



COAXIAL

# Wideband Microwave Amplifier **ZX60-24-S+**

50Ω 5 to 20 GHz SMA Female

## THE BIG DEAL

- Wideband, 5 to 20 GHz
- Gain, 24 dB Typ. and Flatness, ±1.3 dB Typ.
- Output Power at 1 dB Compression, +18.0 dBm Typ.
- Excellent Isolation, 62 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

## APPLICATIONS

- Military and Radar
- Direct Broadcast Satellite
- Wideband Isolation Amplifier
- Microwave Point-to-Point Radio
- Satellite Systems

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

## PRODUCT OVERVIEW

The ZX60-24-S+ two-stage amplifier provides high gain in a very small package, only 0.75x0.74x0.46". 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 +5 V DC power, and has a nickel-plated brass cover and unibody construction for extra durability.

## KEY FEATURES

Feature	Advantages
Extra Wideband, 5 to 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	±1.3 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.
High Gain and Excellent Isolation	24 dB gain with reverse isolation of 62 dB (38 dB directivity) prevents leakage, making the ZX60-24-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.
Unconditionally Stable	No risk of damage to other components from impedance mismatch or internal oscillation.





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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		24.2		dB
	8.0	18.5	24.3		
	10.0	18.5	23.5		
	12.0		23.5		
	14.0		23.4		
	16.0		22.7		
	18.0	18.5	24.0		
	20.0	18.0	22.8		
Gain Flatness	5.0-20.0		±1.3		dB
Input Return Loss	5.0		16.3		dB
	8.0	10.0	16.5		
	10.0		12.2		
	12.0	10.0	15.7		
	14.0		11.0		
	16.0		11.8		
	18.0		11.0		
	20.0		15.6		
Output Return Loss	5.0		22.2		dB
	8.0	10.0	17.2		
	10.0		13.8		
	12.0	10.0	15.9		
	14.0	10.0	22.8		
	16.0		15.0		
	18.0	10.0	26.6		
	20.0		21.0		
Output IP3	5.0		+27.4		dBm
	8.0		+27.7		
	10.0		+27.9		
	12.0		+27.2		
	14.0		+26.9		
	16.0		+27.1		
	18.0		+26.4		
	20.0		+24.9		
Output Power at 1 dB Compression	5.0		+18.0		dBm
	8.0		+18.3		
	10.0	+16.0	+18.5		
	12.0		+18.1		
	14.0		+17.6		
	16.0		+18.0		
	18.0		+18.0		
	20.0		+17.9		
Noise Figure	5.0		8.2		dB
	8.0		6.9		
	10.0		6.3		
	12.0		6.9		
	14.0		6.8		
	16.0		6.8		
	18.0		6.5		
	20.0		7.0		
Directivity (Isolation-Gain)			38		dB
DC Voltage			+5.0		V
DC Current			260	290	mA





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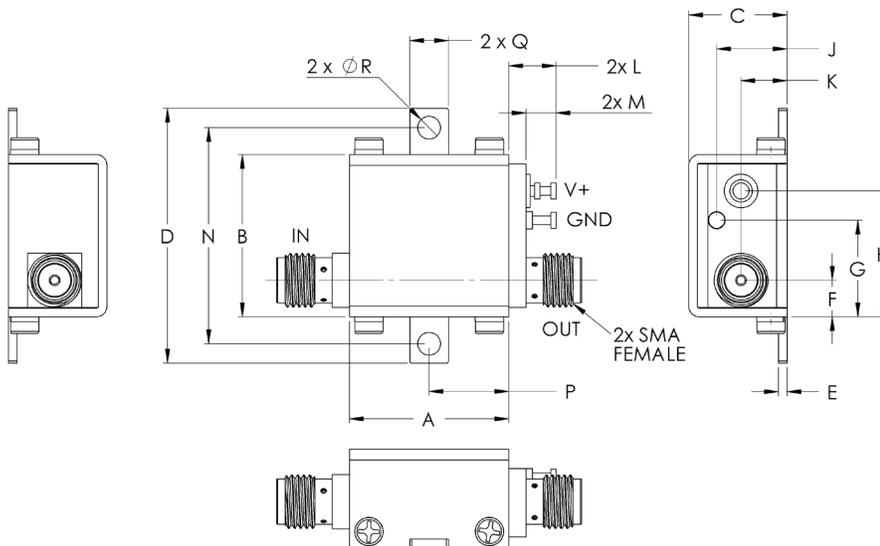
50Ω 5 to 20 GHz SMA Female

## ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40 °C to +85 °C Baseplate 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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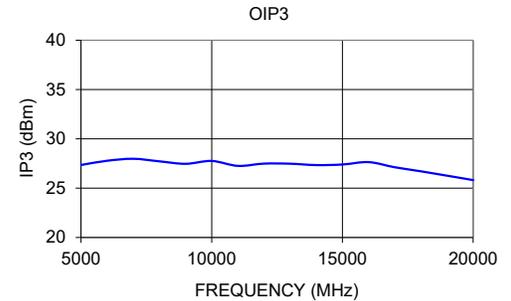
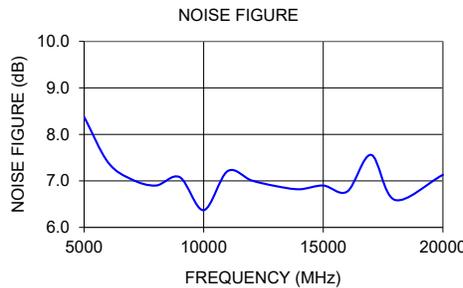
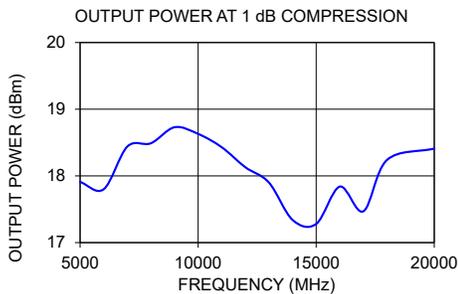
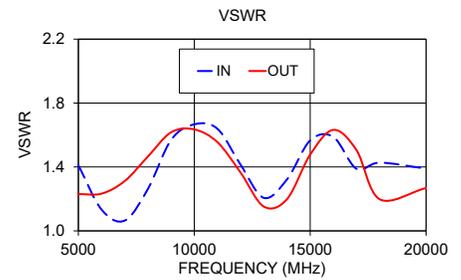
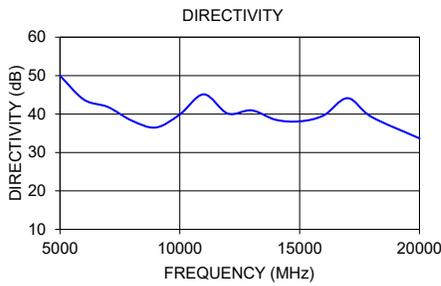
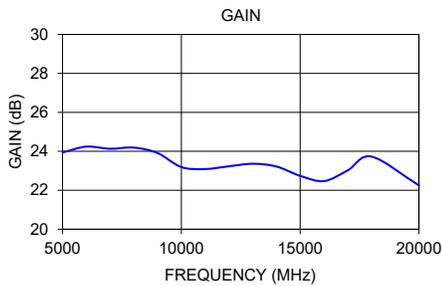
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50Ω 5 to 20 GHz SMA Female

## TYPICAL PERFORMANCE DATA/CURVES

Frequency (MHz)	Gain (dB)	Directivity (dB)	VSWR (:1)		Power Out at 1 dB Compr. (dBm)	OIP3 (dBm)	NF (dB)
			IN	OUT			
5000	23.94	49.97	1.41	1.23	17.91	27.35	8.38
6000	24.24	43.74	1.13	1.23	17.80	27.78	7.40
7000	24.13	41.84	1.06	1.31	18.44	27.98	7.03
8000	24.19	38.28	1.26	1.47	18.49	27.72	6.90
9000	23.91	36.50	1.57	1.62	18.73	27.47	7.08
10000	23.19	39.89	1.67	1.64	18.63	27.76	6.37
11000	23.09	45.13	1.64	1.56	18.43	27.26	7.21
12000	23.23	40.13	1.41	1.36	18.13	27.49	7.01
13000	23.36	40.96	1.21	1.15	17.90	27.48	6.89
14000	23.22	38.51	1.32	1.20	17.34	27.34	6.82
15000	22.74	38.10	1.57	1.48	17.28	27.40	6.90
16000	22.47	39.63	1.59	1.63	17.84	27.64	6.77
17000	23.02	44.13	1.39	1.51	17.47	27.12	7.56
18000	23.73	39.26	1.43	1.20	18.24	26.71	6.59
20000	22.25	33.67	1.39	1.27	18.41	25.82	7.13



- 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)



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# ZX60-24-S+

## Typical Performance Data

FREQUENCY (MHz)	Gain	Directivity	VSWR IN	VSWR OUT	Noise Figure	Pout @ 1dB Compression	Output IP3
	(dB) 5V	(dB) 5V	(:1) 5V	(:1) 5V	(dB) 5V	(dBm) 5V	(dBm) 5V
5000	23.94	49.97	1.41	1.23	8.38	17.91	27.35
6000	24.24	43.74	1.13	1.23	7.40	17.80	27.78
7000	24.13	41.84	1.06	1.31	7.03	18.44	27.98
8000	24.19	38.28	1.26	1.47	6.90	18.49	27.72
9000	23.91	36.50	1.57	1.62	7.08	18.73	27.47
10000	23.19	39.89	1.67	1.64	6.37	18.63	27.76
11000	23.09	45.13	1.64	1.56	7.21	18.43	27.26
12000	23.23	40.13	1.41	1.36	7.01	18.13	27.49
13000	23.36	40.96	1.21	1.15	6.89	17.90	27.48
14000	23.22	38.51	1.32	1.20	6.82	17.34	27.34
15000	22.74	38.10	1.57	1.48	6.90	17.28	27.40
16000	22.47	39.63	1.59	1.63	6.77	17.84	27.64
17000	23.02	44.13	1.39	1.51	7.56	17.47	27.12
18000	23.73	39.26	1.43	1.20	6.59	18.24	26.71
20000	22.25	33.67	1.39	1.27	7.13	18.41	25.82



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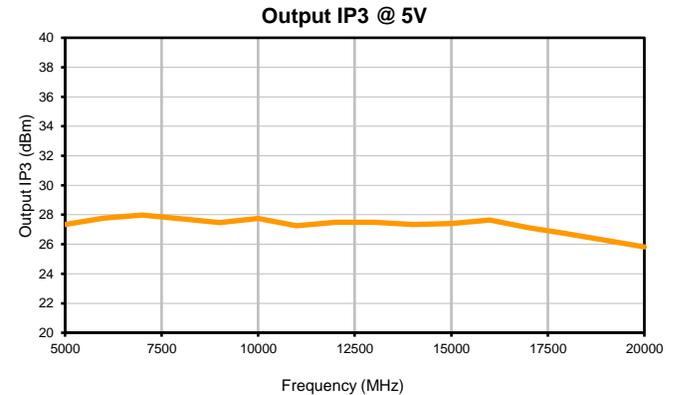
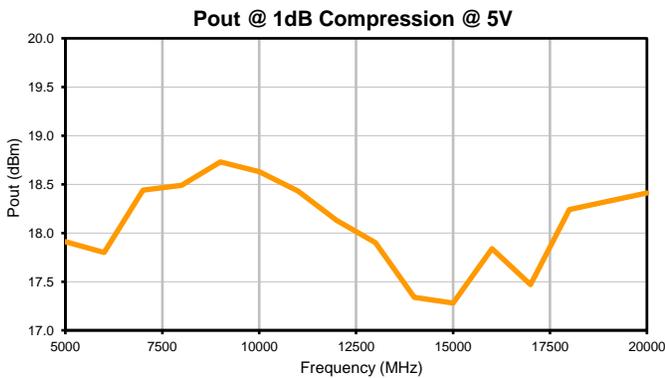
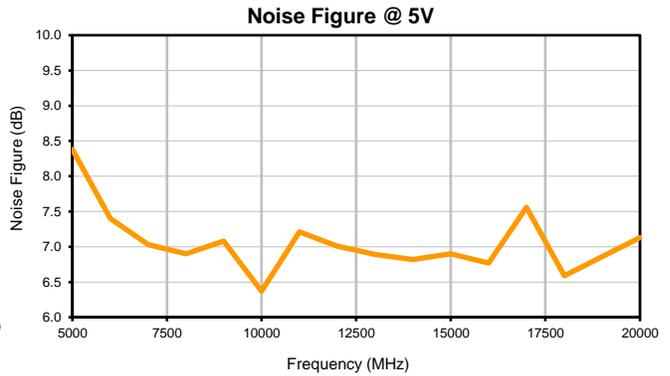
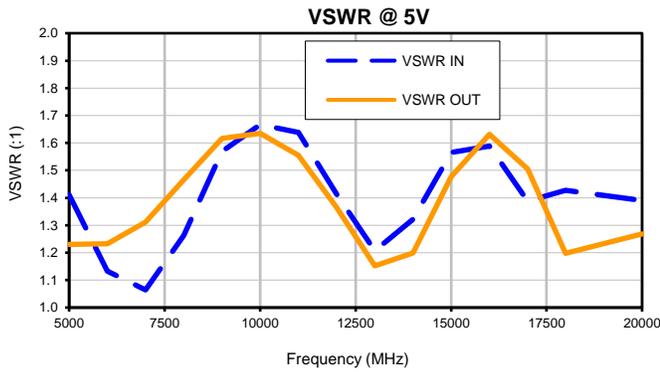
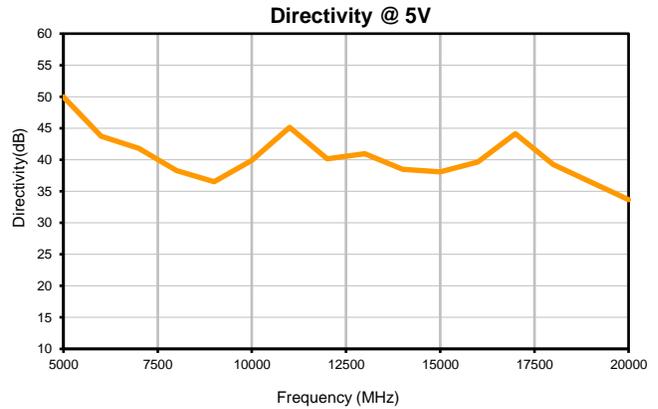
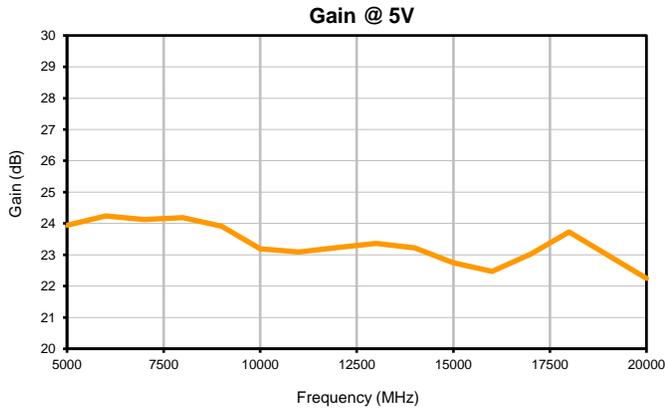


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IF/RF MICROWAVE COMPONENTS

REV. OR  
ZX60-24-S+  
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## Typical Performance Curves







All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C Case Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Stabilization Bake	(non-operating) 125°C, 24 hours	- - -
Burn-in at Elevated Temp.	(DC on) 160 hours at 85° C	MIL-STD-202, Method 108
Thermal Shock	-55° to 100°C, 5 cycles	MIL-STD-202, Method 107, Condition A, except 100°C