SSB-MITE Assembly Manual



David Cripe NM0S
The 4 State QRP Group

## Introduction

Thank you for purchasing a SSB-MITE. We hope you will enjoy building it and find it a useful addition to your QRP station. This kit was conceived to fill a need within the hobby for an inexpensive, high-performing SSB filter capable of being added to nearly any receiver. The SSB-MITE uses simple analog signal-processing circuitry to provide highly effective audio filtering from a simple circuit.

High quality, double sided, printed circuit board construction is used, with solder mask and silk screened component reference designators. All components are through-hole for easy assembly. NO toroids are required. The SSB-MITE can be constructed by beginners as well as experienced builders. Construction time is approximately 1 hour, depending on experience level.

Specifications:

| | |
|---|---|
| Passband Frequency: | 300 to 2700 Hz |
| Signal Gain: | 0 dB to 50 dB, user selectable |
| DC Power: | 5 to 13 VDC, <15 mA |
| Audio Power: | 500 mW into 8 ohms, from 9v supply |

## First Steps

Before getting started with building the SSB-MITE, take some time to organize and familiarize yourself with the parts provided and check them against the Bill of Material. Building over a cookie sheet is recommended to minimize parts being lost. To prevent static damage, it is recommended that the ICs not be removed from their anti-static packaging until you are ready to install them. If parts are missing in your kit, send an email to the kitter listed on the 4SQRP kit page. He will promptly provide replacements.

Schematic and parts-placement files are provided as part of documentation package. It is highly recommended to print a couple of copies for reference during construction. As you build, use a

highlighter to mark off parts that have been soldered onto the PCB on one copy. When you think you are done, you can check that copy to verify that all of the parts have been installed.

The SSB-MITE has a number of assembly options depending on how it is to be used. It can be used as an outboard filter and amplifier, plugging into the headphone jack of an existing receiver, and driving a speaker or headphones. The SSB-MITE can be used as a high gain audio filter and speaker driver in conjunction with a homebrew receiver. Alternately, it may be used as an add-on audio filter internally, in conjunction with an existing receiver that might need a CW filter. Each option has a different assembly sequence.

The following assembly options are possible:

| R11 | R12 | C16 | Gain | Suggested Application |
|---|---|---|---|---|
| 5.6k | 100k | xxx | 0dB - | (stand-alone, to be plugged into headphone jack of existing rig) |
| xxx | 100k | xxx | 10dB | |
| xxx | 5.6k | xxx | 20dB | |
| xxx | 100k | 220u | 30dB | |
| xxx | 5.6k | 220u | 40dB | (at output of detector in receiver) |

Most users will use either the first or last options, but if other gain configurations are desired, the assembly options are listed. A user wanting a volume control may substitute a 5k to 100k audio potentiometer for R11 and R12. There are pads present on the board showing the connection.

Step 1 – Resistors
Decide which assembly option is desired. Insert and solder, and check off each when completed.

| | | | |
|---|---|---|---|
| ( ) | R1 | 36k | orange-blue-orange |
| ( ) | R2 | 36k | orange-blue-orange |
| ( ) | R3 | 1.0M | brown-black-green |
| ( ) | R4 | 7.5k | violet-green-red |
| ( ) | R5 | 7.5k | violet-green-red |
| ( ) | R6 | 30k | orange-black-orange |
| ( ) | R7 | 30k | orange-black-orange |
| ( ) | R8 | 220k | red-red-yellow |
| ( ) | R9 | 1.0M | brown-black-green |
| ( ) | R10 | 10 | brown-black-black |
| ( ) | R11 * | | |
| ( ) | R12 * | | |
| ( ) | R13 | 30k | orange-black-orange |
| ( ) | R14 | 30k | orange-black-orange |

Step 2 – Semiconductors

Be certain that the ICs are inserted correctly, according to the silkscreen diagram.

| | | | |
|---|---|---|---|
| ( ) | U1 | TLC274 | dip 14 |

| | | | | |
|---|---|---|---|---|
| ( ) | U2 | LM386 | dip 8 | |

Step 3 – Capacitors

| | | | | |
|---|---|---|---|---|
| ( ) | C1 | 0.1 | 104 | |
| ( ) | C2 | 0.0033 | 332 | 3n3 |
| ( ) | C3 | 0.056 | 563 | 56n |
| ( ) | C4 | 0.001 | 102 | 1n0 |
| ( ) | C5 | 0.001 | 102 | 1n0 |
| ( ) | C6 | 0.001 | 102 | 1n0 |
| ( ) | C7 | 0.001 | 102 | 1n0 |
| ( ) | C8 | 0.001 | 102 | 1n0 |
| ( ) | C9 | 0.001 | 102 | 1n0 |
| ( ) | C10 | 0.1 | 104 | |
| ( ) | C11 | 0.1 | 104 | |
| ( ) | C12 | 220 | 220u | |
| ( ) | C13 | 220 | 220u | |
| ( ) | C14 | 220 | 220u | |
| ( ) | C15 | 0.1 | 104 | |
| ( ) | C16 | 220 | 220u | |
| ( ) | C17 | 0.001 | 102 | 1n0 |
| ( ) | C18 | 0.001 | 102 | 1n0 |

Step 4 - Final Assembly

The last steps of assembling the SSB-MITE are attaching the interconnecting wires to the board. Pads are provided for connecting the input signal, DC power, and output. Wire gauges from 24 to 22 are ideal. Best results will be had when twisted pairs are used.

The SSB-MITE is capable of driving either low-impedance headphones, or a separate speaker. Alternately, it can be inserted into an existing receiver, and used with that rig's audio amp and speaker. The simplicity of this circuit permits countless variations in how it can be applied.

Theory of Operation

The SSB-MITE provides very sharp passband filtering ideal for use with a SSB receiver. The implementation of this filter is with four op amps to create two low-pass filters, a notch filter, and one high pass filter. This frequency response creates a rapid roll off of frequencies above 3 kHz to reduce objectionable adjacent-channel noise.

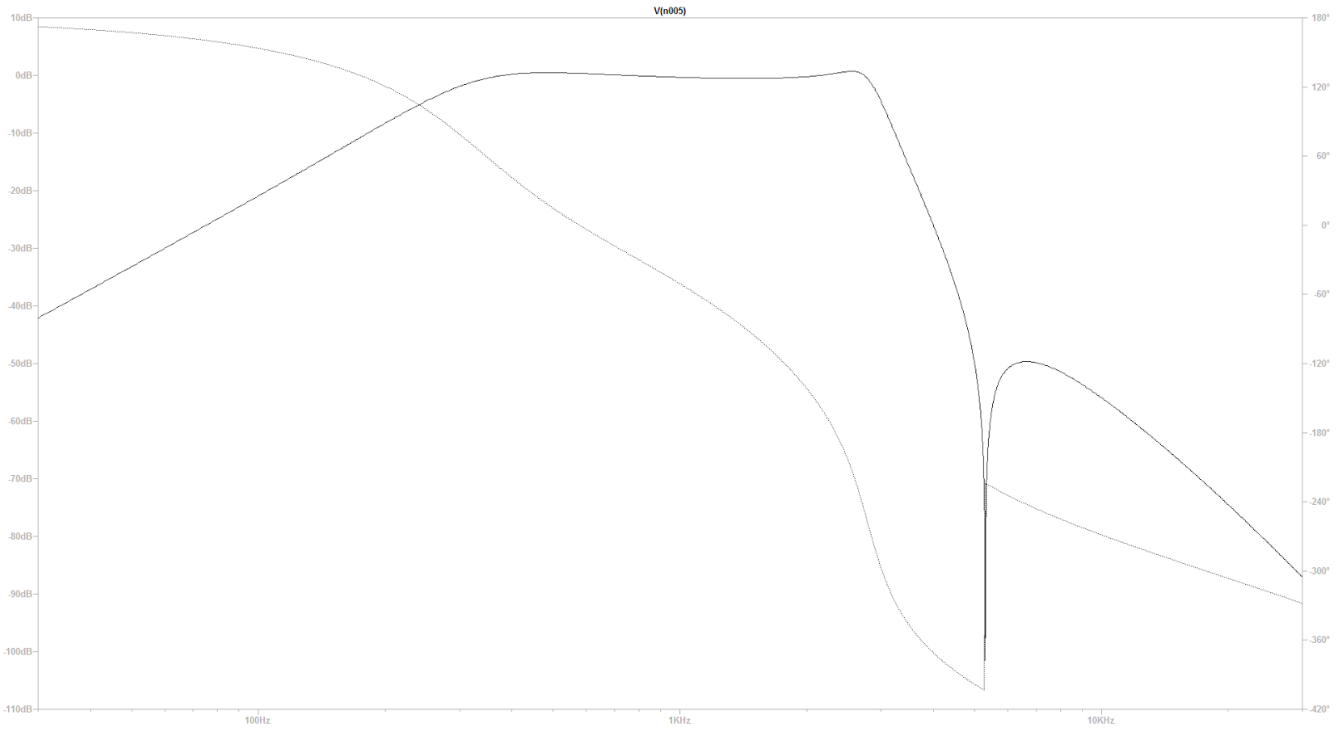



Figure 1: Frequency Response of SSB-Mite Filter

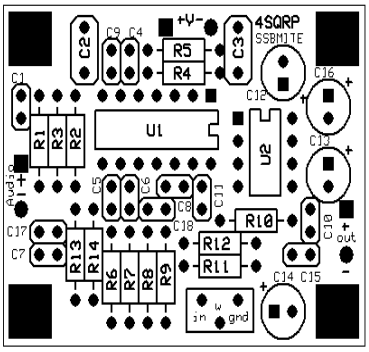
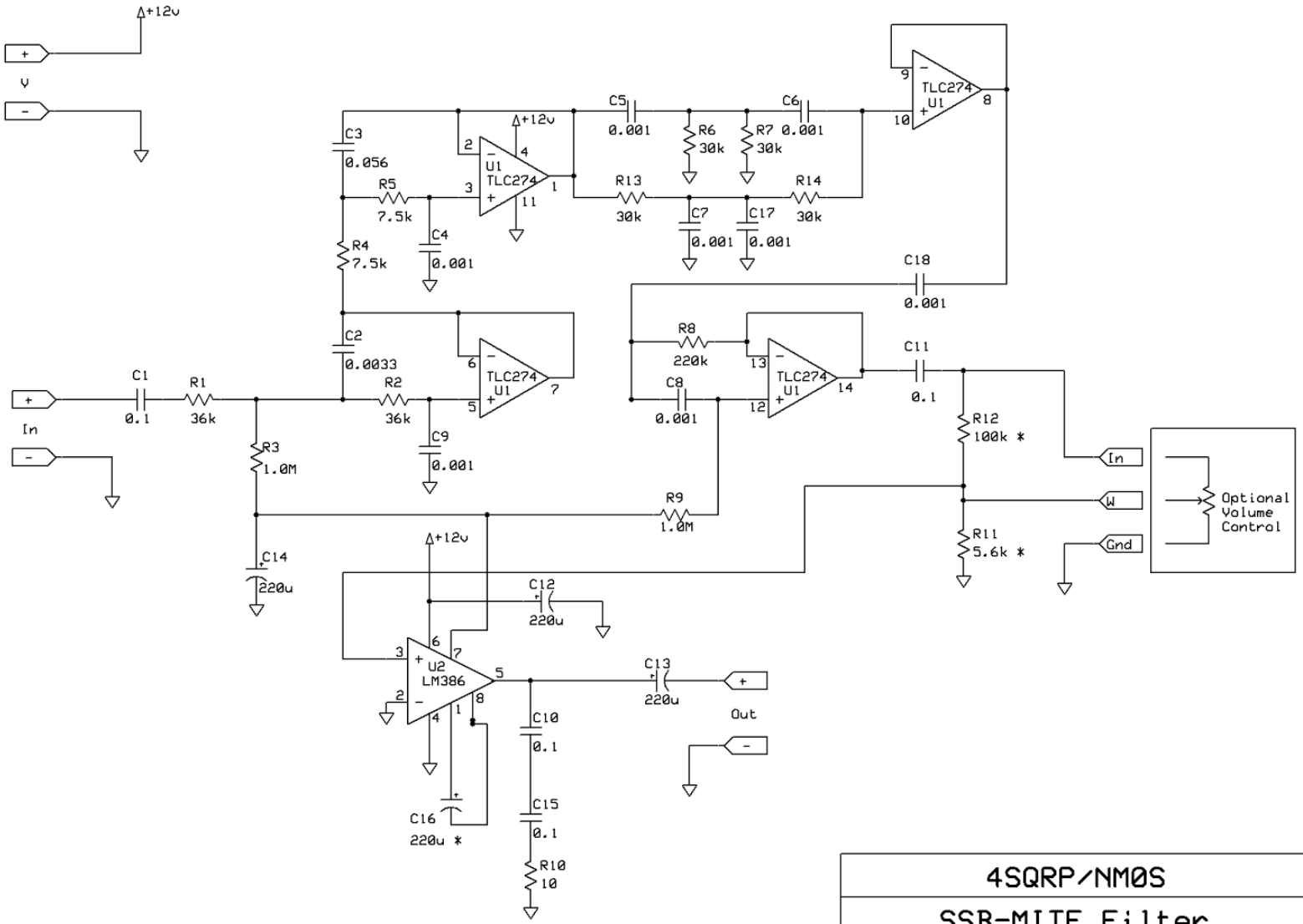



Figure 2: Component Placement




| 4SQRP/NM0S | | |
|---|---|---|
| SSB-MITE Filter | | |
| David Cripe | Rev 1.0<br>11/25/17 | Page #1 of 1 |

Figure 3:  Schematic