ZENTRI

# AMW007 Data Sheet

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# Embedded Wi-Fi Networking Solution

## Features

- Self-contained ultra-low power Wi-Fi module with secure TCP 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

Microprocessor

- 32-bit application processor
- Operates up to 80MHz core frequency

Interfaces*

- UART: 1 x 4-wire, 1 x TX only up to 4.5Mbit/s
- SPI : SPI-Slave/Master (40MHz)
- GPIO: Up to 16 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*

## 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

# 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 up to 80MHz.

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
- 1 x Tx only UART interface
- 1 x SPI interfaces (master/slave)
- 16 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.

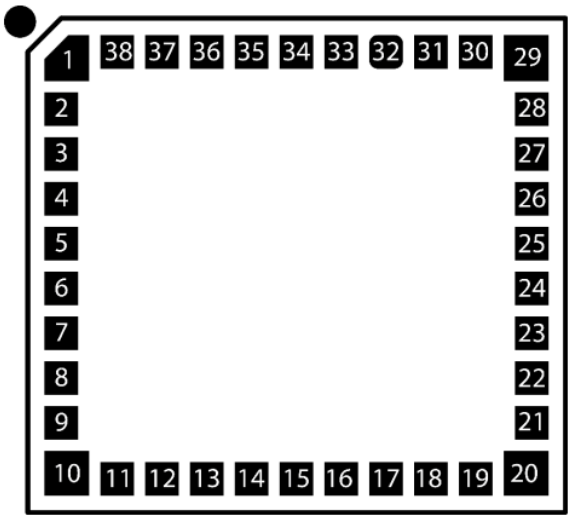
Various powersave modes offer ultra-low power operation. Wake from low power sleep mode is possible using IO pins or the internal real-time clock, and wake from ultra-low power standby mode is achieved using the dedicated wake pin.

The module has FCC & IC modular approval for use in the United States and Canada, CE approval for use in Europe and related approvals for use in other countries.

# Pinout and Signal Descriptions

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 6.1.

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




## Pin Description

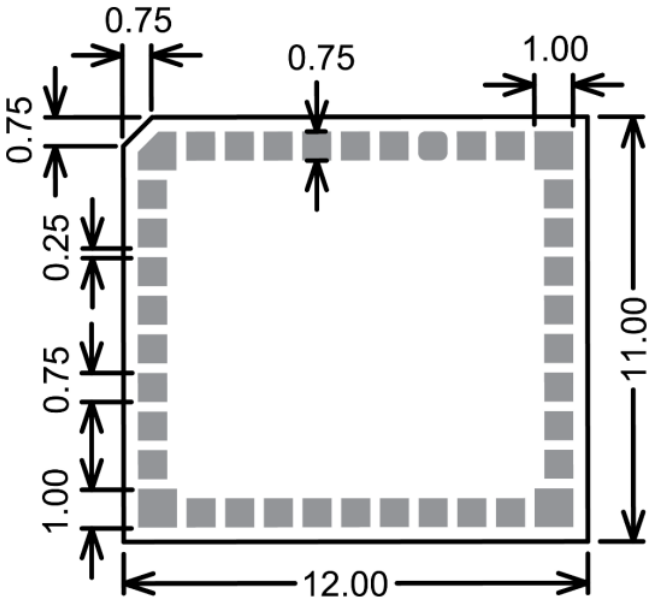
| Pin | Name | Type[1] | Primary Function | Alternate & Other Function(s) |
|---|---|---|---|---|
| 1 | GND | S | Ground | - |
| 2 | - | NC | - | - |
| 3 | GPIO_16 | S | WAKE | GPIO |
| 4 | - | NC | - | - |
| 5 | GPIO_14 | I/O | GPIO | I2C_SCL, PWM2<br>(onboard 2.2k pull up resistor) |
| 6 | GPIO_12 | I/O | GPIO | PWM0 |
| 7 | GPIO_13 | I/O | UART0_CTS | GPIO |
| 8 | GPIO_15 | I/O | UART0_RTS | GPIO, PWM1<br>(onboard 10k pull down resistor) |

| Pin | Name | Type[1] | Primary Function | Alternate & Other Function(s) |
|---|---|---|---|---|
| 9 | GPIO_2 | I/O | GPIO | UART1_TXD, I2C_SDA<br>(onboard 2.2k pull up resistor) |
| 10 | GND | S | Ground | - |
| 11 | GPIO_0 | IO | Boot Control | GPIO |
| 12 | GPIO_4 | I/O | GPIO | PWM3 |
| 13-14 | - | NC | - | - |
| 15 | GPIO_7 | I/O | SPI_DQ1[3] | Not available for digital I/O |
| 16 | GPIO_9 | I/O | SPI_DQ3[3] | Not available for digital I/O |
| 17 | GPIO_6 | I/O | SPI_SCK[3] | Not available for digital I/O |
| 18 | GPIO_10 | I/O | SPI_DQ2[3] | Not available for digital I/O |
| 19 | GPIO_8 | I/O | SPI_DQ0[3] | Not available for digital I/O |
| 20 | GND | S | Ground | - |
| 21 | GPIO_5 | I/O | GPIO | - |
| 22-25 | - | NC | - | - |
| 26 | RESET_N | I | RESET | - |
| 27 | GPIO_3 | I/O | UART0_RXD | GPIO |
| 28 | GPIO_1 | I/O | UART0_TXD | GPIO |
| 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 | GPIO_17 | 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*
2. *Wi-Fi Antenna pins are AC-coupled and have a nominal 50 ohms output impedance.*
3. *Connected to QSPI serial flash inside the module.*

## Recommended PCB Footprint




# Soldering Information

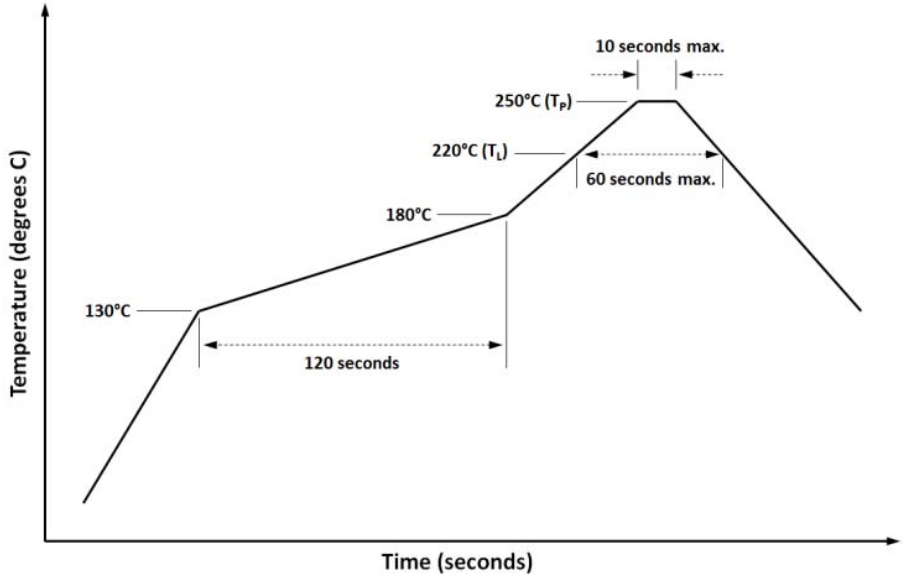



**Figure 4 - Recommended solder reflow profile**

**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 | | | | | | | | |

FCC Statement:

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

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

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to 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.

USERS MANUAL OF THE END PRODUCT:

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.

If the labelling area is small than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

IC Statement:

For product 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.*

IMPORTANT NOTE:

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

*Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.*

**IMPORTANT NOTE:**

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to 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.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

**USERS MANUAL OF THE END PRODUCT:**

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.

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.

**LABEL OF THE END PRODUCT:**

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.

CE Statement:

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 & your body.

**LABEL**


ZENTRI
AMW007
FCC ID: 2ABPY-5B9198
IC: 11685A-5B9198
CE 0681
V:2 FW: 1.0.0

# 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

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.zentri.com/support/

## 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.

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 com-ply 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) at the following website: https://apps.fcc.gov/oetcf/kdb/index.cfm

For products available in the USA/Canada market, only channel 1~11 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.

### 7.1.3 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.

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

## 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 Can-ada, 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.

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 detach-able 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 6.5, 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 6.5, 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

**Excessive data rates or over modulation.**

The module circuit buffers all modulation and control of the transmitter.
The control of the transmitter is via data commands and software instructions contained within the module.
The transmitter is tested with the module operated at the maximum power. Data commands are reduced the power of transmitter but do not influence the modulation contents.

## Power supply regulation.

There is no onboard regulator. The device must be driven with a 3.3v external power supply.