

Vector Modulator, 1.94 to 2.34 GHz

**MAMDCC0006
V5**

Features

- Operation Bands 1.90 to 2.02 GHz & 1.94 to 2.34 GHz
- Chip Scale Package.
- Low Amplitude Ripple
- Linear Phase
- 50 ohm nominal impedance
- Continuously Variable Across a Full 360 degree range
- Test Boards to be Available

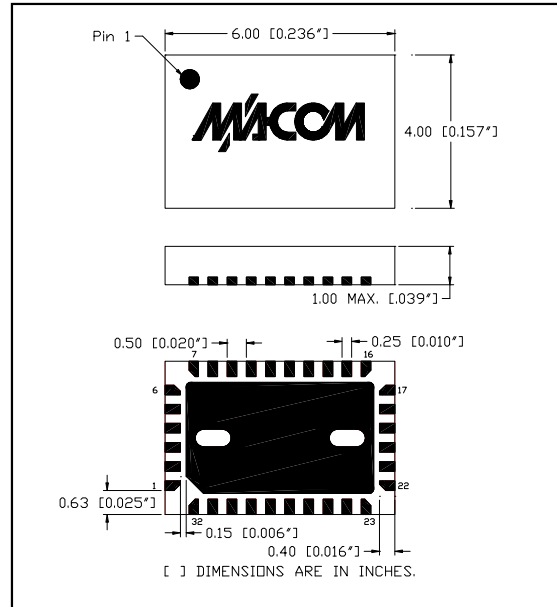
Description

M/A-COM's MAMDCC0006 is a Vector Modulator that significantly reduces the required board space compared to hybrid solutions. The monolithic passive elements will lead to greater repeatability lot-to-lot. Low amplitude ripple will provide superior performance. High intercept and compression points will contribute to more linear system performance. MAMDCC0006 is ideally suited for wireless infrastructure applications. M/A-COM's MADRCC0002 Dual Linearizer is designed to simplify the control of Vector Modulators. See Figure 1 and App Note AN3001.

Pad Configuration

Pin #	Function	Pin #	Function
1	NC	17	NC
2	NC	18	NC
3	NC	19	NC
4	NC	20	NC
5	NC	21	NC
6	NC	22	NC
7	NC	23	NC
8	NC	24	Bias 2B
9	Bias 1A	25	NC
10	NC	26	GND
11	GND	27	RF OUT
12	RF IN	28	GND
13	GND	29	NC
14	NC	30	Bias 1B
15	Bias 2A	31	NC
16	NC	32	NC

CSP-6



Absolute Maximum Ratings ³

Parameter	Absolute Maximum
Max. Input Power 1.5 to 2.0 GHz Other Frequencies	+34 dBm +24 dBm
DC Voltages ⁴ Vbias1 or Vbias2	+1.0V
DC Current	50 mA Max per Bias
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.

4. Note that external dropping resistors are required to limit the current and voltage on the PIN diodes.

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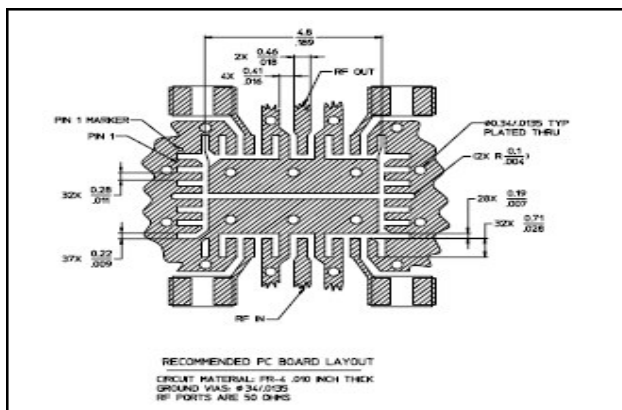
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Electrical Specifications: $T_A = +25^\circ\text{C}$

Parameter	Test Conditions	Frequency	Units	Min	Typical	Max
Impedance	—	—	Ohms	—	50	—
Reference Loss ²	Z = 50 Ohms	1.90—2.02 GHz 2.04—2.24 GHz	dB dB	-16 -12.5	— —	-11 -10
Attenuation Range	Z = 50 Ohms	1.90—2.34 GHz	dB	10	—	—
Phase Shift Range	Z = 50 Ohms	1.90—2.34 GHz	deg	0	—	360
Amplitude Ripple	Z = 50 Ohms, Ref Loss	2.08—2.20 GHz	dB	—	±0.06	±0.15
	Z = 50 Ohms, 5 dB above Ref Loss	2.08—2.20 GHz	dB	—	±0.10	±0.20
	Z = 50 Ohms, 10 dB above Ref Loss	2.08—2.20 GHz	dB	—	±0.14	±0.25
	Z = 50 Ohms, Ref Loss	2.04—2.24 GHz	dB	—	±0.09	±0.25
	Z = 50 Ohms, 5 dB above Ref Loss	2.04—2.24 GHz	dB	—	±0.15	±0.33
	Z = 50 Ohms, 10 dB above Ref Loss	2.04—2.24 GHz	dB	—	±0.20	±0.40
	Z = 50 Ohms, Ref Loss	1.90—2.02 GHz	dB	—	±0.06	±0.35
	Z = 50 Ohms, 5 dB above Ref Loss Z = 50 Ohms, 10 dB above Ref Loss	1.90—2.02 GHz 1.90—2.02 GHz	dB dB	— —	±0.10 ±0.14	±0.45 ±0.50
Deviation from Linear Phase	Z = 50 Ohms, Ref Loss	2.08—2.20 GHz	deg	—	—	±0.5
	Z = 50 Ohms, 5 dB above Ref Loss	2.08—2.20 GHz	deg	—	—	±1.0
	Z = 50 Ohms, 10 dB above Ref Loss	2.08—2.20 GHz	deg	—	—	±1.5
	Z = 50 Ohms, Ref Loss	2.04—2.24 GHz	deg	—	—	±1.0
	Z = 50 Ohms, 5 dB above Ref Loss	2.04—2.24 GHz	deg	—	—	±1.5
	Z = 50 Ohms, 10 dB above Ref Loss	2.04—2.24 GHz	deg	—	—	±2.0
	Z = 50 Ohms, Ref Loss	1.90—2.02 GHz	deg	—	—	±1.0
	Z = 50 Ohms, 5 dB above Ref Loss Z = 50 Ohms, 10 dB above Ref Loss	1.90—2.02 GHz 1.90—2.02 GHz	deg deg	— —	— —	±1.2 ±1.2
Return Loss	Over 10 dB Attenuation Range	2.04—2.24 GHz	dB	15	—	—
		1.90—2.20 GHz	dB	8	—	—
Input IP ₃	Over 10 dB Attenuation Range	1.90—2.24 GHz	dBm	—	+41	—
Input P _{1dB}	Over 10 dB Attenuation Range	1.90—2.24 GHz	dBm	—	+29	—
Noise Figure	Over 10 dB Attenuation Range	1.90—2.24 GHz	dB	—	Note 1	—
Control Bandwidth	Output Modulation Lowered 3dB	—	MHz	—	3.5	—

1. Noise figure is approximately equal to the absolute attenuation.

Recommended PCB Layout



Schematic

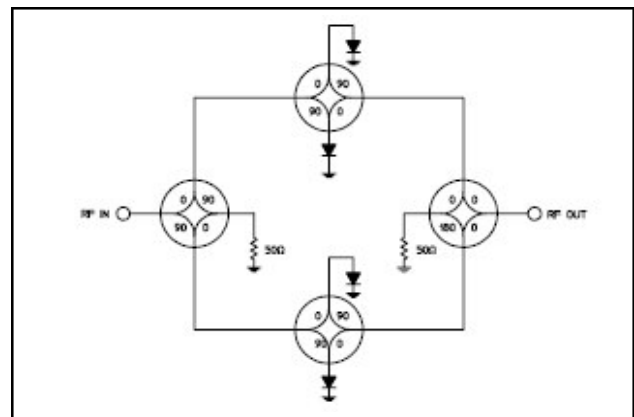


Figure 1A - Phase and Attenuation of MAMDCC0006, Vector Modulator Linearized with MADRCC0006 Linearizer

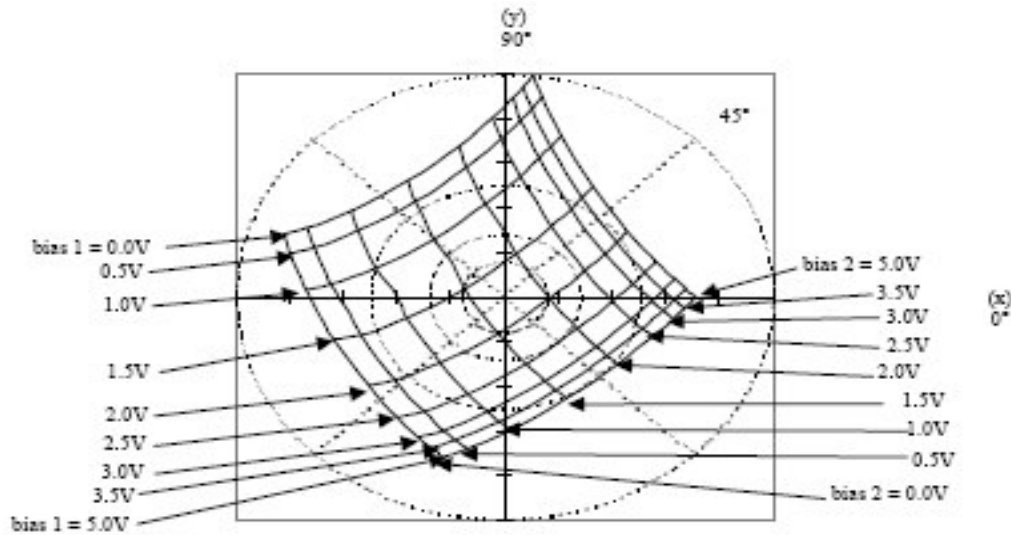
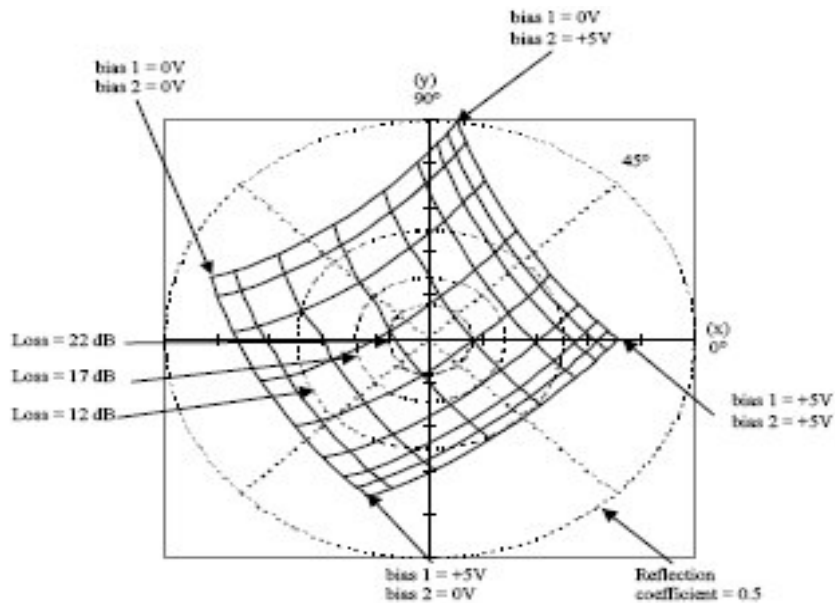


Figure 1B



5. Tic marks on x,y axes refer to reflection coefficient in increments of 0.1V. Reflection coefficients vary from -0.5 to +0.5 on both the x and y axes.
6. Data is for vector modulators driven by linearizers per attached schematic.
7. Inputs to the linearizers vary from 0 to 5V.
8. The phase with the inputs to both linearizers set to +5V is arbitrarily called zero degrees.

Figure 2A - Phase and Attenuation of MAMDCC0006 vs. Bias Current

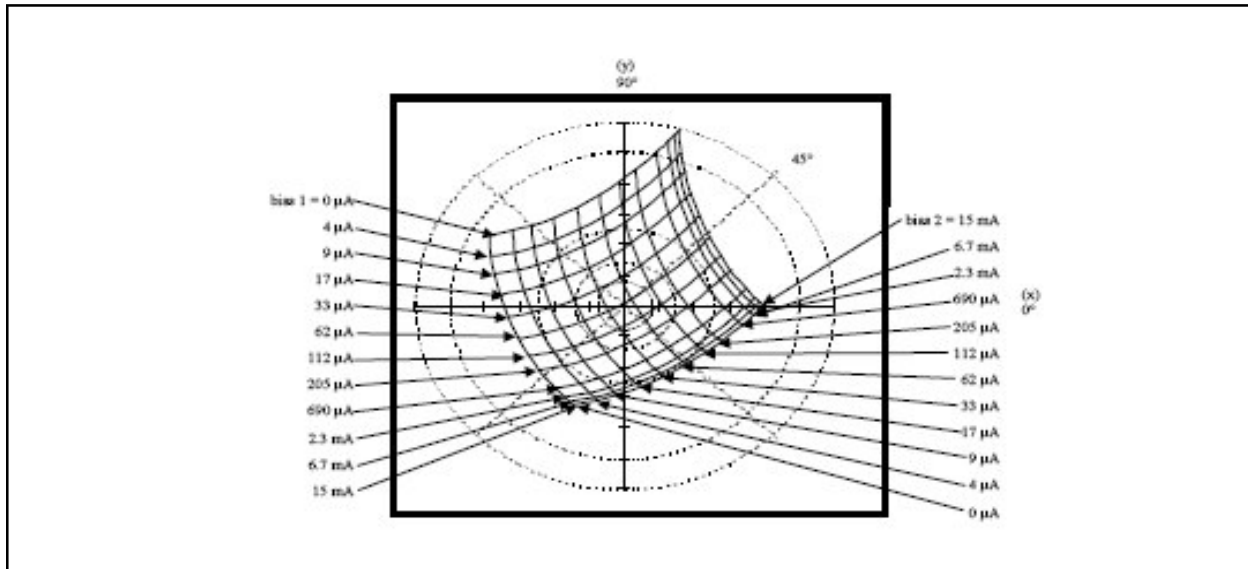
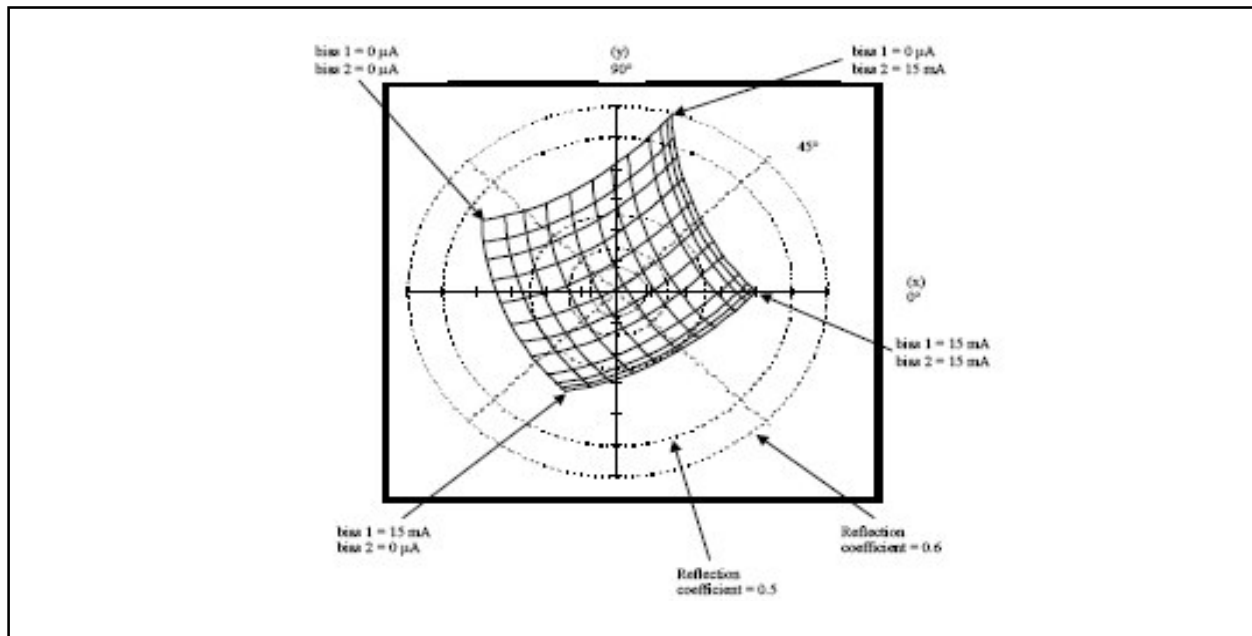


Figure 2B



9. Tic marks on x,y axes refer to reflection coefficient in increments of 0.1. Reflection coefficients vary from -0.6 to +0.6 on both the x and y axes.

10. The phase with the inputs to both linearizers set to +15mA is arbitrarily called zero degrees.

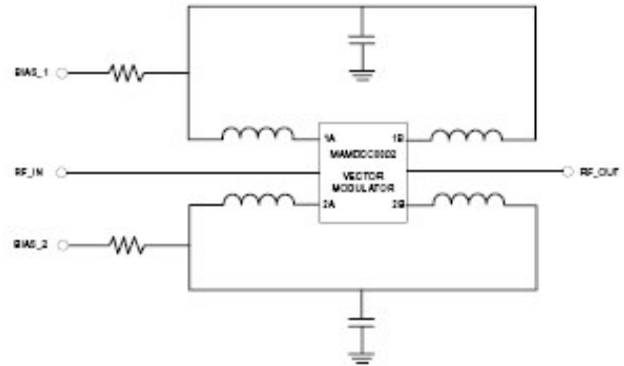
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Ordering Information

Part Number	Package
MAMDCC0006	Bulk Packaging
MAMDCC0006TR	1000 Piece Reel
MAMDCC0006-DC000	Units Mounted on Test Board with Driver

Functional Block Diagram



NOTES
 CAPACITORS ARE 100 PF
 INDUCTORS ARE COILCRAFT SMD025-27MM50 OR EQUIVALENT