HYPERLABS
Innovation at Hyperspeed since 1992

HL9403 Drop-in Broadband Balun (20 GHz)

Features and Technical Specifications

Bandwidth (-3 dB)	5 MHz to 20 GHz
Amplitude Match	± 0.25 dB to 20 GHz See *Fig. 1* below
Phase Match	± 2-4° at 20 GHz See *Fig. 2* below
Rise time	< 17.5 ps
Insertion Delay	≈ 278 ps
Insertion Loss	-6 dB
Return Loss	See *Figs. 3-4* below
VSWR	See *Fig. 5* below
Max Input Power	+30 dBm
Impedance	50 Ω In, 2 x 50 Ω Out
Interface	Drop-in with micro-coax leads
Dimensions	38.1 x 11.43 x 4.6 mm 1.50″ x 0.45″ x 0.18″
Weight	45.3 g (1.6 oz.)
Temperature Limits	-40° to +100° C, operating
RoHS Compliance	RoHS compliant; made with lead-free solder
Warranty	1 year, see website

PRODUCT SUMMARY

The HL9403 is a drop-in (SMT) signal splitter and combiner that offers industry-best amplitude and phase match over a bandwidth of 5 MHz to 20 GHz (-3 dB).

It is suitable for use in high-speed communications systems, high-speed analog-to-digital conversion, frequency response testing for differential devices, and many other applications.

DEPLOYMENT NOTES

Although the HL9403 ports are labeled as RF In/Out, this device is bidirectional and can be used either as a signal splitter or combiner.

If the DC voltage of the input or output is not zero, DC block capacitors are required.

ADDITIONAL DATA

Higher-resolution versions of the charts on the following pages are available on our website.

HL9403 Bandwidth

Bandwidth for all HYPERLABS baluns is defined as the range of frequencies where insertion loss is within -3 dB of the reference level (-6 dB).

Figure 1 below shows better than -9 dB insertion loss up to 20 GHz when the device is used as a signal splitter.

HL9403 Amplitude Match

Amplitude match is a comparison between the signals on the RF Out +/- ports of a balun used as a signal splitter. This specification is derived from the insertion loss (in dB) measured on the output ports of the device.

Figure 1 below shows typical HL9403 insertion loss from 5 MHz to 20 GHz when the device is used as a signal splitter.

The amplitude balance can be seen by comparing the non-inverting output (blue trace), with the inverting output (red trace).

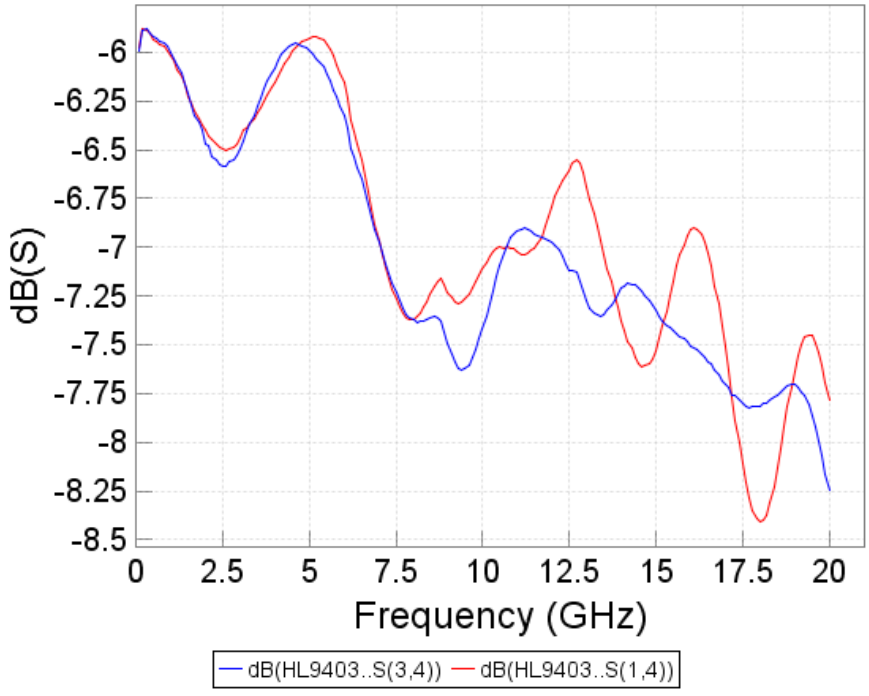

Figure 1: Typical insertion loss measurements of the HL9403 RF Outputs when used as a balun

When the HL9403 is used as a combiner, mixed mode parameters provide additional information on device performance. For more on the HL9403 combiner performance, please see our website for mixed-mode measurement data.

HL9403 Phase Match

The HL9403 is a 180° balun, so the phase match of the RF Out+ and RF Out- ports is specified to degrees from 180°.

Match is dependent on the delay of the output ports. For example, a 2° mismatch at 10 GHz requires the delay of each side of the balun to be within ≈ 0.5 ps of each other. Phase mismatch increases at higher frequencies.

Figure 2 below shows phase mismatch between the RF Outputs from 5 MHz to 20 GHz.

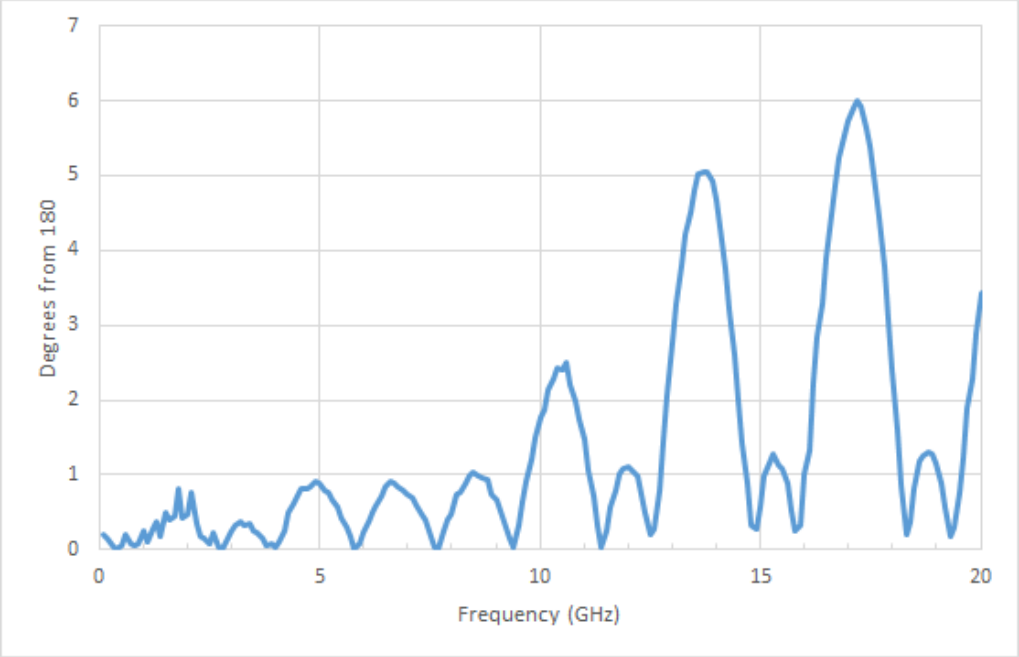

Figure 2: HL9403 phase match, represented as degrees from 180°

HL9403 Return Loss

Figure 3 shows the return loss on the HL9403 RF Input of a device used as a signal splitter. *Figure 4* shows the return loss on the RF Output+ port of a device used as a signal combiner. In both cases, bandwidth is from 5 MHz to 20 GHz.

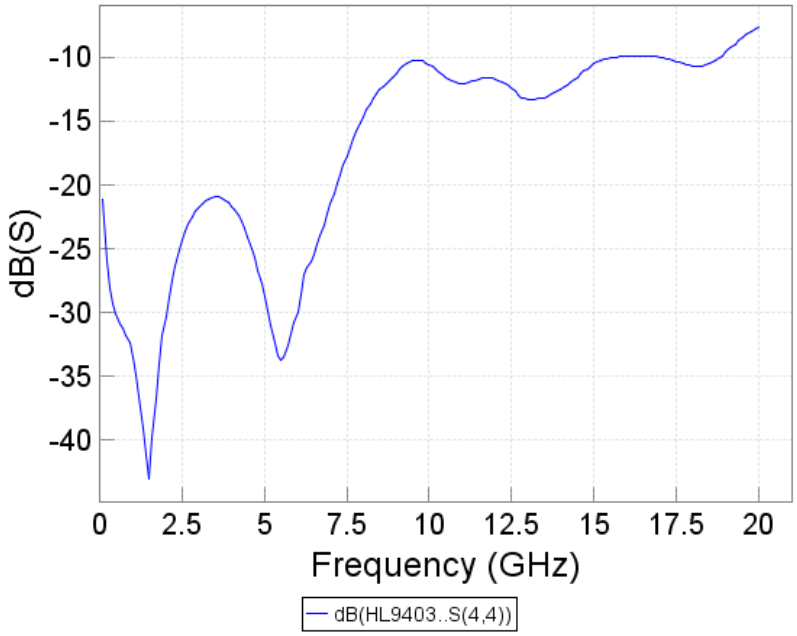

Figure 3: Typical return loss (S11) on the HL9403 RF Input

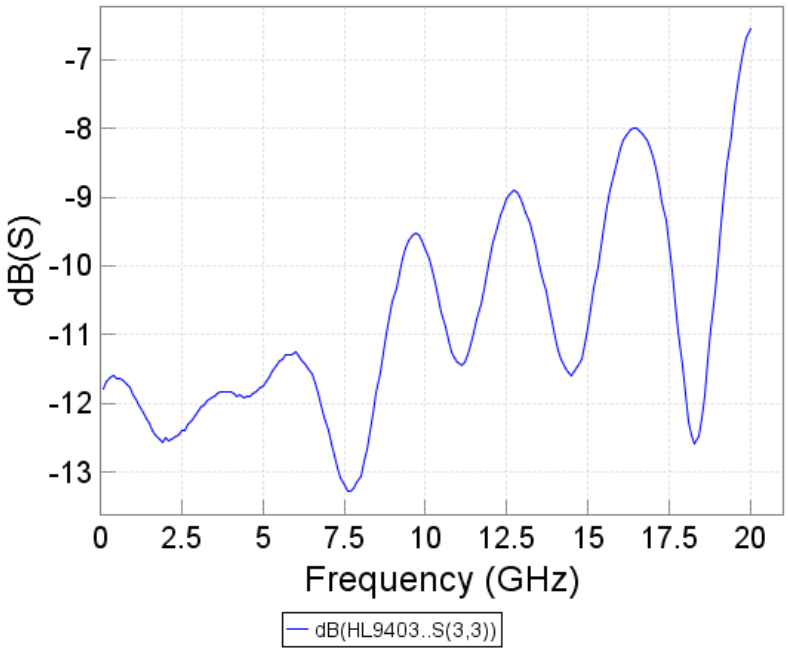

Figure 4: Typical return loss (S11) on the HL9403 RF Output+ port

HL9403 VSWR

The typical Voltage Standing Wave Ratio (VSWR) of the HL9403 is shown in *Figure 5* below.

The blue and orange traces show typical VSWR on the RF In and RF Out+ ports, respectively.

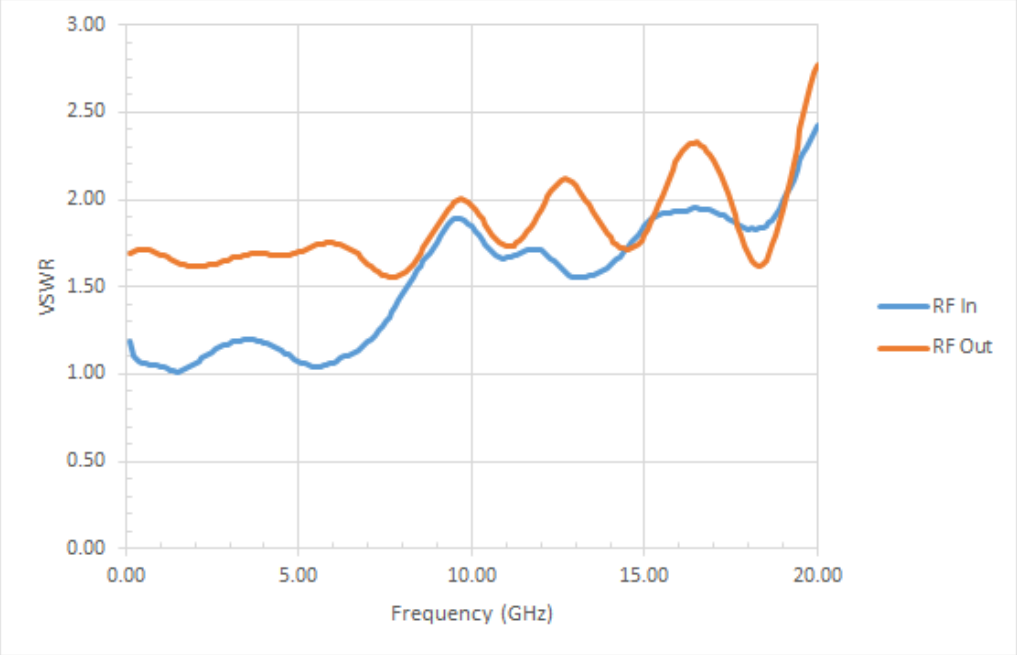

Figure 5: Typical VSWR on the HL9403 RF Input and RF Output