TL431K

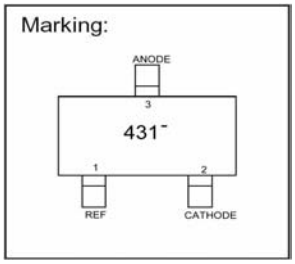
Elektronische Bauelemente

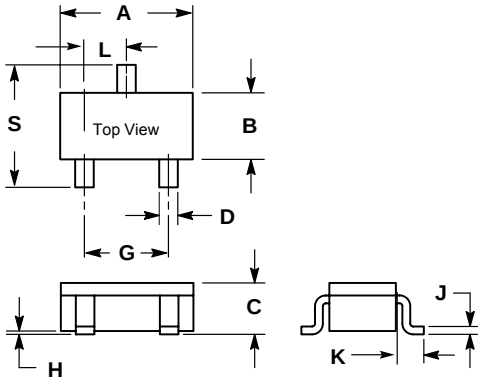
Adjustable Shunt Regulator

RoHS Compliant Product

Description

The TL431K series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.495V) and 36V with two extermal resistors. In provides very wide applications, including shunt regulator, series regulator, switching regulator, voltage reference and others.





SC-59		
Dim	**Min**	**Max**
A	2.70	3.10
B	1.40	1.60
C	1.00	1.30
D	0.35	0.50
G	1.70	2.10
H	0.00	0.10
J	0.10	0.26
K	0.20	0.60
L	0.85	1.15
S	2.40	2.80
All Dimension in mm		

Absolute Maximum Ratings at Ta=25°C

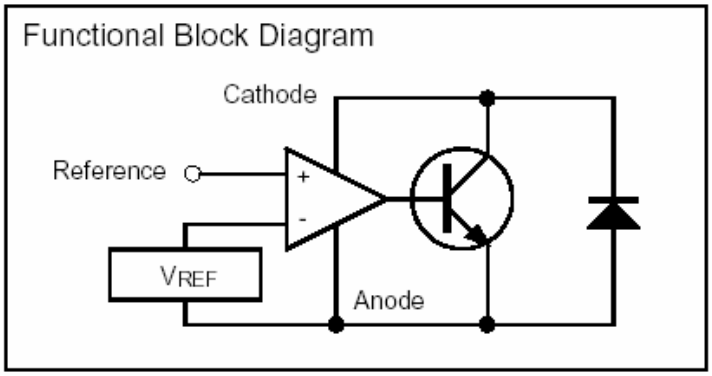
Parameter	Symbol	Ratings	Unit
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_{KA}	-100~+150	mA
Reference Input Current Range	I_{REF}	-0.05~+10	mA
Total Power Dissipation	P_D	225	mW
Operating Junction and Storage Temperature Range	Tj, Tstg	-65~+150	°C

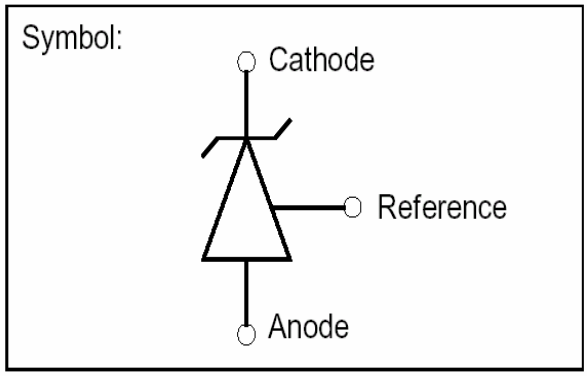
Characteristics at Ta=25°C

Parameter		Symbol	Min.	Typ.	Max.	Unit	Test Condition
Cathode Voltage		V_{KA}	V_{REF}	–	36	V	
Cathode Current		I_{KA}	1	–	100	mA	
Reference Input Voltage	TL431KC	V_{REF}	2.445	2.495	2.545	V	$V_{KA}=V_{REF}, I_K=10mA$
	TL431KB		2.470	2.495	2.520		
	TL431KA		2.483	2.495	2.507		
Deviation of Reference Input Voltage Over Temperature (Note)		$\triangle V_{REF}/\triangle T$	–	4.5	17	mV	$V_{KA}=V_{REF}, I_K=10mA$ $T_{MIN} \leq T_A \leq T_{MAX}$
Ratio of Change in Reference Input Voltage to The Change in Cathode Voltage		$\triangle V_{REF}/\triangle V_{KA}$	–	-1.0	-2.7	mV/V	$I_K=10mA$, $\triangle V_{KA}=10V\sim V_{REF}$
			–	-0.5	-2		$\triangle V_{KA}=36V\sim 10V$
Reference Input Current		I_{REF}	–	1.5	4	uA	$I_K=10mA, R1=10K\Omega, R2=\infty$
Deviation of Reference Input Current Over Full Temperature Range		$\triangle I_{REF}/\triangle T$	–	0.4	1.2	uA	$I_K=10mA, R1=10K\Omega, R2=\infty$ T_A=Full Temperature
Min. Cathode Current For Regulation		I_{KA}(min)	–	0.45	1.0	mA	$V_{KA}=V_{REF}$
Off-State Cathode Current		I_{KA}(off)	–	0.05	1.0	uA	$V_{KA}=36V, V_{REF}=0$
Dynamic Impedance		$\lvert Z_{KA}\rvert$	–	0.15	0.5	Ω	$V_{KA}=V_{REF}, I_K=1\sim100mA$, $F \leq 1KHz$

Note: T_{MIN}=0°C, T_{MAX}=+70°C

Functional Block Diagram & Symbol





Test Circuits

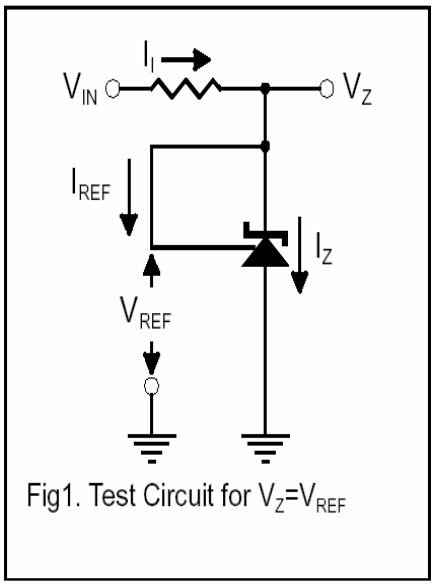


Fig1. Test Circuit for $V_Z=V_{REF}$

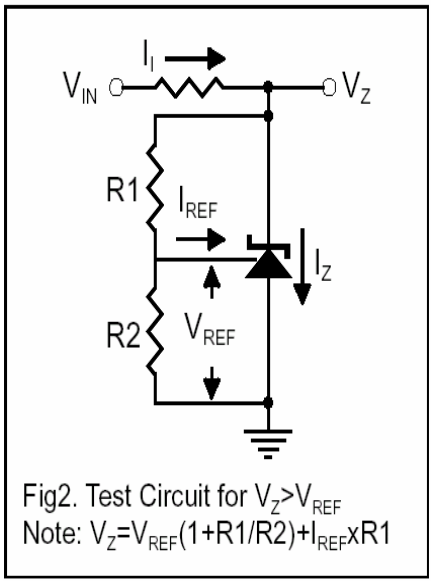


Fig2. Test Circuit for $V_Z>V_{REF}$
Note: $V_Z=V_{REF}(1+R1/R2)+I_{REF}xR1$

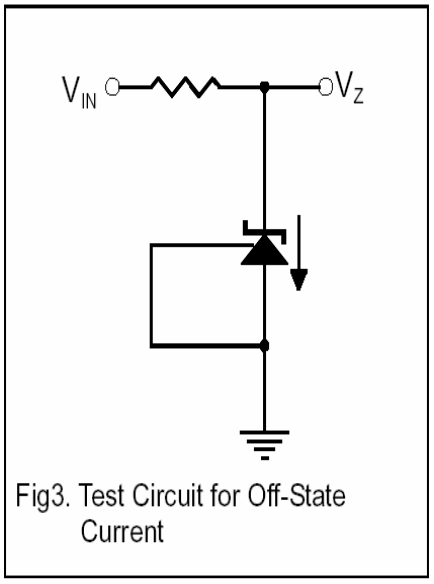
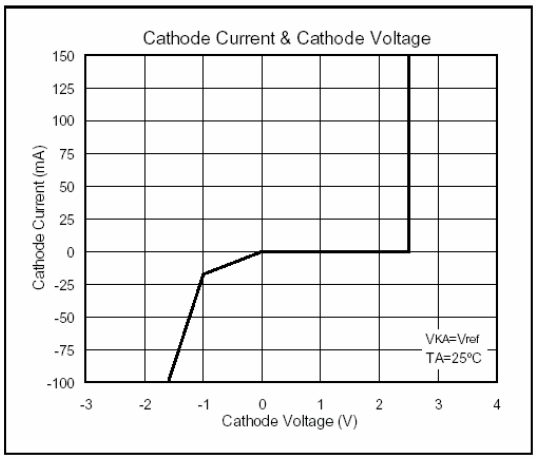
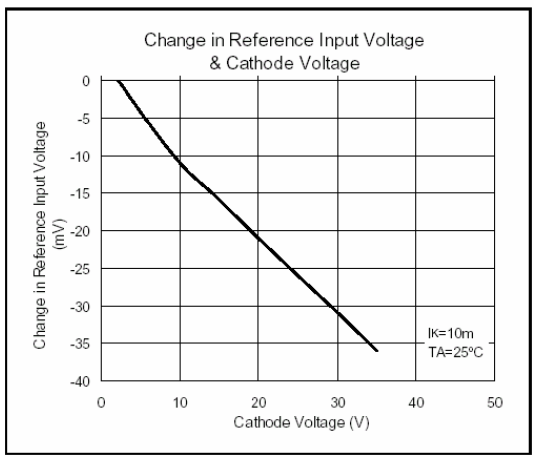
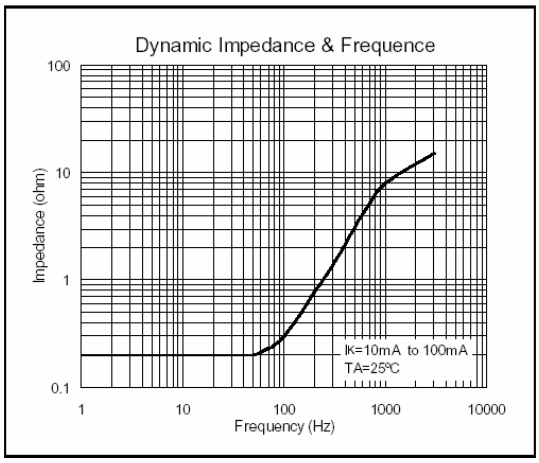


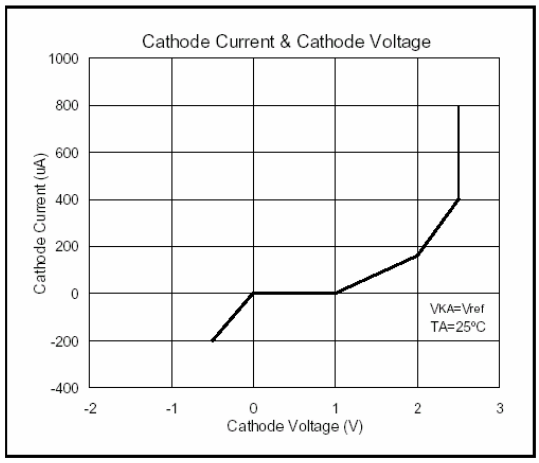
Fig3. Test Circuit for Off-State Current

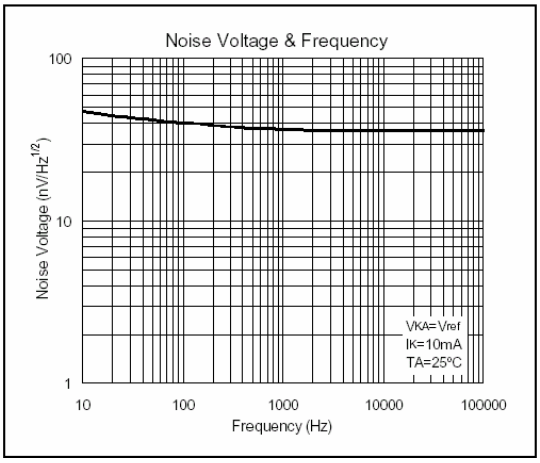
Characteristics Curve

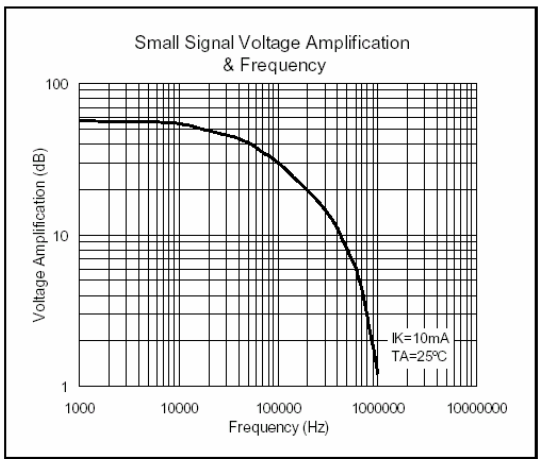


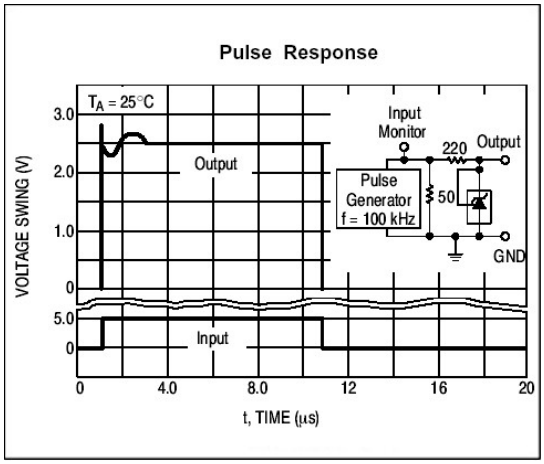



Dynamic Impedance & Frequence
Impedance (ohm)
100
10
1
0.1
1
10
100
1000
10000
Frequency (Hz)
IK=10mA to 100mA
TA=25ºC


Cathode Current & Cathode Voltage
Cathode Current (uA)
1000
800
600
400
200
0
-200
-400
-2
-1
0
1
2
3
Cathode Voltage (V)
VKA=Vref
TA=25ºC


Noise Voltage & Frequency
Noise Voltage (nV/Hz^1/2)
100
10
1
10
100
1000
10000
100000
Frequency (Hz)
VKA=Vref
IK=10mA
TA=25ºC


Small Signal Voltage Amplification
& Frequency
Voltage Amplification (dB)
100
10
1
1000
10000
100000
1000000
10000000
Frequency (Hz)
IK=10mA
TA=25ºC


Pulse Response
TA = 25°C
Input
Monitor
220
Output
Output
Pulse
Generator
f = 100 kHz
50
GND
VOLTAGE SWING (V)
3.0
2.0
1.0
0
5.0
0
Input
0
4.0
8.0
12
16
20
t, TIME (µs)