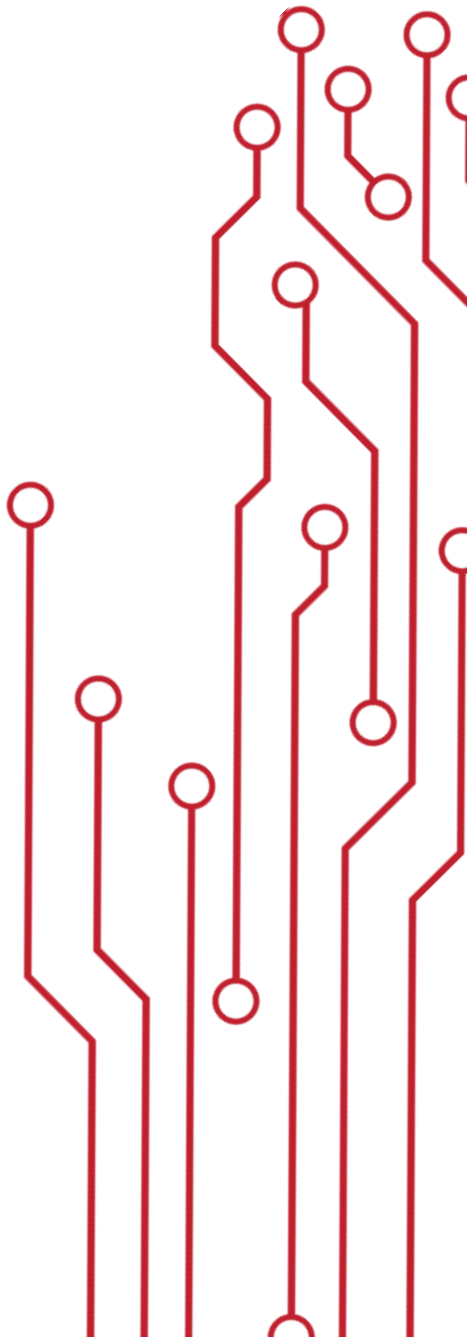
CWD LIMITED

Datasheet

CBTMN05

Multiprotocol 2.4GHz ISM module



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1. General Description

The module CBTMN05 is a multiprotocol module that supports low power RF and is designed for high data rate short-range wireless communication in the 2.4GHz ISM band. It is a low cost, baseline module optimized for small 2-layer PCB design with cost-constrained applications developed by CWD Limited.

The module is based on Nordic Semiconductor's chipset nRF52805 radio transceiver IC that has a 64MHz ARM® Cortex – M4 with 192kB flash and 24kB RAM, embedded 2.4GHz multiprotocol transceiver and an integrated PCB trace antenna. The module incorporates GPIO, UART, I2C, and ADC interfaces for connecting peripherals and sensors.

2. Applications

Due to varied support of protocols and stacks, the CBTMN05 module can support various applications. A brief of the applications is as below:

Low Power RF	• Proprietary protocol devices • Network processor • Beacons • Smart Home sensors • Presenters/Stylus • Health monitoring • Drug delivery • Asset tags • Toys • Disposable medical • Retail tags and labels

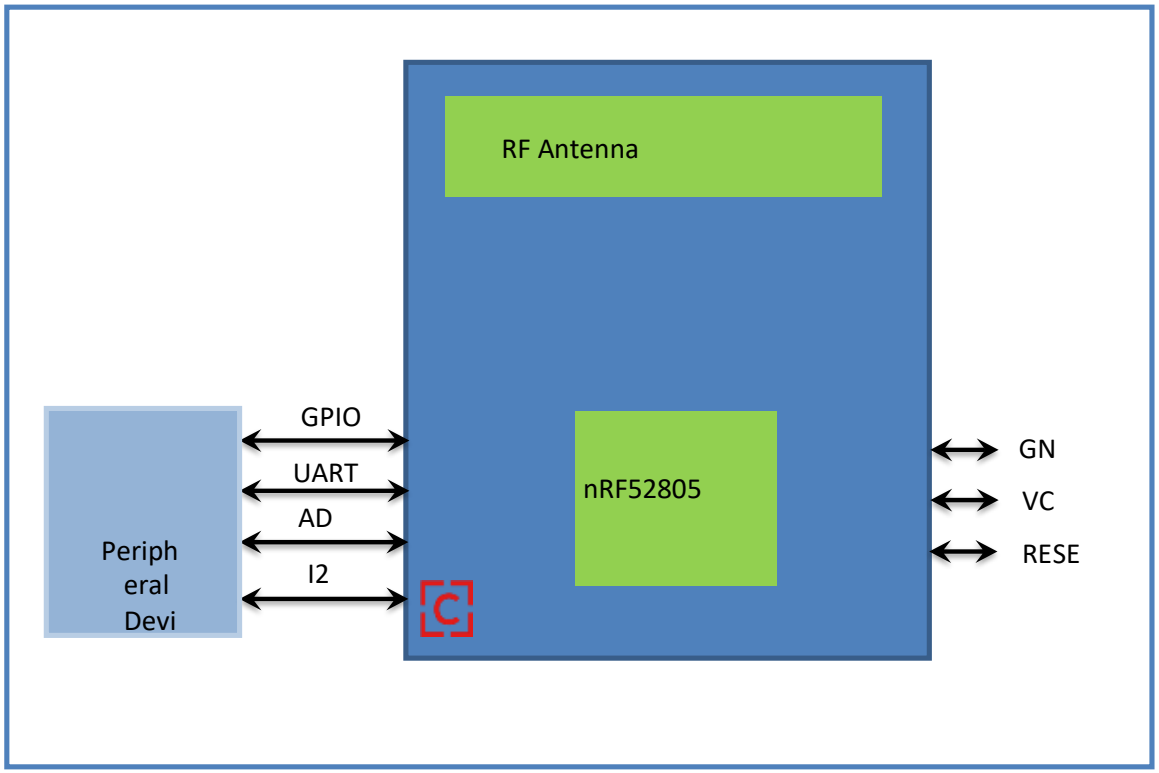
3. Features

2.4 GHz transceiver	• -95 dBm sensitivity in 1 Mbps low power RF mode • -20 to +4 dBm TX power, configurable in 4 dB steps • Single-ended antenna output (on-chip balun) • 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	• 144 EEMBC CoreMark ® score running from flash memory • 34.4 µA/MHz running CoreMark from flash memory • 32.8 µA/MHz running CoreMark from RAM • Serial wire debug (SWD)
Flexible power management	• 1.7 V to 3.6 V supply voltage range • On-chip DC/DC and LDO regulators with automated low current modes • 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 • µA at 3 V in System ON mode, with full 24 kB RAM retention, wake on RTC (running from LFXO clock) • 1.0 µA at 3 V in System ON mode, no RAM retention, wake on RTC (running from LFXO clock)
Memory	• 192 kB flash/24 kB RAM
Other RF features	• Nordic SoftDevice ready with support for concurrent multiprotocol • Temperature sensor • 12-bit, 200 ksps ADC – 2 configurable channels with programmable gain • 3x 32-bit timer with Counter mode • SPI master/slave with EasyDMA • I2C compatible two-wire master/slave

	• UART (CTS/RTS) with EasyDMA • Quadrature decoder (QDEC) • AES HW encryption with EasyDMA • 2x real-time counter (RTC)

4. Application Block Diagram



5. Interfaces

5.1. Power Supply

Regulated power supply is required for this module. The input voltage (Vcc) range should be 1.8V to 3.6V. Suitable decoupling must be provided by external decoupling circuitry (10uF and 0.1uF). It can reduce the noise from power supply and increase power stability.

5.2. System Function Interfaces

5.2.1. GPIOs

There are up to 8 general purpose I/O pins. Each GPIO can be accessed individually with the following user configurable features:

- Input/output direction
- Output drive strength
- Two analogue inputs in the 8 GPIOs

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, 250kbps and 400 kbps.

5.2.3. Flash Program I/Os

The module has two programmer pins, SWDCLK pin and SWDIO pin respectively. 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. SPI Bus

The SPI interface is an alternate function of GPIO pins. The module can be a master device (or slave device) that uses terminals SPI_MOSI, SPI_MISO, SPI_CLK and SPI_CS and is implemented using any spare IO digital output pins to allow multi-dropping. Each multidrop SPI slave device requires a unique and dedicated CS line.

The SPI interface enables full duplex synchronous communication between devices. It supports a 3-wire (SCK, MISO, MOSI) bi-directional bus with fast data transfers to and from multiple slaves. Individual chip select signals are necessary for each of the slave devices attached to a bus but control of these is left to the application through use of SIO signals. I/O data is double-buffered.

The SPI peripheral supports SPI modes 0, 1, 2, and 3. The module has 1 SPI port available.

5.2.5. UARTs

The Universal Asynchronous Receiver/Transmitter offers fast, full-duplex, asynchronous serial communication with built-in flow control (CTS, RTS), and support in hardware up to 1 Mbps baud. Parity checking is supported. It supports 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.

5.2.7. Reset

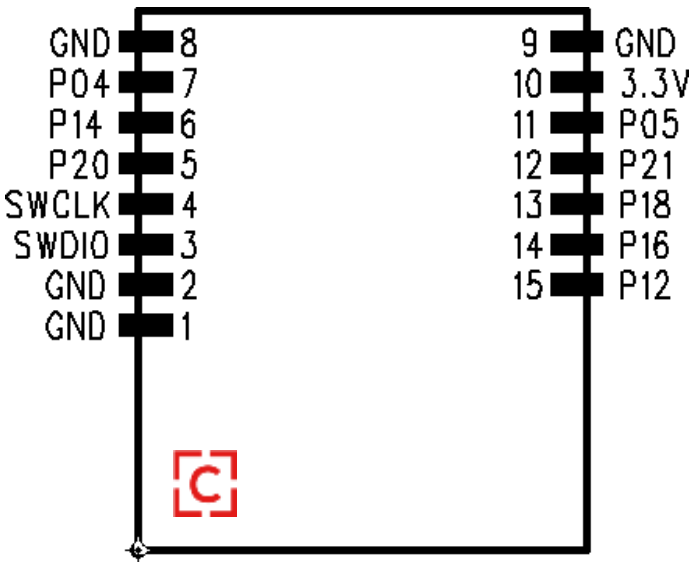
The reset pin of the module is in the internal pull-high state. When the reset pin of the module is input to a low level, the module will be automatically reset.

5. Module Specifications

Hardware Features	
Model	CBTMN05
Antenna Type	PCB antenna
Chipset Solution	Nordic nRF52805
Voltage	1.8V ~ 3.6V
Dimensions (L x W x H)	12mm x 10mm x 2.6mm
Wireless Features	
Wireless Standards	2.4GHz ISM
Frequency Range	2.4GHz to 2.4835GHz
Data Rates	1Mbps, 2Mbps
Wireless Security	128-bit AES
Transmit Power	-20dbm to +4dbm for low power RF in 4db steps
RX sensitivity	-97dbm at 1Mbps

6. Module Pin-out and Pin Description

7.1. Module Pin-out

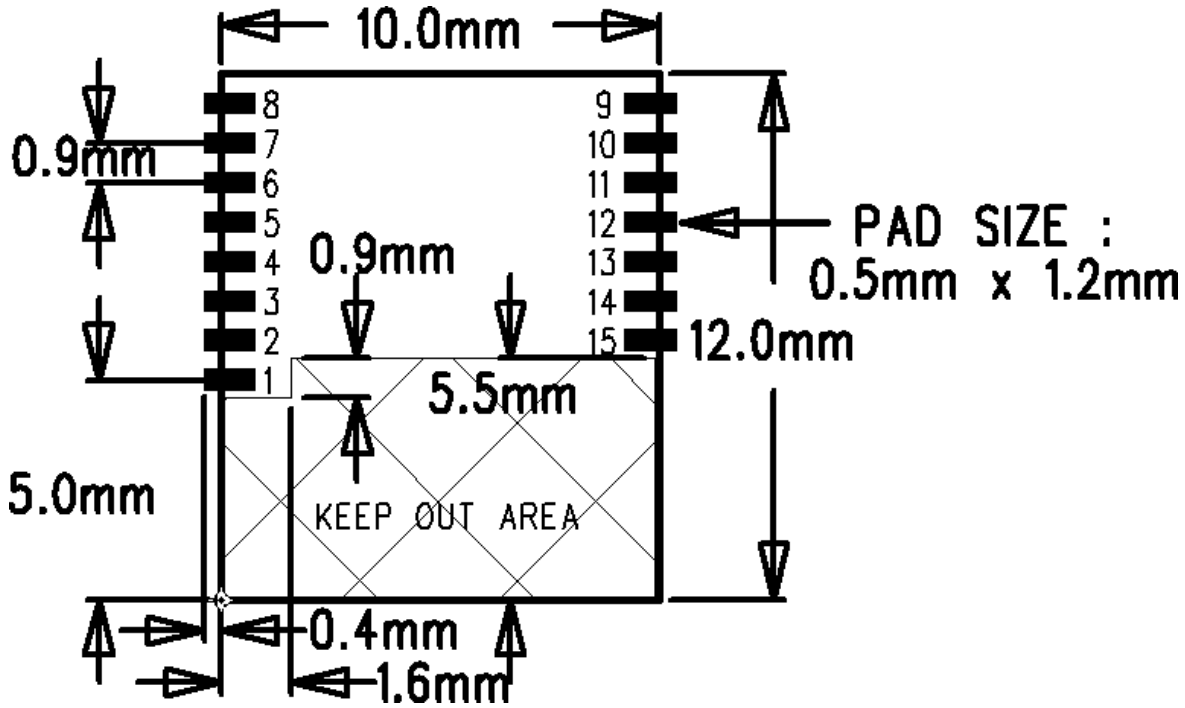


7.2. Pin Description

Pin No.	Pin Name	nRF52832 MCU Pin	Pin Description
1	GND	GND	GND
2	GND	GND	GND
3	SWDIO	SWDIO	Programming Data
4	SWCLK	SWCLK	Programming clock
5	P20	P20	General purpose I/O pin
6	P14	P14	General purpose I/O pin

7	P04	P04	General purpose I/O pin
		AIN2	Analogue Input
8	GND	GND	GND
9	GND	GND	GND
10	3.3V	3.3V	POWER
11	P05	P05	General purpose I/O pin
		AIN3	Analogue Input
12	P21	P21	General purpose I/O pin
		nRESET	Configurable as pin reset
13	P18	P18	General purpose I/O pin
14	P16	P16	General purpose I/O pin
15	P12	P12	General purpose I/O pin

7. PCB Footprint and Dimensions



8. Electrical Characteristics

9.1. Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
Storage Temp.	-40	125	°C
ESD Protection		3000	V
Supply Voltage	-0.3	3.9	V
Voltage on I/O Pin	-0.3	3.9	V

9.2. Recommended Operating Range

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. Ordering Information

Module No.	Shielding
CBTMN05	No/YES

10. Contact Information

Sales enquiries:

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