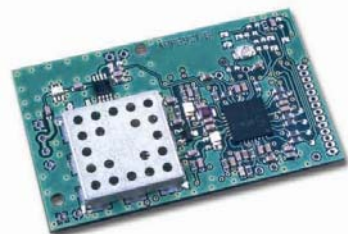


A^{RF29} Transceivers modules



User Guide

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About this Document

This guide describes the A^{RF29} devices, their options and accessories.

Declaration of Conformity



Manufacturer's name:
Manufacturer's address

ADEUNIS R.F.
Parc Technologique PRE ROUX IV
283 rue Louis NEEL
38920 CROLLES - FRANCE

declares that the product if used and installed according to the user guide available on our web site www.adeunis-rf.com

Product Name: **ARF29**

Product Number(s): **ARF6921A / ARF6921C / ARF6921E**

is designed to comply with the RTTE Directive 99/5/EC:

EMC: according to the harmonized standard EN 301 489.

Safety: according to the standard EN 60950-1/2001

Radio: according to harmonized standard EN 300-220 covering essential radio requirements of the RTTE directive.

Notes:
- Conformity has been evaluated according to the procedure described in Annex III of the RTTE directive.
- Receiver class (if applicable): 3.

According to the 1999/519/EC recommendation, minimum distance between the product and the body could be required depending on the module integration.

Warnings: - CE marking applies only to End Products: Because this equipment is only a subassembly, conformity testing has been reduced (equipment has been design in accordance to standards but full testing is impossible). Manufacturer of End Products, based on such a solution, has to insure full conformity to be able to CE label marking.
- As the integration of a radio module requires wireless technological knowledge, ADEUNIS RF proposes its technical proficiency to its customers for a pre-compliance qualification of end products. In case of no-conformity, ADEUNIS RF will not be held back responsible if this stage has not been realised.

Crolles, November 6th, 2007
VINCENT Hervé / Quality manager

A handwritten signature in black ink, appearing to be 'V. Hervé', written over the printed name.

Download of the user guide

Thank you for having chosen the ADEUNIS RF products.

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Products

Paragraph **OEM Modules > Transmitters & Receivers**

Print version available upon request

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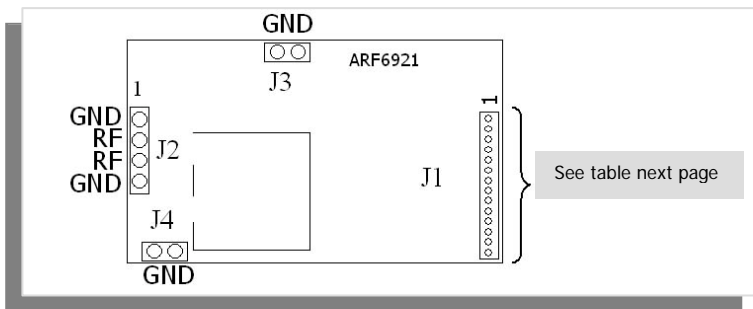
Presentation

The A^{RF29} range comprises transceivers in the 869 MHz band with a transmission power of 500 mW. These transceivers enable connections to be established over several kilometers.

The A^{RF29} is available in 3 versions offering different transmission rate / channelling combinations:

- ARF6921Ex : 1 channel at 38.4 kBps Manchester (38.4 kHz).
- ARF6921Ax : 2 channels at 19.2 kBps Manchester (19.2 kHz).
- ARF6921Cx : 5 channels at 4.8 kBps Manchester (4.8 kHz).

User interface



Connectors	Ref. No.	Name	Direction	Function
J1	1, 14	GND	Power supply	
	2	POWER DOWN	Input	Module in standby
	3	BUSY	Output	Indicates module not available
	4	TX/RX	Input	Transmit/Receive mode selection
	5	P1	Input	Power level select
	6	TXD	Input	Data to transmit
	7	P0	Input	Power level select
	8	VCC	Power supply	Power supply input
	9	C2	Input	Transmission channel select (*)
	10	RXD	Output	Data received
	11	C1	Input	Transmission channel select (*)
	12	RSSI	Output	Indicates RF level received
	13	C0	Input	Transmission channel select (*)
J2	1, 4	GND		
	2, 3	RF		RF output/Module antenna

(*) : according to versions.

Power supply

The A^{RF29} transceiver supply voltage should be chosen in the 3.3V - 5V range and applied between pin 8 and pins 1 and 14 of the connector.

The power supply source must be able to provide a current of 700 mA. This capacity can be reduced to 40 mA if the module is used on receipt only.

NOTE

- Take care! Choose a power supply able to withstand the load variations due to mode changes (Receipt to transmission for example....)
- All the module GND connections must be connected to the motherboard.

Standby

This mode enables to limit the consumption to around 700uA.

Take care! This consumption assumes that the inputs C0, C1, C2, P1 and P2 are OFF. If one of these inputs is activated (ON), 130uA have to be added. Consequently, if the 5 inputs are on ON, the standby current consumption increases to about 1.35mA.

In this mode the module does not receive and does not supply information to the outside.

Power_down = 0V : normal mode

Power_down = VCC : standby mode

Transmit/Receive mode selection

The TX/RX input enables the transceiver to be set to transmission or receipt. Switching from one mode to the other is not instantaneous, see the different switching times in paragraph 4.

TX / RX = 0V : module in receipt mode

TX / RX = VCC : module in transmission mode

Data to transmit / data received

By default, this module operates **in transparent mode**. The frame definition and bit coding/decoding operations are taken charge of by the associated logic.

The data to be transmitted or delivered should be in the form of a digital signal between 0 and VCC. The A^{RF29} module does not process analog data.

The data to be transmitted are to be supplied on the TXD pin

The data received are available on the RXD pin

NOTE

Depending on the application, the transceiver is able to operate in synchronous mode (NRZ or Manchester encoding/decoding performed by the module). In this mode, the TXD and RXD pins do not have the same role as

in transparent mode. For more information concerning this possibility, consult us.

Channel selection

On the multi-channel versions, the choice of channel is performed by setting the inputs C0 to C2.

These inputs are polarized on the module, they must either be unconnected (**OFF**) or **grounded (ON)**.

ARF6921E version : single-channel (for information)
frequency 869.525 MHz.

For this version, the inputs C0 to C2 must not be forced to any potential (OFF position).

ARF6921A version: 2-channel

C2 = OFF : frequency 869.4625 MHz.

C2 = ON : frequency 869.5875 MHz.

The input C2 is sufficient to select the channel, C0 and C1 must not be forced to any potential (OFF position).

ARF6921C version : 5-channel

C0	C1	C2	Frequency
ON	ON	OFF	869.425 MHz
OFF	ON	ON	869.475 MHz
ON	OFF	OFF	869.525 MHz
OFF	ON	OFF	869.575 MHz
OFF	OFF	OFF	869.625 MHz
<i>ON</i>	<i>ON</i>	<i>ON</i>	<i>Reserved - Do not use</i>
<i>ON</i>	<i>OFF</i>	<i>ON</i>	<i>Reserved - Do not use</i>
<i>OFF</i>	<i>OFF</i>	<i>ON</i>	<i>Reserved - Do not use</i>

Transmitted power selection

The two inputs P0 and P1 enable the transmission power to be adjusted and the consumption to be reduced.

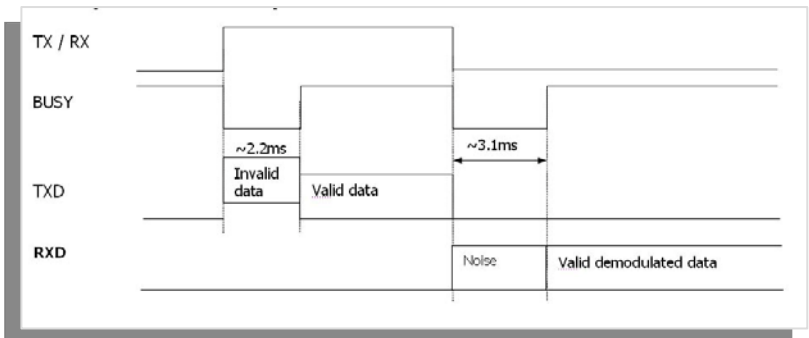
P0	P1	Power
ON	ON	+16 dBm (40mW)
ON	OFF	+21dBm (125mW)
OFF	ON	+24 dBm (250mW)
OFF	OFF	+27dBm (500mW)

Only OFF/OFF mode (maximum power) is guaranteed. The levels of the other modes are given for indication purposes only. At each power step, the consumption gain is about 100mA as compared with the higher level.

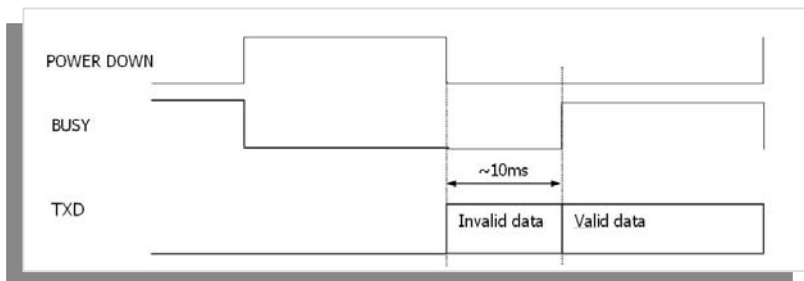
BUSY output

This output indicates by a level that the module is unavailable to transmit or receive. This occurs momentarily when changing mode (e. g. switching from TX to RX, power-up, standby mode exit, etc.) and when calibrations are performed (recalibrating the VCO and adjustment of the PLL for power supply variations >100mV or temperature variations > 20°C). The duration of the calibrations is < 30 ms. The data received or transmitted when the BUSY signal is at low level are non significant or not transmitted.

Switching from transmission / receipt :

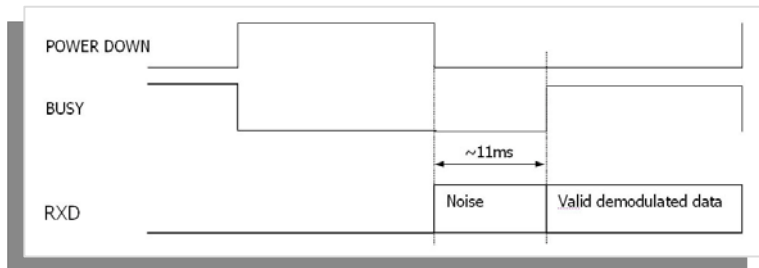


Switching from standby / transmission :

**NOTE**

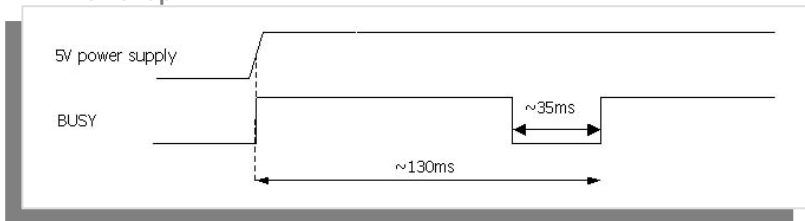
Pay The BUSY time can reach up to 28ms

Switching from standby / receipt :

**NOTE**

The BUSY time can reach up to 28ms

Power up :



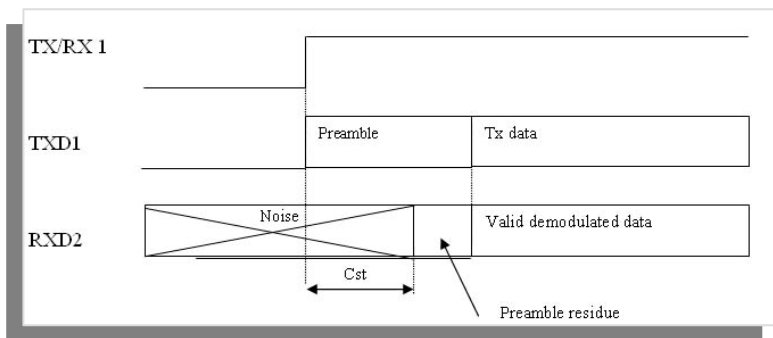
NOTE

On Power-up:

- The module is unavailable for 130ms. It is therefore necessary to wait until the end of the pulse on the Busy signal to consider the module available.
- **ON START-UP** : The BUSY pin is considered as an input by the module. This pin **MUST** therefore be left OFF on power-up.

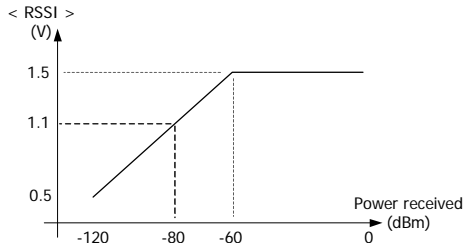
Channel settling time (Cst)

This characteristic corresponds to the time required to obtain the first valid bits on receipt on an A^{RF29} n°2 (RXD2) on continuous listening after transmission of a frame from another remote A^{RF29} n°1 module (TXD1).



RSSI output

The RSSI signal gives an **indication** of the power received. It is an analog output whose mean value varies linearly with the power received.



TAKE CARE

- The RSSI information must not be used to wake up the receiver in applications where range and therefore maximum sensitivity are sought for.
- The RSSI level remains an indicator which must be used with precaution due to dispersions between components.

The curve presented above may therefore be subject to slight changes from one product to the other. These dispersions are also strongly linked to the temperature of use of the A^{RF29}.

- The RSSI level can also indicate the presence of a possible jammer in the channel used. Simply examining the RSSI does not therefore enable detection of a useful signal from a remote transmitter to be ensured. The identity of the transmitter also has to be checked by analyzing the frames received.

RSSI is a necessary but not sufficient condition to achieve correct receipt.

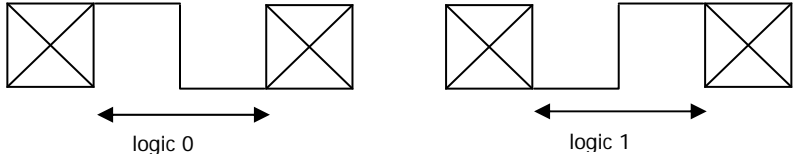
Recommandations for use

Bit encoding

In the case of radio transmission, it is preferable to limit the spectrum of the signals to be transmitted as far as possible, in particular towards low frequencies, even if this involves increasing the main frequency. In addition, it is advantageous to reset the synchronization on each bit transmitted; the

receivers are in fact the cause of large duty cycle errors on the electrical states.

Bit encoding of Manchester (or Biphas) type should therefore be preferred, as described below :



Frame encoding

Once the bits have been encoded, it is then imperative to transmit them according to a frame structure; the radio link is very sensitive to binary flow breaks which only byte "serialization" can minimize.

A conventional frame structure is set out below:



1. **Preamble** : Electrical succession 101010... designed to fix the receiver polarizations and compensate the channel settling time.
2. **Start pattern**: Electrical pattern which marks the start of the useful data by a break in the binary flow of the preamble.
3. **Useful part**: Successions of bytes encoded at bit level.
4. **Stop pattern**: Indicates the end of the frame (necessary when the frame can be of variable length).

Integration

Daughter board

The signals of the different electrical accesses are given in the "user interface" part of this document. The "Low Frequency" pins (connector J1) can be connected on the motherboard by means of a 1.27mm pitch strip. For the J2, J3 and J4 connectors, 2.54mm pitch strips (HE14 type) should be used.

The motherboard can be used to locate the antenna output by means of a 50 Ohm printed line. This line is formed by a printed track 2.5 mm wide which must be situated above the continuous ground plane (the HF cold point should be connected as short as possible to this plane). Avoid running close to the digital lines!

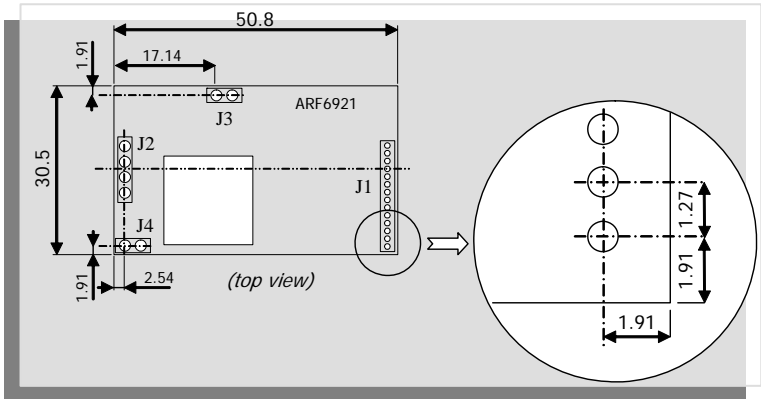
EMC aspect

When integrating a radio element in an electronic system, the motherboard must have a ground plane as continuous as possible. The GND signals from the module should be connected as short as possible to this plane. It is preferable for the module to then be mounted on the ground plane side, opposite the tracks.

A receiver without a mute generates output noise in the absence of a receipt signal. This does not mean that it is polluted by a disturber - the data will be "clear" on receipt.

Take care! The presence of a mobile phone near the receiver may disturb long distance transmissions.

Dimensions



- The dimensions are given in mm.
- The connectors are not supplied with the module.
- J1 has a pitch of 1.27mm and J2, J3 and J4 a pitch of 2.54 mm.

Compliance with regulations

When using radio transceivers in the form of integrated daughter boards, conformity with regulation compliance relates to the finished product.

In Europe, finished products must comply with the RTTE directive. For this type of radio application, conformity with the RTTE directive will be established by compliance with the following requirements :

- EN300220 standard (Efficient use of Radio/spectrum).
- EN301489 standard (EMC).
- EN60950 standard (Electrical safety if necessary)

IMPORTANT

Although the A^{RF29} daughter boards comply with the criteria and dimensions of the EN300220 radio standard, their integration in a “mother” electronic system may modify some electrical characteristics (harmonic levels, spurious RF, etc.)

Before it is sent for laboratory tests, the product therefore has to be examined on our premises to check that it complies with regulations. After presentation, the product and the test reports must be kept as proof of conformity.

Specifications

Transmitter (Tx)

Maximum power	500mW (+27dBm)	In 50 Ohms
Modulation	FSK +/-40kHz FSK +/-20kHz FSK +/-5kHz	Version E (1-channel) Version A (2-channel) Version C (5-channel)
Consumption	650 mA	- @max power - in 50 Ohms - @5V
Wake-up time	10ms	From Power_Down mode
Rx to Tx turn-around time	2ms	

Receiver (Rx)

Sensitivity	-103 dBm (1.6uV) -105 dBm (1.25uV) -110 dBm (0.7uV) For 10^{-3} /PN9	Version E (1-channel) Version A (2-channel) Version C (5-channel)
Passband @3dB	60 KHz 40 kHz 20 kHz	Version E (1-channel) Version A (2-channel) Version C (5-channel)
Consumption	25 mA	
Wake-up time	10 ms	From Power_Down mode
Rx to Tx wake-up time	3 ms	

Transceiver (Trx)

VCC power supply	From 3.3V to 5V	
Transmission rate	38.4 kBps Manchester i.e. 38.4kHz	E version (1-channel)
	19.2 kBps Manchester i.e. 19.2kHz	A version (2-channel)
	4.8 kBps Manchester i.e. 4.8kHz	C version (5-channel)
Digital input/output	0/VCC	
Standby consumption	700µA	Take care over the position of C0, C1, C2, P1 and P2
Channel settling time	2 ms	E version (1-channel)
	2 ms	A version (2-channel)
	3 ms	C version (5-channel)
Free field range	3 km	E version (1-channel)
	4 km	A version (2-channel))
	6 km	C version (5-channel)
Temperature	From -20°C to +70°C	
Dimensions	30.5 x 50.8 x 12	in mm
Standards	EN300220	Radio
	EN301489	EMC

References

ARF6921E : Transceiver – single-channel – transmission rate 38.4 kbps Manchester

ARF6921A : Transceiver – 2-channel – transmission rate 19.2 kbps Manchester

ARF6921C : Transceiver – 5-channel – transmission rate 4.8 kbps Manchester