

SOT-23 Encapsulate Adjustable Reference Source

TL431 Adjustable Accurate Reference Source

Features

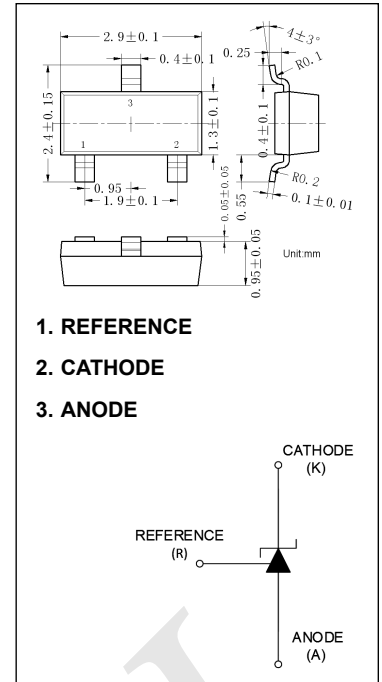
- The output voltage can be adjusted to 36V
- Low dynamic output impedance, its typical value is 0.2Ω
- Trapping current capability is 1 to 100mA
- Low output noise voltage
- Fast on -state response
- The effective temperature compensation in the working range of full temperature
- The typical value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

Applications

- Shunt Regulator
- High-Current Shunt Regulator
- Precision Current Limiter

Description

The TL431 is a three-terminal adjustable shunt regulator offering excellent temperature stability. This device has a typical dynamic output impedance of 0.2Ω. The device can be used as a replacement for zener diodes in many applications.



Absolute Maximum Ratings (Operating temperature range applies unless otherwise specified)

Symbol	Parameter	Value	Unit
V _{KA}	Cathode Voltage	37	V
I _{KA}	Cathode Current Range (Continuous)	-100~+150	mA
I _{ref}	Reference Input Current Range	0.05~+10	mA
P _D	Power Dissipation	300	mW
R _{θJA}	Thermal Resistance from Junction to Ambient	417	°C/W
T _j	Operating Junction Temperature	150	°C
T _{opr}	Operating Ambient Temperature Range	0~+70	°C
T _{stg}	Storage temperature Range	-65~+150	°C

Electrical Characteristics (T_a=25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V _{ref}	Reference input voltage (Fig.1)	V _{KA} =V _{REF} , I _{KA} =10mA	2.445	2.495	2.545	V
ΔV _{ref} /ΔT	Deviation of reference input voltage over temperature (note) (Fig.1)	V _{KA} =V _{REF} , I _{KA} =10mA T _{min} ≤ T _a ≤ T _{max}		4.5	17	mV
ΔV _{ref} /ΔV _{KA}	Ratio of change in reference input voltage to the change in cathode voltage (Fig.2)	I _{KA} =10mA ΔV _{KA} =10V~V _{REF}		-1.0	-2.7	mV/V
		I _{KA} =10mA ΔV _{KA} =36V~10V		-0.5	-2.0	mV/V
I _{ref}	Reference input current (Fig.2)	I _{KA} =10mA, R ₁ =10kΩ R ₂ =∞		1.5	4	μA
ΔI _{ref} /ΔT	Deviation Of reference input current over full temperature range (Fig.2)	I _{KA} =10mA, R ₁ =10kΩ R ₂ =∞ T _a =full Temperature		0.4	1.2	μA
I _{KA(min)}	Minimum cathode current for regulation (Fig.1)	V _{KA} =V _{REF}		0.45	1.0	mA
I _{KA(OFF)}	Off-state cathode Current (Fig.3)	V _{KA} =36V, V _{REF} =0		0.05	1.0	μA
Z _{KA}	Dynamic impedance	V _{KA} =V _{REF} , f ≤ 1.0kHz I _{KA} =1 to 100mA		0.15	0.5	Ω

note: T_{MIN}=0°C, T_{MAX}=+70°C

Classification of V_{ref}

Rank	±0.3	±0.5	±1.0	±2.0
Range	2.448-2.502	2.483-2.507	2.470-2.520	2.445-2.545

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

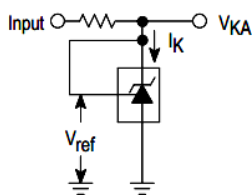


Figure 2. Test Circuit for V_{KA} > V_{ref}

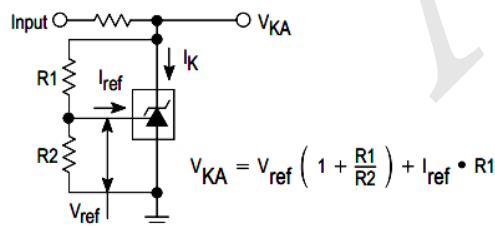
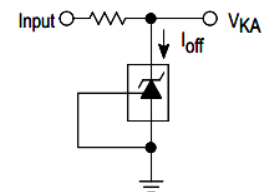
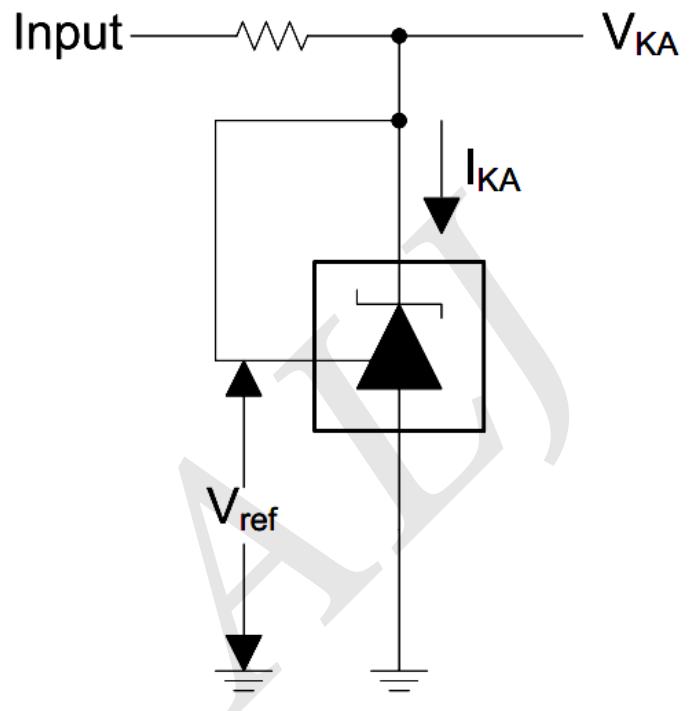
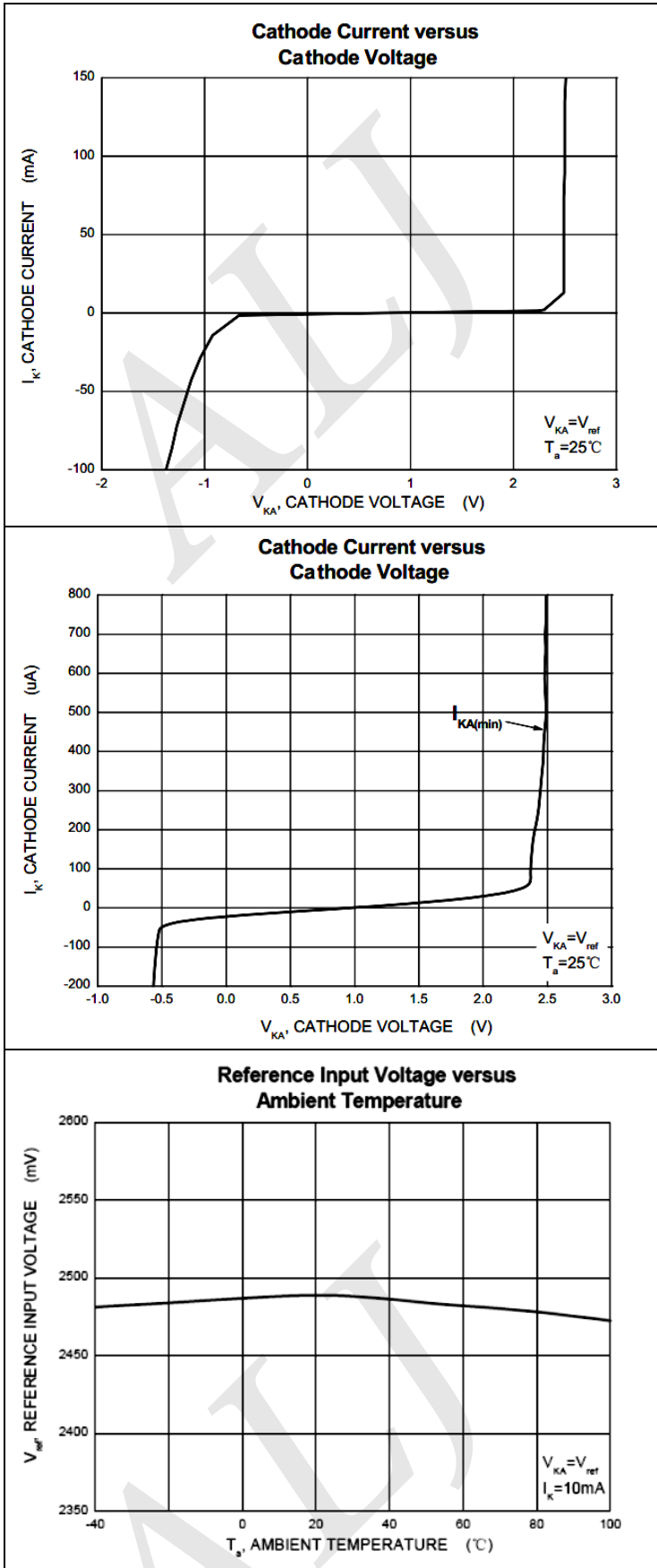


Figure 3. Test Circuit for I_{off}



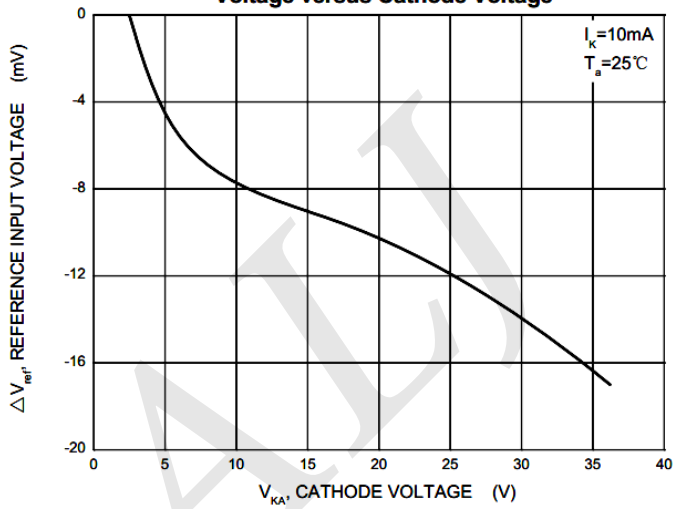
Typical Electrical Characteristics



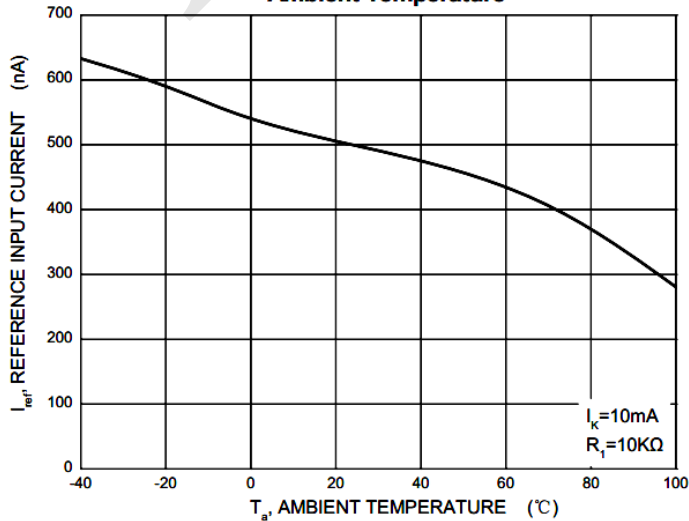
Test Circuit for $V_{KA} = V_{ref}$

Typical Electrical Characteristics (continued)

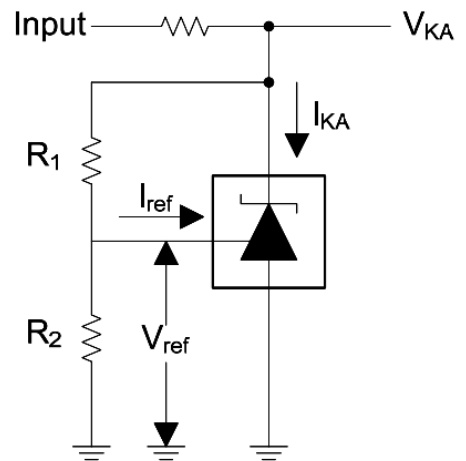
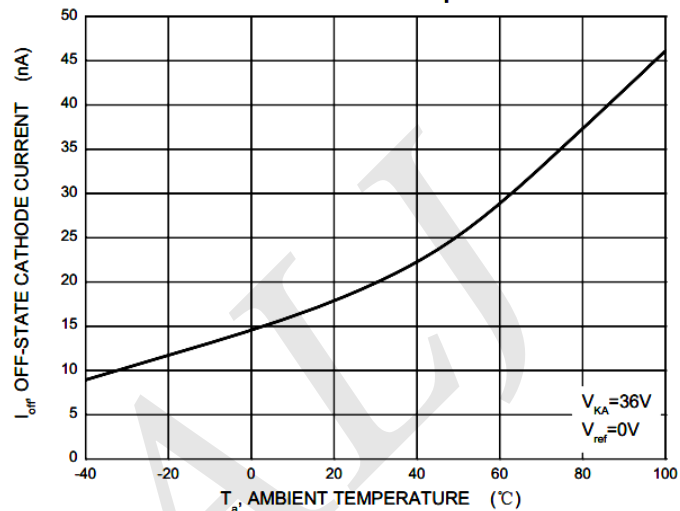
Change in Reference Input Voltage versus Cathode Voltage



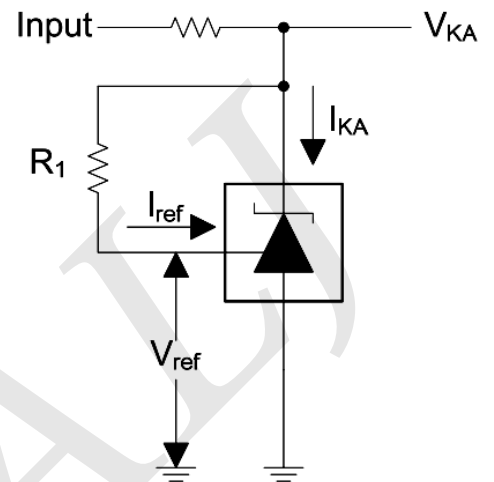
Reference Input Current versus Ambient Temperature



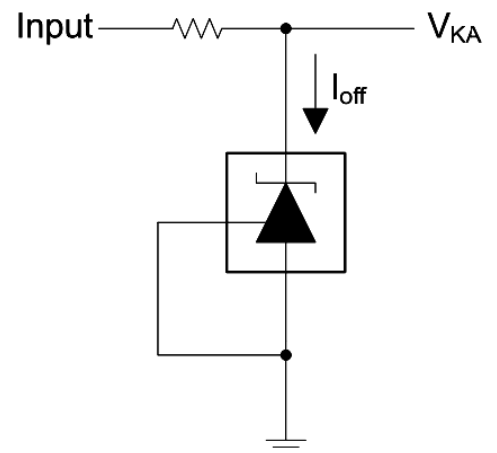
Off-State Cathode Current versus Ambient Temperature



Test Circuit for $V_{KA} = V_{ref}(1 + R1/R2) + R1 * I_{ref}$



Test Circuit for I_{ref}



Test Circuit for I_{off}