

# 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.

## 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.

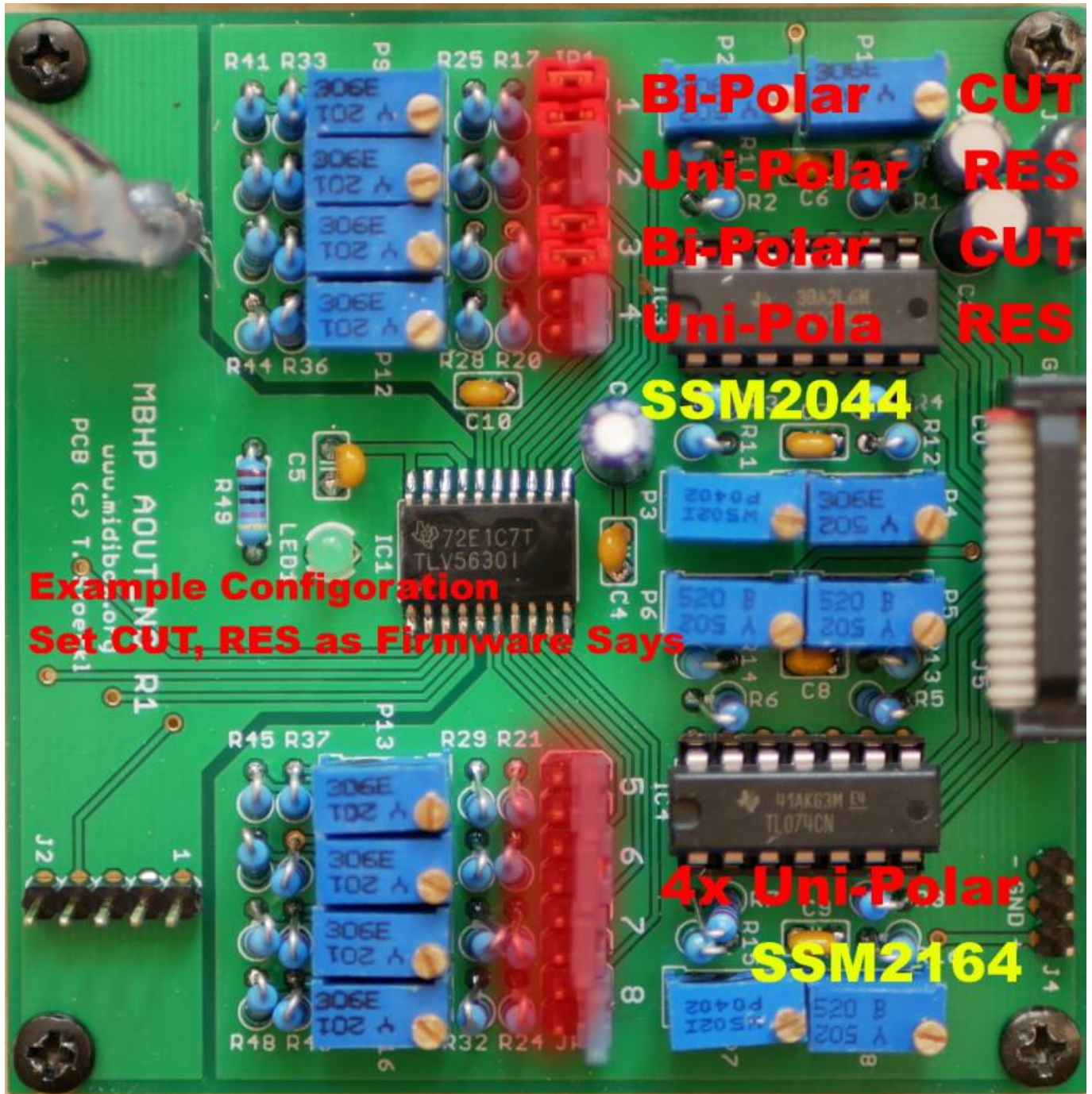
I have never thought about what happens if you apply a negative voltage to the CV input...

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 Jumpering 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'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. (

 **Fix Me!** 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

 **Fix Me!** )

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

 **Fix Me!** )

**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 is Open, no Resistor to +12V (PCB Default)  
Lower current results in higher distortion/lower noise.

### Class A

Pin 1 is Connected to +12V via a Resistor  
Higher current results in lower distortion/higher noise  
lets look in the datasheet:

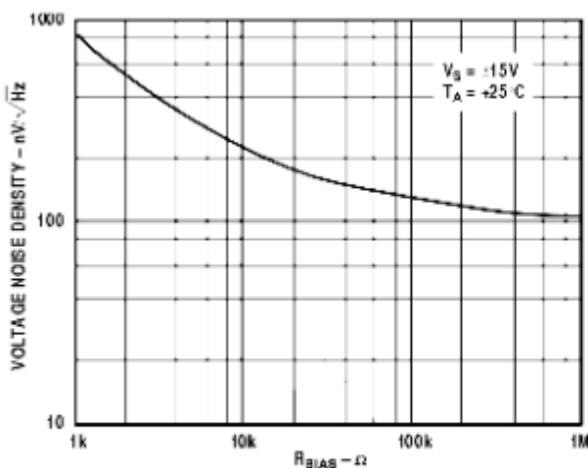


Figure 11. Voltage Noise Density vs.  $R_{BIAS}$

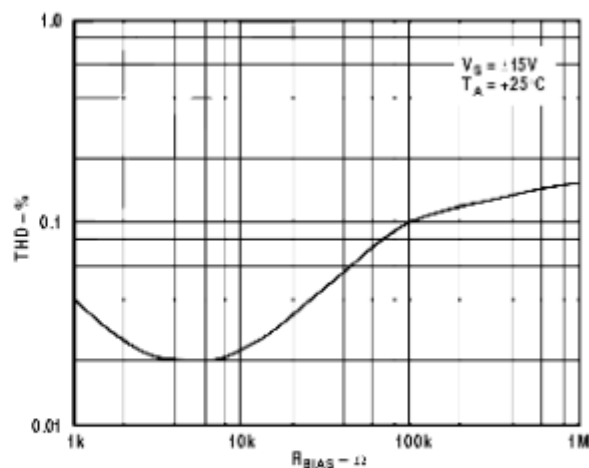


Figure 12. THD vs.  $R_{BIAS}$

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  $\mu$ A in the Gain-Core

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