HL930x Series Baluns (8 MHz to 67 GHz)

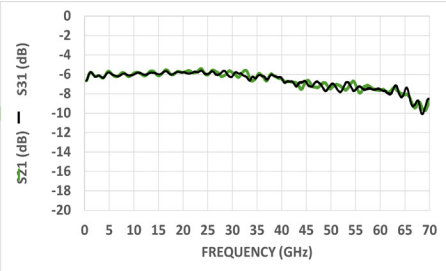
Features and Technical Specifications[1] (HL9307 shown)

Bandwidth	8 MHz to 67 GHz
Amplitude Match	± 0.1 dB, f ≤ 50 GHz ± 0.25 dB, f > 50 GHz See *Fig. 1*
Phase Match	± 4°, f = 20 GHz ± 8°, f = 40 GHz See *Fig. 8*
Insertion Loss	6 dB, single-ended reference See *Figs. 1, 3-4*
Return Loss	> 15 dB, unbalanced port, f ≤ 40 GHz > 10 dB, unbalanced port, f > 40 GHz > 10 dB, balanced ports, f ≤ 50 GHz > 7.5 dB, balanced ports, f > 50 GHz See *Figs. 2, 5*
CMRR	> 25 dB See *Fig. 6*
Group Delay	≈ 270 ps See *Fig. 7*
Max Input Power	1 W (+30 dBm)
Connectors	Standard configuration is 1.85 mm, 3 x jack/female 1.85 mm plug connectors also available
Temperature Limits	-40° to +100° C, operating
RoHS Compliant	Yes, assembled with lead-free solder
REACH Compliant	Yes
Warranty	1 year, see website

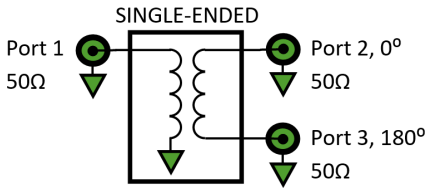
NOTE 1 - Unless otherwise noted, the specifications in this table are typical for Model Number HL9307 using the standard connector configuration (3 x jack). Full specifications for this and related models are available on Page 2 of this datasheet.

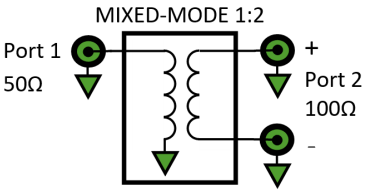


HL9307, standard configuration shown



Typical HL9307 Single-ended Insertion Loss





HL930x Schematic and Port Assignments

PRODUCT SUMMARY

The HL930x series are ultra-broadband 180° signal splitters and combiners that offer excellent amplitude and phase match over a bandwidth of 8 MHz to 67 GHz.

The HL930x series is a lower-cost alternative to the HL940x when the lowest low-frequency cutoff is not required.

They are suitable for use in high-speed analog-to-digital conversion, frequency response testing for differential devices, and many other applications.

DEPLOYMENT NOTES

When the device is used as a signal combiner using differential signals with unmatched source impedance, attenuators (3-6 dB) may be required to improve isolation.

If the DC voltage of the balanced or unbalanced ports is non-zero, DC blocks are required. The balanced ports (2 and 3) are DC shorted.

MODELS & OPTIONS

The following models are available:

- ***HL9302***, 26.5 GHz
- ***HL9304***, 40 GHz
- ***HL9305***, 50 GHz
- ***HL9307***, 67 GHz

The following connector options are available:

- ***-JJJ***, jack/jack/jack
- ***-JPP***, jack/plug/plug
- ***-PJJ***, plug/jack/jack
- ***-PPP,*** plug/plug/plug

HL930x Full Specifications

Parameter	HL9302	HL9304	HL9305	HL9307	Comments
Upper Frequency Limit	26.5 GHz	40 GHz	50 GHz	67 GHz	3 dB roll-off point, relative to nominal insertion loss
Lower Frequency Limit	8 MHz	8 MHz	8 MHz	8 MHz	3 dB roll-off point
Amplitude Match *See Fig. 1*	± 0.1 dB	± 0.1 dB	± 0.1 dB	± 0.1 dB, f ≤ 50 GHz ± 0.25 dB, f > 50 GHz	
Phase Match *See Fig. 8*	± 4°, f = 20 GHz	± 4°, f = 20 GHz	± 4°, f = 20 GHz ± 8°, f = 40 GHz	± 4°, f = 20 GHz ± 8°, f = 40 GHz	
Insertion Loss *See Figs. 1, 3-4*	6 dB				Single-ended reference
Return Loss *See Figs. 2, 5*	> 15 dB, unbal. port > 10 dB, bal. ports	> 15 dB, f ≤ 30 GHz, unbal. port > 12.5 dB, f > 30 GHz, unbal. port, > 10 dB, bal. ports	> 20 dB, f ≤ 30 GHz, unbal. port > 15 dB, f > 30 GHz, unbal. port > 10 dB, bal. ports	> 15 dB, f ≤ 40 GHz, unbal. port > 10 dB, f > 40 GHz, unbal. port > 10 dB, f ≤ 50 GHz, bal. ports > 7.5 dB, f > 50 GHz, bal. ports	unbal. = unbalanced bal. = balanced
Rise Time	13 ps	9 ps	7 ps	5 ps	
CMRR *See Fig. 6*	> 30 dB, f ≤ 20 GHz	> 30 dB, f ≤ 20 GHz > 25 dB, f > 20 GHz	> 30 dB, f ≤ 25 GHz > 25 dB, f > 25 GHz	> 30 dB, f ≤ 25 GHz > 25 dB, f > 25 GHz	Typical
Group Delay *See Fig. 7*	≈ 290 ps	≈ 280 ps	≈ 270 ps	≈ 270 ps	
Max Input Power	1 W (+30 dBm)				
Impedance	50 Ω				Input and Outputs
Connectors (Standard Config)	SMA, 3 x jack/female	2.92 mm, 3 x jack/female	2.4 mm, 3 x jack/female	1.85 mm, 3 x jack/female	Plug/male connectors available
Dimensions (W x D x H)	2.25” x 1.50” x 0.55” 57.2 x 38.1 x 14 mm	2.25” x 1.50” x 0.55” 57.2 x 38.1 x 14 mm	2.35” x 1.50” x 0.55” 59.7 x 38.1 x 14 mm	2.39” x 1.50” x 0.55” 60.8 x 38.1 x 14 mm	Package including connectors
Weight	45.3 g (1.6 oz.)				
Operating Temp.	-40° to +100° C				Case temperature
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 the standard connector configuration (3 x jack). Specifications may vary slightly for other configurations.

HL9307 Plot Diagrams

Figures 1-6 show the typical S-parameter characteristics for both single-ended and mixed-mode (differential) measurements. Other models show similar performance within their respective specified bandwidths.

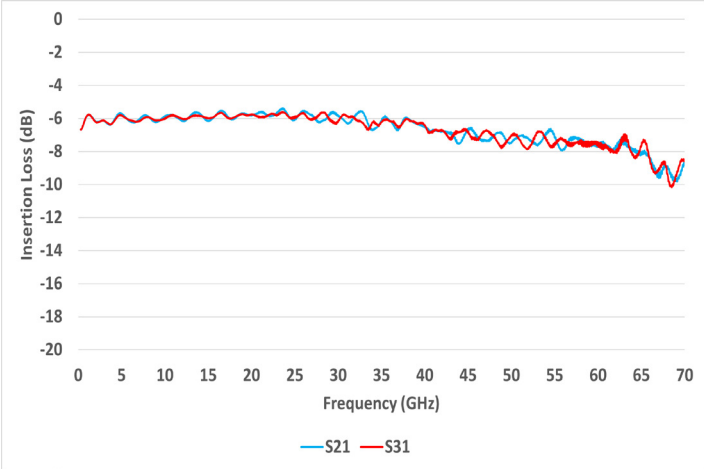


Figure 1: HL9307 Single-ended Insertion Loss

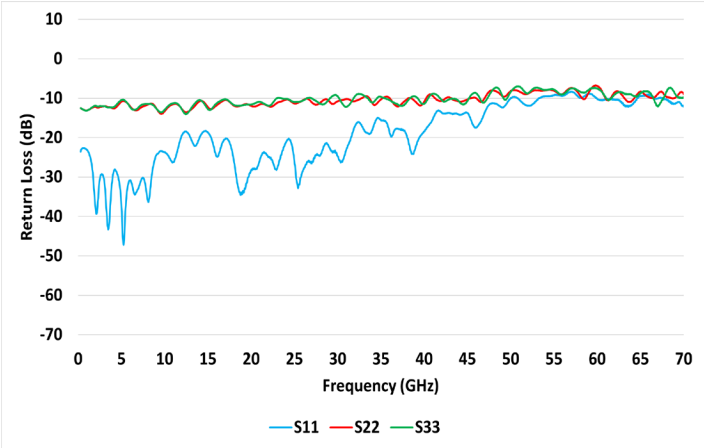


Figure 2: HL9307 Single-ended Return Loss

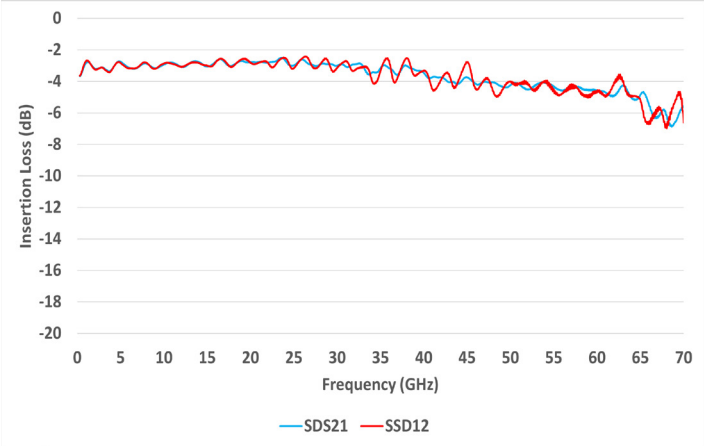


Figure 3: HL9307 Differential Mode Insertion Loss

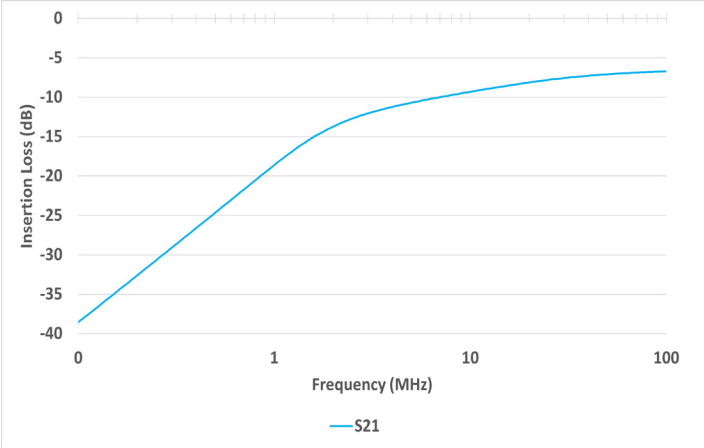


Figure 4: HL9307 Low Frequency Single-ended Insertion Loss

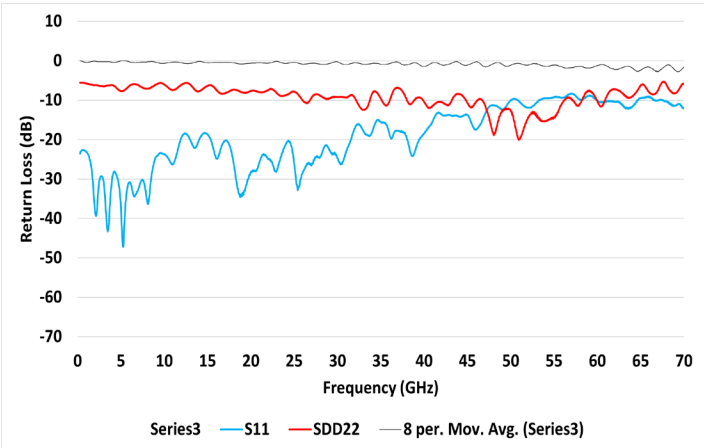


Figure 5: HL9307 Mixed-mode Return Loss

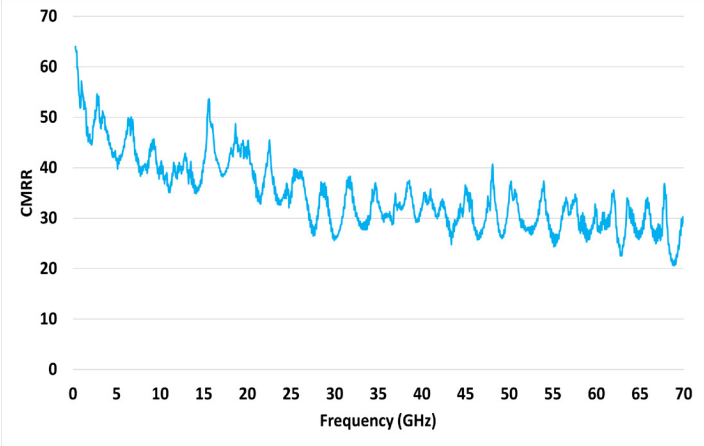


Figure 6: HL9307 Common Mode Rejection Ratio

HL9307 Plot Diagrams (continued)

Figures 7 and 8 show the Group Delay and Phase Mismatch of the HL9307. Other models show similar performance within their respective specified bandwidths.

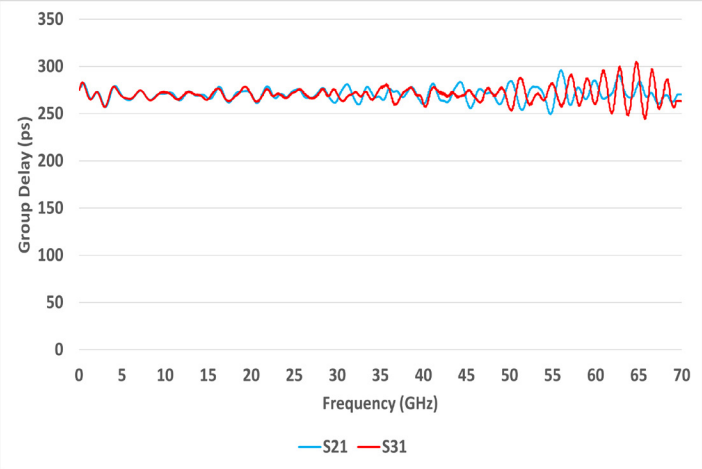


Figure 7: HL9307 Single-ended Group Delay

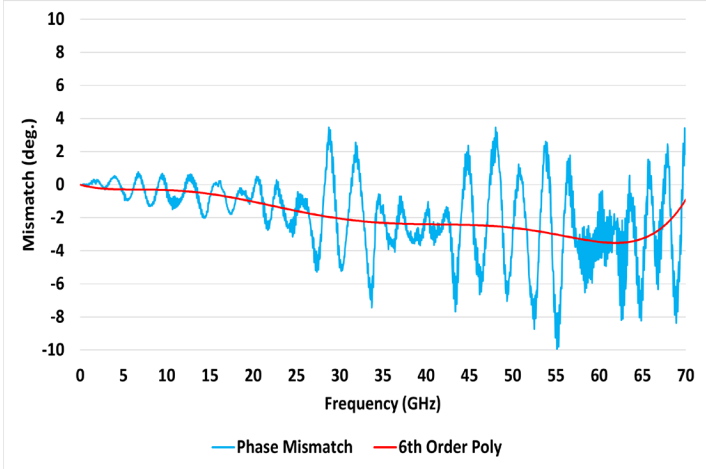


Figure 8: HL9307 Phase Mismatch

HL930x Dimensional Drawing

Figure 9 shows a mechanical drawing of an HL9307. Unless otherwise noted, all units are in inches. Other models vary in width based on connectors.

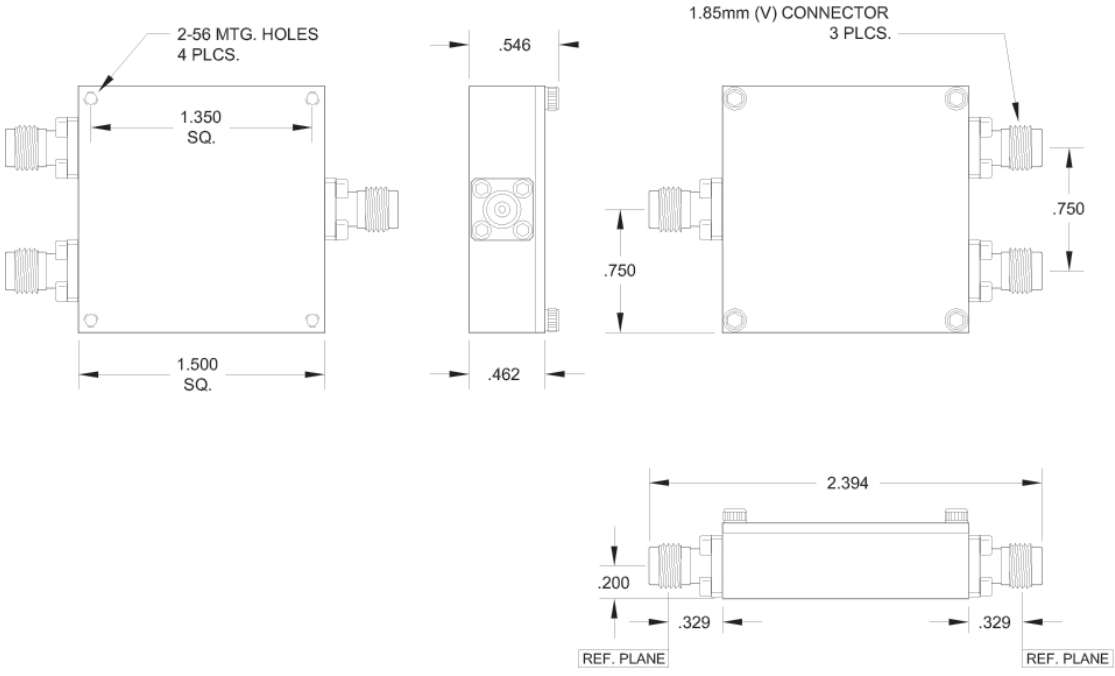


Fig. 9: HL9307 Mechanical Drawing