



Radio Module 2.4GHz integration manual

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1 ABOUT MANUAL

This module installation manual is only intended for the module integration in products manufacture of Jay electronique. All recommendations described in this document about this module also extends to the host product instruction manual. Only persons who are ability and who have training deliver by jay electronique are authorized to change this module in the products.

2 PRODUCT DESCRIPTION

This radio transceiver provides range communication in the band 2.4GHz. The radio module is completely shielded and certified for operation under the US radio regulations for license-free use.

Features

- 2.4GHz transceiver
- High sensitivity
- High efficiency PA
- Low energy consumption
- DSSS & FSK & GFSK supported modulations
- Excellent blocking immunity
- Easy to use data interface
- Conform with FCC CFR 47 part 15

Applications

Remote controlled machines

Cranes

3 QUICK REFERENCE DATA

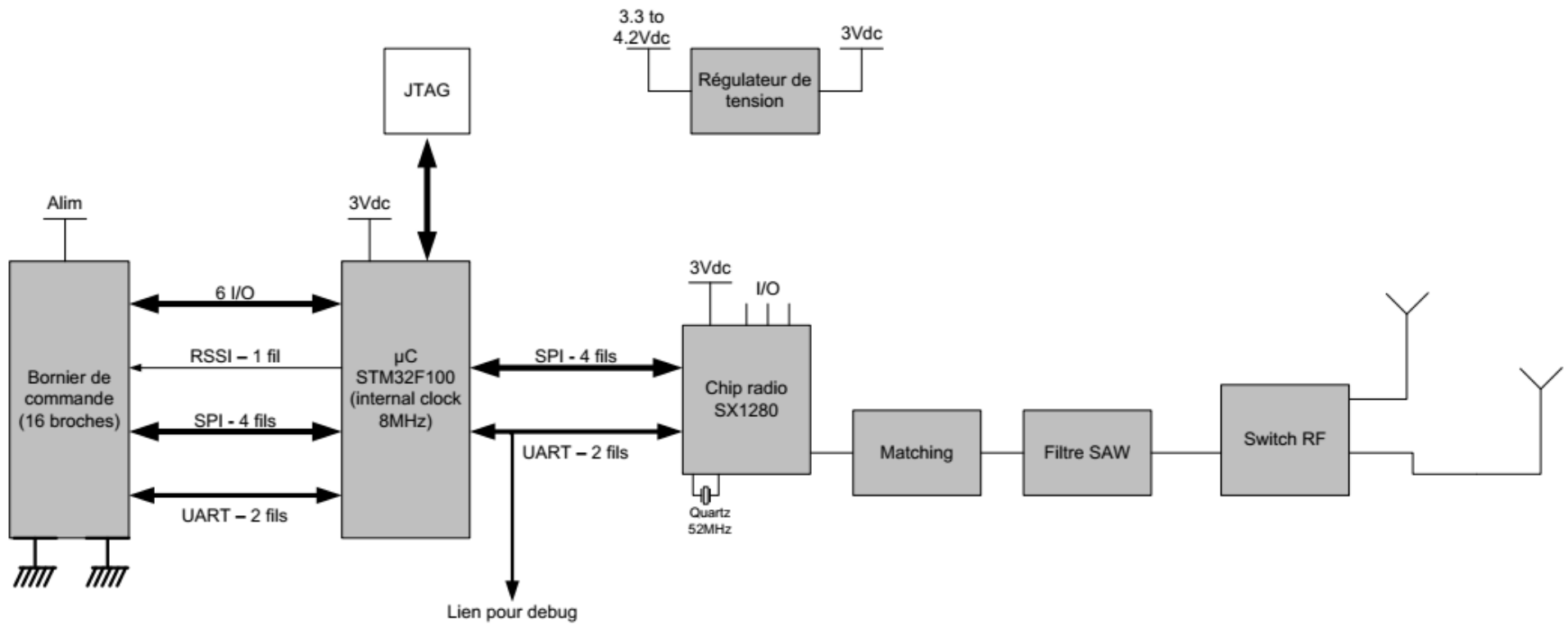
Parameter	Module
Frequency band	2400 – 2483.5 MHz
Number of channels	64
Channel bandwidth	1.25 MHz
Data rate	44.4 Kb/s
Max output power (typ.)	+ 10 dBm
Sensitivity	-120 dBm
Supply voltage	3.3 to 4.2 Vdc
Current consumption, RX	10 mA
Current consumption, TX	15 to 45 mA

Bandes 2,4 GHz			
Canal	Fréquence MHz	Canal	Fréquence MHz
01	2402,00	33	2442,00
02	2403,25	34	2443,25
03	2404,50	35	2444,50
04	2405,75	36	2445,75
05	2407,00	37	2447,00
06	2408,25	38	2448,25
07	2409,50	39	2449,50
08	2410,75	40	2450,75
09	2412,00	41	2452,00
10	2413,25	42	2453,25
11	2414,50	43	2454,50
12	2415,75	44	2455,75
13	2417,00	45	2457,00
14	2418,25	46	2458,25
15	2419,50	47	2459,50
16	2420,75	48	2460,75
17	2422,00	49	2462,00
18	2423,25	50	2463,25
19	2424,50	51	2464,50
20	2425,75	52	2465,75
21	2427,00	53	2467,00
22	2428,25	54	2468,25
23	2429,50	55	2469,50
24	2430,75	56	2470,75
25	2432,00	57	2472,00
26	2433,25	58	2473,25
27	2434,50	59	2474,50
28	2435,75	60	2475,75
29	2437,00	61	2477,00
30	2438,25	62	2478,25
31	2439,50	63	2479,50
32	2440,75	64	2480,75

4 PIN DESCRIPTION

Pin no	Pin name	Description
1	EN_PA	PA / Switch Rx – Tx
2	PWRF2	Not used
3	RTS_TXEN_RADIO	Not used
4	CTS/RXTX/RXEN_RADIO	Not used
5	VAccu	Supply voltage input
6	GND	System ground
7	SPI_uc_SCK/ON_OFF	SPI Clock
8	SPI_uc_MISO	SPI MISO
9	SPI_uc_MOSI	SPI MOSI
10	RESET_RADIO	Reset
11	SEL_FILLE	Download microcontroller firmware
12	SPI_uc_NSS/CONFIG_RADIO	SPI Chip Select
13	RSSI_RADIO	Not used
14	DATA_RX	UART RX Data
15	DATA_TX	UART TX Data
16	GND	System ground

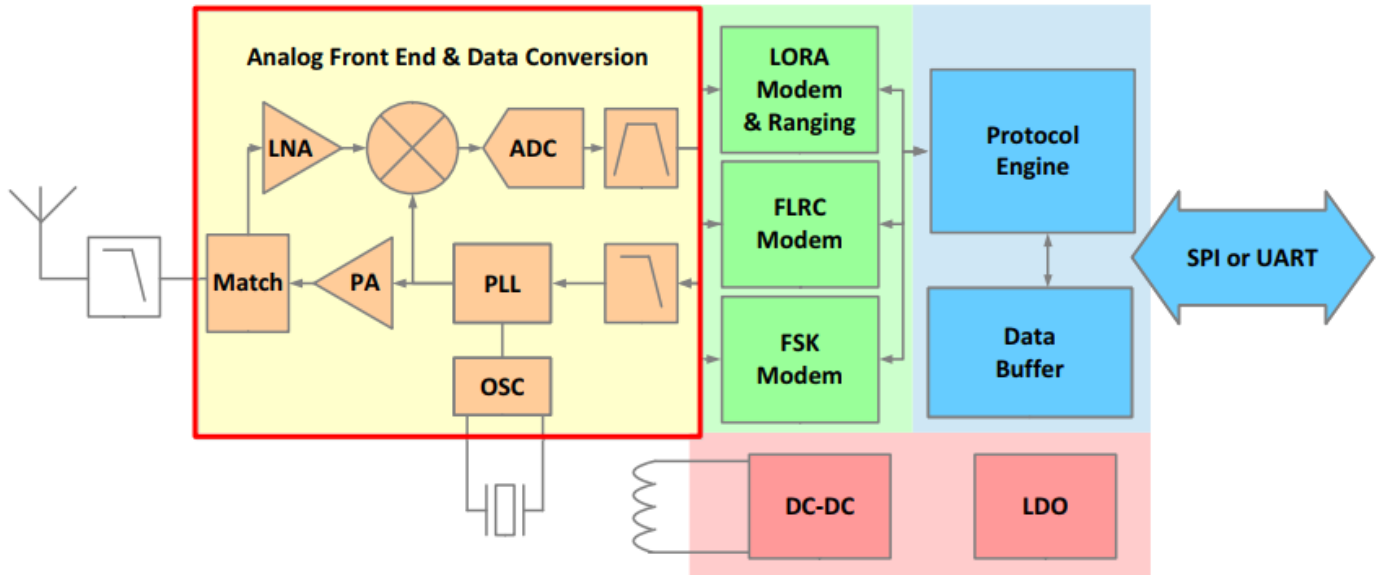
5 BLOCK DIAGRAM



6 CHIP RADIO

The chip radio used is the SX1280 of SEMTECH company. The SX1280 are half-duplex transceivers capable of low power operation in the worldwide 2.4 GHz ISM band. The radio features a high efficiency transmitter and a high linearity receive chain that are both accessed via a common antenna port pin. Frequency conversion between RF and baseband (low-IF) is governed by a digital PLL that is referenced to a 52 MHz crystal. Both transmit and receive chains are interfaced by data converters to the ensuing digital. The analog front end features a single antenna port connection to an integrated matching circuit that permits half- duplex operation of the radio without external RF switching.

Transceiver Block Diagram:



The modem uses spread spectrum modulation and Forward Error Correction (FEC) techniques to increase the range and robustness of radio communication links.

In this modulation the spreading of the spectrum is achieved by generating a chirp signal that continuously varies in frequency. An advantage of this method is that timing and frequency offsets between transmitter and receiver are equivalent, greatly reducing the complexity of the receiver design. The frequency bandwidth of this chirp is equivalent to the spectral bandwidth of the signal. The wanted data signal is chipped at a higher data rate and modulated onto the chirp signal. The relationship between the wanted data bit rate, symbol rate and chip rate for the modulation can be expressed as follows:

We can define the modulation bit rate, R_b , as: $R_b = SF * 1 / [2^{SF}/BW]$ bits/sec

Where:

R_b = Raw Data Rates

SF = spreading factor (7..12)

BW = modulation bandwidth (Hz)

Below principal parameters configured in the radio chip SX1280:

- Type of modulation: spread spectrum modulation
- Raw Data Rates: 44 kb/s (SF7)
- Bandwidth: 812 kHz

7 FCC STATEMENT

The OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.

These following instructions/statements shall be reported on the User Manual:

*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.*

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

NOTE: 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 instruction, 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 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 circuit different from that to which the receiver is connected.*
- Consult the dealer or an experienced radio/TV technician for help.*

*This device complies with FCC radiation exposure limits set forth for general population.
This device must not be co-located or operating in conjunction with any other antenna or transmitter.*

The radio module must be labelled as follows:

FCC ID: OQMS5

Moreover, the host equipment must be labelled as follows:

Contains FCC ID: OQMS5, Model S5, IC: 3393A-S5

Warning:

This module is used exclusively by JAY Electronique. This product and the antennas must be professionally installed.

8 IC STATEMENT

The OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.

These following instructions/statements shall be reported on the User Manual:

This radio transmitter (3393A-S5) has been approved by Industry Canada to operate with the antenna types 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 présent émetteur radio (3393A-S5) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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, and (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, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device complies with ISSED and FCC radiation exposure limits set forth for general population. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux niveaux limites d'exigences d'exposition RF aux personnes définies par ISDE et FCC. L'appareil ne doit pas être installé à proximité ou être utilisé en conjonction avec une autre antenne ou un autre émetteur.

The radio module must be labelled as follows:

FCC ID: OQMS5

Moreover, the host equipment must be labelled as follows:

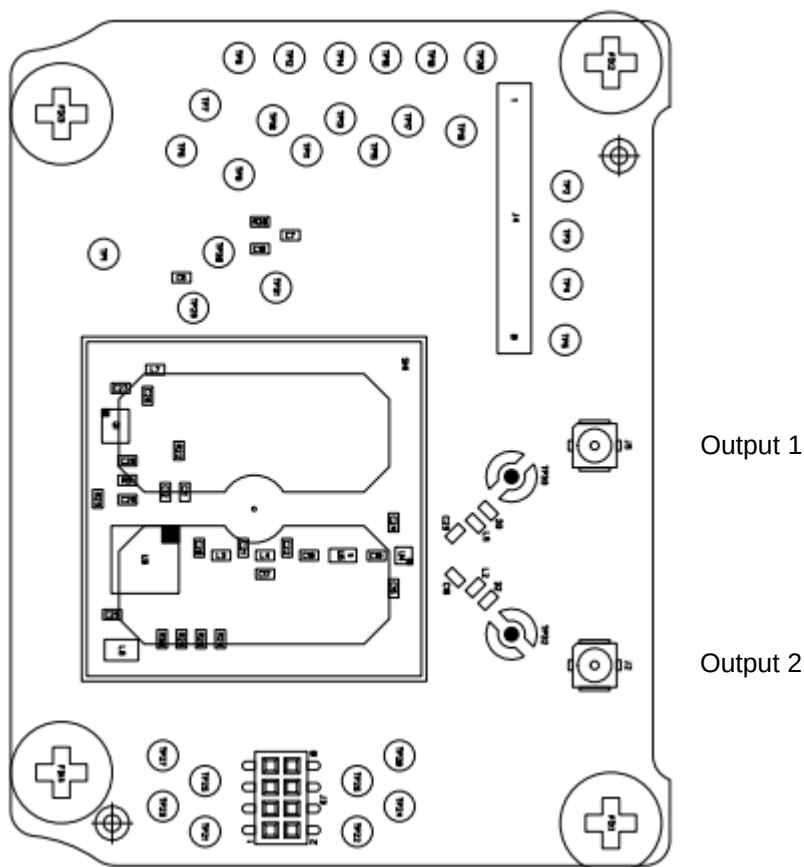
Contains FCC ID: OQMS5, Model S5, IC: 3393A-S5

Warning:

This modular is used exclusively by JAY Electronique. This module and the antennas must be professionally installed.

9 AUTHORIZED ANTENNAS

N°	Manufacturer	Reference
1	Pulse	W3334B0100
2	Inventek Systems	W24P-U
3	Yageo	ANTX100P111B24003
4	EBDS	EBDS-ACJANT-HM-24-3M
5	EBDS	EBDS-ACJANT-MAG-24-3M-SMAM
6	Sirreta	OSCAR40/5M/LL/SMAM/S/S/33
7	RF solution	ANT-24G-WPJ-SMA



Antennas number 1, 2 and 3 can be connected directly to connector UFL on the radio board module. For antennas 4, 5, 6 and 7 it is necessary to have adaptor UFL to SMA female for connected these.

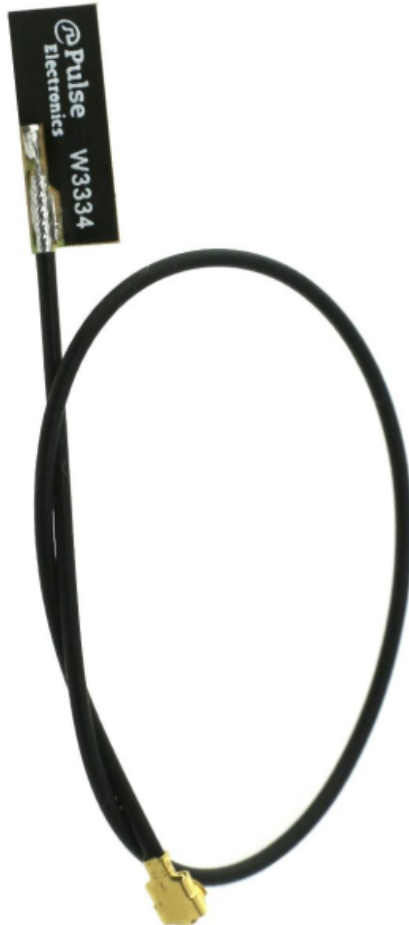
Not ground system are necessary for installing the antenna and radio module.

9.1 Pulse

Description: FPC Antenna 2.4/5.xGHz/DSRC

Series: Internal Antenna

PART NUMBER: W3334XXXXX



Features:

- Peak gain 4/5.5dBi
- VSWR 2:1
- Mounting with adhesive tape
- Ultra small flexible radiator 4.3x15.3x0.1mm
- See connector and cable options page 2

Applications:

- 2.4/5.xGHz radios
- Dualband WiFi
- Bluetooth, BLE, ZigBee
- DSRC 5.85-5.925GHz
- Routers, set top boxes
- IoT, M2M, V2x

9.2 Inventek System

1 GENERAL DESCRIPTION

The [Inventek](#) 2400-2500 Mhz Wi-Fi PCB (30 x 5 mm) antennas let you integrate Wi-Fi functionality into your product quickly and easily. It's suitable for a wide range of applications and recommended for use with Inventek eS-Wi-Fi modules.

2 PART NUMBER DETAIL DESCRIPTION

Ordering Information

Device	Description	Ordering Number
W24P-U	2400-2500 Mhz Wi-Fi PCB antenna with U.FI connector and 90 mm cable length	W24P-U

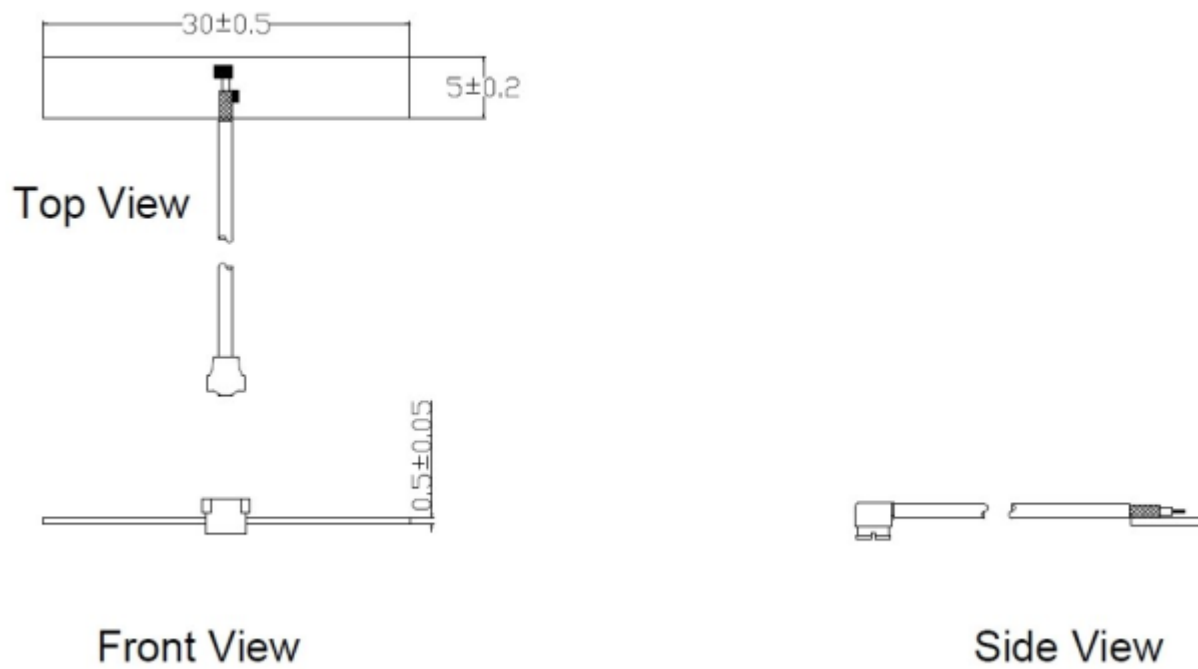
3 GENERAL FEATURES

Characteristics		Specifications	Unit
Outline Dimensions		30 x 5.0 x .05	mm
Center Frequency		2442	MHz
Bandwith		100 min.	MHz
VSWR		2 max.	
Impedance		50	Ω
Polarization		Linear Polarization	
Gain	Peak	3.2 (typical)	dBi
	Efficiency	79 (typical)	%

3.1 Environmental Specifications

Item	Description
Operating temperature rang	-40 deg. C to +80 deg. C
Storage temperature range	-55 deg. C to +100 deg. C
Humidity	95% max non-condensing

Our standard cable length is 90mm long. Minimum order custom cable lengths can be special order by request.



9.3 Yageo

SPECIFICATIONS

Table 1

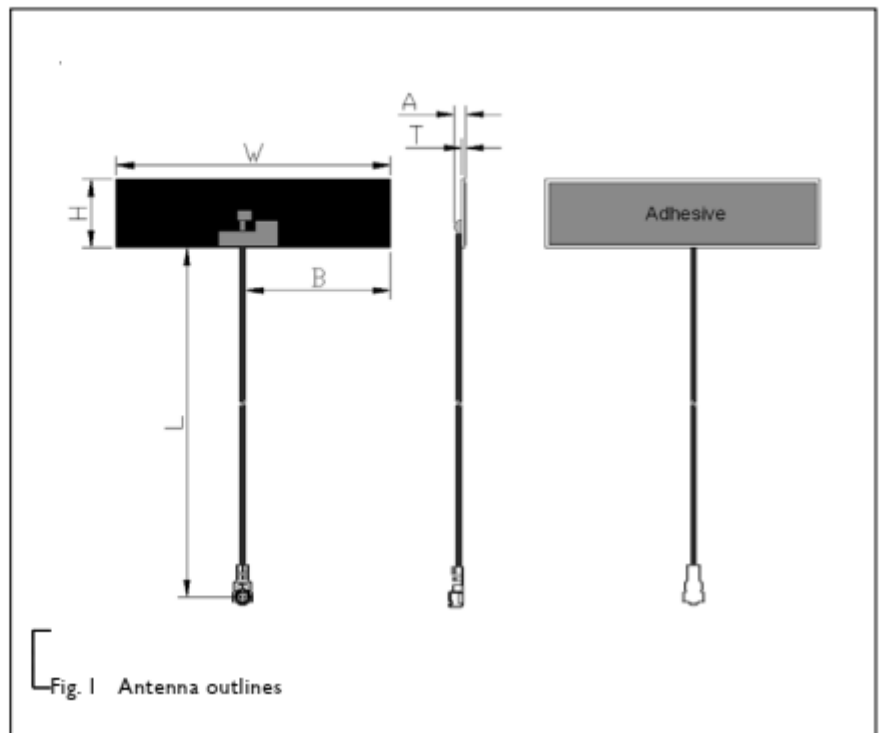
DESCRIPTION	VALUE
Working Frequency	2.40 ~ 2.50 GHz
VSWR	2.5:1max
Peak Gain	3.3 dBi
Polarization	Linear
Radiation Pattern	Omni-directional
Impedance	50 Ω Nominal
Operating Temperature	- 40 °C to 85 °C
Maximum Power	1 W
PCB Dimension	39mm x 10mm x 0.55mm
Radio Connector	I-PEX (20278-112R-13)
Cable Diameter / Length / Color	1.13mm / 100mm / Black
Mounting	Adhesive Tape (HF-DS)

DIMENSIONS

Table 2 Mechanical Dimension

DIMENSION	VALUE
L (mm)	100 $\pm$ 3.00
W (mm)	39 $\pm$ 0.30
H (mm)	10 $\pm$ 0.30
T (mm)	0.55 $\pm$ 0.15
A (mm)	2.30 Max
B (mm)	20.00 $\pm$ 1.00

OUTLINES



9.4 EBDS

EBDS-ACJANT-HM-24-3M



L'antenne **EBDS-ACJANT-HM-24-3M** est une antenne WiFi 2,4GHz **traversante** et qui se fixe par perçage.

Cette **antenne étanche IP65** dispose d'un câble de 3m et existe en deux versions :

- Avec un connecteur SMA-m
- Avec un connecteur RPSMA-m

Caractéristiques

Antenne	Fréquences	2400-2500MHz
	Polarisation	Linéaire
	Gain maximal	3dBi
	VSWR	<2.0
	Impédance	50Ω
Mécanique	Câble	RG174 – 3m
	Connecteur	SMA-m ou RPSMA-m
	Fixation	Traversante
Environnement	Température de fonctionnement	-40°C à +85°C
	Indice de protection	IP65
	Certification environnementale	Conforme ROHS



L'antenne **EBDS-ACJANT-MAG-24-3M-SMAm** est une antenne WiFi 2,4GHz.

Elle dispose d'un **connecteur SMA-m** et d'un **câble de 3m**.

Elle se fixe sur n'importe quelle surface métallique grâce à son **socle magnétique**.

Caractéristiques

Antenne	Fréquences	2400-2483,5MHz
	Polarisation	Linéaire
	Gain maximal	2dBi
	VSWR	<2.0
	Impédance	50Ω
Mécanique	Câble	RG174 – 3m
	Connecteur	SMA-m
	Fixation	Magnétique
Environnement	Température de fonctionnement	-40°C à +85°C
	Certification environnementale	Conforme ROHS

9.5 Siretta



Key Features

- 3G/4G/5G/WiFi frequency bands
- Compact size
- Wall or pole mountings
- 3 to 5.5dBi Gain

Electrical Specifications

Impedance:	50 Ohm
VSWR:	<1.5
Peak Gain:	3 - 5.5dBi
Frequency range:	698-960MHz / 1200 - 5850MHz
Max power:	50W
Polarization:	Vertical, Linear
Operating Temperature	-40°C ~ +70°C

Mechanical Specifications

Dimensions:	L180 x Ø 60mm
Connector:	SMA Male
Radiator:	Aluminium
Radome:	PVC, UV protection
Lightning protection:	Direct ground
Wind loading:	180km/h
Mounting method:	Wall/Pole Mount

2.4GHz WiFi Antenna

Hinged Whip Antenna

Features

- Omni Directional Whip Antenna
- 2.4 - 2.5GHz
- 2.15dBi Gain
- VSWR <2.0
- Rugged Flexible Plastic Finish.
- SMA with Variable Hinge
- Vertical Polarisation
- 50ohm Impedance
- Operating Temp -30 to +60°C
- Insulation resistance 500MΩ
@500Vdc

Description

A Miniature antenna for demanding applications. This antenna provides operation a high performance across a broad spectrum of frequencies. Housed in a rugged low profile ABS, this antenna is compact and resistant to Vandalism.



Applications

- General WiFi
- M2M Applications

10 REVISION HISTORY

Row	Revision Date	Revision Description	By
1	9-12-2020	Initial version	P.Fourey
2	17/12/2020	Modification of §5 paragraph	P.Fourey
3	4/01/2021	Correction	P.Fourey
4	5/01/2021	Modification §5 and §6 paragraph	P.Fourey
5	17/03/2021	Add "Chip radio" paragraph	P.Fourey
6	26/04/2021	Add "About manual" paragraph	P.Fourey
7	04/06/2021	Modification "About manual" paragraph	P.Fourey