Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
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Tech Support: support@markimicrowave.com

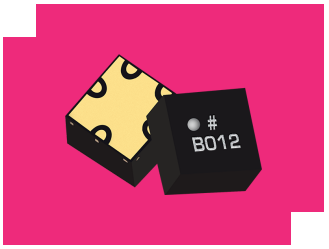
# MBALH-0R106CSP2

## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

## DEVICE OVERVIEW

### General Description

The MBALH-0R106CSP2 is a GaAs passive MMIC 1:1 balun that features excellent 35 dB common mode rejection over a 0.1 to 6 GHz operational bandwidth. The MBALH-0R106CSP2 is footprint compatible with the 1:2 MBAL-0R106CSP2, offering flexibility in system design. For ADC and DAC interface applications, the choice between the 1:2 and 1:1 configurations will depend on specific system requirements. This device is an ideal solution for digital beamforming and other higher-order Nyquist sampling applications, as well as clock distribution and balanced amplifier interfaces. Available in a lead-free, RoHS compliant 2.5 x 2.5 mm CSP2 package, it is compatible with standard pick-and-place assembly processes.




Download s-parameters here

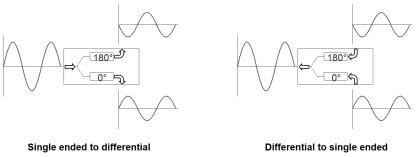
### Features

- 0.1 GHz to 6 GHz
- 1:1 Balun (50Ω Common to 50Ω Differential)
- Optimal Phase and Amplitude Balance of 0.4° and 0.2 dB
- 35 dB Common Mode Rejection
- Compact 2.5mm chip scale package
- This product embodies Marki Microwave's U.S. Pat. 11,869,858.

### Applications

- Balanced Receivers
- Signal Integrity
- Analog to Digital Converters
- Balanced Amplifiers
- Clock Distribution

### Functional Block Diagram




### Part Ordering Options

| Part Number | Description | Package | Green Status | Product Lifecycle | Export Classification |
|---|---|---|---|---|---|
| MBALH-0R106CSP2 | 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun | CSP2 | REACH RoHS | Released | EAR99 |
| EVB-MBALH-0R106 | Evaluation Board, 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun | EVB | REACH RoHS | Released | EAR99 |

# MBALH-0R106CSP2

## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

## Table Of Contents

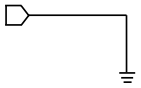
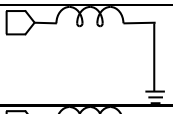
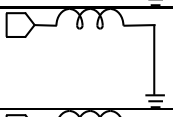
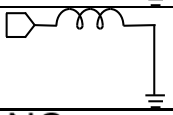
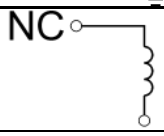


## Revision History

| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2025-04-21 | Initial Release |
| B | 2025-04-28 | Updated Moisture Sensitivity from MSL3 to MSL1 |

## Port Configuration and Functions

### Port Functions

| Port | Function | Description | DC Equivalent Circuit |
|---|---|---|---|
| GND | Ground | Ground pad should be connected to RF/DC ground with low electrical and thermal resistance. |  |
| Pin 1 | Common Port / In (Unbalanced) | The common port is DC short to ground. |  |
| Pin 3 | Out 1 / 0° Port (Balanced) | The 0° port is DC short to ground. |  |
| Pin 4 | Out 2 / 180° Port (Balanced) | The 180° port is DC short to ground. |  |
| Pins 2,5 | NC | Pins 2 and 5 are not internally connected. They can be connected to ground for normal operation. |  |

## Specifications

### Absolute Maximum Ratings

| Parameter | Maximum Rating | Unit |
|---|---|---|
| Maximum Operating Temperature | 100 | °C |
| Maximum Storage Temperature | 125 | °C |
| Minimum Operating Temperature | -55 | °C |
| Minimum Storage Temperature | -65 | °C |

### Package Information

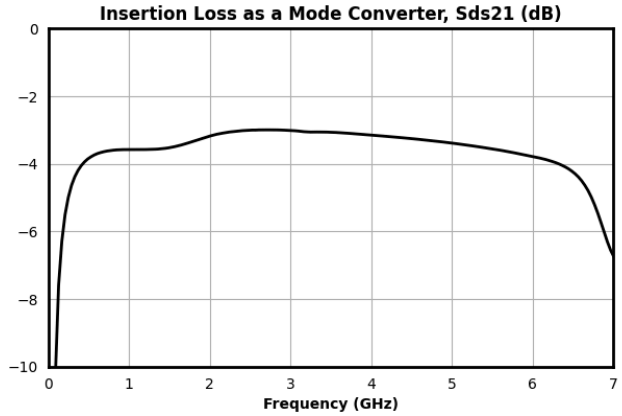
| Parameter | Details | Rating |
|---|---|---|
| ESD | 250 to < 500 Volts | HBM Class 1A |
| Dimensions | - | 2.50 x 2.50 mm |
| Moisture Sensitivity Level | - | MSL 1 |

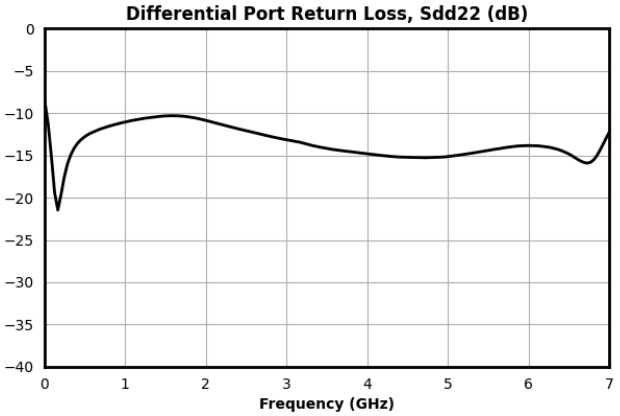
## Electrical Specifications

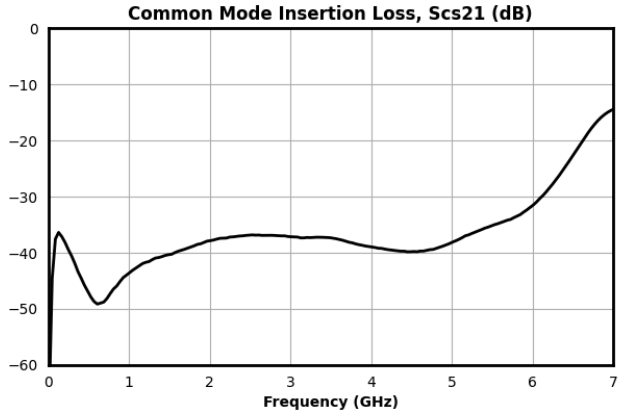
| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Amplitude Balance | Configuration A, 25°C | 0.1 | 6 | - | 0.2 | - | dB |
| Common Mode Rejection | Configuration A, 25°C | 0.1 | 6 | - | 35 | - | dB |
| Common Port Return Loss | Configuration A, 25°C | 0.1 | 6 | - | 12 | - | dB |
| Impedance | Configuration A, 25°C | 0.1 | 6 | - | 50 | - | Ω |
| Insertion Loss as a Mode Converter | Configuration A, 25°C | 0.1 | 6 | - | 3.5 | - | dB |
| Isolation between differential ports | Configuration A, 25°C | 0.1 | 6 | - | 9 | - | dB |
| Nominal Phase Shift | Configuration A, 25°C | 0.1 | 6 | - | 180 | - | ° |
| Output Return Loss | Configuration A, 25°C | 0.1 | 6 | - | 4 | - | dB |
| Phase Balance | Configuration A, 25°C | 0.1 | 6 | - | 0.4 | - | ° |
| Impedance Ratio | - | - | - | - | 1:1 | - | |

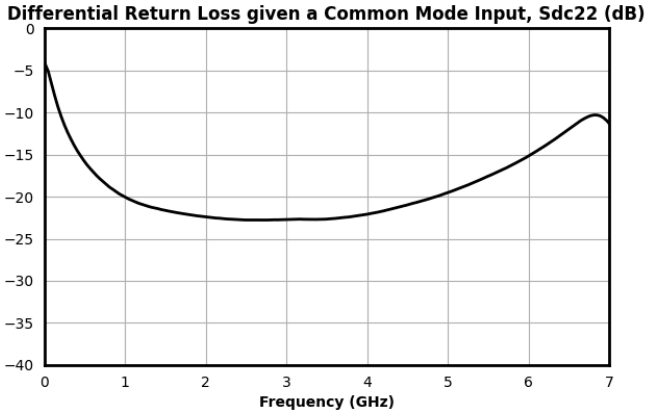
## Mixed Mode Scattering Parameters in 50 Ohm Differential System

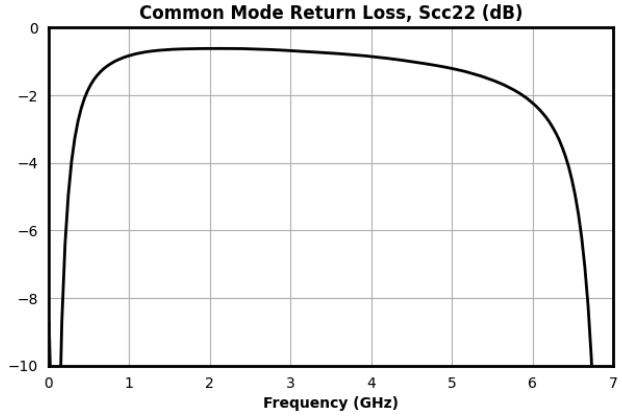
Mixed mode scattering parameters are used to characterize differential circuits. For baluns, this means that the 0° and 180° ports become a single 50Ω differential port and the common port remains the same 50Ω common port. For more information about 1:1 balun data, visit MBAL vs. MBALH Data. The two-port 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.

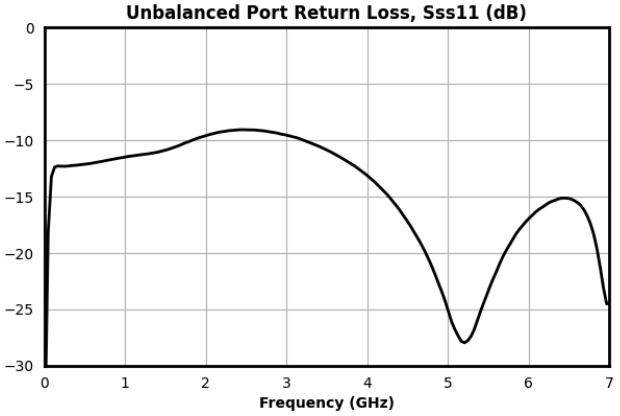


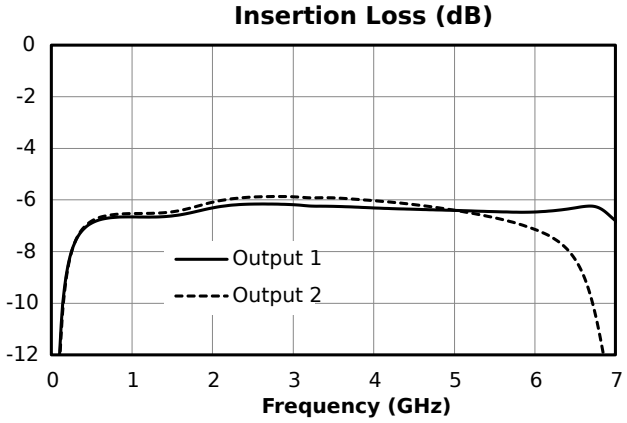



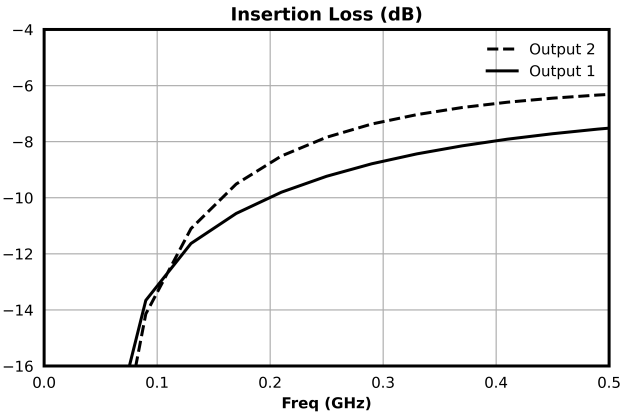

 

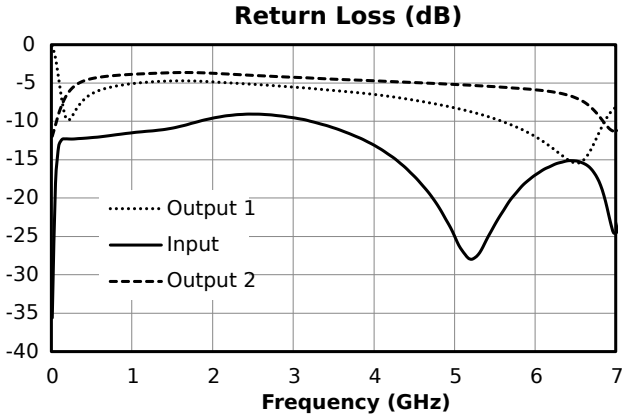
# MBALH-0R106CSP2

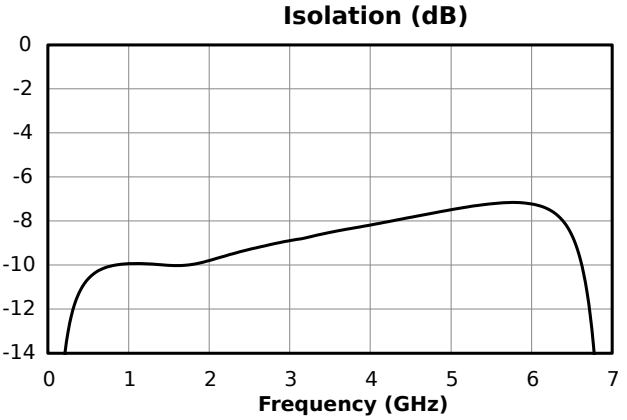
## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

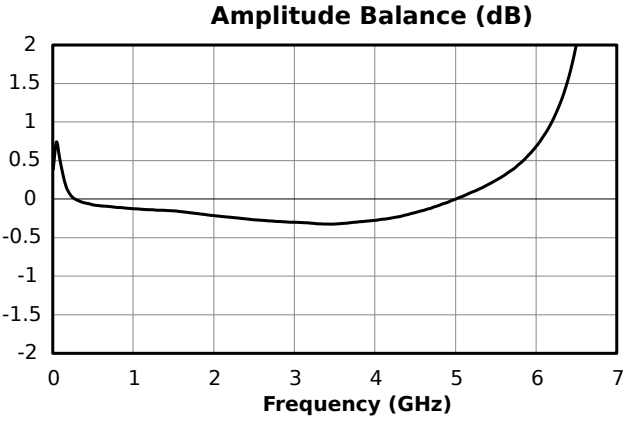
## Typical Performance Scattering Parameters in 50 Ohm Differential System

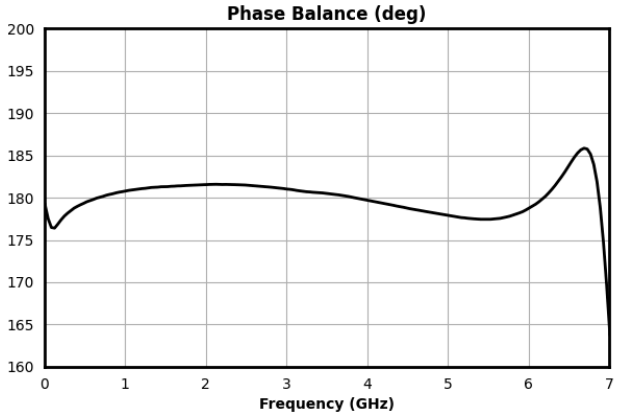


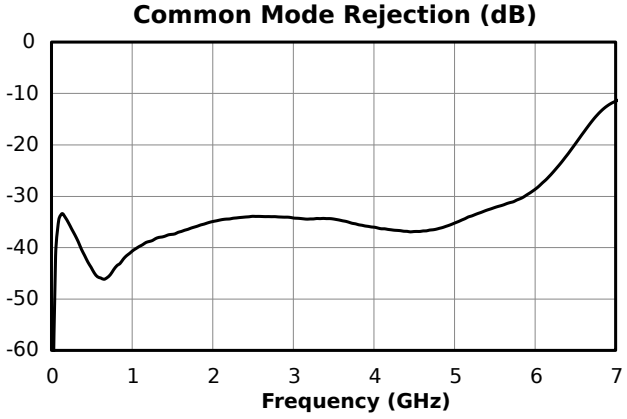



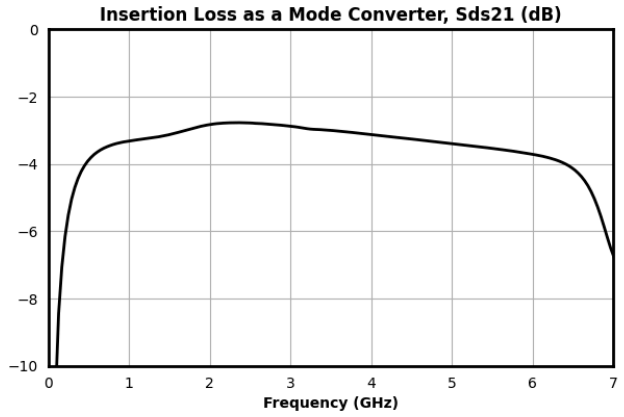



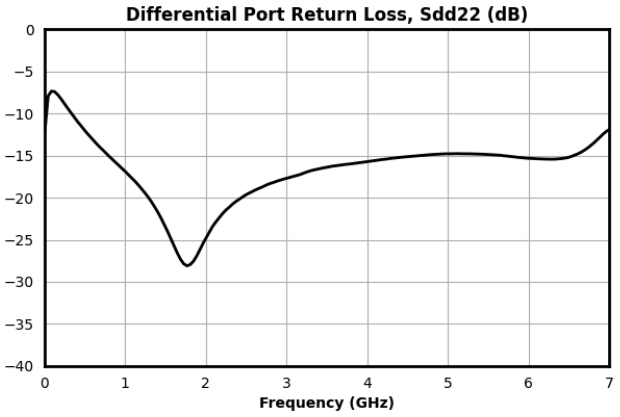



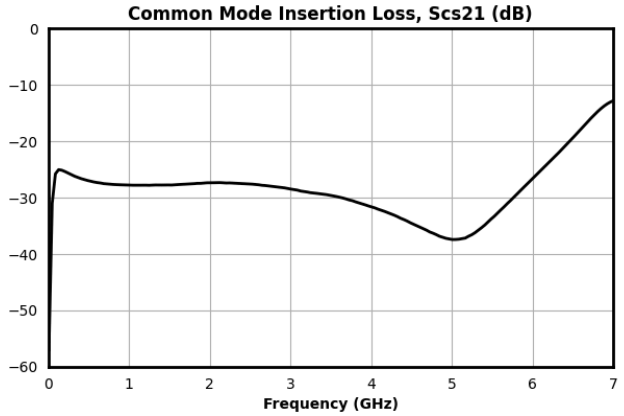
# MBALH-0R106CSP2

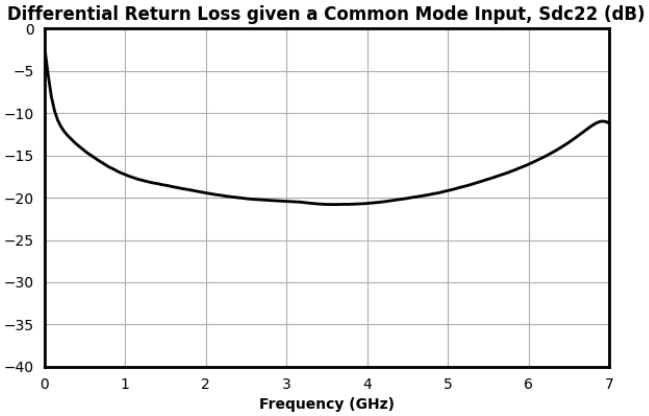
## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

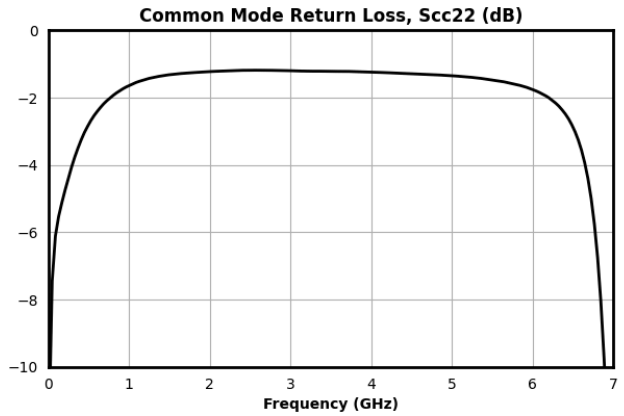
## Mixed Mode Scattering Parameters in 100 Ohm Differential System

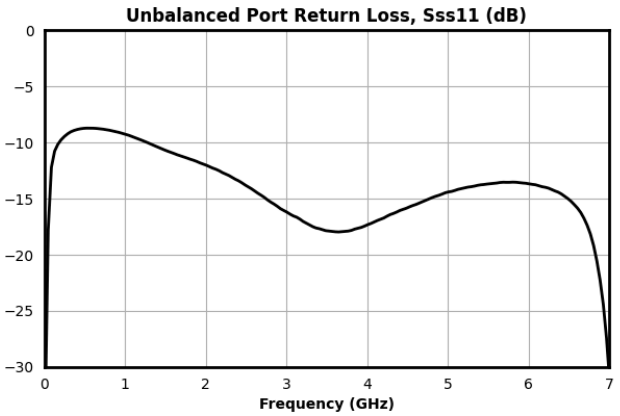


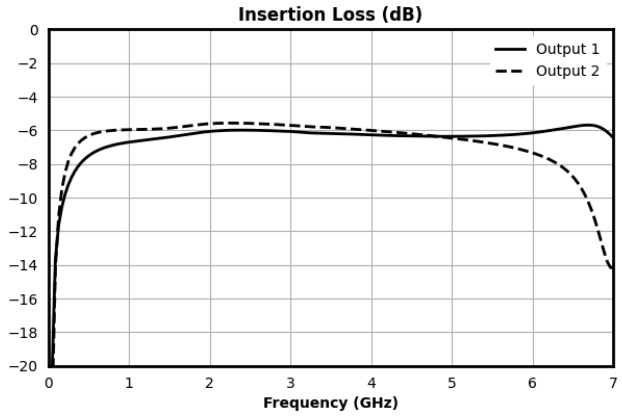



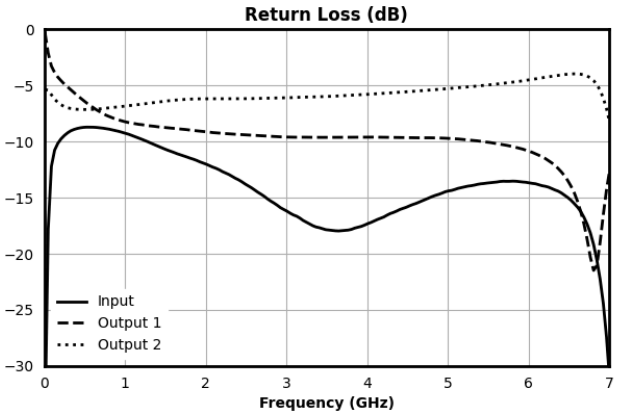



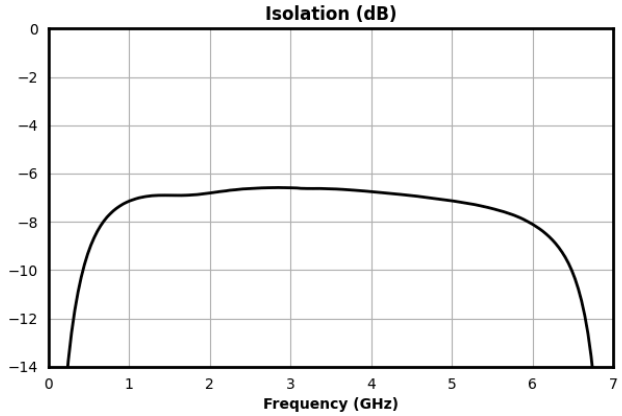
# MBALH-0R106CSP2

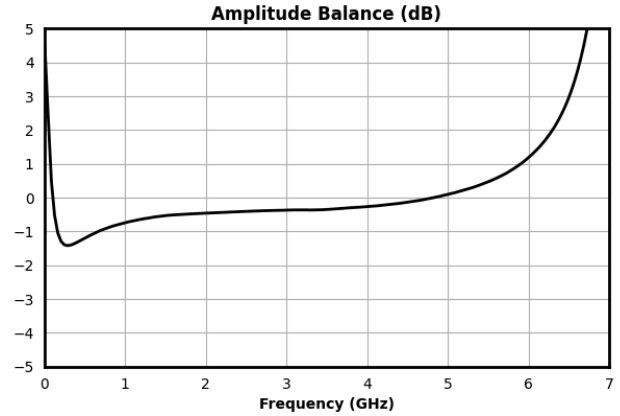
## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

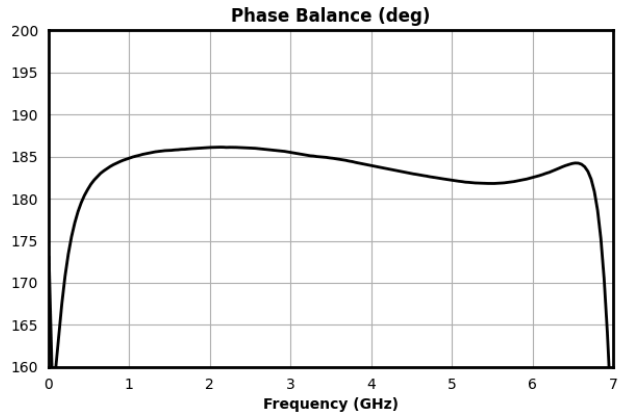
## Typical Performance Scattering Parameters in 100 Ohm Differential System

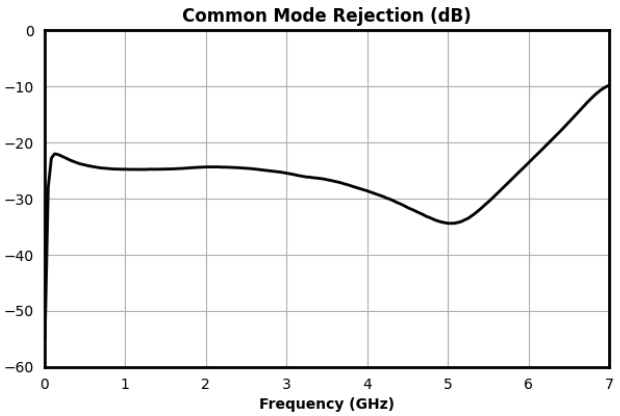



All measurements are de-embedded from the fixture with Automatic Fixture Removal (AFR).

# MBALH-0R106CSP2

## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

## Mechanical Data

## Outline Drawing

Download : Outline 2D Drawing | Outline 3D Drawing | Outline 3D STP

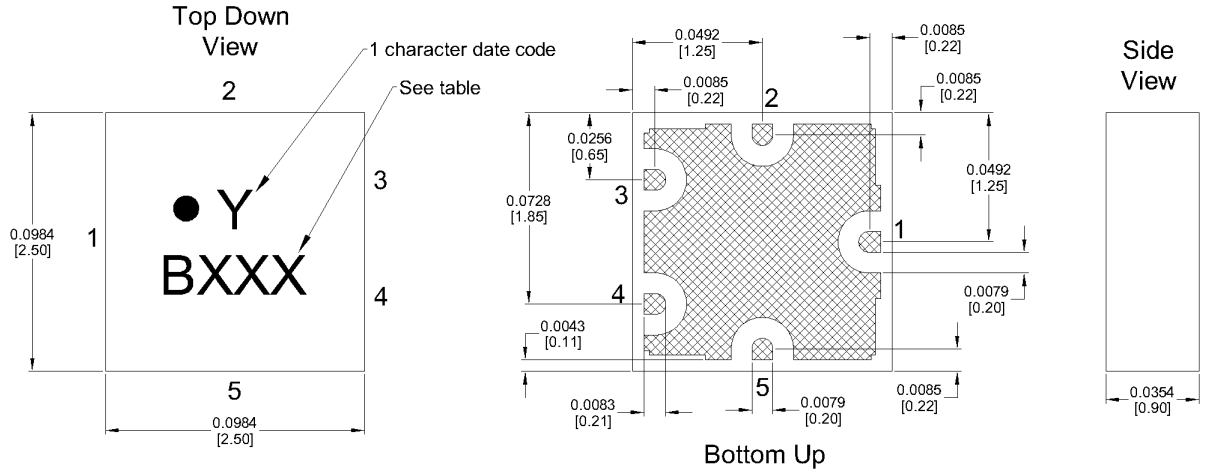
Units in inch +/-.004" [millimeter +/-0.1]

PROJECTION: INCH [MM]

| REVISIONS | | | |
|---|---|---|---|
| REV. | DESCRIPTION | DATE | APPROVALS |
| A | Initial Release | 3/27/25 | AT |

| Port Number | Function |
|---|---|
| 1 | In |
| 2 | NC |
| 3 | Out 1 |
| 4 | Out 2 |
| 5 | NC |

*All measurements are typical




| XXX | MBAL#-#####CSP2 |
|---|---|
| 011 | MBAL-0R106CSP2 |
| 012 | MBALH-0R106CSP2 |
| 013 | MBAL-0R520CSP2 |
| 014 | MBALH-0R520CSP2 |

Notes: (Unless otherwise specified)

1. Front to back registration to be 50.8µm max.
2. Circuits to be shipped individually.
3. Shaded areas are metalized.
4. Finish: Ni: 0.5 - 2.0 µm
   Pd: 0.08 - 0.15 µm
   Au: 0.008 - 0.05 µm

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: HOLE SIZE +.002/-.001, DECIMALS .XX± .01, .XXX± .004, ANGLES ±. MATERIAL: FINISH: DO NOT SCALE DRAWING

NOTES:

| DRAWN BY | DATE |
|---|---|
| AR | 1/7/25 |
| LCG | 3/24/25 |
| WV | 3/24/25 |

Marki microwave www.markimicrowave.com

Outline CSP2 Balun

SIZE A | CAGE CODE 0UC32 | DWG. NO. MBAL#-#####CSP2 | SHEET 1 OF 1



EVB Out- refers to output Out 1

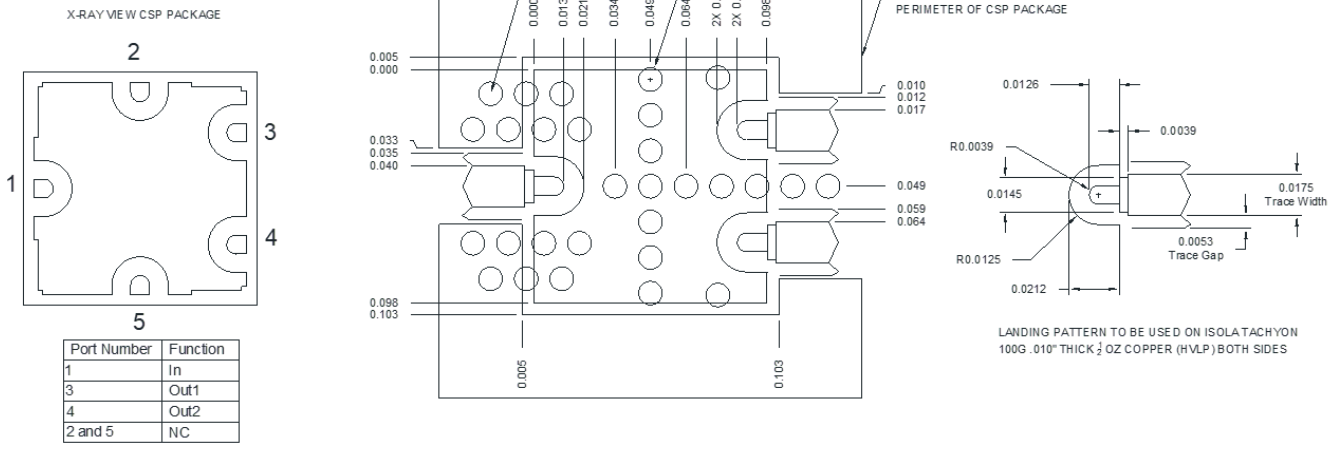
EVB Out+ refers to output Out 2

# MBALH-0R106CSP2

## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

### Footprint Image

Download : Footprint Drawing




| Port Number | Function |
|---|---|
| 1 | In |
| 3 | Out1 |
| 4 | Out2 |
| 2 and 5 | NC |

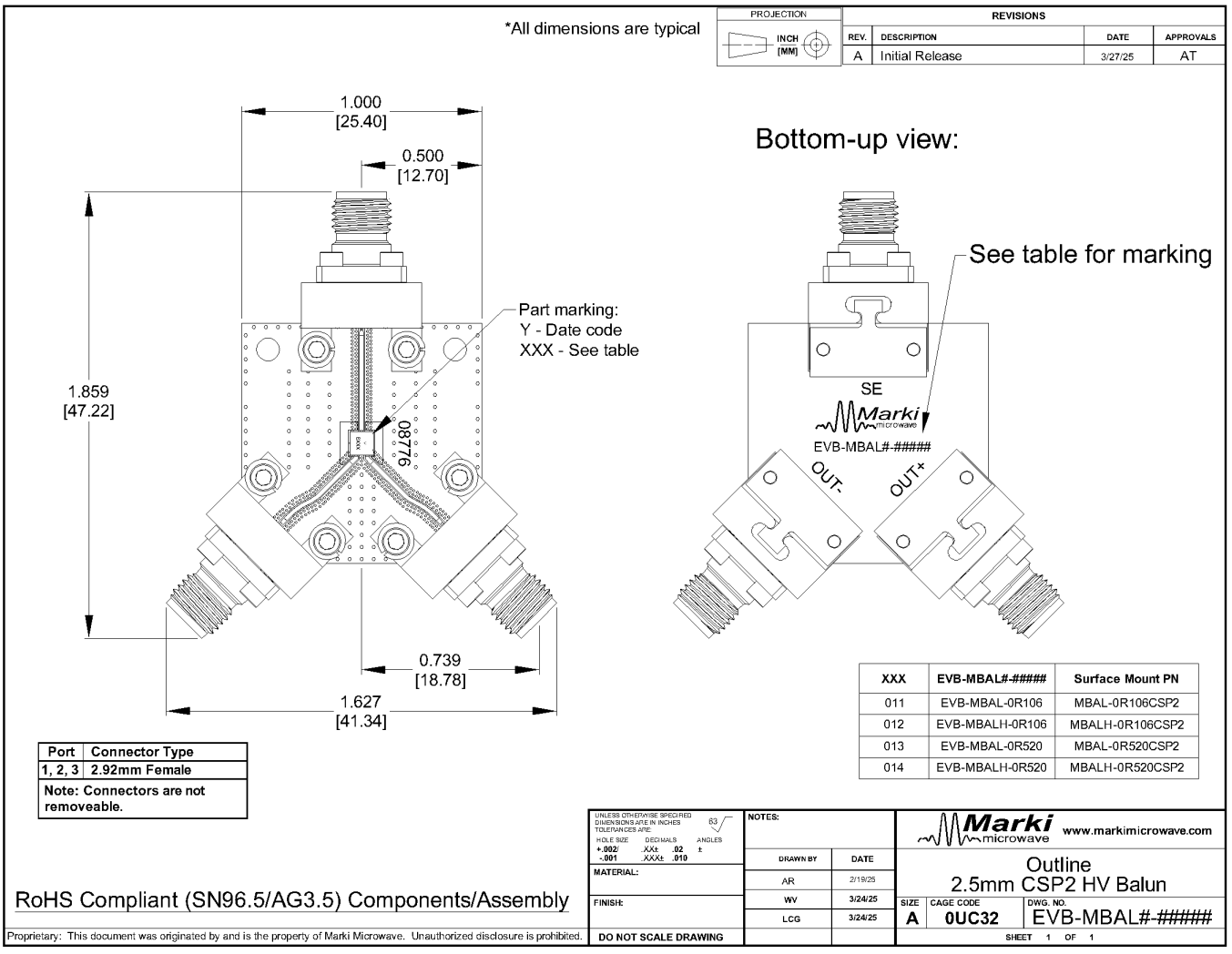
## Evaluation Board - Performance Data

| Parameter | Test Conditions | Frequency Range (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Impedance Ratio | - | - | - | 1 | - | |

# MBALH-0R106CSP2

## 0.1-6 GHz Passive MMIC Chip Scale Package 1:1 Balun

## Evaluation Board - Outline Drawing



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