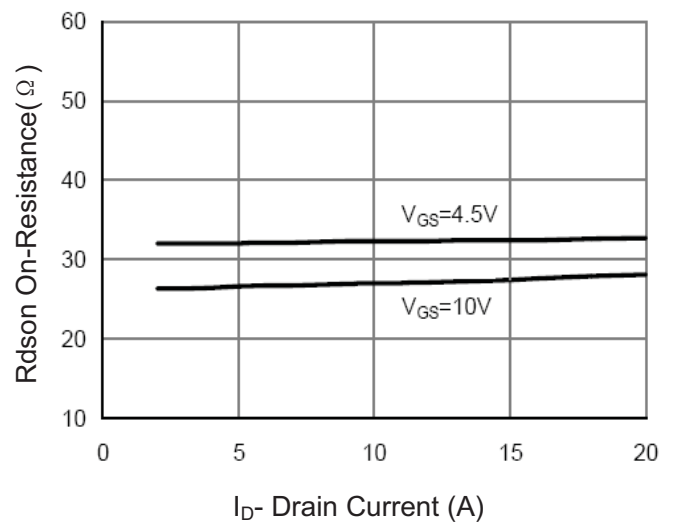
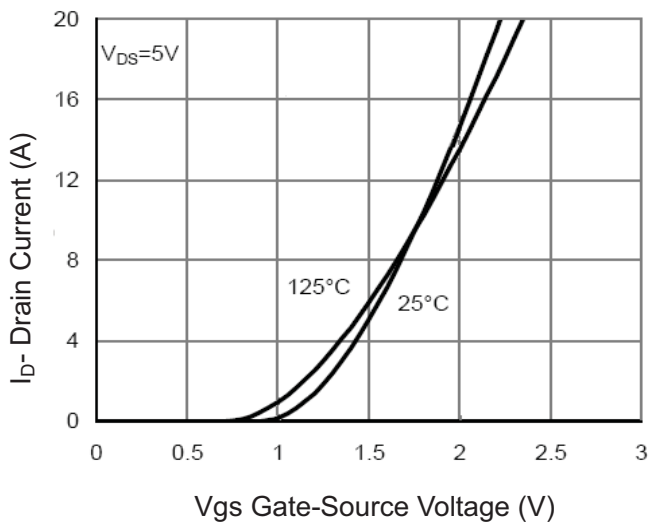
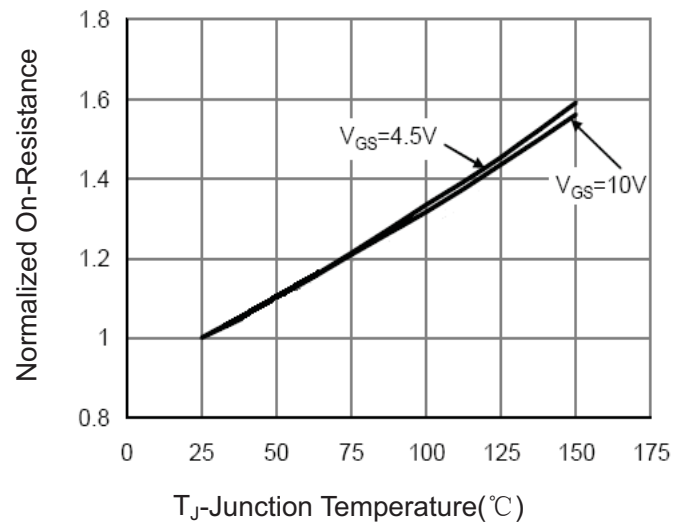


Figure 6 Drain-Source On-Resistance

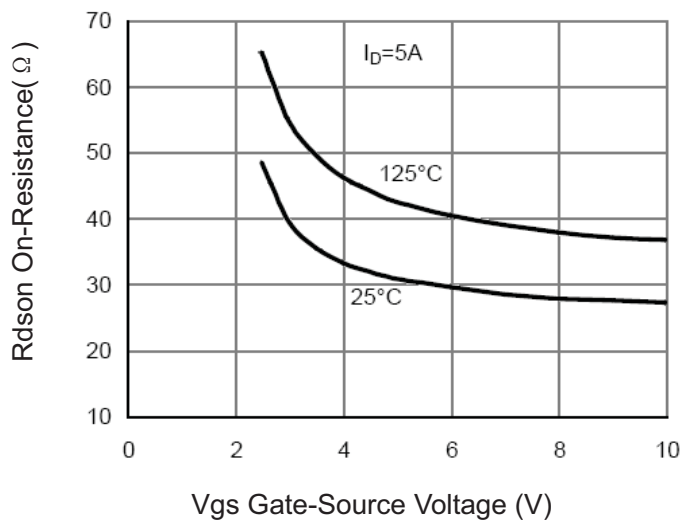
## RATING AND CHARACTERISTICS CURVES (RM3400)



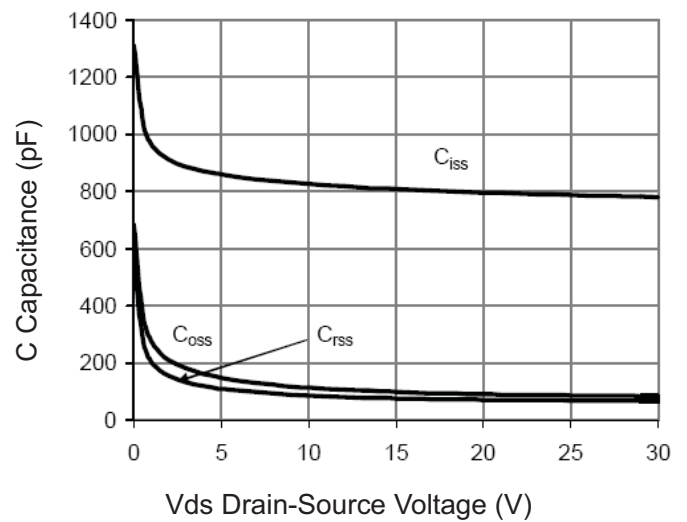
**Figure 7 Transfer Characteristics**



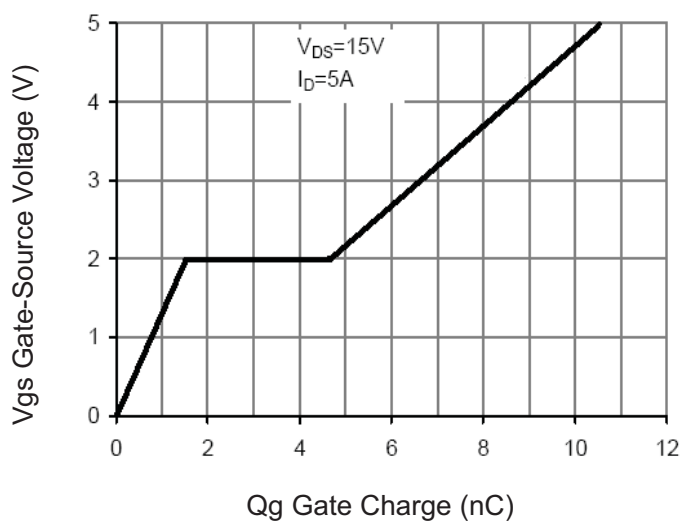
**Figure 8 Drain-Source On-Resistance**



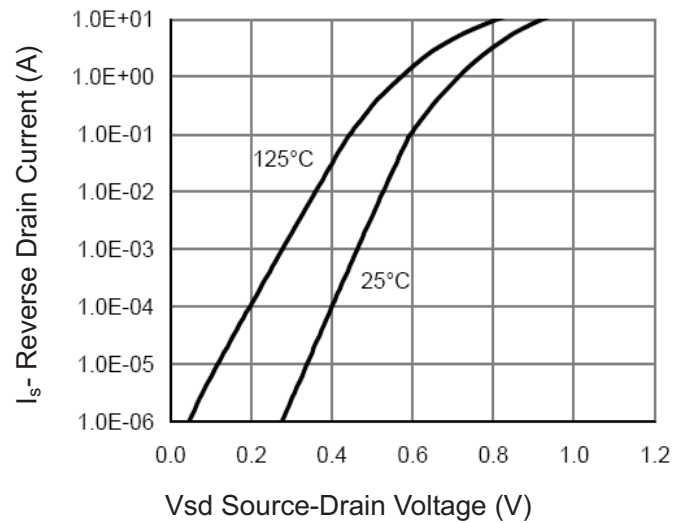
**Figure 9 Rdson vs Vgs**



**Figure 10 Capacitance vs Vds**



**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**

## RATING AND CHARACTERISTICS CURVES (RM3400)

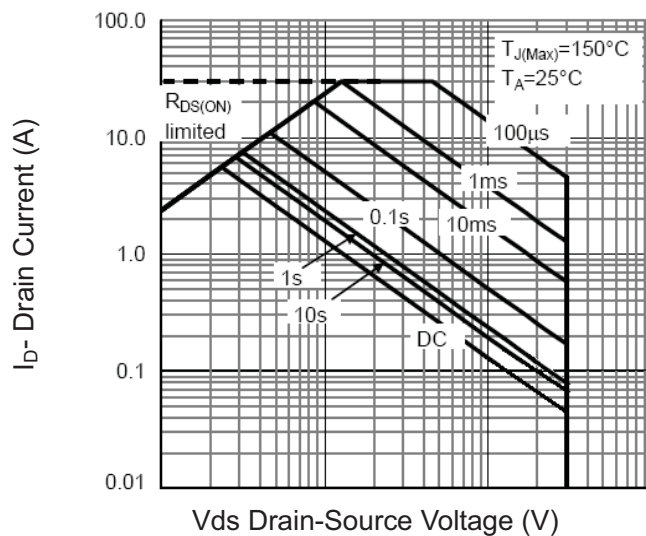


Figure 13 Safe Operation Area

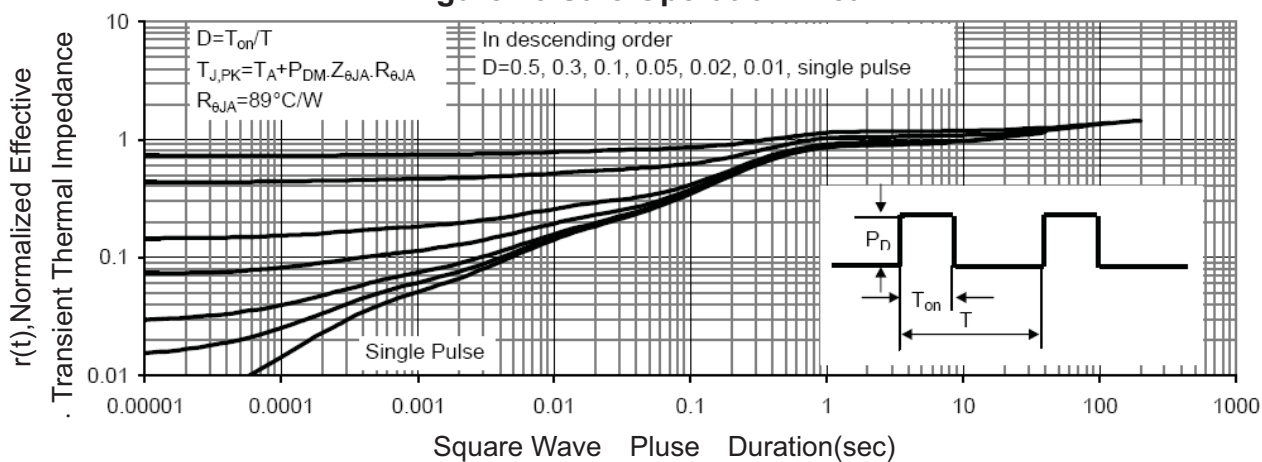
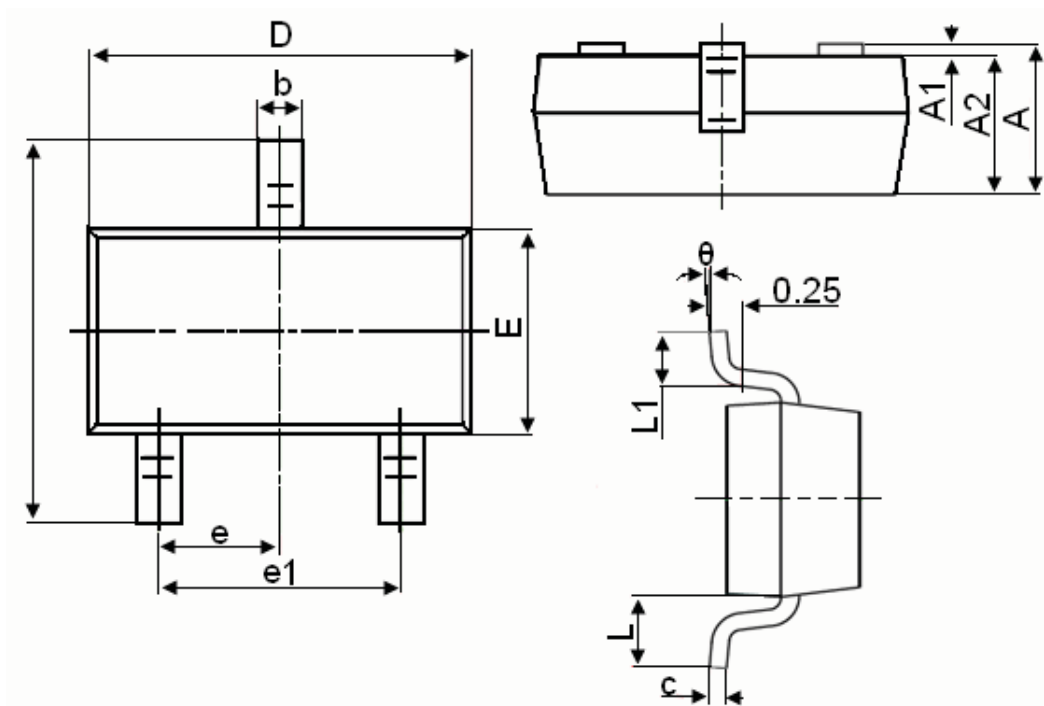


Figure 14 Normalized Maximum Transient Thermal Impedance

## SOT-23 Package Information



| Symbol   | Dimensions in Millimeters |       |
|----------|---------------------------|-------|
|          | MIN.                      | MAX.  |
| A        | 0.900                     | 1.150 |
| A1       | 0.000                     | 0.100 |
| A2       | 0.900                     | 1.050 |
| b        | 0.300                     | 0.500 |
| c        | 0.080                     | 0.150 |
| D        | 2.800                     | 3.000 |
| E        | 1.200                     | 1.400 |
| E1       | 2.250                     | 2.550 |
| e        | 0.950TYP                  |       |
| e1       | 1.800                     | 2.000 |
| L        | 0.550REF                  |       |
| L1       | 0.300                     | 0.500 |
| $\theta$ | 0°                        | 8°    |

### Notes

1. All dimensions are in millimeters.
2. Tolerance  $\pm 0.10\text{mm}$  (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

| Package       | Tube<br>(pcs/tube) | Tube<br>(pcs/inner box) | Tube<br>(pcs/cartoon) | Tape&Reel<br>(pcs/reel) | Tape&Reel<br>(pcs/inner box) | Tape&Reel<br>(pcs/cartoon) |
|---------------|--------------------|-------------------------|-----------------------|-------------------------|------------------------------|----------------------------|
| SOP-8(DFN)    | 100                | 10,000                  | 100,000               | 2,500                   | 5,000                        | 40,000                     |
| TSSOP-8       | 100                | 32,000                  | 128,000               | 3,000                   | 6,000                        | 48,000                     |
| SOT-23-3L     | ——                 | ——                      | ——                    | 3,000                   | 30,000                       | 120,000                    |
| SOT-23-6L     | ——                 | ——                      | ——                    | 3,000                   | 30,000                       | 120,000                    |
| SOT-23(6R)    | ——                 | ——                      | ——                    | 3,000                   | 30,000                       | 120,000                    |
| SOT-363       | ——                 | ——                      | ——                    | 3,000                   | 30,000                       | 120,000                    |
| SOT-523       | ——                 | ——                      | ——                    | 3,000                   | 30,000                       | 120,000                    |
| TO-220        | 50                 | 1,000                   | 5,000                 | ——                      | ——                           | ——                         |
| TO-220F       | 50                 | 1,000                   | 10,000                | ——                      | ——                           | ——                         |
| TO-247        | 30                 | 300                     | 1,200                 | ——                      | ——                           | ——                         |
| TO-251        | 80                 | 4,000                   | 40,000                | ——                      | ——                           | ——                         |
| TO-251S(4R)   | 80                 | 4,000                   | 40,000                | ——                      | ——                           | ——                         |
| TO-252-2L(4R) | 80                 | 4,000                   | 40,000                | 2,500                   | 2,500                        | 25,000                     |
| TO-263-2L     | 50                 | 1,000                   | 10,000                | 800                     | 800                          | 8,000                      |
| TO-3P         | 30                 | 300                     | 3,000                 | ——                      | ——                           | ——                         |
| TO-92         | ——                 | ——                      | ——                    | 1,000(袋装)               | 10,000                       | 100,000                    |

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