

# 3.4 V, 1.2 W RF Power Amplifier IC

V 1.0

## Features

- Ideal for Pager Applications
- +30.8 dBm Output Power
- 30.8 dB Power Gain
- Single Positive Supply
- Class AB Bias
- 50 Ohm Input Impedance
- Single Capacitor Output Match

## Description

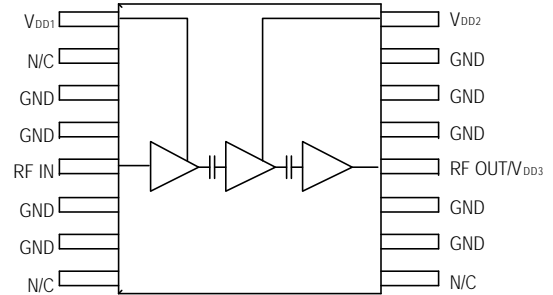
The MA02107AF is a three stage power amplifier, designed for paging applications to have an output power of +30.8 dBm with an input power of 0 dBm. This power amplifier operates at +3.4 volts with 55% typical power added efficiency. The MA02107AF is mounted in a standard outline 16-pin TSSOP plastic package.

The MA02107AF is fabricated using M/A-COM's self-aligned MSAG<sup>®</sup>-Lite MESFET process for a low single supply voltage, high power efficiency, and excellent reliability.

## Ordering Information

| Part Number   | Description              |
|---------------|--------------------------|
| MA02107AF-R7  | 7 inch, 1000 piece reel  |
| MA02107AF-R13 | 13 inch, 3000 piece reel |
| MA02107AF-SMB | Sample Test Board        |

## Functional Schematic



## Pin Configuration

| Pin | Function                            | Description                  |
|-----|-------------------------------------|------------------------------|
| 1   | V <sub>DD1</sub>                    | First Stage Supply Voltage   |
| 2   | N/C                                 | Not Connected                |
| 3   | GND                                 | Ground                       |
| 4   | GND                                 | Ground                       |
| 5   | RF <sub>IN</sub>                    | RF Input                     |
| 6   | GND                                 | Ground                       |
| 7   | GND                                 | Ground                       |
| 8   | N/C                                 | Not Connected                |
| 9   | N/C                                 | Not Connected                |
| 10  | GND                                 | Ground                       |
| 11  | GND                                 | Ground                       |
| 12  | RF <sub>OUT</sub> /V <sub>DD3</sub> | RF Output/Third Stage Supply |
| 13  | GND                                 | Ground                       |
| 14  | GND                                 | Ground                       |
| 15  | GND                                 | Ground                       |
| 16  | V <sub>DD2</sub>                    | Second Stage Supply Voltage  |

Specifications subject to change without notice.

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- **Asia/Pacific:** Tel.+81-44-844-8296, Fax +81-44-844-8298
- **Europe:** Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

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Electrical Specifications:  $T_s = 35\text{ }^\circ\text{C}^1$ ,  $Z_0 = 50\text{ }\Omega^{2,3}$

| Parameter                 | Test Conditions   | Units                     | Min                 | Typ  | Max |
|---------------------------|---|---------------------------|---------------------|------|-----|
| Frequency                 |   | MHz                       | 900                 |      | 942 |
| Output Power              |   | dBm                       | 30.0                | 30.8 |     |
| Power Gain                |   | dB                        |                     | 30.8 |     |
| Power Added Efficiency    |   | %                         | 45                  | 55   |     |
| Input Return Loss         |   | dB                        | 10                  | 15   |     |
| 2 <sup>nd</sup> Harmonics |   | dBc                       |                     | -35  | -29 |
| 3 <sup>rd</sup> Harmonics |   | dBc                       |                     | -50  | -45 |
| Thermal Resistance        | 3 <sup>rd</sup> Stage FET to solder point of pin 13   | $^\circ\text{C}/\text{W}$ |                     | 41   |     |
| Stability                 | +3.0 V < $V_{CC}$ < +5.0 V, $P_{OUT}$ < +31 dBm, VSWR < 5:1, $-40^\circ\text{C} < T_C < +85^\circ\text{C}$ , RBW = 3 MHz max hold |                           | All spurs < -60 dBc |      |     |

1.  $T_s$  is the temperature measured at the soldering point of pin 13.
2. Unless otherwise specified, input power is 0 dBm,  $V_{DD}$  is +3.45 V, and test frequency is 900 MHz.
3. The output is externally matched to 50 ohms.

Absolute Maximum Ratings<sup>1</sup>

| Parameter                    | Absolute Maximum  |
|------------------------------|---|
| Max Input Power              | +6 dBm  |
| Operating Voltages           | +5.0 volts  |
| Operating Temperature, $T_s$ | $-40\text{ }^\circ\text{C}$ to $+70\text{ }^\circ\text{C}$  |
| Channel Temperature          | $+150\text{ }^\circ\text{C}$                                |
| Storage Temperature          | $-40\text{ }^\circ\text{C}$ to $+150\text{ }^\circ\text{C}$ |

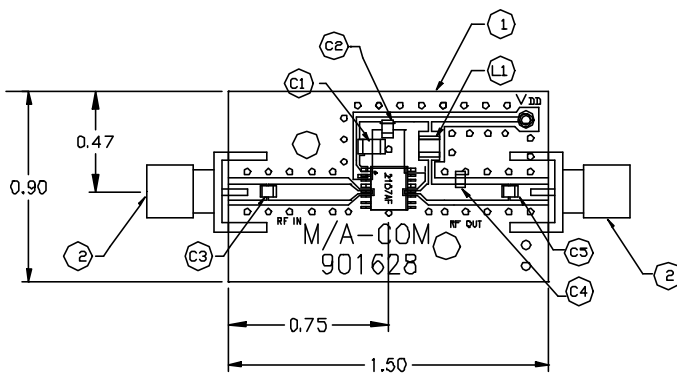
1. Exceeding any one or combination of these limits may cause permanent damage.

Application Information

Static Sensitivity

Gallium arsenide integrated circuits are ESD sensitive and can be damaged by static electricity. Use proper ESD precautions when handling these devices.

Board Layout

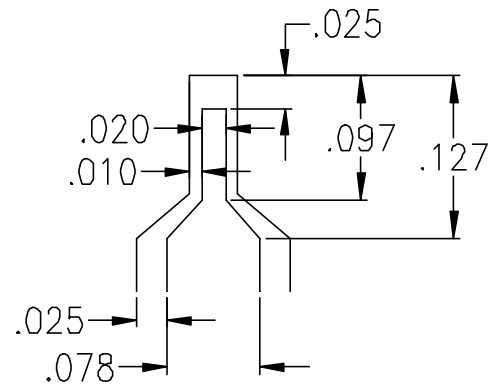


Sample Test Board

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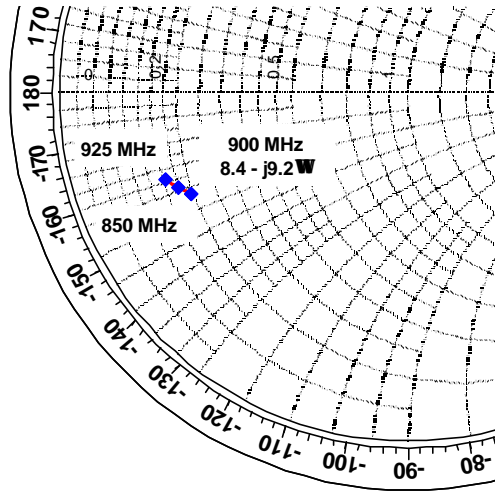
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50 Ohm Lead Transition

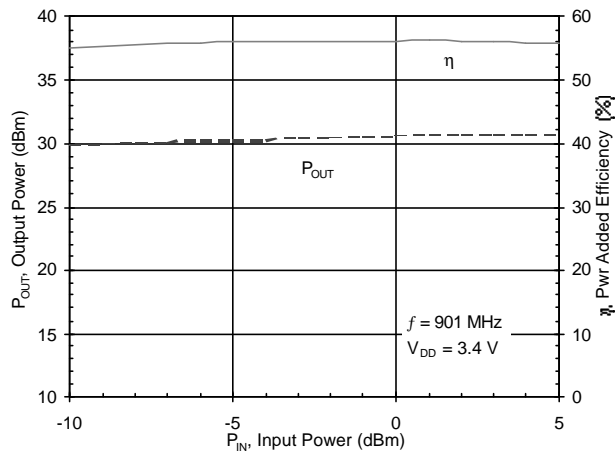


Output Match Impedance (as seen from pin 12)

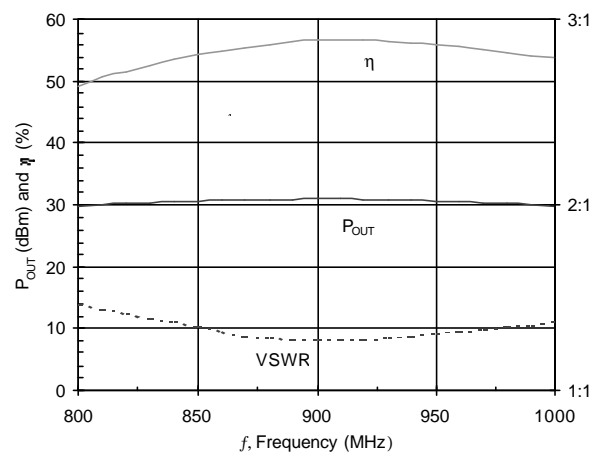


Typical Performance Curves

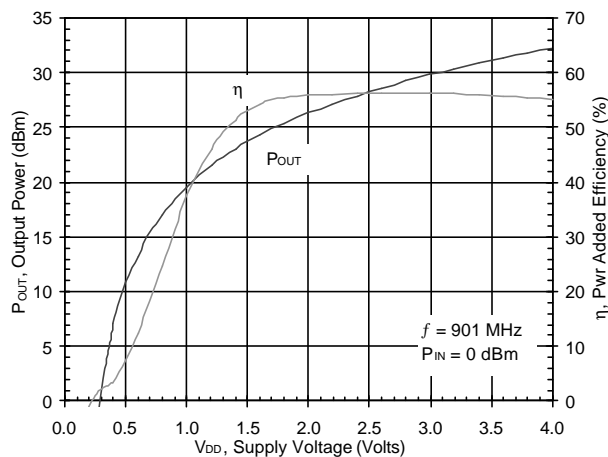
Output Power and PAE vs. Input Power



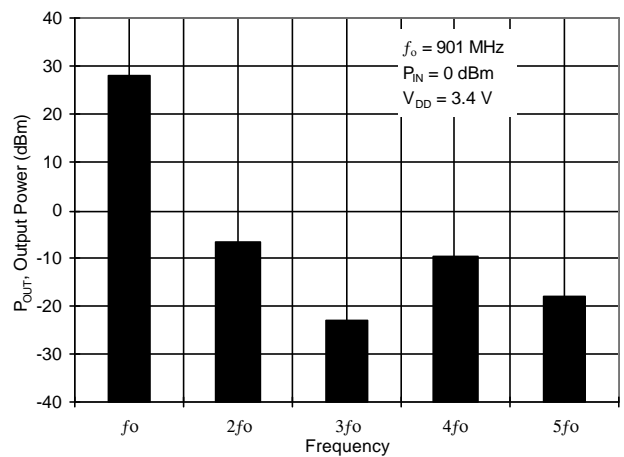
Output Power, PAE, and VSWR vs. Frequency



Output Power and PAE vs. Supply Voltage



Harmonics



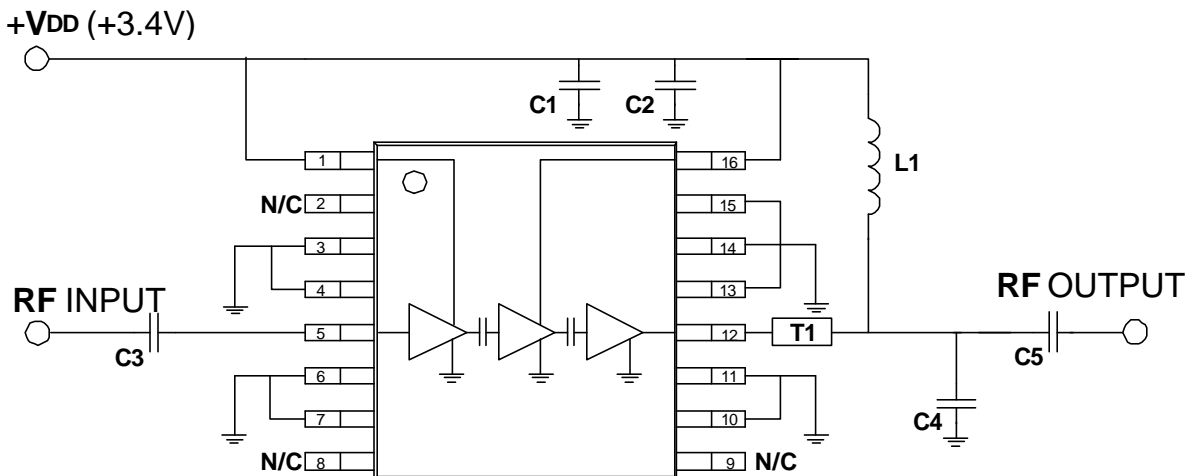
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Application Schematic

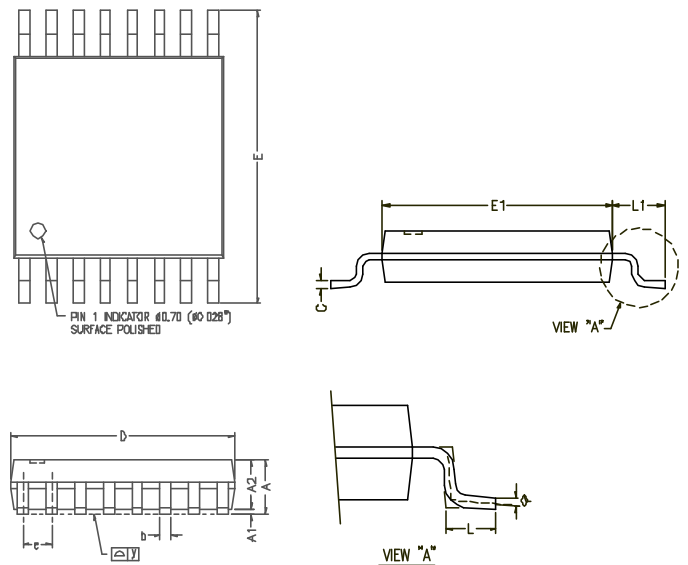


List of components:

- C1 = 0.1µF Kemet multilayer ceramic chip capacitor (C1206C104K5RAC)
- C2 = 4700 pF Kemet multilayer ceramic chip capacitor (C0805C472K5RAC)
- C4 = 6.8 pF DLI multilayer ceramic chip capacitor (C11AH7R5B5TXL)
- C3 = C5 = 100 pF DLI multilayer ceramic chip capacitor (DC Block; C11AH101K5TXL)
- L1 = 39 nH Coilcraft chip inductor (1008CS.390XMBB)
- T1 = 0.19" of 50 ohm grounded coplanar waveguide (60 mil GETEK board)

TSSOP-16 Package

| SYMBOL | Dimensions in millimeters |       |      | Dimensions in inches |       |       |
|--------|---------------------------|-------|------|----------------------|-------|-------|
|        | MIN                       | NOM   | MAX  | MIN                  | NOM   | MAX   |
| A      | 1.05                      | 1.10  | 1.20 | 0.041                | 0.043 | 0.047 |
| A1     | 0.05                      | 0.10  | 0.15 | 0.002                | 0.004 | 0.006 |
| A2     | —                         | 1.00  | 1.05 | —                    | 0.039 | 0.041 |
| b      | 0.20                      | 0.25  | 0.28 | 0.008                | 0.010 | 0.011 |
| C      | —                         | 0.127 | —    | —                    | 0.005 | —     |
| D      | 4.90                      | 5.075 | 5.10 | 0.193                | 0.200 | 0.201 |
| E      | 6.20                      | 6.40  | 6.60 | 0.244                | 0.252 | 0.260 |
| E1     | 4.30                      | 4.40  | 4.50 | 0.169                | 0.173 | 0.177 |
| e      | —                         | 0.65  | —    | —                    | 0.025 | —     |
| L      | 0.50                      | 0.60  | 0.70 | 0.020                | 0.024 | 0.028 |
| L1     | 0.90                      | 1.00  | 1.10 | 0.035                | 0.039 | 0.043 |
| y      | —                         | —     | 0.10 | —                    | —     | 0.004 |
| θ      | 0°                        | 4°    | 8°   | 0°                   | 4°    | 8°    |



NOTES:

1. Controlling dimension: mm
2. Lead frame material: EFTEC 64
3. Dimension "D" does not include mold flash, protrusions or gate burrs
4. Dimension "E" does not include interlead flash or protrusions
5. Tolerance: ±0.254 mm (±0.010") unless otherwise specified
6. End flash max: 0.12 mm (0.005 ")

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