

## N-Channel Enhancement Mode Power MOSFET

**Description**

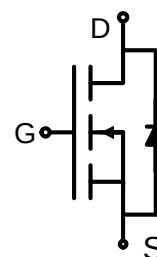
The PE6005 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

**General Features**

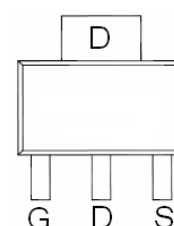
- $V_{DS} = 60V, I_D = 5A$   
 $R_{DS(ON)} < 45m\Omega$  @  $V_{GS} = 10V$  (Typ:  $38m\Omega$ )

**Application**

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



Schematic diagram



SOT-223-3L view

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

| Parameter                                        | Symbol             | Limit      | Unit       |
|--------------------------------------------------|--------------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$           | 60         | V          |
| Gate-Source Voltage                              | $V_{GS}$           | $\pm 20$   | V          |
| Drain Current-Continuous                         | $I_D$              | 5          | A          |
| Drain Current-Continuous( $T_C = 100^\circ C$ )  | $I_D(100^\circ C)$ | 3.5        | A          |
| Pulsed Drain Current                             | $I_{DM}$           | 20         | A          |
| Maximum Power Dissipation                        | $P_D$              | 2          | 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) | $R_{\theta JA}$ | 62.5 | $^\circ C/W$ |
|-------------------------------------------------|-----------------|------|--------------|

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

| Parameter                       | Symbol     | Condition                     | Min | Typ | Max | Unit    |
|---------------------------------|------------|-------------------------------|-----|-----|-----|---------|
| <b>Off Characteristics</b>      |            |                               |     |     |     |         |
| Drain-Source Breakdown Voltage  | $BV_{DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$ | 60  | 69  | -   | V       |
| Zero Gate Voltage Drain Current | $I_{DSS}$  | $V_{DS} = 60V, V_{GS} = 0V$   | -   | -   | 1   | $\mu A$ |

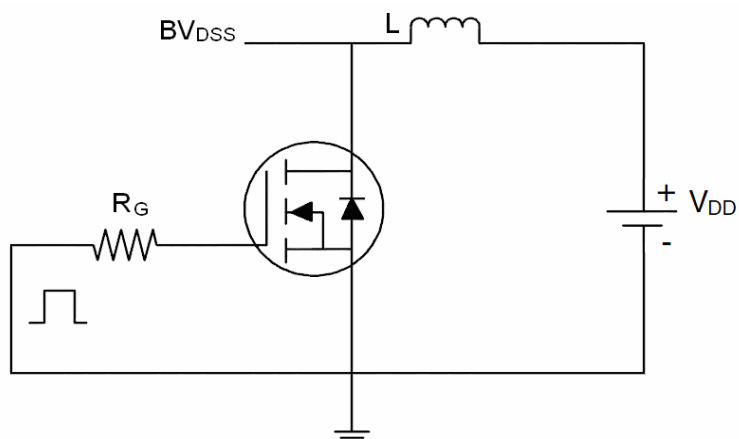
|                                    |                     |                                                                                        |     |      |      |    |
|------------------------------------|---------------------|----------------------------------------------------------------------------------------|-----|------|------|----|
| 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                                | 1.2 | 1.8  | 2.5  | V  |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =4.5A                                             |     | 38   | 45   | mΩ |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =5V,I <sub>D</sub> =4.5A                                               | 11  | -    | -    | S  |
| Dynamic Characteristics (Note4)    |                     |                                                                                        |     |      |      |    |
| Input Capacitance                  | C <sub>ISS</sub>    | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V,<br>F=1.0MHz                                  |     | 450  |      | PF |
| Output Capacitance                 | C <sub>OSS</sub>    |                                                                                        |     | 60   |      | PF |
| Reverse Transfer Capacitance       | C <sub>RSS</sub>    |                                                                                        |     | 25   |      | PF |
| Switching Characteristics (Note 4) |                     |                                                                                        |     |      |      |    |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DS</sub> =30V,I <sub>D</sub> =4.5A<br>V <sub>GS</sub> =10V,R <sub>GEN</sub> =3Ω | -   | 4.7  | -    | nS |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                        | -   | 2.3  | -    | nS |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                        | -   | 15.7 | -    | nS |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                                        | -   | 1.9  | -    | nS |
| Total Gate Charge                  | Q <sub>g</sub>      | V <sub>DS</sub> =30V,I <sub>D</sub> =4.5A,<br>V <sub>GS</sub> =10V                     | -   | 8.5  | -    | nC |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                        | -   | 1.6  | -    | nC |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                        | -   | 2.2  | -    | nC |
| Drain-Source Diode Characteristics |                     |                                                                                        |     |      |      |    |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V,I <sub>S</sub> =3.7A                                               | -   | -    | 1.2  | V  |
| Diode Forward Current (Note 2)     | I <sub>S</sub>      |                                                                                        | -   | -    | 5    | A  |

## Notes:

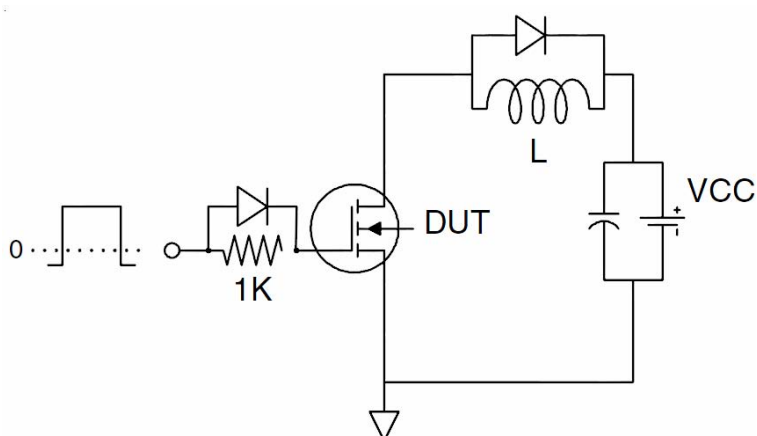
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

## Test Circuit

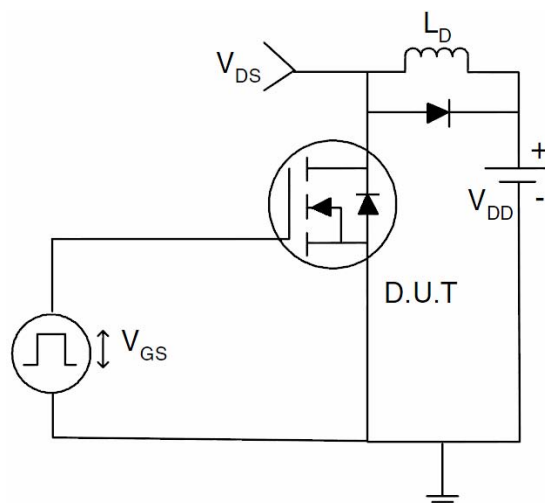
### 1) $E_{AS}$ test Circuit



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit



# Typical Electrical and Thermal Characteristics (Curves)

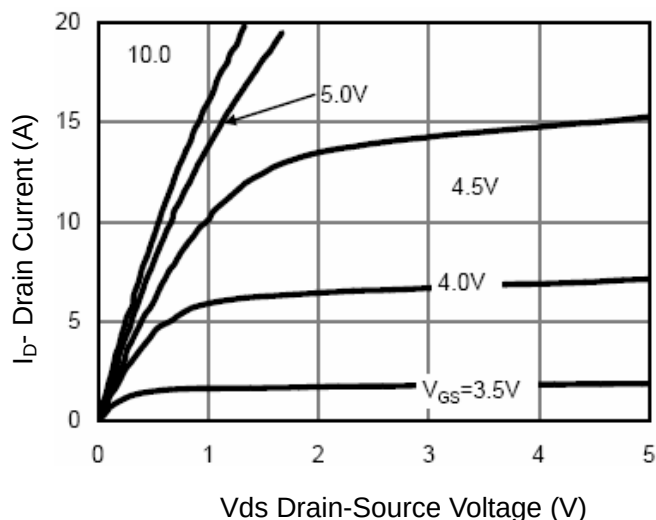


Figure 1 Output Characteristics

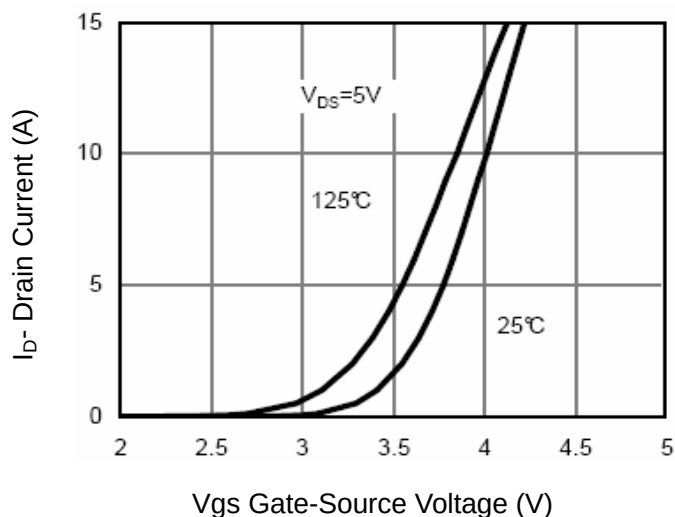


Figure 2 Transfer Characteristics

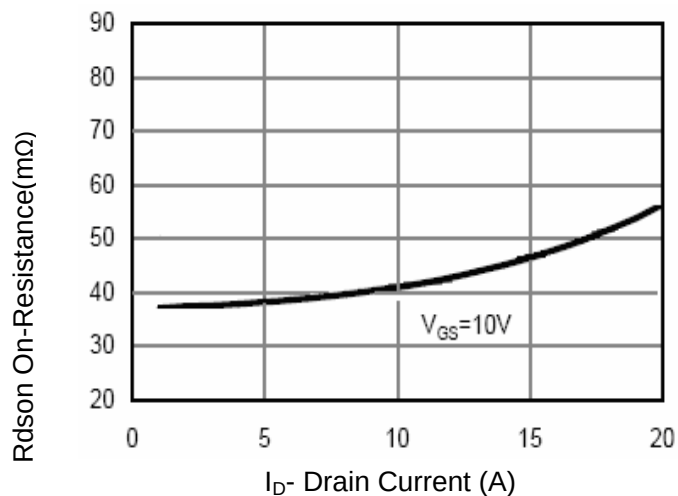


Figure 3  $R_{DS(on)}$ - Drain Current

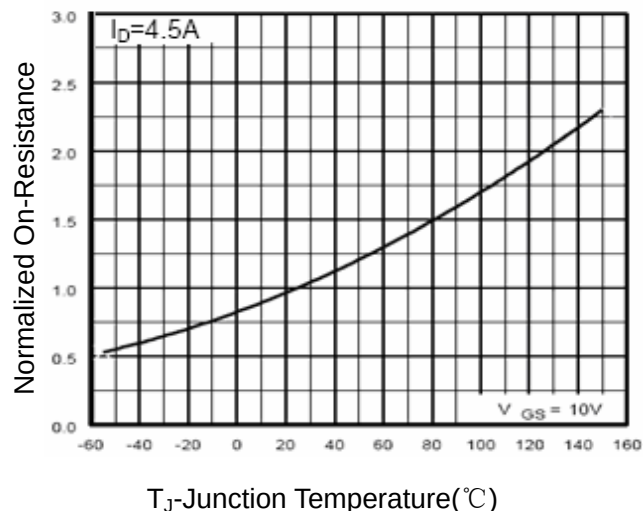


Figure 4  $R_{DS(on)}$ -Junction Temperature

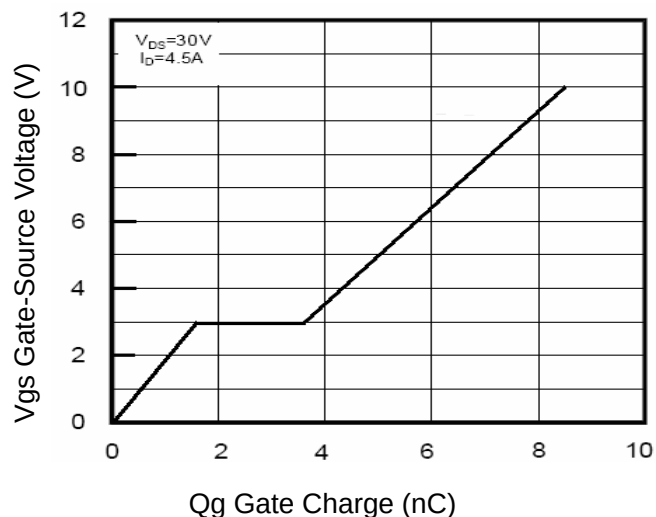


Figure 5 Gate Charge

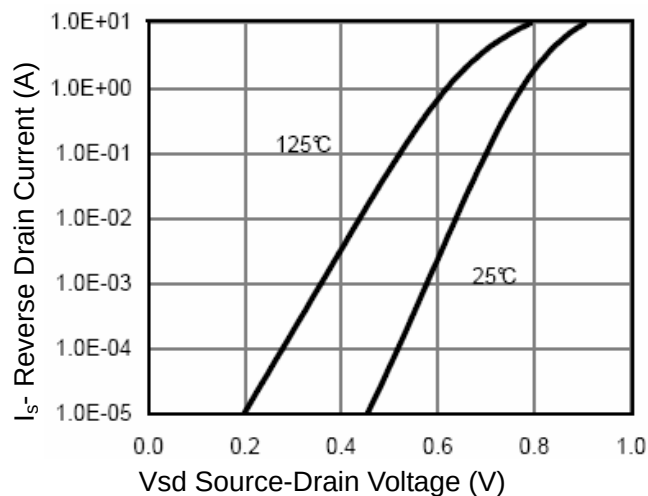


Figure 6 Source- Drain Diode Forward

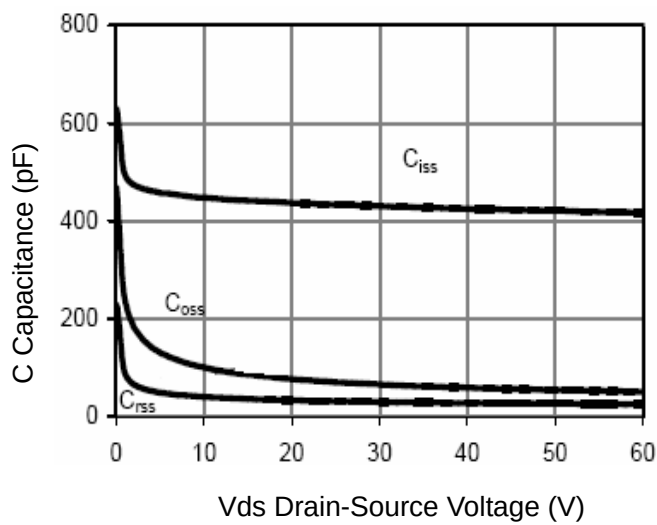


Figure 7 Capacitance vs Vds

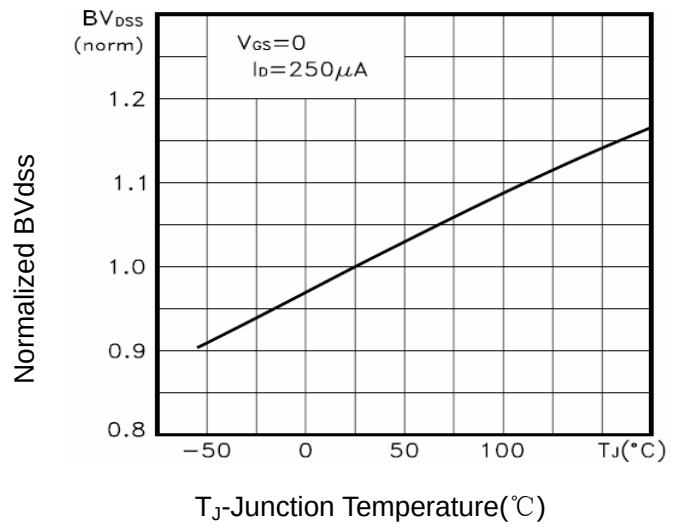


Figure 9  $BV_{DSS}$  vs Junction Temperature

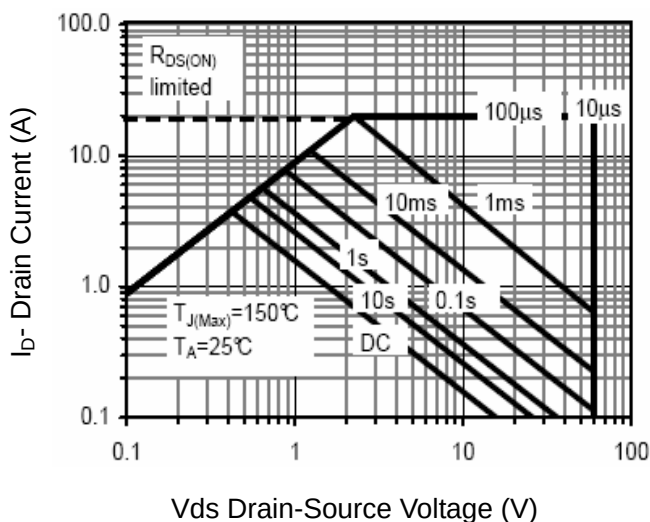


Figure 8 Safe Operation Area

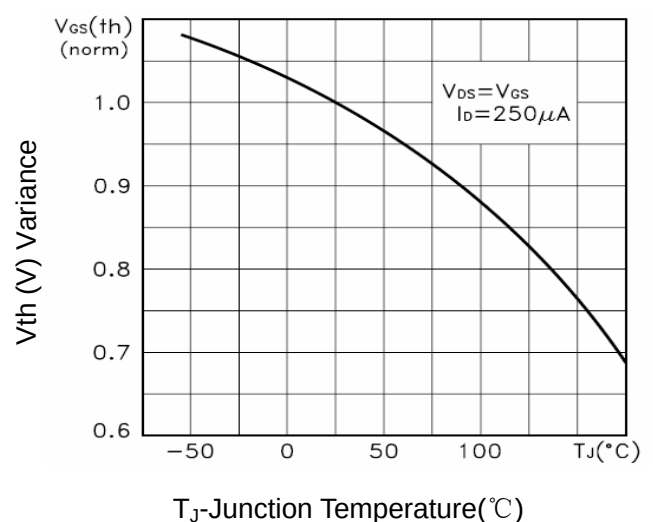


Figure 10  $V_{GS(th)}$  vs Junction Temperature

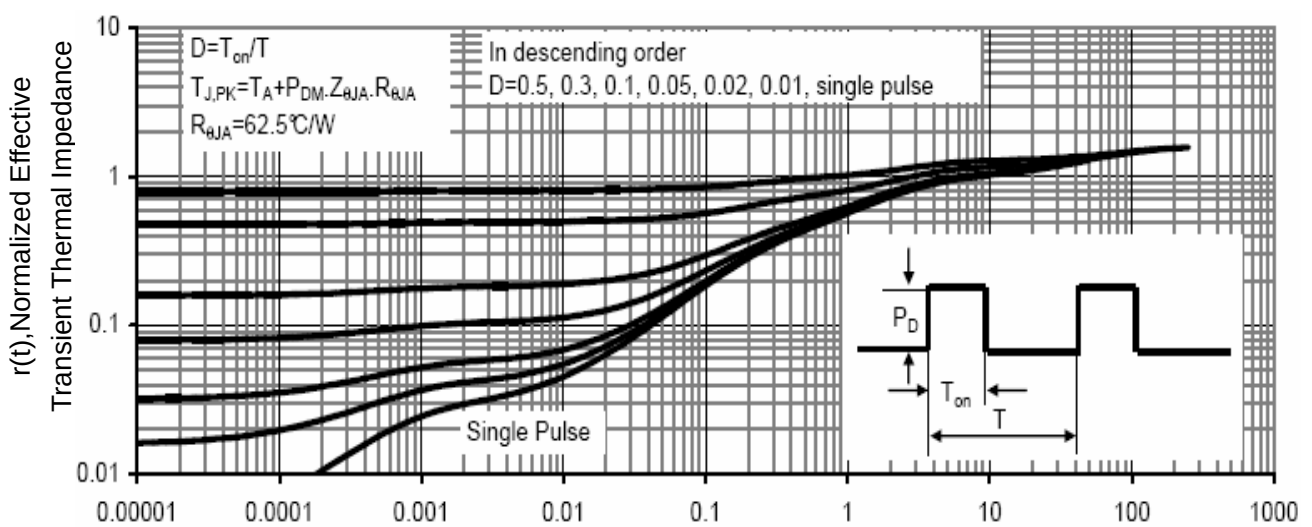
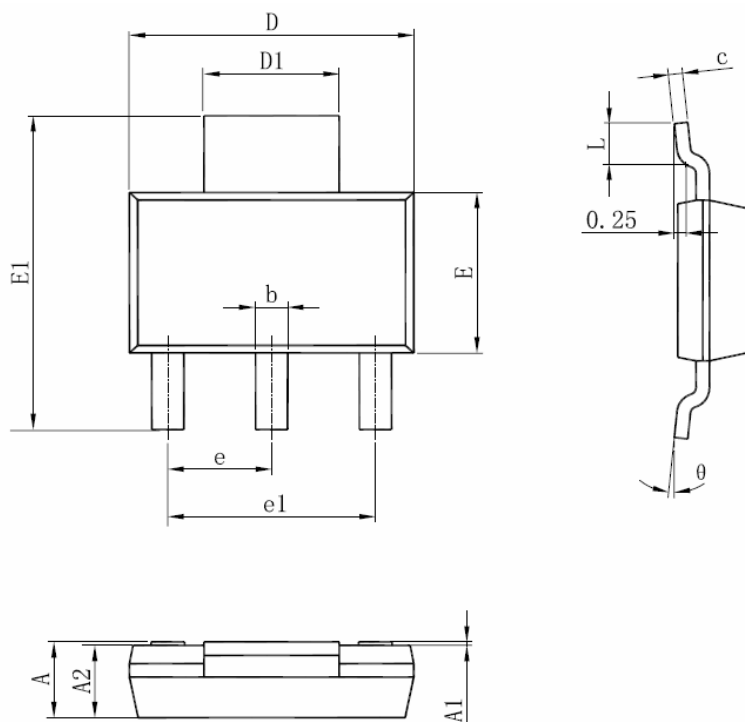


Figure 11 Normalized Maximum Transient Thermal Impedance

# SOT-223-3L Package Information



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.520                     | 1.800 | 0.060                | 0.071 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.500                     | 1.700 | 0.059                | 0.067 |
| b      | 0.660                     | 0.820 | 0.026                | 0.032 |
| c      | 0.250                     | 0.350 | 0.010                | 0.014 |
| D      | 6.200                     | 6.400 | 0.244                | 0.252 |
| D1     | 2.900                     | 3.100 | 0.114                | 0.122 |
| E      | 3.300                     | 3.700 | 0.130                | 0.146 |
| E1     | 6.830                     | 7.070 | 0.269                | 0.278 |
| e      | 2.300(BSC)                |       | 0.091(BSC)           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 0.900                     | 1.150 | 0.035                | 0.045 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |

## 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.