

Low Power Compact Precision Voltage Reference

Features

- Excellent Specified Drift Performance
-40 °C to +125 °C: 30 ppm/°C max
- High Accuracy: 0.2% max
- VIN = 5.5 V max
- Low Dropout: 5 mV
- High Output Current: 20 mA
- Low I_Q: 130 μA
- Tiny 3-Pin SOT23 Package

Applications

- Temperature and Pressure Transmitters
- Portable, Battery-Powered Equipment
- Data Acquisition Systems
- Medical Equipment
- Power Inverters

General Description

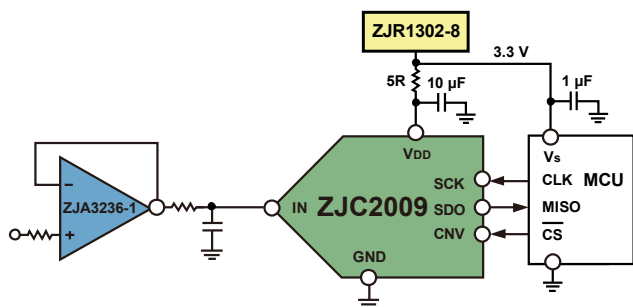
The ZJR1302 is a precision, low-power, low-dropout voltage, compact reference family available in a tiny 3-pin SOT23 package. The ZJR1302 offers excellent temperature drift and initial accuracy while operating at a quiescent current of 130 μA.

The low power consumption and the relatively high precision make the ZJR1302 very attractive for loop-powered industrial applications such as pressure and temperature transmitter applications. The ZJR1302 requires a load capacitor valued between 0.1 μF and 20 μF for stability. The ZJR1302 is specified over the extended industrial temperature range of -40 °C to +125 °C.

The ZJR1302 operates with supplies within 5 mV of output voltage under zero-load conditions. Engineers can use the low dropout, small size, and low power consumption of the ZJR1302 in portable and battery-powered applications.

Model	Output Voltage (V)
ZJR1302-2	2.048
ZJR1302-9	2.5
ZJR1302-3	3
ZJR1302-8	3.3
ZJR1302-4	4.096

Typical Application



Typical Characteristics

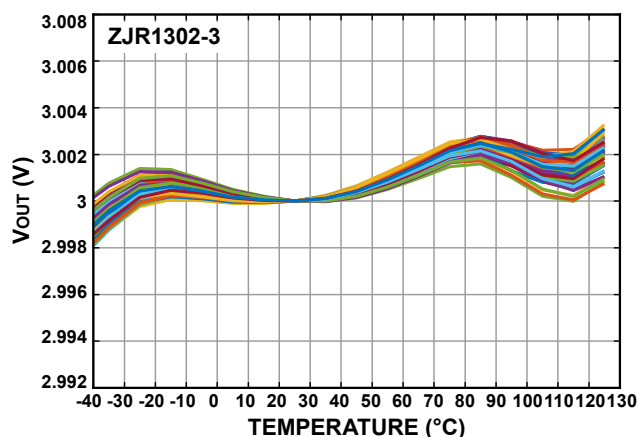


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Version (Release A)¹

Revision History

Dec. 2024 — Release A

Oct. 2024 — Initial

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Pin Configurations and Function

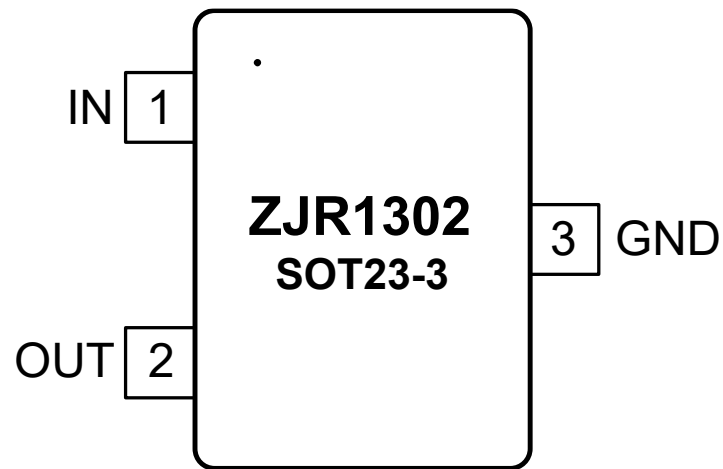


Figure 1. ZJR1302 Pin Configuration (3-lead SOT23)

Mnemonic	Pin No.	I/O ¹	Description
IN	1	AI	Input supply voltage.
OUT	2	AO	Reference output voltage.
GND	3	--	Ground.

¹ AI: Analog Input; P: Power; AO: Analog Output.

Absolute Maximum Ratings ¹

Parameter	Rating
Total Voltage (Across Any 2 Pins)	±5.5 V
Operating Temperature Range	-40 °C to 125 °C
Storage Temperature Range	-65 °C to 150 °C
Junction Temperature Range	-65 °C to 150 °C
Lead Temperature, Soldering (10 sec)	300 °C
ESD Rating (ESD) ²	
Human Body Model (HBM) ³	8 kV
Charge Device Model (CDM) ⁴	1 kV

Thermal Resistance ⁵

Package Type	θ_{JA}	θ_{JC}	Unit
3-lead SOT23	230	146	°C/W

¹ These ratings apply at 25 °C, unless otherwise noted.

Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

² Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry,

damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

³ ANSI/ESDA/JEDEC JS-001 Compliant

⁴ ANSI/ESDA/JEDEC JS-002 Compliant

⁵ θ_{JA} addresses the conditions for soldering devices onto circuit boards to achieve surface mount packaging.

Specifications

The ● denotes the specification which apply over the full operating temperature range, otherwise specifications are at $T_A = 25\text{ }^{\circ}\text{C}$, $V_{IN} = 2.8\text{ V}$ to 5.5 V , $I_{LOAD} = 0\text{ mA}$, $C_L = 0.1\text{ }\mu\text{F}$, unless otherwise noted.

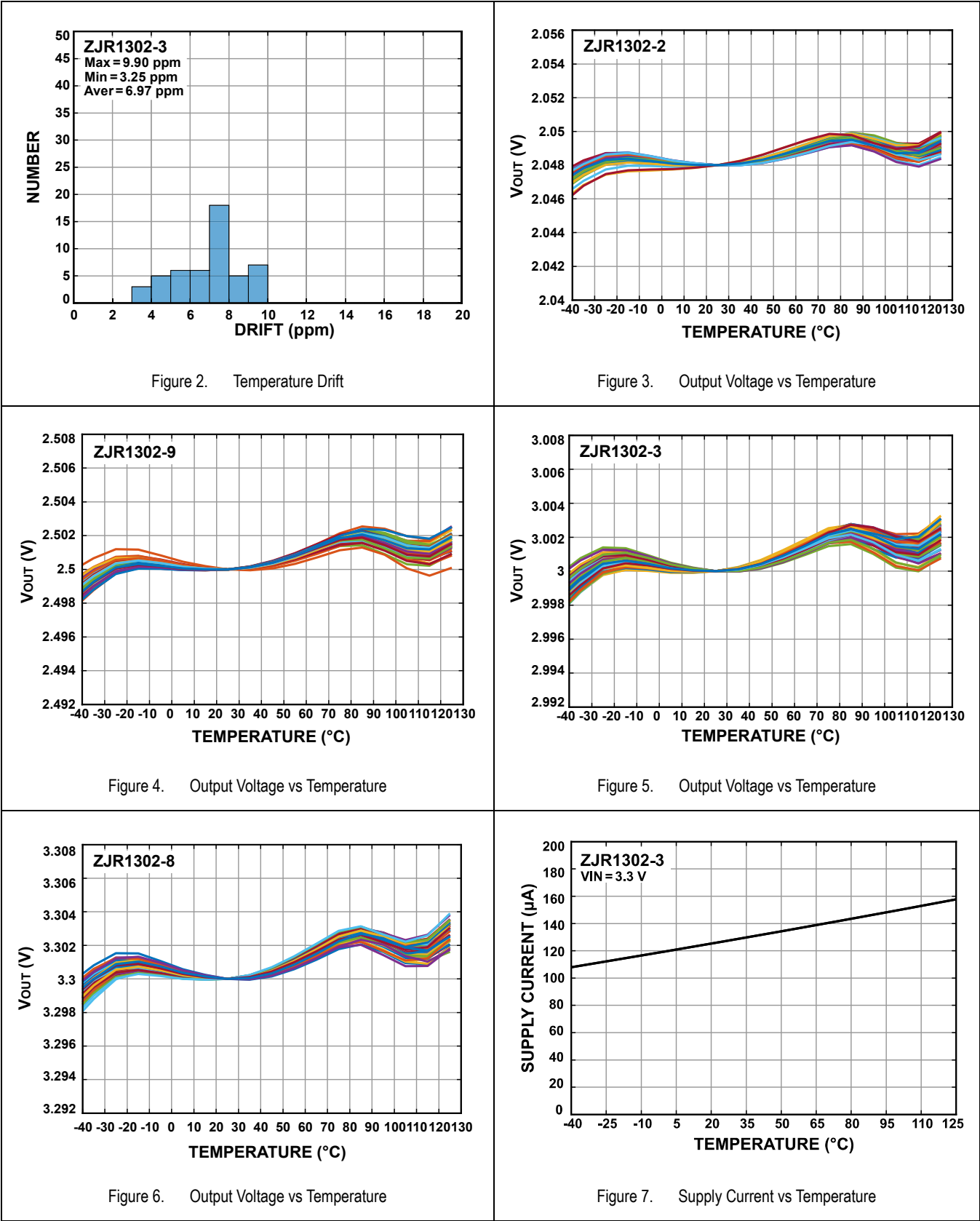
Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Output Voltage	V_{OUT}	ZJR1302-2		2.048		V
		ZJR1302-9		2.5		V
		ZJR1302-3		3		V
		ZJR1302-8		3.3		V
		ZJR1302-4		4.096		V
Initial Accuracy			-0.2		+0.2	%
Temperature Coefficient	TC_{VOUT}	●		7	30	ppm/ $^{\circ}\text{C}$
Voltage Noise		0.1 Hz to 10 Hz		2.5		ppm _{P-P}
Voltage Noise Density	e_n	ZJR1302-2, 1 kHz		167		nV/ $\sqrt{\text{Hz}}$
		ZJR1302-9, 1 kHz		200		nV/ $\sqrt{\text{Hz}}$
		ZJR1302-3, 1 kHz		250		nV/ $\sqrt{\text{Hz}}$
		ZJR1302-8, 1 kHz		268		nV/ $\sqrt{\text{Hz}}$
		ZJR1302-4, 1 kHz		320		nV/ $\sqrt{\text{Hz}}$
Line Regulation		ZJR1302-2: $V_{IN} = 2.8\text{ V} \sim 5.5\text{ V}$ Others: $V_{IN} = V_{OUT} + 0.3\text{ V} \sim 5.5\text{ V}$	●	2 5	10	$\mu\text{V/V}$
Load Regulation		$-10\text{ mA} < I_{LOAD} < 10\text{ mA}$	●	1.5 5	10	$\mu\text{V/mA}$
Supply Voltage	V_{IN}	ZJR1302-2 ¹		2.8	5.5	V
		Others ¹		$V_{OUT} + 0.3$	5.5	V
Dropout Voltage	$V_{IN} - V_{OUT}$	$I_{LOAD} = 0$ ²	●	5		mV
		$I_{LOAD} = 5\text{ mA}$ ²	●	50		mV
Supply Current	I_{SY}	●		130		μA
Short Circuit Current	I_{SC}	$V_{OUT} = \text{GND or } V_{IN}$		16	20	mA
Temperature Range		Specified		-40	125	$^{\circ}\text{C}$

¹ Specified for performance.

² Functional, not Specified for performance (T_c , etc).

Typical Performance Characteristics

At VIN = 5 V, TA = 25 °C, unless otherwise noted.



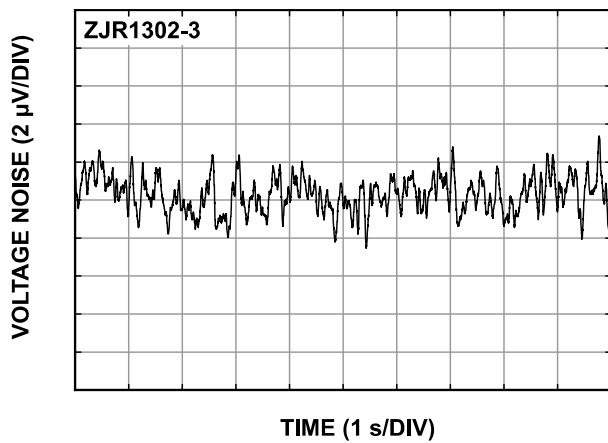


Figure 8. Voltage Noise (0.1 Hz to 10 Hz)

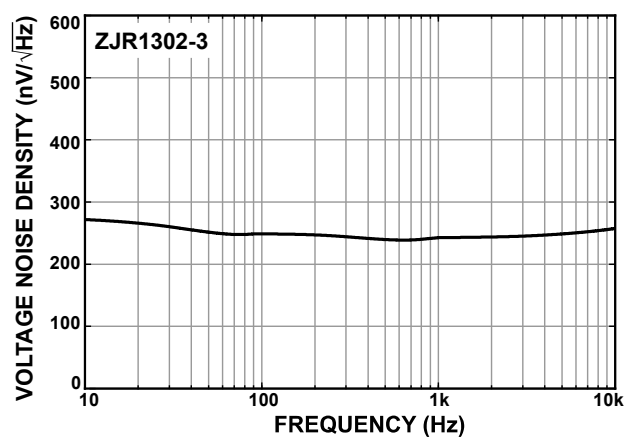


Figure 9. Noise Density vs. Frequency

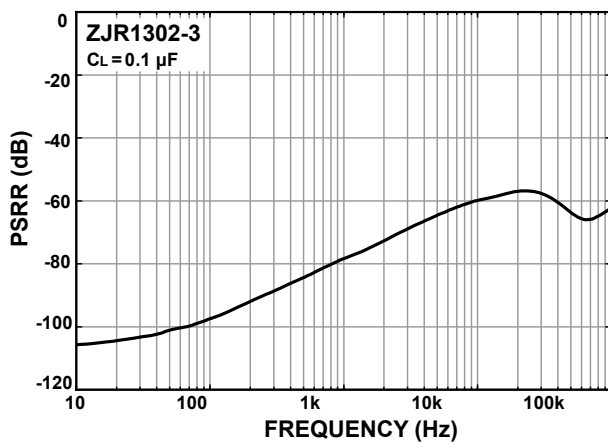


Figure 10. Power Supply Rejection Ratio vs. Frequency

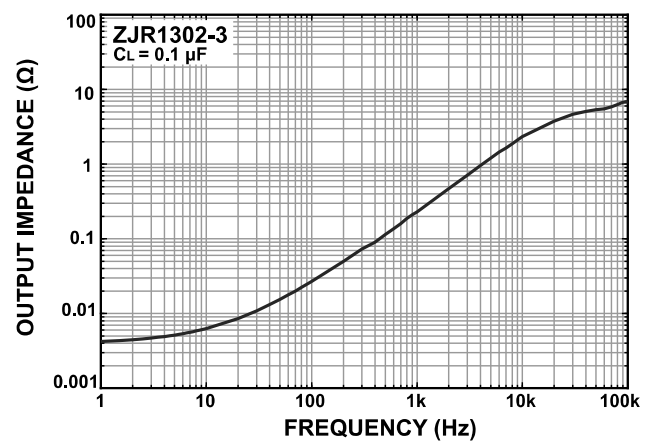


Figure 11. Output Impedance vs. Frequency

Applications and Implementation

NOTE

Information in the following sections is not part of the ZJW component specification, and ZJW does not warrant its accuracy or completeness. Customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Application Information

Figure 12 is the basic connection of ZJR1302. Other than a $0.1\ \mu\text{F}$ capacitor at the output, no further component is needed for normal operation. However, in actual system, the power supply may change rapidly. Adding a $1\ \mu\text{F}$ to $10\ \mu\text{F}$ capacitor at the input can help the performance of the voltage reference. The output capacitance ranges from $0.1\ \mu\text{F}$ to $10\ \mu\text{F}$. Too big capacitive load can cause output oscillation.

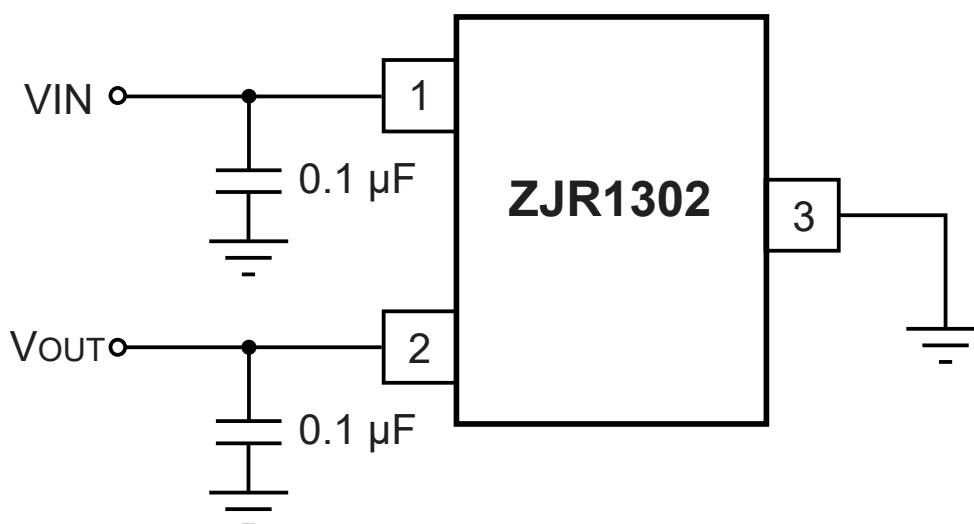


Figure 12. Typical Connections for Operating ZJR1302

Outline Information

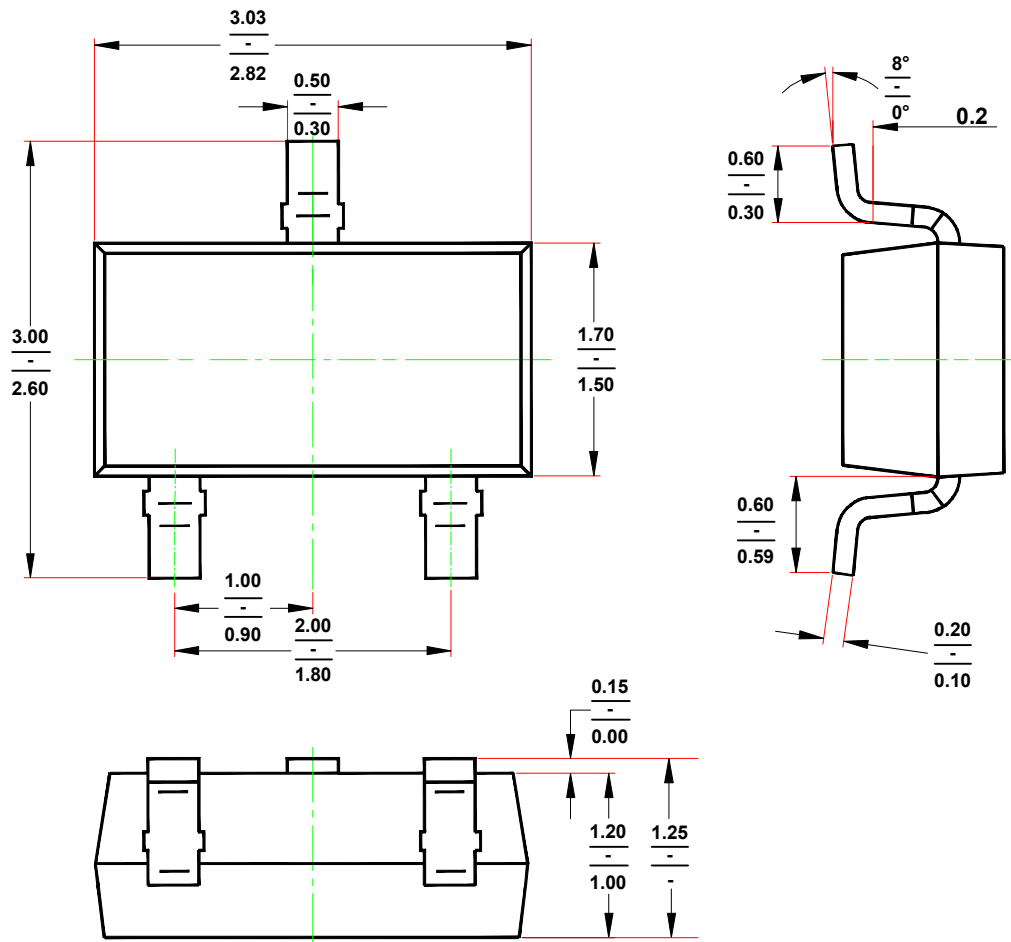


Figure 13. 3-Lead SOT23 Package Dimensions shown in millimeters

Model	Orderable Device	Output Voltage (V)	Max TempCo (ppm/°C)	Temperature Range (°C)	Package	External Package
ZJR1302-2	ZJR1302-2AURBR	2.048	30	-40 to +125	SOT23-3	7"reel
ZJR1302-9	ZJR1302-9AURBR	2.5				
ZJR1302-3	ZJR1302-3AURBR	3				
ZJR1302-8	ZJR1302-8AURBR	3.3				
ZJR1302-4	ZJR1302-4AURBR	4.096				

ZJXXXXX X X X X Q1

Q1: Automotive Grade

External Package: T = Tube; R = TapeReel

Temperature Range: A = -40 °C to 125 °C Automotive Grade 1, B = -40 °C to 125 °C; E = -40 °C to 85 °C

Number of Pins: R = 3; K = 5; T = 6, A = 8; B = 10; D = 14; E = 16; P = 20

Package Type: S = SOIC; U = MSOP, TSSOP, SOT; T = DFN, QFN; X = SC70

Grade: B grade is better than A grade

Base: R = Voltage reference; A = Amplifier; C = Data Converter; G = Switches and Multiplexers; M = Others

Related Parts

Part Number	Description	Comments
ADC		
ZJC2020	20-bit 350 kSPS SAR ADC	Fully differential input, SINAD 101.4 dB, THD -118 dB
ZJC2000/2010	18-bit 400 kSPS/200 kSPS SAR ADC	Fully differential input, SINAD 99.3 dB, THD -113 dB
ZJC2001/2011	16-bit 500 kSPS/250 kSPS SAR ADC	Fully differential input, SINAD 95.3 dB, THD -113 dB
ZJC2002/2012	16-bit 500 kSPS/250 kSPS SAR ADC	Pseudo-differential unipolar input, SINAD 91.7 dB, THD -105 dB
ZJC2003/2013		Pseudo-differential bipolar input, SINAD 91.7 dB, THD -105 dB
ZJC2004/2014	18-bit 400 kSPS/200 kSPS SAR ADC	Pseudo-differential unipolar input, SINAD 94.2 dB, THD -105 dB
ZJC2005/2015		Pseudo-differential bipolar input, SINAD 94.2 dB, THD -105 dB
ZJC2007/2017	14-bit 600 kSPS/300 kSPS SAR ADC	Pseudo-differential unipolar input, SINAD 85 dB, THD -105 dB
ZJC2008/2018		Pseudo-differential bipolar input, SINAD 85 dB, THD -105 dB
ZJC2009	Small size, 12-bit 1 MSPS SAR ADC	Single-ended input, SOT23-6, 2.3 V to 5 V, SINAD 73 dB, THD -89 dB
ZJC2100/1-18	18-bit 400 kSPS/200 kSPS 4-ch differential SAR ADC, SINAD 99.3 dB, THD -113 dB	
ZJC2100/1-16	16-bit 500 kSPS/250 kSPS 4-ch differential SAR ADC, SINAD 95.3 dB, THD -113 dB	
ZJC2102/3-18	18-bit 400 kSPS/200 kSPS 8-ch pseudo-differential SAR ADC, SINAD 94.2 dB, THD -105 dB	
ZJC2102/3-16	16-bit 500 kSPS/250 kSPS 8-ch pseudo-differential SAR ADC, SINAD 91.7 dB, THD -105 dB	
ZJC2102/3-14	14-bit 600 kSPS/300 kSPS 8-ch pseudo-differential SAR ADC, SINAD 85 dB, THD -105 dB	
ZJC2104/5-18	18-bit 400 kSPS/200 kSPS 4-ch pseudo-differential SAR ADC, SINAD 94.2 dB, THD -105 dB	
ZJC2104/5-16	16-bit 500 kSPS/250 kSPS 4-ch pseudo-differential SAR ADC, SINAD 91.7 dB, THD -105 dB	
DAC		
ZJC2541-18/16/14	18/16/14-bit 1 MSPS single channel DAC with unipolar output	Power on reset to 0 V (ZJC2541) or $V_{REF}/2$ (ZJC2543), 1 nV-S glitch, SOIC-8, MSOP-10/8, DFN-10 packages
ZJC2543-18/16/14		
ZJC2542-18/16/14	18/16/14-bit 1 MSPS single channel DAC with bipolar output	Power on reset to 0 V (ZJC2542) or $V_{REF}/2$ (ZJC2544), 1 nV-S glitch, SOIC-14, TSSOP-16, QFN-16 packages
ZJC2544-18/16/14		
Amplifier		
ZJA3000-1/2/4	Single/Dual/Quad 36 V low bias current precision Op Amps	3 MHz, 35 μ V max Vos, 0.5 μ V/ $^{\circ}$ C max TCvos, 25 pA max Ibias, 1 mA/ch, input to V- (ZJA3000 only), RRO, 4.5 V to 36 V
ZJA3001-1/2/4		
ZJA3018-2	OVP ± 75 V, 36 V, Low Power, High Precision Op Amp	1.3 MHz, 10 μ V max Vos, 0.5 μ V/ $^{\circ}$ C max TCvos, 25 pA max Ibias, 0.5 mA/ch, OVP ± 75 V (ZJA3018 only), RRO, 4.5 V to 36 V
ZJA3008-2		
ZJA3512-2	Dual 36 V 7 MHz precision JFET Op Amps	7 MHz, 35 V/ μ S, 50 μ V max Vos, 1 μ V/ $^{\circ}$ C max TCvos, 2 mA/ch, RRO, 9 V to 36 V
ZJA3216/06/02-1/2	Precision 24/11.6/5.3 MHz CMOS RRIO Op Amps	24/11.6/5.3 MHz, RRIO, 30 μ V max Vos, 1 μ V/ $^{\circ}$ C max TCvos, 0.6 pA Ib, 2.7 V to 5.5 V
ZJA3600/1	36 V ultra-high precision in-amp	CMRR 105 dB min (G = 1), 25 pA max Ib, 25 μ V max Vosi, ± 2.4 V to ± 18 V, -40 $^{\circ}$ C to 125 $^{\circ}$ C
ZJA3611, ZJA3609	36 V precision wider bandwidth precision in-amp (G ≥ 10)	CMRR 120 dB min (G = 10), 25 pA max Ibias, 25 μ V max Vosi, 1.2 MHz BW (G = 10)
ZJA3676/7	Low power, G = 1 Single/Dual 36 V difference amplifier	Input protection to ± 65 V, CMRR 104 dB min (G = 1), Vos 100 μ V max, gain error 15 ppm max, 500 kHz BW (G = 1), 330 μ A/channel, 2.7 V to 36 V
ZJA3678/9	Low power, G = 0.5/2 Single/Dual 36 V difference amplifier	
ZJA3669	High Common-Mode Voltage Difference Amplifier	± 270 V CMV, 2.5 kV ESD, 96 dB min CMRR, 450 kHz BW, 4 V to 36 V, SOIC-8
ZJA3100	15 V precision fully differential amplifier	145 MHz, 447 V/ μ S, 50 nS to 16-bit, 50 μ V max Vos, 4.6 mA Iq, SOIC/MSOP-8, QFN-16
ZJA3236/26/22-2	Low-cost 22/10/5 MHz CMOS RRIO Op Amps	22/11/5 MHz, RRIO, 2 mV max Vos, 6 μ V/ $^{\circ}$ C max TCvos, 0.6 pA Ib, 2.7 V to 5.5 V
ZJA3622/8	36 V low-cost precision in-amp	0.5 nA max Ibias, 125 μ V max Vosi, 625 kHz BW (G = 10), 3.3 mA Iq, ± 2.4 V to ± 18 V
Voltage Reference		
ZJR1004	40 V supply precision voltage reference	$V_{OUT} = 2.048/2.5/3/3.3/4.096/5/10$ V, 5 ppm/ $^{\circ}$ C max drift -40 $^{\circ}$ C to 125 $^{\circ}$ C
ZJR1001/2	5.5 V low power voltage reference (ZJR1001 with noise filter option)	$V_{OUT} = 2.048/2.5/3/3.3/4.096/5$ V, 5 ppm/ $^{\circ}$ C max drift -40 $^{\circ}$ C to 125 $^{\circ}$ C, $\pm 0.05\%$ initial error, 130 μ A, ZJR1001/2 in SOT23-6, ZJR1003 in SOIC/MSOP-8
ZJR1003		
ZJR1302	5.5 V low power compact precision voltage reference	$V_{OUT} = 2.048/2.5/3/3.3/4.096$ V, 30 ppm/ $^{\circ}$ C max drift -40 $^{\circ}$ C to 125 $^{\circ}$ C, 130 μ A, SOT23-3
Switches and Multiplexers		
ZJG4438/4439	36 V fault protection 8:1/dual 4:1 multiplexer	Protection to ± 50 V power on & off, latch-up immune, Ron 270 Ω , 14.8 pC, t_{ON} 166 nS
ZJG4428/4429	36 V 8:1/dual 4:1 multiplexer	Latch-up immune, Ron 270 Ω , 14.8 pC charge injection, t_{ON} 166 nS
Quad Matching Resistor		
ZJM5400	± 75 V precision match resistors	Mismatch < 100 ppm, 10k:10k:10k:10k, 100k:100k:100k:100k, 100k:10k:10k:100k, 1k:1k:1k:1k, 1M:1M:1M:1M, 5k:1k:1k:5k, 5k:1.25k:1.25k:5k, 9k:1k:1k:9k, ESD: 3.5 kV