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

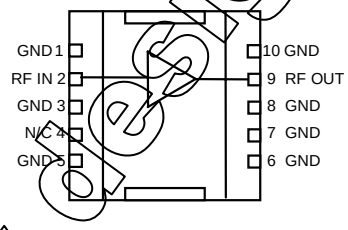
Product Description

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 +85º 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	9
Ground	1, 3, 5, 6
Ground	7, 8, 10
Not Connected (Do not ground)	4

Specifications (1)

Parameters	Units	Min	Typ	Max
Operational Bandwidth	MHz	50		2200
Test Frequency	MHz		900	
Gain	dB		17	
Input Return Loss	dB		20	
Output Return Loss	dB		18	
Output P1dB	dBm	+29	+30	
Output IP3 (2)	dBm	+45	+47	
Noise Figure	dB		2.5	
IS-95 Channel Power (3) @ -45dBc ACPR	dBm		+24	
Operating Current Range	mA	310	350	390
Supply Voltage	V		+11	

1. Test conditions unless otherwise noted: 25ºC, Vdd = 11 V in a tuned application circuit.
2. 3OIP measured with two tones at an output power of +10 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. IS-95, 9 Channels Forward, Pk/Avg Ratio = 11.5 dB at a .001% probability, ±885 kHz offset, 30 kHz bandwidth, Channel BW = 1.23 MHz.

Typical Performance (4)

Parameters	Units	Typical		
Frequency	MHz	900	1900	2140
Gain	dB	17	15	15
Input Return Loss	dB	20	9.1	9.2
Output Return Loss	dB	18	12.6	15
Output P1dB	dBm	+30	+29.7	+29.4
Output IP3	dBm	+47	+46	+45
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		

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

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

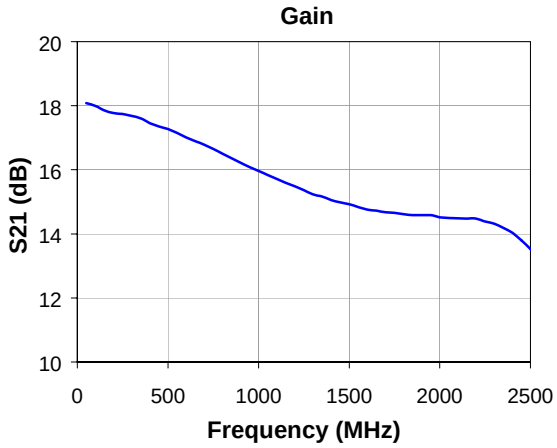
Operation of this device above any of these parameters may cause permanent damage.

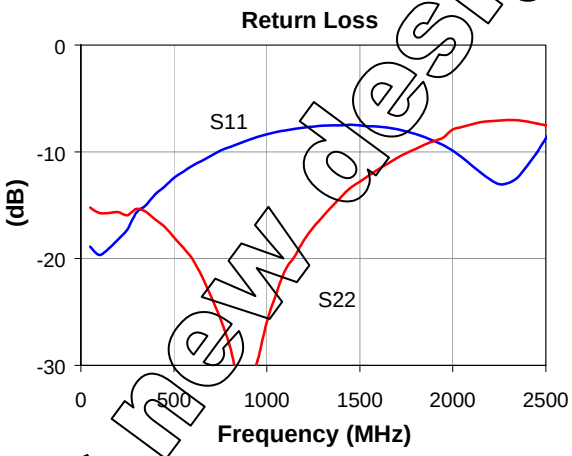
Ordering Information

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 = 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	-22.01	-27.05	-15.91	138.77
600	-11.32	-161.69	17.03	113.80	-22.50	-40.65	-19.50	119.22
800	-9.60	-175.43	16.52	93.61	-23.08	-54.53	-28.09	86.76
1000	-8.38	170.85	15.98	74.11	-23.75	-66.32	-28.42	-67.31
1200	-7.72	156.06	15.50	55.43	-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	123.37	14.78	18.41	-25.58	-107.34	-11.68	-131.45
1800	-8.42	102.05	14.63	-0.87	-26.55	-124.66	-9.76	-146.54
2000	-9.90	76.87	14.53	-21.84	-26.58	-144.30	-7.87	-160.86
2200	-12.60	27.48	14.50	-45.98	-26.08	-170.04	-7.03	-176.78
2400	-11.30	-52.35	14.07	-74.59	-25.82	158.59	-7.07	169.02
2600	-6.47	-110.35	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	-2.00	-178.37	7.60	-161.74	-25.67	70.96	-7.81	158.95

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

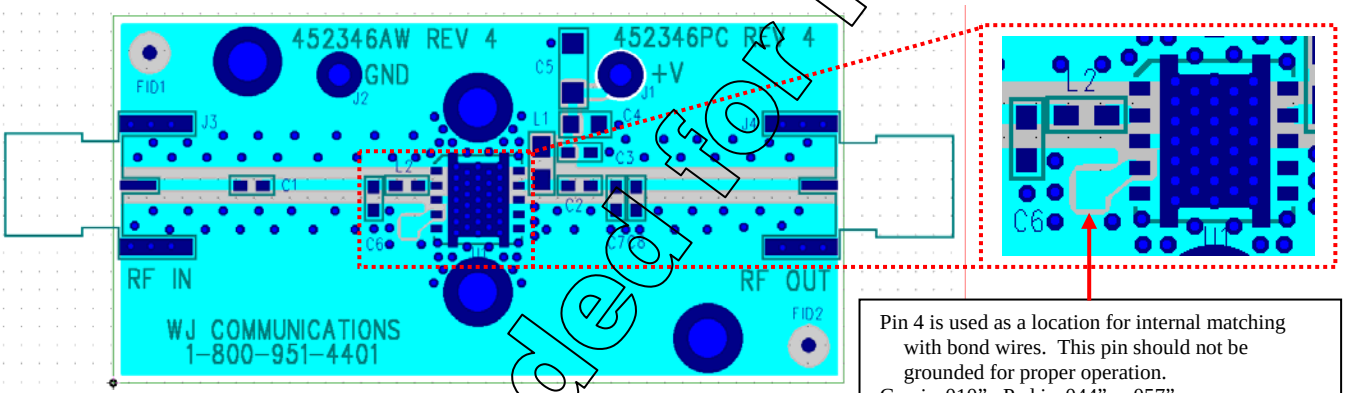
Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
200	-18.33	-140.99	17.78	156.01	-21.55	-12.99	-15.65	157.55
400	-13.98	-150.55	17.45	134.66	-21.89	-26.89	-16.32	136.16
600	-11.28	-161.20	17.01	113.54	-22.42	-40.61	-20.06	113.27
800	-9.55	-174.85	16.51	93.30	-22.97	-54.78	-28.14	66.80
1000	-8.37	170.96	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	76.65	14.52	-22.62	-26.54	-146.07	-7.92	-158.95
2200	-12.60	27.68	14.47	-46.91	-26.12	-171.34	-7.13	-174.81
2400	-11.31	-52.94	14.03	-75.60	-25.97	158.68	-7.18	170.91
2600	-6.49	-110.68	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

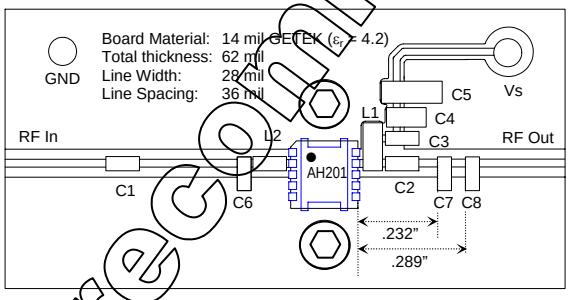
Typical Performance

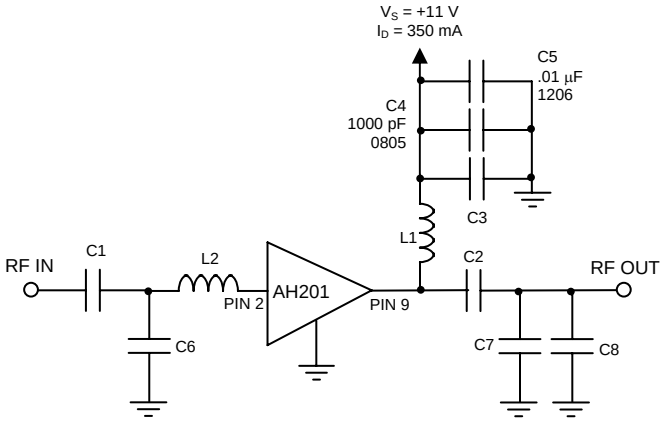
Parameters	Units	Typical		
Frequency	MHz	900	1900	2140
Gain	dB	17	15	15
Input Return Loss	dB	20	9.1	9.2
Output Return Loss	dB	18	15	18
Output P1dB	dBm	+30.0	+29.7	+29.4
Output IP3	dBm	+47	+46	+46
Noise Figure	dB	2.5	3.8	4.2
IS-95 Channel Power[3] @ -45dBc ACPR	dBm	+24	+24	+24
Supply Bias		+11 V @ 350 mA		



Pin 4 is used as a location for internal matching with bond wires. This pin should not be grounded for proper operation.
Gap is .010". Pad is .044" x .057".
Trace at the edge of the pad is .038 wide and tapers to .023 wide to match width of pin 4.

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.





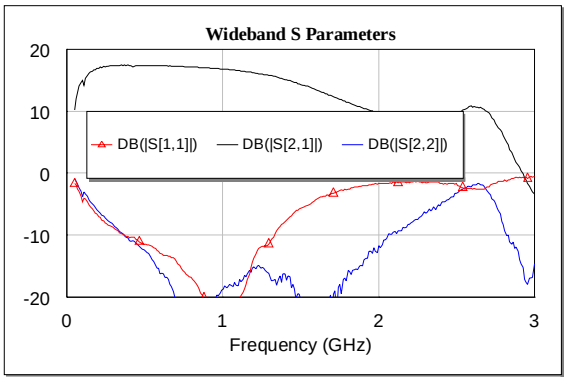
Notes:

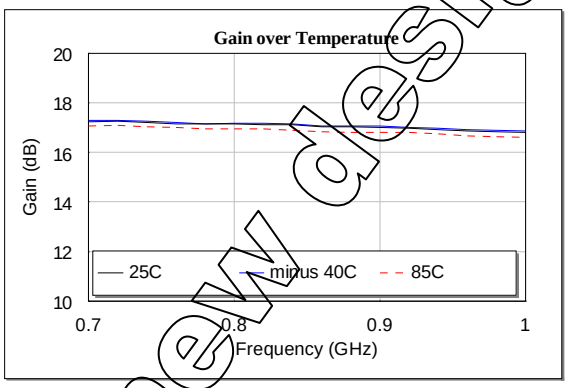
- Via holes are omitted for clarity.
- The microstrip line is weakly co-planer. Ground planes around it are not necessary for operation of the AH201.
- Adequate heat sinking is required for the device. Further mounting instructions are shown in the "Mounting Configuration".
- The RF choke should be a wirewound ceramic type to insure sufficient current carrying capacity. TOKO's LLQ1608 series is recommended.
- Pin 4 should contain a stub as shown above.

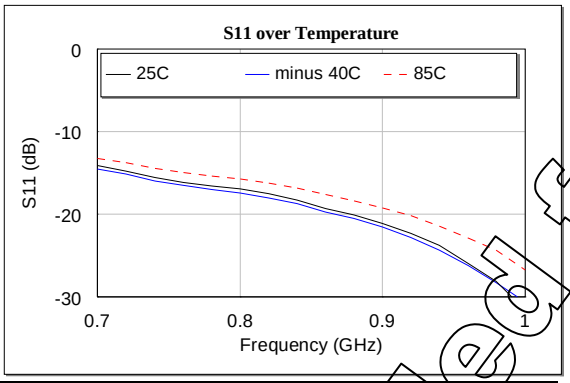
Component values

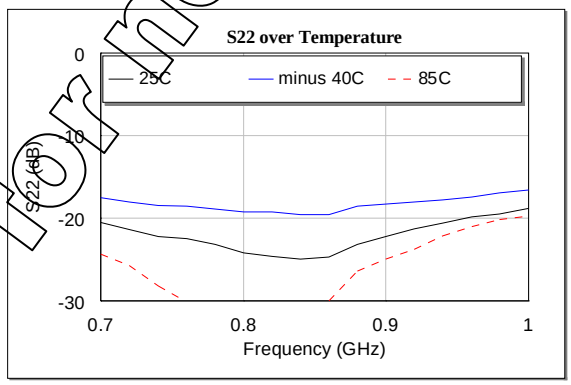
Frequency	900 MHz	1900 MHz	2140 MHz
C1, C2, C3	100 pF	56 pF	56 pF
C6	2.2 pF	0.5 pF	no load
C7	no load	no load	1.1 pF
C8	no load	1.0	no load
L1	33 nH	22 nH	18 nH
L2	3.3 nH	0 Ω	0 Ω

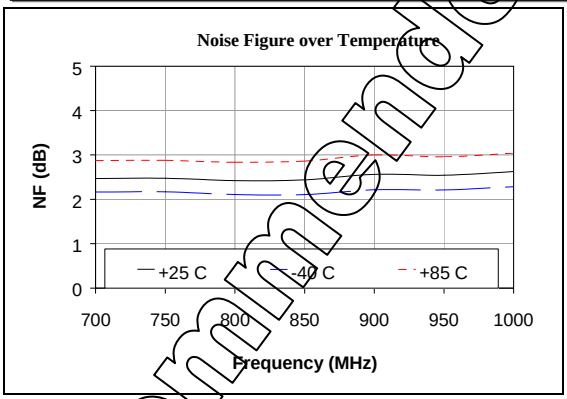
900 MHz Application Circuit Performance (AH201-PCB900)

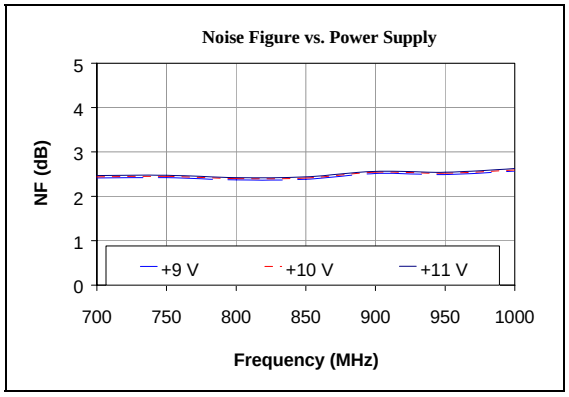


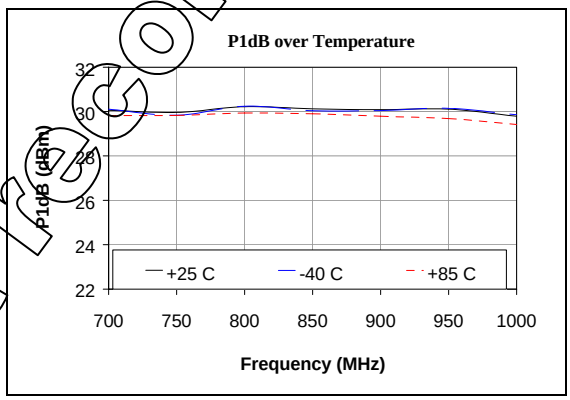




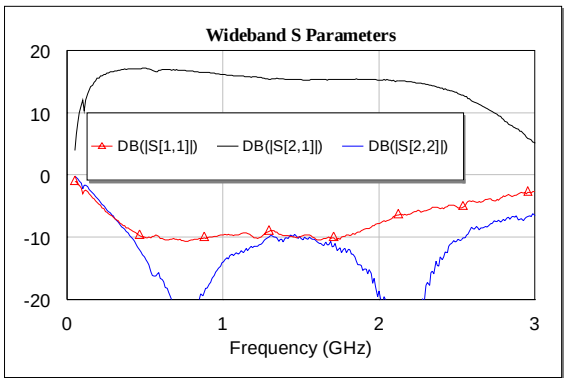


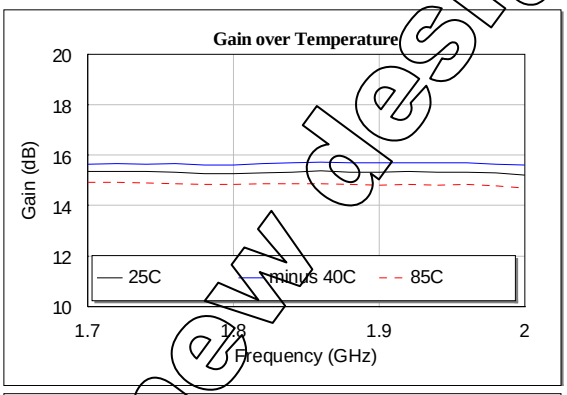


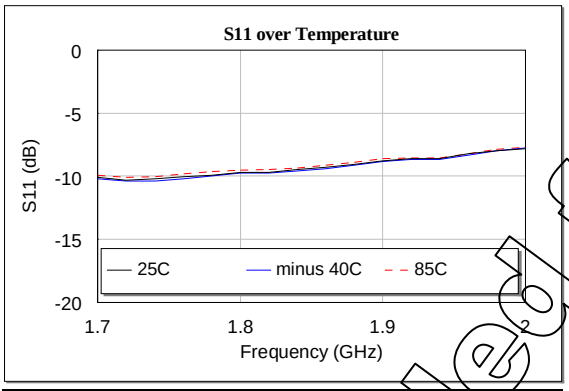


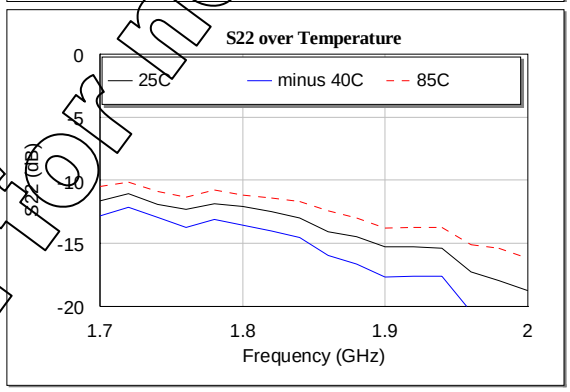


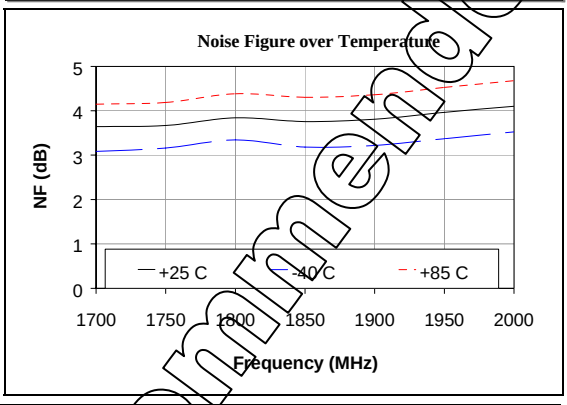
1900 MHz Application Circuit Performance (AH201-PCB1900)

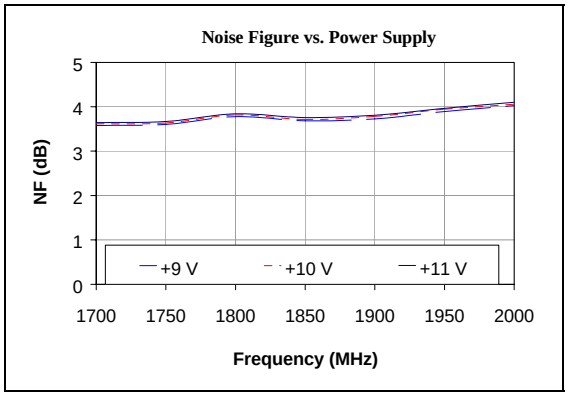


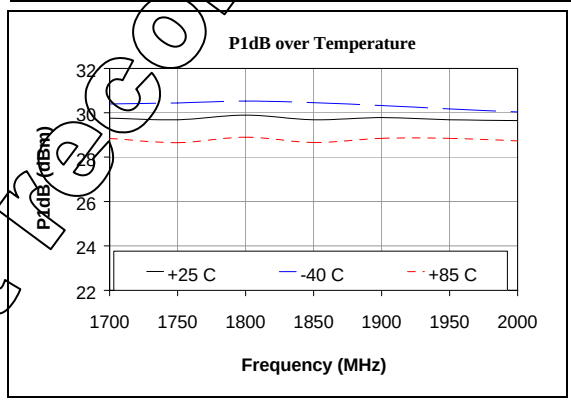




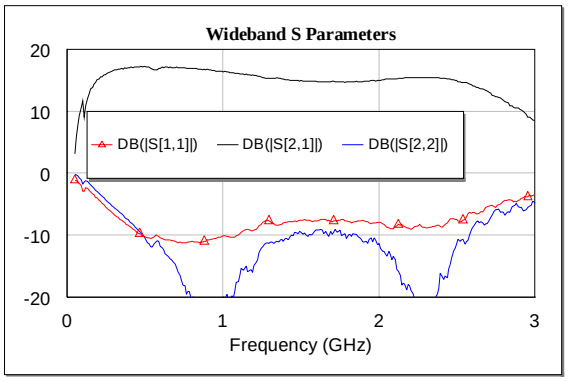


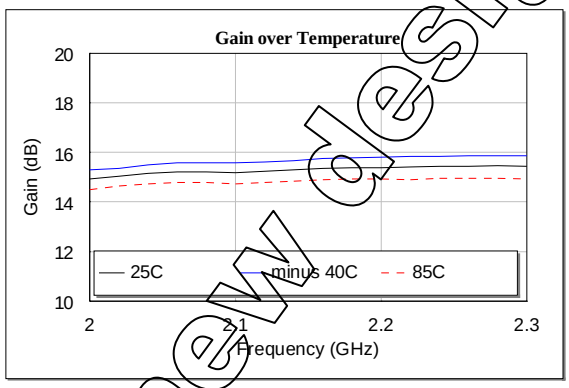


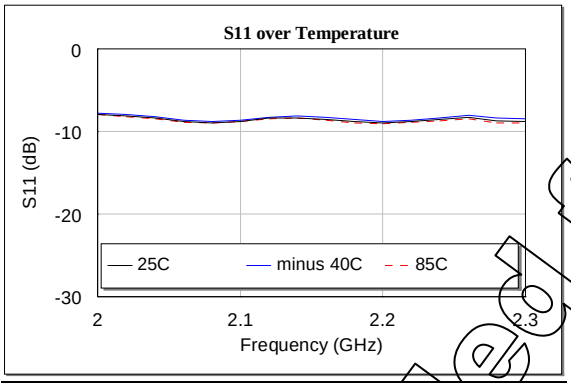


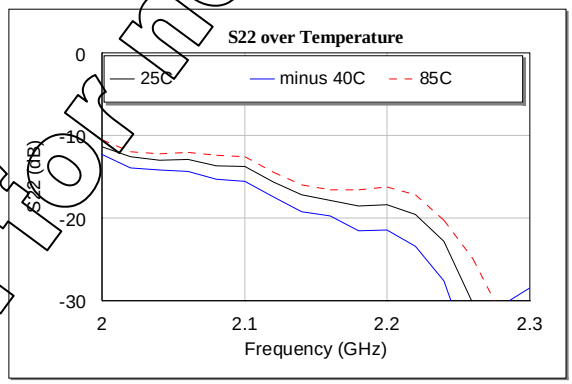


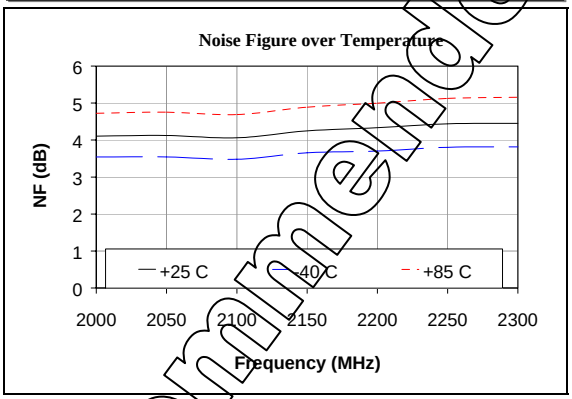
2140 MHz Application Circuit Performance (AH201-PCB2140)

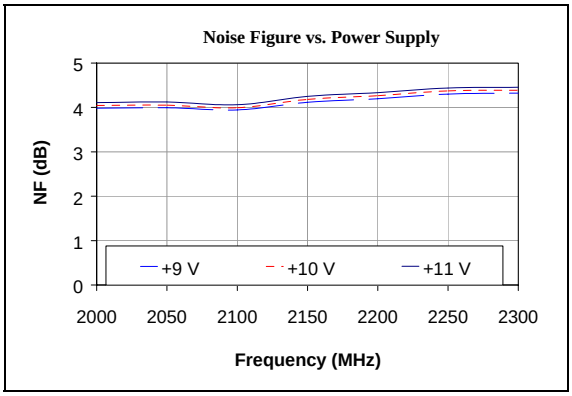


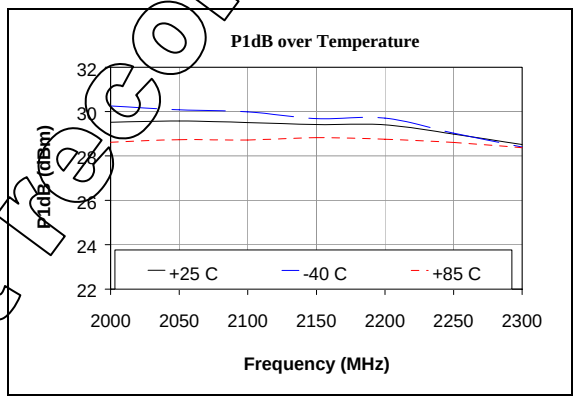












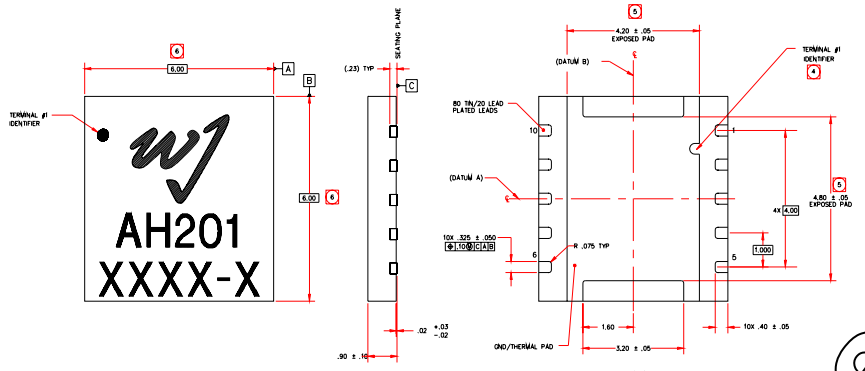
AH201

Medium Power, High Linearity Amplifier

The Communications Edge ™

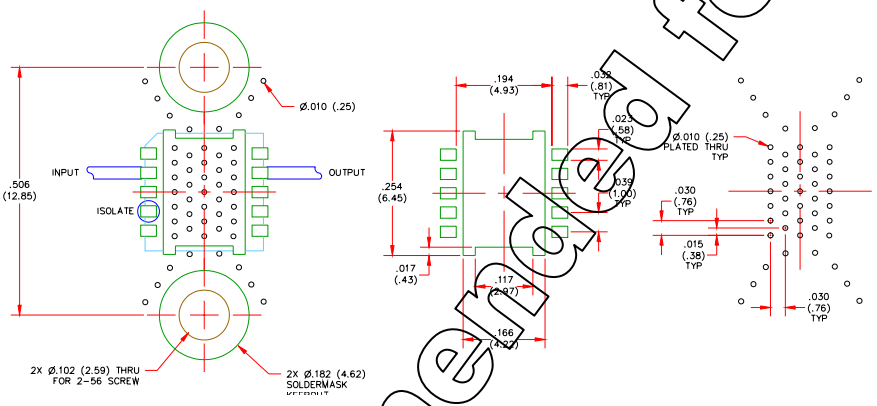
Product Information

Outline Drawing



NOTES:
1. EXCEPT WHERE NOTED, THIS PART OUTLINE CONFORMS TO JEDEC STANDARD MO-220, ISSUE C (VARIATION VJJC) FOR THERMALLY ENHANCED PLASTIC VERY THIN FINE PITCH QUAD FLAT NO LEAD PACKAGE (QFN).
2. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.4M-1994.
3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
4. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION CONFORM TO JESD 95-1 SPP-012.
5. DEVIATION FROM JEDEC MO-220 STANDARD (1.75mm – 4.25mm).
6. PACKAGE BODY LENGTH/WIDTH DOES NOT INCLUDE PLASTIC FLASH PROTRUSION ACROSS MOLD PARTING LINE.

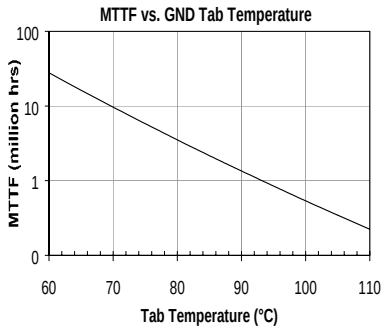
Land Pattern



Thermal Specifications

Parameter	Rating
Operating Case Temperature	-40 to +85° C
Thermal Resistance, Rth (1)	17.5° C / W
Junction Temperature, Tjc (2)	152° C

Notes:
1. The thermal resistance is referenced from the junction-to-case at a case temperature of 85° C.
2. This corresponds to the typical biasing condition of +11V, 350 mA at an 85° C case temperature. A minimum MTTF of 1 million hours is achieved for junction temperatures below 160° 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 1B
Value: Passes between 500 and 1000V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class III
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

1. Ground vias are critical for thermal and RF grounding considerations.
2. Two 2-56 screws with washers should be used for thermal grounding to the main chassis.
3. Ground plane on the backside should extend past the holes for the 2-56 screws as a minimum.
4. No soldermask should be applied to the backside of the board local to the part to ensure contact between the backside metalization and chassis.
5. Via holes and holes for the 2-56 screws should be plated through.
6. Trace width depends on the PC board.
7. A minimum of 1 oz. / 1 oz. Copper should be used.
8. 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