Three-terminal adjustable shunt voltage regulator

Description

The TL431 is 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 26 V with two external resistors.

These devices have provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

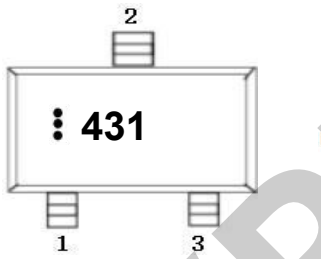
General Features

- 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
- Temperature compensated for operation over full rated operating temperature range
- Low output noise voltage
- Fast turn on response

Application

- Linear adjustment circuit
- Adjustable power supply
- Switching power supply circuits

Schematic diagram



1:REF(R) 2:ANODE(A) 3:CATHODE(K)

Marking and pin assignment

SOT-23

Absolute Maximum Ratings (TA=25℃ unless otherwise noted)

Symbol	Parameter	Value	Units
VKA	Cathode Voltage	37	V
IKA	Cathode Current Range	-100 ～100	mA
IREF	Reference Input Current Range	0.05 ～10	mA
PD	Power Dissipation (TC = 25℃)	300	mW
TJ , TSTG	Operating and Storage Temperature Range	-65 ～150	℃
Topr	Operating Temperature	0～70	℃

Thermal Characteristic

Thermal Resistance Junction- to- Ambient	$R_{\theta JA}$	-	℃/W

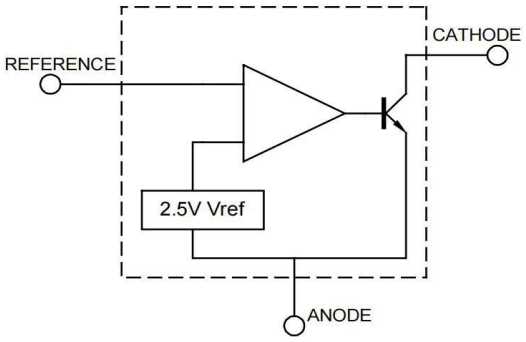
Electrical Characteristics (TA=25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Vref	Benchmark input voltage	VKA =Vref,IKA =10mA	2.445	2.495*	2.545	V
			2.450	2.500*	2.550	
ΔVref/ΔT	Reference voltage temperature drift	VKA =Vref,IC =100μA TA =0～70℃		4.5	17	mV
ΔVref/ΔVKA	Reference and cathode voltage changes ratio	IKA =10mA, ΔVKA =10V～Vref		-1.0	-2.7	mV/V
		IKA =10mA ΔVKA =36V ～10V		-0.5	-2.0	mV/V
IREF	Benchmark input current	IKA =10mA,R1=10KΩ,R2=∞		1.5	4	μA
ΔIREF /ΔT	The reference input current temperature changes Change rate	IKA =10mA,R1=10KΩ, R2=∞ TA =40 ～120℃		0.4	1.2	μA
IKA(MIN)	Minimum stabilized cathode current	VKA =Vref		0.45	1.0	mA
IKA(OFF)	**OFF**（cathodic current ）	VKA =36V, Vref =0		0.05	1.0	μA
ZKA	dynamic impedance	VKA = Vref IKA =1 ～100mA f≤1.0KHz		0.2	0.5	Ω

Classification of Vref (VKA=Vref,IKA=10mA)

Rank	0.5%	1.0%	2.0%
Range	2.483～2.507	2.470～2.520	2.445～2.545
	2.487～2.512	2.475～2.525	2.450～2.550

Block Diagram



***Select the appropriate voltage specifications according to the use requirements**

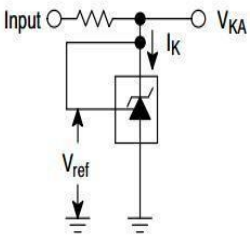


Figure 1. Test Circuit for $V_{KA} = V_{ref}$

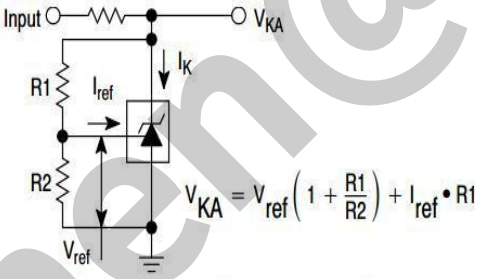


Figure 2. Test Circuit for $V_{KA} > V_{ref}$

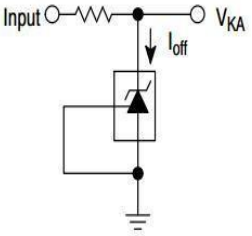
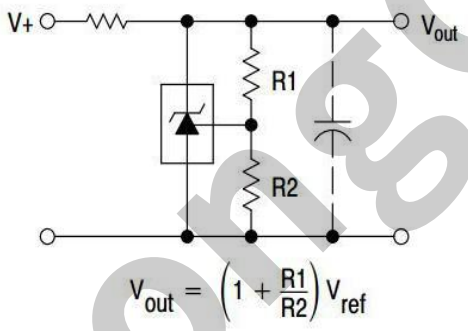
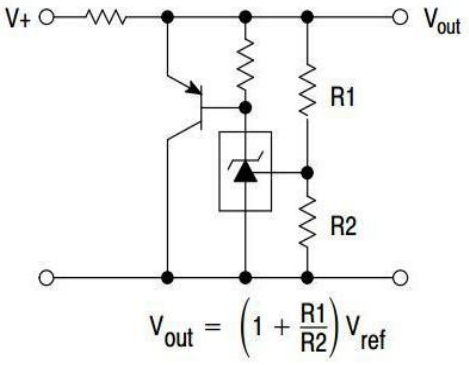


Figure 3. Test Circuit for I_{off}





Typical Electrical and Thermal Characteristics

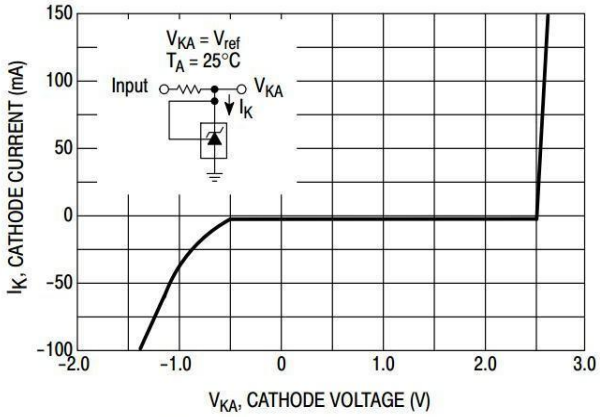


Figure 4. Cathode Current versus Cathode Voltage

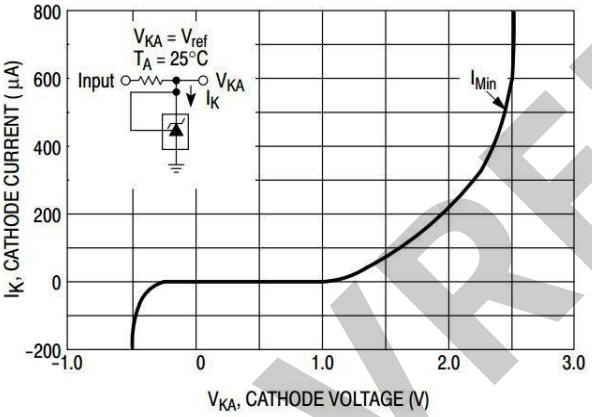


Figure 5. Cathode Current versus Cathode Voltage

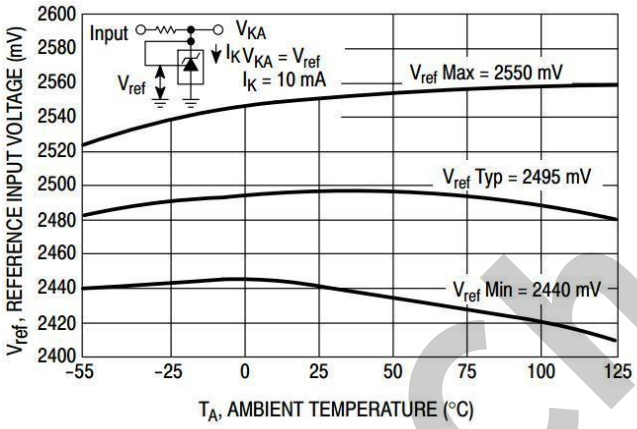


Figure 6. Reference Input Voltage versus Ambient Temperature

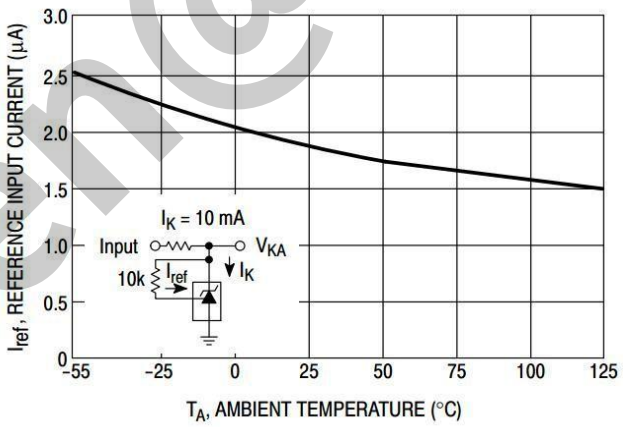


Figure 7. Reference Input Current versus Ambient Temperature

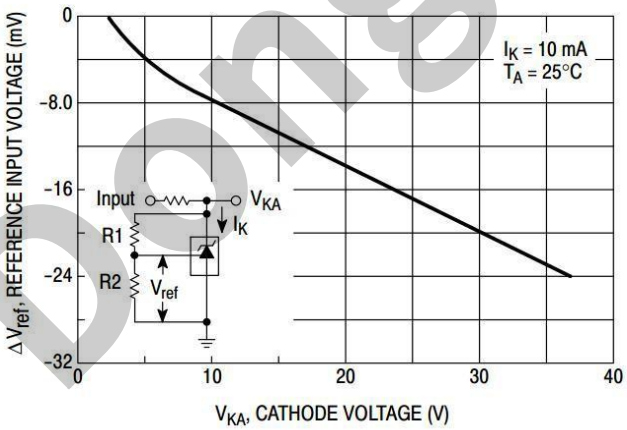


Figure 8. Change in Reference Input Voltage versus Cathode Voltage

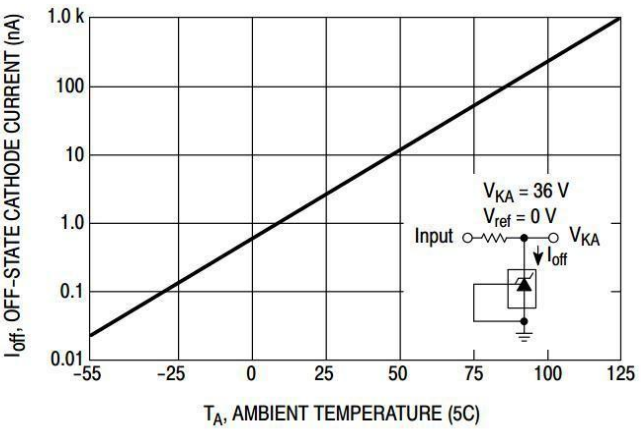


Figure 9. Off–State Cathode Current versus Ambient Temperature

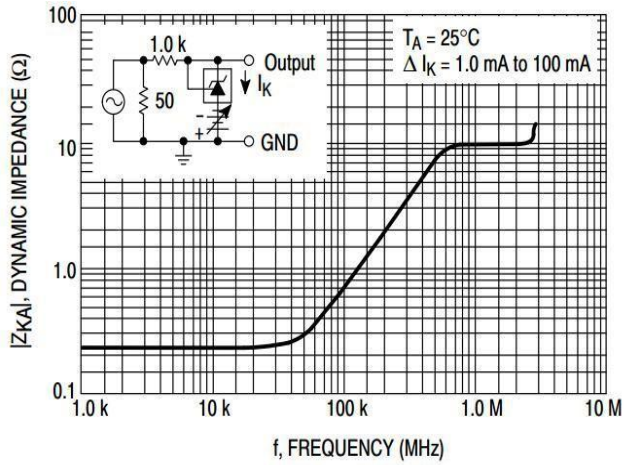


Figure 10. Dynamic Impedance versus Frequency

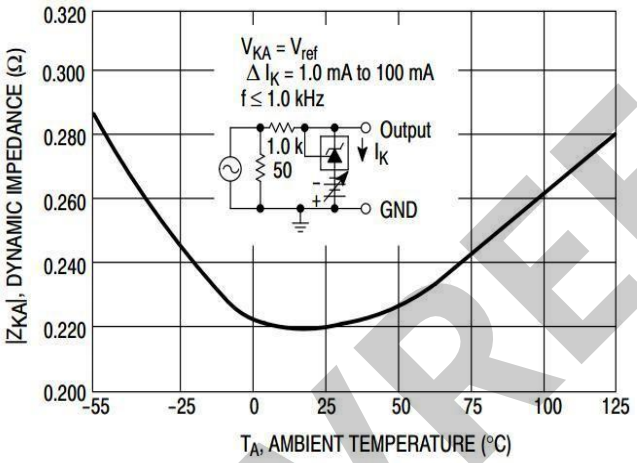


Figure 11. Dynamic Impedance versus Ambient Temperature

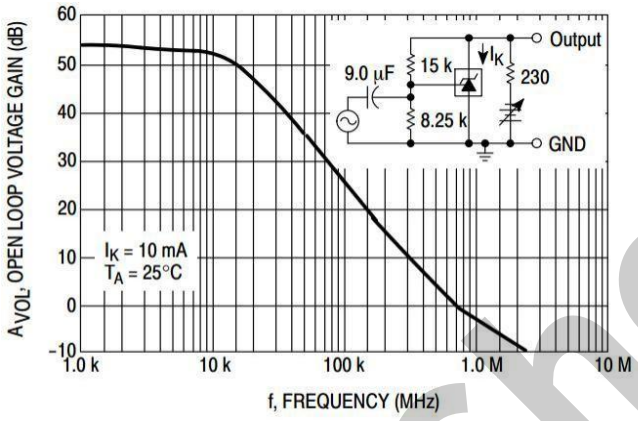


Figure 12. Open−Loop Voltage Gain versus Frequency

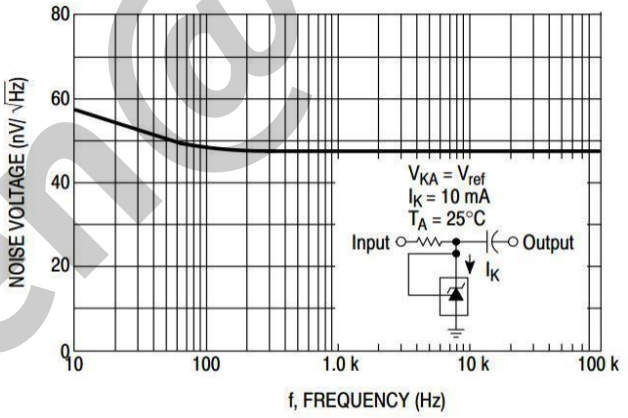


Figure 13. Spectral Noise Density

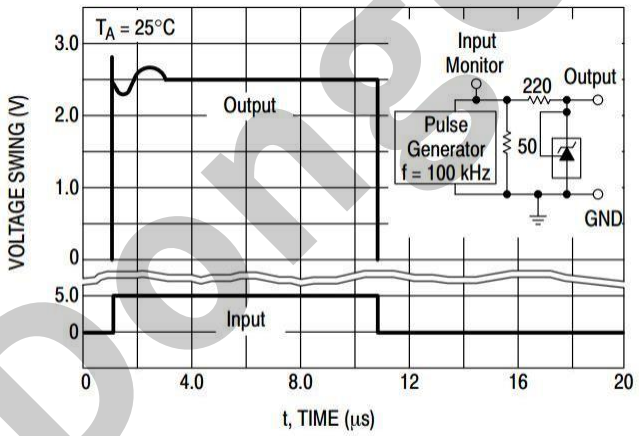


Figure 14. Pulse Response

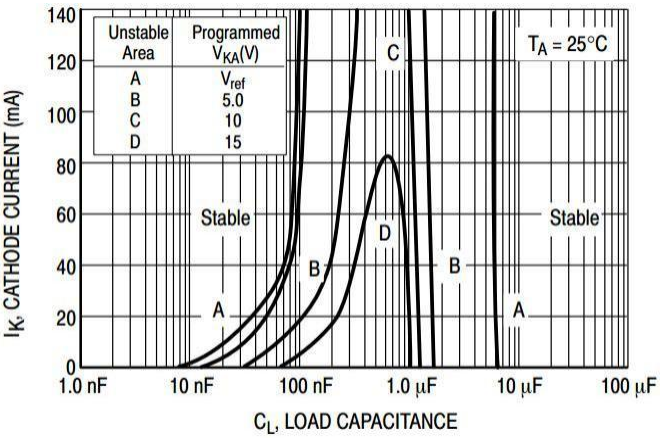
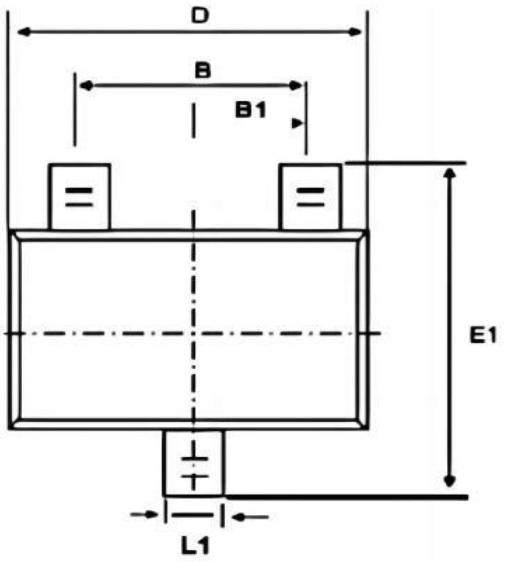
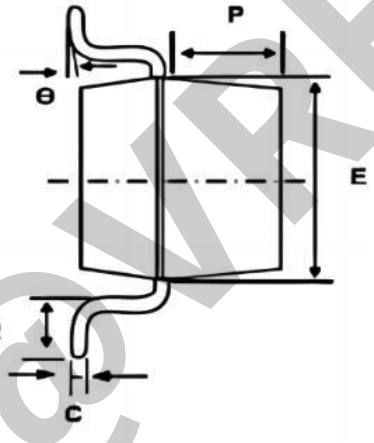
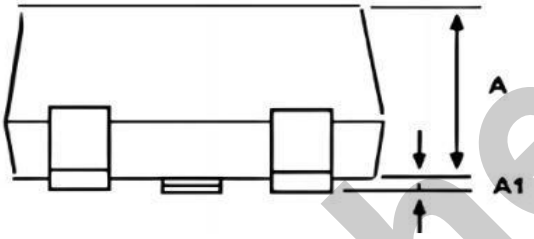


Figure 15. Stability Boundary Conditions

SOT-23 Package Information







Symbol	Dim in mm		
	Min	Nor	Max
A	0.900	1.000	1.100
A1	0.000	0.050	0.100
L1	0.350	0.400	0.500
C	0.100	0.110	0.120
D	2.800	2.900	3.000
E	1.250	1.300	1.350
E1	2.250	2.400	2.550
B	1.800	1.900	2.000
B1	0.950TPY.		
L2	0.200	0.350	0.450
P	0.550	0.575	0.600

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Head Office
Contact Information:
DongChen Electronics Co.,Ltd.
Address：2F., No.407, Sec. 2, Longgang Rd.,Zhongli Dist., Taoyuan City 32097, Taiwan (R.O.C.)
Tel: 03-284-1808
Fax: 03-284-1404
Mail:dc@dongchen.com.tw
Web:www.dongchen.com.tw