Bluetooth® Low Energy module

General description

The Infineon CYW20822-P4xxI040 is a fully integrated Bluetooth® Low Energy wireless module. It includes an onboard crystal oscillator, passive components, flash memory, and the CYW20822 silicon device.

CYW20822-P4xxI040 supports peripheral functions (ADC and PWM), UART, I²C, and SPI communication, and a PDM interface. CYW20822-P4xxI040 includes a royalty-free Bluetooth® stack compatible with Bluetooth® 5.0 core spec in a 20.2 × 10.5 × 2.3 mm package.

CYW20822-P4xxI040 includes 1 MB of embedded flash memory and is pre-loaded with EZ-Serial firmware.

CYW20822-P4xxI040 is fully qualified by Bluetooth® SIG and is targeted at applications requiring cost-optimized Bluetooth® wireless connectivity.

CYW20822-P4xxI040 is offered in two certified versions: CYW20822-P4TAI040 and CYW20822-P4EPI040. CYW20822-P4TAI040 includes an integrated trace antenna. CYW20822-P4EPI040 supports an external antenna through a RF solder pad output.

Features

CYW20822-P4xxI040 provides all necessary components required to operate Bluetooth® Low Energy communication standards.

- Proven ready-to-use hardware design

- Cost optimized for applications without space constraints

- Non-volatile memory for self-sufficient operation and over-the-air updates

- Bluetooth® SIG listed with QDID and declaration ID

- Fully certified module eliminates the time needed for design, development, and certification processes

- Pre-loaded EZ-Serial firmware provides an easy-to-use command interface to configure and use the module

- **Module description**
  - Module size: 20.2 × 10.5 × 2.3 mm
  - Bluetooth® 5.0 core specification qualified module
    - Declaration ID: **D065177**
  - Supports Bluetooth® 2 Mbps, 1 Mbps, 500 kbps, and 125 kbps
  - Supports Bluetooth® Low-Energy long-range (LE-LR)
  - Certified to FCC, ISED, MIC, and CE regulations
  - Castelated solder pad connections for ease-of-use
  - 1-MB embedded on-module serial flash memory
  - Up to 12 GPIOs
  - Temperature range: –45°C to +85°C
  - 16-MHz Arm® Cortex®-M0 microcontroller unit MCU
  - Maximum TX output power
    - +4 dBm for Bluetooth® Low Energy
    - Bluetooth® LE connection range of up to 250 meters at 4 dBm[1]
  - RX sensitivity:
    - Bluetooth® Low Energy: –101 dBm @ 125 kbps

- **Power consumption**
  - Bluetooth® LE current consumption
    - RX current: 1.3 mA @ -95 dBm
    - TX current: 3 mA @ 0 dBm

Features

- Retention: 2 µA @ 32 KB RAM

Hibernation: 0.8 µA

- **Functional capabilities**
  - 8 × 16-bit PWMs
  - 12 × GPIOs
  - Quadrature decoder
  - Analog comparator
  - 2× peripheral UART
  - 2× SPI
  - 2× I2C
  - ADC (10-bit application ADC with one differential input or three single-ended inputs)
  - Hardware security engine

Note
1. Connection range tested module-to-module in full line-of-sight environment, free of obstacles or interference sources with output power of +4 dBM @ 125 kbps. Actual range will vary based on end product design, environment, receive sensitivity, and transmit output power of the central device.

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1 Overview

1.1 Functional block diagram

Figure 1 illustrates CYW20822-P4xxI040 functional block diagram.

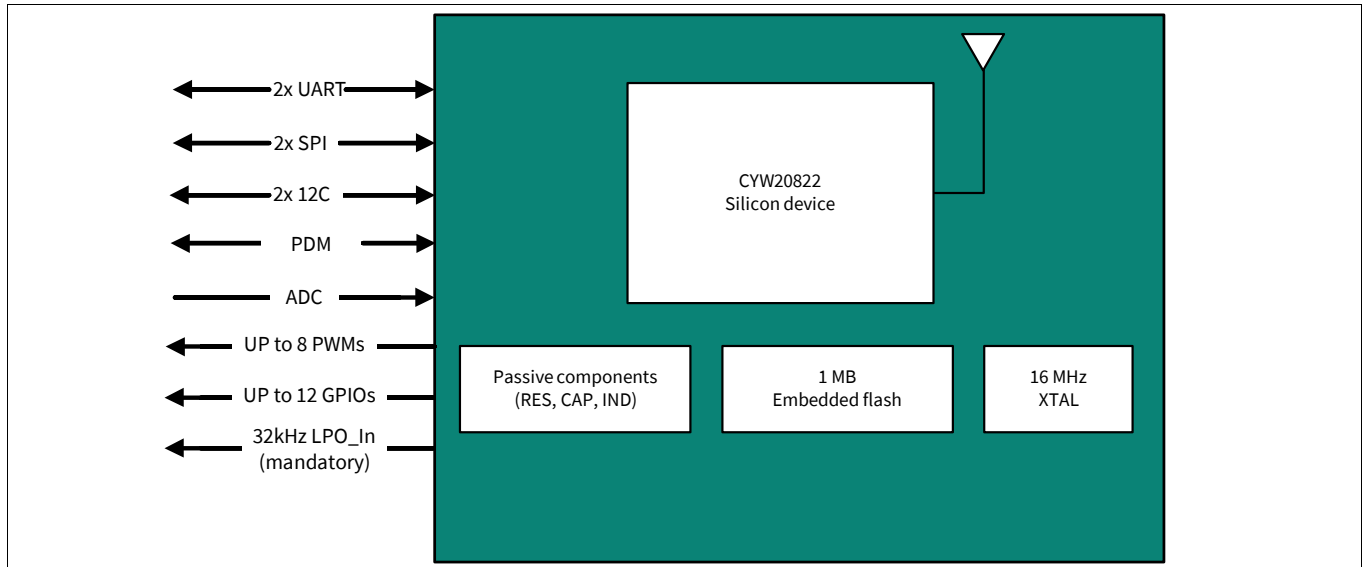**Figure 1**   **Functional block diagram (GPIOs)**

1.2 Module description

CYW20822-P4xxI040 module is a complete module designed to be soldered to the application's main board.

1.2.1 Module dimensions and drawing

Infineon reserves the right to select components from various vendors to achieve the Bluetooth® module functionality. Such selections will still guarantee that all mechanical specifications and module certifications are maintained. Designs should be held within the physical dimensions shown in the mechanical drawings in **Figure 2**. All dimensions are in millimeters (mm).

Table 1   **Module design dimensions**

Dimension item		Specification
Module dimensions	Length (X)	10.5 ± 0.15 mm
	Width (Y)	20.2 ± 0.15 mm
Antenna connection location dimensions	Length (X)	10.6 mm
	Width (Y)	6.35 mm
PCB thickness	Height (H)	0.80 ± 0.05 mm
Shield height	Height (H)	1.45-mm typical
Maximum component height	Height (H)	1.45-mm typical
Total module thickness (bottom of module to highest component)	Height (H)	2.3-mm typical

See **Figure 2** for the mechanical reference drawing for CYW20822-P4xxI040.


```
ANTENNA AREA

SHIELD (DETAIL DIMENSION REFER TO SPEC)

SEEN FROM TOP

0.80±0.10(PCB)

TYP.2.30(PCB+SHIELD)

SEEN FROM SIDE
```

```
(PCB/ANTENNA AREA)
10.50±0.15
7.10    6.35 (ANTENNA AREA)    7.10
27                              1
                        1.05
ø0.40
                0.70
                1.25              20.20±0.15 (PCB)
1.85
18                              10
17    1.50        11    1.85

SEEN FROM BOTTOM
```

MODULE PAD
ASSIGNMENT:

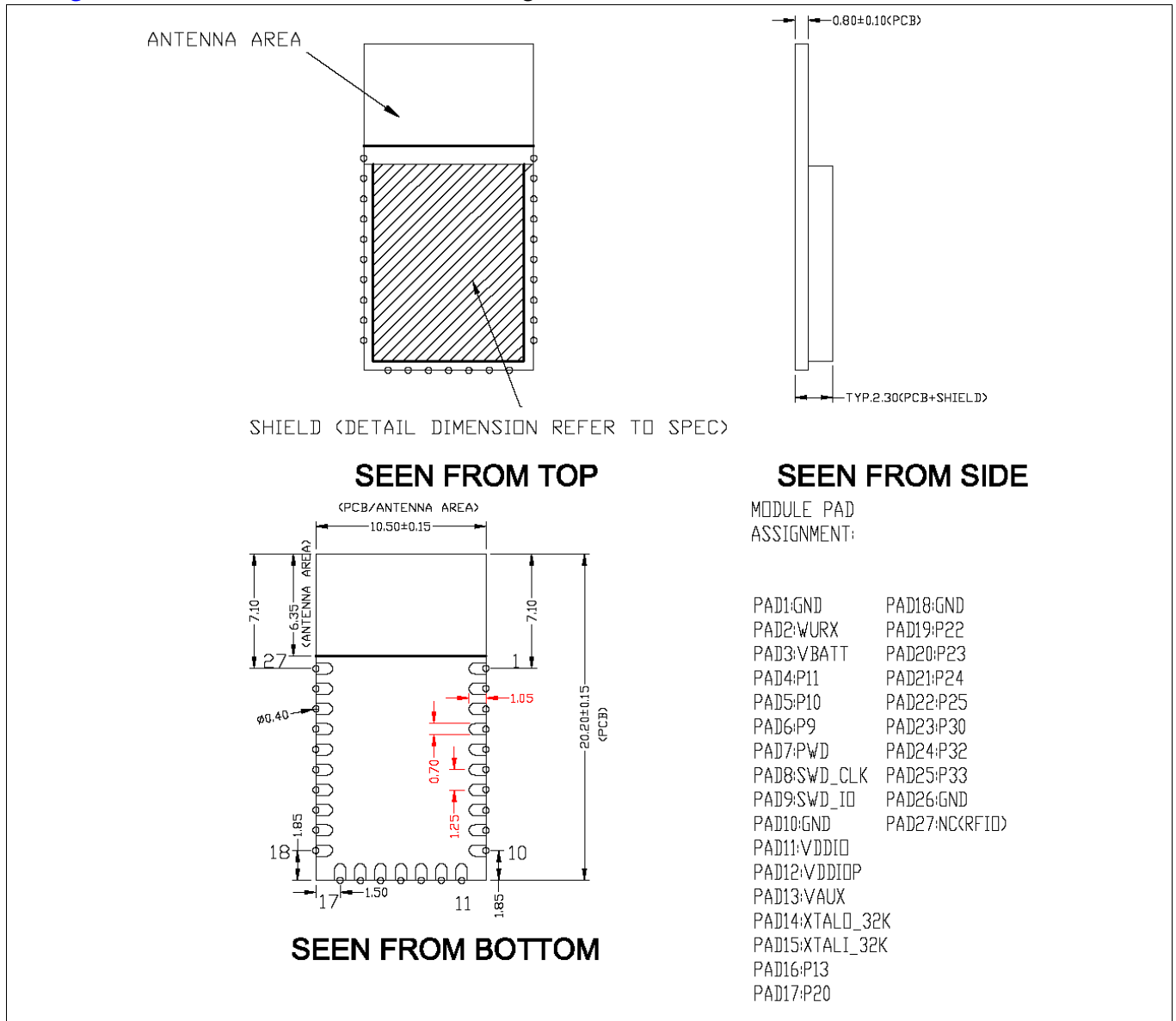|	
PAD1:GND	PAD18:GND
PAD2:WURX	PAD19:P22
PAD3:VBATT	PAD20:P23
PAD4:P11	PAD21:P24
PAD5:P10	PAD22:P25
PAD6:P9	PAD23:P30
PAD7:PWD	PAD24:P32
PAD8:SWD_CLK	PAD25:P33
PAD9:SWD_IO	PAD26:GND
PAD10:GND	PAD27:NC(RFIO)
PAD11:VDDIO	
PAD12:VDDIOP	
PAD13:VAUX	
PAD14:XTALO_32K	
PAD15:XTALI_32K	
PAD16:P13	
PAD17:P20	

Figure 2   Module mechanical drawing

2   Pad connection interface

As shown in the bottom view of **Figure 2**, CYW20822-P4xxI040 connects to the host board via solder pads on the backside of the module. **Table 2** and **Figure 3** detail the solder pad length, width, and pitch dimensions of CYW20822-P4xxI040 module.

Table 2   Connection description

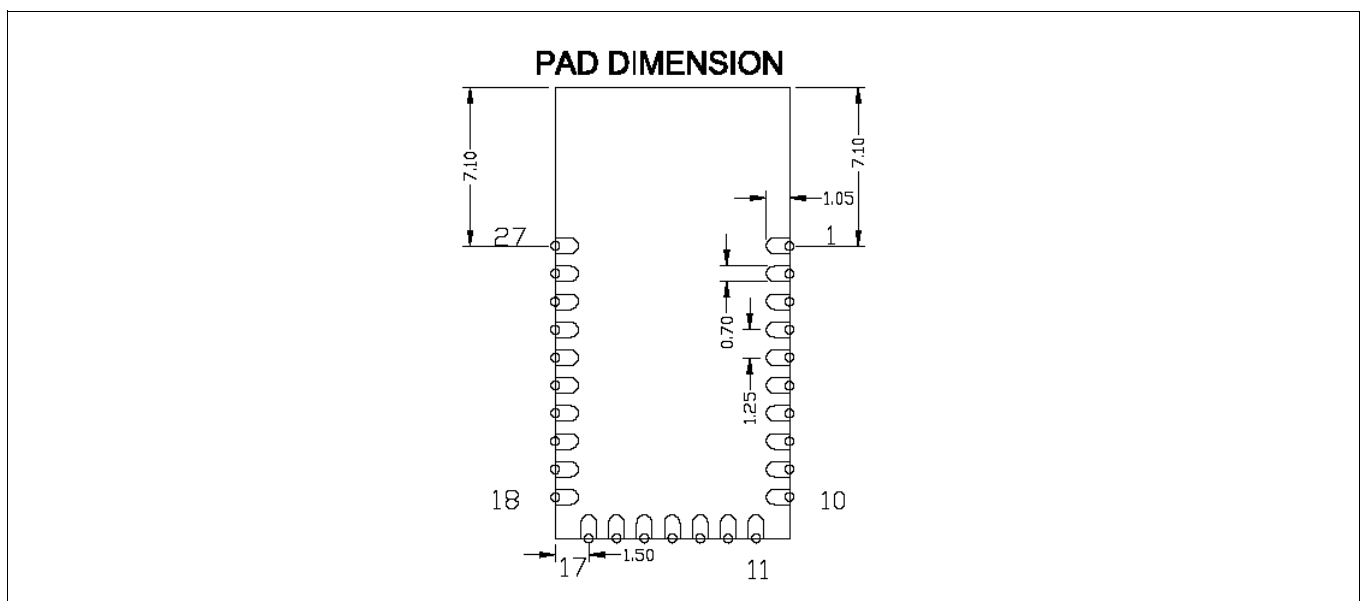| Part number	Name	Connections	Connection type	Pad length dimension	Pad width dimension	Pad pitch
CYW20822-P4TAI040	SP	27	Solder pads	1.05 mm	0.7 mm	1.25 mm
CYW20822-P4EPI040	SP	27	Solder pads	1.05 mm	0.7 mm	1.25 mm

Figure 3   Solder pad dimensions (seen from bottom)

To maximize RF performance, the host layout should follow these recommendations:

1. Antenna Area Keepout: The host board directly below the antenna area of the module (see **Figure 2**) must not contain ground or signal traces. This keepout area requirement applies to all layers of the host board.
2. Module Placement: The ideal placement of the Bluetooth® module is in a corner of the host board with the PCB trace antenna located at the far corner. This placement minimizes the additional recommended keepout area stated in item 2. See **AN96841** for module placement best practices.
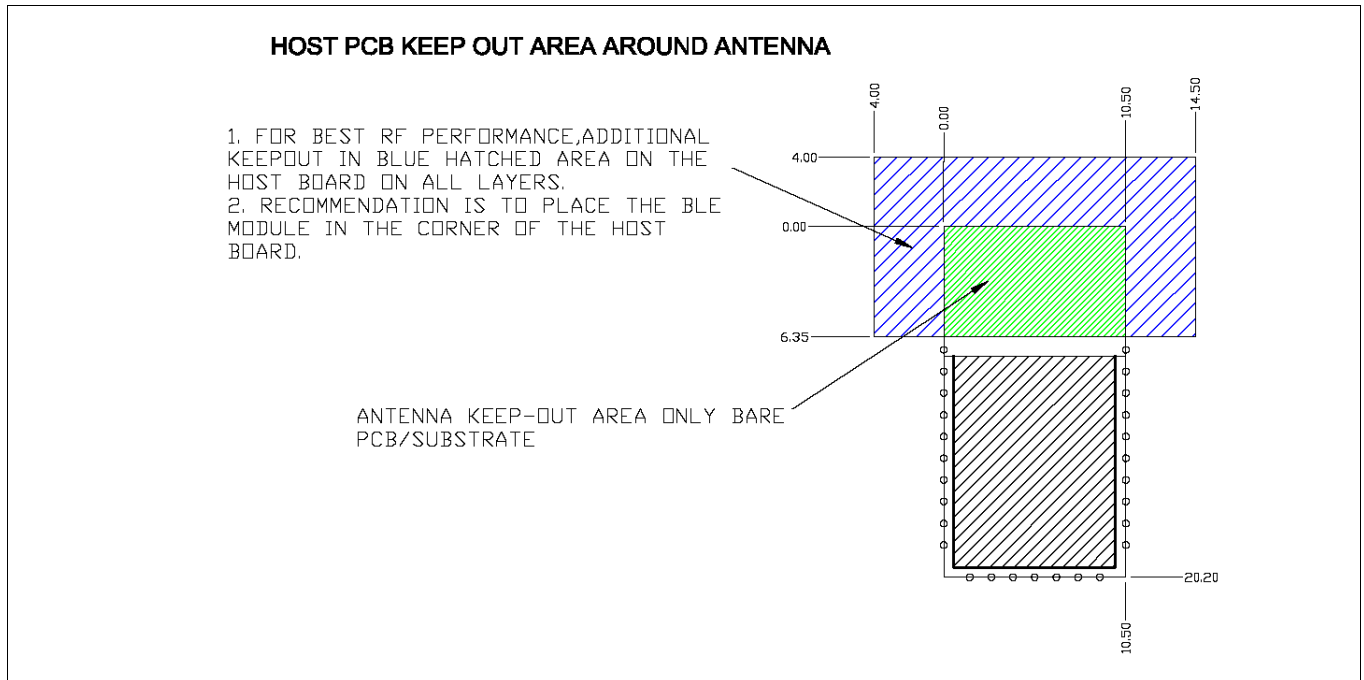
Figure 4 **Recommended host PCB keepout area around the CYW20822-P4xxI040 antenna**

3 Recommended host PCB layout

Figure 5, **Figure 6**, **Figure 7**, and **Table 3** provide details that can be used for the recommended host PCB layout pattern for the CYW20822-P4xxI040. Dimensions are in millimeters unless otherwise noted. The pad length of 1.26 mm (0.64 mm from center of the pad on either side) shown in **Figure 4** is the minimum recommended host pad length. The host PCB layout pattern can be completed using either **Figure 5**, **Figure 6**, or **Figure 7**. It is not necessary to use all figures to complete the host PCB layout pattern.
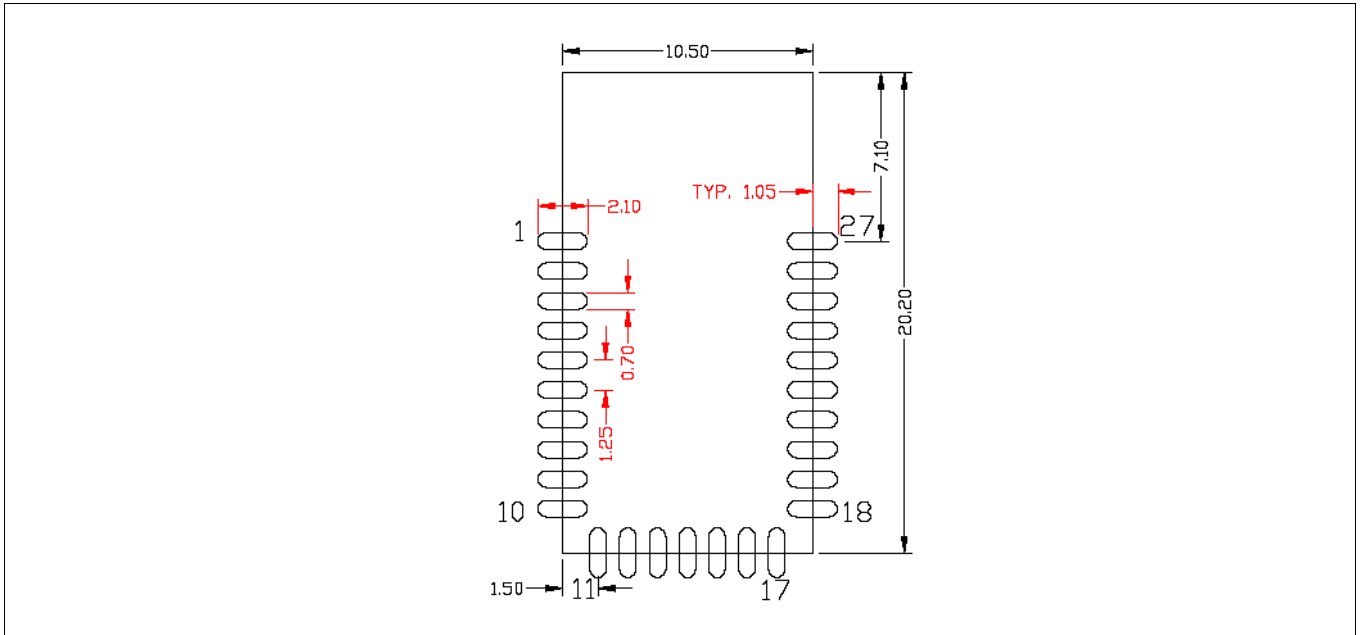

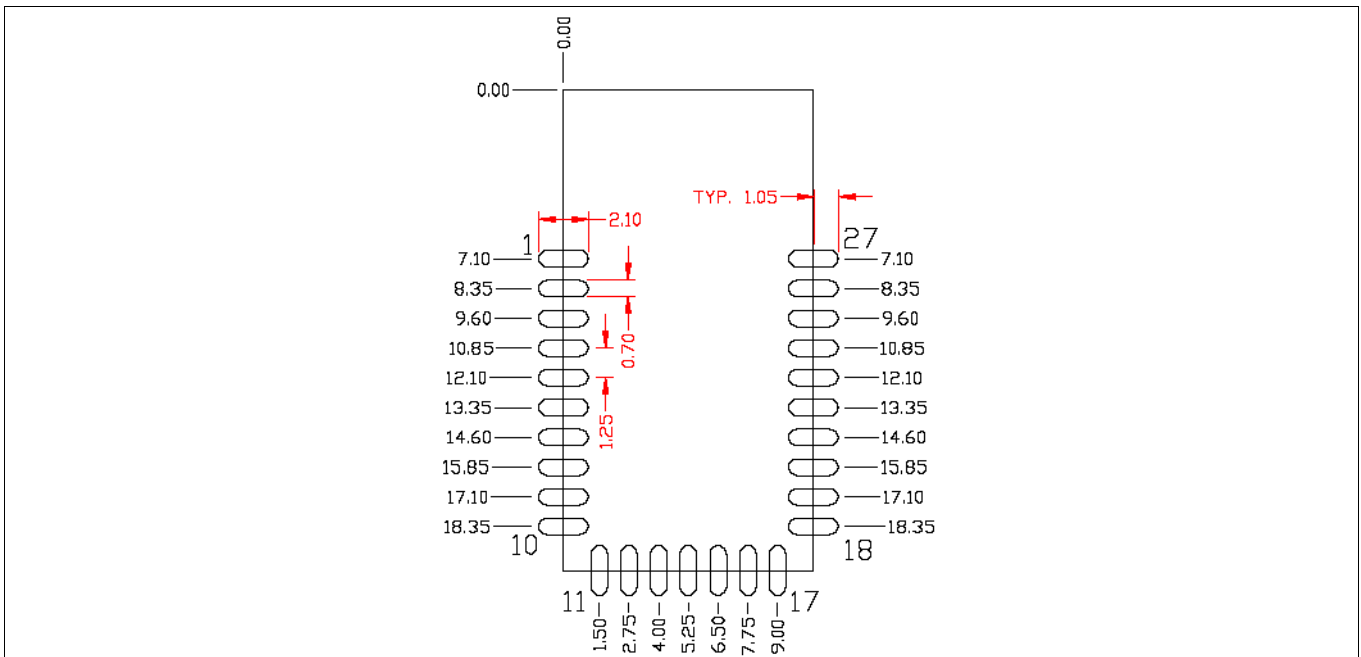**Figure 5**   **CYW20822-P4xxI040 host layout (dimensioned)**

Figure 6   **CYW20822-P4xxI040 host layout (relative to origin)**

Table 3 provides the center location for each solder pad on the CYW20822-P4xxI040. All dimensions are referenced to the center of the solder pad. See **Figure 7** for the location of each module solder pad.

Table 3   Module solder pad location

Solder pad (center of pad)	Location (X,Y) from origin (mm)	Dimension from origin (mil)
1	(0, 7.10)	(0, 279.53)
2	(0, 8.35)	(0, 328.74)
3	(0, 9.6)	(0, 377.95)
4	(0, 10.85)	(0, 427.16)
5	(0, 12.10)	(0, 476.38)
6	(0, 13.35)	(0, 525.59)
7	(0, 14.60)	(0, 574.80)
8	(0, 15.85)	(0, 624.01)
9	(0, 17.10)	(0, 673.23)
10	(0, 18.35)	(0, 722.44)
11	(1.5,20.20)	(59.06, 795.27)
12	(2.75,20.20)	(108.27, 795.27)
13	(4.00,20.20)	(157.48, 795.27)
14	(5.25,20.20)	(206.69, 795.27)
15	(6.50,20.20)	(255.91, 795.27)
16	(7.75,20.20)	(305.12, 795.27)
17	(9.00,20.20)	(354.33, 795.27)
18	(10.5,18.35)	(413.39, 722.44)
19	(10.5,17.10)	(413.39, 673.23)
20	(10.5,15.85)	(413.39, 624.01)
21	(10.5,14.60)	(413.39, 574.80)
22	(10.5,13.35)	(413.39, 525.59)
23	(10.5,12.10)	(413.39, 476.38)
24	(10.5,10.85)	(413.39, 427.16)
25	(10.5,9.6)	(413.39, 377.95)
26	(10.5,8.35)	(413.39, 328.74)
27	(10.5,7.10)	(413.39, 279.53)

Recommended host PCB layout

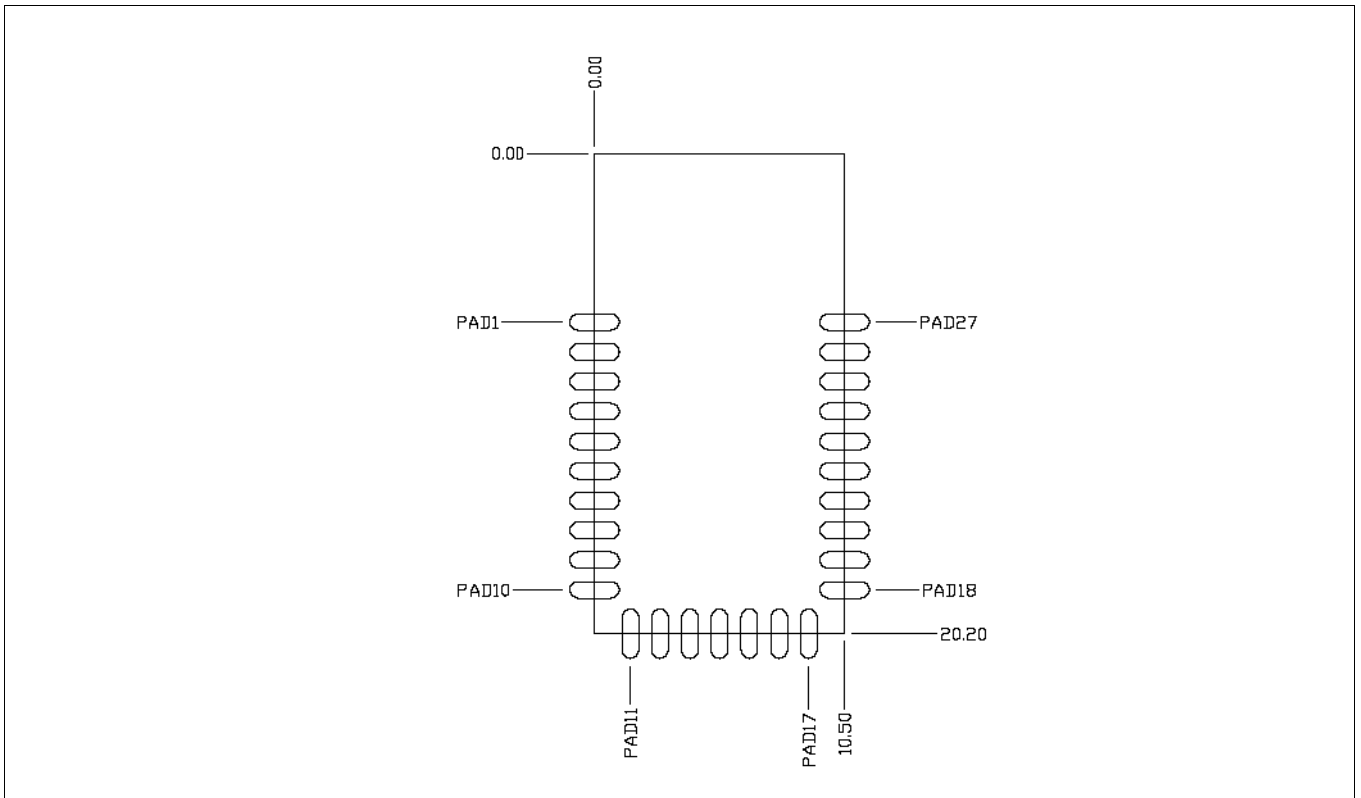**Figure 7**   **Solder pad reference location**

4 Functional description

CYW20822-P4XXI040 module is based on the CYW20822 SoC, which includes a Bluetooth® 5 solution and an RF wakeup receiver. The block diagram of the CYW20822-P4XXI040 module is shown in **Figure 8**.
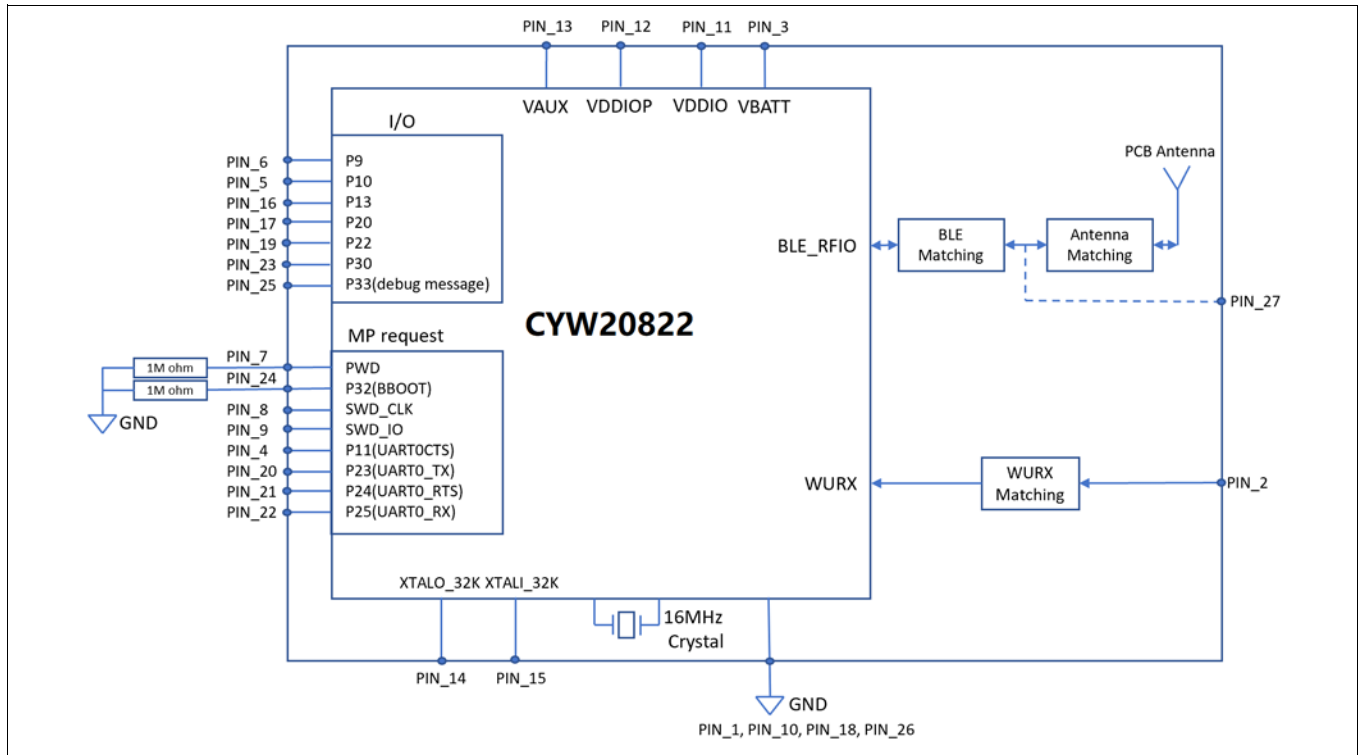

Figure 8   Module block diagram

4.1   Power management unit (PMU)

The PMU provides I/O power supplies to the CYW20822 module. It generates power supply outputs: VDDIOP, and an auxiliary supply VAUX used internally by the PMU (see **Table 4**).

Table 4   PMU external pins

Pin	Description
V_{BATT}	Battery input. Battery voltages from 1.1 V to 3.3 V can be used. Must be connected to a battery or external supply.
V_{DDIOP}	V_{DDIOP} is PMU generated 1.8 V IO supply output
V_{AUX}	Auxiliary supply output of typical value 3.2 V, used internally by the PMU
V_{DDIO}	Power supply input for digital and analog I/O circuits

The PMU provides multiple brownout interrupts to enable more reliable operation.

4.1.1 PMU configurations

Configure the PMU correctly to ensure correct operation. The following modes of operation are supported by the PMU:

- One external power supply or battery with external I/O supply:

- For applications that cannot support fixed 1.8 V I/O supply (see **Figure 9**).
  - Connect VBATT to VDDIO
  - Connect VAUX to VDDIOP
  - Disable I/O supply generation

GPIO voltage = VBATT
VBATT min = 1.8 V
VBATT max = 3.3 V

Figure 9   Regular battery, External I/O supply

- One external power supply or battery with internally generated I/O supply:

- For applications that can use a fixed 1.8 V I/O supply for better power consumption or VBATT ≤ 1.8 V (see **Figure 10**).
  - Connect VDDIOP to VDDIO

GPIO voltage = 1.8 V
VBATT min = 1.1 V
VBATT max = 3.3 V

Figure 10   Regular battery, internal I/O supply

4.1.2   4.1.2 32.768 kHz Crystal

The 32.768 kHz crystal MUST be used, ECS-.327-7-12R-TR from ECS (+/-20 ppm tolerance, 7 pF load capacitance, 70 kΩ maximum ESR) or alternate parts with same parameters.

5 Pin assignments

5.1 CYW20822-P4XXI040 module pinout

Figure 11   Module pin definition

Table 5   Pin type definitions

Pin type	Definition
I/O	Signal input output
RF	Radio frequency
PWR	Power supply
A	Analog
NC	No connection, must be open
GND	Ground

Pin assignments

Table 6 CYW20822-P4XXI040 module pin description

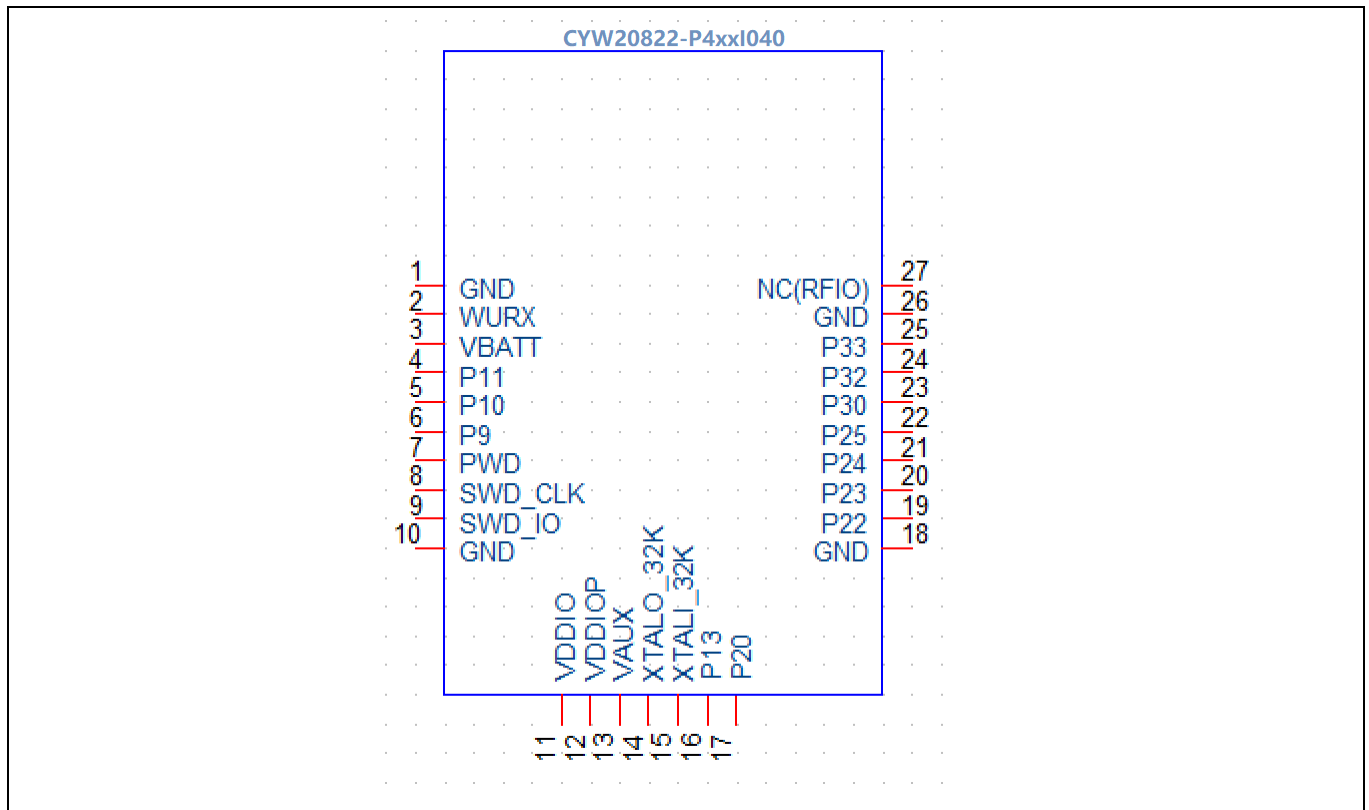| Pin number	Name	Type	Description
1	GND	PWR	Ground reference
2	WURX	RF	Wakeup receiver RF input
3	VBATT	PWR	Battery supply
4	P11	I/O	Programmable digital I/O ADC Input The default definition is UART0_CTS
5	P10	I/O	Programmable Digital I/O ADC input The default definition is SPIO_CS.
6	P9	I/O	Programmable digital I/O ADC Input The default definition is I2C0_SCK
7	PWD	I/O	Power down input (Active High) Must connect to a 1 MΩ pull-down resistor
8	SWD_CLK	I/O	Serial wire debug clock
9	SWD_IO	I/O	Serial wire debug data
10	GND	PWR	Ground reference
11	VDDIO	PWR	Digital I/O power supply input
12	VDDIOP	PWR	1.8 V I/O power supply output generated by switcher, connected to VAUX if unused
13	VAUX	PWR	Reserved for switching regulator internal use
14	XTALO_32k	A	32.768 kHz crystal oscillator output
15	XTALI_32k	A	32.768 kHz crystal oscillator input
16	P13	I/O	Programmable digital I/O The default definition is SPI0_MISO
17	P20	I/O	Programmable digital I/O The default definition is SPIO_CLK.
18	GND	PWR	Ground reference
19	P22	I/O	Programmable digital I/O The default definition is SPIO_MOSI
20	P23	I/O	Programmable digital I/O The default definition is UART0_TX
21	P24	I/O	Programmable digital I/O The default definition is UART0_RTS
22	P25	I/O	Programmable digital I/O The default definition is UART0_RX
23	P30	I/O	Programmable digital I/O The default definition is I2C0_SDA
24	P32	I/O	Programmable digital I/O BBoot , must connect to a 1 MΩ pull-down resistor
25	P33	I/O	Programmable digital I/O The default definition is UART1_TX, to provide SW debug message output
26	GND	PWR	Ground reference
27	NC (RFIO)	NC	No connection Reserved for 2.4 GHz Single-ended RF I/O for Bluetooth® radio external antenna connection (50 Ω)

6 Electrical characteristics

Table 7   Maximum electrical ratings

Parameter	Description	Min	Typ	Max	Unit
V_{BATT}	Battery supply[2]	–0.2	–	3.4	V
V_{DDIO}	I/O supply	–0.2	–	3.4	V
V_{IO}	I/O pin	–0.2	–	3.4	V
T_{STORE}	Storage temperature	–40	–	+85	°C

Table 8   Recommended operating conditions

Parameter	Description	Min	Typ	Max	Unit
V_{DDIO}	I/O supply	1.7	1.8	3.3	V
V_{BATT}	Battery supply	1.1[3]	–	3.3	V
V_{PP25}	OTP programming voltage[4]	2.3	2.5	2.7	V
V_{IO}	I/O pin	–0.2		V_{DDIO} + 0.2	V
	Crystal Osc - 32.768 kHz	–500		500	ppm
T_J	Operating junction temperature	–40	25	+85	°C

Table 9   GPIO characteristics

Parameter	Description	Min	Typ	Max	Unit
V_{IH}	Input	V_{IO}–0.5	V_{IO}	V_{IO}	V
V_{IL}	Input	–0.2	0	0.2	
V_{OH}	Output (2 mA load)	–	V_{IO}–0.2	–	
V_{OL}	Output (2 mA load)	–	0.2	–	

Table 10   Power consumption

Parameter	Conditions	Min	Typ	Max	Unit
Active RX	Sensitivity at -95 dBm	–	1.3	–	mA
Active TX @ 4 dBm	Output power at 4 dBm	–	4	–	mA
Active TX @ 0 dBm	Output power at 0 dBm	–	3	–	mA
Active TX @ -10 dBm	Output power at -10 dBm	–	1.4	–	mA
Retention (32-KB RAM)	1-second connection interval in low power idle mode	–	2	–	µA
Hibernation	–	–	0.8	–	µA
Hibernation with wakeup receiver		–	0.95	–	µA
SoC off		–	300	–	µA

Notes
2. VBATT minimum slew rate is 0.3 V/ms.
3. VBATT minimum supply after boot is 1.0 V.
4. VPP25 is physically connected to VDDIO. Set VDDIO to within VPP25 range when programming the OTP.

7   PCB antenna performance

7.1   Trace antenna specifications

Item	Description
Frequency range	2400-2500 MHz
Peak gain	4.21-dBi typical
Return loss	10 dB minimum

7.2   Trace antenna performance

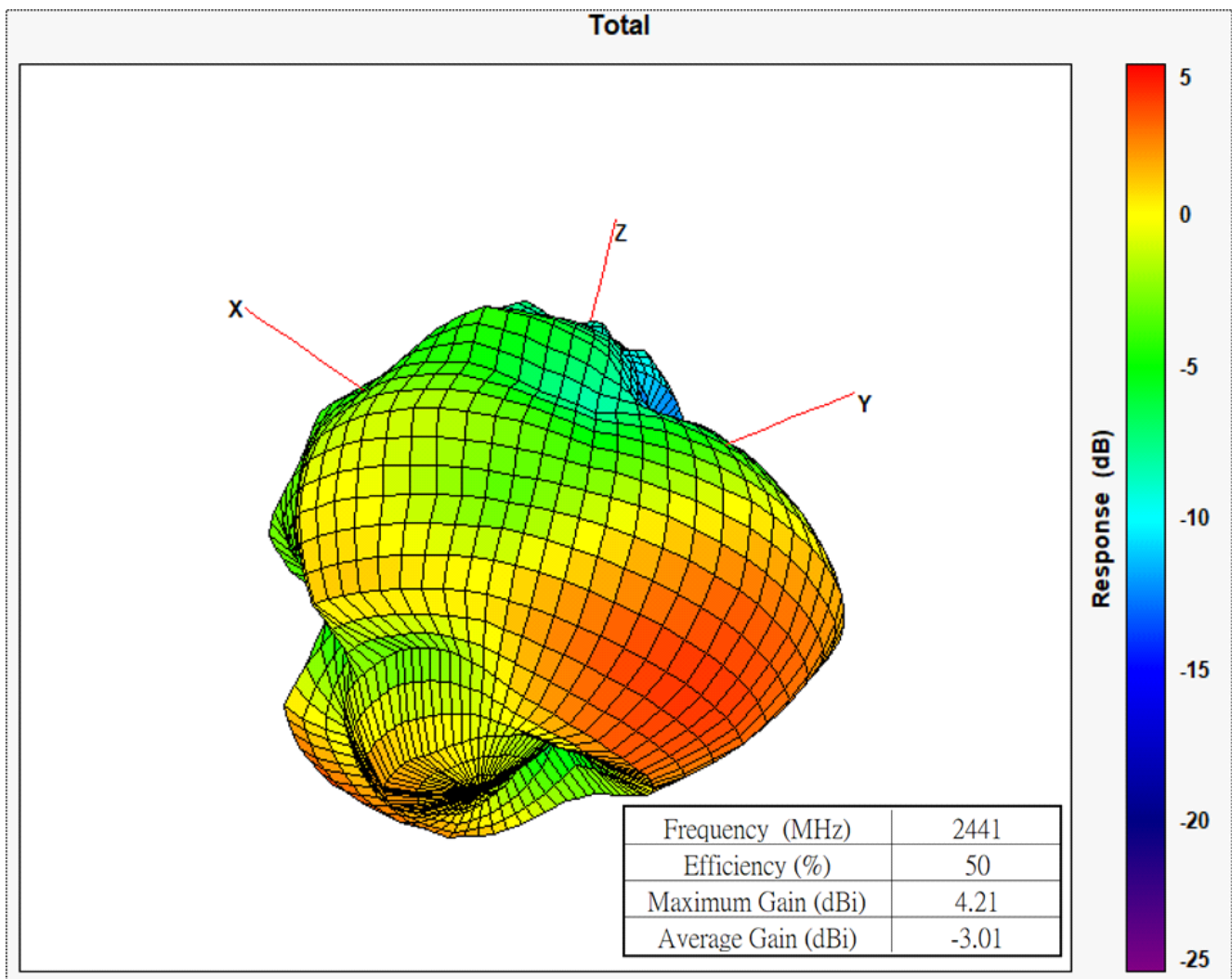| Frequency (MHz)	2441
Efficiency (%)	50
Maximum Gain (dBi)	4.21
Average Gain (dBi)	-3.01

Figure 12   CYW20822-P4XXI040 PCB antenna radiation pattern and characteristics

External antenna performance

Table 7-1   External antenna performance: pulse W1010

Frequency (GHz)	Gain (dBi)	Impedance (nom)	VSWR	Polarization	Electric length	Radiation
2.4 - 2.5	2	50 Ω	≤ 2.0	Vertical	1/4, Di-pole	Omni

8 Environmental specifications

8.1 Environmental compliance

CYW20822-P4xxI040 Bluetooth® LE module is produced in compliance with the Restriction of Hazardous substances (RoHS) and halogen-free (HF) directives. The Infineon module and components used to produce this module are RoHS and HF-compliant.

8.2 RF certification

CYW20822-P4xxI040 module will be certified under the following RF certification standards at production release.

- FCC: WAP822I04

- CE

- ISED: 7922A-822I04

- MIC: 218-230142

8.3 Safety certification

CYW20822-P4xxI040 module complies with the following safety regulations:

- Underwriters Laboratories, Inc. (UL): Filing E331901

- CSA

- TUV

8.4 Environmental conditions

Table 11 describes the operating and storage conditions for the Bluetooth® LE module.

Table 11   Environmental conditions for CYW20822-P4xxI040

Description	Minimum specification	Maximum specification
Operating temperature	–45°C	85°C
Operating humidity (relative, non-condensation)	5%	85%
Thermal ramp rate	–	3°C/minute
Storage temperature	–40 °C	85°C
Storage temperature and humidity	–	85°C at 85%
ESD: Module integrated into end system components[5]	–	15 kV Air 2.0 kV Contact

8.5 ESD and EMI protection

The exposed components require special attention to ESD and electromagnetic interference (EMI).

A grounded conductive layer inside the device enclosure is suggested for EMI and ESD performance. Any openings in the enclosure near the module should be surrounded by a grounded conductive layer to provide ESD protection and a low-impedance path to ground.

Device handling: Proper ESD protocol must be followed in manufacturing to ensure component reliability.

Note

5. This does not apply to the RF pins (ANT).

9   Regulatory information

9.1   FCC

FCC NOTICE:

The device CYW20822-P4xxI040 complies with Part 15 of the FCC Rules. The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.transmitter 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.

CAUTION:

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Infineon may void the user's authority to operate the equipment.

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

This module is only FCC authorized for the specific rule FCC 15.247 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, final host product requires Part 15 Subpart B compliance testing with the modular transmitter installed.

LABELING REQUIREMENTS:

The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Infineon FCC identifier for this product as well as the FCC Notice above. The FCC identifier is FCC ID: WAP822I04.

In any case the end product must be labeled exterior with "Contains FCC ID: WAP822I04".

ANTENNA WARNING:

This device is tested with a standard SMA connector and with the antenna listed in **Table 7**. When integrated in the OEMs product, these fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Any antenna not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions.

RF EXPOSURE:

To comply with FCC RF Exposure requirements, the Original Equipment Manufacturer (OEM) must ensure to install the approved antenna in the previous.

The preceding statement must be included as a CAUTION statement in manuals, for products operating with the approved antenna in **Table 7**, to alert users on FCC RF Exposure compliance. Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.

The radiated output power of CYW20822-P4xxI040 with the trace antenna is far below the FCC radio frequency exposure limits. Nevertheless, use CYW20822-P4xxI040 in such a manner that minimizes the potential for human contact during normal operation.

SAR is not required for this module if the distance is greater than 10 mm from the user.

End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 10 mm between the radiator and your body.

9.2 ISED

Innovation, Science and Economic Development Canada (ISED) Certification

CYW20822-P4xxI040 is licensed to meet the regulatory requirements of Innovation, Science and Economic Development Canada (ISED),

License: IC: 7922A-822I04

Manufacturers of mobile, fixed, or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from **www.ic.gc.ca**.

This device has been designed to operate with the antennas listed in **Table 7**, having a maximum gain of –0.5 dBi. Antennas not included in this list or having a gain greater than –0.5 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

ISED NOTICE:

The device CYW20822-P4xxI040 including the built-in trace antenna complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-GEN. 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.

L'appareil CYW20822-P4xxI040, y compris l'antenne intégrée, est conforme aux Règles RSS-GEN de Canada. L'appareil répond aux exigences d'approbation de l'émetteur modulaire tel que décrit dans RSS-GEN. L'opération est soumise aux deux conditions suivantes: (1) Cet appareil ne doit pas causer d'interférences nuisibles, et (2) Cet appareil doit accepter toute interférence reçue, y compris les interférences pouvant entraîner un fonctionnement indésirable.

ISED INTERFERENCE STATEMENT FOR CANADA

The antenna of this transmitter must provide a separation distance of at least 10 mm from all persons. Installers and end-users

must be provided with antenna installation instructions and transmitter operating conditions and instructions for satisfying RF

exposure compliance.

Compliance of this device in all final product configurations is the responsibility of the Grantee.

Installation of this device into specific final products may require the submission of a Class II permissive change application, containing data pertinent to RF Exposure, emissions and host/module authentication, or new appli-

cation if appropriate. The final product operating with this transmitter must include operating instructions and antenna installation instructions, for end-users and installers to satisfy RF exposure compliance requirements.

L'antenne de cet émetteur doit fournir une distance de séparation d'au moins 10 mm par rapport à toutes les personnes. Les installateurs et les utilisateurs finaux doivent recevoir les instructions d'installation de l'antenne ainsi que les conditions d'utilisation de l'émetteur et les instructions pour satisfaire à la conformité à l'exposition aux radiofréquences.

La conformité de cet appareil dans toutes les configurations de produit final est la responsabilité du bénéficiaire.

L'installation de cet appareil dans des produits finaux spécifiques peut nécessiter la soumission d'une demande de modification permissive de classe II, contenant des données pertinentes sur l'exposition RF, les émissions et l'authentification hôte / module, ou une nouvelle application, le cas échéant. Le produit final fonctionnant avec cet émetteur doit inclure des instructions d'utilisation et des instructions d'installation de l'antenne, pour les utilisateurs finaux et les installateurs afin de satisfaire aux exigences deconformité en matière d'exposition aux RF.

Cet appareil est conforme à la norme sur l'innovation, la science et le développement économique (ISED) norme RSS exempte 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.

ISED RADIATION EXPOSURE STATEMENT FOR CANADA

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 15 mm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux radiations ISED prévues pour un environnement incontrôlé. Cet équipement doit être installé et utilisé avec un minimum de 15 mm de distance entre la source de rayonnement et votre corps.

LABELING REQUIREMENTS:

The Original Equipment Manufacturer (OEM) must ensure that ISED labeling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Infineon IC identifier for this product as well as the ISED Notices above. The IC identifier is 7922A-822I04. In any case, the end product must be labeled in its exterior with "Contains IC: 7922A-822I04"

9.3 European declaration of conformity

Hereby, Infineon declares that the Bluetooth® module CYW20822-P4xxI040 complies with the essential requirements and other relevant provisions of Directive 2014. As a result of the conformity assessment procedure described in Annex III of the Directive 2014, the end-customer equipment should be labeled as follows:

All versions of the CYW20822-P4xxI040 in the specified reference design can be used in the following countries: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, The Netherlands, the United Kingdom, Switzerland, and Norway.

9.4   MIC Japan

CYW20822-P4xxI040 is certified as a module (certification number 218-230142). End products that integrate CYW20822-P4xxI040 do not need additional MIC Japan certification for the end product.

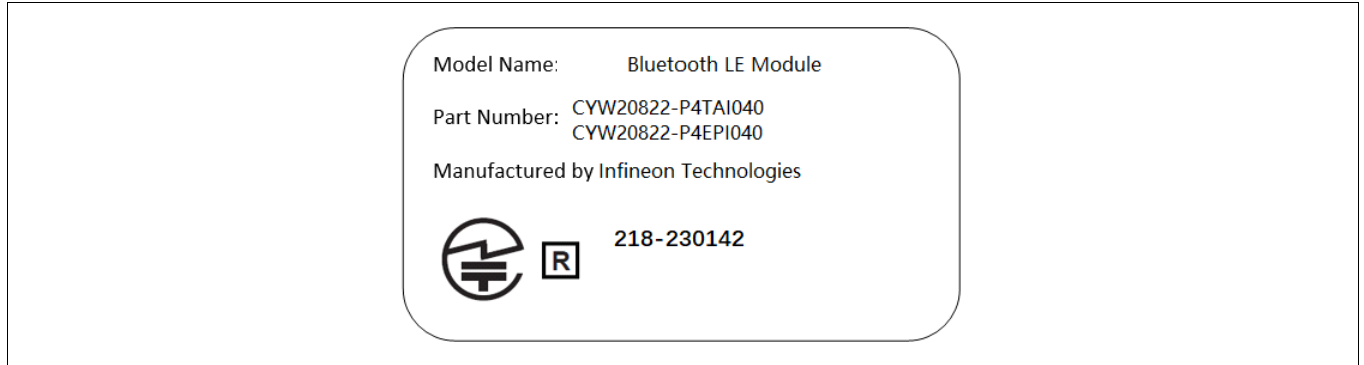End product can display the certification label of the embedded module.

Figure 13   MIC label

10   Packaging

Table 12   Solder reflow peak temperature

Module part number	Package	Maximum peak temperature	Maximum time at peak temperature	No. of cycles
CYW20822-P4TAI040	27-pad SMT	260°C	30 s	2
CYW20822-P4EPI040	27-pad SMT	260°C	30 s	2

Table 13   Package moisture sensitivity level (MSL), IPC/JEDEC J-STD-2

Module part number	Package	MSL
CYW20822-P4TAI040	27-pad SMT	MSL 3
CYW20822-P4EPI040	27-pad SMT	MSL 3

The CYW20822-P4xxI040 is offered in tape and reel packaging. **Figure 14** details the tape dimensions used for the CYW20822-P4xxI040.
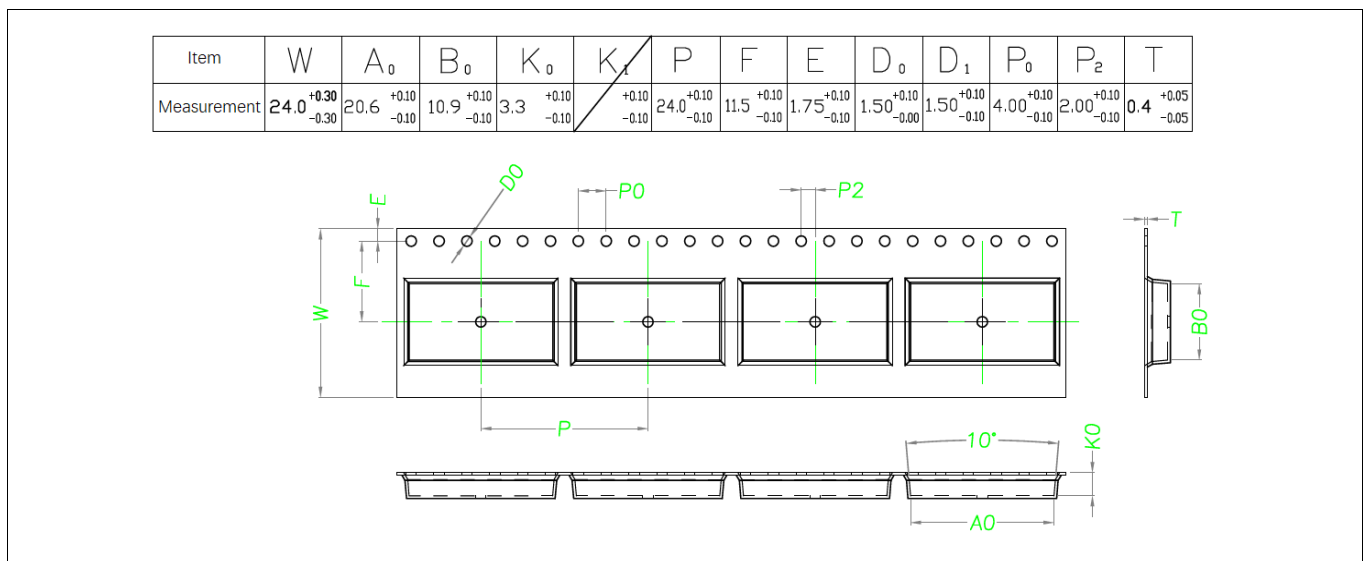

Item	W	A_0	B_0	K_0	K_1	P	F	E	D_0	D_1	P_0	P_2	T
Measurement	$24.0^{+0.30}_{-0.30}$	$20.6^{+0.10}_{-0.10}$	$10.9^{+0.10}_{-0.10}$	$3.3^{+0.10}_{-0.10}$	$^{+0.10}_{-0.10}$	$24.0^{+0.10}_{-0.10}$	$11.5^{+0.10}_{-0.10}$	$1.75^{+0.10}_{-0.10}$	$1.50^{+0.10}_{-0.00}$	$1.50^{+0.10}_{-0.10}$	$4.00^{+0.10}_{-0.10}$	$2.00^{+0.10}_{-0.10}$	$0.4^{+0.05}_{-0.05}$

Figure 14   CYW20822-P4xxI040 tape dimensions

Figure 15 details the orientation of the CYW20822-P4xxI040 in the tape as well as the direction for unreeling.
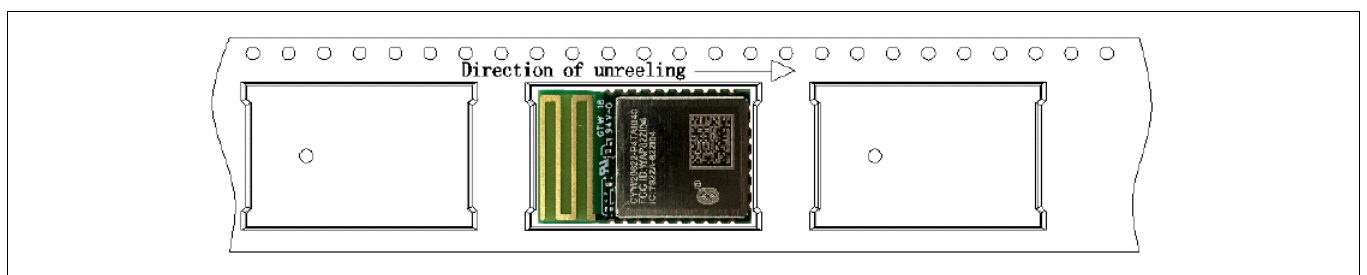

Figure 15   Component orientation in tape and unreeling direction

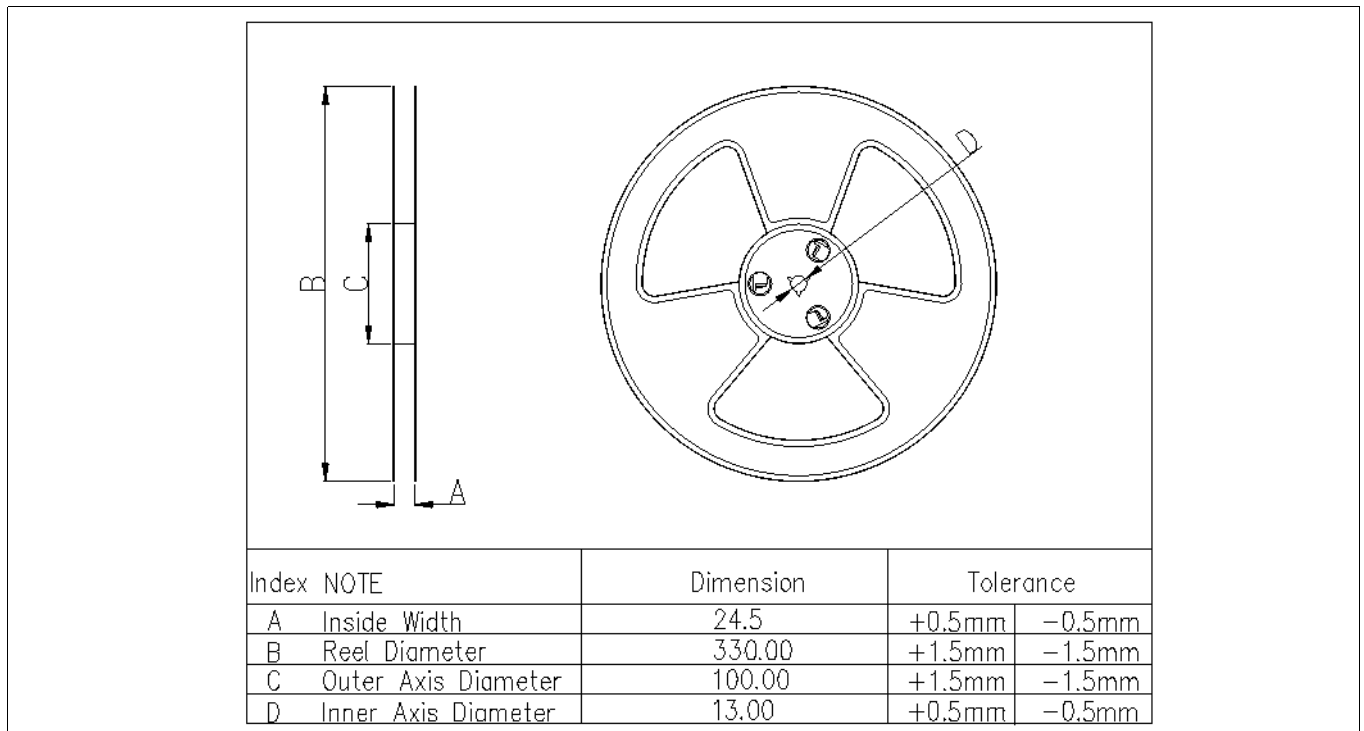Figure 16 details reel dimensions used for the CYW20822-P4xxI040.

Index	NOTE	Dimension	Tolerance	
A	Inside Width	24.5	+0.5mm	−0.5mm
B	Reel Diameter	330.00	+1.5mm	−1.5mm
C	Outer Axis Diameter	100.00	+1.5mm	−1.5mm
D	Inner Axis Diameter	13.00	+0.5mm	−0.5mm

Figure 16　　　Reel dimensions

11 Ordering information

Table 14 lists the CYW20822-P4xxI040 part number and features. **Table 15** lists the reel shipment quantities for the CYW20822-P4xxI040.

Table 14 Ordering information

Product	CPU speed (MHz)	Flash size (MB)	RAM size (KB)	UART	I^{2}C	PWM	Antenna	Package	Packaging
CYW20822-P4TAI040	16	1	128	Yes	Yes	8	Trace	27-SMT	Tape and reel
CYW20822-P4EPI040	16	1	128	Yes	Yes	8	Pad	27-SMT	Tape and reel

Table 15 Tape and reel package quantity and minimum order amount

Description	Minimum reel quantity	Maximum reel quantity	Comments
Reel quantity	500	500	Ships in 500 unit reel quantities
Minimum order quantity (MOQ)	500	–	–
Order increment (OI)	500	–	–

CYW20822-P4xxI040 is offered in tape and reel packaging. CYW20822-P4xxI040 ships in a reel size of 500.

12 Acronyms

Table 16   Acronyms used in this document

Acronym	Description
ADC	analog-to-digital converter
ADV	advertising
ALU	arithmetic logic unit
AMUXBUS	analog multiplexer bus
API	application programming interface
Arm®	advanced RISC machine, a CPU architecture
BLE	Bluetooth® Low Energy
Bluetooth® SIG	Bluetooth® Special Interest Group
BW	bandwidth
CAN	Controller Area Network, a communications protocol
CE	European Conformity
CMRR	common-mode rejection ratio
CPU	central processing unit
CRC	cyclic redundancy check, an error-checking protocol
CSA	Canadian Standards Association
ECC	error correcting code
ECO	external crystal oscillator
EEPROM	electrically erasable programmable read-only memory
EMI	electromagnetic interference
EMIF	external memory interface
EOC	end of conversion
EOF	end of frame
ESD	electrostatic discharge
FCC	Federal Communications Commission
FET	field-effect transistor
FIR	finite impulse response, see also IIR
FPB	flash patch and breakpoint
FS	full-speed
GPIO	general-purpose input/output, applies to a PSoC pin
HCI	host controller interface
HVI	high-voltage interrupt, see also LVI, LVD
I/O	input/output, see also GPIO, DIO, SIO, USBIO
I2C, or IIC	Inter-Integrated Circuit, a communications protocol
IC	integrated circuit
IC	Industry Canada
IDAC	current DAC, see also DAC, VDAC
IDE	integrated development environment
IIR	infinite impulse response, see also FIR

Table 16 **Acronyms used in this document** *(continued)*

Acronym	Description
ILO	internal low-speed oscillator, see also IMO
IMO	internal main oscillator, see also ILO
INL	integral nonlinearity, see also DNL
IPOR	initial power-on reset
IPSR	interrupt program status register
IRQ	interrupt request
ITM	instrumentation trace macrocell
KC	Korea Certification
LCD	liquid crystal display
LIN	Local Interconnect Network, a communications protocol.
LNA	low noise amplifier
LR	link register
LUT	lookup table
LVD	low-voltage detect, see also LVI
LVI	low-voltage interrupt, see also HVI
LVTTL	low-voltage transistor-transistor logic
MAC	multiply-accumulate
MCU	microcontroller unit
MIC	Ministry of Internal Affairs and Communications (Japan)
MISO	master-in slave-out
NC	no connect
NMI	nonmaskable interrupt
NRZ	non-return-to-zero
NVIC	nested vectored interrupt controller
NVL	nonvolatile latch, see also WOL
Opamp	operational amplifier
PA	power amplifier
PAL	programmable array logic, see also PLD
PC	program counter
PCB	printed circuit board
PGA	programmable gain amplifier
PHUB	peripheral hub
PHY	physical layer
PICU	port interrupt control unit
PLA	programmable logic array
PLD	programmable logic device, see also PAL
PLL	phase-locked loop
PMDD	package material declaration data sheet
POR	power-on reset
PRES	precise power-on reset

Table 16   Acronyms used in this document *(continued)*

Acronym	Description
PRS	pseudo random sequence
PS	port read data register
PSoC®	Programmable System-on-Chip
PSRR	power supply rejection ratio
PWM	pulse-width modulator
QDID	qualification design ID
RAM	random-access memory
RISC	reduced-instruction-set computing
RMS	root-mean-square
RTC	real-time clock
RTL	register transfer language
RTR	remote transmission request
RX	receive
S/H	sample and hold
SAR	successive approximation register
SC/CT	switched capacitor/continuous time
SCL	I2C serial clock
SDA	I2C serial data
SINAD	signal to noise and distortion ratio
SIO	special input/output, GPIO with advanced features. See GPIO.
SMT	surface-mount technology; a method for producing electronic circuitry in which the components are placed directly onto the surface of PCBs
SOC	start of conversion
SOF	start of frame
SPI	Serial Peripheral Interface, a communications protocol
SR	slew rate
SRAM	static random access memory
SRES	software reset
STN	super twisted nematic
SWD	serial wire debug, a test protocol
SWV	single-wire viewer
TD	transaction descriptor, see also DMA
THD	total harmonic distortion
TIA	transimpedance amplifier
TN	twisted nematic
TRM	technical reference manual
TTL	transistor-transistor logic
TUV	Germany: Technischer Überwachungs-Verein (Technical Inspection Association)
TX	transmit
UART	Universal Asynchronous Transmitter Receiver, a communications protocol

Table 16   **Acronyms used in this document** *(continued)*

Acronym	Description
UDB	universal digital block
USB	Universal Serial Bus
USBIO	USB input/output, PSoC pins used to connect to a USB port
VDAC	voltage DAC, see also DAC, IDAC
WDT	watchdog timer
WOL	write once latch, see also NVL
WRES	watchdog timer reset
XRES	external reset I/O pin
XTAL	crystal

13 Document conventions

13.1 Units of measure

Table 17 Units of measure

Symbol	Unit of measure
°C	degrees celsius
dB	decibel
dBm	decibel-milliwatts
fF	femtofarads
Hz	hertz
KB	1024 bytes
kbps	kilobits per second
Khr	kilohour
kHz	kilohertz
kΩ	kilo ohm
ksps	kilosamples per second
LSB	least significant bit
Mbps	megabits per second
MHz	megahertz
MΩ	mega-ohm
Msps	megasamples per second
µA	microampere
µF	microfarad
µH	microhenry
µs	microsecond
µV	microvolt
µW	microwatt
mA	milliampere
ms	millisecond
mV	millivolt
nA	nanoampere
ns	nanosecond
nV	nanovolt
Ω	ohm
pF	picofarad
ppm	parts per million
ps	picosecond
s	second
sps	samples per second
sqrtHz	square root of hertz
V	volt

14 References

Infineon provides a wealth of data at **www.infineon.com** to help you to select the right module for your design, and to help you to quickly and effectively integrate the module into your design.

- Module:
  - **CYW20822-P4TAI040**
  - **CYW20822-P4EPI040**

- Development kits:
  - **CYW920822M2P4TAI040-EVK**, CYW20822-P4TAI040 evaluation board
  - **CYW920822M2P4EPI040-EVK**, CYW20822-P4EPI040 evaluation board

- EZ-Serial firmware:
  - User guide of EZ-Serial firmware for CYW20822-P4xxI040

- Knowledge base articles
  - **KBA97095** - AIROC™ Bluetooth® module placement
  - **KBA213976** - FAQ for Bluetooth® LE and regulatory certifications with EZ-BLE modules
  - **KBA210802** - Queries on Bluetooth® LE qualification and declaration processes
  - **KBA218122** - 3D Model Files for EZ-BLE/EZ-BT modules

- Technical support

Visit **Infineon community** the developer community offers you a place to learn, share, and engage with both Infineon experts and other embedded engineers around the world. Visit our **support** page and contact a **local sales representatives**.

Revision history

Document revision	Date	Description of changes
*B	2023-10-12	Publish to web.
*C	2024-03-01	Updated the following: • **General description** • **Module description** • **References**

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