



# DI-W732

# User Manual

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## Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any terminal or mobile incorporating the module. Manufacturers of the terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals of the product.



Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.



Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.



Terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.



The terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.



In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

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# About the Document

## Revision History

| Version | Date      | Author                    | Description            |
|---------|-----------|---------------------------|------------------------|
| 1.0     | 2026-1-23 | Biot Chen,<br>Marden Chen | First official release |

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# 1 Intruction

This document defines the DI-W732 features, performances, and air interfaces and hardware interfaces connected to your applications. The document provides a quick insight into interface specifications, RF performance, electrical and mechanical details, as well as other related information of the module.

## NOTE

For conciseness purposes, DI-W732 will hereinafter be referred to collectively as “the module/modules” in parts hereof applicable to all the models, and individually as DI-W732 in parts hereof referring to the differences between them.

# 2 Product Overview

The DI-W732 module is a Wi-Fi 7 PCIe radio for Immersive Home-class applications.

The DI-W732 module is for IEEE 802.11a/b/g/n/ac/ax/be applications

The DI-W732 module performs AP and WDS-STA functionality.

The module complies with *PCI Express M.2 Specification Revision 3.0* and *PCI Express Base Specification Revision 3.0*.

## 2.1. Key Features

**Table 1: Key Features**

| Basic Information           |     |                                                 |     |      |
|-----------------------------|-----|-------------------------------------------------|-----|------|
| Protocols and Standard      |     | ●Wi-Fi protocols: IEEE 802.11a/b/g/n/ac/ax/be   |     |      |
| Functional Interface        |     | ● PCI Express M.2                               |     |      |
| Power Supplies              |     | MIN                                             | TYP | MAX  |
|                             | VCC | 3.0                                             | 3.3 | 3.6  |
|                             | VDD | 4.5                                             | 5.0 | 5.25 |
| Physical Characteristics    |     | ●Packaging type: M.2 Key-E                      |     |      |
|                             |     | ●Dimensions: 22.0 mm × 30.0 mm × 2.2 mm         |     |      |
|                             |     | ●Weight: approx. 2.55g                          |     |      |
| Temperature Ranges          |     | ●Normal operating temperature: -40 °C to +75 °C |     |      |
|                             |     | ●Storage temperature: -40 °C to +85 °C          |     |      |
| RF Antenna Interfaces       |     |                                                 |     |      |
| Wi-Fi Antenna Interfaces    |     | ●RF coaxial connector: ANT0, ANT1               |     |      |
|                             |     | ●50 Ω characteristic impedance                  |     |      |
| Application Interface       |     |                                                 |     |      |
| Wi-Fi Application Interface |     | ●PCIe 3.0                                       |     |      |

# 3 RF Performances

This chapter mainly describes RF characteristics of the module.

Appropriate antenna type and design should be used with matched antenna parameters according to specific application. It is required to perform a comprehensive functional test for the RF design before mass production of terminal products. The entire content of this chapter is provided for illustration only. Analysis, evaluation and determination are still necessary when designing target products.

## 3.1. Wi-Fi Performances

Table 2: Pin Description of Wi-Fi Antenna Interface

| Pin Name             | I/O                 | Description                             | Description        |
|----------------------|---------------------|-----------------------------------------|--------------------|
| <a href="#">ANT0</a> | <a href="#">AIO</a> | <a href="#">Wi-Fi antenna interface</a> | 2.4G+5G or 2.4G+6G |
| ANT1                 | AIO                 | Wi-Fi antenna interface                 | 2.4G+5G or 2.4G+6G |

Table 3: Wi-Fi Performances

|                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Frequency</b>                                                                                                                                         |
| <ul style="list-style-type: none"><li>● <b>2.4 GHz:</b> 2.400–2.4835 GHz</li><li>● <b>5 GHz:</b> 5.150–5.850 GHz</li><li>● <b>6 GHz:</b> 5.925–7.125 GHz</li></ul> |
| <b>Modulation</b>                                                                                                                                                  |
| DBPSK, DQPSK, CCK, BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM                                                                                              |
| <b>Operating Mode</b>                                                                                                                                              |
| <ul style="list-style-type: none"><li>● AP</li><li>● STA</li></ul>                                                                                                 |
| <b>Encryption Mode</b>                                                                                                                                             |
| AES-CCMP at 128/256 bits                                                                                                                                           |
| AES-GCMP at 128/256 bits                                                                                                                                           |
| WEP, TKIP hardware encryption                                                                                                                                      |
| WAPI 1.0 and WAPI 2.0 hardware encryption                                                                                                                          |
| WPA/PA2 personal/WPA2 enterprise and WPA3 personal                                                                                                                 |

### Transmission Data Rate

- 802.11b: 1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps
- 802.11a/g: 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps
- 802.11n: HT20 (MCS 0–MCS 7), HT40 (MCS 0–MCS 7)
- 802.11ac: VHT20 (MCS 0–MCS 8), VHT40 (MCS 0–MCS 9), VHT80 (MCS 0–MCS 9), VHT160 (MCS 0–MCS 9)
- 802.11ax: HE20 (MCS 0–MCS 11), HE40 (MCS 0–MCS 11), HE80 (MCS 0–MCS 11), HE160 (MCS 0–MCS 11)
- 802.11 be: EHT20 (MCS 0–MCS 13), EHT40 (MCS 0–MCS 13), EHT80 (MCS 0–MCS 13), EHT160 (MCS 0–MCS 13), EHT320 (MCS 0–MCS 13)

### Theoretical Data rate for each band

- 2.4GHz Wi-Fi 7 MIMO 2x2 / 40MHz 688 Mbps
- 5GHz Wi-Fi 7 MIMO 2x2 / 160MHz 2882 Mbps
- 6GHz Wi-Fi 7 MIMO 2x2 / 320MHz 5764 Mbps

### Supported Number of Clients

- 128

### Supported Number of OFDMA

- 8

| Condition (VCC = 3.3 V; Temp. 25 °C) |                         | EVM      | Typ.; Unit: dBm; Tolerance: ±2 dB |                      |
|--------------------------------------|-------------------------|----------|-----------------------------------|----------------------|
|                                      |                         |          | Transmitting Power                | Receiver Sensitivity |
| 2.4GHz                               | 802.11b @ 1 Mbps        | ≤ -9 dB  | 19                                | -98                  |
|                                      | 802.11b @ 11 Mbps       | ≤ -9 dB  | 19                                | -90                  |
|                                      | 802.11g @ 6 Mbps        | ≤ -5 dB  | 19                                | -94                  |
|                                      | 802.11g @ 54 Mbps       | ≤ -25 dB | 19                                | -78                  |
|                                      | 802.11n, HT20 @ MCS 0   | ≤ -5 dB  | 19                                | -92                  |
|                                      | 802.11n, HT20 @ MCS 7   | ≤ -27 dB | 18                                | -73                  |
|                                      | 802.11n, HT40 @ MCS 0   | ≤ -5 dB  | 19                                | -90                  |
|                                      | 802.11n, HT40 @ MCS 7   | ≤ -27 dB | 18                                | -71                  |
|                                      | 802.11ax, HE20 @ MCS 0  | ≤ -5 dB  | 19                                | -93                  |
|                                      | 802.11ax, HE20 @ MCS 11 | ≤ -35 dB | 18                                | -64                  |

|       |                          |               |    |     |
|-------|--------------------------|---------------|----|-----|
| 5 GHz | 802.11ax, HE40 @ MCS 0   | $\leq -5$ dB  | 18 | -90 |
|       | 802.11ax, HE40 @ MCS 11  | $\leq -35$ dB | 16 | -62 |
|       | 802.11be, EHT20 @ MCS 0  | $\leq -5$ dB  | 18 | -92 |
|       | 802.11be, EHT20 @ MCS 13 | $\leq -38$ dB | 17 | -62 |
|       | 802.11be, EHT40 @ MCS 0  | $\leq -5$ dB  | 17 | -90 |
|       | 802.11be, EHT40 @ MCS 13 | $\leq -38$ dB | 15 | -60 |
|       | 802.11a @ 6 Mbps         | $\leq -5$ dB  | 17 | -91 |
|       | 802.11a @ 54 Mbps        | $\leq -25$ dB | 16 | -73 |
|       | 802.11n, HT20 @ MCS 0    | $\leq -5$ dB  | 17 | -90 |
|       | 802.11n, HT20 @ MCS 7    | $\leq -27$ dB | 16 | -70 |
|       | 802.11n, HT40 @ MCS 0    | $\leq -5$ dB  | 17 | -88 |
|       | 802.11n, HT40 @ MCS 7    | $\leq -27$ dB | 15 | -67 |
|       | 802.11ac, VHT20 MCS 0    | $\leq -5$ dB  | 18 | -89 |
|       | 802.11ac, VHT20 MCS 8    | $\leq -30$ dB | 16 | -68 |
|       | 802.11ac, VHT40 @ MCS 0  | $\leq -5$ dB  | 18 | -86 |
|       | 802.11ac, VHT40 @ MCS 9  | $\leq -32$ dB | 16 | -64 |
|       | 802.11ac, VHT80 @ MCS 0  | $\leq -5$ dB  | 18 | -84 |
|       | 802.11ac, VHT80 @ MCS 9  | $\leq -32$ dB | 15 | -58 |
|       | 802.11ac, VHT160 @ MCS 0 | $\leq -5$ dB  | 18 | -82 |
|       | 802.11ac, VHT160 @ MCS 9 | $\leq -32$ dB | 15 | -56 |
|       | 802.11ax, HE20 @ MCS 0   | $\leq -5$ dB  | 17 | -91 |
|       | 802.11ax, HE20 @ MCS 11  | $\leq -35$ dB | 15 | -61 |
|       | 802.11ax, HE40 @ MCS 0   | $\leq -5$ dB  | 17 | -88 |
|       | 802.11ax, HE40 @ MCS 11  | $\leq -35$ dB | 15 | -58 |
|       | 802.11ax, HE80 @ MCS 0   | $\leq -5$ dB  | 17 | -86 |
|       | 802.11ax, HE80 @ MCS 11  | $\leq -35$ dB | 14 | -55 |
|       | 802.11ax, HE160 @ MCS 0  | $\leq -5$ dB  | 17 | -83 |
|       | 802.11ax, HE160 @ MCS 11 | $\leq -35$ dB | 13 | -51 |

|       |                           |               |     |       |
|-------|---------------------------|---------------|-----|-------|
| 6 GHz | 802.11be, EHT20 @ MCS 0   | $\leq -5$ dB  | 16  | -92   |
|       | 802.11be, EHT20 @ MCS 13  | $\leq -38$ dB | 14  | -58   |
|       | 802.11be, EHT40 @ MCS 0   | $\leq -5$ dB  | 16  | -89   |
|       | 802.11be, EHT40 @ MCS 13  | $\leq -38$ dB | 14  | -53   |
|       | 802.11be, EHT80 @ MCS 0   | $\leq -5$ dB  | 16  | -87   |
|       | 802.11be, EHT80 @ MCS 13  | $\leq -38$ dB | 14  | -49   |
|       | 802.11be, EHT160 @ MCS 0  | $\leq -5$ dB  | 16  | -84   |
|       | 802.11be, EHT160 @ MCS 13 | $\leq -38$ dB | 12  | -46   |
|       | 802.11a @ 6 Mbps          | $\leq -5$ dB  | 17  | -91   |
|       | 802.11a @ 54 Mbps         | $\leq -25$ dB | 16  | -73   |
|       | 802.11ax, HE20 @ MCS 0    | $\leq -5$ dB  | 17  | -91   |
|       | 802.11ax, HE20 @ MCS 11   | $\leq -35$ dB | 15  | -61   |
|       | 802.11ax, HE40 @ MCS 0    | $\leq -5$ dB  | 17  | -88   |
|       | 802.11ax, HE40 @ MCS 11   | $\leq -35$ dB | 15  | -59   |
|       | 802.11ax, HE80 @ MCS 0    | $\leq -5$ dB  | 17  | -85   |
|       | 802.11ax, HE80 @ MCS 11   | $\leq -35$ dB | 14  | -56   |
|       | 802.11ax, HE160 @ MCS 0   | $\leq -5$ dB  | 16  | -82   |
|       | 802.11ax, HE160 @ MCS 11  | $\leq -35$ dB | 13  | -53   |
|       | 802.11be, EHT20 @ MCS 0   | $\leq -5$ dB  | 16  | -91   |
|       | 802.11be, EHT20 @ MCS 13  | $\leq -38$ dB | 14  | -53   |
|       | 802.11be, EHT40 @ MCS 0   | $\leq -5$ dB  | 16  | -88   |
|       | 802.11be, EHT40 @ MCS 13  | $\leq -38$ dB | 13  | -52   |
|       | 802.11be, EHT80 @ MCS 0   | $\leq -5$ dB  | 16  | -85   |
|       | 802.11be, EHT80 @ MCS 13  | $\leq -38$ dB | 12  | -50   |
|       | 802.11be, EHT160 @ MCS 0  | $\leq -5$ dB  | 16  | -82.5 |
|       | 802.11be, EHT160 @ MCS 13 | $\leq -38$ dB | 111 | -47   |
|       | 802.11be, EHT320 @ MCS 0  | $\leq -5$ dB  | 15  | -80   |
|       | 802.11be, EHT320 @ MCS 13 | $\leq -38$ dB | 9   | -45   |

## 3.2. RF Antenna Interface

### 3.2.1. RF Coaxial Connector

#### 3.2.1.1. Receptacle Specifications

The mechanical dimensions of the receptacle provided by the module are as follows:

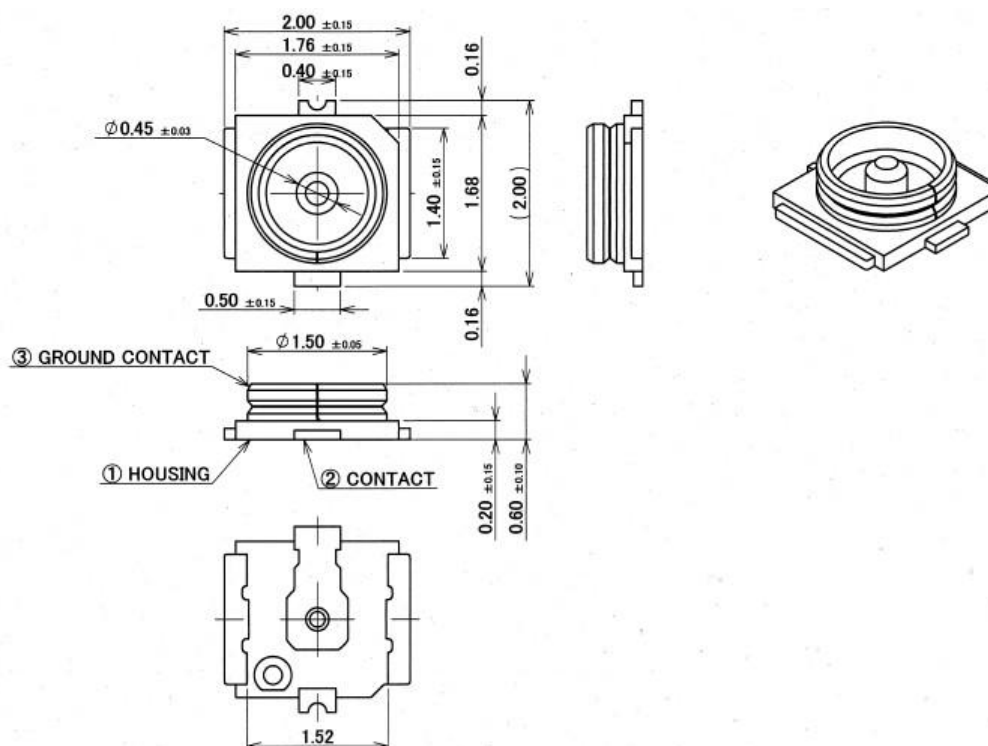


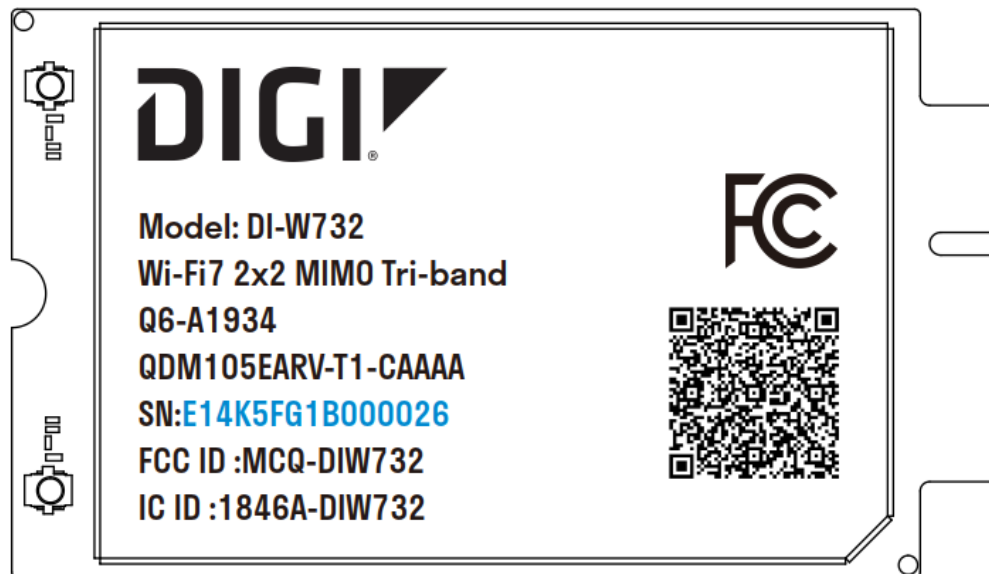
Figure 1: Dimensions of the Receptacle (Unit: mm)

Table 4 :Major Specifications of the Receptacle

| Item                               | Specification                                                                                    |
|------------------------------------|--------------------------------------------------------------------------------------------------|
| Nominal Frequency Range            | DC to 8 GHz                                                                                      |
| Nominal Impedance                  | 50 $\Omega$                                                                                      |
| Temperature Range                  | -40 °C to +85 °C                                                                                 |
| Voltage Standing Wave Ratio (VSWR) | Meet the requirements of:<br>Max. 1.3 (DC–3 GHz)<br>● Max. 1.4 (3–6 GHz)<br>● Max. 1.5 (6–8 GHz) |

### 3.2.1.2. RF Connector Location

DI-W732 have two antenna connectors respectively: ANT0 and ANT1, which are shown as below.

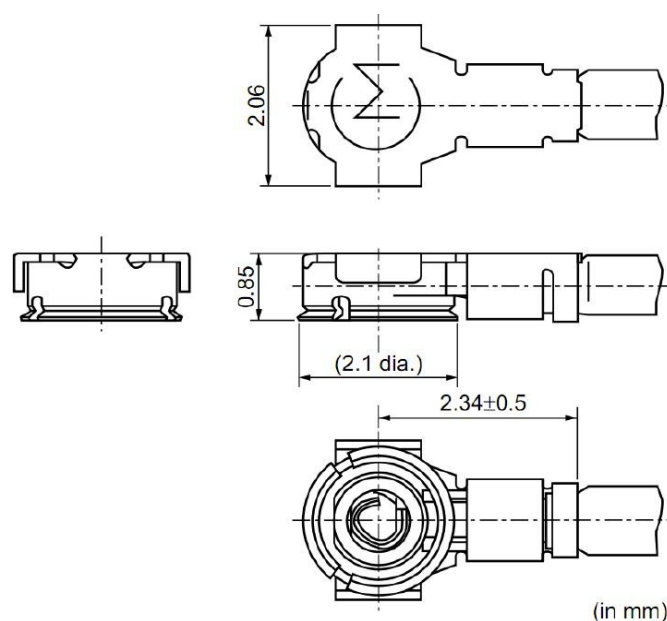


**Figure 2: Antenna Connectors (DI-W732)**

### 3.2.1.3. RF Connector Installation

The receptacle mounted on the module accepts two types of mated plugs that will meet a maximum height of 1.2 mm when using a  $\varnothing 0.81$  mm coaxial cable or a maximum height of 1.45 mm when utilizing a  $\varnothing 1.13$  mm coaxial cable.

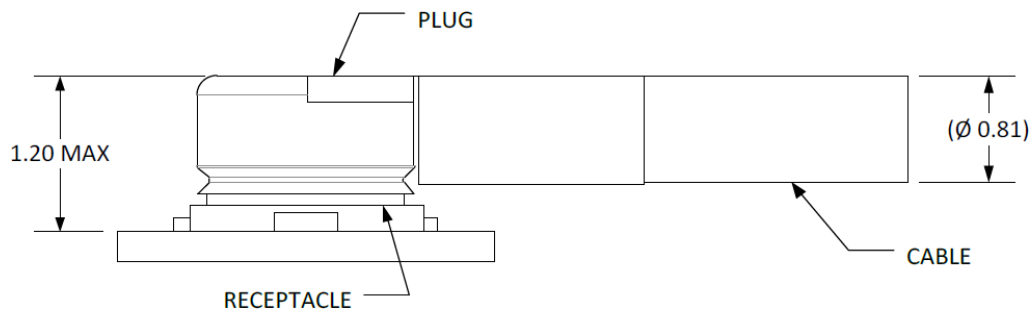
The following figure shows the dimensions of mated plugs using  $\varnothing 0.81$  mm/ $\varnothing 1.13$  mm coaxial cables.



**Figure 3: Dimensions of Mated Plugs ( $\varnothing 0.81$  mm/ $\varnothing 1.13$  mm Coaxial Cables) (Unit: mm)**

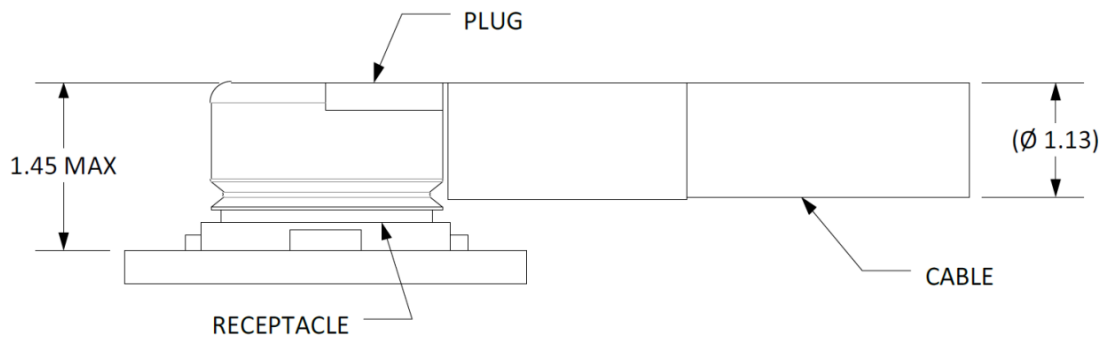
---

The following figure illustrates the connection between the receptacle on the module and the mated plug using a  $\varnothing 0.81$  mm coaxial cable.



**Figure 4: Space Factor of Mated Connectors ( $\varnothing 0.81$  mm Coaxial Cables) (Unit: mm)**

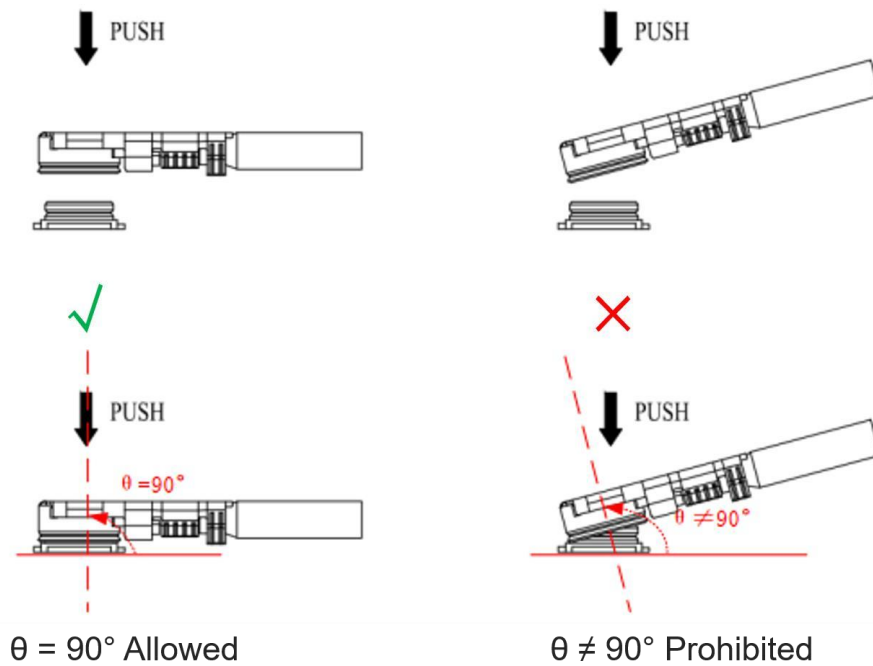
The following figure illustrates the connection between the receptacle on the module and the mated plug using a  $\varnothing 1.13$  mm coaxial cable.



**Figure 5: Space Factor of Mated Connectors ( $\varnothing 1.13$  mm Coaxial Cables) (Unit: mm)**

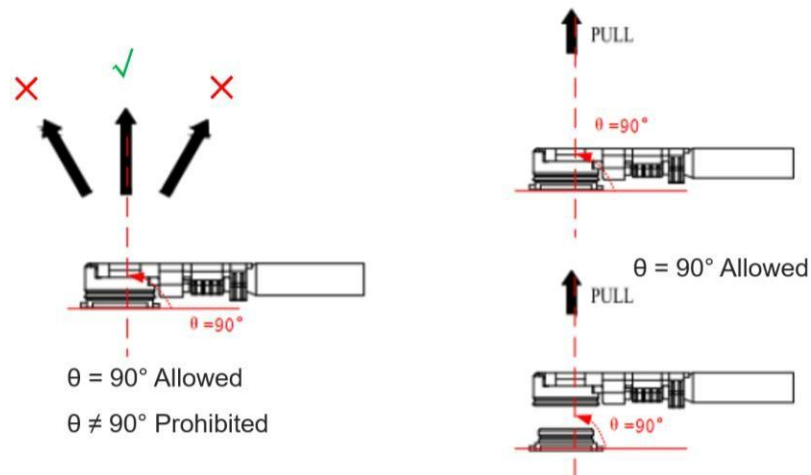
#### 3.2.1.4. Recommended RF Connector for Installation

The pictures for plugging in a coaxial cable plug is shown below,  $\theta = 90^\circ$  is acceptable, while  $\theta \neq 90^\circ$  is not.



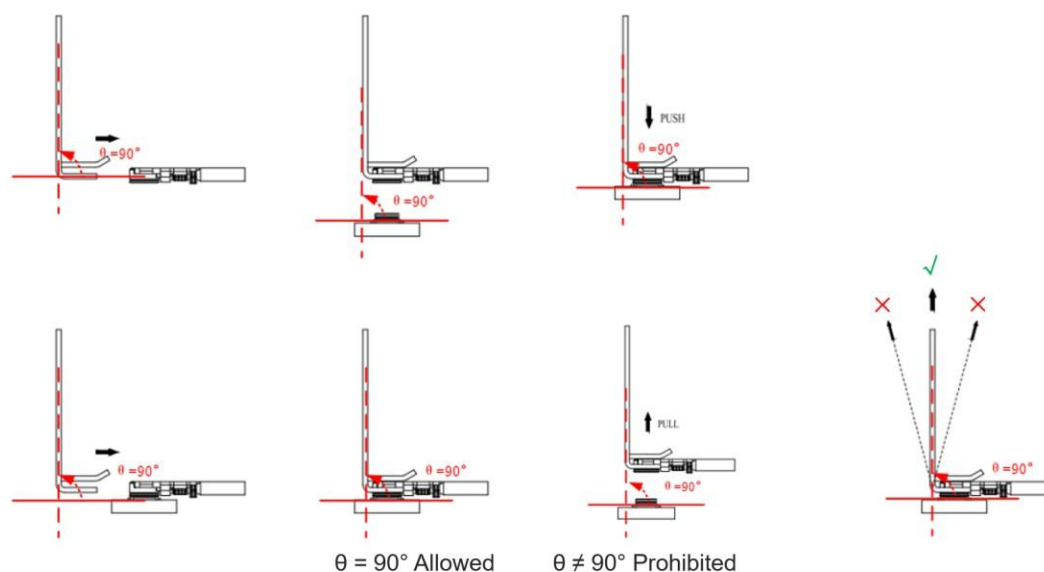
**Figure 6: Plug in a Coaxial Cable Plug**

The pictures of pulling out the coaxial cable plug is shown below,  $\theta = 90^\circ$  is acceptable, while  $\theta \neq 90^\circ$  is not.



**Figure 7: Pull out a Coaxial Cable Plug**

The pictures of installing the coaxial cable plug with a jig is shown below,  $\theta = 90^\circ$  is acceptable, while  $\theta \neq 90^\circ$  is not.



**Figure 8: Install the Coaxial Cable Plug with Jig**

### 3.2.1.5. Recommended Manufacturers of RF Connector and Cable

RF connectors and cables by I-PEX are recommended. For more details, visit <https://www.i-pex.com>.

### 3.2.2. Requirements for Antenna Design

**Table 5: Requirements for Antenna Design**

| Parameter                    | Requirement <sup>2</sup>                                                                                                              |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Frequency Ranges (GHz)       | <ul style="list-style-type: none"> <li>● 2.4 GHz: 2.400–2.4835</li> <li>● 5 GHz: 5.150–5.850</li> <li>● 6 GHz: 5.925–7.125</li> </ul> |
| Cable Insertion Loss (dB)    | < 1                                                                                                                                   |
| VSWR                         | $\leq 2$ (Typ.)                                                                                                                       |
| Gain (dBi)                   | 1 (Typ.)                                                                                                                              |
| Max. Input Power (W)         | 50                                                                                                                                    |
| Input Impedance ( $\Omega$ ) | 50                                                                                                                                    |
| Polarization Type            | Vertical                                                                                                                              |

<sup>2</sup> For more details about the RF performances, see **Chapter 3**.

# 4 Application Interfaces

## 4.1. Pin Assignment

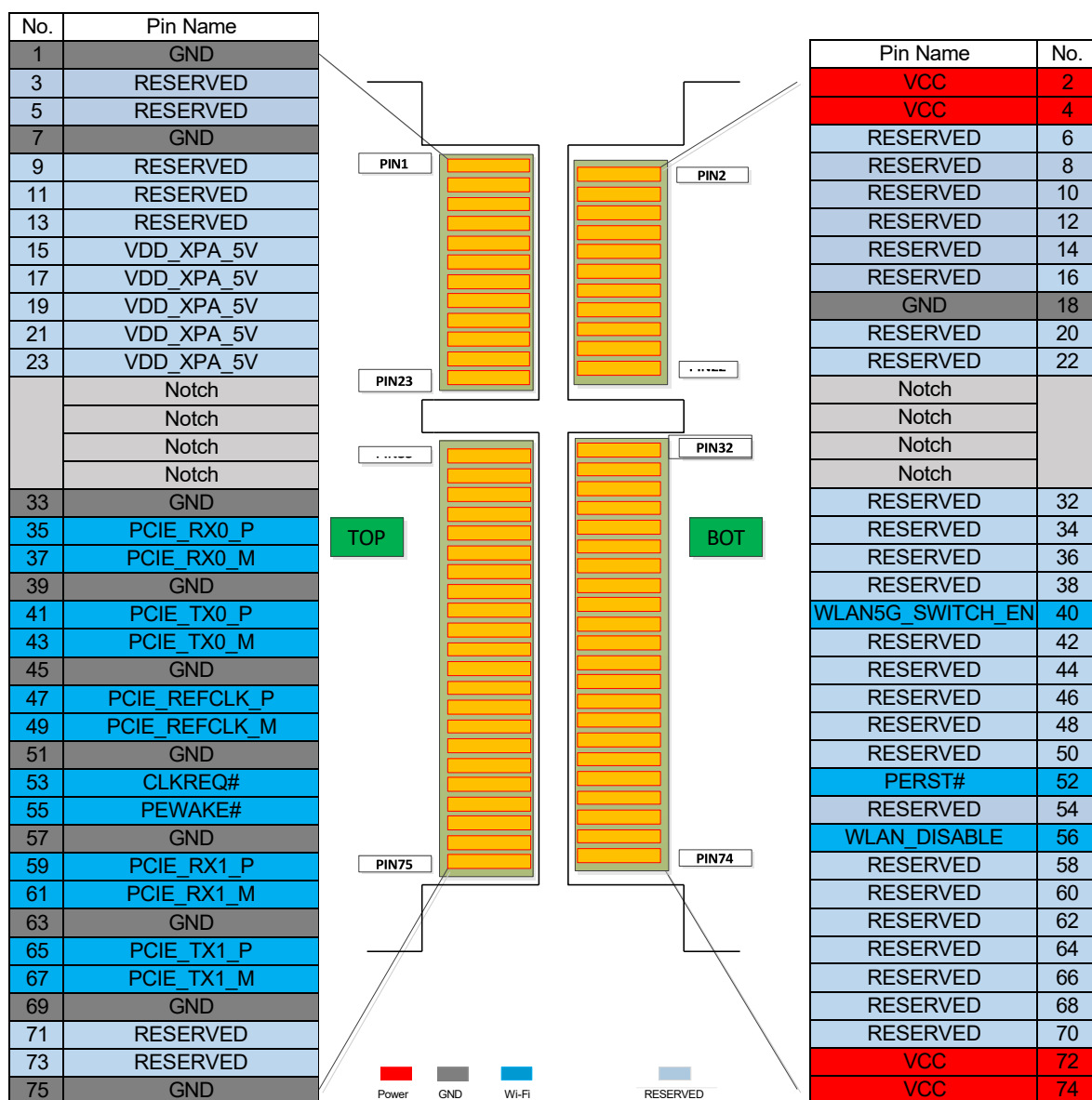


Figure 9: Pin Assignment

### NOTE

1. Keep all RESERVED and unused pins unconnected.
2. All GND pins should be connected to ground.

---

## 4.2. Pin Definitions

**Table 6: Parameter Definition**

| Parameter | Description         |
|-----------|---------------------|
| AI        | Analog Input        |
| AO        | Analog Output       |
| AIO       | Analog Input/Output |
| DI        | Digital Input       |
| DO        | Digital Output      |
| PI        | Power Input         |

DC characteristics include power domain and rated current.

**Table 7: Pin Description**

| Power Supply and GND Pins |                                         |     |                               |                                              |                                                         |
|---------------------------|-----------------------------------------|-----|-------------------------------|----------------------------------------------|---------------------------------------------------------|
| Pin Name                  | Pin No.                                 | I/O | Description                   | DC Characteristics                           | Comment                                                 |
| VCC                       | 2, 4, 72, 74                            | PI  | Power supply for the module   | Vmin = 3.0 V<br>Vnom = 3.3 V<br>Vmax = 3.6 V | It is recommended to provide a current of 4 A at least. |
| VDD_XPA_5V                | 15,17, 19,21, 23                        | PI  | Power supply for the WIFI FEM | Vmin = 4.5 V<br>Vnom = 5 V<br>Vmax = 5.25 V  | It is recommended to provide a current of 4 A at least. |
| GND                       | 1, 7, 18, 33, 39, 45, 51,57, 63, 69, 75 |     |                               |                                              |                                                         |

## Wi-Fi Application Interfaces

| Pin Name         | Pin No | I/O | Description              | DC Characteristics | Comment                                                                                        |
|------------------|--------|-----|--------------------------|--------------------|------------------------------------------------------------------------------------------------|
| PCIE_RX0_P       | 35     | AI  | PCIe receive 0 (+)       | 3.3 V power domain | Only EP mode is supported.<br>Require differential impedance of 90 Ω.<br>PCIe Gen 3 compliant. |
| PCIE_RX0_M       | 37     | AI  | PCIe receive 0 (-)       |                    |                                                                                                |
| PCIE_TX0_P       | 41     | AO  | PCIe transmit 0(+)       |                    |                                                                                                |
| PCIE_TX0_M       | 43     | AO  | PCIe transmit 0 (-)      |                    |                                                                                                |
| PCIE_REFCLK_P    | 47     | AI  | PCIe reference clock (+) |                    |                                                                                                |
| PCIE_REFCLK_M    | 49     | AI  | PCIe reference clock (-) |                    |                                                                                                |
| PCIE_RX1_P       | 59     | AI  | PCIe receive 1 (+)       |                    |                                                                                                |
| PCIE_RX1_M       | 61     | AI  | PCIe receive 1 (-)       |                    |                                                                                                |
| PCIE_TX1_P       | 65     | AO  | PCIe transmit 1 (+)      |                    |                                                                                                |
| PCIE_TX1_M       | 67     | AO  | PCIe transmit 1 (-)      |                    |                                                                                                |
| PERST#           | 52     | DI  | PCIe reset               |                    | Active low.                                                                                    |
| CLKREQ#          | 53     | DO  | PCIe clock request       | 3.3 V power domain | Require a 100 kΩ pull-up resistor at the host side.                                            |
| PEWAKE#          | 55     | DO  | PCIe wake up             |                    |                                                                                                |
| WLAN5G_SWITCH_EN | 40     | DI  | WLAN 5G&6G FEM SWITCH    |                    |                                                                                                |

## RESERVED Pins

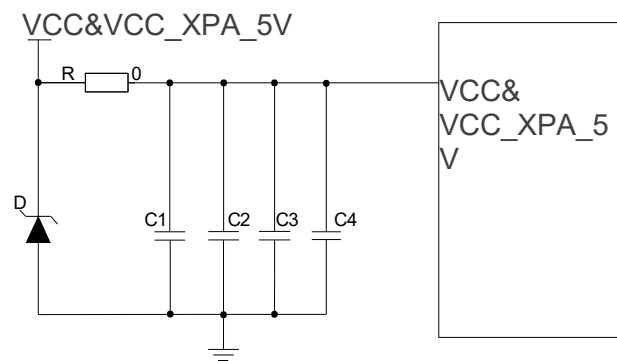
| Pin Name | Pin No.                                                                                                           | Comment |
|----------|-------------------------------------------------------------------------------------------------------------------|---------|
| RESERVED | 6, 8,9,10, 11,12, 13,14, 15,16,20,22, 32, 34, 36, 38, 42, 44, 46,48, 50, 54,56,58, 60, 62, 64, 66, 68, 70, 71, 73 |         |

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### 4.3. Power Supply

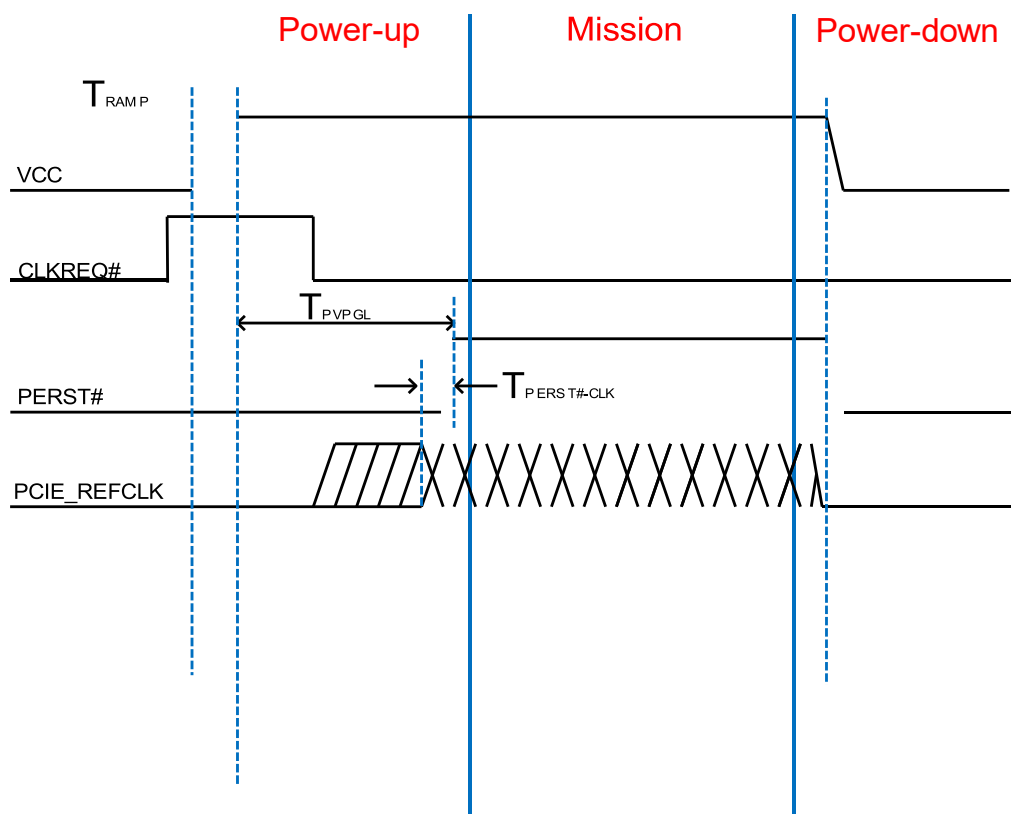
The module is powered by VCC&VCC\_XPA\_5V, and it is recommended to use a power supply chip that provides at least 4 A to ensure sufficient current. For better power supply performance, it is recommended to parallel a 47  $\mu$ F decoupling capacitor and 100 nF, 33 pF and 10 pF filter capacitors near the module's VCC&VCC\_XPA\_5V pins. At the same time, it is suggested to add a TVS near the VCC&VCC\_XPA\_5V pins to improve the surge voltage bearing capacity of the module. In principle, the longer the power supply trace is, the wider it should be.

VCC&VCC\_XPA\_5V reference circuit is shown below:



**Figure 10: Reference Circuit of Power Supply**

The power-up and power-down timing of the module is shown in the figure below.



**Figure 11: Power-up and Power-down Timing**

**Table 8: Power-up and Power-down Timing Parameters (Unit: ms)**

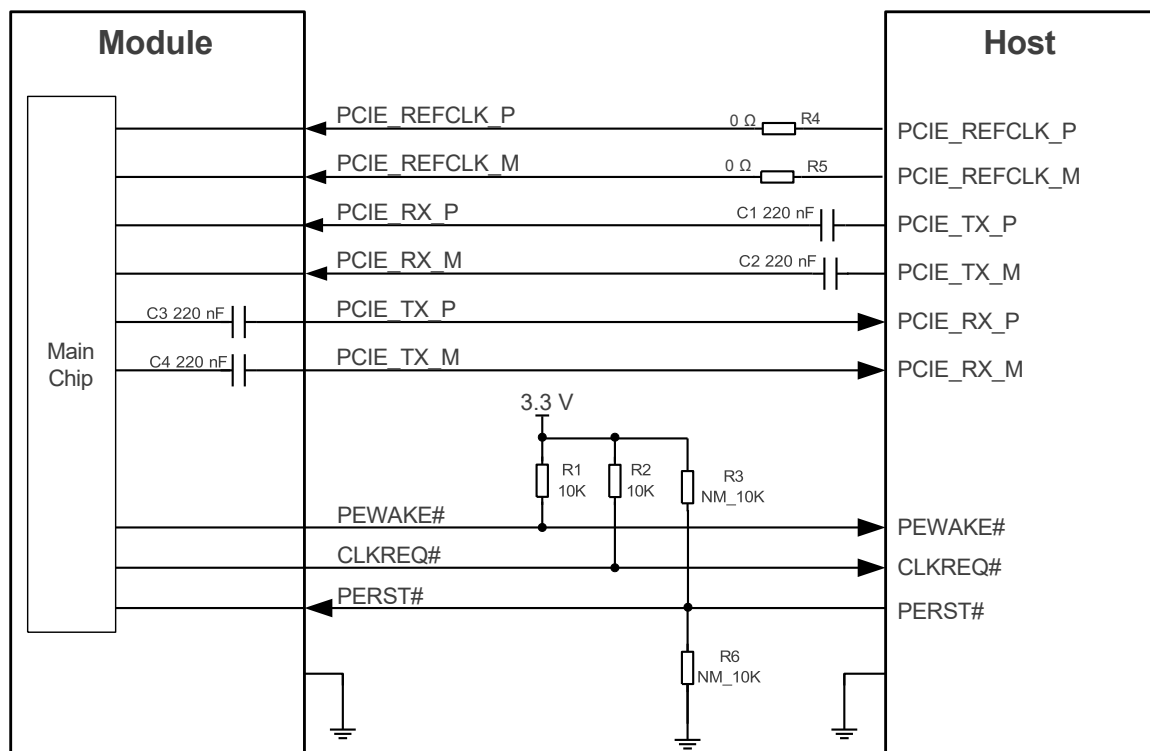
| Parameter         | Description                                 | Min. | Typ. | Max. |
|-------------------|---------------------------------------------|------|------|------|
| $T_{PVPG_L}$      | VCC stable to PERST# drive high             | 50   | -    | -    |
| $T_{RAMP}$        | VCC ramp on 3.3 V                           | -    | -    | 100  |
| $T_{PERST\#-CLK}$ | PCIE_REFCLK stable before PERST# drive high | 0.1  |      |      |

## 4.4. Wi-Fi Application Interface

The module provides a PCIe 3.0 interface for Wi-Fi functions.

### 4.4.1. PCIe Interface

The PCIe interface connection between the module and the host is shown below:



**Figure 12: PCIe Interface Connection**

---

The following principles of PCIe interface design should be complied with to meet PCIe Gen 3 specifications.

- It is important to route PCIe Tx/Rx/REFCLK as differential pairs with ground surrounded. And the differential impedance should be  $90\ \Omega \pm 10\%$ .
- For PCIe signal traces, the recommended maximum length for Tx and Rx differential data pairs should be less than 290 mm, and the intra-lane length mismatch of Tx and Rx differential data pairs should be less than 0.5 mm.
- The trace space between Tx and Rx signal traces should be greater than 3 times the trace width. And the trace space between Tx/Rx signal traces and all other signal traces should be greater than 4 times the trace width.
- Connect 220 nF capacitors in series on the Tx and Rx traces to ensure the signal integrity of PCIe interface. C3 and C4 have been respectively connected in series on the module's Tx traces and placed inside of the module. C1 and C2 should be respectively connected in series on the module's Rx traces and placed close to the host. The extra stubs of traces must be as short as possible.
- Do not route signal traces under crystals, oscillators, magnetic devices, or RF signal traces. It is important to route the PCIe differential traces in inner-layer of the PCB and surround the traces with ground on that layer and with ground planes above and below.

---

# 5 Electrical Characteristics and Reliability

## 5.1. Absolute Maximum Ratings

**Table 9: Absolute Maximum Ratings (Unit: V)**

| Parameter  | Min. | Max. |
|------------|------|------|
| VCC        | -0.3 | 3.6  |
| VCC_XPA_5V | -0.5 | 6    |

## 5.2. Power Supply Ratings

**Table 10: Module Power Supply Ratings (Unit: V)**

| Parameter  | Description                   | Conditions                                                                     | Min. | Typ. | Max. |
|------------|-------------------------------|--------------------------------------------------------------------------------|------|------|------|
| VCC        | Power supply for the module   | The actual input voltages must be kept between the minimum and maximum values. | 3.0  | 3.3  | 3.6  |
| VCC_XPA_5V | Power supply for the wifi FEM | The actual input voltages must be kept between the minimum and maximum values. | 4.5  | 5.0  | 5.25 |

# 6 Mechanical Information

This chapter describes the mechanical dimensions of the module. All dimensions are measured in millimeter (mm), and the dimensional tolerances are  $\pm 0.15$  mm unless otherwise specified.

## 6.1. Mechanical Dimensions

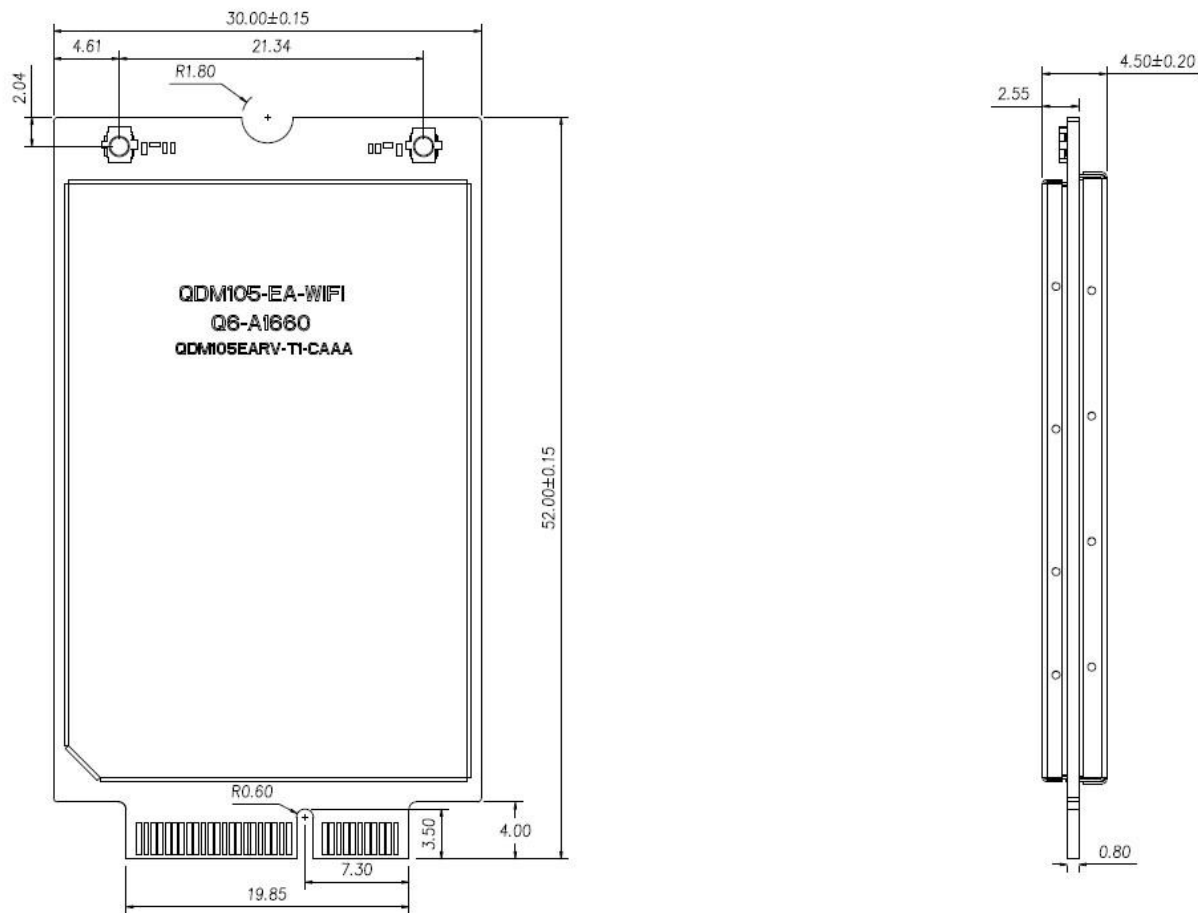


Figure 13: Top and Side Dimensions

## 6.2. M.2 Connector

The module features a standard PCI Express M.2 Key-E interface, using a standard M.2 Key-E connector. For more information, please refer to the *PCI Express M.2 Specification Revision 3*.

---

# 7 Appendix References

**Table 11: Terms and Abbreviations**

| Abbreviation | Description                                |
|--------------|--------------------------------------------|
| AP           | Access Point                               |
| BLE          | Bluetooth Low Energy                       |
| BPSK         | Binary Phase Shift Keying                  |
| BR           | Basic Rate                                 |
| CCK          | Complementary Code Keying                  |
| DBPSK        | Differential Binary Phase Shift Keying     |
| DBS          | Dual Band Simultaneous                     |
| DPSK         | Differential Phase Shift Keying            |
| DQPSK        | Differential Quadrature Phase Shift Keying |
| EDR          | Enhanced Data Rate                         |
| EHT          | Extremely High Throughput                  |
| ESD          | Electrostatic Discharge                    |
| EVB          | Evaluation Board                           |
| EVM          | Error Vector Magnitude                     |
| GFSK         | Gauss frequency Shift Keying               |
| GND          | Ground                                     |
| HE           | High Efficiency                            |
| HT           | High Throughput                            |
| I/O          | Input/Output                               |

---

|                  |                                                   |
|------------------|---------------------------------------------------|
| IC               | Integrated Circuit                                |
| IEEE             | Institute of Electrical and Electronics Engineers |
| MAC              | Media Access Control                              |
| Mbps             | Megabits per second                               |
| MCS              | Modulation and Coding Scheme                      |
| PCB              | Printed Circuit Board                             |
| PCIe             | Peripheral Component Interconnect Express         |
| PCM              | Pulse Code Modulation                             |
| QAM              | Quadrature Amplitude Modulation                   |
| QPSK             | Quadrature Phase Shift Keying                     |
| RF               | Radio Frequency                                   |
| RoHS             | Restriction of Hazardous Substances               |
| Rx               | Receive                                           |
| SDR              | Software-Defined Radio                            |
| STA              | Station                                           |
| TVS              | Transient Voltage Suppressor                      |
| Tx               | Transmit                                          |
| USB              | Universal Serial Bus                              |
| (U)SIM           | (Universal) Subscriber Identity Module            |
| VHT              | Very High Throughput                              |
| V <sub>max</sub> | Maximum Voltage                                   |
| V <sub>min</sub> | Minimum Voltage                                   |
| V <sub>nom</sub> | Nominal Voltage                                   |
| VSWR             | Voltage Standing Wave Ratio                       |
| WPA              | Wi-Fi Protected Access                            |

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# 8 Compliance statements

The following notices is to guide host manufacturer integrating this module inside their final product with the FCC/ISED regulatory requirements.

When this module being integrated in any finished product (Host device) with 6GHz band enabled, the following conditions must be met:

The operation of the host device is restricted to indoor use only. The host device must not have weatherized enclosure. The host device must use the integrated antennas. The host device must be powered by a wired connection and not by battery power. The host device must be labeled with "Contains FCC ID: MCQ-DIW732" alone with "Indoor Use Only".

## 8.1. FCC

Note EMI Considerations--Applicable

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode7; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

### 8.1.1. Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

### 8.1.2. Important Note

notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to DIGI that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

### 8.1.3. End Product Labeling

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text:

"Contains FCC ID: MCQ-DIW732".

The FCC ID can be used only when all FCC compliance requirements are met.

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### 8.1.4. Antenna Installation

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
- (2) The transmitter module may not be co-located with any other transmitter or antenna.
- (3) Only antennas of the same type and with equal or less gains as shown below may be used with this module. Other types of antennas and/or higher gain antennas may require additional authorization for operation.

| DI-W732: PIFA antenna |               |        |
|-----------------------|---------------|--------|
| 2.4G WIFI             | 2402-2462     | 1.7dBi |
| 5G WIFI U-NII-1       | 5150~5250 MHz | 1.3dBi |
| 5G WIFI U-NII-2A      | 5250~5350 MHz | 1.3dBi |
| 5G WIFI U-NII-2C      | 5470~5725 MHz | 2.2dBi |
| 5G WIFI U-NII-3       | 5725~5850 MHz | 3.4dBi |
| 6E                    | 5925~6425MHz  | 4.3dBi |
| 6E                    | 6425~6525MHz  | 2.2dBi |
| 6E                    | 6525~6875MHz  | 3.1dBi |
| 6E                    | 6875~7125MHz  | 3.3dBi |

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

### 8.1.5. Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

### 8.1.6. Federal Communication Commission Interference 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 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 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

---

### 8.1.7. List of applicable FCC rules

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

- a. FCC regulations restrict the operation of this device to indoor use only.
- b. The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet in the 5.925-6.425 GHz band.
- c. Operation of transmitters in the 5.925-7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

### 8.1.8. This device is intended only for OEM integrators under the following conditions:(For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

### 8.1.9. Radiation Exposure Statement

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

## 8.2. ISED

### 8.2.1. Industry Canada Statement

- a. 5925-7125MHz Operation shall be limited to indoor use only  
l'opération sera limitée à l'usage d'intérieur seulement(5925-7125MHz)
- b. Operation on oil platforms, automobiles, trains, maritime vessels and aircraft shall be prohibited except for on large aircraft flying above 3,048 m (10,000 ft).  
l'exploitation sur les plates-formes pétrolières, les automobiles, les trains, les navires maritimes et les aéronefs doit être interdite, sauf à bord des gros aéronefs volant au-dessus de 3 048 m (10 000 pieds)

This device complies with Industry Canada's licence-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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement."

---

### 8.2.2. Radiation Exposure Statement

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

### 8.2.3. Déclaration d'exposition aux radiations:

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

### 8.2.4. RSS-247 Section 6.4 (5) (6) (for local area network devices, 5GHz)

The device could automatically discontinue transmission in case of absence of information to transmit, or operational failure. Note that this is not intended to prohibit transmission of control or signaling information or the use of repetitive codes where required by the technology.

The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

The maximum antenna gain permitted for devices in the bands 5250–5350 MHz and 5470–5725 MHz shall comply with the e.i.r.p. limit.

The maximum antenna gain permitted for devices in the band 5725–5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

L'appareil peut interrompre automatiquement la transmission en cas d'absence d'informations à transmettre ou de panne opérationnelle. Notez que ceci n'est pas destiné à interdire la transmission d'informations de contrôle ou de signalisation ou l'utilisation de codes répétitifs lorsque cela est requis par la technologie.

Le dispositif utilisé dans la bande 5150-5250 MHz est réservé à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable aux systèmes mobiles par satellite dans le même canal. Le gain d'antenne maximal autorisé pour les dispositifs dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être conforme à la norme e.r.p. limite.

Le gain d'antenne maximal autorisé pour les appareils de la bande 5725-5825 MHz doit être conforme à la norme e.i.r.p. les limites spécifiées pour un fonctionnement point à point et non point à point, selon le cas.

### 8.2.5. This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

This radio transmitter 【IC: 1846A-DIW732】 has been approved by Innovation, science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Ce émetteur radio 【IC : 1846A-DIW732】 a été approuvé par Innovation, Science et Economic Development Canada pour fonctionner avec les types d'antennes énumérés ci - dessous, avec le gain maximal autorisé indiqué. Les types d'antennes non inclus dans cette liste ayant un gain supérieur au gain maximal indiqué pour tout type énuméré sont strictement interdits pour une utilisation avec cet appareil.

---

#### **8.2.6. Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

- 1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

#### **8.2.7. IMPORTANT NOTE**

In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

#### **8.2.8. NOTE IMPORTANTE**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

#### **8.2.9. End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 1846A-DIW732".

#### **8.2.10. Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 1846A-DIW732".

#### **8.2.11. Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

#### **8.2.12. Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.