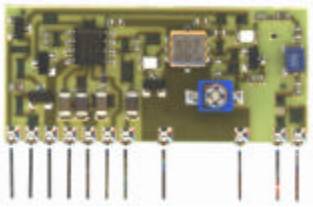
ABACOM TECHNOLOGIES

TX-FM AUDIO Transmitter Module

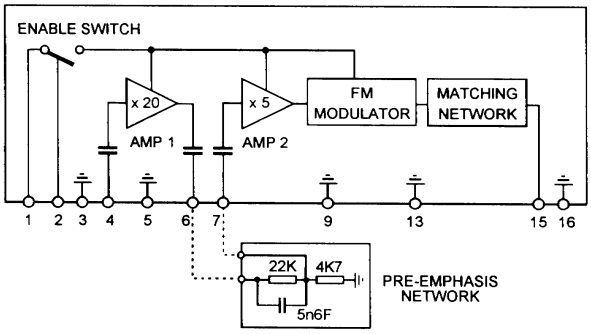
The TX-FM audio transmitter module is designed for use with the **RX FM AUDIO** receiver module and is typically suited to applications such as Hi-Fi quality audio transmission, radio call alert, two way radio, security, remote control (DTMF) systems and analog telemetry .



Technical Features

- High-reliability SIL thick-film hybrid circuit
- Carrier frequency : 433.75MHz ± 100KHz
- SAW resonator stability
- FM modulation with Δf_{MAX} = ± 75KHz
- Modulation sensitivity : 100 mVp-p for Δf_{MAX}
- Audio bandwidth : 20Hz to 30KHz
- Supply : +12V ± 10%
- 15mA consumption with TX enabled
- Zero consumption with TX disabled (pin 2 = 0V)
- LF input impedance : 10KΩ
- RF output impedance : 50Ω
- LF output power with 50Ω load : 10 mW (10dBm)
- Switch-on time less than 100µs
- TX enable with TTL or CMOS logic
- Possible insertion of a pre-emphasis network for improved S/N and AF frequency response
- Dimensions : 40.6 x 19 x 3.5 mm.
- ETS 300 220 compatible.
- Pin pitch 2.54 mm

Block Diagram and Pin-Out



1) +12V
2) TX enable (5 to 12V)
3) Ground
4) Input 1 (LF)
5) Ground
6) Output 1 (LF)
7) Input 2 (LF)
9) Ground
13) Ground
15) RF output
16) Ground

LF Section and Modulator

The Low Frequency section consists of two AC-coupled amplifiers with voltage gains of: AMP 1 = 20 and AMP 2 = 5 and have a LF bandwidth of 20 Hz to 30KHz.

The FM modulator is an oscillator stabilized by means a SAW resonator and modulated by a varicap diode. This can be driven by a signal having a maximum peak-to-peak voltage (V_{pp}) of 10V and, therefore, the maximum V_{pp}that can be input to the AMP 2 (pin 7) is 10V/ 5 = 2V.

In a configuration where the two stages, AMP 1 and AMP 2, are directly connected to each other (by short-circuiting pin 6 with pin 7) in order to amplify the LF input signal as much as possible, the max V_{pp} that may be applied to pin 4 is 10V: (5 x 20) = 100 mV.

Pre-emphasis Network

In order to improve the signal-to-noise ratio and the dynamics of the demodulated signal (see RX-FM AUDIO application note) it's advisable to fit a pre-emphasis network in between the 1st and 2ndLF amplifier stages.

The pre-emphasis network shown above, lowers the bass tones by about 6 times with respect to the trebles, makes the FM modulation index approximately constant over all the audio bandwidth and increases the available dynamics for the bass tones.

Even if the pre-emphasis network is used, the max V_{pp} that can be input to pin 4 remains 100 mV.

TX-Enable

Pin 2 makes it possible to enable or disable the FM transmitter simply by interfacing it with TTL or CMOS logic families supplying output logic levels of 0 to 5V and 0 to 12V respectively

To ensure the FM transmitter module switchoff, the low level driving signal on pin 2 should be a 0V logic level of below 0.5V

The maximum Off/On switching-time is about 100µs.

RF Output

Three types of integral antenna are recommended for use with our RF modules and are descibed as follows:-

A) **Helical**, fig. 4a: Wire coil, connected directly the antenna pin of the particular module and open circuit at the other end. This antenna is very efficient given its small size (20mm x 4mm dia). The helical is a high Q antenna, trimming the wire length or expanding the coil may be performed for optimum results. The helical de-tunes badly with proximity to other conductive objects.

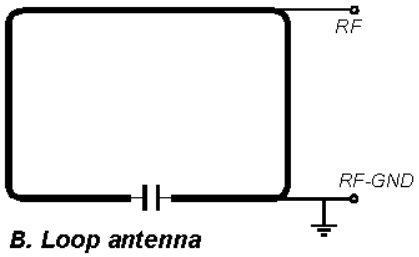
B) **Loop**, fig. 4b: A loop of PCB track tuned by a fixed or variable capacitor to ground at the 'hot' end and fed from the antenna pin at a point 15 to 25% from the ground end. Loops have high immunity to proximity de-tuning.

C) **Whip**, fig. 4c: This is a wire, rod, PCB track or combination connected directly the antenna pin of the RF module. Optimum total length is 17cm (1/4 wave at 418 MHz) or 16.5cm (1/4 wave at 433.92MHz). Keep the open circuit (hot) end well away from metal components to prevent serious de-tuning. Whips are ground plane sensitive and will benefit from internal 1/4 wave earthen radial if the product is small and plastic cased.

A. Helical antenna

0.5 mm enameled copper wire
close wound on 3.2 mm diameter former

418 MHz = 26 turns
433 MHz = 24 turns



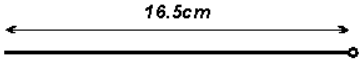
B. Loop antenna

feed point 15% to 25% of total loop length

track width = 1mm

4 to 10 cm^2 inside area

capacitor = 1.5 to 5 pF variable or fixed



C. Whip antenna

wire, rod, PCB-track or a combination of these three

418 MHz = 16.5 cm total from antenna pin 2.
433 MHz = 15.5 cm total from antenna pin 2.

Antenna selection chart:

	A **Helical**	**B** **Loop**	**C** **Whip**
Ultimate performance	**	*	***
Ease of design setup	**	*	***
Size	***	**	*
Immunity to proximity effects	**	***	*

Fig 4.

The antenna choice and position directly controls the system range. Keep it clear (particularly the 'hot' end) of other metal in the system particularly large ones like transformers, batteries and PCB tracks/ground plane. The space around the antenna is as important as the antenna itself.,. The best position by far, is sticking out the top of the product. This is often not desirable for practical/ergonomic reasons and a compromise may be necessary.

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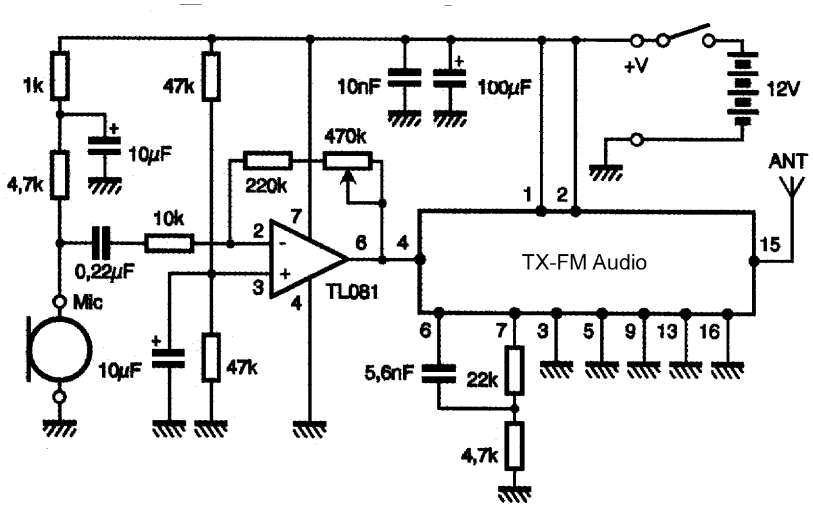
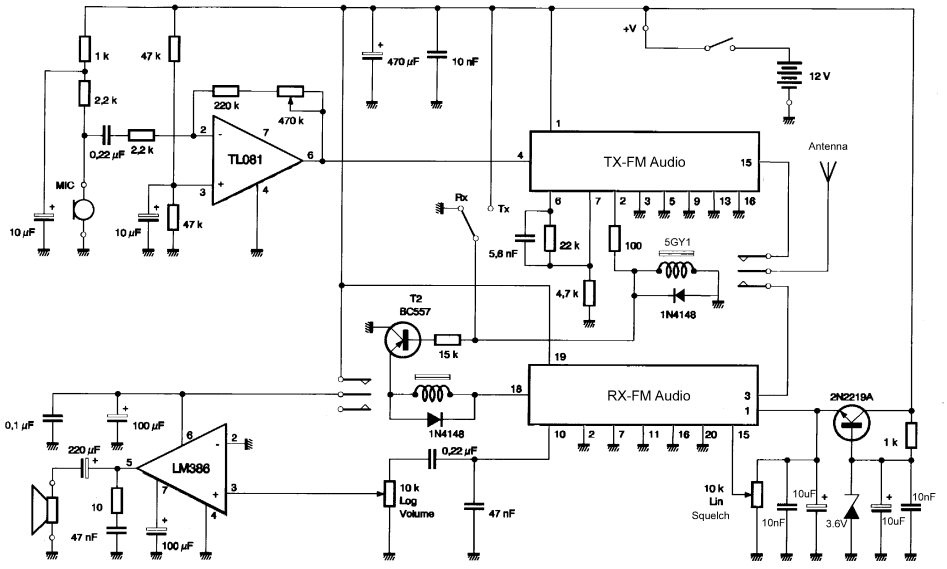
Application Schematics

A/



The above schematic shows the TX-FM AUDIO module interfaced with a condensor microphone and preamplifier circuit. This is suitable for implementation with the companion RX-FM AUDIO receiver module to produce a wireless microphone system. (See RX-FM AUDIO application note for the receiver portion of this application)

B/



The schematic diagram above provides an application example using the RX-FM AUDIO receiver module together with the companion TX-FM AUDIO and interfacing components to make up a half duplex two-way radio or ‘walkie talkie’.

End of app. note -Rev. 06/99- Information contained herein is provided in good faith. ABACOM Technologies will not be held responsible for any errors or omissions the may be resultant in this document.

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