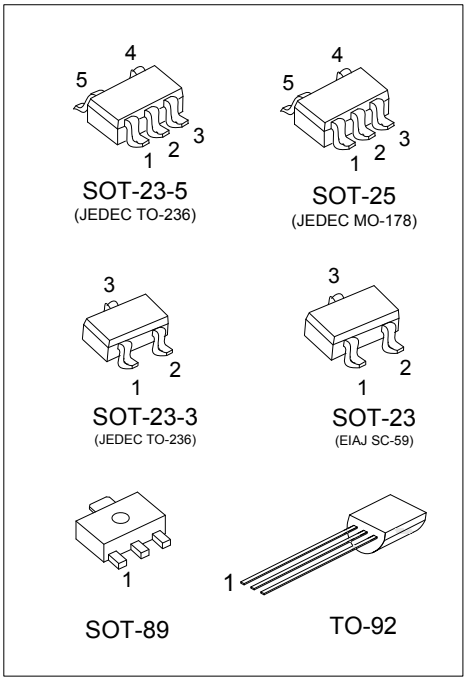
ULVH431

LINEAR INTEGRATED CIRCUIT

LOW-VOLTAGE ADJUSTABLE PRECISION SHUNT REGULATOR



■ 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 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

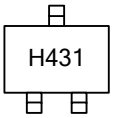
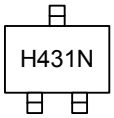
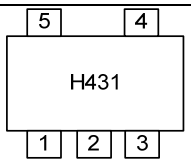
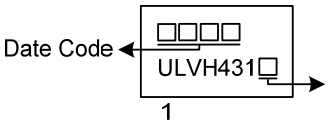
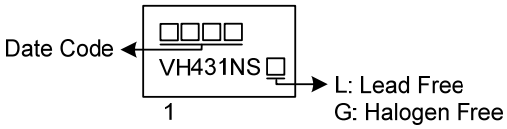
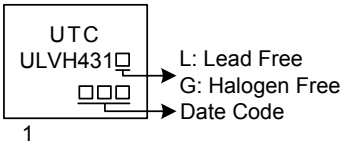
Ordering Number		Package	Pin Assignment					Packing
Lead Free	Halogen Free		1	2	3	4	5	
ULVH431L-AB3-R	ULVH431G-AB3-R	SOT-89	R	A	K	-	-	Tape Reel
ULVH431NSL-AB3-R	ULVH431NSG-AB3-R	SOT-89	K	A	R	-	-	Tape Reel
ULVH431L-AE2-R	ULVH431G-AE2-R	SOT-23-3	R	K	A	-	-	Tape Reel
ULVH431L-AE3-R	ULVH431G-AE3-R	SOT-23	R	K	A	-	-	Tape Reel
ULVH431NSL-AE3-R	ULVH431NSG-AE3-R	SOT-23	K	R	A	-	-	Tape Reel
ULVH431L-AE5-R	ULVH431G-AE5-R	SOT-23-5	X	X	K	R	A	Tape Reel
ULVH431L-AF5-R	ULVH431G-AF5-R	SOT-25	X	X	K	R	A	Tape Reel
ULVH431L-T92-B	ULVH431G-T92-B	TO-92	R	A	K	-	-	Tape Box
ULVH431L-T92-K	ULVH431G-T92-K	TO-92	R	A	K	-	-	Bulk

Note: Pin Code: R: Reference A: Anode K: Cathode X: No Connection

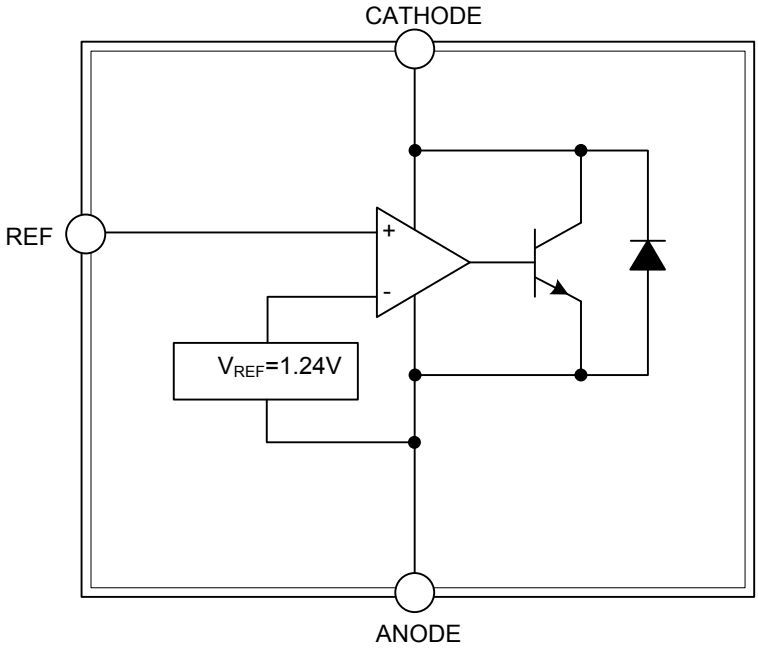
ULVH431G-AB3-R
(1) Packing Type
(2) Package Type
(3) Green Package

(1) R: Tape Reel, B: Tape Box, K: Bulk
(2) AB3: SOT-89, AE2: SOT-23-3, AE3: SOT-23
AE5: SOT-23-5, AF5: SOT-25, T92: TO-92
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

PACKAGE	ULVH431	ULVH431NS
SOT-23-3 SOT-23		
SOT-23-5 SOT-25		-
SOT-89		
TO-92		-

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Voltage (Note 1)	V_{KA}	20	V
Cathode Current Range	I_K	50	mA
Reference Current Range	I_{REF}	-0.05 ~ 3	mA
Operating Virtual Junction Temperature	T_J	+150	°C
Operating Temperature (Note 2)	T_{OPR}	-40 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C

Notes: 1. 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.
2. It is guarantee by design, not 100% be tested.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Package Thermal Impedance	SOT-23-3 SOT-23 SOT-23-5 SOT-25	θ_{JA}	325	°C/W
	SOT-89		125	°C/W
	TO-92		130	°C/W

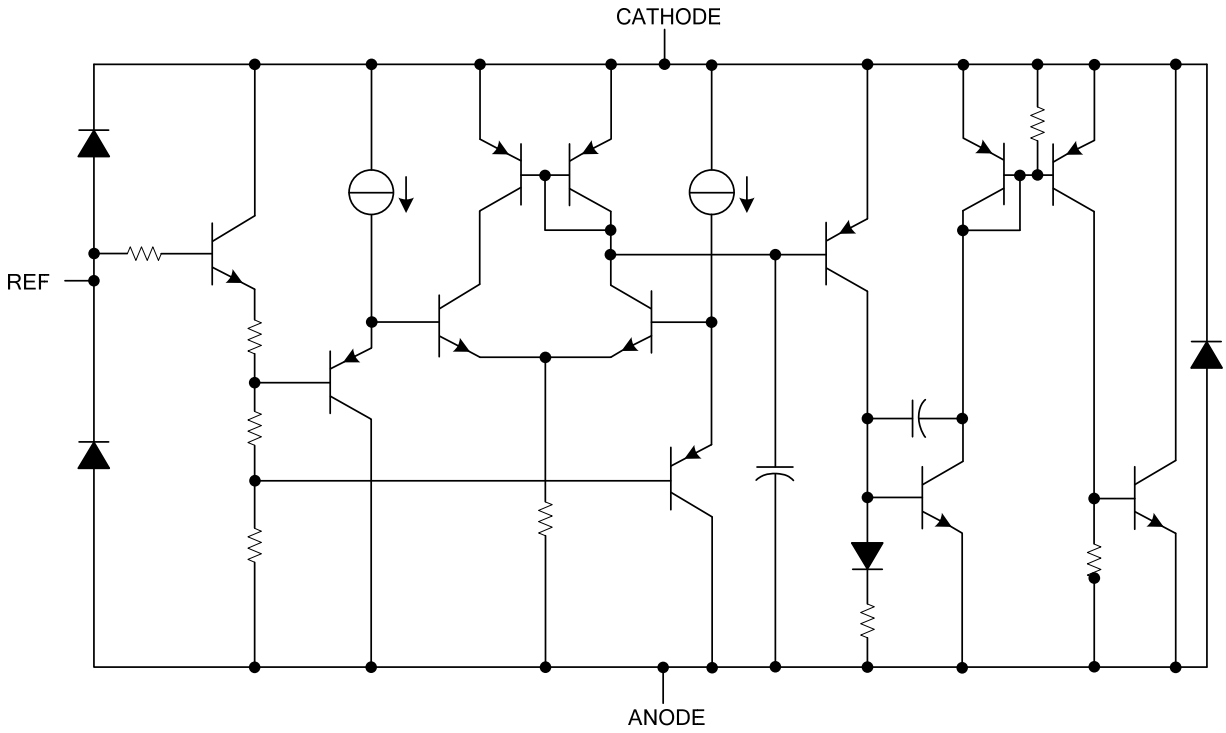
■ RECOMMENDED OPERATING CONDITIONS

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 (±0.5%)	1.234	1.24	1.246	V
				ULVH431-1 (±1%)	1.228	1.24	1.252	V
				ULVH431-2 (+2%)	1.252		1.265	V
				ULVH431-3 (-2%)	1.215		1.228	V
V_{REF} Deviation Over Full Temperature Range	$V_{REF(dev)}$	$V_{KA}=V_{REF}$, I_K=10mA (see 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	$I_{ref(dev)}$	I_K=10mA, R1=10kΩ, R2=Open (see 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	$\|z_{KA}\|$	$V_{KA}=V_{REF}$, f≤1kHz, I_K=0.1mA~50mA (see Figure 1)				0.25	0.4	Ω

■ EQUIVALENT SCHEMATIC



■ PARAMETER MEASUREMENT INFORMATION

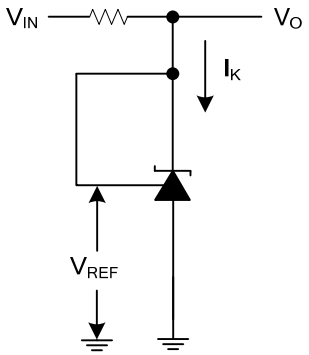


Figure 1. Test Circuit for $V_{KA}=V_{REF}$, $V_O=V_{KA}=V_{REF}$

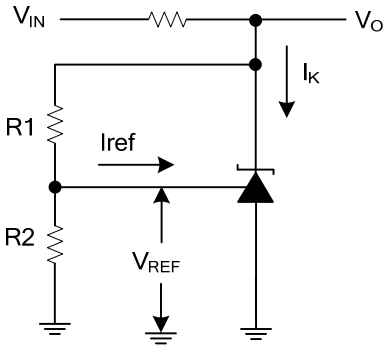


Figure 2. Test Circuit for $V_{KA} > V_{REF}$, $V_O = V_{KA} = V_{REF} \times (1 + R1/R2) + Iref \times R1$

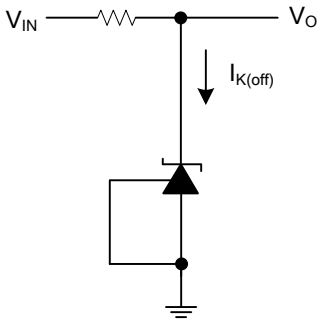


Figure 3. Test Circuit for $I_{K(off)}$

■ TYPICAL CHARACTERISTICS