

Phase Shifter, 4-Bit
1.4—2.4 GHz

M/A-COM Products
RoHS Compliant

Features

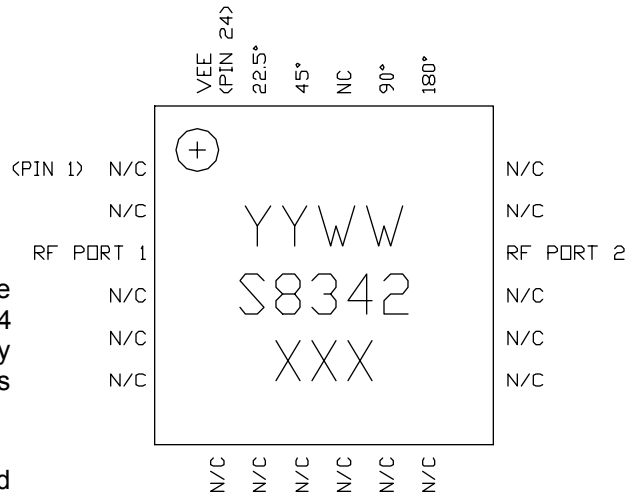
- ◆ 4-Bit Phase Shifter
- ◆ 360° Coverage, LSB = 22.5°
- ◆ TTL Control Inputs
- ◆ MSAG™ Process
- ◆ 4 mm, 24 Lead PQFN Package

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

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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.



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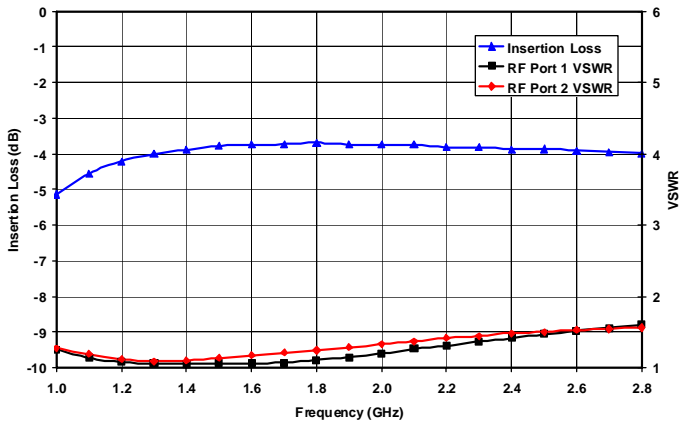


Figure 1. Insertion Loss, RF Port 1 & 2 VSWR vs. Frequency - Reference State

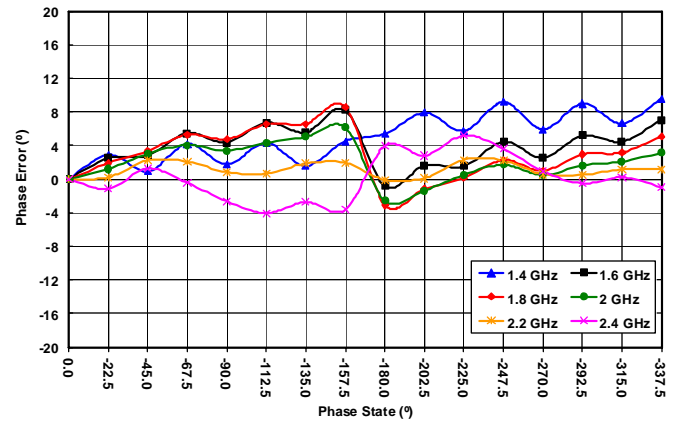


Figure 2. Typical Phase Error vs. Frequency - All Phase States

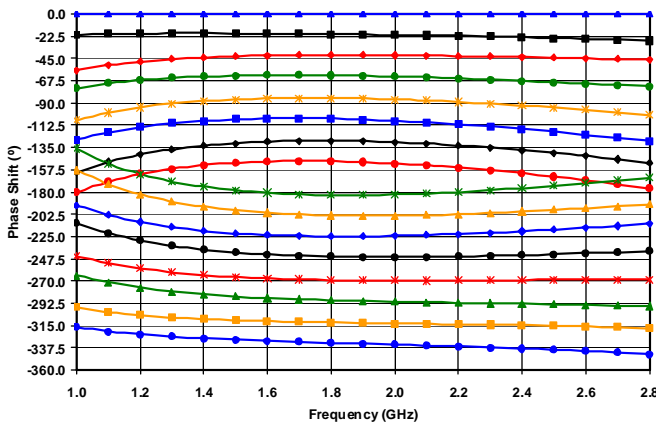


Figure 3. Relative Phase Shift vs. Frequency & Phase State - All States

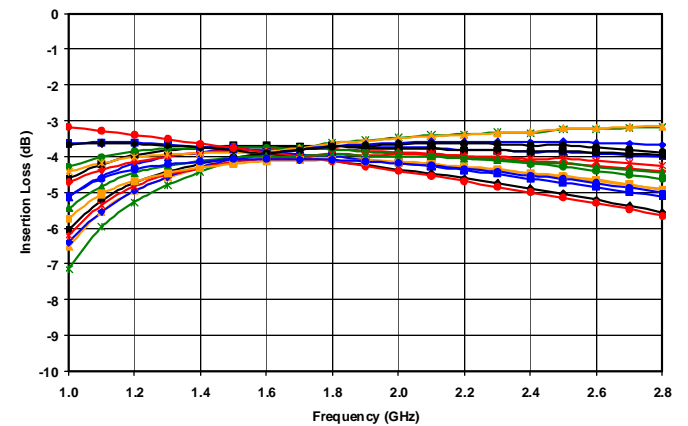


Figure 4. Insertion Loss vs. Frequency & Phase State - All States

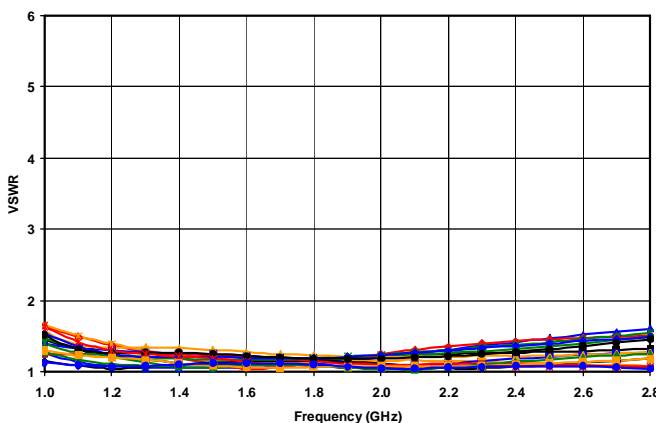


Figure 5. RF Port 1 VSWR vs. Frequency & Phase State - All States

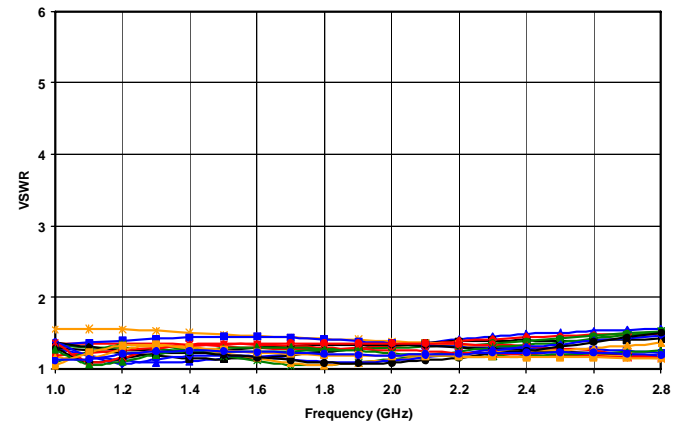


Figure 6. RF Port 2 VSWR vs. Frequency & Phase State - All States

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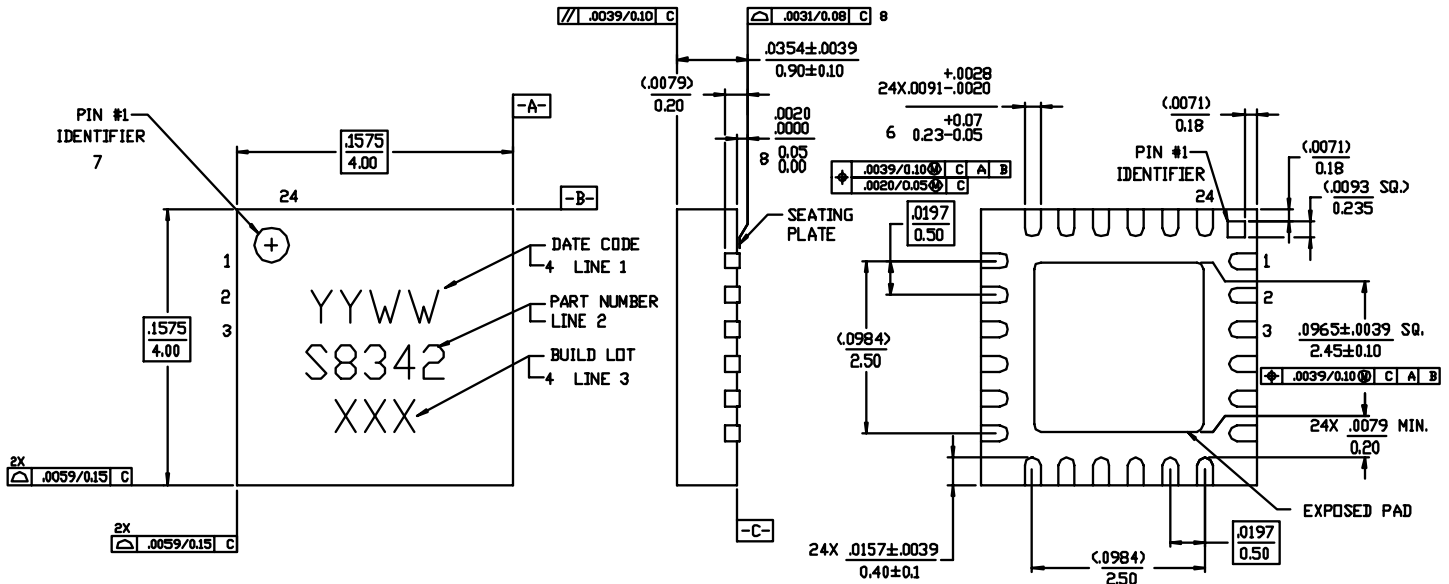


Figure 7. 4x4 mm 24-Lead PQFN Package.

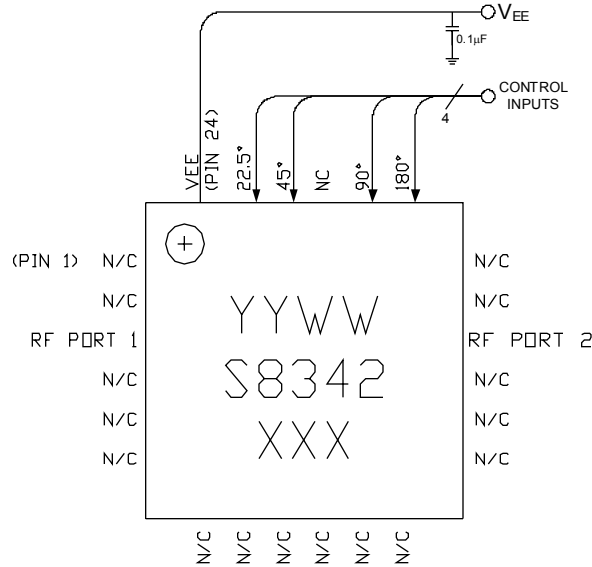


Figure 8. Recommended Bias Configuration.

Note: The exposed pad centered on the package bottom must be connected to RF and dc ground for proper electrical and thermal operation.

Refer to M/A-COM Application Note **Surface Mounting Instructions for PQFN Packages #S2083*** for assembly guidelines.

*Application Notes can be found by going to the Site Search Page of M/A-COM's web page (<http://www.macom.com/Application%20Notes/index.htm>) and searching for the required Application Note.

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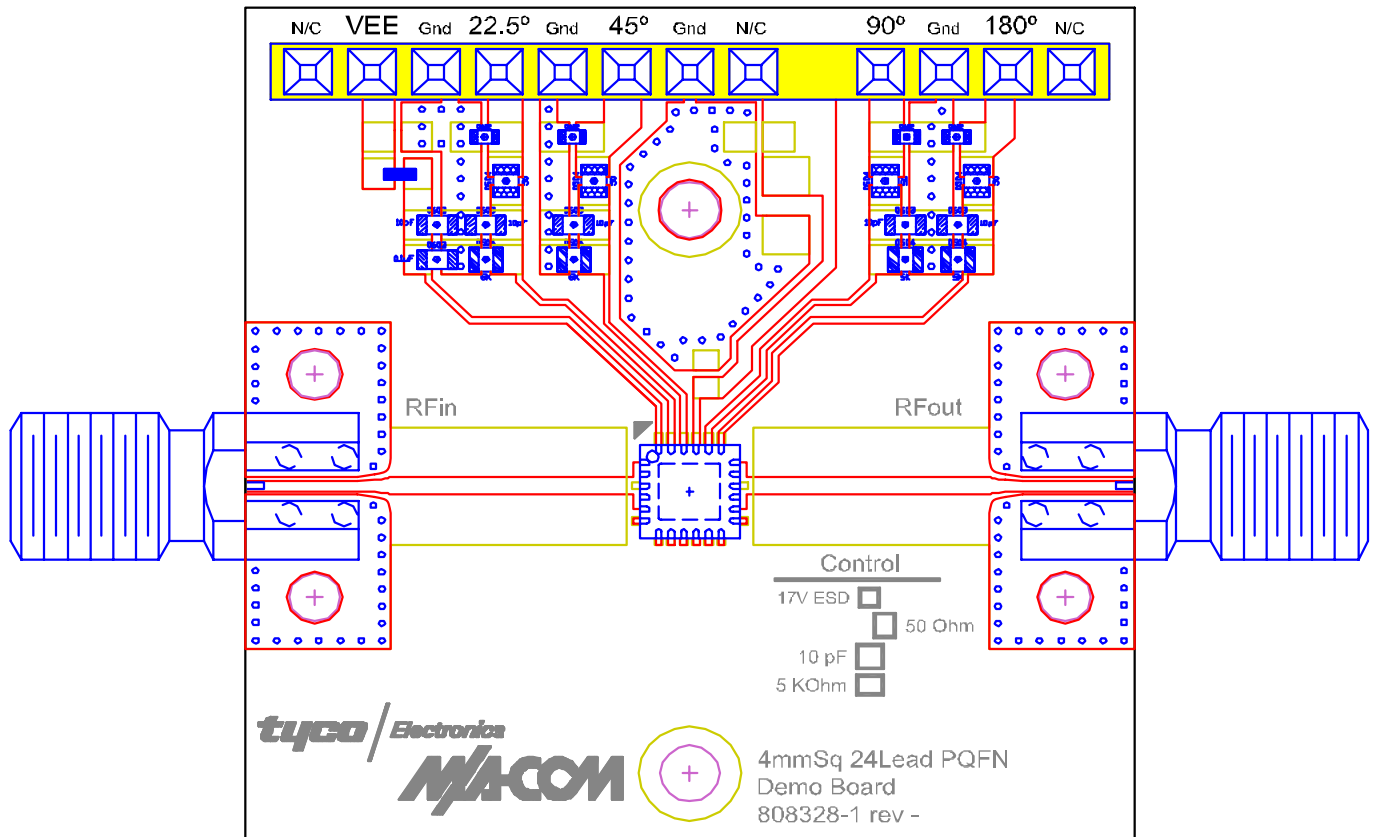


Figure 9. Demonstration Board PN MAPS-008342-SMB003 (available upon request).

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