Descriptions

The TL431 is Precision adjustable shunt regulator in a SOT-23 Plastic Package.

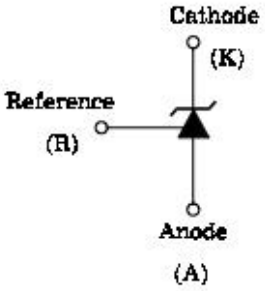
Features

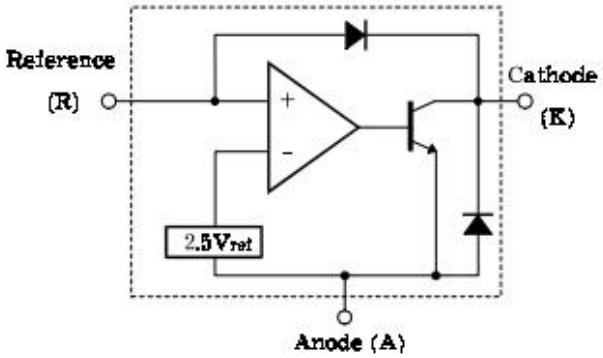
- Programmable Output Voltage to 40V
- Low Dynamic Output Impedance 0.2 Ω
- Sink Current Capability of 0.1 mA to 100 mA
- Equivalent Full-Range Temperature Coefficient of 50 ppm/oC
- Temperature Compensated for Operation over Full Rated Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn on Respons
- TO-92 or SOT-23 and SOT-89 packages

Applications

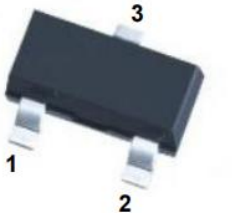
- Linear regulators
- adjustable power supply
- switching power supply

Equivalent Circuit





Pinning



PIN1：R PIN 2：K PIN 3：A

TO-92

Absolute Maximum Ratings(Ta=25℃)

Characteristic	Symbol	Value	Unit
Cathode Voltage	V_{KA}	40	V
Cathode Current Range (Continuous)	I_K	100 ~ 150	mA
Reference Input Current Range	I_{REF}	0.05 ~ 10	mA
Power Dissipation at 25°C: TO – 92 Package ($R_{\theta JA}$ = 178°C/W) SOT – 23 – 3 Package ($R_{\theta JA}$ = 625°C/W)	P_D	 0.7 0.2	 W W
Junction Temperature Range	T_J	0 ~ 150	°C
Operating Temperature Range	T_g	0 ~ 70	°C
Storage Temperature Range	T_{stg}	-65 ~ +150	°C

Recommended Operating Conditions

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Cathode Voltage	V_{KA}		REF		40	V
Cathode Current	I_K		0.5		100	mA

Electrical Characteristics(Ta=25℃)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Reference Input Voltage	V_{REF}	Vka=Vref, Ik=10mA	2.445	2.495	2.545	V
Deviation of Reference Input Voltage Over Full Temperature Range	$V_{REF(dev)}$	$T_{min} \le Ta \le T_{max}$		3	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	ΔV_{KA} = 10V- V_{REF} ΔV_{KA} = 36V- 10V		- 1.4 - 1.0	- 2.7 - 2.0	mV/V
Reference Input Current	I_{REF}	R_1 = 10KΩ, R_2 = ∞		1.8	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$I_{REF(dev)}$	R_1 = 10KΩ, R_2 = ∞		0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{K(min)}$			0.25	0.5	mA
Off-State Cathode Current	$I_{K(off)}$	V_{KA} = 40V, V_{REF} = 0		0.26	0.9	μA
Dynamic Impedance	Z_{KA}	I_K = 10mA to 100 mA , f ≤ 1.0KHz		0.22	0.5	Ω

Typical Application Circuit

Fig.1. Test Circuit for $V_{KA} = V_{REF}$

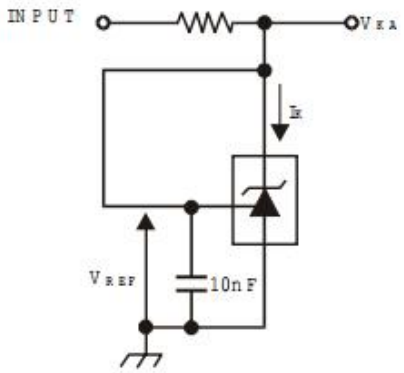
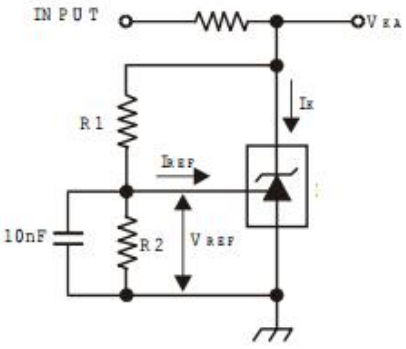
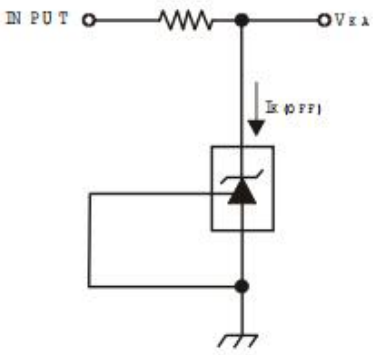


Fig.2. Test Circuit for $V_{KA} \geq V_{REF}$

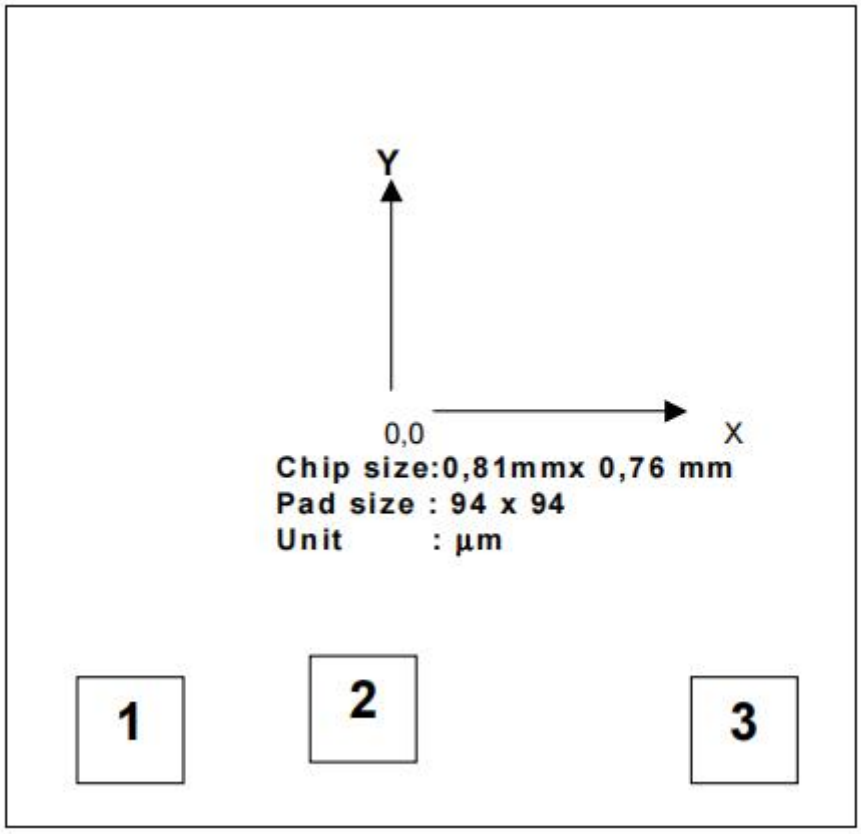


$V_{KA} = V_{REF}(1+R1/R2)+I_{REF}R1$

Fig.3. Test Circuit for I_{off}



Typical Application Circuit



Pad Location

Unit: μm

Pad No.	Pad Name	Description	X	Y
1	R	Reference	-314	-299
2	A	Anode	-75	-275
3	K	Cathode	231	-299

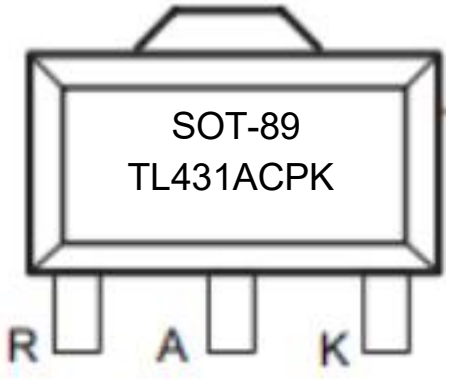
Physical Characteristic

Wafes dia	100 mm (4")
Wafes width	350 ±20μm
Scribe width	90 μm
Passivation	PSG

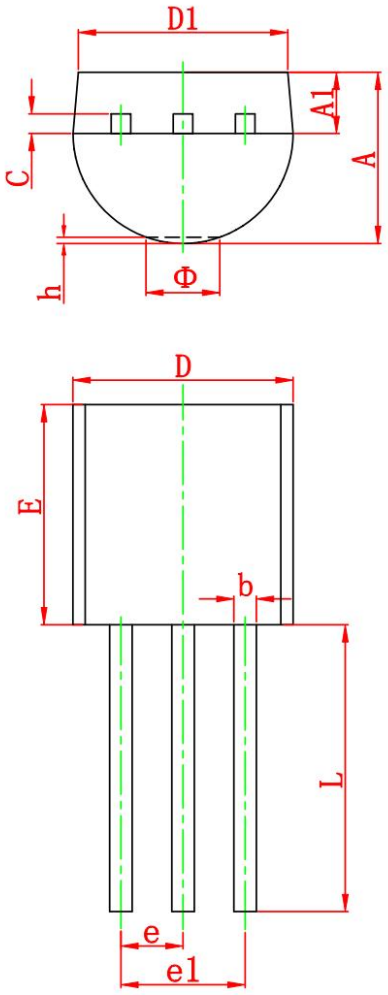
Ordering Information

Grade	Accuracy	Marking	Min.	Typ.	Max.
AA	± 0.5% of Typ.	431	2.488V	2.495V	2.513V
A	± 1 % of Typ.	431	2.475V	2.495V	2.525V
B	±2 % of Typ.	431	2.445V	2.495V	2.545V

Marking Instructions

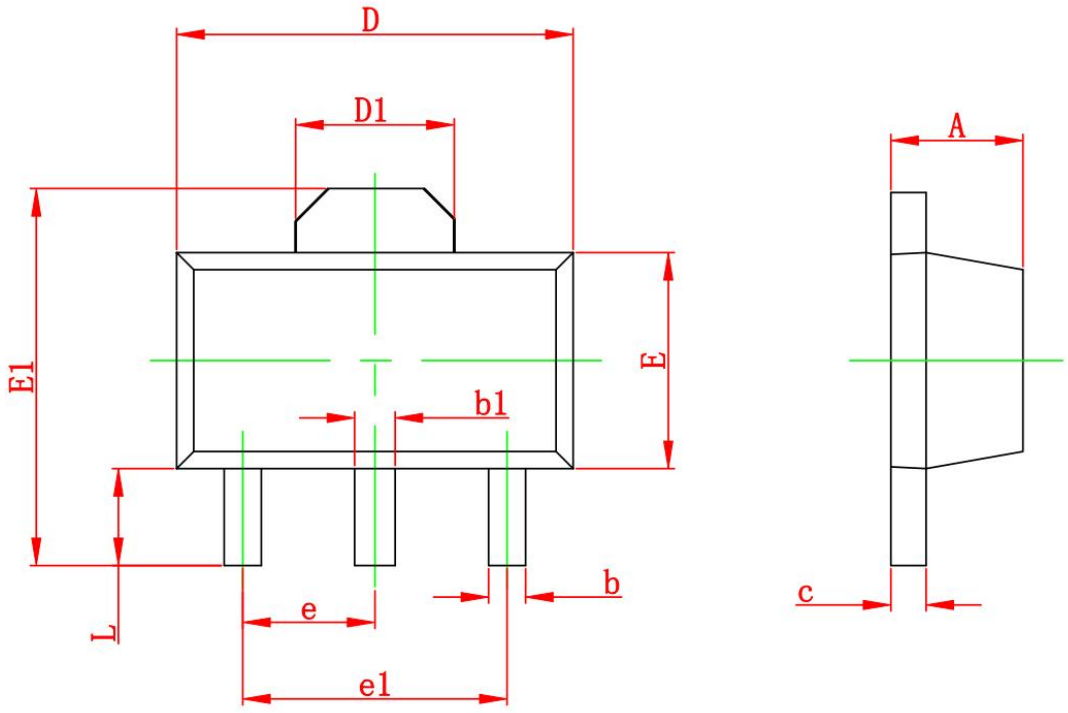


Package Outline Dimensions



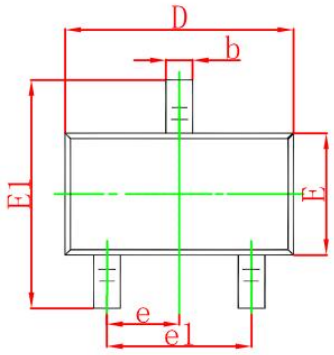
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

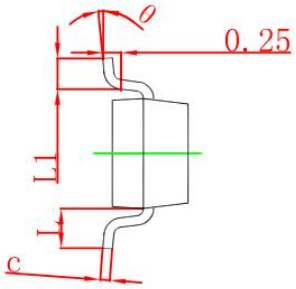
Package Outline Dimensions

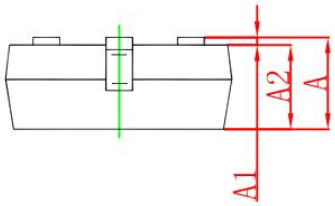


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP	
e1	3.000 TYP		0.118TYP	
L	0.900	1.200	0.035	0.047

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°