



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

### Features and Technical Specifications<sup>1</sup> (HL9429, opt. -6 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)

- 3**, 3 dB attenuation
- 6**, 6 dB attenuation
- 10**, 10 dB attenuation

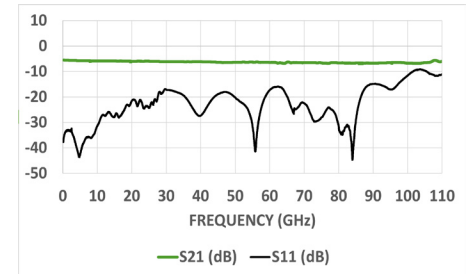
- JJ**, jack RF 1 and RF 2
- JP**, jack RF 1, plug RF 2
- PP**, plug RF 1 and RF 2

Bandwidth	DC to 110 GHz
Amplitude Match (opt. -M only)	$\pm 0.2$ dB, DC < f $\leq$ 60 GHz $\pm 0.5$ dB, 60 GHz < f $\leq$ 110 GHz
Phase Match (opt. -M only)	$\pm 5^\circ$ , DC < f $\leq$ 100 GHz
Insertion Loss	$6 \pm 0.6$ dB, DC < f $\leq$ 90 GHz $6 \pm 1.0$ dB, 90 GHz < f $\leq$ 110 GHz See Fig. 2
Return Loss	15 dB, DC < f $\leq$ 90 GHz 10 dB, 90 GHz < f $\leq$ 110 GHz See Fig. 5
Input Power	20 dBm (24 dBm max) <sup>2</sup>
Group Delay	104 ps See Fig. 7
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

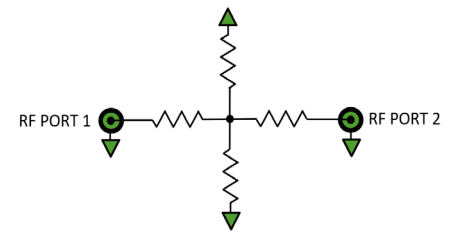
1 - Unless otherwise noted, the specifications in this table are typical for Model Number HL9429. See page 2 for full specifications for each model.  
2 - Long-term power handling testing is ongoing. The preliminary specification is 20 dBm.



HL9429-U-6-JP shown



Typical HL9429, opt. -6 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	20 dBm (24 dBm max)		
Amplitude Match	$\pm 0.2$ dB, DC < f $\leq$ 60 GHz $\pm 0.5$ dB, 60 GHz < f $\leq$ 110 GHz		Typical, opt. -M
Phase Match	$\pm 5^\circ$ , DC < f $\leq$ 100 GHz		Typical, opt. -M
Insertion Loss (3 dB) See Fig. 1	3 $\pm$ 0.6 dB; DC < f $\leq$ 70 GHz	3 $\pm$ 0.6 dB, DC < f $\leq$ 90 GHz 3 $\pm$ 0.9 dB; 90 < f $\leq$ 110 GHz	Typical, opt. -3
Insertion Loss (6 dB) See Fig. 2	6 $\pm$ 0.6 dB; DC < f $\leq$ 70 GHz	6 $\pm$ 0.6 dB, DC < f $\leq$ 90 GHz 6 $\pm$ 1.0 dB; 90 < f $\leq$ 110 GHz	Typical, opt. -6
Insertion Loss (10 dB) See Fig. 3	10 $\pm$ 1.0 dB; DC < f $\leq$ 70 GHz	10 $\pm$ 1.0 dB; DC < f $\leq$ 110 GHz	Typical, opt. -10
Return Loss See Figs. 4-6	15 dB, f $\leq$ 70 GHz	15 dB, f $\leq$ 90 GHz 10 dB, 90 GHz < f $\leq$ 110 GHz	Typical
Rise Time	5 ps	3 ps	Typical
Group Delay See Fig. 7	106 ps	104 ps	All options
Connectors	1.85 mm	1.0 mm	
Impedance	50 $\Omega$		Input and Output
Dimensions (W x D x H)	1.141" x 0.377" x 0.377" 29.0 x 9.57 x 9.57 mm		Package including connectors (1.0 mm option)
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		

## 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. Other models show similar performance within their respective specified bandwidths.

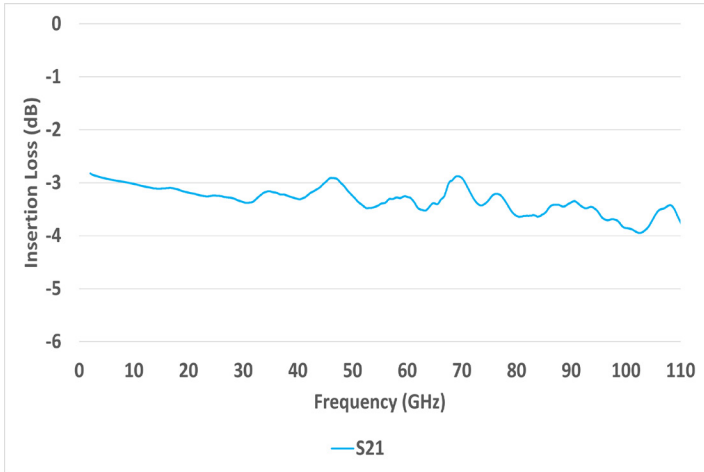


Figure 1: HL9429-3 Insertion Loss

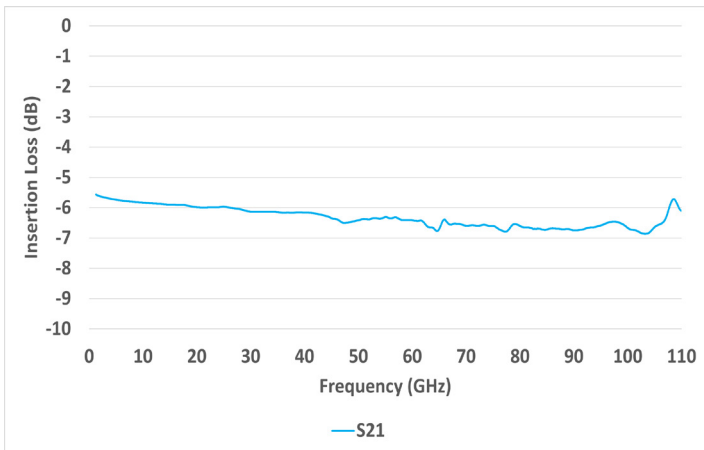


Figure 2: HL9429-6 Insertion Loss

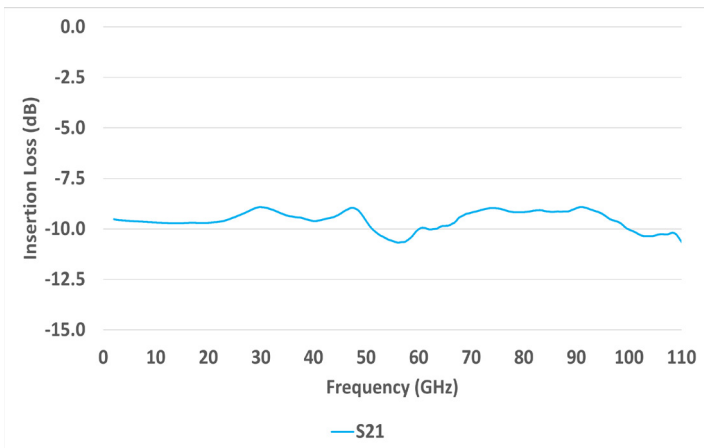


Figure 3: HL9429-10 Insertion Loss

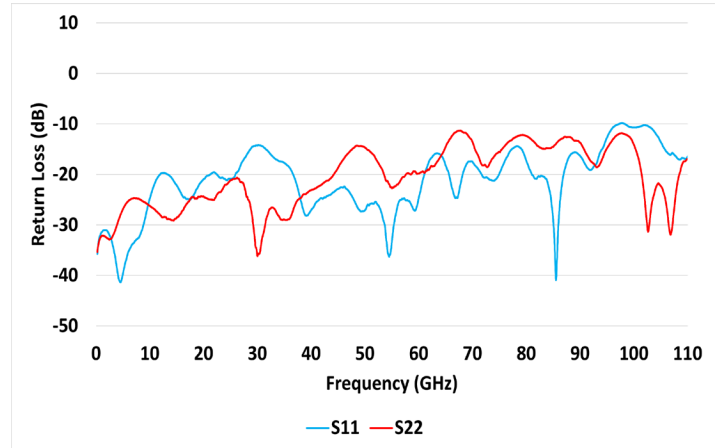


Figure 4: HL9429-3 Reflection Loss

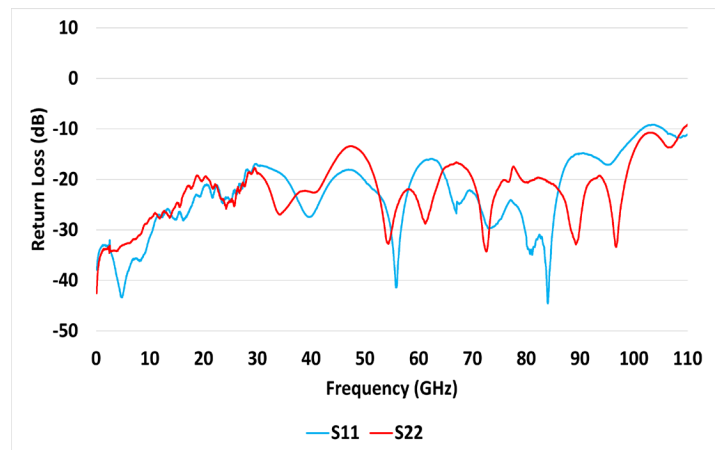


Figure 5: HL9429-6 Reflection Loss

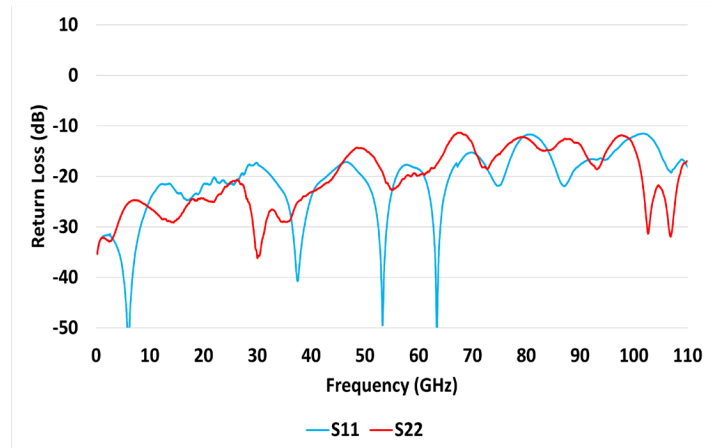


Figure 6: HL9429-10 Reflection Loss

## HL9429 Group Delay

Figure 7 shows the typical HL9429-3 Group Delay to 110 GHz.

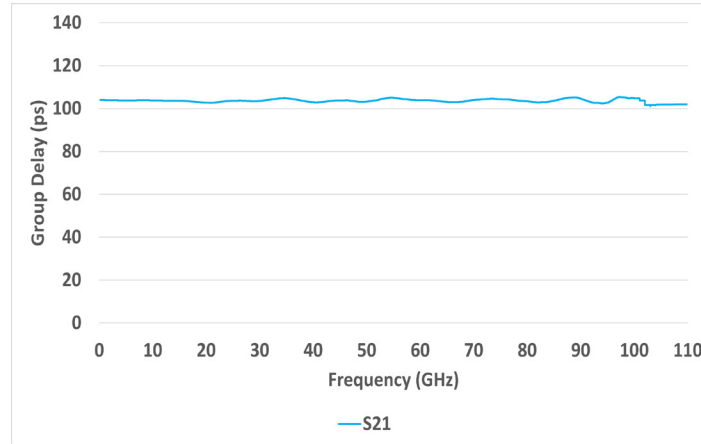


Figure 7: HL9429-3 Group Delay

## HL9429 Dimensional Drawing

Figure 8 shows a mechanical drawing of an HL9429-JP. Unless otherwise noted, all units are in inches. See page 2 for full dimensions.

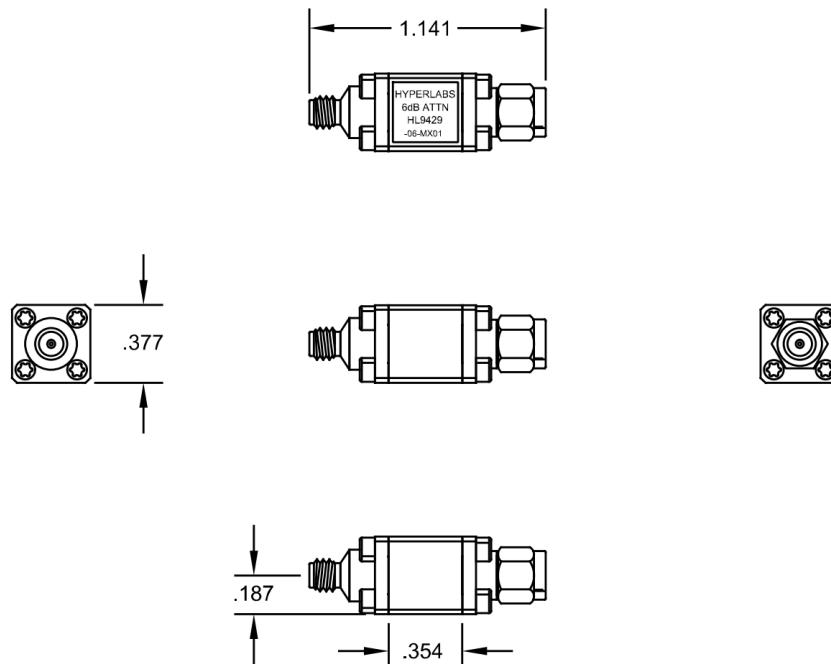


Fig 8: HL9429 Mechanical Drawing