RLCP431AN

Adjustable Precision Shunt Regulators

Descriptions

The RLCP431AN is a three-terminal adjustable shunt regulator with guaranteed thermal stability over a full operation range. It features sharp turn-on characteristics, low temperature coefficient and low output impedance, which make it ideal substitute for Zener diode in applications such as switching power supply, charger and other adjustable regulators.The output voltage of RLCP431AN can be set to any value between VREF (2.5V) and the corresponding maximum cathode voltage (36V).The RLCP431AN precision reference is offered in two voltage tolerance: 0.5% and 0.8%This IC is available in 4 packages: TO92 (bulk or ammo packing), SOT23, SOT25 and SOT89.

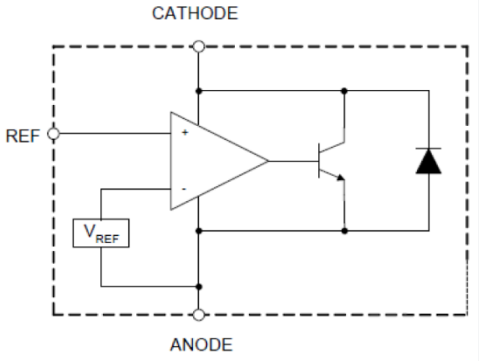
Features

- Programmable Precise Output Voltage from 2.5V to 36V
- High Stability under Capacitive Load
- Low Temperature Deviation: 4.5mV Typical
- Low Equivalent Full-range Temperature Coefficient with 20PPM/oC Typical
- Sink Current Capacity from 1mA to 100mA
- Low Output Noise
- Wide Operating Range of -40 to +125℃
- Lead-Free Packages: TO92, SOT23, SOT25, SOT89
- Totally Lead-Free; RoHS Compliant (Notes 1 & 2)
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. “Green” Device (Note 3)
- TO92、SOT23、SOT25、SOT89 Packages

Applications

- Charger
- Voltage Adapter
- Switching Power Supply
- Graphic Card
- Precision Voltage Reference

Functional Block Diagram

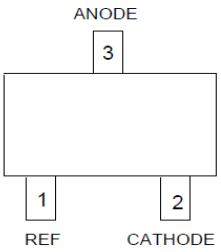


Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See www.rlcmicro.com for more information about Diodes Incorporated’s definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

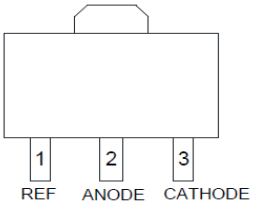
Pin Configuration

(Top View)



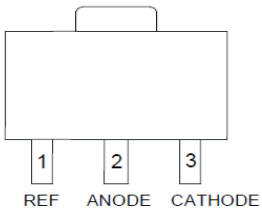
(SOT23/ N Package)

(Top View)



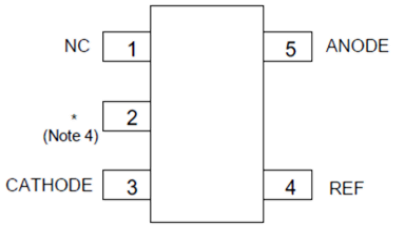
(SOT89 Option 1/ R Package)

(Top View)



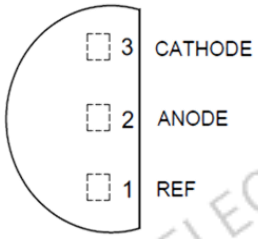
(SOT89 Option 2/ R Package)

(Top View)



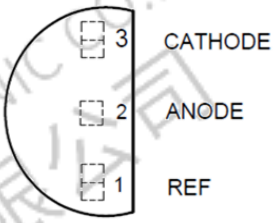
(SOT25/ K Package)

(Top View)



(TO92 (Bulk Packing)/ Z Package)

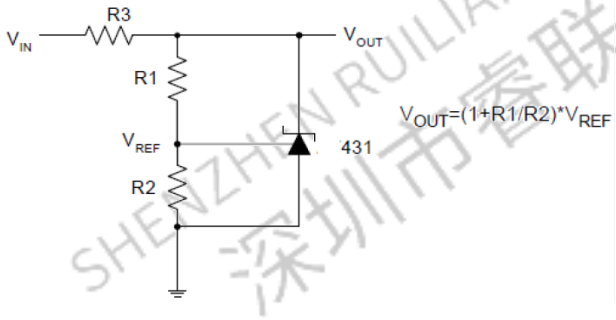
(Top View)



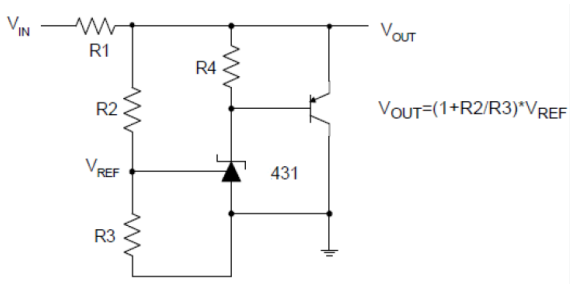
(TO92 (Ammo Packing)/ Z Package)

Note: * Pin 2 is attached to substrate and must be connected to ANODE or open.

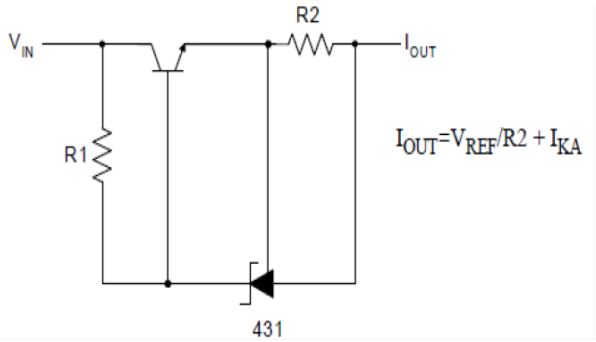
Typical Applications Circuit



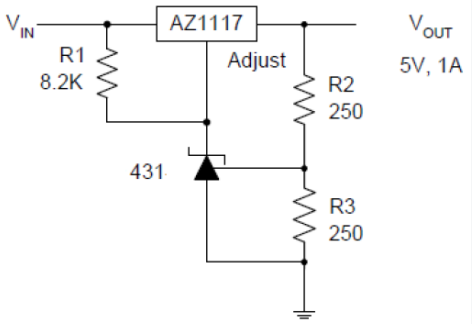
Shunt Regulator



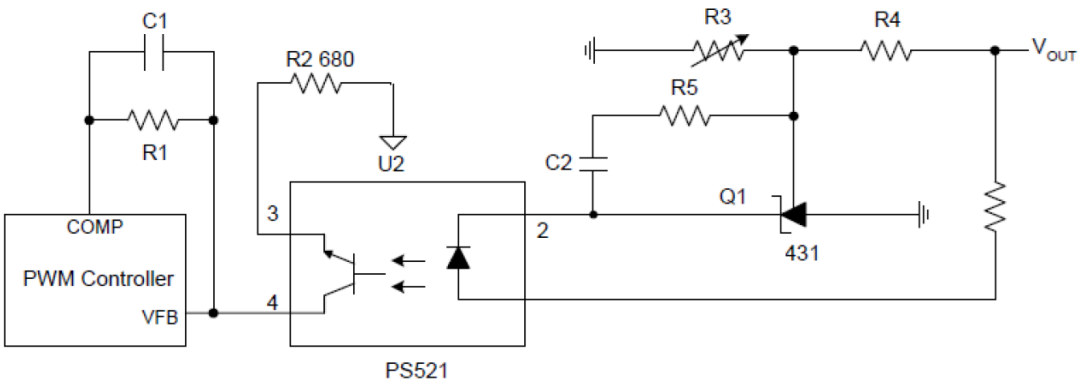
High Current Shunt Regulator



Current Source or Current Limit



Precision 5V 1A Regulator



PWM Converter with Reference

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{KA}	Cathode Voltage	40	V
I_{KA}	Cathode Current Range(Continuous)	-100 to 150	mA
I_{REF}	Reference Input Current Range	10	mA
PD	Power Dissipation	ZR Package: 770 N，K Package: 370	mW
T_J	Junction Temperature	+150	℃
Tstg	Storage Temperature Range	-65 to +150	℃
ESD	ESD(Human Body Model)	2000	V

Note: Stresses greater than 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 under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

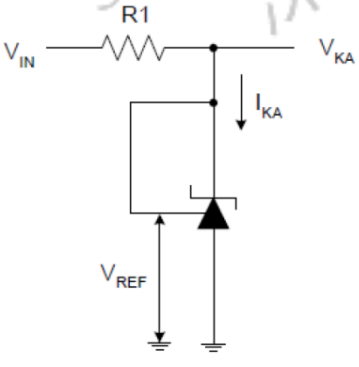
Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	VREF	36	V
I_{KA}	Cathode Current	1.0	100	mA
T_A	Operating Ambient Temperature Range	-40	+125	℃

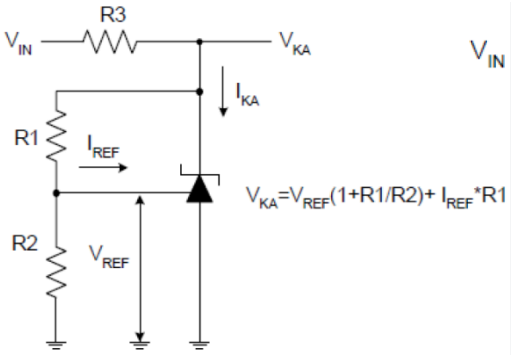
Electrical Characteristics (@TA = +25°C, unless otherwise specified.)

Symbol	Test Circuit	Parameter		Conditions		Min	Typ	Max	Unit
VREF	4	Reference Voltage	0.5%	VKA=VREF, IKA=10mA		2.4875	2.500	2.5125	V
Δ VREF	4	Deviation of Reference Voltage Over Full Temperature Range		VKA =VREF IKA= 10mA	0 to +70℃	-	4.5	8	mV
					-40 to +85℃	-	4.5	10	
					-40 to +125℃		4.5	16	
Δ VREF / Δ VKA	5	Ratio of Change in Reference Voltage to the Change in Cathode Voltage		IKA=10mA	Δ VKA= 10V to VREF	-	-1.0	-2.7	mV/V
					Δ VKA=36V to 10V	-	-0.5	-2.0	
IREF	5	Reference Current		IKA=10mA,R1=10KΩ,R2=∞		-	0.7	4	μA
Δ IREF	5	Deviation of Reference Current Over Full Temperature Range		IKA=10mA.R1=10KΩ R2=∞， TA=-40 to +125℃		-	0.4	1.2	μA
IKA(Min)	4	Minimum Cathode Current for Regulation		VKA=VREF		-	0.4	1.0	mA
IKA(Off)	6	Off-state Cathode Current		VKA=36V,VREF =0		-	0.05	1.0	μA
ZKA	4	Dynamic Impedance		VKA=VREF,IKA=1 to 100mA, f≤ 1.0KHz		-	0.15	0.5	Ω
θJC	-	Thermal Resistance		SOT23		-	135.48	-	℃/W
				SOT25		-	135.48	-	
				TO92		-	81.63	-	
				SOT89			29.80	-	

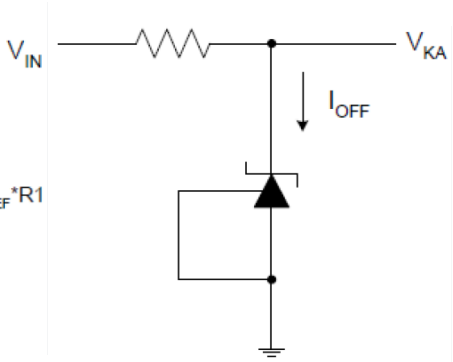
Test Circuit



Test Circuit 4 for VKA = VREF



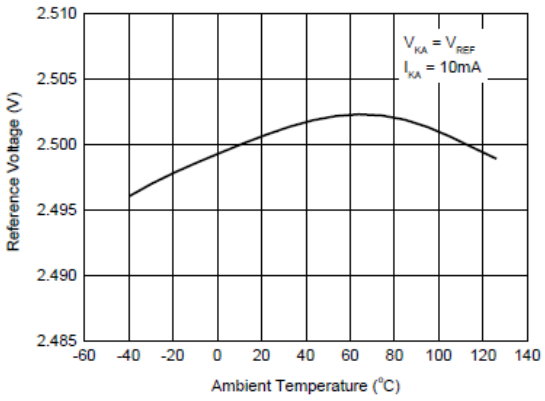
Test Circuit 5 for VKA > VREF



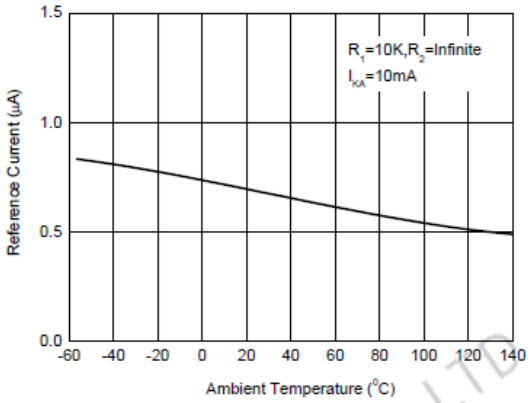
Test Circuit 6 for IOFF

Performance Characteristics

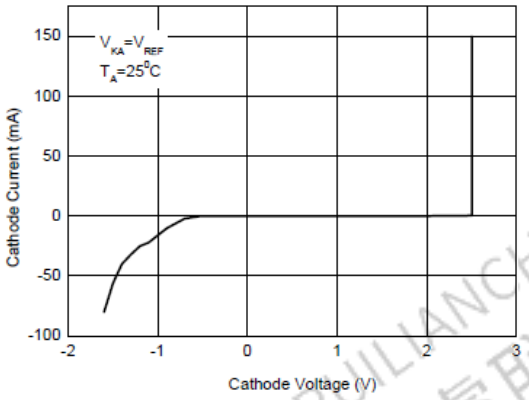
Reference Voltage vs. Ambient Temperature



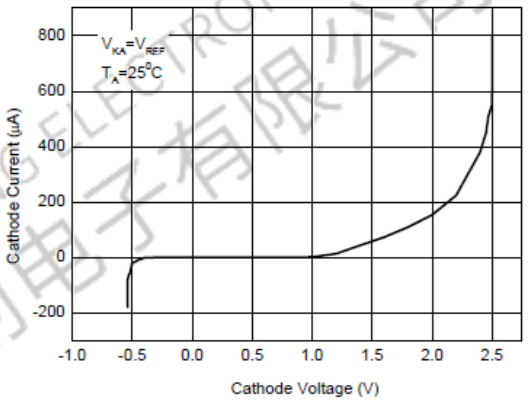
Reference Current vs. Ambient Temperature



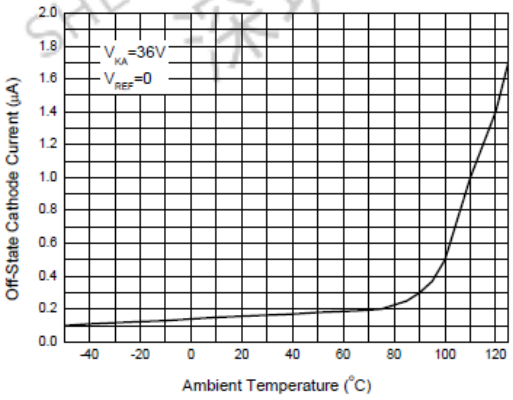
Cathode Current vs. Cathode Voltage



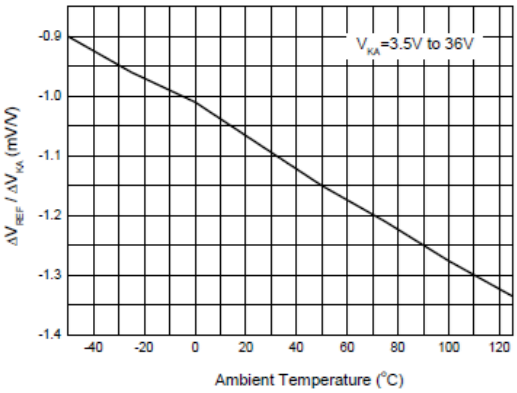
Cathode Current vs. Cathode Voltage



Off-State Cathode Current vs. Ambient Temperature

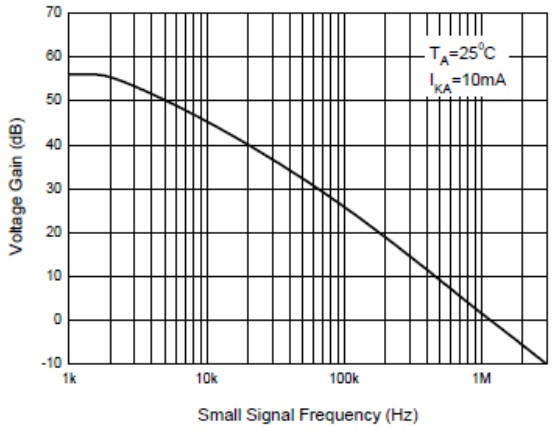


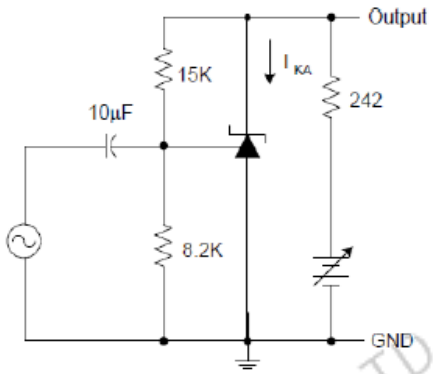
Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage



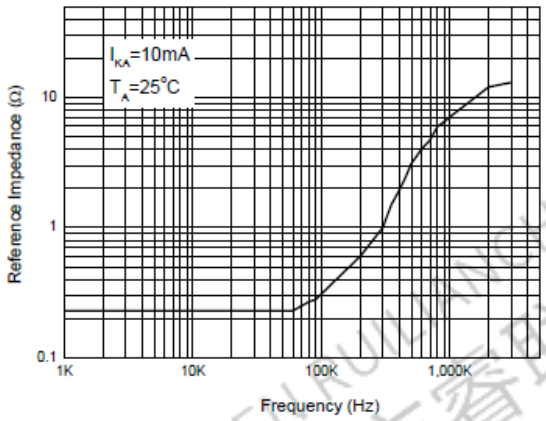
Performance Characteristics

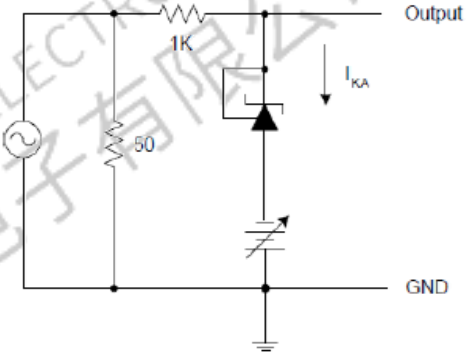
Small Signal Voltage Gain vs. Frequency



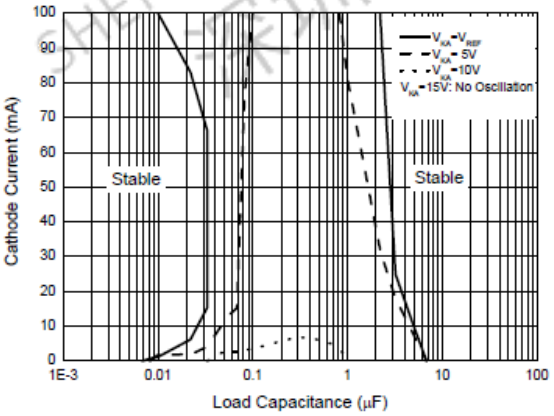


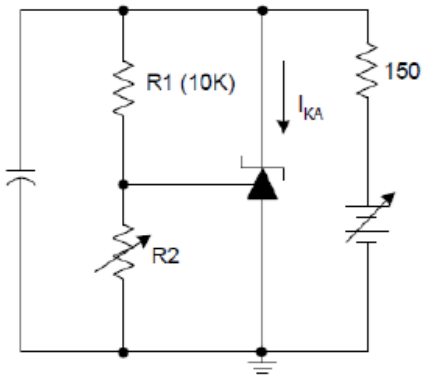
Reference Impedance vs. Frequency



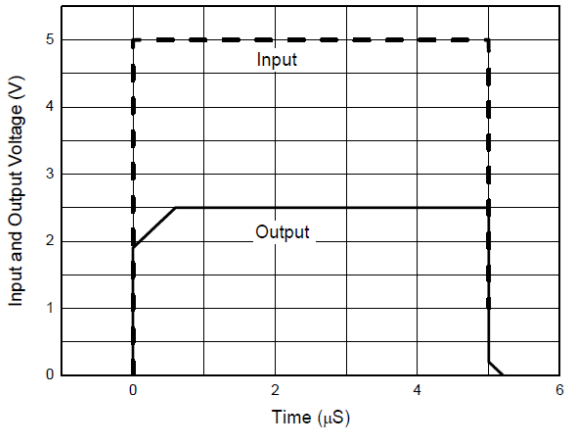


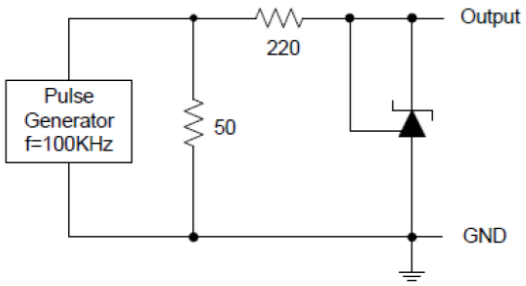
Stability Boundary Conditions vs. Load Capacitance



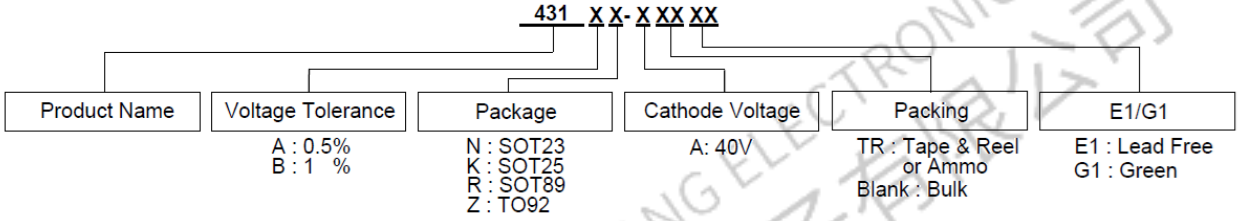


Pulse Response of Input and Output Voltage





Ordering Information

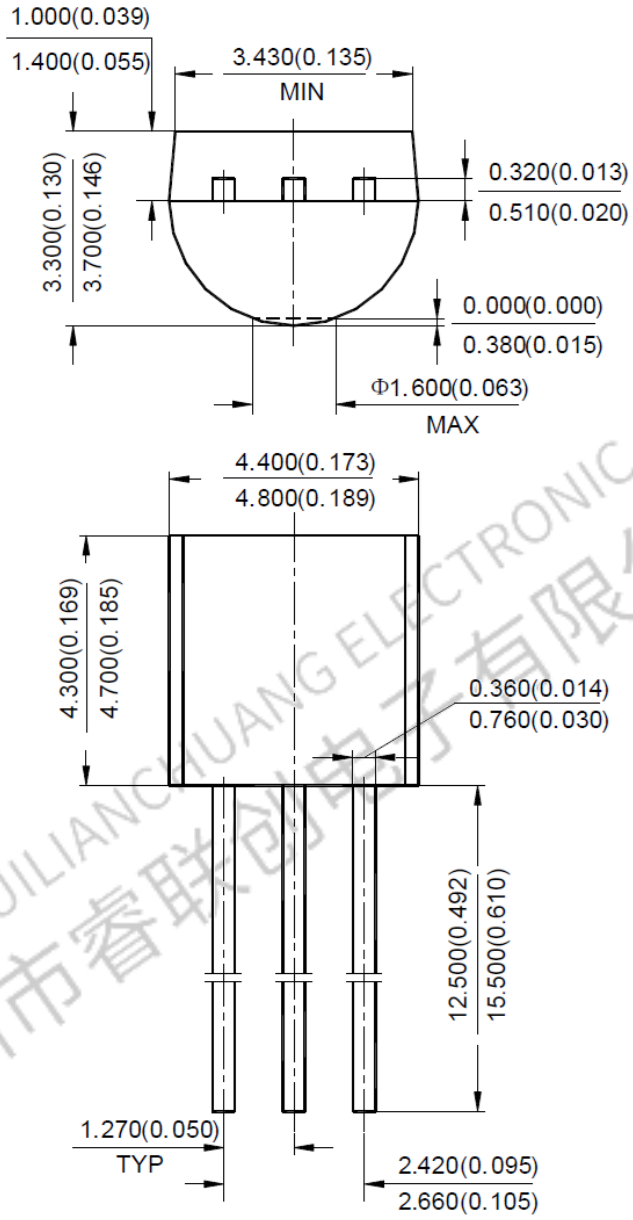


Diodes IC's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.
Products with "G1" suffix are available in green packages.

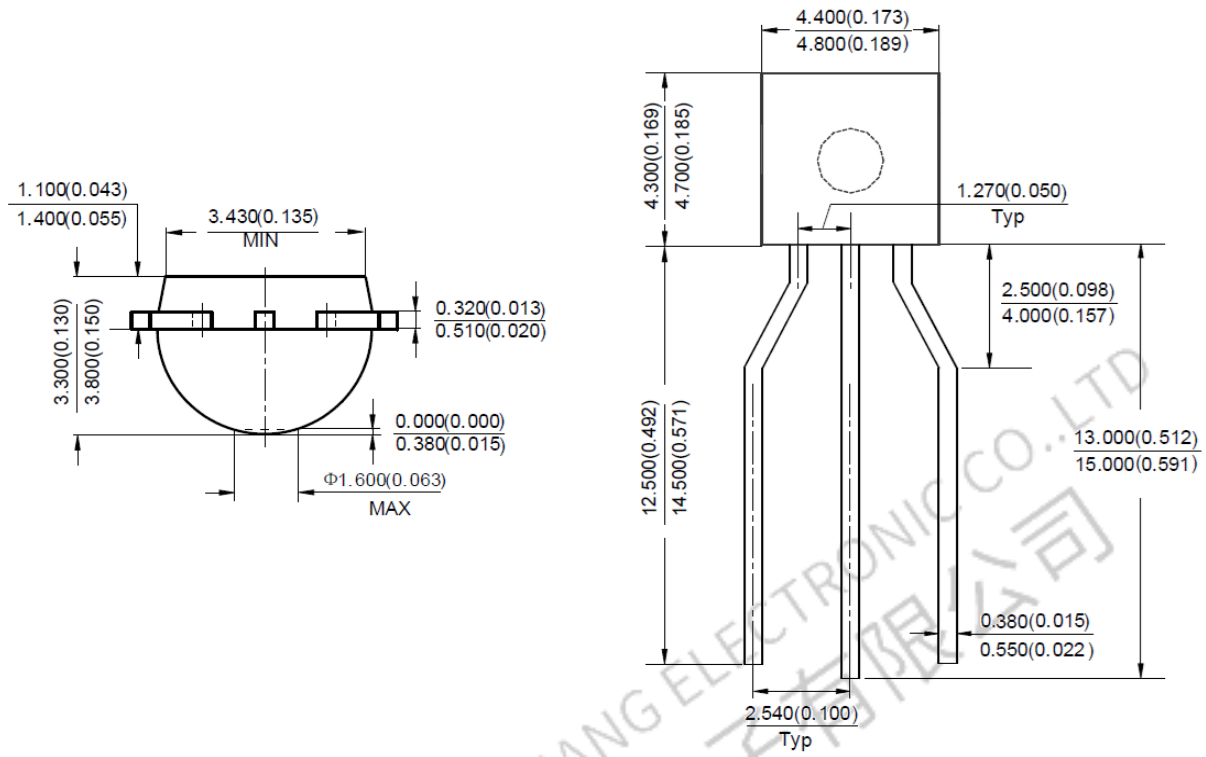
	Package	Temperature Range	Voltage Tolerance	Part Number		Marking ID		Packing
				Lead- Free	Green	Lead-Free	Green	
Lead-Free	SOT23	-40 to +125°C						
Lead-free Green			0.5%	431AN - ATRE1	431AN - ATRG1	EA1	GA1	3000/ Tape & Reel
Lead-Free	SOT25	-40 to +125°C						
Lead-free Green			0.5%	431AK - ATRE1	431AK - ATRG1	E3B	G3B	3000/ Tape & Reel
Lead-Free	TO92	-40 to +125°C						
Lead-free Green			0.5%	431AZ -AE1	431AZ -AG1	431AZ -AE1	431AZ -AG1	1000/ Bulk
			0.5%	431AZ - ATRE1	431AZ - ATRG1	431AZ -AE1	431AZ -AG1	2000/ Ammo
Lead-Free	SOT89	-40 to +125°C						
Lead-free Green			0.5%	431BR - ATRE1	431BR - ATRG1	E43B	G43B	1000/ Tape & Reel

Package Outline Dimensions

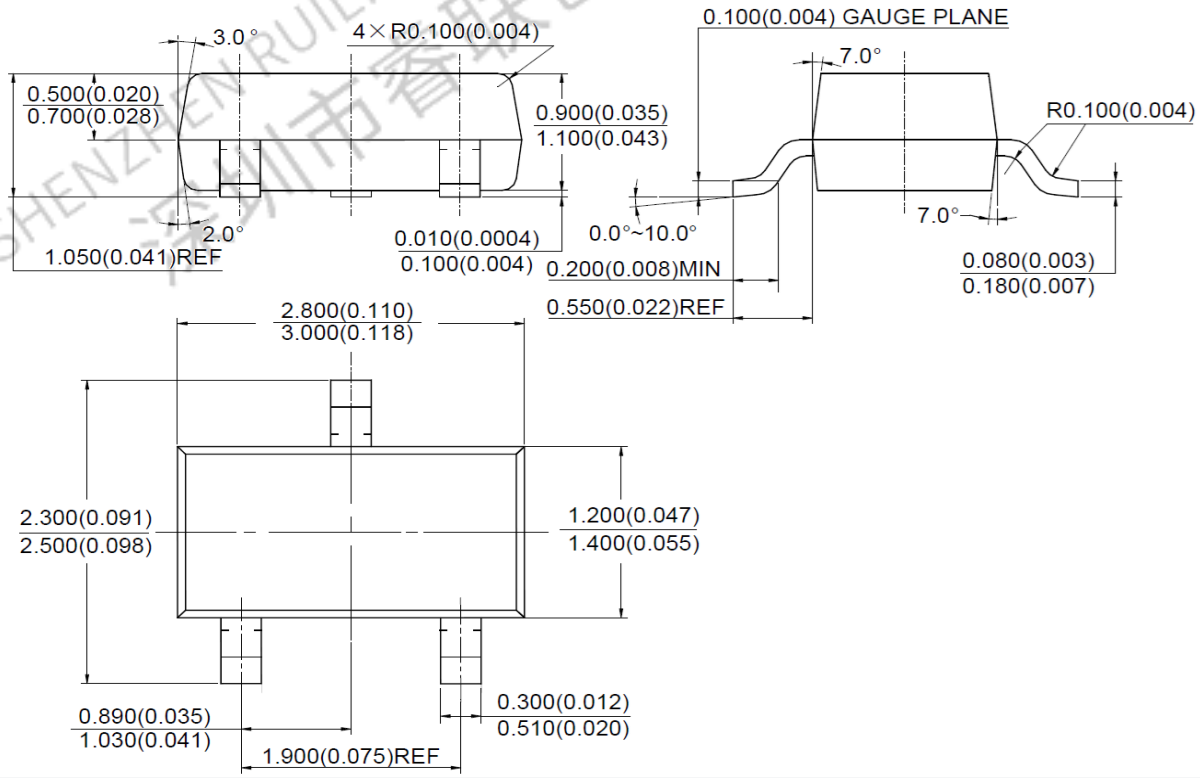
(1) Package Type: TO92 (Bulk Packing)



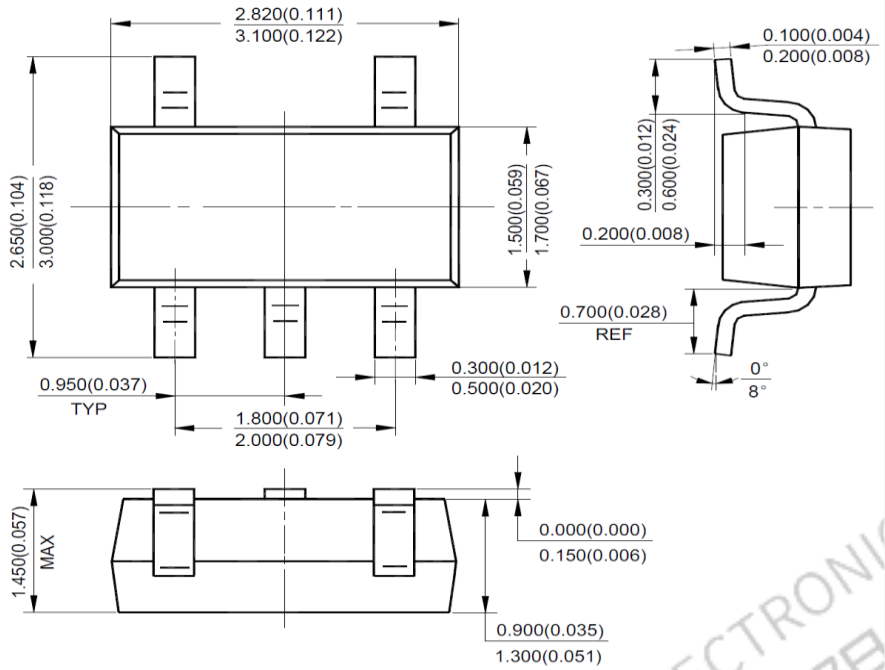
(2) Package Type: TO92 (Ammo Packing)



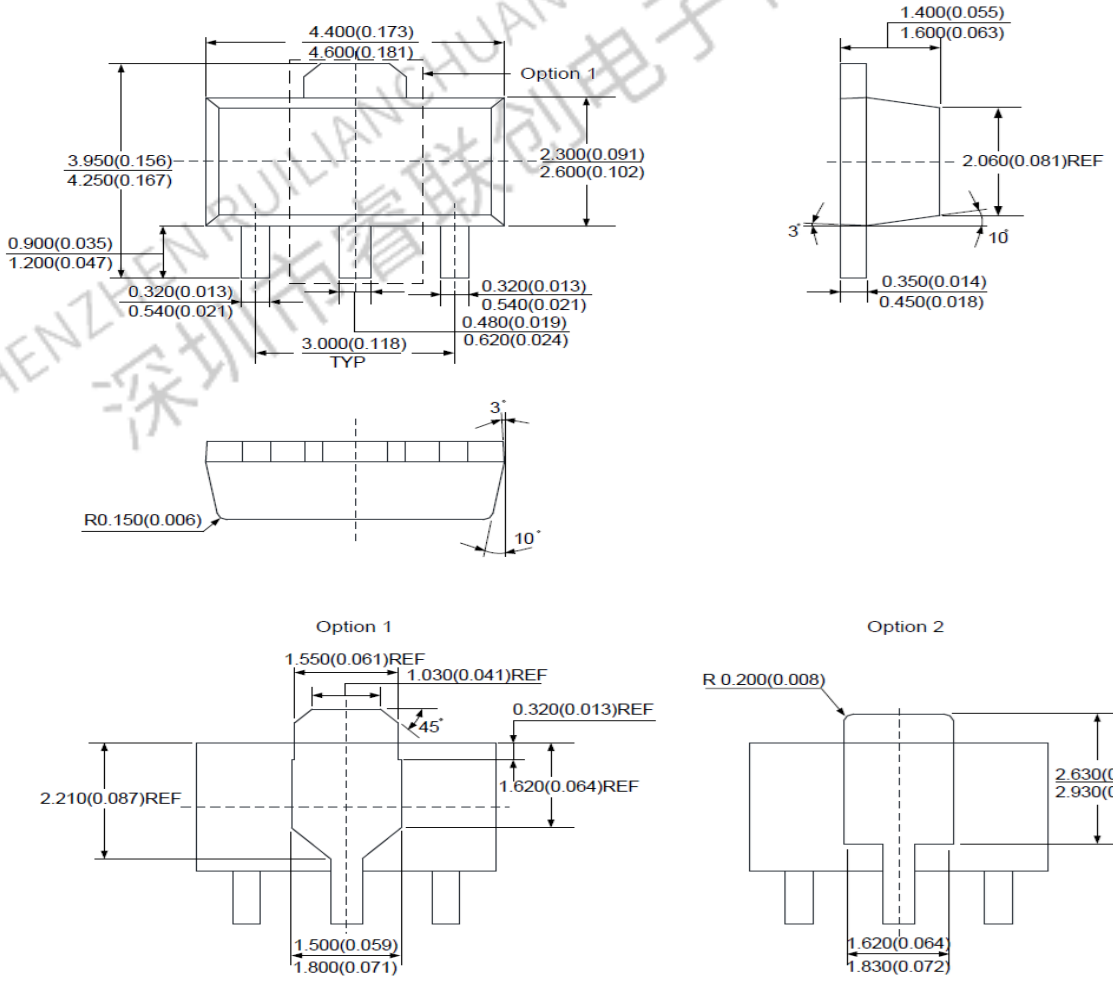
(3) Package Type: SOT23



(4) Package Type: SOT25



(5) Package Type: SOT89



Important Note

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