

High Directivity

Monolithic Amplifier

VNA-28A+

50Ω 0.5 to 2.5 GHz

The Big Deal

- 2.8 & 5V operation
- High directivity, 14-21 dB
- Footprint compatible with VNA-28



CASE STYLE: DL1020

Product Overview

VNA-28A+ is a wideband amplifier providing high directivity. It has built-in DC blocks at input and output and a separate lead for DC. It is fabricated using GaAs MESFET technology and enclosed in a 5x6 mm MCLP plastic package.

Key Features

| Feature | Advantages |
|---|---|
| Footprint compatible with VNA-28 | Can be used as a replacement for obsolete part VNA-28 without PCB design change. Refer to AN-60-065 |
| High directivity, 14-21 dB | Acts as a low cost isolator, minimizing the interaction of pre and post circuits. |
| Built-in DC blocks | Eliminates need for external DC blocks, lowering PCB size & cost. |
| Separate terminal for DC | Eliminates need for output bias-tee, further reducing external component count, cost & PCB size. |
| DC voltage, 2.8 to +5V | No voltage dropping resistor required, allowing low voltage operation. |
| 5 x 6mm 8-lead MCLP package | Provides low inductance, repeatable transitions, and excellent thermal contact to PCB. |
| Footprint compatible to SOIC-8 lead package | Can be used in place of obsolete model VNA-28 without PCB redesign. |



Product Features

- 2.8V & 5V operation
- no external biasing circuit required
- internal DC blocking at RF input and output
- high directivity, 18 dB typ.
- wide bandwidth, 0.5 to 2.5 GHz
- low noise figure, 3.7 dB typ.
- output power, up to +8.7 dBm typ.
- potential replacement for VNA-28 (AN-60-065)
- low cost

**VNA-28A+**

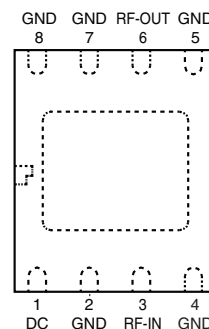
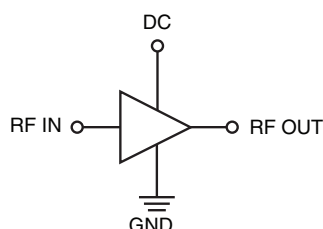
CASE STYLE: DL1020
PRICE: \$4.95 ea. QTY. (20)

Typical Applications

- buffer amplifier
- cellular
- PCN

General Description

VNA-28A+ is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in an 8-lead 5X6 mm MCLP package, footprint compatible with SOIC-8 lead package. VNA-28A+ is fabricated using GaAs MESFET technology. It has a built-in DC blocks at RF-IN and RF-OUT ports and separate lead for DC eliminating the need for bias tee.

simplified schematic and pad description**Pad description**

| Function | Pad Number | Description |
|----------|----------------------|---|
| RF-IN | 3 | RF input pin. |
| RF-OUT | 6 | RF output pin. |
| DC | 1 | Bias pin |
| GND | 2,4,5,7,8 and paddle | Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance. |

Electrical Specifications⁽¹⁾ at 25°C, 50Ω unless noted

| Parameter | Condition (GHz) | Min. | Typ. | | Max. | Units |
|---|---------------------------------|------|--------------------------------------|--------------------------------------|------|-------|
| Frequency Range | | 0.5 | | | 2.5 | GHz |
| at DC Volts | | 5.0 | 5.0 | 2.8 | 5.0 | V |
| Gain | 0.5 1.0 1.5 2.0 2.5 | 18.6 | 16.6 21.2 21.6 20.7 18.0 | 15.8 20.0 20.2 19.4 16.9 | | dB |
| Input Return Loss | 0.75 - 2.5 | | 15.4 | 15.6 | | dB |
| Output Return Loss | 0.75 - 2.5 | | 14.7 | 11.8 | | dB |
| Output Power @ 1 dB compression | 0.5 - 2.5 | | 8.9 | 7.1 | | dBm |
| Output IP3 | 0.5 - 2.5 | | 18.2 | 16.4 | | dBm |
| Noise Figure | 0.5 - 2.5 | | 3.7 | 3.7 | | dB |
| Directivity (Isolation - Gain) | 0.5 - 2.5 | | 14-20 | 15-21 | | dB |
| DC Current | | | 27 | 24 | 45 | mA |
| Thermal Resistance, junction-to-case ⁽²⁾ | | | 78 | | | °C/W |

⁽¹⁾ Measured on Mini-Circuits Characterization test board TB-01. See Characterization Test Circuit (Fig. 1)

⁽²⁾ Case is defined as ground leads.

Absolute Maximum Ratings⁽³⁾

| Parameter | Ratings |
|-----------------------|---|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -65°C to 150°C |
| DC Voltage | 7V at pad 1 10V at pads 3,6 |
| Power Dissipation | 500mW |
| Input Power | +5 dBm (continuous) +25 dBm (5 minutes max.) |

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

Characterization Test Circuit

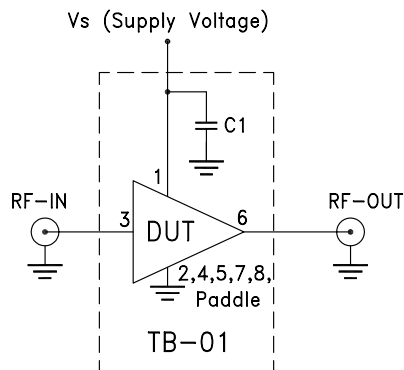


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-01)
Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain: $P_{in} = -25\text{dBm}$
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at input.

Recommended Application Circuit

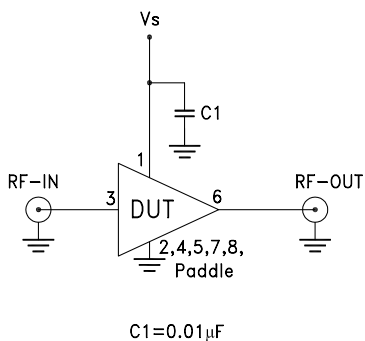
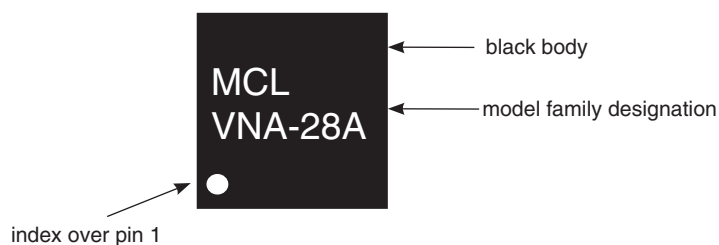


Fig 2. Recommended Application Circuit

Product Marking



Additional Detailed Technical Information

additional information is available on our dash board. To access this information [click here](#)

| | |
|---|---|
| Performance Data | Data Table |
| | Swept Graphs |
| | S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style | DL1020 Plastic model, 8 lead, 5x6 mm MCLP, tin-silver over nickel |
| Tape & Reel Standard quantities available on reel | F68 7" reels with 20, 50, 100, 200, 500 or 1K devices 13" reels with 2K, 4K devices |
| Suggested Layout for PCB Design | PL-077 |
| Evaluation Board | TB-01 |
| Environmental Ratings | ENV08T1 |

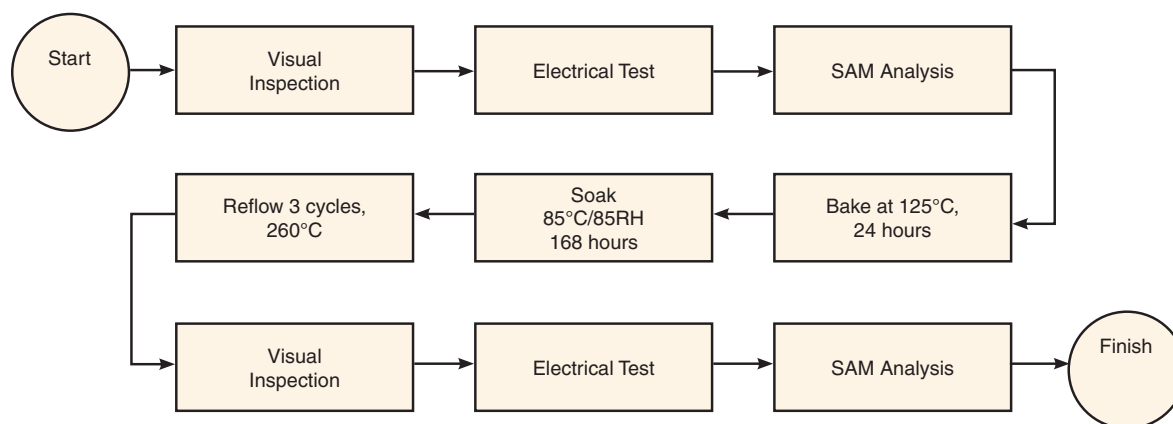
ESD Rating

Human Body Model (HBM): Class 1B (500V to <1000V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (Pass 50V) in accordance with ANSI/ESD STM5.2-1999

MSL Rating

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

MSL Test Flow Chart**Additional 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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