AS3431

Micropower SOT-23, 2.5V Precision Adjustable Shunt Regulator

FEATURES

- **Voltage Tolerance** .....**0.5% & 1.0%**
- **Wide Operating Current** ..... **1ma To 100mA**
- **Extended Temperature Range** ..... **105°C**
- Low Temperature Coefficient .....30 ppm/°C
- Offered in SOT-23, TO-92 & SOT 89
- **Low Output Noise**

APPLICATIONS

- Battery Operating Equipment
- Adjustable Supplies
- Switching Power Supplies
- Error Amplifiers
- Single Supply Amplifier
- Monitors / VCR / TV
- Personal Computers

PRODUCT DESCRIPTION

The AS3431 is a 3-terminal Adjustable Shunt Voltage Regulator providing a highly accurate 0.5% bandgap reference. AS3431 acts as an open-loop error amplifier with a 2.5V temperature compensation reference. The AS3431 thermal stability, wide operating current (100mA) and temperature range (0°C to 105°C) makes it suitable for all variety of applications that are looking for a low cost solution with high performance. **AS3431 tolerance of 0.5% is proven to be sufficient to overcome all the other errors in the system to virtually eliminate the need for trimming in the power supply manufactures assembly line and contribute a big Cost Savings.**

In the standard shunt configuration, the combination of low temperature coefficient (T.C.), sharp turn-on characteristics, low output impedance and programmable output voltage make this precision reference an excellent error amplifier.

The AS3431 is a direct replacement for the AS431 and TL431 in low voltage, low current applications. AS3431 is also available in SOT-89 and TO-92.

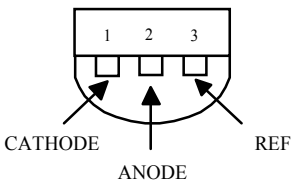
ORDERING INFORMATION

TO-92	SOT-23- 3-PIN	SOT-89- 3-PIN	TEMP RANGE	Output Accuracy
AS3431AN	AS3431AM	AS3431AM1	0°C to 105°C	0.5%
AS3431N	AS3431M	AS3431M1	0°C to 105°C	1%

The AS3431AM is 0.5% tolerance and the marking on the pin should be "3431"
The AS3431M is 1% tolerance and the marking on the pin should be "3432"

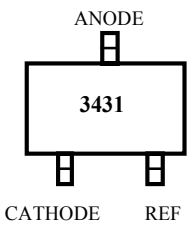
PIN CONNECTIONS

TO-92 (N)



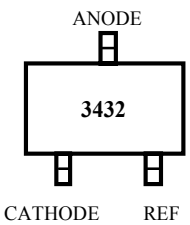
Top View

SOT-23
Marking & pinout for the 0.5% device



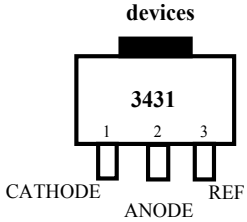
Top View

SOT-23
Marking & pinout for the 1% device

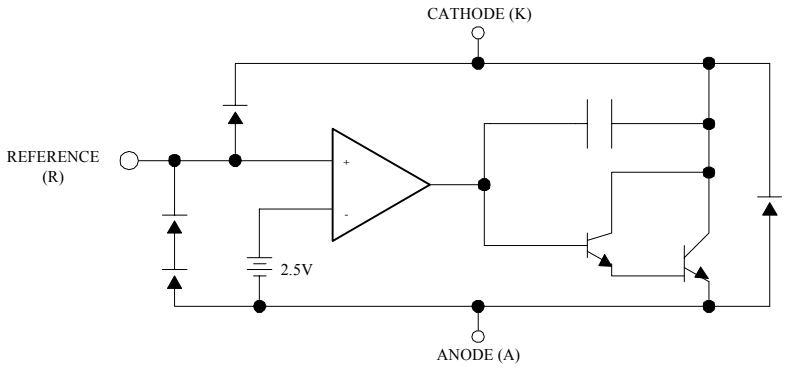


Top View

SOT-89
Marking & pinout for all devices



Top View



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Units
Cathode-Anode Reverse Breakdown	V_{KA}	18	V
Anode-Cathode Forward Current	I_{AK}	1	A
Operating Cathode Current	I_{KA}	100	mA
Reference Input Current	I_{REF}	1	mA
Continuous Power Dissipation at 25°C SOT-23	P_D	300	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 18	V
Cathode Current	1_K	10	mA

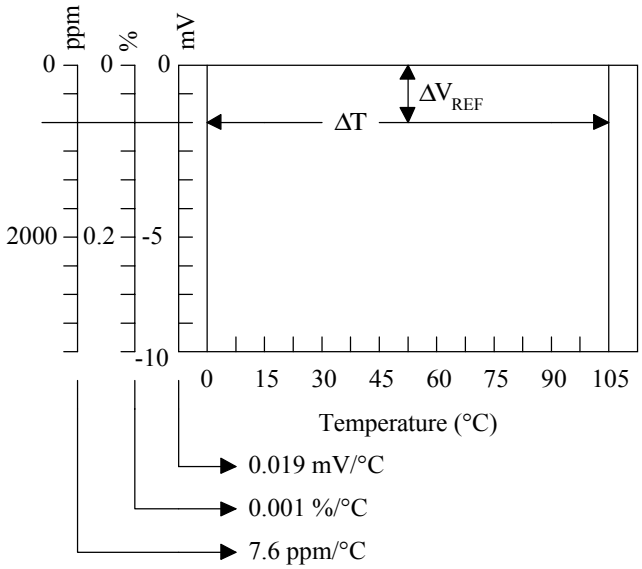
TYPICAL THERMAL RESISTANCES

Package	0_{JA}	0_{JC}	Typical Derating
SOT-23	575° C/W	150° C/W	1.7 mW/°C
SOT-89	575° C/W	80° C/W	9.1 mW/°C
TO-92	575° C/W	80° C/W	6.3 mW/°C

ELECTRICAL CHARACTERISTICS are guaranteed over full junction temperature range (0°C to 105°C). Ambient temperature must be derated based on power dissipation and package thermal characteristics. The conditions are: $V_{KA} = V_{REF}$ and $I_K = 10mA$, unless otherwise specified.

Parameter	Symbol	Test Condition	AS3431A Min	AS3431A Typ	AS3431A Max	AS3431 Min	AS3431 Typ	AS3431 Max	Unit	Circuit
Reference Voltage	V_{REF}	T_A = 25° C	2.490	2.503	2.515	2.475	2.500	2.525	V	1
		Over Temp.	2.480		2.530	2.450		2.550	V	1
ΔV_{REF} with Temp*	TC			0.07	0.20		0.07	0.02	mV/°C	1
Ratio of Change in V_{REF} to Cathode Voltage	$\frac{\Delta V_{REF}}{\Delta V_K}$	V_{REF} to 10 V	-2.7	-1.01		-2.7	-1.01		MV/V	2
		10 V 10 18 V	-2	-0.4	0.3	-2	-0.4	0.3		
Reference Input Current	I_{REF}			0.7	4		0.7	4	µA	2
I_{REF} Temp Deviation	ΔI_{REF}			0.4	1.2		0.4	1.2	µA	2
Min I_K for Regulation	$I_{K(MIN)}$	V_{REF} = 0V V_{KA} = 18V		0.4	1		0.4	1	mA	1
Off State Leakage	$I_{K(OFF)}$			0.04	500		0.04	500	nA	3
Dynamic Output Impedance	Z_{KA}	f ≤ 1 kHz I_K = 1 to 100mA		0.15	0.5		0.15	0.5	Ω	1

Calculating Average Temperature Coefficient (TC)



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

Test Circuits

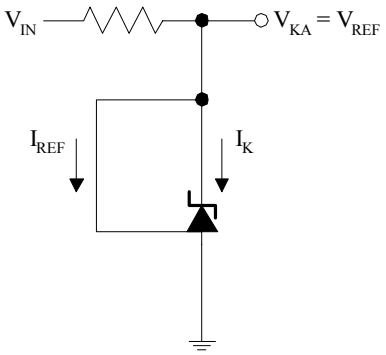


Figure 1a. Test Circuit 1

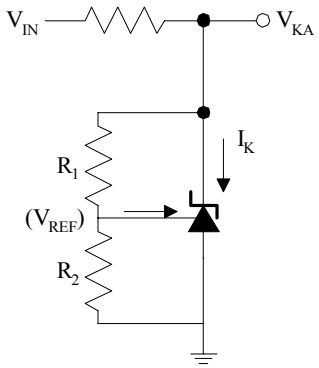


Figure 1b. Test Circuit 2

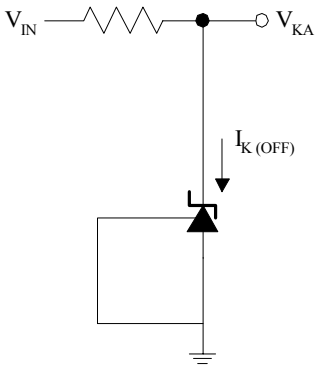


Figure 1c. Test Circuit 3