

Wireless LAN Module

WYSAAVDX7
(IEEE802.11b/g/n)

User Manual

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

We wish the customer to request the Specification Report when the design for the mass production begins because the content of this Data Report might change without a previous notice to the customer.

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Tentative**Document constituent list**

Control name	Control No.	Document Page
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Absolute maximum ratings	HD-AM-A100174	1/1
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Rev. records

9-Mar.-2011> Ver.0.5

6-May-2011> Ver.0.6

4-Apr.-2012> Ver.0.7

1-Apr.-2013> Ver.0.8

13-Nov.-2013>Ver.0.9

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Control No. HD-AG-A100174	(1/4)	Control name General Items
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Scope

This specification ("Specification") applies to the hybrid IC for use Wireless LAN module ("Product") manufacture by TAIYO YUDEN Co., Ltd. ("TAIYO YUDEN")

1. User Code: WYSAAVDX7

Digit3: Customer Code ex) S: TAIYO YUDEN Standard
Digit8: Software Code ex) X: TAIYO YUDEN Standard
Digit9: Hardware Code ex) 7: TAIYO YUDEN Standard

*** User Code may be modified for mass production or other cases.**

Please see "m" for more information.

2. Function: Radio frequency transfer Module. (*IEEE802.11bgn* standard conformity)

3. Application: PC peripheral, Handy terminal

4. Structure: Hybrid IC loaded with silicon monolithic and GaAs semiconductor

Ability of lead free mounting at customer's assembly (Heat resistance of this Product) : Yes

Containment of hazardous substance in this Product

*This product conforms to RoHS Directive (2002/95/EC).

5. Outline: Stacking Connector Type

6. Marking: IC ID, FCC ID, Japan ID, MAC address and Lot at label on the bottom side.

7. Features:

-*IEEE802.11bgn* standard conformity

-Interface: SDIO

-Embedded MPU for reducing loads on host processor

-Built-in EEPROM (MAC address)

8. Security: WEP (64/128), TKIP, AES, WPA, WPA2, WAPI

9. Packing: Packaging method: Tray

Packaging unit: 90pcs./tray

1080pcs./Box

10. Terminal: Data input-output (20pin Stacking Connector)

"Panasonic Electric Works Co., Ltd: AXK820145WG"

RF input-output (Antenna)

11. Mount: with M2 screw

12. Notes:

- Any question arising from this Specification shall be solved through mutual discussion by the parties hereof.
- This Product is not designed for radiation durable and should not be used under the circumstance of radiation.
- The operating conditions of this Product are as shown in this Specification. Please note that TAIYO YUDEN shall not be liable for a failure and/or abnormality which is caused by use under the conditions other than the operating conditions hereof.
- Please note that this users manual should not be provided to end-users.
- The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- This Product mentioned in this Specification is manufactured for use in consumer products. Before using this Product in any special equipment (such as medical equipment, space equipment, air craft, disaster prevention equipment), where higher safety and reliability are duly required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and

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safety operation of those special equipments. Also, evaluation of the safety function of this Product even for use in general electronics equipment shall be thoroughly made and when necessary, a protective circuit shall be added at design stage, all at the customer's sole risk.

- g. i) You are requested to fully check and confirm by the start of mass production of this Product that (1) no bug, defect or other failure is included in firmware incorporated in this Product ("Incorporated Software"), (2) no bug defect or other failure is caused by installation of this Product with Incorporated Software into customer's products, and that Incorporated Software fully meets customer's intended use, although TAIYO YUDEN sufficiently inspects or verifies quality of Incorporated Software.
- ii) Please note that TAIYO YUDEN is not responsible for any failure arising out of bugs or defects in Incorporated Software.
- h. TAIYO YUDEN warrants only that this Product is in conformity with this Specification for one year after purchase and shall in no event give any other warranty.
- i. Communication between this Product and others might not be established nor maintained depending upon radio environment or operating conditions of this Product and other ISM band at 2.4GHz products.
- j. In order to take tests for getting the certification of each country's Radio Law with a device incorporating this module, it is necessary to make the software in Host to put the module into test condition. Please contact TAIYO YUDEN for further details.
- k. This Product operates in the unlicensed ISM band at 2.4GHz. In case this Product is used around the other wireless devices which operate in same frequency band of this Product, there is a possibility that interference occurs between this Product and such other devices. If such interference occurs, please stop the operation of other devices or relocate this Product before using this Product or do not use this Product around the other wireless devices.
- l. Please evaluate adequately our module incorporated to your products before mass production.
- m. User Code Modification Notice.
User Code for sample modules or part numbers you see in this Specification are TAIYO YUDEN standard part numbers. When any modification is made to modules to meet requested specifications, the part number will carry a different part number, due to forfeit originality. Additionally, part numbers may be modified based on mass production stage or other related stages. Please contact TAIYO YUDEN to confirm whether your part number needs to be modified.
Please see the following examples for cases that part numbers are modified:
- for specific firmware version (our standard item firmware will be upgraded occasionally)
- for specific MAC address (our standard item MAC address is owned by TAIYO YUDEN)
- for other relevant cases (specific or different setting, form, sizes, or display etc..)
- n. In some cases, TAIYO YUDEN may use replacements as component parts of Products. Such replacement shall apply only to component part of Products, which TAIYO YUDEN deems it possible to replace or substitute according to (i) Scope provided in this Specification (e.g. Official Standard (Type Approvals etc.)) and (ii) Quality of Products. TAIYO YUDEN also ensures traceability of such replacement on production lot basis.
- o. Do not alter Hardware and/or Software of this Product.
Please note that TAIYO YUDEN shall not be liable for any problem if it is caused by customer's alteration of Hardware or/and Software without Taiyo Yuden's prior approvals.
- p. Caution for Export Control
This Product may be subject to governmental approvals, consents, licenses, authorizations, declarations, filings, and registrations for export or re-export of the Product, required by *Japanese Foreign Exchange and Foreign Trade Law(including related laws and regulations)* and/or any other country's applicable laws or regulations related to export control.
In case you will export or re-export this Product, you are strongly recommended to check and confirm,

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before exporting or re-exporting, necessary procedures for export or re-export of this Product which is required by applicable laws and regulations, and if necessary, you have to obtain necessary and appropriate approvals or licenses from governmental authority at your own risk and expense.

q. Japan Regulatory Information

This product with a specific antenna is a radio system approved for Type Approval.
Please follow the instructions below on designing your product.

a) Please notify clearly below sentences, on your product or in the product manual.

This product has a radio system which was approved as a radio station in a low power data communication system based on the Radio Law and the Telecommunication Business Law.

Name of the radio system: 001WWCA1266

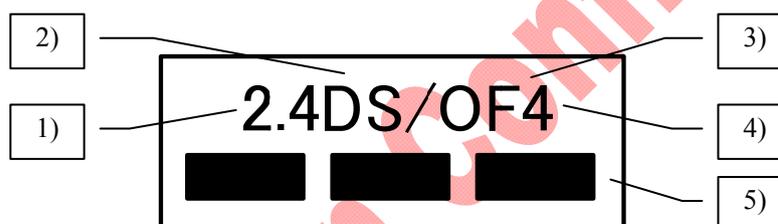
b) Please design your set structure in which this module can be easily attached and taken off by end users.

c) This module is certified by Type Approval as the device which has SDIO Interface.

Please do not use other purposes except that of certified.

Please contact TAIYO YUDEN for more details of purposes of this product.

d) This product is displayed the following actual indication.



- 1) 2.4 : Represents radio equipment using the 2.4GHz band.
 2) DS : Represents modulation DS-SS system.
 3) OF : Represents modulation OFDM system.
 4) 4 : Represents estimated interference-causing radius to premises radio stations for RFID.
 5) ■ ■ ■ : Indicates that the equipment can use the entire band and is capable of avoiding the band used by RFID systems.

This equipment shares a frequency band with a wide range of equipment: e.g. industrial, scientific, and medical equipment such as microwave ovens, premises radio stations (radio stations requiring licenses), and specified low-power radio stations (radio stations not requiring licenses) for RFID used for rectory production lines as well as amateur radio stations (radio stations requiring licenses).

1. Before use, confirm that no premises radio stations and specified low-power radio stations for RFID or amateur radio stations operate in your vicinity.
2. In the event that this equipment causes or halt radio wave emission and contact us at the information indicated below for consultation on interference avoidance measures (e.g., partition installation).
3. Contact us if this equipment causes harmful interference to any specified low-power radio stations for RFID or amateur radio stations or if other problems arise.

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r. Canada Regulatory Information

- a) This device complies with Industry Canada licence-exempt RSS standards.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire de brouillage et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

- b) This product is certified as type of the portable device with Industry Canada in the specific host platform only. To maintain compliance with SAR requirement, please use within specification of this product. Please refer Appendix for more details.

- c) Please notify certified ID by either one of the following method in your product.

-Contains Transmitter module IC : 4389B-WYSAAVDX7

-Contains IC : 4389B-WYSAAVDX7

s. FCC Regulatory Information

- a) 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 interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- b) Please notify certified ID by either one of the following method.

-Contains Transmitter Module FCC ID: RYYWYSAAVDX7

-Contains FCC ID: RYYWYSAAVDX7

- c) CAUTION: changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment

- d) This product is certified as type of the portable device with the FCC Rules in the specific host platform only. To maintain compliance with SAR requirement, please use within specification of this product. Please refer Appendix for more details.

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Control No. HD-AM-A100174	(1/1)	Control name Absolute maximum ratings
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Absolute maximum ratings

Item	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
Supply voltage 1	VBAT	-0.3		6.0	V	
Supply voltage 2	VIO	-		4.0	V	

Recommendation operating range

Item	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
Supply voltage 1	VBAT	3.4	5.0	5.5	V	
Supply voltage 2	VIO	1.62/2.97	1.8/3.3	1.98/3.63	V	
Storage temperature range	Tstg	-30		85	Degrees C	
Operating temperature range (Shielding case surface temperature)	Topr	-20	25	80	Degrees C	

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Control No. HD-AE-A100174	(1/5)	Control name Electrical characteristics
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DC Specifications

Peak Current / Power consumption

The Specification applies for Topr.= 25 degrees C, Supply voltage=Typical voltage (5.0V).

RF output power = Typ.

No.	Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
1	Normal supply voltage 1		VBAT	3.4	5.0	5.5	V
2	Normal supply voltage 2		VIO	1.627/2.97	1.8/3.3	1.98/3.63	V
3	Input Low Voltage		VIL	-0.3		0.3 x VIO	V
4	Input High Voltage		VIH	0.8 x VIO		VIO + 0.3	V
5	Output Low Voltage		VOL	-		0.4	V
6	Output High voltage		VOH	VIO - 0.4		-	V
7	Peak Current1	VBAT	Ip1	-		30	mA
8	Peak Current2	VIO	Ip2	-		400	mA
9	Power consumption1	Burst Tx (150Mbps), Duty 2.4%	Pc1	-	439	-	mW
10	Power consumption2	Continuous Rx (150Mbps)	Pc2	-	552	-	mW
11	Power consumption3	Burst Tx (72.2Mbps), Duty 4.2%	Pc3	-	443	-	mW
12	Power consumption4	Continuous Rx (72.2Mbps)	Pc4	-	514	-	mW
13	Power consumption5	Burst Tx (54Mbps), Duty 25.4%	Pc5	-	502	-	mW
14	Power consumption6	Continuous Rx (54Mbps)	Pc6	-	503	-	mW
15	Power consumption7	Burst Tx (11Mbps), Duty 43.3%	Pc7	-	651	-	mW
16	Power consumption8	Continuous Rx (11Mbps)	Pc8	-	499	-	mW
17	Power consumption9	Power save mode (DTIM=1, Beacon interval =100ms)	Pc9	-	27	-	mW
18	Power consumption10	Deep Sleep	Pc10	-	3	-	mW

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AC Specifications

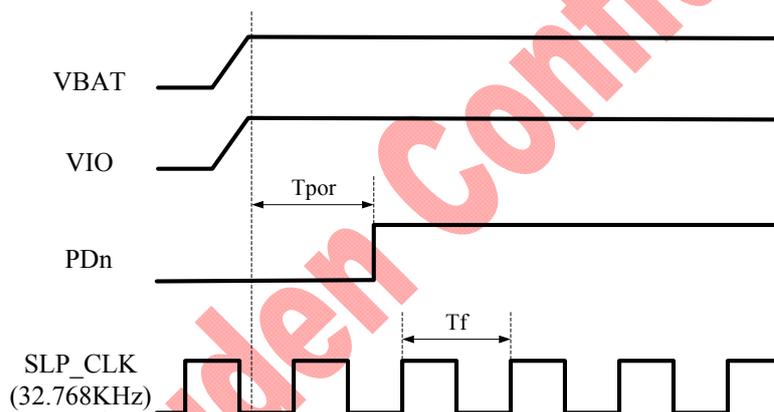
Power-on timing / External sleep clock

	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	Valid Power / RESETn / Clock to PDn de-asserted		Tpor	300			ms	
2	Input SLP_CLK frequency		Tf		32.768		KHz	
3	Input SLP_CLK high voltage		V _{IH}	0.8	1.8	1.98	V	
4	Input SLP_CLK low voltage		V _{IL}	0.0		0.25	V	
5	Input SLP_CLK phase noise requirement		PN		-125		dBc/Hz	@100KHz
6	Input SLP_CLK slew rate limit (10-90%)		SR			100	ns	
7	Input SLP_CLK duty cycle tolerance		DC	20		80	%	

<Power-on sequence>

PDn must remain asserted for minimum of Tpor after VBAT, VIO and SLP_CLK are stable.

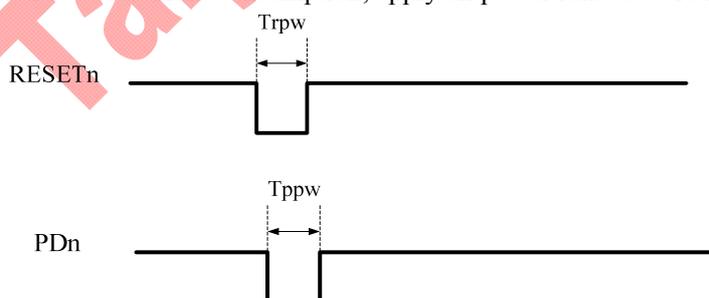
RESETn must be inactive value (asserted high) when PDn is de-asserted (high level).



External reset(RESETn), power down(PDn)

	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RESETn pulse width	Trpw		1			ms	Note1
2	PDn pulse width	Tppw		300			ms	Notes2, 3

1. RESETn should be asserted while VBAT, VIO and SLP_CLK are stable and PDn is de-asserted (high level).
2. PDn should be asserted while VBAT, VIO and SLP_CLK are stable and RESETn is de-asserted (high level).
3. For lowest current consumption, apply all power rails to WYSAAVDX7 during the assertion of PDn pin.



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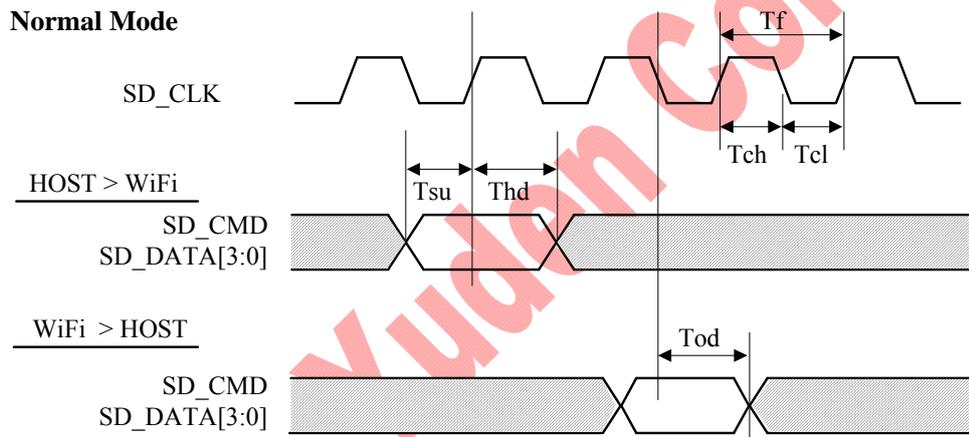
Control No. HD-AE-A100174	(3/5)	Control name Electrical characteristics
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SDIO Interface Specifications

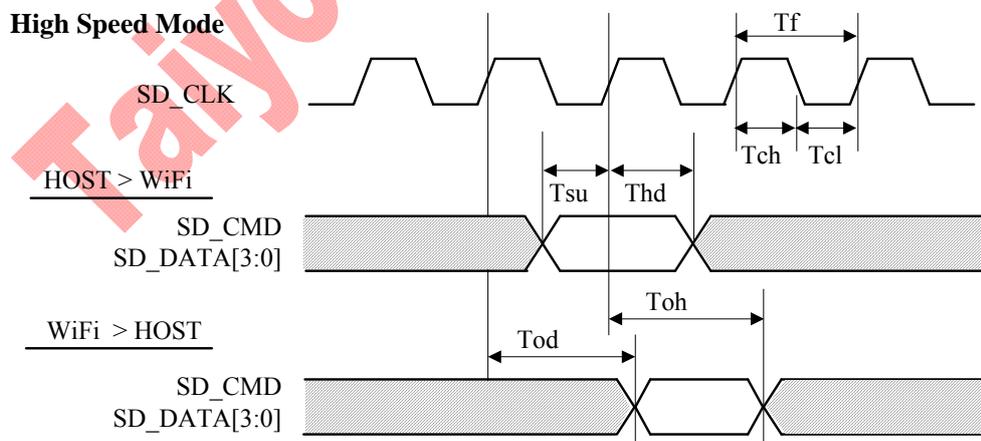
The Specification applies for Topr.= -20 to TBD degrees C , Supply voltage=Typical voltage(5.0V).

	Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
1	Input SDIO_CLK Frequency	Tf	Normal	0	-	25	MHz	
			High Speed	0	-	50		
2	Input SDIO_CLK High Time	Tch	Normal	10	-	-	ns	
			High Speed	7	-	-		
3	Input SDIO_CLK Low Time	Tcl	Normal	10	-	-	ns	
			High Speed	7	-	-		
4	Input SDIO_CMD, DATA[3:0] Setup time	Tsu	Normal	5	-	-	ns	
			High Speed	6	-	-		
5	Input SDIO_CMD, DATA[3:0] Hold time	Thd	Normal	5	-	-	ns	
			High Speed	2	-	-		
6	Output SDIO_CMD, DATA[3:0] Delay time	Tod	-	-	-	7.33	ns	
7	Output SDIO_CMD, DATA[3:0] Hold time	Toh	High Speed	2.5	-	-	ns	

Normal Mode



High Speed Mode



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Control No. HD-AE-A100174	(4/5)	Control name Electrical characteristics
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RF Specifications (WLAN 11n/150Mbps, OFDM)

The Specification applies for Ta=25 degrees C, Supply voltage =Typical voltage (5.0V).

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2422		2462	MHz	
2	TX Power		Po	9	11	13	dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-20	dBc	
		2 nd Side Lobe	M2	-		-28	dBc	
		3 rd Side Lobe	M3	-		-45	dBc	
4	Symbol clock tolerance		Ft	-25		25	ppm	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	Rms	EVM	-		-28	dB	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3	-		-47	dBm	
10	Rx sensitivity	PER<10%	SEN	-	-66	-61	dBm	
11	Maximum Input Level	PER<10%	MIL	-20		-	dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

RF Specifications (WLAN 11n/72.2Mbps, OFDM)

The Specification applies for Ta=25 degrees C, Supply voltage =Typical voltage (5.0V).

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2412		2472	MHz	
2	TX Power		Po	9	11	13	dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-20	dBc	
		2 nd Side Lobe	M2	-		-28	dBc	
		3 rd Side Lobe	M3	-		-45	dBc	
4	Symbol clock tolerance		Ft	-25		25	ppm	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	Rms	EVM	-		-28	dB	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3	-		-47	dBm	
10	Rx sensitivity	PER<10%	SEN	-	-69	-64	dBm	
11	Maximum Input Level	PER<10%	MIL	-20		-	dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

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Control No. HD-AE-A100174	(5/5)	Control name Electrical characteristics
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RF Specifications (WLAN 11g/54Mbps, OFDM)

The Specification applies for Ta=25 degrees C, Supply voltage =Typical voltage (5.0V).

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2412		2472	MHz	
2	TX Power		Po	10	12	14	dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-20	dBc	
		2 nd Side Lobe	M2	-		-28	dBc	
		3 rd Side Lobe	M3	-		-40	dBc	
4	Symbol clock tolerance		Ft	-25		25	ppm	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	Rms	EVM	-		-25	dB	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3	-		-47	dBm	
10	Rx sensitivity	PER<10%	SEN	-	-72	-65	dBm	
11	Maximum Input Level	PER<10%	MIL	-20		-	dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

RF Specifications (WLAN 11b/11Mbps, CCK)

The Specification applies for Ta=25 degrees C, Supply voltage=Typical voltage (5.0V).

No.	Parameter	Condition	Symbol	Min	Typ	Max	Unit	Remark
1	RF frequency range		FREQ	2412		2472	MHz	
2	TX Power		Po	13	15	17	dBm	
3	Spectrum Mask	1 st Side Lobe	M1	-		-30	dBc	
		2 nd Side Lobe	M2	-		-50	dBc	
4	Power up-down rump	Power up	TU	-		2	us	
		Power down	TD	-		2	us	
5	Frequency tolerance		Ft	-25		25	ppm	
6	EVM	Peak	EVM	-		35	%	
7	TX Out of band spurious1	30MHz to 1GHz	TOS1	-		-36	dBm	
8	TX Out of band spurious2	1GHz to 12.75GHz	TOS2	-		-30	dBm	
9	TX Out of band spurious3	1.8GHz to 1.9GHz 5.15GHz to 5.3GHz	TOS3	-		-47	dBm	
10	Rx sensitivity	PER<8%	SEN	-	-86	-76	dBm	
11	Maximum Input Level	PER<8%	MIL	-10		-	dBm	
12	RX Out of band spurious1	30MHz to 1GHz	ROS1	-		-57	dBm	
13	RX Out of band spurious2	1GHz to 12.75GHz	ROS2	-		-47	dBm	

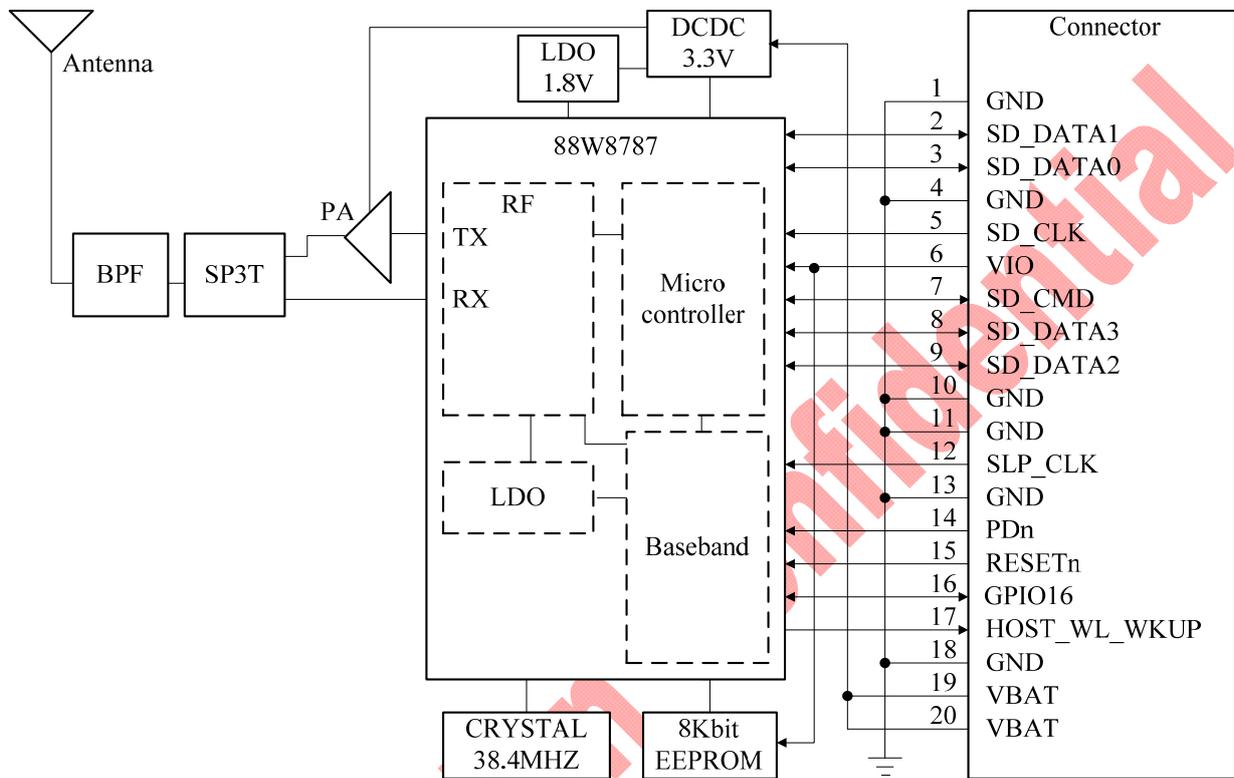
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Control No. HD-MC-A100174	(1/1)	Control name Circuit Schematic
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Block Diagram

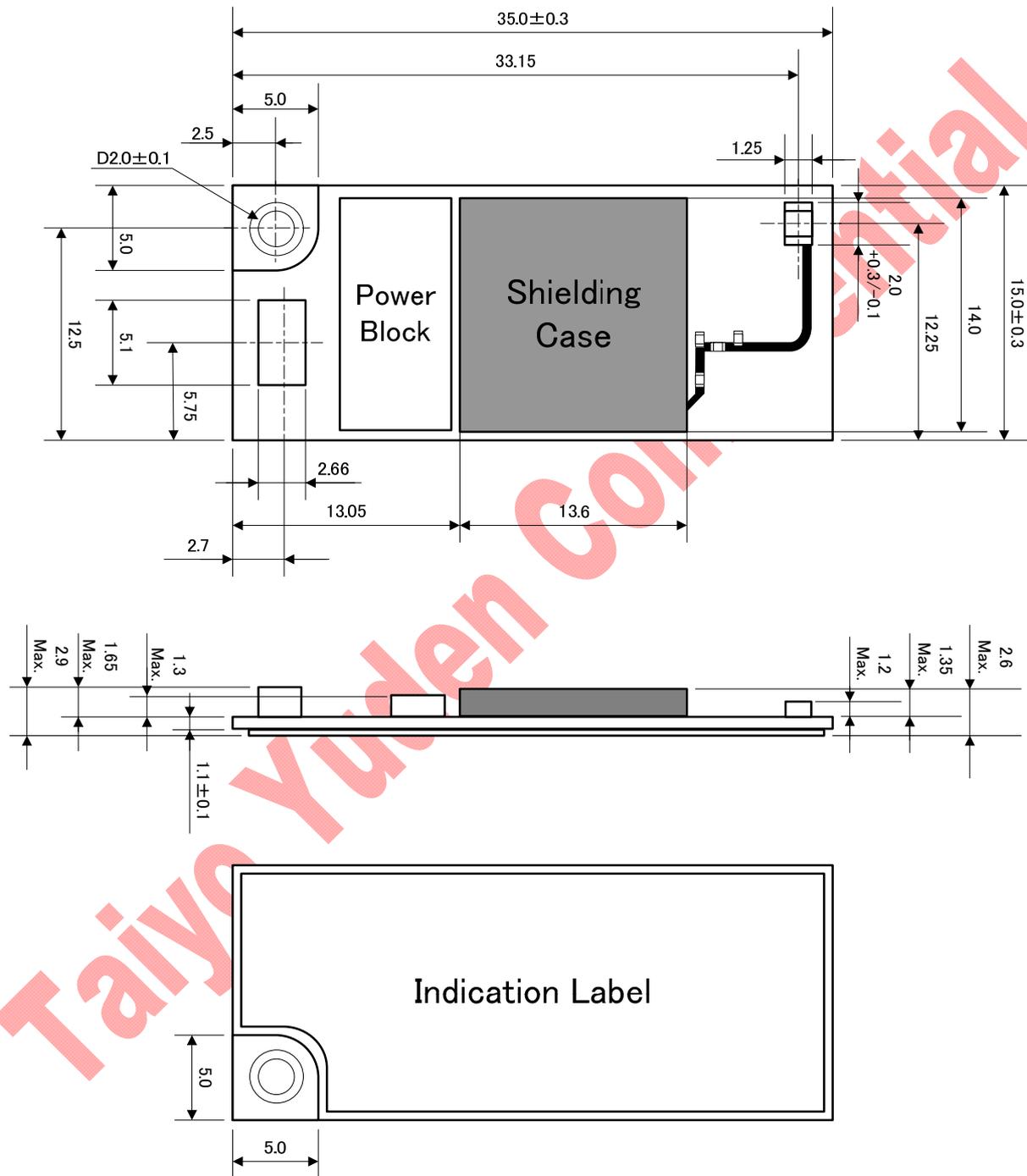


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Control No. HD-AD-A100174	(1/2)	Control name Outline/Appearance
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Unit: mm, Tolerances unless otherwise specified: $\pm 0.2\text{mm}$



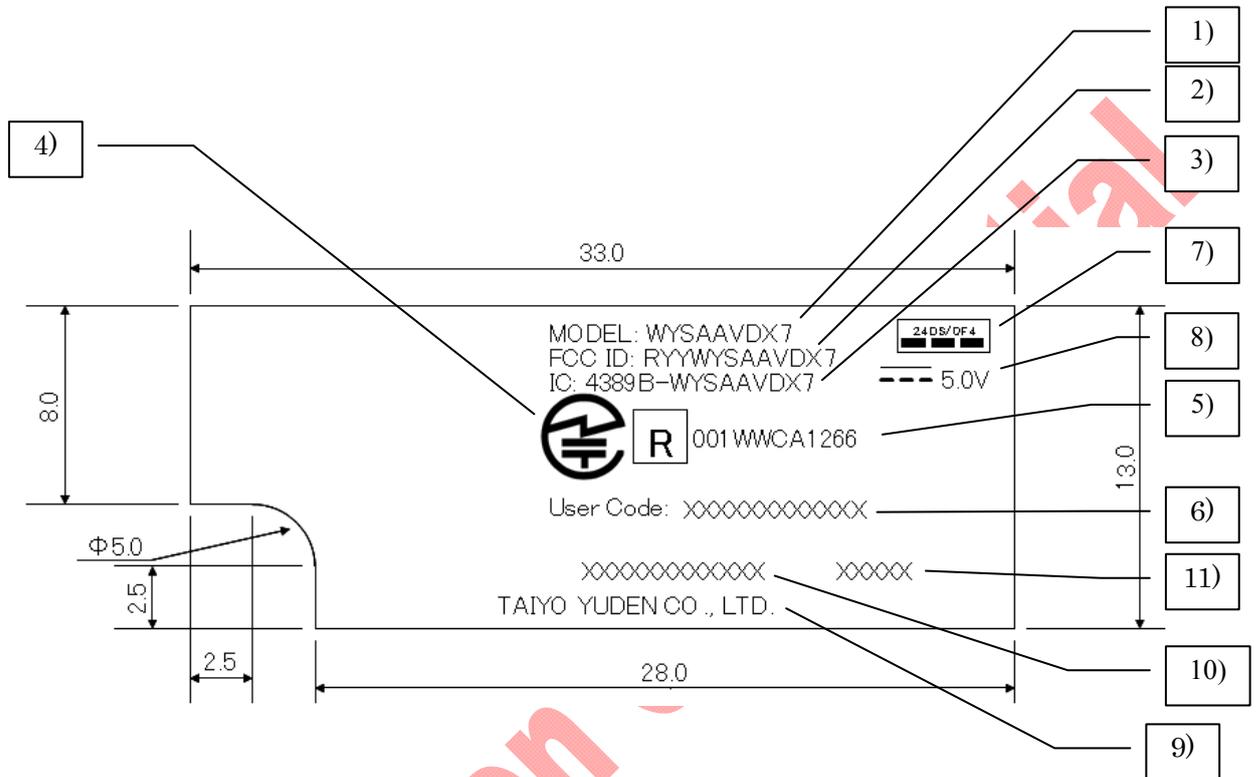
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Control No. HD-AD-A100174	(2/2)	Control name Outline/Appearance
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Indication label description.

Unit: mm, Tolerances unless otherwise specified: ±0.5mm



Indication label description

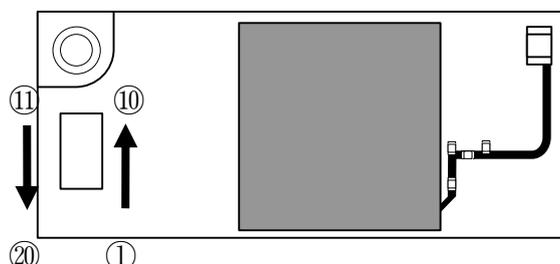
- 1) Model : WYSAAVDX7
- 2) FCC ID : RYYWYSAAVDX7
- 3) Industry Canada ID : 4389B-WYSAAVDX7
- 4) Japan logo mark : Specified logo mark
- 5) Japan ID : 001WWCA1266
- 6) User Code : WYSAAVDX7
- 7) ARIB Actual indication : Indicates that this device is “Second Generation Low Power Data Communication System”
- 8) Type of electrical power supply and rated voltage: Direct current mark and 5.0V
- 9) Manufacture : Taiyo Yuden Co., Ltd.
- 10) MAC address number : XXXXXXXXXXXXX
- 11) Product Lot number : Four digits (Refer to 「Instruction for lot number」)

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Control No. HD-BA-A100174	(1/1)	Control name Pin Layout
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Pin Descriptions

Top view



Terminal No.	Terminal Name	Input/ Output	Pwr Domain	Description	Function
1	GND	-	GND	Ground	Power
2	SD_DATA1	Input/Output	VIO	SDIO Data-1	SDIO
3	SD_DATA0	Input/Output	VIO	SDIO Data-0	SDIO
4	GND	-	GND	Ground	Power
5	SD_CLK	Input	VIO	SDIO Clock	SDIO
6	VIO	Input	VIO	1.8V/3.3V Digital I/O Power Supply	Power
7	SD_CMD	Input/Output	VIO	SDIO Command	SDIO
8	SD_DATA3	Input/Output	VIO	SDIO data-3	SDIO
9	SD_DATA2	Input/Output	VIO	SDIO data-2	SDIO
10	GND	-	GND	Ground	Power
11	GND	-	GND	Ground	Power
12	SLP_CLK	Input	1.8V	Sleep Clock (32.768kHz) Used for WLAN low-power modes.	System
13	GND	-	GND	Ground	Power
14	PDn	Input	VIO	Power Down (active low) with internal pull-up.	System
15	RESETn	Input	VIO	Reset (active low) with internal pull-up.	System
16	GPIO16	Input/ Output	VIO	Reserved, keep on set side terminal	System
17	HOST_WL_WKUP	Output	VIO	HOST wakeup	System
18	GND	-	GND	Ground	Power
19	VBAT	Input	VBAT	5.0V Power Supply	Power
20	VBAT	Input	VBAT	5.0V Power Supply	Power

Appendix of WYSAAVDX7_User Manual

TAIYO YUDEN
Tentative

Canada Regulatory Information

This product is certified as type of the portable device with Industry Canada in the specific host platform only. To maintain compliance with SAR requirement, please use within specification of this product. Please refer the following for more details.

Model. No.	Measured 1gSAR [mW/g] (MAX)	Reported SAR [mW/g]
S4	0.242 (Head), 0.423 (Body)	0.27 (Head), 0.47 (Body)

FCC Regulatory Information

This product is certified as type of the portable device with the FCC Rules in the specific host platform only. To maintain compliance with SAR requirement, please use within specification of this product. Please refer the following for more details.

Model. No.	Measured 1gSAR [mW/g] (MAX)	Reported SAR [mW/g]
S4	0.242 (Head), 0.423 (Body)	0.27 (Head), 0.47 (Body)