ZETEX SEMICONDUCTORS

ZTLV431
1.24V Cost effective shunt regulator

Description

The ZTLV431 is a three terminal adjustable shunt regulator offering excellent temperature stability and output current handling capability up to 20mA. The output voltage may be set to any chosen voltage between 1.24 volts and 10 volts by selection of two external divider resistors.

The ZTLV431 can be used as a replacement for zener diodes in many applications requiring an improvement in zener performance.

The ZTLV431 is available as standard as an A grade which has an initial tolerance of 1% and covers the -40°C to 125°C temperature range as standard.

Features

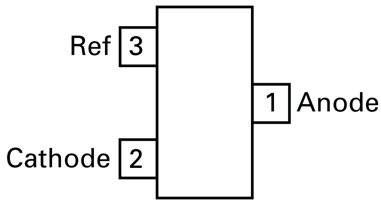
- Low voltage operation V_{REF} = 1.24V
- Temperature range -40 to 125°C
- Reference voltage tolerance at 25°C
  - 1% ZTLV431A
- Typical temperature drift
  - 4 mV (0°C to 70°C)
  - 6 mV (-40°C to 85°C)
  - 11mV (-40°C to 125°C
- 100μA minimum cathode current
- 0.25Ω typical output impedance
- Adjustable output voltage 1.24V to 10V

Applications

- Opto-coupler linearization
- Linear regulators
- Improved Zener
- Variable reference

Pin connections

ZTLV431_F (SOT23)
(top view)



Ordering information

Tol.	Order code	Package	Part mark	Status	Reel size (inches)	Tape width (mm)	Quantity per reel
1%	ZTLV431AFTA	SOT23	S1A	Active	7″ (180mm)	8	3,000

Absolute maximum ratings

Cathode voltage (V_{KA})	10V
Continuous cathode current (I_{KA})	-20 to 20mA
Reference input current range (I_{REF})	-0.05 to 3mA
Operating junction temperature	-40 to 150°C
Storage temperature	-55 to 150°C

Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability.

Unless otherwise stated voltages specified are relative to the ANODE pin.

Package thermal data

Package	Θ_{JA}	P_{DIS} T_A =25°C
SOT23	380°C/W	330 mW
SOT23F	160°C/W	780 mW

Recommended operating conditions

	Min.	**Max.**	**Units**
V_{KA} cathode voltage	V_{REF}	10	V
I_{KA} cathode current	0.1	15	mA
T_A operating ambient temperature range	-40	125	°C

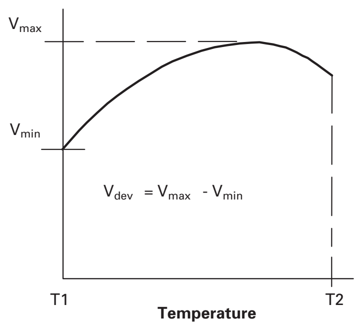
Electrical characteristics (electrical characteristics over recommended operating conditions, T_A = 25°C, K_{KA} = V_{REF}, I_{KA} = 10mA unless otherwise stated)

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
V_{REF}	Reference voltage		ZTLV431A	1.228	1.24	1.252	V
		T_A = -40 to 85°C	ZTLV431A	1.215		1.265	
		T_A = -40 to 125°C	ZTLV431A	1.209		1.271	
$V_{REF(dev)}$	Deviation of reference voltage over full temperature range	T_A = 0 to 70°C			4	12	mV
		T_A = -40 to 85°C			6	20	
		T_A = -40 to 125°C			11	31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of change in reference voltage to the change in cathode voltage	V_{KA} from V_{REF} to I_{KA} = 10mA	6V		-1.5	-2.7	mV/V
			10V		-1.5	-2.7	
I_{REF}	Reference input current	I_{KA} = 10mA, R_1 = 10kΩ., R_2 = OC			0.1	0.5	μA
$I_{REF(dev)}$	I_{REF} deviation over full temperature range	I_{KA} = 10mA, R_1 = 10kΩ, R_2 = OC	T_A = 0 to 70°C		0.05	0.3	μA
			T_A = -40 to 85°C		0.1	0.4	
			T_A = -40 to 125°C		0.15	0.5	
I_{KMIN}	Minimum cathode current for regulation	V_{KA} = V_{REF}	T_A = -40 to 125°C		55	100	μA
$I_{K(OFF)}$	Off-state current	V_{KA} = 10V, V_{REF} =0V			10	30	μA
z_{KA}	Dynamic output impedance	V_{KA} = V_{REF}, f = <1kHz, I_K = 0.1 to 15mA			0.25	0.4	Ω

Deviation of reference input voltage, V_{DEV}, is defined as the maximum variation of the reference input voltage over the full temperature range.

The average temperature coefficient of the reference input voltage, V_{REF} is defined as:

$$V_{REF}\left(\frac{ppm}{°C}\right) = \frac{V_{DEV} x 1000000}{V_{REF}(T_1 - T_2)}$$



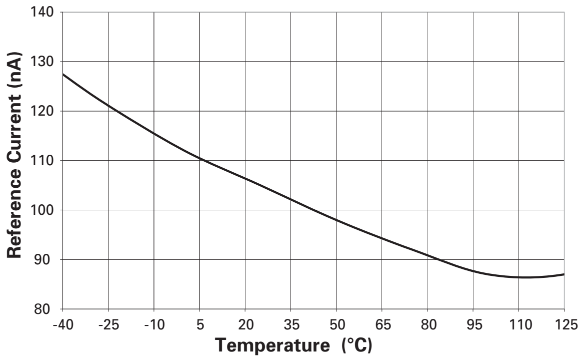
The dynamic output impedance, Z_KA, is defined as:

$$Z_{KA} = \frac{\Delta V_K}{\Delta I_K}$$

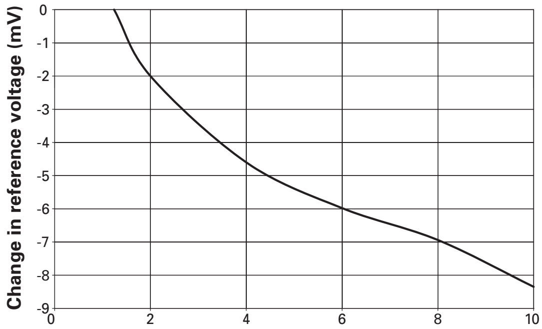
When the device is programmed with two externalresistors, R1 and R2, (fig 2) , the dynamic output impedance of the overall circuit, Z', is defined as:

$$Z' = Z_{KA} x(\; + \frac{R}{R} \;)$$

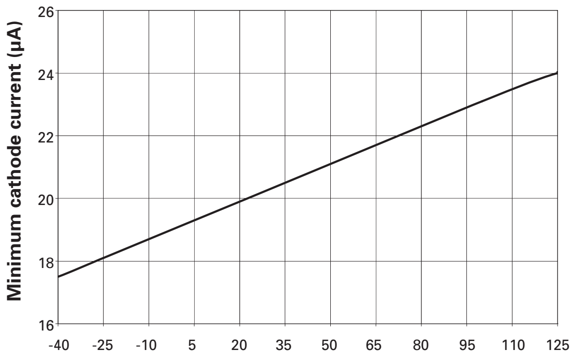
Typical characteristics



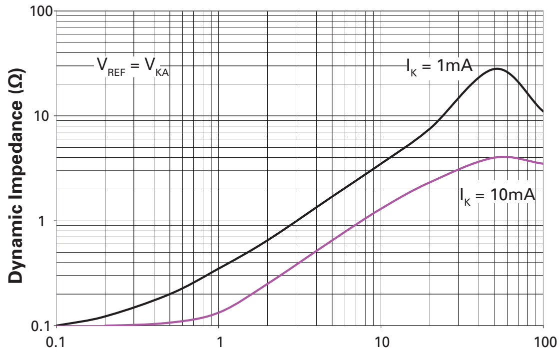
Reference Current v Temperature



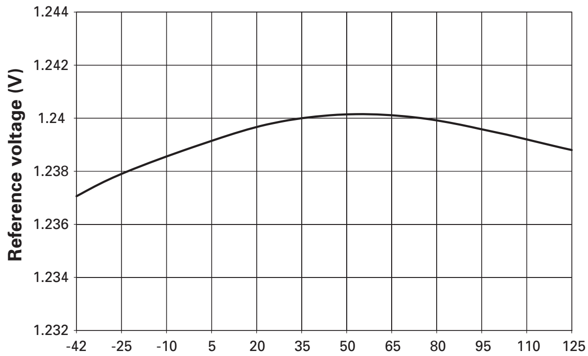
Change in reference voltage vs Cathode voltage



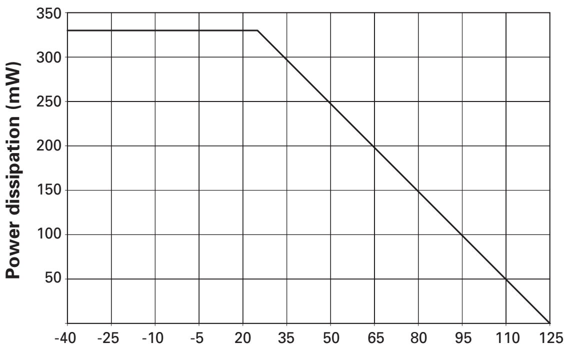
Minimum cathode current vs temperature



Dynamic impedance vs frequency

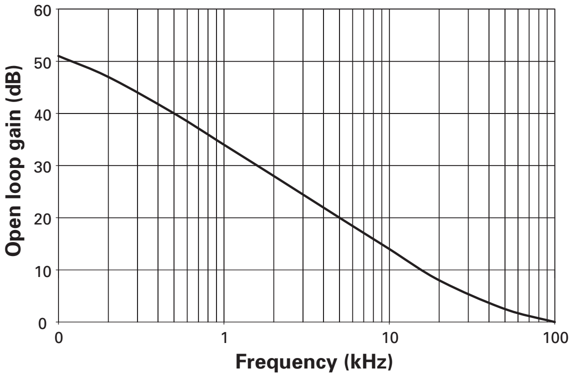


Reference voltage vs Temperature

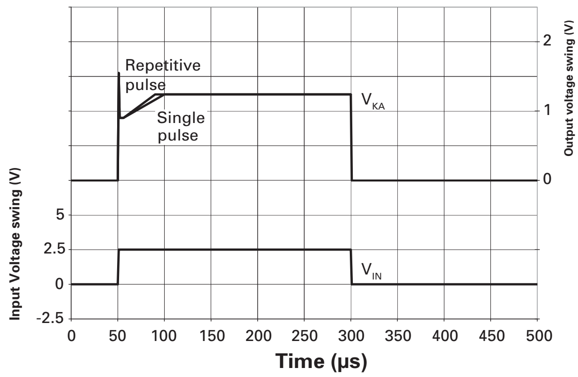


Power dissipation derating

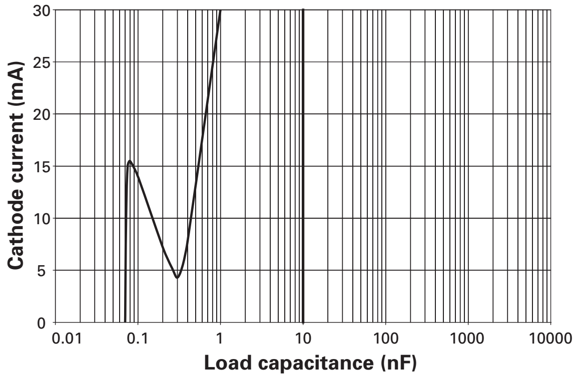
Typical characteristics



Open loop gain vs frequency



Pulse response



Stability boundary conditions

Typical characteristics

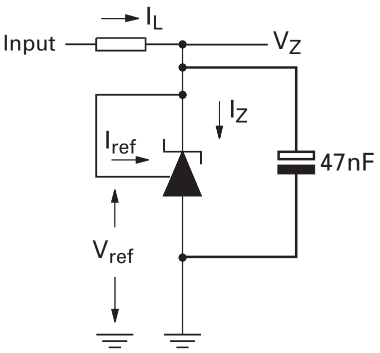


Fig 1 - Test circuit for $V_Z = V_{ref}$

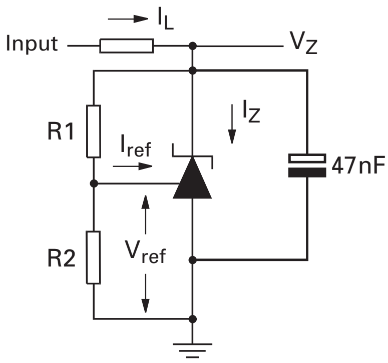


Fig 2 - Test circuit for $V_Z > V_{ref}$

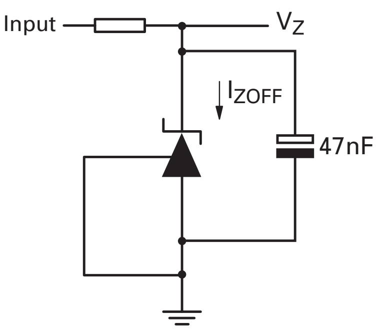
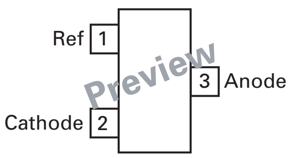


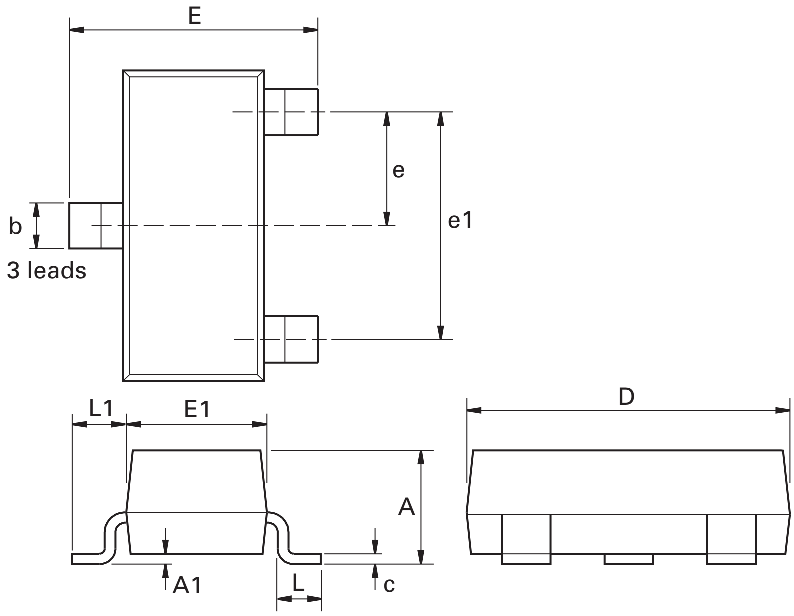
Fig 3 - Test circuit for for Off state current†

Pin connections - preview status devices

ZTLV431_FF (SOT23F)
(top view)



Package outline - SOT23



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
c	0.085	0.20	0.003	0.008	L	0.25	0.60	0.0098	0.0236
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.037 NOM		-	-	-	-	-

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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