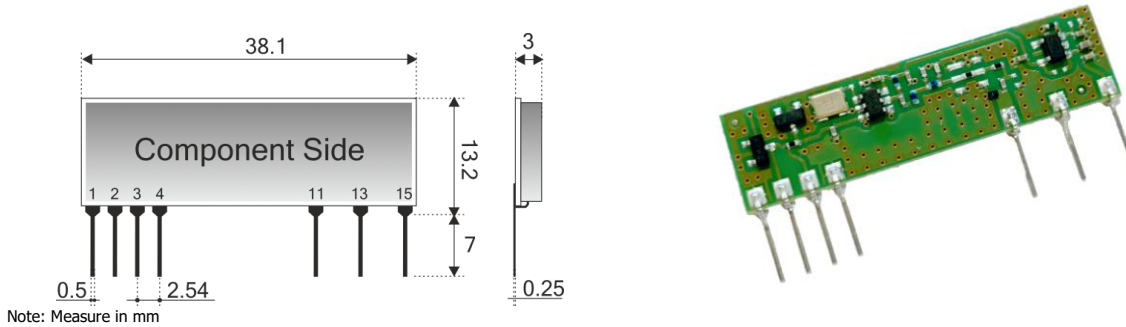


## TX-NB4

Standard Aurel pin-out module working to 433,92MHz in OOK modulation designed with PLL technique.  
Full RED compliance and wide voltage supply range.  
It works in stand-alone mode, no external microcontroller need.

## PIN-OUT



## CONNECTIONS

<b>Pin 1</b>	<b>Ground</b>	GND Connections. To be externally connected to single ground plane.
<b>Pin 2-3</b>	<b>Input modulation</b>	Data input with minimum 50 k $\Omega$ input resistance and 1,8 - 3,6V range.
<b>Pin 4</b>	<b>Ground</b>	GND Connections. To be externally connected to single ground plane.
<b>Pin 11</b>	<b>Antenna</b>	RF output with a characteristic impedance of 50 $\Omega$
<b>Pin13</b>	<b>Ground</b>	GND Connections. To be externally connected to single ground plane.
<b>Pin 15</b>	<b>+V</b>	Connection to the positive pole of the DC supply

## Technical features TX-NB4

	<b>Min</b>	<b>Tipico</b>	<b>Max</b>	<b>Unità</b>	<b>Annotazioni</b>
<b>Working frequency</b>	433.91	433.92	434.93	MHz	See notes 2 and 3
<b>Voltage supply (Vs)</b>	1,8	3	12	V	
<b>Absorbed current - Power down</b>		< 1	1	$\mu$ A	See fig. 2
<b>Absorbed current – PLL active</b>		1,5		mA	See fig. 2
<b>Supply current in TX (continuous carrier)</b>	18,5	35	36	mA	See fig. 2
<b>Supply current in TX (50% square wave modulation)</b>		24		mA	See fig. 2
<b>RF output power pin 11 antenna</b>	7	11	13	dBm	Vedi nota 2
<b>Output impedance pin 11 antenna</b>		50		$\Omega$	
<b>RF spurious emissions</b>		-40		dBm	See note 2

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*

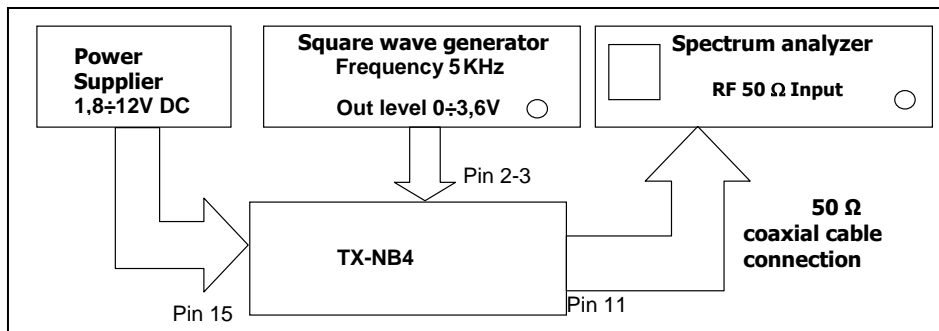
<b>Data rate input modulation</b>			10000	bps	
<b>Switch time PWDN to TX</b>		0,7		ms	
<b>Switch time TX to PWDN</b>	20		90	ms	
<b>Input high logic level</b>	1,8	3	3,6	V	See note 1
<b>Input low logic level</b>	0V		0,2	V	
<b>Working temperature</b>	-20		+80	°C	
<b>Dimensions</b>	25,4 x 13 x 2,5 mm				

**NOTE 1:** It is opportune that the max voltage applied to data input pin is equal to voltage supply.

**NOTE 2:** Values have been obtained by applying the test system shown in Fig. 1 and maximum 3,6 V power supply.

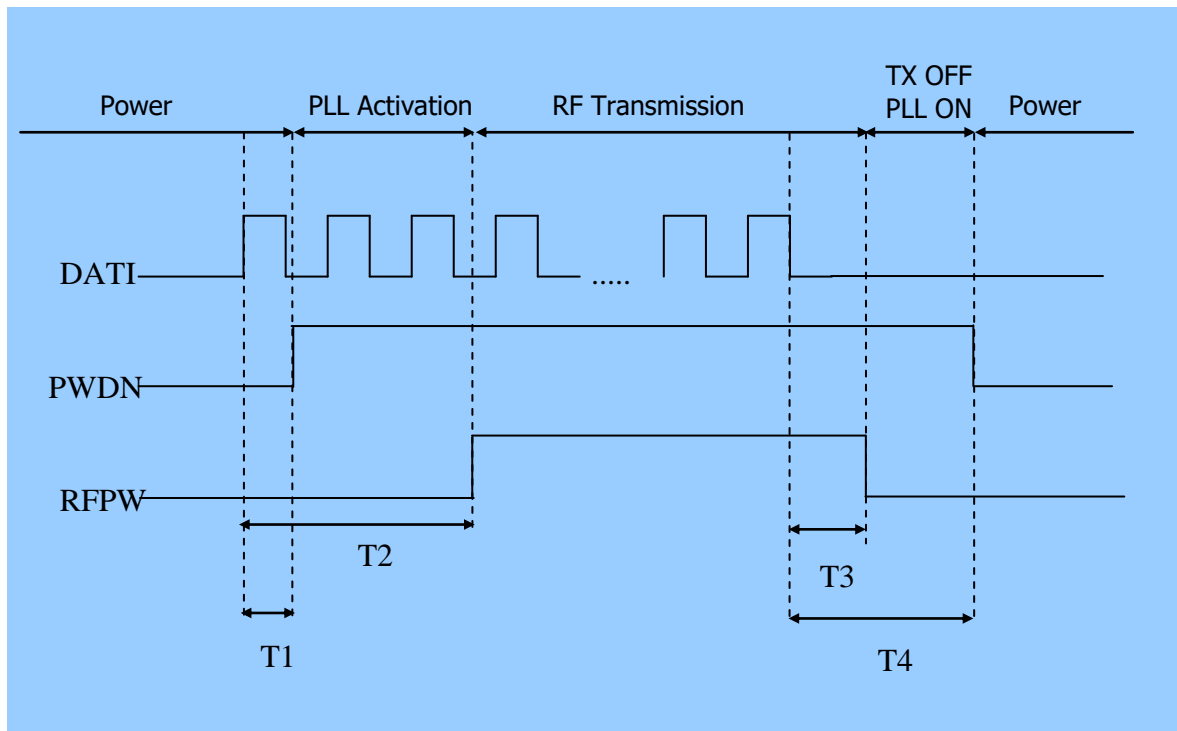
**NOTE 3:** The minimum and maximum showed values are determined by the device's construction tolerance.

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



**Fig.1**

## Device Timing



**Fig.2**

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*

Timings are different due different power supply used.  
Data input must have same amplitude of power supply

Here following are reported switch-on timing in function of voltage supply :

<b>Voltage Supply (V)</b>	<b>T1</b>	<b>T2</b>	<b>T3</b>	<b>T4</b>
1,8 – 12	350µs	0,7ms	20ms	20,5ms

Tab. 1

RF transmission start only in case PWDN and RFPW are High.

In case PWDN high and RFPW low, PLL is active but there is no transmission. With PWDN High, after 0,7ms the RFPW is activated to permit PLL to lock in frequency preventing in such phase to occupy the RF spectrum.

The RFPW and PWDN signal is internal to the module, the data input pin trigger a logic sequence machine that controls the PWDN and RFPW signals.

Transmission start about 0,7ms after first data coming to the pin Data input so first bits are not transmitted.

In the first phase of deactivation is sent down the RFPW (After T3 from last data), inhibit transmission while keeping the device turned on and PLL locked, finally (After T4) keeps Transmitter in PWDN.

Deactivation phase is kept deliberately 20ms long so that using encodings with long pauses between one frame and the subsequent it remain in Transmission and then the arrival of the new frame is being transmitted across (and not so lost the first bit as the first frame).

**NOTE:** only the signal DATA is available to pin 2 and 3 of the module, while the signals and ASK PWDN highlighted in the diagram time (Fig 2) are internal to the module, thus not available from the pins of the module itself, have been incorporated in order to clarifying timing and consumption on the different mode of operation.

## Device usage

In order to obtain the performances described in the technical specifications and to comply with the operating conditions, which characterize the Certification, the transmitter has to be mounted on a printed circuit, and keep into consideration what follows:

### Supply :

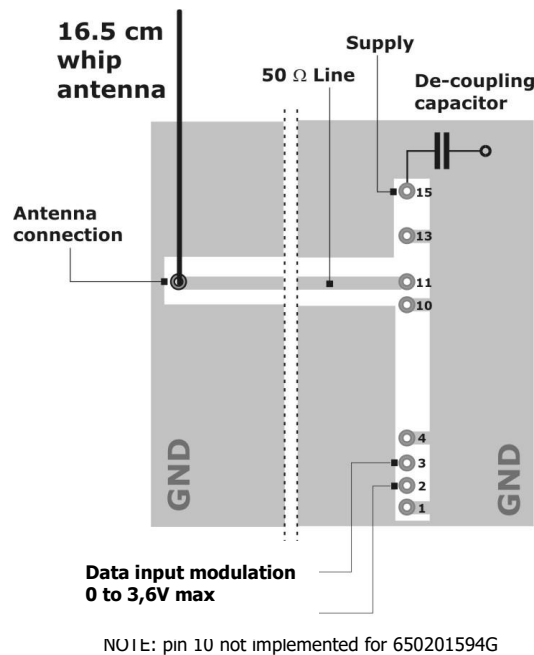
1. The transmitter must be supplied by a very low voltage source, safely protected against short circuits. Maximum voltage variations allowed: 1,8÷12V.
2. De-coupling, next to the transmitter, by means of a minimum 100.000 pF ceramic capacitor.

### Ground:

It must surround at the best the welding area of the transmitter. 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).

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*



**Fig.3** – Suggested Lay-out for best performances

## 50 Ohm line:

1. It must be the 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. It must be kept 3 mm away from the ground circuit on the same side.
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

1. A **whip** antenna, 16,5 mm long and approximately 1 mm dia, brass or copper wire made, must be connected to the RF output of the transmitter (pin 11), (see fig. 3).
2. The antenna body must be kept straight as much as possible and it must be free from other circuits or metal parts (5 cm minimum suggested distance.)
3. It can be utilized either vertically or horizontally, provided that a good ground plane surrounds the connection point between antenna and transmitter output.

**N.B:** As an alternative to the a.m. antenna it is possible to fit the whip model manufactured by **AUR°EL** (see related Data Sheet and Application Notes).  
By fitting whips too different from the described ones, the EEC Certification is not assured.

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*

## Other components:

1. Keep the transmitter 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. Keep them at least at 5 mm distance.
4. If the Antenna Connection is directly used for a radiating whip connection, keep at least 5 cm radius free area. In case a 50  $\Omega$  impedance coaxial cable is connected, then 5 mm radius will suffice.

## Reference rules

**TX-NB4** transmitter complies with the EU rules EN 300-220-2 and EN 301-489-3, with 12V max. Supply. The transmitter must be supplied by a very low voltage source, safely protected against short circuits. The usage of the module is foreseen inside enclosures that guarantee the EN 61000-4-2 normative not directly applicable to the module itself.

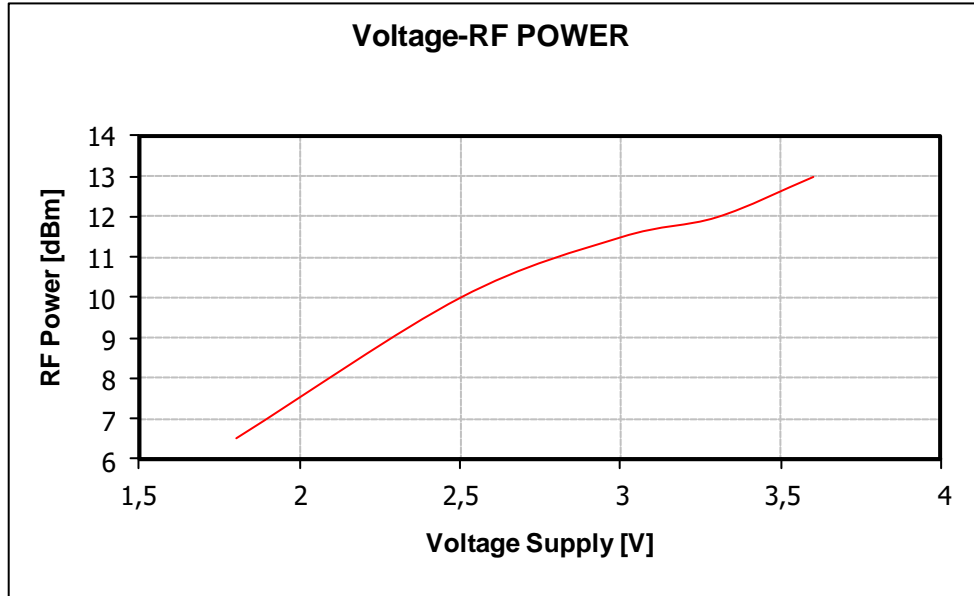
This device is compliant with EN 62479, connected to the electromagnetic field human exposition if used with temporal duty cycle not higher than 10%, like foreseen in CEPT 70-03 recommendation.

## CEPT 70-03 Recommendation

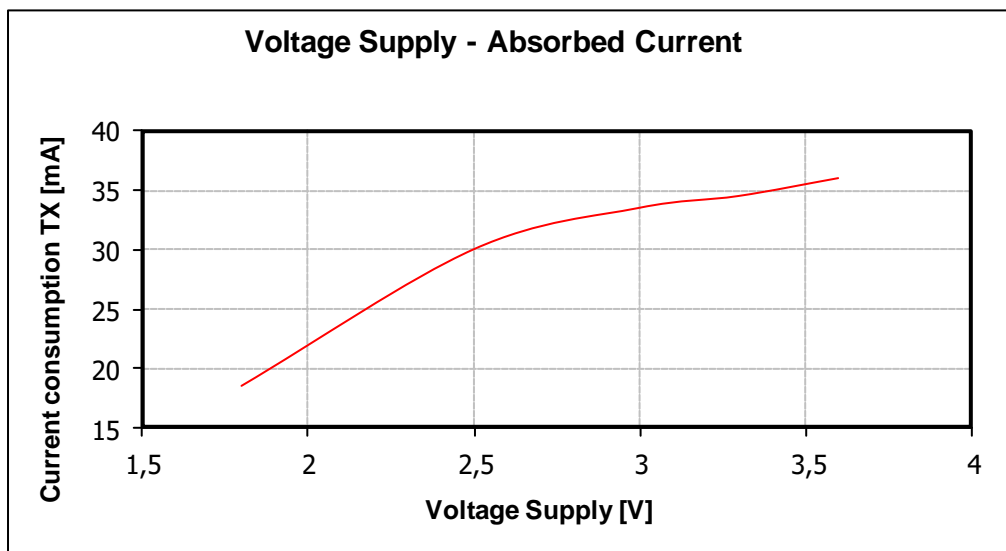
TX-NB4 recommendation is referred to the 433.05 - 434.79 MHz harmonized bandwidth and therefore, in order to comply with local regulations, the device must be used on the time scale with maximum duty-cycle time of 10% (equivalent to 6 minutes of usage on 60 minutes).

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*

## Reference Curves



**Fig. 4 - RF Power Vs Voltage Supply**

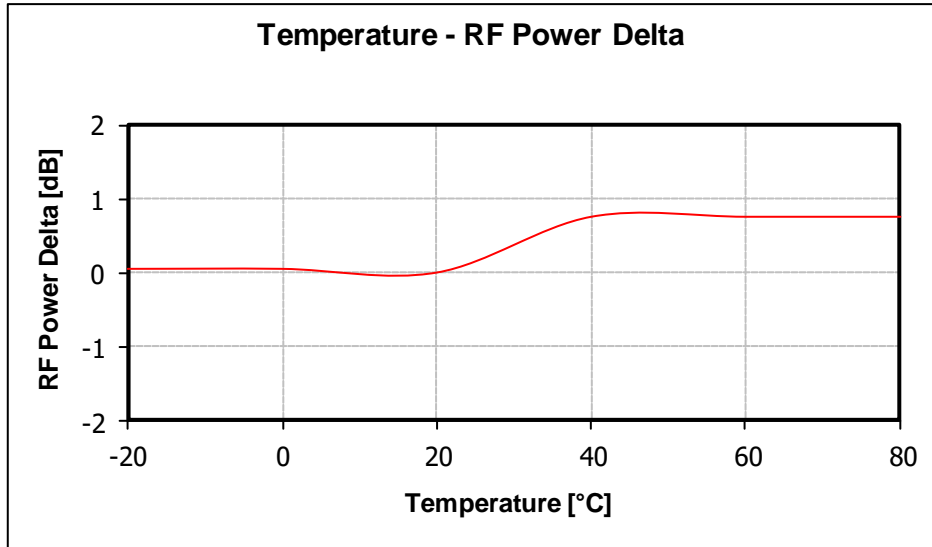


**Fig. 5 - Absorbed Current Vs Voltage Supply**

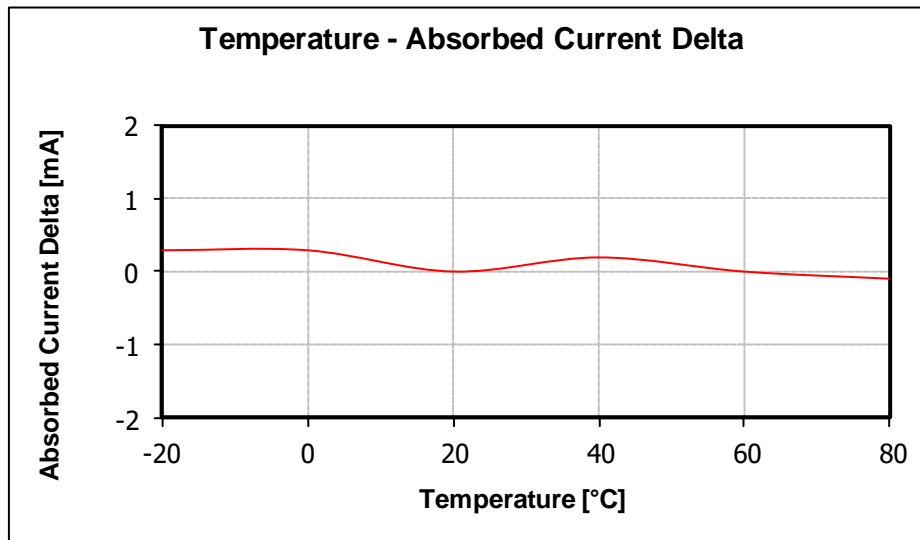
*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*

## Reference thermal curves

The thermal curves have been obtained by the testing system shown in Fig.1

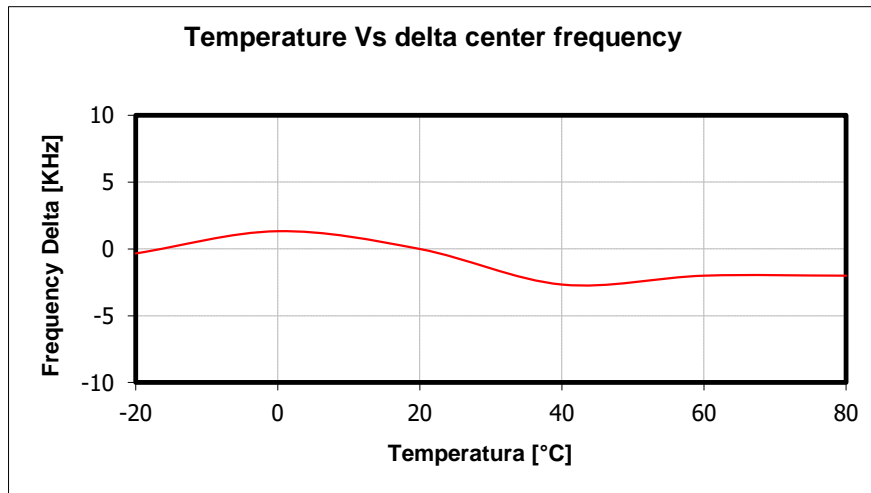


**Fig. 6** - RF Power Delta Vs Temperature.



**Fig. 7** - Absorbed current Delta Vs Temperature in TX mode.

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*



**Fig. 8** - Frequency Delta Vs Temperature

## User manual revision summary

Release date	Revision user manual	Changes from the previous revision
20/07/2023	1.0	First release
03/10/2023	1.1	Change name TX-NB4-5V to TX-NB4

*Technical features are subject to change without notice. AUR°EL S.p.A does not feel responsible for any damage caused by the device's misuse*