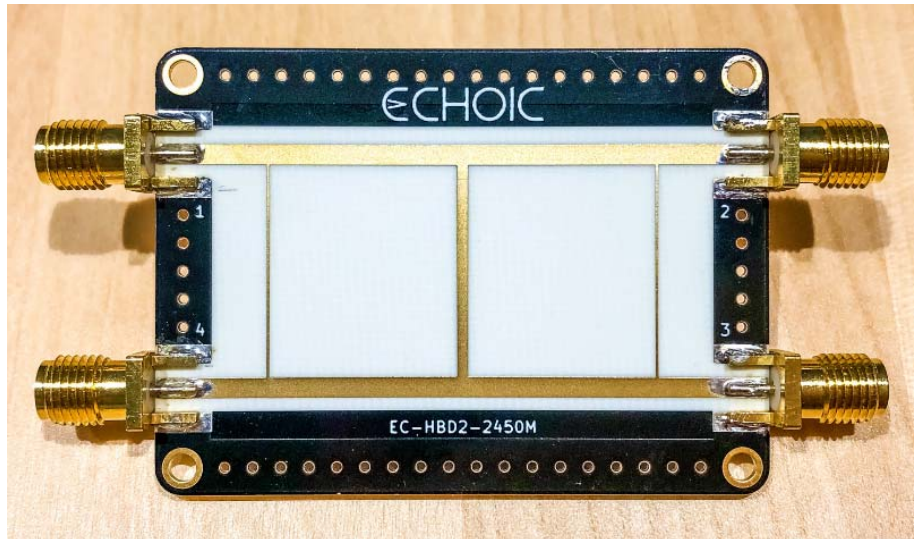


Data Sheet

EC-HBD2-2450M Branchline Hybrid Coupler 2.2-2.8 GHz



Applications

- General-purpose RF, microwave, education
- Wi-Fi 802.11 2.4 GHz
- Other 2.4GHz: ISM, Bluetooth, Zigbee

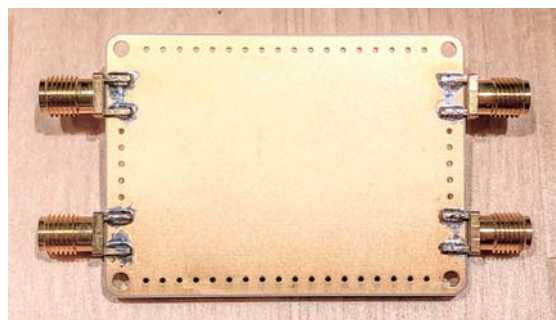
Features

- Return Loss 20dB over a 600 MHz BW
- Insertion loss = 3.01 to 3.6 dB \rightarrow 0.01 to 0.6 dB loss
- Isolation > 20dB over 600 MHz BW

Description

The EC-HBD2-2450M is a two-stage Branchline quadrature (90°) hybrid coupler realized using microstrip transmission-lines on a low-loss microwave laminate. The EC-HBD2-2450M can be used for RF signal processing, test and measurement or educational demonstration. The EC-HBD2-2450M is centered at the widely-used 2.45 GHz WiFi/ISM/Bluetooth/Zigbee band with a bandwidth of 600 MHz when considering a return loss of 20dB. In-band loss is very low and ranges from 0.01 to 0.6dB providing an equal split from port 1 to ports 2 and 3. The port 1 to port 4 (and port 2 to port 3) in-band isolation is > 20dB for 600MHz of bandwidth. The EC-HBD2-2450M maintains an 90° phase difference between ports 2 and 3 with a phase error of 2.3° from 2.20 to 2.80 GHz. The EC-HBD2-2450M can be used over an even larger frequency range when considering different isolation and return loss requirements. The EC-HBD2-2450M is realized on high performance, low-loss Rogers substrate material. The hybrid coupler is equipped with female SMA connectors on all three ports. The backside solder mask is absent, enabling it to be surface mounted if the connectors are removed.

Backside of EC-HBD2-2450M



Specifications

| Parameter | Test Cond. | Min. | Typ. | Max. | Units |
|---------------------|--------------------|--------|------|--------|-------|
| Impedance | | | 50 | | Ohm |
| Center Frequency | | | 2.50 | | GHz |
| Band Edge Frequency | 20dB Return Loss | 2.21 | | 2.82 | GHz |
| VSWR | 2.20 to 2.80 GHz | | | 1.24:1 | |
| Insertion loss | 2.20 to 2.80 GHz | 3.01 | | 3.60 | dB |
| Isolation | 2.20 to 2.80 GHz | 19.25 | | | dB |
| Phase Difference | 2.20 to 2.80 GHz | 89.117 | 90 | 91.427 | deg |
| | Port 2-3, Port 1-4 | | | | |
| Input power | CW | | | 10* | Watts |

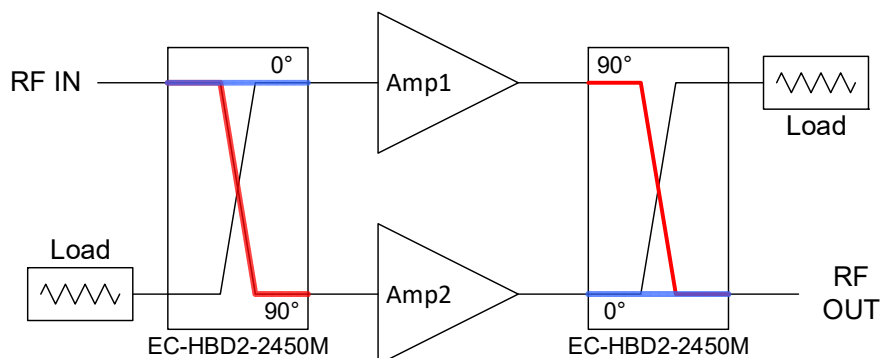
*to be verified

Amplifier Application

The EC-HBD2-2450M can be used in conjunction with power amplifiers to perform equal power split and combining functions. This is especially useful for experimenting with balanced amplifier development. A conventional balanced amplifier configuration is shown below. In the diagram, two identical amplifiers are connected using two units of EC-HBD2-2450M; one at the amplifier inputs and one at the amplifier outputs. The input EC-HBD2-2450M acts as a power divider, receiving an input RF signal and splitting the power equally between Amp1 and Amp2. However, the signal received by Amp2 is 90 deg phase shifted relative to that received by Amp1. The amplifiers amplify their respective signals and pass them to the output EC-HBD2-2450M, which acts as a power combiner to produce the RF output. Since the output EC-HBD2-2450M is also a quadrature coupler, the output signal from Amp1 will experience a 90 deg phase shift relative to the output of Amp2, essentially “unshifting” the phase offset originally introduced by the input EC-HBD2-2450M.

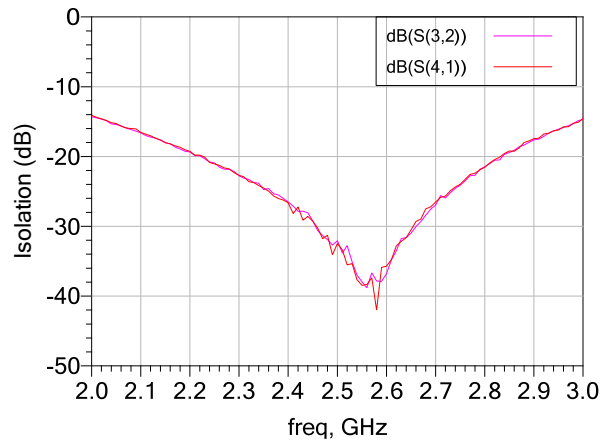
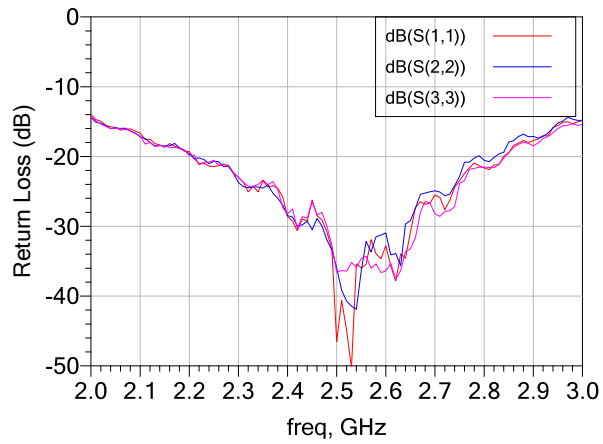
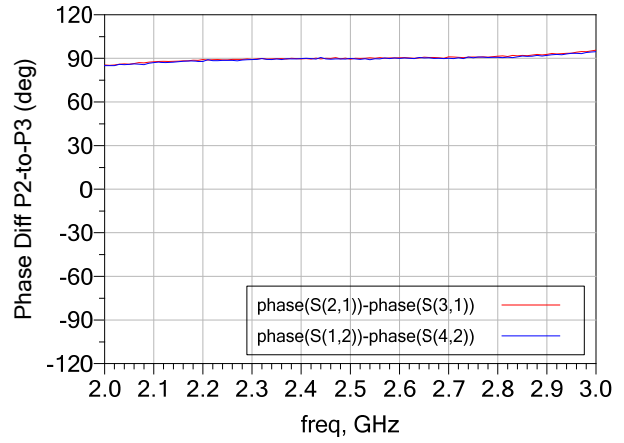
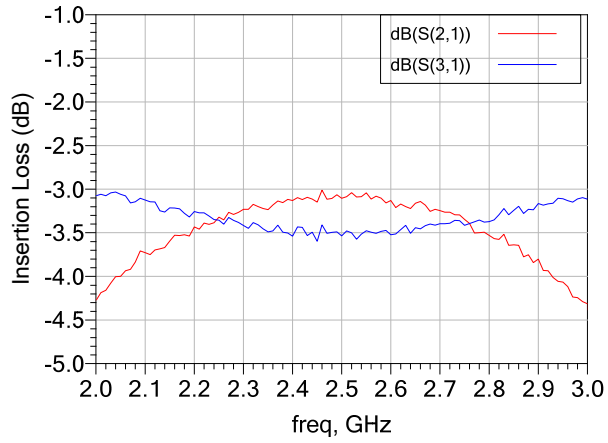
The fourth port of both EC-HBD2-2450M is designated as the isolated port and is terminated with a 50 ohm load. Minimal signal power should leak into this port unless there is an imbalance in the amplifier signal characteristics. No special impedance matching is needed for Amp1 and Amp2 as the ports of EC-HBD2-2450M are matched to 50 ohms. This means that Amp1 can be designed to operate independently and then combined with a second unit if desired. Note that for practical implementations, Amp1 and Amp2 should be identical as well as the interconnects to the EC-HBD2-2450M units. This is to ensure that the signal phase offset between the two amplifier paths is dictated solely by the EC-HBD2-240M units.

Balanced amplifier configuration using two EC-HBD2-2450M (quadrature couplers)



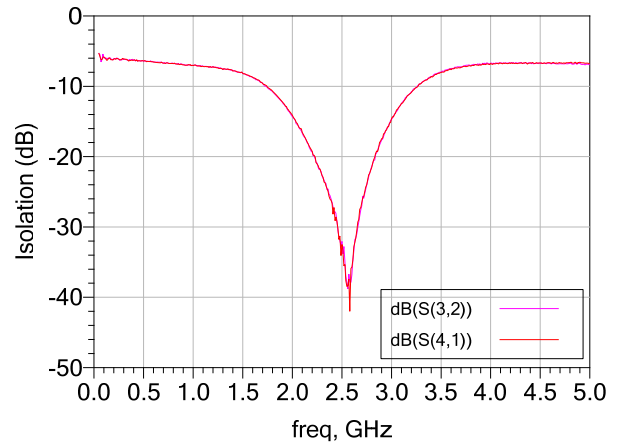
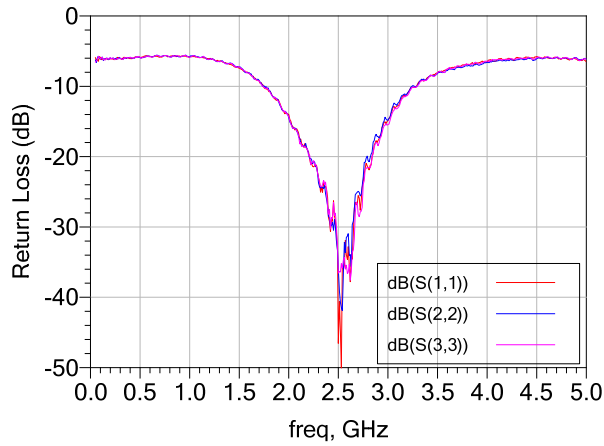
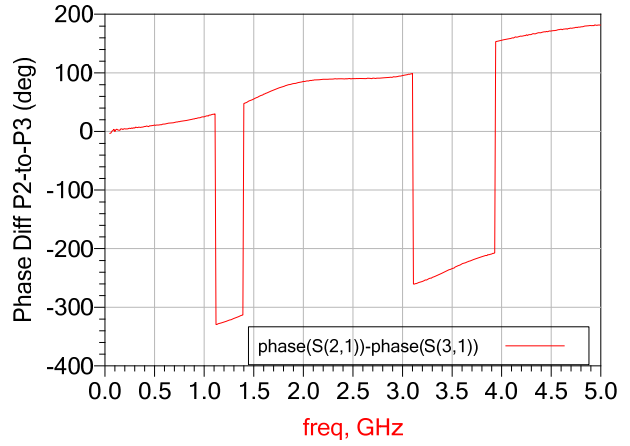
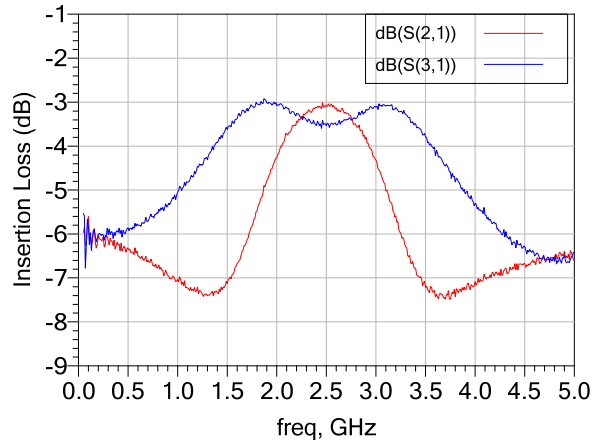
Performance

Typical performance shown from 2.0 to 3.0 GHz



DATA SHEET EC-HBD2-2450M Branchline Hybrid Coupler 2.2-2.8 GHz

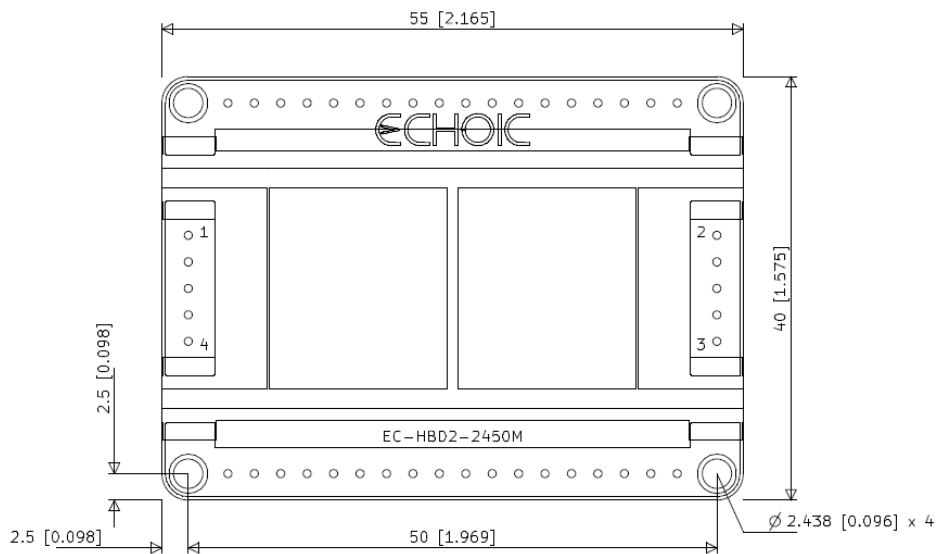
Typical performance shown from 0.1 to 5.0 GHz



Mechanical

| <i>Configuration</i> | <i>Parameter</i> | <i>Typical</i> | <i>Units</i> |
|---|------------------|----------------|--------------|
| PCB only (without case and without connectors) | Width | 40 | mm |
| | Length | 55 | mm |
| | Height | 0.95 | mm |
| PCB and case (without connector) | Width | 40 | mm |
| | Length | 55 | mm |
| | Height | 12.6 | mm |
| Connector | Torque | 8 | In-lbs |

PCB mechanical drawing. All units in mm [inches]. Connectors not shown.

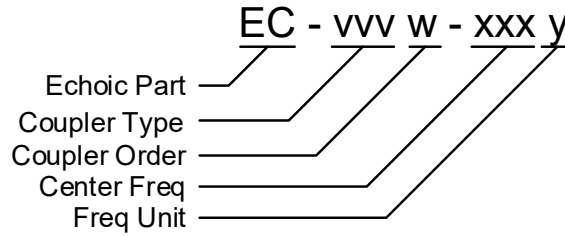


The EC-HBD2-2450M can be used with an optional case .



Ordering Information

Please use the following model number designation for ordering this and any other part from our coupler line:



For example, EC-HBD2-2450M is an Echoic part, two-stage hybrid coupler with center frequency of 2450 MHz.

Web Resource

For more information on other industrial RF and microwave solutions please visit our online store 5G Links: www.5glinks.com

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