

PlnS WiFi reference design

User manual Wi-Fi module

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DOCUMENT CHANGE HISTORY

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16-11-2017	N/A	0.1	First draft
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1 Introduction

1.1 Intended use

WiFi module is a PCB Wi-Fi module based on a WiFi SoC.

The module intended use is to provide connectivity to products in a high quality, lean and effective way.

2 Antennas

The design includes 3 antenna options: PCB trace antenna, external antenna and antenna diversity.
The PCB trace antenna has a maximum gain of 3dBi.

2.1 External Antenna

- This chapter gives an overview of the external antenna that can be fitted to the WiFi module. This radio transmitter IC has been approved by Industry Canada to operate with the antenna type listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
- Le chapitre suivant donne un aperçu de l'antenne externe qui peut être installée sur le module WiFi. Cet émetteur radio IC été approuvé par Industry Canada pour fonctionner avec le type d'antenne énumérés ci-dessous avec le gain maximum autorisé et l'impédance nécessaire pour chaque type d'antenne indiqué. Les types d'antenne ne figurant pas dans cette liste et ayant un gain supérieur au gain maximum indiqué pour ce type-là sont strictement interdits d'utilisation avec cet appareil.

For each antenna, the "Approvals" field defines in which test reports the antenna is included. Definitions of the «Approvals» field are:

- FCC - The antenna is included in the FCC test reports and thus approved for use in countries that accept the FCC radio approvals, primarily USA.
- IC - The antenna is included in the IC (Industry Canada) test reports and thus approved for use in countries that accept the IC radio approvals, primarily Canada.
- ETSI - The antenna is included in the ETSI test reports and thus approved for use in countries that accept the ETSI radio approvals (EU).

2.1.1 Approved external antenna

TE	
Manufacturer	TE connectivity
Part Number	2118309-2
Polarization	Linear
Gain	2.5 dBi (2.4GHz band)
Impedance	50 Ω
Size	40.0 x 8.0 x 1.0 mm
Connector	u.fl
Approval	FCC, IC and ETSI

2.2 Environmental

- Temperature operational range: (-20 ...+70)°C
- Temperature storage range: (5...+50) °C
- Voltage: 3.3V

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2.3 FCC, IC Compliance

The following modes of operation is supported by the module with

WLAN Firmware : wl0: Dec 19 2016 19:29:37 version 7.15.168.78 (r663126) FWID 01-8ba7c839
Country configuration XX/17.

2.3.1 IC compliance

This device complies with Industry Canada license-exempt RSS standard(s).

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.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen in such a way that the equivalent isotropically radiated power (e.i.r.p.) is not more than that is necessary for successful communication. This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment.

2.3.2 Conformité aux normes d'Industrie Canada

Cet appareil est conforme à la(aux) norme(s) RSS sans licence d'Industrie Canada.

Son utilisation est soumise aux deux conditions suivantes :

1. Cet appareil ne doit pas causer d'interférences et
2. il doit accepter toutes interférences reçues, y compris celles susceptibles d'avoir des effets indésirables sur son fonctionnement.

Conformément aux réglementations d'Industrie Canada, cet émetteur radio ne peut fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) ont été approuvés pour cet émetteur par Industrie Canada. Pour réduire le risque d'interférences avec d'autres utilisateurs, il faut choisir le type d'antenne et son gain de telle sorte que la puissance isotrope rayonnée équivalente (p.i.r.e) ne soit pas supérieure à celle requise pour obtenir une communication satisfaisante. Cet équipement respecte les limites d'exposition aux rayonnements IC CNR-102 définies pour un environnement non contrôlé.

2.3.3 FCC statement

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.

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 the 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.

The PInS WiFi module is for OEM integrations only. The end-user product will be professionally installed in such a manner that only the authorized antennas are used.

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2.4 Installation instruction

Changes or modifications made to the module not expressly approved by Philips Innovation Services may void the FCC / IC authorization to operate this equipment.

The use of the transceiver module is authorized in mobile or fixed host devices taking into account the conditions listed below:

- Philips Business Units (integrator) must ensure that the end user manual may not contain any information about the way to install or remove the module from the final product.
- Depending on the final host device additional authorization requirements for the non-transmitter functions of the transmitter module may be required (i.e., Verification, or Declaration of Conformity) Philips Business Units (integrator) are responsible for ensuring that after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements.
- The information on the label and in the user manual is required to be incorporated in the user manual of the final host. see 47 CFR15 requirements for more details (e.g. 15.19 / 15.21 / 15.101 / 15.105 / RSS-GEN / ICES)
- The module must be installed and used in strict accordance with Philips Innovation Services instructions as described in the user documentation that comes with the module.
- The end user manual for the final host product operating with this transmitter must include operating instructions to satisfy RF exposure compliance requirements.

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e.g

Radiofrequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

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

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

- The antenna of the module may not be removed, replaced nor modified. The antenna must not be co-located or operating in conjunction with any other antenna or transmitter. No additional antenna must be used.
- When the final host product operating with this transmitter deviate from above, installation of this module into specific final hosts may require the submission of a Class II permissive change application containing data pertinent to RF Exposure, spurious emissions, ERP/EIRP, and host/module authentication, or new application if appropriate.

2.5 Label requirements for end product

For an end product using the WiFi module there must be a label containing, at least, the following information:

This device contains
FCC ID: 2AALC0031357
IC: 22799-0031357

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

In accordance with 47 CFR § 15.19, the end product shall bear the following statement in a conspicuous location on the device:

"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."

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3 Specifications

3.1 Absolute Maximum Ratings

Caution! The absolute maximum ratings indicate levels where permanent damage to the device can occur, even if these limits are exceeded for only a brief duration. Functional operation is not guaranteed under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the device.

Parameter	Symbol	Value	Unit
3.3V DC supply voltage	VDD_3P3	-0.5 to 3.9	V
Maximum undershoot voltage for I/O	V _{undershoot}	-0.5	V
Maximum overshoot voltage for I/O	V _{overshoot}	VDD_3P3 + 0.5	V
Maximum junction temperature	T _J	-0.5 to 3.9	°C

3.2 Module level recommended Maximum ratings

Description	Range
Supply voltage in the range	3.13V...3.6V
I/O input high voltage in the range	2.0 V...3.8V
I/O input low voltage in the range	-0.5V...0.8V
I/O output high voltage equal or larger than	2.4V
I/O output low voltage equal or less than	0.4V
Supply voltage	V _{pp} <5mV recommended, use correct decoupling and filters if needed