HYPERLABS™
Innovation at Hyperspeed since 1992

HL9427/9 Fixed Attenuators (3, 6, or 10dB), DC to 110GHz

Features and Technical Specifications[1] (HL9429, opt. -06 shown)

PRODUCT SUMMARY

The HL9427 and HL9429 are ultra-broadband attenuators with a typical fixed insertion loss of 3, 6, or 10 dB with a very flat frequency response over the specified bandwidth.

These devices are typically used to reduce RF input power to protect sensitive front-end instrumentation or any other application that requires a signal reduction.

Typical Applications:

- Optical communications
- Test & Measurement
- High-speed data systems
- Pulse experiments
- 224 Gbps PAM4 communications systems

MODELS & OPTIONS

The following models are available:

HL9427, 70 GHz
HL9429, 110 GHz

The following options are available:

-M, matched pair
-U, unmatched part(s)

-03, 3 dB attenuation
-06, 6 dB attenuation
-10, 10 dB attenuation

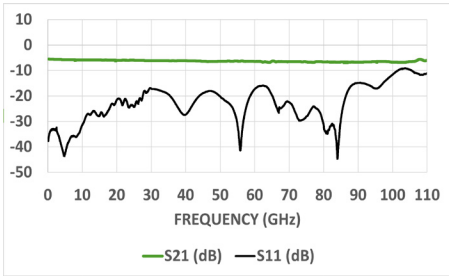
-JJ, jack RF 1 and RF 2
-JP, jack RF 1, plug RF 2
-PP, plug RF 1 and RF 2

Bandwidth	DC to 110 GHz
Amplitude Match (opt. -M only)	± 0.2 dB, DC < f ≤ 60 GHz ± 0.5 dB, 60 GHz < f ≤ 110 GHz
Phase Match (opt. -M only)	± 5°, DC < f ≤ 100 GHz
Insertion Loss	6 ± 0.6 dB, DC < f ≤ 90 GHz 6 ± 1.0 dB, 90 GHz < f ≤ 110 GHz See *Fig. 2*
Return Loss	15 dB, DC < f ≤ 90 GHz 10 dB, 90 GHz < f ≤ 110 GHz See *Fig. 5*
Input Power	24 dBm max
Group Delay	104 ps See *Fig. 13*
Rise Time (10-90%)	3 ps, all options
Connectors (PORT 1 / PORT 2)	1.0 mm, jack/jack (opt. -JJ) 1.0 mm, jack/plug (opt. -JP) 1.0 mm, plug/plug (opt. -PP)
Temperature Limits	-40° to +50° C, case
RoHS Compliant	Yes, assembled with lead-free solder
REACH Compliant	Yes
Warranty	1 year, see website

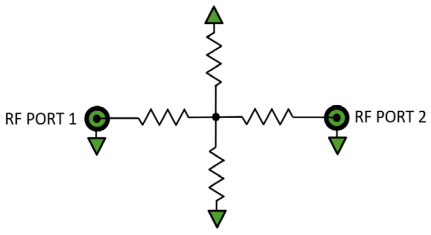
1 - Unless otherwise noted, the specifications in this table are typical for Model Number HL9429 using the standard connector configuration (-JP, jack/plug). See page 2 for full specifications for each model.



HL9429-U-06-JP shown



Typical HL9429, opt. -06 IL and RL



HL9427/9 Schematic and Port Assignments

HL9427 and HL9429 Full Specifications

Parameter	HL9427	HL9429	Comments
Upper Frequency Limit	> 70 GHz	> 110 GHz	
Lower Frequency Limit	DC		
Input Power	30 dBm	24 dBm max	
Amplitude Match	± 0.2 dB	± 0.2 dB, DC < f ≤ 60 GHz ± 0.5 dB, 60 GHz < f ≤ 110 GHz	Typical, opt. -M
Phase Match	± 5°	± 5°, DC < f ≤ 100 GHz	Typical, opt. -M
Insertion Loss (3 dB) See *Figs. 1,7*	3 ± 0.6 dB	3 ± 0.6 dB, DC < f ≤ 90 GHz 3 ± 0.9 dB; 90 < f ≤ 110 GHz	Typical, opt. -03
Insertion Loss (6 dB) See *Figs. 2,8*	6 ± 0.5 dB	6 ± 0.6 dB, DC < f ≤ 90 GHz 6 ± 1.0 dB; 90 < f ≤ 110 GHz	Typical, opt. -06
Insertion Loss (10 dB) See *Figs. 3,9*	10 ± 1.0 dB	10 ± 1.0 dB; DC < f ≤ 110 GHz	Typical, opt. -10
Return Loss See *Figs. 4-6, 10-12*	15 dB	15 dB, f ≤ 90 GHz 10 dB, 90 GHz < f ≤ 110 GHz	Typical
Rise Time	5 ps	3 ps	Typical
Group Delay See *Fig. 13*	106 ps	104 ps	All options
Connectors	1.85 mm	1.0 mm	
Impedance	50 Ω		Input and Output
Dimensions (W x D x H)	1.279” x 0.377” x 0.377” 32.5 x 9.57 x 9.57 mm	1.141” x 0.377” x 0.377” 29.0 x 9.57 x 9.57 mm	Package including connectors
Weight	8 g (0.28 oz.)		
Operating Temperature	-40° to +50° 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 (-JP, jack/plug). Specifications may vary slightly for other configurations.

HL9429 Plot Diagrams

Figures 1-3 show the typical insertion loss for each attenuation option: 3, 6, and 10 dB. Figures 4-6 show the typical reflection loss for each attenuation option: 3, 6, and 10 dB.

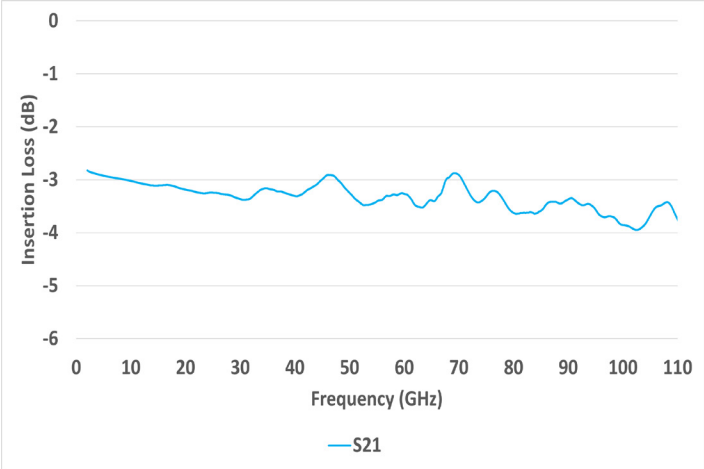


Figure 1: HL9429-03 Insertion Loss

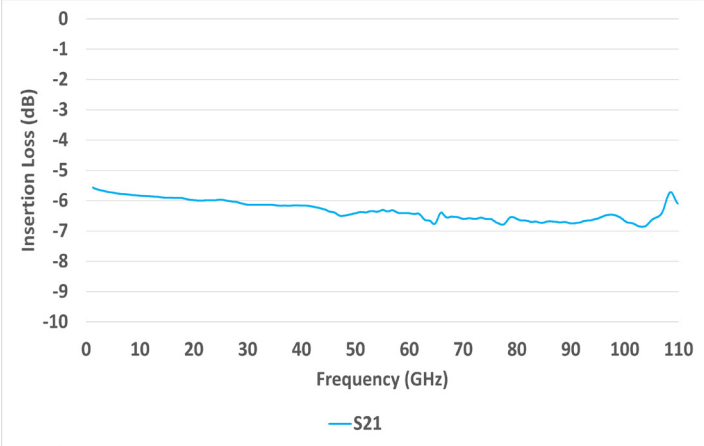


Figure 2: HL9429-06 Insertion Loss

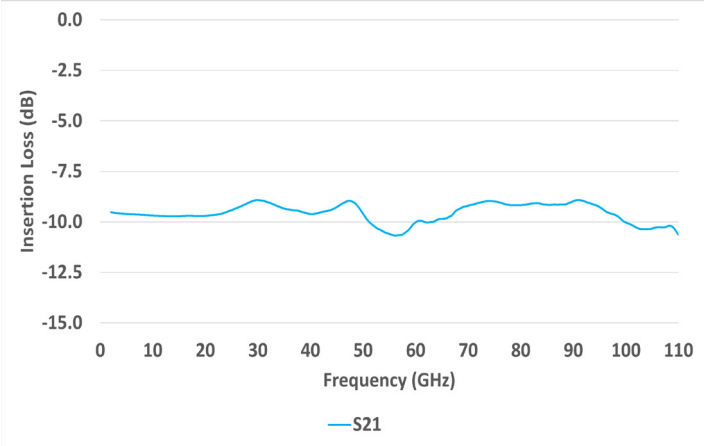


Figure 3: HL9429-10 Insertion Loss

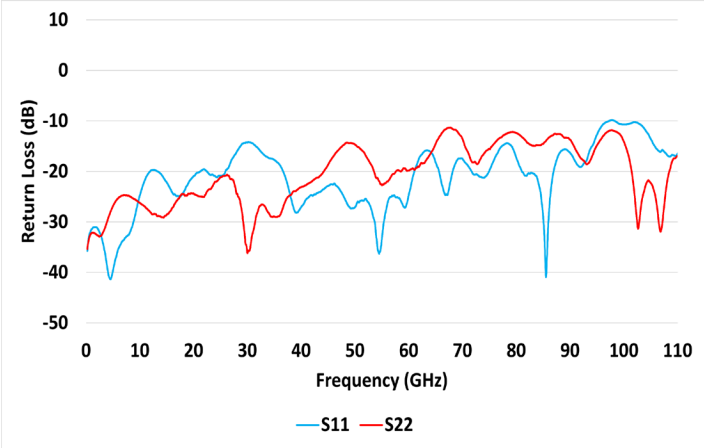


Figure 4: HL9429-03 Reflection Loss

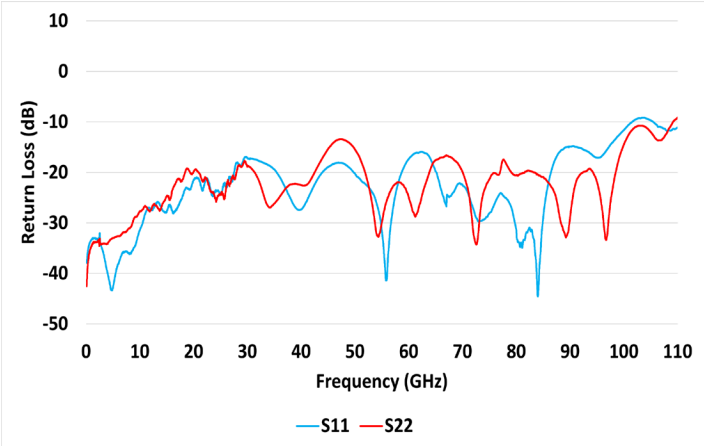


Figure 5: HL9429-06 Reflection Loss

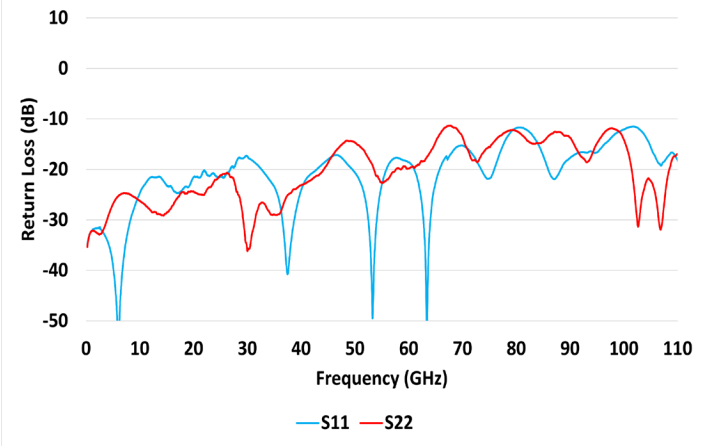


Figure 6: HL9429-10 Reflection Loss

HL9427 Plot Diagrams

Figures 7-9 show the typical insertion loss for each attenuation option: 3, 6, and 10 dB. Figures 10-12 show the typical reflection loss for each attenuation option: 3, 6, and 10 dB.

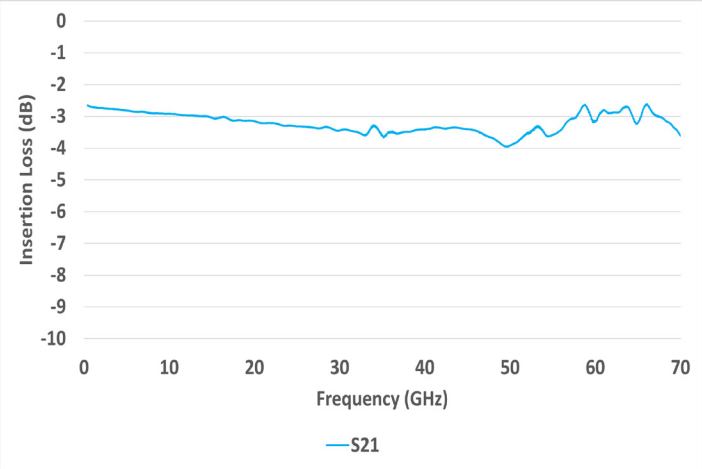


Figure 7: HL9427-03 Insertion Loss

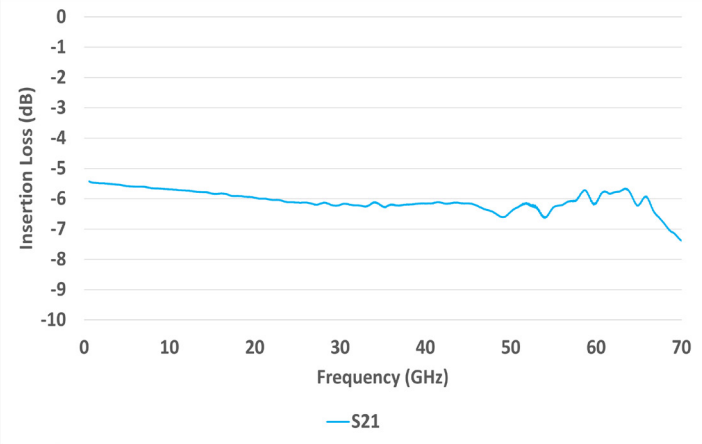


Figure 8: HL9427-06 Insertion Loss

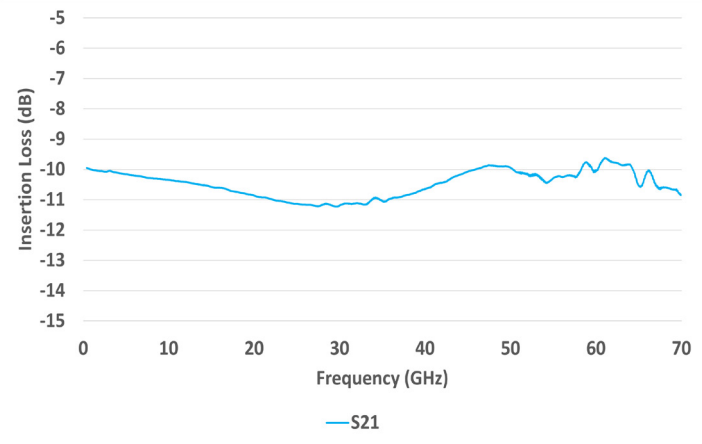


Figure 9: HL9427-10 Insertion Loss

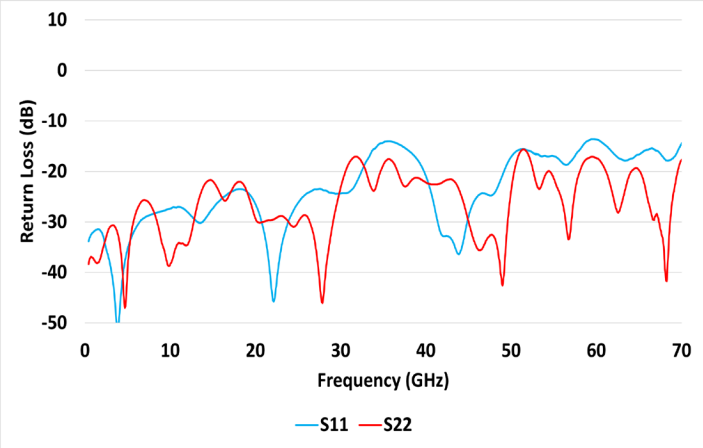


Figure 10: HL9427-03 Reflection Loss

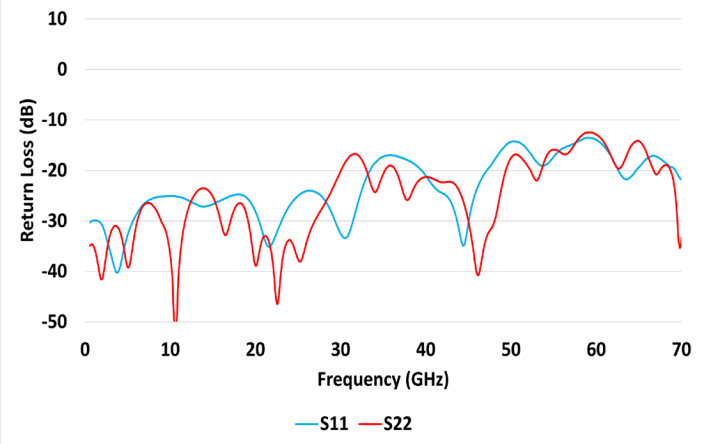


Figure 11: HL9427-06 Reflection Loss

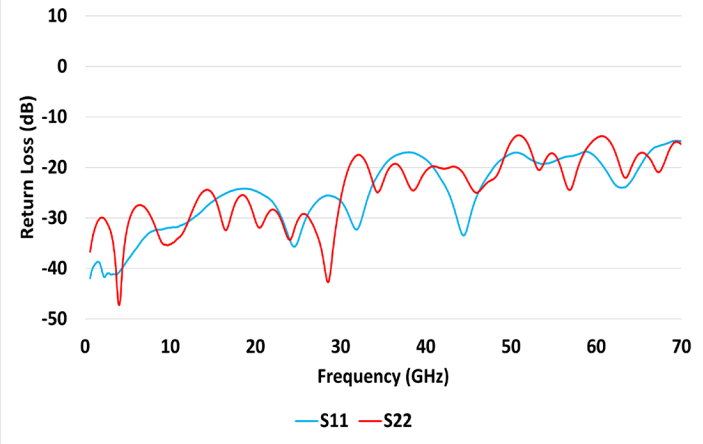


Figure 12: HL9427-10 Reflection Loss

HL9429 Group Delay

Figure 13 shows the typical HL9429-03 Group Delay to 110 GHz.

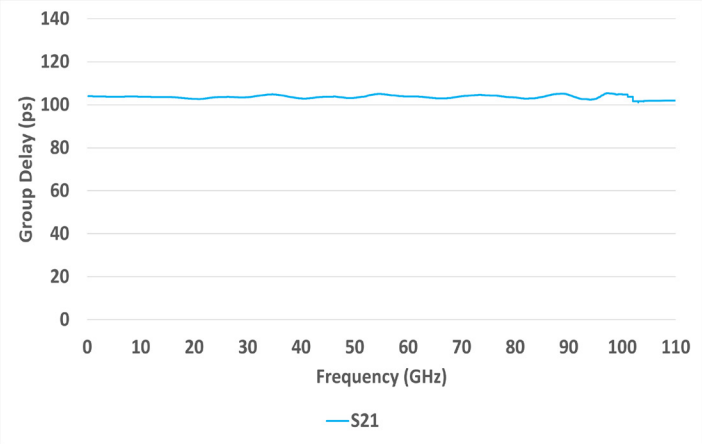


Figure 7: HL9429-03 Group Delay

HL9427 Dimensional Drawing

Figure 14 shows a mechanical drawing of an HL9427-JP. Unless otherwise noted, all units are in inches.

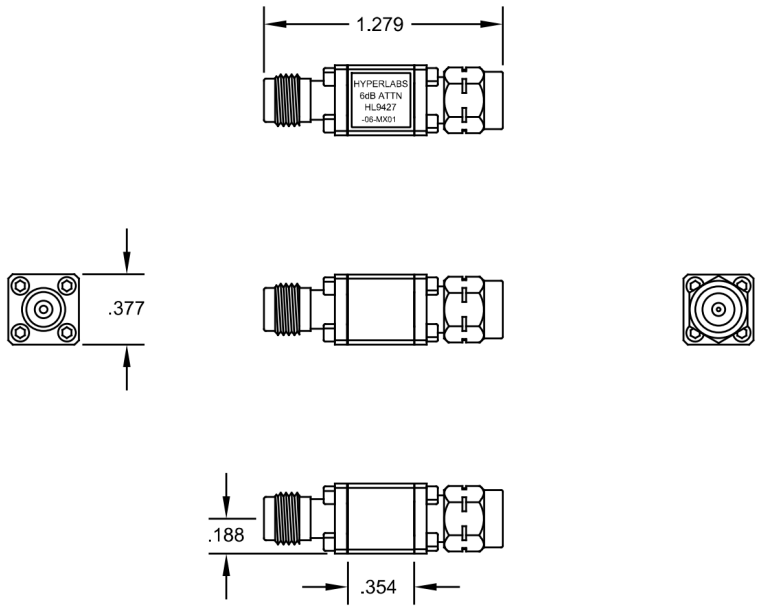


Fig 14: HL9427 Mechanical Drawing

HL9429 Dimensional Drawing

Figure 15 shows a mechanical drawing of an HL9429-JP. Unless otherwise noted, all units are in inches.

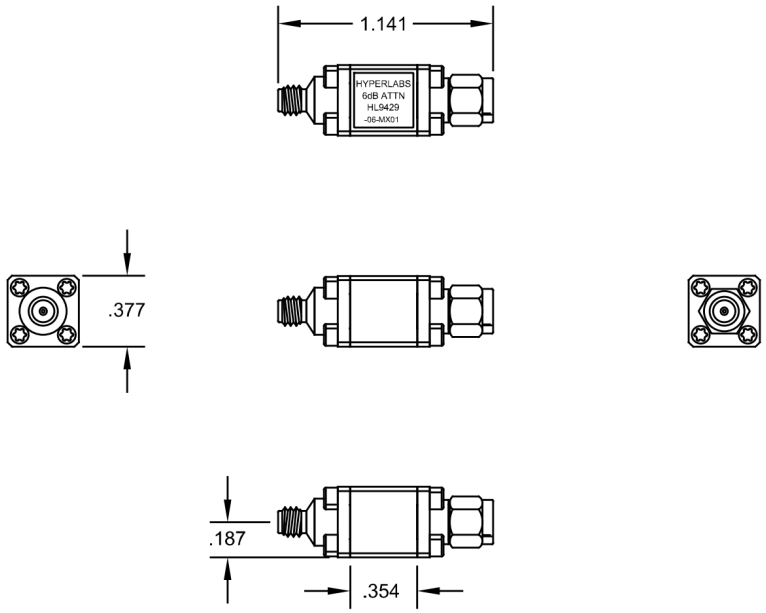


Fig 15: HL9429 Mechanical Drawing