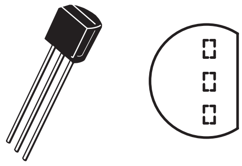
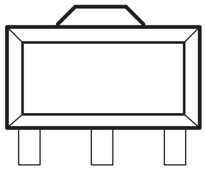
FEATURES

- Programmable Output Voltage to 36V
- Low Dynamic Output Impedance 0.2Ω
- Sink Current Capability of 0.1 mA to 100 mA
- Equivalent Full-Range Temperature Coefficient of 50 ppm/°C
- Temperature Compensated for Operation over Full Rated Operating Temperature Range
- Low Output Noise Voltage
- Fast Turn on Response

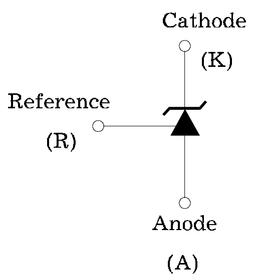




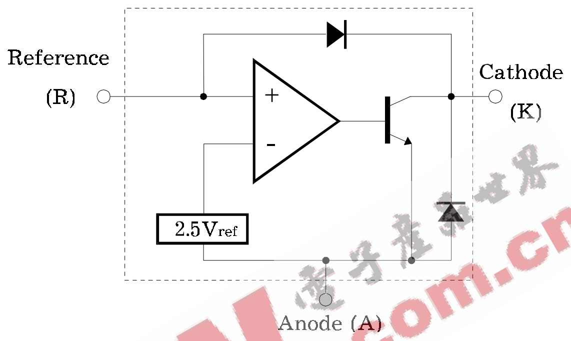
DESCRIPTION

The TL431A is a three-terminal adjustable regulator series with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between Vref (approximately 2.5 volts) and 36 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω. Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.
The TL431A is characterized for operation from -0°C to +70°C.

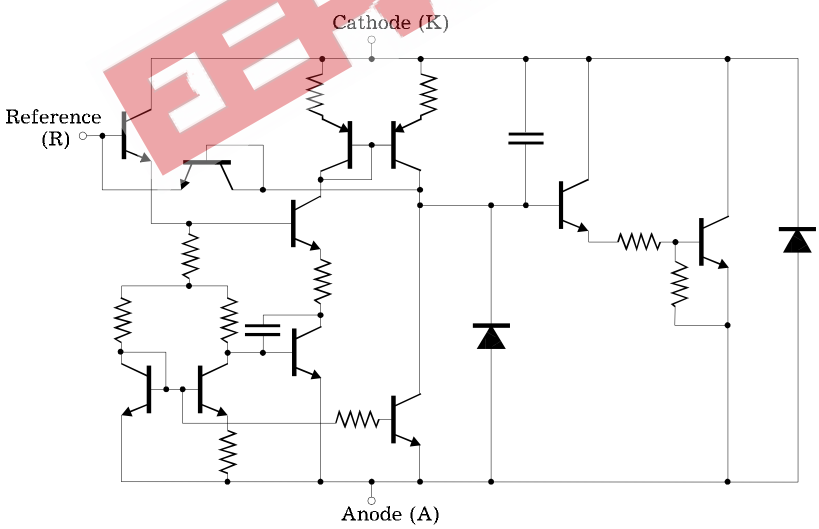
SYMBOL



FUNCTIONAL BLOCK DIAGRAM



SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

(Operating temperature range applies unless otherwise specified)

Characteristic	Symbol	Value	Unit
Cathode Voltage	V_{KA}	37	V
Cathode Current Range (Continuous)	I_K	-100 ~ +150	mA
Reference Input Current Range	I_{REF}	0.05 ~ +10	mA
Operating Temperature Range	T_A	0 ~ +70	^oC
Storage Temperature Range	T_{stg}	-65 ~ +150	^oC

RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Cathode Voltage	V_{KA}		V_{REF}		36	V
Cathode Current	I_K		1.0		100	mA

ELECTRICAL CHARACTERISTICS

(T_A = 25^{o}C, unless otherwise specified)

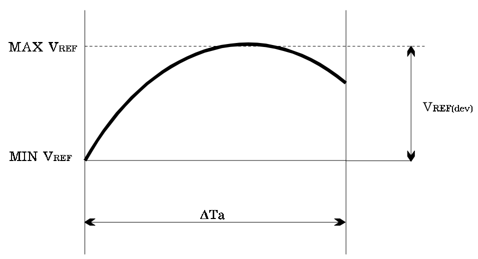
Characteristic	Symbol	Test Condition		Min	Typ	Max	Unit
Reference Input Voltage	V_{REF}	$V_{KA} = V_{REF}$, I_K = 10mA		2.475	2.495	2.515	V
Deviation of Reference Input Voltage Over-Temperature (Note 1)	$V_{REF(dev)}$	$V_{KA} = V_{REF}$, I_K = 10mA $T_{min} \le T_A \le T_{max}$			3	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	I_K = 10mA	ΔV_{KA} = 10V-V_{REF}		-1.4	-2.7	mV/V
			ΔK_{KA} = 36V- 10V		-1.0	-2.0	
Reference Input Current	I_{REF}	I_K = 10mA, R_1 = 10KΩ, $R_2 = \infty$			1,8	4	μA
Deviation of Reference Input Current Over Full Temperature Range	$I_{REF(dev)}$	I_K = 10mA, R_1 = 10KΩ, $R_2 = \infty$ Ta = Full Range			0.4	1.2	μA
Minimum Cathode Current for Regulation	$I_{K(min)}$	$V_{KA} = V_{REF}$			0.5	1.0	mA
Off-State Cathode Current	$I_{K(off)}$	V_{KA} = 36V, V_{REF} = 0			0.26	1.0	μA
Dynamic Impedance (Note2)	Z_{KA}	$V_{KA} = V_{REF}$, I_K = 10mA to 100mA f ≤ 1.0KHz			0.22	0.4	Ω

Note: 1. The deviation parameters $V_{REF(dev)}$ and $I_{REF(dev)}$ are defined as the differences between the maximum and minimum values obtained over the rated temperature range.

$V_{REF(dev)} = V_{REF}(max) - V_{REF}(min)$

The equivalent full-range temperature coefficient of the reference input voltage, αV_{REF} is defined as:

$$\alpha V_{REF}\left(\frac{ppm}{^\circ C}\right) = \frac{\left(\frac{V_{REF(dev)}}{V_{REF}@\ ^\circ C}\right) \times 10^6}{\Delta Ta}$$



Where ΔT_A is the rated operating free-air temperature range of the device.

αV_{REF} can be positive or negative depending on whether minimum V_{REF} or maximum V_{REF} respectively, occurs at the lower temperature.

2. The dynamic impedance is defined as:

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

When the device is operated with two external resistors (see Figure 2), the total dynamic impedance of the circuit is given by:

$$|Z'| = \frac{\Delta V}{\Delta I} = |Z_{KA}| \left(1 + \frac{R1}{R2}\right)$$

TEST CIRCUITS

Fig.1. Test Circuit for $V_{KA} = V_{REF}$

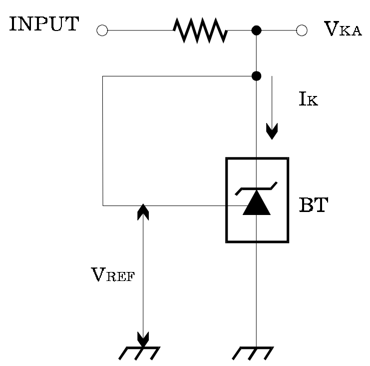


Fig.2. Test Circuit for $V_{KA} \geq V_{REF}$

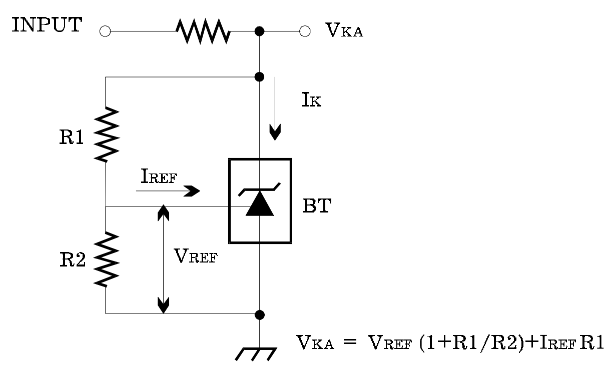
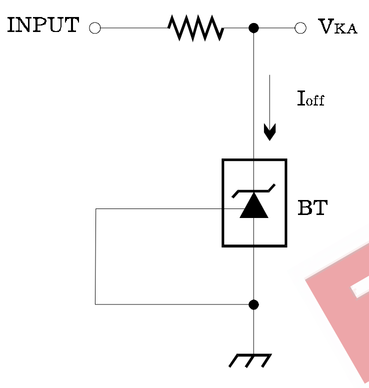
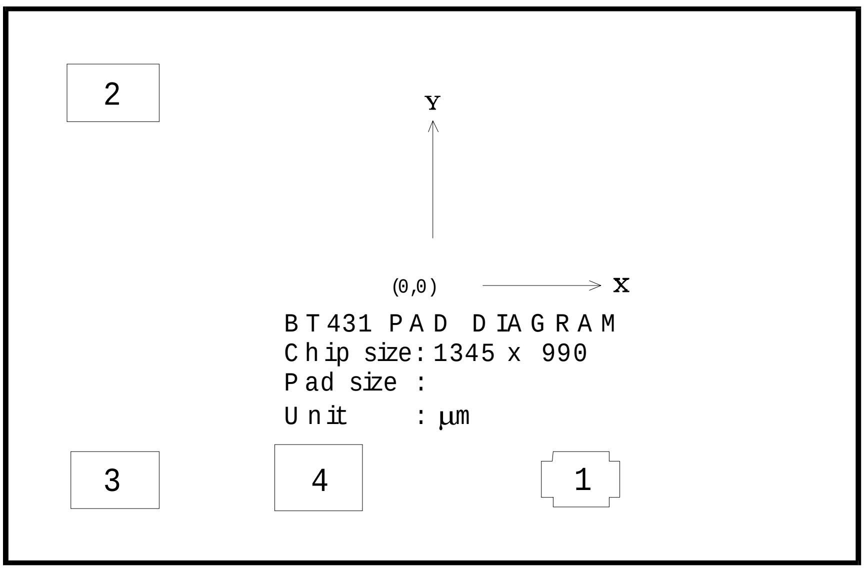


Fig.3. Test Circuit for I_{off}



PAD LAYOUT



PAD LOCATION

Unit: µm

Pad No.	Pad Name	Description	X	Y
1	R	Reference	235	400
2	K	Cathode	-505	343.5
3	K	Cathode	-497.5	-346
4	A	Anode	-177.5	-341.5

Physical Characteristics		
Wafes	4»	4» Wafes 460 ± 40 µm
Size	1.35 × 0.99 mm	
Scribe width	90 µm	
Wafe's Backside	Ti – Ni – Ag: Ti - 0.1 ± 0.02 µm Ni - 0.5 ± 0.1 µm Ag - 0.6 ± 0.1 µm	
Passivation	PSG	