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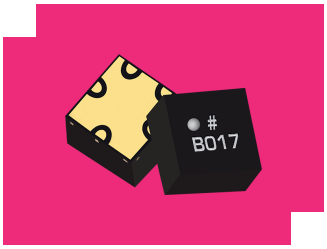
# MBAL-0220CSP2-1

## 2-20 GHz Passive MMIC Chip Scale Package Balun

## DEVICE OVERVIEW

### General Description

The MBAL-0220CSP2-1 is a GaAs passive MMIC balun featuring a frequency range of 2 to 20 GHz. This balun offers low 1.9 dB insertion loss as a mode converter, excellent balance and 27 dB common mode rejection in a compact 2.5 mm CSP2 chip scale package. The leadfree, RoHS compliant CSP2 package is compatible with standard pick and place assembly. It is an ideal solution to interface into dataconverters for S-K band digital beamforming and other higher order Nyquist sampling applications, clock distribution, and balanced amplifiers. The MBAL-0220CSP2-1 is the mirror image orientation of the MBAL-0220CSP2.




Download s-parameters here

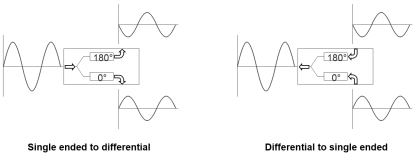
### Features

- 2:1 Impedance Ratio
- 2 to 20 GHz Balun (Balanced to Unbalanced Transformer)
- Insertion Loss as a Mode Converter, 1.9 dB Typical
- Common Mode Rejection, 27 dB Typical
- Phase/Amplitude Balance, 3º and 0.3 dB Typical
- 2.5 x 2.5 mm 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 |
|---|---|---|---|---|---|
| MBAL-0220CSP2-1 | 2-20 GHz Passive MMIC Chip Scale Package Balun | CSP2 | REACH RoHS | Released | EAR99 |
| EVB-MBAL-0220-1 | Evaluation Board, 2-20 GHz Passive MMIC Chip Scale Package Balun | EVB | REACH RoHS | Released | EAR99 |

# MBAL-0220CSP2-1

## 2-20 GHz Passive MMIC Chip Scale Package Balun

## Table Of Contents

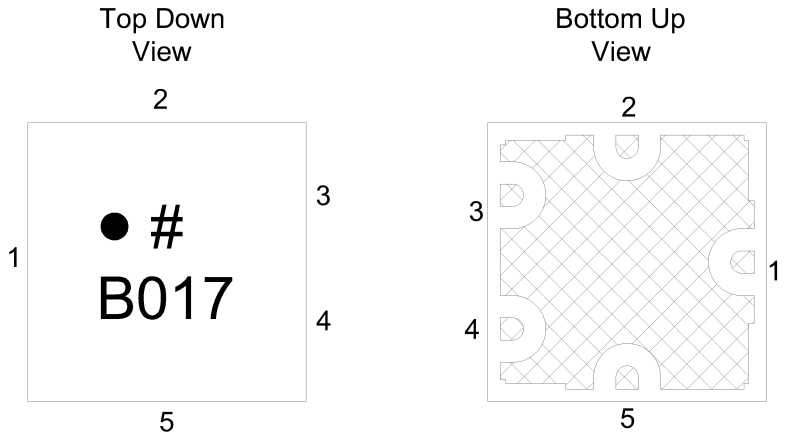


## Revision History

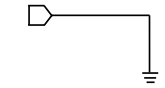
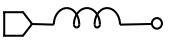
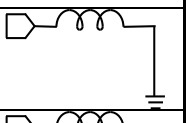
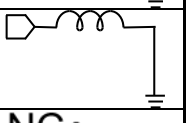
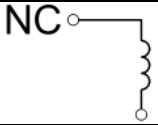
| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2025-11-18 | Initial Release |

## Port Configuration and Functions

### Port Diagram




## 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 open to ground. |  |
| Pin 3 | Out 2 / 180° Port (Balanced) | The 180° port is DC short to ground. |  |
| Pin 4 | Out 1 / 0° Port (Balanced) | The 0° 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 |
| RF Power Handling | 36 | dBm |

### Package Information

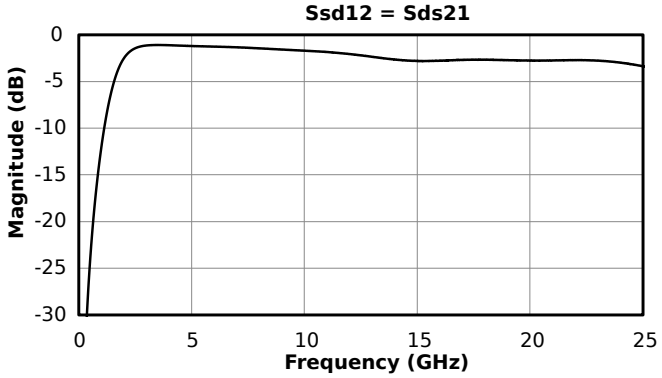
| Parameter | Details | Rating |
|---|---|---|
| ESD | 250 to < 500 Volts | HBM Class 1A |
| Dimensions | - | 2.50 x 2.50 mm |

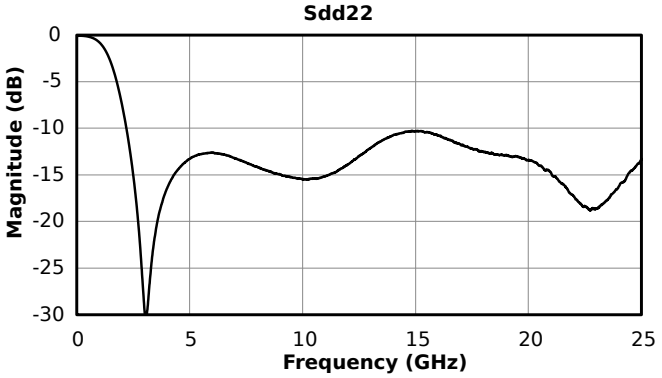
## Electrical Specifications

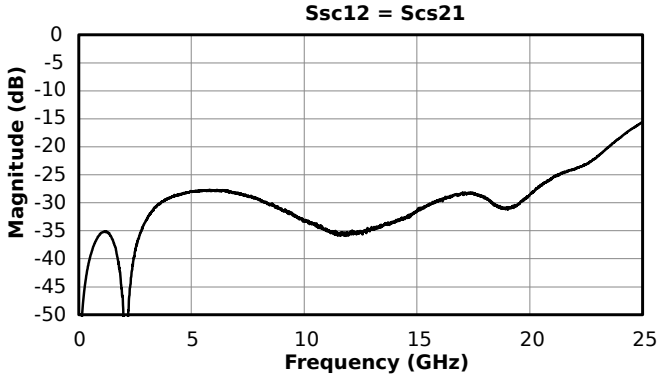
| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Impedance Ratio | - | 2 | 20 | - | 2:1 | - | |
| Amplitude Balance | - | 2 | 20 | - | 0.3 | 1 | dB |
| Common Mode Rejection | - | 2 | 20 | 20 | 27 | - | dB |
| Common Port Return Loss | - | 2 | 20 | - | 13 | - | dB |
| Impedance | - | 2 | 20 | - | 50 | - | Ω |
| Insertion Loss as a Mode Converter | - | 3 | 20 | - | 1.9 | 4 | dB |
| Insertion Loss as a Mode Converter | - | 2 | 3 | - | 1.4 | 6 | dB |
| Isolation between differential ports | - | 2 | 20 | - | 5.3 | - | dB |
| Nominal Phase Shift | - | 2 | 20 | - | 180 | - | ° |
| Output Return Loss | - | 2 | 20 | - | 7 | - | dB |
| Phase Balance | - | 2 | 20 | - | 3 | 10 | ° |

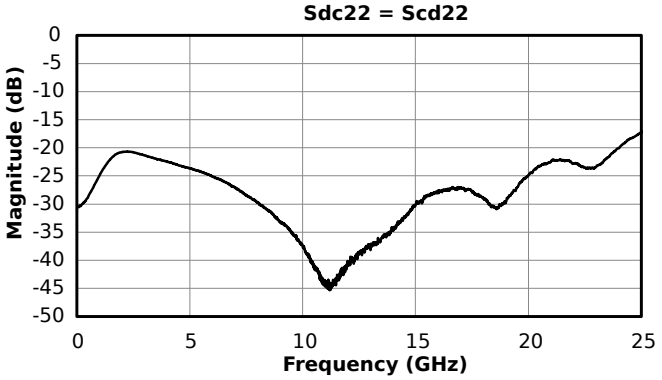
## Mixed Mode Scattering Parameters

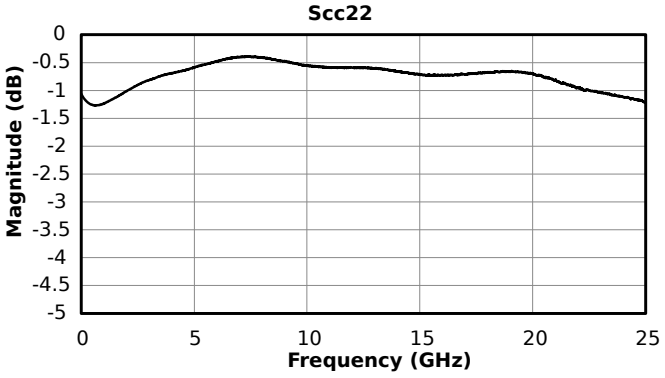
Mixed mode scattering parameters are used to characterize differential circuits. For baluns, this means that the 0° and 180° ports become a single 100Ω differential port and the common port remains the same 50Ω common port. The two-port s-parameters of the balun are then characterized based on differential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

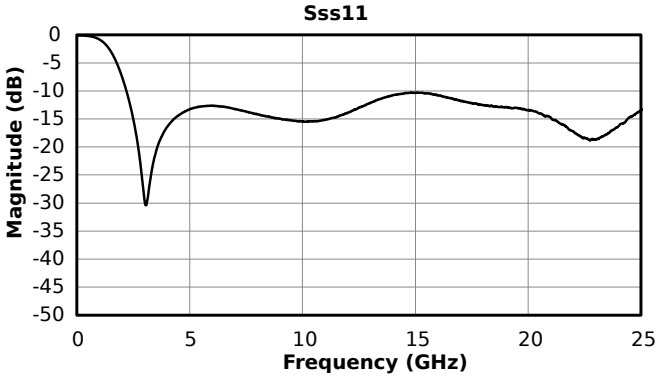


# MBAL-0220CSP2-1

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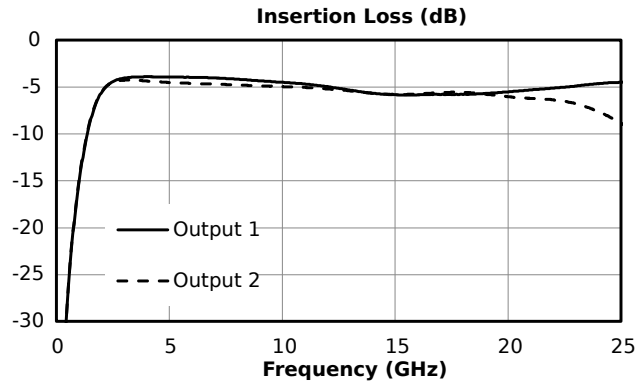
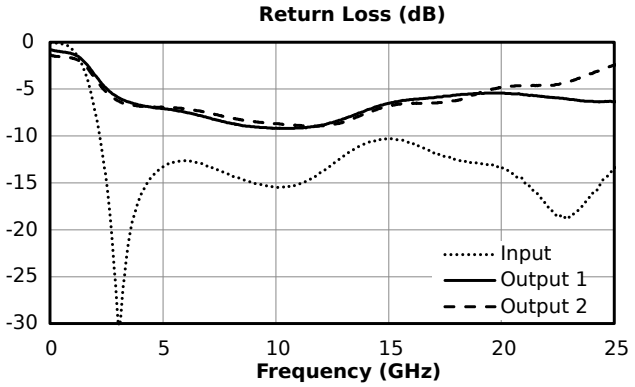
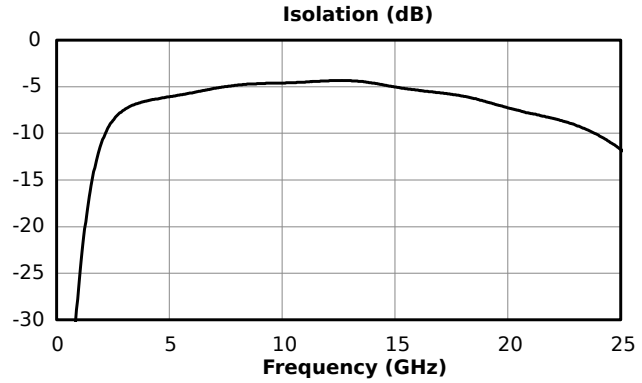
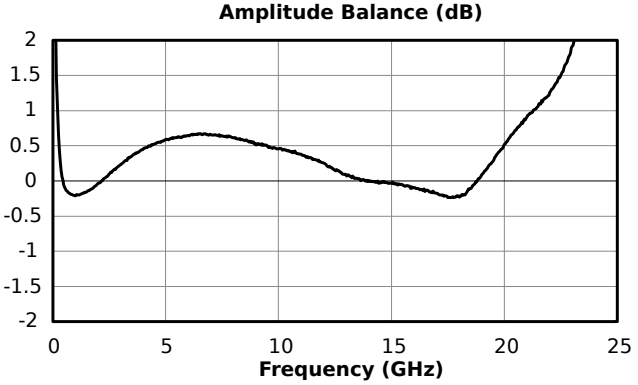
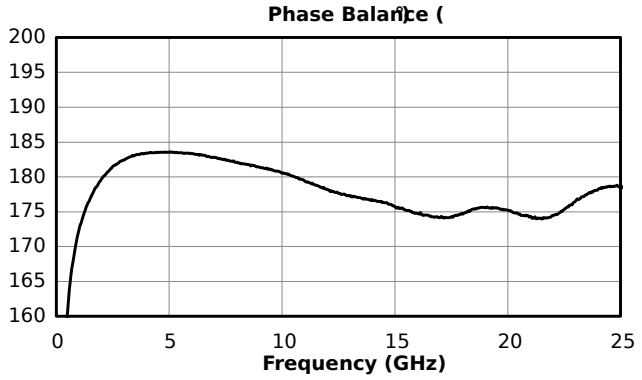
## Typical Performance Scattering Parameters

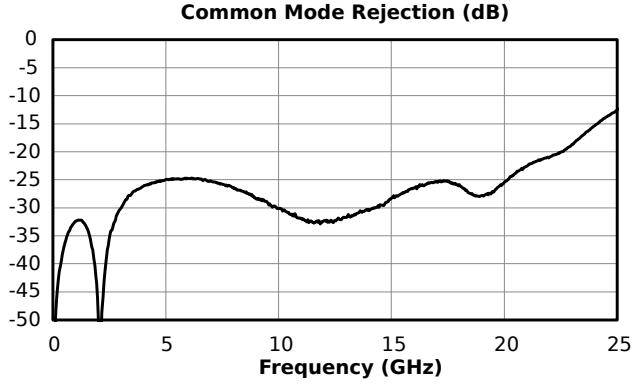



Measured data is de-embedded from fixture using AFR.

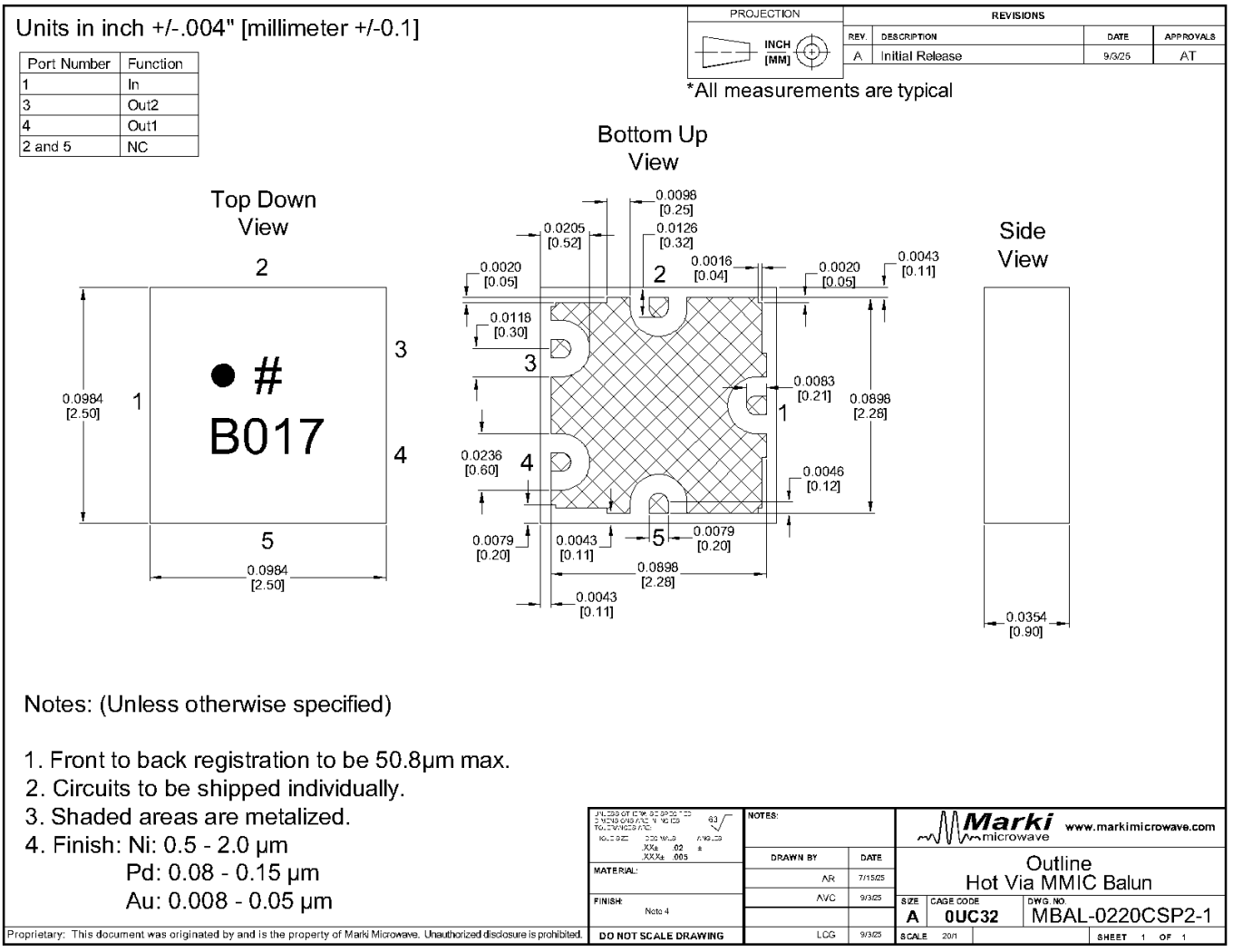
# MBAL-0220CSP2-1

## 2-20 GHz Passive MMIC Chip Scale Package Balun

## Mechanical Data

## Outline Drawing

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




EVB Out- refers to output Out 1

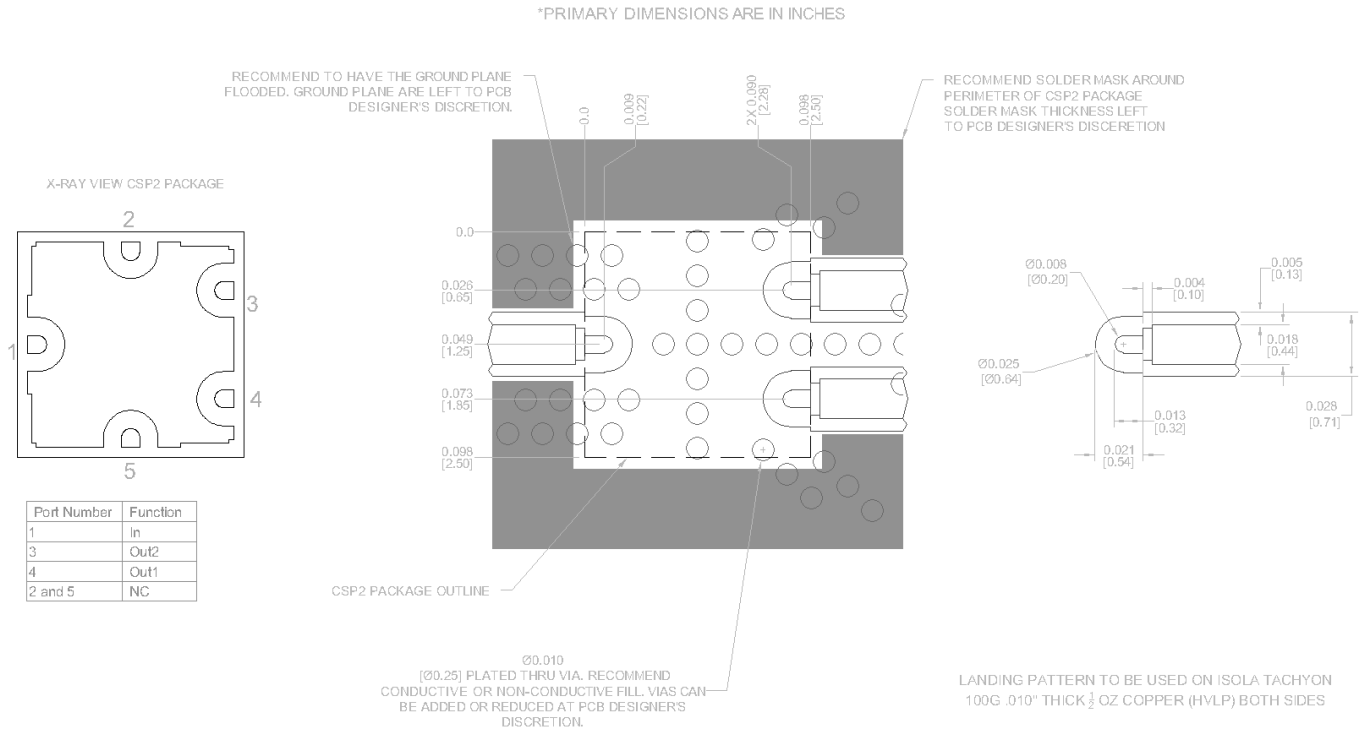
EVB Out+ refers to output Out 2

# MBAL-0220CSP2-1

## 2-20 GHz Passive MMIC Chip Scale Package Balun

### Footprint Image

Download : Footprint Drawing




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

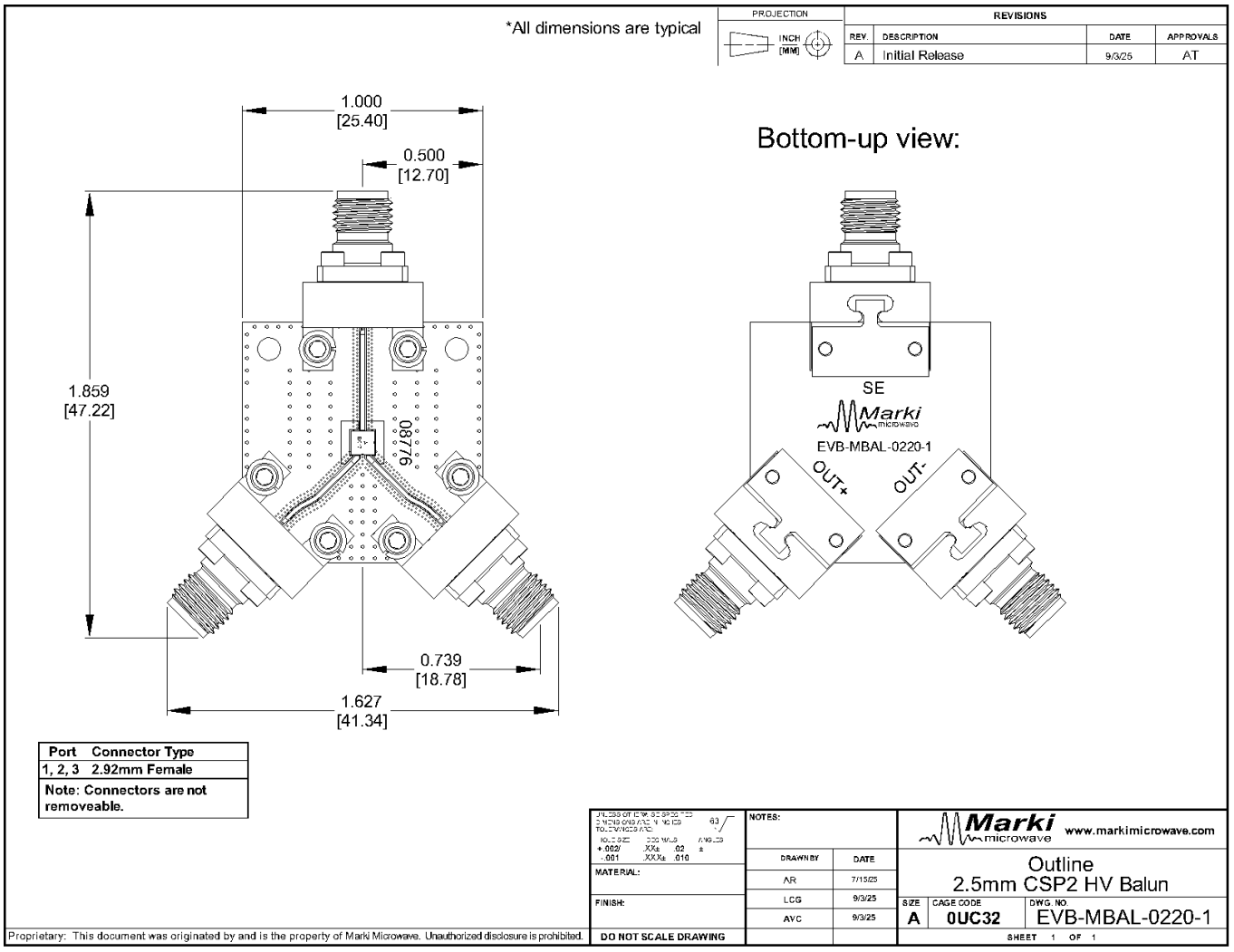
## Evaluation Board - Performance Data

| Parameter | Test Conditions | Frequency Range (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Impedance Ratio | - | - | - | 2 | - | |

# MBAL-0220CSP2-1

## 2-20 GHz Passive MMIC Chip Scale Package Balun

## Evaluation Board - Outline Drawing



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