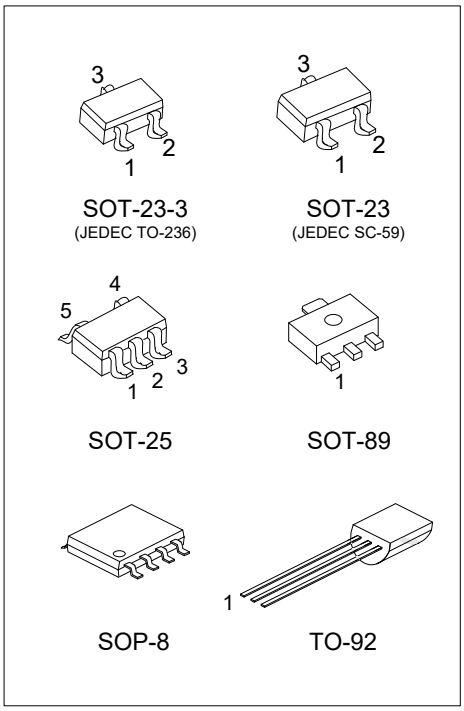
LL431

LINEAR INTEGRATED CIRCUIT

PROGRAMMABLE PRECISION REFERENCE



■ DESCRIPTION

The UTC **LL431** is a three-terminal adjustable regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.5V) and 36 V with two external resistors. It can be used in provides very wide applications including shunt regulator, series regulator, switching regulator, voltage reference and others.

■ FEATURES

*Programmable output Voltage to 36V.
*Sink current capability of 1.0 to 100mA.
*Equivalent full-range temperature coefficient of 50ppm/ °C typical for operation over full rated operating temperature range.

■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
LL431K-AB3-R	LL431G-AB3-R	SOT-89	R	A	K	-	-	-	-	-	Tape Reel
LL431K-AE2-R	LL431G-AE2-R	SOT-23-3	R	K	A	-	-	-	-	-	Tape Reel
LL431NSL-AE2-R	LL431NSG-AE2-R	SOT-23-3	K	R	A	-	-	-	-	-	Tape Reel
LL431K-AE3-R	LL431G-AE3-R	SOT-23	R	K	A	-	-	-	-	-	Tape Reel
LL431NSK-AE3-R	LL431NSG-AE3-R	SOT-23	K	R	A	-	-	-	-	-	Tape Reel
LL431K-AF5-R	LL431G-AF5-R	SOT-25	X	X	K	R	A	-	-	-	Tape Reel
LL431K-S08-R	LL431G-S08-R	SOP-8	K	A	A	X	X	A	A	R	Tape Reel
LL431K-T92-B	LL431G-T92-B	TO-92	R	A	K	-	-	-	-	-	Tape Box
LL431K-T92-K	LL431G-T92-K	TO-92	R	A	K	-	-	-	-	-	Bulk
LL431K-T92-R	LL431G-T92-R	TO-92	R	A	K	-	-	-	-	-	Tape Reel

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

LL431G-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, AF5: SOT-25, S08:SOP-8, T92: TO-92
(3) G: Halogen Free, K: Lead Free
G: Halogen Free, L: Lead Free Only for TL431NS Type

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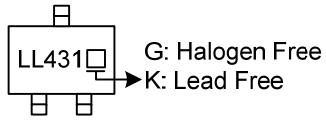
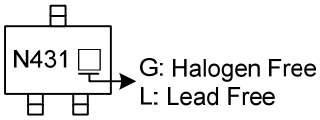
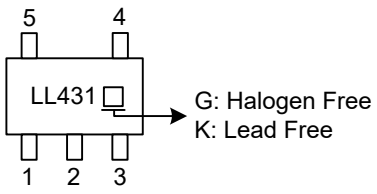
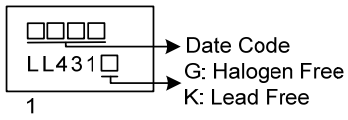
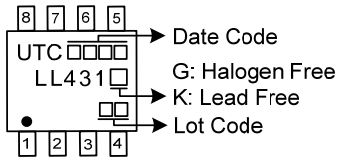
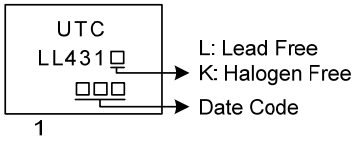
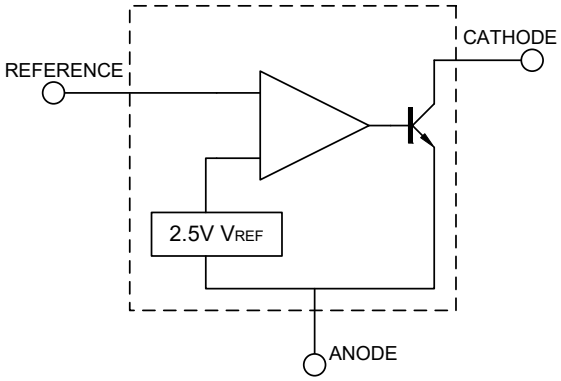
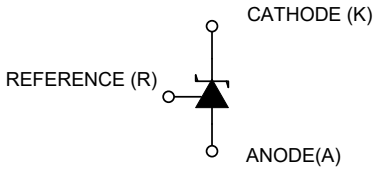
■ MARKING

SOT-23-3 / SOT-23 (LL431)	SOT-23-3 / SOT-23 (LL431NS)	SOT-25
		
SOT-89	**SOP-8**	**TO-92**
		

■ BLOCK DIAGRAM





■ ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Cathode Voltage		V_{KA}	37	V
Cathode Current Range(Continuous)		I_{KA}	-100 ~ +150	mA
Reference Input Current		I_{REF}	-0.05 ~ +10	mA
Power Dissipation	SOT-89	P_D	500	mW
	SOT-23-3/SOT-23 SOT-25		300	mW
	SOP-8		600	mW
	TO-92		770	mW
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-40 ~ +125	°C
Storage Temperature		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.

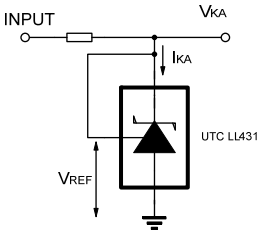
■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Cathode Voltage	V_{KA}	V_{REF} ~ 36	V
Cathode Current	I_{KA}	0.1 ~ 100	mA

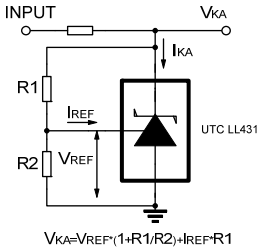
■ ELECTRICAL CHARACTERISTICS (T_C= 25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Reference Input Voltage	V_{REF}	$V_{KA}=V_{REF}, I_{KA}$=10mA	TL431-A (±0.5%)	2.483	2.495	2.507	V
			TL431-1 (±1%)	2.470	2.495	2.520	V
			TL431-2 (+2%)	2.520	-	2.545	V
			TL431-3 (-2%)	2.445	-	2.470	V
Deviation of reference Input Voltage Over temperature	$\Delta V_{REF}/\Delta T$	$V_{KA}=V_{REF}, I_{KA}$=10mA 0°C≦T_A≦70°C			4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$	I_{KA}=10mA	ΔV_{KA}=10V~V_{REF}		-1.0	-2.7	mV/V
			ΔV_{KA}=36V~10V		-0.5	-2.0	
Reference Input Current	I_{REF}	I_{KA}=10mA, R1=10kΩ, R2=∞			0.2	0.4	μA
Deviation of Reference Input Current Over Full Temperature Range	$\Delta I_{REF}/\Delta T$	I_{KA}=10mA, R1=10kΩ, R2=∞ T_A =full Temperature			0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{KA(MIN)}$	$V_{KA}=V_{REF}$				100	μA
Off-State Cathode Current	$I_{KA(OFF)}$	V_{KA}=36V, V_{REF}=0			0.05	0.1	μA
Dynamic Impedance	Z_{KA}	$V_{KA}=V_{REF}$, I_{KA}=1 to 100mA f≤1.0kHz			0.5		Ω

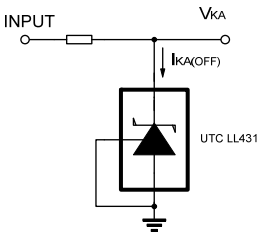
■ TEST CIRCUIT



For $V_{KA}=V_{REF}$

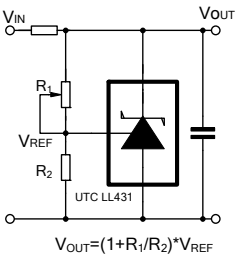


For $V_{KA} \geqq V_{REF}$

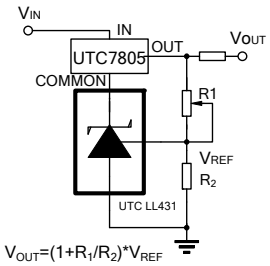


For $I_{KA(OFF)}$

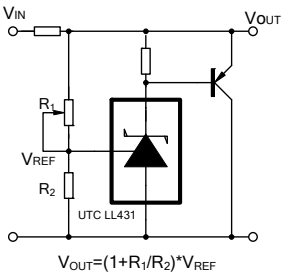
■ APPLICATION CIRCUIT



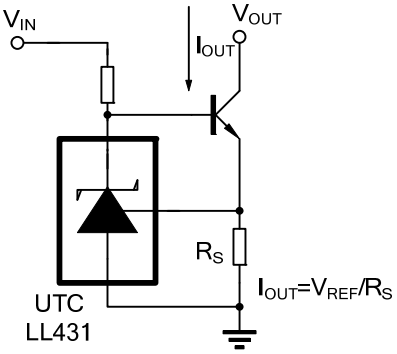
Shutdown Regulator



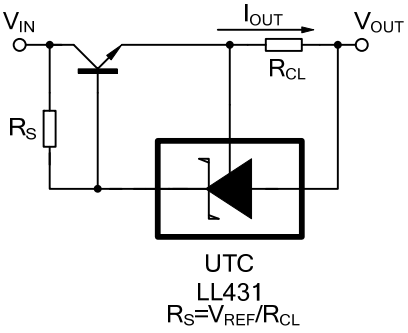
Output Control of a Three -Terminal Fixed Regulator



Higher-current Shunt Regulator



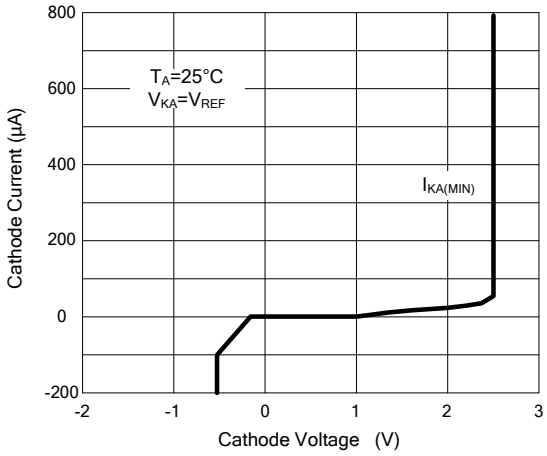
Constant-current Sink



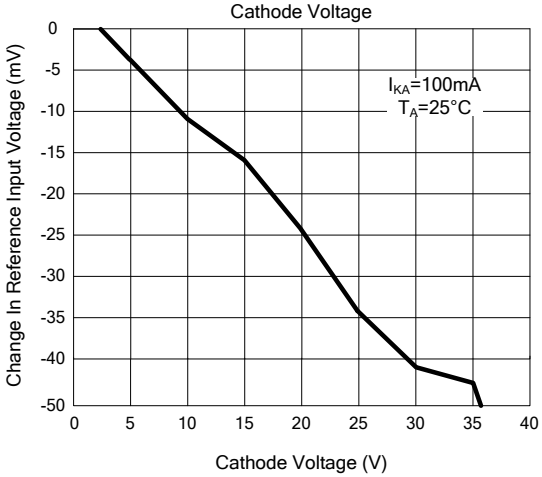
Current Limiting or Current Source

■ TYPICAL CHARACTERISTICS

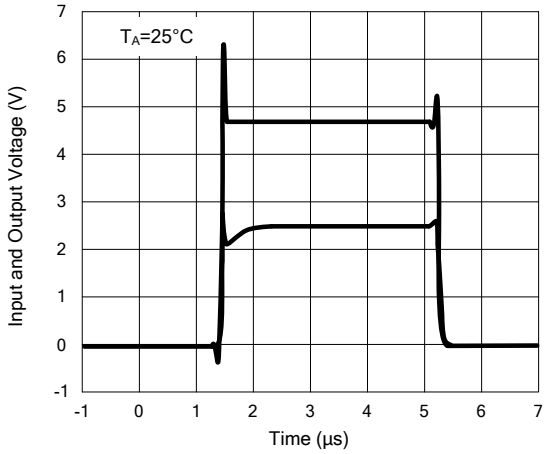
Cathode Current vs. Cathode Voltage



Change in Reference Input Voltage vs. Cathode Voltage



Pulse Response



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