

Product Summary

| BV_{DSS} | $R_{DS(ON)} \text{ Max}$ | $I_D \text{ Max}$ $T_C = +25^\circ\text{C}$ |
|------------|--|--|
| 12V | 3.8m Ω @ $V_{GS} = 4.5\text{V}$ | 70A |
| | 5.1m Ω @ $V_{GS} = 2.5\text{V}$ | 55A |

Description

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.

Applications

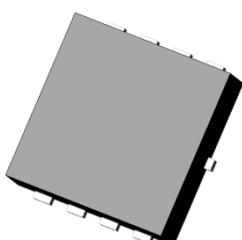
- Power Management Functions
- DC-DC Converters
- Battery

Features

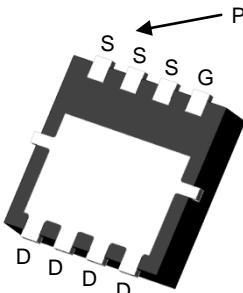
- Low $R_{DS(ON)}$ – Ensures On-State Losses are Minimized
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products
- Occupies just 33% of the Board Area Occupied by SO-8 Enabling Smaller End Product
- ESD Protected Gate**
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

Mechanical Data

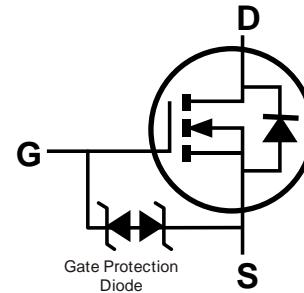
- Case: PowerDI[®] 3333-8 (Type UX)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 ^③
- Weight: 0.072 grams (Approximate)



Top View



Bottom View



Equivalent Circuit

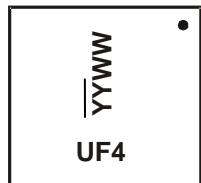
Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|-------------------------|-------------------|
| DMN1004UFV-7 | PowerDI3333-8 (Type UX) | 2,000/Tape & Reel |
| DMN1004UFV-13 | PowerDI3333-8 (Type UX) | 3,000/Tape & Reel |

Notes:

- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 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.
- Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



UF4 = Product Type Marking Code

YYWW = Date Code Marking

YY = Last Two Digits of Year (ex: 16 = 2016)

WW = Week Code (01 to 53)

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---------------------------|---------|-------------|
| Drain-Source Voltage | V_{DSS} | 12 | V |
| Gate-Source Voltage | V_{GSS} | ± 8 | V |
| Continuous Drain Current, $V_{GS} = 4.5\text{V}$ (Note 7) | $T_C = +25^\circ\text{C}$ | 70 | A |
| | $T_C = +70^\circ\text{C}$ | 50 | |
| Pulsed Drain Current (380 μs Pulse, Duty Cycle = 1%) | I_{DM} | 80 | A |
| Maximum Continuous Body Diode Forward Current (Note 7) | I_S | 70 | A |
| Avalanche Current, $L = 0.1\text{mH}$ (Note 8) | I_{AS} | 34 | A |
| Avalanche Energy, $L = 0.1\text{mH}$ (Note 8) | E_{AS} | 60 | mJ |

 Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|--|-----------------|-------------|---------------------------|
| Total Power Dissipation (Note 5) | P_D | 0.9 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 134 | $^\circ\text{C}/\text{W}$ |
| Total Power Dissipation (Note 6) | P_D | 1.9 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 66 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Case (Note 7) | $R_{\theta JC}$ | 3.4 | |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

 Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|--------------|-----|-------|----------|------------------|--|
| OFF CHARACTERISTICS (Note 9) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 12 | — | — | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | 1 | μA | $V_{DS} = 9.6\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 10 | μA | $V_{GS} = \pm 8\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 9) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.3 | — | 1.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 2.8 | 3.8 | $\text{m}\Omega$ | $V_{GS} = 4.5\text{V}, I_D = 15\text{A}$ |
| | | — | 3.2 | 5.1 | | $V_{GS} = 2.5\text{V}, I_D = 10\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | 0.75 | 1.2 | V | $V_{GS} = 0\text{V}, I_S = 3.2\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 10) | | | | | | |
| Input Capacitance | C_{iss} | — | 2,385 | — | pF | $V_{DS} = 6\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 678 | — | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 520 | — | pF | |
| Gate Resistance | R_G | — | 2.2 | — | Ω | |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_G | — | 26 | — | nC | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 8\text{V}$) | Q_G | — | 47 | — | nC | |
| Gate-Source Charge | Q_{GS} | — | 2.8 | — | nC | |
| Gate-Drain Charge | Q_{GD} | — | 5.3 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 5.3 | — | ns | $V_{DD} = 6\text{V}, V_{GS} = 4.5\text{V}, R_G = 1\Omega, I_D = 5\text{A}$ |
| Turn-On Rise Time | t_R | — | 10.7 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 31.6 | — | ns | |
| Turn-Off Fall Time | t_F | — | 16.9 | — | ns | |
| Reverse Recovery Time | t_{RR} | — | 24.3 | — | ns | $I_F = 2\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |
| Reverse Recovery Charge | Q_{RR} | — | 7.4 | — | 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 1-inch square copper plate.
7. Thermal resistance from junction to soldering point (on the exposed drain pad).
8. I_{AS} and E_{AS} rating are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

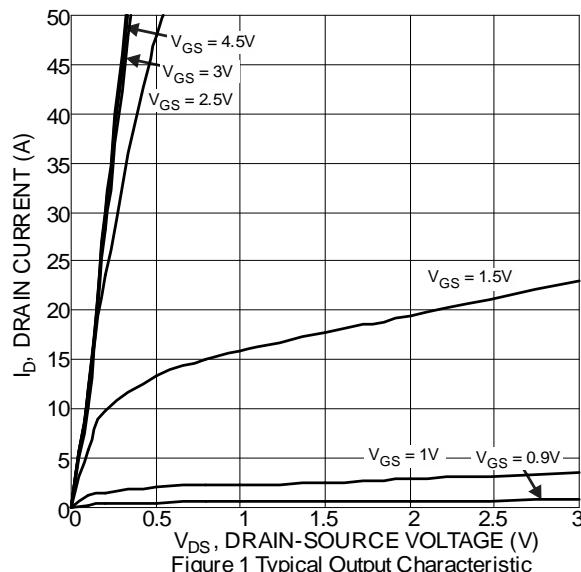


Figure 1 Typical Output Characteristic

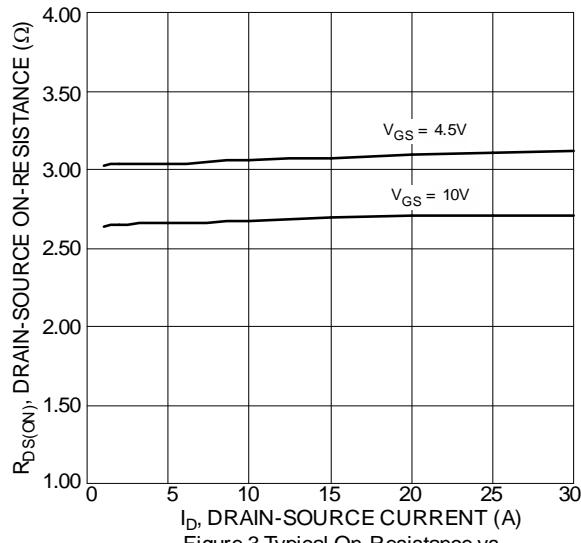


Figure 3 Typical On-Resistance vs.
Drain Current and Gate Voltage

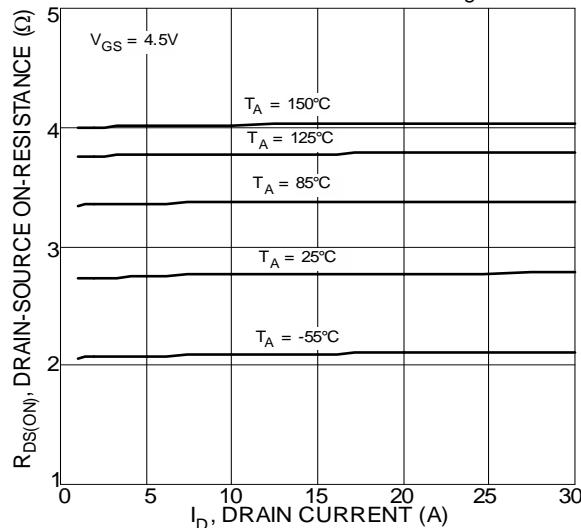


Figure 5 Typical On-Resistance vs.
Drain Current and Temperature

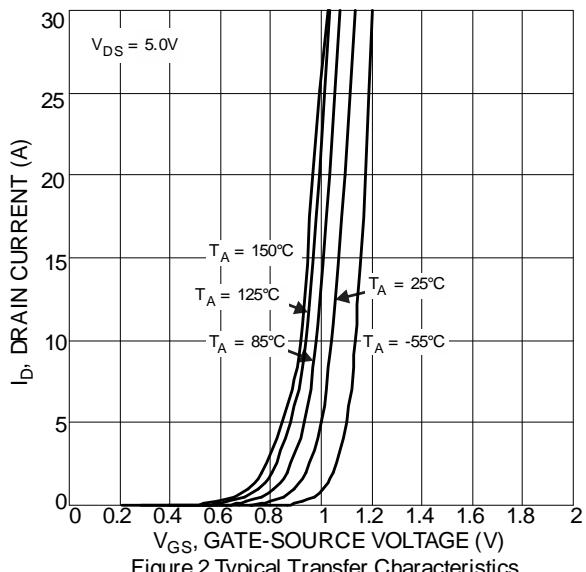


Figure 2 Typical Transfer Characteristics

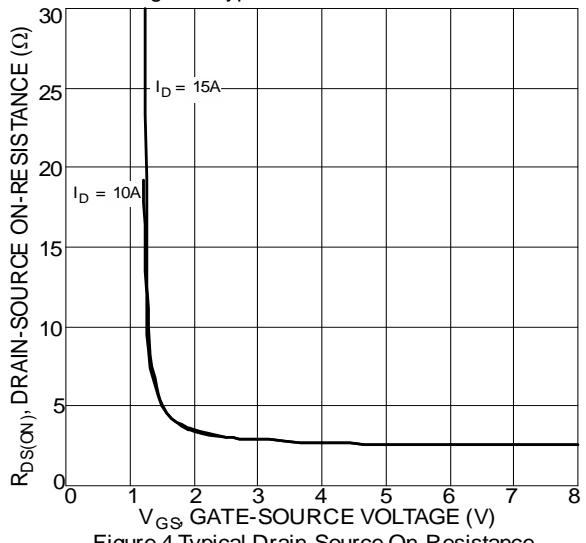


Figure 4 Typical Drain-Source On-Resistance
vs. Gate-Source Voltage

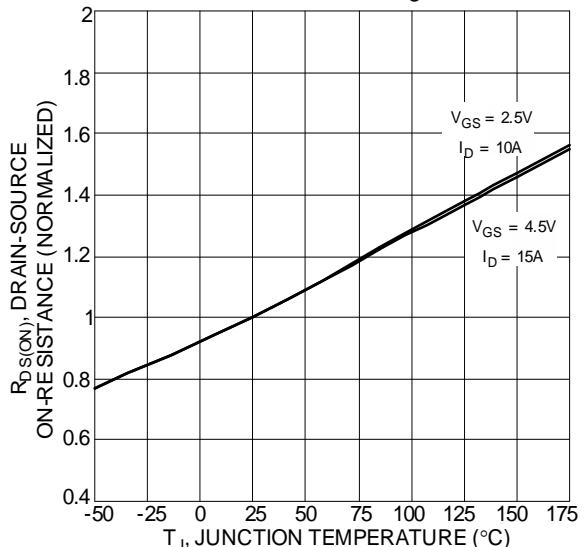
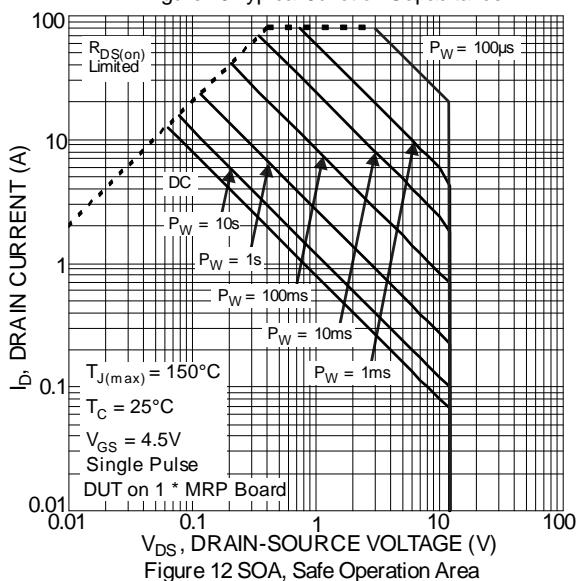
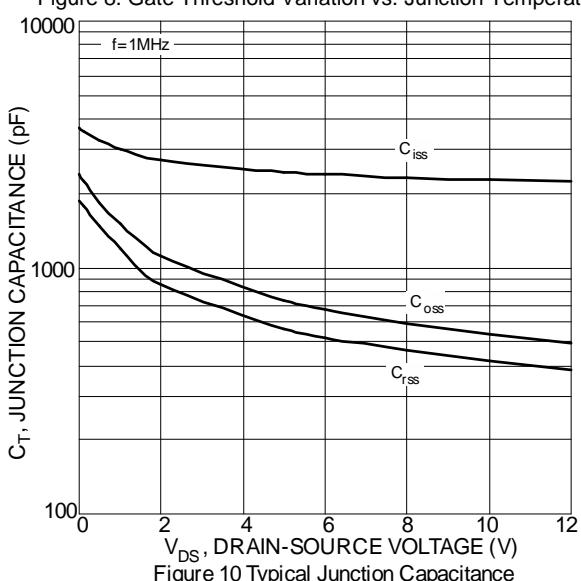
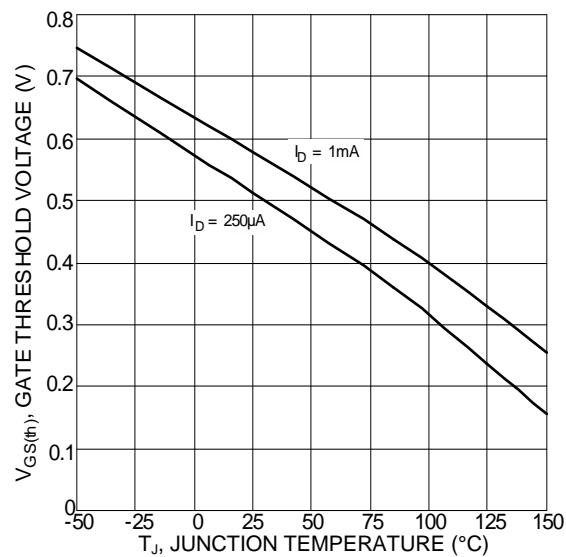
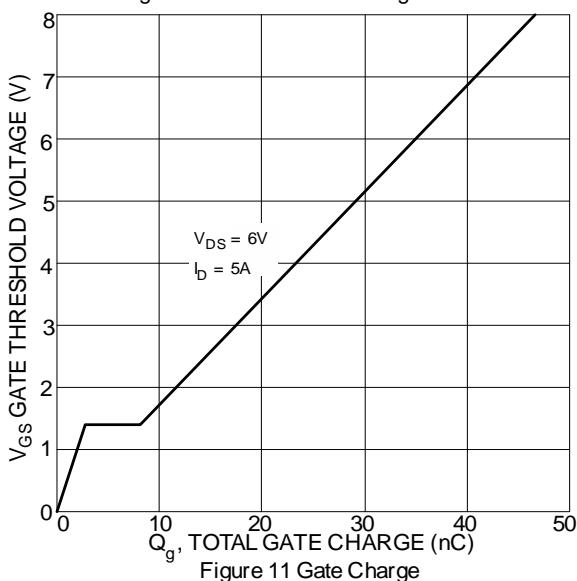
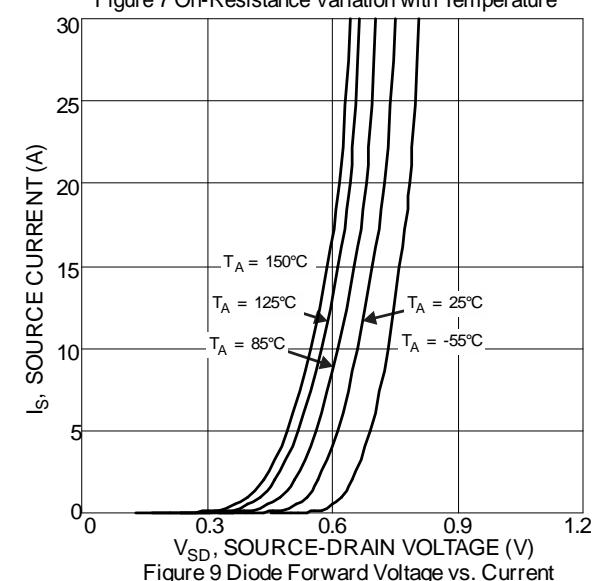
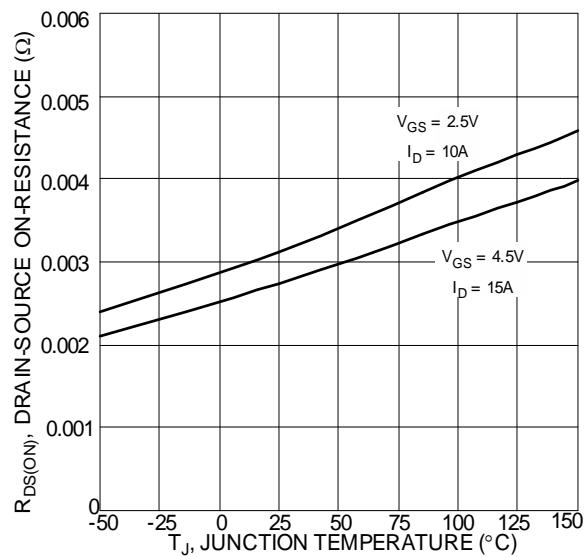


Figure 6 On-Resistance Variation with Temperature



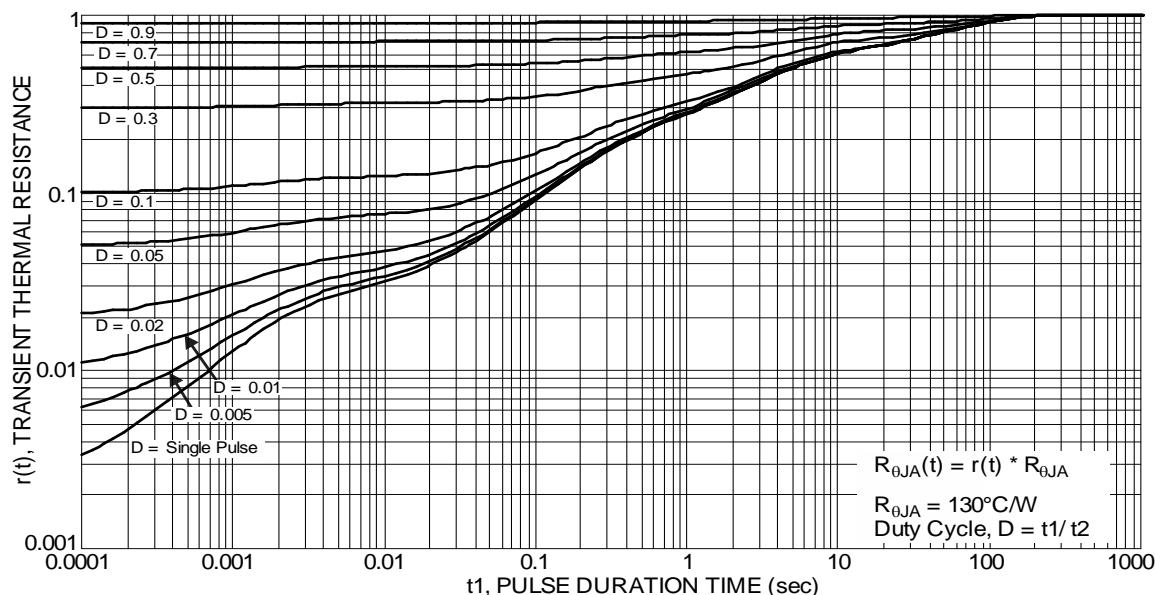
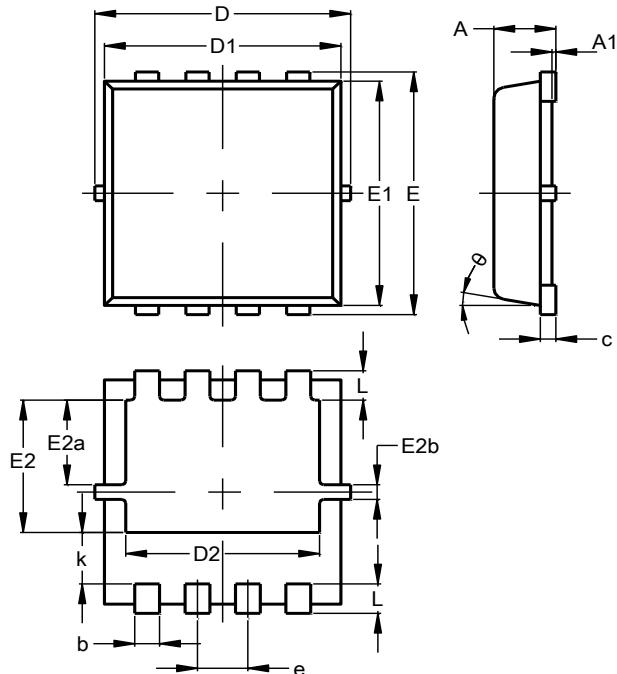


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8 (Type UX)



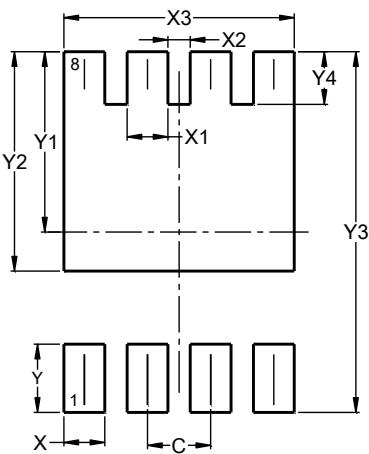
| PowerDI3333-8 (Type UX) | | | |
|----------------------------|----------|------|------|
| Dim | Min | Max | Typ |
| A | 0.75 | 0.85 | 0.80 |
| A1 | 0.00 | 0.05 | -- |
| b | 0.25 | 0.40 | 0.32 |
| c | 0.10 | 0.25 | 0.15 |
| D | 3.20 | 3.40 | 3.30 |
| D1 | 2.95 | 3.15 | 3.05 |
| D2 | 2.30 | 2.70 | 2.50 |
| E | 3.20 | 3.40 | 3.30 |
| E1 | 2.95 | 3.15 | 3.05 |
| E2 | 1.60 | 2.00 | 1.80 |
| E2a | 0.95 | 1.35 | 1.15 |
| E2b | 0.10 | 0.30 | 0.20 |
| e | 0.65 BSC | | |
| 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 (Type UX)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| X | 0.420 |
| X1 | 0.420 |
| X2 | 0.230 |
| X3 | 2.370 |
| Y | 0.700 |
| Y1 | 1.850 |
| Y2 | 2.250 |
| Y3 | 3.700 |
| Y4 | 0.540 |

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