

## P-Channel Enhancement Mode Power MOSFET

### DESCRIPTION

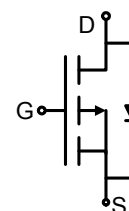
The HM3407B uses advanced trench technology to provide excellent  $R_{DS(ON)}$ . This device is suitable for use as a load switch or in PWM applications.

### GENERAL FEATURES

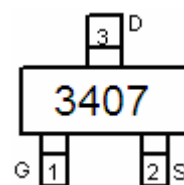
- $V_{DS} = -30V, I_D = -4.1A$   
 $R_{DS(ON)} = 38m\Omega$  (Typ) @  $V_{GS} = -10V$   
 $R_{DS(ON)} = 58m\Omega$  (Typ) @  $V_{GS} = -4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

### 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   |
|----------------|---------|----------------|-----------|------------|------------|
| 3407           | HM3407B | SOT-23         | Ø180mm    | 8 mm       | 3000 units |

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Parameter                                        | Symbol         | Limit      | Unit |
|--------------------------------------------------|----------------|------------|------|
| Drain-Source Voltage                             | $V_{DS}$       | -30        | V    |
| Gate-Source Voltage                              | $V_{GS}$       | ±20        | V    |
| Drain Current-Continuous                         | $I_D$          | -4.1       | A    |
| Drain Current-Pulsed (Note 1)                    | $I_{DM}$       | -20        | A    |
| Maximum Power Dissipation                        | $P_D$          | 1.4        | W    |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | °C   |

### Thermal Characteristic

|                                                  |                 |    |      |
|--------------------------------------------------|-----------------|----|------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 90 | °C/W |
|--------------------------------------------------|-----------------|----|------|

### Electrical Characteristics (TA=25°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 | $I_{DSS}$  | $V_{DS}=-24V, V_{GS}=0V$   | -   | -   | -1  | μA   |

|                                    |                     |                                                                                          |     |      |      |    |
|------------------------------------|---------------------|------------------------------------------------------------------------------------------|-----|------|------|----|
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V                                                | -   | -    | ±100 | nA |
| On Characteristics (Note 3)        |                     |                                                                                          |     |      |      |    |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =-250μA                                 | -1  | -1.5 | -3   | V  |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.1A                                             | -   | 38   | 52   | mΩ |
|                                    |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A                                              | -   | 58   | 82   | mΩ |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-5V,I <sub>D</sub> =-4.1A                                               | 5.5 | -    | -    | S  |
| Dynamic Characteristics (Note4)    |                     |                                                                                          |     |      |      |    |
| Input Capacitance                  | C <sub>Iss</sub>    | V <sub>DS</sub> =-15V,V <sub>GS</sub> =0V,<br>F=1.0MHz                                   | -   | 700  | -    | PF |
| Output Capacitance                 | C <sub>Oss</sub>    |                                                                                          | -   | 120  | -    | PF |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                                          | -   | 75   | -    | PF |
| Switching Characteristics (Note 4) |                     |                                                                                          |     |      |      |    |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> =-15V,R <sub>L</sub> =3.6Ω<br>V <sub>GS</sub> =-10V,R <sub>GEN</sub> =3Ω | -   | 9    | -    | nS |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                          | -   | 5    | -    | nS |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                          | -   | 28   | -    | nS |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                                          | -   | 13.5 | -    | nS |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =-15V,I <sub>D</sub> =-4A,V <sub>GS</sub> =-10V                          | -   | 14   | -    | nC |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                          | -   | 3.1  | -    | nC |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                          | -   | 3.   | -    | nC |
| Drain-Source Diode Characteristics |                     |                                                                                          |     |      |      |    |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V,I <sub>S</sub> =-1A                                                  | -   | -    | -1.2 | V  |

## 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

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

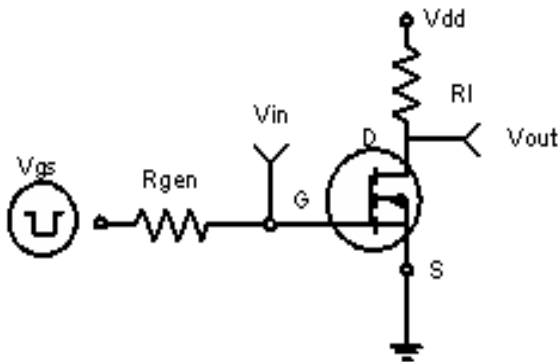


Figure 1: Switching Test Circuit

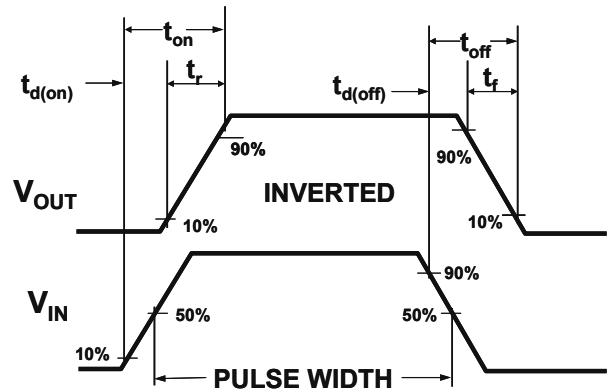


Figure 2: Switching Waveforms

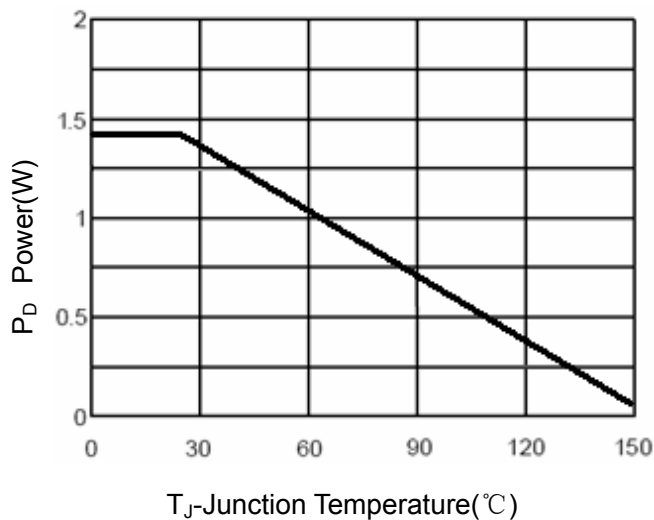


Figure 3 Power Dissipation

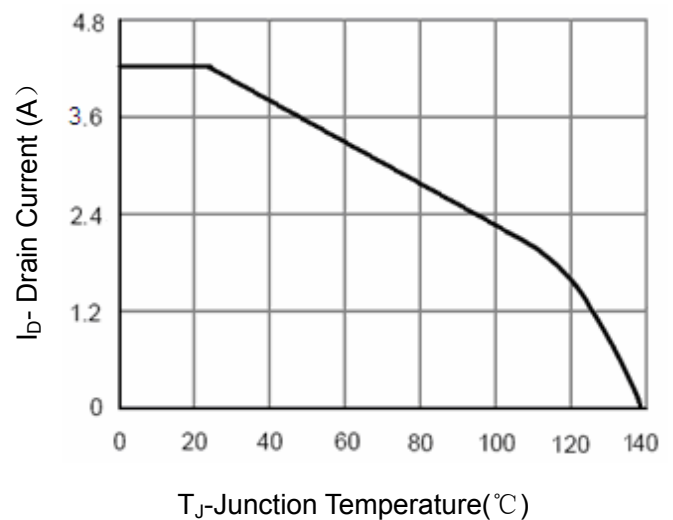


Figure 4 Drain Current

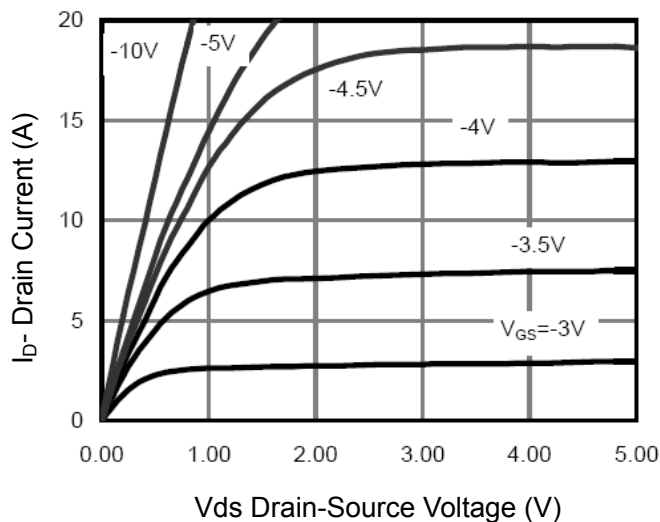


Figure 5 Output CHARACTERISTICS

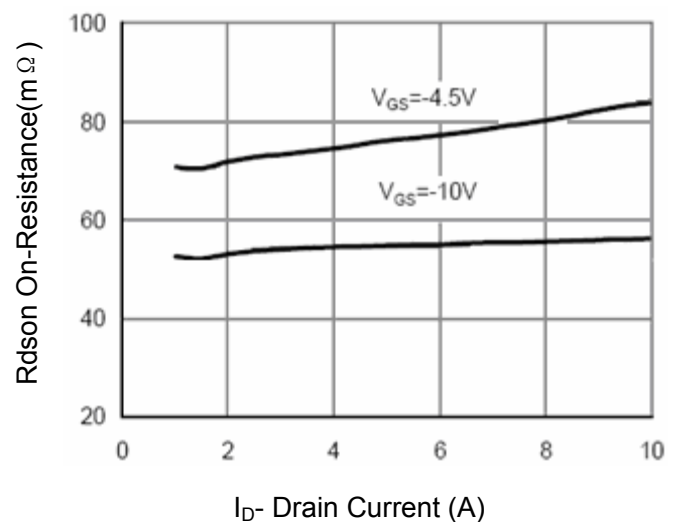


Figure 6 Drain-Source On-Resistance

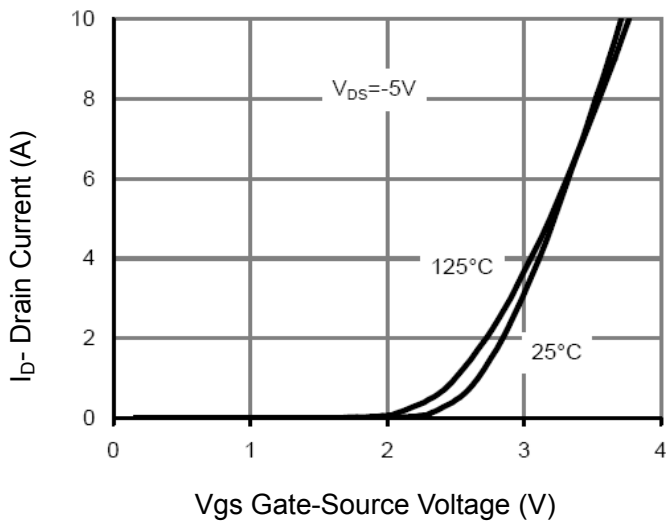


Figure 7 Transfer Characteristics

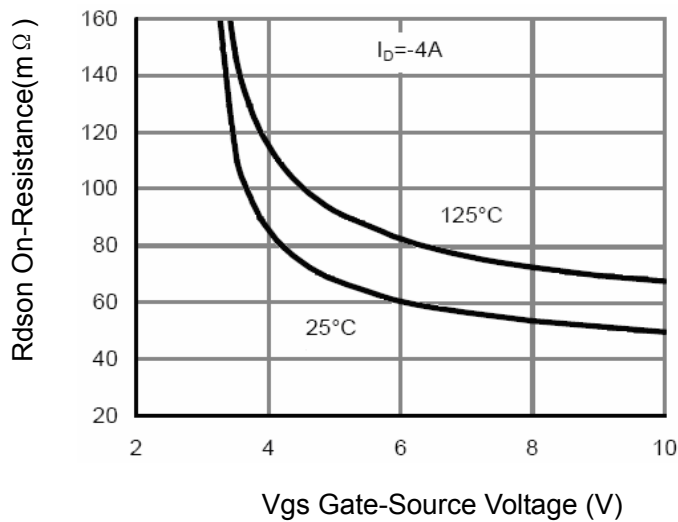


Figure 9  $R_{DS(on)}$  vs  $V_{GS}$

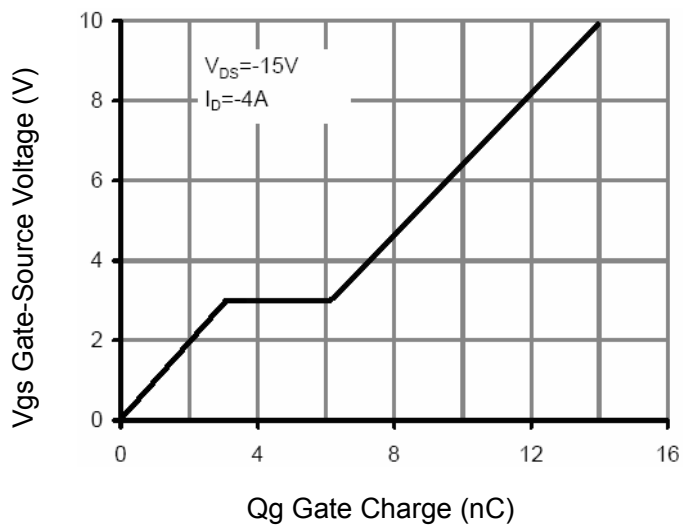


Figure 11 Gate Charge

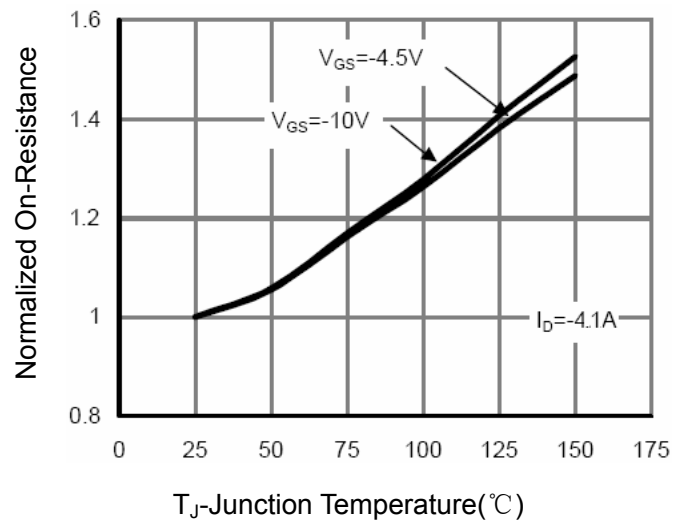


Figure 8 Drain-Source On-Resistance

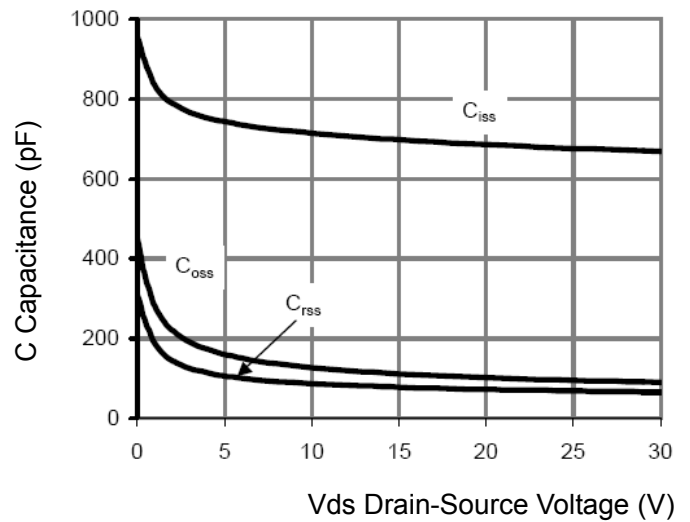


Figure 10 Capacitance vs  $V_{DS}$

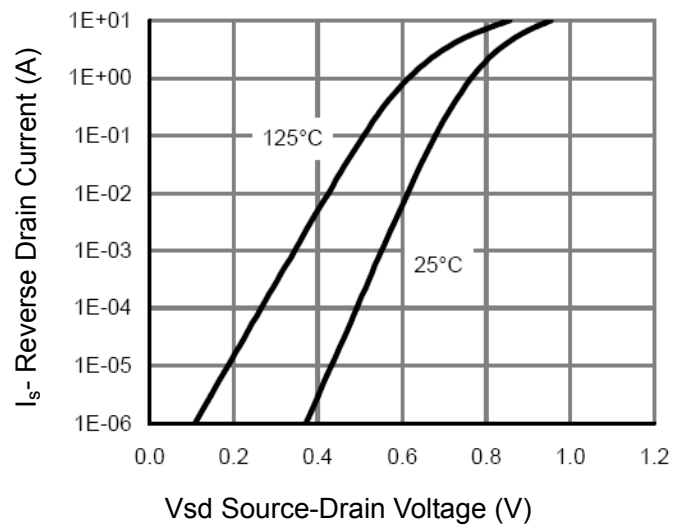


Figure 12 Source- Drain Diode Forward

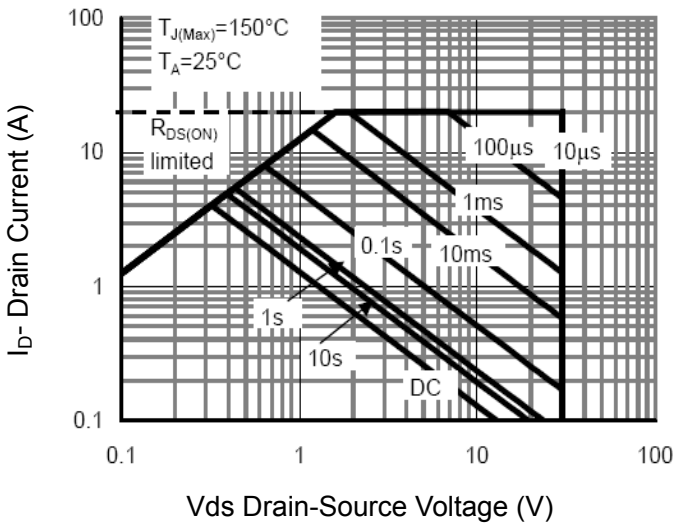


Figure 13 Safe Operation Area

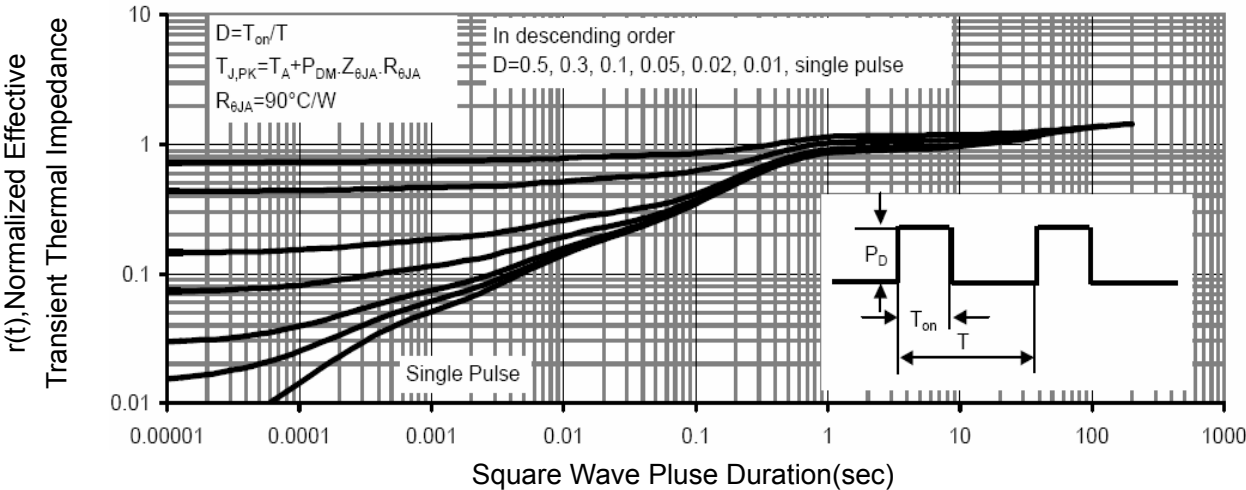
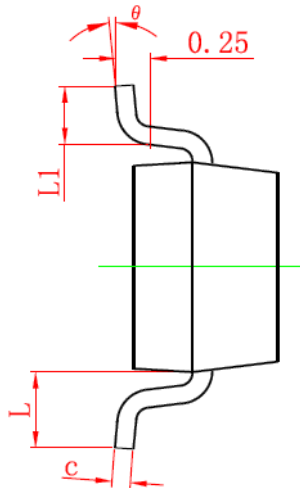
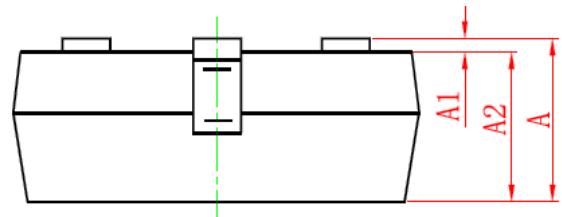
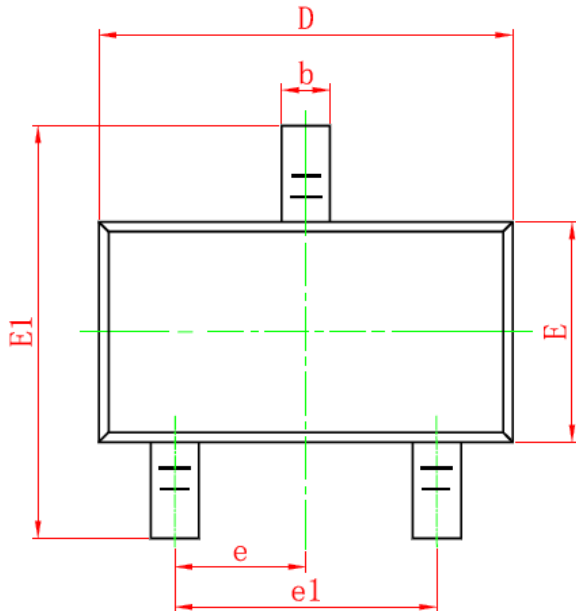


Figure 14 Normalized Maximum Transient Thermal Impedance

## SOT-23 PACKAGE INFORMATION

Dimensions in Millimeters (UNIT:mm)



| 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.