Lead-free Green

JVR431

Shunt Voltage Reference

Description

The JVR431 is a high-precision shunt voltage reference with outstanding thermal stability over the operating temperature between -40ºC and 125ºC.

The JVR431 is designed to turn ON rapidly and exhibits low output impedance and temperature coefficient. As such, the device responds promptly to changes in the load condition while a steady V_{REF} output is maintained. In CE / industrial / automotive applications, JVR431 is an ideal replacement for Zener diode in ADCs / DACs circuits to extend ENOB (effective number of bits), in AC-DC & DC-DC circuits to provide voltage reference.

Packages offered include SOT-23.

Applications

- Voltage reference in data conversion and power conversion circuit, which is immune to variations in ambient temperature / loading / input supply / time
- Commonly adopted in power adapters for computer peripherals & e-Bike & 2/4-wheel scooters, factory automation, industrial controls, manufacturing machineries, test equipment, automotive sub-systems

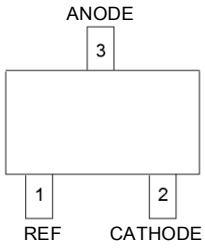
Features and Benefits

- Programmable output voltage (2.5 ~ 36V) with tolerance at ±0.4%
- Low drift (4.5mV typical) upon V_{REF} over full operating temp. range
- Very low drift (20 ppm/°C typical) upon reference voltage (V_{REF}) over wide operating temperature range (-40°C ~ 125ºC)
- Small dynamic output resistance at 0.15Ω typical
- Ability to sink current from 1mA ~ 100mA
- Stable operation with capacitive load at the output
- Lead-free package assembled with 'green' molding compound

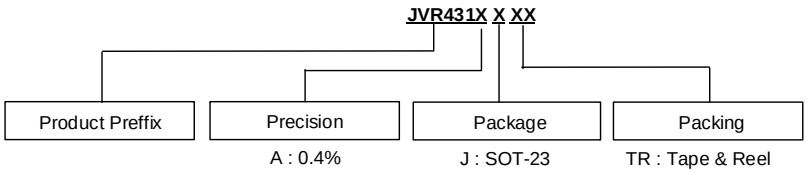
Pin Assignment

Top View

(SOT-23)



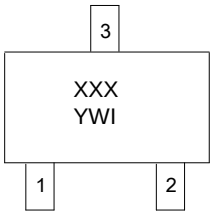
Ordering Information



Product Name	Package	Marking	MSL	T_J (ºC)	Media	Quantity (pcs)
JVR431AJTR	SOT-23	N2A	3	-40 ~ 125	7" T&R	3000

Marking Information

Top View



First Line: Marking (see Ordering Information)

Second Line: Date Code
Y: Year
W: Work Week of Molding
I: Code for Assembly & Test Site

Diagram of Function Blocks

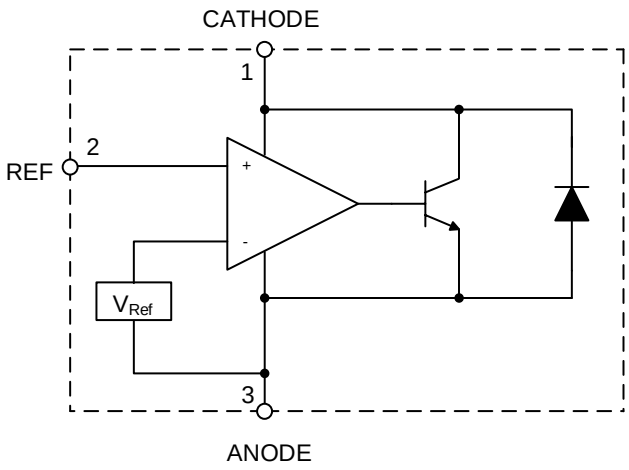


Fig. 1: Function Blocks

Absolute Maximum Ratings *1

Symbol	Parameter	Rating	Unit
V_{KA}	Cathode Voltage	40	V
I_{KA}	Cathode Current Range (continuous)	-100 ~ 150	mA
I_{REF}	Input Reference Current	10	mA
P_D	Power Dissipation	370	mW
T_J	Junction Temperature	150	ºC
T_{STG}	Storage Temperature Range	-65 ~ 150	ºC
HBM	ESD (Human Body Model)	2000	V

Note *1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. While these are stress ratings only, functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” are 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	1	100	mA
T_J	Operating Junction Temperature Range	-40	125	°C

Electrical Characteristics (T_A = 25ºC unless otherwise specified)

Symbol	Parameter	Test Circuit			Min.	Typ.	Max.	Unit
V_{REF}	Reference Voltage	1	$V_{KA} = V_{REF}$, I_{KA} = 10mA		2.492	2.500	2.508	V
ΔV_{REF}	Drift of Reference Voltage over Operating Temperature Range	1	$V_{KA}=V_{REF}$, I_{KA}=10mA	T_A = 0 ~ 70ºC	–	4.5	8.0	mV
				T_A = -40 ~ 85ºC	–	4.5	10.0	
				T_A = -40 ~ 125ºC	–	4.5	16.0	
ΔV_{REF} / ΔV_{KA}	Change in Reference Voltage vs. Change in Cathode Voltage	2	I_{KA}=10mA	ΔV_{KA} = 10V ~ V_{REF}	–	-1.0	-2.7	mV / V
				ΔV_{KA} = 36 ~ 10V	–	-0.5	-2.0	
I_{REF}	Reference Current	2	I_{KA} = 10mA, R1 = 10kΩ, R2 = ∞		–	0.7	4.0	µA
ΔI_{REF}	Drift of Reference Current over Operating Temperature Range	2	I_{KA} = 10mA, R1 = 10kΩ, R2 = ∞ T_A = -40 ~ 125ºC		–	0.4	1.2	µA
I_{KA_Min}	Minimum Cathode Current for Regulation	1	$V_{KA} = V_{REF}$		–	0.4	1.0	mA
I_{KA_OFF}	OFF-state Cathode Current	3	V_{KA} = 36V, V_{REF} = 0V		–	0.05	1.00	µA
Z_{KA}	Dynamic Impedance	1	$V_{KA} = V_{REF}$, I_{KA} = 1 ~ 100mA Freq. ≤ 1.0kHz		–	0.15	0.50	Ω
θ_{JC}	Thermal Resistance	–	SOT-23		–	135	–	ºC / W

Electrical Characteristics (continued)

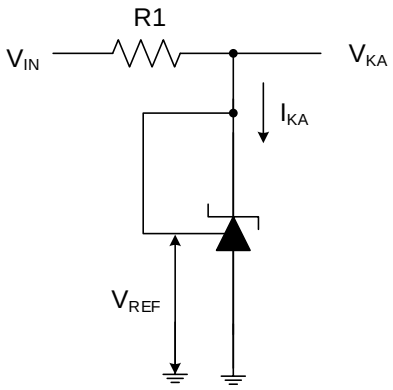


Fig. 2: Test Circuit 1 for $V_{KA} = V_{REF}$

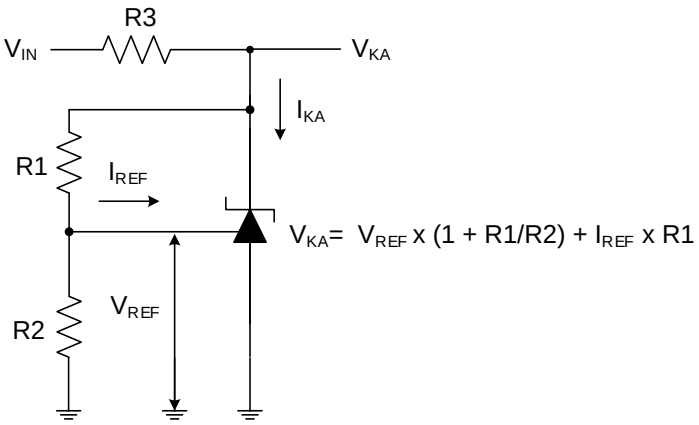


Fig. 3: Test Circuit 2 for $V_{KA} > V_{REF}$

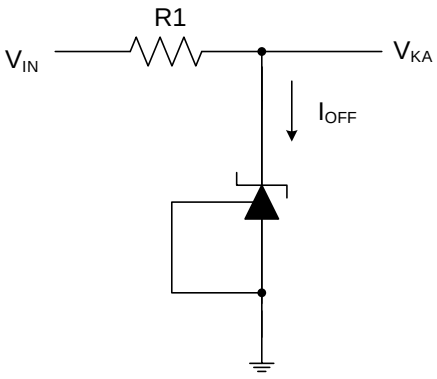


Fig. 4: Test Circuit 3 for I_{OFF}

Performance Characteristics

Fig. 5: Reference Voltage vs. Ambient Temperature

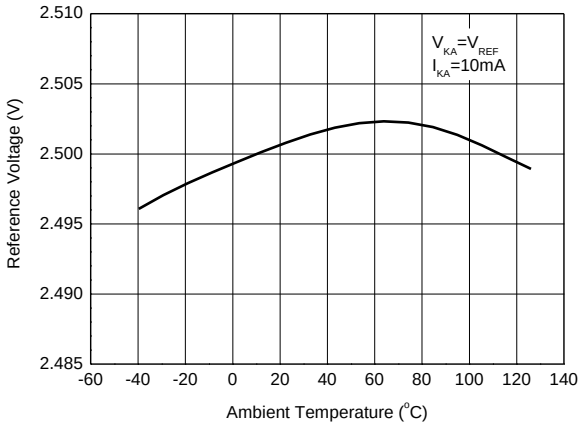


Fig. 6: Reference Current vs. Ambient Temperature

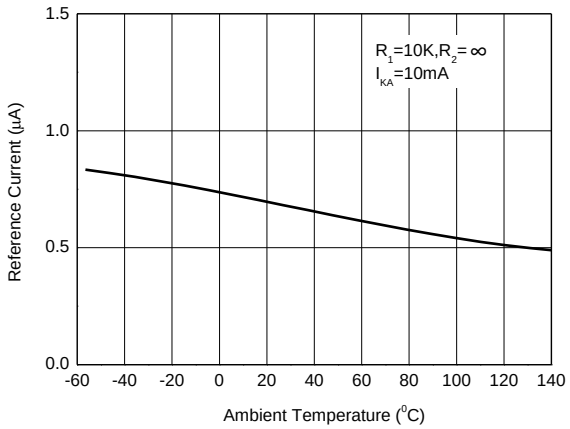


Fig. 7: Cathode Current vs. Cathode Voltage

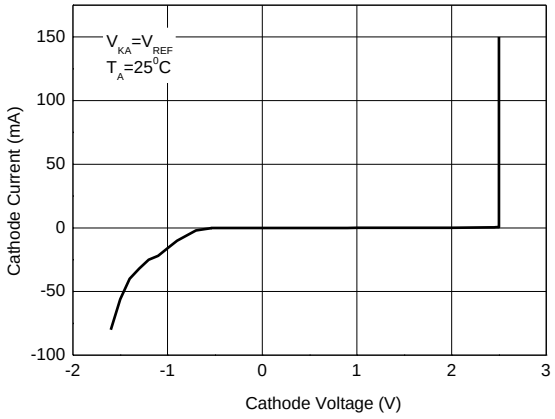


Fig. 8: Cathode Current vs. Cathode Voltage

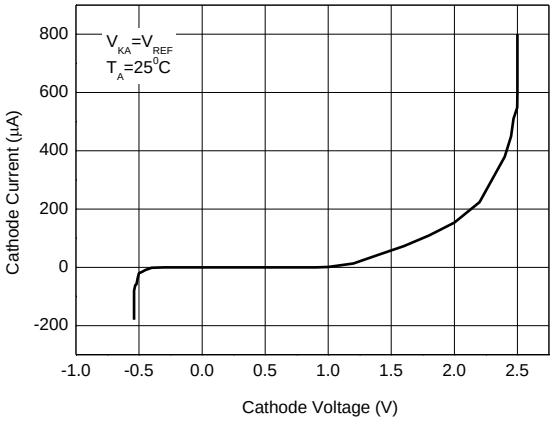


Fig. 9: Off-state Cathode Current vs. Ambient Temperature

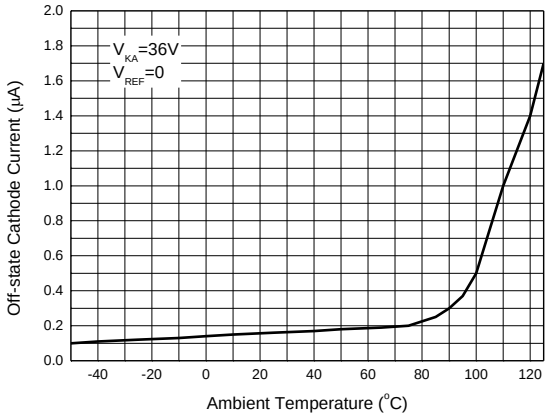
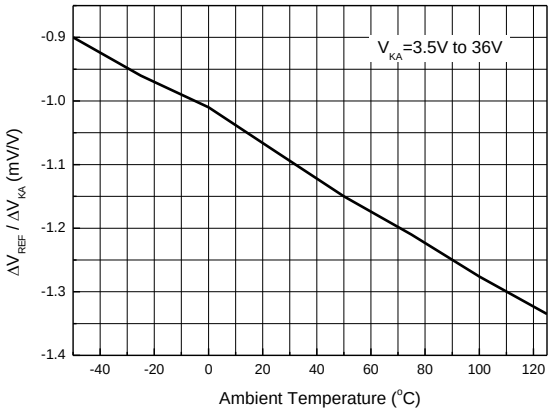
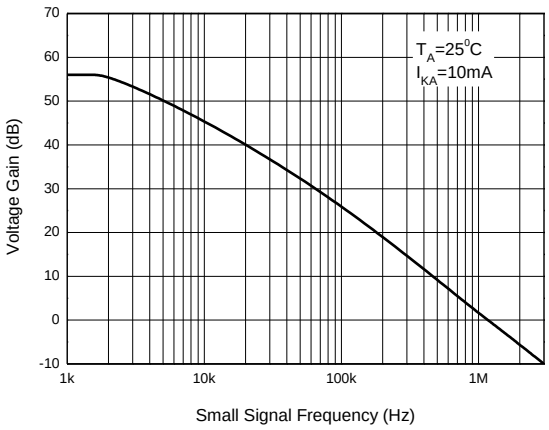


Fig. 10: Ratio of Delta Reference Voltage to Delta Cathode Voltage



Performance Characteristics (continued)

Fig. 11: Small Signal Voltage Gain vs. Frequency



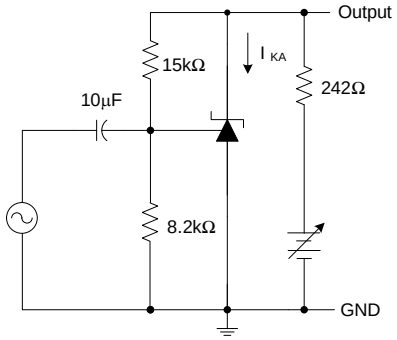
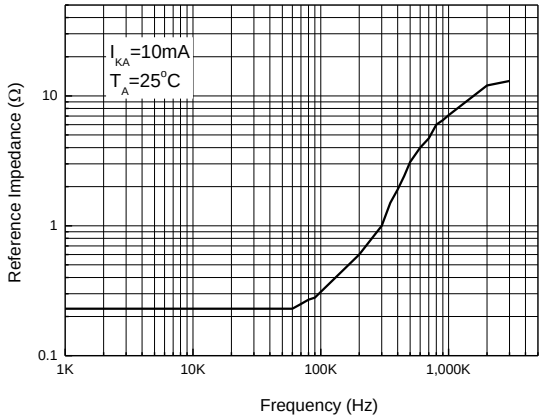


Fig. 12: Reference Impedance vs. Frequency



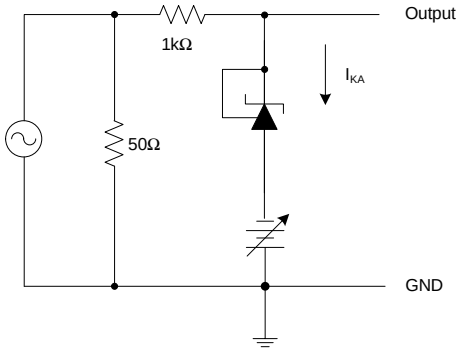
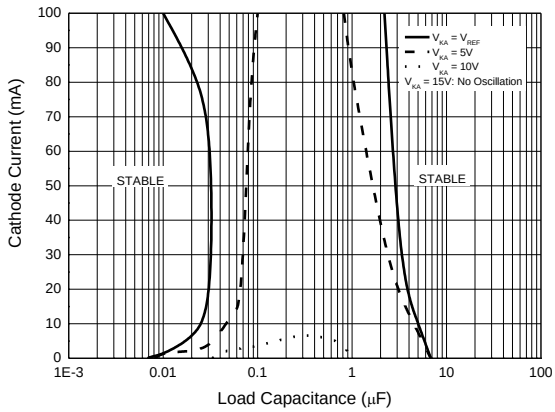
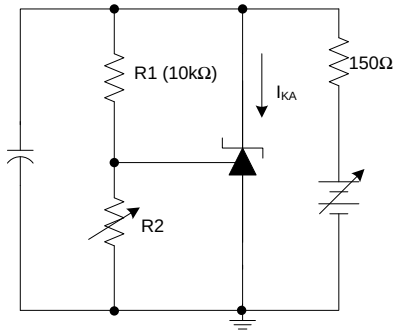


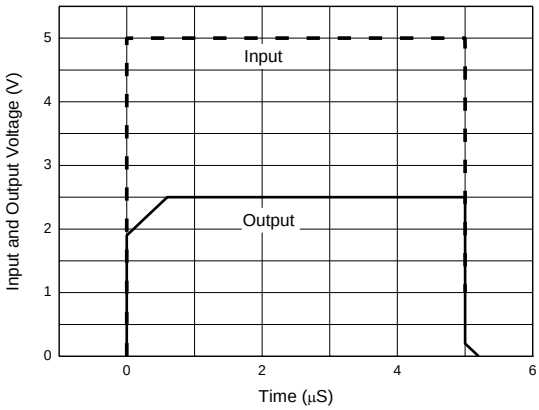
Fig. 13: Stability Boundary Conditions (Cathode Current vs. Load Capacitance)

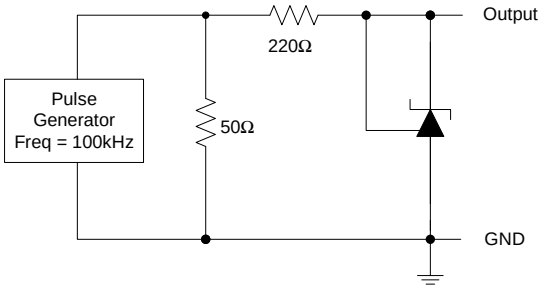




Performance Characteristics (continued)

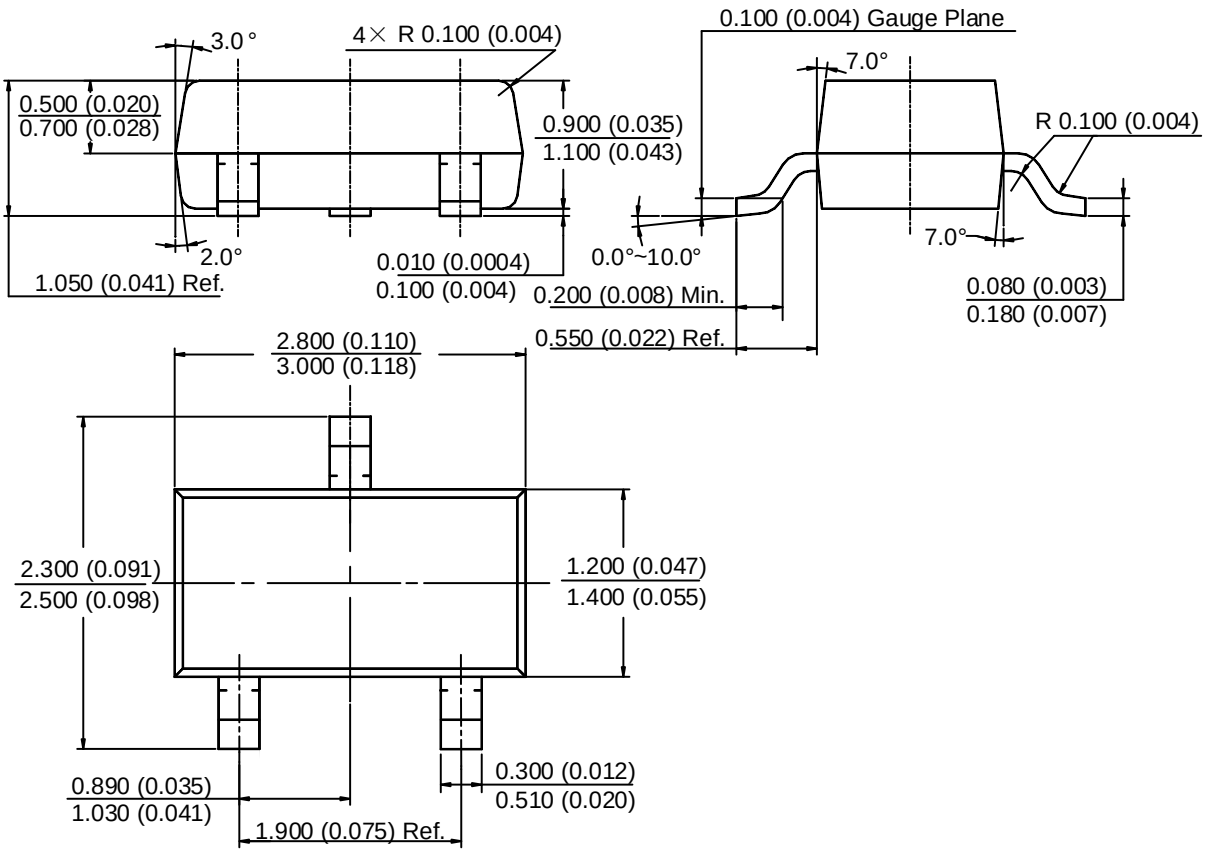
Fig. 14: Pulse Response of Input and Output Voltage





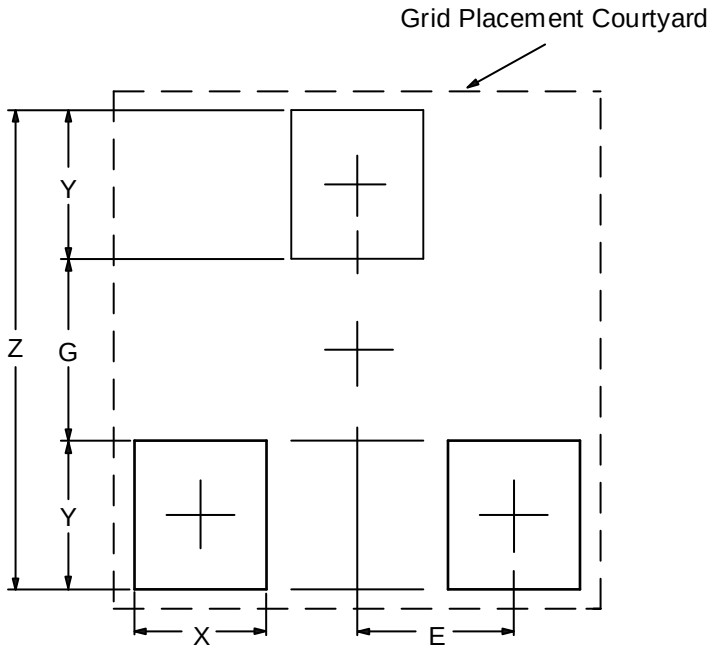
Package Outline (all measurement in mm & inch)

Package Type: SOT-23



Suggested Pad Layout (all measurement in mm & inch)

Package Type: SOT-23



Measurement	Z (mm) / (inch)	G (mm) / (inch)	X (mm) / (inch)	Y (mm) / (inch)	E (mm) / (inch)
Value	2.900 / 0.114	1.100 / 0.043	0.800 / 0.031	0.900 / 0.035	0.950 / 0.037

Revision History

Revision	Release Date	Description
1.0	February 24, 2023	First release of JVR431 Data Sheet
1.0a	April 8, 2023	Pages 1 & 2 refreshed. Fig. 8 annotation were corrected. On pages 1 & 3, T_A corrected to T_J.
1.0b	November 16, 2023	Update PIN notes.