

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) \max}$ | $I_D \max$ $T_A = +25^\circ\text{C}$ |
|---------------|--|---|
| -40V | 13m Ω @ $V_{GS} = -10\text{V}$ | -10.3A |
| | 18m Ω @ $V_{GS} = -4.5\text{V}$ | -8.8A |

Features and Benefits

- Low $R_{DS(ON)}$ – ensures on state losses are minimized.
- Small form factor thermally efficient package enables higher density end products.
- Occupies 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

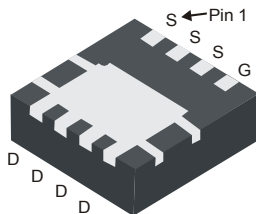
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

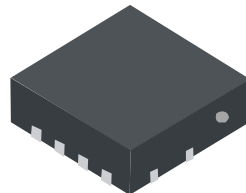
Mechanical Data

- Case: POWERDI®3333-8 (Type B)
- 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)

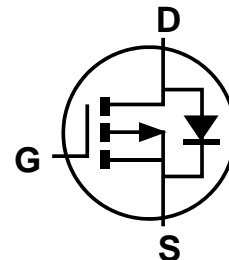
POWERDI3333-8



Bottom View



Top View



Equivalent Circuit

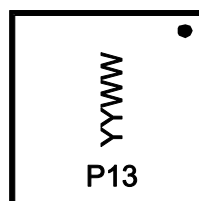
Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|------------------------|-------------------|
| DMP4013LFG-7 | POWERDI3333-8 (Type B) | 2,000/Tape & Reel |
| DMP4013LFG-13 | POWERDI3333-8 (Type B) | 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

POWERDI3333-8



P13= Product Type Marking Code
 YYWW = Date Code Marking
 YY = Last Digit of Year (ex: 13 = 2013)
 WW = Week Code (01 ~ 53)

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

| Characteristic | Symbol | Value | Units | |
|--|------------------|--|---------------|---|
| Drain-Source Voltage | V_{DSS} | -40 | V | |
| Gate-Source Voltage | V_{GSS} | ± 20 | V | |
| Continuous Drain Current (Note 6) $V_{GS} = -10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | -10.3 -8.3 | A |
| | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$ | -13.7 -11 | A |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | I_{DM} | 80 | A | |
| Maximum Continuous Body Diode Forward Current (Note 6) | I_S | 2.6 | A | |
| Avalanche Current, $L = 0.1\text{mH}$ | I_{AS} | 34 | A | |
| Avalanche Energy, $L = 0.1\text{mH}$ | E_{AS} | 58 | mJ | |

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

| Characteristic | Symbol | Value | Units |
|--|------------------|-------------|--------------------|
| Total Power Dissipation (Note 5) | P_D | 1 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | 123 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | 69 | |
| Total Power Dissipation (Note 6) | P_D | 2.1 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | 60 | $^\circ\text{C/W}$ |
| | $t < 10\text{s}$ | 34 | |
| Thermal Resistance, Junction to Case (Note 6) | $R_{\theta JC}$ | 3.3 | |
| 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 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -40 | — | — | 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 | $V_{DS} = -40\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 100 | nA | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -1 | — | -3 | V | $V_{DS} = V_{GS}, I_D = -250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | — | — | 13 | m Ω | $V_{GS} = -10\text{V}, I_D = -10\text{A}$ |
| | | — | — | 18 | | $V_{GS} = -4.5\text{V}, I_D = -8\text{A}$ |
| Diode Forward Voltage | V_{SD} | — | -0.7 | -1.2 | V | $V_{GS} = 0\text{V}, I_S = -1\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C_{iss} | — | 3426 | — | pF | $V_{DS} = -20\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 283 | — | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 235 | — | pF | |
| Gate Resistance | R_g | — | 4.7 | — | 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 | — | 32.5 | — | nC | $V_{DS} = -20\text{V}, I_D = -10\text{A}$ |
| Total Gate Charge ($V_{GS} = -10\text{V}$) | Q_g | — | 68.6 | — | nC | |
| Gate-Source Charge | Q_{gs} | — | 8.2 | — | nC | |
| Gate-Drain Charge | Q_{gd} | — | 9.9 | — | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 5.3 | — | ns | $V_{DD} = -20\text{V}, V_{GEN} = -10\text{V}, R_G = 3\Omega, I_D = -10\text{A}$ |
| Turn-On Rise Time | t_r | — | 20 | — | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 126 | — | ns | |
| Turn-Off Fall Time | t_f | — | 83 | — | ns | |
| Body Diode Reverse Recovery Time | t_{rr} | — | 19.5 | — | nS | $I_f = -10\text{A}, di/dt = 100\text{A}/\mu\text{s}$ |
| Body Diode Reverse Recovery Charge | Q_{rr} | — | 9.8 | — | 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. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

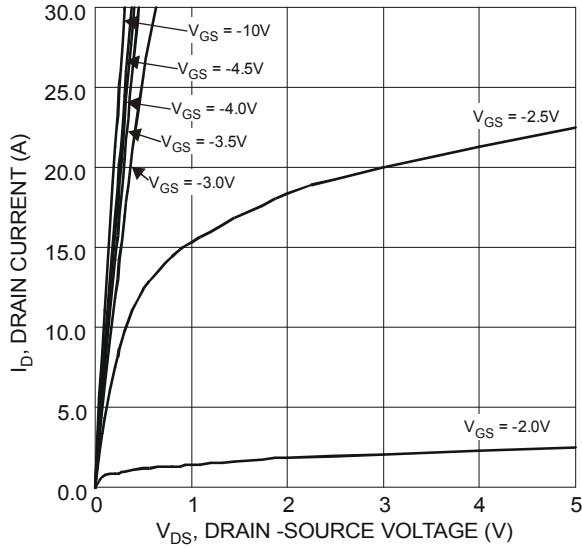


Figure 1 Typical Output Characteristics

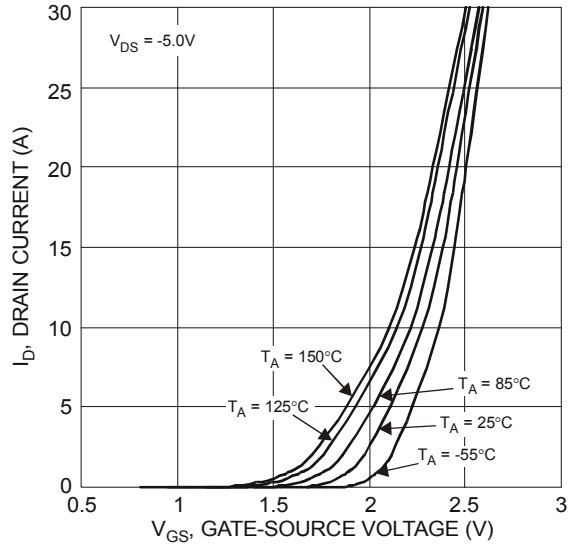


Figure 2 Typical Transfer Characteristics

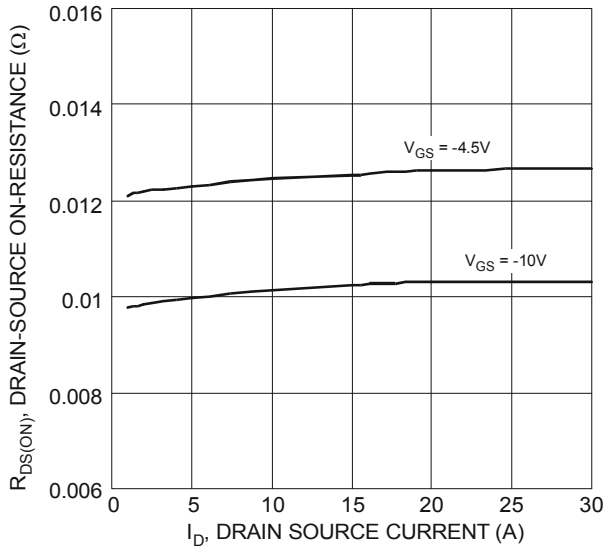


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

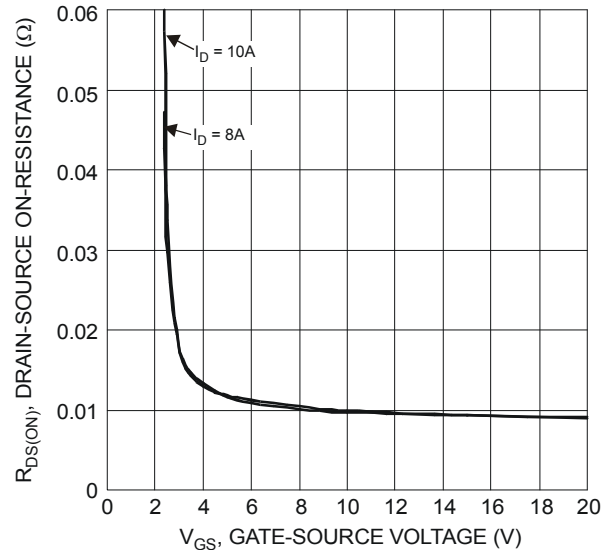


Figure 4 Typical Transfer Characteristics

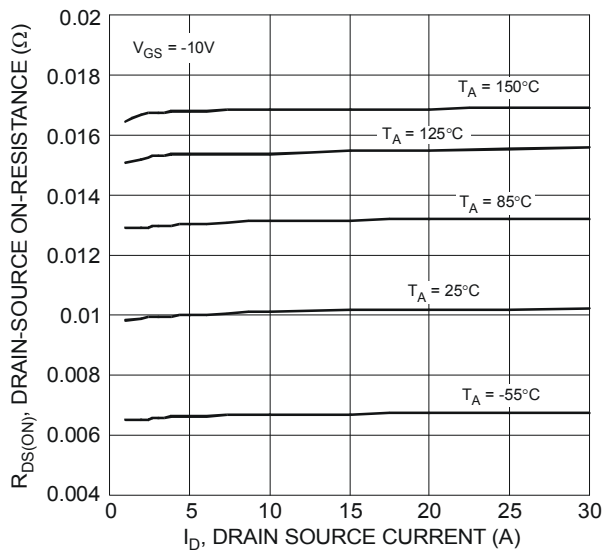


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

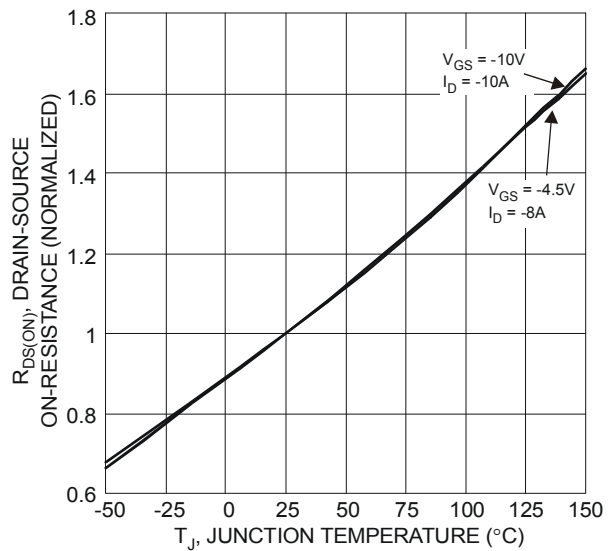


Figure 6 On-Resistance Variation with Temperature

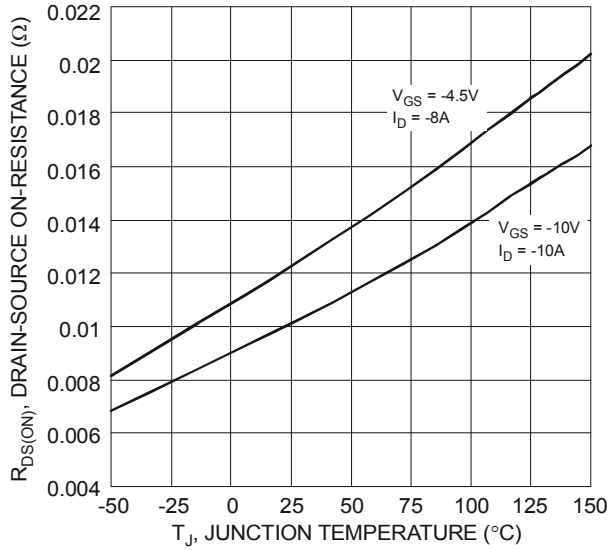


Figure 7 On-Resistance Variation with Temperature

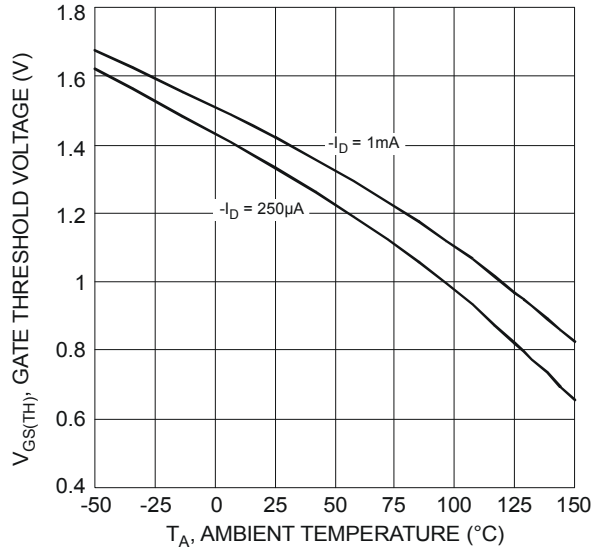


Figure 8 Gate Threshold Variation vs. Ambient Temperature

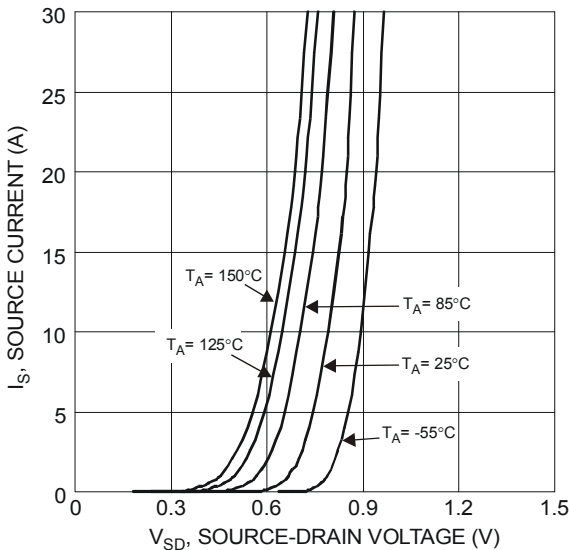


Figure 9 Diode Forward Voltage vs. Current

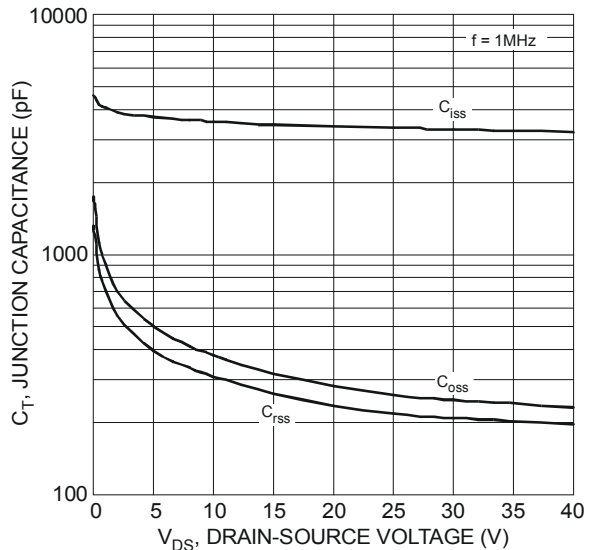


Figure 10 Typical Junction Capacitance

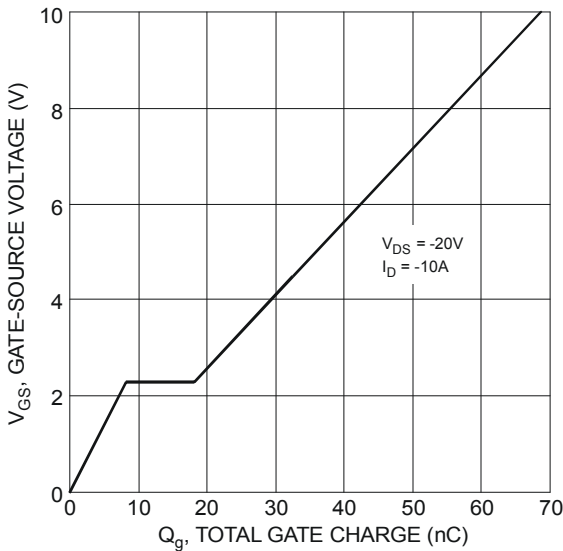


Figure 11 Gate-Charge Characteristics

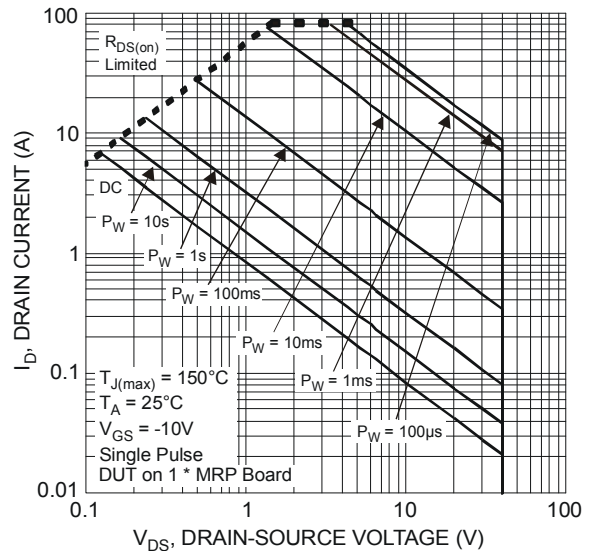
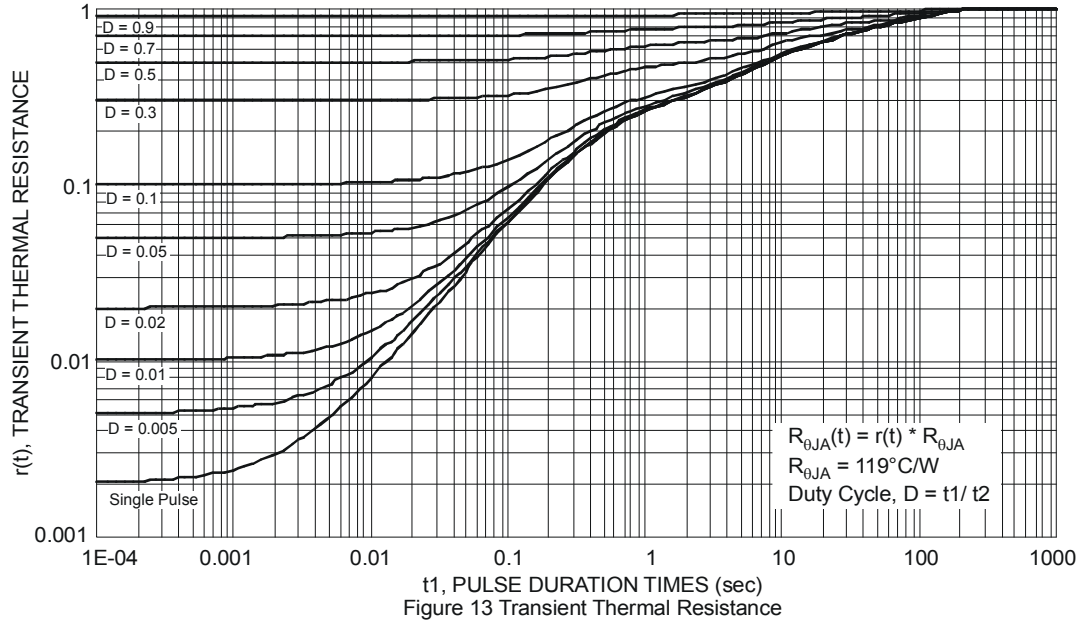
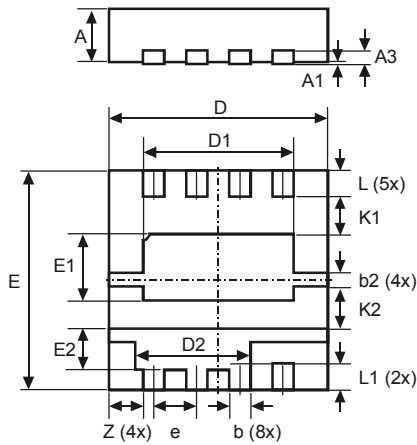


Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

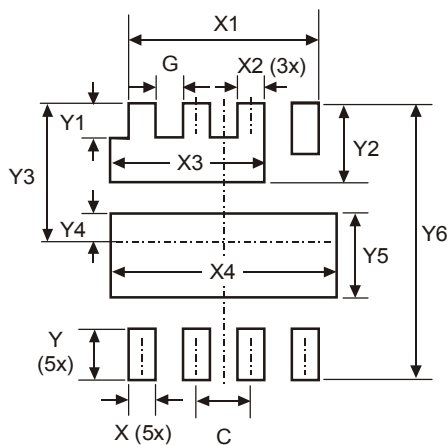
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| POWERDI [®] 3333-8 Type B | | | |
|---------------------------------------|------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.75 | 0.85 | 0.80 |
| A1 | 0 | 0.05 | 0.02 |
| A3 | - | - | 0.203 |
| b | 0.27 | 0.37 | 0.32 |
| b2 | - | - | 0.20 |
| D | 3.25 | 3.35 | 3.30 |
| D1 | 2.55 | 2.66 | 2.61 |
| D2 | 1.74 | 1.84 | 1.79 |
| e | - | - | 0.65 |
| E | 3.25 | 3.35 | 3.30 |
| E1 | 1.14 | 1.24 | 1.19 |
| E2 | 0.61 | 0.71 | 0.66 |
| K1 | - | - | 0.41 |
| K2 | - | - | 0.38 |
| L | 0.35 | 0.45 | 0.40 |
| L1 | - | - | 0.25 |
| Z | - | - | 0.515 |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| G | 0.230 |
| X | 0.420 |
| X1 | 2.370 |
| X2 | 0.420 |
| X3 | 1.890 |
| X4 | 2.710 |
| Y | 0.700 |
| Y1 | 0.400 |
| Y2 | 1.160 |
| Y3 | 1.850 |
| Y4 | 0.405 |
| Y5 | 1.295 |
| Y6 | 3.700 |

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