XPA5431

ADJUSTABLE PRECISION ZENER SHUNT REGULATOR

FEATURES

- Surface mount SOT23 package
- 0.5% tolerance
- Max. temperature coefficient 55 ppm/°C
- Temperature compensated for operation over the full temperature range
- Programmable output voltage
- 100μA to 100mA current sink capability
- Low output noise
- RoHS compliance, Pb and Halogen free

DESCRIPTION

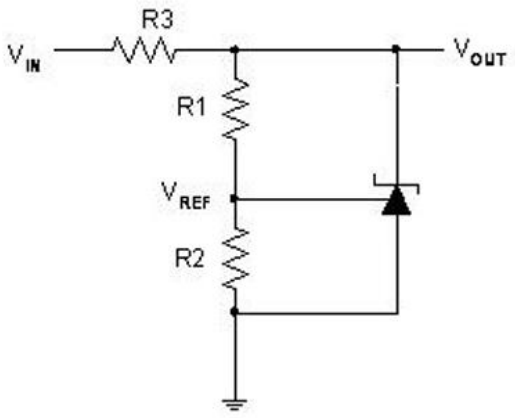
The XPA5431 is a three-terminal adjustable shunt regulator offering excellent temperature stability and output current handling capability up to 100mA. The output voltage may be set to any chosen voltage between 2.5 and 36 volts by selection of two external divider resistors.

The devices can be used as a replacement for zener diodes in many applications requiring an improvement in zener performance.

APPLICATIONS

- Shunt regulator
- Series regulator
- Voltage monitor
- Over voltage/ under voltage protection
- Switch mode power supplies

TYPICAL APPLICATION CIRCUIT



Shunt Regulator

REVISION HISTORY

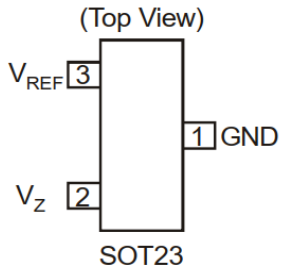
Release	Rev	Changes	Date
Updates	1.0	Update operating junction temperature range	5/9/2024

ORDERING INFORMATION

Part Number	V_{REF}	Top Marking	MPQ
XPA5431T1R	2.5V	A5	3,000

MPQ = Minimum Packaging Quantity.
For production orders greater than MPQ, the order must be a multiple of MPQ per package size above.

PIN CONFIGURATION AND DESCRIPTION



Pin Configuration

Pin	Name	Description
1	GND	Anode.
2	V_Z	Cathode.
3	V_{REF}	Reference.

ABSOLUTE MAXIMUM RATINGS (1)

Parameter	Min	Max	Units
Cathode Voltage, V_Z		40	V
Cathode Current (Continuous), I_Z	-100	150	mA
Operating Junction Temperature, T_J	-40	125	°C
Storage Temperature, T_{ST}	-65	150	°C
Power Dissipation, T_A = 25°C		0.35	W
Electrostatic Discharge (HBM)	-2000	+2000	V

RECOMMENDED OPERATING CONDITIONS (2)

Parameter	Symbol	Min	Max	Units
Cathode Voltage	V_Z	V_{REF}	36	V
Cathode Current	I_Z	0.1	100	mA

(1) Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

(2) The device is not guaranteed to function outside its operating conditions.

ELECTRICAL SPECIFICATIONS

T_A = 25°C, unless otherwise specified.

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Reference voltage (0.5%)	V_{REF}	I_L=1mA, V_Z=V_{REF}	2.487	2.500	2.512	V
Deviation of reference input voltage over temperature	V_{DEV}	I_L=1mA, V_Z=V_{REF}, T_A = -40 to +85°C		6	10	mV
Ratio of the change in reference voltage to the change in cathode voltage	$\frac{\Delta V_{REF}}{\Delta V_Z}$	V_Z from V_{REF} to 10V, I_L=1mA		-1.0	-2.7	mV/V
		V_Z from 10V to 36V, I_L=1mA		-0.5	-2.0	
Reference input current	I_{REF}	R1=10K, R2=O/C, I_L=1mA		0. 2	0.5	μA
Deviation of reference input current over temperature	ΔI_{REF}	R1=10K, R2=O/C, I_L=10mA, T_A = -40 to +125°C		0.1	0.3	μA
Minimum cathode current for regulation	$I_{Z(MIN)}$	V_Z=V_{REF}		50	100	μA
Off-state cathode current	$I_{Z(OFF)}$	V_Z=36V, V_{REF} =0V		0.05	1.0	μA
Dynamic output impedance	R_Z	V_Z= V_{REF}, f≤1.0kHz		0.1	0.3	Ω
Thermal resistance	θ_{JC}	Junction-to-case resistance		140		°C/W

DC TEST CIRCUITS

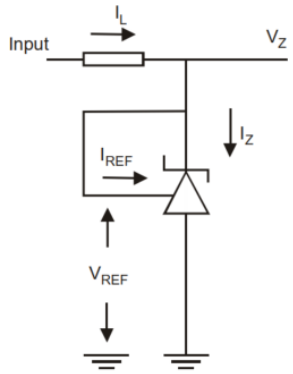


Fig. 1 Test Circuit for V_Z = V_{REF}

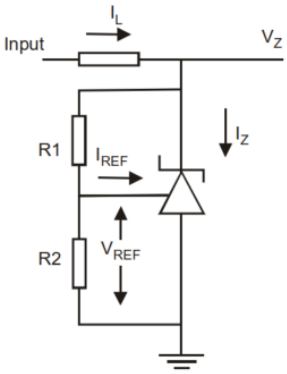


Fig. 2 Test Circuit for V_Z > V_{REF}

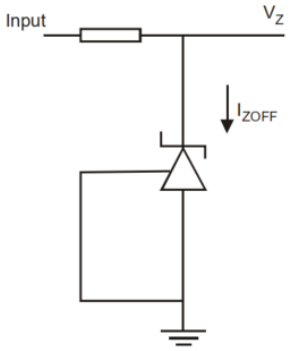
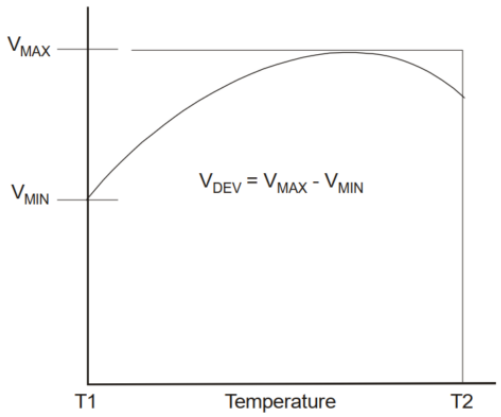


Fig.3 Test Circuit for Off State Current

Deviation of reference input voltage, V_{DEV}, is defined as the maximum variation of the reference input voltage over the full temperature range.

The average temperature coefficient of the reference input voltage, V_{REF} is defined as:



$$V_{ref}(ppm/^oC) = \frac{V_{dev} \times 1000000}{V_{ref}(T1-T2)}$$

The dynamic output impedance, RZ is defined as:

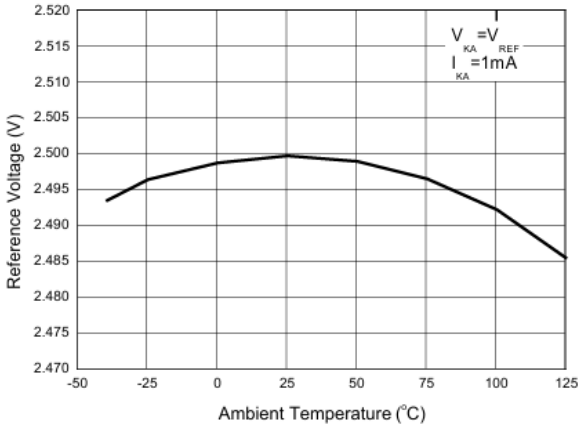
$$R_z = \frac{\Delta V_z}{\Delta I_z}$$

When the device is programmed with two external resistors, R1 and R2, (Fig 2), the dynamic output impedance of the overall circuit, R', is defined as:

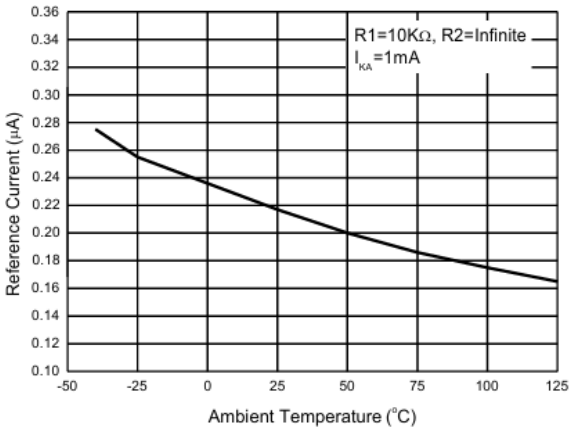
$$R' = R_z(1+\frac{R1}{R2})$$

TYPICAL CHARACTERISTICS

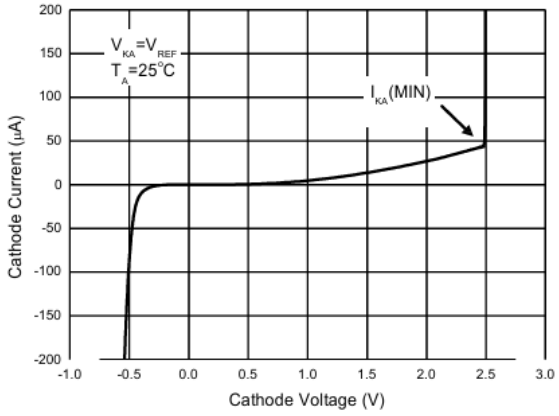
Reference Voltage vs. Ambient Temperature



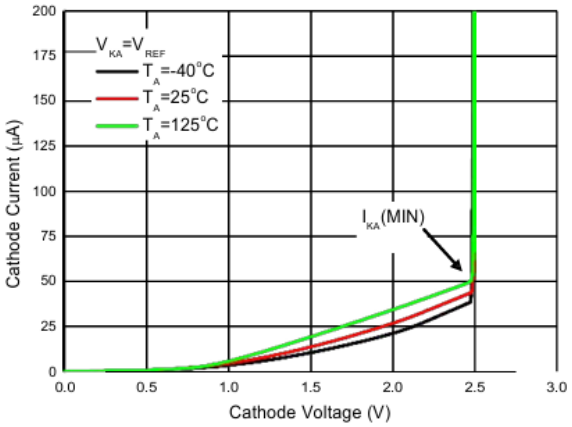
Reference Current vs. Ambient Temperature



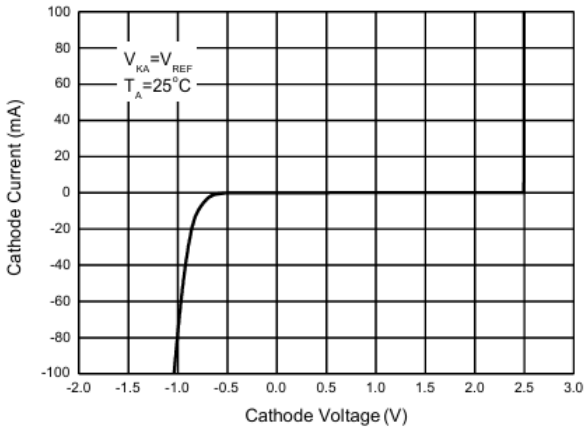
Minimal Cathode Current for Regulation



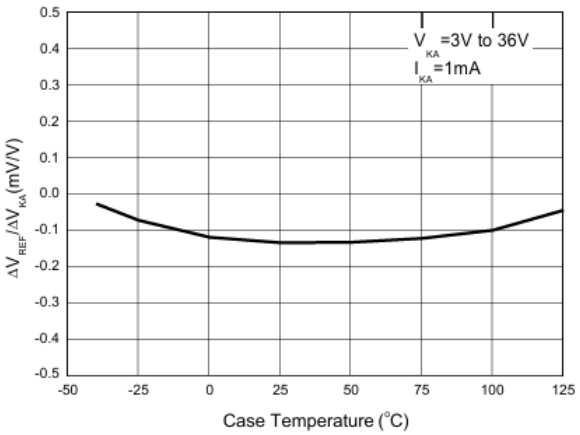
Minimal Cathode Current for Regulation at Different Ambient Temperature



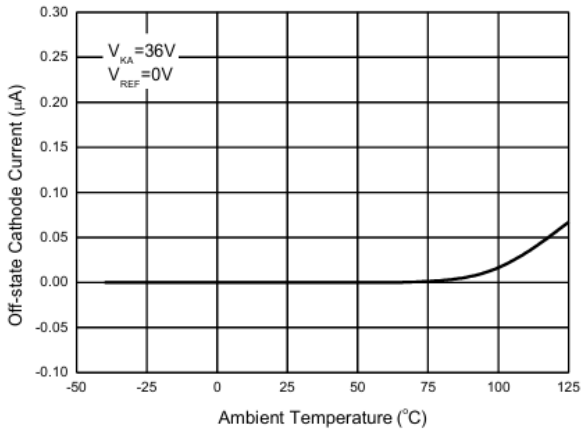
Cathode Current vs. Cathode Voltage



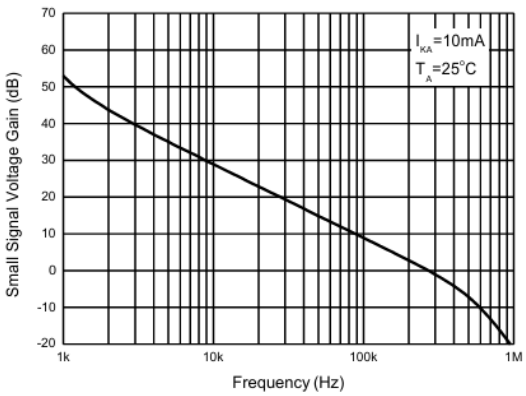
Ratio of Delta Reference Voltage to Delta Cathode Voltage vs. Case Temperature

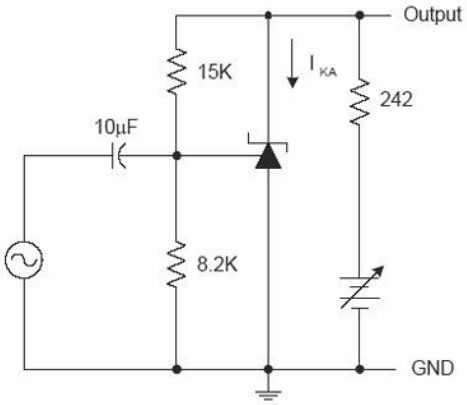


Off-state Cathode Current vs. Ambient Temperature

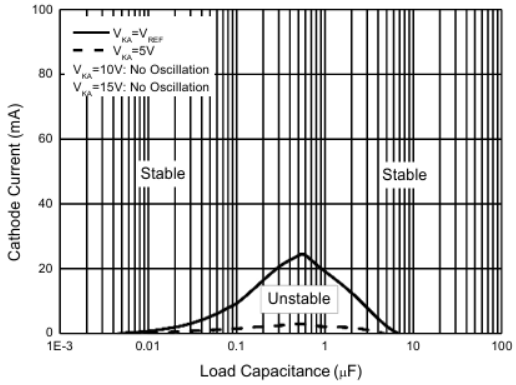


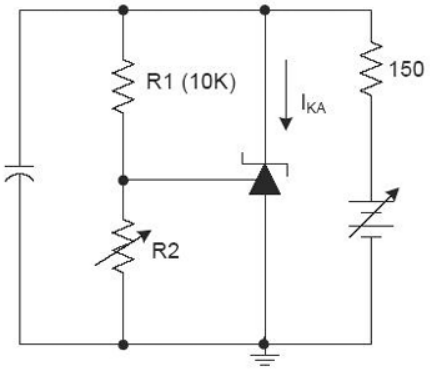
Small Signal Voltage Gain vs. Frequency



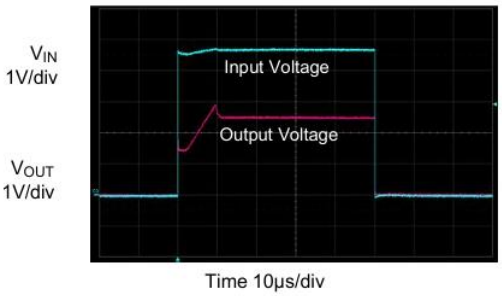


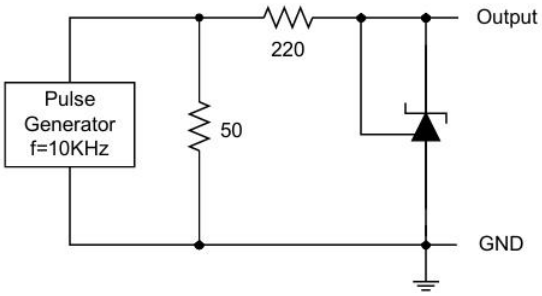
Stability Boundary Conditions



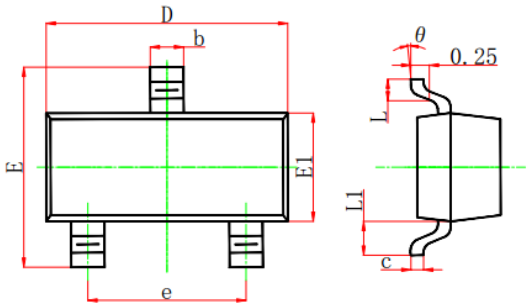


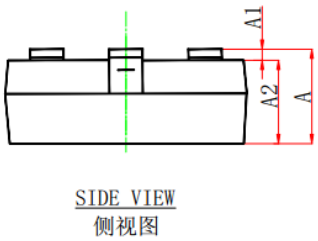
Pulse Response





PHYSICAL DIMENSIONS

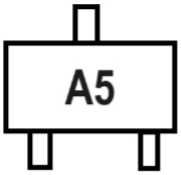




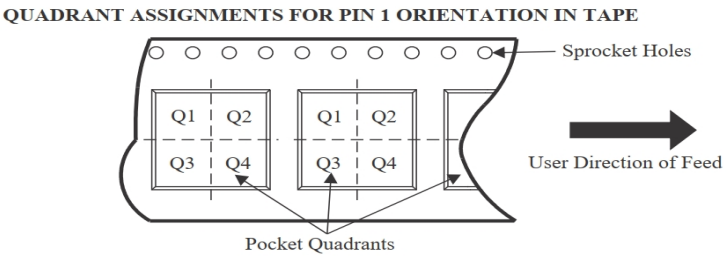
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.15Max.		0.045Max.	
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.132	0.202	0.005	0.008
D	2.800	3.000	0.110	0.118
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
θ	0°	8°	0°	8°

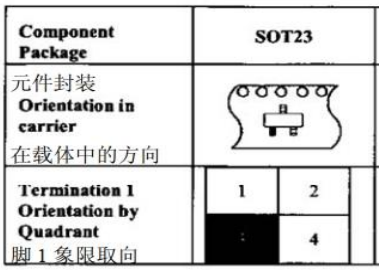
MARKING AND REEL INFORMATION

Format:



Pin 1 located in Q3 direction in T&R(follow EIA-418)





Remark:

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1. Line1: Product Name Code:

Product Name	P/N Code	Remark
XPA5431T1R	A5	

Packing: 3k/Reel