60V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)\ max}$	I_D T_A = +25°C
60V	140mΩ @ V_{GS} = 10V	2.3A
	170mΩ @ V_{GS} = 4.5V	2.1A

Description

This new generation 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.

Applications

- DC-DC Converters
- Power Management Functions
- Analog Switch

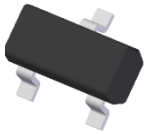
Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **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**

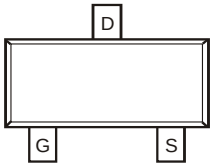
Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.0072 grams (Approximate)

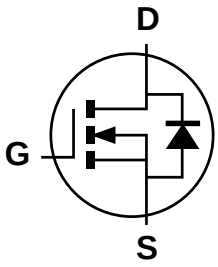
SOT23



Top View



Pin Configuration



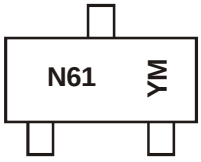
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN6140L-7	SOT23	3,000/Tape & Reel
DMN6140L-13	SOT23	10,000/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



N61 = Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

Year	2011	2012	2013	2014	2015	2016	2017
Code	Y	Z	A	B	C	D	E

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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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 5) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	1.6 1.2	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	2.0 1.6	A
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	2.3 1.8	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	2.9 2.3	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	1.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I_{DM}	10	A

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.7	W
	T_A = +70°C		0.4	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	183	°C/W
	t<10s		115	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.3	W
	T_A = +70°C		0.8	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	94	°C/W
	t<10s		61	
Thermal Resistance, Junction to Case		$R_{\theta JC}$	39	
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	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	—	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	92	140	mΩ	V_{GS} = 10V, I_D = 1.8A
			115	170		V_{GS} = 4.5V, I_D = 1.3A
Forward Transfer Admittance	$\|Y_{fs}\|$	—	2.2	—	S	V_{DS} = 15V, I_D = 1.8A
Diode Forward Voltage	V_{SD}	—	0.75	1.0	V	V_{GS} = 0V, I_S = 0.45A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	315	—	pF	V_{DS} = 40V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	18	—		
Reverse Transfer Capacitance	C_{rss}	—	16	—		
Gate Resistnace	R_g	—	0.65	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 10V)	Q_g	—	8.6	—	nC	V_{DS} = 30V, I_D = 1.8A
Total Gate Charge (V_{GS} = 5V)	Q_g	—	4.1	—		
Gate-Source Charge	Q_{gs}	—	1.0	—		
Gate-Drain Charge	Q_{gd}	—	1.7	—		
Turn-On Delay Time	$t_{D(on)}$	—	2.6	—	ns	V_{DS} = 30V, V_{GS} = 10V, R_G = 6.0Ω, I_D = 1.8A
Turn-On Rise Time	t_r	—	3.6	—		
Turn-Off Delay Time	$t_{D(off)}$	—	16.3	—		
Turn-Off Fall Time	t_f	—	2.7	—		
Reverse Recovery Time	t_{rr}	—	16.8	—	ns	I_F = 1.8A, di/dt =100A/µs
Reverse Recovery Charge	Q_{rr}	—	9.0	—	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 vias to bottom layer 1in. square copper plate.
7 .Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

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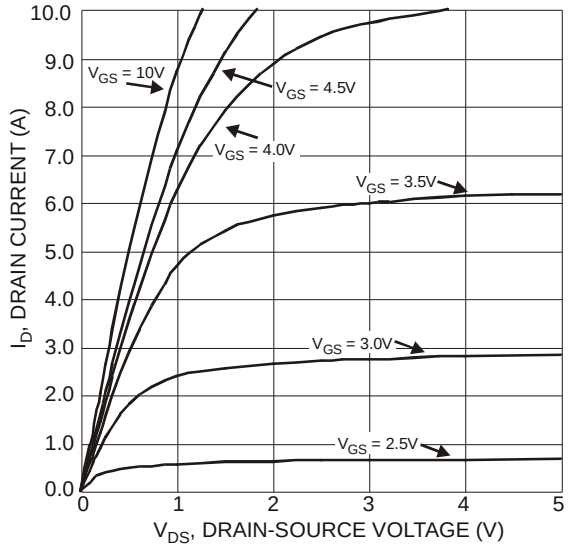


Figure 1 Typical Output Characteristic

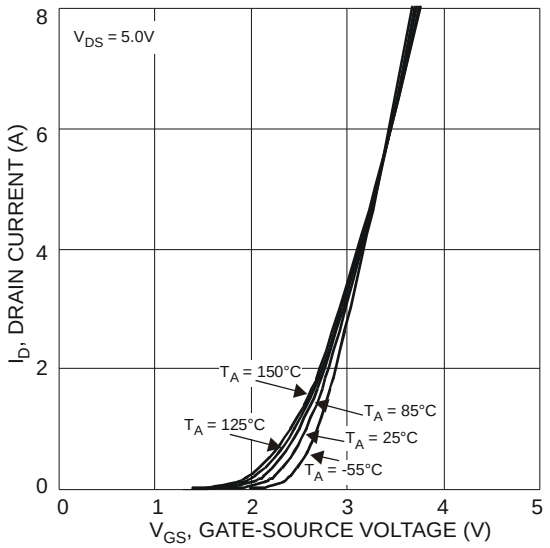


Figure 2 Typical Transfer Characteristics

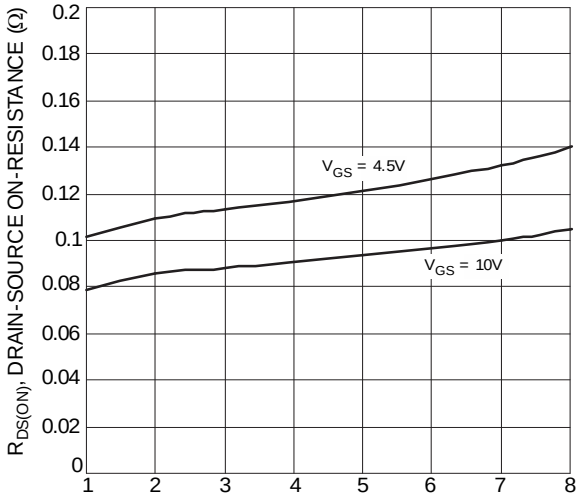


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

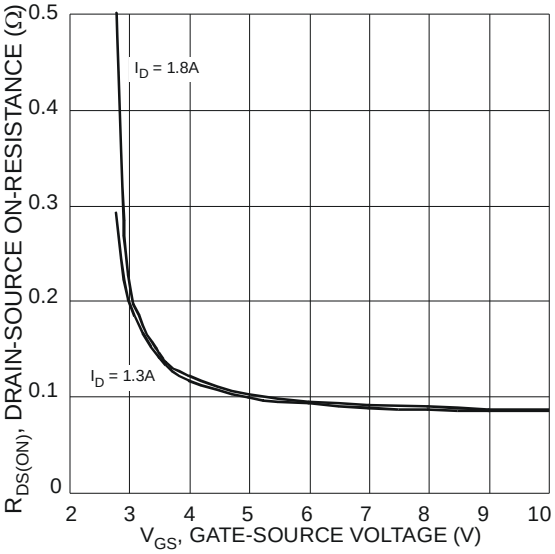


Figure 4 Typical Drain-Source On Resistance vs. Gate-Source Voltage

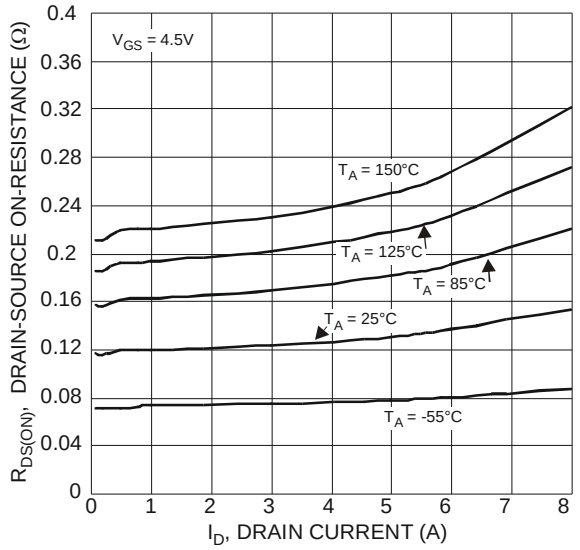


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

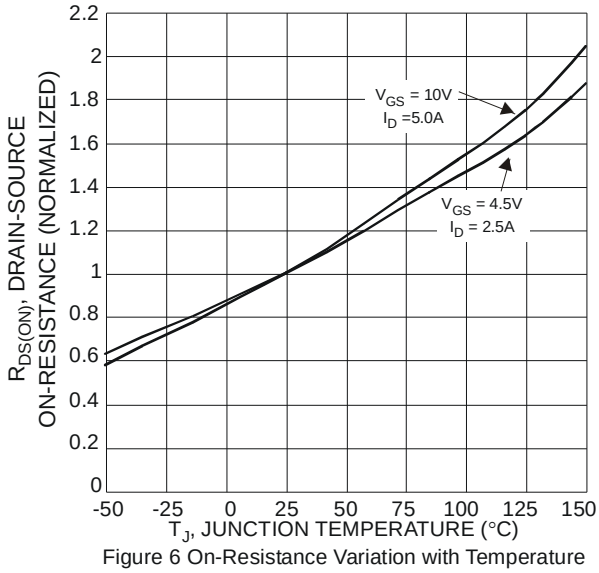


Figure 6 On-Resistance Variation with Temperature

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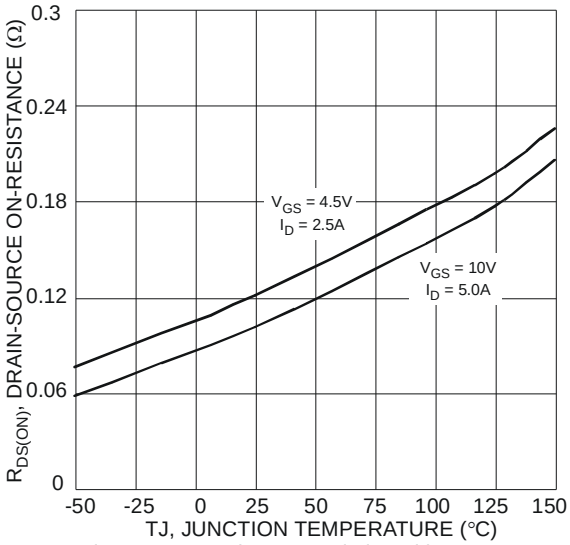


Figure 7 On-Resistance Variation with Temperature

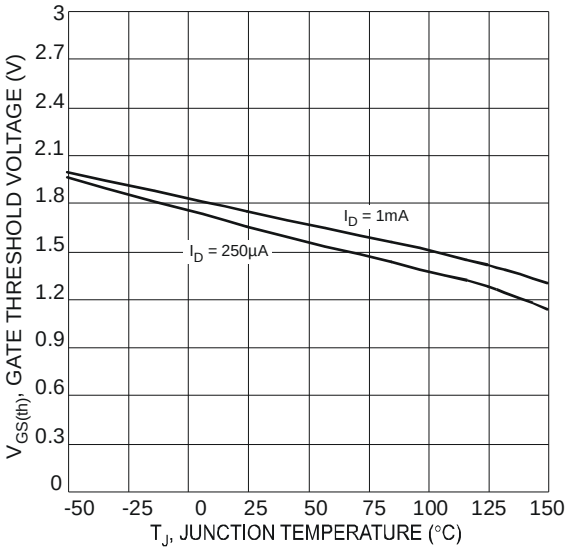


Figure 8 Gate Threshold Variation vs. Ambient Temperature

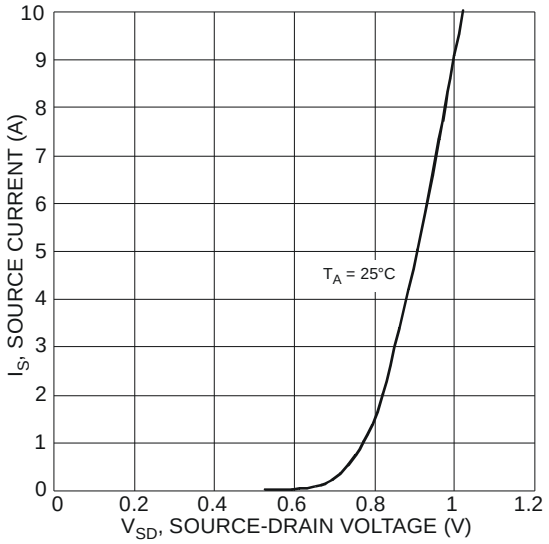


Figure 9 Diode Forward Voltage vs. Current

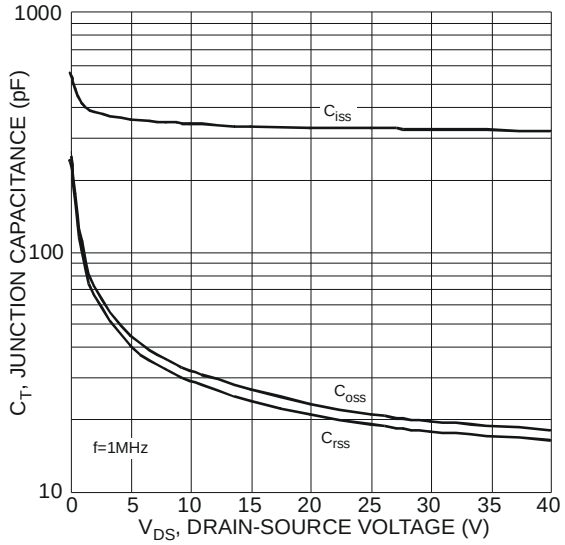


Figure 10 Typical Junction Capacitance

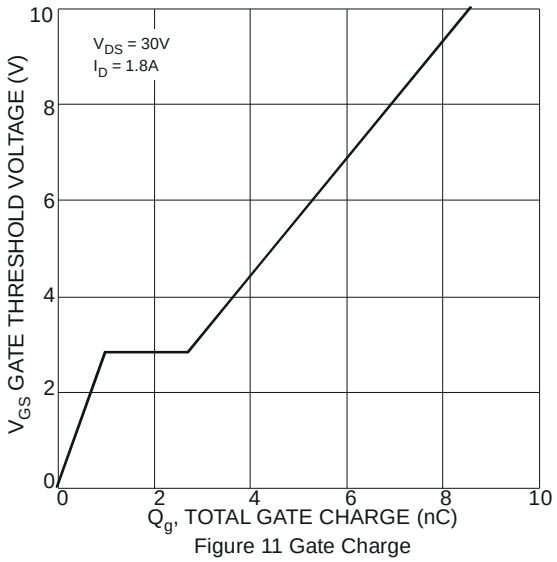


Figure 11 Gate Charge

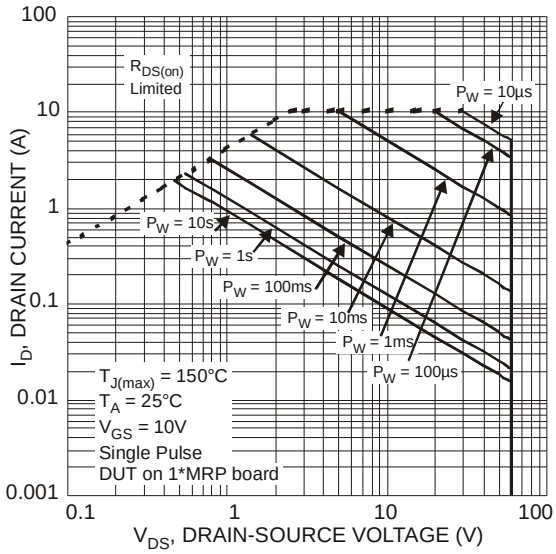


Figure 12 SOA, Safe Operation Area

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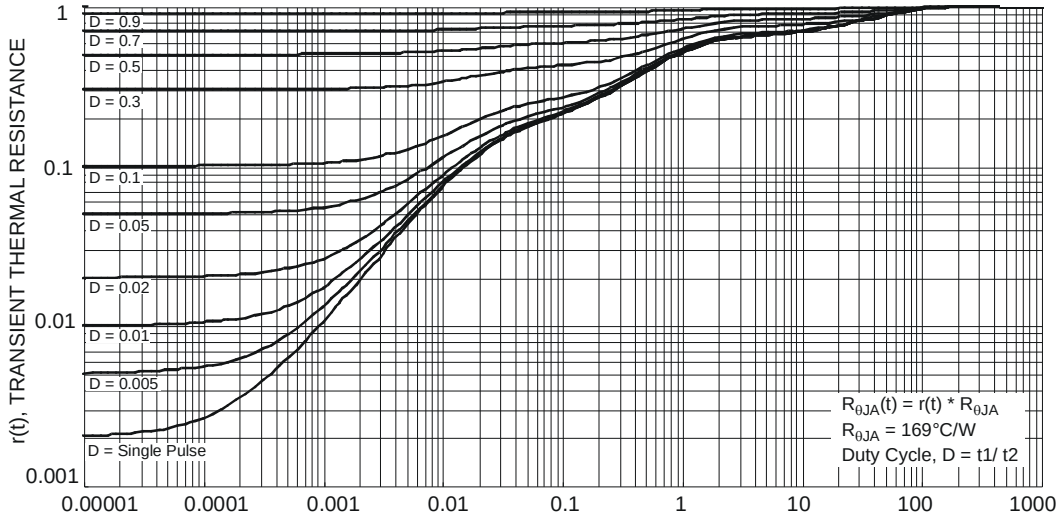
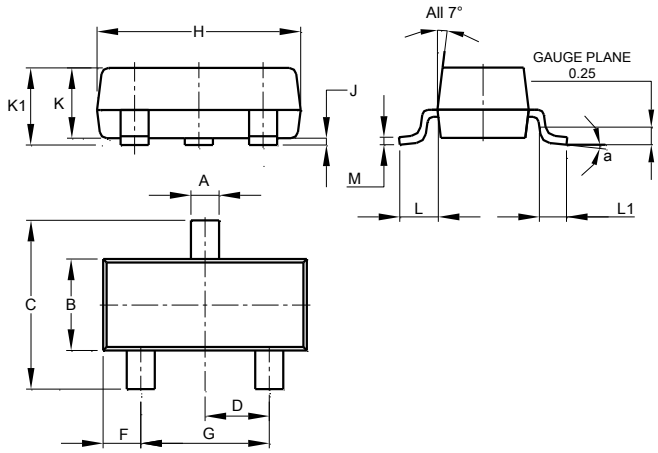


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

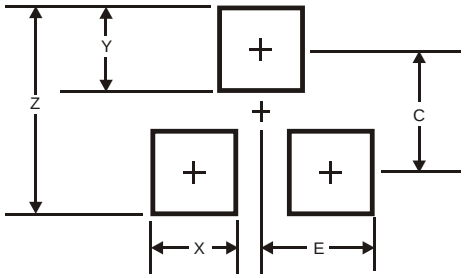
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
α	8°		
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)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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