



# WIM1481

The compact-sized BLE 5.0 module, designed for intelligent wireless controls, enables ultra-low power connectivity and provides considerable design flexibility to the engineers. WIM1481, with options for an external or a chip antenna, also has 16 General Purpose IO pins including, 6 PWM, ADC, I2C, UART, and SPI



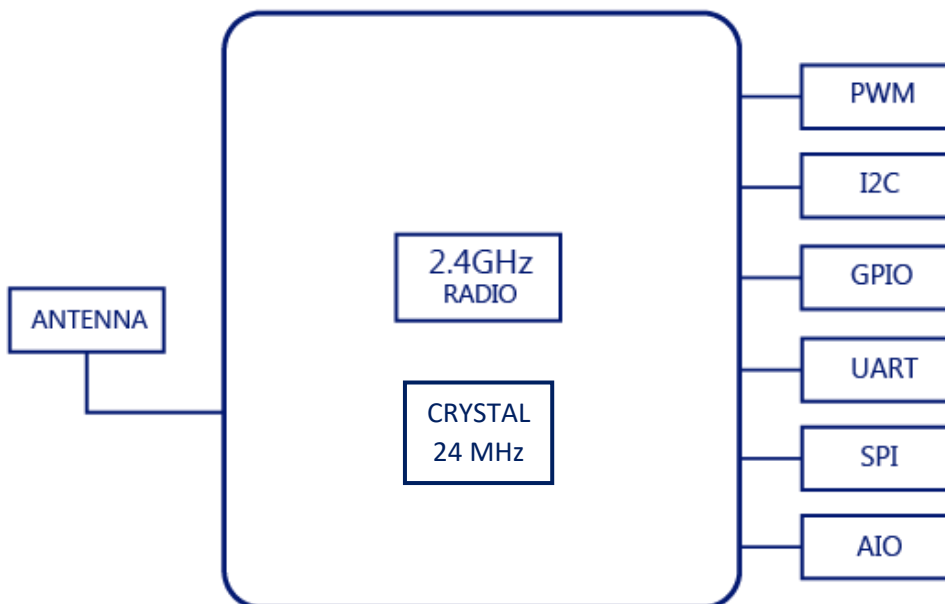
# Table of Contents

- 1. Features..... 3
- 2. Block Diagram..... 3
- 3. Specifications..... 4
- 4. Module Dimensions ..... 6
- 5. Land Pattern Dimensions ..... 7
- 6. Design Recommendations..... 8
- 7. Antenna ..... 9
- 8. Pinout Details ..... 12
- 9. Soldering Information ..... 14
- 10. Packaging Information ..... 15
- 11. Ordering Information..... 17
- 12. Precautions..... 17

## 1. Features

- BLE 5.0 based non-flooding intelligent mesh
- PWM/AIO/SPI/I2C/UART/IO interface options
- TX output power up to +10dBm
- -96dBm RX sensitivity
- 14 programmable GPIOs
- 6 PWM channels
- External antenna
- Compact form factor
- Zero downtime Over-the-Air (OTA) firmware updates
- FCC, CE, ISED certified
- RoHS2.0 compliant
- Max power: 1±1

## 2. Block Diagram



### 3. Specifications

#### Electrical specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Input voltage	VDD	1.8		3.6	V	
IO supply voltage			VDD		V	

#### RF specifications

Parameter	Min.	Typ.	Max.	Unit
Operating frequency	2402	-	2480	MHz
Maximum output power	-	10	-	dBm
Receiver sensitivity	-	-96	-	dBm

#### ADC specifications

Parameter	Min.	Typ.	Max.	Unit	Remark
ADC input voltage	0	-	1.2	V	@3.3V input

#### PWM specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
PWM frequency		0.1	32	1000	kHz	Up to 10kHz for low frequency PWM pins
Maximum voltage for logic low	V <sub>OL</sub>	0	-	0.4	V	
Maximum voltage for logic high	V <sub>OH</sub>	VDDx0.7	-	VDD	V	

#### Current specifications

Parameter	Min.	Typ.	Max.	Unit	Remarks
Deep sleep current	-	-	0.4	μA	@3V
TX peak current	-	13	-	mA	@10dBm
RX peak current	-	5.3	-	mA	@1Mbps

### Environmental specifications

Parameter	Symbol	Min.	Max.	Unit
Operating temperature	T <sub>opr</sub>	-40	85	°C
Storage temperature	T <sub>str</sub>	-65	150	°C

### Mechanical specifications

Parameter	Typ.	Max.	Unit	Remarks
Dimension	22.5 x 8.0 x 2.95		mm	For chip antenna
Dimension	16.60 x 8.0 x 2.41		mm	For external antenna

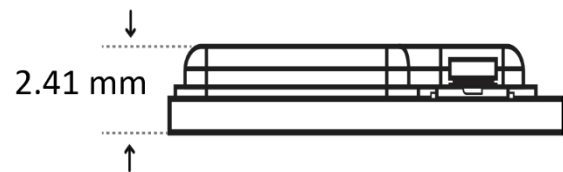
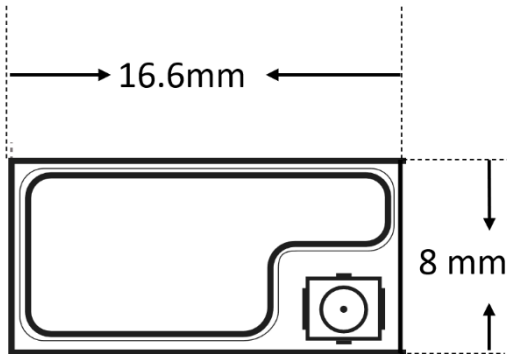
### Certifications

Certifications	Details
CE	
FCC	
ISED	
RoHS 2.0	

## 4. Module Dimensions

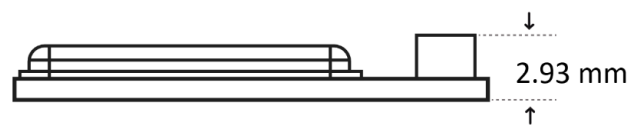
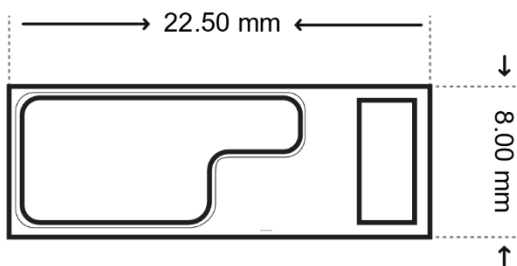
### External antenna version (WIM1481E)

- Dimensions: 16.60 x 8.0 x 2.41 mm (with external antenna)
- Pitch: 1.33 mm
- Module pad dimensions: 0.737 x 0.698 mm



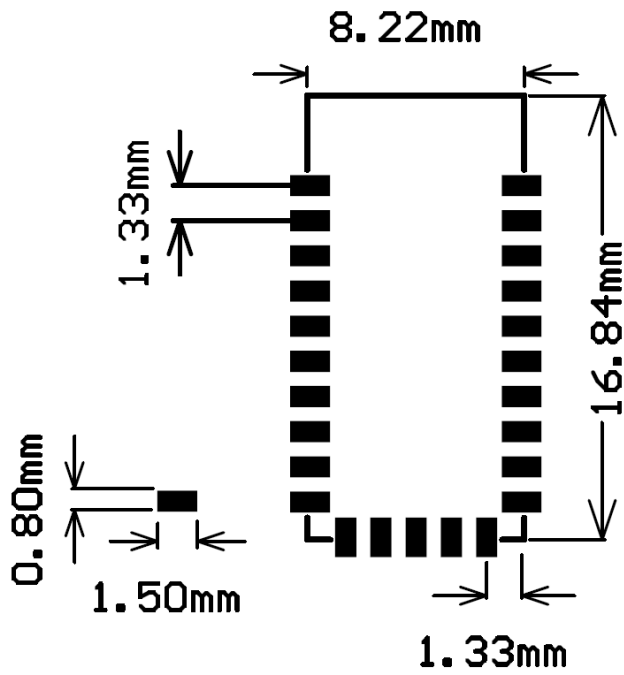
### Chip antenna version (WIM1481C)

- Dimensions: 22.50 x 8.0 x 2.95 mm (with chip antenna)
- Pitch: 1.33 mm
- Module pad dimensions: 0.737 x 0.698 mm

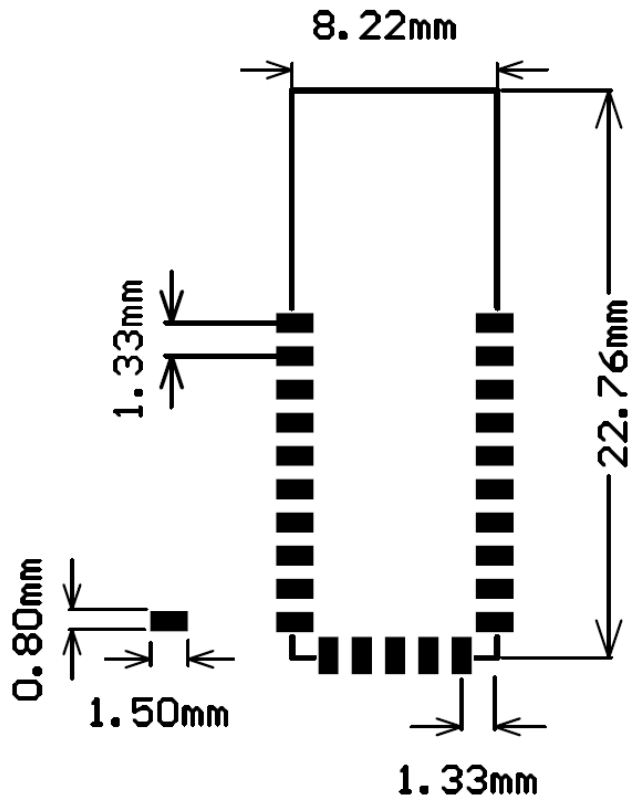


## 5. Land Pattern Dimensions

All dimensions are in mm



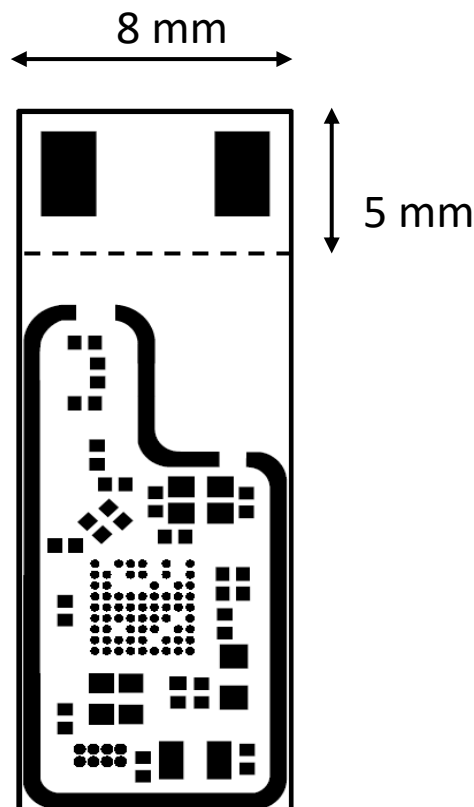
WIM1481E



WIM1481C

## 6. Design Recommendations

- a) Keep out enough area for the chip antenna.
- b) Avoid any routing under antenna area as shown in the below image.
- c) Better to place the module away from High frequency circuitry like other RF, and large components or metallic objects.
- d) All GND pins must be well grounded.
- e) The area around the module should be free of any ground planes, power planes, trace routings or metal for 6 mm from the module antenna position in all directions.
- f) Better not to route any traces underneath the module.
- g) The WIM1481 series modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the WIM series modules without proper ESD protection may destroy or damage them permanently.





## 7. Antenna

### External wire antenna – 37mm



37mm wire antenna

Antenna Properties	
Frequency range	2.4GHz-2.5GHz
Impedance	50Ω Nominal
VSWR	1.92:1 Max
Return loss	-10dB Max
Gain (Peak)	2dBi
Cable loss	0.3dBi Max

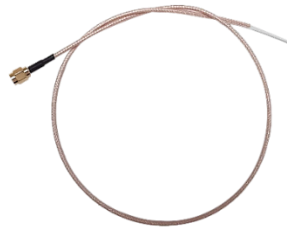
### External wire antenna – 150mm



150mm wire antenna

Antenna Properties	
Frequency range	2.4 GHz-2.5GHz
Impedance	50 Ω Nominal
VSWR	1.92:1 Max
Return loss	-10 dB Max
Gain(peak)	1.5 dBi
Cable loss	0.3 dBi Max
Polarization	Linear

**External wire antenna – 600mm**



600mm wire antenna

Antenna Properties	
Frequency range	2.4GHz-2.5GHz
Impedance	50Ω Nominal
VSWR	≤ 1.3
Gain (Peak)	3dBi

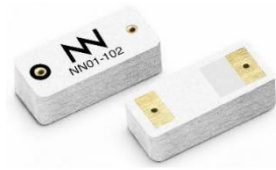
**Stick antenna**



Stick antenna

Antenna Properties	
Frequency range	2.4GHz-2.5GHz
Impedance	50Ω Nominal
VSWR	1.92:1 Max
Return loss	-10dB Max
Gain (Peak)	2dBi
Cable loss	0.3dBi Max
Polarization	Linear Vertical

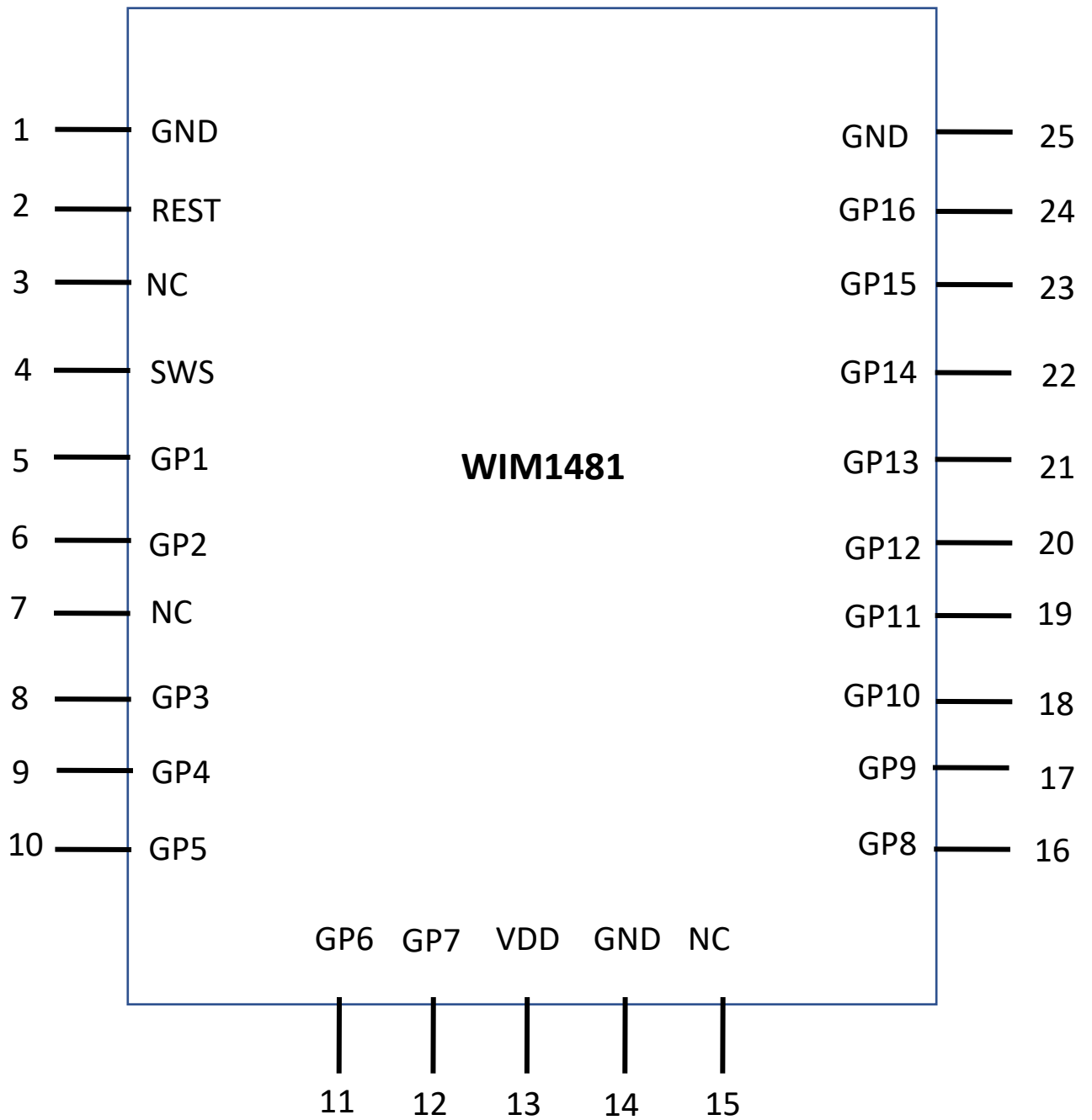
**Chip antenna**



Chip antenna

Antenna Properties	
Frequency range	2.4 GHz-2.5 GHz
Impedance	50 Ω
Peak Gain	1.7 dBi
VSWR	<2:1
Radiation pattern	Omnidirectional
Polarization	Linear

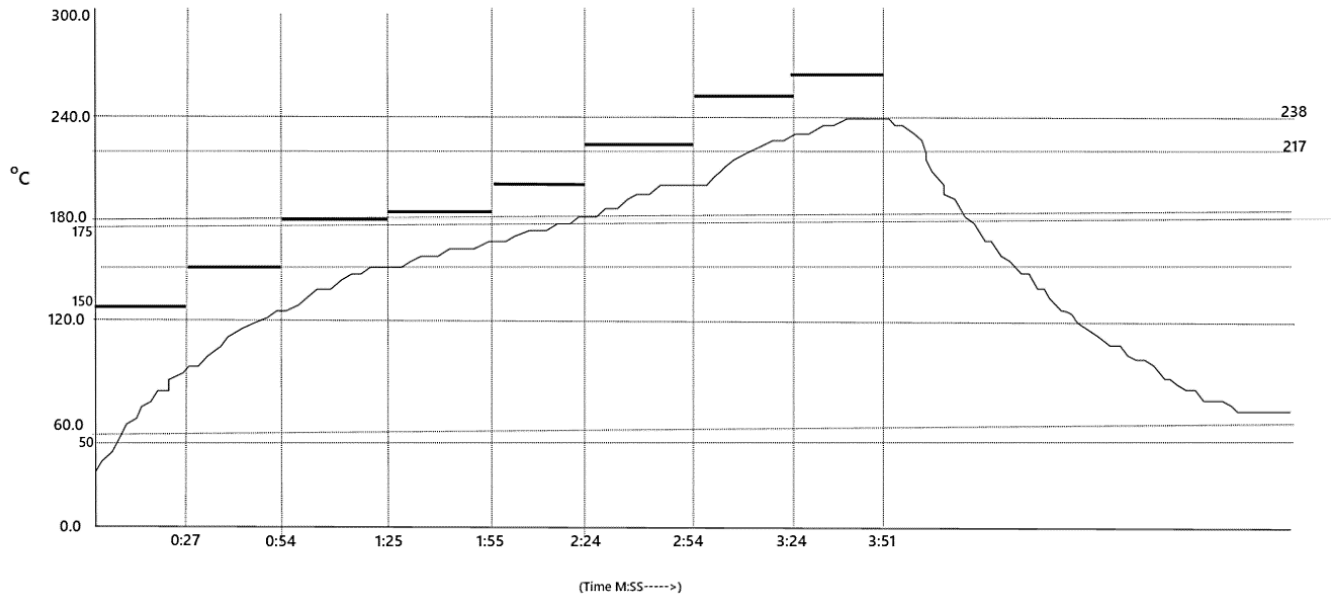
## 8. Pinout Details



PIN NO	PIN NAME	SUPPORTING FUNCTIONS	COMMENTS
1	GND	GROUND	Ground
2	RST	RESET	Reset
3	NC	NC	NC
4	SWS	Single wire slave	Serial wire debug IO for debug and programming
5	GP1	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
6	GP2	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
7	NC	NC	NC
8	GP3	IO	AIO or Digital IO
9	GP4	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
10	GP5	IO/PWM/I2C/SPI/UART/AIO	AIO or Digital IO or PWM or Serial interface
11	GP6	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
12	GP7	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
13	VDD	POWER (3.3V)	Power
14	GND	GROUND	Ground
15	NC	NC	NC
16	GP8	IO/PWM	Digital IO or PWM
17	GP9	IO/PWM	Digital IO or PWM
18	GP10	IO/PWM/AIO	AIO or Digital IO or PWM
19	GP11	IO/PWM	Digital IO or PWM
20	GP12	IO/PWM	Digital IO or PWM
21	GP13	IO/PWM/AIO	AIO or Digital IO or PWM
22	GP14	IO/PWM	PWM/ Digital IO
23	GP15	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
24	GP16	IO/PWM/I2C/SPI/UART	PWM or Digital IO or Serial interface
25	GND	GROUND	Ground

## 9. Soldering Information

### Leadfree reflow soldering



Do not exceed peak temperature ( $T_p$ ) of 242°C. Time at maximum temperature is 27 seconds. After reflow soldering, optical inspection of the module is recommended to verify proper alignment. Hand soldering is also possible.

### Cleaning

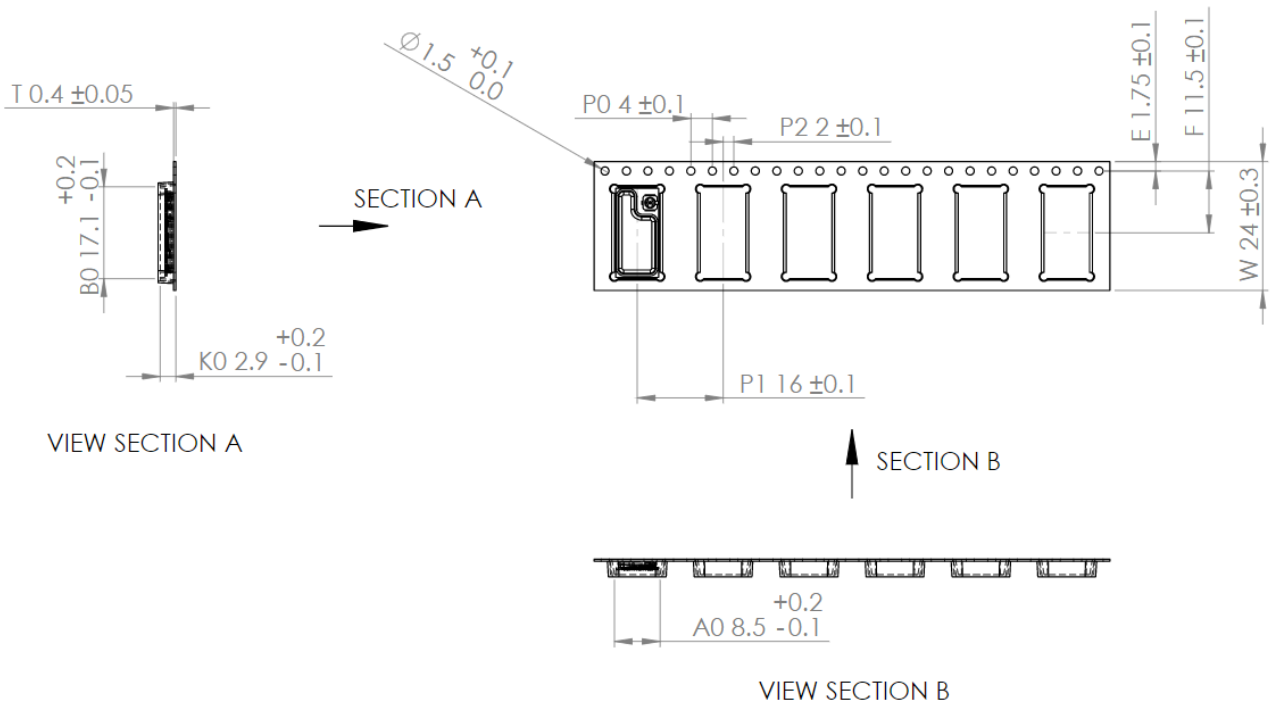
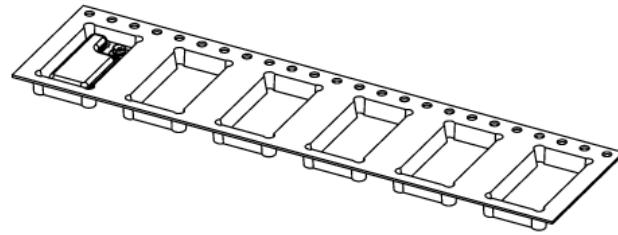
In general, cleaning the populated modules is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process.

1. Cleaning with water can lead to capillary effects where water is absorbed into the gap between the host board and the module. The combination of soldering flux residuals and encapsulated water could lead to short circuits between neighboring pads. Water could also damage any stickers or labels.
2. Cleaning with alcohol or a similar organic solvent will likely flood soldering flux residuals into the RF shield, which is not accessible for post-washing inspection. The solvent could also damage any stickers or labels.

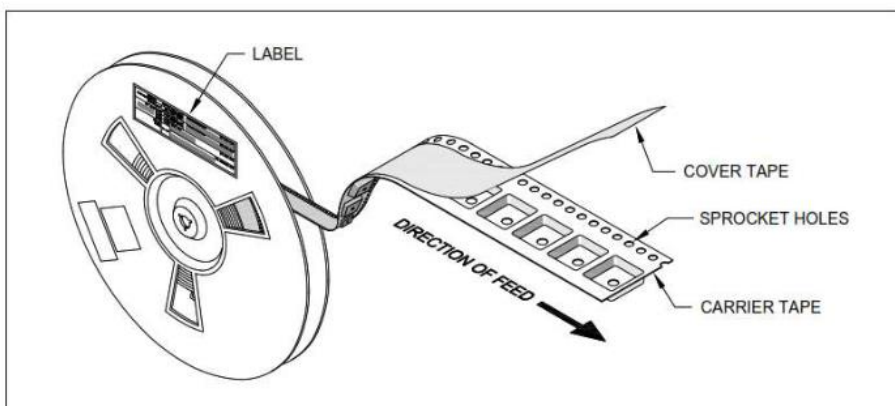
# 10. Packaging Information

## Tape Dimensions

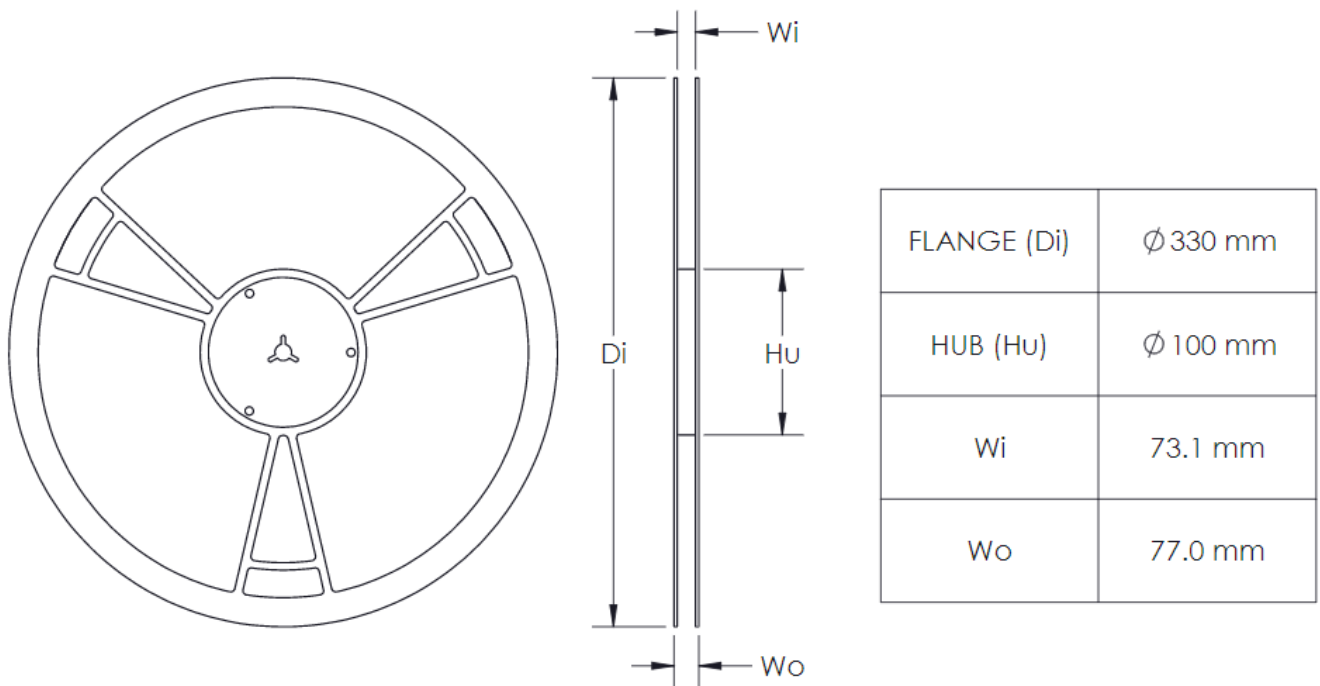
All dimensions are in mm



## Direction of Feed



Reel Information

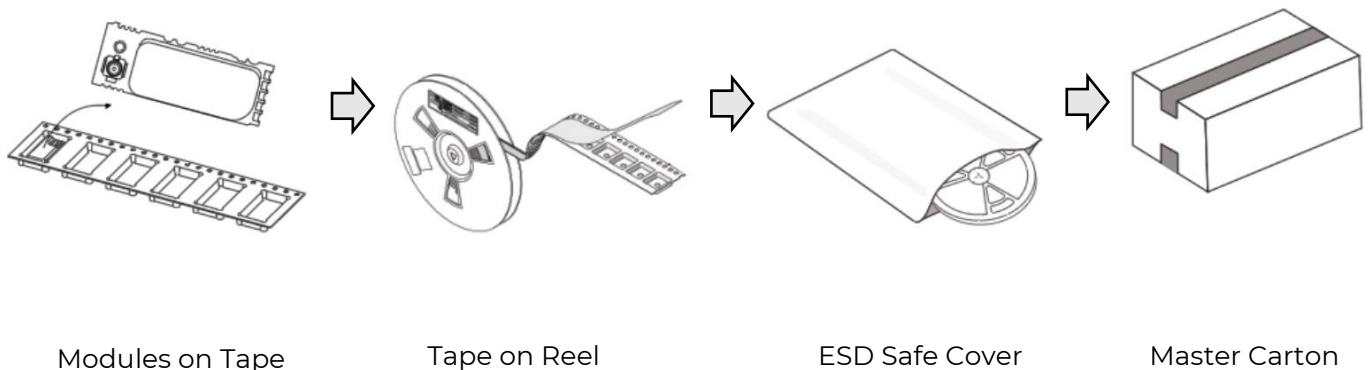


A full reel can hold 1000 modules and weighs approximately 1100 gm (including the modules). The module antennas are packed separately and supplied along with the modules.

Please note:

1. Tape material: Conductive Polystyrene; Black; 0.4mm thickness
2. All tape and sprocket hole dimensioning are as per EIA-481 unless otherwise stated
3. Order volume less than a full reel will be supplied on cut tape (without a reel)

Packaging hierarchy





## 11. Ordering Information

Product code	Communication	Voltage Rating	Analog Channel I/O	PWM I/O	Serial Interface	Antenna	Dimensions (mm)
WIM1481C	BLE 5.0	3.0V DC	4 AIO	6Channels	UART/SPI/I2C	Chip	22.50 x 8.0 x 2.95
WIM1481E	BLE 5.0	3.0V DC	4 AIO	6Channels	UART/SPI/I2C	External	16.60 x 8.0 x 2.41

## 12. Precautions

- While integrating module, make sure all the pads are soldered properly.
- Please use a voltage regulator if the power supply is above the max ratings.
- For best wireless signals, please avoid packing the antenna close to metal parts or cases.
- Stresses above the listed maximum ratings may cause permanent damage to the device.

## FCC Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help

Important Note:

### 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 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Country Code selection feature to be disabled for products marketed to the US/Canada

This device is intended only for OEM integrators under the following conditions:

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

### Important Note:

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.

### End Product Labeling

The final end product must be labeled in a visible area with the following" Contains FCC ID: 2AG4N-WIM1481"

### 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.

# Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

## 2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

## 2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

## 2.4 Limited module procedures

Not applicable

## 2.5 Trace antenna designs

Not applicable

## 2.6 RF exposure considerations

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

## 2.7 Antennas

This radio transmitter **FCC ID:2AG4N-WIM1481** has been approved by Federal Communications Commission 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.

Antenna No.	Model No. of antenna:	Type of antenna and Gain of the antenna (Max.)	Frequency range:
BLE	/	Antenna 1: 37mm wire antenna, 2.0dBi(Max.) Antenna 2: 150mm wire antenna, 1.5dBi(Max.) Antenna 3: 600mm wire antenna, 3.0dBi(Max.) Antenna 4: Stick antenna, 2.0dBi(Max.) Antenna 5: Ceramic antenna, 2.0dBi(Max.)	2400-2483.5MHz

## 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2AG4N-WIM1481**".

## 2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

## 2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

## ISED Statement

English: This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The digital apparatus complies with Canadian CAN ICES 3 (B)/NMB 3(B).

French: 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. L'appareil numérique du CIEM conforme canadien peut 3 (b) / nmb 3 (b).

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 2.5 du CNR - 102 et conformité avec RSS 102 de l'exposition aux RF, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs RF et la conformité.

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment.

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

## ISED Modular Usage Statement

NOTE 1: When the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use the wording "Contains transmitter module IC: 25222-WIM1481" or "Contains IC: 25222-WIM1481".

NOTE 1: Lorsque le numéro de certification ISED n'est pas visible lorsque le module est installé dans un autre appareil, l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut être libellée Contient le module émetteur IC: 25222-WIM1481 ou Contient IC: 25222-WIM1481.



CONNECTING THINGS TO LIFE

23282 Mill Creek Dr #340, Laguna Hills  
CA 92653, USA

Version 1.0