

General Description

The AHK432 is a low voltage adjustable shunt reference with thermal stability guaranteed over the full industrial temperature range. This 3-terminal regulator has an output voltage range that extends from V_{REF} (1.24V) to 20V, giving designers outstanding flexibility in the development of power supplies and instrumentation. With a low operating current of 60µA, the AHK432 is well suited for battery-powered portable electronic applications. It also has a sharp turn-on characteristic and a dynamic resistance of only 50mΩ making it an excellent replacement for zener diodes in low tempco designs.

The AHK432 is available in the surface-mount 3 or 5 pin SOT-23, as well as the through hole TO-92. Three voltage tolerance options are offered in each package: ±0.5%, ±1%, and ±2%.

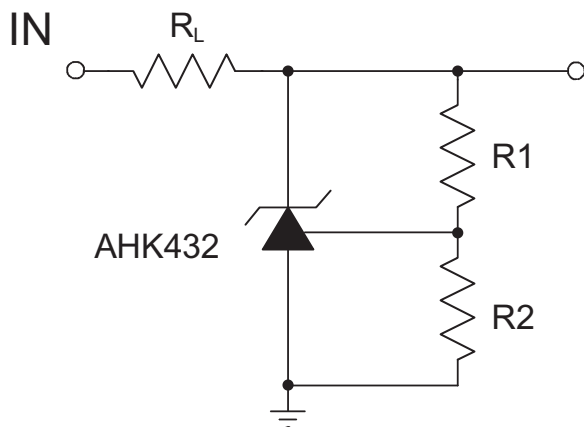
Features

- Wide output voltage range (1.24 to 20V)
- Operating current from 60µA to 100mA
- Low dynamic output resistance of 50mΩ
- ±0.5% trimmed voltage reference
- 10mV typ. V_{REF} deviation, from -40 to +105°C
- Surface mount 3 or 5 pin SOT-23 or through-hole 3 pin TO-92 packages

Applications

- Notebook computers
- Isolated feedback in switching power supplies
- Adjustable and programmable supplies
- Linear regulators (External Reference)
- Instrumentation
- Medical Electronics*
- Global voltage reference for multiple power supplies

Typical Application



Adjustable regulator:

$$OUT = V_{REF} \left(\frac{R1 + R2}{R2} \right)$$

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$ unless otherwise noted)

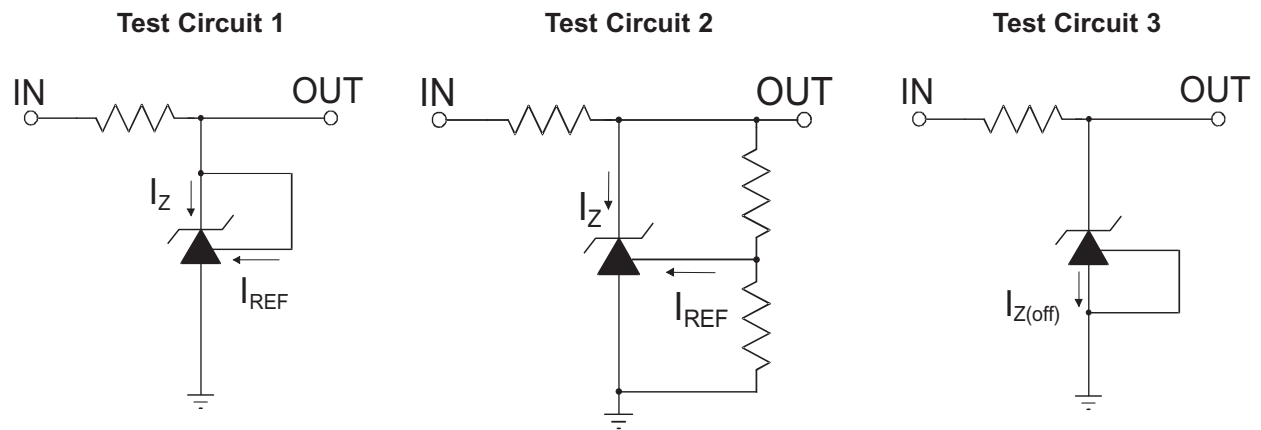
Symbol	Description	Value	Units
V_Z	Cathode Voltage	20	V
I_Z	Continuous Cathode Current	100	mA
I_{REF}	Reference Current	3	mA
T_J	Operating Junction Temperature Range	-40 to 150	$^\circ\text{C}$
Θ_{JA}	Maximum Thermal Resistance	TO-92	160
		SOT-23-3, SOT-23-5	410
P_D	Maximum Power Dissipation	TO-92	780
		SOT-23-3, SOT-23-5	300
T_{LEAD}	Maximum Soldering Temperature (at Leads)	260	$^\circ\text{C}$

Note: Stresses above those listed in Absolute Maximum Ratings may cause permanent damage to the device. Functional operation at conditions other than the operating conditions specified is not implied. Only one Absolute Maximum rating should be applied at any one time.

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Description	Conditions	AHK432 0.5%			AHK432 1.0%			AHK432 2.0%			Units	
			min	typ	max	min	typ	Max	min	typ	max		
V_{REF}	Reference Voltage	$V_Z=V_{REF}$ $I_Z=10\text{mA}$ (test circuit 1)	$T_A=25^\circ\text{C}$	1.234	1.240	1.246	1.228	1.240	1.252	1.215	1.240	1.265	V
			$T_A=-40$ to $+105^\circ\text{C}$	1.222		1.258	1.215		1.265	1.200		1.280	
V_{DEV}	V_{REF} Temp Deviation	$T_A=-40$ to $+105^\circ\text{C}$, $V_Z=V_{REF}$, $I_Z=10\text{mA}$ (test circuit 1)		10	25		10	25		10	25	mV	
$\Delta V_{REF}/\Delta V_Z$	Ratio of Change in V_{REF} to Change in Cathode Voltage	$I_Z=10\text{mA}$, $\Delta V_Z=16\text{V}$ to V_{REF} (test circuit 2)		-1.0	-2.7		-1.0	-2.7		-1.0	-2.7	mV/V	
I_{REF}	Reference Input Current	$R1=10\text{k}\Omega$, $R2=\infty$, $I_Z=10\text{mA}$ (test circuit 2)		0.15	0.5		0.15	0.5		0.15	0.5	μA	
$I_{REF(DEV)}$	I_{REF} Temp Deviation	$T_A=-40$ to $+105^\circ\text{C}$ $R1=10\text{k}\Omega$, $R2=\infty$, $I_Z=10\text{mA}$ (test circuit 2)		0.1	0.4		0.1	0.4		0.1	0.4	μA	
$I_{Z(OFF)}$	Off State Cathode Current	$V_{REF}=0\text{V}$ (test circuit 3)	$V_Z=6\text{V}$	0.04	0.1		0.04	0.1		0.04	0.1	μA	
			$V_Z=16\text{V}$	0.04	0.5		0.04	0.5		0.04	0.5		
R_Z	Dynamic Output Impedance	$f<1\text{kHz}$, $V_Z=V_{REF}$, $I_Z=100\text{mA}$ to 100mA (test circuit 1)		0.05	0.2		0.05	0.2		0.05	0.2	Ω	
$I_{Z(MIN)}$	Minimum Operating Current	$V_Z=V_{REF}$ (test circuit 1)		60	80		60	80		60	80	μA	

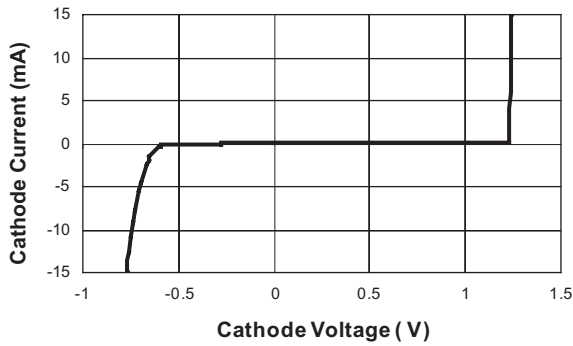
Test Circuits



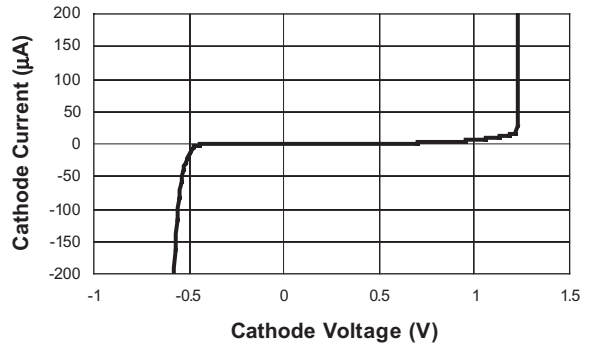
Typical Characteristics

(Unless otherwise noted, $T_A = 25^\circ\text{C}$, $I_Z = 10\text{mA}$)

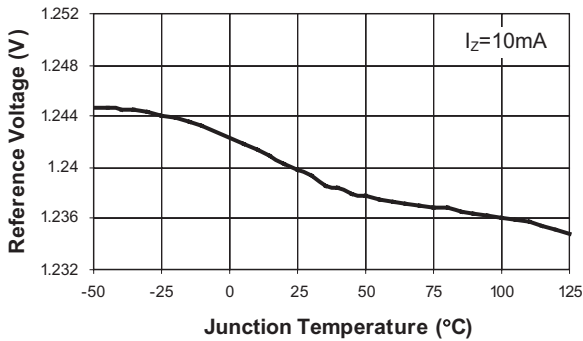
Cathode Current vs. Cathode Voltage



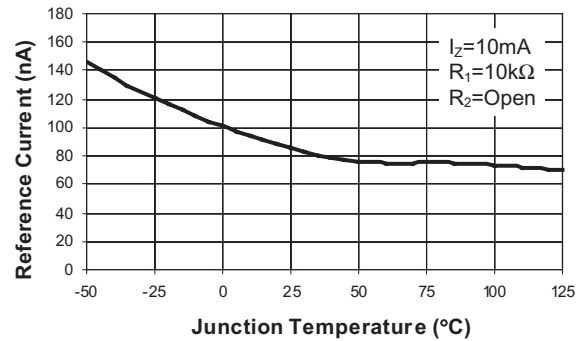
Cathode Current vs. Cathode Voltage



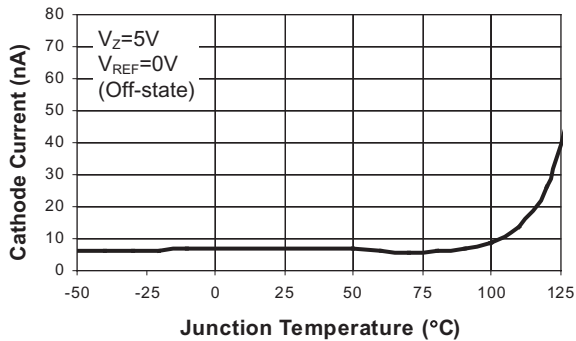
Reference Voltage vs. Temperature



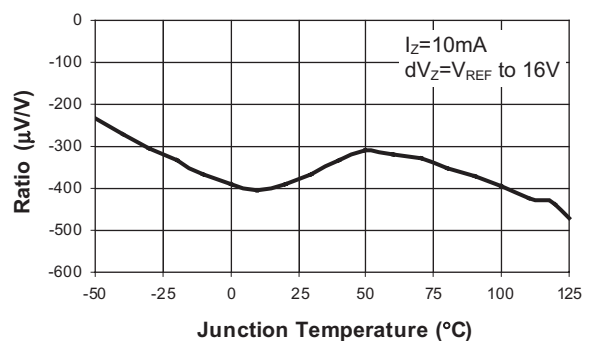
Reference Current vs. Temperature



Cathode Current vs. Temperature

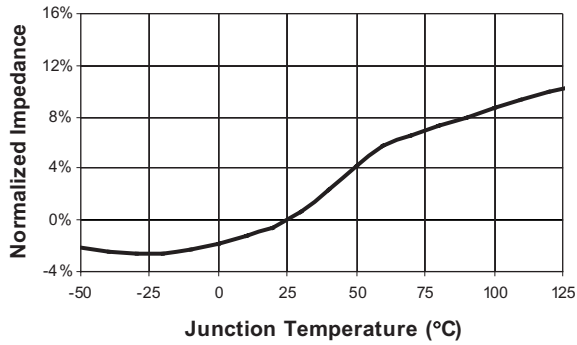


Ratio of $\Delta V_{\text{REF}} / \Delta V_Z$ vs. Temperature

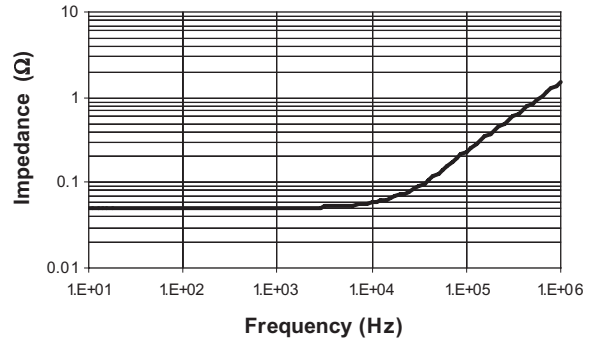


(Unless otherwise noted, $T_A = 25^\circ\text{C}$, $I_Z = 10\text{mA}$)

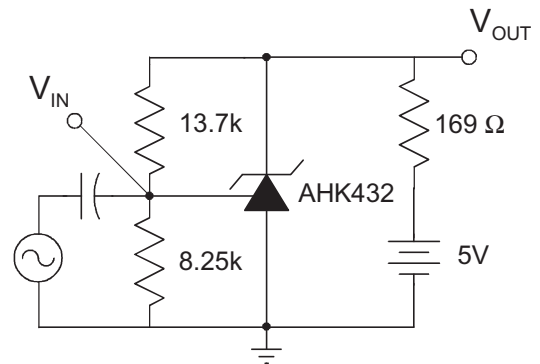
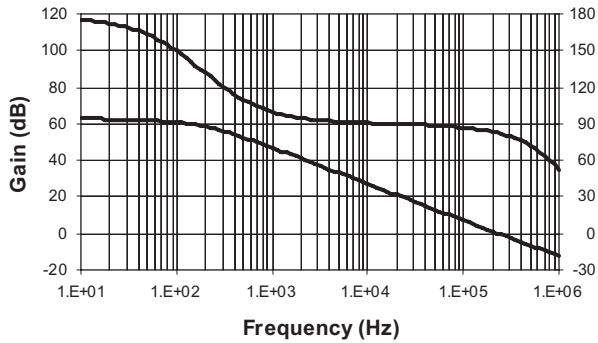
Cathode Impedance vs. Temperature



Impedance vs. Frequency

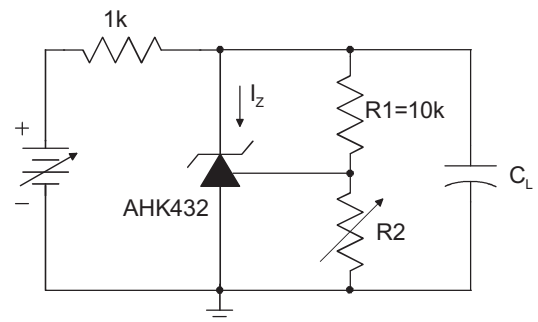
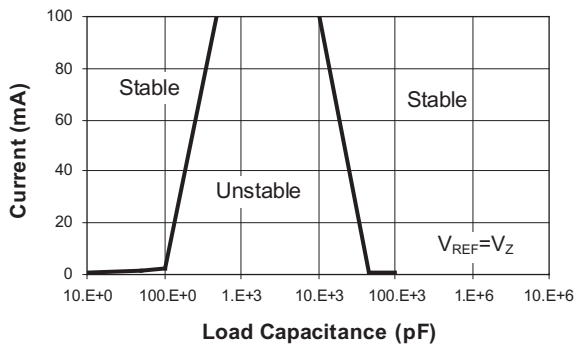


Gain and Phase vs. Frequency



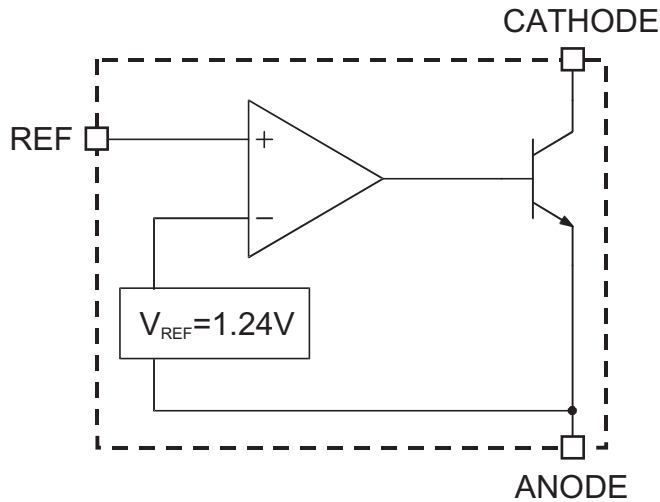
Test Circuit for Voltage Gain and Phase

Stability Boundary

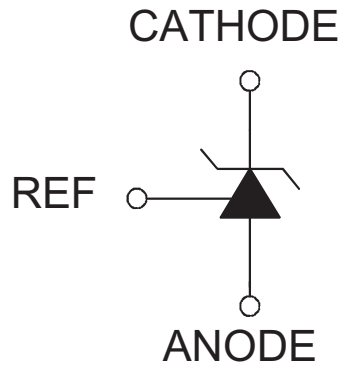


Test Circuit for Stability

Functional Block Diagram



Symbol Diagram



Ordering Information

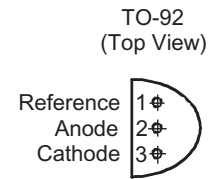
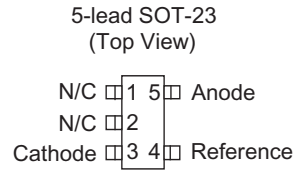
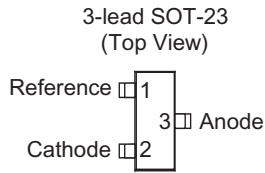
Package	Bulk or Tape and Reel	Tolerance		
		0.5%	1.0%	2.0%
SOT-23-3	Bulk	N/A	N/A	N/A
SOT-23-5		N/A	N/A	N/A
TO-92		AHK432ILY-.5-B1	AHK432ILY-1-B1	AHK432ILY-2-B1
SOT-23-3	Tape and Reel	AHK432IGY-.5-T1	AHK432IGY-1-T1	AHK432IGY-2-T1
SOT-23-5		AHK432IGV-.5-T1	AHK432IGV-1-T1	AHK432IGV-2-T1
TO-92	Ammo	AHK432ILY-.5-A1	AHK432ILY-1-A1	AHK432ILY-2-A1

*** LIFE SUPPORT POLICY**

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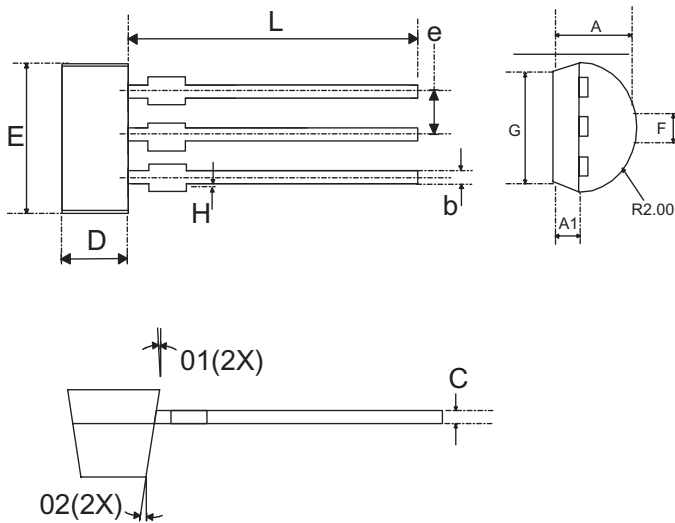
1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

Pin Configuration



Package Information

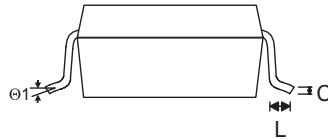
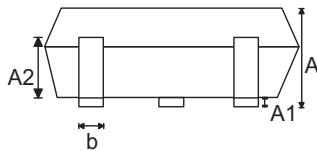
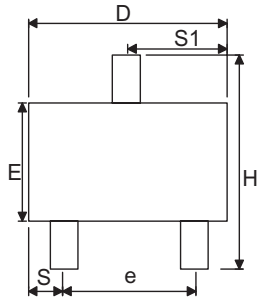
TO-92 M



Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	2.40	2.60	0.094	0.102
A1	0.70	0.90	0.028	0.036
b	0.35	0.55	0.014	0.022
C	0.00	0.00	0.000	0.000
D	2.80	3.20	0.110	0.126
E	3.80	4.20	0.149	0.165
e	0.00	0.00	0.000	0.000
F	1.91	2.31	0.075	0.091
G	3.35	3.75	0.132	0.148
H	0.00	0.15	0.000	0.006
L	13.80	14.20	0.543	0.559
θ1	2°		2°	
θ2	5°		5°	

Note: PACKAGE OUTLINE EXCLUSIVE OF ANY MOLD FLASHES AND BURR DIMENSION

SOT-23-3

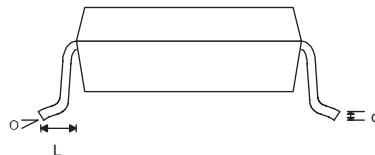
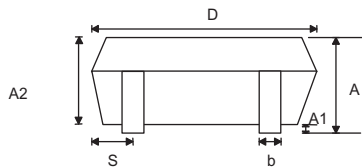
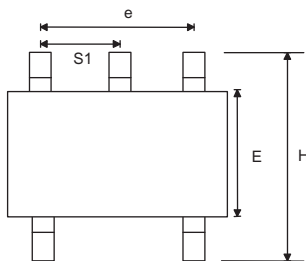


Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	.887	1.02	0.034	.040
A1	.013	0.10	0.0005	.004
A2	-	-	-	-
b	0.37	0.51	0.015	0.020
C	0.085	0.180	0.003	0.007
D	2.80	3.04	0.110	0.120
E	1.20	1.40	0.047	0.055
e	1.78	2.05	0.070	0.080
H	2.10	2.64	0.083	0.104
L	-	0.69	-	0.027
S	0.45	0.60	0.018	0.024
S1	0.89	1.03	0.035	0.040
θ	0°	8°	0°	8°

Note:

1. PACKAGE BODY SIZE EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.
2. TOLERANCE ± 0.1000 mm (4mi) UNLESS OTHERWISE SPECIFIED
3. COPLANARITY: 0.1000
4. DIMENSION L IS MEASURED IN GAGE PLANE

SOT-23-5



Dim	Millimeters		Inches	
	Min	Max	Min	Max
A	0.95	1.45	0.037	0.057
A1	0.05	0.15	0.002	0.006
A2	0.90	1.30	0.035	0.051
b	0.35	0.50	0.014	0.019
c	0.08	0.20	0.003	0.078
D	2.84	3.00	0.112	0.112
E	1.50	1.70	0.059	0.067
e	1.90		0.0748	
H	2.60	3.00	0.102	0.118
L	0.35	0.55	.0137	.0216
S	0.47	0.55	0.019	.0216
S1	.95		0.037	
θ	0°	10°	0°	10°