

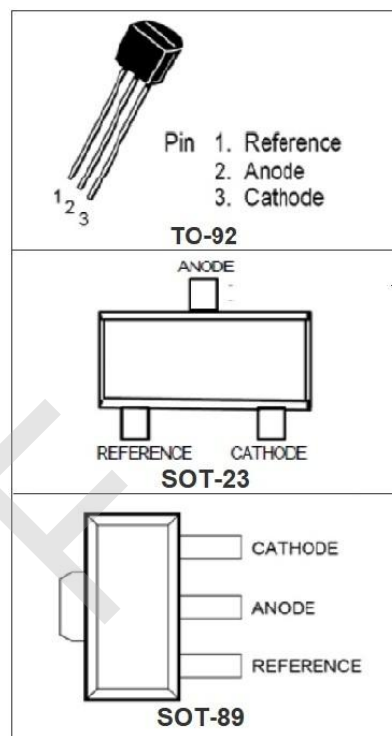
Programmable Shunt Regulator TL431

Description

The TL431 is a three-terminal adjustable shunt regulator with specified thermal stability. The output voltage may be set to any value between V_{REF} (Approx. 2.495V) and 36V with two external resistors. This device has a typical output impedance of 0.2Ω . Active output circuitry provides a very sharp turn-on characteristic, making this device an excellent replacement for zener diodes in many applications.

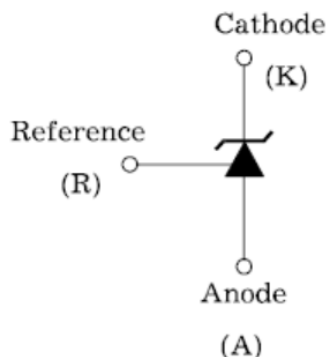
Features

- Equivalent Full Range Temperature Coefficient 50PPM/°C
- Temperature Compensated For Operation Over Full Rate Operating Temperature Range
- Adjustable Output Voltage
- Fast Turn-on Response
- Sink Current Capability 1 mA to 100 mA
- Low (0.27Ω Typ.) Dynamic Output Impedance
- Low Output Noise
- Available in TO-92, SOT-89 or SOT-23 packages

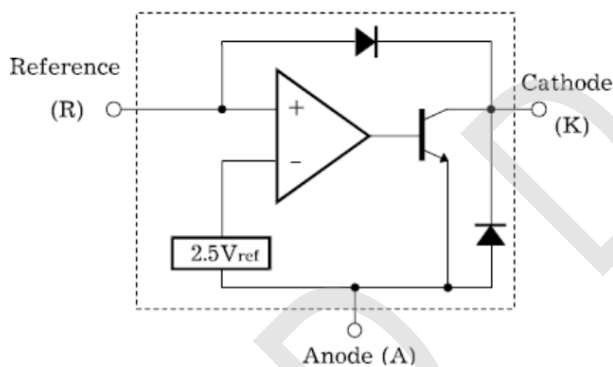


in Assignments

Symbol



Functional Block Diagram



Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified)

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	PD	TO -92	770	mW
		SOT-23	300	
		SOT-89	500	
Junction Temperature Range	T _J	150		°C
Operating Temperature Range	TOPR	-40~ +125		°C
Storage Temperature Range	T _{stg}	-65 ~ +150		°C

Recommended Operating Conditions

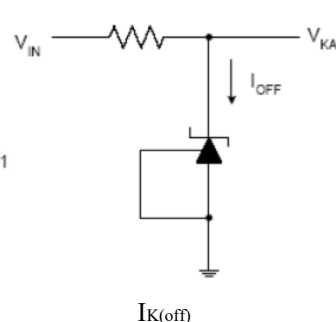
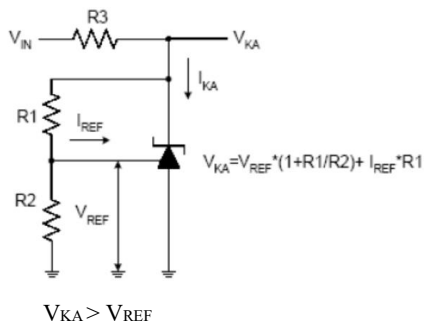
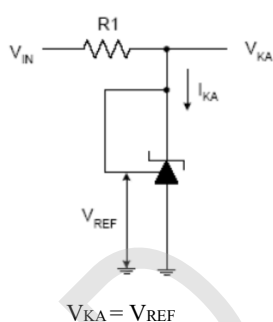
Parameter	Symbol	Min	Max	Unit
Cathode Voltage	V _{KA}	V _{REF}	40	V
Cathode Current	I _{KA}	0.1	100	mA

Electrical Characteristics

(T_a=25°C, V_{KA}= V_{REF}, I_K=10 mA unless otherwise specified)

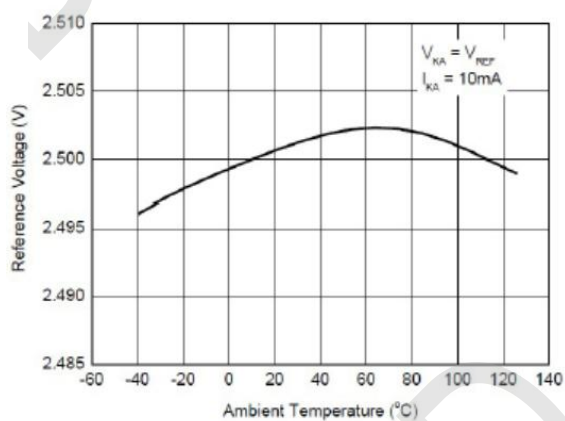
Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
References Input Voltage	V _{REF}	V _{KA} = V _{REF} , I _K =10 mA	2.483	2.495	2.507	V
Deviation of Reference Input Voltage Over Full Temperature Range	V _{REF(dev)(1)}	T _{min} ≤T _a ≤T _{max}		3	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$\Delta V_{KA}=10V-V_{REF}$ $\Delta V_{KA}=36V-10V$	-0.4 -0.4		2.7 2.0	mV/V
References Input Current	I _{REF}	R ₁ =10KΩ, R ₂ =∞		1.8	4.0	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		0.17	0.9	μA
Dynamic Impedance	Z _{KA}	I _K =1.0mA to 100 mA f≤1.0KHz		0.27	0.5	Ω

Test Circuit

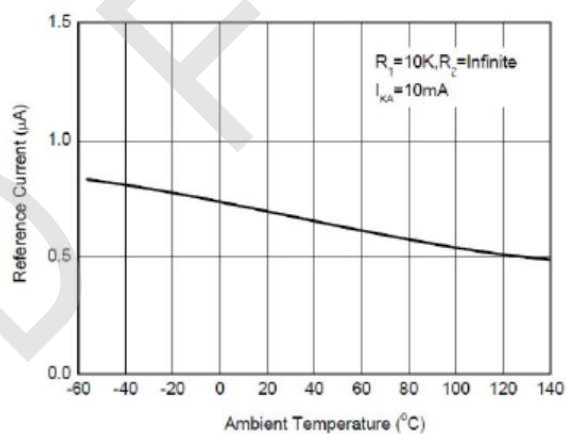


Typical Performance Characteristics

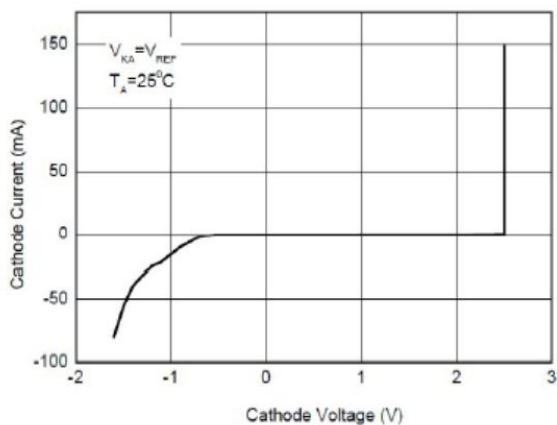
Reference Voltage vs. Ambient Temperature



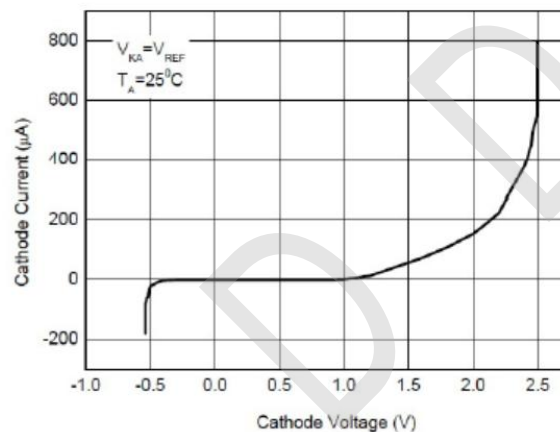
Reference Current vs. Ambient Temperature



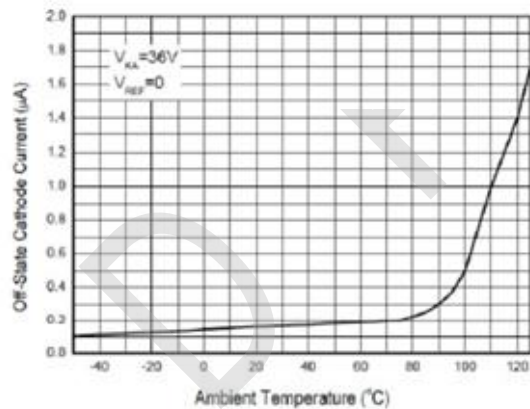
Cathode Current vs. Cathode Voltage



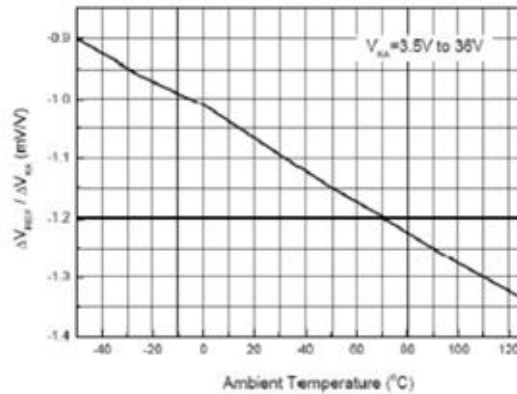
Cathode Current vs. Cathode Voltage



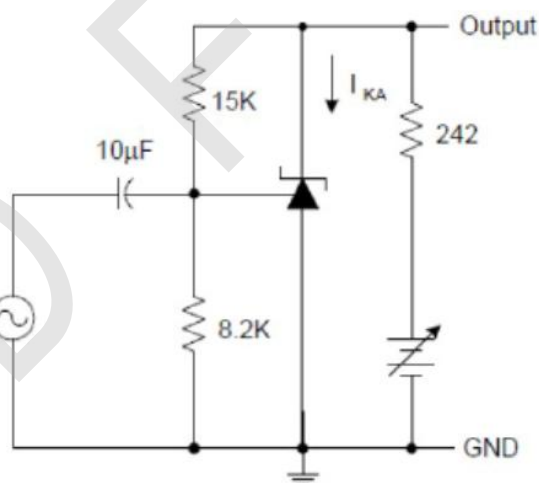
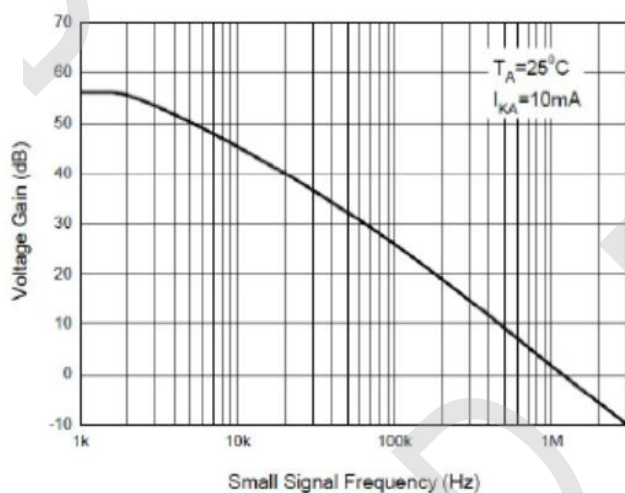
Off-State Cathode Current vs. Ambient Temperature



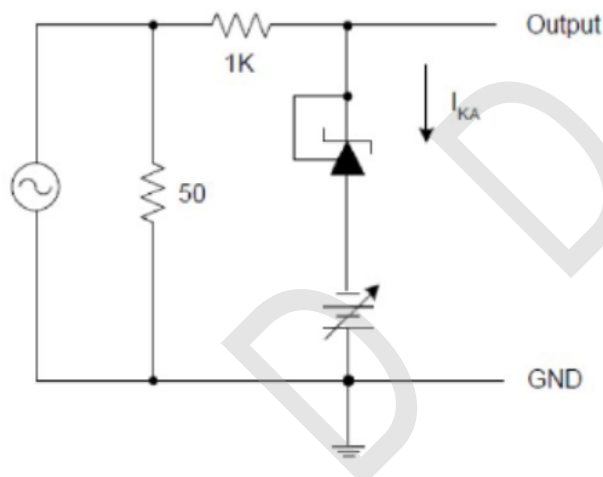
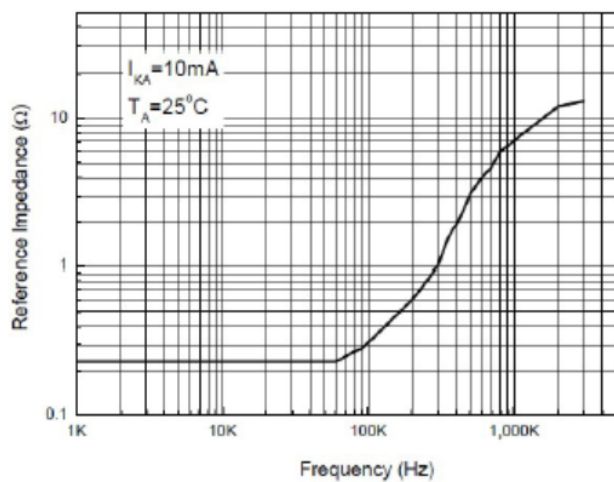
Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage



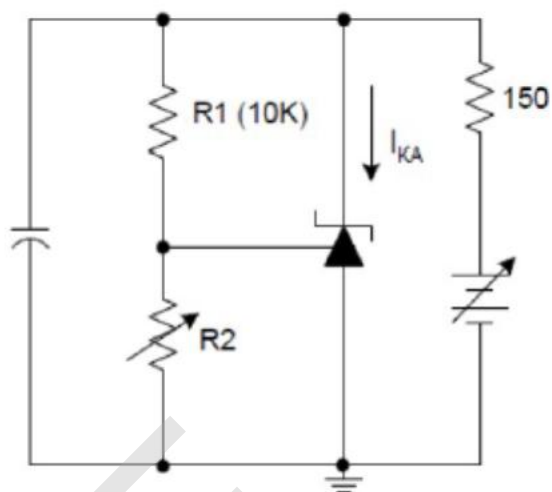
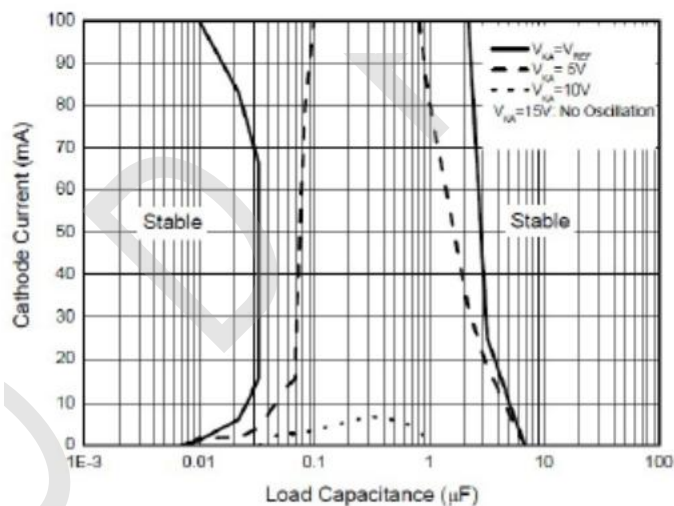
Small Signal Voltage Gain vs. Frequency



Reference Impedance vs. Frequency



Stability Boundary Conditions vs. Load Capacitance



Pulse Response of Input and Output Voltage

