



SUPER WIDEBAND, LOW NOISE

Monolithic Amplifier Die **AVA-0233LN-D+**

50Ω 2 to 30GHz

THE BIG DEAL

- Super Wideband & Flat Gain, 16.8±0.3dB @2 to 30GHz
- Outstanding Match for Signal Chain Integration, >15dB
- Low Noise Figure (NF<2dB), and High OIP3 (OIP3 >26dBm at Mid Band)
- Potential Replacement for HMC7950^{a,b}

APPLICATIONS

- Test & Instrument
- Military & Space
- Fixed Satellite
- Mobile



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

SEE ORDERING INFORMATION ON THE LAST PAGE

PRODUCT OVERVIEW

AVA-0233LN-D+ is a GaAs, pHEMT, MMIC Distributed Amplifier Die that operates from 2 to 30GHz. The amplifier typically provides 16.8dB Gain and 2.0dB Noise Figure, 14dBm Output Power at 1dB Gain Compression, 25.7dBm OIP3. The amplifier is well-matched to 50Ω at both input and output. AVA-0223LN-D+ is a self-biased single positive supply device with VDD = 5V and IDD = 65.2 mA Typical.

KEY FEATURES

Feature	Advantages
Super-Wide Bandwidth with Flat Gain • 16.8 ±0.3 dB over 3 - 20 GHz	General Purpose Wideband Amplifier with adjustable gain vs. control voltage is suitable for wide variety of applications.
Low Noise Figure Typical: • <3dB from 3.5 to 27.5GHz • <2dB from 5 to 20GHz	Enables lower system noise figure performance.
High Output IP3 • 27dBm from 2 to 20GHz • 25dBm from 20 to 30GHz	Easy to integrate into signal chain.
Excellent Wideband In/Out Return Loss • >15dB from 2 to 30GHz	
Unpackaged Die	Enables user to integrate it directly into hybrids

Notes:
 a. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application and compatibility with other components and environmental conditions and stresses.
 b. The HMC7950 part number is used for identification and comparison purposes only

REV. OR
 ECO-007871
 AVA-0233LN-D+
 MCLNY
 210520





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ELECTRICAL SPECIFICATIONS¹ AT 25°C, 50Ω, UNLESS NOTED

Parameter	Condition (MHz)	VDD = 5V & VC = Open			Units
		Min.	Typ.	Max.	
Frequency range		2000		30000	MHz
Gain	2000		16.8		dB
	10000		16.8		
	20000		17.0		
	30000		16.7		
Input Return loss	2000		26.0		dB
	10000		16.0		
	20000		17.8		
	30000		22.7		
Output Return loss	2000		13.3		dB
	10000		23.5		
	20000		20.1		
	30000		26.8		
P1dB	2000		16.5		dBm
	10000		15.0		
	20000		13.5		
	30000		12.3		
OIP3 (Pout= 0 dBm/Tone)	2000		28.3		dBm
	10000		26.8		
	20000		25.7		
	30000		22.0		
Noise Figure	2000		4.1		dB
	10000		1.4		
	20000		2.2		
	30000		3.9		
Device operating voltage (VDD)		4.75	5	5.25	V
Device operating current (IDD)			65.2	92	mA
Device current variation vs. temperature ²			-10		μA/°C
Device current variation vs voltage ³			0.0128		mA/mV
Thermal resistance, junction-to-ground Lead			14.7		°C/W

1. Measured on Mini-Circuits Characterization Test Board MB-089. See Characterization Test & Application Circuit (Fig. 2)

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

3. Device Current Variation vs. Voltage = (Current in mA at 5.25V - Current in mA at 4.75V) / (5.25V-4.75V)*1000 mA/mV

MAXIMUM RATINGS⁴

Parameter	Ratings
Operating temperature (ground lead)	-40°C to 85°C
Storage temperature	-65°C to 150°C
Junction Temperature	150°C ⁵
Total power dissipation	1.55W
Input power (CW)	20dBm
DC voltage at VC	-2.5V to 3.0V
DC voltage at VDD	8V

4. Permanent damage may occur if any of those limits are exceeded.

Electrical maximum ratings are not intended for continuous normal operation.

5. Tj = 85 °C + (VDD)*(IDD)*θ(JC) = 90 °C

Nominal Operating Condition with Tj = 90 °C will ensure MTTF > 428Years

FIG 1. GAIN VS. CONTROL VOLTAGE (VC)

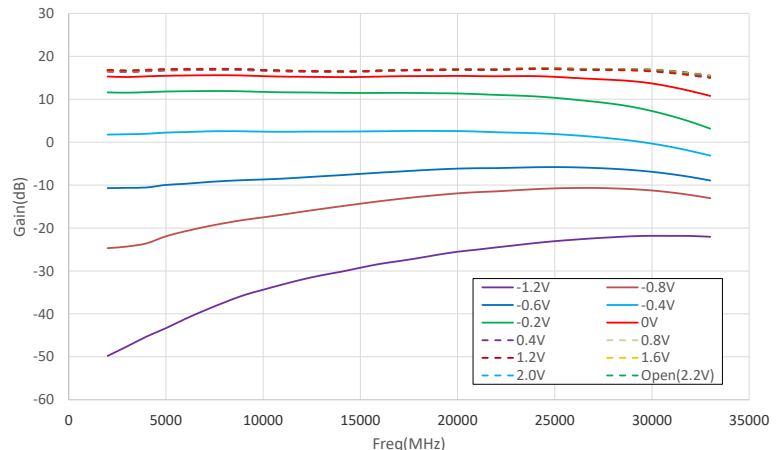


FIG 1. When VC = Open, the measured VC = 2.2V typical. For RF Performance at different VC, please see View Data and Graph.

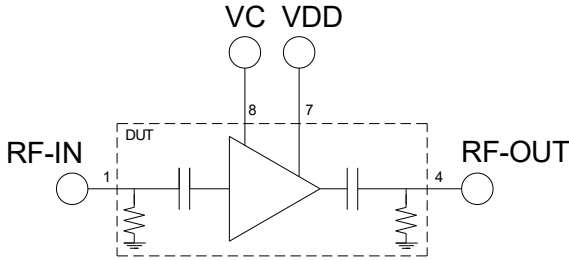




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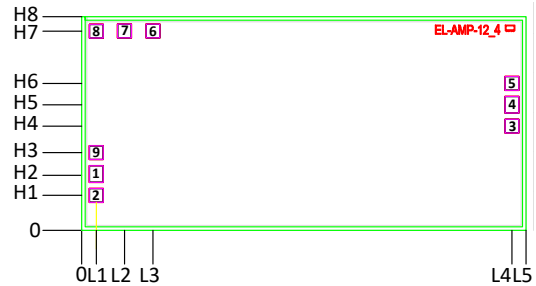
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SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Pad Number	Description
1	RF IN
4	RF OUT
7	VDD
8	VC
2, 3, 5, 6, 9 & Bottom of Die	GROUND

BONDING PAD POSITION



Dimension in μm

L1	L2	L3	L4	L5	H1	H2
102	300	500	3021	3120	246	396

H3	H4	H5	H6	H7	H8
546	732	882	1032	1398	1500

Thickness	Die size	Pad size 1,4	Pad size 2, 3, 5, 6, 7, 8 & 9
100	3120 x 1500	93 x 113	93 x 93

CHARACTERIZATION, APPLICATION CIRCUIT & ASSEMBLY DRAWING

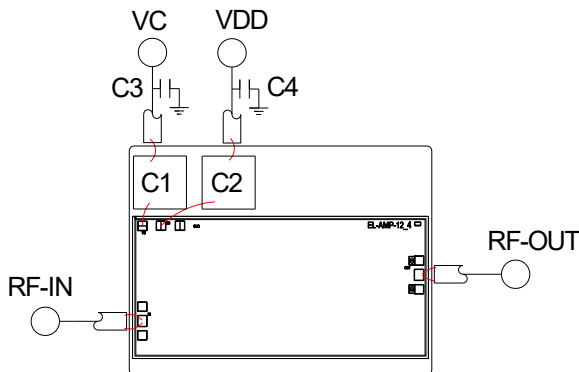


Fig 2. Characterization, Application Circuit & Assembly Drawing


Note: This block diagram is used for characterization. (DUT was soldered on test board of Mini-Circuits Characterization Test Board MB-089). Gain, Return loss, Output power at 1dB compression (P1dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

- VDD=5V, VC=Open
- Gain and Return loss: Pin= -25dBm
- Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

Component#	Size	Value	Manufacturer	P/N
C1, C2	22x22mil	100pF	Macon Inc	MA4M3100
C3, C4	0402	0.1uF	Murata	GRM155R71C04KA88D

ASSEMBLY PROCEDURE

- Storage**
Dice should be stored in a dry nitrogen purged desiccators or equivalent.
- ESD**
 MMIC PHEMT amplifier dice are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be open in clean room conditions at an appropriately grounded anti-static workstation.
- Die Handling and Attachment**
Devices need careful handling using correctly designed collets, it is recommended to handle the chip along the edges with a custom design collet. The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are Ablestik 84-1 LMISR4 or equivalents. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. The surface of the chip has exposed air bridges and should not be touched with vacuum collet, tweezers or fingers.
- Wire Bonding**
Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the dice gold bond pads. Thermo-sonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1mil diameter. Bonds must be made from the bond pads on the die to the packaged or substrate. All bond wires should be kept as short as low as reasonable to minimize performance degradation due to undesirable series inductance.





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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD.

Performance Data	Data Table								
	Swept Graphs								
	S-Parameter (S2P Files) Data Set with and without port extension(.zip file)								
Case Style	Die								
Die Ordering and packaging information	<table border="0"> <tr> <td>Quantity, Package</td> <td>Model No.</td> </tr> <tr> <td>Small, Gel - Pak: 5,10,50,100 KGD*</td> <td>AVA-0233LN-DG+</td> </tr> <tr> <td>Medium†, Partial wafer: KGD*<464</td> <td>AVA-0233LN-DP+</td> </tr> <tr> <td>Full Wafer</td> <td>AVA-0233LN-DF+</td> </tr> </table>	Quantity, Package	Model No.	Small, Gel - Pak: 5,10,50,100 KGD*	AVA-0233LN-DG+	Medium†, Partial wafer: KGD*<464	AVA-0233LN-DP+	Full Wafer	AVA-0233LN-DF+
	Quantity, Package	Model No.							
Small, Gel - Pak: 5,10,50,100 KGD*	AVA-0233LN-DG+								
Medium†, Partial wafer: KGD*<464	AVA-0233LN-DP+								
Full Wafer	AVA-0233LN-DF+								
	†Available upon request contact sales representative Refer to AN-60-067								
Environmental Ratings	ENV80								

*Known Good Die ("KGD") means that the dice in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such dice fall within a predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

ADDITIONAL 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.
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