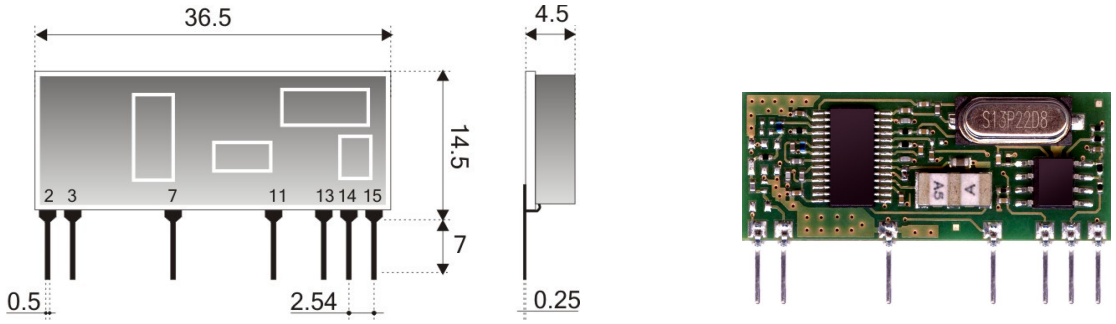
RX 4MM5/F receiver

AM OOK super-heterodyne receiver miniaturized at high sensitivity, high immunity against interference electromagnetic field. This device with digital output filter allows to eliminate short pulses(shorter than 150usec) which can be onto received signal (Example: due to strong noise of motors with brushes), permitting the correct working of the receiver. It can use in those applications where there is lot of disturbance like gate opener commands and industrial noisy environments. Optimized for HCS encoding.

Pin-out



Connections

Pin 2-7	**Ground**	GND connections. Internally connected with an only ground plane
Pin 3	**Antenna**	Antenna connection, 50Ω impedence
Pin 11	**AGC On-Off**	Automatic gain control selection. Low logic level: automatic gain control ON. High logic level: automatic gain control OFF. Always in high sensitivity mode.
Pin 13	**RSSI**	RSSI output. It indicates the RF signal level received in input.
Pin 14	**Data Out**	Digital output of receiver. Use loads bigger than 10 KΩ.
Pin 15	**+V**	Connections to the positive voltage supply (+5.0 V)

Technical features

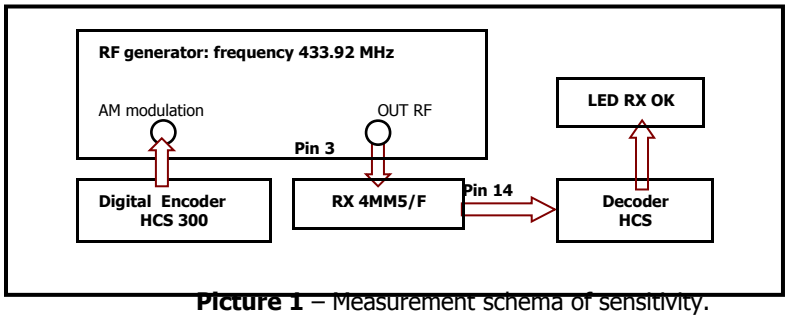
	Min	Typical	Max	Unit	Notes
Reception frequency		433.92		MHz	
VDD voltage supply	4.5	5.0	5.5	V	
Current supply		7.5	8.6	mA	
RF sensitivity	-110	-113		dBm	See note 1
RF bandwidth at -3dB		600		KHz	
IF bandwidth at -3dB	300			KHz	
Output square wave	0.1	2.0	3.0	KHz	
Output low logic level			0.2 Vd	V	See note 4
Output high logic level	0.8 Vd			V	See note 4
Spurious RF emission in antenna			-60	dBm	See note 2
Operating temperature	-20		+80	°C	

The technical features can change without forecasting. AUR°EL S.p.A doesn't assume any responsability of demage due to the improper use of the device.

Dimensions	36.5 x 14.5 x 4.5 mm	

Note1: Sensibility obtained with 100% modulate RF generator, and system shown in picture one.
Note2: The RF emission measure is obtained connecting directly the spectrum analyzer on the 14 Pin of the RX.
Note4: All values is obtained with 10 KΩ maximum load.

All the technical features stated, are obtained by using the follow test system:



Picture 1 – Measurement schema of sensitivity.

Usage of AGC On-Off pin 11.

The RX 4MM5++/F receiver has a pin on which is possible enable the Automatic Gain Control(AGC). The AGC is on when a low logic level is applied in: this allows to decode correctly RF signal with power between -114 dbm and 0 dbm. In this mode the receiver works correctly with maximum dynamic of input signal. The AGC is off when a high logic level is applied on pin 11, the receiver is set to work in maximum sensitivity. If RF power is lower than a threshold, the receiver works in linear behavior while for higher received power it works in saturation behavior. The last behavior mentioned can be utilized to give an distance indication of receiver from transmitter. The following indications will show the RSSI output with AGC is off.

Device usage

In order to obtain the performance mentioned in the technical features and to achieve the operative conditions which featured the Certification, the receiver must be mounted on a printed circuit considering what follow:

5,0 Vdc voltage supply:

1. The receiver must be supplied from very low voltage safety source protected against the printed circuits.
2. Maximum dynamic supply admitted: ± 0,50 V.
3. Decupling, next to the receiver, with 100.000 pF ceramic capacitor.

Ground:

1. It must surround in the better way the welding area of the receiver. The circuit must be achieved in double layer, with throughout vias to the ground planes, approximately each 15 mm.

2. It must be properly dimensioned in the antenna connection area, in case a radiant whip antenna is fitted in(and area of approximately 50 mm is suggested).

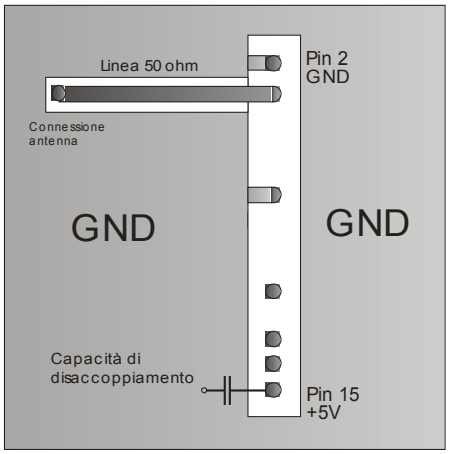


Fig. 2 - Advice Lay-out for a correct working of the device.

50 Ohm line:

1. It must be as shorter as possible.
2. 1,8 mm large for 1mm thickness FR4 circuit and 2,9 mm large for 1,6 mm thickness FR4 circuit. It must be placed 2 mm from the ground on the same side.
3. On the opposite side, it must be present a ground circuit area.

Antenna connection:

1. It can be used as direct connection point for the radiant whip antenna.
2. It may be utilized to connect the central conductor of an 50 Ω coaxial wire. Ensure that the braid is welded to the ground.

Antenna

1. It must be cabled in RF receiver input a whip, 17 cm long and about 1mm diameter, made of copper or brass metal.
2. The body of the antenna must be placed as more straight as possible and free from other circuits or metal bodies (5 cm minimum distance advised).
3. It may be utilized horizontally and vertically, but the important is that the antenna is surrounded by a good ground plane.

N.B: In alternative at the antenna above mentioned, is possible to use whip model of Aurel production(see relative Data Sheet ed Application Notes).
The usage of other very different models don't ensure the CE omologation.

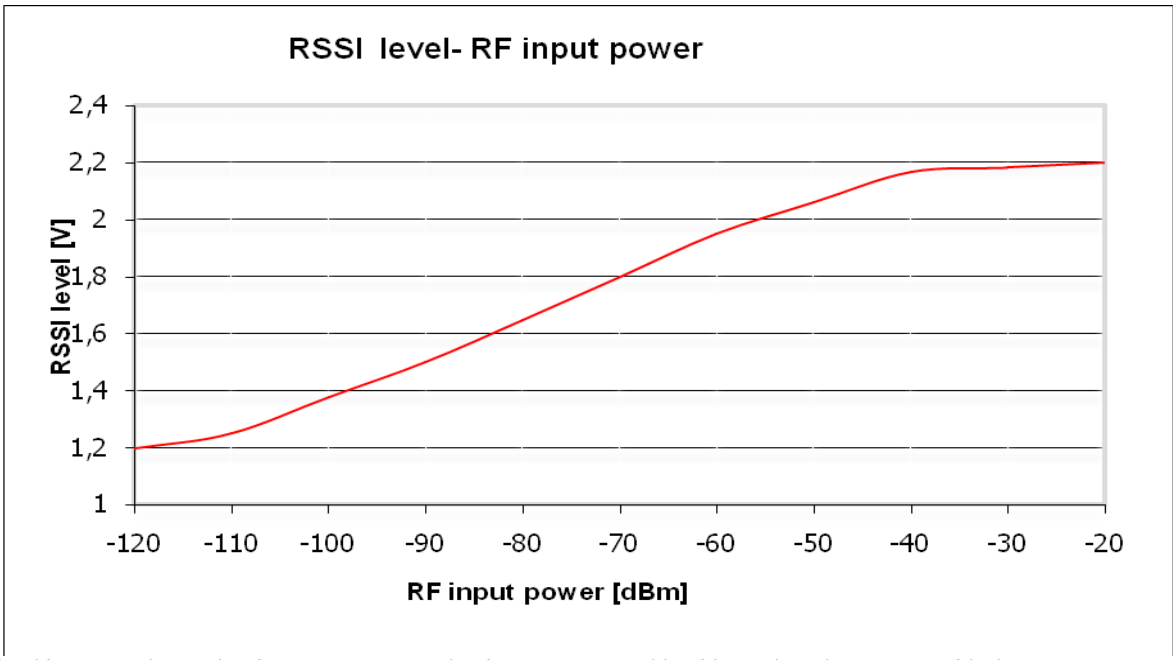
Other components:

1. Keep out the receiver from the other components of the circuits(more than 5mm).

2. Keep particularly out and shielded 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.

Pin 13 RSSI output

In Fig. 3 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 uF capacitor between pin 13 and GND, the measurement was obtained by oscilloscope and using a probe with 10 MOhm impedence with the scope of not falsify the voltage measured . 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 untill it has a linear behaviour and a proximity information when it assumes the saturation voltage (useful if you need to monitor accesses).
Note: It's depending from the device used.



Picture 3 – RSSI livel in according with RF power received.

Blocking measurement

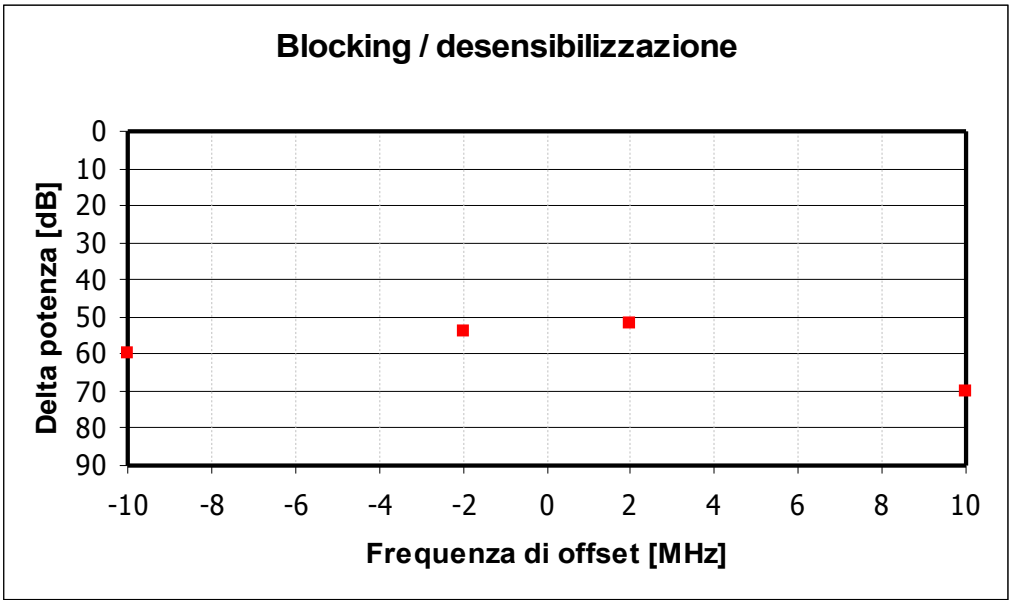


Fig. 4 –Blocking measure in respect of ETSI EN 300 220-1 Normative.

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 V1.4.1 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.