LOXONE
MANUAL

Manual Loxone Air Cpu-Modul

1. Introduction

1.1. Abbreviations and Acronyms

ADC	Analog-to-Digital Converter
API	Application Programming Interface
DC	Direct Current
DTR	Data Terminal Ready
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
GPIO	General Purpose Input/output
HAF	High Frequency
HVAC	Heating, Ventilating, and Air Conditioning
HW	Hardware
I^{2}C	Inter-Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
IRQ	Interrupt Request
ISM	Industrial, Scientific, and Medical radio band
JTAG	Digital interface for debugging of embedded device, also known as IEEE 1149.1 standard interface
MAC	Medium Access Control layer
MCU	Microcontroller Unit. In this document it also means the processor, which is the core of a ZigBit module
NRE	Network layer
OEM	Original Equipment Manufacturer
OTA	Over-The-Air upgrade
PA	Power Amplifier

PCB	Printed Circuit Board
PER	Package Error Ratio
RAM	Random Access Memory
RF	Radio Frequency
RPC	Reduced Power Consumption
RTS/CTS	Request to Send/ Clear to Send
RX	Receiver
SMA	Surface Mount Assembly
SoC	System on Chip
SPI	Serial Peripheral Interface
SW	Software
TTM	Time-To-Market
TX	Transmitter
UART	Universal Asynchronous Receiver/Transmitter
USART	Universal Synchronous/Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
ZigBee, ZigBee PRO	Wireless networking standards targeted at low-power applications
802.15.4	The IEEE 802.15.4-2003 standard applicable to low-rate wireless Personal Area Network

1.2. Related Documents

[1] IEEE Std 802.15.4-2003 IEEE Standard for Information technology - Part 15.4 Wireless Medium Access Control

(MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LR-WPANs).

[2] AT86RF212B Datasheet in http://www.atmel.com/devices/AT86RF212B.aspx?tab=documents.

2. Modul Overview

The Loxone Air Cpu-Modul is a low power IEEE 802.15.4/6LoPAN module for Loxone Air Smart Home Products.

3. Specification

3.1. Electrical Characteristics

3.1.1. Absolute Maximum Ratings

Parameter	Minimum	Maximum
Voltage on any pin, except RESET with respect to ground	-0.3 V	3.6 V ($V_{DD\ MAX}$)
Input RF level		+10dBm
Current into V_{CC} pins		200mA

Notes:

1. Absolute Maximum Ratings are the values beyond which damage to the device may occur. Under no circumstances must the absolute maximum ratings given in this table be violated. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only. Functional operation of the device at these or other conditions, beyond those indicated in the operational sections of this specification, is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

2. **Attention**! The Loxone Air CPU Module is an ESD-sensitive device. Precaution should be taken when handling the device in order to prevent permanent damage.

3.1.2. Power Supply

Parameter	Range	Unit
Supply voltage, V_{DD}	1.8 to 3.6	V

3.1.3. RF Characteristics[1]

Parameter	Condition	Range	Unit
Frequency band – FCC and Industry Canada[2]		902 – 928	MHz
Numbers of channels (FCC and Industry Canada)		10	
Channel spacing (FCC and Industry Canada)		2	MHz
Frequency band – ETSI (European Union)[2]		863 - 870	MHz
Number of channels (European Union)		4	

Channel spacing (European Union)		1	MHz
Transmitter output power	Adjusted in 36 steps	-25 to +11	dBm
Receiver sensitivity	PER = 1%	-103	dBm
On-air data rate		40 up to 250	Kbps
TX output/ RX input nominal impedance	For balanced	50	Ω

Note 1: For detailed characteristics, refer to [2].

Note 2: Appropriate FW (Register selection) must be used for operating this Module in United States and Canada.

Note 3: Range measured is Line of Sight and at 10ft elevation from Ground at different combinations of orientations of transmitter and receiver, with special conditions were there is minimal or no RF interference from other sources.

3.2.   Physical/environmental Characteristics and Outline

Parameters	Value	Comments
Size	22.9 x 14.9 mm	
Operating temperature range	-40°C to +85°C	-40°C to +85°C operational

3.3.   Soldering Profile

The J-STD-020C-compliant soldering profile is recommended according to the following table.

Profile Feature	Green Package
Average ramp-up rate (217°C to peak)	3°C/s max.
Preheat temperature 175°C ±25°C	180s max.
Temperature maintained above 217°C	60s to 150s
Time within 5°C of actual peak temperature	20s to 40s
Peak temperature range	260°C
Ramp-down rate	6°C/s max
Time within 25°C to peak temperature	8 minutes

4.   Agency Certifications

4.1.   United States (FCC)

This equipment complies with Part 15 of the FCC rules and regulations. To fulfill FCC Certification requirements, an OEM manufacturer must comply with the following regulations:

1. Modules must be installed by original equipment manufacturers (OEM) only.

2. The module must only be operated with antennas adhering to the requirements defined in section Supported Antennas.

3. The Loxone Air Cpu-Modul modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

IMPORTANT: Contains FCC ID: *2ARRV-000376*. This equipment 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 (FCC 15.19).

Installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance. This device is approved as a portable device with respect to RF exposure compliance, and may only be marketed to OEM installers.

IMPORTANT: Modifications not expressly approved by this company could void the user's authority to operate this equipment (FCC section 15.21).

IMPORTANT: 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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense (FCC section 15.105).

4.2. Innovation, Science and Economic Development Canada (ISED) Compliance statements

This device complies with ISED licence-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 conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with radio frequency exposure limits set forth by Industry Canada for an uncontrolled environment.

Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par Industrie Canada pour un environnement non contrôlé.

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

The OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

This Module is labelled with its own IC ID. If the IC ID Certification Number is not visible while installed inside another device, then the device should display the label on it referring the enclosed module. In that case, the final end product must be labelled in a visible area with the following:

"Contains Transmitter Module IC: 24564-000376" OR

"Contains IC: 24564-000376"

Ce module est étiqueté avec son propre ID IC. Si le numéro de certification IC ID n'est pas visible lorsqu'il est installé à l'intérieur d'un autre appareil, l'appareil doit afficher l'étiquette sur le module de référence ci-joint. Dans ce cas, le produit final doit être étiqueté dans un endroit visible par le texte suivant:

"Contains Transmitter Module IC: 24564-000376" OR

"Contains IC: 24564-000376"

4.3. Supported Antennas

The FCC compliance testing of the Loxone Air Cpu-Modul has been carried out using the W5012 antenna from PulseLarsen Antennas. This antenna has an omnidirectional radiation pattern at an antenna gain of 2 dBi. In order to be allowed to use the module without re-certification, the product incorporating the Loxone

Air Cpu-Modul module must either use the antenna mentioned above or must use an antenna with an omnidirectional radiation pattern and a gain being less than or equal to 2 dBi.

5.   Revision History

Doc. Rev.	Date	Comments
1.0	13/09/2018	Initial document release