

N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	I_D max $T_A = +25^\circ C$
20V	72mΩ @ $V_{GS} = 4.5V$	3.4A
	110mΩ @ $V_{GS} = 2.5V$	2.7A

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD protected gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

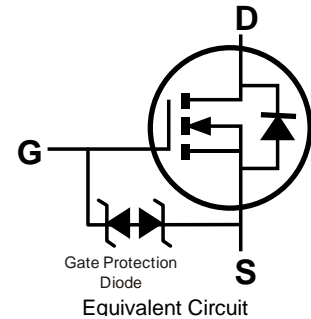
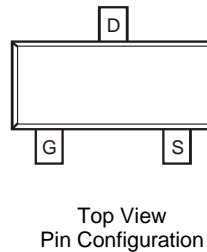
Description and Applications

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.

- Battery Charging
- Power Management Functions
- DC-DC Converters
- Portable Power Adaptors

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 Copper Leadframe. Solderable per MIL-STD-202, Method 208 (3)
- Terminals Connections: See Diagram Below
- Weight: 0.008 grams (Approximate)

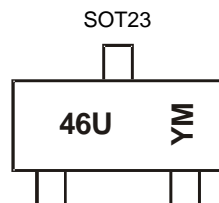


Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2046U-7	SOT23	3,000/Tape & Reel
DMN2046U-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



46U = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: B = 2014)
 M = Month (ex: 9 = September)

Date Code Key

Year	2014	2015	2016	2017	2018	2019	2020	2021
Code	B	C	D	E	F	G	H	I

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

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V_{DSS}	20	V
Gate-Source Voltage	V_{GSS}	± 12	V
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	I_D	Steady State $T_A = +25^\circ\text{C}$	3.4
		$T_A = +70^\circ\text{C}$	2.7
Pulsed Drain Current (Pulse width $\leq 10\mu\text{s}$, Duty Cycle $\leq 1\%$)	I_{DM}	18	A

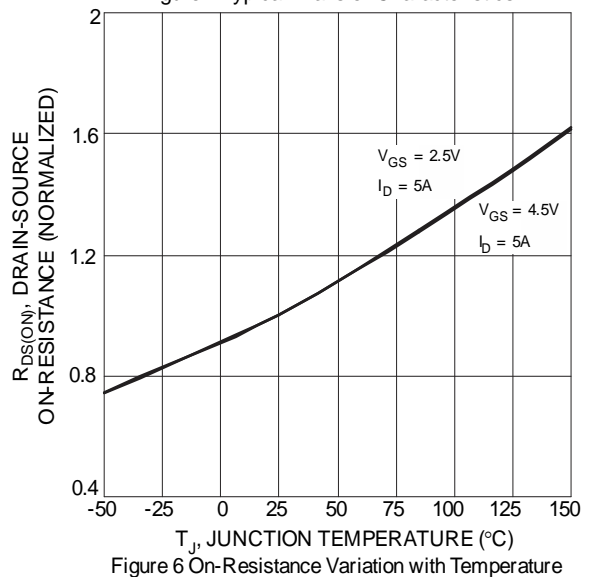
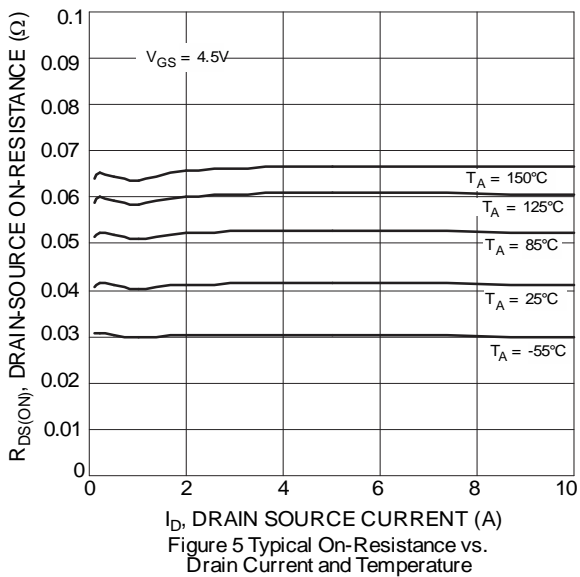
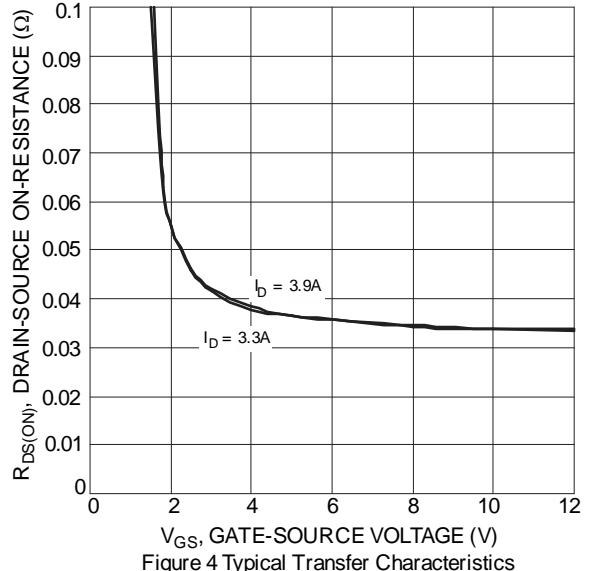
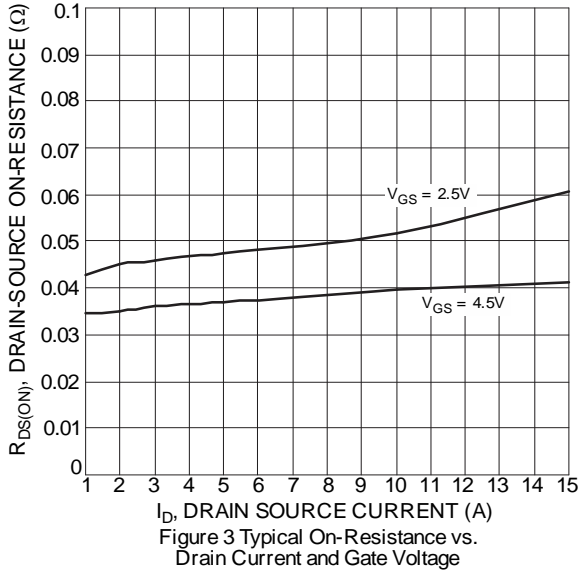
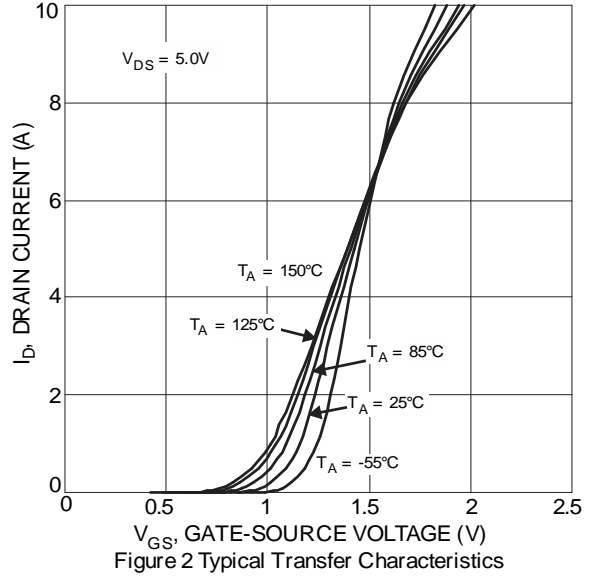
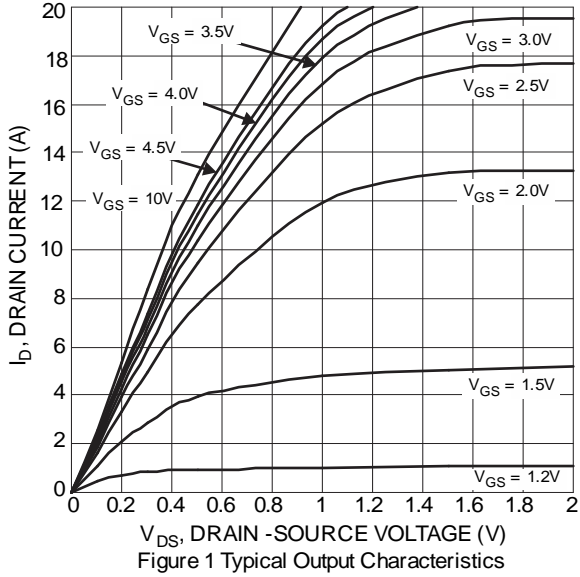
Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P_D	0.76	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	166	$^\circ\text{C/W}$
Power Dissipation (Note 6)	P_D	1.26	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	100	$^\circ\text{C/W}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Electrical Characteristics @ $T_A = +25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	-	-	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	I_{DSS}	-	-	1.0	μA	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	-	-	± 10	μA	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	0.4	-	1.4	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	-	-	72	m Ω	$V_{GS} = 4.5\text{V}, I_D = 3.6\text{A}$
				110		$V_{GS} = 2.5\text{V}, I_D = 3.1\text{A}$
Diode Forward Voltage	V_{SD}	-	-	1.2	V	$V_{GS} = 0\text{V}, I_S = 0.94\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	292	-	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	-	36	-	pF	
Reverse Transfer Capacitance	C_{rss}	-	32	-	pF	
Gate Resistance	R_g	-	63	-	Ω	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge	Q_g	-	3.8	-	nC	$V_{GS} = 4.5\text{V}, V_{DS} = 10\text{V}, I_D = 5.1\text{A}$
Gate-Source Charge	Q_{gs}	-	0.5	-	nC	
Gate-Drain Charge	Q_{gd}	-	0.8	-	nC	
Turn-On Delay Time	$t_{D(on)}$	-	6.7	-	ns	$V_{DD} = 10\text{V}, V_{GS} = 4.5\text{V}, R_L = 2.4\Omega, R_G = 6\Omega$
Turn-On Rise Time	t_r	-	25.1	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	69.1	-	ns	
Turn-Off Fall Time	t_f	-	34.1	-	ns	
Reverse Recovery Time	t_{rr}	-	18.2	-	ns	$I_F = 4.1\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge	Q_{rr}	-	3.6	-	nC	$I_F = 4.1\text{A}, di/dt = 100\text{A}/\mu\text{s}$

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1-inch square copper plate.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to production testing.



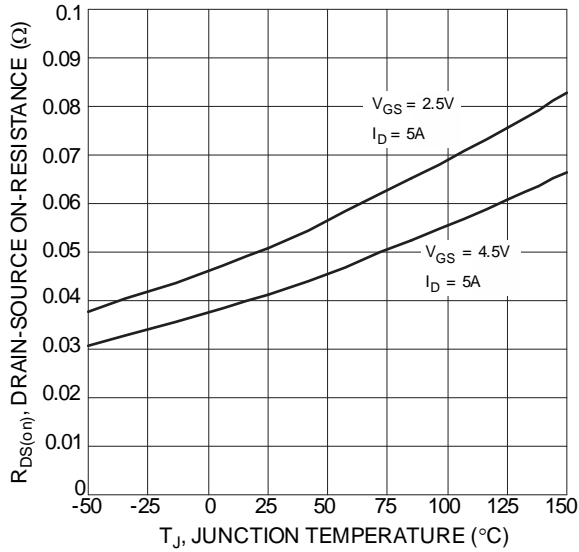


Figure 7 On-Resistance Variation with Temperature

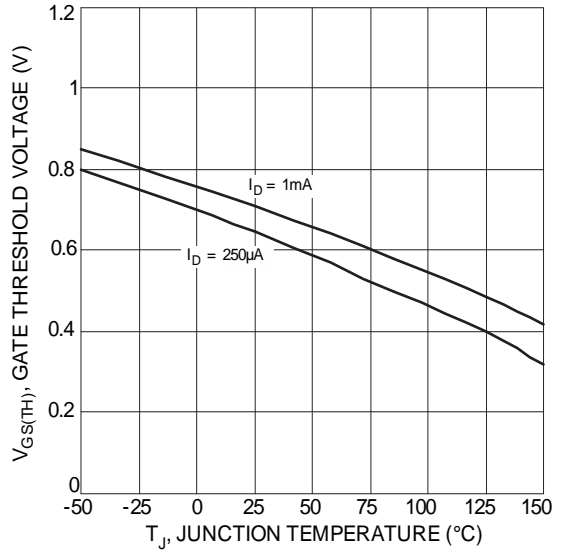


Figure 8 Gate Threshold Variation vs. Ambient Temperature

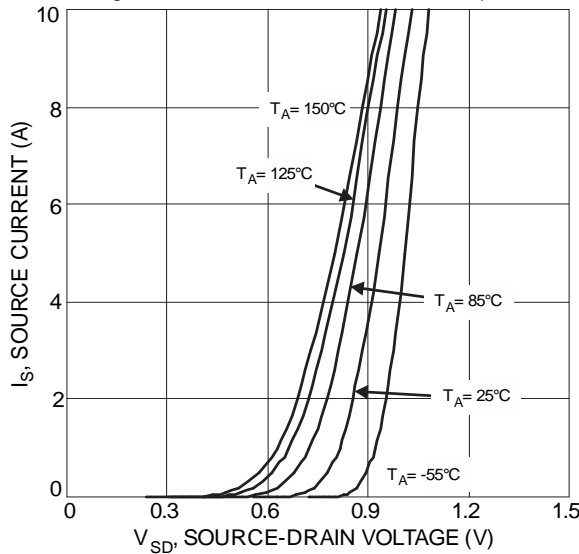


Figure 9 Diode Forward Voltage vs. Current

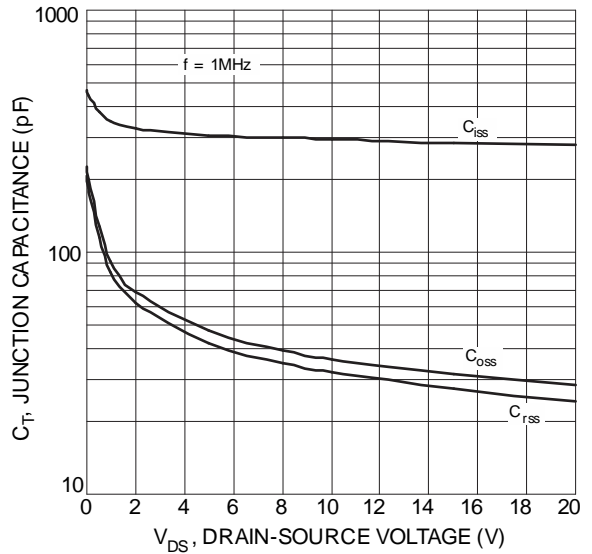


Figure 10 Typical Junction Capacitance

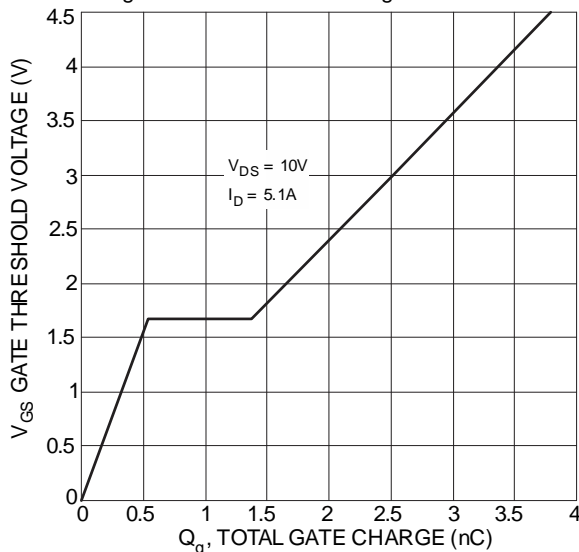


Figure 11 Gate Charge

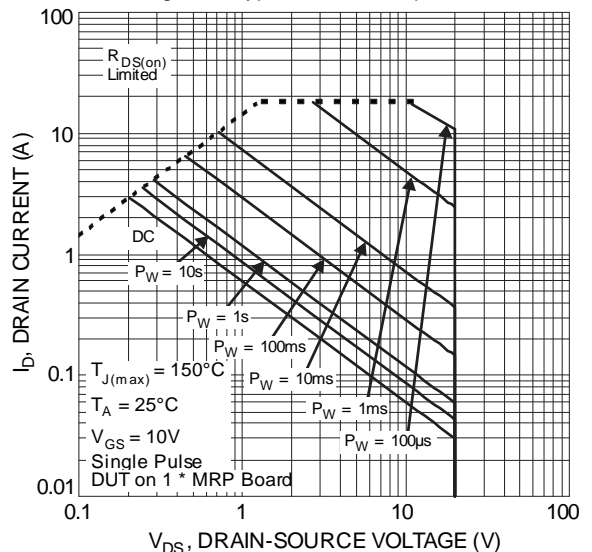
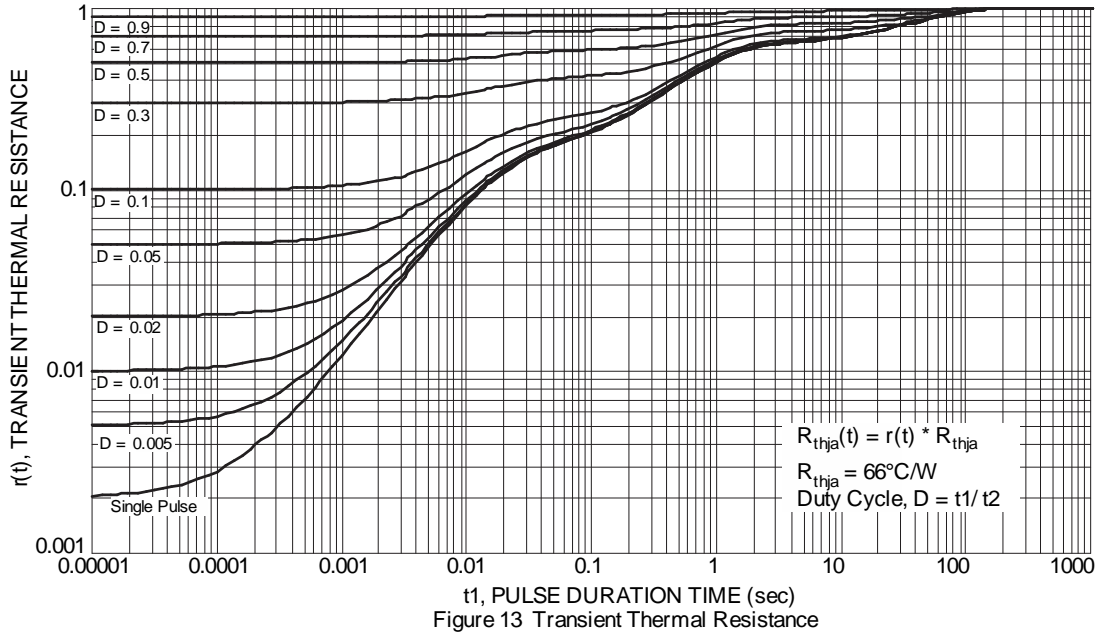
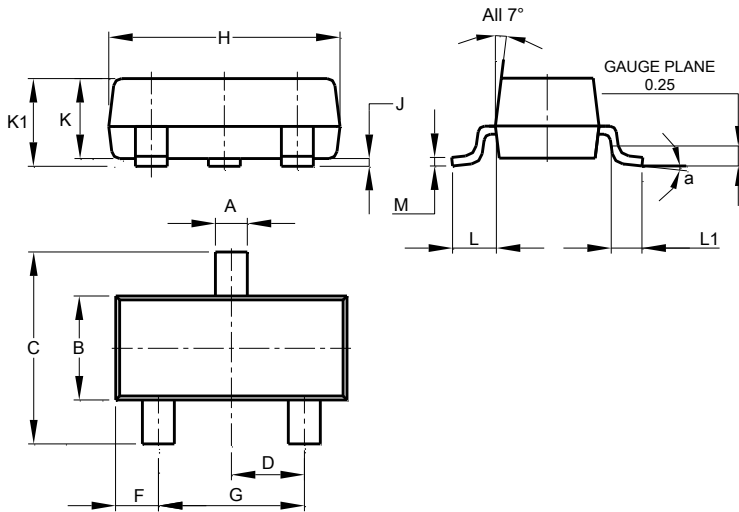


Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

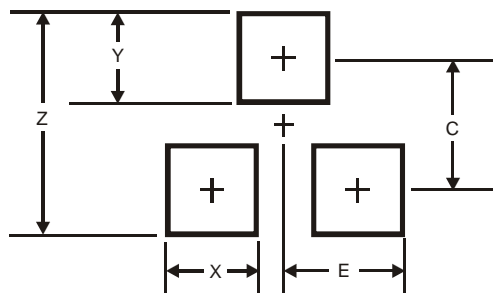
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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
a	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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