

Pre-emphasis for FM Transmitter



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Specifications

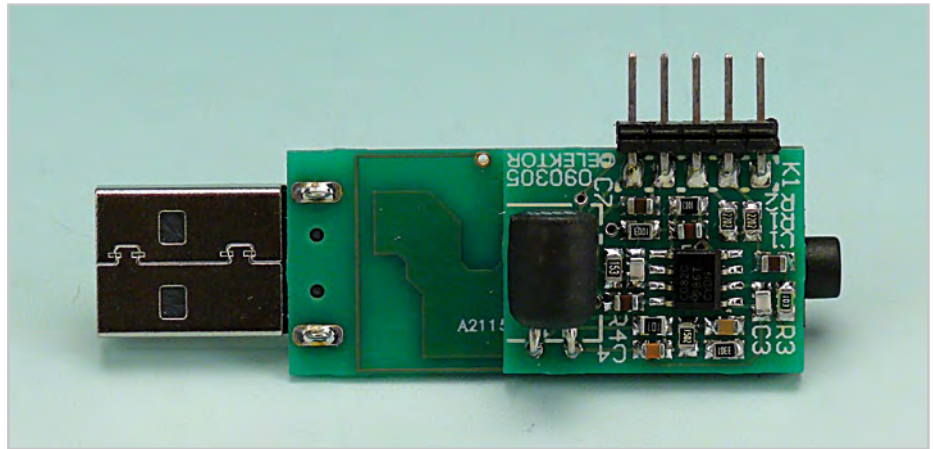
- Correction network for FM Transmitter 080727
- Also includes a 19-kHz filter
- Current consumption of 3 mA

This circuit was specially designed to be used with the FM Audio Transmitter found elsewhere in this issue, but it can also be useful as an addition to other transmitters.

The circuit uses a dual opamp. The first opamp (IC1A) functions as a mixer and a buffer for the following correction network. The input sensitivity can be adjusted with the help of R3 (a lower value reduces the sensitivity). The 50 μ s correction for the pre-emphasis is carried out by C5 and R6. IC1B buffers the signal before it is fed to the transmitter via K1.

Since the FM transmitter is a mono version, a 19 kHz filter has been included to prevent a stereo FM receiver from mistakenly switching to stereo mode due to the presence of 19 kHz components in the received signal. Any signals around 19 kHz are blocked with the help of a simple tuned circuit (L1/C4). R4 ensures that the Q isn't too large. Due to tolerances you may find that the frequency can deviate from 19 kHz (in our prototype the resonance frequency was closer to 20 kHz). In view of the value of the inductor, a through-hole version has been used for this (see component list). Without the parallel circuit the crossover point of the correction network is about 16.7 kHz. This is more than enough for audio via VHF FM. The addition of the parallel circuit causes the amplitude around 10 kHz to increase a little, and the -3 dB point is then reached at 13.5 kHz. In the prototype this cut-off point was about 1 kHz higher due to component tolerances.

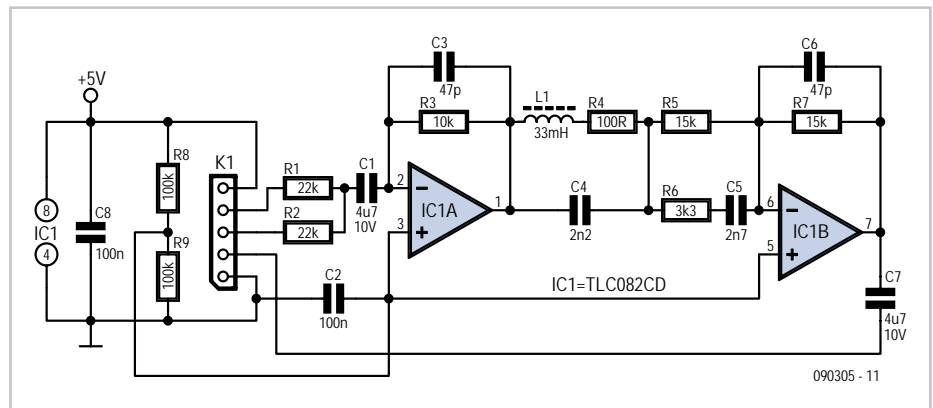
The board designed for this circuit has been kept as small as possible through the use of SMDs for most components. The dimensions



of the FM transmitter board also played a part here. To make it easier to connect this circuit to the transmitter board, a connector was included on this board. The supply voltage and audio signals are carried via this connector. The board has been designed in such a

as aerial and connected to the transmitter board (it just so happens there is a via next to C4).

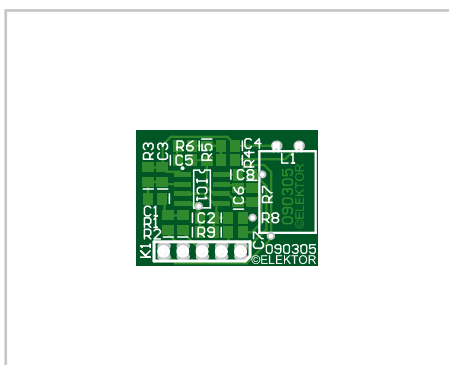
To measure the effect of the pre-emphasis circuit we first measured the frequency response of the output of a small radio. The



way that it can either be mounted behind the FM transmitter or alongside it.

When the pre-emphasis board is used R1 and R2 should be removed from the transmitter board. When the circuit is mounted behind the transmitter board it was found that the FM signal strength was clearly reduced, so it would be better if a length of wire was used

result of this can be seen in the graph (1 = without pre-emphasis, 2 = with pre-emphasis). It can be clearly seen that the higher frequency components are attenuated by the de-emphasis filter in the radio. When the pre-emphasis circuit is connected to the transmitter the result is an almost flat response above 1 kHz. The 'bump' around 100 Hz is caused by a type of bass-boost in the radio to improve



COMPONENT LIST

Resistors (all SMD 0805)

- R1, R2 = 22k Ω
- R3 = 10k Ω
- R4 = 100 Ω
- R5, R7 = 15k Ω (24k Ω for 75 μ s)
- R6 = 3k Ω (3k Ω 6 for 75 μ s)
- R8, R9 = 100k Ω

Capacitors

- C1, C7 = 4 μ F 10V

- C2, C8 = 100nF

- C3, C6 = 47pF

- C4 = 2nF2

- C5 = 2nF7

Inductors

- L1 = 33mH, e.g. 22R336C Murata Power Solutions (Farnell # 1077046)

Semiconductors

- IC1 = TLC082CD SO8 (Farnell # 8453713)

the quality of the sound. The low cut-off point has risen slightly due to the inclusion of two extra coupling capacitors in the pre-emphasis circuit, but in practice this will be hardly noticeable. The current consumption of the transmitter is increased by this circuit from 2 to just over 5 mA.

The component values in the circuit diagram are for 50 μ s pre-emphasis. For adaptations to 75 μ s as used in the USA and other countries, please refer to the parts list.

(090305)

Download

090305-1: PCB layout (.pdf), from www.elektor.com/090305

