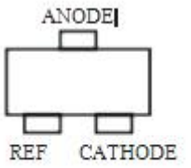
Programmable Shunt Regulator TL431A VER:G1-1

FEATURES

- Low Dynamic output impedance 0.1Ω (Typ)
- Reference Input Voltage 2.5V
- Adjustable output voltage
- Fast turn-on response
- Sink current capability of 1mA to 100mA
- Low output noise
- Industrial temperature range
- Improved temperature compensation
- Excellent temperature coefficient 25ppm/°C
- Electrostatic discharge voltage 2.5kV



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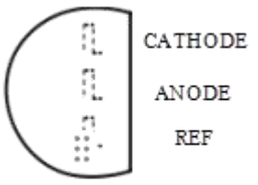

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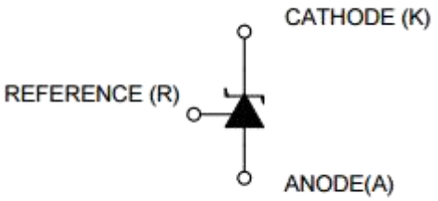
APPLICATION

- Shunt Regulator
- Precision High-Current Series Regulator
- High-Current Shunt Regulator
- Crowbar Circuit
- PWM Converter With Reference
- Voltage Monitor
- Precision Current Limiter



DESCRIPTION

The TL431 are three-terminal adjustable shunt regulators with a specified thermal stability. The output voltage may be set to any value between Vref (approx. 2.5V) and 36V with two external resistors. The active output circuitry provides a very sharp turn-on characteristic making these devices an excellent replacement for zener diodes in many applications.

ABSOLUTE MAXIMUM RATINGS

(Over operating free-air temperature range, unless otherwise noted)

PARAMETER	VALUE	UNIT
Cathode voltage (Note 1)	40	V
Continuous cathode current range	-100 to 150	mA
REF(Reference) input current range	-50uA to 10mA	
Operating free-air temperature range	-40 to 125	℃
Lead temperature(1.6mm aside from the case,10seconds)	260	
ESD(HBM)	2.5	kV

Note 1: The voltage values are with respect to the anode terminal unless otherwise noted.

RECOMMENDED OPERATING CONDITIONS

Programmable Shunt Regulator TL431A VER:G1-1

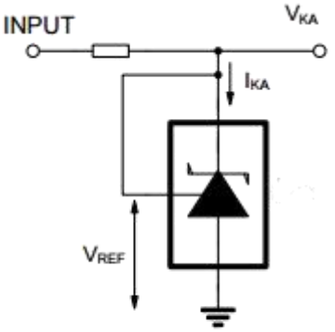
PARAMETER	MIN	MAX	UNIT
Cathode voltage,V_{KA}	V_{ref}	36	V
Cathode current,I (for regulation)	0.3	100	mA

ELECTRICAL CHARACTERISTICS

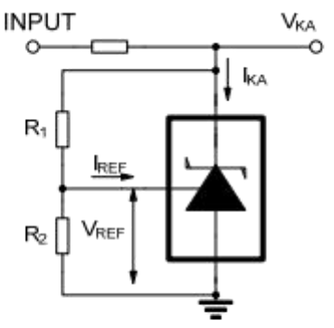
(At 25°C free-air temperature, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Reference voltage accuracy at wafer testing	dVref	Wafer testing, Vka=Vref		0.3%	0%	0.3%	%
Packaged dice with Vref accuracy ±0.5%		V_{ka}=Vref			93%		%
REF input voltage	V_{ref}	$V_{KA}=V_{ref}$, I_K=10mA	A1	2450		2487	mV
			A	2487		2513	mV
			A2	2513		2550	mV
Deviation of the REF input voltage over full temperature range	$V_{ref(dev)}$	$V_{KA}=V_{ref}$, I_K=10mA, T_A=0 to 125℃			8	17	mV
REF input voltage-to-cathode voltage change ratio	$\triangle V_{ref}/\triangle V_{KA}$	I_K=10mA	$\triangle V_{KA}$=10v to V_{ref}	-2.7	-1.0		mV/V
			$\triangle V_{KA}$=36V to10V	-2	-0.4		
REF input current	Iref	I_K=10mA, R1=10kΩ, R2=∞			0.5	1.2	uA
Deviation of the REF input current over full temperature range	Iref(dev)	I_K=10mA, R1=10k, R2=∞, T_A=full range			0.4	1.2	
Minimum cathode current for regulation	Imin	V_{KA}=Vref			0.08	0.3	mA
Off-state cathode current	I_{KAoff}	V_{KA}=36V, Vref=0			0.01	0.8	uA
Dynamic impedance	$\|Z_{KA}\|$	$V_{KA}=V_{ref}$, I_K=0.2mA to 100mA, f≤1kHz			0.1	0.37	Ω

TEST CIRCUIT

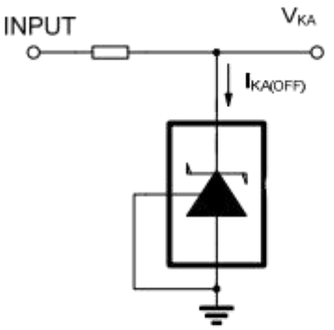


For $V_{KA}=V_{REF}$



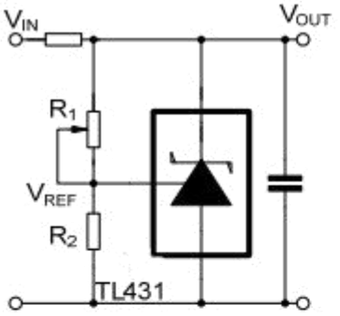
$V_{KA}=V_{REF}\times(1+R_1/R_2)+I_{REF}\times R_1$

For $V_{KA}\geq V_{REF}$



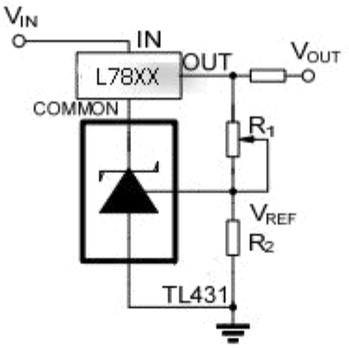
For $I_{KA(OFF)}$

APPLICATION CIRCUIT

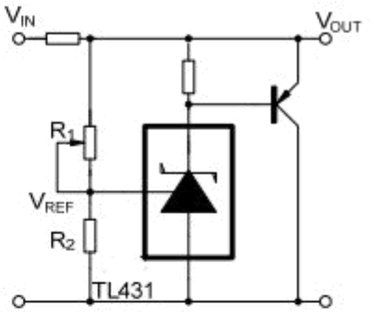


$V_{OUT}=(1+R_1/R_2)\times V_{REF}$

Shutdown Regulator

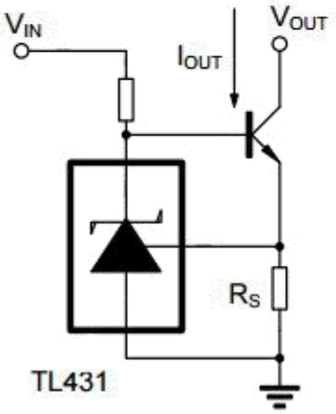


$V_{OUT}=(1+R_1/R_2)\times V_{REF}$
Minimum $V_{OUT}=V_{REF}+5V$
Output Control of a Three
-Terminal Fixed Regulator

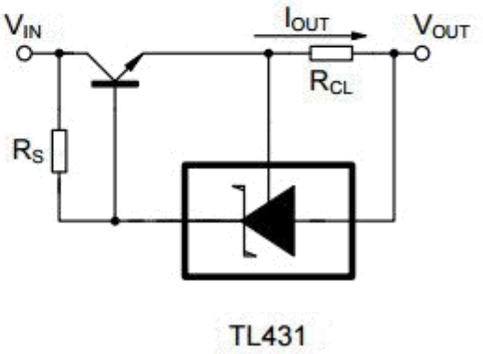


$V_{OUT}=(1+R_1/R_2)\times V_{REF}$

Higher-current Shunt Regulator

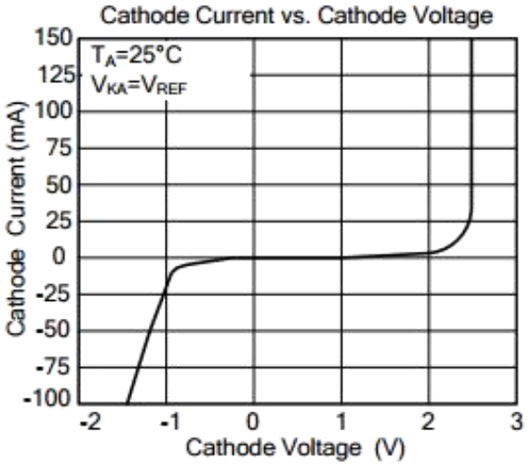


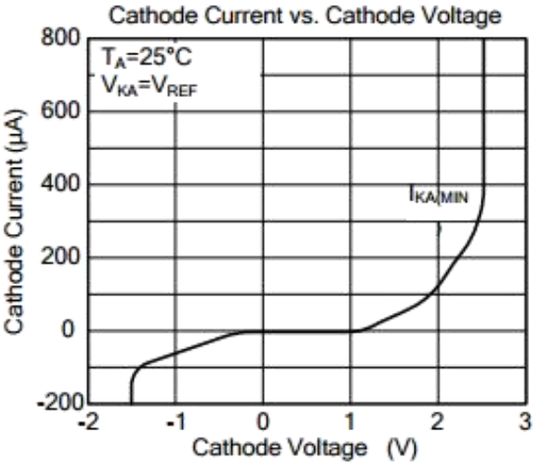
$I_{OUT}=V_{REF}/R_S$
Constant-current Sink

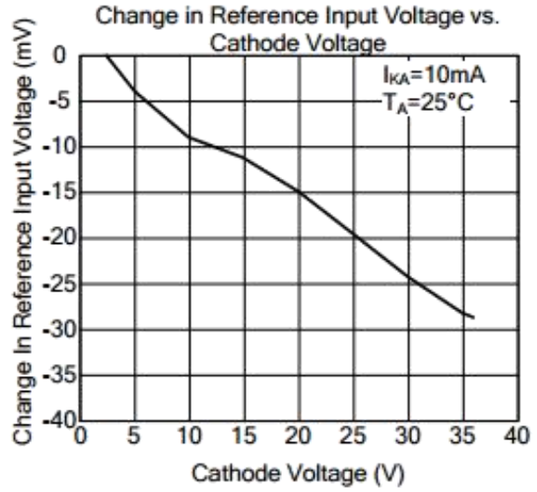


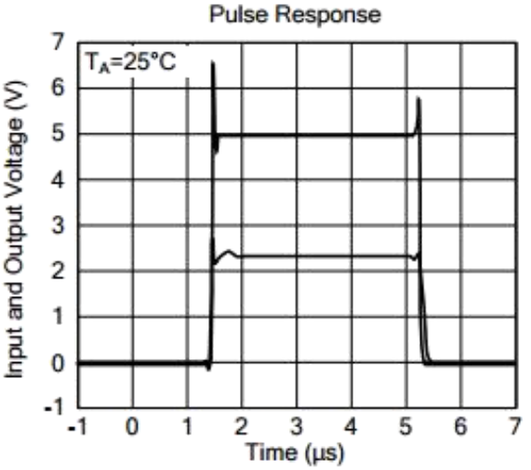
$I_{OUT}=V_{REF}/R_{CL}$
Current Limiting or Current Source

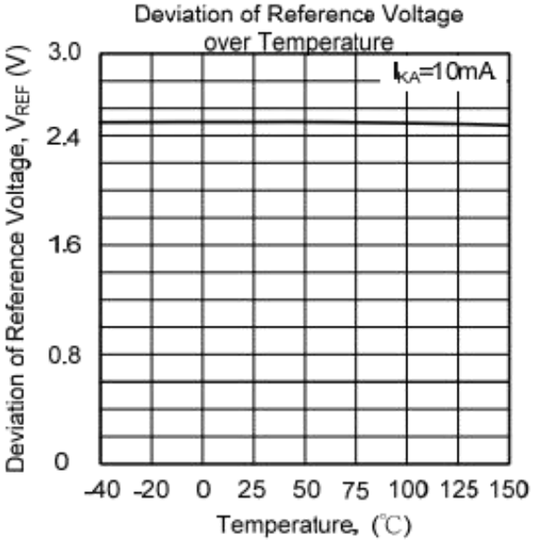
TYPICAL CHARACTERISTICS

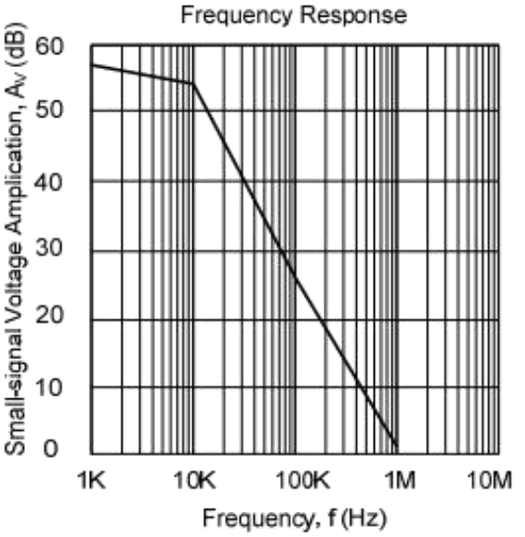




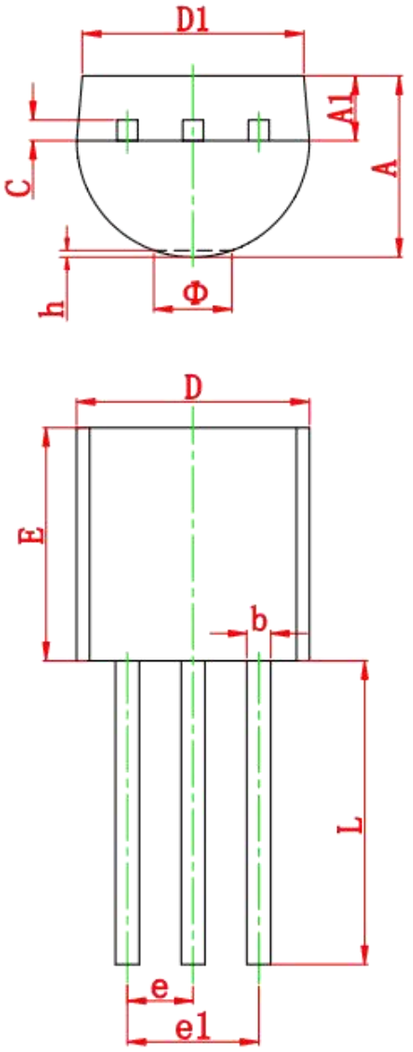






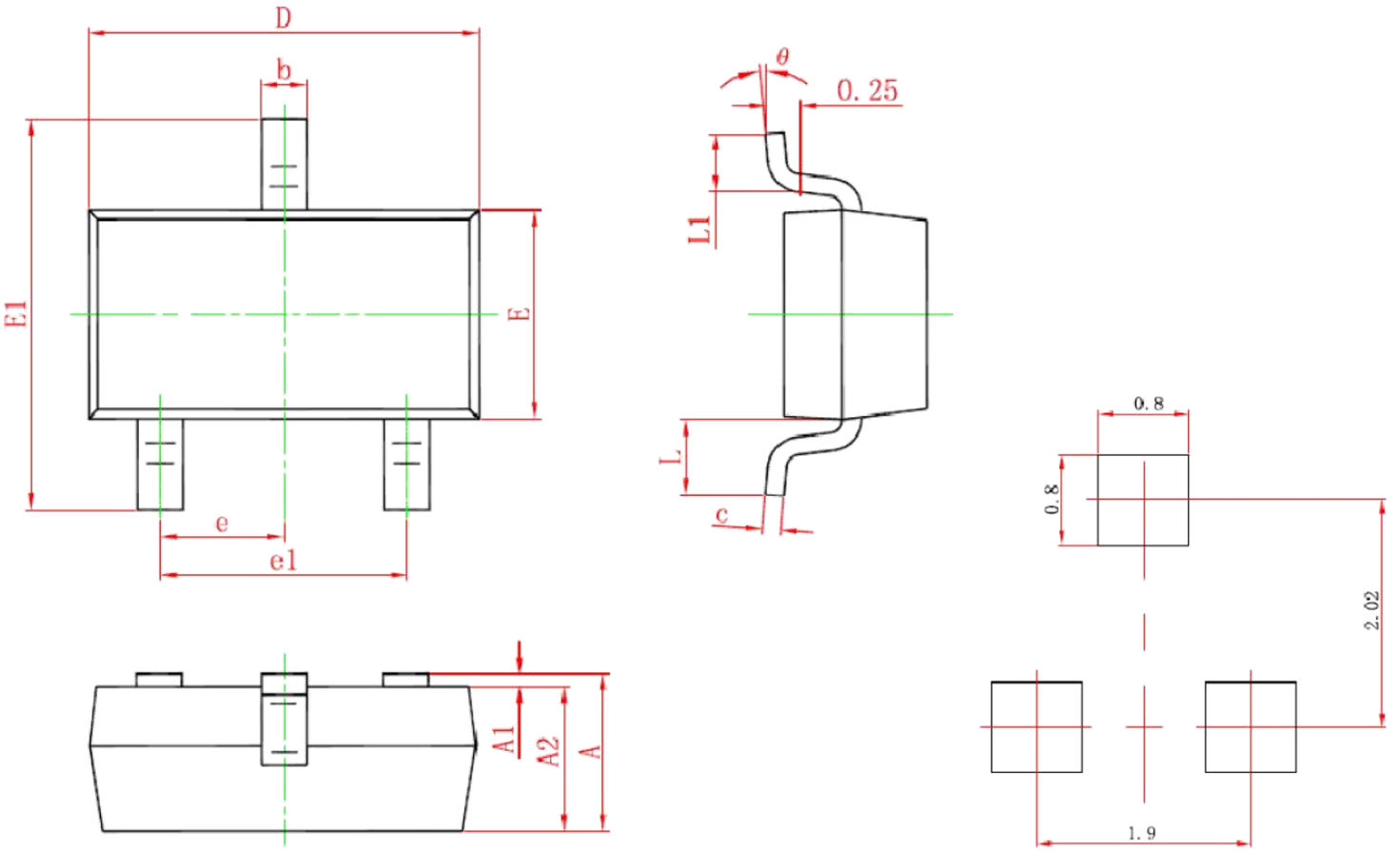


TO-92 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

SOT23 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°