

Adjustable shunt voltage reference IC

General Description:

The uP431 series ICs are three-terminal adjustable shunt regulators with guaranteed thermal stability over a full operation range. These ICs feature very sharp turn-on characteristics, low temperature coefficient and low output impedance, which make them ideal substitutes for Zener diodes in applications such as switching power supply, charger, and other adjustable regulators.

The uP431 is especially suitable for industry applications types.

The uP431 precision reference is offered in two band- gap tolerance: A: 0.4% and B:1%.

The uP431 are characterized for operation from – 40°C to 125°C.

Features:

- Reference Voltage Tolerance at 25°C
 - 0.4% (A Grade)
 - 1% (B Grade)
- Adjustable Output Voltage: V_{REF} to 46 V
- Operation From –40°C to 125°C
- Typical Temperature Drift
 - 6mV (-40 to 85°C)
 - 14 mV (-40 to 125°C)
- Low Output Noise
- Sink-Current Capability: 1 mA to 100 mA

Applications:

- Precision Voltage Reference
- Switching Power Supply
- Charger
- Voltage Adapter
- Adjusted Power Supply

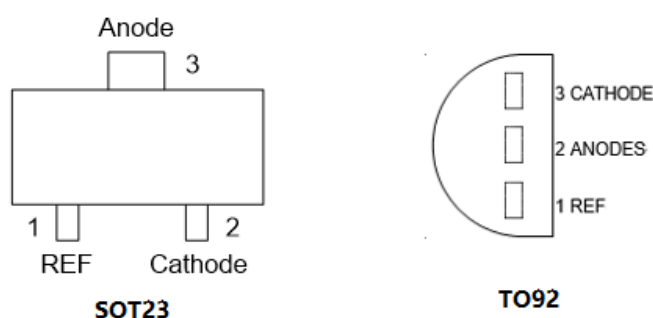


Figure 1. Package types of uP431

Ordering Information

Device Name	Package Types	Accuracy	Mark ID	Operating Free-Air Temperature (TA)
uP431AN	SOT23	0.4%	GB3	-40°C to 125°C
uP431BN	SOT23	1%	GB6	
uP431AZ	TO-92	0.4%	uP431AZ	
uP431BZ	TO-92	1%	uP431BZ	

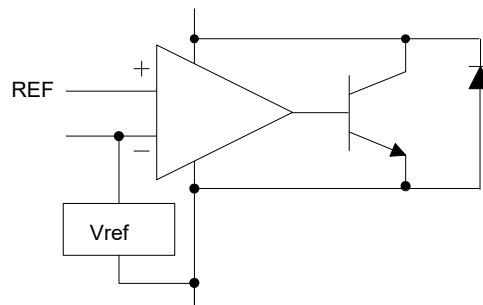
Functional Block Diagram:

Figure 2. Functional Block Diagram of uP431

Absolute Maximum Ratings:

(Operation temperature range applies unless otherwise specified.)

Parameter	Symbol	Range	Unit
Cathode voltage	V_{KA}	46	V
Continuous cathode current	I_{KA}	-100 to 150	mA
Reference input current range	I_{REF}	-0.05 to 10	mA
Maximum junction temperature	T_{JMAX}	150	°C
Maximum lead temperature	T_{LEAD}	260	°C
Storage temperature	T_{STG}	-65 to 150	°C
Thermal resistance SOT23	θ_{JC}	76	°C/W
ESD rating	CDM	+/-1000	V

Note: 1. Absolute maximum ratings indicate stresses beyond which may cause permanent damage to the device.

Recommended Operation Ratings:

Parameter	Symbol	Min.	Max.	Unit
Cathode Voltage	V_{KA}	V_{REF}	46	V
Cathode Current	I_{KA}	1.0	100	mA
Operating Ambient Temperature Range		-40	125	°C

Adjustable shunt voltage reference IC

Electrical Characteristics:(Typical and limits appearing in normal tape apply for $T_J=25^{\circ}\text{C}$ unless otherwise noted.)

Parameter		Test Circuit	Symbol	Conditions		UP431			Unit
						Min.	Typ.	Max.	
Reference Voltage	A: 0.4%	Fig.3	V _{REF}	V _{KA} =V _{REF} I _{KA} =10mA		2.490	2.500	2.510	V
	B: 1%					2.475	2.500	2.525	
Deviation of Reference Voltage Over-Temperature		Fig.3	ΔV _{REF}	V _{KA} =V _{REF} I _{KA} = 10mA	-40 to 85°C	-	6	12	mV
				-40 to 125°C	-	6	20		
Ratio of Change in Reference Voltage to the Change in Cathode Voltage		Fig.4	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I _{KA} =10mA	ΔV _{KA} = 10V to V _{REF}	-	-1.0	-2.7	mV/V
					ΔV _{KA} = 46V o 10V	-	-0.5	-2.0	
Reference Current		Fig.4	I _{REF}	I _{KA} =10mA, R1=10kΩ, R2=∞		-	0.7	4	μA
Deviation of Reference Current Over Full Temperature Range		Fig.4	ΔI _{REF}	I _{KA} =10mA, R1=0KΩ, R2=∞ T _A =-40 to 105°C		-	0.4	1.2	μA
Minimum Cathode Current for Regulation		Fig.4	I _{KA} (MIN)	V _{KA} =V _{REF}		-	0.4	0.6	mA
Off-State Cathode Current		Fig.5	I _{KA} (OFF)	V _{KA} =46 V, V _{REF} =0			0.1	0.5	μA
Dynamic Impedance		Fig.3	Z _{KA}	V _{KA} =V _{REF} , I _{KA} =1 to 100mA f≤1.0kHz		-	0.2	0.5	Ω

Parameter Measurement Information

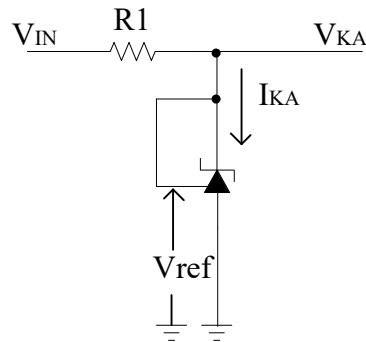


Figure 3. Test Circuit for $V_{KA}=V_{ref}$

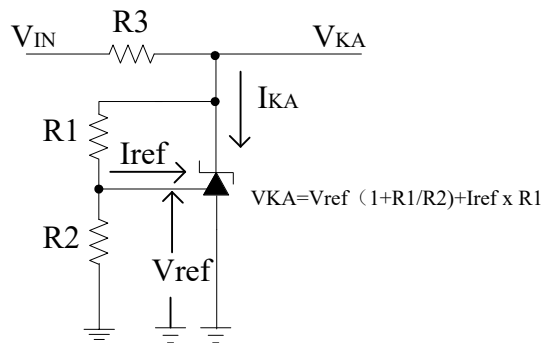


Figure 4. Test Circuit for $V_{KA}>V_{ref}$

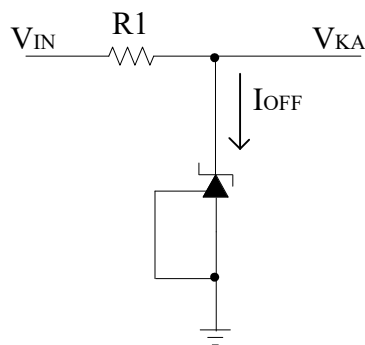
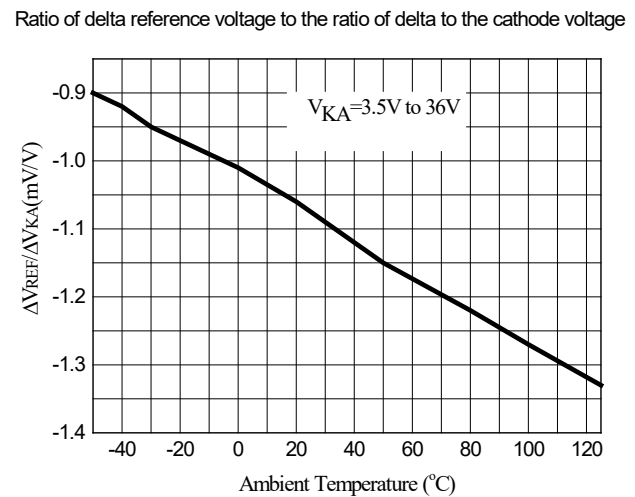
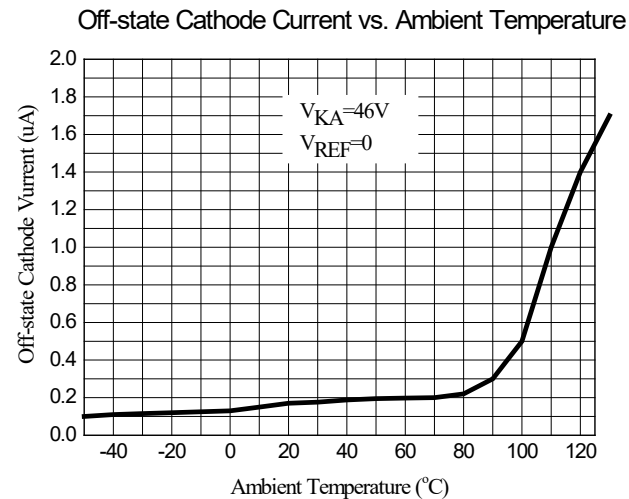
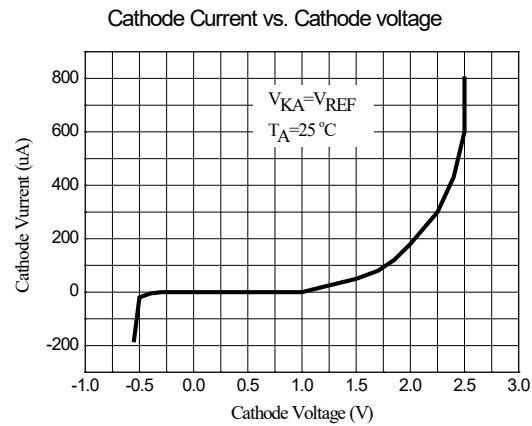
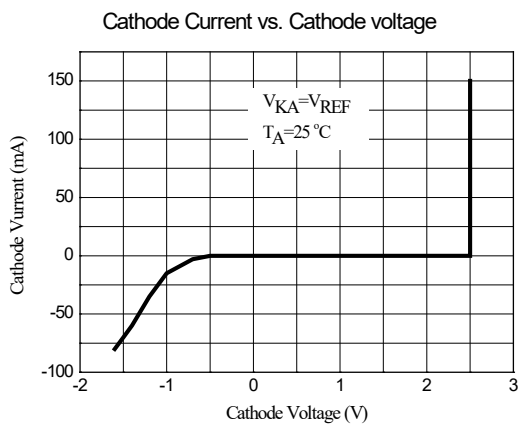
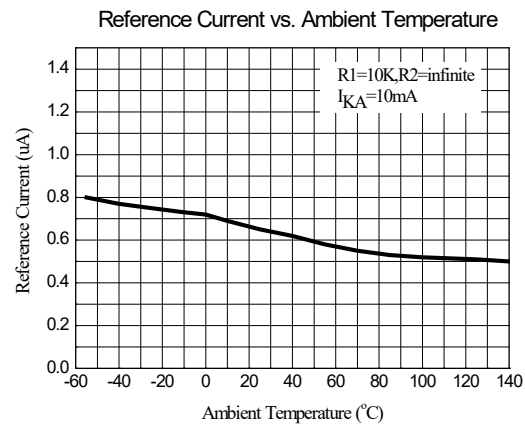
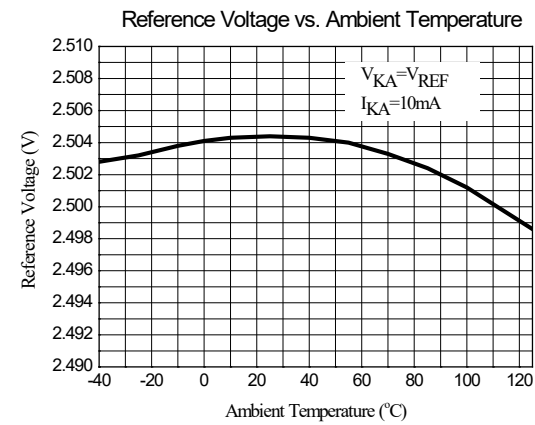
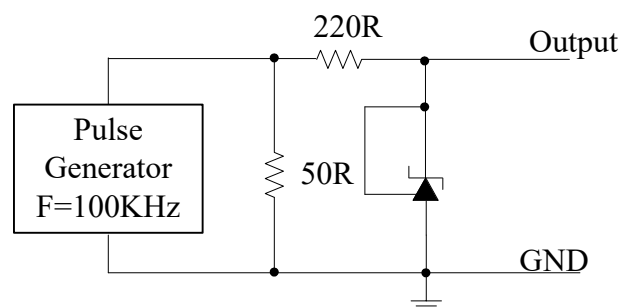
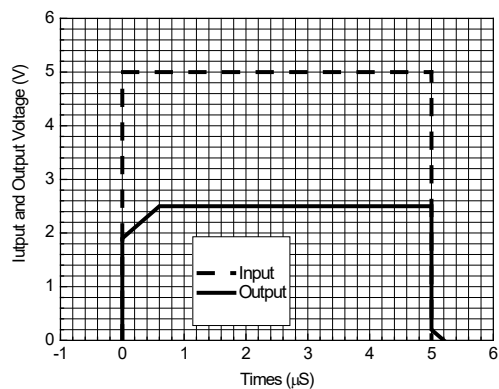
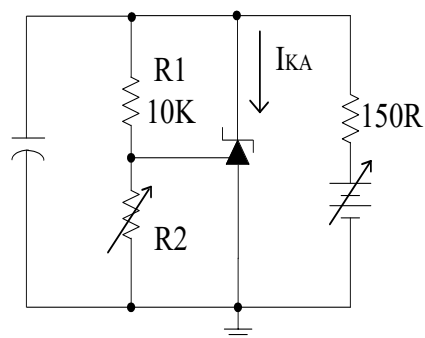
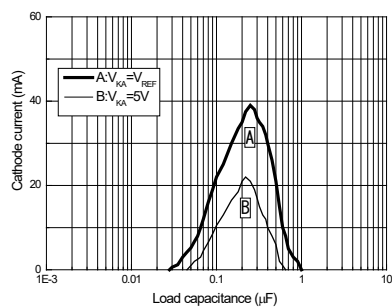
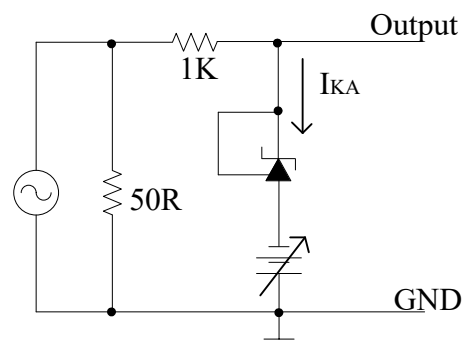
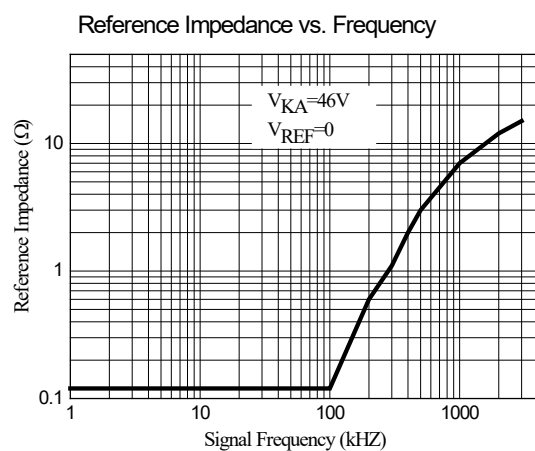
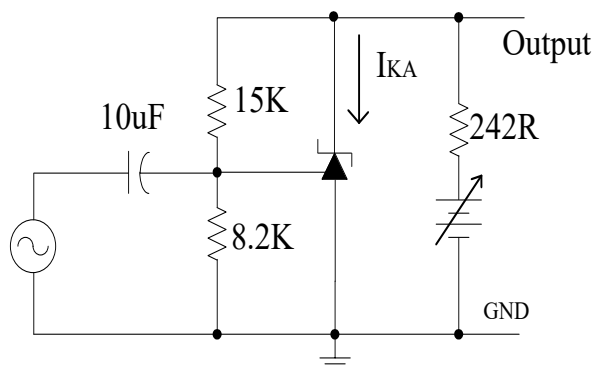
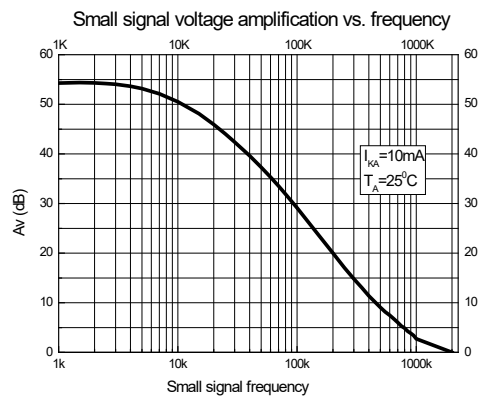


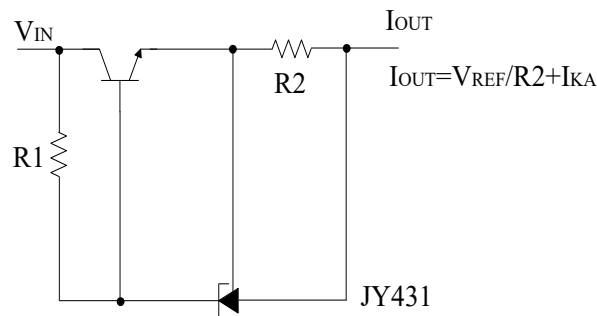
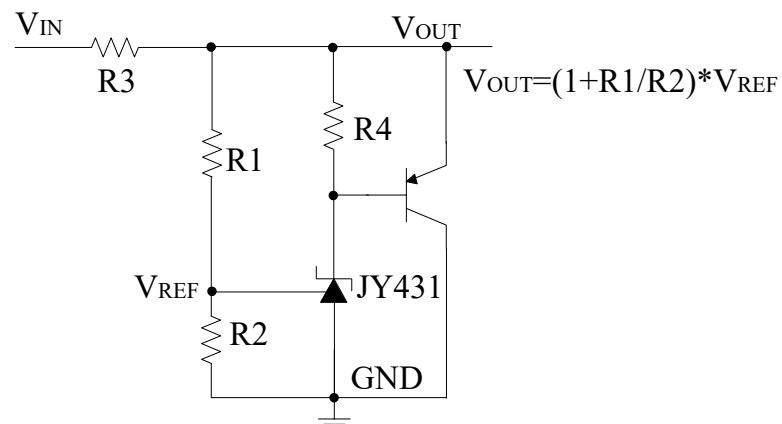
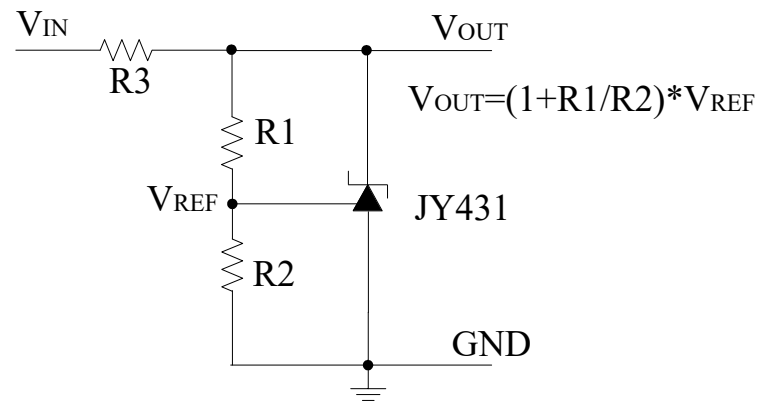
Figure 5. Test Circuit for I_{OFF}

Performance Characteristics

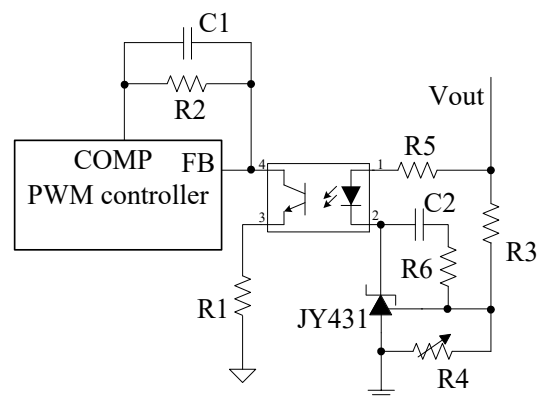




Typical Applications Circuit



Current Source or Current Limit



PWM Converter with Reference

