

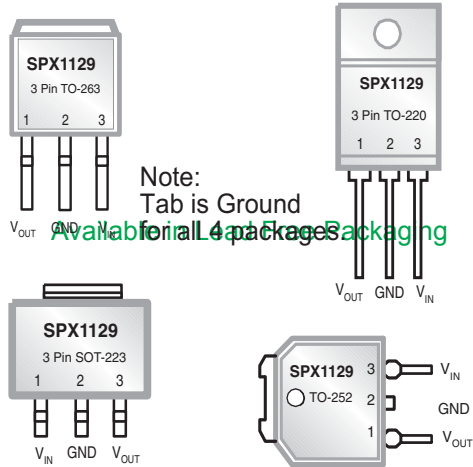
# 400mA Low Dropout Voltage Regulator

## 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

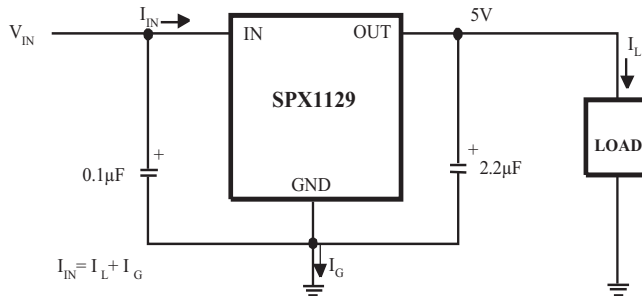


## DESCRIPTION

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

Thermal Resistance $\theta_{JA}$	
TO-263 .....	31.4°C/W
TO-220 .....	29.4°C/W
SOT-223 .....	62.3°C/W

## 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 (Note 2)	TYP	MIN	MAX	UNITS
<b>3.3V Version</b>					
Output Voltage	$1mA \leq I_L \leq 400mA$	3.3 <b>3.3</b>	3.267 <b>3.217</b>	3.333 <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 <b>5.0</b>	4.950 <b>4.880</b>	5.050 <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 Temperature Coefficient	(Note1)	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 <b>30</b>	mV
Dropout Voltage (Note 5)	$I_L = 1mA$	0.13		0.17 <b>0.25</b>	V
	$I_L = 400mA$	0.42		0.55 <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
	$I_L = 100mA$ $I_L = 400mA$	<b>2</b> <b>7</b>		<b>6</b> <b>25</b>	
Current Limit	$V_{OUT} = 0$	330		<b>800</b>	mA
Ripple Rejection	$V_{IN} - V_{OUT} = 1V(Avg)$ , $V_{RIPPLE} = 0.5Vp-p, F_{RIPPLE} = 120Hz$ , $I_{LOAD} = 400mA, T_J = 25^\circ C$	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.

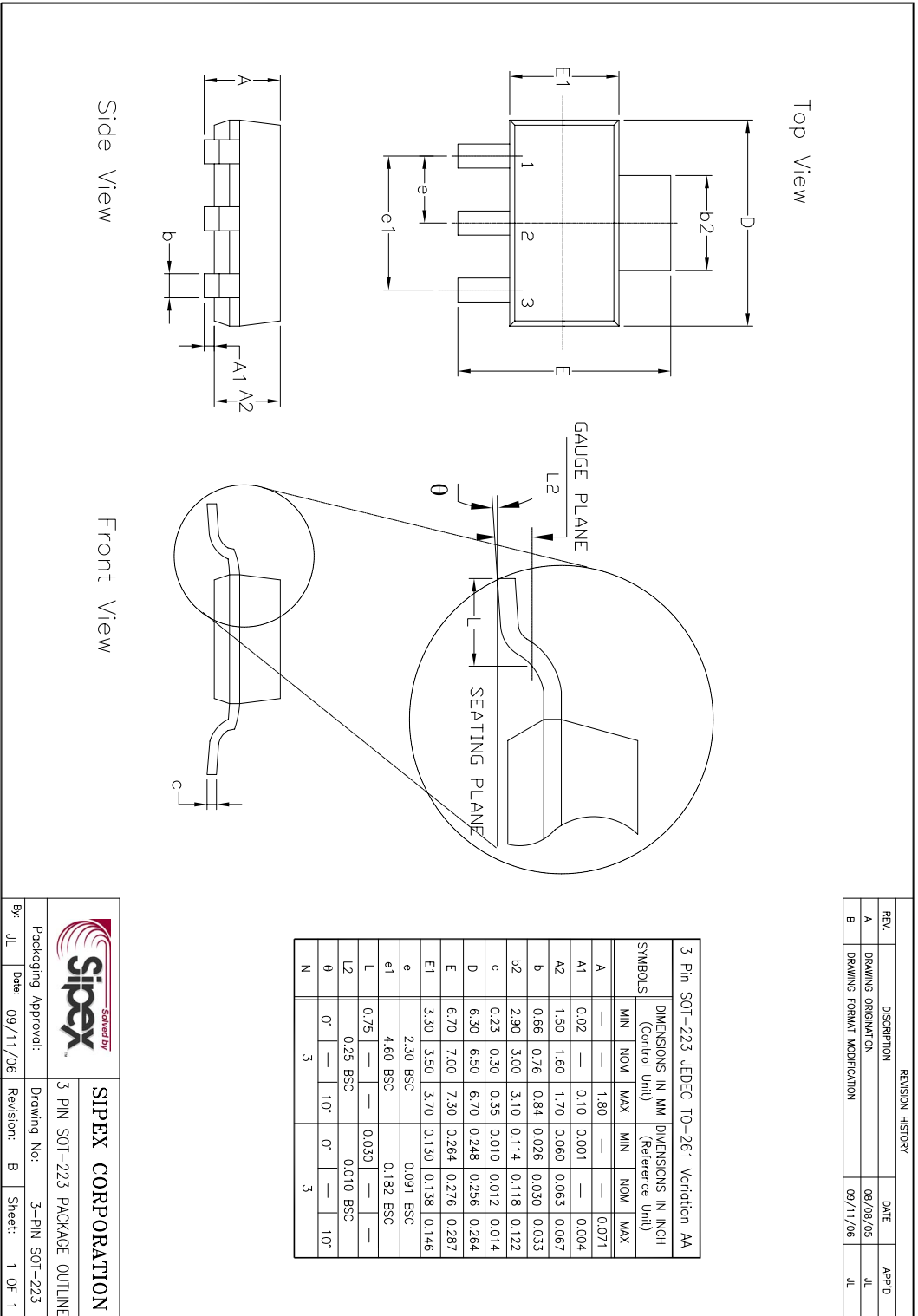
The SPX1129, unlike other low dropout regulators will remain stable and in regulation with no load in addition to the internal voltage divider.

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.

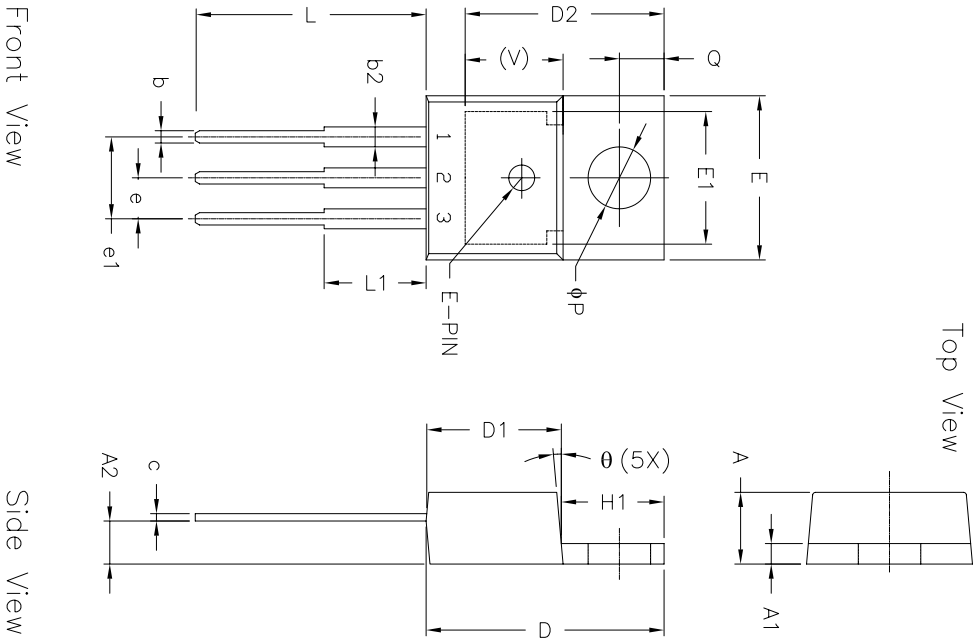


REVISION HISTORY			
REV.	DESCRIPTION	DATE	APP'D
A	DRAWING ORIGINATION	08/09/05	JL
B	DRAWING FORMAT MODIFICATION	09/11/06	JL

SYMBOLS	DIMENSIONS IN MM (Control Unit)			DIMENSIONS IN INCH (Reference Unit)		
	MIN	NOM	MAX	MIN	NOM	MAX
A	—	1.80	—	—	—	0.071
A1	0.02	—	0.10	0.001	—	0.004
A2	1.50	1.80	1.70	0.060	0.063	0.067
b	0.66	0.76	0.84	0.026	0.030	0.033
b2	2.90	3.00	3.10	0.114	0.118	0.122
c	0.23	0.30	0.35	0.010	0.012	0.014
D	6.30	6.30	6.70	0.248	0.256	0.264
E	6.70	7.00	7.30	0.264	0.276	0.287
E1	3.30	3.50	3.70	0.130	0.138	0.146
e	2.30 BSC			0.091 BSC		
e1	4.60 BSC			0.182 BSC		
L	0.75	—	—	0.030	—	—
L2	0.25 BSC			0.010 BSC		
$\theta$	0°	—	10°	0°	—	10°
N	3			3		

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Packaging Approval:	Drawing No:	Revision:	Sheet:
By: JL Date: 09/11/06	3-PIN SOT-223	B	1 OF 1





Top View


Front View

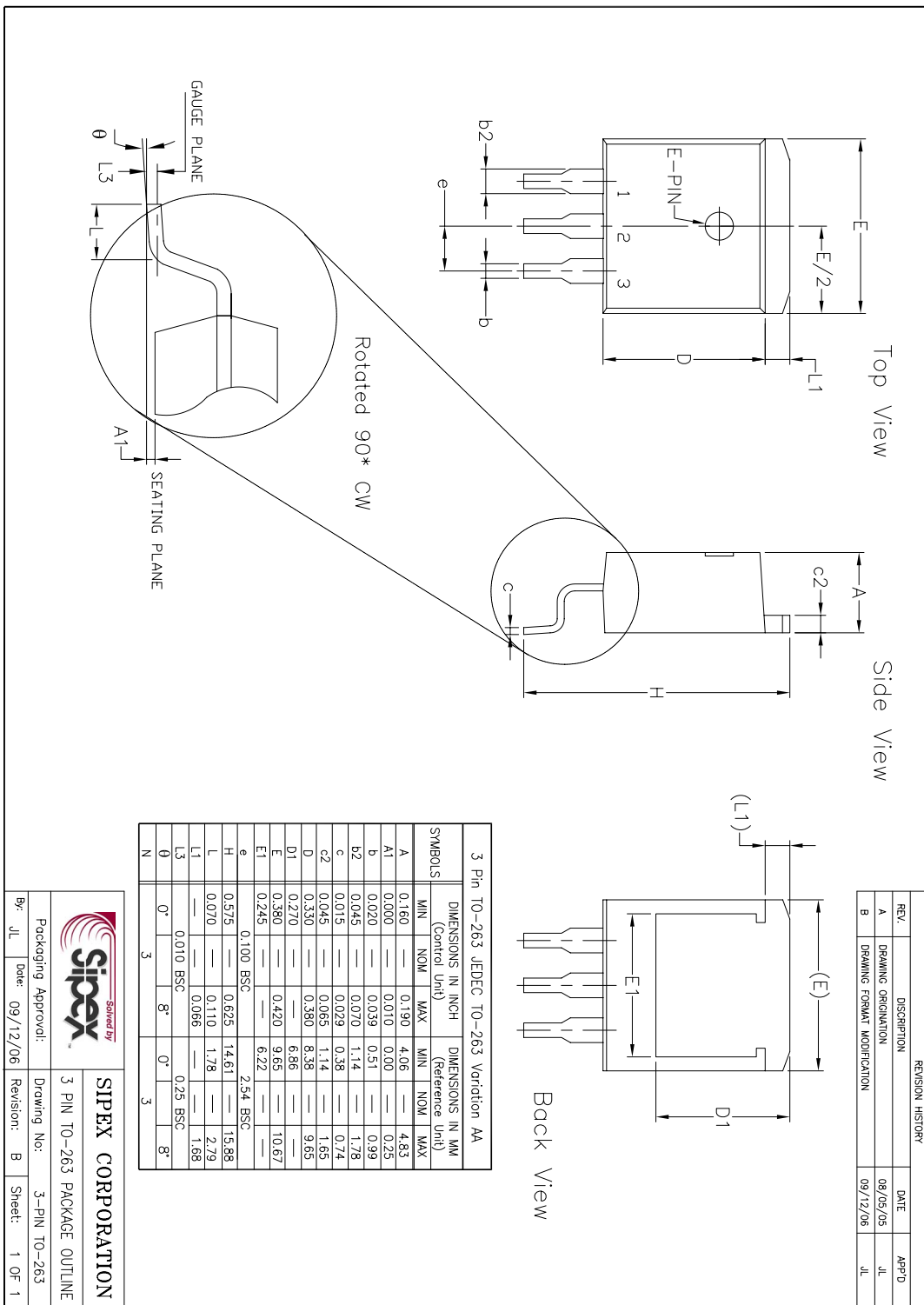
Side View

REVISION HISTORY			
REV.	DESCRIPTION	DATE	APP'D
A	DRAWING ORIENTATION	09/04/05	JL
B	DRAWING FORMAT MODIFICATION	05/25/06	JL

3 Pin TO-220 (Option 1)* JEDEC TO-220-AB				
SYMBOLS	DIMENSIONS IN INCH (Control Unit)		DIMENSIONS IN MM (Reference Unit)	
	MIN	MAX	MIN	MAX
A	0.140	0.190	3.56	4.82
A1	0.020	0.055	0.51	1.40
A2	0.080	0.115	2.03	2.92
b	0.015	0.040	0.38	1.02
c	0.014	0.024	0.36	0.61
D	0.560	0.650	14.22	16.51
D1	0.330	0.355	8.38	9.02
D2	0.480	0.507	12.19	12.88
E	0.380	0.420	9.65	10.67
E1	0.270	0.350	6.86	8.89
e	0.100 BSC		2.54 BSC	
e1	0.200 BSC		5.08 BSC	
H1	0.230	0.270	5.84	6.86
L	0.500	0.580	12.70	14.73
L1	—	0.250	—	6.35
P	0.139	0.156	3.53	3.96
Q	0.103	0.113	2.62	2.87
V	0.240 REF		6.10 REF	
theta	3°	7°	3°	7°
N	3		3	

\* Refer to product datasheet for P0D option being used

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Packaging Approval:		Drawing No:	
By: JL	Date: 05/25/06	Revision: B	Sheet: 1 OF 2



Part Number	Package Code	RoHS	Status	Pack Quantity
SPX1129M3-3-3	SOT-223-3		OBS	Bulk
SPX1129M3-3-3/TR	SOT-223-3		OBS	2500 Tape & Reel
SPX1129M3-5-0	SOT-223-3		OBS	Bulk
SPX1129M3-5-0/TR	SOT-223-3		OBS	2500 Tape & Reel
SPX1129M3-L-3-3	SOT-223-3	▪	OBS	Bulk
SPX1129M3-L-3-3/TR	SOT-223-3	▪	OBS	2500 Tape & Reel
SPX1129M3-L-5-0	SOT-223-3	▪	OBS	Bulk
SPX1129M3-L-5-0/TR	SOT-223-3	▪	OBS	2500 Tape & Reel
SPX1129R-3-3	TO-252		OBS	Bulk
SPX1129R-3-3/TR	TO-252		OBS	2000 Tape & Reel
SPX1129R-5-0	TO-252		OBS	Bulk
SPX1129R-5-0/TR	TO-252		OBS	2000 Tape & Reel
SPX1129R-L-3-3	TO-252	▪	OBS	Bulk
SPX1129R-L-3-3/TR	TO-252	▪	OBS	2000 Tape & Reel
SPX1129R-L-5-0	TO-252	▪	OBS	Bulk
SPX1129R-L-5-0/TR	TO-252	▪	OBS	2000 Tape & Reel
SPX1129T-3-3	TO-263-3		OBS	Bulk
SPX1129T-3-3/TR	TO-263-3		OBS	500 Tape & Reel
SPX1129T-5-0	TO-263-3		OBS	Bulk
SPX1129T-5-0/TR	TO-263-3		OBS	500 Tape & Reel
SPX1129T-L-3-3	TO-263-3	▪	OBS	Bulk
SPX1129T-L-5-0	TO-263-3	▪	OBS	Bulk
SPX1129U-3-3	TO-220-3		OBS	Bulk
SPX1129U-5-0	TO-220-3		OBS	Bulk
SPX1129U-L-3-3	TO-220-3	▪	OBS	Bulk
SPX1129U-L-5-0	TO-220-3	▪	OBS	Bulk



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