

Product Summary

| BV_{DSS} | $R_{DS(ON)}$ Max | I_D Max $T_C = +25^\circ C$ |
|------------|--------------------------------|----------------------------------|
| 60V | 50m Ω @ $V_{GS} = 10V$ | 18A |
| | 63m Ω @ $V_{GS} = 4.5V$ | 16A |

Features and Benefits

- Low $R_{DS(ON)}$ – Ensures On-State Losses are Minimized
- Small Form Factor Thermally Efficient Package Enables Higher Density End Products (PowerDI[®])
- Occupies Just 33% of the Board Area Occupied by SO-8 Enabling Smaller End Product
- **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**

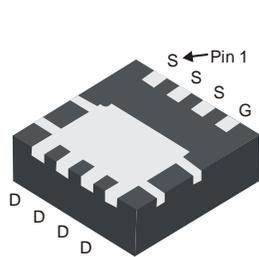
Description and Applications

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.

- Backlighting
- Power Management Functions
- DC-DC Converters

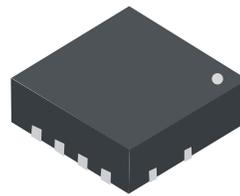
Mechanical Data

- Case: PowerDI3333-8
- 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
- Weight: 0.03 grams (Approximate)

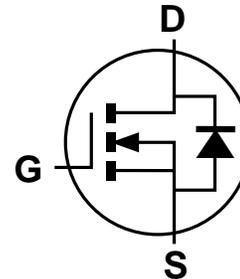


Bottom View

PowerDI3333-8



Top View



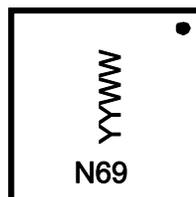
Equivalent Circuit

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|---------------|-------------------|
| DMN6069SFG-7 | PowerDI3333-8 | 2,000/Tape & Reel |
| DMN6069SFG-13 | PowerDI3333-8 | 3,000/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



N69 = 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 | Units |
|---|--------------|--|------------|-------|
| Drain-Source Voltage | | V_{DSS} | 60 | V |
| Gate-Source Voltage | | V_{GSS} | ± 20 | V |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | 5.6 4.5 | A |
| | Steady State | $T_C = +25^\circ\text{C}$ $T_C = +70^\circ\text{C}$ | 18 14.5 | A |
| Pulsed Drain Current (380 μs Pulse, Duty Cycle = 1%) | | I_{DM} | 25 | A |
| Maximum Continuous Body Diode Forward Current (Note 6) | | I_S | 2.5 | A |
| Avalanche Current (Note 7) $L = 0.1\text{mH}$ | | I_{AS} | 12 | A |
| Avalanche Energy (Note 7) $L = 0.1\text{mH}$ | | E_{AS} | 7.2 | mJ |

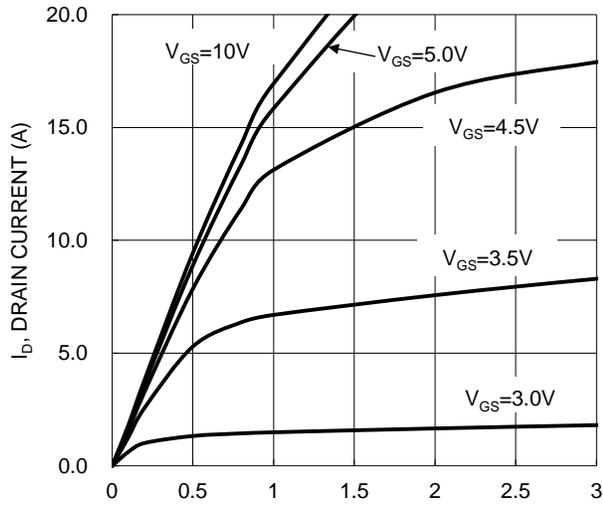
Thermal Characteristics

| Characteristic | | Symbol | Value | Units |
|--|------------------|-----------------|-------------|--------------------|
| Total Power Dissipation (Note 5) | | P_D | 0.93 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 134 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | | 82 | |
| Total Power Dissipation (Note 6) | | P_D | 2.4 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 53 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | | 33 | |
| Thermal Resistance, Junction to Case | | $R_{\theta JC}$ | 5 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

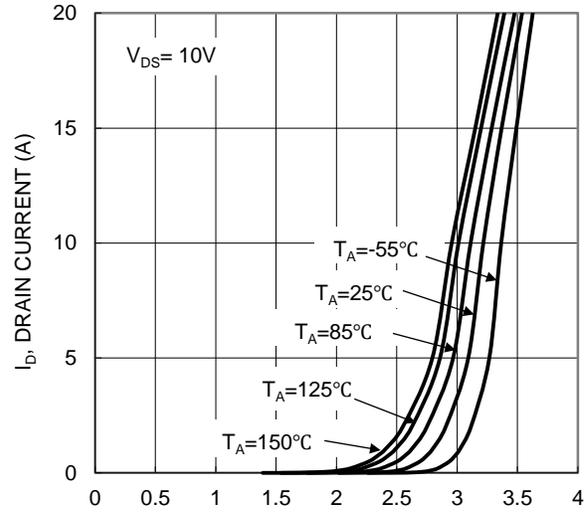
Electrical Characteristics ($T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|--------------|-----|-----|-----------|---------------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 60 | — | — | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$ | I_{DSS} | — | — | 1 | μA | $V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$ |
| Zero Gate Voltage Drain Current $T_J = +150^\circ\text{C}$ (Note 9) | I_{DSS} | — | — | 100 | μA | $V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 1 | — | 3 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 39 | 50 | m Ω | $V_{GS} = 10\text{V}, I_D = 4.5\text{A}$ |
| | | — | 47 | 63 | | $V_{GS} = 4.5\text{V}, I_D = 3\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | — | 1.1 | V | $V_{GS} = 0\text{V}, I_S = 2.5\text{A}$ |
| On State Drain Current (Note 9) | $I_{D(ON)}$ | 20 | — | — | A | $V_{DS} \geq 5\text{V}, V_{GS} = 10\text{V}$ |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C_{ISS} | — | 740 | 1,480 | pF | $V_{DS} = 30\text{V}, V_{GS} = 0\text{V},$ $f = 1.0\text{MHz}$ |
| Output Capacitance | C_{OSS} | — | 40 | 80 | pF | |
| Reverse Transfer Capacitance | C_{RSS} | — | 28 | 55 | pF | |
| Gate Resistance | R_G | — | 2.2 | 4 | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_G | — | 6.4 | 12 | nC | $V_{DS} = 30\text{V}, I_D = 12\text{A}$ |
| Total Gate Charge ($V_{GS} = 10\text{V}$) | Q_G | — | 14 | 25 | nC | |
| Gate-Source Charge | Q_{GS} | — | 2.8 | 5.5 | nC | |
| Gate-Drain Charge | Q_{GD} | — | 2.3 | 5 | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 3.6 | 10 | ns | $V_{DS} = 30\text{V}, I_D = 12\text{A}$ $V_{GS} = 10\text{V}, R_G = 6.0\Omega$ |
| Turn-On Rise Time | t_R | — | 5.0 | 10 | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 12 | 24 | ns | |
| Turn-Off Fall Time | t_F | — | 3.3 | 10 | ns | |
| Body Diode Reverse Recovery Time | t_{RR} | — | 11 | 22 | ns | $I_F = 4.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{RR} | — | 5.1 | 10 | nC | |

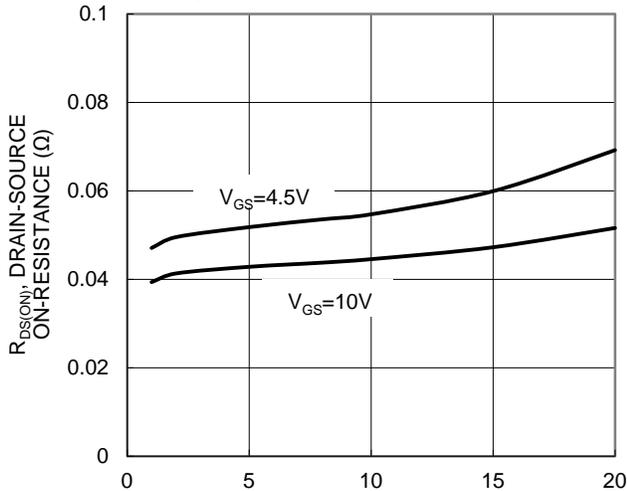
- Notes:
- Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
 - I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.



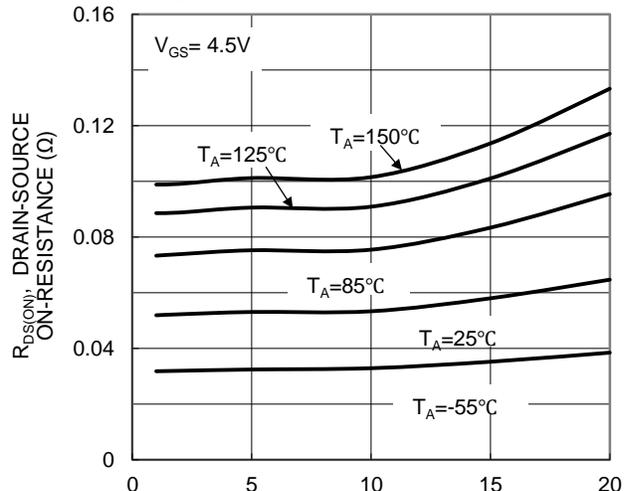
V_{DS} , DRAIN-SOURCE VOLTAGE (V)
Figure 1. Typical Output Characteristic



V_{GS} , GATE-SOURCE VOLTAGE (V)
Figure 2. Typical Transfer Characteristic



I_D , DRAIN-SOURCE CURRENT (A)
Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage



I_D , DRAIN CURRENT (A)
Figure 4. Typical On-Resistance vs. Drain Current and Temperature

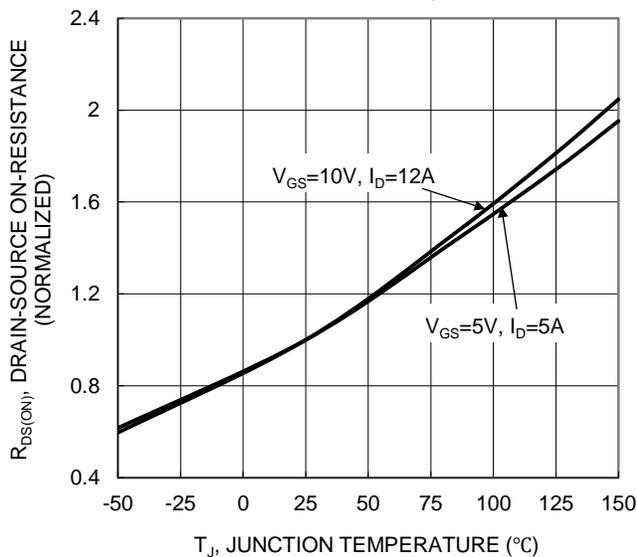


Figure 5. On-Resistance Variation with Temperature

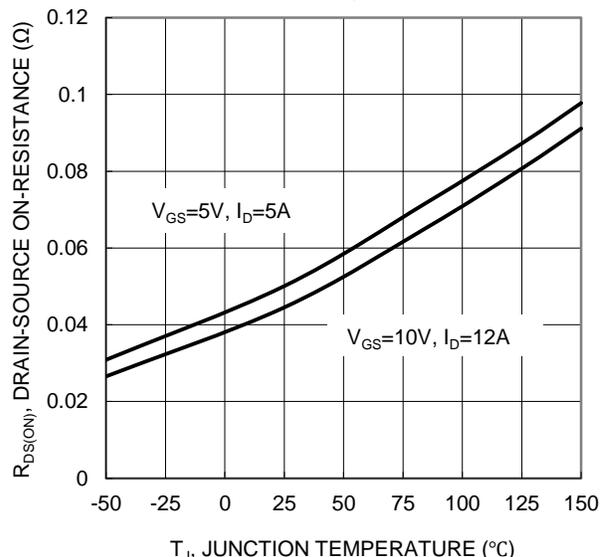


Figure 6. On-Resistance Variation with Temperature

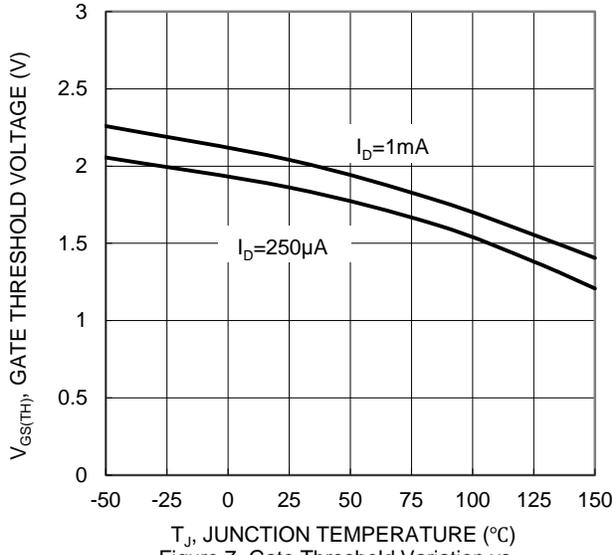


Figure 7. Gate Threshold Variation vs. Junction Temperature

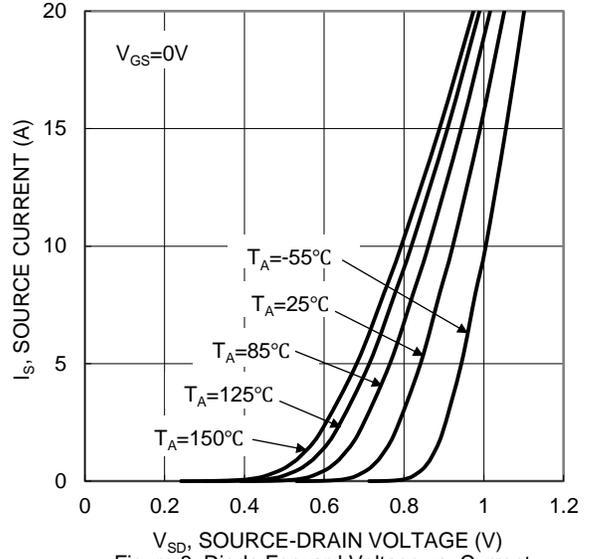


Figure 8. Diode Forward Voltage vs. Current

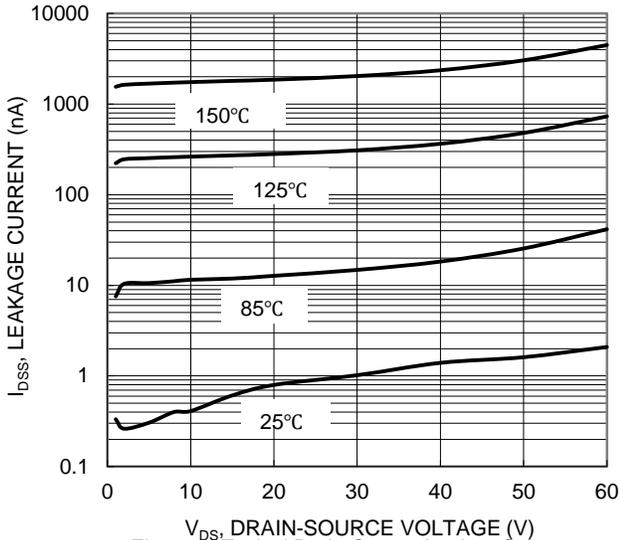


Figure 9. Typical Drain-Source Leakage Current vs. Voltage

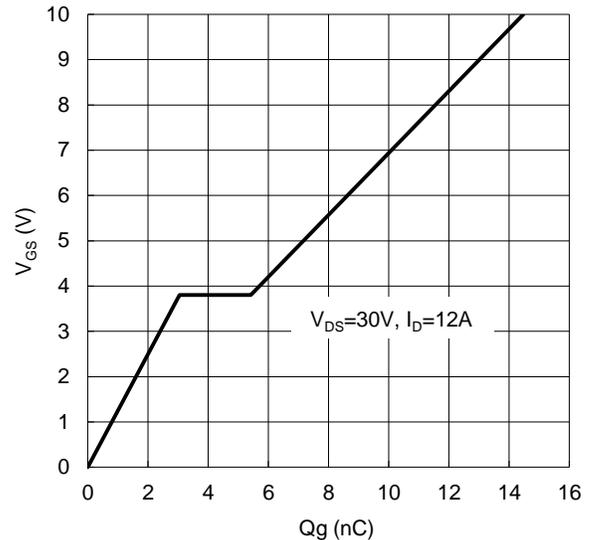


Figure 10. Gate Charge

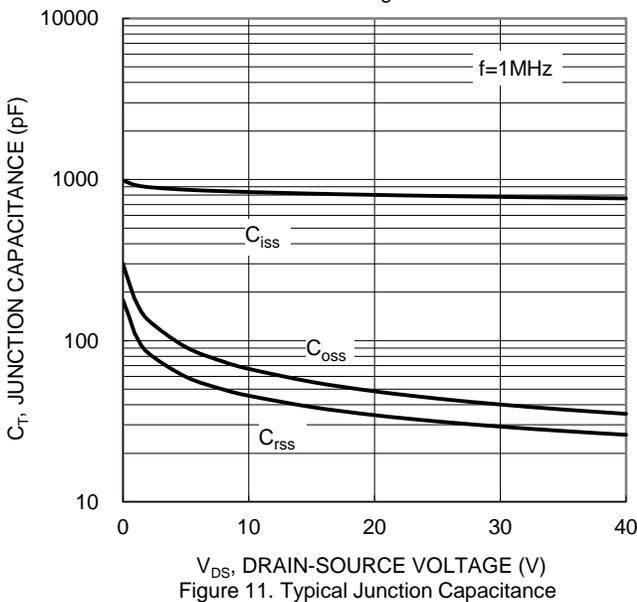


Figure 11. Typical Junction Capacitance

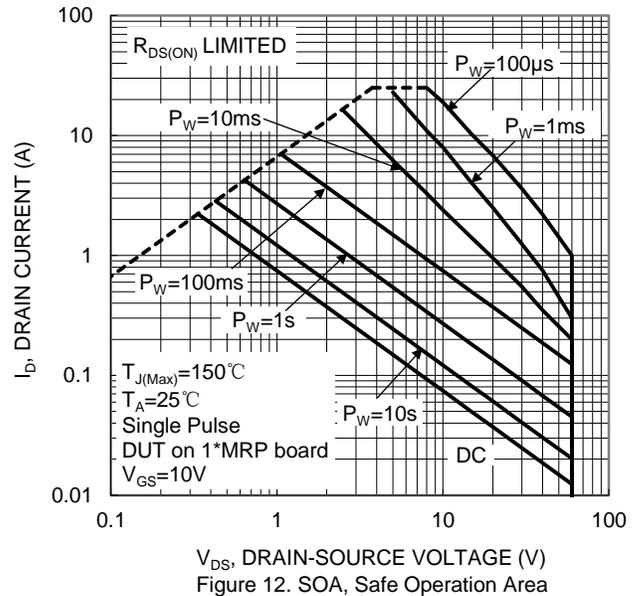


Figure 12. SOA, Safe Operation Area

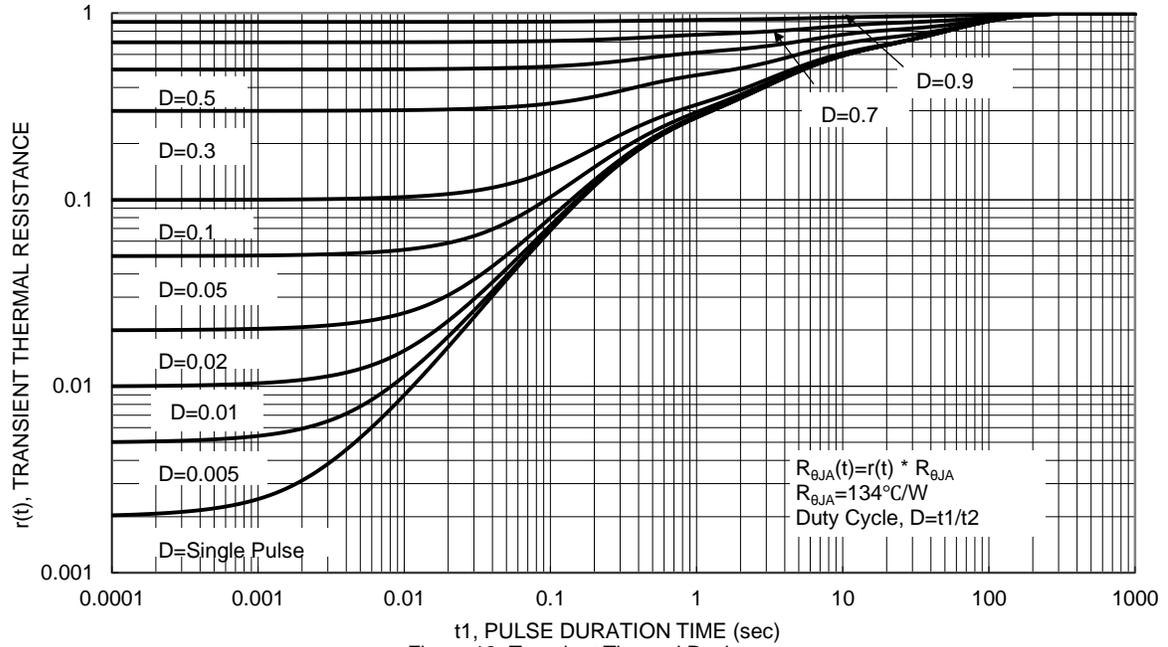
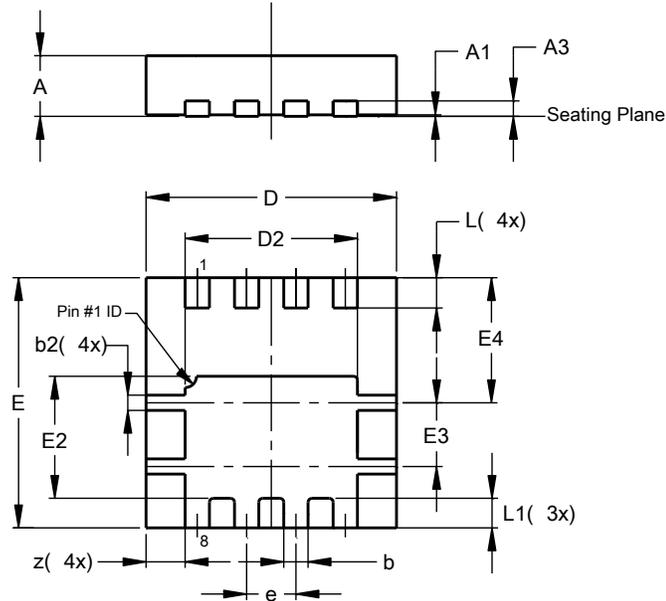


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

PowerDI3333-8

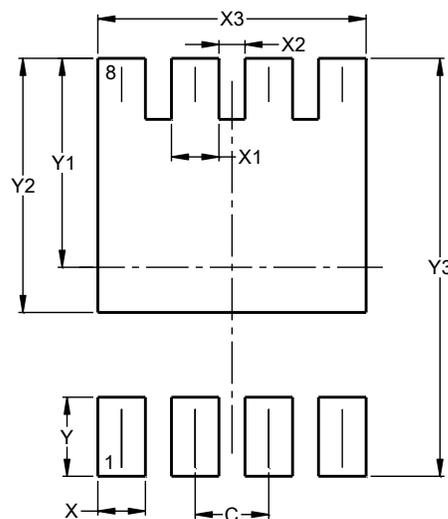


| PowerDI3333-8 | | | |
|----------------------|------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.75 | 0.85 | 0.80 |
| A1 | 0.00 | 0.05 | 0.02 |
| A3 | - | - | 0.203 |
| b | 0.27 | 0.37 | 0.32 |
| b2 | 0.15 | 0.25 | 0.20 |
| D | 3.25 | 3.35 | 3.30 |
| D2 | 2.22 | 2.32 | 2.27 |
| E | 3.25 | 3.35 | 3.30 |
| E2 | 1.56 | 1.66 | 1.61 |
| E3 | 0.79 | 0.89 | 0.84 |
| E4 | 1.60 | 1.70 | 1.65 |
| e | - | - | 0.65 |
| L | 0.35 | 0.45 | 0.40 |
| L1 | - | - | 0.39 |
| z | - | - | 0.515 |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

PowerDI3333-8



| 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 |

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