

# WDH210S User Manual

## 1. Introduction

WDH210S is a 2.4GHz-only Wi-Fi module optimized for ultra-low power applications and supports IEEE802.11 b/g/n standards. This module is for Samsung A/V Products.

## 2. Main Chipset Information

Item	Vendor	Part Number
IEEE802.11 b.g.n	RENESAS	DA16200

## 3. . Operating Condition

Parameter	Min	Typ.	Max	Unit
Operating Voltage	3.14	3.3	3.47	V
Operating Temperature	-10	-	50	℃

## 4. Product Details

- Modulation
  - . DSSS: DBPSK, DQPSK, CCK for 802.11b
  - . OFDM: BPSK, QPSK, 16QAM, 64QAM for 802.11 g, n
- Frequency Range
  - . 2400-2483.5 MHz
- Features
  - . Supports IEEE 802.11 b/g/n, 1x1, 20MHz Channel Bandwidth
  - . Built-in LNA, PA, and T/R switch (Optional LNA and PA supported)
  - . Wi-Fi Security: WPA/WPA2-Enterprise/Personal, WPA2 SI, WPA3 SAE, OWE
  - . EAP Methods: EAP-TTLS/MSCHAPv2, PEAPv0/EAP-MSCHAPv2, PEAPv1, EAP-FAST, EAP-TLS
  - . Secure debugging via JTAG/SWD and UART ports
  - . RF Center Frequency
    - RF frequency is generated through a 40 MHz reference clock frequency
  - . Clock Characteristics
    - WDH210S requires two clock sources: a 32.768 kHz clock for the RTC block and a 40 MHz clock for the internal processor and Wi-Fi system. Specifically, the 40 MHz clock is used as the source clock for the internal PLL, and the PLL output is used for

the internal processor and Wi-Fi system blocks

. Wi-Fi Transmission

Digital baseband data signals are modulated into analog signals through DAC.

The baseband signals such as DSSS and OFDM are converted to RF signals via direct conversion, then amplified by the final stage power amplifier and transmitted through the antenna to the air.

. Wi-Fi Reception

WDH210S supports 2.4GHz reception and has a built-in low-noise amplifier (LNA) to amplify weak signals. The amplified signals are converted into digital signals via ADC, and the main processor interprets the packets containing information

**5. Pin Definition**

Pin#	Pin Name	Description	I/O	Remark
1	VDD3.3	Supply Voltage Input	PI	
2	VDD3.3	Supply Voltage Input	PI	
3	UART1_RX	UART1 RX Data	I	
4	UART1_TX	UART1 TX Data	O	
5	GND	Common Ground	G	
6	GND	Common Ground	G	
7	NRESET	Main IC Reset Input	I	
8	LPM_WAKE_UP	WAKE UP	I/O	
9	LPM_CTRL	Customer GPIO	I/O	
10	LPM_CTRL_GPIO	Customer GPIO	I/O	



[Regulation statement]

US FCC statement

This device complies with Part 15 of the FCC's 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 undesirable operation.

To satisfy FCC exterior labeling requirements, the following text must be placed on the exterior of the end product.

**Contains Transmitter module FCC ID: A3LWDH210S**

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 provide reasonable protection against harmful interference in a residential installation.

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 equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.
- The OEM integrator is responsible for ensuring the end-user has no manual instruction to remove or install module.
- The module is limited to installation in mobile or fixed applications.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The module has been certified for integration into products only by OEM integrators under the following condition:

- The antenna(s) must be installed such that a minimum separation distance of at least 20cm is maintained between the radiator(antenna) and all persons at all times.
- The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:

KDB 996369 D03 OEM Manual v01 rule sections:

## 2.2 List of applicable FCC rules

This module has been tested for compliance with CFR 47 FCC Part 15 C (15.247, DTS and DSS) and CFR 47 FCC Part 15 E (NII). It is applicable to the modular transmitter

### 2.3 Summarize the specific operational use conditions

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) will need a separate reassessment through a class II permissive change application or new certification.

Further operation restrictions on the host product include:

\*Prohibited for control of or Communications with unmanned aircraft systems.

This radio transmitter FCC ID: A3L **WDH210S** has been approved by Federal Communications Commission to operate with the integrated Metal antenna and Chip antenna. Use of any other antenna is strictly prohibited without filing an application for a new system-specific FCC ID.

### 2.4 Limited module procedures.

The module complies with FCC Part 15.247 / Part 15.407 and applies for Single module approval.

### 2.5 Trace antenna designs Not applicable.

The antenna is integrated into the module and cannot be modified. See section 2.3.

### 2.6 RF exposure considerations

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. A separate SAR/Power Density evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

### 2.7 Antennas


Note 1: Use of other antenna types or the same type of antenna with higher gain than listed above must perform additional testing and appropriate permissive change approval.

Note 2: Additional testing/submission (C2PC) will be required if the device does not meet the antenna and RF exposure requirements.

Note 3: Contact Samsung for additional guidance, if choose to use different antenna types or higher/lower gain antennas in the end system.

**IMPORTANT:** The final host product must have an integral antenna that is not removable by the end user.

#### WIFI antenna gain table

	Antenna P/N	PA2450MJ4G-351-ZPW1
	Antenna Type	Patch Antenna
	Frequency Range	2400 – 2485 MHz
	Efficiency(%)	45% ~ 56%
	Peak Gain(dBi)	1.73 dBi

Note : The antenna are permanently attached and can't be replaced.

## 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: “Contains FCC ID: A3L**WDH210S**”.

The grantee's FCC ID can be used only when all FCC compliance requirements are met.

## 2.9 Information on test modes and additional testing requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitters need class II permissive change re-evaluation or new certification.

## 2.10 Additional testing, Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance with this portion of rule requirements if applicable. If all conditions above are met, further transmitter tests will not be required. However, the OEM integrator is still responsible for testing their end product for any additional compliance requirements required with this module installed.

**IMPORTANT NOTE:** In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

## 2.11 Note EMI Considerations

The host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

## 2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

## Manual Information to the End User

The OEM integrator must be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

## OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module.

The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules.

This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment. Modules: extended to host manufacturers by integration instructions.



## Canada IC statement

### IC approval

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution: Any change or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Attention: Toute change ou modifications non expressément approuvées par la partie responsable de la conformité pourraient annuler l'utilisateur's autorité de faire fonctionner cet équipement.

Please notice that if the ICED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 649E-**WDH210S**" any similar wording that expresses the same meaning may be used.

L'appareil hôte doit porter une étiquette donnant le numéro de certification du module d'Industrie Canada, précédé des mots (Contient un module d'émission, du mot IC: 649E-**WDH210S**) ou d'une formulation similaire exprimant le même sens, comme suit

The device meets the exemption from the routine evaluation limits in section 6.6 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 6.6 de RSS 102 et la conformité à l'exposition de RSS-102 RF, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de RF.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.



Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

IMPORTANT: The final host product must have an integral antenna that is not removable by the end user.

Europe CE approval statement CE, UKCA approval

This device operates in the 2.4GHz band and complies with CE and UKCA standards. No 5GHz or 6GHz operation is supported.

Frequency Range and Maximum Output Power (EIRP)

- 2412 MHz to 2472 MHz: Below 20 dBm for WI-FI

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Hereby, Samsung declares that this radio equipment is in compliance with Directive 2014/53/EU and the relevant UK statutory requirements. The full text of the declaration of conformity is available at the following internet address: [www.samsung.com](http://www.samsung.com)

This equipment may be operated in all EU countries and in the UK.

Manufacturer Name: SAMSUNG ELECTRONICS CO., LTD.

Address: 129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI, GYEONGGI-DO, 16677, KOREA

EU Importer Name: Samsung

Address: PO Box 12987, Dublin. IE

UKCA Importer Name: Samsung

Address: Yateley, GU46 6GG. UK

Note:

1. This module cannot be installed in a weatherized enclosure and cannot operate from a battery but only power sources.
2. The host device must be connected to a power source as it has no battery.
3. Tests such as host level EMC testing, safety testing, and potential RF tests such as RX blocking, radiated spurious emissions, etc. should be considered based on the installation and proximity to other circuits which may reduce receiver performance or couple/retransmit radiated signals.