

3-Terminal Adjustable shunt Regulators

FEATURE

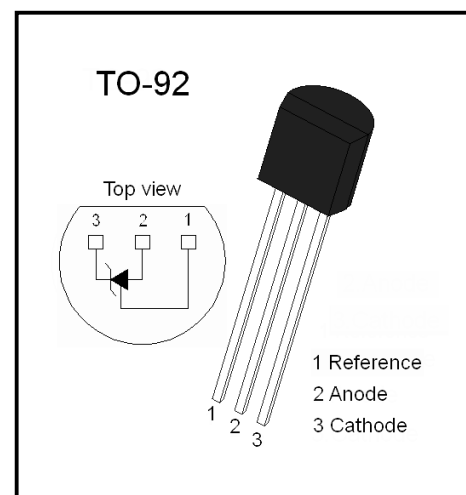
- ◆Adjustable Output Voltage: 2.5 to 36V
- ◆Sink Current Capability: 1 to 100mA
- ◆Typical Output Impedance: 0.22Ω
- ◆0.5% ,1% And 2% Voltage Precision

DESCRIPTION

The TL431G 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 TL431G operates with a wide current range from 1 to 100mA with a typical dynamic impedance of 0.22Ω



Absolute Maximum Ratings

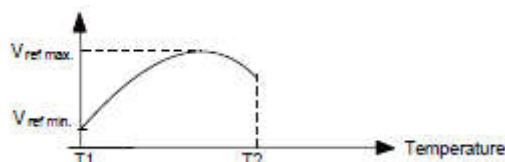
Parameter	Symbol	Value	Unit
Cathode to Anode Voltage	V_{KA}	37	V
Continuous Cathode Current Range	I_K	-100 to +150	mA
Reference Input Current Range	I_{ref}	-0.05 to +10	μA
Power Dissipation	P_D	625	mW
Storage Temperature Range	T_{STG}	-55 ~ +150	°C

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 $|Z_{KA}| = \Delta V_{KA} / \Delta I_K$

Application Circuits

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

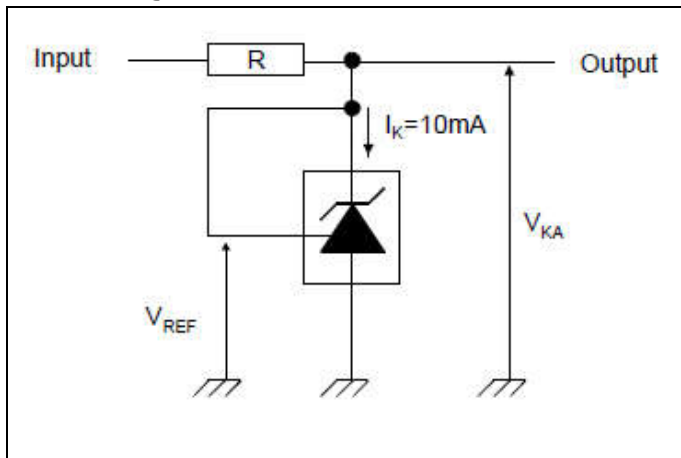


Figure 3 : Test Circuit for I_{OFF}

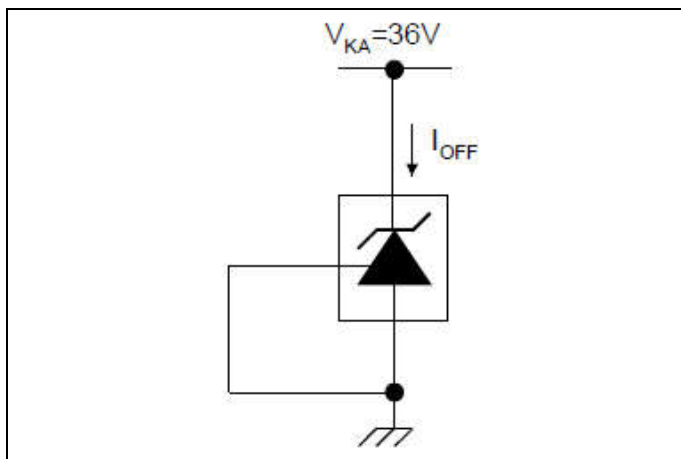


Figure 5 : Block diagram of TL1431

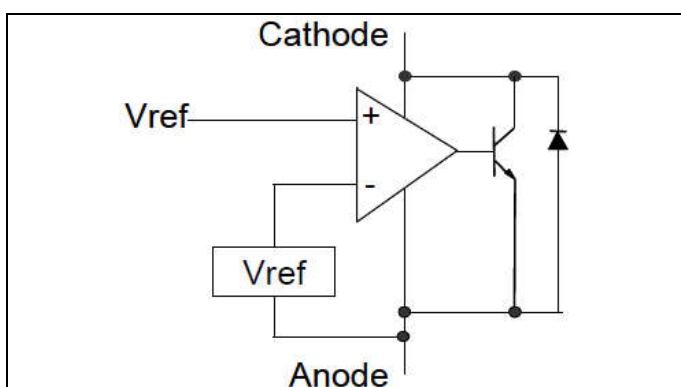


Figure 2 : Test Circuit for $V_{KA} > V_{REF}$

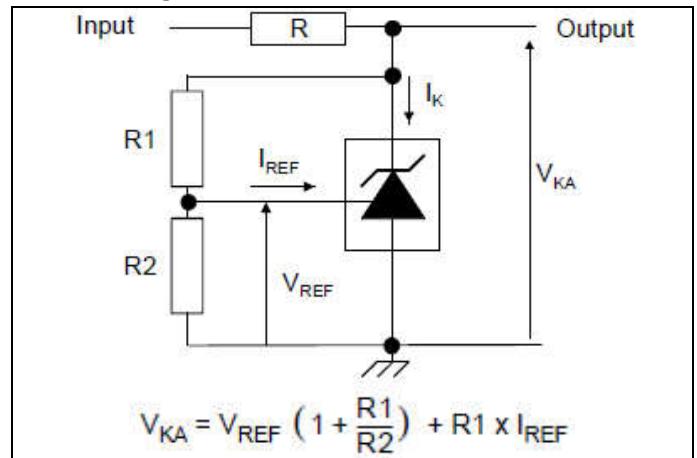


Figure 4 : Test Circuit for Phase Margin and Voltage Gain

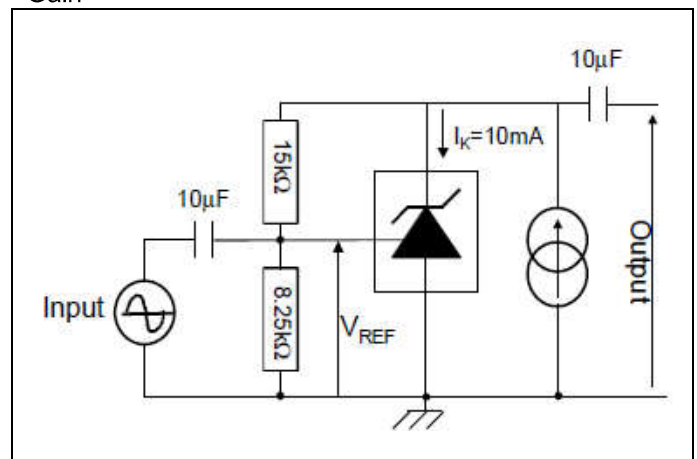
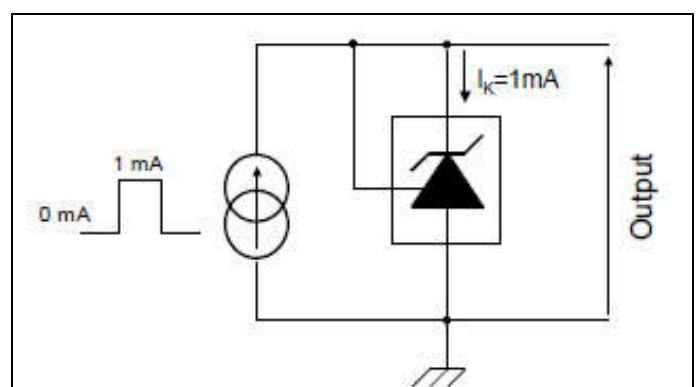
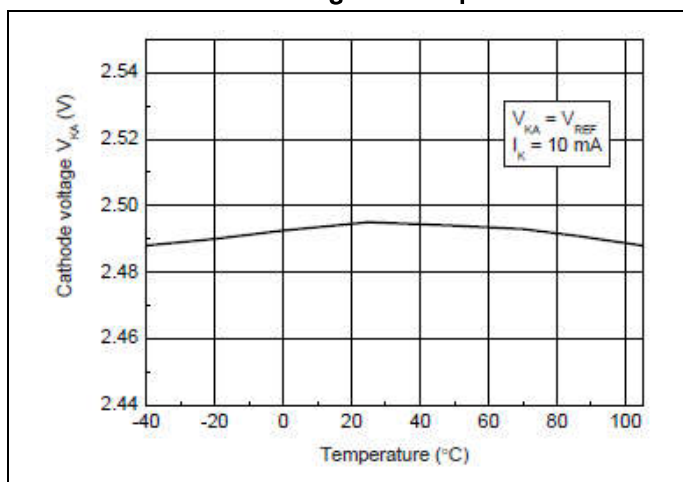


Figure 6 : Test Circuit for Response time

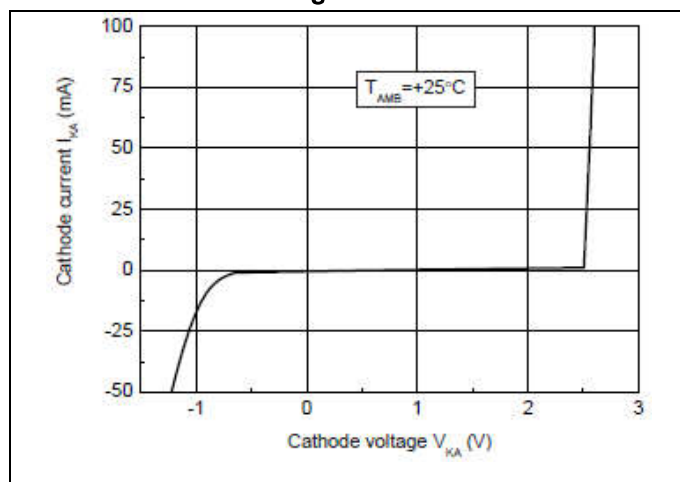


Typical Characteristics

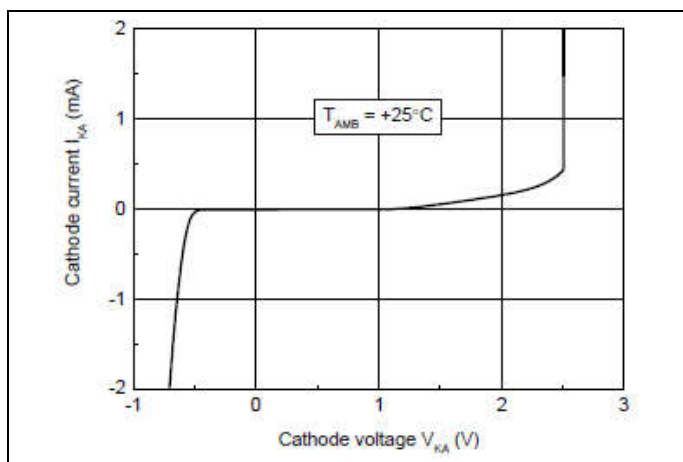
Reference voltage vs Temperature



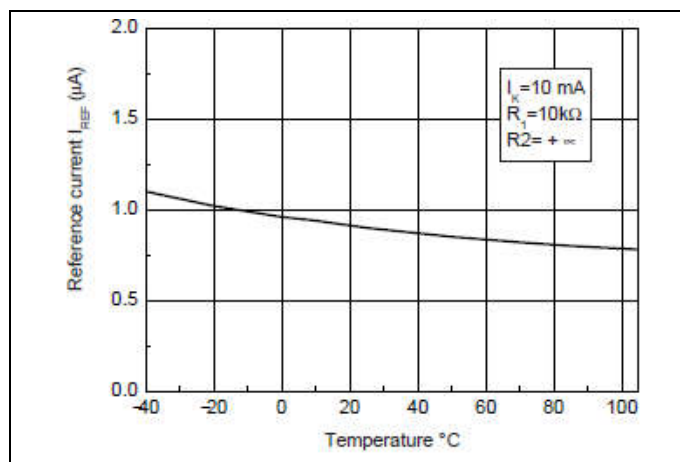
Reference voltage vs cathode current



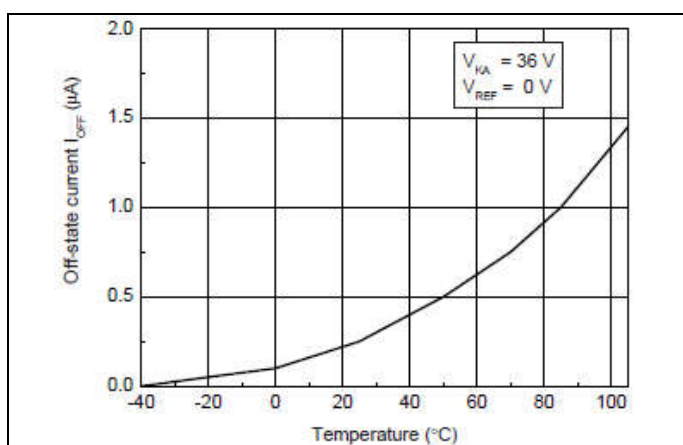
Reference voltage vs cathode current



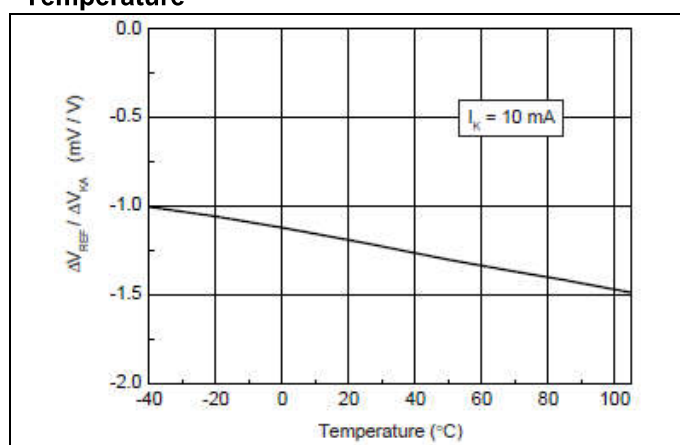
Reference current vs temperature



Off-state cathode current vs temperature



Ratio of change in VREF to change in VKA vs Temperature



Ordering information

Package	Packing Description	Base Quantity
TO-92	Bulk	1000pcs/Bag
	Tape	2000pcs/Box

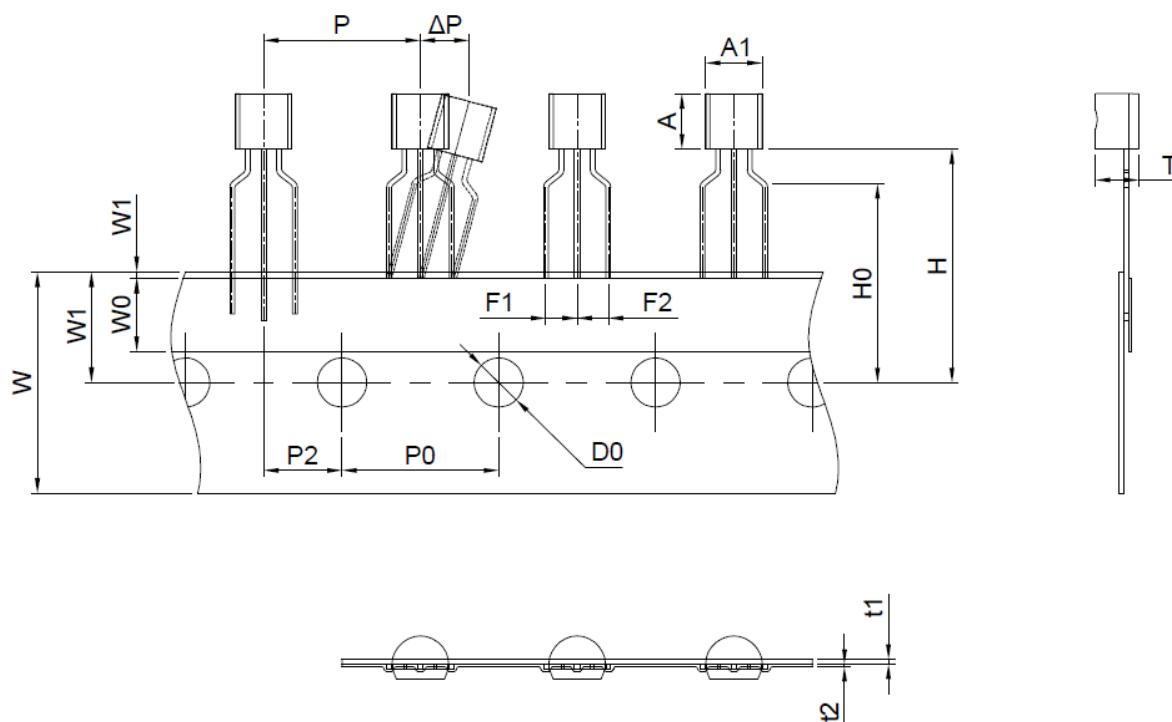
Package Dimensions

TO-92

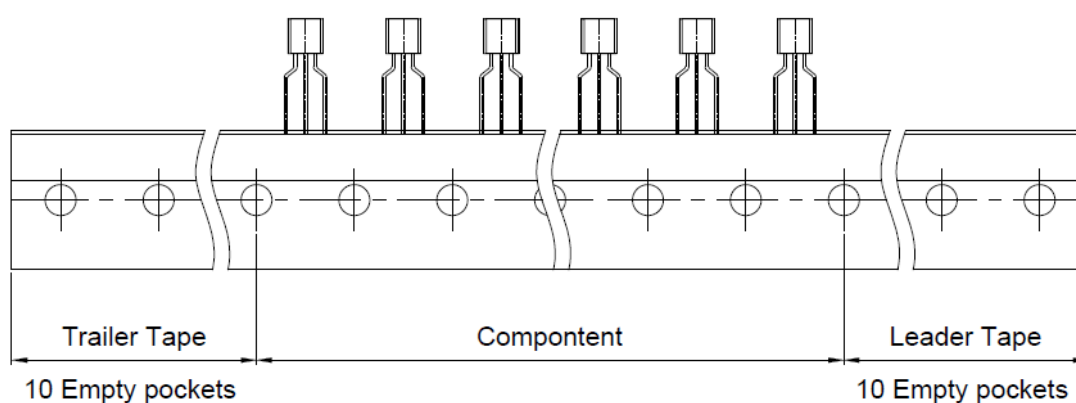
Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	3.30	3.70	0.130	0.146
A1	2.30	2.70	0.091	0.106
b	0.40	0.50	0.016	0.020
b1	0.50	0.70	0.020	0.028
c	0.35	0.45	0.014	0.018
D	4.45	4.70	0.175	0.185
E	4.40	4.65	0.173	0.183
e	1.17	1.37	0.046	0.054
e1	2.34	2.64	0.092	0.104
L	13.50	14.50	0.531	0.571
L1	1.80	2.20	0.071	0.087

Taping Dimensions

TO-92



Dimiensions are in millimeter								
A	A1	T	P	P0	P2	F1	F2	W
4.6	4.6	3.5	12.7	12.7	6.35	2.54	2.54	18.0
W0	W1	W2	H	H0	D0	t1	T2	ΔP
6.0	9.0	1.0Max	19.0	18.0	4.0	0.4	0.2	0



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