MODEL 8001 12.5 GB/S DRIVER AMPLIFIER LABWARE MODULE

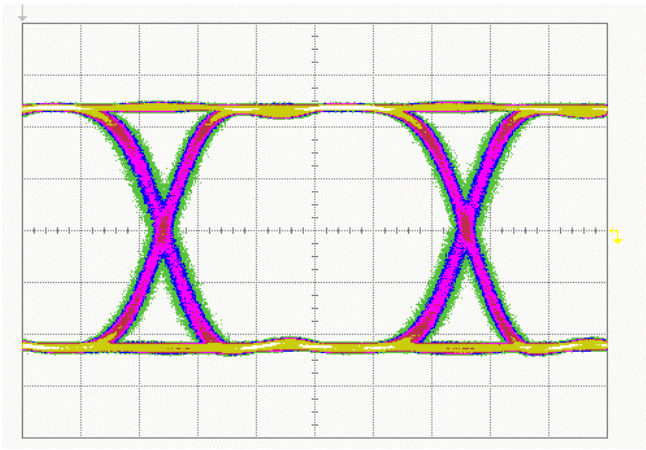
PRODUCT SPECIFICATION

Features:

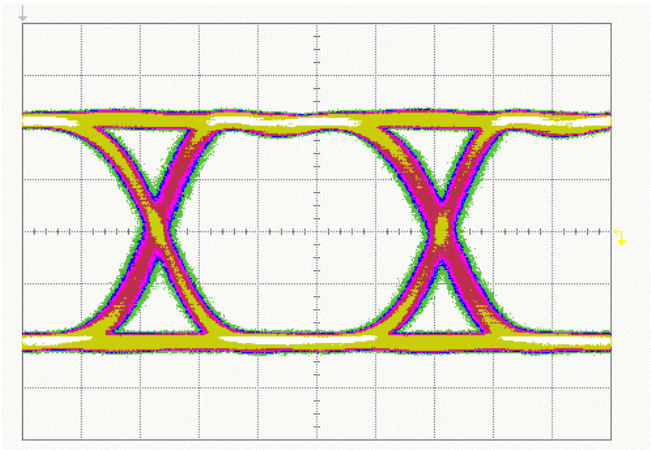
- **12.5 Gb/s Driver Amplifier**
- **LABWare Bench-top Instrument**
- **Integrated Power Supplies, Amplitude, and Crossing-point Controls**
- **7.5 Vpp Output Eye Amplitude**
- **Outstanding Quality Driver Output**
- **Excellent 26dB Gain Linear Amplifier**

Picosecond Pulse Lab's Model 8001 12.5 Gb/s Driver Amplifier LABware Module is designed for bench-top lab use. This LABware module may simply be plugged in with a line cord (either 110V or 220V) and the driver amplifier is ready for use. The 8001 is ideal for driving Lithium Niobate optical modulators using NRZ signals for test and characterization experiments. The 8001 may also be used as a linear amplifier with 26dB gain and 12GHz bandwidth for inputs less than ±150mV (300mVp-p with 50% duty cycle).

Typical 10.0 Gb/s Eye Measurements



Input Test Signal [1]

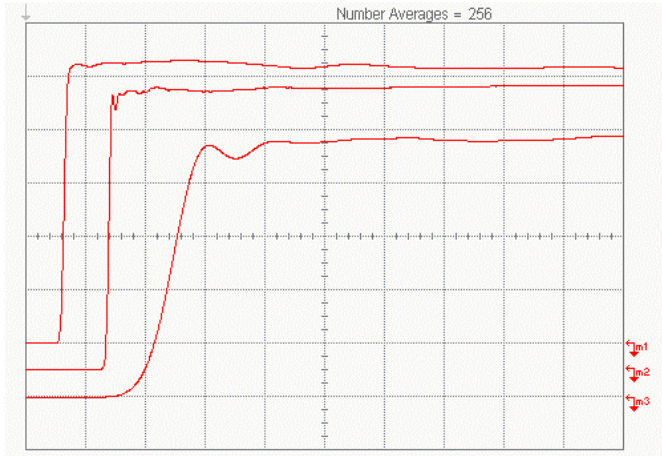


Output Response [2]

[1] Input test signal generated by Agilent Pattern Generator model 70843B, 2^{23}-1 PRBS, 654mV Eye Amplitude.
[2] Output response measured using Agilent oscilloscope model 86100A with model 83484A 50 GHz plug-in module.

Typical Step Response

The graph at the right shows the response of the 8001 to a positive 20ps risetime 100mV step. From top to bottom, the time scales are: 2ns/div, 500ps/div, and 50ps/div. The data was recorded using an Agilent 86100A sampling oscilloscope with 40 GHz plug-in.



Ordering Information:

Part Number	Description
8001	12.5 G-b/s Driver Amplifier

PICOSECOND PULSE LABS, P.O. BOX 44, BOULDER, CO 80306, USA, TEL: 1.303.443.1249, FAX: 1.303.447.2236
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Electrical Specifications under large signal conditions – measured at 23C

PARAMETER	SYMBOL	UNITS	MIN	TYPICAL	MAX	COMMENTS
Polarity						Non-inverting
Output Eye Voltage with Amplitude (A) control = 10.0	V_{OUT}	V_{amp}	7.0	7.5		V_{in} = 0.5 V_{amp}, 12.5 Gb/s PRBS
Output Eye Voltage with Amplitude (A) control = 0.0	V_{OUT}	V_{amp}		3.2	4.0	V_{in} = 0.5 V_{amp}
Deconvolved Rise / Fall Time [1]	$t_{r,f}$	ps		14 / 23	30 / 30	10% to 90%, V_{in} = 0.5 V_{amp}, 12.5 Gb/s PRBS
Additive Jitter [1] RMS Peak-to-Peak		ps ps_{pp}		0.7 4	1.5 8	V_{in} = 0.5 V_{amp}, 12.5 Gb/s PRBS, measured at crossing point
Crossing Point (XP) Adjust Amplitude (A) control = 10.0		%	±10	±15		V_{in} = 0.5 V_{amp}
Overshoot / Undershoot		%		5		12.5 Gb/s PRBS

[1] Deconvolution is done by root sum of squares. Input rise/fall times were 27 ps. Input jitter was 2.3 ps RMS / 9.8 ps pk-pk.

Electrical Specifications under small signal (linear) conditions – measured at 23C

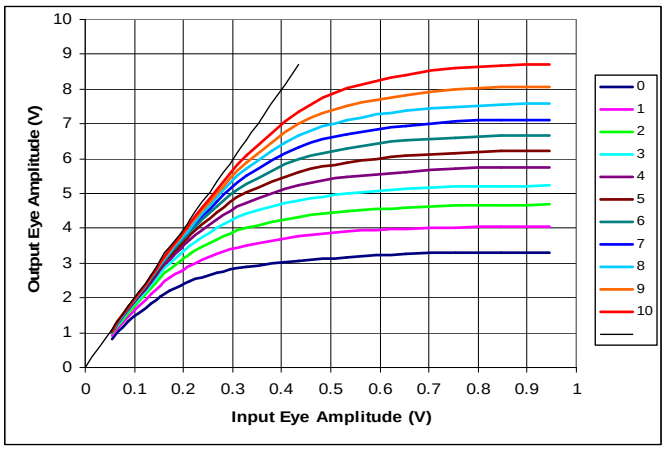
PARAMETER	SYMBOL	UNITS	MIN	TYPICAL	MAX	COMMENTS
Upper Frequency 3 dB Point	$f_{3dB,upper}$	GHz		12		Small signal, relative to gain at 2 GHz
Lower Frequency 3 dB Point	$f_{3dB,lower}$	kHz		30		Small signal, relative to gain at 2 GHz
Small signal gain	S_{21}	dB		26.5		Measured at 2 GHz
Deconvolved Rise / Fall Time [1]	$t_{r,f}$	ps		30		10% to 90%, V_{in} = 100mV
Output Power at 1dB Gain Compression Square wave Sine wave	P_{1dB}	dBm		 23.5 20.5		Measured at 2 GHz AC-coupled at Input and Output
Input / Output Return Loss 50 MHz < f < 5 GHz 5 GHz ≤ f < 12 GHz	S_{11}, S_{22}	dB		 -14 -11	 -12 -9	
Noise Figure	NF	dB		5.75	6.5	f = 1 GHz

Operating Specifications

PARAMETER	COMMENTS
Maximum allowed Input	1.5 Max Vamp (Damage threshold for input)
AC Power	100, 117, 200, or 230 VAC, 50/60 Hz, 15VA (60 Hz)
Environment Operating Storage	 Indoors, 20 C to 30 C, 80% rh 0C to 50C
Safety Certifications	Conforms to EN-061010-1 (CE mark), UL-1244 and IEC-348. Safety class I. For lab use by qualified personnel.
Dimensions	9.6 x 7.5 x 1.7 in. (244 x 190 x 33 mm)
Weight	3.3 lbs. (1.5 kg)
Accessories	USA power cord
Warranty	1 year for workmanship and defects.[1]

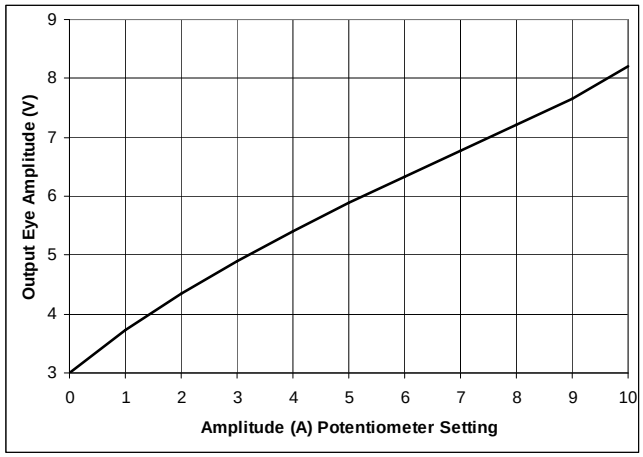
[1] The 8001 is **static-sensitive**. Warranty does not apply to failures due to customer misuse or mishandling.

Output Eye Amplitude vs. Input Amplitude



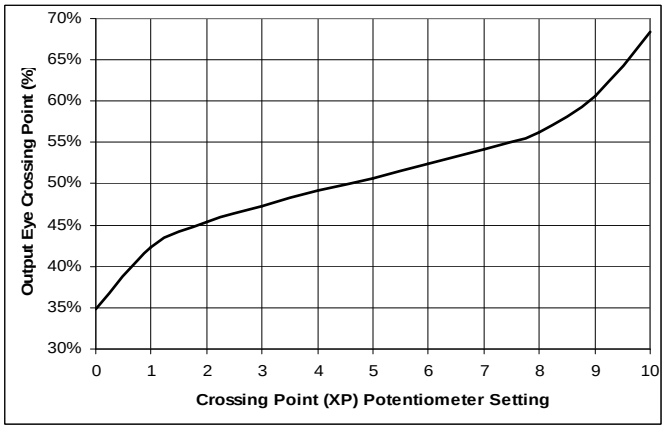
10.0 G-b/s NRZ signal, 2^{23}-1 PRBS, Crossing Point (XP) = 5.0
Black line shows 26dB gain for comparison

Output Eye Amplitude vs. Amplitude Setting



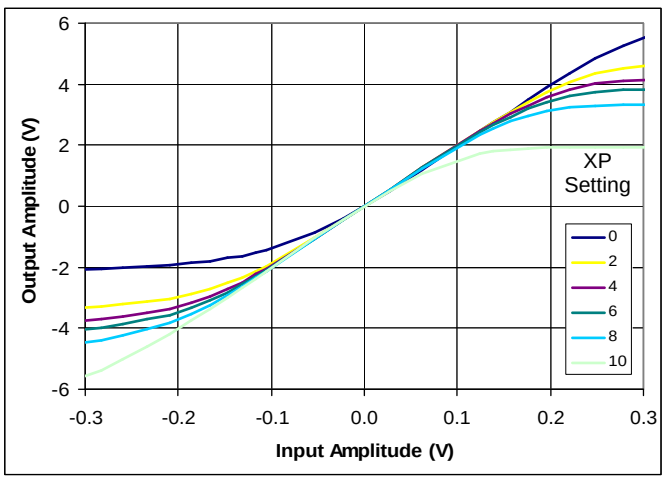
10.0 G-b/s NRZ signal, 2^{23}-1 PRBS
Input Eye Amplitude = 654 mV, Crossing Point (XP) = 5.0

Output Eye Crossing Point vs. Crossing Point (XP) Setting



10.0 G-b/s NRZ signal, 2^{23}-1 PRBS, Amplitude (A) = 10.0,
Input Eye Amplitude = 654 mV

Output Voltage Range vs. Crossing Point (XP) Control



10ns pulse with 0.1% duty cycle, Amplitude (A) = 10.0

The Amplitude (A) control has very little effect on the output voltage under small signal conditions. Generally, it should be set to 10.0 when the 8001 is used as a linear amplifier. The Crossing Point (XP) control sets the bias point of the amplifier. It should be set to 5.0. Both the Amplitude (A) and Crossing Point (XP) controls have locking levers. Be sure that the locks are released before rotating the knobs.

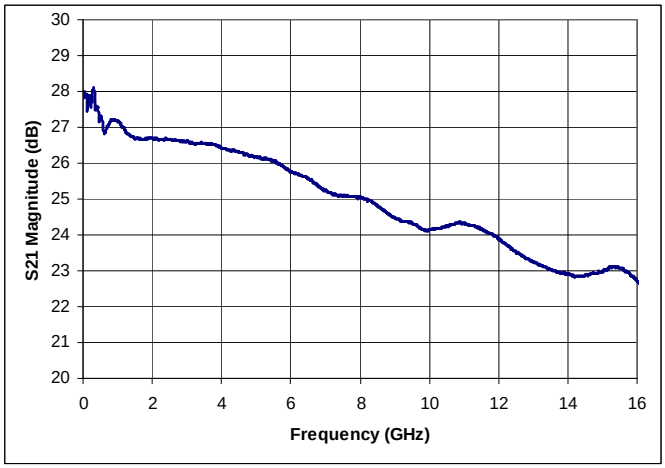
The Crossing Point (XP) control provides an adjustment for the crossing point of NRZ signals. By shifting the bias point, it can also compensate for NRZ signals that do not have a Mark Ratio of 1:2, RZ signals, or signals with low or high duty cycles.

The 8001 is AC-coupled at the Input and Output, and the average value of the output signal (the DC component) must be at 0V. Most NRZ data streams are conditioned to have a 50% duty cycle when averaged over a long period, about a microsecond. Those signals make full use of the positive and negative halves of the amplifier's operating range.

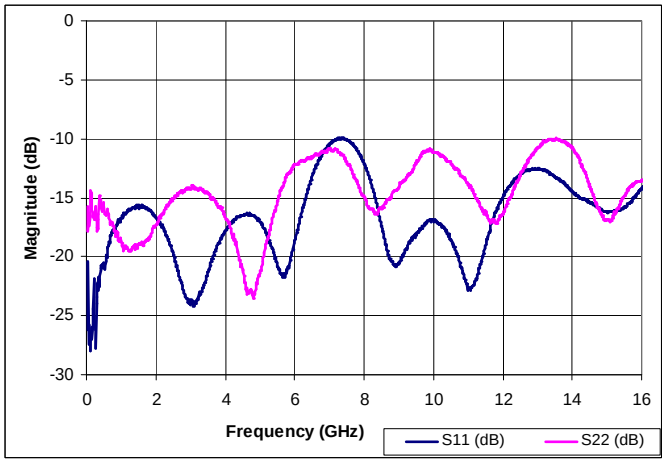
The average amplitude of low duty cycle signals can be virtually at the baseline. These signals use only one half of the 8001 operating range, and the maximum output amplitude may be 4V instead of 8V. The Crossing Point (XP) control can shift the amplifier's operating point and increase the output amplitude up to 6V in some cases.

PSPL recommends that the 8001 be driven with a negative polarity signal when the duty cycle is very low. Narrow positive pulses can generate excessive heat within the 8001 and damage the amplifier. Similarly, large duty signals should be positive.

Typical Small Signal S21



Typical Small Signal S11 & S22



Caution: The 8001 contains a static sensitive amplifier. Always short the terminals of a device before connecting it to the input or output of the 8001. Even coax cables must be shorted before making the connection.