

MAPCGM0002-DIE RO-P-DS-3050 A Preliminary Information

Features

- 6 Bit Phase Shifter
- ♦ 360° Coverage, LSB = 5.6°
- TTL Control Inputs
- MSAG[™] Process

Description

The MAPCGM0002-Die is a 6-bit Phase Shifter with Parallel TTL Input Control. This product is fully matched to 50 ohms on both the input and output. The part has 360° of phase coverage with LSB of 5.6°.

Fabricated using M/A-COM's repeatable, high performance and highly reliable GaAs Multifunction Self-Aligned Gate MESFET Process, each device is 100% RF tested on wafer to ensure performance compliance.

M/A-COM's MSAG[™] process features robust silicon-like manufacturing processes, planar processing of ion implanted transistors, multiple implant capability enabling power, low-noise, switch and digital FETs on a single chip, and polyimide scratch protection for ease of use with automated manufacturing processes. The use of refractory metals and the absence of platinum in the gate metal formulation prevents hydrogen poisoning when employed in hermetic packaging.



Primary Applications

- Satellite Communication
- Phased Array Radar

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Parameter	Symbol	Typical	Units			
Bandwidth	f	3.5 - 6.0	GHz			
Insertion Loss, Reference State	IL	6	dB			
Input VSWR, All States	VSWR	1.5:1				
Output VSWR, All States	VSWR	1.7:1				
RMS Phase Error	фrms	8	0			
RMS Phase Error, Calibrated	ф ямs	3	0			
Peak to Peak Gain Variation, All States	ΔG	< 3	dB			
Current	I _{EE}	< 10	mA			
Input Third Order Intercept	ITOI	32	dBm			
Input 1-dB Compression Point	P1dB	26	dBm			

Electrical Characteristics: $T_B = 40^{\circ}C^1$, $Z_0 = 50\Omega$, $V_{EE} = -5V$

1. T_B = MMIC Base Temperature

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Maximum Operating Conditions¹

Parameter	Symbol	Absolute Maximum	Units
Input Power	P _{IN}	31	dBm
Source Supply Voltage	V _{EE}	-6.0	V
Junction Temperature	TJ	180	°C
Storage Temperature	T _{STG}	-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	Тур	Мах	Unit
Source Voltage	V_{EE}	-5.2	-5	-4.8	V
Control Voltage	V control pads				
Logic High		3	5	5	V
Logic Low		0	0	0.4	V

Operating Instructions

This device is static and light sensitive. Digital circuit operation can be impaired under high intensity light, e.g. microscope light. Please handle with care. To operate the device, follow these steps.

- 1. Power Up: Apply $V_{EE} = -5 V$.
- 2. Apply Logic Voltages to control Circuits as listed in Recommended Operating Conditions
- 3. Power Down: Set $V_{EE} = 0$



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MAPCGM0002-DIE

RO-P-DS-3050 A

3.5-6.0 GHz Phase Shifter



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





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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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Mechanical Information Chip Size: 3.816 x 1.354 x 0.075 mm (150 x 53 x 3 mils) 0.139mm 3.674mm 2.194mm 3.816mm 1.781mm . 183mm .375mm .394mm .594mm .994mm 1.354mm. 1.200mm. 0.843mm. 0.818mm. 0 0

Figure 7. Die Layout

Bond Pad Dimensions

Pad	Size (μm)	Size (mils)
RF In and Out	100 x 200	4 x 8
DC Supply Voltage VEE	125 x 125	5 x 5
DC Control Voltage VC	125 x 125	5 x 5

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Figure 8. Recommended bonding diagram for pedestal mount. Support circuitry typical of MMIC characterization.

Assembly Instructions:

Die attach: Low thermal conductivity silver epoxies are acceptable for die attach of this MMIC. Follow the manufacturer's instructions. If solder is employed, use AuSn (80/20) 1-2 mil preform solder. Limit time @ 300 °C to less than 5 minutes.

Wirebonding: Bond @ 160 °C using standard ball or thermal compression wedge bond techniques. For DC and RF pad connections, use either ball or wedge bonds. For best performance, especially above 10 GHz, wedge bonds of shortest length employed on the RF interconnects is preferred over ball bonds.

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