



Mini-Circuits

ULTRA HIGH DYNAMIC RANGE

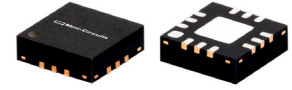
Monolithic Amplifier

LHA-23LN+

50Ω 30 MHz to 2 GHz

THE BIG DEAL

- Ultra-High IP3, +36.9 dBm typ
- Gain, 21.2 dB typ. at 1 GHz
- Low noise figure, 1.2 dB at 1 GHz
- Low voltage, +5V and +3V.



Generic photo used for illustration purposes only

CASE STYLE: DQ1225

+RoHS Compliant

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

APPLICATIONS

- Base station infrastructure
- CATV
- Cellular

PRODUCT OVERVIEW

LHA-23LN+ (RoHS compliant) is an advanced wideband amplifier fabricated using E-PHEMT technology and offers extremely high dynamic range over a broad frequency range and with low noise figure. In addition, the LHA-23LN+ has good input and output return loss over a broad frequency range. LHA-23LN+ is enclosed in a 3mm x 3mm, 12-lead MCLP package and has very good thermal performance.

KEY FEATURES

Feature	Advantages
Broad Band: 30 MHz to 2 GHz	Broadband covering primary wireless communications bands: VHF, UHF, Cellular
Extremely High IP3 +40.3 dBm typical at 0.5 GHz +36.9 dBm typical at 1GHz	The LHA-23LN+ matches industry leading IP3 performance relative to device size and power consumption. The combination of the design and E-PHEMT Structure provides enhanced linearity over a broad frequency range as evidence in the IP3 being approximately 11-17 dB above the P1dB point. This feature makes this amplifier ideal for use in: <ul style="list-style-type: none">• Driver amplifiers for complex waveform up converter paths• Drivers in linearized transmit systems• Secondary amplifiers in ultra-High Dynamic range receivers
Low Noise Figure 1.2 dB at 1 GHz	Enables lower system noise figure performance and along with High OIP3 provides high dynamic range
Low Supply Voltage	LHA-23LN+ supports low supply voltage operation which indicate low power consumption.

REV. A
ECO-011665
LHA-23LN+
MCL NY
240725





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

Parameter	Condition (MHz)	Vd=+5V ¹			Vd=+3V ¹ Typ.	Units
		Min.	Typ.	Max.		
Frequency Range		30		2000	30-2000	MHz
Gain	30	—	23.0	—	22.3	dB
	500	—	21.9	—	21.1	
	1000	18.9	21.2	23.1	19.9	
	1500	18.1	20.4	22.1	18.8	
	2000	—	19.6	—	17.6	
Input Return Loss	30		12		12	dB
	500		11		11	
	1000		10		8	
	1500		10		7	
	2000		10		8	
Output Return Loss	30		14		16	dB
	500		15		18	
	1000		19		23	
	1500		15		13	
	2000		11		9	
Reverse Isolation	1000		26.9		26.6	dB
Output Power @1 dB compression	30		+22.8		+17.1	dBm
	500		+24.2		+19.2	
	1000		+23.8		+18.8	
	1500		+23.2		+18.4	
	2000		+23.0		+18.0	
Output IP3 ²	30		+39.8		+33.9	dBm
	500		+39.0		+33.5	
	1000		+36.9		+31.6	
	1500		+35.2		+30.7	
	2000		+34.6		+30.0	
Noise Figure	30		1.0		1.0	dB
	500		1.1		1.1	
	1000		1.2		1.2	
	1500		1.3		1.3	
	2000		1.5		1.6	
Device Operating Voltage			+5.0		+3.0	V
Device Operating Current			146	162	75	mA
Device Current Variation vs. Temperature ³			-26.1		17.5	μA/°C
Device Current Variation vs Voltage			0.0359		0.0364	mA/mV
Thermal Resistance, junction-to-ground lead						
Junction-to-ground lead at 85°C stage temperature			23.3		23.3	°C/W

1. Measured on Mini-Circuits Characterization test board TB-1061-23LN+. See Characterization Test Circuit (Fig. 1)

2. Tested at Pout= 0 dBm / tone.

3. (Current at 105°C — Current at -45°C)/150

ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to +105°C
Storage Temperature	-65°C to +150°C
Power Dissipation ⁵	3.3 W
Input Power (CW)	+22 dBm (5 minutes max) ⁶ +4 dBm (continuous) for 0.03-1GHz at 3V +8 dBm (continuous) for 0.03-1GHz at 5V +12 dBm (continuous) for 1-2GHz at 3V +15 dBm (continuous) for 1-2GHz at 5V
DC Voltage on Pin 7	+10 V

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

5. Up to 85°C, derate linearly to 2.5W at 105°C.

6. Up to 85°C, derate linearly to +19dBm at 105°C.





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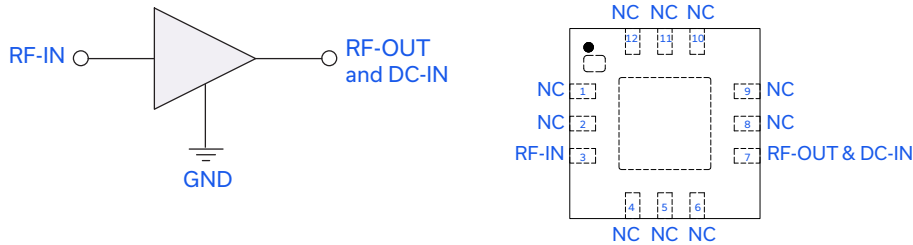
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SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	3	RF Input
RF-OUT and DC-IN	7	RF Output and DC Bias
GND	Paddle	Connections to ground.
NC	1-2, 4-6, 8-12	No connection, grounded externally

CHARACTERIZATION TEST / RECOMMENDED APPLICATION CIRCUIT

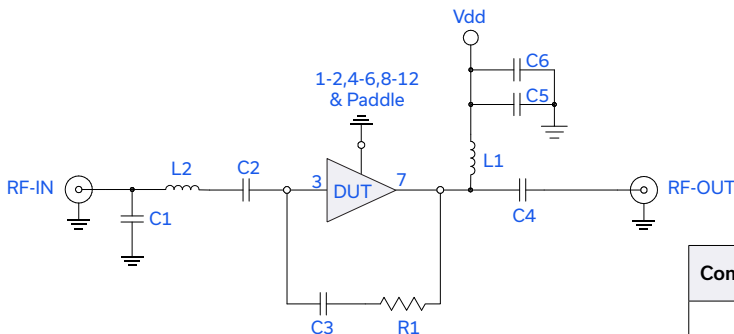


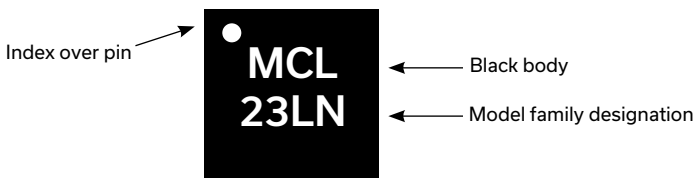
Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-1061-23LN+)
Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain and Return loss: $P_{IN} = -25\text{dBm}$
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/ tone at output.

Components	Size	Value	Manu- facturer	P/N
C1	0402	1.2pF	Murata	GRM1555C1H1R2WA01D
C2,C3,C6		0.1uF		GRM155R71C104KA88D
C4		0.001uF		GRM1555C1H102JA01D
C5		0.01uF		GRM155R71E103KA01D
R1		1.21KOhm	KOA	RK73H1ETTP1211F
L1	0805	0.68uH	Coilcraft	0805LS-681XJLB
L2	0402	1nH		0402CS-1N0XJLW

PRODUCT MARKING



Marking may contain other features or characters for internal lot control





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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. [CLICK HERE](#)

Performance Data	Data Table Swept Graphs
Case Style	DQ1225 Plastic package, exposed paddle lead finish: Matte-Tin
Tape & Reel Standard quantities available on reel	F66 7" reels with 20, 50, 100, 200, 500, 1K, 2K or 3K devices
Suggested Layout for PCB Design	PL-587
Evaluation Board	TB-1061-23HLN+
Environmental Ratings	ENV08T9

ESD RATING

Human Body Model (HBM): Class 1B (Pass 500 V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/terms/viewterm.html

