

Adjustable shunt voltage reference IC

General Description:

The uP431H 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 uP431H is especially suitable for industry applications types.

The uP431H precision reference is offered in one band- gap tolerance: A: $\pm 0.3\%$

The uP431H are characterized for operation from $-40\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$.

Features:

- Reference Voltage Tolerance at $25\text{ }^{\circ}\text{C}$
– $\pm 0.3\%$ (A Grade)
- Adjustable Output Voltage: V_{REF} to 40 V
- Operation From $-40\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$
- Typical Temperature Drift
– 4 mV (-40 to $85\text{ }^{\circ}\text{C}$)
– 7 mV (-40 to $125\text{ }^{\circ}\text{C}$)
- Low Output Noise
- Sink-Current Capability: 0.1 mA to 80 mA

Applications:

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

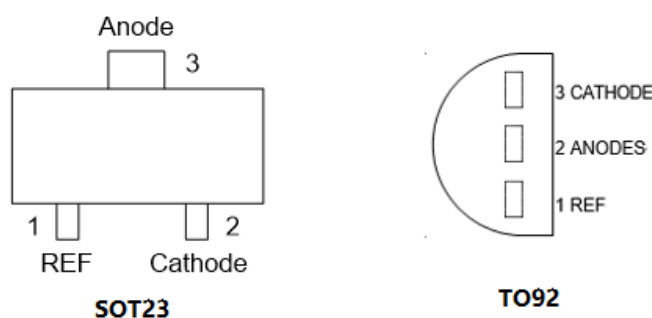


Figure 1. Package types of uP431H

Ordering Information

Device Name	Package Types	Accuracy	Mark ID	Operating Free-Air Temperature (TA)
uP431HAN	SOT23	0.3%	GH3	$-40\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$
uP431HAZ	TO-92	0.3%	uP431HAZ	

Functional Block Diagram:

Adjustable shunt voltage reference IC

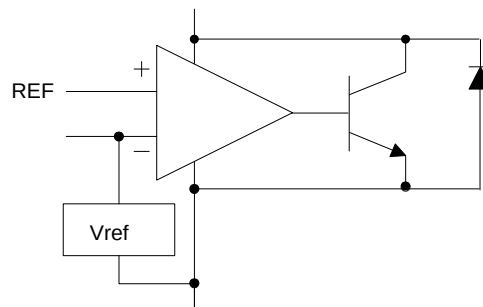


Figure 2. Functional Block Diagram of uP431H

Absolute Maximum Ratings:

(Operation temperature range applies unless otherwise specified.)

Parameter	Symbol	Range	Unit
Cathode voltage	V_{KA}	40	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}	36	V
Cathode Current	I_{KA}	0.15	80	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		UP431H			Unit
						Min.	Typ.	Max.	
Reference Voltage	A: 0.3%	Fig.3	VREF	VKA=VREF, IKA=10mA		2.487	2.495	2.502	V
Deviation of Reference Voltage Over-Temperature		Fig.3	ΔV_{REF}	$V_{KA}=V_{REF}$ $I_{KA}=10\text{mA}$	-40 to 85°C	-	4	10	mV
					-40 to 125°C	-	4	15	
Ratio of Change in Reference Voltage to the Change in Cathode Voltage		Fig.4	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_{KA}=10\text{mA}$	$\Delta V_{KA}=10\text{V to } V_{REF}$	-	-1.0	-2.7	mV/V
					$\Delta V_{KA}=36\text{V o } 10\text{V}$	-	-0.5	-2.0	
Reference Current		Fig.4	I_{REF}	$I_{KA}=10\text{mA}$, $R1=10\text{k}\Omega$, $R2=\infty$		-	0.7	4	μA
Deviation of Reference Current Over Full Temperature Range		Fig.4	ΔI_{REF}	$I_{KA}=10\text{mA}$, $R1=0\text{K}\Omega$, $R2=\infty$ $T_A=-40\text{ to } 105^{\circ}\text{C}$		-	0.4	1.2	μA
Minimum Cathode Current for Regulation		Fig.4	I_{KA} (MIN)	$V_{KA}=V_{REF}$		-	0.1	0.3	mA
Off-State Cathode Current		Fig.5	I_{KA} (OFF)	$V_{KA}=36\text{ V}$, $V_{REF}=0$			0.1	0.5	μA
Dynamic Impedance		Fig.3	$ Z_{KA} $	$V_{KA}=V_{REF}$, $I_{KA}=1\text{ to } 80\text{mA}$ $f \leq 1.0\text{kHz}$		-	0.2	0.5	Ω

Parameter Measurement Information

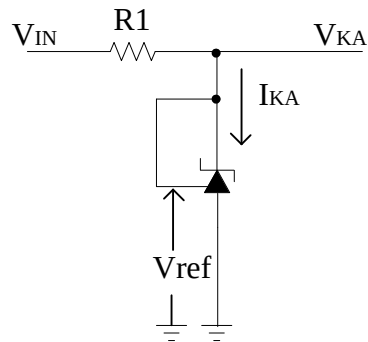


Figure 3. Test Circuit for $V_{KA}=V_{ref}$

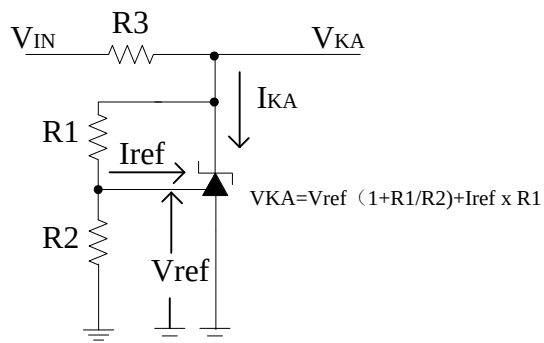


Figure 4. Test Circuit for $V_{KA}>V_{ref}$

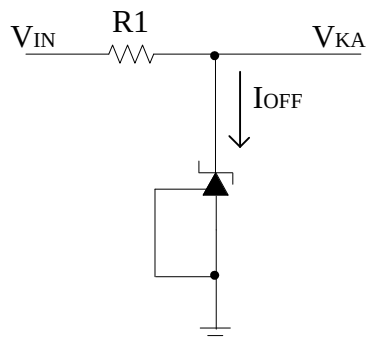
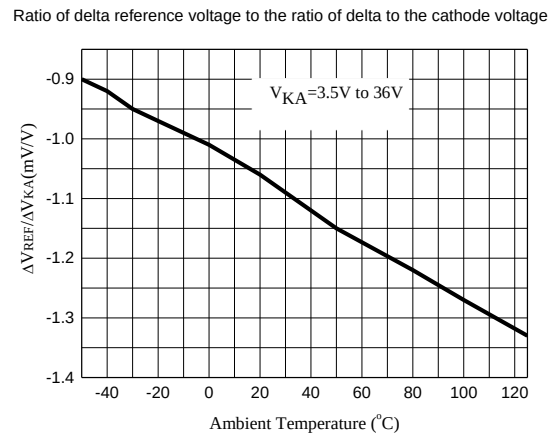
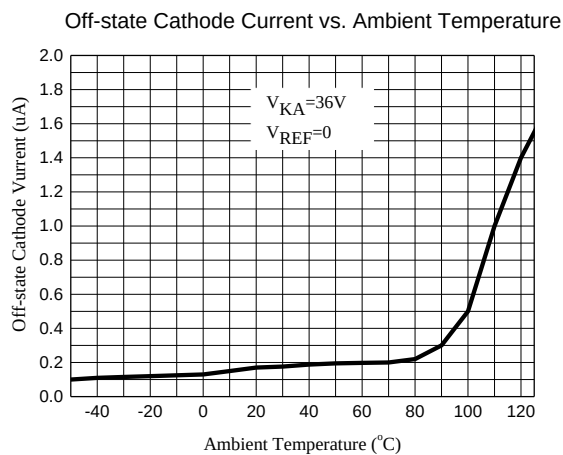
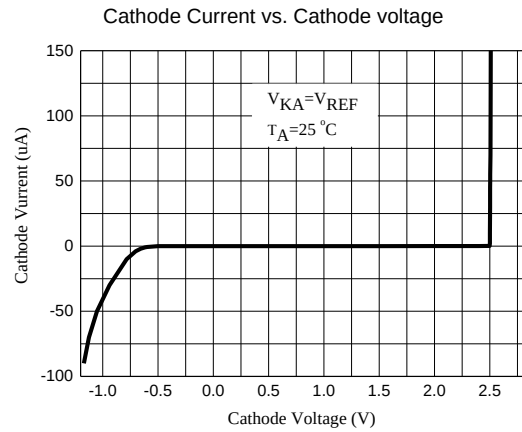
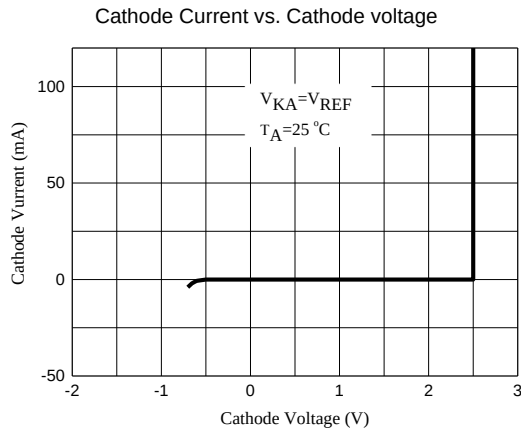
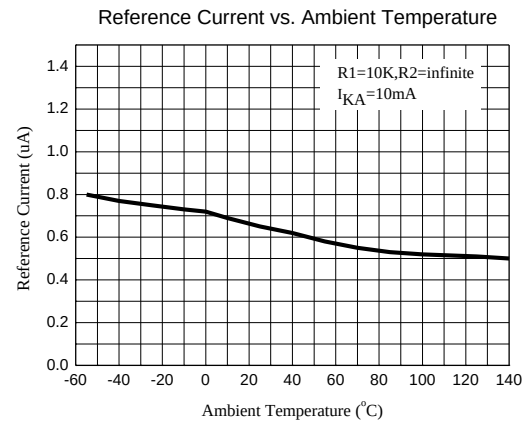
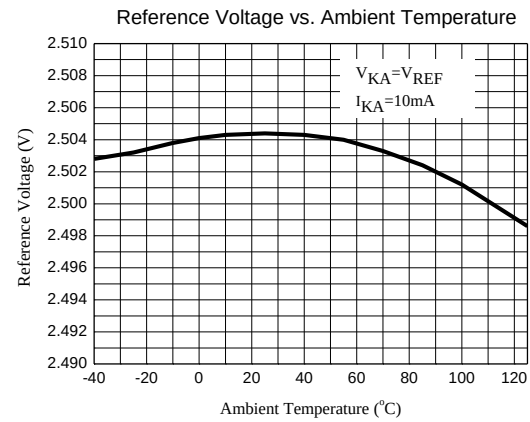


Figure 5. Test Circuit for I_{OFF}

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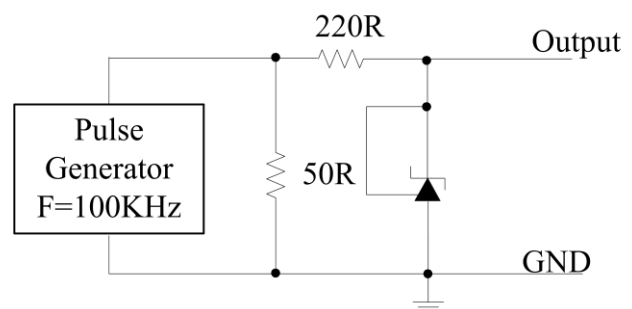
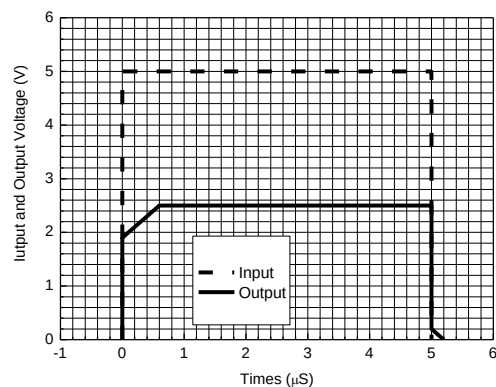
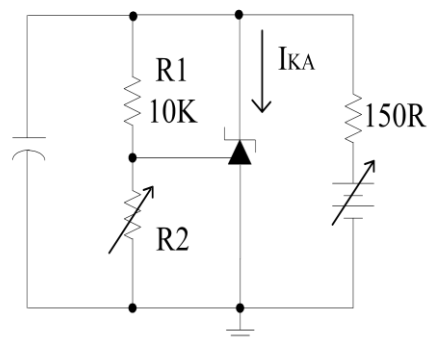
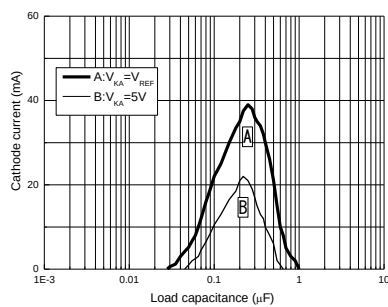
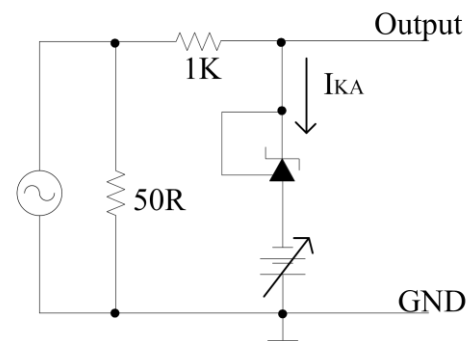
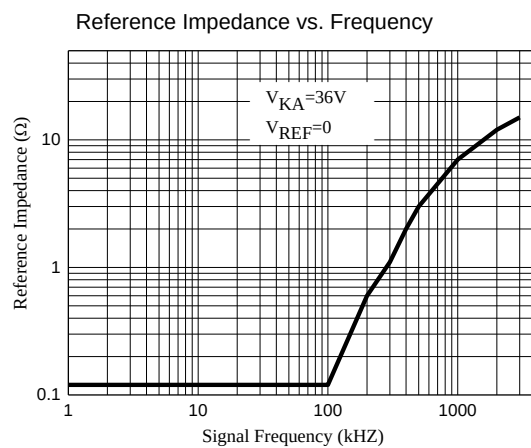
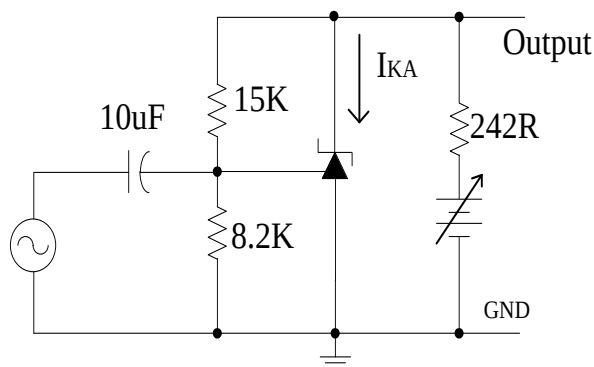
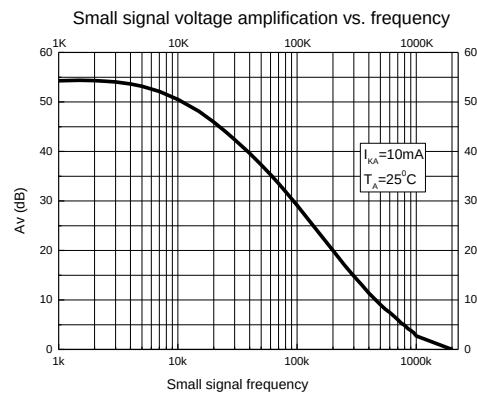
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Performance Characteristics



uP431H

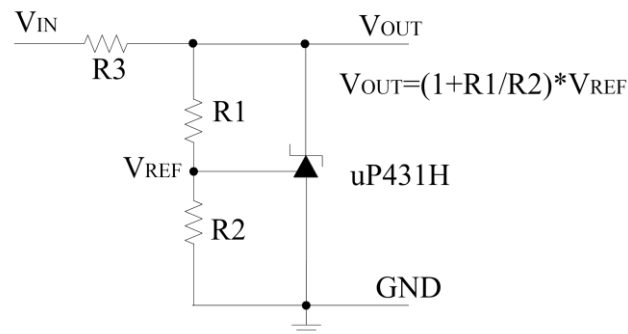
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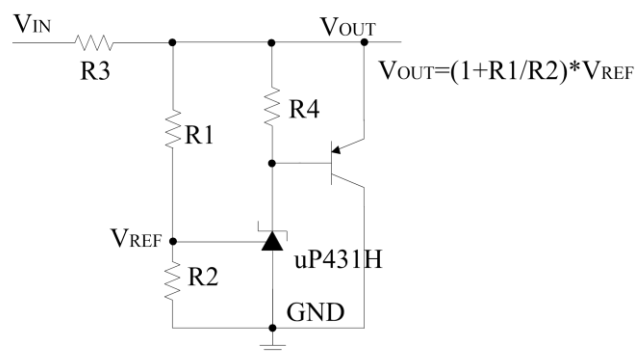
uP431H

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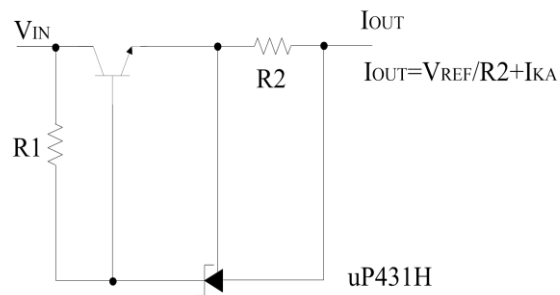
Typical Applications Circuit



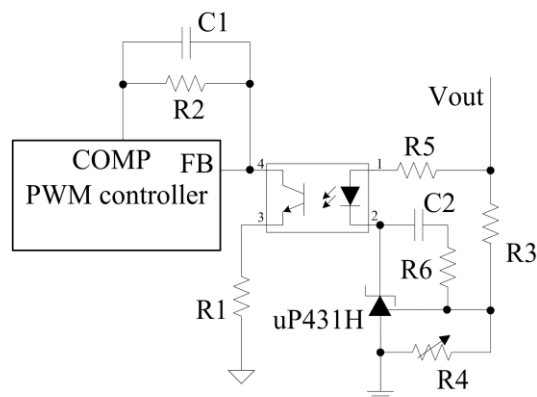
Shunt Regulator



High Current Shunt Regulator



Current Source or Current Limit



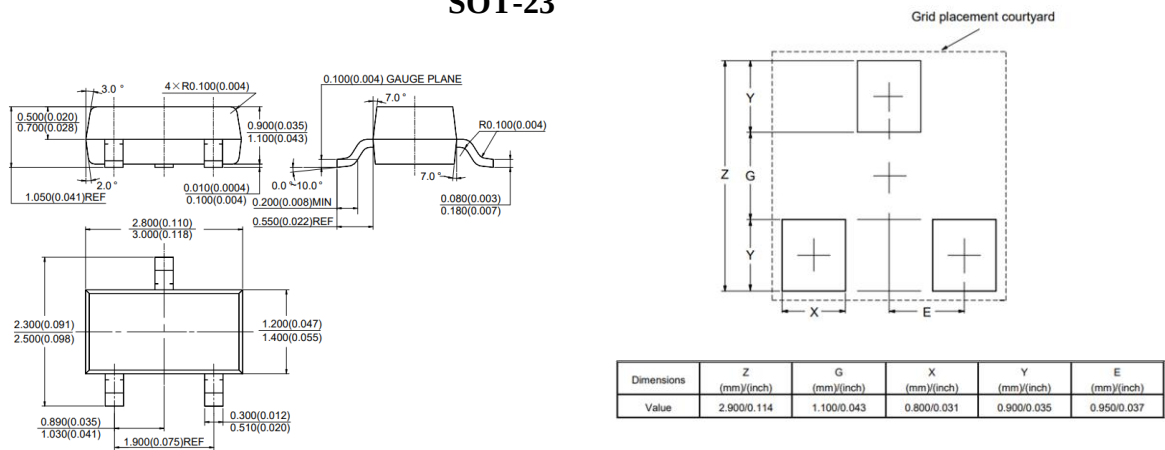
PWM Converter with Reference

uP431H

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Package Outline Dimensions:

SOT-23



TO-92

