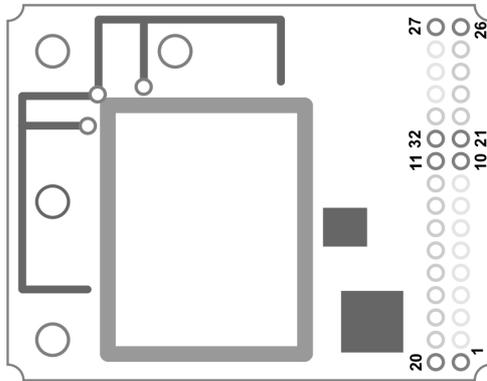


## RX-AUDIO-2.4



## Features

- Non-compression for high sound quality with delay time 0.5 ms.
- Digital audio with 44.1 KHz sampling rate and 16-bit resolution.
- FSK digital demodulation
- Embedded antenna for cost-effect and fast development
- Improved performance in harsh environment by antenna diversity
- 8 selectable channels
- Low power consumption for mobile application
- To be used with 650201004G TX-AUDIO-2.4 and 650201062G TX-AUDIO-2.4/AE transmitter modules

## Specification

	Min	Typical	Max	Unit	Notes
<b>Supply Voltage</b>	4,9	5,0	5,1	V <sub>DC</sub>	
	2,2		3,6	V <sub>DC</sub>	headphones side
<b>Current Consumption</b>		65		mA	
<b>Operating temperature</b>	-10		+60	°C	
<b>Modulation</b>		FSK			
<b>Frequency range</b>	2400		2483.5	MHz	
<b>Channel number</b>		8			
<b>Channel spacing</b>		9		MHz	
<b>Frequency stability</b>	-100		+100	KHz	
<b>Sensitivity</b>		-83		dBm	
<b>Output impedance</b>		12		ohm	headphones side
<b>Output level</b>			1,8	V <sub>PP</sub>	headphones side
<b>Response</b>	20		20.000	Hz	(1)
<b>Dynamic Range</b>		92		dB	(1)
<b>Separation</b>		80		dB	(1)
<b>SN radio</b>		87		dB	(1)
<b>Board dimensions</b>	47 x 32 x 7			mm	

**NOTE 1:** When used with TX-AUDIO-2.4 650201004G

Le caratteristiche tecniche possono subire variazioni senza preavviso. AUREL S.p.A non si assume la responsabilità di danni causati dall'uso improprio del dispositivo.  
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## Pin description

The RX-AUDIO-2.4 module can be ideally divided into two sections: the first oriented to be plugged with an usual power supply (pin 1 to 20), the other optimized to meet the needs of portable devices (pin 21 to 36). This is the reason why pins do not follow an usual ordering, but it's like having two devices arranged side by side.

Pin	Name	Description
1	PWR ON	The level is logical high (at least 2.7V) 1-2 seconds after DC power supply is applied to the module. It can be used to turn on the audio power amplifier to prevent pop-noise turning on RX module <sup>(2)</sup>
2	MUTE	The voltage level equals $V_{supply}$ (see Power Supply section) while receiving a radio signal and logical low during poor receiving condition. It can be used for receiving indicator, extra noise reduction when TX is turn off, etc... <sup>(2)</sup>
3	USER_BIT	Data stream output, correspondent to the data stream applied to USER_BIT signal of TX module (Max data rate: 5Kbps) <sup>(2)</sup>
4	FORMAT	Pull down to use scrambling digital audio (internal pull up)
5	OB	Forced down enables Out of Band channel, recommended for testing purposes only (nternal pull up)
6	TACT_SW	Switch / scan / automatically scan channel, requires a low impulse (internal pull up), see channel mode setting table for details <sup>(3)</sup>
7	$V_{CC}$	$5 \pm 0.1V_{DC}$
8	DAC_L	Left channel of audio output from DAC directly. Useful to feed audio signal to a power amplifier. A DC blocking capacitor (>10 uF) should be added, unless the load is high-impedance than 10Kohm
9	GND	Ground
10	DAC_R	Right channel of audio output from DAC directly. Useful to feed audio signal to a power amplifier. A DC blocking capacitor (>10 uF) should be added, unless the load is high-impedance than 10Kohm
11	SW2	In DIP MODE used to manually select the channel (internal pull up), see DIP MODE selection table for details
12	SW1	
13	SW0	
14	ID3	ID selection, low active (internal pull up). Only receiver(s) with the same transmitter ID combination can reproduce transmitted audio.
15	ID2	
16	ID1	
17	ID0	
18	CH_MODE	Channel mode setting: '0' for DIP mode, '1' for TACT mode (internal pull up), see channel mode setting table for details.
19	TACT_SCAN	TACT mode switch / scan channel: '0' to switch channel by channel each low-impulse is applied on TACT_SW pin; '1' to automatically search transmission channel when a low-impulse is applied on TACT_SW pin (internal pull up), see channel mode setting table for details.
20	CT_INU	Automatically scan procedure enable: '0' to start channel scan when a low-impulse is applied to TACT_SW; '1' to automatically search channel when poor receiving condition is verified (internal pull up), see channel mode setting table for details.

**NOTE 2:** PWR ON, MUTE and USER\_BIT outputs can each deliver a current up to 25mA.

**NOTE 3:** Input is caught on the TACT\_SW rising edge, we recommend to apply a negative pulse with a duration of at least 10ms.

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Pin	Name	Description
21	GND	Ground
22	DC_IN	Headphone amplifier supply voltage, if less than 2.2V <sub>DC</sub> the receiver goes in "battery-low" protection mode
23	GND	Ground
24	CH_R	Right channel audio headphone driver. A DC blocking capacitor (>100 uF) should be added.
25	GND	Ground
26	CH_L	Left channel audio headphone driver. A DC blocking capacitor (>100 uF) should be added.
27	DAC_L	Left channel of audio output from DAC directly. Useful to feed audio signal to a power amplifier. A DC blocking capacitor (>10 uF) should be added, unless the load is high-impedance than 10Kohm (same as pin 8, which is internally connected).
28	DAC_R	Right channel of audio output from DAC directly. Useful to feed audio signal to a power amplifier. A DC blocking capacitor (>10 uF) should be added, unless the load is high-impedance than 10Kohm (same as pin 10, which is internally connected).
29	AMP_R	Headphone driver Right channel input (volume adjust)
30	AMP_L	Headphone driver Left channel input (volume adjust)
31	GND	Ground
32	TACT_SW	Switch / scan / automatically scan channel, requires a low impulse (internal pull up), see channel mode setting table for details (same as pin 6, which is internally connected) <sup>(3)</sup>

**NOTE 3:** Input is caught on the TACT\_SW rising edge, we recommend to apply a negative pulse with a duration of at least 10ms.

All inputs are in CMOS logic, with  $V_{supply}/2$  threshold value to discriminate between high or low level.

## Power Supply

The RX-AUDIO-2.4 receiver module has two alternative supply ways: 5V to V<sub>CC</sub> (pin 7) or 2.2 to 3.6V to DC\_IN (pin 22). Whatever source is used, the circuit make use of an internally regulated voltage, V<sub>supply</sub>, of 3V. The low voltage power supply input DC\_IN (pin 22) allows to connect a portable device and acquire the power from that. When the radio signal is too weak to be played, a circuit protection is activate to safeguard energy consumption and unnecessary battery current drainage, at the same time audio outputs AMP\_R and AMP\_L are brought to logic level low. The receiver module operates up to a lower limit voltage of 1.6 V on pin DC\_IN, below which it turns off. To return to have a running device DC\_IN must be brought to a voltage level sufficient to restart the microcontroller on board (about 3V).

With a 5V power on V<sub>CC</sub> input (pin 7) there is no control of the supply voltage, and if it drops too low (below 3V) none audio get out from the outputs but only a DC voltage which comes from the power supply.

The ripple power immunity of audio outputs signals (corresponding to a voltage that varies between 2.2 and 3.6V) is:

- 100mV ripple voltage at 100Hz, with volume up to the limit, generates an output variation of 10mV<sub>pp</sub>
- 700mV ripple voltage at 100Hz, with volume up to the limit, generates an output variation of 20mV<sub>pp</sub>

## Channel mode setting

There are two main ways to change the audio channel in use between 8 availables: a manually mode, called DIP MODE, or automatic switches, called TACT MODE. When CH\_MODE (pin 18) input signal value is '0' DIP MODE is selected, when it's value is a logic '1' TACT MODE is active (see channel mode setting table).

In DIP MODE channel is selected manually by setting SW2, SW1 and SW0 input signals. Inputs are low active and SW2 is the most significant bit of the hexadecimal negated combination: it means that a 1-1-1 configuration correspond to channel '0', at lowest frequency; 1-1-0 is for the channel '1', immediately above, until to 0-0-0 that select the channel '7', at higher frequency, as in table below:

channel	SW2	SW1	SW0	Carrier frequency
7	0	0	0	2473 MHz
6	0	0	1	2464 MHz
5	0	1	0	2455 MHz
4	0	1	1	2446 MHz
3	1	0	0	2437 MHz
2	1	0	1	2428 MHz
1	1	1	0	2419 MHz
0	1	1	1	2410 MHz

**NOTE 4:** SW2, SW1 and SW0 inputs are internally pulled up.

**Table 1** – DIP MODE selecting channel

In DIP MODE SW2, SW1 and SW0 inputs are continuously monitored, so is not necessary to switch values simultaneously or doing any kind of synchronization.

In TACT MODE is possible to change channel by the single input signal TACT\_SW (on pin 6 or 32). The way used to do the change depends by the settings of two more input signals: TACT\_SCAN (pin 19) and CT\_INU (pin 20). The configuration of that three inputs select in which mode the channel will change after the low impulse on TACT\_SW: switching channel by channel until reaching the desired transmission (useful especially when there are more broadcasts on multiple channels), starting an automatic search through all channels to find the only one transmitting, or automatically start a search of the transmitting channel when poor receiving condition are detected.

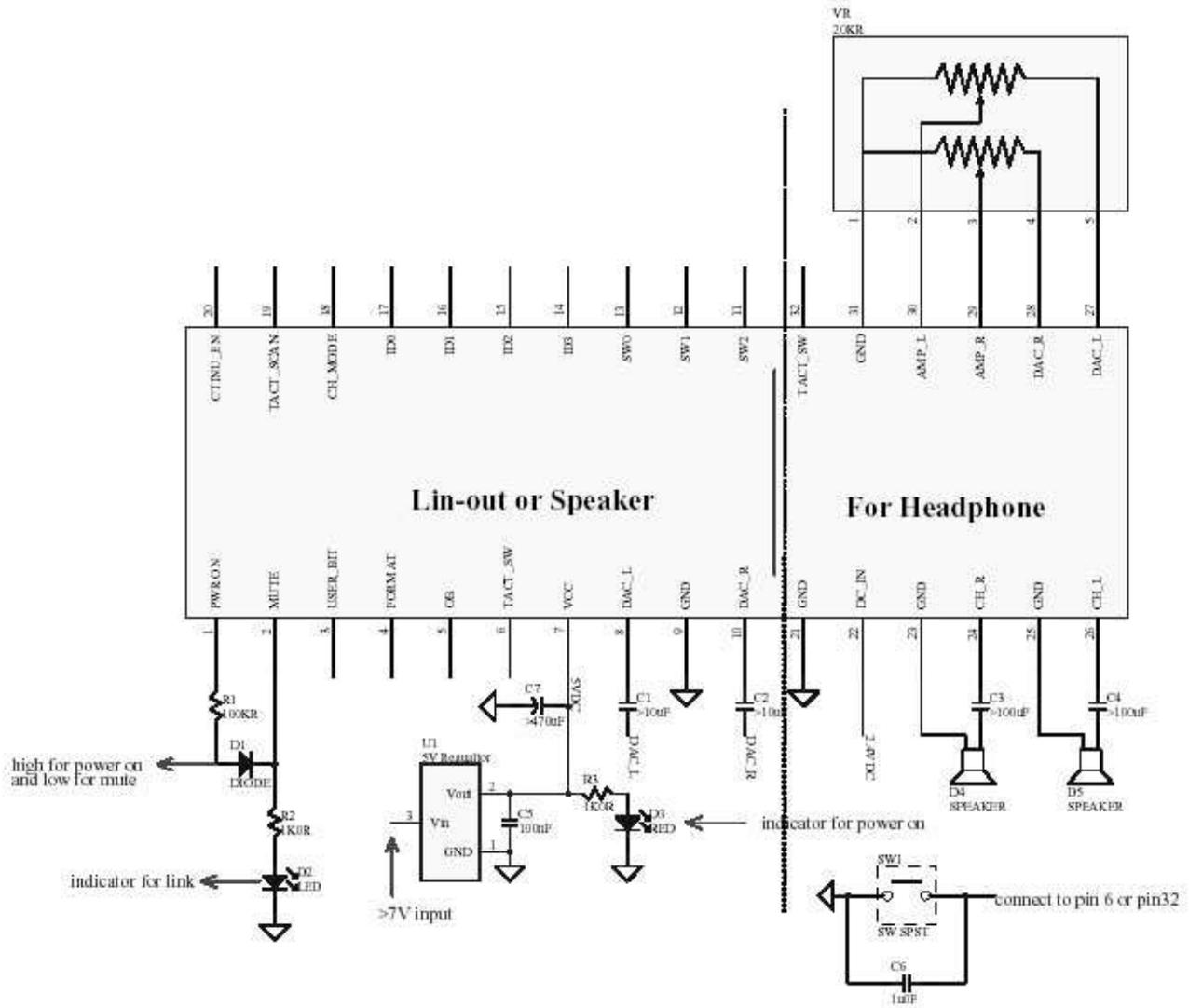
Channel change mode	CH_MODE (pin 18)	TACT_SCAN (pin 19)	CT_INU (pin 20)	Function
DIP	GND	x	x	Manual mode: set SW2, SW1 and SW0 to choose the channel
TACT	x	GND	x	Switch channel by channel when each low-impulse is applied to TACT_SW (pin 6)
TACT SCAN	x	x	GND	Automatically search channel when low-impulse is applied to TACT_SW (pin 6)
TACT AUTO SCAN	x	x	x	Automatically search channel when poor receiving condition

**NOTE 3:** X indicate a floating pin, internally pulled up.

**Table 2** – Channel mode setting table

After a channel change in TACT MODE, the module is ready to work on the new channel after 100ms from the rising edge detected on TACT\_SW input.

## Application Circuit



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## Notes to application circuit

- ❑ At USER\_BIT pin, serialized data stream (max. 5Kbps) is available, as delivered from corresponding USER\_BIT pin of transmitter, with no interference on digitalized audio.

Data examples are remote control commands or titles of musical composition being transmitted.

- ❑ Input signals FORMAT (pin 4), OB (pin 5), ID3 – ID2 – ID1 – ID0 (pins 14 to 17) function **only when the used transmitter is a TX-AUDIO-2.4/AE** (Aurel code 650201062G). Those functions are **NOT** available when the transmitter is a TX-AUDIO-2.4 (Aurel code 650201004G).
- ❑ RX AUDIO 2.4 modules (Aurel code 650201005G), delivered prior of mid 2008, use **ONLY** pins 1 to 20 (pins 21 to 32 are NOT connected)

Now the Aurel code 650201004G corresponds by default to the second series of the module.



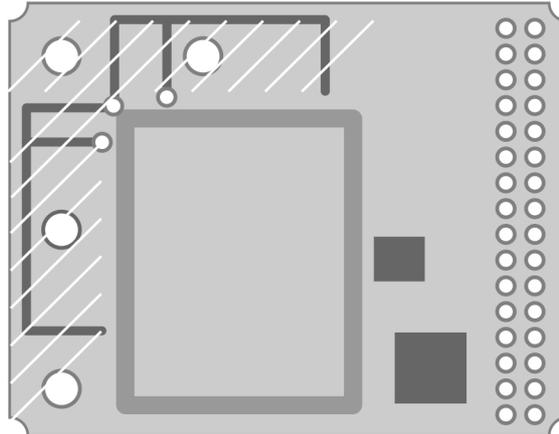
First series (pins 1 to 20 only)

Second series (full pin-out)

## Application information

Designing the transmitter module in wireless speakers and headphones, must pay attention to the following considerations:

- ✓ Do not let any metal objects too close to antenna



**Figure 1** - Antenna area (marked by diagonal lines)

- ✓ Receiver module must be kept over 3 cm away from speakers to avoid magnetic interference
- ✓ Power supply to receiver module must be independent, separate from the power of amplifier
- ✓ Avoid to put any cable or circuit nearby antenna (1-2 cm)