

Product Features

- 50 – 870 MHz
- +41 dBm OIP3
- 3 dB Noise Figure
- 13 dB Gain
- +20 dBm P1dB
- Lead-free/Green/RoHS-compliant SOT-89 Package
- Single +5 V Supply
- MTTF > 100 years

Applications

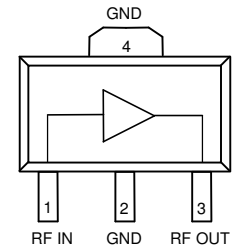
- Mobile Infrastructure
- CATV / DBS
- RFID
- Defense / Homeland Security
- Fixed Wireless

Product Description

The AH3 is a high dynamic range amplifier in a low-cost surface-mount package. The combination of low noise figure and high output IP3 at the same bias point makes it ideal for receiver and transmitter applications. The device combines dependable performance with superb quality to maintain MTTF values exceeding 100 years at mounting temperatures of +85°C. The AH3 is available in the environmentally-friendly lead-free/green/RoHS-compliant SOT-89 package.

The broadband amplifier uses a high reliability GaAs MESFET technology and is targeted for applications where high linearity is required. In addition, the AH3 is internally matched for 50 ohms.

Functional Diagram



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

Specifications ⁽¹⁾

Parameter	Units	Min	Typ	Max
Operational Bandwidth	MHz	50		870
Test Frequency	MHz		800	
Gain	dB	12	12.9	14
Input Return Loss	dB		10	
Output Return Loss	dB		20	
Output P1dB	dBm		+20	
Output IP3 ⁽²⁾	dBm	+37	+41	
Noise Figure ⁽³⁾	dB		2.9	
Operating Current Range	mA	120	150	180
Supply Voltage	V		5	

1. Test conditions unless otherwise noted: T = 25° C, 50 Ω system.
2. 3OIP measured with two tones at an output power of +5 dBm/tone separated by 10 MHz. The suppression on the largest IM3 product is used to calculate the 3OIP using a 2:1 rule.
3. Noise figure can be optimized by matching the input for optimal return loss.

Typical Performance ⁽⁴⁾

Parameter	Units	Typical		
Frequency	MHz	50	450	800
S21	dB	12.7	12.3	11.7
S11	dB	-8.4	-15.2	-14
S22	dB	-16.7	-16.5	-15
Output P1dB	dBm	+20	+20	+20
Output IP3 ⁽²⁾	dBm	+36	+40	+41
Noise Figure	dB	5	3.3	3.1
Supply Voltage	V		5	
Device Current	mA		150	

4. Parameters reflect performance in an AH3WB-PCB application circuit, as shown on page 3.

Absolute Maximum Rating

Parameter	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-55 to +125 °C
Supply Voltage	+6 V
RF Input Power (continuous)	+10 dBm
Junction Temperature	+220 °C

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

Ordering Information

Part No.	Description
AH3*	High Dynamic Range Amplifier (lead-tin SOT-89 Pkg)
AH3-G	High Dynamic Range Amplifier (lead-free/green/RoHS-compliant SOT-89 Pkg)
AH3WB-PCB	50 – 870 MHz Fully Assembled Application Circuit

- * This package is being phased out in favor of the green package type which is backwards compatible for existing designs. Refer to Product Change Notification WJPCN06MAY05TC1 on the WJ website.

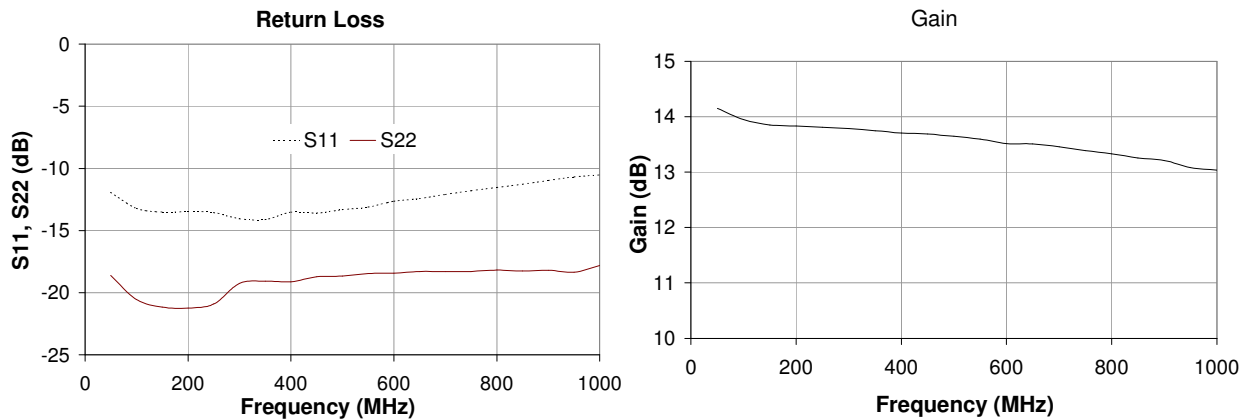


Typical Device Data

S-Parameters ($V_D = +5\text{ V}$, $I_D = 150\text{ mA}$, $T = 25^\circ\text{C}$, calibrated to device leads)

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
50	-11.93	-33.34	14.15	169.58	-19.95	7.77	-18.60	-126.62
100	-13.21	-28.09	13.95	170.57	-19.98	2.69	-20.54	-149.57
150	-13.51	-28.85	13.85	169.10	-19.86	0.25	-21.16	-160.72
200	-13.48	-32.18	13.83	167.34	-19.85	-1.46	-21.23	-167.36
250	-13.55	-36.10	13.81	164.90	-19.87	-3.41	-20.91	-170.48
300	-14.05	-44.73	13.78	162.57	-19.86	-4.62	-19.26	-177.22
350	-14.12	-48.60	13.75	160.01	-19.91	-5.48	-19.07	-175.89
400	-13.53	-55.70	13.70	157.51	-19.92	-7.31	-19.12	-178.33
450	-13.60	-61.16	13.69	155.04	-19.95	-7.85	-18.71	-179.04
500	-13.32	-65.93	13.65	152.52	-19.90	-10.12	-18.67	178.55
550	-13.11	-70.97	13.60	150.15	-19.85	-10.20	-18.46	178.78
600	-12.65	-75.78	13.52	147.48	-19.91	-11.07	-18.43	177.91
650	-12.43	-80.45	13.51	145.06	-19.89	-12.83	-18.29	177.33
700	-12.10	-84.62	13.46	142.56	-19.87	-12.67	-18.31	175.94
750	-11.79	-88.75	13.39	140.08	-19.82	-14.15	-18.29	176.28
800	-11.54	-93.43	13.33	137.61	-19.92	-14.94	-18.18	174.92
850	-11.28	-96.17	13.26	135.38	-19.84	-15.94	-18.26	173.97
900	-10.97	-100.66	13.21	132.61	-20.09	-16.96	-18.20	174.37
950	-10.69	-104.85	13.08	129.83	-20.09	-19.21	-18.35	175.02
1000	-10.53	-107.99	13.04	127.70	-19.92	-19.33	-17.83	174.09

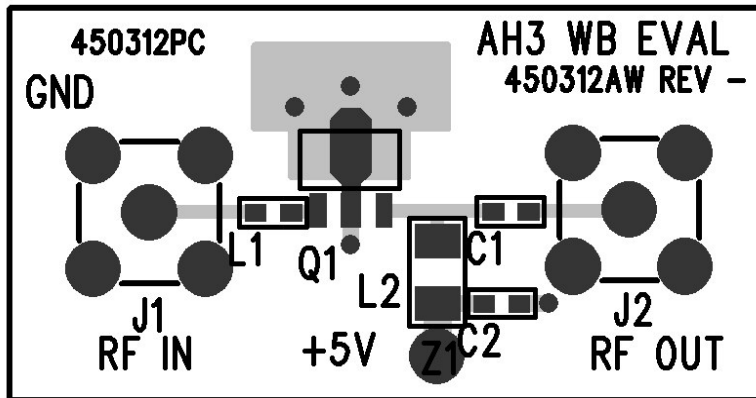
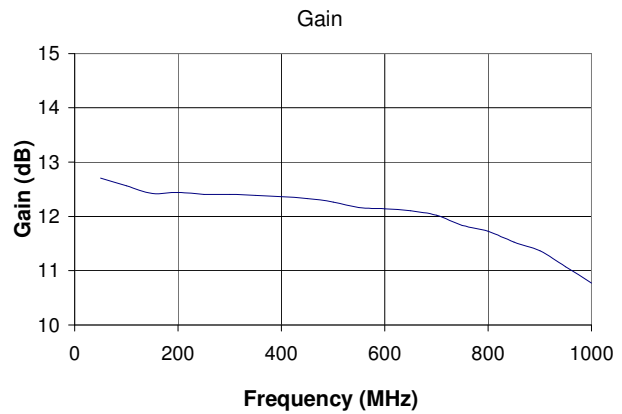
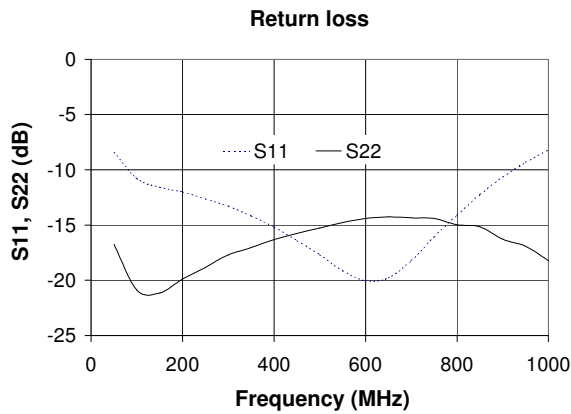
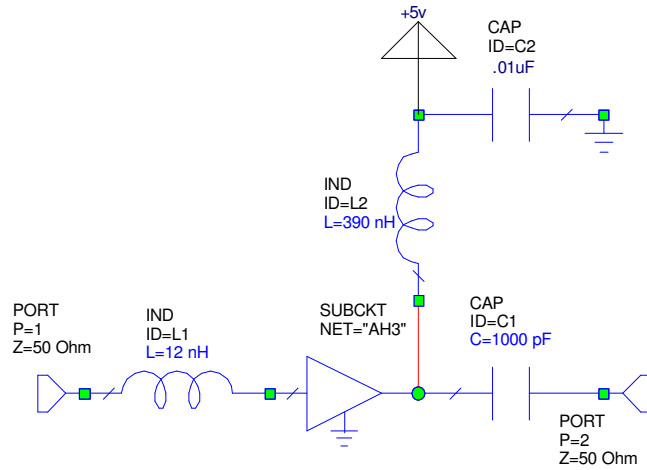
Device S-parameters are available for download on the website at: <http://www.wj.com>



Application Circuit: 50 – 870 MHz (AH3WB-PCB)

Typical RF Performance at 25°C

Frequency	MHz	50	450	800
S21 – Gain	dB	12.7	12.3	11.7
S11 – Input R.L.	dB	-8.4	-15.2	-14
S22 – Output R.L.	dB	-16.7	-16.5	-15
Output P1dB	dBm	+20	+20	+20
Output IP3 (+5 dBm / tone, 10 MHz spacing)	dBm	+36	+40	+41
Noise Figure	dB	5	3.3	3.1
Device Bias		+5V @ 150mA		



Circuit Board Material: .062" total thickness with a .014" FR-4 top RF layer, 4 layers (other layers added for rigidity), 1 oz copper, 50Ω Microstrip line details: width = .025".



AH3

High Dynamic Range Gain Block

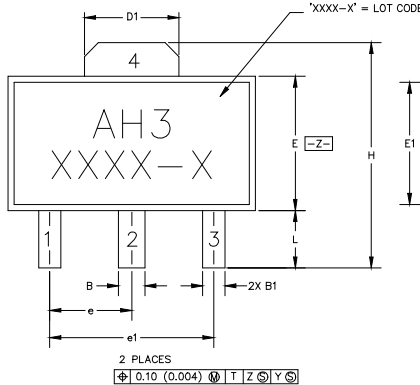
The Communications Edge™

Product Information

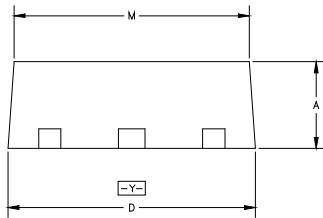
AH3 (SOT-89 Package) Mechanical Information

This package may contain lead-bearing materials. The plating material on the leads is SnPb.

Outline Drawing



SYMBOL	MIN	MAX
A	1.40 (.055)	1.60 (.063)
B	.44 (.017)	.56 (.022)
B1	.36 (.014)	.48 (.019)
C	.35 (.014)	.44 (.017)
D	4.40 (.173)	4.60 (.181)
D1	1.62 (.064)	1.83 (.072)
E	2.29 (.090)	2.60 (.102)
E1	2.01 (.079)	2.29 (.090)
e	1.50 BSC (.059)	
e1	3.00 BSC (.118)	
H	3.94 (.155)	4.25 (.167)
L	.89 (.035)	1.20 (.047)
M	4.04 (.159)	4.25 (.167)



- NOTES:
1. DIMENSIONS CONFORM WITH JEDEC TO-243C EXCEPT WHERE INDICATED.
 2. DIMENSIONS ARE EXPRESSED IN MILLIMETERS.
 3. DIMENSIONING AND TOLERANCING (IAW ANSIS Y14.5M-2002).

Process Marking

The AH3 is marked with "AH3" designator. An alphanumeric code ("XXXX-X") is also marked on the part designator on the top surface of the package.

For more information on this part see the website in the "Application Notes" section.

MSL ESD Rating

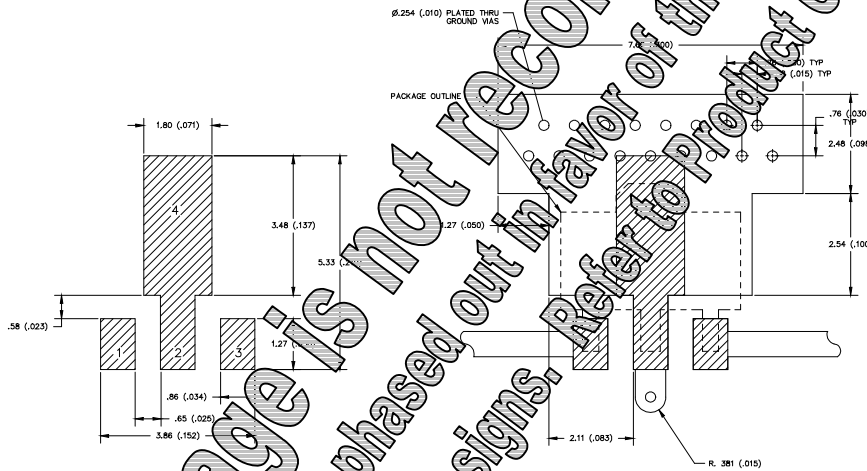
ESD Sensitive! ESD sensitive device.

ESD Rating: Class 1B
 Value: Passes $\geq 500V$ to $<1000V$
 Human Body Model (HBM)
 Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV
 Value: Passes $\geq 1000V$ to $<2000V$
 Charged Device Model (CDM)
 Standard: JEDEC Standard JESD22-C101

MSL Rating: Level 3 at $+235^\circ C$ convection reflow
 Standard: JEDEC Standard J-STD-020

Land Pattern



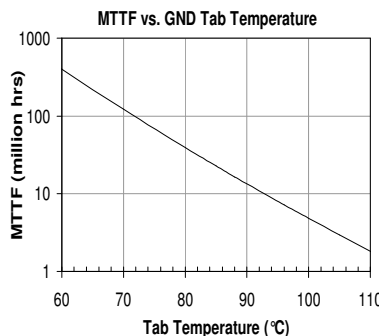
Mounting Config. Notes

1. Ground / thermal vias are critical for the performance of this device. Vias should use a .35mm (#80 / .0135") diameter drill and have a final plated thru diameter of .25mm (.010").
2. Add as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.
3. Mounting screws can be added near the part to fasten the board to a heatsink. Ensure that the ground / thermal via region contacts the heatsink.
4. Do not put solder mask on the backside of the PC board in the region where the board contacts the heatsink.
5. RF trace width depends upon the PC board material and construction.
6. Use 1 oz. Copper minimum.
7. All dimensions are in millimeters (inches). Angles are in degrees.

Thermal Specifications

Param	Value
Operating Temperature	-40 to $+85^\circ C$
Thermal Resistance, $\theta_{JA}^{(1)}$	$129^\circ C/W$
Junction Temperature, $T_{jC}^{(2)}$	$129^\circ C$

The thermal resistance is measured from the hottest part of the junction to the ground tab (pin 4). This corresponds to the typical biasing condition of $+5V$, $10mA$ at $129^\circ C$ case temperature. A minimum MTTF of one million hours is achieved for junction temperature below $160^\circ C$.



Specifications and information are subject to change without notice.

