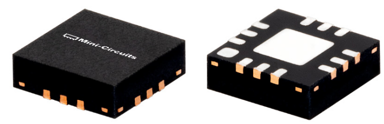
MMIC SURFACE MOUNT

Low Noise Amplifier PMA3-14LV+

50Ω 0.05 to 10 GHz Wideband Amplifier

THE BIG DEAL

- Low Noise Figure, Typ. 1.1 dB
- High OIP3, Typ. +27.7 dBm
- High P1dB, Typ. +20.3 dBm
- Single Supply Voltage, +5 V at 55 mA
- 3x3 mm 12-Lead QFN-Style Package

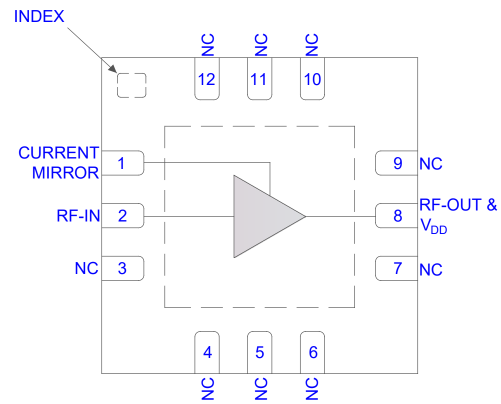


Generic photo used for illustration purposes only

APPLICATIONS

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

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

The PMA3-14LV+ is a GaAs pHEMT-based low noise MMIC amplifier with high IP3 and flat gain. Operating from 0.05 to 10 GHz, this amplifier features high dynamic range with typical 1.1 dB noise figure, 21.5 dB gain, +20.3 dBm P1dB, and +27.7 dBm OIP3. This combination of performance makes it ideal for sensitive high dynamic range receiver applications. PMA3-14LV+ operates from a single +5 V supply, is well matched to 50Ω, and comes in a very small, low profile 3x3 mm QFN-style package for easy integration into dense circuit board layouts.

KEY FEATURES

Feature	Advantages
Low Noise Figure, Typ. 1.1 dB	A 50Ω matched low noise MMIC device enables low system noise figure performance without the need for complicated discrete-based solutions.
Low Power Consumption, Typ. +5 V at 55 mA	At only 55 mA, this amplifier is ideal for applications with limited available power or densely packed applications where thermal and power management is critical.
3x3 mm 12-Lead QFN-Style Package	Very small footprint saves space in dense PCB layouts while providing low inductance, repeatable transitions, and excellent thermal contact with the PCB. Industry standard packaging allows for easy assembly in high volume manufacturing processes.

ELECTRICAL SPECIFICATIONS[1] AT +25°C, V_{DD} = +5 V, Zo = 50Ω, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.05		10	GHz
Gain	0.05	20.4	21.4		dB
	2	20.4	21.6		
	4	20.4	21.5		
	8	20.9	22.2		
	10	18.1	20.7		
Input Return Loss	0.05		17		dB
	2		15		
	4		12		
	8		22		
	10		13		
Output Return Loss	0.05		21		dB
	2		22		
	4		17		
	8		15		
	10		20		
Isolation	0.05-10		26		dB
Output Power at 1 dB Compression (P1dB)	0.05		+19.7		dBm
	2		+21.5		
	4		+20.3		
	8		+18.6		
	10		+15.2		
Output Third-Order Intercept (P_{OUT} = +5 dBm/Tone)	0.05		+29.8		dBm
	2		+30.0		
	4		+27.7		
	8		+28.7		
	10		+28.1		
Noise Figure	0.05		1.7		dB
	2		1.0		
	4		1.1		
	8		1.4		
	10		2.3		
Device Operating Voltage (V_{DD})		+4.75	+5.0	+5.25	V
Device Operating Current (I_{DD})[2]			55		mA
DC Current Variation vs. Temperature[3]			20		µA/°C
DC Current Variation vs. Voltage[4]			0.029		mA/mV

1. Tested on Mini-Circuits Characterization Test Board TB-PMA3-14LVC+. See Figure 2. Board loss de-embedded to the device.
2. Current at P_{IN} = -25 dBm. Increases to 77 mA at P1dB.
3. (Current at +105°C - Current at -45°C) / (+105°C - -45°C)
4. (Current at +5.25 V - Current at +4.75 V) / (+5.25 V - +4.75 V)

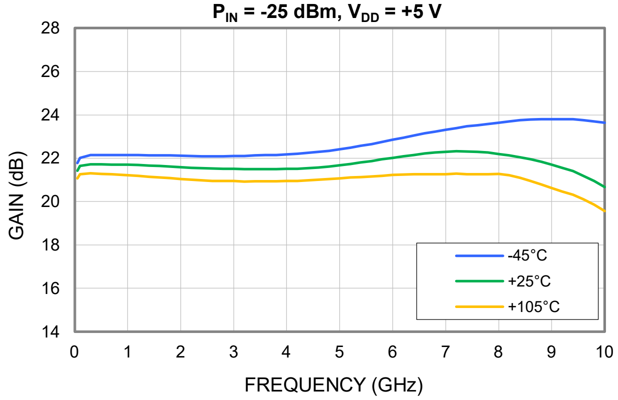
Low Noise Amplifier

PMA3-14LV+

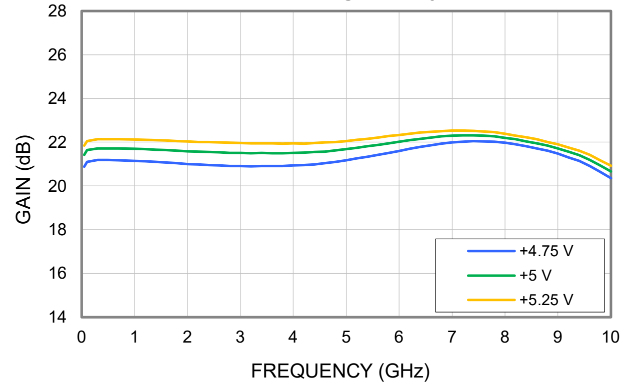
50Ω 0.05 to 10 GHz Wideband Amplifier

TYPICAL PERFORMANCE GRAPHS

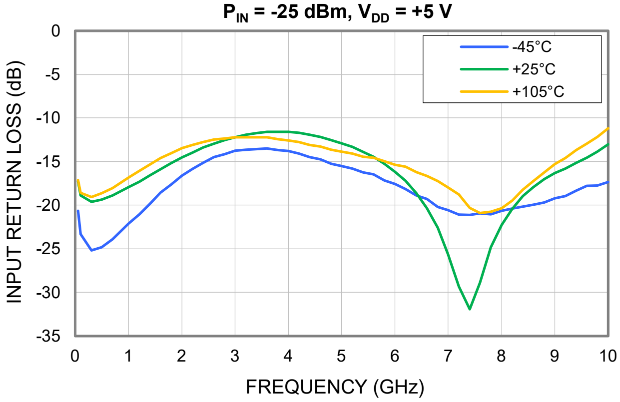
GAIN vs. TEMPERATURE, P_{IN} = -25 dBm, V_{DD} = +5 V



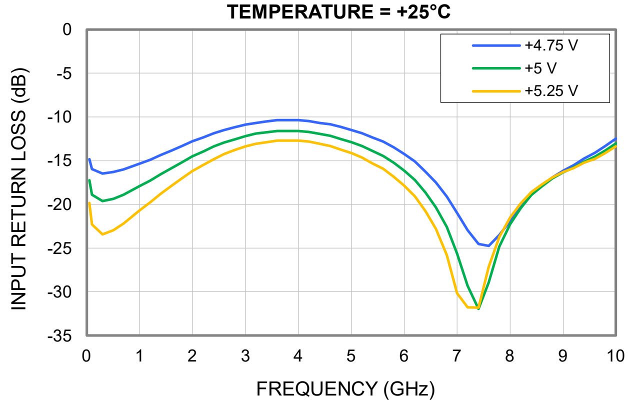
GAIN vs. VOLTAGE, TEMPERATURE = +25°C



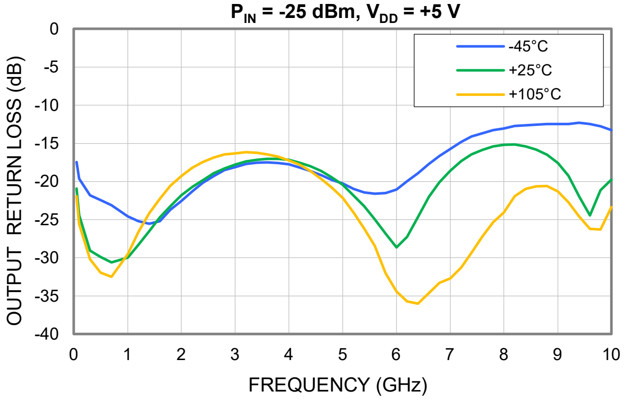
INPUT RETURN LOSS vs.TEMPERATURE, P_{IN} = -25 dBm, V_{DD} = +5 V



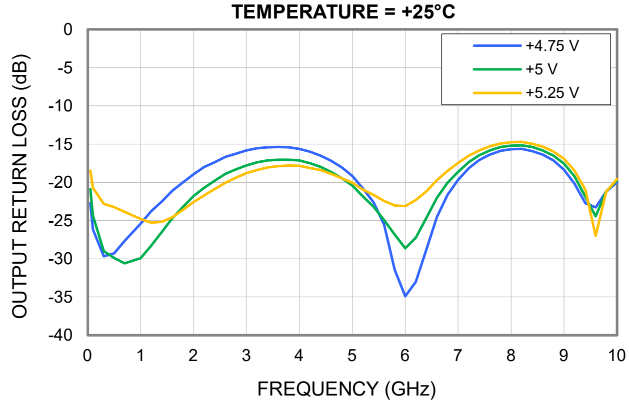
INPUT RETURN LOSS vs. VOLTAGE, TEMPERATURE = +25°C



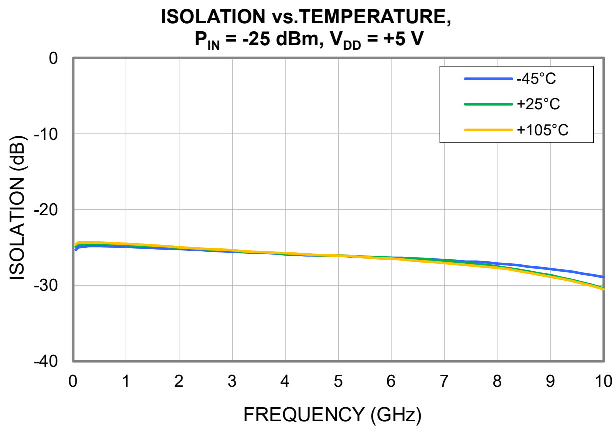
OUTPUT RETURN LOSS vs. TEMPERATURE, P_{IN} = -25 dBm, V_{DD} = +5 V

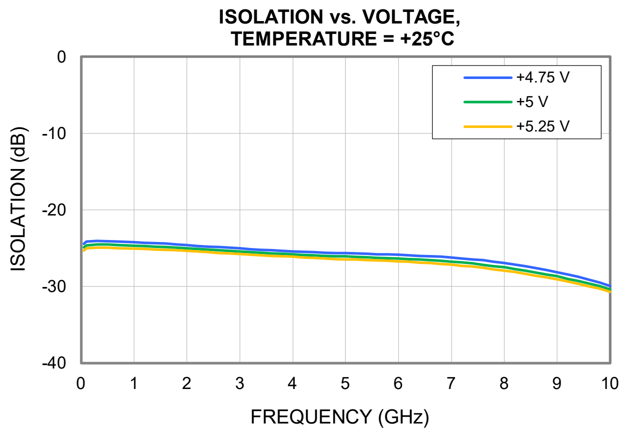


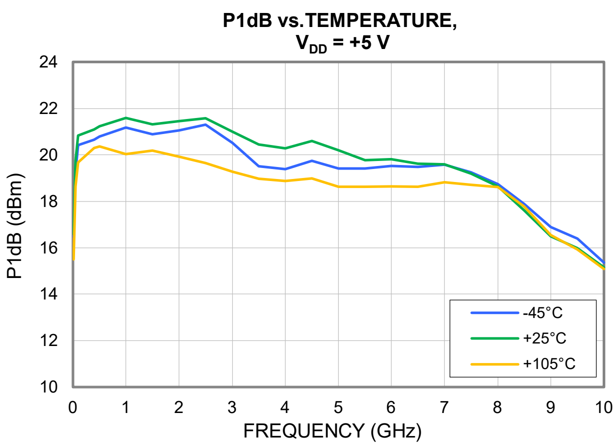
OUTPUT RETURN LOSS vs. VOLTAGE, TEMPERATURE = +25°C

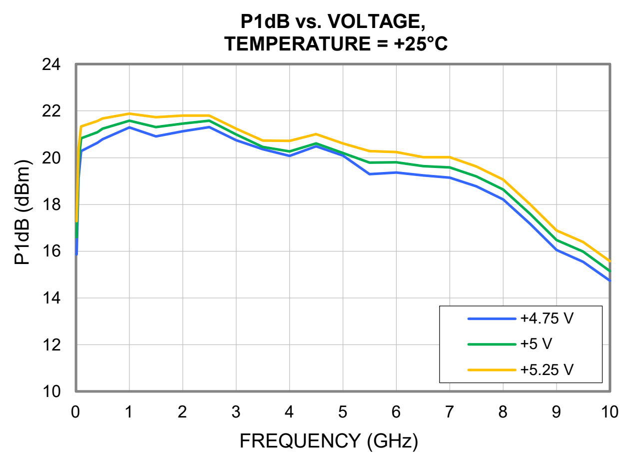


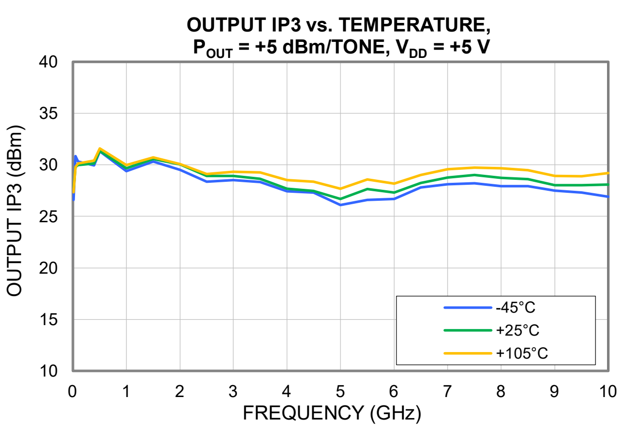
TYPICAL PERFORMANCE GRAPHS

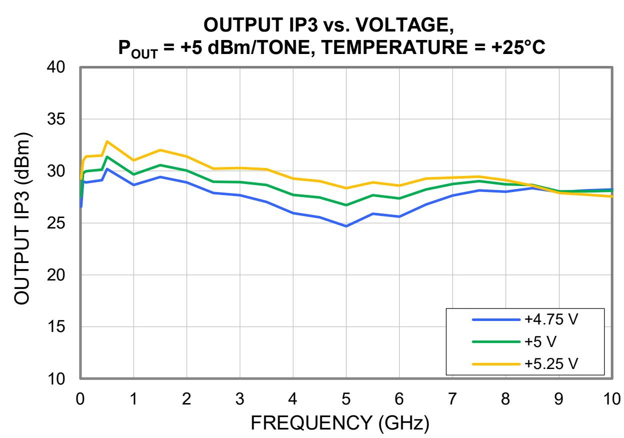












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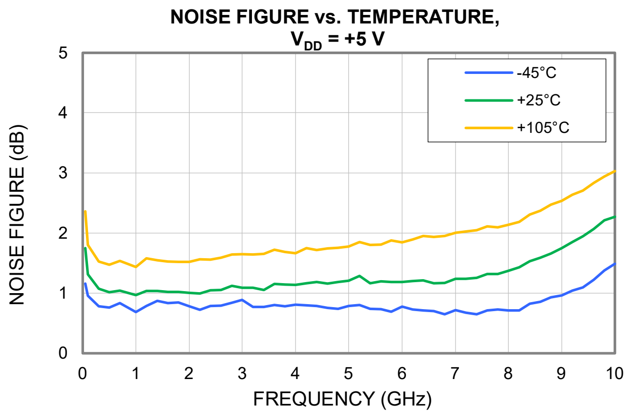
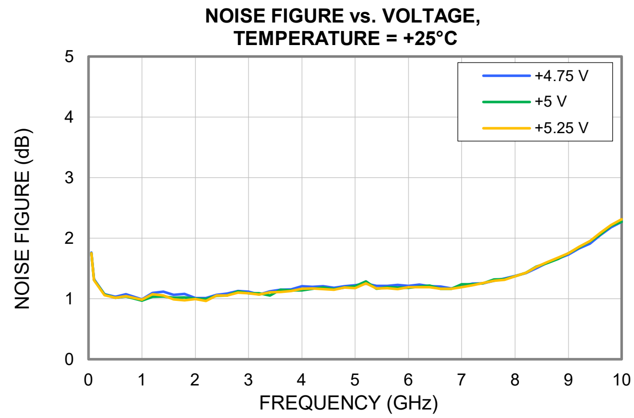
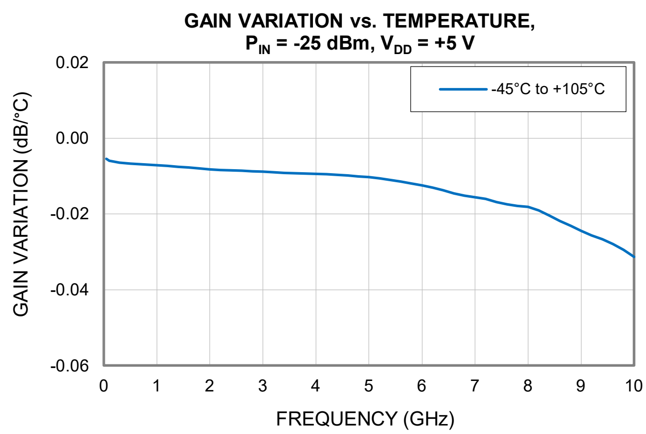






ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-45°C to +105°C
Storage Temperature	-65°C to +150°C
Junction Temperature[6]	+150°C
Total Power Dissipation	0.83 W
Input Power (CW), V_{DD} = +5 V	+25 dBm
DC Voltage at RF-OUT & V_{DD}	+8 V
DC Current I_{DD}	130 mA

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]	53.9°C/W

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

ESD RATING

	Class	Voltage Range	Reference Standard
HBM	1B	500 V to < 1000 V	ANSI/ESD STM 5.1 - 2001
CDM	C3	≥ 1000 V	ANSI/ESDA/JEDEC JS-002-2022

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-020D /JEDEC J-STD-033C

MMIC SURFACE MOUNT

Low Noise Amplifier

PMA3-14LV+

50Ω 0.05 to 10 GHz Wideband Amplifier

FUNCTIONAL DIAGRAM

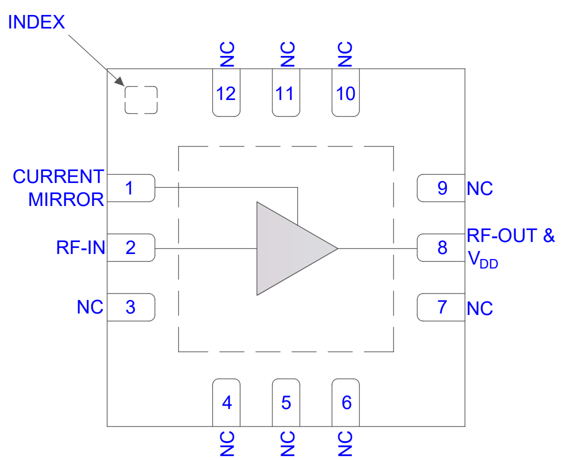


Figure 1. PMA3-14LV+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description (Refer to Figure 2)
RF-IN	2	RF-IN Pad connects to RF Input port.
RF-OUT & V_{DD}	8	RF-OUT Pad connects to RF Output port. V_{DD} is applied via external bias tee.
CURRENT MIRROR[8]	1	Current Mirror Pad. Supplies gate voltage to RF-IN via L1. See details in Figure 2.
NC	3-7, 9, 11-12	Connects to ground on the test board.
NC	10	No connection to ground on the test board. Pin 10 can be grounded similar to Pins 3-7, 9 & 11-12 or left open.
GND	PADDLE & INDEX	Connects to ground.

8. To achieve the specified performance, follow the current mirror circuit described in Figure 2. For the part to operate, a DC feedback loop to RF-IN must be present.

CHARACTERIZATION TEST BOARD

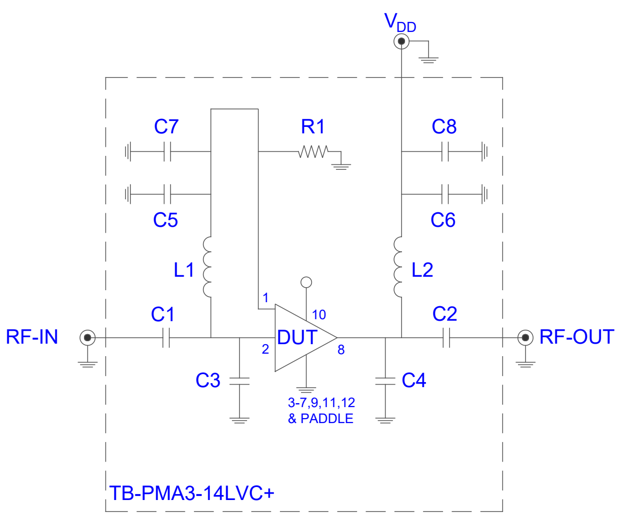


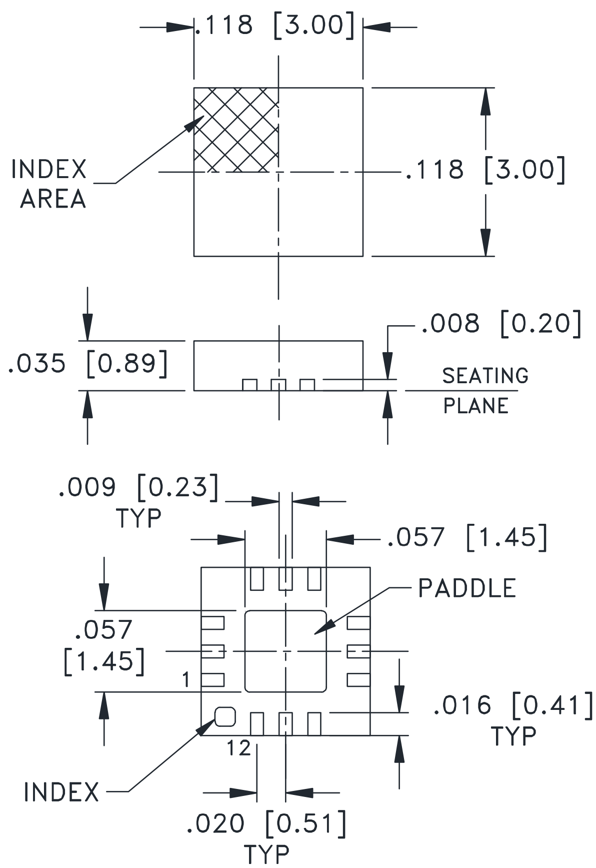
Figure 2. PMA3-14LV+ Characterization and Application Circuit

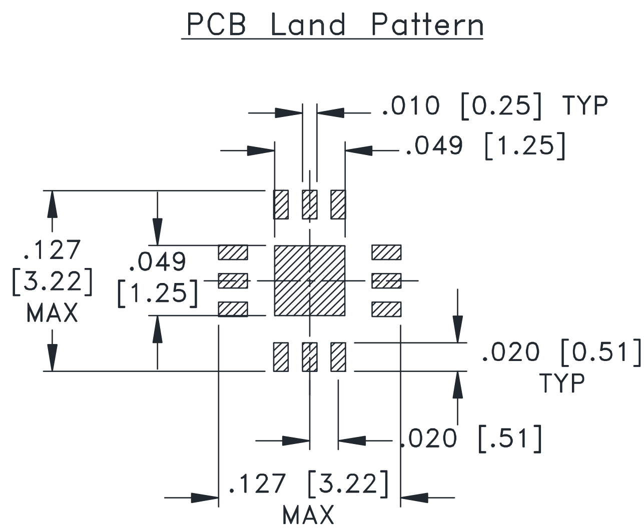
Electrical Parameters and Conditions
Gain, Return Loss, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3), and Noise Figure measured using N5242A PNA-X microwave network analyzer.

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

Component	Value	Size	Part Number	Manufacturer
C1, C2	0.01 µF	0402	GRM155R71H103KA88D	Murata
C3	0.2 pF	0402	GJM1555C1HR20WB01D	Murata
C4	0.1 pF	0402	GJM1555C1HR10WB01D	Murata
C5, C6	100 pF	0402	GRM1555C1H101JA01D	Murata
C7, C8	0.1 µF	0402	GRM155R71H104KE14J	Murata
L1, L2	900 nH	0402	0402DF-901XJRU	Coilcraft
R1	1k Ω	0402	RK73H1ETTP1001F	KOA Speer

CASE STYLE DRAWING

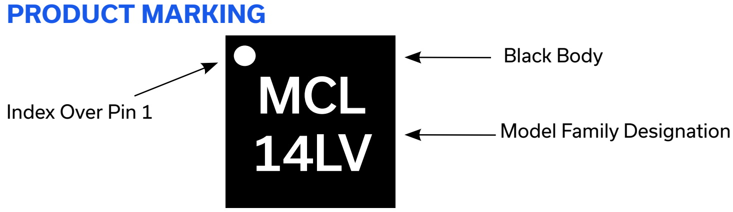




SUGGESTED LAYOUT,
TOLERANCE TO BE WITHIN ±.002

Weight: .02 Grams
Dimensions are in inches [mm]. Tolerances in inches: 2 Pl. ±.01; 3 Pl.±.004 inches

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.

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	DQ1225 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, 1000, 2000, or 3000 devices
Suggested Layout for PCB Design	PL-820
Evaluation Board	TB-PMA3-14LVC+ Gerber File
Environmental Ratings	ENV08T1