



AH3

High Dynamic Range Gain Block

The Communications Edge™

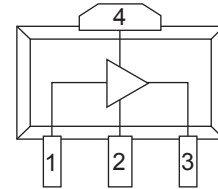
Product Features

- 50 - 870 MHz
- +41 dBm Output IP3
- No Matching Elements Required
- 3.0 dB Noise Figure
- 13 dB Gain
- +20 dBm P1dB
- MTBF >100 Years
- SOT-89 SMT Package
- Single Bias Supply (+5 V)

Product Description

The AH3 is a high dynamic range amplifier for IF requirements. The product achieves low noise figure and high output IP3 at the same bias point, making it ideal for receiver and transmitter applications. In addition, the device is internally matched for 50 ohms in a low cost SOT-89 package. The AH3 is manufactured using GaAs MESFET technology and boasts an MTBF of >100 years³ at a mounting temperature of 85°C. The package is a SOT-89. All devices are 100% RF and DC tested.

Functional Diagram



Function	Pin No.
Input	1
Ground	2
Output/Bias	3
Ground	4

Specifications

Parameter	Units	Minimum	Typical	Maximum	Condition
Frequency Range	MHz	50	800	870	
S21 - Gain	dB	12	12.9	14	
S11 - Input Return Loss ¹	dB		-10		
S22 - Output Return Loss	dB		-20		
Output IP3	dBm	+37	+41		
Output P1dB	dBm		+20		
Noise Figure ¹	dB		4.5		50 MHz
Noise Figure	dB		3.0		450 MHz
Operating Current Range	mA	120	150	180	Vdd = 5.0 V
Supply Voltage	V		5		

Test conditions unless otherwise noted, T = 25°C, Vdd = 5.0 V, 50 Ω system, 800 MHz.

1. S11 and Noise Figure can be improved using an optional input matching network.

2. OIP3 measured with 2 tones at an output power of +5 dBm/tone separated by 10 MHz. The suppression on the largest IM3 product is used to calculate OIP3 using a 2:1 slope rule.

3. MTBF calculated with ground lead temperature at 85°C.

Absolute Maximum Ratings

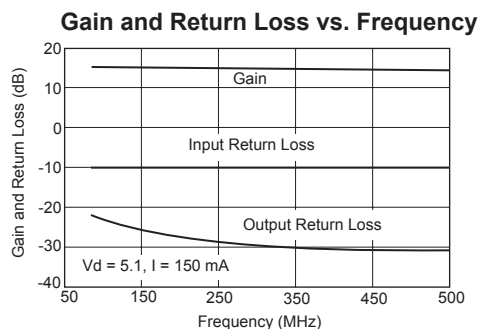
Parameter	Rating
Operating Case Temperature	-40 to +85°C
Storage Temperature	-55 to +125°C
Supply Voltage	+6.0 V
Input RF Power (continuous)	+10 dBm

Operation of this device above any of these parameters may cause permanent damage.

Ordering Information

Part No.	Description
AH3	High Dynamic Range Amplifier (Available in tape and reel)
AH3WB-PCB	50 - 870 MHz Fully Assembled Application Circuit

Performance Charts ($V_{ds} = 5\text{ V}$, $I_{ds} = 150\text{ mA}$, $T = 22^\circ\text{C}$, unmatched device in a 50 ohm system)

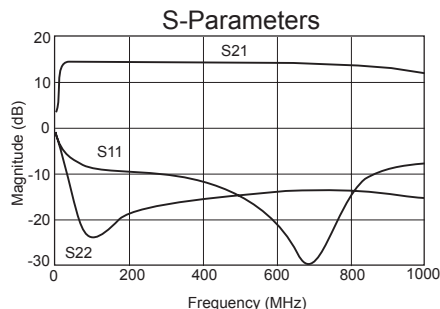
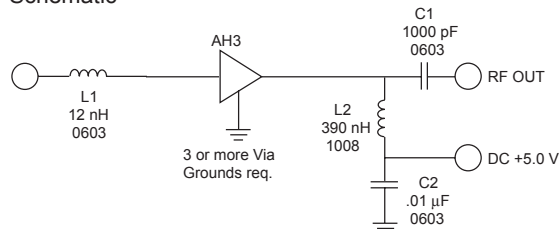


Application Circuit: 50 to 870 MHz (AH3 WB-PCB)

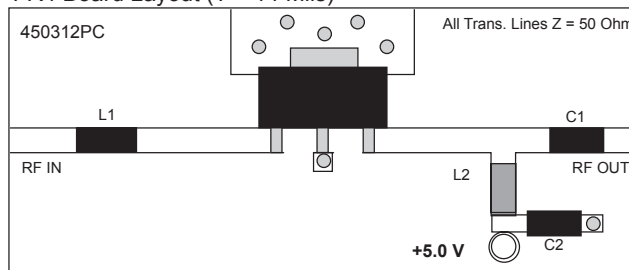
Typical Performance

Frequency	50 MHz	450 MHz
Magnitude S21	12.9 dB	12.9 dB
Magnitude S11	-8.3 dB	-13.3 dB
Magnitude S22	-18.0 dB	-15.2 dB
OIP3	36 dBm	40 dBm
Noise Figure	3.6 dB	2.7 dB
Bias	$V_{ds} = 5.0\text{ V}$, $I_d = 150\text{ mA}$	

Schematic



FR4 Board Layout (T = 14 Mils)



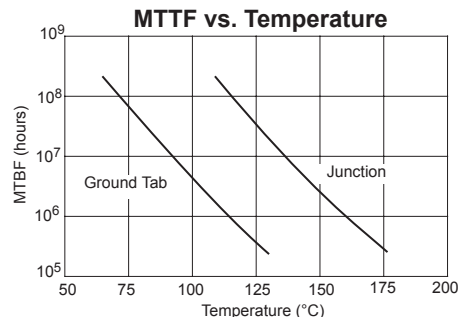
NOTE: The application circuit is designed for wide bandwidth. For narrow band applications, S11 and S21 can be improved with an input shunt microstrip element to ground.

Thermal Specifications

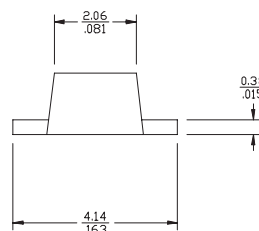
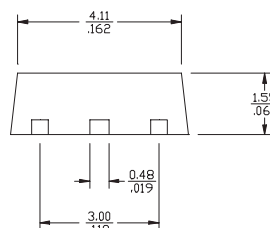
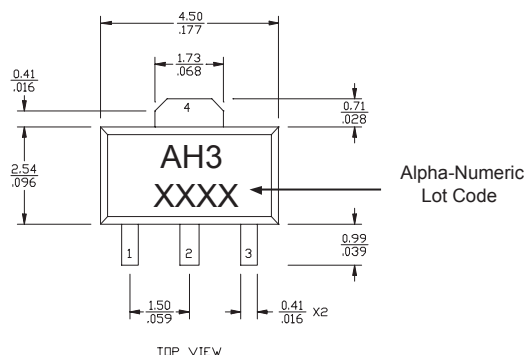
Parameter	Rating
Operating Case Temperature	-40 to +85°C
Thermal Resistance (Maximum)	59°C/W
Junction Temperature (Recommended Maximum)	+155°C

Notes:

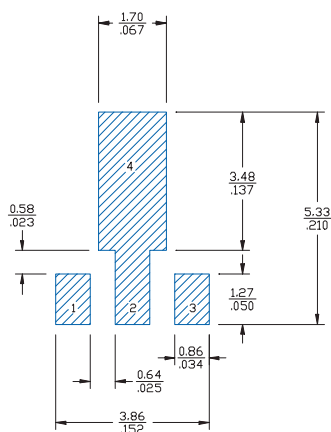
1. Thermal Resistance determined at Maximum Tab Temperature and Max Power Dissipation.
2. Recommended Maximum Junction Temperature insures a MTBF of 1 million hours.
3. Refer to WJ Application Note "AH3 Temperature Effects on Reliability" for more information.



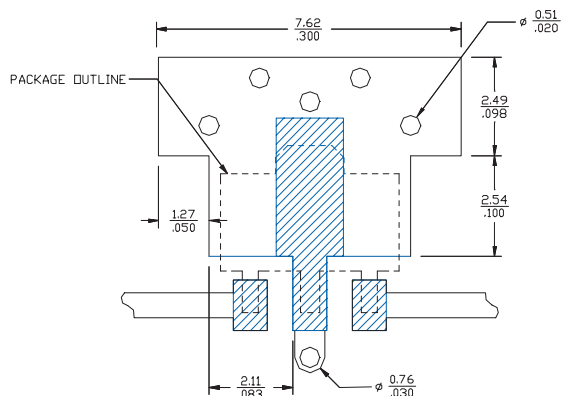
Outline Drawing



Land Pattern



Mounting Configuration



FUNCTION	PIN NO.
INPUT	1
GROUND	2
OUTPUT (BIAS)	3
GROUND	4

- Notes:
1. Ground vias are critical for thermal and RF grounding considerations.
 2. A minimum of 6 ground vias are required for 14 mil and 28 mil FR4 board.
 3. If your PCB design rules allow, ground vias should be placed under the land pattern for better RF and thermal performance. Otherwise ground vias should be placed as close to land pattern as possible.
 4. Trace width depends on PC board.



Typical Test Data

S-Parameters (Vds = +5 V, Ids = 150 mA, Vds = +5 V, T = 22°C, unmatched device in a 50 ohm system)

Freq (MHz)	S11 (dB)	S11 (Ang)	S21 (dB)	S21 (Ang)	S12 (dB)	S12 (Ang)	S22 (dB)	S22 (Ang)
50	-11.925	-33.34	14.151	169.58	-19.946	7.77	-18.603	-126.62
100	-13.214	-28.09	13.945	170.57	-19.984	2.69	-20.540	-149.57
150	-13.514	-28.85	13.851	169.10	-19.861	0.25	-21.161	-160.72
200	-13.481	-32.18	13.830	167.34	-19.850	-1.46	-21.226	-167.36
250	-13.550	-36.10	13.808	164.90	-19.869	-3.41	-20.906	-170.48
300	-14.051	-44.73	13.783	162.57	-19.859	-4.62	-19.259	-177.22
350	-14.115	-48.60	13.746	160.01	-19.908	-5.48	-19.065	-175.89
400	-13.529	-55.70	13.704	157.51	-19.919	-7.31	-19.122	-178.33
450	-13.598	-61.16	13.687	155.04	-19.952	-7.85	-18.712	-179.04
500	-13.321	-65.93	13.645	152.52	-19.904	-10.12	-18.665	178.55
550	-13.112	-70.97	13.595	150.15	-19.850	-10.20	-18.459	178.78
600	-12.649	-75.78	13.515	147.48	-19.911	-11.07	-18.430	177.91
650	-12.426	-80.45	13.509	145.06	-19.893	-12.83	-18.289	177.33
700	-12.102	-84.62	13.455	142.56	-19.865	-12.67	-18.306	175.94
750	-11.793	-88.75	13.389	140.08	-19.823	-14.15	-18.286	176.28
800	-11.540	-93.43	13.330	137.61	-19.924	-14.94	-18.176	174.92
850	-11.275	-96.17	13.257	135.38	-19.838	-15.94	-18.259	173.97
900	-10.971	-100.66	13.210	132.61	-20.092	-16.96	-18.196	174.37
950	-10.691	-104.85	13.080	129.83	-20.087	-19.21	-18.346	175.02
1000	-10.532	-107.99	13.035	127.70	-19.920	-19.33	-17.826	174.09