

High bandwidth Op-Amps

Outline

- **LMH5401**
 - 8-GHz, Low-Noise, Low-Power, Fully-Differential Amplifier
- **LMH6554**
 - 2.8-GHz Ultra Linear Fully Differential Amplifier
- **LMH6881**
 - DC to 2.4-GHz, High-Linearity, Programmable Differential Amplifier
- **LMH6882**
 - DC to 2.4-GHz, High-Linearity, Dual, Programmable Differential Amplifier

LMH5401

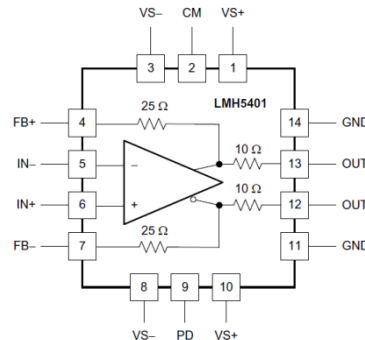
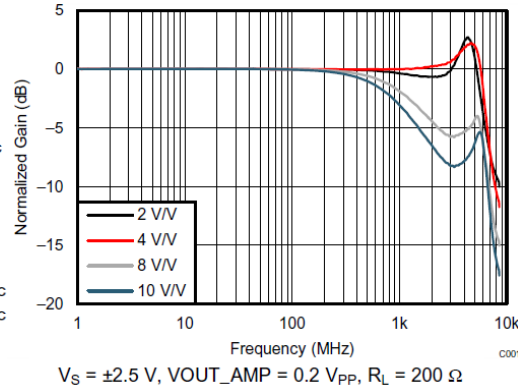
8-GHz, Low-Noise, Low-Power, Fully-Differential Amplifier

Features

- Gain Bandwidth Product (GBP): 8 GHz
- Excellent Linearity Performance:
DC to 2 GHz, $G = 12$ dB
- Slew Rate: 17,500 V/ μ s
- Low HD2, HD3 Distortion
(1 V_{PP} , 200 Ω , DE-DE, $G = 12$ dB):
 - 100 MHz: HD2 at -104 dBc, HD3 at -96 dBc
 - 200 MHz: HD2 at -95 dBc, HD3 at -92 dBc
 - 500 MHz: HD2 at -80 dBc, HD3 at -77 dBc
 - 1 GHz: HD2 at -64 dBc, HD3 at -58 dBc
- Low IMD2, IMD3 Distortion
(2 V_{PP} , 200 Ω , DE-DE, $G = 12$ dB):
 - 200 MHz: IMD2 at -96 dBc, IMD3 at -95 dBc
 - 500 MHz: IMD2 at -80 dBc, IMD3 at -83 dBc
 - 1 GHz: IMD2 at -70 dBc, IMD3 at -63 dBc
- Input Voltage Noise: 1.25 nV/ $\sqrt{\text{Hz}}$
- Input Current Noise: 3.5 pA/ $\sqrt{\text{Hz}}$
- Supports Single- and Dual-Supply Operation
- Power Consumption: 55 mA
- Power-Down Feature

Applications

- GPS ADC Drivers
- ADC Drivers for High-Speed Data Acquisition
- ADC Drivers for 1-GBPS Ethernet over Microwave
- DAC Buffers
- IF, RF, and Baseband Gain Blocks
- SAW Filter Buffers and Drivers
- Balun Replacement DC to 2 GHz
- Level Shifters



The LMH5401 device is a very high-performance, differential amplifier optimized for radio frequency (RF), intermediate frequency (IF), or high-speed, dc-coupled, time-domain applications. The device is ideal for dc- or ac-coupled applications that may require a single-ended-to-differential (SE-DE) conversion when driving an analog-to-digital converter (ADC). The LMH5401 generates very low levels of second- and third-order distortion when operating in SE-DE or differential-to-differential (DE-DE) mode.

The amplifier is optimized for use in both SE-DE and DE-DE systems. The device has unprecedented usable bandwidth from DC to 2 GHz. The LMH5401 can be used for SE-DE conversions in the signal chain without external baluns in a wide range of applications such as test and measurement, broadband communications, and high-speed data acquisition.

A common-mode reference input pin aligns the amplifier output common-mode with the ADC input requirements. Power supplies between 3.3 V and 5 V can be selected and dual-supply operation is supported when required by the application. A power-down feature is also available for power savings.

LMH6554

2.8-GHz Ultra Linear Fully Differential Amplifier

Features

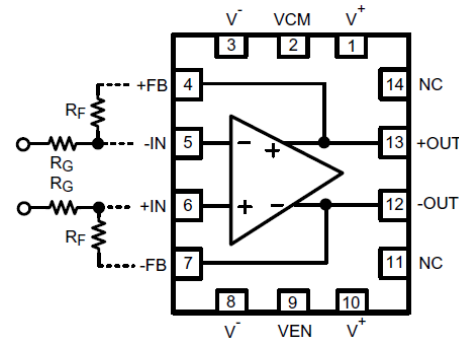
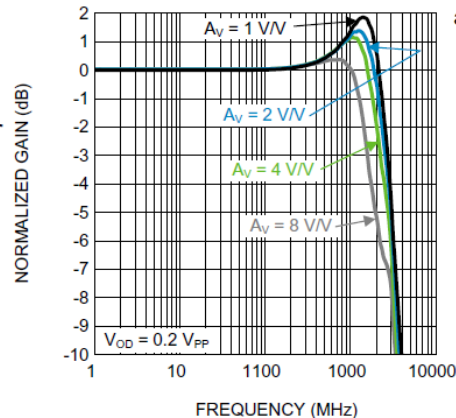
- Small-Signal Bandwidth 2.8 GHz
- $2 V_{PP}$ Large-Signal Bandwidth 1.8 GHz
- 0.1 dB Gain Flatness 830 MHz
- OIP3 at 150 MHz 46.5 dBm
- HD2/HD3 at 75 MHz $-96 / -97$ dBc
- Input Noise Voltage $0.9 \text{ nV}/\sqrt{\text{Hz}}$
- Input Noise Current $11 \text{ pA}/\sqrt{\text{Hz}}$
- Slew Rate $6200 \text{ V}/\mu\text{s}$
- Power 260 mW
- Typical Supply Current 52 mA
- 14-Lead UQFN Package

Applications

- Differential ADC Driver
- Single-Ended to Differential Converter
- High-Speed Differential Signaling
- IF/RF and Baseband Gain Blocks
- SAW Filter Buffer/Driver
- Oscilloscope Probes
- Automotive Safety Applications
- Video Over Twisted Pair
- Differential Line Driver

The LMH6554 device is a high-performance fully differential amplifier designed to provide the exceptional signal fidelity and wide large-signal bandwidth necessary for driving 8- to 16-bit high-speed data acquisition systems. Using TI's proprietary differential current mode input stage architecture, the LMH6554 has unity gain, small-signal bandwidth of 2.8 GHz and allows operation at gains greater than unity without sacrificing response flatness, bandwidth, harmonic distortion, or output noise performance.

The low-impedance differential output of the device is designed to drive ADC inputs and any intermediate filter stage. The LMH6554 delivers 16-bit linearity up to 75 MHz when driving 2-V peak-to-peak into loads as low as 200Ω .



LMH6881

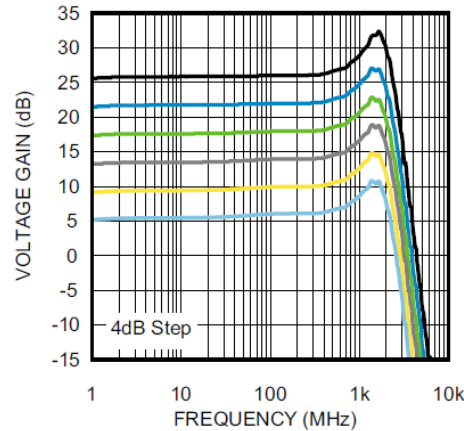
DC to 2.4-GHz, High-Linearity, Programmable Differential Amplifier

• Features

- Small Signal Bandwidth: 2400 MHz
- OIP3 at 100 MHz: 44 dBm
- HD3 at 100 MHz: -100 dBc
- Noise Figure: 9.7 dB
- Voltage Gain Range: 26 dB to 6 dB
- Voltage Gain Step Size: 0.25 dB
- Input Impedance: 100 Ω
- Parallel and Serial Gain Control
- Power Down Capability

• Applications

- Oscilloscope Front End
- Spectrum Analyzer Gain Block
- Differential ADC Driver
- Differential Cable Driver
- IF/RF and Baseband Gain Blocks
- Medical Imaging

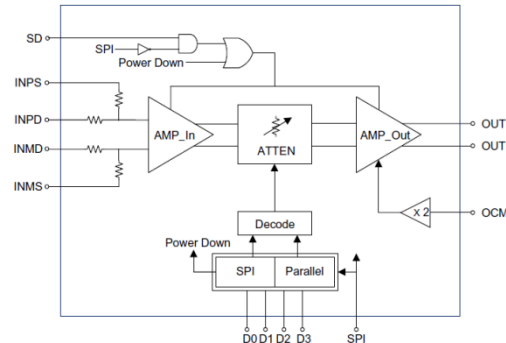


The LMH6881 is a high-speed, high-performance, programmable differential amplifier. With a bandwidth of 2.4 GHz and high linearity of 44 dBm OIP3, the LMH6881 is suitable for a wide variety of signal conditioning applications.

The LMH6881 programmable differential amplifier combines the best of both fully differential amplifiers and variable-gain amplifiers. The device offers superior noise and distortion performance over the entire gain range without external resistors, enabling the use of just one device and one design for multiple applications requiring different gain settings.

The LMH6881 is an easy-to-use amplifier that can replace both fully differential, fixed-gain amplifiers as well as variable-gain amplifiers. The LMH6881 requires no external gain-setting components and supports gain settings from 6 dB to 26 dB with small, accurate 0.25-dB gain steps. With an input impedance of 100 Ω , the LMH6881 is easy to drive from a variety of sources such as mixers or filters. The LMH6881 also supports 50- Ω single-ended signal sources and supports both DC- and AC-coupled applications.

Parallel gain control allows the LMH6881 to be soldered down in a fixed-gain so that no control circuit is required. If dynamic-gain control is desired, the LMH6881 can be changed with SPI™ serial commands or with the parallel pins.



LMH6882

DC to 2.4-GHz, High-Linearity, Dual, Programmable Differential Amplifier

• Features

- Small Signal Bandwidth: 2400 MHz
- OIP3 @ 100 MHz: 42 dBm
- HD3 @ 100 MHz: -100 dBc
- Noise Figure: 9.7 dB
- Voltage Gain: 26 dB to 6 dB
- Voltage Gain Step Size: 0.25 dB
- Input Impedance: 100 Ω
- Parallel and Serial Gain Control
- Power Down Capability

• Applications

- Microwave Backhaul Radio Receiver
- Zero IF Sampling
- In-Phase/Quadrature (I/Q) Sampling
- Medical Imaging
- RF/IF and Baseband Gain Blocks
- Differential Cable Driver

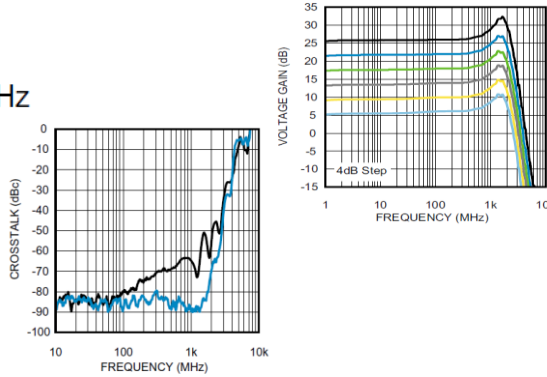
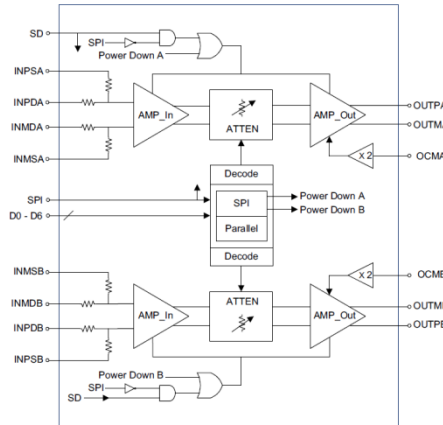


Figure 29. Crosstalk



The LMH6882 is a high-speed, high-performance programmable differential amplifier. With a bandwidth of 2.4 GHz and high linearity of 42 dBm OIP3, the LMH6882 is suitable for a wide variety of signal conditioning applications.

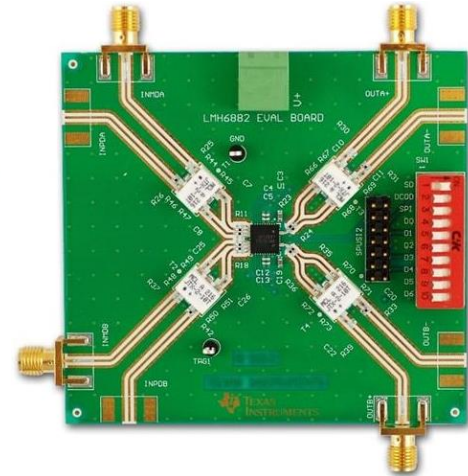
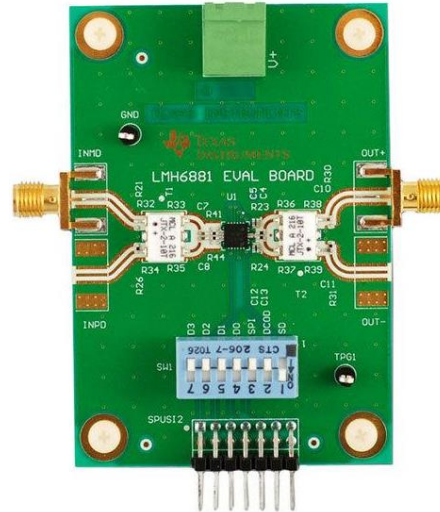
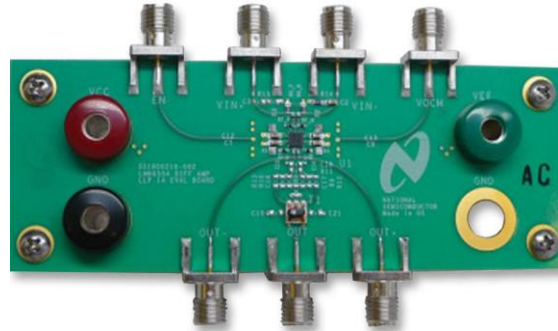
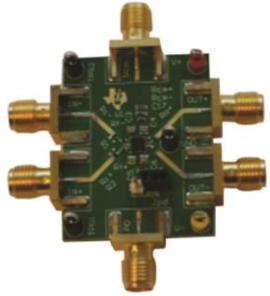
The LMH6882 programmable differential amplifier combines the best of both fully differential amplifiers and variable-gain amplifiers. The device offers superior noise and distortion performance over the entire gain range without external resistors, enabling the use of just one device and one design for multiple applications requiring different gain settings.

The LMH6882 is an easy-to-use amplifier that can replace both fully differential, fixed-gain amplifiers as well as variable-gain amplifiers. The LMH6882 requires no external gain-setting components and supports gain settings from 6 dB to 26 dB with small, accurate 0.25-dB gain steps. As shown in the adjacent voltage gain chart the gain steps are very accurate over the entire gain range. With an input impedance of 100 Ω , the LMH6882 is easy to drive from a variety of sources such as mixers or filters. The LMH6882 also supports 50- Ω single-ended signal sources and supports DC- and AC-coupled applications.

Parallel gain control allows the LMH6882 to be soldered down in a fixed-gain so that no control circuit is required. If dynamic gain control is desired, the LMH6882 can be changed with SPI™ serial commands or with the parallel pins.

Evaluation boards

Device	Evaluation board	Mouser	AVNET	ARROW	DIGIKEY	farnell
LMH5401	LMH5401EVM	595-LMH5401EVM			296-38529-ND	2469351
LMH6554	LMH6554LE-EVAL			LMH6554LE-EVAL/NOPB	LMH6554LE-EVAL/NOPB-ND	2334153
LMH6881	LMH6881EVAL/NOPB		LMH6881EVAL/NOPB		296-41173-ND	
LMH6882	LMH6882EVAL/NOPB	595-LMH6882EVAL/NOPB			296-45779-ND	2379143



LMH5401EVM

LMH6554LE-EVAL

LMH6881EVAL/NOPB

LMH6882EVAL/NOPB