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# TL431X

## Programmable Precision Shunt Regulator

### SOT-89

1. REFERENCE  
2. ANODE  
3. CATHODE

DIM	DIMENSINS				NOTES
	INCHES		MM		
A	MIN	MAX	MIN	MAX	
A	.173	.181	4.39	4.60	
B	.063	.071	1.60	1.80	
C	.154	.165	3.91	4.19	
D	.031	.039	0.80	1.00	
E	.092	.100	2.34	2.54	
F	.118	----	3.00	----	TYP
G	.013	.019	0.33	0.48	
H	.015	.021	0.38	0.53	
J	.015	.016	0.38	0.41	
K	.055	.063	1.40	1.60	

### Features

- Output voltage can be adjusted to 36V
- Trapping current capability is 1 to 100 mA
- The effective temperature compensation in the working range of full temperature

### Maximum Ratings @ T<sub>opr</sub> Applies Unless Otherwise Noted

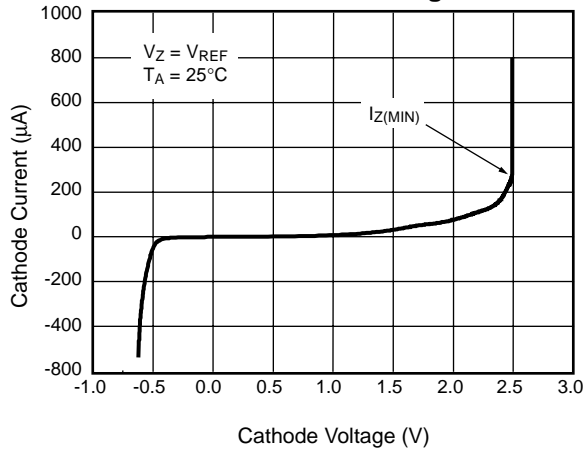
Parameter	Symbol	Value	Unit
Input Voltage (Vo=5.8V)	V <sub>1</sub>	37	V
Operating Junction Temperature	T <sub>opr</sub>	0---70	°C
Storage Temperature Range	T <sub>stg</sub>	-55---+150	°C

### Electrical Characteristics @ 25 °C Unless Otherwise Specified

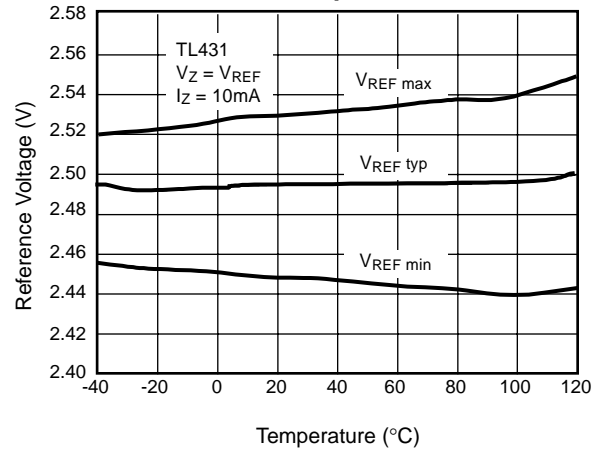
Parameter	Sym	Min	Typ	Max	Test conditions
Reference Input Voltage	V <sub>ref</sub>	2.44V 0V	2.49V 5V	2.55V 0V	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA
Deviation of reference input voltage	$\Delta V_{ref}/\Delta T$		4.5mV	17mV	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA T <sub>min</sub> ≤ T <sub>a</sub> ≤ T <sub>max</sub>
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{ref}/\Delta V_{KA}}$		-1.0	-2.7	$\Delta V_{KA} = 10V \sim V_{ref}$ $\Delta V_{KA} = 36V \sim 10V$ I <sub>KA</sub> =10mA
Reference Input Current	I <sub>ref</sub>		1.5uA	4uA	I <sub>KA</sub> =10mA, R1=10KΩ R2=∞
Deviation of Reference Input Current Over Full Temperature Range	$\Delta I_{ref}/\Delta T$		0.4uA	1.2uA	I <sub>KA</sub> =10mA, R1=10KΩ R2=∞ T <sub>A</sub> =full Temperature
Minimum Cathode Current for Regulation	I <sub>KA(min)</sub>		0.45m A	1.0mA	V <sub>KA</sub> =V <sub>REF</sub>
Off-State Cathode Current	I <sub>KA(OFF)</sub>		0.05uA	1.0uA	V <sub>KA</sub> =36V, V <sub>REF</sub> =0V
Dynamic Impedance	Z <sub>KA</sub>		0.15Ω	0.5Ω	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =1 to 100mA, f ≤ 1.0KHz

\*Note: Bypass Capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators

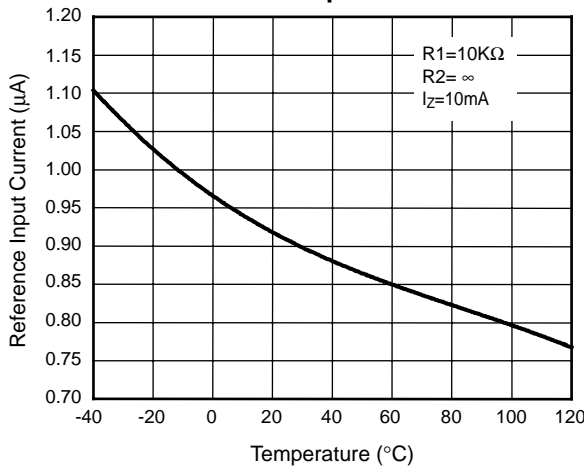
**Fig. 1 – Cathode Current vs. Cathode Voltage**



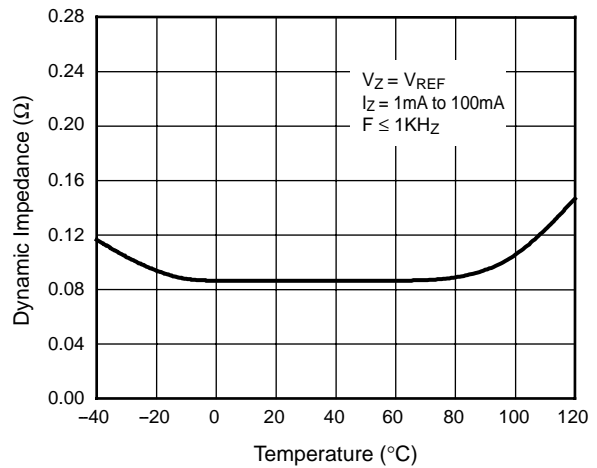
**Fig. 2– Reference Voltage vs. Temperature**



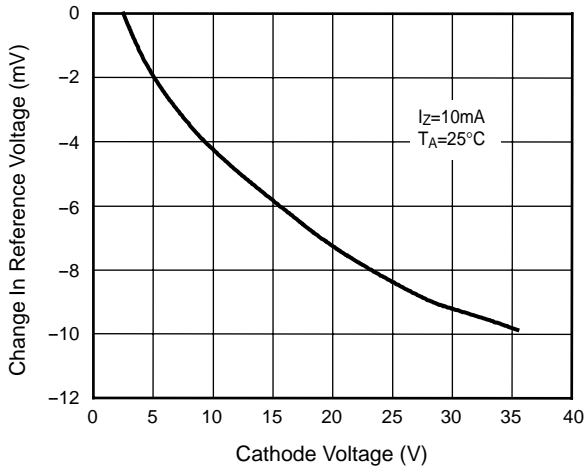
**Fig. 3 – Reference Input Current vs. Temperature**



**Fig. 4 – Dynamic Impedance vs. Temperature**



**Fig. 5 – Change in Reference Voltage vs. Cathode Voltage**



**Fig. 6 – Off-State Cathode Current vs. Temperature**

