

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON) \max}$	$I_D \max$ $T_A = +25^\circ\text{C}$
60V	7.5Ω @ $V_{GS} = 5V$	210mA

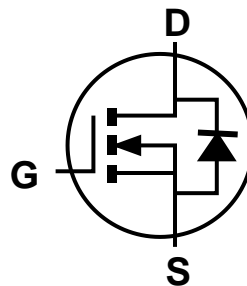
Description and Applications

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.

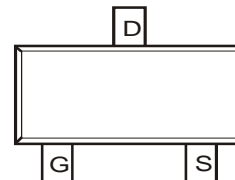
- Motor Control
- Power Management Functions



Top View



Equivalent Circuit



Top View

Features and Benefits

- N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Small Surface Mount Package
- **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

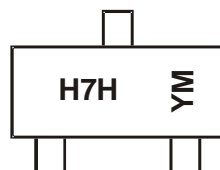
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 @3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

Ordering Information (Note 4)

Part Number	Case	Packaging
2N7002H-7	SOT23	3,000/Tape & Reel
2N7002H-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



H7H = 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}	60	V	
Gate-Source Voltage		V_{GSS}	±20	V	
			±40		
Continuous Drain Current (Note 5) $V_{GS} = 10\text{V}$	Steady State	I_D	$T_A = +25^\circ\text{C}$	170	mA
			$T_A = +85^\circ\text{C}$	120	
			$T_A = +100^\circ\text{C}$	105	
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	I_D	$T_A = +25^\circ\text{C}$	210	mA
			$T_A = +85^\circ\text{C}$	150	
			$T_A = +100^\circ\text{C}$	135	
Maximum Body Diode Forward Current (Note 6)		I_S	0.5	A	
			2		
Pulsed Drain Current (10µs pulse, duty cycle = 1%)		I_{DM}	500	mA	

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

Characteristic		Symbol	Value	Units
Total Power Dissipation	(Note 5)	P_D	370	mW
	(Note 6)		510	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	341	$^\circ\text{C/W}$
	(Note 6)		249	
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}	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 10\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1.0	µA	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$
Gate-Body Leakage	I_{GSS}	—	—	±100	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	2.0	—	3.0	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(on)}$	—	3.0	7.5	Ω	$V_{GS} = 5.0\text{V}, I_D = 0.05\text{A}$
Diode Forward Voltage	V_{SD}	—	0.78	1.5	V	$V_{GS} = 0\text{V}, I_S = 115\text{mA}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	26	—	pF	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$
Output Capacitance	C_{oss}	—	2.8	—	pF	
Reverse Transfer Capacitance	C_{riss}	—	2.1	—	pF	
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	352	—	pC	$V_{DS} = 10\text{V}, I_D = 250\text{mA}$
Gate-Source Charge	Q_{gs}	—	203	—		
Gate-Drain Charge	Q_{gd}	—	123	—		
Turn-On Delay Time	$t_{D(on)}$	—	3.7	—	ns	$V_{DD} = 30\text{V}, I_D = 0.2\text{A},$ $R_L = 150\Omega, V_{GEN} = 10\text{V},$ $R_{GEN} = 25\Omega$
Turn-On Rise Time	t_r	—	2.9	—		
Turn-Off Delay Time	$t_{D(off)}$	—	8.4	—		
Turn-Off Fall Time	t_f	—	4.7	—		
Body Diode Reverse Recovery Time	t_{rr}	-	9.3	-	ns	$I_S = 0.5\text{A}, dI/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{rr}	-	3.5	-	nC	$I_S = 0.5\text{A}, dI/dt = 100\text{A}/\mu\text{s}$

- 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.

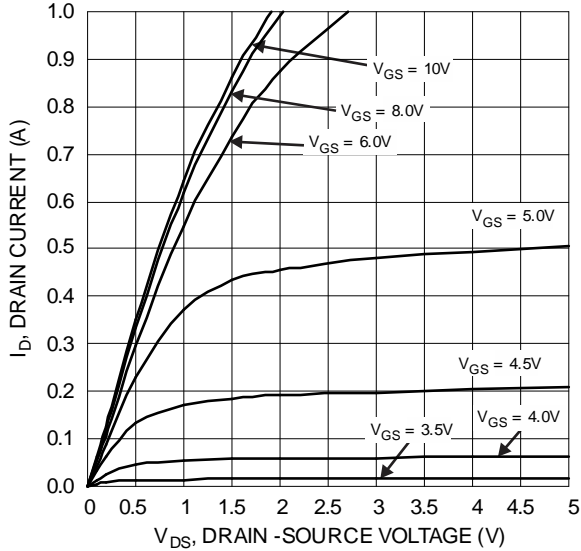


Figure 1 Typical Output Characteristics

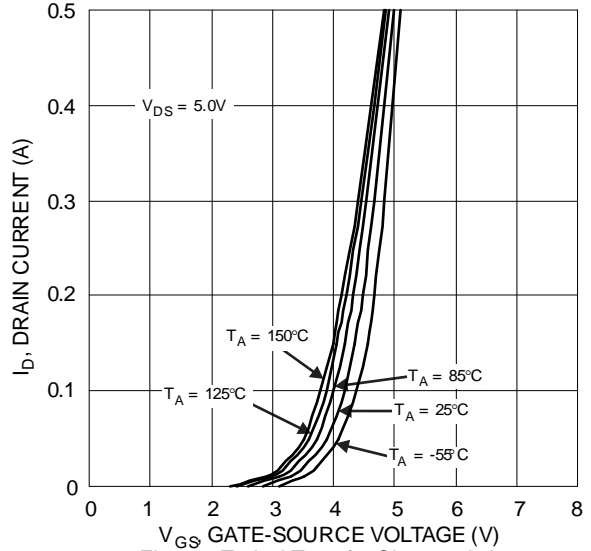


Figure 2 Typical Transfer Characteristics

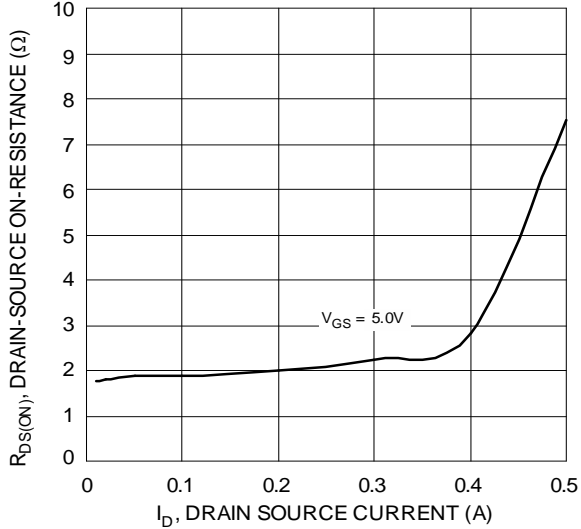


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

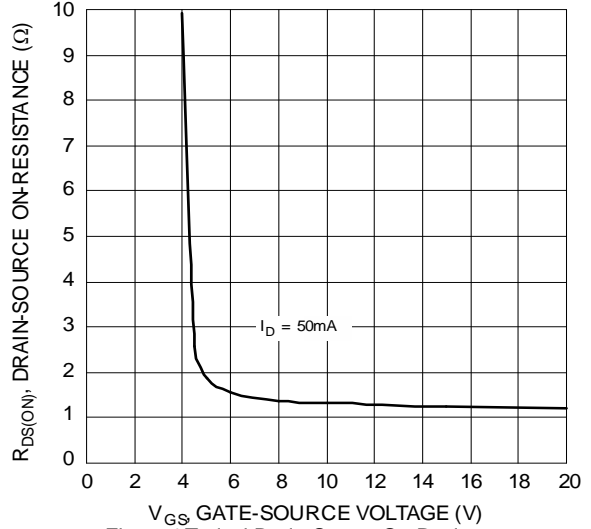


Figure 4 Typical Drain-Source On-Resistance vs. Gate-Source Voltage

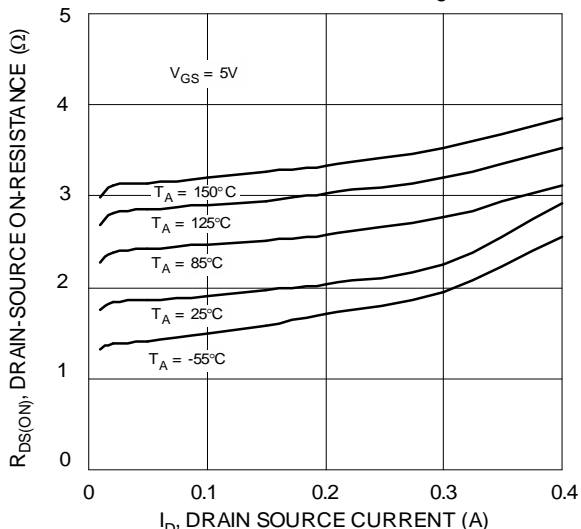


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

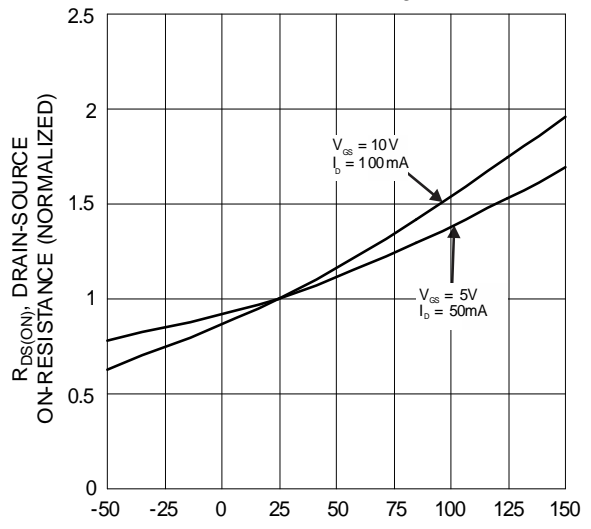


Figure 6 On-Resistance Variation with Temperature

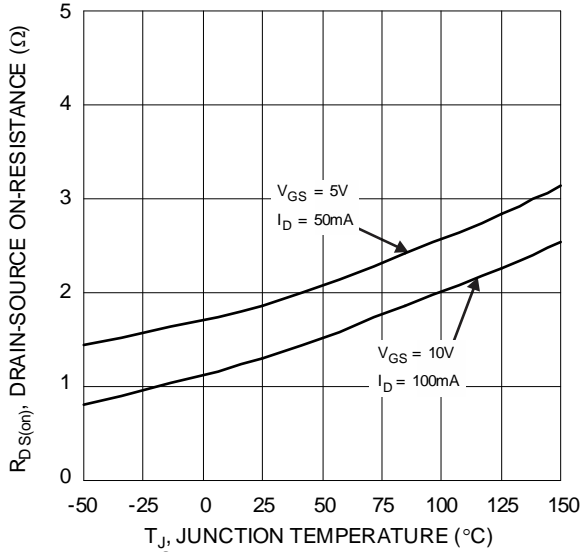


Figure 7 On-Resistance Variation with Temperature

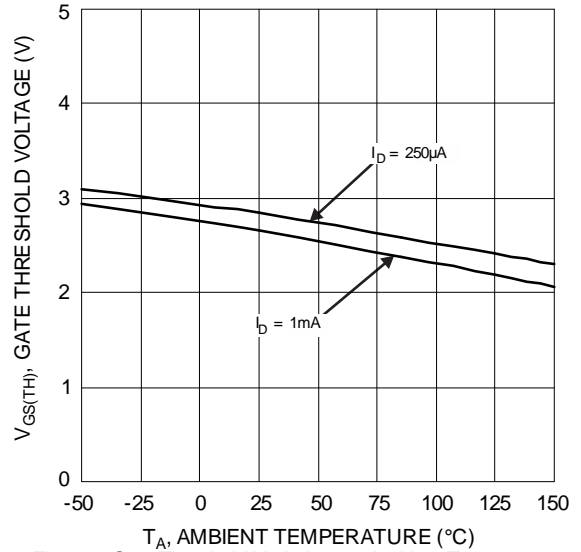


Figure 8 Gate Threshold Variation vs. Ambient Temperature

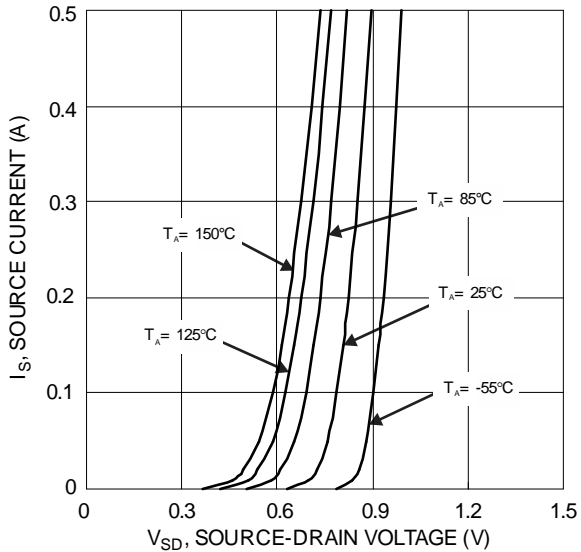


Figure 9 Diode Forward Voltage vs. Current

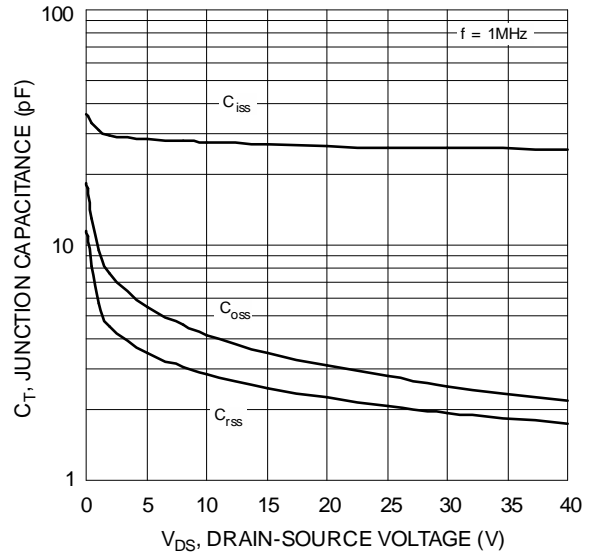


Figure 10 Typical Junction Capacitance

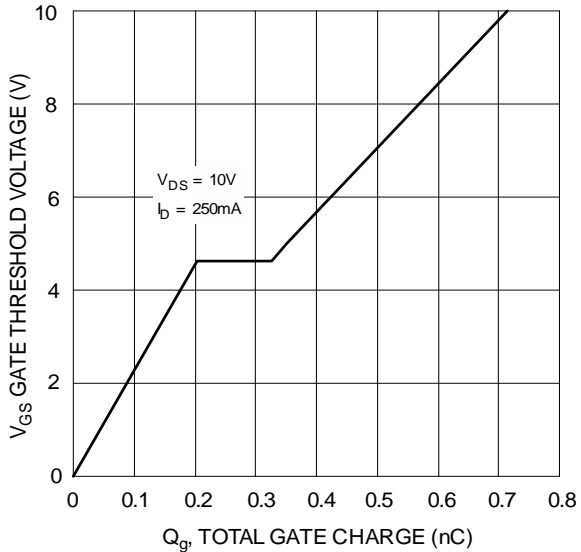


Figure 11 Gate Charge

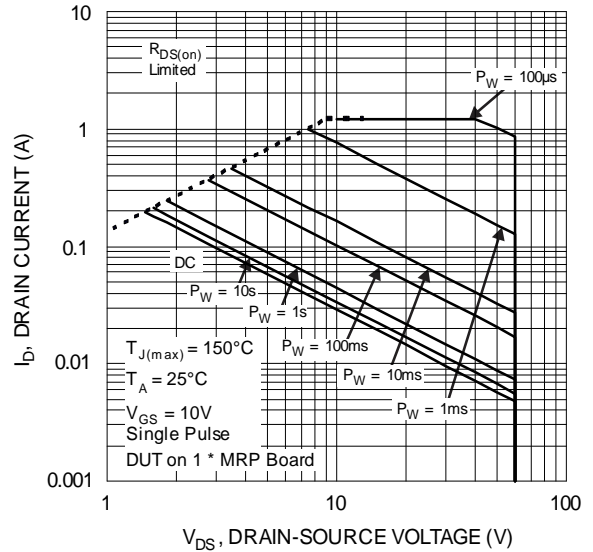
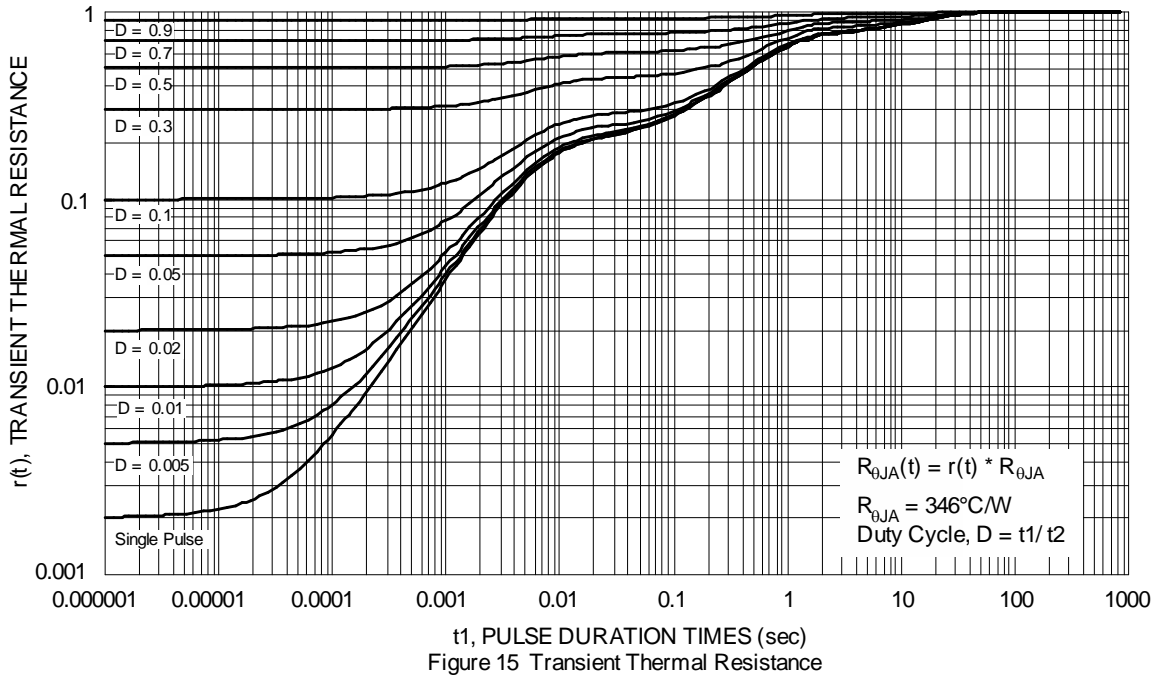
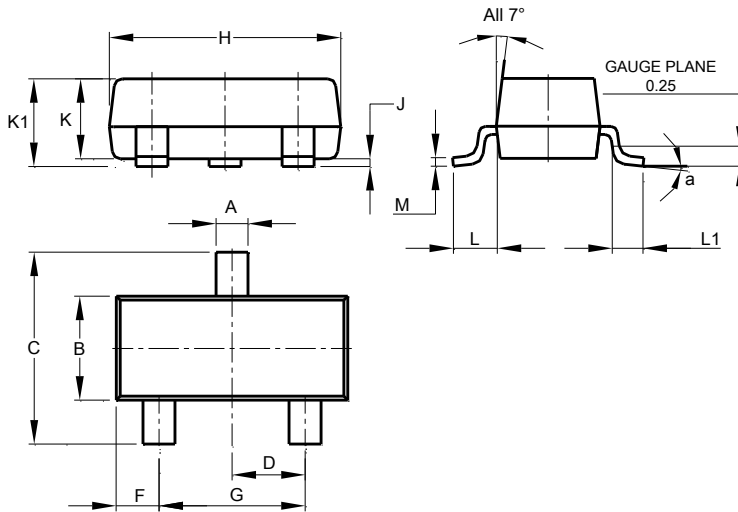


Figure 12 SOA, Safe Operation Area



Package Outline Dimensions

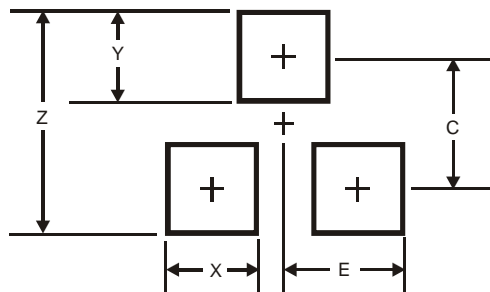
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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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