

# UTC TL431A LINEAR INTEGRATED CIRCUIT

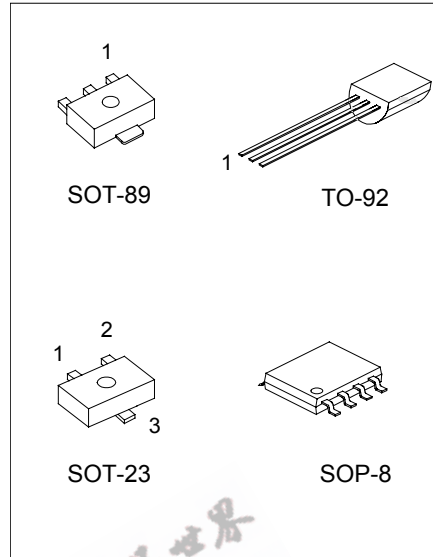
## PROGRAMMABLE PRECISION REFERENCE

### DESCRIPTION

The UTC TL431A 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 36V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.

### FEATURES

- \*Programmable output Voltage to 36V.
- \*Low dynamic output impedance  $0.2\Omega$ .
- \*Sink current capability of 1 to 100mA.
- \*Equivalent full-range temperature coefficient of 50ppm/°C typical for operation over full rated operating temperature range.



SOP-8 1: Cathode 2,3,6,7: Anode 8: Ref.  
4,5: N.C.

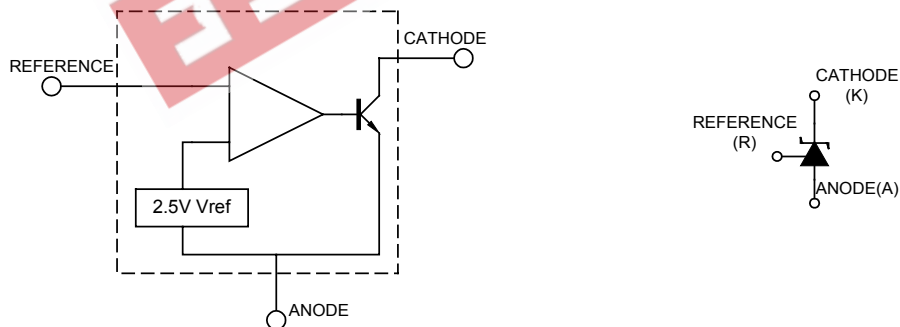
TO-92 1: Ref; 2: Anode; 3: Cathode

SOT-89 1: Ref; 2: Anode; 3: Cathode

SOT-23 1: Cathode; 2: Ref; 3: Anode

\*Pb-free plating product number: TL431AK

### BLOCK DIAGRAM



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

PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V <sub>KA</sub>	37	V
Cathode Current Range(Continuous)	I <sub>KA</sub>	-100 ~ +150	mA
Reference Input Current Range	I <sub>ref</sub>	-0.05 ~ +10	mA
Operating Junction Temperature	T <sub>j</sub>	150	°C
Operating Ambient Temperature	T <sub>opr</sub>	-40 ~ +85	°C
Storage Temperature Temperature	T <sub>stg</sub>	-65 ~ +150	°C

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V <sub>KA</sub>	V <sub>REF</sub>		36	V
Cathode Current	I <sub>KA</sub>	1		100	mA

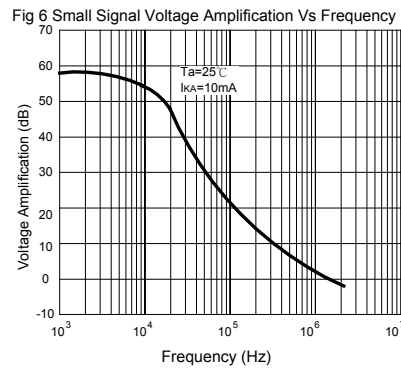
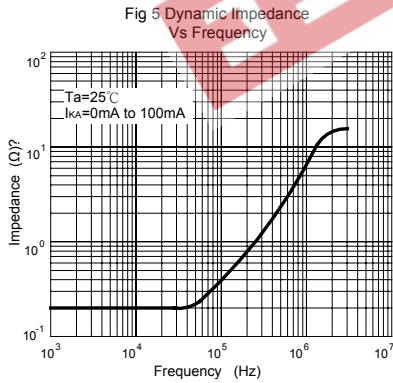
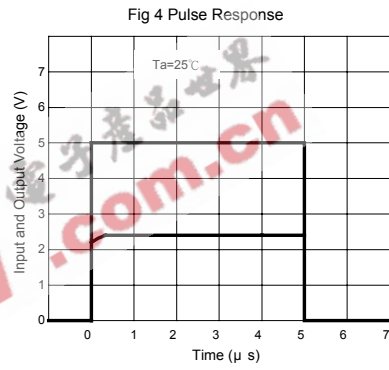
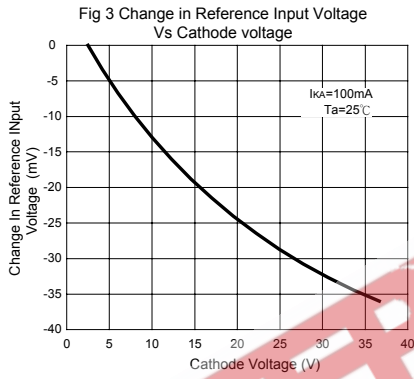
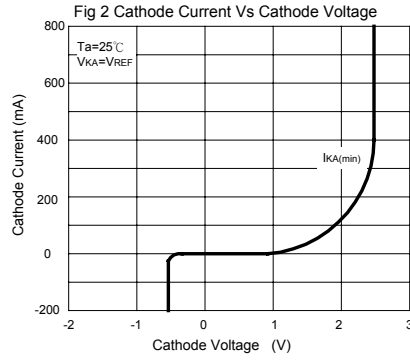
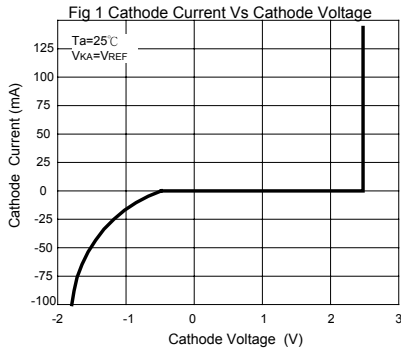
## ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Input Voltage	V <sub>ref</sub>	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA	2.483	2.495	2.507	V
Deviation of reference Input Voltage Over temperature(note 1)	ΔV <sub>ref</sub> /ΔT	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =10mA T <sub>MIN</sub> ≤T <sub>A</sub> ≤T <sub>MAX</sub>		4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	ΔV <sub>ref</sub> / ΔV <sub>KA</sub>	I <sub>KA</sub> =10mA ΔV <sub>KA</sub> =10V~V <sub>REF</sub> ΔV <sub>KA</sub> =36V~10V		-1.0 -0.5	-2.7 -2.0	mV/V
Reference Input Current	I <sub>ref</sub>	I <sub>KA</sub> =10mA, R <sub>1</sub> =10kΩ, R <sub>2</sub> =∞		1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	ΔI <sub>ref</sub> /ΔT	I <sub>KA</sub> =10mA, R <sub>1</sub> =10kΩ, R <sub>2</sub> =∞ T <sub>A</sub> =full Temperature		0.4	1.2	μA
Minimum Cathode Current for Regulation	I <sub>KA</sub> (min)	V <sub>KA</sub> =V <sub>REF</sub>		0.45	1.0	mA
Off-State Cathode Current	I <sub>KA</sub> (OFF)	V <sub>KA</sub> =36V, V <sub>REF</sub> =0		0.05	1.0	μA
Dynamic Impedance	Z <sub>KA</sub>	V <sub>KA</sub> =V <sub>REF</sub> , I <sub>KA</sub> =1 to 100mA f≤1.0kHz		0.15	0.5	Ω

Note: T<sub>MIN</sub>=0°C, T<sub>MAX</sub>=+70°C

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## TYPICAL PERFORMANCE CHARACTERISTICS



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## TEST CIRCUIT

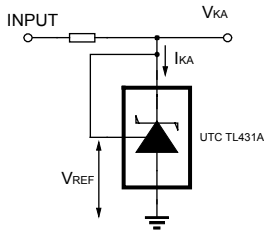


Fig 7 Test Circuit For  $V_{KA}=V_{REF}$

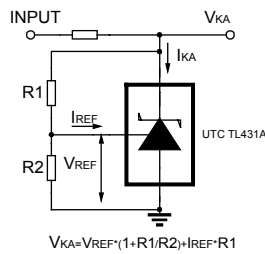


Fig 8 Test Circuit for  $V_{KA} \geq V_{REF}$

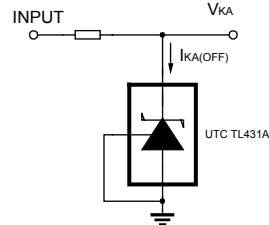


Fig 9 Test Circuit For  $I_{KA(OFF)}$

## APPLICATION CIRCUIT

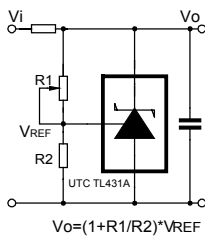


Fig 10 Shutdown Regulator

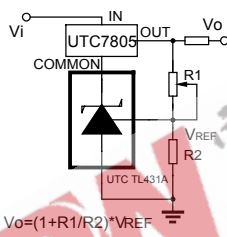


Fig 11 Output Control of a Three-Terminal Fixed Regulator

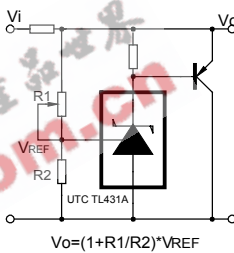


Fig 12 Higher-current Shunt Regulator

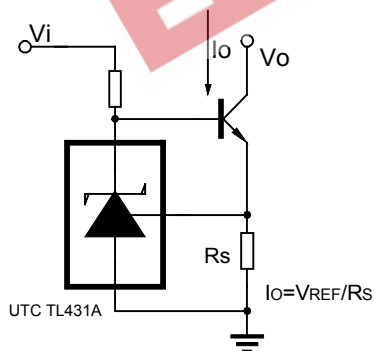


Fig 13 Constant-current Sink

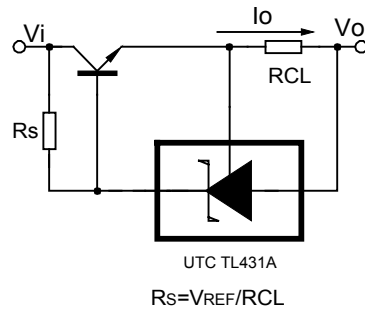


Fig 14 Current Limiting or Current Source

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5

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