

N-Channel Enhancement Mode Power MOSFET

Description

The HM4444 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

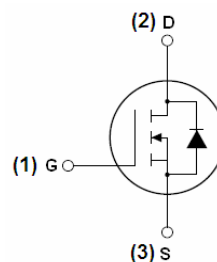
- $V_{DS} = 80V, I_D = 12.5A$
 $R_{DS(ON)} < 16m\Omega @ V_{GS} = 10V$ (Typ: 13m Ω)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

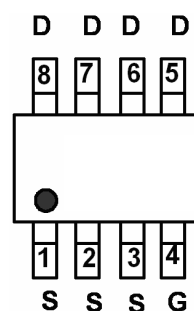
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

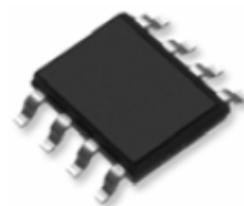
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin Assignment



SOP-8 top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|--------|----------------|-----------|------------|----------|
| HM4444 | HM4444 | SOP-8 | - | | |

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

| Parameter | Symbol | Limit | Unit |
|---|--------------------|------------|---------------|
| Drain-Source Voltage | V_{DS} | 80 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 12.5 | A |
| Drain Current-Continuous($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | 8.75 | A |
| Pulsed Drain Current | I_{DM} | 37.5 | A |
| Maximum Power Dissipation | P_D | 3 | W |
| Derating factor | | 0.73 | W/ $^\circ C$ |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 450 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|--|-----------------|------|--------------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 1.36 | $^\circ C/W$ |
|--|-----------------|------|--------------|

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

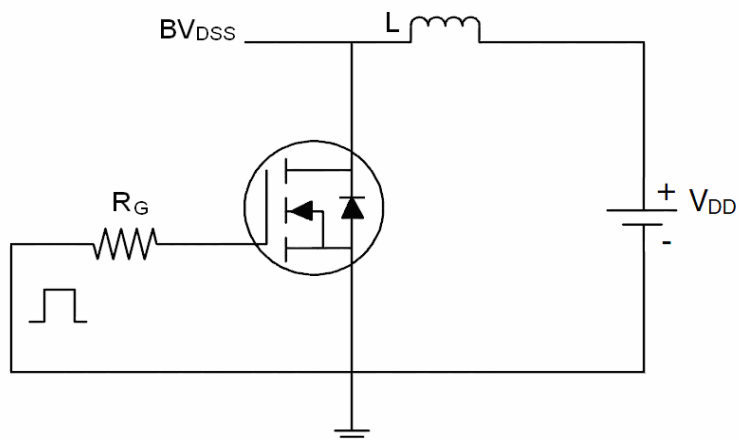
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 80 | - | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=80V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1.2 | 1.7 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=20A$ | - | 13 | 16 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=10V, I_D=20A$ | 28 | - | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=25V, V_{GS}=0V,$ $F=1.0\text{MHz}$ | - | 2350 | - | PF |
| Output Capacitance | C_{OSS} | | - | 337 | - | PF |
| Reverse Transfer Capacitance | C_{RSS} | | - | 165 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=40V, I_D=2A, R_L=2\Omega$ $V_{GS}=10V, R_G=3\Omega$ | - | 12 | - | nS |
| Turn-on Rise Time | t_r | | - | 9 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 20 | - | nS |
| Turn-Off Fall Time | t_f | | - | 18 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=40V, I_D=20A,$ $V_{GS}=10V$ | - | 55 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 13 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 16 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage | V_{SD} | $V_{GS}=0V, I_S=20A$ | - | - | 1.2 | V |
| Diode Forward Current | I_S | | - | - | 12.5 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^{\circ}\text{C}, I_F = 20A$ $di/dt = 100A/\mu s$ (Note 3) | - | 21 | | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 65 | | nC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

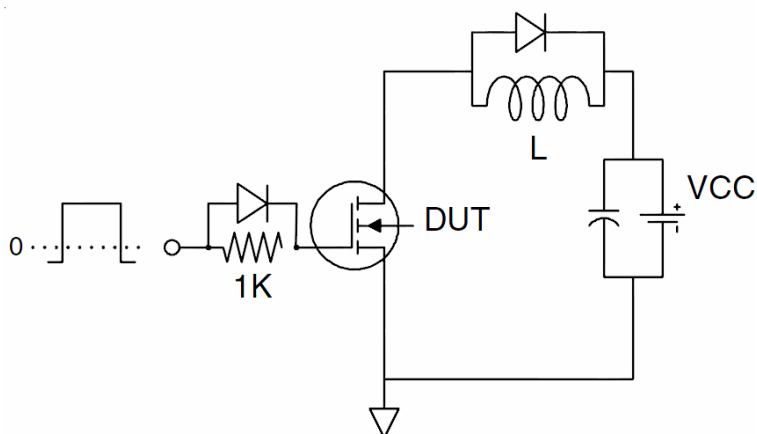
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

Test Circuit

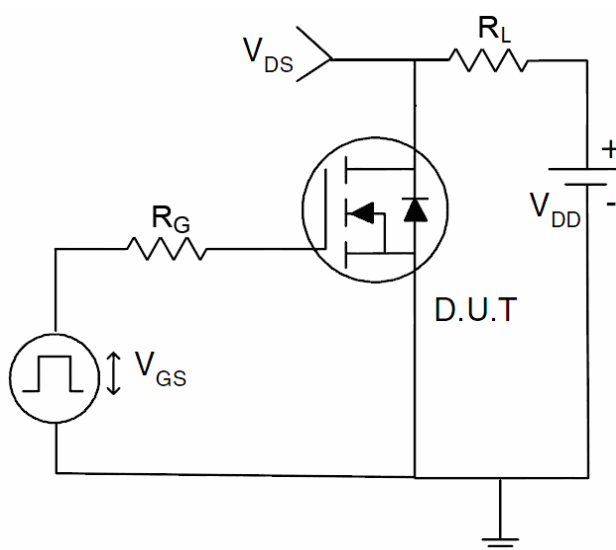
1) E_{AS} test Circuits



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

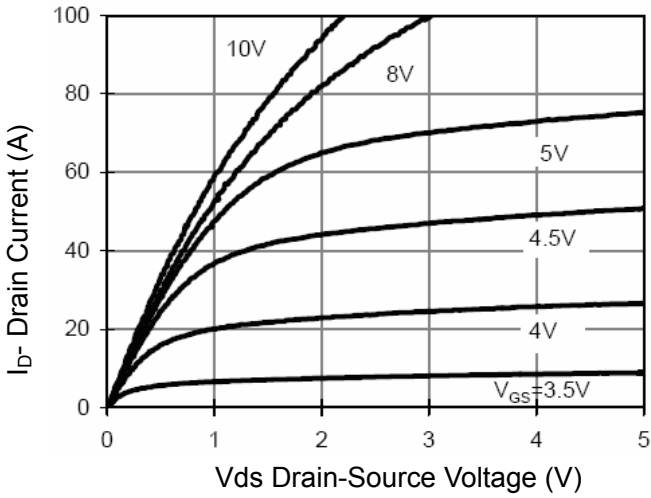


Figure 1 Output Characteristics

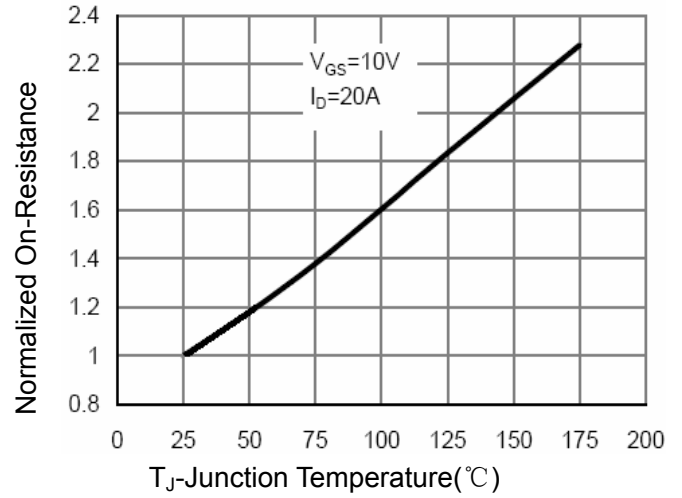


Figure 4 Rdson-Junction Temperature

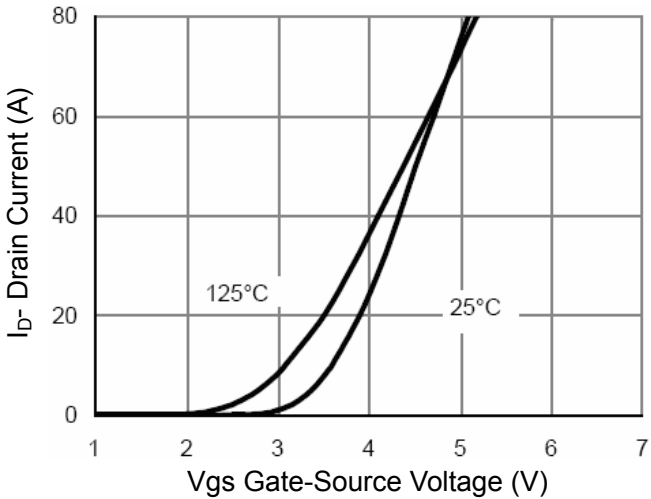


Figure 2 Transfer Characteristics

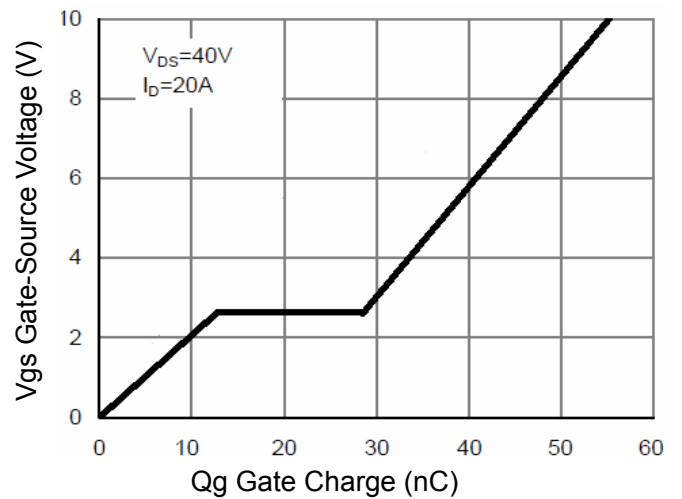


Figure 5 Gate Charge

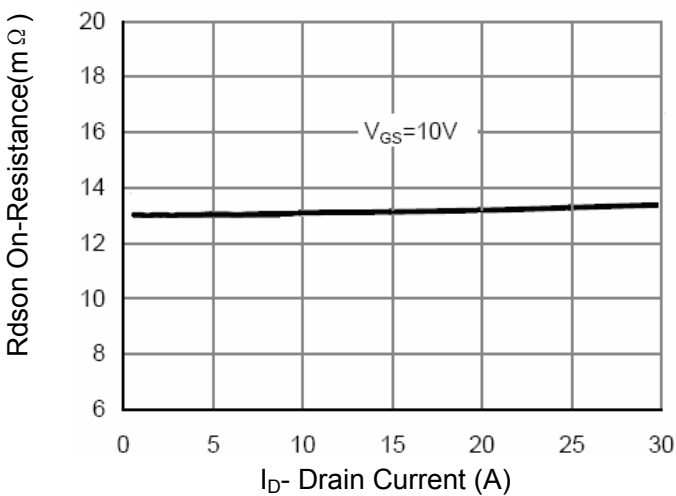


Figure 3 Rdson- Drain Current

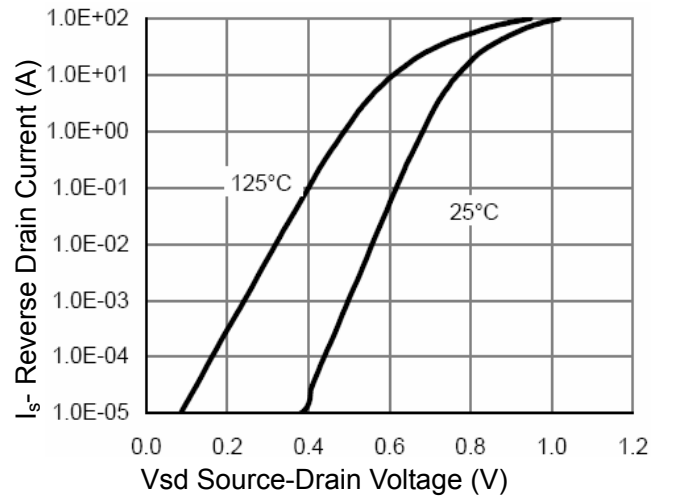


Figure 6 Source- Drain Diode Forward

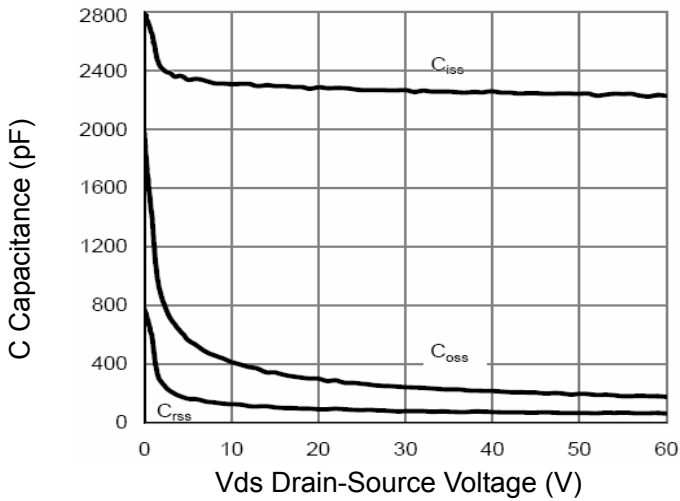


Figure 7 Capacitance vs Vds

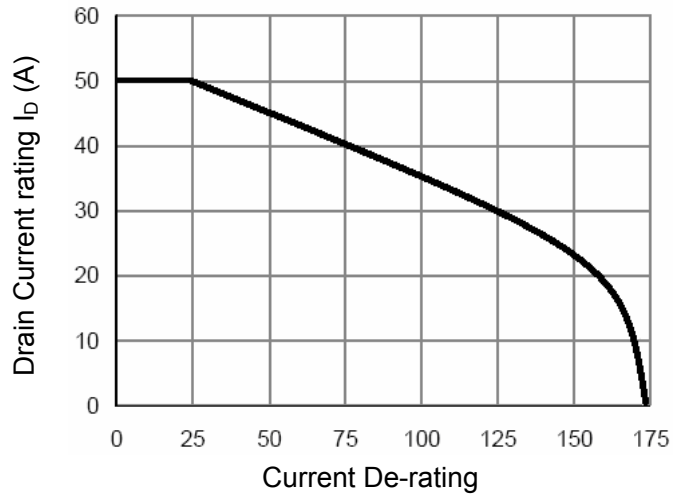


Figure 9 Drain Current vs Junction Temperature

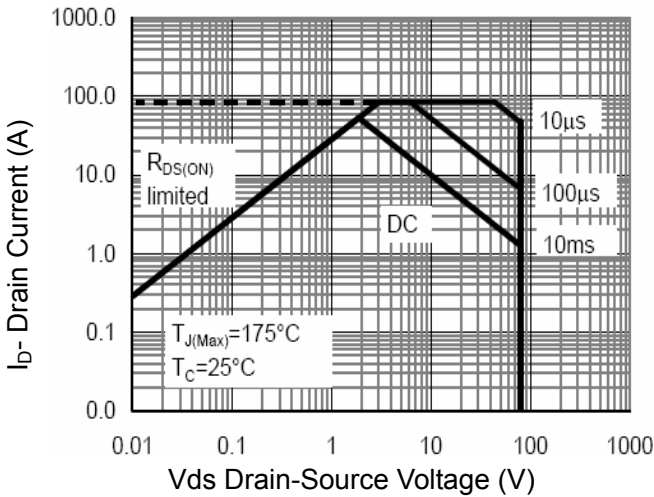


Figure 8 Safe Operation Area

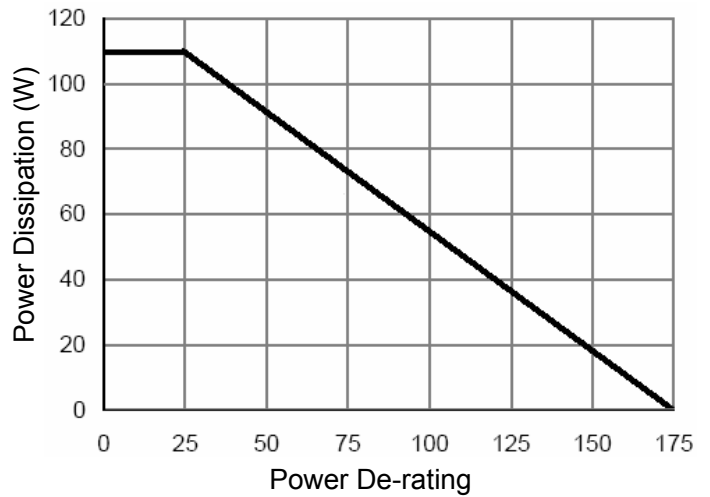


Figure 10 Power vs Junction Temperature

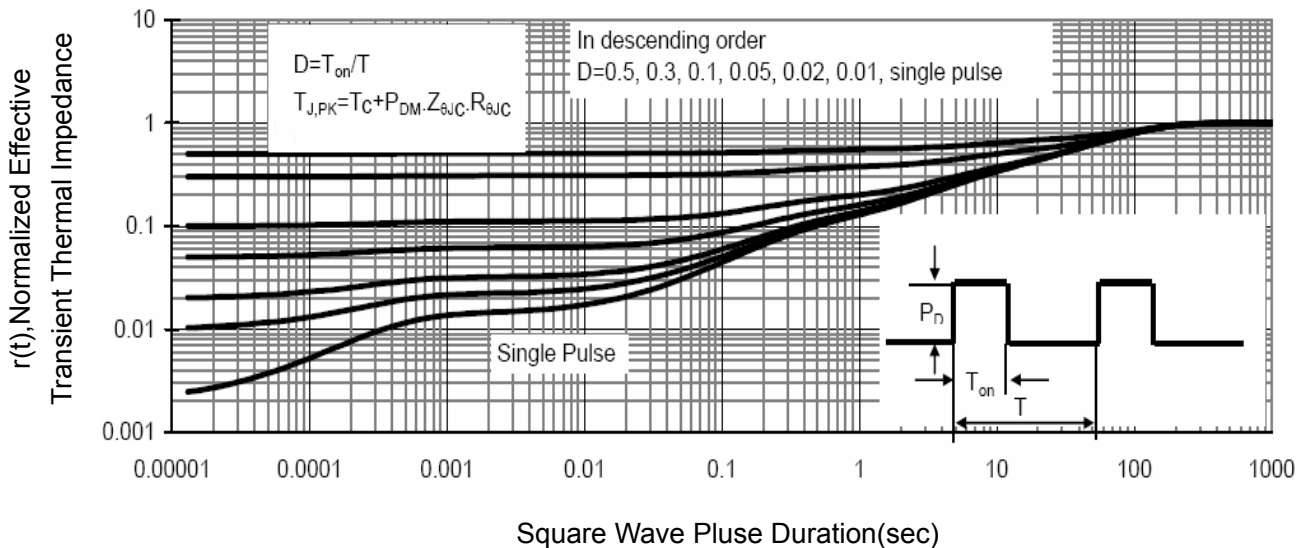
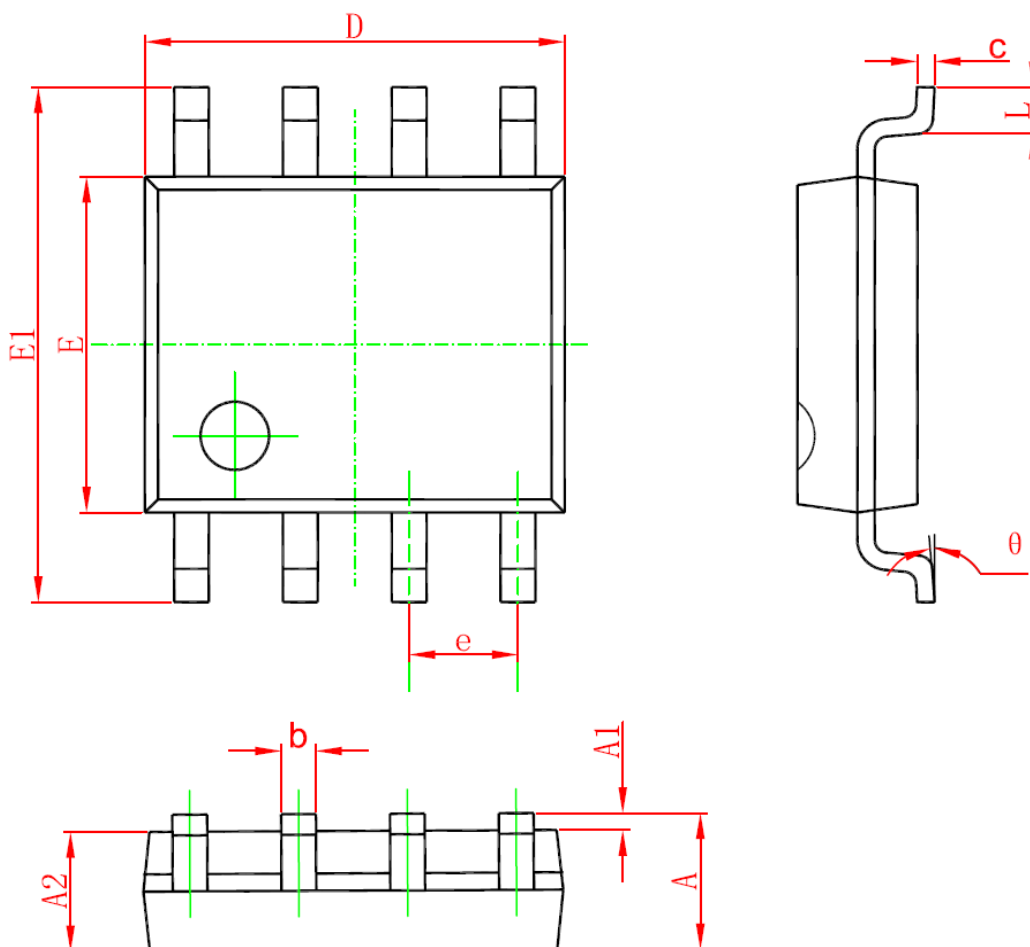


Figure 11 Normalized Maximum Transient Thermal Impedance

SOP-8 PACKAGE IN FORMATION



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

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