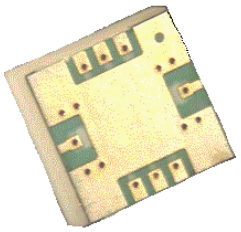
*Preliminary Information*

# AMMP-6420
# 6-18 GHz 1W Power Amplifier
## Data Sheet

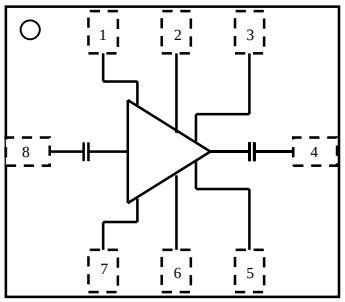


## Features

- **5x5mm Surface Mount Package**
- **Wide Frequency Range 6-18 GHz**
- **One Watt Output Power**
- **High Gain**
- **Partially Matched**
- **DC Supply Bias at 5V, -1V, 700 mA**
- **Integrated Output Power Detector**

## Applications

- Microwave Radio systems
- Satellite VSAT and DBS systems
- Commercial grade military
- 802.16 & 802.20 WiMax BWA systems
- WLL and MMDS loops




PACKAGE BASE GND

| Pin | Function |
|---|---|
| 1 | $V_g$ |
| 2 | $V_d$ |
| 3 | $DET_o$ |
| 4 | $RF_{Out}$ |
| 5 | $DET_R$ |
| 6 | $V_d$ |
| 7 | $V_g$ |
| 8 | $RF_{In}$ |

## Description

Agilent's AMMP-6420 is a high gain amplifier in a surface mount package that operates from 6 to 18 GHz. It is a cost-effective alternative in commercial communications systems to discrete FET hybrid or MIC amplifiers. The MMIC has a partial input and output match to 50Ω (-5dB typical return loss) but can be easily externally matched by single element lossy or reactive means (inductor or capacitor) for 20% frequency coverage (or 100% coverage if used in a balance configuration with Lange coupler) The MMIC is unconditionally stable over all frequencies and bias conditions. Bias can be applied from either side. Gate voltage is set using the Vg pin to optimize for linear or saturated power amplification. A reference and output detector allows differential output power detection over 15 dB of range. It is fabricated in a PHEMT process to provide exceptional power and gain performance.

### AMMP-6420: DC & RF Specifications

| Sym | Parameters/Conditions | | Typ. | Min/ Max |
|---|---|---|---|---|
| $V_d$ | Drain Supply Voltage | V | 5 | |
| $V_g$ | Gate Voltage | V | -0.8 | |
| $I_D$ | Drain Supply Current | mA | 750 | 800 |
| Gain | Small-signal Gain | dB | 19 | 15 |
| $RL_{in}$ | Input Return Loss | dB | -5 | |
| $RL_{out}$ | Output Return Loss | dB | -5 | |
| P-1dB | Power @ 1dB Gain Comp | dBm | 29 | 27 |
| Isol | Reverse Isolation | dB | -30 | -25 |
| OIP3 | Output 3rd Order Int Point | dBm | +39 | |
| Vdet | Power Detector Voltage | V/W | 0.2 | |



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**AMMP-6420 Typical Performances**

($T_A$ = 25°C, $V_d$ =5.0 V, $I_D$ = 750 mA, $Z_{in}$ = $Z_{out}$ = 50 Ω)

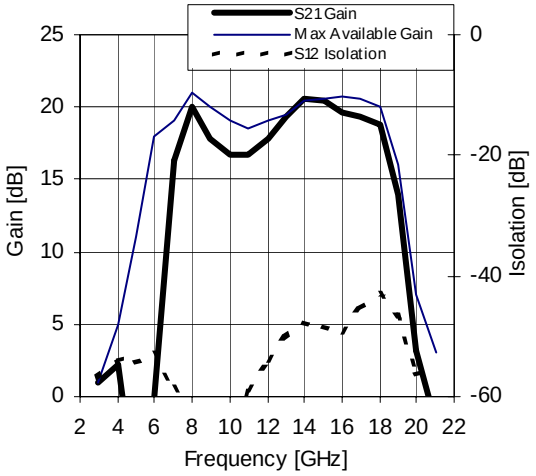


**Figure 1. Typical Gain and Reverse Isolation**

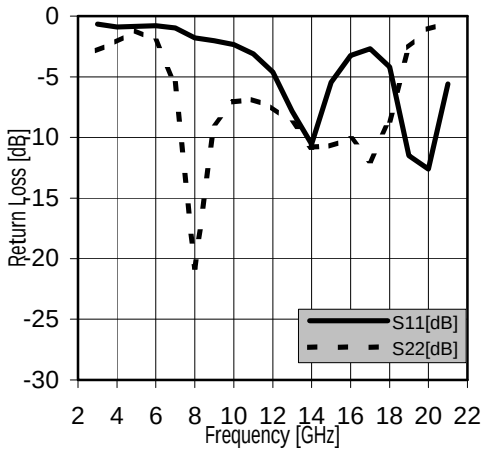


**Figure 2. Typical Input & Output Return Loss**

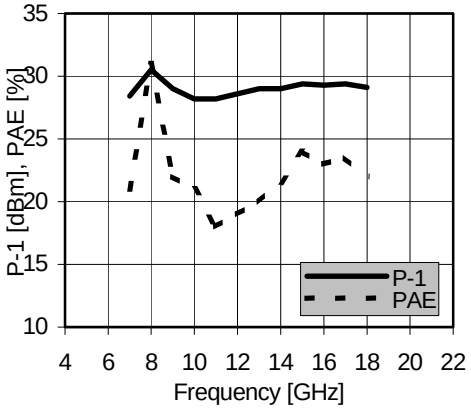


**Figure 3. Typical Output Power (P-1db) and PAE**

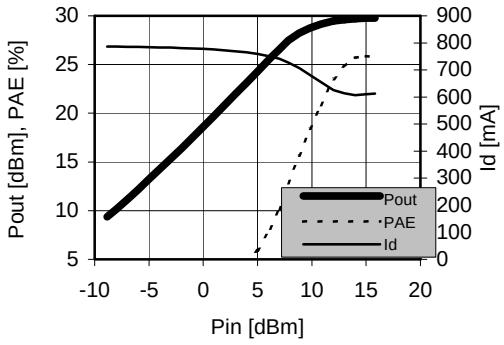


**Figure 4. Output Power, PAE, and Total Drain Current versus Input Power at 17GHz**

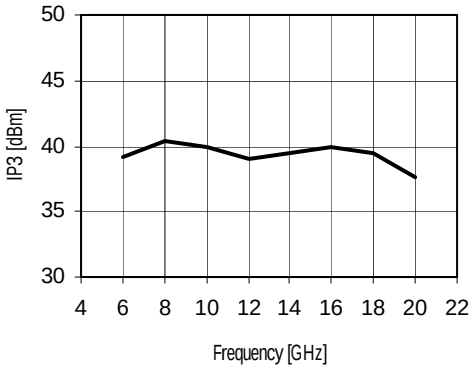


**Figure 5. Typical IP3 (Third Order Intercept)**

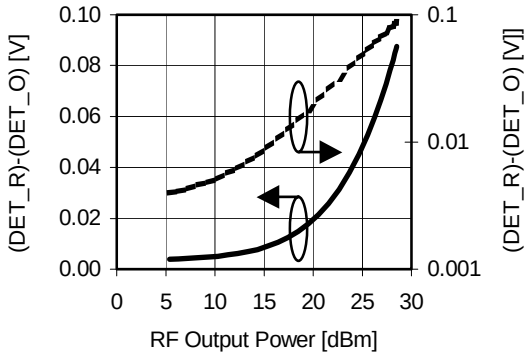


**Figure 6. Typical Detector voltage vs. Output Power**



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**Typical Scattering Parameters** [1], ($T_A$ = 25°C, $V_d$ =5.0 V, $I_D$ = 750 mA, $Z_{in}$ = $Z_{out}$ = 50 Ω)

| Freq | S11 | | | S21 | | | S12 | | | S22 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [GHz] | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase | dB | Mag | Phase |
| 1 | -0.87 | 0.91 | -54.11 | -22.86 | 0.07 | -38.55 | -85.33 | 0.0001 | 169.56 | -0.50 | 0.94 | -57.01 |
| 1.5 | -1.45 | 0.85 | -77.52 | -29.09 | 0.04 | -78.78 | -80.94 | 0.0001 | -175.18 | -0.48 | 0.95 | -83.04 |
| 2 | -2.05 | 0.79 | -98.38 | -38.89 | 0.01 | -86.10 | -800.00 | 0.0000 | 0.00 | -0.48 | 0.95 | -107.24 |
| 2.5 | -2.60 | 0.74 | -117.02 | -52.07 | 0.00 | -13.41 | -74.51 | 0.0002 | 82.70 | -0.53 | 0.94 | -129.93 |
| 3 | -3.13 | 0.70 | -133.84 | -40.04 | 0.01 | 132.81 | -95.11 | 0.0000 | -5.03 | -0.59 | 0.93 | -151.46 |
| 3.5 | -3.63 | 0.66 | -149.08 | -25.57 | 0.05 | 137.83 | -95.24 | 0.0000 | -70.69 | -0.79 | 0.91 | -172.69 |
| 4 | -4.16 | 0.62 | -162.85 | -14.78 | 0.18 | 122.75 | -79.98 | 0.0001 | 160.38 | -1.18 | 0.87 | 165.39 |
| 4.5 | -4.71 | 0.58 | -174.89 | -5.24 | 0.55 | 96.22 | -80.18 | 0.0001 | -76.68 | -1.99 | 0.80 | 141.75 |
| 5 | -5.29 | 0.54 | 175.16 | 3.44 | 1.49 | 56.13 | -74.19 | 0.0002 | -71.45 | -3.83 | 0.64 | 114.07 |
| 5.5 | -5.73 | 0.52 | 167.60 | 10.58 | 3.38 | 0.78 | -68.60 | 0.0004 | -155.78 | -8.60 | 0.37 | 77.29 |
| 6 | -5.85 | 0.51 | 161.58 | 14.63 | 5.39 | -64.52 | -63.48 | 0.0007 | 161.36 | -24.98 | 0.06 | -87.52 |
| 6.5 | -5.65 | 0.52 | 155.54 | 15.64 | 6.05 | -123.83 | -62.90 | 0.0007 | 110.41 | -8.61 | 0.37 | -165.36 |
| 7 | -5.19 | 0.55 | 148.54 | 15.42 | 5.90 | -171.25 | -62.76 | 0.0007 | 64.88 | -5.31 | 0.54 | 165.39 |
| 7.5 | -4.68 | 0.58 | 139.87 | 15.06 | 5.66 | 149.79 | -61.90 | 0.0008 | 21.69 | -4.11 | 0.62 | 143.61 |
| 8 | -4.25 | 0.61 | 130.07 | 14.92 | 5.57 | 115.92 | -61.14 | 0.0009 | -15.34 | -3.72 | 0.65 | 125.20 |
| 8.5 | -3.96 | 0.63 | 119.80 | 15.07 | 5.67 | 84.71 | -61.19 | 0.0009 | -53.65 | -3.80 | 0.65 | 108.20 |
| 9 | -3.79 | 0.65 | 109.47 | 15.48 | 5.94 | 54.35 | -59.70 | 0.0010 | -84.79 | -4.23 | 0.61 | 92.39 |
| 9.5 | -3.70 | 0.65 | 99.32 | 16.07 | 6.36 | 23.93 | -57.70 | 0.0013 | -118.53 | -5.08 | 0.56 | 77.76 |
| 10 | -3.65 | 0.66 | 89.33 | 16.76 | 6.88 | -7.01 | -55.71 | 0.0016 | -148.81 | -6.27 | 0.49 | 64.46 |
| 10.5 | -3.61 | 0.66 | 79.50 | 17.47 | 7.47 | -38.42 | -54.00 | 0.0020 | 179.69 | -7.79 | 0.41 | 52.94 |
| 11 | -3.55 | 0.66 | 69.50 | 18.24 | 8.16 | -70.18 | -51.89 | 0.0025 | 150.91 | -9.71 | 0.33 | 43.04 |
| 11.5 | -3.44 | 0.67 | 58.76 | 19.13 | 9.05 | -102.74 | -50.21 | 0.0031 | 120.36 | -12.29 | 0.24 | 32.52 |
| 12 | -3.37 | 0.68 | 46.60 | 20.22 | 10.26 | -137.44 | -48.36 | 0.0038 | 89.71 | -17.94 | 0.13 | 20.35 |
| 12.5 | -3.45 | 0.67 | 32.92 | 21.28 | 11.59 | -176.87 | -47.00 | 0.0045 | 57.43 | -23.00 | 0.07 | 162.57 |
| 13 | -3.85 | 0.64 | 13.79 | 21.40 | 11.75 | 142.33 | -44.15 | 0.0062 | 30.43 | -9.62 | 0.33 | 135.14 |
| 13.5 | -5.88 | 0.51 | 0.42 | 21.48 | 11.86 | 99.76 | -43.54 | 0.0067 | -17.97 | -5.26 | 0.55 | 106.88 |
| 14 | -7.35 | 0.43 | -5.47 | 20.42 | 10.50 | 57.22 | -44.62 | 0.0059 | -59.39 | -3.42 | 0.67 | 80.19 |
| 14.5 | -8.02 | 0.40 | -11.98 | 19.04 | 8.95 | 20.45 | -45.60 | 0.0052 | -92.99 | -2.93 | 0.71 | 56.91 |
| 15 | -8.42 | 0.38 | -22.81 | 17.91 | 7.86 | -12.89 | -46.42 | 0.0048 | -124.14 | -3.03 | 0.71 | 36.82 |
| 15.5 | -9.02 | 0.35 | -38.63 | 17.16 | 7.21 | -45.24 | -46.76 | 0.0046 | -155.91 | -3.50 | 0.67 | 18.44 |
| 16 | -9.99 | 0.32 | -59.66 | 16.76 | 6.89 | -78.40 | -46.65 | 0.0047 | 172.05 | -4.24 | 0.61 | 0.84 |
| 16.5 | -11.32 | 0.27 | -88.81 | 16.62 | 6.78 | -113.79 | -46.21 | 0.0049 | 135.75 | -5.30 | 0.54 | -16.80 |
| 17 | -12.58 | 0.23 | -129.48 | 16.57 | 6.74 | -152.21 | -45.93 | 0.0051 | 97.60 | -6.89 | 0.45 | -35.36 |
| 17.5 | -12.37 | 0.24 | -178.96 | 16.45 | 6.64 | 165.77 | -45.34 | 0.0054 | 54.57 | -9.41 | 0.34 | -55.07 |
| 18 | -10.42 | 0.30 | 135.67 | 16.04 | 6.34 | 119.59 | -45.72 | 0.0052 | 9.79 | -14.81 | 0.18 | -71.02 |
| 18.5 | -8.13 | 0.39 | 98.32 | 15.07 | 5.67 | 69.37 | -46.75 | 0.0046 | -42.66 | -21.32 | 0.09 | -2.67 |
| 19 | -6.44 | 0.48 | 64.76 | 13.21 | 4.58 | 16.14 | -49.85 | 0.0032 | -99.91 | -10.63 | 0.29 | -0.14 |
| 19.5 | -5.54 | 0.53 | 32.49 | 10.33 | 3.29 | -37.14 | -54.54 | 0.0019 | -174.42 | -6.40 | 0.48 | -35.36 |
| 20 | -5.33 | 0.54 | -0.33 | 6.65 | 2.15 | -88.56 | -54.97 | 0.0018 | 100.12 | -4.59 | 0.59 | -73.82 |
| 20.5 | -5.63 | 0.52 | -37.08 | 2.37 | 1.31 | -138.35 | -52.19 | 0.0025 | 36.40 | -3.75 | 0.65 | -110.91 |
| 21 | -6.21 | 0.49 | -81.51 | -2.59 | 0.74 | 172.10 | -51.29 | 0.0027 | -8.72 | -3.30 | 0.68 | -145.06 |
| 21.5 | -6.54 | 0.47 | -133.73 | -8.62 | 0.37 | 123.31 | -51.19 | 0.0028 | -48.36 | -2.95 | 0.71 | -175.67 |
| 22 | -6.04 | 0.50 | 176.00 | -16.11 | 0.16 | 77.94 | -52.06 | 0.0025 | -86.25 | -2.57 | 0.74 | 158.19 |
| 22.5 | -5.17 | 0.55 | 136.35 | -25.54 | 0.05 | 38.87 | -55.52 | 0.0017 | -123.07 | -2.27 | 0.77 | 135.92 |
| 23 | -4.42 | 0.60 | 107.30 | -38.98 | 0.01 | 25.37 | -59.02 | 0.0011 | -141.45 | -1.99 | 0.80 | 116.67 |
| 23.5 | -3.84 | 0.64 | 85.86 | -42.63 | 0.01 | 95.60 | -64.94 | 0.0006 | -153.62 | -1.77 | 0.82 | 100.50 |
| 24 | -3.39 | 0.68 | 68.76 | -40.35 | 0.01 | 72.97 | -76.41 | 0.0002 | -154.09 | -1.57 | 0.83 | 86.10 |
| 24.5 | -3.03 | 0.71 | 54.55 | -42.31 | 0.01 | 37.28 | -72.38 | 0.0002 | -115.43 | -1.39 | 0.85 | 73.34 |
| 25 | -2.78 | 0.73 | 42.25 | -45.89 | 0.01 | 6.70 | -77.30 | 0.0001 | -145.84 | -1.25 | 0.87 | 62.16 |
| 25.5 | -2.61 | 0.74 | 31.43 | -49.21 | 0.00 | -19.68 | -69.79 | 0.0003 | -11.93 | -1.16 | 0.88 | 51.84 |



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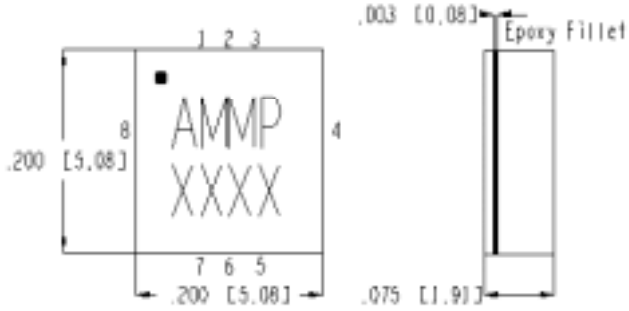
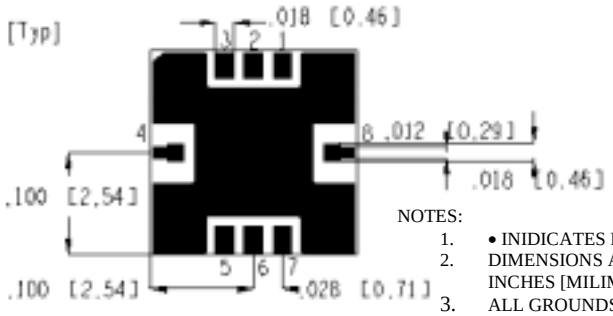
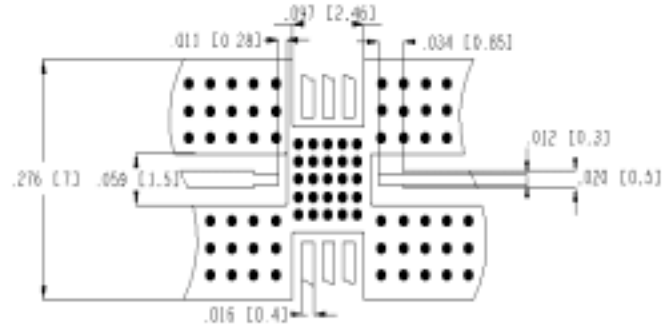
## Outline Drawing



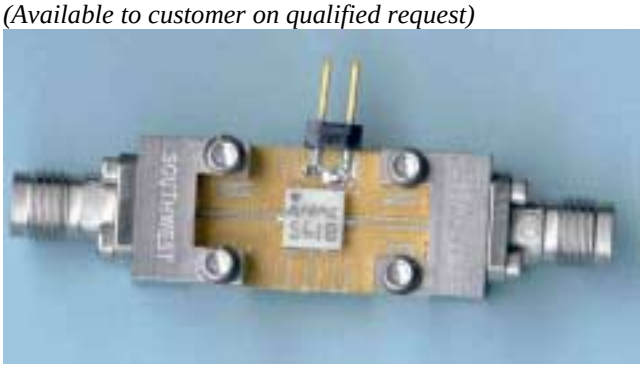

NOTES:
1. • INIDICATES PIN 1
2. DIMENSIONS ARE IN INCHES [MILIMETERS]
3. ALL GROUNDS MUST BE SOLDERED TO PCB RF GROUND

## Suggested PCB Material and Land Pattern




## Evaluation Test Circuit (Demo Board)

*(Available to customer on qualified request)*



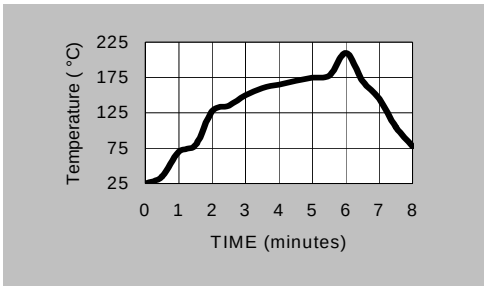
## Recommended SMT Attachment

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 from www.agilent.com/view/rf or upon request from Agilent Application Engineering.

Manual Assembly for Prototypes

1. Follow ESD precautions while handling packages.
2. Handling should be along the edges with tweezers or from topside if using a vacuum collet.
3. Recommended attachment is solder paste. Please see recommended solder reflow profile. Conductive epoxy is not recommended. Hand soldering is not recommended.
4. Apply solder paste using either 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. ***Excessive solder will degrade RF 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 235°C for 15 seconds. Verify that the profile will not expose device beyond these limits.
7. Clean off flux per vendor's recommendations.
8. Clean the module with Acetone. Rinse with alcohol. Allow the module to fully dry before testing.




*Recommended solder reflow profile*

For product information and a complete list of Agilent contacts and distributors, please go to our website:
www.agilent.com/semiconductors
*E-mail:* SemiconductorSupport@agilent.com
Data subject to change.

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