

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

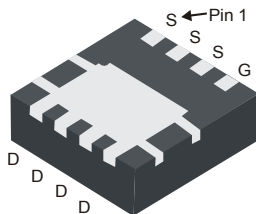
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

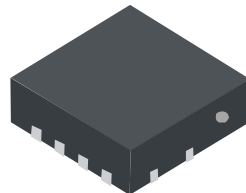
Mechanical Data

- 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)

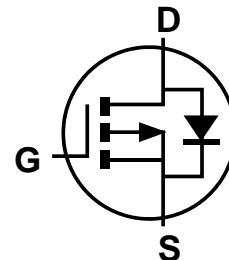
POWERDI3333-8



Bottom View



Top View



Equivalent Circuit

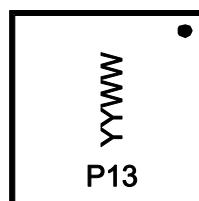
Ordering Information (Note 4)

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°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} = -10V	I _D	T _A = +25°C	-10.3
		T _A = +70°C	-8.3
Pulsed Drain Current (10µs pulse, duty cycle = 1%)	I _{DM}	T _A = +25°C	-13.7
		T _A = +70°C	-11
Maximum Continuous Body Diode Forward Current (Note 6)	I _S	2.6	A
Avalanche Current, L = 0.1mH	I _{AS}	34	A
Avalanche Energy, L = 0.1mH	E _{AS}	58	mJ

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P _D	1	W
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	Steady State	123
		t < 10s	69
Total Power Dissipation (Note 6)	P _D	2.1	W
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	Steady State	60
		t < 10s	34
Thermal Resistance, Junction to Case (Note 6)	R _{θJC}	3.3	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

Electrical Characteristics (@T_A = +25°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} = 0V, I _D = -250µA
Zero Gate Voltage Drain Current T _J = +25°C	I _{DSS}	—	—	-1	µA	V _{DS} = -40V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	-1	—	-3	V	V _{DS} = V _{GS} , I _D = -250µA
Static Drain-Source On-Resistance	R _{DS(on)}	—	—	13	mΩ	V _{GS} = -10V, I _D = -10A
		—	—	18	mΩ	V _{GS} = -4.5V, I _D = -8A
Diode Forward Voltage	V _{SD}	—	-0.7	-1.2	V	V _{GS} = 0V, I _S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iSS}	—	3426	—	pF	V _{DS} = -20V, V _{GS} = 0V, f = 1MHz
Output Capacitance	C _{oss}	—	283	—	pF	
Reverse Transfer Capacitance	C _{rSS}	—	235	—	pF	
Gate Resistance	R _g	—	4.7	—	Ω	V _{DS} = 0V, V _{GS} = 0V, f = 1MHz
Total Gate Charge (V _{GS} = -4.5V)	Q _g	—	32.5	—	nC	V _{DS} = -20V, I _D = -10A
Total Gate Charge (V _{GS} = -10V)	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} = -20V, V _{GEN} = -10V, R _G = 3Ω, I _D = -10A
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 = -10A, di/dt = 100A/µs
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.

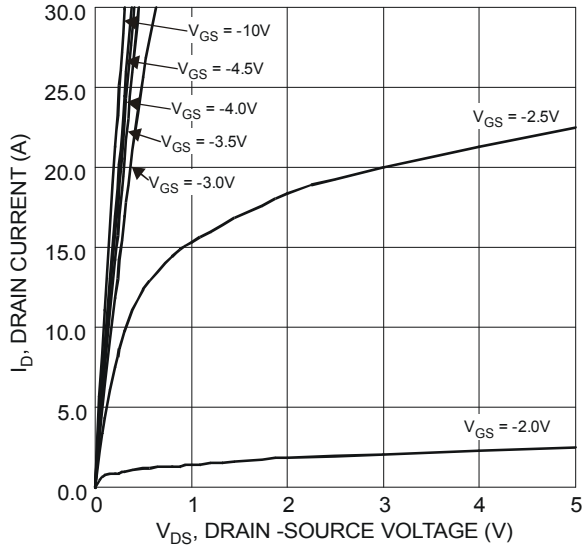


Figure 1 Typical Output Characteristics

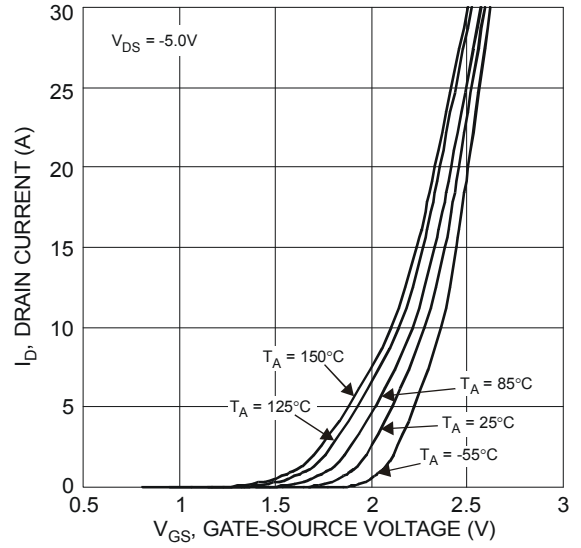


Figure 2 Typical Transfer Characteristics

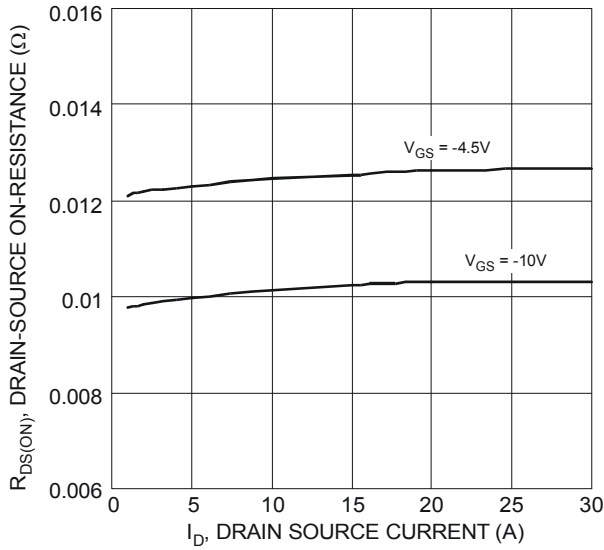


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

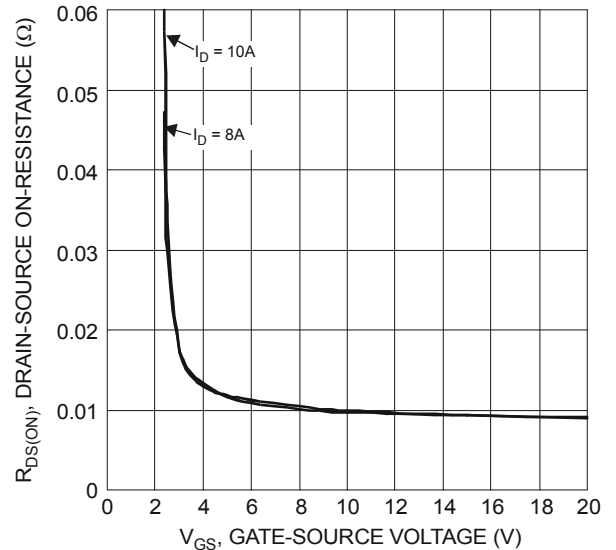


Figure 4 Typical Transfer Characteristics

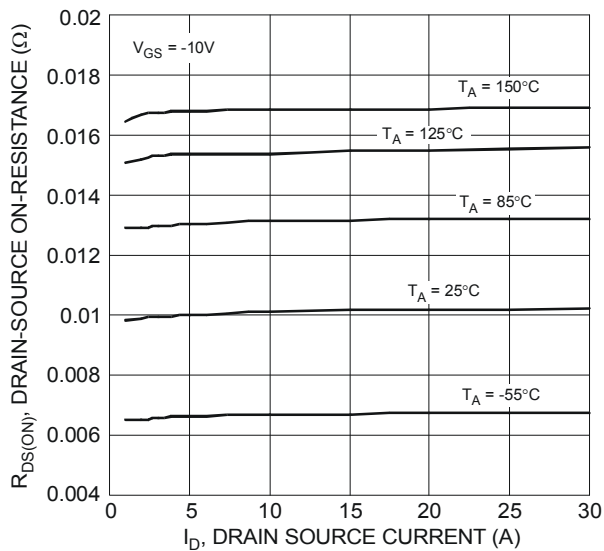


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

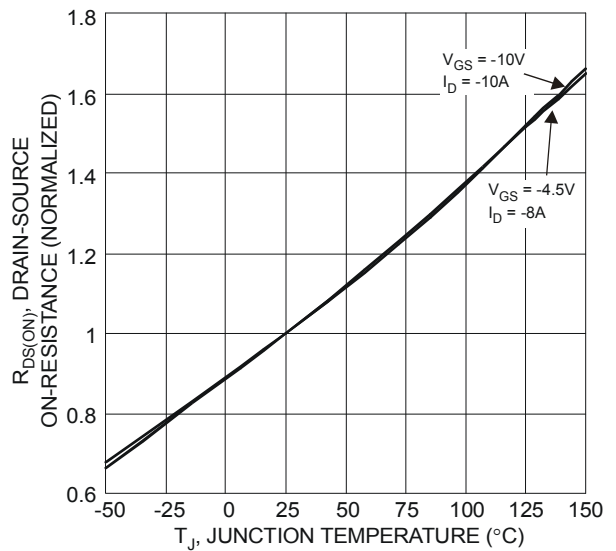


Figure 6 On-Resistance Variation with Temperature

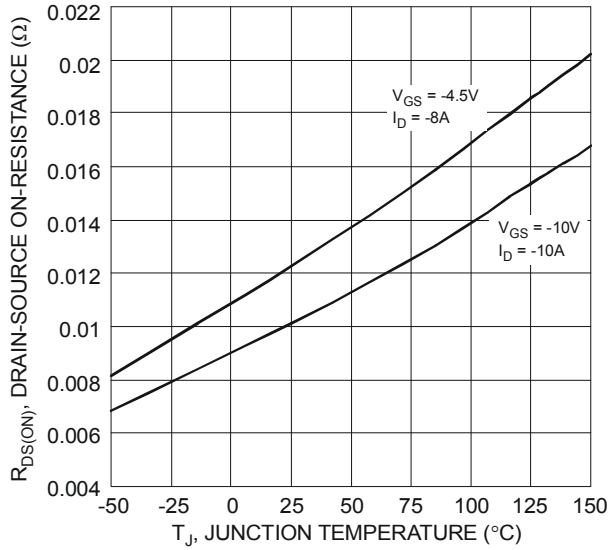


Figure 7 On-Resistance Variation with Temperature

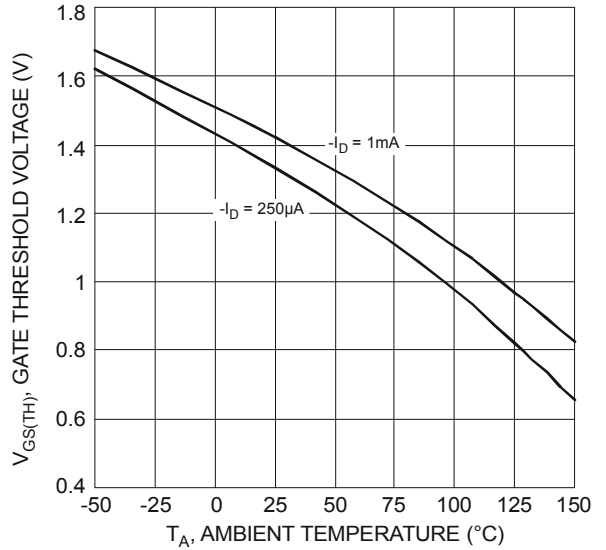


Figure 8 Gate Threshold Variation vs. Ambient Temperature

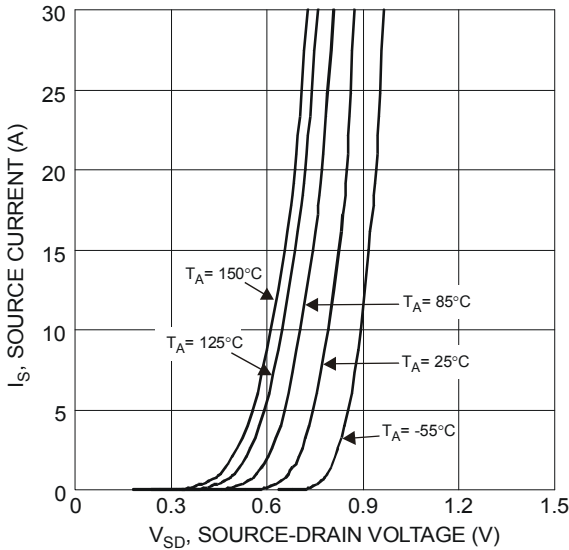


Figure 9 Diode Forward Voltage vs. Current

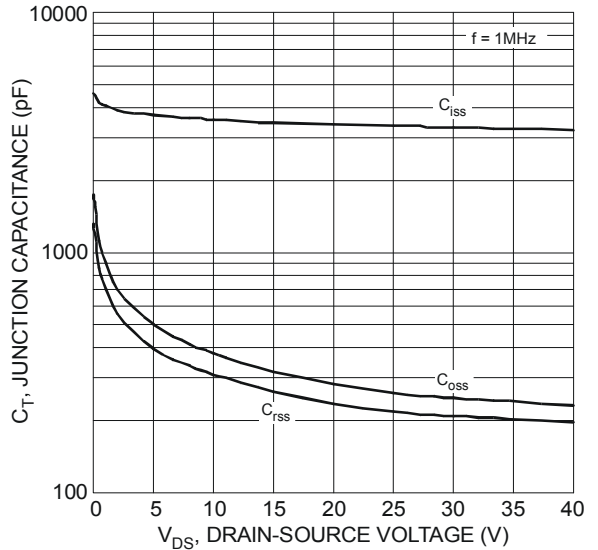


Figure 10 Typical Junction Capacitance

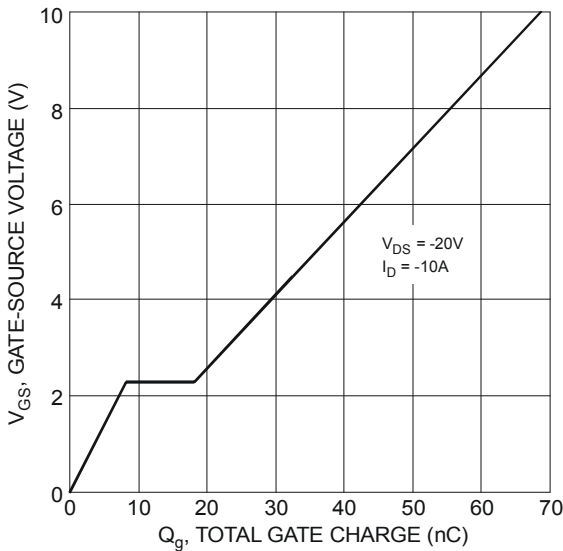


Figure 11 Gate-Charge Characteristics

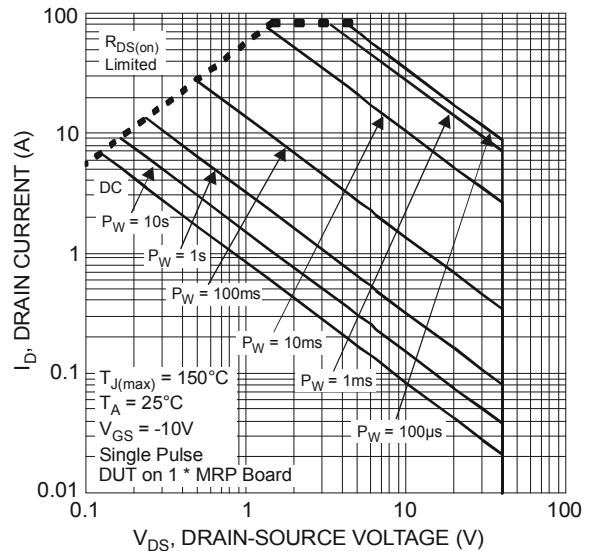
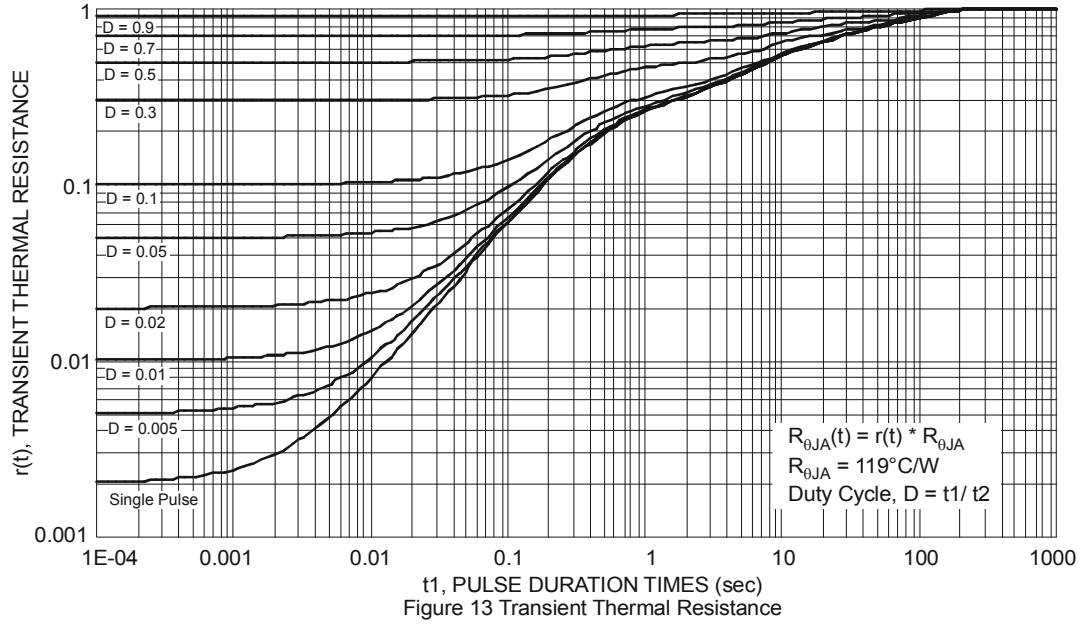
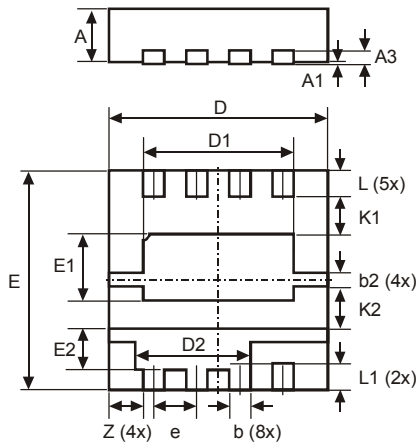


Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

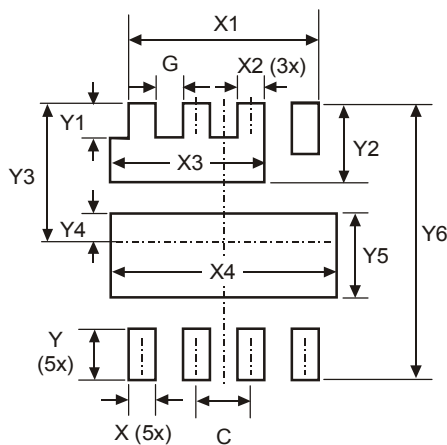
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



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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