LEAD-FREE / RoHS-COMPLIANT

SURFACE-MOUNT BROADBAND BALUN

BAL-0416SMG

The BAL-0416SMG is a Surface Mount Microlithic™ balun. As with all Microlithic™ baluns, it features excellent amplitude balance, phase balance, and common mode rejection across a broad bandwidth and in a miniaturized form factor. It has significant isolation, reducing the reflection of unwanted common mode signals. The BAL-0416SMG is a lead free, RoHS compliant package compatible with standard leaded and lead-free solder reflows. SMA connectorized evaluation packages are available. The BAL-0416SMG is an excellent choice for balanced amplifiers, clock distribution, and higher order Nyquist sampling in analog to digital converters

Features

- 4 GHz to 16 GHz 1:2 Balun (Balanced to Unbalanced Transformer)
- Transforms 50 Ω Input to 100 Ω Differential (50 Ohm Single) Output
- Tuned for Optimal Phase/Amplitude Balance
- Applications: Analog to Digital Converters, Balanced Receivers, Balanced Amplifiers, Mixers, Clock Distribution, Signal Integrity
- BAL-0416SMG.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)[1]	4 GHz to 16 GHz		3.3	5.5
Nominal Phase Shift (Degrees)			180	
Amplitude Balance (dB)			0.4	1
Phase Balance (Degrees)	4 GHz to 12 GHz		1	5
	12 GHz to 16 GHz		6	15
Common Mode Rejection (dB)	4 GHz to 12 GHz	25	35	
	12 GHz to 16 GHz	15	26	
Isolation (dB)			15	
VSWR			2.5	
Total Input Power (W)				1

[1]Includes fixture losses.

Model Number	Description
BAL-0416SMG	4 GHz to 16 GHz Balun, Surface Mount, LEAD-FREE/RoHS COMPLIANT

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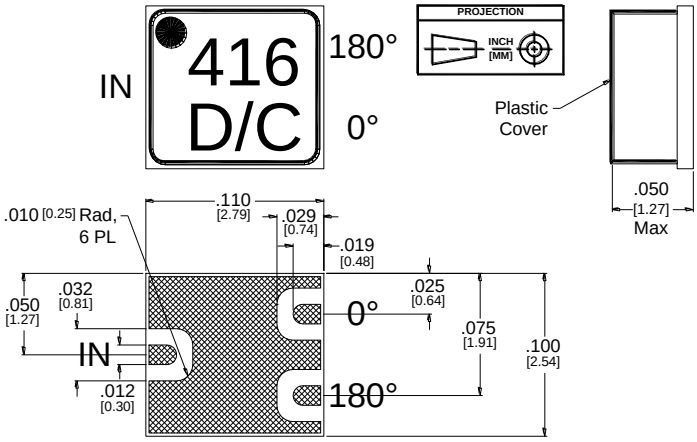
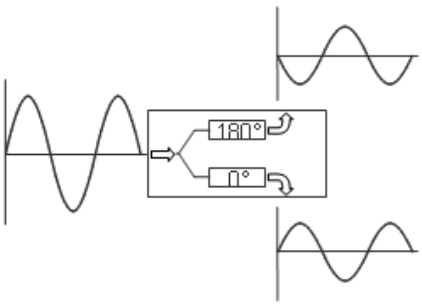
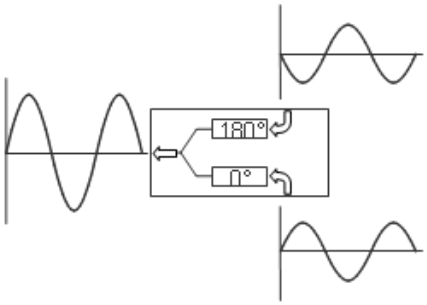


I/O traces and ground plane finish is TiWNiAu, 0.5 microns Au max over 0.15 microns Ni.
See BALSM-ML-PCB for suggested PCB layout.

Block Diagram



Single ended to differential



Differential to single ended

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.

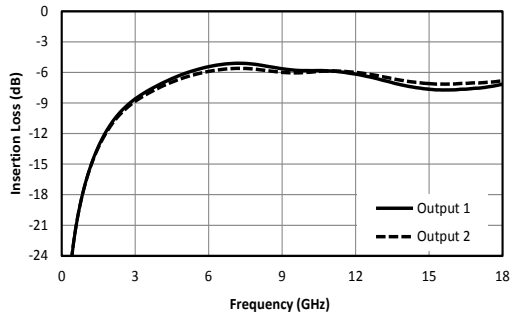


Fig. 1. Common to balanced port insertion loss[1]

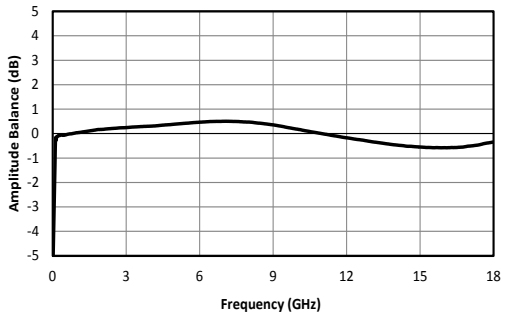


Fig. 2. Amplitude balance between balanced ports.

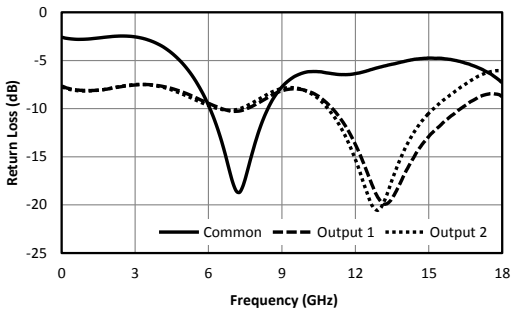


Fig. 3. Return loss for common port and balanced ports.

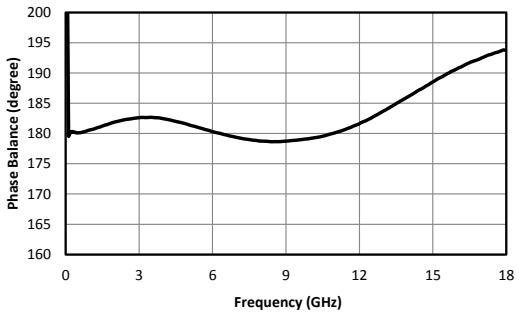


Fig. 4. Phase balance between balanced ports.

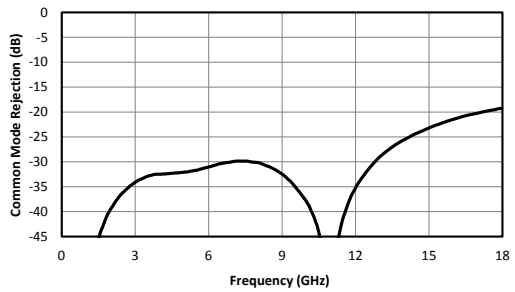


Fig. 5. Common mode rejection

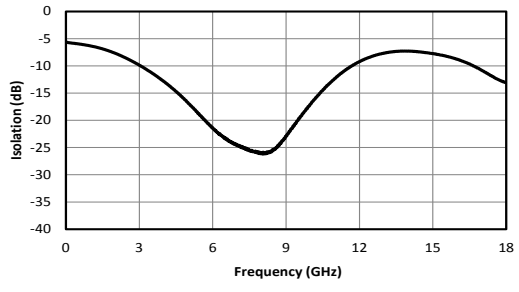


Fig. 6. Balanced port to balanced bort isolation

[1]Includes test fixture loss. Results are not de-embedded.

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.

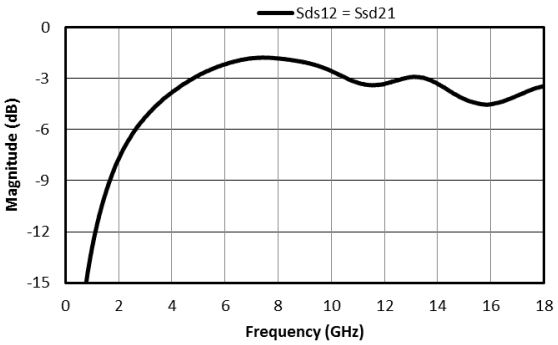


Fig. 7. Insertion loss as a mode converter

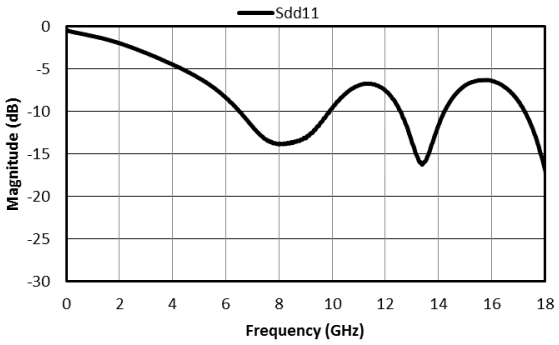


Fig. 8. Differential port return loss

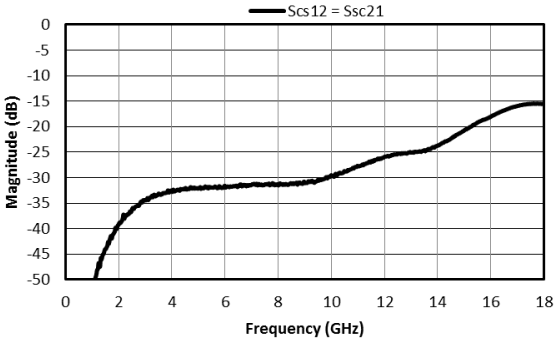


Fig. 9. Insertion loss of a common mode signal

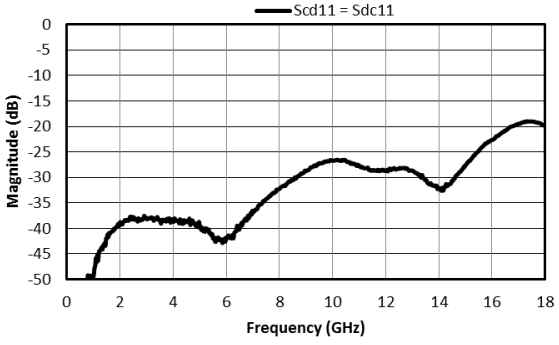


Fig. 10. Reflection converted between differential and common modes

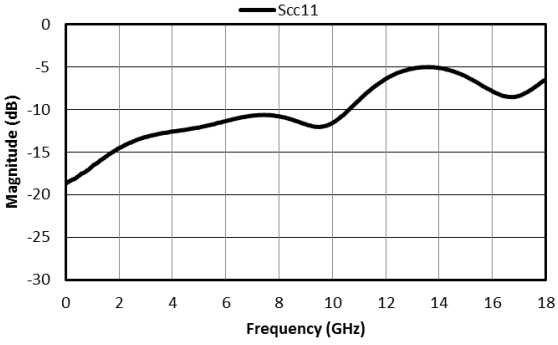


Fig. 11. Return loss of a common mode signal

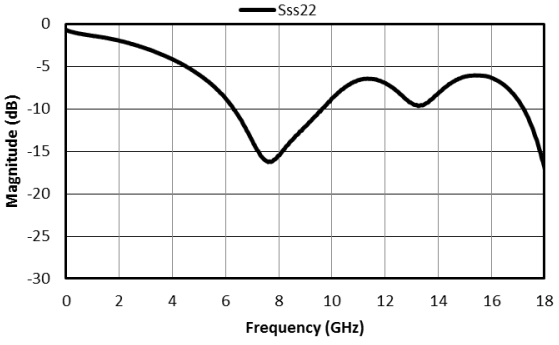


Fig. 12. Unbalanced port return loss

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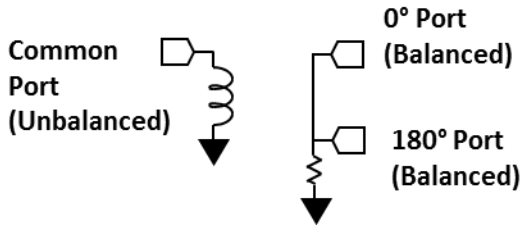
DC Interface

Port	Description	DC Interface Schematic
Common Port (Unbalanced)	The common port is DC short to ground.	
0° Port (Balanced)	The 0° port is DC short to the 180° port and passes through a resistor to ground.	
180° Port (Balanced)	The 180° port is DC short to the 0° port and passes through a resistor to ground.	

Revision History

Revision code	Revision Date	Comment
-	2014	Datasheet initial Release
A	2016	Typical Performance Plots Updated
B	October 2019	Mixed Mode Scattering Parameters added
C	July 2020	Specs table update
D	October 2020	Specs table update