

# Ultra High Dynamic Range Monolithic Amplifier

## LHA-23HLN+

50Ω      30MHz to 2 GHz

### The Big Deal

- Ultra-High IP3, +44.7 dBm typ.
- Medium power, +28.3 dBm typ.
- Excellent Noise Figure, 1.3 dB typ.



CASE STYLE: DQ1225

### Product Overview

LHA-23HLN+ (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-23HLN+ has good input and output return loss over a broad frequency range. LHA-23HLN+ is enclosed in a 3mm x 3mm, 12-lead MCLP package and has very good thermal performance.

### Key Features

Feature	Advantages
Broad Band: 30MHz to 2GHz	Broadband covering primary wireless communications bands: VHF, UHF, Cellular
Extremely High IP3 43.8 dBm typical at 0.5 GHz 44.7 dBm typical at 1GHz	The LHA-23HLN+ 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"><li>• Driver amplifiers for complex waveform up converter paths</li><li>• Drivers in linearized transmit systems</li><li>• Secondary amplifiers in ultra-High Dynamic range receivers</li></ul>
Low Noise Figure 1.3 dB at 1 GHz	Enables lower system noise figure performance and along with High OIP3 provides high dynamic range
High P1dB, 28.3 dBm at 1 GHz	High P1dB, High OIP3, Low NF results in a very dynamic range preventing amplifier saturation under strong interfering signals.



# Ultra High Dynamic Range Monolithic Amplifier

30MHz to 2 GHz

## Product Features

- High IP3, 44.7 dBm typ. at 1GHz
- Gain, 21.5 dB typ. at 1 GHz
- Low noise figure, 1.3 dB at 1 GHz
- High P1dB, 28.3 dBm at 1 GHz



## LHA-23HLN+

CASE STYLE: DQ1225

## Typical Applications

- Base station infrastructure
- CATV
- Cellular

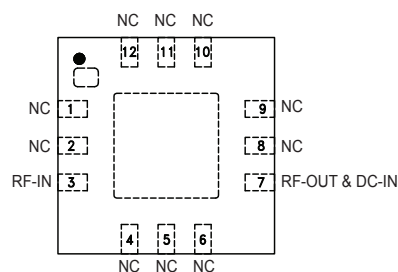
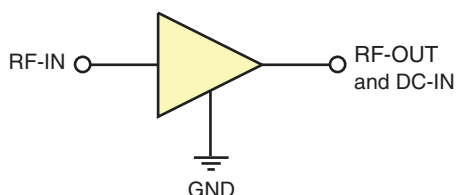
### +RoHS Compliant

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

## General Description

LHA-23HLN+ (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-23HLN+ has good input and output return loss over a broad frequency range. LHA-23HLN+ is enclosed in a 3mm x 3mm, 12-lead MCLP package and has very good thermal performance.

### simplified schematic and pad description



Function	Pin 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



**Electrical Specifications<sup>1</sup> at 25°C, 50Ω, unless noted**

Parameter	Condition (GHz)	Vd=8V <sup>1</sup>			Units
		Min.	Typ.	Max.	
Frequency Range		30		2000	MHz
Gain	30	—	23.2	—	dB
	500	—	22.1	—	
	1000	19.2	21.5	23.5	
	1500	18.5	20.9	22.6	
	2000	—	20.2	—	
Input Return Loss	30		12		dB
	500		11		
	1000		10		
	1500		10		
	2000		11		
Output Return Loss	30		14		dB
	500		13		
	1000		14		
	1500		12		
	2000		10		
Reverse isolation	1000		27.2		dB
Output Power @ 1 dB compression	30		26.0		dBm
	500		28.3		
	1000		28.3		
	1500		28.0		
	2000		27.9		
Output IP <sub>3</sub> <sup>2</sup>	30		41.1		dBm
	500		43.8		
	1000		44.7		
	1500		45.6		
	2000		45.2		
Noise Figure	30		1.3		dB
	500		1.2		
	1000		1.3		
	1500		1.5		
	2000		1.7		
Device Operating Voltage			8		V
Device Operating Current			244	273	mA
Device Current Variation vs. Temperature <sup>3</sup>			-241		μA/°C
Device Current Variation vs Voltage			0.0286		mA/mV
Thermal Resistance, junction-to-ground lead			23.3		°C/W
Junction-to-ground lead at 85°C stage temperature					

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

2. Tested at P<sub>out</sub>= 0 dBm / tone.

3. (Current at 95°C — Current at -45°C)/140

**Absolute Maximum Ratings<sup>4</sup>**

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to 95°C
Storage Temperature	-65°C to 150°C
Power Dissipation <sup>5</sup>	3.3W
Input Power (CW)	+22 dBm (5 minutes max) <sup>6</sup> +11 dBm (continuous) for 0.03-1GHz +18 dBm (continuous) for 1-2 GHz
DC Voltage on Pin 7	10V

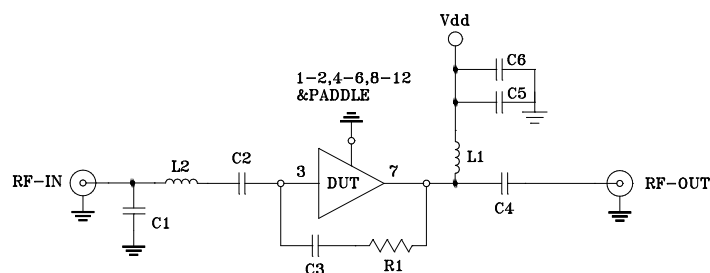
4. Permanent damage may occur if any of these limits are exceeded.

Electrical maximum ratings are not intended for continuous normal operation.

5. Up to 85°C, derate linearly to 3W at 95°C.

6. Up to 85°C, derate linearly to +19dBm at 95°C.

## Characterization Test / Recommended Application Circuit



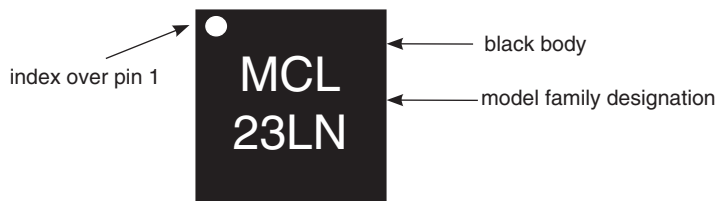
Component	Size	Value	Manufacturer	P/N
C1		1.2pF	Murata	GRM1555C1H1R2WA01D
C2,C3,C6	0402	0.1uF		GRM155R71C104KA88D
C4		0.001uF		GRM1555C1H102JA01D
C5		0.01uF		GRM155R71E103KA01D
R1		1.21KOhm	KOA	RK73H1ETTP1211F
L1	0805	0.68uH	Coilcraft	0805LS-681XJLB
L2	0402	1nH		0402CS-1N0XJLW

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

**Conditions:**

1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/ tone at output.

## Product Marking



Marking may contain other features or characters for internal lot control

Additional Detailed Technical Information	
additional information is available on our dash board. To access this information <a href="#">click here</a>	
Performance Data	Data Table
	Swept Graphs
	S-Parameter (S2P Files) Data Set (.zip file)
Case Style	DQ1225 <i>Plastic package, exposed paddle lead finish: Matte-Tin</i>
Tape & Reel Standard quantities available on reel	F66 <i>7" reels with 20, 50, 100, 200, 500 or 1K devices</i>
Suggested Layout for PCB Design	PL-587
Evaluation Board	TB-1061-23HLN+
Environmental Ratings	ENV08T9

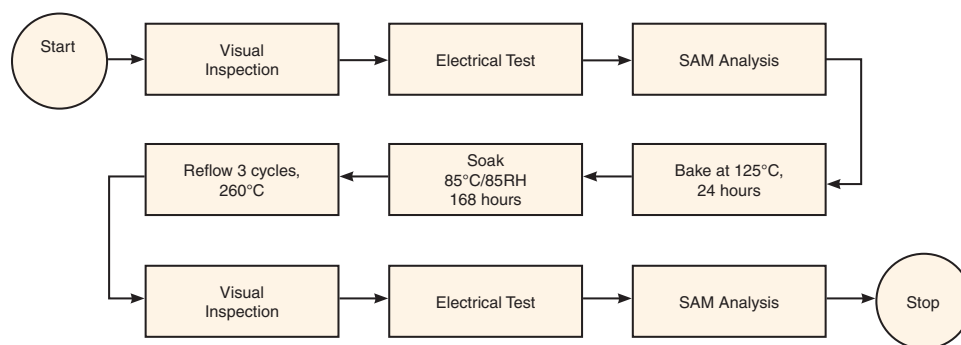
## ESD Rating

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

### MSL Test Flow Chart



### Additional 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)