

JVR431

## Shunt Voltage Reference

### Description

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

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.

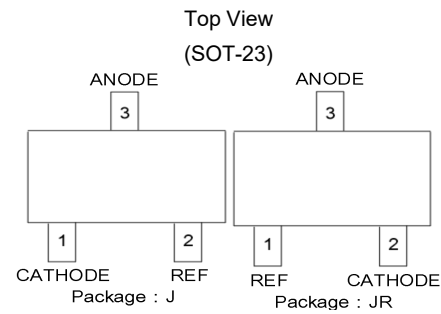
### Applications

- 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

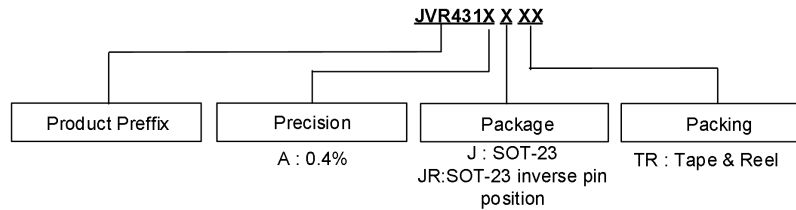
### Features and Benefits

- Programmable output voltage (2.5 ~ 36V) with tolerance at  $\pm 0.4\%$
- 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 ~ 125°C)
- 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

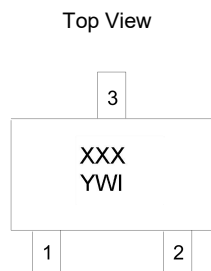


### Ordering Information



Product Name	Package	Marking	MSL	TJ (°C)	Media	Quantity (pcs)
JVR431AJTR	SOT-23	GAB	3	-40 ~ 125	7" T&R	3000
JVR431AJRTR	SOT-23	N2A	3	-40 ~ 125	7" T&R	3000

### Marking Information



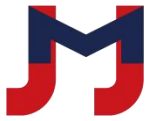
First Line: Marking (see Ordering Information)

Second Line: Date Code

Y: Year

W: Work Week of Molding

I: Code for Assembly & Test Site



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## Diagram of Function Blocks

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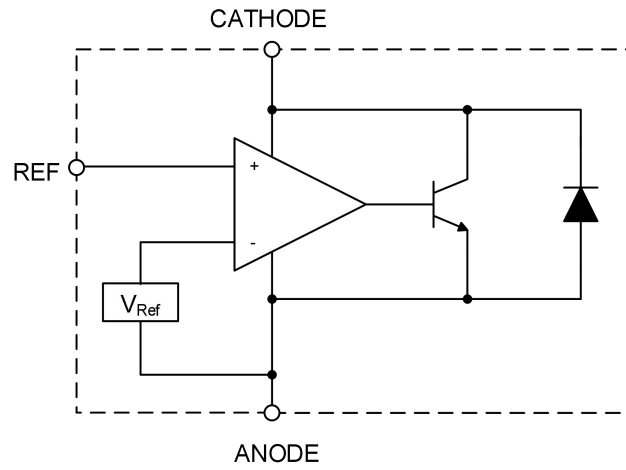
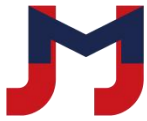


Fig. 1: Function Blocks

**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	°C
$T_{STG}$	Storage Temperature Range	-65 ~ 150	°C
HBM	ESD (Human Body Model)	2000	V

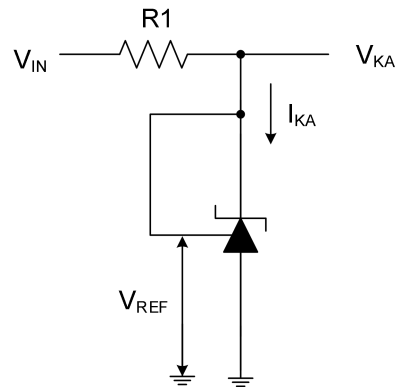
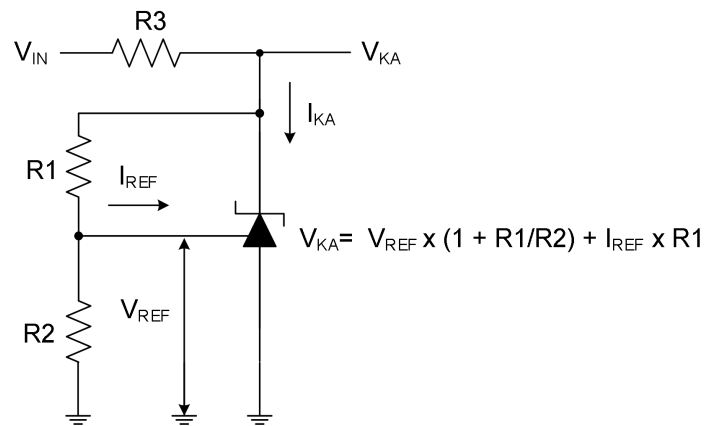
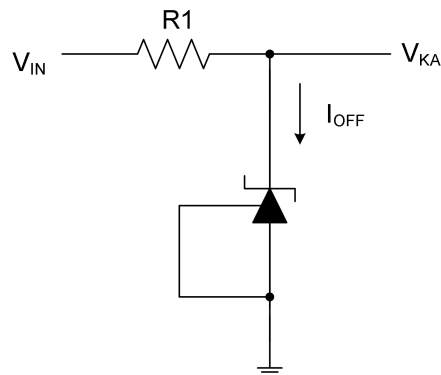
Note \*1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. While these are stress ratings only, functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" are not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

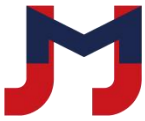
**Recommended Operating Conditions**

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** ( $T_A = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Test Circuit	Min.	Typ.	Max.	Unit		
$V_{REF}$	Reference Voltage	1	$V_{KA} = V_{REF}, I_{KA} = 10\text{mA}$			V		
$\Delta V_{REF}$	Drift of Reference Voltage over Operating Temperature Range	1	$V_{KA} = V_{REF}, I_{KA} = 10\text{mA}$	$T_A = 0 \sim 70^\circ\text{C}$	-	4.5	8.0	mV
				$T_A = -40 \sim 85^\circ\text{C}$	-	4.5	10.0	
				$T_A = -40 \sim 125^\circ\text{C}$	-	4.5	16.0	
$\Delta V_{REF} / \Delta V_{KA}$	Change in Reference Voltage vs. Change in Cathode Voltage	2	$I_{KA} = 10\text{mA}$	$\Delta V_{KA} = 10\text{V} \sim V_{REF}$	-	-1.0	-2.7	mV / V
				$\Delta V_{KA} = 36 \sim 10\text{V}$	-	-0.5	-2.0	
$I_{REF}$	Reference Current	2	$I_{KA} = 10\text{mA}, R1 = 10\text{k}\Omega, R2 = \infty$			$\mu\text{A}$		
$\Delta I_{REF}$	Drift of Reference Current over Operating Temperature Range	2	$I_{KA} = 10\text{mA}, R1 = 10\text{k}\Omega, R2 = \infty$ $T_A = -40 \sim 125^\circ\text{C}$			$\mu\text{A}$		
$I_{KA\_Min}$	Minimum Cathode Current for Regulation	1	$V_{KA} = V_{REF}$			mA		
$I_{KA\_OFF}$	OFF-state Cathode Current	3	$V_{KA} = 36\text{V}, V_{REF} = 0\text{V}$			$\mu\text{A}$		
$Z_{KA}$	Dynamic Impedance	1	$V_{KA} = V_{REF}, I_{KA} = 1 \sim 100\text{mA}$ Freq. $\leq 1.0\text{kHz}$			$\Omega$		
$\theta_{JC}$	Thermal Resistance	-	SOT-23			°C / 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

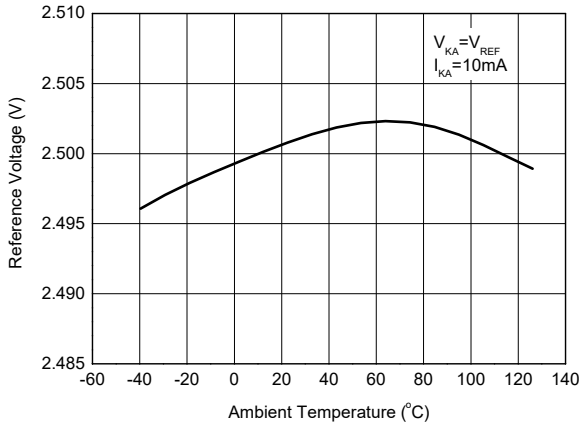


Fig. 6: Reference Current vs. Ambient Temperature

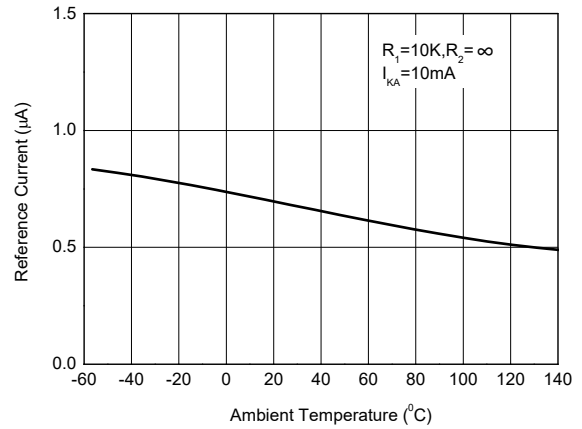


Fig. 7: Cathode Current vs. Cathode Voltage

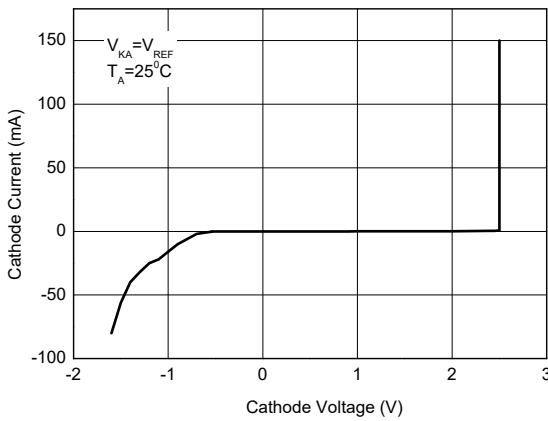


Fig. 8: Cathode Current vs. Cathode Voltage

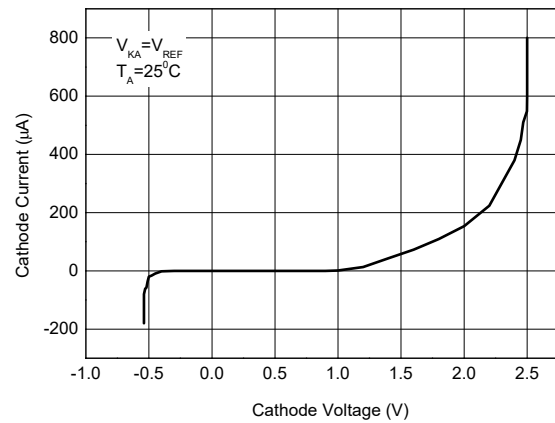


Fig. 9: Off-state Cathode Current vs. Ambient Temperature

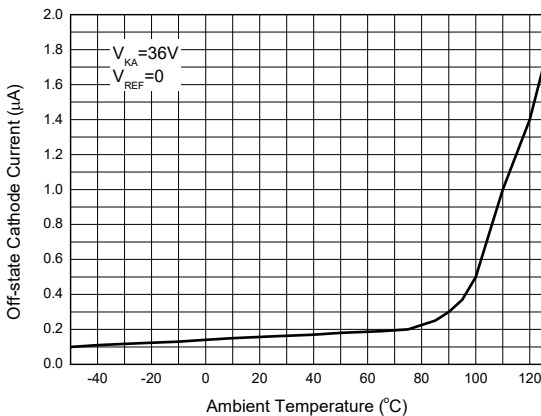
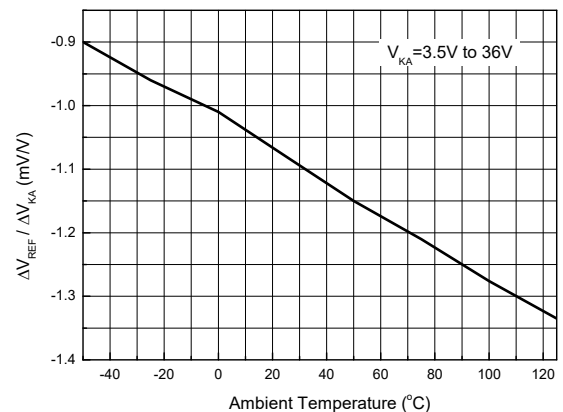
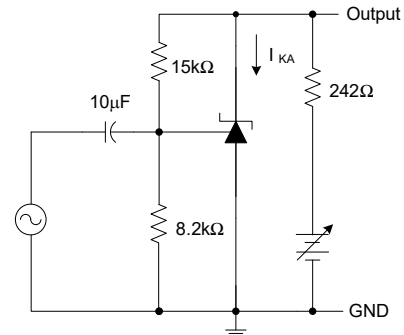
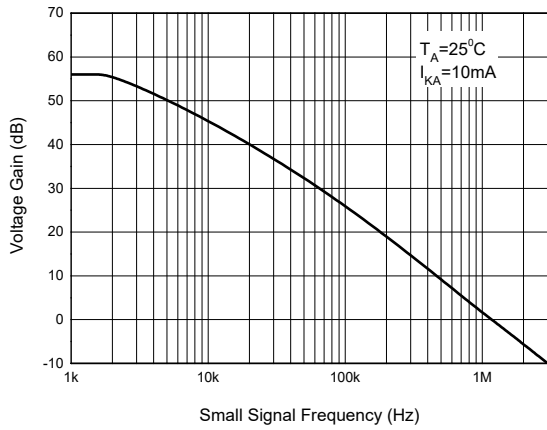
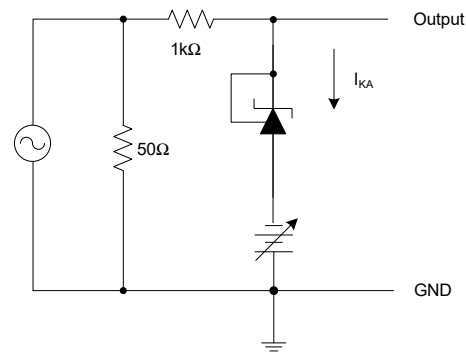
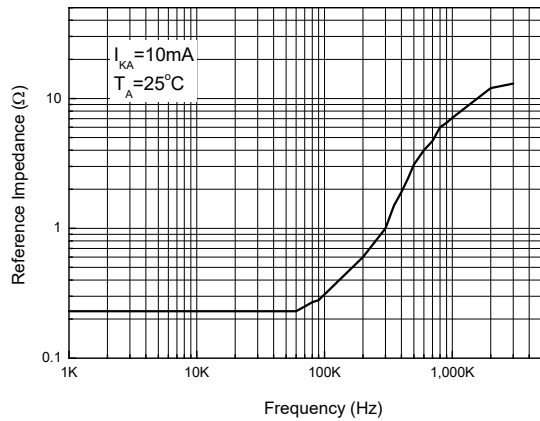
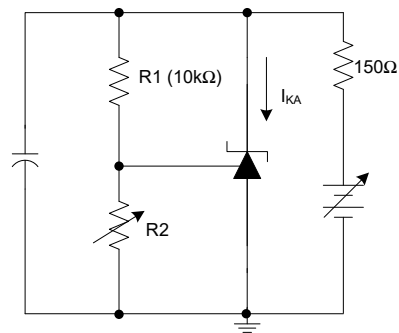
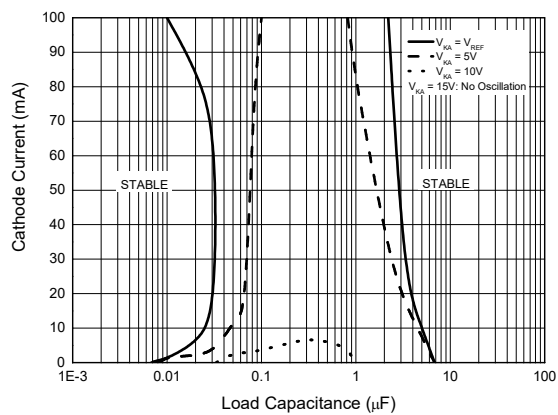
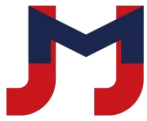


Fig. 10: Ratio of Delta Reference Voltage to Delta Cathode Voltage



**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)**


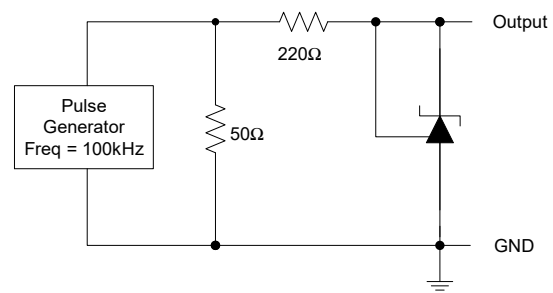
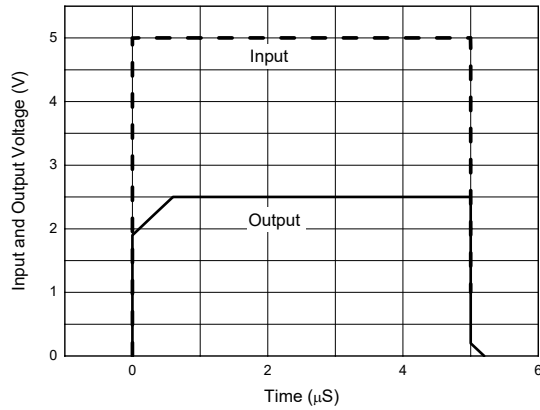


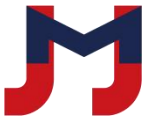
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## Performance Characteristics (continued)

Fig. 14: Pulse Response of Input and Output Voltage



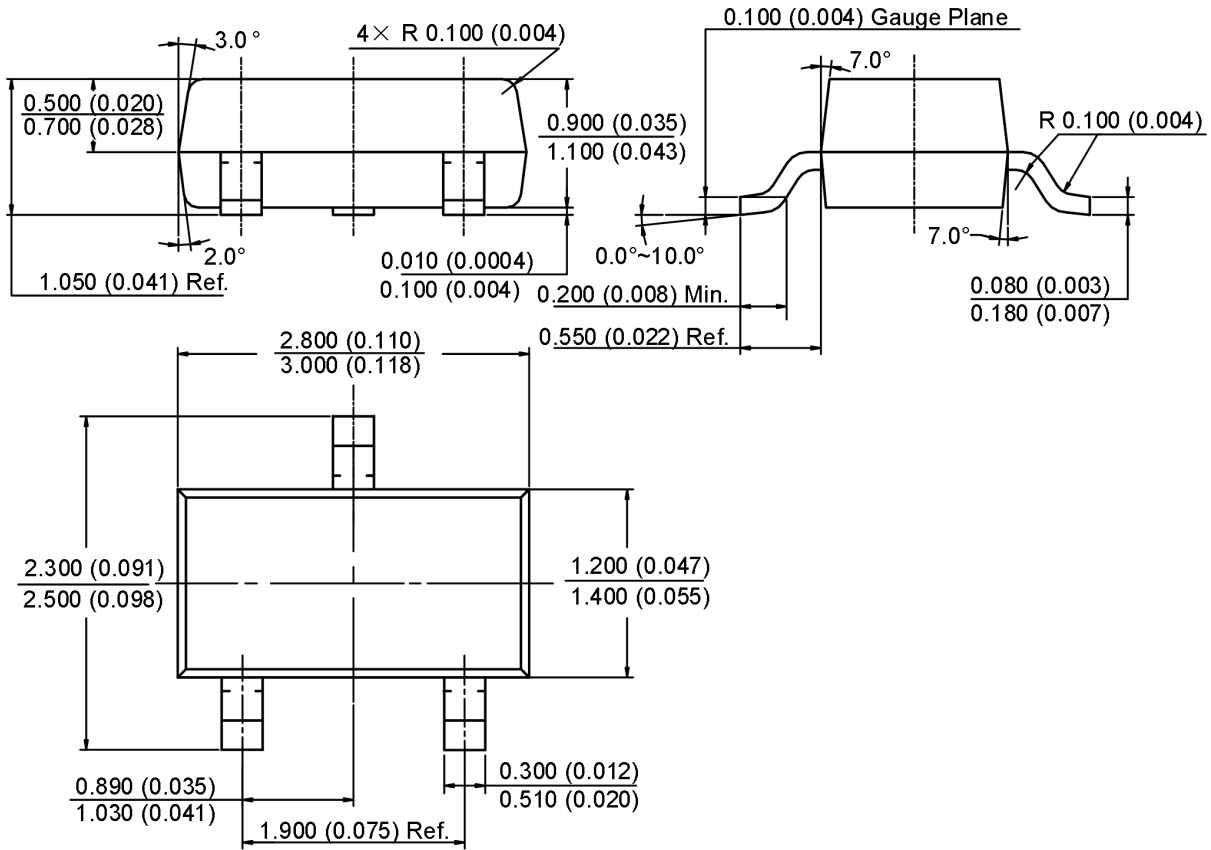


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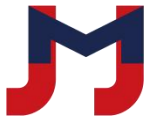
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**Package Outline** (all measurement in mm & inch)

Package Type: SOT-23





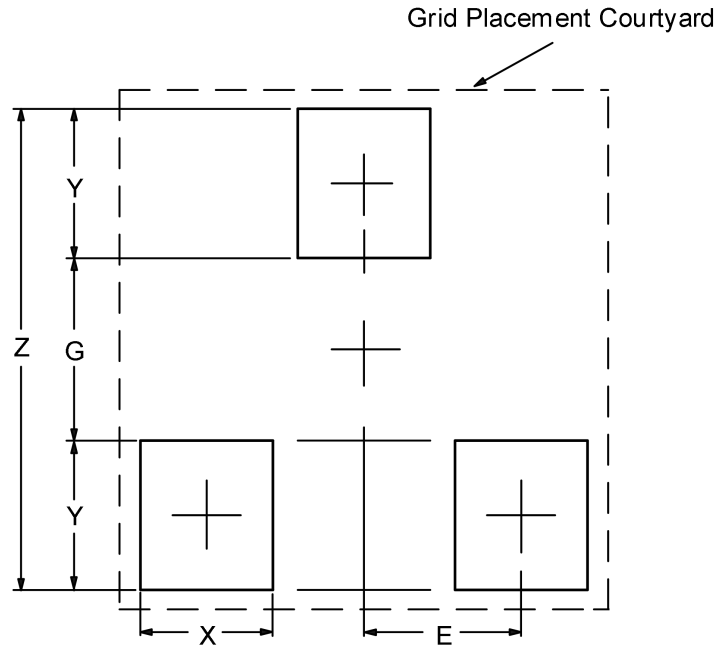


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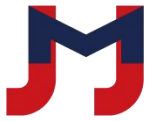
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**Suggested Pad Layout** (all measurement in mm & inch)

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



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## 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 $T_J$ .
1.1a	March 19, 2024	Add SOT-23 inverse pin position package

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