

ARF29 User Guide



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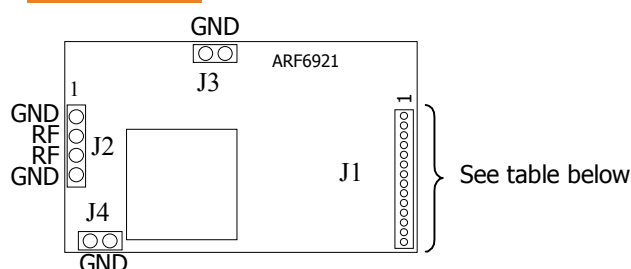
PRESENTATION

The ARF29 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 ARF29 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 ARF29 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.

NB : - 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 ARF29 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

NB : 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.

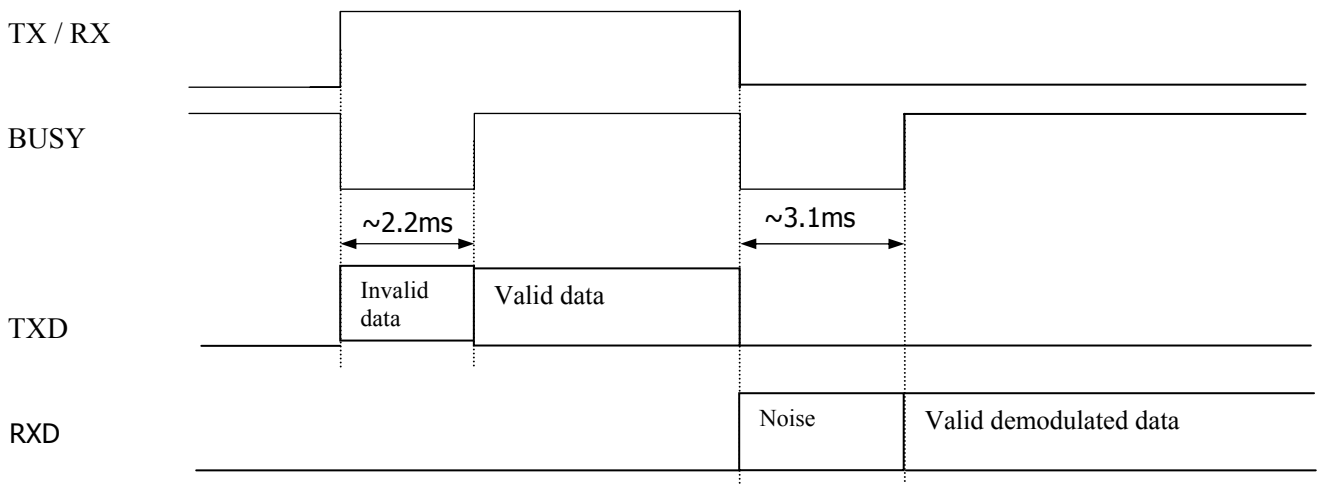
- **BUSY output**

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).

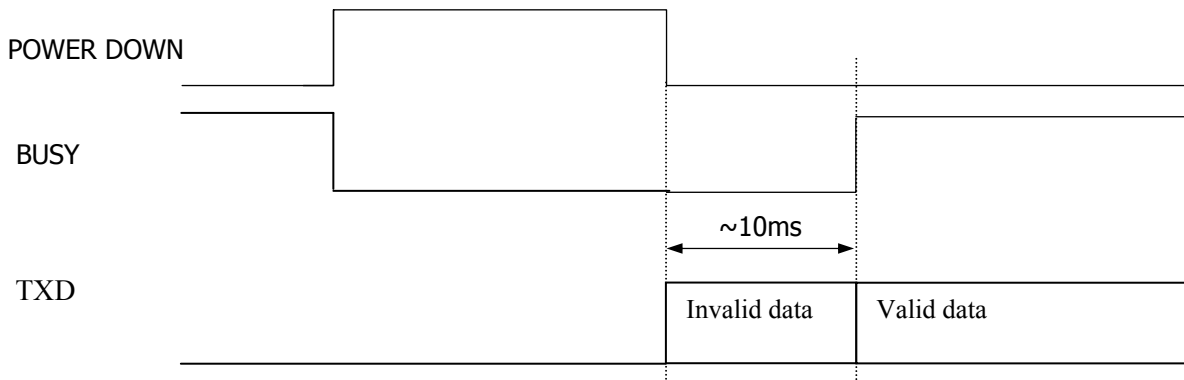
The duration of the calibrations is < 30 ms.

The data received or transmitted when the BUSY signal is at low level are non significant or not transmitted.

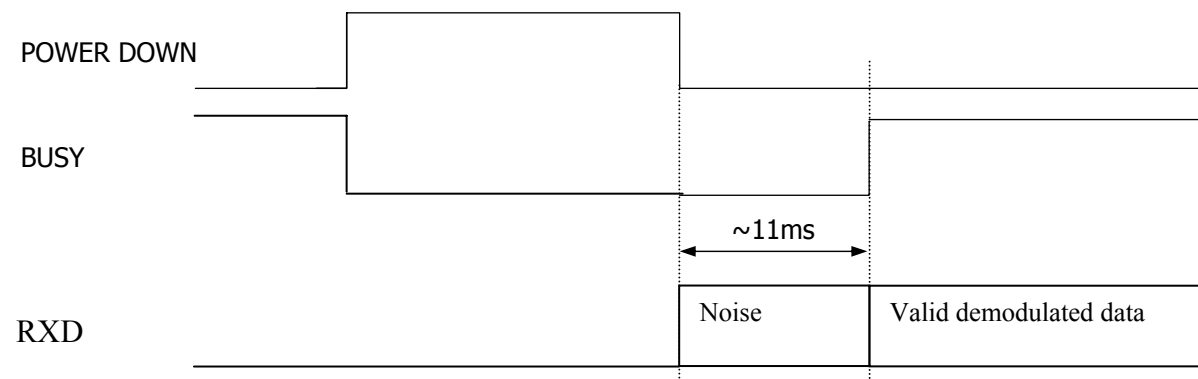
Switching from transmission / receipt:



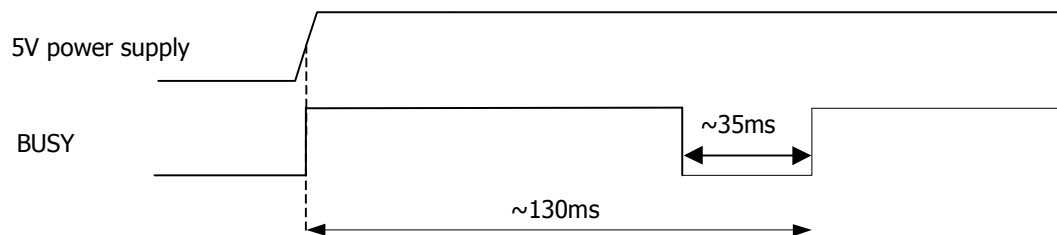
Switching from standby / transmission



Switching from standby / receipt:



Power up :

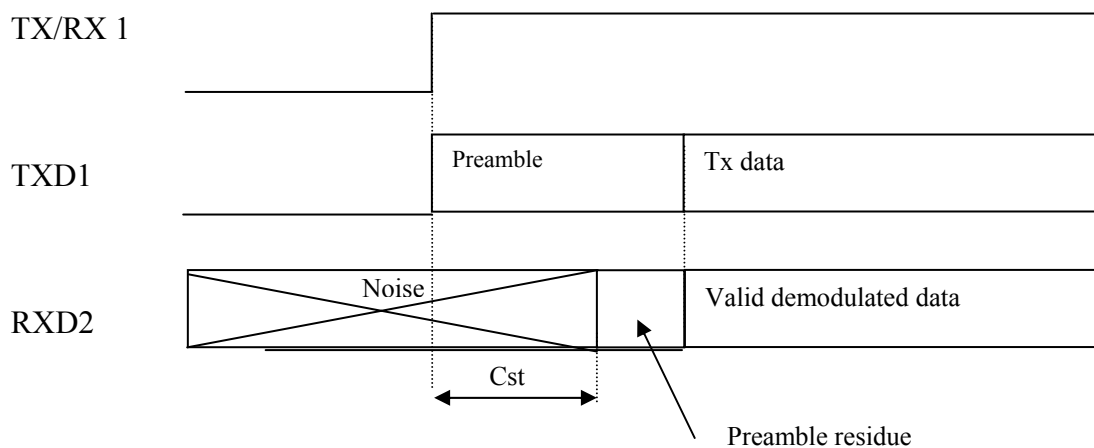


NB : On Power-up:

- 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)

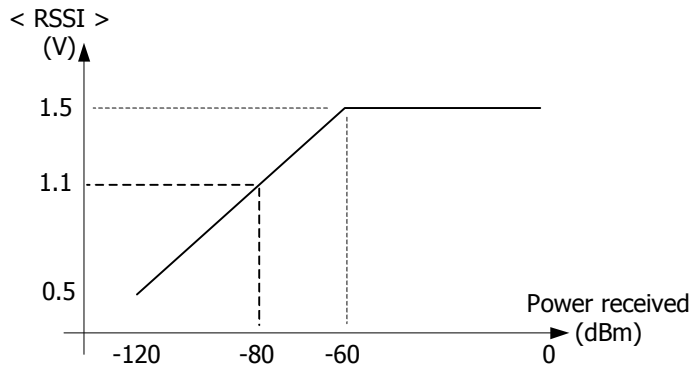
This characteristic corresponds to the time required to obtain the first valid bits on receipt on an ARF29 n°2 (RXD2) on continuous listening after transmission of a frame from another remote ARF29 n°1 module (TXD1).



Cst = 2ms for versions A and E.
3ms for version C.

- **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 ARF29.

- 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.

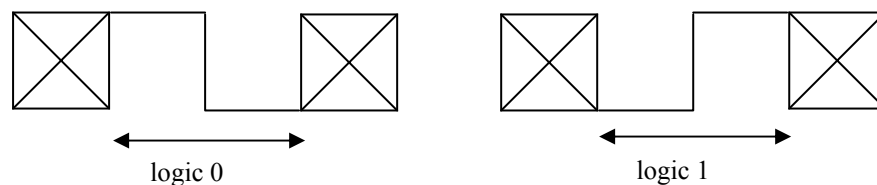
RSSI is a necessary but not sufficient condition to achieve correct receipt.

RECOMMENDATIONS 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.

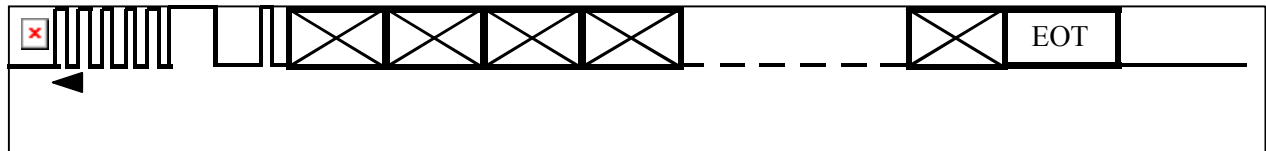
Bit encoding of Manchester (or Biphas) type should therefore be preferred, as described below:



- **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!

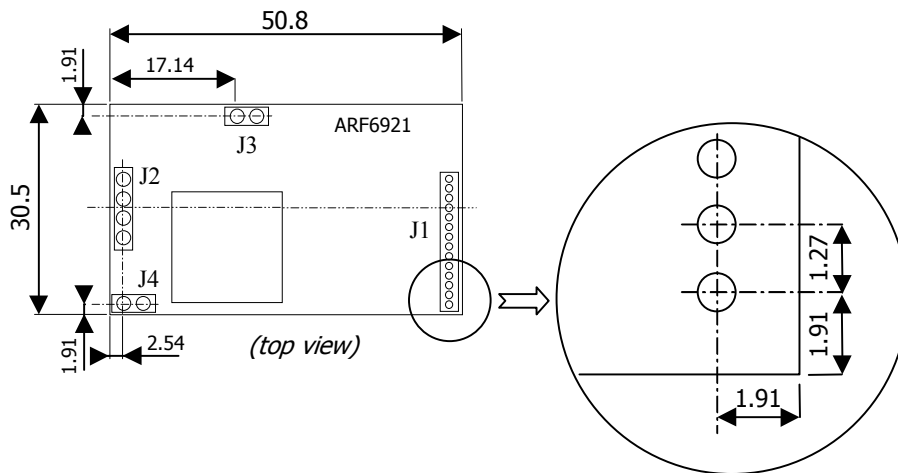
EMC aspect:

- 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.

SPECIFICATIONS

	Parameter	Value	Conditions
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)	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	VCC power supply	From 3.3V to 5V	
	Transmission rate	38.4 kBps Manchester i.e. 38.4kHz 19.2 kBps Manchester i.e. 19.2kHz 4.8 kBps Manchester i.e. 4.8kHz	E version (1-channel) A version (2-channel) 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 2 ms 3 ms	E version (1-channel) A version (2-channel) C version (5-channel)
	Free field range	3 km 4 km 6 km	E version (1-channel) A version (2-channel)) C version (5-channel)
	Temperature	From -20°C to +70°C	
	Dimensions	30.5 x 50.8 x 12	in mm
	Standards	EN300220 EN301489	Radio EMC

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 ARF29 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.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN45014



Manufacturer's name: **ADEUNIS R.F.**

Manufacturer's address: Parc technologique PRE ROUX IV
283 rue Paul Louis NEEL
38920 CROLLES - FRANCE

declares that the product

Product Name: 869 MHz FSK Transceiver Module
Product Number(s): ARF6921A - ARF6921C - ARF6921E - ARF6921G

Product options:

conforms to the RTTE Directive 99/5/EC :

EMC : conformity is proven by compliance to the standard EN 301489 according to the requirements of EMC Directive 89/336/EEC.

Safety : conformity to the standard EN 60950 according to the requirements of Low Voltage Directive 73/23/EEC and to E Field Exposure Rec 519/5/CE .

Radio : conformity is proven by compliance to harmonised standard EN 300220 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.
- Spectrum is harmonised according to the ERC/DEC(01)04.

Restrictions : - 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.

Crolles, June 14th, 2005

VINCENT Hervé / Quality manager

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