# 30V N-CHANNEL ENHANCEMENT MODE MOSFET
# PowerDI3333-8 (SWP) (Type UX)

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_C$ = +25°C |
|---|---|---|
| 30V | 11mΩ @ $V_{GS}$ = 10V | 50A |
| | 13mΩ @ $V_{GS}$ = 4.5V | 45A |

## Features and Benefits

- Low $R_{DS(ON)}$ – Ensures On State Losses Are Minimized
- 100% Unclamped Inductive Switching (Test in Production) – Ensures More Reliable
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- Occupies Just 33% of The Board Area Occupied by SO-8 Enabling Smaller End Product
- Wettable Flank for Improved Optical Inspection
- **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**
- **PPAP Capable (Note 4)**

## Description and Applications

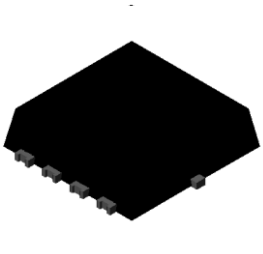
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

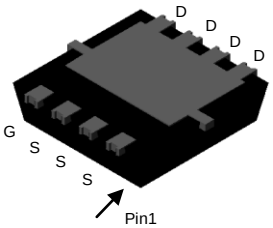
## Mechanical Data

- Case: PowerDI®3333-8 (SWP) (Type UX)
- 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: 0.03 grams (Approximate)

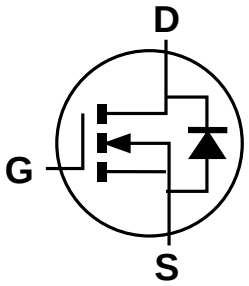
PowerDI3333-8 (SWP) (Type UX)



Top View




Bottom View



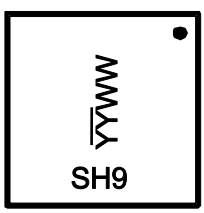

Equivalent Circuit

## Ordering Information (Note 5)

| Part Number | Case | Packaging |
|---|---|---|
| DMT3009LFVWQ-7 | PowerDI3333-8 (SWP) (Type UX) | 2,000/Tape & Reel |
| DMT3009LFVWQ-13 | PowerDI3333-8 (SWP) (Type UX) | 3,000/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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to https://www.diodes.com/quality/.
5. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information




SH9= Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 18 = 2018)
WW = Week Code (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 | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 12<br>10 | A |
| | $T_C$ = +25°C<br>$T_C$ = +70°C | $I_D$ | 50<br>37 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | $I_S$ | 3 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | $I_{DM}$ | 90 | A |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | | $I_{SM}$ | 90 | A |
| Avalanche Current, L = 0.1mH | | $I_{AS}$ | 19 | A |
| Avalanche Energy, L = 0.1mH | | $E_{AS}$ | 19 | mJ |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 2.3 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 55 | °C/W |
| Total Power Dissipation (Note 9) | $T_C$ = +25°C | $P_D$ | 35.7 | W |
| Thermal Resistance, Junction to Case (Note 9) | Steady State | $R_{\theta JC}$ | 3.5 | °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 7)** | | | | | | |
| 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 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | - | 3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | - | 6.6 | 11 | mΩ | $V_{GS}$ = 10V, $I_D$ = 14.4A |
| | | - | 10.5 | 13 | | $V_{GS}$ = 4.5V, $I_D$ = 7A |
| | | - | 13.4 | 20 | | $V_{GS}$ = 3.8V, $I_D$ = 5A |
| Diode Forward Voltage | $V_{SD}$ | - | 0.8 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 10A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 823 | - | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 352 | - | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 52 | - | pF | |
| Gate Resistance | $R_g$ | - | 1.2 | - | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1.0MHz |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | - | 5.8 | - | nC | $V_{DS}$ = 15V, $I_D$ = 14.4A |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | - | 12 | - | nC | |
| Gate-Source Charge | $Q_{gs}$ | - | 1.7 | - | nC | |
| Gate-Drain Charge | $Q_{gd}$ | - | 2.4 | - | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | - | 3.2 | - | ns | $V_{GS}$ = 10V, $V_{DD}$ = 15V, $R_G$ = 1Ω, $I_D$ = 10A |
| Turn-On Rise Time | $t_R$ | - | 5.2 | - | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | - | 8.9 | - | ns | |
| Turn-Off Fall Time | $t_F$ | - | 1.5 | - | ns | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | - | 16.4 | - | ns | $I_F$ = 10A, dI/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | - | 5.9 | - | nC | |

Notes: 6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.
9. Thermal resistance from junction to soldering point (on the exposed drain pad).


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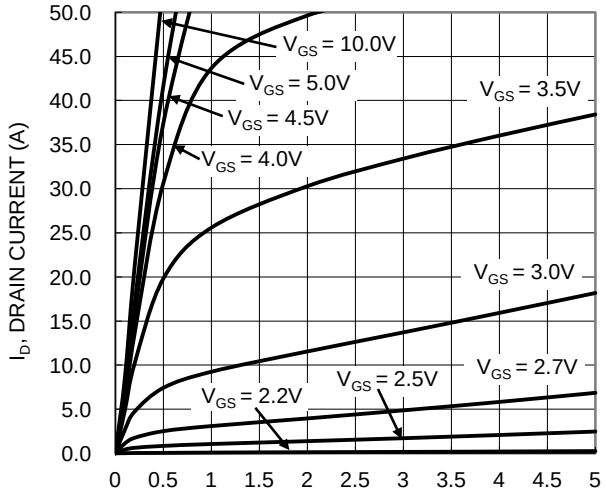



Figure 1.Typical Output Characteristic

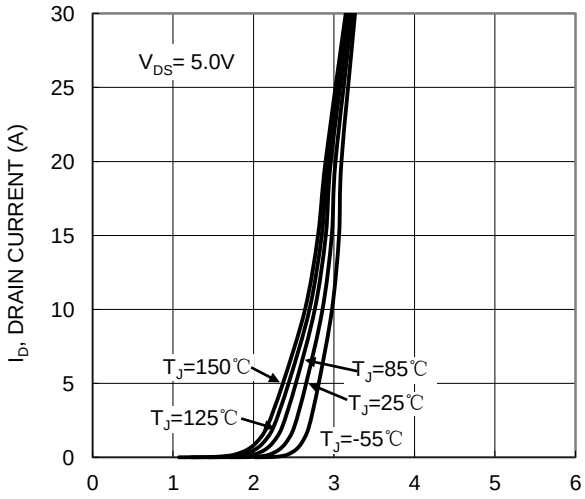



Figure 2. Typical Transfer Characteristic

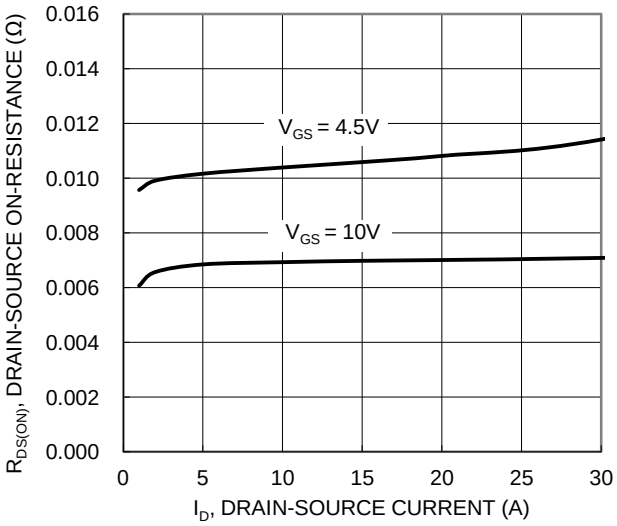



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

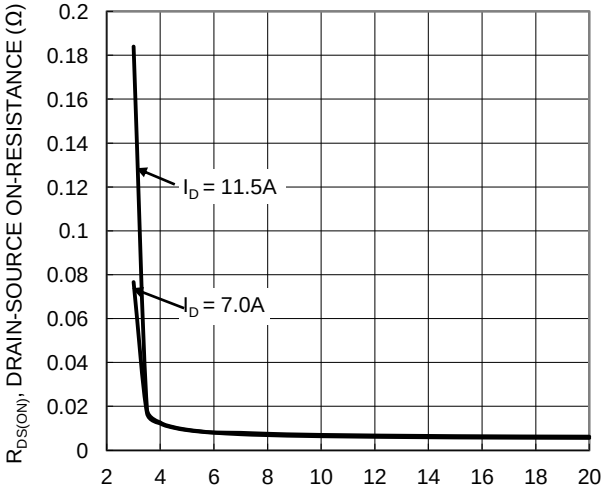



Figure 4. Typical Transfer Characteristic

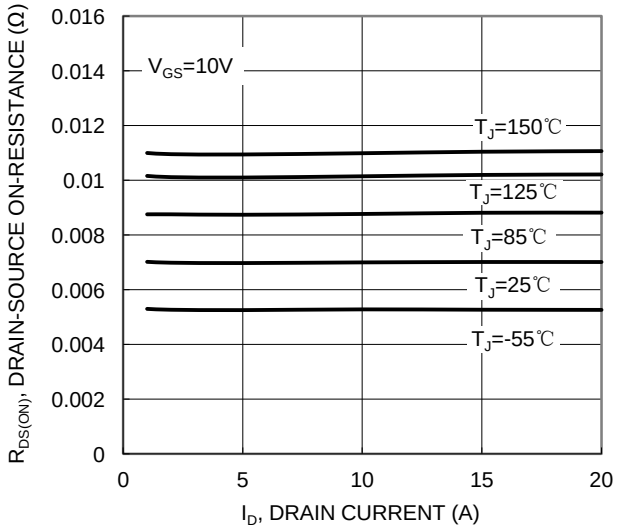



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

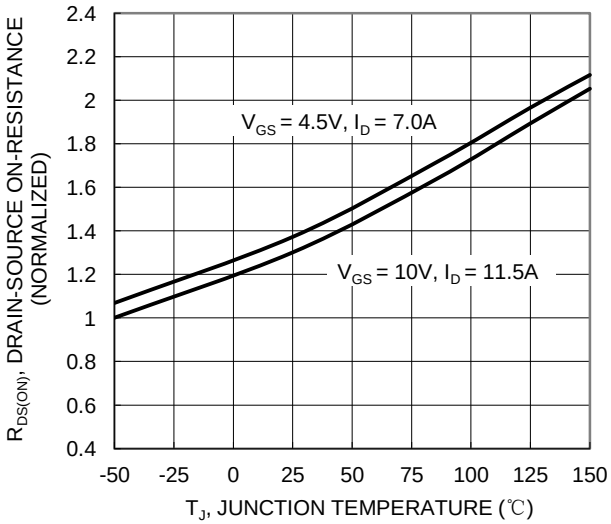



Figure 6. On-Resistance Variation with Temperature


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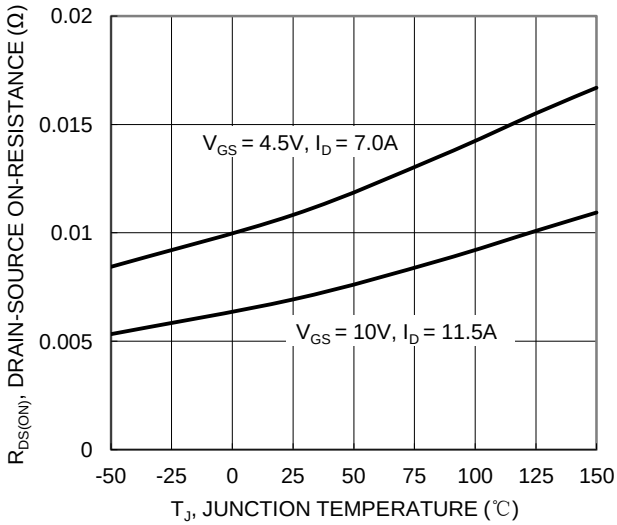



Figure 7. On-Resistance Variation with Temperature

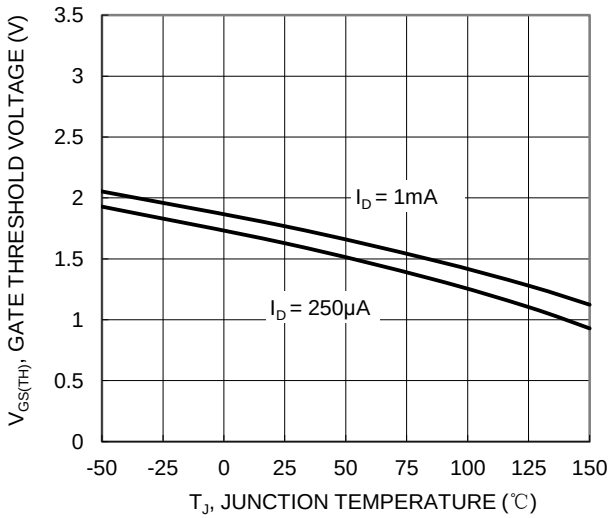



Figure 8. Gate Threshold Variation vs Junction Temperature

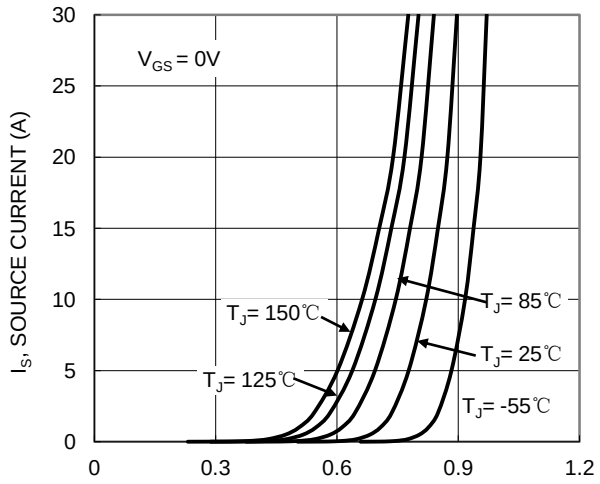



Figure 9. Diode Forward Voltage vs. Current

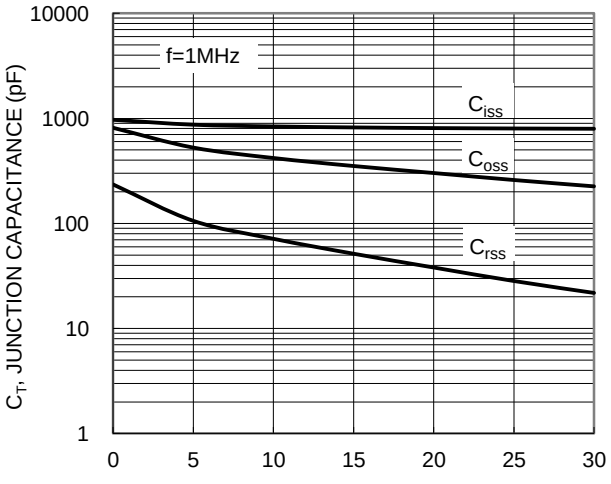



Figure 10. Typical Junction Capacitance

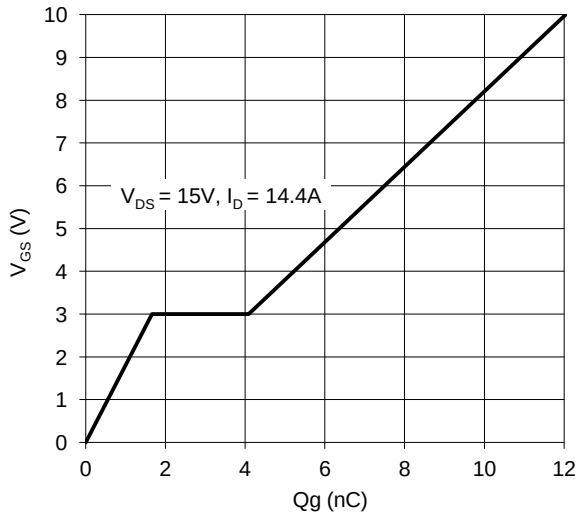



Figure 11. Gate Charge

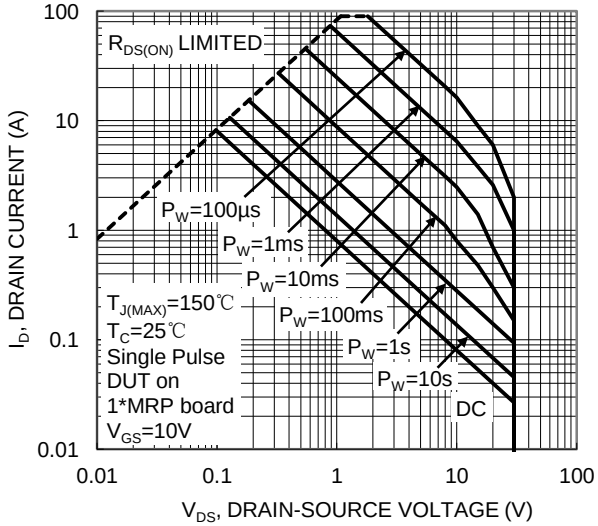



Figure 12. SOA, Safe Operation Area


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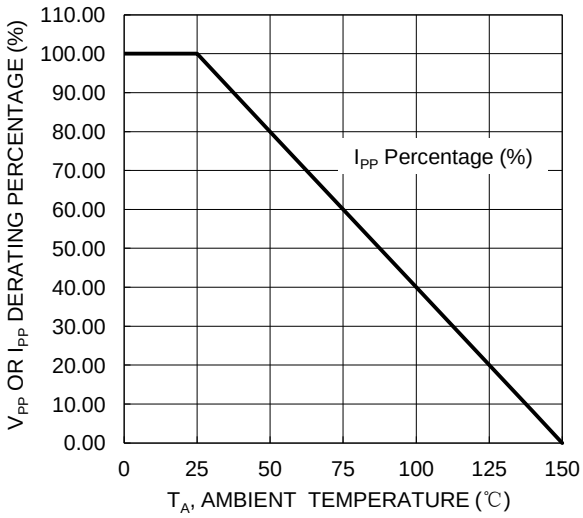



Figure 13. $P_D$ vs. Ambient Temperature

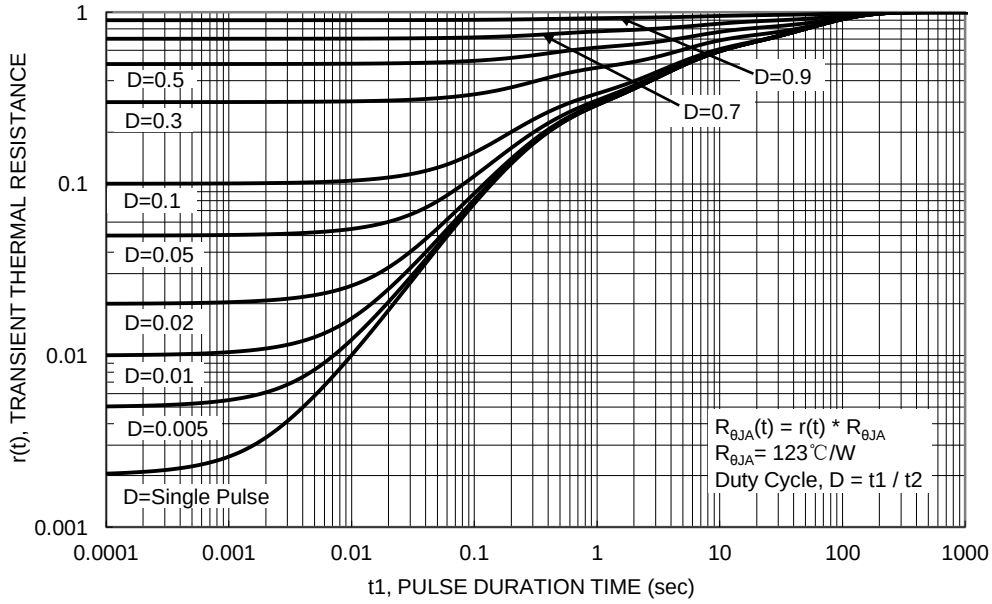


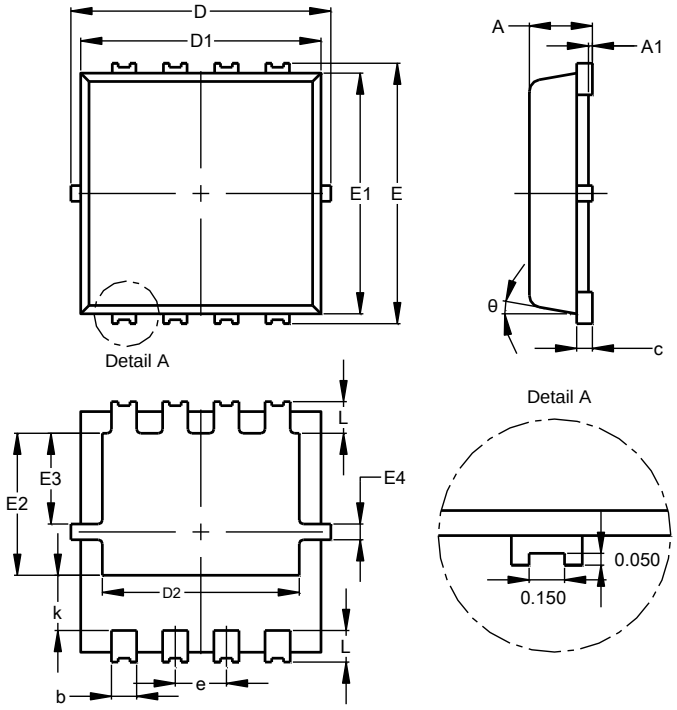

Figure 14. Transient Thermal Resistance


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## Package Outline Dimensions

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

**PowerDI3333-8 (SWP) (Type UX)**

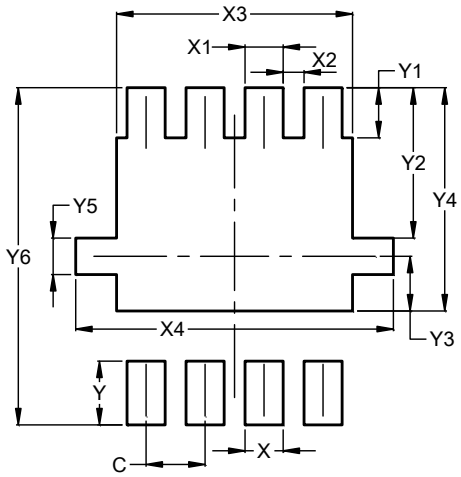



| PowerDI3333-8 (SWP) (Type UX) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | -- |
| **b** | 0.25 | 0.40 | 0.32 |
| **c** | 0.10 | 0.25 | 0.15 |
| **D** | 3.20 | 3.40 | 3.30 |
| **D1** | 2.95 | 3.15 | 3.05 |
| **D2** | 2.30 | 2.70 | 2.50 |
| **E** | 3.20 | 3.40 | 3.30 |
| **E1** | 2.95 | 3.15 | 3.05 |
| **E2** | 1.60 | 2.00 | 1.80 |
| **E3** | 0.95 | 1.35 | 1.15 |
| **E4** | 0.10 | 0.30 | 0.20 |
| **e** | – | – | 0.65 |
| **k** | 0.50 | 0.90 | 0.70 |
| **L** | 0.30 | 0.50 | 0.40 |
| **θ** | 0° | 12° | 10° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**PowerDI3333-8 (SWP) (Type UX)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **X** | 0.420 |
| **X1** | 0.420 |
| **X2** | 0.230 |
| **X3** | 2.600 |
| **X4** | 3.500 |
| **Y** | 0.700 |
| **Y1** | 0.550 |
| **Y2** | 1.650 |
| **Y3** | 0.600 |
| **Y4** | 2.450 |
| **Y5** | 0.400 |
| **Y6** | 3.700 |


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