Three Terminal Regulator

Features

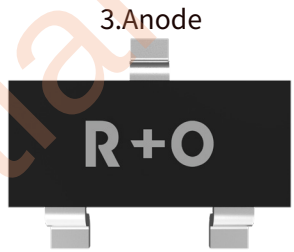
- Programmable Output Voltage to 36V
- Voltage Reference Tolerance: ±0.2%(Typ.)@ 25°C (TL431D)
- Sink Current Capability of 1.0 mA to 100 mA
- Low Dynamic Output Impedance,0.27Ω Typical
- Wide Operating Range of -20 to 85°C
- Pb-Free, Halogen-Free/BFR-Free,Compliant with RoHS
- Low Output Noise Voltage

Output Voltage
36V**(Max.)**
Reference Voltage Tolerance(Min.)
0.1%

Applications

- Adjustable Voltage and Current References
- Voltage monitoring
- Replacement of Zener Diode
- Comparator with Integrated Reference

SOT-23



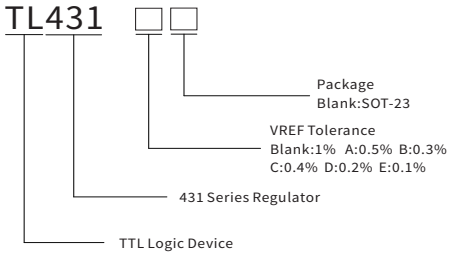
General Description

The TL431 is three-terminal adjustable regulator with a guaranteed thermal stability over applicable emperature ranges.The output voltage may be set to any value between V_{REF}(approximately 2.495V) and 36V 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.

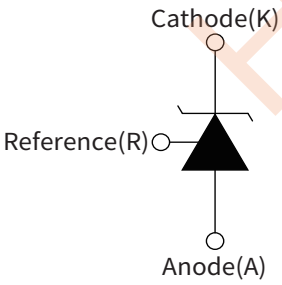
Reference News

MARKING:
TL431:431
TL431A:431
TL431B:431
TL431C:431B
TL431D:431
TL431E:431

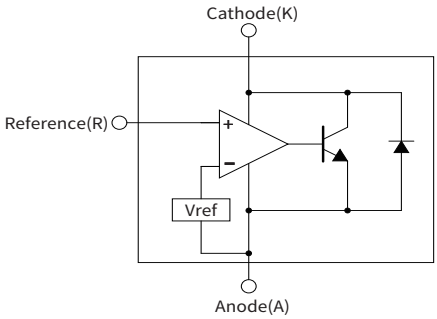
Part Numbering



Schematic Diagram



Functional Block Diagram

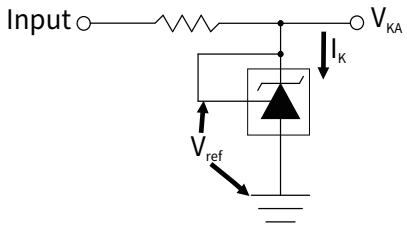


Ordering Information

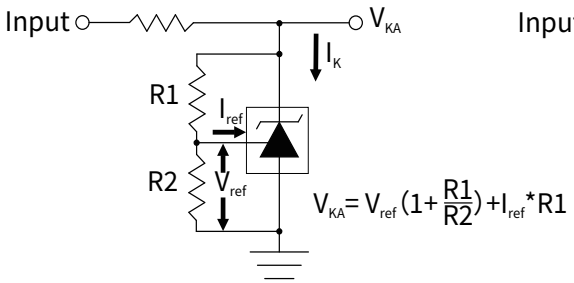
Order Number	Package	Package Code	Unit Weight(g)	Reel(pcs)	Box(pcs)	Carton(pcs)	Delivery Mode	MSL
TL431 Series	SOT-23	R1	0.008	3000	30000	180000	7''	3

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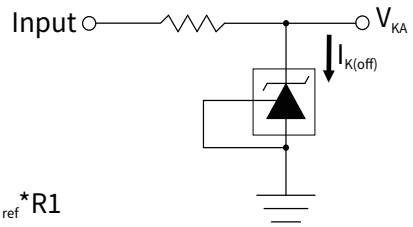
Typical Application Circuit



Test Circuit
for $V_{KA} = V_{ref}$



Test Circuit
for $V_{KA} > V_{ref}$



Test Circuit
for $I_{K(off)}$

Absolute Maximum Ratings (T_A = 25°C Unless otherwise specified.)

Parameter	Symbol	Value	Unit
Cathode to Anode Voltage	V_{KA}	40	V
Cathode Current Range	I_K	-100 to +150	mA
Reference Input Current Range	I_{REF}	-0.05 to +10	mA
Power Dissipation	P_D	200	mW
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	625	°C /W
Solder Temperature	T_d	260/10	°C /S
Operating Ambient Temperature	T_{op}	-20 to +85	°C
Junction and Storage Temperature	T_j,T_{stg}	-40 to +125	°C

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.

Electrical Characteristics ($V_{KA} = V_{REF}$, I_{KA} = 10mA, T_A = 25°C Unless otherwise specified.)

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Reference Input Voltage	0.1%	V_{REF}	$V_{KA}=V_{REF}$ I_{KA}=10mA	2.493	2.495	2.497	V
	0.2%			2.490	2.495	2.500	
	0.3%			2.488	2.495	2.502	
	0.4%			2.485	2.495	2.505	
	0.5%			2.483	2.495	2.507	
	1%			2.470	2.495	2.520	
Deviation Of reference Input Voltage Over temperature		$\triangle V_{REF} / \triangle T$	$V_{KA}=V_{REF}$,I_{KA}=10mA -20~+85°C	—	3	17	mV
Ratio Of Change In Reference Input Voltage Change In Cathode Voltage		$\triangle V_{REF} / \triangle V_{KA}$	I_{KA}=10mA, $\triangle V_{KA}$=10V~V_{REF}	-0.4	0	2.7	mV/V
			$\triangle V_{KA}$=36V~10V	-0.4	0	2.0	
Reference Input Current		I_{REF}	I_{KA}=10mA R1=10kΩ,R2= ∞	—	1.8	4	μA
Deviation of Reference Input Current Over Full Temperature Range		$\triangle I_{REF} / \triangle T$	I_{KA}=10mA, R1=10kΩ,R2= ∞ T_A=-20~+85°C	—	0.4	1.2	μA
Minimum Cathode Current For Regulation		I_{KA}(MIN)	$V_{KA}=V_{REF}$	—	0.25	0.5	mA
Off-state Cathode Current		I_{KA}(OFF)	V_{KA}=40V,V_{REF}=0V	—	0.17	1.0	μA
Dynamic Impedance		Z_{KA}	$V_{KA}=V_{REF}$,I_{KA}=1~100mA f ⩽ 1kHz	—	0.27	0.5	Ω

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Ratings And Characteristics Curves (T_A = 25°C Unless otherwise specified.)

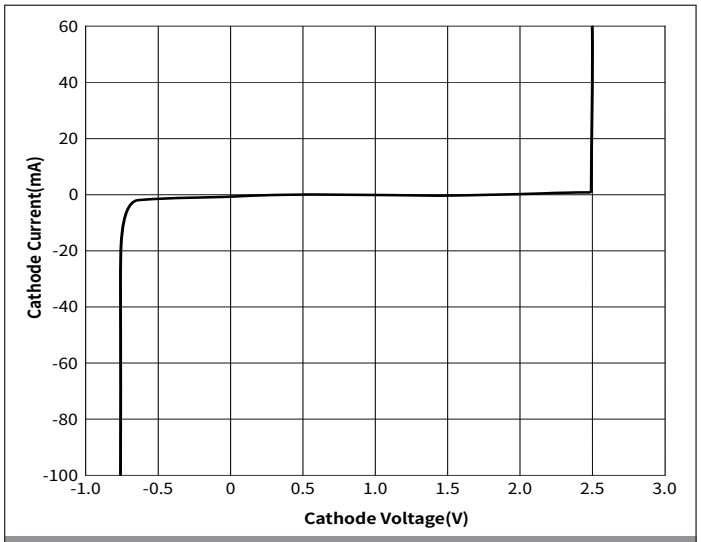


Fig.1 Cathode Current vs. Cathode Voltage

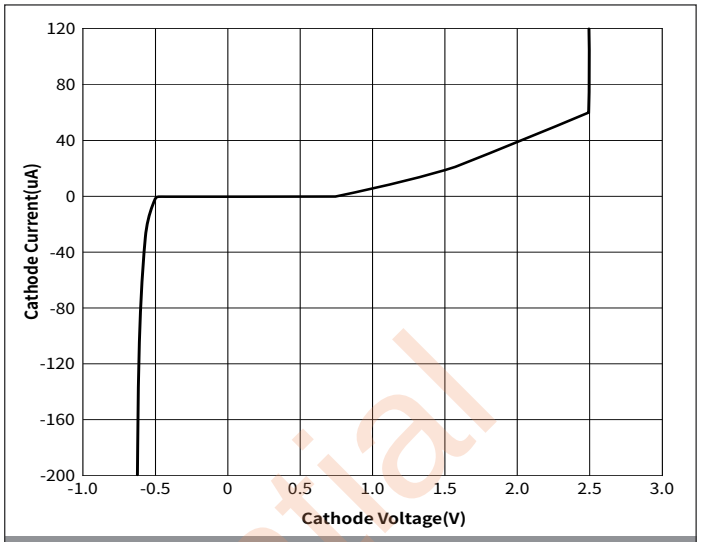


Fig.2 Cathode Current vs. Cathode Voltage

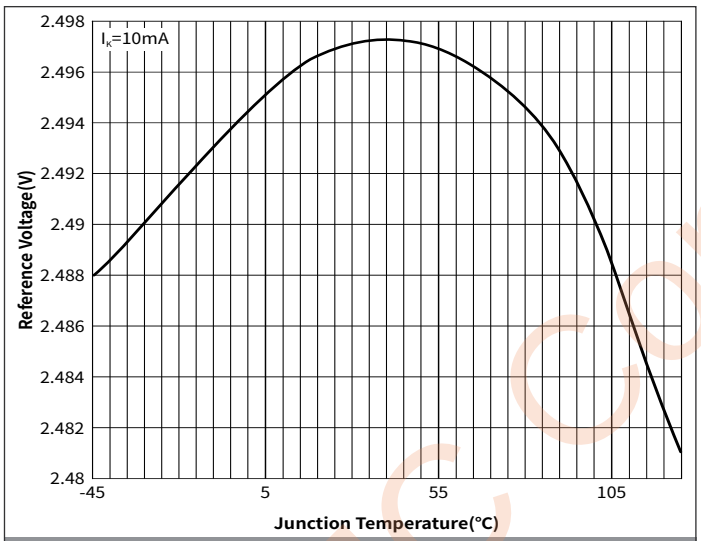


Fig.3 Reference Voltage vs. Junction Temperature

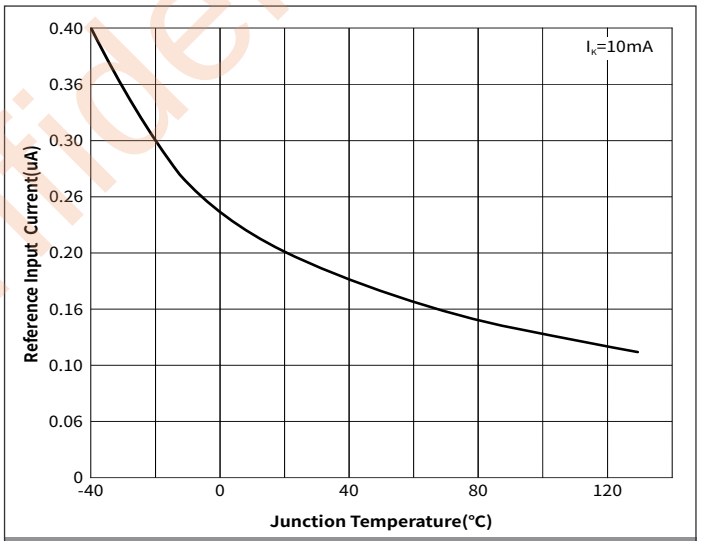


Fig.4 Reference Input Current vs. Junction Temperature

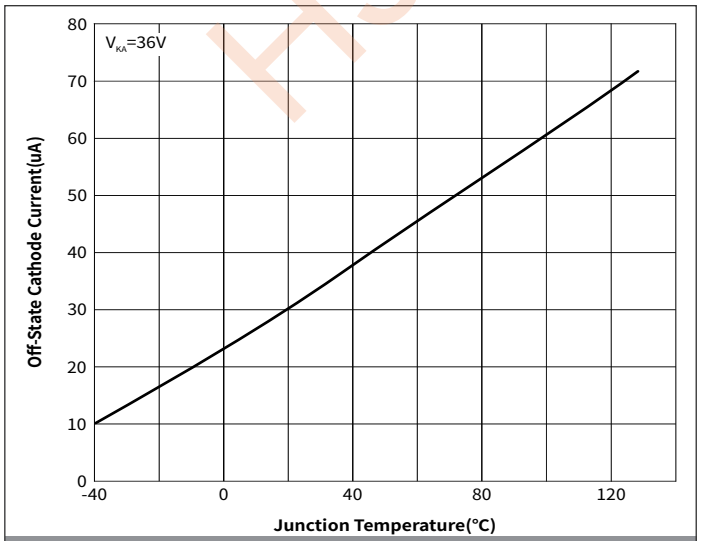


Fig.5 Off-State Cathode Current vs. Junction Temperature

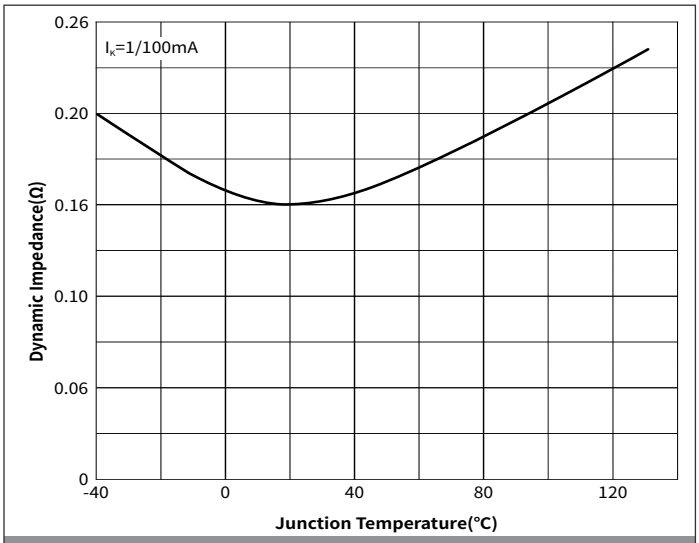
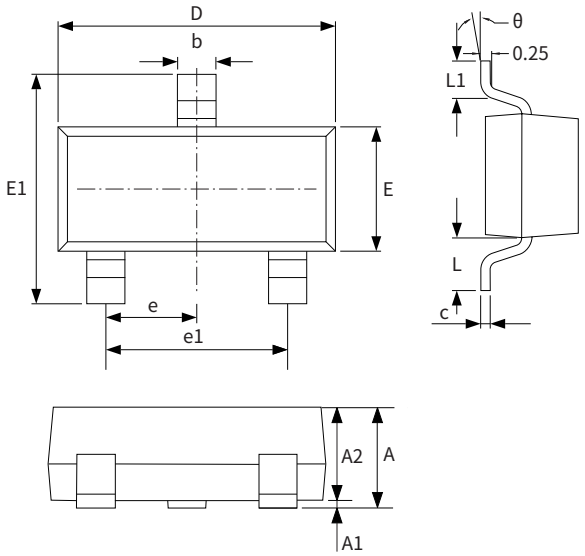


Fig.6 Dynamic Impedance vs. Junction Temperature

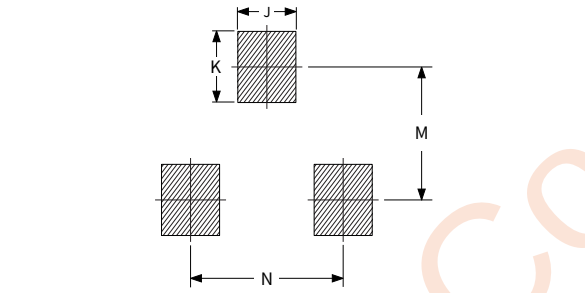
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Package Outline Dimensions (SOT-23)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	-	0.10	-	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.10	0.20	0.004	0.008
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.950TYP		0.037TYP	
e1	1.80	2.00	0.071	0.079
L	0.550REF		0.022REF	
L1	0.30	0.50	0.012	0.020
θ	-	8°	-	8°

Suggested Pad Layout



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
J	0.80	-	0.031	-
K	-	0.90	-	0.035
M	2.00	-	0.078	-
N	-	1.90	-	0.074

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