

Ultra 1.24V Precision Adjustable Shunt Regulator

FEATURES

- Low Voltage Operation 1.24V
- **Trimmed Bandgap to** **0.5% / 1%**
- **Wide Operating Current** **1mA to 100mA**
- **Extended Temperature Range** **0°C to 105°C**
- Adjustable Output Voltage V_{REF} to 18V
- Low Temperature Coefficient 50 ppm/°C
- **Offered in TO-92, SOIC, SOT-23-3, SOT-23-5**
- **Improved** Replacement in Performance for TLV431

APPLICATIONS

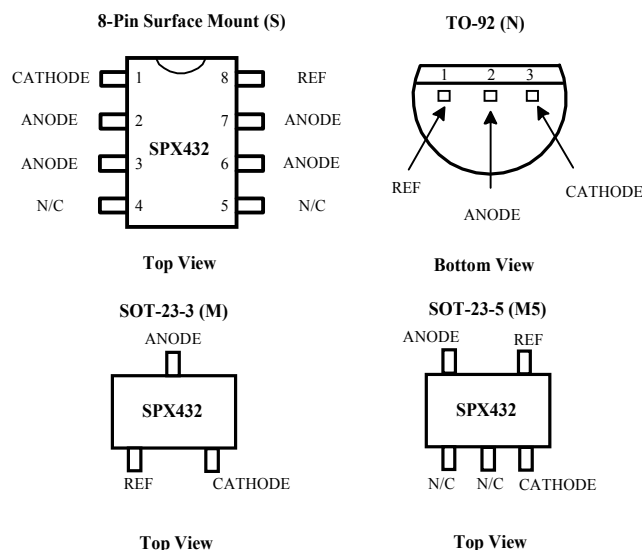
- 3.0V to 3.3V Switching Power Supplies
- Adjustable Supplies
- Error Amplifiers
- Single Supply Amplifier
- Monitors / VCR / TV
- Personal Computers

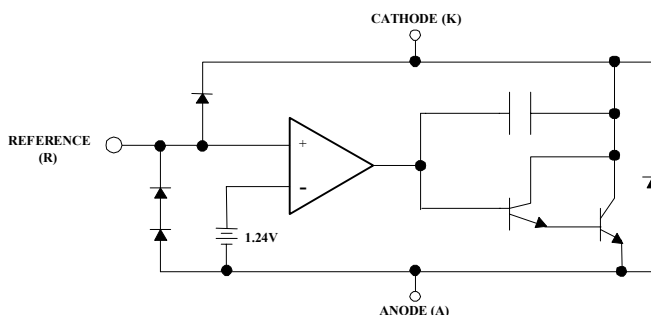
PRODUCT DESCRIPTION

The SPX432 is a 3-terminal Adjustable Shunt Voltage Regulator providing a highly accurate 1.24V bandgap reference with 0.5% tolerance. The SPX432 thermal stability, wide operating current (80mA) and temperature range (0°C to 105°C) makes it suitable for a broad range of applications. **SPX432 tolerance of 0.5% is proven to be sufficient to overcome other errors in the system to virtually eliminate the need for trimming in the power supply manufacturers assembly line and contribute a significant cost savings.**

The SPX432 is an ideal voltage reference in an isolated feedback circuit for 3.0V to 3.3V switching mode power supplies. SPX432 offers many advantages over TLV431, such as, wider output voltage up to 18V vs. 6V, output current of 80mA vs. 15mA, and a wider temperature range with tighter tolerance down to 0.5%.

PIN CONNECTIONS





ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Units
Cathode-Anode Reverse Breakdown	V_{DA}	18	V
Anode-Cathode Forward Current	I_{AK}	1	A
Operating Cathode Current	I_{KA}	80	mA
Reference Input Current	I_{REF}	1	mA
Continuous Power at 25°C	P_D		
TO-92		775	mW
8L SOIC		750	mW
SOT-23		200	mW
Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	- 65 to +150	°C
Lead Temperature (Soldering 10 sec.)	TL	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 18	V
Cathode Current	I_K	10	mA

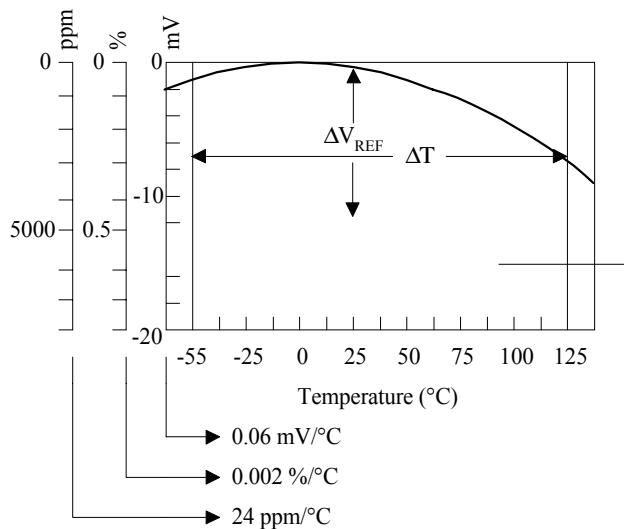
TYPICAL THERMAL RESISTANCES

Package	θ_{JA}	θ_{JC}	Typical Derating
TO-92	160 °C/W	80 °C/W	6.3 mW/°C
SOIC	175 °C/W	45 °C/W	5.7 mW/°C
SOT-23	575 °C/W	150 °C/W	1.7mW/°C

ELECTRICAL CHARACTERISTICS are guaranteed 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 $I_K = 10\text{mA}$.

Parameter	Symbol	Test Circuit	Test Condition	SPX432A			SPX432			Unit
				Min	Typ	Max	Min	Typ	Max	
Output Voltage	V_{REF}	1	$I_K = 10\text{mA}$, $T_J = 25^\circ\text{C}$, $V_K = V_{REF}$	1.2338	1.240	1.2462	1.2276	1.240	1.2524	V
Line Regulation	V_{REF}	1	$V_{KA} = 1.25\text{V to }15\text{V}$		19	37		19	37	mV
Load Regulation	V_{REF}	1	$I_K = 1 \text{ to } 80\text{mA}$		3	6		3	6	mV
Temperature Deviation	V_{REF}	1	$0 < T_J < 105^\circ\text{C}$		2	6		2	6	mV
Reference Input Current	I_{REF}	2			3	6		3	6	μA
Reference Input Current Temperature Coefficient	I_{REF}	2	$0 < T_J < 105^\circ\text{C}$		0.3	0.6		0.3	0.6	μA
Minimum Cathode Current for Regulation	$I_{K(MIN)}$	1			0.6	1		0.6	1	mA
Off State Leakage	$I_{K(MIN)}$	3	$V_{REF} = 0\text{V}$, $V_{KA} = 18\text{V}$		0.04	500		0.04	500	nA

Calculating Average Temperature Coefficient (TC)



- $TC \text{ in mV}/^\circ\text{C} = \frac{\Delta V_{REF} \text{ (mV)}}{\Delta T_A}$
- $TC \text{ in } \%/^\circ\text{C} = \frac{\left(\frac{\Delta V_{REF}}{V_{REF} \text{ at } 25^\circ\text{C}} \right)}{\Delta T_A} \times 100$
- $TC \text{ in ppm}/^\circ\text{C} = \frac{\left(\frac{\Delta V_{REF}}{V_{REF} \text{ at } 25^\circ\text{C}} \right)}{\Delta T_A} \times 10^6$

TEST CIRCUITS

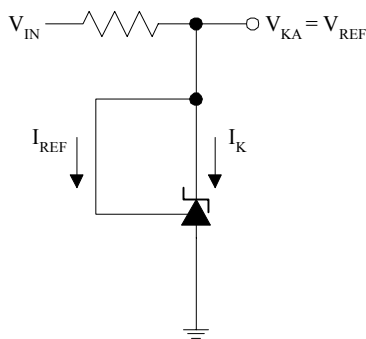


Figure 1a. Test Circuit 1

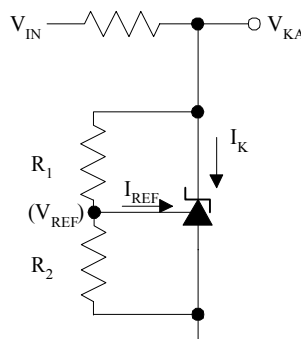


Figure 1b. Test Circuit 2

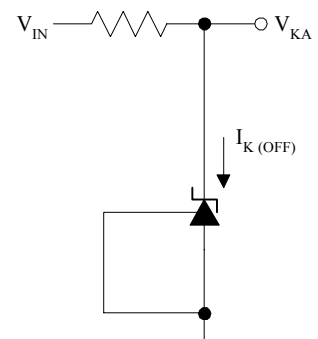
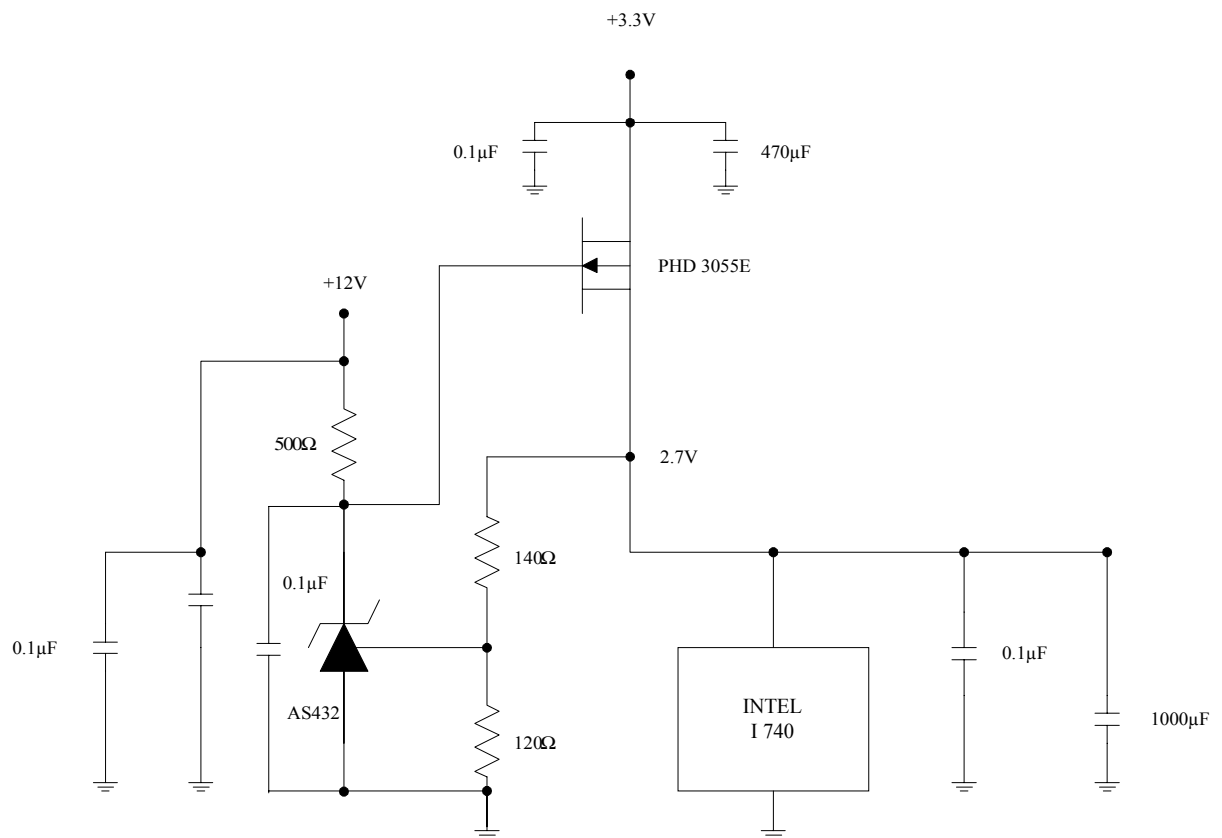


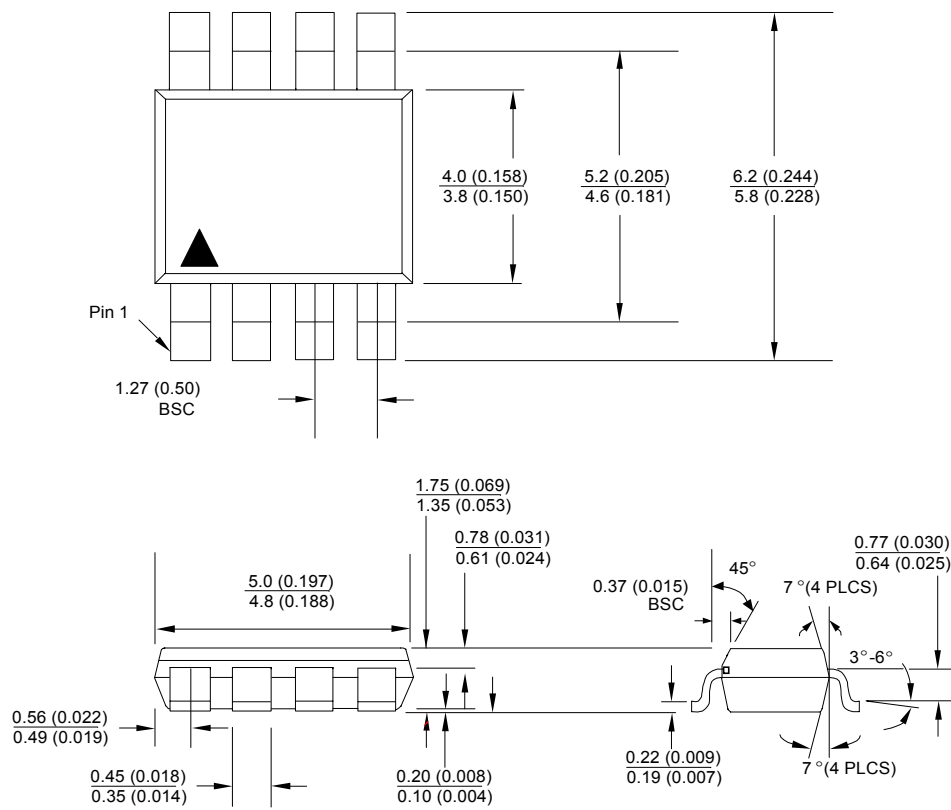
Figure 1c. Test Circuit 3

TYPICAL APPLICATIONS

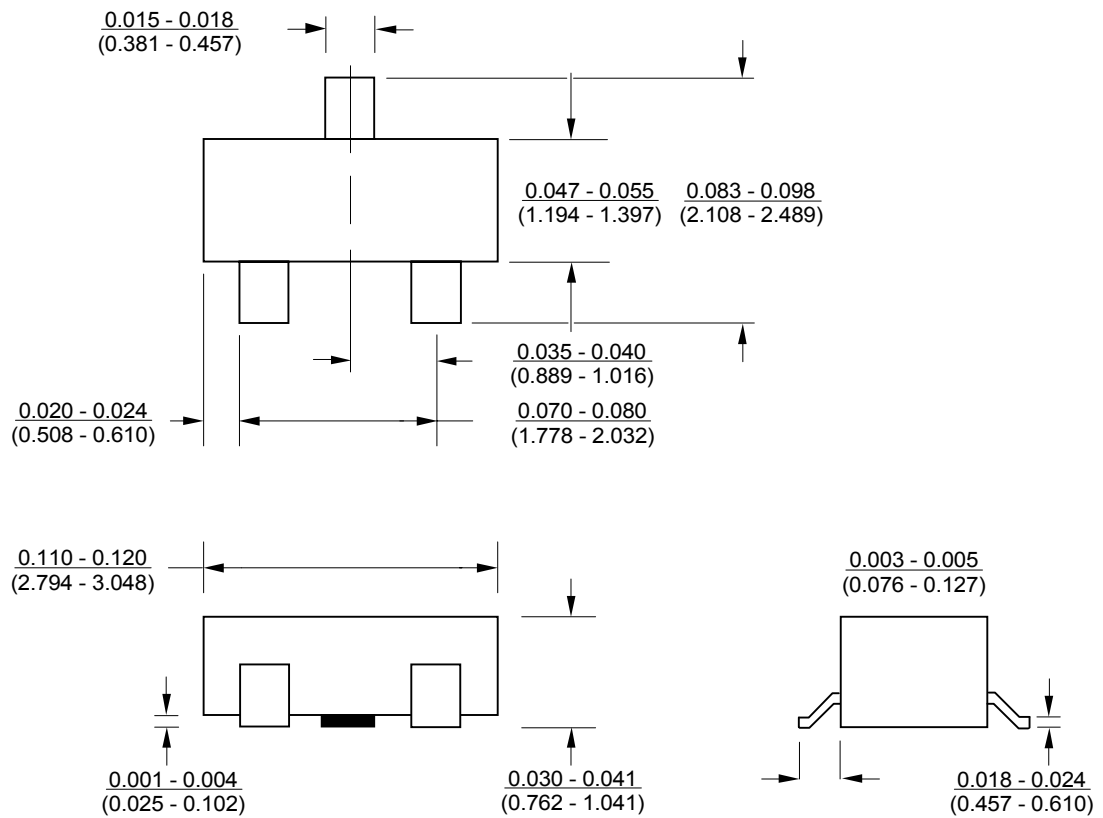


*If the output voltage has noise, then please add a 0.1μF in between drain and gate of power MOSFET to reduce the noise.

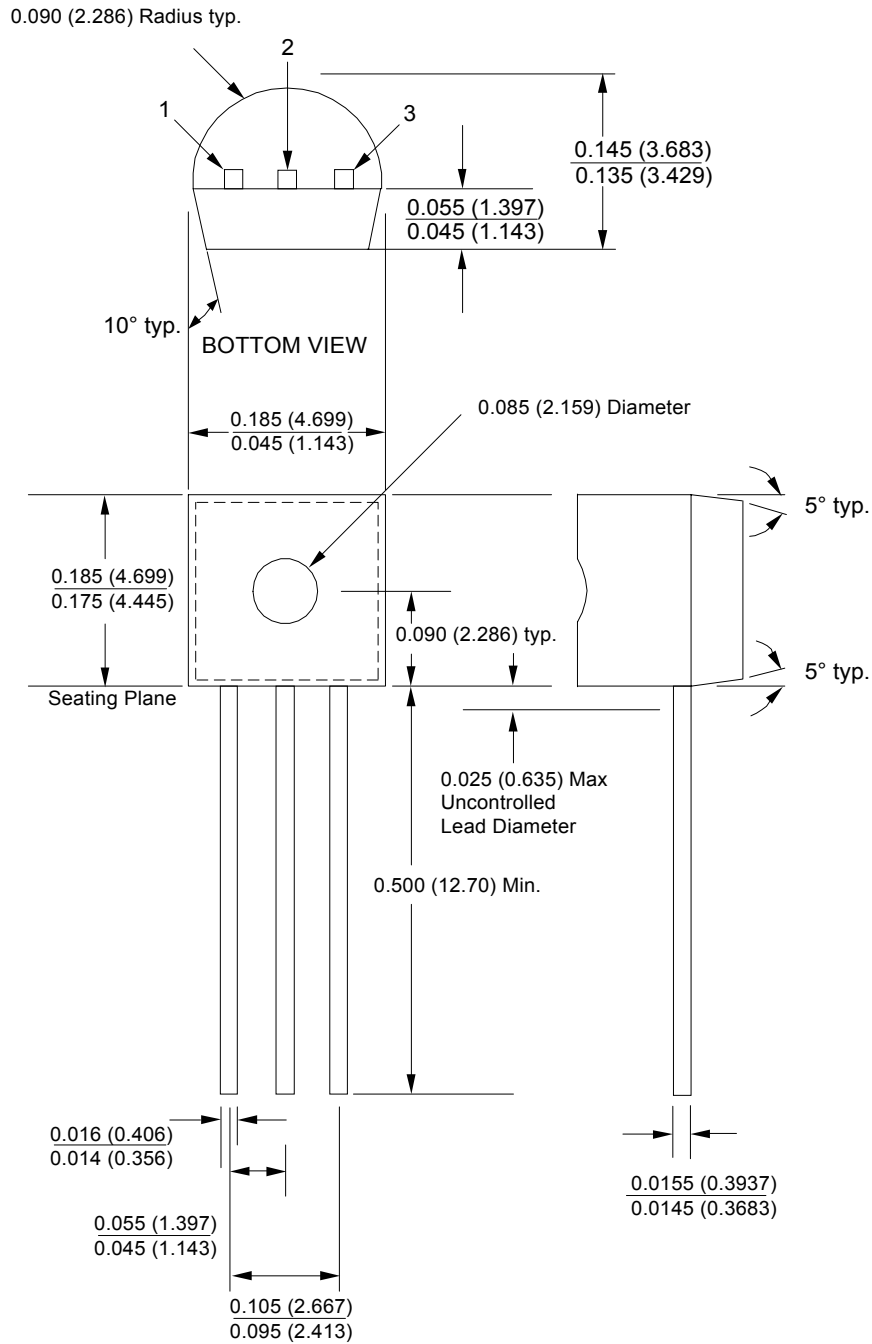
PACKAGE DRAWING
SOIC-8 (S)



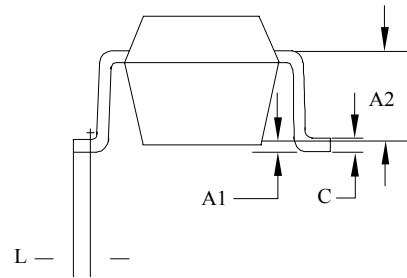
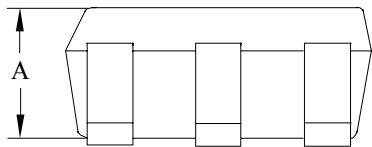
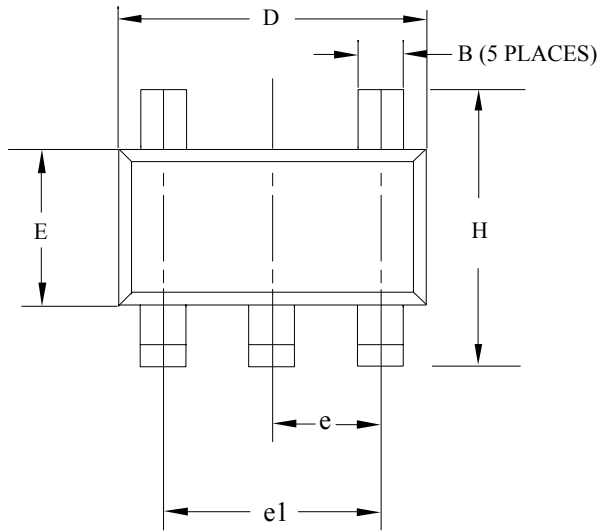
PACKAGE DRAWING
SOT-23-3L (M)



PACKAGE DRAWING
TO-92 (N)



PACKAGE DRAWING
SOT-23-5L (M5)



SYMBOL	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.90	1.30	.035	.051
A1	0	0.10	0	.004
A2	0.80 REF		.0315 REF	
B	0.30	0.50	.012	.019
C	0.10	0.35	.004	.0137
D	2.70	3.10	.106	.122
E	1.40	1.80	.055	.071
e	0.95 BSC.		.037 BSC.	
e1	1.70	2.10	.066	.082
H	2.50	3.00	.098	.118
L	MIN 0.2		MIN .0078	

NOTE:

1. REFER TO APPLICABLE
2. CONTROLLING DIMENTION : MILLIMETER
3. PACKAGE SURFACE FINISHING TO BE SMOOTH FINISH.

ORDERING INFORMATION

Ordering No.	Precision	Output Accuracy	Packages
SPX432M	1%	1.24V	3 Lead SOT-22-3
SPX432AM	0.5%	1.24V	3 Lead SOT-23-3
SPX432M5	1%	1.24V	5 Lead SOT-22-5
SPX432AM5	0.5%	1.24V	5 Lead SOT-23-5
SPX432S	1%	1.24V	8 Lead SOIC
SPX432AS	0.5%	1.24V	8 Lead SOIC
SPX432N	1%	1.24V	3 Lead TO-92
SPX432AN	0.5%	1.24V	3 Lead TO-92

MARKING INFORMATION

[For SOT-23 (3 and 5 Pin) and SOT-89 only]

Device	Marking
SPX432A	4321
SPX432	4322



SIGNAL PROCESSING EXCELLENCE

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