MMIC SURFACE MOUNT

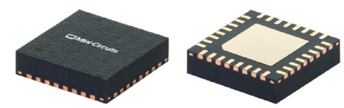
Wideband LNA

AVA-0233LN+

50Ω 2 to 30 GHz

THE BIG DEAL

- Wide Bandwidth, 2 to 30 GHz
- Flat Gain Response, Typ. 16.3 dB ± 1 dB
- Noise Figure, Typ. 2.4 dB
- 5x5mm 32-Lead SMT Package
- Gain Control, Typ. 30 dB



Generic photo used for illustration purposes only

CASE STYLE: DG1677-4

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

APPLICATIONS

- 5G MIMO and Back Haul Radio Systems
- Satellite Ka-Band Communications
- Test and Measurement Equipment
- Radar, EW, and ECM Defense Systems

PRODUCT OVERVIEW

The AVA-0233LN+ is a GaAs pHEMT MMIC Distributed Amplifier that operates from 2 to 30 GHz. The amplifier provides solid performance of 16.3 dB gain, 2.4 dB noise figure, +13.6 dB P1dB, and +25.7 dBm OIP3 from a self-biased single +5V supply drawing only 65 mA. The control voltage bias input VC enables the gain to be varied by over 30 dB across the operating band. The AVA-0233LN+ MMIC amplifier is housed in an industry standard 5x5mm QFN-style package, with RF ports internally matched to 50Ω, facilitating easy integration into microwave system PC boards.

KEY FEATURES

Features	Advantages
Wideband response with adjustable Gain: 2-30 GHz, Typ. Gain 16.3 dB, 30 dB dynamic range	General purpose wideband amplifier with adjustable gain vs. control voltage is suitable for wide variety of applications.
Noise Figure: 2 dB Typ. 6-20 GHz 4 dB Typ. 2-30 GHz	Usable as first or second stage amplifier.
OIP3: +26 dBm Typ. 2-20 GHz +23 dBm Typ. 20-30 GHz	Easy to integrate into signal chain.
Return Loss 15 dB Typ. 2-20 GHz 10 dB Typ. 20-30 GHz	
5 x 5mm 32-Lead QFN-style package	Small footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

ELECTRICAL SPECIFICATIONS[1] AT 25°C, Zo=50Ω, VDD=+5V, VC = OPEN, UNLESS NOTED OTHERWISE.

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		2		30	GHz
Gain	2	16.9	17.2	17.8	dB
	10	15.8	16.7	17.4	
	20	15.2	16.3	17.3	
	28	12.9	14.7	16.5	
	30	12.7	15.5	17.5	
Input Return Loss	2		20.0		dB
	10		14.8		
	20		12.5		
	28		8.9		
	30		17.2		
Output Return Loss	2		11.5		dB
	10		19.3		
	20		13.1		
	28		6.5		
	30		11.4		
Reverse Isolation	2-30		37.0		dB
Output Power @ 1 dB Compression	2		+16.4		dBm
	10		+15.1		
	20		+13.6		
	28		+11.5		
	30		+11.5		
Output Third-Order Intercept Pout = 0 dBm/Tone	2		+28.4		dBm
	10		+27.0		
	20		+25.7		
	28		+22.5		
	30		+20.6		
Noise Figure	2		4.2		dB
	10		1.5		
	20		2.4		
	28		4.5		
	30		4.8		
Device Operating Voltage (VDD)		+4.75	+5	+5.25	V
Device Operating Current (IDD)			65	92	mA
Device Control Voltage (VC)		-1.2	Open	+2.4	V
Gain Variation over Control Voltage (VC)[4] over -1.2V to 0V	2-30		30		dB
Gain Variation over Control Voltage (VC)[4] over 0V to +2.4V	2-30		1		dB
Device Current (IDD) Variation vs. Temperature[2]			-10		µA/°C
Device Current (IDD) Variation vs. Voltage[3]			0.0128		mA/mV
Thermal Resistance, Junction-to-Ground-Lead (ΘJC)			14.7		°C/W

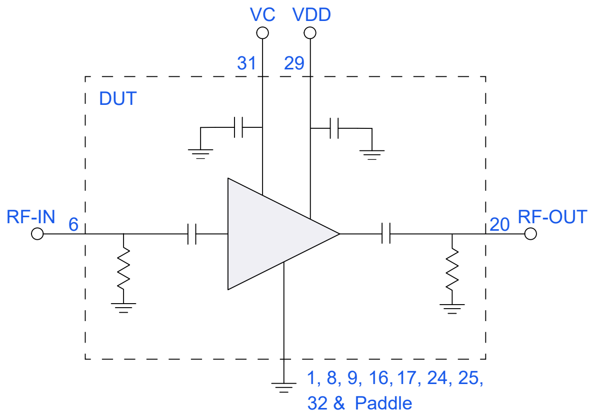
1. Measured on Mini-Circuits Characterization Test Board TB-AVA-0233LNC+. See Characterization and Application Circuit (Fig.1).
2. Device Current Variation vs. Temperature = (Current in mA at +85°C – Current in mA at -45°C)/+130°C
3. Device Current Variation vs. Voltage = (Current in mA at +5.25V – Current in mA at +4.75V) / (+5.25V-+4.75V)*1000mA/mV)
4. Gain is nominal when VC = Open. When VC is left floating, there is a measured voltage of +2V on the pin. To reduce gain, add a negative bias.

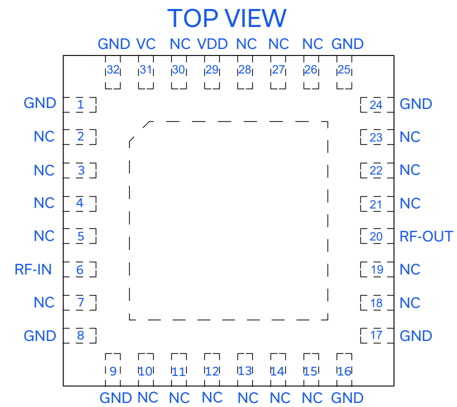
MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Case Temperature	-45°C to +85°C
Storage Temperature	-65°C to +150°C
Total Power Dissipation	1.55W
Junction Temperature	+150°C
RF Input Power (CW)	+20 dBm
DC Voltage at VDD	+8V
DC Voltage at VC	-2.5V to +3V
Current IDD	140mA
Current IC	5mA
DC Voltage on RF-IN and RF-OUT	+18V

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

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION





Function	Pad Number	Description (Refer to Figure 1)
RF-IN	6	RF-Input Pad connects to RF-Input through an integrated shunt resistor for ESD protection and DC blocking capacitor.
RF-OUT	20	RF-Output Pad connects to RF-Output through an integrated shunt resistor for ESD protection and DC blocking capacitor.
VDD	29	DC Input Pad connects to the voltage input of the device and passes through C2 and an integrated capacitor.
VC	31	Control Voltage Bias Pad connects to the control voltage input of the device and passes through C1 and an integrated capacitor.
Ground	1, 8, 9, 16, 17, 24, 25, 32	Connects to ground.
No Connection	2 - 5, 7, 10 - 15, 18, 19, 21 - 23, 26 - 28, 30	Not used internally. Connected to ground on test board.

CHARACTERIZATION TEST & APPLICATION CIRCUIT

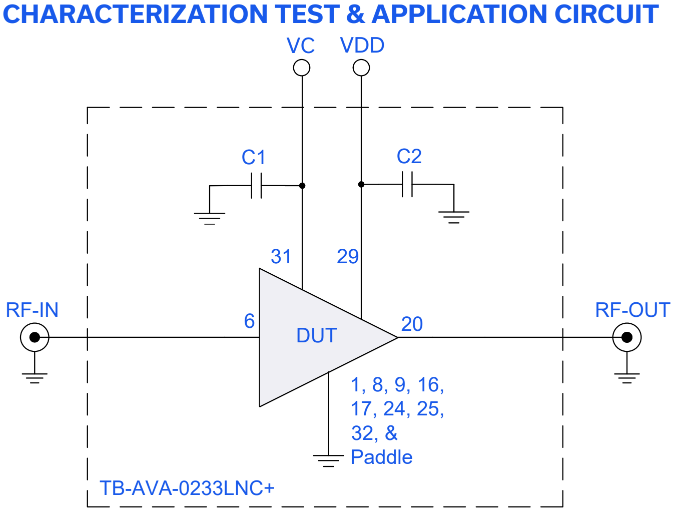
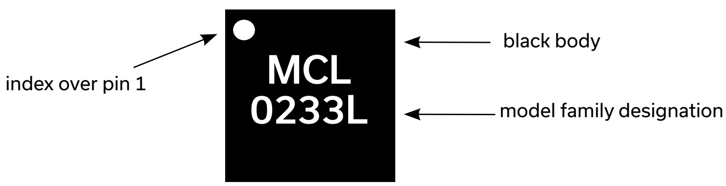


Fig 1. Characterization and Application Circuit
Note: This block diagram is used for characterization (DUT is soldered on Mini-Circuits Test Board TB-AVA-0233LNC+). Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Keysight PNA-X N5247B Microwave Network Analyzer.

Conditions:
1. VDD = +5V, VC = Open
2. Gain and Return Loss P_{IN} = -25 dBm
3. Output IP3 (OIP3): Two Tones, spaced 1 MHz apart, 0 dBm/Tone at output.

Component	Size	Value	Manufacturer	P/N
C1, C2	0402	0.1uF	Murata	GRM155R71C104KA88D

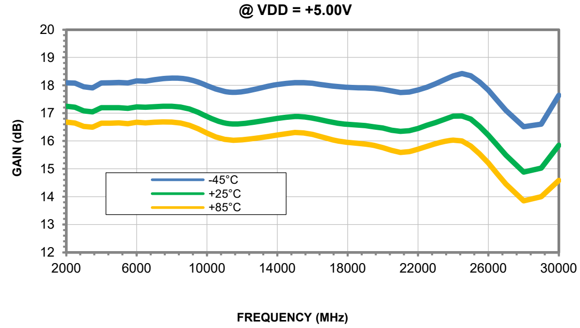
PRODUCT MARKING



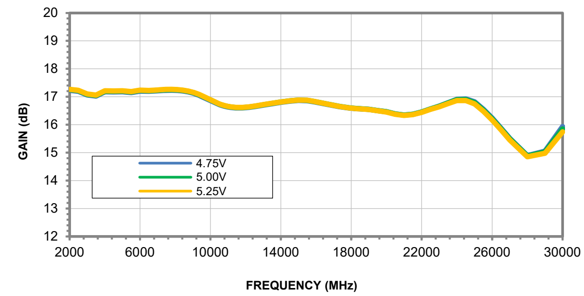
Marking may contain other features or characters for internal lot control

TYPICAL PERFORMANCE CURVES

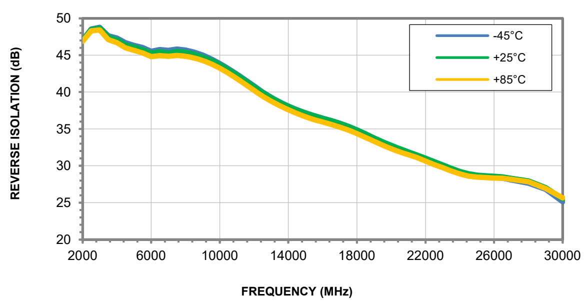
GAIN vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



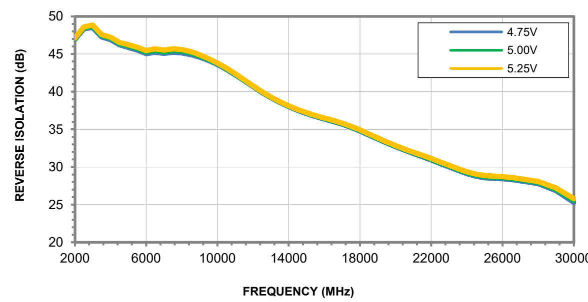
GAIN vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



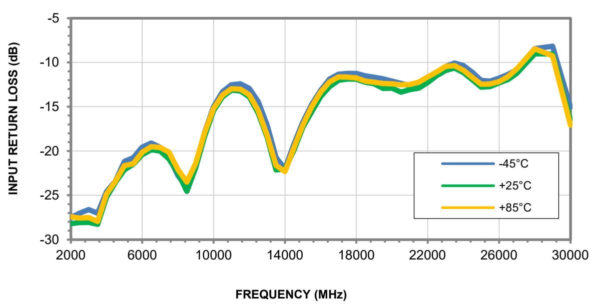
REVERSE ISOLATION vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



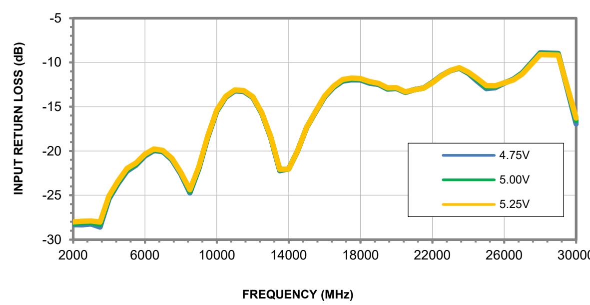
REVERSE ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



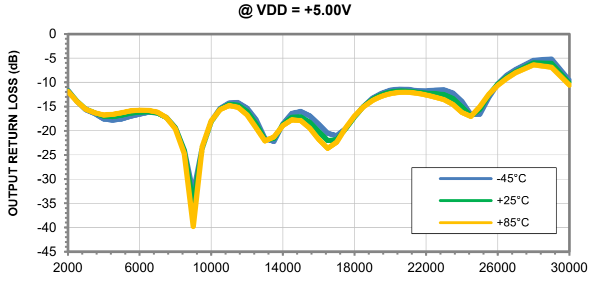
INPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +5.00V



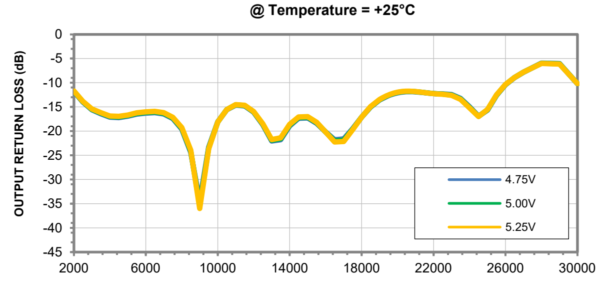
INPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C



OUTPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +5.00V

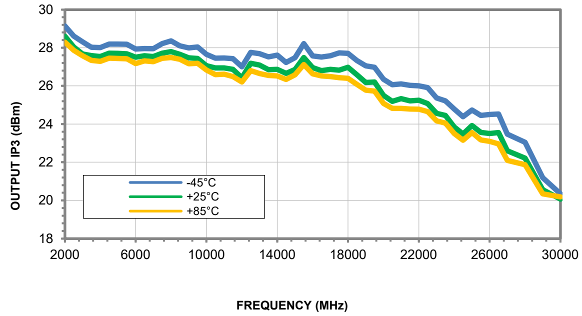


OUTPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C

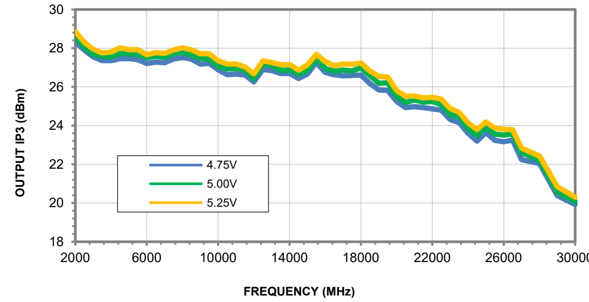


TYPICAL PERFORMANCE CURVES

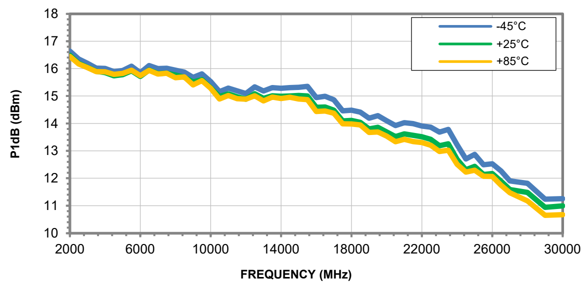
OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



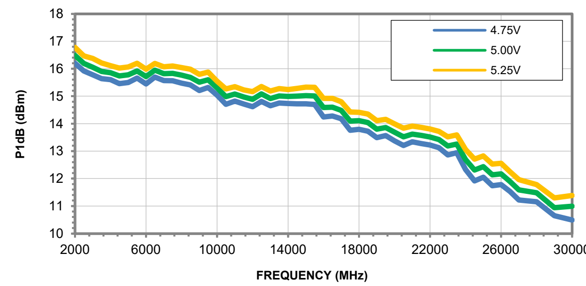
OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



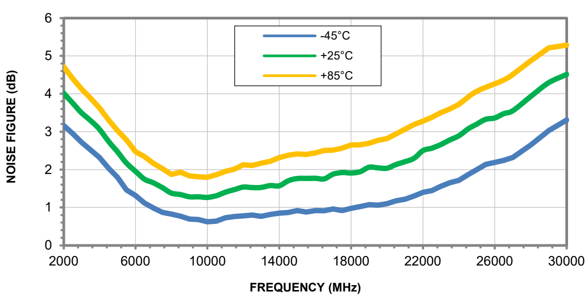
P1dB vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00V



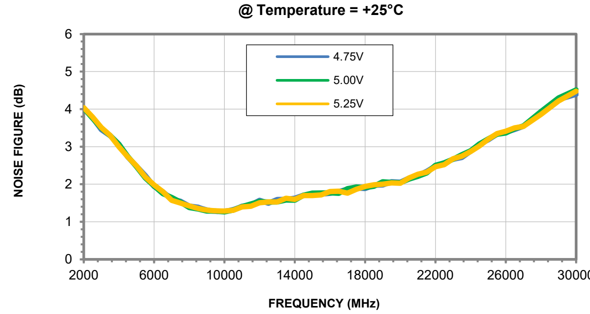
P1dB vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C



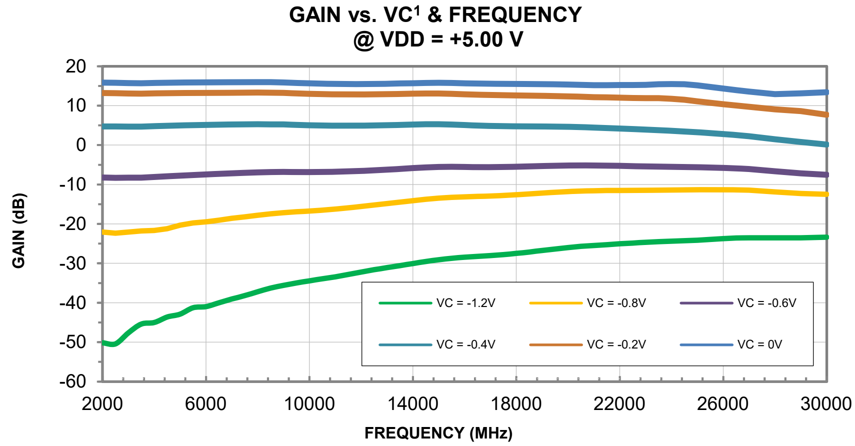
NOISE FIGURE vs. FREQUENCY & TEMPERATURE
@ VDD = +5.00 V

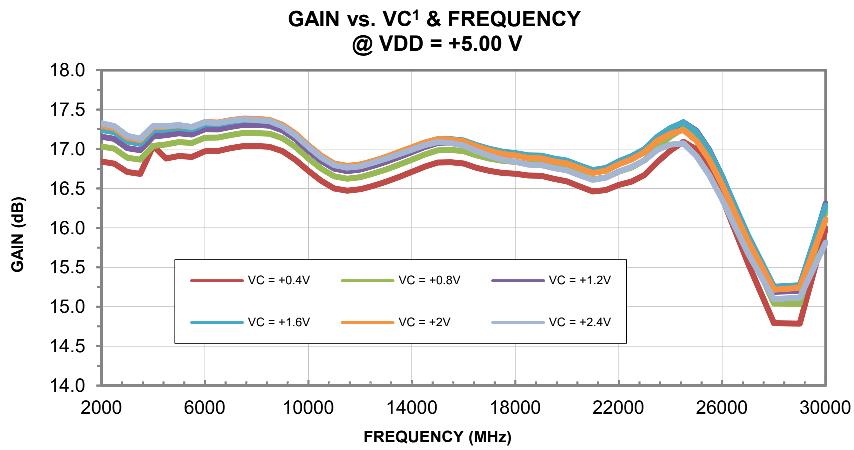


NOISE FIGURE vs. FREQUENCY & DEVICE VOLTAGE
@ Temperature = +25°C

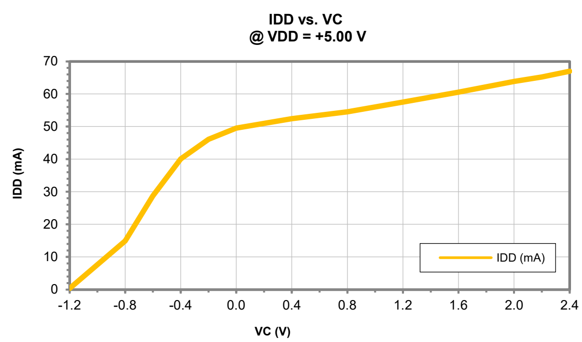


VC CONTROL VS. GAIN, FREQUENCY, & CONTROL CURRENT





1. Gain is nominal when VC = Open. When VC is left floating, there is a measured voltage of +2V on the pin.



ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DG1677-4 QFN-style package, exposed paddle, lead finish: PPF
Tape & Reel **Standard quantities available on reel**	F66 7" reels with 20, 50, 100, 200, 500 or 1000 devices
Suggested Layout for PCB Design	PL-741
Evaluation Board	TB-AVA-0233LNC+
Environmental Ratings	ENV08T10
Product Handling	The use of no-clean solder is recommended. This package cannot be subjected to aqueous wash.

ESD RATING
Human Body Model (HBM): Class 1A (250V) in accordance with ANSI/ESDA/JEDEC JS-001-2017
Charged Device Model (CDM): Class C3 (1000V) in accordance with JESD22-C101F

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