

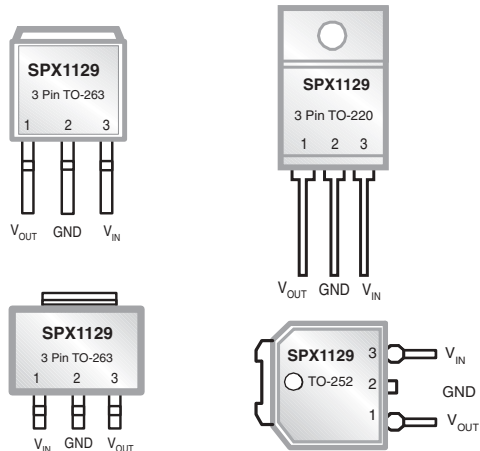
## 400mA Low Dropout Voltage Regulator

### FEATURES

- 1% Output Accuracy 3.3V, 5V, at 500mA Output
- Very Low Quiescent Current
- 0.42V Dropout Voltage at 400mA
- Extremely Tight Load and Line Regulation
- Current & Thermal Limiting
- Reverse Battery Protection
- Equivalent Replacement For LT1129

### APPLICATIONS

- Power Supply
- Communications Equipment
- Computers and Peripherals



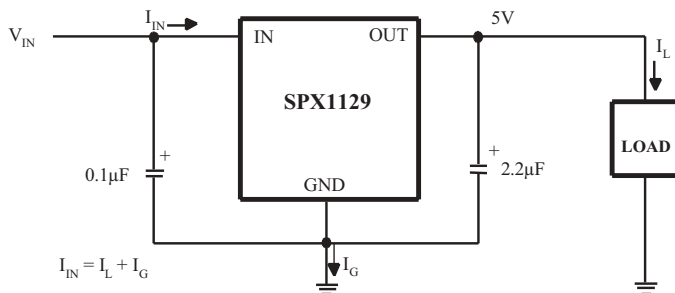
Now Available in Lead Free Packaging

### DESCRIPTION

The SPX1129 is a low power voltage regulator. This device is an excellent choice for use in battery-powered applications such as cordless telephones, radio control systems, and portable computers. The SPX1129 features very low quiescent current and very low dropout voltage of 0.42 volts. This includes a tight initial tolerance of  $\pm 1\%$  max, and a very low output temperature coefficient, making the SPX1129 useful as a low-power voltage reference.

The SPX1129 is offered in a SOT-223, TO-220, TO-252 & TO-263 3 lead packages.

### TYPICAL APPLICATION CIRCUIT



*Fixed +5V Regulator Circuit..*

## ABSOLUTE MAXIMUM RATINGS

Power Dissipation ..... Internally Limited  
 Lead Temp. (Soldering, 5 Seconds) ..... 260°C  
 Storage Temperature Range ..... -65°C to +150°C  
 Operating Junction Temperature Range ..... -40°C to +125°C

Input Supply Voltage ..... -20V to +20V  
 ESD Rating ..... 2kV Min

## ELECTRICAL CHARACTERISTICS

Electrical characteristics at  $V_{IN} = 6V$ ,  $I_O = 1mA$ ,  $C_{OUT} = 2.2\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified. **Boldface** applies over the full operating temperature range.

| PARAMETER                                 | CONDITIONS<br>(Note 2)   | TYP                  | MIN                   | MAX                   | UNITS   |
|---|--|----------------------|-----------------------|-----------------------|---------|
| <b>3.3V Version</b>                       |  |                      |                       |                       |         |
| Output Voltage                            | $1mA \leq I_L \leq 400mA$  | 3.3<br><b>3.3</b>    | 3.267<br><b>3.217</b> | 3.333<br><b>3.382</b> | V       |
| Reverse Output Current                    | $V_{OUT} = 3.3V, V_{IN} = 0V$  | 16                   |                       | 25                    | $\mu A$ |
| <b>5.0V Version</b>                       |  |                      |                       |                       |         |
| Output Voltage                            | $1mA \leq I_L \leq 400mA$  | 5.0<br><b>5.0</b>    | 4.950<br><b>4.880</b> | 5.050<br><b>5.120</b> | V       |
| Reverse Output Current                    | $V_{OUT} = 5.0V, V_{IN} = 0V$  | 16                   |                       | 25                    | $\mu A$ |
| <b>All Voltage Options</b>                |  |                      |                       |                       |         |
| Output Voltage<br>Temperature Coefficient | (Note 1)   | 20                   |                       | <b>100</b>            | ppm/°C  |
| Line Regulation                           | $6V \leq V_{IN} \leq 20V$ (Note 4)   | 1.5                  |                       | <b>10</b>             | mV      |
| Load Regulation (Note 3)                  | $I_L = 1$ to 400mA   | 6                    |                       | 20<br><b>30</b>       | mV      |
| Dropout Voltage (Note 5)                  | $I_L = 1mA$  | 0.13                 |                       | 0.17<br><b>0.25</b>   | V       |
|   | $I_L = 400mA$  | 0.42                 |                       | 0.55<br><b>0.70</b>   |         |
| Ground Current                            | $I_L = 1mA$  | <b>100</b>           |                       | <b>200</b>            | $\mu A$ |
|   | $I_L = 10mA$   | <b>350</b>           |                       | <b>500</b>            |         |
|   | $I_L = 50mA$   | <b>1.5</b>           |                       | <b>3</b>              | mA      |
|   | $I_L = 100mA$<br>$I_L = 400mA$   | <b>2</b><br><b>7</b> |                       | <b>6</b><br><b>25</b> |         |
| Current Limit                             | $V_{OUT} = 0$  | 330                  |                       | <b>800</b>            | mA      |
| Ripple Rejection                          | $V_{IN} - V_{OUT} = 1V(Avg)$ ,<br>$V_{RIPPLE} = 0.5Vp-p, F_{RIPPLE} = 120Hz$ ,<br>$I_{LOAD} = 400mA, T_J = 25^\circ C$ | 58                   | 50                    |                       | dB      |
| Input Reverse Leakage Current             | $V_{IN} = -20V, V_{OUT} = 0V$  |                      |                       | <b>1.0</b>            | mA      |

**Note 1:** Output or reference voltage temperature coefficients defined as the worst case voltage change divided by the total temperature range.

**Note 2:** Unless otherwise specified all limits are guaranteed for  $T_J = 25^\circ C$ ,  $V_{IN} = 6V$ ,  $I_L = 1mA$  and  $C_L = 2.2\mu F$ .

**Note 3:** Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation.

**Note 4:** Line regulation for the SPX1129 is tested at  $25^\circ C$  for  $I_L = 1mA$ . For  $T_J = 125^\circ C$ , line regulation is guaranteed by design.

**Note 5:** Dropout voltage is defined as the input to output differential at which the output voltage drops 100 mV below its nominal value measured at 1V differential.

**External Capacitors**

The stability of the SPX1129 requires a 2.2 $\mu$ F or greater capacitor between output and ground. Oscillation could occur without this capacitor. Most types of tantalum or aluminum electrolytic works fine here. For operations of below -25°C solid tantalum is recommended since the many aluminum types have electrolytes that freeze at about -30°C. The ESR of about 5 $\Omega$  or less and resonant frequency above 500kHz are the most important parameters in the value of the capacitor. The capacitor value can be increased without limit.

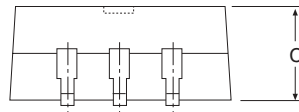
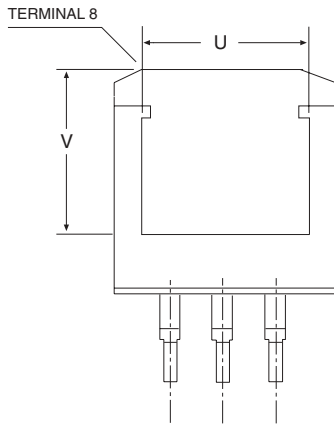
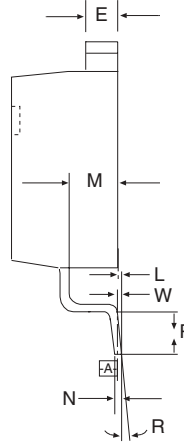
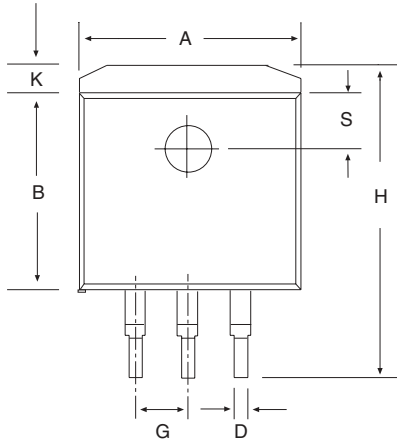
The SPX1129, unlike other low dropout regulators will remain stable and in regulation with no load in addition to the internal voltage divider.

This feature is especially important in applications like CMOS RAM keep-alive.

If there is more than 10 inches of wire between the input and the AC filter capacitor, or if a battery is used as the input, then a 0.1 $\mu$ F tantalum or aluminum electrolytic capacitor should be placed from the input to the ground.

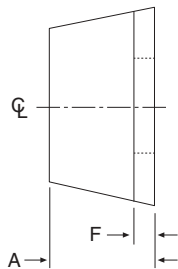
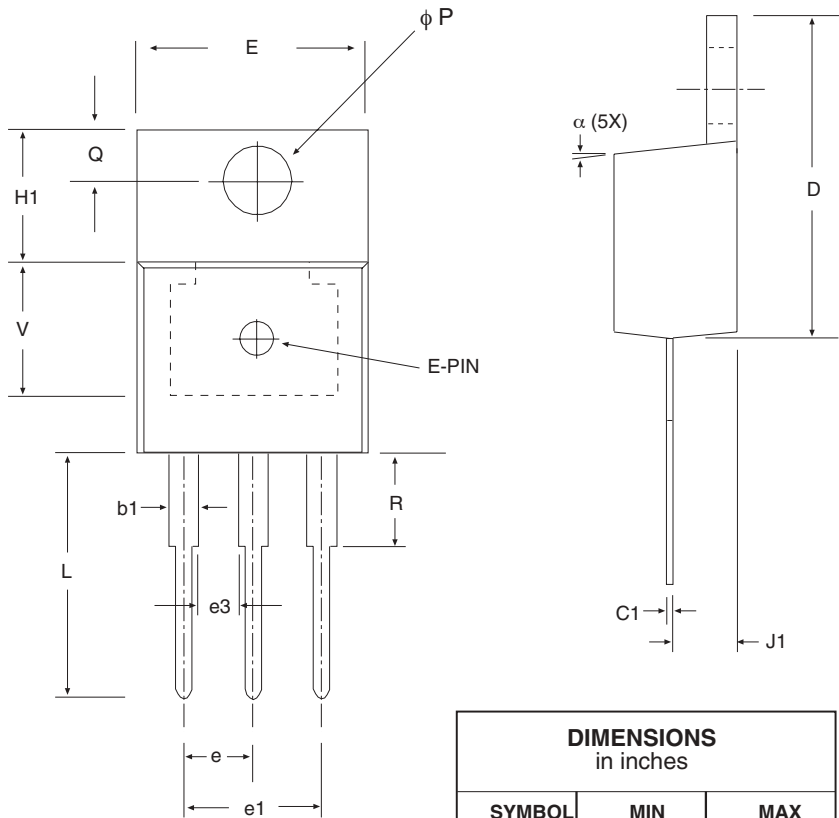
**Reducing Output Noise**

It may be an advantage to reduce the AC noise present at the output. One way is to reduce the regulator bandwidth by increasing the size of the output capacitor. Increasing the capacitor from 1 $\mu$ F to 220 $\mu$ F decreases the noise from 430 $\mu$ V to 160 $\mu$ V rms for a 100kHz bandwidth at 5V output.



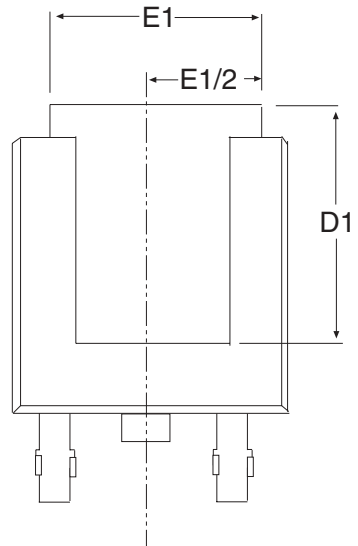
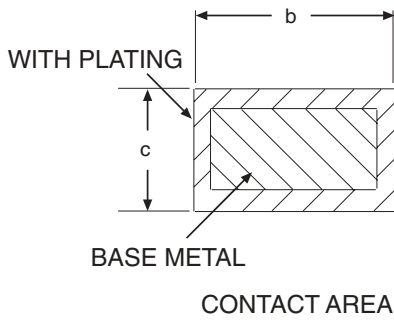
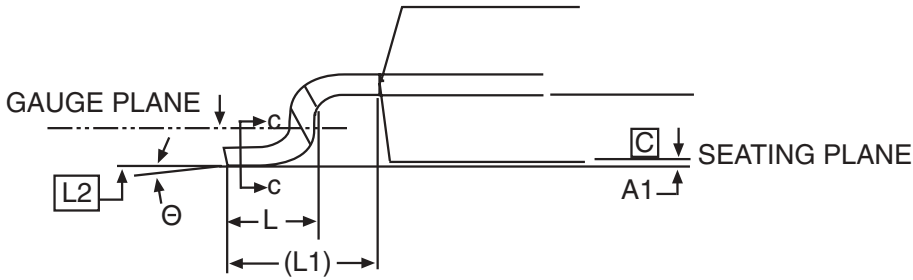
| DIMENSIONS<br>in inches |           |           |
|-------------------------|-----------|-----------|
| SYMBOL                  | MIN       | MAX       |
| A                       | .396      | 0.406     |
| B                       | 0.326     | 0.336     |
| C                       | 0.170     | 0.180     |
| D                       | 0.026     | 0.036     |
| E                       | 0.045     | 0.055     |
| G                       | 0.100 REF | 0.100 REF |
| H                       | 0.580     | 0.620     |
| K                       | 0.055     | 0.066     |
| L                       | .000      | .010      |
| M                       | 0.098     | 0.108     |
| N                       | .017      | .023      |
| P                       | .090      | .110      |
| R                       | 0°        | 8°        |
| S                       | .095      | .105      |
| U                       | .30 REF   | .30 REF   |
| V                       | .305 REF  | .305 REF  |
| W                       | .010      | .010      |

3 Pin TO-263



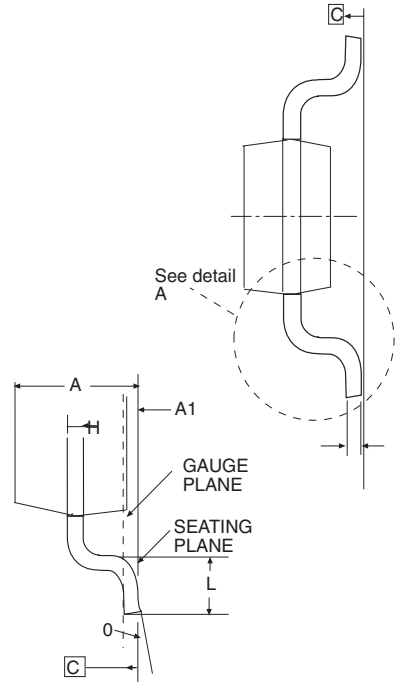
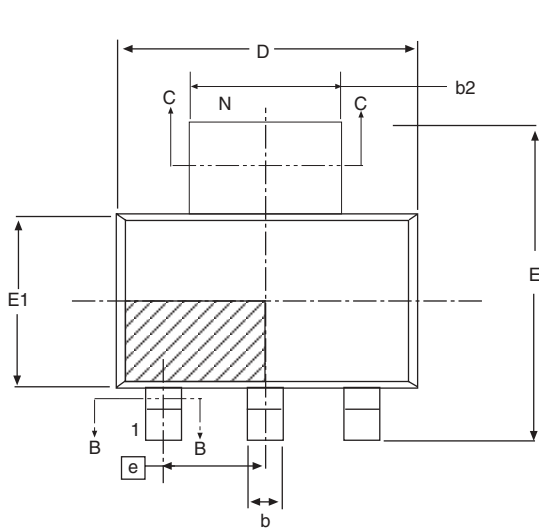
| DIMENSIONS<br>in inches |           |           |
|-------------------------|-----------|-----------|
| SYMBOL                  | MIN       | MAX       |
| A                       | 0.160     | 0.190     |
| b                       | 0.025     | 0.040     |
| C1                      | 0.015     | 0.022     |
| D                       | 0.560     | 0.590     |
| E                       | 0.385     | 0.415     |
| e                       | 0.090     | 0.110     |
| e1                      | 0.190     | 0.210     |
| e3                      | 0.045     | 0.055     |
| F                       | 0.045     | 0.055     |
| H1                      | 0.234     | 0.258     |
| J1                      | 0.090     | 0.115     |
| $\phi P$                | 0.146     | 0.156     |
| Q                       | 0.103     | 0.113     |
| L                       | 0.540     | 0.560     |
| $\alpha$                | 3° typ    | 7° typ    |
| b1                      | 0.450     | 0.060     |
| R                       | 0.243 REF | 6.170 REF |
| U                       | 0.300 REF | 7.620 REF |
| V                       | 0.240 REF | 6.100 REF |

3 Pin TO-220

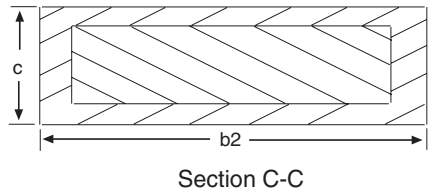
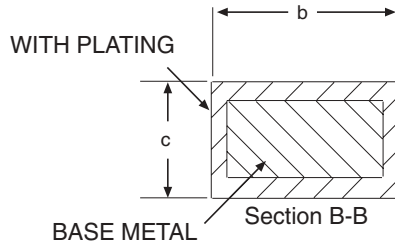


| 3 PIN TO-252<br>JEDEC TO-252<br>(AA) Variation | Dimensions in inches |      |      |
|--|----------------------|------|------|
|  | MIN                  | NOM  | MAX  |
| A1   | -                    | -    | .005 |
| c  | .018                 | -    | .024 |
| D1   | .205                 | -    | -    |
| E1   | .170                 | -    | -    |
| H  | .370                 | -    | .410 |
| L  | .055                 | .060 | .070 |
| L1   | .108 REF             |      |      |
| L2   | .020 BSC             |      |      |

**3 PIN TO-252**



| 3 PIN SOT-223<br>JEDEC TO-261<br>(AA) Variation | Dimensions in (mm) |      |      |
|---|--------------------|------|------|
|   | MIN                | NOM  | MAX  |
| A   | -                  | -    | 1.80 |
| A1  | 0.02               | -    | 0.10 |
| A2  | 1.50               | 1.60 | 1.70 |
| b   | 0.66               | 0.76 | 0.84 |
| b2  | 2.90               | 3.00 | 3.10 |
| c   | 0.23               | 0.30 | 0.35 |
| D   | 6.30               | 6.50 | 6.70 |
| E   | 6.70               | 7.00 | 7.30 |
| E1  | 3.30               | 3.50 | 3.70 |
| e   | 2.30 BASIC         |      |      |
| e1  | 4.60 BASIC         |      |      |
| L   | 0.75               | -    | -    |
| φ   | 0°                 | -    | 10°  |



**3 PIN SOT-223**

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## ORDERING INFORMATION

| PART NUMBER      | ACCURACY | TEMPERATURE    | OUTPUT VOLTAGE | PACKAGES      |
|------------------|----------|----------------|----------------|---------------|
| SPX1129M3-3.3    | 1%       | -40°C to 125°C | 3.3V           | 3-Pin SOT-223 |
| SPX1129M3-3.3/TR | 1%       | -40°C to 125°C | 3.3V           | 3-Pin SOT-223 |
| SPX1129M3-5.0    | 1%       | -40°C to 125°C | 5.0V           | 3-Pin SOT-223 |
| SPX1129M3-5.0/TR | 1%       | -40°C to 125°C | 5.0V           | 3-Pin SOT-223 |
| SPX1129R-3.3     | 1%       | -40°C to 125°C | 3.3V           | 3-Pin TO-252  |
| SPX1129R-3.3/TR  | 1%       | -40°C to 125°C | 3.3V           | 3-Pin TO-252  |
| SPX1129R-5.0     | 1%       | -40°C to 125°C | 5.0V           | 3-Pin TO-252  |
| SPX1129R-5.0/TR  | 1%       | -40°C to 125°C | 5.0V           | 3-Pin TO-252  |
| SPX1129T3-3.3    | 1%       | -40°C to 125°C | 3.3V           | 3-Pin TO-263  |
| SPX1129T3-3.3/TR | 1%       | -40°C to 125°C | 3.3V           | 3-Pin TO-263  |
| SPX1129T3-5.0    | 1%       | -40°C to 125°C | 5.0V           | 3-Pin TO-263  |
| SPX1129T3-5.0/TR | 1%       | -40°C to 125°C | 5.0V           | 3-Pin TO-263  |
| SPX1129U-3.3     | 1%       | -40°C to 125°C | 3.3V           | 3-Pin TO-220  |
| SPX1129U-5.0     | 1%       | -40°C to 125°C | 5.0V           | 3-Pin TO-220  |

Available in lead free packaging. To order add "-L" suffix to part number.

Example: SPX1129T3-5.0/TR = standard; SPX1129T3-L-5.0/TR = lead free

/TR = Tape and Reel

Pack quantity is 500 for TO-263, 2,000 for TO-252 and 2,500 for SOT-223.



ANALOG EXCELLENCE

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