



WIDEBAND

# Microwave Amplifier

## ZX60-24A-S+

Mini-Circuits

50Ω 5 to 20 GHz SMA Female

### THE BIG DEAL

- Wideband, 5 to 20 GHz
- Gain, 24 dB typ and flatness,  $\pm 2.2$  dB typ.
- Output power at 1 dB compression, 18.3 dBm typ.
- Excellent isolation, 67 dB typ.
- Unconditionally stable
- Protected by US patent 6,790,049



Generic photo used for illustration purposes only

Model No.	ZX60-24-S+
Case Style	GC957
Connectors	SMA Female

### +RoHS Compliant

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

### APPLICATIONS

- Military and radar
- DBS
- Wideband isolation amplifier
- Microwave point to point radio
- Satellite systems

### PRODUCT OVERVIEW

The ZX60-24A-S+ two-stage amplifier provides high gain in a very small package, only 0.75" x 0.74" x 0.46" high. Internal compensating circuitry provides a consistent, flat response over the extra wide bandwidth. Designed for 50Ω SMA coax systems, the gold-plated package uses convenient 5V DC power, and has a nickel-plated brass cover and unibody construction for extra durability.

### KEY FEATURES

Feature	Advantages
Extra Wideband, 5-20 GHz	Wider frequency range supports a wider array of applications, from microwave radio and radar to military communications, satellite communications, and countermeasures
Excellent Gain Flatness, $\pm 2.2$ dB	$\pm 2.2$ dB gain flatness across entire bandwidth minimizes the need for external equalizer networks, making it a great fit for instrumentation, test lab, EW, or any other amplitude sensitive system
Excellent Isolation, 67 dB typ.	24-dB gain with reverse isolation of 67 dB typ. (43 dB typ. directivity) minimizes leakage, making the ZX60-24A-S+ an excellent choice for minimizing interactions between different microwave components. It is an ideal LO driver amplifier and provides designers system flexibility and robustness when integrating cascaded RF components. Can replace expensive isolators in many applications.
Unconditionally Stable	No risk of oscillation due to impedance mismatch.

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### ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		5.0		20.0	GHz
Gain	5.0	—	23.0	—	dB
	8.0	22.4	25.8	28.3	
	10.0	21.3	24.4	26.9	
	12.0	—	23.9	—	
	14.0	—	24.0	—	
	16.0	—	25.3	—	
	18.0	22.2	25.5	28.1	
	20.0	19.3	22.2	24.4	
Gain Flatness	5.0 - 20.0	—	±2.2	—	dB
Input Return Loss	5.0	—	10.1	—	dB
	8.0	10	17.5	—	
	10.0	—	17.4	—	
	12.0	10	21.2	—	
	14.0	—	17.0	—	
	16.0	—	15.7	—	
	18.0	—	11.5	—	
	20.0	—	7.6	—	
Output Return Loss	5.0	—	7.5	—	dB
	8.0	10	13.3	—	
	10.0	—	11.0	—	
	12.0	10	14.2	—	
	14.0	—	14.7	—	
	16.0	—	12.4	—	
	18.0	—	10.7	—	
	20.0	—	14.3	—	
Output IP3 @ Output Power +8 dBm / tone. (Tone spacing, 1 MHz)	5.0		30.5		dBm
	8.0		28.2		
	10.0		26.8		
	12.0		25.4		
	14.0		24.8		
	16.0		25.1		
	18.0		23.1		
	20.0		23.4		
Output Power @ 1 dB compression	5.0		17.4		dBm
	8.0		18.6		
	10.0		19.0		
	12.0		18.3		
	14.0		18.4		
	16.0		18.1		
	18.0		19.4		
	20.0		18.2		
Noise Figure	5.0		9.4		dB
	8.0		5.3		
	10.0		6.0		
	12.0		6.4		
	14.0		7.4		
	16.0		7.6		
	18.0		6.9		
	20.0		7.2		
Directivity (Isolation-Gain)		—	43	—	dB
DC Voltage		—	5.0	—	V
DC Current		—	270	295	mA





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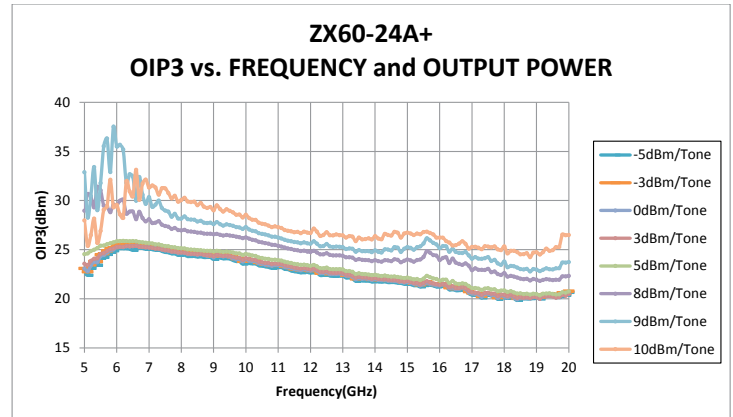
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50Ω 5 to 20 GHz SMA Female

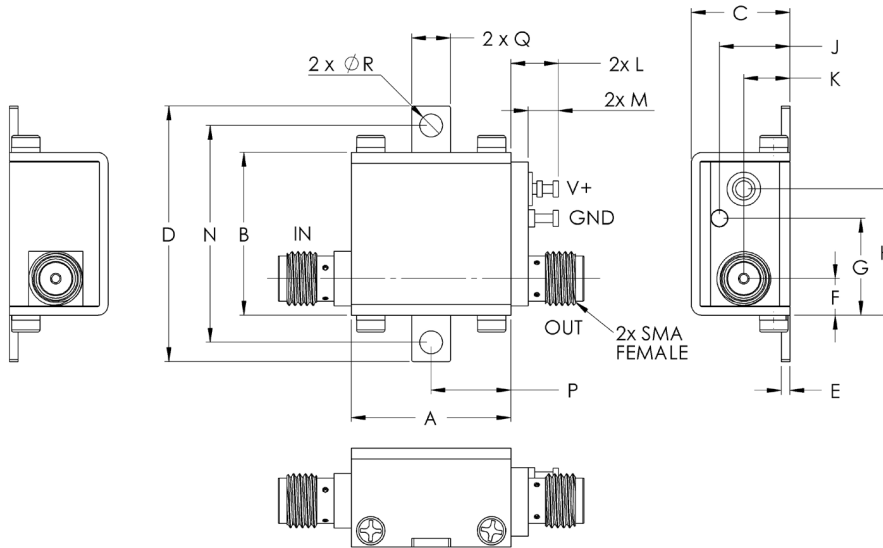
### ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-20°C to 85°C Base Plate Temp.
Storage Temperature	-55°C to 100°C
DC Voltage	5.5 V
Input RF Power (no damage)	+20 dBm
Power Dissipation	1.6 W

Permanent damage may occur if any of these limits are exceeded.



### OUTLINE DRAWING



**!** NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminal. See Application Note [AN-40-010](#).

### OUTLINE DIMENSIONS (Inches/mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	wt
.74	.75	.46	1.18	.04	.17	.45	.59	.33	.21	.22	.14	1.00	.37	.18	.106	grams
18.80	19.1	11.68	30.0	1.02	4.32	11.4	14.99	8.38	5.33	5.59	3.56	25.40	9.40	4.57	2.69	23.0





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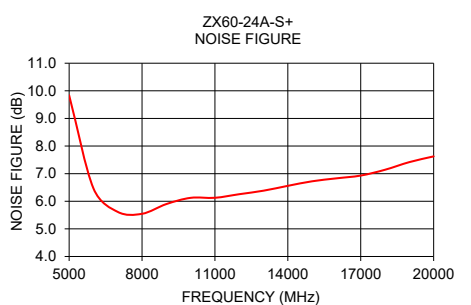
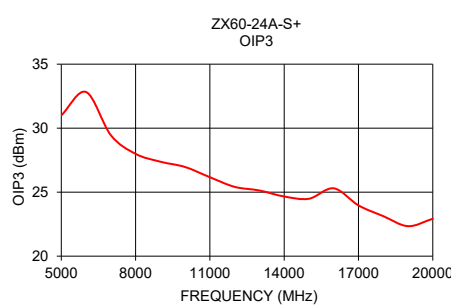
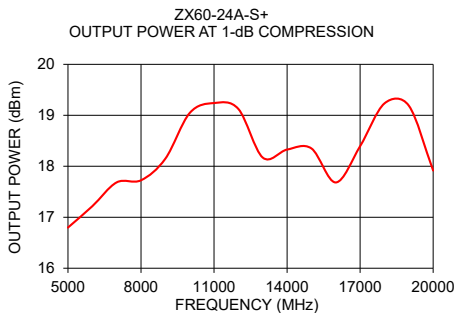
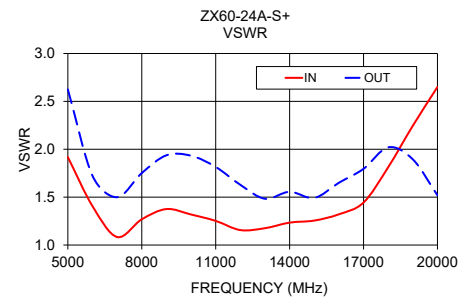
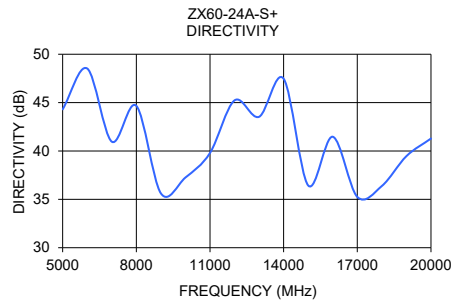
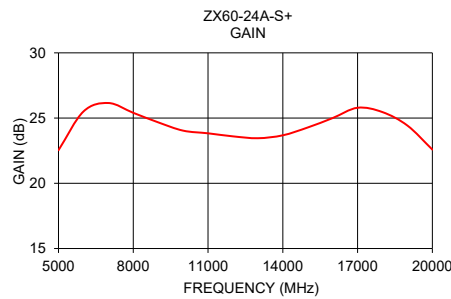
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### TYPICAL PERFORMANCE DATA/CURVES

Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1)		Power Out @1 dB Compr. (dBm)	NF (dB)	OIP3 (dBm)
			IN	OUT			
5000	22.54	44.30	1.92	2.63	16.80	9.84	31.00
6000	25.50	48.52	1.41	1.72	17.22	6.47	32.82
7000	26.15	40.96	1.08	1.50	17.68	5.61	29.45
8000	25.40	44.67	1.27	1.75	17.73	5.55	27.99
9000	24.67	35.62	1.38	1.94	18.15	5.90	27.38
10000	24.04	37.26	1.32	1.93	19.05	6.12	26.96
11000	23.83	39.79	1.25	1.82	19.24	6.13	26.17
12000	23.60	45.23	1.16	1.63	19.12	6.26	25.41
13000	23.46	43.53	1.18	1.48	18.17	6.38	25.13
14000	23.68	47.46	1.23	1.56	18.33	6.56	24.66
15000	24.28	36.43	1.26	1.49	18.35	6.72	24.49
16000	25.00	41.47	1.32	1.65	17.68	6.83	25.30
17000	25.79	35.25	1.44	1.80	18.39	6.93	23.97
18000	25.46	36.38	1.81	2.02	19.23	7.14	23.13
19000	24.42	39.47	2.25	1.89	19.19	7.42	22.34
20000	22.58	41.29	2.65	1.52	17.92	7.63	22.92



- 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](http://www.minicircuits.com/terms/viewterm.html)

