

FEATURES

Low wideband noise

1 nV/ $\sqrt{\text{Hz}}$

2.8 pA/ $\sqrt{\text{Hz}}$

Low 1/f noise

2.4 nV/ $\sqrt{\text{Hz}}$ @ 10 Hz

Low distortion: -115 dBc @ 100 kHz, $V_{\text{OUT}} = 2 \text{ V p-p}$

Low power: 3 mA/amp

Low input offset voltage: 0.5 mV maximum

High speed

230 MHz, -3 dB bandwidth ($G = +1$)

120 V/ μs slew rate

45 ns settling time to 0.1%

Rail-to-rail output

Wide supply range: 3 V to 10 V

Output disable feature

APPLICATIONS

Low noise preamplifier

Ultrasound amplifiers

PLL Loop filters

High performance ADC drivers

DAC buffers

GENERAL DESCRIPTION

The ADA4897-2 is a unity gain stable, low noise, rail-to-rail output, high speed voltage feedback amplifier that has a quiescent current of 3 mA. With the 1/f noise of 2.4 nV/ $\sqrt{\text{Hz}}$ at 10 Hz and a spurious-free dynamic range of -80 dBc at 2 MHz, the ADA4897-2 is an ideal solution in a variety of applications, including ultrasound, low noise preamplifiers, and drivers of high performance ADCs. Analog Devices, Inc., proprietary next generation SiGe bipolar process and innovative architecture enables such a high performance amplifier.

The ADA4897-2 has 230 MHz bandwidth, 120 V/ μs slew rate, and settle to 0.1% in 45 ns. With a wide supply voltage range (3 V to 10 V), the ADA4897-2/ADA4897-1 is an ideal candidates for systems that require high dynamic range, precision, and high speed.

The ADA4897-2 is available in an 10-lead MSOP package and operates over the extended industrial temperature range of -40°C to +125°C.

FUNCTIONAL BLOCK DIAGRAM

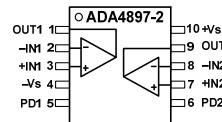


Figure 1. 10-Lead ADA4897-2 MSOP

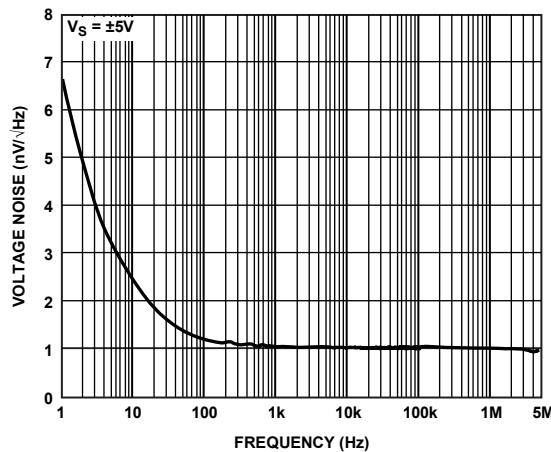


Figure 2. Voltage Noise vs. Frequency

09447-027

Table 1. Other Low Noise Amplifiers

Part Number	V_N (nV/ $\sqrt{\text{Hz}}$) @ 1 kHz	V_N (nV/ $\sqrt{\text{Hz}}$) @ 100 kHz	BW (MHz)	Supply Voltage (V)
AD797	0.9	0.9	8	10 to 30
AD8021	5	2.1	490	5 to 24
AD8099	7	0.95	510	5 to 12
AD8045	6	3	1000	3.3 to 12
ADA4899-1	1.4	1	600	5 to 12
ADA4896-2/ ADA4897-1/	1	1	230	3 to 10
ADA4898-1/ ADA4898-2	0.9	0.9	65	10 to 32

Table 2. Complementary ADCs

Part Number	Bits	Speed (MSPS)	Power (mW)
AD7944	14	2.5	15.5
AD7985	16	2.5	15.5
AD7986	18	2	15

Rev. PrA

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TABLE OF CONTENTS

Features	1	±5 V Supply	3
Applications	1	+5 V Supply	5
General Description	1	+3 V Supply	7
Functional Block Diagram	1	Outline Dimensions	9
Revision History	2	Ordering Guide	9
Specifications.....	3		

SPECIFICATIONS

$\pm 5\text{ V}$ SUPPLY

$T_A = 25^\circ\text{C}$, $G = +1$, $R_L = 1\text{ k}\Omega$ to ground, unless otherwise noted.

Table 3.

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3 dB Bandwidth	$G = +1, V_{OUT} = 0.02\text{ V p-p}$	230			MHz
	$G = +1, V_{OUT} = 2\text{ V p-p}$	30			MHz
	$G = +2, V_{OUT} = 0.02\text{ V p-p}$	90			MHz
Bandwidth for 0.1 dB Flatness	$G = +2, V_{OUT} = 2\text{ V p-p}, R_L = 100\text{ }\Omega$	7			MHz
Slew Rate	$G = +2, V_{OUT} = 6\text{ V step}$	120			V/ μs
Settling Time to 0.1%	$G = +2, V_{OUT} = 2\text{ V step}$	45			ns
Settling Time to 0.01%	$G = +2, V_{OUT} = 2\text{ V step}$	90			ns
NOISE/HARMONIC PERFORMANCE					
Harmonic Distortion (dBc) SFDR	$f_C = 100\text{ kHz}, V_{OUT} = 2\text{ V p-p}$	-115			dBc
	$f_C = 1\text{ MHz}, V_{OUT} = 2\text{ V p-p}$	-93			dBc
	$f_C = 2\text{ MHz}, V_{OUT} = 2\text{ V p-p}$	-80			dBc
	$f_C = 5\text{ MHz}, V_{OUT} = 2\text{ V p-p}$	-61			dBc
Input Voltage Noise	$f = 10\text{ Hz}$	2.4			nV/ $\sqrt{\text{Hz}}$
	$f = 100\text{ kHz}$	1			nV/ $\sqrt{\text{Hz}}$
Input Current Noise	$f = 10\text{ Hz}$	31			pA/ $\sqrt{\text{Hz}}$
	$f = 100\text{ kHz}$	2.8			pA/ $\sqrt{\text{Hz}}$
0.1 Hz to 10 Hz Noise	$G = +101, R_F = 1\text{ k}\Omega, R_G = 10\text{ }\Omega$	99			nV p-p
DC PERFORMANCE					
Input Offset Voltage		-500	-28	+500	μV
Input Offset Voltage Drift			0.2		$\mu\text{V}/^\circ\text{C}$
Input Bias Current		-17	-11	-4	μA
Input Bias Current Drift			3		$\text{nA}/^\circ\text{C}$
Input Bias Offset Current		-0.6	-0.02	+0.6	μA
Open-Loop Gain	$V_{OUT} = -4\text{ V to }+4\text{ V}$	100	110		dB
INPUT CHARACTERISTICS					
Input Resistance	Common mode/differential		10M/10k		Ω
Input Capacitance	Common mode/differential		3/11		pF
Input Common-Mode Voltage Range			-4.9 to +4.1		V
Common-Mode Rejection	$V_{CM} = -2\text{ V to }+2\text{ V}$	-92	-120		dB
OUTPUT CHARACTERISTICS					
Output Overdrive Recovery Time	$V_{IN} = \pm 5\text{ V}, G = +2$		81		ns
+Output Voltage Swing	$R_L = 1\text{ k}\Omega$	4.85	4.96		V
-Output Voltage Swing	$R_L = 1\text{ k}\Omega$	-4.85	-4.97		V
+Output Voltage Swing	$R_L = 100\text{ }\Omega$	4.5	4.73		V
-Output Voltage Swing	$R_L = 100\text{ }\Omega$	-4.5	-4.84		V
Output Current	45 dBc SFDR		80		mA
Short-Circuit Current	Sinking/sourcing		135		mA
Capacitive Load Drive	30% overshoot, $G = +2$		39		pF
POWER SUPPLY					
Operating Range			3 to 10		V
Quiescent Current per Amplifier		2.8	3.0	3.2	mA
Positive Power Supply Rejection	$\overline{\text{DISABLE}} = -5\text{ V}$		0.25		mA
Negative Power Supply Rejection	$+V_S = 4\text{ V to }6\text{ V}, -V_S = -5\text{ V}$	-96	-125		dB
	$+V_S = 5\text{ V}, -V_S = -4\text{ V to }-6\text{ V}$	-96	-121		dB

Parameter	Conditions	Min	Typ	Max	Unit
DISABLE PIN					
DISABLE Voltage	Enabled Disabled				
Input Current					
Enabled	DISABLE = +5 V		-2.5		µA
Disabled	DISABLE = -5 V		-80		µA
Switching Speed					
Enabled			0.25		µs
Disabled			12		µs

+5 V SUPPLY

$T_A = 25^\circ\text{C}$, $G = +1$, $R_L = 1 \text{ k}\Omega$ to midsupply, unless otherwise noted.

Table 4.

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
–3 dB Bandwidth	$G = +1, V_{OUT} = 0.02 \text{ V p-p}$	230			MHz
	$G = +1, V_{OUT} = 2 \text{ V p-p}$	30			MHz
	$G = +2, V_{OUT} = 0.02 \text{ V p-p}$	90			MHz
Bandwidth for 0.1 dB Flatness	$G = +2, V_{OUT} = 2 \text{ V p-p}, R_L = 100 \Omega$	7			MHz
Slew Rate	$G = +2, V_{OUT} = 3 \text{ V step}$	100			V/ μs
Settling Time to 0.1%	$G = +2, V_{OUT} = 2 \text{ V step}$	45			ns
Settling Time to 0.01%	$G = +2, V_{OUT} = 2 \text{ V step}$	95			ns
NOISE/Harmonic PERFORMANCE					
Harmonic Distortion (dBc) SFDR	$f_C = 100 \text{ kHz}, V_{OUT} = 2 \text{ V p-p}$	–115			dBc
	$f_C = 1 \text{ MHz}, V_{OUT} = 2 \text{ V p-p}$	–93			dBc
	$f_C = 2 \text{ MHz}, V_{OUT} = 2 \text{ V p-p}$	–80			dBc
	$f_C = 5 \text{ MHz}, V_{OUT} = 2 \text{ V p-p}$	–61			dBc
Input Voltage Noise	$f = 10 \text{ Hz}$	2.4			nV/ $\sqrt{\text{Hz}}$
	$f = 100 \text{ kHz}$	1			nV/ $\sqrt{\text{Hz}}$
Input Current Noise	$f = 10 \text{ Hz}$	31			pA/ $\sqrt{\text{Hz}}$
	$f = 100 \text{ kHz}$	2.8			pA/ $\sqrt{\text{Hz}}$
0.1 Hz to 10 Hz Noise	$G = +101, R_F = 1 \text{ k}\Omega, R_G = 10 \Omega$	99			nV p-p
DC PERFORMANCE					
Input Offset Voltage		–500	–30	+500	μV
Input Offset Voltage Drift			0.2		$\mu\text{V}/^\circ\text{C}$
Input Bias Current		–17	–11	–4	μA
Input Bias Current Drift			3		nA/ $^\circ\text{C}$
Input Bias Offset Current		–0.6	–0.02	+0.6	μA
Open-Loop Gain	$V_{OUT} = 0.5 \text{ V to } 4.5 \text{ V}$	97	110		dB
INPUT CHARACTERISTICS					
Input Resistance	Common mode/differential		10M/10k		Ω
Input Capacitance	Common mode/differential		3/11		pF
Input Common-Mode Voltage Range			0.1 to 4.1		V
Common-Mode Rejection	$V_{CM} = +1 \text{ V to } +4 \text{ V}$	–91	–118		dB
OUTPUT CHARACTERISTICS					
Overdrive Recovery Time	$V_{IN} = 0 \text{ V to } 5 \text{ V}, G = +2$		96		ns
+Output Voltage Swing	$R_L = 1 \text{ k}\Omega$	4.85	4.98		V
–Output Voltage Swing	$R_L = 1 \text{ k}\Omega$	0.15	0.014		V
+Output Voltage Swing	$R_L = 100 \Omega$	4.8	4.88		V
–Output Voltage Swing	$R_L = 100 \Omega$	0.2	0.08		V
Output Current	45 dBc SFDR		70		mA
Short-Circuit Current	Sinking/sourcing		125		mA
Capacitive Load Drive	30% overshoot, $G = +2$		39		pF
POWER SUPPLY					
Operating Range			3 to 10		V
Quiescent Current per Amplifier		2.6	2.8	2.9	mA
	<u>DISABLE</u> = 0 V		0.18		
Positive Power Supply Rejection	$+V_S = 4.5 \text{ V to } 5.5 \text{ V}, -V_S = 0 \text{ V}$	–96	–123		dB
Negative Power Supply Rejection	$+V_S = 5 \text{ V}, -V_S = –0.5 \text{ V to } +0.5 \text{ V}$	–96	–121		dB

Parameter	Conditions	Min	Typ	Max	Unit
DISABLE PIN					
DISABLE Voltage	Enabled Disabled	$>+V_S - 0.5$ $<+V_S - 2$			V
Input Current					
Enabled	$\overline{\text{DISABLE}} = +5 \text{ V}$	-2.5			μA
Disabled	$\overline{\text{DISABLE}} = 0 \text{ V}$	-50			μA
Switching Speed					
Enabled		0.25			μs
Disabled		12			μs

+3 V SUPPLY

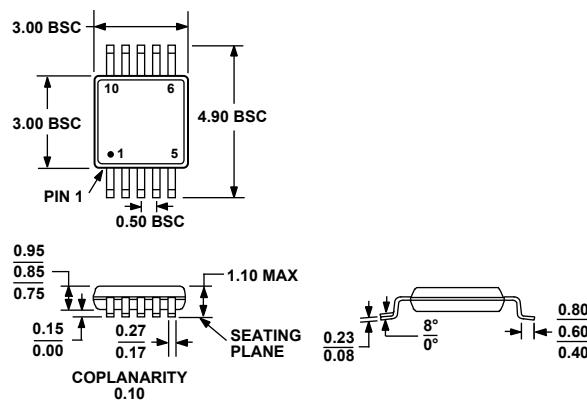
$T_A = 25^\circ\text{C}$, $G = +1$, $R_L = 1 \text{ k}\Omega$ to midsupply, unless otherwise noted.

Table 5.

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3 dB Bandwidth	$G = +1, V_{OUT} = 0.02 \text{ V p-p}$	230			MHz
	$G = -1, V_{OUT} = 1 \text{ V p-p}$	45			MHz
	$G = +2, V_{OUT} = 0.02 \text{ V p-p}$	90			MHz
Bandwidth for 0.1 dB Flatness	$G = +2, V_{OUT} = 2 \text{ V p-p}, R_L = 100 \Omega$	7			MHz
Slew Rate	$G = +2, V_{OUT} = 1 \text{ V step}$	85			V/ μs
Settling Time to 0.1%	$G = +2, V_{OUT} = 2 \text{ V step}$	45			ns
Settling Time to 0.01%	$G = +2, V_{OUT} = 2 \text{ V step}$	96			ns
NOISE/HARMONIC PERFORMANCE					
Harmonic Distortion (dBc) SFDR	$f_C = 100 \text{ kHz}, V_{OUT} = 2 \text{ V p-p}, G = +2$	-105			dBc
	$f_C = 1 \text{ MHz}, V_{OUT} = 1 \text{ V p-p}, G = -1$	-84			dBc
	$f_C = 2 \text{ MHz}, V_{OUT} = 1 \text{ V p-p}, G = -1$	-77			dBc
	$f_C = 5 \text{ MHz}, V_{OUT} = 1 \text{ V p-p}, G = -1$	-60			dBc
Input Voltage Noise	$f = 10 \text{ Hz}$	2.3			nV/ $\sqrt{\text{Hz}}$
	$f = 100 \text{ kHz}$	1			nV/ $\sqrt{\text{Hz}}$
Input Current Noise	$f = 10 \text{ Hz}$	31			pA/ $\sqrt{\text{Hz}}$
	$f = 100 \text{ kHz}$	2.8			pA/ $\sqrt{\text{Hz}}$
0.1 Hz to 10 Hz Noise	$G = +101, R_F = 1 \text{ k}\Omega, R_G = 10 \Omega$	99			nV p-p
DC PERFORMANCE					
Input Offset Voltage		-500	-30	+500	uV
Input Offset Voltage Drift			0.2		$\mu\text{V}/^\circ\text{C}$
Input Bias Current		-17	-11	-4	μA
Input Bias Current Drift			3		$\text{nA}/^\circ\text{C}$
Input Bias Offset Current		-0.6	-0.02	+0.6	μA
Open-Loop Gain	$V_{OUT} = 0.5 \text{ V to } 2.5 \text{ V}$	95	108		dB
INPUT CHARACTERISTICS					
Input Resistance	Common mode/differential		10M/10k		Ω
Input Capacitance	Common mode/differential		3/11		pF
Input Common-Mode Voltage Range			0.1 to 2.1		V
Common-Mode Rejection	$V_{CM} = +1.1 \text{ V to } +1.9 \text{ V}$	-90	-124		dB
OUTPUT CHARACTERISTICS					
Overdrive Recovery Time	$V_{IN} = 0 \text{ V to } +3 \text{ V}, G = +2$		83		ns
+Output Voltage Swing	$R_L = 1 \text{ k}\Omega$	2.85	2.97		V
-Output Voltage Swing	$R_L = 1 \text{ k}\Omega$	0.15	0.01		V
+Output Voltage Swing	$R_L = 100 \Omega$	2.8	2.92		V
-Output Voltage Swing	$R_L = 100 \Omega$	0.2	0.05		V
Output Current	45 dBc SFDR		60		mA
Short-Circuit Current	Sinking/sourcing		120		mA
Capacitive Load Drive	30% overshoot, $G = +2$		39		pF
POWER SUPPLY					
Operating Range			3 to 10		V
Quiescent Current per Amplifier		2.5	2.7	2.9	mA
	$\overline{\text{DISABLE}} = 0 \text{ V}$		0.15		
Positive Power Supply Rejection	$+V_S = 2.7 \text{ V to } 3.7 \text{ V}, -V_S = 0 \text{ V}$	-96	-121		dB
Negative Power Supply Rejection	$+V_S = 3 \text{ V}, -V_S = -0.3 \text{ V to } 0.7 \text{ V}$	-96	-120		dB

Parameter	Conditions	Min	Typ	Max	Unit
DISABLE PIN					
DISABLE Voltage	Enabled Disabled	$>+V_S - 0.5$ $<-V_S + 2$			V
Input Current					
Enabled	$\overline{\text{DISABLE}} = +3 \text{ V}$	-2.5			μA
Disabled	$\overline{\text{DISABLE}} = 0 \text{ V}$	-40			μA
Switching Speed					
Enabled		0.25			μs
Disabled		12			μs

OUTLINE DIMENSIONS



COMPLIANT TO JEDEC STANDARDS MO-187-BA

Figure 3. 10-Lead Mini Small Outline Package [MSOP]

(RM-10)

Dimensions shown in millimeters

ORDERING GUIDE

Model ¹	Temperature Range	Package Description	Package Option	Ordering Quantity	Branding
ADA4897-2ARMZ	-40°C to +125°C	10-Lead MSOP	RM-10	1	
ADA4897-2ARMZ-R7	-40°C to +125°C	10-Lead MSOP	RM-10	1,000	
ADA4897-2ARMZ-RL	-40°C to +125°C	10-Lead MSOP	RM-10	3,000	

¹ Z = RoHS Compliant Part.

NOTES

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