60V N-CHANNEL ENHANCEMENT MODE MOSFET
POWERDI®

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max T_A = +25°C
60V	13mΩ @ V_{GS} = 10V	10.3A
	18mΩ @ V_{GS} = 4.5V	8.8A

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

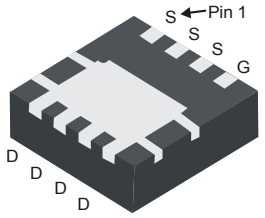
Features and Benefits

- 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**

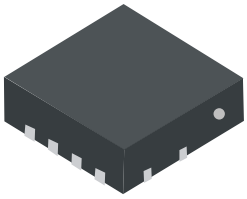
Mechanical Data

- Case: 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 208 e3
- Weight: 0.072 grams (approximate)

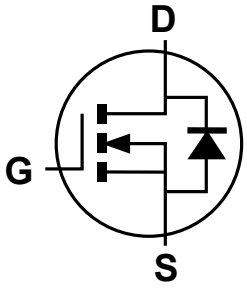
POWERDI®3333-8



Bottom View



Top View



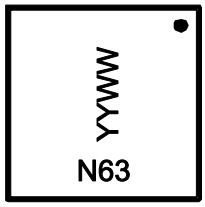
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN6013LFG-7	POWERDI®3333-8	2,000/Tape & Reel
DMN6013LFG-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 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



N63= Product Type Marking Code
YYWW = Date Code Marking
YY = Last digit of year (ex: 13 = 2013)
WW = Week code (01 ~ 53)

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Maximum Ratings (@T_A = +25°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} = 10V	T_A = +25°C T_A = +70°C	I_D	10.3 8.3	A
	T_C = +25°C T_C = +100°C	I_D	45 28	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)		I_{DM}	58.3	A
Maximum Continuous Body Diode Forward Current (Note 6)		I_S	3	A
Avalanche Current, L = 0.1mH		I_{AS}	33.3	A
Avalanche Energy, L = 0.1mH		E_{AS}	56.8	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)	Steady state	$R_{\theta JA}$	123	°C/W
	t < 10s		69	
Total Power Dissipation (Note 6)		P_D	2.1	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	60	°C/W
	t < 10s		34	
Total Power Dissipation (Note 6)		P_D	40	W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	6.7	°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}	60	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current, T_J = +25°C	I_{DSS}	—	—	1	µA	V_{DS} = 60V, 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	1.8	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	9.3	13	mΩ	V_{GS} = 10V, I_D = 10A
		—	12.3	18		V_{GS} = 4.5V, I_D = 8A
Diode Forward Voltage	V_{SD}	—	0.7	1.2	V	V_{GS} = 0V, I_S = 1.7A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2577	—	pF	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	162	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	132	—	pF	
Gate Resistance	R_g	—	0.9	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	26.6	—	nC	V_{DS} = 30V, I_D = 10A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	55.4	—	nC	
Gate-Source Charge	Q_{gs}	—	9.3	—	nC	
Gate-Drain Charge	Q_{gd}	—	12.6	—	nC	
Turn-On Delay Time	$t_{D(on)}$	—	6.2	—	ns	V_{GS} = 10V, V_{DS} = 30V, R_G = 3Ω, I_D = 10A
Turn-On Rise Time	t_r	—	9.9	—	ns	
Turn-Off Delay Time	$t_{D(off)}$	—	27.6	—	ns	
Turn-Off Fall Time	t_f	—	11.7	—	ns	
Body Diode Reverse Recovery Time	t_{rr}	—	9.4	—	nS	I_F = 10A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{rr}	—	18.6	—	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 1inch square copper plate
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

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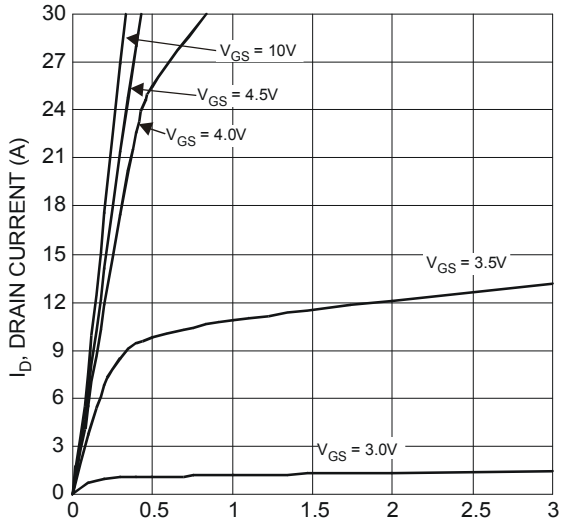


Figure 1 Typical Output Characteristics

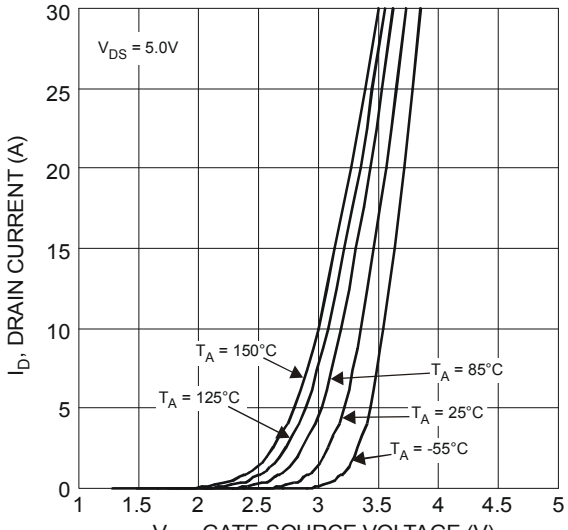


Figure 2 Typical Transfer Characteristics

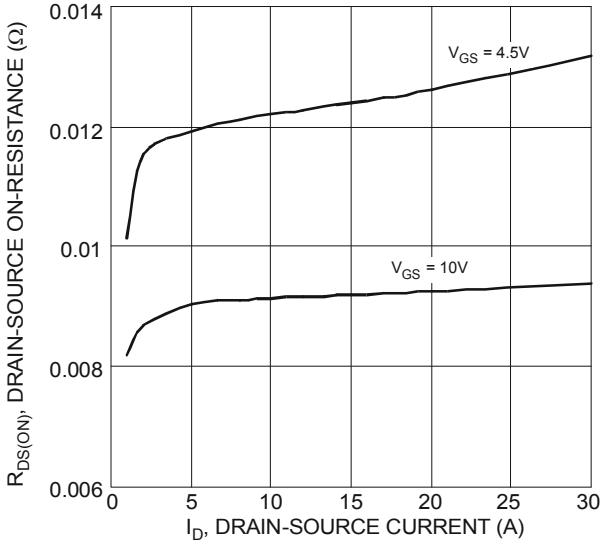


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

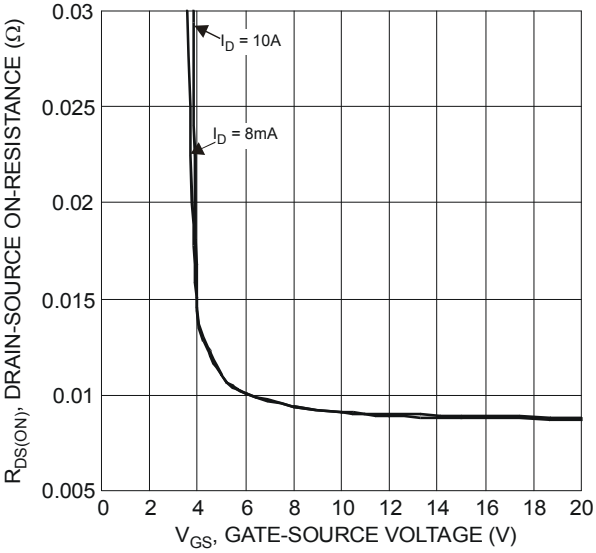


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

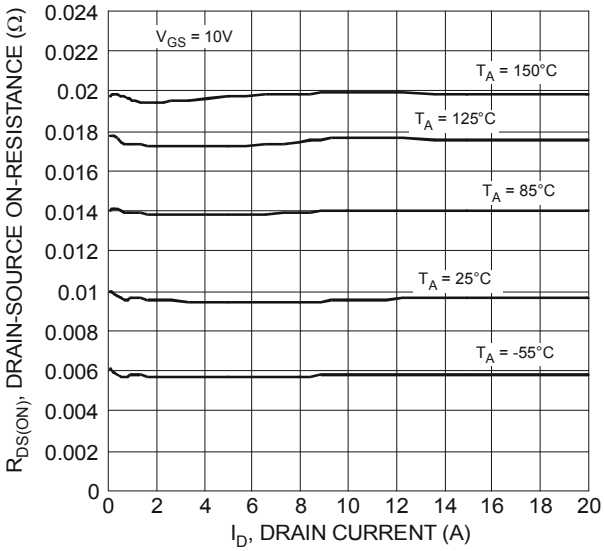


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

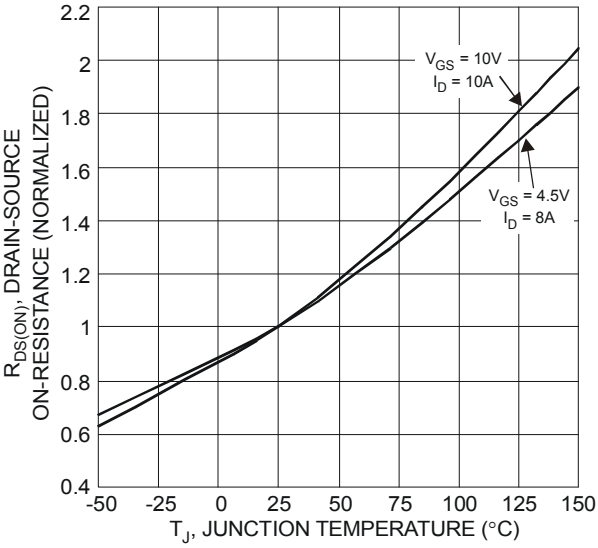


Figure 6 On-Resistance Variation with Temperature

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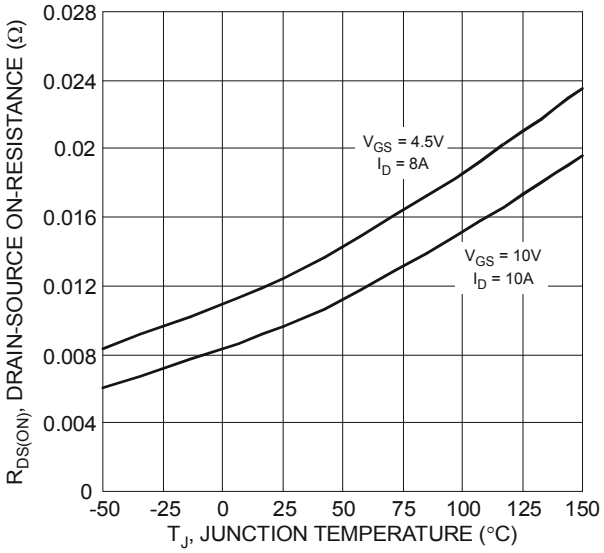


Figure 7 On-Resistance Variation with Temperature

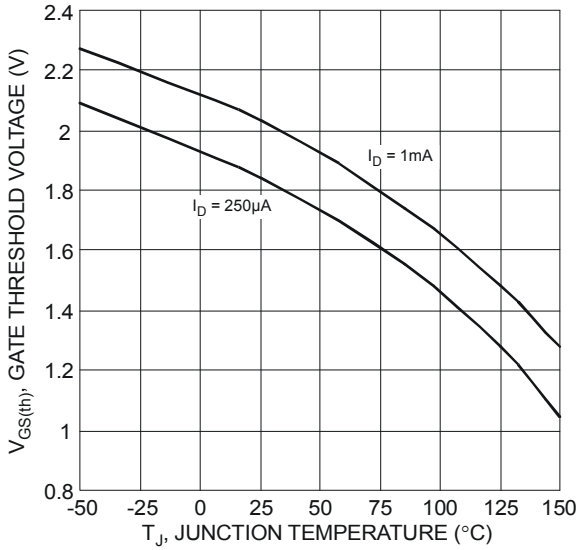


Figure 8 Gate Threshold Variation vs. Ambient Temperature

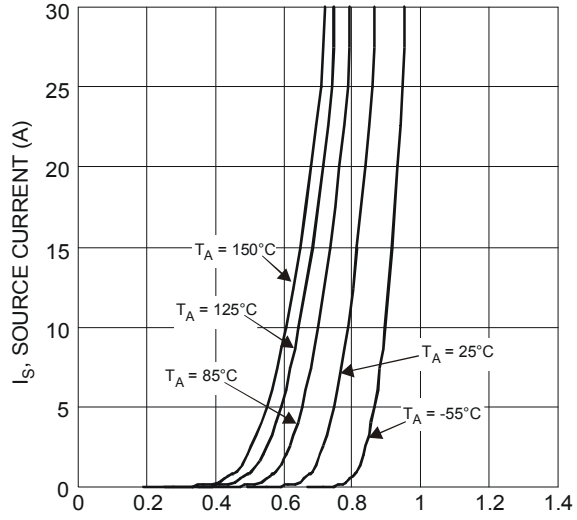


Figure 9 Diode Forward Voltage vs. Current

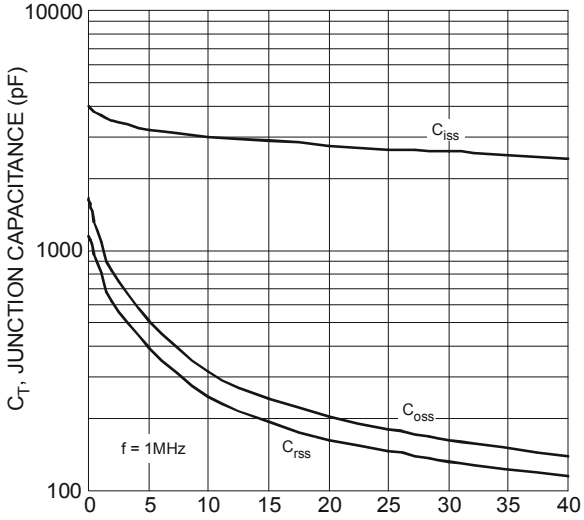


Figure 10 Typical Junction Capacitance

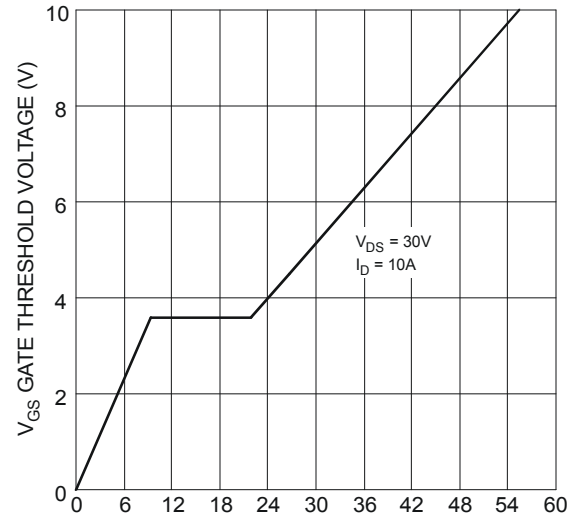


Figure 11 Gate Charge

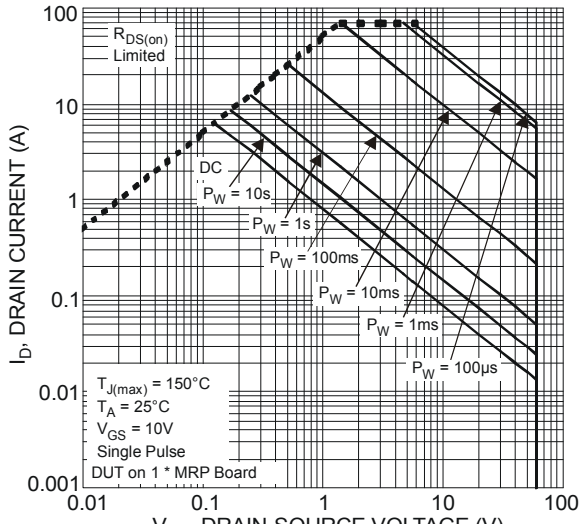


Figure 12 SOA, Safe Operation Area

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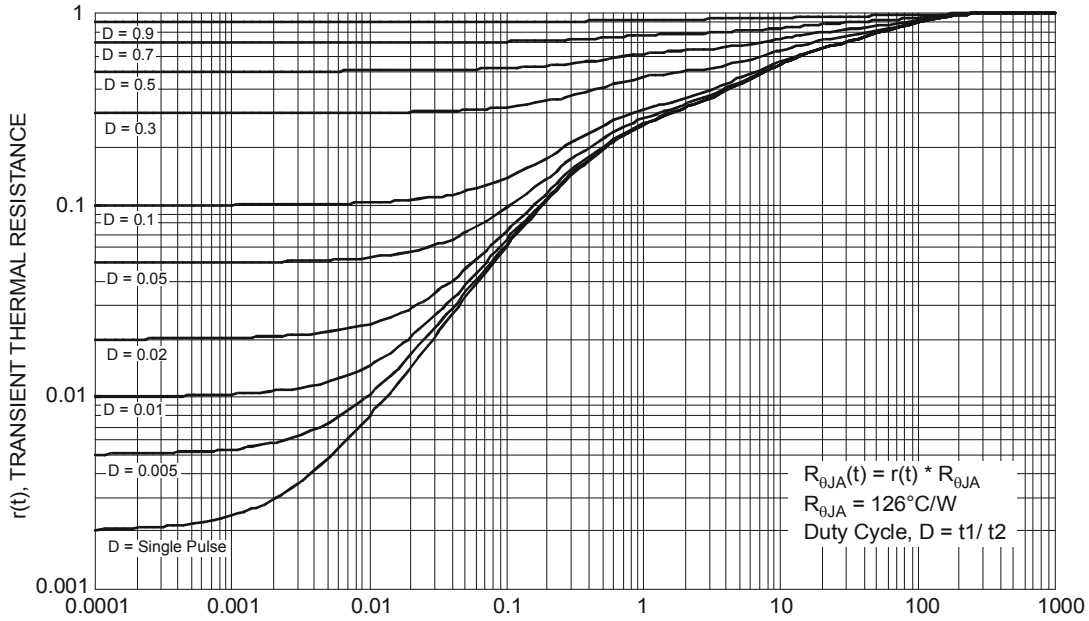
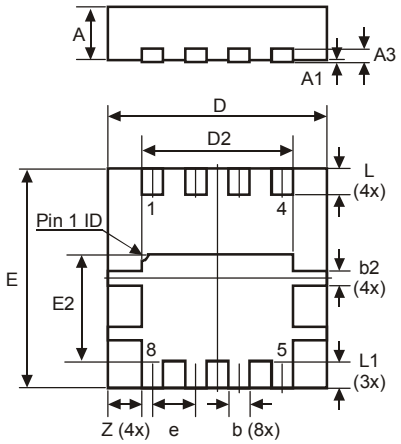


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

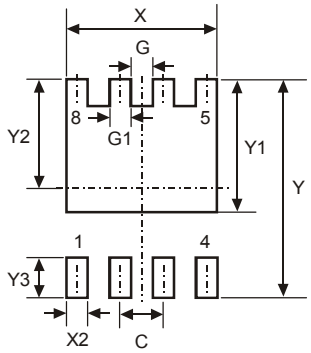
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



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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