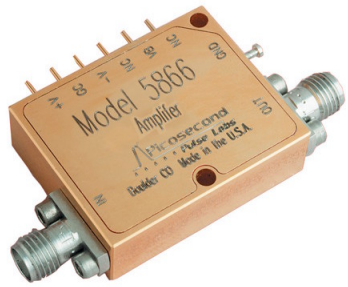
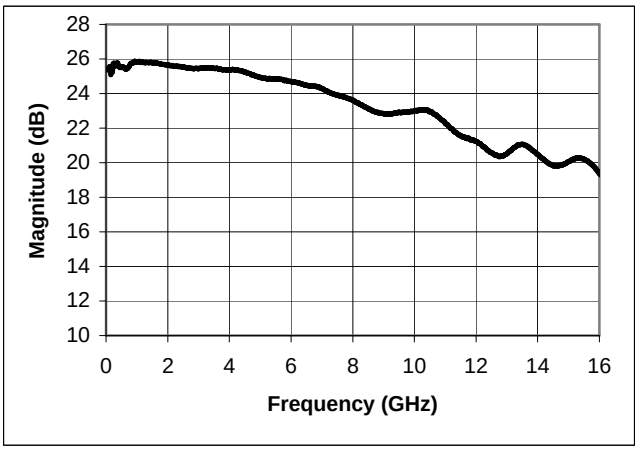
MODEL 5866
10 GHZ LINEAR AMPLIFIER

PRODUCT SPECIFICATION

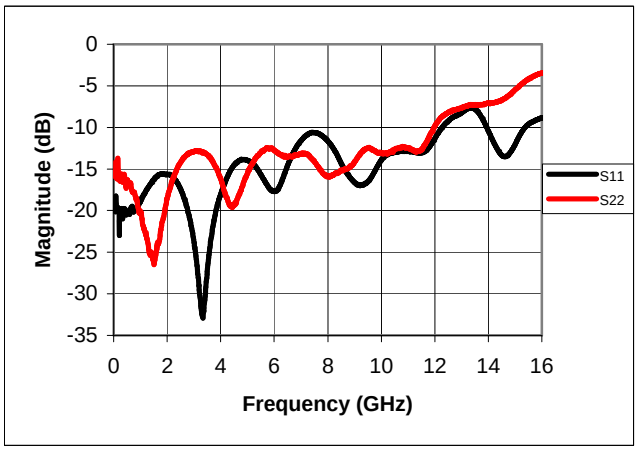
- **Linear amplifier with 26 dB gain and 2.5 kHz - 10 GHz bandwidth**
- **High gain with low power dissipation (1.7 watts at +17 dBm)**
- **> 4 V p-p linear output**
- **Temperature compensated design for output stability**



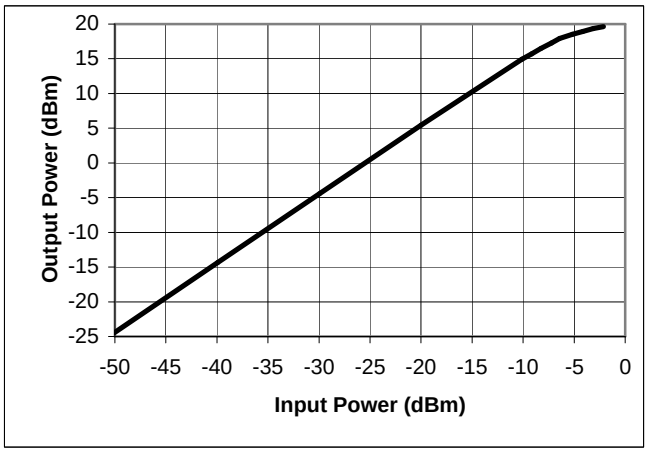
The Picosecond Pulse Labs Model 5866 amplifier has been designed to minimize the variations in gain and phase and to operate at very low frequencies. The 5866 includes internal temperature compensation for excellent output stability over temperature, and exhibits both high output and low power dissipation. It also incorporates internal sequencing circuitry, making it insensitive to power supply application sequence.



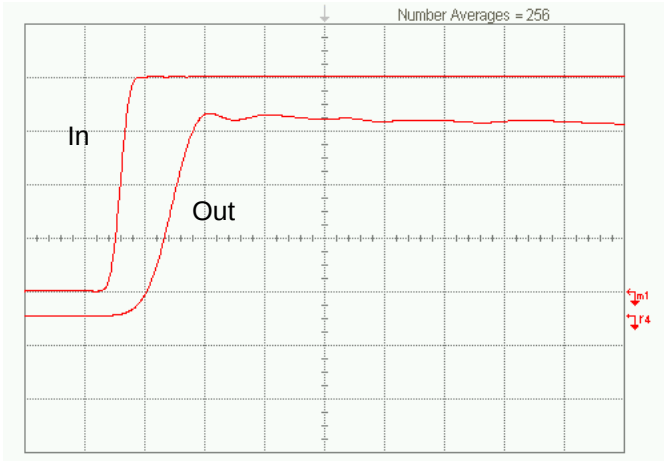
Typical S_{21}
(measured at –22dBm input power)



Typical S_{11} and S_{22}
(measured at –22dBm input power)



Typical Linearity
(measured with 400 MHz CW)



Typical Response to 15ps Risetime Step
(measured using a PSPL 4022-TDR source and Agilent 40 GHz Oscilloscope)

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5866 Electrical Specifications [2]

PARAMETER	SYMBOL	UNITS	MIN	TYPICAL	MAX	COMMENTS
Polarity						Non-inverting
Upper Frequency 3 dB Point	$f_{3dB,upper}$	GHz	8	10		Relative to gain at 1000 MHz
Lower Frequency 3 dB Point	$f_{3dB,lower}$	kHz		2.5	3	Relative to gain at 1000 MHz
Small Signal Gain	S_{21}	dB	25.0	25.5		Measured at 1000 MHz
Output Power at 1dB Gain Compression	P_{1dB}	dBm		17		Measured at 1000 MHz
Deconvolved Risetime [1]	$t_{r,f}$	ps		35		10% to 90%
Additive Jitter [1] RMS Peak-to-Peak		ps ps_{pp}		0.7 4	1.5 8	
Input / Output Return Loss	S_{11}, S_{22}	dB		12	8	
Noise Figure	NF	dB		5.75	6.5	f = 1 GHz

[1] Deconvolution is done by root sum of squares. Input risetime was 15 ps.

[2] Specifications are valid for operation at room temperature.

5866 Operating Specifications

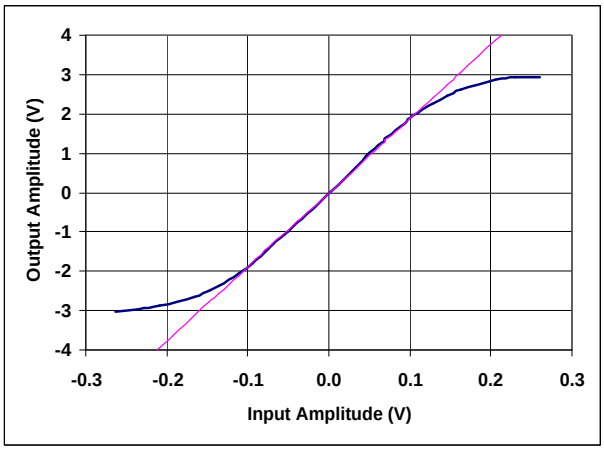
PARAMETER	SYMBOL	UNITS	MIN	TYPICAL	MAX	COMMENTS
Maximum allowed Input		V_{amp}			1.5	Damage threshold for input
DC Supply Current (pos)	$+I_{DC}$	mA			220	Damage threshold
Bias Point Adjust	V_{CP}	V_{DC}	-5		+1	Damage threshold
DC Voltage Supply (pos)	$+V_{DC}$	V_{DC}	8	8	8.25	200 mA typical with V_{OUT} = 4 V_{p-p}
DC Voltage Supply (neg)	$-V_{DC}$	V_{DC}	-5.25	-5	-4.75	20 mA typical
Power Dissipation	P_{diss}	W		1.7	2.0	V_{OUT} = 4 V_{p-p}
Output Voltage Bias	V_{bias}	V_{DC}	0		16	2.5 kΩ resistor (DC current ≤ 3.5 Ma)
Operating Temperature	T_{CASE}	^oC	-5		75	Case Temperature
Storage Temperature	T_{CASE}	^oC	-40		125	Case Temperature

Static sensitive device, limited 30 day warranty.

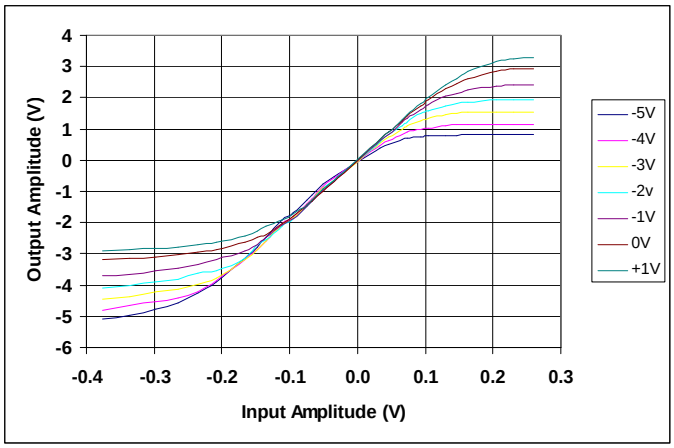
Note: PSPL recommends that the 5866 be driven with a negative polarity signal when the duty cycle is very low. The amplifier may be damaged by excessive heat that is produced with narrow positive pulses. Similarly, signals with a very high duty cycle should be positive. To ensure the amplifier will not be damaged by overheating under such operating conditions, PSPL recommends the positive supply voltage has its current limit set to 220 mA.

The 5866 is AC-coupled at the input and output. As a result, the average value of the output signal (the DC component) must be at 0 volts. Most data streams are conditioned to have 50% duty cycle when averaged over many microseconds. Those signals make full use of the positive and negative portions of the amplifier's operating range.

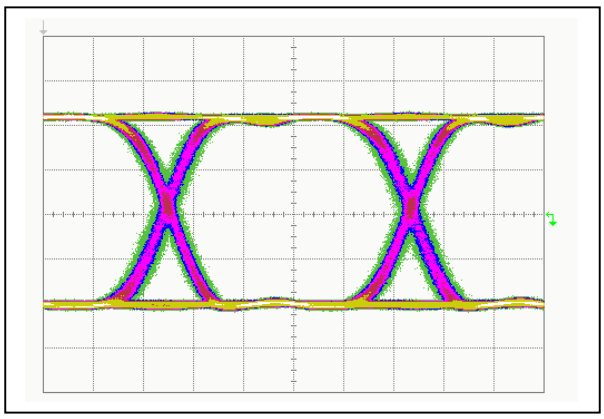
The average amplitude of a low duty cycle signal can be virtually at the baseline. These signals use only one half of the 5866's operating range, and the maximum linear output may be 2 volts peak-peak instead of 4 volts peak-peak. Offsetting Vcp will shift the amplifier's operating range so that the amplifier's 4-volt linear range is not centered on 0 V. The following graph shows these shifted operating ranges.



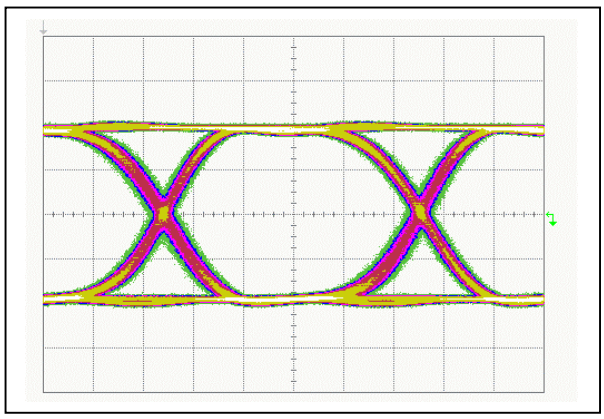
Input vs. Output for Model 5866 using a 3ns Input pulse with pulse repetition frequency of 100kHz and Vcp = 0 V. The duty cycle is 0.03%. The 5866 remains linear for inputs from <-0.1V to >+0.1 V. The purple line shows 25.5 dB linear gain for comparison.



Input vs. Output as Vcp is varied (–5 V < Vcp < +1 V). For example, when –4V is applied to Vcp, the output voltage range for linear operation will be approximately –4 V to 0 V.

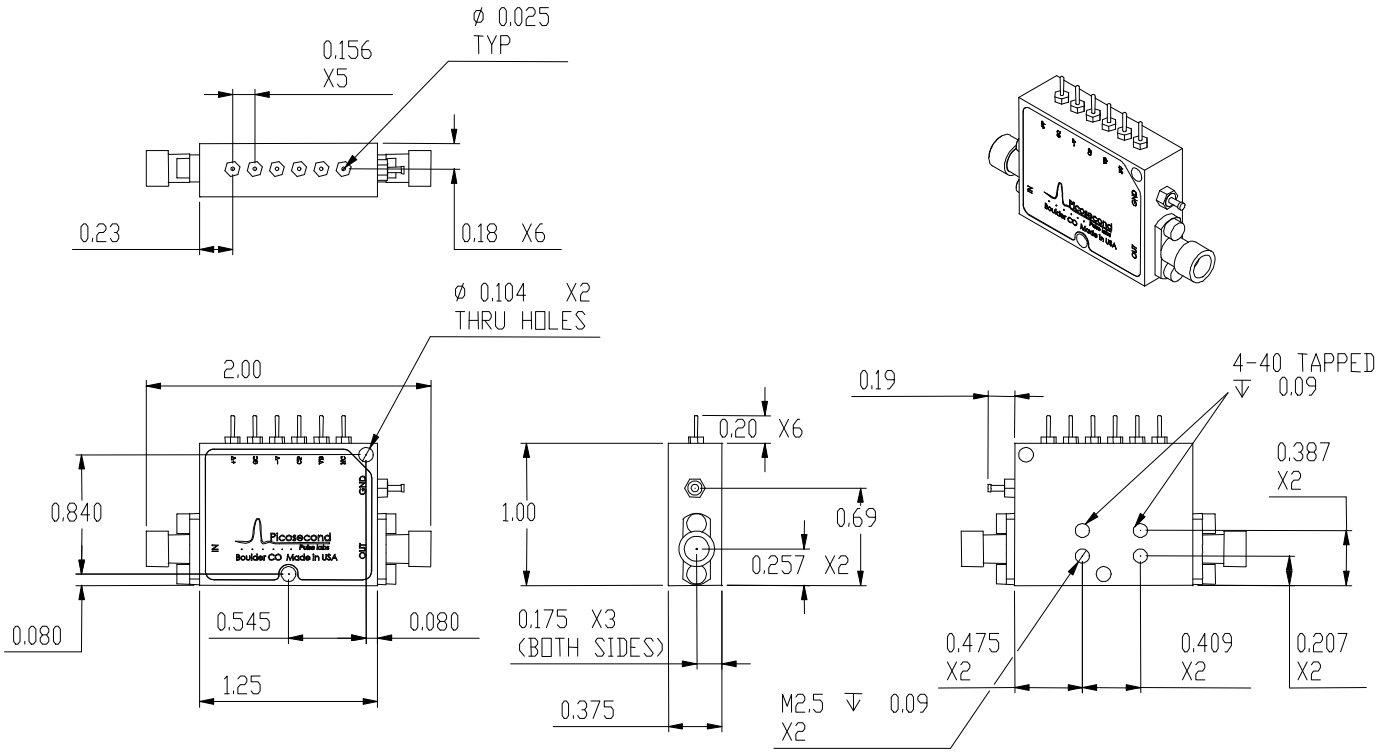


Input Signal from Pattern Generator
10G-b/s, 2^{23}-1 Pattern, 200mV Amplitude
Amplitude Scale = 50 mV/div, Time Scale = 20 ps/div



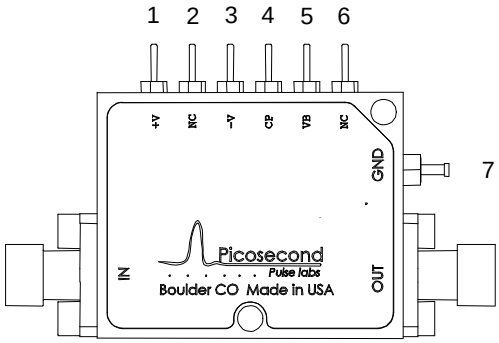
5866 Output Signal is 4 volts
Amplitude Scale = 1 V/div, Time Scale = 20 ps/div

5866 Mechanical Dimensions (in inches unless otherwise stated)



Instructions for Use

The Picosecond Pulse Labs 5866 11 GHz amplifier may be operated using only three of the available 7 pins. The DC pins required for operation are 1, 3, and 7. The RF connectors and DC pins are diagramed and defined below.



Pin Descriptions

Pin #	Pin Label	Description
	IN	SMA, signal input, $V_{amp} \leq 1.5$ V (damage threshold)
1	+V	Positive DC voltage supply, 8 V (see Note 1 and Note 2)
2	NC	No connection / Not used
3	-V	Negative DC voltage supply, -5.25 V ≤ V ≤ -4.75 V (see Note 2)
4	CP	Bias point adjust, -5 V ≤ V_{cp} ≤ 1 V (see Note 3)
5	VB	DC Voltage bias, 0 ≤ VB ≤ +16 (see Note 4)
6	NC	No connection / Not used
7	GND	Ground connection
	OUT	SMA, signal output

Warning: The 5866 requires a ground connection at pin #7 prior to voltage application to prevent damage.

NOTES:

Note 1: At +17 dBm output, approximately 1.7W is dissipated.
Note 2: No power sequencing is necessary. Voltages may be applied in any order **after** ground is applied.
Note 3: The bias point may vary until unit achieves thermal equilibrium.
Note 4: Voltage Bias: The VB pin allows the user to apply a *low current* (less than 3.5 mA) DC offset through an internal 2 kΩ resistor to the Signal Output.

Ordering Information

Model Number	Connector Configuration *
5866-107	RF input SMA jack, RF output SMA jack
5866-114	RF input SMA jack, RF output SMA plug
5866-122	RF input SMA plug, RF output SMA plug

* Other connector configurations may be available upon request.

Contact Information

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