



# Monolithic Amplifier PMA3-223GLN+

50Ω 10 to 22 GHz

## THE BIG DEAL

- Wideband, 10 to 22 GHz
- High Gain, 27.9 dB typ. at 15 GHz
- Low NF, 1.8 dB typ. at 15 GHz
- P1dB, 10 dBm typ. at 20 GHz
- OIP3, 22.1 dBm typ. at 15 GHz
- Built-in Bias Tee and DC Blocks
- Patent Pending

*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

- 5G
- Space Research
- Mobile

## PRODUCT OVERVIEW

The PMA3-223GLN+ is a PHEMT based wideband, low noise MMIC amplifier with a unique combination of high gain and low noise figure over a very board bandwidth making it ideal for using as the first stage driver amplifier of receiver applications. This design operates on a single 4V supply, is matched to 50Ohm and comes in a tiny plastic package (3 x 3 x 0.89mm), accommodating dense circuit board layouts.

## KEY FEATURES

| Feature                       | Advantages  |
|-------------------------------|---|
| Low noise, 1.8 dB at 15 GHz   | Enables lower system noise figure performance.  |
| High Gain, 27.9 dB at 15 GHz  | Enables signal amplification without the need for multiple gain stage, minimizing the effect of subsequent stages on noise figure.            |
| Built-in Bias Tee & DC Blocks | Minimizes the external component count & PC board space, making it less expensive and user friendly for system designers.                     |
| 3 x 3mm 12-lead MCLP package  | Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. |

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ECO-011519  
PMA3-223GLN+  
GY/RS/CP/AM  
220120



WIDEBAND, HIGH GAIN, LOW NOISE

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## ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C, V<sub>s</sub>=4V AND R<sub>1</sub>=18Ω, UNLESS NOTED OTHERWISE

| Parameter   | Condition (GHz) | V <sub>s</sub> =4.0V |      |      | Units |
|---|-----------------|----------------------|------|------|-------|
|   |                 | Min.                 | Typ. | Max. |       |
| Frequency Range                                       | —               | 10                   |      | 22   | GHz   |
| Noise Figure  | 10              |                      | 1.9  |      | dB    |
|   | 15              |                      | 1.8  |      |       |
|   | 20              |                      | 1.6  |      |       |
|   | 22              |                      | 1.6  |      |       |
| Gain  | 10              | 22.5                 | 25.3 | 29.2 | dB    |
|   | 15              | 24.7                 | 27.9 | 31.5 |       |
|   | 20              | 22.2                 | 25.5 | 31.1 |       |
|   | 22              | —                    | 24.0 | —    |       |
| Input Return Loss                                     | 10              |                      | 13   |      | dB    |
|   | 15              |                      | 13   |      |       |
|   | 20              |                      | 21   |      |       |
|   | 22              |                      | 15   |      |       |
| Output Return Loss                                    | 10              |                      | 12   |      | dB    |
|   | 15              |                      | 10   |      |       |
|   | 20              |                      | 10   |      |       |
|   | 22              |                      | 8    |      |       |
| Output Power @ 1 dB compression                       | 10              |                      | 8.5  |      | dBm   |
|   | 15              |                      | 9.5  |      |       |
|   | 20              |                      | 10.0 |      |       |
|   | 22              |                      | 10.7 |      |       |
| Output IP3  | 10              |                      | 18.6 |      | dBm   |
|   | 15              |                      | 22.1 |      |       |
|   | 20              |                      | 22.0 |      |       |
|   | 30              |                      | 22.3 |      |       |
| Device Operating Voltage (V <sub>s</sub> )            |                 | 3.75                 | 4.0  | 4.25 | V     |
| Device Operating Current (I <sub>S</sub> )            |                 |                      | 68   | 112  | mA    |
| Device Current Variation vs. Temperature <sup>2</sup> |                 |                      | -50  |      | μA/°C |
| Device Current Variation vs. Voltage                  |                 |                      | 0.02 |      | mA/mV |
| Thermal Resistance, junction-to-ground lead           |                 |                      | 106  |      | °C/W  |

1. Measured on Mini-Circuits Characterization test board TB-PMA3-223GLN+ with thru-line loss being deducted. See Characterization Test Circuit (Fig. 1)

2. Device Current Variation vs. Temperature = (Current at 85°C - Current at -45°C)/130°C

## MAXIMUM RATINGS<sup>3</sup>

| Parameter                            | Ratings  |
|--------------------------------------|--|
| Operating Temperature (ground lead)  | -40°C to 85°C                                    |
| Storage Temperature                  | -65°C to 150°C                                   |
| Junction Temperature                 | 146°C  |
| Total Power Dissipation              | 0.65W  |
| Input Power (CW), V <sub>s</sub> =4V | +23 dBm (5 minutes max.)<br>+13 dBm (continuous) |
| DC Voltage at Port 2 & 8             | 2V   |
| DC Voltage (V <sub>s</sub> )         | 6V   |

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

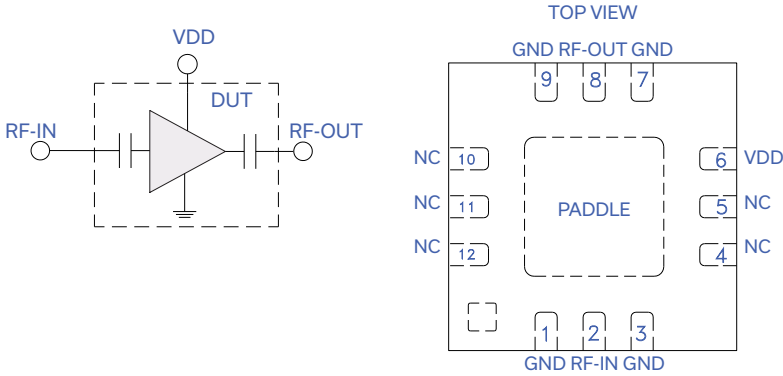




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## SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



| Function      | Pad Number       | Description (Fig. 1)                                      |
|---------------|------------------|---|
| RF-IN         | 2                | RF Input Pad. Connects to RF input                        |
| RF-OUT        | 8                | RF Output Pad. Connects to RF output                      |
| VDD           | 6                | DC Power Supply Pad. Connects to Voltage Source Vs via R1 |
| Ground        | 1,3,7,9 & Paddle | Connects to ground  |
| No Connection | 4,5,10,11&12     | Not used internally. Connected to ground on test board    |

## RECOMMENDED APPLICATION AND CHARACTERIZATION TEST CIRCUIT

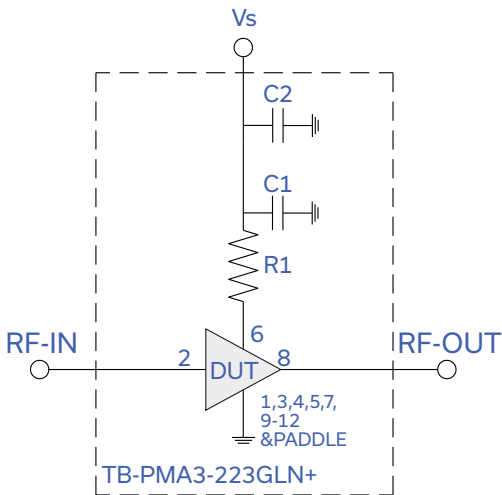


Fig 1. Application and Characterization Circuit

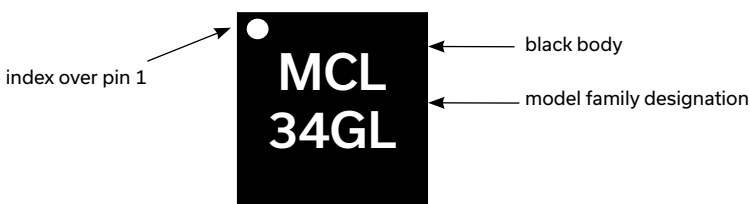
Note: This block diagram is used for characterization. (DUT is soldered on Mini-Circuits Characterization test board TB-PMA3-223GLN+) Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5245A microwave network analyzer.

Conditions:

1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5dBm/tone at output.

| Component | Size | Value  | Part Number        | Manufacturer |
|-----------|------|--------|--------------------|--------------|
| R1        | 0603 | 18 Ohm | SG73G1JTTD18R0C    | KOA          |
| C1        | 0402 | 5 pF   | GJM1555C1H5R0CB01D | Murata       |
| C2        | 0402 | 0.1 uF | GRM155R71C104KA88D | Murata       |

## 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 DASH BOARD. TO ACCESS [CLICK HERE](#)

|  |   |
|--|---|
| Performance Data                                     | Data Table<br>graphs, s-parameter data set (.zip file)                    |
| Case Style   | DQ1225<br>Plastic package, exposed paddle, lead finish: Matte Tin         |
| Tape & Reel<br>Standard quantities available on reel | F66<br>7" reels with 20, 50, 100, 200, 500, 1K, or 2K devices.            |
| Suggested Layout for PCB Design                      | PL-674  |
| Evaluation Board                                     | TB-PMA3-223GLN+ (Without connectors)<br>TB-PMA3223GLNC+ (With connectors) |
| Environmental Ratings                                | ENV08T1   |

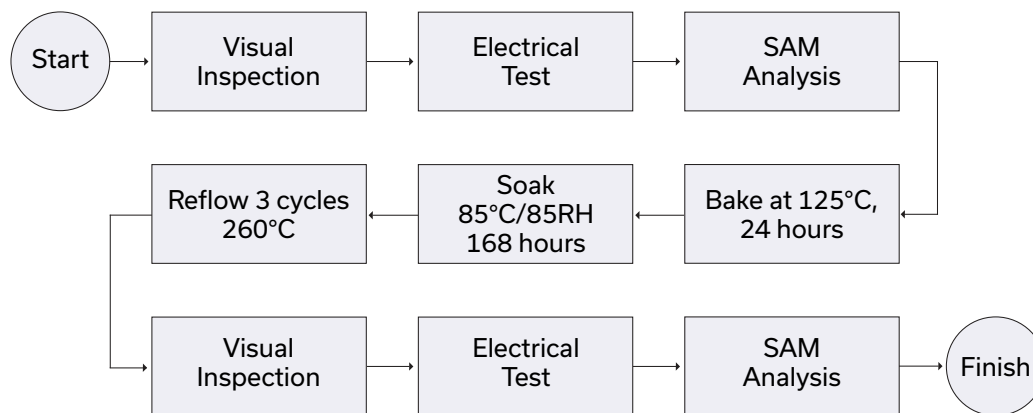
### ESD RATING

Human Body Model (HBM): Class 1A (250 to <500V) 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



- 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-Circuits' applicable established test performance criteria and measurement instructions.
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