

# M/A-COM S-Band Phase Shifter

## 2.3-4.1 GHz

MAPCGM0003

### Preliminary Information

#### Features

- ◆ 2.3 to 4.1 GHz Operation
- ◆ 6 Bit Phase Shifter
- ◆ 360° Coverage, LSB = 5.6°
- ◆ TTL Control Inputs
- ◆ Self-Aligned MSAG® MESFET Process
- ◆ 6mm, 28 Lead, FQFP-N Package

#### Primary Applications

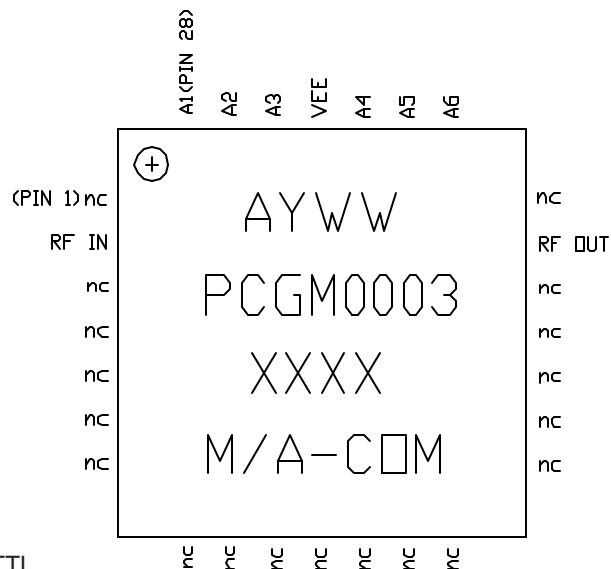
- ◆ Satellite Communication
- ◆ Phased Array Radar

#### Description

The MAPCGM0003 is a 6-bit Phase Shifter with Parallel TTL Input Control and is packaged in a micro lead package (MLP). This product is fully matched to 50 ohms on both the input and output. This part has 360° of phase coverage in 5.6° increments.

Each device is 100% RF tested on wafer to ensure performance compliance. The part is fabricated using M/A-COM's repeatable, high performance and highly reliable GaAs Multifunction Self-Aligned Gate (MSAG®) MESFET Process.

### 2.3-4.1 GHz GaAs MMIC Phase Shifter



Pin Number	Designation
2	RF IN
20	RF OUT
22	A6 (180°)
23	A5 (90°)
24	A4 (45°)
25	V <sub>EE</sub>
26	A3 (22.5°)
27	A2 (11.25°)
28	A1 (5.6°)
1,3-19,21	No connection

### Maximum Operating Conditions <sup>1</sup>

Parameter	Symbol	Absolute Maximum	Units
Input Power	P <sub>IN</sub>	30	dBm
Source Supply Voltage	V <sub>EE</sub>	-4.8	V
Junction Temperature	T <sub>J</sub>	180	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

**1. Operation outside of these ranges may reduce product reliability. Operation at other than the typical values may result in performance outside the guaranteed limits.**

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ	Max	Unit
Digital Supply Voltage	VEE	-5.2	-5.0	-4.8	V
Control Voltage	A1 thru A6				
Logic High		3	5	5	V
Logic Low		0	0	0.4	V
Junction Temperature	T <sub>J</sub>			150	°C

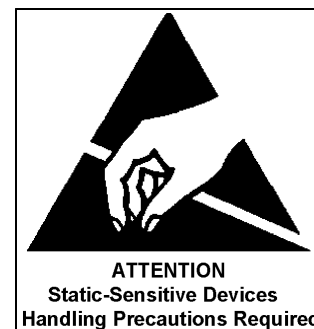
**Electrical Characteristics: T<sub>B</sub> = 25°C, Z<sub>0</sub> = 50W, V<sub>EE</sub> = -5V**

Parameter	Symbol	Typical	Units
Bandwidth	f	2.3-4.1	GHz
Insertion Loss	IL	6	dB
Input VSWR (At Reference)	VSWR	1.5:1	
Output VSWR (At Reference)	VSWR	1.2:1	
RMS Phase Error	RMS	6	°
RMS Phase Error — Calibrated	RMS	3	°
Phase Range	??	360	°
Gain Variation over all Phase Shifter settings	?G	< 3	dB
Digital Supply Current	I <sub>EE</sub>	< 10	mA
Input Third Order Intercept	ITOI	36	dBm
Input 1-dB Compression Point	P <sub>1dB</sub>	23	dBm

## Operating Instructions

This device is static sensitive. Please handle with care. To operate the device, follow these steps.

1. Apply V<sub>EE</sub> = -5 V.
2. Apply Logic Voltages to control circuit as listed in Recommended Operating Conditions Table.
3. Power Down. Set V<sub>EE</sub> = 0.



Specifications subject to change without notice.

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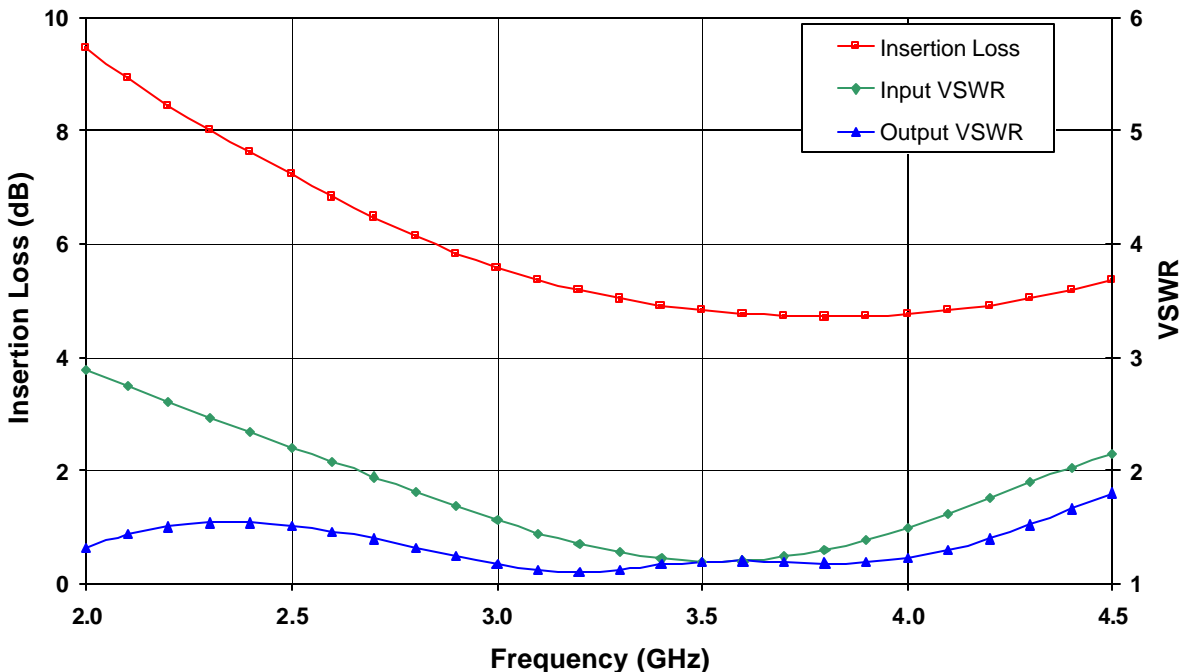


Figure 1. Reference State Insertion Loss, Input and Output VSWR vs. Frequency

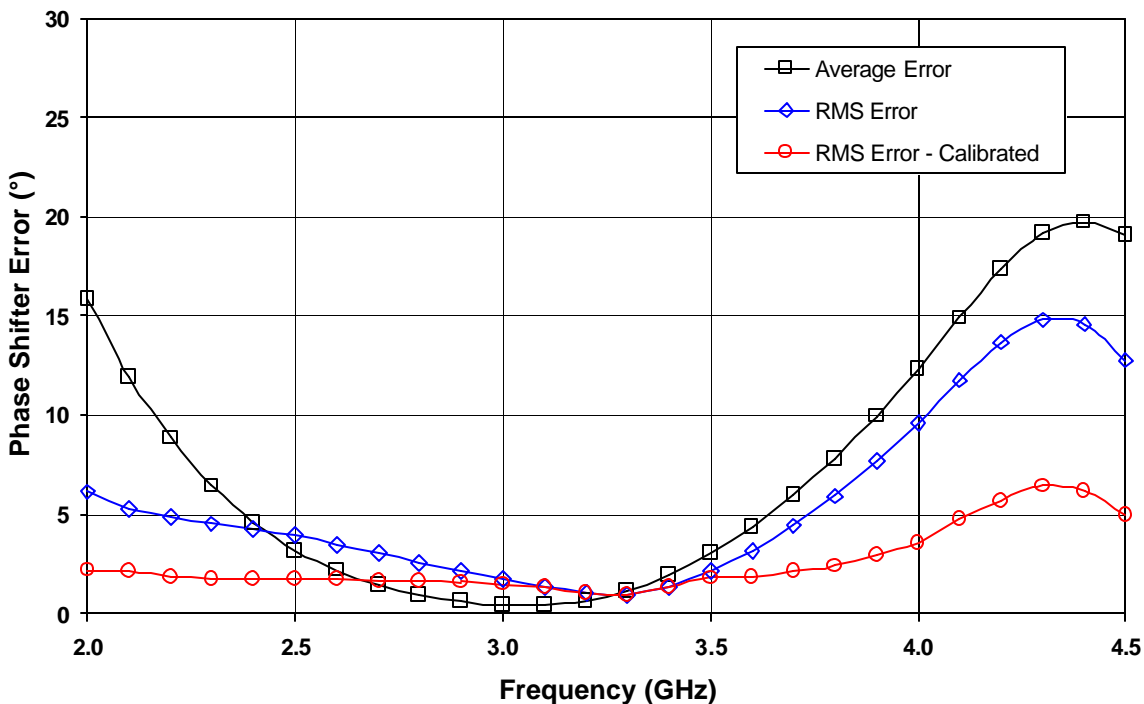


Figure 2. Phase Shifter Figures of Merit: Average Error vs. Reference State, RMS Error and Calibrated RMS Error Over All States

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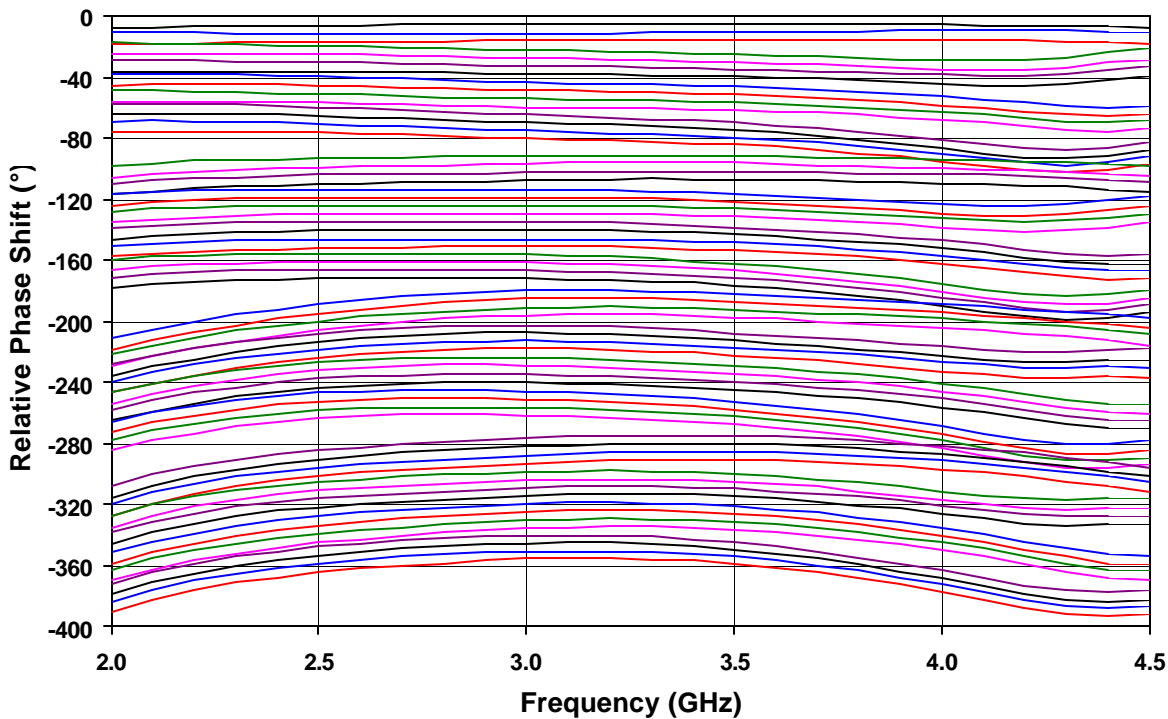


Figure 3. Relative Phase Shift vs. Phase Shifter State

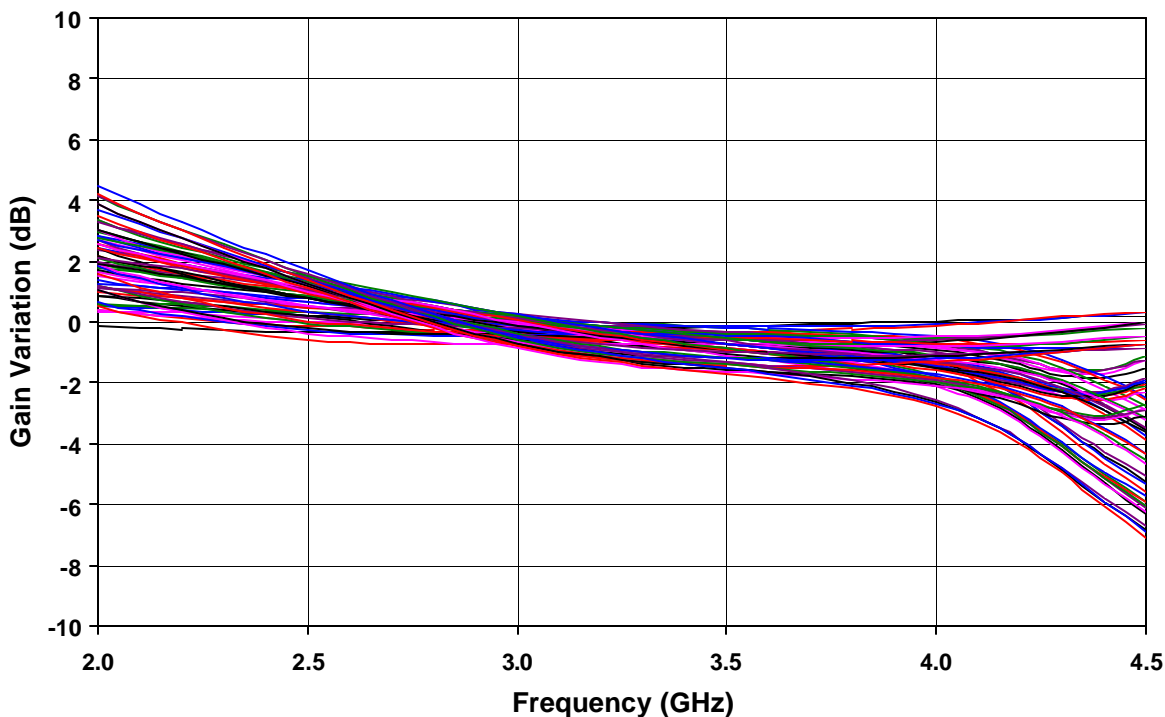


Figure 4. Relative Gain Change vs. Phase Shifter State

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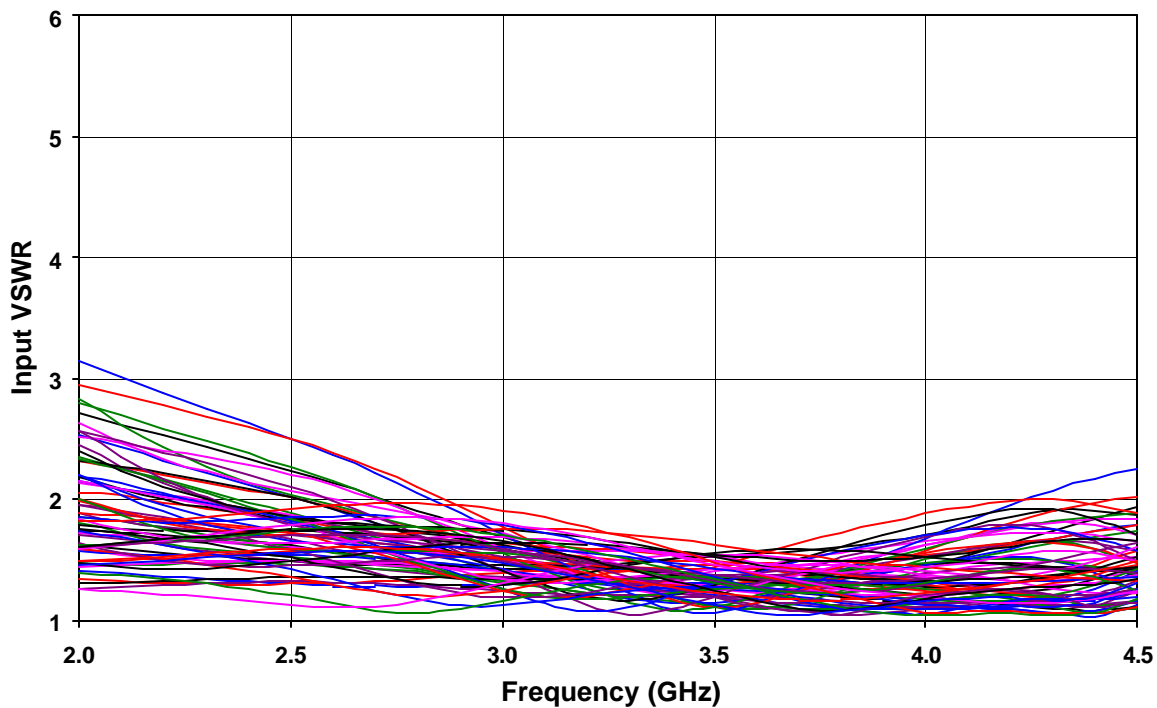


Figure 5. Input VSWR vs. Phase Shifter State

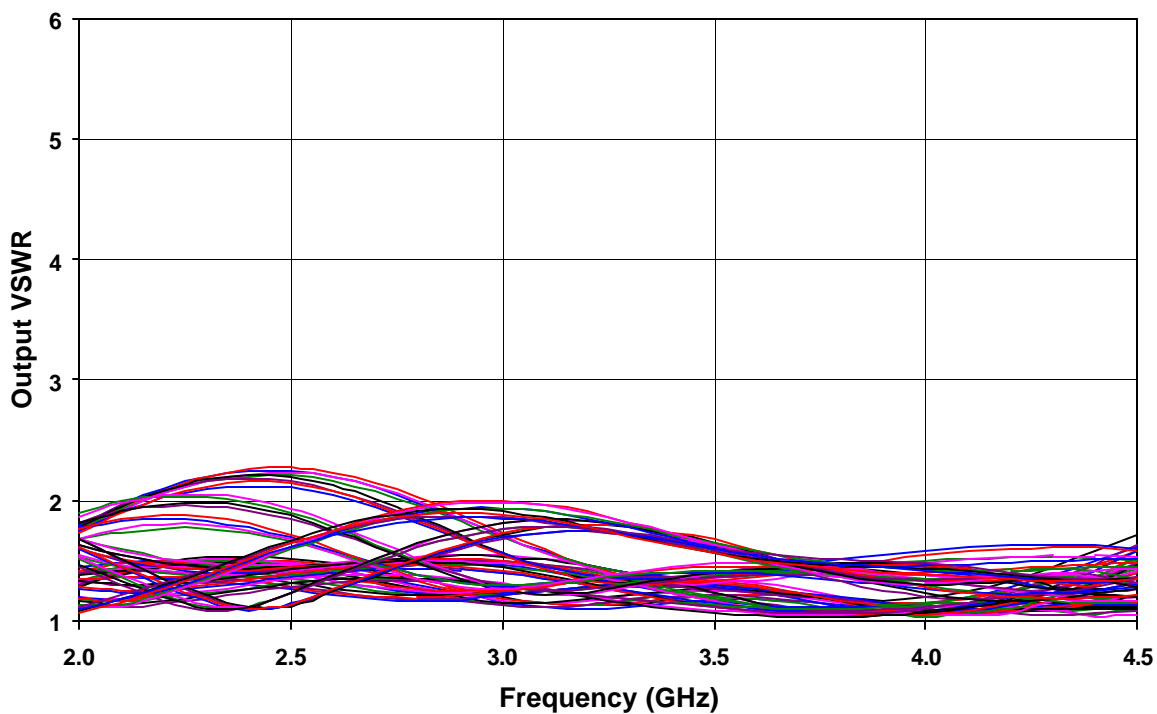


Figure 6. Output VSWR vs. Phase Shifter State

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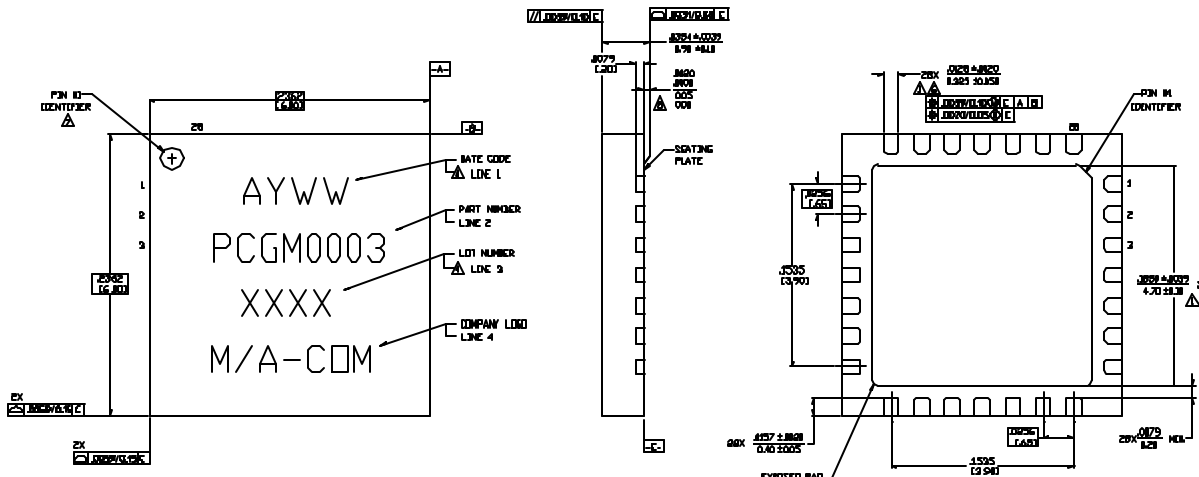


Figure 7. FQFP-N, 6mm, 28 Lead Package Drawing

Reference JEDEC M0-220 (see <http://www.jedec.org>), VAR. VJJC-3 (Issue E) for additional dimensional and tolerance information.

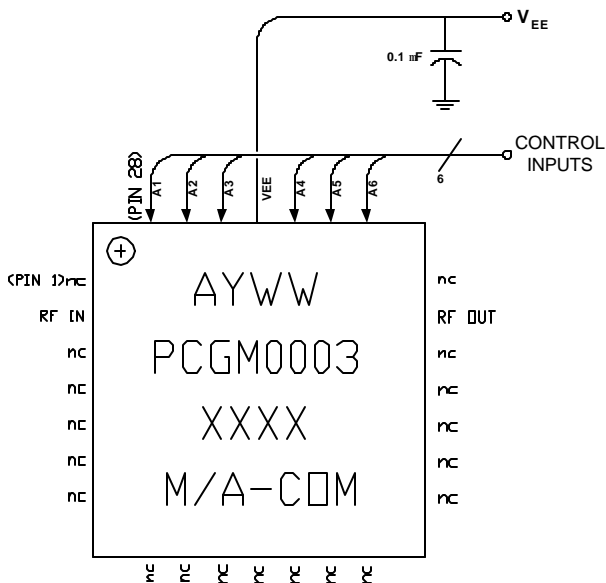


Figure 8. Recommended Bias Configuration

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

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

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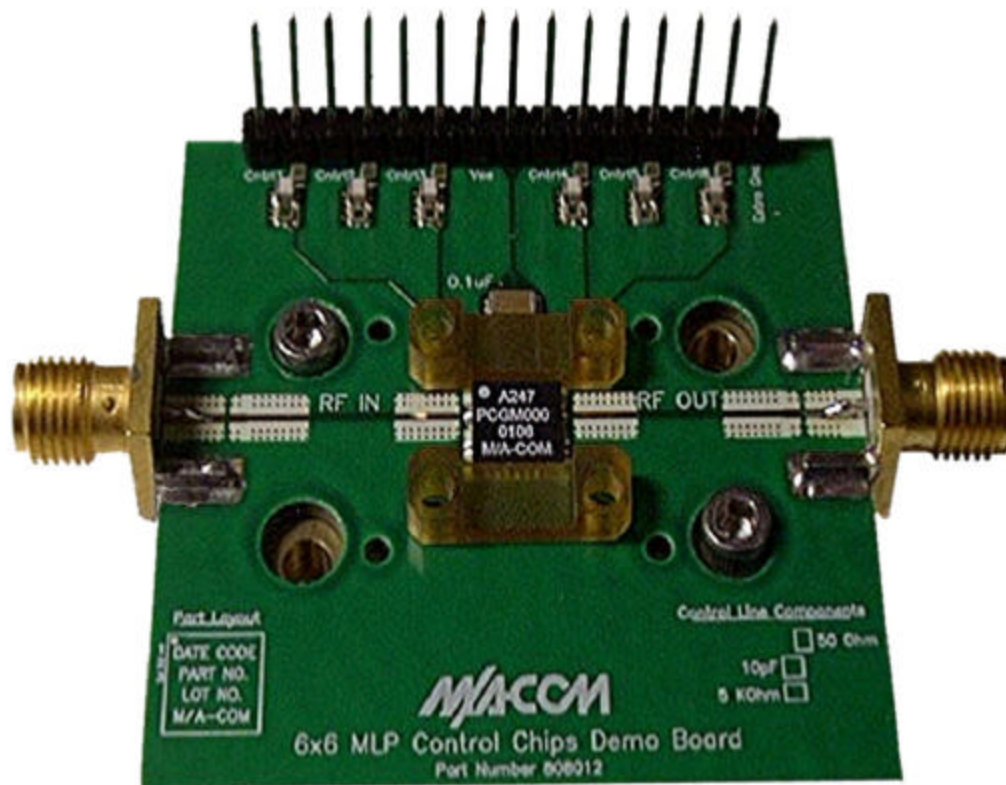


Figure 9. Demonstration Board (available upon request).

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