HL9403 SMT Broadband Balun (20 GHz)

The HL9403 is a drop-in/SMT broadband balun with ± 0.25 dB typical amplitude match from 5 MHz to 20 GHz and typical ± 2 degree phase match at 10 GHz.

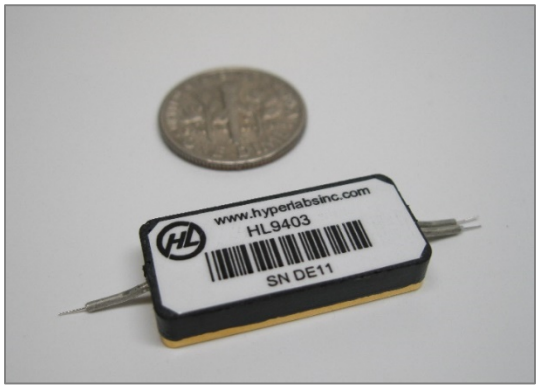

Figure 1: HL9403 SMT Broadband Balun (20 GHz)

Applications

- Signal integrity testing
- Serial data link measurement
- Analog to digital conversion
- High-linearity down-converter sampling modules

Features and Technical Specifications

Bandwidth (-3 dB)	5 MHz to 20 GHz
Amplitude Matching	± 0.25 dB
Phase Balance	± 2°, typical at 10 GHz
Risetime	< 17.5 ps
Insertion Delay	196 ps
Insertion Loss	-6 dB, see *Figure 3* on following page
Return Loss	See *Figures 4-5* on following page
Impedance	50 Ω In, 2 x 50 Ω Out
Isolation	RF Out +/- not isolated
Dimensions (excluding leads)	22.35 x 11.43 x 4.57 mm 1.0″ x 0.45″ x 0.18″
Weight (excluding leads)	4.4 g 0.16 oz
Temperature Limits	0° to +40° C, operating -40° to +85° C, storage
Warranty	1 year, repair or return, see website for details

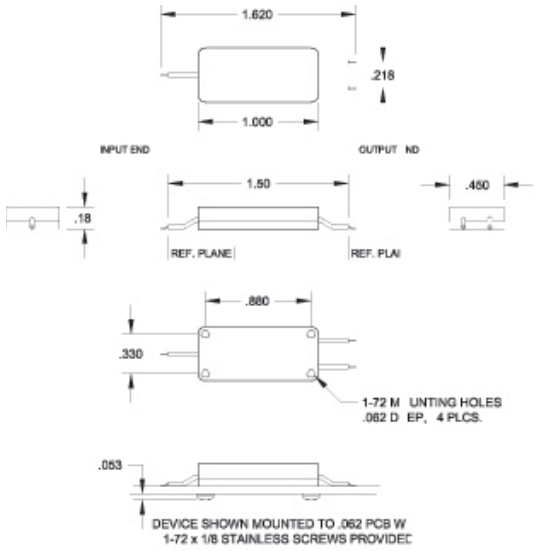

Figure 2: Dimensional Drawing of the HL9403

Deployment Notes

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

Testing Methology

The HL9403 is a drop-in component, so a test fixture was required to connect it to a network analyzer.

For questions about the performance of the HL9403 in a different testing environment, please contact us.

HL9403 RF Output Measurements

In *Figure 3* below, the insertion loss of the RF Outputs of the HL9403 is measured from 5 MHz to 20 GHz. The vertical axis is dB (0 to -10).

The blue trace is the Non-inverting (+) Output, and the red trace is the Inverting (-) Output.

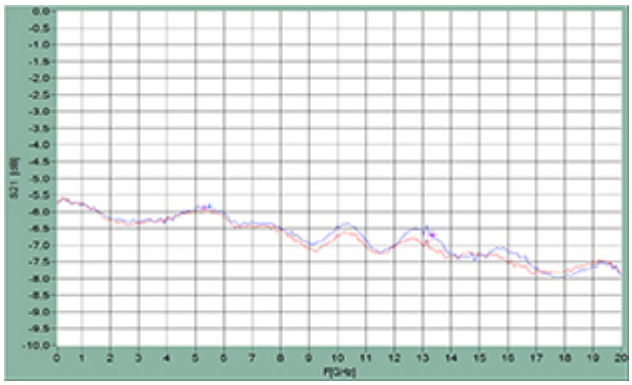

Figure 3: Insertion loss (S21/S31) measurements of the HL9403 RF Outputs

In *Figure 4*, the HL9403 is used in combiner (reverse balun) mode. Return loss of the Non-inverting (blue) and Inverting (red) Outputs is shown from 5 MHz to 20 GHz. The vertical axis is dB (0 to -40).

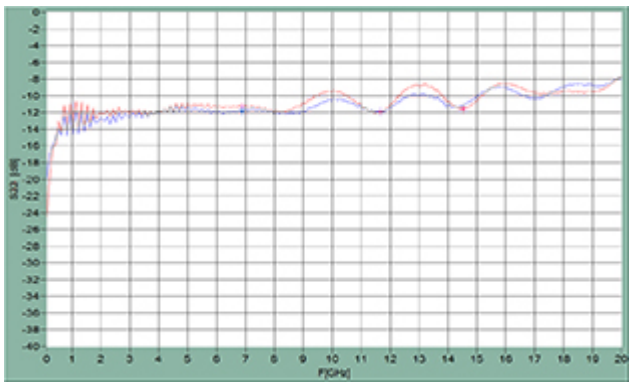

Figure 4: Return loss (S22/S33) measurements of the HL9403 RF Outputs

HL9403 RF Input Measurements

In *Figure 5*, return loss is measured on the RF Input of the HL9403 from 5 MHz to 20 GHz. The vertical axis is dB (0 to -40).

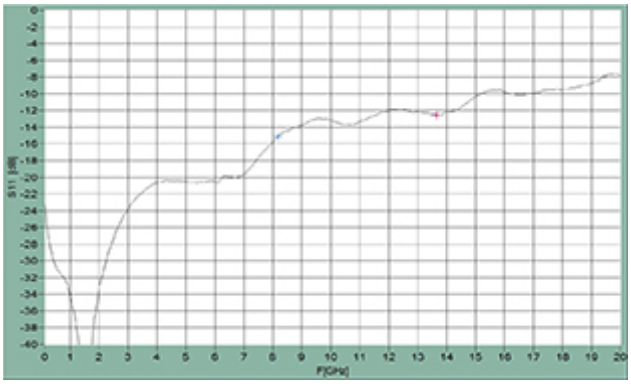

Figure 5: Return loss (S11) measurement of the HL9403 RF Input

Figure 6 shows the common-mode rejection ratio of the HL9403 when used in combiner mode. The horizontal axis is frequency (5 MHz to 20 GHz), while the vertical is dB (0 to -60).

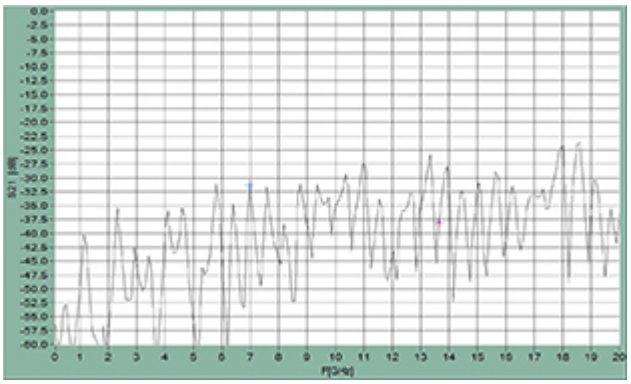

Figure 6: CMRR Measurement of the HL9403

HL9403 Time Domain Measurements

Figure 7 shows the rise time of the positive going input signal as 34.08 ps and a time window delay of 37.25 ns.

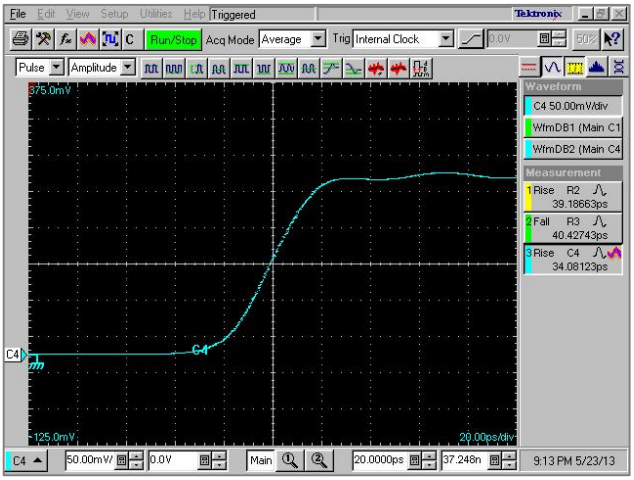

Figure 7: Positive going input signal of the HL9403 measured in the time domain

Figure 8 shows that the Non-inverting (yellow trace) and Inverting (green) Output signals have a rise time of 39.18 ps and a fall time of 40.42 ps, respectively. The time window delay is 37.53 ns.

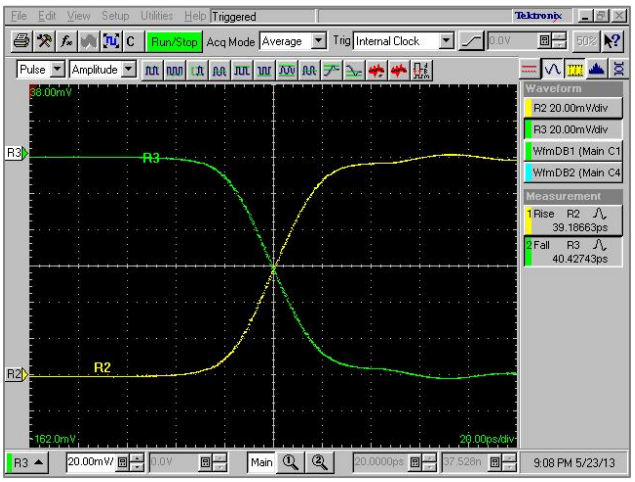

Figure 8: Non-inverting and Inverting Outputs of the HL9403 Measured in the Time Domain

These data demonstrate a rise time of 8.2 ps and a fall time of 12.8 ps, derived using the root of the difference of squares and the 17.5 ps rise time of a Tektronix 80E02 Sampling Head.

The insertion delay is 196 ps, taken by subtracting the insertion delay of two SMA adapters (84 ps total) in the test fixture from the measured delay of 280 ps.

HL9403 Eye Diagrammer Measurements

Figure 9 shows an eye diagram of a 10 GBit/s Pseudo-Random Bit Sequence (PRBS) used as the input signal for testing the HL9403.

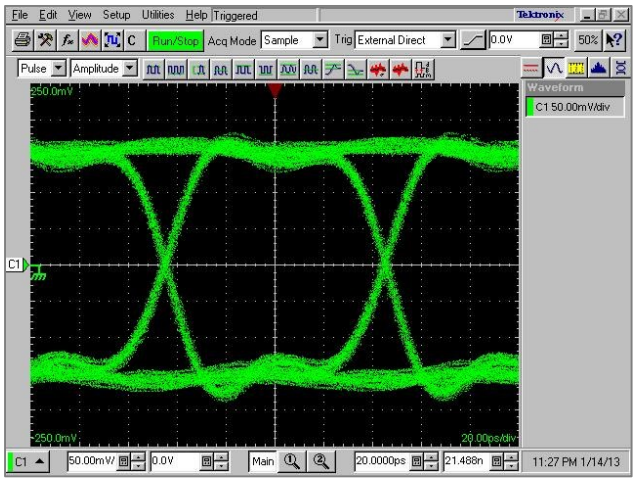

Figure 9: Eye Diagram of the HL9403 Interfaced with a 10 Gbit/s PRBS

In *Figure 10*, the same 10 Gbit/s PRBS was used. The Non-inverting (+) and Inverting (-) RF Outputs are shown in yellow and green, respectively.

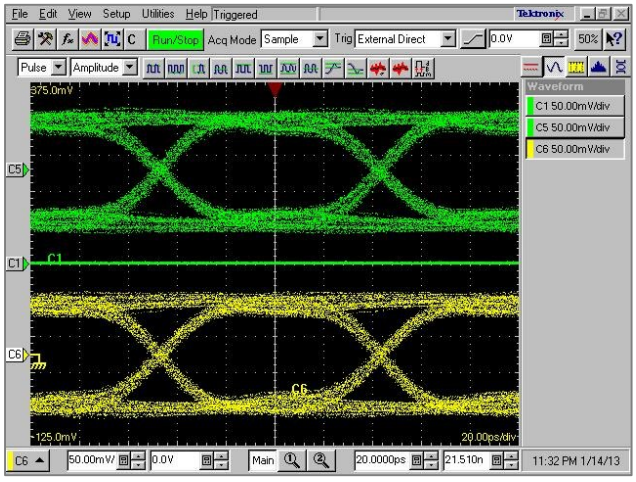

Figure 10: Eye Diagram of the HL9403 Interfaced with a 10 Gbit/s PRBS