

ssm2164_seppoman pcb introduction

seppomans building information;[ssm2164_pcb](#)

the following informations are take from the midibox forum, its a collection of infos, without the claim to be 100% true, i will try to test the given information.

Schematic

not found anywhere... 🤔

also reverse engeniering/understanding/troubleshooting/moding is nearly impossible when the pcbs are stuffed, because most of the traces are on the component site... or hidden behind the black paint\ — first i want to know for what are those POTs? Input Gain of Audio? or of CV? or some BIAS? seppoman said nothing...

POT P1 middle & right Pin connected to VCC-

POT P1 left Pin connected to a 27K Resistor and this resistor to a nother 27K Resistor which is connected to CV1+ Input. the middle point of this2xresistors is going to the TL74-OP-Amp Pin1 which is a inverting input...

The Output of this TL74 Stage is Pin1: its connected to Pin 6 SSM2164, which is the CV-Input

When i measure Pin6 to Ground, and Turn P1 most left:1,8V... Turn P1 most right: 2,47V

so what does it? no one said: its a zero offset for bipolar cv? or is it gain-control? 🛠️ **Fix Me!** 🤔

Power

+ GND -

J5 is obviously the only connector where you could come to the conclusion that it might have something to do with power supply. Just like the:

AOUT(NG), the 2044 board, the MB_FM module etc, **it expects a bipolar power supply of +/- 12 V and GND.**

CV

as a general rule of thumb you can assume that everything that doesn't specifically mention a bipolar control voltage will expect an unipolar CV.

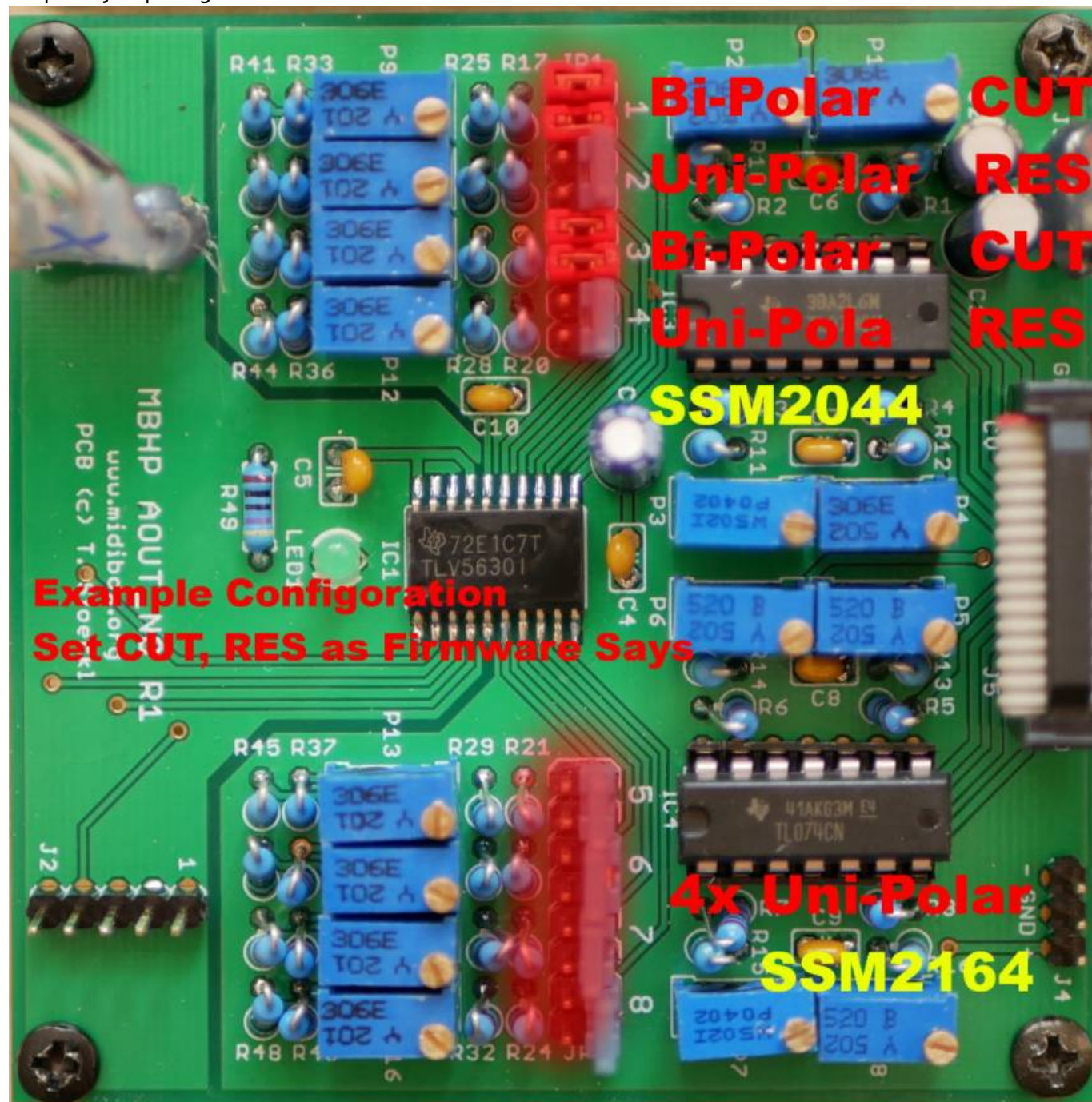
In the case of this module, IIRC the dynamic range of the regular **CV range (0 .. 11.67V)** (uni-polar!) is about 65 dB, with 0V being "silence" and 11.67V being unity gain.

I have never thought about what happens if you apply a negative voltage to the CV input...

Note also that generally a bipolar control voltage (CV) still doesn't mean that there are more than two wires involved, just the one signal can be above or below GND.

AOUT_NG Connect and Setup

Unipolar Jumping like shown:



AOUT_NG Stuffing Parts PCB

Resistor Solution stock - very low voltage

if you followed [aout_ng](#) built plan you will get following Stock-CV-Voltages @+12V PSU:

Uni-Polar CV-Range: 0-11,4V

Bi-Polar CV-Range: +-3V

SSM2164 & Stock AOUT_NG:

As the SSM2164 is UniPolar, and seppoman designed it as a couple with AOUT_NG. stock is ok

SSM2044 & Stock AOUT_NG:

As the CUT-Off-CV is UniPolar, and seppoman designed it as a couple with AOUT_NG. stock is ok
I guess for proper +/- 5V operation I'll have to try out a few other resistor values on the SSM module, but this will only apply if you if you're using a different CV source than an AOUT_NG.\|

If you need more CV-Range: for more distortion, drive, range, or other modules:

if you sum two voltages through two resistors of same value, you'll get $(V1+V2) / 2$ as a result...

Resistor Solution low voltage - seppomans preferred

R9...R16 > 5.6k (only on the channels that are setup for bipolar mode)

+/-3.5V to +/-5.8V Bi-Polar calibration range

Pro: easy job, still have a decent precision when calibrating.

Con: "just change the jumpers if you need some channel in bipolar mode" thought will not work. (

 really?)

Resistor Solution Stock - -5V Level shifter - NorthernLightX preferred


we came to the conclusion that it's probably much easier to have the AOUT only output **unipolar 0 to 10 volt**, and design **a simple -5v level shifter board** that can be used as an add-on (or separate module with hands-on access to the level shifting) to **shift the output to -5 to +5 volt** where needed.

Things to consider are:


- not a lot of equipment actually makes use of negative voltages
- equipment that needs bipolar CV input can be retrofitted with a fixed level shifter at the input to make it compatible with your other modules
- negative voltages can be used for CV modulation purposes (modulate one CV source with another) so it's certainly not useless

Resistor Solution high voltage

R1...R8 > 10k

R9...R16 > 2.2k (on all channels). (QUESTION WHY ON ALL? )

+9.5V to +22V Uni-Polar calibration-range

+2.4V to +/-5.5V Bi-Polar calibration-range (dont think so )

Pro: preserve the "just change the jumpers if you need some channel in bipolar mode" thought behind this option.

Con: dramatically increase the calibration range, i.e. exactly calibrating the outputs will get harder because the same angle of turning the pot will have much more impact.

MODs

MODE Resistor - Noise vs Distortion

SSM2164 Pin 1 (the first pin) sets the “Mode”

Class AB

Pin 1 is Open, no Resistor to +12V (PCB Default)

Lower current results in higher distortion/lower noise.

—i do want distortion and dont care about noise— so i do not change anything, the pcb is fine.

Class A

Pin 1 is Connected to +12V via a Resistor

Higher current results in lower distortion/higher noise

lets look in the datasheet:

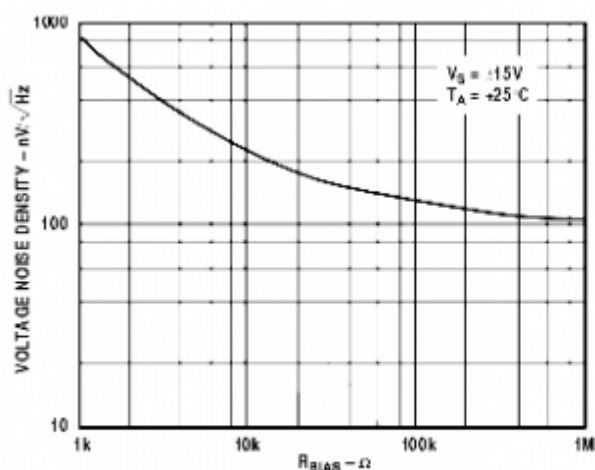


Figure 11. Voltage Noise Density vs. R_{BIAS}

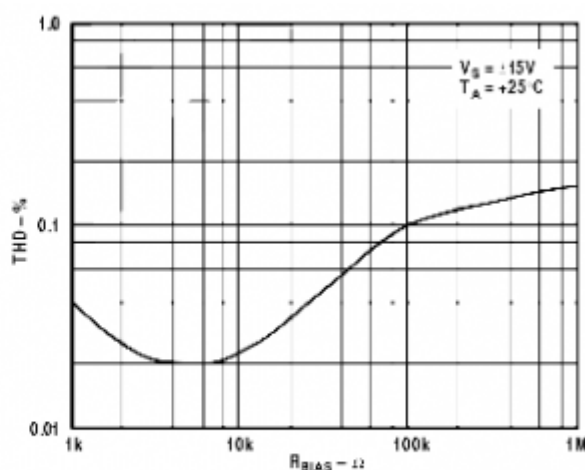


Figure 12. THD vs. R_{BIAS}

Figures 11 and 12 show the THD and noise performance of the SSM2164 as the bias current is adjusted

$$I_{MODE} = (V_+ - 0.6V) / R_B$$

$$1,52mA = (12V - 0.6V) / 7,5K$$

Leaving the MODE pin open sets the SSM2164 in Class AB with 30 μA in the Gain-Core

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Last update: 2018/04/26 20:28



