

Wideband, Microwave

# Monolithic Amplifier

AVA-183A+

50Ω

5 to 18 GHz

## The Big Deal

- Surface Mount Amplifier up to 18 GHz
- Integrated matching, DC Blocks and bias circuits
- Superior Value
- Suitable for low phase noise applications



CASE STYLE: DQ849

## Product Overview

The AVA-183A+ is a surface mount, microwave amplifier fabricated using InGaAs PHEMT technology and is a fully integrated gain block up to 18 GHz. It is packaged in Mini-Circuits industry standard 3x3 mm MCLP package, which provides excellent RF and thermal performance. The AVA-183A+ integrates the entire matching network with the majority of the bias circuit inside the package, reducing the need for complicated external circuits. This approach makes the AVA-183A+ extremely flexible and enables simple, straightforward use.

## Key Features

| Feature  | Advantages   |
|--|--|
| Wideband, 5 GHz to 18 GHz                                      | Broad frequency range supports a wide array of applications from microwave radio and radar , to military communications and countermeasures.   |
| Excellent Gain Flatness  | Typical $\pm 1.2$ dB gain flatness across the entire frequency range minimizes the need for external equalizer networks making it a great fit for instrumentation and EW applications.   |
| High Isolation   | With reverse isolation of 31-42 dB (17-23 dB directivity), the AVA-183A+ is an excellent choice for buffering broadband circuits. It is an ideal LO driver amplifier and provides designers system flexibility and margin when integrating cascaded RF components. |
| Single +5V Supply  | <ul style="list-style-type: none"><li>• No hassle associated with amplifiers using dual supply; such as power supply sequencing.</li><li>• Integrated output bias-tee, simplifies layout &amp; reduces cost.</li></ul>   |
| Manufacturability  | MSL1 and ESD Class1A (HBM) ratings minimize special handling on production lines.  |
| Low additive phase noise, typically -151 dBc/Hz @10 KHz offset | Ideal for low phase noise synthesizer applications   |

### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



# Monolithic Amplifier

5 GHz - 18 GHz

## Product Features

- Gain, 13.8 dB typ. & Flatness,  $\pm 1.2$  dB
- Output Power, up to +19.0 dBm typ.
- Excellent isolation, 36 dB typ. at 12 GHz
- Single Positive Supply Voltage, 5.0V
- Integrated DC blocks, Bias-Tee & Microwave bypass capacitor
- Unconditionally Stable
- Aqueous washable; 3mm x 3mm SMT package



Generic photo used for illustration purposes only

## AVA-183A+

CASE STYLE: DQ849

**+RoHS Compliant**

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

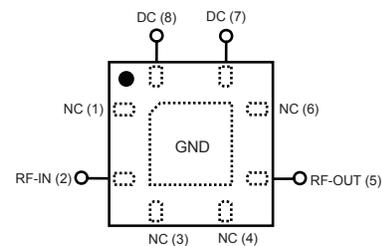
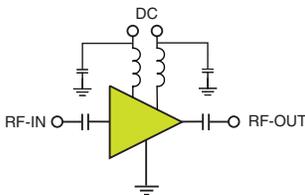
## Typical Applications

- Military EW and Radar
- DBS
- Wideband Isolation amplifier
- Microwave point-to-point radios
- Satellite systems

## General Description

The AVA-183A+ is a wideband monolithic amplifier fabricated using InGaAs PHEMT technology with outstanding gain flatness up to 18 GHz. It is unconditionally stable, outstanding isolation enables it to be used as a wideband isolation amplifier or buffer amplifier in a variety of microwave systems.

### simplified schematic and pad description



| Function | Pad Number                   | Description (See Application Circuit, Fig. 2)                  |
|----------|------------------------------|--|
| RF-IN    | 2                            | RF input pad   |
| RF-OUT   | 5                            | RF output pad  |
| DC       | 8( $V_{D1}$ ), 7( $V_{D2}$ ) | DC power supply  |
| GND      | paddle in center of bottom   | Connected to ground  |
| NOT USED | 1,3,4,6                      | No internal connection; recommended use: per PCB Layout PL-328 |

#### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
 C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

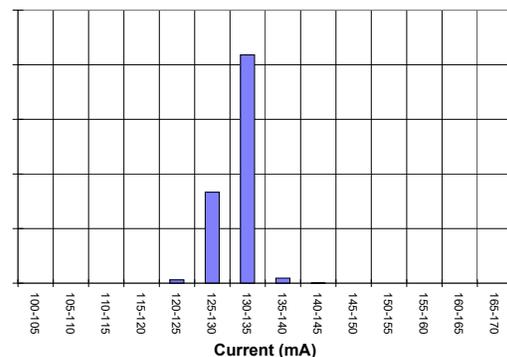


**Electrical Specifications<sup>(1)</sup> at 25°C, Z<sub>o</sub>=50Ω, (refer to characterization circuit, Fig. 1)**

| Parameter   | Condition (GHz)       | Min. | Typ.  | Max. | Units  |
|---|-----------------------|------|-------|------|--------|
| Frequency Range                                     |                       | 5.0  |       | 18.0 | GHz    |
| DC Voltage (V <sub>D1</sub> , V <sub>D2</sub> )     |                       |      | 5.0   |      | V      |
| DC Current (I <sub>D1</sub> +I <sub>D2</sub> )      |                       | 104  | 131   | 166  | mA     |
| Gain  | 5.0                   | —    | 12.9  | —    | dB     |
|   | 8.0                   | 12.0 | 14.7  | —    |        |
|   | 10.0                  | 12.0 | 14.0  | —    |        |
|   | 12.0                  | —    | 13.4  | —    |        |
|   | 14.0                  | —    | 13.1  | —    |        |
|   | 16.0                  | —    | 13.6  | —    |        |
|   | 18.0                  | 10.8 | 12.4  | —    |        |
| Input Return Loss                                   | 5.0                   |      | 10.4  |      | dB     |
|   | 8.0                   |      | 17.0  |      |        |
|   | 10.0                  |      | 11.0  |      |        |
|   | 12.0                  |      | 11.0  |      |        |
|   | 14.0                  |      | 11.0  |      |        |
|   | 16.0                  |      | 11.0  |      |        |
| Output Return Loss                                  | 5.0                   |      | 8.0   |      | dB     |
|   | 8.0                   |      | 18.0  |      |        |
|   | 10.0                  |      | 14.0  |      |        |
|   | 12.0                  |      | 11.0  |      |        |
|   | 14.0                  |      | 10.6  |      |        |
|   | 16.0                  |      | 11.2  |      |        |
| Output IP3 <sup>(2)</sup>                           | 5.0                   |      | 32.2  |      | dBm    |
|   | 8.0                   |      | 29.0  |      |        |
|   | 10.0                  |      | 27.7  |      |        |
|   | 12.0                  |      | 26.3  |      |        |
|   | 14.0                  |      | 25.1  |      |        |
|   | 16.0                  |      | 24.3  |      |        |
| Output Power @ 1 dB compression                     | 5.0                   | —    | 17.6  |      | dBm    |
|   | 8.0                   | —    | 18.0  |      |        |
|   | 10.0                  | 16.0 | 19.0  |      |        |
|   | 12.0                  | —    | 19.0  |      |        |
|   | 14.0                  | —    | 19.9  |      |        |
|   | 16.0                  | —    | 19.6  |      |        |
| Noise Figure  | 5.0                   |      | 7.4   |      | dB     |
|   | 8.0                   |      | 4.3   |      |        |
|   | 10.0                  |      | 4.5   |      |        |
|   | 12.0                  |      | 4.8   |      |        |
|   | 14.0                  |      | 5.1   |      |        |
|   | 16.0                  |      | 5.1   |      |        |
| Additive Phase Noise                                | 5.0                   |      |       |      | dBc/Hz |
|   | 8.0                   |      |       |      |        |
|   | 10.0                  |      |       |      |        |
|   | 12.0                  |      |       |      |        |
|   | 14.0                  |      |       |      |        |
|   | 16.0                  |      |       |      |        |
| Directivity (Isolation-Gain)                        | 5.0 GHz, 10KHz offset |      | -151  |      | dB     |
| DC Current Variation vs. Temperature <sup>(3)</sup> |                       |      | 0.046 |      | mA/°C  |
| Thermal Resistance                                  |                       |      | 61    |      | °C/W   |

**Absolute Maximum Ratings<sup>(4)</sup>**

| Parameter                            | Ratings        |
|--------------------------------------|----------------|
| Operating Temperature <sup>(5)</sup> | -40°C to 85°C  |
| Storage Temperature                  | -55°C to 100°C |
| Channel Temperature                  | 150°C          |
| DC Voltage (Pad 7,8)                 | 5.5 V          |
| DC Voltage (Pads 2, 5)               | 10 V           |
| Power Dissipation                    | 980 mW         |
| DC Current (Pad 7+8)                 | 180 mA         |
| Input Power (CW)                     | 20 dBm         |



<sup>(1)</sup> Measured on Mini-Circuits Characterization test fixture TB-547-2+ See Characterization Test Circuit (Fig. 1)

<sup>(2)</sup> At P<sub>out</sub>=9dBm/100MHz

<sup>(3)</sup> (Current at 85°C - Current at -45°C)/130

<sup>(4)</sup> Permanent damage may occur if any of these limits are exceeded.

<sup>(5)</sup> These maximum ratings are not intended for continuous normal operation.

<sup>(6)</sup> Defined with reference to ground pad temperature.

**Notes**

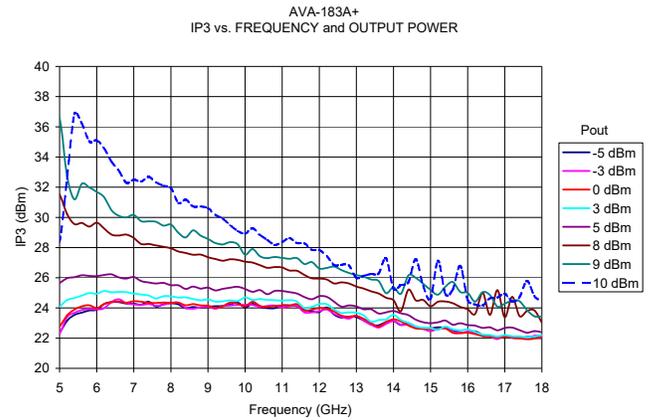
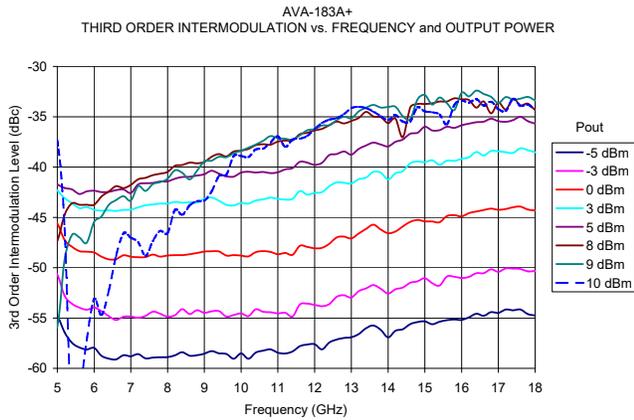
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

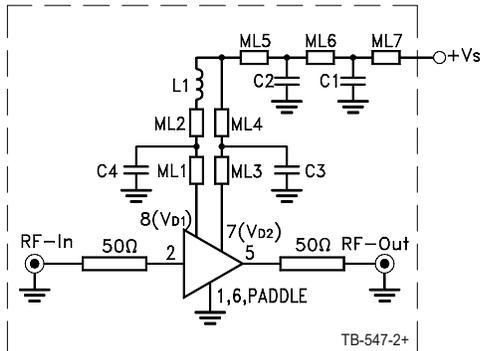
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



Intermodulation and IP3 vs. Frequency and Output Power



Characterization Test Circuit



C1=5.6pF, 0402 (NPO) ML1-ML7 are short microstrip lines Refer to 98-PL-328  
 C2=18pF, 0402 (NPO)  
 C3=0.001μF, 0402 (NPO)  
 C4=0.1 μF, 0402 (X7R)  
 L1=3.3nH, 0805 (wire wound)

Recommended Application Circuit

(refer to evaluation board for PCB Layout and component values)

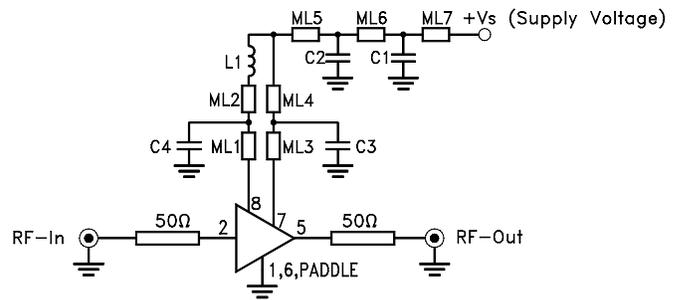


Fig 2. Recommended Application Circuit

Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Board TB-547-2+) Gain, Output power at 1dB compression (P1dB), Noise Figure, Output IP3 (OIP3) are measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain: Pin=-25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 9 dBm/tone at output.
3. Vs adjusted for 5.0V at device ( $V_{D1}$  and  $V_{D2}$ ), compensating loss of bias lines.

Product Marking



← black body  
 ← model family designation

Marking may contain other features or characters for internal lot control

Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



| <b>Additional Detailed Technical Information</b>  |   |
|---|---|
| <i>additional information is available on our dash board. To access this information <a href="#">click here</a></i> |   |
| <b>Performance Data</b>   | Data Table  |
|   | Swept Graphs  |
|   | S-Parameter (S2P Files) Data Set (.zip file)                                  |
| <b>Case Style</b>   | DQ849 <i>Plastic package, exposed paddle, lead finish: Matte-tin</i>          |
| <b>Tape &amp; Reel</b><br>Standard quantities available on reel   | F104<br><i>7" reels with 10, 20, 50, 100, 200, 500, 1000 or 2000 devices.</i> |
| <b>Suggested Layout for PCB Design</b>  | PL-328  |
| <b>Evaluation Board</b>   | TB-547-2+   |
| <b>Environmental Ratings</b>  | ENV08T1   |

## ESD Rating

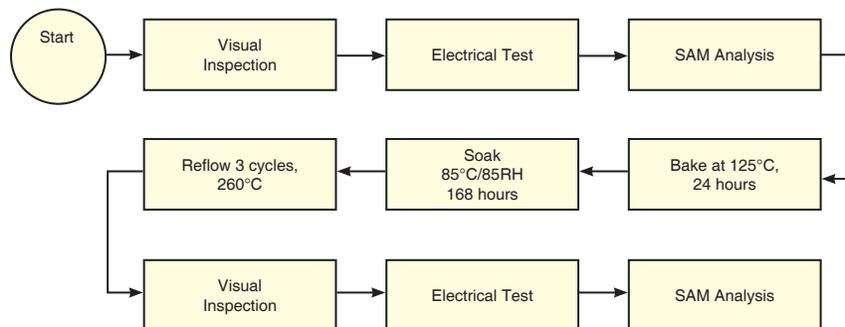
Human Body Model (HBM): 1A (250 to <500V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): M1 (25V) in accordance with ANSI/ESD STM5.2-1999

## MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

### MSL Test Flow Chart



#### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
 C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

