

## Adjustable Accurate Reference Source

### 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.

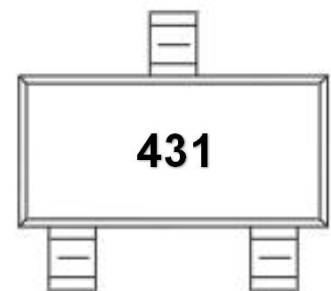
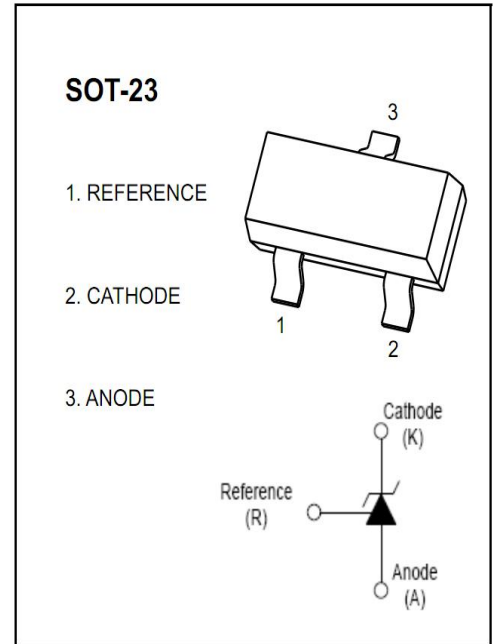
### FEATURES:

- #. The output voltage can be adjusted to 36V
- #. Low dynamic output impedance, its typical value is 0.2Ω
- #. 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

### APPLICATION:

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

### MARKING:



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

Parameter	Symbol	Value	Unit
Cathode Voltage	VKA	37	V
Cathode Current Range (Continuous)	IKA	-100~+150	mA
Reference Input Current Range	Iref	0.05~+150	mA
Power Dissipation	PD	300	mW
Thermal Resistance from Junction to Ambient	RθJA	417	°C/W
Operating Junction Temperature	Tj	150	°C
Operating Ambient Temperature Range	Topr	-25~+85	°C
Storage temperature Range	Tstg	-65~+150	°C

**ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise specified)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Reference input voltage (Fig.1)	Vref	VKA=VREF, IKA=10mA	2.475	2.5	2.525	V
Deviation of reference input voltage over temperature (note) (Fig.1)	$\Delta V_{ref} / \Delta T$	VKA =VREF, IKA =10mA TMIN≤Ta≤TMAX		4.5	17	mV
Ratio of change in reference input voltage to the change in cathode voltage (Fig.2)	$\Delta V_{ref} / \Delta V_{KA}$	IKA=10mA	$\Delta V_{KA}=10V \sim V_{RE}$	-1.0	-2.7	mV/V
			$\Delta V_{KA}=36V \sim 10V$	-0.5	-2.0	mV/V
Reference input current (Fig.2)	Iref	IKA=10mA, R1=10kΩ R2=∞		1.5	4	μA
Deviation Of reference input current over full temperature range (Fig.2)	$\Delta I_{ref} / \Delta T$	IKA=10mA, R1=10kΩ R2=∞ TA=-25 to 85°C		0.4	1.2	μA
Minimum cathode current for regulation (Fig.1)	IKA(min)	VKA=VREF, IKA=10mA		0.45	1.0	mA
Off-state cathode Current (Fig.3)	IKA(OFF)	VKA=36V, VREF=0		0.05	1.0	μA
Dynamic impedance	ZKA	VKA=VREF, IKA=1 to100mA f≤1.0kHz		0.15	0.5	Ω

Note: TMIN=-25°C ,TMAX=+85°C

**CLASSIFICATION of Vref**

Rank	0.50%	1%
Range	2.487-2.513	2.475-2.525

Figure 1. Test Circuit for VKA = Vref

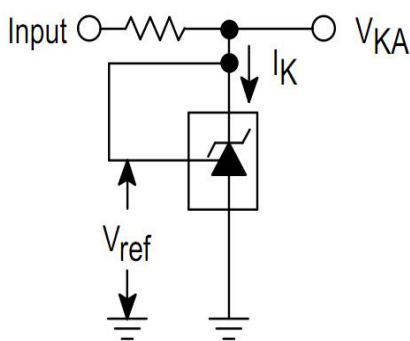
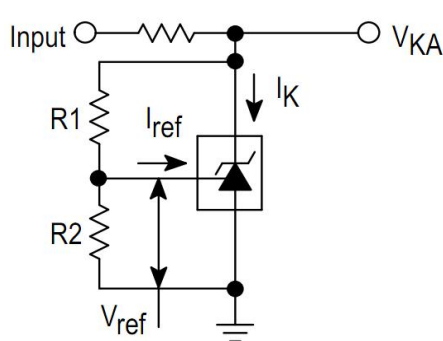
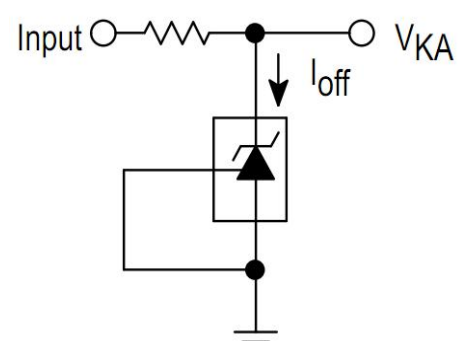


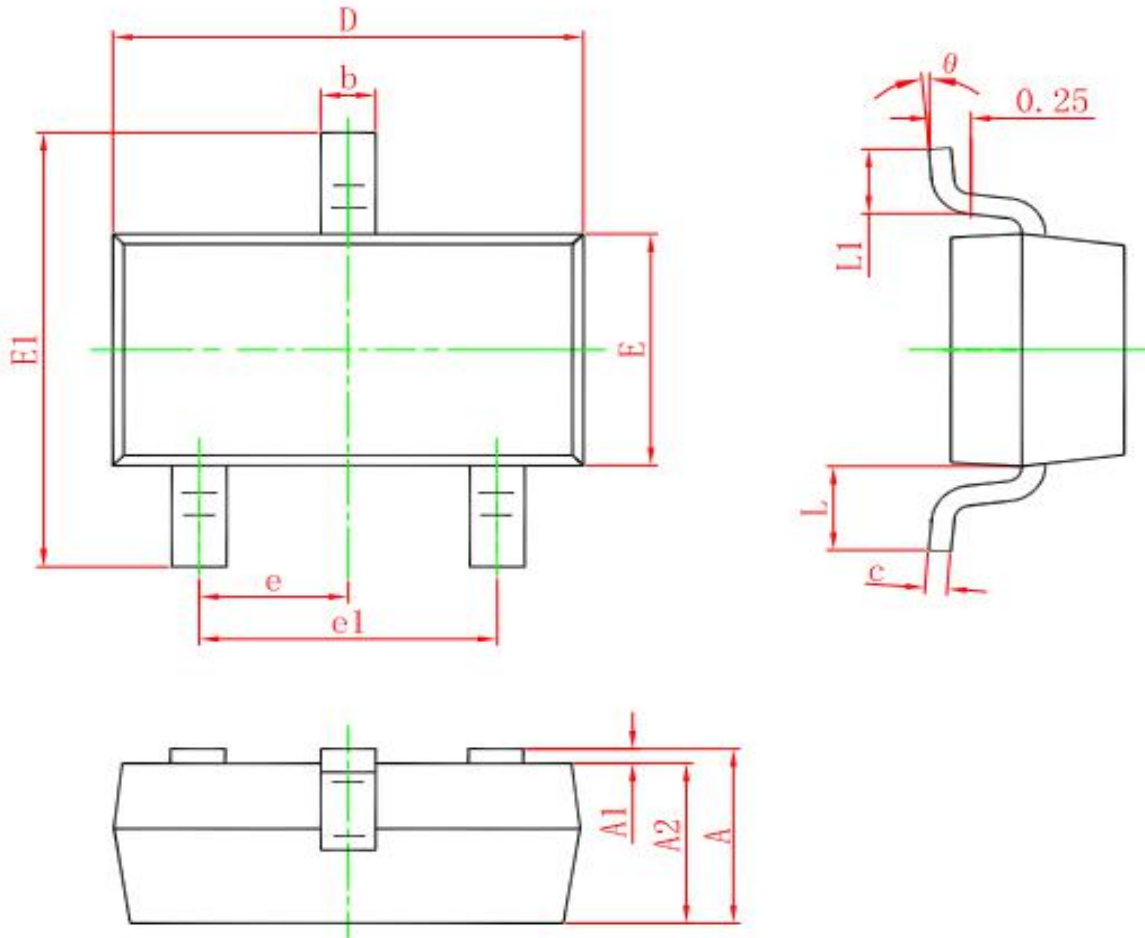
Figure 2. Test Circuit for VKA &gt; Vref



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

Figure 3. Test Circuit for Ioff



**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°

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