

**ABSOLUTE MAXIMUM RATINGS**

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

Cathode-Anode Reverse Breakdown Volt. V_{KA} 37V
Operating Cathode Current (cont.) I_{KA} 150mA
Reference Input Current Range I_{REF} 10mA
Power Dissipation SOT-89-TO-92 (Cont. 25°C) P_D .. 770mW
Junction Temperature 150°C
Storage Temperature T_{STG} -65°C to 150°C
ESD Rating (HBM - Human Body Model) 2kV

OPERATING RATINGS

Cathode-Anode Reverse Breakdown Volt. V_{KA} 36V
Operating Cathode Current (cont.) I_{KA} <100mA
Ambient Temperature Range -40°C to 125°C

ELECTRICAL SPECIFICATIONS

Specifications with standard type are for an Operating Ambient Temperature of $T_A = 25^\circ\text{C}$ only; limits applying over the full Operating Ambient Temperature range are denoted by a "•". Minimum and Maximum limits are guaranteed through test, design, or statistical correlation. Typical values represent the most likely parametric norm at $T_A = 25^\circ\text{C}$, and are provided for reference purposes only.

Parameter	Min.	Typ.	Max.	Units	Conditions
Reference Voltage	2.493	2.503	2.515	V	Test circuit 1 $V_{KA}=V_{REF}$, $I_{KA}=10\text{mA}$
ΔV_{REF} with temperature T_C		4.5	8	mV	Test circuit 1 $V_{KA}=V_{REF}$, $I_{KA}=10\text{mA}$, $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$
ΔV_{REF} with temperature T_C		4.5	16	mV	• Test circuit 1 $V_{KA}=V_{REF}$, $I_{KA}=10\text{mA}$
Ratio of change in V_{REF} to Cathode Voltage $\Delta V_{REF} / \Delta V_{KA}$	-2.7	-1.0		mV/V	Test circuit 2 $V_{REF} \leq \Delta V_{KA} \leq 10\text{V}$, $I_{KA}=10\text{mA}$
	-2	-0.4			Test circuit 2 $10\text{V} \leq \Delta V_{KA} \leq 36\text{V}$, $I_{KA}=10\text{mA}$
Reference Input Current I_{REF}		0.7	4	μA	Test circuit 2 $I_{KA}=10\text{mA}$, $R1=10\text{k}\Omega$, $R2=\infty$
I_{REF} Temperature Deviation ΔI_{REF}		0.4	1.2	μA	• Test circuit 2 $I_{KA}=10\text{mA}$, $R1=10\text{k}\Omega$, $R2=\infty$
Minimum I_{KA} for Regulation $I_{KA(MIN)}$		0.4	1	mA	Test circuit 1 $V_{KA}=V_{REF}$
Off State Leakage $I_{KA(OFF)}$		40	250	nA	Test circuit 3 $V_{KA}=0$, $V_{REF}=36\text{V}$
Dynamic Outout Impedance Z_{KA}		0.15	0.5	Ω	Test circuit 1 $f_z \leq 1\text{KHz}$, $I_{KA}=1$ to 100mA

BLOCK DIAGRAM

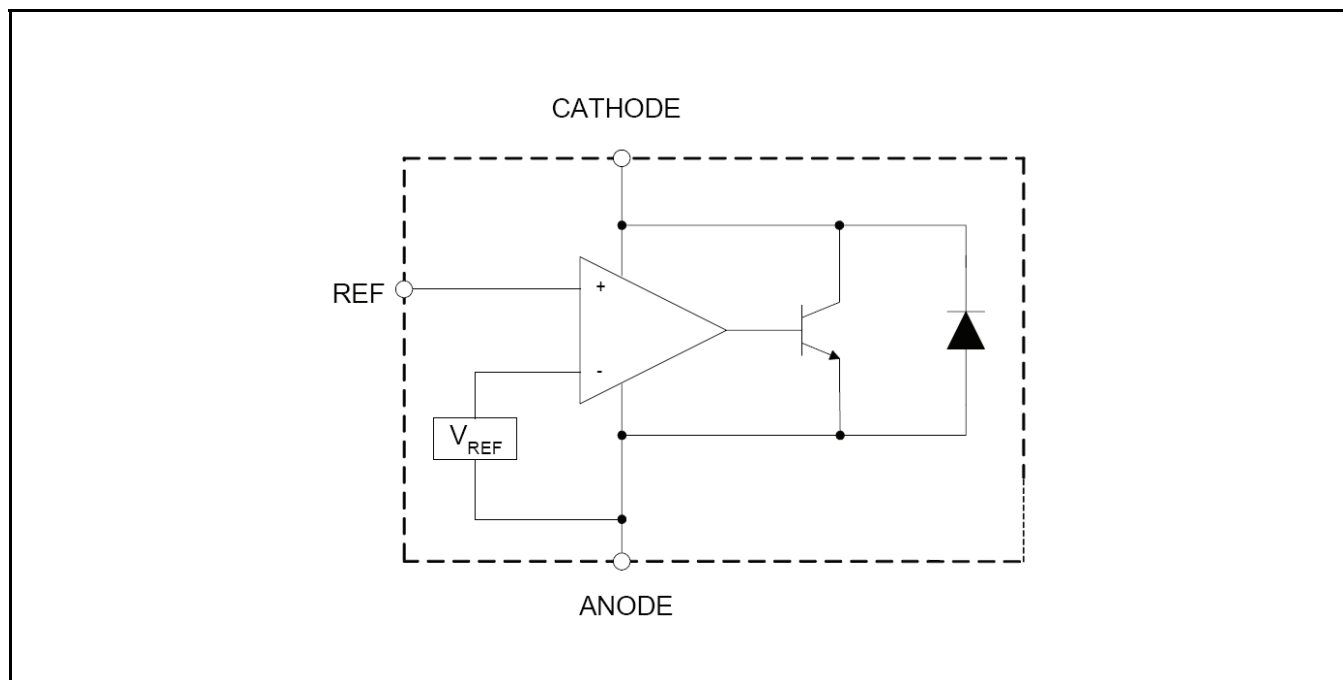


Fig. 2: SPX431A Block Diagram

PIN ASSIGNMENT

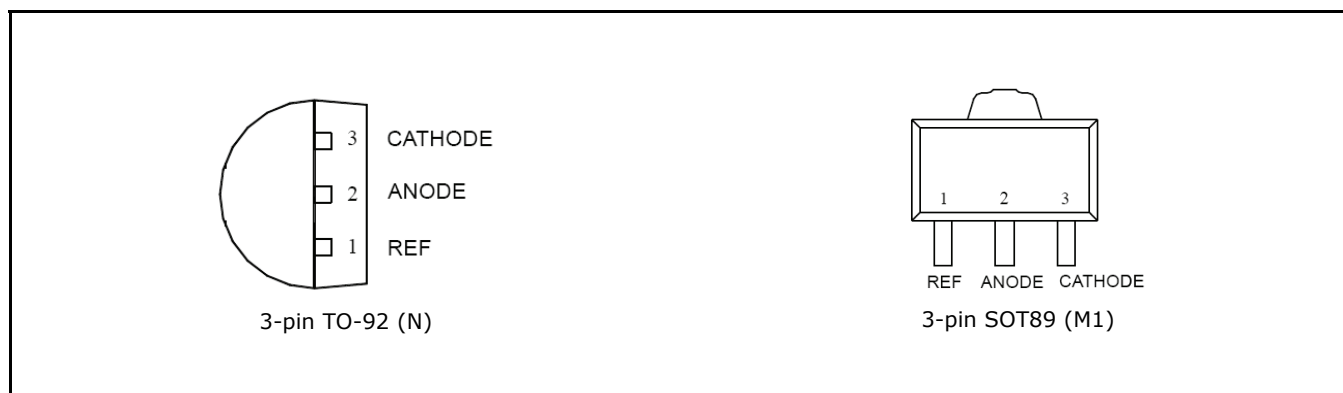


Fig. 3: SPX431A Pin Assignment

ORDERING INFORMATION

Part Number	Temperature Range	Marking	Package	Packing Quantity	Note 1	Note 2
SPX431AM1-L/TR	$-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$		SOT89	2.5K/Tape & Reel	RoHS Compliant Lead Free	
SPX431AN-L/TR	$-40^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$		TO-92	2K/Tape & Reel	RoHS Compliant Lead Free	Ammo Pack

"YY" = Year - "WW" = Work Week - "X" = Lot Number

TYPICAL PERFORMANCE CHARACTERISTICS

All data taken at $T_A = 25^\circ\text{C}$, unless otherwise specified - Schematic and BOM from Application Information section of this datasheet.

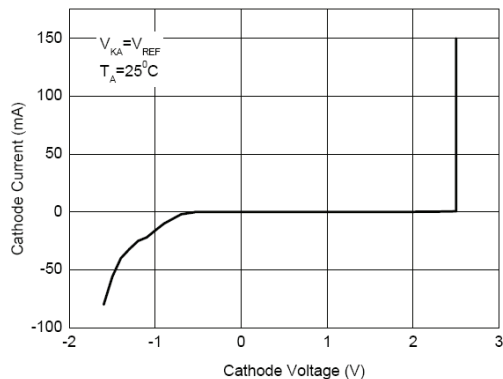


Fig. 4: Cathode Current vs Cathode Voltage

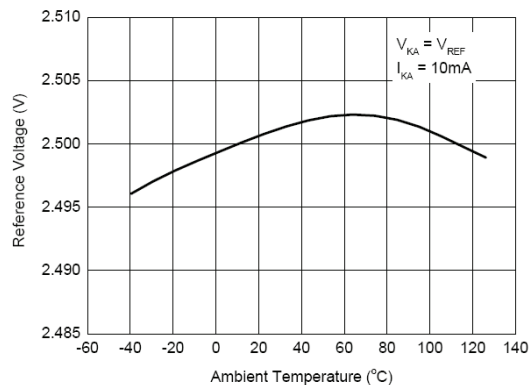


Fig. 5: Reference Voltage vs Ambient Temperature

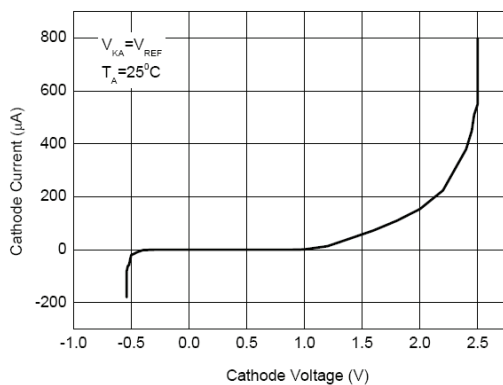


Fig. 6: Low Current Operating Characteristics

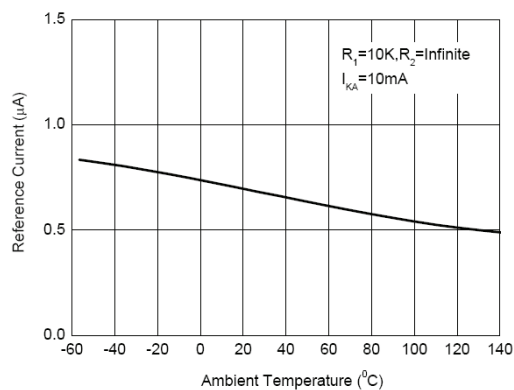


Fig. 7: Reference Input Current vs Ambient Temperature

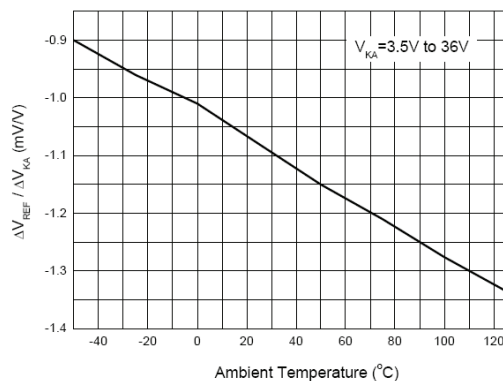


Fig. 8: Δ Reference Voltage to Δ Cathode Voltage Ratio

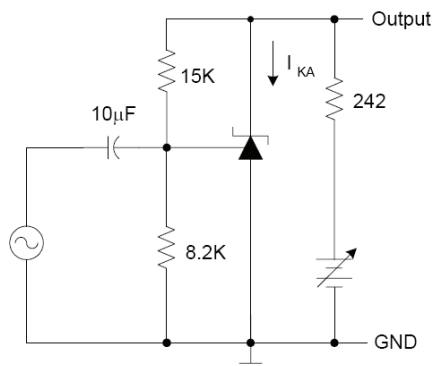


Fig. 9: Test Circuit for Gain vs Frequency Response

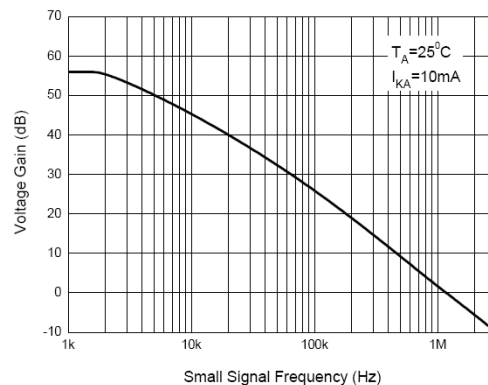


Fig. 10: Small Signal Gain vs Frequency

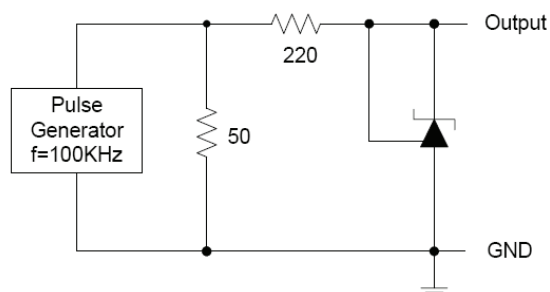


Fig. 11: Test Circuit for Pulse Response

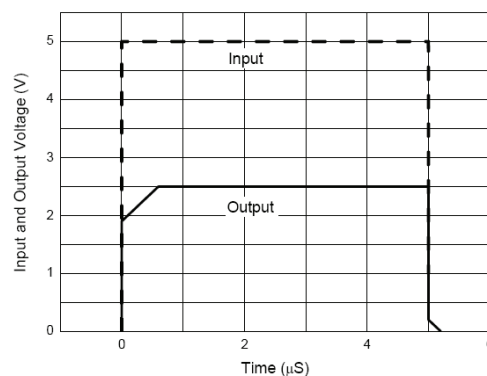


Fig. 12: Pulse Response

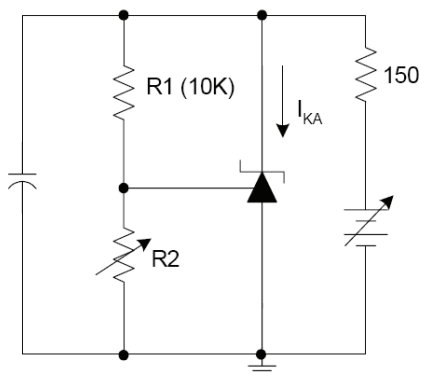


Fig. 13: Test Circuit for Stability

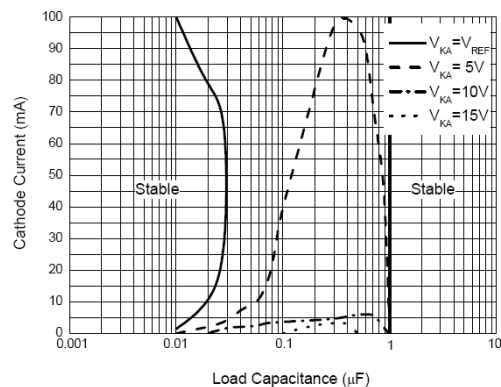


Fig. 14: Stability Boundary Conditions

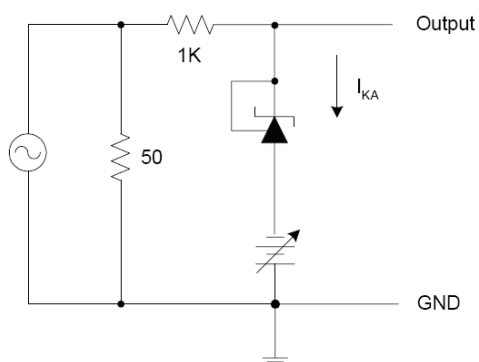


Fig. 15: Test Circuit for Dynamic Output Impedance

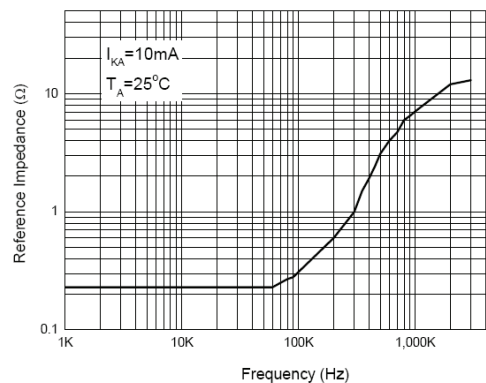


Fig. 16: Dynamic Output Impedance

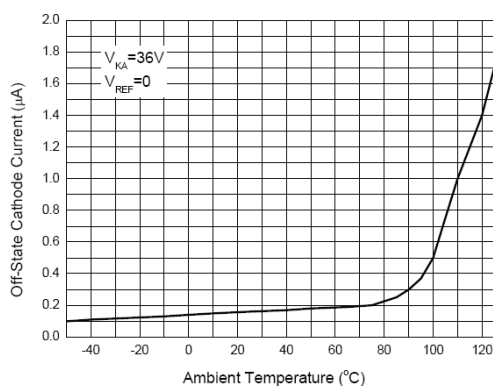


Fig. 17: Off State Leakage

TYPICAL APPLICATION SCHEMATICS

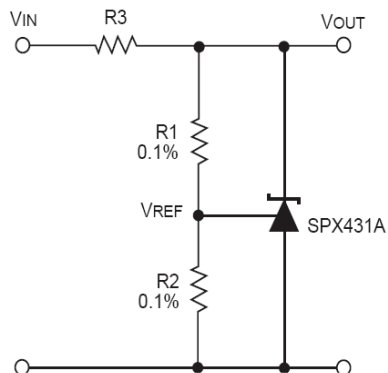


Fig. 18: Shunt Regulator $V_{OUT} = (1 + R1/R2)V_{REF}$

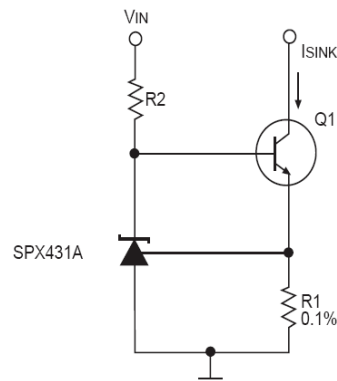


Fig. 19: Constant Current Sink $I_{SINK} = V_{REF}/R1$

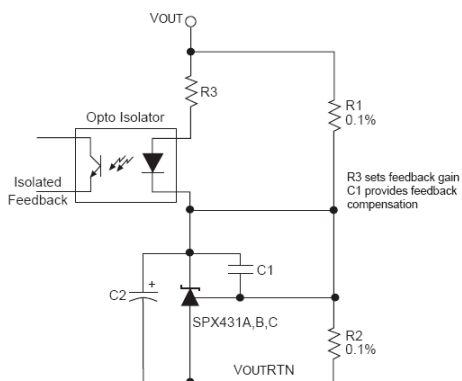


Fig. 20: Reference Amplifier for Isolated Feedback in Offline DC-DC Coinverters

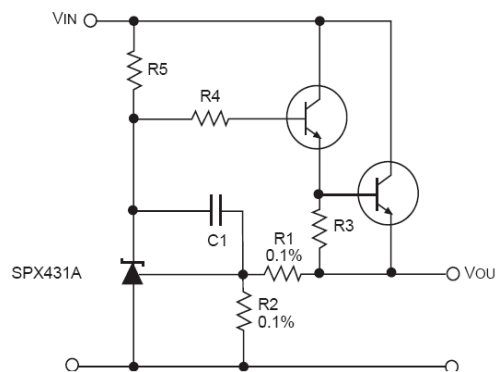


Fig. 21: Precision High Current Series Regulator $V_{OUT} = (1 + R1/R2)V_{REF}$

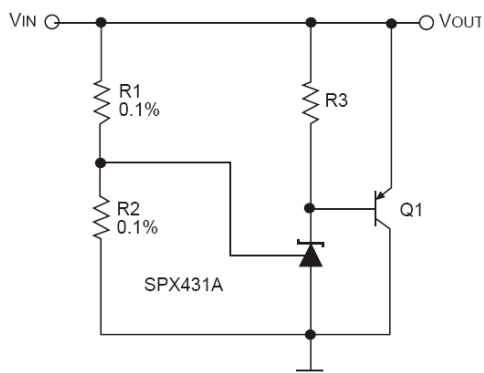


Fig. 22: High Current Shunt Regulator $V_{OUT} = (1 + R1/R2)V_{REF}$

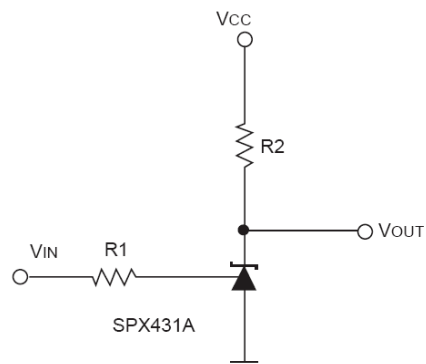
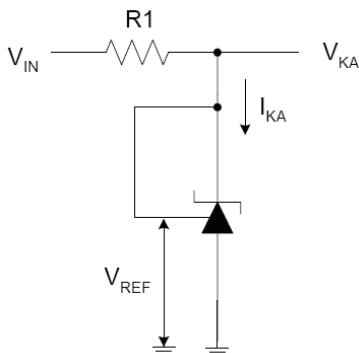


Fig. 23: Single Supply Comparator with Temperature Compensated Threshold

TEST CIRCUITS

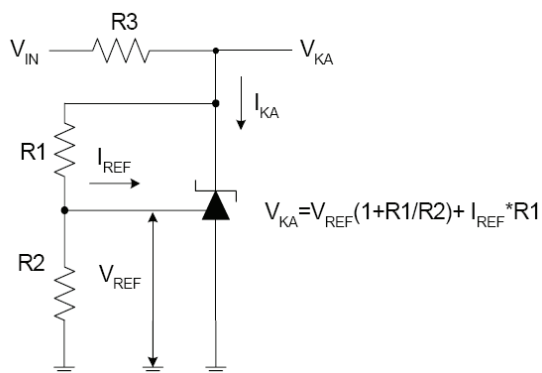
TEST CIRCUIT 1

Test circuit for $V_{KA} = V_{REF}$



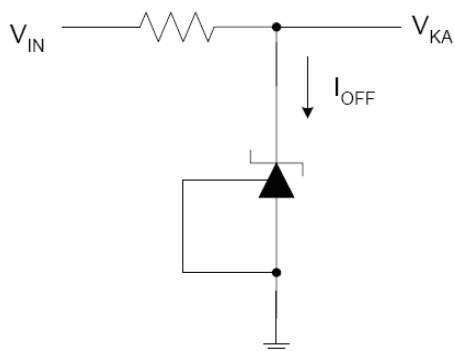
TEST CIRCUIT 2

Test circuit for $V_{KA} > V_{REF}$



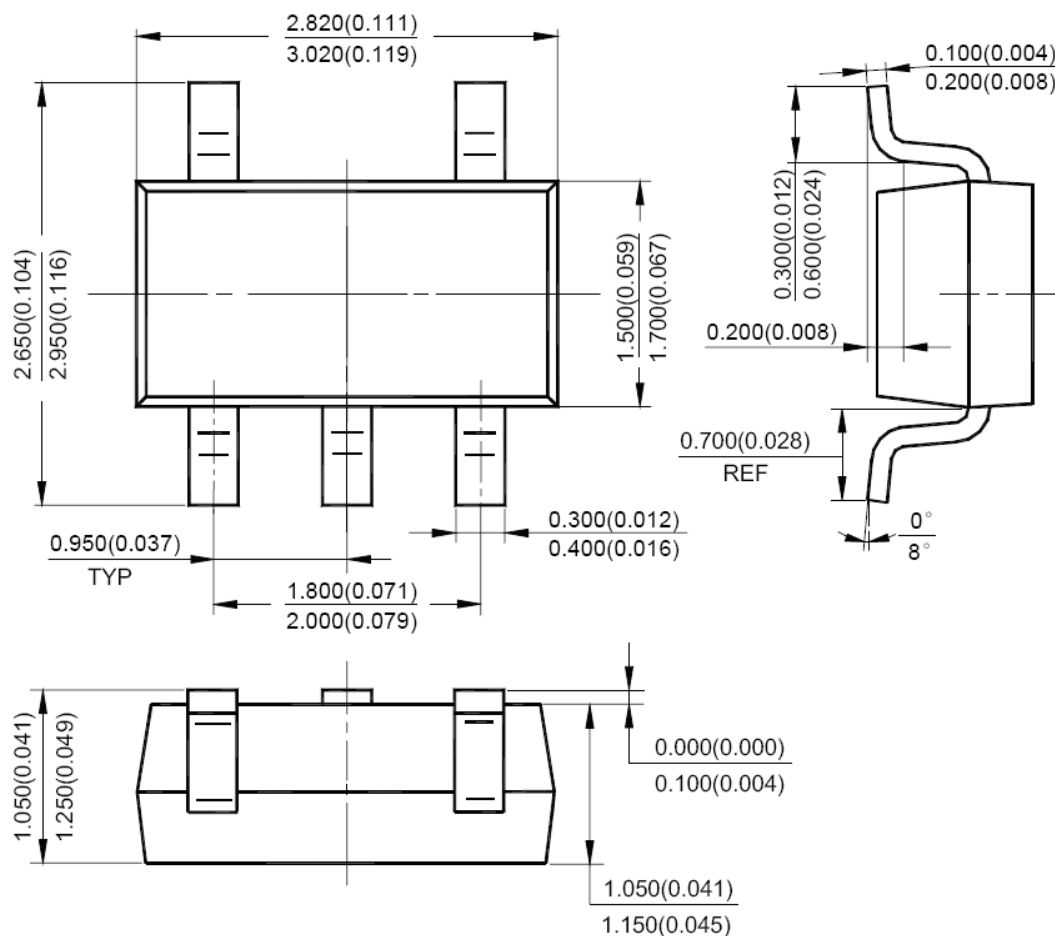
TEST CIRCUIT 3

Test circuit for I_{KOFF}



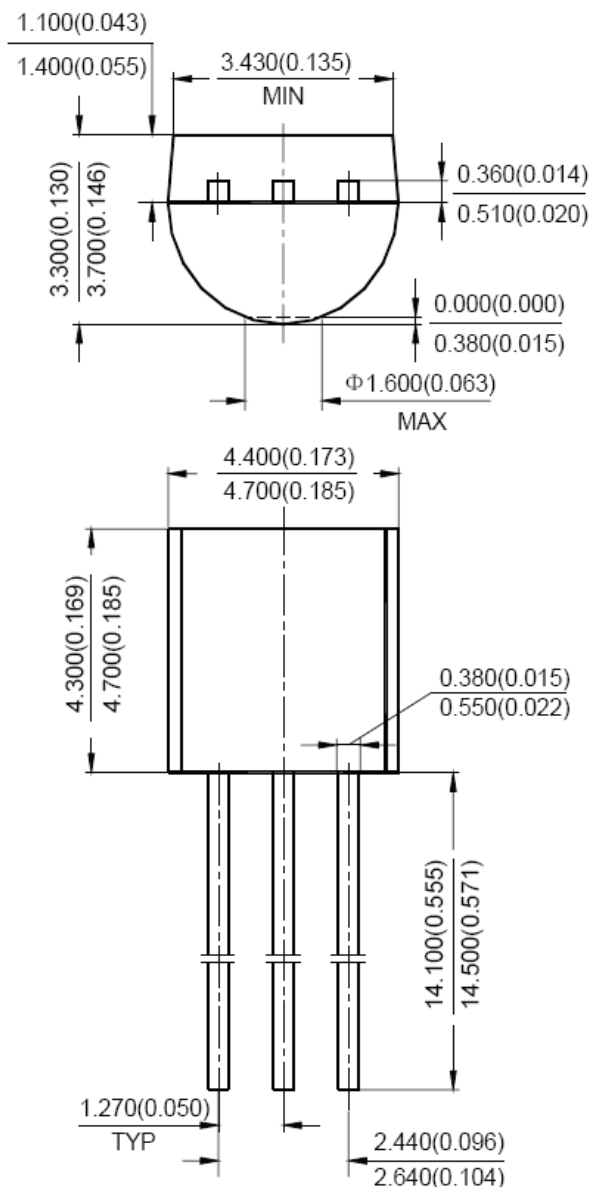
PACKAGE SPECIFICATION
SOT-89

Unit: mm (inch)



TO-92

Unit: mm (inch)



**SPX431A****Precision Adjustable Shunt Regulator****REVISION HISTORY**

Revision	Date	Description
2.0.0	04/15/09	Reformat of Datasheet Updated ordering part numbers Updated application and block diagram

FOR FURTHER ASSISTANCE

Email:

customersupport@exar.com

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48720 Kato Road

Fremont, CA 94538 – USA

Tel.: +1 (510) 668-7000

Fax: +1 (510) 668-7030

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