

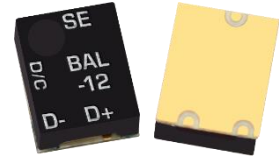
LEAD-FREE / RoHS-COMPLIANT

SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Features

- 10 MHz to 12 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, Baseband Digital Modulation, Signal Integrity
- [BAL-0012SSG.s3p](#)



SMT

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

Parameter	Frequency Range	Min	Typ	Max
Insertion Loss as a mode converter (dB)	10 MHz to 12 GHz		5	6.5
Nominal Phase Shift (Degrees)			180	
Amplitude Balance (dB)			0.6	1.8
Phase Balance (Degrees)			5	12
Common Mode Rejection (dB)		18	26	
Isolation (dB)			8	
VSWR			1.6	
Total Input Power (W)				

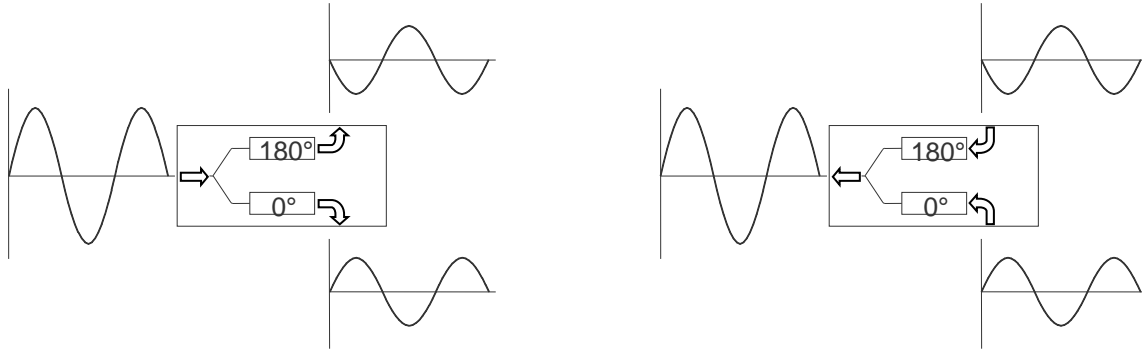
Model Number	Description
BAL-0012SSG	10 MHz to 12 GHz Balun, Surface Mount, LEAD-FREE/RoHS COMPLIANT
EVAL-BAL-0012	Connectorized Evaluation Fixture, LEAD-FREE/RoHS COMPLIANT

SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Page 2

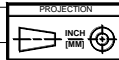
Block Diagram

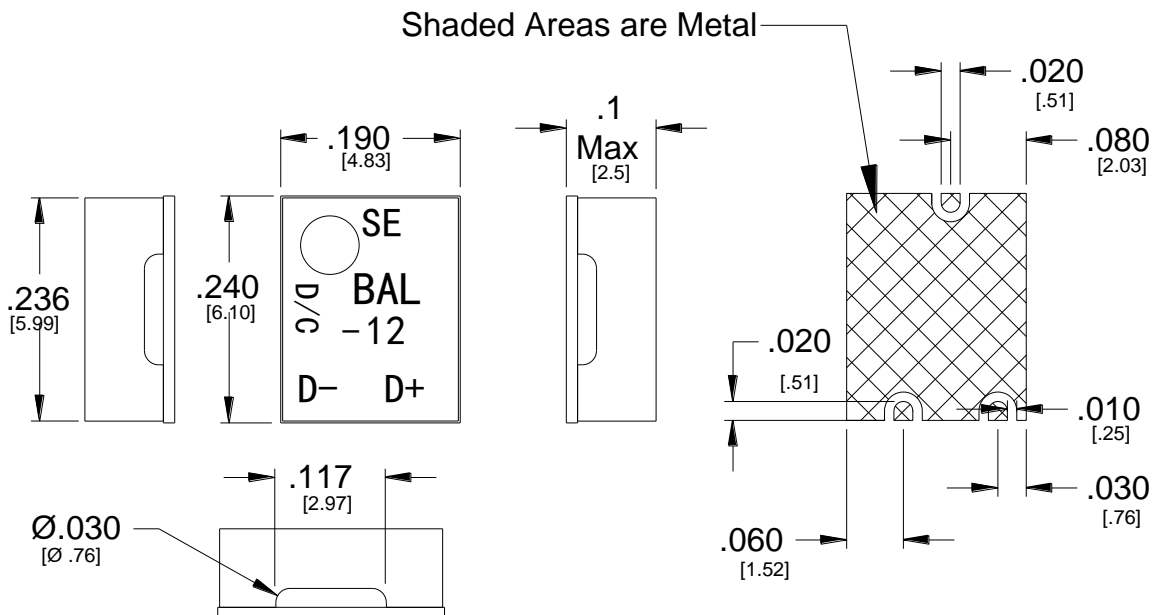


Single ended to differential

Differential to single ended

Outline Drawing

All measurements are typical 



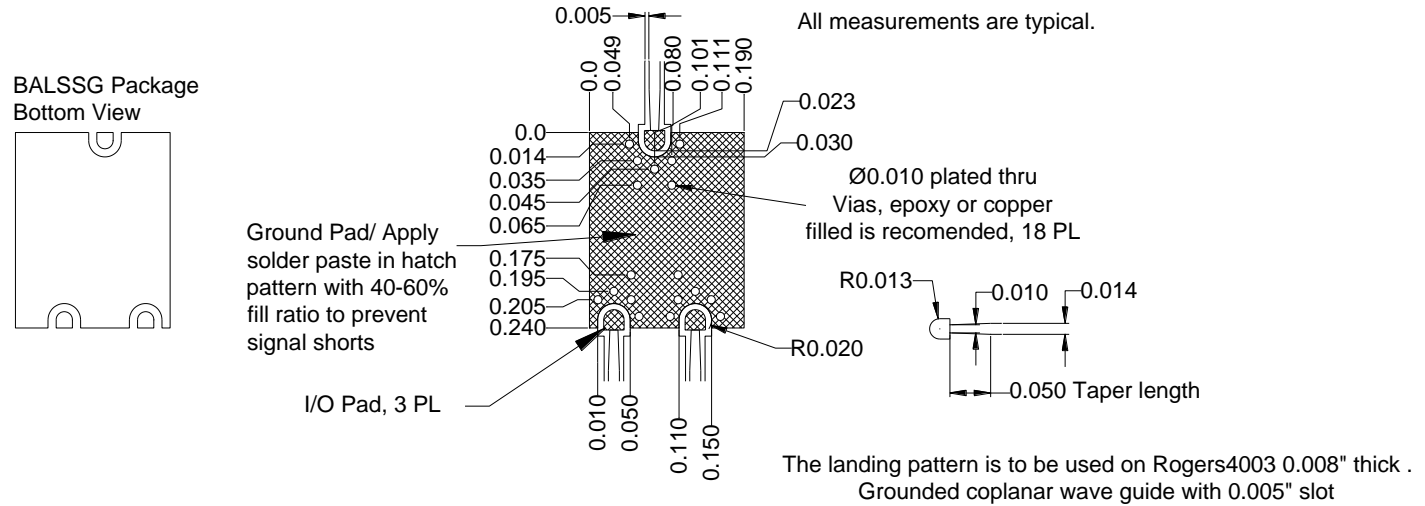
Substrate material is 8-mil thick Rogers 4003, 1 Oz Rolled Cu. I/O Pads & Ground Plane Finish is Gold, 2 to 8 μ-inches, over solderable Electroplated Nickel, 100-200 μ-inches per QQ-N_290A. Or ENIG

SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

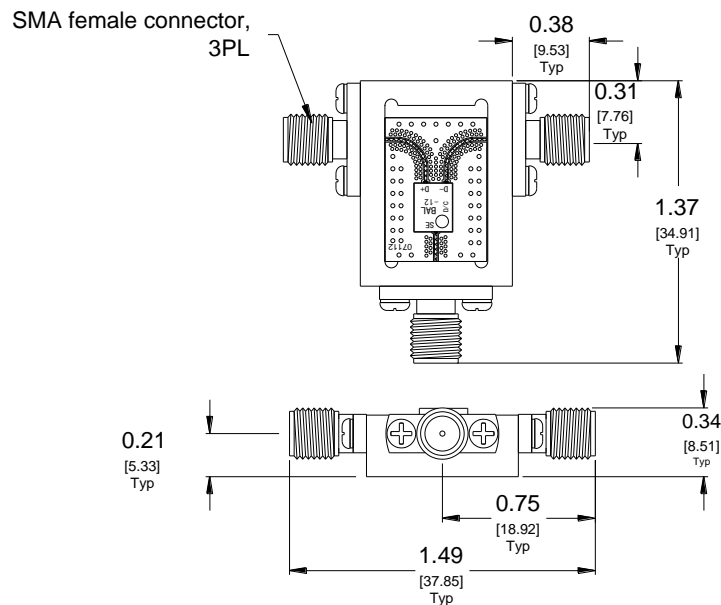
Page 3

PCB Footprint Drawing



[Click here for a DXF of the above layout.](#)

Eval Package Outline Drawing



SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Page 4

Mixed Mode Scattering Parameters²

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: Sds21 is the differential output response given a single ended input.

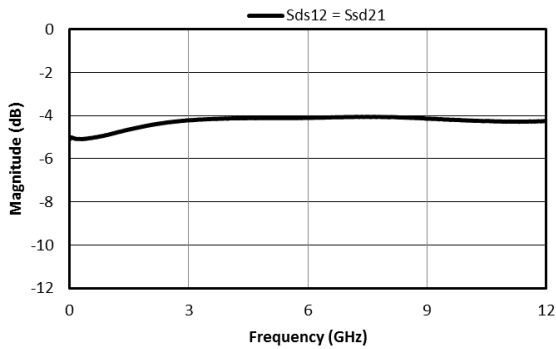


Fig. 1. Insertion loss as a mode converter

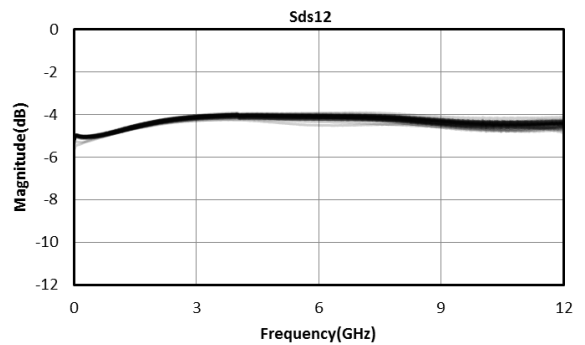


Fig. 2. Insertion loss as a mode converter, 50 units spread

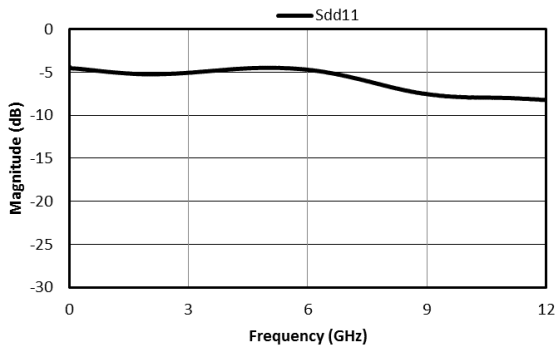


Fig. 3. Differential port return loss

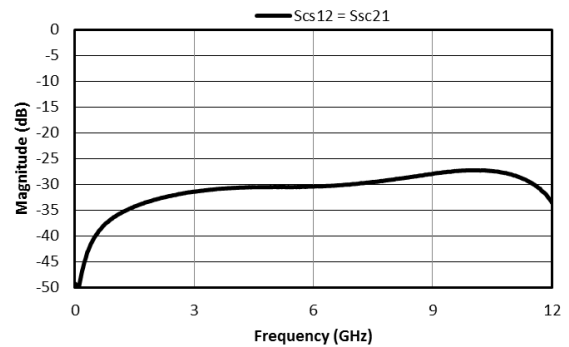


Fig. 4. Insertion loss of a common mode signal

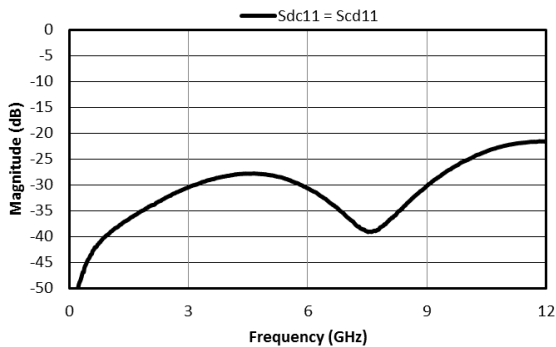


Fig. 5. Reflection converted between differential and common modes

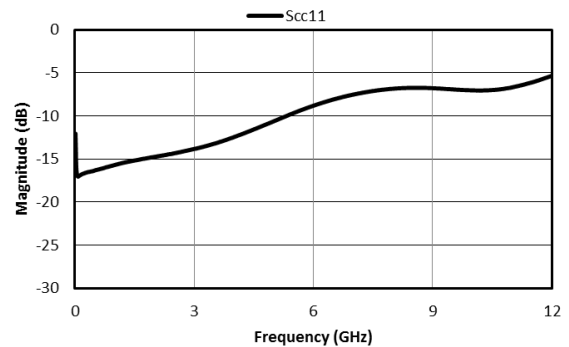


Fig. 6. Return loss of a common mode signal

SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Page 5

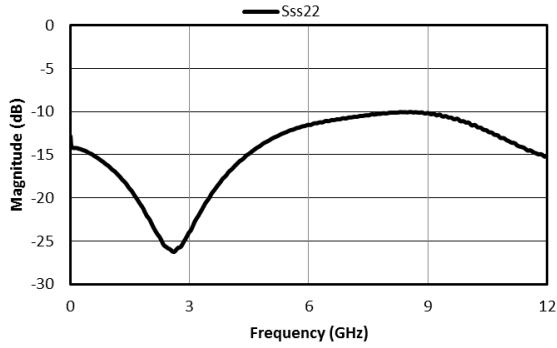


Fig. 7. Unbalanced port return loss

Typical Performance Scattering Parameter

Three port scattering parameters measured as three single-ended 50Ω ports showing relationship between any two ports.

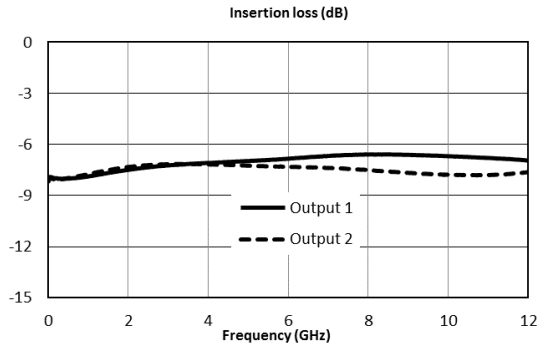


Fig. 8. Common to output port insertion loss

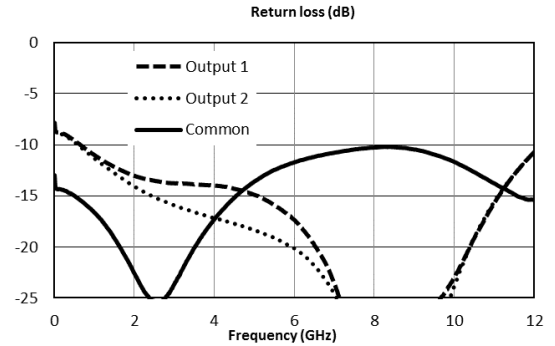


Fig. 9. Return loss for common port and output ports.

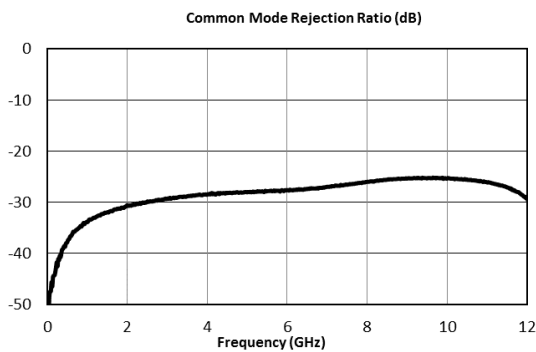


Fig. 10. Common mode rejection.

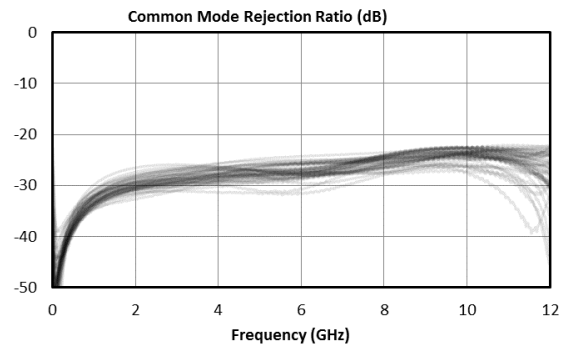


Fig. 11. Common mode rejection, 50 units spread.

SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Page 6

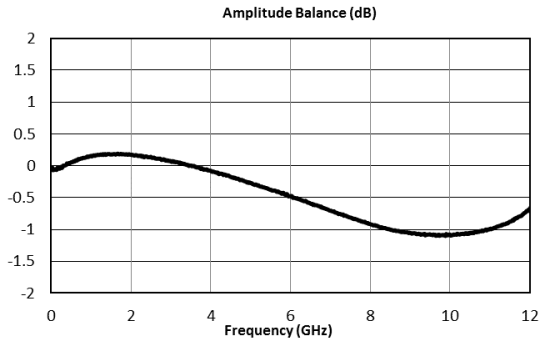


Fig. 12. Amplitude balance between output ports.

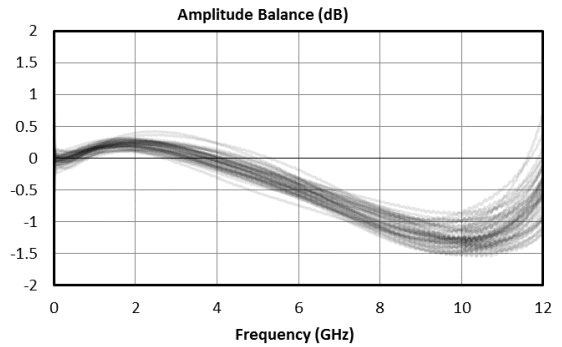


Fig. 13. Amplitude balance between output ports, 50 unit spread.

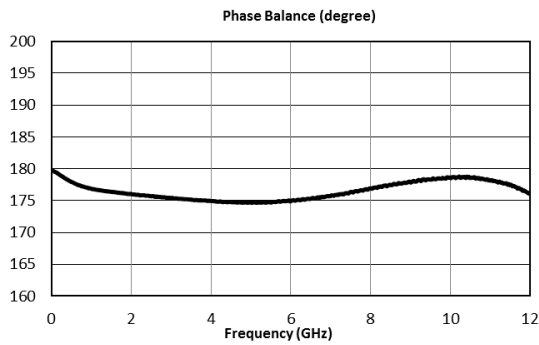


Fig. 14. Phase balance between output ports.

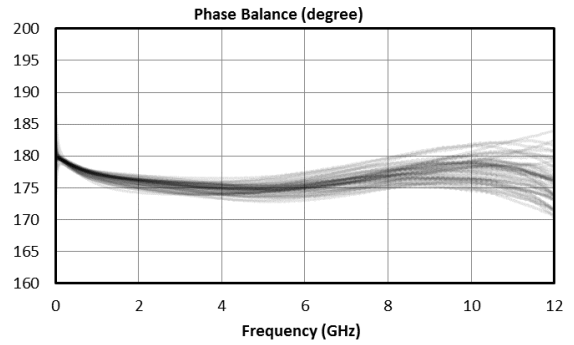


Fig. 15. Phase balance between output ports, 50 unit spread.

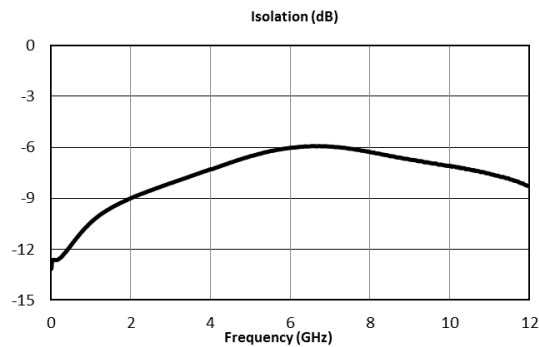


Fig. 16. Isolation between output ports

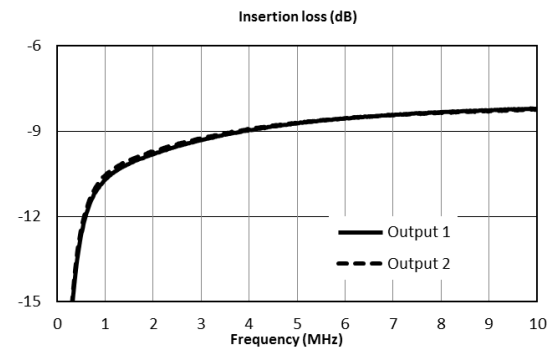


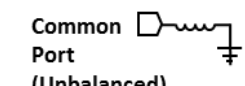
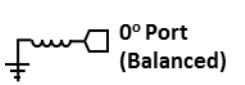
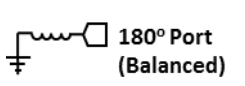
Fig. 17. Low Frequency Insertion Loss

SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Page 7

DC Interface

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

Absolute Maximum Ratings	
Parameter	Maximum Rating
DC Current	TBD
RF Power Handling	30 dBm
Operating Temperature	-55°C to +100°C
Storage Temperature	-65°C to +125°C



SURFACE-MOUNT BROADBAND BALUN

BAL-0012SSG

Page 8

DATASHEET NOTES:

1. Excess Insertion Loss = (Common Port to Output Port Insertion Loss) – 6 dB.
2. Sdd11: differential return loss of the differential port driven with a differential signal
Sdc11: differential return loss of the differential port driven with a common signal
Sds12: insertion loss from a single ended input to a differential output
Scc11: common mode return loss of the differential port driven with a common signal
Scd11: common mode return loss of the differential port driven with a differential signal
Scs12: insertion loss from a single ended input to a common output
Sss22: single ended return loss
Ssd21: insertion loss from a differential signal to single ended output
Ssc12: insertion loss from a common signal to single ended output

Revision History

Revision code	Revision Date	Comment
-	June 2020	Initial Datasheet Release

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