

Phase Shifter, 4-Bit
1.4—2.4 GHz

M/A-COM Products
RoHS Compliant

Features

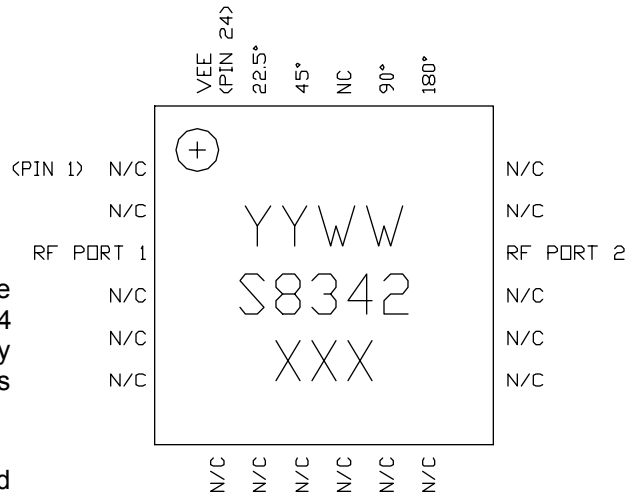
- ◆ 4-Bit Phase Shifter
- ◆ 360° Coverage, LSB = 22.5°
- ◆ TTL Control Inputs
- ◆ MSAG™ Process
- ◆ 4 mm, 24 Lead PQFN Package

Description

The MAPS-008342-PKG003 is a bi-directional 4-bit phase shifter with parallel TTL input control and is available in a 24 lead, 4 mm PQFN plastic package. This product is fully matched to 50 ohms on both the input and output. This part has 360° of phase coverage in 22.5° increments.

Fabricated using M/A-COM's repeatable, high performance and highly reliable GaAs Multifunction Self-Aligned Gate Process, each device is 100% RF tested on wafer to ensure performance compliance. The MTTF is 1 million hours at a 170°C junction temperature.

The 4 mm PQFN package is RoHS compliant and compatible with industry standard lead-free solder reflow processes up to 260°C. This low cost package is ideal for high volume micro-wave applications.



Primary Applications

- ◆ Satellite Communications
- ◆ Inmarsat

Ordering Information

| Description | DIE | Tape & Reel (500) | Tape & Reel (1000) | Plastic Package Sample Board |
|-------------|--------------------|--------------------|--------------------|------------------------------|
| Part Number | MAPS-008342-DIE000 | MAPS-008342-TR0500 | MAPS-008342-TR1000 | MAPS-008342-SMB003 |

Electrical Characteristics: $T_B = 25^\circ\text{C}^1$, $Z_0 = 50 \Omega$, $V_{EE} = -5V$

| Parameter | Symbol | Typical | Units |
|---|--------------|---------|-------|
| Bandwidth | f | 1.4-2.4 | GHz |
| Insertion Loss—Reference State | IL | 4.0 | dB |
| RF Port 1 VSWR All States | VSWR | 1.5:1 | |
| RF Port VSWR All States | VSWR | 1.5:1 | |
| Peak Phase Error, All States | ϕ_{err} | -4/+8 | ° |
| Peak to Peak Gain Variation, All States | ΔG_n | < 2 | dB |
| Digital Supply Current | I_{EE} | < 5 | mA |
| Input Third Order Intercept | ITOI | 32 | dBm |
| Input 1-dB Compression Point | P_{1dB} | 22 | dBm |
| tRise, tFall (10/90% RF) | τ_R | 8 | ns |
| tOn, tOff (50% Control to 50% RF) | | 12 | ns |

1. $T_B = \text{MMIC Base Temperature.}$

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

• **North America** Tel: 800.366.2266 / Fax: 978.366.2266
 • **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
 • **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit www.macom.com for additional data sheets and product information.

ADVANCED: Data Sheets contain information regarding a product M/A-COM is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.
RELEASED: In full production, samples readily available, standard lead times apply.

**Phase Shifter, 4-Bit
 1.4—2.4 GHz**

M/A-COM Products
 RoHS Compliant

Maximum Ratings²

| Parameter | Symbol | Absolute Maximum | Units |
|------------------------|------------------|------------------|-------|
| Input Power | P _{IN} | 30 | dBm |
| Digital Supply Voltage | V _{EE} | -6 | V |
| Junction Temperature | T _J | 170 | °C |
| Storage Temperature | T _{STG} | -55 to +150 | °C |

2. Operation beyond these limits may result in permanent damage to the part.

Recommended Operating Conditions³

| Characteristic | Symbol | Min | Typ | Max | Unit |
|------------------------|-----------------|------|-----|------|------|
| Digital Supply Voltage | V _{EE} | -5.2 | -5 | -4.8 | V |
| Control Voltage | | | | | |
| Logic High / On | | 3 | 5 | 5.5 | V |
| Logic Low / Off | | 0 | 0.2 | 0.4 | V |

3. Operation outside of these ranges may reduce product reliability.

Truth Table⁴

| Designation | Description | Level | State |
|-------------|-----------------|------------|----------------------|
| P4 | 180° Phase Bit | Logic High | Phase Shift = -180° |
| P3 | 90° Phase Bit | Logic High | Phase Shift = -90° |
| P2 | 45° Phase Bit | Logic High | Phase Shift = -45° |
| P1 | 22.5° Phase Bit | Logic High | Phase Shift = -22.5° |

4. All Phase Bits at Logic Low = Reference State.

Operating Instructions

This device is static sensitive. Please handle with care.
 Reference Application Note AN3016*.

This device does not require voltage sequencing.



M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

ADVANCED: Data Sheets contain information regarding a product M/A-COM is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

RELEASED: In full production, samples readily available, standard lead times apply.

Phase Shifter, 4-Bit
 1.4—2.4 GHz

M/A-COM Products
 RoHS Compliant

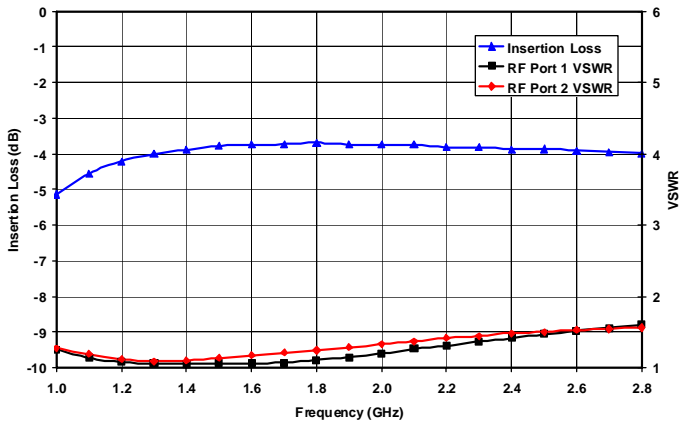


Figure 1. Insertion Loss, RF Port 1 & 2 VSWR vs. Frequency - Reference State

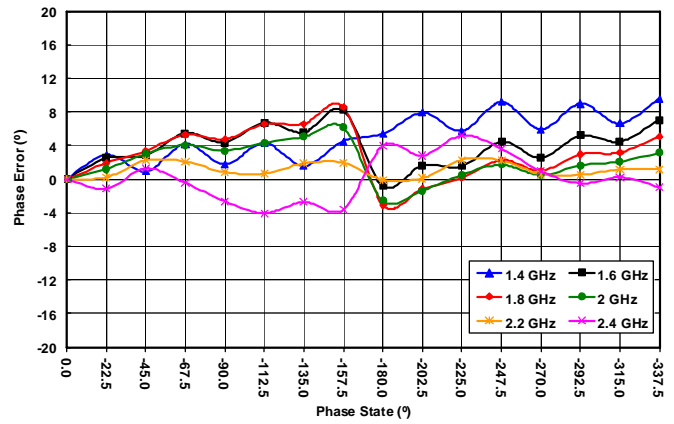


Figure 2. Typical Phase Error vs. Frequency - All Phase States

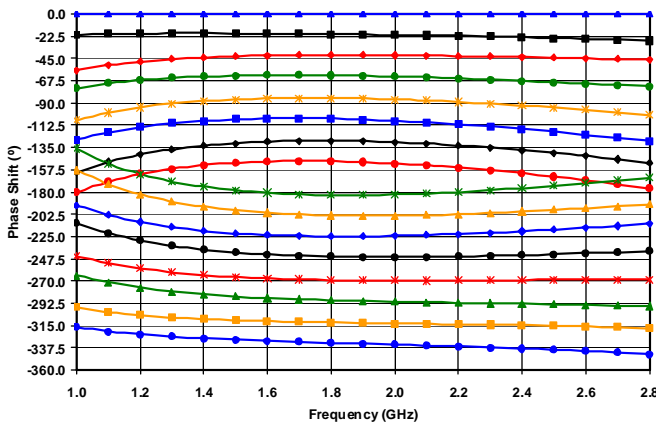


Figure 3. Relative Phase Shift vs. Frequency & Phase State - All States

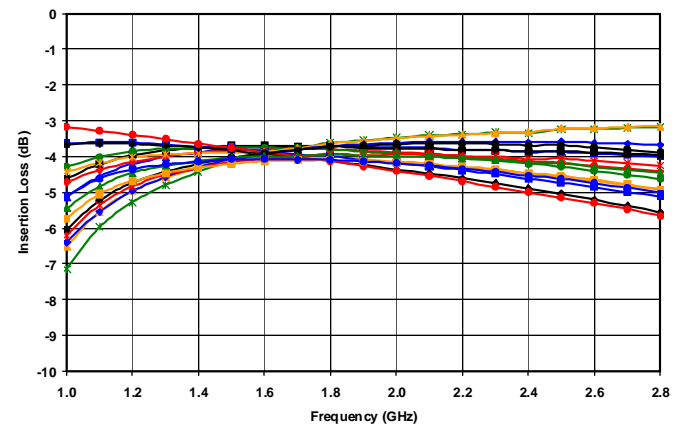


Figure 4. Insertion Loss vs. Frequency & Phase State - All States

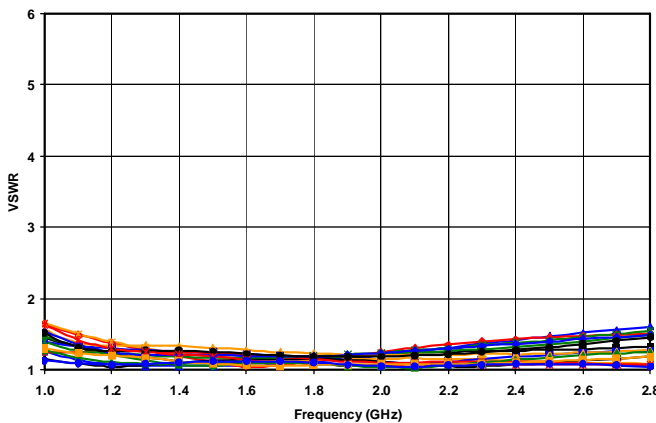


Figure 5. RF Port 1 VSWR vs. Frequency & Phase State - All States

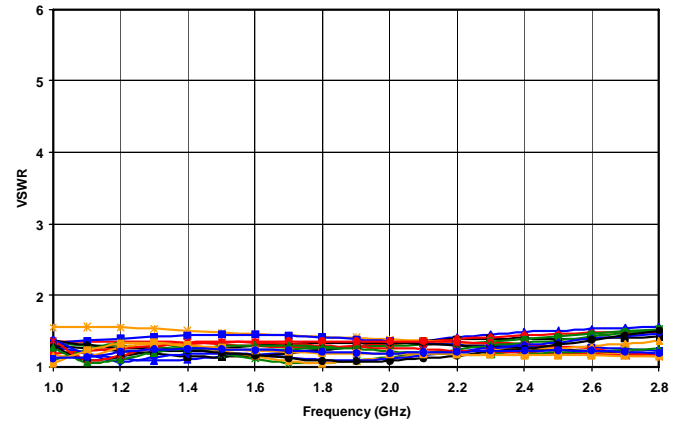


Figure 6. RF Port 2 VSWR vs. Frequency & Phase State - All States

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
 - **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
 - **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
- Visit www.macom.com for additional data sheets and product information.

ADVANCED: Data Sheets contain information regarding a product M/A-COM is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.
PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.
RELEASED: In full production, samples readily available, standard lead times apply.

Phase Shifter, 4-Bit
 1.4—2.4 GHZ

M/A-COM Products
 RoHS Compliant

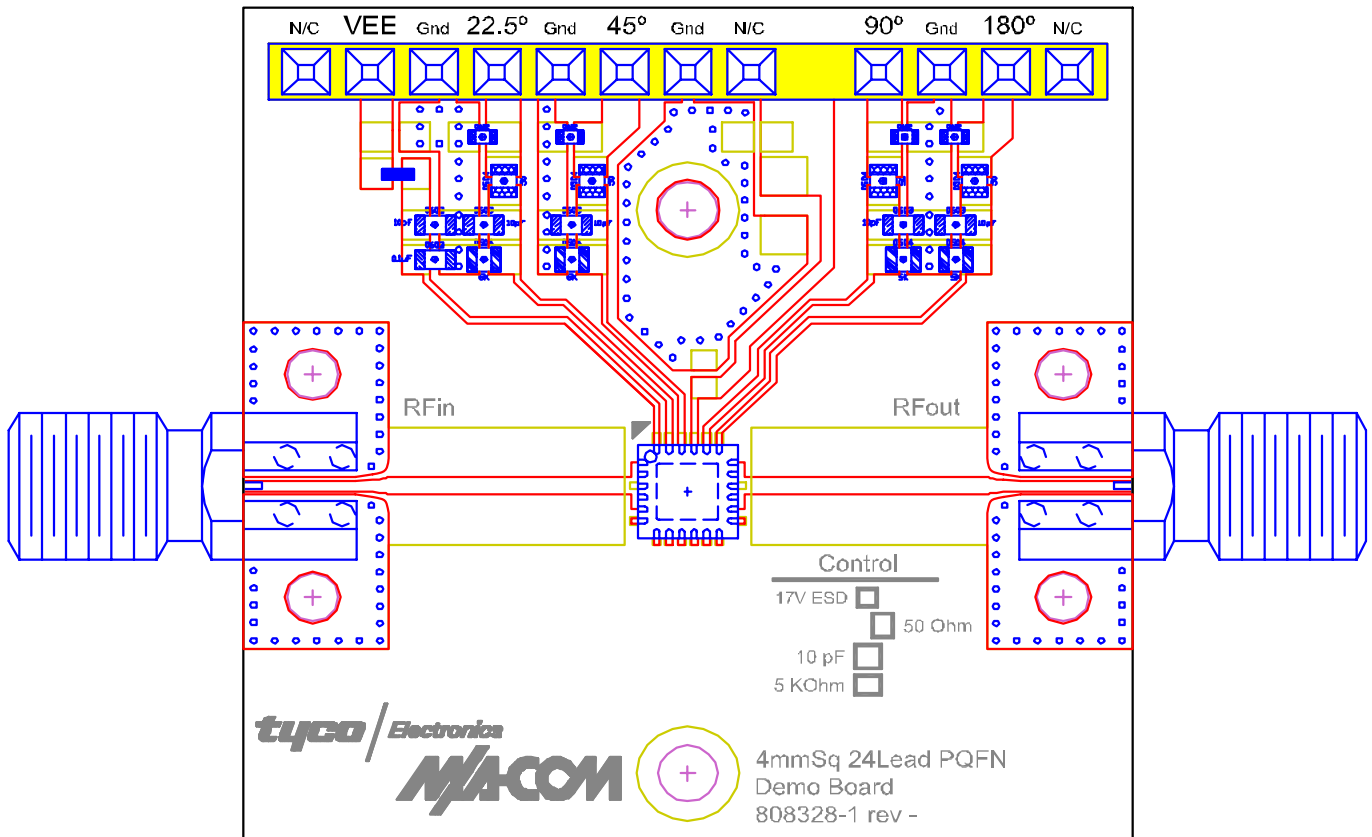


Figure 9. Demonstration Board PN MAPS-008342-SMB003 (available upon request).

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
 - **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
 - **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
- Visit www.macom.com for additional data sheets and product information.

ADVANCED: Data Sheets contain information regarding a product M/A-COM is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

PRELIMINARY: Data Sheets contain information regarding a product M/A-COM has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

RELEASED: In full production, samples readily available, standard lead times apply.