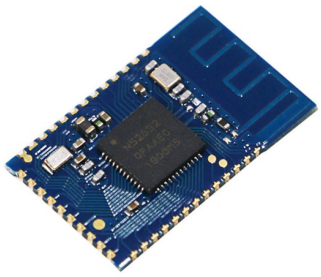


Comosia COMO-N832C Bluetooth Module User Manual

Bluetooth Module

COMO-N832C
Bluetooth ver. 5.0 Module
User Manual

Contents

Overview

COMO-N832C is Bluetooth Low Energy Module. COMO-N832C integrates all features of Bluetooth radio, software stack, antenna, and host end-user applications, which means no external microcontroller.
It provides a Bluetooth Low Energy fully compliant system for a data communication.

Applications

- Internet of Things (IoT)
  - Home automation
  - Sensor networks
  - Building automation
  - Industrial
  - Retail
- Personal area networks
  - Health/fitness sensor and monitor devices
  - Medical devices
  - Key fobs and wristwatches
- Interactive entertainment devices
  - Remote controls
  - Gaming controllers
- Beacons A4WP wireless chargers and devices Remote control toys Computer peripherals and I/O devices

    - Mouse
    - Keyboard
    - Multi-touch trackpad
    - Gaming

Features

- Bluetooth 5.0
- Integrated Bluetooth Smart Stack
    - GAP, GATT, L2CAP and SMP
    - Bluetooth Smart profiles
- RF Performance
    - Transmit power : +4 dBm (-20 dBm ~ +4 dBm)
    - Receiver sensitivity : -96 dBm
- Low Power Consumption
    - Transmit : 7.5 mA peak
    - Receiver : 12.9 mA peak
    - Sleep mode : 0.5 uA Peripheral Interfaces
    - UART/SPI(Master/Slave)/I2C
    - GPIO
    - 12-bit ADC
    - I2S and PDM
    - Timer
    - Temperature Sensor
- Power supply : 1.7 ~ 3.6 V
- Dimension : 5.6 x8.8 x 2.0 mm (W x L x H)
- Antenna List
    - Dipole Antenna
    - Chip Antenna
    - PCB Antenna(Change Model)

- Engineering Samples (ES)

  If Engineering Samples are delivered to the customer, these samples have the status "Engineering Samples". This means that the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and they may differ from the published Product Specification.

  Engineering Samples are not qualified and they are not to be used for reliability testing or series production.

- Disclaimer

  The customer acknowledges that samples may deviate from the Product Specification and may bear defects due to their status of development and the lack of qualification mentioned above.

  Comosia rejects any liability or product warranty for Engineering Samples. In particular, Comosia disclaims liability for damages caused by:
- The use of the Engineering Sample other than for evaluation purposes, particularly the installation or integration in another product to be sold by the customer,
- Deviation or lapse in function of the Engineering Sample,
- Improper use of the Engineering Sample.

  Comosia disclaims any liability for consequential and incidental damages.

  In case of any queries regarding the Engineering Samples, please contact your local sales partner or the related product manager.
- About This Document

Purpose and Audience

This Product Specification provides details on the functional, operational, and electrical characteristics of the Comosia “COMO-N832C” module. It is intended for
hardware design, application, and Original Equipment Manufacturers (OEM) engineers. The product is referred to as “COMO-N832C” or “the module” within this document.

Revision History

Revision	Date	Modifications/Remarks
–	Nov. 29. 2019	1st preliminary version

Overview

The COMO-N832C is a short-range, Class 2, BLE single mode module for implementing Bluetooth functionality into various electronic devices.
And cost-effective, low-power, true system-on-chip (SoC) for Bluetooth low energy applications. It enables robust BLE master or slave nodes to be built with very low total bill-of-material costs.

Key features for main core

■ 2.4 GHz transceiver
◉ -96dBm sensitivity in Bluetooth low energy mode
◉ Surpported data rates : 1Mbps, 2Mbps Bluetooth low energy mode
◉ -20 to + 4 dBm TX power, configurable in 4 dB steps
◉ On-chip balun (single-ended RF)
◉ 5.3mA peak current in TX (0 dBm)
◉ 5.4mA peak current in RX
◉ RSSI (1dB resolution)
■ ARM Cortex-M4 32-bit processor with FPU, 64 MHz
◉ 215 EEMBC Core Mark score running from flash memory
◉ 58 µA/MHz running from flash memory
◉ 51.6 µA/MHz running from RAM

◉ Data watch point and trace (DWT), embedded trace macrocell (ETM), and instrumentation trace macrocell (ITM)
◉ Serial wire debug (SWD)
◉ Trace port
■ Flexible power management
◉ 1.7V – 3.6V supply voltage range
◉ Fully automatic LDO and DC/DC regulator system
◉ Fast wake-up using 64 MHz internal oscillator
◉ 0.3 µA at 3 V in System OFF mode
◉ 0.7 µA at 3 V in System OFF mode with full 64 kB RAM retention
◉ 1.9 µA at 3 V in System OFF mode, no RAM retention, wake on RTC
■ Memory
◉ 512kB flash/64kB RAM
■ Nordic Soft device ready
■ Support for concurrent multi-protocol
■ Type 2 near filed communication (NFC-A) tag with wakeup-on-filed and touch-to-pair capabilities
■ 12-bit, 200 kbps ADC-8 configurable channels with programmable gain
■ 64 level comparator
■ 15 level low power comparator with wakeup from System OFF mode
■ Temperature sensor
■ 32 general purpose I/O pins
■ 3×4 Channel pulse width modulator (PWM) unit with Easy DMA
■ Digital microphone interface (PDM)
■ 5×32 – bit timer with counter mode
■ Up to 3xSPI master/slave with Easy DMA
■ Up to 2xI2C compatible 2-wire master / slave
■ I2S with Easy DMA
■ UART (CTS / RTS) with Easy DMA
■ Programmable peripheral interconnect (PPI)
■ Quadrature decoder (QDEC)
■ AES HW encryption with Easy DMA
■ Autonomous peripheral operation without CPU intervention using PPI and Easy DMA
■ 3x real-time counter (RTC)
■ Single crystal operation

Electrical Characteristics

Absolute Maximum Ratings

ITEM	**Condition**	**MM.**	**Max.**	**Unit**
Storage Temp.		-40	+85	°C
VDD		-Op	+3.9	V
10 Pin Voltage	VDD53.6V	0.	VDD+0.3V	V
	VDD>3.6V	0.	3.9V	V

Recommended Operating Conditions

ITEM	**Min.**	**Nom.**	**Max.**	**Unit**
Storage Temp.	-40	+25	+85	°C
VDD	2.	3.0	4.	V

Power Consumption

ITEM	Condition	Typ	Unit
Transmit	RF Pow = +4 dBm	8.	mA
	RF Pow = 0 dBm	5.	mA
Receive	Data Rate 1 Mbps	12.	mA
	Data Rate 2 Mbps	13.	mA

RF Characteristics

TEM	Min.	Nom.	Max.	Unit
Operating Frequencies	2402		2480	M Hz
TX Maximum output power		4		dBm
TX RF power control range	20	24		dB
TX RF power accuracy			±4	dB
TX 1st Adjacent Channel Transmit Power (2 Mbps)		-25		dBc
TX 2nd Adjacent Channel Transmit Power (2 Mbps)		-50		dBc
TX 1st Adjacent Channel Transmit Power (1 Mbps)		-25		dBc
TX 2nd Adjacent Channel Transmit Power (1 Mbps)		-50		dBc
RX maximum received signal strength at < 0.1 % PER		0		dBm
RX Sensitivity (0.1% BER) at 2 Mbps		-89		dBm
RX Sensitivity (0.1% BER) at 1 Mbps		-93		dBm
RX RSSI accuracy(-90 dBm to -20 dBm)		±2		dB
RX RSSI resolution		1		dB
RX RSSI sample period		8		us

Clock Management

The module has a 32 MHz main crystal oscillator and 32.768 kHz RTC crystal oscillator.

- Option : 32.768KHz RTC Crystal

Peripherals

The general GPIO is organized as one port with up to 30 I/Os enabling access and control of up to 30 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 signal.

The transceiver receives and transmits data directly to and from system memory for flexible and efficient packet data management. The module's transceiver has the following features.

◉ General modulation features
◉ GFSK modulation
◉ Data whitening
◉ On-air data rates (250 kbps/1 Mbps/2 Mbps)
◉ Transmitter with programmable output power of +4 dBm to -20 dBm, in 4 dB step
◉ RSSI function (1 dB resolution)
◉ Receiver with integrated channel filters achieving maximum sensitivity
◉ Baseband controller
◉ Easy DMA RX and TX packet transfer directly to and from RAM
◉ Dynamic payload length
◉ On-the-fly packet assembly/disassembly and AES CCM payload encryption
◉ 8 bit, 16 bit and 24 bit CRC check

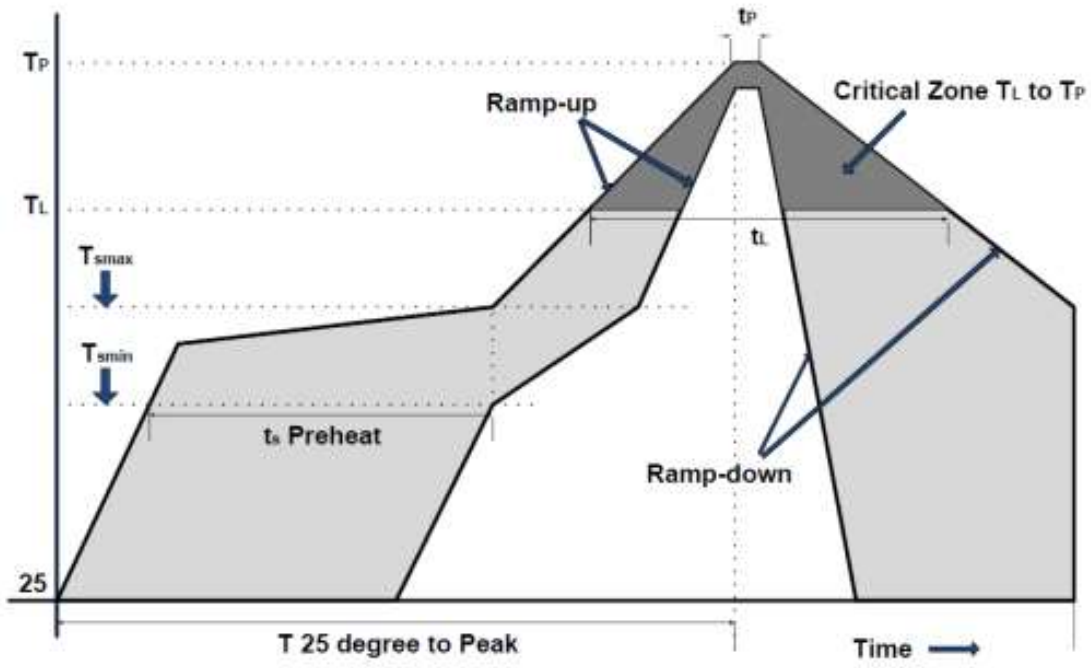
The timer runs on the high-frequency clock source (HFCLK) and includes a four-bit (1/2X) pre-scaler that can divide the timer input clock from the HFCLK controller. Clock source selection between PCLK16M and PCLK1M is automatic according to TIMER base frequency set by the pre-scaler.
The TIMER base frequency is always given as 16 MHz divided by the pre-scaler value.
The PPI system allows a TIMER event to trigger a task of any other system peripheral of the device. The PPI system also enables the TIMER task/event features to generate periodic output and PWM signals to any GPIO. The number of input/outputs used at the same time is limited by the number of GPIOTE channels.

The temperature sensor measures die temperature over the temperature range of the device with 0.25-degree resolution.
The SPI is implemented with Easy DMA support for ultra-low power serial communication from an external SPI master. Easy DMA in conjunction with hardware-based semaphore mechanisms removes all real-time requirements associated with controlling the SPI slave from a low-priority CPU execution context.
The TWI slave with Easy DMA (TWIS) is compatible with I2C operating at 100 kHz and 400 kHz. The TWI transmitter and receiver implement Easy DMA.
The Universal asynchronous receiver/transmitter with Easy DMA (UART) offers fast, full-duplex, asynchronous serial communication with built-in flow control (CTS, RTS) support in hardware at a rate up to 1 Mbps, and Easy DMA data transfer from/to RAM.
The ADC supports up to eight external analog input channels, depending on package variant. It can be operated in a one-shot mode with sampling under software control, or a continuous conversion mode with a programmable sampling rate.
The analog inputs can be configured as eight single-ended inputs, four differential inputs or a combination of these. Each channel can be configured to select AIN0 to AIN7 pins, or the VDD pin. Channels can be sampled individually in one-shot or continuous sampling modes, or using scan mode, multiple channels can be sampled in sequence. Channels can also be oversampled to improve noise performance. The I2S (Inter-IC Sound) module, supports the original two-channel I2S format, and left or right- aligned formats. It implements Easy DMA for sample transfer directly to and from RAM without CPU intervention. The I2S peripheral has the following main

features :
◉ Master and Slave mode
◉ Simultaneous bi-directional (TX and RX) audio streaming
◉ Original I2S and left- or right-aligned format
◉ 8, 16 and 24-bit sample width
◉ Low-jitter Master Clock generator

Recommended Soldering Profile

The data here is given only for guidance on solder and has to be adapted to your process and other reflow parameters for example the used solder paste.
The paste manufacturer provides a reflow profile recommendation for his products.



Preheat		**Main Heat**		**Peak**	
Tsmax		-limas		tpmax	
Temperature	Time	Temperature	Time	Temperature	Time
Degree	sec	Degree	sec	Degree	sec
150	100	217	90	260	10
		230	50		

Parameter	**Value**	**Unit**
Average ramp-up rate	3	Degree/sec
Average ramp-down rate	6	Degree/sec
Max. Time 25 degree to Peak Temperature	8	Min.

Opposite side re-flow is prohibited due to module weight. Devices will withstand the specified profile and will withstand up to 1 re-flows to a maximum temperature of 260 degree.
The re-flow soldering profile may only be applied if the COMO-N832C resides on the PCB side looking up. Heat above the solder eutectic point, while the COMO-N832C is mounted facing down, may damage the module permanently

Cautions

Failure to follow the guidelines set forth in this document may result in degrading of the modules functions and damage to the module.

Design Notes

1. Follow the conditions written in this specification, especially the control signals of this module.
2. The supply voltage must be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a ecoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47 µF directly at the module).
3. This module should not be mechanically stressed when installed.
4. Keep this module away from heat. Heat is the major cause of decreasing the lifetime of these modules.
5. The supply voltage should abide by the maximum ratings. It should not carry noise and/or spikes.
6. Avoid assembly and use of the target equipment in conditions where the module temperature may exceed the maximum tolerance.
7. Keep this module away from other high-frequency circuits.
8. Refer to the recommended pattern when designing a board.

Installation Notes

1. Reflow soldering is possible twice based on the conditions set forth in Set up the temperature at the soldering portion of this module according to this reflow profile.
2. Carefully position the modules so that their heat will not burn into printed circuit boards or affect the other components that are susceptible to heat.
3. Carefully locate the module, to avoid an increased temperature caused by heat generated by neighboring components.
4. If a vinyl-covered wire comes into contact with the module, the wire cover will melt and generate toxic gas, damaging the insulation. Never allow contact between a vinyl cover and these modules to occur.
5. This module should not be mechanically stressed or vibrated when reflowed.
6. To repair the board by hand soldering, follow the conditions set forth in this chapter.
7. Do not wash the module.
8. Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the unit.

Usage Condition Notes

1. Take measures to protect the module against static electricity.
   If pulses or transient loads (a large load, which is suddenly applied) are applied to the modules, check and evaluate their operation before assembly of the final products.
2. Do not use dropped modules.
3. Do not touch, damage or soil the pins.
4. Follow the recommended condition ratings about the power supply applied to this module.
5. Electrode peeling strength: Do not apply a force of more than 4.9 N in any direction on the soldered module
6. Pressing on parts of the metal cover or fastening objects to the metal cover will cause damage.
7. These modules are intended for general purpose and standard use in general electronic equipment, such as

home appliances, office equipment, information, and communication equipment.

Storage Notes

1. The module should not be stressed mechanically during storage.
2. Do not store these modules in the following conditions or the performance characteristics of the module, such as RF performance will be adversely affected:
   ◉ Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX,
   ◉ Storage in direct sunlight,
   ◉ Storage in an environment where the temperature may be outside the range of 5 °C to 35 °C, or where the humidity may be outside the 45 % to 85 % range,
   ◉ Storage of the modules for more than one year after the date of delivery storage period: Please check the adhesive strength of the embossed tape and soldering after six months of storage.
3. Keep this module away from water, poisonous gas, and corrosive gas.
4. This module should not be stressed or shocked when transported.
5. Follow the specification when stacking packed crates (max. 10).

Safety Cautions

These specifications are intended to preserve the quality assurance of products and individual components. Before use, check and evaluate the operation when mounted on your products.
Abide by these specifications without deviation when using the products.
These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, provide the following failsafe functions as a minimum:

1. Ensure the safety of the whole system by installing a protection circuit and a protection device.
2. Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a single fault causing an unsafe status.

Other Cautions

1. Do not use the module for other purposes than those listed in the doucument.
2. Be sure to provide an appropriate fail-safe function on your product to prevent any additional damage that may be caused by the abnormal function or the failure of the module.
3. These modules are not intended for use under the special conditions shown below. Before using these modules under such special conditions, carefully check their performance and reliability under the said special conditions to determine whether or not they can be used in such a manner:
   ◉ In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash,
   ◉ In direct sunlight, outdoors, or in a dusty environment,
   ◉ In an environment where condensation occurs,
   ◉ In an environment with a high concentration of harmful gas (for exmaple salty air, HCl, Cl2, SO2, H2S, NH3, and NOX).
4. If an abnormal voltage is applied, due to a problem occurring in other components or circuits, replace these modules with new modules. They may not be able to provide normal performance even if their electronic

characteristics and appearances appear satisfactory.

Life Support Policy

This Comosia product is not designed for use in life support appliances, devices,
or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.
Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Comosia for any damages resulting.

Restricted End Use

Comosia product is not designed for any restricted activity that supports the development, production, handling usage, maintenance, storage, inventory or proliferation of any weapons or military use.
Transfer, export, re-export, usage or reselling of this product to any destination, end user or any end use prohibited by the European Union, United States or any other applicable law is strictly prohibited.

Certification Information

Brand Name: Comosia Co.,Ltd.
Address: #504-1, Business Incubator, 545, Seobu-ro, Uijeongbu-si, Gyeonggi-do, 11618, Korea
Tel: +82-70-7949-8907
Product name: BLE module
Model number: COMO-N832C
FCC IC : 2AXON-COMO-N832C
Manufacturer / Country of Origin: Comosia Co.,Ltd / Korea

Label

FCC ID label on the final system must be labeled with “Contains FCC ID : 2AXON-COMO-N832C ” or : Contains transmitter module FCC ID : 2AXON-COMO-N832C ”

Caution: Any changes or modifications in construction of this device which are not expressly approved by the responsible for compliance could void the user’s authority to operate the equipment.
NOTE: 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 interface, 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 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 radio or television off and on, the user is encouraged to try to correct interference by one or more of the following measures.

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on another circuit.
4. Consult the dealer or an experienced radio/TV technician for help.

The module is limited to OEM installation ONLY.
OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.
This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated. Additional testing and certification may be necessary when multiple modules are used.
In the users manual of the end product, the end user has to be informed to keep at least 20 cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.
The end user has to also be informed that any changes or modifications not expressly approved by manufacturer could void the user's authority to operate this equipment.
If the labelling area is small than the palm of the hand, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies wirh Part 15 of 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.
If the labelling area is larger than the palm of the hand, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.
The module is limited to installation in mobile or fixed applications, according to Part 2.1091(b) Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configuration.

Contact Details

Please contact our office for details on additional product options and services:

Comosia Co.,Ltd.
Website : www.comosia.com
Email : como@comosia.com
Tel : 070-7949-8907

Documents / Resources

	Comosia COMO-N832C Bluetooth Module [pdf] User Manual COMO-N832C Bluetooth Module, Bluetooth Module
	Comosia COMO-N832C Bluetooth Module [pdf] User Manual COMO-N832C Bluetooth Module, Bluetooth Module

References

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