# 40V +175°C N-CHANNEL ENHANCEMENT MODE MOSFET
## PowerDI3333-8

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max<br>$T_C$ = +25°C |
|---|---|---|
| 40V | 8.9mΩ @ $V_{GS}$ = 10V | 49.0A |
| | 13.5mΩ @ $V_{GS}$ = 4.5V | 40.0A |

## Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- Low $R_{DS(ON)}$ – Ensures On-State Losses are Minimized
- Excellent $Q_{gd}$ x $R_{DS(ON)}$ Product (FOM)
- Wettable Flank for Improved Optical Inspection
- 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-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

## Description and Applications

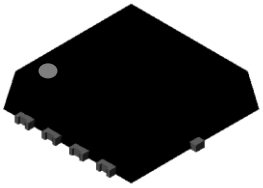
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power management functions
- DC-DC converters

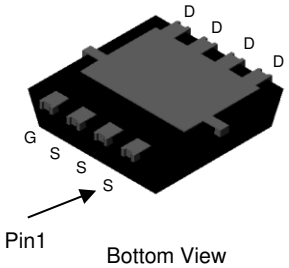
## Mechanical Data

- Package: PowerDI®3333-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Finish - Matte Tin Annealed over Copper Leadframe; Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (Approximate)

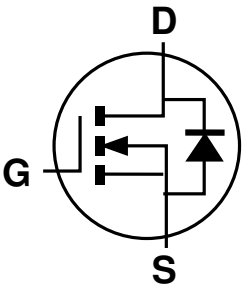
PowerDI3333-8 (SWP) (Type UX)



Top View




Bottom View




Equivalent Circuit

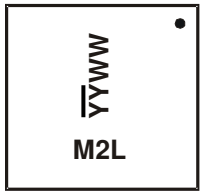
## Ordering Information (Note 4)

| Part Number | Package | Packing | |
|---|---|---|---|
| | | Qty. | Carrier |
| DMTH47M2LFVW-7 | PowerDI3333-8 (SWP) (Type UX) | 2,000 | Tape & Reel |
| DMTH47M2LFVW-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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information

PowerDI3333-8 (SWP) (Type UX)




M2L = Product Type Marking Code
$\overline{YY}$WW = Date Code Marking
$\overline{YY}$ = Last Two Digits of Year (ex: 22 = 2022)
WW = Week Code (01 to 53)

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 40 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Note 5), $V_{GS}$ = 10V | | $T_C$ = +25°C<br>$T_C$ = +100°C | $I_D$ | 49.0<br>34.7 | A |
| Continuous Drain Current (Note 6), $V_{GS}$ = 10V | Steady State | $T_A$ = +25°C<br>$T_A$ = +100°C | $I_D$ | 13.6<br>9.6 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 196 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | 49 | A |
| Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{SM}$ | 196 | A |
| Avalanche Current, L = 0.1mH | | | $I_{AS}$ | 24 | A |
| Avalanche Energy, L = 0.1mH | | | $E_{AS}$ | 28.8 | mJ |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 2.9 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 52 | °C/W |
| Total Power Dissipation (Note 5) | $T_C$ = +25°C | $P_D$ | 37.5 | W |
| Thermal Resistance, Junction to Case (Note 5) | | $R_{\theta JC}$ | 4 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

Notes: 5. Thermal resistance from junction to soldering point (on the exposed drain pad).
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.

## 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 | $BV_{DSS}$ | 40 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 1 | μA | $V_{DS}$ = 32V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ±20V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1.2 | — | 2.3 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 6.6 | 8.9 | mΩ | $V_{GS}$ = 10V, $I_D$ = 20A |
| | | — | 8.9 | 13.5 | | $V_{GS}$ = 4.5V, $I_D$ = 10A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.9 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 20A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 881 | — | pF | $V_{DS}$ = 20V, $V_{GS}$ = 0V<br>f = 1MHz |
| Output Capacitance | $C_{oss}$ | — | 496 | — | | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 19.5 | — | | |
| Gate Resistance | $R_g$ | — | 2.06 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = 10V) | $Q_g$ | — | 12.3 | — | nC | $V_{DS}$ = 20V, $I_D$ = 20A |
| Total Gate Charge ($V_{GS}$ = 4.5V) | $Q_g$ | — | 5.8 | — | | |
| Gate-Source Charge | $Q_{gs}$ | — | 2.6 | — | | |
| Gate-Drain Charge | $Q_{gd}$ | — | 1.6 | — | | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.82 | — | ns | $V_{DD}$ = 20V, $V_{GS}$ = 10V<br>$R_g$ = 3Ω, $I_D$ = 20A |
| Turn-On Rise Time | $t_R$ | — | 4.76 | — | | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 12.6 | — | | |
| Turn-Off Fall Time | $t_F$ | — | 4.83 | — | | |
| Body Diode Reverse Recovery Time | $t_{RR}$ | — | 31.9 | — | ns | $I_F$ = 20A, dI/dt = 100A/μs |
| Body Diode Reverse Recovery Charge | $Q_{RR}$ | — | 25.0 | — | nC | |

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

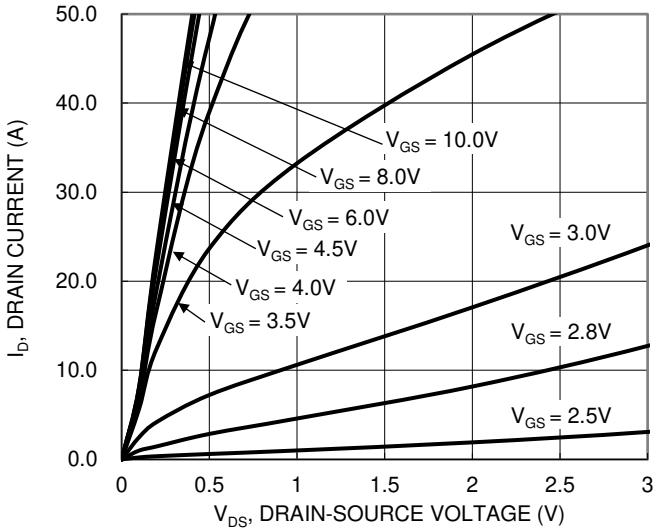



Figure 1. Typical Output Characteristic

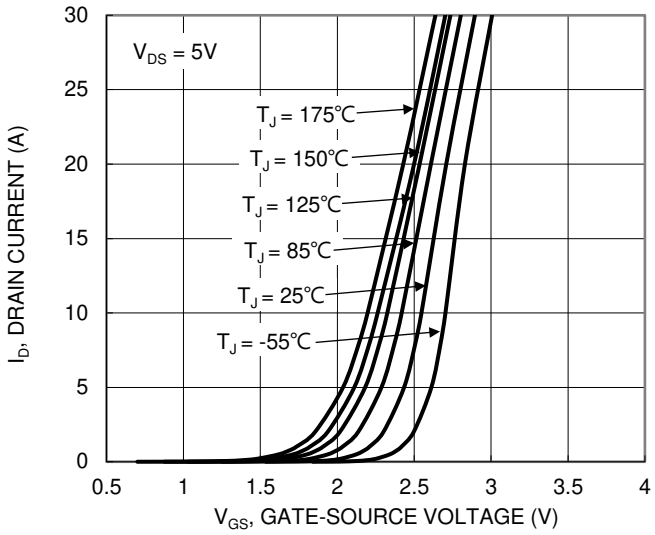



Figure 2. Typical Transfer Characteristic

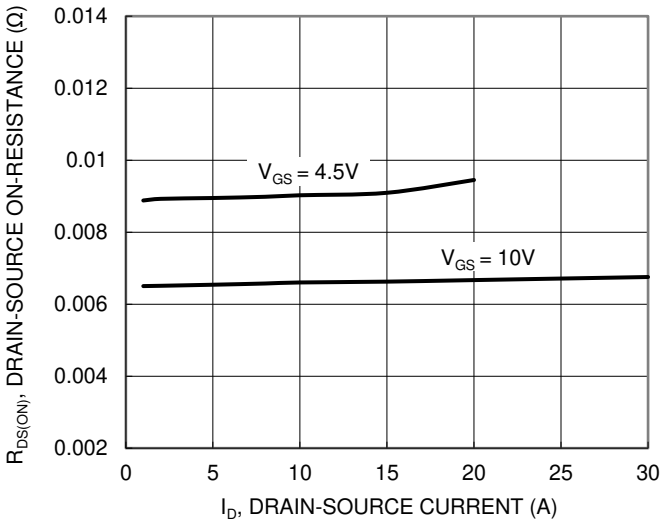



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

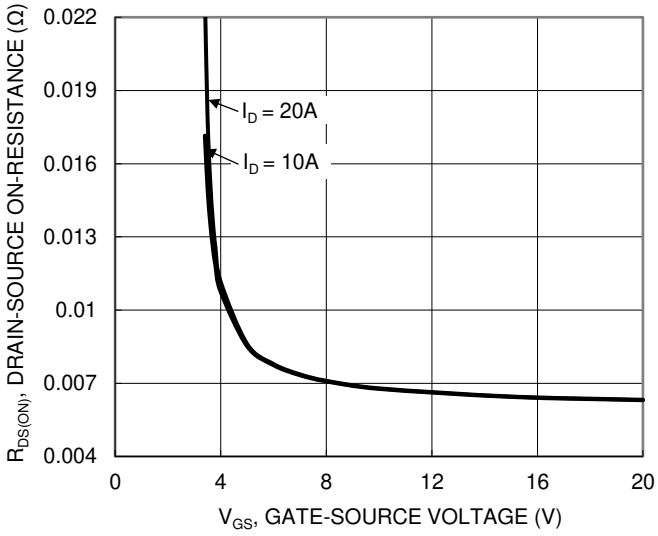



Figure 4. Typical Transfer Characteristic

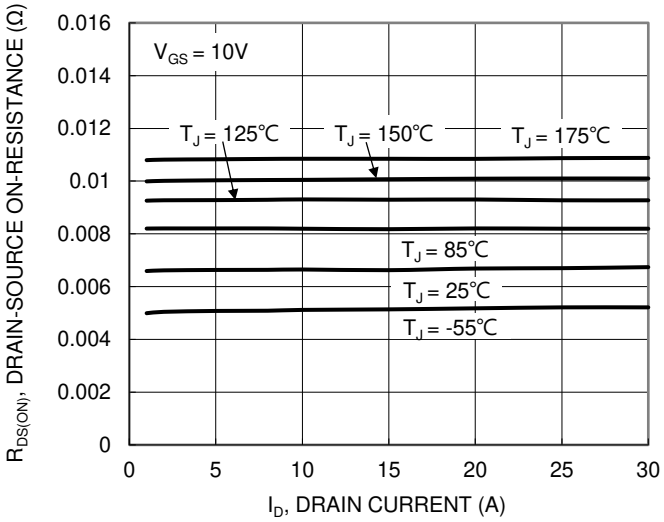



Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

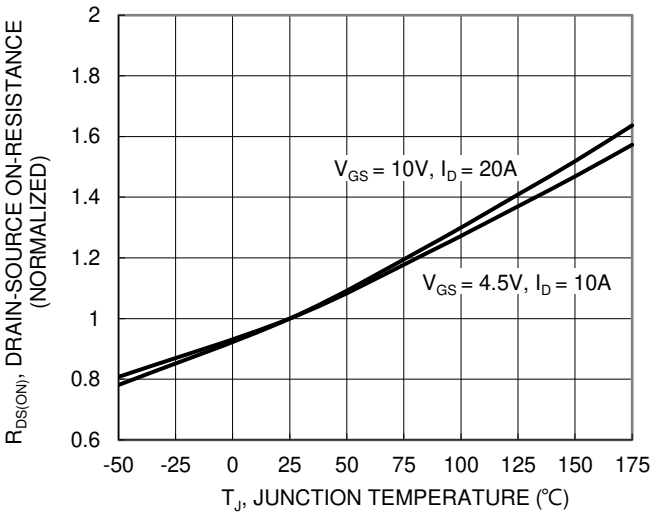



Figure 6. On-Resistance Variation with Junction Temperature

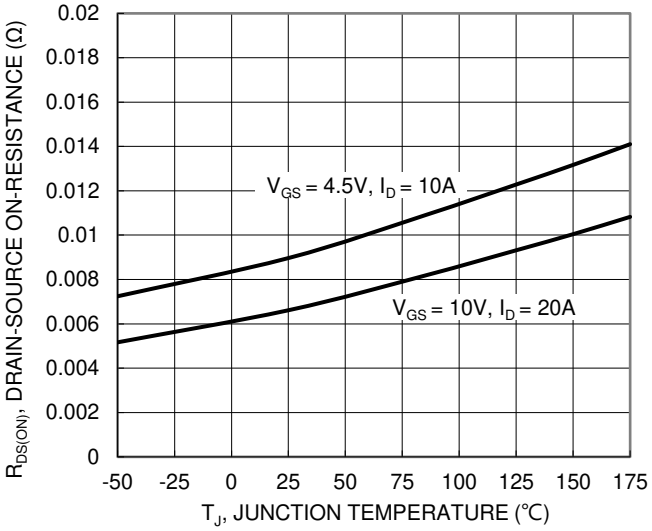



Figure 7. On-Resistance Variation with Junction Temperature

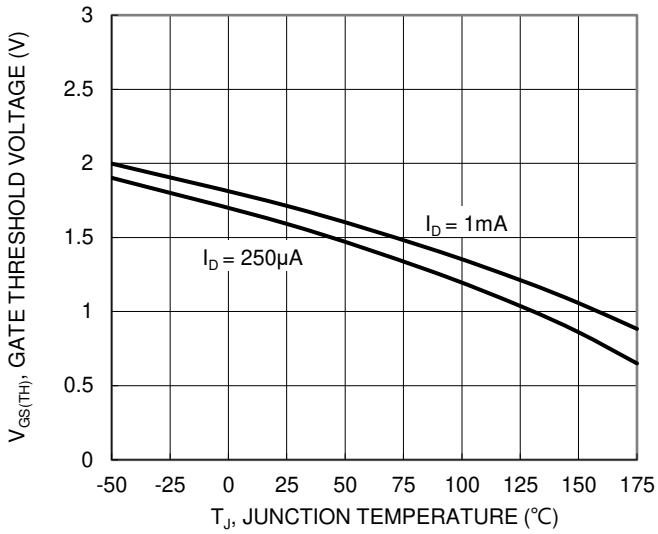



Figure 8. Gate Threshold Variation vs. Junction Temperature

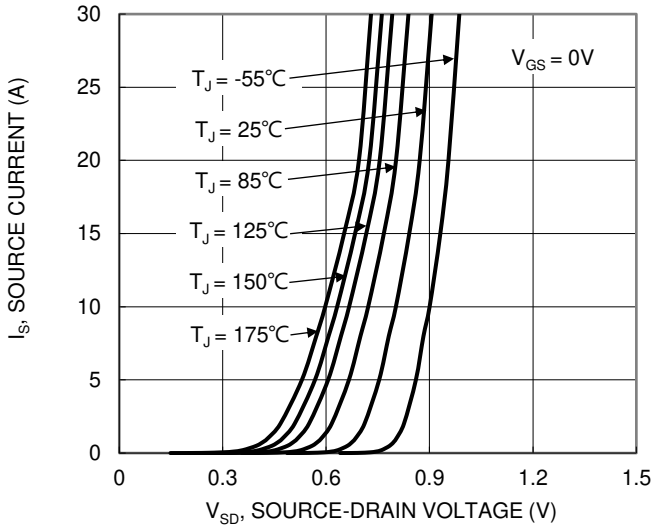



Figure 9. Diode Forward Voltage vs. Current

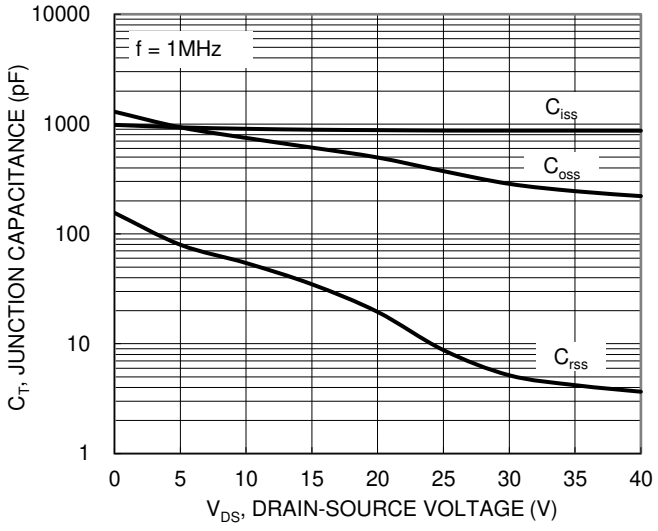



Figure 10. Typical Junction Capacitance

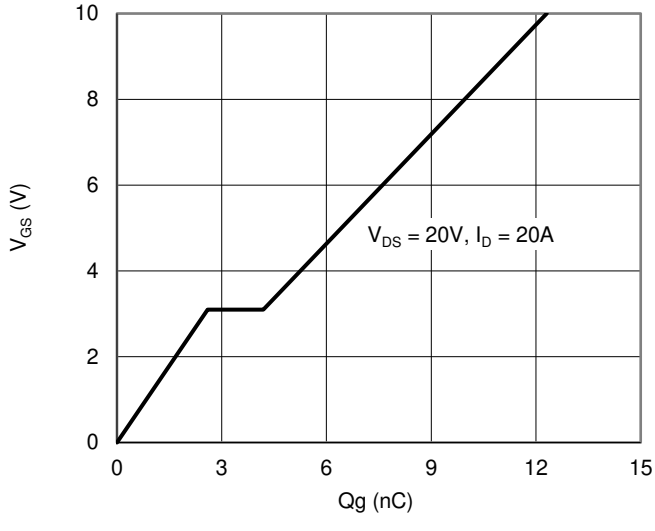



Figure 11. Gate Charge

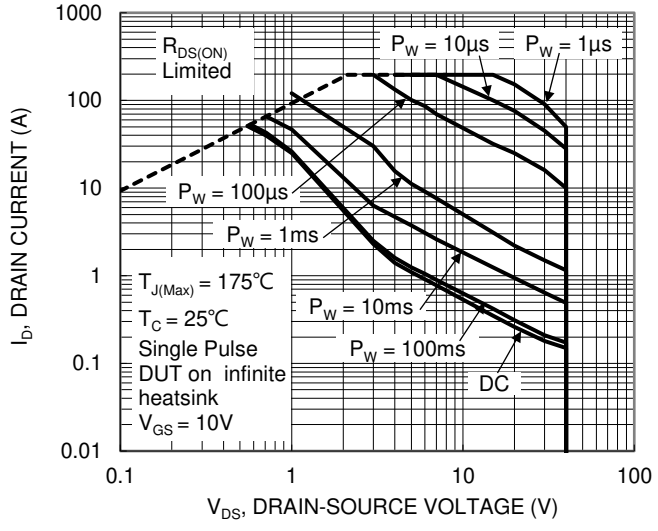



Figure 12. SOA, Safe Operation Area

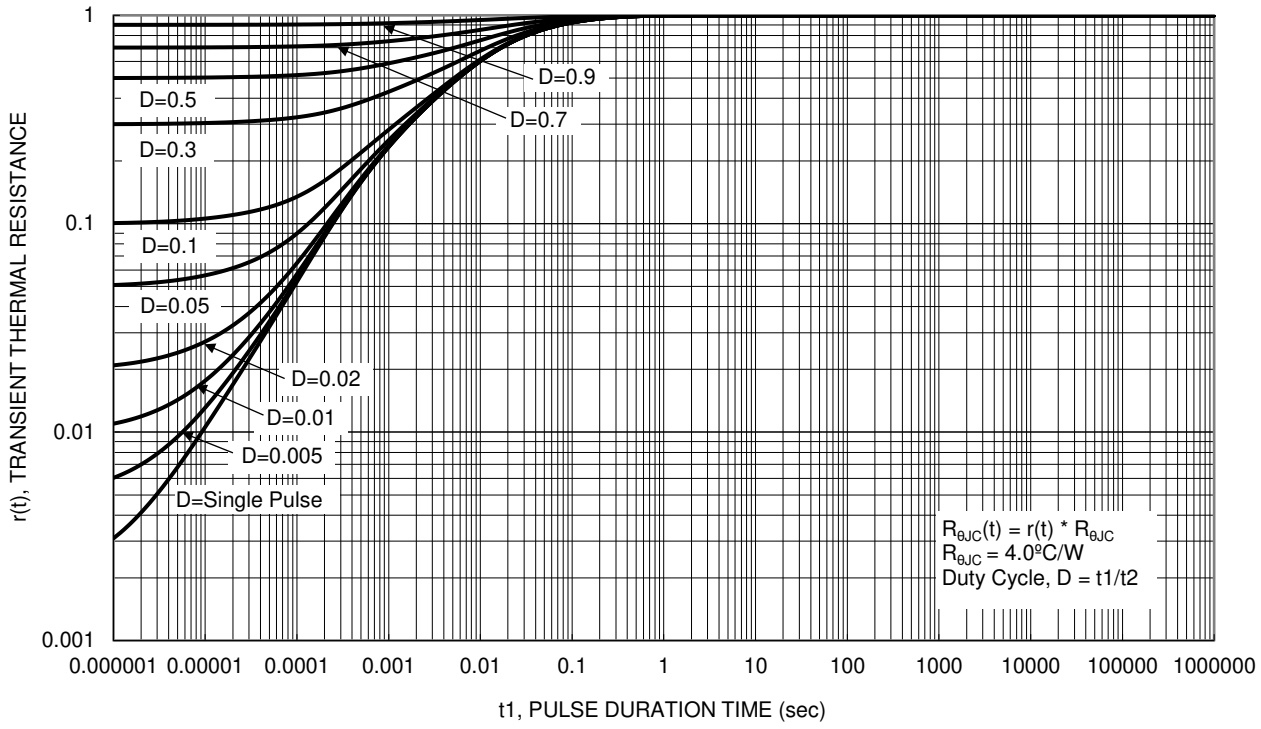
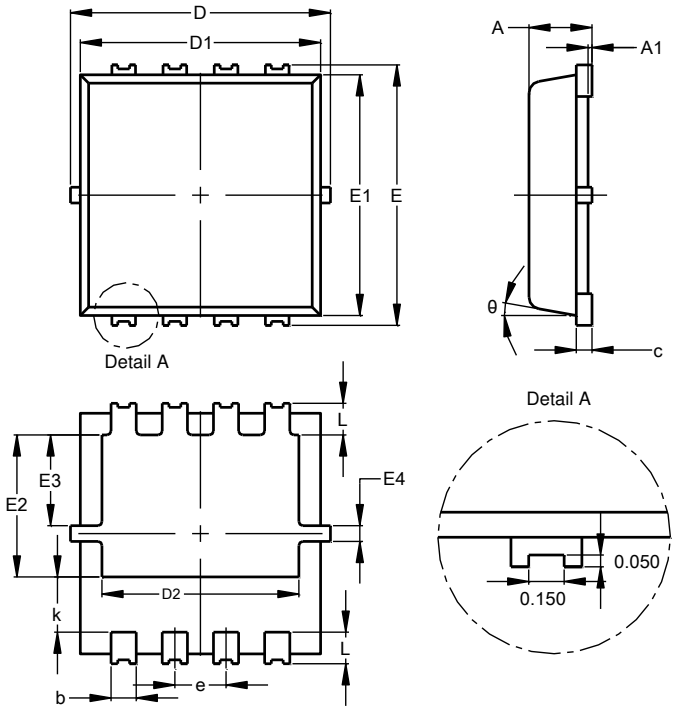



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

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

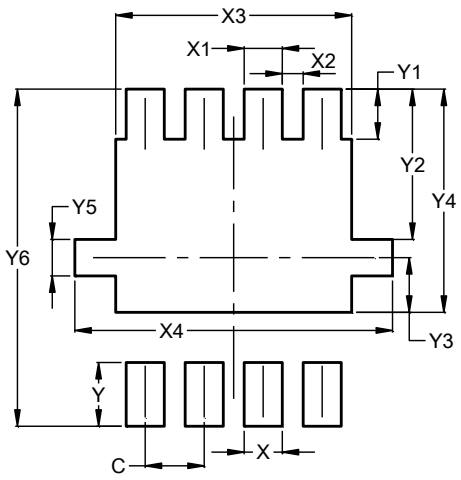



| PowerDI3333-8 (SWP) (Type UX) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | -- |
| **b** | 0.25 | 0.40 | 0.32 |
| **c** | 0.10 | 0.25 | 0.15 |
| **D** | 3.20 | 3.40 | 3.30 |
| **D1** | 2.95 | 3.15 | 3.05 |
| **D2** | 2.30 | 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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