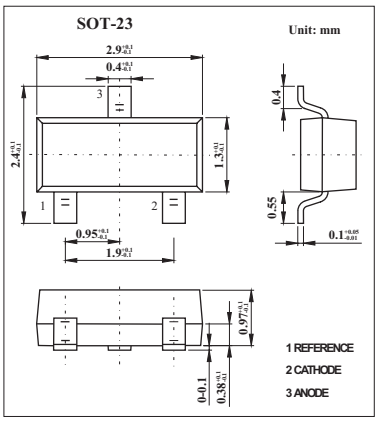
Adjustable Accurate Reference Source

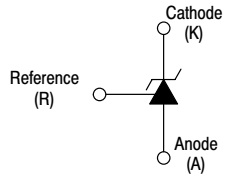
TL431

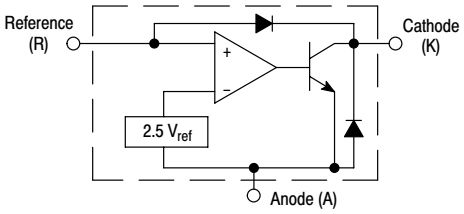
■ Features

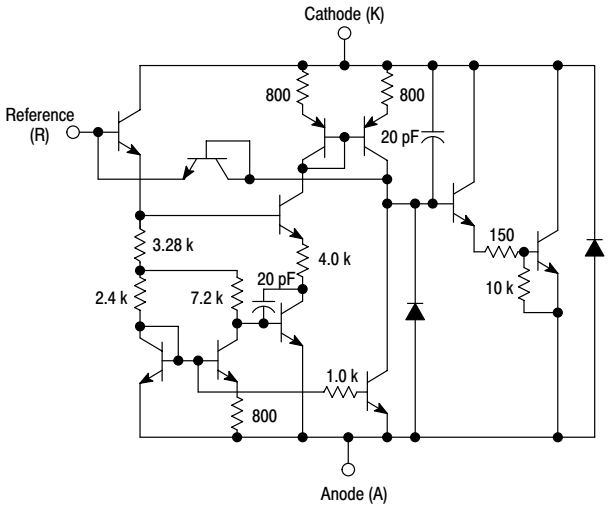
- The output voltage can be adjusted to 36v.
- Low dynamic output impedance, its typical value is 0.2Ω
- Trapping current capability is 1 too 100mA.
- The typical value of the equivalent temperature factor in the whole temperature scope is 50 ppm/℃.
- The effective temperature compensation in the working Range of full temperature.
- Low output noise voltage.
- Fast on-state response.



■ Internal Block Diagram







■ Absolute Maximum Ratings Ta = 25℃

Parameter	Symbol	Rating	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	P_D	350	mW
Operating Temperature	Topr	0-70	℃
Storage Temperature Range	Tstg	-65 to +150	℃

TL431

■ Electrical Characteristics Ta = 25℃

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Reference Input Voltage	Vref	$V_{KA}=V_{REF}$, I_{KA}=10mA	2.450	2.5	2.550	V
Deviation of reference Input Voltage Over temperature *	△Vref/△T	$V_{KA}=V_{REF}$, I_{KA}=10mA,Tmin≤Ta≤Tmax		4.5	17	mV
Ratio Of Change in Reference Input Voltage to the change in Cathode Voltage	$\triangle V_{ref}/\triangle V_{KA}$	I_{KA}=10mA △V_{KA} =10V~V_{REF} I_{KA}=10mA △V_{KA} =36V~10V		-1.0 -0.5	-2.7 -2.0	mV/V
Reference input Current	Iref	I_{KA}=10mA, R_1=10KΩ R2=∞		1.5	4	μA
Deviation Of Reference Input Current Over Full Temperature Range	△Iref/△T	I_{KA}= 10mA, R_1=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}=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

*.T_{MIN}=0℃ T_{MAX}=+70℃

■ Marking

Marking	431

■ Classification of Vref

Rank	0.5%	1%	2%
Range	2.487-2.512	2.475-2.525	2.45-2.55

■ Test Circuits

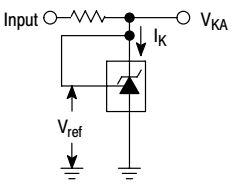


Figure 1. Test Circuit for $V_{KA} = V_{ref}$

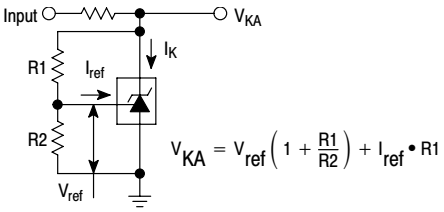


Figure 2. Test Circuit for $V_{KA} > V_{ref}$

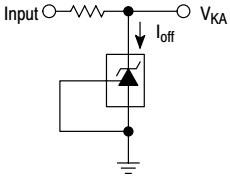


Figure 3. Test Circuit for I_{off}

TL431

■ Typical Characteristics

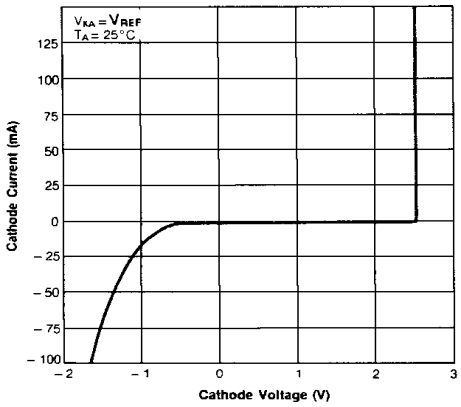


Figure 1. Cathode Current vs. Cathode Voltage

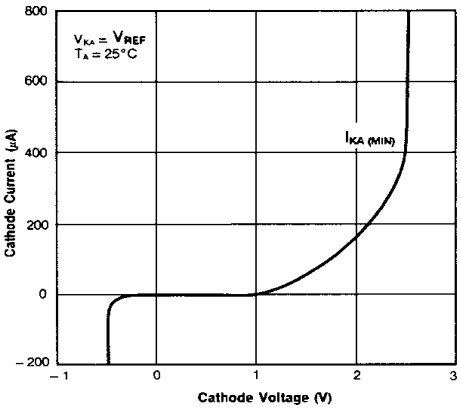


Figure 2. Cathode Current vs. Cathode Voltage

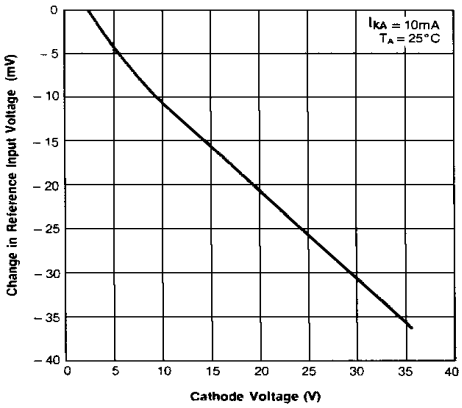


Figure 3. Change In Reference Input Voltage vs. Cathode Voltage

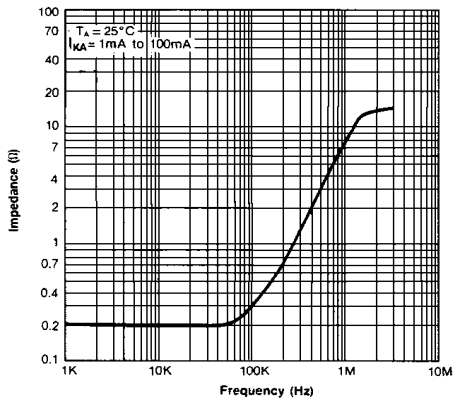


Figure 4. Dynamic Impedance Frequency

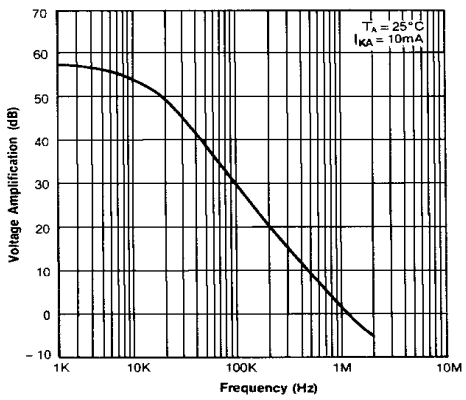


Figure 5. Small Signal Voltage Amplification vs. Frequency

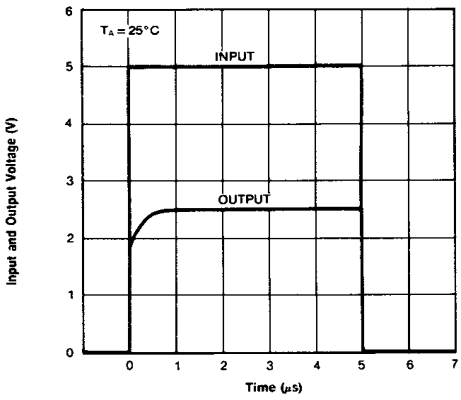


Figure 6. Pulse Response