

## TAP2305

### P-Channel Power MOSFET

#### Description

The TAP2305 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 load switch or in PWM applications.

#### General Features

$V_{DS} = -20V, I_D = -4.1A$

$R_{DS(ON)} < 75m\Omega @ V_{GS} = -2.5V$

$R_{DS(ON)} < 42m\Omega @ V_{GS} = -4.5V$

High power and current handing capability

Lead free product is acquired

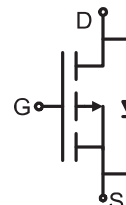
Surface mount package

#### Application

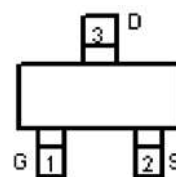
PWM applications

Load switch

Power management



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   |
|----------------|---------|----------------|-----------|------------|------------|
| A5SHB/2305     | TAP2305 | SOT-23         | Ø180mm    | 8 mm       | 3000 units |

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

| Parameter                                        |                    | Symbol         | Limit      | Unit       |
|--------------------------------------------------|--------------------|----------------|------------|------------|
| Drain-Source Voltage                             |                    | $V_{DS}$       | -20        | V          |
| Gate-Source Voltage                              |                    | $V_{GS}$       | $\pm 12$   | V          |
| Continuous Drain Current                         | $T_C = 25^\circ C$ | $I_D$          | -4.1       | A          |
|                                                  | $T_C = 70^\circ C$ |                | -3.2       |            |
|                                                  | $T_A = 25^\circ C$ |                | -3         |            |
|                                                  | $T_A = 70^\circ C$ |                | -2.3       |            |
| Drain Current -Pulsed (Note 1)                   |                    | $I_{DM}$       | -15        | A          |
| Maximum Power Dissipation                        |                    | $P_D$          | 1.7        | W          |
| Operating Junction and Storage Temperature Range |                    | $T_J, T_{STG}$ | -55 To 150 | $^\circ C$ |

#### Thermal Characteristic

|                                                  |                 |    |              |
|--------------------------------------------------|-----------------|----|--------------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 74 | $^\circ C/W$ |
|--------------------------------------------------|-----------------|----|--------------|

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#### 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                                                                          | -20   | -    | -    | V    |
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                                                          | -     | -    | -1   | μA   |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                                                          | -     | -    | ±100 | nA   |
| On Characteristics (Note 3)        |                     |                                                                                                                     |       |      |      |      |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                                           | -0.45 | -0.7 | -1.0 | V    |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.1A                                                                       | -     | 32   | 42   | mΩ   |
|                                    |                     | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A                                                                         | -     | 50   | 75   |      |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-2A                                                                           | 6     | -    | -    | S    |
| Dynamic Characteristics (Note4)    |                     |                                                                                                                     |       |      |      |      |
| Input Capacitance                  | C <sub>ISS</sub>    | V <sub>DS</sub> =-4V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                                              | -     | 740  | -    | PF   |
| Output Capacitance                 | C <sub>OSS</sub>    |                                                                                                                     | -     | 290  | -    | PF   |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                                                                     | -     | 190  | -    | PF   |
| Switching Characteristics (Note 4) |                     |                                                                                                                     |       |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> =-4V, I <sub>D</sub> =-3.3A ,<br>R <sub>L</sub> =-1.2Ω, V <sub>GEN</sub> =-4.5V, R <sub>g</sub> =1Ω | -     | 12   | -    | nS   |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                                                     | -     | 35   | -    | nS   |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                                                     | -     | 30   | -    | nS   |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                                                                     | -     | 10   | -    | nS   |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =-4V, I <sub>D</sub> =-4.1A, V <sub>GS</sub> =-4.5V                                                 | -     | 7.8  | -    | nC   |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                                                     | -     | 1.2  | -    | nC   |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                                                     | -     | 1.6  | -    | nC   |
| Drain-Source Diode Characteristics |                     |                                                                                                                     |       |      |      |      |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1.6A                                                                          | -     | -    | -1.2 | V    |
| Diode Forward Current (Note 2)     | I <sub>S</sub>      |                                                                                                                     | -     | -    | 1.6  | 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

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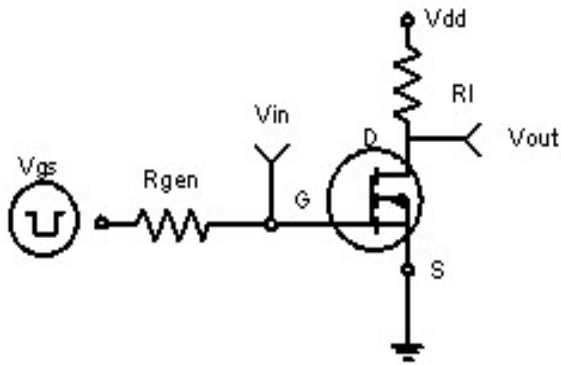


Figure 1: Switching Test Circuit

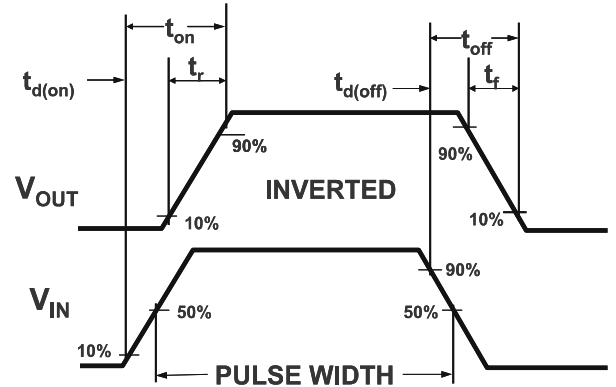
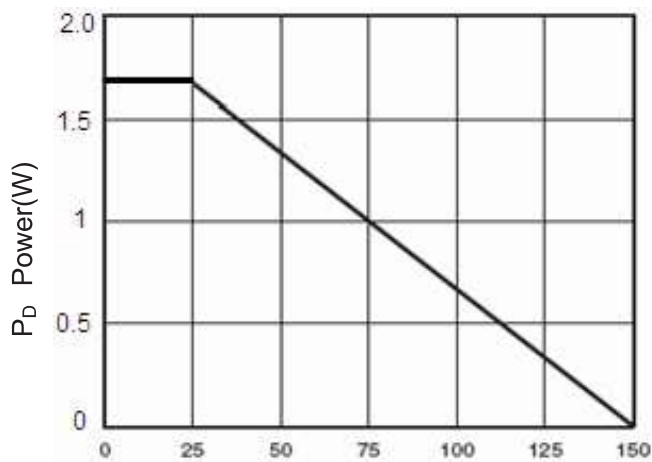
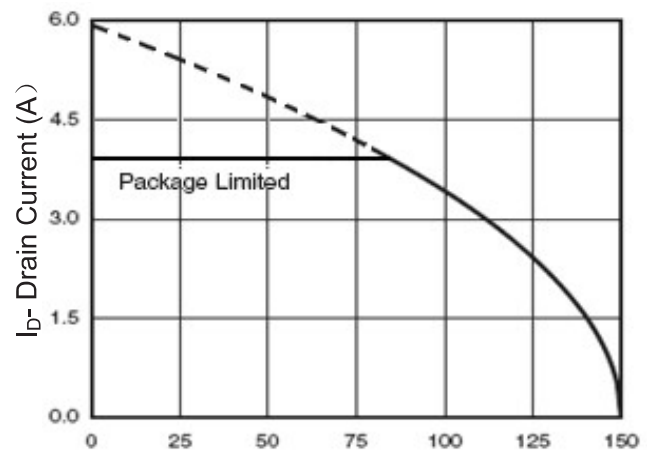


Figure 2: Switching Waveforms



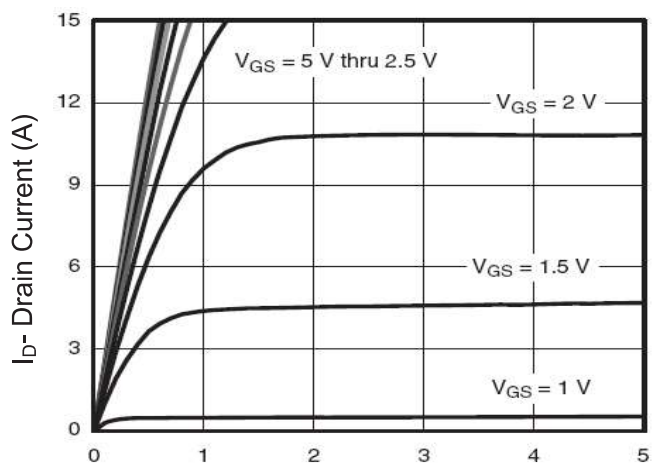
$T_J$ -Junction Temperature(°C)

Figure 3 Power Dissipation



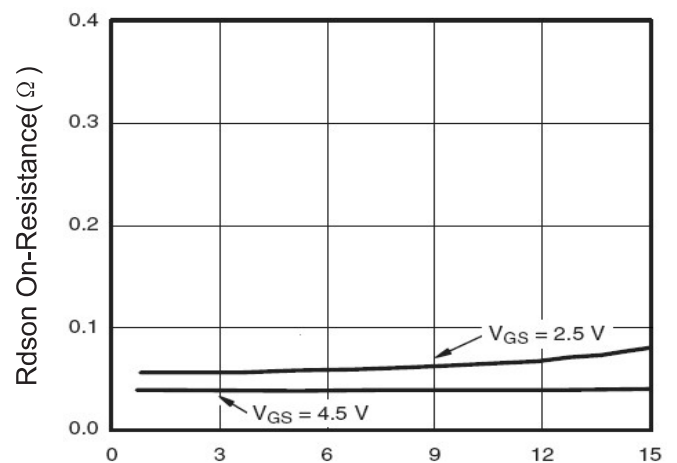
$T_J$ -Junction Temperature(°C)

Figure 4 Drain Current



$V_{DS}$  Drain-Source Voltage (V)

Figure 5 Output Characteristics



$I_D$ -Drain Current (A)

Figure 6 Drain-Source On-Resistance

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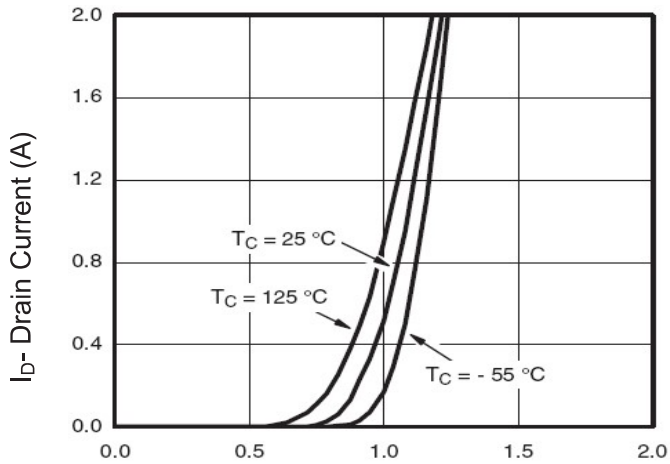


Figure 7 Transfer Characteristics

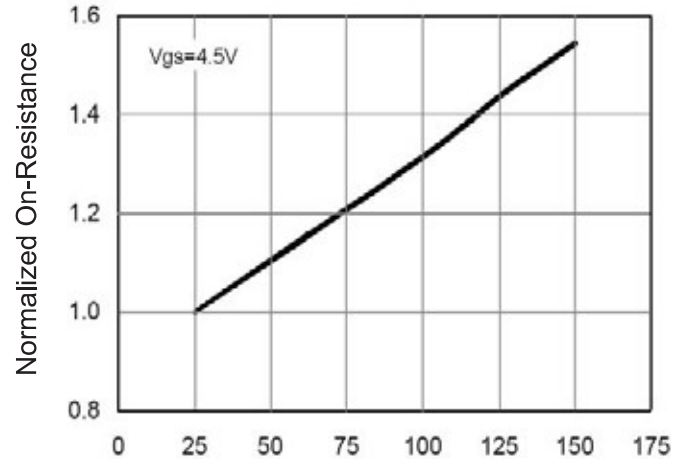


Figure 8 Drain-Source On-Resistance

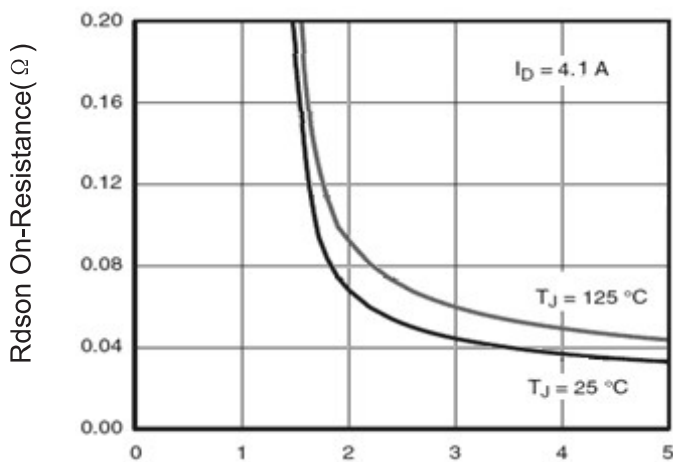


Figure 9 Rdson vs Vgs

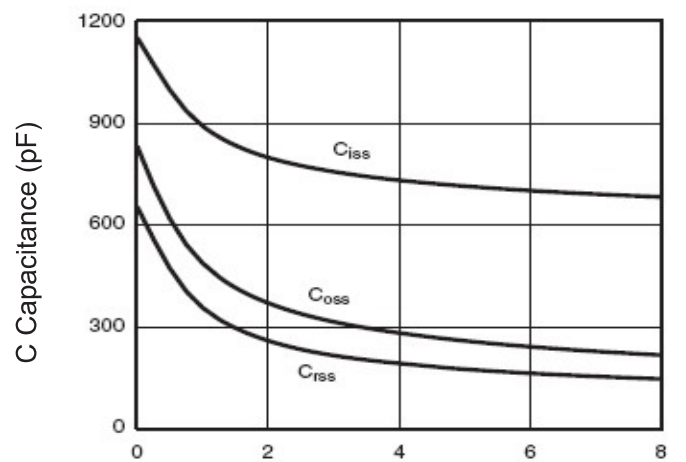


Figure 10 Capacitance vs Vds

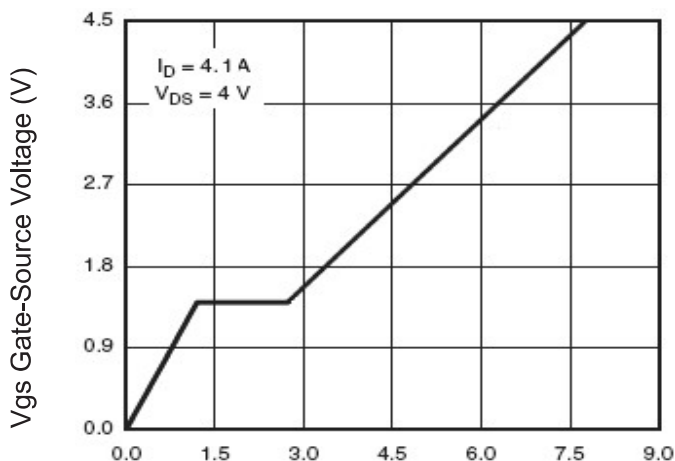


Figure 11 Gate Charge

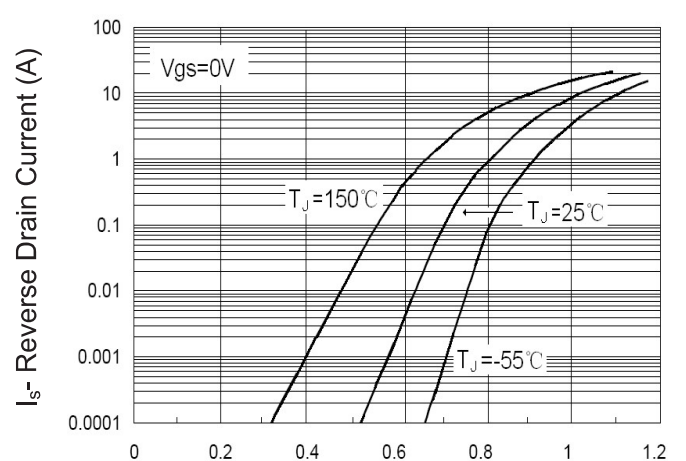
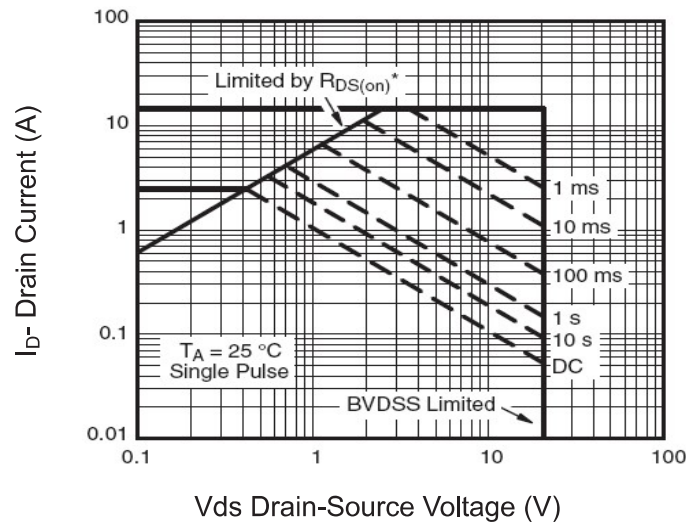


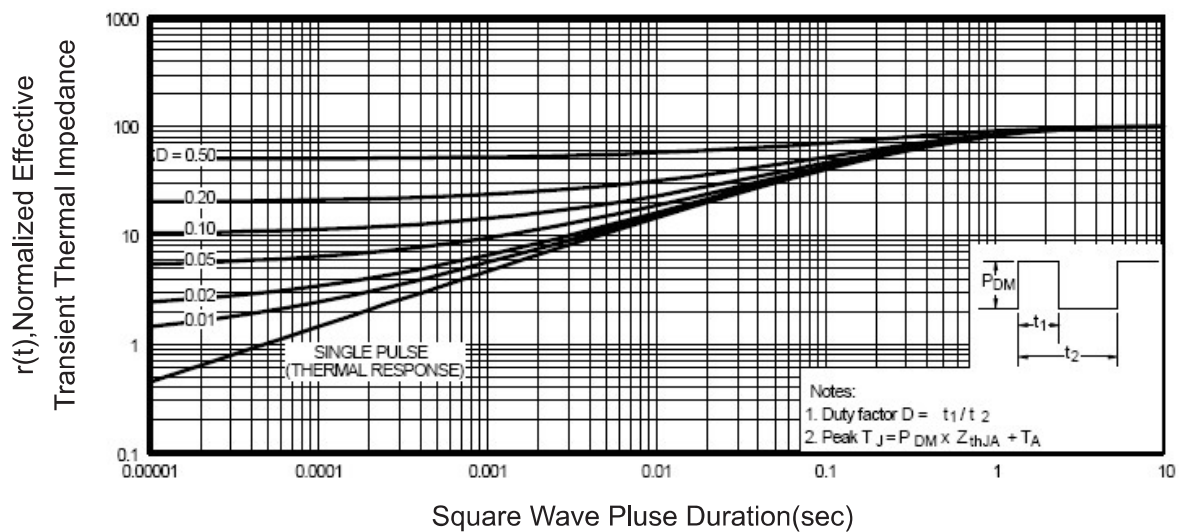
Figure 12 Source- Drain Diode Forward

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**Figure 13 Safe Operation Area**

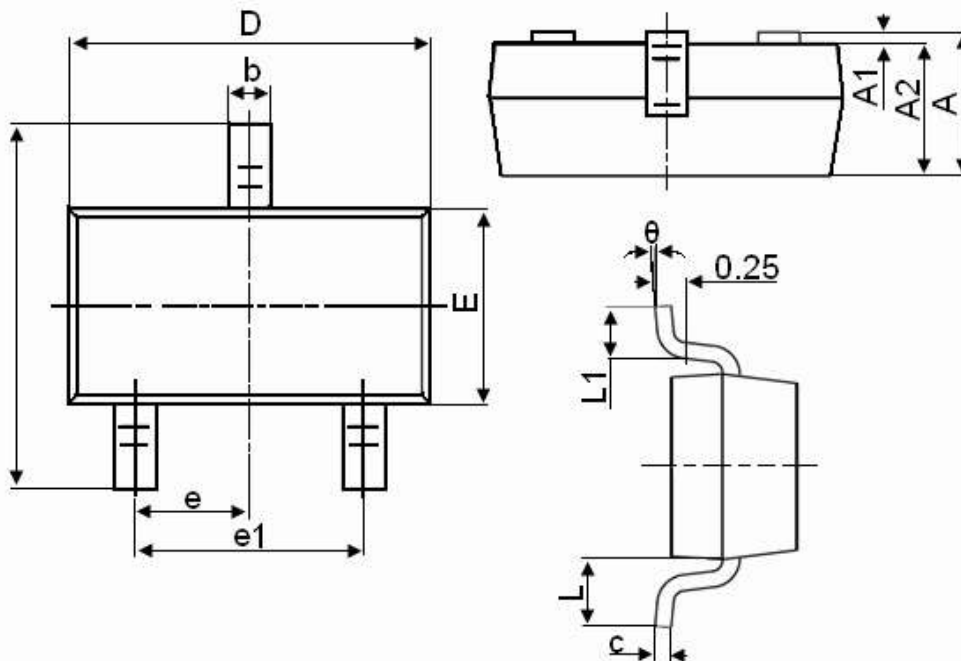


**Figure 14 Normalized Maximum Transient Thermal Impedance**

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#### 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 |
| θ      | 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.