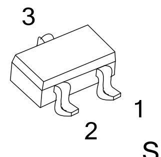
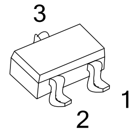
UTC **UNISONIC TECHNOLOGIES CO., LTD**

LOW-VOLTAGE ADJUSTABLE PRECISION SHUNT REGULATOR



SOT-23
(EIAJ SC-59)



SOT-23-3
(JEDEC TO-236)

■ DESCRIPTION

The UTC **ULVH431** is a low-voltage 3-terminal programmable shunt regulator with guaranteed thermal stability over full applicable industrial and commercial temperature ranges.

The output voltage of UTC **ULVH431** can be set to any value between V_{REF} (1.24V) and the corresponding maximum cathode voltage (18V) with two external resistors. The device operates from a lower voltage (1.24V) than the widely used TL431 and TL1431 shunt-regulator references.

The UTC **ULVH431** is an ideal voltage reference in isolated feedback circuits for 3-V to 3.3-V switching-mode power supplies when it is used with an opto-coupler. It has a typical output impedance of 0.25Ω. Active output circuitry supplies a very sharp turn-on characteristic, which makes the UTC **ULVH431** very good substitute for low-voltage Zener diode in many applications such as adjustable power supplies and on-board regulation.

■ FEATURES

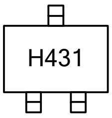
* Adjustable output voltage, V_O=V_{REF} to 18 V
* Low-Voltage operation: V_{REF}= 1.24 V
* Wide operating cathode current range: 100μA to 50mA
* Reference voltage tolerances at 25°C
* 0.25-Ω typical output impedance
* -40°C ~ 125°C specifications

■ ORDERING INFORMATION

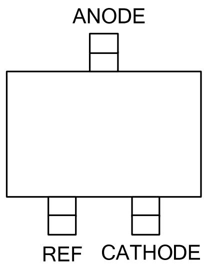
Ordering Number	Package	Pin Assignment			Packing
		1	2	3	
ULVH431G-AE2-R	SOT-23-3	K	R	A	Tape Reel
ULVH431G-AE3-R	SOT-23	K	R	A	Tape Reel

ULVH431G-AE3-R	
(1) Packing Type	(1) R: Tape Reel
(2) Package Type	(2) AE2: SOT-23-3, AE3: SOT-23
(3) Green Package	(3) G: Halogen Free and Lead Free

■ MARKING



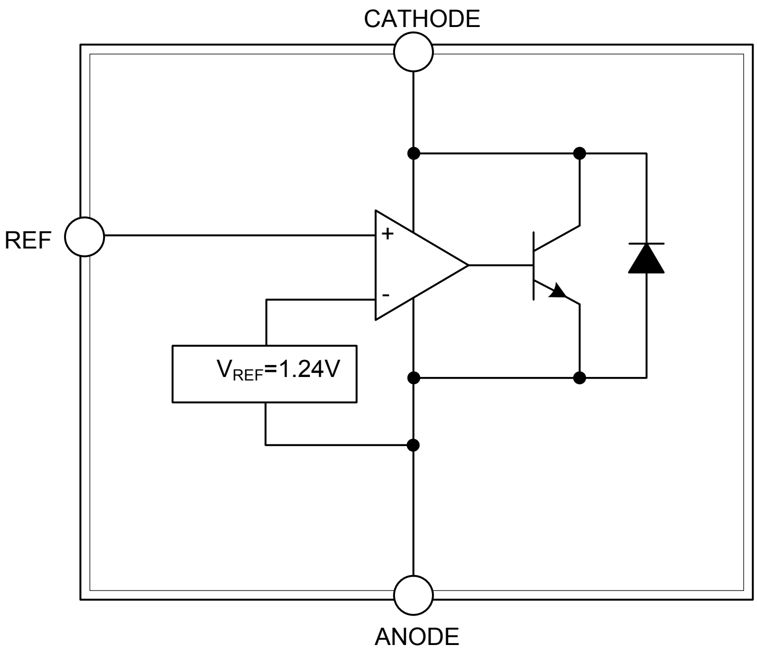
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	CATHODE	Cathode voltage
2	REF	Reference voltage
3	ANODE	Anode voltage

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Voltage (Note 1)	V_{KA}	20	V
Cathode Current Range	I_K	-25 ~ 50	mA
Reference Current Range	I_{REF}	-0.05 ~ 3	mA
Operating Virtual Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL RESISTANCES CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Package Thermal Impedance (Note 2)	θ_{JA}	206	°C/W

Note: Voltage values are with respect to the anode terminal, unless otherwise noted.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V_{KA}	V_{REF}		18	V
Cathode Current (Continuous)	I_K	0.1		50	mA
Operating Free-Air Temperature Range	T_A	-40		125	°C

■ ELECTRICAL CHARACTERISTICS (T_A=25°C free-air temperature, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS			MIN	TYP	MAX	UNIT
Reference Voltage	V_{REF}	$V_{KA}=V_{REF}$, I_K=10mA	T_A=25°C	ULVH431-A	1.234	1.24	1.246	V
				ULVH431-1	1.228	1.24	1.252	V
				ULVH431-2	1.252		1.265	V
				ULVH431-3	1.215		1.228	V
V_{REF} Deviation Over Full Temperature Range (Note 2)	$V_{REF(dev)}$	$V_{KA}=V_{REF}$, I_K=10mA (Note 1 and Figure 1)				11	31	mV
Ratio of V_{REF} Change to Cathode Voltage Change	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I_K=10mA (see Figure 2), $V_{KA}=V_{REF}$~18V				-1.5	-2.7	mV/V
Reference Terminal Current	I_{ref}	I_K=10mA, R1=10kΩ, R2=OPEN (see Figure 2)				0.1	0.5	μA
I_{ref} Deviation Over Full Temperature Range (Note 2)	$I_{ref(dev)}$	I_K=10mA, R1=10kΩ, R2=Open (see Note 1 and Figure 2)				0.15	0.5	μA
Minimum Cathode Current for Regulation	$I_{K(min)}$	$V_{KA}=V_{REF}$ (see Figure 1)				60	100	μA
Off-State Cathode Current	$I_{K(off)}$	V_{REF}=0, V_{KA}=18V (see Figure 3)				0.02	0.1	μA
Dynamic Impedance (Note 3)	$\|z_{KA}\|$	$V_{KA}=V_{REF}$, f≤1kHz, I_K=0.1mA~50mA (see Figure 1)				0.25	0.4	Ω

Notes: 1. Full temperature ranges are: -40°C~125°C for ULVH431.

2. The deviation parameters $V_{REF(dev)}$ and $I_{ref(dev)}$ are defined as the differences between the maximum and minimum values obtained over the rated temperature range. The average full-range temperature coefficient of the reference input voltage, αV_{REF}, is defined as: $|\alpha V_{REF}|\left(\frac{ppm}{°C}\right)=\frac{\left(\frac{V_{REF(dev)}}{V_{REF}(T_A=25°C)}\right)\times 10^6}{\Delta T_A}$

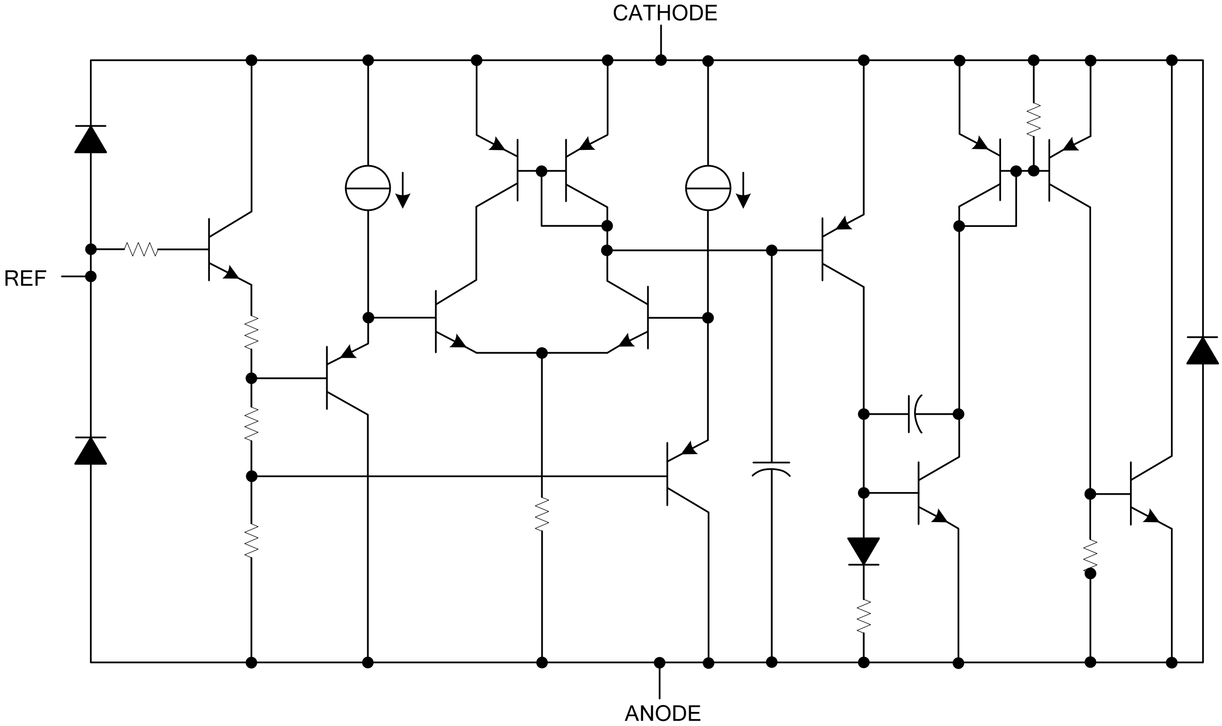
   where ΔT_A is the rated operating free-air temperature range of the device.

   αV_{REF} can be positive or negative, depending on whether minimum V_{REF} or maximum V_{REF}, respectively, occurs at the lower temperature.

3. The dynamic impedance is defined as: $|z_{ka}|=\frac{\Delta V_{KA}}{\Delta I_K}$

   When the device is operating with two external resistors (see Figure 2), the total dynamic impedance of the circuit is defined as: $|z_{ka}|=\frac{\Delta V}{\Delta I}\approx|z_{ka}|\times(1+\frac{R1}{R2})$

■ EQUIVALENT SCHEMATIC



■ PARAMETER MEASUREMENT INFORMATION

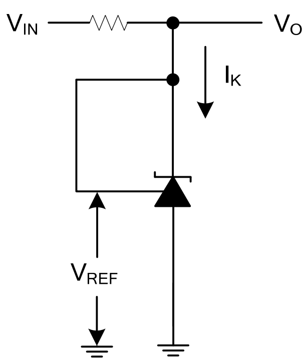


Figure 1. Test Circuit for
$V_{KA}=V_{REF}$, $V_O=V_{KA}=V_{REF}$

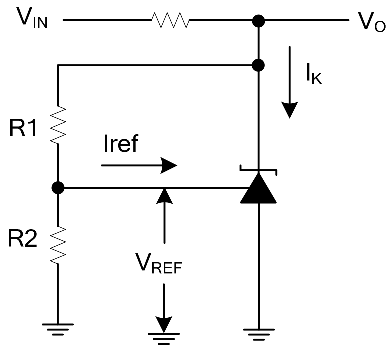


Figure 2. Test Circuit for $V_{KA} > V_{REF}$,
$V_O = V_{KA} = V_{REF} \times (1 + R1/R2) + Iref \times R1$

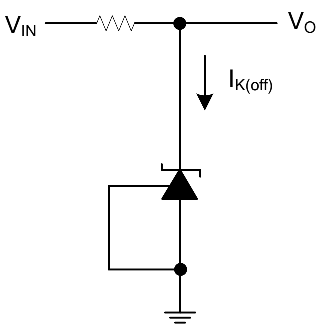


Figure 3. Test Circuit for $I_{K(off)}$