UTC TL431L LINEAR INTEGRATED CIRCUIT

PROGRAMMABLE PRECISION REFERENCE

DESCRIPTION

The UTC TL431L 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 Vref(approximately 2.5V) and 20V with two external resistors. It provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.

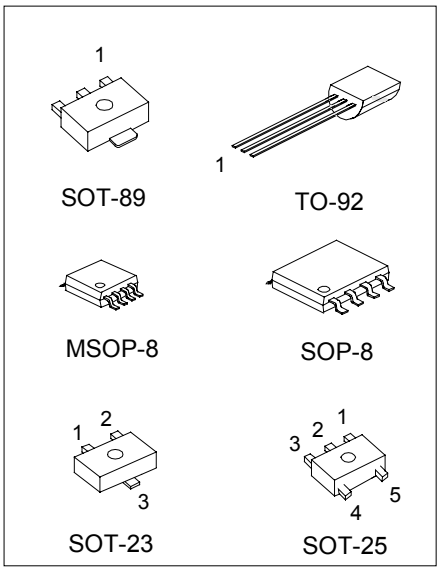
FEATURES

*Programmable output Voltage to 20V.

*Low dynamic output impedance 0.2Ω.

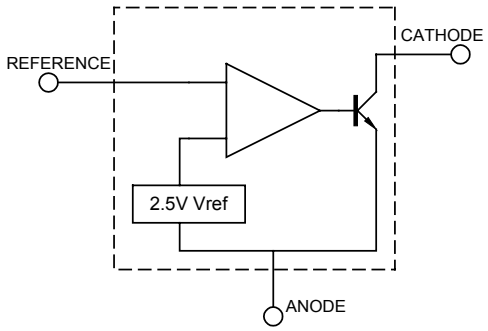
*Sink current capability of 1.0 to 100mA.

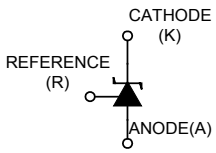
*Equivalent full-range temperature coefficient of 50ppm/ °C typical for operation over full rated operating temperature range.



SOP-8 1: Cathode; 2,3,6,7: Anode
8: Ref. ; 4,5: N/C
MSOP-8 1: Cathode ; 6: Anode ; 8: Ref.
2,3,4,5,7: 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
SOT-25 1,2: N/C; 3: Cathode; 4: Ref.; 5: Anode

BLOCK DIAGRAM





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

PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V_{KA}	20	V
Cathode Current Range (Continuous)	I_{KA}	-100 ~ +150	mA
Reference Input Current Range	Iref	-0.05 ~ +10	mA
Operating Junction Temperature	Tj	150	°C
Operating Ambient Temperature	Topr	0 ~ +70	°C
Storage Temperature	Tstg	-65 ~ +150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V_{KA}	V_{REF}		20	V
Cathode Current	I_{KA}	1		100	mA

ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Reference Input Voltage	Vref	$V_{KA}=V_{REF}, I_{KA}$=10mA		2.450	2.50	2.550	V
Deviation of reference Input Voltage Over temperature (note 1)	ΔVref/ΔT	$V_{KA}=V_{REF}, I_{KA}$=10mA $T_{MIN}<=T_A<=T_{MAX}$			4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	ΔVref /ΔV_{KA}	I_{KA}=10mA	ΔV_{KA}=10V~V_{REF} ΔV_{KA}=20V~10V		-1.0 -0.5	-2.7 -2.0	mV/V
Reference Input Current	Iref	I_{KA}=10mA,R1=10kΩ,R2=∞			1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	ΔIref/ΔT	I_{KA}=10mA,R1=10kΩ,R2=∞ T_A=full Temperature			0.4	1.2	μA
Minimum Cathode Current for Regulation	I_{KA}(min)	$V_{KA}=V_{REF}$			0.45	1.0	mA
Off-State Cathode Current	I_{KA}(OFF)	V_{KA}=20V, V_{REF}=0			0.05	1.0	μA
Dynamic Impedance	Z_{KA}	$V_{KA}=V_{REF}, I_{KA}$=1 to 100mA f≤1.0kHz			0.15	0.5	Ω

Note:T_{MIN}=0°C,T_{MAX}=+70°C

Remark: Reference voltage of ±1% tolerance is also available per customer's request.

TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1 Cathode Current Vs Cathode Voltage

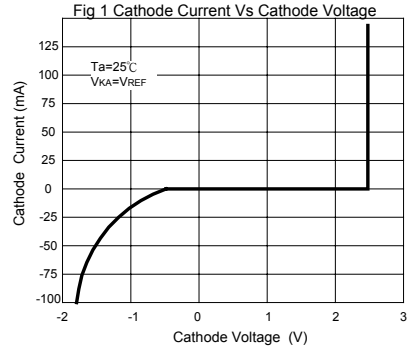


Fig 2 Cathode Current Vs Cathode Voltage

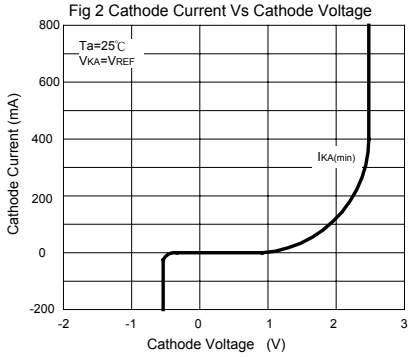


Fig 3 Change in Reference Input Voltage Vs Cathode voltage

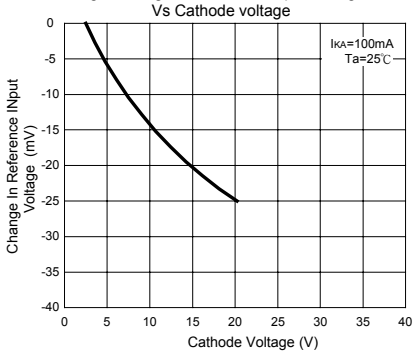


Fig 4 Pulse Response

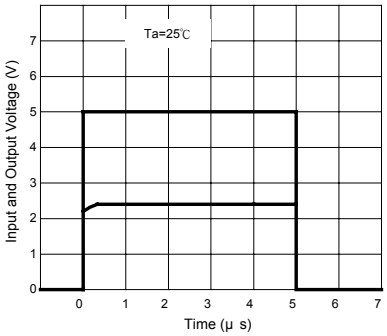


Fig 5 Dynamic Impedance Vs Frequency

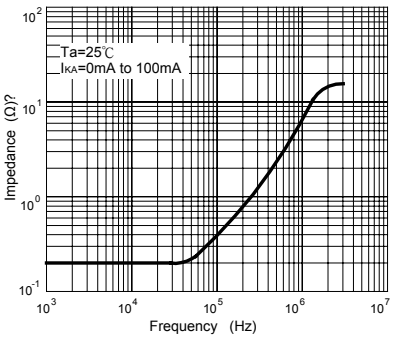
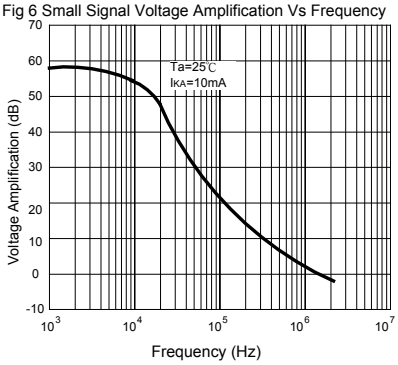


Fig 6 Small Signal Voltage Amplification Vs Frequency



TEST CIRCUIT

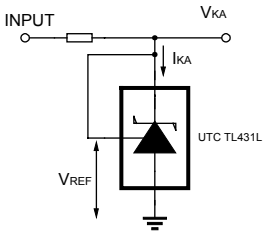


Fig 7 Test Circuit For $V_{KA}=V_{REF}$

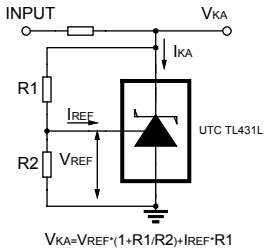


Fig 8 Test Circuit for $V_{KA} >= V_{REF}$

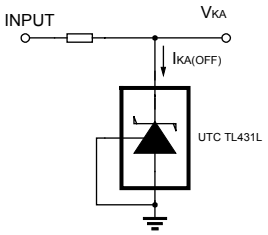


Fig 9 Test Circuit For $I_{KA(OFF)}$

APPLICATION CIRCUIT

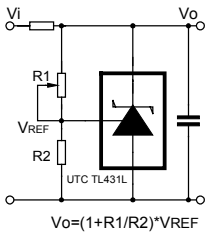


Fig 10 Shutdown Regulator

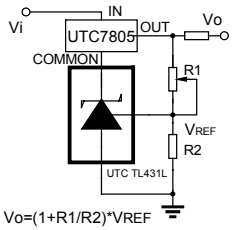


Fig 11 Output Control of a Three -Terminal Fixed Regulator

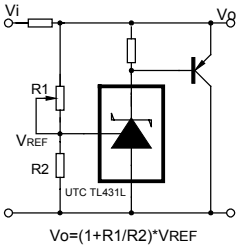


Fig 12 Higher-current Shunt Regulator

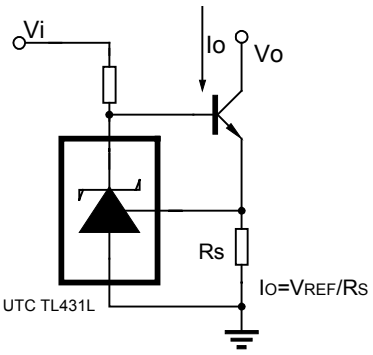


Fig 13 Constant-current Sink

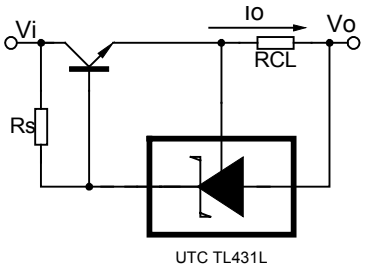


Fig 14 Current Limiting or Current Source