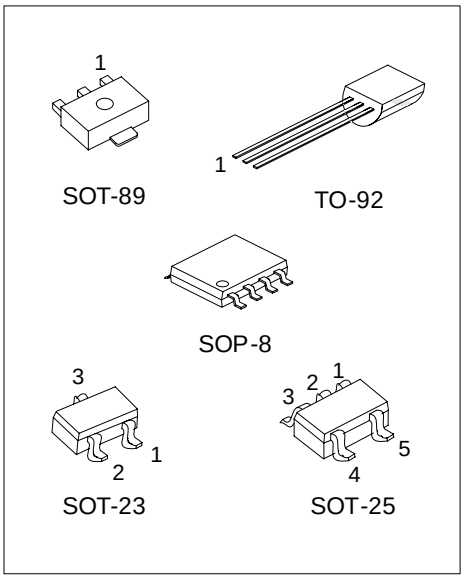
TL431

LINEAR INTEGRATED CIRCUIT

PROGRAMMABLE PRECISION REFERENCE

.



*Pb-free plating product number: TL431K
*Pb-free plating product for SOT-23NS type number: TL431NSL

■ 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 V_{REF} (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.

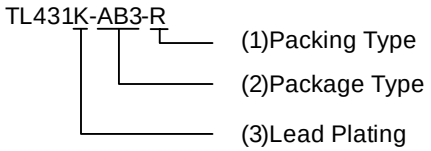
■ FEATURES

*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.

■ ORDERING INFORMATION

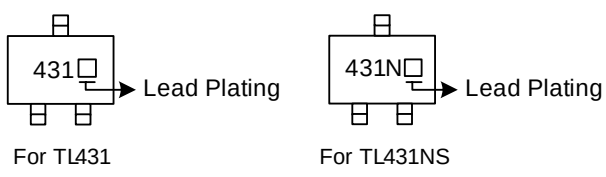
Order Number		Pin Assignment								Package	Packing
Normal	Lead Free Plating	1	2	3	4	5	6	7	8		
TL431-AB3-R	TL431K-AB3-R	R	A	K	-	-	-	-	-	SOT-89	Tape Reel
TL431-AE3-R	TL431K-AE3-R	K	R	A	-	-	-	-	-	SOT-23	Tape Reel
TL431NS-AE3-R	TL431NSL-AE3-R	R	K	A	-	-	-	-	-	SOT-23	Tape Reel
TL431-AF5-R	TL431K-AF5-R	X	X	K	R	A	-	-	-	SOT-25	Tape Reel
TL431-S08-R	TL431K-S08-R	K	A	A	X	X	A	A	R	SOP-8	Tape Reel
TL431-S08-T	TL431K-S08-T	K	A	A	X	X	A	A	R	SOP-8	Tube
TL431-T92-B	TL431K-T92-B	R	A	K	-	-	-	-	-	TO-92	Tape Box
TL431-T92-K	TL431K-T92-K	R	A	K	-	-	-	-	-	TO-92	Bulk
TL431-T92-R	TL431K-T92-R	R	A	K	-	-	-	-	-	TO-92	Tape Reel

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

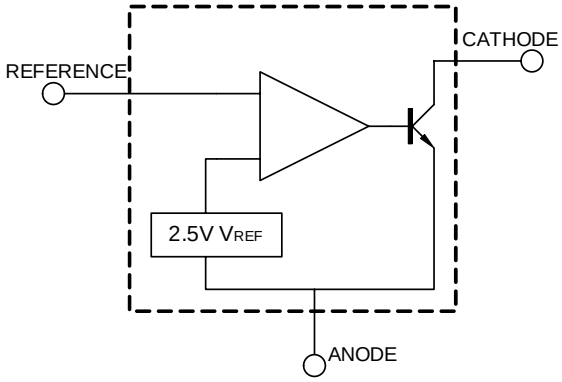


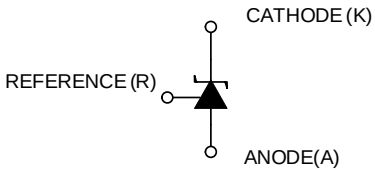
(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube
(2) AB3: SOT-89, AE3: SOT-23, AF5: SOT-25, S08:SOP-8, T92: TO-92
(3) K: Lead Free Plating, Blank: Pb/Sn
L : Lead Free Plating Only for SOT-23NS Type

■ MARKING (SOT-23/SOT-25)



■ 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 Range		I_{REF}	-0.05 ~ +10	mA
Power Dissipation	TO-92	P_D	770	mW
	SOT-89		800	mW
	SOT-23/SOT-25		300	mW
Operating Junction Temperature		T_J	+150	°C
Operating Ambient Temperature		T_{OPR}	-40 ~ +85	°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

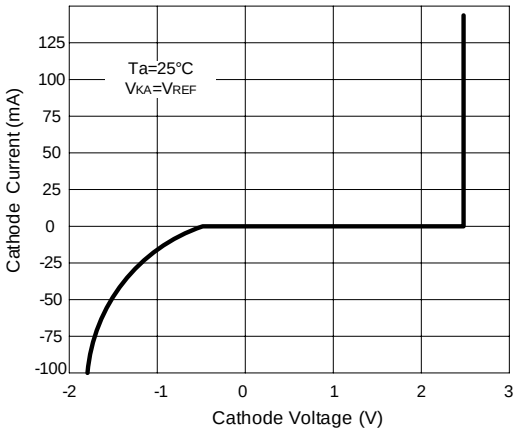
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Cathode Voltage	V_{KA}	V_{REF}		36	V
Cathode Current	I_{KA}	1		100	mA

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

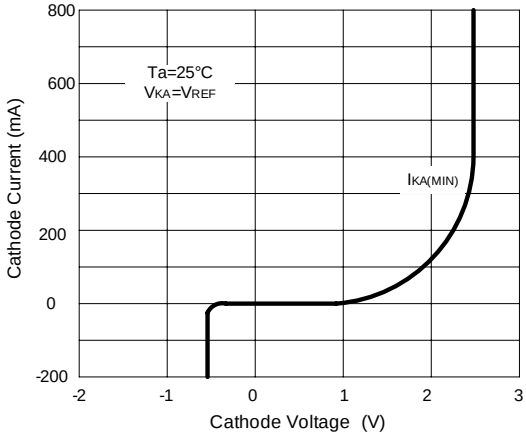
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Reference Input Voltage	V_{REF}	$V_{KA}=V_{REF}$,I_{KA}=10mA		2.470	2.495	2.520	V
Deviation of reference Input Voltage Over temperature	$\Delta V_{REF}/\Delta T$	$V_{KA}=V_{REF}$,I_{KA}=10mA 0°C≦Ta≦70°C			4.5	17	mV
Ratio of Change in Reference Input 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=∞			1.5	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$\Delta I_{REF}/\Delta T$	I_{KA}=10mA, R1=10kΩ, R2=∞ Ta =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

■ TYPICAL CHARACTERISTICS

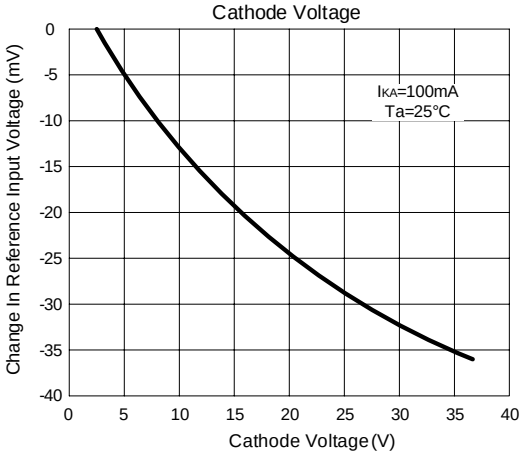
Cathode Current vs. Cathode Voltage



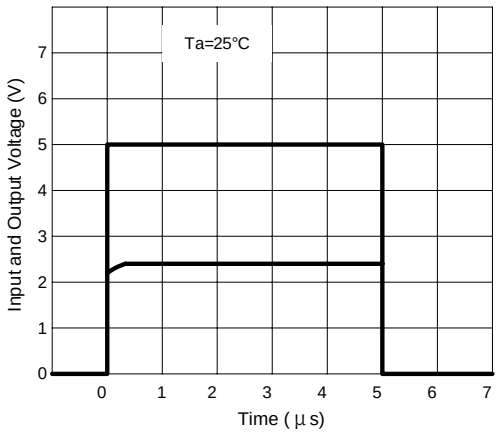
Cathode Current vs. Cathode Voltage



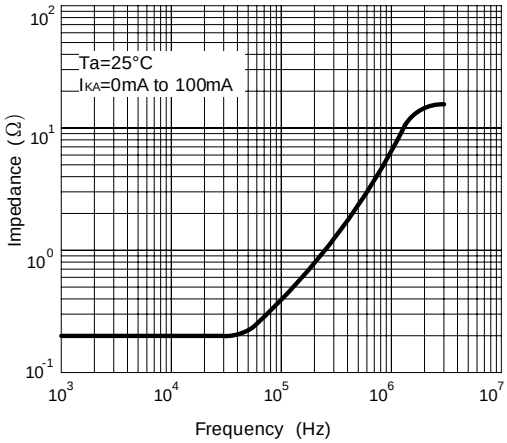
Change in Reference Input Voltage vs. Cathode Voltage



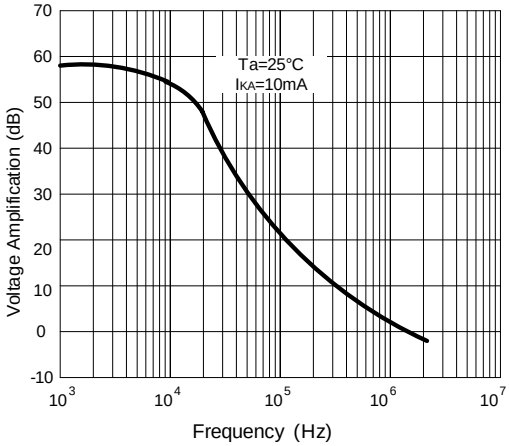
Pulse Response



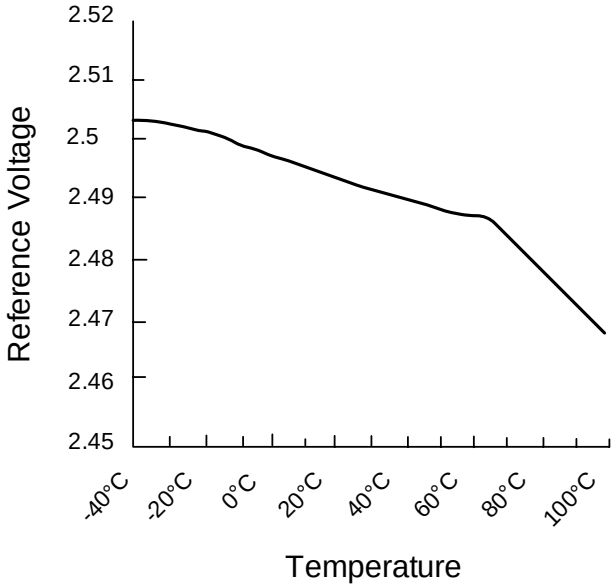
Dynamic Impedance vs. Frequency

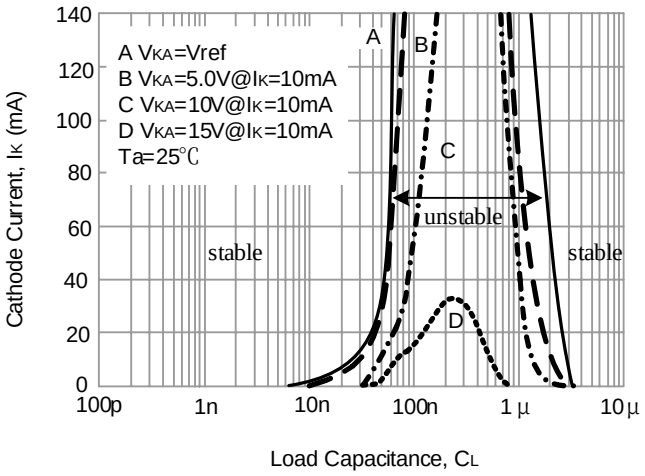


Small Signal Voltage Amplification vs. Frequency

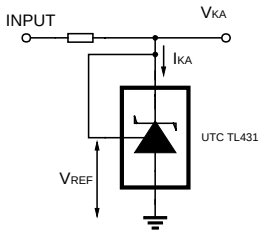


■ TYPICAL CHARACTERISTICS (Cont.)

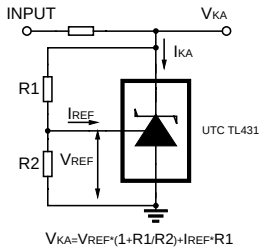




■ TEST CIRCUIT

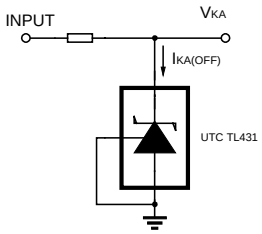


For $V_{KA}=V_{REF}$



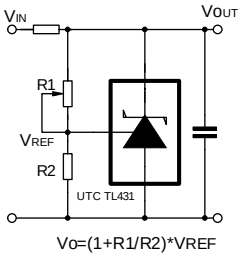
$V_{KA}=V_{REF}*(1+R1/R2)+I_{REF}*R1$

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



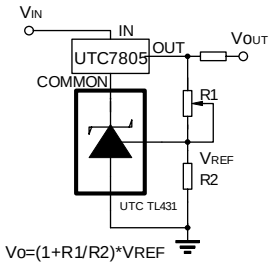
For $I_{KA(OFF)}$

■ APPLICATION CIRCUIT



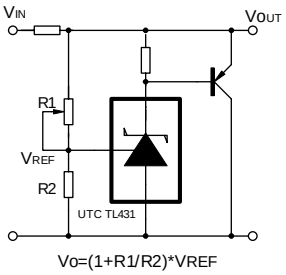
Vo=(1+R1/R2)*VREF

Shutdown Regulator



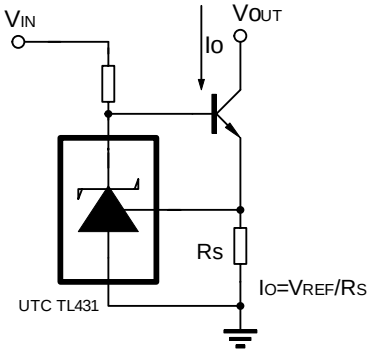
Vo=(1+R1/R2)*VREF

Output Control of a Three -Terminal Fixed Regulator



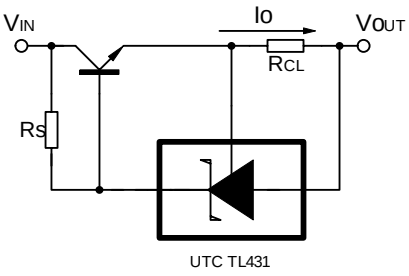
Vo=(1+R1/R2)*VREF

Higher-current Shunt Regulator



$I_O=V_{REF}/R_S$

Constant-current Sink



$R_S=V_{REF}/R_{CL}$

Current Limiting or Current Source