ULTRA HIGH DYNAMIC RANGE

Monolithic Amplifier

PHA-102+

50Ω 50 MHz to 6 GHz

THE BIG DEAL

- Ultra Wideband, 50 MHz to 6 GHz
- Excellent gain flatness 14.3 ± 0.3 dB from 0.05-3 GHz
- High Linearity, +26.4 dBm P1dB & +50 dBm OIP3 at 0.9 GHz
- May be used as a replacement for AH102[a,b]



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

- WiFi
- WLAN
- LTE
- WiMAX
- S-band Radar

PRODUCT OVERVIEW

The PHA-102+ (RoHS compliant) is an advanced wideband amplifier fabricated using PHEMT technology and offers extremely high dynamic range over a broad frequency range and with excellent gain flatness. In addition, the PHA-102+ has good input and output return loss over a broad frequency range. PHA-102+ is enclosed in a SOT-89 package and has very good thermal performance.

KEY FEATURES

Feature	Advantages
Ultra Wideband: 50MHz to 6GHz	Broadband covering primary wireless communications bands
Extremely High IP3 +50 dBm typ. at 0.9 GHz +40.3 dBm typ. at 3 GHz	The PHA-102+ matches industry leading IP3 performance relative to device size and power consumption. The combination of the design and PHEMT Structure provides enhanced linearity over a broad frequency range as evidence in the IP3 being approxi- mately 17 dB above the P1dB point. This feature makes this amplifier ideal for use in: • Driver amplifiers for complex waveform up converter paths • Drivers in linearized transmit systems • Secondary amplifiers in ultra-High Dynamic range receivers
Excellent Gain Flatness, 50 MHz-3GHz	Typical ±0.3 dB gain flatness across the entire frequency range minimizes the need for external equalizer networks making it a great fit for instrumentation and EW application.

a. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application, compatibility with other components and environmental conditions and stresses.
b. The WJ AH102 part number is used for identification and comparison purposes only.

REV. B
ECO-010399
PHA-102+
MCL NY
240722

Monolithic Amplifier

PHA-102+

50Ω 50 MHz to 6 GHz

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

Parameter	Condition (MHz)	V_{DD}=+9V[1]			Vs=+9V[2]	Units
		Min.	Typ.	Max.	Typ.	
Frequency Range		50		6000	50-6000	MHz
Gain	50	13.1	14.6	16.0	14.2	dB
	900	—	14.5	—	14.2	
	2000	12.7	14.1	15.5	13.8	
	2500	—	14.0	—	13.7	
	3000	12.5	14.0	15.3	13.8	
	6000	—	11.9	—	10.9	
Gain flatness (±)	50-3000		0.3		0.25	dB
Input Return Loss	50		14		12	dB
	900		14		13	
	2000		12		13	
	2500		12		14	
	3000		12		15	
	6000		4		4	
Output Return Loss	50		18		13	dB
	900		17		17	
	2000		15		15	
	2500		14		15	
	3000		14		15	
	6000		4		4	
Output Power @1dB compression	50		+26.1		+25.4	dBm
	900		+26.4		+26.0	
	2000		+26.5		+26.1	
	2500		+26.1		+25.6	
	3000		+25.6		+25.0	
	6000		+20.4		+19.8	
Output IP3 (Pout = 0dBm/Tone)	50		+44.8		+41.6	dBm
	900		+50.0		+49.3	
	2000		+43.0		+42.5	
	2500		+41.4		+41.4	
	3000		+40.3		+40.4	
	6000		+37.3		+38.1	
Noise Figure	50		3.6		3.6	dB
	900		3.4		3.6	
	2000		3.7		3.8	
	2500		3.7		3.7	
	3000		4.0		4.0	
	6000		6.7		7.0	
Device Operating Voltage		+8.5	+9	+9.5	+9	V
Device Operating Current			192	211	191	mA
Device Current Variation vs. Temperature[3]			57.69		57.69	µA/°C
Device Current Variation vs. Voltage[4]			0.026		0.026	mA/mV
Thermal Resistance Junction-To-Ground Lead at 85°C stage temperature			20.4		20.4	°C/W

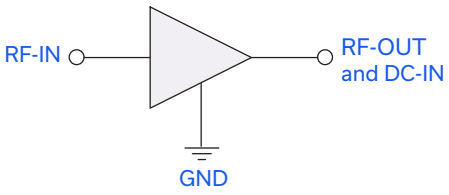
1. Measured on Mini-Circuits Characterization Test Board. See Characterization Test Circuit (Figure 1A, 1B & 1C).
2. Measured on Mini-Circuits Application Evaluation Board TB-PHA-102+. See Application Test Circuit (Figure 2).
3. Device Current Variation vs. Temperature= (Current at 85°C - Current at -45°C)/130°C
4. Device Current Variation vs. Voltage = (Current at 9.5V - Current at 8.5V) / ((9.5V-8.5V)*1000 mV/V)

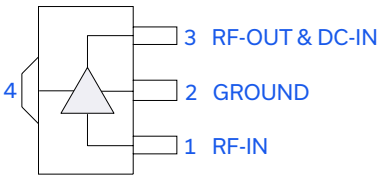
ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature (ground lead)	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Power Dissipation	3.18 W
Input Power (CW)	+22 dBm (continuous) +25 dBm (5 minutes max)
DC Voltage on Pin 3	+11 V

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

SIMPLIFIED SCHEMATIC AND PIN DESCRIPTION





Function	Pin Number	Description
RF-IN	1	RF Input pin.
RF-OUT and DC-IN	3	RF Output and DC Bias
GND	Paddle	Connections to ground.

CHARACTERIZATION TEST CIRCUIT FOR S-PARAMETER & NOISE FIGURE MEASUREMENT

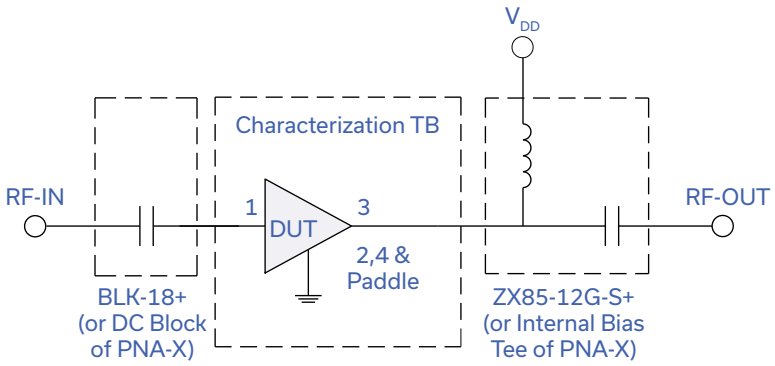


Fig 1A. Block Diagram of Test Circuit used for S-Parameter and Noise Figure Measurement. (DUT is soldered on Mini-Circuits Characterization test board.) Gain, Return loss and noise figure are measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:
1. Gain and Return loss: P_{IN}= -25dBm

CHARACTERIZATION TEST CIRCUIT FOR P1dB MEASUREMENT

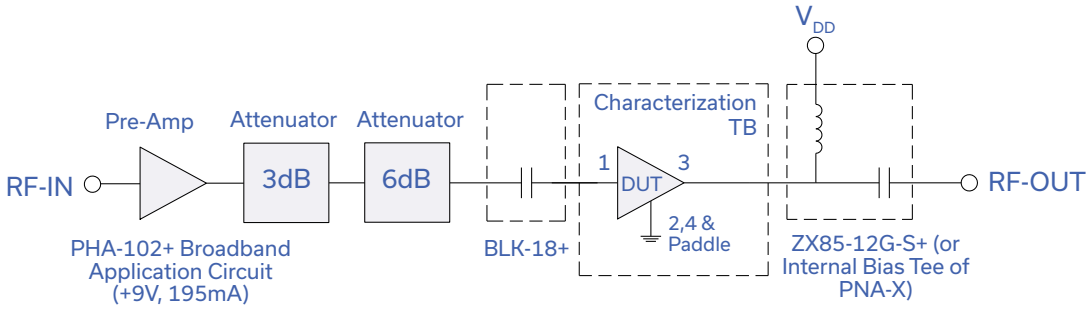


Fig 1B. Block Diagram of Test Circuit used for P1dB Measurement. (DUT is soldered on Mini-Circuits Characterization test board.) Output power at1dB compression is measured using Agilent's N5242A PNA-X microwave network analyzer.

CHARACTERIZATION TEST CIRCUIT FOR IP3 MEASUREMENT

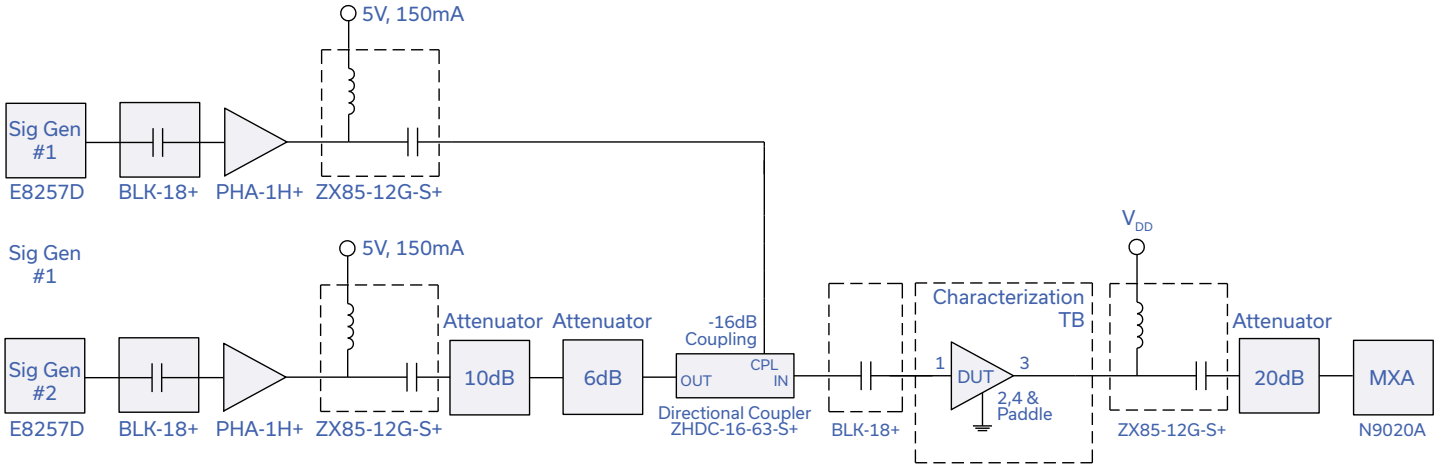
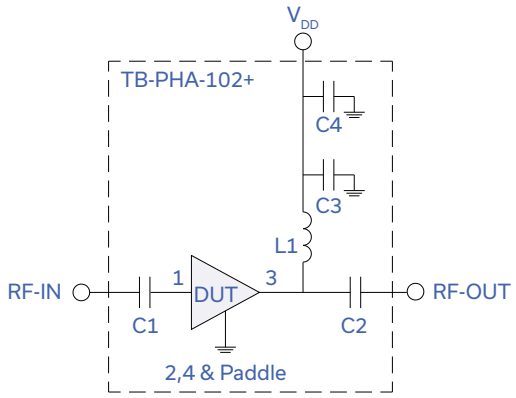


Fig 1C. Block Diagram of Test Circuit used for IP3 Measurement. (DUT is soldered on Mini-Circuits Characterization test board) P1dB is measured using two E8257D Signal Generators and one N9020A MXA Signal Analyzer.

Condition:
1. Output IP3 (OIP3): Two Tones spaced 1 MHz apart, 8 dBm/ tone at output.

APPLICATION TEST CIRCUIT

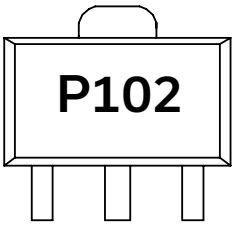


Component	Size	Value	Part Number	Manufacturer
C1	0402	1000pF	GRM1555C1H102JA01D	Murata
C2	0402	1000pF	GRM1555C1H102JA01D	Murata
C3	0402	100pF	GRM1555C1H101JA01D	Murata
C4	0402	10000pF	GRM155R71H103KA88D	Murata
L1	0603	390nH	LQW18CNR39J00D	Murata

Fig 2. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Application test board TB-PHA-102+) Gain, Return loss, Output power at1dB compression (P1dB), output IP3 (OIP3) and noise figure are measured per Figure 1A, 1B & 1C, except DC block BLK-18+ and Bias-Tee ZX85-12G-S+(or Internal Bias-Tee of PNA-X) are not required.

Conditions:
1. Gain and Return loss: P_{IN}= -25dBm
2. Output IP3 (OIP3): Two Tones spaced 1 MHz apart, 8 dBm/ tone at output.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

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-670
Evaluation Board	TB-PHA-102+
Environmental Ratings	ENV008T1

ESD RATING

Human Body Model (HBM): Class 1A (250V) in accordance with ANSI/ESD STM 5.1 - 2001

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/terms/viewterm.html