

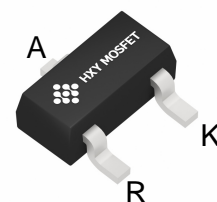


## DEVICE DESCRIPTION

The TL431 is a three-terminal adjustable shunt regulator offering excellent temperature stability. This device has a typical dynamic output impedance of 0.2Ω. The device can be used as a replacement for zener diodes in many applications.

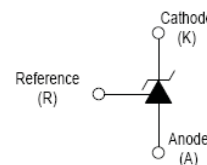
## FEATURES

- The output voltage can be adjusted to 36V
- Low dynamic output impedance, its typical value is 0.2K
- Trapping current capability is 1 to 100mA
- Low output noise voltage
- Fast on-state response
- The effective temperature compensation in the working range of full temperature
- The typical value of the equivalent temperature factor in the whole temperature scope is 50 ppm/°C



**SOT-23**

## Equivalent Circuit



## APPLICATION

- Shunt Regulator
- High-Current Shunt Regulator
- Precision Current Limiter

## Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
TL431	SOT-23	431	3000

## ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

Parameter	Symbol	Value	Unit
Cathode Voltage	$V_{KA}$	36	V
Cathode Current Range (Continuous)	$I_{KA}$	-100~+150	mA
Reference Input Current Range	$I_{ref}$	0.05~+10	mA
Power Dissipation	$P_D$	300	mW
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	417	°C/W
Operating Temperature	$T_{opr}$	-25~+85	°C
Junction Temperature	$T_J$	150	°C
Storage Temperature Range	$T_{STG}$	-65~+150	°C



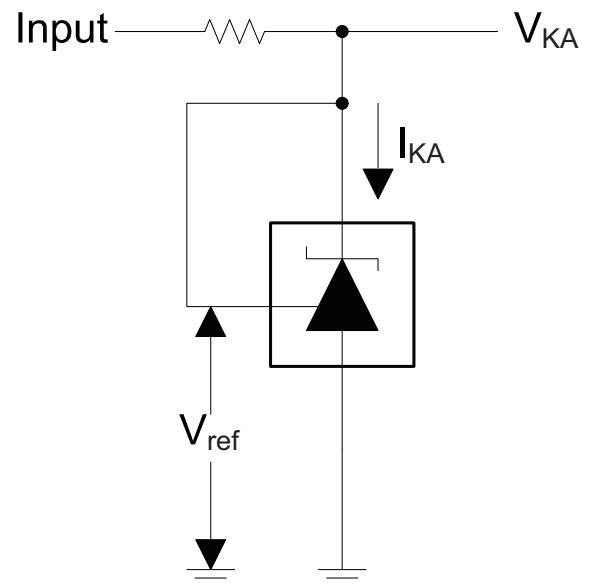
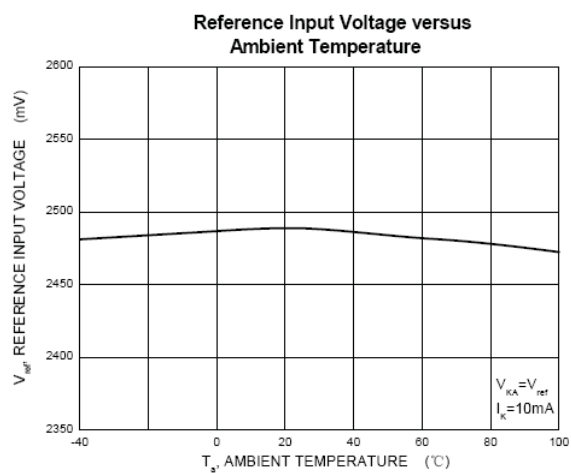
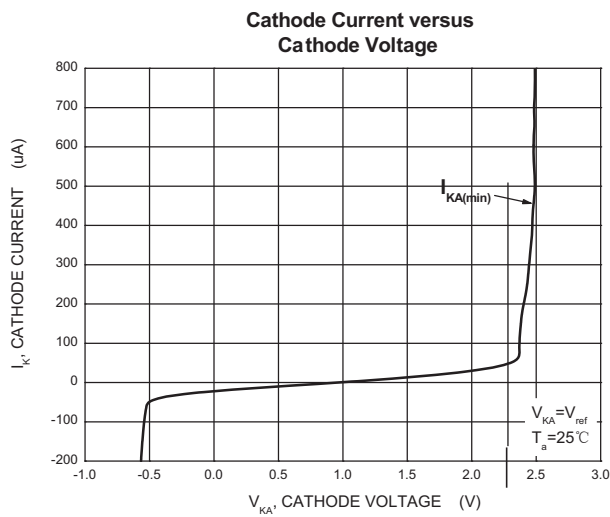
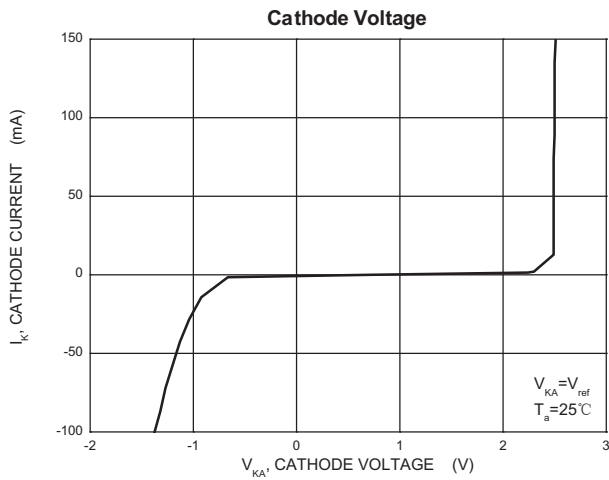
**ELECTRICAL CHARACTERISTICS ( $T_a=25^{\circ}\text{C}$  unless otherwise specified)**

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Reference input voltage	$V_{\text{ref}}$	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=10\text{mA}$	2.475	2.5	2.525	V
Deviation of reference Input voltage over temperature (note)	$\Delta V_{\text{ref}}/\Delta T$	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=10\text{mA}$ $T_{\text{MIN}}\leq T_a\leq T_{\text{MAX}}$		4.5	17	mV
Ratio of change in reference Input voltage to the change in cathode voltage	$\Delta V_{\text{ref}}/\Delta V_{\text{KA}}$	$I_{\text{KA}}=10\text{mA}$ $\Delta V_{\text{KA}}=10\text{V}\sim V_{\text{REF}}$		-1.0	-2.7	mV/V
		$\Delta V_{\text{KA}}=36\text{V}\sim 10\text{V}$		-0.5	-2.0	mV/V
Reference input current	$I_{\text{ref}}$	$I_{\text{KA}}=10\text{mA}, R_1=10\text{k}\Omega$ $R_2=\infty$		1.5	4	$\mu\text{A}$
Deviation of reference input current over full temperature range	$\Delta I_{\text{ref}}/\Delta T$	$I_{\text{KA}}=10\text{mA}, R_1=10\text{k}\Omega$ $R_2=\infty$ $T_a=-25$ to $85^{\circ}\text{C}$		0.4	1.2	$\mu\text{A}$
Minimum cathode current for regulation	$I_{\text{KA(min)}}$	$V_{\text{KA}}=V_{\text{REF}}$		0.45	1.0	mA
Off-state cathode current	$I_{\text{KA(OFF)}}$	$V_{\text{KA}}=36\text{V}, V_{\text{REF}}=0$		0.05	1.0	$\mu\text{A}$
Dynamic impedance	$Z_{\text{KA}}$	$V_{\text{KA}}=V_{\text{REF}}, I_{\text{KA}}=1$ to $100\text{mA}$ $f\leq 1.0\text{kHz}$		0.15	0.5	$\Omega$

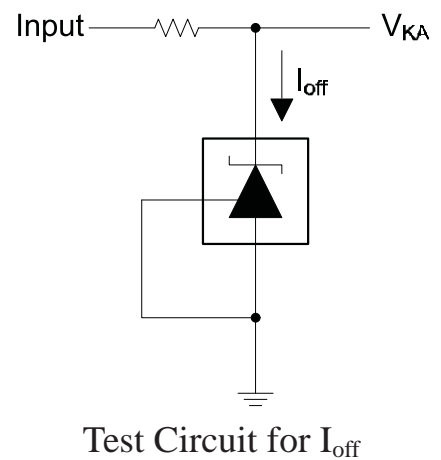
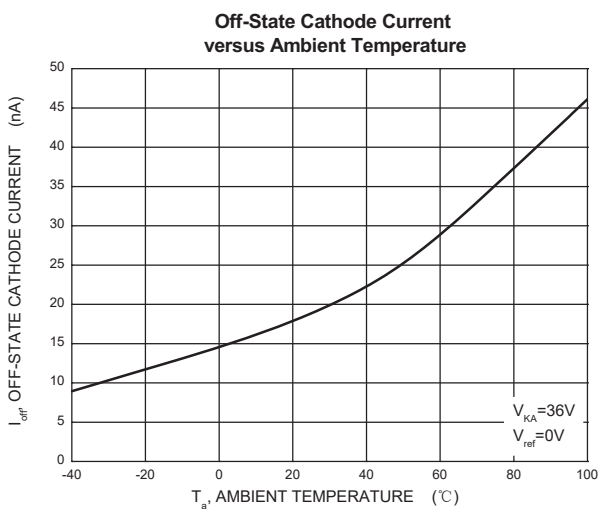
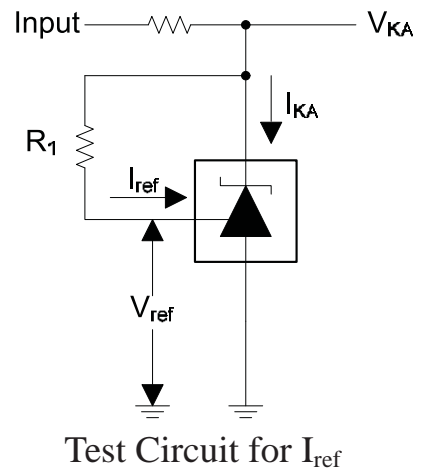
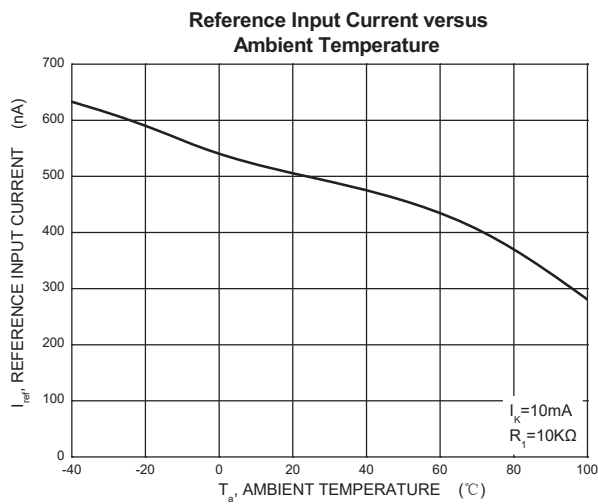
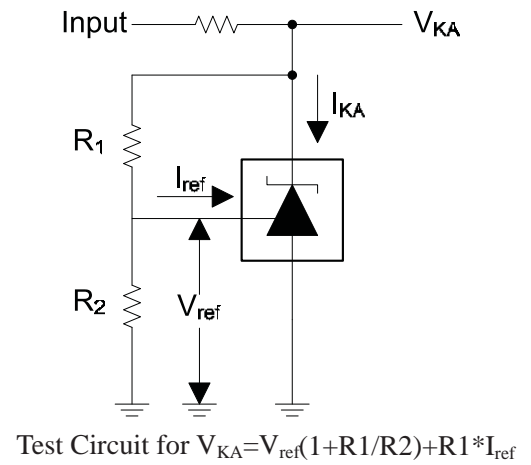
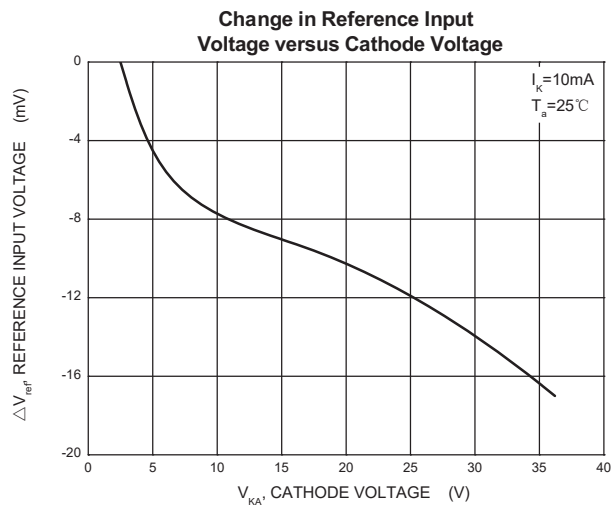
Note:  $T_{\text{MIN}}=-25^{\circ}\text{C}$ ,  $T_{\text{MAX}}=+85^{\circ}\text{C}$

**CLASSIFICATION cZV<sub>ref</sub>**

Rank	*** 0.5%	*****1%
Range	2.487-2.513	2.475-2.525

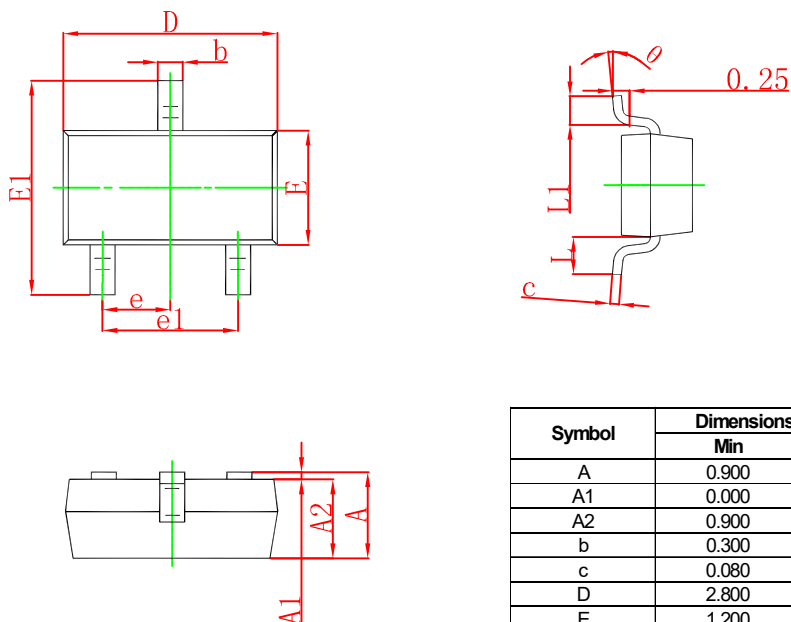


Test Circuit for  $V_{KA} = V_{ref}$



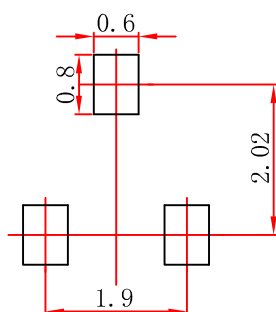


## SOT-23 Package Outline Dimensions



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
θ	0°	8°	0°	8°

## SOT-23 Suggested Pad Layout



Note:  
1. Controlling dimension: in millimeters.  
2. General tolerance:  $\pm 0.05\text{mm}$ .  
3. The pad layout is for reference purposes only.



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