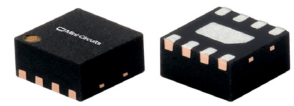
MMIC SURFACE MOUNT

Low Noise Amplifier **PMA2-162LNA+**

50Ω 700 to 1600 MHz Ultra Low Noise

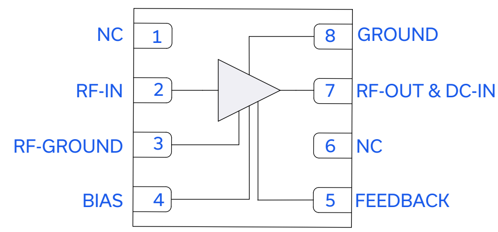
THE BIG DEAL

- Noise Figure, Typ 0.5 dB
- Adjustable Gain, Typ. 19.7 dB to 23.5 dB
- Class 1B HBM ESD (500V)
- OIP3, Typ. +30 dBm
- P1dB, Typ +20 dBm
- 2x2mm 8-Lead SMT Package
- May be used as a replacement for MGA-631P8[a,b]



Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

- Base Station Infrastructure
- Portable Wireless
- LTE
- GPS
- GSM
- Airborn Radar

PRODUCT OVERVIEW

The PMA2-162LNA+ is an E-pHEMT* amplifier that operates from 700 to 1600 MHz. The amplifier has a low noise figure of 0.5 dB typical while providing 22.7 dB of gain, +30 dBm OIP3, and +20 dBm P1dB with 18 dB typical return loss with a +4V and 55mA DC power. Gain is adjustable from 19.7 dB to 23.5 dB. The amplifier is housed in an industry standard 2x2mm SMT package, with RF ports internally matched to 50Ω, facilitating easy integration into microwave system PC boards.

KEY FEATURES

Feature	Advantages
Ultra Low Noise Figure • Typ. 0.5 dB	Excellent noise figure performance.
High OIP3 • OIP3, Typ. +30 dBm	Suitable as a driver amplifier in receiver/transmitter chains.
Adjustable Gain	By changing feedback resistor R1, gain can be changed from 19.7 dB to 23.5 dB.
Max Input Power, +25 dBm	Ruggedized design operates up to high input power often seen at Receiver inputs eliminating the need for an external limiter.
Class 1B ESD (500V HBM)	The PMA2-162LNA+ is a super low noise E-pHEMT based design. Mini-Circuits incorporates ESD protection on die to achieve industry leading ESD performance for a low noise amplifier.
2x2mm 8-Lead SMT package	Small footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

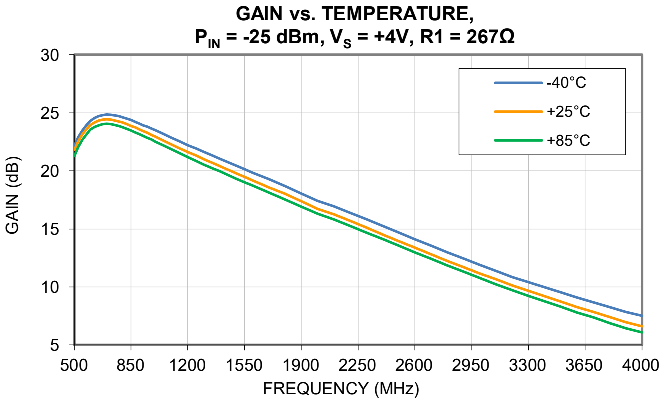
a. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application, and compatibility with other components and environmental conditions and stresses.
b. The Avago MGA-631P8 part number is used for identification and comparison purposes only.
*Enhanced mode Pseudomorphic High Electron Mobility Transistor

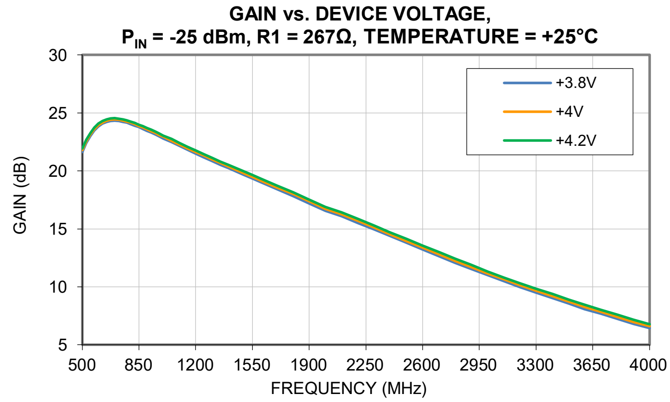
ELECTRICAL SPECIFICATIONS[1,2] AT +25°C, Z_O = 50Ω, AND V_S = +4V UNLESS NOTED OTHERWISE

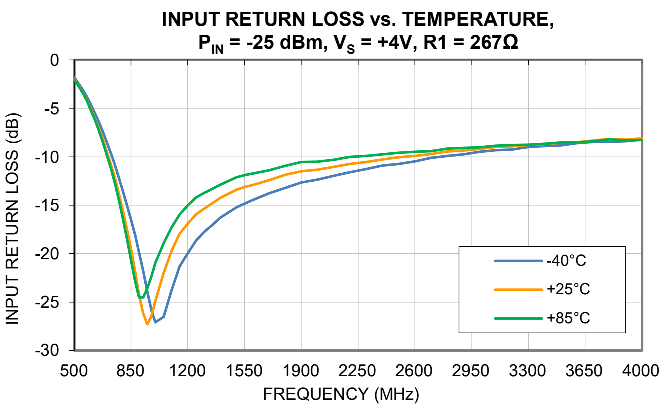
Parameter	Condition (MHz)	R1 = 267Ω[1]			R1 = 93Ω[2]			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
Frequency Range		700		1600	700		1600	MHz
Gain	700	20.9	24.4	24.5	18.6	22.7	23.1	dB
	800		24.1			22.2		
	1000		22.7			20.8		
	1300		20.7			19.1		
	1600		18.8			17.7		
Input Return Loss	700		9.5			11.5		dB
	800		15.5			18.8		
	1000		17.9			20.0		
	1300		12.4			14.5		
	1600		10.8			12.4		
Output Return Loss	700		13.6			21.6		dB
	800		16.1			17.8		
	1000		18.9			16.0		
	1300		15.6			15.1		
	1600		10.7			11.6		
Isolation	700-1600		38.2			34.2		dB
Output Power at 1 dB Compression (P1dB)	700		+19.5			+18.3		dBm
	800		+19.8			+18.9		
	1000		+19.9			+19.7		
	1300		+19.7			+19.8		
	1600		+18.8			+19.0		
Output Third-Order Intercept Point (Pout = 0 dBm/Tone)	700		+29.1			+28.3		dBm
	800		+30.3			+38.5		
	1000		+30.0			+29.0		
	1300		+30.1			+29.2		
	1600		+29.4			+28.5		
Noise Figure	700		0.55			0.57		dB
	800		0.51			0.54		
	1000		0.47			0.48		
	1300		0.64			0.65		
	1600		0.80			0.81		
Device Operating Voltage (V_S)		+3.8	+4.0	+4.2	+3.8	+4.0	+4.2	V
Device Operating Current (I_S)[3]			55			55		mA
Device Current Variation Vs. Temperature[4]			2			2		µA/°C
Device Current Variation Vs. Voltage[5]			0.018			0.016		mA/mV

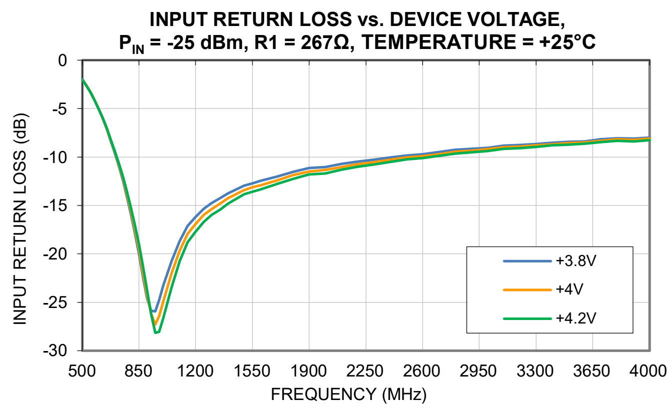
1. Tested in Mini-Circuits Characterization Test/Evaluation Board TB-PMA2162LNAC+ with R1 = 267Ω. See Figure 2. De-embedded to the device reference plane.
2. Tested in Mini-Circuits Characterization Test/Evaluation Board TB-PMA2162LNAC+ with R1* = 93Ω. See Figure 2. De-embedded to the device reference plane.
3. Current at P_{IN} = -25 dBm. Increases to 95 mA at P1dB.
4. ((Current at Tmax°C – Current at -Tmin°C))/(Tmax °C -Tmin °C)
5. (Current at Nominal V +ΔV in mA)- (Current at Nominal V -ΔV mA)/(2ΔV mV)

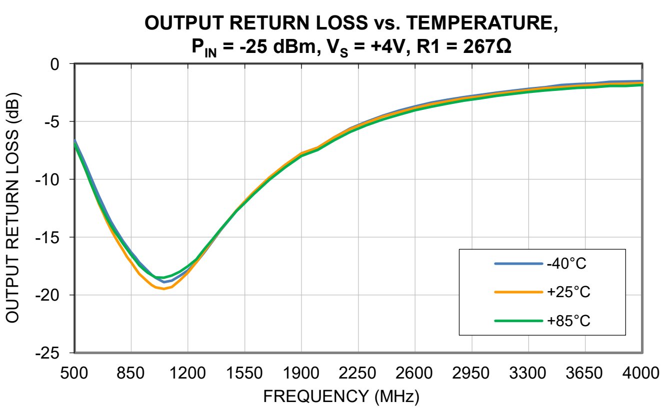
TYPICAL PERFORMANCE GRAPHS

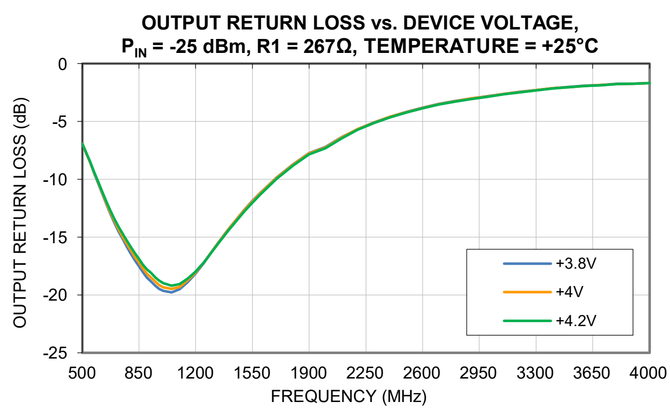






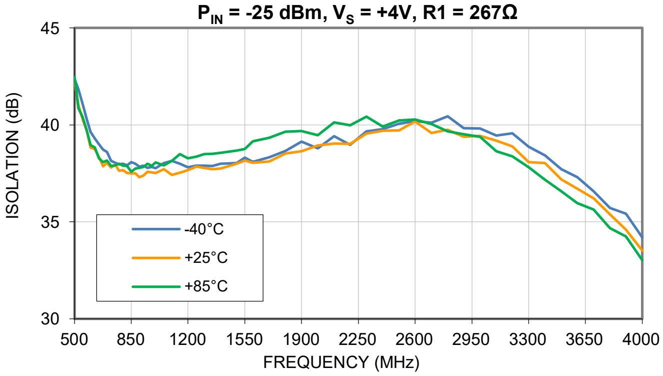




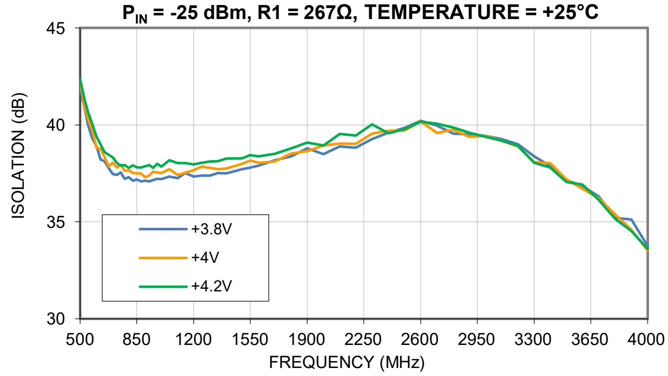


TYPICAL PERFORMANCE GRAPHS

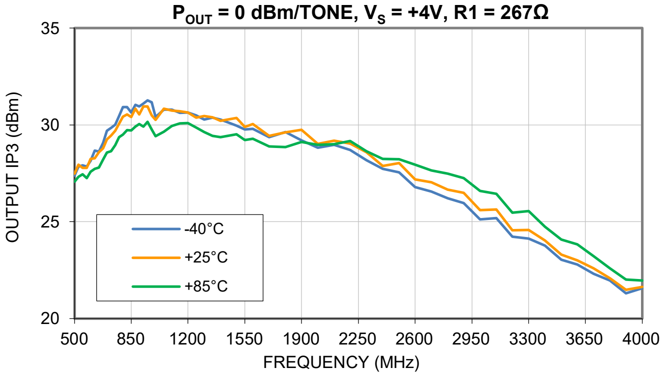
ISOLATION vs. TEMPERATURE, P_{IN} = -25 dBm, V_S = +4V, R1 = 267Ω



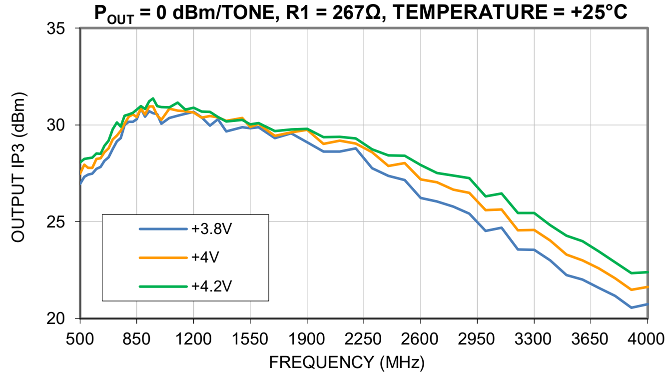
ISOLATION vs. DEVICE VOLTAGE, P_{IN} = -25 dBm, R1 = 267Ω, TEMPERATURE = +25°C



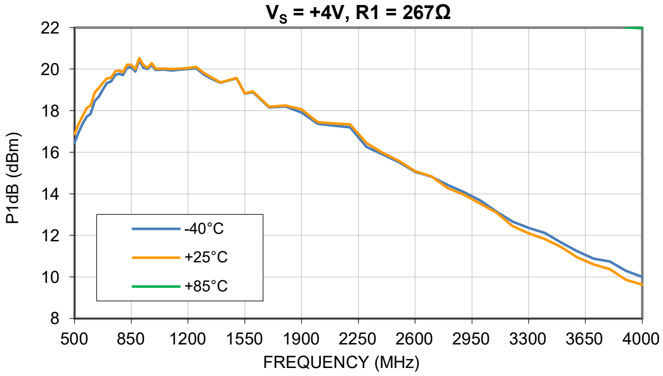
OUTPUT IP3 vs. TEMPERATURE, P_{OUT} = 0 dBm/TONE, V_S = +4V, R1 = 267Ω



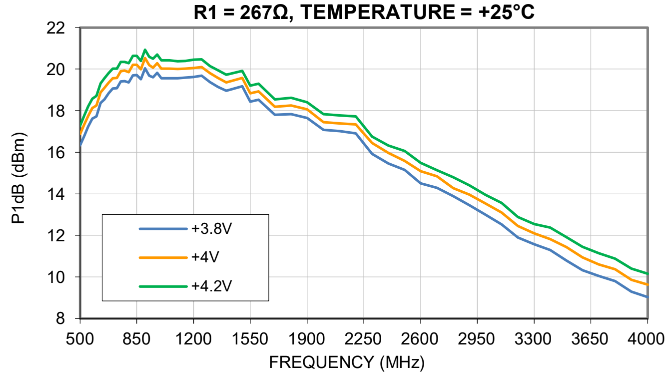
OUTPUT IP3 vs. DEVICE VOLTAGE, P_{OUT} = 0 dBm/TONE, R1 = 267Ω, TEMPERATURE = +25°C



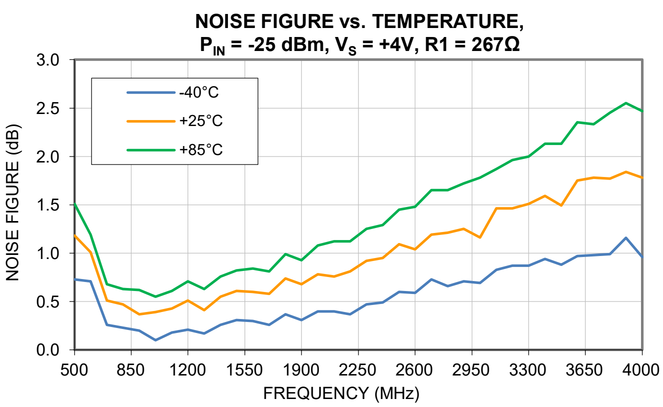
P1dB vs. TEMPERATURE, V_S = +4V, R1 = 267Ω

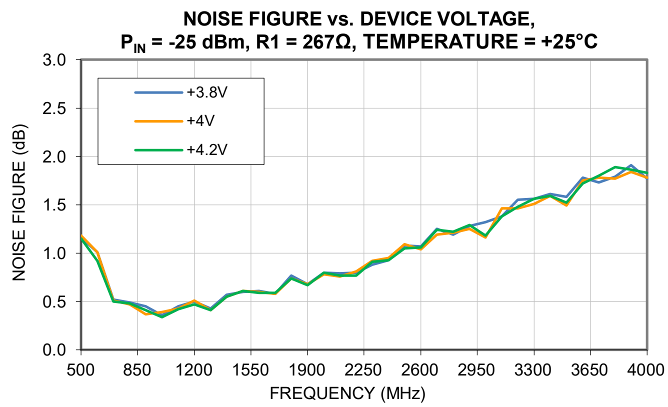


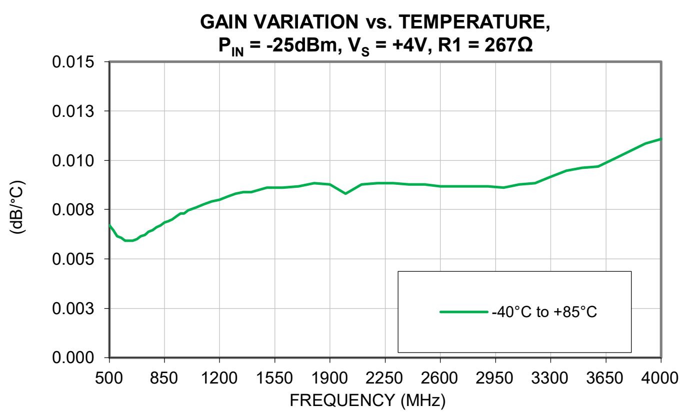
P1dB vs. DEVICE VOLTAGE, R1 = 267Ω, TEMPERATURE = +25°C



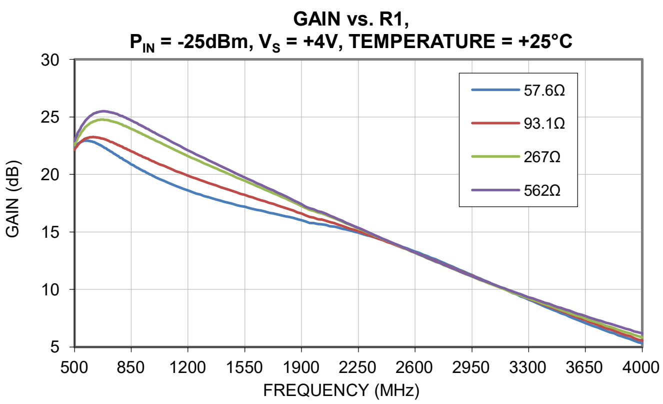
TYPICAL PERFORMANCE GRAPHS

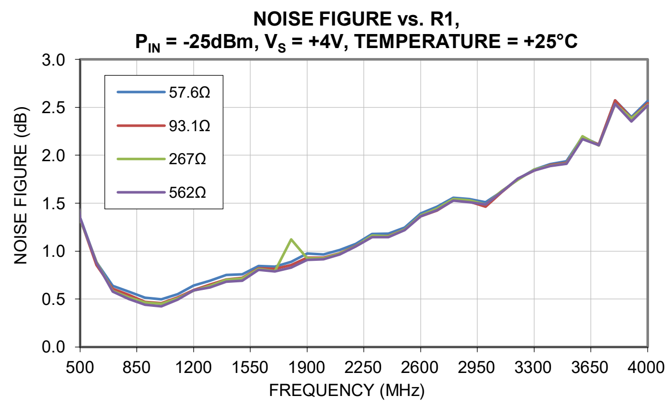


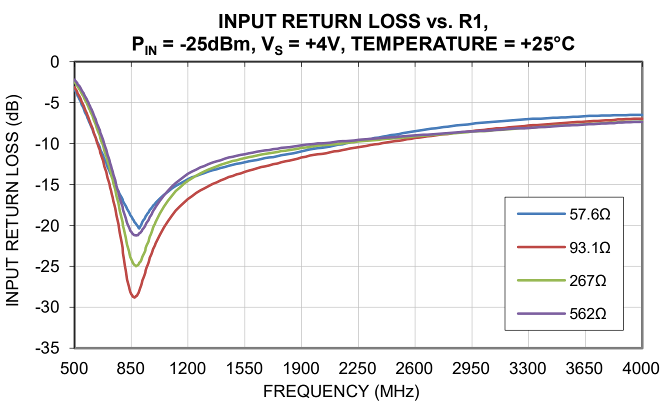


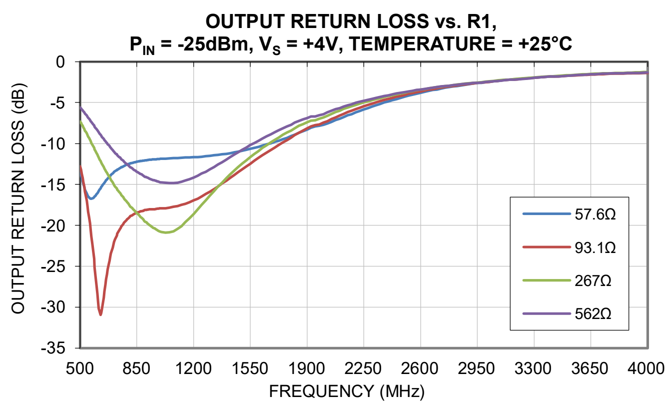


TYPICAL PERFORMANCE GRAPHS









ABSOLUTE MAXIMUM RATINGS[6]

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Total Power Dissipation	0.55 W
Junction Temperature[7]	+150°C
Input Power (CW), V_S = +4 V	+25 dBm
DC Voltage on V_S	+5.5 V
Current I_S	130 mA

6. Permanent damage may occur if any of these limits are exceeded. Maximum ratings are not intended for continuous normal operation.
7. Peak temperature on top of Die.

THERMAL RESISTANCE

Parameter	Ratings
Thermal Resistance (Θ_{jc})[8]	53°C/W

8. Θ_{jc}= (Hot Spot Temperature on Die - Temperature at Ground Lead)/Dissipated Power

ESD RATING

	Class	Voltage Range	Reference Standard
Human Body Model (HBM)	1B	500V to <1000V	ANSI/ESDA/JEDEC JS-001-2017
Machine Model (MM)	M1	25V	JESD22-C101F

ESD HANDLING PRECAUTION: This device is designed to be Class 1B 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: MSL1 in accordance with IPC/JEDEC J-STD-020E/JEDEC J-STD-033C

FUNCTIONAL DIAGRAM

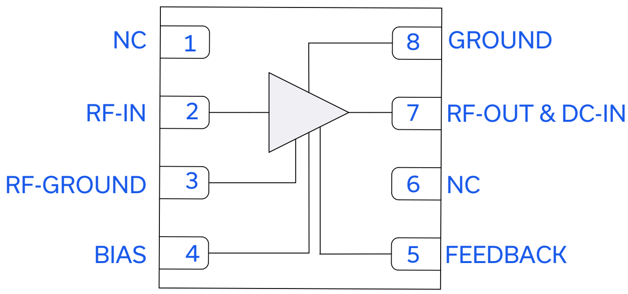


Figure 1. PMA2-162LNA+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF-IN	2	RF-IN Pad connects to RF-Input port.
RF-OUT & DC-IN	7	RF-OUT Pad connects to RF-Output and the voltage input port, DC-IN.
BIAS	4	Bias Pad that is used to adjust the bias voltage supplied to the DUT through the use of an RBIAS resistor.
FEEDBACK	5	Feedback Pad used to reflect any feedback into the DUT.
RF-GROUND	3	RF-Ground Pad used for grounding.
GROUND	8 & Paddle	Connects to ground.
NC	1 & 6	Not used internally. Connected to ground on test board.

CHARACTERIZATION TEST BOARD

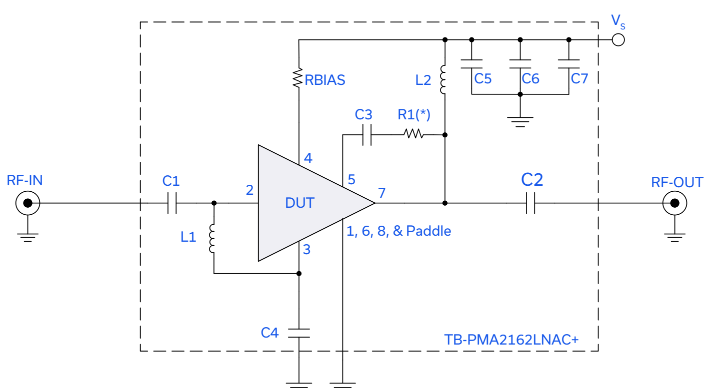


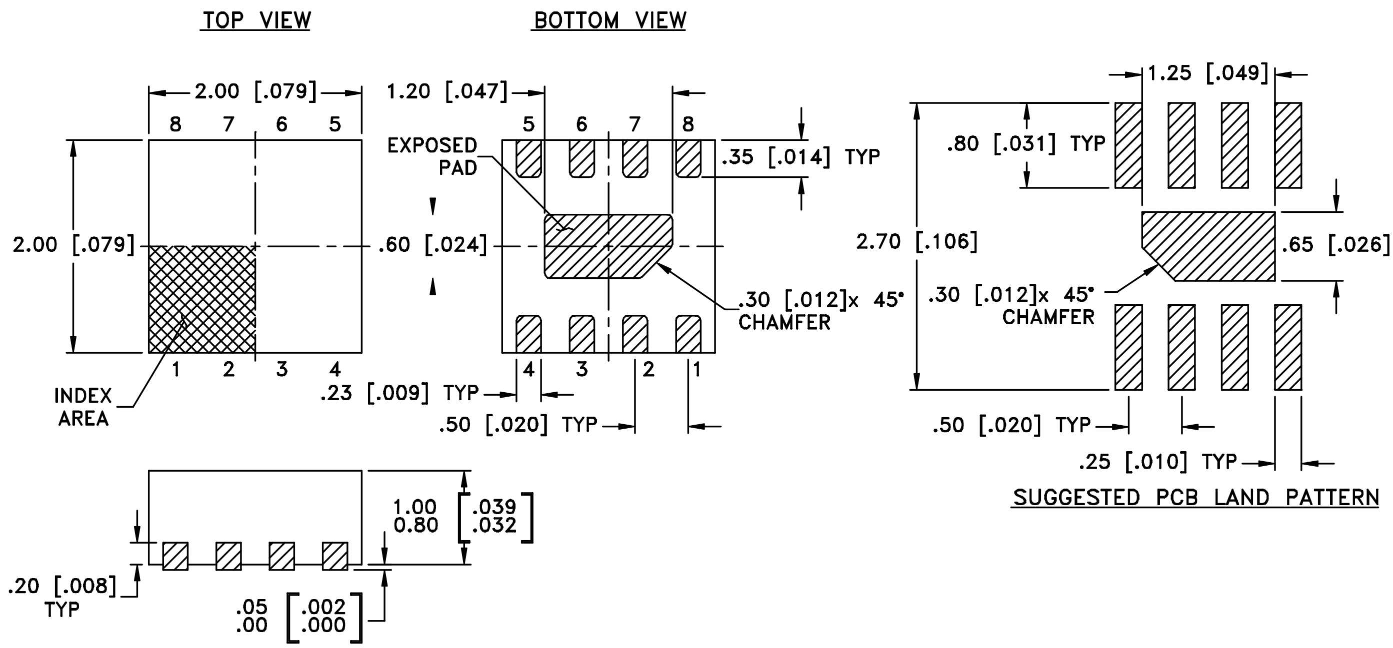
Figure 2. DUT soldered on Mini-Circuits Characterization Test Board: TB-PMA2162LNAC+

Gain, Return Loss, Output Power at 1dB compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using PNA-X N5242A Microwave Network Analyzer.

Conditions:
1. Gain and Return Loss: P_{IN}= -25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.
3. V_S = +4V

Component	Vendor	Vendor P/N	Value	Size
C1, C6	AVX CORP	04025U9R1CAT2A	9.1pF	0402
C2, C4	Murata	GRM15555C1H101JA01D	100pF	0402
C3	Murata	GJM1555C1H5R6BB01D	5.6pF	0402
C5, C7	Murata	GRM155R71C104KA88D	0.1µF	0402
R1	KOA Speer Electronics	RK73H1ETTP2670F	267Ω	0402
R1*	KOA Speer Electronics	RK73H1ETTP930F	93Ω	0402
Rbias	KOA Speer Electronics	RK73H1ETTP7500F	750Ω	0402
L1	Coilcraft	0402CS-6N8XGLW	6.8nH	0402
L2	Coilcraft	0402CS-15NXGLW	15nH	0402

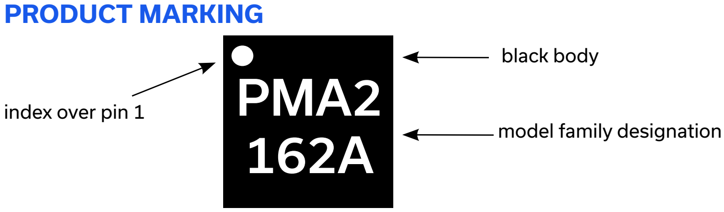
CASE STYLE DRAWING



Weight: 0.006 grams
Dimensions are in inches [mm].

Figure 3. MC1631-1 Case Style Drawing

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

Figure 4. PMA2-162LNA+ Product Marking

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD

CLICK HERE

Performance Data	Data Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1631-1. Plastic Package, Exposed Paddle, Lead Finish: Matte Tin
RoHs Status	Compliant
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-737
Evaluation Board	TB-PMA2162LNAC+ Gerber File
Environmental Ratings	ENV08T1