

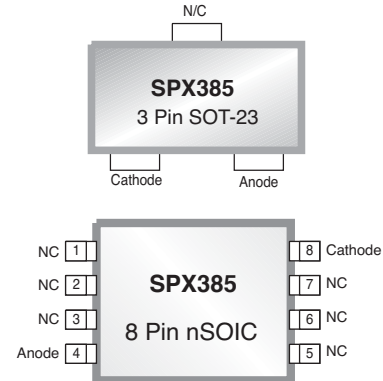
5V Micropower Voltage Reference

FEATURES

- Trimmed Bandgap 1%
- Wide Operating Current 50 μ A to 20mA
- Extended Temperature Range ... -40°C to +85°C
- Dynamic Impedance 1 Ω 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 μ 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

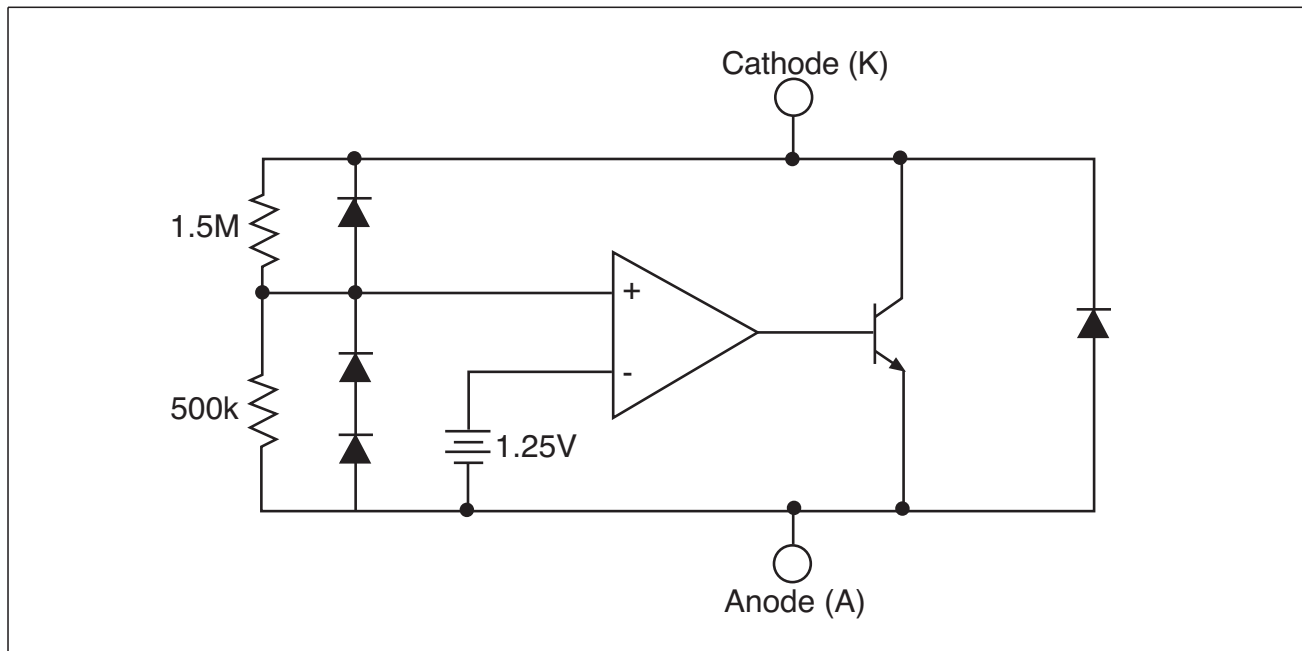


Figure 1: Block Diagram

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 | 5.10 5.05 | \blacklozenge | V | 2% 1% |
| Dynamic Output Impedance | | 0.6 | 1.0 | \blacklozenge \blacklozenge | Ω | 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 | μA | |
| Output Wideband Noise | | 120 | | \blacklozenge | μV_{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)

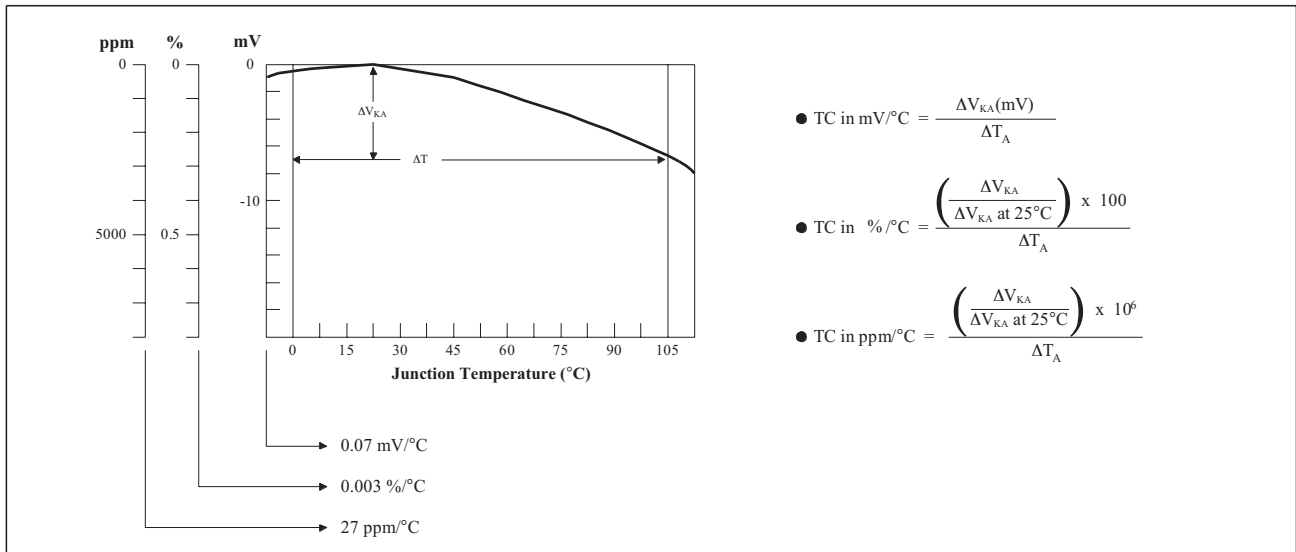


Figure 2. V_{KA} vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS

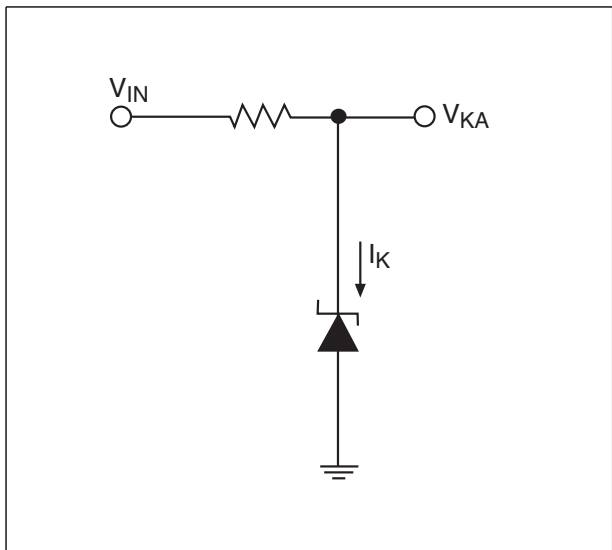


Figure 1. Improving Regulation of Adjustable Regulators

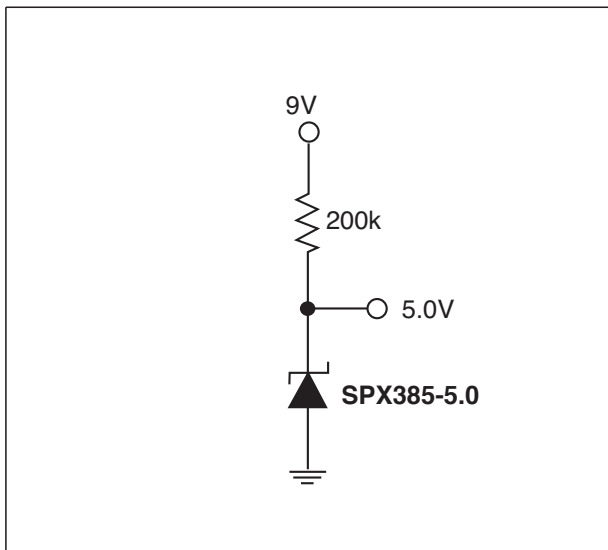


Figure 2. Micropower Reference from 9V Battery

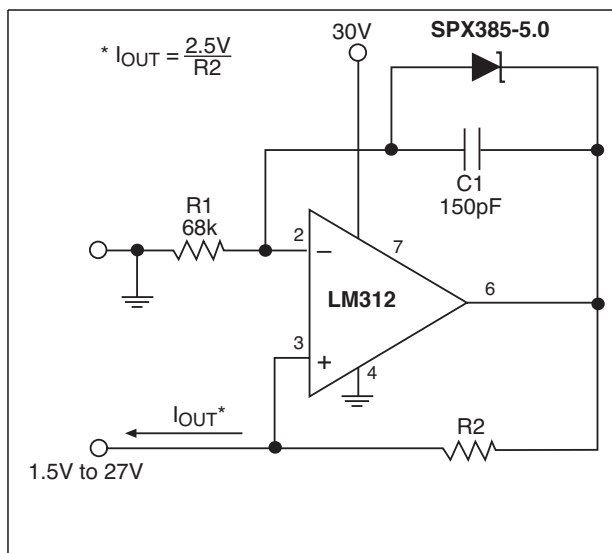


Figure 3. Precision 1µA to 1mA Current Source

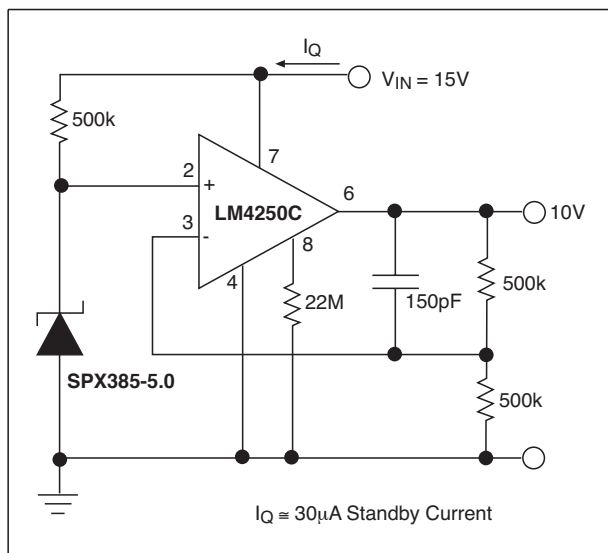
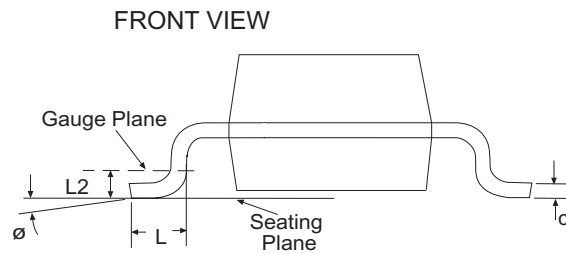
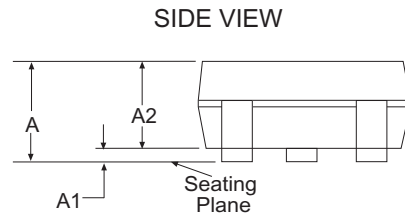
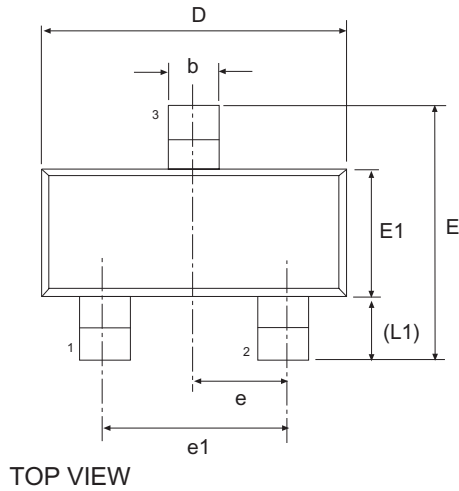
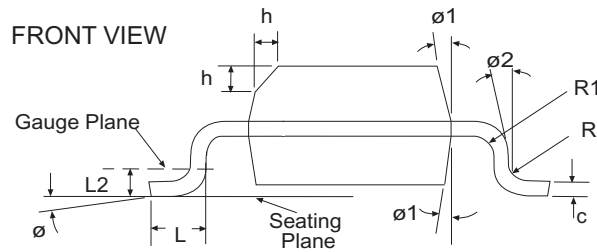
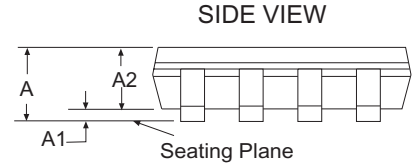
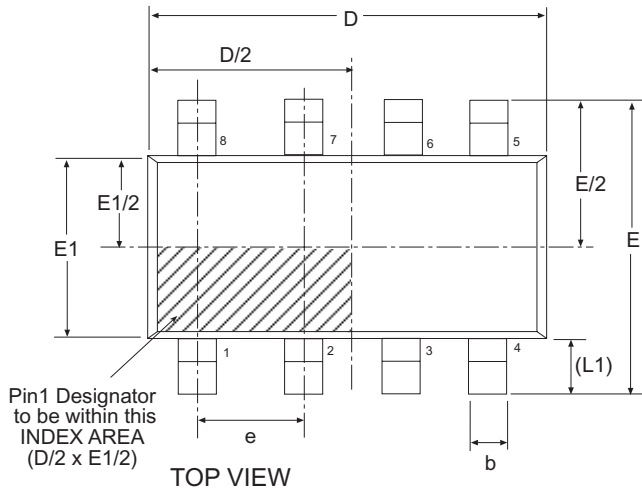


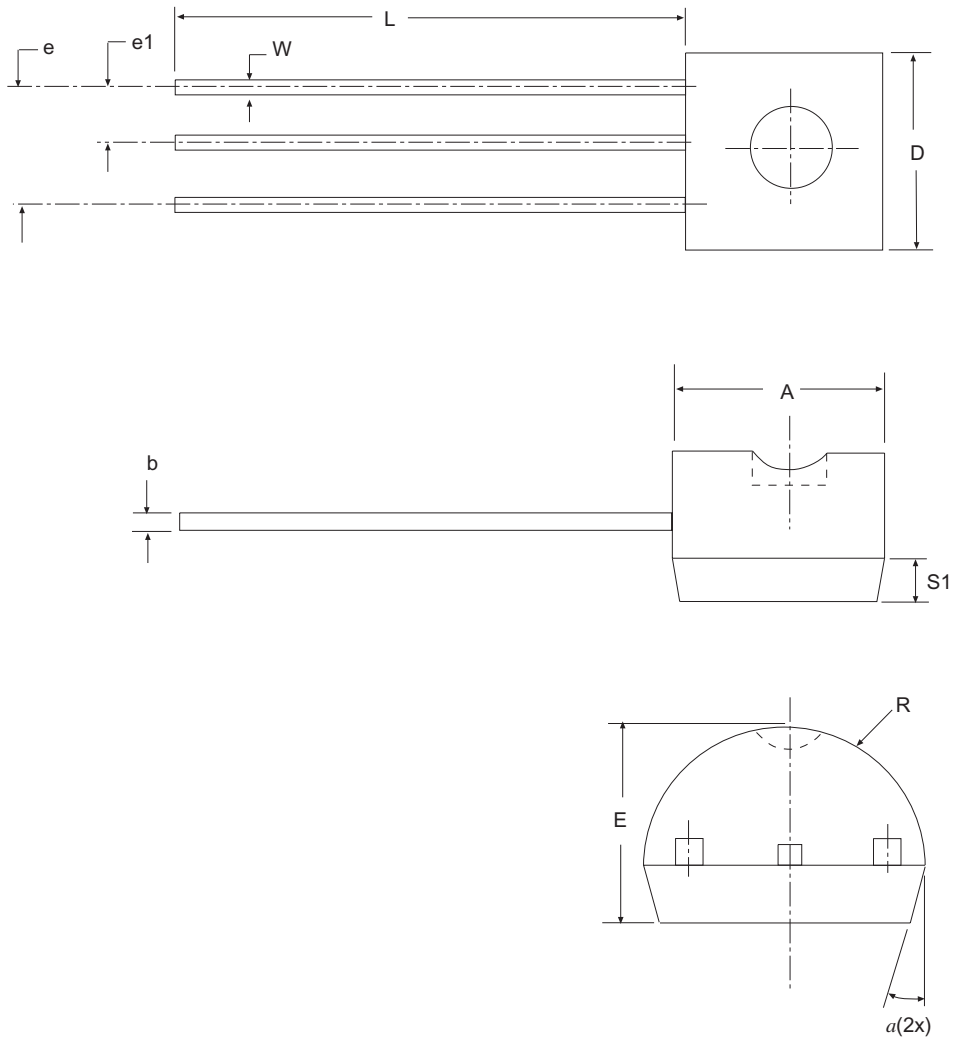
Figure 4. Precision Micropower 10V Reference



| 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 | | |
| ∅ | 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 | | |

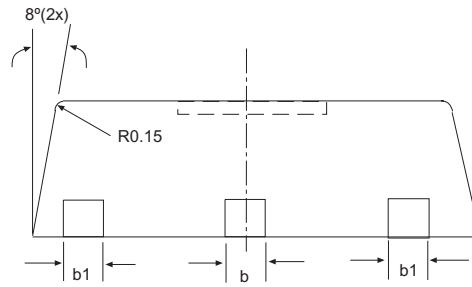
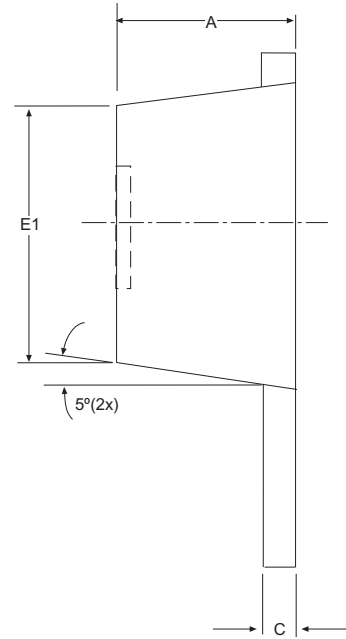
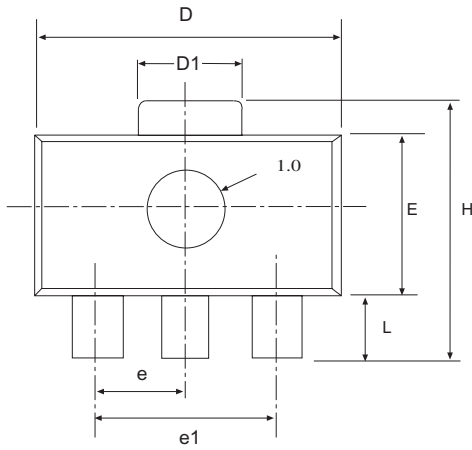


| 8 Pin NSOIC | | JEDEC MS-012 | | Variation AA | | |
|-----------------------------|---|--------------|------|---|-----|-------|
| SYMBOL | Dimensions in Millimeters: Controlling Dimension | | | Dimensions in Inches Conversion Factor: 1 Inch = 25.40 mm | | |
| | MIN | NOM | MAX | MIN | NOM | MAX |
| 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 | - | - |
| ϕ | 0° | - | 8° | 0° | - | 8° |
| $\phi 1$ | 5° | - | 15° | 5° | - | 15° |
| $\phi 2$ | 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 |
| α | 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 | | | |

| Part Number | Accuracy | Output Voltage | Package Type |
|--------------------|-----------------|-----------------------|---------------------|
| 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

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