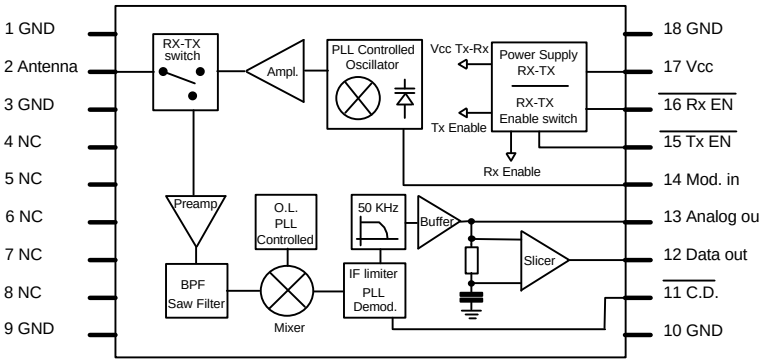
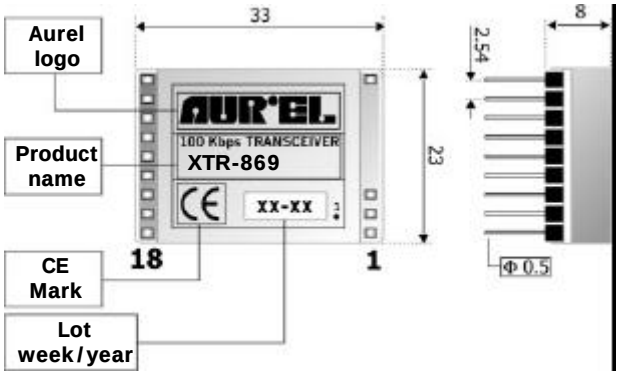
XTR-869 mod. Transceiver

Miniaturized data transceiver module, **100 Kbps** maximum speed, 869,85 MHz operating frequency.
Band without any duty-cycle restriction in the use time (100%).

Pin-Out and block diagram



Mechanical dimensions



Connections

Pin 1-3	**RF GND**	RF circuit GND
Pin 2	**Antenna**	50Ω impedance antenna connection
Pin 9-10-18	**GND**	Connections to GND. Internally connected also to the module's shield.
Pin 11	**CD**	Carrier Detect. With enabled receiver, a low signal (voltage level 0V), indicates that the receiver detects an RF carrier. The line activates with an RF signal of minimum –96dBm applied to pin 2 (antenna). High impedance output available only for loads under CMOS logic.
Pin 12	**RXD**	Receiver data output. Load impedance allowed: over 100KΩ without any capacitor in parallel.
Pin 13	**AF**	Filtered and buffered output of the FM detector. Load impedance allowed: over 2KΩ and less than 100pF.
Pin 14	**TXD**	Input to transmitter; accepts serial data in TTL logic (0 ÷ 5V) with a 10KΩ load impedance.
Pin 15	**TX ENABLE**	Active when low, (voltage level 0V), enables the transmitter circuit. Max 1mA
Pin 16	**RX ENABLE**	Active when low, (voltage level 0V), enables the receiver circuit. Max. 0,5 mA
Pin 17	**Vcc**	Connection to the positive pole of the supply voltage (+5V ± 10%)

The technical tests and reports have been carried out and obtained by the laboratories of:
Messrs PRIMA RICERCA & SVILUPPO – via Campagna, 58 – 22020 Gaggino Faloppio (CO).

Technical features [@5V T=25°C]

Characteristics	Min	Typical	Max	Unity	Remarks
Voltage supply	4.5	5	5.5	Vdc	
Absorbed current (TX ON)	24	28	32	mA	
Absorbed current (RX ON)	10	11	12	mA	
Absorbed current (TX/RX OFF)			100	nA	
RX Section					
Reception frequency		869.85		MHz	
RF sensitivity		-100	-102	dBm	See note 1
IF passband		150		KHz	
Interferences rejection [±5% band's extremities]		-80		dBm	
RF spurious emissions in antenna	**ETS 300 220 compliance**				See note 2
Output square wave			50	KHz	
Output low logic level		0,1		V	See note 4
Output high logic level		3,5		V	See note 4
Carrier Detect (CD) threshold	-96	-98		dBm	
RX Switch-on time		1		mS	
TX Section					
Transmission frequency		869.85		MHz	
Modulation passband			50	KHz	
FM deviation		±25		KHz	
TX output power			7	dBm	
Antenna impedance		50		Ω	
TX Switch-on time		1		mS	
Operating temperature	-20		+80	°C	
Working temperature [ETS 300 220]	-20		+55	°C	
Dimensions	33 x 23 x 8 mm				

Note1: Values have been obtained by **test as per Fig. 3** at RF IN –100 dBm, ±25KHz FM deviation, and with a 40 KHz modulating frequency.

Note2: The R.F. emission measure has been obtained by connecting the spectrum analyser directly to the XTR module pin 2.

Note3: By switch-on time is meant the time required by the device to acquire the declared characteristics, from the very moment the enabling is applied.

Note4: Values obtained with an applied 100KΩ load.

TX/RX Enabling

Pin 15 (TX ENABLE) and 16 (RX ENABLE) can acquire the following status:

Pin 15 TX ENABLE	Pin 16 RX ENABLE	Obtained function
1	1	Disabled module
1	0	Enabled receiver
0	1	Enabled transmiter
0	0	Not to be used condition

Considerations over the serial data transceiving

Pulse amplitude time
The circuit characteristics (passband in base band and AC couplings) determine the time has to elapse between each two consecutive level transitions on the line of the serial signal. For the correct operation of the **XTR-869**, such time must be comprised between 10 and 500 µs.

Settling time
The Data Slicer requires that for atleast 1 ms before the data themselves, a preamble, composed by a square wave, is transmitted in order to consider reliable the data coming out from the RXD line.

Bit ON/Bit OFF relation
The Data Slicer is optimized for a 50:50 duty cycle. It shall continue to operate, even with bigger distortion and less tolerance to interferences, till a 30:70 or 70:30 duty cycle. It is not possible, therefore, to directly transmit in RS232 logic unless by caring to balance the ratio 1 and 0 in the output, since the duty-cycle could be also of the 90% not permitting thus, the correct operation of the receiver.
During the transmiter modulation, while conditioning the input pin [pin 14] by a logic signal, it is recommended not to exceede the maximum continuous length of **500 µS** without transition ON/OFF – OFF/ON ; this in order not to degrade the receiver's sentivity. It is therefore necessary to modulate by means of specific techniques that allow a low duty-cycle like Manchester, coding from 8 to 12 bits or other suitable techiniques. In lack of balancing techniques on the specifications bit, if it is requested to operate with RS232 protocol, it is recommended to utilize a minimum 19.200 bps speed in order to take advantage of the full performances by transmitting, for instance, one byte and its complementary one after the other [balancing over the byte].

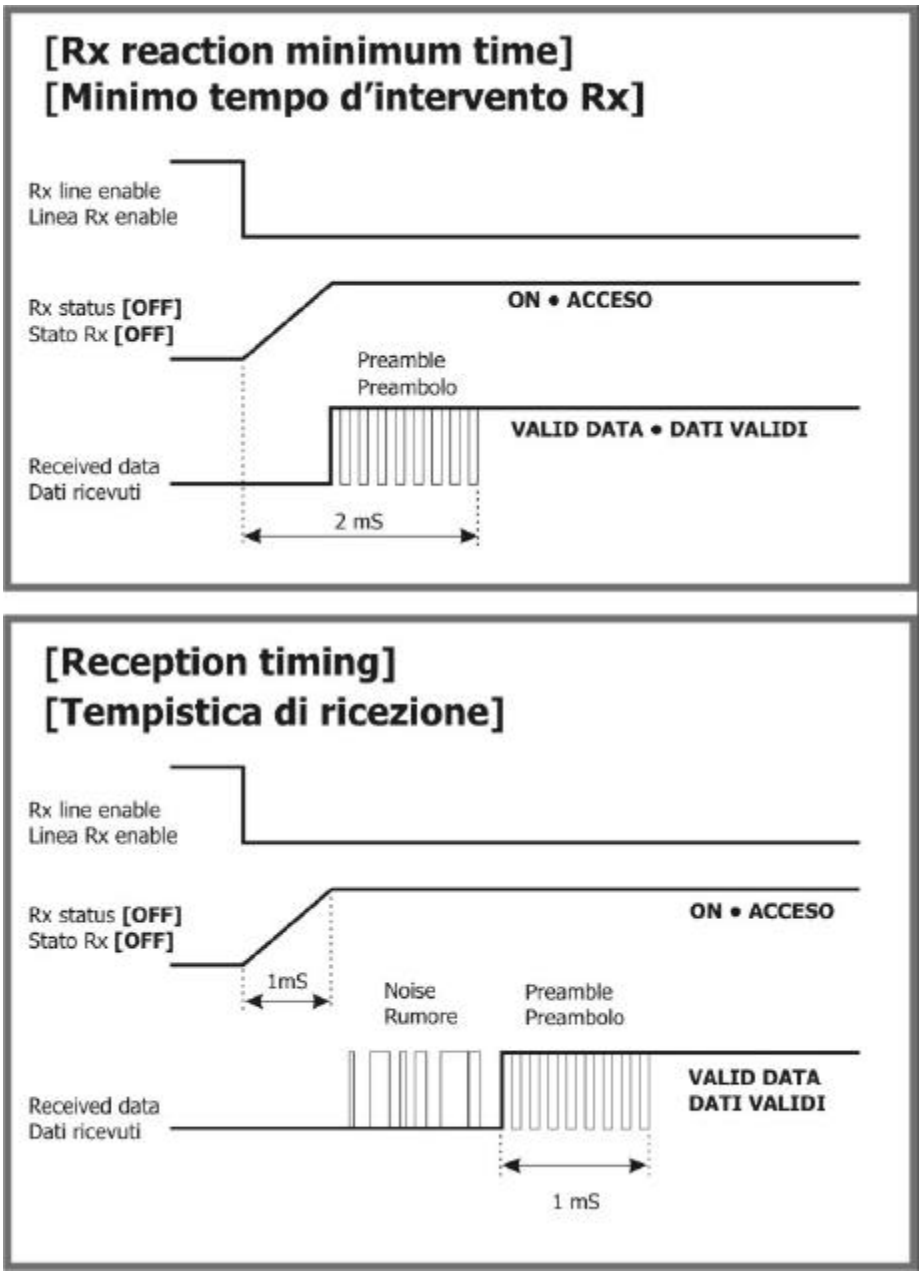
Device usage

To take advantage of the performances detailed in the Technical Specifications, and in order to comply with the operating conditions which characterize the Certification, the transmitter must be fitted on a printed circuit considering the followings:

5 V dc supply:

1. The transceiver must be supplied by a very low voltage safety source, protected against short circuits.
2. Maximum voltage variations allowed: ± 0,5 V
3. De-coupling, next to the transmitter, by means of a minimum 10 ìF capacitor.
4. It is suggested to place in series to the suppl, a 10 Ω resistance, as closer as possible to pin 17.

Reference Curves

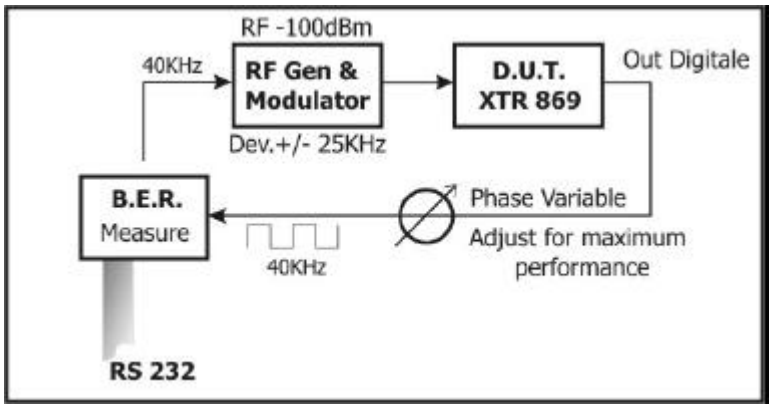


Usage of the devices in net-work systems

The device has been designed to allow a minimum switching time between reception and transmission the minimum transmission speed requested permitting.
The **XTR-869** model shows the less possible time, allowing at most in 2 mS to be operative after the inversion Rx/Tx.
It is recommended therefore to evaluate this minimum value during the device use since, to a minimum switching time, it is normally associated the necessity of an ultra high modulation technique with consequently operating difficulties.

RF Sensitivity

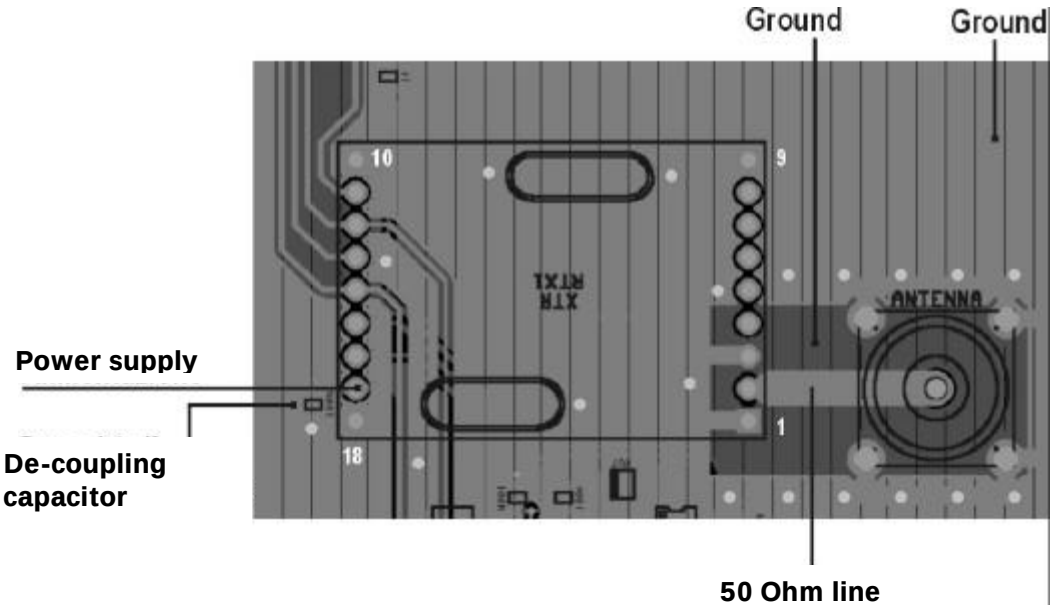
The declared technical features have been obtained by applying the following testing system:



Use suggestions

Ground:

1. It must surround at the best the welded area of the module. The circuit must be double layer, with throughout vias to the ground planes, approximately each 15 mm.
2. 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.)



50 Ohm Line (connection between antenna and pin 2):

1. It must be as shortest 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 2 mm away from the ground circuit.
3. On the opposite side a ground circuit area must be present.

Antenna connection:

1. It may be utilized as the direct connection point for the radiating whip antenna.
2. 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.

Antenna:

A **whip** antenna, 8,50 mm long and approximately 1 mm dia., brass or copper wire made, must be connected to the RF input of the transceiver.
The antenna body must be keep as much as possible straight and it must be free from other circuits or metal parts (5 cm minimum suggested distance.)
It can be utilized both vertically and horizontally, provided that a good ground plane surrounds the connection point between antenna and receiver input.

N.B: As an alternative to the a.m. antenna it is possible to utilize the whip model manufactured by Aurel (see related Data Sheet ed Application Notes).
By fitting whips too different from the described ones the CE Certification is not assured.

Other components:

1. Keep the transceiver separate from all other components of the circuit (more than 5 mm).

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 Rules

The **XTR-869** transceiver is CE certified and in particular it complies with the European Rules **EN 300 220,** and **EN 301 489**. The equipment has been tested according to rule EN 60950 and it can be utilized inside a special insulated housing that assures the compliance with the above-mentioned rule. The transceiver must be supplied by a very low voltage safety source protected against short circuits
The use of the transceiver module is foreseen inside housings that assure the overcoming of the Rule **EN 61000-4-2** not directly applicable to the module itself. In particular, it is at the user' s care the insulation of the external antenna connection, and of the antenna itself since the RF output of the receiver is not built to directly bear the electrostatic charges foreseen by the a.m. rule.

CEPT 70-03 Recommendation

The 869.7÷870 Mhz band utilisation, allows to operate with a 100% of duty-cycle, which means without any time limitations of the RF emission.