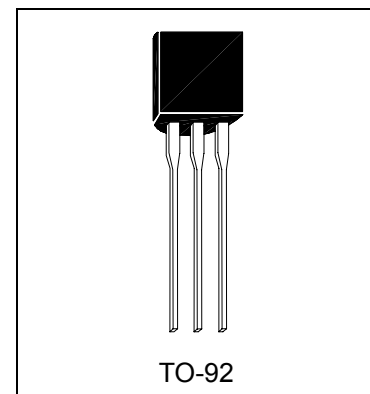


Adjustable Precision Shunt Regulators

TL431XA3

Description

The TL431 series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.495 volts) and 36 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.



Features

- Programmable output voltage
- Temperature coefficient is 50ppm/°C typical
- Temperature compensated for operation over full temperature range
- Low output noise voltage
- Fast turn on response
- Pb-free package

Classification

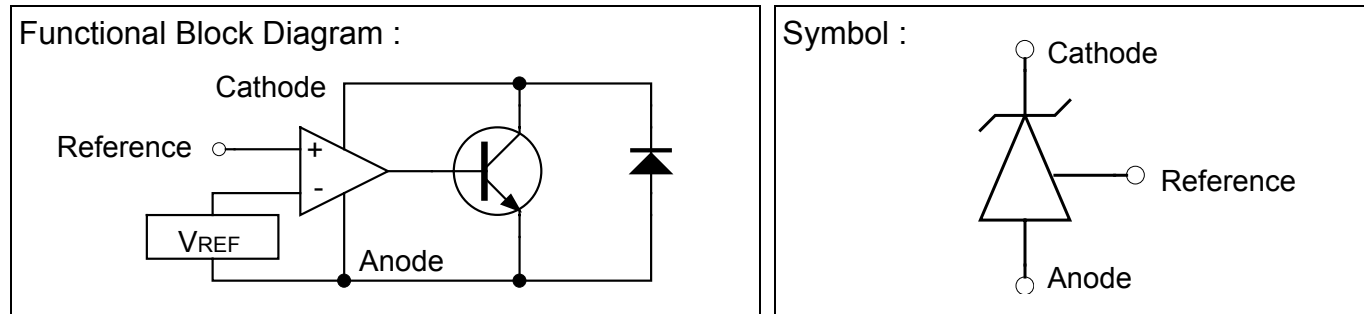
Rank	A	B	C
V_{REF}	$2.495 \pm 0.5\%$	$2.495 \pm 1\%$	$2.495 \pm 2\%$

Absolute Maximum Ratings

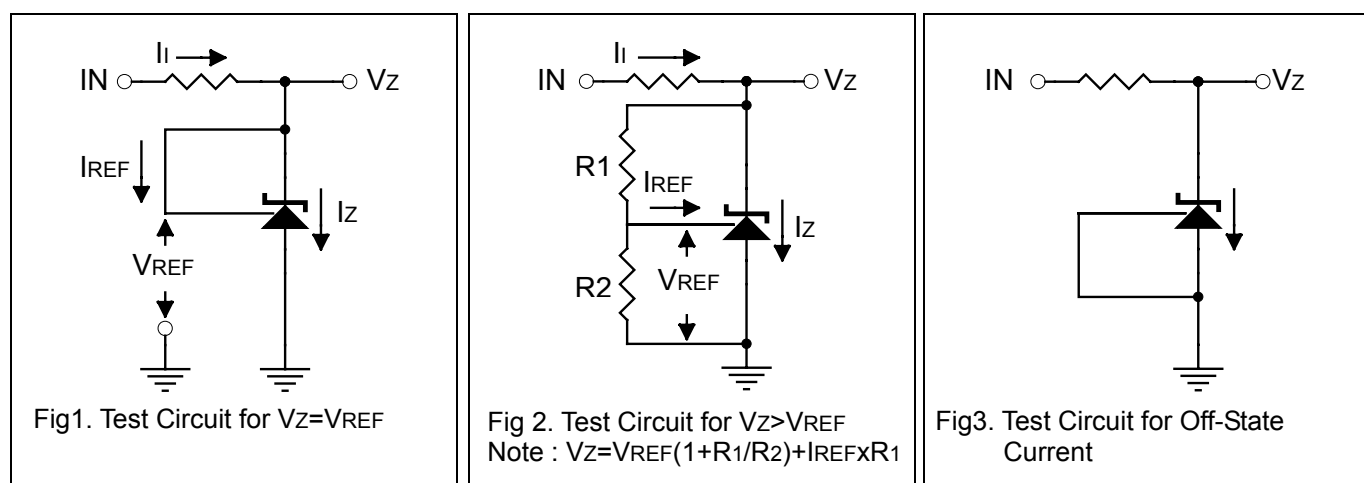
(Operating temperature range applies unless otherwise specified)

Characteristics	Symbol	Value	Unit
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_K	-100~+150	mA
Reference Input Current Range	I_{REF}	0.05~+10	mA
Power Dissipation	P_D	770	mW
Operating Temperature Range	T_{opr}	0~+70	°C
Storage Temperature Range	T_{stg}	-65~+150	°C

Functional Block Diagram & Symbol



Test Circuits

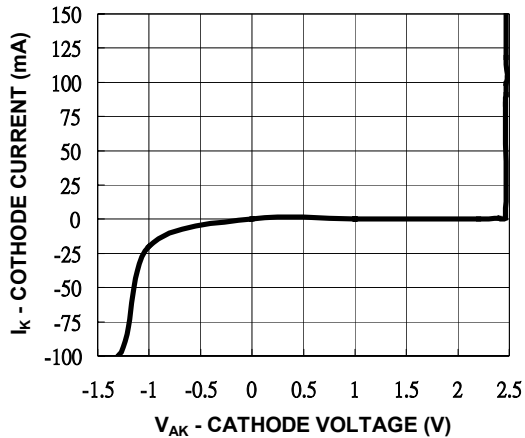


Electrical Characteristics ($T_a = 25^\circ\text{C}$ unless otherwise specified)

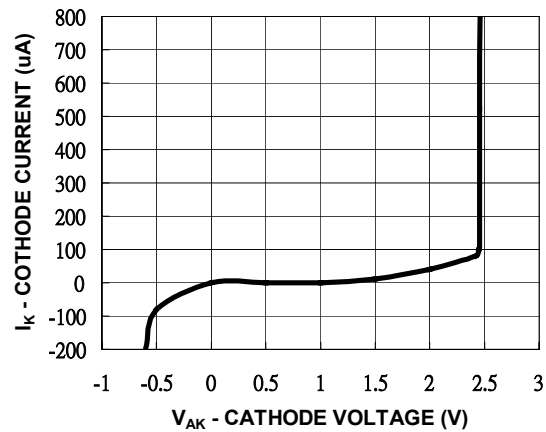
Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Input Voltage TL431A TL431B TL431C	V_{REF}	$V_{KA} = V_{REF}, I_K = 10\text{mA}$	2.445 2.470 2.480	2.495 2.495 2.495	2.545 2.520 2.510	V
Deviation of Reference Input Voltage Over-Temperature	$V_{REF(\text{dev})}$	$V_{KA} = V_{REF}, I_K = 10\text{mA}$ $T_{\min} \leq T_a \leq T_{\max}$	-	4	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF} / \Delta V_{KA}$	$I_K = 10\text{mA}, \Delta V_{KA} = 10\text{V} - V_{REF}$	-	-1.4	-2.7	mV
		$I_K = 10\text{mA}, \Delta V_{KA} = 36\text{V} - 10\text{V}$	-	-1.0	-2.0	V
Reference Input Current	I_{REF}	$I_K = 10\text{mA}, R_1 = 10\text{k}\Omega, R_2 = \infty$	-	2	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$I_{REF(\text{dev})}$	$I_K = 10\text{mA}, R_1 = 10\text{k}\Omega, R_2 = \infty, T_a = \text{Full Range}$	-	0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{K(\min)}$	$V_{KA} = V_{REF}$	-	0.4	1.0	mA
Off-State Cathode Current	$I_{K(\text{off})}$	$V_{KA} = 36\text{V}, V_{REF} = 0$	-	0.1	1.0	μA
Dynamic impedance	Z_{KA}	$V_{KA} = V_{REF}, f \leq 1.0\text{KHz}$ $I_K = 1 \text{ to } 100\text{mA}$	-	0.2	0.5	Ω

Characteristic Curves

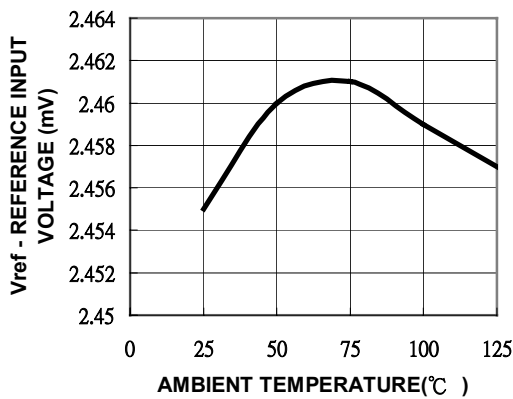
CATHODE CURRENT vs
CATHODE VOLTAGE



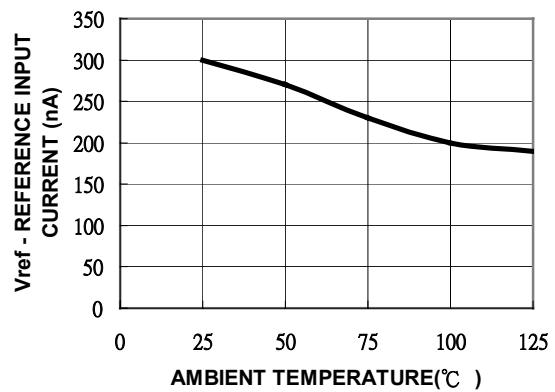
CATHODE CURRENT vs
CATHODE VOLTAGE



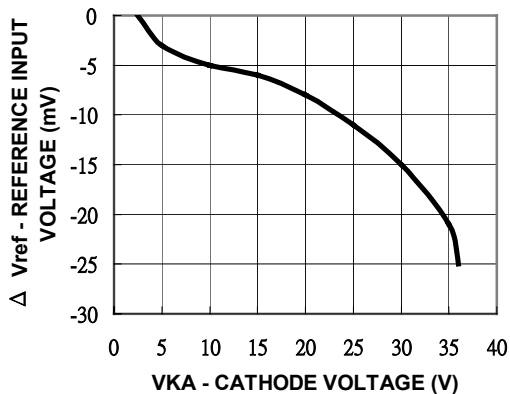
REFERENCE INPUT VOLTAGE
vs AMBIENT TEMPERATURE



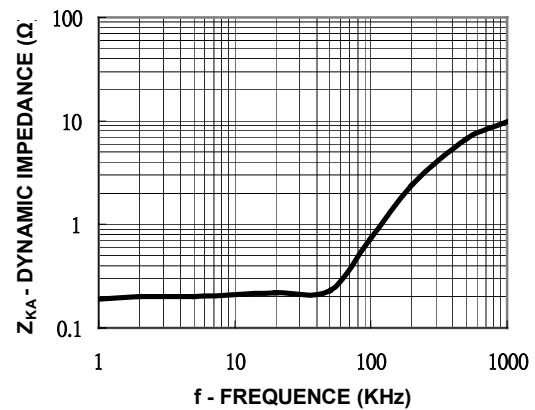
REFERENCE INPUT CURRENT
vs AMBIENT TEMPERATURE



CATHODE VOLTAGE vs REFERENCE
INPUT VOLTAGE

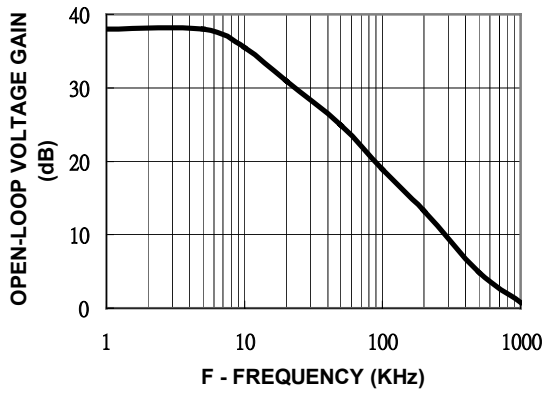


DYNAMIC IMPEDANCE vs FREQUENCY

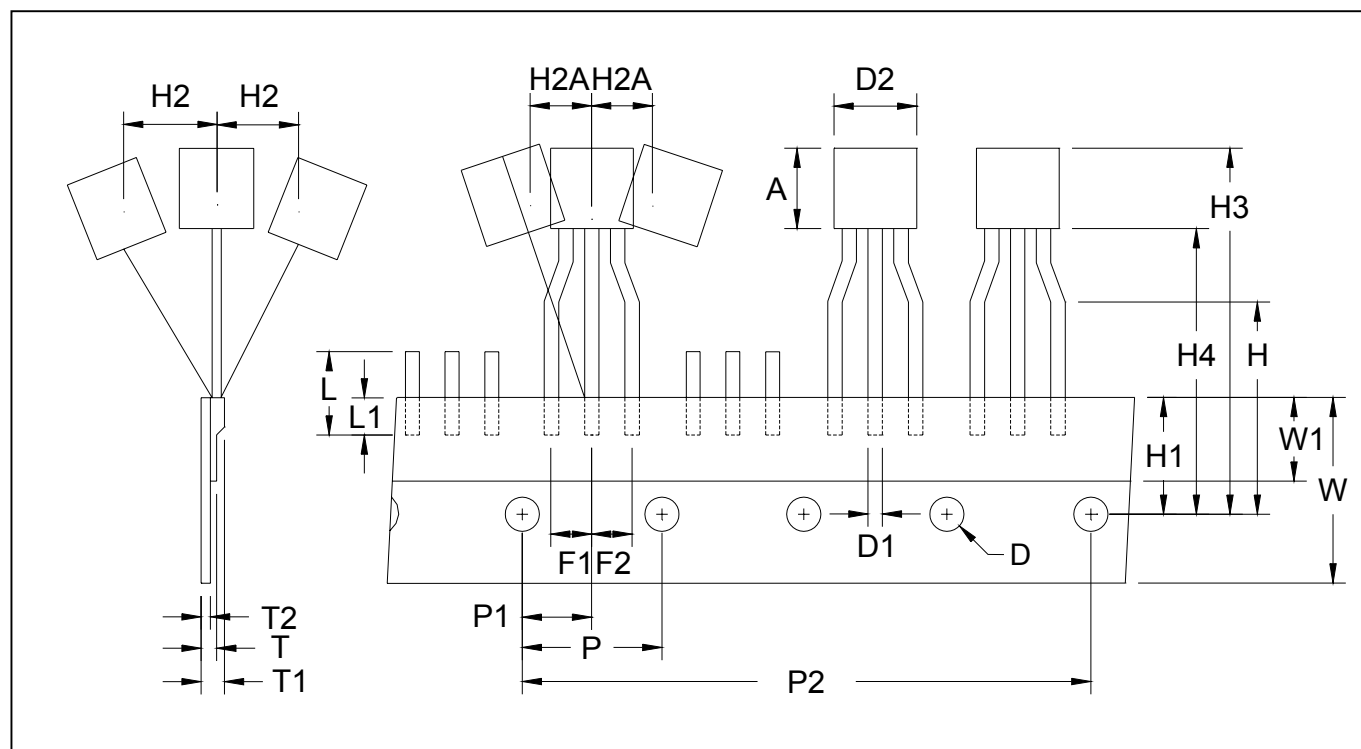




**OPEN-LOOP VOLTAGE GAIN
vs FREQUENCY**

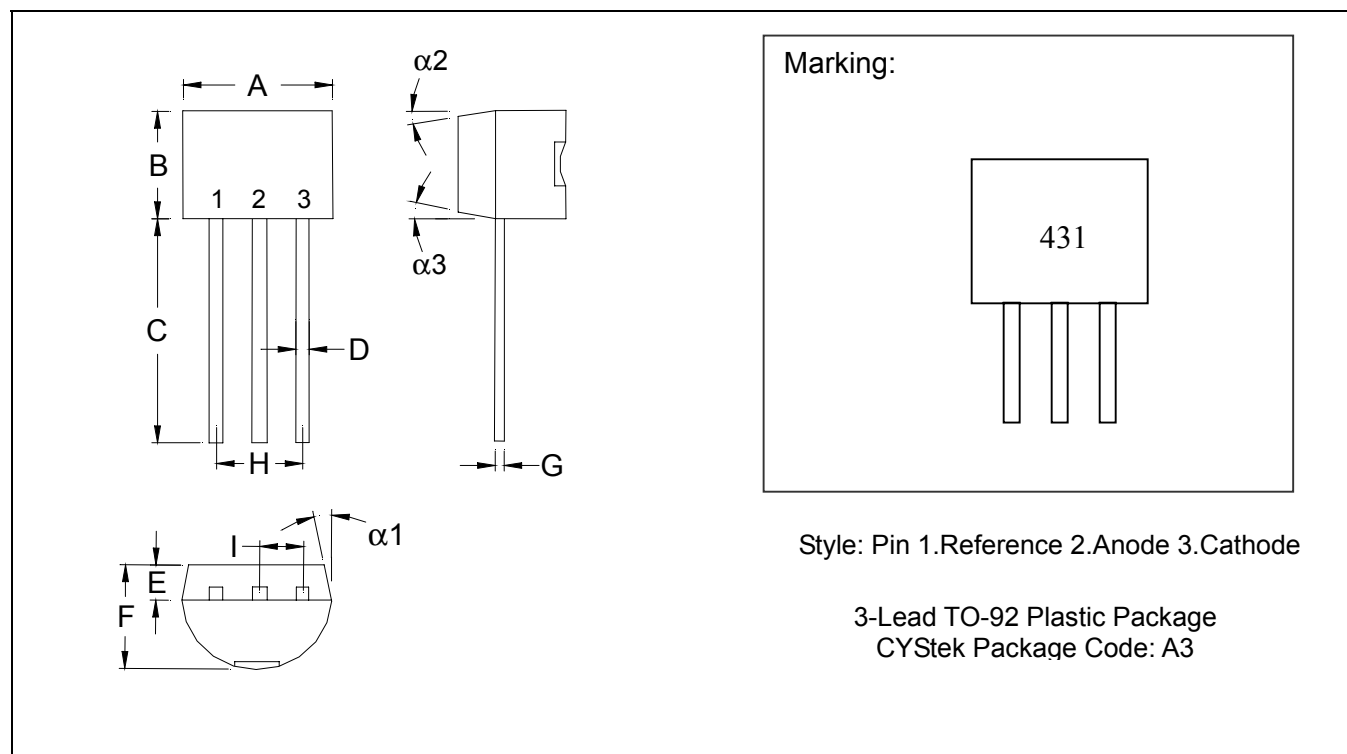


TO-92 Taping Outline



DIM	Item	Millimeters	
		Min.	Max.
A	Component body height	4.33	4.83
D	Tape Feed Diameter	3.80	4.20
D1	Lead Diameter	0.36	0.53
D2	Component Body Diameter	4.33	4.83
F1,F2	Component Lead Pitch	2.40	2.90
F1,F2	F1-F2	-	±0.3
H	Height Of Seating Plane	15.50	16.50
H1	Feed Hole Location	8.50	9.50
H2	Front To Rear Deflection	-	1
H2A	Deflection Left Or Right	-	1
H3	Component Height	-	27
H4	Feed Hole To Bottom Of Component	-	21
L	Lead Length After Component Removal	-	11
L1	Lead Wire Enclosure	2.50	-
P	Feed Hole Pitch	12.50	12.90
P1	Center Of Seating Plane Location	5.95	6.75
P2	4 Feed Hole Pitch	50.30	51.30
T	Over All Tape Thickness	-	0.55
T1	Total Taped Package Thickness	-	1.42
T2	Carrier Tape Thickness	0.36	0.68
W	Tape Width	17.50	19.00
W1	Adhesive Tape Width	5.00	7.00
-	20 pcs Pitch	253	255

TO-92 Dimension



*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1704	0.1902	4.33	4.83	G	0.0142	0.0220	0.36	0.56
B	0.1704	0.1902	4.33	4.83	H	-	*0.1000	-	*2.54
C	0.5000	-	12.70	-	I	-	*0.0500	-	*1.27
D	0.0142	0.0220	0.36	0.56	$\alpha 1$	-	*5°	-	*5°
E	-	*0.0500	-	*1.27	$\alpha 2$	-	*2°	-	*2°
F	0.1323	0.1480	3.36	3.76	$\alpha 3$	-	*2°	-	*2°

Notes: 1.Controlling dimension: millimeters.

2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.

3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: 42 Alloy ; solder plating
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

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