Lead-free Green

±0.4% Shunt Voltage Regulator

Description

The YJ431E is a high-precision shunt voltage regulator with outstanding thermal stability over wide operating junction temperature range between -40ºC and 125ºC.

The device is designed to turn ON rapidly. It features low output impedance and temperature coefficient. As such, while the device can respond promptly to sudden changes in the load condition, the V_{REF} output can be kept steady. In CE / industrial / automotive applications, YJ431E 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, SOT-23R.

Features and Benefits

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

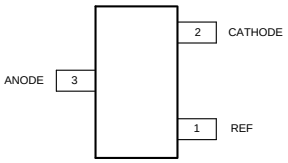
Applications

- Voltage regulation for wireless access modules
- Mainboards in Industrial robotics, remote networked clients, A/EIoT smart terminals
- Motherboards in telecommunication base station, power boards in commercial transportation and after-market add-ons

Pin Assignment

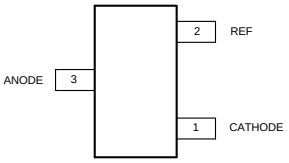
SOT-23

(Top View)



SOT-23R

(Top View)



Ordering Information

YJ431E X

Product Prefix

Package

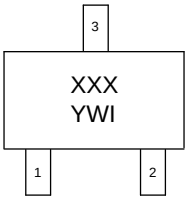
S: SOT-23
SR: SOT-23R

Product Name	Package	Marking	MSL	T_J (ºC)	Media	Quantity (pcs)
YJ431ES	SOT-23	N1A	3	-40 ~ 125	7" T&R	3,000
YJ431ESR	SOT-23R	NpA				

Marking Information

SOT-23

(Top View)

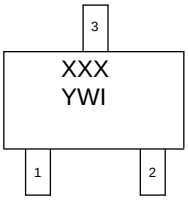


First Horizontal Line: Marking (see *Ordering Information*)

Second Line (Horizontal or Vertical): Date Code
Y: Year of Molding
W: Work-week of Molding
I: Internal Code

SOT-23R

(Top View)



Functional Blocks

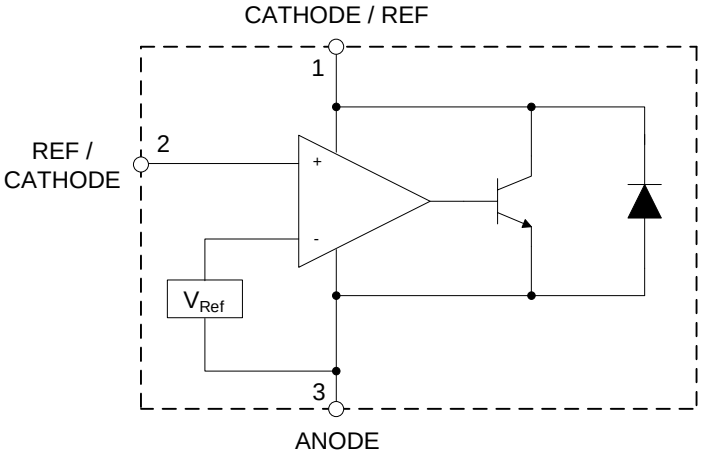


Fig. 1: Diagram of Internal Functional Blocks

Absolute Maximum Ratings *1 (All measurements were made at T_A = 25°C unless otherwise stated)

Symbol	Parameter	Conditions	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
V_{ESD}	ESD (Human Body Model)	2	kV

Notes 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" over extended periods may adversely affect the 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	-40	125	ºC

Electrical Characteristics

Test Conditions: T_A = 25°C applicable to the following measurements unless otherwise stated.

Symbol	Parameter	Test Circuit	Test Conditions		Min.	Typ.	Max.	Unit
V_{REF}	Reference Voltage	1	V_{KA} = V_{REF}; I_{KA} = 10mA		2.490	2.500	2.510	V
ΔV_{REF}	Drift of Reference Voltage vs. 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 ~ 105ºC		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} = 36V - 10V		-0.5	-2.0	
I_{REF}	Reference Current	2	I_{KA} = 10mA; R1 = 10kΩ; R2 = ∞Ω		-	0.7	4.0	μA
ΔI_{REF}	Drift of Reference Current over Operating Junction Temperature	2	I_{KA} = 10mA; R1 = 10kΩ; R2 = ∞Ω T_A = -40 ~ 105ºC		-	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 Frequency ≤ 1kHz		-	0.15	0.50	Ω

Electrical Characteristics (Continued)

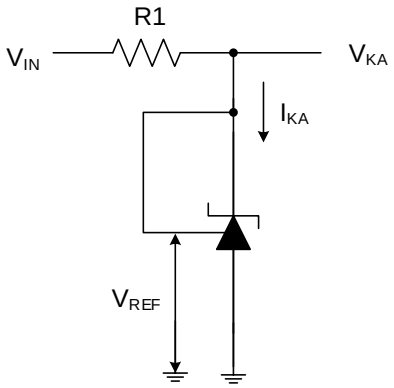


Fig. 2: Test Circuit 1 for $V_{KA} = V_{REF}$

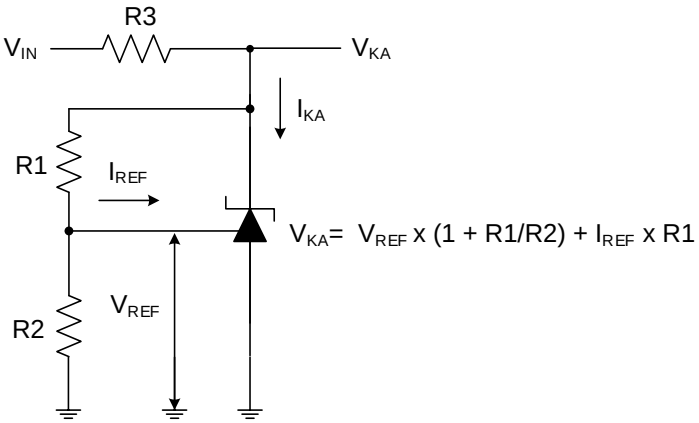


Fig. 3: Test Circuit 2 for $V_{KA} > V_{REF}$

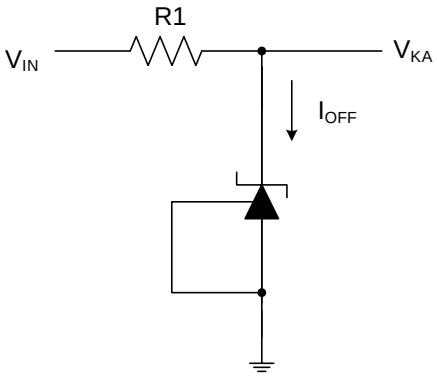


Fig. 4: Test Circuit 3 for I_{OFF}

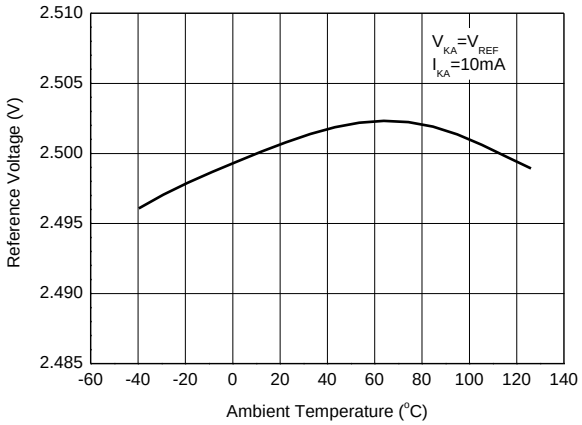
Thermal Properties

Test Conditions: Device mounted on FR-4 substrate, 2-layer PCB, 2oz copper, with minimum recommended cooling pad to dissipate heat

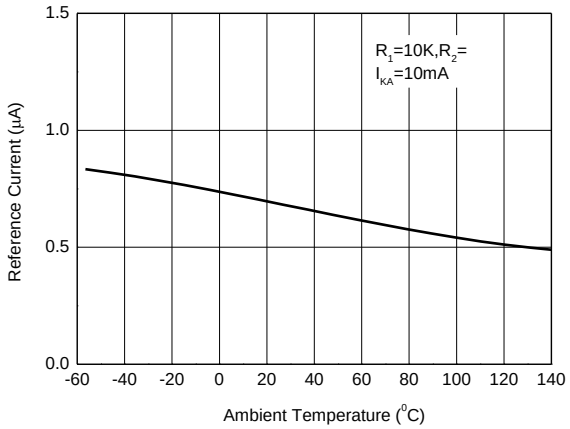
Symbol	Parameter	Conditions	Rating	Unit
$R_{\Theta JA}$	Thermal Resistance (junction-to-case)	SOT-23	135	°C/W
		SOT-23R	135	

Typical Performance Characteristics

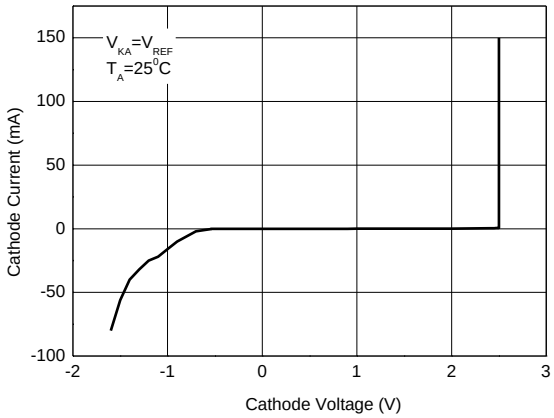
Graph 1: Reference Voltage vs. Ambient Temperature



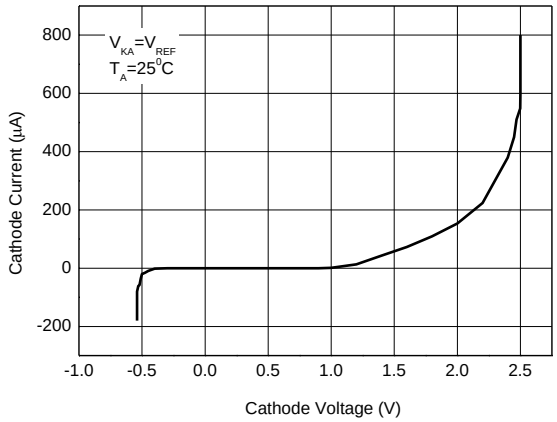
Graph 2: Reference Current vs. Ambient Temperature



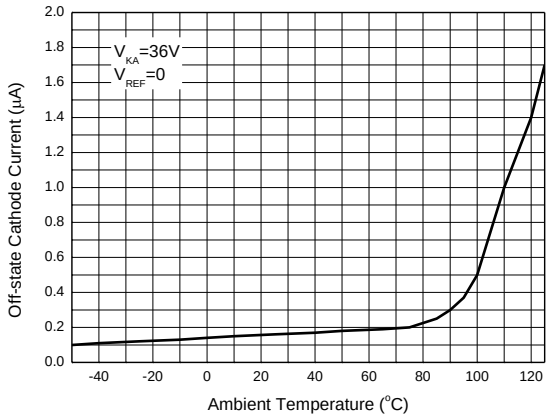
Graph 3: Cathode Current vs. Cathode Voltage



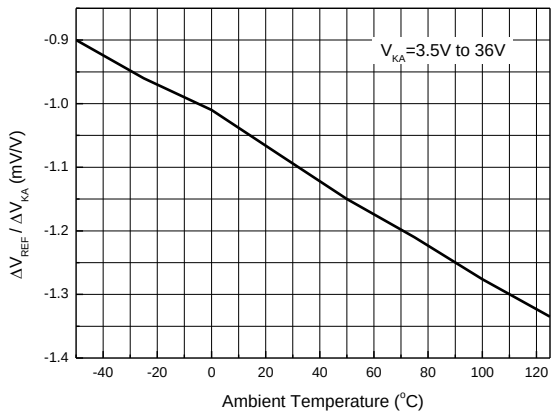
Graph 4: Cathode Current vs. Cathode Voltage



Graph 5: Off-state Cathode Current vs. Ambient Temperature

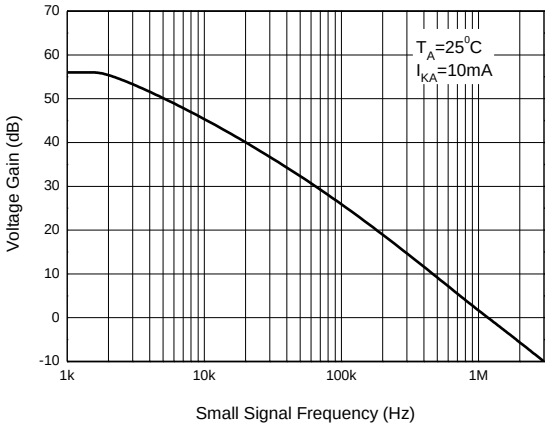


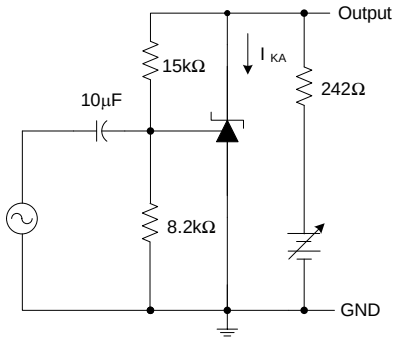
Graph 6: Ratio of Δ Reference Voltage to Δ Cathode Voltage



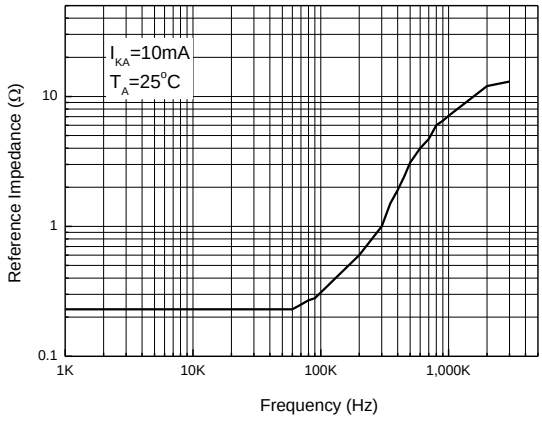
Performance Characteristics (Continued)

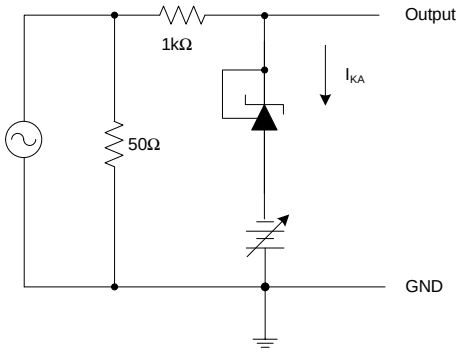
Graph 7: Small Signal Voltage Gain vs. Frequency



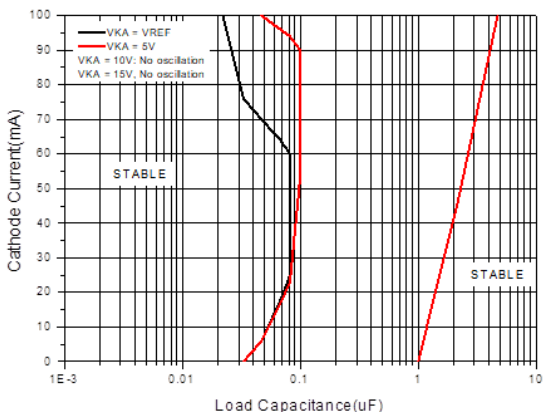


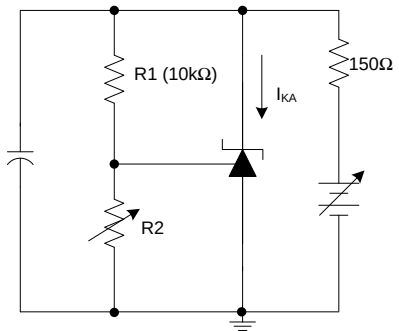
Graph 8: Reference Impedance vs. Frequency





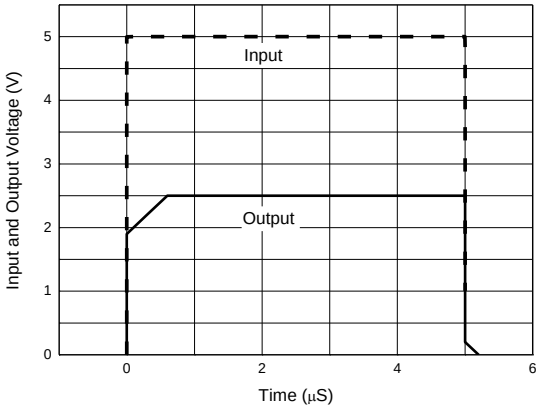
Graph 9: Stability Boundary Conditions (Cathode Current vs. Load Capacitance)

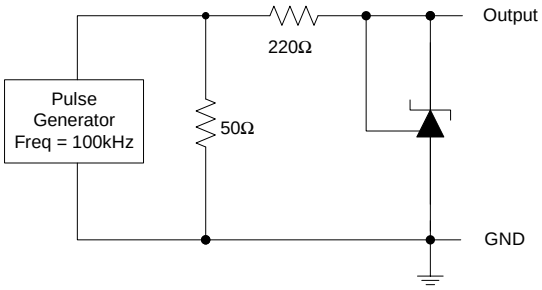




Performance Characteristics (continued)

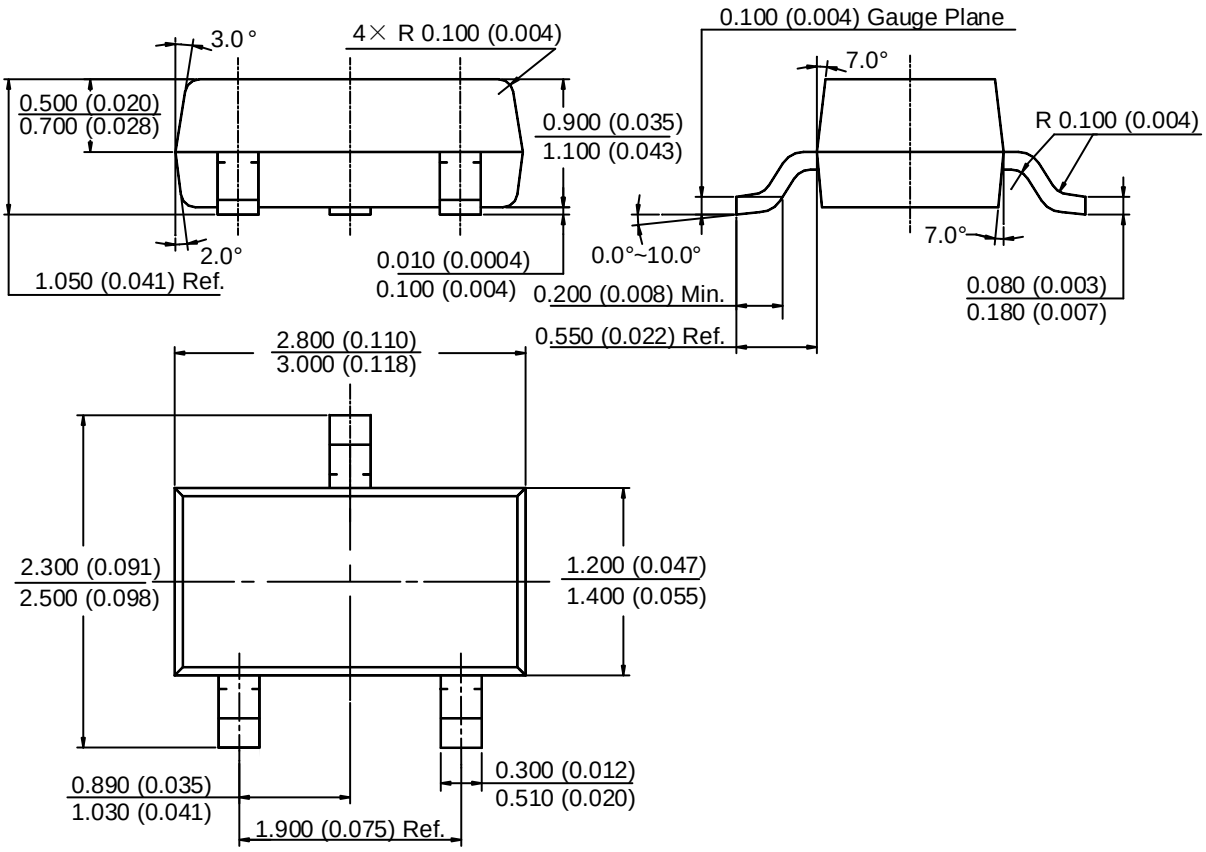
Graph 10: Pulse Response of Input and Output Voltage





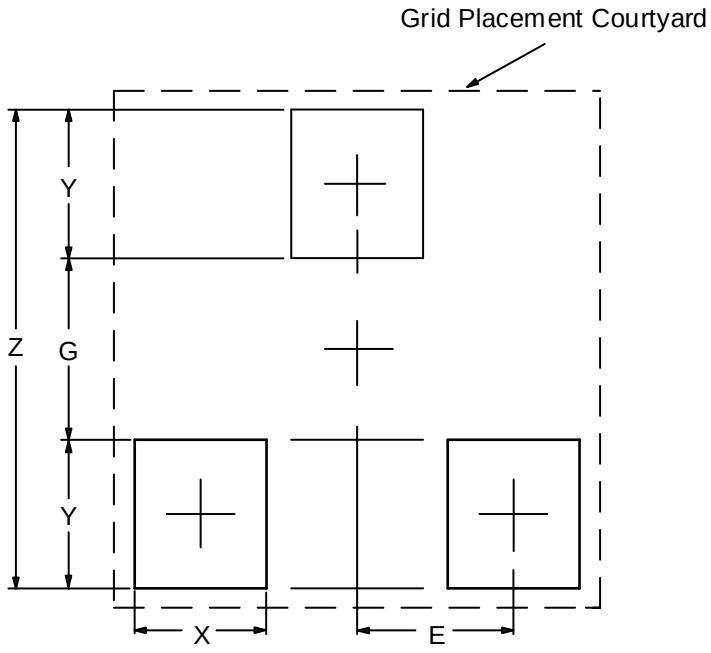
Package Outline (All measurements in mm & inch)

Package Type: SOT-23 (J1), SOT-23R (J1)



Suggested Pad Layout (All measurements in mm & inch)

Package Type: SOT-23 (J1), SOT-23R (J1)



Dimension	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

Disclaimer

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