

3-Terminal Adjustable shunt Regulators

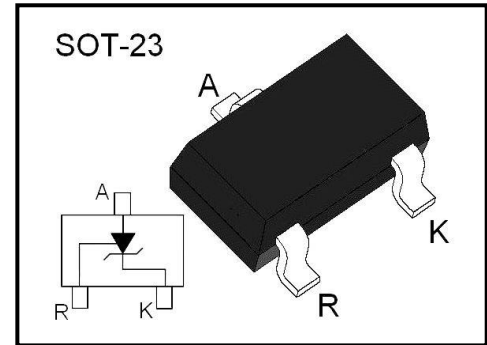
- Adjustable Output Voltage : 2.5 to 36V
- Sink Current Capability: 1 to 100mA
- Typica Output Impedance: 0.22Ω
- 0.5% ,1% And 2% Voltage Precision

DESCRIPTION

The TL431 is a programmable shunt voltage reference with guaranteed temperature stability over the entire temperature range of operation.

The output voltage may be set to any value between 2.5V and 36V with two external resistors.

The TL431 operates with a wide current range from 1 to 100mA with a typical dynamic impedance of 0.22Ω.



Absolute Maximum Ratings

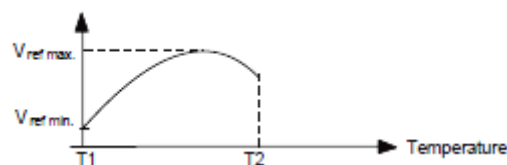
Parameter	Symbol	Value	Unit
Cathode to Anode Voltage	V_{KA}	37	V
Continuous Cathode Current Range	I_K	-100 to +150	mA
Reference Input Current Range	I_{ref}	-0.05 to +10	μA
Power Dissipation	P_D	300	mW
Storage Temperature Range	T_{STG}	-55 ~ + 150	°C

Electrical Characteristics $T_{amb} = 25^\circ\text{C}$ (unless otherwise specified)

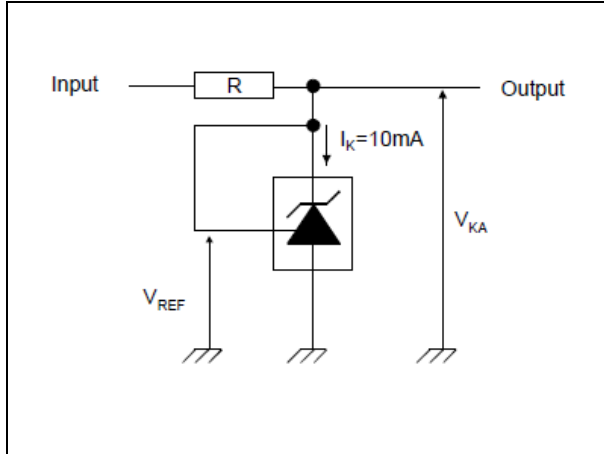
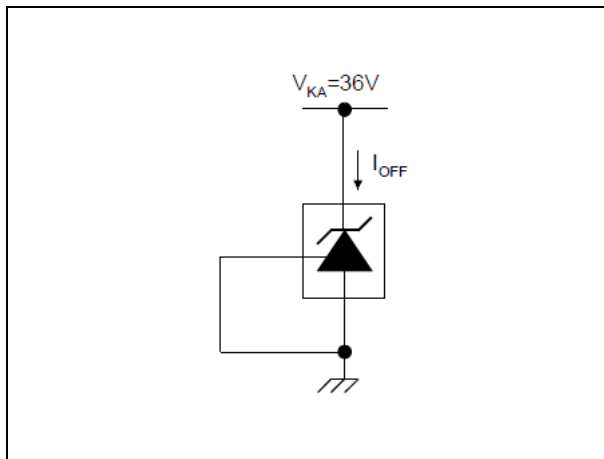
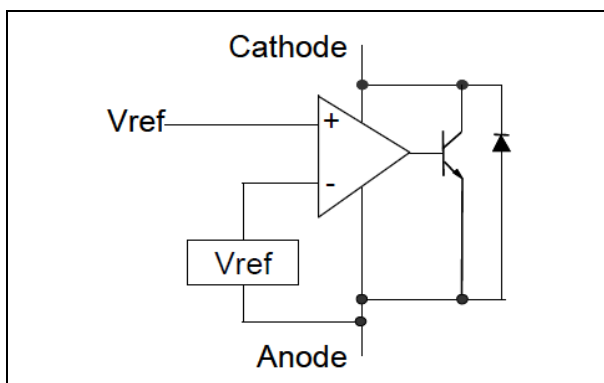
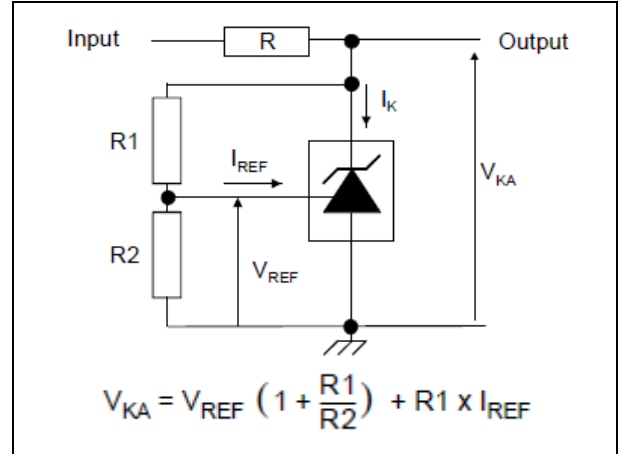
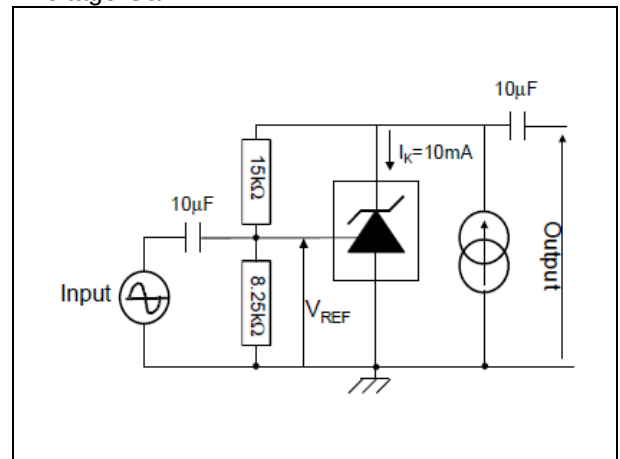
Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Reference Input Voltage	V_{ref}	$V_{KA} = V_{ref}$ $I_K = 10\text{mA}$ $T_{amb} = 25^\circ\text{C}$	2.44	2.495	2.55	V
		$T_{min} \leq T_{amb} \leq T_{max}$	2.423		2.567	
Reference Input Voltage Deviation Over-Temperature Range - note 1	ΔV_{ref}	$V_{KA} = V_{ref}$, $I_K = 10\text{mA}$, $T_{min} \leq T_{amb} \leq T_{max}$		3	17	mV
Ratio of Change in Reference Input Voltage to Change in Cathode to Anode Voltage - (figure 2)	$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	$I_K = 10\text{mA}$ $\Delta V_{KA} = 10\text{V to } V_{ref}$		-1.4	-2.7	mV/V
		$\Delta V_{KA} = 36\text{V to } 10\text{V}$		-1	-2	
Reference Input Current	I_{ref}	$I_K = 10\text{mA}$ $R_1 = 10\text{k}\Omega$ $R_2 = \infty$ $T_{amb} = 25^\circ\text{C}$		1.8	4	μA
		$T_{min} \leq T_{amb} \leq T_{max}$			5.2	
Reference Input Current Deviation Over Temperature Range	ΔI_{ref}	$I_K = 10\text{mA}$, $R_1 = 10\text{k}\Omega$, $R_2 = \infty$ $T_{min} \leq T_{amb} \leq T_{max}$		0.4	1.2	μA
Minimum Cathode Current for Regulation	I_{min}	$V_{KA} = V_{ref}$		0.5	1	mA
Off-State Cathode Current	I_{off}			2.6	1000	nA
Dynamic Impedance - note 2	$ Z_{KA} $	$V_{KA} = V_{ref}$, $\Delta I_K = 1 \text{ to } 100\text{mA}$, $f \leq 1\text{kHz}$		0.22	0.5	Ω

Notes:

1) ΔV_{ref} is defined as the difference between the maximum and minimum values obtained over the full temperature range.
 $\Delta V_{ref} = V_{ref \text{ max.}} - V_{ref \text{ min.}}$



2) The dynamic Impedance is defined as $|Z_{KA}| = \Delta V_{KA} / \Delta I_K$

Test Circuits
Figure 1 : Test Circuit for $V_{KA} = V_{REF}$

Figure 3 : Test Circuit for I_{OFF}

Figure 5 : Block diagram of TL1431

Figure 2 : Test Circuit for $V_{KA} > V_{REF}$

Figure 4 : Test Circuit for Phase Margin and Voltage Gain

Figure 6 : Test Circuit for Response time
