XH431S

Descriptions

The XH431S 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 XH431S can be set to any value between V_{REF} (2.495V or 2.5V) and the corresponding maximum cathode voltage (36V).

The XH431S precision reference is offered in two voltage tolerance: 0.5% and 1.0%.

This IC is available in 2 packages: TO92 (Ammo Packing) and SOT23.

Features

- Programmable Precise Output Voltage from 2.495V or 2.5V to 36V
- High Stability under Capacitive Load
- Low Temperature Deviation: 5mV Typical
- Low Equivalent Full-range Temperature Coefficient with 20PPM/°C Typical
- Sink Current Capacity from 0.5mA to 100mA
- Low Output Noise
- Wide Operating Range of -40 to +125°C
- Lead-Free Packages, Available in “Green” Molding Compound: SOT23, TO92 (Ammo Packing)
- Totally Lead-Free & Fully RoHS Compliant (Notes 1)
- Halogen and Antimony Free. “Green” Device (Note 2)

Applications

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

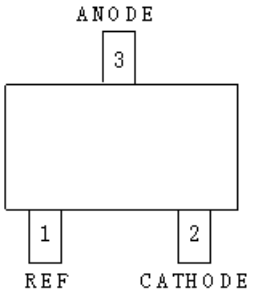
Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.

2. Halogen- and Antimony-free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

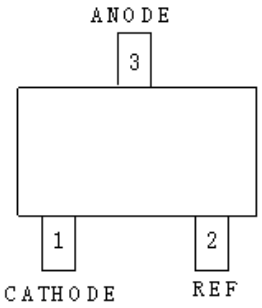
Pin Assignments

Top View

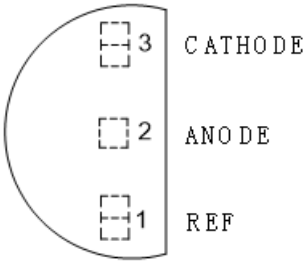
SOT-23（N）



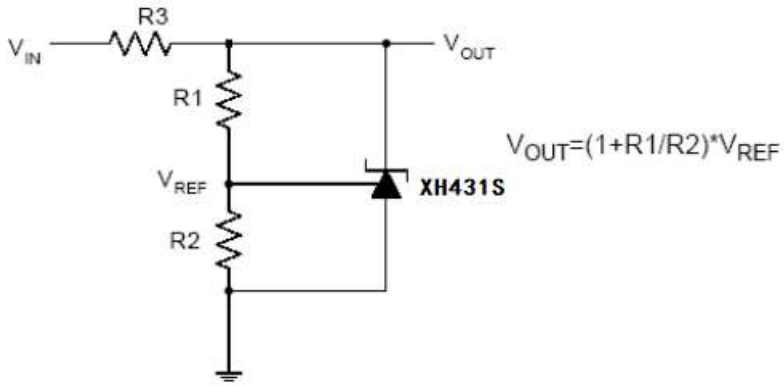
SOT-23(N1)



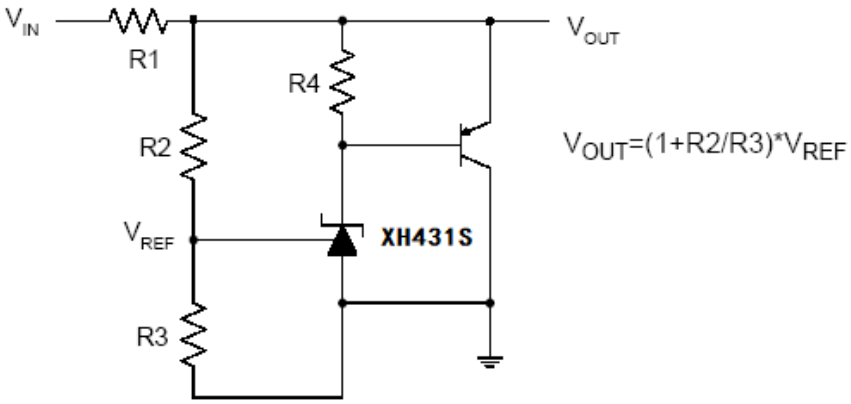
TO-92(Ammo)



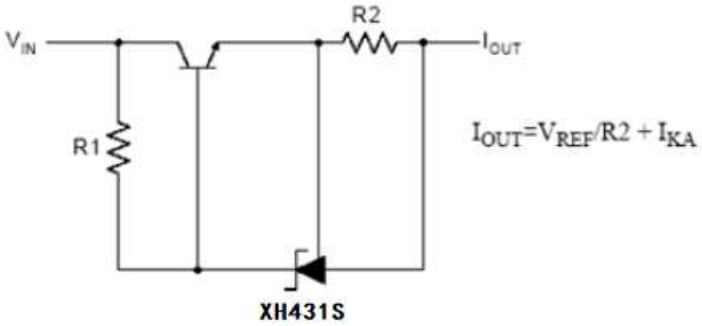
Typical Applications Circuit



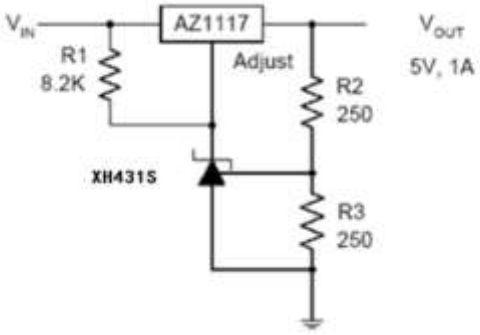
Shunt Regulator



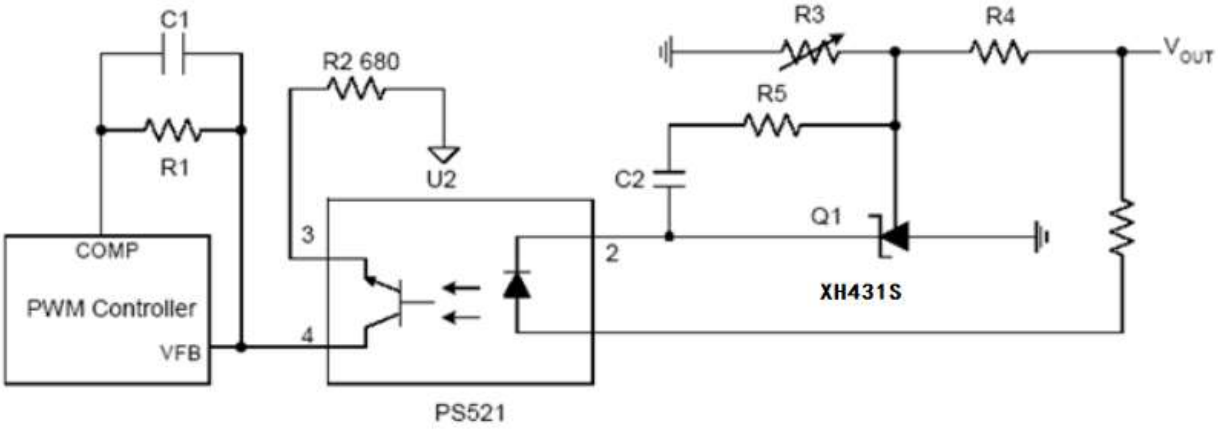
High Current Shunt Regulator



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
θ_{JA}	Thermal Resistance	SOT23	380	℃/W
		TO92 (Ammo Packing)	165	
T_J	Junction Temperature	+150		℃
T_{STG}	Storage Temperature Range	-65 to +150		℃
ESD	ESD (Human Body Model)	2000		V

Note 3: 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.

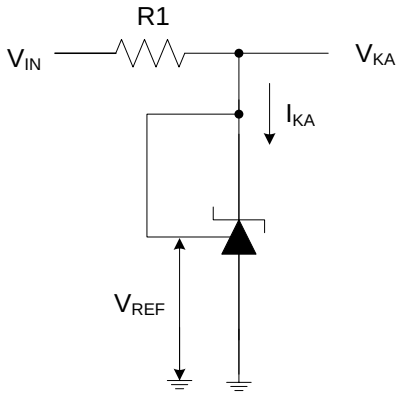
Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{KA}	Cathode Voltage	V_{REF}	36	V
I_{KA}	Cathode Current	0.5	100	mA
T_A	Operating Ambient Temperature Range	-40	+125	℃

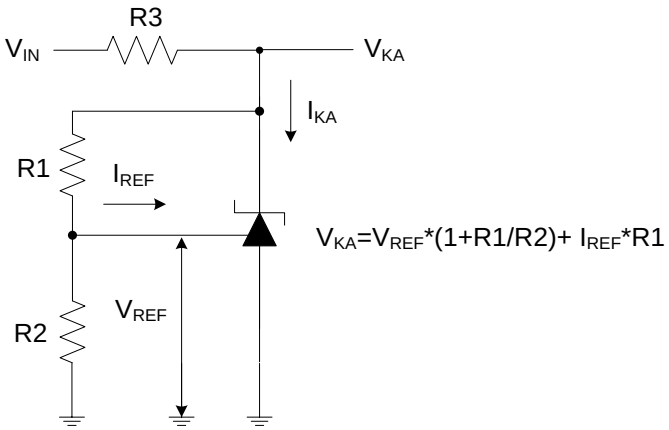
Electrical Characteristics（@T_A=+25℃,unless otherwise specified.）

Symbol	Parameter		Conditions		Min	Typ	Max	Unit
V_{REF}	Reference Voltage	0.5%	V_{KA} = V_{REF}, I_{KA} = 10mA		2.487	2.500	2.512	V
		1.0%			2.475	2.500	2.525	
		0.5%	V_{KA} = V_{REF}, I_{KA} = 10mA		2.482	2.495	2.507	
		1.0%			2.470	2.495	2.520	
ΔV_{REF}	Deviation of Reference Voltage Over Full Temperature Range		V_{KA} = V_{REF}, I_{KA} = 10mA	0 to +70℃	—	4.5	8	mV
				-40 to +85℃	—	4.5	10	
				-40 to +125℃	—	4.5	16	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of Change in Reference Voltage to the Change in Cathode Voltage		I_{KA} = 10mA	ΔV_{KA} = 10V to V_{REF}	—	-1.0	-2.7	mV/V
				ΔV_{KA} = 36V to 10V	—	-0.5	-2.0	
I_{REF}	Reference Current		I_{KA} = 10mA, R1 = 10kΩ, R2 = ∞		—	0.7	4	μA
ΔI_{REF}	Deviation of Reference Current Over Full Temperature Range		I_{KA} = 10mA, R1 = 10kΩ, R2 = ∞, T_A = -40 to +125°C		—	0.4	1.2	μA
I_{KA}(Min)	Minimum Cathode Current for Regulation		V_{KA} = V_{REF}		—	0.4	1.0	mA
I_{KA}(Off)	Off-state Cathode Current		V_{KA} = 36V, V_{REF} = 0		—	0.05	1.0	μA
Z_{KA}	Dynamic Impedance		V_{KA} = V_{REF}, I_{KA} = 0.5 to 100mA, f ≤ 1.0KHz		—	0.15	0.5	Ω
θ_{JC}	Thermal Resistance		SOT23		—	135.9	—	℃/W
			TO92 (Ammo Packing)		—	81.9	—	

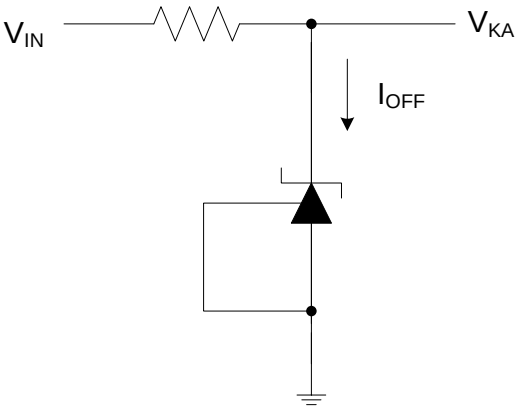
Electrical Characteristics



Test Circuit 4 for $V_{KA}=V_{REF}$

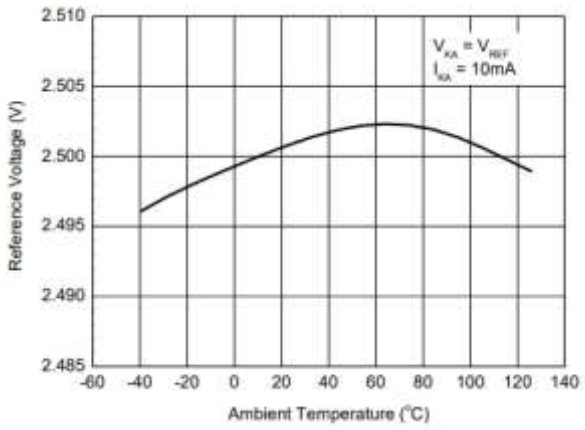


Test Circuit 5 for $V_{KA}>V_{REF}$

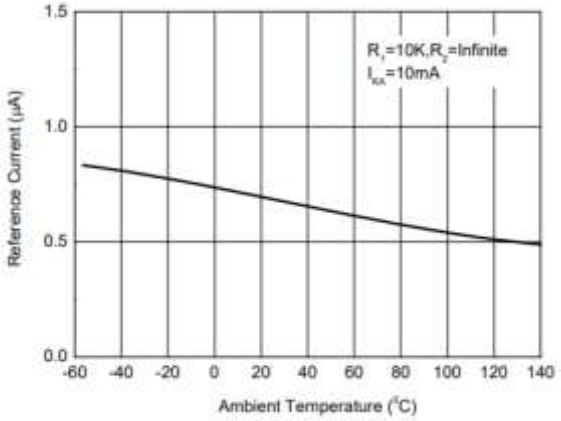


Test Circuit 6 for I_{OFF}

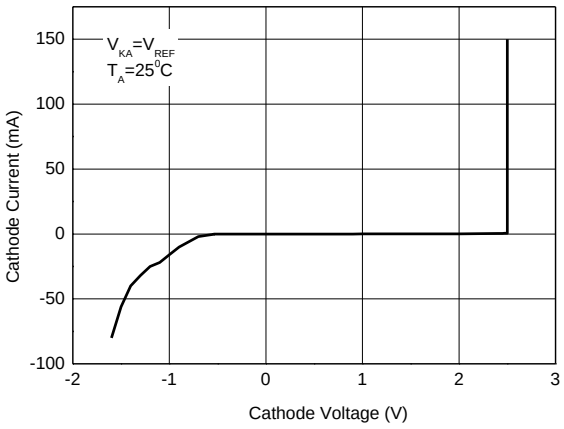
Reference Voltage vs. Ambient Temperature



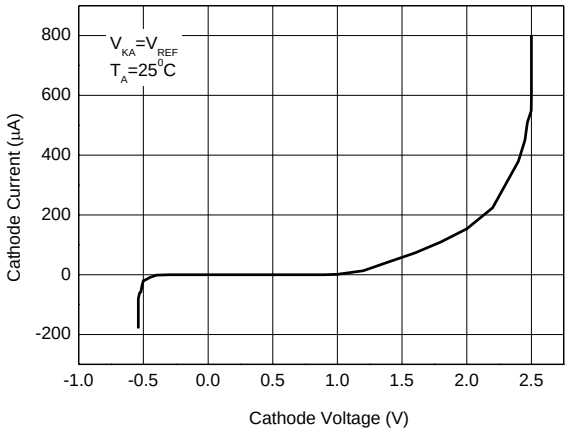
Reference Current vs. Ambient Temperature



Cathode Current vs. Cathode Voltage

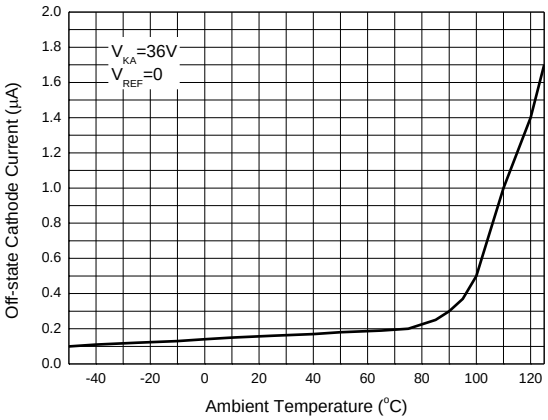


Cathode Current vs. Cathode Voltage



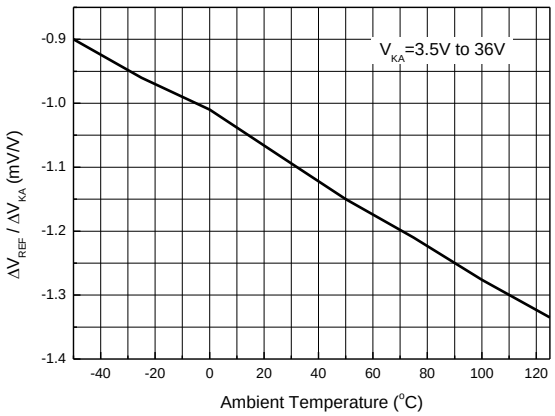
Off-state Cathode Current

vs. Ambient Temperature

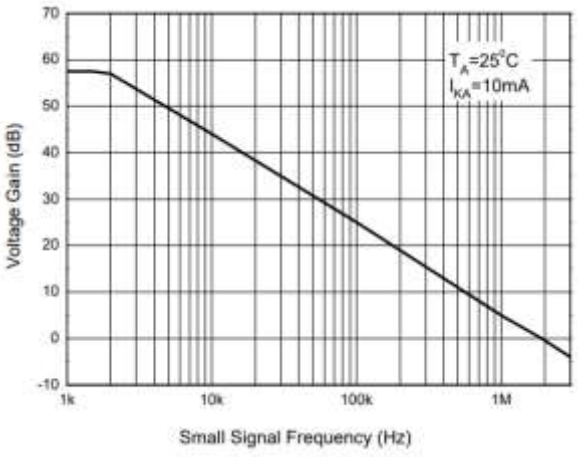


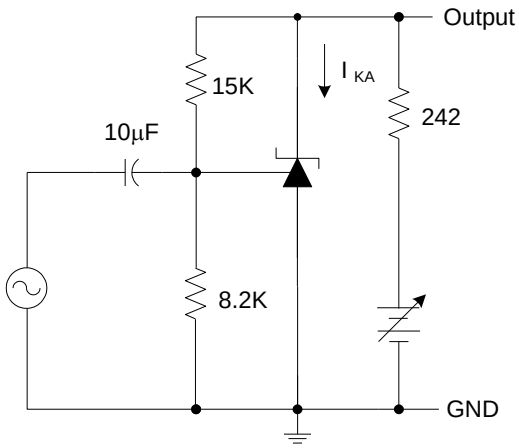
Ratio of Delta Reference Voltage to the

Ratio of Delta Cathode Voltage

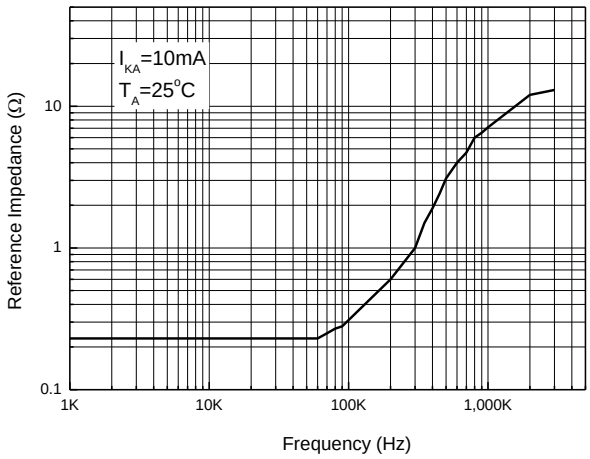


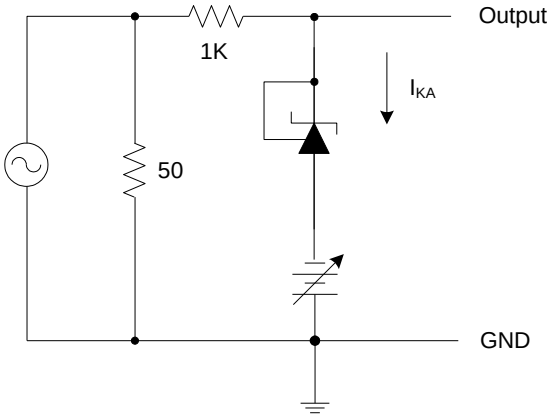
Small Signal Voltage Gain vs. Frequency



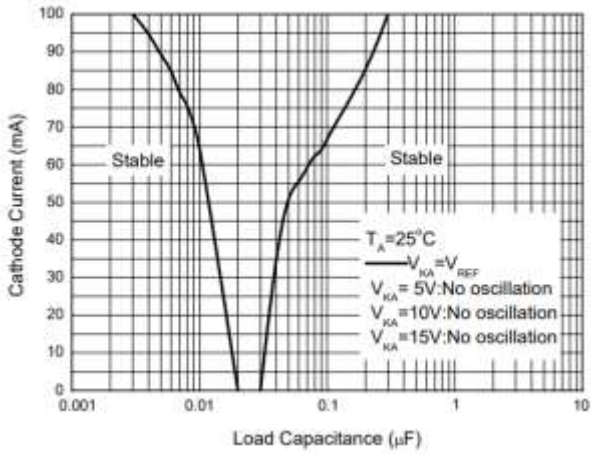


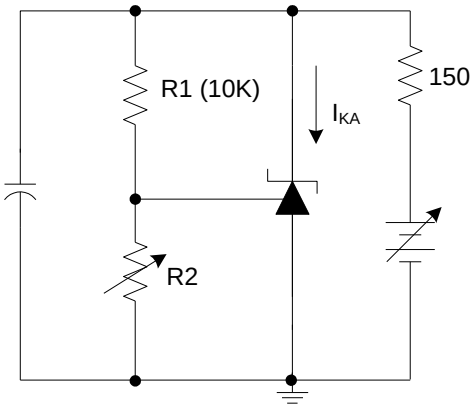
Reference Impedance vs. Frequency



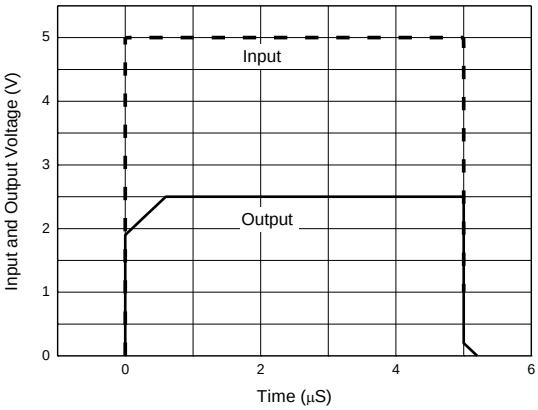


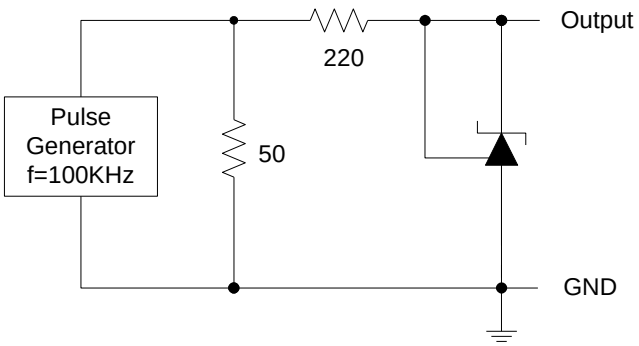
Stability Boundary Conditions vs. Load Capacitance



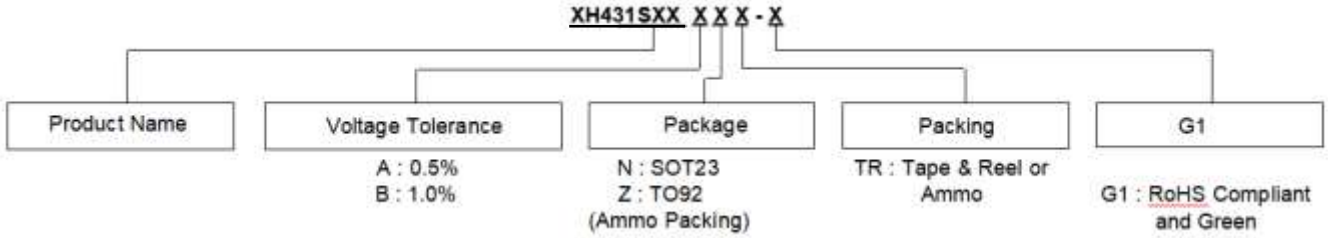


Pulse Response of Input and Output Voltage





Ordering Information



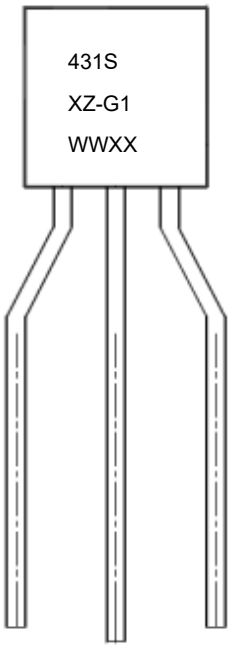
Protuct name	Reference Voltage	Pin out
XH431S	2.5V	Pin1：Ref Pin2：Cathode
XH431SH	2.495V	Pin1：Ref Pin2：Cathode
XH431SC	2.5V	Pin1：Cathode Pin2：Ref
XH431SHC	2.495V	Pin1：Cathode Pin2：Ref

Package	Temperature Range	Voltage Tolerance	Part Number	Marking ID	Packing
SOT23 (N)	-40 to +125°C	0.5%	XH431SANTR-G1	NJA	3000/Tape & Reel
			XH431SHANTR-G1	NSA	3000/Tape & Reel
		1.0%	XH431SBNTR-G1	NJB	3000/Tape & Reel
			XH431SHBANTR-G1	NSB	3000/Tape & Reel
SOT23 (N1)	-40 to +125°C	0.5%	XH431SCANTR-G1	NTA	3000/Tape & Reel
			XH431SHCANTR-G1	NUA	3000/Tape & Reel
		1.0%	XH431SCBNTR-G1	NTB	3000/Tape & Reel
			XH431SHCBNTR-G1	NUB	3000/Tape & Reel
TO92 (Ammo Packing)	-40 to +125°C	0.5%	XH431SAZTR-G1	431SAZ-G1	2000/Ammo
			XH431SHAZTR-G1	431SHAZ-G1	2000/Ammo
		1.0%	XH431SBZTR-G1	431SBZ-G1	2000/Ammo
			XH431SHBZTR-G1	431SHBZ-G1	2000/Ammo

Marking Information

(1) TO92 (Ammo Packing)

(Top View)



First line and second line：Marking ID (See Ordering Information)

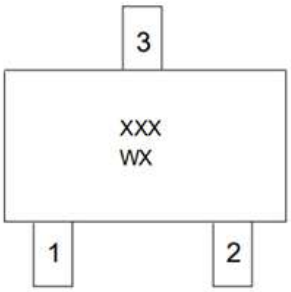
WWXX: Date code

WW: Work Week of Molding

XX: Internal Code

（2）SOT23

(Top View)



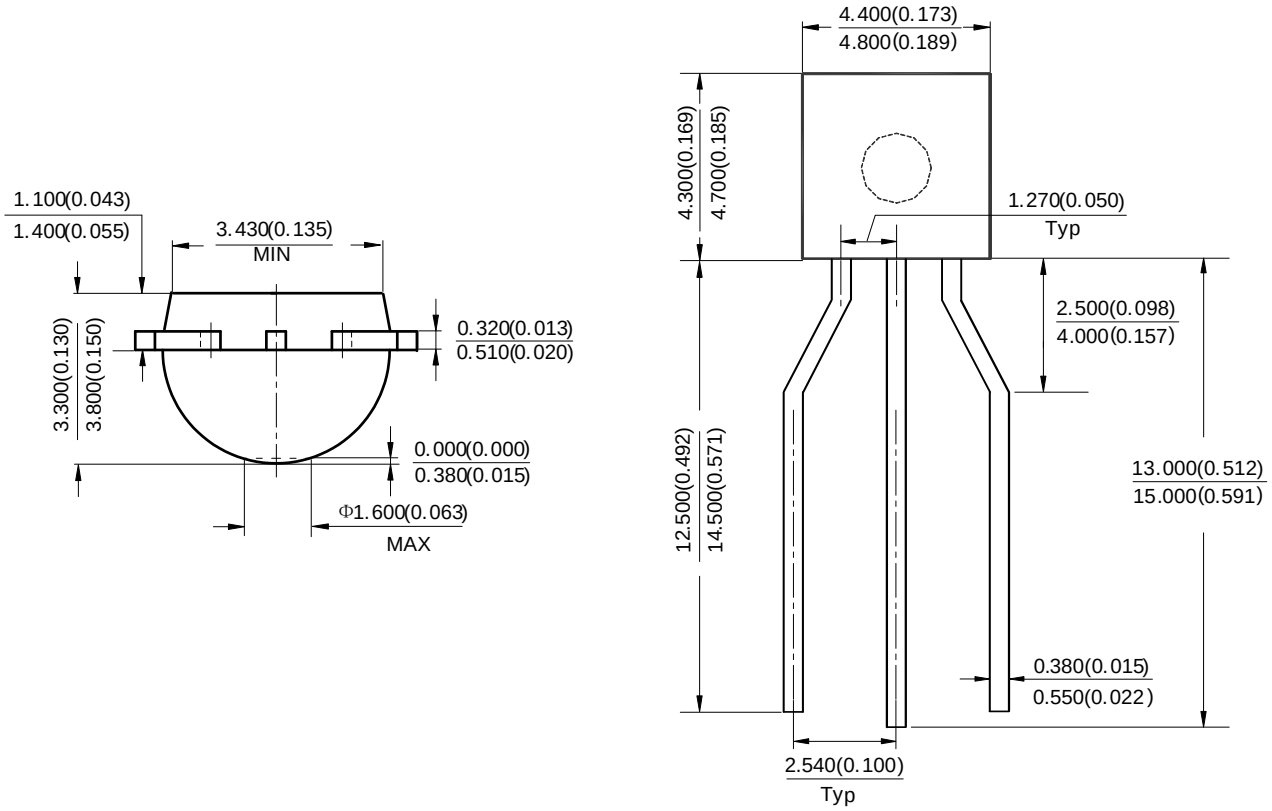
XXX: Marking ID (See Ordering Information)

WX W: Weekly

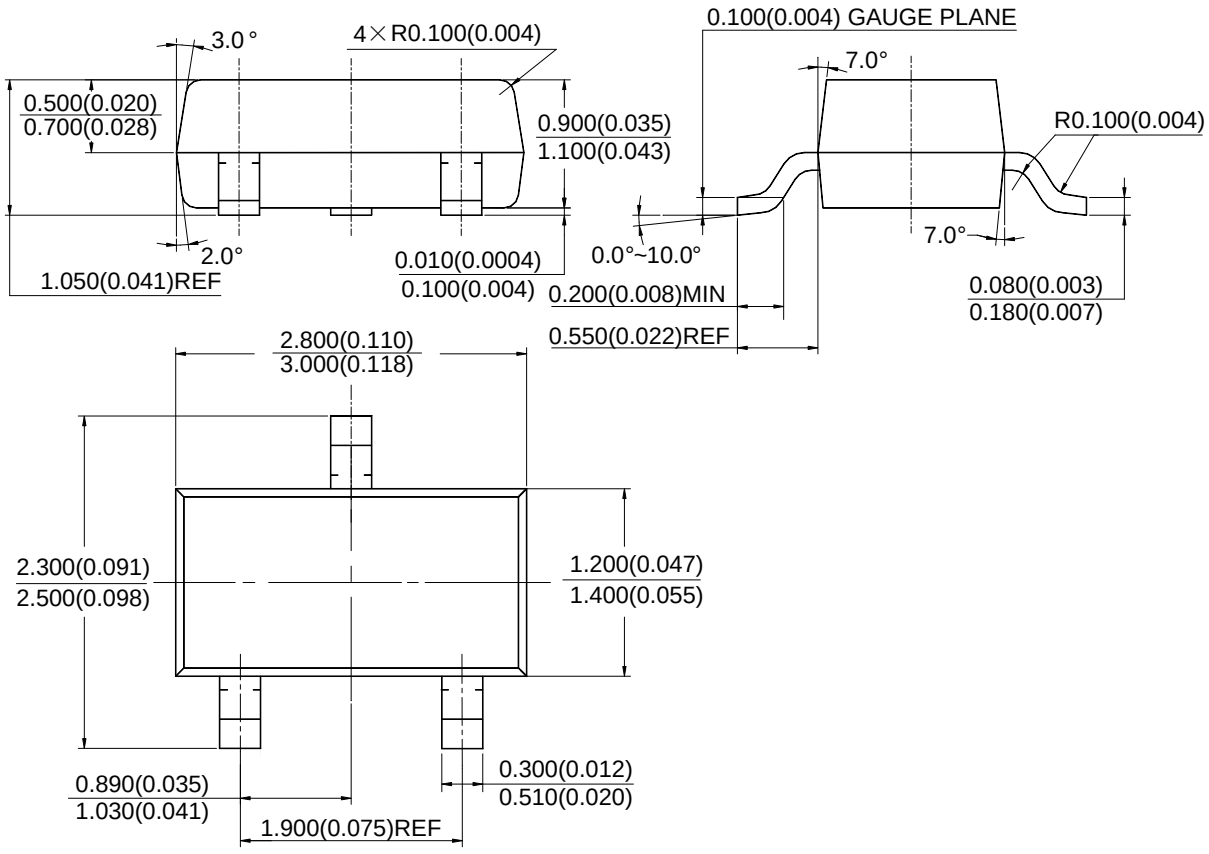
X: Internal Code

Package Outline Dimensions

（1）TO92 (Ammo Packing)

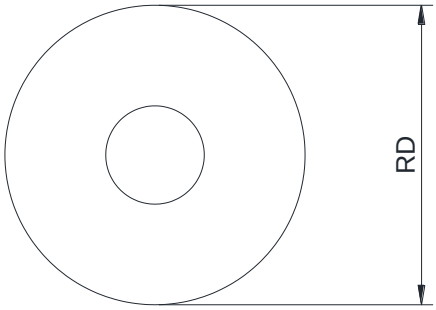


（2）SOT-23

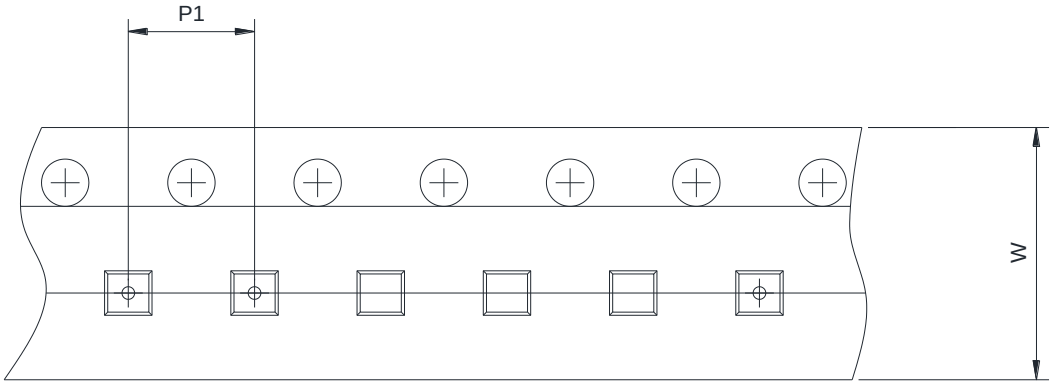


Tape and Reel Information

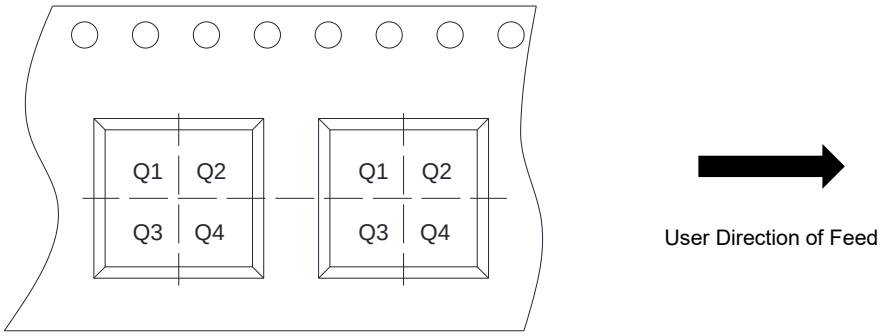
Reel Dimensions



Tape Dimensions



Quadrant Assignments for Pin1 Orientation in Tape



Project		SOT-23	TO-92
RD	Reel Dimension	7inch	仅纸带
W	Overall Width of the Carrier Tape	8mm	18mm
P1	Pitch between Successive Cavity Centers	4mm	8mm
Pin1	Pin1 Quadrant	Q3	Q3