

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max $T_A = +25^\circ\text{C}$
60V	2Ω @ $V_{GS} = 10\text{V}$	380mA
	3Ω @ $V_{GS} = 5\text{V}$	310mA

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

- Motor Control
- Power Management Functions
- Backlighting

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD Protected Up To 2kV**
- **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

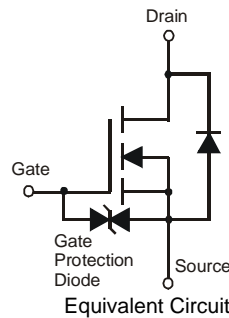
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208 [Ⓔ]
- Weight: 0.008 grams (approximate)



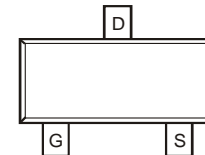
ESD protected up to 2kV



Top View



Equivalent Circuit



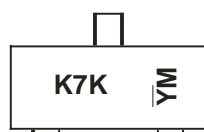
Top View

Ordering Information (Note 4)

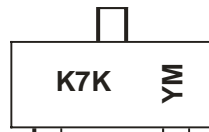
Part Number	Compliance	Case	Packaging
2N7002K-7	Standard	SOT23	3000/Tape & Reel
2N7002KQ-7	Automotive	SOT23	3000/Tape & Reel
2N7002K-13	Standard	SOT23	10000/Tape & Reel
2N7002KQ-13	Automotive	SOT23	10000/Tape & Reel

- 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



Chengdu A/T Site



Shanghai A/T Site

K7K = Product Type Marking Code
 YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)
 ȲM = Date Code Marking for CAT (Chengdu Assembly/ Test site)
 Y or Ȳ = Year (ex: A = 2013)
 M = Month (ex: 9 = September)

Date Code Key

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Code	T	U	V	W	X	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

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	Steady State	T _A = +25°C T _A = +70°C	I _D	380 300	mA
	t < 5s	T _A = +25°C T _A = +70°C	I _D	430 340	mA
Continuous Drain Current (Note 6) V _{GS} = 5V	Steady State	T _A = +25°C T _A = +70°C	I _D	310 240	mA
	t < 5s	T _A = +25°C T _A = +70°C	I _D	350 270	mA
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	0.5	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%) (Note 6)			I _{DM}	1.2	A

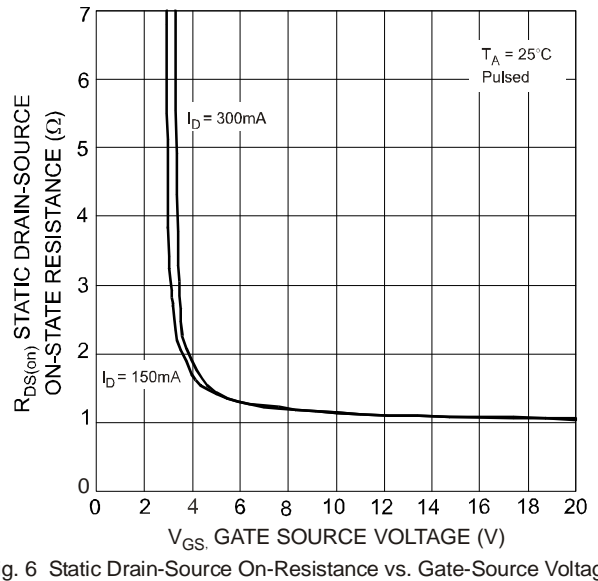
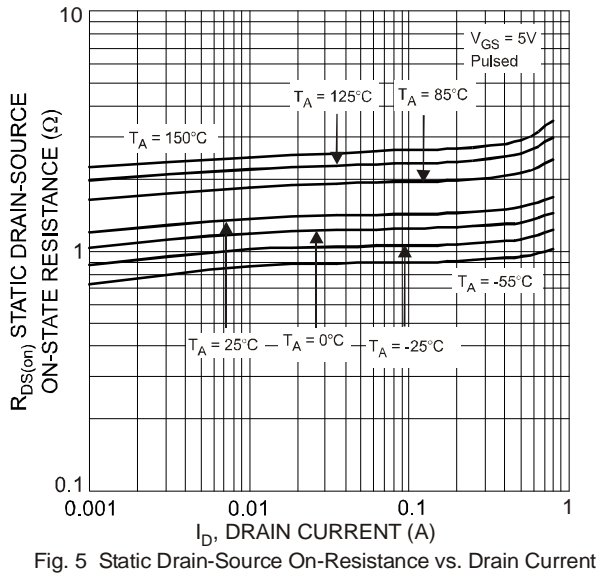
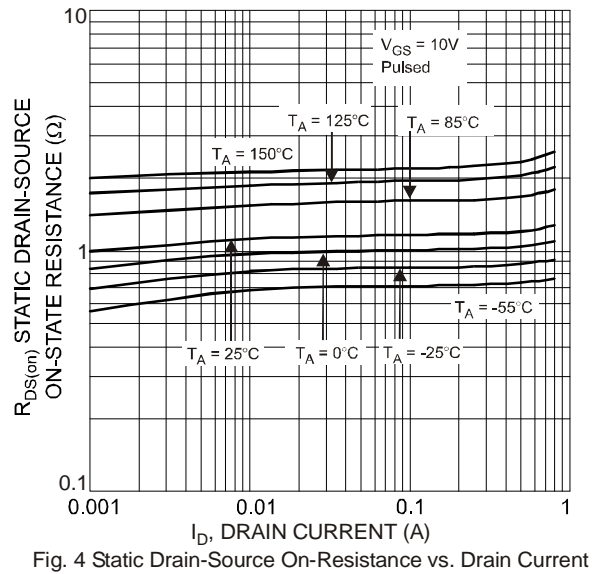
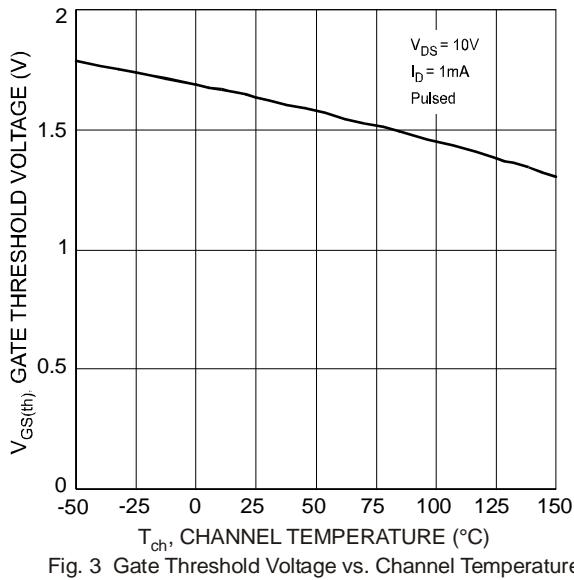
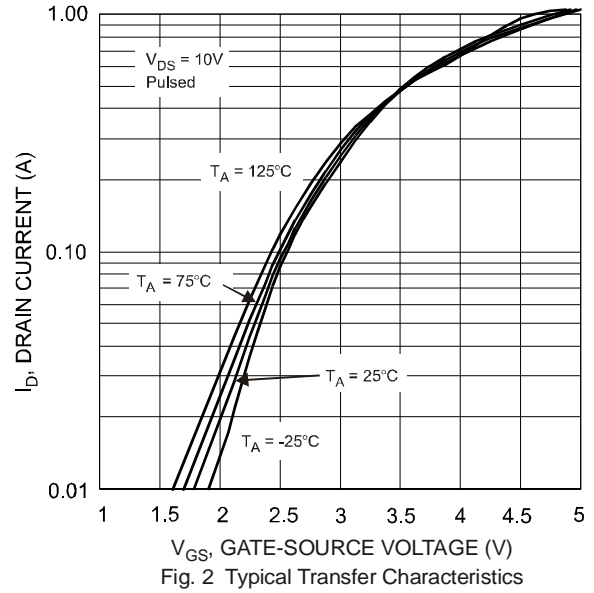
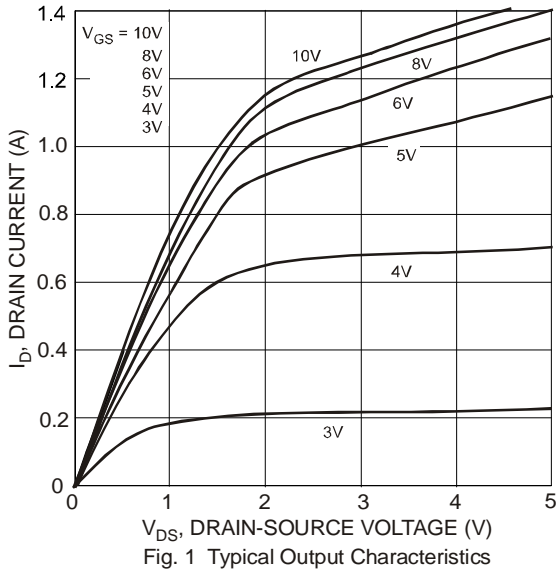
Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)		P _D	370	mW
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	R _{θJA}	357	°C/W
	t < 5s		292	
Total Power Dissipation (Note 6)		P _D	540	mW
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	240	°C/W
	t < 5s		197	
Thermal Resistance, Junction to Case (Note 6)		R _{θJC}	91	
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 = 10μA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1.0	μA	V _{DS} = 60V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±10	μA	V _{GS} = ±20V, V _{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	V _{GS(th)}	1.0	1.6	2.5	V	V _{DS} = 10V, I _D = 1mA
Static Drain-Source On-Resistance	R _{DS(on)}	—	—	2.0	Ω	V _{GS} = 10V, I _D = 0.5A
		—	—	3.0		V _{GS} = 5V, I _D = 0.05A
Forward Transfer Admittance	Y _{fs}	80	—	—	ms	V _{DS} = 10V, I _D = 0.2A
Diode Forward Voltage	V _{SD}	—	0.75	1.1	V	V _{GS} = 0V, I _S = 115mA
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C _{iss}	—	30	50	pF	V _{DS} = 25V, V _{GS} = 0V f = 1.0MHz
Output Capacitance	C _{oss}	—	4.2	25	pF	
Reverse Transfer Capacitance	C _{rss}	—	2.9	5.0	pF	
Gate Resistance	R _g	—	133	—	Ω	f = 1MHz, V _{GS} = 0V, V _{DS} = 0V
Total Gate Charge	Q _g	—	0.3	—	nC	V _{GS} = 4.5V, V _{DS} = 10V, I _D = 250mA
Gate-Source Charge	Q _{gs}	—	0.2	—	nC	
Gate-Drain Charge	Q _{gd}	—	0.08	—	nC	
Turn-On Delay Time	t _{D(on)}	—	3.9	—	ns	V _{DD} = 30V, V _{GS} = 10V, R _G = 25Ω, I _D = 200mA
Turn-On Rise Time	t _r	—	3.4	—	ns	
Turn-Off Delay Time	t _{D(off)}	—	15.7	—	ns	
Turn-Off Fall Time	t _f	—	9.9	—	ns	

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout
 - Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.



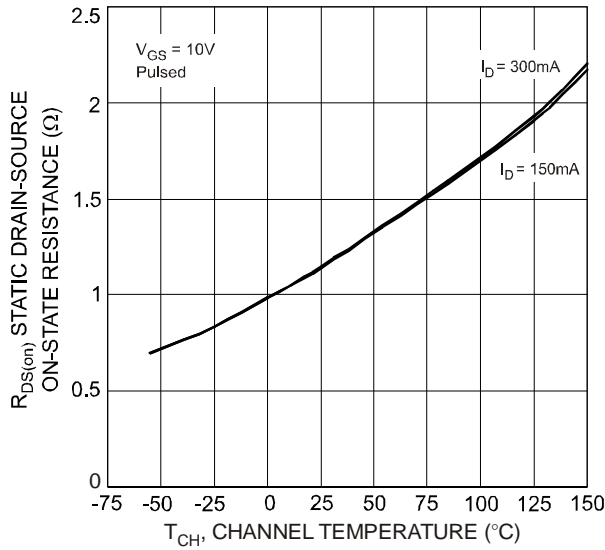


Fig. 7 Static Drain-Source On-State Resistance vs. Channel Temperature

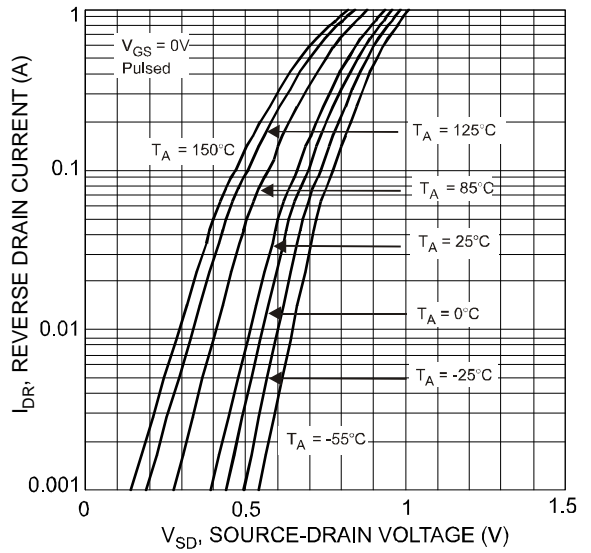


Fig. 8 Reverse Drain Current vs. Source-Drain Voltage

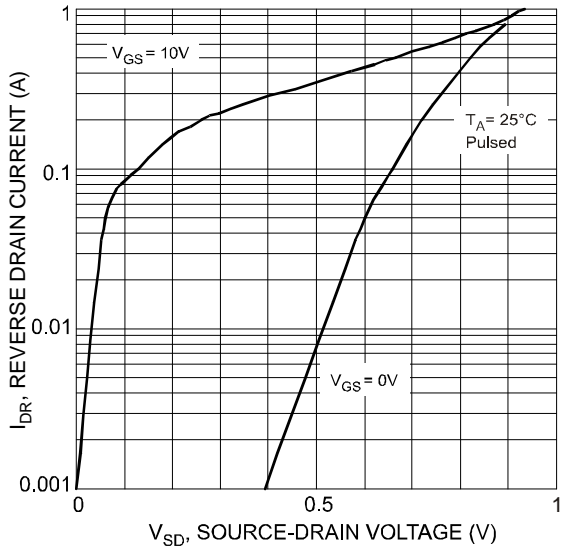


Fig. 9 Reverse Drain Current vs. Source-Drain Voltage

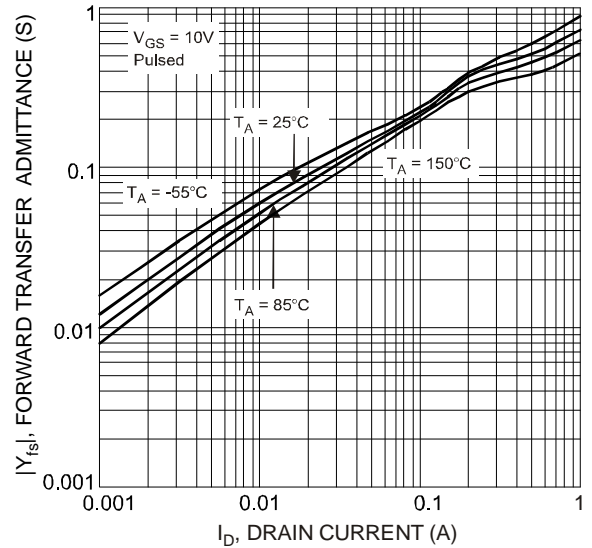


Fig. 10 Forward Transfer Admittance vs. Drain Current

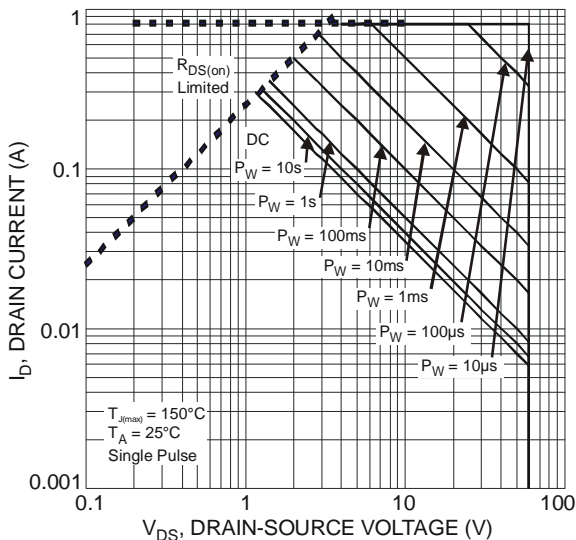


Fig. 11 Safe Operation Area

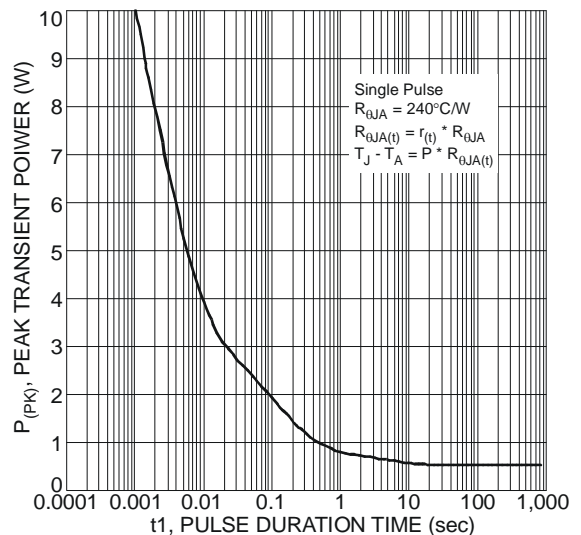


Fig. 12 Single Pulse Maximum Power Dissipation

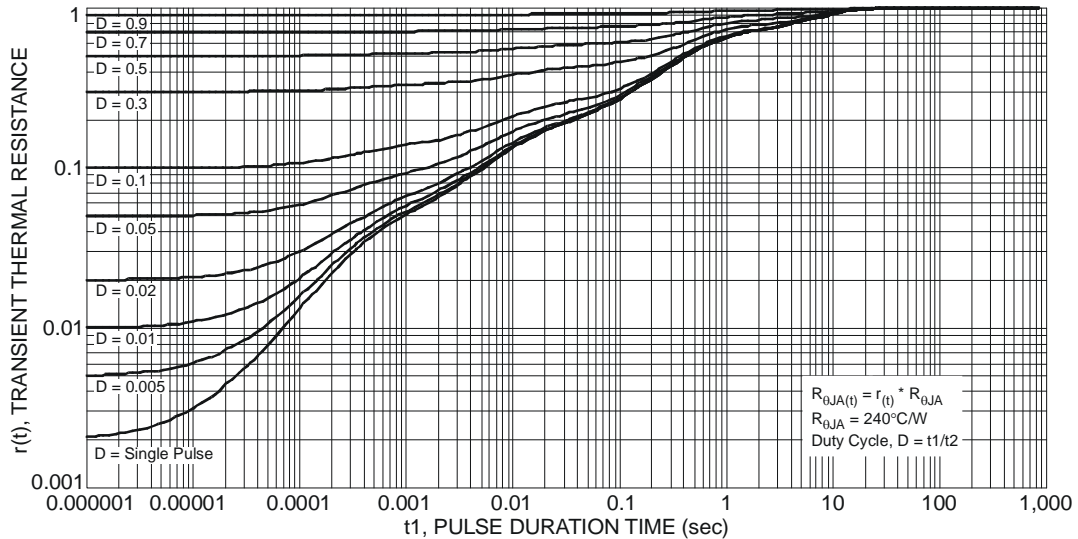
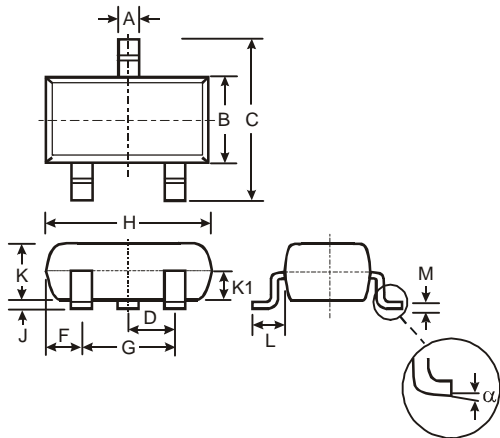


Fig. 13 Transient Thermal Resistance

Package Outline Dimensions

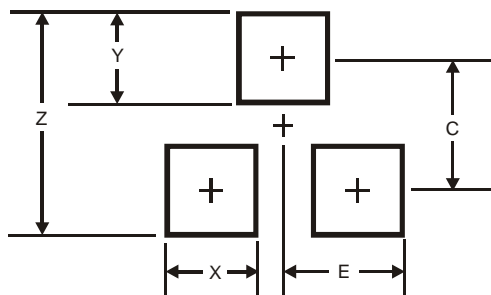
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	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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