M2-MAYA-W1

M.2 card for the MAYA-W1 Wi-Fi 4 and Bluetooth 5.2 module

Product Manual

Abstract

This technical data sheet describes the M2-MAYA-W1 card module which offers 1x1 802.11a/b/g/n and dual-mode Bluetooth 5.2 in an M.2 Key E form factor. The M2-MAYA-W1 card provides all the features and functionality supported in the MAYA-W1 module, with the added benefits associated with easy installation and replacement. The card can be inserted in a standard M.2 Key E slot without the need to solder the module on a host or carrier PCB.

Document information

Title	**M2-MAYA-W1**
Subtitle	M.2 card for the MAYA-W1 Wi-Fi 4 and Bluetooth 5.2 module
Document type	Product Manual
Document number	
Revision and date	R01 28-Feb-2023
Disclosure restriction	C3-Confidential

Product status	Corresponding content status	
Functional sample	Draft	For functional testing. Revised and supplementary data will be published later.
In development / Prototype	Objective specification	Target values. Revised and supplementary data will be published later.
Engineering sample	Advance information	Data based on early testing. Revised and supplementary data will be published later.
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	Chipset	Type number	IN/PCN reference	Product status
M2-MAYA-W161	NXP IW416	M2-MAYA-W161-00C-00	N/A	Initial production
M2-MAYA-W166	NXP IW416	M2-MAYA-W166-10C-00	N/A	In development

Contents

1　Functional description

1.1　Overview

The M2-MAYA-W1 card features the MAYA-W1 multi-radio module, based on the NXP IW416 chipset. This Type 2230 Key E M.2 card supports all features and functionality of the module on a convenient expansion card that plugs directly to the host platform.

MAYA-W1 modules can be operated in the following modes:

- Wi-Fi 1x1 802.11a/b/g/n in 2.4 GHz or 5 GHz bands
- Dual-mode Bluetooth 5.2 (BR/EDR and BLE), can be operated simultaneously with Wi-Fi

Even though the M2-MAYA-W1 card is of standard grade, the module variant used on the card is either the MAYA-W161-00B or the MAYA-W166-00B professional grade module.

1.2　Product features

As the M2-MAYA-W1 card supports all of the features that the integrated MAYA-W1 module supports, this document aims to describe the extended features of the M2-MAYA-W1 card specifically. For more information about the MAYA-W1 module, see the MAYA-W1 series data sheet [1]. Table 1 describes the features of the card.

	M2-MAYA-W161	M2-MAYA-W166
Grade		
Automotive		
Professional		
Standard	•	•
Radio		
Chip inside	NXP IW416	
Bluetooth qualification	v5.2	v5.2
Bluetooth profiles	HCI	HCI
Bluetooth BR/EDR	•	•
Bluetooth Low Energy	•	•
Wi-Fi 4 IEEE 802.11 standards	a/b/g/n	a/b/g/n
Wi-Fi frequency band [GHz]	2.4 and 5	2.4 and 5
Bluetooth output power conducted [dBm]	10	10
Wi-Fi output power conducted [dBm]	18	18
Antenna type	2 U-FL connectors	1 pcb antenna
OS support		
Android / Linux drivers (from u-blox)	•	•
RTOS (via NXP i.MX RT MCUs)	•	•
Interfaces		
High-speed UART (Bluetooth)	1	1
PCM, I2S (Bluetooth audio)	1	1
SDIO (Wi-Fi) [version]	3.0	3.0
Features		
Micro Access Point [max connects]	8	8
Wi-Fi direct	•	•
WPA3	•	•
RF calibration in OTP	•	•
Programmed MAC address	•	•

Table 1: Key features of the M2-MAYA-W1 module

1.3 Product description

Product name	Description
M2-MAYA-W161	Standard grade M.2 card module equipped with two separate antenna connectors: one for 2.4 GHz and 5 GHz 802.11 a/b/g/n and another for Bluetooth/Bluetooth Low Energy (LE) 5.2). The module integrates the NXP IW416 chipset.
M2-MAYA-W166	Standard grade M.2 card module with embedded PCB antenna for 2.4 GHz and 5 GHz 802.11 a/b/g/n, Bluetooth Basic Rate/Enhanced Data Rate (BR/EDR), and Bluetooth Low Energy (LE) 5.2. The module integrates the NXP IW416 chipset.

Table 2: Product description

1.4 Block diagram

Figure 1 shows the block diagram of the M2-MAYA-W161 card that integrates the MAYA-W161 module and includes two antenna connectors for attaching two external antennas: one for Wi-Fi and another for Bluetooth.
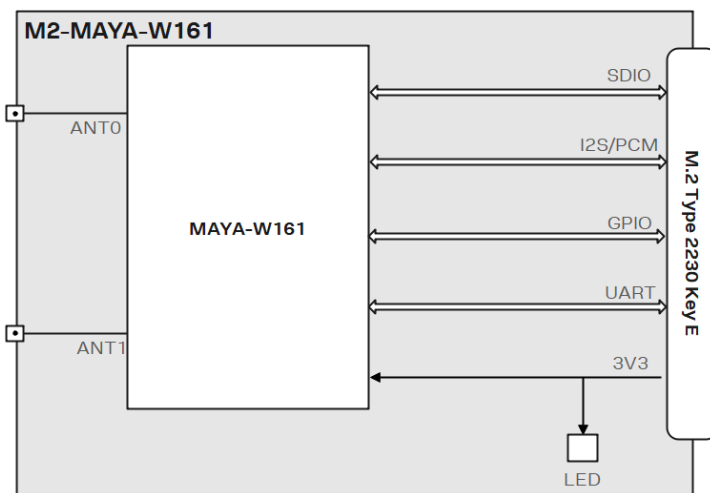

Figure 1: Block diagram of the M2-MAYA-W161 card module

Figure 2 shows the block diagram of the M2-MAYA-W166 card that includes the MAYA-W166 module with an embedded PCB antenna for both Wi-Fi and Bluetooth communication.
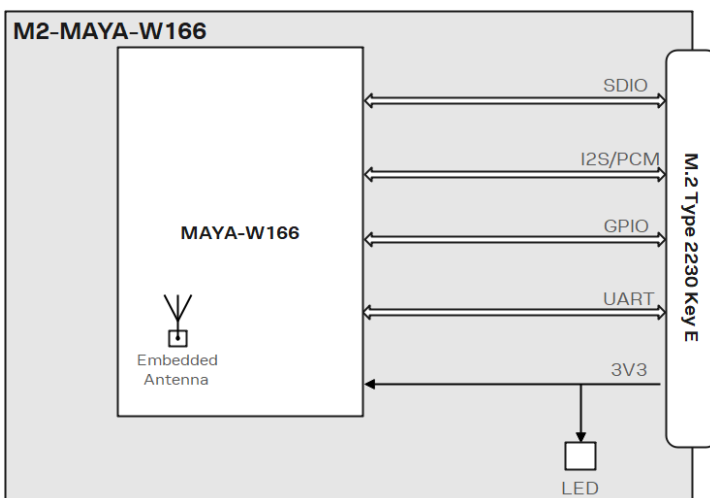
Figure 2: Block diagram of the M2-MAYA-W166 card module

Contents

2 Interfaces

The M2-MAYA-W1 card supports all MAYA-W1 module interfaces. For more information about these interfaces, see the MAYA-W1 series data sheet [1].

2.1 Boot configuration pins

By default, the M2-MAYA-W1 card is configured for using the SDIO interface for Wi-Fi and the UART interface for Bluetooth.

Host interface selection and firmware boot options are selected using the MAYA-W1 module configuration pin **CONFIG[1:0]**. The configuration settings for the available boot options are shown in Table 3.

CONFIG[1]	CONFIG[0]	Wi-Fi	Bluetooth	Number of SDIO functions
1	0	SDIO	UART	1 (Wi-Fi)

Table 3: Firmware boot options of the MAYA-W1 module

The M2-MAYA-W1 card supports the same boot options as the MAYA-W1 module. To set the **CONFIG[1:0]** configuration pin to logic-low level ("0"), it must be pulled down with a 51 kΩ resistor to GND. MAYA-W1 has an internal pull-up resistor connected to this pin and as a result, no external pull-up resistor is required to set the configuration pin to logic-high level ("1").

Figure 3 shows the "10" default configuration used to select the SDIO interface for Wi-Fi and UART interface for Bluetooth.
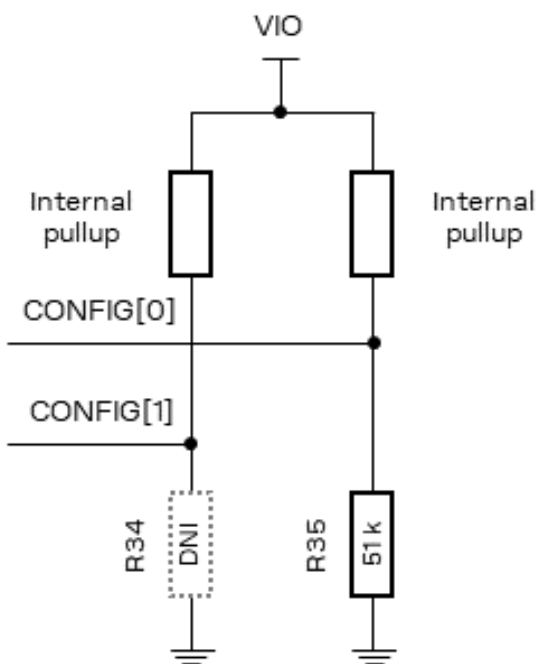
Figure 3: Default configuration of the M2-MAYA-W1 boot pins

Figure 4 shows the physical locations of pulldown resistor positions, R34 and R35.
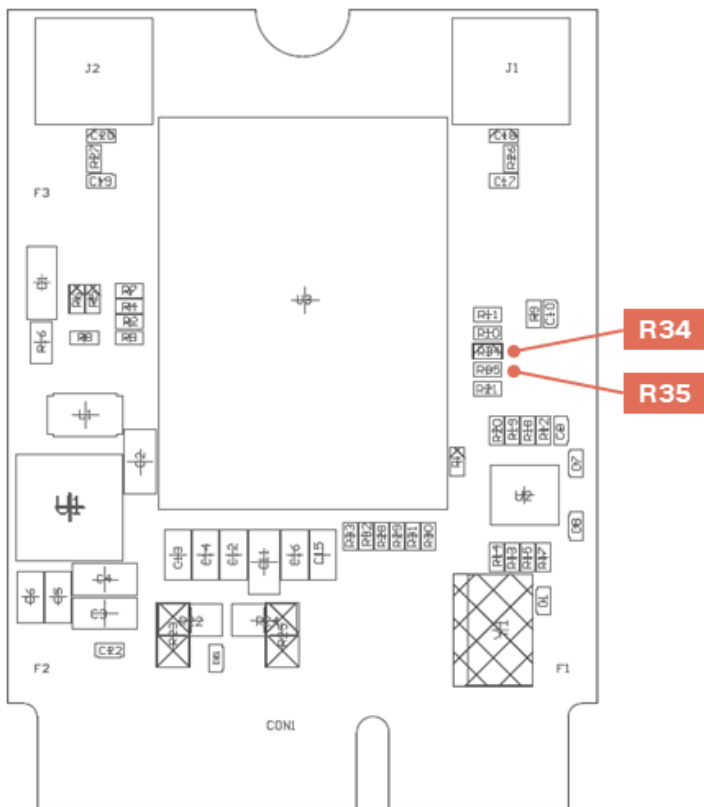
Figure 4: Position of resistors R34 and R35 on M2-MAYA-W1

2.2 SDIO

The SDIO device interface is conformant with the industry standard SDIO 3.0 specification (UHS-I up to 50 MB/s) and allows a host controller to access MAYA-W1 Wi-Fi functionality using the SDIO bus protocol. The interface supports 4-bit SDIO transfer mode over the full clock range up to 100 MHz. All bus speed modes are supplied from the SDIO I/O power supply (by default set to 1.8 V).

2.3 UART

MAYA-W1 series modules support a high-speed UART interface that is conformant with the industry-standard 16550 specification. For information about the features and baud rates supported in the MAYA-W1 series high-speed UART, see the MAYA-W1 data sheet [1].

2.4 PCM/I2S

M2-MAYA-W1 supports the full functionality of the MAYA-W1 series PCM and I2S interfaces for audio. The pins of the PCM and I2S interfaces are shared. See also, the MAYA-W1 data sheet [1].

3 Pin definition

The M2-MAYA-W1 card module implements the standard pinout of M.2 mechanical Type E sockets, as defined by the PCI Express M.2 Specification [5]. In co-operation with NXP, the card fully supports the optional sideband and debug signals defined by the NXP Wi-Fi/Bluetooth M.2 Key E Pinout Definition [6].

3.1 Pin assignment

Figure 5: M2-MAYA-W1 pin assignment

3.2 Pin description

Table 4 and Table 5 describe the M2-MAYA-W1 pins located at the top and bottom side of the M.2 card, respectively. The signal direction of the pins (inputs or outputs) is shown from the M2-MAYA-W1 card perspective.

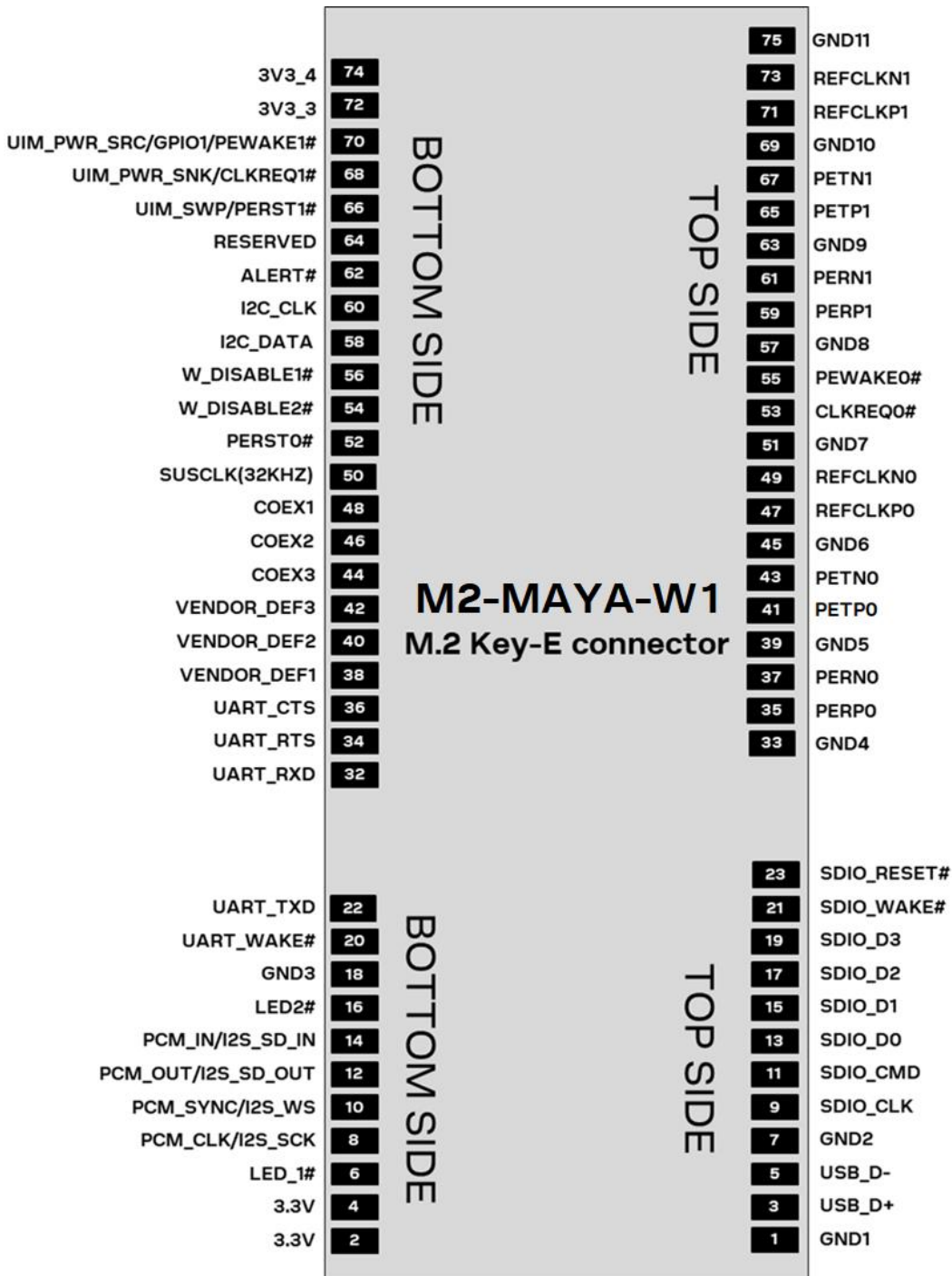| Pin no.	Pin name	Pin type	Voltage	Description
1	GND1	GND		Ground
3	USB_D+	NC		USB data + serial data interface. Not connected
5	USB_D-	NC		USB data - serial data interface. Not connected
7	GND2	GND		Ground
9	SDIO_CLK	I	VIO_SD	SDIO Clock
11	SDIO_CMD	I/O	VIO_SD	SDIO Command
13	SDIO_D0	I/O	VIO_SD	SDIO Data 1
15	SDIO_D1	I/O	VIO_SD	SDIO Data 2
17	SDIO_D2	I/O	VIO_SD	SDIO Data 3
19	SDIO_D3	I/O	VIO_SD	SDIO Data 4
21	SDIO_WAKE#	O	VIO	NXP usage: **WLAN_WAKE_HOST**. Sideband signal used by the Wi-Fi radio to wake up the platform. Active Low by default. Connect to Host GPIO Open drain. Pullup required on platform
23	SDIO_RESET#	NC	VIO	NXP usage: **WLAN_INDEPENDENT_RESET**. Sideband signal to independently reset the Wi-Fi radio. Active Low by default. Connect to Host GPIO
				M.2 Key E connector notch
33	GND4	GND		Ground
35	PERP0	NC		PCIe RX. Not connected
37	PERN0	NC		PCIe RX. Not connected
39	GND5	GND		Ground
41	PETP0	NC		PCIe TX. Not connected
43	PETN0	NC		PCIe TX. Not connected
45	GND6	GND		Ground
47	REFCLKP0	NC		PCIe Reference Clock. Not connected
49	REFCLKN0	NC		PCIe Reference Clock. Not connected
51	GND7	GND		Ground
53	CLKREQ0#	NC		PCIe Clock Request. Not connected
55	PEWAKE0#	NC		PCIe PME Wake. Not connected
57	GND8	GND		Ground
59	PERP1	NC		PCIe RX. Not connected
61	PERN1	NC		PCIe RX. Not connected
63	GND9	GND		Ground
65	PETP1	NC		PCIe TX. Not connected
67	PETN1	NC		PCIe TX. Not connected
69	GND10	GND		Ground

Pin no.	Pin name	Pin type	Voltage	Description
71	REFCLKP1	NC		PCIe Reference Clock. Not connected
73	REFCLKN1	NC		PCIe Reference Clock. Not connected
75	GND11	GND		Ground

Table 4: M2-MAYA-W1 pinout – top side

Table 5 describes the M2-MAYA-W1 pins located on the bottom side of the M.2 card. The signal direction of the pins (inputs or outputs) is shown from the M2-MAYA-W1 card perspective.

Pin no.	Pin name	Pin type	Voltage	Description
2	3.3V	P	3.3 V	Supply voltage pin
4	3.3V	P	3.3 V	Supply voltage pin
6	LED_1#	NC		Not connected
8	PCM_CLK/I2S_SCK	I/O	VIO	PCM data clock
10	PCM_SYNC/I2S_WS	I/O	VIO	PCM frame sync
12	PCM_OUT/I2S_SD_OUT	O	VIO	PCM data output
14	PCM_IN/I2S_SD_IN	I	VIO	PCM data input
16	LED2#	NC		Not connected
18	GND3	GND		Ground
20	UART_WAKE#	O	3.3 V	NXP usage: BT_WAKE_HOST. Sideband signal used by the Bluetooth radio to wake up the platform. Active Low by default. Connect to Host GPIO Open drain. Pullup required on platform.
22	UART_TXD	O	VIO	UART transmit. Connected to host platform UART receive (UART_RXD)
			M.2 Key E connector notch	
32	UART_RXD	I	VIO	UART receive. Connected to host platform UART transmit (UART_TXD)
34	UART_RTS	O	VIO	UART Request-To-Send. Connected to host platform UART Clear-To-Send (UART_CTS)
36	UART_CTS	I	VIO	UART Clear-To-Send. Connected to host platform UART Request-To-Send (UART_RTS)
38	VENDOR_DEF1	I/O	VIO	NXP usage: **JTAG_TDO**. Used for debug. Connected to JTAG header on platform
40	VENDOR_DEF2	I	VIO	NXP usage: **DEV_WLAN_WAKE**. Sideband signal used by the platform to wake up the Wi-Fi radio. Active Low. Connect to Host GPIO
42	VENDOR_DEF3	I	VIO	NXP usage: **DEV_BT_WAKE**. Sideband signal used by the platform to wake up the Bluetooth radio. Active Low. Connect to Host GPIO
44	COEX3	I/O	VIO	NXP usage: **JTAG_TDI** Used for debug. Connected to header on platform
46	COEX2	I/O	VIO	NXP usage: **JTAG_TCK**. Used for debug. Connected to header on platform
48	COEX1	I/O	VIO	NXP usage: **JTAG_TMS**. Used for debug. Connected to header on platform
50	SUSCLK(32KHZ)	NC		Not connected

Pin no.	Pin name	Pin type	Voltage	Description
52	PERST0#	NC		PCIe host indication to reset the device. Not connected
54	W_DISABLE2#	I	3.3 V	NXP usage: **BT_INDEPENDENT_RESET**. Sideband signal to independently reset the Bluetooth radio. Active Low by default. Connected to Host GPIO
56	W_DISABLE1#	I	3.3 V	NXP usage: **PDn**. Full Power-down for the Wi-Fi/BT radio: High = normal mode, Low = full power-down mode. Connect to host GPIO
58	I2C_DATA	NC		I2C data. Not connected
60	I2C_CLK	NC		I2C clock. Not connected
62	ALERT#	NC		Not connected
64	RESERVED	NC		Not connected
66	UIM_SWP/PERST1#	NC		Not connected
68	UIM_PWR_SNK/CLKREQ1#	NC		Not connected
70	UIM_PWR_SRC/GPIO1/PEWAKE1#	NC		Not connected
72	3V3_3	P	3.3 V	Supply voltage pin
74	3V3_4	P	3.3 V	Supply voltage pin

Table 5: M2-MAYA-W1 pinout (bottom side)

4 Electrical specifications

⚠ Stressing the device above one or more of the ratings of the Absolute maximum ratings can cause permanent damage. These are stress ratings only. Operating the module at these ratings or in 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.

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

4.1 Absolute maximum ratings

Symbol	Description	Min.	Max.	Units
3V3	Power supply voltage	-0.3	6.5 (DC)	V
		-0.3	7.0 (400ms)	V
T$_{STORAGE}$	Storage temperature	-40	+85	°C

Table 6: 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 6 must be limited to values within the specified boundaries by using appropriate protection devices.

4.2 Maximum ESD ratings

Applicability	Min.	Max.	Units
Human Body Model (HBM), according to ANSA/ESDA/JEDEC JS-001-2014.	-2000	+2000	V
Charged Device Model (CDM), according to JESD22-C101.	-500	+2000	V

Table 7: Maximum ESD ratings

4.3 Operating conditions

Symbol	Parameter	Min.	Typ	Max.	Units
3V3	Power supply voltage	2.80	-	5.50	V
T$_A$	Ambient operating temperature	-40	-	+85	°C
Ripple Noise	Peak-to-peak voltage ripple on all supply lines.	-	-	30	mV

Table 8: Operating conditions

4.4 Digital pad ratings

Symbol	Parameter	VIO	Min.	Max.	Units
V$_{IH}$	Input high voltage	1.8 V - 3.3 V	0.7*VIO	VIO+0.4	V
V$_{IL}$	Input low voltage	1.8 V - 3.3 V	-0.4	0.3*VIO	V
V$_{HYS}$	Input hysteresis	1.8 V - 3.3 V	100	-	mV
V$_{OH}$	Output high voltage	1.8 V - 3.3V	VIO-0.4	-	V
V$_{OH}$	Output low voltage	1.8 V - 3.3 V	-	0.4	V

Table 9: DC characteristics VIO

4.5 Power consumption

Peak current condition	Temperature	Supply current	Units
Active transmission at max. rated output power (WiFi)	Room temperature	0.400	A
Active transmission at max. rated output power (Bluetooth)	Room temperature	0.120	A
Firmware initialization	Room temperature	0.145	A

Table 19: Peak current consumption

4.6 Radio specification

4.6.1 Bluetooth

Parameter	Specification
RF Frequency Range	2.402 – 2.480 GHz
Supported Modes	Bluetooth 5.2 Bluetooth Low Energy (LE) • LE long range • Shared RF with BR/EDR • 2 Mbps LE
Modulation	1 Mbit/s: GFSK (BR) 2 Mbit/s: π/4 DQPSK (EDR) 3 Mbit/s: 8DQPSK (EDR)
Transmit Power	Class 1 BR: +10 dBm ± 1 dB
	Class 1 EDR: +10 dBm ± 1 dB
	Bluetooth LE: +8 dBm ± 1 dB
Receiver sensitivity (typical values)	Bluetooth BR: -94 dBm ± 1.5 dB
	Bluetooth EDR: -88 dBm ± 1.5 dB
	Bluetooth LE: -95 dBm ± 1.5 dB Bluetooth LE Coded PHY: -100 dBm ± 1.5 dB

Table 10: Bluetooth radio parameters

4.6.2 Wi-Fi

M2-MAYA-W1 modules support dual-band Wi-Fi with 802.11a/b/g/n operation in the 2.4 GHz and 5 GHz radio bands. The module is designed to operate in only one frequency band at a time.

Parameter	Operating mode	Specification
RF Frequency range	802.11b/g/n	2.400 – 2.500 GHz
	802.11a/n	5.150 – 5.850 GHz
Modulation	802.11b	CCK and DSSS
	802.11a/g/n	OFDM
Supported data rates	802.11b	1, 2, 5.5, 11 Mbps
	802.11a/g	6, 9, 12, 18, 24, 36, 48, 54 Mbps
	802.11n SISO	MCS0 – MCS7 (150 Mbps)
Supported channel bandwidth	802.11n	20, 40 MHz
Supported guard interval (GI)	802.11n	400, 800 ns

Table 11: Wi-Fi radio parameters

Band	Operating mode	Data rate	Bandwidth	Specification
2.4 GHz	802.11b	1 Mbps / 2 Mbps	20 MHz	-98 dBm / -94 dBm
		5.5 Mbps / 11 Mbps		-94 dBm / -90 dBm
	802.11g	6 Mbps / 9 Mbps	20 MHz	-91 dBm / -91 dBm
		12 Mbps / 18 Mbps		-91 dBm / -89 dBm
		24 Mbps / 36 Mbps		-86 dBm / -82 dBm
		48 Mbps / 54 Mbps		-78 dBm / -77 dBm
	802.11n	MCS0 / MCS1	20 MHz	-91 dBm / -90 dBm
		MCS2 / MCS3		-87 dBm / -84 dBm
		MCS4 / MCS5		-81 dBm / -76 dBm
		MCS6 / MCS7		-75 dBm / -73 dBm
		MCS0 / MCS1	40 MHz	-87 dBm / -87 dBm
		MCS2 / MCS3		-84 dBm / -82 dBm
		MCS4 / MCS5		-77 dBm / -74 dBm
		MCS6 / MCS7		-72 dBm / -71 dBm
5 GHz	802.11a	6Mbps/9Mbps	20 MHz	-90 dBm / -90 dBm
		12 Mbps/18 Mbps		-89 dBm / -87 dBm
		24 Mbps/36 Mbps		-84 dBm / -80 dBm
		48 Mbps/54 Mbps		-76 dBm / -75 dBm
	802.11n	MCS0 / MCS1	20 MHz	-90 dBm / -87 dBm
		MCS2 / MCS3		-85 dBm / -82 dBm
		MCS4 / MCS5		-79 dBm / -75 dBm
		MCS6 / MCS7		-72 dBm / -70 dBm
		MCS0 / MCS1	40 MHz	-86 dBm / -85 dBm
		MCS2 / MCS3		-82 dBm / -79 dBm
		MCS4 / MCS5		-76 dBm / -72 dBm
		MCS6 / MCS7		-70 dBm / -69 dBm

Table 122: Wi-Fi receiver characteristics

☞ Please refer to Appendix A for the Tx output power limits

5   Antenna connectors

The M2-MAYA-W161 card features two U.FL connectors: one for each of the two antenna pins.

- Connector J1 is connected to MAYA-W161 pin K1 (**ANT1**) for Wi-Fi operation.
- Connector J2 is connected to MAYA-W161 pin K9 (**ANT2**) for Bluetooth.

The location of the U.FL connectors on the M.2 card is shown in Figure 6.

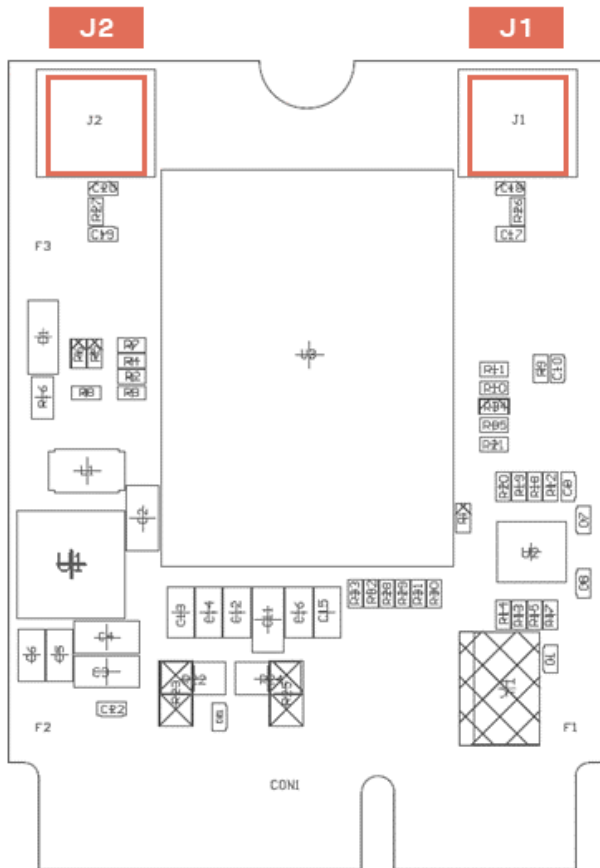**Figure 6: Location of M2-MAYA-W161 antenna U.FL connectors**

☞   Given the small size and low profile of the U.FL connector, be sure to follow the manufacturer's instructions to avoid any damage when mating and un-mating the connector. See also the U.FL series guideline [7] and U.FL series data sheet [8].

6   Voltages

The M2-MAYA-W1 card requires a 3.3 V power supply. The card takes the 3.3 V supply from the **3V3** pins on the M.2 connector, while the 1.8 V supply is generated by the on-card DC-DC converter.

The default setting for **VIO** is 1.8 V but this can be changed to 3.3 V by moving the 0 Ω resistor in position R22 to R23 (default = DNI), as shown in Figure 7 (a). Note that R22 and R23 share a common pad. Only one of the two resistors R22 and should be present at any time.

The default setting for **VIO_SD** is 1.8 V but this can be changed to 3.3 V by moving the 0 Ω resistor in position R24 to R25 (default = DNI), as shown in Figure 7 (b). Note that R24 and R25 share a common pad. Only one of the two resistors R24 and R25 should be present at any time.
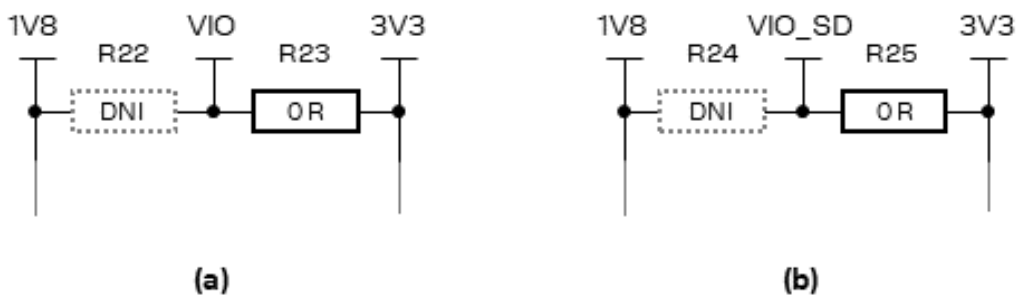

Figure 7: Placement of 0 Ω resistor to change (a) VIO from 1V8 V to 3V3, (b) VIO_SD from 1V8 V to 3V3

Figure 8 shows the resistor positions used for changing the voltage supply levels for **VIO** and **VIO_SD.**
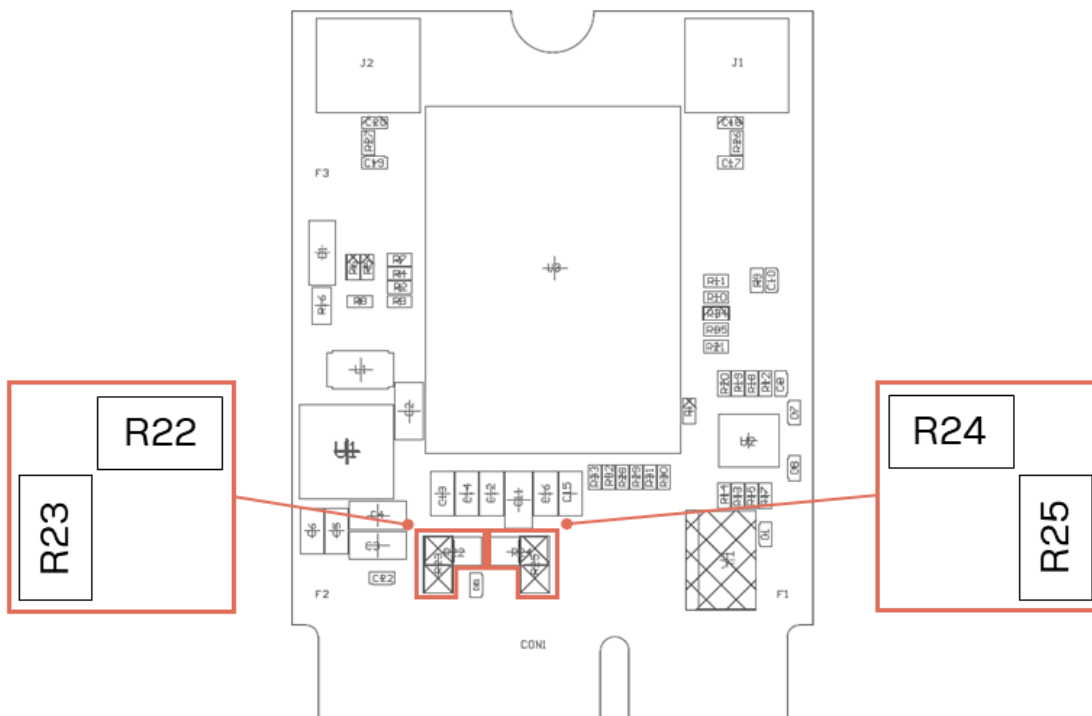

Figure 8: R22 and R23 positions for selecting VIO, and R24 and R25 positions for selecting VIO_SD

Figure 9 shows the on-card level-shifter that translates the M.2 signals, **UART_WAKE#** and **W_DISABLE1#,** from 3.3 V to VIO.
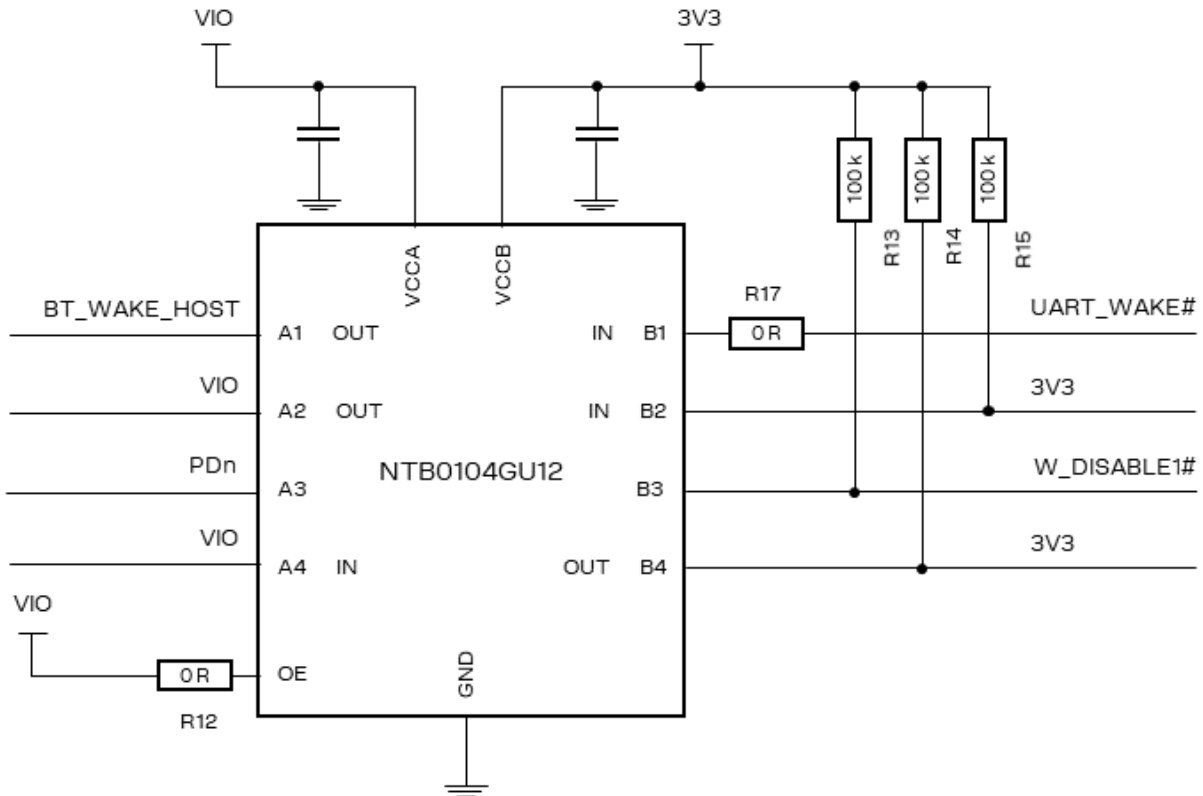

Figure 9: VIO-to-3.3 V level shifter showing

Figure 10 shows the position of the level-shifter (U5) on the card.
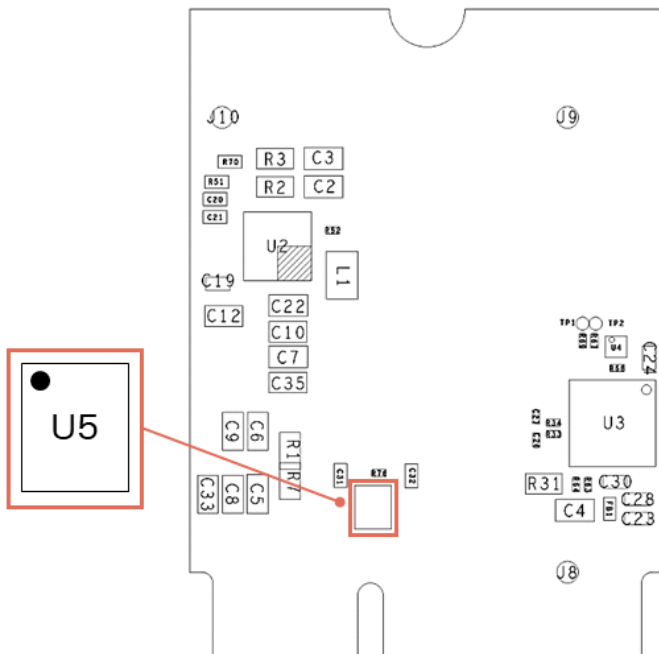

Figure 10: Position of VIO-to-3.3 V level shifter on M2-MAYA-W1

7 Test points

On-card test points TP1, TP2, TP3 and TP4 allow NXP sideband signals to be probed, as shown in Table 13. For information that describes how these signals are used in NXP platforms, see the Pin description. See also the NXP M.2 Key E Pinout Definition [6].

Test point #	M.2 pin#	NXP usage
TP1	44	JTAG_TDI
TP2	38	JTAG_TDO
TP3	48	JTAG_TMS
TP4	46	JTAG_TCK

Table 13: M.2 pin number and functionality of the M2-MAYA-W2 cards test points

8   Mechanical specification

8.1   Physical dimensions

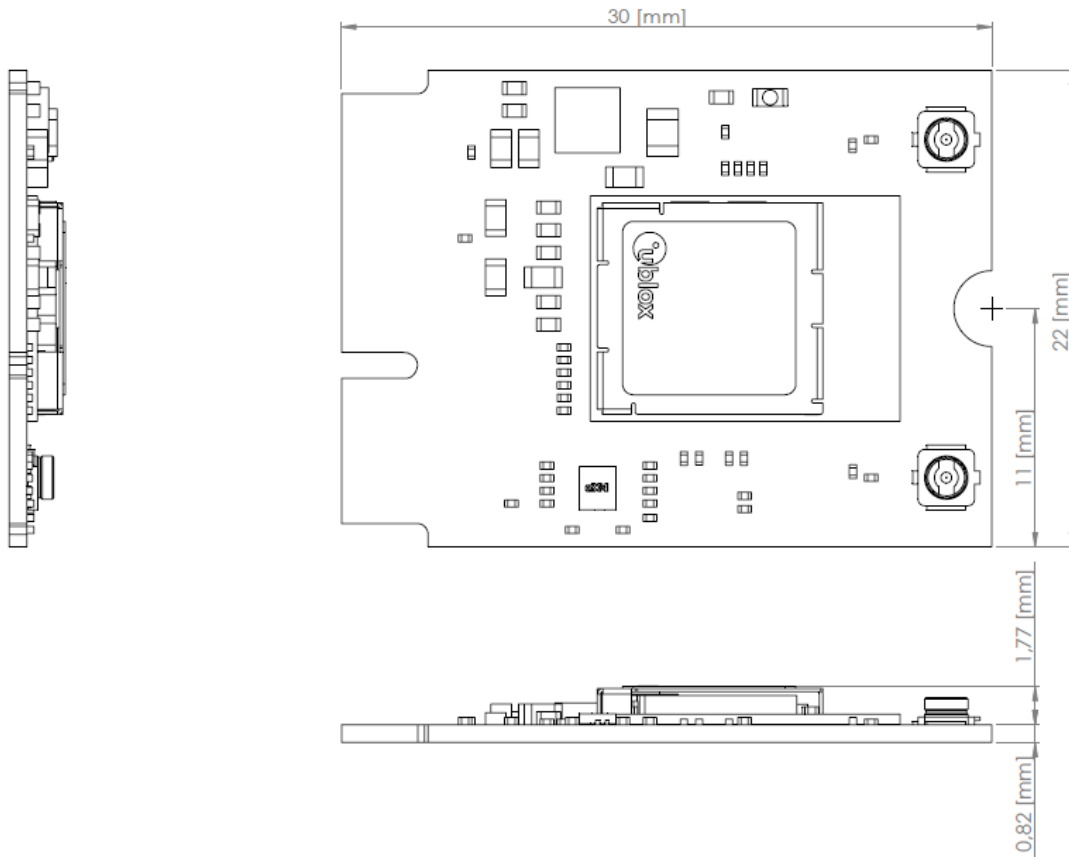Figure 11 shows the critical physical dimensions of the card.

Figure 11: Physical dimensions of the M2-MAYA-W1 card

9   Software

M2-MAYA-W1 cards are based on the NXP IW416 chipset and the drivers and firmware required to operate MAYA-W1 series modules are also developed by NXP. A firmware binary is downloaded by the host operating system driver at start-up.

The following software options are available for the card:

- Open-source Linux/Android driver (`mxm_mwifiex`) for mainstream use is available free of charge and already integrated into the Linux BSP for NXP i.MX application processors
- MCUXpresso Wi-Fi/Bluetooth support for supported NXP MCUs

The software packages typically include:

- Dedicated kernel driver that binds the Wi-Fi device to the kernel. Driver sources are provided.
- Dedicated Wi-Fi/Bluetooth firmware image that is uploaded during initialization of the device.
- Laboratory and manufacturing tools.

10 Regulatory compliance

10.1 General requirements

M2-MAYA-W1 card is designed to comply with the regulatory demands of Federal Communications Commission (FCC), , UK Conformity Assessed (UKCA), and European standards for CE marking.[1]

This section contains instructions on the process needed for an integrator when including the M2-MAYA-W1 card into an end-product.

- Any deviation from the process described may cause the M2-M2-MAYA-W1 not to comply with the regulatory authorizations of the module and thus void the user's authority to operate the equipment.
- Any changes to hardware, hosts or co-location configuration may require new radiated emission and SAR evaluation and/or testing.
- The regulatory compliance of M2-MAYA-W1 card does not exempt the end-product from being evaluated against applicable regulatory demands; for example, FCC Part 15B criteria for unintentional radiators **Error! Reference source not found.**.
- The end-product manufacturer must follow all the engineering and operating guidelines as specified by the grantee (u-blox).
- Only authorized antenna(s) may be used. Refer to section 10.3 for the list of authorized antennas. In the end-product, the M2-MAYA-W1 module must be installed in such a way that only authorized antennas can be used.
- The end-product must use the specified antenna trace reference design, as described in the Antenna integration application note **Error! Reference source not found.**.
- Any notification to the end user about how to install or remove the integrated radio module is NOT allowed.

⚠ If these conditions cannot be met or any of the operating instructions are violated, the u-blox regulatory authorization will be considered invalid. Under these circumstances, the integrator is responsible to re-evaluate the end-product including the M2-1 card and obtain their own regulatory authorization, or u-blox may be able to support updates of the u-blox regulatory authorization. See also Antenna requirements.

10.2 FCC/ISED End-product regulatory compliance

u-blox represents that the modular transmitter fulfills the FCC/ISED regulations when operating in authorized modes on any host product given that the integrator follows the instructions as described in this document. Accordingly, the host product manufacturer acknowledges that all host products referring to the FCC ID or ISED certification number of the modular transmitter and placed on the market by the host product manufacturer need to fulfil all of the requirements mentioned below. Non-compliance with these requirements may result in revocation of the FCC approval and removal of the host products from the market. These requirements correspond to questions featured in the FCC guidance for software security requirements for U-NII devices, FCC OET KDB 594280 D02 **Error! Reference source not found.**.

⚠ The approval of the M2-MAYA-W1 product, or any other radio module, does not exempt the end product from being evaluated against applicable regulatory demands.

---

[1] All approvals pending

The evaluation of the end product shall be performed with the M2-MAYA-W1 card installed and operating in a way that reflects the intended end product use case. The upper frequency measurement range of the end product evaluation is the 10th harmonic of 5.8 GHz as described in KDB 996369 D04.

The following requirements apply to all products that integrate a radio module:

- Subpart B - UNINTENTIONAL RADIATORS
  To verify that the composite device of host and module comply with the requirements of FCC part 15B, the integrator shall perform sufficient measurements using ANSI 63.4-2014.
- Subpart C - INTENTIONAL RADIATORS
  It is required that the integrator carries out sufficient verification measurements using ANSI 63.10-2013 to validate that the fundamental and out of band emissions of the transmitter part of the composite device complies with the requirements of FCC part 15C.

When the items listed above are fulfilled, the end product manufacturer can use the authorization procedures as mentioned in Table 1 of 47 CFR Part 15.101, before marketing the end product. This means the customer has to either market the end product under a Suppliers Declaration of Conformity (SDoC) or to certify the product using an accredited test lab.

The description is a subset of the information found in applicable publications of FCC Office of Engineering and Technology (OET) Knowledge Database (KDB). We recommend the integrator to read the complete document of the referenced OET KDB's.

- KDB 178919 D01 Permissive Change Policy
- KDB 447498 D01 General RF Exposure Guidance
- KDB 594280 D01 Configuration Control
- KDB 594280 D02 U-NII Device Security
- KDB 784748 D01 Labelling Part 15 18 Guidelines
- KDB 996369 D01 Module certification Guide
- KDB 996369 D02 Module Q&A
- KDB 996369 D04 Module Integration Guide

10.2.1 Referring to the u-blox FCC/ISED certification ID

If the General requirements, FCC/ISED End-product regulatory compliance regulations, and all Antenna requirements are met, the u-blox modular FCC/ISED regulatory authorization is valid and the end-product may refer to the u-blox FCC ID and ISED certification number. u-blox may be able to support updates to the u-blox regulatory authorization; for example, adding new antennas to the u-blox authorization.

⚠ To use the u-blox FCC / ISED grant and refer to the u-blox FCC ID / ISED certification ID, the integrator must confirm with u-blox that all requirements associated with the Configuration control and software security of end-products are fulfilled.

10.2.2 Obtaining own FCC/ISED certification ID

Integrators who do not want to refer to the u-blox FCC/ISED certification ID, or who do not fulfil all requirements to do so may instead obtain their own certification. With their own certification, the integrator has full control of the grant to make changes.

Integrators who want to base their own certification on the u-blox certification can do so via a process called "Change in ID" (FCC) / "Multiple listing" (ISED). With this, the integrator becomes the grantee of a copy of the u-blox FCC/ISED certification. u-blox will support with an approval letter that shall be filed as a Cover Letter exhibit with the application.

☞ For modules where the FCC ID / ISED certification ID is printed on the label, the integrator must replace the module's label with a new label containing the new FCC/ISED ID. For more information about the labeling requirements, see in section 10.2.6.

⚠ It is the responsibility of the integrator to comply with any upcoming regulatory requirements.

10.2.3 Antenna requirements

In addition to the general requirement to use only authorized antennas, the u-blox grant also requires a separation distance of at least 20 cm from the antenna(s) to all persons. The antenna(s) must not be co-located with any other antenna or transmitter (simultaneous transmission) as well. If this cannot be met, a Permissive Change as described below must be made to the grant.

☞ In order to support verification activities that may be required by certification laboratories, customers applying for Class-II Permissive changes must implement the setup described in the Radio test guide application note **Error! Reference source not found.**.

10.2.3.1 Separation distance

If the required separation distance of 20 cm cannot be fulfilled, a SAR evaluation must be performed. This consists of additional calculations and/or measurements. The result must be added to the grant file as a Class II Permissive Change.

10.2.3.2 Co-location (simultaneous transmission)

If the module is to be co-located with another transmitter, additional measurements for simultaneous transmission are required. The results must be added to the grant file as a Class II Permissive Change.

10.2.3.3 Adding a new antenna for authorization

If the authorized antennas and/or antenna trace design cannot be used, the new antenna and/or antenna trace designs must be added to the grant file. This is done by a Class I Permissive Change or a Class II Permissive Change, depending on the specific antenna and antenna trace design.

- Antennas of the same type and with less or same gain as an already approved antenna can be added under a Class I Permissive Change.
- Antenna trace designs deviating from the u-blox reference design and new antenna types are added under a Class II Permissive Change.
- For 5 GHz modules, the combined minimum gain of antenna trace and antenna must be greater than 0 dBi to comply with DFS testing requirements.

⚠ Integrators with the intention to refer to the u-blox FCC ID / ISED certification ID must Contact their local support team to discuss the Permissive Change Process. Class II Permissive Changes will be subject to NRE costs.

10.2.4 Configuration control and software security of end-products

☞ "Modular transmitter" hereafter refers to M2-MAYA-W161 (FCC ID XPYMAYAW161)[2].

As the end-product must comply with the requirements addressed by the OET KDB 594280 **Error! Reference source not found.**, the host product integrating the M2-MAYA-W1 card must comply with the following requirements:

- Upon request from u-blox, the host product manufacturer will provide all of the necessary information and documentation to demonstrate how the requirements listed below are met.
- The host product manufacturer will not modify the modular transmitter hardware.
- The configuration of the modular transmitter when installed into the host product must be within the authorization of the modular transmitter at all times and cannot be changed to include unauthorized modes of operation through accessible interfaces of the host product. The Wi-Fi Tx output power limits must be followed. In particular, the modular transmitter installed in the host product will not have the capability to operate on the operating channels/frequencies referred to in the section(s) below, namely one or several of the following channels: 12 (2467 MHz), 13 (2472 MHz), 120 (5600 MHz), 124 (5620 MHz), and 128 (5640 MHz). The channels 12 (2467 MHz), 13 (2472 MHz), 120 (5600 MHz), 124 (5620 MHz), and 128 (5640 MHz) are allowed to be used only for modules that are certified for the usage ("modular transmitter"). Customers must verify that the module in use is certified as supporting DFS client/master functionality.
- The host product uses only authorized firmware images provided by u-blox and/or by the manufacturer of the RF chipset used inside the modular transmitter.
- The configuration of the modular transmitter must always follow the requirements specified in Operating frequencies and cannot be changed to include unauthorized modes of operation through accessible interfaces of the host product.
- The modular transmitter must when installed into the host product have a regional setting that is compliant with authorized US modes and the host product is protected from being modified by third parties to configure unauthorized modes of operation for the modular transmitter, including the country code.
- The host product into which the modular transmitter is installed does not provide any interface for the installer to enter configuration parameters into the end product that exceeds those authorized.
- The host product into which the modular transmitter is installed does not provide any interface to third parties to upload any unauthorized firmware images into the modular transmitter and prevents third parties from making unauthorized changes to all or parts of the modular transmitter device driver software and configuration.

☞ The OET KDB 594280 D01 **Error! Reference source not found.** lists the topics that must be addressed to ensure that the end-product specific host meets the Configuration Control requirements.

☞ The OET KDB 594280 D02 **Error! Reference source not found.** lists the topics that must be addressed to ensure that the end-product specific host meets the Software Security Requirements for U-NII Devices.

---

[2] Approvals are pending

10.2.5 Operating frequencies

M2-MAYA-W1 802.11b/g/n operation outside the 2412–2462 MHz band is prohibited in the US and Canada and 802.11a/n operation in the 5600–5650 MHz band is prohibited in Canada. Configuration of the module to operate on channels 12–13 and 120–128 must be prevented accordingly. The channels allowed are described in Table8.

Channel number	Channel center frequency [MHz]	Allowed channels	Remarks
1 – 11	2412 – 2462	Yes	
12 – 13	2467 – 2472	No	
36 – 48	5180 – 5240	Yes	Canada (ISED): Devices are restricted to indoor operation only and the end product must be labelled accordingly.
52 – 64	5260 – 5320	Yes[3]	
100 – 116	5500 – 5580	Yes[3]	
120 – 128	5600 – 5640	No	USA (FCC): Client device operation allowed under KDB 905462
132 – 144	5660 – 5720	Yes[3]	
149 – 165	5745 – 5825	Yes	

Table 8: Allowed channel usage under FCC/ISED regulation

☞ 15.407 (j) Operator Filing Requirement:
Before deploying an aggregate total of more than one thousand outdoor access points within the 5.15–5.25 GHz band, parties must submit a letter to the Commission acknowledging that, should harmful interference to licensed services in this band occur, they will be required to take corrective action. Corrective actions may include reducing power, turning off devices, changing frequency bands, and/or further reducing power radiated in the vertical direction. This material shall be submitted to Laboratory Division, Office of Engineering and Technology, Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046. Attn: U-NII Coordination, or via Web site at https://www.fcc.gov/labhelp with the subject line: "U-NII-1 Filing".

10.2.6 End product labeling requirements

For an end-product using the M2-MAYA-W1, there must be a label containing, at least, the following information:

```
This device contains
FCC ID: (XYZ)(UPN)
IC: (CN)-(UPN)
```

(XYZ) represents the FCC "Grantee Code", this code may consist of Arabic numerals, capital letters, or other characters, the format for this code will be specified by the Commission's Office of Engineering and Technology[4]. (CN) is the Company Number registered at ISED. (UPN) is the Unique Product Number decided by the grant owner.

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 labeling requirements of OET KDB 784748. The host user manual must also contain clear instructions on how end users can find and/or access the FCC ID of the end product.

---

[3] DFS certification is pending.
[4] 47 CFR 2.926

The label on the M2-MAYA-W1 card containing the original FCC ID acquired by u-blox can be replaced with a new label stating the end-product's FCC/ISED ID in compliance with the modular labeling requirements of OET KDB 784748.

FCC end product labeling

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: This device may not cause harmful interference, and This device must accept any interference received, including interference that may cause undesired operation.

ISED end product labeling

The end product shall bear the following statement in both English and French in a conspicuous location on the device:

Operation is subject to the following two conditions: This device may not cause interference, and This device must accept any interference, including interference that may cause undesired operation of the device.

Son utilisation est soumise aux deux conditions suivantes: Cet appareil ne doit pas causer d'interférences et il doit accepter toutes interférences reçues, y compris celles susceptibles d'avoir des effets indésirables sur son fonctionnement.

Labels of end products capable to operate within the band 5150–5250 MHz shall also include:

For indoor use only

Pour usage intérieur seulement

When the device is so small or for such use that it is not practicable to place the statements 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. However, the FCC/ISED ID label must be displayed on the device as described above.

In case, where the final product will be installed in locations where the end-consumer is unable to see the FCC/ISED ID and/or this statement, the FCC/ISED ID and the statement shall also be included in the end-product manual.

10.3 Pre-approved antennas

This section lists the different external antennas that are pre-approved for use with the M2-MAYA-W1 card.

10.3.1 Wi-Fi / Bluetooth dual band antennas

For Wi-Fi operation in the 2.4 GHz and 5 GHz bands M2-MAYA-W1 has been tested and approved for use with the dual-band antennas shown in **Error! Reference source not found.**9.

Manufacturer	Part Number	Antenna type	Peak gain [dBi]	
			2.4 GHz band	5 GHz band
Linx	ANT-DB1-RAF-RPS	Dual-band dipole antenna	2.5	4.6

Table 9: List of approved dual-band antennas

10.3.2 Bluetooth antenna

For Bluetooth operation in the 2.4 GHz bands M2-MAYA-W1 has been tested and approved for use with the dual-band antennas shown in **Error! Reference source not found.**10.

Manufacturer	Part Number	Antenna type	Peak gain [dBi] 2.4 GHz band
Linx	ANT-2.4-CW-RCT-RP	Single-band dipole antenna	2.2

Table 10: List of approved single-band antennas

⚠ Important: For compliance with FCC §15.407(a), the EIRP is not allowed to exceed 125 mW (21 dBm) at any elevation angle above 30° (measured from the horizon) when operated as an outdoor access point in U-NII-1 band, 5.150-5.250 GHz.

10.4 Configuration of Wi-Fi transmit power limits

MAYA-W1 modules contain calibration data for the output power limits in OTP. This calibration data enables the module to achieve maximum transmit power levels that still pass the required EVM and spectral mask limits. The maximum transmit-power levels that can be used in an end-product also depend on:

- Regulatory domain limits
- Restricted band of usage
- Gain of the antenna and antenna trace design

A configuration file on the host system and the utility `mlanutl` is used to reduce the transmit power levels as required.

☞ Transmit power limit configuration files are provided by u-blox for the certified regulatory domains which addresses the reference designs and the approved antennas.

⚠ The correct transmit power limits must be applied to the module after startup of the host system or change of the regulatory domain during runtime.

10.4.1 Wi-Fi power table

The Wi-Fi power table defines the transmit power levels for the Wi-Fi radio. The power levels are based on regulatory compliance, IEEE 802.11 requirements, and product design constraints. The TX power table can be adjusted to achieve the highest transmit power level for each Wi-Fi channel, bandwidth, and modulation within the constraints defined by the certification.

The Wi-Fi power table is defined in a transmit power configuration file, `txpwrlimit_cfg_XX.conf`, where "XX" stands for the alpha2 country code. It allows developers to fine tune specific transmit power levels for the Wi-Fi radio, including:

- Band (2G and 5G)
- Channel
- Modulation rate (CCK and OFDM)
- Bandwidth (20, 40, and 80 MHz)

☞ Transmit power configuration files for each completed certification are included in the Yocto meta-layer. Transmit power config files are named as per the name of the certification region, for example `txpwrlimit_cfg_ETSI.conf`. The configuration files are used by the recipe in the meta-

layer to derive binary files, which can be automatically loaded by the driver, for each country in the certification region, such as, Germany (DE), France (FR), and so on.

For the exact power limits used for the various certifications, see the Appendix: Wi-Fi Tx output power limits. The MAYA-W1 system integration manual [2] contains details about configuring Wi-Fi Tx output power limits along with examples.

11 Product handling

11.1 Packaging

Packaged and shipped in trays containing multiple M.2 cards.

11.2 Shipment, storage, and handling

☞ For more information regarding shipment, storage and handling see the u-blox package information guide. [3]

11.2.1 ESD handling precautions

⚠ M2-MAYA-W1 cards are Electrostatic Sensitive Devices (ESD) that demand the observance of special handling precautions against electrostatic damage. Failure to observe the precautions can result in severe damage to the card.

M2-MAYA-W1 cards are manufactured through a highly automated process, which complies with IEC61340-5-1 (STM5.2-1999 Class M1 devices) standard. In compliance with the following European regulations, proper measures must be taken to protect M2-MAYA-W1 from ESD events on any pin that might be exposed to the end user:

- ESD testing standard CENELEC EN 61000-4-2
- Radio equipment standard ETSI EN 301 489-1

The minimum requirements that must be met to satisfy European regulations are described in Table 14.

Application	Category	Immunity level
All exposed surfaces of the radio equipment and ancillary equipment in a representative configuration of the end product.	Contact discharge	4 kV
	Air discharge	8 kV

Table 141: ESD immunity ratings based on EN 61000-4-2

Compliance with standard protection level specified in EN 61000-4-2 is achieved by including proper ESD protection in the production line and close to all areas that are accessible to the end user.

12 Labeling and ordering

The labels applied to M2-MAYA-W1 cards include important product information. Table 15 describes each of the features on the product label for each product variant.

Reference	Description
1	Text in bold font: "Model:" type number with the product version
2	DataMatrix (product identifier, serial number, datacode) • Product identifier: 3 digits defined by EMS • Serial number Datacode: 4 digits
3	Company logo and trademark
4	Placeholder for CE marking (when certified)
5	Panel position number
6	Production date YY/WW (year/week)

Table 152. M2-MAYA-W1 card label description

12.1 M2-MAYA-W161 cards

Figure 12 shows the label applied to M2-MAYA-W161 cards. Each of the given label references are described in Table 15.
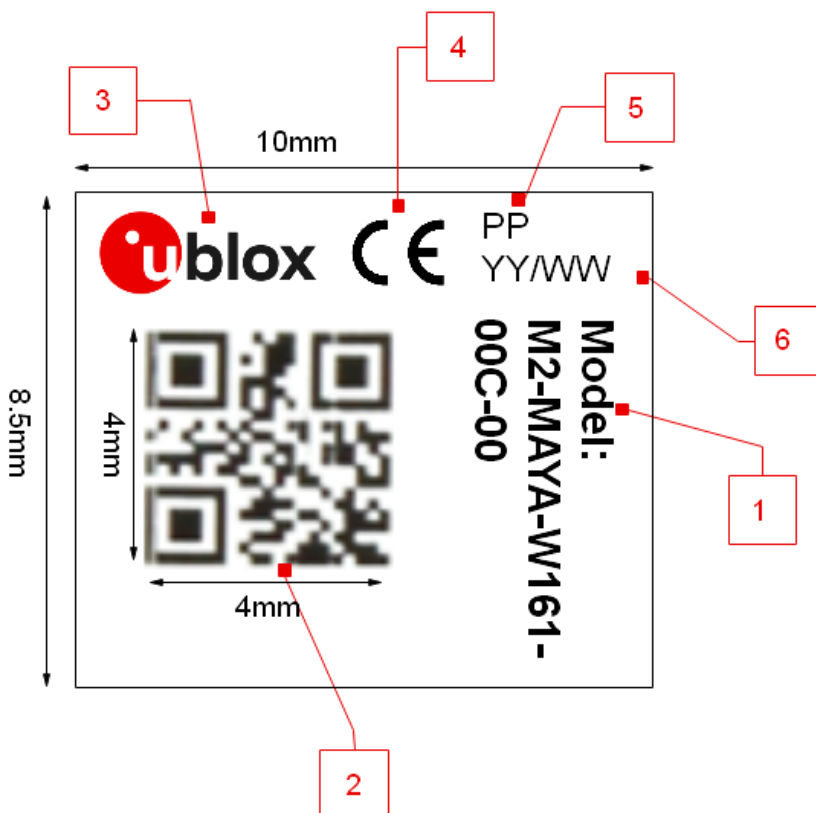

Figure 12: Product label format with dimensions for M2-MAYA-W161

12.2 M2-MAYA-W166 cards

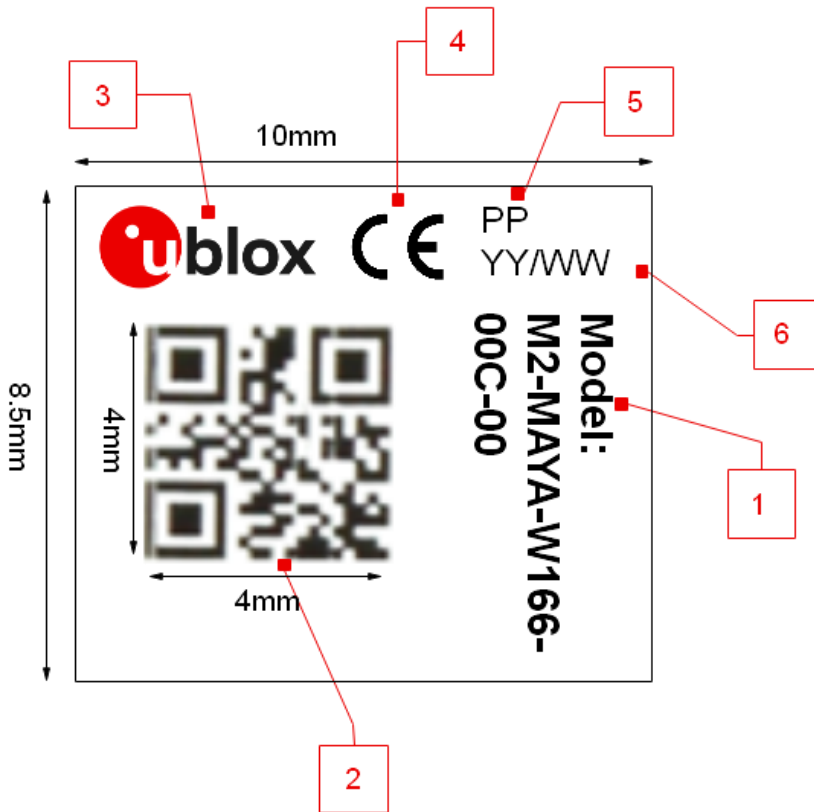Figure 13 shows the label applied to M2-MAYA-W166 cards. Each of the given label references are described in Table 15.

Figure 13: Product label format with dimensions for M2-MAYA-W166

12.3 Ordering codes

Ordering Code	Product name	Product
M2-MAYA-W161-00C	M2-MAYA-W161	M.2 key E card (2230) with two antenna U.FL connectors (one for 2.4 GHz and 5 GHz 802.11a/b/g/n and another for Bluetooth/Bluetooth Low Energy (LE) 5.2). Operational temperature -40 ^{0}C to +85 ^{0}C, standard grade module with NXP chipset IW416. Packaged in tray containing multiple M.2 cards.
M2-MAYA-W166-10C	M2-MAYA-W166	M.2 key E card (2230) with embedded PCB antenna (for 2.4 GHz and 5 GHz 802.11a/b/g/n, and for Bluetooth/Bluetooth Low Energy (LE) 5.2). Operational temperature -40 ^{0}C to +85 ^{0}C, standard grade module with NXP chipset IW416. Packaged in carton box containing a single M.2 card.

Table 163: Product ordering codes

☞ Product changes affecting form, fit or function are documented by u-blox. Visit our website for a list of Product Change Notifications (PCNs).

Appendix A: Wi-Fi Tx output power limits

A.1. FCC/ISED regulatory domain

A.1.1. Bluetooth Output power

Channel	Channel bandwidth	Data rates	Maximum power setting
0 - 78	1 MHz	BR/EDR	7 dBm
0 - 39	2 MHz	BLE	8 dBm

A.1.2. Wi-Fi Output power for 2.4 GHz band

Channel	Modulation	Channel bandwidth	Data rates	Maximum power setting
1 - 2	CCK and DSSS	20 MHz	1, 2, 5.5, 11 Mbps	14 dBm
3	CCK and DSSS	20 MHz	1, 2, 5.5, 11 Mbps	15 dBm
4	CCK and DSSS	20 MHz	1, 2, 5.5, 11 Mbps	16 dBm
5	CCK and DSSS	20 MHz	1, 2, 5.5, 11 Mbps	17 dBm
6 - 11	CCK and DSSS	20 MHz	1, 2, 5.5, 11 Mbps	18 dBm
1	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	16 dBm
2 – 9	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	18 dBm
10	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	17 dBm
11	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	16 dBm
1	OFDM	20 MHz	HT20 MCS0-MCS7	15 dBm
2 - 10	OFDM	20 MHz	HT20 MCS0-MCS7	16 dBm
11	OFDM	20 MHz	HT20 MCS0-MCS7	15 dBm
3, 4	OFDM	40 MHz	HT40 MCS0-MCS7	14 dBm
5	OFDM	40 MHz	HT40 MCS0-MCS7	15 dBm
6	OFDM	40 MHz	HT40 MCS0-MCS7	16 dBm
7 - 9	OFDM	40 MHz	HT40 MCS0-MCS7	15 dBm

Table 174: FCC Wi-Fi power table for operation in the 2.4 GHz band

A.1.3. Wi-Fi output power for 5 GHz band

Channel	Modulation	Channel bandwidth	Data rates	Maximum power setting
36 - 60	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	17 dBm
64	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	16 dBm
36 - 60	OFDM	20 MHz	HT20 MCS0-MCS7	16 dBm
64	OFDM	20 MHz	HT20 MCS0-MCS7	15 dBm
38	OFDM	40 MHz	HT40 MCS0-MCS7	14 dBm
46, 54	OFDM	40 MHz	HT40 MCS0-MCS7	16 dBm
62	OFDM	40 MHz	HT40 MCS0-MCS7	14 dBm

Table 185: FCC Wi-Fi power table for operation in the 5 GHz U-NII-1 and U-NII-2A bands

Channel	Modulation	Channel bandwidth	Data rates	Maximum power setting
100	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	16 dBm
104 - 132	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	18 dBm
136	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	16 dBm
140	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	14 dBm
100	OFDM	20 MHz	HT20 MCS0-MCS7	15 dBm
104 - 136	OFDM	20 MHz	HT20 MCS0-MCS7	16 dBm
140	OFDM	20 MHz	HT20 MCS0-MCS7	14 dBm
102	OFDM	40 MHz	HT40 MCS0-MCS7	13 dBm
110	OFDM	40 MHz	HT40 MCS0-MCS7	16 dBm
134	OFDM	40 MHz	HT40 MCS0-MCS7	13 dBm

Table 196: FCC Wi-Fi power table for operation in the 5 GHz U-NII-2e band

Channel	Modulation	Channel bandwidth	Data rates	Maximum power setting
149 - 153	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	16 dBm
157	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	17 dBm
161 - 165	OFDM	20 MHz	6, 9, 12, 18, 24, 36, 48, 54 Mbps	18 dBm
149 - 165	OFDM	20 MHz	HT20 MCS0-MCS7	16 dBm
151 - 159	OFDM	40 MHz	HT40 MCS0-MCS7	16 dBm

Table 17: FCC Wi-Fi power table for operation in the 5 GHz U-NII-3 band

Appendix B: Glossary

Abbreviation	Definition
BLE	Bluetooth Low Energy
BR/EDR	Bluetooth Basic Rate / Enhanced Data Rate
BSP	Board Support Package
BT	Bluetooth
DNI	Do Not Insert
I2S	Inter-IC-Sound
IC	Integrated Circuit
PCM	Pulse Code Modulation
SDIO	Secure Digital Input Output
TBD	To be defined / determined
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus
VIO	Input /Output Voltage
U.FL	Low-profile SMT coaxial connector

Table 18: Explanation of the abbreviations and terms used

Related documentation

[1]   MAYA-W1 series data sheet, UBX-21006380
[2]   MAYA-W1 series system integration manual, UBX-21010495
[3]   Product packaging reference guide, UBX-14001652
[4]   NXP IW416 preliminary data sheet, Rev. 3, 16 February 16, 2021
[5]   PCI Express M.2 Specification Revision 4.0, Version 1.0, November 5, 2020
[6]   Wi-Fi/Bluetooth M.2 Key E Pinout Definition – NXP Application Note AN13049, Rev.1, November 12, 2020
[7]   Hirose Electric Co. LTD - U.FL Series Catalog, August 2021
[8]   Hirose Electric Co. LTD - U.FL Series Specification Sheet, June 19, 2020
[9]   u-blox Limited Use License Agreement (LULA-M)

☞   For product change notifications and regular updates of u-blox documentation, register on our website, www.u-blox.com.

Revision history

Revision	Date	Name	Comments
R01	28-Feb-2023	frca	Initial release

Contact

For further support and contact information, visit us at www.u-blox.com/support.