## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_C$ = +25°C |
|---|---|---|
| 20V | 11mΩ @ $V_{GS}$ = 4.5V | 21A |
| | 13mΩ @ $V_{GS}$ = 2.5V | 20A |

## Features and Benefits

- Low Gate Threshold Voltage
- Low On-Resistance
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Description and Applications

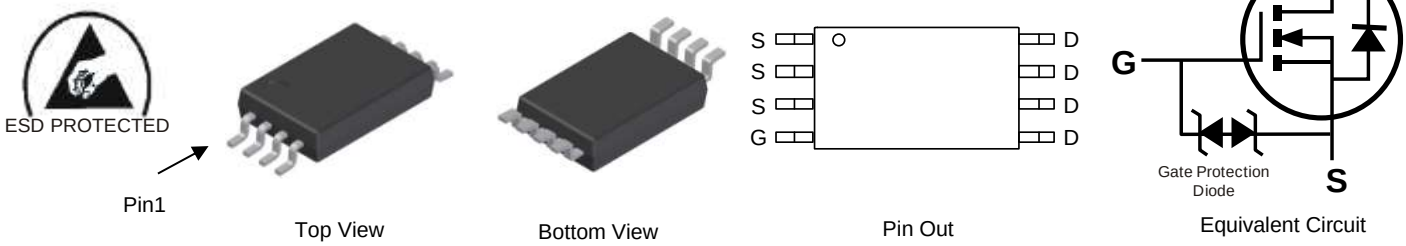
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Battery Management Application
- Power Management Functions
- DC-DC Converters

## Mechanical Data

- Case: TSSOP-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.039 grams (Approximate)

TSSOP-8



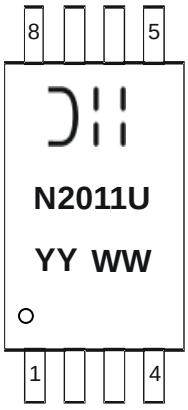

Top View | Bottom View | Pin Out | Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMN2011UTS-13 | TSSOP-8 | 2,500/Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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 http://www.diodes.com/products/packages.html.

## Marking Information




= Manufacturer's Marking
N2011U = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 17 = 2017)
WW = Week (01 to 53)

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 9.0<br>7.2 | A |
| | Steady State | $T_C$ = +25°C<br>$T_C$ = +70°C | $I_D$ | 21<br>17 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 70 | A |
| Continuous Source-Drain Diode Current (Note 6) | | | $I_S$ | 3 | A |
| Pulsed Source-Drain Diode Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{SM}$ | 25 | A |
| Avalanche Current (Note 7) L = 0.1mH | | | $I_{AS}$ | 18 | A |
| Avalanche Energy (Note 7) L = 0.1mH | | | $E_{AS}$ | 17 | mJ |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 0.9 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 144 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 1.3 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 93 | °C/W |
| Thermal Resistance, Junction to Case (Note 6) | Steady State | $R_{\theta JC}$ | 16 | |
| 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 | $BV_{DSS}$ | 20 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 16V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±10V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.4 | — | 1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 7.2 | 11 | mΩ | $V_{GS}$ = 4.5V, $I_D$ = 7A |
| | | | 9.0 | 13 | | $V_{GS}$ = 2.5V, $I_D$ = 7A |
| | | | 11.5 | 25 | | $V_{GS}$ = 1.8V, $I_D$ = 5A |
| | | | 19.1 | 50 | | $V_{GS}$ = 1.5V, $I_D$ = 3A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.7 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 8.5A |
| **DYNAMIC CHARACTERISTICS** (Note 9) | | | | | | |
| Input Capacitance | $C_{ISS}$ | — | 2,248 | — | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{OSS}$ | — | 295 | — | pF | |
| Reverse Transfer Capacitance | $C_{RSS}$ | — | 265 | — | pF | |
| Gate Resistance | $R_G$ | — | 1.5 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_G$ | — | 24 | — | nC | $V_{DS}$ = 10V, $I_D$ = 8.5A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_G$ | — | 56 | — | nC | |
| Gate-Source Charge | $Q_{GS}$ | — | 3.5 | — | nC | |
| Gate-Drain Charge | $Q_{GD}$ | — | 5.1 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.6 | — | ns | $V_{DS}$ = 10V, $I_D$ = 8.5A<br>$V_{GS}$ = 4.5V, $R_G$ = 1.8Ω |
| Turn-On Rise Time | $t_R$ | — | 2.6 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 21.6 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 13.5 | — | ns | |
| Reverse Recovery Time | $t_{RR}$ | — | 12.8 | — | ns | $I_F$ = 8.5A, di/dt = 210A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 6.9 | — | nC | |

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 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.

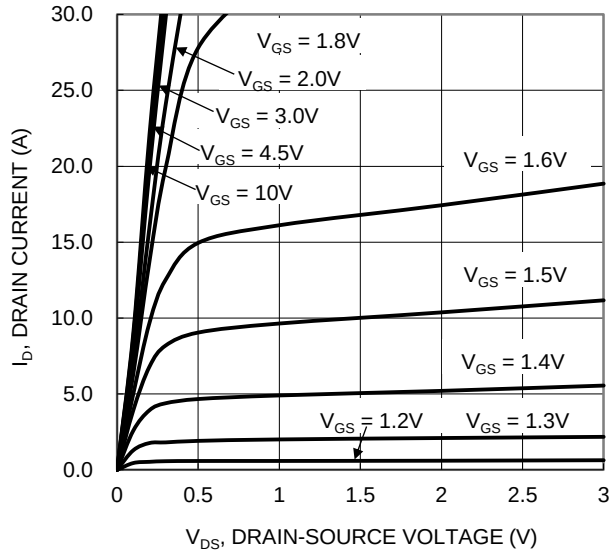



Figure 1. Typical Output Characteristic

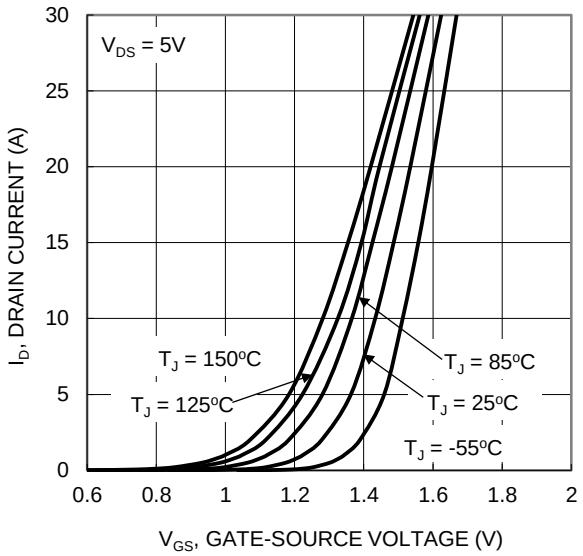



Figure 2. Typical Transfer Characteristic

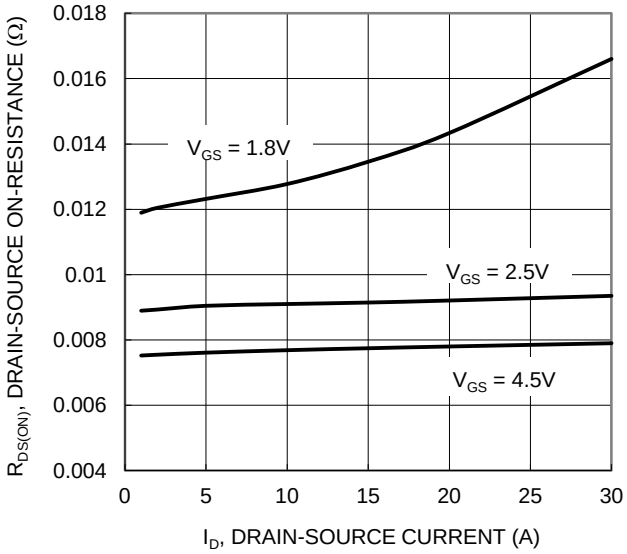



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

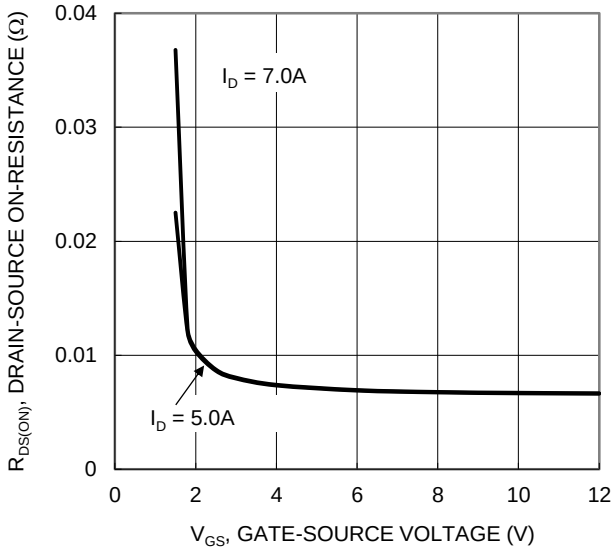



Figure 4. Typical Transfer Characteristic

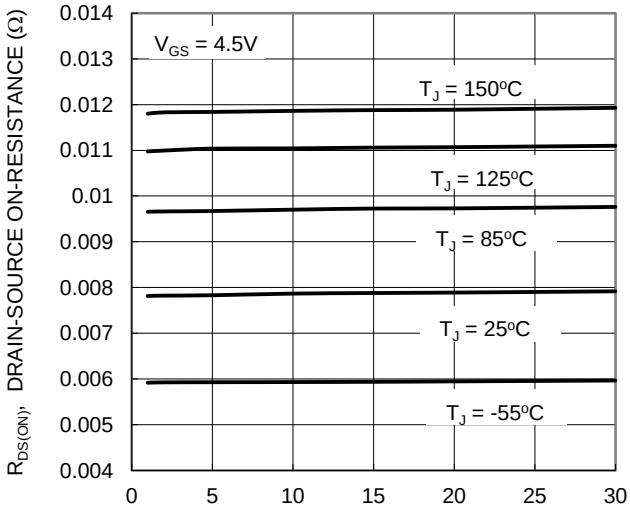



Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

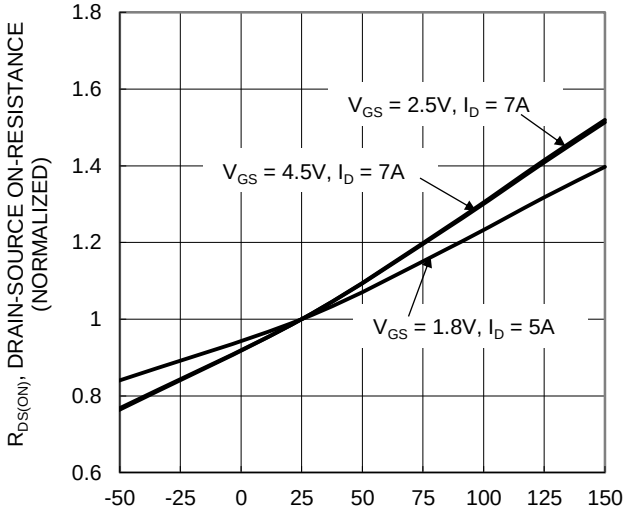



Figure 6. On-Resistance Variation with Junction Temperature

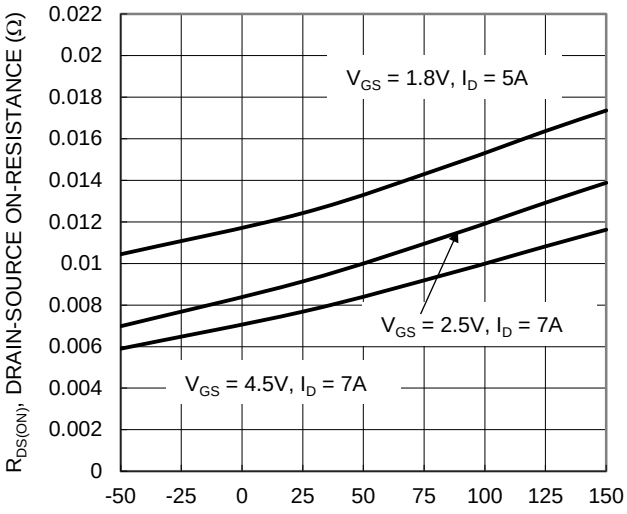



Figure 7. On-Resistance Variation with Junction Temperature

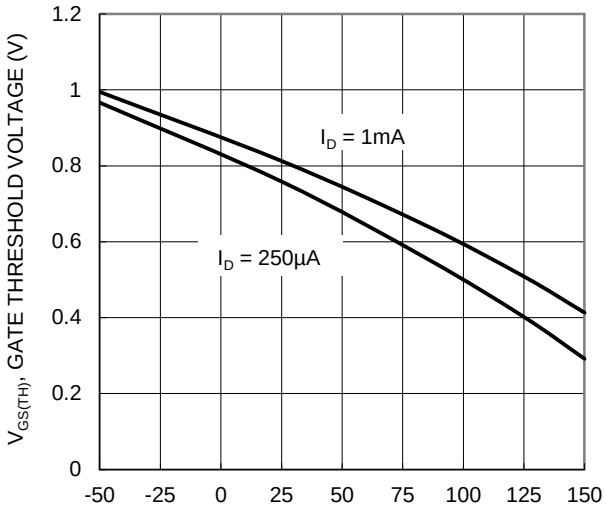



Figure 8. Gate Threshold Variation vs. Junction Temperature

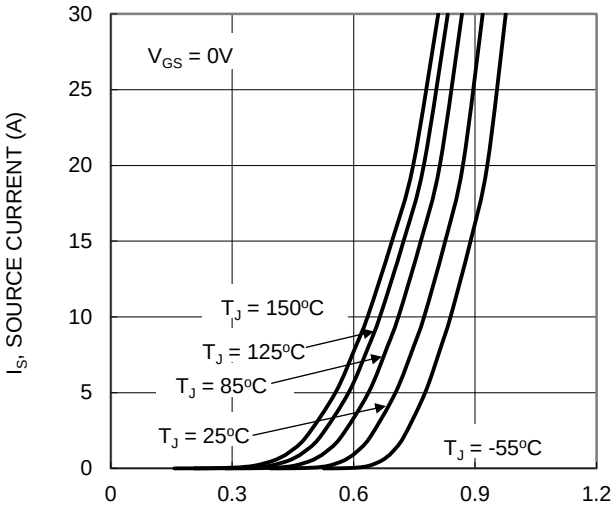



Figure 9. Diode Forward Voltage vs. Current

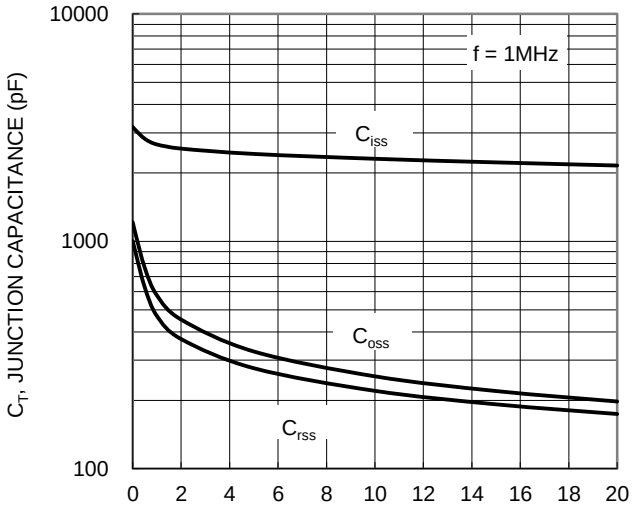



Figure 10. Typical Junction Capacitance

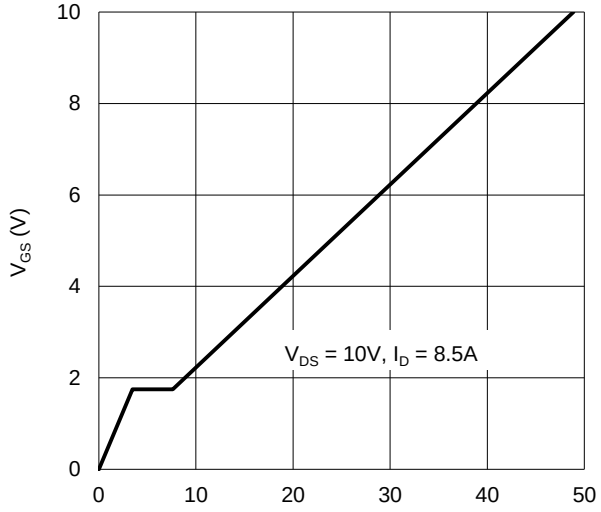



Figure 11. Gate Charge

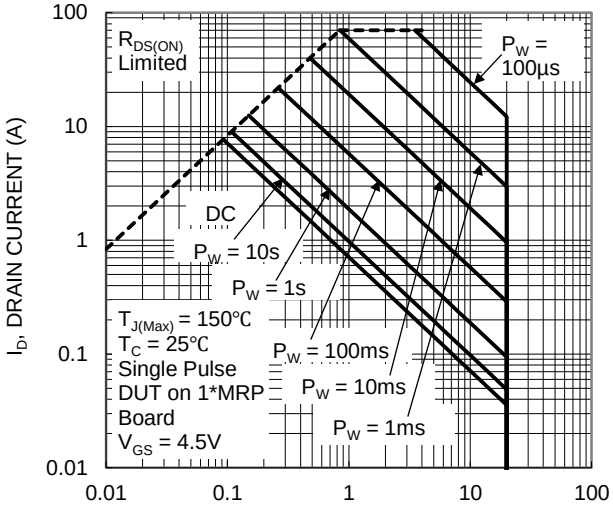



Figure 12. SOA, Safe Operation Area

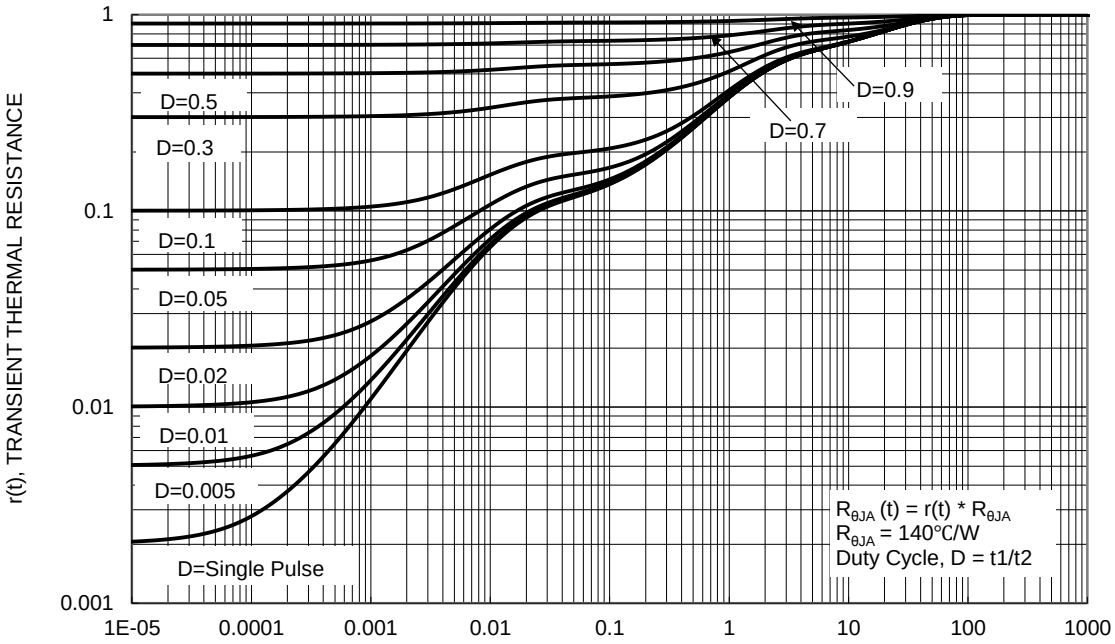
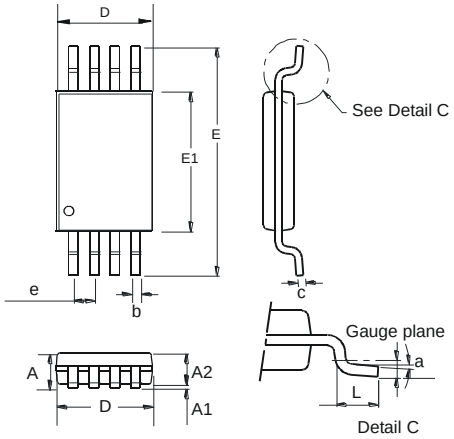



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

**TSSOP-8**

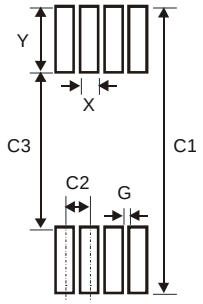



| TSSOP-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **a** | 0.09 | – | – |
| **A** | – | 1.20 | – |
| **A1** | 0.05 | 0.15 | – |
| **A2** | 0.825 | 1.025 | 0.925 |
| **b** | 0.19 | 0.30 | – |
| **c** | 0.09 | 0.20 | – |
| **D** | 2.90 | 3.10 | 3.025 |
| **e** | – | – | 0.65 |
| **E** | – | – | 6.40 |
| **E1** | 4.30 | 4.50 | 4.425 |
| **L** | 0.45 | 0.75 | 0.60 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**TSSOP-8**




| Dimensions | Value (in mm) |
|---|---|
| **X** | 0.45 |
| **Y** | 1.78 |
| **C1** | 7.72 |
| **C2** | 0.65 |
| **C3** | 4.16 |
| **G** | 0.20 |

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