

**FEATURES**

Programmable Output Voltage to 40V  
 Low Dynamic Output Impedance 0.27 (Typ)  
 Sink Current Capability of 0.1mA to 100 mA  
 Equivalent Full-Range temperature Coefficient of 50 ppm/  
 Temperature Compensated for Operation over Full Rated Operating Temperature Range  
 Low Output Noise Voltage  
 Fast Turn on Response  
 TO-92, SOP-8, SOT-89 or SOT-23-3 packages

**DESCRIPTION**

The TL431 is a three-terminal adjustable regulator series with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between Vref (approximately 2.5 volts) and 40 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2 . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

The TL431 is characterized for operation from -0 to +70 .

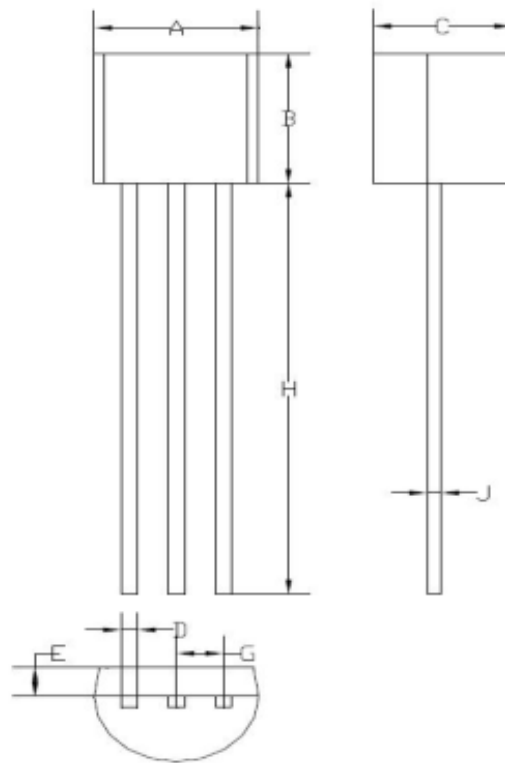
TO-92

1. REFERENCE  
 2. ANODE  
 3. CATHODE



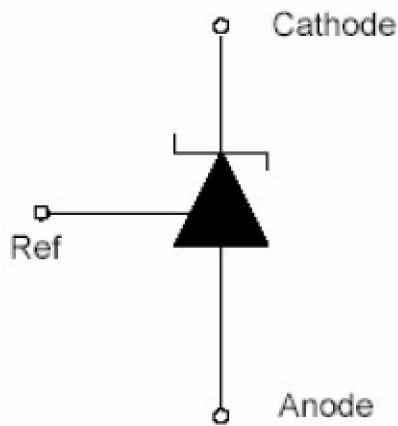
Pin Configuration

TO-92 Package Information

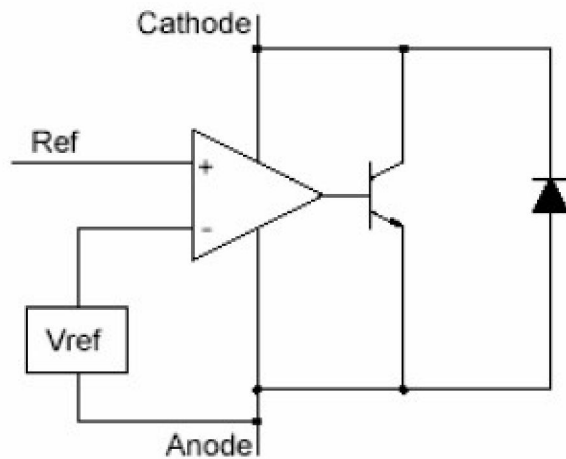


Symbol	Dimensions in Millimeters		
	MIN.	NOM.	MAX.
A	4.59	4.60	--
B	4.58	4.60	4.62
C	3.50	3.55	3.60
D	2.50	2.55	2.60
E	--	1.25	1.30
G	1.24	1.27	1.30
H	14.28	14.30	14.32
J	0.38		
All Dimensions in mm			

Symbol Diagram and Block Diagram



Symbol Diagram

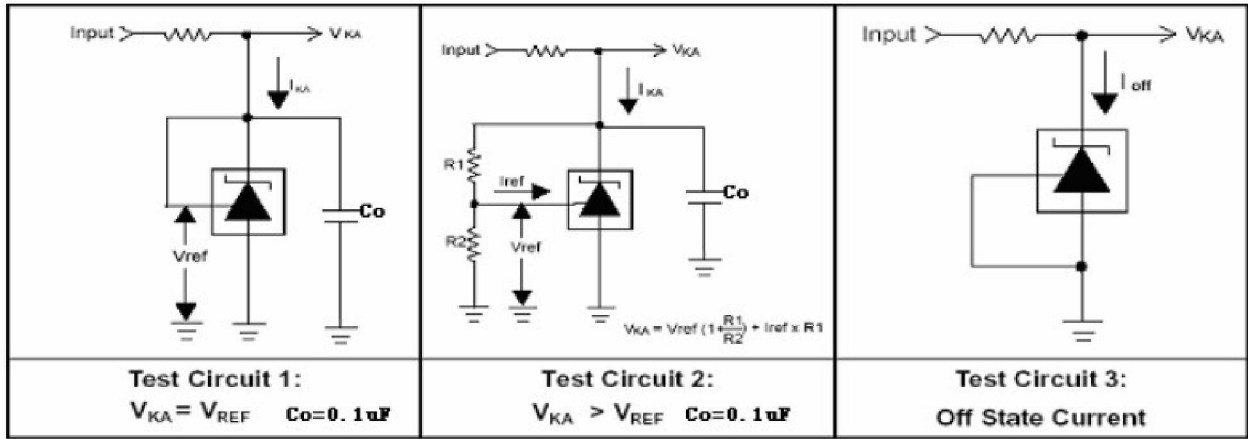


Block Diagram

<b>Absolute Maximum Ratings (Operating temperature range applies unless otherwise specified)</b>			
Characteristic	Symbol	Value	Unit
Cathode Voltage	$V_{KA}$	40	V
Continuous Cathode Current Range	$I_K$	-100 ~ 150	mA
Reference Input Current Range	$I_{REF}$	0.05 ~ 10	mA
Power Dissipation at 25 °C : TO-92 package ( $R_{JA}=178 \text{ } \mu\text{W/W}$ ) SOT-23-3 Package ( $R_{JA}=625 \text{ } \mu\text{W/W}$ )	PD	0.7 0.2	W W
Junction Temperature Range	$T_J$	0 ~ 150	
Operating Temperature Range	$T_g$	0 ~ 70	
Storage Temperature Range	$T_{STG}$	-65 ~ 150	

<b>Recommended Operating Conditions</b>					
Characteristic	Symbol	Min	Typ	Max	Unit
Cathode current	$I_K$	0.5		100	mA
Cathode voltage	$V_{KA}$	$V_{REF}$		40	V

Parameter Measurement Information



Electrical Characteristics						
$T_A = 25^\circ C$ , $V_{KA} = V_{REF}$ , $I_K = 10 \text{ mA}$ unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reference Input Voltage	$V_{REF}$	$I_K = 10 \text{ mA}$ , $V_{KA} = V_{REF}$	2.47	2.495	2.52	V
Deviation of Reference Input Voltage over Full Temperature Range	$V_{REF}$	$T_{min}$ $T_a$ $T_{max}$	-	3	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\frac{V_{REF}}{V_{KA}}$	$V_{KA} = 10 \text{ V to } V_{REF}$	-0.4	0.0	2.7	mV/V
		$V_{KA} = 36 \text{ V to } 10 \text{ V}$	-0.4	0.0	2.0	
Reference Input Current	$I_{REF}$	$R1 = 10 \text{ K}$ , $R2 =$	-	1.8	4	$\mu A$
Deviation of Reference Current over Full Temperature Range	$I_{i(DEV)}$	$R1 = 10 \text{ K}$ , $R2 =$	-	0.4	1.2	$\mu A$
Minimum Cathode Current for Regulation	$I_{Kmin}$		-	0.25	0.5	mA
Off-State Cathode Current	$I_{K off}$	$V_{KA} = 40 \text{ V}$ $V_{REF} = 0$	-	0.17	0.9	$\mu A$
Dynamic Impedance	$Z_{KA}$	$I_K = 10 \text{ mA to } 100 \text{ mA}$ , $f = 1.0 \text{ kHz}$	-	0.27	0.5	