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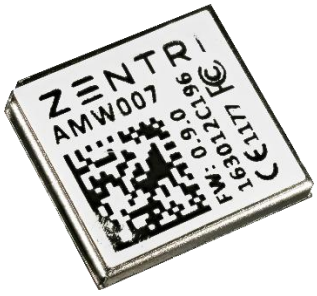
Zentri AMW007

Data Sheet



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Contact

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About this Data Sheet

This document provides information on the AMW007 802.11b/g/n Wi-Fi networking module from Zentri. Specifications for the module I/O, peripherals the WLAN subsystem were compiled from vendor datasheets and measured data.

Organization

This data sheet is organized into the following sections:

1 General Description....1
2 Block Diagram....2
3 Electrical Specifications....3
4 WLAN RF Specifications....6
5 Pinout and Signal Descriptions....8
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AMW007 Data Sheet
Embedded Wi-Fi Networking Solution

General Features

- Self-contained ultra-low power Wi-Fi module with support for ZentriOS-WL Firmware, including industry standard SSL/TLS secure TCP/IP network stack.
- Integrated SPI-serial flash for software upgrades and user accessible read/write file system

Wi-Fi

- 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

Microprocessorp

- 32-bit application processor
- Operates up to 160MHz core frequency

Interfaces*

- UART: 1 x 4-wire, 1 x TX only up to 4.5Mbit/s
- GPIO: Up to 8 GPIOs (overlaid with peripherals)
- A/D converter: 1 x 10-bit resolution
- PWM: Up to 4 PWM outputs
- Wake-up: Wake pin for ultra-low power operation

**Some interfaces share module pins*

Operational & Radio

- Single operating voltage : 3.3V (typical)
- Operational Temperature Range: -40°C to +85°C
- Size : 12 x 11 x 1.8mm (0.47” x 0.43” x 0.07”)
- Weight : 0.03 oz (1g)
- Current consumption @ 3.3V, 25°C
  - Standby : 0.9mA
  - Deep sleep / RTC : 20 / 60µA
  - Sleep (Memory Retention) : 0.31mA
  - Wi-Fi Powersave : 0.86mA (DTIM = 3)
  - Active receive : 65mA
  - Active transmit :
    - 100mA @ +0dBm
    - 200mA @ +18dBm
- Maximum RF transmit power
  - 802.11b/g : +20 dBm
  - 802.11n : +16 dBm
- Minimum Receive sensitivity
  - 802.11b/g : -93 dBm
  - 802.11n : -85 dBm

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

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ZentriOS-WL Firmware Features

The ZentriOS-WL firmware supplied with the AMW007 provides a wide range of features beyond the underlying hardware, and supports application development via its command API.

For complete documentation of ZentriOS-WL, see:

https://docs.zentri.com/zentrios/wl/latest/

Software APIs

- ZentriOS-WL command API

Interfaces

- Serial (UART, remote terminal)
- SoftAP and WLAN client (not concurrent)

Servers

- TCP, UDP, HTTP, DHCP, DNS
- HTTP Server with RESTful API
- Fully customizable mobile responsive Web application with JavaScript and Python libraries

Clients

- TCP, TLS, NTP, DHCP, DNS
- HTTP(S) client
- Websocket client

Setup

- Multiple Wi-Fi setup options, including via serial command and Web setup with SoftAP

Peripherals and Sensors

- GPIOs for control, indication and monitoring
- Automated broadcast and streaming of sensor data
- Local caching of sensor data

Update and Recovery

Wireless OTA (Over-the-Air) update to remote manage firmware using the Zentri DMS (Device Management Service)

System Management

- System configuration and monitoring via setting and getting a wide range of variables
- Configurable power states
Sleep/wake timers

File System

- Read/write file system
- Storage of large files
- HTTP download to file system, HTTP upload from file system

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1 General Description

The AMW007 module from Zentri provides an advanced stand-alone Wi-Fi and networking solution.

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 embedded connected operating system, pre-programmed into all modules, may be used to fast-track module integration into end-products.

With dimensions of just 12mm x 11mm and a wide temperature range, the module is suitable for integration into most embedded applications.

The Wi-Fi device 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.

The AMW007 microcontroller core operates at a frequency of 160MHz.

The AMW007 module offers extensive I/O and peripheral interfaces listed below, and provides additional interface combinations by leveraging multiplexing and alternate function capabilities.

- 1 x 4-Wire UART interface
- 8 x GPIOs
- 1 x 10-bit A/D converters
- 4 x PWM outputs
- 1 x ultra-low power wake input

The module is powered by a single 3.3V power supply.

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 has numerous modular approvals. See Section 7, Regulatory Certification.

1.1 ZentriOS

This document is designed to cover the physical and electrical characteristics of the AMW007 module. For information on ZentriOS see http://docs.zentri.com/zentrios/wl/latest/

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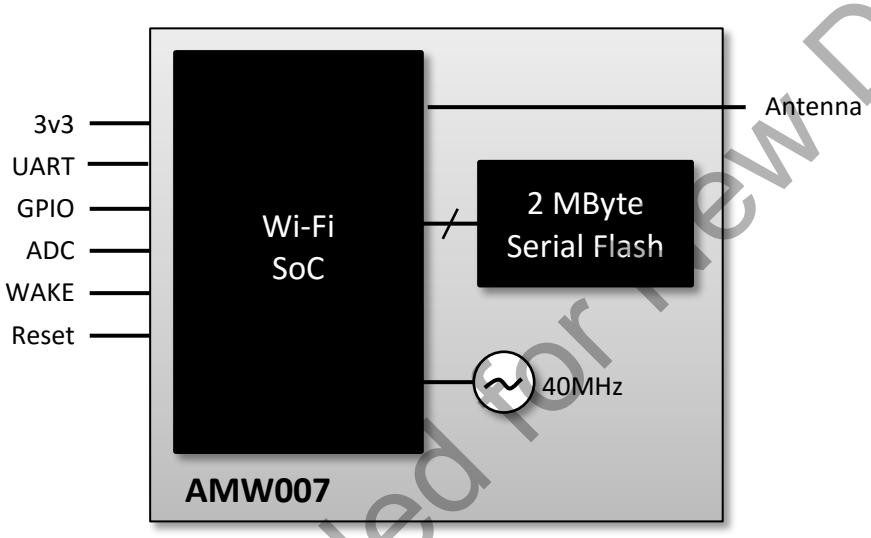
2 Block Diagram

Figure 1 is a block diagram of the AMW007 module. The main components of the module are a Wi-Fi System-on-Chip (SoC) and the quad-SPI serial flash. The processor and peripherals are driven by a 40MHz crystal. An on-board 2 MByte serial flash chip may be used to store user applications, data and configuration, and firmware images as part of the Zentri secure over the air (OTA) update process.

Figure 1. AMW007 Architecture



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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.

Table 1. Absolute Maximum Voltage Ratings

Symbol	Ratings	Min	Max	Unit
VDD	External power supply voltage	-0.3	3.6	V
V_{in}	Input voltage on any other GPIO pin	GND - 0.3	VDD + 0.4	

Table 2. Absolute Maximum Environmental Ratings

Characteristic	Note	Min	Max	Unit
Storage Temperature	–	-40	+125	°C
Storage Humidity	Non-condensing (storage)	–	65	%
Electrostatic Discharge (HBM)	TEMP=25°C		2	kV
Electrostatic Discharge (CDM)	TEMP=25°C		0.5	kV
Maximum Soldering Temperature	IPC/JEDEC JSTD-020		260	°C

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

Symbol	Ratings	Min	Typ	Max	Unit
VDD[1]	External power supply voltage	3.0	3.3	3.6	V

***Notes**:*

1. *The performance of the Wi-Fi subsystem is degraded significantly at low voltages*

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3.2.2 Environmental Conditions

Table 4. Recommended Environmental Conditions

Characteristic	Note	Min	Max	Unit
Ambient Temperature	Limited by crystal specification	-30[1]	+85	°C
Relative Humidity	Non-condensing (operating)	–	85	%

***Notes**:*

1. *If you require an extended temperature range, contact Zentri.*

3.3 Power Consumption

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

Parameters	Min	Typical	Max	Unit
Transmit @ +18dBm[1]		200		mA
Transmit @ +12dBm		150		mA
Transmit @ +0dBm		100		mA
Receive		50		mA
Application running, radio off		25		mA
Sleep		10		µA
Power up, 70ms boot time		15		mA

***Notes**:*

A low impedance power supply, capable of delivering a continuous 300mA, is recommended to cater for inrush currents at extremes of temperature and supply voltage. See 6.7, Power Supply.

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3.4 Digital IO Characteristics

All digital IO pads are bidirectional, non-inverting and tri-state. Each pad includes an input and an output buffer with tristate control inputs. When the AMW007 is powered down, all output enable signals can be set to hold high or low to minimize power consumption.

The hold functionality introduces some positive feedback into the pad. Hence, the external driver that drives the pad must be stronger than the positive feedback. The required drive strength is however small – in the range of 5uA.

Table 6. Digital IO Characteristics

Parameters	Min	Max	Unit
Input low voltage	-0.3	0.25 x VDD	V
Input high voltage	0.75 x VDD	3.6	V
Input leakage current		50	µA
Output low voltage		0.1 x VDD	V
Output high voltage	0.8 x VDD		V
Input pin capacitance		2	pF
Maximum drive capability		12	mA

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4 WLAN RF 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

Feature Supported	Description
WLAN Standard	IEEE 802.11b/g/n 1x1 SISO
Frequency Band	2.412 GHz – 2.484 GHz
WLAN Channels	Channels 1 – 14
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)

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4.2 WLAN Specifications

Table 8. WLAN Receiver Performance Specifications

Parameter	Condition/Notes	Min	Typical	Max	Unit
Frequency Range	–	2412	–	2484	MHz
Operating Temperature[1]	–	-40	–	+85	°C
Receive Sensitivity[2] (8% PER for 1024 octet PSDU) at either antenna port	1 Mbps DSSS	–	-98	–	dBm
	11 Mbps CCK	–	-91	–	
Receive Sensitivity[2] (10% PER for 1000 octet PSDU) at antenna port	6 Mbps OFDM	–	-93	–	dBm
	54 Mbps OFDM	–	-75	–	
Receive Sensitivity[2] (10% PER for 4096 octet PSDU) at either antenna port.	6.5 Mbps MCS0, HT20 65 Mbps MCS7, HT20	– –	-85 -72	– –	dBm
Transmit power @ 72.2Mbps		14	15	16	dBm
Transmit power @ 1MBps		18	19	20	dBm

***Notes**:*

1. *Operation below -20°C and above +65°C with parameter derating per Note 2*
2. *Derate receive sensitivity by 1.5dB for operation between temperatures of -40°C to -20°C and 65°C to 85°C*

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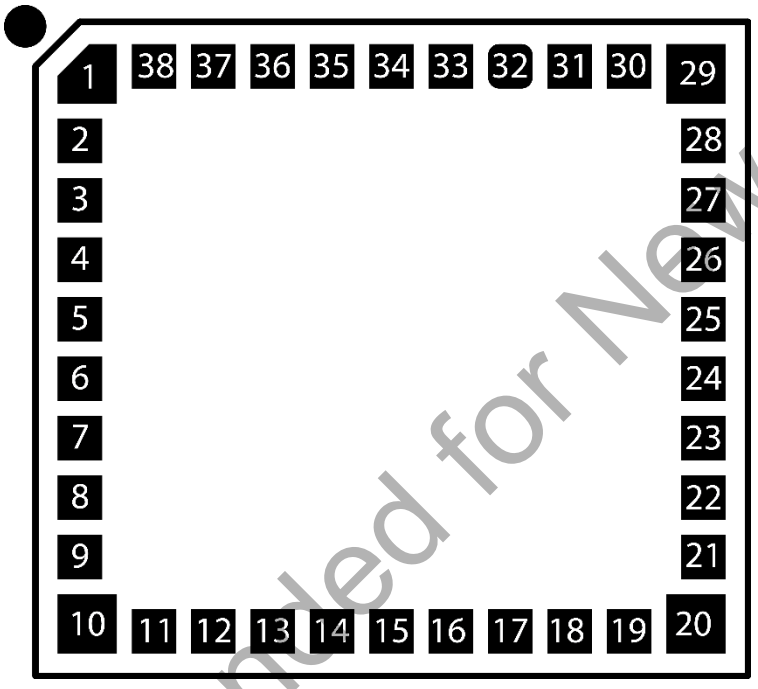
5 Pinout and Signal Descriptions

5.1 Pinout

A top view of the AMW007 pinout is depicted in Figure 2. All dimensions are in thousands of an inch. A recommended footprint is provided in Section 6.2.

Figure 2. AMW007 Pinout (TOP View – Pins NOT visible from top!)



5.2 Pin Description

Table 9. AMW007 Pin Definitions

Pin	Name	Type[1]	Primary Function	Alternate & Other Function(s)
1	GND	S	Ground	-
2	-	NC	-	-
3	WAKE	O	WAKE	-
4	-	NC	-	-
5	GPIO_0	I/O	GPIO / Factory Reset	PWM_0
6	GPIO_1	I/O	GPIO	PWM_1
7	UART_RX	I/O	-	-
8	UART_TX	I/O	-	Boot Control[3] (onboard 10k pull down resistor)

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9	GPIO_2	I/O	GPIO	Boot Control[3] DEBUG_UART_TX (onboard 2.2k pull up resistor)
10	GND	S	Ground	-
11	GPIO_3	IO	GPIO	Boot Control[3] (onboard 2.2k pull up resistor)
12	GPIO_4	I/O	GPIO	PWM2
13-19	-	NC	-	-
20	GND	S	Ground	-
21	GPIO_5	I/O	GPIO	-
22-25	-	NC	-	-
26	RESET_N	I	RESET	-
27	GPIO_6	I/O	GPIO	UART_CTS
28	GPIO_7	I/O	GPIO	UART_RTS
29	GND	S	Ground	-
30	-	NC	-	-
31	GND	S	-	-
32	ANTENNA	A	ANTENNA[2]	-
33	GND	S	Ground	-
34	CHIP_EN	I	Chip Enable	VDD = Enable module GND = Deep Sleep Mode
35	ADC	A	ADC	-
36	-	NC	-	-
37	GND	S	Ground	-
38	VDD	S	Power Supply	+3.3V nominal

Notes:

1. *I = Input, O = Output, S = Supply, A = Analog, NC = No Connection (Do not connect to ground)*
2. *The Wi-Fi Antenna pin is AC-coupled and has a nominal 50 ohms output impedance.*
3. *The Boot Control pins must be at the following levels immediately after a reset in order for the module to boot correctly: UART_TX = GND, GPIO_2 = VDD, GPIO_3 = VDD*

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6 Design Guidelines

6.1 Dimensions

Figure 3 - AMW007 Spectre Dimensions

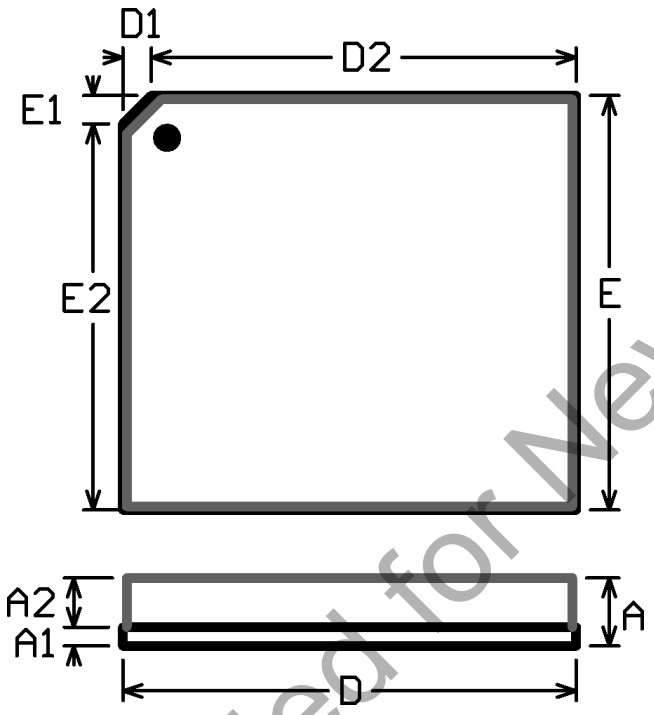

Table 6 - AMW007 Spectre Dimensions

Symbol	Imperial (thou)	Tolerance (thou)	Metric (mm)	Tolerance (mm)
A	71	±6	1.80	±0.15
A1	20	±3	0.51	±0.08
A2	51	±6	1.30	±0.15
D	472	±5	12.00	±0.13
D1	30	±5	0.76	±0.13
D2	449	±6	11.40	±0.15
E	433	±5	11.00	±0.13
E1	30	±5	0.76	±0.13
E2	409	±6	10.40	±0.15

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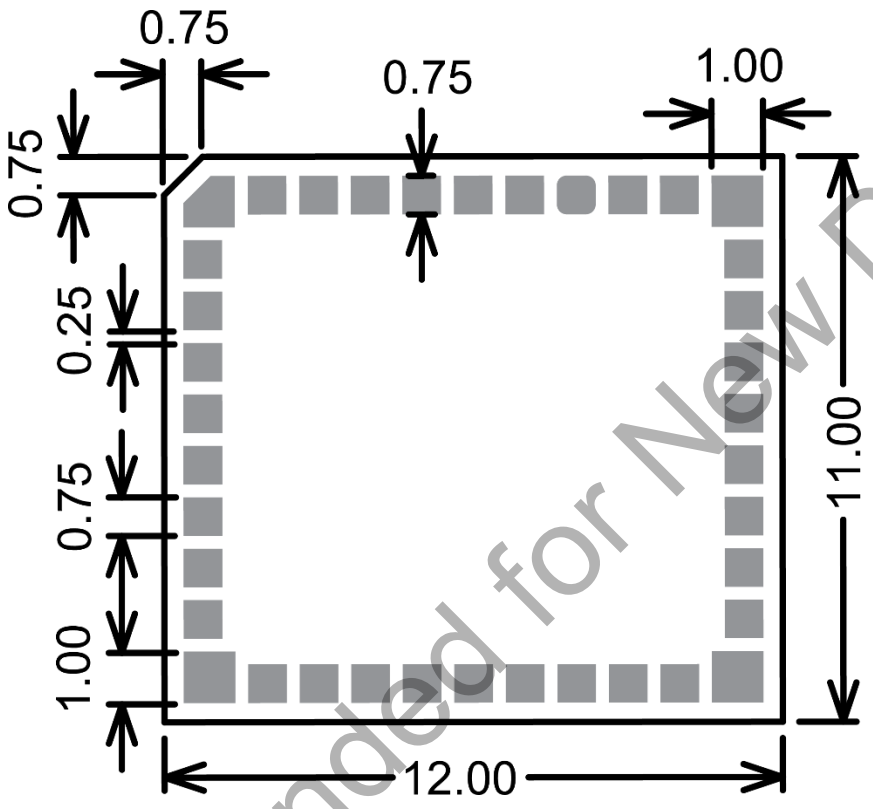
6.2 Recommended PCB Footprint

All dimensions in Figure 4 are in millimeters unless otherwise marked.

Figure 4. AMW007 Recommended Footprint (Top)



6.3 Routing Recommendations

When designing a carrier board, the addition of ground fill directly underneath the AMW007 module, rather than signal or power traces, is recommended. All ground pads adjacent to antenna pins must be connected to a solid ground plane. Failure to comply with these recommendations may result in degraded performance of WLAN functionality.

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6.4 Soldering Information

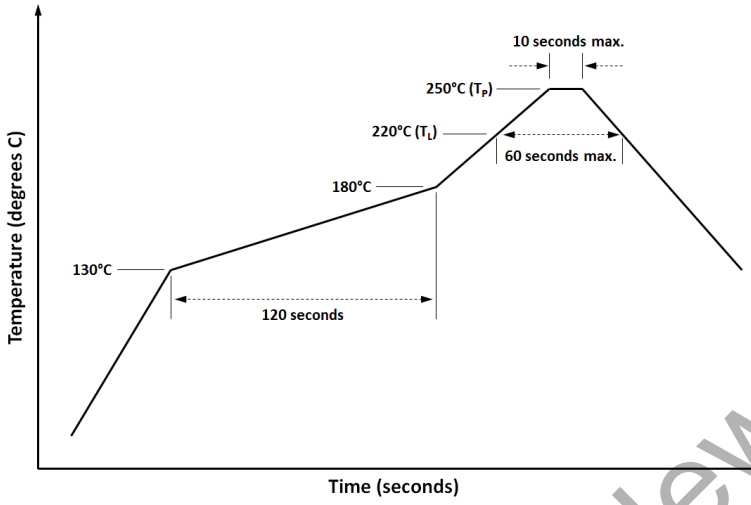
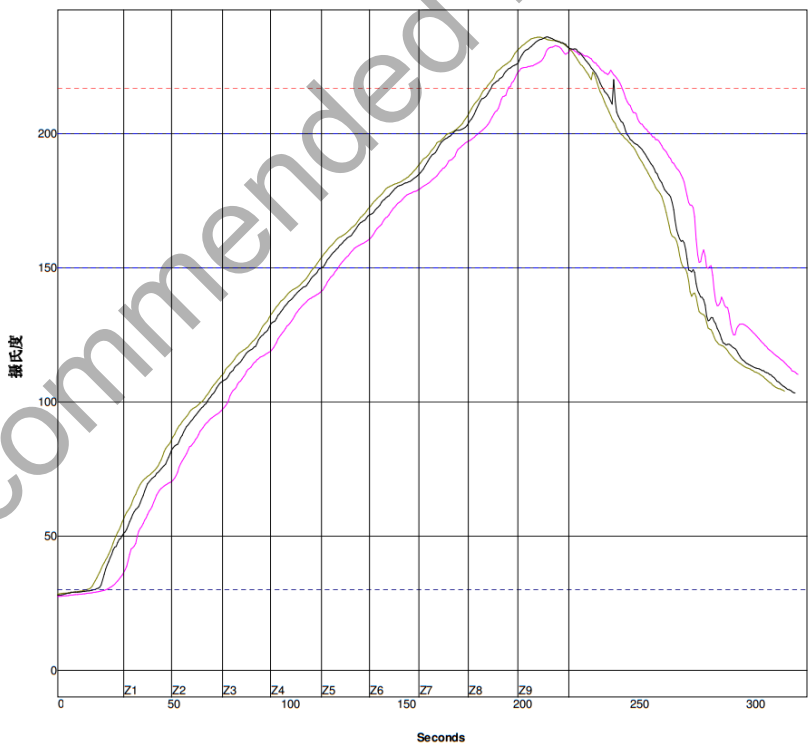


Figure 5 - Recommended solder reflow profile

Oven Name: HELLER Process Window Name: ALPHA_OM325

Setpoints (摄氏度)									
Zone	1	2	3	4	5	6	7	8	9
Top	100	120	140	160	180	200	235	255	250
Bottom	100	120	140	160	180	200	235	255	250
Conveyor Speed (cm/min):	70.0								



PWI= 87%	Max Rising Slope		Max Falling Slope		Preheat 30-150C		Soak Time 150-200C		Reflow Time /217C		Peak Temp	
<TC2>	1.64	9%	-4.74	-87%	99.98	50%	60.17	-71%	48.88	-37%	232.83	-77%
<TC4>	1.62	8%	-3.27	-14%	98.09	45%	57.87	-78%	48.45	-39%	235.95	-52%
<TC5>	1.65	10%	-3.43	-22%	98.04	45%	56.43	-82%	48.08	-40%	236.06	-52%
Delta	0.03		1.47		1.94		3.74		0.80		3.23	

Figure 6 - Example solder reflow profile (AMW007-E03 evaluation board)

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6.5 Module Photograph

Figure 7. AMW007 Photograph (Top)

6.6 External Antennas

The AMW007 module supports a single external antenna.

Table 10 - Tested External Antenna Types

Model	Type[1]	Gain (dBi)
Printed Antenna	PCB Trace	3.3
Compact Printed Antenna	PCB trace	3.18
ACA-WIRE-2458	Wired	2.1
Johanson Tech. 2450AT42A100E	Chip	0.0
ACA-1SRPP-2400	Dipole	0.6
ACA-4HSRPP-2458	Dipole	1.0

(1) An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.

6.6.1 PCB Trace Antenna

This is an efficient, wide bandwidth PCB-style antenna with dimensions 25.7 x 7.5 mm.

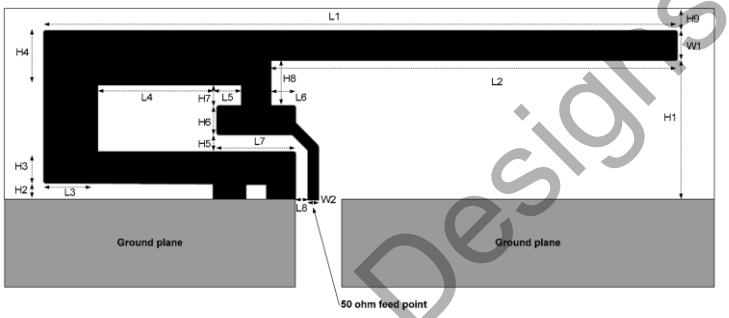

Table 11 – PCB Trace Antenna Dimensions

Dimension	Length (mm)	Dimension	Length (mm)
H1	5.70	W2	0.46
H2	0.74	L1	16.40
H3	1.29	L2	16.40
H4	2.21	L3	2.18
H5	0.66	L4	4.80
H6	1.21	L5	1.00
H7	0.80	L6	1.00
H8	1.80	L7	3.20
H9	0.61	L8	0.45
W1	1.21		

6.6.2 Compact PCB Trace Antenna

This 2.4 GHz PCB antenna can fit in an area smaller than 21mm x 10mm, and as small as 15mm x 6mm. To achieve optimum performance, make an exact copy of this reference design.

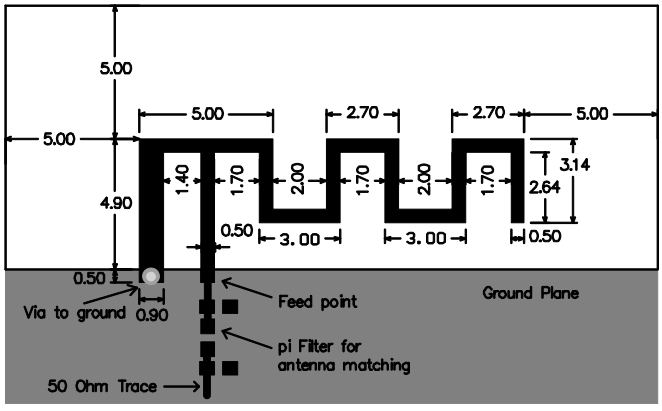

Figure 8 - Trace Antenna (dimensions in mm)

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6.6.3 Wire Antenna

A suitable wire antenna is an 18-gauge wire with a length of 25.4mm ± 2mm. The wire antennas should be perpendicular to the carrier board.

NOTE! Do **NOT** bend antennas backwards over the module; doing so will cause poor performance and may cause undesirable out-of-band radio transmissions.

Chip Antenna

The AMW007 is certified for use with a chip antenna from Johanson, part number 2450AT42A100E. Be sure to follow the antenna layout design guidelines in the antenna datasheet.

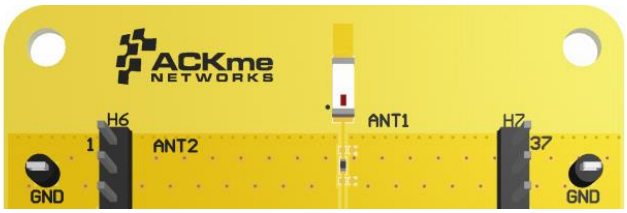

Figure 9 – Chip antenna layout example

6.6.4 Monopole Antenna

Suitable monopole antennas include the ACA_1SSRPP_2400 and ACA_4HSRPP_2458, both of which are available online at https://www.zentri.com/accessories.

Figure 10 - ACA-1SSRPP-2400

Figure 11 - ACA-4HSRPP-2458

6.7 Power Supply

The AMW007's typical transmit current requirement is 200mA. To handle sudden demand for this typical current, we recommend a power supply capable of delivering a continuous 300mA.

We also recommend bypass capacitors to meet instantaneous power requirements. For design guidelines on bypass capacitors, see the AMWx06 Hardware Design Guide, which also applies to the AMW0x7 regarding characteristics and placement of capacitors. Note that references to specific pin numbers should be adjusted for the AMW007 and AMW037.

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6.8 Application Examples

6.8.1 Operation using ZentriOS

Each AMW007 module is pre-installed with and licensed to use ZentriOS-WL, Zentri's feature-rich and reliable Wi-Fi networking application. The module can be used with an external host microcontroller via the serial interface command API.

For more details see https://docs.zentri.com/zentrios.

To use ZentriOS with a host processor, the module only requires an external connection to power and a UART serial interface. A host processor connects to the UART (pins 7/8) as shown in Figure 12. Zentri recommends UART hardware flow control (RTS/CTS) is used to improve the reliability of data communications.

GPIO0 is the default factory reset pin. In order for the module to boot normally (and avoid factory reset), the GPIO0 pin must be pulled or driven to ground during a reset. A 100k pull down resistor on this pin is recommended.

The CHIP_EN pin must be pulled to 3V3 to enable ZentriOS to boot. A 100k pull up resistor is recommended if this pin is not driven by an external host MCU.

The WAKE pin is an output from the module, and may be used to wake the module from deep sleep. Connect WAKE to RESET_N using a 1k resistor to enable sleep/wake functionality. This connection is not required if sleep/wake functionality is not used, or a host MCU has explicit control of the RESET_N pin.

6.8.2 Hardware Design Guidelines

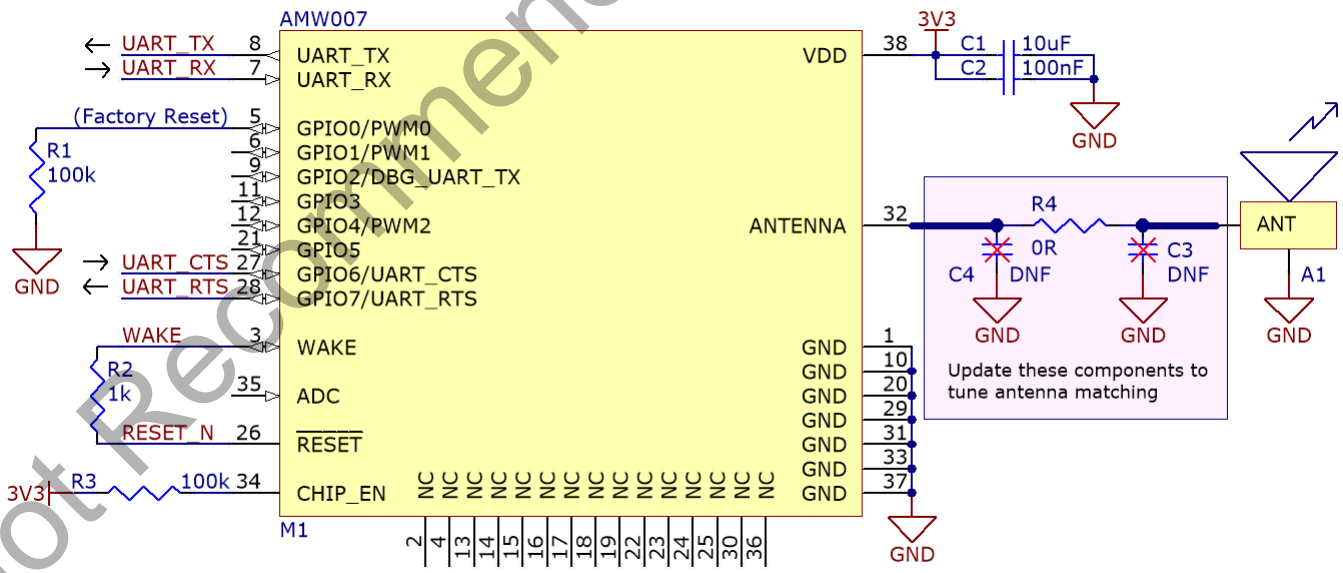
For hardware design guidelines, see:

Zentri online documentation, AMWx06 Hardware Design

The general guidelines for the AMWx06 devices apply to all Zentri devices.

Pin numbers should be adjusted for actual device used.

Figure 12. Using the AMW007 Module running ZentriOS and a UART serial interface



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7 Regulatory Certification

The AMW007 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

The certifications listed in this section are valid at the time of publication. For up-to-date information refer to Zentri documentation online at:

https://docs.zentri.com

All AMW007 test reports are available on the Zentri website at:

https://docs.zentri.com/zentri/docresources#amw007

Should you require regulatory certification for the AMW007 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://www.silabs.com/about-us/contact-us.

7.1 United States

The Zentri AMW007 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 AMW007 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 AMW007 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-5B9198
> 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.

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If the exterior label area is smaller than the palm of the hand, the end product user manual must contain the above statement. The user manual should contain the following additional statement:

> This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
> - Reorient or relocate the receiving antenna.
> - Increase the separation between the equipment and receiver.
> - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
> - Consult the dealer or an experienced radio/TV technician for help.

The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.

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.

For products available in the USA/Canada market, only channels 1 to 11 can be operated. Selection of other channels is not possible.

This module is intended for OEM integrators. The OEM integrator is responsible for compliance in all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used.

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 AMW007 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.

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7.1.4 Approved External Antenna Types

Modular approval testing of the AMW007 was performed with the antenna types listed in Table 10 - Tested External Antenna Types.

To maintain modular approval in the United States, only the tested antenna types shall be used. It is permissible to use different antenna manufacturers provided the antenna types match: in-band and out-of-band radiation patterns and antenna gain must be similar to those tested.

7.1.5 Further Information

Additional information regarding FCC certification and use of the AMW007 module in the United States is available from the following sources.

- Federal Communications Commission (FCC)
  http://www.fcc.gov

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7.3 Canada

The AMW007 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.

7.3.1 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-5B9198

The user documentation should contain the following information:

> For products available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.
>
> *Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.*

The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.

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.
>
> Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux onditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

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 brouil-lage radioélectrique à l'intention des autres utilisa-teurs, 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.

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In the users manual of the end product, the end user has to be informed to keep at least 20 cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

> This radio transmitter IC ID 11685A-5B9198 has been approved by Industry Canada to operate with the antenna types listed in 6.6, External Antennas, 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 IC ID 11685A-5B9198 a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans in 6.6, External Antennas, 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.

7.3.2 External Antenna Types

Modular approval testing of the AMW007 was performed with the antenna types listed in Table 10 - Tested External Antenna Types.

Transmitter Antenna (from Section 7.1.2 RSS-Gen, Issue 3, December 2010):

The AMW007 module can only be sold or operated with antennas with which it was approved. Transmitter may be approved with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest gain antenna of each combination of transmitter and antenna type for which approval is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type having equal or lesser gain as an antenna that had been successfully tested with the transmitter, will also be considered approved with the transmitter, and may be used and marketed with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer.

For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power limits.

7.3.3 Further Information

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

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7.5 Europe

The AMW007 module is a Radio Equipment Directive (RED) assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The AMW007 module has been tested to Radio Equipment Directive (2014/53/EU) and R&TTE Directive (1999/5/EC).

See Table 12. European Compliance Testing.

Opinion has also been issued.

See AMW0x7 CE Reports

The R&TTE Compliance Association provides guidance on modular devices in the document titled Technical Guidance Note 01.

NOTE: To maintain conformance to the testing listed in Table 12. 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.

7.5.1 Labeling and User Information Requirements

The label on the final product which contains the AMW007 module must follow CE marking requirements. The R&TTE Compliance Association Technical Guidance Note 01 provides guidance on final product CE marking.

The end user manual or labelling should contain the following information:

This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

7.5.1 External Antenna Requirements

From R&TTE Compliance Association Document Technical Guidance Note 01:

Provided the integrator installing an assessed radio module with an integral or specific antenna and installed in conformance with the radio module manufacturer's installation instructions requires no further evaluation under Article 3.2 of the R&TTE Directive and does not require further involvement of an R&TTE Directive Notified Body for the final product. [Section 2.2.4]

The European Compliance Testing listed in Table 12. European Compliance Testing was performed using antenna types listed in Table 10 - Tested External Antenna Types.

7.5.2 Further Information

Further information may be obtained by searching for:

- European Conference of Postal and Telecommunications Administrations (CEPT)
- Radio Equipment Directive (RED), which replaces Radio and Telecommunications Terminal Equipment (R&TTE)

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Table 12. European Compliance Testing

Certification	Standard	Report Number	Date	Laboratory
Safety	EN 60950-1:2006, A11:2009, A1:2010, A12:2011, A2:2013	L641926L244	20 July 2016	Sporton International Inc. Lab
EMF	EN 62311:2008	EA641926	26 May 2016	Sporton International Inc. Lab
EMC	EN 301 489-1 v2.1.1 (2016-11), Class B EN 301 489-17 v3.1.1 (2016-11)	21274927_001	10 July 2017	TÜV Rheinland
	EN 55022:2010/AC:2011, Class B EN 55024:2010	EH641926	26 May 2016	Sporton International Inc. Lab
Radio	EN 300 328 v2.1.1 (2016-11)	21274937_001	10 July 2017	TÜV Rheinland
Notified Body Opinion		G0M-1607-5753-C-V01	26 July 2016	Eurofins

7.6 Australia

Australian radio regulations do not provide a modular approval policy similar to the United States (FCC) or Canada (IC). However, AMW007 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. AMW007 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 at:

https://www.silabs.com/about-us/contact-us.

7.6.1 External Antenna Requirements

Compliance tests were performed using antenna types listed in Table 10 - Tested External Antenna Types.

If an external antenna is used with the AMW007 module, additional testing of the end product is needed to meet Australian regulatory requirements.

7.6.2 Further Information

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

7.7 New Zealand

New Zealand radio regulations do not provide a modular approval policy similar to the United States (FCC) or Canada (IC). However, AMW007 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. AMW007 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://www.silabs.com/about-us/contact-us.

7.7.1 External Antenna Requirements

Compliance tests were performed using antenna types listed in Table 10 - Tested External Antenna Types.

If an external antenna is used with the AMW007 module, additional testing of the end product is needed to meet New Zealand regulatory requirements.

7.7.2 Further Information

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

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7.8 Japan

The AMW007 radio module is certified to comply with the Technical Regulations Conformity Certification of Specified Radio equipment (ordinance of MPT No 37, 1981). For further information see:

Ministry of Internal Affairs and Communications, Japan, Information and Communications Policy

For the full certification package, see:

AMW0x7 Japan Certification Package.

The following table shows antenna types tested:

Table 7 - Tested External Antenna Types

Model	Type[1]	Gain (dBi)
Printed Antenna	PCB Trace	3.3
ACA-WIRE-2458	Wired	2.1
Johanson Tech. 2450AT42A100E	Chip	0.0
ACA-4HSRPP-2458	Dipole	1.0

(1) An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.

Table 8. Japan Compliance Testing

Certification	Standard	Report Number	Date	Laboratory
Verification of Compliance	Equipment Radio Regulations: 2008 (including amendments)	JR641926	Feb 7, 2018	Sporton International Inc. Hsinchu Division
Radio	Notice No. 88 Appendix No. 43	JR641926-03	Dec 19, 2017	
Equipment Marking		JR641926	Feb 7, 2018	Sporton International Inc. Hsinchu Division

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8 Packaging, Handling and Storage, RoHS

8.1 Packaging

Modules are shipped either in cut tape, with ESD-safe packaging, or in reels. Reels and cut-tape are shipped in Moisture Barrier Bags.

For package quantity, see section 9, Ordering Information.

The shelf life of the sealed reel or cut tape 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.

Ensure that all modules are managed in accordance with Moisture Sensitive Level 3 (MSL3) per **IPC/JEDEC J-STD-20**.

If reflow is required, AMW007 modules **must be baked** first, according to Joint Industry Standard J-STD-033C.

8.2 Handling & Storage

CAUTION
MSL3 Sensitive Device!

The AMW007 module is a moisture sensitive device rated at Moisture Sensitive Level 3 (MSL3) per **IPC/JEDEC J-STD-20**. Note that the AMW007 cannot be hand-soldered.

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 AMW007 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.

Recommendation: Bake product prior to any solder flow operation. This ensures optimal protection.

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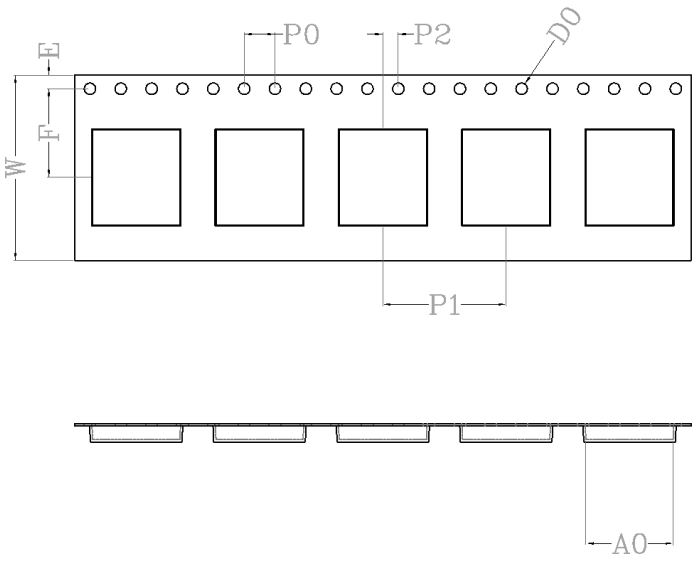
8.4 Tape and Reel Specifications



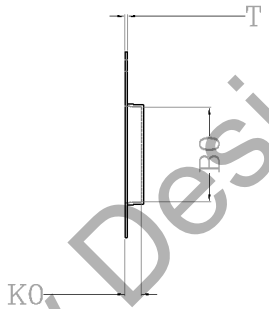


Figure 13 - Tape Specifications

Symbol	A0	B0	D0	E	F	K0
Specification (mm)	11.3 ± 0.10	11.3 ± 0.10	1.5 ± 0.50	1.75 ± 0.10	11.5 ± 0.10	2.10 ± 0.10

Symbol	P0	P1	P2	T	W
Specification (mm)	4.00 ± 0.10	16.00 ± 0.10	2.00 ± 0.10	0.30 ± 0.05	24.0 ± 0.30

- Tape material : black PS material, in line with ROHS environmental management substances
- Tape thickness: 0.3 mm ± 0.05 mm
- Tape width: 24mm (0.94")
- Distance between chain hole centers within the range of ± 0.2 mm of cumulative error
- The maximum cumulative tolerance is ± 0.20 mm for 10 sprocket hole pitch
- Cambers do not exceed 1.0 mm in 250mm length
- Tolerances not marked : ± 0.20 mm
- One 13” reel = 29.4 meters
- All dimensions follow EIA-481-2A Series definition

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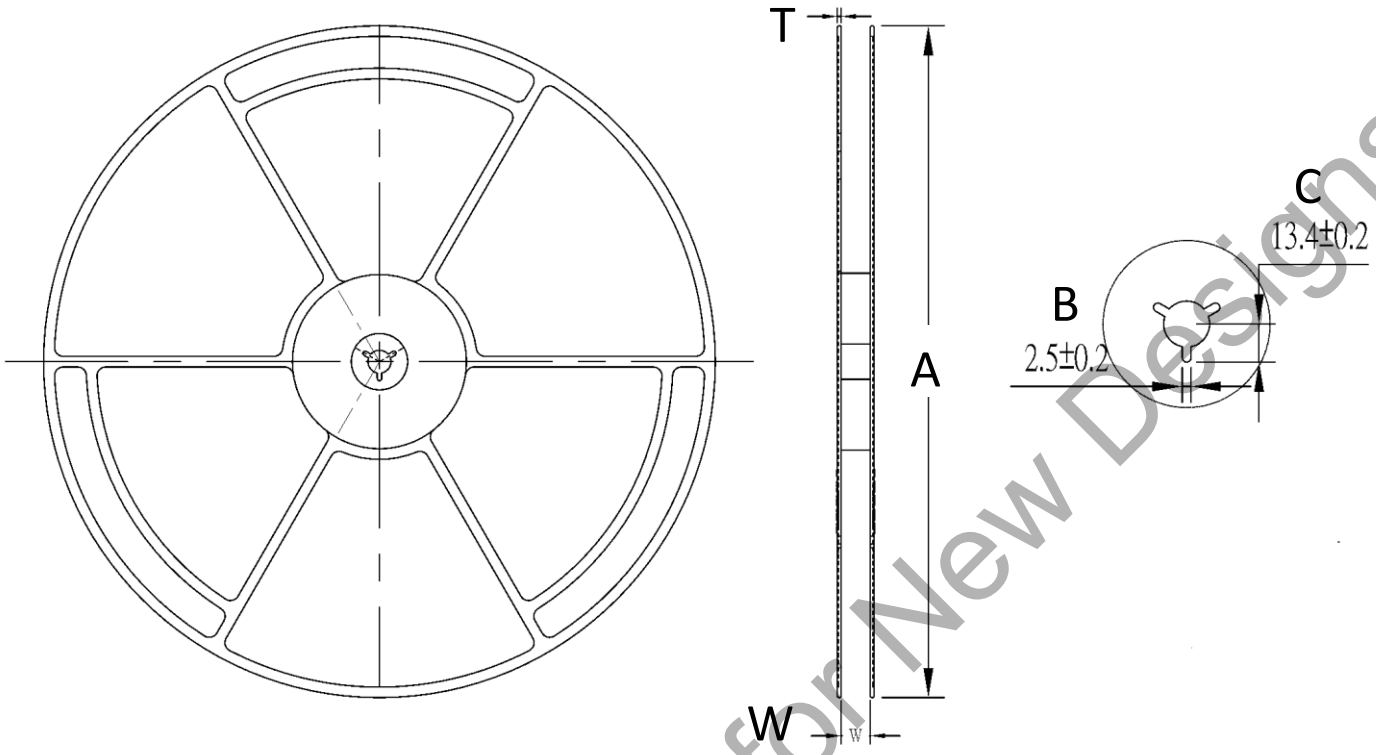

Figure 14 - Reel Specifications

Symbol	A	B	C	T	W
Specification (mm)	33.0 ± 1.0	2.5 ± 0.2	13.4 ± 0.2	2.2 ± 0.2	24.5 ± 1

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9 Ordering Information

You can order AMW007 modules as either cut tape pre-loaded with an unspecified ZentriOS, or as a full reel of **1000** units, pre-loaded with either a specific ZentriOS version or a version of your embedded custom application.

When you order, refer to the OPN (Orderable Part Number), as described below. For examples, see Table 9 - Ordering Information below.

9.1 Ordering an Unspecified ZentriOS Version

OPN: AMW007
When ordering an unspecified ZentriOS version as cut tape, the OPN is simply AMW007.

When ZentriOS version is unspecified, orders of AMW007 modules ship with whatever versions of ZentriOS are available. The ZentriOS version is not guaranteed to be the same for all items shipped. Cut tape is suitable for sampling, evaluation, and pilot builds.

Upon delivery, you can update modules individually, via OTA (Over-The-Air update), with a specific ZentriOS version.

9.2 Ordering a Specific ZentriOS-WL Version or a Custom Firmware Version

ZentriOS version OPN: AMW007-x.y.zR

Custom firmware version OPN: AMW007-xxxxxxR

Volume orders are delivered in reels, as indicated by the **R** suffix. To ensure consistency, specify an OPN corresponding to a specific version.

ZentriOS version: the OPN is of the form AMW007-x.y.zR, where **x** is major version, **y** is minor version and **z** is patch version.

Custom firmware version: the OPN is of the form AMW007-xxxxxxR, where **xxxxxx** is a unique ID indicating a specific product version. Zentri ships reels with the product version specified.

A custom firmware version includes a specific version of ZentriOS, and additional configuration details.

After shipping, individual modules may be updated to later versions of this product only.

Table 9 - Ordering Information

Order Type	Delivery Format	Quantity	Example OPN
Unspecified firmware	Cut tape	Less than 1000 units	AMW007
Specified ZentriOS version	Full reel box	1000 units	AMW007-1.0.2R
Custom firmware	Full reel box	1000 units	AMW007-H35GHJR

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9.3 ZentriOS Version History

ZentriOS-WL firmware revision history is available online at:

https://docs.zentri.com/zentrios/editions-and-versions#zentrioswl

10 Revision History & Glossary

10.1 Revision History

Table 14: Document Revision History

Revision	Date	Change Description
ADS-MW007-100R	Feb 6, 2016	Initial release
ADS-MW007-101R	Aug 26, 2016	Added certification information
ADS-MW007-104R	Aug 3, 2017	Added ZentriOS-WL Firmware Features, Dimensions section, updated ordering information, updated European Certification
ADS-MW007-105R	April 4, 2018	In section 8, noted that cut tape is shipped in a Moisture Barrier Bag. Added section 7.8, Japan Certification. Added section 6.7, Design, Power Supply and note in Power Consumption table, section 3.3.

10.2 Glossary

In most cases, acronyms and abbreviations are defined on first use. A comprehensive list of acronyms and other terms used in Zentri documents are provided at https://docs.zentri.com/zentri/glossary.

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11 References

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

1. IEEE 802.11 Standard
   Institute of Electrical and Electronics Engineers.
   http://standards.ieee.org

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Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
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- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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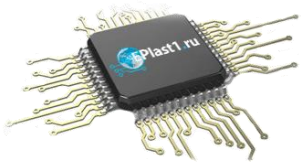
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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