



LEAD-FREE / RoHS-COMPLIANT

HIGH POWER BALUN (200 kHz to 3 GHz)

BALH-0003

Features

- 200 kHz to 3 GHz Balun (Balanced to Unbalanced Transformer)
- Better than 37 dBm 1-dB compression point
- Tuned for Optimal Phase/Amplitude Balance
- Applications: Analog to Digital Converters, Balanced Receivers, Baseband Digital Modulation, Signal Integrity
- [BALH-0003.s3p](#)



Electrical Specifications - Specifications guaranteed from -55 to +100°C, measured in a 50Ω system.

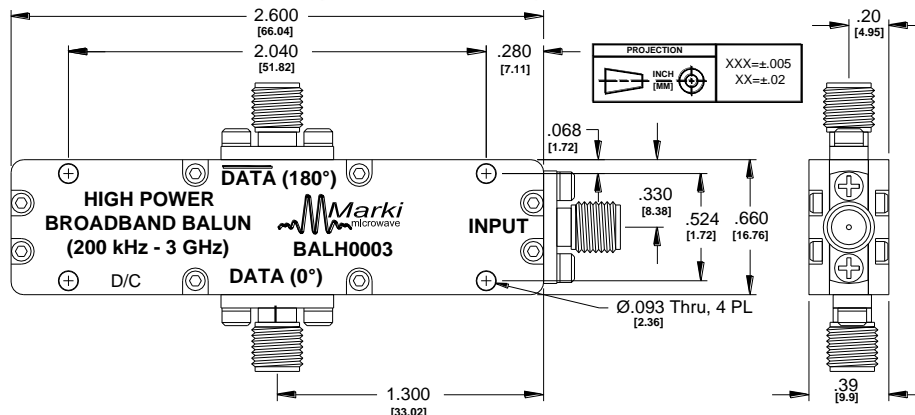
Parameter	Frequency Range	Min	Typ	Max	
Insertion Loss as a mode converter (dB)	200 kHz to 3 GHz		1.5	2.5	
Input 1 dB Compression (dBm) ¹		37			
Nominal Phase Shift (Degrees)			180		
Amplitude Balance (dB)			0.1	0.5	
Phase Balance (Degrees)			1	5	
Common Mode Rejection (dB)			35	45	
Isolation (dB)				7	
VSWR (Input)				1.6	
VSWR (Output)				1.6	
Risetime /Falltime (ps) ²				13	
Weight (g)				27	

¹Measured in a well-heat sunked environment.

²Specified as 90%/10%. Calculated from $\tau_{balun}^2 = (\tau_{out}^2 - \tau_{in}^2)$

Model Number	Description
BALH-0003	200 kHz to 3 GHz High Power Balun with SMA connectors ¹ , LEAD-FREE/RoHS COMPLIANT

¹Default is SMA female connectors. Consult factory for other connector options.

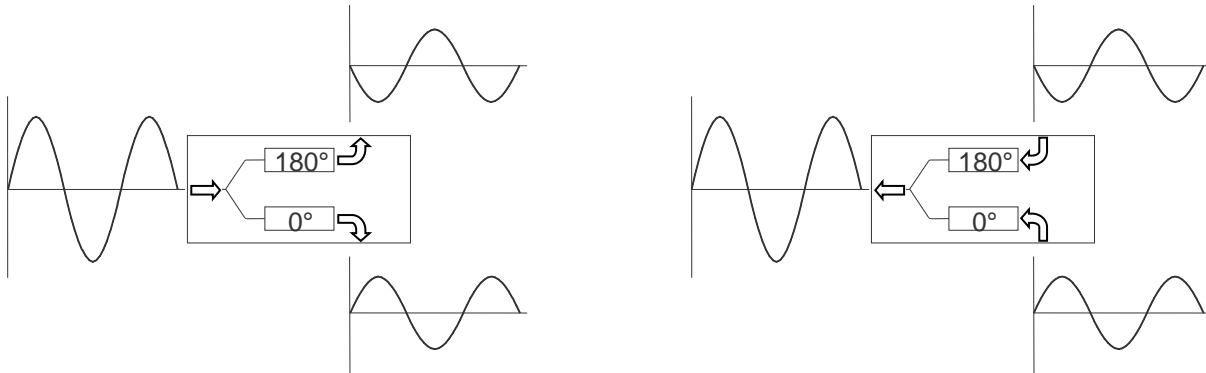


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Block Diagram



Single ended to differential

Differential to single ended

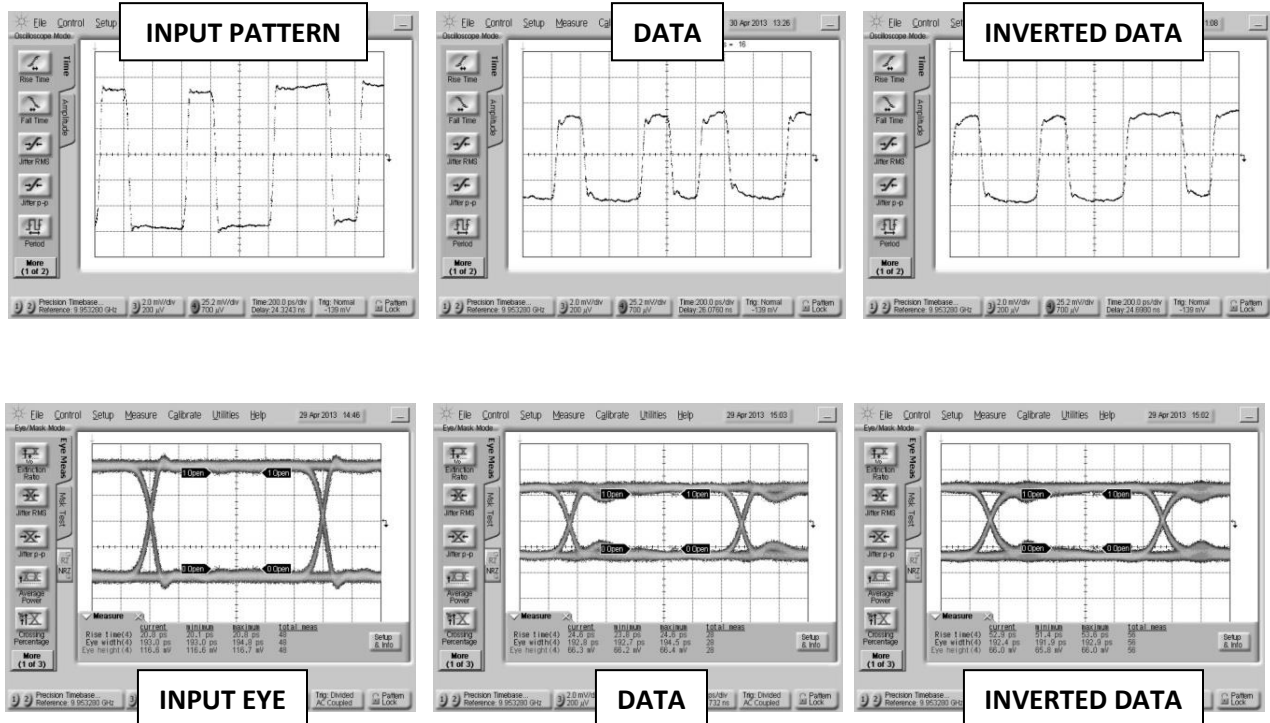


Fig. 1. Oscilloscope measurements of the BALH-0003 with a 5 Gb/s PRBS pattern. Bit pattern is measured with a 2^7-1 PRBS input demonstrating extremely good pulse fidelity for both inverted and non-inverted output. Eye diagrams are taken with a $2^{31}-1$ PRBS input demonstrating minimal eye distortion/closure afforded by the extremely low frequency operation of the balun (<200 kHz).

Typical Performance Scattering Parameters

Three port scattering parameters measured as three single-ended 50Ω ports showing relationship between any two ports. For example: S₂₁ and S₃₁, often referred to as insertion loss of a balun, is the output response on ports 2 and 3 with an input stimulus on port 1.

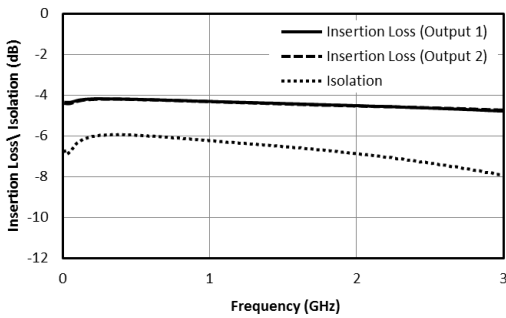


Fig. 2. Common to output port insertion loss and output to output port Isolation.

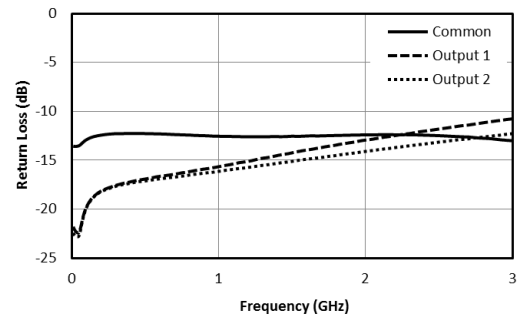


Fig. 3. Return loss for common port and output ports.

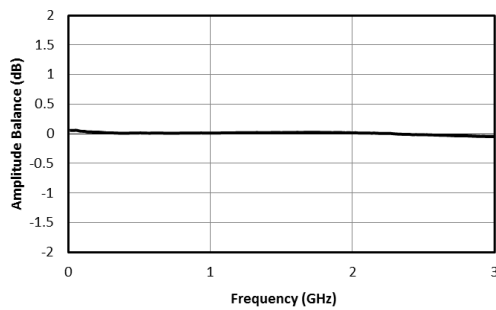


Fig. 4. Amplitude balance between output ports.

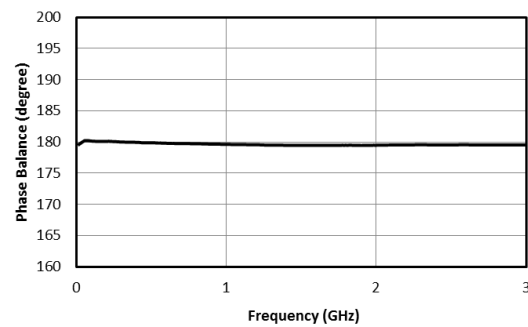


Fig. 5. Phase balance between output ports.

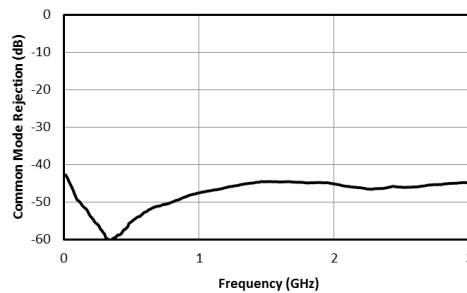


Fig. 6. Common mode rejection.

Mixed Mode Scattering Parameters

Mixed mode scattering parameters are used to characterize differential circuits. For baluns, this means that the 0° and 180° ports become a single 100Ω differential port and the common port remains the same 50Ω common port. The two-port s-parameters of the balun are then characterized based on differential (d), common mode (c), or single-ended (s) signals. For example: Scs12 is the Common output response given a single ended input.

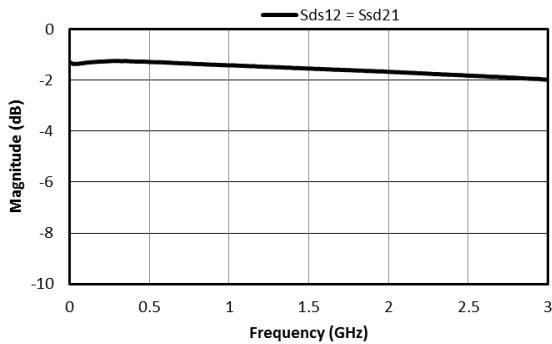


Fig. 7. Insertion loss as a mode converter

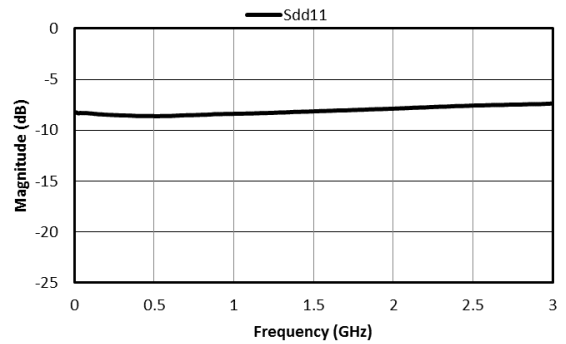


Fig. 8. Differential port return loss

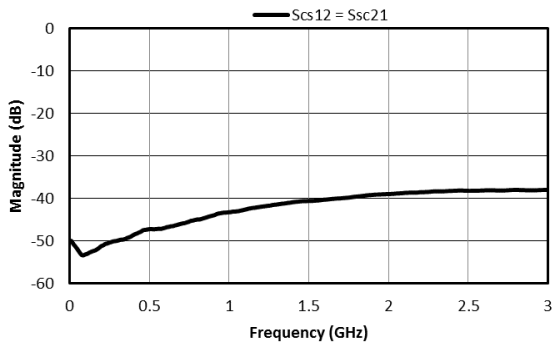


Fig. 9. Insertion loss of a common mode signal

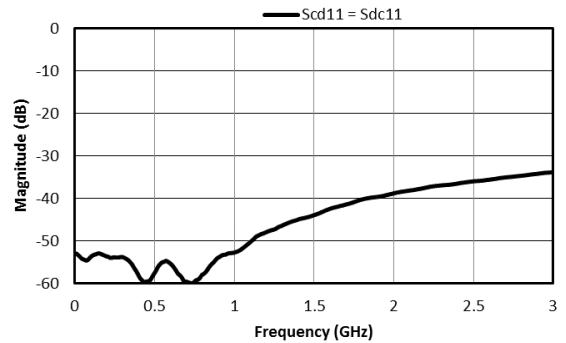


Fig. 10. Reflection converted between differential and common modes

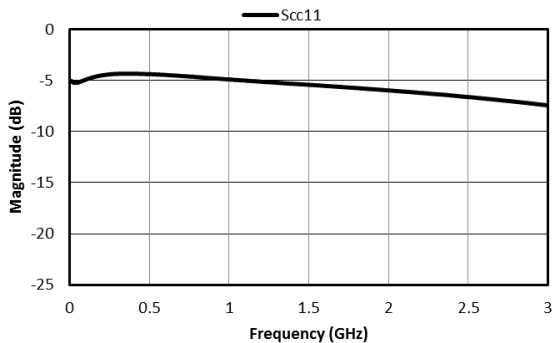


Fig. 11. Return loss of a common mode signal

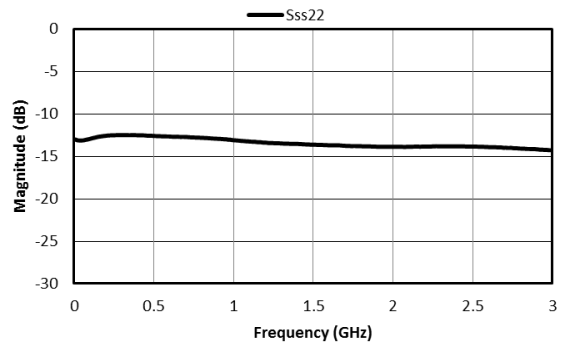


Fig. 12. Unbalanced port return loss

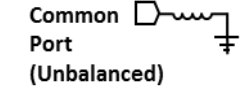
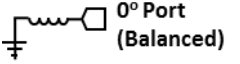
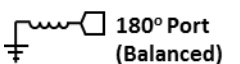


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DC Interface

Port	Description	DC Interface Schematic
Common Port / In (Unbalanced)	The common port is DC short to ground.	 Common Port (Unbalanced)
Out 1 / 0° Port (Balanced)	The 0° port is DC short to ground.	 0° Port (Balanced)
Out 2 / 180° Port (Balanced)	The 180° port is DC short to ground.	 180° Port (Balanced)

Revision History

Revision code	Revision Date	Comment
-	2014	Datasheet initial Release
A	October 2019	Mixed Mode Scattering Parameters added
B	November 2019	RoHS Compliant assembly
C	July 2020	Specs table update
D	October 2020	Specs table update

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