



**AOS**  
**SEMICONDUCTOR**

## 产品规格说明书

Product Data Sheet

AOS321xx

WEB | [www.aossemi.cn](http://www.aossemi.cn) 



电源管理IC



通信接口芯片



二三极管



LDO稳压器



逻辑器件



MOSFETs



运算放大器



显示驱动



MCU单片机



光电器件



## 1.1MHz, Precision, Rail-to-Rail I/O CMOS Operational Amplifier

### DESCRIPTIONS

The AOS321, AOS358, AOS324, AOS321S, AOS358S families of products offer low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (1.1MHz) and slew rate of 0.5V/us. The op-amps are unity gain stable and feature an ultra-low input bias current. The devices are ideal for sensor interfaces, active filters and portable applications. The AOS321S, AOS358S include a shutdown mode. Under logic control, the amplifiers can be switched from normal operation to a standby current that is less than 1uA. The AOS321, AOS358, AOS324, AOS321S, AOS358S families of operational amplifiers are specified at the full temperature range of -40°C to +125°C under single or dual power supplies of 2.5V to 5.5V.

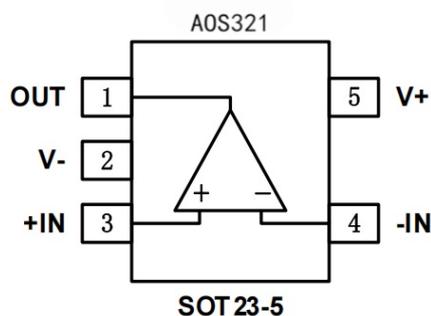
### FEATURES

- HIGH GAIN BANDWIDTH: 1.1MHz
- RAIL-TO-RAIL INPUT AND OUTPUT 0.8mV Typical Vos
- INPUT VOLTAGE RANGE: -0.1V to +5.6V with Vs = 5.5V
- SUPPLY RANGE: +2.5V to +5.5V
- SHUTDOWN: AOS321S/AOS358S
- SPECIFIED UP TO +125°C
- Micro SIZE PACKAGES: SOT23-5, SOT23-6

### APPLICATIONS

- SENSORS
- PHOTODIODE AMPLIFICATION
- ACTIVE FILTERS
- TEST EQUIPMENT
- DRIVING A/D CONVERTERS

### PIN CONFIGURATIONS





ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

Supply Voltage, V+ to V-.....	7.0V
Input Terminals, Voltage <sup>(2)</sup> .....	- 0.5 to (V+) + 0.5V
Current <sup>(2)</sup> .....	±10mA
Storage Temperature .....	-65°C to +150°C
Operating Temperature .....	-40°C to +125°C
Junction Temperature.....	150°C
Package Thermal Resistance @ T <sub>A</sub> = +25°C	
SOT23-5, SOT23-6.....	200°C/W
MSOP-10, SOIC-8 .....	150°C/W
SOIC-14, TSSOP-14.....	100°C/W
Lead Temperature (Soldering, 10s) .....	260°C
ESD Susceptibility	
HBM .....	5000V
MM .....	400V



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

(1) 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) Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING	PACKAGEOPTION
AOS321	AOS321XF	-40 ~125	SOT23-5	321	Tape and Reel , 3000
	AOS321BXF	-40 ~125	SOT23-5	321B	Tape and Reel , 3000



**ELECTRICAL CHARACTERISTICS**

(At  $T_A = +25^{\circ}\text{C}$ ,  $V_S = 5\text{V}$ ,  $R_L = 10\text{k}$  connected to  $V_S/2$ , and  $V_{OUT} = V_S/2$ , unless otherwise noted.)

PARAMETER	CONDITIONS	$T_J$	AOS321			UINTS
			MIN	TYP	MAX	
<b>POWER SUPPLY</b>						
$V_S$	Operating Voltage Range	25	2.5		5.5	V
$I_Q$	Quiescent Current/ Amplifier	25		60	80	$\mu\text{A}$
PSRR	Power-Supply Rejection Ratio	$V_S = 2.5\text{V to } 5.5\text{V}$ , $V_{cm} = (V_-) + 0.5\text{V}$	25	62	85	dB
		-40 to 125	58			
<b>INPUT</b>						
$V_{os}$	Input Offset Voltage	25		0.8	4.5	mV
$V_{osTC}$	Input Offset Voltage Average Drift	-40 to 125		2.9		$\mu\text{V/}$
$I_B$	Input Bias Current	25		1	10	pA
$I_{os}$	Input Offset Current	25		1	10	pA
$V_{cm}$	Common-Mode Voltage Range	$V_S = 5.5\text{V}$	25	-0.1	5.6	V
CMRR	Common-Mode Rejection Ratio	$V_S = 5.5\text{V}$ , $V_{cm} = -0.1\text{V to } 4\text{V}$	25	65	80	dB
		-40 to 125	62			
		$V_S = 5.5\text{V}$ , $V_{cm} = -0.1\text{V to } 5.6\text{V}$	25	57	75	
		-40 to 125	55			
<b>OUTPUT</b>						
AOL	Open-Loop Voltage Gain	$R_L = 2\text{K}$ , $V_o =$ $0.15\text{V to } 4.85\text{V}$	25	75	95	dB
		-40 to 125	72			
		$R_L = 10\text{K}$ , $V_o = 0.05\text{V}$ to $4.95\text{V}$	25	85	100	
		-40 to 125	82			
	Output Swing From Rail	$R_L = 2\text{K}$	25	26		mV
		$R_L = 10\text{K}$		8		
$I_{out}$	Output Short-Circuit Current	25		54		mA
<b>FREQUENCY RESPONSE</b>						
SR	Slew Rate	25		0.5		V/ $\mu\text{s}$
GBP	Gain-Bandwidth Product	25		1.1		MHz
PM	Phase Margin	25		64		$^{\circ}$
$t_s$	Setting Time, 0.1%			1.3		$\mu\text{s}$
	Overload Recovery Time	$V_{IN}$ Gain $V_S$		2.3		$\mu\text{s}$

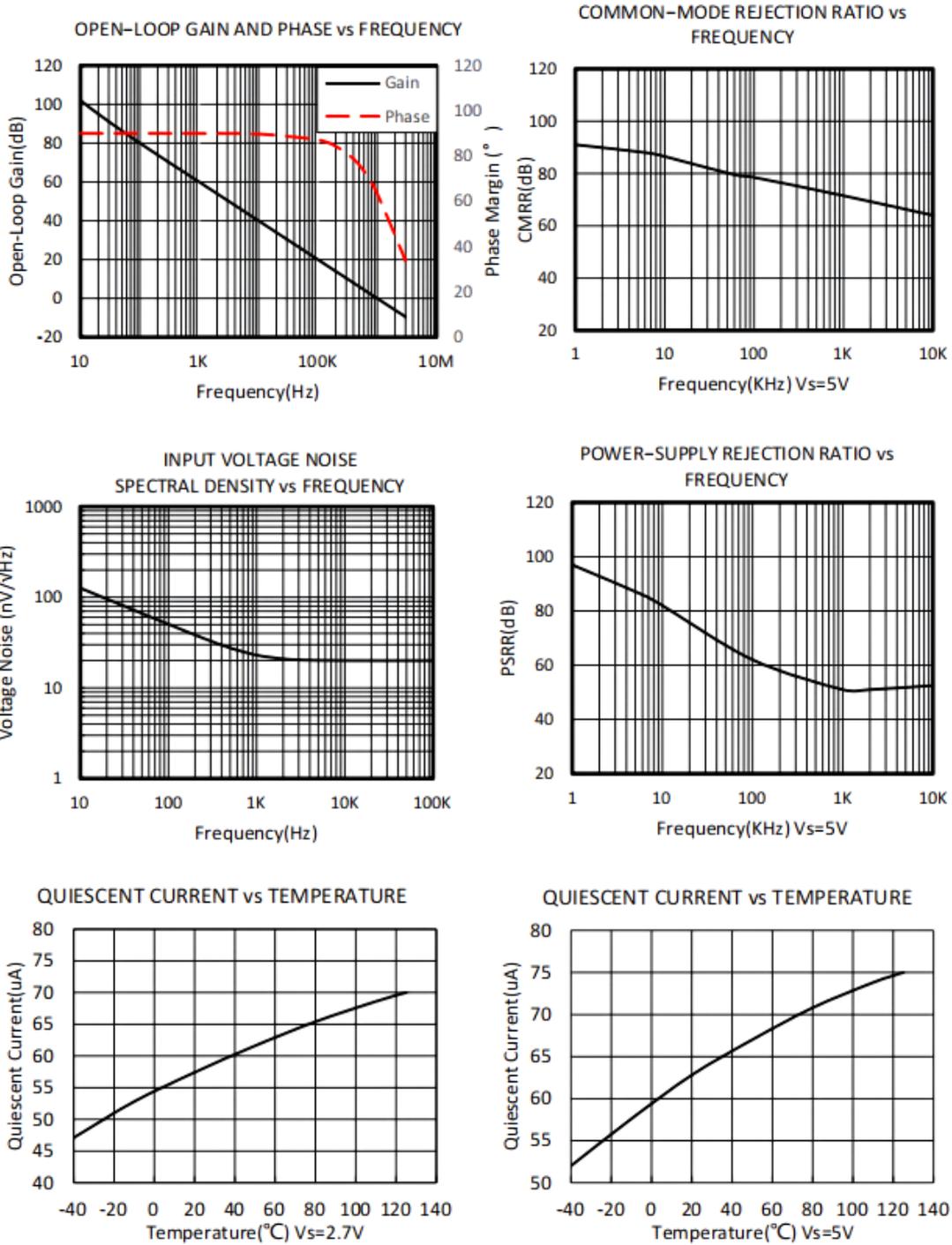


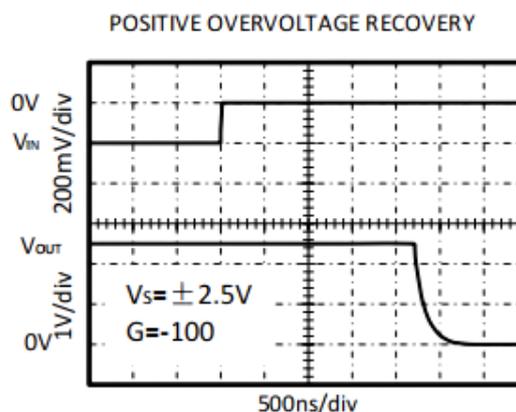
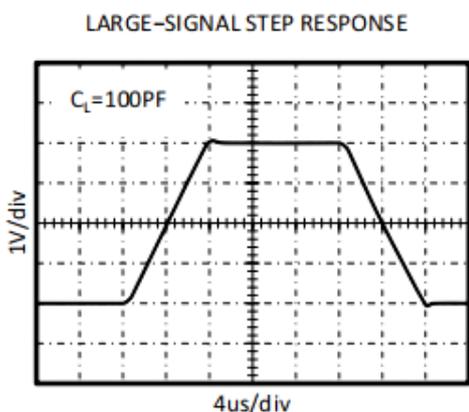
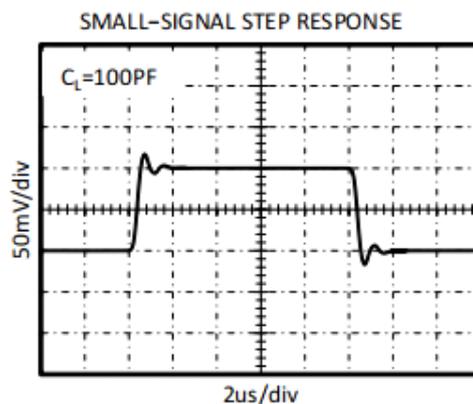
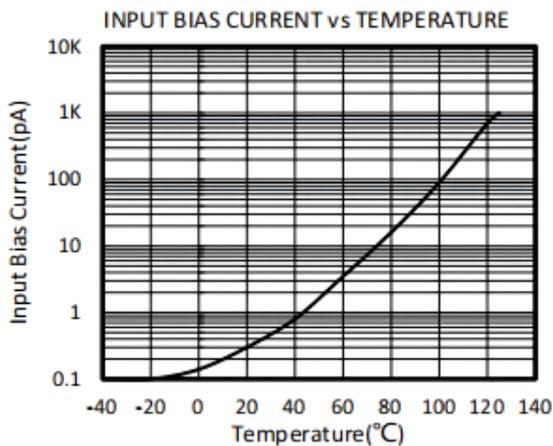
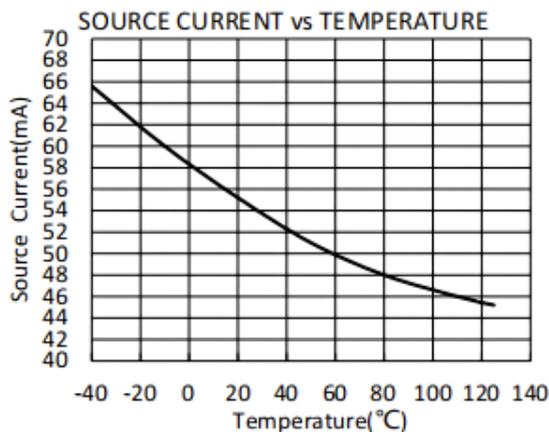
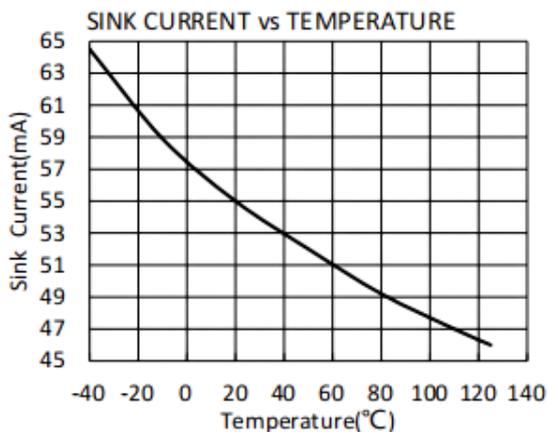
NOISE							
en	Input Voltage Noise Density	f = 1KHz	25		23		nV/ Hz
		f = 10KHz	25		20		nV/ Hz
I <sub>Q(OFF)</sub>	Supply Current in Shutdown		25		<1		uA
t <sub>OFF</sub>			25		3		us
t <sub>ON</sub>			25		20		us
V <sub>L</sub>	Shut Down		25	V-		(V-) +0.8	V
V <sub>H</sub>	Amplifier Is Active		25	(V-) +2		V+	V



TYPICAL CHARACTERISTICS

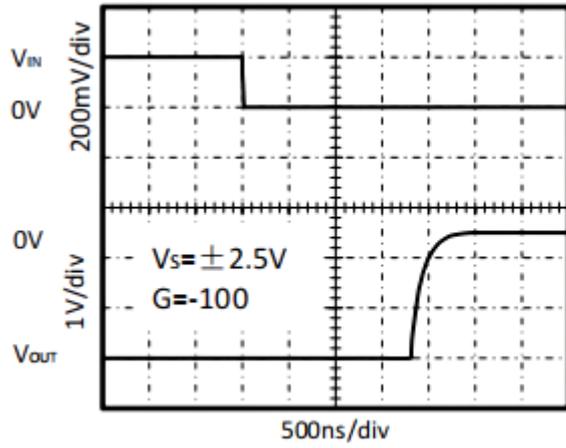
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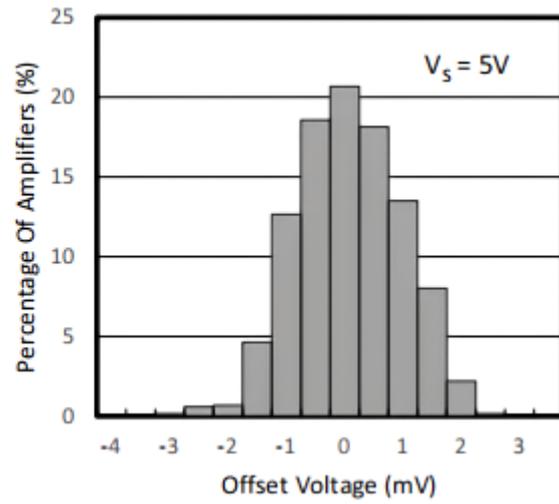




Negative Overvoltage Recovery



Offset Voltage Production Distribution





### APPLICATION NOTES

The AOS321, AOS358, AOS324, AOS321S, AOS358S are high precision, rail-to-rail operational amplifiers that can be run from a single-supply voltage 2.5V to 5.5V( $\pm 1.25V$  to  $\pm 2.75V$ ). Supply voltages higher than 7V (absolute maximum) can permanently damage the amplifier.

Rail-to-rail input and output swing significantly increases dynamic range, especially in low-supply applications.

Good layout practice mandates use of a 0.1 $\mu$ F capacitor place closely across the supply pins.

### AOS321S/AOS358S ENABLE FUNCTION

The AOS321S/AOS358S includes a shutdown mode.

Under logic control, the amplifiers can be switched from normal mode to a standby current of 1 $\mu$ A.

When the Enable pin is connected to high, the amplifier is active. Connecting Enable low disables the amplifier, and places the amplifier, and place the output in a high-impedance state.

### LAYOUT GUIDELINS

Attention to good layout practices is always recommended. Keep traces short. When possible, use a PCB ground plane with surface-mount components placed as close to the device pins as possible. Place a 0.1 $\mu$ F capacitor closely across the supply pins.

These guidelines should be applied throughout the analog circuit to improve performance and provide benefits such as reducing the EMI susceptibility.

### INSTRUMENTATION AMPLIFIER

In the three-op amp, instrumentation amplifier configuration shown in Figure 2

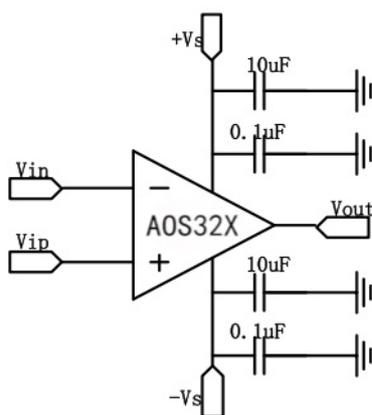


Figure1. Amplifier with Bypass Capacitors

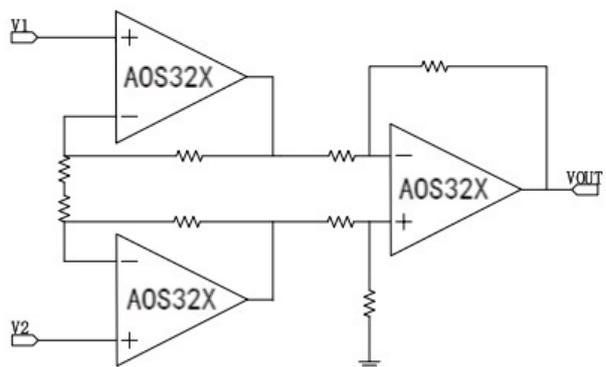
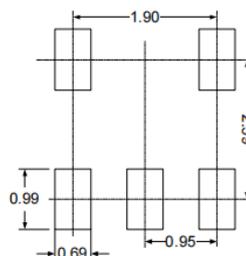
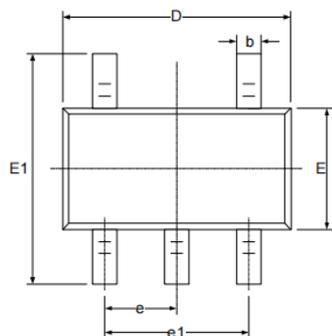


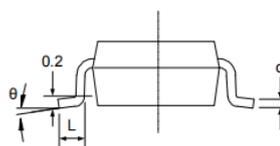
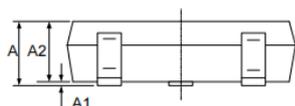
Figure2. Amplifier instrumentation amplifier



PACKAGE OUTLINE DIMENSIONS  
SOT23-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
	0°	8°	0°	8°