ELM0431AxA Adjustable precision shunt regulator

■General description

ELM0431AxA series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature range. The output voltage may be set to any value between Vref (Typ.2.495V) and 40V 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.

ELM0431AxA shunt regulator is available in a SOT-89 package.

■Features

- Programmable output voltage
- Temperature coefficient is 50ppm/°C typical
- Temperature compensated for operation over full temperature range
- Low output noise voltage
- Fast turn on response
- Package : SOT-89

■Application

- Linear regulator
- Precision voltage reference
- Switching power supplies
- Battery operating equipment
- Instrumentation

■Classification

Rank	A	B	C
Vref	2.495V±0.5%	2.495V±1%	2.495V±2%

■Maximum absolute ratings

(Operating temperature range applies unless otherwise specified)

Parameter	Symbol	Limit	Unit
Cathode voltage	Vka	42	V
Cathode current range (Continuous)	Ik	-100 to +150	mA
Reference input current range	Iref	-0.05 to +10	mA
Power dissipation (Ta=25℃)	Pd	500 (*1)	mW
		1000 (*2)	
Junction temperature	Tj	150	°C
Operationg temperature range (Tj<150℃)	Top	-40 to +125	°C
Storage temperature range	Tstg	-65 to +150	°C

* 1. No mounted, IC alone.

* 2. When mounted on glass epoxy 2-layers PCB (EIJ/JEDEC standard size: 76.2 mm×114.3 mm×1.6 mm), Cu thickness 35 μm, copper foil area ratio 20% on the front side, back side 100% .

■Selection guide

ELM0431AxA-S

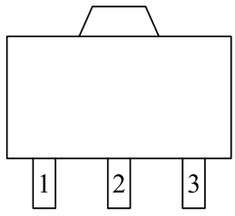
Symbol		
a	Package	A: SOT-89
b	Rank	A: 2.495V±0.5% B: 2.495V±1% C: 2.495V±2%
c	Product version	A
d	Taping direction	S: Please refer to page 6

ELM0431 A x A - S
↑ ↑ ↑ ↑
a b c d

* Taping direction is one way.

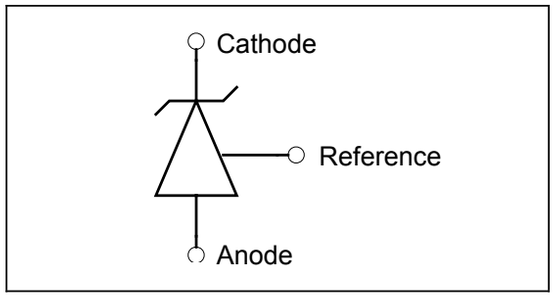
■Pin configuration

(TOP VIEW)

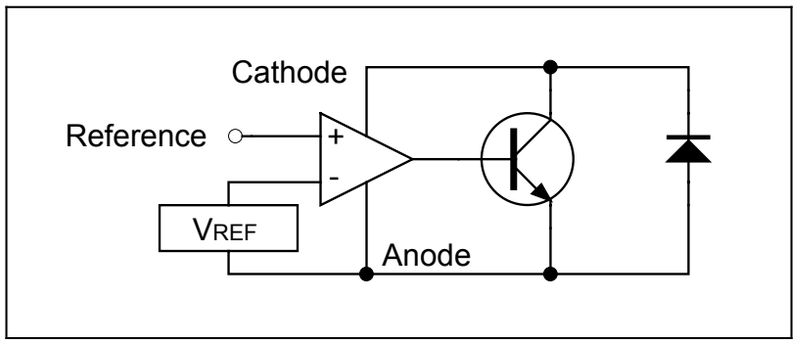


Pin No.	Pin name
1	Reference
2	Anode
3	Cathode

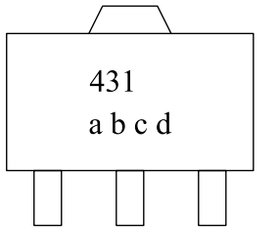
■Circuit



■Block diagram



■Marking



Mark	Content
431	Product ID
a to d	Assembly lot No.

■Electrical characteristics

Vka=Vref, Ik=10mA, Top=25°C, unless otherwise stated

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note*1
Reference input voltage	A-rank	Vref	Vka=Vref, Ik=10mA	2.483	2.495	2.507	V	1
	B-rank			2.470	2.495	2.520		
	C-rank			2.445	2.495	2.545		
Deviation of reference input voltage over-temperature (Note)		ΔVref	Vka=Vref, Ik=10mA Tmin≤Top≤Tmax *2	-	4	17	mV	1
Ratio of change in reference input voltage to the change in cathode voltage		$\frac{\Delta Vref}{\Delta Vka}$	Ik=10mA, ΔVka=10V~Vref	-	-1.4	-2.7	mV/V	2
			Ik=10mA, ΔVka=36V to 10V	-	-1.0	-2.0		
Reference input current		Iref	Ik=10mA, R1=10kΩ, R2=∞	-	1.1	4.0	μA	2
Deviation of reference input current over full temperature range		ΔIref	Ik=10mA, R1=10kΩ, R2=∞, Tmin≤Top≤Tmax *2	-	0.4	1.2	μA	2
Minimum cathode current for regulation		Ik(min)	Vka=Vref	-	0.33	0.50	mA	1
Off-state cathode current		Istandby	Vka=36V, Vref=0V	-	0.17	1.00	μA	3
Dynamic impedance		Zout	Vka=Vref, f≤1.0KHz Ik=1 to 100mA	-	0.2	0.5	Ω	1

*1) : test circuit No.
*2) : Tmin=0°C, Tmax=70°C

■Test circuits

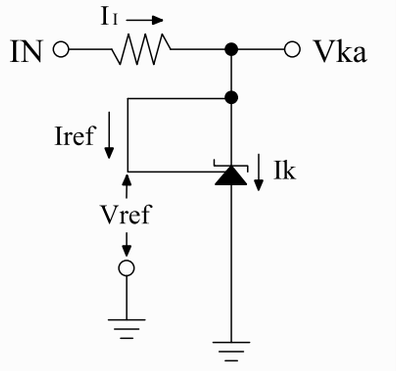


Fig1. Test circuit for Vka=Vref

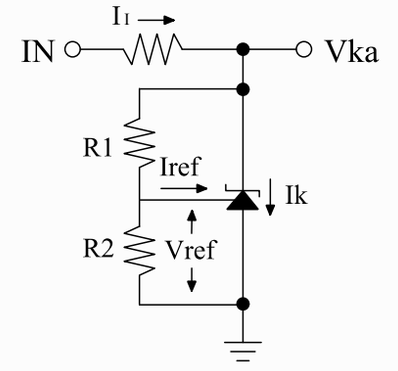


Fig2. Test circuit for Vka>Vref
Note: Vka=Vref(1+R1/R2)+Iref×R1

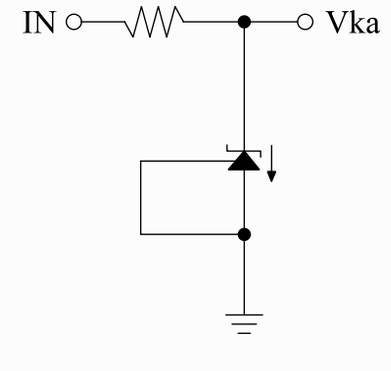
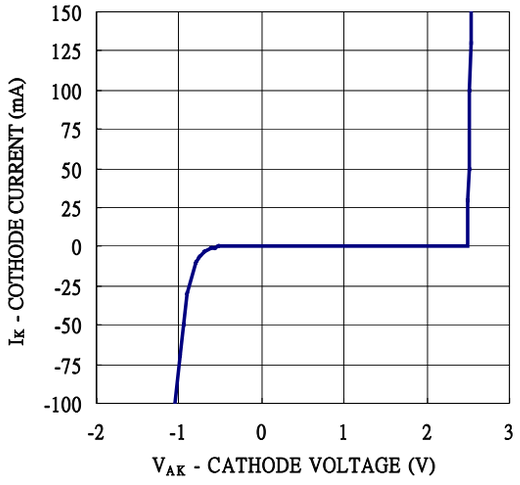


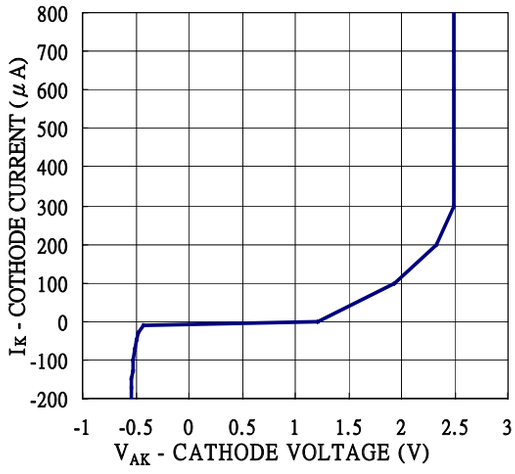
Fig3. Test circuit for Off-State current

■Typical characteristics

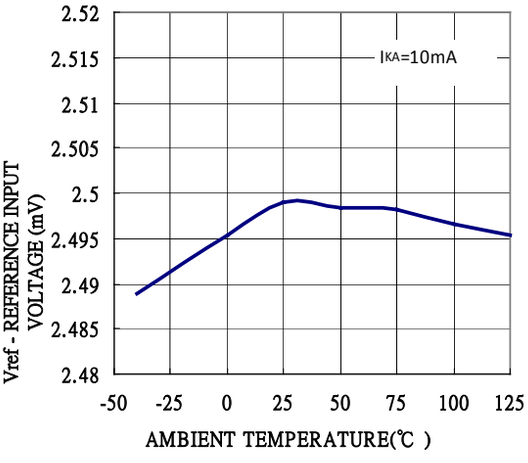
CATHODE CURRENT vs CATHODE VOLTAGE



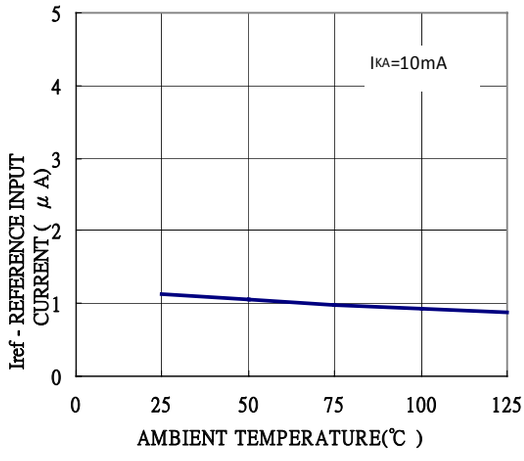
CATHODE CURRENT vs CATHODE VOLTAGE



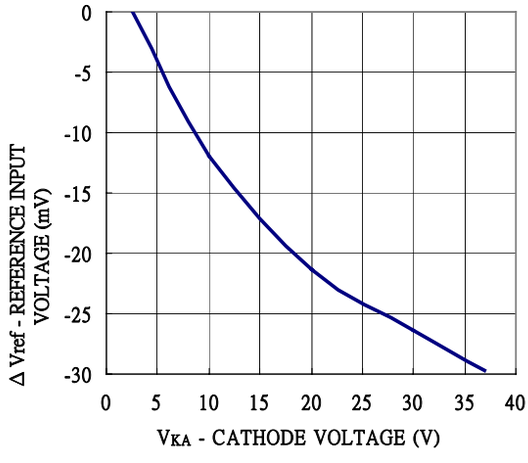
REFERENCE INPUT VOLTAGE vs AMBIENT TEMPERATURE



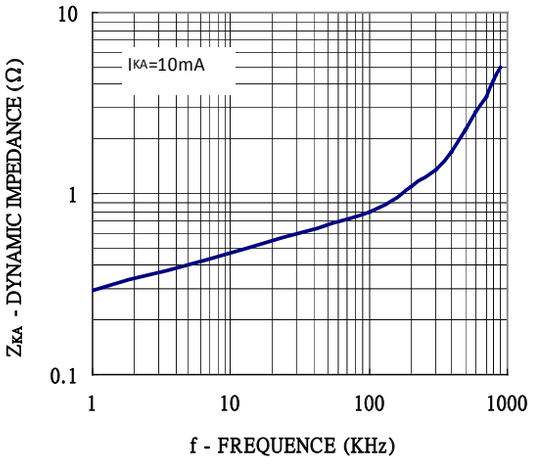
REFERENCE INPUT CURRENT vs AMBIENT TEMPERATURE



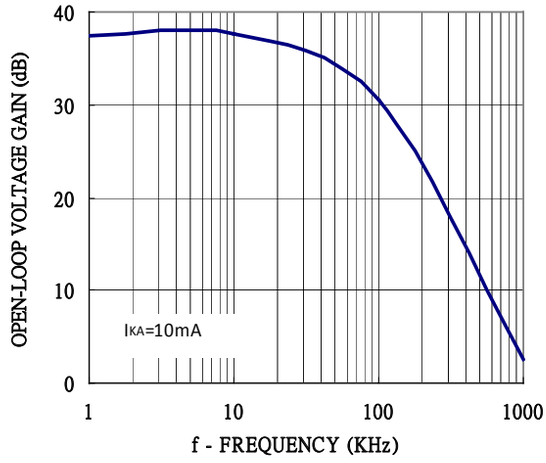
CATHODE VOLTAGE vs REFERENCE INPUT VOLTAGE



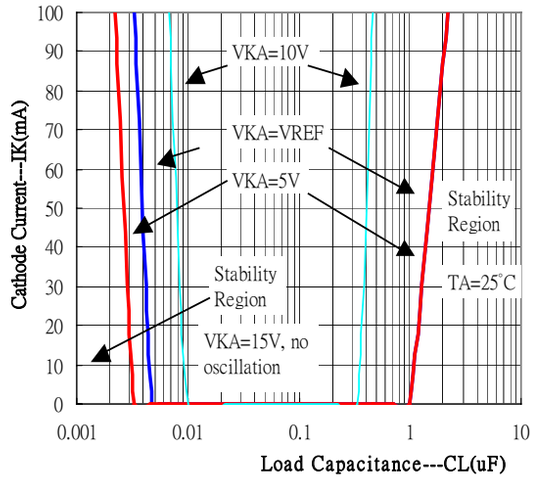
DYNAMIC IMPEDANCE vs FREQUENCE



OPEN-LOOP VOLTAGE GAIN vs FREQUENCY

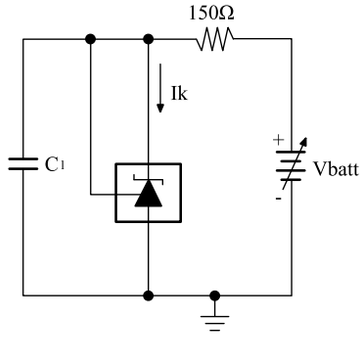


Stability Boundary Conditions

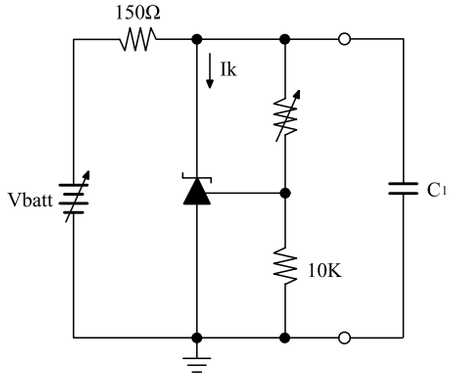


■Test circuit for stability boundary conditions

Vka=Vref

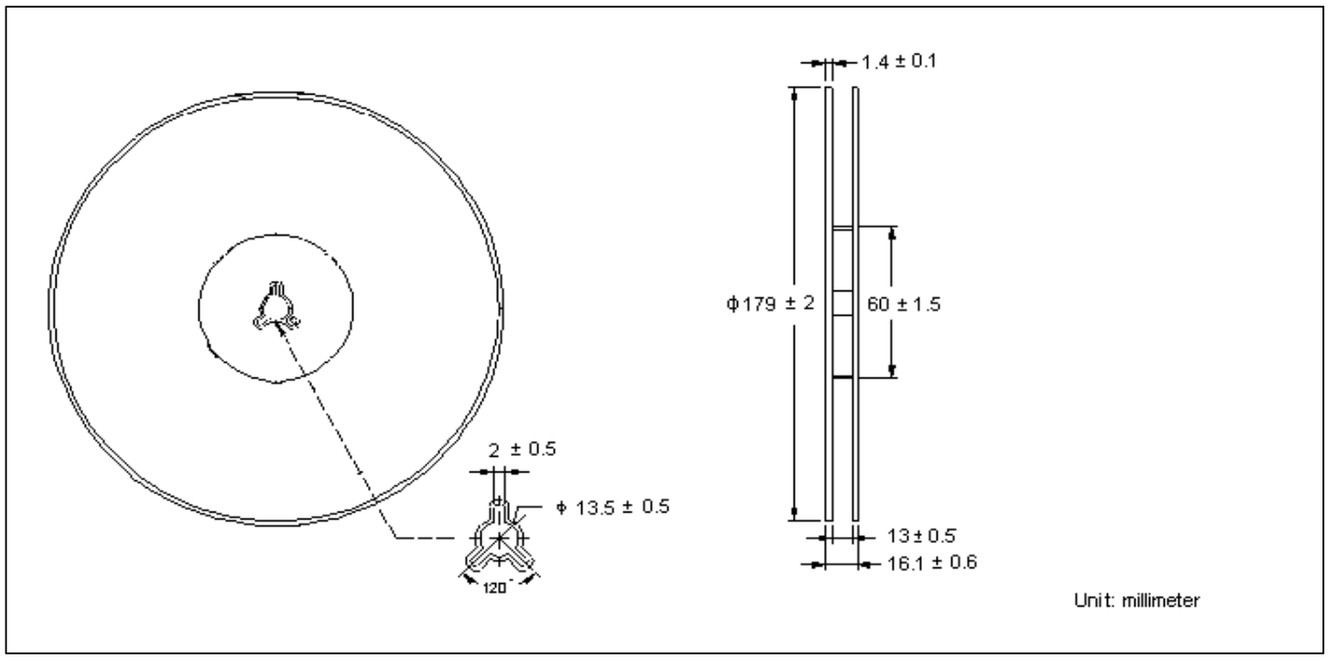


Vka=5V, 10V, 15V

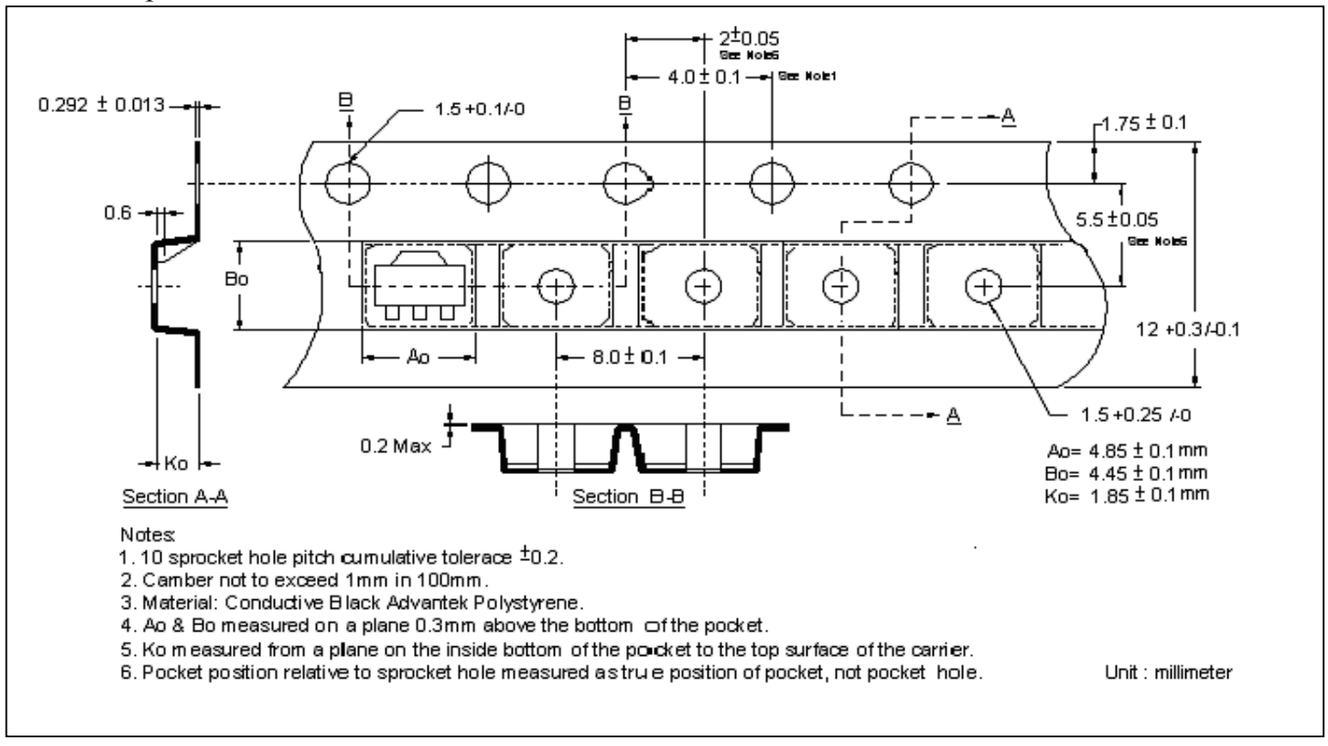


■Reel & carrier tape dimension

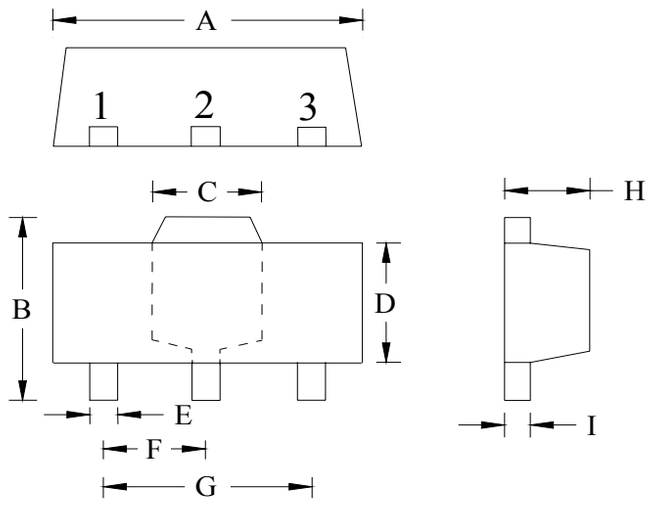
• Reel



• Carrier tape



■SOT-89 dimension



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1732	0.1811	4.40	4.60	F	0.0591 TYP		1.50 TYP	
B	0.1551	0.1673	3.94	4.25	G	0.1181 TYP		3.00 TYP	
C	0.0610 REF		1.55 REF		H	0.0551	0.0630	1.40	1.60
D	0.0906	0.1024	2.30	2.60	I	0.0138	0.0173	0.35	0.44
E	0.0126	0.0205	0.32	0.52					

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.