Wireless LAN Module

IEEE802.11b/g/n

WYSAGVDX7

Application Note

In case you adopt this module and design some appliance, please ask for the latest specifications to the local sales office.

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Revision log

Revision	Date	Change history
Version 1.0	10 -Mar. 2015	Original release
Version 1.1	4-Apr. 2017	Update

1. Overview

The content of this material is design guideline to provide stable characteristics of wireless communication module which is developed and sold by TAIYO YUDEN CO., LTD.. It is technical data for the purpose of utilization in designing of equipment which adopt module, and module peripheral circuit.

In case of designing peripheral circuit or equipment with reference to this material, please make full evaluation of module characteristics at customer's premises before practical application. For any inquiry, please contact our staff.

2. Scope

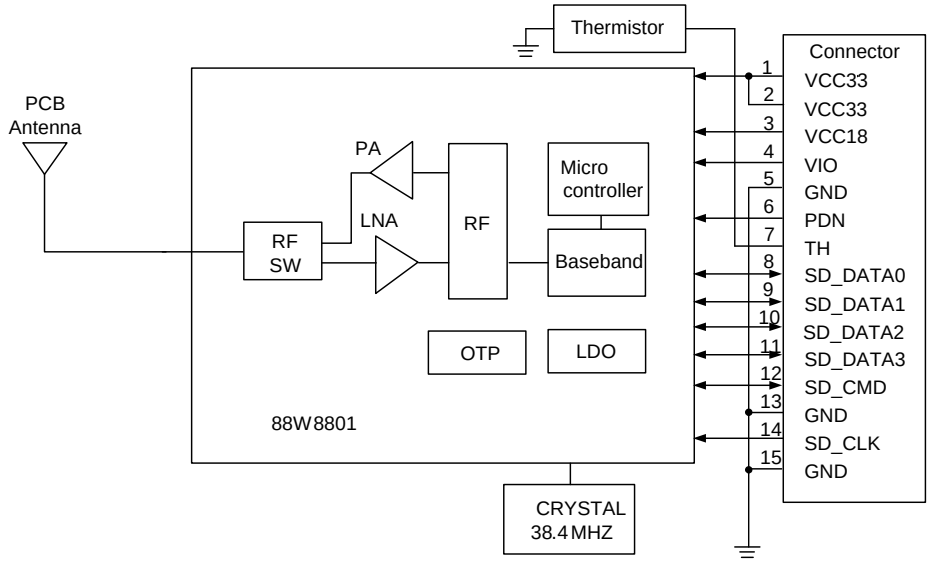
The content of this material is applicable to following product of wireless communication module which is developed and sold by TAIYO YUDEN CO., LTD..

Objective item: WYSAGVDX7

3. Summary description of this module

This module is module with hybrid functionality adopting 88W8787 by Marvell. It is compact module with multifunction, compliant to IEEE802.11b/g/n and possesses interface such as SDIO. For detailed function, characteristics, etc., please obtain and check the latest Data Report.

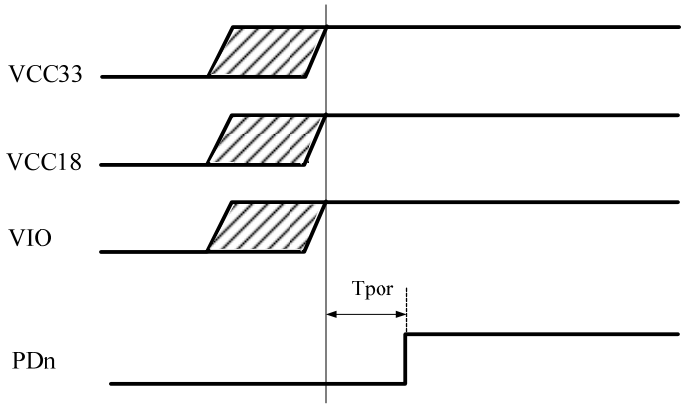
3-1 Module configuration



4. Design guide

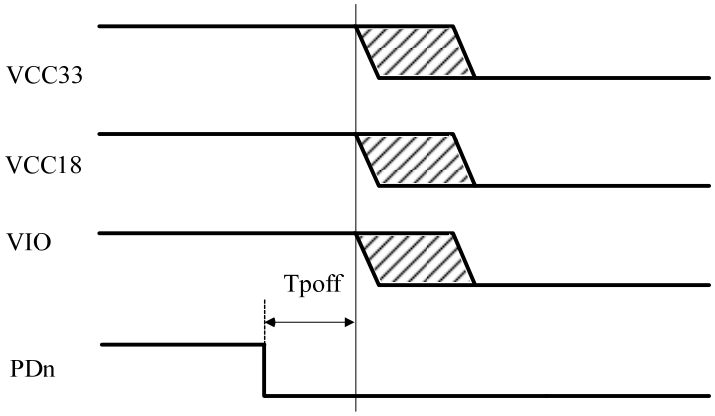
4-1 Power up sequence.

In order to start up power supply, set PDn from low level to high level to actuate POWER ON RESET, and make normal start up of module. PDn must remain asserted for a minimum of Tpor (100msec.) after VCC33, VCC18 and VIO are stable.



4-2 Power off sequence

In order to power off the module, set PDn from high level to low level first. PDn should be asserted low (active) for a minimum of Tpoff (100mS) before VCC33, VCC18 and VIO start to ramp down. Furthermore PDn should be asserted low during VCC33, VCC18 and VIO ramp down.



4-3 Recommended power circuit

As module power supply, there are 3 power supplies named VCC33 , VCC18 and VIO. VCC33 and VCC18 are power supplies for analog circuit. VIO is power supply for digital circuit.

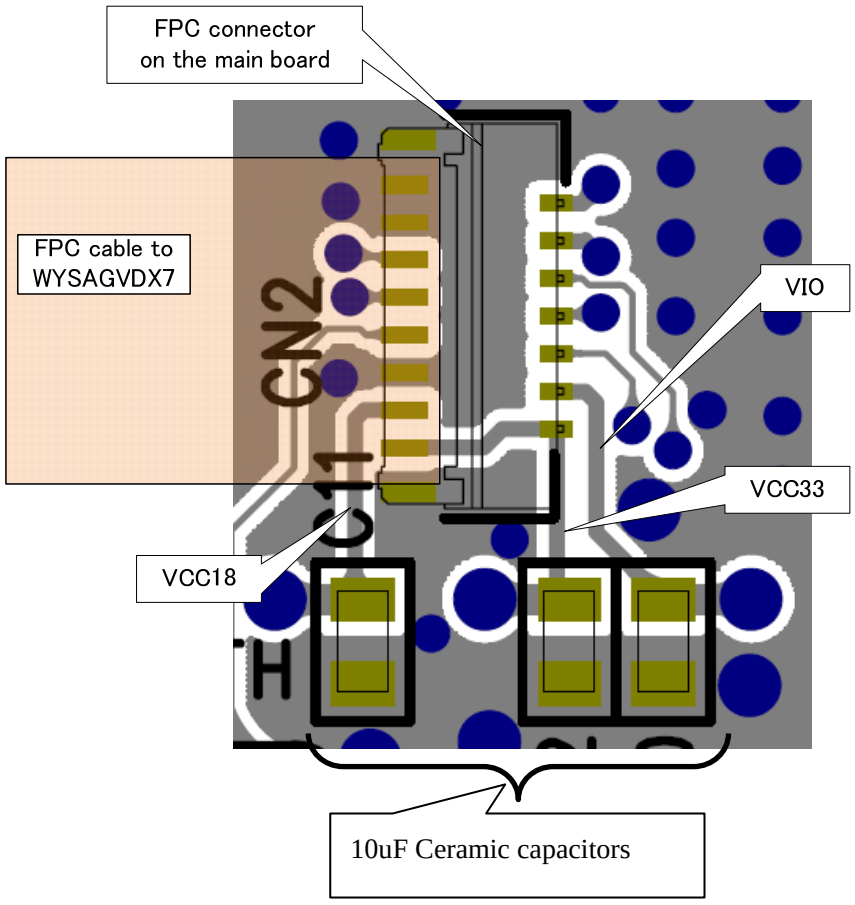
Regarding power supply, consideration on noise shall be taken in order to stabilize RF and other characteristics of module. Maximum output ripple voltage on VCC33, VCC18 and VIO are recommended 60mVpp, 30mVpp and 60mVpp respectively.

4-4 Pattern design guide

4-4-1 Power supply

Bypass capacitors on each power supply line shall be placed close to FPC connector to the module. Since capacitance will be affected by quality of power supply, optimum constant shall be required. 10uF ceramic capacitors on each power lines are recommended.

Regarding line width of VCC33 and VCC18 allowance shall be considered and more than 500um is recommended.



4-4-2 Digital I/F

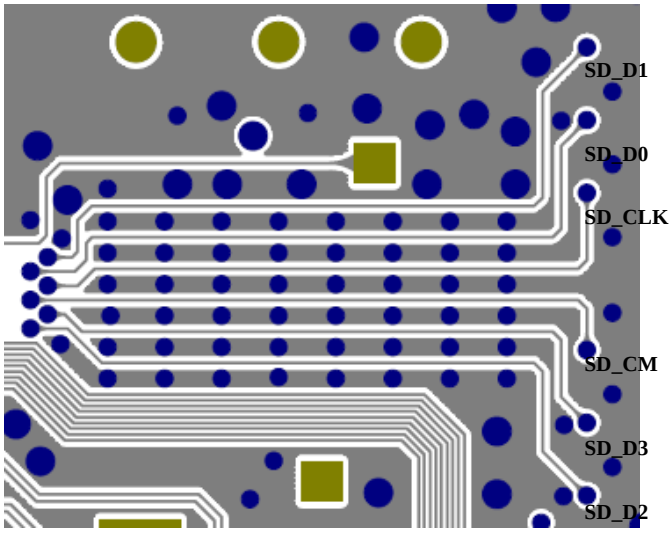
<SDIO>

On pattern design of SDIO line between module and HOST, pay attention to following items.

-Each SDIO line between module and HOST should be routed with the same length as short as possible and must be parallel and symmetrical. GND via shall be set between each line (especially SD_CLK), for shielding.

-In case of long wiring or connector application between boards, effect by reflection shall be eliminated by making series insertion of dumping resistor, etc. to each line as necessary.

<Example>



<Others>

-For other digital signals, they shall be away from SD_CLK, and shall not overlap with this signal between layers.

4-4-3 Unused terminal processing

Unused terminals (unconnected terminal) shall be open in circuit.

4-4-4 Length of FPC cable

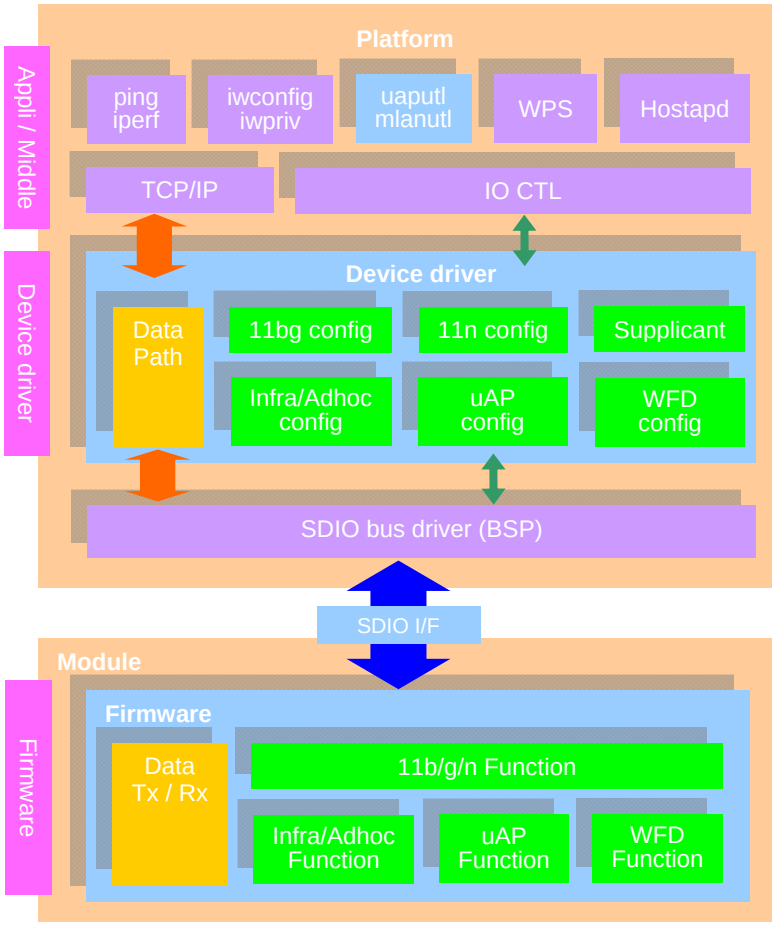
Length of FPC cable affects the quality of SDIO signals. Less than 50mm is recommended. Please make enough evaluation of module characteristics with your FPC cable before practical application.

4-5 Mounting location of module

RF antenna is built in WYSAGVDX7. Mounting location of module in the main board or equipment should be considered for better antenna characteristic and RF performance. Regarding the mounting location of module, please refer to "WYSAGVDX7 Antenna Application Note" for the details.

5. Explanation on software

5-1. Software configuration and type



- *Firmware and driver:*

  The firmware and driver package are provided by TAIYO YUDEN CO., LTD. under the license agreement. It includes *uaputl* application for access-point function and *mlanutl* application for Infrastructure function.

- *Supplicant :*

  Embedded supplicant is implemented in device driver. Alternatively, open source

wpa_supplicant / *hostapd* are available as external supplicant. The choice is up to your application.

It is recommended to use Embedded supplicant.

* *hostapd* needs to be customized to match driver interface.
Sample code of *hostapd* is included in the package for reference,
however, we will not support the code.

5-2. Type of Marvell standard driver

As below table, Linux driver for x86 architecture and Android / Linux driver for ARM architecture are only available.

For other CPU/OS, porting will be required.

[Marvell standard driver]

CPU / OS	I/F	Providing method
ARM series + Android or Linux 3.x (Linux 3.x compatible)	SDIO	Source code
x86 + Fedora18 (Linux-3.6.10)	SDIO	Source code

5-3. License agreement

To obtain source code package, you shall close a contract of SLA (Software License Agreement) with Marvell or TAIYO YUDEN CO., LTD..

* As for object package, SLA is not required.

5-4. Note on driver install

5-4-1. Pre condition

To run WLAN driver, following function is required.

- SDIO

5-4-2. SDIO controller

One of the important factors for WLAN throughput is SDIO-Clock frequency. In our experience, better throughput at 25MHz or higher. However, from the perspective of power consumption, lower clock is preferred. Therefore, SDIO-Clock frequency should be determined considering power consumption and WLAN throughput.

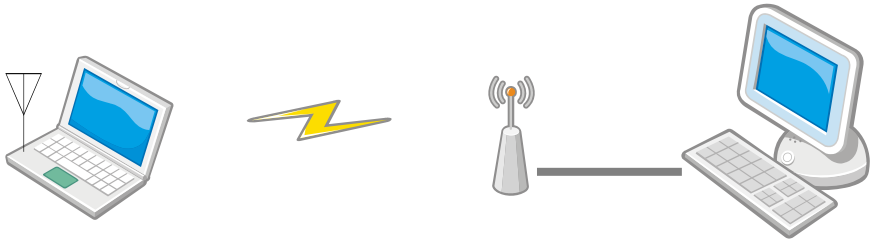
It is recommended that SD controller specification of the product satisfy the following.

- SDIO: SDIO-Clock, more than 25MHz, SDIO-Bus 4bit mode
- Data transfer system: Multi-Block transfer support by DMA

5-5. WLAN throughput measurement environment

As software tool for measurement of WLAN throughput, there is charge-free version of iperf, paid software of IxChariot, etc. iperf can be used for checking of rough measurement value, while IxChariot for detailed data analysis, graph display, etc. in addition to measurement.

[Measurement environment image]



WLAN(88W8801)
Iperf or Endpoint (IxChariot)

Access Point

iperf or IxChariot

iperf source URL : http://code.google.com/p/iperf/
IxChariot URL: http://www.ixiacom.com/products/ixchariot

5-6. Software development support (Paid service, to be separately arranged)

Following software development support is available.
Please do not hesitate to contact us if you need any further information.

(1) Driver Porting
Linux OS (including Android) : TAIYO YUDEN CO., LTD.
Other OS (WinCE, uITON, etc.) : We will help to find software vendor.
* It may be required to provide us with the development environment of your product.

(2) Performance Tuning
When the customer can not achieve the required performance, we will analyze the bottleneck and propose the improvement.
* It may be required to provide us with the development environment of your product.

(3) Verification

We can verify that your product is complied with IEEE802.11.

* It may be required to provide us with the development environment of your product.

(4) Wi-Fi® Certification

If your product needs Wi-Fi CERTIFIED logo, we will arrange the test house.

6. FAQ

-Q1. How much power does the module consume?

-A1. Please refer to Data Report.

-Q2. Does the module support power save mode?

-A2. The module supports IEEE Power Save and original Deep Sleep functions.

-Q3. When Host CPU is in Sleep state, how does the module wake it up?

-A3. Upon receipt of WLAN data, the module notifies the host with WL_HOST_WKUP.

-Q4. Do the modules come with MAC addresses assigned?

-A4. A Unique MAC address is assigned to each module before shipment. These addresses cannot be changed.

-Q5. Is there reference circuit?

-A5. Please refer to the Application Note and Evaluation Board Manual.

-Q6. Does the module comply with Radio Law?

-A6. WYSAAVDX7 comply with Japan, FCC and IC.

-Q7. Is the module Wi-Fi certified?

-A7. The module itself is not Wi-Fi certified. However, Wi-Fi certification can be obtained at the product level.

-Q8. Is firmware embedded in the module?

-A8. Firmware is downloaded into the module by the host CPU at runtime. The device driver does the process automatically.

-Q9. What WLAN modes does the module support?

-A9. The module supports Infrastructure mode, uAP mode (micro Access Point), Wi-Fi Direct and Ad-hoc.

-Q10. What WLAN upper protocols are included in the module?

-A10. Upper protocols (e.g. HTTP, TCP/IP) are not included in the module.