

KA431/KA431A/KA431L

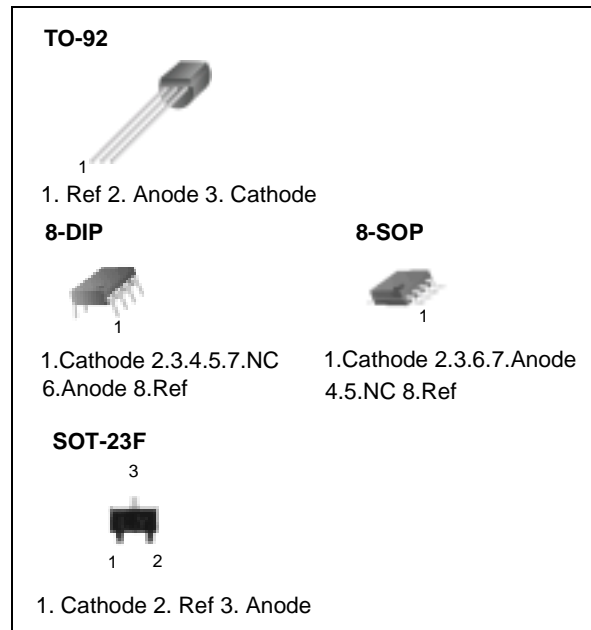
Programmable Shunt Regulator

Features

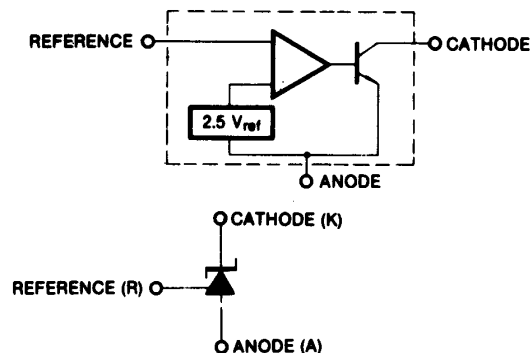
- Programmable output voltage to 36 volts
- Low dynamic output impedance 0.20 typical
- Sink current capability of 1.0 to 100mA
- Equivalent full-range temperature coefficient of 50ppm/°C typical
- Temperature compensated for operation over full rated operating temperature range
- Low output noise voltage
- Fast turn-on response

Description

The KA431/KA431A/KA431L are three-terminal adjustable regulator series with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between VREF (approximately 2.5 volts) and 36 volts 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.



Internal Block Diagram



Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified.)

Parameter	Symbol	Value	Unit
Cathode Voltage	V _{KA}	37	V
Cathode Current Range (Continuous)	I _{KA}	-100 ~ + 150	mA
Reference Input Current Range	I _{REF}	0.05 ~ + 10	mA
Power Dissipation D, Z Suffix Package DIP Package	P _D	770 1000	mW mW
Operating Temperature Range	T _{OPR}	-25 ~ + 85	°C
Storage Temperature Range	T _{STG}	-65 ~ + 150	°C

Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Cathode Voltage	V _{KA}	V _{REF}	-	36	V
Cathode Current	I _{KA}	1.0	-	100	mA

Electrical Characteristics

(TA = +25°C, unless otherwise specified)

Parameter	Symbol	Conditions	KA431			KA431A			KA431L			Unit	
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
Reference Input Voltage	VREF	VKA=VREF, IKA=10mA	2.450	2.500	2.550	2.470	2.495	2.520	2.482	2.495	2.508	V	
Deviation of Reference Input Voltage Over-Temperature	$\Delta V_{REF}/\Delta T$	VKA=VREF, IKA=10mA TMIN≤TA≤TMAX	-	4.5	17	-	4.5	17	-	4.5	17	mV	
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage	$\Delta V_{REF}/\Delta V_{KA}$	IKA=10mA	$\Delta V_{KA}=10$ V-VREF	-	-10	-2.7	-	-1.0	-2.7	-	-1.0	-2.7	mV/V
			$\Delta V_{KA}=36$ V-10V	-	-0.5	-2.0	-	-0.5	-2.0	-	-0.5	-2.0	
Reference Input Current	IREF	IKA=10mA, R1=10KΩ,R2=∞	-	1.5	4	-	1.5	4	-	1.5	4	μA	
Deviation of Reference Input Current Over Full Temperature Range	$\Delta I_{REF}/\Delta T$	IKA=10mA, R1=10KΩ,R2=∞ TA =Full Range	-	0.4	1.2	-	0.4	1.2	-	0.4	1.2	μA	
Minimum Cathode Current for Regulation	IKA(MIN)	VKA=VREF	-	0.45	1.0	-	0.45	1.0	-	0.45	1.0	mA	
Off - Stage Cathode Current	IKA(OFF)	VKA=36V, VREF=0	-	0.05	1.0	-	0.05	1.0	-	0.05	1.0	μA	
Dynamic Impedance	ZKA	VKA=VREF, IKA=1 to 100mA f ≥1.0KHz	-	0.15	0.5	-	0.15	0.5	-	0.15	0.5	Ω	

- TMIN= -25 °C, TMAX= +85 °C

Test Circuits

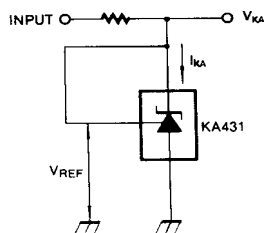


Figure 1. Test Circuit for $V_{KA} = V_{REF}$

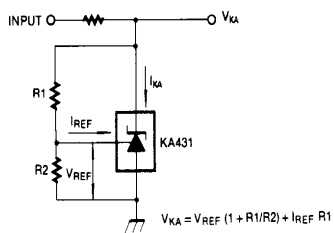


Figure 2. Test Circuit for $V_{KA} \geq V_{REF}$

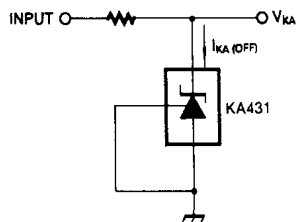


Figure 3. Test Circuit for $I_{KA(OFF)}$

Typical Performance Characteristics

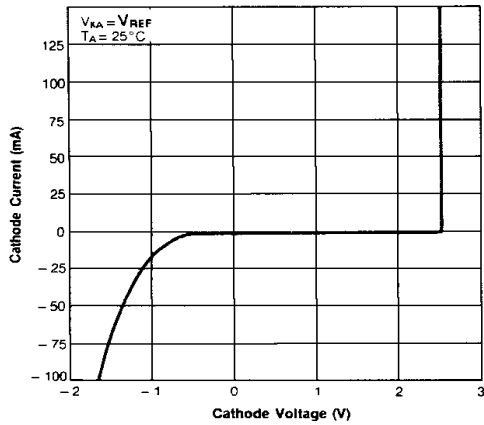


Figure 1. Cathode Current vs. Cathode Voltage

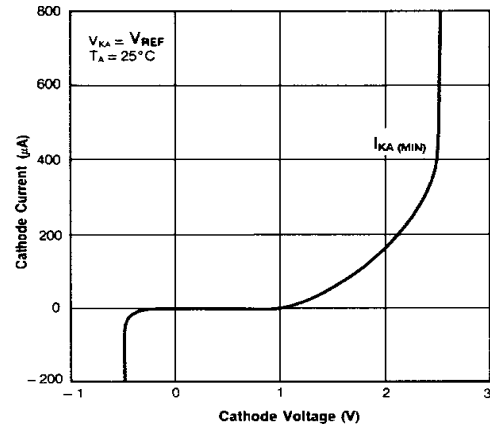


Figure 2. Cathode Current vs. Cathode Voltage

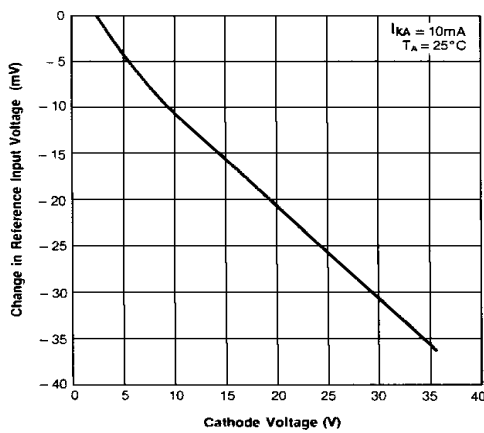


Figure 3. Change In Reference Input Voltage vs. Cathode Voltage

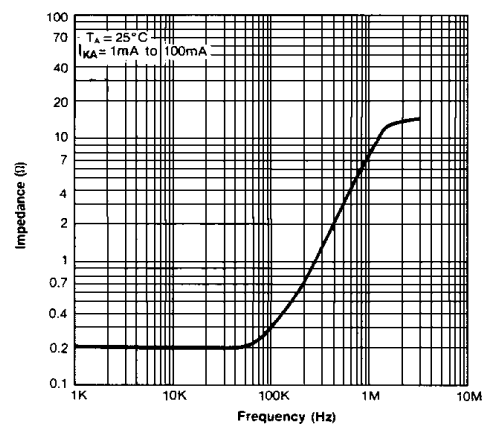


Figure 4. Dynamic Impedance Frequency

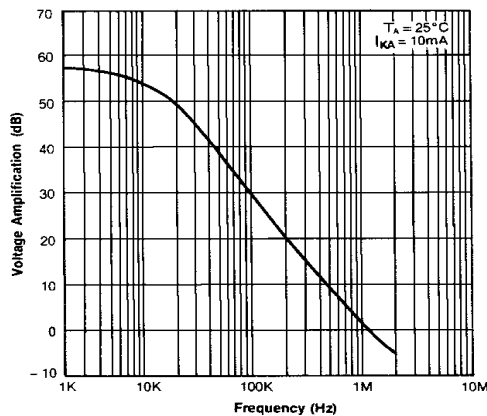


Figure 5. Small Signal Voltage Amplification vs. Frequency

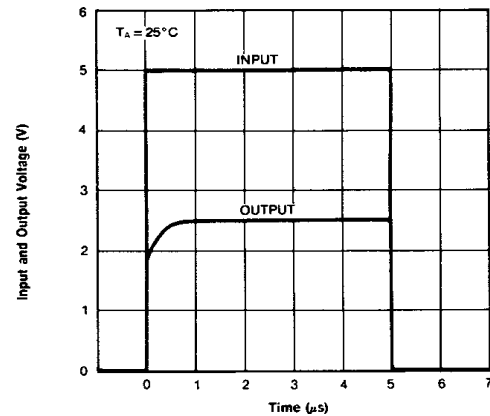


Figure 6. Pulse Response

Typical Application

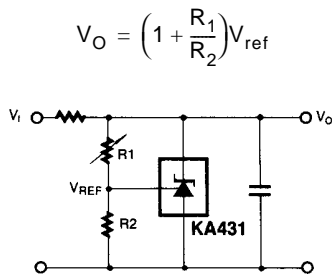


Figure 10. Shunt Regulator

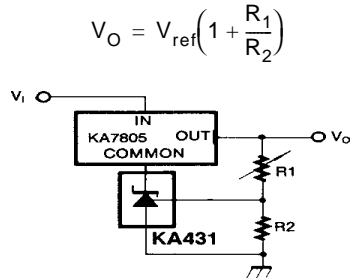


Figure 11. Output Control for Three-Termianl Fixed Regulator

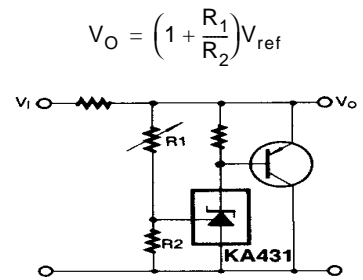


Figure 12. High Current Shunt Regulator

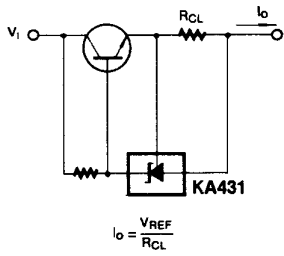


Figure 13. Current Limit or Current Source

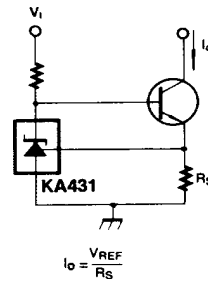
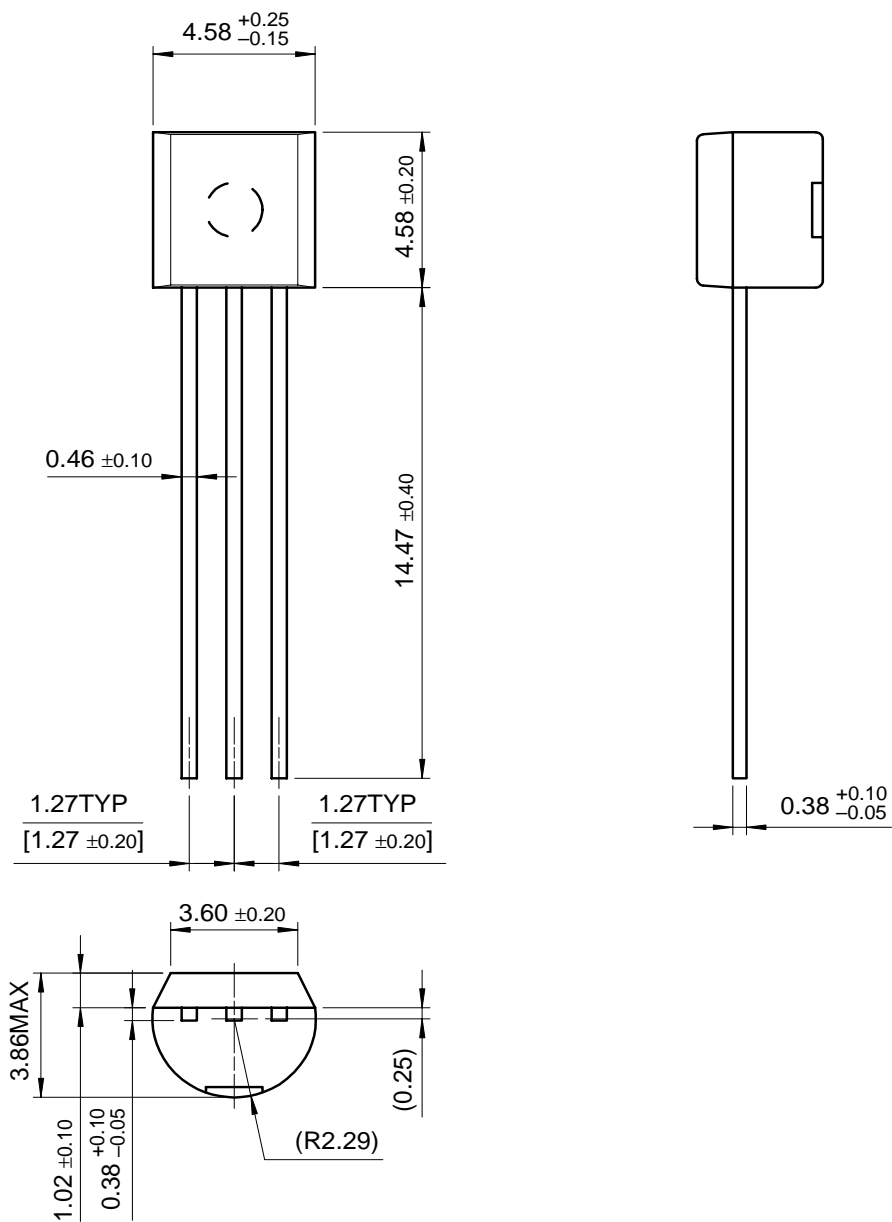


Figure 14. Constant-Current Sink

Mechanical Dimensions

Package

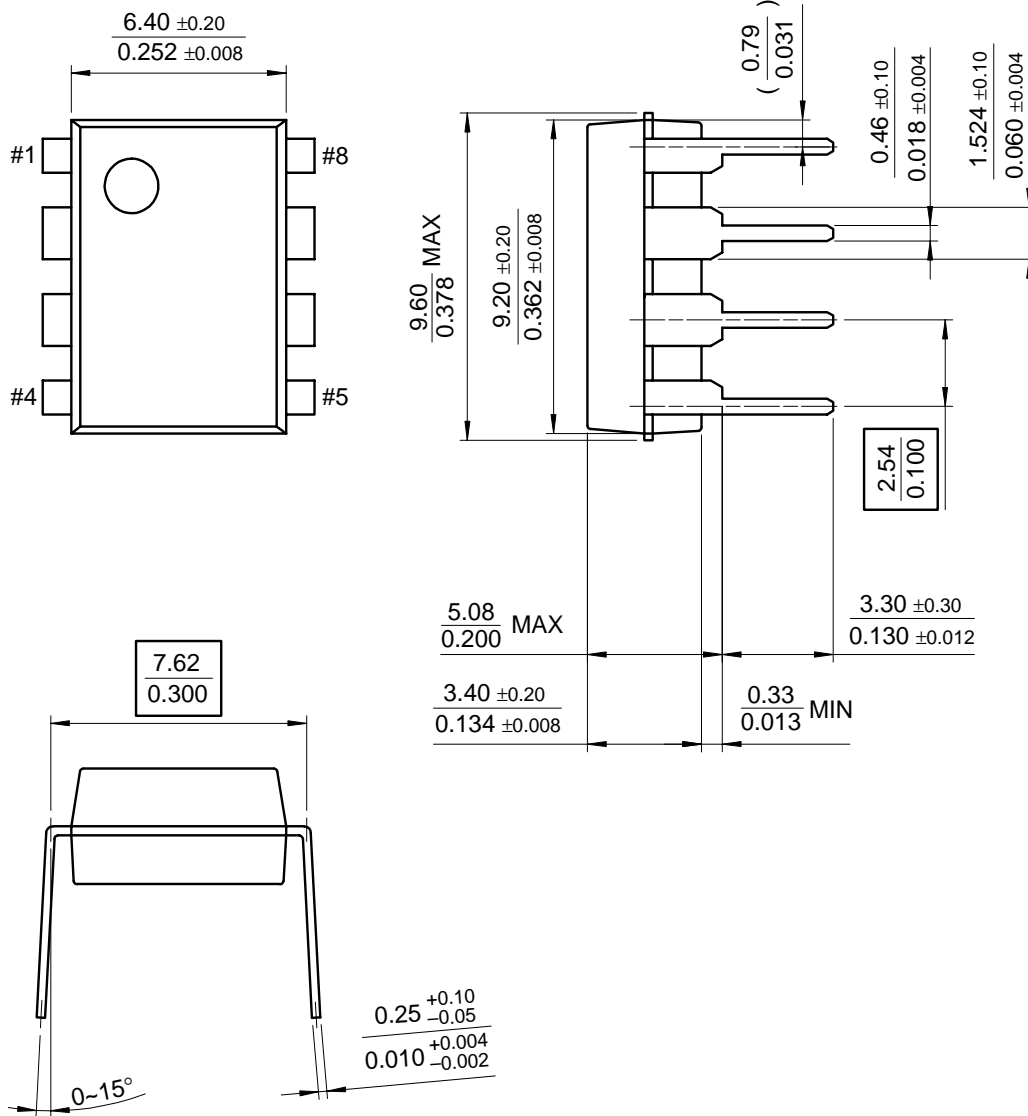
TO-92



Mechanical Dimensions (Continued)

Package

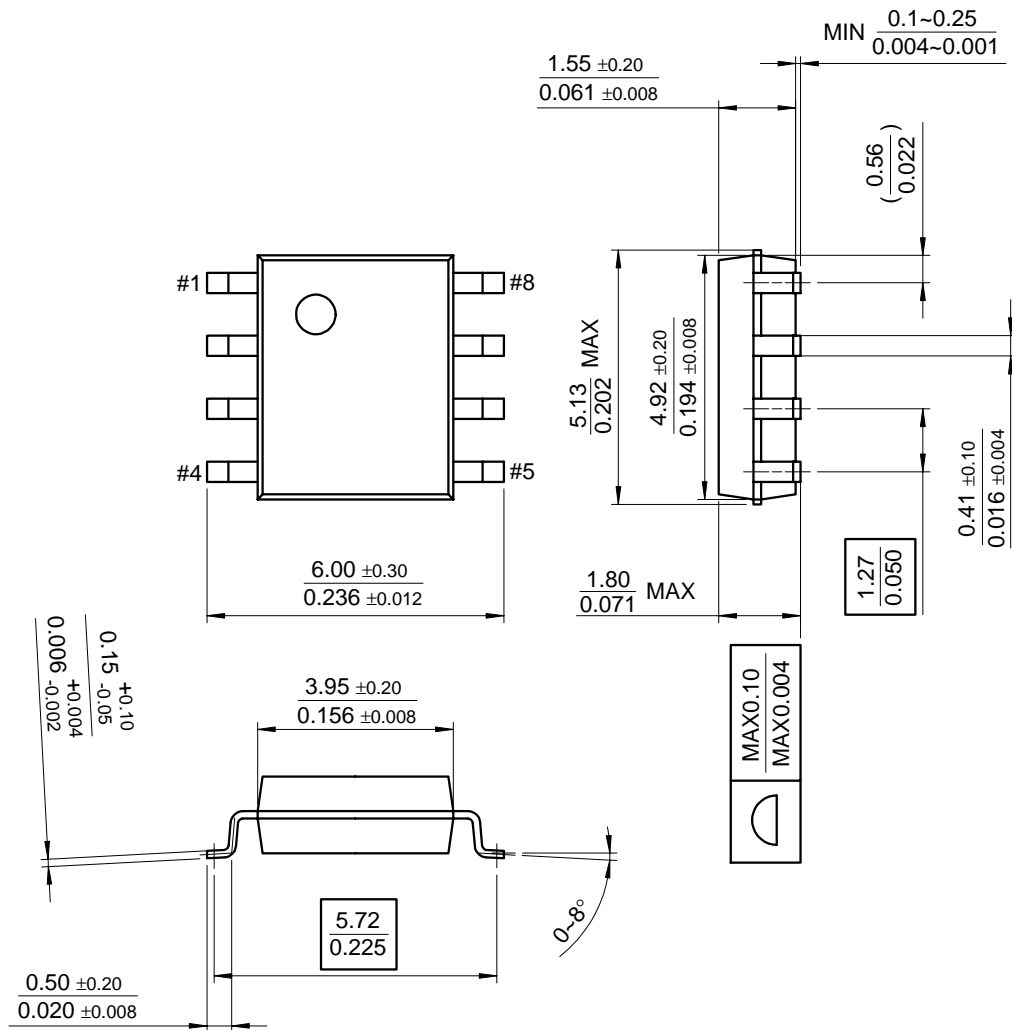
8-DIP

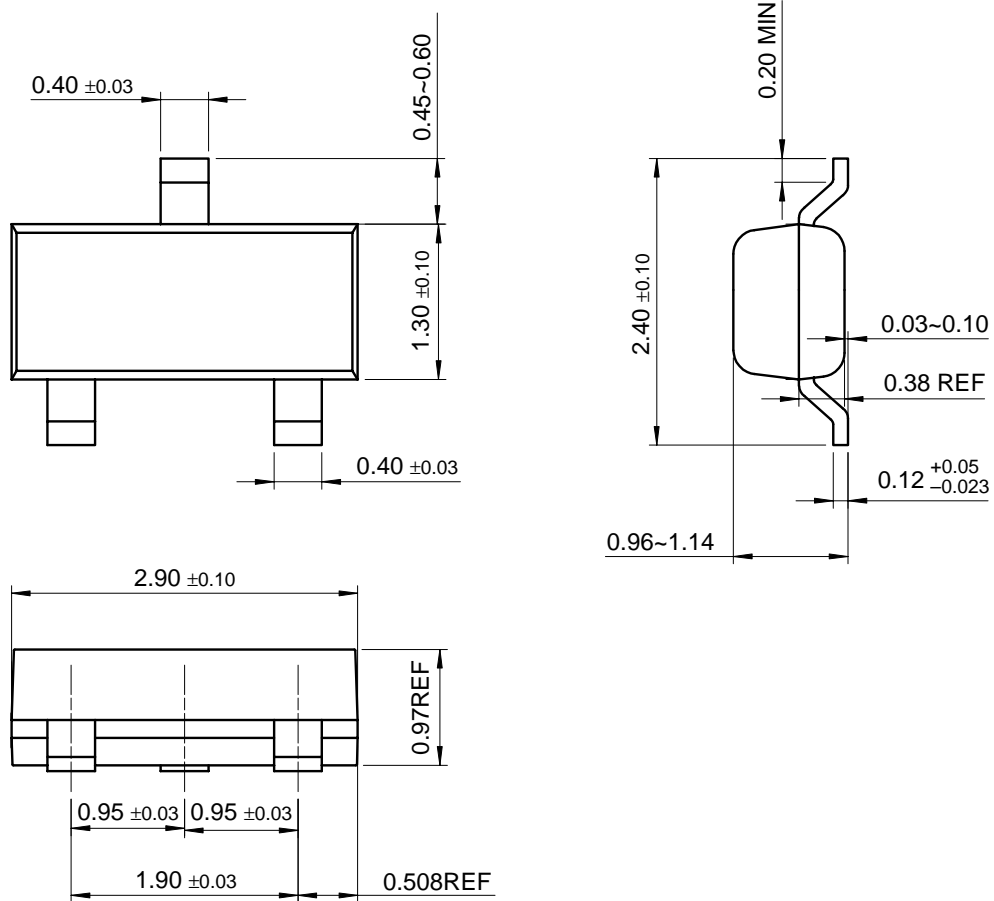


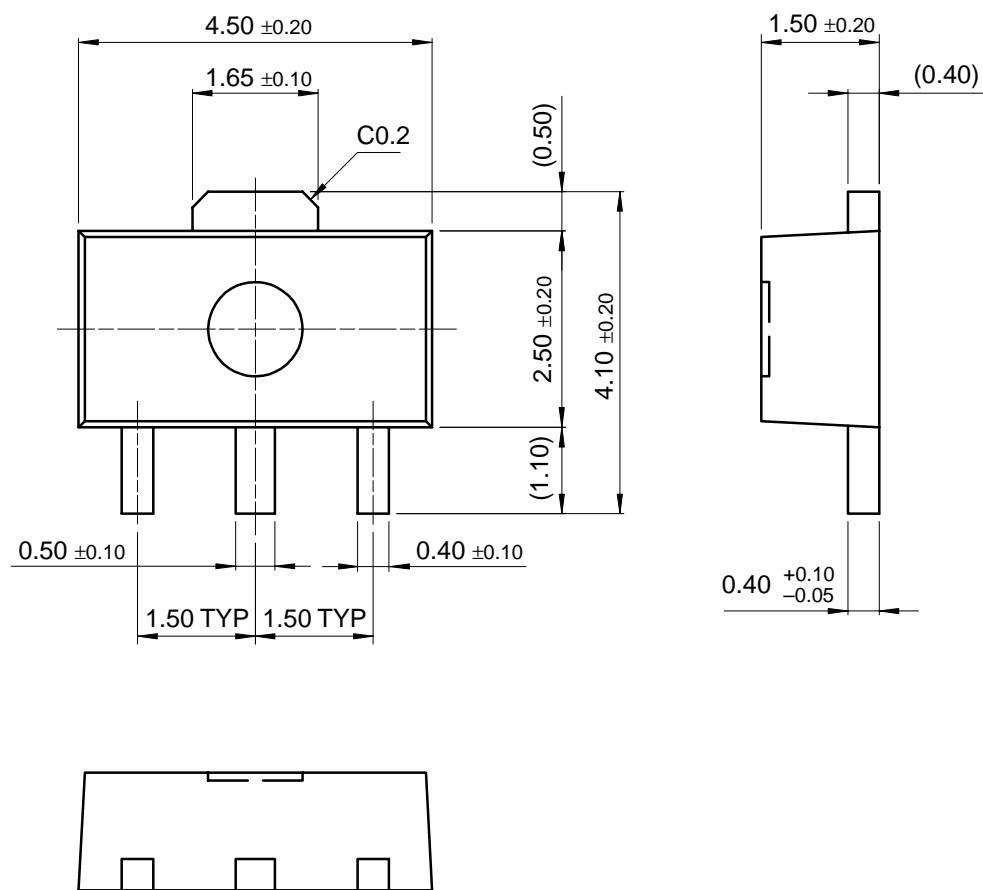
Mechanical Dimensions (Continued)

Package

8-SOP



Mechanical Dimensions (Continued)**Package****SOT-23F**

Mechanical Dimensions (Continued)**Package****SOT-89**

Ordering Information

Product Number	Output Voltage Tolerance	Package	Operating Temperature
KA431LZ	0.5%	TO-92	-25 ~ + 85 °C
KA431LD		8-SOP	
KA431LMF		SOT-23F	
KA431AZ	1%	TO-92	
KA431AD		8-SOP	
KA431AMF		SOT-23F	
KA431	2%	8-DIP	
KA431Z		TO-92	
KA431D		8-SOP	
KA431MF		SOT-23F	

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