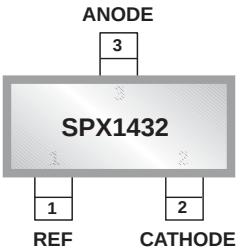
1.24V Precision Adjustable Shunt Regulator

FEATURES

- Reference Voltage: 1.24V
- Initial Accuracy: 0.5%
- Wide Operating Current, 60μA to 100mA
- Ultra Low Reference Input Current, 100nA
- Operating Voltage Range: V_{REF} to 20V
- 0°C to 105°C Guaranteed Operation
- SOT-23-3 Package
- Upgrade to LMV431, TLV431, SC431L



Now Available in Lead Free Packaging

APPLICATIONS

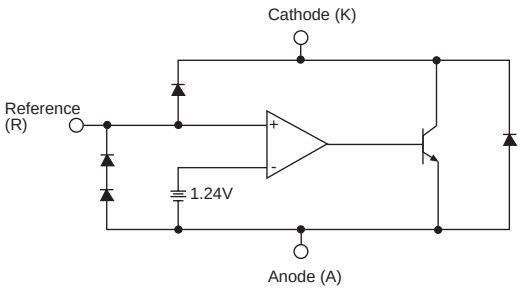
- Switching Power Supplies
- Adjustable Supplies
- Error Amplifiers
- Single Supply Amplifier
- Monitors / VCRs / TVs
- Personal Computers
- Voltage References

DESCRIPTION

The SPX1432 is a three terminal adjustable shunt voltage regulator that provides a highly accurate 1.24V bandgap reference with 0.5% accuracy, eliminating the need for trimming in most power supply designs. Offered in the tiny SOT-23 package, the SPX1432 has an extremely wide operating current range of 60uA to 100mA, and reference input current of only 100nA (typ). The SPX1432 can regulate outputs from V_{REF} to 20V, using two external resistors, and is guaranteed over the extended commercial temperature range of 0°C to 105°C.

The combination of the small size, wide output current capability, flexible voltage range, and stable performance over the entire extended commercial temperature range, makes the SPX1432 the ideal candidate a variety of shunt regulator and current source designs in applications such as Portable meters, Instrumentation, and Industrial Process Control.

FUNCTIONAL DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

Cathode-Anode Reverse Breakdown V_{KZ} 22V
Anode-Cathode Forward Current, (<10ms) I_{AK} 1A
Operating Cathode Current I_{KA} 120mA
Reference Input Current I_{REF} 1mA

Continuos Power Dissipation at 25°C P_D
SOT-23 ..... 200 mW
Junction Temperature T_J ..... 150 °C
Storage Temperature T_{STG} ..... -65 to 150 °C
Lead Temperature (Soldering 10 sec.) T_L ..... 300°C

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.

RECOMMENDED CONDITIONS

PARAMETER	SYMBOL	RATING	UNIT
Cathode Voltage	V_{KA}	V_{REF} to 20	V
Cathode Current	I_K	10	mA

TYPICAL THERMAL RESISTANCES

PACKAGE	θ_{JA}	θ_{JC}	TYPICAL DERATING
SOT-23	575°C/W	150°C/W	1.7 mW/°C

Typical deratings of the thermal resistances are given for ambient temperature >25°.

ELECTRICAL CHARACTERISTICS

Electrical characteristics are guaranted over the full junction temperature range (0°C to 105°C). Ambient temperature must be derated based upon power dissipation and package thermal characteristics. Unless otherwise specified, test conditions are: $V_{KA} = V_{REF}$ and $I_K = 10mA$.

PARAMETER	SYMBOL	FIGURE	CONDITIONS	MIN	TYP	MAX	UNITS
Accuracy 0.5%					**SPX1432A**		
Output Voltage	V_{REF}	2	T_J = 25°C	1.234	1.240	1.246	V
Temperature Deviation	V_{REF}	2	0 < T_J < 105°C		6	12	mV
Line Regulation	V_{REF}	3	V_{KA} = 1.25V to 15V		15	37	mV
Load Regulation	V_{REF}	2	I_K = 100µA to 100mA		10	30	mV
Reference Input Current	I_{REF}	3	T_J = 25°C, R1 = 10KΩ, R2 = ∞		0.1	0.3	µA
Reference Input Current Temperature Coefficient	I_{REF}	3	0 < T_J < 105°C, R1 = 10KΩ, R2 = ∞		0.05	0.2	µA
Minimim Cathode Current for Regulation	$I_{K(MIN)}$	2	T_J = 25°C		60	80	µA
Off State Leakage	$I_{K(MIN)}$	4	V_{REF} = 0V, V_{KA} = 18V, T_J = 25°C		0.01	500	nA

PARAMETER	SYMBOL	FIGURE	CONDITIONS	MIN	TYP	MAX	UNITS
Accuracy 1.0%					**SPX1432**		
Output Voltage	V_{REF}	2	T_J = 25°C	1.228	1.240	1.252	V
Temperature Deviation	V_{REF}	2	0 < T_J < 105°C		9	18	mV
Line Regulation	V_{REF}	3	V_{KA} = 1.25V to 15V		15	37	mV
Load Regulation	V_{REF}	2	I_K = 100µA to 100mA		10	30	mV
Reference Input Current	I_{REF}	3	T_J = 25°C, R1 = 10KΩ, R2 = ∞		0.1	0.5	µA
Reference Input Current Temperature Coefficient	I_{REF}	3	0 < T_J < 105°C, R1 = 10KΩ, R2 = ∞		0.05	0.4	µA
Minimim Cathode Current for Regulation	$I_{K(MIN)}$	2	T_J = 25°C		60	100	µA
Off State Leakage	$I_{K(MIN)}$	4	V_{REF} = 0V, V_{KA} = 18V, T_J = 25°C		0.01	500	nA

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CALCULATION AVERAGE TEMPERATURE COEFICIENT (TC)

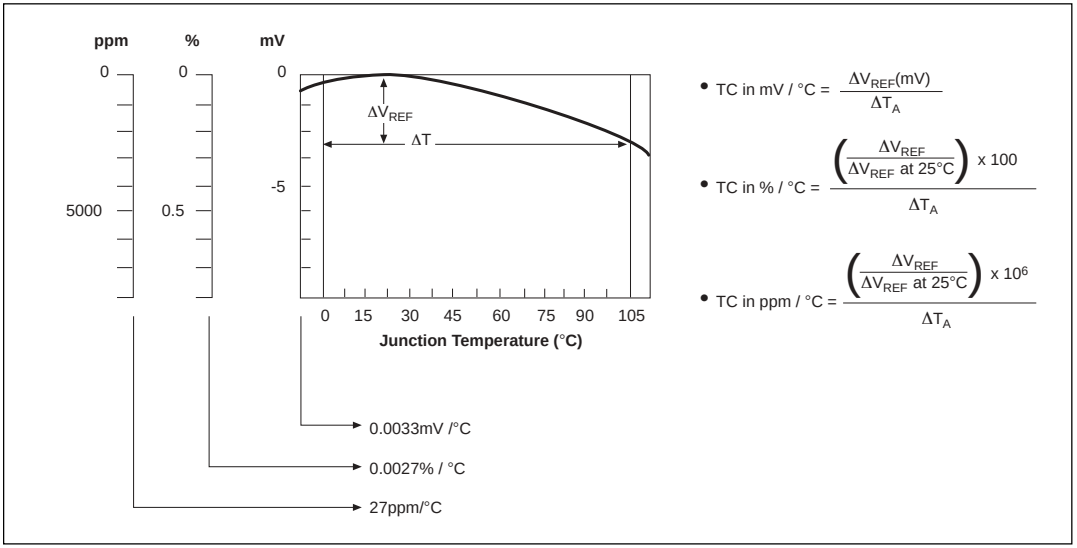


Figure 1. V_{REF} VS Temperature.

TEST CIRCUITS

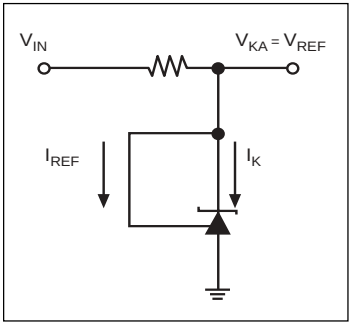


Figure 2. Test Circuit for $V_{KA} = V_{REF}$

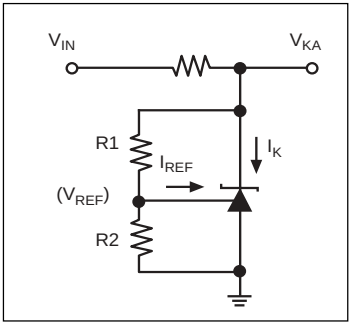


Figure 3. Test Circuit for $V_{KA} > V_{REF}$

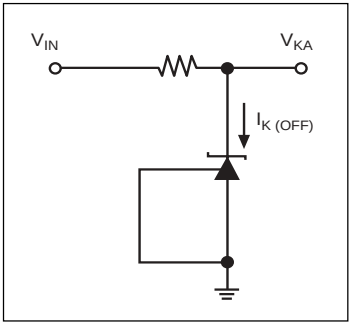
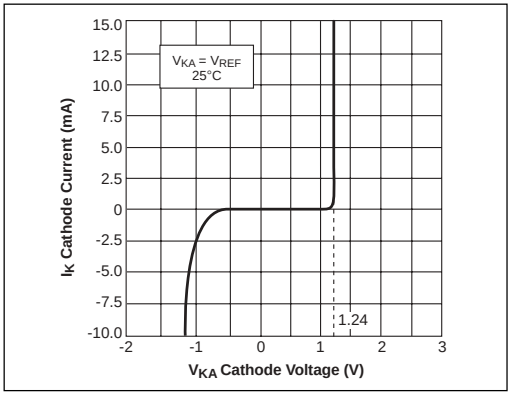
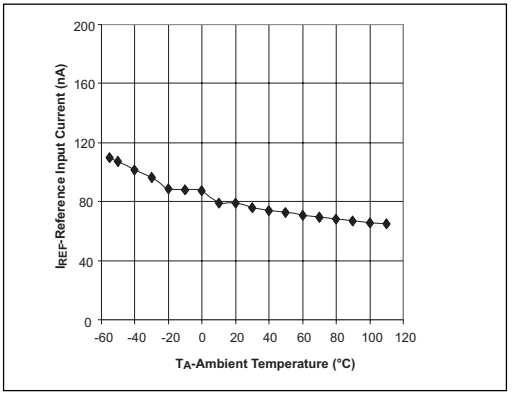


Figure 4. Test Circuit for I_{KOFF}

TYPICAL PERFORMANCE CHARACTERISTICS



High Current Operating Characteristics.



Reference Input Current VS Ambient Temperature.

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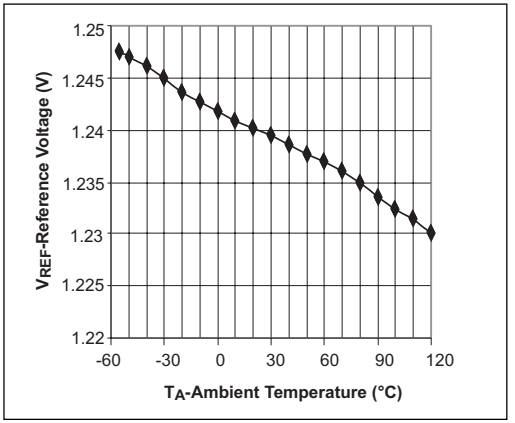
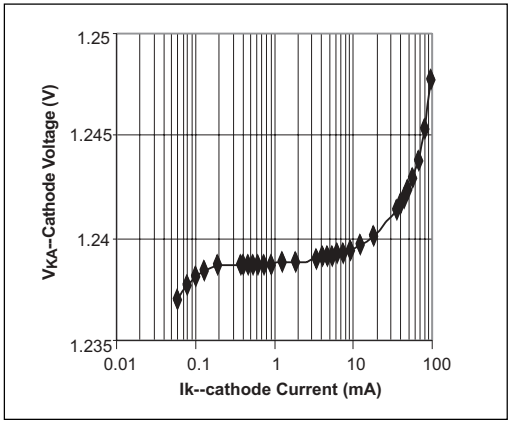
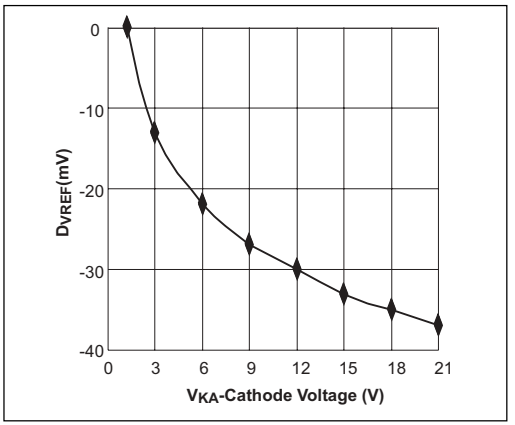


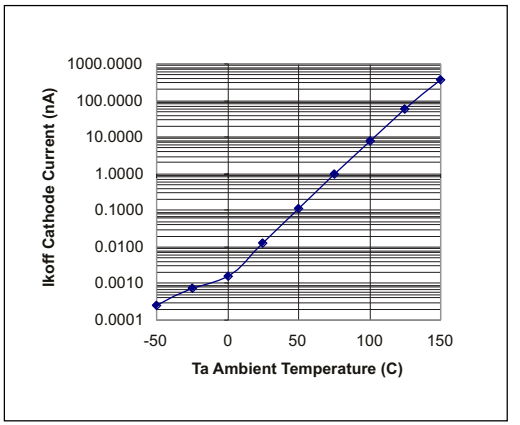
Reference Voltage VS Ambient Temperature.



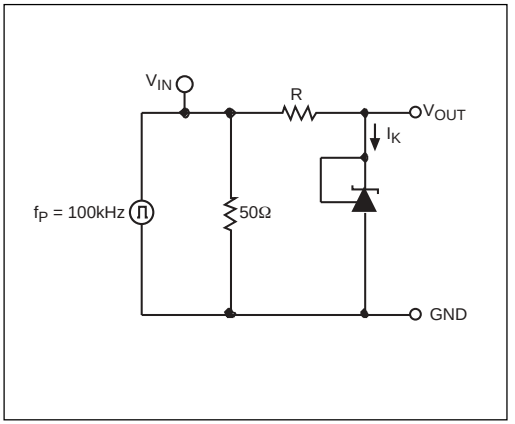
Reference Voltage Load Regulation.



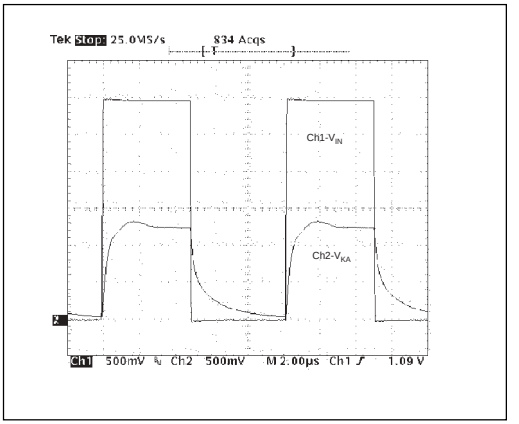
Reference Voltage Line Regulation.



Off State Leakage VS Ambient Temperature.



Test Circuit for Pulse Response.



I_{KA} = 0 to 100µA.

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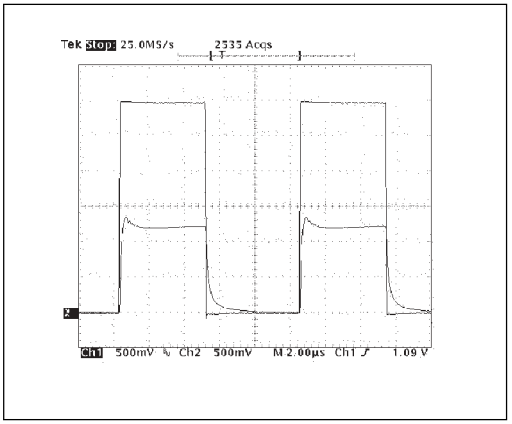
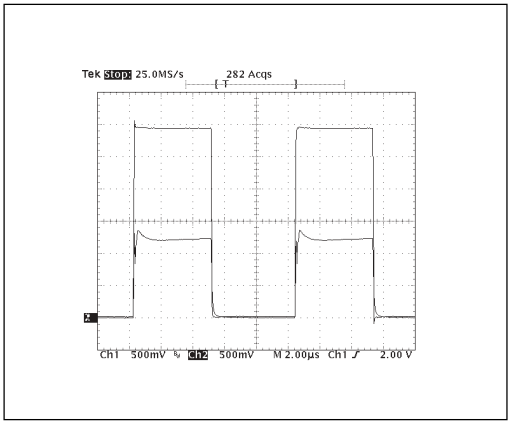
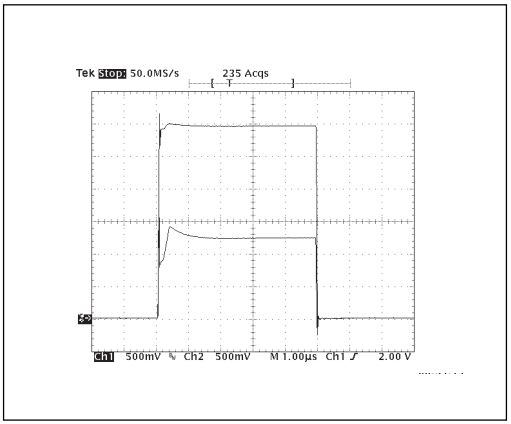


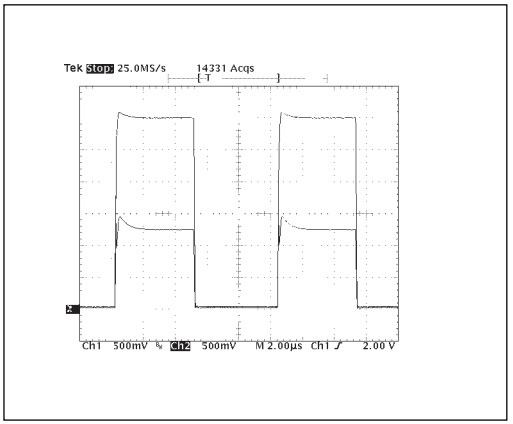
I_{KA} = 0 to 300µA.



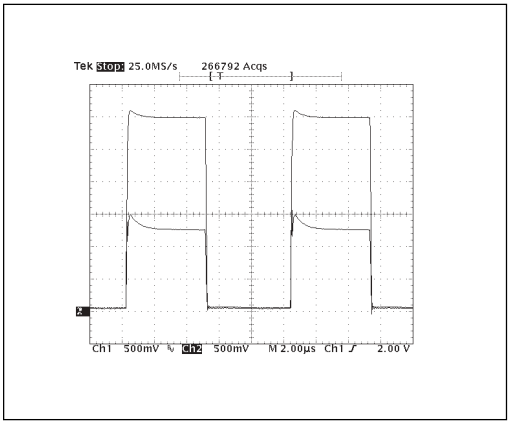
I_{KA} = 0 to 1mA.



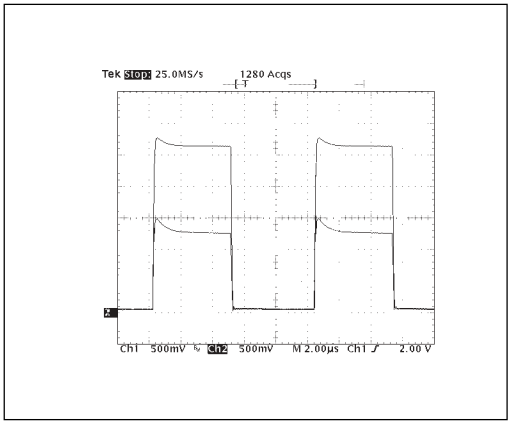
I_{KA} = 0 to 10mA.



I_{KA} = 0 to 50mA.



I_{KA} = 0 to 80mA



I_{KA} = 0 to 100mA

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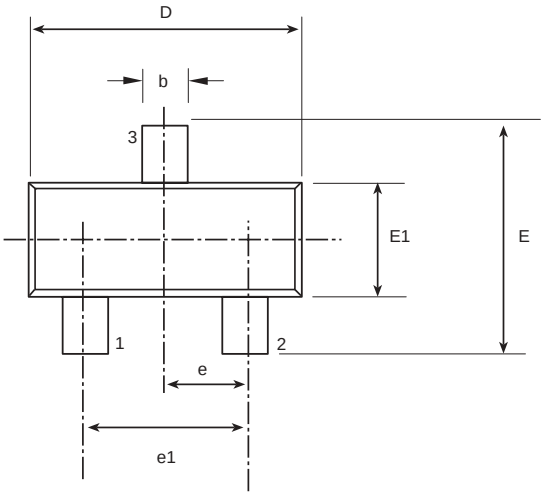
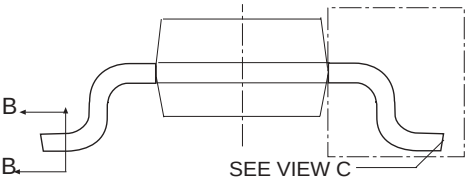
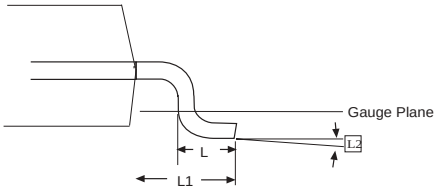
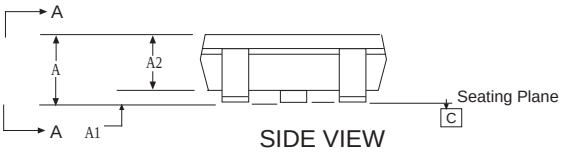




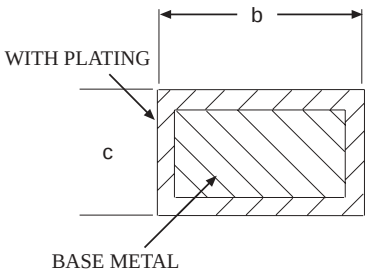


VIEW C

3 PIN SOT-23 JEDEC TO-236 (AB) Variation	Dimensions in (mm)		
	MIN	NOM	MAX
A	0.89	-	1.12
A1	0.01	-	0.10
A2	0.88	.95	1.02
b	0.30	-	0.50
c	0.08	-	0.20
D	2.80	2.90	3.04
e	0.95 BSC		
e1	1.90 BSC		
E	2.10	-	2.64
E1	1.20	1.30	1.40
L	0.30	0.45	0.60
L1	0.54 REF		
Ø	0º	-	8º



SIDE VIEW



3 PIN SOT-23

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PART NUMBER	ACC	OUTPUT VOLTAGE	TOP MARK	PACKAGES
SPX1432AM	0.5%	1.24V	W1	3-Pin SOT-23
SPX1432AM/TR	0.5%	1.24V	W1	3-Pin SOT-23
SPX1432M	1.0%	1.24V	F2	3-Pin SOT-23
SPX1432M/TR	1.0%	1.24V	F2	3-Pin SOT-23

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

Example: SPX1432AM/TR = standard; SPX1432AM-L/TR = lead free

/TR = Tape and Reel

Pack quantity is 2500 for SOT-23.

Sipex Corporation

ANALOG EXCELLENCE

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