



Datasheet

CBTMN10

Multiprotocol BLE, ANT, 2.4 GHz module

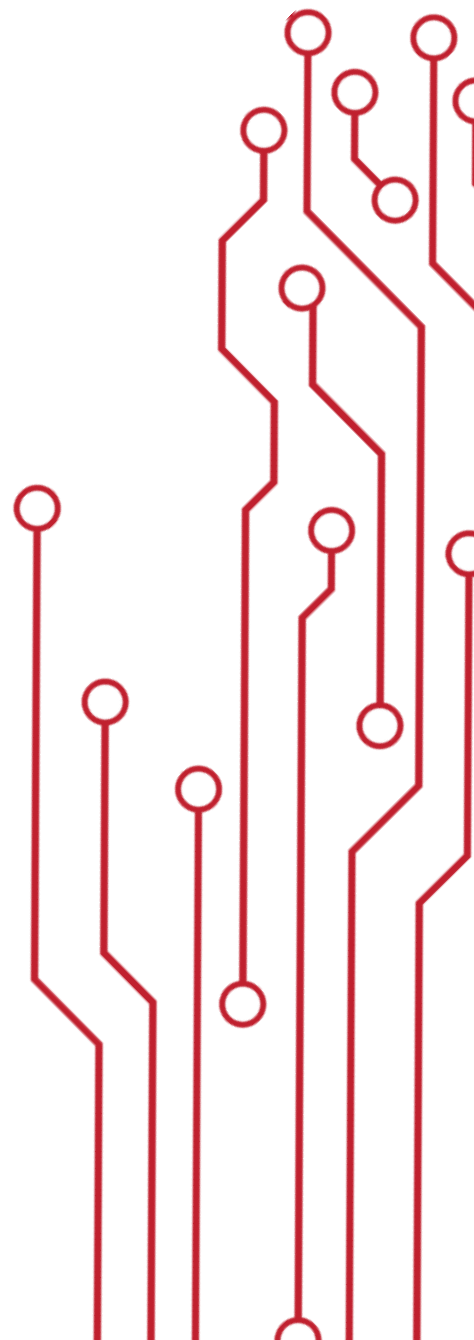


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1. General Description

The module CBTMN10 is a powerful, highly flexible, ultra-low power Bluetooth Low Energy module using Nordic nRF52810 SoC solution developed by CWD Limited. This module supports BLE 5.3 standards. With an ARM Cortex M4 Processor available, it provides 192 kB Flash, 24kB RAM, embedded 2.4GHz multiprotocol transceiver and an integrated PCB trace antenna or x.FL connector for external antenna.

The module incorporates: GPIO, SPI, UART, I2C, I2S, PMD, PWM, ADC and USB interfaces for connecting peripherals and sensors.

2. Features

2.4 GHz transceiver	<ul style="list-style-type: none"> • -96 dBm sensitivity in Bluetooth® low energy mode • Supported data rates: 1 Mbps Bluetooth® low energy mode • -20 to +4 dBm TX power, configurable in 4 dB steps • On-chip balun (single-ended RF) • 4.6 mA peak current in TX (0 dBm) • 4.6 mA peak current in RX • RSSI (1 dB resolution)
ARM® Cortex®-M4 32-bit processor, 64 MHz	<ul style="list-style-type: none"> • 144 EEMBC CoreMark® score running from flash memory • 34.4 µA/MHz running from flash memory • 32.8 µA/MHz running from RAM • Serial wire debug (SWD)
Flexible power management	<ul style="list-style-type: none"> • 1.7 V–3.6 V supply voltage range • Fully automatic LDO and DC/DC regulator system

	<ul style="list-style-type: none"> • Fast wake-up using 64 MHz internal oscillator • 0.3 μA at 3 V in System OFF mode, no RAM retention • 0.5 μA at 3 V in System OFF mode with full 24 kB RAM retention • 1.5 μA at 3 V in System ON mode, with full 24 kB RAM retention
Memory	<ul style="list-style-type: none"> • 192 kB flash/24 kB RAM
Other features	<ul style="list-style-type: none"> • Microprocessor Control Unit (MCU): nRF52810 • Nordic SoftDevice ready • Support for concurrent multi-protocol • 12-bit, 200 kSPS ADC - 8 configurable channels with programmable gain • 64 level Comparator • Temperature sensor • Up to 15 general purpose I/O pins • 4-channel pulse width modulator (PWM) unit with EasyDMA

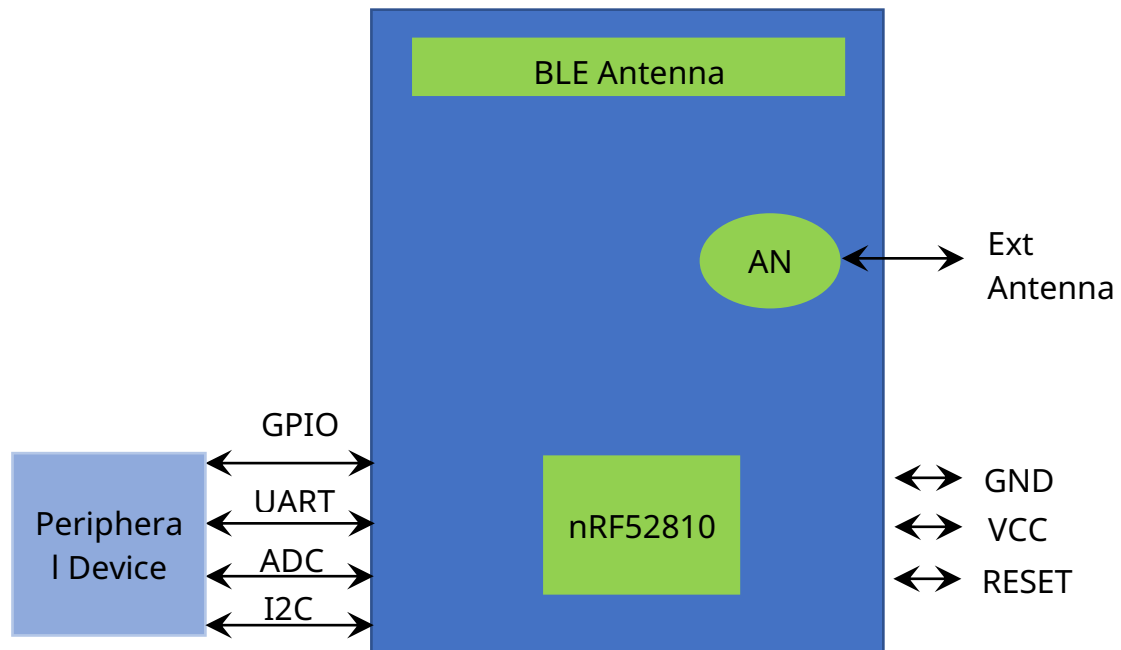
	<ul style="list-style-type: none">• Digital microphone interface (PDM)• 3x 32-bit timer with counter mode• SPI master/slave with EasyDMA• I2C compatible 2-wire master/slave• UART (CTS/RTS) with EasyDMA• Programmable peripheral interconnect (PPI)• Quadrature decoder (QDEC)• AES HW encryption with EasyDMA• 2x real-time counter (RTC)
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3. Applications

Due to varied support of protocols and stacks, the BLE module nRF52810 can support varied applications. A brief of the applications is as below:

Internet of Things	<ul style="list-style-type: none">• Smart home products• Industrial mesh networks• Smart city infrastructure
Advanced Wearables	<ul style="list-style-type: none">• Connected watches• Advanced personal fitness devices• Wearables with wireless payment• Connected health• Virtual/Augmented reality applications
Interactive Entertainment Devices	<ul style="list-style-type: none">• Advanced remote controls• Gaming controller
Personal Area Networks	<ul style="list-style-type: none">• Health/Fitness sensor and monitor device• Medical device

4. Application Block Diagram



5. Interfaces

5.1. Power Supply

The input voltage V_{cc} range should be 1.7V to 3.6V. Suitable decoupling must be provided by external decoupling circuitry (10 μ F and 0.1 μ F). It can reduce the noise from power supply and increase power stability.

5.2. System Function Interfaces

5.2.1. GPIOs

The general purpose I/O is organized as one port with up to 15 I/Os enabling access and control of up to 15 pins through one port. Each GPIO can be accessed individually with the following user configurable features:

- Input/output direction
- Output drive strength
- Internal pull-up and pull-down resistors
- Wake-up from high- or low-level triggers on all pins
- Trigger interrupt on all pins
- All pins can be used by the PPI task/event system; the maximum number of pins that can be interfaced through the PPI at the same time is limited by the number of GPIOTE channels
- All pins can be individually configured to carry serial interface or quadrature demodulator signals
- All pins can be configured as PWM

- There are 4 ADC input in the 15 I/Os

5.2.2. Two-wire Interface (I2C Compatible)

The two-wire interface can communicate with a bi-directional wired-AND bus with two lines (SCL, SDA). The protocol makes it possible to interconnect up to 127 individually addressable devices. The interface is capable of clock stretching, supporting data rates of 100 kbps, 250 kbps and 400 kbps.

5.2.3. Flash Program I/Os

The module has two programmer pins, respectively SWDCLK pin and SWDIO pin. The two pin Serial Wire Debug (SWD) interface provided as a part of the Debug Access Port (DAP) offers a flexible and powerful mechanism for non-intrusive debugging of program code. Breakpoints and single stepping are part of this support.

5.2.4. Serial Peripheral Interface

The SPI interfaces enable full duplex synchronous communication between devices. They support a three-wire (SCK, MISO, MOSI) bi-directional bus with fast data transfers. The SPI Master can communicate with multiple slaves using individual chip select signals for each of the slave devices attached to a bus. Control of chip select signals is left to the application through use of GPIO signals. SPI Master has double buffered I/O data. The SPI Slave includes EasyDMA for data transfer directly to and from RAM allowing Slave data

transfers to occur while the CPU is IDLE. The GPIOs are used for each SPI interface line and can be chosen from any GPIOs on the device and configured independently. This enables great flexibility in device pinout and efficient use of printed circuit board space and signal routing.

The SPI peripheral supports SPI mode 0, 1, 2, and 3. The module has 3 SPI ports and their properties are as below:

Instance	Master / Slave
SPI0	Master
SPI1	Master
SPIS1	Slave

5.2.5. UARTs

The Universal Asynchronous Receiver/Transmitter offers fast, full-duplex, asynchronous serial communication with built-in flow control (CTS, RTS), support in hardware up to 1 Mbps baud. Parity checking is supported. Support the following baud rate in bps unit:

1200/2400/4800/9600/14400/19200/28800/38400/57600/76800/115200.

Note: The GPIOs are used for each SPI/TWI/UART interface line and can be chosen from any GPIOs on the device and configured independently.

5.2.6. Analogue to Digital Converter (ADC)

The 12-bit incremental Analogue to Digital Converter (ADC) enables sampling of up to 8 external signals through a front-end multiplexer. The ADC has configurable input and reference pre-scaling, and sample resolution (8,10, and 12 bit).

Note: The ADC module uses the same analogue inputs as the LPCOMP module. Only one of the modules can be enabled at the same time.

Module PIN Number	nRF52810 PIN Number	Description
15	P0.04/AIN2	General Purpose I/O
14	P0.05/AIN3	General Purpose I/O
29	P0.28/AIN4	General Purpose I/O
27	P0.30 /AIN6	General Purpose I/O

5.2.7. Reset

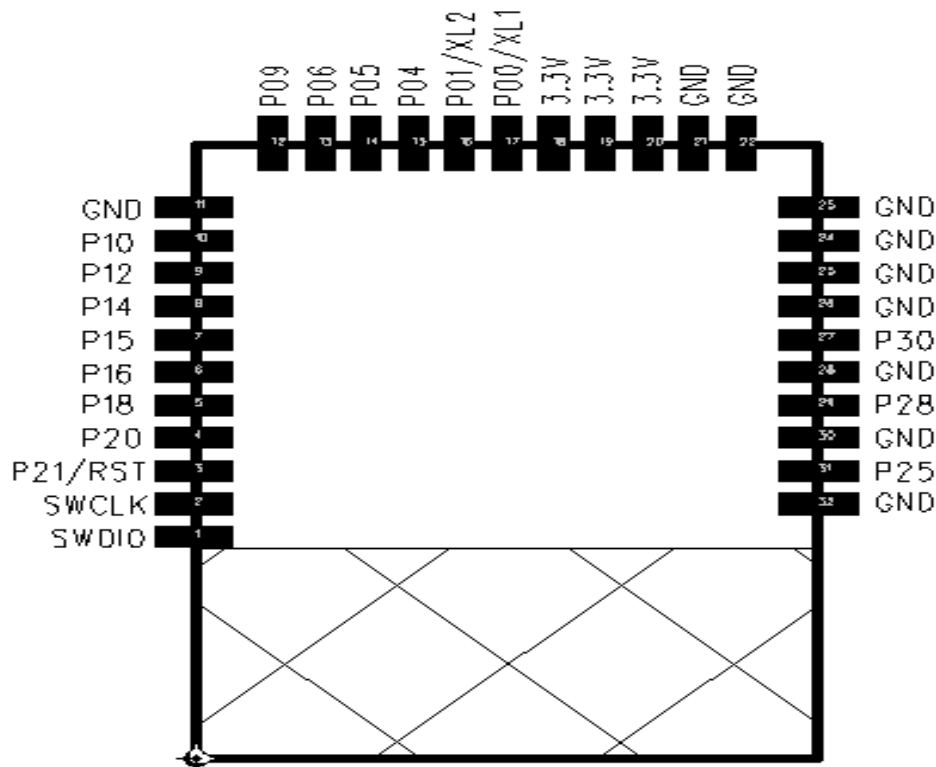
The reset pin of the module is in the internal pull-high state. When the reset pin of the module is input to a low level, the module will be automatically reset. After the reset pin is used, the parameters of the current setting will not be ANT.

6. Module Specifications

Hardware Features	
Model	CBTMN10
Antenna Type	PCB Antenna and connector for Patch Antenna
Chipset Solution	nRF52810
Voltage	1.7V ~ 3.6V
Dimensions (L x W x H)	15 x 11 x 2 mm
Wireless Features	
Wireless Standards	BLE 5.3, ANT
Frequency Range	2400MHz-2483.5MHz
Data Rates	1Mbps
Wireless Security	AES HW Encryption
Transmit Power	Tx Power -20 to +4 dBm in 4dB Steps
Operating Mode	Central / Peripheral in BLE

7. Module Pin-out and Pin Description

7.1. Module Pin-out



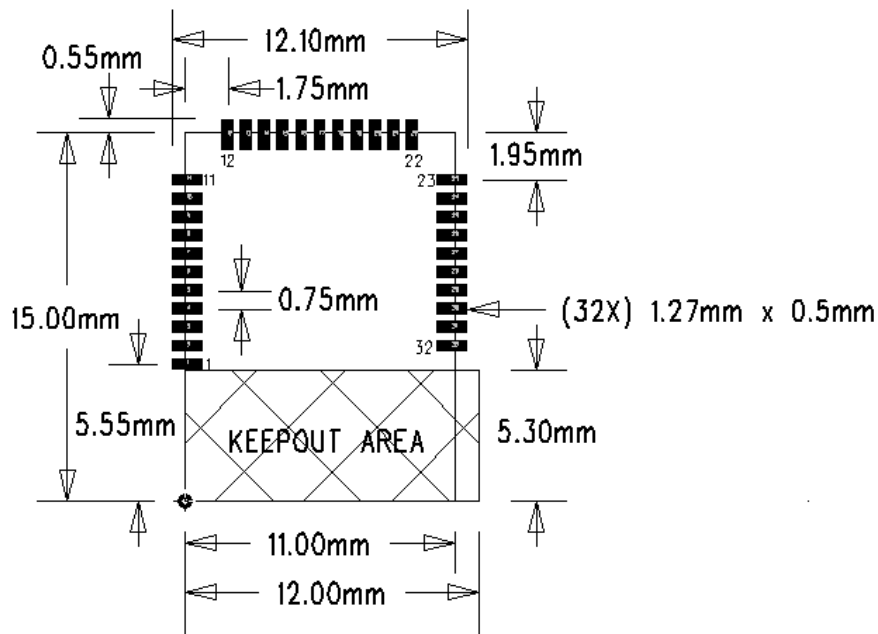
7.2. Pin Description

Pin No.	Pin Name	nRF52810 MCU Pin	Pin Description
1	SWDIO	SWDIO	Programming Data
2	SWCLK	SWCLK	Programming clock
3	P21	P21	General purpose I/O pin.
		RESET	Configurable as pin Reset

4	P20	P20	General purpose I/O pin
5	P18	P18	General purpose I/O pin
6	P16	P16	General purpose I/O pin
7	P15	P15	General purpose I/O pin
8	P14	P14	General purpose I/O pin
9	P12	P12	General purpose I/O pin
10	P10	P10	General purpose I/O pin
11	GND	GND	GND
12	P09	P09	General purpose I/O pin
13	P06	P06	General purpose I/O pin
14	P05	P05	General purpose I/O pin
		AIN3	Analogue input
15	P04	P04	General purpose I/O pin
		AIN2	Analogue input
16	XL2	P01	Reserved
		XL2	Reserved
17	XL1	P00	Reserved
		XL1	Reserved
18	3.3V	3.3V	PWR
19	3.3V	3.3V	PWR
20	3.3V	3.3V	PWR
21	GND	GND	GND
22	GND	GND	GND
23	GND	GND	GND
24	GND	GND	GND
25	GND	GND	GND

26	GND	GND	GND
27	P30	P30	General purpose I/O pin
		AIN6	Analogue input
28	GND	GND	GND
29	P28	P28	General purpose I/O pin
		AIN4	Analogue input
30	GND	GND	GND
31	P25	P25	General purpose I/O pin
32	GND	GND	GND

8. PCB Footprint and Dimensions



PCB SIZE: (L) 15 mm x (W) 11 mm x (H) 2mm

9. Electrical Characteristics

9.1. Absolute Maximum Ratings

Parameter	Condition	Min.	Typical	Max.	Unit
Storage Temp.		-40		125	°C
ESD Protection				4000	V
Supply Voltage		-0.3		3.9	V
Voltage on I/O Pin		-0.3		3.6	V

9.2. Recommended Operating Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Temp.	TA	-40		85	°C
Power Supply	VCC	1.7	3.3	3.6	V
Input Low Voltage	VIL	-0.3		0.3*VCC	V
Input High Voltage	VIH	0.7*VCC		VCC	V

9.3. Current Ratings

System State	TX Peak @ 4dBm	RX Peak	Sleep Mode (Average)	Idle Mode (Average)
Current (peak) @ 3V	7.5 mA	10 mA	2.5 uA	2.5 uA

FCC Statement

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.

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

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.

FCC 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 & your body

IC Caution:

- English:

This device complies with Industry Canada licence-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 device should be installed and used within a distance of at least 20 cm between the radiator and the body.

- 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.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Déclaration d'exposition aux radiations Cet équipement est conforme Canada

limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

This module has been granted modular approval as below listed FCC rule parts. -FCC Parts 15 Subpart C, 15.225

Summarize the specific operational use conditions

-The OEM integrator should use equivalent antennas which is the same type and equal or less gain than an antenna listed in 2.7 in this instruction manual.

RF exposure considerations The module has been certified for integration into products only by OEM integrators under the following condition:

-The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.

-The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

-Mobile use

As long as the three conditions above are met, further transmitter testing will not be required.

OEM integrators should provide the minimum separation distance to end users in their end-product manuals.

Any new antenna type, higher gain than listed antenna should be met the requirements of FCC rule 15.203 and 2.1043 as permissive change procedure.

Label and compliance information End Product Labeling

The module is labeled with its own FCC ID and IC Certification Number. If the FCC ID and IC Certification Number are 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. In that case, the final end product must be labeled in a visible area with the following:

“Contains FCC ID: 2A8UI-CBTMN10”

“Contains IC: 29411-CBTMN10”

Information on test modes and additional testing requirements

-OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, additional transmitter in the host, etc.).

Additional testing, Part 15 Subpart B disclaimer

-The final host product also requires Part 15 subpart B compliance testing with the modular transmitter installed

to be properly authorized for operation as a Part 15 digital device.

10. Ordering Information

Module No	Shielding	Antenna
CBTMN10	No	PCB & Patch Antenna Connector

11. Certifications

Certifications	CE RED, RoHS
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12. Contact Information

Sales enquiries:

- **India:** sales@cw din.com
- **Americas Region:** sales.americas@cw din.com
- **APAC Region:** sales.apac@cw din.com
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