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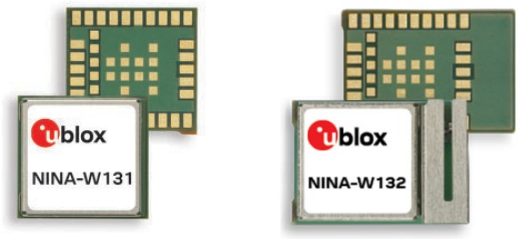
NINA-W13 series

Stand-alone Wi-Fi modules

Data sheet



Abstract

This technical data sheet describes the NINA-W13 series stand-alone Wi-Fi modules. NINA-W13 modules come with pre-flashed application software, supporting 802.11b/g/n in the 2.4 GHz ISM band. The module has several important embedded security features, including secure boot, which ensures that only authenticated software can run on the module. This makes NINA-W13 ideal for critical IoT applications where security is important.

Document information

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Product status	Corresponding content status	
Functional Sample	Draft	For functional testing. Revised and supplementary data will be published later.
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Initial Production	Early Production Information	Data from product verification. Revised and supplementary data may be published later.
Mass Production / End of Life	Production Information	Document contains the final product specification.

This document applies to the following products:

Product name	Type number	u-connectXpress software version	Hardware version	PCN reference	Product status
NINA-W131	NINA-W131-03B-01	4.0.0	08	UBX-21043575	Initial Production
NINA-W132	NINA-W132-03B-01	4.0.0	08	UBX-21043575	Initial Production

Contents

1 Functional description

1.1 Overview

NINA-w13 is a small stand-alone wireless module that integrates a powerful microcontroller (MCU) and a radio for wireless communication. NINA-W13 modules come with pre-flashed application software, supporting 802.11b/g/n in the 2.4 GHz ISM band. The host system can set up and control the module through the AT command interface. This greatly reduces the time and complexity to add Wi-Fi connectivity to the end product.

NINA-W13 modules provide top grade security, thanks to secure boot, which ensures the module only boots up with original u-blox software. Intended applications include telematics, low power sensors, connected factories, connected buildings (appliances and surveillance), point-of-sales, and health devices.

Device design is simplified as developers can choose to either use an external antenna (NINA-W131) or take advantage of the internal antenna (NINA-W132). Additionally, the NINA-W13 modules are pin-compatible with other NINA modules, thus offering maximum flexibility for development of similar devices offering different radio technologies.

NINA-W13 is assessed to comply with RED and is certified as a modular transmitter in the following countries: US (FCC), Canada (IC / ISED RSS), Japan (MIC), Taiwan (NCC), South Korea (KCC), Australia / New Zealand (ACMA), Brazil (Anatel), South Africa (ICASA). The modules are qualified according to ISO 16750 for professional grade operation, supporting an extended temperature range of –40 °C to +85 °C.

1.2 Applications

- Internet of Things (IoT)
- Wi-Fi networks
- Telematics
- Point-of-sales
- Medical and industrial networking
- Access to laptops, mobile phones, and similar consumer devices
- Home/building automation
- Ethernet/Wireless Gateway

1.3 Block diagram

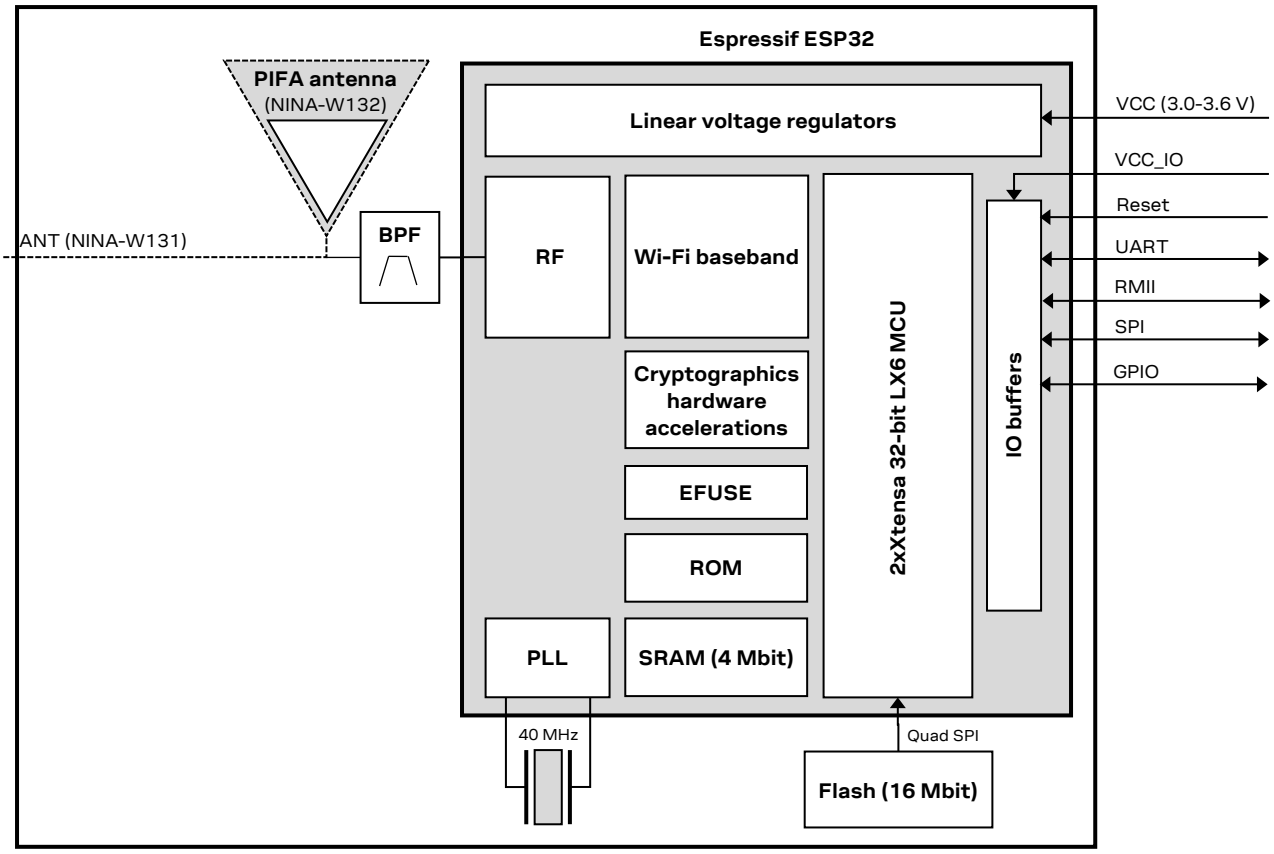


Figure 1: Block diagram of NINA-W13 series

1.4 Product variants

NINA-W13 series modules come with pre-flashed application software, supporting Wi-Fi 802.11b/g/n in the 2.4 GHz ISM band. The host system can set up and control the module through the AT command interface. See also u-connectXpress AT commands manual [3] for more information about AT commands.

1.4.1 NINA-W131

NINA-W131 has no internal antenna. Instead, the RF signal is available at a module pin for routing to an external antenna or antenna connector. The module outline is smaller compared to the module variant with antenna, only 10.0 x 10.6 mm. The module height is 2.2 mm.

1.4.2 NINA-W132

NINA-W132 has an internal PIFA antenna mounted on the module. The RF signal is not connected to any module pin. The module outline is 10.0 x 14.0 mm and the height 3.8 mm.

1.5 Radio performance

Both the variants of the NINA-W13 series support Wi-Fi and conform to IEEE 802.11b/g/n single-band 2.4 GHz operation.

Wi-Fi
IEEE 802.11b/g/n IEEE 802.11d
Band support Station mode: 2.4 GHz, channel 1-13* Access Point mode: 2.4 GHz, channel 1-11
Maximum conducted output power 15 dBm
Maximum radiated output power 18 dBm EIRP**
Conducted sensitivity -96 dBm
Data rates: IEEE 802.11b: 1 / 2 / 5.5 / 11 Mbit/s IEEE 802.11g: 6 / 9 / 12 / 18 / 24 / 36 / 48 / 54 Mbit/s IEEE 802.11n: MCS 0-7, HT20 (6.5-72 Mbit/s)

* Maximum supported channels for 802.11d depends on the region.

** RF power including maximum antenna gain (3 dBi).

Table 1: NINA-W13 series Wi-Fi characteristics

1.6 Software options

The NINA-W13 series modules come with the pre-flashed application software, supporting 802.11b/g/n in the 2.4 GHz ISM band. The host system can set up and control the module through the AT command interface. The NINA-W13 modules provide top grade security, thanks to secure boot, which ensures the module boots up only with original u-blox software. In addition, they will provide end-to-end security on the wireless link with the latest 802.11i (WPA2) standard and enterprise security to provide a secure connection to the infrastructure. This makes NINA-W13 ideal for critical IoT applications where security is important.

1.6.1 AT command support

You can configure the NINA-W131 and NINA-W132 modules with the u-blox s-center toolbox software using AT commands. See also the u-connectXpress AT commands manual [3] for information about the supported AT commands.

The s-center evaluation software supporting the AT commands is also available free of charge and can be downloaded from the u-blox website.

1.6.2 Software upgrade

For Information on how to upgrade the software for NINA-W13 series, see also System control IO signals and the NINA-W1 series, system integration manual [1].

1.7 IEEE 802.11d and additional regulatory domains

NINA-W13 series modules support the IEEE 802.11d wireless network standard, which extends the original IEEE 802.11 specification to include support for “additional regulatory domains”.

NINA-W13-based devices configure automatically to operate in accordance regulatory domains.

By passively scanning (listening) for beacons available wireless networks, NINA-W13 modules identify the channels supported by each network and determine the best access point with which to connect. The modules configure automatically to operate in accordance with the policies and regulations of the regional domain in which they operate.

Passive scans are performed once on startup and then once every hour. After the first passive scan the channel list will be filtered to according to 802.11d.

1.7.1 NINA-W13 IEEE 802.11d implementation description

When used as Wi-Fi stations, NINA-W1 modules passively scan access point (AP) beacons at start-up. A new scan is performed every hour to update the regulatory domain. The algorithm is restarted when the module is turned on or reset. It is not possible to override the algorithm described by reconfiguring the device.

The beacons include information elements that describe the country name, data rates, channel quantity, signal strength, and maximum transmission level of the wireless network that they represent. Based on the information received from the beacons, the modules compare APs and choose which one to use. NINA-W1 modules configure automatically to operate on all bands supported in the regulatory domain of the chosen AP, as shown in Table 2.

NINA-W13 supports the following three domains:

- FCC: This is the regulatory body for products used in the US. If the scan results include country information pertaining solely to the FCC the regulatory domain is set to FCC.
- ETSI: This is the regulatory domain for the products sold primarily in Europe. If at least three scan results contain country information pertaining to non-FCC countries, and no other contrary information is received, the regulatory domain is set to ETSI.
- WORLD: In this domain, NINA-W1 modules operate on all channels supported both by FCC, ETSI, and most other countries in the world. This is the initial regulatory domain. If subsequent scans contain country information for both FCC and non-FCC countries, the regulatory domain is always set to WORLD. This state is shown as WORLD-FINAL. This state is not to be exited until the device is reset.

The state transition diagram shown in Figure 2 describes the algorithm for selecting the current regulatory domain.

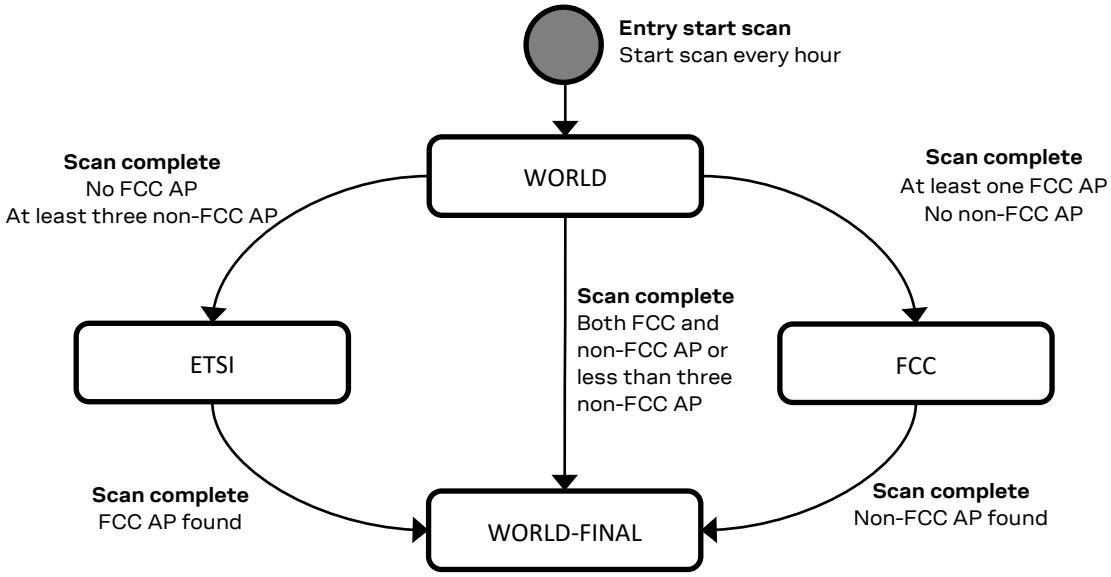


Figure 2: NINA-W13 series IEEE 802.11d state transition diagram

Table 2 shows the channels that are supported in the different regulatory domains.

Regulatory domain	Band	Tx channels
WORLD	2.4 GHz	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
ETSI	2.4 GHz	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
FCC	2.4 GHz	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11

Table 2: Channel list for supported regulatory domains

⚠ Channels 12 and 13 are not allowed in Taiwan. A device that is put on the Taiwanese market must make these channels unavailable to an end-user. This is done by forcing the module to operate in WORLD mode using `AT+UWCFG=11,1` command.

The maximum output power is reduced on some channels depending on regulatory requirements. For example, frequency band edge requirements can limit the output power on channels close to band edges.

1.8 MAC addresses

NINA-W13 has four unique consecutive MAC addresses reserved for each module and the addresses are stored in the configuration memory during production. The first Wi-Fi MAC address is included in the data matrix shown on the Product labeling.

MAC address	Assignment	Last bits of MAC address	Example
Module 1, address 1	Wi-Fi	00	*D4:CA:6E:90:04:90*
Module 1, address 2	RMII/Ethernet	01	*D4:CA:6E:90:04:91*
Module 1, address 3	Reserved	10	*D4:CA:6E:90:04:92*
Module 1, address 4	Reserved	11	*D4:CA:6E:90:04:93*
Module 2, address 1	Wi-Fi	00	*D4:CA:6E:90:04:94*
Module 2, address 2	RMII/Ethernet	01	*D4:CA:6E:90:04:95*
Module 2, address 3	Reserved	10	*D4:CA:6E:90:04:96*
Module 2, address 4	Reserved	11	*D4:CA:6E:90:04:97*

Table 3: Example MAC addresses assignment for two modules

2 Interfaces

2.1 Power supply

The power for NINA-W13 series modules is supplied through **VCC** and **VCC_IO** pins by DC voltage.

☞ The system power supply circuit must be able to support peak power as during operation, the current drawn from **VCC** and **VCC_IO** can vary significantly based on the power consumption profile of the Wi-Fi technology.

2.1.1 Module supply input (VCC)

NINA-W13 series modules use an integrated Linear Voltage converter to transform the supply voltage presented at the **VCC** pin into a stable system voltage.

2.1.2 Digital I/O interfaces reference voltage (VCC_IO)

All modules in the NINA-W13 series provide an additional voltage supply input for setting the I/O voltage level. The separate **VCC_IO** pin enables integration of the module in many applications with different voltage levels (for example, 1.8 V or 3.3 V) without any level converters. NINA-W13 modules support only 3.3 V as IO voltage level currently.

2.2 Low Power Clock

The internal clocks of NINA-W13 are used for the lowest power modes.

2.3 System functions

NINA-W13 series modules are power efficient devices capable of operating in different power saving modes and configurations. Different sections of the modules can be powered off when they are not needed, and complex wake up events can be generated from different external and internal inputs. See also Module power on and Module power off Module reset.

The following system power modes are available:

- Automatic:
  - ACTIVE mode
  - STANDBY mode
- Manual:
  - SLEEP mode
  - STOP mode

2.3.1 Module power on

You can switch on or reboot the NINA-W13 series modules in one of the following ways:

- Rising edge on the VCC pin to a valid supply voltage
- Issuing a reset of the module. See also Module reset.

If the u-connectXpress software has been configured to start in AT mode, `+STARTUP` is sent over the UART interface when the software has booted and is ready to accept commands.

2.3.2 Module power off

There is no dedicated pin to power down the NINA-W13 series modules. Instead, the “STOP” power mode can be used to keep the module in the deepest power save mode. STOP mode is more power efficient than holding the module in reset.

2.3.3 Module reset

The NINA-W13 series modules can be reset (rebooted) in one of the following ways:

- Low level on the **RESET_N** pin, which is normally set high by an internal pull-up. This causes a "hardware reset" of the module. The **RESET_N** signal should be driven by an open drain, open collector or contact switch.
- Reset using an AT command `+CPWROFF`, as described in the AT commands manual [3]. This causes a "software reset" of the module.

2.3.4 ACTIVE mode

In this mode the module is actively transmitting or receiving data over one or more of its interfaces; 2.4 GHz radio, UART, and so on. The module CPU is operating at its highest clock speed. The module seamlessly switches between ACTIVE mode and STANDBY automatically without user involvement.

2.3.5 STANDBY mode

In this mode the module "idles" and performs only background activities. As radio and physical connections are maintained, no packets are lost in this mode. When necessary, the module automatically enters ACTIVE mode without delay.

The user can further decrease current consumption in STANDBY mode by:

- Enabling Automatic Frequency Adaption (AFA)
- Increasing the Bluetooth low energy connection interval
- Increasing the DTIM listen interval (Wi-Fi Station mode only)
- Storing and sending data in concentrated bursts

Automatic Frequency Adaption (AFA) allows the internal clocks to be automatically reduced whenever possible. AFA is configured using the `AT+UPWRMNG` command.

☞ Enabling AFA will limit the maximum baud rate of the UART interface to 1 Mbaud.

For more information about using AT commands for configuring u-connectXpress software, see also the u-connectXpress AT commands manual [3] and u-connectXpress software user guide [6].

2.3.6 SLEEP mode

For radio modes that support SLEEP mode, the module operates with even lower power consumption than that required in STANDBY mode. As the module functionality is limited in this mode, it must be activated manually by the host.

In SLEEP mode, radio and peer connections are maintained, but incoming data or URCs are not sent over the UART until SLEEP mode is deactivated, hence incoming data or URCs may be lost.

Enable SLEEP mode control using command `AT&D3` and toggle the UART **DSR** pin to enter/leave SLEEP mode.

SLEEP mode is supported in the following radio modes:

- Wi-Fi Station
- Radio turned off

To further decrease power consumption in SLEEP mode, the following software settings can be used:

- Enabling Automatic Frequency Adaption (AFA)
- Increasing the Bluetooth Low Energy connection interval
- Increase the DTIM listen interval (Wi-Fi Station mode only)

☞ Enabling AFA can put limits on certain module functions, maximum UART baud rate, and so on. Check the u-connectXpress AT commands manual [3] to determine which clock speeds are acceptable for your application.

For more information about using AT commands for configuring u-connectXpress software, see also the u-connectXpress AT commands manual [3] and u-connectXpress software user guide [6].

2.3.7 STOP mode

STOP mode is the deepest power saving mode of NINA-W13 modules. To ensure minimum power consumption during STOP mode, all functionality is stopped, and all existing connections are dropped. The system RAM is not retained. The module always reboots during the wake up from STOP mode.

The user must manually enter the STOP mode with one of the following methods:

- Enable STOP mode control using command `AT&D4` and toggle the UART **DSR** pin to enter/leave STOP mode.
- Use command `AT+USTOP` to configure which GPIO pin is used to enter/leave STOP mode. The GPIOs capable of controlling STOP mode are shown in Table 6: NINA-W131/NINA-W132 pinout.
- Use command `AT+USTOP` to configure a timer to automatically wake up after a delay set by the user.

If the u-connectXpress software is configured to start in AT mode, the `+STARTUP` command is sent over the UART interface when the module is ready to accept commands.

For more information about using AT commands for configuring u-connectXpress software, see also the u-connectXpress AT commands manual [3] and u-connectXpress software user guide [6].

2.4 Bootstrap pins

Table 4 shows boot configuration pins on the module that must be set correctly during boot. The bootstrap pins are configured to the default state internally on the module and ESP32 chip and must NOT be configured externally.

During boot, pin 27 controls the boot mode. It is then reconfigured to the RMII clock line, **RMII_CLK**. For more information about using the RMII interface See also the NINA-W1 series system integration manual [1].

During boot, pin 32 controls whether additional system information should be transmitted on the UART interface during startup. After the system has booted, it is reconfigured to the SPI chip select signal, **SPI_CS**.

During boot, pin 36 controls the voltage level of the internal flash during startup. After the system has booted, it is reconfigured to **SPI_MISO**, the SPI slave data output signal. It must NOT be pulled down by an external MCU or circuitry. After the module has booted, the **RMII_CLK**, **UART_RXD**, **SPI_DRDY** and **SPI_SCLK** are used to determine which command interfaces to activate. See also Data and command interfaces.

Pin	State during boot	Default	Behavior	Description
27	0		ESP boot mode (factory boot)	ESP Factory boot Mode/RMII clock line.
	1	Pull-up*	Normal Boot from internal Flash	
32	0		Silent	Printout on UART0 TXD during boot
	1	Pull-up*	UART0 TXD Toggling	
36	0		VDD_SDIO=3.3V (Not allowed)	Internal flash voltage
	1	10 kΩ pull-up	VDD_SDIO=1.8V (VDD_SDIO should always be at 1.8 V)	

*About 45 kΩ

Table 4: NINA-W13 series bootstrap pins

2.5 RF antenna interface

The RF antenna interface of the NINA-W13 series supports 2.4 GHz Wi-Fi. The module is equipped with a 2.4 GHz bandpass filter between the radio chip and RF antenna interface. See also Block diagram.

The NINA-W13 series supports either an internal antenna (NINA-W132) or external antennas connected through an antenna pin (NINA-W131).

2.5.1 Internal antenna

NINA-W132 has an internal antenna specifically designed and optimized for the NINA module, which is a 2.4 GHz PIFA antenna.

It is recommended to place the NINA-W132 module in such a way that the internal antenna is in the corner of the host PCB (the corner closest to pin 16 should be in the corner). The antenna side (short side closest to the antenna) positioned along one side of the host PCB ground plane is the second-best option.

For NINA-W132 keep a minimum clearance of 5 mm between the antenna and the casing. Keep a minimum of 10 mm free space from the metal around the antenna including the area below. If a metal enclosure is required, use NINA-W131 and an external antenna. It is beneficial to have a large solid ground plane on the host PCB and have a good grounding on the module. Minimum ground plane size is 24x30 mm but recommended is more than 50x50 mm.

For more information about antenna design, see the NINA-W1 series system integration manual [1].

⚠ The ANT signal is not available on the solder pins of the NINA-W132 module.

2.5.2 External RF antenna interface

NINA-W131 has an antenna signal (**ANT**) pin with a characteristic impedance of 50 Ω for using an external antenna. The antenna signal supports both Tx and Rx.

The external antenna, for example, can be an SMD antenna (or PCB integrated antenna) on the host board. An antenna connector for using an external antenna via a coaxial cable could also be implemented. A cable antenna might be necessary if the module is mounted in a shielded enclosure such as a metal box or cabinet.

The external antenna connector (U.FL. connector) reference design, as described in the system integration manual [1], must be followed to comply with the NINA-W1 FCC/IC modular approvals. See also Approved antennas.

2.6 IO signals

NINA-W13 series modules have a versatile pin-out with up to 16 GPIO pins overall.

2.6.1 Drive capability

All GPIO pins are normally configured for medium current consumption. Using this standard drive capability, a pin configured as output can source and an input sink a certain amount of current. See also Digital pins.

2.6.2 System status IO signals

The **RED**, **GREEN** and **BLUE** pins are used to signal the status. They are active low and are intended to be routed to an RGB LED. See also the u-connectXpress AT commands manual [3] for more information about connectivity software signals IOs.

Mode	Status	RGB LED color	GREEN	BLUE	RED
Data mode	IDLE	Green	LOW	HIGH	HIGH
Command mode	IDLE	Orange	LOW	HIGH	LOW
Data mode, Command mode	CONNECTING*	Purple	HIGH	LOW	LOW
Data mode, Command mode	CONNECTED*	Blue	HIGH	LOW	HIGH

* = LED flashes on data activity

Table 5: System status indication

☞ The **RED**, **GREEN** and **BLUE** signals are disabled when the RMII interface is enabled.

2.6.3 System control IO signals

The following input signals are used to control the system:

- **RESET_N** is used to reset the system. See also Module reset.
- If **SWITCH_1** is driven low during start up, the UART serial settings are restored to their default values.
- **SWITCH_2** can be used to open a connection to a peripheral device.
- If both **SWITCH_1** and **SWITCH_2** are driven low during start up, the system will enter the bootloader mode.
- If both **SWITCH_1** and **SWITCH_2** are driven low during start up and held low for 10 seconds, the system will exit the bootloader mode and restore all settings to their factory defaults.

For further information about the connectivity software signals IOs, see also the u-connectXpress AT commands manual [3].

2.6.4 UART IO signals

In addition to the normal **RXD**, **TXD**, **CTS,** and **RTS** signals, the NINA-W131/NINA-W132 software adds the **DSR** and **DTR** pins to the UART interface. Note that they are not used as originally intended, but to control the state of the NINA module. Depending on the current configuration, the **DSR pin** can be used to:

- Enter command mode
- Disconnect and/or toggle connectable status

If **CTS/RTS** flow control is disabled, those pins can be used as GPIOs.

2.7 Data and command interfaces

There are three data interfaces available on a NINA-W13 module: UART, RMII, and SPI. All interfaces cannot be used at the same time. During module startup, the sequence shown in Figure 3 is used to determine which of the interfaces should be enabled prior to activating the AT command parser. AT commands can be used to enable or disable certain interfaces after module startup.

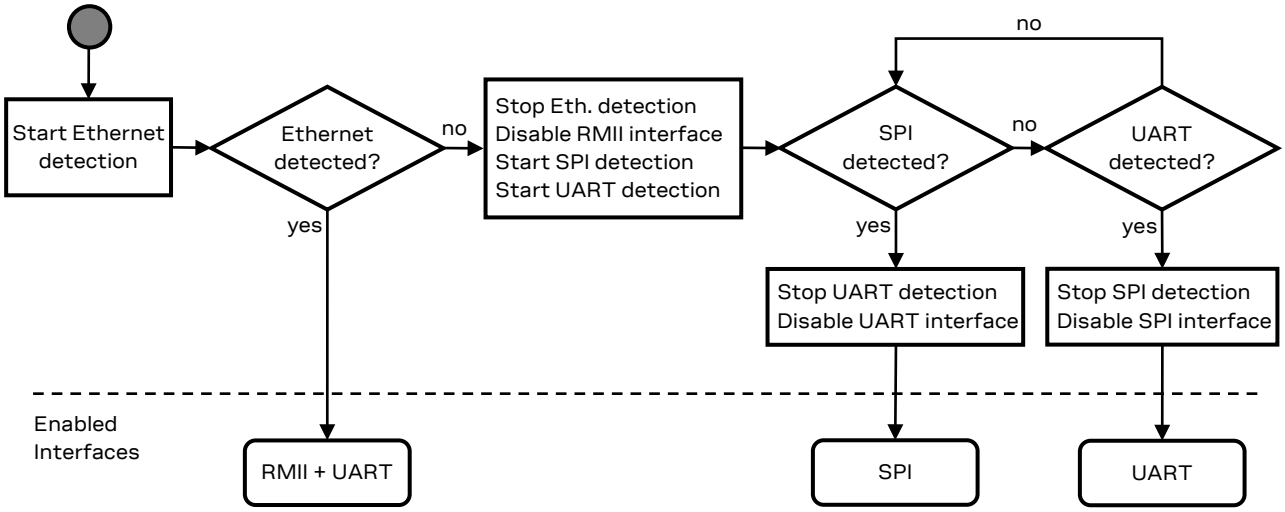


Figure 3: Interface detection flow chart

☞ This process will be active until an interface is successfully detected.

During Ethernet detection, NINA-W13 looks for a clock signal on **RMII_CLK**. If Ethernet is detected, only the **UART_RXD** and **UART_TXD** signals are available.

If SPI detection is started, the NINA-W13 module will start toggling the **SPI_DRDY** signal periodically. Once the SPI master has sent eight clock signals on the **SPI_SCLK** line, the SPI interface is active and the UART interface is disabled.

If an AT command is sent to the NINA-W13 module over the UART interface, the **SPI_DRDY** signal will stop toggling and the SPI interface will be disabled.

☞ For more information on how to use these data and command interfaces, see also the u-connectXpress software user guide [6].

2.7.1 UART

NINA-W131 and NINA-W132 modules include a 6-wire UART for communication with an application host processor (AT commands, Data communication, and software upgrades).

The following UART signals are available:

- Data lines (**RXD** as input, **TXD** as output)
- Hardware flow control lines (**CTS** as input, **RTS** as output)
- Link status (**DTR** as output, **DSR** as input). The **DTR/DSR** signals behavior is adapted to the u-connectXpress software functionality and differs from the UART standard. See also UART IO signals.
- Programmable baud-rate generator allows most industry standard rates, as well as non-standard rates up to 3 Mbaud.
- Frame format configuration:
  - 8 data bits
  - Even or no-parity bit
  - 1 stop bit

- Default frame configuration is 8N1:
  - 8 data bits
  - No (N) parity bit
  - 1 stop bit

2.7.2 RMII

The RMII (Reduced Media Independent Interface) Ethernet interface is intended for connecting to an external PHY. The following signals are used:

- **RMII_TXD0**, **RMII_TXD1** – Transmit data output bits 0 and 1.
- **RMII_TXEN** – Output signal used to indicate when data is being transmitted.
- **RMII_RXD0**, **RMII_RXD1** – Receive data input bits 0 and 1.
- **RMII_CRSDV** – Carrier sense and RX data valid in signals, multiplexed on alternate clock cycles.
- **RMII_CLK** – 50 MHz clock input signal that must be supplied by an external oscillator or the Ethernet PHY chip.

An MDIO (Management Data Input/Output) interface used for controlling the external PHY is also available:

- **RMII_MDCLK** – Management interface clock output signal
- **RMII_MDIO** – Management interface data input and output signal

The flow control (**RTS** and **CTS**) of the UART interface is multiplexed with the RMII interface and cannot be used simultaneously. The **RED**, **GREEN** and **BLUE** signals are also disabled when the RMII interface is enabled because the **BLUE** signal is multiplexed with the RMII interface.

☞ For more information about how to use the RMII interface, see also the NINA-W1 series system integration manual [1].

2.7.3 SPI

The serial peripheral interface of NINA-W13 only runs in “SPI slave mode”, meaning a host controller running in “SPI master mode” is intended to send commands to the NINA module.

The following signals are used:

- **SPI_SCLK** – Serial clock input signal
- **SPI_MOSI** – Serial data input signal
- **SPI_MISO** – Serial data output signal
- **SPI_CS** – Chip Select input, enable control signal
- **SPI_DRDY** – (optional) Additional “Data Ready” output signal, used to indicate to the controller when data is available. This signal can be disabled but is enabled by default.
- **SPI_NORX** – (optional) Additional flow control output signal used to indicate when the NINA module cannot receive any more data. This signal is not enabled by default.

An SPI master must comply with the following:

- 10 MHz maximum clock speed
- SPI mode 1 or 3
- The SPI master must clock at least 8 bytes minimum and 4096 bytes maximum per transaction, and transaction lengths must be on 4 byte boundary

☞ For more information about using the SPI interface, see also the application note [7].

3 Pin definition

3.1 Pin assignment

The pinout shown in Figure 4 describes the pin configuration used in the NINA-W131 and NINA-W132 u-connectXpress software modules.

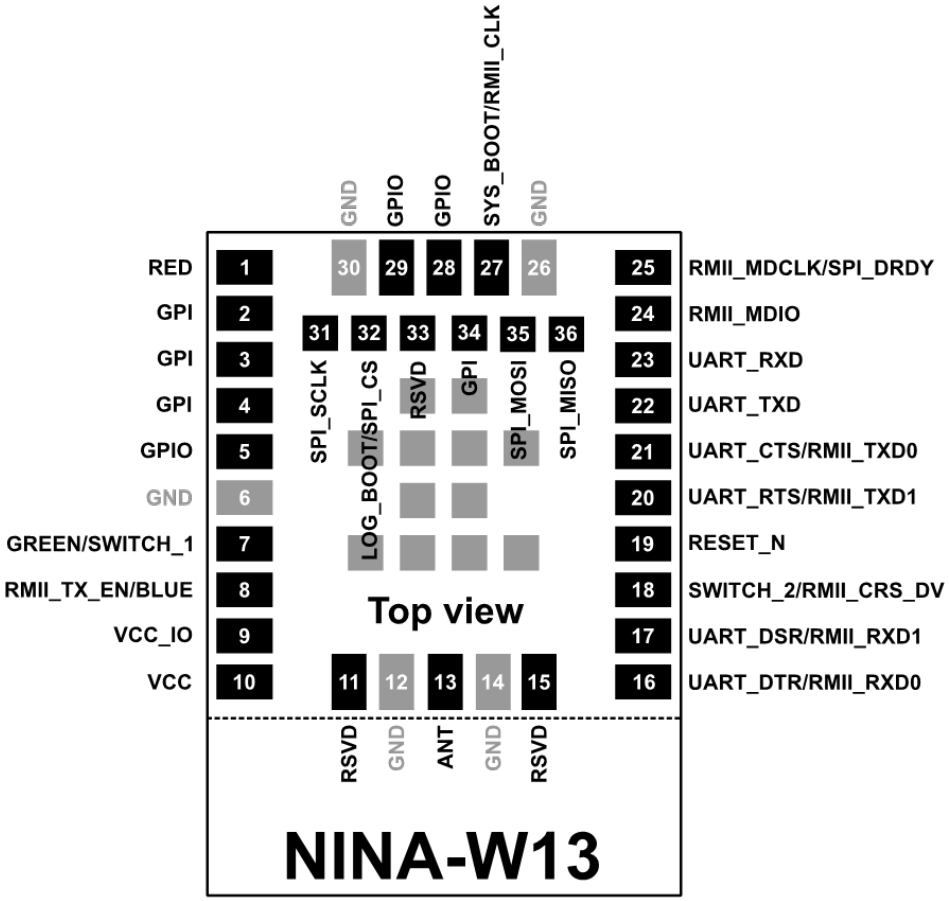


Figure 4: NINA-W13x pin assignment (top view)

The grey pins in the center of the modules are GND pins. The lower part below the dotted line is the antenna part of NINA-W132 and the outline of the NINA-W131 module ends at this line.

Some of the signals are bootstrap signals, as shown in Table 6. It is important that these signals are in the correct state during startup. See also System functions and IO signals.

Pin	Name	I/O	Description	Alt. function	Remarks
1	RED	O	Logic Red LED Signal		See also System status IO signals
2	GPI_2	I	General Purpose Input	WKUP_2	Can control STOP mode
3	GPI_3	I	General Purpose Input	WKUP_3	Can control STOP mode
4	GPI_4	I	General Purpose Input	WKUP_4	Can control STOP mode
5	GPIO_5	I/O	General Purpose Input /Output		
6	GND		Ground		
7	GREEN/ SWITCH_1	I/O	GREEN: System status signal SWITCH_1: Restore UART serial settings / Enter bootloader		Active low. See also System status IO signals and System control IO signals.

Pin	Name	I/O	Description	Alt. function	Remarks
8	BLUE/ RMII_TXEN	O	Logic Blue LED Signal/ RMII transmit enable output		See also System status IO signals and RMII.
9	VCC_IO	I	Module I/O level voltage input		IO voltage supply
10	VCC	I	Module supply voltage input		Module voltage supply
11	RSVD		Reserved for future use		Do not connect.
12	GND		Ground		
13	ANT	I/O	Antenna Tx/Rx interface		50 Ω nominal characteristic impedance
14	GND		Ground		
15	RSVD		Reserved for future use		Do not connect
16	UART_DTR/ RMII_RXD0	I/O	UART Data Terminal Ready/ RMII receive data input 0		The DTR signaling is not according to UART standard. See also RMII.
17	UART_DSR/ RMII_RXD1	I	UART Data Set Ready/ RMII receive data input 1		The DSR signaling is not according to UART standard. See also UART IO signals and RMII.
18	SWITCH_2/ RMII_CRSDV	I	SWITCH_2: Connect on external signal / Enter bootloader RMII_CRSDV: Carrier Sense / Receive Data Valid input	WKUP_18	Active low. See also System control IO signals and RMII. Can also control STOP mode.
19	RESET_N	I	External system reset input.		Active low
20	UART_RTS/ RMII_TXD1	O	UART request to send/ RMII transmit data 1	GPIO_20	Active low. See also UART IO signals and RMII.
21	UART_CTS/ RMII_TXD0	I/O	UART clear to send/ RMII transmit data 0	GPIO_21	Active low. See also UART IO signals and RMII
22	UART_TXD	O	UART data output.		See also UART
23	UART_RXD	I	UART data input.		See also UART
24	RMII_MDIO	I/O	Management Interface data I/O	GPIO_24	See also RMII
25	RMII_MDCLK/ SPI_DRDY	I/O	Management Interface clock output/ SPI data ready output	GPO_25	See also RMII and SPI
26	GND		Ground		
27	RMII_CLK/ SYS_BOOT	I/O	RMII clock input/ Boot Mode	GPO_27	Default pulled-up. See also Bootstrap pins and RMII
28	GPIO_28	I/O	General Purpose Input /Output.		
29	GPIO_29	I/O	General Purpose Input /Output		
30	GND		Ground		
31	SPI_SCLK	I	SPI clock input signal	GPIO_31 WKUP_31	Can also control STOP mode. See also SPI.
32	LOG_BOOT/ SPI_CS	I/O	Debug printout on UART enable/ SPI chip select signal	GPIO_32	Default pulled-up. See also Bootstrap pins and SPI.
33	RSVD		Reserved for future use.		Do not connect.
34	GPI_34	I	General Purpose Input	WKUP_34	Can also control STOP mode
35	SPI_MOSI	I	SPI serial data in signal	GPIO_35 WKUP_35	Can also control STOP mode. See also SPI.
36	SPI_MISO	O	SPI serial data out signal	GPO_36	Default pulled-up. See also Bootstrap pins and SPI..

Table 6: NINA-W131/NINA-W132 pinout

4 Electrical specifications

⚠ Stressing the device above one or more of the Absolute maximum ratings can cause permanent damage. These are stress ratings only. Operating the module at these or at any conditions other than those specified in the Operating conditions should be avoided. Exposure to absolute maximum rating conditions for extended periods can affect device reliability.

☞ Where application information is given, it is advisory only and does not form part of the specification.

4.1 Absolute maximum ratings

Symbol	Description	Condition	Min	Max	Unit
VCC/ VCC_IO	Module supply voltage	Input DC voltage at VCC and VCC_IO pins	-0.3	3.6	V
$I_{VCC\ MAX}$ + $I_{VCC\_IO\ MAX}$	Absolute maximum power consumption			500	mA
DPV	Digital pin voltage	Input DC voltage at any digital I/O pin	-0.3	3.6	V
P_ANT	Maximum power at receiver	Input RF power at antenna pin		0	dBm
Tstr	Storage temperature		-40	+85	°C

Table 7: Absolute maximum ratings

⚠ The product is not protected against overvoltage or reversed voltages. If necessary, voltage spikes exceeding the power supply voltage specification, given in table above, must be limited to values within the specified boundaries by using appropriate protection devices.

4.1.1 Maximum ESD ratings

Parameter	Min.	Typical	Max.	Unit	Remarks
ESD immunity			±8*	kV	Indirect discharge according to IEC 61000-4-2
ESD sensitivity, tested for all pins except RSVD and ANT pins #11, #15, #13			2.0	kV	Human body model according to JEDEC JS001

*Tested on EVK-NINA-W1 evaluation board.

Table 8: Maximum ESD ratings

⚠ NINA-W13 series modules are Electrostatic Sensitive Devices that demand special handling precautions. See also ESD precautions.

4.2 Operating conditions

⚠ Operation beyond the specified operating conditions is not recommended and extended exposure beyond them may affect device reliability.

☞ Unless otherwise specified, all operating condition specifications are at an ambient temperature of 25 °C and at a supply voltage of 3.3 V.

4.2.1 Operating temperature range

Parameter	Min	Max	Unit
Operating temperature	-40*	+85	°C

* See voltage supply condition for the lowest temperature range in Supply/power pins.

Table 9: Temperature range

4.2.2 Supply/power pins

Symbol	Parameter	Condition	Min	Typ	Max	Unit
VCC	Input supply voltage	Ambient temperature -20 °C to +85 °C	3.00	3.30	3.60	V
		Ambient temperature -40 °C to +85 °C	3.00	3.30	3.45	V
VCC_IO	I/O reference voltage	Ambient temperature -20 °C to +85 °C	3.00	3.30	3.60	V
		Ambient temperature -40 °C to +85 °C	3.00	3.30	3.45	V

Table 10: Input characteristics of voltage supply pins

4.2.3 RESET_N pin

Pin name	Parameter	Min	Typ	Max	Unit
RESET_N	Low-level input	0		0.3*VCC	V
	Internal pull-up resistance		100		kΩ
	Internal capacitance		10		nF
t_Startup	Startup time after release of reset		2.6		s

Table 11: RESET_N pin characteristics

4.2.4 Digital pins

Pin name	Parameter	Min	Typ	Max	Unit	Remarks
Any digital pin	Input characteristic: Low-level input	0		0.3*VCC_IO	V	
	Input characteristic: high-level input	0.7*VCC_IO		VCC_IO	V	
	Output characteristic: Low-level output	0		0.4	V	
	Output characteristic: High-level output	VCC_IO-0.4		VCC_IO	V	
	Drive capability			12	mA	Source/Sink
	Pull-up/pull-down resistance		45		kΩ.	

Table 12: Digital pin characteristics

4.2.5 Current consumption

Table 13 shows the typical current consumption for NINA-W13 modules using u-connectXpress v3.0.0 software. Unless stated otherwise, the module is powered at 3.3 V and uses factory default configurations.

Radio mode	Activity	Power mode	Role	Typ	Unit	Remarks
Wi-Fi to UART	Transmitting	ACTIVE	AP	120	mA	Data throughput 1 Mbit/s
			Station	120	mA	Data throughput 1 Mbit/s
	Receiving	ACTIVE	AP	110	mA	Data throughput 1 Mbit/s
			Station	110	mA	Data throughput 1 Mbit/s
	Connected	STANDBY*	AP	100	mA	
			Station	30	mA	
		SLEEP*	AP	100	mA	
			Station	3.5	mA	
Wi-Fi to RMII	Transmitting (15 dBm)	ACTIVE	AP	170	mA	
			Station	130	mA	
	Receiving	ACTIVE	AP	125	mA	
			Station	115	mA	
	Connected	STANDBY	AP	115	mA	
			Station	40	mA	
Disabled	None	STANDBY*	-	30	mA	
		SLEEP*	-	1.5	mA	
		STOP*	-	5	uA	
	Reset	Reset	-	35	uA	Module held in reset

Table 13: Current consumption of a NINA-W13 module during typical use cases

*AFA enabled, minimum allowed clock speed set to 80 MHz, Wi-Fi Station beacon listen interval set to 10.

4.2.6 Wi-Fi radio characteristics

Parameter	Operation mode			Specification	Unit
RF frequency range	802.11b/g/n			2.400 – 2.4835	GHz
Channels				1-13*	
Modulation	802.11b			CCK and DSSS	
	802.11g/n			OFDM	
Supported data rates	802.11b			1, 2, 5.5, 11	Mbit/s
	802.11g			6, 9, 12, 18, 24, 36, 48, 54	Mbit/s
	802.11n			MCS0 - MCS7	
Supported bandwidth	802.11n			20	MHz
Supported guard Interval	802.11n			400, 800	ns
Conducted transmit power (typical)	802.11b	Channel 6	1 Mbit/s	13** ± 1	dBm
			11 Mbit/s	13** ± 1	dBm
	802.11g	Channel 6	6 Mbit/s	15** ± 1	dBm
			54 Mbit/s	12** ± 1	dBm
	802.11n	Channel 6	MCS0	15** ± 1	dBm
			MCS7	11** ± 1	dBm
Receiver sensitivity (typical)	802.11b		1 Mbit/s	-96 ± 2	dBm
			11 Mbit/s	-88 ± 2	dBm
	802.11g		6 Mbit/s	-92 ± 2	dBm

Parameter	Operation mode			Specification	Unit
			54 Mbit/s	-74 ± 2	dBm
	802.11n	20 MHz	MCS0	-91 ± 2	dBm
			MCS7	-72 ± 2	dBm

Characteristics assume VCC = 3.3 V, Tamb = 25 °C
* The maximum supported channels for 802.11d depends on the region.
** There is lower output power on band edge channels and also on the highest data rates.

Table 14: Wi-Fi radio characteristics

4.2.7 Antenna radiation patterns

The radiation patterns displayed in Table 15 show the radiation patterns of the NINA-W132 with internal PIFA antenna. Figure 5 provides an overview of the measurement procedure and shows how the NINA-W132 module is aligned to the XYZ-coordinate system. The procedure requires measurements to be taken in all positions shown as dots (left), with the subsequent measurements represented as grid points in the radiation pattern (right).

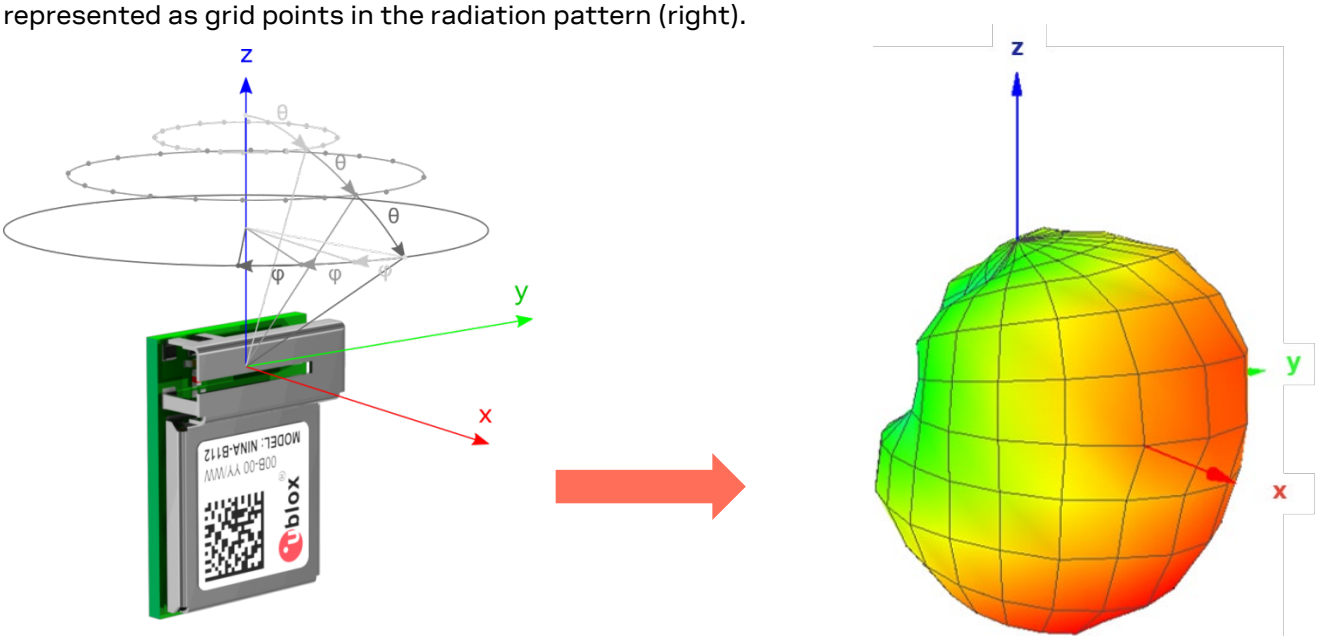


Figure 5: Measurement procedure for determining radiation patterns

Table 15 shows the displayed radiation patterns of the internal PIFA antenna in NINA-W132.

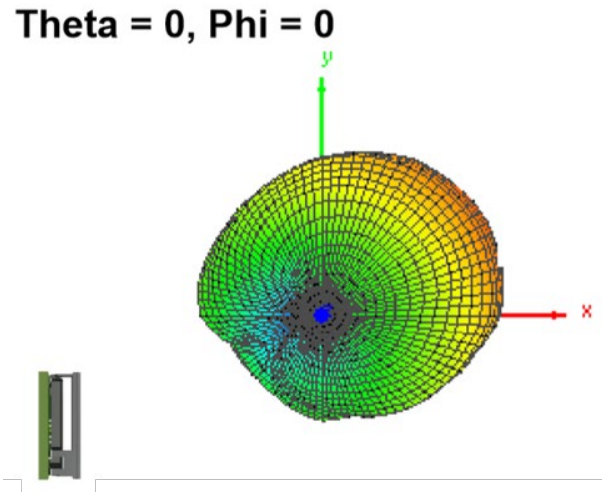
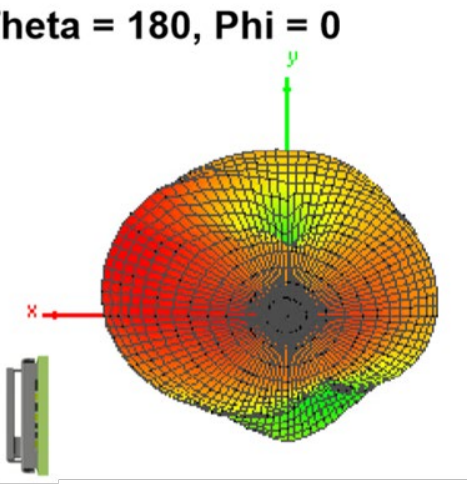
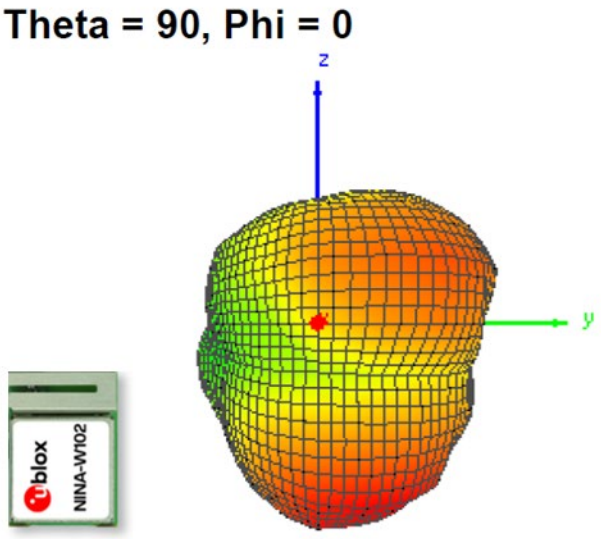
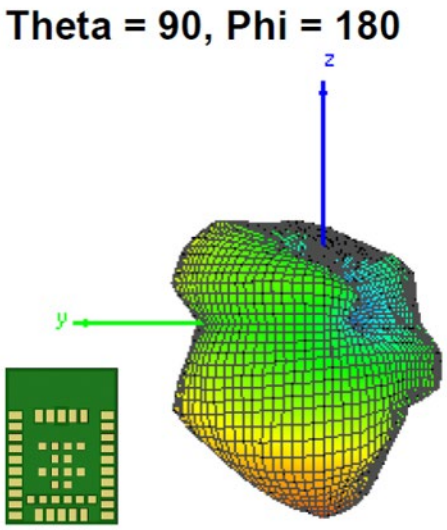
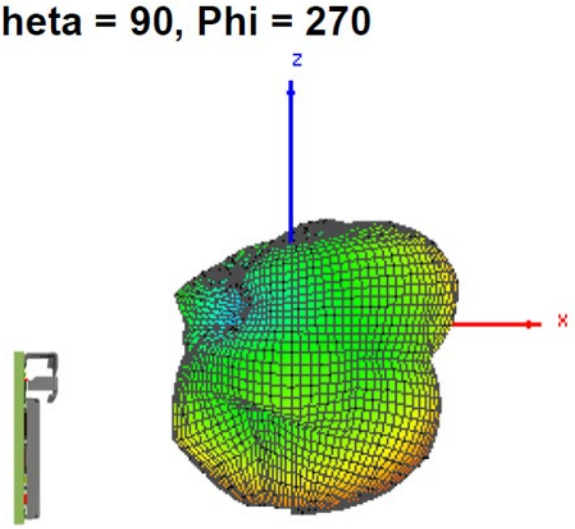
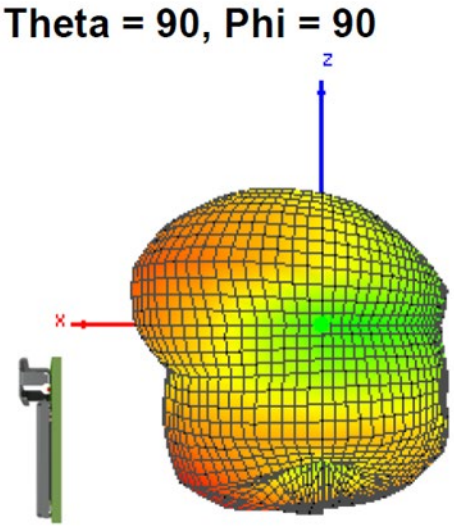
Theta = 0, Phi = 0 	Theta = 180, Phi = 0 
Theta = 90, Phi = 0 	Theta = 90, Phi = 180 
Theta = 90, Phi = 270 	Theta = 90, Phi = 90 

Table 15: NINA-W132 antenna radiation patterns

5 Mechanical specifications

5.1 NINA-W131 mechanical specification

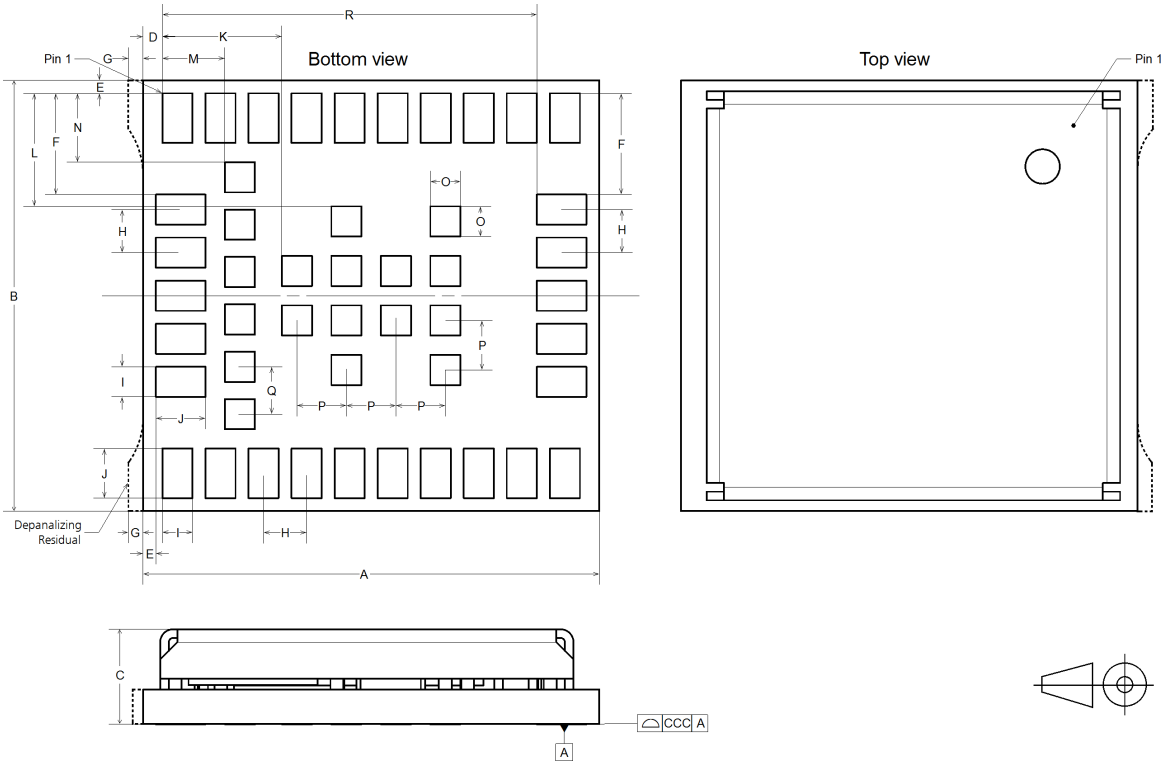


Figure 6: NINA-W131 mechanical outline

Parameter	Description	Typical		Tolerance	
A	Module PCB length [mm]	10.6	(417.3 mil)	+0.20/-0.10	(+7.9/-3.9 mil)
B	Module PCB width [mm]	10.0	(393.7 mil)	+0.20/-0.10	(+7.9/-3.9 mil)
C	Module thickness [mm]	2.2	(86.6 mil)	+0.40/-0.20	(+15.8/-7.9 mil)
ccc	Seating plane coplanarity [mm]	0.10	(3.9 mil)	+0.02/-0.10	(+0.8/-3.9 mil)
D	Horizontal edge to lateral pin 1 edge [mm]	0.45	(17.7 mil)	+0.10/-0.10	(+3.9/-3.9 mil)
E	Vertical and horizontal edge to lateral pin 1 edge [mm]	0.30	(11.8 mil)	+0.10/-0.10	(+3.9/-3.9 mil)
F	Vertical pin 1 edge to lateral pin edge [mm]	2.35	(92.5 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
G	Depanalizing residual [mm]	0.10	(3.9 mil)	+0.25/-0.10	(+9.8/-3.9 mil)
H	Lateral and antenna row pin to pin pitch [mm]	1.0	(39.4 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
I	Lateral and antenna row pin width [mm]	0.70	(27.6 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
J	Lateral and antenna row pin height [mm]	1.15	(45.3 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
K	Horizontal pin 1 edge to central pin edge [mm]	2.78	(109.4 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
L	Vertical pin 1 edge to central pin edge [mm]	2.63	(103.5 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
M	Horizontal pin 1 edge to Inner row pin edge [mm]	1.45	(57.1 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
N	Vertical pin 1 edge to Inner row pin edge [mm]	1.6	(63.0 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
O	Central pin and Inner row width and height [mm]	0.70	(27.6 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
P	Central pin to central pin pitch [mm]	1.15	(45.3 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
Q	Inner row pin to pin pitch [mm]	1.1	(43.3 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
R	Horizontal pin 1 edge to antenna row pin edge [mm]	8.7	(342.5 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
	Module weight [g]	<1.0			

Table 16: NINA-W131 mechanical outline data

5.2 NINA-W132 mechanical specification

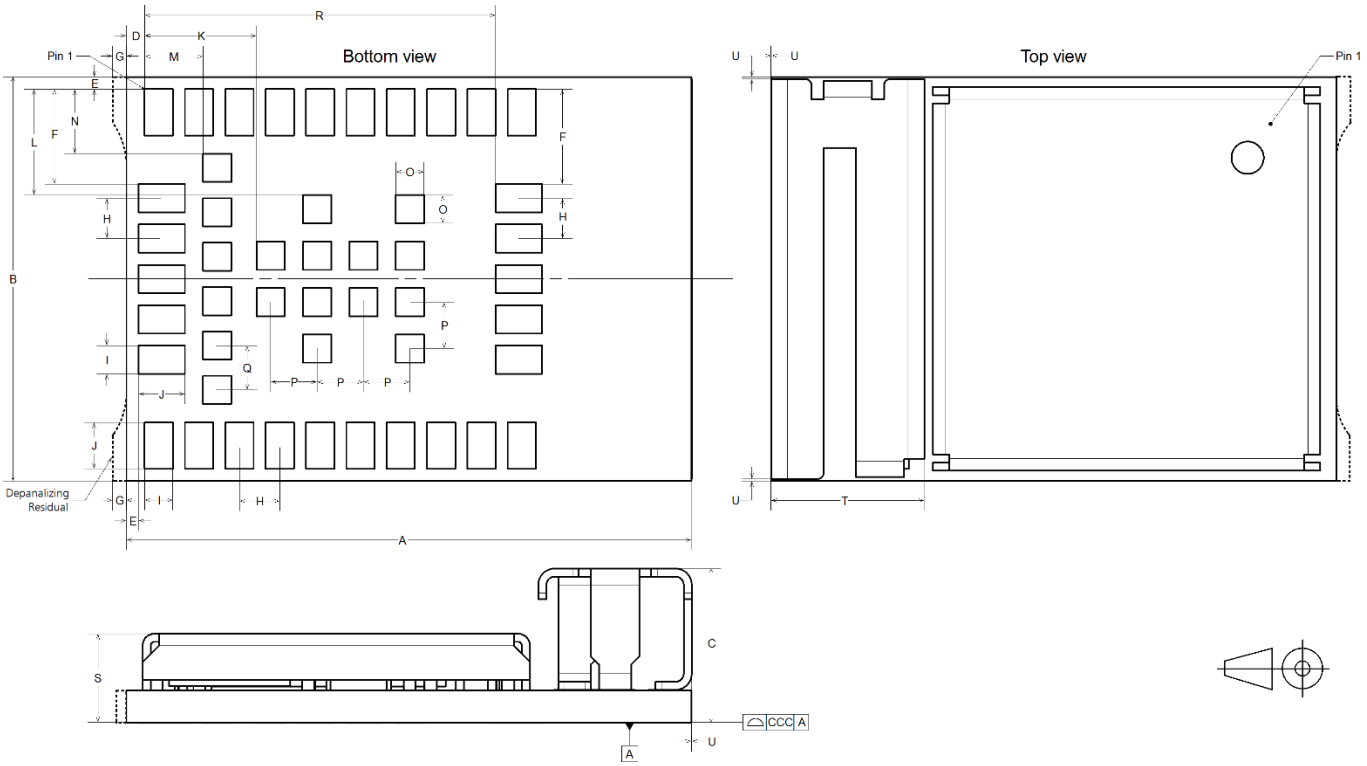


Figure 7: NINA-W132 mechanical outline

Parameter	Description	Typical		Tolerance	
A	Module PCB length [mm]	14.0	(551.2 mil)	+0.20/-0.10	(+7.9/-3.9 mil)
B	Module PCB width [mm]	10.0	(393.7 mil)	+0.20/-0.10	(+7.9/-3.9 mil)
C	Module thickness [mm]	3.8	(149.6 mil)	+0.40/-0.20	(+15.8/-7.9 mil)
ccc	Seating plane coplanarity [mm]	0.10	(3.9 mil)	+0.02/-0.10	(+0.8/-3.9 mil)
D	Horizontal edge to lateral pin 1 edge [mm]	0.45	(17.7 mil)	+0.10/-0.10	(+3.9/-3.9 mil)
E	Vertical and horizontal edge to lateral pin 1 edge [mm]	0.30	(11.8 mil)	+0.10/-0.10	(+3.9/-3.9 mil)
F	Vertical pin 1 edge to lateral pin edge [mm]	2.35	(92.5 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
G	Depanalizing residual [mm]	0.10	(3.9 mil)	+0.25/-0.10	(+9.8/-3.9 mil)
H	Lateral and antenna row pin to pin pitch [mm]	1.0	(39.4 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
I	Lateral and antenna row pin width [mm]	0.70	(27.6 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
J	Lateral and antenna row pin height [mm]	1.15	(45.3 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
K	Horizontal pin 1 edge to central pin edge [mm]	2.78	(109.4 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
L	Vertical pin 1 edge to central pin edge [mm]	2.63	(103.5 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
M	Horizontal pin 1 edge to Inner row pin edge [mm]	1.45	(57.1 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
N	Vertical pin 1 edge to Inner row pin edge [mm]	1.6	(63.0 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
O	Central pin and Inner row width and height [mm]	0.70	(27.6 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
P	Central pin to central pin pitch [mm]	1.15	(45.3 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
Q	Inner row pin to pin pitch [mm]	1.1	(43.3 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
R	Horizontal pin 1 edge to antenna row pin edge [mm]	8.7	(342.5 mil)	+0.05/-0.05	(+2.0/-2.0 mil)
S	PCB and shield cover thickness [mm]	2.2	(86.6 mil)	+0.40/-0.20	(+15.8/-7.9 mil)
T	Module antenna width [mm]	3.8	(149.6 mil)	+0.20/-0.20	(+7.9/-7.9 mil)
U	Antenna overhang outside module outline on any side	0.0	(0.0 mil)	+0.60	(+23.6 mil)
	Module weight [g]	<1.0			

Table 17: NINA-W132 mechanical outline data

6 Qualification and approvals

6.1 Country approvals

The NINA-W13 module series is certified for use in the following countries/regions:

- Europe (RED)
- Canada (IC)
- USA (FCC)
- Taiwan (NCC)
- Japan (MIC)
- South Korea (KCC)
- Brazil (ANATEL)
- Australia and New Zeeland (ACMA)
- South Africa (ICASA)

See the following sections for additional information.

6.2 European Union regulatory compliance

Information about regulatory compliance of the European Union for NINA-W13 series modules is available in the NINA-W13 Declaration of Conformity [4].

6.2.1 Radio Equipment Directive (RED) 2014/53/EU

NINA-W13 series modules comply with the essential requirements and other relevant provisions of Radio Equipment Directive (RED) 2014/53/EU.

6.2.2 Compliance with the RoHS directive

The NINA-W13 series modules comply with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

6.3 FCC/IC compliance

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s).

⚠ Any changes or modifications NOT explicitly APPROVED by u-blox AG may cause the module cease to comply with FCC rules part 15 thus void the user's authority to operate the equipment.

6.3.1 FCC compliance

NINA-W13 modules are for OEM integrations only. The end product will be professionally installed in such manner that only the authorized antennas can be used.

The NINA-W131 external antenna (U.FL. connector) reference design, as described in the NINA-W1 series system integration manual, must be followed to comply with the NINA-W13 FCC/IC modular approval.

6.3.2 FCC statement

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.

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 the 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

6.3.3 RF-exposure statement

6.3.3.1 IC compliance

This equipment complies with the requirements of IC RSS-102 issue 5 radiation exposure limits set forth for an uncontrolled environment.

To ensure that the output power remains below the SAR evaluation Exemption limits defined in RSS-102 issue 5, customer applications integrating NINA-W131 and NINA-W132 must include a separation distance of at least 30 mm between the user (or bystander) and the antenna (or radiating element).

6.3.3.2 FCC compliance

This device complies with the FCC radiation exposure limits set forth for an uncontrolled environment.

To ensure that the output power remains below the SAR evaluation Exemption limits defined in SAR test exclusion limits in KDB 447498 D01v06, customer applications integrating NINA-W131 and NINA-W132 must include a separation distance of at least 25 mm between the user (or bystander) and the antenna (or radiating element).

6.3.4 End product user manual instructions

6.3.4.1 IC compliance

User manuals for license-exempt radio apparatus shall contain the following text, or an equivalent notice that shall be displayed in a conspicuous location, either in the user manual or on the device, or both:

This device complies with Industry Canada's license-exempt RSSs. 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.

Under Industry Canada regulations, this radio transmitter can 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 chosen in such a way that the equivalent isotropically radiated power (e.i.r.p.) is not more than that is necessary for successful communication.

☞ Le manuel d'utilisation des appareils radio exempts de licence doit contenir l'énoncé qui suit, ou l'équivalent, à un endroit bien en vue dans le manuel d'utilisation ou sur l'appareil, ou encore aux deux endroits.

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;
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Conformément aux réglementations d'Industry Canada, cet émetteur radio ne peut fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) ont été approuvés pour cet émetteur par Industry Canada. Pour réduire le risque d'interférences avec d'autres utilisateurs, il faut choisir le type d'antenne et son gain de telle sorte que la puissance isotrope rayonnée équivalente (p.i.r.e) ne soit pas supérieure à celle requise pour obtenir une communication satisfaisante.

6.3.5 End product labeling requirements

6.3.5.1 IC compliance

The host product shall be properly labelled to identify the modules within the host product.

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 product must be labelled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word "Contains" or similar wording expressing the same meaning, as shown in Figure 8.

Le produit hôte devra être correctement étiqueté, de façon à permettre l'identification des modules qui s'y trouvent.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit:

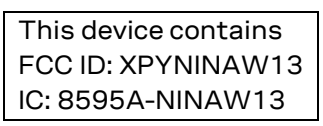


Figure 8: Example of an end product label

6.3.5.2 FCC compliance

For an end product that uses the NINA-W131 or NINA-W132 modules, there must be a label containing, at least, the information shown in Figure 8:

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

☞ In accordance with 47 CFR § 15.19, the end product shall bear the following statement in a conspicuous location on the device:

"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."

When the device is so small or for such use that it is not practicable to place the statement above on it, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

In case, where the final product will be installed in locations where the end-user is not able to see the FCC ID and/or this statement, the FCC ID and the statement shall also be included in the end product manual.

Model	FCC ID	IC Certification Number
NINA-W131	XPYNINAW13	8595A-NINAW13
NINA-W132	XPYNINAW13	8595A-NINAW13

Table 18: FCC and IC IDs for the NINA-W13 series modules

6.3.6 End product compliance

6.3.6.1 General requirements

- Any changes to hardware, hosts or co-location configuration may require new radiated emission and SAR evaluation and/or testing.
- The regulatory compliance of NINA-W131 and NINA-W132 does not exempt the end product from being evaluated against applicable regulatory demands; for example, FCC Part 15B criteria for unintentional radiators.
- Only authorized antenna(s) may be used.
- Any notification to the end user about how to install or remove the integrated radio module is NOT allowed.

6.3.6.2 Co-location (simultaneous transmission)

If the module is to be co-located with another transmitter, additional measurements for simultaneous transmission are required.

6.4 Japan radio equipment compliance

Figure 9: Giteki mark, R and the NINA-W131/NINA-W132 MIC certification number

For information about compliance of the NINA-W131/NINA-W132 modules with the Giteki certification, see also the NINA-W1 u-connectXpress system integration manual [1].

6.5 NCC Taiwan compliance

6.5.1 Taiwan NCC warning statement

- 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。**
- **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，指依電信法規定作業之無線電通信。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。

Statement translation:

- Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to an approved low power radio-frequency devices.
- The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act. The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

6.5.2 NINA-W131 labeling requirements for end product

When a product integrated with a NINA-W131 module is placed on the Taiwan market, the product must be affixed with a label marking as shown below. The label can use wording such as the following:

Contains Transmitter Module

內含發射器模組: CCAJ18LP0B42T2

Any similar wording that expresses the same meaning may be used. The marking must be visible for inspection.

6.5.3 NINA-W132 labeling requirements for end product

When a product integrated with a NINA-W132 module is placed on the Taiwan market, the product must be affixed with a label marking as shown below. The label can use wording such as the following:

Contains Transmitter Module

內含發射器模組: CCAJ18LP0B52T5

Any similar wording that expresses the same meaning may be used. The marking must be visible for inspection.

6.6 KCC South Korea compliance

NINA-W13 series modules are certified by the Korea Communications Commission (KCC).

When a product containing a NINA-W13 module is placed on the South Korean market, the product must be affixed with a label or marking containing the KCC logo and certification number shown below. NINA-W131 and NINA-W132 has the same certification number as the NINA-W151 and NINA-W152 products. This information must also be included in the products user manuals.

R-C-ULX-NINA-W151

The height of the KCC logo must be at least 5 mm.

6.7 Brazil compliance

When a product containing NINA-W131 or NINA-W132 modules is placed on the Brazilian market, the product must be affixed with a label or marking containing the Anatel logo, NINA-W131/NINA-W132 Homologation number: 06870-18-05903 and a statement claiming that the device may not cause harmful interference but must accept it (Resolution No 506).

ANATEL
06870-18-05903

"Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário."

Statement translation:

"This equipment operates on a secondary basis and, consequently, must accept harmful interference, including from stations of the same kind, and may not cause harmful interference to systems operating on a primary basis."

When the device is so small or for such use that it is not practicable to place the statement above on it, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

In case, where the final product will be installed in locations where the end user is unable to see the Anatel logo, NINA-W131/NINA-W132 Homologation number and/or this statement, the Anatel logo, NINA-W131/NINA-W132 Homologation number, and the statement shall also be included in the end product manual.

6.8 Australia and New Zealand regulatory compliance

NINA-W131 and NINA-W132 modules are compliant with the standards made by the Australian Communications and Media Authority (ACMA).

The modules are compliant with AS/NZS 4268:2012 standard – Radio equipment and systems – Short range devices – Limits and methods of standard measurement. The NINA-W131/NINA-W132 modules test reports can be used as part of the product certification and compliance folder. For more information about the test reports, contact your local support team.

To meet overall Australian and/or New Zealand end product compliance, the integrator must create a compliance folder containing all the relevant compliance test reports such as RF, EMC, electrical safety and DoC (Declaration of Conformity) and so on. It is the responsibility of the integrator to know what is required in the compliance folder for ACMA compliance.

For more information about compliance in Australia, see also the Australian Communications and Media Authority web site http://www.acma.gov.au/.

For more information about compliance in New Zealand, see also to the New Zealand Radio Spectrum Management Group web site www.rsm.govt.nz.

6.9 South Africa regulatory compliance

NINA-W131 and NINA-W132 modules are compliant and certified by the Independent Communications Authority of South Africa (ICASA). End products that are made available for sale or lease or is supplied in any other manner in South Africa shall have a legible label permanently affixed to its exterior surface. The label shall have the ICASA logo and the ICASA issued license number as shown below. The minimum width and height of the ICASA logo shall be 3 mm. The approval labels must be purchased by the customer's local representative directly from the approval authority ICASA. A sample of a NINA-W131/NINA-W132 ICASA label is included below:

More information on registration as a Responsible Integrator and labeling requirements can be found on the Independent Communications Authority of South Africa (ICASA) web site: https://www.icasa.org.za

6.10 Safety compliance

In order to fulfill the safety standard EN 60950-1, NINA-W13 series modules must be supplied with a Class-2 Limited Power Source.

7 Antennas

This chapter gives an overview of the different external antennas that can be used together with the module.

⚠ This radio transmitter IC: 8595A-NINAW13 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

⚠ Cet émetteur radio IC: 8595A-NINAW13 été approuvé par Industry Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximum autorisé et l'impédance nécessaire pour chaque type d'antenne indiqué. Les types d'antenne ne figurant pas dans cette liste et ayant un gain supérieur au gain maximum indiqué pour ce type-là sont strictement interdits d'utilisation avec cet appareil.

For each antenna, the "Approvals" field defines in which test reports the antenna is included. Definitions of the «Approvals» field are:

- FCC - The antenna is included in the FCC test reports and thus approved for use in countries that accept the FCC radio approvals, primarily US.
- IC - The antenna is included in the IC (Industrie Canada) test reports and thus approved for use in countries that accept the IC radio approvals, primarily Canada.
- RED - The antenna is included in the ETSI test reports and thus approved for use in countries that accept the Radio Equipment Directive, primarily the European countries.
- MIC - The antenna is included in the Japanese government affiliated MIC test reports and thus approved for use in the Japanese market.
- NCC - The antenna is included in the Taiwan NCC test reports and thus approved for use in Taiwan.
- KCC - The antenna is included in the Korea KCC test reports and thus approved for use in Korea.
- ANATEL – The antenna is included in the Brazil ANATEL test reports and thus approved for use in Brazil.
- ACMA – The antenna is included in the Australia and New Zealand test reports and thus approved for use in Australia and New Zealand.
- ICASA – The antenna is included in the South Africa ICASA test reports and thus approved for use in South Africa.

In general, antennas with SMD connection, Reverse Polarity SMA connector or U.FL connector are included in FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA radio tests. The antennas with SMA connector are included in RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA radio tests but not in the FCC or IC due to FCC/IC regulations.

The external antennas are connected to the board through U.FL connectors. Some antennas are connected directly to the U.FL connector of the board while some are connected using an SMA or reversed polarity SMA connector through a short U.FL to SMA or reversed polarity SMA adapter cable.

7.1 Antenna accessories

Name	U.FL to SMA adapter cable
Connector	U.FL and SMA jack (outer thread and pin receptacle)
Impedance	50 Ω
Minimum cable loss	0.5 dB, The cable loss must be above the minimum cable loss to meet the regulatory requirements. Minimum cable length 100 mm.
Comment	The SMA connector can be mounted in a panel. See also the NINA-W1 series, system integration manual [1] for information how to integrate the U.FL connector.
Approval	RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

Name	U.FL to Reverse Polarity SMA adapter cable
Connector	U.FL and Reverse Polarity SMA jack (outer thread and pin)
Impedance	50 Ω
Minimum cable loss	0.5 dB, The cable loss must be above the minimum cable loss to meet the regulatory requirements. Minimum cable length 100 mm.
Comment	The Reverse Polarity SMA connector can be mounted in a panel. See also the NINA-W1 series system integration manual [1] for information how to integrate the U.FL connector. It is necessary to follow this reference design to comply with the NINA-W13 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

7.2 Approved antennas

7.2.1 Single band antennas

NINA-W132	
Manufacturer	ProAnt
Gain	+3 dBi
Impedance	50 Ω
Size (HxWxL)	3.0 x 3.8 x 9.9 mm
Type	PIFA
Comment	SMD PIFA antenna on NINA-W132. Should not be mounted inside a metal enclosure. See also Internal antenna.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

GW.26.0111	
Manufacturer	Taoglas
Polarization	Vertical
Gain	+2.0 dBi
Impedance	50 Ω
Size	Ø 7.9 x 30.0 mm
Type	Monopole
Connector	SMA (M) .
Comment	To be mounted with the U.FL to SMA adapter cable.
Approval	RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

ANT-2.4-CW-RH-RPS	
Manufacturer	Linx
Polarization	Vertical
Gain	-1.0 dBi
Impedance	50 Ω
Size	Ø 7.4 x 27.0 mm
Type	Monopole
Connector	Reverse Polarity SMA plug (inner thread and pin receptacle).
Comment	To be mounted with the U.FL to Reverse Polarity SMA adapter cable. An SMA version antenna is also available but not recommended for use (ANT-2.4-CW-RH-SMA).
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

Ex-It 2400 28 RP-SMA	
Manufacturer	ProAnt
Polarization	Vertical
Gain	+3.0 dBi
Impedance	50 Ω
Size	Ø 12.0 x 28.0 mm
Type	Monopole
Connector	Reverse Polarity SMA plug (inner thread and pin receptacle).
Comment	The antenna needs to be surrounded by a metal ground plane for best performance. It is mounted with the U.FL to Reverse Polarity SMA adapter cable. An SMA version antenna is also available but not recommended for use (Ex-IT 2400 SMA 28-001).
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA (certified unde PN Ex-IT 2400 RP-SMA 28-001)

Ex-It 2400 28 U.FL-100	
Manufacturer	ProAnt
Polarization	Vertical
Gain	+2.0 dBi
Impedance	50 Ω
Size	Ø 12.0 x 28.0 mm
Type	Monopole
Cable length	100 mm
Connector	U.FL. connector
Comment	The antenna needs to be surrounded by a metal ground plane for best performance. To be mounted with a U.FL connector. For information about integrating the U.FL connector, see also the NINA-W1 u-connectXpress system integration manual [1]. It is necessary to follow this reference design to comply with the NINA -W13 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA (certified under the PN Ex-IT 2400 MHF 28)

Ex-It 2400 Foldable RP-SMA	
Manufacturer	ProAnt
Polarization	Vertical
Gain	+3.0 dBi
Impedance	50 Ω
Size	Ø 10 x 83 mm
Type	Monopole
Connector	Reverse Polarity SMA plug (inner thread and pin receptacle)
Comment	To be mounted with the U.FL to Reverse Polarity SMA adapter cable. An SMA version antenna is also available but not recommended for use (Ex-IT 2400 SMA 70-002).
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA (certified under the PN Ex-IT 2400 RP-SMA 70-002)

Ex-It 2400 70	
Manufacturer	ProAnt
Polarization	Vertical
Gain	+3.0 dBi
Impedance	50 Ω
Size	Ø 9.4 x 70.5 mm
Type	Monopole
Cable length	100 mm
Connector	U.FL. connector
Comment	To be mounted with a U.FL connector. For information about integrating the U.FL connector, see also the NINA-W1 u-connectXpress system integration manual [1]. It is necessary to follow this reference design to comply with the NINA-W1 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA (certified under the PN Ex-IT 2400 MHF 70-001)

InSide™ 2400	
Manufacturer	ProAnt
Gain	+3.0 dBi
Impedance	50 Ω
Size	27 x 12 mm (triangular)
Type	Patch
Cable length	100 mm
Connector	U.FL. connector
Comment	Should be attached to a plastic enclosure or part for best performance. To be mounted with a U.FL connector. For information about integrating the U.FL connector, see also the NINA-W1 u-connectXpress system integration manual [1]. It is necessary to follow this reference design to comply with the NINA-W13 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

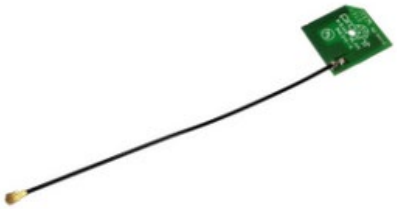
FlatWhip™ 2400	
Manufacturer	ProAnt
Gain	+3.0 dBi
Impedance	50 Ω
Size	Ø 50.0 x 30.0 mm
Type	Monopole
Connector	SMA plug (inner thread and pin)
Comment	To be mounted with the U.FL to SMA adapter cable. EOL, not for new products.
Approval	RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

Outside™ 2400	
Manufacturer	ProAnt
Gain	+3.0 dBi
Impedance	50 Ω
Size	36.0 x 18.0 x 16.0 mm
Type	Patch
Cable length	70 mm
Connector	U.FL. connector
Comment	To be mounted with a U.FL connector. For information about integrating the U.FL connector, see also the NINA-W1 u-connectXpress system integration manual [1]. It is necessary to follow this reference design to comply with the NINA-W13 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

7.2.2 Dual-band antennas

InSide™ WLAN	
Manufacturer	ProAnt
Gain	+3.0 dBi
Impedance	50 Ω
Size	27 x 12 mm (triangular)
Type	Patch
Cable length	100 mm
Connector	U.FL. connector
Comment	Should be attached to a plastic enclosure or part for best performance. Dual-band (2.4 GHz / 5 GHz) antenna to be mounted with a U.FL connector. For information about integrating the U.FL connector, see also the NINA-W1 u-connectXpress system integration manual [1]. It is necessary to follow this reference design to comply with the NINA-W13 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA

InSide™ WLAN Square	
Manufacturer	ProAnt
Gain	+3.0 dBi
Impedance	50 Ω
Size	24 x 22 x 1 mm with mounting hole
Type	Patch
Cable length	100 mm
Connector	U.FL. connector
Comment	Should be attached to a plastic enclosure or part for best performance. Dual-band (2.4 GHz / 5 GHz) antenna to be mounted with a U.FL connector. For information about integrating the U.FL connector, see also the NINA-W1 u-connectXpress system integration manual [1]. It is necessary to follow this reference design to comply with the NINA-W13 FCC/IC modular approvals.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA



Ex-It WLAN Foldable RP-SMA	
Manufacturer	ProAnt
Type	½ wave dipole dual-band antenna
Polarization	Vertical
Gain	+3 dBi
Impedance	50 Ω
Size	107 mm (Straight)
Type	Monopole
Connector	Reverse Polarity SMA plug (inner thread and pin receptacle)
Comment	To be mounted with the U.FL to Reverse Polarity SMA adapter cable.
Approval	FCC, IC, RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA (certified under the PN Ex-IT WLAN RPSMA)

8 Product handling

8.1 Packaging

To enable efficient production, production lot set-up, and tear-down, INA-W13 series modules are delivered as hermetically sealed, reeled tapes. For more information about packaging, see also the Packaging information reference [2].

8.1.1 Reels

NINA-W13 modules are deliverable in quantities of 500 pieces on a reel. The reel types for the modules are provided in Table 19.

Model	Reel type
NINA-W131	B
NINA-W132	A

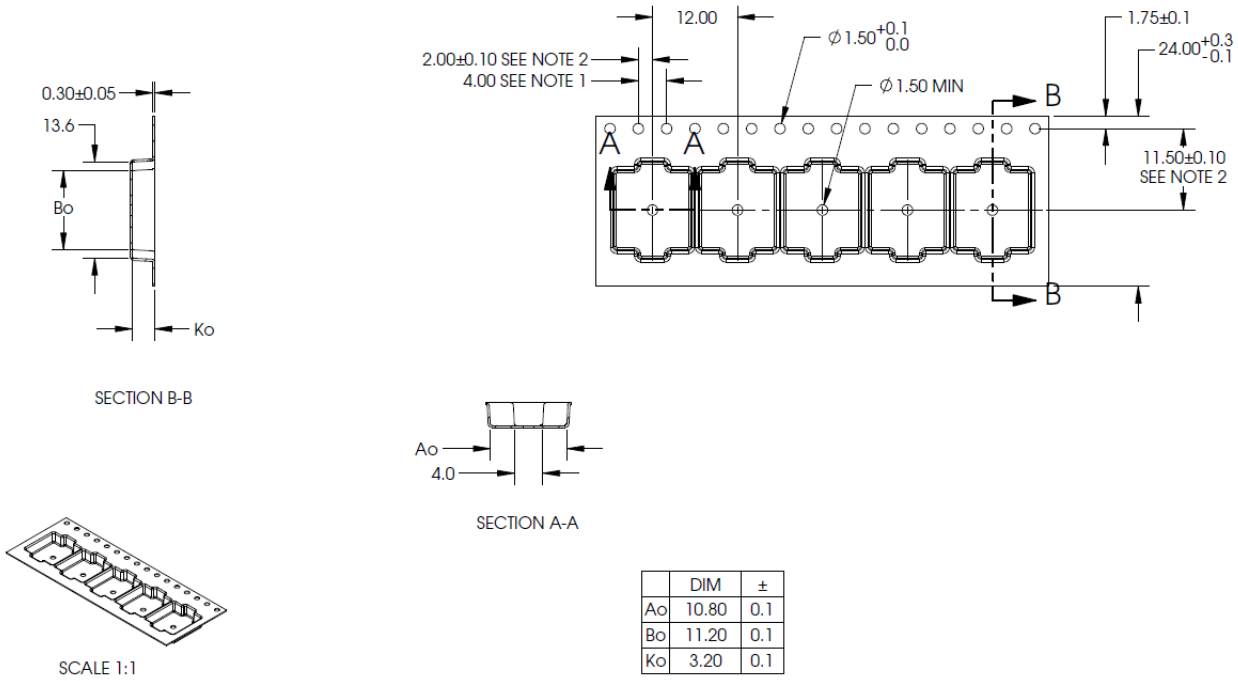
Table 19: Reel types for different models of the NINA-W13 series

8.1.2 Tapes

Figure 10 and Figure 11 show the position and orientation of the NINA-W13 modules as they are delivered on tape. The dimensions of the tapes are specified in Figure 12 and Figure 13.

Figure 10: Orientation of NINA-W131 module on tape

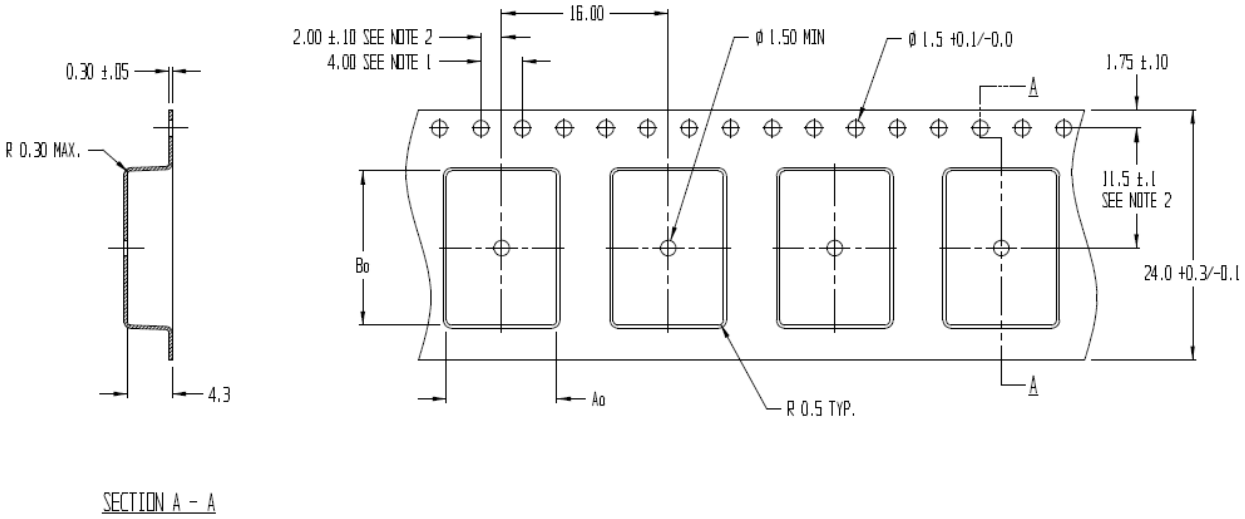
Figure 11: Orientation of NINA-W132 module on tape



	DIM	±
Ao	10.80	0.1
Bo	11.20	0.1
Ko	3.20	0.1

NOTES:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE.
3. Ao AND Bo ARE MEASURED ON A PLANE AT A DISTANCE "R" ABOVE THE BOTTOM OF THE POCKET.

Figure 12: NINA-W131 tape dimension



Ao = 10.6
Bo = 14.8
Ko = 4.3

NOTES:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE
3. Ao AND Bo ARE CALCULATED ON A PLANE AT A DISTANCE "R" ABOVE THE BOTTOM OF THE POCKET.

Figure 13: NINA-W132 tape dimensions

8.2 Moisture sensitivity levels

⚠ NINA-W13 modules are rated as MSL Level 4 devices in accordance with the IPC/JEDEC J-STD-020 standard. For detailed information, see the moisture sensitive warning label on the MBB (Moisture Barrier Bag).

After opening the dry pack, the modules must be mounted within 168 hours in factory conditions of maximum 30 °C/60%RH or must be stored at less than 10%RH. The modules require baking if the humidity indicator card shows more than 10% when read at 23±5 °C or if the conditions mentioned above are not met. For information about the bake procedure, see also the J-STD-033B standard.

For more information regarding MSL (Moisture Sensitivity Level), labeling, and storage, see also the Packaging information reference [2].

8.3 Reflow soldering

NINA-W13 modules are approved for two-time reflow processes.

⚠ Reflow soldering profiles must be selected in accordance with u-blox soldering recommendations described in the NINA-W1 series system integration manual [1]. Failure to observe these recommendations can result in severe damage to the product.

8.4 ESD precautions

⚠ NINA-W13 series modules are Electrostatic Sensitive Devices that demand the observance of special handling precautions against static damage. Failure to observe these precautions can result in severe damage to the product. See also Maximum ESD ratings.

Proper ESD handling and packaging procedures must be applied throughout the processing, handling, and operation of any application that incorporates NINA-W13. ESD precautions are particularly relevant when handling the application board on which the module is mounted.

For further information about the handling of NINA-W13 series modules, see also the NINA-W13 series system integration manual [1] .

9 Labeling and ordering information

9.1 Product labeling

The labels (7.5x7.5 mm) of the NINA-W13 series modules include important product information.

Figure 14 shows the label applied to NINA-W13 series modules. Each of the given label references are described in Table 20.

Figure 14: Location of product type number on the NINA-W13 series module label

Reference	Description
1	Date of unit production encoded YY/WW (year, week)
2	Major and minor product version information
3	Product model name (NINA-W131 or NINA-W132)
4	Data Matrix with unique serial number comprising 19 alphanumeric symbols: - The first 3 symbols are used for production tracking and are an abbreviated representation of the Type number that is unique to each module variant. - The following 12 symbols represent the unique hexadecimal Bluetooth address of the module AABBCCDDEEFF, and - The last 4 symbols represent the hardware and firmware version encoded HHFF. See also MAC addresses.
5	u-blox logo with the red dot to indicate the position of pin 1.

Table 20: NINA-W13 series label description

9.2 Product identifiers

Table 21 describes the three product identifiers, namely the Type number, Model name and Ordering code.

Format	Description	Nomenclature
Model name	Describes the form factor, platform technology and platform variant. Used mostly in product documentation like this data sheet, the model name represents the most common identity for all u-blox products	PPPP-TGVV
Ordering code	Comprises the model name – with additional identifiers to describe the major product version and quality grade	PPPP-TGVV-TTQ
Type number	Comprises the model name and ordering code – with additional identifiers to describe minor product versions.	PPPP -TGVV-TTQ-XX

Table 21: Product code formats

9.3 Identification codes

Table 22 explains the parts of the product code.

Code	Meaning	Example
PPPP	Form factor	NINA
TG	Platform (Technology and Generation) T – Dominant technology, For example, W: Wi-Fi, B: Bluetooth G - Generation	W1: Wi-Fi Generation 1
VV	Variant based on the same platform; range [00…99]	31: u-connectXpress software product with antenna pin
TT	Major Product Version	00: first revision
Q	Quality grade A: Automotive B: Professional C: Standard	B: professional grade
XX	Minor product version (not relevant for certification)	Default value is 00

Table 22: Part identification code

9.4 Ordering information

Ordering Code	Product
NINA-W131-03B	Wi-Fi IEEE802.11b/g/n module with antenna pin. With u-connectXpress software. Uses ESP32-D0WDQ6-V3.
NINA-W132-03B	Wi-Fi IEEE802.11b/g/n module with internal PIFA antenna. With u-connectXpress software. Uses ESP32-D0WDQ6-V3.

Table 23: Product ordering codes

Appendix

A Glossary

Abbreviation	Definition
ADC	Analog to Digital Converter
AFA	Automatic Frequency Adaption
BLE	Bluetooth Low Energy
BPF	Band Pass Filter
CAN	Controller Area Network
CTS	Clear To Send
DAC	Digital to Analog Converter
DC	Direct Current
DSR	Data Set Ready
DTR	Data Terminal Ready
ESD	Electro Static Discharge
FCC	Federal Communications Commission
GND	Ground
GPIO	General Purpose Input/Output
I	Input (means that this is an input port of the module)
I2C	Inter-Integrated Circuit
IC	Industry Canada
IEEE	Institute of Electrical and Electronics Engineers
IoT	Internet of Things
L	Low
LPO	Low Power Oscillator
MCU	Micro Controller Unit
MDIO	Management Data Input / Output
MII	Media-Independent Interface
MIMO	Multi-Input Multi-Output
MISO	Master Input Slave Output
MOSI	Master Output Slave Input
MRD	Market Requirement Document
MSD	Moisture Sensitive Device
N/A	Not Applicable
O	Output (means that this is an output port of the module)
PCN	Product Change Notification
PIFA	Planar Inverted F antenna
PD	Pull-Down
PU	Pull-Up
QSPI	Quad Serial Peripheral Interface
RMII	Reduced Media Independent Interface
RTS	Request To Send
RXD	Receive Data
SDIO	Secure Digital Input Output
SDK	Software Development Kit

Abbreviation	Definition
SPI	Serial Peripheral Interface
TBD	To Be Defined
TXD	Transmit Data
UART	Universal Asynchronous Receiver/Transmitter
WKUP	Wake Up

Table 24: Explanation of the abbreviations and terms used

Related documents

[1] NINA-W1 series, system integration manual, UBX-17005730
[2] Packaging information reference, UBX-14001652
[3] u-connectXpress AT commands manual, UBX-14044127
[4] NINA-W13 Declaration of Conformity, UBX-18007182
[5] NINA-W13 series, product summary, UBX-16029109
[6] u-connectXpress software user guide, UBX-16024251
[7] u-connectXpress SPI peripheral protocol specification, UBX-20028725

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Revision history

Revision	Date	Name	Comments
R01	23-Mar-2017	mwej	Initial release.
R02	30-Jun-2017	mwej	Updated the product status to Engineering Sample. Added information about band pass filter (sections 0 and 2.5). Updated maximum UART speed to 921600 bps (section 2.7.1). Updated best conducted Wi-Fi sensitivity to -96 dBm (section 4.2.6). Updated the information in section 6.2.2.
R03	11-Oct-2017	mwej, kgom	Modified the software version to 1.0.0 for NINA-W13 series in the table on page 2. Included information about the multiradio open CPU variants – NINA-W101 and NINA-W102 in many sections. Updated the FCC IDs (section 6.3).
R04	12-Mar-2018	mwej, kgom	Included information about “NINA-W13 series” only in this Data Sheet and moved information about NINA-W10 series to a separate Data Sheet (UBX-17065507). Updated the product status to Initial Production. Updated Overview section. Support for Wi-Fi channel 12-13 and 802.11n 40 MHz channel bandwidth is disabled. Updated the maximum ESD ratings **(***Tested on EVK-NINA-W1 evaluation board. Table 8Updated the Regulatory information (section 6) and made a few minor changes in section 7.
R05	19-Apr-2018	mlju, ovik, kgom	Updated the type number and u-connectXpress software version in the second table on page 2 with NINA-W13x-00B-01 and 1.0.1 respectively. Removed "pending" status for Canada (IC) in section 6.1. Updated the product ordering codes (Table 23).
R06	4-Jan-2019	mwej, kgom	Updated the type number and u-connectXpress software version in the second table on page 2 with NINA-W13x-00B-01 and 2.0.0 respectively. Removed "pending" status for Japan (MIC) and South Korea (KCC) in section 6.1. Updated label description (Table 20). Added information about RMII in section 2.7.2 and 3.1. Removed LPO functionality. Updated RF characteristics in section 4.2.6. Added current consumption data (Table 13).
R07	14-Aug-2019	mwej	Updated description of DSR signal usage in section 2.6.4. Added certification information for Brazil, Australia, New Zealand and South Africa (sections 6.7-6.9). Updated information about approved antennas (chapter 7). Updated with RoHS 3 compliance (section 6.2.2). Updated voltage supply range (section 4.2.2) and absolute maximum module supply voltage and maximum RF input ratings (section 4.1). Updated maximum ESD ratings (section 4.1.1). Corrected information about restoring UART setting to default (section 2.6.3). Corrected Wi-Fi typical output power in section 1.5 (matching Wi-Fi radio characteristics section). Corrected information about blue LED signal in connected mode (Table 5). Added information that the RED, GREEN and BLUE signals are disabled when using the RMII interface (sections 0 and 2.7.2).
R08	27-Jan-2020	mlju	Updated type numbers in the second table on page 2 with NINA-W13x-00B-02 and NINA-W13x-01B-01.
R09	13-May-2020	hekf	Added IEEE 802.11d and additional regulatory domains (section 0). New variants of NINA-W131 and W132. Antenna radiation pattern is added (section 4.2.7). Boot strap information is added (section 2.4). ESD ratings is changed (section 4.1.1). GPIO drive strength current is added (section 4.2.4). Number of available GPIOs is changed. Software name is changed to u-connectXpress.
R10	17-Jul-2020	ajoh, mwej	Added information in section 2.7 on how the different data interfaces are enabled. Added information on the SPI interface in section 2.7.3 and throughout the document (pinout diagram and table etc.). Updated current consumption in Table 13. Added info about bootstrap pin 36 in section 2.4
R11	19-Mar-2021	ajoh, hekf	Updated 802.11d description. Updated current consumption in section 4.2.5. Updated frequency range in section 4.2.6. Revised 802.11d implementation description in section 1.7.1. Removed table 1 Product features, changed pull-up/pull-down resistance in section 4.2.4. Changed section 3 RSVD pins to GPIO and added SPI. Changed number of GPIO in sections 2.6 and 3. Adding product variants NINA-W131-03B and NINA-W132-03B in section 9.4.

Revision	Date	Name	Comments
R12	31-May-2021	hekf	Revised RESET_N description in Module reset. Updated the product status of NINA-W131-03B-00 and NINA-W132-03B-00 module variants in Document information. Following products are removed since End of Life: NINA-W131-00B, NINA-W131-01B, NINA-W131-02B, NINA-W132-00B, NINA-W132-01B, NINA-W132-02B from Document information and Ordering information.
R13	03-Nov-2021	hekf, cche	Updated names for ProAnt Ex-It series antennas and FlatWhip EOL in Approved antennas. Added information on how to disable channel 12 and 13 for Taiwan in IEEE 802.11d and additional regulatory domains. Added new products NINA-W131/W132-03B-01 and removed NINA-W131/W132-03B-00 in Document information. Removed ambiguous description of operating condition ranges in Electrical specifications. Updated information describing Moisture sensitivity levels, Reflow soldering, and ESD precautions. Revised Maximum ESD ratings.

Contact

For complete contact information, visit us at www.u-blox.com.

u-blox Offices

North, Central and South America

u-blox America, Inc.

Phone: +1 703 483 3180
E-mail: info_us@u-blox.com

Regional Office West Coast:

Phone: +1 408 573 3640
E-mail: info_us@u-blox.com

Technical Support:

Phone: +1 703 483 3185
E-mail: support_us@u-blox.com

Headquarters
Europe, Middle East, Africa

u-blox AG

Phone: +41 44 722 74 44
E-mail: info@u-blox.com
Support: support@u-blox.com

Asia, Australia, Pacific

u-blox Singapore Pte. Ltd.

Phone: +65 6734 3811
E-mail: info_ap@u-blox.com
Support: support_ap@u-blox.com

Regional Office Australia:

Phone: +61 3 9566 7255
E-mail: info_anz@u-blox.com
Support: support_ap@u-blox.com

Regional Office China (Beijing):

Phone: +86 10 68 133 545
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Chongqing):

Phone: +86 23 6815 1588
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shanghai):

Phone: +86 21 6090 4832
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shenzhen):

Phone: +86 755 8627 1083
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office India:

Phone: +91 80 405 092 00
E-mail: info_in@u-blox.com
Support: support_in@u-blox.com

Regional Office Japan (Osaka):

Phone: +81 6 6941 3660
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Japan (Tokyo):

Phone: +81 3 5775 3850
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Korea:

Phone: +82 2 542 0861
E-mail: info_kr@u-blox.com
Support: support_kr@u-blox.com

Regional Office Taiwan:

Phone: +886 2 2657 1090
E-mail: info_tw@u-blox.com
Support: support_tw@u-blox.com

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