



# Adjustable Voltage Reference – TLV431W

Rev 1.0  
18/03/21

## Precision low-voltage programmable Shunt Reference in bare die form

### Description

The TLV431W three-terminal shunt reference combines low temperature co-efficient zener band-gap regulation with programmability. The device operates over a wide 80µA to 100mA current range with voltage adjustable from  $V_{REF}$  (1.24V) to 18V, set via x2 external resistors. With high temperature stability and typical dynamic impedance of 0.2Ω, these references make excellent replacements for zener diodes in many high reliability applications. With sharp accurate response, the device is simply implemented as either positive or negative reference.

### Features:

- Programmable output voltage to 18V
- ±0.5% reference voltage tolerance at 25°C
- Low dynamic output impedance: 0.2Ω Typ
- Sink current capability: 80µA to 100mA
- Band-gap reference corrects temperature drift
- Direct replacement for TLV431 and TLVH431
- Full military temperature range.

### Ordering Information

The following part suffixes apply:

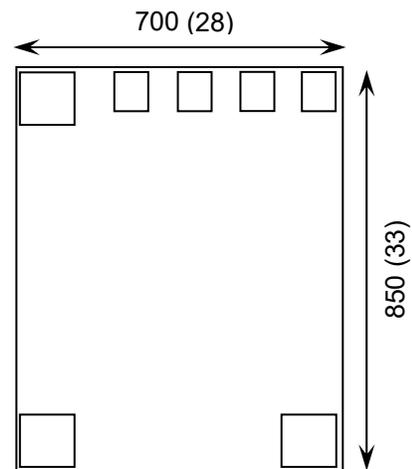
- No suffix - MIL-STD-883 /2010B Visual Inspection
- "H" - MIL-STD-883 /2010B Visual Inspection + MIL-PRF-38534 Class H LAT
- "K" - MIL-STD-883 /2010A Visual Inspection (Space) + MIL-PRF-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

[www.siliconsupplies.com/quality/bare-die-lot-qualification](http://www.siliconsupplies.com/quality/bare-die-lot-qualification)

### Die Dimensions in µm (mils)



### Supply Formats:

- Default - Die in Waffle Pack (400 per tray capacity)
- ~~Sawn Wafer on Tape~~ – On request
- Unsawn Wafer – On request
- Die Thickness <=> 280µm(11 Mils) – On request
- In Metal or Ceramic package – On request

### Mechanical Specification

Die Size (Unsawn)	700 x 850 28 x 33	µm mils
Minimum Bond Pad Size	100 x 100 3.94 x 3.94	µm mils
Die Thickness	260 (±20) 11 (±0.8)	µm mils
Top Metal Composition	Al 1%Si 1.4µm	
Back Metal Composition	N/A – Bare Si	

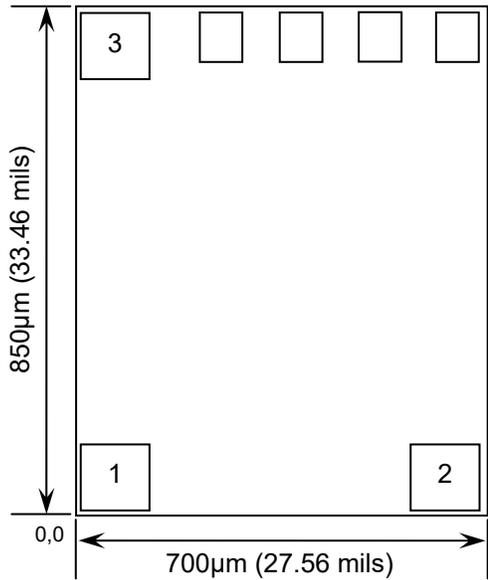




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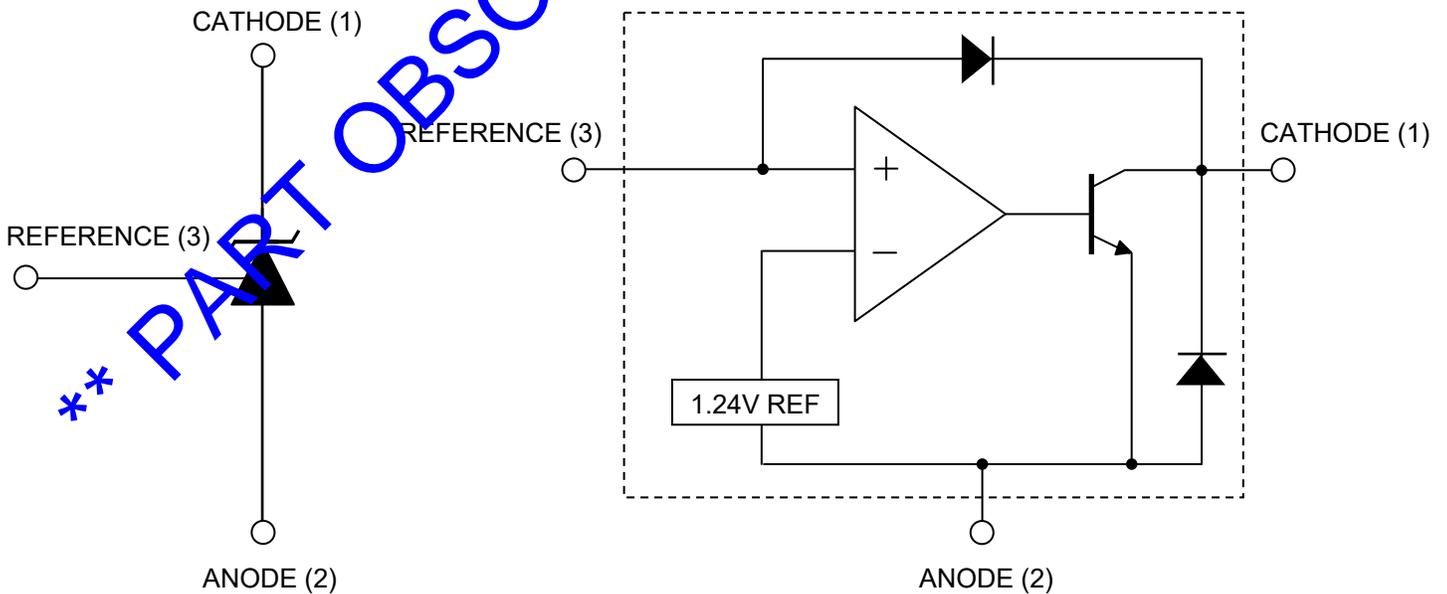
## Pad Layout and Functions



PAD	FUNCTION	COORDINATES (µm)	
		X	Y
1	CATHODE (K)	60	60
2	ANODE (A)	540	60
3	REFERENCE	60	690

CONNECT CHIP BACK TO ANODE

## Symbol & functional block diagram





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## Absolute Maximum Ratings<sup>1</sup> $T_A = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	VALUE	UNIT
Cathode to Anode Voltage	$V_{KA}$	20	V
Cathode Current Range, Continuous	$I_K$	120	mA
Reference Input Current Range, Continuous	$I_{REF}$	-0.05 to 3	mA
ESD Rating (Human Body Model)	$V_{ESD}$	>2	kV
Operating Junction Temperature Range	$T_J$	150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-65 to 150	$^\circ\text{C}$

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

## Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNIT
Cathode Voltage	$V_{KA}$	$V_{REF}$	18	V
Cathode Current	$I_K$	0.08	100	mA
Ambient Operating Temperature Range	$T_A$	-55 to 125		$^\circ\text{C}$

## Electrical Characteristics, $T_A = 25^\circ\text{C}$ , $V_{KA} = V_{REF}$ , $I_K = 10\text{mA}$ unless otherwise stated

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Reference input voltage	$V_{REF}$	$V_{KA} = V_{REF}$ , $I_K = 10\text{mA}$	1.235	1.240	1.245	V
Reference input voltage, Deviation over temperature range	$\Delta V_{REF}$	$V_{KA} = V_{REF}$ , $I_K = 10\text{mA}$ , $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$	-	10	20	mV
Ratio of change in reference input voltage to change in cathode to anode voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_K = 10\text{mA}$ , $\Delta V_{KA} = 18\text{V to } V_{REF}$	-1.0	-0.4	-	mV/V
Reference input current	$I_{REF}$	$I_K = 10\text{mA}$ , $R_1 = 10\text{k}\Omega$ , $R_2 = \infty$	-	0.1	0.5	$\mu\text{A}$
Reference input current, Deviation over temperature range	$\Delta I_{REF}$	$I_K = 10\text{mA}$ , $R_1 = 10\text{k}\Omega$ , $R_2 = \infty$	-	0.04	0.2	$\mu\text{A}$
Minimum cathode current for regulation	$I_{K(MIN)}$	$1.215\text{V} \leq V_{REF} \leq 1.265\text{V}$	-	60	80	$\mu\text{A}$
Off-State cathode current	$I_{K(OFF)}$	$V_{KA} = 18\text{V}$ , $V_{REF} = 0\text{V}$	-	0.01	0.5	$\mu\text{A}$
Dynamic impedance	$ Z_{KA} $	$I_K = 100\text{mA to } 1\text{mA}$ , $f \leq 1.0\text{KHz}$	-	0.2	0.4	$\Omega$





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## Test Circuits

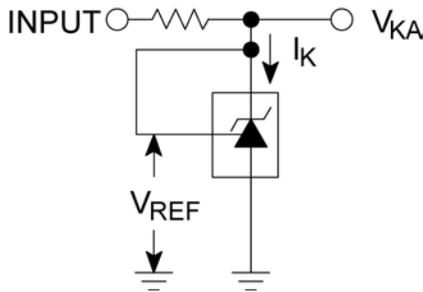


FIGURE 1.  $V_{KA} = V_{REF}$

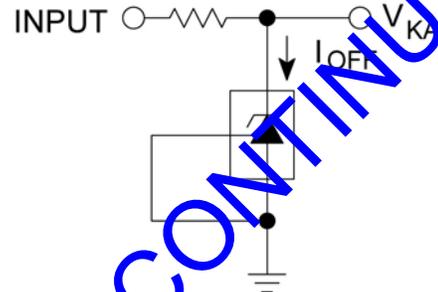
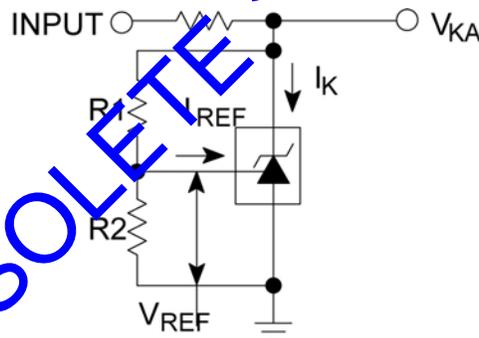


FIGURE 2.  $I_{OFF}$



$$V_{KA} = V_{REF} \left( 1 + \frac{R1}{R2} \right) + I_{REF} \cdot R1$$

FIGURE 3.  $V_{KA} > V_{REF}$

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