

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	$I_D$ $T_A = +25^\circ C$
50V	1.8Ω @ $V_{GS} = 10V$	500mA
	2.0Ω @ $V_{GS} = 4.5V$	450mA

## Description

This new generation 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

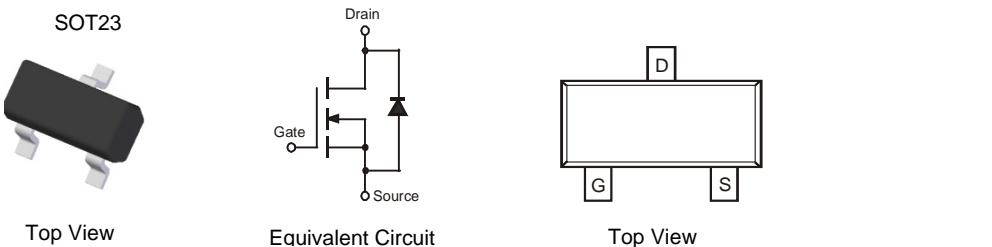
- Backlighting
- DC-DC Converters
- Power Management Functions

## 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
- PPAP Capable (Note 4)

## 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: Matte Tin Finish annealed over Alloy 42 leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208③
- Terminal Connections: See Diagram
- Weight: 0.008 grams (approximate)



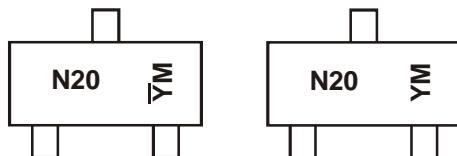
## Ordering Information (Note 5)

Part Number	Qualification	Case	Packaging
BSN20-7	Standard	SOT23	3000/Tape & Reel
BSN20Q-7	Automotive	SOT23	3000/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](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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_grade\\_definitions/](http://www.diodes.com/quality/product_grade_definitions/)
5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



N20 = Product Type Marking Code

YM = Date Code Marking for SAT (Shanghai Assembly/ Test site)

YM = Date Code Marking for CAT (Chengdu Assembly/ Test site)

Y or YM = Year (ex: A = 2013)

M = Month (ex: 9 = September)

Chengdu A/T Site

Shanghai A/T Site

Date Code Key

Year	2009	2010	2011	2012	2013	2014	2015					
Code	W	X	Y	Z	A	B	C					
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			$V_{DSS}$	50	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current @ $T_{SP} = +25^\circ\text{C}$ (Note 6)	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +100^\circ\text{C}$	$I_D$	500 300	mA
Pulsed Drain Current @ $T_{SP} = +25^\circ\text{C}$ (Notes 6 & 7)			$I_{DM}$	1.2	A

**Thermal Characteristics**

Characteristic	Symbol	Value	Units
Power Dissipation, @ $T_A = +25^\circ\text{C}$ (Note 6)	$P_D$	600	mW
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 6)	$R_{\theta JA}$	200	°C/W
Power Dissipation, @ $T_{SP} = +25^\circ\text{C}$ (Note 6)	$P_D$	920	mW
Thermal Resistance, @ $T_{SP} = +25^\circ\text{C}$ (Note 6)	$R_{\theta JSP}$	136	°C/W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	50	—	—	V	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current $T_J = +25^\circ\text{C}$	$I_{DSS}$	—	—	0.5	$\mu\text{A}$	$V_{DS} = 50\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Body Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	$V_{GS(\text{th})}$	0.4	1.0	1.5	V	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(\text{ON})}$	—	1.3 1.6	1.8 2.0	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 0.22\text{A}$ $V_{GS} = 4.5\text{V}$ , $I_D = 0.1\text{A}$
Forward Transfer Admittance	$ Y_{fs} $	40	320	—	mS	$V_{DS} = 10\text{V}$ , $I_D = 0.1\text{A}$
Diode Forward Voltage	$V_{SD}$	—	1.0	1.5	V	$V_{GS} = 0\text{V}$ , $I_S = 180\text{mA}$
Source (diode forward) Current	$I_S$	—	—	194	mA	$T_{SP} = +25^\circ\text{C}$
Peak Source (diode forward) Current	$I_{SM}$	—	—	1.2	A	$T_{SP} = +25^\circ\text{C}$ (Notes 3 & 4)
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	21.8	40	pF	$V_{DS} = 10\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$
Output Capacitance	$C_{oss}$	—	5.6	15	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	3.3	10	pF	
Gate Resistance	$R_g$	—	49	—	$\Omega$	$V_{DS} = 0\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$
Total Gate Charge	$Q_g$	—	800	—	pC	$V_{GS} = 10\text{V}$ , $V_{DD} = 25\text{V}$ , $I_D = 250\text{mA}$
Gate-Source Charge	$Q_{gs}$	—	100	—	pC	
Gate-Drain Charge	$Q_{gd}$	—	100	—	pC	
Turn-On Delay Time	$t_{D(\text{on})}$	—	2.93	—	ns	$V_{DD} = 30\text{V}$ , $V_{GEN} = 10\text{V}$ , $R_L = 150\Omega$ , $R_{\text{GEN}} = 50\Omega$ , $I_D = 0.2\text{A}$
Turn-On Rise Time	$t_r$	—	2.99	—	ns	
Turn-Off Delay Time	$t_{D(\text{off})}$	—	9.45	—	ns	
Turn-Off Fall Time	$t_f$	—	8.3	—	ns	

Notes:

6. Device mounted on FR-4 PCB, with minimum recommended pad layout.
7. Repetitive rating, pulse width limited by junction temperature.
8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to production testing.

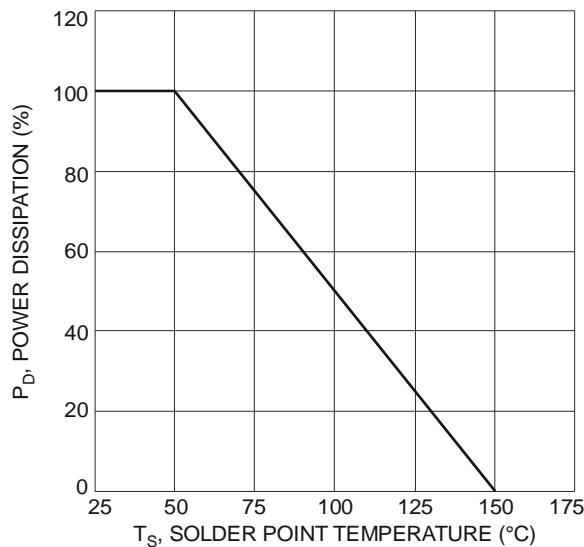


Fig 1. Normalized Total Power Dissipation as a Function of Solder Point Temperature

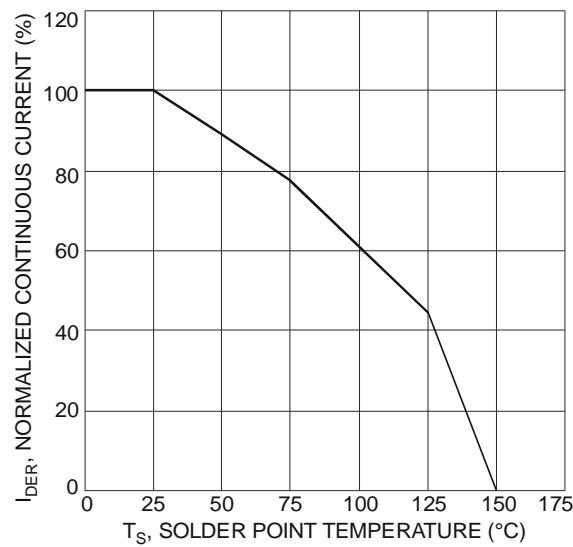


Fig 2. Normalized Continuous Current vs. Solder Point Temperature

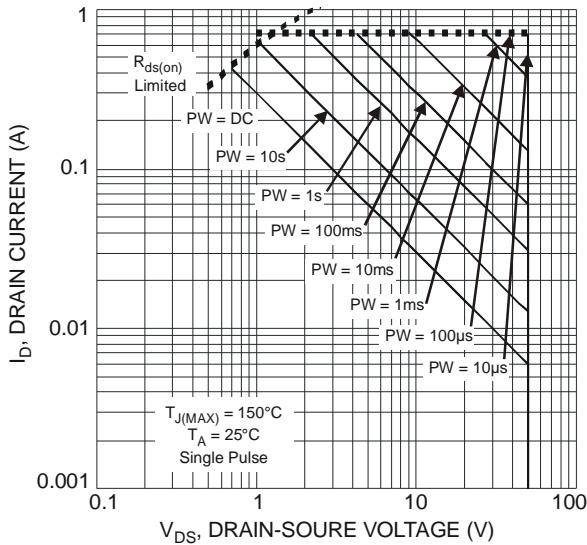


Fig. 3 SOA, Safe Operation Area

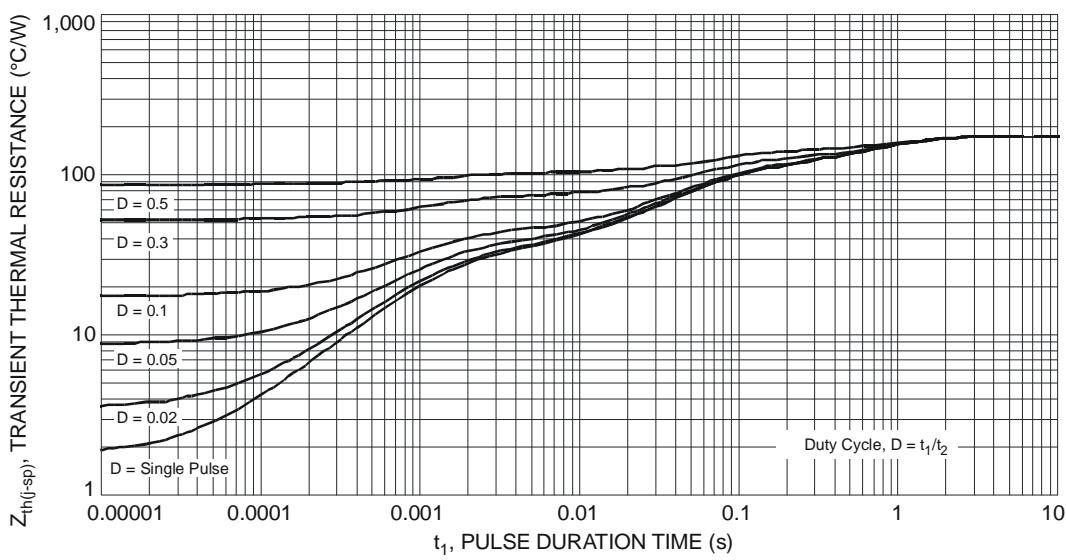
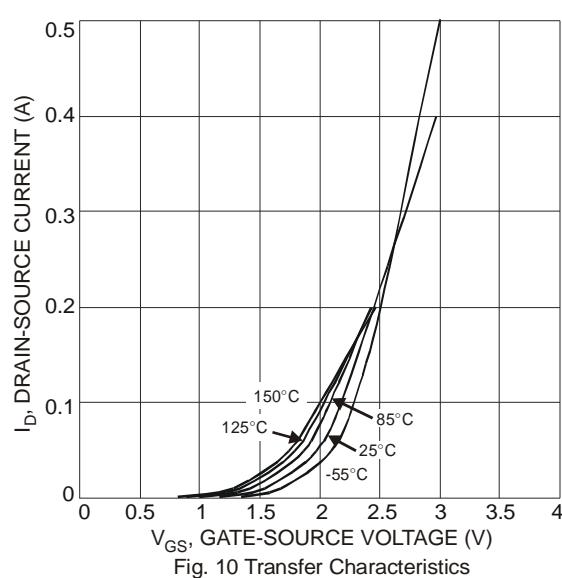
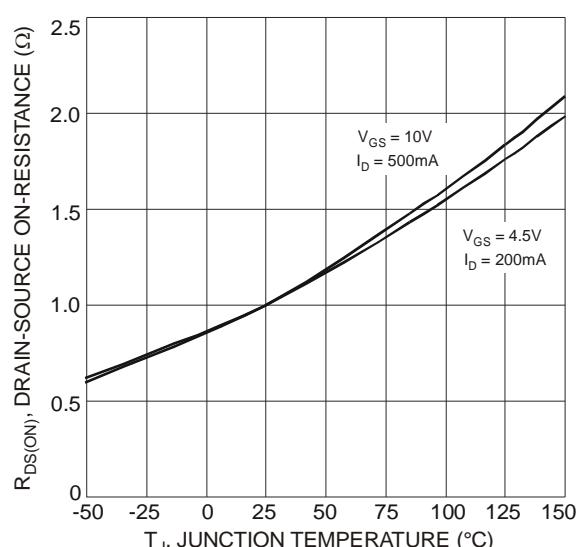
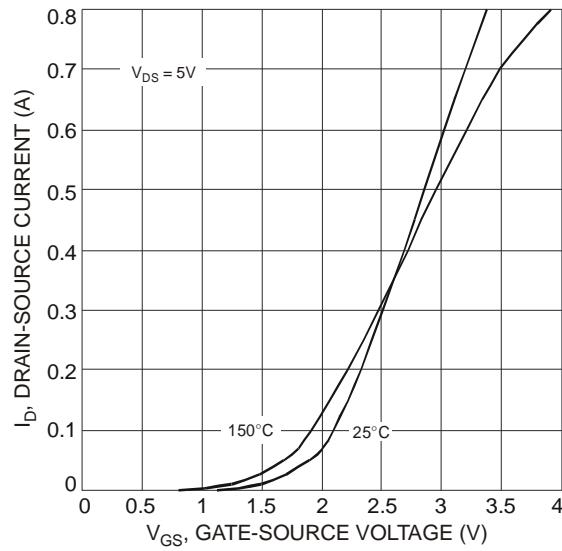
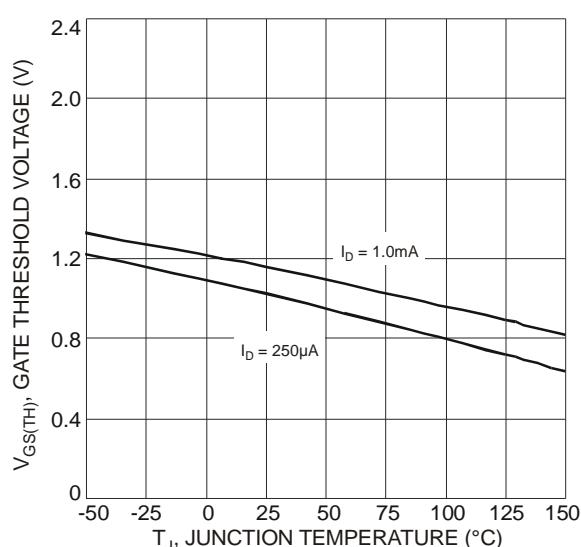
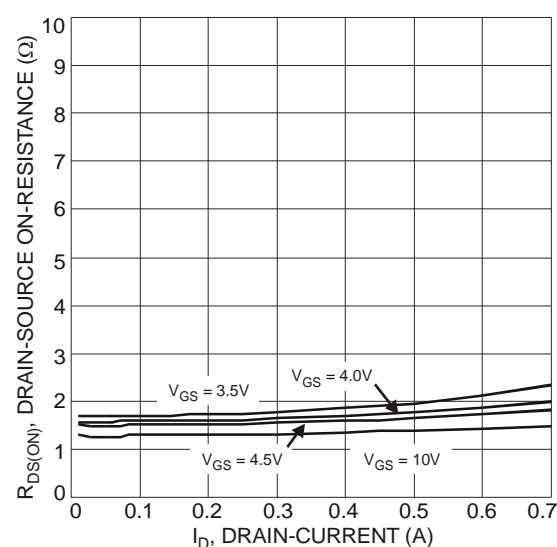
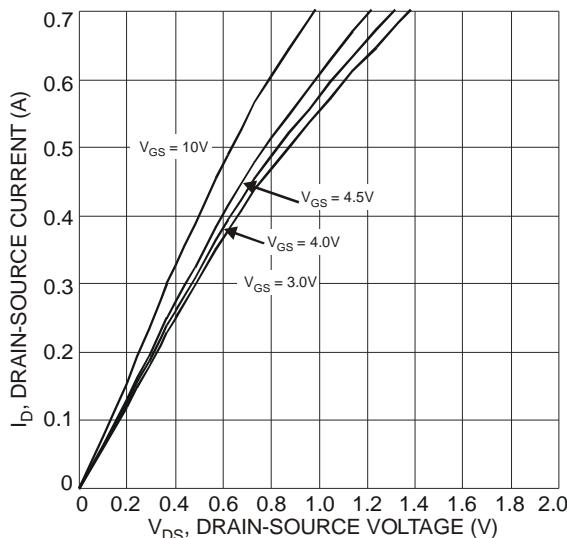
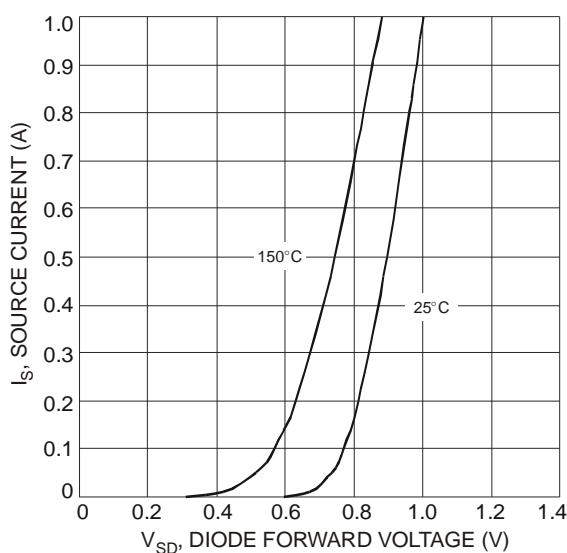
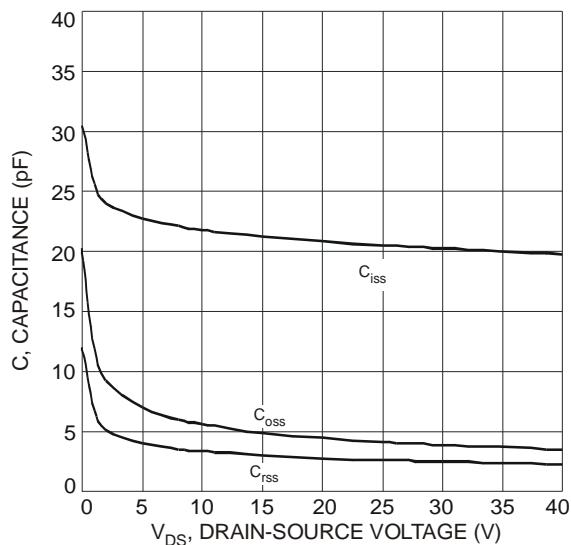
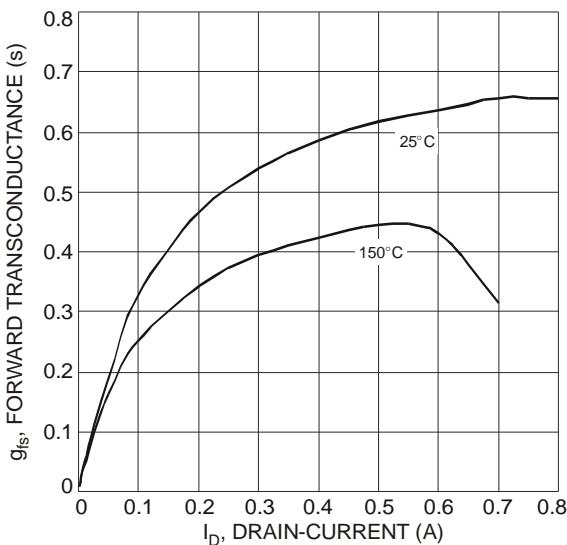


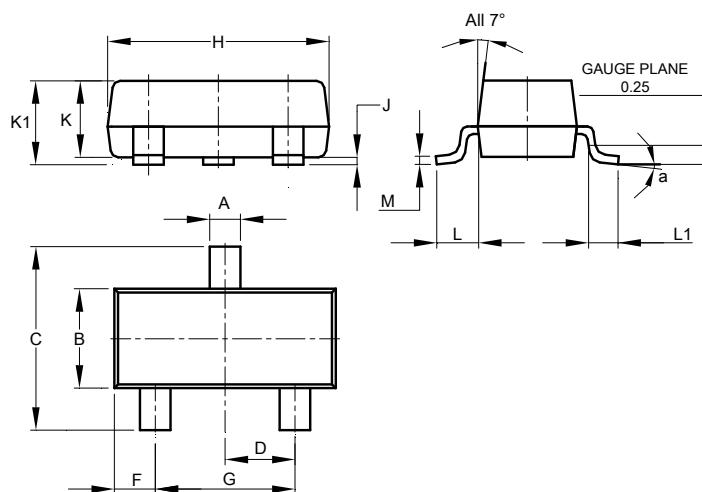
Fig. 4 Transient Thermal Response





## Package Outline Dimensions

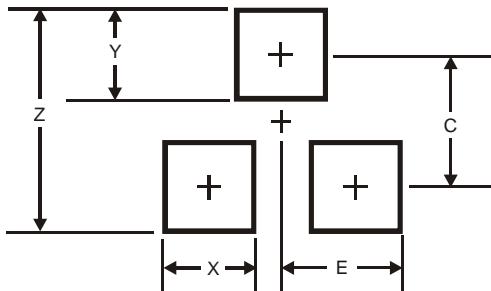
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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	0.890	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
$\alpha$	8°		
All Dimensions in mm			

## Suggested Pad Layout

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