



ULTRA HIGH DYNAMIC RANGE

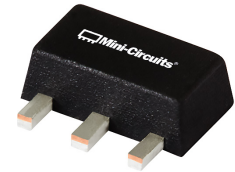
Monolithic Amplifier

PHA-23LN+

50Ω 30 MHz to 2 GHz

THE BIG DEAL

- Ultra-High IP3, +37.4 dBm typ. at 1 GHz
- Low supply voltage, +3 to +5V
- Excellent Noise Figure, 1.2 dB typ. at 1 GHz
- Gain, 21 dB at 1 GHz



Generic photo used for illustration purposes only

CASE STYLE: DF782

+RoHS Compliant

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

APPLICATIONS

- Base station infrastructure
- CATV
- Cellular

PRODUCT OVERVIEW

PHA-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 PHA-23LN+ has good input and output return loss over a broad frequency range. PHA-23LN+ is enclosed in a SOT-89 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 +40.9 dBm typical at 30 MHz +37.4 dBm typical at 1 GHz | The PHA-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 13-18 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 | PHA-23LN+ supports low supply voltage operation which indicate low power consumption. |

REV. B
ECO-010399
PHA-23LN+
MCL NY
240722





ULTRA HIGH DYNAMIC RANGE

Monolithic Amplifier

PHA-23LN+

50Ω 30 MHz to 2 GHz

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

| Parameter | Condition (MHz) | Vd=+5V ¹ | | | Vd=+3V ¹ | Units |
|---|-----------------|---------------------|--------|------|---------------------|-------|
| | | Min. | Typ. | Max. | Typ. | |
| Frequency Range | | 30 | | 2000 | 30-2000 | MHz |
| Gain | 30 | — | 23.0 | — | 22.3 | dB |
| | 500 | — | 21.9 | — | 21.0 | |
| | 1000 | 18.9 | 21.0 | 23.1 | 19.7 | |
| | 1500 | 18.1 | 20.1 | 22.1 | 18.5 | |
| | 2000 | — | 18.9 | — | 17.0 | |
| Input Return Loss | 30 | | 12.0 | | 12.4 | dB |
| | 500 | | 11.6 | | 10.5 | |
| | 1000 | | 9.4 | | 7.5 | |
| | 1500 | | 9.6 | | 7.7 | |
| | 2000 | | 8.9 | | 6.9 | |
| Output Return Loss | 30 | | 14.9 | | 16.6 | dB |
| | 500 | | 16.5 | | 21.0 | |
| | 1000 | | 18.8 | | 18.0 | |
| | 1500 | | 12.2 | | 10.8 | |
| | 2000 | | 9.4 | | 8.5 | |
| Reverse Isolation | 1000 | | 27.2 | | 26.9 | dB |
| Output Power @1 dB compression | 30 | | +22.8 | | +17.4 | dBm |
| | 500 | | +24.1 | | +19.0 | |
| | 1000 | | +23.9 | | +18.8 | |
| | 1500 | | +23.4 | | +18.4 | |
| | 2000 | | +23.3 | | +18.0 | |
| Output IP3 ² | 30 | | +40.9 | | +34.7 | dBm |
| | 500 | | +39.3 | | +33.3 | |
| | 1000 | | +37.4 | | +30.9 | |
| | 1500 | | +36.3 | | +30.5 | |
| | 2000 | | +35.6 | | +29.7 | |
| Noise Figure | 30 | | 1.1 | | 1.1 | dB |
| | 500 | | 1.0 | | 1.0 | |
| | 1000 | | 1.2 | | 1.2 | |
| | 1500 | | 1.3 | | 1.3 | |
| | 2000 | | 1.6 | | 1.6 | |
| Device Operating Voltage | | | +5.0 | | +3.0 | V |
| Device Operating Current | | | 141.7 | 162 | 72.4 | mA |
| Device Current Variation vs. Temperature ³ | | | 14.2 | | 33.1 | μA/°C |
| Device Current Variation vs Voltage | | | 0.0354 | | 0.0354 | mA/mV |
| Thermal Resistance, Junction-to-ground lead at 85°C stage temperature | | | 23.3 | | 23.3 | °C/W |

1. Measured on Mini-Circuits Characterization test board TB-951-23LN+. See Characterization Test Circuit (Fig. 1)

2. Tested at Pout= 0 dBm / tone.

3. (Current at 85°C – Current at -45°C)/130



ULTRA HIGH DYNAMIC RANGE

Monolithic Amplifier

PHA-23LN+

50Ω 30 MHz to 2 GHz

ABSOLUTE MAXIMUM RATINGS⁴

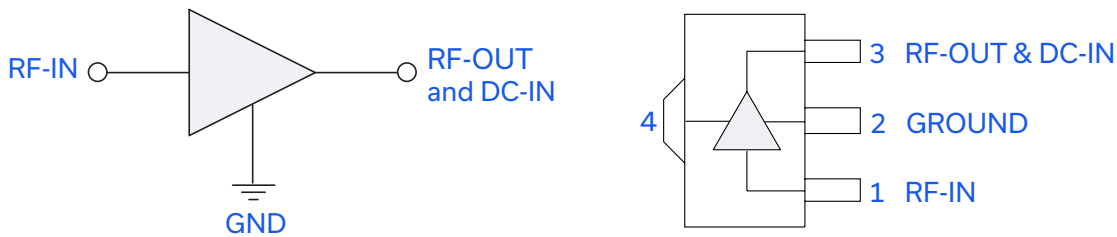
| Parameter | Ratings |
|-------------------------------------|--|
| Operating Temperature (ground lead) | -40°C to +105°C |
| Storage Temperature | -65°C to +150°C |
| Power Dissipation ⁵ | 3.3 W |
| Input Power (CW) | +22 dBm (5 minutes max) ⁶ +4 dBm (continuous) for 0.03-1GHz at +3V +8 dBm (continuous) 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 3 | +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 2.5 W at 105°C.

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

SIMPLIFIED SCHEMATIC AND PIN DESCRIPTION



| Function | Pin Number | Description |
|------------------|------------|------------------------|
| RF IN | 1 | RF Input |
| RF-OUT and DC-IN | 3 | RF Output and DC Bias |
| GND | 2,4 | Connections to ground. |



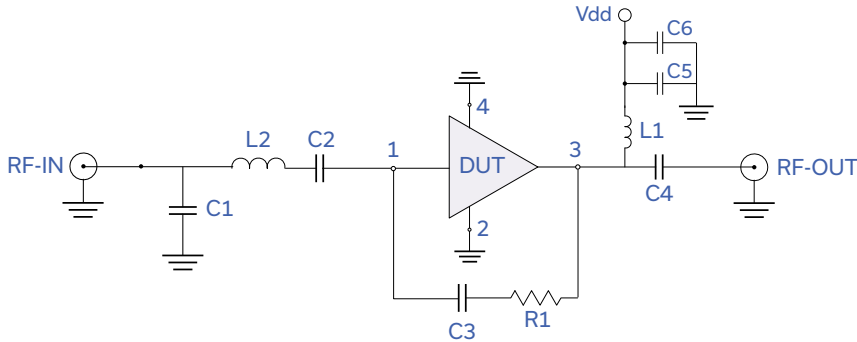
ULTRA HIGH DYNAMIC RANGE

Monolithic Amplifier

PHA-23LN+

50Ω 30 MHz to 2 GHz

CHARACTERIZATION TEST / RECOMMENDED APPLICATION CIRCUIT



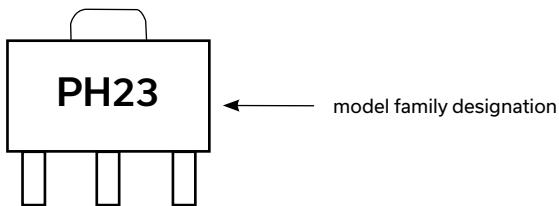
| Component | Size | Value | Manufacturer | P/N |
|-----------|------|----------|--------------|--------------------|
| C1 | 0402 | 1.2pF | Murata | GRM1555C1H1R2WA01D |
| C2,C3,C6 | | 0.1uF | | GRM155R71C104KA88D |
| C4 | | 0.001uF | | GRM1555C1H102JA01D |
| C5 | | 0.01uF | | GRM155R71E103KA01D |
| R1 | | 1.21KOhm | | KOA |
| 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-951-23LN+) 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: $P_{IN} = -25dBm$
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





ULTRA HIGH DYNAMIC RANGE

Monolithic Amplifier

PHA-23LN+

50Ω 30 MHz to 2 GHz

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

| | |
|--|--|
| Performance Data | Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style | DF782 (SOT 89) Plastic package, exposed paddle lead finish: matte-tin |
| Tape & Reel Standard quantities available on reel | F55 7" reels with 20, 50, 100, 200, 500 or 1K devices |
| Suggested Layout for PCB Design | PL-512 |
| Evaluation Board | TB-951-23LN+ |
| 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

- A. 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.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. 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

