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HL5887 Broadband Linear Amplifier (40 GHz)

PRODUCT SUMMARY

The HL5887 is an ultra-broadband, thermally-compensated linear amplifier that demonstrates exceptional gain flatness over a typical bandwidth of 15 kHz to 40 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 64 Gbps PAM4 signaling.

DEPLOYMENT NOTES

All specifications contained herein are typical unless otherwise noted.

S-PARAMETERS

S-parameters files are available on our website.

AVAILABLE OPTIONS

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

- ***-24***, 2.4 mm connectors
- ***-29***, 2.92 mm connectors

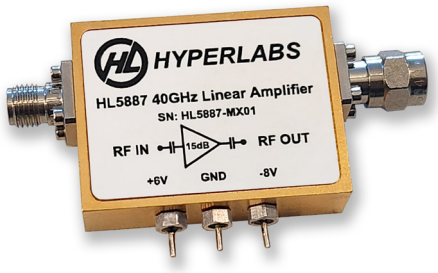
- ***-JP***, jack in, plug out
- ***-PJ***, plug in, jack out
- ***-PP***, plug in & out
- ***-JJ***, jack in & out

Standard configuration is 2.92 mm jack in / plug out (opt. -29-JP)

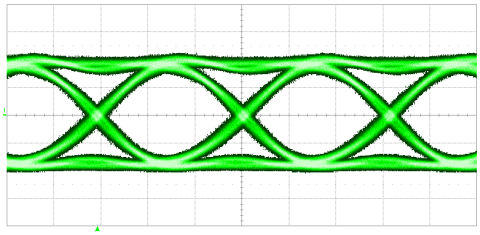
Key Features and Technical Specifications[1]

Bandwidth (3 dB)	15 kHz to 40 GHz
Small Signal Gain	15 dB See *Fig. 1*
Amplitude Deviation	± 3%, 0-60° C See *Fig. 3*
XP Deviation	± 2%, 0-60° C See *Fig. 4*
Return Loss	10 dB, input 10 dB, output See *Fig. 2*
Max Power Out	20 dBm
Dimensions	55.9 x 33.7 x 10.2 mm (opt. -29-JJ) 2.2” x 1.326” x 0.400”
Weight	25 g (0.88 oz)
Temperature Limits	0° to +60° C, operating
RoHS Compliant	Yes, assembled with lead-free solder
REACH Compliant	Yes
Warranty	1 year, see website

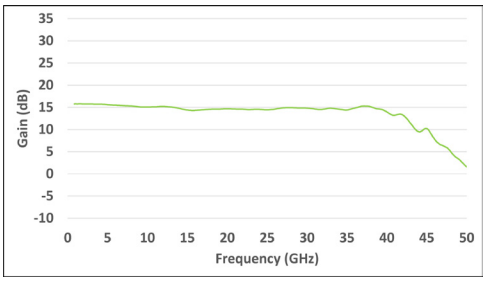
NOTE 1 - The specifications in this table are typical based on configuration -29-JP.. Full specifications, are available on Pages 2-3 of this datasheet.



HL5887, option -29-JP similar shown



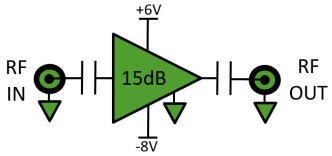
32 Gbps PRBS11 pattern on the RF Out port of HL5887-29-JP; see also Figs. 5-10



Typical Small Signal Gain of HL5887-29-JP; see also Fig. 1

DEVICE PORT ASSIGNMENTS

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



HL5887 Full Specifications

Parameter	Conditions	Minimum	Typical	Maximum	Comments
Upper 3 dB Frequency		38 GHz	40 GHz		3 dB roll-off point, relative to avg. gain from 35 MHz to 210 MHz
Lower 3 dB Frequency			15 kHz		3 dB roll-off point
Small Signal Gain	P_{IN} = -10 dBm	13 dB	15 dB		Avg. from 35 MHz to 210 MHz
Deviation from Linear Phase			5 deg.		50 MHz < f < 20 GHz
Return Loss, Input			10 dB		50 MHz < f < 32 GHz
Return Loss, Output			10 dB		50 MHz < f < 32 GHz
Group Delay			300 ps		
Input Referred Noise Voltage			125 µV rms		20 GHz broadband measurement
Noise Figure			6 dB		f = 1 GHz
P1dB	1 dB gain compression		14 dBm		32 GHz input signal
Psat Out			20 dBm		32 GHz input signal
Impedance			50 Ω		
Polarity	Inverting				
Coupling	AC, input and output				
Supply Voltage (+)		+5.5 V_{DC}	+6 V_{DC}	+6.5 V_{DC}	
Supply Voltage (-)		-8.5 V_{DC}	-8 V_{DC}	-7.5 V_{DC}	
Supply Current (+)			215 mA		
Supply Current (-)			25 mA		
Power Dissipation			1.5 W	2.5 W	

HL5887 Full Specifications (continued)

Parameter	Conditions	Minimum	Typical	Maximum	Comments
Damage Threshold Input				15 dBm	Input damage threshold
Input DC Bias Range		-15 V_{DC}		+16 V_{DC}	Input is AC coupled
Output DC Bias Range		-10 V_{DC}		+16 V_{DC}	Output is AC coupled
Operating Temperature		0° C		60° C	Ambient temperature
Storage Temperature		-40° C		125° C	
RF Connectors	2.92 mm (opt. -29); specify jack or plug for both input and output ports 2.4 mm (opt. -24); specify jack or plug for both input and output ports *Standard configuration is 2.92 mm jack/plug (opt. -29-JP)* *Other configurations also available*				
DC Connector	Solder pins				
Dimensions (W x D x H)	55.9 x 33.7 x 10.2 mm (opt. -29-JP) 2.2” x 1.326” x 0.400”				
Weight	25 g. (0.88 oz.)				
RoHS Compliant	Yes, assembled with lead-free solder				
REACH Compliant	Yes				
Warranty	1 year, repair or replacement; see website for details				

NOTE - All specifications are based on test results using connector configuration (-29-JP, 2.92 mm jack/jack). Supply voltages set at +6 V and -8 V. Specifications may vary slightly for other configurations.

HL5887 Gain

Figure 1 shows the small signal gain of the HL5887 to 50 GHz.

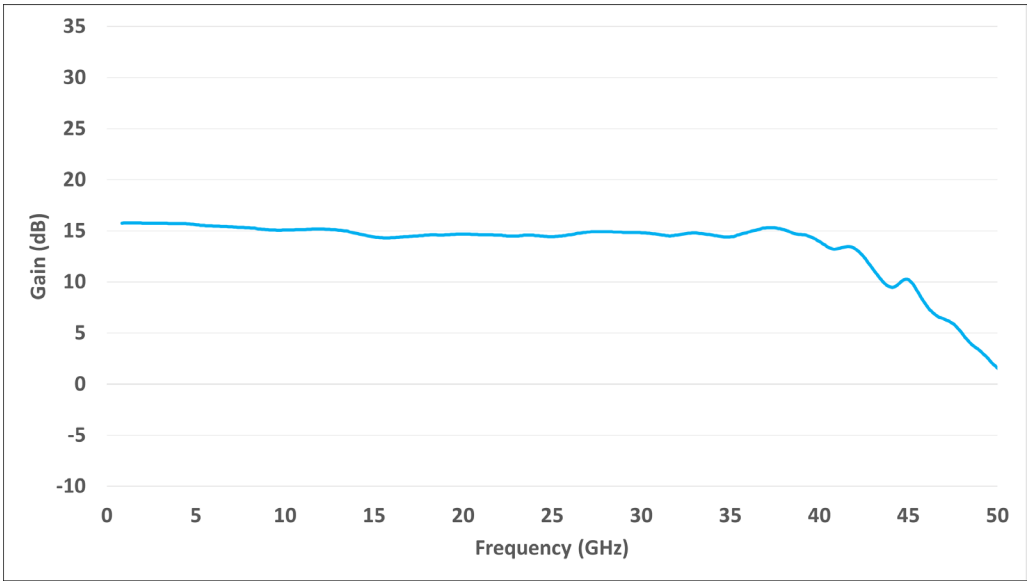


Figure 1: HL5887 Gain (opt. -29-JP)

HL5887 Return Loss

Figure 2 shows the return loss of the HL5887 to 50 GHz.

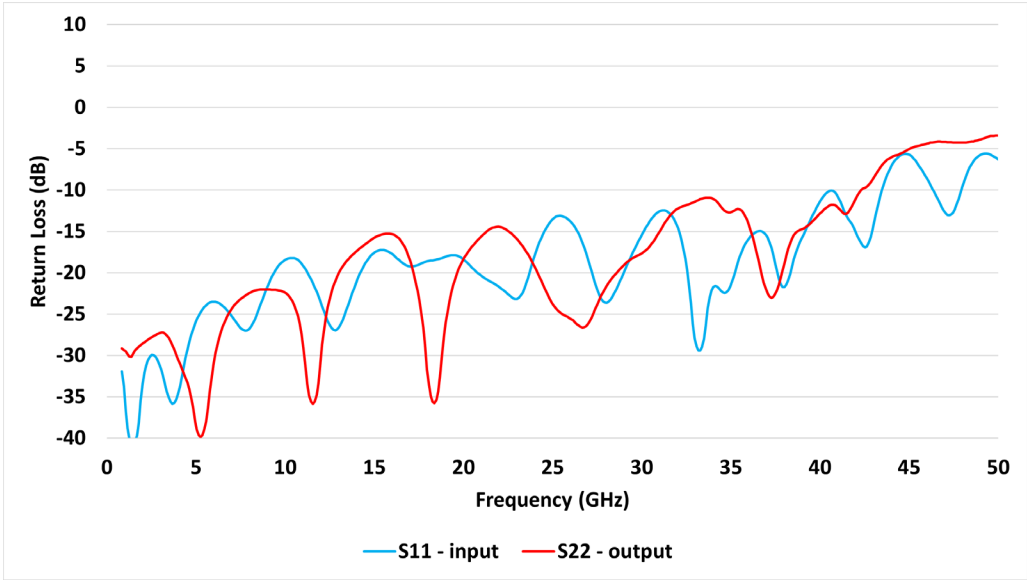


Figure 2: HL5887 Return Loss (opt. -29-JP)

HL5887 Performance Over Temperature

Figures 3-4 show the typical amplitude deviation and the typical crossing point (XP) deviation, respectively, over the operating temperature range of 0 to +60 °C.

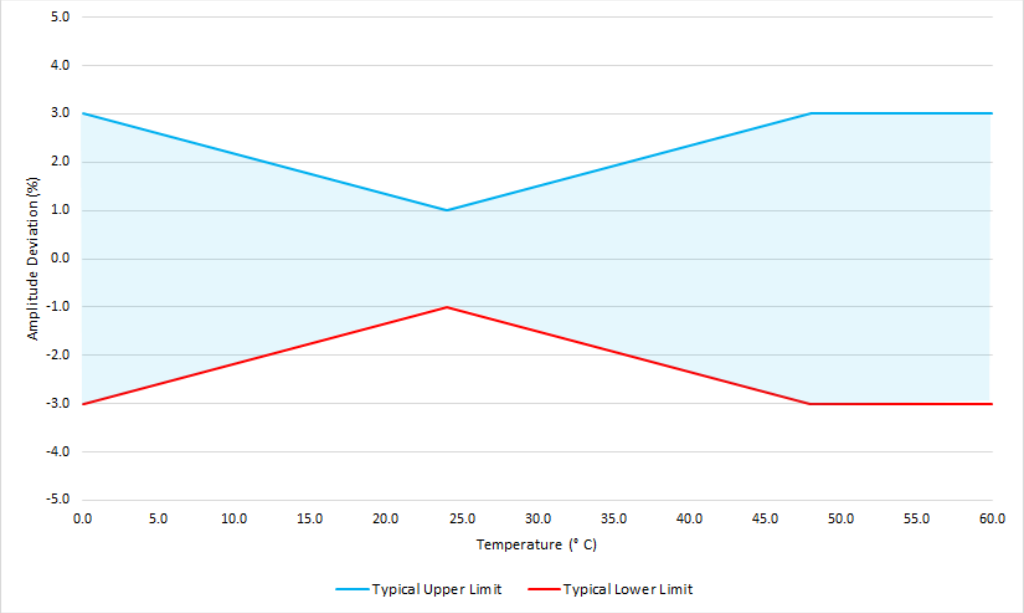


Figure 3: HL5887 Amplitude Deviation

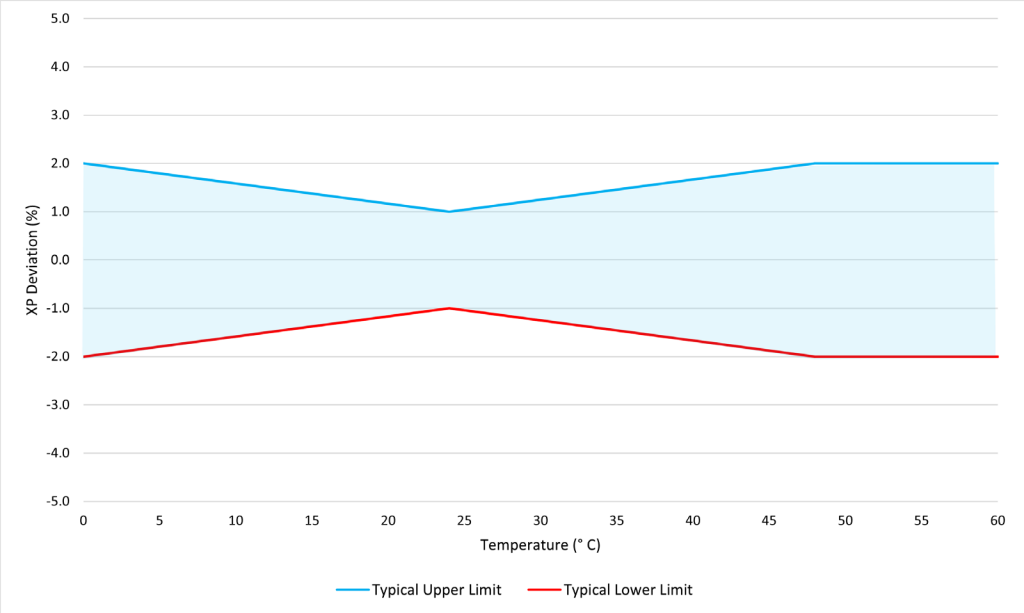


Figure 4: HL5887 Crossing Point Deviation

HL5887 Small Signal Eye Diagrams and Step Response

Figures 5 and 6 show input and output signals of a 32 Gbps PRBS11 NRZ pattern.
Figures 7 and 8 show input and output signals of a 64 Gbps PAM4 pattern.
Figures 9 and 10 show input and output signals of a 500 MHz step.

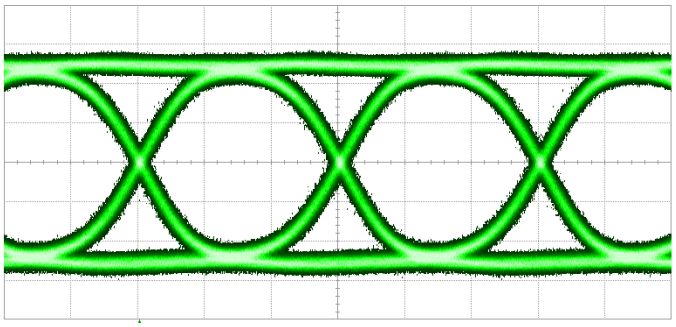


Fig. 5: 32 Gbps PRBS11 pattern on RF In, 60mV/div.

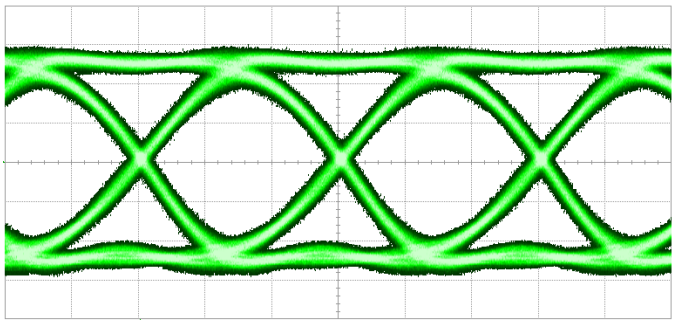


Fig. 6: 32 Gbps PRBS11 pattern on RF Out, 360mV/div.

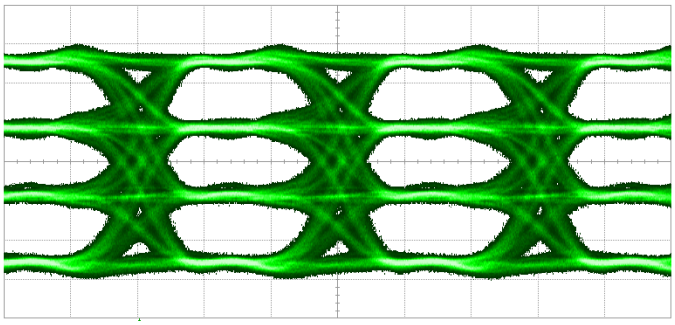


Fig. 7: 64 Gbps PAM4 pattern on RF In, 60mV/div.

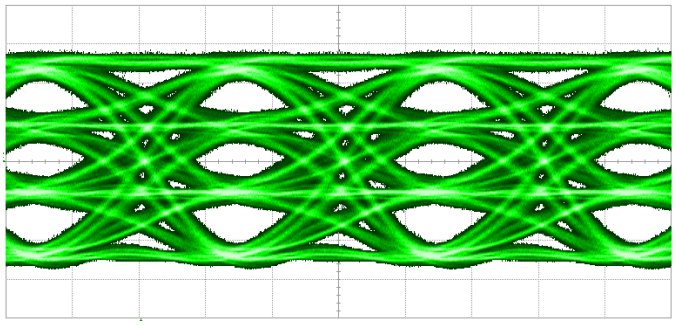


Fig. 8: 64 Gbps PAM4 pattern on RF Out, 360mV/div.

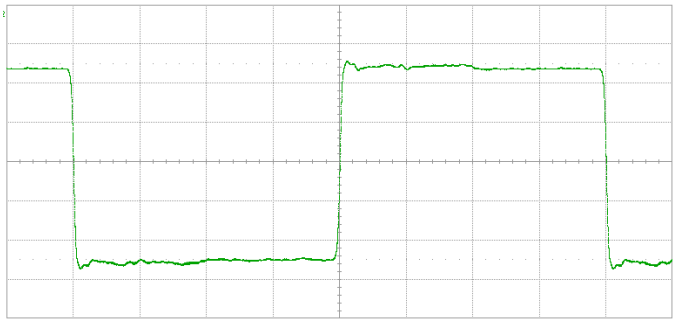


Fig. 9: 500 MHz Step Input, 60mV/div.

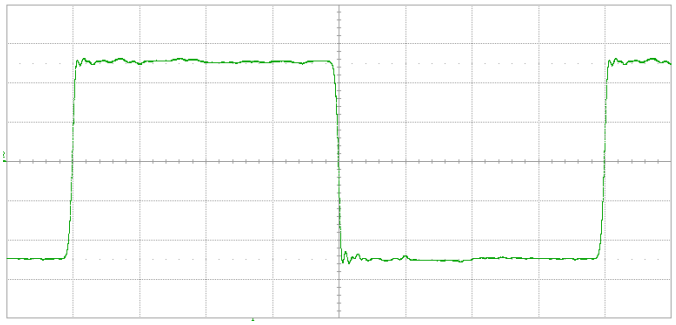


Fig. 10: 500 MHz Step Output, 360mV/div.

HL5887 4 V_{PP} Eye Diagrams and Step Response

Figures 11 and 12 show input and output signals of a 4 V 32 Gbps PRBS11 NRZ pattern.
Figures 13 and 14 show input and output signals of a 4 V 64 Gbps PAM4 pattern.
Figures 15 and 16 show input and output signals of a 4 V 500 MHz step.

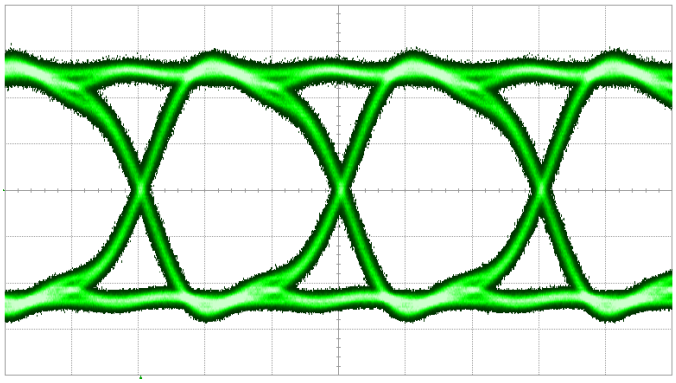


Fig. 11: PRBS11 32 Gbps pattern on RF In, 150mV/div.

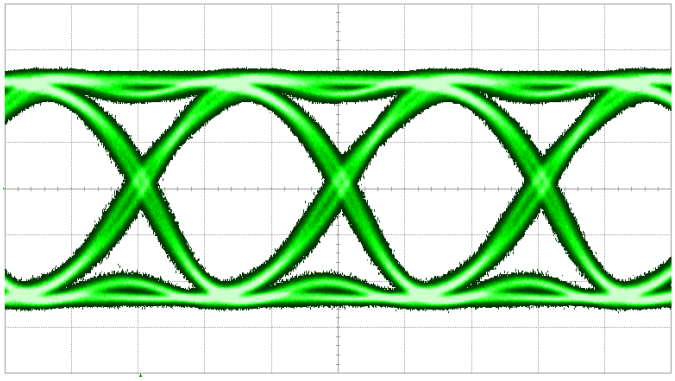


Fig. 12: PRBS11 32 Gbps pattern on RF Out, 880mV/div.

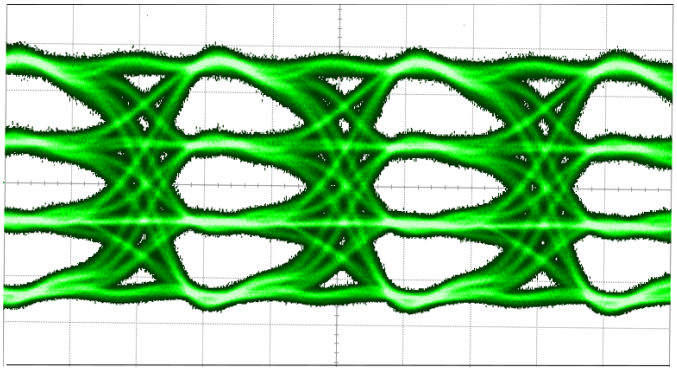


Fig. 13: 64 Gbps PAM4 pattern on RF In, 150mV/div.

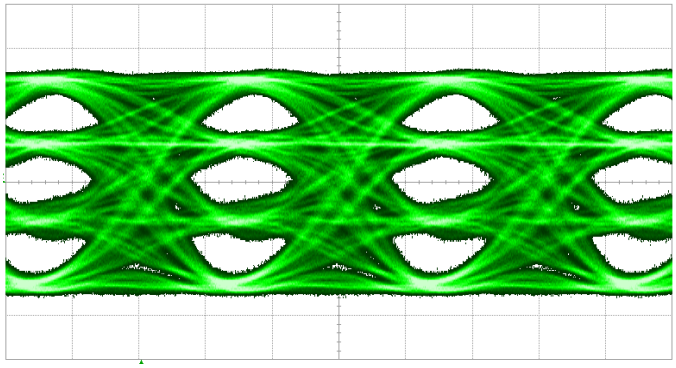


Fig. 14: 64 Gbps PAM4 pattern on RF Out, 880mV/div.

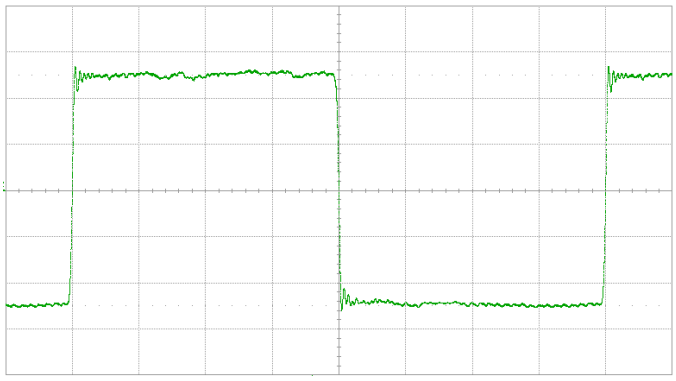


Fig. 15: 500 MHz Step Input, 150mV/div.

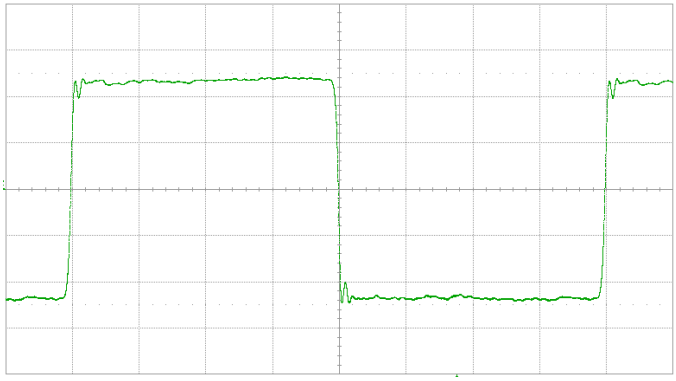


Fig. 16: 500 MHz Step Output, 880mV/div.

HL5887 Dimensional Drawing

Figure 17 shows a mechanical drawing of an HL5887, option -29-JP. Unless otherwise noted, all units are in inches.

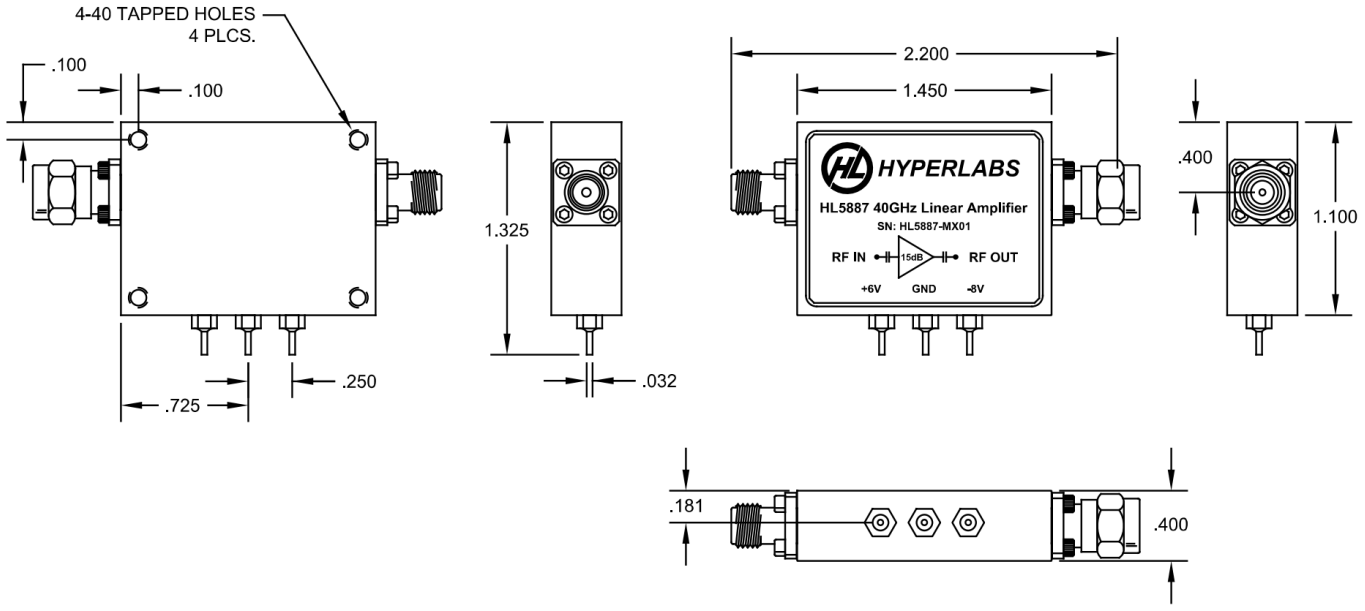


Figure 17: HL5887 mechnical drawing (opt. -29-JP), inches