# MHC3500L03

## 3dB 90° Directional Coupler

### Applications

1, Low Insertion Loss For Power Combining
2, Doherty Power Amplifier
3, Small Cell & Pico
4, GNSS Antenna


### Features

1, Low Insertion Loss
2, High Isolation, 20 dB typ.
3, Excellent high-power capacity up to 100W
4, RoHS compliance (Pb-Free)

### Description

The MHC3500L03 is a low cost, high performance 3 dB hybrid coupler in an easy used surface mount package. The MHC3500L03 is ideal for doherty power amplifier, circular polarized antenna and other applications where low insertion loss and tight amplitude and phase balance are required. MHC3500L03 is constructed from ceramic filled PTFE composites which possess excellent electrical and mechanical stability. All components are 100% RF tested.

### Characteristics

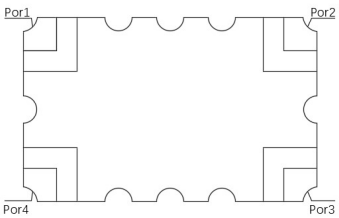
Table 1. MHC3500L03 Characteristics

| Item | Min. | Type | Max. | Unit |
|---|---|---|---|---|
| Frequency Range | 3300 | | 3700 | MHz |
| Isolation | 20 | 22 | | dB |
| Insertion Loss | | 0.7 | 0.8 | dB |
| Phase Unbalance | -5 | | +5 | degrees |
| Amplitude | -0.5 | | +0.5 | dB |
| Return Loss | 16 | 18 | | dB |
| Operating Temp. | -40 | | +85 | °C |
| Power | | | 100 | W |

All the above data are based on specified demo board and tested in 25° environment.

### Port Configuration

Figure 1. MHC3500L03 (Bottom View)



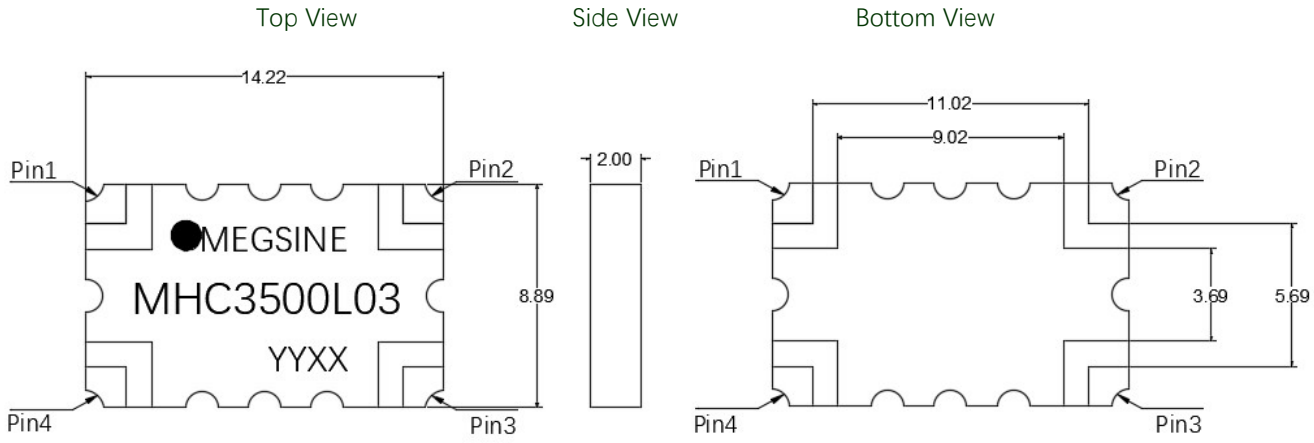
The MHC3500L03 port configurations depending on how input signals are split. The Case 1, Case 2, Case 3, and Case 4, configurations mean that one input signal is split into two output signals. When port 1 is defined, the other ports are defined automatically

Table 2. MHC3500L03 Port Configurations

| Configuration | Port 1 | Port 2 | Port 3 | Port 4 |
|---|---|---|---|---|
| Case1. | Input | Isolated | Direct -3dB, -90° | Coupling -3dB, 0° |
| Case2. | Isolated | Input | Coupling -3dB, 0° | Direct -3dB, -90° |
| Case3. | Direct -3dB, -90° | Coupling -3dB, 0° | Input | Isolated |
| Case4. | Coupling -3dB, 0° | Direct -3dB, -90° | Isolated | Input |

**Outline Drawing**

Figure 2. MHC3500L03 Outline Drawing




Unit: mm

**Typical Performance** (25°C, 3300-3700 MHz)

Figure 3. MHC3500L03 Coupling

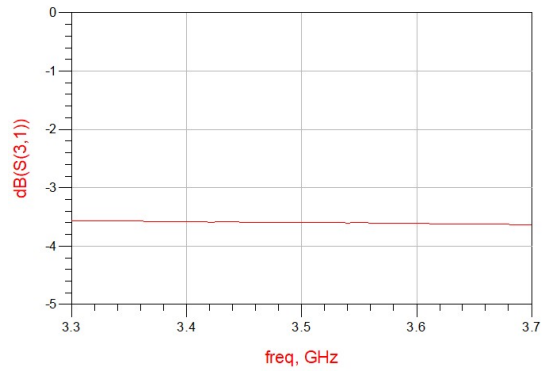



Figure 4. MHC3500L03 Transmission

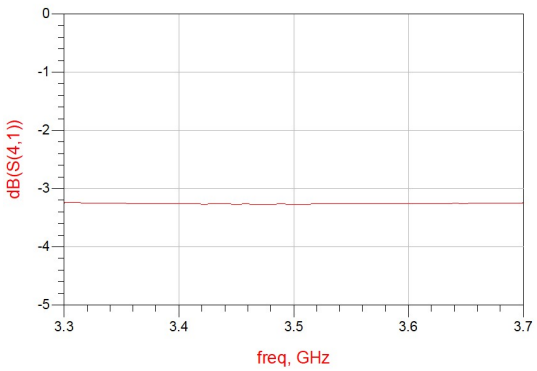


Figure 5. MHC3500L03 Return Loss (S11)

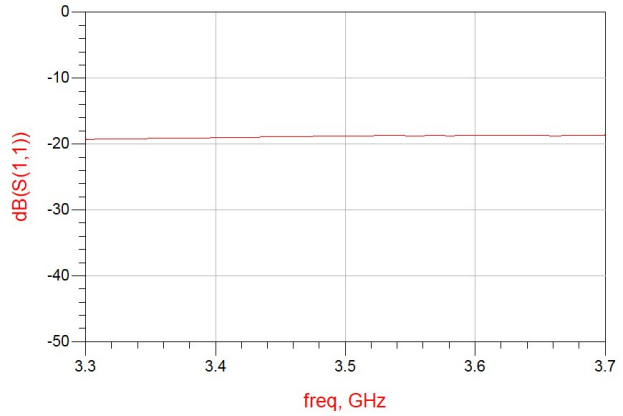



Figure 6. MHC3500L03Return Loss (S22)

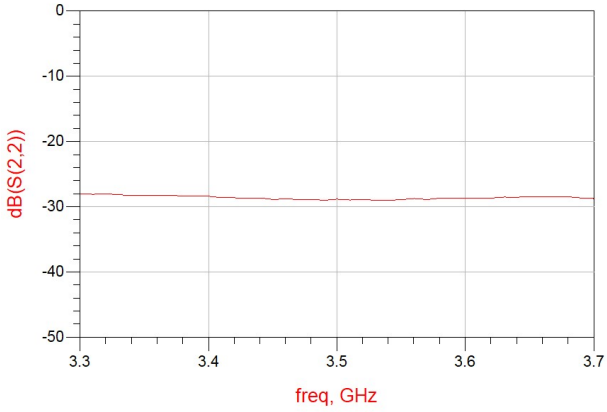



Figure 7. MHC3500L03 Return Loss (S33)

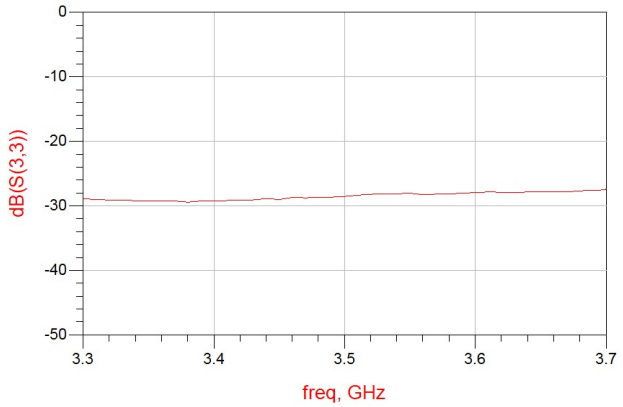



Figure 8. MHC3500L03 Return Loss (S44)

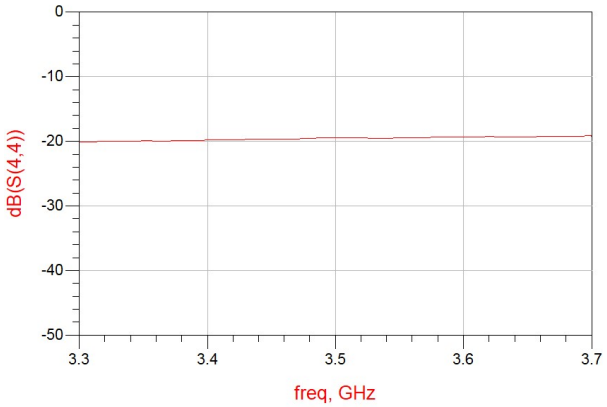



Figure 9. MHC3500L03 Isolation

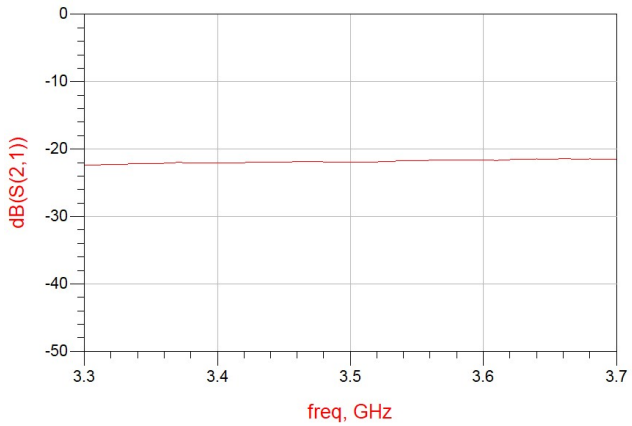



Figure 10. MHC3500L03 Phase

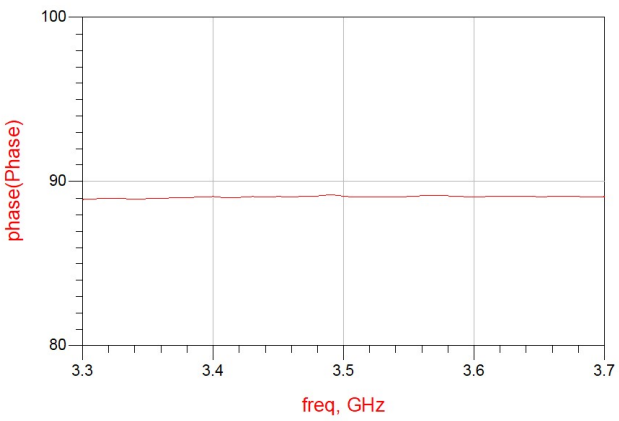


Figure 10. MHC3500L03 IL

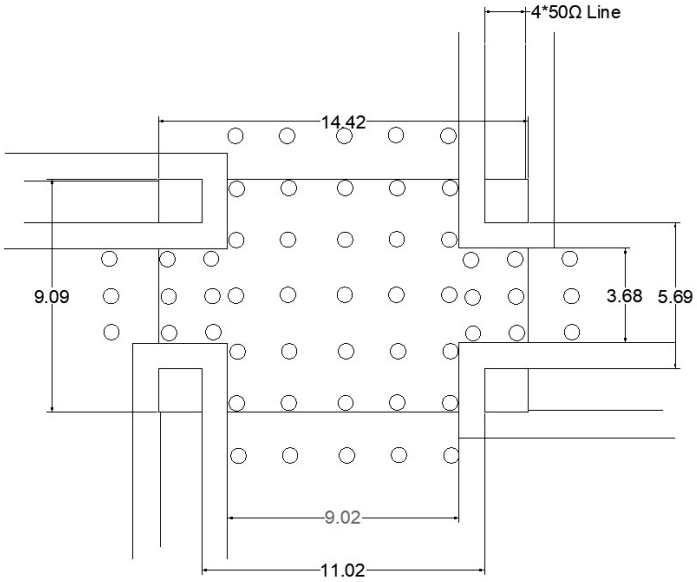
**Definition of Measured Specifications**

Table 3. Mathematical Formula for the MHC3500L03 Parameters

| Parameter | Definition | Mathematical Representation |
|---|---|---|
| VSWR (Voltage Standing Wave Ratio) | The impedance match of the coupler to a 50W system. A VSWR of 1:1 is optimal. | $VSWR = \frac{V_{max}}{V_{min}}$<br>$V_{max}$ = voltage maxima of a standing wave<br>$V_{min}$ = voltage minima of a standing wave |
| Return Loss | The impedance match of the coupler to a 50W system. Return Loss is an alternate means to express VSWR. | Return Loss (dB)= $20\log\frac{VSWR+1}{VSWR-1}$ |
| Insertion Loss | The input power divided by the sum of the power at the two output ports. | Insertion Loss(dB)= $10\log\frac{P_{in}}{P_{cp1}+P_{transmission}}$ |
| Isolation | The input power divided by the power at the isolated port. | Isolation(dB)= $10\log\frac{P_{in}}{P_{iso}}$ |
| Phase Balance | The difference in phase angle between the two output ports. | Phase at coupled port – Phase at transmisson port |
| Amplitude Balance | The power at each output divided by the average power of the two outputs. | $10\log\frac{P_{cp1}}{\frac{P_{cp1}+P_{transmission}}{2}}$ and<br>$10\log\frac{P_{transmission}}{\frac{P_{cp1}+P_{transmission}}{2}}$ |

**Recommended PCB Layout**

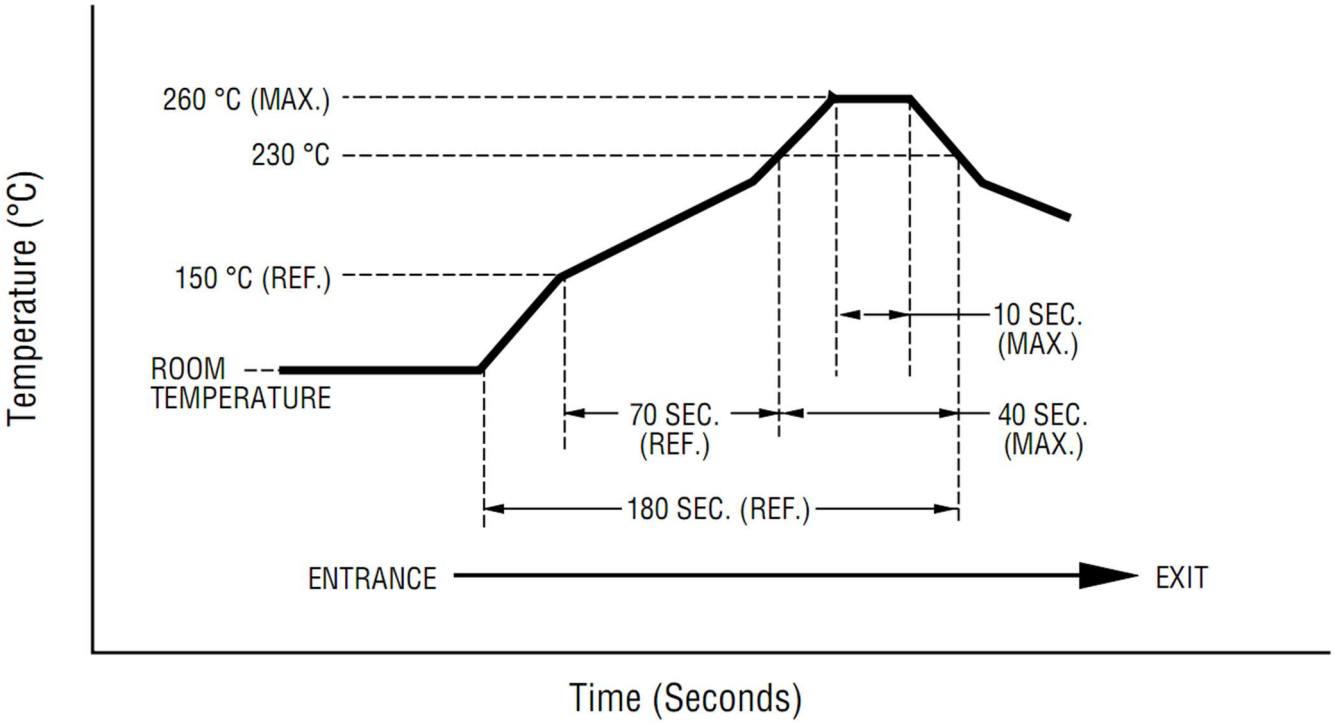
Figure 11. Recommended PCB Layout



50Ω Line mm/inch

**Reflow Profile**

Figure 12. MHC3500L03 Thermal Reflow Profile




**Packaging and Ordering Information**

Table 4. MHC3500L03 Ordering Information

| Device | Package | Reel | Shipping |
|---|---|---|---|
| MHC3500L03 | 14.22*8.89mm | 7'' | 1000 Reel |

| Revison | Description | Date |
|---|---|---|
| Rev0 | Preliminary | 2024/2/26 |
| | | |
| | | |