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HL5897 Ultra-Broadband Linear Amplifier (63 GHz)

PRODUCT SUMMARY

The HL5897 is an ultra-broadband, linear amplifier that demonstrates exceptional gain flatness over a typical bandwidth of 48 kHz to 63 GHz.

This amplifier is optimized as a data driver to amplify signals with a minimum amount of eye distortion. This is ideal for use as a linear gain block in applications such as fiber optic receiver channels or 112 Gbps PAM4 signaling.

Only a single 6 V supply is needed for operation.

APPLICATIONS

Optical Communications
Satellite Communications
Data Signaling
High-Speed Pulses
Analog Signals
Antenna Measurements
Research & Develpment

S-PARAMETERS

S-parameters files are available on our website.

AVAILABLE OPTIONS

Connector size and configuration must be specified from the available options:

-10, 1.0 mm connectors
-18, 1.85 mm connectors

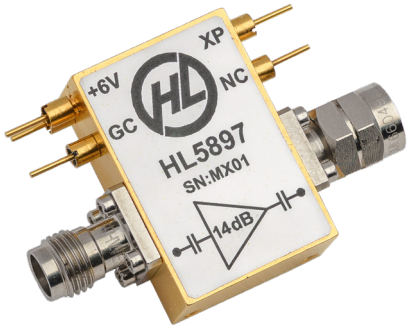
-JP, jack in, plug out
-PJ, plug in, jack out
-PP, plug in & out
-JJ, jack in & out

Standard configuration is 1.85 mm jack in / plug out (opt. -18-JP)

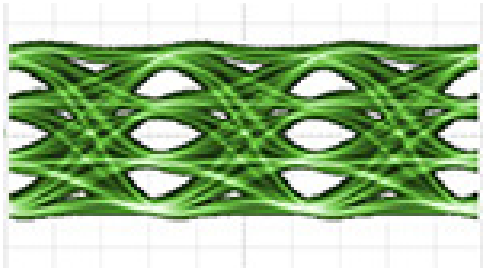
Key Features and Technical Specifications

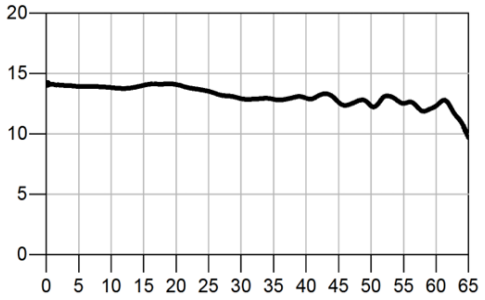
Bandwidth (3 dB)	48 kHz to 63 GHz
Small Signal Gain	14 dB
Return Loss	10 dB, input 10 dB, output
$P_{in\ max}$	15 dBm (damage threshold)
P1dB (24 GHz))	16.5 dBm
Power Supply	+6 V @ 0.18 A
Power Consumption	1.1 W typical
Dimensions (L x H x D)	41.5 x 27.0 x 10.0 mm (opt. -18-JP) 1.63” x 1.06” x 0.40”
Weight	25 g (0.88 oz)
Operating Temp. Storage Temp.	0° to +50° C, case temp -40° to +50° C, case temp
RoHS Compliant	Yes, assembled with lead-free solder
REACH Compliant	Yes
Warranty	1 year, see website

NOTE - Unless otherwise noted, all specifications are based on test results using the standard connector configuration: 1.85 mm jack/plug (opt. -18-JP). Other configurations may vary slightly.



HL5897, option -18-JP shown

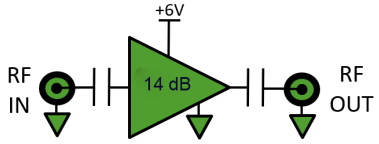

Eye diagram of HL5987 driving 9.5" coaxial cable at 112 Gbps



Typical Small Signal Gain of HL5897

DEVICE PORT ASSIGNMENTS

For the purposes of this datasheet, the below port assignments are used.



HL5897 Full Specifications (based on opt. -18-JP)

Parameter	Conditions	Minimum	Typical	Maximum	Comments
Upper 3 dB Frequency			63 GHz		3 dB roll-off point, relative to avg. gain from 35 MHz to 210 MHz
Lower 3 dB Frequency			48 kHz		3 dB roll-off point, relative to avg. gain from 35 MHz to 210 MHz
Small Signal Gain	P_{in} = -10 dBm	12 dB	14 dB		Avg from 35 MHz to 210 MHz
Return Loss, Input			10 dB		35 MHz < f < 65 GHz
Return Loss, Output			10 dB		35 MHz < f < 65 GHz
Group Delay			0.19 ns		
Input Referred Noise Voltage	DC = 20 GHz		0.15 mV_{RMS}		Integrated DC to 20 GHz broadband measurement
Max RF Input				15 dBm	Damage threshold
Noise Figure	2 - 10 GHz		6 dB		PRELIMINARY
	10 - 20 GHz		4 dB		
	20 - 30 GHz		5 dB		
	30 - 40 GHz		6 dB		
	40 - 50 GHz		9 dB		
Impedance			50 Ω		Input and output
Polarity	Inverting				
Supply Voltage (+)		+5.8 V_{DC}	+6 V_{DC}	+7 V_{DC}	
Supply Current (+)			180 mA	200 mA	Do not exceed 200 mA operating limit max
Power Dissipation			1.1 W		
Gain Control Voltage		-10 V	+2 V	+3 V	Pin floats to +2 V
XP Control		-1V	+1.2 V	+6 V	Pin floats to +1.2 V

Table 1: Output Compression Table
All output in dBm

Compression	100 MHz	6 GHz	12 GHz	24 GHz
1 dB	14.3	15.9	16.2	16.5
2 dB	15.7	17.0	17.9	17.5
3 dB	16.4	17.6	18.9	18.3

Note(1): Compression measurements made using Keysight U2002A Average Power Sensor

HL5897 Typical Performance Characteristics

The data presented in Figures 1 through 6 were obtained using a MICRAM DAC4 signal source and LeCroy SDA 100G Sampling Oscilloscope with 70GHz (SE-70) remote sampling module.

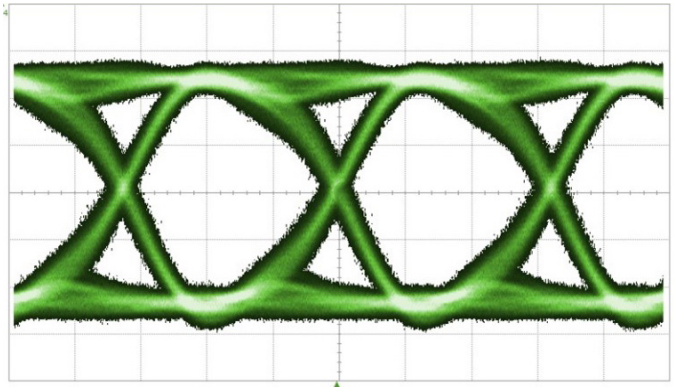


Fig. 1: 56 Gbps PRBS11 pattern on RF In. 60 mv/div

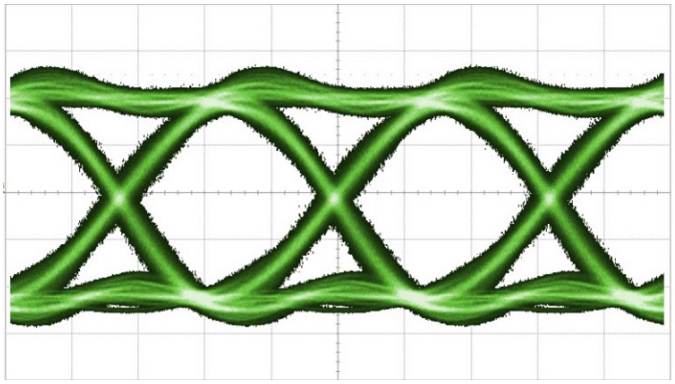


Fig. 2: 56 Gbps PRBS11 pattern on RF Out. 325 mv/div

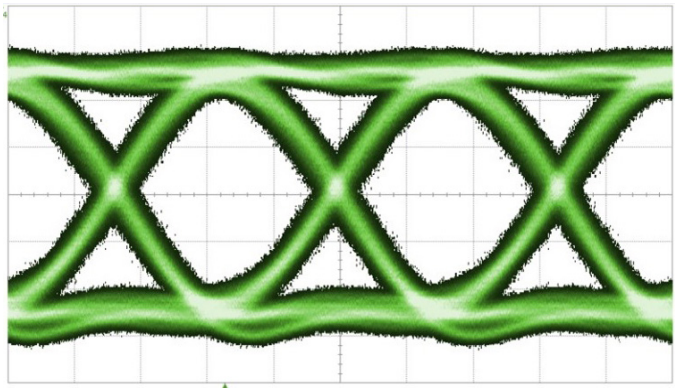


Fig. 3: 80 Gbps PRBS7 pattern on RF In. 53 mv/div

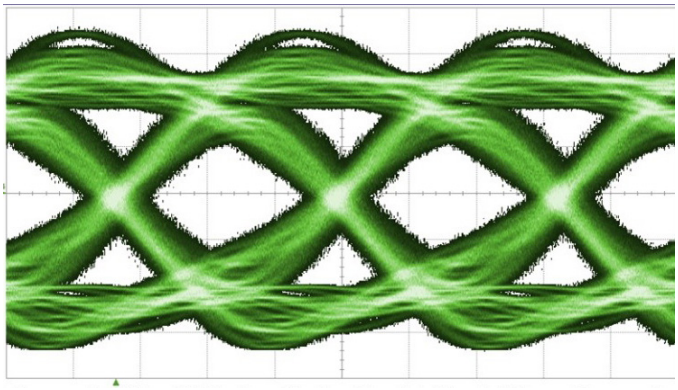


Fig. 4: 80 Gbps PRBS7 pattern on RF Out. 280 mv/div

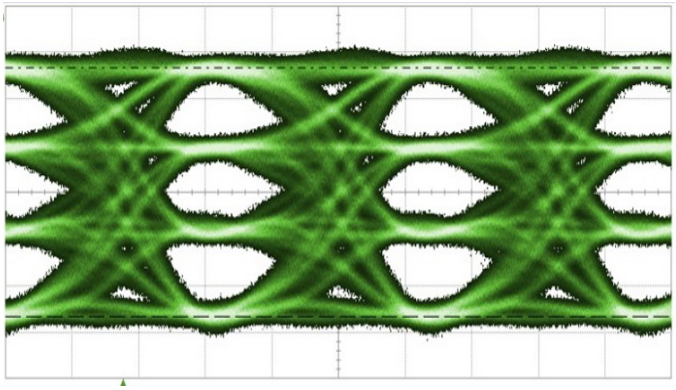


Fig. 5: 112 Gbps PAM4 pattern on RF In. 50 mv/div

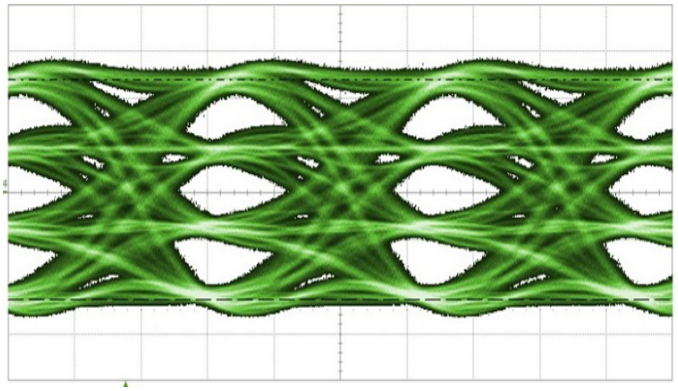


Fig. 6: 112 Gbps PAM4 pattern on RF out. 280 mv/div

HL5897 Typical Performance Characteristics

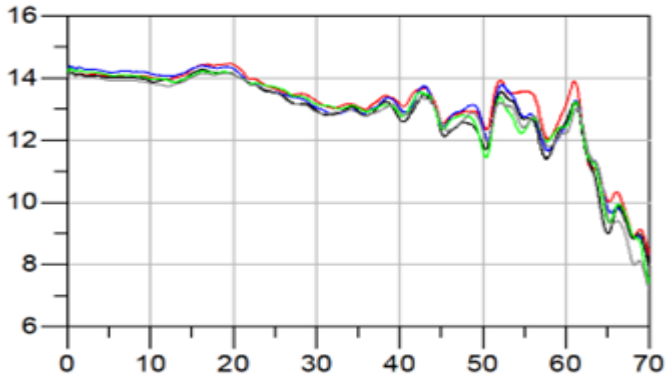


Fig. 7: Typical Gain (dB) vs Linear Frequency (GHz)

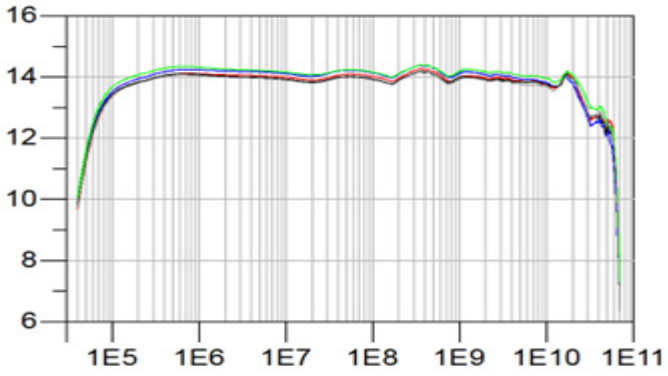


Fig. 8: Typical Gain (dB) vs Log Frequency (Hz)

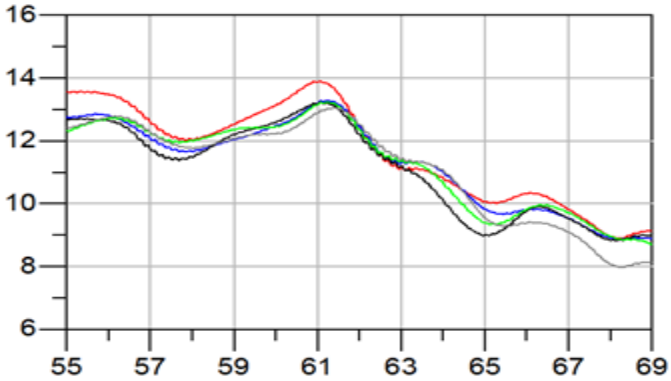


Fig. 9: Typical Gain (dB) High-Frequency Cut-off Region (GHz)

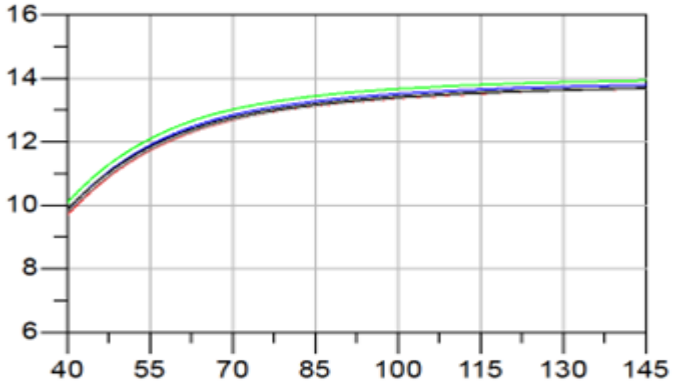


Fig. 10: Typical Gain (dB) Low-Frequency Cut-off Region (kHz)

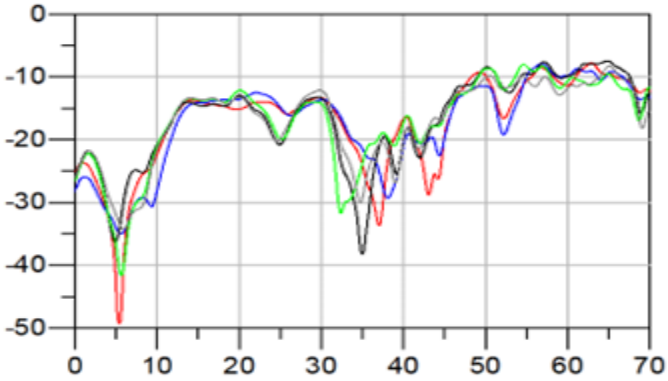


Fig. 11: Typical Input Return Loss (dB) vs Frequency (GHz)

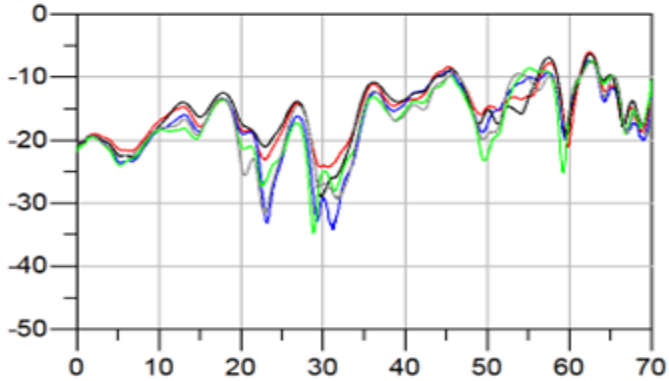


Fig. 12: Typical Output Return Loss (dB) vs Frequency (GHz)

HL5897 Typical Gain Control and Crossing Point (XP) Control Functions

The data presented in Figures 13 through 18 were obtained using a MICRAM DAC4 signal source and LeCroy SDA 100G Sampling Oscilloscope with 50GHz (SE-50) remote sampling module. All measurements were made at 270mV input eye amplitude and 51% input eye crossing point. Gain control and crossing control functions are dependent on input amplitude. Adjust both controls interactively to control output amplitude while maintaining 50% crossing point as shown in Figures 15 through 18.

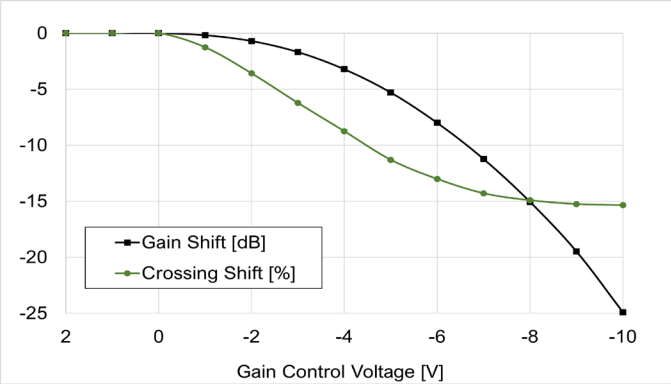


Fig. 13: Gain Control Function with Crossing Control pin floating

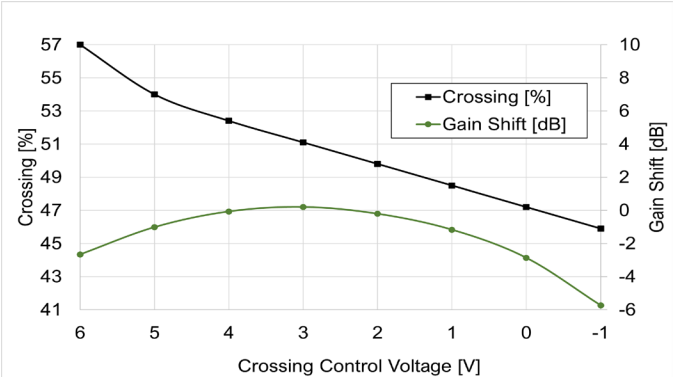


Fig.14: Crossing Control Function with Gain Control pin floating

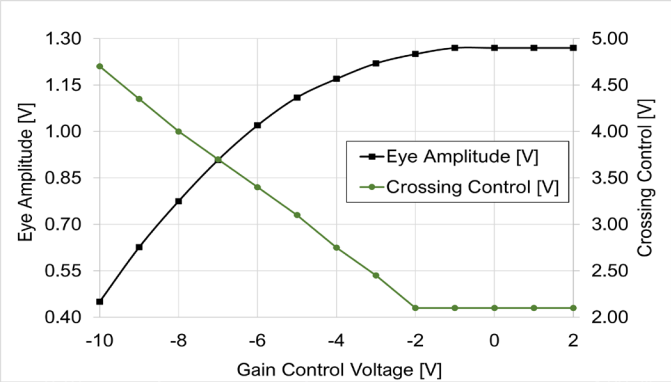


Fig. 15: Interactive Control Example with constant 50% Crossing Pt

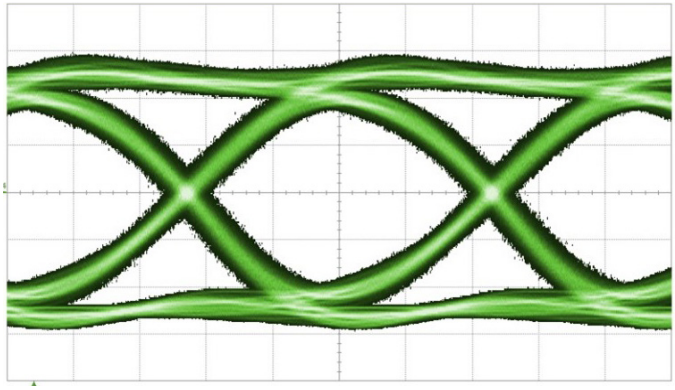


Fig. 16: Vgc=2V, Vxp=2.1V, XP=50%, Eye Amplitude=1.27V

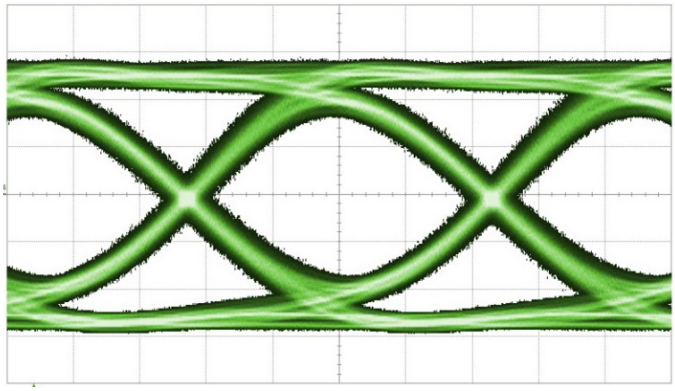


Fig. 17: Vgc=-7V, Vxp=3.7V, XP=50%, Eye Amplitude = 0.91V

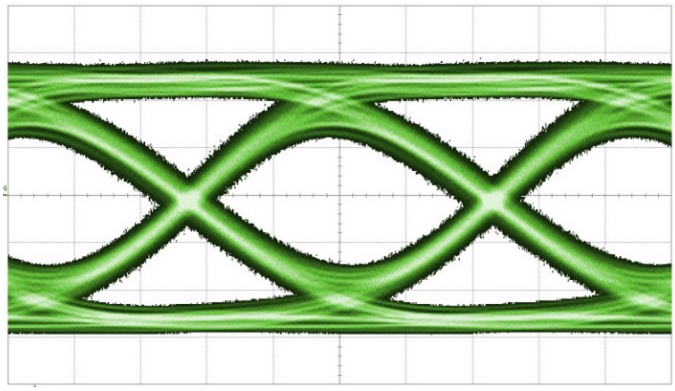
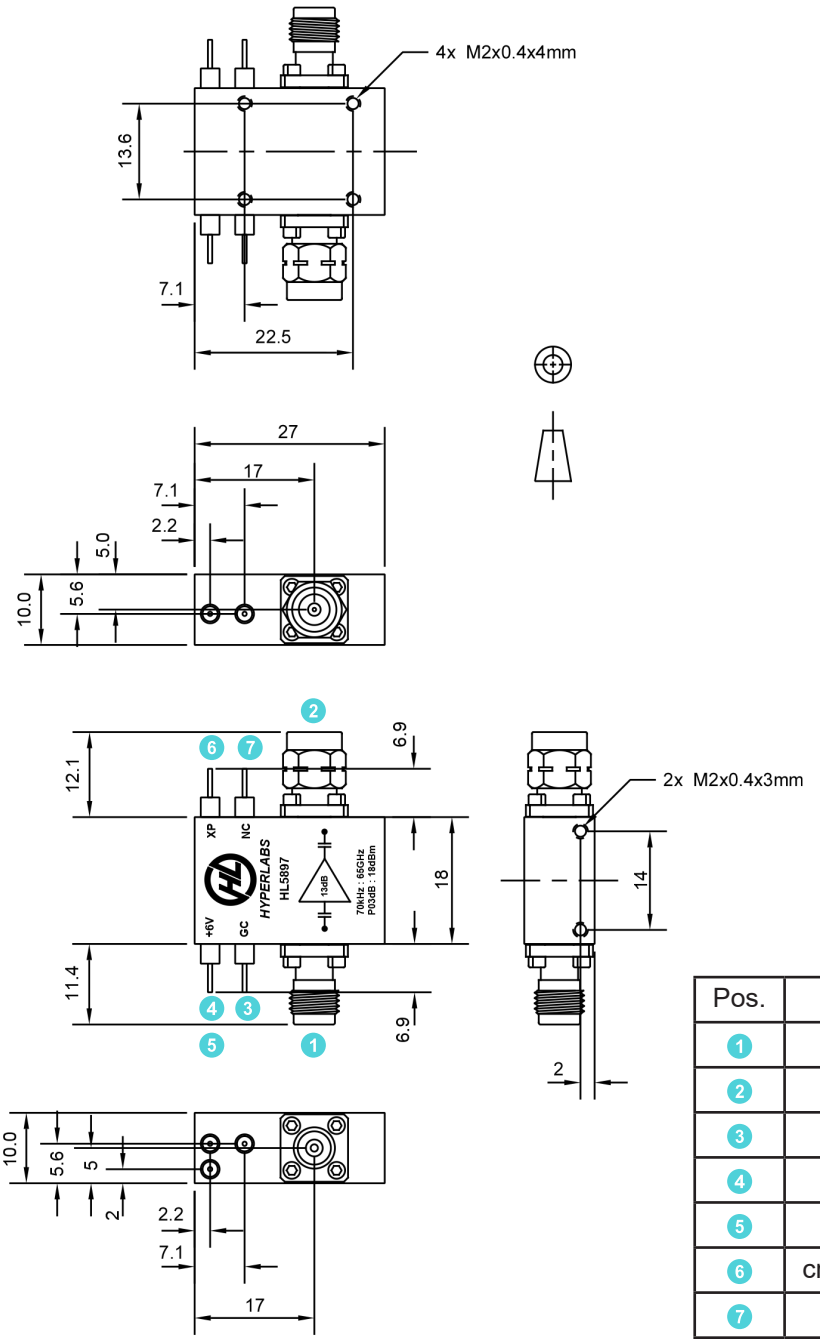


Fig. 18: Vgc=-10V, Vxp=4.7V, XP=50%, Eye Amplitude = 0.46V

HL5897 Dimensional Drawing

Figure 1 shows a mechanical drawing of an HL5897, option -18-JP. Unless otherwise noted, all units are in mm.



Pos.	Connector
1	Input
2	Output
3	Gain control
4	+6 V / 0.2 A
5	GND
6	crossing control
7	nc (optional)

Figure 1: HL5897 mechnical drawing (opt. -18-JP), mm