

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

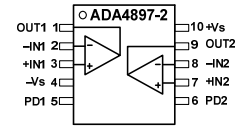


Figure 1. 10-Lead ADA4897-2 MSOP

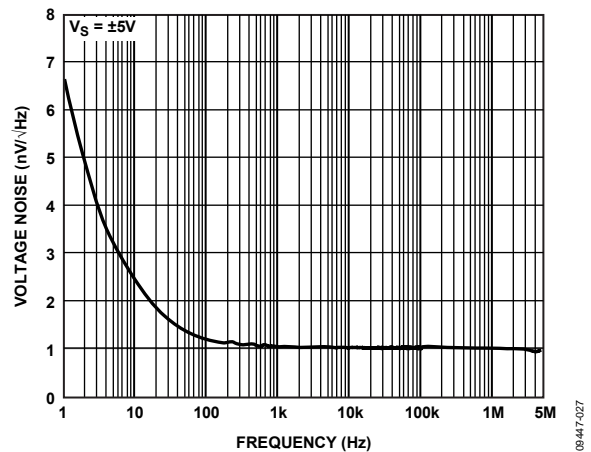


Figure 2. Voltage Noise vs. Frequency

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

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Specifications subject to change without notice. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices. Trademarks and registered trademarks are the property of their respective owners.

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

±5 V SUPPLY

T_A = 25°C, G = +1, R_L = 1 kΩ to ground, unless otherwise noted.

Table 3.

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3 dB Bandwidth	G = +1, V _{OUT} = 0.02 V p-p		230		MHz
	G = +1, V _{OUT} = 2 V p-p		30		MHz
Bandwidth for 0.1 dB Flatness	G = +2, V _{OUT} = 0.02 V p-p		90		MHz
	G = +2, V _{OUT} = 2 V p-p, R _L = 100 Ω		7		MHz
Slew Rate	G = +2, V _{OUT} = 6 V step		120		V/μs
Settling Time to 0.1%	G = +2, V _{OUT} = 2 V step		45		ns
Settling Time to 0.01%	G = +2, V _{OUT} = 2 V step		90		ns
NOISE/HARMONIC PERFORMANCE					
Harmonic Distortion (dBc) SFDR	f _C = 100 kHz, V _{OUT} = 2 V p-p		-115		dBc
	f _C = 1 MHz, V _{OUT} = 2 V p-p		-93		dBc
	f _C = 2 MHz, V _{OUT} = 2 V p-p		-80		dBc
	f _C = 5 MHz, V _{OUT} = 2 V p-p		-61		dBc
Input Voltage Noise	f = 10 Hz		2.4		nV/√Hz
	f = 100 kHz		1		nV/√Hz
Input Current Noise	f = 10 Hz		31		pA/√Hz
	f = 100 kHz		2.8		pA/√Hz
0.1 Hz to 10 Hz Noise	G = +101, R _F = 1 kΩ, R _G = 10 Ω		99		nV p-p
DC PERFORMANCE					
Input Offset Voltage		-500	-28	+500	μV
Input Offset Voltage Drift			0.2		μV/°C
Input Bias Current		-17	-11	-4	μA
Input Bias Current Drift			3		nA/°C
Input Bias Offset Current		-0.6	-0.02	+0.6	μA
Open-Loop Gain	V _{OUT} = -4 V to +4 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 V to +2 V	-92	-120		dB
OUTPUT CHARACTERISTICS					
Output Overdrive Recovery Time	V _{IN} = ±5 V, G = +2		81		ns
+Output Voltage Swing	R _L = 1 kΩ	4.85	4.96		V
-Output Voltage Swing	R _L = 1 kΩ	-4.85	-4.97		V
+Output Voltage Swing	R _L = 100 Ω	4.5	4.73		V
-Output Voltage Swing	R _L = 100 Ω	-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
	DISABLE = -5 V		0.25		mA
Positive Power Supply Rejection	+V _S = 4 V to 6 V, -V _S = -5 V	-96	-125		dB
Negative Power Supply Rejection	+V _S = 5 V, -V _S = -4 V to -6 V	-96	-121		dB

Parameter	Conditions	Min	Typ	Max	Unit
DISABLE PIN					
DISABLE Voltage	Enabled		$>+V_S - 0.5$		V
	Disabled		$<+V_S - 2$		V
Input Current					
Enabled	$\overline{\text{DISABLE}} = +5\text{ V}$		-2.5		μA
Disabled	$\overline{\text{DISABLE}} = -5\text{ V}$		-80		μA
Switching Speed					
Enabled			0.25		μs
Disabled			12		μs

+5 V SUPPLY

T_A = 25°C, G = +1, R_L = 1 kΩ to midsupply, unless otherwise noted.

Table 4.

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3 dB Bandwidth	G = +1, V _{OUT} = 0.02 V p-p		230		MHz
	G = +1, V _{OUT} = 2 V p-p		30		MHz
	G = +2, V _{OUT} = 0.02 V p-p		90		MHz
Bandwidth for 0.1 dB Flatness	G = +2, V _{OUT} = 2 V p-p, R _L = 100 Ω		7		MHz
Slew Rate	G = +2, V _{OUT} = 3 V step		100		V/μs
Settling Time to 0.1%	G = +2, V _{OUT} = 2 V step		45		ns
Settling Time to 0.01%	G = +2, V _{OUT} = 2 V step		95		ns
NOISE/Harmonic PERFORMANCE					
Harmonic Distortion (dBc) SFDR	f _C = 100 kHz, V _{OUT} = 2 V p-p		-115		dBc
	f _C = 1 MHz, V _{OUT} = 2 V p-p		-93		dBc
	f _C = 2 MHz, V _{OUT} = 2 V p-p		-80		dBc
	f _C = 5 MHz, V _{OUT} = 2 V p-p		-61		dBc
Input Voltage Noise	f = 10 Hz		2.4		nV/√Hz
	f = 100 kHz		1		nV/√Hz
Input Current Noise	f = 10 Hz		31		pA/√Hz
	f = 100 kHz		2.8		pA/√Hz
0.1 Hz to 10 Hz Noise	G = +101, R _F = 1 kΩ, R _G = 10 Ω		99		nV p-p
DC PERFORMANCE					
Input Offset Voltage		-500	-30	+500	μV
Input Offset Voltage Drift			0.2		μV/°C
Input Bias Current		-17	-11	-4	μA
Input Bias Current Drift			3		nA/°C
Input Bias Offset Current		-0.6	-0.02	+0.6	μA
Open-Loop Gain	V _{OUT} = 0.5 V to 4.5 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 V to +4 V	-91	-118		dB
OUTPUT CHARACTERISTICS					
Overdrive Recovery Time	V _{IN} = 0 V to 5 V, G = +2		96		ns
+Output Voltage Swing	R _L = 1 kΩ	4.85	4.98		V
-Output Voltage Swing	R _L = 1 kΩ	0.15	0.014		V
+Output Voltage Swing	R _L = 100 Ω	4.8	4.88		V
-Output Voltage Swing	R _L = 100 Ω	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	DISABLE = 0 V	2.6	2.8	2.9	mA
			0.18		mA
Positive Power Supply Rejection	+V _S = 4.5 V to 5.5 V, -V _S = 0 V	-96	-123		dB
Negative Power Supply Rejection	+V _S = 5 V, -V _S = -0.5 V to +0.5 V	-96	-121		dB

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

+3 V SUPPLY

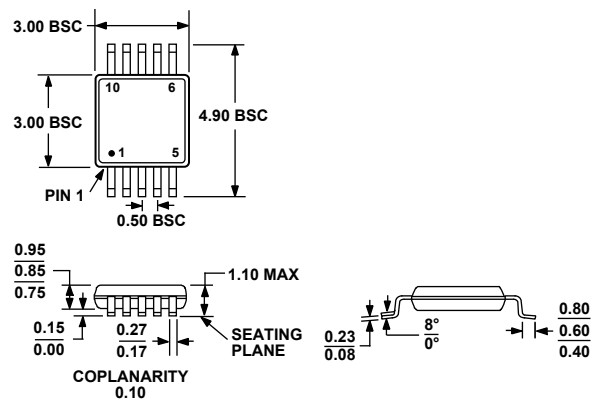
T_A = 25°C, G = +1, R_L = 1 kΩ to midsupply, unless otherwise noted.

Table 5.

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
-3 dB Bandwidth	G = +1, V _{OUT} = 0.02 V p-p		230		MHz
	G = -1, V _{OUT} = 1 V p-p		45		MHz
	G = +2, V _{OUT} = 0.02 V p-p		90		MHz
Bandwidth for 0.1 dB Flatness	G = +2, V _{OUT} = 2 V p-p, R _L = 100 Ω		7		MHz
Slew Rate	G = +2, V _{OUT} = 1 V step		85		V/μs
Settling Time to 0.1%	G = +2, V _{OUT} = 2 V step		45		ns
Settling Time to 0.01%	G = +2, V _{OUT} = 2 V step		96		ns
NOISE/Harmonic PERFORMANCE					
Harmonic Distortion (dBc) SFDR	f _c = 100 kHz, V _{OUT} = 2 V p-p, G = +2		-105		dBc
	f _c = 1 MHz, V _{OUT} = 1 V p-p, G = -1		-84		dBc
	f _c = 2 MHz, V _{OUT} = 1 V p-p, G = -1		-77		dBc
	f _c = 5 MHz, V _{OUT} = 1 V p-p, G = -1		-60		dBc
Input Voltage Noise	f = 10 Hz		2.3		nV/√Hz
	f = 100 kHz		1		nV/√Hz
Input Current Noise	f = 10 Hz		31		pA/√Hz
	f = 100 kHz		2.8		pA/√Hz
0.1 Hz to 10 Hz Noise	G = +101, R _F = 1 kΩ, R _G = 10 Ω		99		nV p-p
DC PERFORMANCE					
Input Offset Voltage		-500	-30	+500	μV
Input Offset Voltage Drift			0.2		μV/°C
Input Bias Current		-17	-11	-4	μA
Input Bias Current Drift			3		nA/°C
Input Bias Offset Current		-0.6	-0.02	+0.6	μA
Open-Loop Gain	V _{OUT} = 0.5 V to 2.5 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 V to +1.9 V	-90	-124		dB
OUTPUT CHARACTERISTICS					
Overdrive Recovery Time	V _{IN} = 0 V to +3 V, G = +2		83		ns
+Output Voltage Swing	R _L = 1 kΩ	2.85	2.97		V
-Output Voltage Swing	R _L = 1 kΩ	0.15	0.01		V
+Output Voltage Swing	R _L = 100 Ω	2.8	2.92		V
-Output Voltage Swing	R _L = 100 Ω	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
	DISABLE = 0 V		0.15		
Positive Power Supply Rejection	+V _S = 2.7 V to 3.7 V, -V _S = 0 V	-96	-121		dB
Negative Power Supply Rejection	+V _S = 3 V, -V _S = -0.3 V to 0.7 V	-96	-120		dB

Parameter	Conditions	Min	Typ	Max	Unit
DISABLE PIN					
DISABLE Voltage	Enabled		>+V _S - 0.5		V
	Disabled		<-V _S + 2		V
Input Current					
Enabled	DISABLE = +3 V		-2.5		μA
Disabled	DISABLE = 0 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