

## General Description

The AQ431R is a three-terminal adjustable shunt regulator based on a highly stable bandgap reference and is an excellent replacement for standard TL431 references when used as a secondary feedback element in Switch Mode Power Supplies.

The AQ431R meets all of the requirements of the standard 431 specifications that are needed to monitor the secondary output voltage and provide the feedback signal to the primary through an opto-coupler. It is offered in both the very popular SOT23-3 and TO-92 packages.

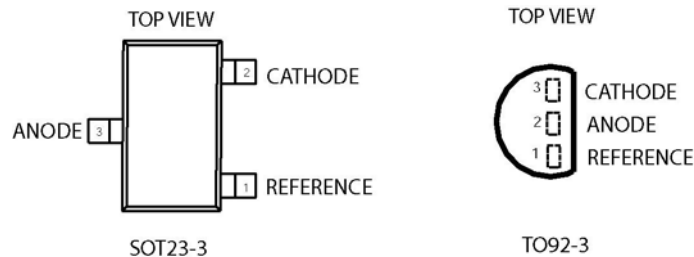
## Applications

- Power supply control loop
- Low TC voltage reference
- Power management applications

## Features

- Programmable precise output voltage 2.5V to 15V
- Wide temp range: -40° to 85°C standard
- Improved stability with capacitive loads
- Low TC voltage reference
- Wide range of package options
- **RoHS compliant**

## Pin Configuration



## Pin Descriptions

Pin Name	Function
CATH	Output and supply terminal, must be greater than 2.5V for normal operation
REF	Input, nominally 2.495V in normal operation.
ANODE	Ground and Substrate

## Ordering Information

Device	Operating Tj	%Tol	PKG Type	VOUT	Wrap	Ordering Number
AQ431R	-40°C ≤ 85°C	1.5	TO-92-3	2.5V	BULK	AQ431REX-N3-25-BUL
AQ431R	-40°C ≤ 85°C	1.5	TO-92-3	2.5V	T&R	AQ431REX-N3-25-TRL
AQ431R	-40°C ≤ 85°C	1.5	SOT-23-3	2.5V	T&R	AQ431REX-M3-25-TRL

Note: All parts are Lead Free and RoHS compliant.

## Absolute Maximum Ratings

Stress greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These stress ratings only, and functional operation of the device at these or any conditions beyond those indicated under recommended Operating Conditions is not implied. Exposure to “Absolute Maximum Rating” for extended periods may affect device reliability. Use of standard ESD handling precautions is required.

Parameter	Value	Units
CATH Voltage	18	V
REF Current	10	mA
CATH, ANODE Currents	100	mA
Operating Junction Temperature	150	°C
Lead Temperature (soldering 10 seconds)	260	°C
Storage Temperature Range	-65 to +150	°C
ESD Rating (HBM)	3	KV

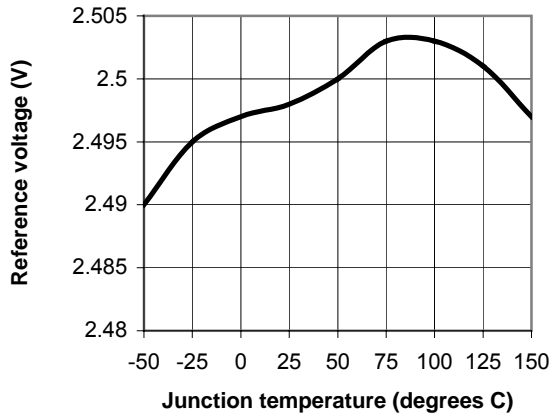
## Electrical Specifications

Electrical characteristics are guaranteed over the full temperature range -40°C < Tj < 85°C unless otherwise stated. Ambient temperature must be de-rated based upon power dissipation and package thermal characteristics.

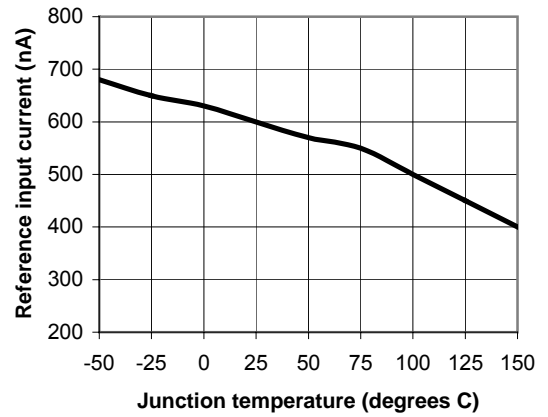
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>REF</sub>	Reference Voltage	25°C; V <sub>REF</sub> =V <sub>CATH</sub> ; I <sub>CATH</sub> =10mA	2.458	2.495	2.532	V
ΔV <sub>REF</sub>	V <sub>REF</sub> Temperature deviation	-40°C < Tj < 85°C.		8	25	mV
$\frac{\Delta V_{REF}}{\Delta V_{CATH}}$	Ratio of V <sub>REF</sub> Change to V <sub>CATH</sub> Change (Line Reg; 1/gain)	I <sub>CATH</sub> =10mA, V <sub>CATH</sub> = V <sub>REF</sub> to 15V		-1	-2.7	mV/V
I <sub>REF</sub>	Reference input current	I <sub>CATH</sub> =10mA		0.7	4	μA
ΔI <sub>REF</sub>	I <sub>REF</sub> Temperature Deviation			0.04	0.2	μA
I <sub>CATH(min)</sub>	Minimum Cathode Current			.5	1	mA
I <sub>CATH(OFF)</sub>	Off-State Cathode Current	V <sub>REF</sub> =0V; V <sub>CATH</sub> =15V		.05	1	μA
r <sub>CATH</sub>	Dynamic Output Impedance	I <sub>CATH</sub> =0.1 to 100mA f ≤ 1.0 kHz		0.2	0.5	Ω

## Typical Performance Characteristics

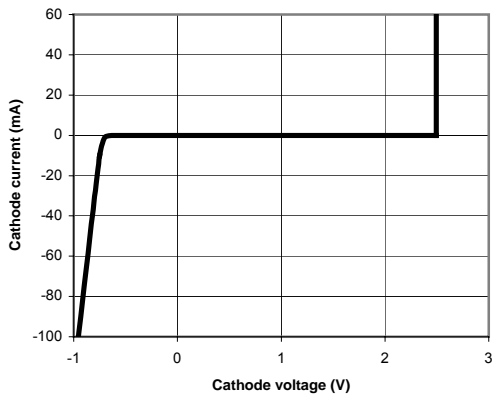
Reference voltage  
vs  
Junction temperature



Reference input current vs junction  
temperature

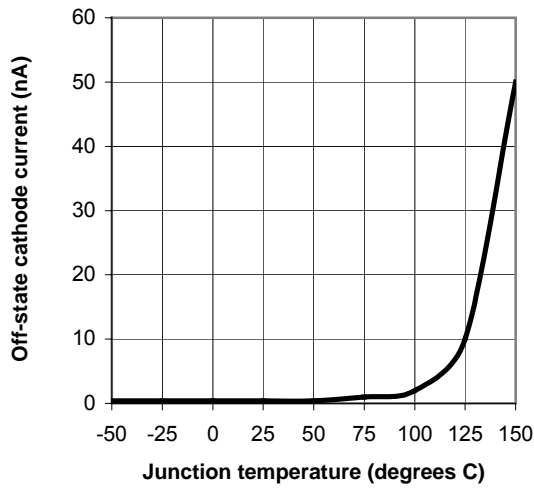


Cathode current vs Cathode voltage

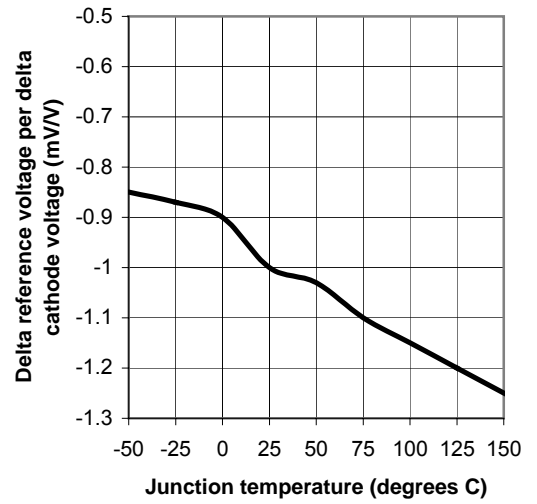


## Typical Performance Characteristics (contd.)

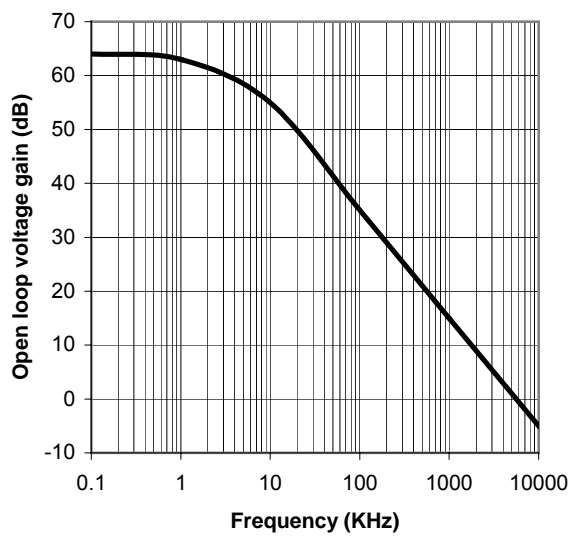
Off-state cathode current vs Junction temperature



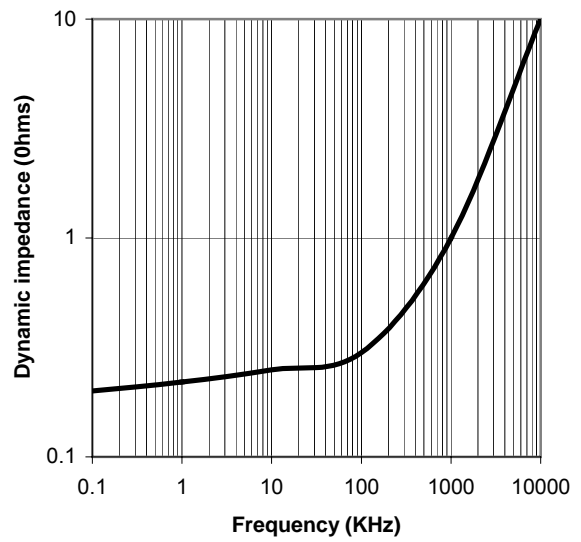
Delta Reference voltage per delta cathode voltage vs junction temperature



Open loop voltage gain vs frequency

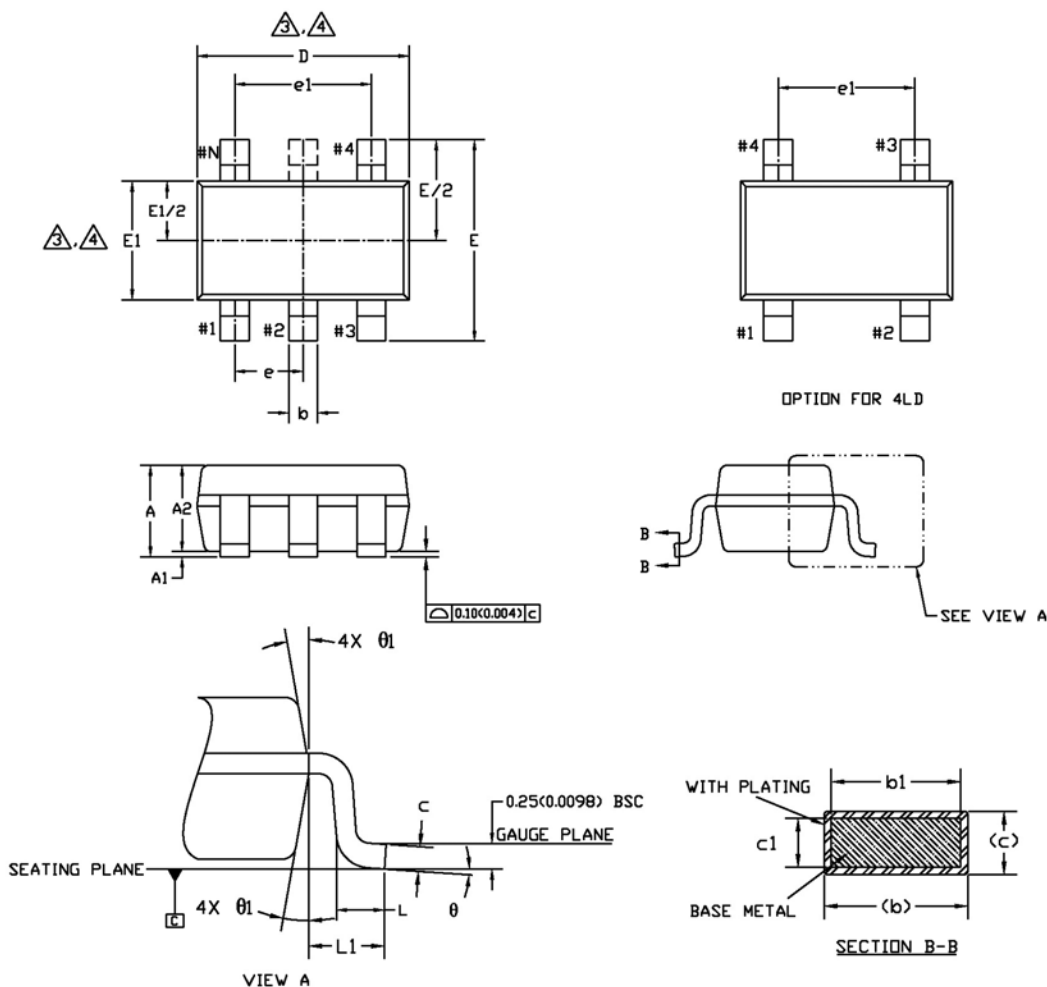


Dynamic impedance vs frequency



### Package Dimensions

### SOT23-3, SOT23-4, SOT23-5, SOT23-6



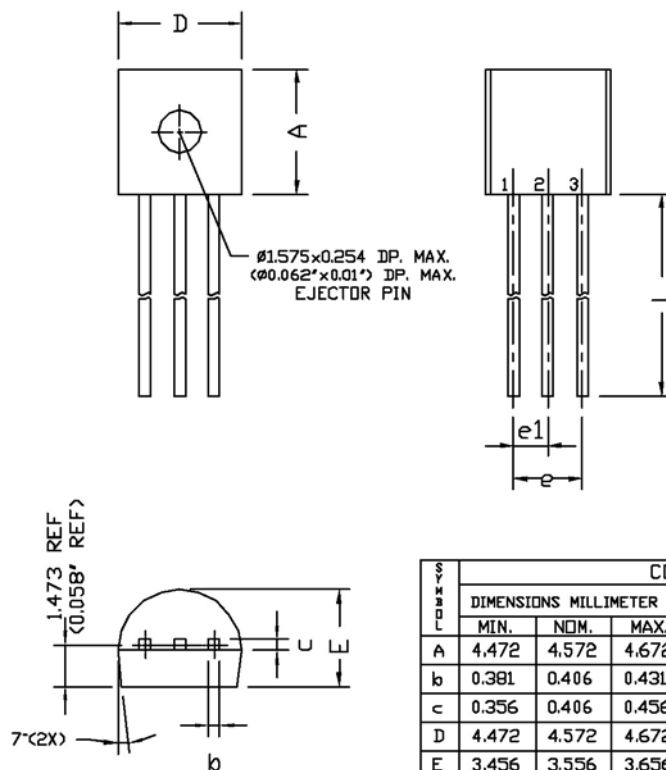
SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.20	1.30	1.40	0.047	0.051	0.055
A1	0.05	-	0.15	0.002	-	0.006
A2	0.90	1.15	1.30	0.035	0.045	0.051
b	0.35	-	0.50	0.013	-	0.020
b1	0.35	0.40	0.45	0.013	0.015	0.017
c	0.08	-	0.22	0.003	-	0.008
c1	0.08	0.13	0.20	0.003	0.005	0.007
D	2.90 BSC			0.114 BSC		
E	2.80 BSC			0.110 BSC		
E1	1.60 BSC			0.062 BSC		
e	0.95 BSC			0.037 BSC		
e1	1.90 BSC			0.074 BSC		
L	0.35	0.45	0.55	0.013	0.017	0.021
L1	0.60 REF.			0.023 REF.		
theta	0°	4°	8°	0°	4°	8°
theta1	10° TYP			10° TYP		

NOTE :

1. Dimensioning and tolerancing per ASME Y 14.5 M - 1994.
2. Dimensions are in millimeters. Converted inch dimension are not necessarily exact.
3. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 0.15 mm per side. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.15 mm per side.
4. Top package may be smaller than the bottom package. Dimension D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash gate burrs and interlead flash.
5. Terminal numbers are shown for reference only. Die is facing up for molding. Die is facing down for trim/form.

## Package Dimensions

### TO92-2, TO92-3



SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	4.472	4.572	4.672	0.176	0.180	0.184
b	0.381	0.406	0.431	0.015	0.016	0.017
c	0.356	0.406	0.456	0.014	0.016	0.018
D	4.472	4.572	4.672	0.176	0.180	0.184
E	3.456	3.556	3.656	0.136	0.140	0.144
e	2.413	2.540	2.667	0.095	0.100	0.105
e1	1.143	1.270	1.397	0.045	0.050	0.055
L	13.87	13.97	14.07	0.546	0.550	0.554

NOTES :

1. CONTROLLING DIMENSION : MILLIMETER. CONVERTED INCH DIMENSION ARE NOT NECESSARILY EXACT.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.
3. FOR 2 LEAD PACKAGE CENTER LEAD IS CLIPPED

## Contact Information

Acutechnology Semiconductor Inc.  
 3487 McKee Rd. Suite 52  
 San Jose CA , USA 95127

TEL: (408) 259-2300  
 FAX: (408) 259-9160  
 website: [www.acutechnology.com](http://www.acutechnology.com)

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