



Description

The SE432 is a low voltage three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between V_{REF} (approximately 1.24 V) to 12V with two external resistors. This device has a typical output impedance of 0.25Ω. Active output circuitry provides a very sharp turn on characteristic, making this device excellent replacement for Zener diodes in many applications.

The SE432 is characterized for operation from 0°C to 105°C, and four package options (SOT-23-3, SOT-23-5, TO-92 and SOP-8) allow the designer the opportunity to select the proper package for their applications.

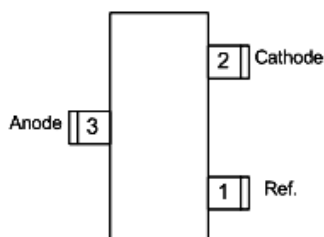
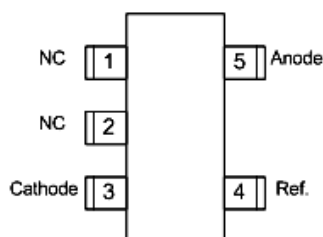
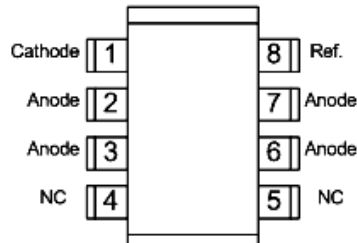
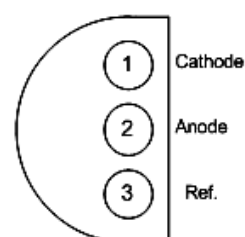
Features

- Low voltage operation (1.24V)
- Adjustable output voltage $V_0 = V_{REF}$ to 12V
- Wide operating current range 60μA to 100mA
- Low dynamic output impedance 0.25Ω (Typ.)
- Trimmed bandgap design up to $\pm 0.5\%$.
- ESD rating is 4KV(Per MIL-STD-883D)
- Available in Lead-Free Packages.

Application

- Linear Regulators
- Adjustable Supplies
- Switching Power Supplies
- Battery Operated Computers
- Instrumentation
- Computer Disk Drives

Pin Configuration

SOT-23-3, SC59-3L**(Top View)****SOT-23-5L****(Top View)****SOP-8****(Top View)****TO-92****(Top View)**

Marking Information

Package	Marking	Production Year Code	Production Week Code	Lead-Free Package
SOT-23-3 SC59-3L	SE432W	Starting with S, a bar on top of S is for production year 2001, and underlined S is for year 2002. The next character is marked on top for 2003, and underlined for 2004. The naming pattern continues with consecutive characters for later years.	A-Z: 1-26 a-z: 27-52	Lead-free package is indicated by a dot on top of the week code.
SOT-23-5L	SE432W			
SOP-8	SE432 YYWW	YY is for the year of production. 04 means the product is manufactured in year of 2004.	WW is for the week of production. 26 means the product is manufactured in the 26 th week	Lead-free package is indicated by LF after YYWW.
TO-92	SE432 YYWW			


Absolute Maximum Rating

Parameter	Symbol	Maximum	Units
Cathode Voltage	V_{KA}	12	V
Continuous Cathode Current	I_{KA}	150	mA
Reference Current	I_{REF}	3	mA
Operating Junction Temperature Range	T_J	150	°C
Storage Temperature Range	T_{STG}	-45 to 150	°C
Thermal Resistance	θ_{JA}	230 (SOT-23-3)	°C/W
		230 (SOT-23-5)	
		150 (SOP-8)	
		220 (TO-92)	
Lead Temperature (Soldering) 10 seconds	T_{LEAD}	260	°C

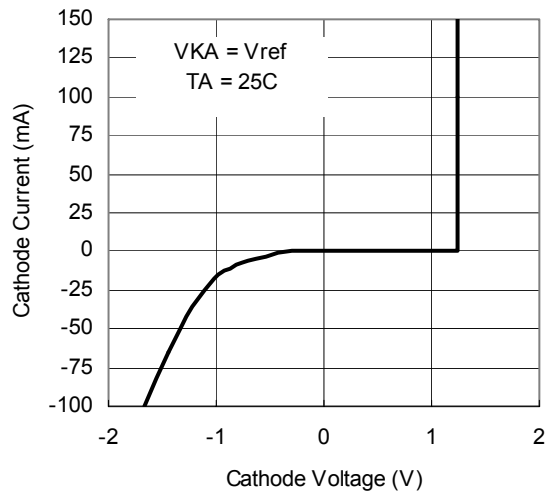
Electrical Characteristics

Parameter		Symbol	Test Conditions & Circuit	Min	Typ	Max	Unit
Reference Voltage	$1.250V \pm 0.5\%$	V_{REF}	Test circuit #1 $V_{KA} = V_{REF}, I_{KA} = 10mA$	1246	1250	1256	mV
	$1.240V \pm 0.5\%$			1234	1240	1246	
	$1.240V \pm 1.0\%$			1228	1240	1252	
	$1.240V \pm 1.5\%$			1221	1240	1259	
	$1.240V \pm 2.0\%$			1215	1240	1265	
Deviation of Reference Voltage over Full Temperature Range		$V_{I(DEV)}$	Test circuit #1 $V_{KA} = V_{REF}, I_{KA} = 10mA,$ $T_A = 0^\circ C - 105^\circ C$	--	10	25	mV
Ratio of Change in Reference Voltage to the Change in Cathode Voltage		$\Delta V_{REF}/\Delta V_{KA}$	Test circuit #2 $I_{KA} = 10mA, \Delta V_{KA} = 12V \text{ to } V_{REF}$	--	-1.0	-2.7	mV/V
Reference Current		I_{REF}	Test circuit #2 $I_{KA} = 10mA, R1=10k\Omega, R2 = \infty$	--	0.15	2	μA
Deviation of Reference Current over Full Temperature Range		$I_{I(DEV)}$	Test circuit #2 $I_{KA} = 10mA, R1=10k\Omega, R2 = \infty$ $T_A = 0^\circ C - 105^\circ C$	--	0.10	0.50	μA
Minimum Cathode Current for Regulation		I_{MIN}	Test circuit #1 $V_{KA} = V_{REF}$	--	60	100	μA
Off-state Cathode Current		I_{OFF}	Test circuit #3 $V_{KA} = 12V, V_{REF} = 0$	--	0.04	0.8	μA
Dynamic Impedance		$ Z_{KA} $	Test circuit #1 $I_{KA} = 100\mu A - 80mA,$ $V_{KA} = V_{REF}, f \leq 1kHz$	--	0.25	1	Ω

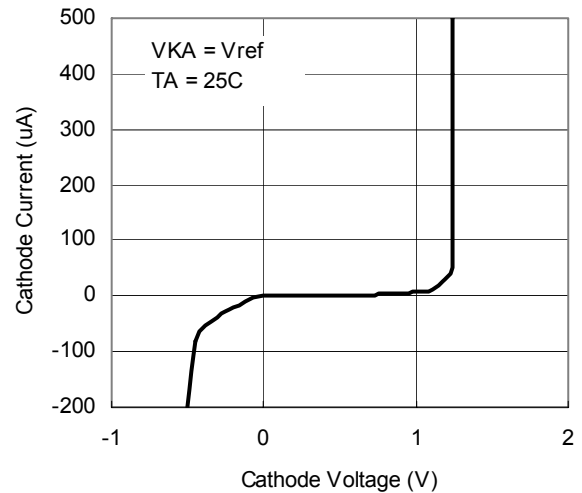


Typical Performance Characteristics

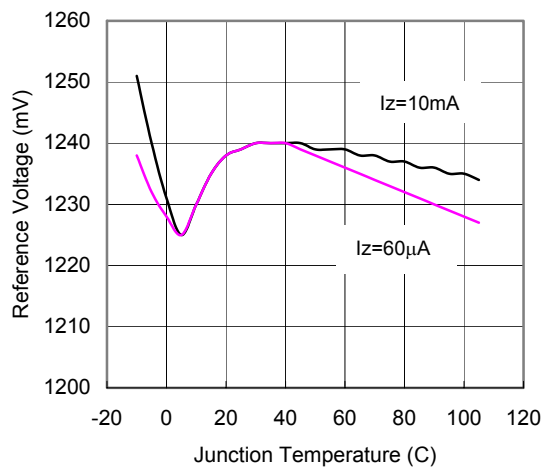
Cathode Current VS Cathode Voltage



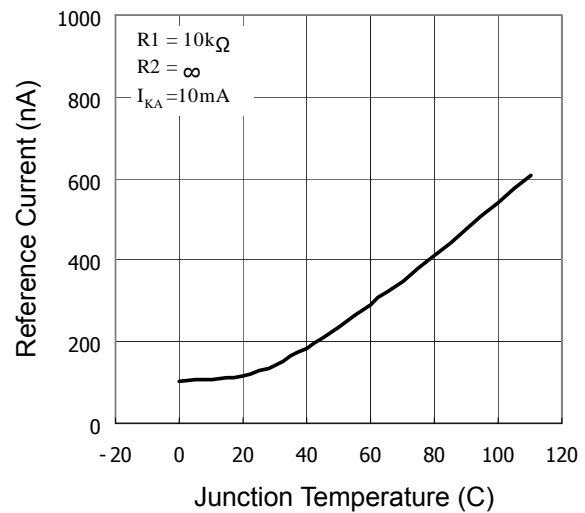
Cathode Current VS Cathode Voltage



Reference Voltage VS Junction Temperature

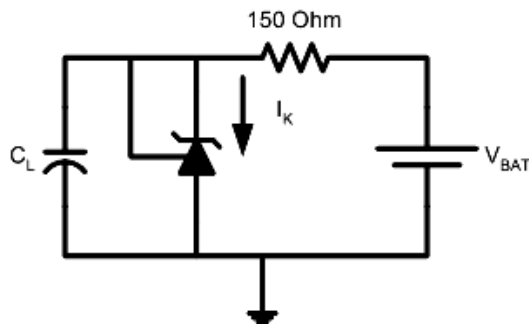
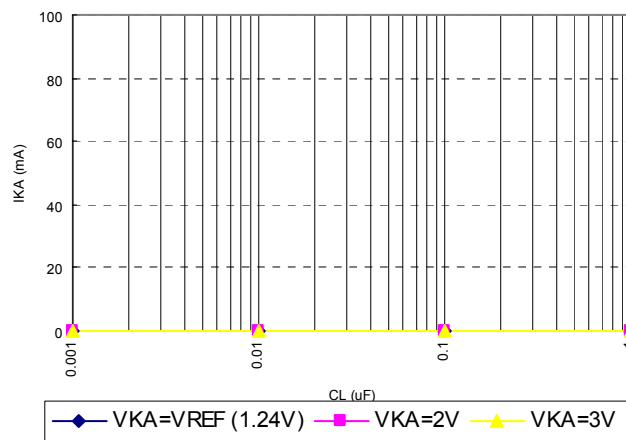


Reference Input Current VS Junction Temperature

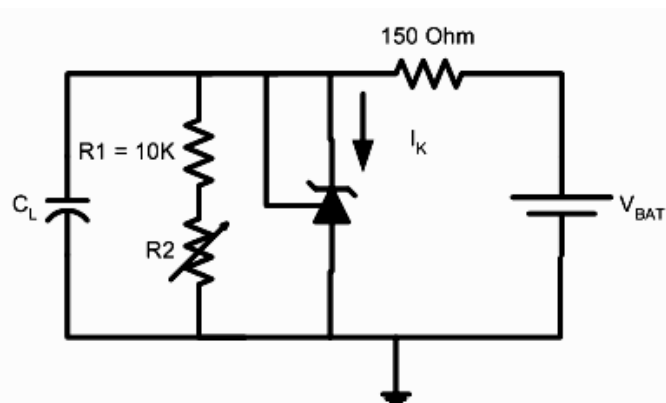




Stability Boundary Condition



Test Circuit for $V_{KA} = V_{REF}$

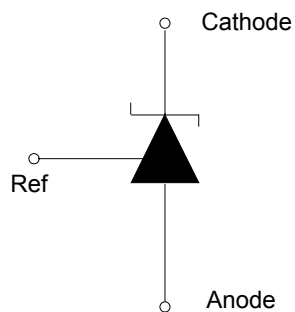


Test Circuit for $V_{KA} = 2V, 3V$

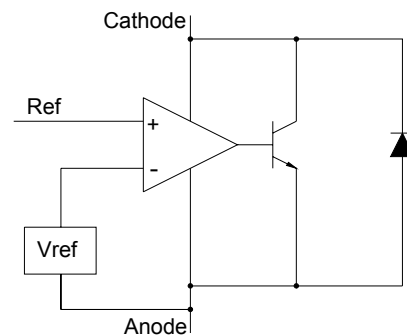
The areas under the curves represent conditions that may cause the device to oscillate. For $V_{KA} = 2V$ and $3V$ curves, $R2$ and V_{BAT} were adjusted to establish the initial V_{KA} and I_K conditions with $C_L = 0$. V_{BAT} and C_L then were adjusted to determine the ranges of stability. As the graph suggested, SE432 is unconditional stable with I_K from 0 to 100mA and with C_L from 0.001 μ F to 1 μ F.



Symbol Diagram



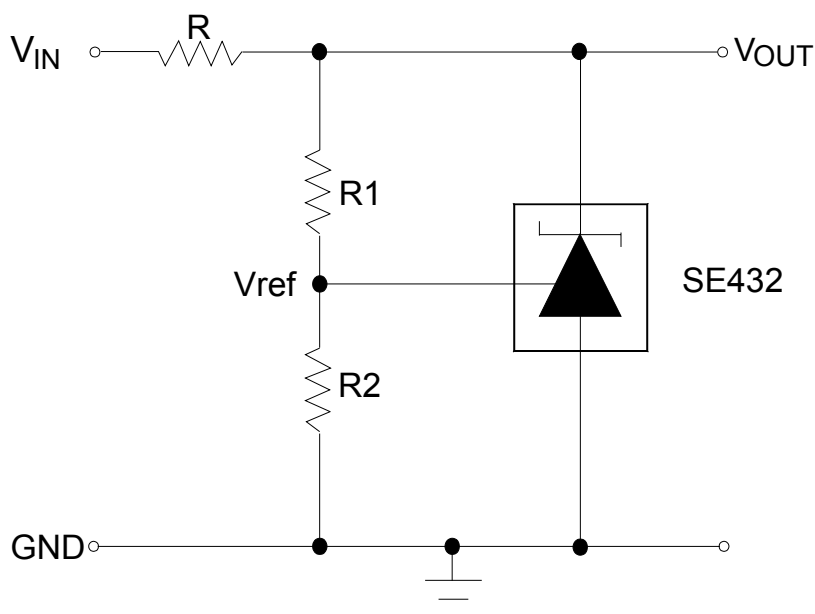
Block Diagram



Test Circuits

Test Circuit 1: $V_{KA} = V_{REF}$	Test Circuit 2: $V_{KA} > V_{REF}$	Test Circuit 3: Off State Current

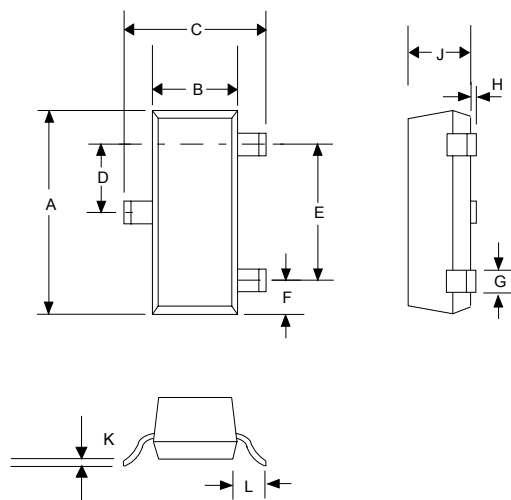
Application Circuit



$$V_{OUT} = V_{ref} \left(1 + \frac{R1}{R2}\right)$$

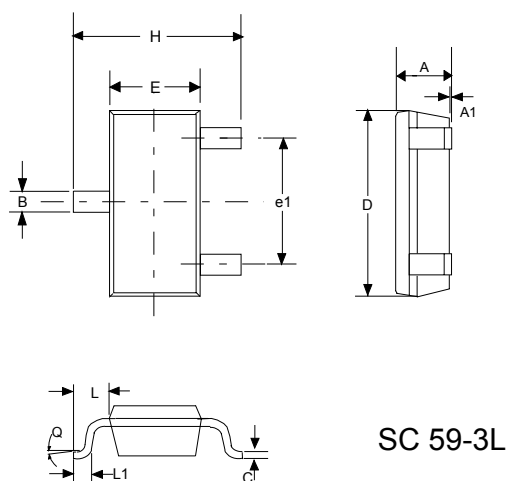


OUTLINE DRAWING SOT-23-3



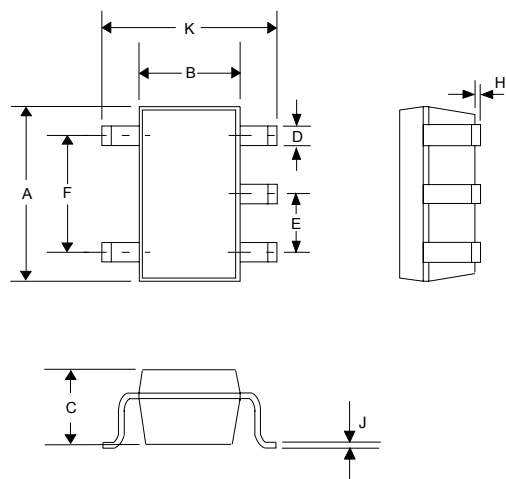
DIMENSIONS				
DIM ^N	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.110	0.120	2.80	3.04
B	0.047	0.055	1.20	1.40
C	0.083	0.104	2.10	2.64
D	0.035	0.040	0.89	1.03
E	0.070	0.080	1.78	2.05
F	0.018	0.024	0.45	0.60
G	0.015	0.020	0.37	0.51
H	0.0005	0.004	0.013	0.10
J	0.034	0.040	0.887	1.02
K	0.003	0.007	0.085	0.18
L	-	0.027	-	0.69

OUTLINE DRAWING SC59-3L



DIMENSIONS				
DIM ^N	INCHE		MM	
	MIN	MAX	MIN	MAX
A	0.035	0.043	0.90	1.10
A1	0.0004	0.005	0.01	0.13
B	0.012	0.020	0.30	0.50
C	0.004	0.008	0.09	0.20
D	0.110	0.122	2.80	3.10
H	0.098	0.122	2.50	3.10
E	0.059	0.067	1.50	1.70
e	0.037REF		0.95REF	
e1	0.075REF		1.90REF	
L1	0.008	0.022	0.20	0.55
L	0.014	0.031	0.35	0.80
Q	0°C	10°C	0°C	10°C

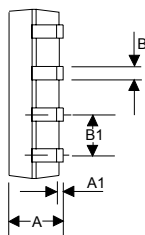
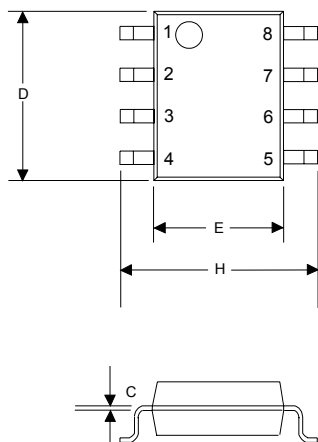
OUTLINE DRAWING SOT-23-5L



DIMENSIONS				
DIM ^N	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.110	0.120	2.80	3.05
B	0.059	0.070	1.50	1.75
C	0.036	0.051	0.90	1.30
D	0.014	0.020	0.35	0.50
E	-	0.037	-	0.95
F	-	0.075	-	1.90
H	-	0.006	-	0.15
J	0.0035	0.008	0.090	0.20
K	0.102	0.118	2.60	3.00

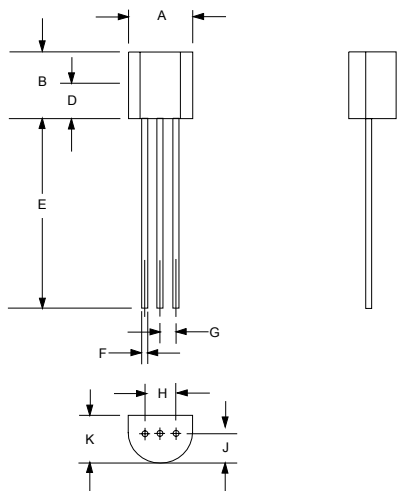


OUTLINE DRAWING SOP-8



DIM ^N	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.0532	0.0688	1.35	1.75
A1	0.0040	0.0098	0.10	0.25
B	0.0130	0.0200	0.33	0.51
B1	0.050 BSC		1.27 BSC	
C	0.0075	0.0098	0.19	0.25
D	0.1890	0.1968	4.80	5.00
H	0.2284	0.2440	5.80	6.20
E	0.1497	0.1574	3.80	4.00

OUTLINE DRAWING TO-92



DIM ^N	DIMENSIONS			
	INCHES		MM	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.445	5.207
B	0.170	0.210	4.318	5.334
E	0.500	0.610	12.70	15.50
F	0.016	0.021	0.407	0.533
G	0.045	0.055	1.143	1.397
H	0.095	0.105	2.413	2.667
J	0.080	0.105	2.032	2.667
K	0.125	0.165	3.175	4.191



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