MAPS-008343-PKG003

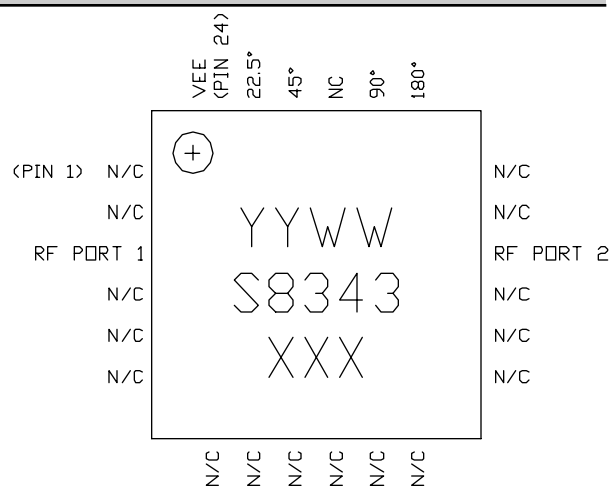
Tyco Electronics

Phase Shifter, 4-Bit, S-Band 2.3—3.8 GHZ

M/A-COM Products
Preliminary: Rev B

Features

- **4-Bit, S-Band Phase Shifter**
- **360º Coverage, LSB = 22.5º**
- **TTL Control Inputs**
- **MSAG™ Process**
- **RoHS Compliant**



Description

The MAPS-008343-PKG003 is a 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 360º of phase coverage in 22.5º 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 microwave applications

Primary Applications

- Satellite Communication
- Electronically Steered Antenna
- WiMax

Ordering Information

Description	Die	T/R (500)	T/R (1000)	Plastic Package Sample Board
Part Number	MAPS-008343-DIE000	MAPS-008343-TR0500	MAPS-008343-TR1000	MAPS-008343-SMB003

Electrical Characteristics: T_B = 25°C[1], Z_0 = 50 Ω, V_{EE} = -5V

Parameter	Symbol	Typical	Units
Bandwidth	f	2.3-3.8	GHz
Insertion Loss	IL	4.5	dB
Input VSWR (All States)	VSWR	1.5:1	
Output VSWR (All States)	VSWR	1.5:1	
Peak Phase Error (All States)	ϕ	-5/+8	º
Peak to Peak Gain Variation (All States)	ΔGn	< 2.5	dB
Digital Supply Current	I_{EE}	< 10	mA
Input Third Order Intercept (Ref State)	ITOI	26	dBm
Input 1-dB Compression Point	P_{1dB}	20	dBm
tRise, tFall (10/90% RF)	τ_R	8	ns
tOn, tOff (50% Control to 50% RF)		12	ns

1. **T_B = MMIC Base Temperature.**

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Maximum Ratings[2]

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 Conditions[3]

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	V
Logic Low / Off		0	0	0.4	V

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

Truth Table[4]

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

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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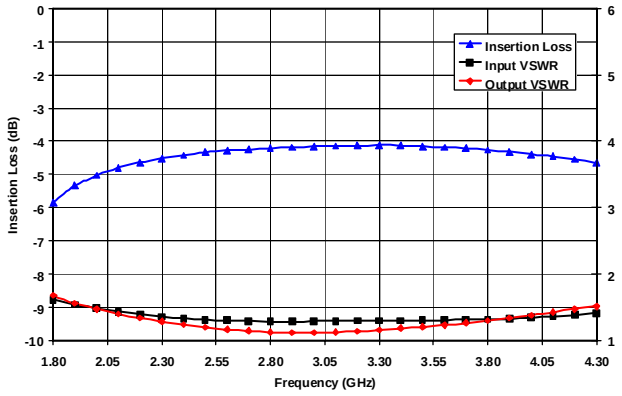

Figure 1. Insertion Loss, RF Port 1 & 2 VSWR vs. Frequency - Reference State

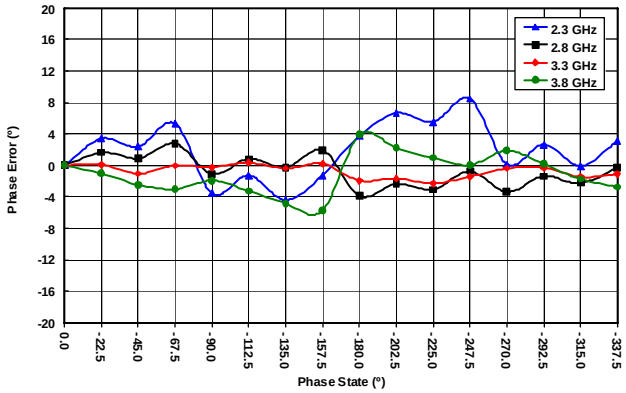

Figure 2. Typical Phase Error vs. Frequency - All Phase States

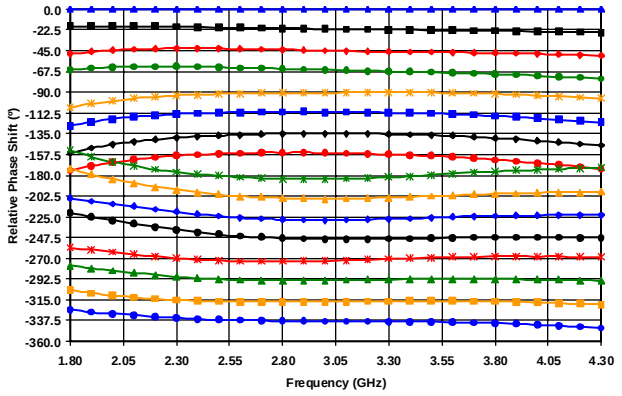

Figure 3. Relative Phase Shift vs. Frequency & Phase State - All States

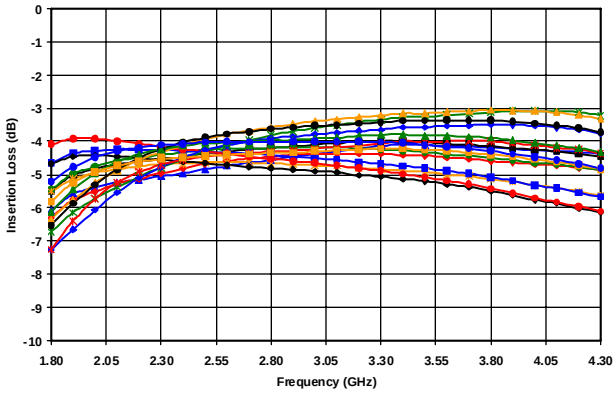

Figure 4. Insertion Loss vs. Frequency & Phase State - All States

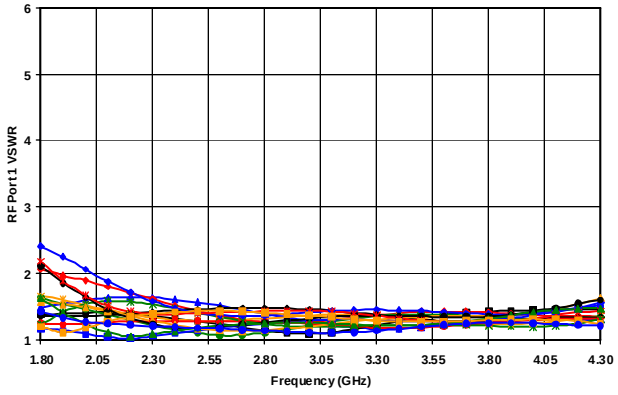

Figure 5. RF Port 1 VSWR vs. Frequency & Phase State - All States

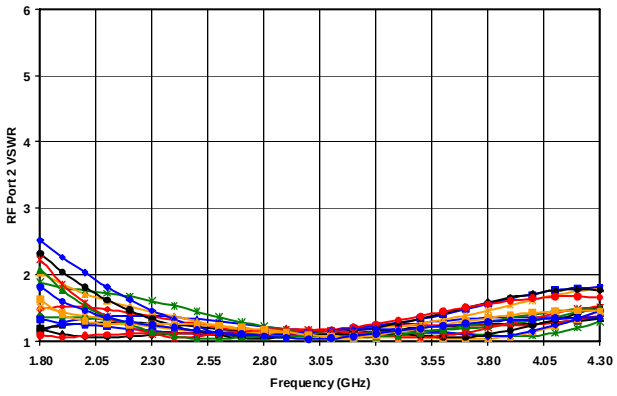

Figure 6. RF Port 2 VSWR vs. Frequency & Phase State - All States

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

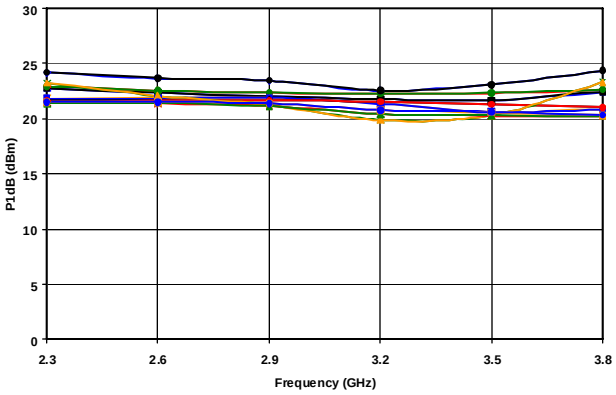

Figure 7. Input P1dB vs. Frequency and Phase State – All Phase States

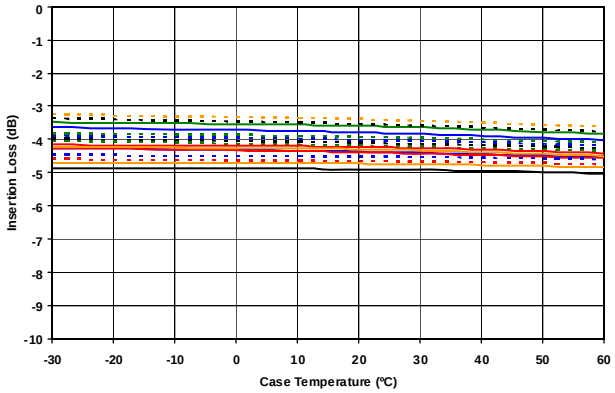

Figure 8. Insertion Loss vs. Case Temperature and Phase State – All Phase States @ 3.0 GHz

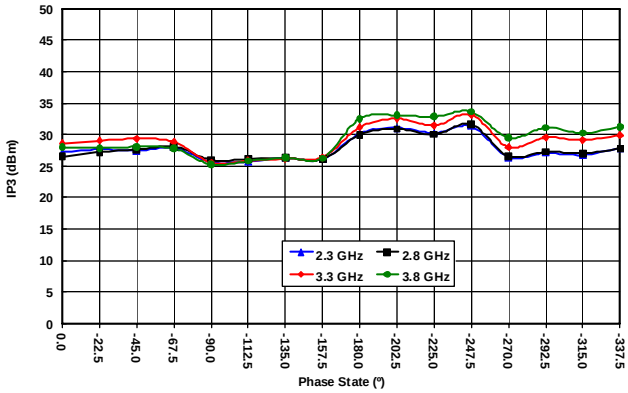

Figure 9. Input Third Order Intercept vs. Phase State and Frequency – All Phase States

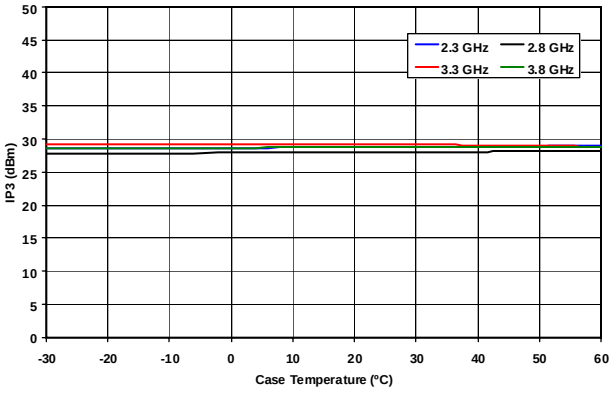

Figure 10. Input Third Order Intercept vs. Case Temperature and Frequency – Reference State

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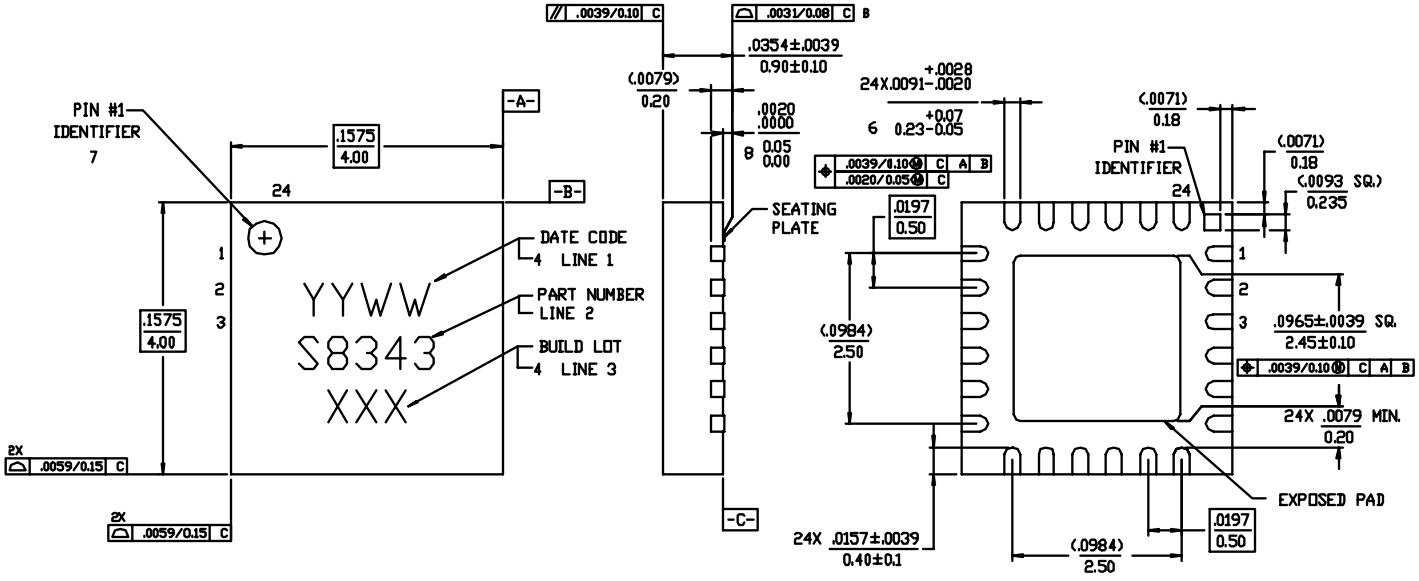

Figure 7. 4x4 24-Lead PQFN Package.

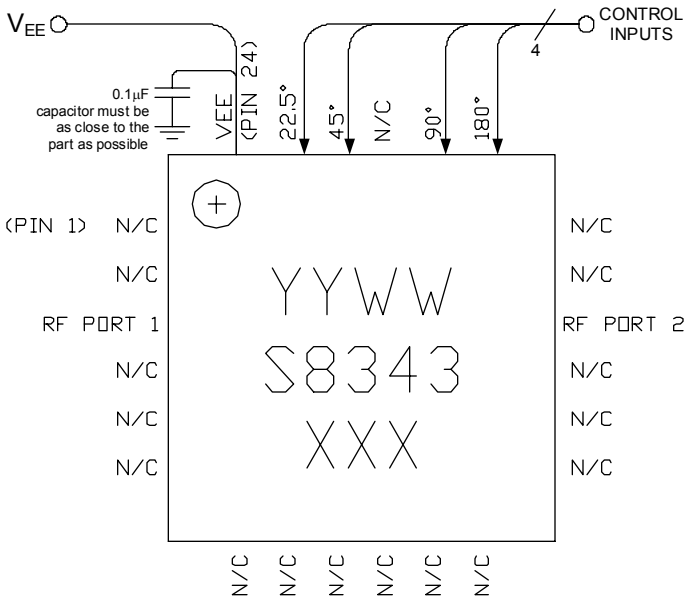

Figure 8. Recommended Bias Configuration.

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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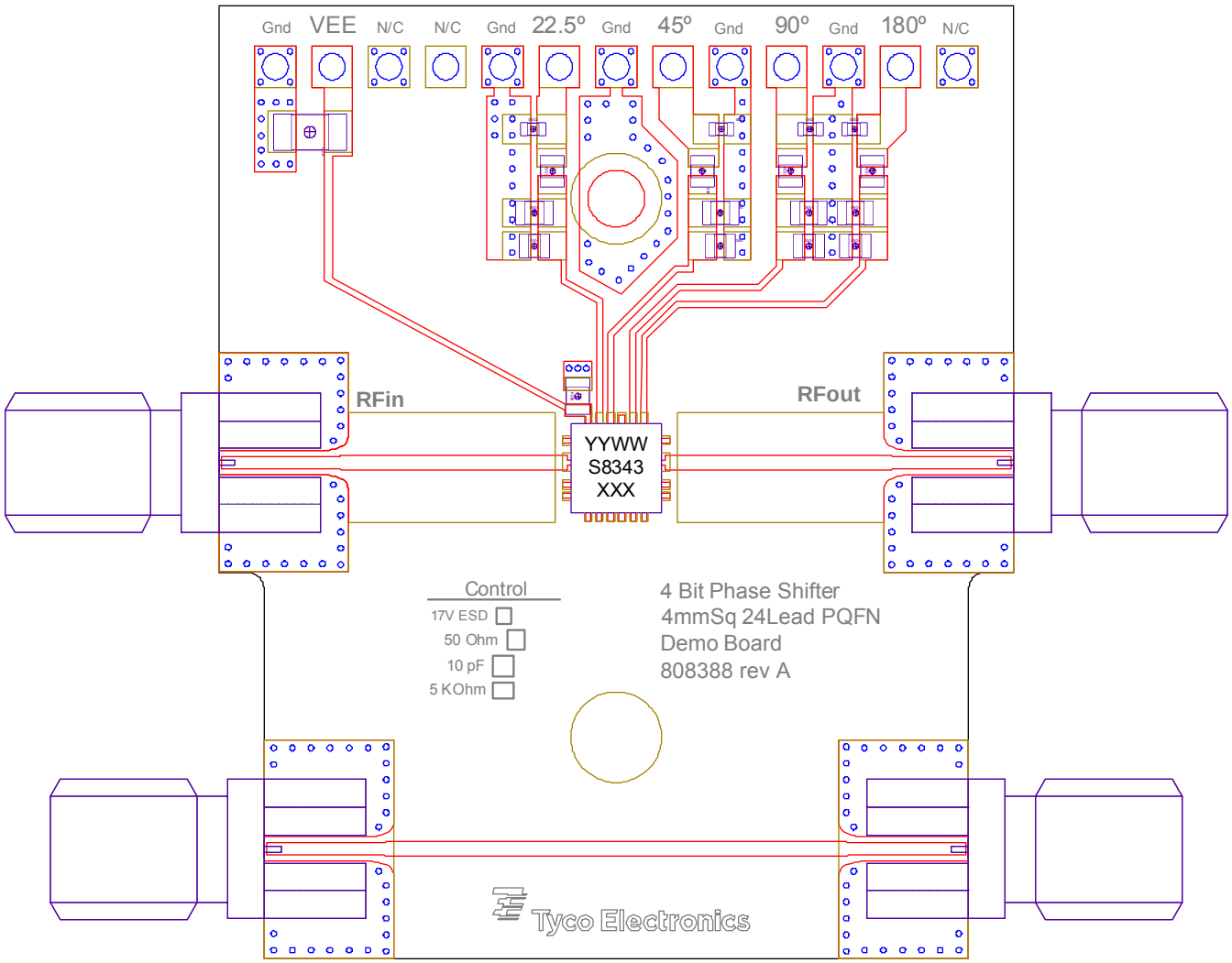

Figure 9. Demonstration Board P/N MAAP-008343-SMB003 (available upon request).

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