MMIC SURFACE MOUNT

Monolithic Amplifier VNA-28B+

50Ω 0.5 to 2.5 GHz High Directivity

FEATURES

- +2.8 V & +5 V Operation
- High Directivity, 16-23 dB
- Footprint compatible with VNA-28 & VNA-28A+
- Low Noise Figure, 3.0 dB typ.
- Output Power, up to +11.4 dBm typ. at 1.5 GHz

Generic photo used for illustration purposes only

CASE STYLE: DL1020

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

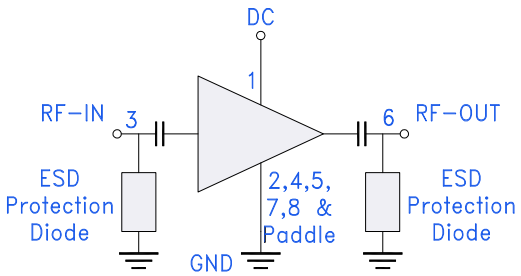
APPLICATIONS

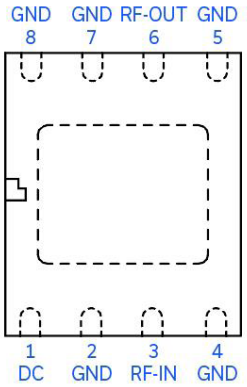
- Buffer Amplifier
- Cellular
- PCN

PRODUCT OVERVIEW

Mini-Circuits' VNA-28B+ is a wideband amplifier offering high dynamic range. It is enclosed in an 8-lead 5X6 mm MCLP package, footprint compatible with SOIC-8 lead package. VNA-28B+ is fabricated using PHEMT technology. It has built-in DC blocks at RF-IN and RF-OUT ports and separate pad for DC eliminating the need for bias tee.

SIMPLIFIED SCHEMATIC AND PIN 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.

REV. A
VNA-28B+
ECO-025227
VNA-28B+
250415

Monolithic Amplifier VNA-28B+

50Ω 0.5 to 2.5 GHz High Directivity

ELECTRICAL SPECIFICATIONS[1] AT +25°C, 50Ω UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Vs=+5 V Min.	Vs=+5 V Typ.	Vs=+5 V Max.	Vd=+2.8 V Typ.	Units
Frequency range		0.5		2.5	0.5-2.5	GHz
Gain	0.5		21.2		20.2	dB
	0.75		23.2		21.9	
	1.0		23.5		22.0	
	1.5		23.0		21.1	
	2.0	19.5	21.7	24.0	19.7	
	2.5		19.9		17.9	
Input Return Loss	0.5		5.0		5.2	dB
	0.75		10.0		10.7	
	1.0		14.9		16.1	
	1.5		17.3		19.4	
	2.0		16.1		17.0	
	2.5		13.9		14.0	
Output Return Loss	0.5		12.0		12.5	dB
	0.75		13.9		21.0	
	1.0		11.7		17.9	
	1.5		10.6		16.3	
	2.0		11.2		17.3	
	2.5		13.3		20.8	
Output Power @1dB Compression	0.5		+13.3		+11.4	dBm
	0.75		+12.9		+11.4	
	1.0		+11.9		+10.8	
	1.5		+11.4		+10.2	
	2.0		+10.9		+9.7	
	2.5		+10.5		+9.1	
Output IP3	0.5		+24.3		+22.2	dBm
	0.75		+24.6		+22.3	
	1.0		+23.4		+21.5	
	1.5		+22.7		+20.8	
	2.0		+21.8		+20.1	
	2.5		+21.2		+19.3	
Noise Figure	0.5		3.2		3.3	dB
	0.75		3.0		3.1	
	1.0		3.0		3.0	
	1.5		2.9		3.1	
	2.0		3.0		3.1	
	2.5		3.1		3.3	
Directivity (Isolation-Gain)	0.5		17.1		19.5	dB
	0.75		20.0		23.0	
	1.0		23.3		22.9	
	1.5		20.7		18.9	
	2.0		18.7		17.4	
	2.5		17.5		16.5	
DC Current			34	45	32	mA
Device Current Variation vs Temperature[2]			16		7	µA°/C
Device Current Variation vs Voltage			0.0004[3]		0.0013[4]	mA/mV
Thermal Resistance at +85°C			64		64	°C/W

1. Measured on Mini-Circuits Characterization test board TB-01-28B+. See Characterization Test Circuit (Fig. 1)
2. Current at +85°C - Current at -45°C)/130
3. Current at +5.25 V - Current at +3.29 V)/1.35
4. Current at +3.9 V - Current at +2.66 V)/1.24

Monolithic Amplifier VNA-28B+

50Ω 0.5 to 2.5 GHz High Directivity

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
DC Voltage	+7 V at pad 1 +1 V at pads 3 & 6; +10 V at pads 3,6
Power Dissipation	700 mW
Input Power	+5 dBm (continuous operation) +28 dBm (5 minutes max.)

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

CHARACTERIZATION TEST CIRCUIT

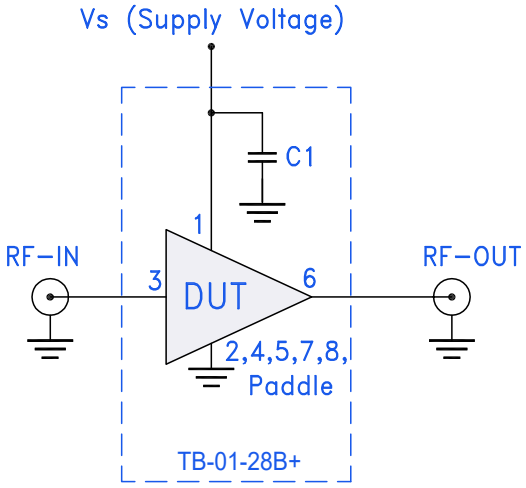


Fig 1. Characterization Test Circuit

Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-01-28B+) 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}= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at input.

RECOMMENDED APPLICATION CIRCUIT

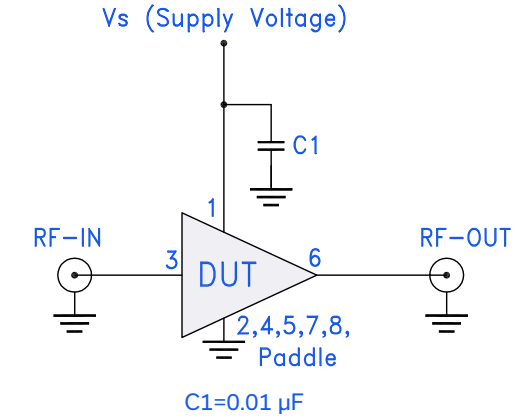
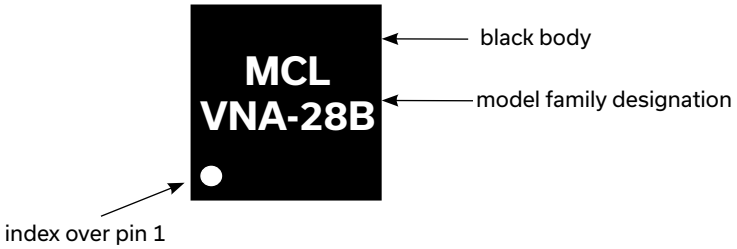


Fig 2. Recommended Application Circuit

PRODUCT MARKING



Monolithic Amplifier VNA-28B+

50Ω 0.5 to 2.5 GHz High Directivity

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. CLICK HERE

Performance Data & Graphs	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, 3K, 4K devices
Suggested Layout for PCB Design	PL-077
Evaluation Board	TB-01-28B+
Environmental Ratings	ENV08T1

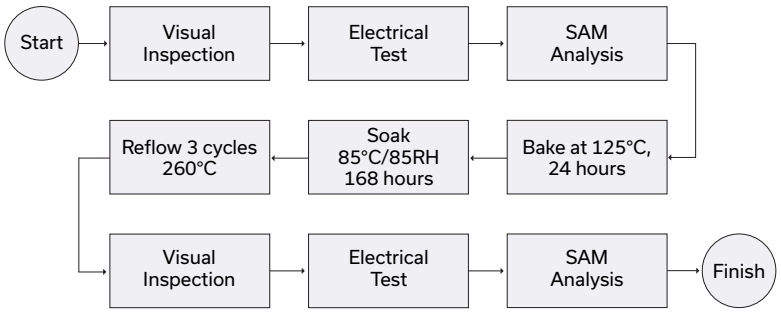
ESD RATING

Human Body Model (HBM): Class 1A (250 V to <500 V) in accordance with ANSI/ESD STM 5.1 - 2001
Machine Model (MM): Class M1 (Pass 25 V) in accordance with ANSI/ESD STM5.2-1999

MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

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.
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/terms/viewterm.html