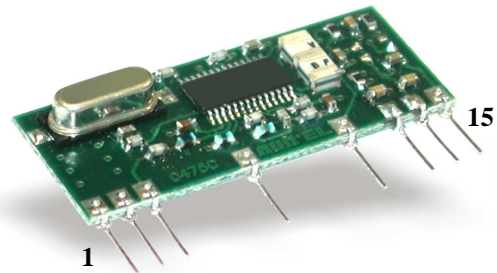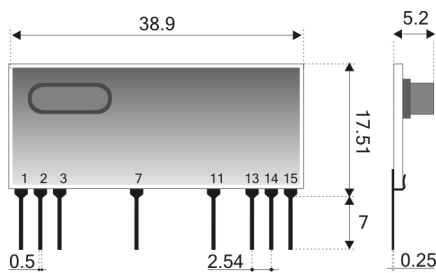RX 4MM3/PREN FAST is a digital data super het receiver, working at 433,92 MHz ISM band, a new version of RX 4MM3, it changes for pin 15. Pin15 is used to enable the receiver, allowing less than 2 uA of current supply in stand-by mode and very fast switching-on to the valid reception(less than 1msec). The other technical features are the same; 3V of power supply and OOK modulation. Main features are the very high sensitivity (-114 dbm) and the frequency image rejection obtained through a new circuital technique. An RSSI output allows a distance indication of the matched transmitter, providing a signal proportional to the power of RF input signal.

PIN-OUT

CONNECTIONS

Pin 1	+V	3V - 3,6V range for voltage supply
Pin 2-7	Ground	GND
Pin 3	Antenna	Antenna input, impedance 50 ohm.
Pin 11	AGC On-Off	Switching-on of the Automatic Gain Control. Low logic level: Automatic Gain Control is on (advised setting). High logic level: Automatic Gain Control is off. Max sensitivity. (see "Pin 11 working" section).
Pin 13	RSSI OUT – Test Point	RSSI analogue output, proportional to the power of RF received signal (For details see page 4)
Pin 14	Data output	Data. Normally low with no RF signal is in input.
Pin 15	Enable	Pin enable: High logic level: RX is switch-on. Low logic level: RX is switch-off. (PWRDN mode)

Technical features

	Min	Typical	*Max*	*Unit*	Notes
Reception frequency	433,9	433.92	433,94	**MHz**	
Vs voltage supply	3	3,3	3,6	**V**	
Current supply RX = ON ENABLE (pin 15) = 1		5,8	7	**mA**	
Stand-by current supply ENABLE (pin 15) = 1 Vcc			3	**uA**	
RF sensitivity	-110	-114	-115	**dBm**	See note 1
Modulation		ASK			
IF bandwidth @ −3dB		280		**KHz**	
Interference rejection at ±10MHz	60			**dB**	
Output square wave		2	3	**KHz**	
Output low logic level (pin 14)			gnd+0,4	**V**	See note 3
Output high logic level (pin 14)	V_s-0,4			**V**	See note 3
Input high logic level (pin 15)	Vs-0,4			**V**	
Input low logic level (pin 15)			0,4	**V**	
Current consumption pin15 with High logic level		10		**uA**	
Spurious RF emission in antenna			-60	**dBm**	
Switch-on time Usage condition: (pin 1) Vcc e (pin 15) Enable = 0 1			0,4	**s**	See note 2
Switch-on time PWRDN RX-ON Usage condition (pin 1) Vcc = 1 (pin15) Enable = 0 1		0,5		**ms**	
Working temperature	-20		+80	**°C**	
Dimension		38,9 x 17.51 x 5.2 mm			

NOTA 1: Sensitivity obtained through an RF generator with 100% modulation.
NOTA 2: By switch on time is meant the time required by the receiver to assume the declared characteristics from the very moment the power supply is applied.
**NOTA 3:** Values obtained with 10KΩ maximum load applied.

How it works:

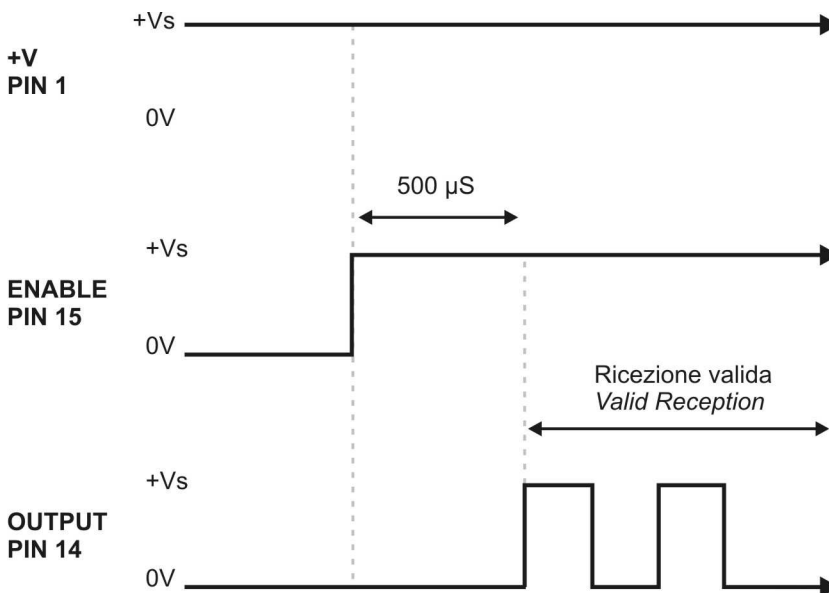The RX 4MM3/FAST PREN receiver is able to work in two different ways:

1. **POWER-DOWN mode:** By setting the PWRDN Pin 15 to low logical level, the receiver goes to stand-by mode and it does not receive with a maximum of 2uA current consumption.
2. **Reception mode:** By setting the PWRDN Pin 15 from low logical level to high logic level, the receiver switches on within 1 ms(typically 0,5 ms) and starts to receive depending on the features above. In the case of first power supply, the switching-on time is 400 ms by setting high Pin 1 and Pin 15.

TIME CHART RX > ON
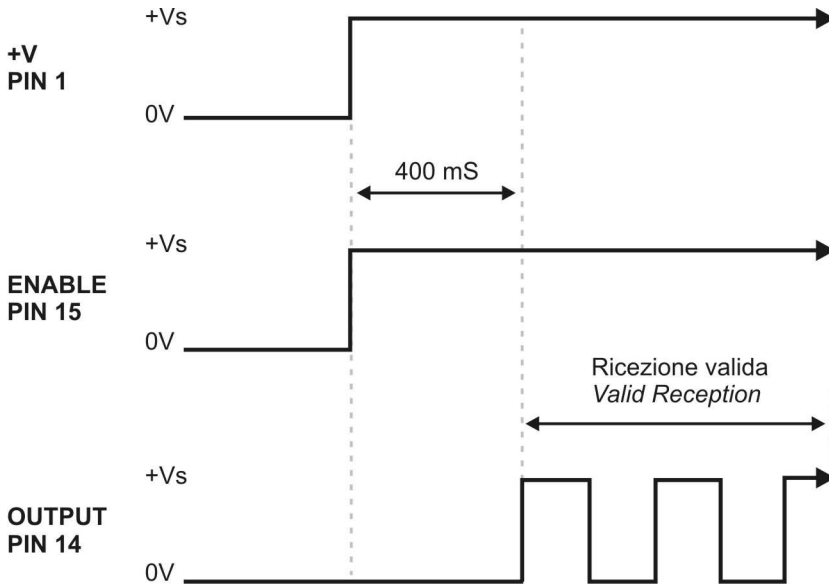
TIME CHART PWRDN >RX

Pin 11 AGC On-Off

The RX 4MM3/FAST PREN receiver is endowed with a pin designed to enable the automatic gain control. Setting at a low level the AGC ON-OFF pin, the automatic gain control is on: now it is possible to correctly decode RF signals received with an RF power included in the range [-114dBm, 0dBm] that means that the RX 4MM3/PREN FAST accepts the largest dynamics of the received waveform (that is up to 0 dBm).
If you put a logic high level on pin 11 the automatic gain control is disabled and the receiver works always with the maximum sensitivity. If the RF power is lower than a threshold the RX 4MM3/PREN FAST works with a linear behaviour while if the input power is higher than the same threshold the receiver works in the saturation zone. This behaviour can be exploited if you need the distance indication of the receiver from its correspondent transmitter. The following indications handle with the RSSI output with automatic gain control disabled.

Pin 13 RSSI output

In **Fig. 1** it's depicted the behaviour of the voltage at the RSSI output in function of the power of the input signal with the automatic gain control disabled (pin 11 at a logic high level). The diagram has been obtained applying at the antenna input (pin 3) the 99% AM modulated signal coming from an RF generator made up of a 1 KHz square waveform and putting a 10 µF capacitor between pin 13 and GND. The RSSI output has a linear behaviour in correspondence with an RF power up to –40 dBm ca., after which it assumes the saturation value of 2,2V. In the linear zone the RSSI output is directly proportional to the RF power: the voltage at pin 13 can be then used as a measure of the intensity of the received signal and to recover the distance from the transmitter. When the RSSI output assumes a constant value, the received signal is no more directly proportional and only a proximity information can be extracted. The maximum distance of the transmitter from its receiver can be calculated as the RF power at which the RSSI output changes its values up to the saturation voltage. The distance over which the receiver works in the saturation zone is in theory 4m ca. (transmitting and receiving antennas on line of sight and 0dBm transmitted power, typical RF power of the handheld transmitters) and depends on the presence of obstacles placed in the middle of the radio link that cause multipath and reflections. Therefore the RSSI represents a measure of distance until it has a linear behaviour and a proximity information when it assumes the saturation voltage (useful if you need to monitor accesses).
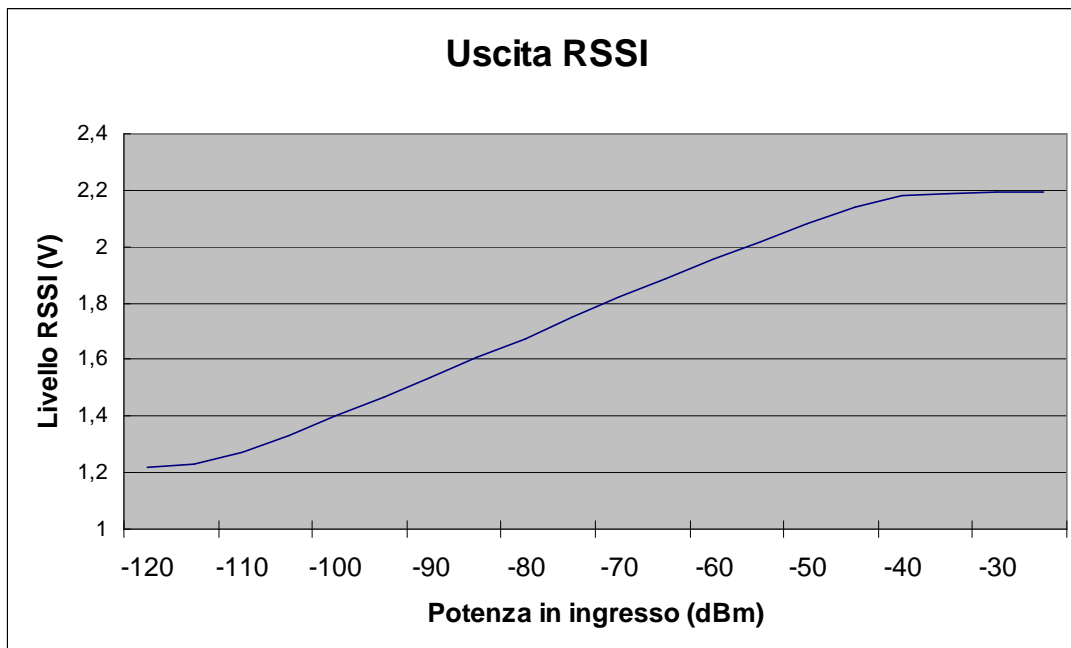

Fig. 1 – The picture shows RSSI output, when AGC is switched-off, depending on the RF input signal.

Device usage

In order to obtain all the technical features and to comply the European normative, the receiver has to be mounted, keeping in mind what follows:

Power supply:

1. The receiver must be supplied by very low voltage source, safety protected against short circuits. Maximum voltage variations allowed: ± 0,5 V.
2. De-coupling, next to the receiver, by means of a ceramic capacitor of minimum 100.000 pF value.

Ground:

It must surround at the best the welding area of the receiver. The circuit must be double layer, with throughout vias to the ground planes, approximately each 15 mm.

It must be properly dimensioned, especially in the antenna connection area, in case a radiating whip antenna is fitted in it (an area of approximately 50 mm radius is suggested.)

Fig.2 Advised lay-out for a correct working of the device.
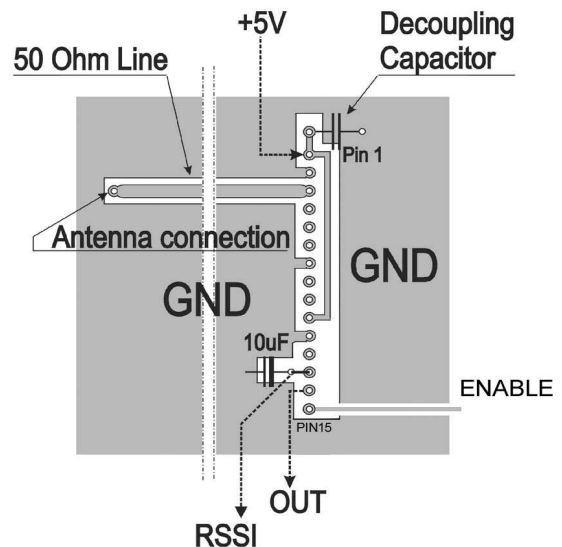
50 Ohm Line:

1. It must be as shorter as possible.
2. 1,8 mm wide for 1 mm thick FR4 printed circuits and 2,9 mm wide for 1,6 mm thick FR4 printed circuits. On the same side it must be kept 2mm away from the ground.
3. On the opposite side a ground circuit area must be present.

Antenna connection:

It may be utilized as the direct connection point for the radiating whip antenna. It is deeply suggested to put a 100nH inductance from pin 3 to ground in order to protect the device from the electrostatic discharges.

It can bear the connection of the central wire of a 50 Ω coaxial cable. Be sure that the braid is welded to the ground in a close point.

Technical features can be change without forecast. AUREL S.p.A. doesn't assume any responsibility of damages due to the improper device usage.

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Antenna

1. A whip antenna, 16.5mm long and approximately 1 mm dia, brass or copper wire made, must be connected to the RF input of the receiver.
2. The antenna body must be kept straight as much as possible and must be free from other circuits or metal parts (5cm minimum suggested distance).
3. It can be utilised both vertically or horizontally (the previous is highly suggested), providing that connection point between antenna and receiver input is surrounded by a good ground plane.

N.B: As an alternative to the above mentioned antenna it is possible to use the whip model manufactured by Aurel (see related Datasheet and Application Notes).
By fitting whips too different from the described ones, the EEC Certification is not assured.

Other components:

1. Keep the receiver separate from all other components of the circuit (more than 5mm).
2. Keep particularly far away and shielded all microprocessors and their clock circuits.
3. Do not fit components around the 50 Ohm line. At least keep them at 5 mm distance.
4. If the antenna connection is directly used for a radiating whip connection, keep at least a 5 cm radius free area. In case of coaxial cable connection, 5 mm radius will suffice.

Reference normative

The RX 4MM5/F is approved by CE and in particular satisfies the European normatives EN 300 220-1 V2.3.1 in class 2, ed EN 301 489-1 V1.8.1 in class 2. The product was tested in according with EN 60950 normative and it's usable fitted in an isolated housing to ensure the above normative. The receiver must be supplied by very low voltage security source against the short circuits. Usage of receiver module is foreseen fitted in the housing which ensure the agreement of EN 61000-4-2 normative not directly applicable to the module itself. In particular, it's at the user's care the isolating of the extern antenna connection and antenna too, in fact the RF output of the receiver is not able to directly bear electrostatic charges foreseen in the above normative.

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