

khs

instruments

analog::blocks

200 MHz Amplifier

Application Note

Rev. 1.0

The analog::blocks OpAmp platform uses pre-routed boards and prototype modules that can be populated and modified for different applications.

In this application note, three amplifier modules, one USB power supply module and one voltage regulator module are combined on the Base Board to build a 0 to 200 MHz amplifier with 40 dB gain.

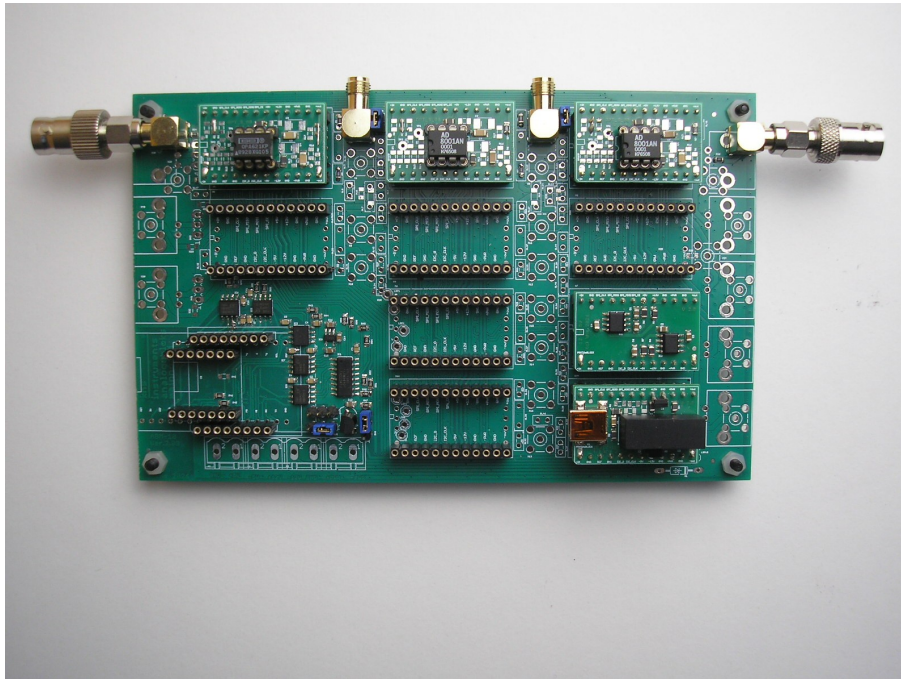


Figure 1. Base Board with modules

The amplifier modules use OpAmp Boards for DIL-8 operational amplifiers. The first stage uses an OPA621 with a gain-bandwidth product of 500 MHz. The second and third stages use the AD8001, a 900 MHz current-feedback amplifier.

The OPA621 and AD8001 are obsolete devices, but they are well suited to demonstrate how the amplifier boards can be modified for high-frequency applications.

The OPA621 and especially the AD8001 require high-frequency layout techniques. In general, all printed-circuit-board conductors should be wide to provide low-resistance, low-impedance signal paths. They should also be kept as short as possible.

Because nearly all analog::blocks modules and boards provide a solid ground plane, components can be mounted on the solder side to provide extremely short connections to the IC.

Additionally, the Base Board has a solid ground plane on the solder side to provide low-impedance current paths. The analog interconnections have an impedance of approximately 50 Ω , so their influence on the signal is relatively small.

Figure 2 shows the wiring of the AD8001 module. The decoupling capacitor and the input resistor are soldered directly to the ground plane.

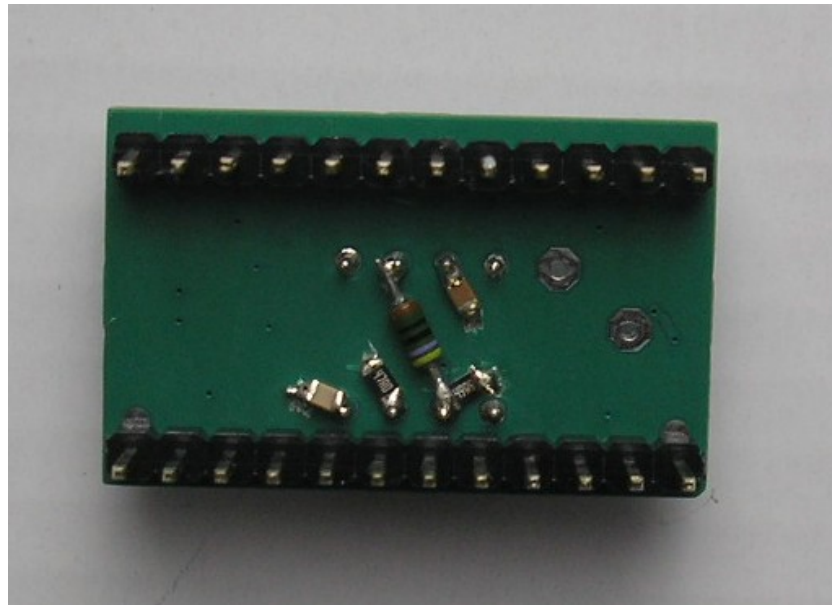


Figure 2. Wiring of the AD8001 module

The isolated USB-to- ± 12 V converter is used as the power supply. The galvanic isolation prevents a direct ground connection through the USB interface and helps to avoid ground-loop problems during measurements.

Since the operational amplifiers operate from ± 5 V, an additional voltage regulator module is used to generate the ± 5 V supply.

To minimize magnetic coupling between the DC/DC converter transformer and the first amplifier stage, the distance between the two modules was maximized. The DC/DC converter module was therefore placed in the lower-right corner of the analog::blocks Base Board, while the first amplifier module was placed in the upper-left corner.

Because the analog::blocks Base Board provides separate ± 12 V and ± 5 V power rails, no additional power wiring is required. The DC/DC converter module supplies the ± 12 V rails, while the voltage regulator module is powered from these rails and supplies the ± 5 V rails used by the amplifier modules.

The frequency response was measured using an Advantest R3131 spectrum analyzer with tracking generator. The measured -3 dB bandwidth is approximately 220 MHz.

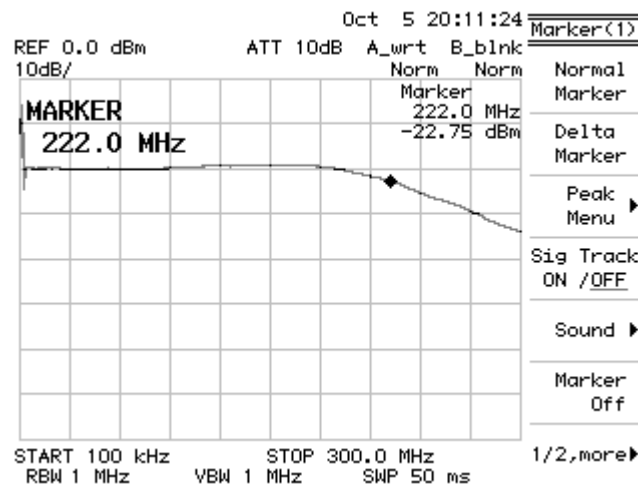


Figure 3. Frequency Response

The output noise was measured using a R&S URV35 RF voltmeter with an URV5-Z2 probe.

The measured output noise is 4.5 mV RMS at a voltage gain of 100, corresponding to an input-referred RMS noise of 45 μ V.

The measurement includes the complete amplifier system, including the USB-powered DC/DC converter and the ± 5 V regulator module installed on the Base Board.

History:

Revision	date yy/mm/dd	Changes
1.0	26/10/05	Initial.