

## LA-22 Low Noise Lab Amplifier

The LA-22 Low Noise Lab Amplifier is intended to make it easy to do low-level measurements using ordinary lab equipment such as oscilloscopes, spectrum analyzers, and data acquisition bricks, which usually have noise levels in the tens of nanovolts per root hertz.

The LA-22 has 1-nV/ $\sqrt{\text{Hz}}$  voltage noise, wide bandwidth, FET input, 100 $\times$  gain, and good manners: in the time domain, 20-ns edges with low overshoot, and in the frequency domain, 500 Hz–20 MHz bandwidth with a smooth rolloff and no high-frequency peaking.

### Description

The design philosophy is to minimize surprises, so that you can concentrate on your measurement instead of your apparatus.

**Gain of 100 $\pm$ 1** Enough that ordinary lab equipment doesn't limit the measurement. That spectrum analyzer's 30-dB noise figure is now 3 dB or better.

**AC Coupling** Helps protect the sensitive input from damage, and reduces low-frequency hum and other noise.

**20 MHz Bandwidth** Wide enough for most low-noise measurements, and doesn't produce a lot of grass on a scope display.

**Flat Frequency Response** There's no mystery about what the noise gain is—you can do measurements without worrying about normalization.

**Clean Edges** With high linearity and less than 1% overshoot, the LA-22 shows you your signal's time dependence accurately.

**1 k $\Omega$  AC Input Resistance** Prevents excessive output noise and possible oscillation when an unterminated cable is attached to the input. The LA-22 has good manners in all sorts of situations.

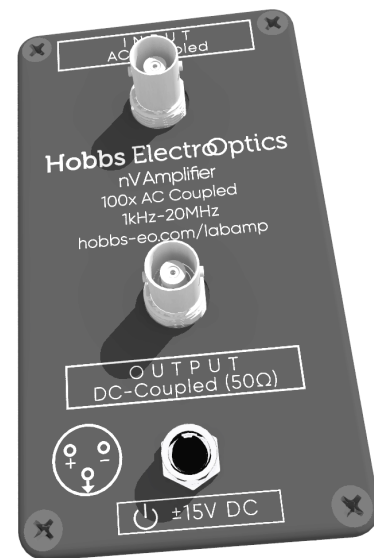


Figure 1: The LA22 delivers simple and reliable low noise amplifier useful for test & development of low noise systems.

### Construction

The LA22 is designed to make testing problems go away. These physically small devices feature ESD, power supply overvoltage, pulse input overvoltage, and over temperature cutoff. Solidly constructed with zinc coated die cast brass connectors, and a die cast aluminum enclosure these will survive harsh treatment without the performance suffering. Solid metal BNCs for signals, M8-3 to color-coded banana plugs or plug-in power supply optional.

## LA22 Typical Specifications

### LA22

<b>Gain:</b>	100 × ± 1 %
<b>Bandwidth</b>	500 Hz–20 MHz @ -3 dB
<b>Input-Referred Noise</b>	1.1 nV/√Hz (short circuit)
<b>Input Impedance</b>	1 kΩ in series with 330 nF
<b>Output Range</b>	Greater than ±10 V
<b>Rise/Fall Time</b>	21/21 ns (10 %- 90%)
<b>Overshoot</b>	1% typical
<b>Power Supply</b>	±15 V @ > 150 mA max

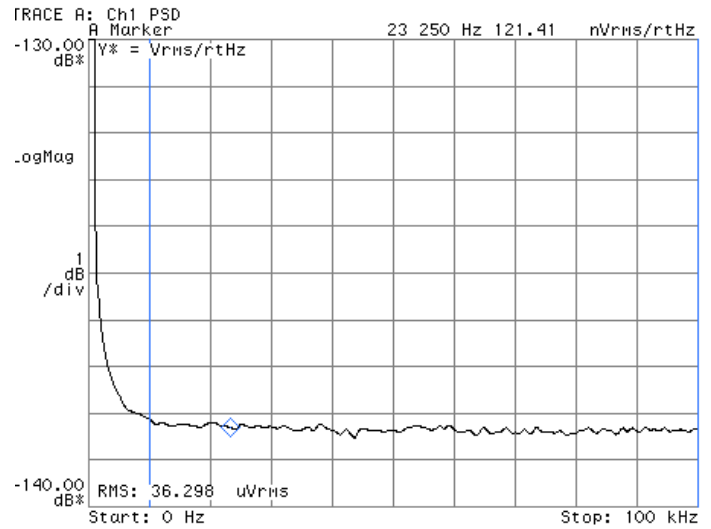


Figure 4: Output noise, DC-100 kHz with 12.5Ω source resistance  $R_S$ .

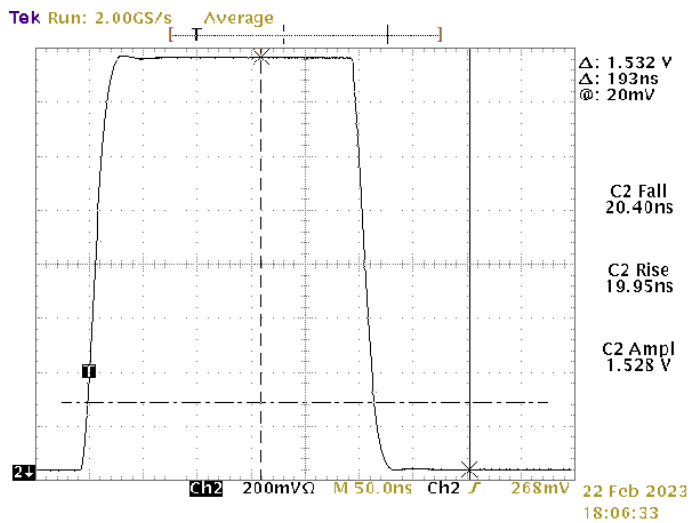


Figure 2: Response to a 250-ns, 31 mV pulse, into a 50-ohm oscilloscope input.

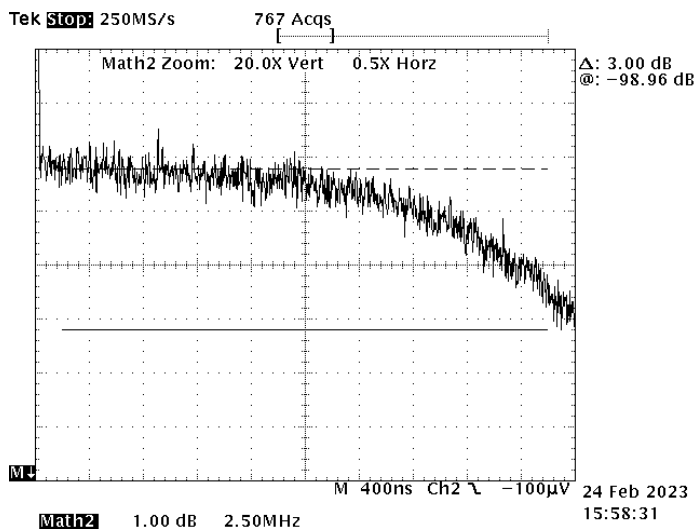


Figure 3: Output noise, DC-25 MHz with 12.5Ω source resistance  $R_S$  ( $R_S$  adds 0.9 dB extra noise). Scope FFT at 15000 samples at 250 MS/s, Hamming window, 767 averages. Vertical scale is dBV in 16.7 kHz bandwidth (250 MS/s / 15000 samples, rectangle window function).

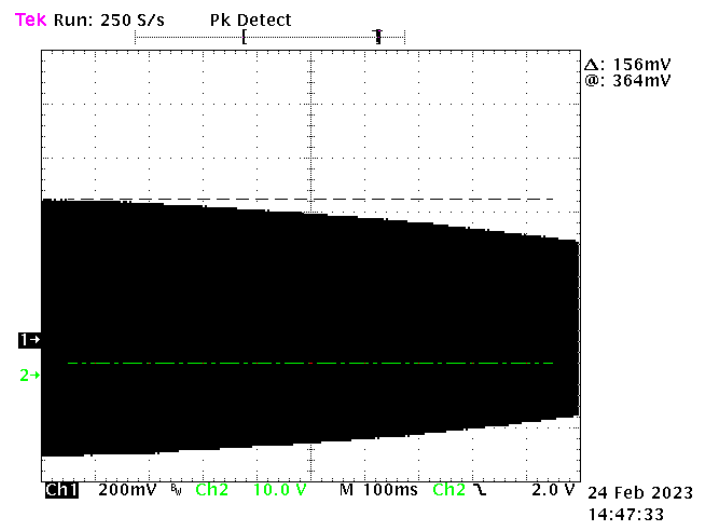


Figure 5: Swept-sine measurement of frequency response, DC-20 MHz (2 MHz/division). The p-p voltage decreases smoothly from 520 mV at low frequency to 364 mV (-3 dB) at 20 MHz.

### Resources

**Product Page:** [hobbs-eo.com/LA22](http://hobbs-eo.com/LA22)

**User Manual:** [hobbs-eo.com/LA22/manual](http://hobbs-eo.com/LA22/manual)

**Other Amplifiers:** [hobbs-eo.com/amplifier-modules](http://hobbs-eo.com/amplifier-modules)

### Company Information

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