

# AH201

Medium Power, High Linearity Amplifier

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

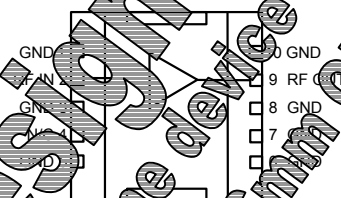
## Product Description

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                 | 9        |
| Ground                      | 1, 5, 6  |
| Ground                      | 3, 4, 10 |
| Not Connected (Down ground) | 7, 8     |

## Specifications <sup>(1)</sup>

| 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    |     |     |      | Output P1dB                        | dBm   | +30, +29.7, +29.4 |
| Output P1dB                        | dBm   | +29 |     |      | Output IP3 <sup>(2)</sup>          | dBm   | +47, +46, +45     |
| Output IP3 <sup>(2)</sup>          | dBm   | +45 |     |      | Noise Figure                       | dB    | 2.5, 3.8, 4.2     |
| Noise Figure                       | dB    |     |     |      | IS-95 Channel Power <sup>(3)</sup> | dBm   | +24, +24          |
| IS-95 Channel Power <sup>(3)</sup> | dBm   |     |     |      | Supply Bias                        | V     | +11 V @ 350 mA    |
| Operating Current Range            | mA    |     | 350 | 900  |                                    |       |                   |
| Supply Voltage                     | V     |     | +11 |      |                                    |       |                   |

## Typical Performance <sup>(4)</sup>

1. Test conditions unless otherwise noted: 25°C, V<sub>cc</sub> = +11 V, 350 mA, 50 ohm application circuit.  
 2. 3OIP measured with two tones at an output of +30 dBm/line, modulated by 10 MHz, 10% modulation, 10% suppression on the largest IM3 product is used to calculate the 3OIP. The 3OIP is based on the 1:1 rule.  
 3. IS-95, 9 Channels Forward, Pk/Avg Ratio = 1.5, 12.5% modulation, ±885 kHz offset, 30 kHz bandwidth, Channel BW = 1.23 MHz.  
 4. Data reflects performance of a typical AH201 in an application circuit including associated circuit board and component losses.

## Absolute Maximum Ratings

| Parameters                   | Rating         |
|------------------------------|----------------|
| Operating Temperature        | -55 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.

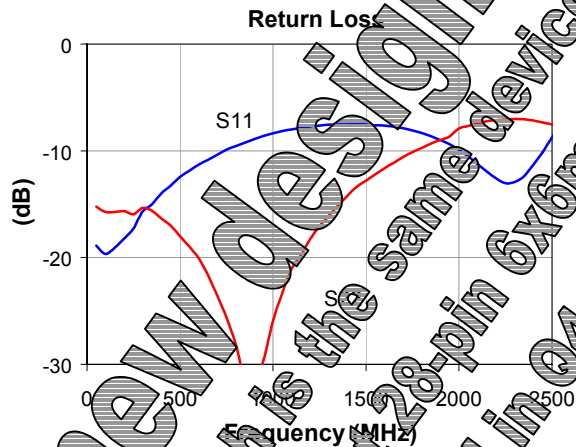
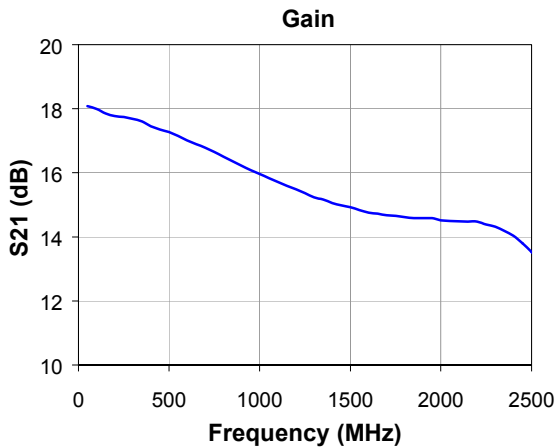
## Ordering Information

| 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 probe 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 of the device.

S-Parameters ( $V_{DS} = +10V$ ,  $I_{DS} = 350\text{mA}$ ,  $T_C = 25^\circ\text{C}$ , 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    | 136.16    | -21.60   | -12.80    | -15.22   | 158.80    |
| 400        | -14.01   | -151.43   | 17.45    | 134.85    | -22.06   | -27.06    | -15.91   | 138.77    |
| 600        | -11.32   | -161.69   | 17.01    | 113.86    | -22.42   | -40.61    | -19.50   | 119.22    |
| 800        | -9.60    | -175.43   | 16.57    | 93.30     | -22.97   | -54.78    | -28.09   | 86.76     |
| 1000       | -8.38    | 170.85    | 16.13    | 71.11     | -23.63   | -68.09    | -28.42   | -67.31    |
| 1200       | -7.72    | 156.06    | 15.70    | 54.43     | -24.49   | -80.75    | -18.92   | -96.94    |
| 1400       | -7.51    | 140.70    | 15.27    | 37.11     | -25.23   | -94.35    | -14.49   | -115.52   |
| 1600       | -7.69    | 123.63    | 14.78    | 18.41     | -25.58   | -107.34   | -11.68   | -131.45   |
| 1800       | -8.42    | 102.07    | 14.27    | -0.87     | -26.17   | -124.66   | -9.76    | -146.54   |
| 2000       | -9.90    | 76.61     | 14.52    | -22.62    | -26.54   | -146.07   | -7.87    | -160.86   |
| 2200       | -12.60   | 27.11     | 14.03    | -46.91    | -26.12   | -171.34   | -7.03    | -176.78   |
| 2400       | -11.30   | 12.55     | 13.07    | -75.59    | -25.97   | 158.68    | -7.07    | 169.02    |
| 2600       | -6.47    | 117.35    | 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 ( $V_{DS} = +11V$ ,  $I_{DS} = 350\text{mA}$ ,  $T_C = 25^\circ\text{C}$ , unmatched device in a 50 Ω system)

| Freq (MHz) | S11 (ang) | S21 (dB) | S21 (ang) | S12 (dB) | S12 (ang) | S22 (dB) | S22 (ang) |
|------------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 200        | 140.99    | 17.78    | 136.01    | -21.55   | -12.99    | -15.65   | 157.55    |
| 400        | 150.55    | 17.45    | 134.66    | -21.89   | -26.89    | -16.32   | 136.16    |
| 600        | -161.20   | 17.01    | 113.54    | -22.42   | -40.61    | -20.06   | 113.27    |
| 800        | -174.69   | 16.57    | 93.30     | -22.97   | -54.78    | -28.14   | 66.80     |
| 1000       | 170.85    | 16.13    | 71.11     | -23.63   | -68.09    | -25.96   | -57.60    |
| 1200       | 156.06    | 15.70    | 54.43     | -24.49   | -80.75    | -18.30   | -91.67    |
| 1400       | 140.70    | 15.27    | 36.62     | -25.19   | -92.07    | -14.20   | -111.26   |
| 1600       | 123.63    | 14.78    | 17.90     | -25.65   | -110.24   | -11.62   | -128.20   |
| 1800       | 101.89    | 14.61    | -1.59     | -26.17   | -126.52   | -9.75    | -144.01   |
| 2000       | 76.61     | 14.52    | -22.62    | -26.54   | -146.07   | -7.92    | -158.95   |
| 2200       | 27.11     | 14.03    | -46.91    | -26.12   | -171.34   | -7.13    | -174.81   |
| 2400       | 12.55     | 13.07    | -75.59    | -25.97   | 158.68    | -7.18    | 170.91    |
| 2600       | 117.35    | 12.76    | -106.82   | -25.45   | 124.53    | -7.89    | 162.45    |
| 2800       | 149.16    | 10.46    | -136.86   | -25.52   | 96.19     | -8.36    | 161.68    |
| 3000       | -178.91   | 7.50     | -162.88   | -25.80   | 71.90     | -7.77    | 161.32    |

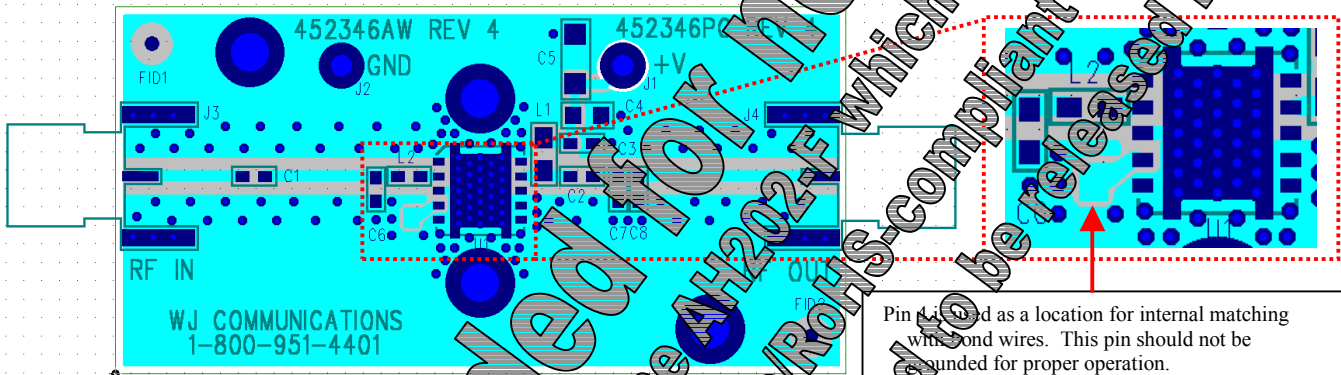
Device S-parameters are available for download off of the website at: <http://www.wj.com>



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

### Typical Performance

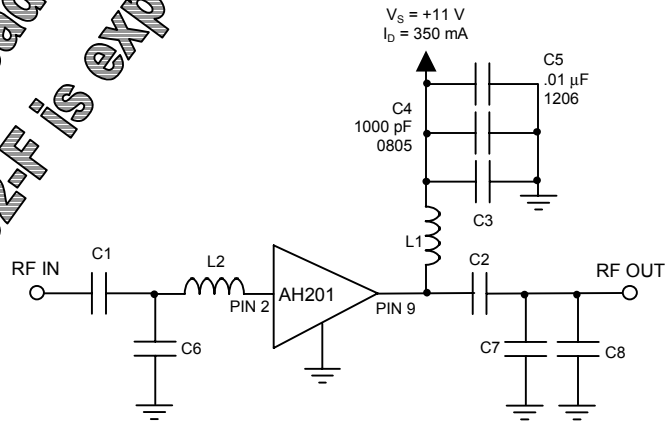
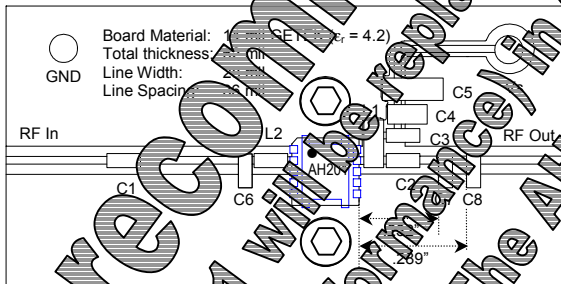
| Parameters  | Units | Typical |        |       |
|---|-------|---------|--------|-------|
| Frequency   | MHz   | 900     | 1900   | 2140  |
| Gain  | dB    | 17      | 15     | 15    |
| Input Return Loss                                 | dB    | 20      | 9.1    | 9.1   |
| Output Return Loss   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



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". Distance 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 layer (3 signal layers and 1 ground for rigidity),

.062" total thickness, 1 oz copper  
Microstrip line details: width = 0.015", spacing = 0.015"  
The stub on pin 4 is added for a convenient external matching.



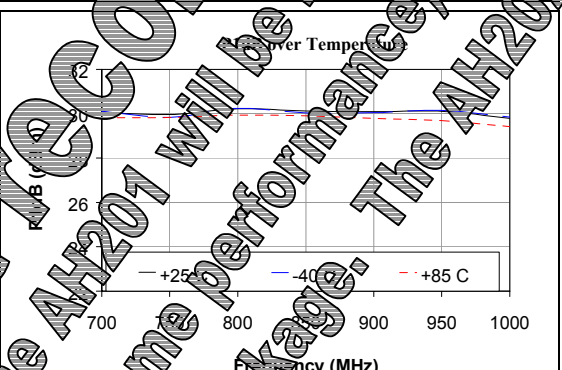
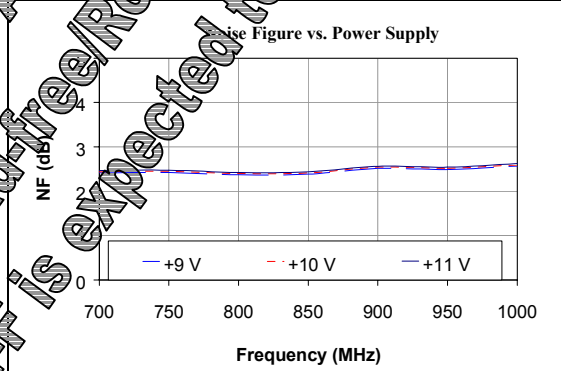
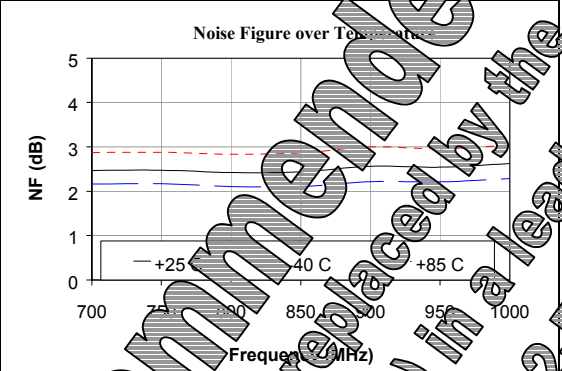
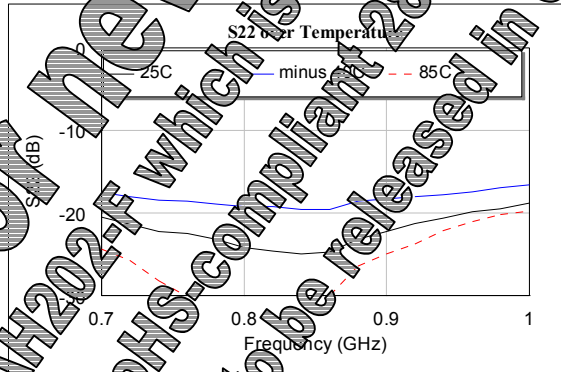
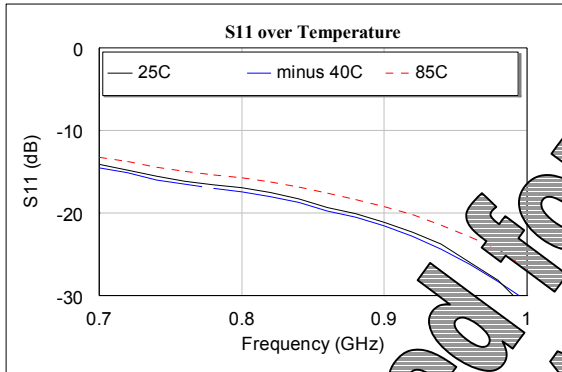
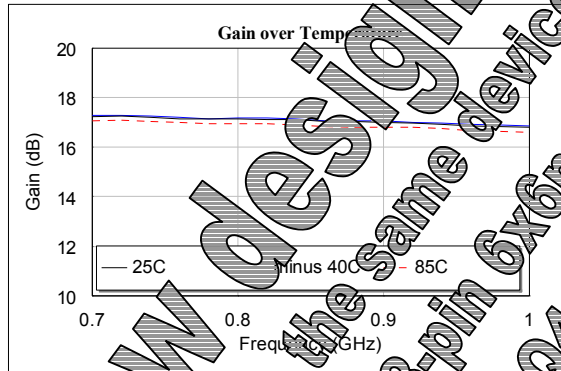
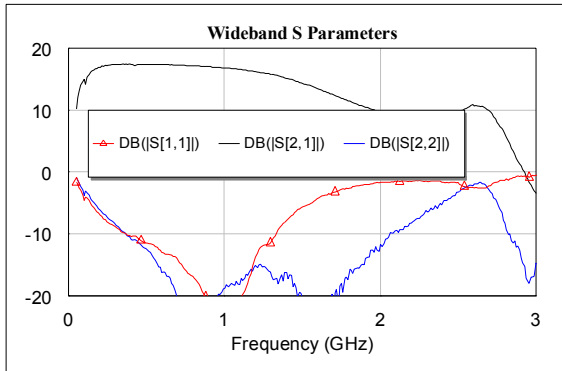
### Component values

| 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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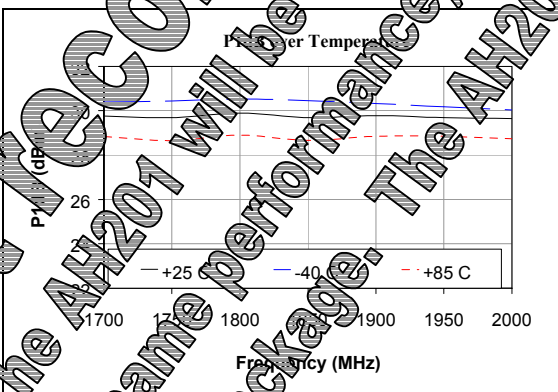
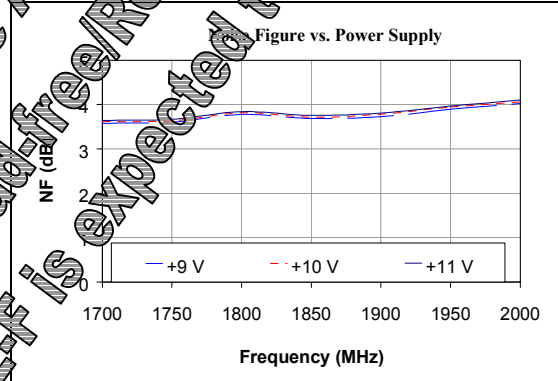
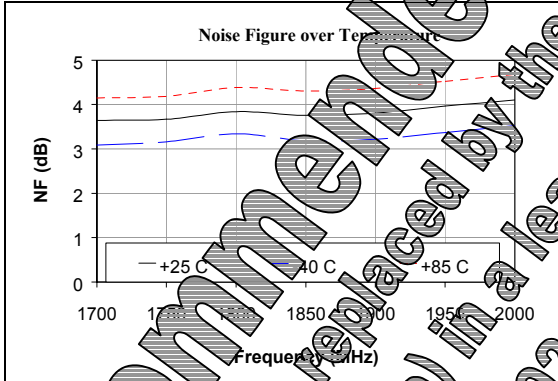
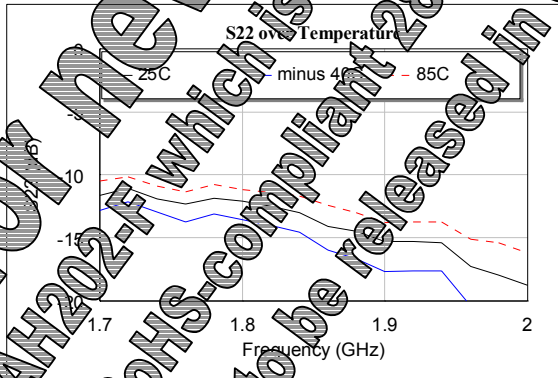
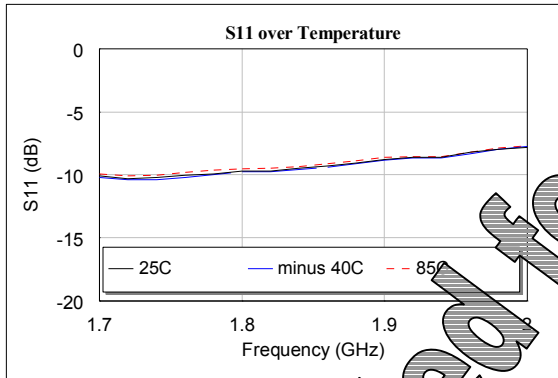
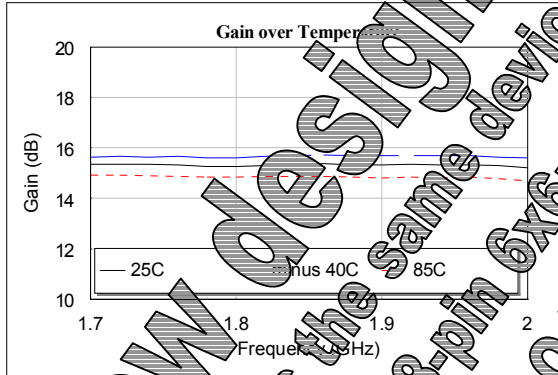
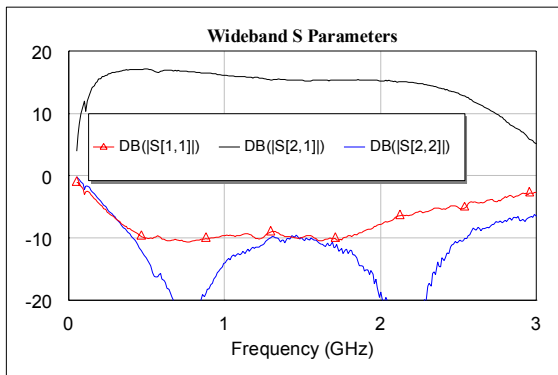
## 900 MHz Application Circuit Performance (AH201-PCB)



**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



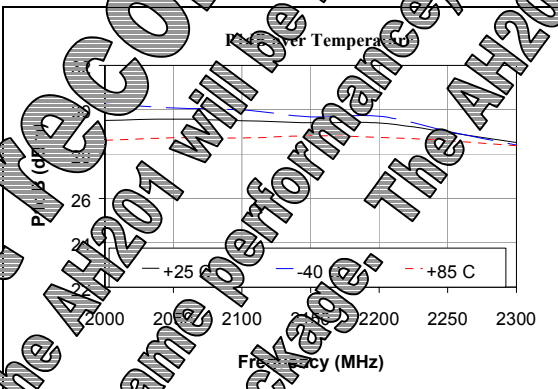
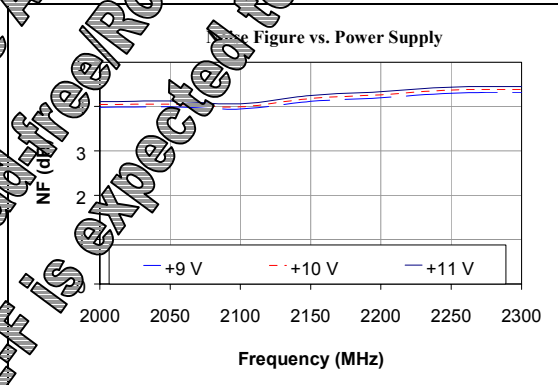
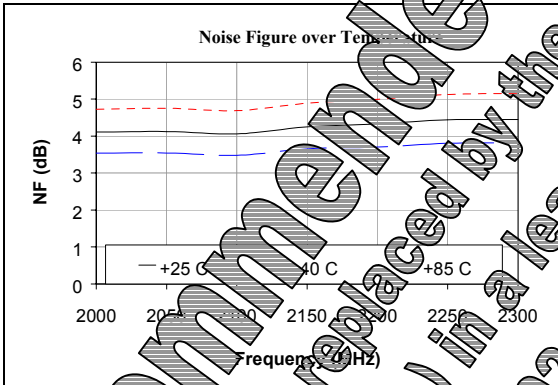
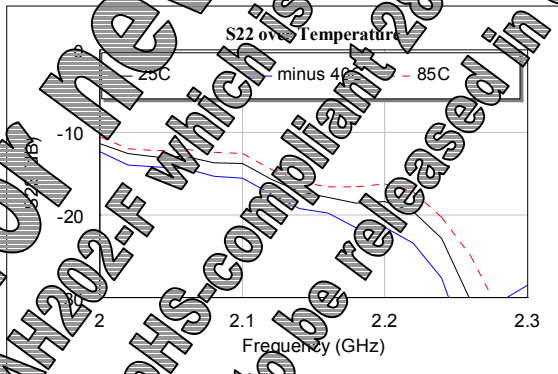
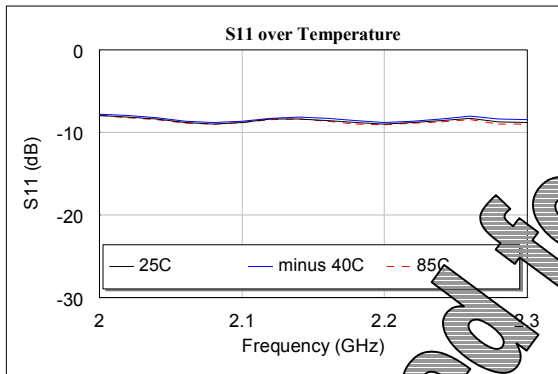
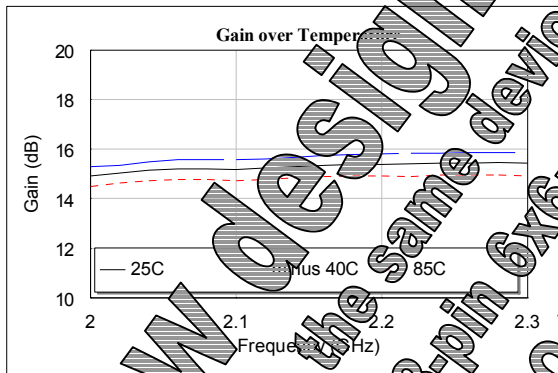
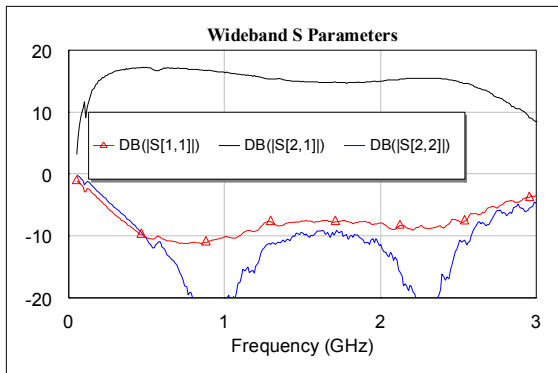
## 1900 MHz Application Circuit Performance (AH201-PCB)



**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-PCB21)



**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

