RS431/RS432 Precision Programmable Reference

Features

- **Reference Voltage Tolerance at 25°C**
  0.5% (A Grade)
  1% (B Grade)
- **Programmable output voltage to 36V**
- **Low dynamic output impedance 0.2Ω**
- **Sink current capability of 0.5 to 100mA**
- **Equivalent full-range temperature coefficient of 50ppm/°C typical**
- **Temperature compensated for operation over full rated operating temperature range**
- **Low output noise voltage**
- **Fast turn on response**
- **Operation from -40°C to 85°C**
- **Lead-Free Packages: SOT23**

Applications

- **Adjustable voltage and current referencing**
- **Power supply**
- **Zener replacement**
- **Voltage monitoring**
- **Comparator with integrated reference**
- **As precision voltage reference**

Description

The RS431 and RS432 device are three-terminal adjustable shunt regulators, with a guaranteed thermal stability over applicable temperature ranges. The output voltage can be set to any value between Vref (approximately 2.5V) and 36V with two external resistors. These devices have provides a very sharp turn-on characteristic, making these devices excellent replacement for Zener diodes in many applications.

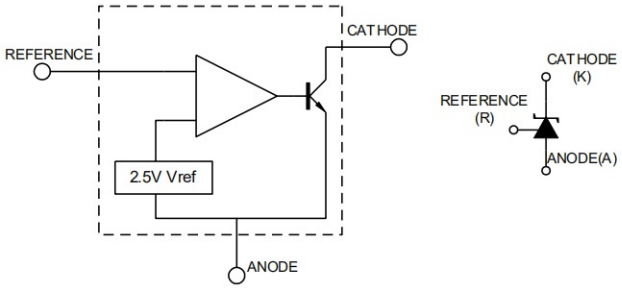
Both the RS431 and RS432 devices are offered in two grades, with initial tolerances (at 25°C) of 0.5% and 1%, for A and B grade.

Device Information

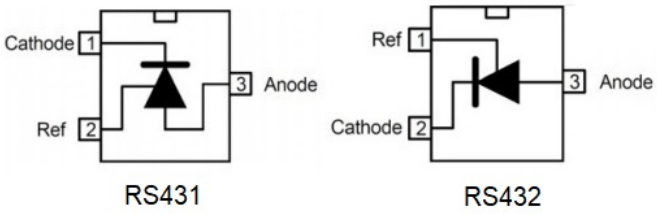
PART NUMBER	PACKAGE(PIN)	BODY SIZE (NOM)
RS431	SOT23(3)	1.30mm×2.92mm
RS432	SOT23(3)	1.30mm×2.92mm

For more detail information packages, see the order sheet.

Block Diagram



Pin configuration and Functions



Pin Functions

NAME	PIN		DESCRIPTION
	RS431	RS432	
Cathode	1	2	Shunt Current/Voltage input
Ref	2	1	Threshold relative to common anode
Anode	3	3	Common pin, normally connected to ground

Ordering information

PRODUCT	ORDERING NUMBER	Voltage Tolerance	PACKAGE LEAD	PACKAGE MARKING	PACKAGE OPTION
RS431	RS431AYSF3	0.5%	SOT23	431AXX	Tape and Reel,3000
	RS431BYSF3	1%	SOT23	431BXX	Tape and Reel,3000
RS432	RS432AYSF3	0.5%	SOT23	432AXX	Tape and Reel,3000
	RS432BYSF3	1%	SOT23	432BXX	Tape and Reel,3000

NOTE:
1. XX = Date Code .

Absolute Maximum Ratings

Characteristics	Symbol	MIN	MAX	UNIT
Cathode Voltage	VKA	-0.3	37	V
Cathode Current Range (Continuous)	IKA	-100	+155	mA
Reference Input Current Range	Iref	-0.05	+10	mA
Operating temperature	Topr	-40	+105	°C
Power Dissipation	P_D	370		mW
Storage temperature	Tstg	-55	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause damage to the device.These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltages are with respect to the GND pin.

ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM)	4000	V
		Charge device model (MM)	200	V

Recommended Operating Conditions

Characteristics	Symbol	MIN	MAX	UNIT
Cathode Voltage	VKA	Vref	36	V
Cathode Current Range (Continuous)	IKA	0.5	100	mA
Operating Ambient Temperature Range	TA	-40	+85	°C

Thermal Information

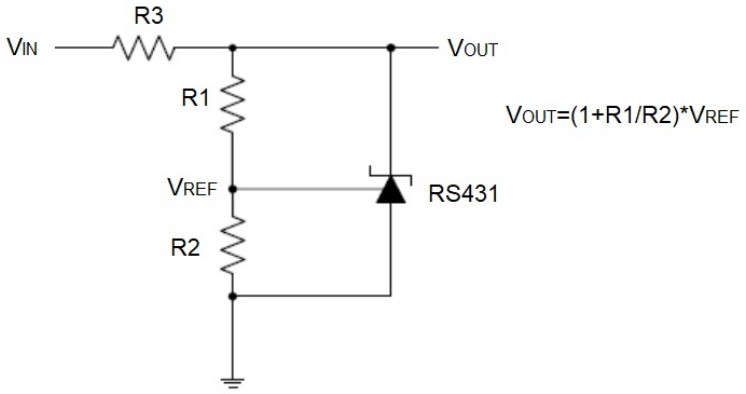
THERMAL METRIC (1)		RS431/RS432 SOT23 3 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	185.6	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	104.3	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	54.5	°C/W
ψ_{JT}	Junction-to-top characterization parameter	31.0	°C/W
ψ_{JB}	Junction-to-board characterization parameter	54.5	°C/W
$R_{JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	°C/W

Electrical Characteristics

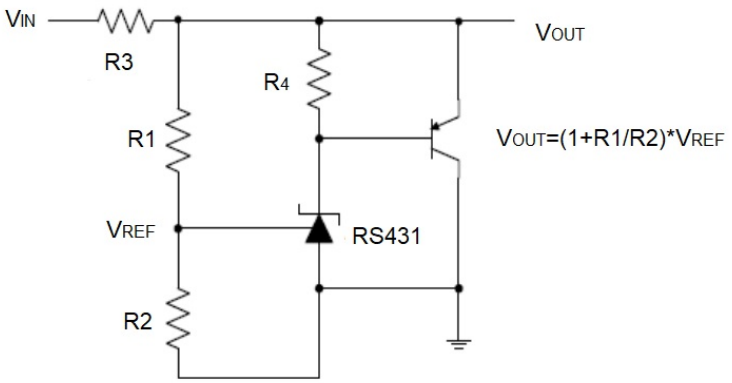
(Over recommended operating conditions, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Reference Input Voltage	VREF	VKA=VREF,IKA=10mA	0.5%	2.488	2.50	2.512	V
			1%	2.475	2.50	2.525	V
Deviation of reference Input Voltage Over temperature	ΔVREF	VKA=VREF,IKA=10mA Tmin≤TA≤Tmax		-	4.5	25	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	ΔVREF/ ΔVKA	IKA=10mA	ΔVKA=10V~Vref	-	-1.0	-2.7	mV/V
			ΔVKA=36V~10V	-	-0.5	-2.0	
Reference Input Current	IREF	IKA=10mA,R1=10kΩ ,R2=∞		-	1.5	4	uA
Deviation of Reference Input Current Over Full Temperature Range	ΔIREF/ΔTA	IIKA=10mA,R1=10kΩ ,R2=∞ TA=full Temperature		-	0.2	0.4	uA
Minimum cathode current for regulation	IKA(min)	VKA=VREF		-	0.3	0.5	mA
Off-state cathode Current	IKA(OFF)	VKA=36V， VREF=0		-	0.05	0.5	uA
Dynamic Impedance	ZKA	VKA=VREF,IKA=1 to100mA f≤1.0KHz		-	0.15	0.5	Ω

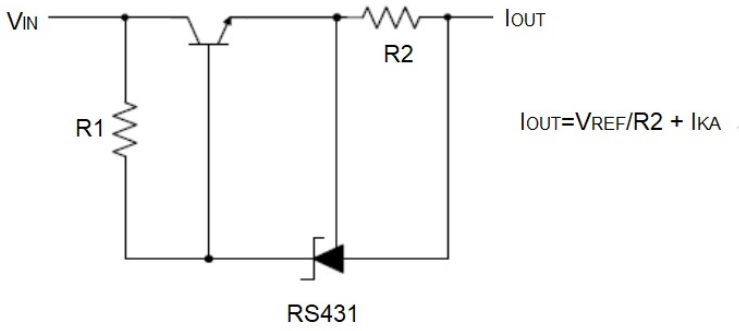
Typical Applications Circuit



Shunt Regulator



High Current Shunt Regulator



Current Source or Current Limit

Typical Performance Characteristics

Fig 1 Cathode Current Vs Cathode Voltage

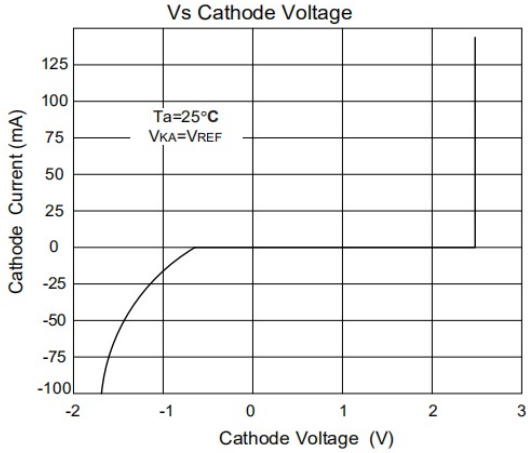


Fig 2 Cathode Current Vs Cahode Voltage

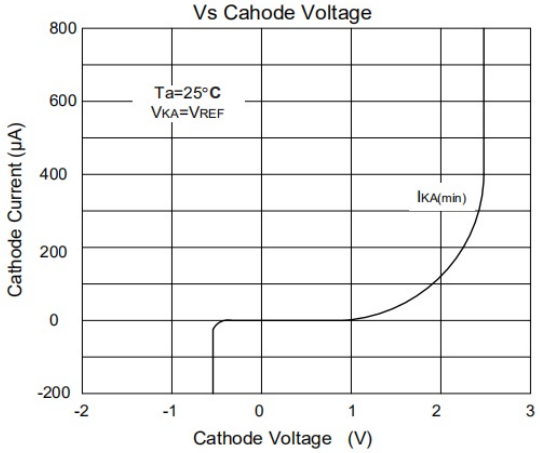


Fig 3 Change in Reference Input Voltage Vs Cathode voltage

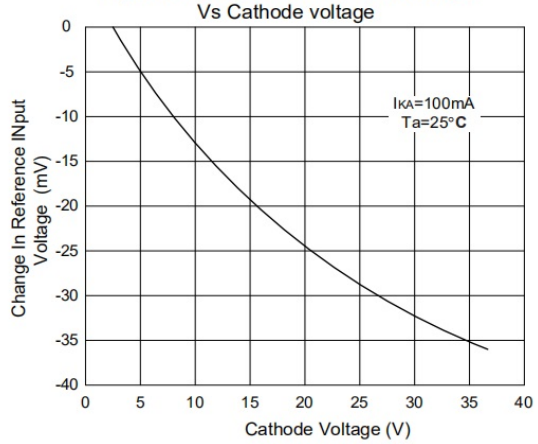


Fig 4 Pulse Response

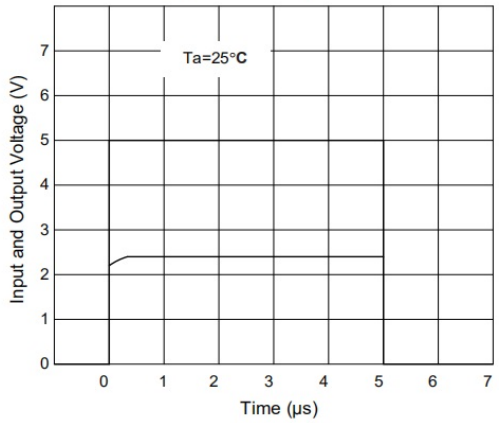


Fig 5 Dynamic Impedance Vs Frequency

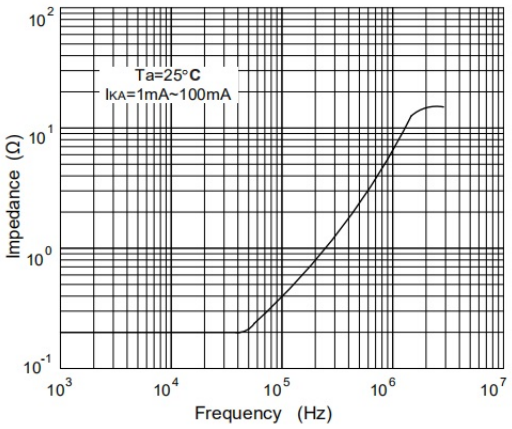


Fig 6 Small Signal Voltage Amplification Vs Frequency

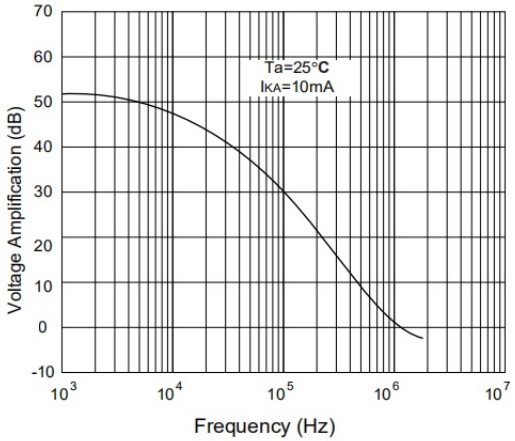


Fig 7 Cathode Current Vs Load Capacitance

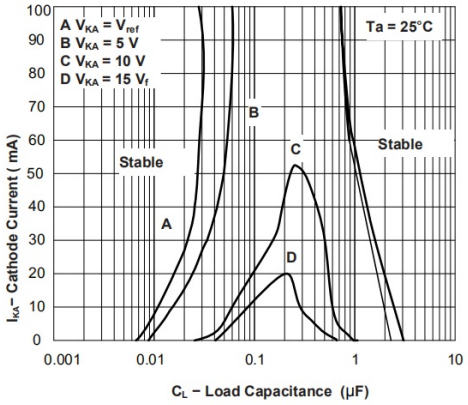
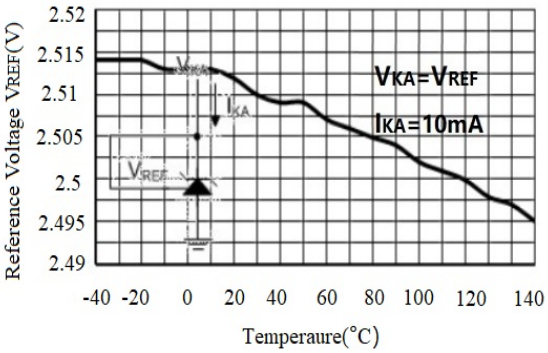
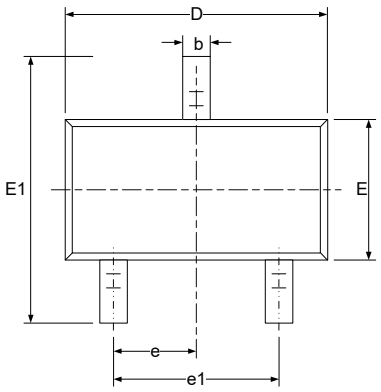


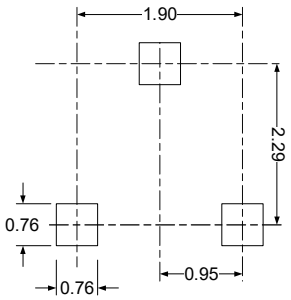
Fig 8 Reference Voltage vs. Ambient Temperature



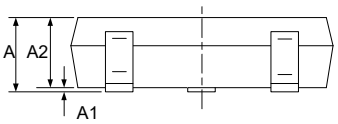
Marking Information

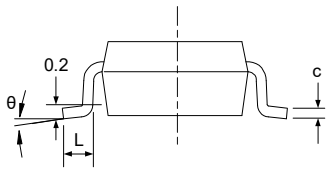
SOT23





RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°