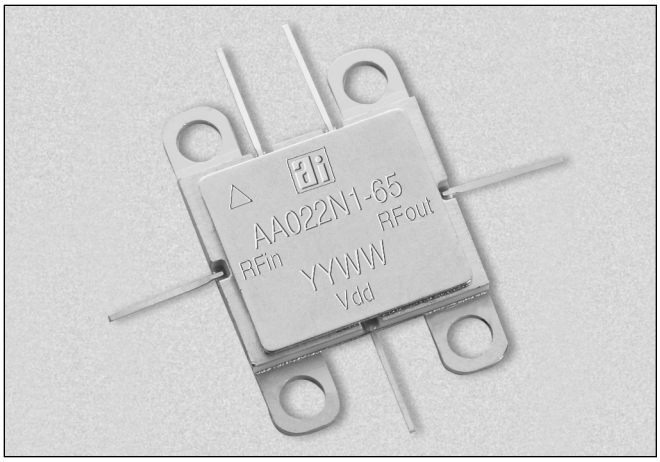
20–24 GHz Low Noise Amplifier

AA022N1-65

Features

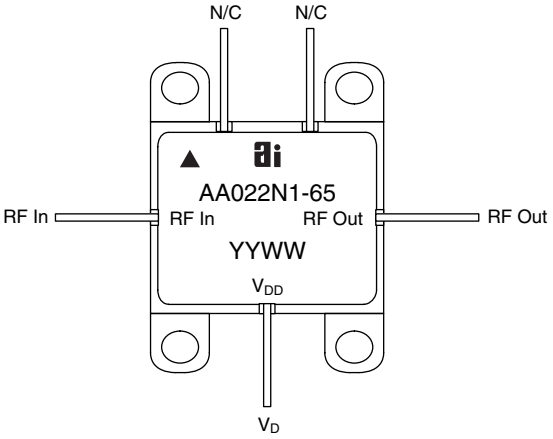
- 3.2 dB Noise Figure
- 17 dB Gain
- +9 dBm Output Power
- Hermetic Package with Solderable Leads
- Single Voltage Operation
- 100% RF and DC Testing



Description

The AA022N1-65 is a broadband millimeterwave amplifier in a hermetic package. The amplifier is designed for use in millimeterwave communication and sensor systems as the receiver front-end, transmitter gain stage, or local oscillator gain stage when high gain, wide dynamic range, and low noise figure are required. The solder-sealed hermetic package provides excellent electrical performance, excellent thermal performance, and complete environmental protection for long-term reliability. A single supply voltage simplifies bias requirements. All amplifiers are screened at the operating frequencies prior to shipment for guaranteed performance. The amplifier is targeted for millimeterwave point-to-point and point-to-multipoint wireless communications systems.

Pin Out



Electrical Specifications at 25°C (V_D = 5.5 V)

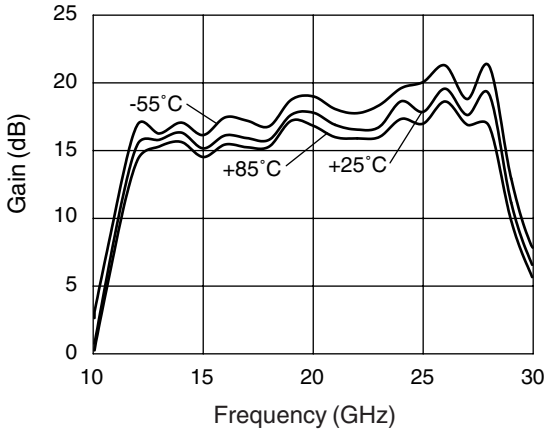
RF

Parameter	Symbol	Min.	Typ.	Max.	Unit
Bandwidth	BW	20	19–25	24	GHz
Small Signal Gain	G	15	17		dB
Noise Figure	NF		3.2	3.9	dB
Input Return Loss	RL_I		8		dB
Output Return Loss	RL_O		11		dB
Output Power at 1 dB Gain Compression	$P_{1\ dB}$		9		dBm
Temperature Coefficient of Gain	dG/dT		-0.028		dB/C

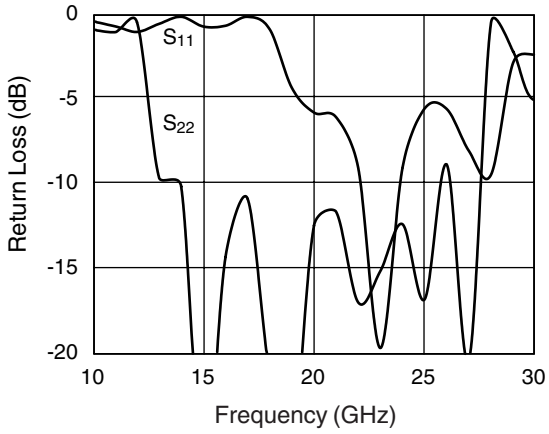
DC

Parameter	Symbol	Min.	Typ.	Max.	Unit
Drain Current	I_D		60	90	mA

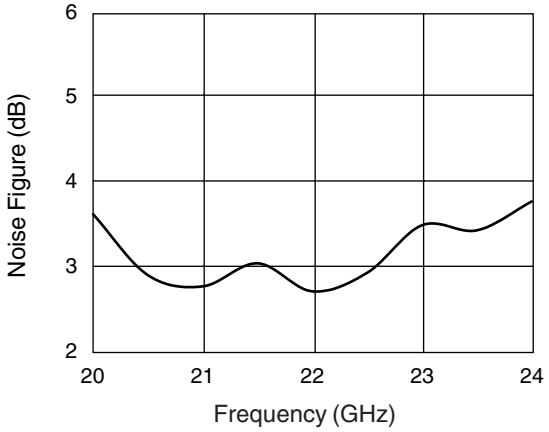
Typical Performance Data



Gain vs. Frequency



Return Loss vs. Frequency

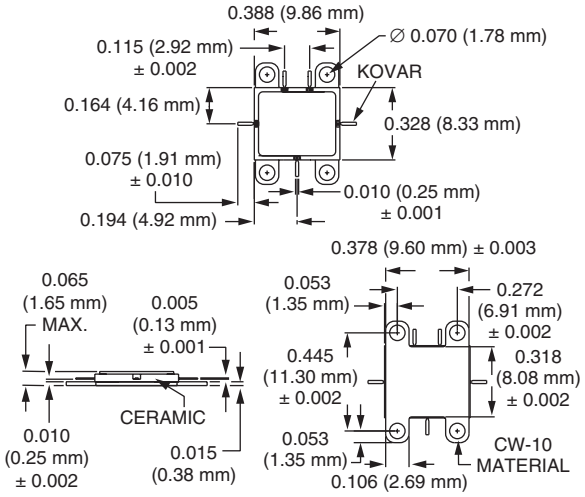


Noise Figure vs. Frequency

Absolute Maximum Ratings

Characteristic	Value
Operating Temperature (T_C)	-55°C to +90°C
Storage Temperature (T_{ST})	-65°C to +150°C
Bias Voltage (V_D)	6 V_{DC}
Power In (P_{IN})	13 dBm

Outline



Typical S-Parameters at 25°C (V_D = 5.5 V)

Frequency (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
5.0	-0.23	154.65	-43.85	86.28	-45.99	85.59	-0.02	64.98
7.0	-0.23	-111.06	-37.45	56.97	-51.79	-104.35	-0.05	159.26
9.0	-0.08	13.10	-8.78	102.07	-44.05	66.64	-0.61	-116.95
11.0	-0.65	104.53	8.89	152.07	-37.56	-114.12	-1.01	-40.73
12.0	-0.99	-48.85	15.42	-26.69	-47.14	130.43	-0.42	168.72
13.0	-0.51	166.36	15.79	157.28	-49.08	37.53	-9.57	22.43
14.0	-0.10	55.47	16.34	-5.38	-47.31	112.82	-10.10	24.64
15.0	-0.67	-55.35	15.16	-139.82	-37.37	-47.11	-27.18	-136.61
16.0	-0.63	156.89	16.13	84.35	-40.46	-161.21	-14.25	51.89
17.0	-0.10	18.10	15.92	-48.83	-44.76	90.70	-10.82	-54.46
18.0	-0.83	-83.22	15.81	-169.31	-43.32	6.41	-21.13	-167.32
19.0	-4.28	152.57	17.65	60.67	-36.37	-126.11	-25.24	-155.34
20.0	-5.74	-61.50	17.80	-95.05	-35.20	98.48	-12.39	-88.92
21.0	-6.01	-179.42	16.90	133.41	-35.38	-12.60	-11.58	144.87
22.0	-9.01	88.52	16.55	14.42	-34.87	-115.99	-16.93	44.72
23.0	-19.60	48.18	16.75	-110.63	-31.84	151.62	-15.07	-156.77
24.0	-9.00	-41.19	18.64	127.32	-30.18	33.65	-12.31	56.67
25.0	-5.49	147.20	17.87	-32.70	-32.94	-79.66	-16.74	109.43
26.0	-5.53	-9.75	19.57	-165.11	-36.65	-80.66	-8.81	-38.71
27.0	-8.00	-45.79	17.63	87.22	-35.32	98.43	-20.32	-13.38
28.0	-9.41	-22.84	19.14	-81.69	-28.71	77.45	-0.46	-21.58
29.0	-2.80	-165.39	11.16	135.62	-25.82	-63.56	-2.14	-149.84
30.0	-2.33	100.83	6.39	21.60	-28.49	-164.40	-5.02	115.71
32.0	-2.61	-97.59	-0.47	151.84	-29.33	-9.95	-2.70	-119.75
34.0	-1.05	62.48	-4.75	-49.44	-42.31	-155.10	-2.59	74.44
36.0	-5.37	-174.78	-2.17	42.82	-37.64	-35.81	-8.87	-99.71
38.0	-2.11	-176.06	-16.06	-112.92	-48.35	-143.83	-2.90	44.51
40.0	-2.85	-79.93	-11.61	5.61	-31.46	-46.85	-1.07	-108.06

Leaded Millimeterwave Package Handling and Mounting

The leaded millimeterwave package requires careful mounting design to maintain optimal performance.

Handling

The leaded millimeterwave package is extremely rugged. Care should be exercised when handling with metal tools. Only personnel trained in both ESD precautions and handling precautions should be allowed to handle these packages.

Package Construction

The construction of the leaded millimeterwave package consists of a metal base and ceramic walls. The package is topped by a solder-sealed metal lid. All metal parts are gold-plated.

Mounting Design

The leaded millimeterwave package is mounted by placing it in a hole cut in a printed circuit board. The bottom of the package leads should be in the same plane as the top surface of the printed circuit board traces. The hole should be cut as close as possible to the outer dimensions of the package to minimize the gap between package and printed circuit board. The gap should be no more than 0.005" (0.127 mm). The base of the package should be mounted directly to a surface that provides a good ground plane for the printed circuit board and provides a good thermal ground.

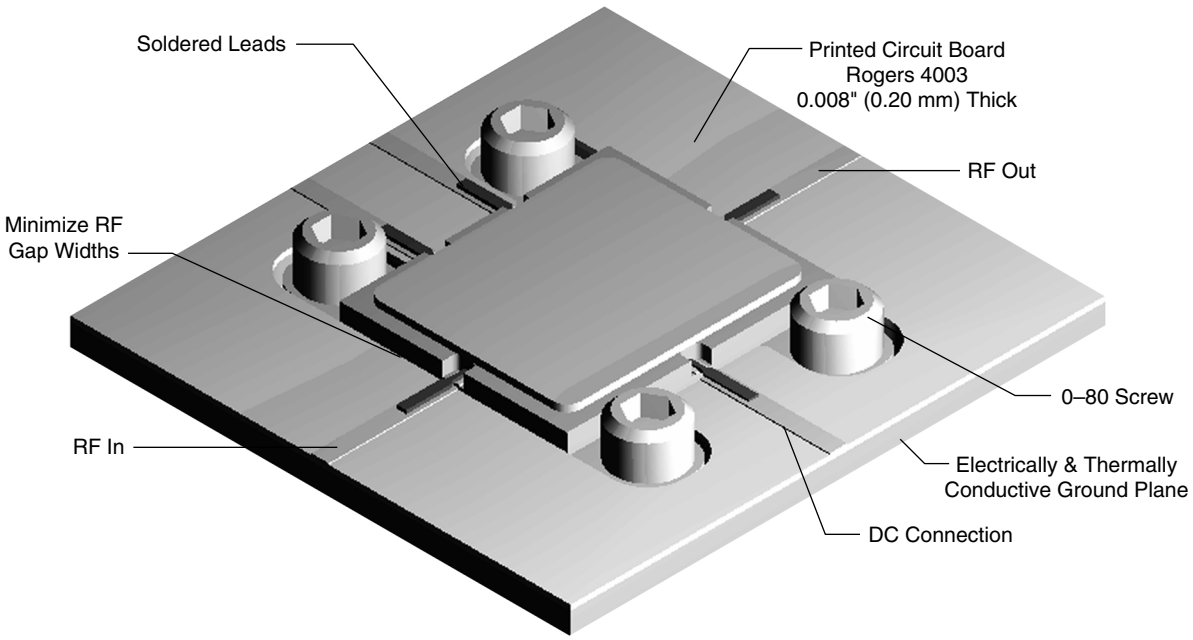
Mounting the Package

The leaded millimeterwave package should be attached to its mounting surface using a silver-filled conductive paste epoxy or solder. Care should be taken to ensure that there are no voids or gaps in the epoxy or solder underfill so that a good ground contact is maintained.

Screw hardware attachment should be used in addition to epoxy or solder in situations where additional mechanical integrity is desired. Care should be exercised when tightening screws because over-tightening could deform the package base.

Connecting the Package

Connection of the package leads to the printed circuit board traces is accomplished with solder. Attached leads should lie flat upon the printed circuits board traces. Package leads can be trimmed if desired.



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