# AWL6152

2.4 GHz Wireless LAN
Power Amplifier Module

**ADVANCED PRODUCT INFORMATION - Rev 0.2**

## FEATURES

- InGaP HBT Technology
- < 3.5% EVM at +25 dBm Output Power (+5 V Supply), with 802.11g Modulation at 54 Mbps Data Rate
- < 3% EVM at +21 dBm Output Power (+3.3 V Supply), with 802.11g Modulation at 54 Mbps Data Rate
- +3 V to +5 V Supply
- High Efficiency
- 4 x 4 x 1.5 mm Surface Mount Module
- 50Ω - Matched RF Ports for Reduced External Component Count



## APPLICATIONS

- 802.11g/b WLAN Stations and Client Cards
- 802.11g/b WLAN Access Points


**M7 Package**
**10 Pin 4mm x 4mm**
**Surface Mount Module**

## PRODUCT DESCRIPTION

The ANADIGICS AWL6152 WLAN Power Amplifier is an easy to use module that delivers high levels of linearity and efficiency for high data rate applications. Designed for the 2.4 GHz WLAN standards, it supports the 54 Mbps data rates specified in IEEE 802.11g.

Requiring a single +3 V to +5 V supply and a reference voltage input, the AWL6152 reduces system power consumption by offering a low leakage current while the amplifier is shut down. No external circuits are required for RF impedance matching, thus reducing component costs and making it easy to incorporate the device into new designs.

The AWL6152 is manufactured using an advanced InGaP HBT technology that offers state-of-the-art reliability, temperature stability and ruggedness. It is offered in a 4mm x 4mm x 1.5mm surface mount module optimized for a 50Ω system.

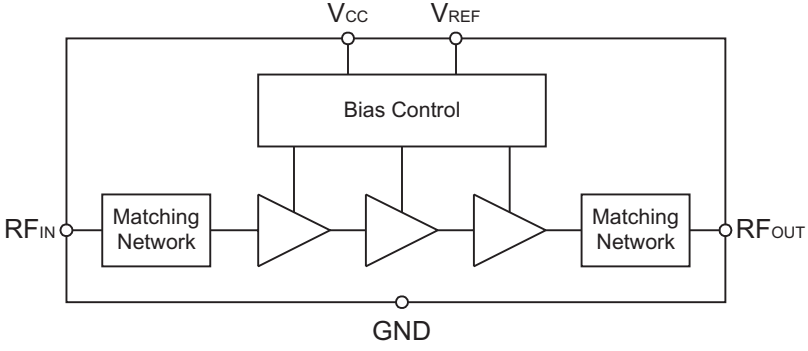



**Figure 1: Module Block Diagram**

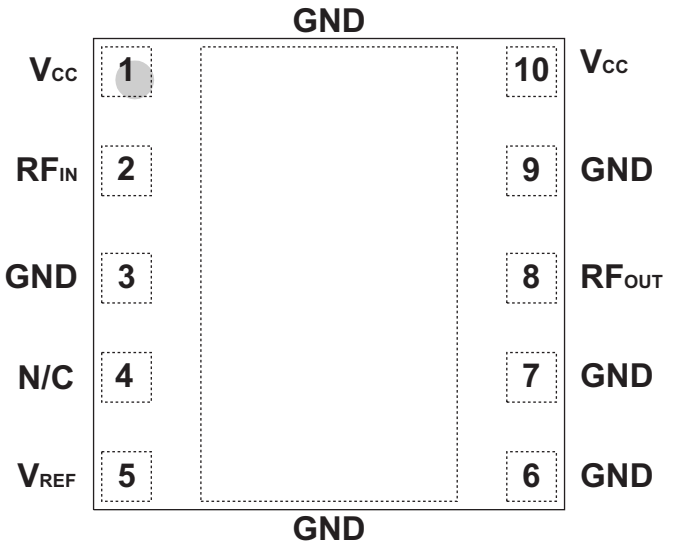





**Figure 2: Pinout (X-ray Top View)**

**Table 1: Pin Description**

| PIN | NAME | DESCRIPTION |
|---|---|---|
| 1 | $V_{CC}$ | Supply Voltage |
| 2 | $RF_{IN}$ | RF Input |
| 3 | GND | Ground |
| 4 | N/C | No Connection |
| 5 | $V_{REF}$ | Reference Voltage |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | $RF_{OUT}$ | RF Output |
| 9 | GND | Ground |
| 10 | $V_{CC}$ | Supply Voltage |

## ELECTRICAL CHARACTERISTICS

**Table 2: Absolute Minimum and Maximum Ratings**

| PARAMETER | MIN | MAX | UNIT |
|---|---|---|---|
| Supply Voltage ($V_{CC}$) | 0 | +5.5 | V |
| Reference Voltage ($V_{REF}$) | 0 | +3.5 | V |
| RF Input Power ($P_{IN}$) | - | +10 | dBm |
| Storage Temperature | -40 | +150 | °C |

**Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.**



**Table 3: Operating Ranges**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Operating Frequency (f) | 2400 | - | 2485 | MHz | |
| Supply Voltage ($V_{CC}$) | +3.0 | - | +5.5 | V | |
| Reference Voltage ($V_{REF}$) | -<br>0 | +2.85<br>- | -<br>+0.5 | V | PA"on"<br>PA"shut down" |
| RF Output Power ($P_{OUT}$) | -<br>-<br>-<br>- | +21<br>+25<br>+25<br>+28 | -<br>-<br>-<br>- | dBm | $V_{CC}$ = +3.3 V, 802.11g modulation<br>$V_{CC}$ = +5.0 V, 802.11g modulation<br>$V_{CC}$ = +3.3 V, 802.11b modulation<br>$V_{CC}$ = +5.0 V, 802.11b modulation |
| Case Temperature ($T_C$) | -25 | - | +85 | °C | |

**The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.**

**Table 4: Electrical Specifications - 802.11g Modulation, 54 Mbps Data Rate**
**($T_C$ = +25 °C, $V_{CC}$ = +3.3 V, $V_{REF}$ = +2.85 V, $P_{OUT}$ = +21 dBm, 50 Ω system)**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Gain | - | 31.5 | - | dB | |
| Gain Ripple | - | - | 0.3 | dB | within each channel |
| Constellation RMS Error | -<br>- | 3<br>-30 | -<br>- | %<br>dB | |
| Spectrum Mask at ±11 MHz Offset | - | - | -20 | dB | |
| Spectrum Mask at ±20 MHz Offset | - | - | -28 | dB | |
| Spectrum Mask at ±30 MHz Offset | - | - | -40 | dB | |
| Current Consumption<br>$V_{CC}$<br>$V_{REF}$ | <br>-<br>- | <br>190<br>5.5 | <br>-<br>- | mA | |
| Leakage Current | - | <10 | - | µA | $V_{REF}$ = 0 V |
| Input Return Loss | - | <-10 | - | dB | 50 Ω impedance |
| P1dB | - | +28 | - | dBm | CW tone |
| Harmonics<br>2fo<br>3fo | <br>-<br>- | <br>-45<br>-56 | <br>-<br>- | dBc | |
| Maximum load mismatch stress with no permanent degradation or failure | 10:1 | - | - | VSWR | $V_{CC}$ = +5.5 V |

**Table 5: Electrical Specifications - 802.11g Modulation, 54 Mbps Data Rate**
**($T_C$ = +25 °C, $V_{CC}$ = +5 V, $V_{REF}$ = +2.85 V, $P_{OUT}$ = +25 dBm, 50 Ω system)**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Gain | - | 32.5 | - | dB | |
| Gain Ripple | - | - | 0.3 | dB | within each channel |
| Constellation RMS Error | -<br>- | 3.5<br>-29 | -<br>- | %<br>dB | |
| Spectrum Mask at ±11 MHz Offset | - | - | -20 | dB | |
| Spectrum Mask at ±20 MHz Offset | - | - | -28 | dB | |
| Spectrum Mask at ±30 MHz Offset | - | - | -40 | dB | |
| Current Consumption<br>$V_{CC}$<br>$V_{REF}$ | <br>-<br>- | <br>290<br>5.5 | <br>-<br>- | mA | |
| Leakage Current | - | <10 | - | µA | $V_{REF}$ = 0 V |
| Input Return Loss | - | <-10 | - | dB | 50 Ω impedance |
| P1dB | - | +31 | - | dBm | CW tone |
| Harmonics<br>2fo<br>3fo | <br>-<br>- | <br>-42<br>-56 | <br>-<br>- | dBc | |
| Maximum load mismatch stress with no permanent degradation or failure | 10:1 | - | - | VSWR | $V_{CC}$ = +5.5 V |

**Table 6: Electrical Specifications - 802.11b Modulation**
**($T_C$ = +25 °C, $V_{CC}$ = +3.3 V, $V_{REF}$ = +2.85 V, $P_{OUT}$ = +25 dBm, 50 Ω system)**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Gain | - | 31.5 | - | dB | |
| First Sidelobe Power | - | - | -30 | dBc | Gaussian filtering |
| Second Sidelobe Power | - | - | -50 | dBc | Gaussian filtering |
| Current Consumption<br>$V_{CC}$<br>$V_{REF}$ | <br>-<br>- | <br>300<br>5.5 | <br>-<br>- | mA | |
| Leakage Current | - | <10 | - | µA | $V_{REF}$ = 0 V |
| Input Return Loss | - | <-10 | - | dB | 50 Ω impedance |
| P1dB | - | +28 | - | dBm | CW tone |
| Harmonics<br>2fo<br>3fo | <br>-<br>- | <br>-50<br>-63 | <br>-<br>- | dBc | CW Input |
| Maximum load mismatch stress with no permanent degradation or failure | 10:1 | - | - | VSWR | $V_{CC}$ = +5.5 V |

**Table 7: Electrical Specifications - 802.11b Modulation**
**($T_C$ = +25 °C, $V_{CC}$ = +5 V, $V_{REF}$ = +2.85 V, $P_{OUT}$ = +28 dBm, 50 Ω system)**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Gain | - | 32.5 | - | dB | |
| First Sidelobe Power | - | - | -30 | dBc | Gaussian filtering |
| Second Sidelobe Power | - | - | -50 | dBc | Gaussian filtering |
| Current Consumption<br>$V_{CC}$<br>$V_{REF}$ | <br>-<br>- | <br>420<br>5.5 | <br>-<br>- | mA | |
| Leakage Current | - | <10 | - | µA | $V_{REF}$ = 0 V |
| Input Return Loss | - | <-10 | - | dB | 50 Ω impedance |
| P1dB | - | +31 | - | dBm | CW tone |
| Harmonics<br>2fo<br>3fo | <br>-<br>- | <br>-50<br>-63 | <br>-<br>- | dBc | CW Input |
| Maximum load mismatch stress with no permanent degradation or failure | 10:1 | - | - | VSWR | $V_{CC}$ = +5.5 V |

## PERFORMANCE DATA

**Figure 3: EVM and Gain vs. Frequency ($T_A$ = +25 °C, $V_{CC}$ = +3.3 V, $V_{REF}$ = +2.85 V, $P_{OUT}$ = +21 dBm, 54 Mbps 802.11g)**

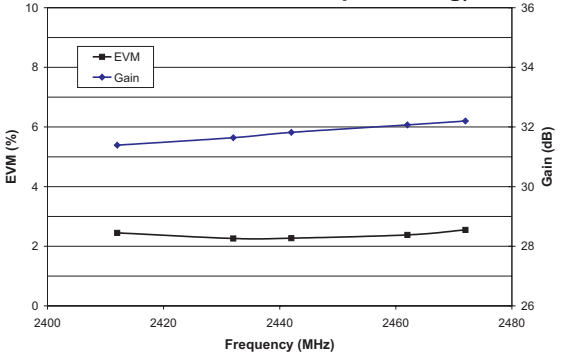



**Figure 4: EVM and Gain vs. Frequency ($T_A$ = +25 °C, $V_{CC}$ = +5 V, $V_{REF}$ = +2.85 V, $P_{OUT}$ = +25 dBm, 54 Mbps 802.11g)**

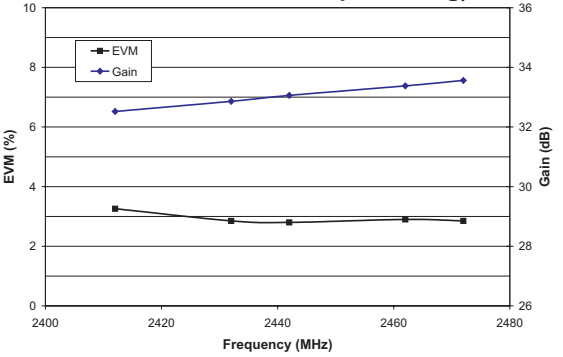





**Figure 5: Gain and Current Consumption vs. Output Power ($T_A$ = +25 °C, $V_{CC}$ = +3.3 V, $V_{REF}$ = +2.85 V, f = 2472 MHz, 54 Mbps 802.11g)**

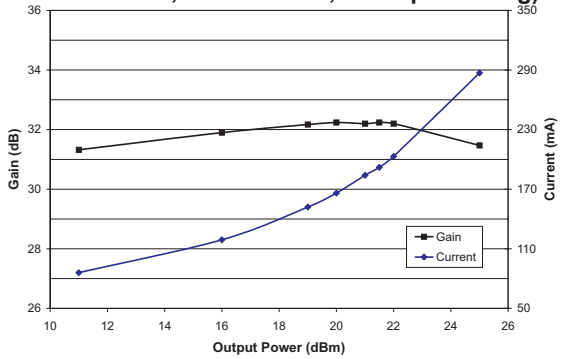



**Figure 6: Gain and Current Consumption vs. Output Power ($T_A$ = +25 °C, $V_{CC}$ = +5 V, $V_{REF}$ = +2.85 V, f = 2472 MHz, 54 Mbps 802.11g)**

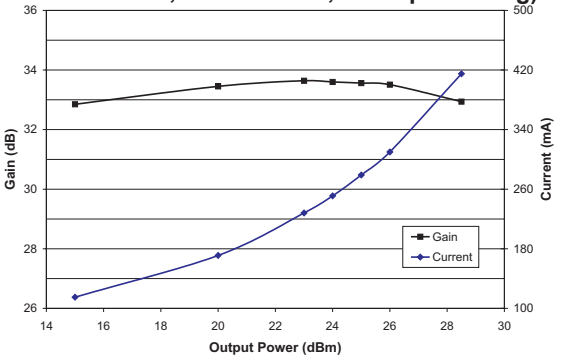


**Figure 7: Gain and Current Consumption vs. $V_{REF}$ ($T_A$ = +25 °C, $V_{CC}$ = +3.3 V, f = 2472 MHz, $P_{OUT}$ = +21 dBm, 54 Mbps 802.11g)**

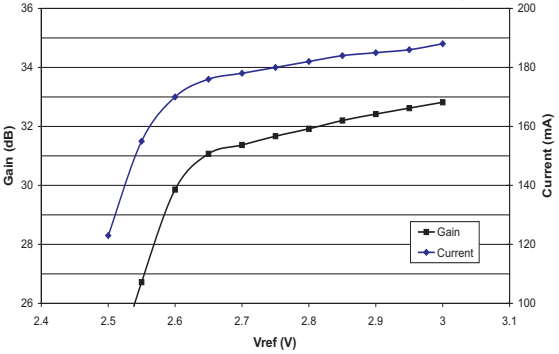



**Figure 8: Gain and Current Consumption vs. $V_{REF}$ ($T_A$ = +25 °C, $V_{CC}$ = +5 V, f = 2472 MHz, $P_{OUT}$ = +25 dBm, 54 Mbps 802.11g)**

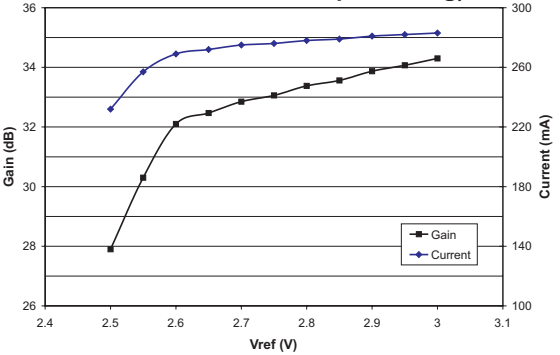





**Figure 9: EVM vs. $V_{REF}$ ($T_A$ = +25 °C, f = 2472 MHz, 54 Mbps 802.11g)**

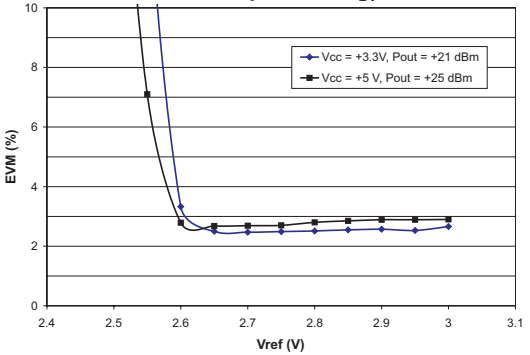
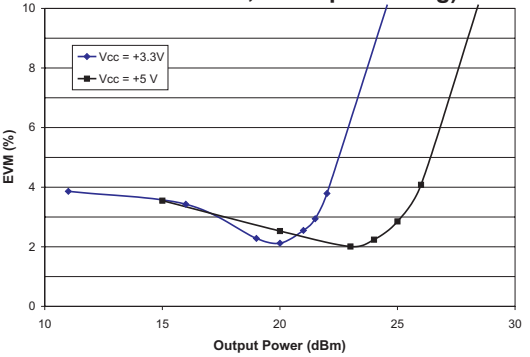



**Figure 10: EVM vs. Output Power ($T_A$ = +25 °C, $V_{REF}$ = +2.85 V, f = 2472 MHz, 54 Mbps 802.11g)**



## APPLICATION INFORMATION

The only external components required for the AWL6152 are bypass capacitors for the supply and reference voltages (see Figure 11). When $V_{REF}$ is pulled down to 0 V, the amplifier is placed in a low-current shut down mode.

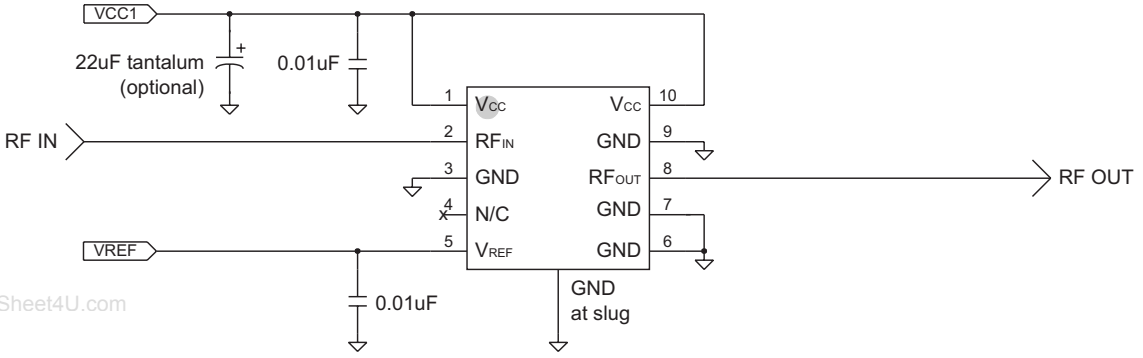
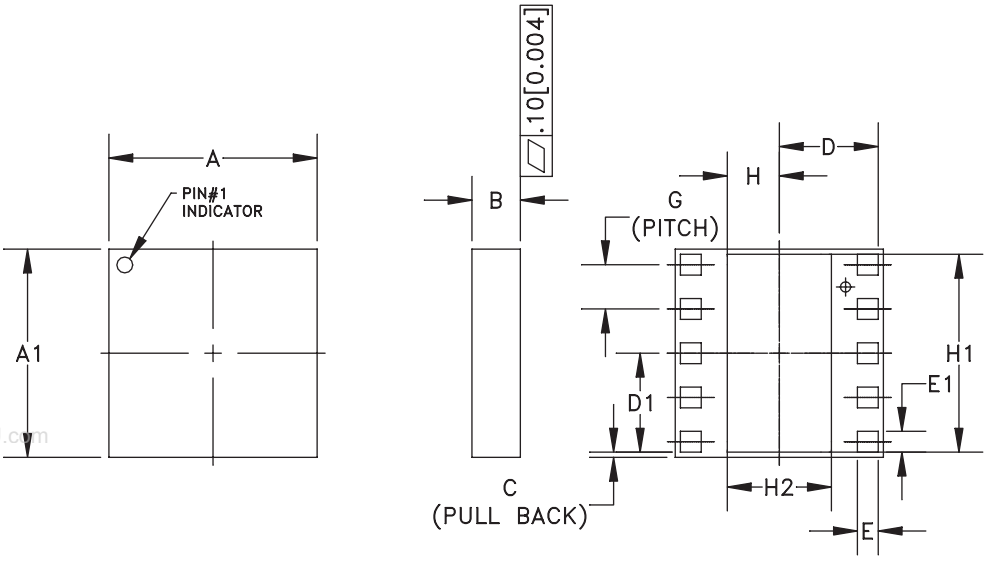





**Figure 11: Application Circuit**

## PACKAGE OUTLINE






| SYMBOL | MILLIMETERS | | | INCHES | | | NOTE |
|---|---|---|---|---|---|---|---|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | |
| A | 3.88 | 4.00 | 4.12 | 0.152 | 0.157 | 0.162 | – |
| A1 | 3.88 | 4.00 | 4.12 | 0.152 | 0.157 | 0.162 | – |
| B | 1.26 | 1.41 | 1.56 | 0.049 | 0.055 | 0.061 | – |
| C | – | 0.10 | – | – | 0.004 | – | – |
| D | – | 1.90 | – | – | 0.075 | – | – |
| D1 | – | 1.90 | – | – | 0.075 | – | – |
| E | 0.35 | 0.40 | 0.45 | 0.013 | 0.015 | 0.017 | – |
| E1 | 0.35 | 0.40 | 0.45 | 0.013 | 0.015 | 0.017 | – |
| G | 0.85 BSC | | | 0.033 BSC | | | – |
| H | – | 1.00 | – | – | 0.039 | – | – |
| H1 | – | 3.80 | – | – | 0.149 | – | – |
| H2 | – | 2.00 | – | – | 0.078 | – | – |

NOTES:

1. CONTROLLING DIMENSIONS: MILLIMETERS
2. UNLESS SPECIFIED TOLERANCE=±0.076[0.003].
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**Figure 12: M7 Package Outline - 10 Pin 4mm x 4mm Surface Mount Module**

## ORDERING INFORMATION

| ORDER NUMBER | TEMPERATURE RANGE | PACKAGE DESCRIPTION | COMPONENT PACKAGING |
|---|---|---|---|
| AWL6152M7P8 | -25 °C to +85°C | 10 Pin 4mm x 4mm Surface Mount Module | 2,500 piece Tape and Reel |



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