



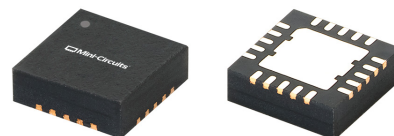
MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

## THE BIG DEAL

- High P1dB, Typ. +22.9 dBm
- High OIP3, Typ. +33 dBm
- Supply Voltage, +6 V at 160 mA
- 4x4 mm 20-Lead QFN-Style Package

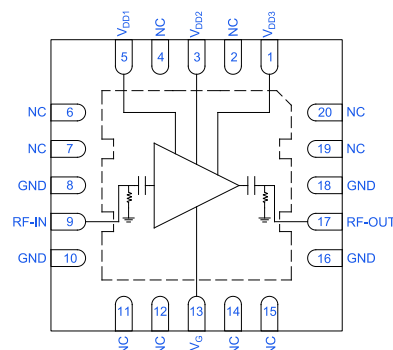


Generic photo used for illustration purposes only

## APPLICATIONS

- Test and Measurement Equipment
- Satellite Communications
- Radar, EW, and ECM Defense Systems
- 5G mmWave, MIMO Wireless Infrastructure Systems
- Microwave Radio & VSAT

## FUNCTIONAL DIAGRAM (Top View)



## PRODUCT OVERVIEW

The AVA-17303+ is a GaAs MMIC Medium Power Amplifier operating from 17 to 31.5 GHz. This amplifier provides typical 20.5 dB of gain, +22.9 dBm P1dB, and +33 dBm OIP3 while operating from a +6 V power supply at 160 mA. Additionally, it is internally matched to 50Ω and comes in a 4x4 mm 20-Lead QFN-Style package. These characteristics make it ideally suited as a driver amplifier in point-to-point radios and communications systems requiring high operating output power while maintaining low distortion characteristics.

## KEY FEATURES

| Features                                             | Advantages                                                                                                                                                                                                                                     |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High Gain, Typ. 20.5 dB<br>High P1dB, Typ. +22.9 dBm | High gain and output power make this device excellent for wideband systems from 17 to 31.5 GHz that require at least 0.2 W of operating output power over the full band.                                                                       |
| High OIP3, Typ. +33 dBm                              | High operating OIP3 provides very low in-band distortion products, enabling minimal signal degradation in high fidelity measurement systems and demanding communication systems.                                                               |
| 4x4 mm 20-Lead QFN-Style Package                     | Small footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. Industry standard packaging allows for ease of assembly in high volume manufacturing processes. |





MMIC SURFACE MOUNT

Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

**ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C,  $V_{DD} = +6$  V, AND  $Z_0 = 50\Omega$  UNLESS NOTED OTHERWISE**

| Parameter                                                         | Condition (GHz) | Min. | Typ.  | Max. | Units |
|-------------------------------------------------------------------|-----------------|------|-------|------|-------|
| Frequency Range                                                   |                 | 17   |       | 31.5 | GHz   |
| Gain                                                              | 17              | 18.4 | 21.0  |      | dB    |
|                                                                   | 20              | 17.7 | 20.4  |      |       |
|                                                                   | 24              | 16.8 | 20.5  |      |       |
|                                                                   | 27              | 18.7 | 21.9  |      |       |
|                                                                   | 30              | 16.0 | 23.7  |      |       |
|                                                                   | 31.5            | 13.7 | 20.1  |      |       |
| Input Return Loss                                                 | 17              |      | 11    |      | dB    |
|                                                                   | 20              |      | 17    |      |       |
|                                                                   | 24              |      | 12    |      |       |
|                                                                   | 27              |      | 8     |      |       |
|                                                                   | 30              |      | 10    |      |       |
|                                                                   | 31.5            |      | 7     |      |       |
| Output Return Loss                                                | 17              |      | 19    |      | dB    |
|                                                                   | 20              |      | 13    |      |       |
|                                                                   | 24              |      | 12    |      |       |
|                                                                   | 27              |      | 10    |      |       |
|                                                                   | 30              |      | 17    |      |       |
|                                                                   | 31.5            |      | 20    |      |       |
| Isolation                                                         | 17 - 31.5       |      | 56    |      | dB    |
| Output Power at 1 dB Compression ( $P_{1dB}$ )                    | 17              |      | +23.3 |      | dBm   |
|                                                                   | 20              |      | +22.6 |      |       |
|                                                                   | 24              |      | +22.9 |      |       |
|                                                                   | 27              |      | +23.7 |      |       |
|                                                                   | 30              |      | +23.2 |      |       |
|                                                                   | 31.5            |      | +21.8 |      |       |
| Output Power at Saturation ( $P_{SAT}$ ) <sup>2</sup>             | 17              |      | +25.2 |      | dBm   |
|                                                                   | 20              |      | +23.7 |      |       |
|                                                                   | 24              |      | +23.6 |      |       |
|                                                                   | 27              |      | +23.8 |      |       |
|                                                                   | 30              |      | +23.5 |      |       |
|                                                                   | 31.5            |      | +21.9 |      |       |
| Output Third-Order Intercept (OIP3)<br>( $P_{OUT} = +6$ dBm/Tone) | 17              |      | +31   |      | dBm   |
|                                                                   | 20              |      | +31   |      |       |
|                                                                   | 24              |      | +33   |      |       |
|                                                                   | 27              |      | +33   |      |       |
|                                                                   | 30              |      | +34   |      |       |
|                                                                   | 31.5            |      | +31   |      |       |
| Noise Figure                                                      | 17              |      | 5.7   |      | dB    |
|                                                                   | 20              |      | 4.9   |      |       |
|                                                                   | 24              |      | 4.1   |      |       |
|                                                                   | 27              |      | 3.7   |      |       |
|                                                                   | 30              |      | 3.4   |      |       |
|                                                                   | 31.5            |      | 3.5   |      |       |
| Device Operating Voltage ( $V_{DD}$ ) <sup>3</sup>                |                 | +5   | +6    | +7   | V     |
| Device Operating Current ( $I_{DD}$ ) <sup>4</sup>                |                 |      | 160   |      | mA    |
| Gate Voltage ( $V_G$ )                                            |                 |      | -0.54 |      | V     |
| Gate Current ( $I_G$ ) <sup>5</sup>                               |                 |      | 57    |      | μA    |
| Device Current Variation vs. Temperature <sup>6</sup>             |                 |      | -3.6  |      | μA/°C |

1. Tested on Mini-Circuits Evaluation Test Board TB-AVA-17303C+. See Figure 2. Board loss de-embedded.

2. Defined as output power at which change is 0.1 per 1 dB change in input power.

3.  $V_{DD} = V_{DD1} = V_{DD2} = V_{DD3}$ 4. Current at  $P_{IN} = -25$  dBm. Increases to 250 mA at P1dB.  $I_{DD} = I_{DD1} + I_{DD2} + I_{DD3}$ .5. Current at  $P_{IN} = -25$  dBm. Increases to 300 μA at P1dB.6. (Current at +85°C - Current at -55°C)/(140°C).  $V_G$  held constant over temperature.

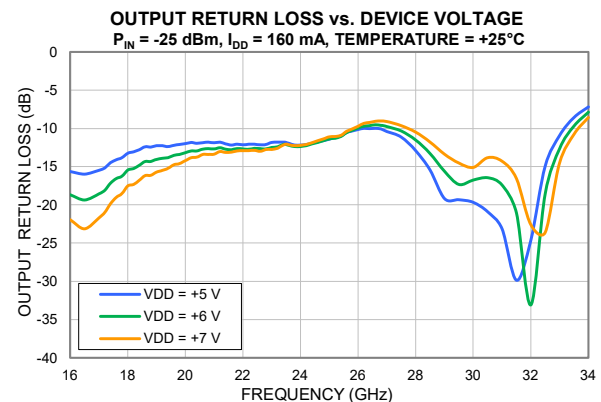
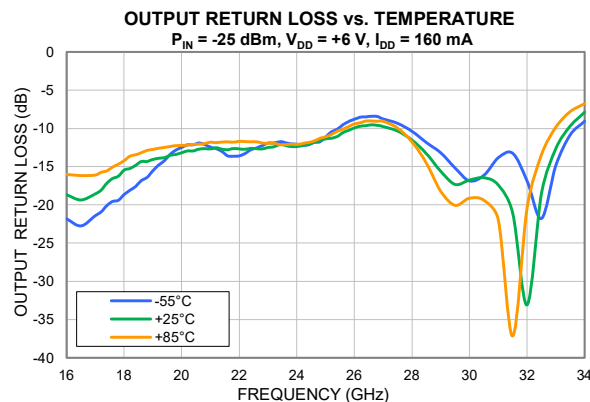
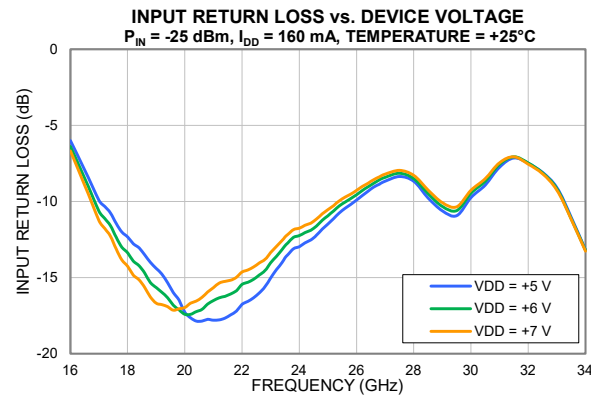
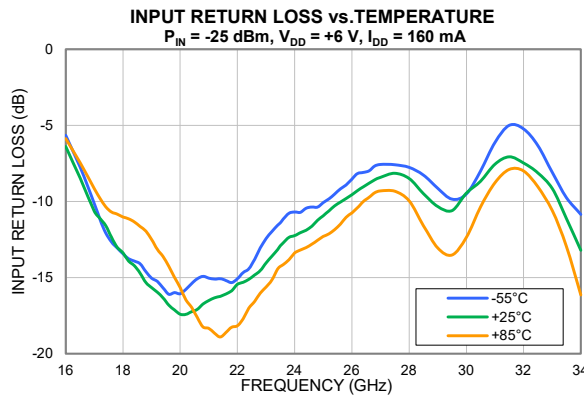
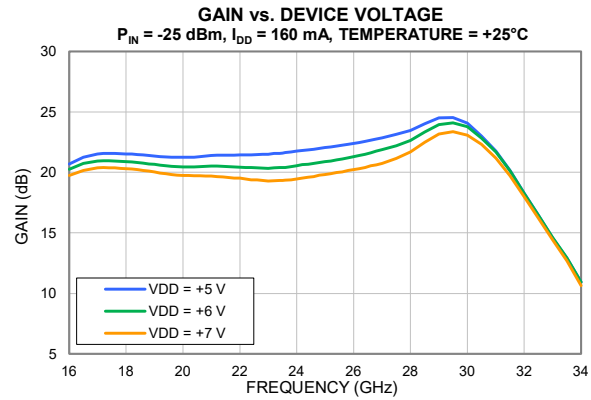
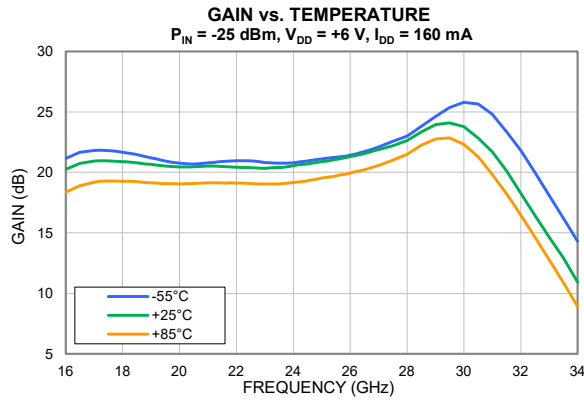


MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

## TYPICAL PERFORMANCE GRAPHS



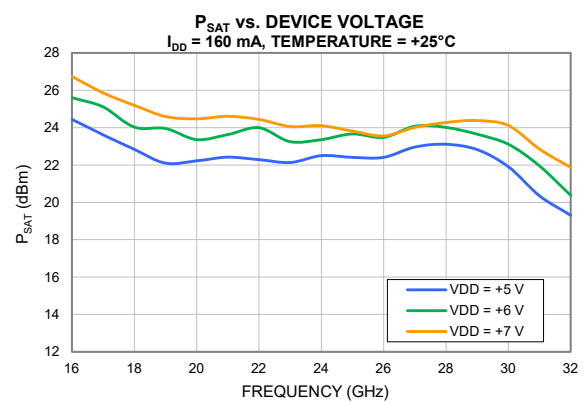
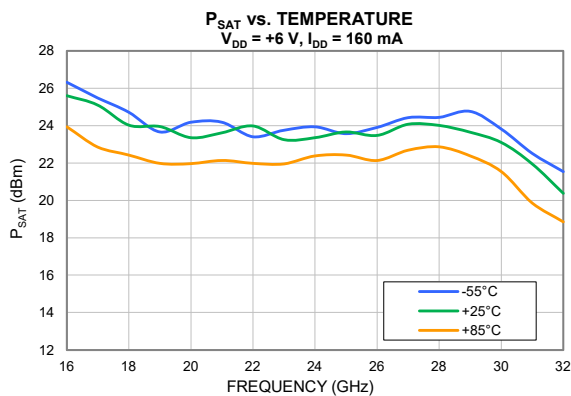
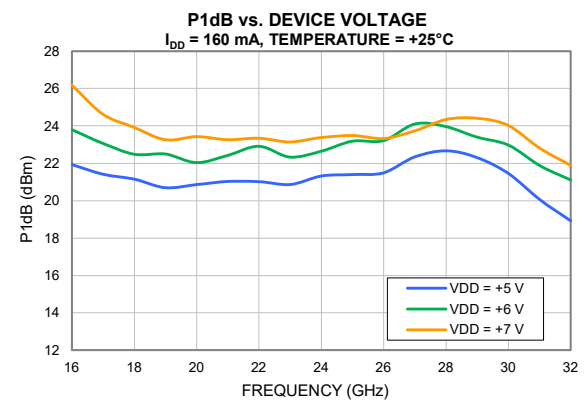
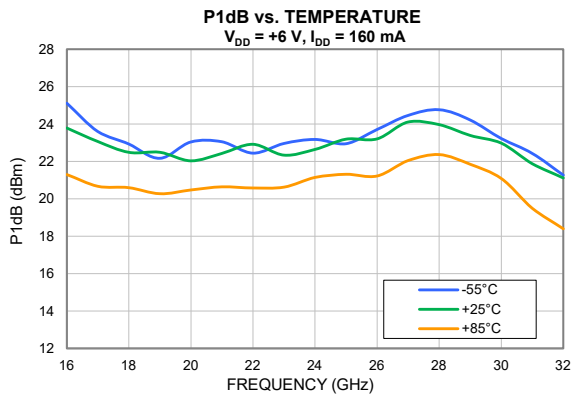
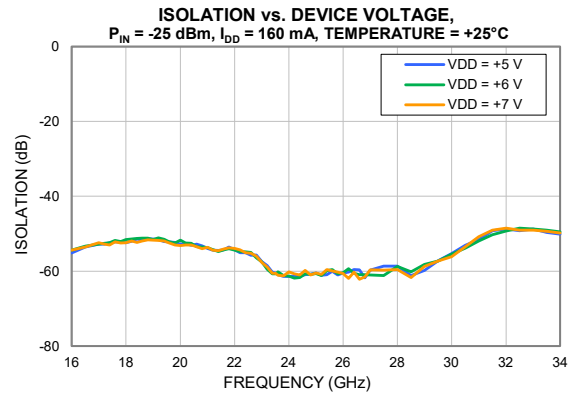
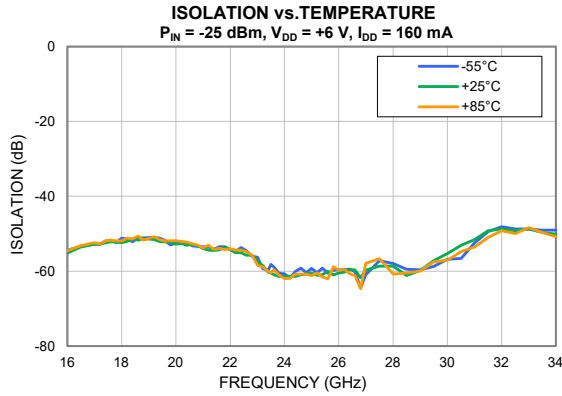


MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

## TYPICAL PERFORMANCE GRAPHS



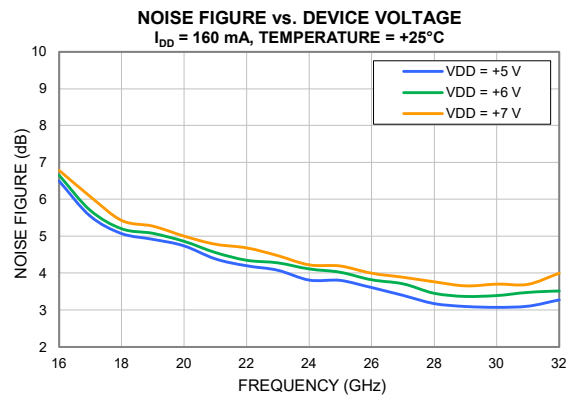
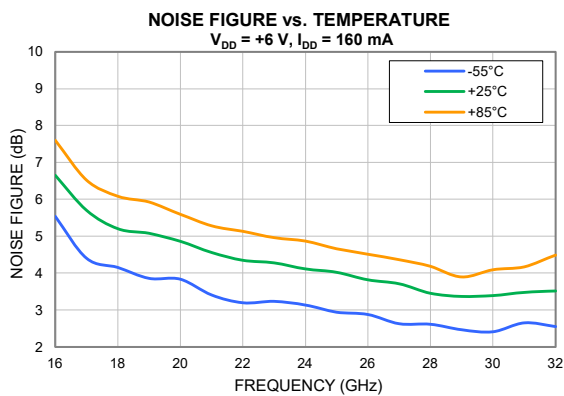
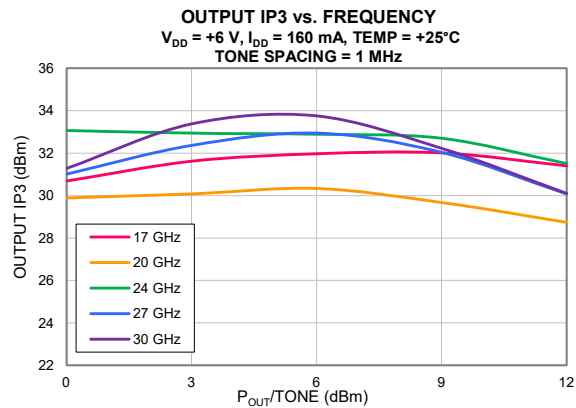
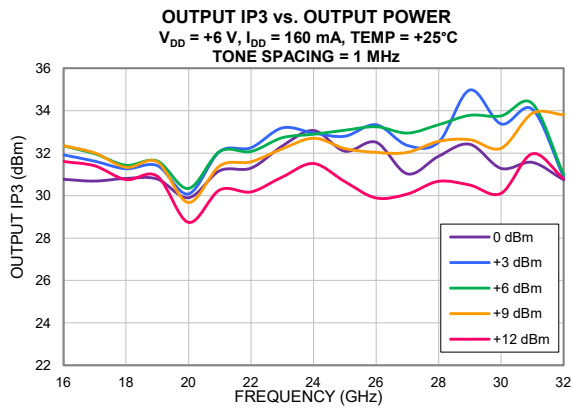
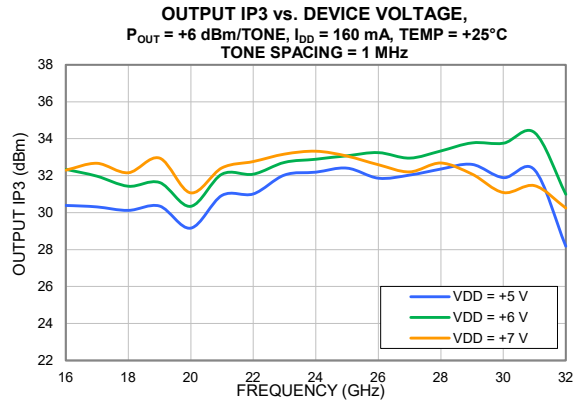
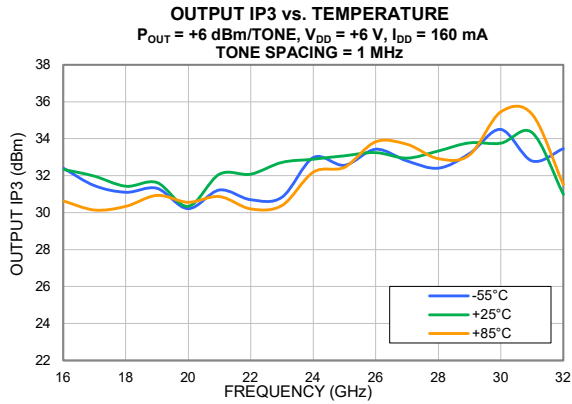


MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

## TYPICAL PERFORMANCE GRAPHS





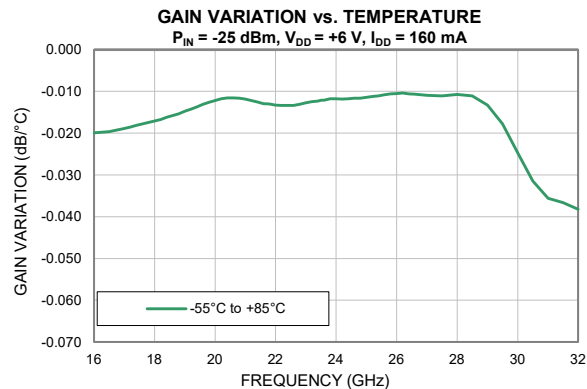
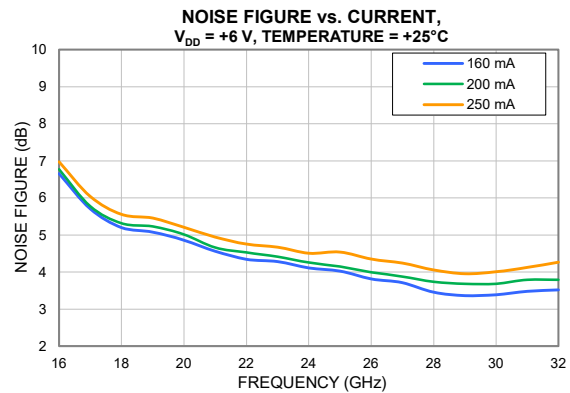
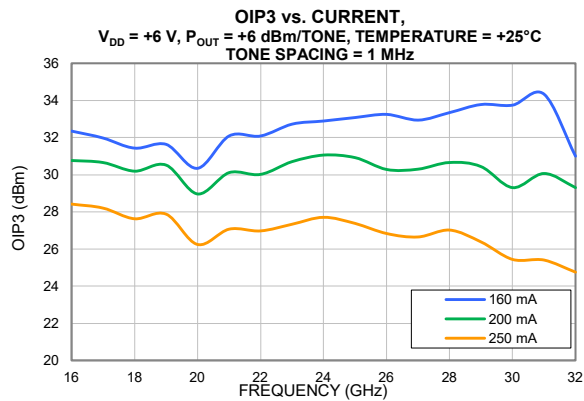
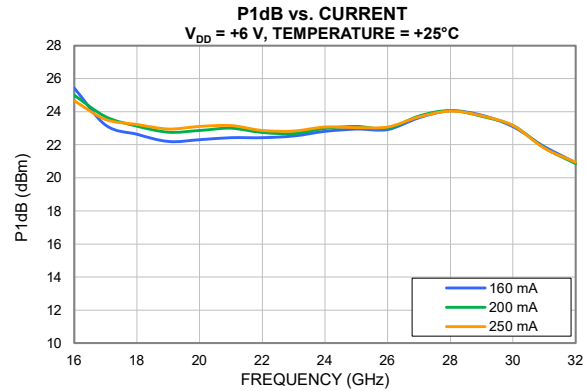
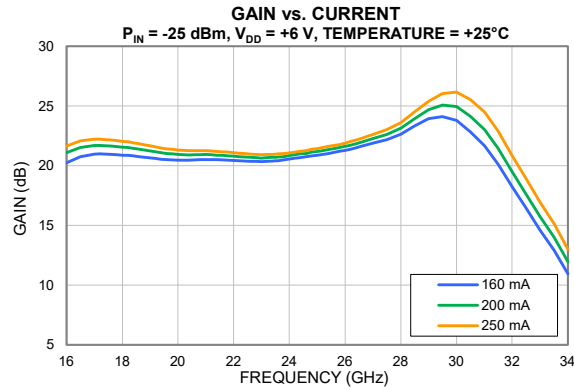
MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

Mini-Circuits

50Ω 17 to 31.5 GHz High Linearity Driver

## TYPICAL PERFORMANCE GRAPHS





MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

## ABSOLUTE MAXIMUM RATINGS<sup>7</sup>

| Parameter                                 | Ratings         |
|-------------------------------------------|-----------------|
| Operating Temperature (ground lead)       | -55°C to +85°C  |
| Storage Temperature                       | -65°C to +150°C |
| Junction Temperature <sup>8</sup>         | +175°C          |
| Total Power Dissipation                   | 1.8 W           |
| Input Power (CW), $V_{DD} = +6$ V         | +25 dBm         |
| DC Drain Voltage on $V_{DD}$ <sup>9</sup> | +9 V            |
| DC Drain Current $I_{DD}$ <sup>10</sup>   | 500 mA          |
| DC Voltage at RF-IN                       | +9 V            |
| DC Voltage at RF-OUT                      | +9 V            |
| DC Gate Voltage on $V_G$                  | -6 V to +1 V    |
| DC Gate Current $I_G$                     | 8 mA            |

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

8. Peak Temperature on top of Die.

9.  $V_{DD} = V_{DD1} = V_{DD2} = V_{DD3}$ .

10.  $I_{DD} = I_{DD1} + I_{DD2} + I_{DD3}$ .

## THERMAL RESISTANCE

| Parameter                                          | Ratings  |
|----------------------------------------------------|----------|
| Thermal Resistance ( $\Theta_{JC}$ ) <sup>11</sup> | 46.9°C/W |

11.  $\Theta_{JC} = (\text{Hot Spot Temperature on Die} - \text{Temperature at Ground Lead}) / \text{Dissipated Power}$

## ESD RATING

|     | Class | Voltage Range    | Reference Standard          |
|-----|-------|------------------|-----------------------------|
| HBM | 1A    | 250 V to < 500 V | ANSI/ESDA/JEDEC JS-001-2023 |
| CDM | C2A   | 500 V to < 750 V | ANSI/ESDA/JEDEC JS-002-2022 |



ESD HANDLING PRECAUTION: This device is designed to be Class 1A for HBM. Static charges may easily produce potentials higher than this with improper handling and can discharge into DUT and damage it. As a preventive measure Industry standard ESD handling precautions should be used at all times to protect the device from ESD damage.

## MSL RATING

Moisture Sensitivity: MSL3 in accordance with IPC/JEDEC J-STD-020E/JEDEC J-STD-033C





MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

## FUNCTIONAL DIAGRAM (Top View)

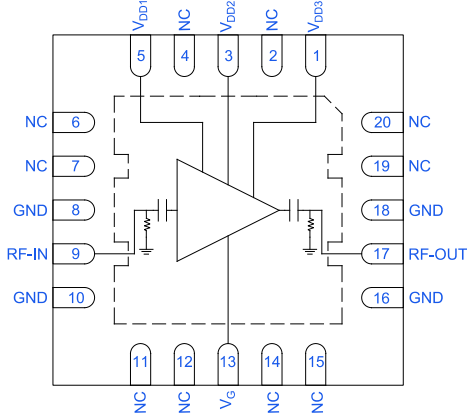


Figure 1. AVA-17303+ Functional Diagram

## PAD DESCRIPTION

| Function         | Pad Number                         | Description (Refer to Fig 2)                            |
|------------------|------------------------------------|---------------------------------------------------------|
| RF-IN            | 9                                  | RF-IN Pad connects to RF Input port.                    |
| RF-OUT           | 17                                 | RF-OUT Pad connects to RF Output port.                  |
| V <sub>DD1</sub> | 5                                  | DC input pad connects to Drain voltage 1.               |
| V <sub>DD2</sub> | 3                                  | DC input pad connects to Drain voltage 2.               |
| V <sub>DD3</sub> | 1                                  | DC input pad connects to Drain voltage 3.               |
| V <sub>G</sub>   | 13                                 | DC input pad connects to Gate control voltage.          |
| NC               | 2, 4, 6, 7, 11, 12, 14, 15, 19, 20 | Not used internally. Connected to ground on test board. |
| GND              | 8, 10, 16, 18, Paddle              | Connects to ground.                                     |

## EVALUATION TEST BOARD

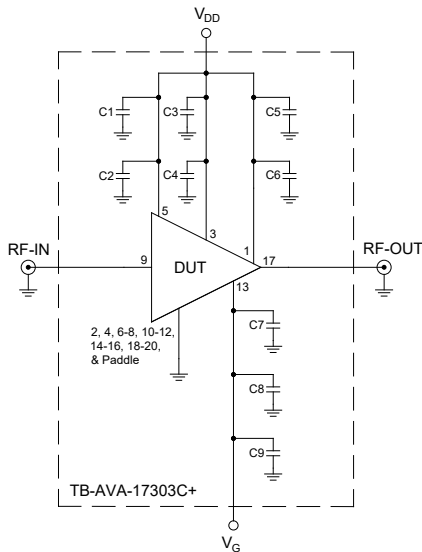


Figure 2. AVA-17303+ Evaluation and Application Circuit

## Electrical Parameters and Conditions

Gain, Return Loss, Output Power at 1 dB Compression (P<sub>1dB</sub>), Output IP<sub>3</sub> (OIP<sub>3</sub>), and Noise Figure measured using N5245B PNA-X Microwave Network Analyzer.

### Conditions:

- Gain and Return Loss: P<sub>IN</sub> = -25 dBm
- Output IP<sub>3</sub> (OIP<sub>3</sub>): Two tones, spaced 1 MHz apart, +6 dBm/Tone at output.

### Power ON/Power OFF Sequence

Caution: Permanent damage to the device will occur if the Power ON and Power OFF sequences are not followed.

### POWER ON:

- Set V<sub>G</sub> = -1.2 V and Turn ON.
- Set V<sub>DD</sub> = +6 V and Turn ON.
- Increase V<sub>G</sub> to desired nominal I<sub>DD</sub> = 160 mA.
- Turn ON RF signal.

### POWER OFF:

- Turn OFF RF signal.
- Decrease V<sub>G</sub> to -1.2 V.
- Turn OFF V<sub>DD</sub>.
- Turn OFF V<sub>G</sub>.

| Component      | Value  | Size | Part Number        | Manufacturer    |
|----------------|--------|------|--------------------|-----------------|
| C1, C3, C5, C9 | 10 μF  | 1206 | CL31B106KBHNNNE    | SAMSUNG         |
| C2, C4, C6, C8 | 0.1 μF | 0603 | 06035C104KAT2A     | AVX CORPORATION |
| C7             | 100 pF | 0603 | GRM1885C1H101GA01D | MURATA          |





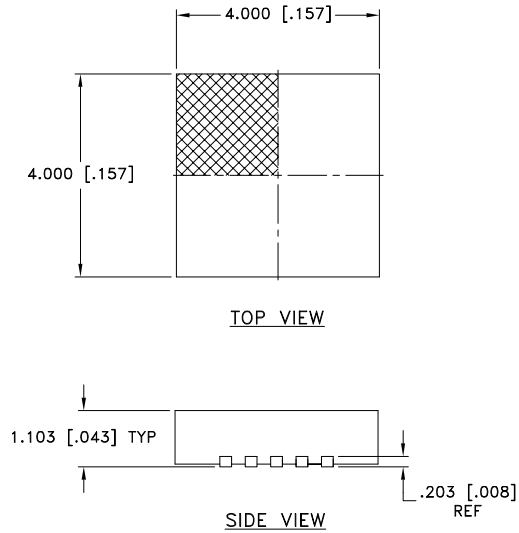
## MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

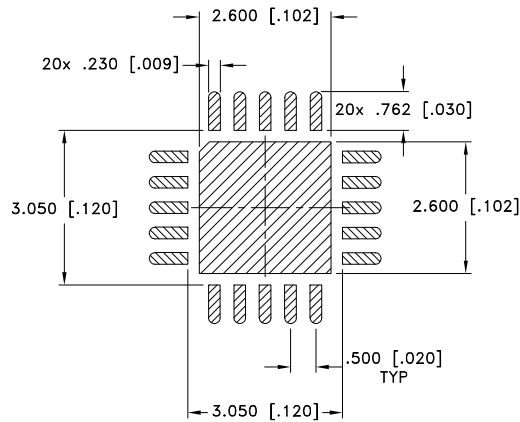
Mini-Circuits

50Ω 17 to 31.5 GHz High Linearity Driver

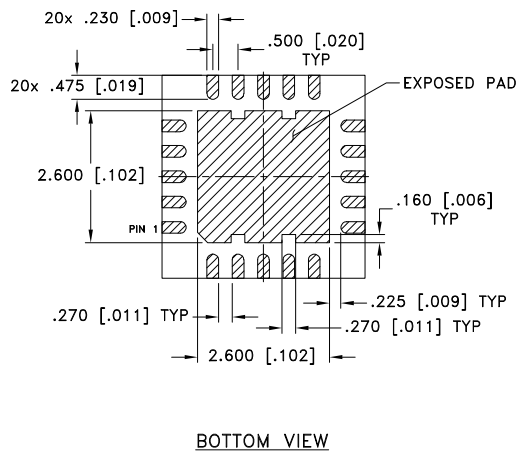
### CASE STYLE DRAWING



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.050$  [0.002]

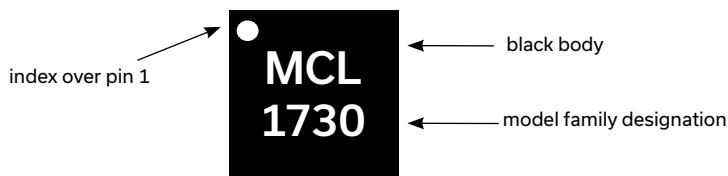


DENOTES METALLIZATION

Weight: .042 Grams

Dimensions are in mm [Inches]. Tolerances: 2 Pl.  $\pm 0.254$  [0.01]; 3 Pl.  $\pm 0.127$  [0.005] mm [inches]

### PRODUCT MARKING



Marking may contain other features or characters for internal lot control





Mini-Circuits

MMIC SURFACE MOUNT

# Medium Power Amplifier **AVA-17303+**

50Ω 17 to 31.5 GHz High Linearity Driver

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD

[CLICK HERE](#)

|                                                      |                                                                                                           |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Performance Data & Graphs                            | Data                                                                                                      |
|                                                      | Graphs                                                                                                    |
|                                                      | S-Parameter (S2P Files) Data Set (.zip file)                                                              |
| Case Style                                           | DG983-4 Plastic package, exposed paddle, Lead Finish: Nickel-Palladium-Gold                               |
| RoHS Status                                          | Compliant                                                                                                 |
| Tape & Reel<br>Standard quantities available on reel | F68<br>7" reels with 20, 50, 100, 200, 500, or 1000 devices<br>13" reels with 2000, 3000, or 4000 devices |
| Suggested Layout for PCB Design                      | PL-811                                                                                                    |
| Evaluation Board                                     | TB-AVA-17303C+                                                                                            |
|                                                      | Gerber File                                                                                               |
| Environmental Ratings                                | ENV08T1                                                                                                   |
| Product Handling                                     | The use of no-clean solder is recommended. This package cannot be subjected to aqueous wash.              |

## 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)

