

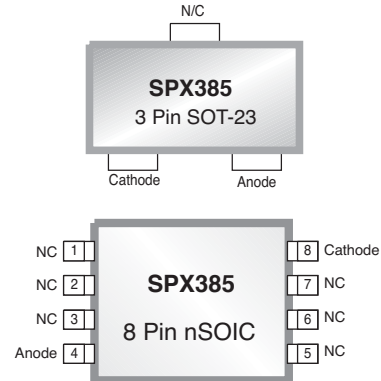
## 5V Micropower Voltage Reference

### FEATURES

- Trimmed Bandgap ..... 1%
- Wide Operating Current ..... 50 $\mu$ A to 20mA
- Extended Temperature Range ... -40°C to +85°C
- Dynamic Impedance ..... 1 $\Omega$  max
- Offered in Small SOT-23, TO-92, NSOIC, and SOT-89
- Low Cost Solution

### APPLICATIONS

- Battery Operated Equipment
- Adjustable Supplies
- Switching Power Supplies
- Error Amplifiers
- Single Supply Amplifier



Now Available in Lead Free Packaging

- Monitors / VCR / TV
- Personal Computers
- Power use meter

### DESCRIPTION

The SPX385-5.0 is a micropower 2-terminal band-gap voltage reference with a very wide operating current range from 50 $\mu$ A to 20mA that provides a stable voltage.

The SPX385-5.0 is available in SOT-23, TO-92, NSOIC, and SOT-89 packages with an operating temperature range of -40°C to 85°C. A 1.2 and 2.5 volt device are also available - SPX385-1.2, SPX385-2.5.

### BLOCK DIAGRAM

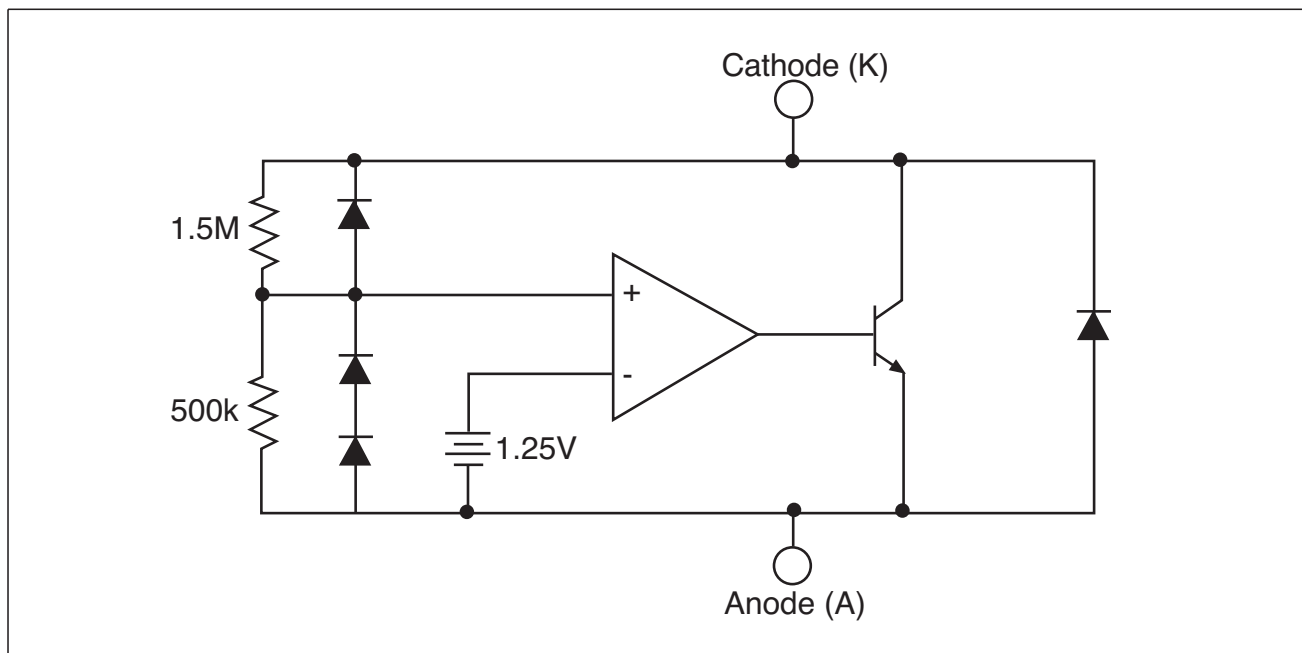


Figure 1: Block Diagram

## ABSOLUTE MAXIMUM RATINGS

Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Reverse Current ( $I_{KA}$ ) .....	30mA
Forward Current ( $I_{AK}$ ) .....	10mA
Operating Temperature Range ( $T_A$ ) .....	-40 to +85°C
Junction Temperature ( $T_J$ ) .....	150°C
Storage Temperature ( $T_{STG}$ ) .....	- 65 to 150°C
Lead Temperature (Soldering 10 sec.), $T_L$ .....	300°C

## ELECTRICAL CHARACTERISTICS

$I_{IN} = 100\mu A$ ,  $T_A = 25^\circ C$ , unless otherwise specified. The  $\blacklozenge$  denotes the specifications which apply over the full operating temperature range.

PARAMETER	MIN.	TYP.	MAX		UNIT	CONDITIONS
Reference Voltage	4.90 4.95	5.00 5.00	5.10 5.05	$\blacklozenge$	V	2% 1%
Dynamic Output Impedance		0.6	1.0	$\blacklozenge$ $\blacklozenge$	$\Omega$	F = 20Hz $I_R = 100\mu A$
Reference Voltage Change with $I_R$ .		10	20	$\blacklozenge$	mV	$20\mu A \leq I_R \leq 20mA$
Temperature Coefficient		30	50	$\blacklozenge$	ppm/ $^\circ C$	Note 1
Minimum Operating Current	30		50	$\blacklozenge$	$\mu A$	
Output Wideband Noise		120		$\blacklozenge$	$\mu V_{rms}$	$10Hz \leq f \leq 10kHz$
Long Term Stability		60		$\blacklozenge$	ppm	T=1000Hr; $T_A = 25^\circ C \pm 0.1^\circ C$
Operating Temperature	-40		+85		$^\circ C$	

Note 1. Three-point measurement guarantees the error band over the specified temperature range.

### \*CALCULATING AVERAGE TEMPERATURE COEFFICIENT (TC)

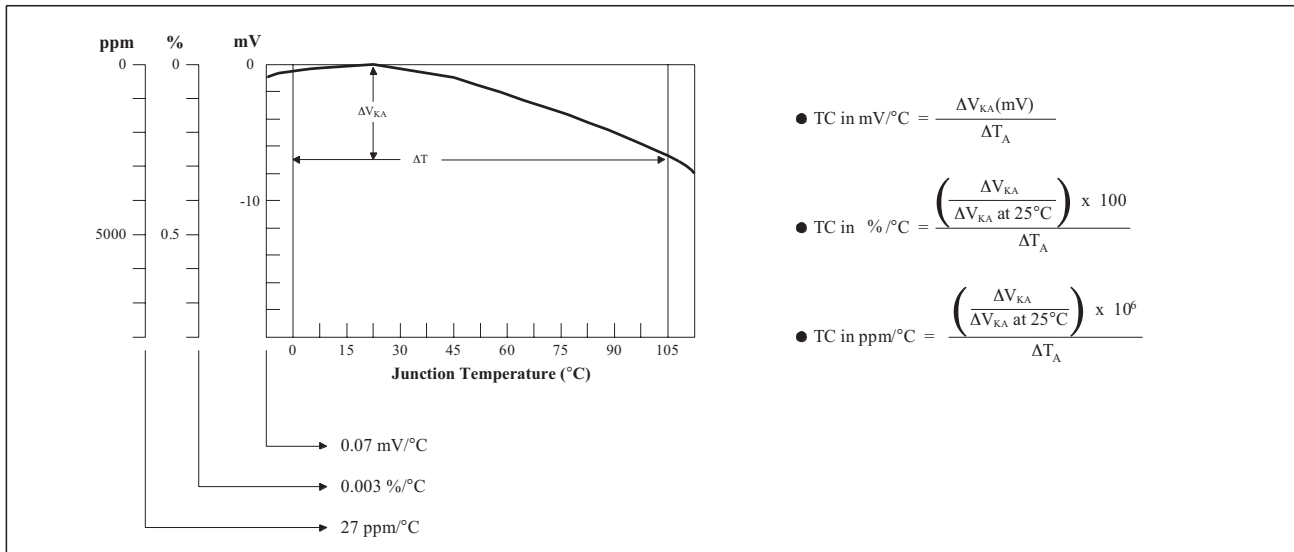


Figure 2.  $V_{KA}$  vs. Temperature

## TYPICAL PERFORMANCE CHARACTERISTICS

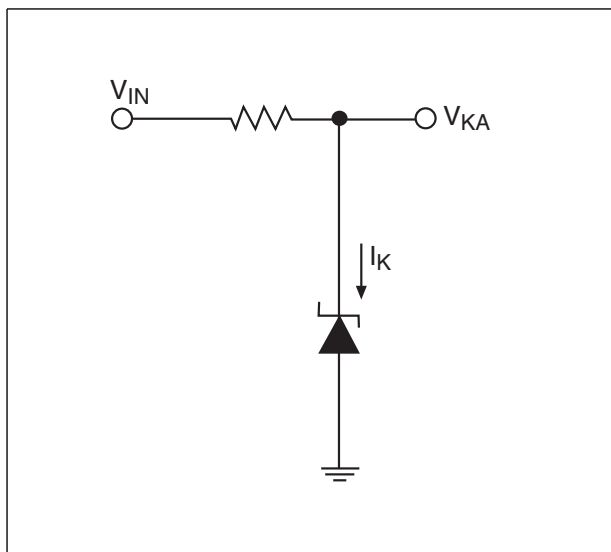


Figure 1. Improving Regulation of Adjustable Regulators

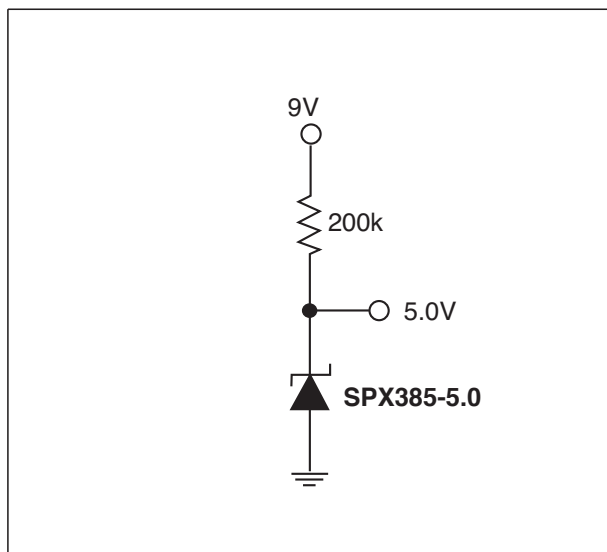


Figure 2. Micropower Reference from 9V Battery

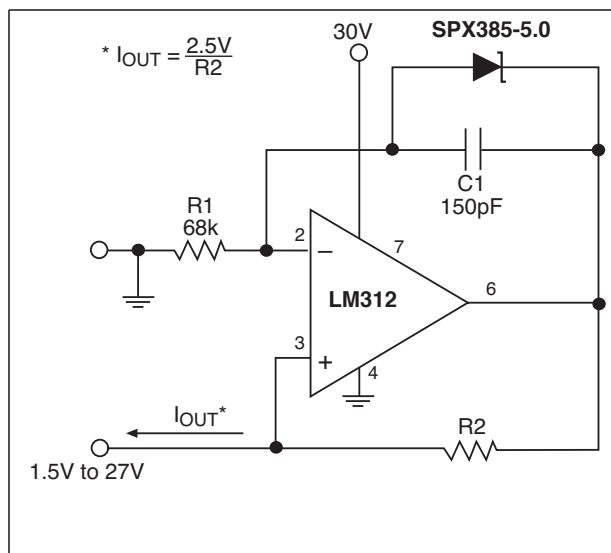


Figure 3. Precision  $1\mu\text{A}$  to  $1\text{mA}$  Current Source

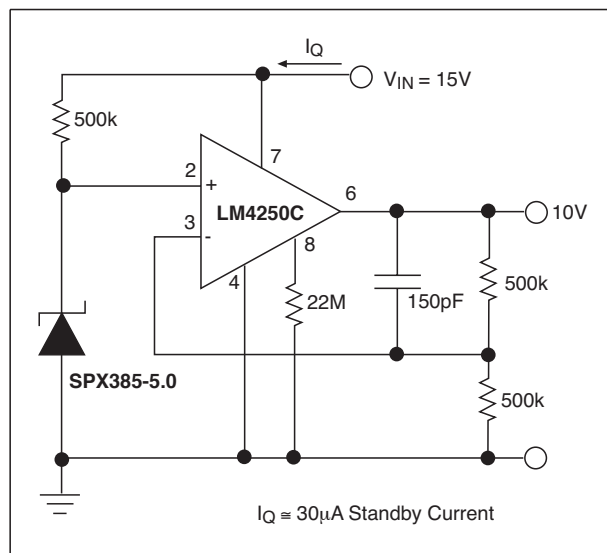
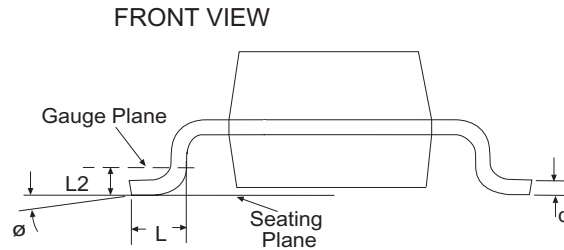
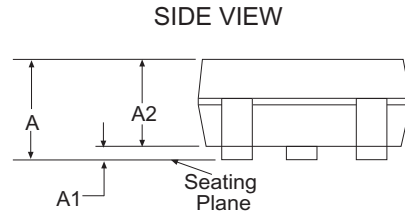
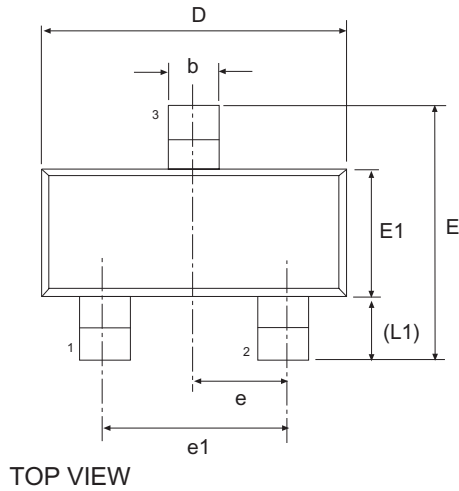
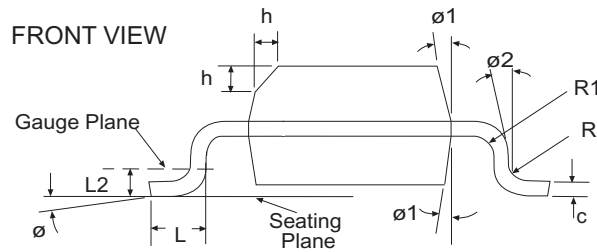
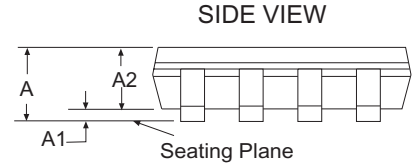
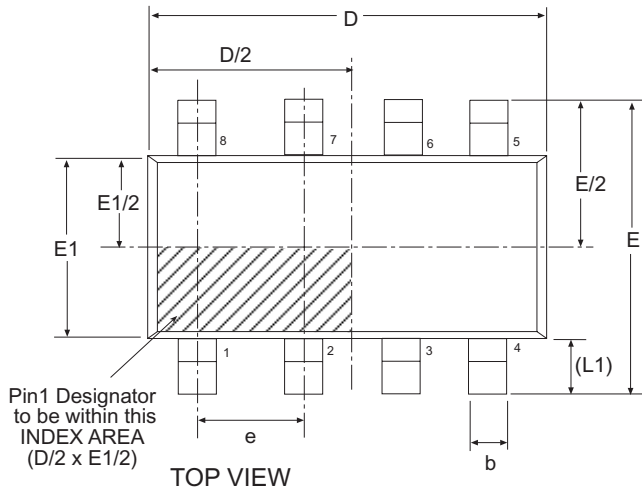


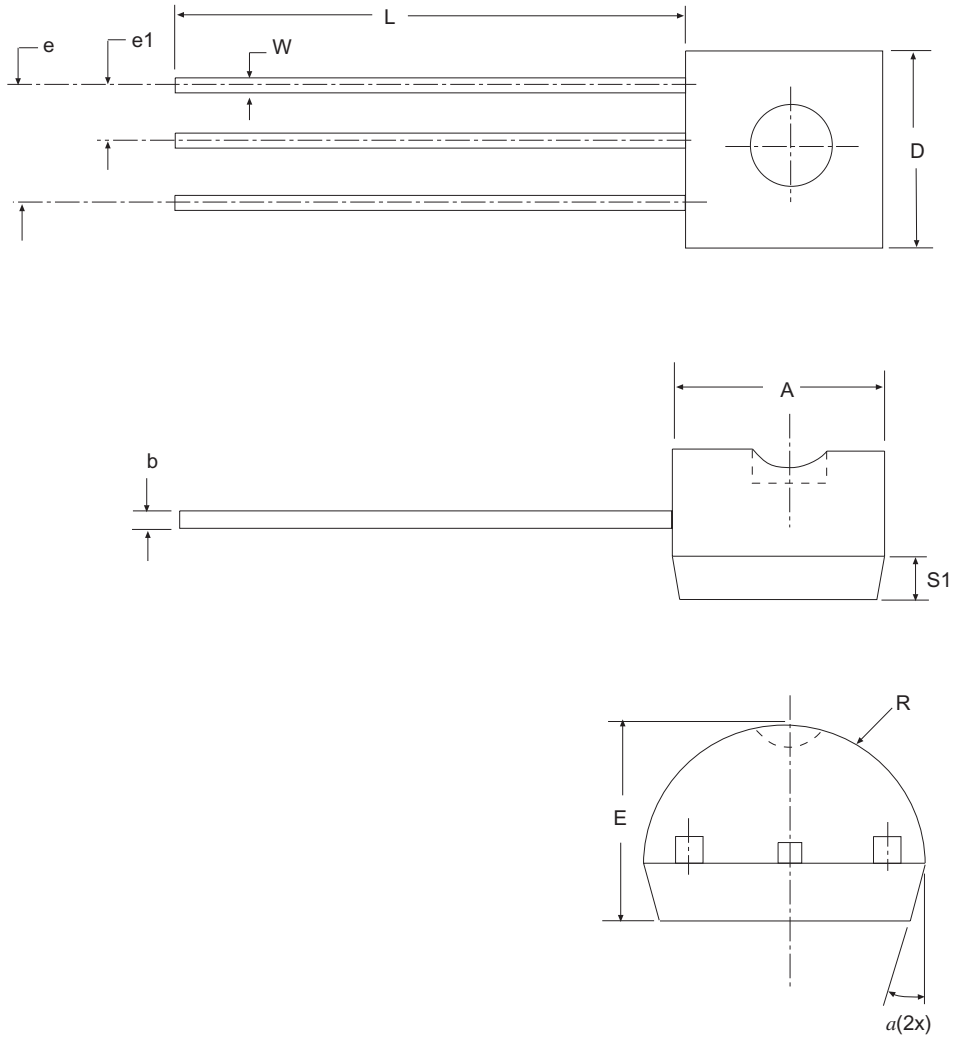
Figure 4. Precision Micropower 10V Reference



3 Pin SOT-23 JEDEC TO-236 Variation AB						
SYMBOL	Dimensions in Millimeters: Controlling Dimension			Dimensions in Inches Conversion Factor: 1 Inch = 25.40 mm		
	MIN	NOM	MAX	MIN	NOM	MAX
b	0.30	-	0.50	0.012	-	0.020
c	0.08	-	0.20	0.003	-	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	2.10	-	2.64	0.083	-	0.104
E1	1.20	1.30	1.40	0.047	0.051	0.055
e	0.95 BSC			0.038 BSC		
e1	1.90 BSC			0.075 BSC		
L	0.40	0.50	0.60	0.016	0.020	0.024
L1	0.54 REF			0.021 REF		
L2	0.25 BSC			0.010 BSC		
Ø	0°	-	8°	0°	-	8°
A	0.89	-	1.12	0.035	-	0.044
A1	0.01	-	0.10	0.000	-	0.004
A2	0.88	0.95	1.02	0.035	0.037	0.040
SIPEX Pkg Signoff Date/Rev:				JL Oct25-05 / Rev A		

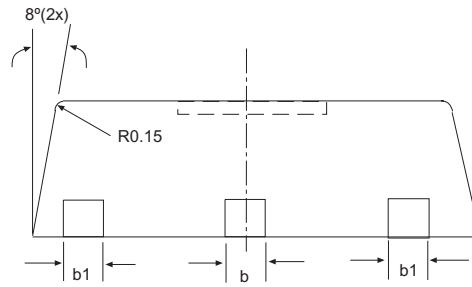
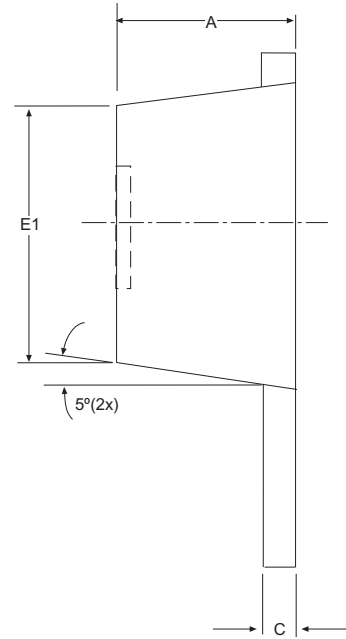
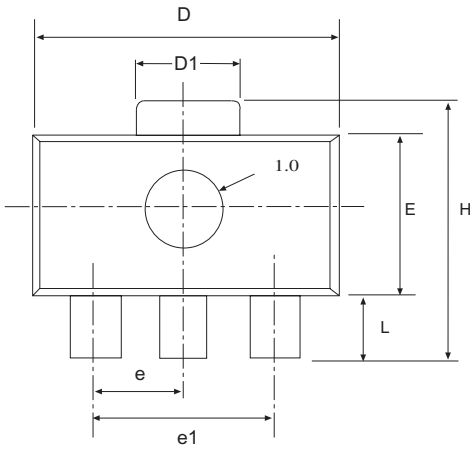


8 Pin NSOIC		JEDEC MS-012		Variation AA		
SYMBOL	Dimensions in Millimeters: Controlling Dimension			Dimensions in Inches Conversion Factor: 1 Inch = 25.40 mm		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	-	1.75	0.053	-	0.069
A1	0.10	-	0.25	0.004	-	0.010
A2	1.25	-	1.65	0.049	-	0.065
b	0.31	-	0.51	0.012	-	0.020
c	0.17	-	0.25	0.007	-	0.010
E	6.00 BSC			0.236 BSC		
E1	3.90 BSC			0.154 BSC		
e	1.27 BSC			0.050 BSC		
h	0.25		0.50	0.010	-	0.020
L	0.40	-	1.27	0.016	-	0.050
L1	1.04 REF			0.041 REF		
L2	0.25 BSC			0.010 BSC		
R	0.07	-	-	0.003	-	-
R1	0.07	-	-	0.003	-	-
ø	0°	-	8°	0°	-	8°
ø1	5°	-	15°	5°	-	15°
ø2	0°	-	-	0°	-	-
D	4.90 BSC			0.193 BSC		
SIPEX Pkg Signoff Date/Rev:				JL Aug16-05 / Rev A		



3 Pin TO-92						
SYMBOL	Dimensions in Inches: Controlling Dimension			Dimensions in Millimeters Conversion Factor: 1 Inch = 25.40 mm		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.170	-	0.195	4.32	-	4.95
b	0.014	-	0.020	0.36	-	0.51
E	0.130	-	0.155	3.30	-	3.94
e	0.095	-	0.105	2.41	-	2.67
e1	0.045	-	0.055	1.14	-	1.40
L	0.500	-	0.610	12.70	-	15.49
R	0.085	-	0.095	2.16	-	2.41
S1	0.045	-	0.060	1.14	-	1.52
W	0.016	-	0.022	0.41	-	0.56
D	0.175	-	0.195	4.45	-	4.95
$\alpha$	4°	-	6°	4°	-	6°

SIPEX Pkg Signoff Date/Rev: JL Sept23-05 / RevA



3 Pin SOT-89		JEDEC TO-243			Variation AA		
SYMBOL	Dimensions in Millimeters: Controlling Dimension			Dimensions in Inches Conversion Factor: 1 Inch = 25.40 mm			
	MIN	NOM	MAX	MIN	NOM	MAX	
A	1.40	-	1.60	0.055	-	0.063	
B	0.44	-	0.56	0.017	-	0.022	
B1	0.36	-	0.48	0.014	-	0.019	
C	0.35	-	0.44	0.014	-	0.017	
D	4.40	-	4.60	0.173	-	0.181	
D1	1.62	-	1.83	0.064	-	0.072	
E	2.29	-	2.60	0.090	-	0.102	
E1	2.13	-	2.29	0.084	-	0.090	
e	1.50 BSC			0.059 BSC			
e1	3.00 BSC			0.118 BSC			
H	3.94	-	4.25	0.155	-	0.167	
L	0.89	-	1.20	0.035	-	0.047	
SIPEX Pkg Signoff Date/Rev:				JL Feb2-06/ RevA			

<b>Part Number</b>	<b>Accuracy</b>	<b>Output Voltage</b>	<b>Package Type</b>
SPX385AM-5-0	1.0%	5.0V	3 Pin SOT-23
SPX385AM-5-0/TR	1.0%	5.0V	3 Pin SOT-23
SPX385AM1-5-0	1.0%	5.0V	3 Pin SOT-89
SPX385AM1-5-0/TR	1.0%	5.0V	3 Pin SOT-89
SPX385AN-5-0	1.0%	5.0V	3 Pin TO-92
SPX385AN-5-0/TR	1.0%	5.0V	3 Pin TO-92
SPX385AS-5-0	1.0%	5.0V	8 Pin NSOIC
SPX385AS-5-0/TR	1.0%	5.0V	8 Pin NSOIC
SPX385BM-5-0	2.0%	5.0V	3 Pin SOT-23
SPX385BM-5-0/TR	2.0%	5.0V	3 Pin SOT-23
SPX385BM1-5-0	2.0%	5.0V	3 Pin SOT-89
SPX385BM1-5-0/TR	2.0%	5.0V	3 Pin SOT-89
SPX385BN-5-0	2.0%	5.0V	3 Pin TO-92
SPX385BN-5-0/TR	2.0%	5.0V	3 Pin TO-92
SPX385BS-5-0	2.0%	5.0V	8 Pin NSOIC
SPX385BS-5-0/TR	2.0%	5.0V	8 Pin NSOIC
SPX385M-5-0	2.0%	5.0V	3 Pin SOT-23
SPX385M-5-0/TR	2.0%	5.0V	3 Pin SOT-23
SPX385N-5-0	2.0%	5.0V	3 Pin TO-92
SPX385N-5-0/TR	2.0%	5.0V	3 Pin TO-92
SPX385S-5-0	2.0%	5.0V	8 Pin NSOIC
SPX385S-5-0/TR	2.0%	5.0V	8 Pin NSOIC

Available in lead free packaging. To order add “-L” suffix to part number.  
 Example: SPX385BS-5-0/TR = standard; SPX385BS-L-5-0/TR = lead free

/TR = Tape and Reel

Pack quantity is 2,000 for TO-92 and 2,500 NSOIC, SOT-23, SOT-89.



ANALOG EXCELLENCE

**Sipex Corporation**

**Sipex Corporation**

**Headquarters and  
 Sales Office:**  
 233 Hillview Dr  
 Milpitas, CA 95035  
 TEL: (408) 934-7500  
 FAX: (408) 935-7600

Sipex Corporation reserves the right to make changes to any products described herein. Sipex does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights nor the rights of others.