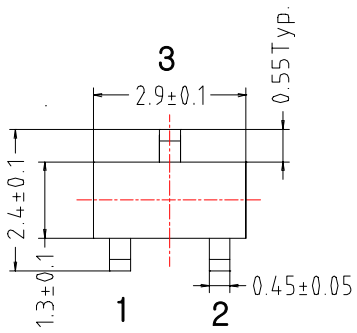
1. Features

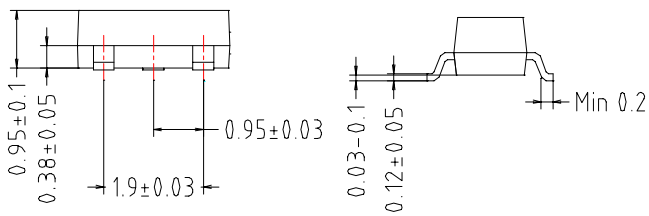
· Programmable output voltag to 36 volts
· Low dynamic output impedance 0.20 typical
· Sink current capability of 1.0 to 100mA
· Equivalent full-range temperature coefficient of 50ppm/℃ typical
· Temperature compensated for operation over full rated operating temperature range.
· Low output noise voltage
· Fast turn-on response

2. Ordering Information

Device	Marking	Package
TL431	431	SOT-23
TL431AS	31A	SOT-23
TL431CS	31C	SOT-23

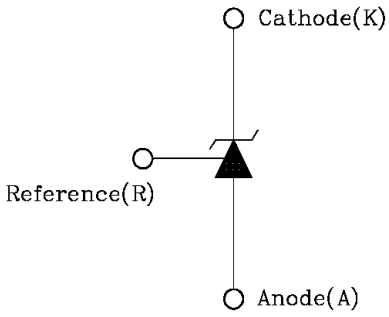
3. Outline Dimensions



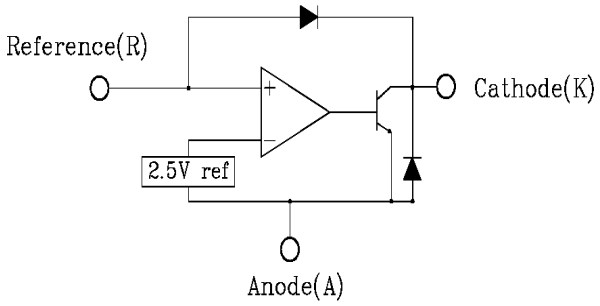


PIN Connections
1. Reference
2. Chathode
3. Anode

Symbol



Functional block diagram



4. Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified.)

Parameter	Symbol	Ratings	Units
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	300	mW
Operating Temperature Range	T_{opr}	-20 ~ +85	℃
Storage Temperature Range	T_{stg}	-65 ~ +150	℃

5. Recommended Operating Conditions

Parameter	Symbol	Ratings			Units
		Min	Typ	Max	
Cathode Voltage	V_{KA}	V_{REF}	-	36	V
Cathode Current	I_K	1	-	100	mA

6. Electrical Characteristics

(Ta=+25℃ , Unless otherwise specified)

Parameter		Symbol	Conditions	Ratings			Units
				Min	Typ	Max	
Reference input voltage	TL431S	V_{REF}	$V_{KA}=V_{REF}$, I_K=10mA	2.44	2.495	2.55	V
	TL431AS			2.47	2.495	2.52	
	TL431CS			2.482	2.495	2.508	
Deviation of reference input voltage over temperature (Fig. 1 , Note 1,2)		$\Delta V_{REF}/\Delta T$	$V_{KA}=V_{REF}$, I_K=10mA $T_{MIN} \le T_A \le T_{MAX}$	-	2	17	mV
Ratio of change in reference input voltage to the change in cathode voltage (Fig. 2)		$\Delta V_{REF}/\Delta V_{KA}$	I_K=10mA $\Delta V_{KA}=10V-V_{REF}$ $\Delta V_{KA}=36V-10V$	-	-1.4 -1.0	-2.7 -2.0	mV/V
Reference input current (Fig. 2)		I_{REF}	I_{KA}=10mA R1=10KΩ, R2=∞	-	2	4	µA
Deviation of reference input voltage over temperature (Fig. 2)		$\Delta I_{REF}/\Delta T$	I_{KA}=10mA R1=10KΩ, R2=∞ T_A=Full Range	-	0.4	1.2	µA
Minimum cathode current for regulation (Fig. 1)		$I_{KA(MIN)}$	$V_{KA}=V_{REF}$	-	0.4	1	mA
Off-state cathode current(Fig. 3)		$I_{KA(OFF)}$	V_{KA}=36V, V_{REF}=0	-	0.1	1	µA
Dynamic impedance(Fig. 1 , Note 3)		Z_{KA}	$V_{KA}=V_{REF}$ I_{KA}=1 to 100mA f≥1.0KHz	-	0.2	0.5	Ω

7. Test Circuits

Fig. 1

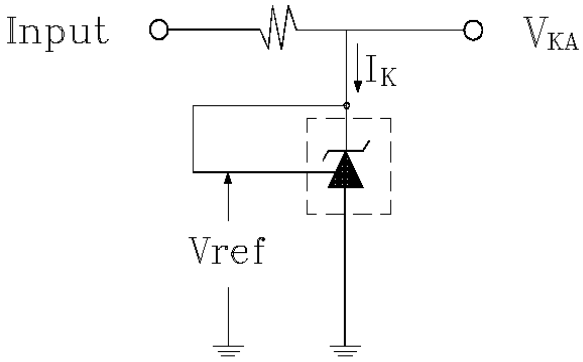


Fig. 2

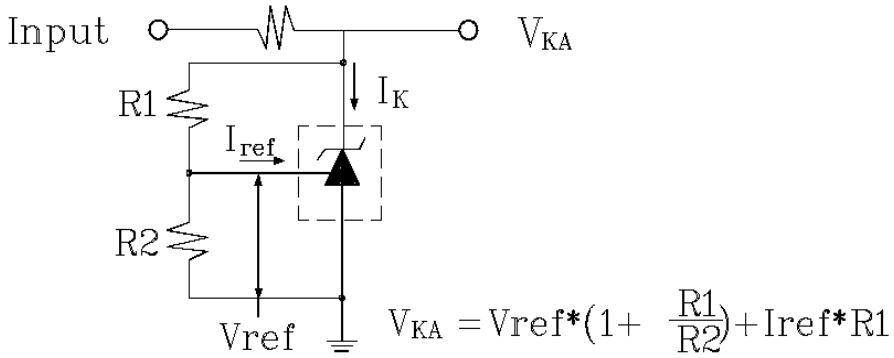
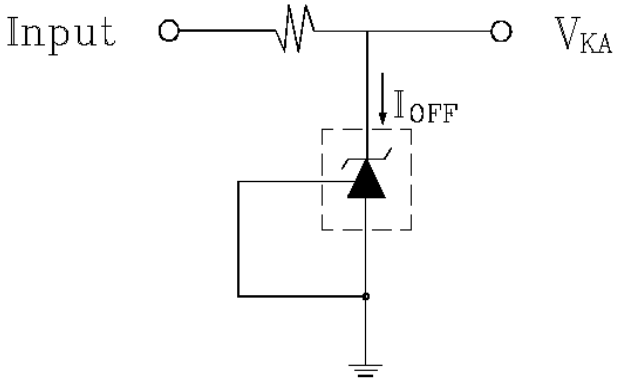


Fig. 3



Note 1> T_{MIN}=-40℃ , T_{MAX}=+85℃

Note 2> $\Delta VREF = V_{REF(MAX)} - V_{REF(MIN)}$

Note 3> $Z_{KA} = \Delta V_{KA} / \Delta I_K$

8. Characteristic Diagrams

Fig. 4 I_K vs V_{KA}

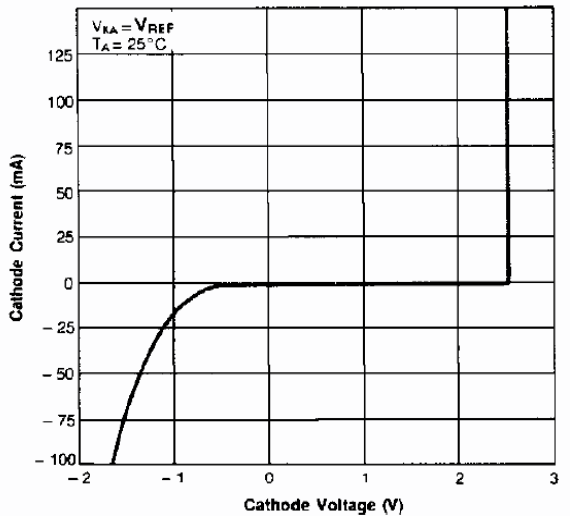


Fig. 5 I_{MIN} vs V_{KA}

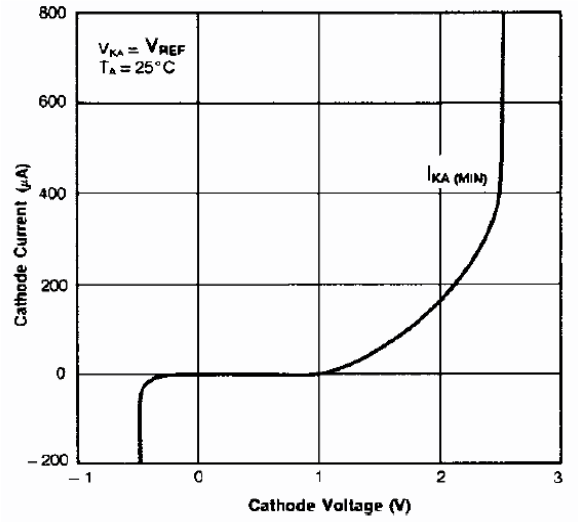


Fig. 6 ΔV_{REF} vs T_A

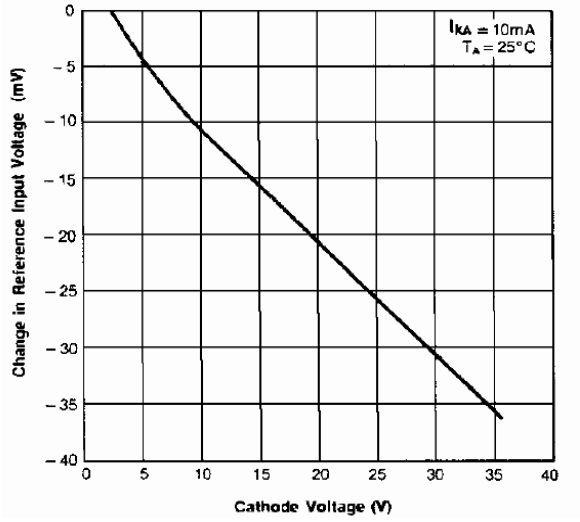


Fig. 7 Z_{KA} vs frequency

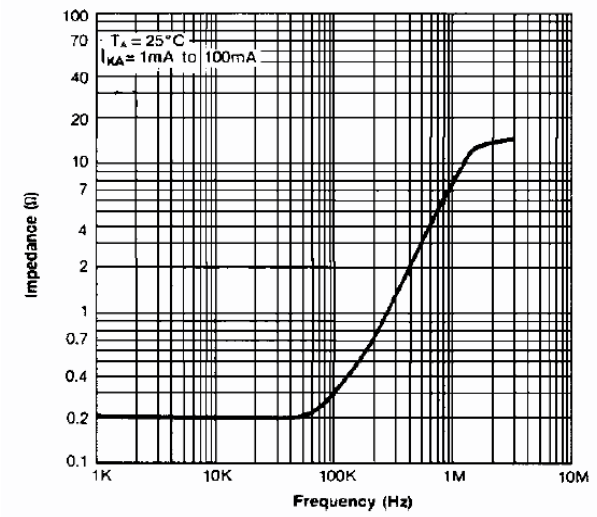


Fig. 8 G_V vs frequency

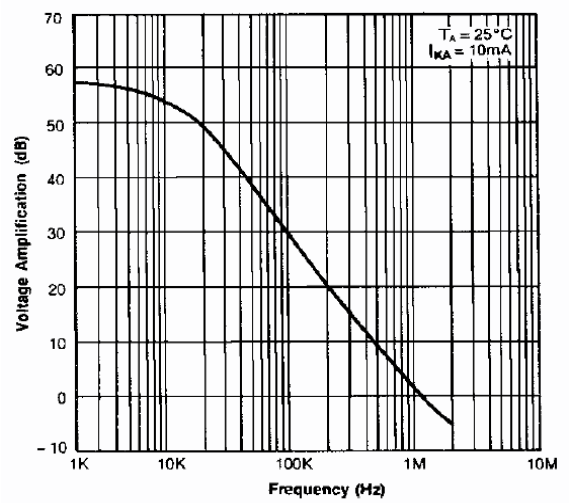


Fig. 9 Pulse Response