

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON) \text{ max}}$	$I_D \text{ max}$ $T_A = +25^\circ\text{C}$
40V	12mΩ @ $V_{GS} = 10\text{V}$	11.5A
	15mΩ @ $V_{GS} = 4.5\text{V}$	10.3A

## 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**

## Description and Applications

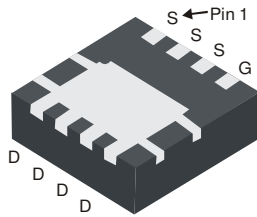
This MOSFET is designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high-efficiency power management applications such as:

- Backlighting
- Power Management Functions
- DC-DC Converters

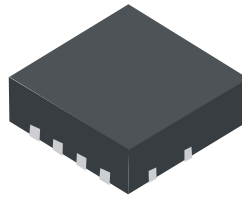
## Mechanical Data

- Case: POWERDI 3333-8
- 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 208③
- Weight: 0.072 grams (Approximate)

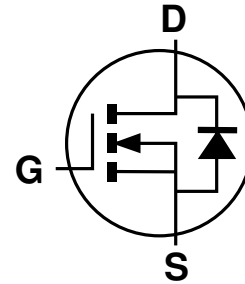
POWERDI 3333-8



Bottom View



Top View



Equivalent Circuit

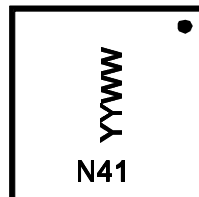
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN4010LFG-7	POWERDI 3333-8	2,000/Tape & Reel
DMN4010LFG-13	POWERDI 3333-8	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](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

POWERDI 3333-8



N41 = 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			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	11.5 9.2	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	14.2 11.4	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	80	A
Maximum Continuous Body Diode Forward Current (Note 6)			$I_S$	2	A
Avalanche Current (Note 7) $L = 0.1\text{mH}$			$I_{AS}$	27	A
Avalanche Energy (Note 7) $L = 0.1\text{mH}$			$E_{AS}$	37	mJ

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

Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 5)			$P_D$	0.93	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady state		$R_{\theta JA}$	137	$^\circ\text{C/W}$
	$t < 10\text{s}$			89	
Total Power Dissipation (Note 6)			$P_D$	2.45	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state		$R_{\theta JA}$	52	$^\circ\text{C/W}$
	$t < 10\text{s}$			34	
Thermal Resistance, Junction to Case (Note 6)			$R_{\theta JC}$	3	
Operating and Storage Temperature Range			$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- 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 1inch square copper plate.
  7.  $I_{AS}$  and  $E_{AS}$  rating are based on low frequency and duty cycles to keep  $T_J = +25^\circ\text{C}$ .

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	—	3.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	—	12	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 14A
		—	—	15		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 11A
Diode Forward Voltage	V <sub>SD</sub>	—	0.72	—	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 14A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	1,810	—	pF	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	135	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	112	—	pF	
Gate Resistance	R <sub>g</sub>	—	1.7	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	—	17	—	nC	V <sub>DS</sub> = 20V, I <sub>D</sub> = 14A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	37	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	—	5.6	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	7.1	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	5.1	—	ns	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 20V, R <sub>G</sub> = 6Ω, I <sub>D</sub> = 14A
Turn-On Rise Time	t <sub>r</sub>	—	13	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	36	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	13	—	ns	
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	12.2	—	nS	I <sub>F</sub> = 3A, di/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	5.4	—	nC	I <sub>F</sub> = 3A, di/dt = 100A/μs

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

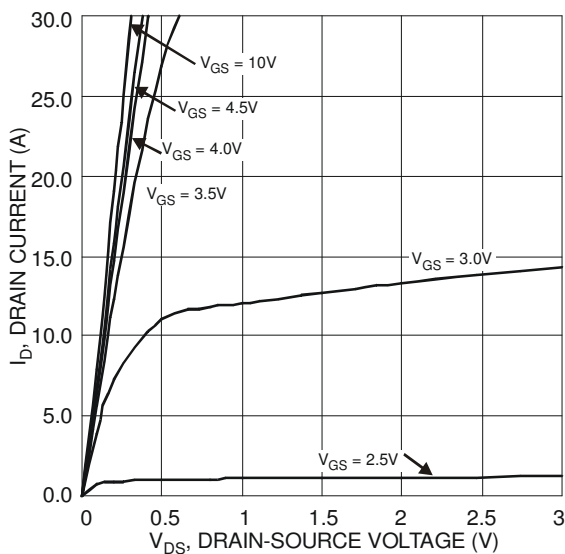


Figure 1 Typical Output Characteristic

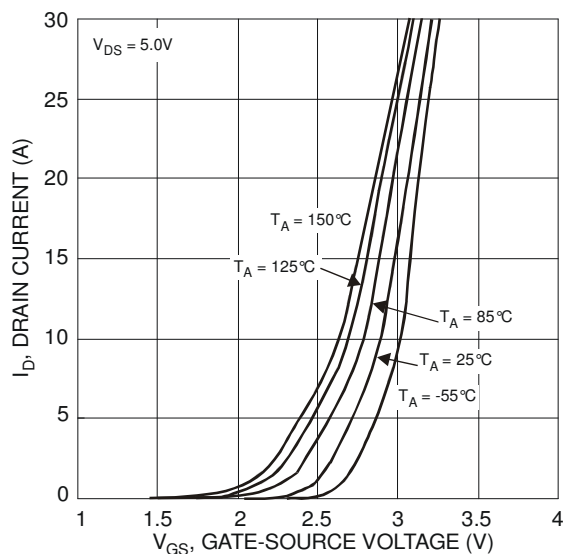


Figure 2 Typical Transfer Characteristics

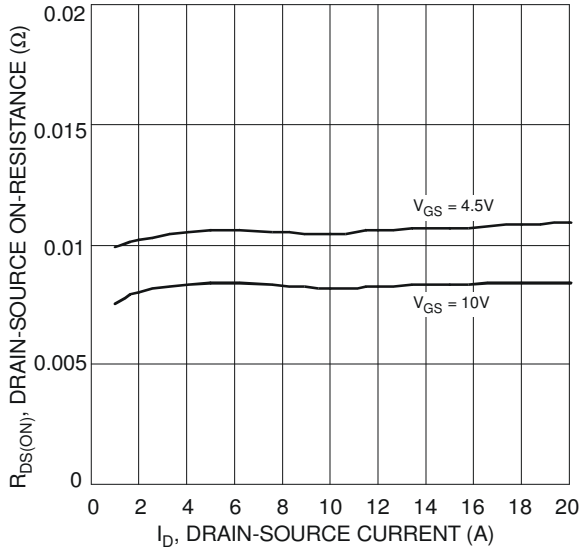


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

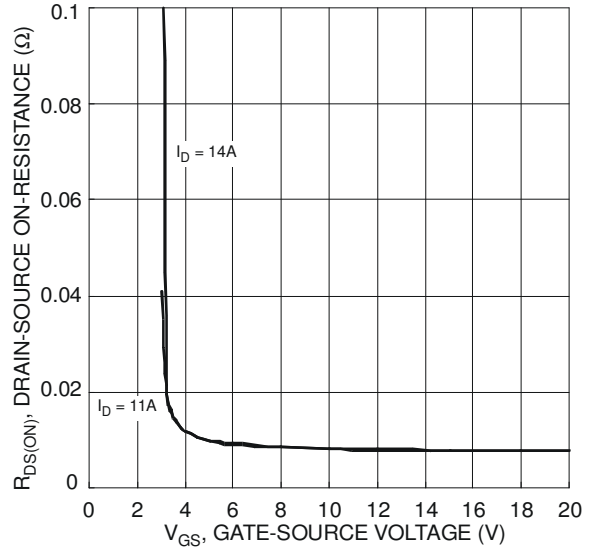


Figure 4 Typical Transfer Characteristic

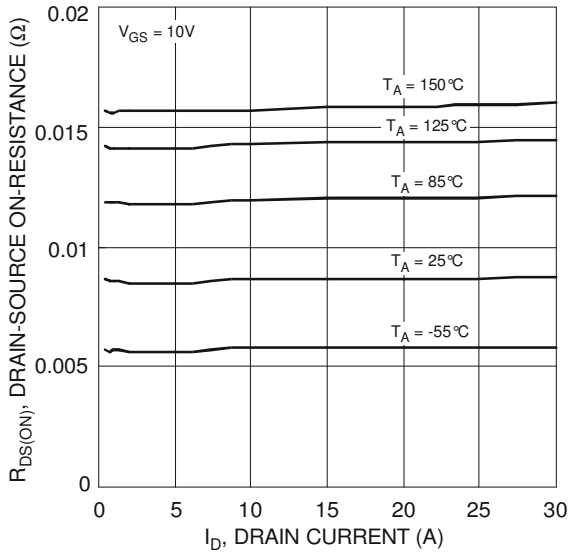


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

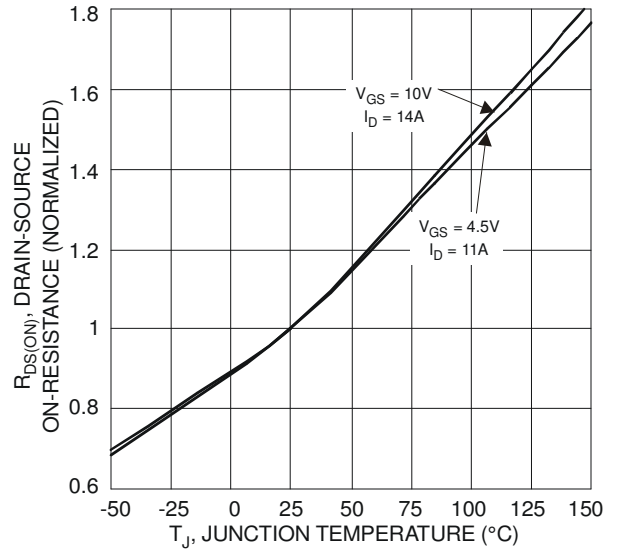


Figure 6 On-Resistance Variation with Temperature

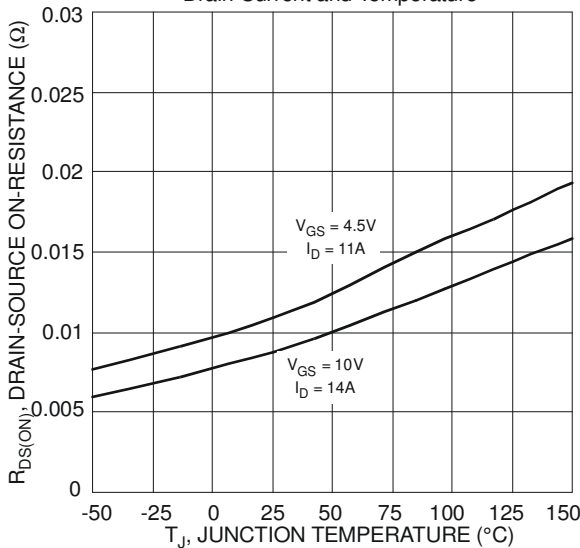


Figure 7 On-Resistance Variation with Temperature

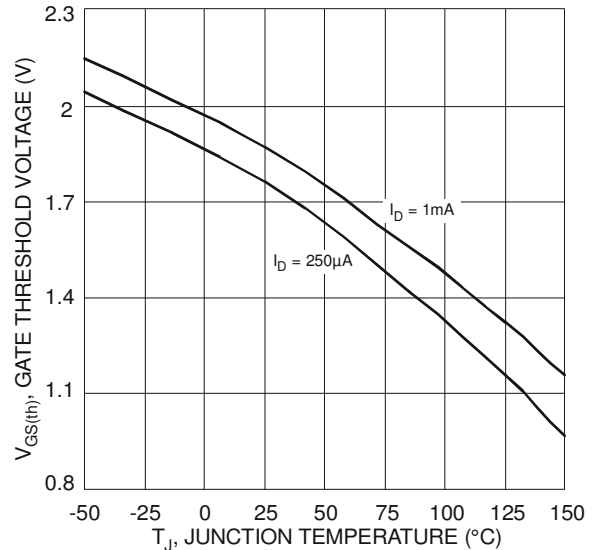


Figure 8 Gate Threshold Variation vs. Ambient Temperature

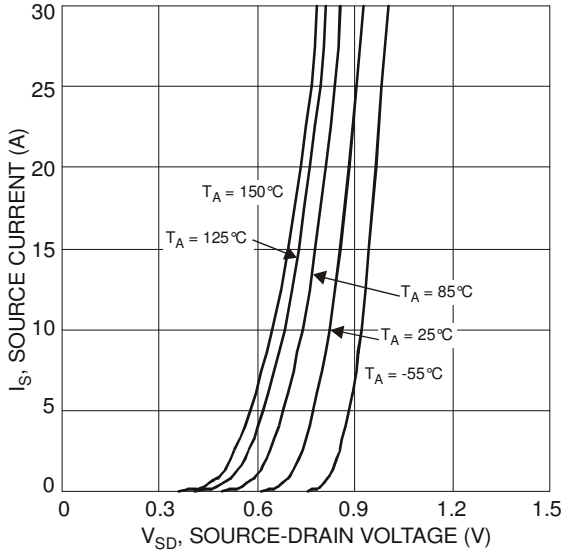


Figure 9 Diode Forward Voltage vs. Current

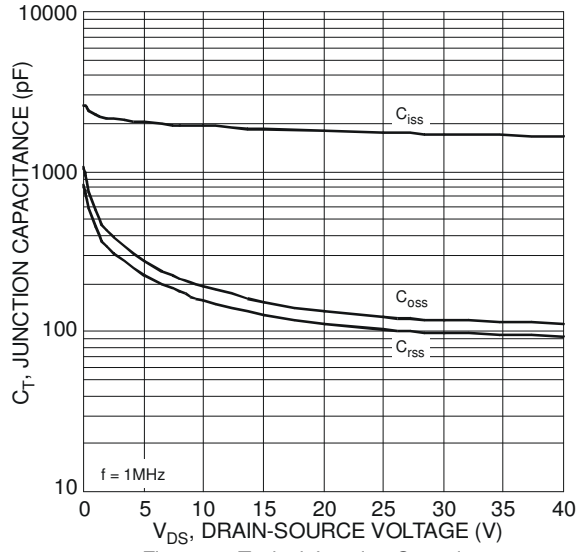


Figure 10 Typical Junction Capacitance

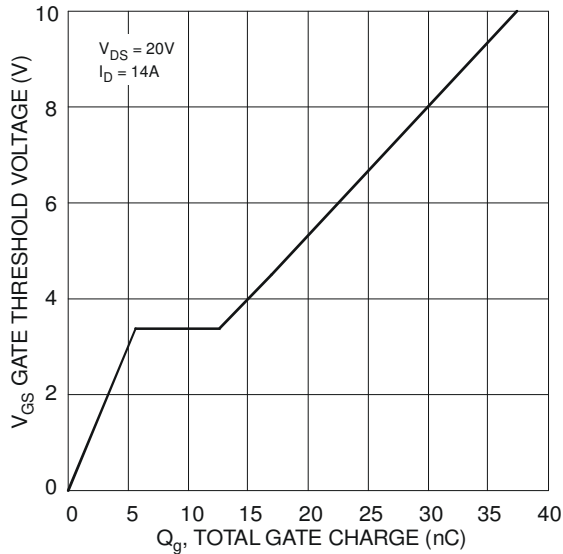


Figure 11 Gate Charge

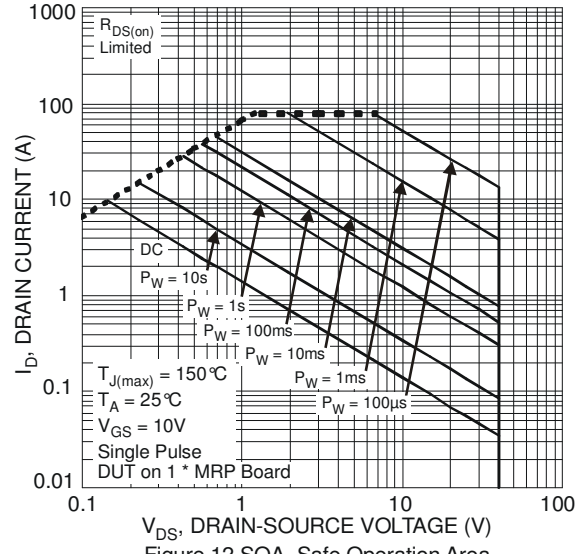


Figure 12 SOA, Safe Operation Area

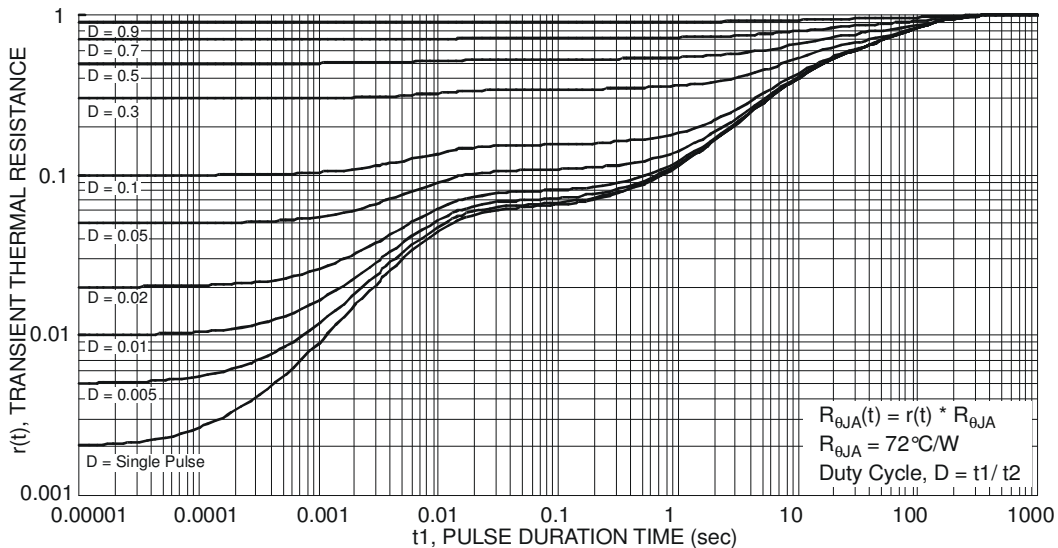
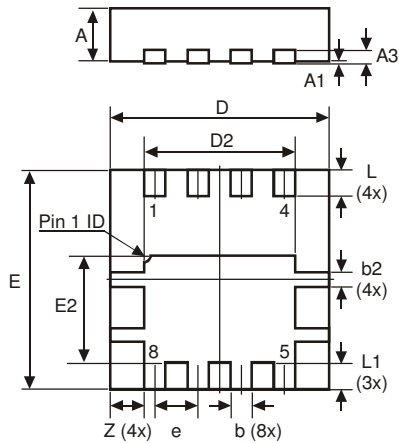


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

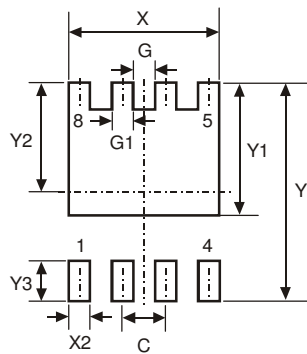
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



POWERDI® 3333-8			
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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