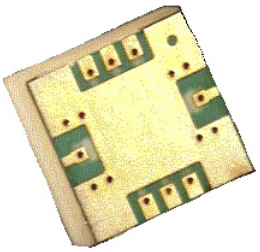
# AMMP-5620
6 – 20 GHz High Gain Amplifier in SMT Package



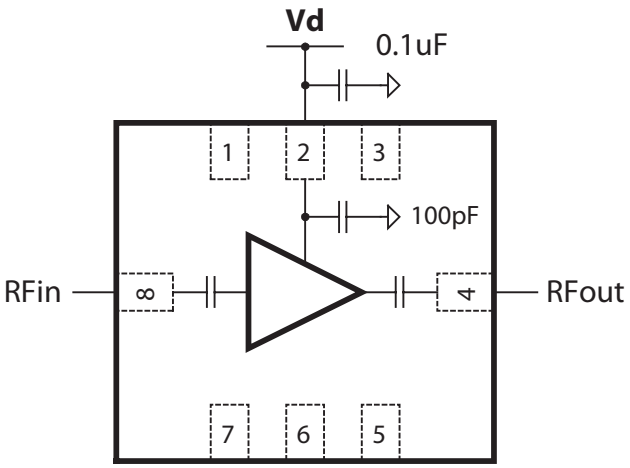
## Data Sheet



### Description

The AMMP-5620 MMIC is a GaAs wide-band amplifier in a surface mount package designed for medium output power and high gain over the 6-20 GHz frequency range. The 3 cascaded stages provide high gain while the single bias supply offers ease of use. It is fabricated using a PHEMT integrated circuit process. The RF input and output ports have matching circuitry for use in 50-ohms environments. The MMIC is a cost effective alternative to hybrid (discrete FET) amplifiers that require complex tuning and assembly processes.

### Pin Connections (Top View)




**AMMP-5620**

Note: Package base: GND

### Features

- Surface Mount Package, 5.0 x 5.0 x 1.25 mm
- Wide Frequency Range 6-20 GHz
- High Gain: 17.5 dB Typical
- Medium Output P1dB: 14.8 dBm Typical
- Input and Output Return Loss: <-10 dB Typical
- 50 Ohm Input and Output Match
- Single Supply Bias: 5V @ 95 mA Typical

### Applications

- General purpose, wide band amplifier in communication systems or microwave instrumentation
- High Gain Amplifier

**Attention:**
**Observe precautions for handling electrostatic sensitive devices.**

**ESD Machine Model (= 40 V)**
**ESD Human Body Model (= 150 V)**
**Refer to Avago Application Note A004R: Electrostatic Discharge Damage and Control**

## Table 1. Absolute Maximum Ratings [1]

| Symbol | Parameters and Test Conditions | Unit | Minimum | Maximum |
|---|---|---|---|---|
| $V_{dd}$ | Positive Drain Voltage | V | - | 7.5 |
| $I_{dd}$ | Total Drain Current | mA | - | 135 |
| $P_{dc}$ | DC Power Dissipation | W | - | 1.0 |
| $P_{in}$ | RF CW Input Power | dBm | - | 20 |
| $T_{ch}$ | Operating Channel Temperature | °C | - | +150 |
| $T_{stg}$ | Storage Case Temperature | °C | -65 | +150 |
| $T_{max}$ | Maximum Assembly Temperature (20 sec max) | °C | - | +260 |

Notes:
1. Operation in excess of any one of these conditions may result in permanent damage to this device.
   The absolute maximum ratings for Vdd, Idd, Pdc and Pin were determined at an ambient temperature of 25°C unless noted otherwise.

## Table 2. DC Specifications [1]

| Symbol | Parameters and Test Conditions | Unit | Minimum | Typical | Maximum |
|---|---|---|---|---|---|
| $V_{dd}$ | Recommended Drain Supply Voltage | V | - | 5 | - |
| $I_{dd}$ | Total Drain Supply Current | mA | 70 | 95 | 130 |
| $\Theta_{ch-b}$ | Thermal Resistance [2] | °C/W | - | 28 | - |

Notes:
1. Ambient operation temperature $T_A$ = 25°C unless otherwise noted.
2. Channel-to-board Thermal Resistance is measured using Infrared Microscopy method.

## Table 3. RF Specifications [2,3] ($T_A$ = 25°C, Freq = 18GHz, Vdd = 5V, Idd = 95mA)

| Symbol | Parameters and Test Conditions | Unit | Minimum | Typical | Maximum |
|---|---|---|---|---|---|
| $\|S21\|^2$ | Small signal Gain [1,4] | dB | 15.5 | 17.5 | 19.5 |
| RLin | Input Return Loss | dB | - | 11.5 | - |
| RLout | Output Return Loss | dB | - | 11.6 | - |
| $\|S12\|^2$ | Reverse Isolation | dB | - | -43.0 | - |
| P1dB | Output Power at 1dB Gain Compression | dBm | - | 14.8 | - |
| OIP3 | Output 3rd Order Intercept Point | dBm | - | 22.5 | - |
| NF | Noise Figure [1,4] | dB | - | 5.1 | 7.0 |

Notes:
1. Typical value determined from a sample size of 500 parts from 2 wafers.
2. Small/large signal data measured in a fully de-embedded test fixture at $T_A$ = 25 degree Celsius.
3. Specifications are derived from measurements in a 50 Ohm test environment. Aspects of the amplifier performance may be improved over a narrower bandwidth by application of additional conjugate, linearity, or low noise matching.
4. All tested parameters guaranteed with measurement accuracy ± 0.5 dB for NF and ± 1.0 dB for gain.

## AMMP-5620 Typical Performance vs. Frequency ($T_A$ = 25°C, Vdd = 5V, Idd = 95mA, Zin = Zo = 50Ω)



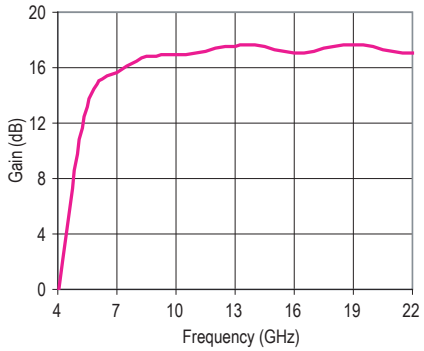



**Figure 1. Gain**

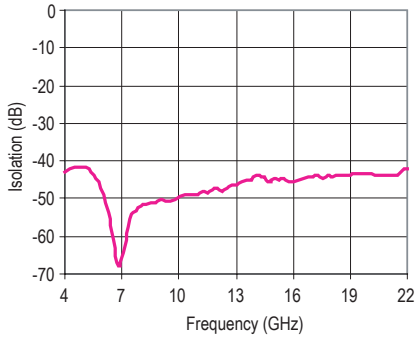



**Figure 2. Isolation**

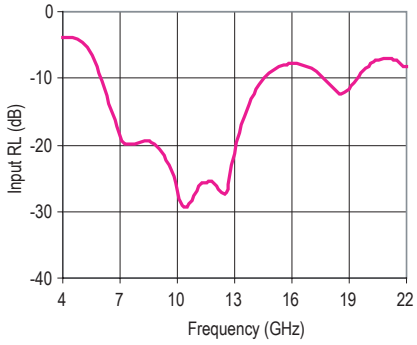



**Figure 3. Input Return Loss**

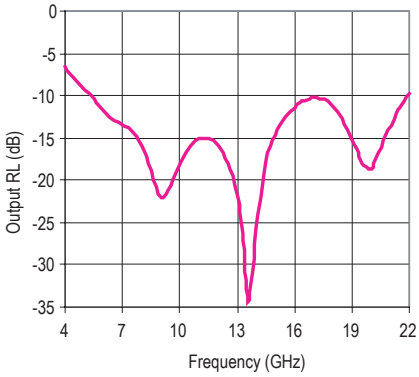



**Figure 4. Output Return Loss**

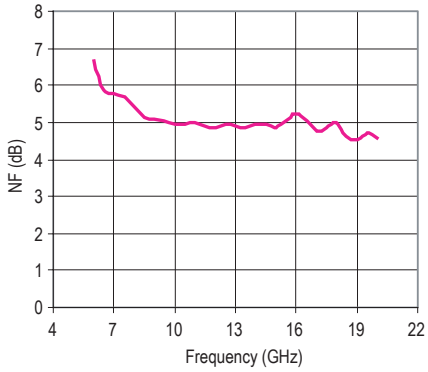



**Figure 5. Noise Figure**

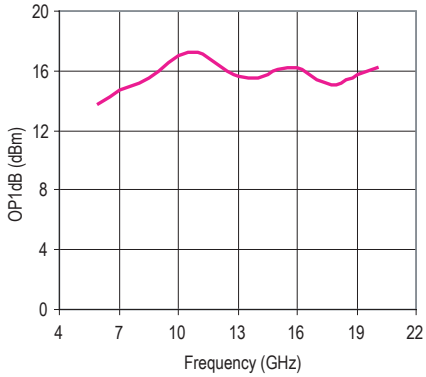



**Figure 6. P1dB**

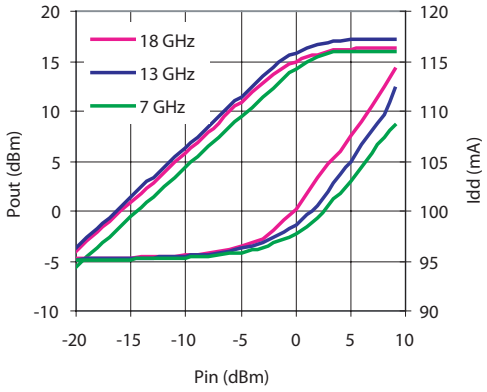



**Figure 7. Pout and Idd vs. Pin**

Note: These measurements are obtained using demo board with 50 Ohm traces at input and output. Aspects of the amplifier performance may be improved over a narrower bandwidth by application of additional conjugate, linearity or low noise matching.

## AMMP-5620 Typical Performance vs. Supply Voltage ($T_A$ = 25°C, Zin = Zo = 50Ω)

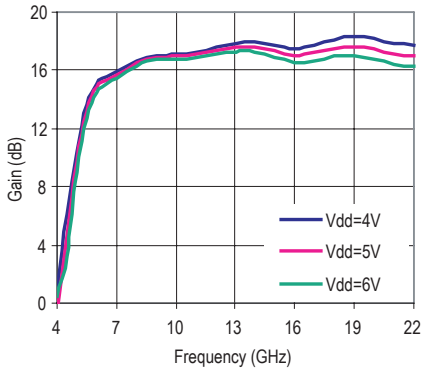



**Figure 8. Gain and Voltage**

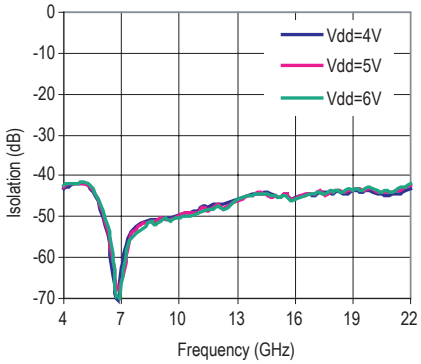



**Figure 9. Isolation and Voltage**

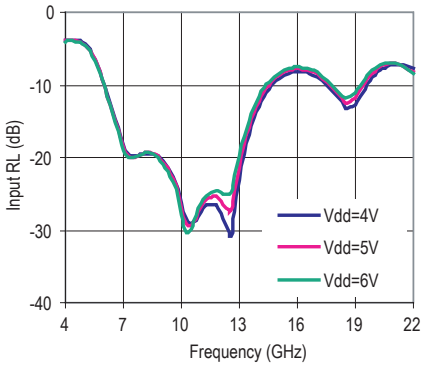



**Figure 10. Input Return Loss and Voltage**

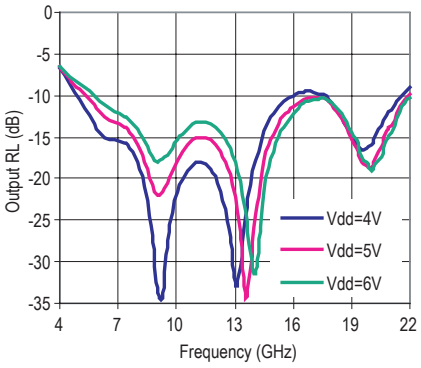



**Figure 11. Output Return Loss and Voltage**

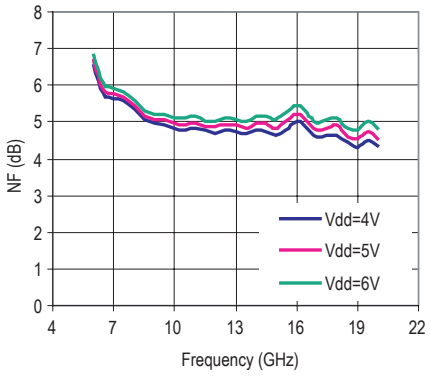



**Figure 12. Noise Figure and Voltage**

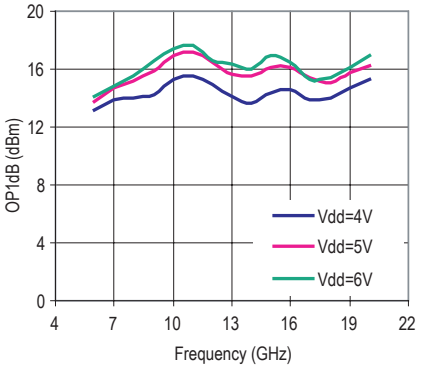



**Figure 13. P1dB and Voltage**

Note: These measurements are obtained using demo board with 50 Ohm traces at input and output. Aspects of the amplifier performance may be improved over a narrower bandwidth by application of additional conjugate, linearity or low noise matching.

## AMMP-5620 Typical Performance vs. Temperature (Vdd = 5V, Zin = Zo = 50Ω)

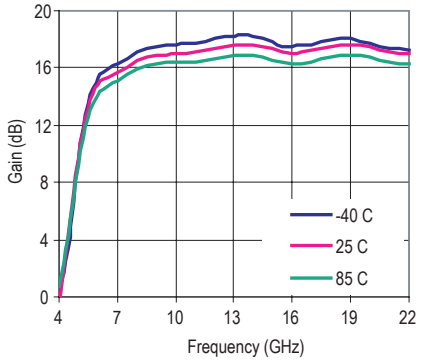



**Figure 14. Gain and Temperature**

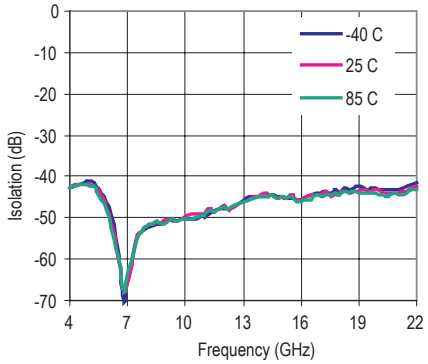



**Figure 15. Isolation and Temperature**

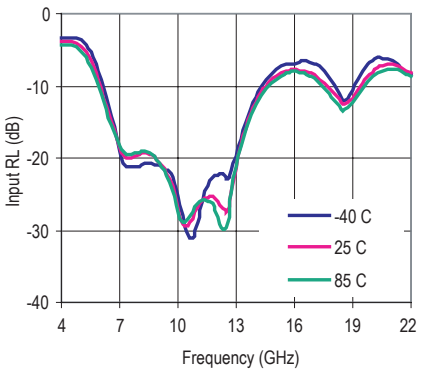



**Figure 16. Input Return Loss and Temperature**

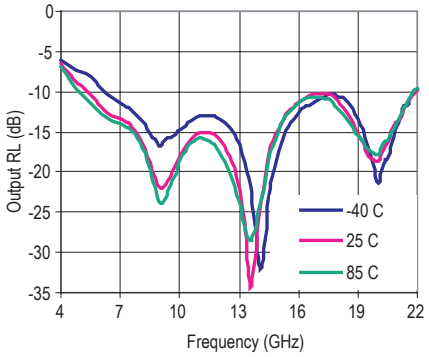



**Figure 17. Output Return Loss and Temperature**

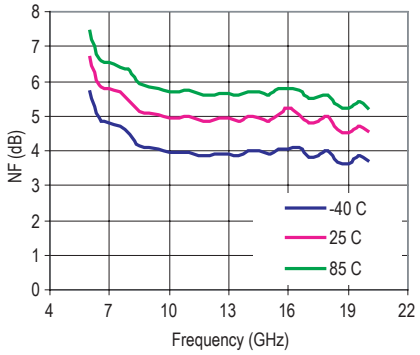



**Figure 18. Noise Figure and Temperature**

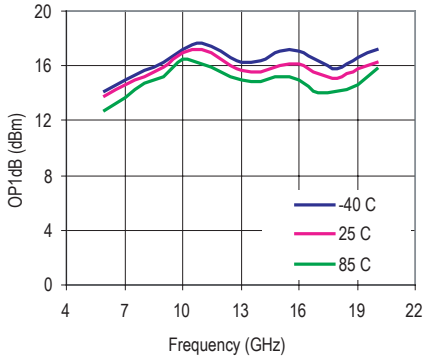



**Figure 19. P1dB and Temperature**

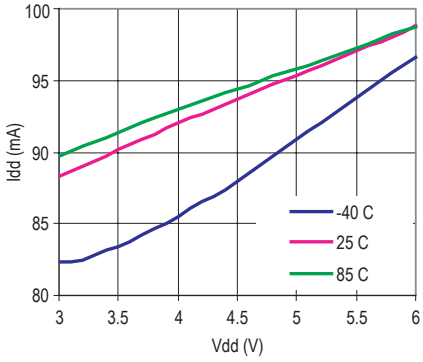



**Figure 20. Idd vs. Vdd**

Note: These measurements are obtained using demo board with 50 Ohm traces at input and output. Aspects of the amplifier performance may be improved over a narrower bandwidth by application of additional conjugate, linearity or low noise matching.

## AMMP-5620 Typical Scattering Parameters ($T_A$ = 25°C, Vdd = 4V, Idd = 92mA, Zo = 50Ω)

| Freq | | S11 | | | S21 | | | S12 | | | S22 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GHz | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase |
| 2.00 | -3.392 | 0.677 | 53.71 | -22.616 | 0.074 | 64.56 | -47.331 | 0.004 | -43.40 | -1.731 | 0.819 | 131.99 |
| 2.50 | -3.821 | 0.644 | -9.44 | -16.131 | 0.156 | -9.57 | -45.680 | 0.005 | -126.00 | -2.767 | 0.727 | 77.32 |
| 3.00 | -4.034 | 0.629 | -73.08 | -10.218 | 0.308 | -76.02 | -44.583 | 0.006 | 147.93 | -4.038 | 0.628 | 25.10 |
| 3.50 | -4.037 | 0.628 | -136.32 | -4.886 | 0.570 | -136.04 | -44.013 | 0.006 | 56.21 | -5.274 | 0.545 | -28.02 |
| 4.00 | -3.883 | 0.640 | 162.19 | 0.492 | 1.058 | 166.25 | -43.223 | 0.007 | -31.89 | -6.640 | 0.466 | -88.45 |
| 4.50 | -3.799 | 0.646 | 102.28 | 5.728 | 1.934 | 105.77 | -42.158 | 0.008 | -116.60 | -8.443 | 0.378 | -161.20 |
| 5.00 | -4.301 | 0.610 | 41.50 | 10.597 | 3.387 | 39.41 | -42.047 | 0.008 | 162.33 | -10.385 | 0.303 | 116.30 |
| 5.50 | -6.217 | 0.489 | -19.26 | 13.987 | 5.004 | -34.08 | -43.876 | 0.006 | 90.43 | -12.242 | 0.244 | 39.65 |
| 6.00 | -9.881 | 0.321 | -73.25 | 15.547 | 5.989 | -106.30 | -49.630 | 0.003 | 19.94 | -14.244 | 0.194 | -14.96 |
| 6.50 | -14.370 | 0.191 | -113.37 | 16.018 | 6.323 | -171.85 | -61.938 | 0.001 | -28.72 | -15.199 | 0.174 | -52.05 |
| 7.00 | -18.027 | 0.126 | -139.47 | 16.297 | 6.529 | 129.56 | -60.915 | 0.001 | 60.78 | -15.411 | 0.170 | -85.59 |
| 7.50 | -19.794 | 0.102 | -160.36 | 16.684 | 6.827 | 74.54 | -53.979 | 0.002 | 32.98 | -15.826 | 0.162 | -122.02 |
| 8.00 | -19.593 | 0.105 | 170.89 | 17.170 | 7.219 | 19.92 | -51.701 | 0.003 | -12.09 | -17.735 | 0.130 | -162.68 |
| 8.50 | -19.461 | 0.106 | 130.27 | 17.430 | 7.439 | -33.97 | -50.752 | 0.003 | -49.75 | -22.114 | 0.078 | 152.70 |
| 9.00 | -20.455 | 0.095 | 84.36 | 17.536 | 7.530 | -86.25 | -50.752 | 0.003 | -83.81 | -32.324 | 0.024 | 96.16 |
| 9.50 | -22.361 | 0.076 | 34.60 | 17.575 | 7.564 | -136.97 | -50.173 | 0.003 | -118.89 | -28.134 | 0.039 | -70.69 |
| 10.00 | -25.900 | 0.051 | -26.77 | 17.641 | 7.622 | 173.56 | -49.370 | 0.003 | -149.20 | -21.927 | 0.080 | -118.97 |
| 10.50 | -28.947 | 0.036 | -109.35 | 17.694 | 7.668 | 124.81 | -48.874 | 0.004 | 178.49 | -19.236 | 0.109 | -157.79 |
| 11.00 | -27.535 | 0.042 | 167.11 | 17.784 | 7.749 | 76.68 | -48.636 | 0.004 | 142.57 | -18.146 | 0.124 | 164.93 |
| 11.50 | -26.430 | 0.048 | 103.17 | 17.978 | 7.924 | 29.02 | -47.744 | 0.004 | 113.01 | -18.244 | 0.122 | 127.03 |
| 12.00 | -27.432 | 0.043 | 47.93 | 18.185 | 8.114 | -18.34 | -46.936 | 0.005 | 78.56 | -19.576 | 0.105 | 87.45 |
| 12.50 | -30.722 | 0.029 | -46.78 | 18.275 | 8.199 | -66.32 | -46.558 | 0.005 | 47.55 | -23.440 | 0.067 | 45.23 |
| 13.00 | -23.702 | 0.065 | -149.09 | 18.489 | 8.403 | -114.29 | -45.514 | 0.005 | 10.59 | -31.768 | 0.026 | -33.28 |
| 13.50 | -17.115 | 0.139 | 157.09 | 18.693 | 8.603 | -162.54 | -44.883 | 0.006 | -28.75 | -25.067 | 0.056 | -170.66 |
| 14.00 | -13.132 | 0.221 | 114.54 | 18.841 | 8.751 | 149.01 | -44.293 | 0.006 | -64.72 | -18.223 | 0.123 | 139.13 |
| 14.50 | -10.686 | 0.292 | 75.62 | 18.570 | 8.482 | 100.90 | -44.152 | 0.006 | -101.95 | -14.535 | 0.188 | 99.29 |
| 15.00 | -9.229 | 0.346 | 38.70 | 18.197 | 8.126 | 54.29 | -45.036 | 0.006 | -139.33 | -12.274 | 0.243 | 62.73 |
| 15.50 | -8.382 | 0.381 | 2.16 | 18.245 | 8.170 | 9.19 | -44.583 | 0.006 | -175.53 | -10.776 | 0.289 | 28.24 |
| 16.00 | -8.197 | 0.389 | -34.39 | 18.109 | 8.044 | -34.26 | -45.352 | 0.005 | 158.27 | -10.114 | 0.312 | -5.12 |
| 16.50 | -8.291 | 0.385 | -70.91 | 18.239 | 8.164 | -79.87 | -44.883 | 0.006 | 123.49 | -9.646 | 0.329 | -38.26 |
| 17.00 | -8.855 | 0.361 | -108.85 | 18.433 | 8.349 | -127.21 | -44.731 | 0.006 | 85.22 | -9.549 | 0.333 | -72.46 |
| 17.50 | -9.949 | 0.318 | -150.10 | 18.445 | 8.360 | -172.86 | -44.152 | 0.006 | 54.36 | -9.870 | 0.321 | -107.43 |
| 18.00 | -11.496 | 0.266 | 162.22 | 18.647 | 8.558 | 139.62 | -44.437 | 0.006 | 15.26 | -10.885 | 0.286 | -145.36 |
| 18.50 | -13.104 | 0.221 | 103.16 | 18.818 | 8.727 | 93.41 | -44.293 | 0.006 | -15.94 | -12.483 | 0.238 | 173.22 |
| 19.00 | -12.765 | 0.230 | 36.19 | 19.126 | 9.043 | 43.83 | -43.742 | 0.007 | -52.34 | -14.813 | 0.182 | 123.98 |
| 19.50 | -10.701 | 0.292 | -23.30 | 19.268 | 9.192 | -5.97 | -43.876 | 0.006 | -86.50 | -16.444 | 0.151 | 62.33 |
| 20.00 | -8.835 | 0.362 | -70.75 | 19.077 | 8.992 | -55.35 | -44.013 | 0.006 | -120.15 | -15.901 | 0.160 | 1.77 |
| 20.50 | -7.677 | 0.413 | -111.70 | 18.685 | 8.595 | -104.03 | -44.437 | 0.006 | -154.67 | -13.744 | 0.206 | -47.46 |
| 21.00 | -7.218 | 0.436 | -150.98 | 18.366 | 8.285 | -150.44 | -44.583 | 0.006 | 175.09 | -11.890 | 0.254 | -85.98 |
| 21.50 | -7.190 | 0.437 | 168.74 | 18.081 | 8.018 | 162.58 | -44.437 | 0.006 | 150.09 | -10.354 | 0.304 | -121.21 |
| 22.00 | -7.614 | 0.416 | 124.80 | 18.370 | 8.289 | 115.35 | -43.350 | 0.007 | 119.82 | -9.077 | 0.352 | -157.12 |
| 22.50 | -8.050 | 0.396 | 73.12 | 18.942 | 8.854 | 67.61 | -41.110 | 0.009 | 84.67 | -8.148 | 0.391 | 164.79 |
| 23.00 | -7.490 | 0.422 | 7.61 | 19.537 | 9.481 | 17.62 | -39.016 | 0.011 | 35.70 | -7.802 | 0.407 | 121.56 |
| 23.50 | -6.164 | 0.492 | -80.14 | 19.515 | 9.457 | -42.37 | -40.537 | 0.009 | -27.89 | -8.752 | 0.365 | 81.87 |
| 24.00 | -5.293 | 0.544 | -161.93 | 18.527 | 8.440 | -104.37 | -45.514 | 0.005 | -68.17 | -8.847 | 0.361 | 48.30 |
| 24.50 | -4.602 | 0.589 | 129.44 | 17.199 | 7.243 | -161.50 | -49.630 | 0.003 | -81.81 | -8.802 | 0.363 | 11.43 |
| 25.00 | -4.247 | 0.613 | 70.63 | 15.285 | 5.811 | 146.41 | -49.897 | 0.003 | -93.56 | -8.828 | 0.362 | -26.36 |

Note: S-parameters are obtained using demo board with 50 Ohm traces at input and output.

## AMMP-5620 Typical Scattering Parameters ($T_A$ = 25°C, Vdd = 5V, Idd = 95mA, Zo = 50Ω)

| Freq | S11 | | | S21 | | | S12 | | | S22 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GHz | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase |
| 2.00 | -3.407 | 0.676 | 53.67 | -23.012 | 0.071 | 64.54 | -47.535 | 0.004 | -46.84 | -1.719 | 0.820 | 131.87 |
| 2.50 | -3.838 | 0.643 | -9.56 | -16.623 | 0.148 | -9.82 | -45.680 | 0.005 | -127.29 | -2.711 | 0.732 | 76.91 |
| 3.00 | -4.066 | 0.626 | -73.27 | -10.798 | 0.288 | -76.79 | -44.883 | 0.006 | 147.52 | -3.953 | 0.634 | 23.89 |
| 3.50 | -4.085 | 0.625 | -136.57 | -5.550 | 0.528 | -137.32 | -43.609 | 0.007 | 59.64 | -5.188 | 0.550 | -30.29 |
| 4.00 | -3.957 | 0.634 | 161.91 | -0.284 | 0.968 | 164.88 | -42.853 | 0.007 | -29.81 | -6.479 | 0.474 | -91.93 |
| 4.50 | -3.908 | 0.638 | 102.02 | 4.862 | 1.750 | 104.89 | -41.724 | 0.008 | -115.15 | -7.935 | 0.401 | -165.83 |
| 5.00 | -4.423 | 0.601 | 41.50 | 9.760 | 3.076 | 39.54 | -41.724 | 0.008 | 165.10 | -9.211 | 0.346 | 112.05 |
| 5.50 | -6.310 | 0.484 | -19.18 | 13.283 | 4.615 | -33.23 | -43.479 | 0.007 | 91.89 | -10.354 | 0.304 | 36.78 |
| 6.00 | -9.984 | 0.317 | -73.52 | 14.987 | 5.615 | -105.50 | -48.404 | 0.004 | 18.63 | -11.849 | 0.256 | -19.81 |
| 6.50 | -14.624 | 0.186 | -113.60 | 15.547 | 5.989 | -171.58 | -59.172 | 0.001 | -41.02 | -12.872 | 0.227 | -61.58 |
| 7.00 | -18.395 | 0.120 | -138.23 | 15.908 | 6.243 | 129.38 | -64.437 | 0.001 | 66.84 | -13.453 | 0.213 | -98.68 |
| 7.50 | -19.931 | 0.101 | -158.07 | 16.387 | 6.597 | 74.06 | -54.425 | 0.002 | 32.17 | -14.071 | 0.198 | -138.00 |
| 8.00 | -19.576 | 0.105 | 172.38 | 16.956 | 7.043 | 18.71 | -52.041 | 0.003 | -13.20 | -15.682 | 0.164 | 176.27 |
| 8.50 | -19.453 | 0.107 | 130.69 | 17.261 | 7.295 | -36.19 | -51.057 | 0.003 | -48.69 | -18.592 | 0.118 | 120.56 |
| 9.00 | -20.565 | 0.094 | 83.97 | 17.386 | 7.401 | -89.26 | -50.458 | 0.003 | -84.50 | -21.884 | 0.081 | 49.32 |
| 9.50 | -22.698 | 0.073 | 32.87 | 17.394 | 7.408 | -140.66 | -50.752 | 0.003 | -114.52 | -20.640 | 0.093 | -34.05 |
| 10.00 | -26.651 | 0.047 | -31.69 | 17.420 | 7.430 | 169.24 | -49.370 | 0.003 | -149.09 | -17.931 | 0.127 | -91.80 |
| 10.50 | -29.396 | 0.034 | -122.59 | 17.431 | 7.440 | 119.81 | -49.119 | 0.004 | 179.06 | -16.060 | 0.157 | -138.08 |
| 11.00 | -27.013 | 0.045 | 153.65 | 17.470 | 7.473 | 71.18 | -48.874 | 0.004 | 145.67 | -15.114 | 0.176 | -179.35 |
| 11.50 | -25.613 | 0.052 | 90.79 | 17.612 | 7.597 | 23.17 | -48.636 | 0.004 | 112.76 | -15.021 | 0.177 | 140.77 |
| 12.00 | -26.021 | 0.050 | 32.22 | 17.791 | 7.755 | -24.60 | -47.131 | 0.004 | 80.42 | -15.756 | 0.163 | 101.16 |
| 12.50 | -27.171 | 0.044 | -56.40 | 17.838 | 7.796 | -73.06 | -47.535 | 0.004 | 48.72 | -17.835 | 0.128 | 62.47 |
| 13.00 | -21.724 | 0.082 | -145.03 | 17.996 | 7.940 | -121.36 | -46.196 | 0.005 | 12.23 | -21.745 | 0.082 | 19.12 |
| 13.50 | -16.088 | 0.157 | 159.43 | 18.133 | 8.066 | -169.78 | -45.036 | 0.006 | -27.17 | -32.616 | 0.023 | -58.58 |
| 14.00 | -12.432 | 0.239 | 115.43 | 18.204 | 8.132 | 141.80 | -44.152 | 0.006 | -61.69 | -24.898 | 0.057 | 155.40 |
| 14.50 | -10.117 | 0.312 | 75.65 | 17.909 | 7.860 | 93.60 | -44.437 | 0.006 | -101.48 | -18.216 | 0.123 | 109.09 |
| 15.00 | -8.749 | 0.365 | 38.09 | 17.492 | 7.492 | 46.59 | -44.883 | 0.006 | -137.21 | -14.765 | 0.183 | 72.08 |
| 15.50 | -7.954 | 0.400 | 0.98 | 17.443 | 7.450 | 1.09 | -44.583 | 0.006 | -171.56 | -12.560 | 0.236 | 37.77 |
| 16.00 | -7.789 | 0.408 | -36.04 | 17.188 | 7.235 | -42.76 | -45.680 | 0.005 | 158.96 | -11.415 | 0.269 | 5.30 |
| 16.50 | -7.907 | 0.402 | -73.32 | 17.217 | 7.259 | -88.02 | -44.583 | 0.006 | 126.85 | -10.580 | 0.296 | -27.45 |
| 17.00 | -8.475 | 0.377 | -112.22 | 17.395 | 7.409 | -135.20 | -44.293 | 0.006 | 92.92 | -10.215 | 0.309 | -61.15 |
| 17.50 | -9.559 | 0.333 | -154.89 | 17.333 | 7.356 | 179.22 | -44.583 | 0.006 | 56.05 | -10.303 | 0.305 | -95.10 |
| 18.00 | -11.044 | 0.280 | 155.57 | 17.493 | 7.493 | 131.68 | -44.152 | 0.006 | 21.24 | -11.128 | 0.278 | -130.85 |
| 18.50 | -12.356 | 0.241 | 94.68 | 17.516 | 7.512 | 85.39 | -43.876 | 0.006 | -10.75 | -12.616 | 0.234 | -168.75 |
| 19.00 | -11.768 | 0.258 | 28.44 | 17.752 | 7.719 | 36.44 | -43.609 | 0.007 | -48.52 | -15.055 | 0.177 | 148.38 |
| 19.50 | -9.832 | 0.322 | -29.47 | 17.897 | 7.849 | -12.86 | -43.479 | 0.007 | -82.80 | -17.897 | 0.127 | 92.99 |
| 20.00 | -8.223 | 0.388 | -76.66 | 17.687 | 7.663 | -61.51 | -43.350 | 0.007 | -114.34 | -18.644 | 0.117 | 28.34 |
| 20.50 | -7.323 | 0.430 | -117.90 | 17.321 | 7.346 | -109.66 | -44.013 | 0.006 | -149.87 | -16.205 | 0.155 | -29.59 |
| 21.00 | -7.103 | 0.441 | -157.70 | 16.972 | 7.057 | -155.84 | -44.013 | 0.006 | -179.43 | -13.601 | 0.209 | -72.00 |
| 21.50 | -7.351 | 0.429 | 161.32 | 16.689 | 6.831 | 157.50 | -43.742 | 0.007 | 149.78 | -11.483 | 0.267 | -109.23 |
| 22.00 | -8.112 | 0.393 | 116.27 | 16.962 | 7.048 | 110.49 | -42.270 | 0.008 | 117.97 | -9.911 | 0.320 | -146.85 |
| 22.50 | -8.920 | 0.358 | 62.93 | 11.755 | 7.493 | 62.42 | -40.630 | 0.009 | 78.99 | -8.913 | 0.358 | 174.20 |
| 23.00 | -8.688 | 0.368 | -4.82 | 17.900 | 7.852 | 12.29 | -39.332 | 0.011 | 28.16 | -8.709 | 0.367 | 131.96 |
| 23.50 | -7.331 | 0.430 | -91.21 | 17.558 | 7.549 | -45.62 | -41.618 | 0.008 | -33.37 | -9.335 | 0.341 | 95.47 |
| 24.00 | -6.166 | 0.492 | -168.93 | 16.641 | 6.793 | -104.51 | -46.936 | 0.005 | -69.14 | -8.981 | 0.356 | 61.41 |
| 24.50 | -5.232 | 0.548 | 125.79 | 15.583 | 6.014 | -159.57 | -50.752 | 0.003 | -80.08 | -8.742 | 0.366 | 24.42 |
| 25.00 | -4.687 | 0.583 | 68.92 | 13.967 | 4.993 | 149.42 | -50.173 | 0.003 | -80.98 | -8.547 | 0.374 | -13.10 |

Note: S-parameters are obtained using demo board with 50 Ohm traces at input and output.

## AMMP-5620 Typical Scattering Parameters ($T_A$ = 25°C, Vdd = 6V, Idd = 99mA, Zo = 50Ω)

| Freq | S11 | | | S21 | | | S12 | | | S22 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GHz | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase |
| 2.00 | -3.416 | 0.675 | 53.66 | -23.295 | 0.068 | 64.59 | -47.131 | 0.004 | -44.87 | -1.710 | 0.821 | 131.81 |
| 2.50 | -3.851 | 0.642 | -9.62 | -17.047 | 0.140 | -10.40 | -45.849 | 0.005 | -125.03 | -2.675 | 0.735 | 76.65 |
| 3.00 | -4.094 | 0.624 | -73.39 | -11.275 | 0.273 | -77.86 | -44.731 | 0.006 | 150.46 | -3.894 | 0.639 | 23.09 |
| 3.50 | -4.126 | 0.622 | -136.79 | -6.106 | 0.495 | -138.83 | -44.152 | 0.006 | 59.41 | -5.119 | 0.555 | -31.79 |
| 4.00 | -4.016 | 0.630 | 161.59 | -0.927 | 0.899 | 163.06 | -42.615 | 0.007 | -28.22 | -6.355 | 0.481 | -94.22 |
| 4.50 | -3.999 | 0.631 | 101.74 | 4.127 | 1.608 | 103.24 | -41.724 | 0.008 | -113.46 | -7.614 | 0.416 | -168.71 |
| 5.00 | -4.535 | 0.593 | 41.39 | 9.012 | 2.822 | 38.51 | -41.412 | 0.009 | 165.26 | -8.536 | 0.374 | 109.84 |
| 5.50 | -6.419 | 0.478 | -19.13 | 12.588 | 4.260 | -33.69 | -43.098 | 0.007 | 92.29 | -9.332 | 0.342 | 35.77 |
| 6.00 | -10.097 | 0.313 | -73.67 | 14.381 | 5.237 | -105.87 | -47.959 | 0.004 | 21.78 | -10.536 | 0.297 | -21.31 |
| 6.50 | -14.827 | 0.181 | -113.73 | 15.013 | 5.632 | -172.25 | -57.721 | 0.001 | -35.16 | -11.483 | 0.267 | -65.12 |
| 7.00 | -18.688 | 0.116 | -137.28 | 15.433 | 5.911 | 128.40 | -64.437 | 0.001 | 42.77 | -12.111 | 0.248 | -104.28 |
| 7.50 | -20.044 | 0.100 | -156.35 | 15.981 | 6.295 | 72.88 | -55.391 | 0.002 | 34.32 | -12.732 | 0.231 | -145.31 |
| 8.00 | -19.601 | 0.105 | 173.55 | 16.608 | 6.767 | 16.96 | -53.152 | 0.002 | -14.23 | -14.032 | 0.199 | 167.20 |
| 8.50 | -19.510 | 0.106 | 131.02 | 16.943 | 7.033 | -38.71 | -51.373 | 0.003 | -48.50 | -16.060 | 0.157 | 110.46 |
| 9.00 | -20.762 | 0.092 | 83.56 | 17.083 | 7.147 | -92.36 | -51.057 | 0.003 | -87.09 | -17.924 | 0.127 | 44.58 |
| 9.50 | -23.173 | 0.069 | 31.58 | 17.068 | 7.135 | -144.29 | -51.057 | 0.003 | -118.15 | -17.228 | 0.138 | -26.23 |
| 10.00 | -27.660 | 0.041 | -36.67 | 17.060 | 7.129 | 165.08 | -50.458 | 0.003 | -151.04 | -15.509 | 0.168 | -82.70 |
| 10.50 | -29.843 | 0.032 | -136.34 | 17.035 | 7.108 | 115.14 | -49.897 | 0.003 | 179.35 | -14.089 | 0.198 | -130.16 |
| 11.00 | -26.521 | 0.047 | 141.48 | 17.029 | 7.103 | 66.07 | -49.119 | 0.004 | 147.01 | -13.287 | 0.217 | -172.78 |
| 11.50 | -24.867 | 0.057 | 80.58 | 17.137 | 7.192 | 17.81 | -48.404 | 0.004 | 116.50 | -13.167 | 0.220 | 146.51 |
| 12.00 | -24.852 | 0.057 | 20.29 | 17.281 | 7.313 | -30.36 | -47.535 | 0.004 | 80.62 | -13.689 | 0.207 | 106.47 |
| 12.50 | -24.867 | 0.057 | -63.84 | 17.287 | 7.317 | -79.21 | -47.744 | 0.004 | 51.23 | -15.154 | 0.175 | 67.50 |
| 13.00 | -20.131 | 0.099 | -144.42 | 17.399 | 7.412 | -127.72 | -45.849 | 0.005 | 15.67 | -17.768 | 0.129 | 25.89 |
| 13.50 | -15.179 | 0.174 | 159.95 | 17.480 | 7.482 | -176.25 | -45.036 | 0.006 | -21.21 | -23.388 | 0.068 | -21.43 |
| 14.00 | -11.822 | 0.256 | 115.28 | 17.483 | 7.484 | 135.39 | -44.583 | 0.006 | -64.33 | -31.150 | 0.028 | -141.86 |
| 14.50 | -9.672 | 0.328 | 74.94 | 17.173 | 7.222 | 87.09 | -44.583 | 0.006 | -98.24 | -21.971 | 0.080 | 126.31 |
| 15.00 | -8.379 | 0.381 | 37.04 | 16.722 | 6.857 | 39.86 | -44.883 | 0.006 | -135.72 | -16.887 | 0.143 | 83.97 |
| 15.50 | -7.641 | 0.415 | -0.43 | 16.599 | 6.760 | -5.93 | -44.883 | 0.006 | -170.92 | -13.897 | 0.202 | 48.18 |
| 16.00 | -7.504 | 0.422 | -37.75 | 16.261 | 6.502 | -50.07 | -45.514 | 0.005 | 160.43 | -12.238 | 0.244 | 15.40 |
| 16.50 | -7.656 | 0.414 | -75.55 | 16.216 | 6.468 | -95.08 | -44.731 | 0.006 | 129.01 | -11.032 | 0.281 | -17.95 |
| 17.00 | -8.239 | 0.387 | -115.08 | 16.385 | 6.596 | -142.16 | -44.293 | 0.006 | 94.65 | -10.429 | 0.301 | -51.84 |
| 17.50 | -9.332 | 0.342 | -158.72 | 16.268 | 6.507 | 172.29 | -44.293 | 0.006 | 58.22 | -10.305 | 0.305 | -85.61 |
| 18.00 | -10.773 | 0.289 | 150.47 | 16.398 | 6.605 | 124.73 | -44.013 | 0.006 | 22.77 | -10.912 | 0.285 | -120.38 |
| 18.50 | -11.879 | 0.255 | 88.51 | 16.310 | 6.539 | 78.43 | -44.013 | 0.006 | -11.16 | -12.146 | 0.247 | -156.35 |
| 19.00 | -11.132 | 0.278 | 22.99 | 16.495 | 6.680 | 29.89 | -43.609 | 0.007 | -45.88 | -14.226 | 0.194 | 164.49 |
| 19.50 | -9.289 | 0.343 | -33.82 | 16.645 | 6.796 | -19.03 | -43.479 | 0.007 | -82.45 | -17.109 | 0.140 | 116.97 |
| 20.00 | -7.836 | 0.406 | -80.69 | 16.432 | 6.631 | -67.23 | -43.223 | 0.007 | -114.76 | -18.985 | 0.112 | 56.33 |
| 20.50 | -7.078 | 0.443 | -122.07 | 16.097 | 6.380 | -114.99 | -43.876 | 0.006 | -149.02 | -17.393 | 0.135 | -8.93 |
| 21.00 | -6.998 | 0.447 | -162.32 | 15.726 | 6.114 | -161.08 | -43.876 | 0.006 | -179.37 | -14.462 | 0.189 | -57.64 |
| 21.50 | -7.416 | 0.426 | 156.08 | 15.444 | 5.919 | 152.40 | -42.853 | 0.007 | 151.62 | -12.003 | 0.251 | -98.38 |
| 22.00 | -8.363 | 0.382 | 109.87 | 15.704 | 6.099 | 105.40 | -42.158 | 0.008 | 117.02 | -10.249 | 0.307 | -137.92 |
| 22.50 | -9.391 | 0.339 | 54.50 | 16.211 | 6.465 | 57.04 | -40.724 | 0.009 | 76.50 | -9.213 | 0.346 | -177.68 |
| 23.00 | -9.304 | 0.343 | 15.31 | 16.483 | 6.670 | 6.64 | -39.576 | 0.011 | 24.33 | -9.030 | 0.354 | 140.91 |
| 23.50 | -7.872 | 0.404 | -100.07 | 15.909 | 6.243 | -50.00 | -42.499 | 0.008 | -35.37 | -9.254 | 0.345 | 105.41 |
| 24.00 | -6.558 | 0.470 | -174.74 | 14.992 | 5.618 | -107.02 | -47.744 | 0.004 | -67.10 | -8.685 | 0.368 | 69.77 |
| 24.50 | -5.546 | 0.528 | 122.43 | 14.052 | 5.042 | -160.62 | -51.057 | 0.003 | -70.24 | -8.372 | 0.381 | 32.18 |
| 25.00 | -4.939 | 0.566 | 67.01 | 12.600 | 4.266 | 149.39 | -50.458 | 0.003 | -80.53 | -8.094 | 0.394 | -5.43 |

Note: S-parameters are obtained using demo board with 50 Ohm traces at input and output.

## Biasing and Operation

The AMMP-5620 only requires a single positive supply connected to the Vd pin (2). The recommended supply voltage is 5V. The supply should be bypassed with a 0.1uF capacitor placed as close to the component as possible. The package base is the RF and DC ground connection. The biasing arrangement is shown in Figure 21.

Figure 22 shows a simplifies schematic for the amplifier die. All three stages are self-biased as shown. Each stage has feedback around it to control the gain, match and performance, resulting in excellent wideband performance. Also shown are the on-chip DC blocking capacitors for both the RFin and RFout pins.

Please refer to the Absolute Maximum Ratings table for allowed DC and thermal conditions.

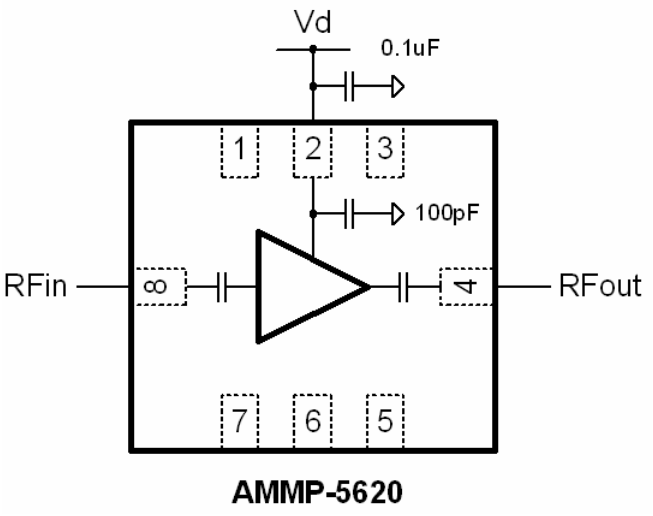



**Figure 21. Typical Application.**

## Recommended SMT Attachment

The AMMP Packaged Devices are compatible with high volume

surface mount PCB assembly processes. The PCB material and mounting pattern, as defined in the data sheet, optimizes RF performance and is strongly recommended. An electronic drawing of the land pattern is available upon request from Agilent Sales & Application Engineering.

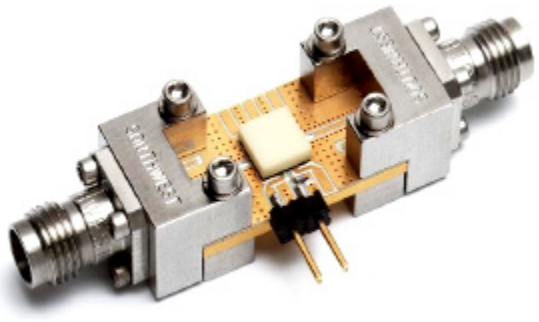


**Figure 23. Demonstration Board (available upon request).**

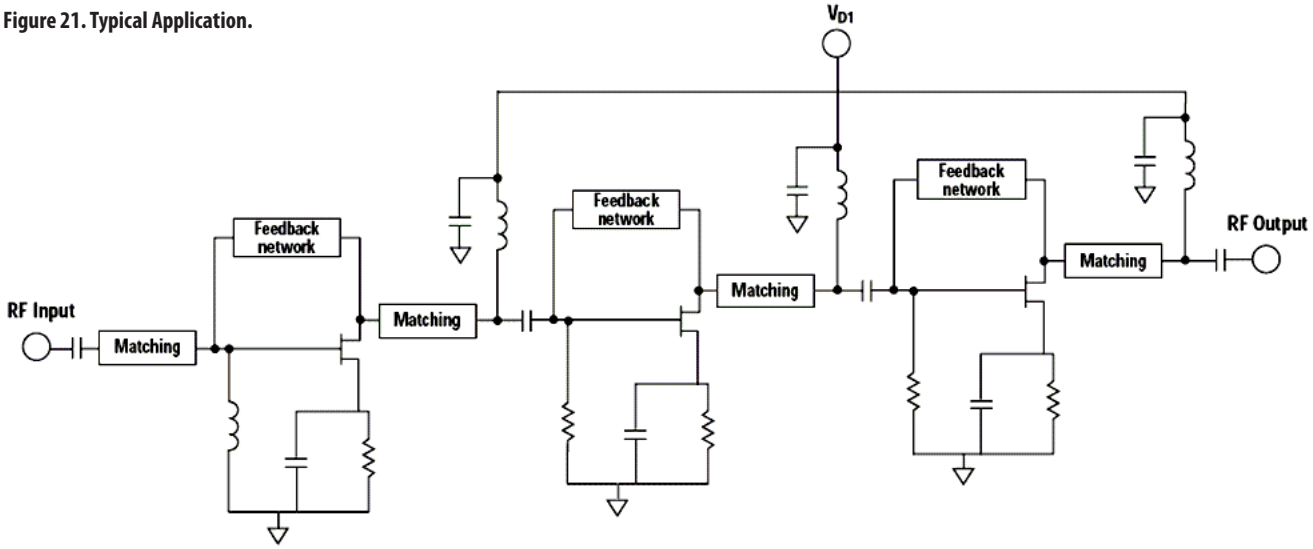



**Figure 22. Simplified MMIC Schematics.**

## Manual Assembly

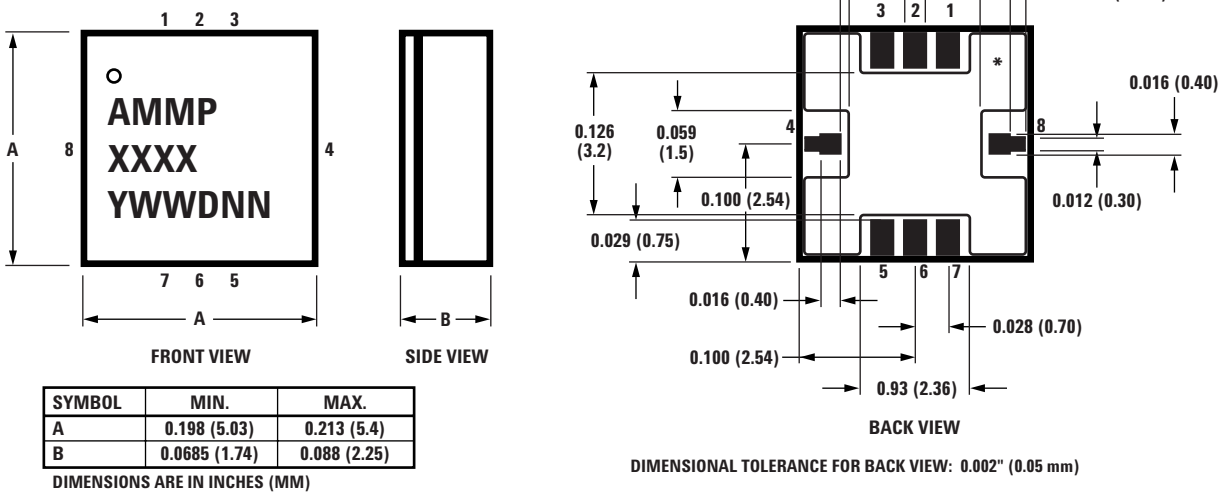
1. Follow ESD precautions while handling packages.
2. Handling should be along the edges with tweezers.
3. Recommended attachment is conductive solder paste.

   Please see recommended solder reflow profile. Conductive

   epoxy is not recommended. Hand soldering is not recommended.
4. Apply solder paste using a stencil printer or dot placement.

   The volume of solder paste will be dependent on PCB and component layout and should be controlled to ensure consistent mechanical and electrical performance.
5. Follow solder paste and vendor's recommendations when developing a solder reflow profile. A standard profile will have a steady ramp up from room temperature to the pre-heat temperature to avoid damage due to thermal shock.
6. Packages have been qualified to withstand a peak temperature of 260°C for 20 seconds. Verify that the profile will not expose device beyond these limits.

## Outline Drawing




| SYMBOL | MIN. | MAX. |
|---|---|---|
| A | 0.198 (5.03) | 0.213 (5.4) |
| B | 0.0685 (1.74) | 0.088 (2.25) |

DIMENSIONS ARE IN INCHES (MM)

DIMENSIONAL TOLERANCE FOR BACK VIEW: 0.002" (0.05 mm)

NOTES:
1. * INDICATES PIN 1
2. DIMENSIONS ARE IN INCHES (MILLIMETERS)
3. ALL GROUNDS MUST BE SOLDERED TO PCB RF GROUND

**Figure 24.Outline Drawing.**

## Stencil Design Guidelines

A properly designed solder screen or stencil is required to ensure optimum amount of solder paste is deposited onto the PCB pads. The recommended stencil layout is shown in Figure 26. The stencil has a solder paste deposition opening approximately 70% to 90% of the PCB pad. Reducing stencil opening can potentially generate more voids underneath. On the other hand, stencil openings larger than 100% will lead to excessive solder paste smear or bridging across the I/O pads. Considering the fact that solder paste thickness will directly affect the quality of the solder joint, a good choice is to use a laser cut stencil composed of 0.127 mm (5 mils) thick stainless steel which is capable of producing the required fine stencil outline.

The combined PCB and stencil layout is shown in Figure 27.

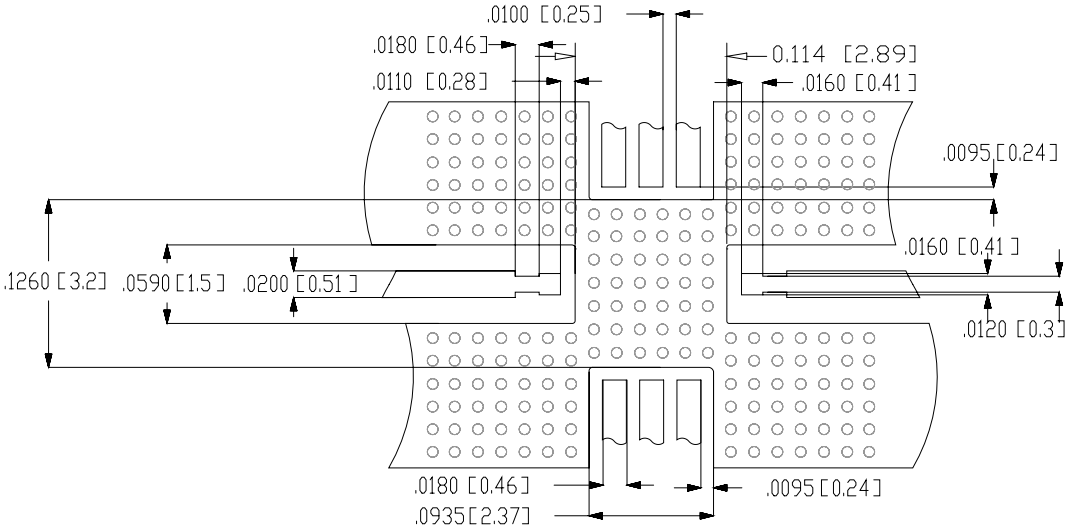



**Figure 25. Suggested PCB Land Pattern and Stencil Layout**

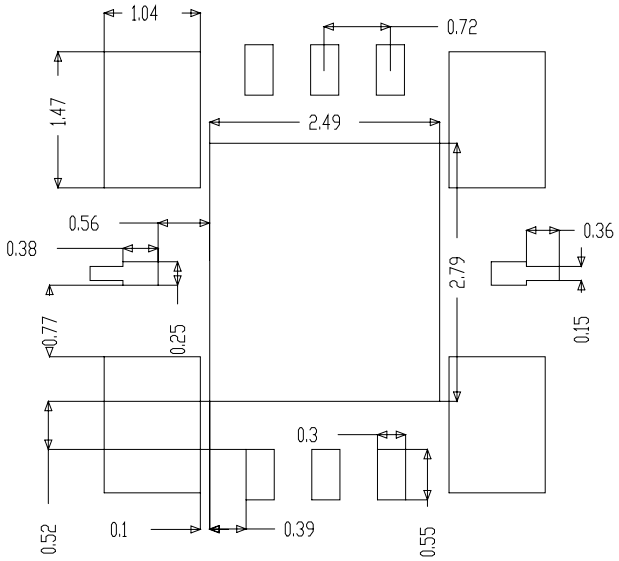



**Figure 26. Stencil Outline Drawing (mm)**

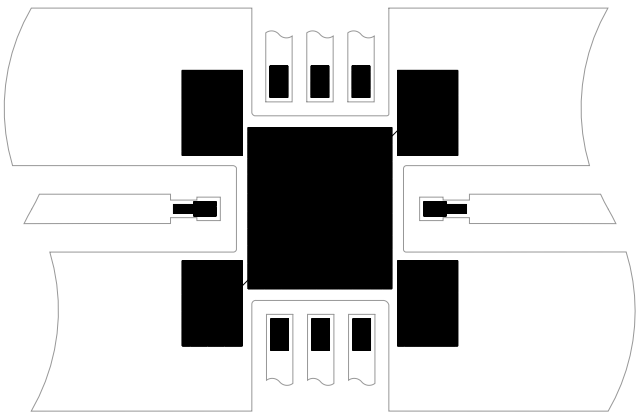
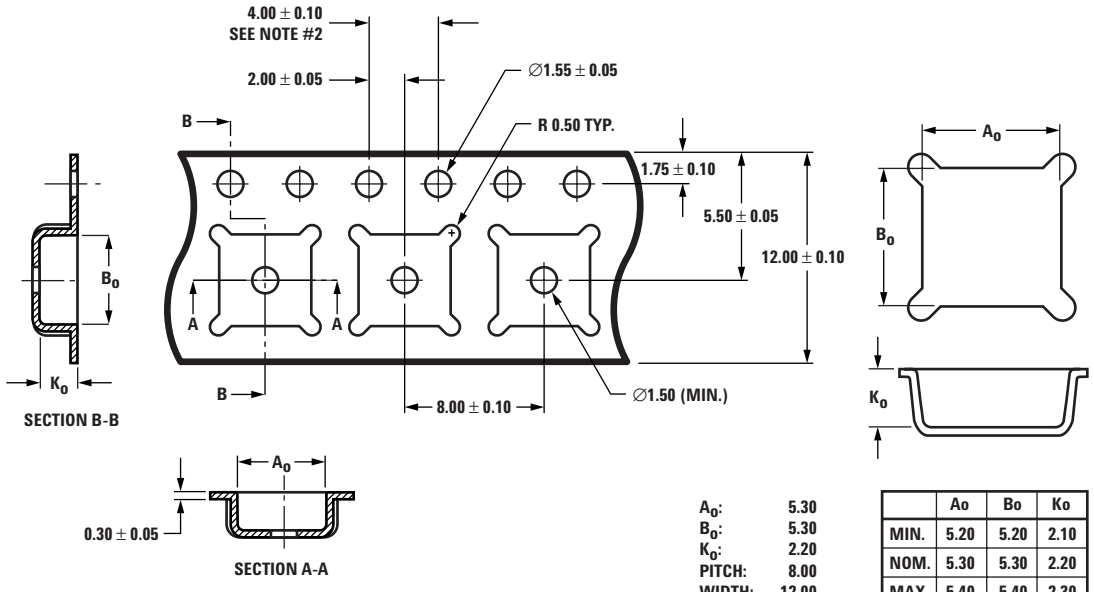


**Figure 27. Combined PCB and Stencil Layout**

## Carrier Tape and Pocket Dimensions

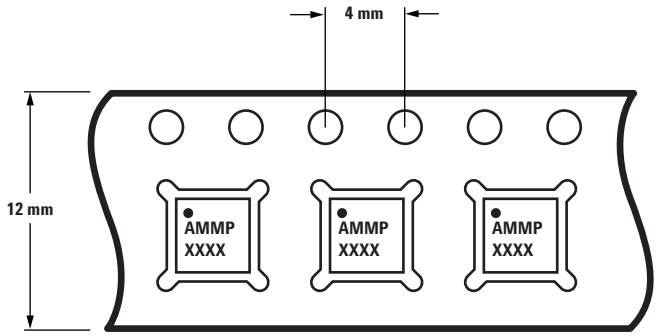



| | |
|---|---|
| $A_0$: | 5.30 |
| $B_0$: | 5.30 |
| $K_0$: | 2.20 |
| PITCH: | 8.00 |
| WIDTH: | 12.00 |

| | Ao | Bo | Ko |
|---|---|---|---|
| MIN. | 5.20 | 5.20 | 2.10 |
| NOM. | 5.30 | 5.30 | 2.20 |
| MAX. | 5.40 | 5.40 | 2.30 |

**NOTES:**
1. $A_0$ AND $B_0$ MEASURED AT 0.3 mm ABOVE BASE OF POCKET.
2. 10 PITCHES CUMULATIVE TOLERANCE IS ± 0.2 mm.
3. DIMENSIONS ARE IN MILLIMETERS (mm).

## Device Orientation (Top View)




## Part Number Ordering Information

| Part Number | Devices per Container | Container |
|---|---|---|
| AMMP-5620-BLKG | 10 | Antistatic Bag |
| AMMP-5620-TR1G | 100 | 7″ Reel |
| AMMP-5620-TR2G | 500 | 7″ Reel |

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**


AV02-0513EN - June 14, 2007