



Julius Blum GmbH
Industriestrasse 1
6973 Hoechst
Austria

www.blum.com

SERVO-DRIVE

RF Module 23.A00L83 Manual 1.0.2

Edition

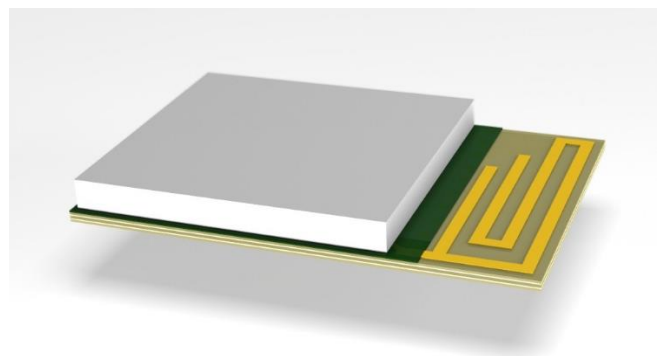
30.08.2019

Authors

Rashid Talib, Arendi
Armin R. Elbs, Blum

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History

Date	Author	Changes
30.08.2019	ELAR	Version 1.0.2 -- Regulatory Information for Canada und USA added
28.08.2019	ELAR	Version 1.0.1 -- Regulatory Information for Taiwan added
22.08.2019	ELAR	Version 1.0
04.05.2018	TALRA	1st draft

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1 Terms and definitions

BLE	Bluetooth Low Energy
dBm	Power level in decibel, relative to 1mW
dBc	Power level in decibel, relative to carrier
DTM	Direct Test Mode
VNA	Vector Network Analyzer
PER	Packet Error Rate
SoC	System on Chip

2 References

- [1] nRF52832 Datasheet v1.4: http://infocenter.nordicsemi.com/pdf/nRF52832_PS_v1.4.pdf

3 Specifications

- 2.4 GHz transceiver
- Supporting BLE 4 and shock burst protocols
- 3.3 V Supply Voltage
- Fully automatic LDO and DC/DC regulator system
- EMC Shielding
- Antenna

Supply

- VDD, GND

Control

- nRESET, WKUP

Communication Interface

- UART: RX, TX (RTS, CTS)

Debugging Interface

- SWDIO, SWDCLK

4 Overview

The Module is a compact 2.4GHz RF Module supporting BLE 4 and shock burst protocols. The module is designed to add RF functionalities to applications with limited space and requires no additional components. The Module is certified and easy to use, no RF knowledge is required.

4.1 Block diagram

Image 1 shows the relevant components on the module:

- nRF52832 SoC
- Voltage regulation
- SWD programming and debugging interface
- 32MHz crystal
- Filter and matching components
- Antenna
- Digital I/Os and analog inputs
- EMC shielding

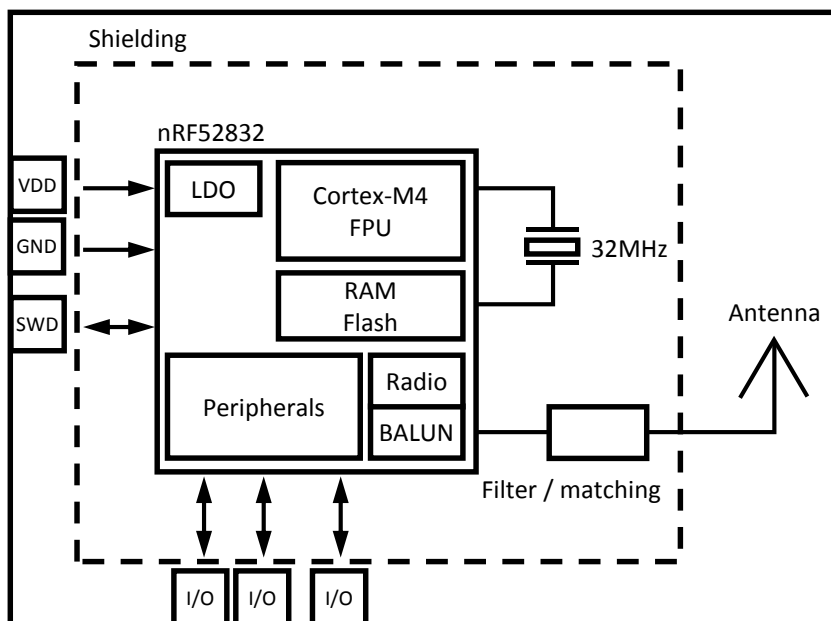


Image 1 Block diagram

4.2 Peripherals

The following peripherals are available:

- Up to 14 digital I/Os
- Up to 6 analog inputs
- 1x NCF
- 1x UART
- 1x I2S
- Quadrature decoder
- Connections for external 32kHz crystal
- Configurable Reset pin
- Pin for external DC/DC configuration
- SWD programming and debugging interface
- Up to 3 4-channel PWM units
- Up to 3 SPI interfaces with master/slave configurations
- Up to 2 I2C interfaces with master/slave configurations

4.3 Schematic

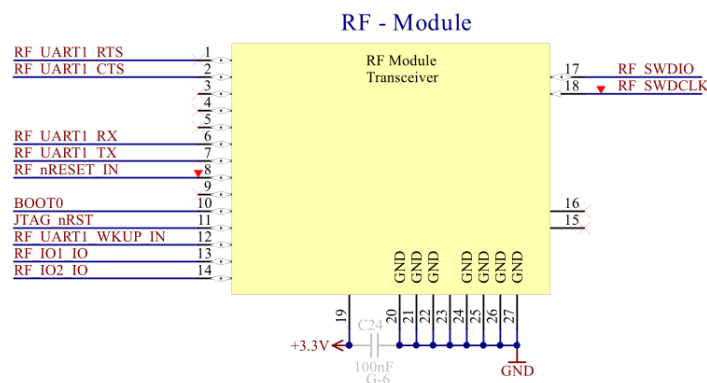
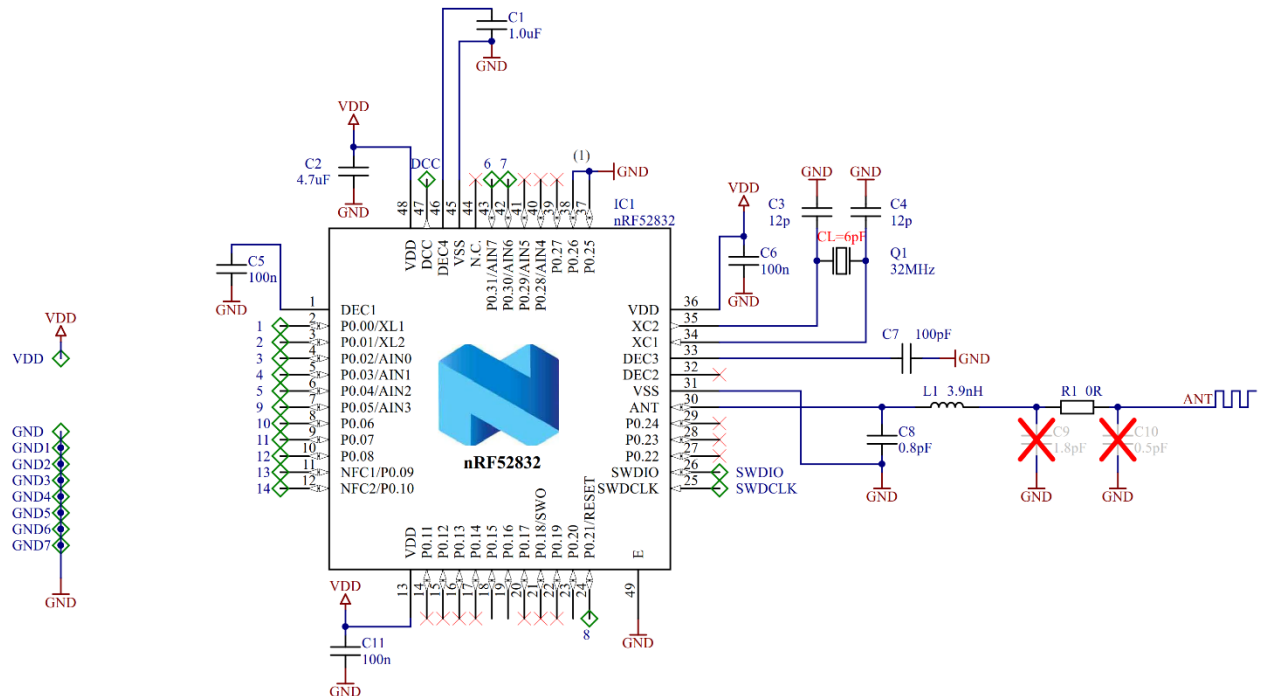


Image 2 Schematic

5 Mechanical

5.1 Dimensions

Image 3 shows the dimensions of the module.

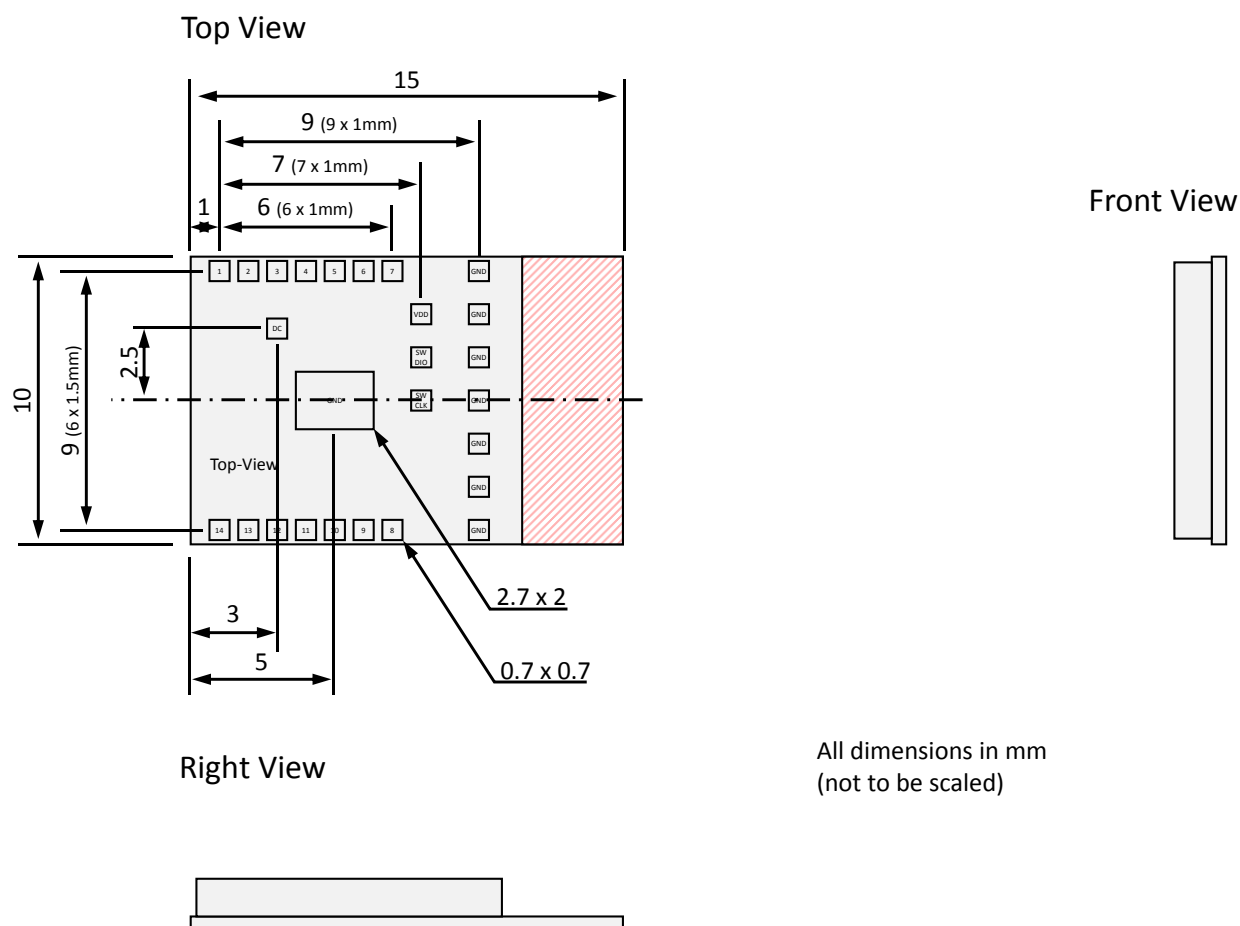


Image 3 Module dimensions

5.2 Pinout

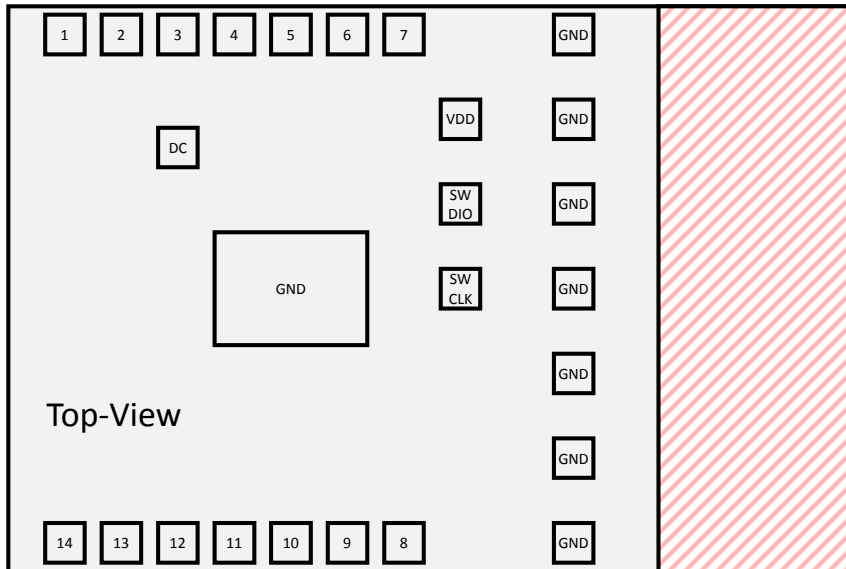


Image 4 Pinout

Pin	Function	Type	Remarks
1	P0.00	Digital I/O	General purpose I/O
	XL1 RTS	Analog input	32kHz crystal input ¹ (LFXO)
2	P0.01	Digital I/O	General purpose I/O
	XL2 CTS	Analog input	32kHz crystal input ¹ (LFXO)
3	P0.02	Digital I/O	General purpose I/O
	AIN0	Analog input	SAADC/COMP/LPCOMP input
4	P0.03	Digital I/O	General purpose I/O
	AIN1	Analog input	SAADC/COMP/LPCOMP input
5	P0.04	Digital I/O	General purpose I/O
	AIN2	Analog input	SAADC/COMP/LPCOMP input
6	P0.31	Digital I/O	General purpose I/O
	AIN7 RX	Analog input	SAADC/COMP/LPCOMP input
7	P0.30	Digital I/O	General purpose I/O
	AIN6 TX	Analog input	SAADC/COMP/LPCOMP input
8	P0.21	Digital I/O	General purpose I/O
	nRESET nRESET	Digital input	Configurable as pin reset
9	P0.05	Digital I/O	General purpose I/O
	AIN3	Analog input	SAADC/COMP/LPCOMP input
10	P0.06	Digital I/O	General purpose I/O

11	P0.07	Digital I/O	General purpose I/O
12	P0.08 WKUP	Digital I/O	General purpose I/O
13	NFC1	NFC input	NFC antenna connection ¹
	P0.09	Digital I/O	General purpose I/O
14	NFC2	NFC input	NFC antenna connection ¹
	P0.10	Digital I/O	General purpose I/O
GND	GND GND	Power	Ground Pad
VDD	VDD VDD	Power	Supply Pad
DCC	DCC	Power	DC/DC regulator output. Connect to inductor when internal DC/DC regulator is used ¹ , leave unconnected otherwise
SWDIO	SWDIO SWDIO	Digital I/O	Serial wire debug I/O for debug and Programming
SWDCLK	SWDCLK SWDCLK	Digital input	Serial wire debug clock input for debug and programming

¹ See nRF52832 datasheet [2] for reference circuit and layout recommendations

Table 1 Pin description

5.3 Recommended PCB dimensions

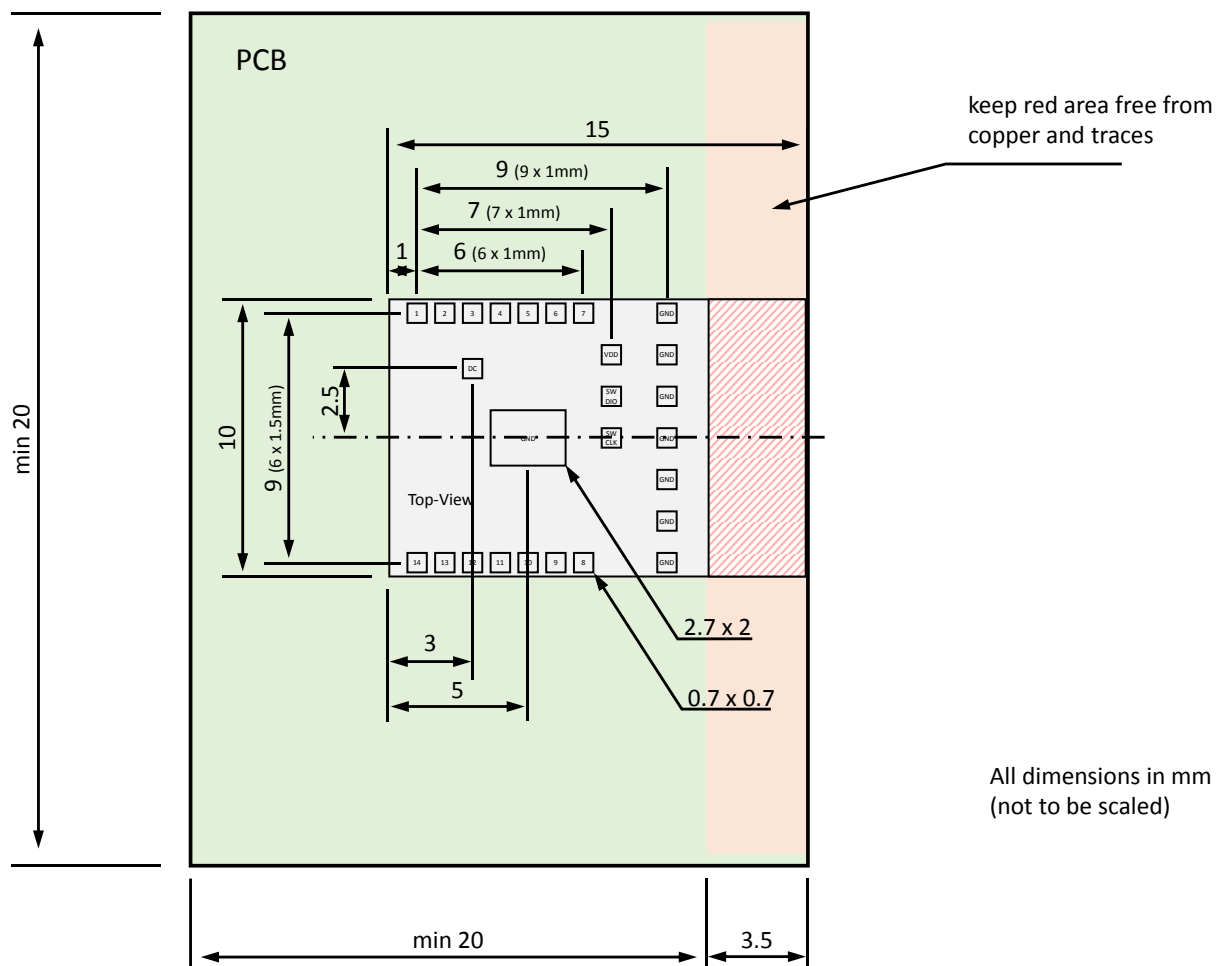


Image 5 Recommended PCB dimensions

6 Regulatory Approval

The module has received regulatory approval for the following countries:

- United States / FCC ID: W95-23A00L83
- Canada / ISED
ID: 8352A-23A00L83
HVIN: 23.A00L83
- Europe/CE
- Taiwan

The integrated trace antenna of the module is of an optimized design and must not be modified. Host-design must strongly follow the recommendation found in chapter 5.3. The shielding is an integral part of the module.

6.1 Module Photos

The following photos show the module from the bottom and the top and the module from the top without the shielding.



6.2 United States of America

The module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” single-modular approval in accordance with Part 15.212 Modular Transmitter approval. Single-modular transmitter approval is defined as a complete RF

transmission sub-assembly, designed to be incorporated into another device, that must demonstrate compliance with FCC rules and policies independent of any host. A transmitter with a modular grant can be installed in different end-use products (referred to as a host, host product, or host device) by the grantee or other equipment manufacturer, then the host product may not require additional testing or equipment authorization for the transmitter function provided by that specific module or limited module device.

The user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance. The host product itself is required to comply with all other applicable FCC equipment authorizations regulations, requirements and equipment functions that are not associated with the transmitter module portion. For example, compliance must be demonstrated: to regulations for other transmitter components within a host product; to requirements for unintentional radiators (Part 15 Subpart B), such as digital devices, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification, or Declaration of Conformity) as appropriate (e.g., Bluetooth transmitter modules may also contain digital logic functions).

6.2.1 Labeling and User Information requirements

The module has been 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 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 RF Module FCC ID: W95-23A00L83

or

Contains FCC ID: W95-23A00L83

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.

A user's manual for the product must include the following 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

Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748, which is available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) <https://apps.fcc.gov/oetcf/kdb/index.cfm>

6.2.2 RF Exposure

All transmitters regulated by FCC must comply with RF exposure requirements. KDB 447498 General RF Exposure Guidance provides guidance 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).

From the FCC Grant: Output power listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be

co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with FCC multi-transmitter product procedures.

The installation of the transmitter must ensure that the antenna has a separation distance of at least 30 mm from all persons or compliance, and it must be demonstrated according to the FCC SAR procedures.

6.3 Canada

The module has been certified for use in Canada under Innovation, Science and Economic Development Canada (ISED, formerly Industry Canada) Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247. Modular approval permits the installation of a module in a host device without the need to recertify the device.

6.3.1 Labeling and User Information requirements

Labeling Requirements (from RSP-100, Issue 11, Section 3): The host product shall be properly labeled to identify the module within the host device. The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product, otherwise the host device must be labeled to display the Innovation, Science and Economic Development Canada certification number of the module, preceded by the word "Contains", or similar word expressing the same meaning, as follows:

Contains IC: 8352A-23A00L83

User Manual Notice for License-Exempt Radio Apparatus (from Section 8.4 RSS-Gen, Issue 4, November 2014): 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's 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 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.

6.3.2 RF Exposure

All transmitters regulated by the Innovation, Science and Economic Development Canada (ISED) must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands).

This transmitter is restricted for use with a specific antenna tested in this application for certification, and must not be co-located or operating in conjunction with any other antenna or transmitters, except in accordance with Innovation, Science and Economic Development Canada multi-transmitter guidelines.

The installation of the transmitter must ensure that the antenna has a separation distance of at least 30 mm from all persons or compliance must be demonstrated according to the ISED SAR procedures.

6.4 Europe

The 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 module has been tested to RED 2014/53/EU Essential Requirements for Health and Safety (Article (3.1(a)), Electro Magnetic Compatibility (EMC) (Article 3.1(b)), and Radio (Article 3.2)

Note: To maintain conformance, 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 against the RED.

6.4.1 Labeling and User Information requirements

The label on the final product which contains the module must follow CE marking requirements.

6.5 Taiwan

The module has received compliance approval in accordance with the Telecommunications Act. Customers seeking to use the compliance approval in their product must contact Julius Blum GmbH to obtain a Letter of Authority.

Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed.

6.5.1 Labeling and User Information requirements

For the module, due to limited module size, the NCC mark and ID are displayed in the data sheet and/or packaging and cannot be displayed on the module label.

The user's manual must contain below warning (for RF device) in traditional Chinese:

注意！

依據 低功率電波輻射性電機管理辦法

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信規定作業之無線電信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用 電波輻射性電機設備之干擾。

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:

“Contains Transmitter Module NCC ID:  CCXXxxLPyyyZzW”

or

“Contains NCC ID:  CCXXxxLPyyyZzW”

or any similar wording that expresses the same meaning may be used. – with one line