## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_C$ = +25°C |
|---|---|---|
| 30V | 2.7mΩ @ $V_{GS}$ = 10V | 78A |
| | 4mΩ @ $V_{GS}$ = 4.5V | 64A |

## Description and Applications

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

- Backlighting
- Power Management Functions
- DC-DC Converters

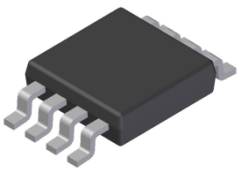
## Features and Benefits

- Low $R_{DS(ON)}$ – Minimizes On-State Losses
- Excellent $Q_{gd}$ x $R_{DS(ON)}$ Product (FOM)
- Advanced Technology for DC-DC Converters
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- 100% Unclamped Inductive Switching (UIS) Test in Production – Ensures More Reliable and Robust End Application
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

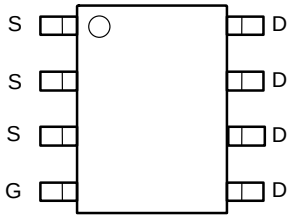
## Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections Indicator: See Diagram Below
- Terminals: Finish — Matte Tin Annealed over Copper Lead Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (Approximate)

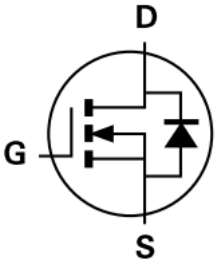
SO-8



Top View




Top View
Pin Configuration



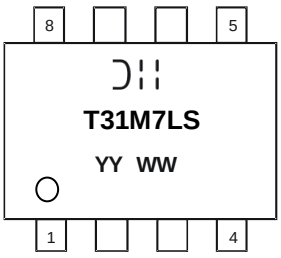

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMT31M7LSS-13 | SO-8 | 2,500/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
T31M7LS = Product Type Marking Code
YYWW = Date Code Marking
YY or YY = Year (ex: 21 = 2021)
WW or WW= Week (01 to 53)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## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current, $V_{GS}$ = 10V (Note 6) | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 25<br>20 | A |
| Continuous Drain Current, $V_{GS}$ = 10V (Note 7) | $T_C$ = +25°C<br>$T_C$ = +70°C | $I_D$ | 78<br>63 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | $I_S$ | 3.3 | A |
| Pulsed Drain Current (380µs Pulse, Duty Cycle = 1%) | | $I_{DM}$ | 150 | A |
| Pulsed Body Diode Forward Current (380µs Pulse, Duty Cycle = 1%) | | $I_{SM}$ | 150 | A |
| Avalanche Current, L=0.1mH (Note 8) | | $I_{AS}$ | 59 | A |
| Avalanche Energy, L=0.1mH (Note 8) | | $E_{AS}$ | 176 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 1.7 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 73 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 2.2 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 56 | °C/W |
| Thermal Resistance, Junction to Case (Note 7) | $T_C$ = +25°C | $R_{\theta JC}$ | 5.9 | °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 9)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 30 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 24V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±16V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 9)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.0 | — | 3.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 2.1 | 2.7 | mΩ | $V_{GS}$ = 10V, $I_D$ = 20A |
| | | — | 2.6 | 4 | | $V_{GS}$ = 4.5V, $I_D$ = 20A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.7 | 1.0 | V | $V_{GS}$ = 0V, $I_S$ = 2A |
| **DYNAMIC CHARACTERISTICS (Note 10)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 5492 | — | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 2261 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 317 | — | | |
| Gate Resistance | $R_g$ | — | 1.6 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 84 | — | nC | $V_{DD}$ = 15V, $I_D$ = 20A |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 43 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 13 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 12 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 15 | — | ns | $V_{DD}$ = 15V, $V_{GS}$ = 10V, $R_g$ = 3Ω, $I_D$ = 20A |
| Turn-On Rise Time | $t_R$ | — | 7 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 55 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 41 | — | | |
| Reverse Recovery Time | $t_{RR}$ | — | 33 | — | ns | $I_F$ = 15A, dI/dt = 500A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 55 | — | nC | $I_F$ = 15A, dI/dt = 500A/µs |

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. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. $I_{AS}$ and $E_{AS}$ ratings are based on low frequency and duty cycles to keep $T_J$ = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.


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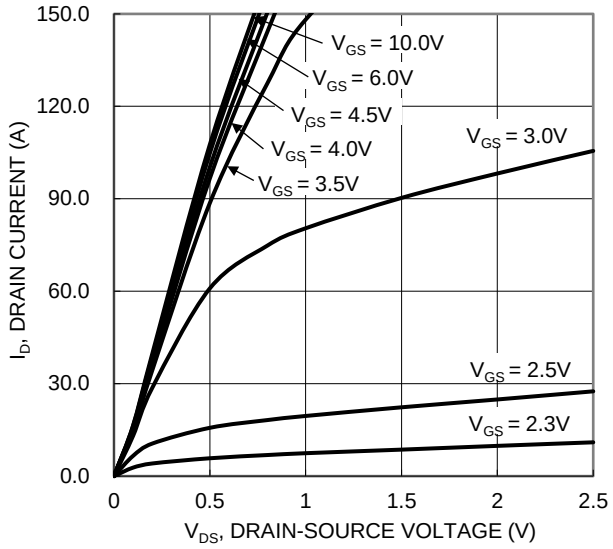

Figure 1. Typical Output Characteristic

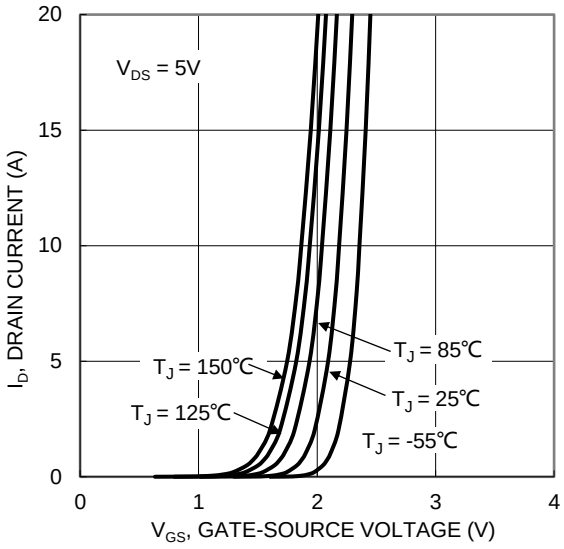

Figure 2. Typical Transfer Characteristic

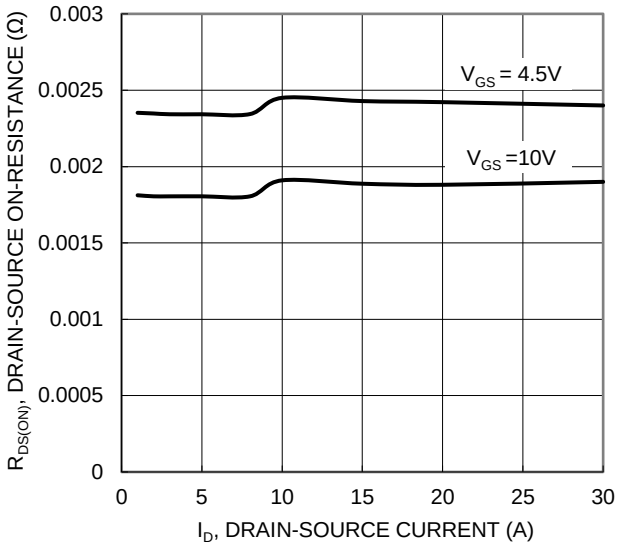

Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

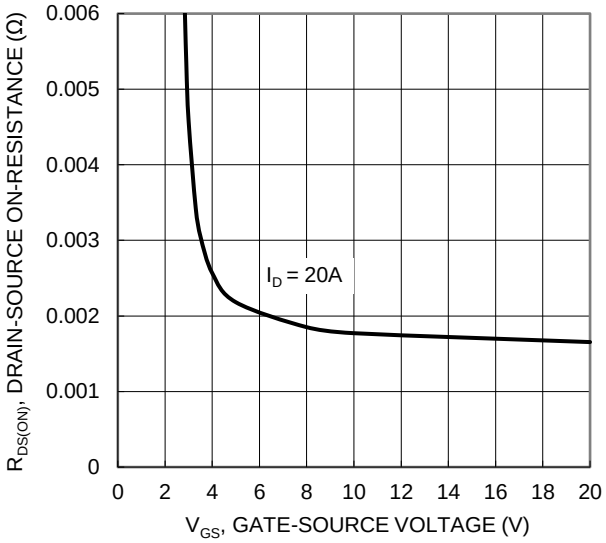

Figure 4. Typical Transfer Characteristic

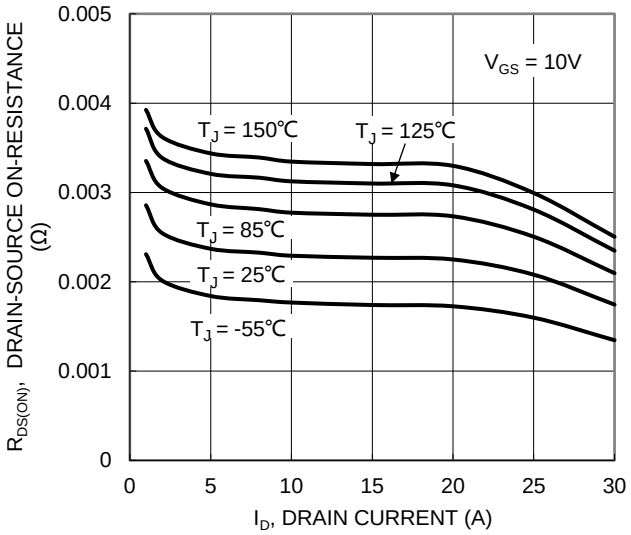

Figure 5. Typical On-Resistance vs. Drain Current and Temperature

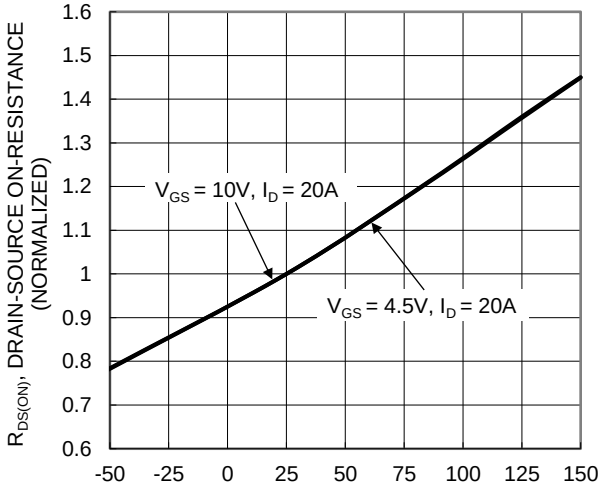

Figure 6. On-Resistance Variation with Temperature


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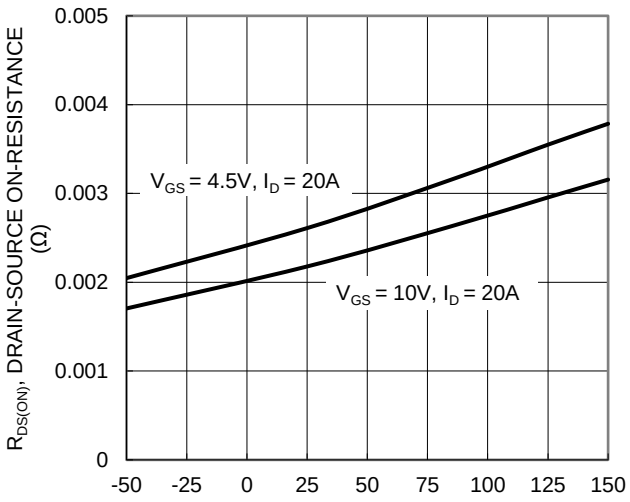

Figure 7. On-Resistance Variation with Temperature

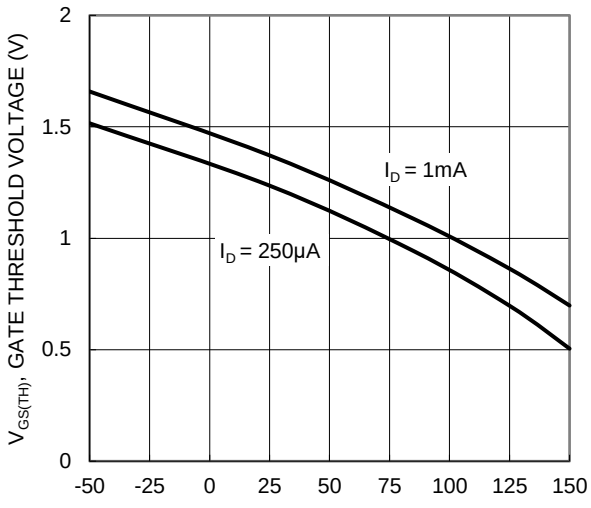

Figure 8. Gate Threshold Variation vs. Junction Temperature

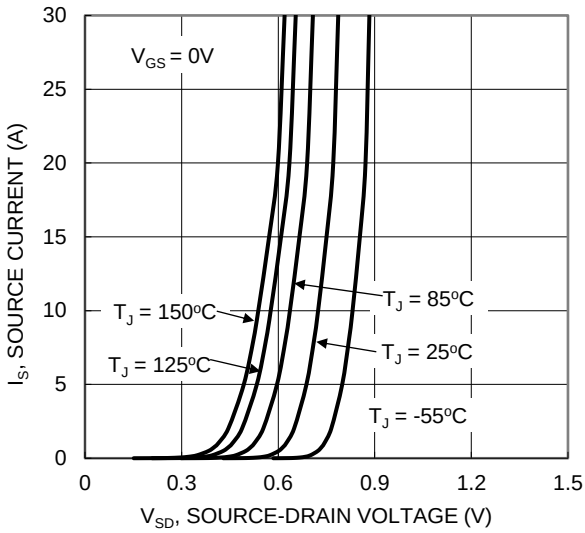

Figure 9. Diode Forward Voltage vs. Current

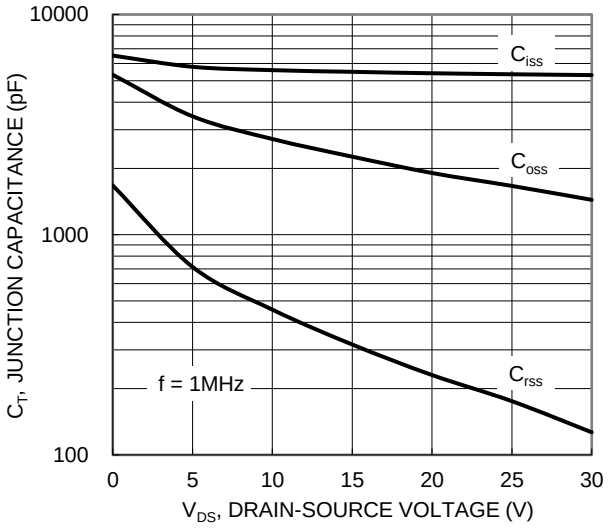

Figure 10. Typical Junction Capacitance

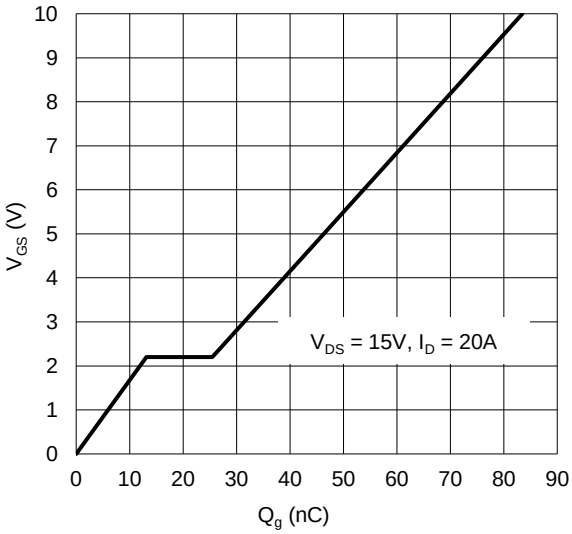

Figure 11. Gate Charge

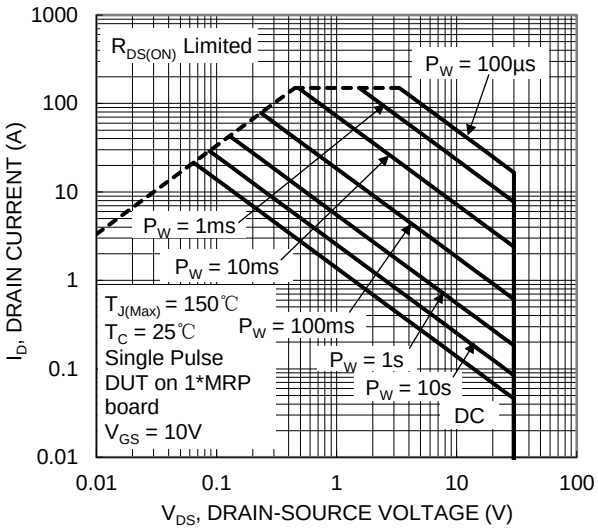

Figure 12. SOA, Safe Operation Area


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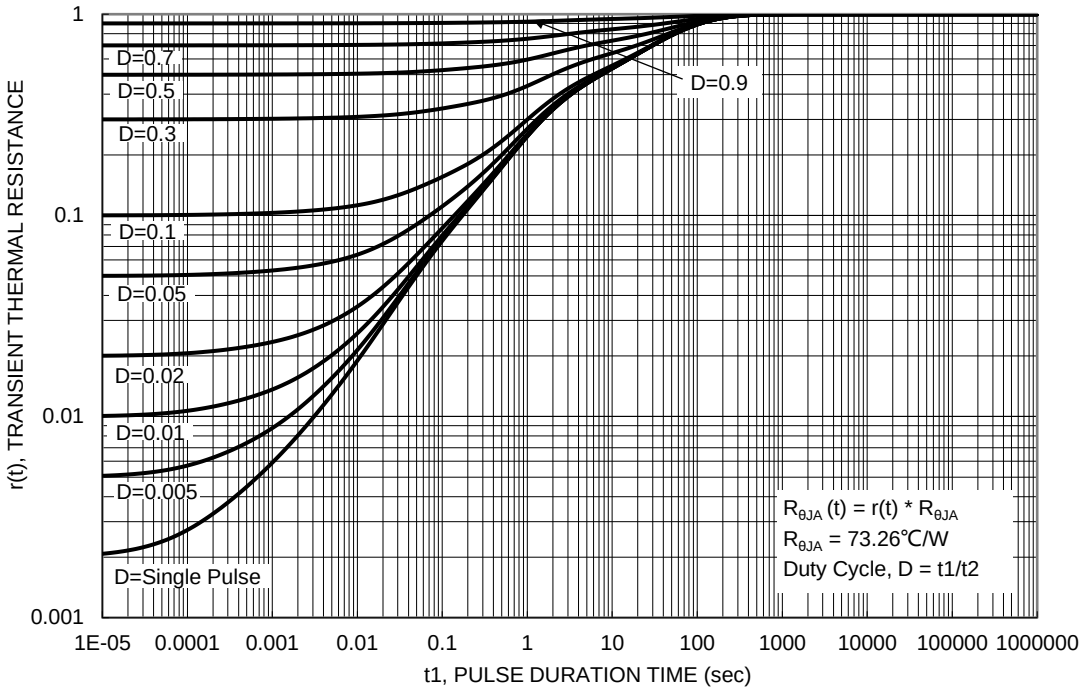


Figure 13. Transient Thermal Resistance


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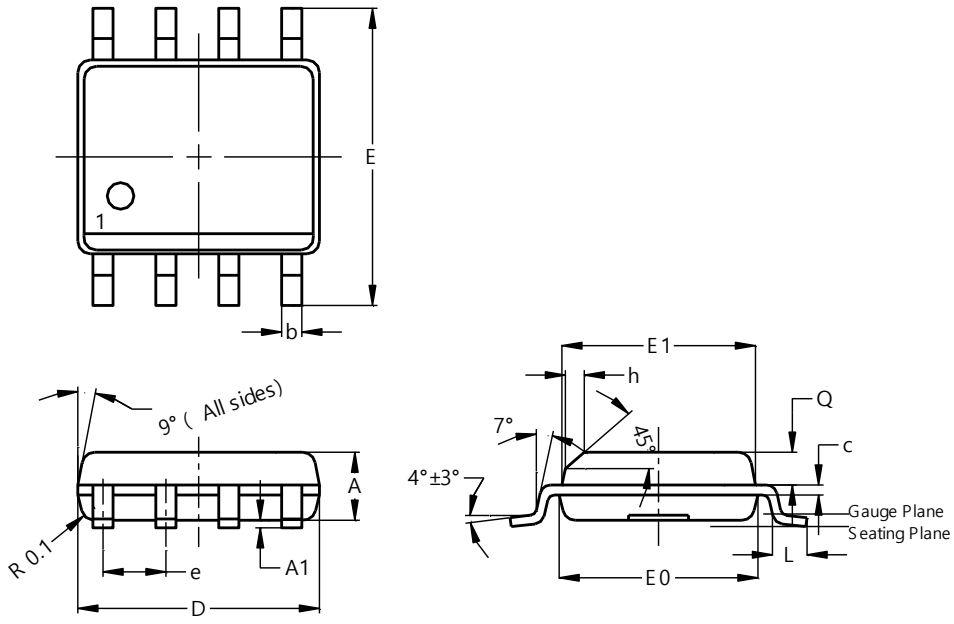
## Package Outline Dimensions

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

**SO-8**

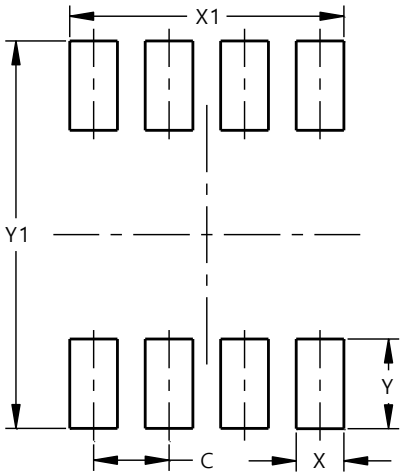



| SO-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.40 | 1.50 | 1.45 |
| **A1** | 0.10 | 0.20 | 0.15 |
| **b** | 0.30 | 0.50 | 0.40 |
| **c** | 0.15 | 0.25 | 0.20 |
| **D** | 4.85 | 4.95 | 4.90 |
| **E** | 5.90 | 6.10 | 6.00 |
| **E1** | 3.80 | 3.90 | 3.85 |
| **E0** | 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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