

## FEATURES

- 3% Dynamic EVM @  $P_{OUT} = +17$  dBm with IEEE 802.11a 64 QAM OFDM at 54 Mbps
- 3% Dynamic EVM @  $P_{OUT} = +20$  dBm with IEEE 802.11g 64 QAM OFDM at 54 Mbps
- -30 dBc 1st Sidelobe / -50 dBc 2nd Sidelobe at +22.5 dBm w/ IEEE 802.11b, 1 Mbps CCK/ DSSS
- 31 dB of Linear Power Gain in 2 GHz and 5 GHz Transmit Paths
- 2.6 dB Noise Figure in 2 GHz Receive Path and 2.5 dB in 5 GHz Receive Path
- Single +3.3 V Nominal Supply
- SP3T RF Switch w/Bluetooth and 2 GHz Tx/Rx
- SP2T RF Switch for 5 GHz Tx/Rx Function
- Independent Switch Control for BT, 2 GHz, and 5 GHz Tx/Rx Paths
- 12 dB Gain in 2 GHz Receive Path and 14 dB in 5 GHz Receive Path
- LNA Bypass Mode in 2 GHz and 5 GHz Receive Paths
- 50  $\Omega$  - Matched RF Ports
- Leadfree Package
- Materials set consistent with RoHS Directive
- 4.0 x 4.0 x 0.55 mm QFN Package

## APPLICATIONS

- 802.11a/b/g/n WLAN for Fixed, Mobile, and Handheld applications

## PRODUCT DESCRIPTION

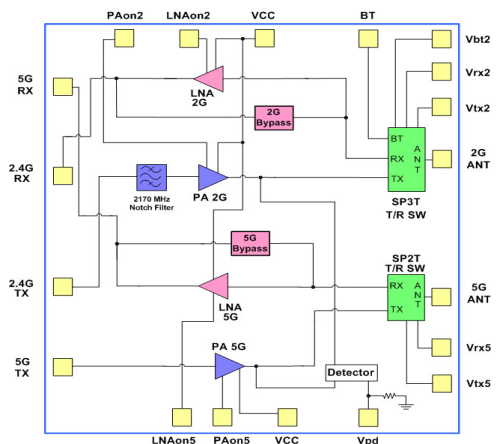
The ANADIGICS AWL9966 is a high performance FEIC that incorporates dual band power amplifiers, low-noise amplifiers, RF switches, and filters. The FEIC is designed for WLAN transmit and receive applications in the 2.412-2.484 GHz and 5.15-5.85 GHz bands. Matched to 50 Ohms at all RF inputs and outputs, the part requires no additional RF matching components off-chip. The antenna ports are switched between WLAN transmit, WLAN receive, Bluetooth, and simultaneous WLAN and Bluetooth paths with low loss RF switches. The PAs exhibit unparalleled



**S36 Package**  
**24 Pin 4 mm x 4 mm x 0.55 mm**  
**QFN**

linearity and efficiency for IEEE 802.11g, 802.11b, 802.11a and 802.11n WLAN systems under the toughest signal configurations within these standards.

A single temperature-compensated power detector is used in the FEIC to serve both WLAN bands. The detector provides a single-ended output voltage with excellent accuracy over a wide range of operating temperatures. All circuits are biased by a single +3.3V supply and consume ultra-low current in the OFF mode.



**Figure 1: Block Diagram and Pinout**

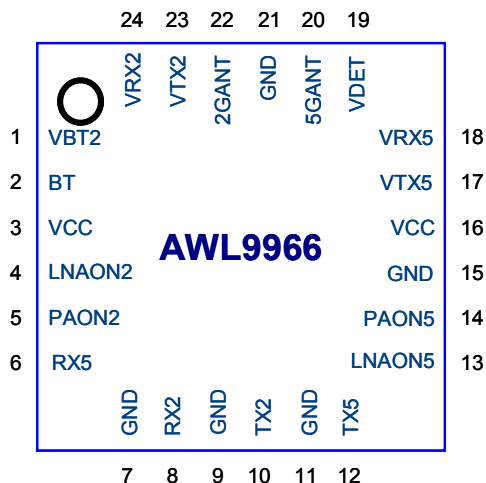


Figure 2: Pinout Diagram

Table 1: Pin Description

| PIN | NAME   | DESCRIPTION                                                                      | PIN | NAME   | DESCRIPTION                                                                      |
|-----|--------|----------------------------------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------|
| 1   | VBT2   | Bluetooth enable. On/Off control for the Bluetooth RF path.                      | 13  | LNAON5 | 5 GHz LNA Enable. On/Off control for the 5 GHz receive path low noise amplifier. |
| 2   | BT     | Bluetooth RF port.                                                               | 14  | PAON5  | 5 GHz PA Enable. On/Off control for the 5 GHz transmit path power amplifier.     |
| 3   | VCC    | Power Supply. Bias for transistors.                                              | 15  | GND    | Ground.                                                                          |
| 4   | LNAON2 | 2 GHz LNA Enable. On/Off control for the 2 GHz receive path low noise amplifier. | 16  | VCC    | Power Supply. Bias for transistors.                                              |
| 5   | PAON2  | 2 GHz PA Enable. On/Off control for the 2 GHz transmit path power amplifier.     | 17  | VTX5   | Switch control for 5 GHz transmit path.                                          |
| 6   | RX5    | 5 GHz RF receive output port.                                                    | 18  | VRX5   | Switch control for 5 GHz receive path.                                           |
| 7   | GND    | Ground.                                                                          | 19  | VDET   | Power Detector Output. DC coupled power detector output                          |
| 8   | RX2    | 2 GHz RF receive output port.                                                    | 20  | 5GANT  | 5 GHz Antenna Port.                                                              |
| 9   | GND    | Ground.                                                                          | 21  | GND    | Ground.                                                                          |
| 10  | TX2    | 2 GHz RF transmit input port.                                                    | 22  | 2GANT  | 2 GHz Antenna Port.                                                              |
| 11  | GND    | Ground.                                                                          | 23  | VTX2   | Switch control for 2 GHz transmit path.                                          |
| 12  | TX5    | 5 GHz RF transmit input port.                                                    | 24  | VRX2   | Switch control for 2 GHz receive path.                                           |

**ELECTRICAL CHARACTERISTICS**

**Table 2: Absolute Minimum and Maximum Ratings**  
**Operating Conditions: T<sub>c</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, V<sub>controls</sub> = +3.3 V**

| PARAMETER                            | MIN       | MAX    | UNIT | COMMENTS                                                         |
|--------------------------------------|-----------|--------|------|------------------------------------------------------------------|
| DC Power Supply Voltages (VCC)       | -         | +6.0   | V    |                                                                  |
| RF Input Level, 2.4 GHz PA, 5 GHz PA | -         | +5     | dBm  | Modulated                                                        |
| Ambient Temperature                  | -40       | +85    | °C   |                                                                  |
| Storage Temperature                  | -55       | +85    | °C   |                                                                  |
| Storage Humidity                     | -         | 60     | %    |                                                                  |
| ESD Tolerance                        | 400<br>25 | -<br>- | V    | Human Body Model (HBM), all pins<br>Machine Model (MM), all pins |
| MSL Rating                           | -         | MSL-2  | -    |                                                                  |

**Notes:**

*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 Ranges                                                                                                                                                                            | 2412<br>5150 | -<br>-    | 2484<br>5850 | MHz  | 802.11b/g<br>802.11a           |
| DC Power Supply Voltage (VCC)                                                                                                                                                                         | +3.0         | +3.3      | +3.6         | V    | With RF applied                |
| Control Pin Voltage (PA <sub>ON2</sub> , LNA <sub>ON2</sub> , PA <sub>ON5</sub> , LNA <sub>ON5</sub> , V <sub>BT2</sub> , V <sub>RX2</sub> , V <sub>TX2</sub> , V <sub>RX5</sub> , V <sub>TX5</sub> ) | +2.8<br>0    | +3.3<br>0 | +3.6<br>+0.5 | V    | Logic High/On<br>Logic Low/Off |
| Ambient Temperature                                                                                                                                                                                   | -40          | -         | +85          | °C   |                                |

**Notes:**

*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 - 802.11b/g Transmit Path**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, P<sub>AON2</sub> = +3.3 V, V<sub>TX2</sub> = +3.3 V, V<sub>RX2</sub> = V<sub>BT2</sub> = 0 V)**  
**Static Mode 64 QAM OFDM 54 Mbps**

| PARAMETER                                         | MIN         | TYP               | MAX          | UNIT     | COMMENTS                                                                                               |
|---------------------------------------------------|-------------|-------------------|--------------|----------|--------------------------------------------------------------------------------------------------------|
| Operating Frequency                               | 2412        | -                 | 2484         | MHz      |                                                                                                        |
| Power Gain                                        | 27          | 31                | 36           | dB       |                                                                                                        |
| Gain Flatness                                     | -<br>-      | +/-1.0<br>+/-0.5  | -<br>-       | dB       | Across full band<br>Across any 40 MHz band                                                             |
| Error Vector Magnitude (EVM) <sup>(1)</sup>       | -<br>-      | -30<br>190        | -<br>-       | dB<br>mA | P <sub>OUT</sub> = 20 dBm, Dyn Mode, 54 Mbps<br>Avg current during packet                              |
|                                                   | -<br>-      | -33<br>175        | -28.5<br>195 | dB<br>mA | P <sub>OUT</sub> = 18 dBm, Dyn Mode, 54 Mbps<br>Avg current during packet                              |
|                                                   | -<br>-      | -36<br>140        | -<br>-       | dB<br>mA | P <sub>OUT</sub> = 16 dBm, Dyn Mode, 54 Mbps<br>Avg current during packet                              |
|                                                   | -<br>-      | -40<br>95         | -<br>-       | dB<br>mA | P <sub>OUT</sub> = 5 dBm, Dyn Mode, 54 Mbps<br>Avg current during packet                               |
| ACPR Sidelobe 1                                   | 21          | 22.6              | -            | dBm      | ACPR1 = -30 dBc, CCK 1 Mbps, root cosine filtering $\alpha = 0.45$                                     |
| ACPR Sidelobe 2                                   | 21          | 22.6              | -            | dBm      | ACPR2 = -50 dBc, CCK 1 Mbps, root cosine filtering $\alpha = 0.45$                                     |
| Transmit Mask                                     | Pass        | -                 | -            | dBm      | P <sub>OUT</sub> = 22.5 dBm CCK all rates<br>P <sub>OUT</sub> = 20 dBm OFDM all rates,                 |
| PA Noise Figure                                   | -           | 5                 | -            | dB       |                                                                                                        |
| PA Out of Band Noise Power                        | -           | -150              | -            | dBm/Hz   | WCDMA RX Band<br>(2.11 to 2.17 GHz)                                                                    |
| P <sub>SAT</sub>                                  | -           | 26                | -            | dBm      |                                                                                                        |
| Group Delay                                       | -           | 2.5               | -            | nS       |                                                                                                        |
| Group Delay Variation                             | -           | 0.5               | -            | nS       | For any 20 MHz channel                                                                                 |
| Return Loss, Input                                | 12          | 17                | -            | dB       | 50 $\Omega$                                                                                            |
| Return Loss, Output                               | 6           | 10                | -            | dB       | 50 $\Omega$                                                                                            |
| TX Output Spurious Levels<br>2 fo<br>3 fo<br>4 fo | -<br>-<br>- | -29<br>-48<br>-55 | -<br>-<br>-  | dBm/MHz  | For power levels up to 23 dBm,<br>CCK at 1 Mbps                                                        |
| TX Output Spurious Levels<br>Non-Harmonics        | -           | -60               | -            | dBm/MHz  | For power levels up to 23 dBm,<br>CCK at 1 Mbps                                                        |
| Stability and Load<br>Mismatch Susceptibility     | -           | -60               | -            | dBc      | Unconditionally stable and no damage,<br>5:1 VSWR, up to P <sub>OUT</sub> = 20 dBm,<br>OFDM at 54 Mbps |
| Settling Time                                     | -           | 0.5               | 1.0          | $\mu$ s  | Within 1.0 dB of final value                                                                           |
| Quiescent Current                                 | -           | 95                | 115          | mA       |                                                                                                        |
| Shutdown Current                                  | -           | 12                | 25           | $\mu$ A  | V <sub>CC</sub> = 3.3 V, all other controls = 0 V                                                      |

Note:

(1) EVM includes system noise floor of 1% (-40 dB).

**Table 5: Electrical Specification - 2 GHz Receive Path - LNA Mode**  
**(T<sub>c</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, LNA<sub>ON</sub>2 = +3.3 V, V<sub>RX</sub>2 = +3.3 V, V<sub>TX</sub>2 = V<sub>BT</sub>2 = 0 V)**

| PARAMETER                         | MIN  | TYP               | MAX  | UNIT | COMMENTS                                   |
|-----------------------------------|------|-------------------|------|------|--------------------------------------------|
| Operating Frequency               | 2412 | -                 | 2484 | MHz  |                                            |
| Power Gain                        | 10   | 12                | 14   | dB   |                                            |
| Gain Flatness                     | -    | +/-0.5<br>+/-0.25 | -    | dB   | Across full band<br>Across any 40 MHz band |
| Noise Figure                      | -    | 2.6               | 3.9  | dB   |                                            |
| Reverse Isolation                 | -    | 17                | -    | dB   |                                            |
| Group Delay                       | -    | 1.0               | -    | nS   |                                            |
| Group Delay Variation             | -    | 0.5               | -    | nS   | For any 20 MHz channel                     |
| Input Return Loss                 | -    | 4                 | -    | dB   | 50 Ω                                       |
| Output Return Loss                | -    | 7                 | -    | dB   | 50 Ω                                       |
| IIP3                              | -    | -1                | -    | dBm  |                                            |
| IP1dB                             | -    | -10               | -    | dBm  |                                            |
| Settling Time                     | -    | 0.5               | 1.0  | μs   | Within 1.0 dB of final value               |
| I <sub>CC</sub> Quiescent Current | -    | 10                | 14   | mA   |                                            |

**Table 6: Electrical Specification - 2 GHz Receive Path - Bypass Mode**  
**(T<sub>c</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, LNA<sub>ON2</sub> = 0 V, V<sub>RX2</sub> = +3.3 V, V<sub>TX2</sub> = V<sub>BT2</sub> = 0 V)**

| PARAMETER           | MIN    | TYP               | MAX    | UNIT | COMMENTS                                   |
|---------------------|--------|-------------------|--------|------|--------------------------------------------|
| Operating Frequency | 2412   | -                 | 2484   | MHz  |                                            |
| Insertion Loss      | -      | 3.5               | 4.5    | dB   |                                            |
| Gain Flatness       | -<br>- | +/-0.5<br>+/-0.25 | -<br>- | dB   | Across full band<br>Across any 40 MHz band |
| Input Return Loss   | -      | 7                 | -      | dB   | 50 Ω                                       |
| Output Return Loss  | -      | 6                 | -      | dB   | 50 Ω                                       |
| IIP3                | -      | 27                | -      | dBm  |                                            |
| IP1dB               | -      | 24                | -      | dBm  |                                            |
| Settling Time       | -      | 0.5               | 1.0    | μs   | Within 1.0 dB of final value               |
| Quiescent Current   | -      | 12                | 25     | μA   |                                            |

**Table 7: Electrical Specification - Bluetooth TX/RX**  
**(T<sub>c</sub> = +25 °C, V<sub>CC</sub> = 0 V, LNA<sub>ON2</sub> = 0 V, V<sub>RX2</sub> = 0 V, V<sub>BT2</sub> = +3.3 V, V<sub>TX2</sub> = 0 V)**

| PARAMETER           | MIN  | TYP     | MAX  | UNIT | COMMENTS                     |
|---------------------|------|---------|------|------|------------------------------|
| Operating Frequency | 2402 | -       | 2480 | MHz  |                              |
| Insertion Loss      | -    | 1.4     | 2.5  | dB   |                              |
| Gain Flatness       | -    | +/-0.25 | -    | dB   | Across any 40 MHz band       |
| Input Return Loss   | -    | 10      | -    | dB   | 50 Ω                         |
| Output Return Loss  | -    | 10      | -    | dB   | 50 Ω                         |
| BT - RX Isolation   | -    | 20      | -    | dB   |                              |
| BT - TX Isolation   | -    | 40      | -    | dB   |                              |
| Settling Time       | -    | 0.5     | 1.0  | μs   | Within 1.0 dB of final value |
| Quiescent Current   | -    | 12      | 25   | μA   |                              |

**Table 8: Electrical Specification - 802.11a Transmit Path**  
**(T<sub>c</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, PA<sub>ON5</sub> = +3.3 V, V<sub>TX5</sub> = +3.3 V, V<sub>RX5</sub> = 0 V,**  
**Static Mode 64 QAM OFDM 54 Mbps)**

| PARAMETER                                         | MIN         | TYP               | MAX         | UNIT        | COMMENTS                                                                                              |
|---------------------------------------------------|-------------|-------------------|-------------|-------------|-------------------------------------------------------------------------------------------------------|
| Operating Frequency                               | 5150        | -                 | 5850        | MHz         |                                                                                                       |
| Power Gain                                        | 27          | 31                | 36          | dB          |                                                                                                       |
| Gain Flatness                                     | -           | +/-2.0<br>+/-0.5  | -           | dB          | Across full band<br>Across any 40 MHz band                                                            |
| Error Vector Magnitude (EVM) <sup>(1)</sup>       | -           | -30               | -28         | dB          | P <sub>OUT</sub> = 17 dBm, Dyn Mode, 54 Mbps                                                          |
|                                                   | -           | 160               | 185         | mA          | Avg current during packet                                                                             |
|                                                   | -           | -33               | -           | dB          | P <sub>OUT</sub> = 15 dBm, Dyn Mode, 54 Mbps                                                          |
|                                                   | -           | 130               | -           | mA          | Avg current during packet                                                                             |
|                                                   | -           | -40               | -           | dB          | P <sub>OUT</sub> = 5 dBm, Dyn Mode, 54 Mbps                                                           |
|                                                   | -           | 90                | -           | mA          | Avg current during packet                                                                             |
| Transmit Mask                                     | Pass        | -                 | -           | N/A         | OFDM, All rates, P <sub>OUT</sub> = 18 dBm                                                            |
| PA Noise Figure                                   | -           | 6                 | -           | dB          |                                                                                                       |
| Group Delay                                       | -           | 1.5               | -           | nS          |                                                                                                       |
| Group Delay Variation                             | -           | 0.5               | -           | nS          | For any 20 MHz channel                                                                                |
| Input Return Loss                                 | 7           | 11                | -           | dB          |                                                                                                       |
| Output Return Loss                                | 10          | 14                | -           | dB          |                                                                                                       |
| TX Output Spurious Levels<br>2 fo<br>3 fo<br>4 fo | -<br>-<br>- | -26<br>-42<br>-60 | -<br>-<br>- | dBm/<br>MHz | For power levels up to 18 dBm,<br>OFDM 54 Mbps                                                        |
| TX Output Spurious Levels<br>Non-Harmonics        | -           | -52               | -           | dBm/<br>MHz | For power levels up to 18 dBm,<br>OFDM 54 Mbps                                                        |
| Stability and Load Mismatch<br>Susceptibility     | -           | -60               | -           | dBc         | Unconditionally stable and no<br>damage, 5:1 VSWR, up to<br>P <sub>OUT</sub> = 18 dBm, OFDM @ 54 Mbps |
| Settling Time                                     |             | 0.8               | 2.0         | μs          | Within 1.0 dB of final value                                                                          |
| Quiescent Current                                 | -           | 95                | 115         | mA          |                                                                                                       |
| Shutdown Current                                  | -           | 12                | 25          | μA          | V <sub>CC</sub> = 3.3 V, all other controls = 0 V                                                     |

Note:

(1) EVM includes system noise floor of 1% (-40 dB).

**Table 9: Electrical Specification - 5 GHz Receive Path - LNA Mode**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, LNA<sub>ON5</sub> = +3.3 V, V<sub>Rx5</sub> = +3.3 V, V<sub>Tx5</sub> = 0 V)**

| PARAMETER             | MIN    | TYP               | MAX    | UNIT | COMMENTS                                   |
|-----------------------|--------|-------------------|--------|------|--------------------------------------------|
| Operating Frequency   | 5150   | -                 | 5850   | MHz  |                                            |
| Power Gain            | 10     | 14                | 18     | dB   |                                            |
| Gain Flatness         | -<br>- | +/-1.0<br>+/-0.25 | -<br>- | dB   | Across full band<br>Across any 40 MHz band |
| Noise Figure          | -      | 2.5               | 3.9    | dB   |                                            |
| Reverse Isolation     | -      | 21                | -      | dB   |                                            |
| Group Delay           | -      | 1.5               | -      | nS   |                                            |
| Group Delay Variation | -      | 0.5               | -      | nS   | For any 20 MHz channel                     |
| Input Return Loss     | -      | 4                 | -      | dB   | 50 Ω                                       |
| Output Return Loss    | -      | 6                 | -      | dB   | 50 Ω                                       |
| IIP3                  | -      | -12               | -      | dBm  |                                            |
| IP1dB                 | -      | -18               | -      | dBm  |                                            |
| Settling Time         | -      | 0.5               | 1.0    | μs   | Within 1.0 dB of final value               |
| Quiescent Current     | -      | 12                | 16     | mA   |                                            |



**Table 10: Electrical Specification - 5 GHz Receive Path - Bypass Mode****(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, LNA<sub>ON5</sub> = 0 V, V<sub>Rx5</sub> = +3.3 V, V<sub>Tx5</sub> = 0 V)**

| PARAMETER           | MIN    | TYP               | MAX    | UNIT | COMMENTS                                   |
|---------------------|--------|-------------------|--------|------|--------------------------------------------|
| Operating Frequency | 5150   |                   | 5850   | MHz  |                                            |
| Insertion Loss      | -      | 5.25              | 6.5    | dB   |                                            |
| Gain Flatness       | -<br>- | +/-1.0<br>+/-0.25 | -<br>- | dB   | Across full band<br>Across any 40 MHz band |
| Input Return Loss   | -      | 13                | -      | dB   | 50 Ω                                       |
| Output Return Loss  | -      | 10                | -      | dB   | 50 Ω                                       |
| IIP3                | -      | 30                | -      | dBm  |                                            |
| IP1dB               | -      | 20                | -      | dBm  |                                            |
| Settling Time       | -      | 0.5               | 1.0    | μs   | Within 1.0 dB of final value               |
| Quiescent Current   | -      | 12                | 25     | μA   |                                            |

**Table 11: Electrical Specification - Power Detector****(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, PA<sub>ON2/5</sub> = +3.3 V, V<sub>Tx2/5</sub> = +3.3 V)**

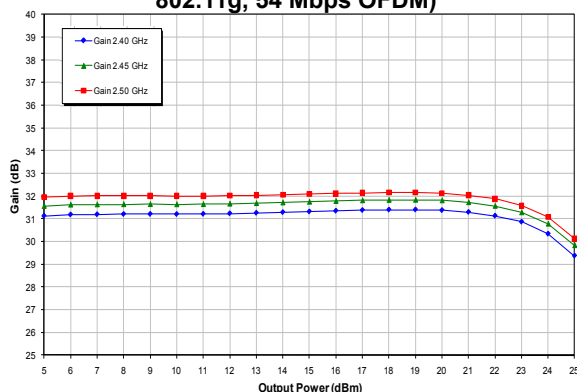
| PARAMETER                     | MIN | TYP | MAX | UNIT  | COMMENTS                                                   |
|-------------------------------|-----|-----|-----|-------|------------------------------------------------------------|
| Voltage Range                 | 200 | -   | 800 | mV    | +1 dBm < P <sub>OUT</sub> < +21 dBm CW,<br>2 GHz and 5 GHz |
| Total Internal Load Impedance | -   | 5   | -   | kΩ    |                                                            |
| Dynamic Range                 | -   | 20  | -   | dB    |                                                            |
| Resolution                    | -   | 15  | -   | mV/dB | P <sub>OUT</sub> > +7 dBm                                  |
| Video Bandwidth               | -   | 15  | -   | MHz   | Adjustable with external RC Load                           |

**Table 12: Electrical Specification - Switch and Control Lines**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, V<sub>control</sub> pins High = +3.3 V, V<sub>control</sub> pins Low = 0 V)**

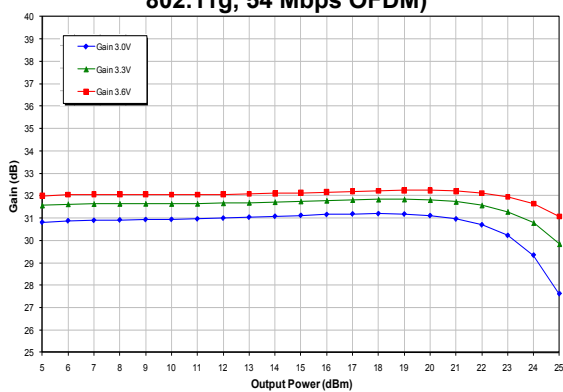
| PARAMETER                                                                                                                                 | MIN    | TYP        | MAX    | UNIT | COMMENTS                       |
|-------------------------------------------------------------------------------------------------------------------------------------------|--------|------------|--------|------|--------------------------------|
| Control Pin Steady State Input Current<br>(PA <sub>ON2</sub> , LNA <sub>ON2</sub> , PA <sub>ON5</sub> , LNA <sub>ON5</sub> )              | -<br>- | 200<br>0.5 | -<br>- | μA   | Logic High/On<br>Logic Low/Off |
| Control Pin Steady State Input Current<br>(V <sub>BT2</sub> , V <sub>RX2</sub> , V <sub>TX2</sub> , V <sub>RX5</sub> , V <sub>TX5</sub> ) | -<br>- | 5<br>0.5   | -<br>- | μA   | Logic High/On<br>Logic Low/Off |
| Control Pin Input Impedance                                                                                                               | -      | 16.5       | -      | kΩ   | Logic High/On                  |
| TX2 - RX2 Isolation                                                                                                                       | -      | 30         | -      | dB   |                                |
| TX5 - RX5 Isolation                                                                                                                       | -      | 25         | -      | dB   |                                |

## PERFORMANCE DATA PLOTS: 2 GHz Tx Performance

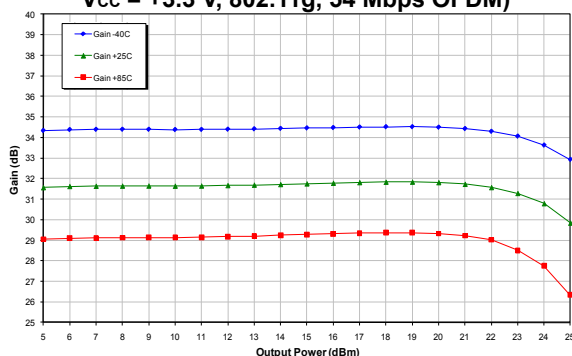
**Figure 3: Tx Path Gain vs. Output Power Across Frequency ( $V_{CC} = +3.3$  V,  $T_C = +25$  °C, 802.11g, 54 Mbps OFDM)**



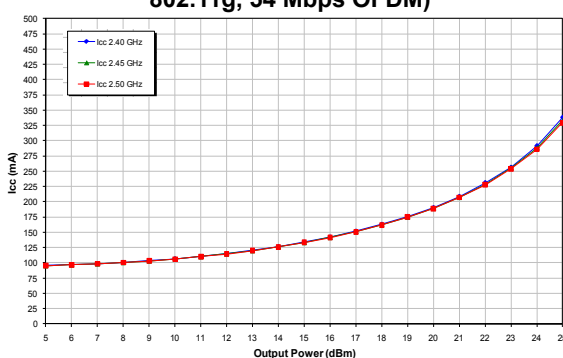
**Figure 4: Tx Path Gain vs. Output Power Across Voltage (Freq = 2.45 GHz,  $T_C = +25$  °C, 802.11g, 54 Mbps OFDM)**



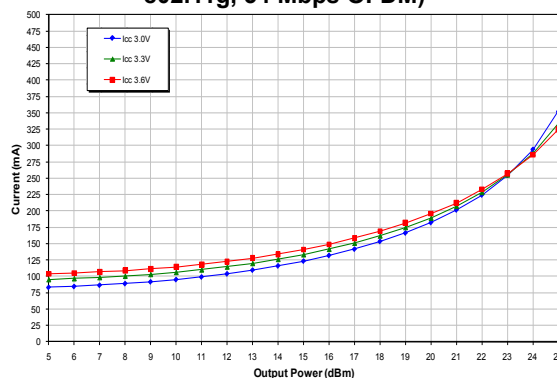
**Figure 5: Tx Path Gain vs. Output Power Across Temperature (Freq = 2.45 GHz,  $V_{CC} = +3.3$  V, 802.11g, 54 Mbps OFDM)**



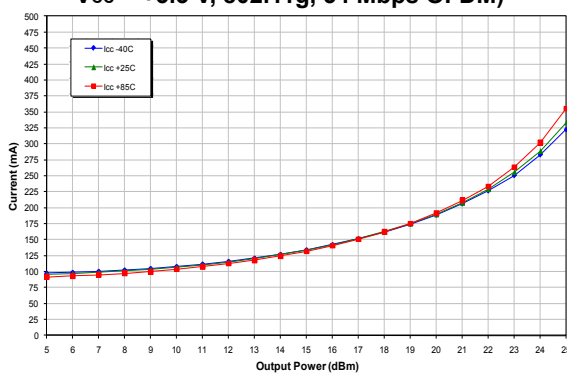
**Figure 6: Tx Path  $I_{CC}$  vs. Output Power Across Frequency ( $V_{CC} = +3.3$  V,  $T_C = +25$  °C, 802.11g, 54 Mbps OFDM)**



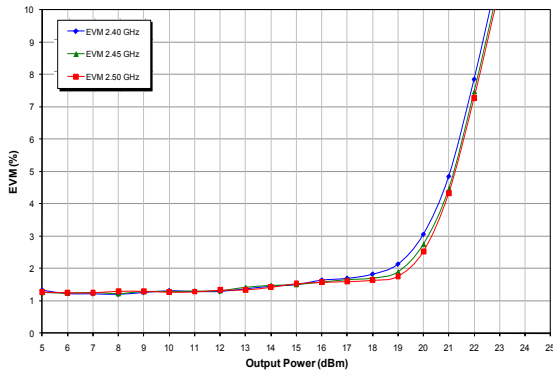
**Figure 7: Tx Path  $I_{CC}$  vs. Output Power Across Voltage (Freq = 2.45 GHz,  $T_C = +25$  °C, 802.11g, 54 Mbps OFDM)**



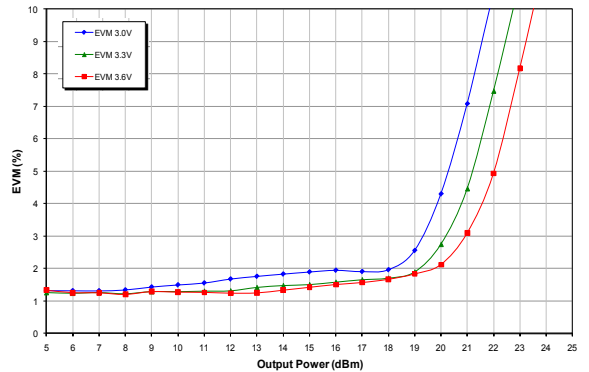
**Figure 8: Tx Path  $I_{CC}$  vs. Output Power Across Temperature (Freq = 2.45 GHz,  $V_{CC} = +3.3$  V, 802.11g, 54 Mbps OFDM)**



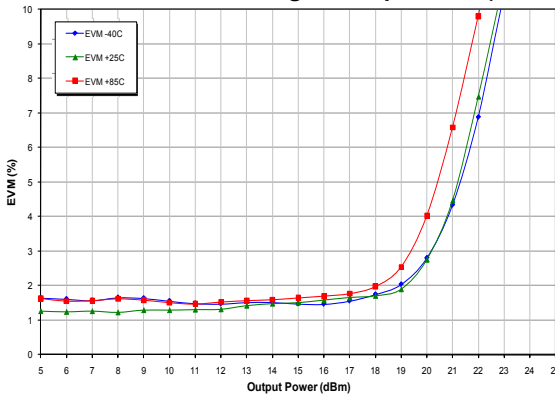
**Figure 9: Tx Path Dynamic EVM vs. Output Power Across Frequency (  $V_{CC} = +3.3$  V,  $T_C = +25$  °C, 802.11g, 54 Mbps OFDM)**



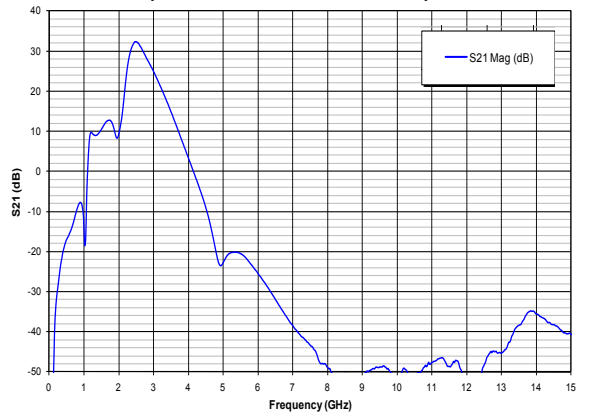
**Figure 10: Tx Path Dynamic EVM vs. Output Power Across Voltage (Freq = 2.45 GHz,  $T_C = +25$  °C, 802.11g, 54 Mbps OFDM)**



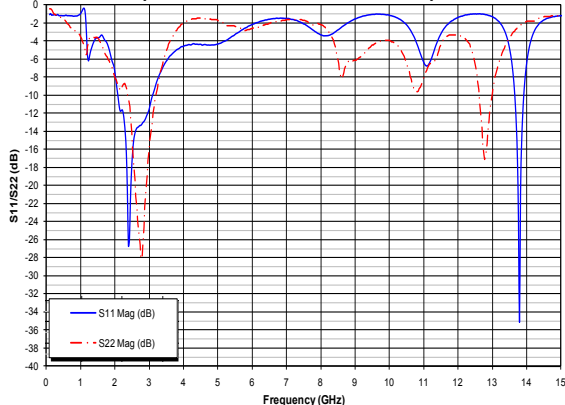
**Figure 11: Tx Path Dynamic EVM vs. Output Power Across Temperature (Freq = 2.45 GHz,  $V_{CC} = +3.3$  V, 802.11g, 54 Mbps OFDM)**



**Figure 12: 2 GHz Tx Path S21 Response ( $T_C = +25$  °C  $V_{CC} = +3.3$  V)**

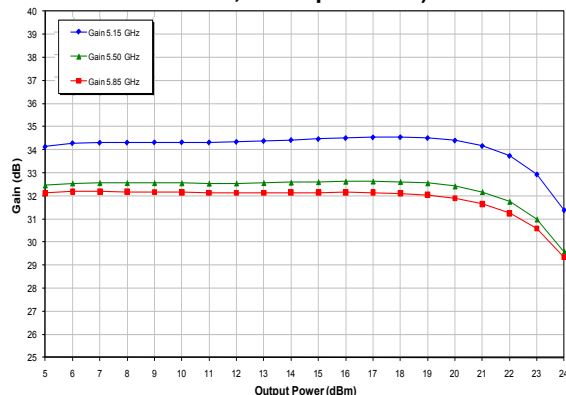


**Figure 13: 2 GHz Tx Path S11 & S22 Return Loss ( $T_C = +25$  °C,  $V_{CC} = +3.3$  V)**

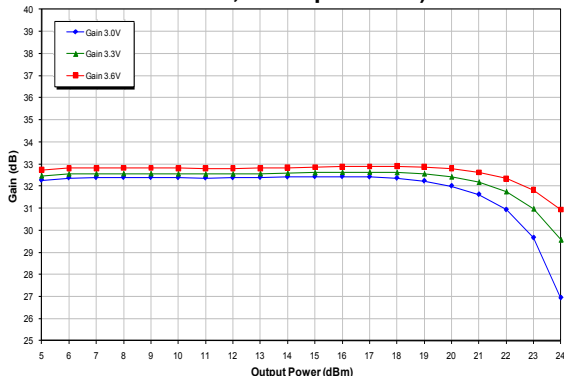


## 5 GHz Tx Performance

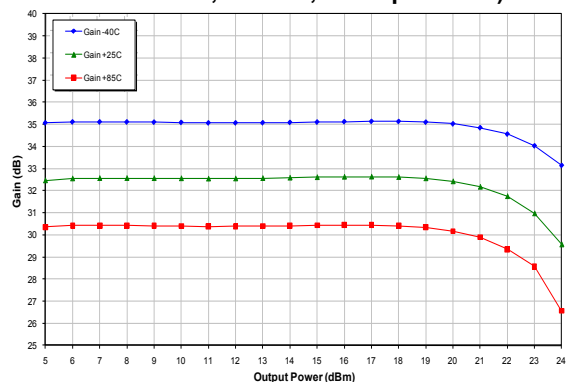
**Figure 14: Tx Path Gain vs. Output Power Across Frequency ( $T_c = +25^\circ\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ , 802.11a, 54 Mbps OFDM)**



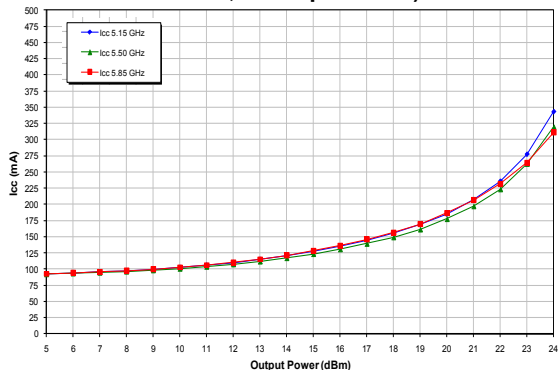
**Figure 15: Tx Path Gain vs. Output Power Across Voltage ( $T_c = +25^\circ\text{C}$ , Freq = 5.5 GHz, 802.11a, 54 Mbps OFDM)**



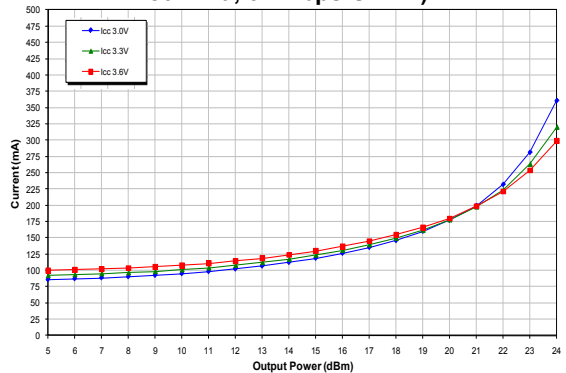
**Figure 16: Tx Path Gain vs. Output Power Across Temperature (Freq = 5.5 GHz,  $V_{CC} = +3.3\text{ V}$ , 802.11a, 54 Mbps OFDM)**



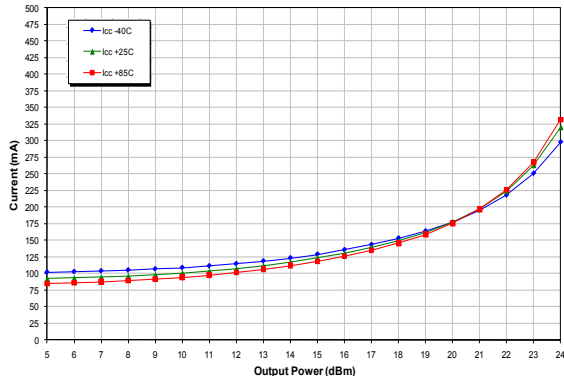
**Figure 17: Tx Path ICC vs. Output Power Across Frequency ( $T_c = +25^\circ\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ , 802.11a, 54 Mbps OFDM)**



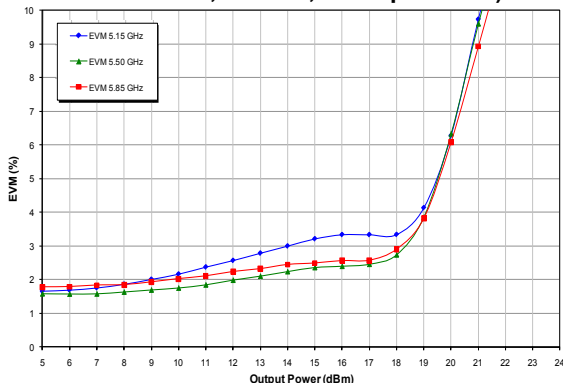
**Figure 18: Tx Path ICC vs. Output Power Across Voltage ( $T_c = +25^\circ\text{C}$ , Freq = 5.5 GHz, 802.11a, 54 Mbps OFDM)**



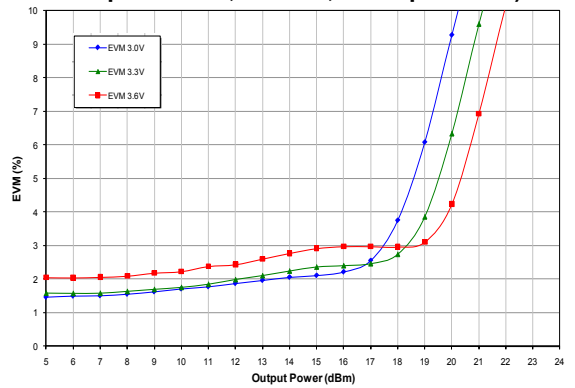
**Figure 19: Tx Path ICC vs. Output Power Across Temperature (Freq = 5.5 GHz,  $V_{CC} = +3.3\text{ V}$ , 802.11a, 54 Mbps OFDM)**



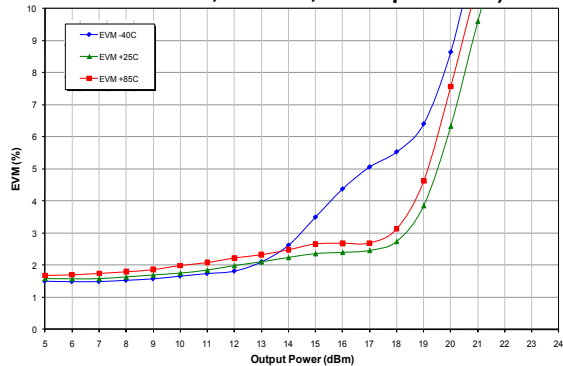
**Figure 20: Tx Path Dynamic EVM vs. Output Power Across Frequency ( $T_c = +25^\circ\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ , 802.11a, 54 Mbps OFDM)**



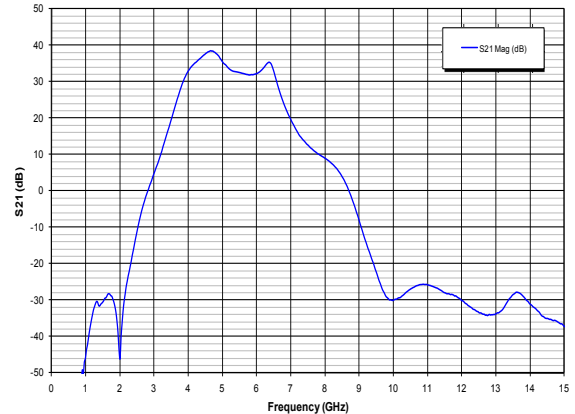
**Figure 21: Tx Path Dynamic EVM vs. Output Power Across Voltage ( $T_c = +25^\circ\text{C}$ ,  $\text{Freq} = 5.5\text{ GHz}$ , 802.11a, 54 Mbps OFDM)**



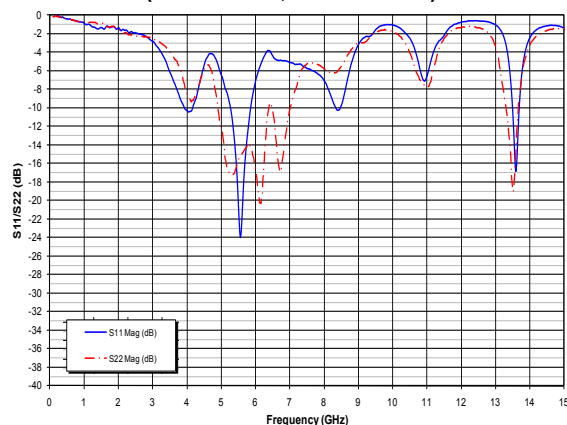
**Figure 22: Tx Path Dynamic EVM vs. Output Power Across Temperature ( $\text{Freq} = 5.5\text{ GHz}$ ,  $V_{CC} = +3.3\text{ V}$ , 802.11a, 54 Mbps OFDM)**



**Figure 23: 5 GHz Tx Path S21 Response ( $T_c = +25^\circ\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ )**

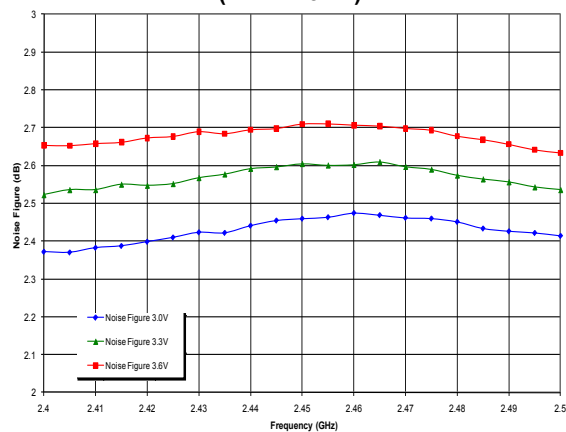


**Figure 24: 5 GHz Tx Path S11 & S22 Return Loss ( $T_c = +25^\circ\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ )**

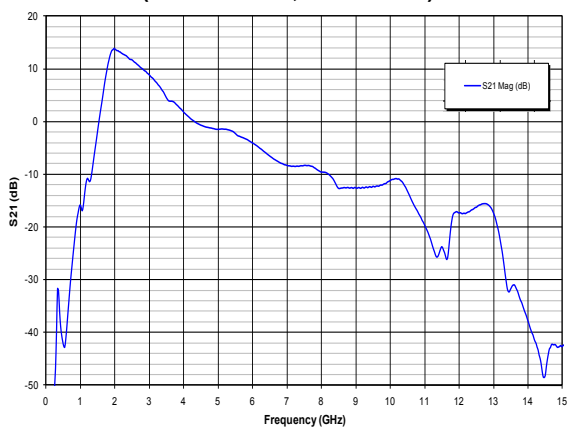


## 2 GHz Rx Performance

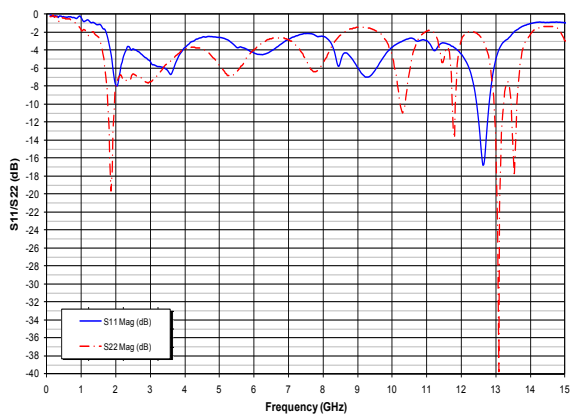
**Figure 25: 2 GHz Rx Path Noise**  
( $T_c = +25\text{ }^{\circ}\text{C}$ )



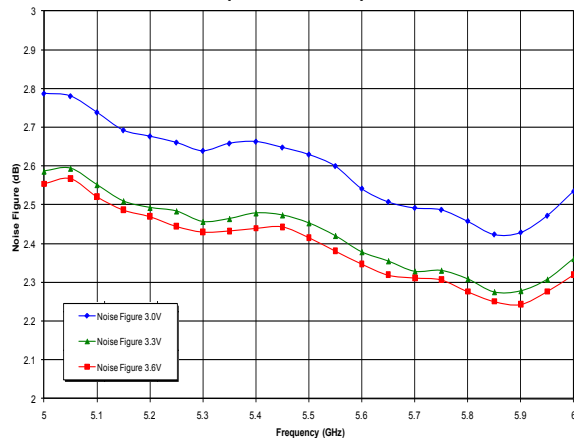
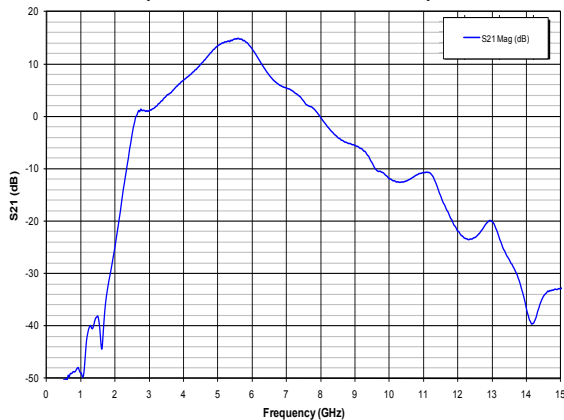
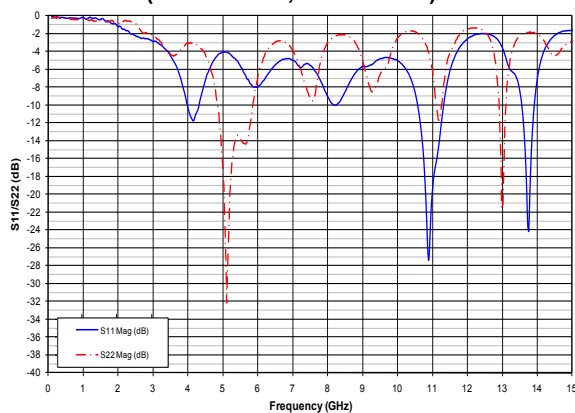
**Figure 26: 2 GHz Rx Path S21 Response**  
( $V_{CC} = +3.3\text{ V}$ ,  $T_c = +25\text{ }^{\circ}\text{C}$ )



**Figure 27: 2 GHz Rx Path S21 Return Loss**  
( $V_{CC} = +3.3\text{ V}$ ,  $T_c = +25\text{ }^{\circ}\text{C}$ )



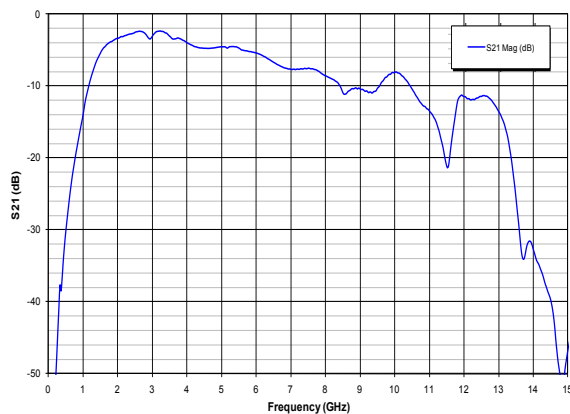
## 5 GHz Rx Performance

Figure 28: 5 GHz Rx Path Noise Figure  
( $T_C = +25\text{ }^{\circ}\text{C}$ )Figure 29: 5 GHz Rx Path S21 Response  
( $V_{CC} = +3.3\text{ V}$ ,  $T_C = +25\text{ }^{\circ}\text{C}$ )Figure 30: 5 GHz Rx Path S11 & S22 Return Loss  
( $V_{CC} = +3.3\text{ V}$ ,  $T_C = +25\text{ }^{\circ}\text{C}$ )

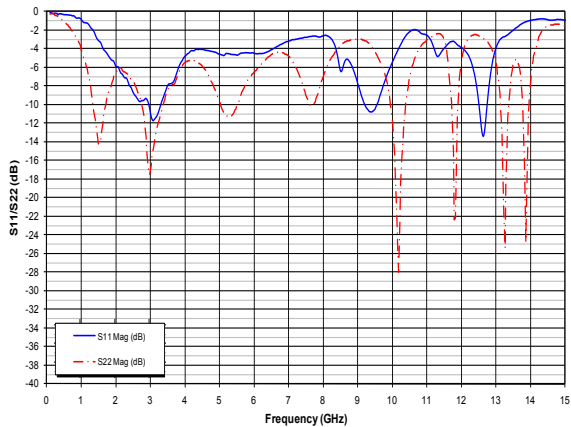


## 2 GHz and 5 GHz Rx Bypass Mode Performance

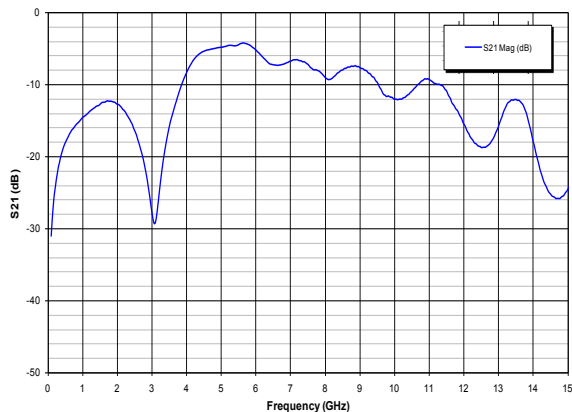
**Figure 31: 2 GHz Rx Bypass Mode S21 Response**  
( $V_{CC} = +3.3\text{ V}$ ,  $T_C = +25\text{ }^{\circ}\text{C}$ )



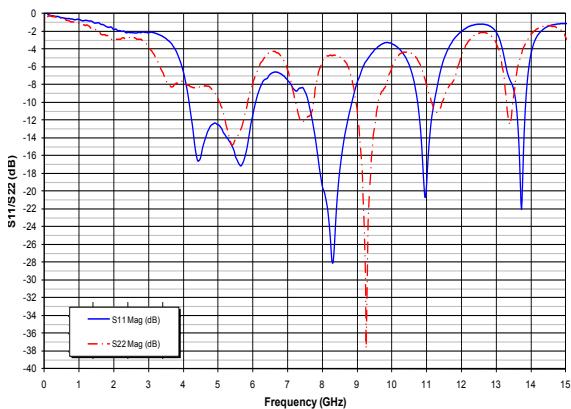
**Figure 32: 2 GHz Rx Bypass Mode S11 & S22 Return Loss**  
( $V_{CC} = +3.3\text{ V}$ ,  $T_C = +25\text{ }^{\circ}\text{C}$ )



**Figure 33: 5 GHz Rx Bypass Mode S21 Response**  
( $V_{CC} = +3.3\text{ V}$ ,  $T_C = +25\text{ }^{\circ}\text{C}$ )



**Figure 34: 5 GHz Rx Bypass Mode S21 Response**  
( $V_{CC} = +3.3\text{ V}$ ,  $T_C = +25\text{ }^{\circ}\text{C}$ )



Bluetooth Performance

Figure 35: Bluetooth Path S21 Response  
(V<sub>CC</sub> = +3.3 V, T<sub>C</sub> = +25 °C)

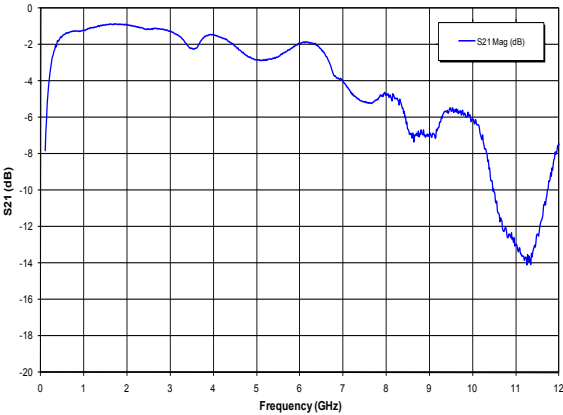
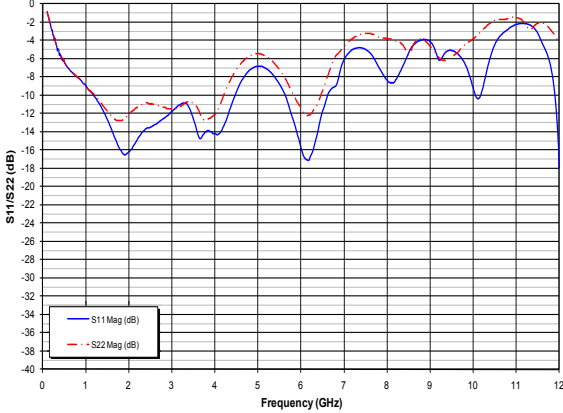
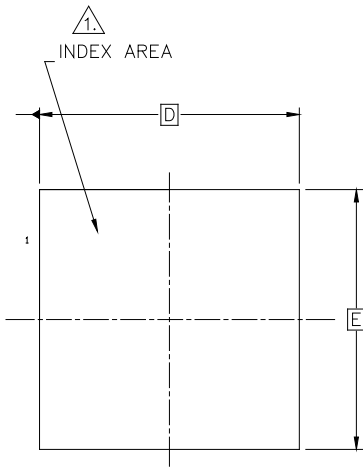
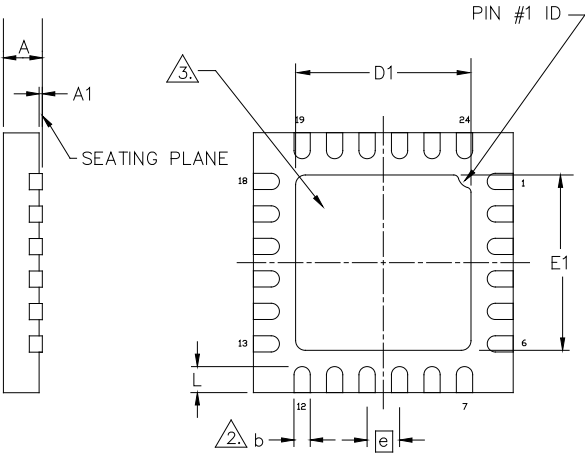


Figure 36: Bluetooth Path S11 & S22 Return Loss  
(V<sub>CC</sub> = +3.3 V, T<sub>C</sub> = +25 °C)





TOP VIEW



SIDE VIEW

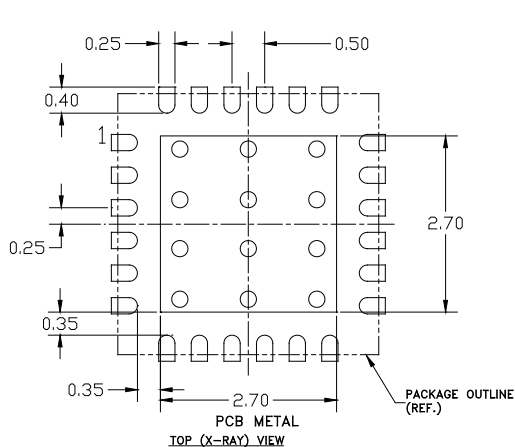
BOTTOM VIEW

| S<br>Y<br>M<br>B<br>O<br>L | DIMENSIONS—MM |       |      | N<br>O<br>T<br>E |
|----------------------------|---------------|-------|------|------------------|
|                            | MIN.          | NOM.  | MAX. |                  |
| A                          | 0.50          | 0.55  | 0.60 |                  |
| A1                         | 0.00          | 0.02  | 0.05 |                  |
| b                          | 0.18          | 0.250 | 0.30 |                  |
| D                          | 3.95          | 4.00  | 4.05 |                  |
| D1                         | 2.55          | 2.70  | 2.80 |                  |
| E                          | 3.95          | 4.00  | 4.05 |                  |
| E1                         | 2.55          | 2.70  | 2.80 |                  |
| e                          | 0.50 BSC      |       |      |                  |
| L                          | 0.30          | 0.40  | 0.50 |                  |

NOTES :

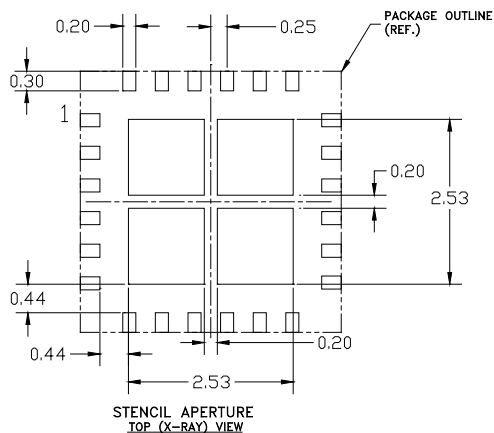
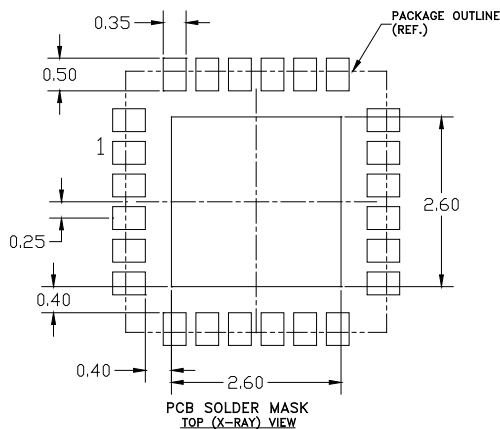
1. TERMINAL #1 IDENTIFIER AND PAD NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012.
2. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30mm FROM TERMINAL TIP.
3. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

Figure 37: S36 Package Outline - 24 Pin 4 mm x 4 mm x 0.55 mm QFN

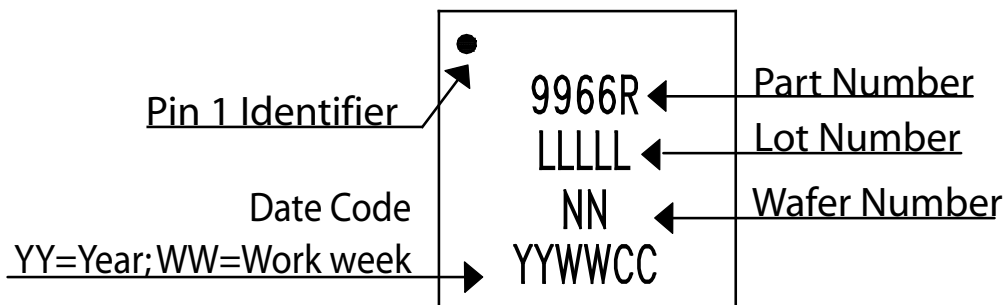


## NOTES:

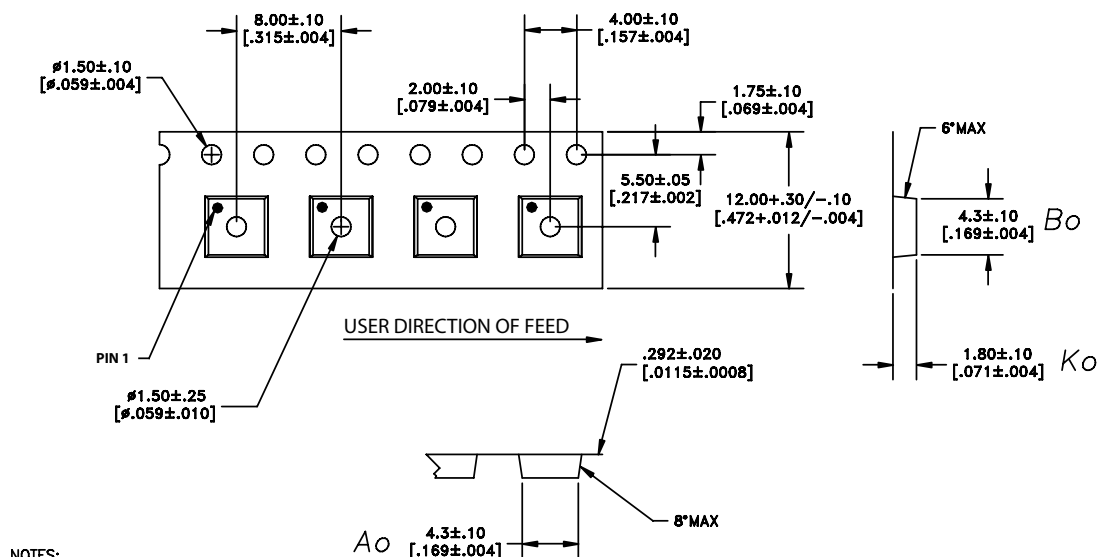
- (1) OUTLINE DRAWING REFERENCE:  
98001-TBD
- (2) UNLESS SPECIFIED DIMENSIONS  
ARE SYMMETRICAL ABOUT CENTER  
LINES SHOWN.
- (3) DIMENSIONS IN MILLIMETERS.
- (4) VIAS SHOWN IN PCB METAL VIEW  
ARE FOR REFERENCE ONLY.  
NUMBER & SIZE OF THERMAL VIAS  
REQUIRED DEPENDENT ON HEAT  
DISSIPATION REQUIREMENT AND THE  
PCB PROCESS CAPABILITY.
- (5) RECOMMENDED STENCIL THICKNESS:  
APPROX. 0.125mm (5 Mils)



**Figure 38: S36 Package Footprint - 24 Pin 4 mm x 4 mm x 0.55 mm QFN**



**Figure 39: Branding Specification - S36 Package**

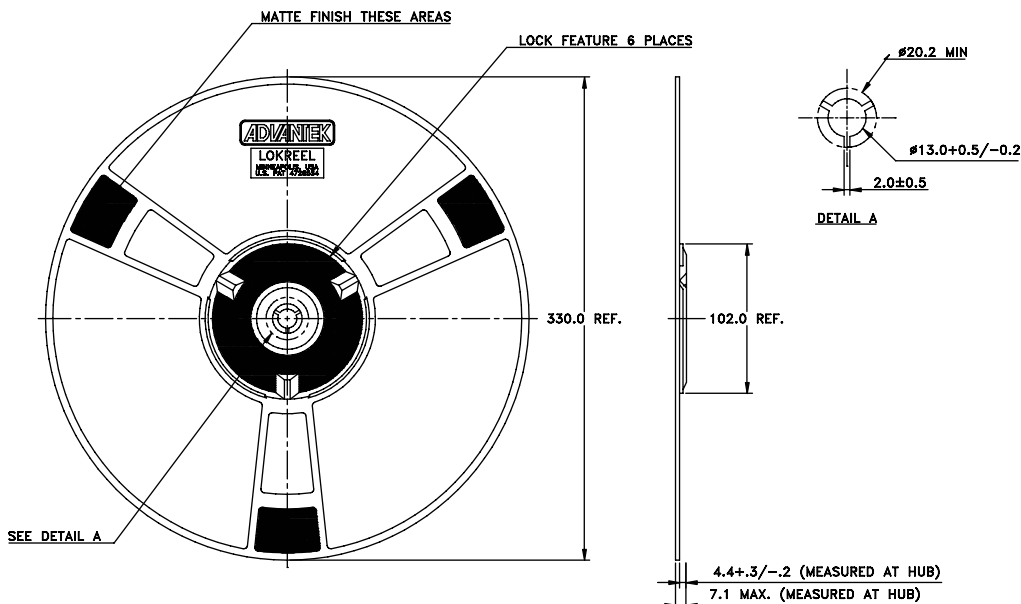


**NOTES:**

1. MATERIAL: 3000 (CARBON FILLED POLYCARBONATE)  
100% RECYCLABLE.

***DIMENSIONING AND TOLERANCING PER ASME Y14.5M***

### Figure 40: Carrier Tape



NOTES:

1. SURFACE RESISTIVITY:  $\leq 10^8$  ohms/square ASTM D-257  
MATERIAL: HIGH IMPACT POLYSTYRENE  
SHELF LIFE: INDEFINITE  
COLOR: BLACK

DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994

### Figure 41: Reel

## APPLICATION INFORMATION

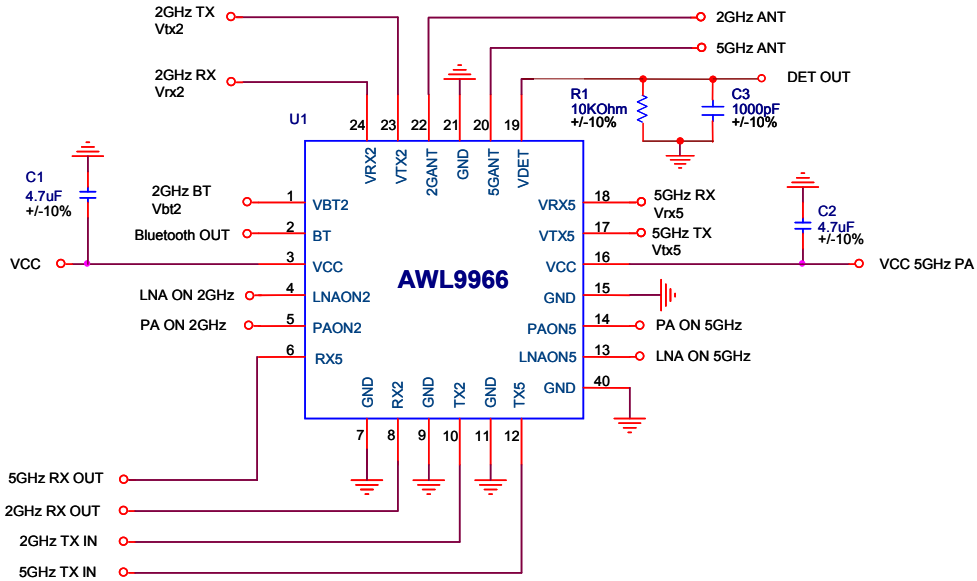


Figure 42: Application Circuit

Table 13: Switch Modes of Operation

| MODES OF OPERATION | PA <sub>ON2</sub> | PA <sub>ON5</sub> | LNA <sub>ON2</sub> | LNA <sub>ON5</sub> | V <sub>BT2</sub> | V <sub>Rx2</sub> | V <sub>Tx2</sub> | V <sub>Rx5</sub> | V <sub>Tx5</sub> |
|--------------------|-------------------|-------------------|--------------------|--------------------|------------------|------------------|------------------|------------------|------------------|
| TX 2 GHz           | HIGH              | LOW               | LOW                | LOW                | LOW              | LOW              | HIGH             | LOW              | LOW              |
| RX 2 GHz           | LOW               | LOW               | HIGH               | LOW                | LOW              | HIGH             | LOW              | LOW              | LOW              |
| 2 GHz RX Bypass    | LOW               | LOW               | LOW                | LOW                | LOW              | HIGH             | LOW              | LOW              | LOW              |
| BT 2 GHz           | LOW               | LOW               | LOW                | LOW                | HIGH             | LOW              | LOW              | LOW              | LOW              |
| BT & Bypass 2 GHz  | LOW               | LOW               | LOW                | LOW                | HIGH             | HIGH             | LOW              | LOW              | LOW              |
| BT & Rx 2 GHz      | LOW               | LOW               | HIGH               | LOW                | HIGH             | HIGH             | LOW              | LOW              | LOW              |
| TX 5 GHz           | LOW               | HIGH              | LOW                | LOW                | LOW              | LOW              | LOW              | LOW              | HIGH             |
| RX 5 GHz           | LOW               | LOW               | LOW                | HIGH               | LOW              | LOW              | LOW              | HIGH             | LOW              |
| 5 GHz RX Bypass    | LOW               | LOW               | LOW                | LOW                | LOW              | LOW              | LOW              | HIGH             | LOW              |
| Power High Reset   | LOW               | LOW               | LOW                | LOW                | LOW              | LOW              | LOW              | LOW              | LOW              |

Notes:

V<sub>CC</sub> = +3.0 V to +3.6 V; Logic State LOW = 0 V to +0.5 V; Logic State HIGH = +3.0 V to +3.6 V

**ORDERING INFORMATION**

| ORDER NUMBER  | TEMPERATURE RANGE | PACKAGE DESCRIPTION                                                | COMPONENT PACKAGING       |
|---------------|-------------------|--------------------------------------------------------------------|---------------------------|
| AWL9966RS36P8 | -40°C to +85°C    | RoHS-Compliant 24 Pin<br>4 mm x 4 mm x 0.55 mm<br>Surface Mount IC | 2,500 piece Tape and Reel |

**ANADIGICS, Inc.**

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Warren, New Jersey 07059, U.S.A.

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Fax: +1 (908) 668-5132

URL: <http://www.anadigics.com>

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