Hobbs ElectroOptics

# LP870 Nanosecond Light Source


## User's Guide

**Rev. 0.1.0**

# LEGAL NOTICE AND WARRANTY

# Contents

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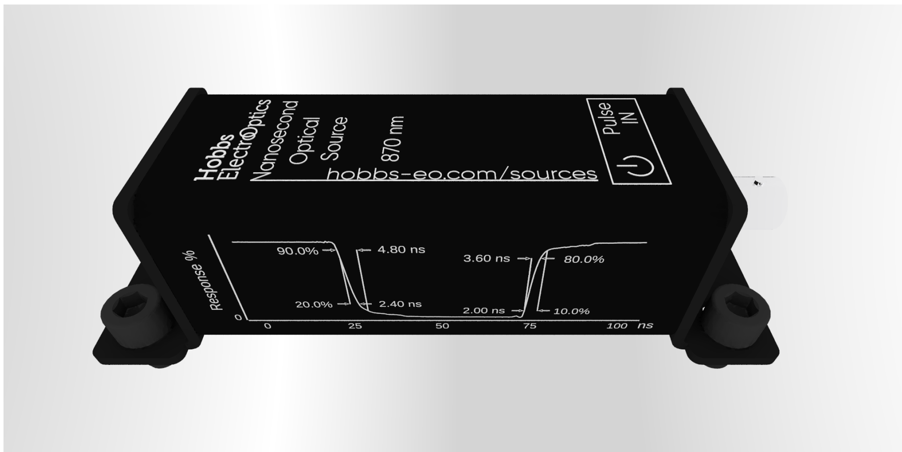
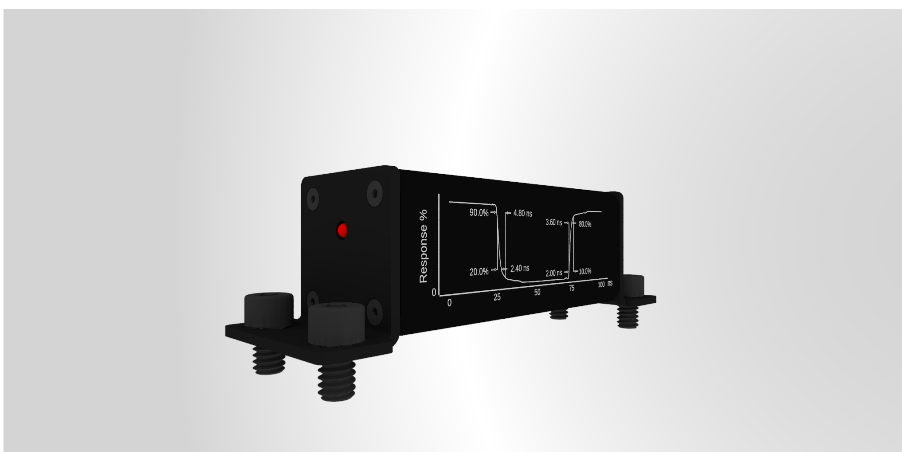
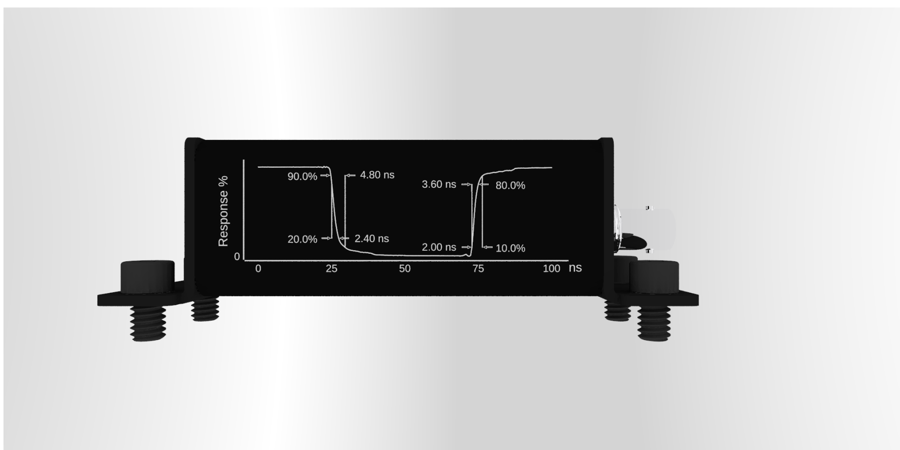
# 1 Introduction




The LP870 Nanosecond Light Source is a simple, robust, convenient DC coupled LED pulser. Specifically designed for testing the pulse response of photoreceivers in a test and calibration system with minimal setup time.

The LP870 uses a specially-designed LED, and as you can see from Figure 1.2, it produces nice rectangular pulses with quick edges: rise / fall times of 3.75 ns / 2.25 ns (10%-90%) and 2.5 / 1.25 ns (20%–80%). (The measurements were made with a prototype 1-GHz-class silicon APD photoreceiver. Look for a product like that soon.)


The LP870 uses an LED which makes uniform illumination and alignment a none problem speeding up the test and characterization process.

## 1.1 Description

Our LP870 Nanosecond Light Source is a convenient and accurate low-coherence source for testing and characterization of silicon photodetection systems. Its fast edges (sub-4 ns rise and fall time typical) and clean pulses enable quick and reliable measurements up to a 50 MHz bandwidth, with no guesswork. It provides a clean optical step input to measure the rise/fall times and overshoot of your system, which tells you its bandwidth as well. It's suitable both for lab use and for integration into test and calibration jigs working at up to 50 MHz. Using an incoherent source ensures eye safety and makes it a breeze to get uniform illumination of the test device. Just plug in the power cord and connect your pulse generator. The LP870 has high internal voltage gain, which steepens up the input waveform to make sharp-edged optical pulses even when driven from ordinary 3.3 V to 5 V logic sources.

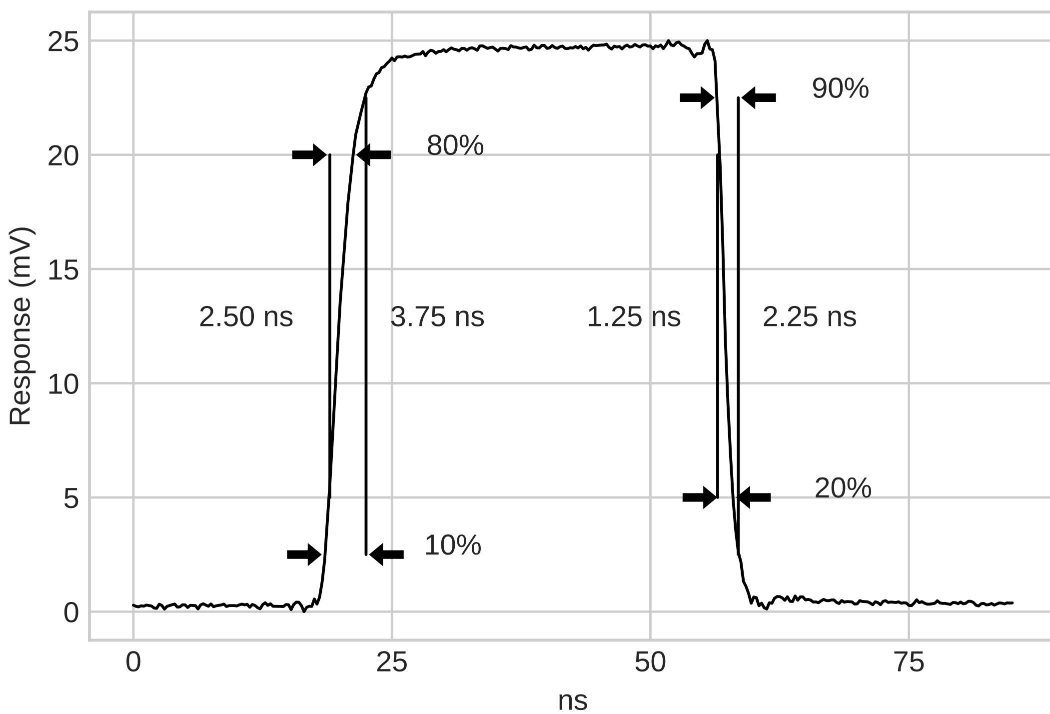



Figure 1.1: Pulse response of the LP870, measured with a P400 pulser and a prototype fast APD photoreceiver. Measured rise / fall times are 3.75 ns / 2.25 ns (10%–90%) and 2.5 / 1.25 ns (80%–20%).

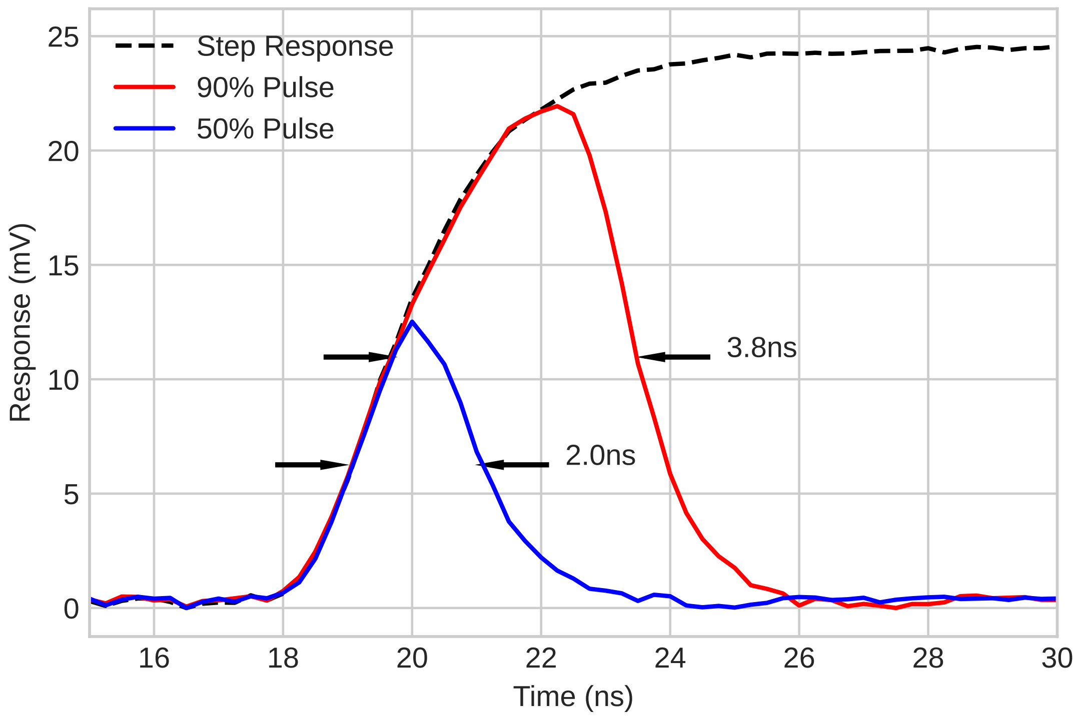



Figure 1.2: Pulse response reaching 50% & 90% of full scale output. FWHM point is marked on both.

# 2 Specifications

**LP870 Nanosecond Light Source**

| | |
|---|---|
| WAVELENGTH | 870 nm, 70 nm FWHM |
| RISE/FALL TIME | < 6 / 6 ns, 10%-90% |
| | < 3 / 3 ns, 20%-80% |
| DIVERGENCE ANGLE | $< 10^o$ |
| PULSE-TOP ARTIFACTS | < 1% |
| OPTICAL POWER | 14 mW Typical |
| PULSE INPUT | Active High, 0-5V CMOS |
| PULSE WIDTH | 4ns - ∞ |
| DIMENSIONS | 118 x 32 x 32 mm |
| REPETITION RATE | > 60 MHz |
| OPTICAL COUPLING | Free space |
| DIODE SIZE | 5 mm |
| POWER | 5V @ > 150mA Max. 5.5 x 2.5 mm barrel. |

## 2.1 Performance Verification

Verifying these specifications requires a photoreceiver sensitive in the near-IR with > 200 MHz. A 200 MHz photoreceiver with a Gaussian filter has an expected 1.75 ns 10-90 rise time. Since the detector and LP870 rise times will be convolved we take the RSS combination.

$$t_{\text{rise}} = \sqrt{1.75^2 + t^2_{\text{rise LP870}}} \tag{2.1}$$

For the nominal LP870 rise time of 3.75 ns we expect to measure a rise time of 4.1 ns with a 200 MHz photoreceiver. We recommend an APD for this measurement.

A quick and dirty method is mounting an APD (such as one of Marktech's offerings) directly on a coax connector, anode to the inner conductor (SMA works well) with a current limited bias supply connected to the cathode. Bypass the bias with a 100nF or larger leaded capacitor. Use the 50 Ohm impedance setting on your oscilloscope. Use a function generator or similar as the pulse source (use a 50 Ohm output impedance to reduce cable reflections).

Be cautious of cable reflections from coax that isn't exactly 50 Ohms. If there are lumps on the waveform try changing cables and cable length. If they move with cable length then it's a reflection.

The oscilloscope used will need to be fast enough to make the measurement. Our apparatus uses a Tektronix TDS 784A 1-GHz, 4-GS/s oscilloscope, and a Highland Technology P400 digital delay generator for the pulses.

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