



AH201

Medium Power, High Linearity Amplifier

The Communications Edge™

Product Information

Product Features

- 50 – 2200 MHz
- +30 dBm P1dB
- +47 dBm Output IP3
- 17 dB Gain @ 900 MHz
- MTTF >100 Years
- Single Positive Supply
- Internally Matched
- 24dBm IS-95 Channel Power @ -45dBc ACPR

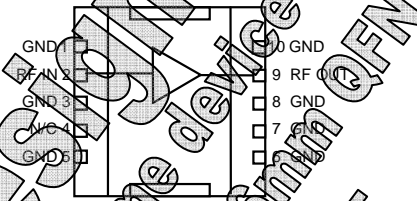
Product Description

The AH201 is a 1-Watt driver amplifier that offers excellent dynamic range in a low-cost, 6 x 6 mm 10-pin QFN surface-mount package. Biased at +11 V, this device provided its optimum P1dB and OIP3 performance; it can be biased as low as +9 V for lower power applications.

The backside metalization provides excellent thermal dissipation while allowing visible evidence of solder reflow across the bottom of the package on a SMT board. Superior thermal design allows the product an MTTF of over 100 years at a mounting temperature of +85°C. All devices are 100% RF & DC tested.

The product is targeted for use as a driver amplifier for wireless infrastructure or CATV applications where high linearity and medium power is required.

Functional Diagram



Function	Pin No.
Input	2
Output/Bias	1
Ground	3, 4, 5, 6, 7, 8, 10
Not Connected (Do not ground)	9

Specifications ⁽¹⁾

Parameters	Units	Min	Typ	Max	Parameters	Units	Typical
Operational Bandwidth	MHz	50		2200	Frequency	MHz	900, 1900, 2140
Test Frequency	MHz		900		Gain	dB	17, 15, 15
Gain	dB		17		Input Return Loss	dB	20, 9.1, 9.2
Input Return Loss	dB		20		Output Return Loss	dB	18, 12.6, 15
Output Return Loss	dB		18		Output P1dB	dBm	+30, +29.7, +29.4
Output P1dB	dBm	+29	+30		Output IP3	dBm	+47, +46, +45
Output IP3 ⁽²⁾	dBm	+45	+47		Noise Figure	dB	2.5, 3.8, 4.2
Noise Figure	dB		2.5		IS-95 Channel Power ⁽³⁾	dBm	+24, +24
IS-95 Channel Power ⁽³⁾	dBm		+24		Supply Bias		+11 V @ 350 mA
Operating Current Range	mA	310	350	390			
Supply Voltage	V		+11				

Typical Performance ⁽⁴⁾

Data reflects performance of a typical AH201 in an application circuit including associated circuit board and passive component losses.

1. Test conditions unless otherwise noted: 25°C, V_{dd} = +11 V in a tuned application circuit.
 2. 3OIP measured with two tones at an output power of +30 dBm/line, modulated by 10 MHz, 1% suppression on the largest IM3 product is used to calculate the 3OIP per ANSI-1 rule.
 3. IS-95, 9 Channels Forward, Pk/Avg Ratio = +1.5 dB at a .001% probability, ±885 kHz offset, 30 kHz bandwidth, Channel BW = 1.23 MHz.

Absolute Maximum Rating

Parameters	Rating
Operating Case Temperature	-40 to +85 °C
Storage Temperature	-55 to +125 °C
DC Voltage	+13 V
RF Input Power (Continuous)	+16 dBm
Maximum Junction Temperature	+220 °C

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

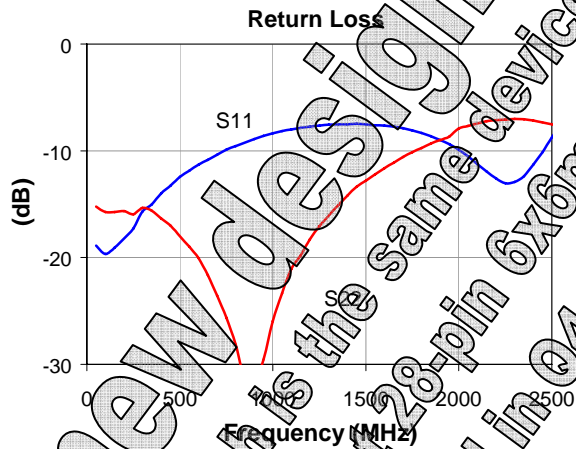
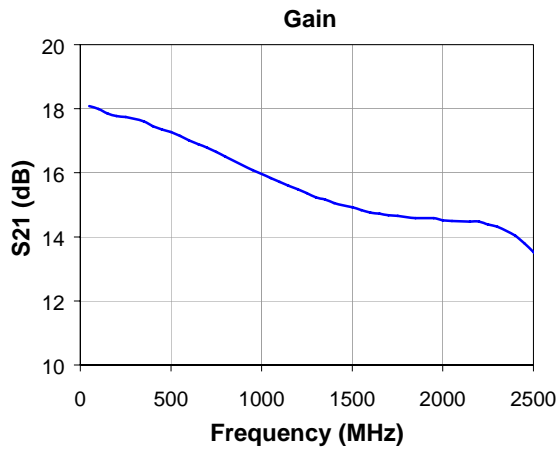
Ordering Information

Part No.	Description
AH201	Med. Power High Linearity Amp.

Specifications and information are subject to change without notice



Typical Device Data



Notes

- Measurements are shown for an unmatched packaged device with the data being de-embedded to the device leads.
- The amplifier requires a matching network at the input for proper operation. The amplifier is intrinsically well matched at the output and ideally should "look" into 50 Ω. Any deviation from this can affect the linearity IP3 performance for the device.

S-Parameters (V_{DS} = +10V, I_{DS} = 350 mA, T_C = 25°C, unmatched device in a 50 Ω system)

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
200	-18.13	-141.77	17.77	156.16	-21.60	-12.80	-15.22	158.80
400	-14.01	-151.43	17.47	134.85	-22.07	-27.05	-15.91	138.77
600	-11.32	-161.69	17.03	112.83	-22.97	-40.61	-19.50	119.22
800	-9.60	-175.43	16.52	93.30	-22.97	-54.78	-28.09	86.76
1000	-8.38	170.85	15.98	74.11	-22.97	-68.09	-28.42	-67.31
1200	-7.72	156.06	15.50	54.43	-24.58	-80.56	-18.92	-96.94
1400	-7.51	140.70	15.09	37.11	-25.23	-94.35	-14.49	-115.52
1600	-7.69	123.57	14.78	18.44	-25.58	-107.34	-11.68	-131.45
1800	-8.42	102.05	14.61	-0.87	-26.54	-124.66	-9.76	-146.54
2000	-9.90	78.77	14.52	-22.62	-26.54	-144.30	-7.87	-160.86
2200	-12.60	57.45	14.47	-46.91	-26.12	-170.04	-7.03	-176.78
2400	-11.30	33.35	14.03	-75.60	-25.97	158.59	-7.07	169.02
2600	-6.47	11.35	12.82	-105.64	-25.42	125.63	-7.82	159.81
2800	-3.46	-149.16	10.54	-135.77	-25.19	97.73	-8.39	158.80
3000	-2.05	-178.37	7.60	-162.88	-25.67	70.96	-7.81	158.95

S-Parameters (V_{DS} = +11V, I_{DS} = 350 mA, T_C = 25°C, unmatched device in a 50 Ω system)

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
200	-18.23	-140.99	17.78	156.01	-21.55	-12.99	-15.65	157.55
400	-13.98	-150.55	17.45	134.66	-21.89	-26.89	-16.32	136.16
600	-11.25	-161.20	17.03	113.54	-22.42	-40.61	-20.06	113.27
800	-9.55	-174.68	16.51	93.30	-22.97	-54.78	-28.14	66.80
1000	-8.33	170.85	15.97	73.75	-23.63	-68.09	-25.96	-57.60
1200	-7.72	156.06	15.48	54.97	-24.49	-80.75	-18.30	-91.67
1400	-7.52	140.70	15.06	36.62	-25.19	-92.07	-14.20	-111.26
1600	-7.63	123.63	14.76	17.90	-25.65	-110.24	-11.62	-128.20
1800	-8.33	101.89	14.61	-1.59	-26.17	-126.52	-9.75	-144.01
2000	-9.90	76.66	14.52	-22.62	-26.54	-146.07	-7.92	-158.95
2200	-12.60	57.45	14.47	-46.91	-26.12	-171.34	-7.13	-174.81
2400	-11.30	33.35	14.03	-75.60	-25.97	158.68	-7.18	170.91
2600	-6.49	11.35	12.76	-106.82	-25.45	124.53	-7.89	162.45
2800	-3.44	-149.63	10.46	-136.86	-25.52	96.19	-8.36	161.68
3000	-2.05	-178.91	7.50	-162.88	-25.80	71.90	-7.77	161.32

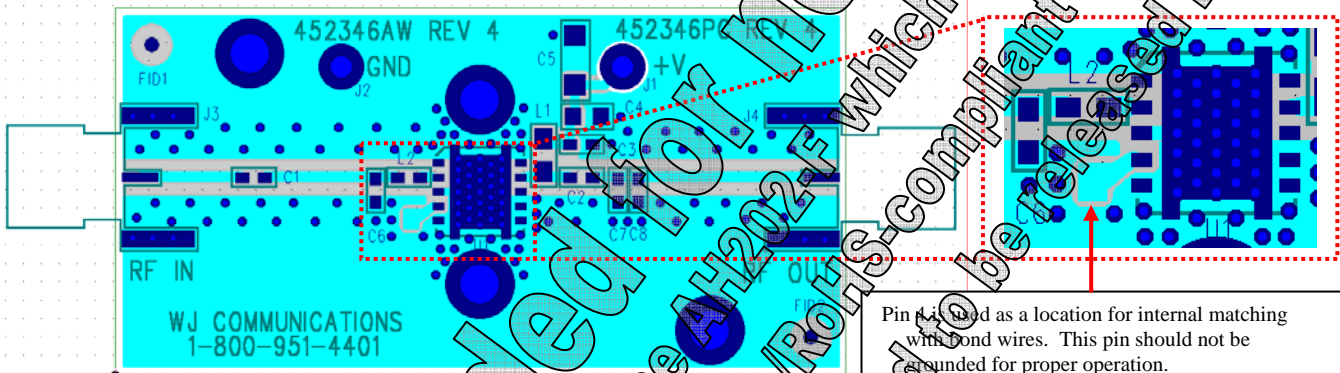
Device S-parameters are available for download off of the website at: <http://www.wj.com>



Application Circuit PC Board Layout and Schematic for 900 MHz, 1900 MHz, and 2140 MHz Reference Designs

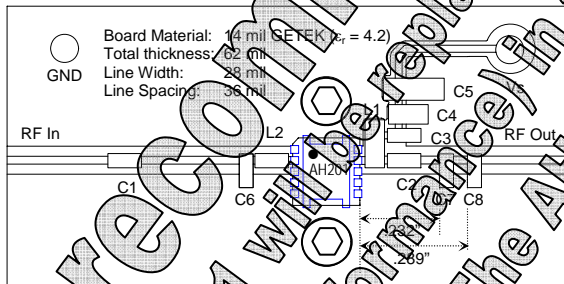
Typical Performance

Parameters	Units	Typical		
Frequency	MHz	900	1900	2140
Gain	dB	17	15	15
Input Return Loss	dB	20	9.1	9.1
Output Return Loss	dB	18	15	18
Output P1dB	dBm	+30.0	+29.7	+29.4
Output IP3	dBm	+47	+46	+46
Noise Figure	dB	2.5	3.8	4.2
IS-95 Channel Power ³ @ -45dBc ACPR	dBm	+24		+24
Supply Bias		+11 V @ 350 mA		



Circuit Board Material: .014" Getek, 4 layers (other layers added for rigidity),
 .062" total thickness, 1 oz copper
 Microstrip line details: width = .028" spacing = .036"
 The stub on pin 4 is added for additional external matching.

Pin 4 is used as a location for internal matching with bond wires. This pin should not be grounded for proper operation. Pad is .044" x .057". Edge at the edge of the pad is .038 wide and tapers to .023 wide to match width of pin 4.



- Notes:
- Via holes are omitted for clarity.
 - The microstrip line is weakly coplanar. Ground planes around it are not necessary for operation of the AH201.
 - Adequate heat sinking is required for the device. Further mounting instructions are shown in the "Mounting Configuration".
 - The heat sink should be a wirewound ceramic type to insure sufficient current carrying capacity. TOKIN LQ1608 series is recommended.
 - Pin 4 should contain a stub as shown above.

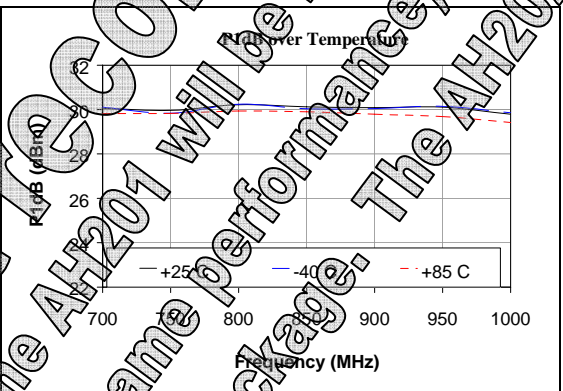
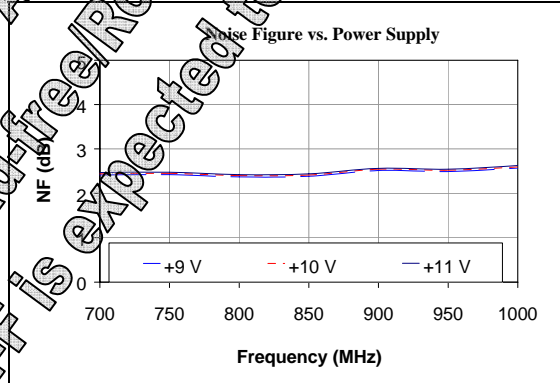
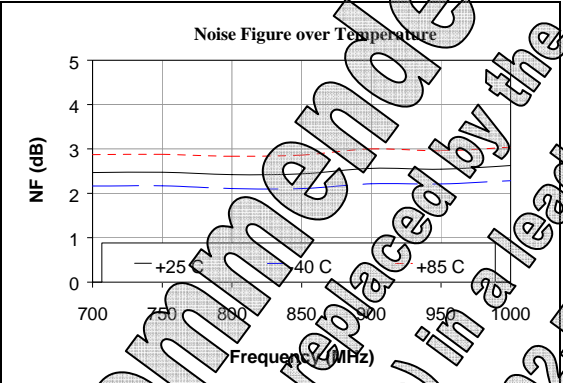
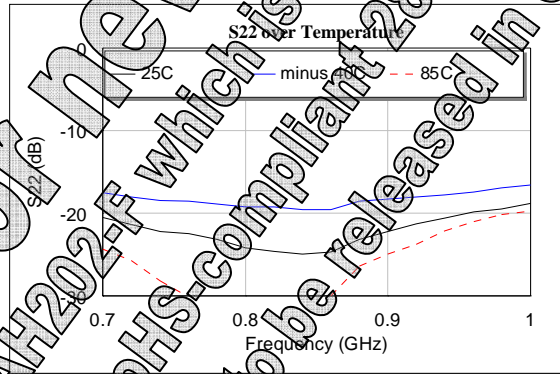
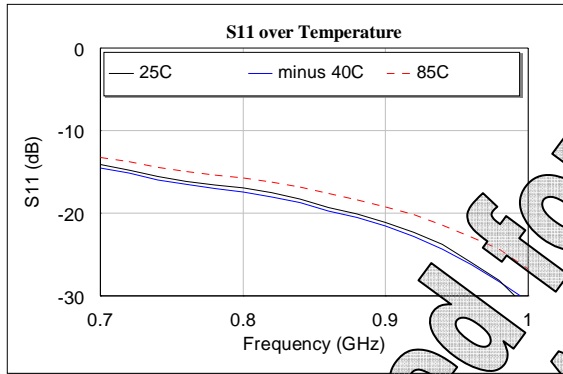
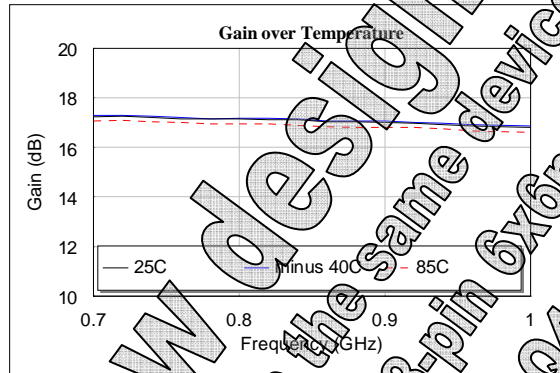
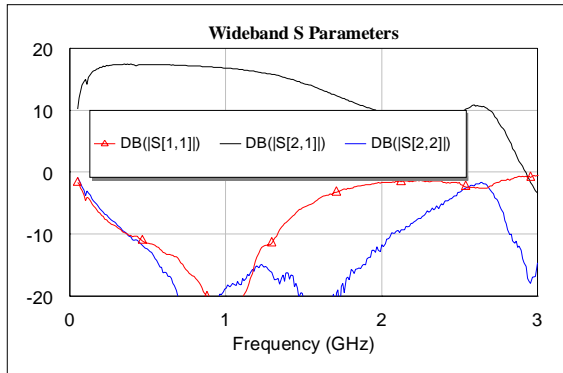
Component values

Frequency	900 MHz	1900 MHz	2140 MHz
C1, C2, C3	100 pF	56 pF	56 pF
C6	2.2 pF	0.5 pF	no load
C7	no load	no load	1.1 pF
C8	no load	1.0	no load
L1	33 nH	22 nH	18 nH
L2	3.3 nH	0 Ω	0 Ω

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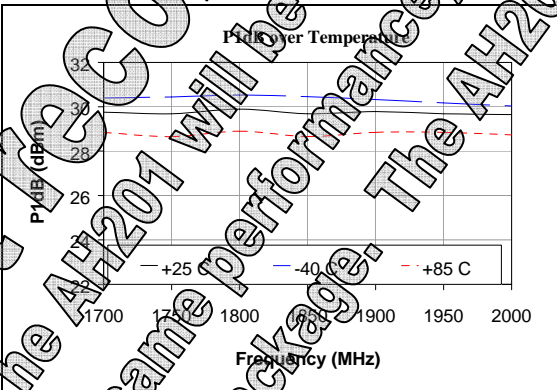
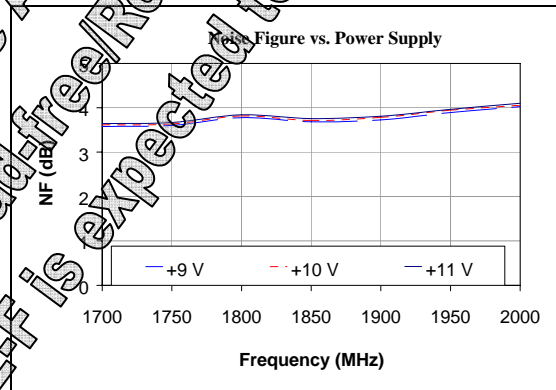
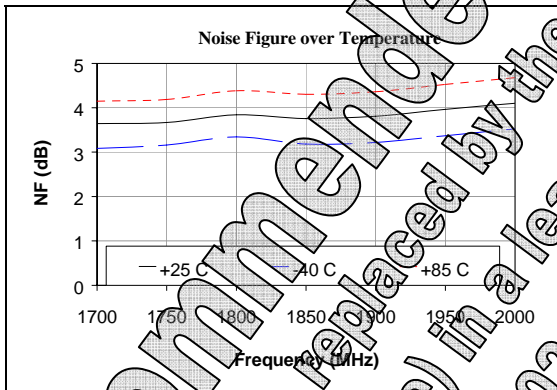
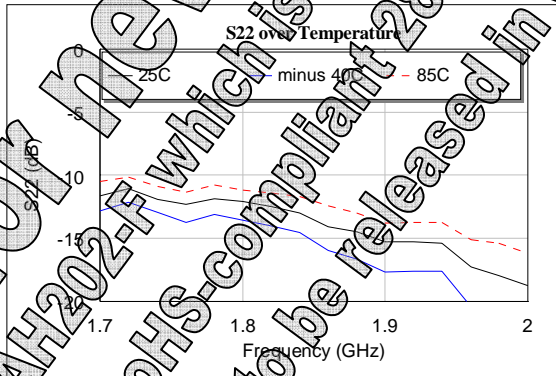
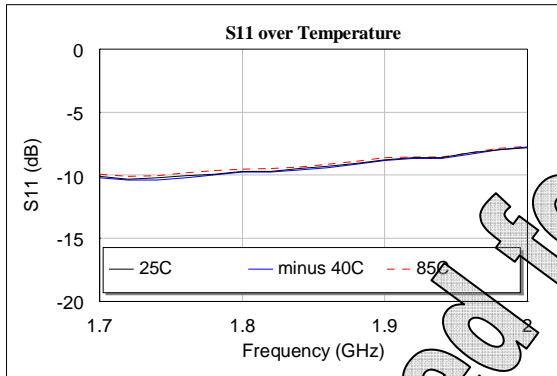
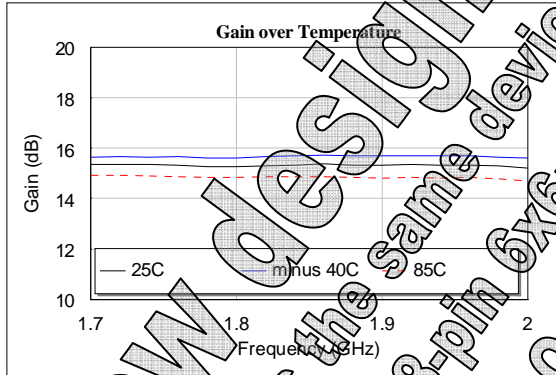
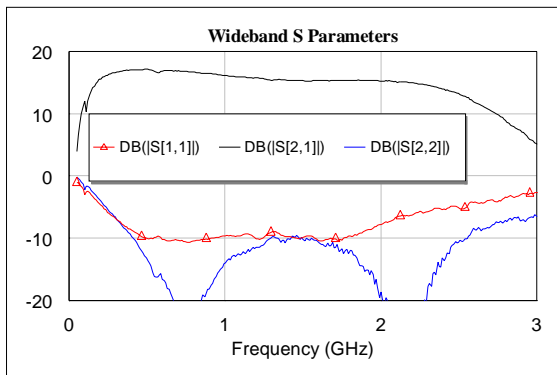
900 MHz Application Circuit Performance (AH201-PCB900)



Not Recommended for New Designs!
The AH201 will be replaced by the AH202-F which is the same device (with same performance) in a lead-free/ROHS-compliant 28-pin 6x6mm QFN package. The AH202-F is expected to be released in Q4 2005



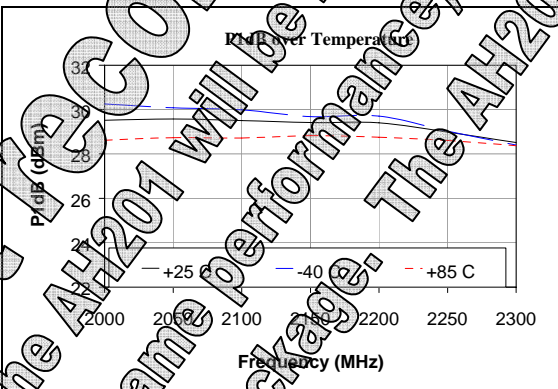
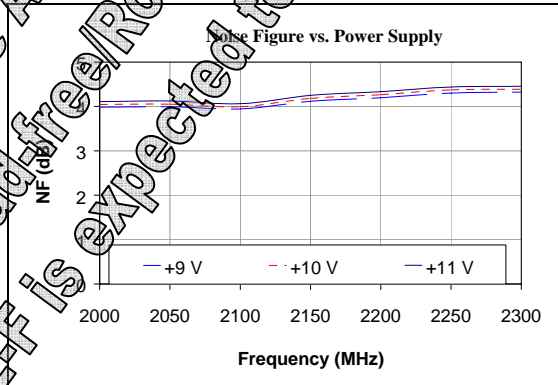
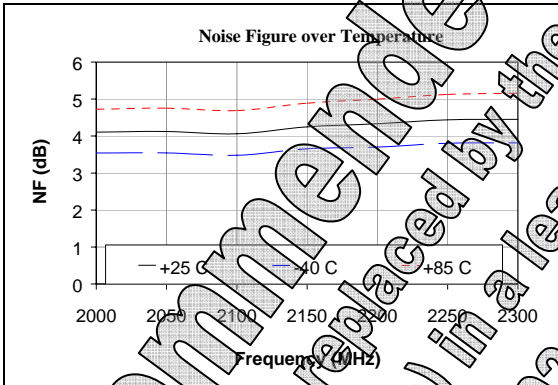
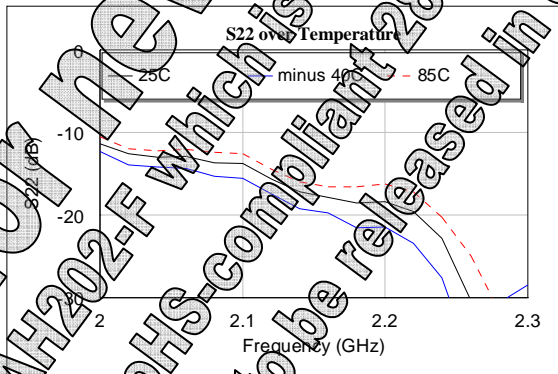
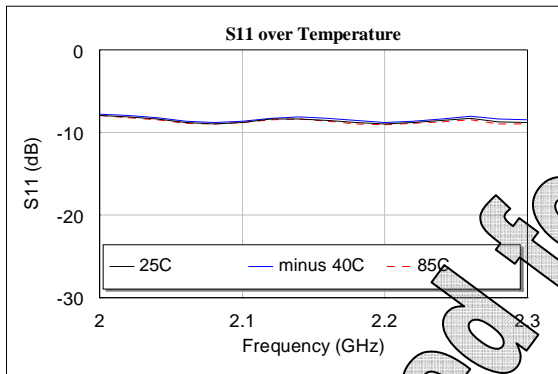
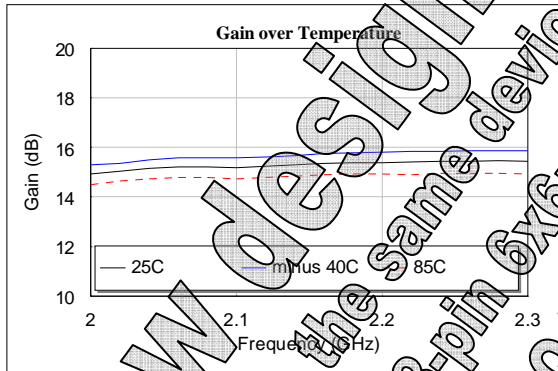
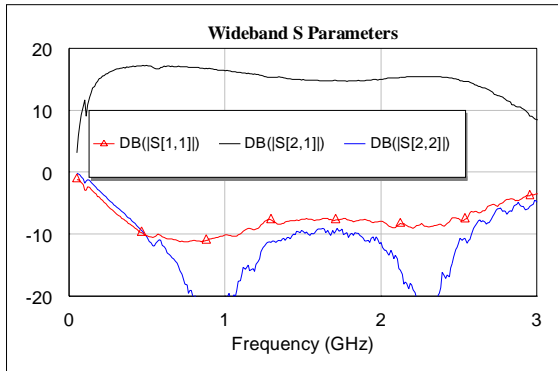
1900 MHz Application Circuit Performance (AH201-PCB1900)



Not Recommended for New Designs!
 The AH201 will be replaced by the AH202-F which is the same device (with same performance) in a lead-free/ROHS-compliant 28-pin 6x6mm QFN package. The AH202-F is expected to be released in Q4 2005

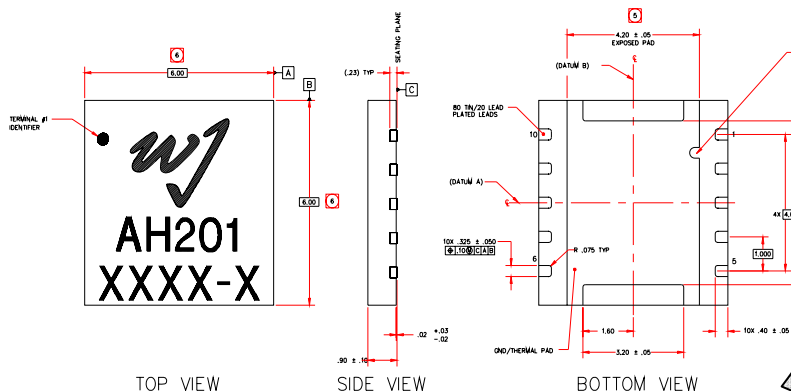


2140 MHz Application Circuit Performance (AH201-PCB2140)



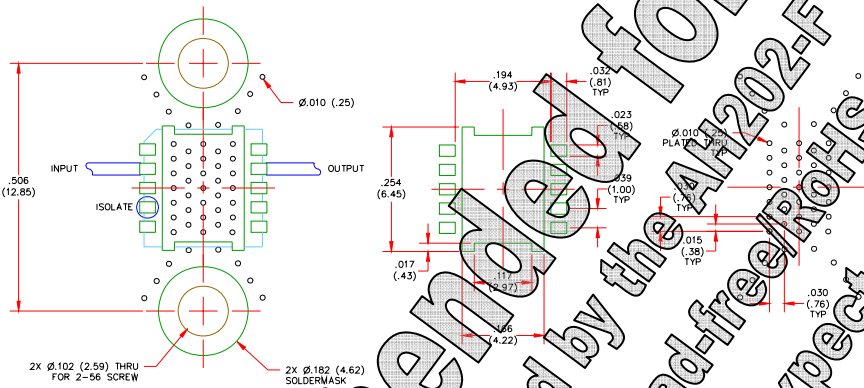
Not Recommended for New Designs!
The AH201 will be replaced by the AH202-F which is the same device (with same performance) in a lead-free/ROHS-compliant 28-pin 6x6mm QFN package. The AH202-F is expected to be released in Q4 2005

Outline Drawing



- NOTES:
- EXCEPT WHERE NOTED, THIS PART OUTLINE CONFORMS TO JEDEC STANDARD MO-220, ISSUE C (VARATION 1302) FOR THERMALLY ENHANCED PLASTIC VERY THIN FINE PITCH QUAD FLAT NO LEAD PACKAGE (QFN).
 - DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.4M-1994.
 - ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
- 1 THE TERMINAL # IDENTIFIER AND TERMINAL NUMBERING CONVENTION CONFORM TO JEDEC 95-1 SP-012.
 - 2 DEVIATION FROM JEDEC MO-220 STANDARD (1.75mm = 4.30mm).
 - 3 PACKAGE BODY LENGTH/WIDTH DOES NOT INCLUDE PLASTIC FLASH PROTRUSION ACROSS MOLD PARTING LINE.

Land Pattern

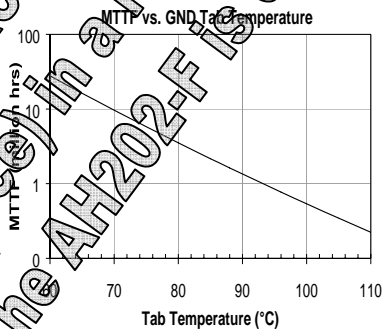


Thermal Specifications

Parameter	Rating
Operating Case Temperature	-40 to +100 °C
Thermal Resistance, R _{th(j-c)}	17.5 °C/W
Junction Temperature, T _c (2)	150 °C

Notes:

- The thermal resistance is referenced from the junction to case at a case temperature of +100 °C.
- This corresponds to the typical biasing condition of +11V, 370 mA at an 85 °C case temperature. A minimum MTTF of 1 million hours is achieved at junction temperatures below 100 °C.



Product Marking

The component will be lasermarked with an "AH201" product label with a five-digit alphanumeric lot code on the top surface of the package.

Tape and reel specifications for this part are located on the website in the "Application Notes" section.

ESD / MSL Information

- Caution: ESD sensitive device.
- ESD Rating: Class B
- Value: Passes between 500 and 1000V
- Test: Human Body Model (HBM)
- Standard: JEDEC Standard JESD22-A114
- ESD Rating: Class B
- Value: Passes between 500 and 1000V
- Test: Charged Device Model (CDM)
- Standard: JEDEC Standard JESD22-C101
- MSL Rating: Level 1 at +235° C convection reflow
- Standard: JEDEC Standard J-STD-020A

Mounting Config. Notes

- Ground vias are critical for thermal and RF grounding considerations.
- Two 2-56 screws with washers should be used for thermal grounding to the main chassis.
- Ground plane on the backside should extend past the holes for the 2-56 screws as a minimum.
- No soldermask should be applied to the backside of the board local to the part to ensure contact between the backside metalization and chassis.
- Via holes and holes for the 2-56 screws should be plated through.
- Trace width depends on the PCB board.
- A minimum of 1 oz. / 1 oz. Copper should be used.
- Pin 4 should not be connected for proper operation.

Functional Pin Layout

Pin	FUNCTION
1	GND
2	RF Input
3	GND
4	No Connect (Do not ground)
5	GND
6	GND
7	GND
8	GND
9	RF Output / Bias
10	GND

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