WLAN Module

Frequently Asked Questions

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General

TAIYO YUDEN has published the following documents describing our modules on the website.
-Overview: Shows an overview of the module.
-Data Report: Shows the module specifications.
-Application Note: This is the design guide when using the module.
  For the embedded CPU module, this document is included in Data Report.
-Evaluation Board/ Kit Manual: This is the operation manual for the evaluation board to evaluate our
  modules.
These materials can be downloaded by accessing the following URL and proceed with the related
page of each module.
  TAIYO YUDEN Wireless Module Lineup
>   Japan: https://www.yuden.co.jp/jp/product/category/module/lineup/#WLAN
>   North America:https://www.yuden.co.jp/ut/product/category/module/lineup/#WLAN
>   Europe: https://www.yuden.co.jp/eu/product/category/module/lineup/#WLAN
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>   China: https://www.yuden.co.jp/cs/product/category/module/lineup/#WLAN
>   Korea: https://www.yuden.co.jp/kr/product/category/module/lineup/#WLAN
>   Other region: https://www.yuden.co.jp/or/product/category/module/lineup/#WLAN

1. About Wireless LAN and Bluetooth®

Q1-1: What is wireless LAN?
A1-1:
At present, various IEEE 802.11 standards are in place, and a network consisting of devices that comply with the technical standards is generally called a wireless LAN. Standards have been added and modified as the process progresses, achieving higher speeds.
The first standardization has been done as IEEE 802.11, and then IEEE 802.11b was standardized with a maximum transmission speed of 11Mbps using the 2.4GHz band. After that, IEEE 802.11a with a transmission speed of 54 Mbps using the 5 GHz band was also standardized. Subsequently, the IEEE 802.11g standard of 54 Mbps in the 2.4 GHz band compatible with IEEE 802.11b was also defined.
In 2009, IEEE 802.11n, which achieves the maximum transmission speed of 600 Mbps on the outline, was standardized, and from 2014, IEEE 802.11ac, which theoretically enables high-speed communication of 6.93 Gbps, was standardized.

Please refer to the documents of Overview or Data Report to see which standards above TAIYO YUDEN's modules support.

Q1-2: What WLAN function does the TAIYO YUDEN's WLAN/ *Bluetooth®* combo module have ?
A1-2:
TAIYO YUDEN's module supports major functions such as Wi-Fi Direct, WPA2, WPS and Power Save mode. For details, please refer "Software Feature Set" for WYSBHVGXG/ WYSAGVDXG/ WYSEGVDXG or "Feature" for WYSACVLAY-XZ/ WYSACVLAY-WX in each Overview document.

Q1-3: What *Bluetooth®* function does the TAIYO YUDEN's WLAN/ *Bluetooth®* combo module have?
A1-3:
In case of the module supported SDIO interface such as WYSBHVGXG/ WYSAGVDXG/ WYSEGVDXG, it supports Classic *Bluetooth®* (max. 3Mbps) and *Bluetooth®* LE as Ver.4.2 compliant.

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Although the functions of LE 2M PHY, LE Coded PHY and LE Advertising Extension haven't been supported by these modules, customers can obtain Ver 5.0 Qualification. Please contact your Qualification body for details on Qualification.

For more details, please refer to Overview of "Software Feature Set" on Wireless LAN modules: WYSBHVGXG/ WYSAGVDXG/ WYSEGVDXG.

The CPU embedded modules such as WYSACVLAY-XZ/ WYSACVLAY-WX do not support *Bluetooth*®.
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Q1-4: Is TAIYO YUDEN's module with WLAN and *Bluetooth*® functions capable of transmitting and receiving WLAN and *Bluetooth*® at the same time? If yes, how is radio wave interference considered?
A1-4:
It is possible to use them at the same time. For WLAN communication and *Bluetooth*® communication, the communication timing is switched by time division control mechanism inside the module to prevent radio wave interference. However, because of this mechanism, the throughput may be decreased.

Q1-5: Can *Bluetooth*® Classic and *Bluetooth*® LE be used at the same time?
A1-5:
It is possible to operate both *Bluetooth*® functions at the same time due to the time division control function which is the same as A1-4.

2. About WLAN/ Bluetooth® combo Module.

Q2-1: How can I get the documents of Overview, Data Report and Application Note of each module?
A2-1:
You can download them by going to the page of each module from the URL below.

    Japan: https://www.yuden.co.jp/jp/product/category/module/lineup/#WLAN
    North America:https://www.yuden.co.jp/ut/product/category/module/lineup/#WLAN
    Europe: https://www.yuden.co.jp/eu/product/category/module/lineup/#WLAN
    Asia Pacific: https://www.yuden.co.jp/ap/product/category/module/lineup/#WLAN
    China: https://www.yuden.co.jp/cs/product/category/module/lineup/#WLAN
    Korea: https://www.yuden.co.jp/kr/product/category/module/lineup/#WLAN
    Other region: https://www.yuden.co.jp/or/product/category/module/lineup/#WLAN

Q2-2: What is the difference between TAIYO YUDEN's WLAN module products. What types of WLAN modules are available from TAIYO YUDEN?
A2-2:
A wide range of products are available according to the customer's application. There are broadly two types of WLAN modules as below.
The module with SDIO interface is capable of high-speed communication using NXP 88W8887 SoC compatible with 11ac/Wi-Fi 5, and the CPU embedded module that uses NXP 88MW320 SoC. For the modules with SDIO interface, WYSBHVGXG which is compact and low-cost, WYSAGVDXG which is equipped with TAIYO YUDEN's dual band chip antenna and WYSEGVDXG which is equipped with an RF connector and can be connected to an external antenna are in our product lineup.

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As for the modules with embedded CPU, WYSACVLAY-WX which comes with built-in original software made by TAIYO YUDEN and WYSACVLAY-XZ which is a blank type for customers to design own software are in our product lineup as well.

Please refer to Q5-7 for the information of type approval certificate that each module obtained.

Q2-3: Is the antenna embedded?

A2-3:

Please refer to the table below.

Part #	Interface	Antenna	Remarks
WYSBHVGXG	SDIO	Not embedded	Recommended antenna: AH104N2450D1
WYSAGVDXG	SDIO	Embedded	
WYSEGVDXG	SDIO	RF Connector is build-in	Recommended antennas differ depending on the region. For details, refer to the URL below.
WYSACVLAY-WX	UART	Embedded	
WYSACVLAY-XZ	UART/ I2C/ SPI	Embedded	

For the recommended external antenna of WYSEGVDXG, please access the URL below and click Antenna List to see the details.

WYSEGVDXG Recommended Antenna List.

Japan: https://www.yuden.co.jp/jp/product/category/module/lineup/wysegvdxg/

North America: https://www.yuden.co.jp/ut/product/category/module/lineup/wysegvdxg/

Europe: https://www.yuden.co.jp/eu/product/category/module/lineup/wysegvdxg/

Asia Pacific: https://www.yuden.co.jp/ap/product/category/module/lineup/wysegvdxg/

China: https://www.yuden.co.jp/cs/product/category/module/lineup/wysegvdxg/

Korea: https://www.yuden.co.jp/kr/product/category/module/lineup/wysegvdxg/

Other region: https://www.yuden.co.jp/or/product/category/module/lineup/wysegvdxg/

When purchasing recommended antennas, please contact each manufacturer directly or distributor.

Q2-4: What types of CPU is installed in the CPU embedded module?

A2-4:

The 88MW320 used in the CPU embedded modules is equipped with ARM Cortex-M4F 200MHz clock and memory which are 512kB RAM and 128kB ROM.

Q2-5: What is the benefit of embedded CPU?

A2-5:

By using the CPU embedded module, it is possible to embed and operate application software in the module other than software for wireless LAN function.

Q2-6: What is feature of WYSACVLAY-XZ/ -WX?

A2-6:

In the case of WYSACVLAY-WX, it is possible to connect and communicate with the access point (AP) by simple command control through UART interface. In addition, it also supports the μAP mode.

In the case of WYSACVLAY-XZ, it depends on the software developed by the customer. For more

details, please visit the following website and refer Overview document.

- WYSACVLAY-WX
    Japan: https://www.yuden.co.jp/jp/product/category/module/lineup/wysacvlay-wx/
    North America: https://www.yuden.co.jp/ut/product/category/module/lineup/wysacvlay-wx/
    Europe: https://www.yuden.co.jp/eu/product/category/module/lineup/wysacvlay-wx/
    Asia Pacific: https://www.yuden.co.jp/ap/product/category/module/lineup/wysacvlay-wx/
    China: https://www.yuden.co.jp/cs/product/category/module/lineup/wysacvlay-wx/
    Korea: https://www.yuden.co.jp/kr/product/category/module/lineup/wysacvlay-wx/
    Other region: https://www.yuden.co.jp/or/product/category/module/lineup/wysacvlay-wx/

- WYSACVLAY-XZ
    Japan: https://www.yuden.co.jp/jp/product/category/module/lineup/wysacvlay-xz/
    North America: https://www.yuden.co.jp/ut/product/category/module/lineup/wysacvlay-xz/
    Europe: https://www.yuden.co.jp/eu/product/category/module/lineup/wysacvlay-xz/
    Asia Pacific: https://www.yuden.co.jp/ap/product/category/module/lineup/wysacvlay-xz/
    China: https://www.yuden.co.jp/cs/product/category/module/lineup/wysacvlay-xz/
    Korea: https://www.yuden.co.jp/kr/product/category/module/lineup/wysacvlay-xz/
    Other region: https://www.yuden.co.jp/or/product/category/module/lineup/wysacvlay-xz/

Q2-7: Which interface is supported at each module?
A2-7:
WYSBHVGXG, WYSAGVDXG and WYSEGVDXG have SDIO and PCM interface. WYSACVLAY-WX supports UART. WYSACVLAY-XZ has a capability to support UART, I2C, SPI, etc. depending on the software to be developed by customer.
For details, please refer to the Feature page on the Overview of each module on TAIYO YUDEN's website.

Q2-8: Does TAIYO YUDEN's WLAN module support uAP mode? What is the maximum number of units that can be connected?
A2-8:
-The WLAN modules with SDIO.
  uAP mode is supported. The module hardware has a capability to connect up to 10 stations as the maximum number.
- The CPU embedded modules.
  The capability of maximum connection number of WYSACVLAY-XZ is 8 on module hardware
  The capability of maximum connection number of WYSACVLAY-WX is 8.
  Please note that simultaneous process cannot be performed. After one process complete, then next processing is to start perform.

Q2-9: When the host is in sleep mode, is it possible to wake up the host from the module when WLAN communication occurs? On the other hand, is it possible to wake up the module from the host when the module is in sleep mode?
A2-9:
Regarding the SDIO WLAN modules, when the module receives data while the host is in sleep mode, a signal is output from specified GPIO and then it wakes the host up.
Also, when the module is in sleep mode, the command via SDIO or a signal from specified GPIO are able to wake the host up.
WYSACVLAY-XZ depends on the function of the software to be developed by customer.
Regarding WYSACVLAY-WX, there is no function to wake up the host side. However, there is a

function to be woken up by the host.

Q2-10: What is the max SDIO clock supported on module?
A2-10:

Please refer to the SDIO interface specifications in Electrical Characteristics section in Data Report of each module.

3. About the evaluation board and evaluation kit.

Q3-1: How can I get the module, evaluation board (EVB) and evaluation kit (EVK)?
A3-1:

Please contact your local sales office or agent.

Please refer to the below link for TAIYO YUDEN sales offices and agents.

Japan: https://www.yuden.co.jp/jp/contact/
North America: https://www.yuden.co.jp/ut/contact/
Europe: https://www.yuden.co.jp/eu/contact/
Asia Pacific: https://www.yuden.co.jp/ap/contact/
China: https://www.yuden.co.jp/cs/contact/
Korea: https://www.yuden.co.jp/kr/contact/
Other region: https://www.yuden.co.jp/or/contact/

Please refer to the below link for TAIYO YUDEN's online distributors.

Japan: https://www.yuden.co.jp/jp/product/agency.html
North America: https://www.yuden.co.jp/ut/product/stockcheck/
Europe: https://www.yuden.co.jp/eu/product/stockcheck/
Asia Pacific: https://www.yuden.co.jp/ap/product/stockcheck/
China: https://www.yuden.co.jp/cs/product/stockcheck/
Korea: https://www.yuden.co.jp/kr/product/stockcheck/
Other region: https://www.yuden.co.jp/or/product/stockcheck/

Q3-2: What is the product number of the evaluation board and the evaluation kit?
A3-2:

Please refer to the table below.

Module Part #	EVB	EVK
WYSBHVGXG	WBSBHVGXG	WKSBHVGXG
WYSAGVDXG	WBSAGVDXG	WKSAGVDXG
WYSEGVDXG	WBSEGVDXG	WKSEGVDXG
WYSACVLAY-WX	WBSACVLAY-WX	N/A
WYSACVLAY-XZ	WBSACVLAY-XZ	WKSACVLAY-XZ

Q3-3: What is included in the evaluation board and evaluation kit?
A3-3:

The evaluation board of the WLAN module includes the evaluation board with the module and a document that describes how to download the Evaluation Object Package, etc. The Evaluation

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Object Package contains a driver and RF test tool that runs on a Linux PC with Fedora 18 installed. A Linux PC is required to support SDIO interface.

The evaluation kit comes with a single board computer called ESPRESSObin equipped with ARM processor in addition to an evaluation board. Since ESPRESSObin can be used as a replacement for a Linux PC, if you do not have a Linux PC with SDIO slot, we recommend utilizing the evaluation kit.

USB-Serial conversion IC is equipped on the evaluation board of the CPU embedded module.
This makes it possible to verify the operation via the USB port of the PC.
Since TAIYO YUDEN's software embedded module does not require for customer to develop software, no evaluation kit is offered and only the evaluation board is available.
The evaluation kit of blank type module is a set of the evaluation board and the debug tool which is called J-Link Lite.
For details, please refer to Overview and Evaluation Board Manual.

Q3-4: What can I do with the evaluation board?
A3-4:

The evaluation board (EVB) is a development board that allows the customer to evaluate, verify and measure for the module before designing it on your products. A module and peripheral circuit necessary for the module operation are contained in one circuit board, and it allows any customers to evaluate the module as it is without any peripheral circuit design. In addition, the circuit diagram of the evaluation board serves as reference information when customer designing the end product. For details, please refer to the Evaluation Board/ Kit Manual.

Q3-5: Is the software to operate the evaluation board or the evaluation kit included?
A3-5:
-The SDIO WLAN modules.
 The evaluation board comes with software for Linux PC with Fedora 18.
 Software for ESPRESSObin is attached to the evaluation kit.
-The CPU embedded module (TAIYO YUDEN's software Embedded type): WYSACVLAY-WX
 Since the software is already embedded in the module, the customer can control the module via UART without special software.
- The CPU embedded module (Blank type): WYSACVLAY-XZ.
 Any software is not included as this module is a product that the customer develops software for.

4. About Software.

Q4-1: I am considering TAIYO YUDEN's Module for our product. What kind of software support I can expect?
A4-1:
-The SDIO WLAN modules.
 If you agree and having SLA, Software License Agreement, in place, we will provide the source code package of Linux and Ubuntu base.
 * SLA is an English document, and the text cannot be modified.
 The source code package of Linux and Ubuntu base cannot be redistributed to any third parties Customers can develop software based on this source code.
 It is also possible for TAIYO YUDEN to introduce software development company who you can consider outsourcing of software development on behalf.

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- The CPU embedded modules.
WYSACVLAY-WX: Customer can obtain Data Report, Software Manual, Operation Tool, etc. from TAIYO YUDEN's website.
WYSACVLAY-XZ: Customer can obtain the software development environment such as SDK as free of charge by having an NDA in place with NXP.
* * By having a Sublicense Agreement with TAIYO YUDEN, NXP's SDK can be provided from TAIYO YUDEN, however TAIYO YUDEN does not support NXP's SDK.

Q4-2: What Kernel version does the source code package support for Linux?
A4-2:
From Linux 2.6.32 to 5.2.9.

Q4-3: What is included in the source code package (Linux base)?
A4-3:
It includes WLAN and *Bluetooth®* communication Driver Source Code, Firmware and User Manual. Also it comes with software called MFG for RF evaluation. MFG includes RF Evaluation Firmware and Application Software.

Q4-4: How to obtain the source code package?
A4-4:

It can be obtained by having the SLA, Software Sublicense Agreement, in place. The below will explain about necessary documents and the process when we proceed with the SLA.

First, please provide us of your company name, mailing address, email address of the person who communicate with TAIYO YUDEN on this regard, application information that uses module, name of the person who signs the SLA contract. All of the information should be provided in English. Then TAIYO YUDEN will send you the SLA document for you to review and sign. Please return the signed original documents. Upon confirmation of receipt of the documents, TAIYO YUDEN registers your information and contact customer by sending email with a related URL where customer can download the source code package.

When a version of the package is updated, an update notification will be sent to customer.

Please kindly note that if the destination of the package is located other than Japan, it may take some time to complete parameter sheet for custom declaration.

Q4-5: What should I do about the driver for OS other than Linux?
A4-5:
TAIYO YUDEN does not prepare drivers for OSs other than Linux. TAIYO YUDEN may able to introduce third party software partner. Please kindly contact TAIYO YUDEN for further information.

Q4-6: In case of module with SDIO interface, is it possible to evaluate in environment other than Linux PC or evaluation kit (ESPRESSObin)?
A4-6:

If customer wants to evaluate in an environment other than those introduced by TAIYO YUDEN, customer needs to prepare the environment by themselves.

Q4-7: What are the CPUs and OSs that operation has been verified with TAIYO YUDEN's WLAN modules?
A4-7:
CPUs that have been verified function at TAIYO YUDEN are;
 -NXP i.MX6ULL, i.MX 8QuadMax.

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-Renesas RZ/ G1E-PF.

The operating system in which we have verified function is Linux. For other than Linux, please contact TAIYO YUDEN for further information.

5. Frequently asked questions.

Q5-1: What should I do about the peripheral circuit diagram when using the module?
A5-1:

Please refer to the following materials.
 -Schematic in Data Report.
 -Design Guides in Application Note.
 -Evaluation Board Schematic in Evaluation Board Manual.
It is possible for us to review your circuit design, if you ask us with the data.

Q5-2: What should I do about the layout surrounding antenna?
A5-2:

 - The recommended antenna for WYSBHVGXG is AH104N2450D1 manufactured by TAIYO YUDEN. For the layout of the antenna, please refer to the Antenna matching in Application Note of the module.
 - For information on WYSAGVDXG, please refer to the Antenna Application Note on Data Report.
 - For WYSEGVDXG, please select antenna from the Antenna List on Q2-3 and ask each manufacturer for recommended conditions.
 - For WYSACVLAY-XZ/ WX, please refer to Antenna Application Note on Data Report.
 If you can make a placement plan, please send us of data as needed for us to review the placement.

Q5-3: What should I do about the size of the land and the amount of solder when mounting the module?
A5-3:

Please refer to Recommended Land Pattern Dimension and Recommended Metal Mask (Solder Mask) Conditions in Outline/Appearance section of Data Report for each module.

Q5-4: How should the unused terminals of the module be handled?
A5-4:

Please keep open unused reserve terminals and unconnected pins.

Q5-5: What is the power consumption of the module?
A5-5:

The power consumption during transmitting/ receiving at each data rate and low power consumption mode in the case of using our evaluation board and RF test tool is described as a reference value in Electrical characteristics section of Data Report.
Since the power consumption during actual use varies depending on the communication conditions and standards, please evaluate in the environment where the module is installed in the device.

Q5-6: How much is the throughput?
A5-6:

According to our measurement, it is about 90Mbps with SDIO 2.0 high speed and 180Mbps with SDIO 3.0 ultra-high speed in case of the SDIO WLAN module. In case of the CPU embedded module, it is about 20Mbps when processing is completed by module. In case of controlling from host via UART, it is about 1.4Mbps.
The throughput varies depending on the measurement conditions such as host CPU capacity,

surrounding RF environment, etc.

Q5-7 What kind of type approval certificate has module obtained?
A5-7:
-The SDIO WLAN module.
 For WYSBHVGXG, it is necessary to obtain a type approval certificate in combination with the antenna in the customer's products.
 WYSAGVDXG and WYSEGVDXG have been certified with the Federal Communications Commission (FCC) (USA), Innovation, Science and Economic Development Canada (ISED) (Canada) and Ministry of Internal Affairs and Communications (MIC) (Japan).
 Regarding WYSAGVDXG, the conduction test reports of harmonised standards; EN 300 328 and EN 301 893 have been released. The conduction test reports can be downloaded from the related page of WYSAGVDXG on website. It is necessary to conform with your end products except for the conduction test.
 Regarding WYSEGVDXG, please refer to the recommended antenna that obtained the above certification in Q2-3 on this FAQ.

-The CPU Embedded Module.
 Both WYSACVLAY-XZ and WYSACVLAY-WX have been certified with FCC (USA), ISED (Canada) and MIC (Japan), and the conduction test reports of harmonised standards; EN 300 328 have been released. The conduction test reports can be downloaded from the related page of each module. It is necessary to conform with your end product except for the conductive test. For details on the conditions for obtaining certification, refer to the related articles of the Radio Law in General Items of Data Report of each module.

Q5-8: How can I get the RF testing tool when I apply to the Radio Law?
A5-8:
It is necessary to have the SLA in place and use MFG in the source code package.
Labtool, which is a CUI tool running on a Windows PC, can be used on your end products when performing continuous transmitting/ receiving testing. When you control the device externally you need to pull out a signal line, and when you control the device itself, you need to prepare porting the driver to the device, etc. We recommend that you discuss the test conditions with your certification body in advance.

Q5-9: Do you have certification of Wi-Fi Alliance certification programs?
A5-9:
TAIYO YUDEN's module does not come with the certification.
If the customer needs the certification on the end product, please consult with an authorized test lab.

Q5-10: What are the packing specifications and regular order quantity?
A5-10:
WYSBHVGXG: Standard packaging method is tape and reel.
WYSAGVDXG/ WYSEGVDXG/ WYSACVLAY-XZ/ WYSACVLAY-WX: Standard packing method is tray.
For details on standard order quantity and other packaging specifications, please refer to Packaging Specification on Data Report of each module.

Q5-11: How long is the lead time when purchasing the module?
A5-11:
Please contact your nearest TAIYO YUDEN sales office or agent.

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