Bluetooth® low energy Module

Frequently Asked Questions

TAIYO YUDEN CO., LTD.

Rev. record

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1. General

Q1-1: How to order the modules, evaluation boards (EVB) and evaluation kits (EVK)?

A1-1: To order, please contact your local sales office or distributor.

Taiyo Yuden Sales Office:

Japan: http://www.yuden.co.jp/jp/contact/

North America: http://www.t-yuden.com/salesOffice/

Europe: http://www.yuden.co.jp/eu/contact/

Asia Pacific: http://www.yuden.co.jp/ap/contact/

China: http://www.yuden.co.jp/cs/contact/

Korea: http://www.yuden.co.jp/kr/contact/

Other region: http://www.yuden.co.jp/or/contact/

Distributors:

Japan: http://www.yuden.co.jp/jp/solutions/ble/buy/

North America: http://www.yuden.co.jp/ut/solutions/ble/buy/

Europe: http://www.yuden.co.jp/eu/solutions/ble/buy/

Asia Pacific: http://www.yuden.co.jp/ap/solutions/ble/buy/

China: http://www.yuden.co.jp/cs/solutions/ble/buy/

Korea: http://www.yuden.co.jp/kr/solutions/ble/buy/

Other region: http://www.yuden.co.jp/or/solutions/ble/buy/

Q1-2: What is Bluetooth® low energy (BLE)?

A1-2: It is a wireless personal area network technology featuring low power consumption. It was standardized in the Bluetooth® Core Specification Version 4.0 in 2010. Bluetooth® low energy uses the same 2.4GHz frequency as classic Bluetooth®, but is not compatible with the classic Bluetooth®. The data rate is 1Mbps. The major advantages of Bluetooth® low energy are low power consumption, operating for months or years with a coin cell battery, small size and compatibility with large numbers of smart phones, tablets and computers. The applications include IoT devices, healthcare, fitness, beacons, security and smart home. Bluetooth® SIG released Bluetooth® Core Specification Version 4.1 in 2013 and 4.2 in 2014. The latest version is Bluetooth v5. Please see the next item for additional details on Bluetooth v5.

Q1-3: What is the difference between Bluetooth® v4.2 and v5?

A1-3: Bluetooth® SIG released Bluetooth v5 on December 2016. Bluetooth v5 gives us several key features: 2x the speed, 4x the range and 8x the broadcast capacity of v4.2. Longer range is achieved by increasing receiver sensitivity through error control coding, which reduces the data rate; therefore 4x the range and 2x the speed cannot be realized at the same time. The application should select the Bluetooth v5 feature implementation that will best meet the required performance. These key Bluetooth v5 features are not mandatory. A product can claim to be Bluetooth v5 qualified even if it does not support any of the these key features; so it's important to make sure you check with your supplier which features are supported. Taiyo yuden's Bluetooth v5 modules support at least some of these key Bluetooth v5 functions.

To learn more about the key Bluetooth v5 features, please refer to this Taiyo Yuden article: https://www.allaboutcircuits.com/industry-articles/get-up-to-speed-on-bluetooth-5

Q1-4: What is the difference between Classic Bluetooth® and Bluetooth® low energy?

A1-4: Compared to Classic Bluetooth®, Bluetooth® low energy is intended to provide lower power consumption. See comparison table for other items.

Table1 Comparison table

Items	Classic Bluetooth technology	Bluetooth® Core Specification Version 4.x	Bluetooth® Core Specification Version 5.x
Spectrum range	2.400–2.4835 GHz	2.400–2.4835 GHz	2.400–2.4835 GHz
Channels	79 ch, BW 1MHz/ch	40 ch, BW 2MHz/ch	40 ch, BW 2MHz/ch
Modulation	GFSK/QPSK	GFSK	GFSK
Over the air data rate	1–3Mbps	1Mbps	2Mbps, 1Mbps, 500kbps, 125kbps
Active slaves	7	Not defined. Depends on implementation.	Not defined. Depends on implementation.
Voice capability	Yes	Yes for limited applications *	Yes**

* The voice bandwidth usable in the application might be restricted by the over the air data rate of V4.x. Voice application needs to be developed by customer with their own profile.

** There is no voice profile released by Bluetooth SIG at this moment. Voice application needs to be developed by customer with their own profile.

2. Module

Q2-1: What is the difference of Taiyo Yuden BLE modules? What types of BLE modules are available from Taiyo Yuden.

A2-1: Taiyo Yuden has 2 types of BLE modules that are based on Nordic Semiconductor's chipset: the nRF51 series and the nRF52 series modules. These modules offer 2 software options: Basic and Software Embedded.

A Basic module has no preprogrammed application. It only has the SoftDevice (i.e. protocol stack) and the bootloader preprogrammed into the device; therefore your application can be hosted right on the module eliminating the need for an external host processor. These Basic modules are available with different RAM and flash sizes.

A Software Embedded module has Taiyo Yuden's application preprogrammed into the module. If you are looking a simple "cable replacement", this module would be an excellent option. This module comes with a simple ASCII-based Application Programming Interface (API) to help you get your project up and running quickly. However, since our application is preprogrammed into the module, your application will have to be hosted on a separate host processor.
For additional details, visit:
http://www.yuden.co.jp/or/product/category/module/lineup.html#Bluetooth

Q2-2: What are the part numbers of the Taiyo Yuden BLE modules?
A2-2: For a complete list of part numbers visit:
http://www.yuden.co.jp/or/product/category/module/lineup.html#Bluetooth

Q2-3: Is an external system clock necessary?
A2-3: No, each BLE module has an internal 32MHz clock. Please note, Nordic's nRF51 evaluation board and nRF51 sample applications are designed to run on a 16MHz clock. Since Taiyo Yuden modules run on a 32MHz clock, Nordic's nRF51 sample applications will need some modification in order for it to work on Taiyo Yuden modules. Please see Data Report for modification details.

Q2-4: What is the supported interface?
A2-4: All of the BLE modules have configurable GPIOs and the number of supported GPIO depends on the module. Some of the GPIO pins can be configured as UART, SPI, I2C, I2S, PDM or ADC by the application software. Please see Nordic's Website and the documents for details.
http://infocenter.nordicsemi.com/index.jsp

Q2-5: What is pre-programmed in the module?
A2-5: In each Basic type module, Nordic's SoftDevice and Bootloader are preprogrammed into the module. The version of SoftDevice depends on the module. Please see BLE module Overview document or the Data Report to determine the SoftDevice version. For additional information on the different versions of SoftDevice please see Nordic's website.
http://infocenter.nordicsemi.com/index.jsp

Software Embedded type modules are preprogrammed with Taiyo Yuden's application software.

Q2-6: What type of processor is inside the module?
A2-6: nRF51 series modules have ARM® Cortex® M0 internally.
nRF52 series modules have ARM® Cortex® M4F internally.

Q2-7: What memory size does the module have?
A2-7: EYSGxNZXX series has 256kB FLASH and 16kB RAM.
EYSGxNZWY series and EYAGJNZXX have 256kB FLASH and 32kB RAM.
EYSHxNZWZ series has 512kB FLASH and 64kB RAM.

Q2-8: What is the expected battery life of the BLE module?
A2-8: The power consumption completely depends on the use case and the operational conditions. In scenarios where battery consumption is kept to an absolute minimum, it should be possible to achieve a year or more of battery life with a coin cell battery.

Q2-9: What is the output power and communication distance of the module?
A2-9: Tx power is -20 to +4dBm in 4dB steps. It enables the adequate communication distance for any applications used in a room or an office. Please be aware that the actual distance varies depending on the communication environment where the module is used.

Q2-10: Is an external 32.768kHz clock required?

A2-10: The EYSHCN and EYSGCN series modules come with an internal 32.768kHz clock; therefore external 32.768kHz clock is not required. For the EYSHSN, EYSHJN, EY*GJN series modules, you have the option of adding an external 32.768kHz crystal or using the nRF5's built-in internal 32.768kHz RC oscillator. Generating a clock from a 32.768kHz 20ppm crystal will keep the current consumption lower than using the internal RC oscillator. Using the internal RC oscillator requires the processor to periodically wake up and perform calibration (i.e. current goes up slightly). The method to enable the RC oscillator is described in Evaluation Board/Kit Manual.

Q2-11: What regulatory certification do the modules have?

A2-11: The modules are Bluetooth® qualified as a Component and Japan, FCC and ISED certified. The modules are Bluetooth® qualified at the PHY layer only. The QDID is provided in the Data Report. Please consult a qualification test facility to determine Bluetooth® qualification requirements for your end product. Bluetooth® qualification and radio certification were done using the preprogrammed version of SoftDevice in the module. The customer can replace the preprogrammed SoftDevice with any version of SoftDevice (i.e. it can be a newer or older SoftDevice as long as it is a valid Nordic SoftDevice for the chip). Replacing the SoftDevice will not invalidate the Bluetooth® qualification and radio certification; so if the customer decides to upgrade to a newer SoftDevice, PHY layer Bluetooth® requalification and radio recertification is not necessary. The only exception is programming a Bluetooth v5 SoftDevice into the EYSHCNZXZ and EYSHJNZXZ v4.2 modules. Bluetooth v5 introduced a new modulation rate. The EYSHCNZXZ and EYSHJNZXZ were never Bluetooth® qualified or radio certified with this new modulation rate. Programming a v5 SoftDevice into these modules will invalidate the Bluetooth® qualification and radio certification; therefore recertification/qualification will be required. If Bluetooth v5 functionality is required on your product, we recommend the EYSHCNZWZ or the EYSHJNZWZ. These modules are the same identical hardware as EYSHCNZXZ and EYSHJNZXZ. However, they are preprogrammed with a Bluetooth v5 SoftDevice; therefore they are already Bluetooth v5 qualified and radio certified.

Conducted test report for CE radio regulation EN 300 328 Ver2.1.1 is available. Customers should get CE certification at the end product level not the module level.

Q2-12: How should we design the schematic and layout the board and the surrounding area of antenna to maximize antenna performance?

A2-12: For schematic design, please refer to the "Reference Circuit" in the Data Report and the "Evaluation board circuit schematic" in the Evaluation Board/Kit Manual. For board layout details, please refer to the "Design guide" of the Data Report. For the antenna area design, please refer to the "Antenna application note" section of the Data Report.

Q2-13: What support does Taiyo Yuden provide for BLE modules?

A2-13: Hardware support is provided by Taiyo Yuden. Software support is handled by Nordic on the Basic modules. Software support is handled by Taiyo Yuden on the Software Embedded modules.

3. EVB/EVK

Q3-1: What are the part numbers of the evaluation boards and evaluation kits?

A3-1: Please see Taiyo Yuden Website below or see BLE module Overview document.
http://www.yuden.co.jp/or/product/category/module/lineup.html#Bluetooth

Q3-2: What is contained in the evaluation boards and the evaluation kits?

A3-2: Evaluation board contains a circuit board (evaluation board) with a module mounted, and a document with instructions on how to download technical documents (e.g. Data Report and Evaluation manual).
Evaluation kit contains an evaluation board, a document with instructions on how to download technical documents (e.g. Data Report and Evaluation manual), and a J-Link Lite board. J-Link Lite is a JTAG/SWD (Serial Wire Debug) debug probe for Cortex-M cores used in Taiyo Yuden's BLE modules. It is used for software development and debugging. Please see Evaluation Board/Kit Manual for details on how to use J-Link Lite.

Q3-3: What can be done with Evaluation board and Evaluation kit?

A3-3: The Evaluation board and Evaluation kit can be used to perform functional and performance testing (e.g. communication and current consumption tesing). For Basic modules, J-Link Lite is necessary to program test application software on the module.

4. Software

Q4-1: What BLE profiles are available for the modules?

A4-1: Please see table 1 in the document below for the profiles supported by nRF51 SoftDevice S120.
http://infocenter.nordicsemi.com/pdf/S120_SDS_v2.1.pdf

Please see the Website below for the profiles supported by nRF52 SoftDevice S132.
http://infocenter.nordicsemi.com/index.jsp?topic=%2Fcom.nordic.infocenter.s132.sds%2Fdita%2Fsoftdevices%2Fs130%2Fble_protocol_stack%2Fprofile_service_support.html

Please check Nordic's website for addtional details on supported profiles.
http://infocenter.nordicsemi.com/index.jsp

Q4-2: What tools are available for software development and debugging?

A4-2: The software development environment (IDE: Integrated Development Environment) for ARM processors (MDK: Microcontroller Development Kit) is necessory. Taiyo Yuden's BLE modules are supported by three IDEs, Keil uVision IDE (MDK-ARM), GNU/GCC and IAR, shown in Nordic Website below.
http://infocenter.nordicsemi.com/topic/com.nordic.infocenter.gs/dita/gs/nordic_tools.html?

Q4-3: How can I get SDK (Software Development Kit) for application development?

A4-3: Please visit the Nordic's website below to download the SDK.
http://infocenter.nordicsemi.com/topic/com.nordic.infocenter.gs/dita/gs/develop_sw.html?cp=1_2

https://developer.nordicsemi.com/

Q4-4: What resources are available other than SDK?

A4-4: A lot of resources, contents and documents are available on Nordic's Website including nRF51/52 SoftDevice, nRFgo Studio, Master Control Panel, etc. Please visit Nordic's Website.
http://infocenter.nordicsemi.com/index.jsp

https://developer.nordicsemi.com/nRF5_SDK/doc/

Q4-5: How do I get detailed software information and support?

A4-5: A wealth knowledge and information on RF51/52 application development are available on the following Nordic's websites:
http://infocenter.nordicsemi.com/index.jsp

https://github.com/NordicSemiconductor

https://devzone.nordicsemi.com/

https://www.nordicsemi.com/eng/Support-Community

Taiyo Yuden Tutorials and Sample Code are aslo available in the links below:
Taiyo Yuden YouTube channel: https://www.youtube.com/channel/UCVHK64avLBpCNtzEIt74xbQ

Taiyo Yuden GitHub Page: https://github.com/TaiyoYudenUSA

Q4-6: How do I get started with the software development?

A4-6: A Quick Start Guide document which describes the software development environment, SDK, necessary software and the basic instructions will be provided for the customers who purchased the Evaluation board.