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DMG7401SFG

**P-CHANNEL ENHANCEMENT MODE MOSFET
 POWERDI®**

Product Summary

| V _{(BR)DSS} | R _{DS(ON)} max | I _D max T _A = +25°C |
|----------------------|--------------------------------|--|
| -30V | 13mΩ @ V _{GS} = -10V | -9.8A |
| | 25mΩ @ V _{GS} = -4.5V | -7.0A |

Description

This MOSFET has been 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.

Applications

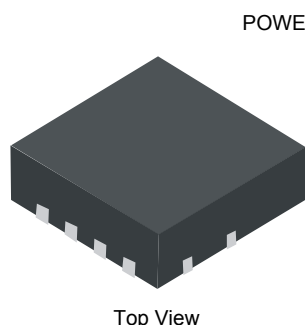
- Backlighting
- Power Management Functions
- DC-DC Converters

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 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**

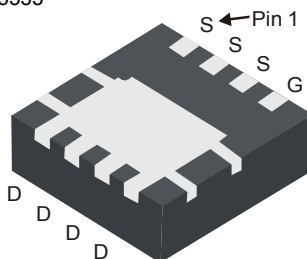
Mechanical Data

- Case: POWERDI3333
- 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: 0.0174 grams (approximate)

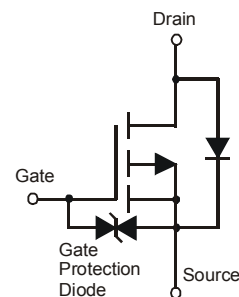


Top View

POWERDI3333



Bottom View



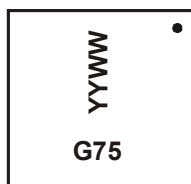
Equivalent Circuit

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|-------------|------------------|
| DMG7401SFG-7 | POWERDI3333 | 2000/Tape & Reel |
| DMG7401SFG-13 | POWERDI3333 | 3000/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



G75 = Product marking code
 YYWW = Date code marking
 YY = Last digit of year (ex: 10 for 2010)
 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} | -30 | V |
| Gate-Source Voltage | V_{GSS} | ± 25 | V |
| Continuous Drain Current (Note 6) $V_{GS} = -10\text{V}$ | I_D | $T_A = +25^\circ\text{C}$ | -9.8 |
| | | $T_A = +70^\circ\text{C}$ | -7.7 |
| | I_D | $T_A = +25^\circ\text{C}$ | -13.5 |
| | | $T_A = +70^\circ\text{C}$ | -10.8 |
| Maximum Continuous Body Diode Forward Current (Note 5) | I_S | -3.0 | A |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | I_{DM} | -80 | A |
| Avalanche Current (Notes 7 & 8) | I_{AR} | 14 | A |
| Repetitive Avalanche Energy (Notes 7 & 8) $L = 1\text{mH}$ | E_{AR} | 104 | mJ |

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

| Characteristic | Symbol | Value | Units |
|--|-----------------|---------------------------|--------------------|
| Total Power Dissipation (Note 5) | P_D | $T_A = +25^\circ\text{C}$ | 0.94 |
| | | $T_A = +70^\circ\text{C}$ | 0.6 |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | Steady State | 137 |
| | | $t < 10\text{s}$ | 82 |
| Total Power Dissipation (Note 6) | P_D | $T_A = +25^\circ\text{C}$ | 2.2 |
| | | $T_A = +70^\circ\text{C}$ | 1.3 |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | Steady State | 60 |
| | | $t < 10\text{s}$ | 36 |
| Thermal Resistance, Junction to Case (Note 6) | $R_{\theta JC}$ | 3.0 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

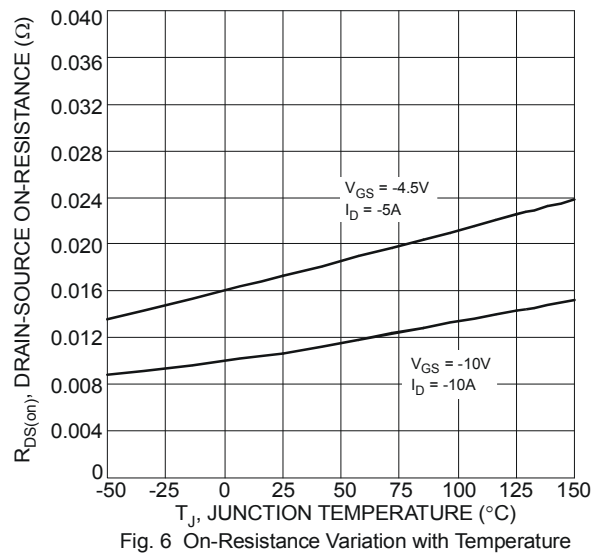
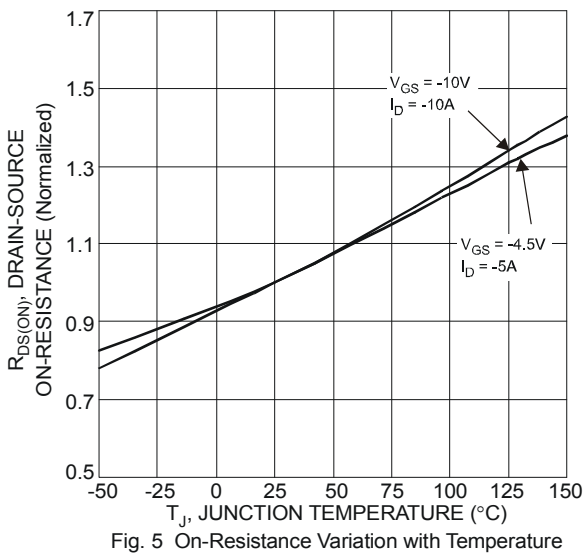
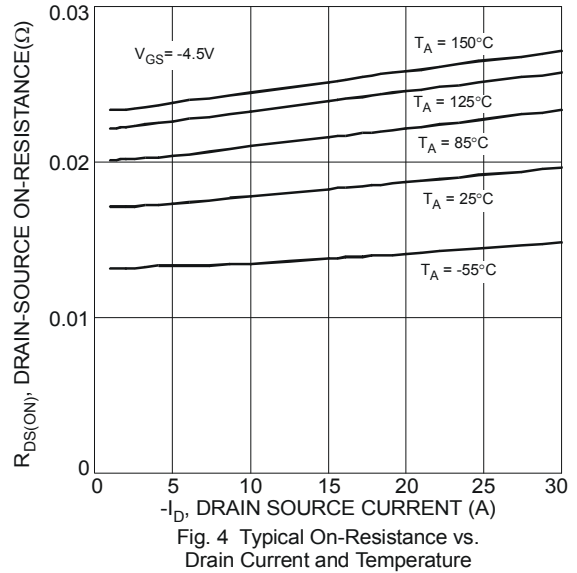
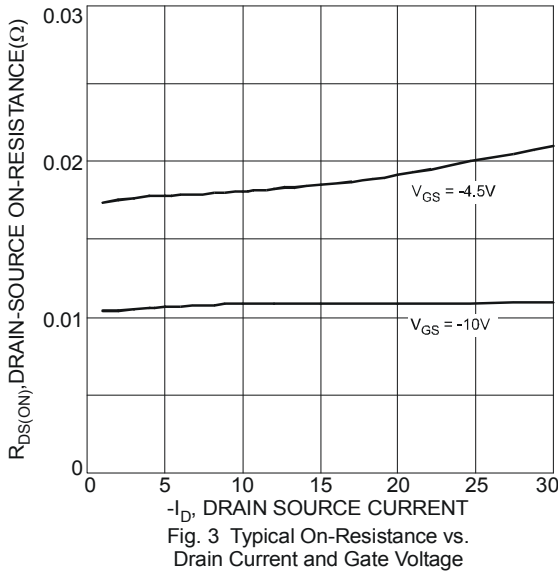
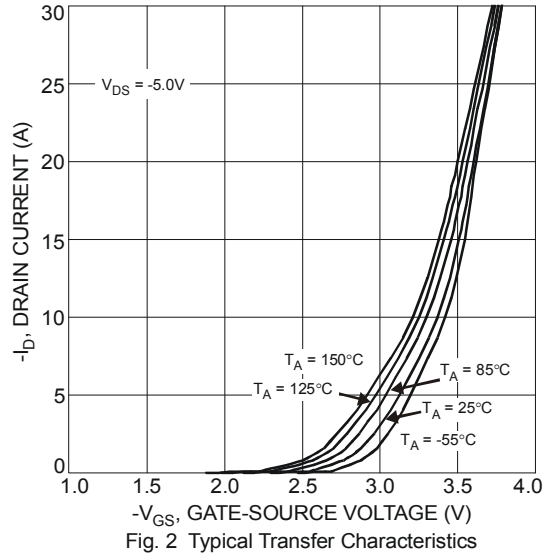
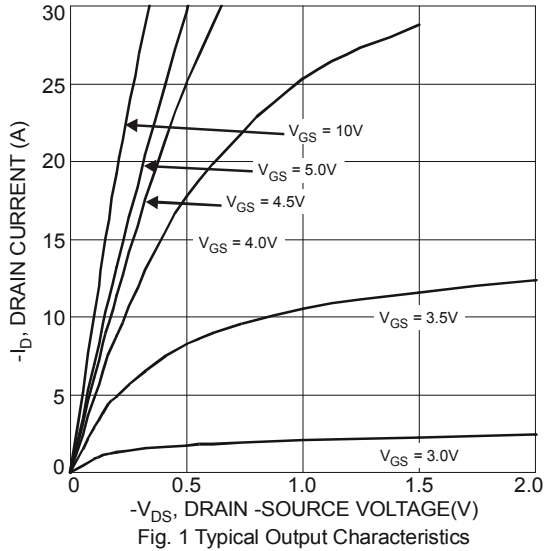
Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|--------------|------|------|----------|---------------|--|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | -30 | — | — | V | $V_{GS} = 0\text{V}, I_D = -250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | — | — | -1 | μA | $V_{DS} = -30\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | — | — | ± 10 | μA | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -1.7 | — | -3.0 | V | $V_{DS} = V_{GS}, I_D = -250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | — | 9 | 11 | m Ω | $V_{GS} = -20\text{V}, I_D = -12\text{A}$ |
| | | — | 10 | 13 | | $V_{GS} = -10\text{V}, I_D = -9\text{A}$ |
| | | — | 17 | 25 | | $V_{GS} = -4.5\text{V}, I_D = -5\text{A}$ |
| Forward Transfer Admittance | $ Y_{fs} $ | — | 21 | — | S | $V_{DS} = -5\text{V}, I_D = -10\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C_{iss} | — | 2246 | 2987 | pF | $V_{DS} = -15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | — | 352 | 468 | pF | |
| Reverse Transfer Capacitance | C_{rss} | — | 294 | 391 | pF | |
| Gate resistance | R_g | — | 5.1 | 10 | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_g | — | 20.5 | 30 | nC | $V_{DS} = -15\text{V}, I_D = -12\text{A}$ |
| Total Gate Charge ($V_{GS} = 10\text{V}$) | Q_g | — | 41 | 58 | nC | |
| Gate-Source Charge | Q_{gs} | — | 7.6 | - | nC | |
| Gate-Drain Charge | Q_{gd} | — | 8.0 | - | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 11.3 | 23 | ns | |
| Turn-On Rise Time | t_r | — | 15.4 | 31 | ns | $V_{DD} = -15\text{V}, V_{GS} = -10\text{V}, R_L = 1.25\Omega, R_G = 3\Omega,$ |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 38.0 | 61 | ns | |
| Turn-Off Fall Time | t_f | — | 22.0 | 38 | ns | |
| BODY DIODE CHARACTERISTICS | | | | | | |
| Diode Forward Voltage | V_{SD} | — | -0.7 | -1.0 | V | $V_{GS} = 0\text{V}, I_S = -1\text{A}$ |
| Reverse Recovery Time (Note 9) | t_{rr} | — | 20 | 31 | ns | $I_S = -9.5\text{A}, dI/dt = 100\text{A}/\mu\text{s}$ |
| Reverse Recovery Charge (Note 9) | Q_{rr} | — | 9.5 | 18 | nC | |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AR} and E_{AR} rating 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



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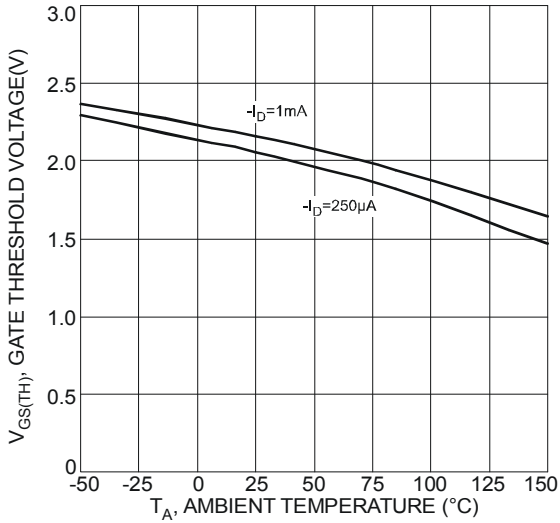


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

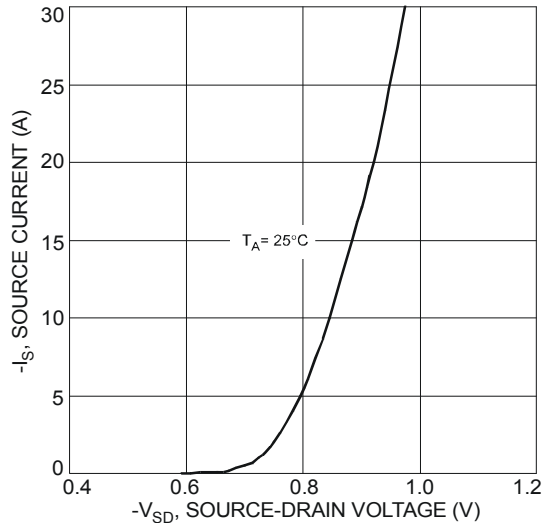


Fig. 8 Diode Forward Voltage vs. Current

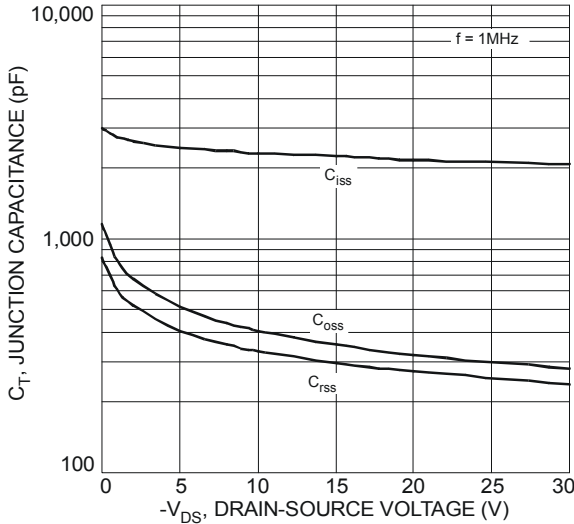


Fig. 9 Typical Junction Capacitance

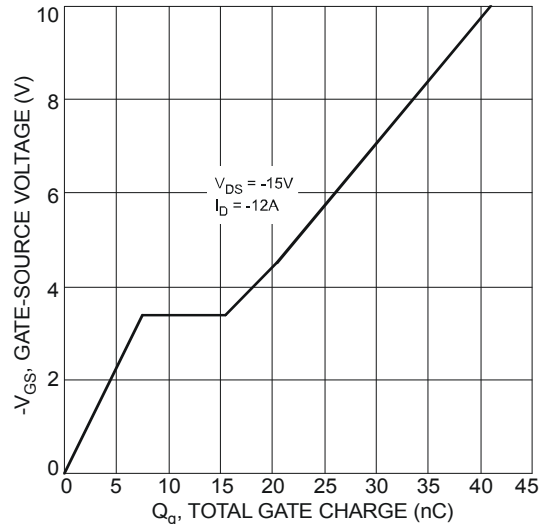


Fig. 10 Gate-Charge Characteristics

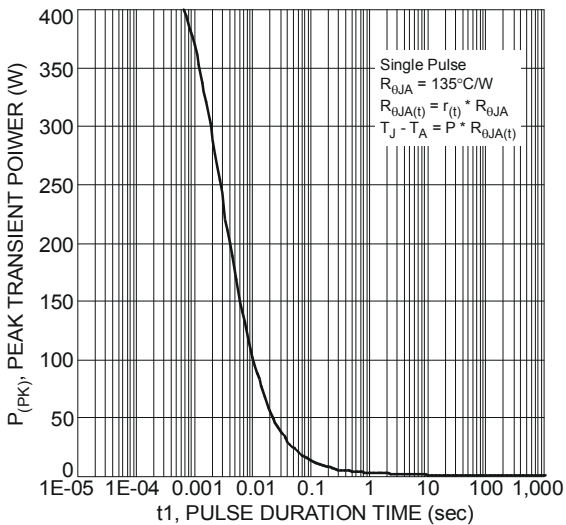


Fig. 11 Single Pulse Maximum Power Dissipation

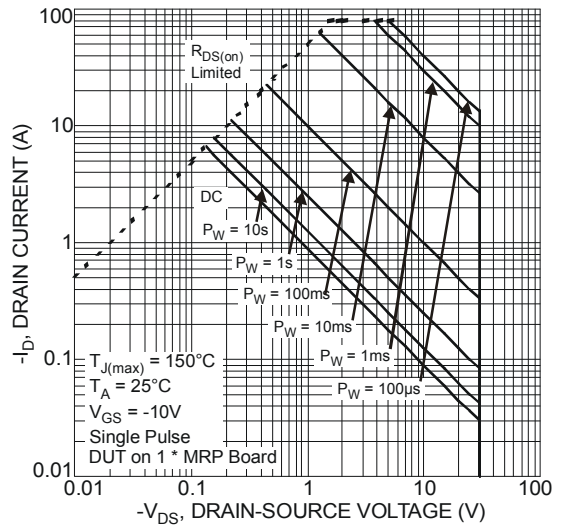


Fig. 12 SOA, Safe Operation Area

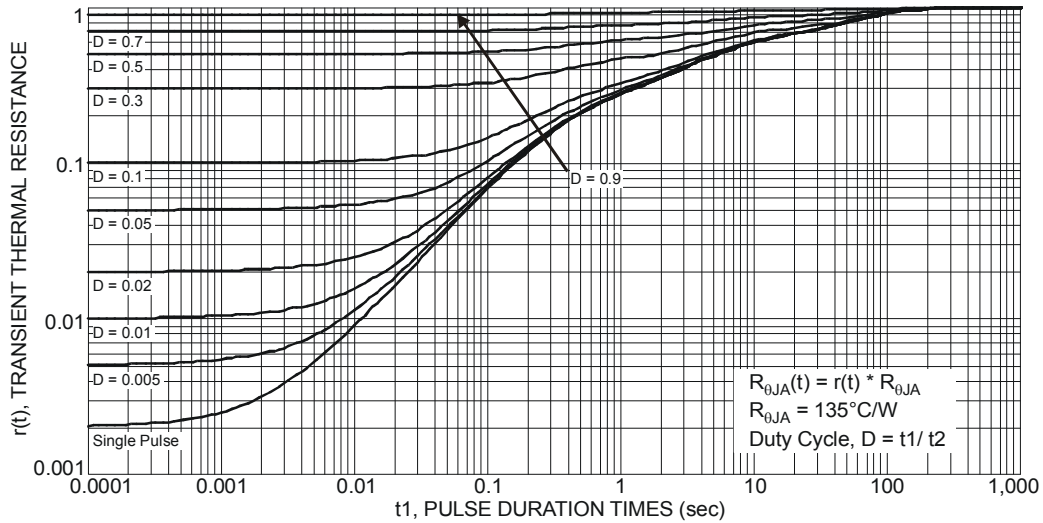
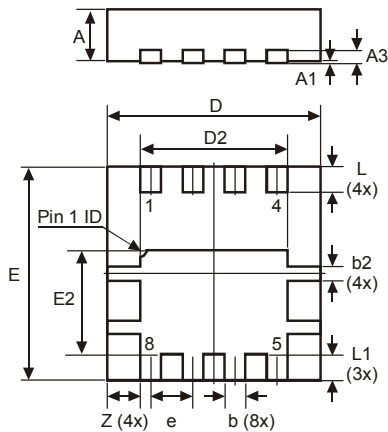


Fig. 13 Transient Thermal Resistance

Package Outline Dimensions

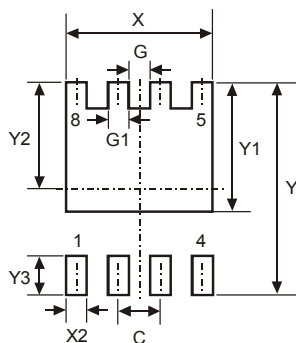
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| POWERDI3333-8 | | | |
|----------------------|------|------|-------|
| Dim | Min | Max | Typ |
| D | 3.25 | 3.35 | 3.30 |
| E | 3.25 | 3.35 | 3.30 |
| D2 | 2.22 | 2.32 | 2.27 |
| E2 | 1.56 | 1.66 | 1.61 |
| 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 |
| L | 0.35 | 0.45 | 0.40 |
| L1 | - | - | 0.39 |
| e | - | - | 0.65 |
| 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 |
| G1 | 0.420 |
| Y | 3.700 |
| Y1 | 2.250 |
| Y2 | 1.850 |
| Y3 | 0.700 |
| X | 2.370 |
| X2 | 0.420 |

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