



Mini-Circuits

HIGH GAIN, LOW CURRENT

# Monolithic Amplifier

PSA-8A+

50Ω

DC to 4 GHz

## THE BIG DEAL

- Wideband, DC to 4 GHz
- High Gain, 31 dB typ. at 0.1GHz
- Low NF 3.0 dB typ. at 0.1GHz
- Low Current, 36 mA typ.
- Protected by US Patent 6,943,629



Generic photo used for illustration purposes only

CASE STYLE: CA1389

### +RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

## APPLICATIONS

- Cellular
- PCS
- Communication receivers & Transmitters
- Satellite communication
- Military

## PRODUCT OVERVIEW

The PSA-8A+ is a HBT based wideband low noise MMIC Amplifier with high gain and low current. This design operates on a single 5V supply, is well matched for 50 Ohms and comes in a SOT-363 package, accommodating dense circuit board layouts.

## KEY FEATURES

| Feature                          | Advantages                                                                                                                                    |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| High Gain, 31 dB typ. at 0.1GHz  | Enables signal amplification without the need for multiple gain stages.                                                                       |
| Low Noise, 3.0 dB typ. at 0.1GHz | Enables lower system noise figure performance. Low NF and High Gain results in lower NF systems                                               |
| SOT-363 Package                  | Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. |

REV. A  
ECO-011279  
PSA-8A+  
MCL NY  
220105





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**PSA-8A+****ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C, ZO=50Ω**

| Parameter                                             | Condition (GHz) | Min. | Typ.  | Max. | Units |
|-------------------------------------------------------|-----------------|------|-------|------|-------|
| Frequency Range <sup>4</sup>                          |                 | DC   |       | 4.0  | GHz   |
| Gain                                                  | 0.01            | 26.7 | 30.8  | 36.2 | dB    |
|                                                       | 0.1             | 26.9 | 31    | 36.4 |       |
|                                                       | 1.0             | 22.1 | 25.4  | 29.9 |       |
|                                                       | 2.0             | 17.5 | 20.1  | 23.6 |       |
|                                                       | 3.0             | —    | 15.6  | —    |       |
|                                                       | 4.0             | —    | 11.2  | —    |       |
| Input Return Loss                                     | 0.01            |      | 11    |      | dB    |
|                                                       | 0.1             |      | 12    |      |       |
|                                                       | 1.0             |      | 18    |      |       |
|                                                       | 2.0             |      | 18    |      |       |
|                                                       | 3.0             |      | 12    |      |       |
|                                                       | 4.0             |      | 8     |      |       |
| Output Return Loss                                    | 0.01            |      | 20    |      | dB    |
|                                                       | 0.1             |      | 19    |      |       |
|                                                       | 1.0             |      | 7     |      |       |
|                                                       | 2.0             |      | 9     |      |       |
|                                                       | 3.0             |      | 16    |      |       |
|                                                       | 4.0             |      | 9     |      |       |
| P1dB                                                  | 0.01            |      | 12.1  |      | dBm   |
|                                                       | 0.1             |      | 12.8  |      |       |
|                                                       | 1.0             |      | 11.9  |      |       |
|                                                       | 2.0             |      | 9.6   |      |       |
|                                                       | 3.0             |      | 6.5   |      |       |
|                                                       | 4.0             |      | 3.1   |      |       |
| OIP3<br>(Pout = -5dBm/Tone)                           | 0.01            |      | 26.1  |      | dBm   |
|                                                       | 0.1             |      | 25.8  |      |       |
|                                                       | 1.0             |      | 23.2  |      |       |
|                                                       | 2.0             |      | 20    |      |       |
|                                                       | 3.0             |      | 16.2  |      |       |
|                                                       | 4.0             |      | 11.3  |      |       |
| Noise Figure                                          | 0.01            |      | 3.1   |      | dB    |
|                                                       | 0.1             |      | 3     |      |       |
|                                                       | 1.0             |      | 3.7   |      |       |
|                                                       | 2.0             |      | 4     |      |       |
|                                                       | 3.0             |      | 4.4   |      |       |
|                                                       | 4.0             |      | 4.8   |      |       |
| Supply Voltage (Vs)                                   | DC              | 4.75 | 5     | 5.25 | V     |
| Device Operating Current (Is)                         | DC              |      | 36    | 39   | mA    |
| Device Current Variation vs. Voltage <sup>2</sup>     |                 |      | 0.024 |      | mA/mV |
| Device Current Variation vs. Temperature <sup>3</sup> |                 |      | 7.7   |      | μA/°C |
| Thermal Resistance, Junction to ground lead           |                 |      | 140   |      | °C/W  |

1. Measured on Mini-Circuits Characterization Test Board TB-PSA-8A+. See Characterization Test Circuit (Fig. 1)

2. Device Current Variation vs. Voltage = (Current at 5.25V - Current at 4.75V)/(5.25V-4.75V)\*1000)

3. Device Current Variation vs. Temperature = (Current at 85°C - Current at -45°C)/130

4. Guaranteed specifications DC to 4 GHz. Low frequency cut-off determined by external coupling capacitor.

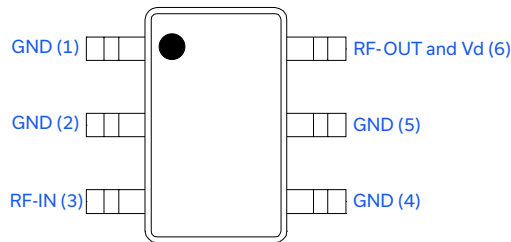
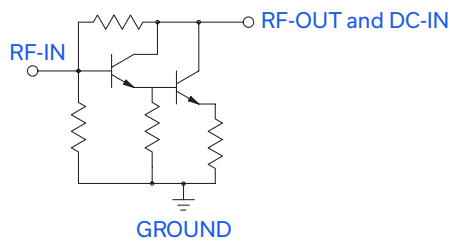


# Monolithic Amplifier

**PSA-8A+****MAXIMUM RATINGS<sup>5</sup>**

| Parameter                  | Ratings        |
|----------------------------|----------------|
| Operating Temperature      | -40°C to 85°C  |
| Storage Temperature        | -65°C to 150°C |
| Input Power (CW)           | 13 dBm         |
| Operating Current on Pin 6 | 65mA           |

5. Permanent damage may occur if any of these limits are exceeded. Electrical Maximum ratings are not intended for continuous normal operation.

**SIMPLIFIED SCHEMATIC AND PIN DESCRIPTION**

| Function       | Pin Number | Description (See Application Circuit, Fig. 1)                                                                   |
|----------------|------------|-----------------------------------------------------------------------------------------------------------------|
| RF-IN          | 3          | RF input pin (connect to RF-IN via C1)                                                                          |
| RF-OUT & DC-IN | 6          | RF output pin (connected to RF-OUT via blocking cap C2 and supply voltage VDD via RF Choke (CHK) & Resistor R1) |
| GND            | 1,2,4,5    | Connections to ground                                                                                           |



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## CHARACTERIZATION TEST / APPLICATION CIRCUIT

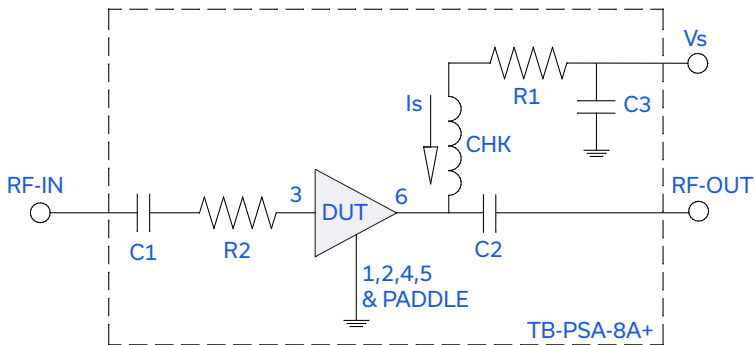


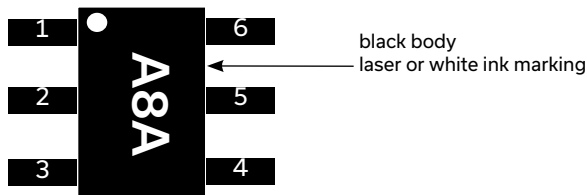
Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Board TB-PSA-8A+) Gain, Return loss, Output power at 1dB compression (P1 dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain: Pin = -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at output.

| Component | Size      | Value    | Part Number         | Manufacturer |
|-----------|-----------|----------|---------------------|--------------|
| DUT       | SOT-363   | --       | PSA-8A+             | MCL          |
| C1,C2     | 0402      | 2400pF   | GRM155R71H-242JA01D | Murata       |
| C3        | 0603      | 0.1uF    | GCJ188R71H-104KA12D | Murata       |
| R1        | 0805      | 36.5Ohms | RK73H2ATTD36R5F     | KOA          |
| CHK       | 0.15x0.15 | --       | TCCH-80+            | MCL          |
| R2        | 402       | 100hms   | RK73H1ETTP10R0F     | KOA          |

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control

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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS [CLICK HERE](#)

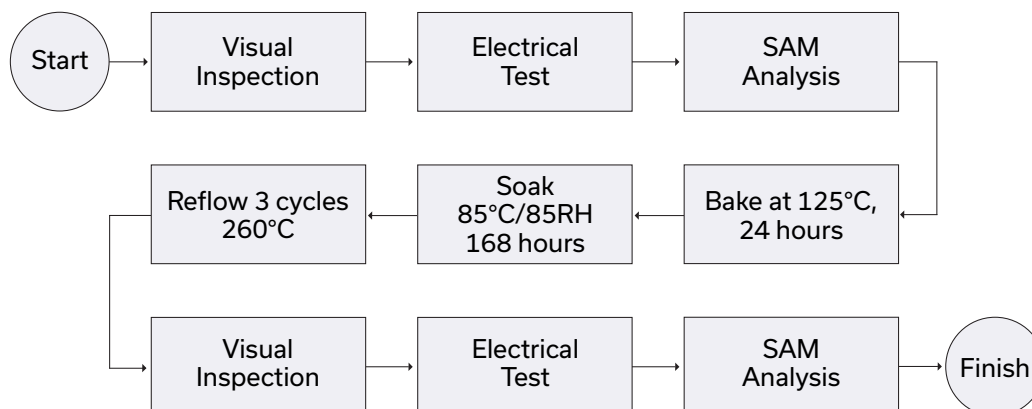
|                                                      |                                                                            |
|------------------------------------------------------|----------------------------------------------------------------------------|
| Performance Data                                     | Data Table<br>Swept Graphs<br>S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style                                           | CA1389 Plastic molded SOT-363 package, lead finish: Matte-Tin              |
| Tape & Reel<br>Standard quantities available on reel | F101<br>7" reels with 20, 50, 100, 200, 500, 1K, or 2K devices             |
| Suggested Layout for PCB Design                      | PL-643                                                                     |
| Evaluation Board                                     | TB-PSA-8A+                                                                 |
| Environmental Ratings                                | ENV08T2                                                                    |

## ESD RATING

Human Body Model (HBM): Class 1B (500 v to < 1,000 v) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (< 100 v) in accordance with ANSI/ESD STM 5.2 - 1999

## MSL TEST FLOW CHART



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