

Description

The TL431ACLP-CN is a programmable shunt voltage reference with guaranteed temperature stability over the entire temperature range of operation. The output voltage may be set to any value between 2.5V and 36V with two external resistors.

The TL431ACLP-CN operates with a wide current range from 1 to 100mA with a typical dynamic impedance of 0.22Ω.

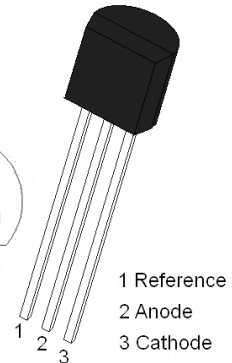
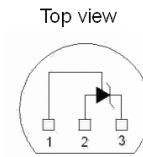
Features

- Adjustable Output Voltage : 2.5 to 36V
- Sink Current Capability: 1 to 100mA
- Typical Output Impedance: 0.22Ω
- 0.5% ,1% And 2% Voltage Precision

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Cathode to Anode Voltage	V_{KA}	37	V
Continuous Cathode Current Range	I_K	-100 to +150	mA
Reference Input Current Range	I_{ref}	-0.05 to +10	μA
Power Dissipation	P_D	625	mW
Storage Temperature Range	T_{STG}	-55 ~ + 150	°C

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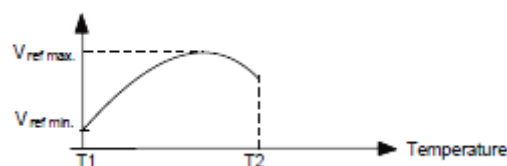


Electrical Characteristics $T_{amb} = 25^{\circ}\text{C}$ (unless otherwise specified)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Reference Input Voltage	V_{ref}	$V_{KA} = V_{ref}$ $I_K = 10\text{mA}$ $T_{min} \leq T_{amb} \leq T_{max}$	2.44	2.495	2.55	V
Reference Input Voltage Deviation Over-Temperature Range - Note 1	ΔV_{ref}	$V_{KA} = V_{ref}$, $I_K = 10\text{mA}$, $T_{min} \leq T_{amb} \leq T_{max}$		3	17	mV
Ratio of Change in Reference Input Voltage to Change in Cathode to Anode Voltage - (figure 2)	$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	$I_K = 10\text{mA}$, $\Delta V_{KA} = 10\text{V to } V_{ref}$		-1.4	-2.7	mV/V
		$\Delta V_{KA} = 36\text{V to } 10\text{V}$		-1	-2	
Reference Input Current	I_{ref}	$I_K = 10\text{mA}$ $R_1 = 10\text{k}\Omega$ $R_2 = \infty$ $T_{min} \leq T_{amb} \leq T_{max}$		1.8	4	μA
Reference Input Current Deviation Over Temperature Range	ΔI_{ref}	$I_K = 10\text{mA}$, $R_1 = 10\text{k}\Omega$, $R_2 = \infty$ $T_{min} \leq T_{amb} \leq T_{max}$		0.4	1.2	μA
Minimum Cathode Current for Regulation	I_{min}	$V_{KA} = V_{ref}$		0.5	1	mA
Off-State Cathode Current	I_{off}			2.6	1000	nA
Dynamic Impedance - Note 2	$ Z_{KA} $	$V_{KA} = V_{ref}$, $\Delta I_K = 1 \text{ to } 100\text{mA}$, $f \leq 1\text{kHz}$		0.22	0.5	Ω

Notes:

- 1) ΔV_{ref} is defined as the difference between the maximum and minimum values obtained over the full temperature range.
 $\Delta V_{ref} = V_{ref \text{ max.}} - V_{ref \text{ min.}}$



- 2) The dynamic Impedance is defined as $|Z_{KA}| = \Delta V_{KA} / \Delta I_K$

Test Circuits

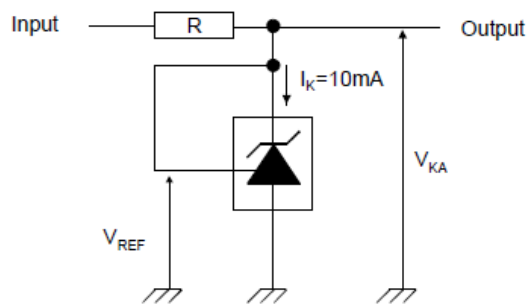
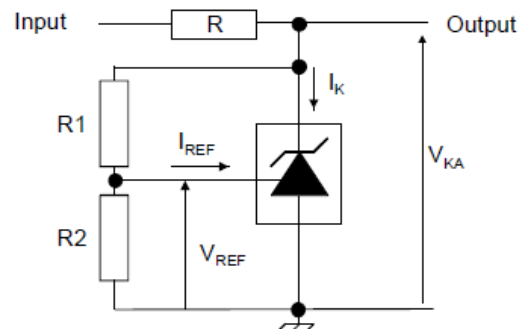


Figure 1 : Test Circuit for $V_{KA} = V_{REF}$



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

Figure 2 : Test Circuit for $V_{KA} > V_{REF}$

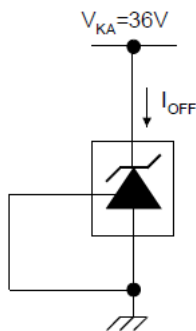


Figure 3 : Test Circuit for I_{OFF}

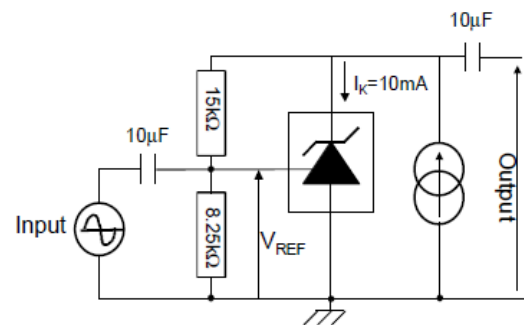


Figure 4 : Test Circuit for Phase Margin and Voltage Gain

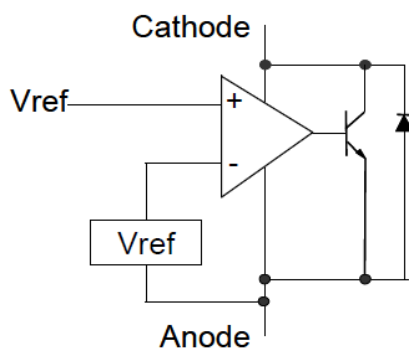


Figure 5 : Block diagram

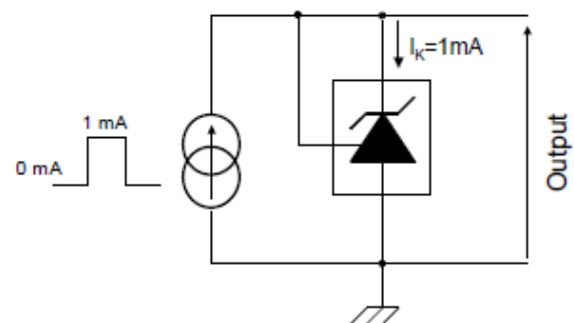


Figure 6 : Test Circuit for Response time

Typical Characteristics

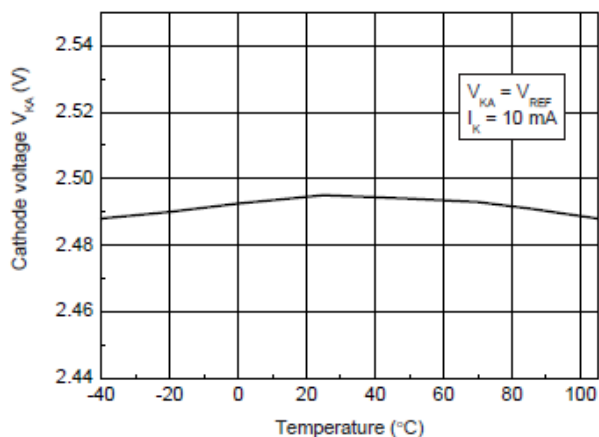


Figure 7. Reference voltage vs Temperature

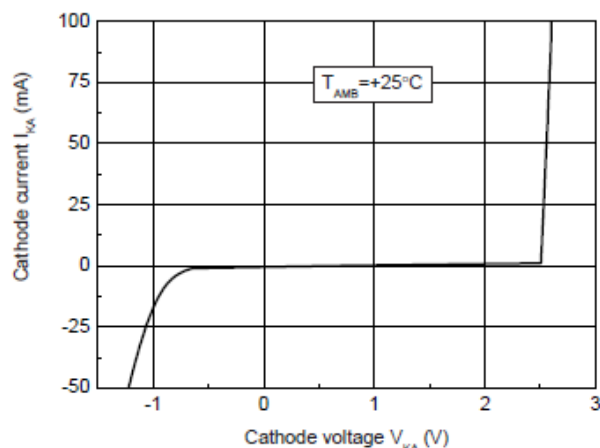


Figure 8. Reference voltage vs cathode current

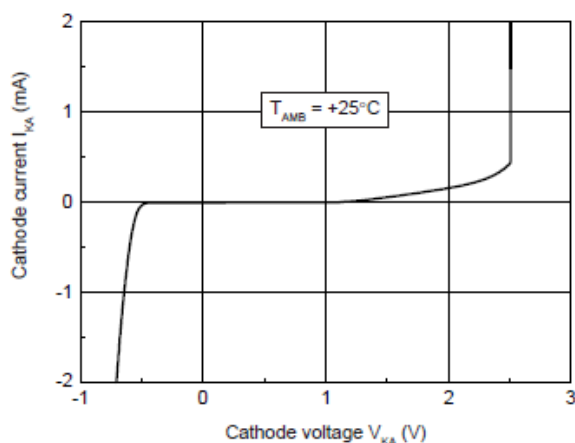


Figure 9. Reference voltage vs cathode current

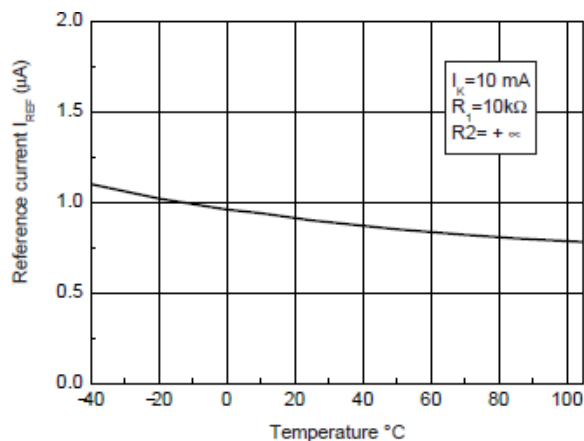


Figure 10. Reference current vs temperature

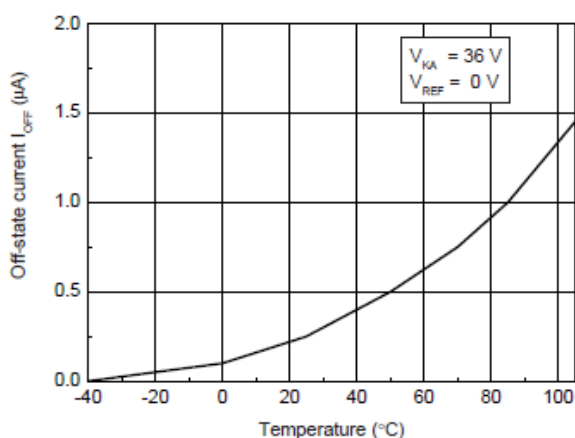
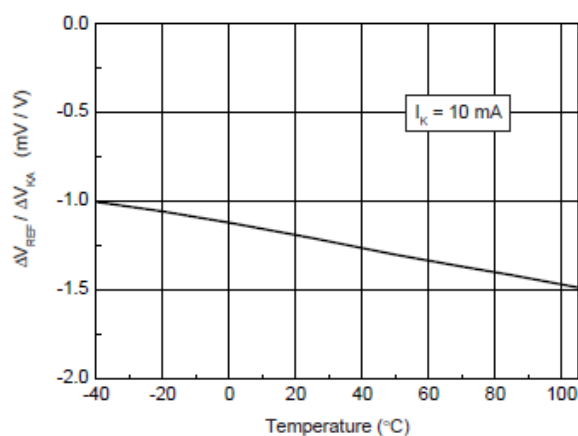
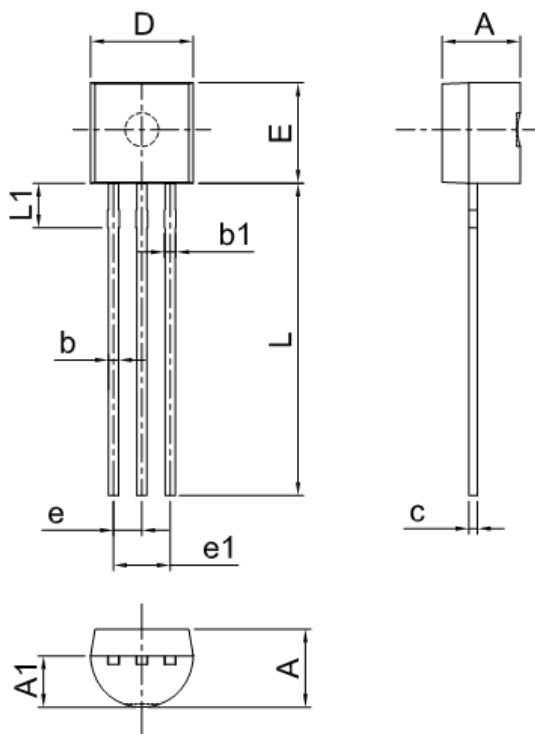


Figure 11. Off-state cathode current vs temperature


Figure 12. Ratio of change in V_{REF} to change in V_{KA} vs Temperature

Package Dimensions


Symbol	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	3.30	3.70	0.130	0.146
A1	2.30	2.70	0.091	0.106
b	0.40	0.50	0.016	0.020
b1	0.50	0.70	0.020	0.028
c	0.35	0.45	0.014	0.018
D	4.45	4.70	0.175	0.185
E	4.40	4.65	0.173	0.183
e	1.17	1.37	0.046	0.054
e1	2.34	2.64	0.092	0.104
L	13.50	14.50	0.531	0.571
L1	1.80	2.20	0.071	0.087

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