## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_A$ = +25°C |
|---|---|---|
| 60V | 14.3mΩ @ $V_{GS}$ = 10V | 10A |
| | 21mΩ @ $V_{GS}$ = 4.5V | 8.1A |

## Features and Benefits

- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- High Conversion Efficiency
- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Description and Applications

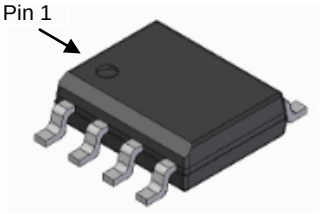
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and maintain superior switching performance, making it ideal for high efficiency power management applications.

- High Frequency Switching
- Synchronous Rectification
- DC-DC Converters

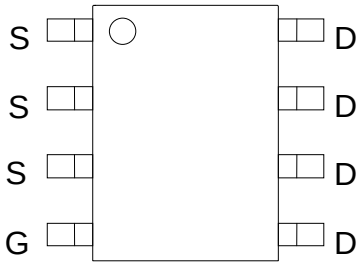
## Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.076 grams (Approximate)

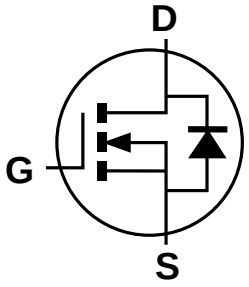
SO-8




Top View




Pin-Out
Top View



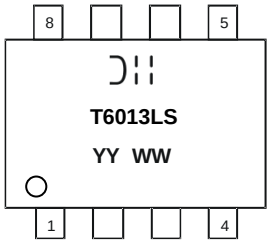

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMT6013LSS-13 | SO-8 | 2500/Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information




= Manufacturer's Marking
T6013LS = Product Type Marking Code
YYWW = Date Code Marking
YY or $\overline{YY}$ = Year (ex: 19 = 2019)
WW = Week (01 to 53)

## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 10V | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 10<br>7.8 | A |
| Continuous Drain Current (Note 6) $V_{GS}$ = 4.5V | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 8.1<br>6.5 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | $I_{DM}$ | 60 | A |
| Maximum Continuous Body Diode Forward Current | | $I_S$ | 10 | A |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | | $I_{SM}$ | 60 | A |
| Avalanche Current (Note 7) L = 0.1mH | | $I_{AS}$ | 17.1 | A |
| Avalanche Energy (Note 7) L = 0.1mH | | $E_{AS}$ | 14.6 | mJ |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Total Power Dissipation (Note 5) | $P_D$ | 1.4 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 89.8 | °C/W |
| Total Power Dissipation (Note 6) | $P_D$ | 2.1 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 60.4 | °C/W |
| Thermal Resistance, Junction to Case (Note 6) | $R_{\theta JC}$ | 25.7 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 8)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 60 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 48V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | — | 2.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 11.2 | 14.3 | mΩ | $V_{GS}$ = 10V, $I_D$ = 10A |
| | | — | 16.1 | 21 | | $V_{GS}$ = 4.5V, $I_D$ = 6A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.7 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 1A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 1081 | — | pF | $V_{DS}$ = 30V, $V_{GS}$ = 0V, f = 1MHz |
| Output Capacitance | $C_{oss}$ | — | 253 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 22 | — | | |
| Gate Resistance | $R_g$ | — | 1.22 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 8.5 | — | nC | $V_{DS}$ = 30V, $I_D$ = 10A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 15 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 2.2 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 4.4 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 4.3 | — | ns | $V_{GS}$ = 10V, $V_{DS}$ = 30V, $R_G$ = 6Ω, $I_D$ = 10A |
| Turn-On Rise Time | $t_R$ | — | 6.5 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 15.8 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 6.1 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 19.7 | — | ns | $I_F$ = 10A, di/dt = 100A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 9.5 | — | nC | |

Notes: 5. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
7. $I_{AS}$ and $E_{AS}$ ratings are based on low frequency and duty cycles to keep $T_J$ = +25°C.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

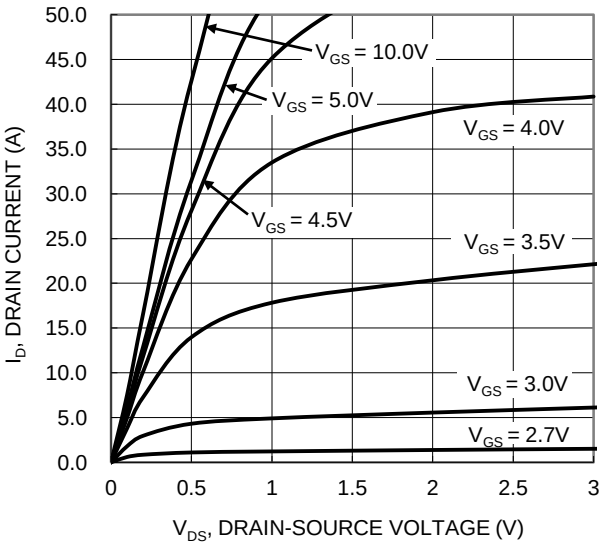



Figure 1. Typical Output Characteristic

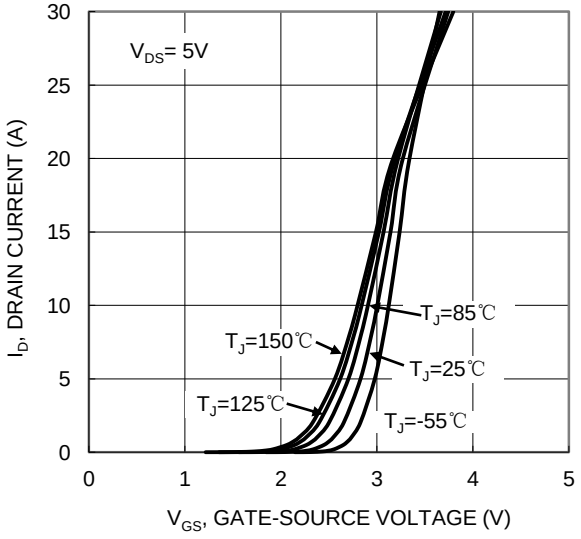



Figure 2. Typical Transfer Characteristic

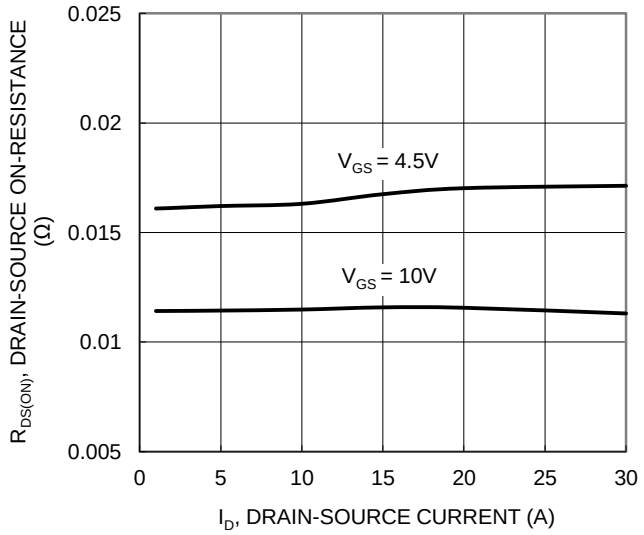



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

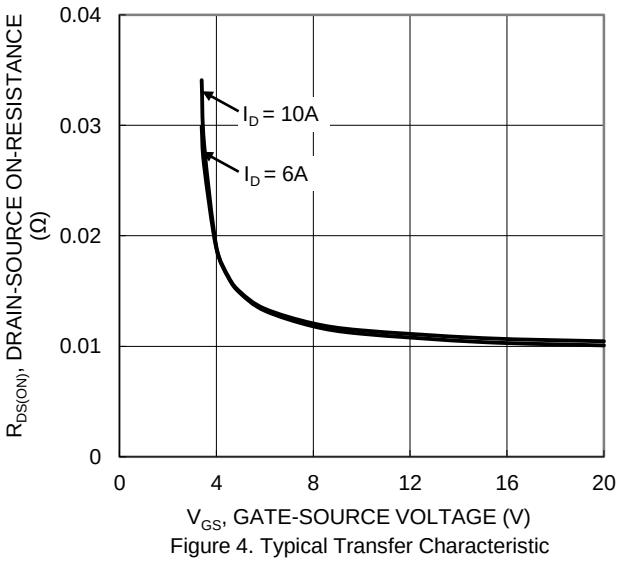



Figure 4. Typical Transfer Characteristic

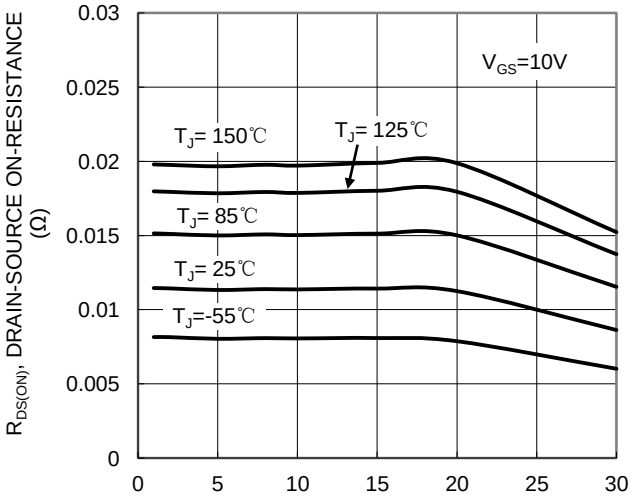



Figure 5. Typical On-Resistance vs .Drain Current and Temperature

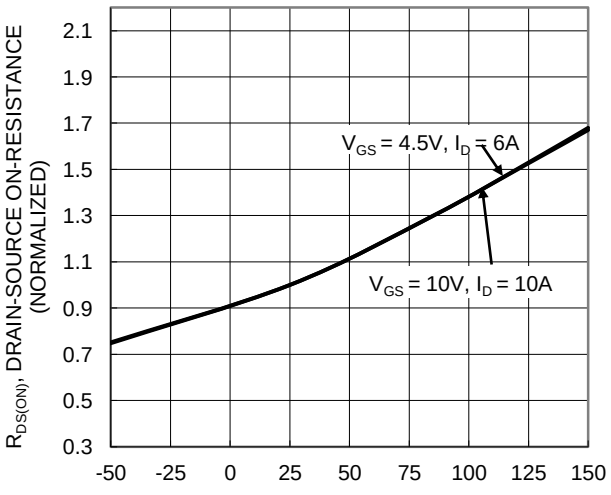



Figure 6. On-Resistance Variation with Junction Temperature

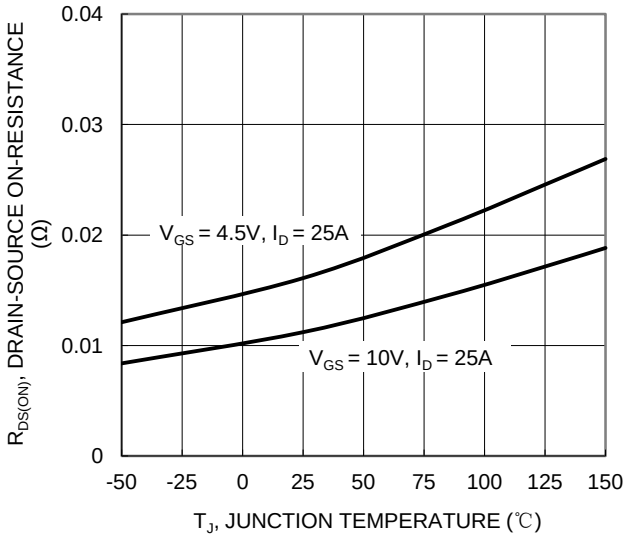



Figure 7. On-Resistance Variation with Temperature

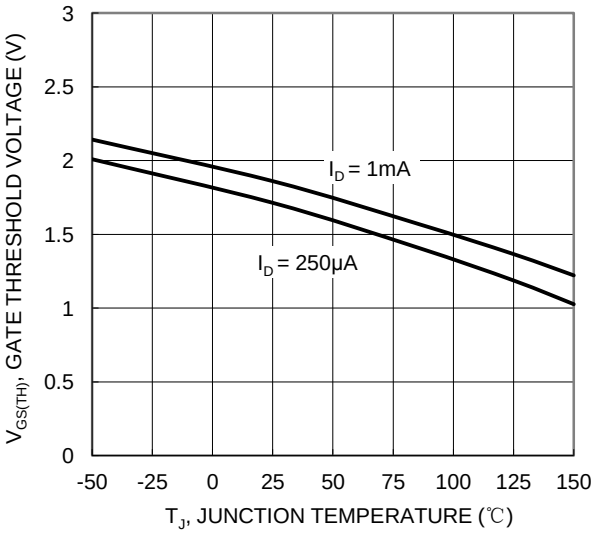



Figure 8. Gate Threshold Variation vs. Temperature

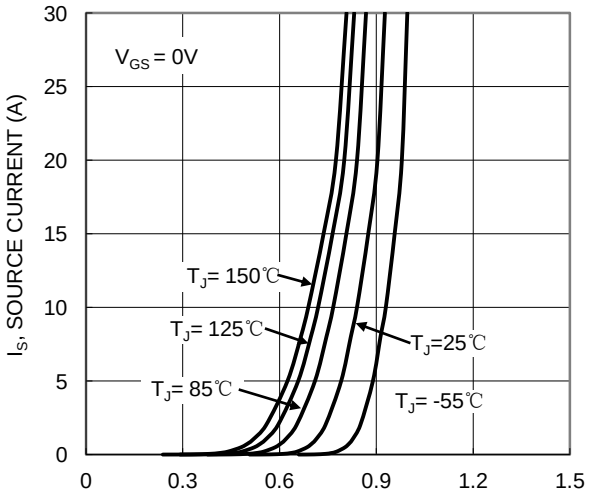



Figure 9. Diode Forward Voltage vs. Current

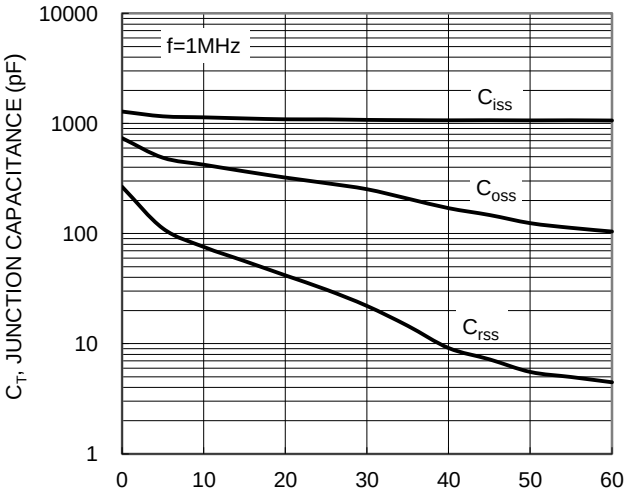



Figure 10. Typical Junction Capacitance

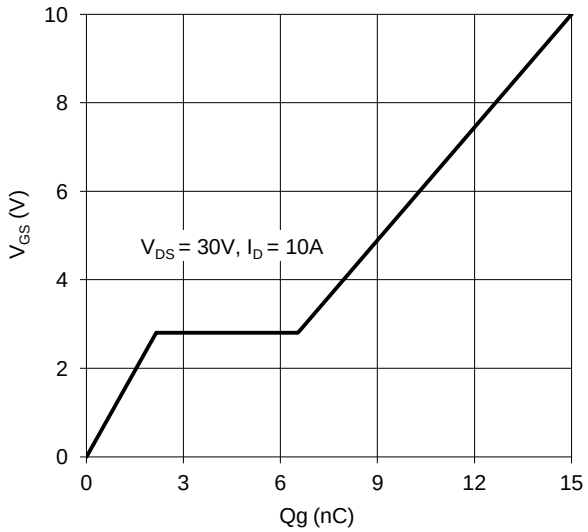



Figure 11. Gate Charge

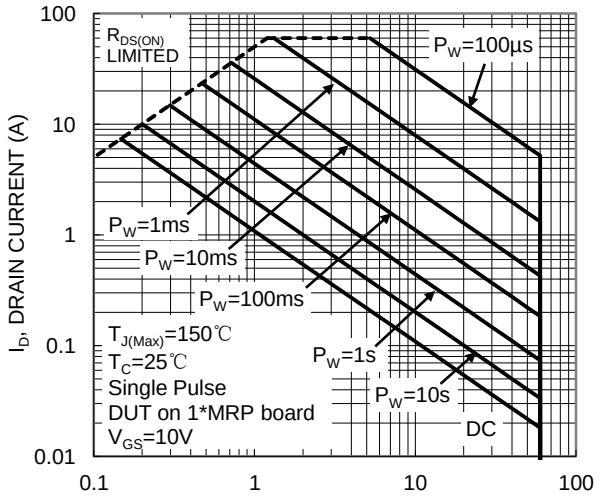



Figure 12. SOA, Safe Operation Area

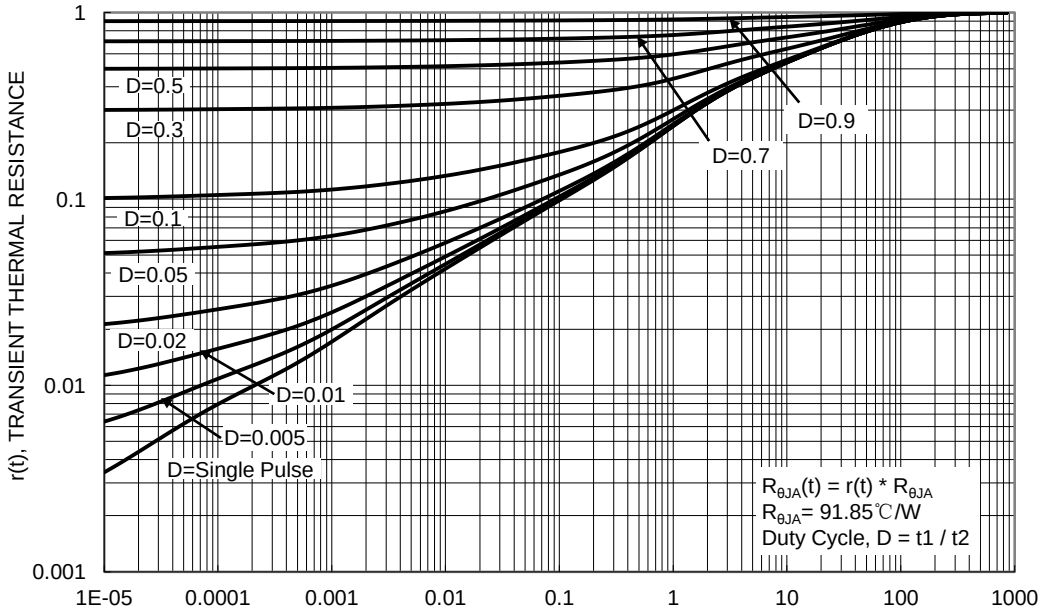
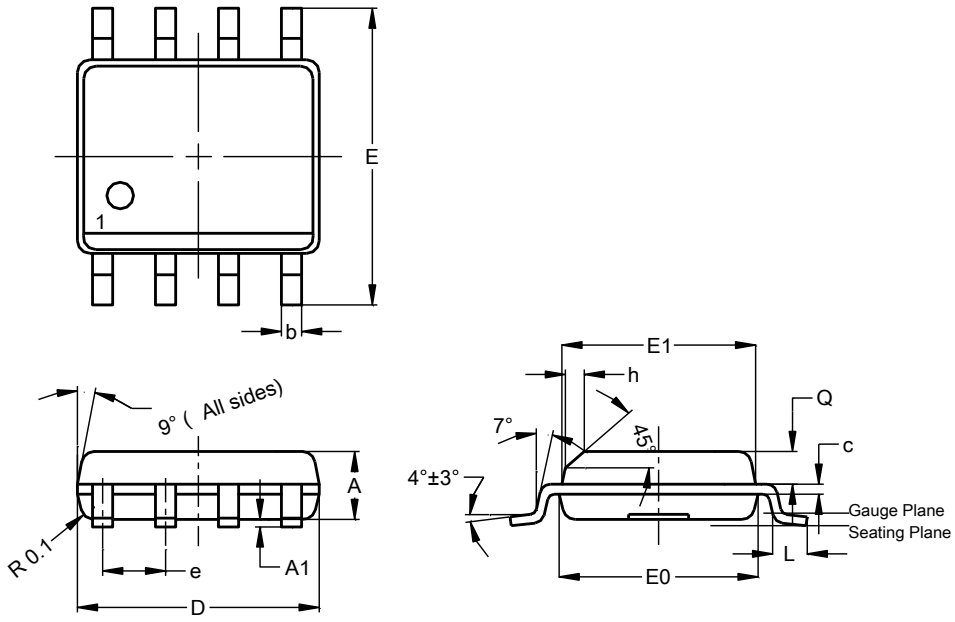



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SO-8**

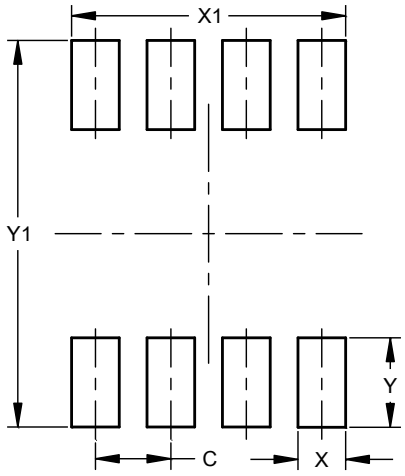



| SO-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.40 | 1.50 | 1.45 |
| **A1** | 0.10 | 0.20 | 0.15 |
| **b** | 0.30 | 0.50 | 0.40 |
| **c** | 0.15 | 0.25 | 0.20 |
| **D** | 4.85 | 4.95 | 4.90 |
| **E** | 5.90 | 6.10 | 6.00 |
| **E1** | 3.80 | 3.90 | 3.85 |
| **E0** | 3.85 | 3.95 | 3.90 |
| **e** | -- | -- | 1.27 |
| **h** | - | -- | 0.35 |
| **L** | 0.62 | 0.82 | 0.72 |
| **Q** | 0.60 | 0.70 | 0.65 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SO-8**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 1.27 |
| **X** | 0.802 |
| **X1** | 4.612 |
| **Y** | 1.505 |
| **Y1** | 6.50 |

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