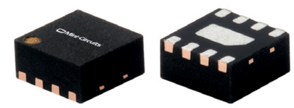
MMIC SURFACE MOUNT

Low Noise Amplifier PMA2-252LNA+

50Ω 1500 to 2500 MHz Ultra Low Noise

THE BIG DEAL

- Noise Figure, Typ 0.8 dB
- Adjustable Gain at V_S=+4V, Typ. 14.5 to 17.6 dB
- OIP3, Typ. +30 dBm
- P1dB, Typ. +17.8 dBm
- 2x2mm 8-Lead SMT Package
- May be used as a replacement for MGA-632P8[a,b]

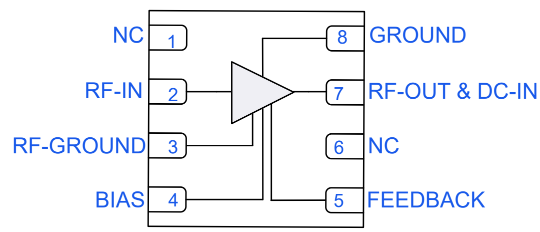


Generic photo used for illustration purposes only

APPLICATIONS

- Base Station Infrastructure
- Satellite Communication (Inmarsat)
- GPS
- Tactical Air Navigation

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

The PMA2-252LNA+ is an E-PHEMT amplifier that operates from 1500 to 2500 MHz. The amplifier has a low noise figure of 0.8 dB typical while providing 17.6 dB of gain, +30 dBm OIP3, and +17.8 dBm P1dB with 18 dB typical return loss from a +4V supply drawing 57 mA. Gain is adjustable across the operating bandwidth by changing the external feedback resistor R1. 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. 0.8 dB	Excellent noise figure performance.
High OIP3 • OIP3, Typ. +30 dBm	Suitable as a driver amplifier in receiver/transmitter chains.
Adjustable Gain, 14.5 to 17.6 dB	By changing the feedback resistor R1, the device gain may be adjusted to optimize the signal chain.
Max Input Power, +27 dBm	Ruggedized design operates up to high input power often seen at receiver inputs eliminating the need for an external limiter.
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-632P8 part number is used for identification and comparison purposes only.

REV. C
ECO-017307
PMA2-252LNA+
MCL NY
230328

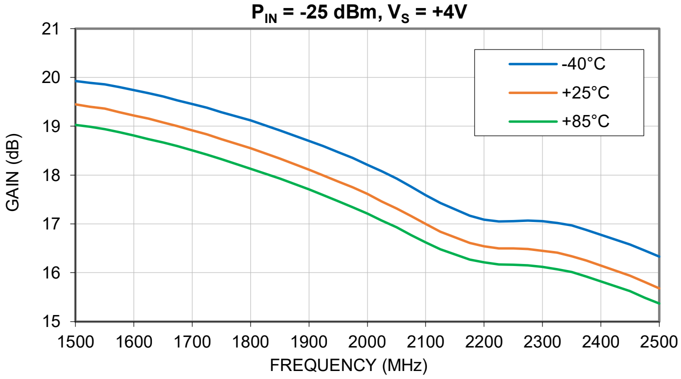
ELECTRICAL SPECIFICATIONS[1] AT 25°C, Zo=50Ω, UNLESS NOTED OTHERWISE

Parameter	Condition (MHz)	V_S = +4V[1] Min.	V_S = +4V[1] Typ.	V_S = +4V[1] Max.	V_S = +3V[1] Typ.	Units
Frequency Range		1500		2500		MHz
Gain	1500		19.5		18.8	dB
	1800		18.6		17.8	
	2000	15.7	17.6	19.5	16.8	
	2200		16.5		15.7	
	2500		15.7		14.8	
Input Return Loss	1500		21.3		17.5	dB
	1800		19.9		15.4	
	2000		18.0		14.4	
	2200		16.3		13.4	
	2500		14.9		13.0	
Output Return Loss	1500		10.0		10.8	dB
	1800		23.3		28.5	
	2000		18.2		16.9	
	2200		12.9		11.9	
	2500		8.3		7.9	
Isolation	1500-2500		37.4		35.8	dB
Output Power at 1 dB Compression (P1dB)	1500		+18.5		+16.2	dBm
	1800		+17.9		+15.9	
	2000		+17.8		+15.6	
	2200		+17.4		+15.3	
	2500		+16.2		+13.9	
Output Third-Order Intercept Point (Pout = +2 dBm/Tone)	1500		+31.1		+27.1	dBm
	1800		+30.1		+25.5	
	2000		+30.0		+25.3	
	2200		+29.3		+24.8	
	2500		+27.6		+23.2	
Noise Figure	1500		0.7		0.7	dBm
	1800		0.8		0.8	
	2000		0.8		0.9	
	2200		0.8		1.1	
	2500		1.2		1.1	
Device Operating Voltage (V_S)		+3.5	+4.0	+4.5	+3.0	V
Device Operating Current (I_S) [2]			57		41	mA
Device Current Variation Vs. Temperature[3]			-19.0		-3.4	uA/°C
Device Current Variation Vs. Voltage[4]			0.018		0.017	mA/mV

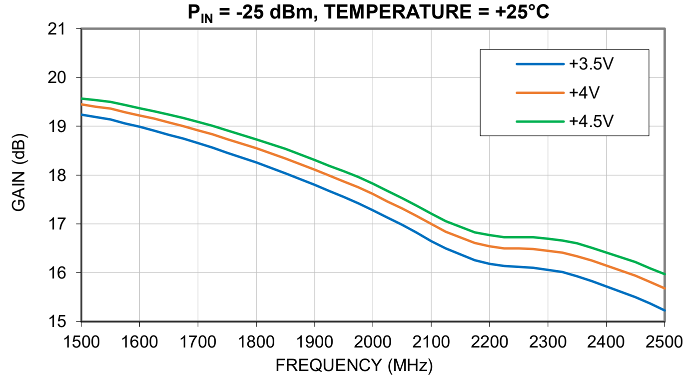
1. Tested in Mini-Circuits Characterization Test/Evaluation Board TB-PMA2252LNAC+ with R1 = 825 Ω. See Figure 2. De-embedded to the device reference plane.
2. Current at P_{IN} = -25 dBm. Increases to 95 mA at P1dB.
3. ((Current at Tmax°C - Current at -Tmin°C))/(Tmax °C -Tmin °C)
4. (Current at Nominal V +ΔV in mA)- (Current at Nominal V -ΔV mA)/(2ΔV mV)

TYPICAL PERFORMANCE GRAPHS

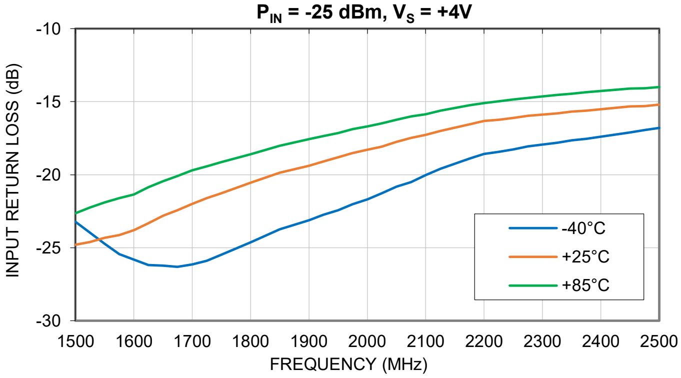
GAIN vs. TEMPERATURE,
P_{IN} = -25 dBm, V_S = +4V



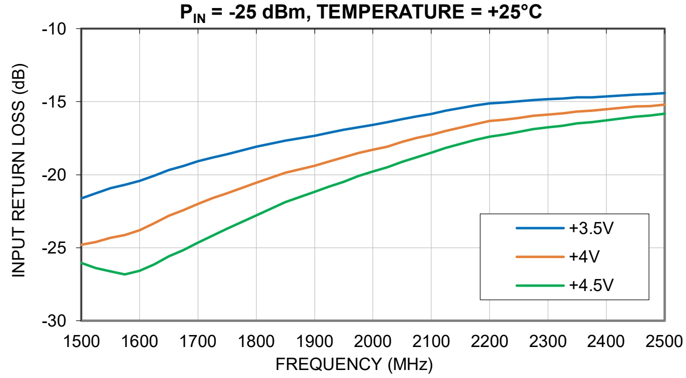
GAIN vs. DEVICE VOLTAGE,
P_{IN} = -25 dBm, TEMPERATURE = +25°C



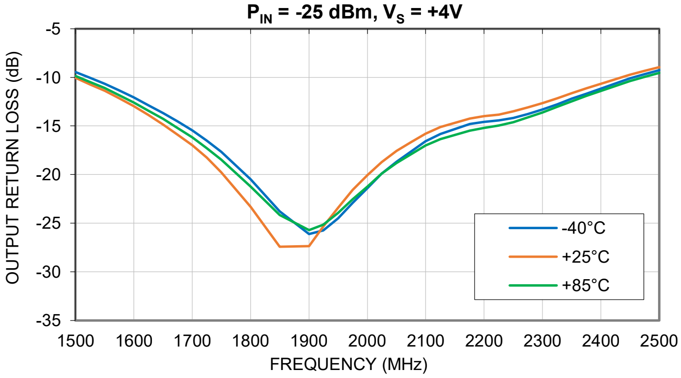
INPUT RETURN LOSS vs. TEMPERATURE,
P_{IN} = -25 dBm, V_S = +4V



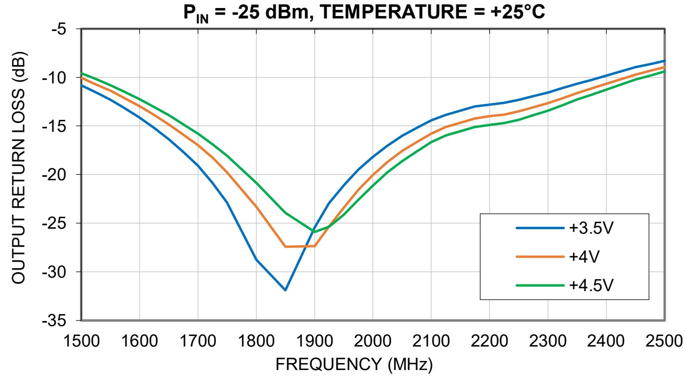
INPUT RETURN LOSS vs. DEVICE VOLTAGE,
P_{IN} = -25 dBm, TEMPERATURE = +25°C



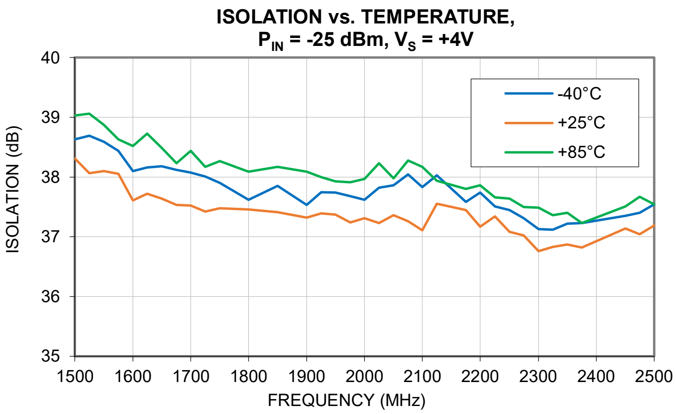
OUTPUT RETURN LOSS vs. TEMPERATURE,
P_{IN} = -25 dBm, V_S = +4V

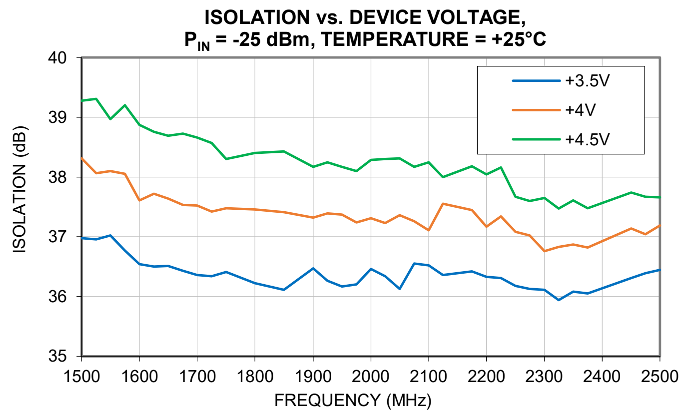


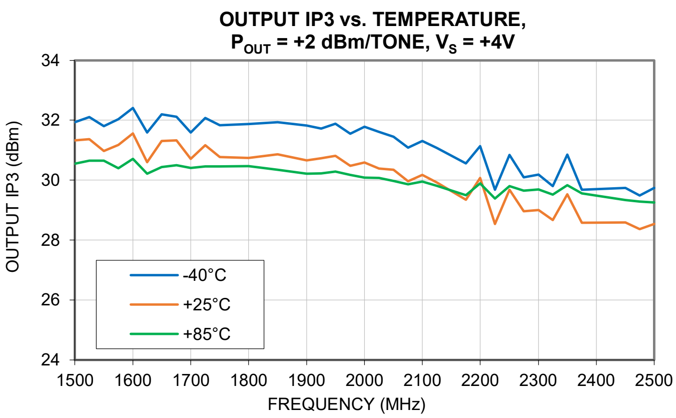
OUTPUT RETURN LOSS vs. DEVICE VOLTAGE,
P_{IN} = -25 dBm, TEMPERATURE = +25°C

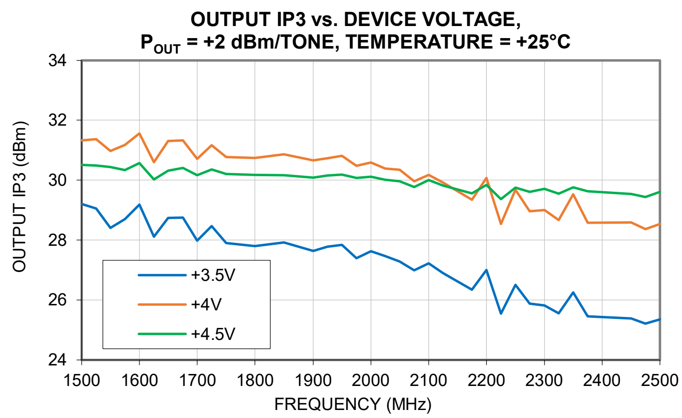


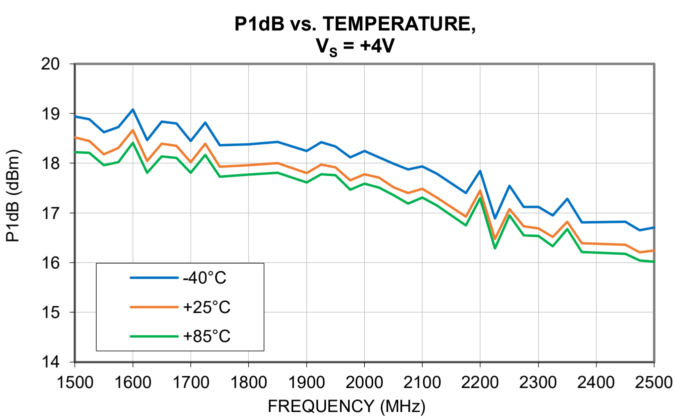
TYPICAL PERFORMANCE GRAPHS

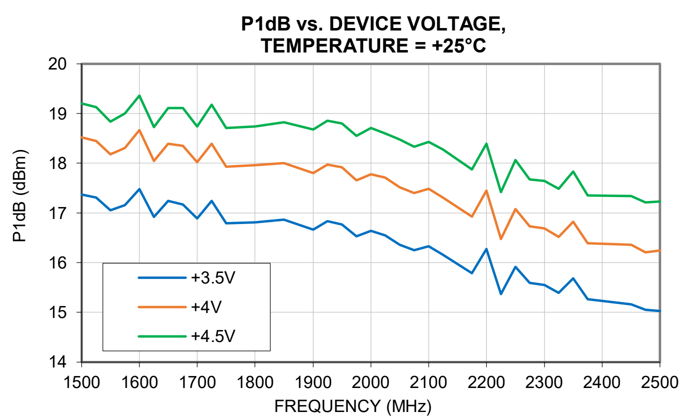




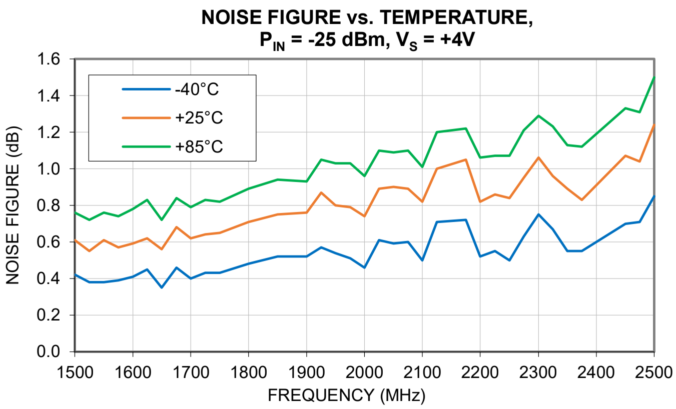


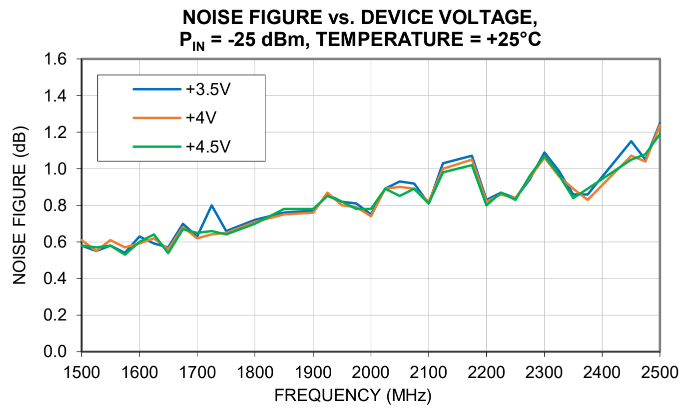


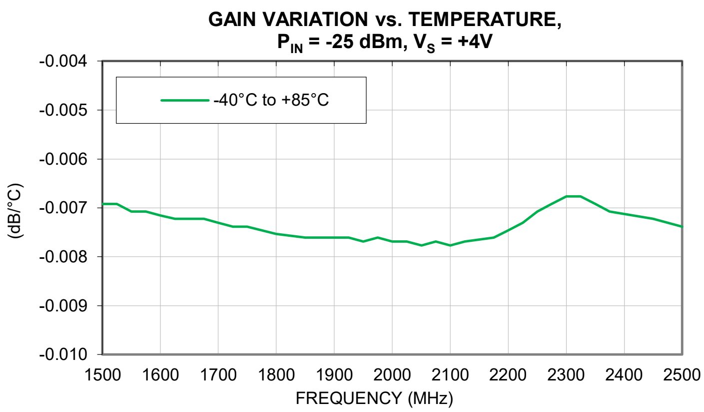




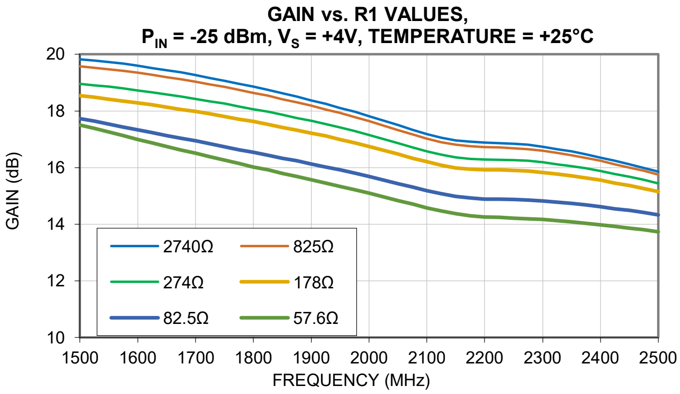
TYPICAL PERFORMANCE GRAPHS

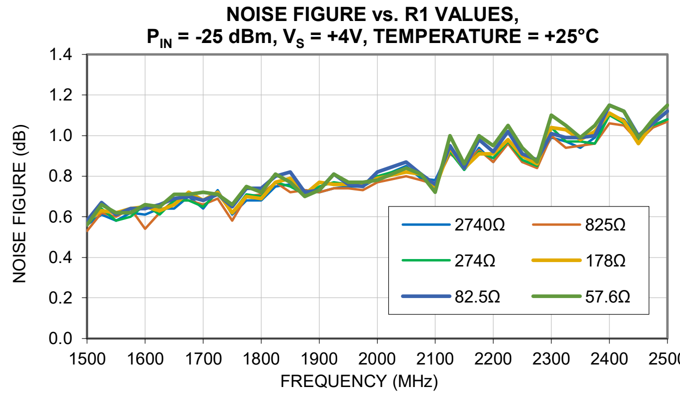


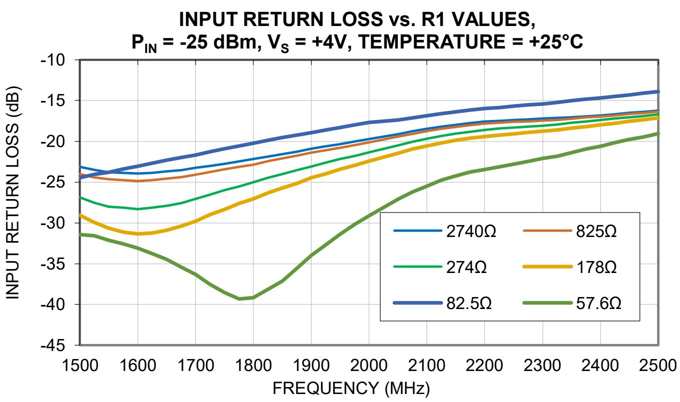


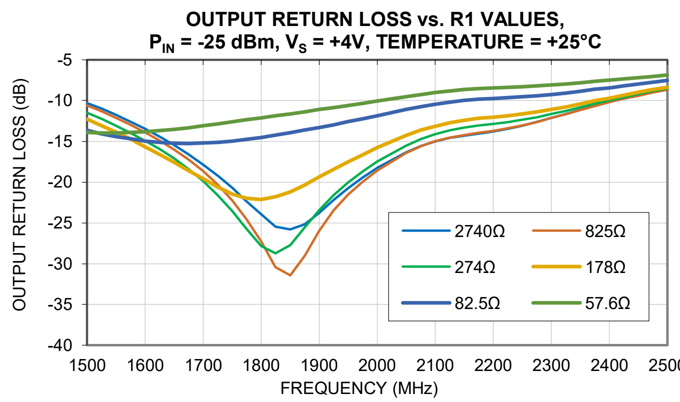


TYPICAL PERFORMANCE GRAPHS



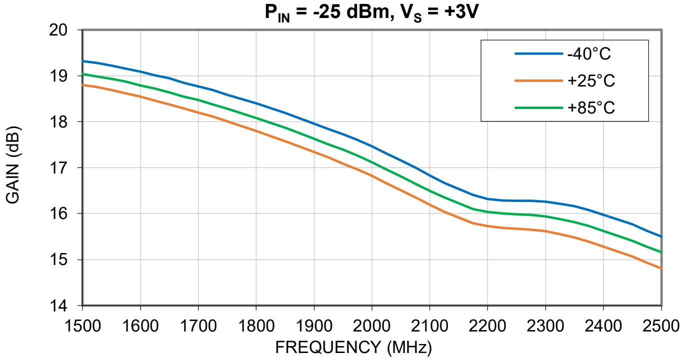




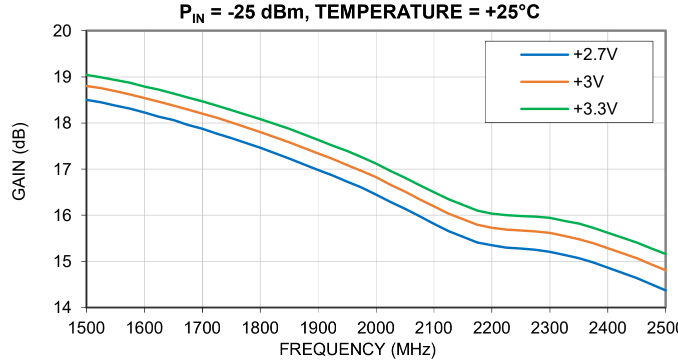


TYPICAL PERFORMANCE GRAPHS

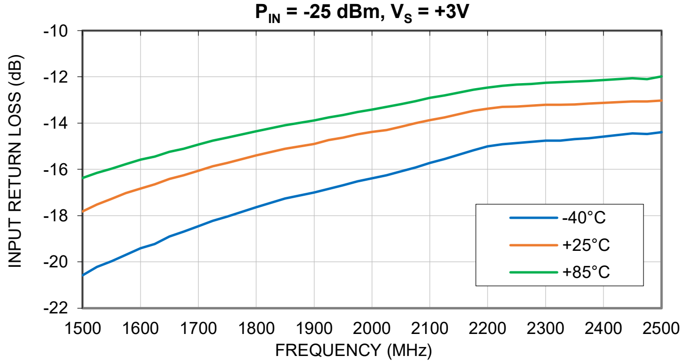
GAIN vs.TEMPERATURE, P_{IN} = -25 dBm, V_S = +3V



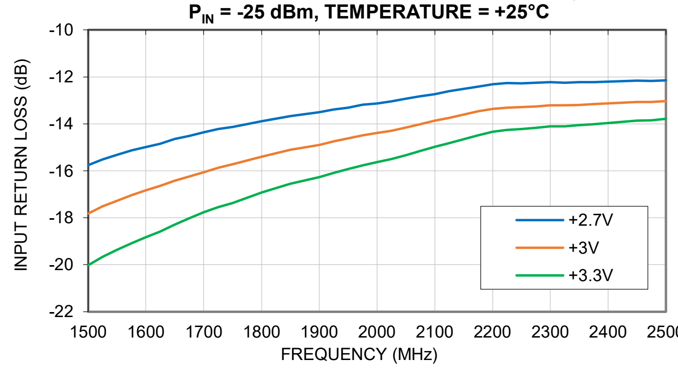
GAIN vs. DEVICE VOLTAGE, P_{IN} = -25 dBm, TEMPERATURE = +25°C



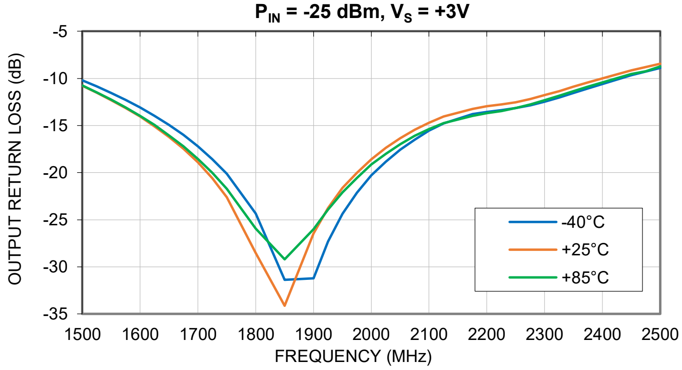
INPUT RETURN LOSS vs. TEMPERATURE, P_{IN} = -25 dBm, V_S = +3V



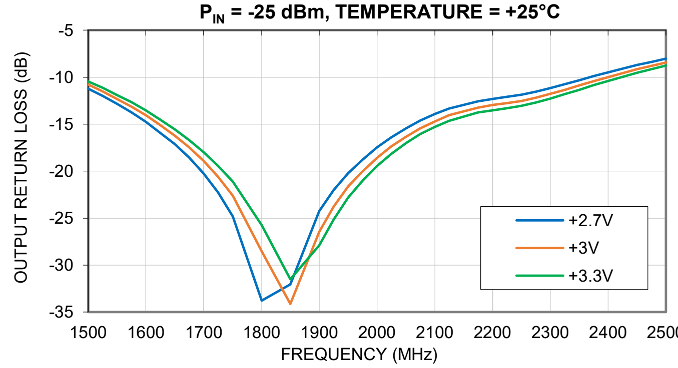
INPUT RETURN LOSS vs. DEVICE VOLTAGE, P_{IN} = -25 dBm, TEMPERATURE = +25°C



OUTPUT RETURN LOSS vs. TEMPERATURE, P_{IN} = -25 dBm, V_S = +3V

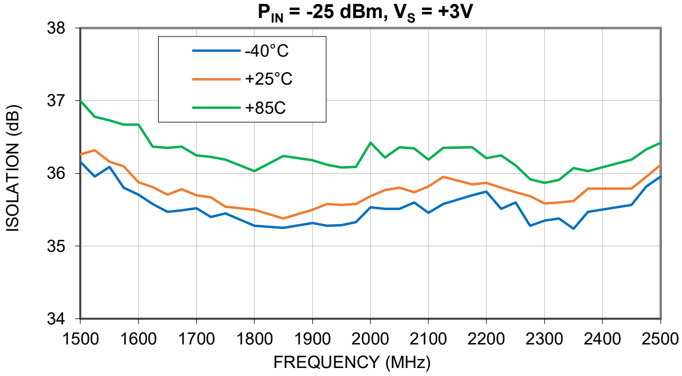


OUTPUT RETURN LOSS vs. DEVICE VOLTAGE, P_{IN} = -25 dBm, TEMPERATURE = +25°C

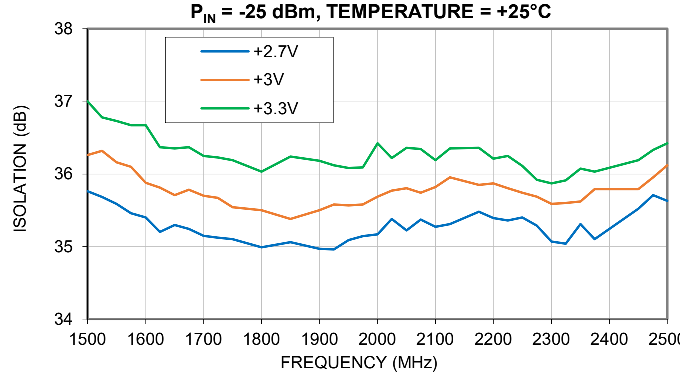


TYPICAL PERFORMANCE GRAPHS

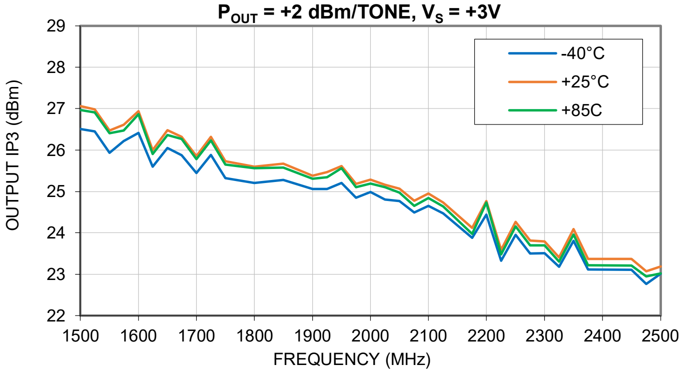
ISOLATION vs. TEMPERATURE,
P_{IN} = -25 dBm, V_S = +3V



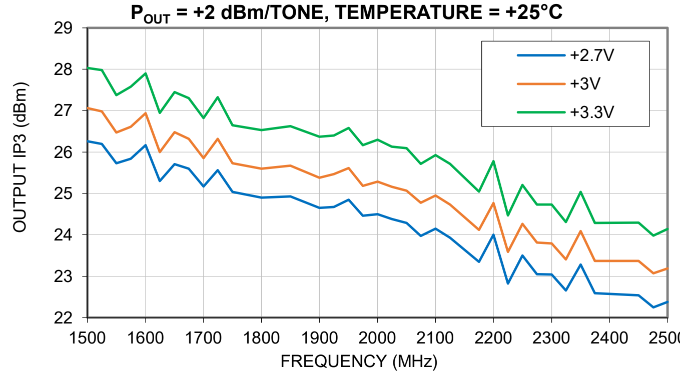
ISOLATION vs. DEVICE VOLTAGE,
P_{IN} = -25 dBm, TEMPERATURE = +25°C



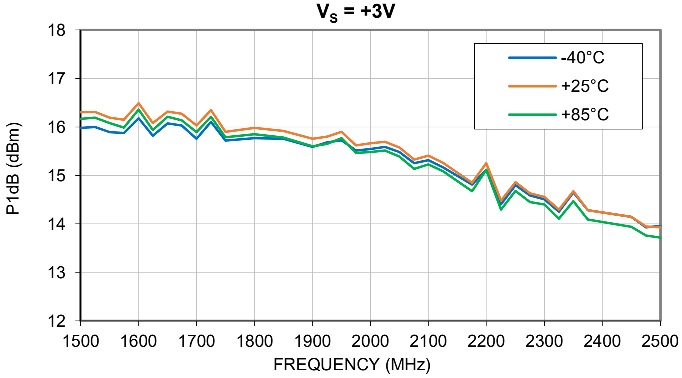
OUTPUT IP3 vs. TEMPERATURE,
P_{OUT} = +2 dBm/TONE, V_S = +3V



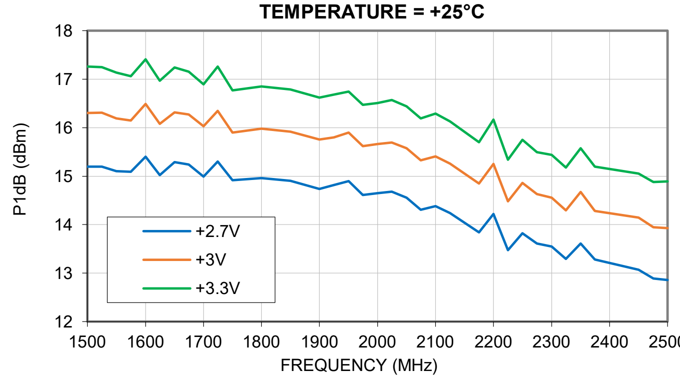
OUTPUT IP3 vs. DEVICE VOLTAGE,
P_{OUT} = +2 dBm/TONE, TEMPERATURE = +25°C



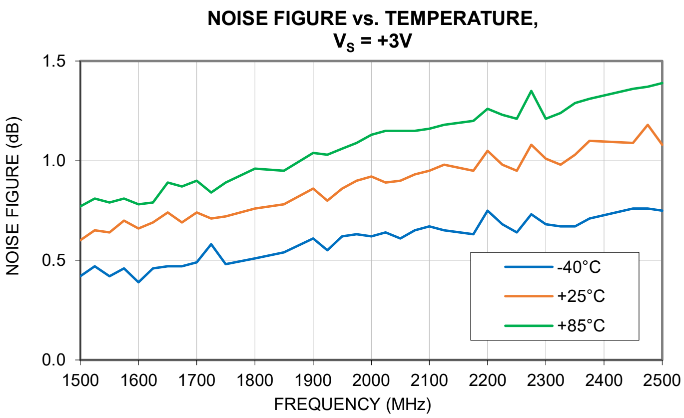
P1dB vs. TEMPERATURE,
V_S = +3V

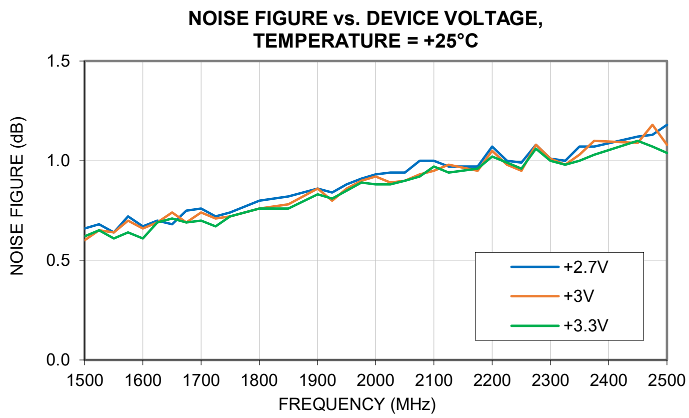


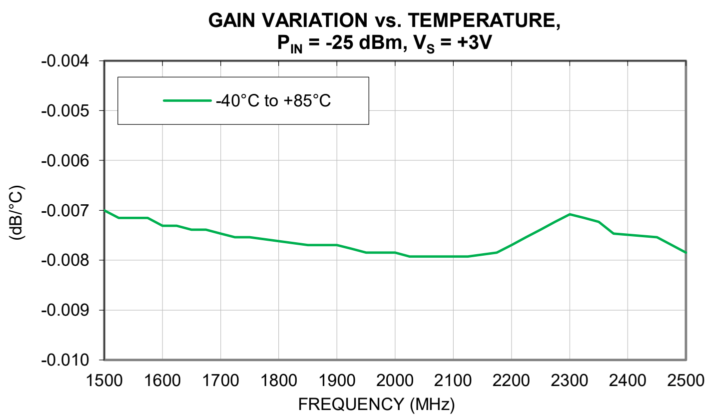
P1dB vs. DEVICE VOLTAGE,
TEMPERATURE = +25°C



TYPICAL PERFORMANCE GRAPHS

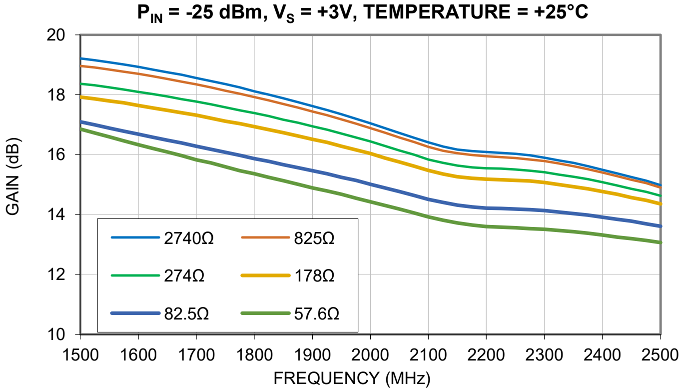




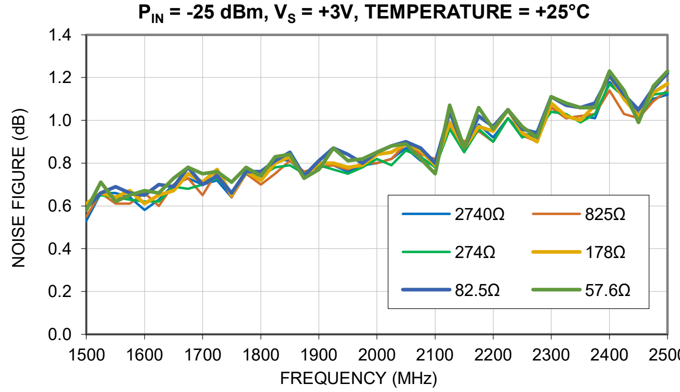


TYPICAL PERFORMANCE GRAPHS

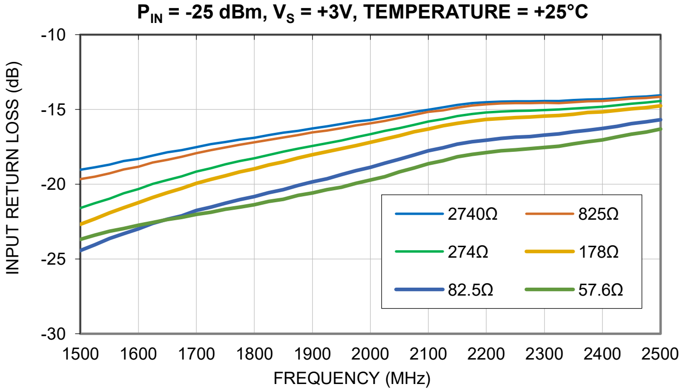
GAIN vs. R1 VALUES,
P_{IN} = -25 dBm, V_S = +3V, TEMPERATURE = +25°C



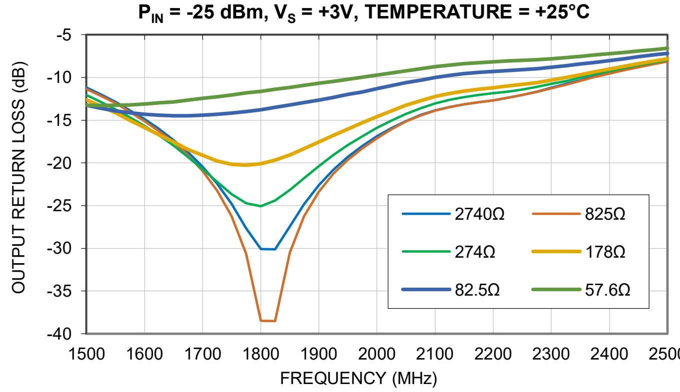
NOISE FIGURE vs. R1 VALUES,
P_{IN} = -25 dBm, V_S = +3V, TEMPERATURE = +25°C



INPUT RETURN LOSS vs. R1 VALUES,
P_{IN} = -25 dBm, V_S = +3V, TEMPERATURE = +25°C



OUTPUT RETURN LOSS vs. R1 VALUES,
P_{IN} = -25 dBm, V_S = +3V, TEMPERATURE = +25°C



ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Total Power Dissipation	0.55W
Junction Temperature[6]	+150°C
Input Power (CW), V_S = +4V, or V_S = +3V	+25 dBm (5-minutes max) +20 dBm (Continuous)
DC Voltage on V_S	+5.5V
Current I_S	130mA

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

THERMAL RESISTANCE

Parameter	Ratings
Thermal Resistance (Θ_{jc})[7]	53°C/W

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

ESD RATING

	Class	Voltage Range	Reference Standard
Human Body Model (HBM)	1A	250V to <500V	ANSI/ESDA/JEDEC JS-001-2017
Machine Model (MM)	M1	25V	JESD22-C101F

ESD HANDLING PRECAUTION: This device is designed to be Class 1A for HBM and Class M1 for MM. 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

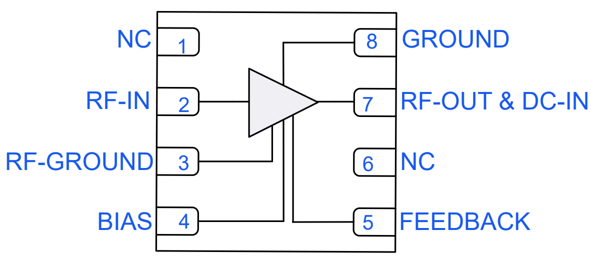


Figure 1. PMA2-252LNA+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description (See Figure 1)
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 external resistor.
FEEDBACK	5	FEEDBACK Pad used to reflect any feedback into the DUT.
RF-GROUND	3	RF-GND 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

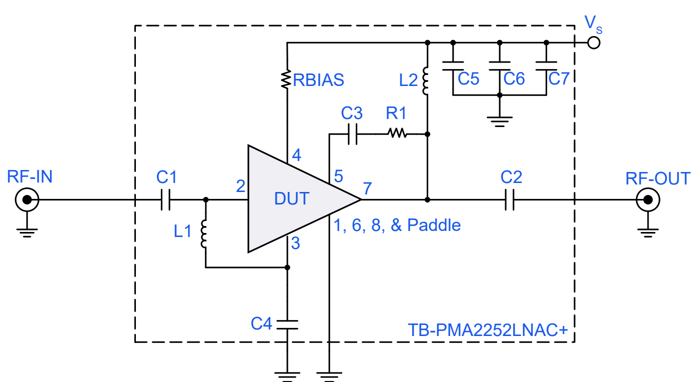
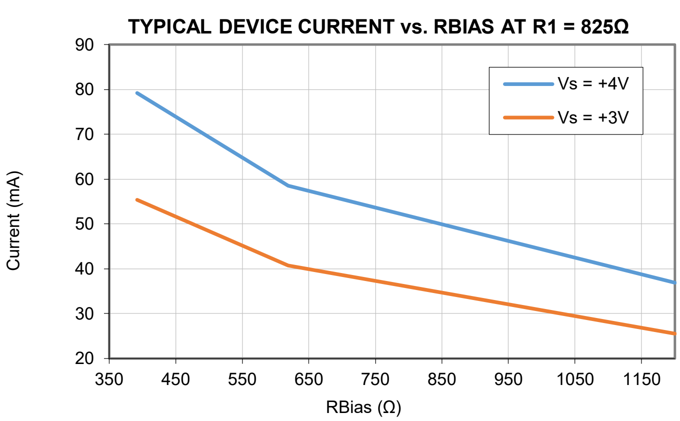


Figure 2. DUT soldered on Mini-Circuits Characterization Test Board: TB-PMA2252LNAC+

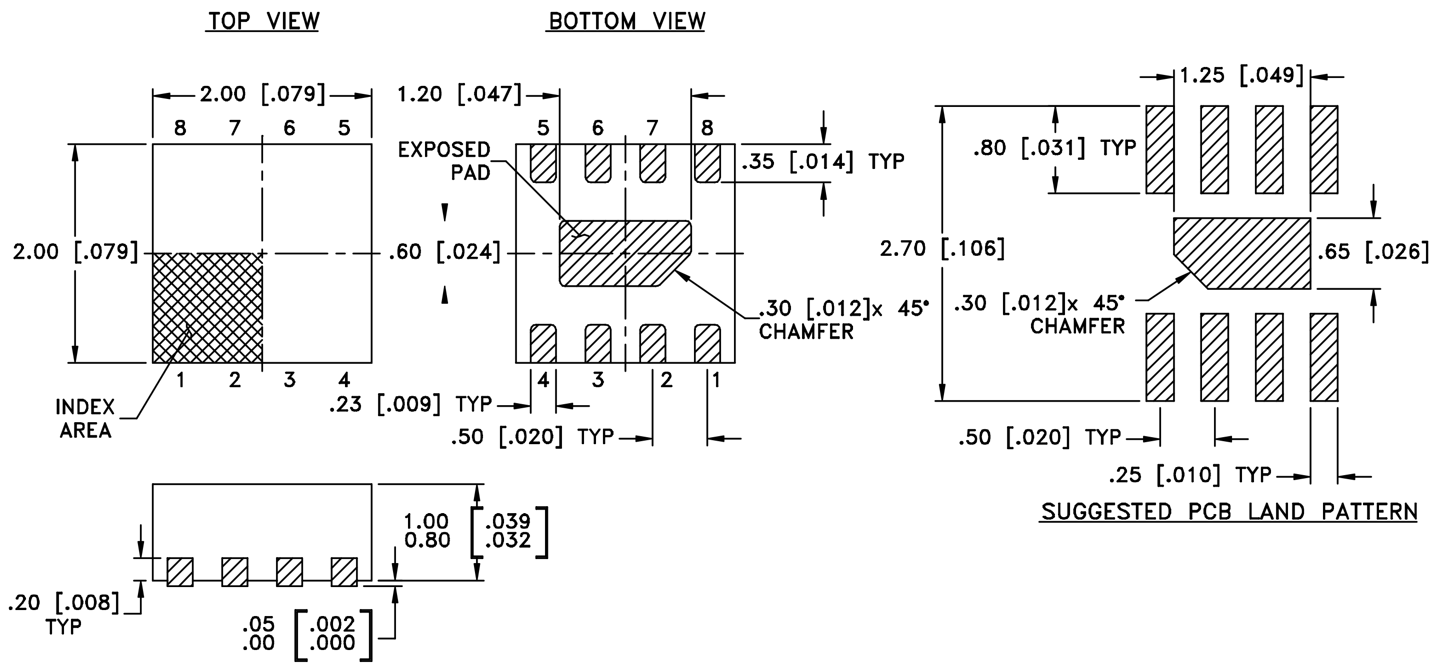
Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using N5242A PNA-X Microwave Network Analyzer:

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

Component	Vendor	Vendor P/N	Value	Size
C1	Murata	GRM1555C1H270JA01D	27pF	0402
C2	Murata	GRM1555C1H2R7BZ01D	2.7pF	0402
C3	Murata	GRM1555C1H1R2WA01D	1.2pF	0402
C4	Murata	GRM1555C1H221GA01D	220pF	0402
C5	Murata	GRM1555C1H7R0WA01D	7pF	0402
C6, C7	Murata	GRM155R71C104KA88D	0.1µF	0402
L1	Coilcraft	0402CS-6N8XJRW	6.8nH	0402
L2	Coilcraft	0402CS-2N2XJRW	2.2nH	0402
RBIAS	KOA Speer Electronics	RK73H1ETTP6190F	619Ω	0402
R1	KOA Speer Electronics	RK73H1ELTP8250F	825Ω	0402



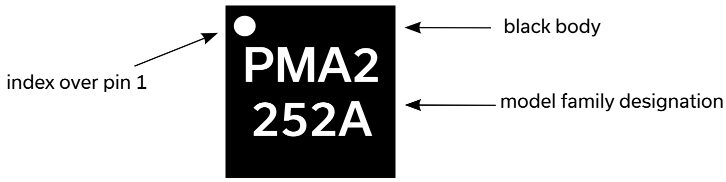
CASE STYLE DRAWING



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. PMA2-252LNA+ Product Marking