AMW036 / AMW136
Data Sheet

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Contact

https://www.zentri.com/contact-us/

About this User Guide

This document provides information on the AMWx36 802.11b/g/n Wi-Fi networking module from Zentri.

Modules covered by this datasheet include:
AMWx36 Rev 2

Further information about ZentriOS is available from:
http://docs.zentri.com

Organization

This document is organized into the following sections:

1  General Description ........................................1
2  Block Diagram ..............................................2
3  Electrical Specifications.................................3
4  WLAN RF Specifications.................................5
5  Pinout and Signal Descriptions.........................7
6  Design Guidelines..........................................9
7  Regulatory Certification .................................13
8  Packaging, Handling and Storage, RoHS ............19
9  Ordering Information ........................................21
10  Revision History & Glossary..........................21
11  References ..................................................21
Features
- Self-contained ultra-low power Wi-Fi module with microcontroller and secure TCP network stack.
- Integrated SPI-serial flash for software upgrades and user accessible read/write file system

Wi-Fi
- Broadcom single band 2.4GHz IEEE 802.11b/g/n 1x1 Wi-Fi transceiver
- Includes support for all Wi-Fi security modes including Open, WEP, WPA, and WPA2-PSK

Microprocessor
- ARM Cortex® M4 based microprocessor
- AMW036: operates up to 84MHz core frequency
- AMW136: operates up to 100MHz core frequency

RAM
- AMW036: 96 KB
- AMW136: 128 KB

Interfaces*
- UART: 2 x 4-wire up to 10.5Mbit/s
- SPI: SPI-Master (42Mbit/s), SPI-Slave (21Mbit/s)
- GPIO: Up to 21 GPIOs (overlaid with peripherals)
- A/D converter: 9 channel input, 12-bit resolution, 2.4MSPS sampling in single-shot or scan mode
- PWM: Up to 14 PWM outputs
- Wake-up: Wake pin for ultra-low power operation
- Built in PCB trace antenna

*Some interfaces share module pins

Operational & Radio
- Single operating voltage: 3.3V (typical)
- All I/O pins are +5V tolerant
- Operational Temperature Range: -30°C to +85°C
- Size: 20.3 x 15.2 x 2.7mm (0.80” x 0.60” x 0.11”)
- Weight: 0.07 oz (2g)
- Current consumption @ 3.3V, 25°C
  - VBAT: 0.97µA (with 32k RTC)
  - Standby: 2.8µA (3.8uA with 32k RTC)
  - Stop: 10µA with RAM retention (113µs wake)
  - Wi-Fi Powersave: 0.77mA (DTIM = 3)
  - Active receive: 5.7mA @ 1Mbit/s UDP
  - Active transmit: 11.4mA @ 1Mbit/s UDP
- Maximum RF transmit power
  - 802.11b/g: +18 dBm
  - 802.11n: +14 dBm
- Minimum Receive sensitivity
  - 802.11b/g: -94 dBm
  - 802.11n: -86 dBm
- Sustained TCP throughput: 10 Mbit/s

Applications
- Industrial, M2M and Home Automation
  - Environmental monitoring
  - Energy monitoring
  - Wireless sensing, remote data logging
  - HVAC, power, light, & thermostat control
  - Appliance control
- Security
  - Cameras, Doors/Window monitoring
  - Alarms, Smoke Detectors
  - Door and entry control
- Health & Fitness
  - Fitness Equipment
  - Home health monitoring e.g. weight scales
- Consumer
  - Audio, Toys, Robots
## Contents

1. General Description ............................................. 1
2. Block Diagram .................................................. 2
3. Electrical Specifications ....................................... 3
   3.1. Absolute Maximum Ratings .............................. 3
   3.2. Recommended Operating Conditions .................. 3
      3.2.1. DC Operating Conditions ......................... 3
      3.2.2. Environmental Conditions ......................... 4
   3.3. Power Consumption ....................................... 4
   3.4. 32kHz Crystal .............................................. 4
4. WLAN RF Specifications ......................................... 5
   4.1. Summary WLAN Specifications .......................... 5
   4.2. WLAN Receiver Specifications ......................... 5
   4.3. WLAN Transmitter Specifications ..................... 6
5. Pinout and Signal Descriptions ............................... 7
   5.1. Pinout ...................................................... 7
   5.2. Pin Description ........................................... 7
6. Design Guidelines ............................................... 9
   6.1. Recommended PCB Footprint ............................... 9
   6.2. Routing Recommendations ................................ 10
   6.3. Soldering Information ..................................... 10
   6.4. Module Photograph ........................................ 12
   6.5. Application Examples ..................................... 12
      6.5.1. Operation using ZentriOS Serial Interface ......... 12
7. Regulatory Certification ......................................... 13
   7.1. United States ............................................. 13
      7.1.1. Labeling and User Information Requirements ...... 13
      7.1.2. RF Exposure ........................................... 14
      7.1.3. Further Information ................................ 14
   7.2. Canada ..................................................... 14
      7.2.1. Labeling and User Information Requirements ...... 15
7.2. Further Information ........................................... 16
7.3. Europe ....................................................... 16
   7.3.1. Labeling and User Information Requirements ...... 16
   7.3.2. Further Information ................................ 16
7.4. Australia ..................................................... 17
   7.4.1. Further Information ................................ 17
7.5. New Zealand .................................................. 17
   7.5.1. Further Information ................................ 17
7.6. Japan ........................................................ 17
8. Packaging, Handling and Storage, RoHS ..................... 19
   8.1. Packaging .................................................. 19
   8.2. Handling & Storage ....................................... 19
   8.3. RoHS Directive ............................................ 19
   8.4. Tape and Reel Specifications ............................. 20
9. Ordering Information ............................................ 21
10. Revision History & Glossary ................................... 21
   10.1. Revision History ......................................... 21
11. References ....................................................... 21
1 General Description

The AMW036 and AMW136 modules from Zentri combine a microcontroller with a BCM43362 Wi-Fi device to provide an advanced stand-alone Wi-Fi and networking solution.

The term AMWx36 refers to both modules.

An integrated module avoids difficult RF layout and enables designers to rapidly embed Wi-Fi and secure networking functionality into virtually any device.

The ZentriOS serial-to-Wi-Fi application may be used to fast-track module integration into end-products.

With dimensions of just 20.3mm x 22.9mm and a wide temperature range, the module is suitable for integration into most embedded applications.

The Wi-Fi device from Broadcom includes an integrated RF transmit power amplifier and provides superior Wi-Fi performance and full compatibility with all 2.4GHz 802.11b/g/n Wi-Fi networks. Connections for two external antennas provide applications with maximum radio range and mechanical design flexibility.

The microprocessor is based on a high-performance ARM® 32-bit Cortex™-M4.

The AMW036/AMW136 microcontroller core operates at a frequency up to 84/100MHz providing up to 125 DMIPS or 1.25 DMIPS/MHz (Dhrystone 2.1).

The AMW036 has 96KB of RAM.

The AMW136 has 128KB of RAM.

The AMWx36 module offers extensive I/O and peripheral interfaces listed below, and provides additional interface combinations by leveraging multiplexing and alternate function capabilities.

- 2 x 4-Wire UART interfaces
- 2 x SPI interfaces (1 master, 1 slave)
- 21 x GPIOs
- 9 x 12-bit A/D converters
- 14 x PWM outputs
- 1 x ultra-low power wake input

The module is powered by a 3.3V power supply, a separate WLAN power supply pin is provided to minimize noise coupling into the WLAN subsystem. Various powersave modes offer ultra-low power operation. Wake from low power sleep mode is possible using IO pins or the internal real-time clock, and wake from ultra-low power standby mode is achieved using the dedicated wake pin.

The module incorporates a 32.768kHz crystal to maintain an accurate real time clock. A 32kHz clock output is available on a dedicated module pin in both active power save modes. The 32kHz clock output may be used to drive the clock input of other system devices. This avoids the need for an additional crystal thereby minimizing total system cost.

The module has FCC & IC modular approval for use in the United States and Canada, CE approval for use in Europe, TELE/MIC approval for use in Japan and related approvals for use in other countries.
2 Block Diagram

Figure 1 is a block diagram of the AMWx36 module. The main components of the module are a microprocessor and BCM43362 Wi-Fi System-on-Chip (SoC). The processor and peripherals are driven by a 26MHz crystal. The integrated real-time clock (RTC) is driven by a 32.768kHz crystal. An on-board 1MByte serial flash chip may be used to store user data and configuration, additional applications, and firmware images as part of the Zentri secure over the air (OTA) update process.

The WLAN subsystem is controlled by ZentriOS enabling the module to achieve minimum power consumption when the Wi-Fi networking interface is not required. The module includes an antenna diversity switch. The switch enables static or dynamic control of the external antenna(s).

Figure 1. AMW036 / AMW136 Architecture
3 Electrical Specifications

3.1 Absolute Maximum Ratings

CAUTION! The absolute maximum ratings in Table 1 and Table 2 indicate levels where permanent damage to the device can occur, even if these limits are exceeded for only a brief duration. Functional operation is not guaranteed under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the device.

The values in Table 1 reflect absolute maximum ratings from the respective microprocessor and BCM43362 datasheets.

Table 1. Absolute Maximum Voltage Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Ratings</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBAT</td>
<td>External power supply voltage to MCU VBAT pin</td>
<td>-0.3</td>
<td>4.0</td>
<td>V</td>
</tr>
<tr>
<td>VDD_3V3</td>
<td>External power supply voltage to MCU subsystem</td>
<td>-0.3</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>VDD_WIFI</td>
<td>External power supply voltage to WLAN subsystem</td>
<td>-0.5</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>V_in</td>
<td>Input voltage on any other MCU pin</td>
<td>GND - 0.3</td>
<td>VDD_3V3 + 4.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Absolute Maximum Environmental Ratings

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>–</td>
<td>-40</td>
<td>+125</td>
<td>°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>Non-condensing (storage)</td>
<td>–</td>
<td>65</td>
<td>%</td>
</tr>
</tbody>
</table>

3.2 Recommended Operating Conditions

Functional operation is not guaranteed outside the limits shown in Table 3 and Table 4, and operation outside these limits for extended periods can adversely affect long-term reliability of the device.

3.2.1 DC Operating Conditions

Table 3. Recommended DC Operating Conditions

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Ratings</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBAT</td>
<td>External power supply voltage to MCU VBAT pin</td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>VDD_3V3</td>
<td>External power supply voltage to MCU subsystem</td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>VDD_WIFI</td>
<td>External power supply voltage to WLAN subsystem</td>
<td>3.0</td>
<td>3.3</td>
<td>3.6</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. VDD_3V3 and VDD_WIFI must be at the same voltage when using the Wi-Fi subsystem
2. The performance of the Wi-Fi subsystem is degraded significantly at low voltages
3.2.2 Environmental Conditions

Table 4. Recommended Environmental Conditions

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>Limited by WLAN chip specification</td>
<td>-30</td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>Non-condensing (operating)</td>
<td></td>
<td>85</td>
<td>%</td>
</tr>
</tbody>
</table>

3.3 Power Consumption

Table 5. Power consumption (VDD_3V3, VDD_WIFI, VBAT @ 3.3V)

<table>
<thead>
<tr>
<th>Operational State</th>
<th>Note</th>
<th>Typ(^1)</th>
<th>Max(^1)</th>
<th>Max(^1)</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBAT(^7)</td>
<td>MCU VBAT Mode, RTC on, Wi-Fi powered off</td>
<td>0.97</td>
<td>–</td>
<td>3.0</td>
<td>µA</td>
</tr>
<tr>
<td>Standby(^7)</td>
<td>MCU Standby Mode, RTC on, Wi-Fi powered off</td>
<td>3.8</td>
<td>5.0</td>
<td>17.0</td>
<td>µA</td>
</tr>
<tr>
<td>Stop(^3,7)</td>
<td>MCU Stop Mode, Wi-Fi powered off</td>
<td>10</td>
<td>28</td>
<td>230</td>
<td>µA</td>
</tr>
<tr>
<td>Wi-Fi Powersave(^2,3)</td>
<td>MCU Stop mode, Wi-Fi in powersave</td>
<td>0.77</td>
<td>–</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Active Receive(^2,3,4)</td>
<td>MCU Stop mode, Wi-Fi active receive</td>
<td>5.7</td>
<td>–</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Active Transmit(^2,3,5)</td>
<td>MCU Stop mode, Wi-Fi active transmit</td>
<td>11.4</td>
<td>–</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Wi-Fi Tx Test Mode(^6)</td>
<td>MCU Stop mode, Wi-Fi active transmit</td>
<td></td>
<td></td>
<td>320</td>
<td>mA</td>
</tr>
</tbody>
</table>

Notes:
1. Total combined current consumed by all power supplies: VBAT, VDD_3V3, VDD_WIFI.
2. 802.11 beacon Interval = 102.4ms, DTIM=3, Beacon Duration = 1ms @ 1Mbps.
3. MCU Stop Mode with 113µs wakeup latency (flash in deep power down mode), VDD_WIFI = 0V
4. Average current receiving 1Mbit/s UDP at 802.11n MCS7
5. Average current transmitting 1Mbit/s UDP at 802.11n MCS7
6. Wi-Fi Transmitting at +18dBm CCK 11Mbit/s with maximum duty cycle
7. Hardware capability; minimum power consumption is dependent on ZentriOS version and external components connected to AMWx36 pins

3.4 32kHz Crystal

Table 6. 32kHz Crystal Specifications\(^1\)

<table>
<thead>
<tr>
<th>Operational State</th>
<th>Note</th>
<th>Min</th>
<th>Typical</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td>32768</td>
<td></td>
<td>Hz</td>
</tr>
<tr>
<td>Frequency Tolerance</td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td>ppm</td>
</tr>
<tr>
<td>Frequency Ageing</td>
<td>Measured @25°C ±3°C</td>
<td>-3</td>
<td>–</td>
<td>+3</td>
<td>ppm</td>
</tr>
</tbody>
</table>

Notes:
1. Reproduced from manufacturer’s datasheet.
4 WLAN RF Specifications

The AMWx36 WLAN radio specifications are derived from the Broadcom BCM43362 WLAN radio specifications.

Unless otherwise stated, the specifications in this section apply when the operating conditions are within the limits specified in Section 3.2, Recommended Operating Conditions. Functional operation outside these limits is not guaranteed.

All specifications are measured by connecting directly to either of the antenna ports via a short PCB trace with the other antenna port terminated in 50 ohms.

4.1 Summary WLAN Specifications

Table 7. Summary WLAN Specifications

<table>
<thead>
<tr>
<th>Feature Supported</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLAN Standard</td>
<td>IEEE 802.11b/g/n 1x1 SISO</td>
</tr>
<tr>
<td>Frequency Band</td>
<td>2.400 GHz – 2.484 GHz</td>
</tr>
<tr>
<td>WLAN Channels</td>
<td>Channels 1 – 13</td>
</tr>
</tbody>
</table>
| Data Rates        | 802.11b (1, 2, 5.5, 11 Mbps)  
                           802.11g (6, 9, 12, 24, 36, 48, 54 Mbps)  
                           802.11n (HT20 MCS0-MCS7) |
| Maximum Receive level @ 2.4GHz | -2.5 dBm @ 1, 2 Mbps (8% PER, 1024 octets)  
                                             -8.5 dBm @ 5.5, 11 Mbps (8% PER, 1024 Octets)  
                                             -12 dBm @ 6-54 Mbps (10% PER, 1000 Octets) |
| Maximum RF Tx Output Power | +18 dBm @ 802.11b (EVM < -9 dB)  
                                             +14 dBm @ 802.11n MCS7 (EVM < -28 dB) |
| Carrier Frequency Accuracy | ±20 ppm (26MHz crystal with ±10 ppm @ 25C) |

4.2 WLAN Receiver Specifications

Table 8. WLAN Receiver Performance Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition/Notes</th>
<th>Min</th>
<th>Typical</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td></td>
<td>2400</td>
<td>–</td>
<td>2500</td>
<td>MHz</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td></td>
<td>-30</td>
<td>–</td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Receive Sensitivity</td>
<td>1 Mbps DSSS</td>
<td>–</td>
<td>-94</td>
<td>-91</td>
<td>dBm</td>
</tr>
<tr>
<td>(8% PER for 1024 octet PSDU)</td>
<td>11 Mbps CCK</td>
<td>–</td>
<td>-87</td>
<td>-83</td>
<td>dBm</td>
</tr>
<tr>
<td>Receive Sensitivity</td>
<td>6 Mbps OFDM</td>
<td>–</td>
<td>-86</td>
<td>-81</td>
<td>dBm</td>
</tr>
<tr>
<td>(10% PER for 1000 octet PSDU)</td>
<td>54 Mbps OFDM</td>
<td>–</td>
<td>-73</td>
<td>-69</td>
<td>dBm</td>
</tr>
</tbody>
</table>
### 4.3 WLAN Transmitter Specifications

#### Table 9. WLAN Transmitter Performance Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition/Notes</th>
<th>Min</th>
<th>Typical</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td></td>
<td>2400</td>
<td></td>
<td>2500</td>
<td>MHz</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td></td>
<td>-30</td>
<td></td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Transmit power measured at</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highest power level setting at</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25°C, VDD-3V3_RF_IN=3.3V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with spectral mask and EVM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVM does NOT exceed :</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Mbps DSSS</td>
<td></td>
<td>-11</td>
<td>+14</td>
<td>+16</td>
<td>+18</td>
</tr>
<tr>
<td>11 Mbps CCK</td>
<td></td>
<td>-11</td>
<td>+14</td>
<td>+16</td>
<td>+18</td>
</tr>
<tr>
<td>6 Mbps OFDM</td>
<td></td>
<td>-22</td>
<td>+12</td>
<td>+14</td>
<td>+16</td>
</tr>
<tr>
<td>54 Mbps OFDM</td>
<td></td>
<td>-25</td>
<td>+12</td>
<td>+14</td>
<td>+16</td>
</tr>
<tr>
<td>MCS0, HT20</td>
<td></td>
<td>-22</td>
<td>+10</td>
<td>+12</td>
<td>+14</td>
</tr>
<tr>
<td>MCS7, HT20</td>
<td></td>
<td>-28</td>
<td>+10</td>
<td>+12</td>
<td>+14</td>
</tr>
</tbody>
</table>

**Notes:**

1. *Operation below -20°C and above +65°C with parameter derating per Note 2*
2. *Derate transmit power by 1.5dB for operation between temperatures of -30°C to -20°C and 65°C to 85°C*
3. *All measurements performed with the other antenna port terminated in 50 ohms*
5 Pinout and Signal Descriptions

5.1 Pinout

A top view of the AMWx36 pinout is depicted in Figure 2. All dimensions are in thousands of an inch. A recommended footprint is provided in Section 6.1.

Figure 2. AMWx36 Pinout (TOP View – Pins NOT visible from top!)

5.2 Pin Description

Table 10. AMWx36 ZentriOS Pin Definitions

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Type</th>
<th>Primary Function</th>
<th>Alternate &amp; Other Function(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>GND</td>
<td>S</td>
<td>Ground</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>VBAT</td>
<td>S</td>
<td>VBAT MCU supply</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>GPIO_0</td>
<td>I/O</td>
<td>Factory Reset²</td>
<td>SPI1_MISO (S), GPIO</td>
</tr>
<tr>
<td>5</td>
<td>GPIO_1</td>
<td>I/O</td>
<td>GPIO</td>
<td>-</td>
</tr>
<tr>
<td>Pin</td>
<td>Name</td>
<td>Type</td>
<td>Primary Function</td>
<td>Alternate &amp; Other Function(s)</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>------</td>
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</tr>
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<td>6</td>
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<td>I/O</td>
<td>GPIO</td>
<td>SPI1_SCK (S)</td>
</tr>
<tr>
<td>7</td>
<td>GPIO_3</td>
<td>I/O</td>
<td>GPIO</td>
<td>SPI1_CS (S)</td>
</tr>
<tr>
<td>8</td>
<td>GPIO_4</td>
<td>I/O</td>
<td>GPIO</td>
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</tr>
<tr>
<td>9</td>
<td>OSC_32K_OUT</td>
<td>O</td>
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<td>-</td>
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<tr>
<td>10</td>
<td>VDD_3V3</td>
<td>I/O</td>
<td>3.3V MCU supply</td>
<td>-</td>
</tr>
<tr>
<td>11-12</td>
<td>GND</td>
<td>S</td>
<td>Ground</td>
<td>-</td>
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<td>13</td>
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<td>I/O</td>
<td>GPIO</td>
<td>SPI1_MOSI (slave), PWM5</td>
</tr>
<tr>
<td>14</td>
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<td>SPI0_MISO (M)</td>
<td>ADC6 (when SPI not in use). Not available for digital I/O.</td>
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<td>GPIO_7</td>
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<td>ADC5 (when SPI not in use). Not available for digital I/O.</td>
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<td>SPI0_MOSI (M)</td>
<td>ADC7 (when SPI not in use). Not available for digital I/O.</td>
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<td>I/O</td>
<td>GPIO</td>
<td>UART0_RTS</td>
</tr>
<tr>
<td>18</td>
<td>GPIO_10</td>
<td>I/O</td>
<td>GPIO</td>
<td>UART0_CTS, PWM0</td>
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<tr>
<td>19</td>
<td>GPIO_11</td>
<td>I/O</td>
<td>UART0_RX</td>
<td>GPIO, PWM0</td>
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<td>20</td>
<td>GPIO_12</td>
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<td>GPIO, PWM0</td>
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<td>GPIO_13</td>
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<td>GPIO</td>
<td>PWM1</td>
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<td>GPIO_14</td>
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<td>GPIO</td>
<td>PWM3</td>
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<td>PWM3</td>
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<td>I/O</td>
<td>GPIO</td>
<td>PWM6</td>
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<td>25</td>
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<td>I/O</td>
<td>GPIO</td>
<td>UART1_RX, ADC3, PWM4</td>
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<td>26-27</td>
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<td>I/O</td>
<td>Ground</td>
<td>-</td>
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<td>I/O</td>
<td>GPIO</td>
<td>-</td>
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<td>29</td>
<td>GPIO_19</td>
<td>I/O</td>
<td>GPIO</td>
<td>UART1_TX, ADC2, PWM4</td>
</tr>
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<td>I/O</td>
<td>GPIO</td>
<td>ADC9, PWM2</td>
</tr>
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<td>31</td>
<td>GPIO_21</td>
<td>I/O</td>
<td>GPIO</td>
<td>ADC8, PWM2</td>
</tr>
<tr>
<td>32</td>
<td>GPIO_22</td>
<td>I/O</td>
<td>GPIO</td>
<td>UART1_CTS, WAKE, ADC0, PWM1</td>
</tr>
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<td>33</td>
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<td>GPIO</td>
<td>UART1_RTS, ADC1, PWM4</td>
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<tr>
<td>34</td>
<td>RESET_N</td>
<td>I</td>
<td>System Reset</td>
<td>-</td>
</tr>
<tr>
<td>35</td>
<td>VDD_WIFI</td>
<td>S</td>
<td>3.3V WLAN supply</td>
<td>-</td>
</tr>
<tr>
<td>36-52</td>
<td>GND</td>
<td>S</td>
<td>Ground</td>
<td>-</td>
</tr>
</tbody>
</table>
Notes:
1. \( I = \text{Input}, \ O = \text{Output}, \ S = \text{Supply} \)
2. Factory reset is sampled at power-on-reset and available for other purposes thereafter.
3. Wi-Fi Antenna pins are AC-coupled and have a nominal 50 ohms output impedance.
4. The module Reset pin is connected to the internal MCU via a 1k resistor.
   
   We recommend driving the pin. If the pin is not driven, connect a 0.1uF capacitor to ground close to the pin to bypass noise which may cause unintended reset.
5. Connected to SPI serial flash inside the module.

6 Design Guidelines

6.1 Recommended PCB Footprint

All dimensions in Figure 3 are in thousands of an inch unless otherwise marked.

Figure 3. AMWx36 Recommended Footprint (Top)
6.2 Routing Recommendations

When designing a carrier board, the addition of ground fill directly underneath the AMWx36 module, rather than signal or power traces, is recommended. All ground pads must be connected to a solid ground plane. Failure to comply with these recommendations may result in degraded performance of WLAN functionality.

6.3 Soldering Information

![Recommended solder reflow profile](Downloaded from Arrow.com)
Figure 5 - Example solder reflow profile (AMWx36-E03 evaluation board)
6.5 Application Examples

6.5.1 Operation using ZentriOS Serial Interface

To use Zentri’s easy-to-use ZentriOS serial-to-Wi-Fi application, the module only requires an external connection to power and a UART serial interface. A host processor connects to UART0 (pins 17-20) as shown in Figure 7.

Figure 7. Using the AMW036 Module with ZentriOS and a UART serial interface
7 Regulatory Certification

The AMWx36 module has been certified for operation in various regulatory domains. This section outlines certification information specific to the following countries and regions:

- United States
- Canada
- Europe
- Australia
- New Zealand
- Japan

Should you require regulatory certification for the AMWx36 module in a country or region not listed, please contact your local Zentri sales office or create a support request via our website at https://support.zentri.com.

7.1 United States

The Zentri AMWx36 module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Sub-part C “Intentional Radiators” modular approval in accordance with Part 15.212 Modular Transmitter approval. Modular approval allows the end user to integrate the AMWx36 module into a finished product without obtaining subsequent and separate FCC approvals for intentional radiation, provided no changes or modifications are made to the module circuitry. Changes or modifications could void the user’s authority to operate the equipment. The end user must comply with all of the instructions provided by the Grantee which indicate installation and/or operating conditions necessary for compliance.

The finished product is required to comply with all applicable FCC equipment authorization, regulations, requirements, and equipment functions not associated with the transmitter module portion. For example, compliance must be demonstrated to regulations for other transmitter components within the host product; to requirements for unintentional radiators (Part 15 Sub-part B “Unintentional Radiators”), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for non-transmitter functions on the transmitter module (i.e. Verification, or Declaration of Conformity) (e.g., transmitter modules may also contain digital logic functions) as appropriate.

7.1.1 Labeling and User Information Requirements

The AMWx36 module has been labelled with a unique FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording as follows:

```
Contains FCC ID: 2ABPY-B5BD9
This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference,
and (2) this device must accept any interference
received, including interference that may cause
undesired operation.
```

The user manual for the product should include the following statement:
Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748 available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) at the following website: https://apps.fcc.gov/oetcf/kdb/index.cfm

7.1.2 RF Exposure

All transmitters regulated by FCC must comply with RF exposure requirements. OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, provides assistance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC). The bulletin offers guidelines and suggestions for evaluating compliance.

If appropriate, compliance with exposure guidelines for mobile and unlicensed devices can be accomplished by the use of warning labels and by providing users with information concerning minimum separation distances from transmitting structures and proper installation of antennas.

The following statement must be included as a CAUTION statement in manuals and OEM products to alert users of FCC RF exposure compliance:

To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the AMWx36 module is used in a portable application (i.e., the antenna is less than 20 cm from persons during operation), the integrator is responsible for performing Specific Absorption Rate (SAR) testing in accordance with FCC rules 2.1091.

7.1.3 Further Information

Additional information regarding FCC certification and use of the AMWx36 module in the United States is available from the following sources.

- FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) http://apps.fcc.gov/oetcf/kdb/index.cfm

7.2 Canada

The AMWx36 module has been certified for use in Canada under Industry Canada (IC) Radio Standards Specification (RSS) RSS-210 and RSSGen. Modular approval permits the installation of a module in a host device without the need to recertify the device.
7.2.1 Labeling and User Information Requirements

Labeling Requirements for the Host Device (from Section 3.2.1, RSS-Gen, Issue 3, December 2010): The host device shall be properly labeled to identify the module within the host device.

The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words “Contains transmitter module”, or the word “Contains”, or similar wording expressing the same meaning, as follows:

Contains transmitter module IC: 11685A-61F8D

User Manual Notice for License-Exempt Radio Apparatus (from Section 7.1.3 RSS-Gen, Issue 3, December 2010): User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Transmitter Antenna Notification (from Section 7.1.2 RSS-Gen, Issue 3, December 2010): User manuals for transmitters shall display the following notice in a conspicuous location:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

The above notice may be affixed to the device instead of displayed in the user manual.
User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s’il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d’antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d’antenne. Les types d’antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi) and required impedance for each.

7.2.2 Further Information
Additional information may be obtained from the Industry Canada website at http://www.ic.gc.ca

7.3 Europe
The AMWx36 module is an R&TTE Directive assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The AMWx36 module has been tested to R&TTE Directives as summarized in Table 11. European Compliance Testing. Opinion has also been issued. All AMWx36 test reports are available on the Zentri website at https://support.zentri.com.


NOTE: To maintain conformance to the testing listed in Table 11. European Compliance Testing, the module shall be installed in accordance with the installation instructions in this data sheet and shall not be modified.

When integrating a radio module into a completed product the integrator becomes the manufacturer of the final product and is therefore responsible for demonstrating compliance of the final product with the essential requirements of the R&TTE Directive.

7.3.1 Labeling and User Information Requirements
The label on the final product which contains the AMWx36 module must follow CE marking requirements. The R&TTE Compliance Association Technical Guidance Note 01 provides guidance on final product CE marking.

7.3.2 Further Information
A document that can be used as a starting point in understanding the use of Short Range Devices (SRD) in Europe is the European Radio Communications Committee (ERC) Recommendation 70-03 E, which can be downloaded from the European Radio Communications Office (ERO) at: http://www.ero.dk.

Further information may be obtained from the following websites:

- Radio and Telecommunications Terminal Equipment (R&TTE) http://ec.europa.eu/enterprise/rtte/index_en.htm
- European Conference of Postal and Telecommunications Administrations (CEPT) http://www.cept.org
- European Telecommunications Standards Institute (ETSI) http://www.etsi.org
Table 11. European Compliance Testing

<table>
<thead>
<tr>
<th>Certification</th>
<th>Standard</th>
<th>Report Number</th>
<th>Date</th>
<th>Laboratory</th>
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<tr>
<td>EMF</td>
<td>EN 62311:2008</td>
<td>EA560122</td>
<td>Jul 1, 2015</td>
<td>Sporton International, Inc. (Taiwan)</td>
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<tr>
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<td>EN 300 328 v1.9.1 (2015-02)</td>
<td>ER560122</td>
<td>Jul 1, 2015</td>
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7.4 Australia

Australian radio regulations do not provide a modular approval policy similar to the United States (FCC) and Canada (IC). However, AMWx36 module test reports may be used in part to demonstrate compliance in accordance with ACMA Radio communications “Short Range Devices” Standard 2004 which references Australia/New Zealand industry standard AS/NZS-4268:2012. AMWx36 RF transmitter test reports may be used as part of the product certification and compliance folder. For further information regarding the availability of RF test reports, please contact Zentri via our website at https://support.zentri.com.

7.4.1 Further Information

Additional information may be obtained from the Australian Communications and Media Authority website at http://www.acma.gov.au.

7.5 New Zealand

New Zealand radio regulations do not provide a modular approval policy similar to the United States (FCC) and Canada (IC). However, AMWx36 module test reports may be used in part to demonstrate compliance with the New Zealand “General User Radio License for Short Range Devices”. New Zealand Radio communications (Radio Standards) Notice 2010 references Australia/New Zealand industry standard AS/NZS-4268:2012. AMWx36 RF transmitter test reports may be used as part of the product certification and compliance folder. For further information regarding the availability of RF test reports, please contact Zentri via our website at https://support.zentri.com.

7.5.1 Further Information

Additional information may be obtained from the New Zealand Radio Spectrum Ministry of Economic Development website at http://www.rsm.govt.nz.

7.6 Japan

The AMWx36 has been tested to comply with the radio regulations set forth by the Japanese Ministry of Internal Affairs and Communications (MIC) as documented in
Table 12. The module is certified for operation with the antenna supplied.

Table 12. Japan Compliance Testing

<table>
<thead>
<tr>
<th>Certification</th>
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<th>Report Number</th>
<th>Date</th>
<th>Laboratory</th>
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<td>JV560122</td>
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<td>Sporton International, Inc. (Taiwan)</td>
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<td>Radio</td>
<td>Notice No. 88 Appendix No. 43</td>
<td>JRF560122</td>
<td>Jul 1, 2015</td>
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<td>Equipment Marking</td>
<td><img src="201-150256" alt="RF mark" /></td>
<td>152150256/AA/00</td>
<td>Jul 6, 2015</td>
<td>Telefication, BV. (The Netherlands)</td>
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8 Packaging, Handling and Storage, RoHS

8.1 Packaging

Each AMWx36/S module is individually packaged in an ESD bag. The bag is NOT compliant with MSL3, and accordingly AMWx36/S modules should NOT be passed through a reflow oven. AMWx36/S modules should be hand-soldered ONLY!

If reflow is required, AMWx36/S must be baked first according to Joint Industry Standard J-STD-033C.

AMWx36/R modules are shipped in a reel enclosed inside a moisture resistant sealed bag. The shelf life of the sealed reel is 12 months at 40°C and <90% Relative Humidity (RH). Please refer to the bag seal date and the following section for handling & storage.

8.2 Handling & Storage

CAUTION

MSL3 Sensitive Device!

The AMW036 module is a moisture sensitive device rated at Moisture Sensitive Level 3 (MSL3) per IPC/JEDEC J-STD-20.

After opening the moisture sealed storage bag, modules that will be subjected to reflow solder or other high temperature processes must be:

1. mounted to a circuit board within 168 hours at factory conditions (≤30°C and <60% RH)

   OR

2. continuously stored per IPC/JEDEC J-STD-033

Modules that have been exposed to moisture and environmental conditions exceeding packaging and storage conditions MUST be baked before mounting according to IPC/JEDEC J-STD-033.

Failure to meet packaging and storage conditions will result in irreparable damage to modules during solder reflow.

8.3 RoHS Directive

The AMWx36 module is produced according to the RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment) directive and complies with the directive.
8.4 Tape and Reel Specifications

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<th>B0</th>
<th>D0</th>
<th>E</th>
<th>F</th>
<th>K0</th>
<th>P</th>
<th>P0</th>
<th>S0</th>
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<td>0.30</td>
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<td>±0.10</td>
<td>±0.10</td>
<td>±0.10</td>
<td>±0.10</td>
<td>±0.10</td>
<td>±0.10</td>
<td>±0.10</td>
<td>±0.10</td>
<td>±0.15</td>
<td>±0.05</td>
<td>±0.30</td>
</tr>
</tbody>
</table>

- All dimensions in mm unless otherwise specified
- Sprocket hole pitch cumulative tolerance ± 0.2mm
- Carrier camber not to exceed 1mm in 100mm
- All dimensions meet EIA-481C requirements
- Material: PS black polystyrene
- Thickness: 0.30 ± 0.05mm
- Packing length per 13” reel: 24.6 meters.
- Component load per 13” reel: 500pcs
- This product conforms to ROHS environmental protection
9 Ordering Information

The AMWx36 module is available individually or in a bulk reel of 500 units as described in Table 13.

**Note**: Modules ship with the latest available firmware unless otherwise stated. Customers can use the Zentri DMS (Device Management Service) to perform OTA (Over-The-Air) upgrades. If customers require volume orders of a specific firmware version (including older versions) contact Zentri for a custom part number. Minimum Order Quantities (MOQs) apply.

Table 13. Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMW036/S</td>
<td>1 x AMW036 module with ZentriOS pre-installed. Each module is individually packaged in an ESD bag.</td>
</tr>
<tr>
<td>AMW036/R</td>
<td>A single reel containing 500 x AMW036 modules, each with ZentriOS pre-installed. The entire reel is packaged in an ESD and MSL3-rated moisture sensitive bag.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMW136/S</td>
<td>1 x AMW136 module with ZentriOS pre-installed. Each module is individually packaged in an ESD bag.</td>
</tr>
<tr>
<td>AMW136/R</td>
<td>A single reel containing 500 x AMW136 modules, each with ZentriOS pre-installed. The entire reel is packaged in an ESD and MSL3-rated moisture sensitive bag.</td>
</tr>
</tbody>
</table>

10 Revision History & Glossary

10.1 Revision History

Table 14: Document Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Change Description</th>
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<tbody>
<tr>
<td>ADS-MWx36-100D</td>
<td>Jun 6, 2016</td>
<td>Initial preliminary release</td>
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</table>

11 References

Throughout this data sheet, references to other documents are listed. The following documents provide additional material:

1. IEEE 802.11 Standard – 2012
   Institute of Electrical and Electronics Engineers.
   http://standards.ieee.org
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ADS-MWx36-100R • AMWx36 Datasheet

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