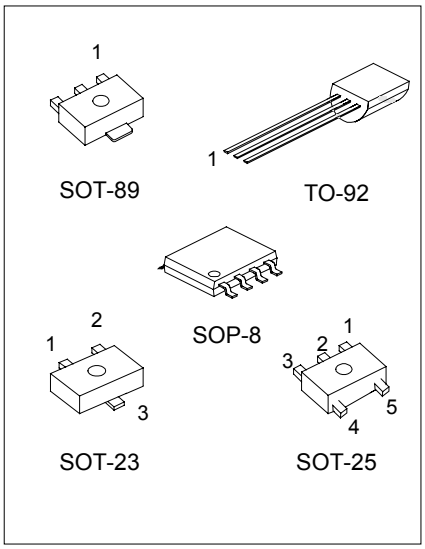
UTC TL431 LINEAR INTEGRATED CIRCUIT

PROGRAMMABLE PRECISION REFERENCE



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 See MARKING INFORMATION
SOT-25 1,2: NC; 3: Cathode; 4: Ref.; 5: Anode

*Pb-free plating product number: TL431K

DESCRIPTION

The UTC TL431 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 36 V 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 0.2Ω.

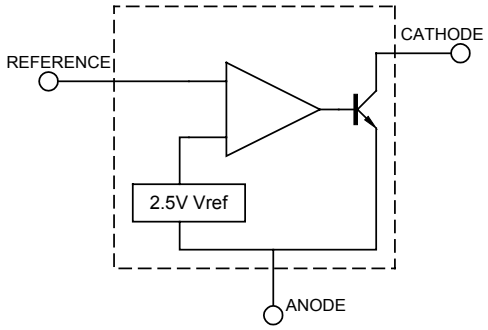
*Sink current capability of 1.0 to 100mA.

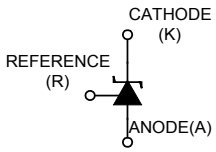
*Equivalent full-range temperature coefficient of 50ppm/ °C typical for operation over full rated operating temperature range.

MARKING INFORMATION (SOT-23)

PART NUMBER	PIN 1	PIN 2	PIN 3	MARKING
TL431	Cathode	Ref	Anode	431
TL431-NS	Ref	Cathode	Anode	431N

BLOCK DIAGRAM





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

PARAMETER	SYMBOL	VALUE	UNIT
Cathode Voltage	V_{KA}	37	V
Cathode Current Range(Continuous)	I_{KA}	-100 ~ +150	mA
Reference Input Current Range	Iref	-0.05 ~ +10	mA
Power Dissipation SOT-23 SOT-89 TO-92 SOP-8	P_D	 280 770 770 770	mW
Operating Junction Temperature	Tj	150	°C
Operating Ambient Temperature	Topr	-40 ~ +85	°C
Storage Temperature	Tstg	-65 ~ +150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V_{KA}	V_{REF}		36	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	$V_{KA}=V_{REF}, I_{KA}=10mA$		2.470	2.495	2.520	V
Deviation of reference Input Voltage Over temperature (note 1)	$\Delta Vref/\Delta T$	$V_{KA}=V_{REF}, I_{KA}=10mA$ $T_{MIN}<=T_A<=T_{MAX}$			4.5	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta Vref/\Delta V_{KA}$	$I_{KA}=10mA$	$\Delta V_{KA}=10V\sim V_{REF}$ $\Delta V_{KA}=36V\sim 10V$		-1.0 -0.5	-2.7 -2.0	mV/V
Reference Input Current	Iref	$I_{KA}=10mA, R1=10k\Omega, R2=\infty$			1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$\Delta Iref/\Delta T$	$I_{KA}=10mA, R1=10k\Omega, R2=\infty$ 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)	$V_{KA}=36V, V_{REF}=0$			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

TYPICAL PERFORMANCE CHARACTERISTICS

Fig 1 Cathode Current Vs Cathode Voltage

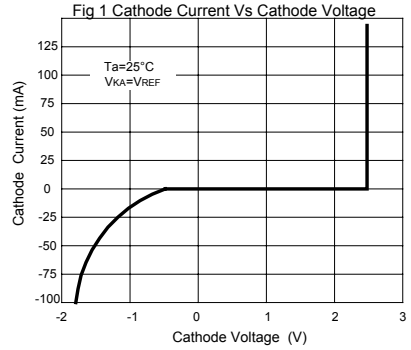


Fig 2 Cathode Current Vs Cathode Voltage

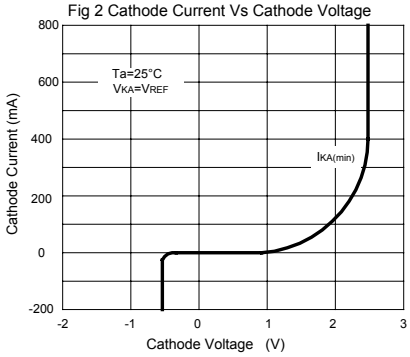


Fig 3 Change in Reference Input Voltage Vs Cathode voltage

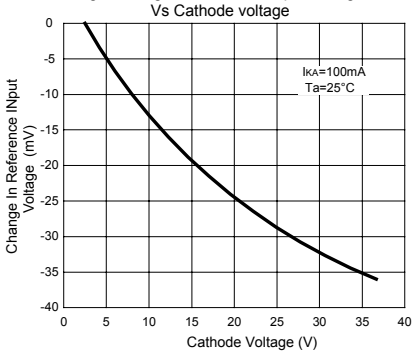


Fig 4 Pulse Response

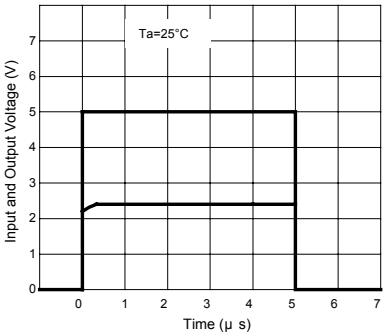


Fig 5 Dynamic Impedance Vs Frequency

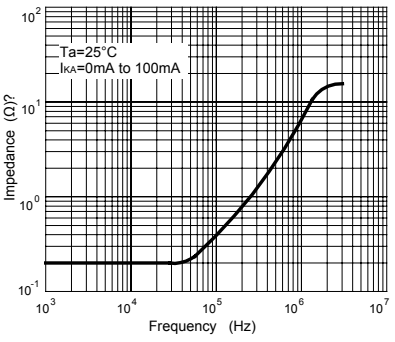
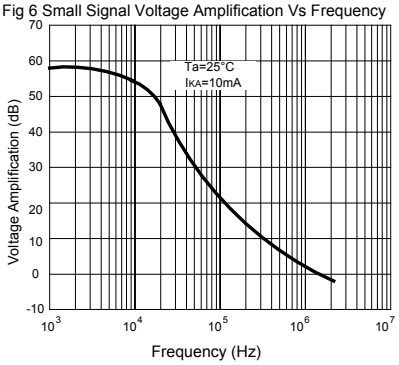


Fig 6 Small Signal Voltage Amplification Vs Frequency



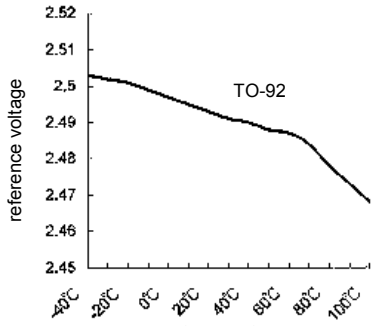
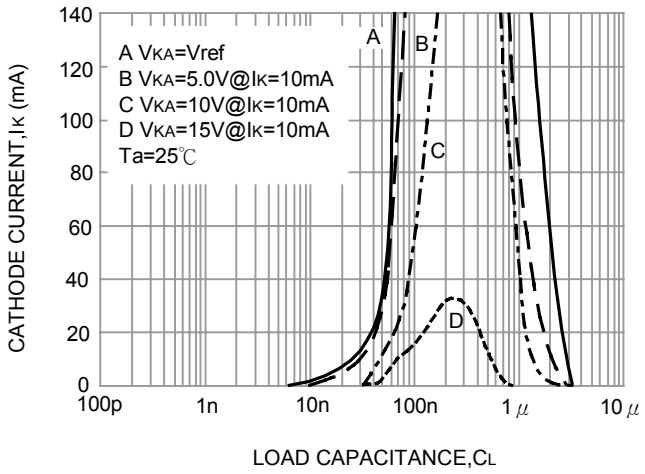


Fig. 7



TEST CIRCUIT

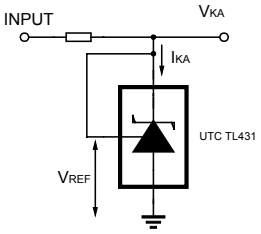


Fig 8 Test Circuit For $V_{KA}=V_{REF}$

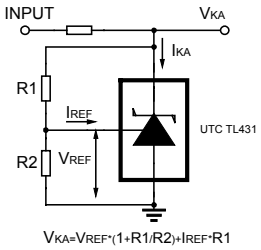


Fig 9 Test Circuit for $V_{KA} >= V_{REF}$

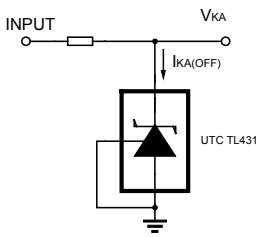


Fig 10 Test Circuit For $I_{KA(OFF)}$

APPLICATION CIRCUIT

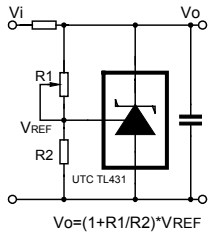


Fig 11 Shutdown Regulator

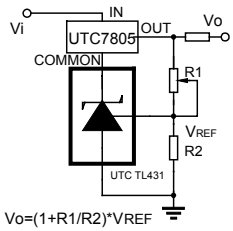


Fig 12 Output Control of a Three -Terminal Fixed Regulator

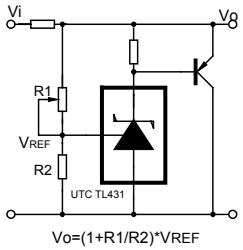


Fig 13 Higher-current Shunt Regulator

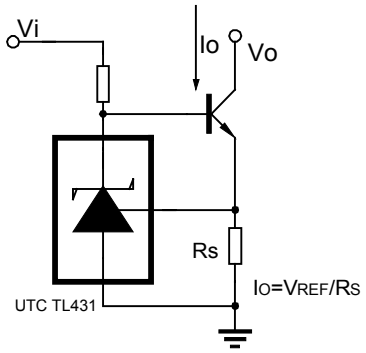


Fig 14 Constant-current Sink

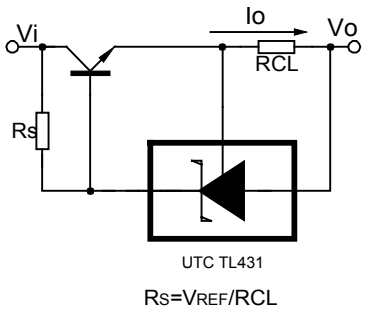


Fig 15 Current Limiting or Current Source