

Features

- Operates 925 to 960 MHz
- Low Amplitude Ripple
- Linear Phase
- 50 Ohm Nominal Impedance
- Continuously Variable Across a Full 360 degree range
- Test Boards to be Available
- Test Boards Available
- Lead-Free 4x6 mm PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of MAMDCC0005

Description

M/A-COM's MAIA-007099-000100 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. MAMDCC0005 is ideally suited for wireless infrastructure applications.

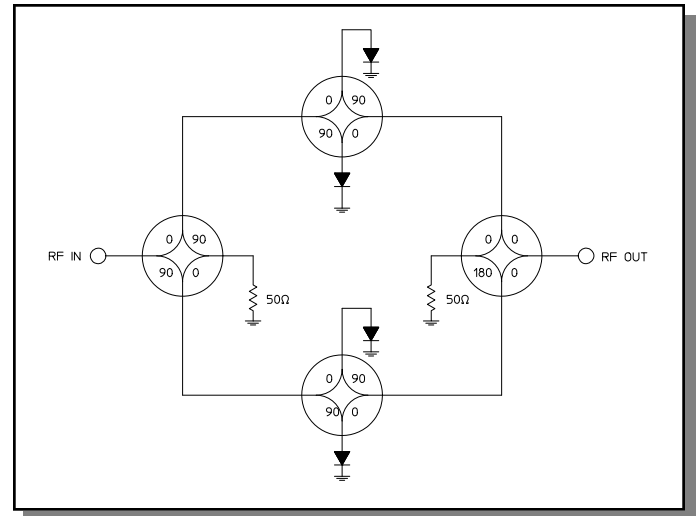
M/A-COM's MADR-007131-000100 Dual Linearizer is designed to simplify the control of Vector Modulators. See Figure 1 and App Note AN3001.

Ordering Information

| Part Number | Package |
|--------------------|-------------------|
| MAIA-007099-000100 | Bulk Packaging |
| MAIA-007099-0001TR | 1000 piece reel |
| MAIA-007099-0001TB | Sample Test Board |

Note: Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

| Pin No. | Function | Pin No. | 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 |

The exposed pad centered on the package bottom must be connected to RF and DC ground. (For PQFN Packages)

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 50\Omega$

| Parameter | Test Conditions | Frequency | Units | Min | Typ | Max |
|-----------------------------|--|---------------|-------|-------|------------|------------|
| Impedance | — | — | Ohms | — | 50 | — |
| Reference Loss | $Z = 50$ Ohms | 925 — 960 MHz | dB | -14.5 | — | -11.5 |
| Attenuation Range | $Z = 50$ Ohms Above Reference Loss | 925 — 960 MHz | dB | 10 | — | — |
| Phase Shift Range | $Z = 50$ Ohms, Over minimum Attenuation Range | 925 — 960 MHz | deg | 0 | — | 360 |
| Amplitude Ripple | $Z = 50$ Ohms, Ref Loss to 10 dB above Ref Loss | 925 — 960 MHz | dB | — | ± 0.05 | ± 0.15 |
| Deviation from Linear Phase | $Z = 50$ Ohms, Ref Loss to 10 dB above Ref Loss | 925 — 960 MHz | deg | — | — | ± 0.75 |
| Return Loss - Input | Ref Loss 5 to 10 dB above Ref Loss | 925 — 960 MHz | dB | 12 | 16 | — |
| | | 925 — 960 MHz | dB | 15 | 18 | — |
| Return Loss - Output | Ref Loss 5 dB 10 dB | 925 — 960 MHz | dB | 8.5 | 15 | — |
| | | 925 — 960 MHz | dB | 11.5 | 18 | — |
| | | 925 — 960 MHz | dB | 14 | 18 | — |
| Input IP_3 | Over 10 dB Attenuation Range | 925 — 960 MHz | dBm | — | +41 | — |
| Input P_{1dB} | Over 10 dB Attenuation Range | 925 — 960 MHz | dBm | — | +29 | — |
| Noise Figure | Over 10 dB Attenuation Range | 925 — 960 MHz | dB | — | — | Note 1 |
| Switching Speed | 50% Control to 10% / 90% RF | — | ns | — | 1000 | — |
| I Supply | — | — | mA | — | — | 25 |

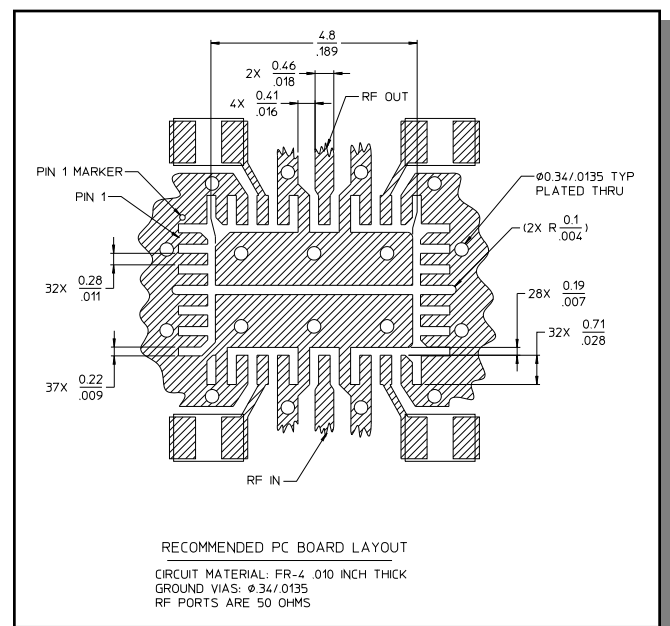
1. Noise figure is approximately equal to the absolute attenuation.

Absolute Maximum Ratings ^{2,3}

| Parameter | Absolute Maximum |
|---|--------------------|
| Max. Input Power 0.8 to 1.1 GHz Other Frequencies | +30 dBm +24 dBm |
| DC Voltages ⁴ V_{bias1} or V_{bias2} | +1.0V |
| DC Current | 50 mA Max per Bias |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +125°C |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.
- Note that external dropping resistors are required to limit the current and voltage on the PIN diodes.

Recommended PCB Configuration



Phase and Attenuation of MAIA-007099-000100, Vector Modulator Linearized with MADR-007131-000100 Dual Linearizer^{5,6,7,8}

Figure 1A

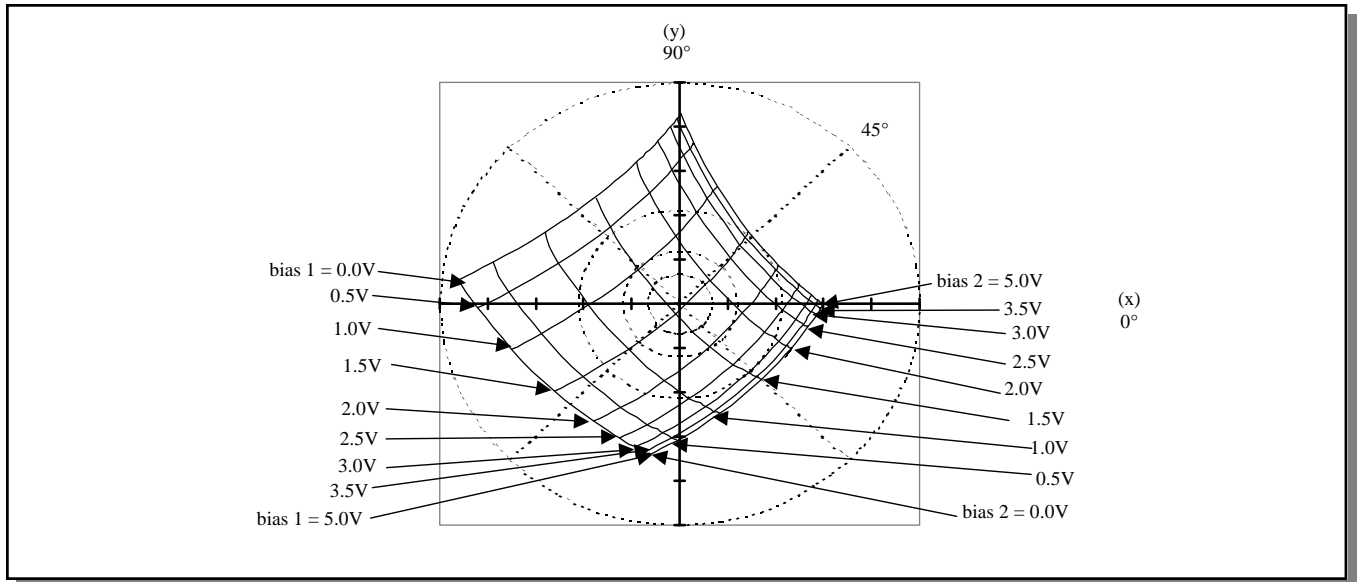
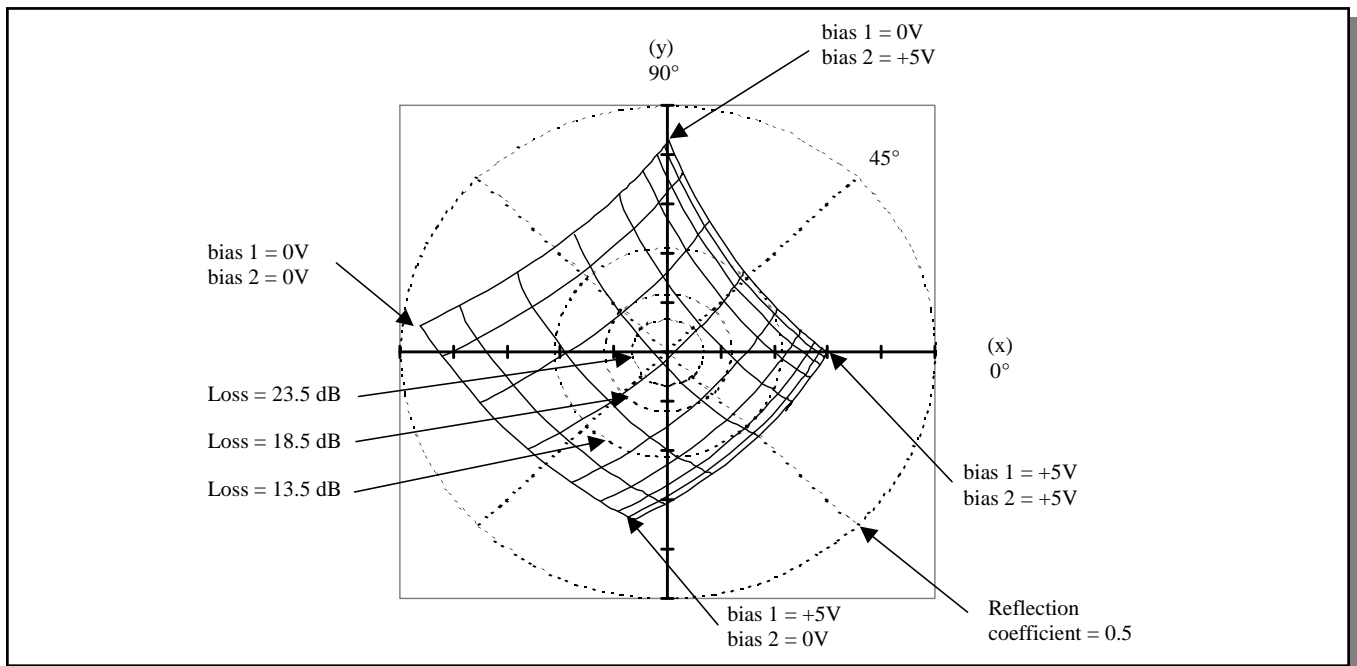


Figure 1B



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. See Application Note AN3001.
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.

Phase and Attenuation of MAIA-007099-000100, Vector Modulator with Current Drive^{9,10}

Figure 2A

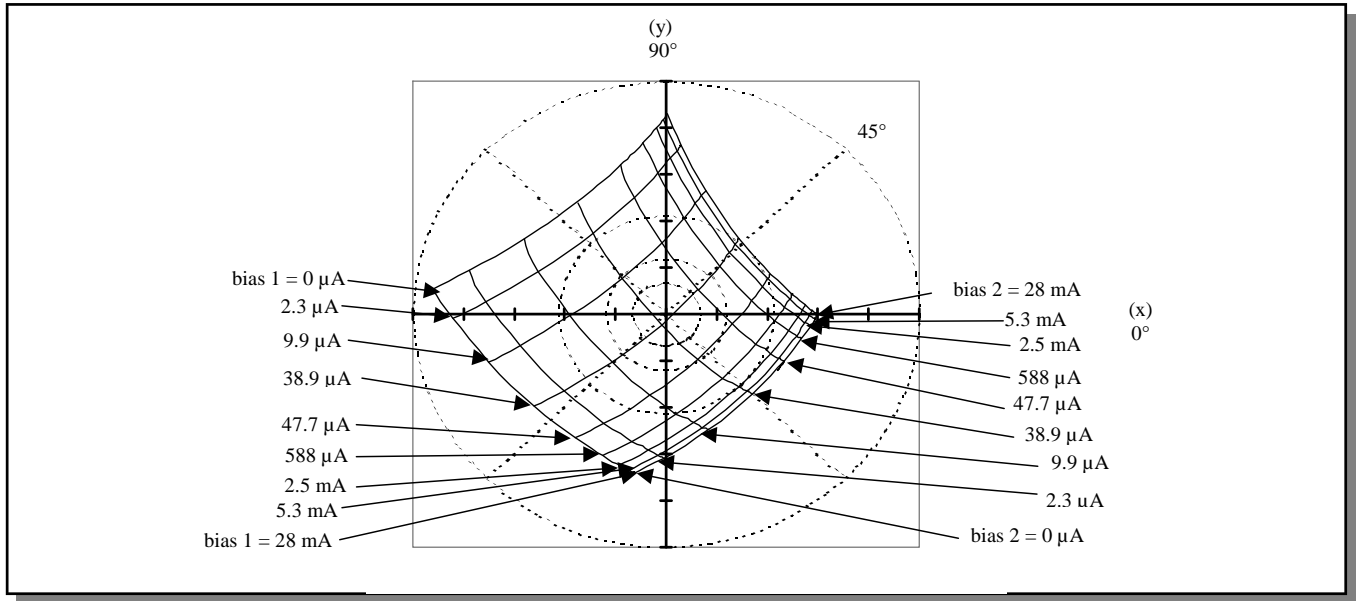
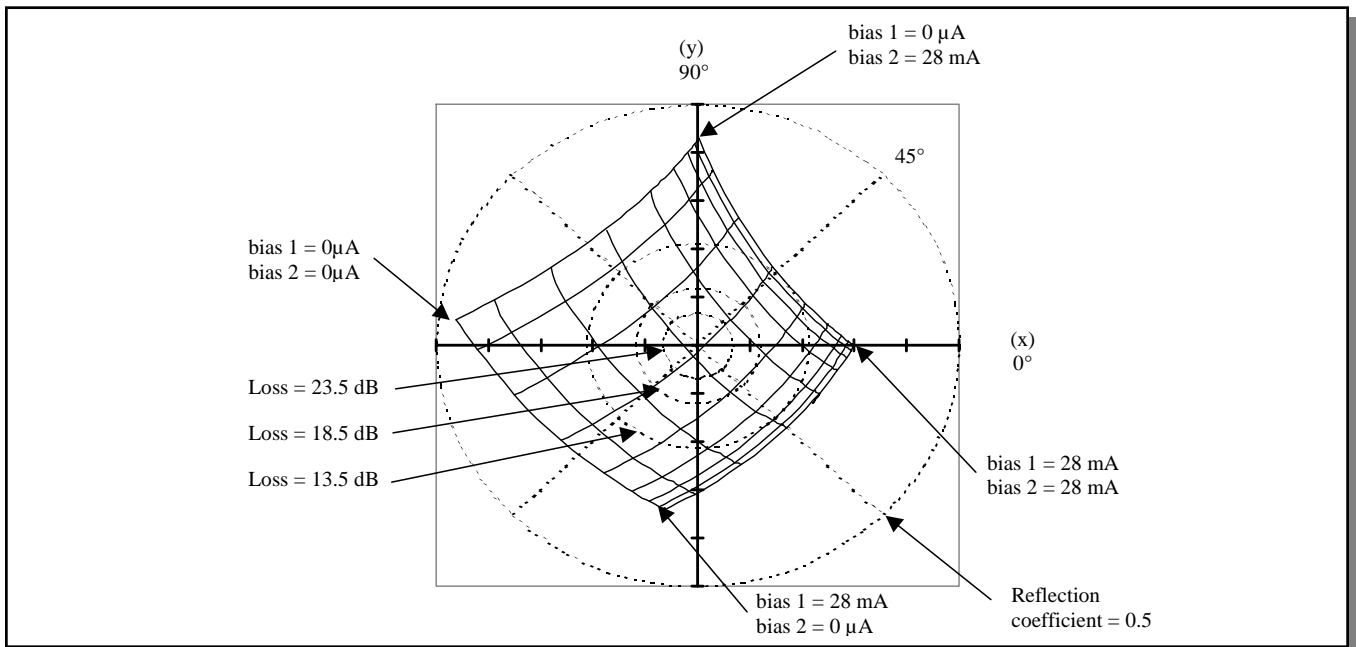


Figure 2B



9. Tic marks on x,y axes refer to reflection coefficient in increments of 0.1. Reflection coefficients vary from -0.5 to $+0.5$ on both the x and y axes.

10. The phase with the inputs to both linearizers set to $+28$ mA is arbitrarily called zero degrees.

Handling Procedures

Please observe the following precautions to avoid damage:

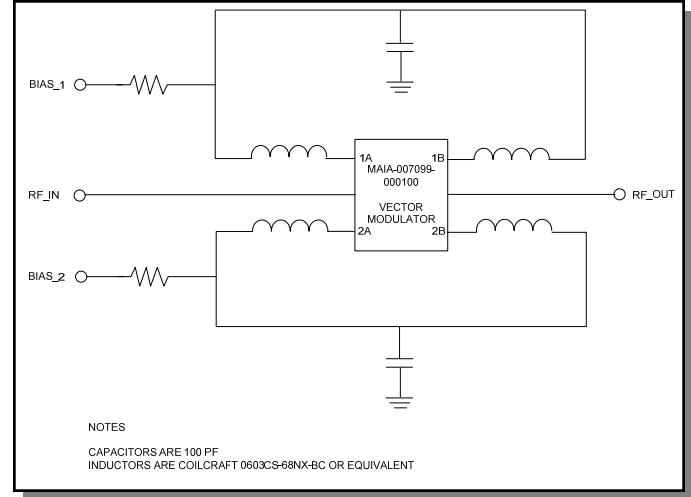
Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

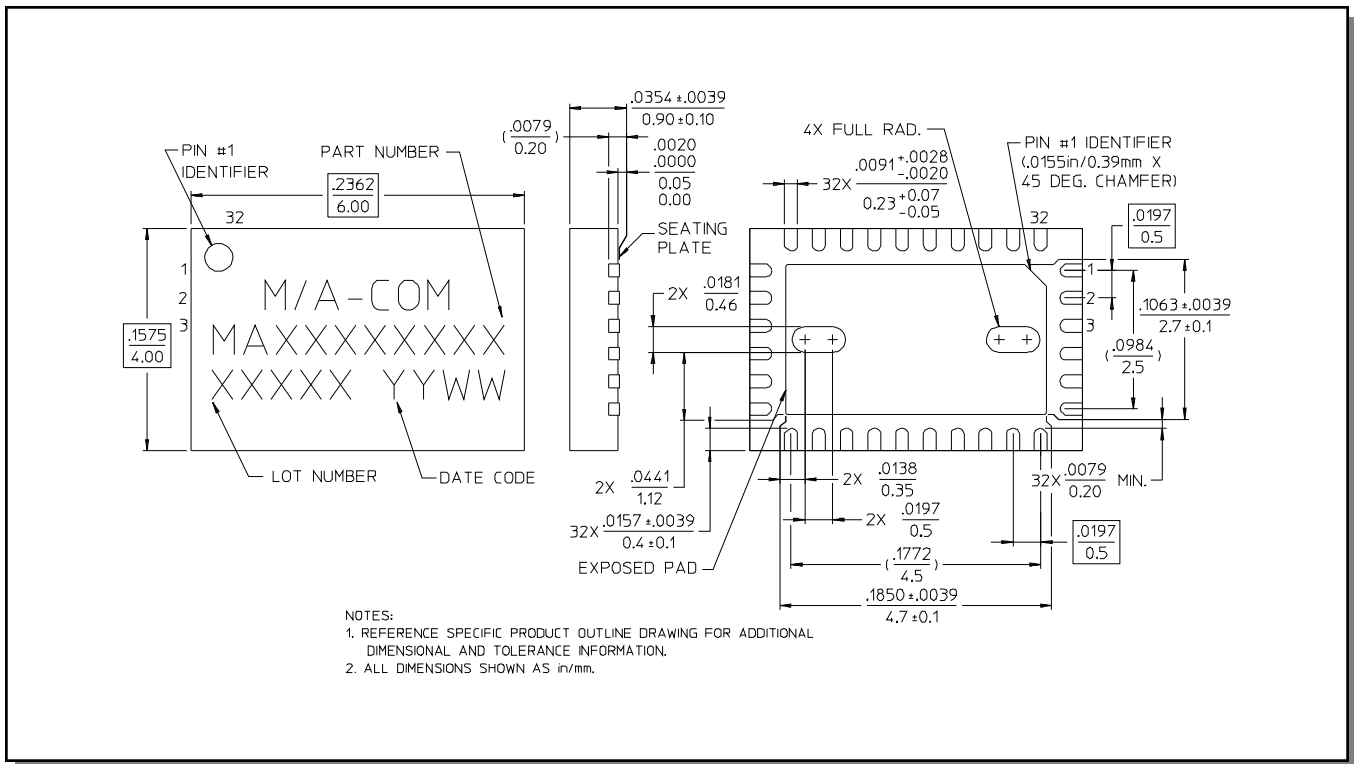
Moisture Sensitivity

The MSL rating for this part is defined as Level 2 per IPC/JEDEC J-STD-020. Parts shall be stored and/or baked as required for MSL Level 2 parts.

Schematic with Off-Chip Components



CSP-6, Lead-Free, 4 x 6 mm, 32-lead, PQFN†



† Reference Application Note M538 for lead-free solder reflow recommendations.