

## Low Voltage Adjustable Precision Shunt Regulator

### DESCRIPTION

The TL432 are three-terminal adjustable shunt regulators with guaranteed thermal stability over applicable extended commercial temperature ranges. The output voltage may be set to any value between  $V_{REF}$  1.24V and 20 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2 $\Omega$ . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

### FEATURES

- ◆ Voltage Reference Accuracy of 1%, 0.5%
- ◆ Low-Voltage Operation
- ◆ Adjustable Output Voltage from  $V_{REF}$  to 20V
- ◆ Low output noise voltage
- ◆ Fast turn on response

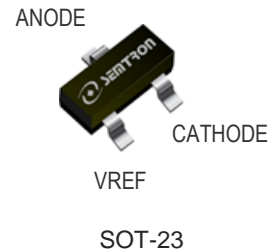
### APPLICATIONS

- ◆ Battery Power Equipment
- ◆ Switch Power Supply

### PART NUMBER INFORMATION

**TL 432 X SN - TR G**  
 a b c d e f

- a : Product type name.
- b : Product serial number.
- c : Accuracy code.           A:0.5%   B:1%
- c : Package code            SN:SOT-23
- d : Handling code            TR:Tape&Reel
- e : Green produce code    G:RoHS Compliant



### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

Symbol	Parameter	Rating	Units
$P_D$	Power Dissipation	280	mW
$V_{KA}$	Cathode Voltage	20	V
$I_{KA}$	Continuous Cathode Current	100	mA
$I_{REF}$	Reference Current Range	3	mA
$T_J$	Operation Junction Temperature	-40/150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55/150	$^\circ\text{C}$
$T_{SOL}$	Lead Temperature Range (Soldering 10sec.)	260	$^\circ\text{C}$

Note: The power dissipation values are based on the condition that temperature  $T_J$  and ambient temperature  $T_A$  difference is 100 $^\circ\text{C}$ . Stresses beyond those listed under "absolute maximum rating" may cause permanent damage to the device. These are stress rating only, and function operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

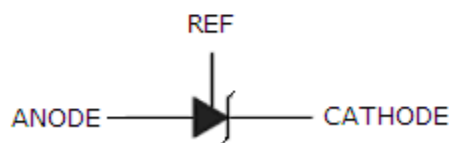
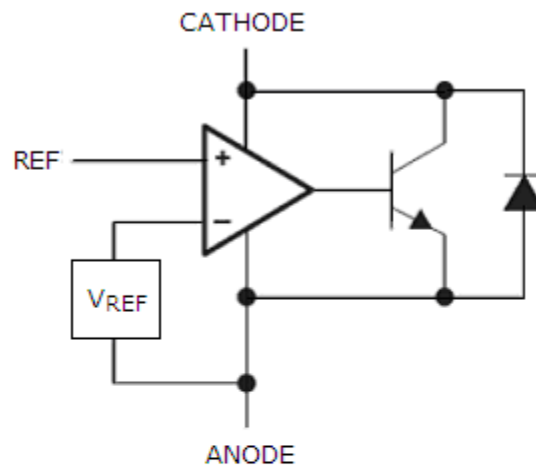
### THERMAL RESISTANCE

Symbol	Parameter	Typ	Max	Units
$R_{\theta JA}$	Thermal Resistance Junction to Ambient <sup>AC</sup>	Steady-State	200	$^\circ\text{C}/\text{W}$

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ Unless otherwise noted)

Symbol	Parameter	Condition		Min	Typ	Max	Unit
$V_{REF}$	Reference Input Voltage ( $I_K=10\text{mA}, V_K=V_{REF}$ )	TL432A (0.5%)	$T_A=-25^\circ\text{C}$ $T_A=-40^\circ\text{C}\sim+80^\circ\text{C}$	1.234 1.222	1.24	1.246 1.258	V
$V_{REF}$	Reference Input Voltage ( $I_K=10\text{mA}, V_K=V_{REF}$ )	TL432B (1%)	$T_A=-25^\circ\text{C}$ $T_A=-40^\circ\text{C}\sim+80^\circ\text{C}$	1.228 1.215	1.24	1.252 1.265	V
$V_{DEV}$	Deviation of Reference Input Voltage Over-Temperature	$T_A=-40^\circ\text{C}\sim105^\circ\text{C}$ $V_K=V_{REF}, I_K=10\text{mA}$			10	25	mV
$\Delta V_{REF}/\Delta V_K$	Ratio Of Change In $V_{REF}$ To Change In Cathode Voltage	$I_K=10\text{mA}, \Delta V_K=16\text{V}\sim V_{REF}$			-1	-2.7	mV/V
$I_{REF}$	Reference Input Current	$I_K=10\text{mA}, R_1=10\text{K}\Omega, R_2=\infty$			0.25	0.5	$\mu\text{A}$
$I_{REF(DEV)}$	Deviation of Reference Input Current Over Full Temperature Range	$T_A=-40^\circ\text{C}\sim105^\circ\text{C}$ $R_1=10\text{K}\Omega, R_2=\infty, I_K=10\text{mA}$			0.05	0.3	$\mu\text{A}$
$I_{K(OFF)}$	Off-State Cathode Current	$V_{REF}=0\text{V}, V_K=18\text{V}$			0.5	1.0	$\mu\text{A}$
$I_{K(MIN)}$	Minimum Operating Current	$V_K=V_{REF}$			50	80	$\mu\text{A}$
$Z_K$	Dynamic Output Impedance	$F \leq 1\text{kHz}, V_K=V_{REF}$ $I_K=1\text{mA}\sim100\text{mA}$			0.2	0.4	$\Omega$

## BLOCK DIAGRAM



**APPLICATION CIRCUIT**

Fig 1.  $V_K = V_{REF}$

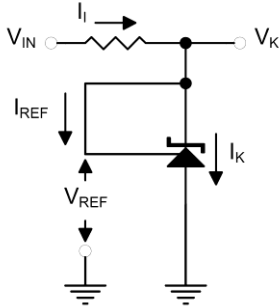
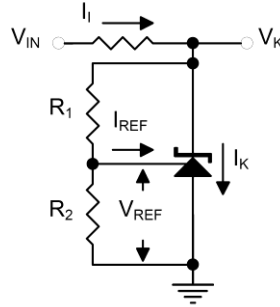
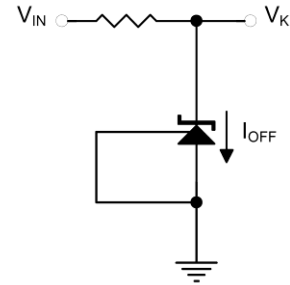


Fig 2.  $V_K > V_{REF}$

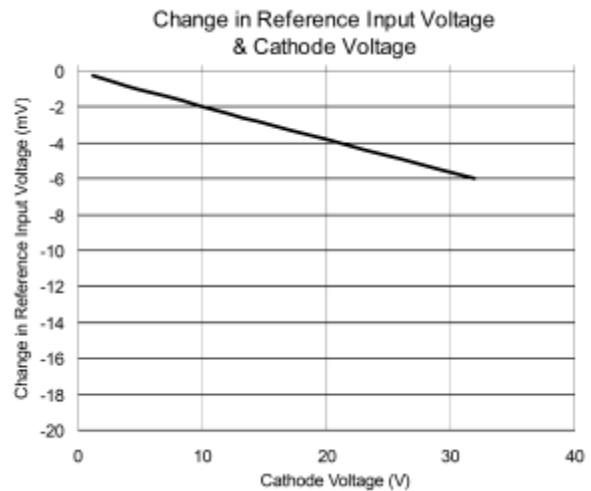
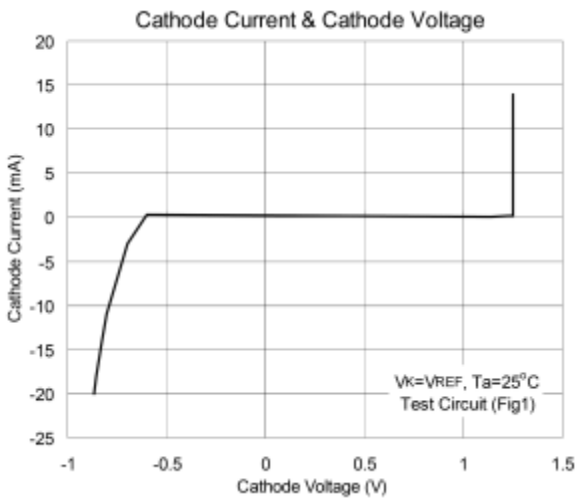
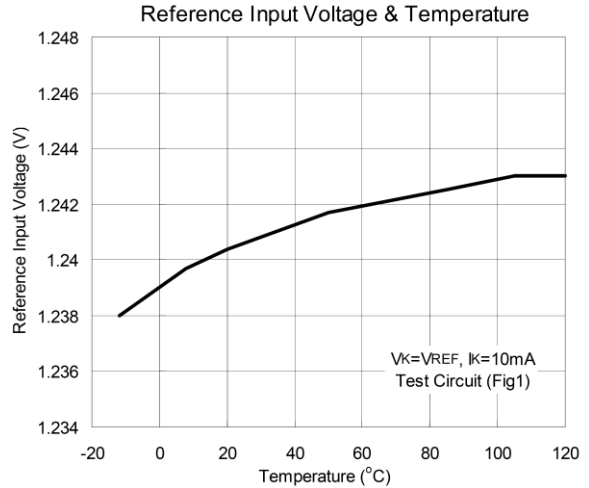
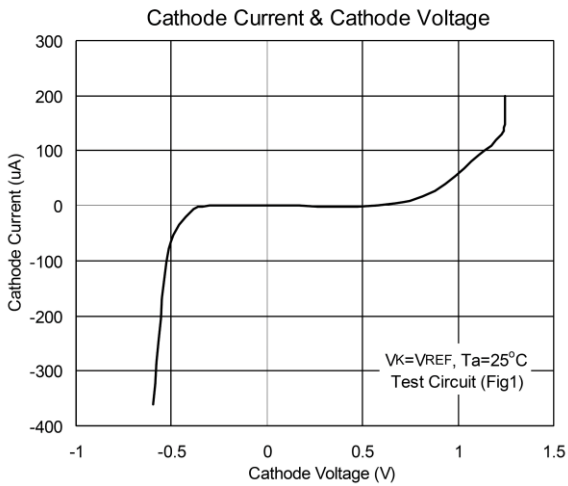


Note:  $V_K = V_{REF}(1 + R_1/R_2) + I_{REF} \times R_1$

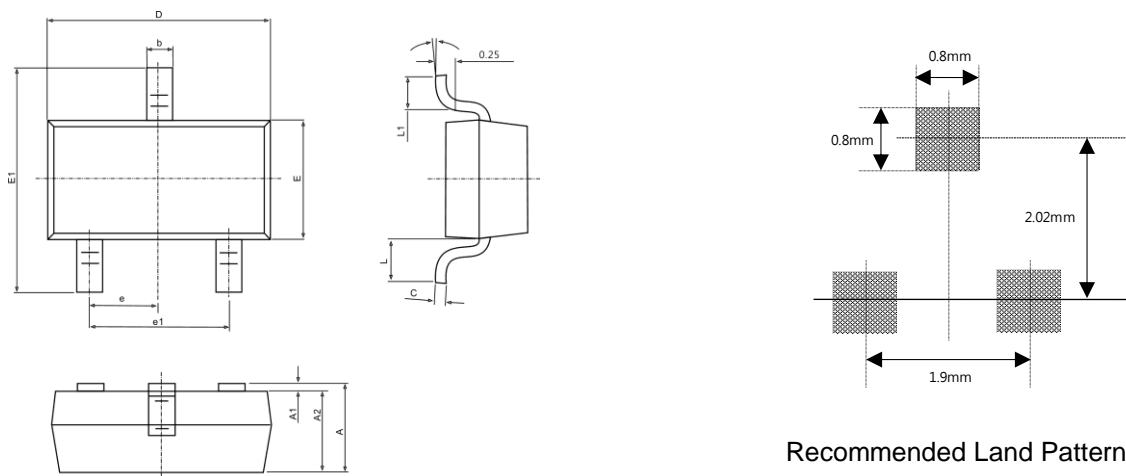
Fig 3. Off-State Current



**TYPICAL CHARACTERISTICS**



## SOT-23 PACKAGE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
$\theta$	0°	8°	0°	8°