QRP-RIG

Arduino based SDR RX & TX

QRP-RIG

- Objective is to build a QRP, SDR based, RX & TX on an Arduino Shield

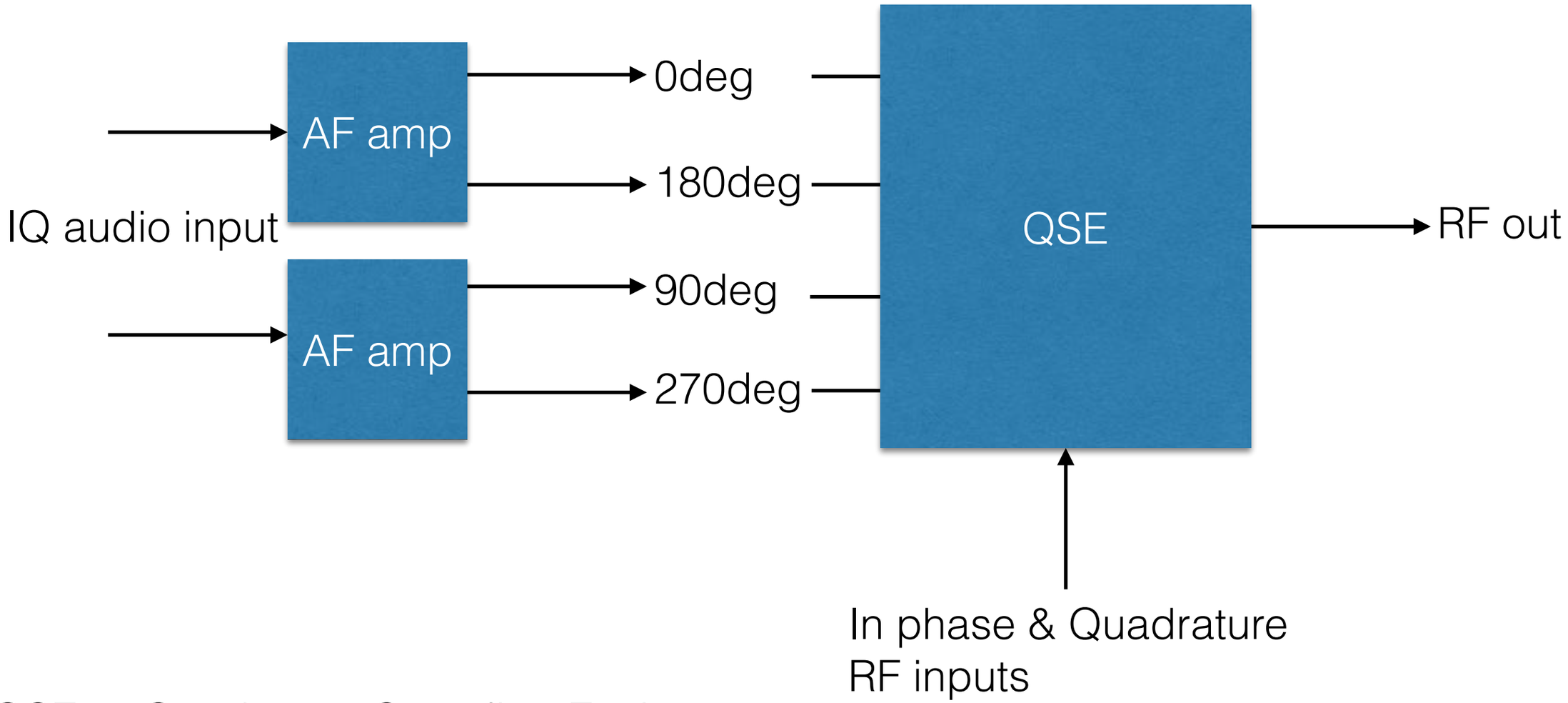
- Wide band operation, external BPF to cover 40, 30 & 20m

- All modes supported by HDSDR software (PC or Mac)

- Based on principles in ARRL article “Software Defined Radio for the Masses”, original of Flexradio designs.

QRP-RIG

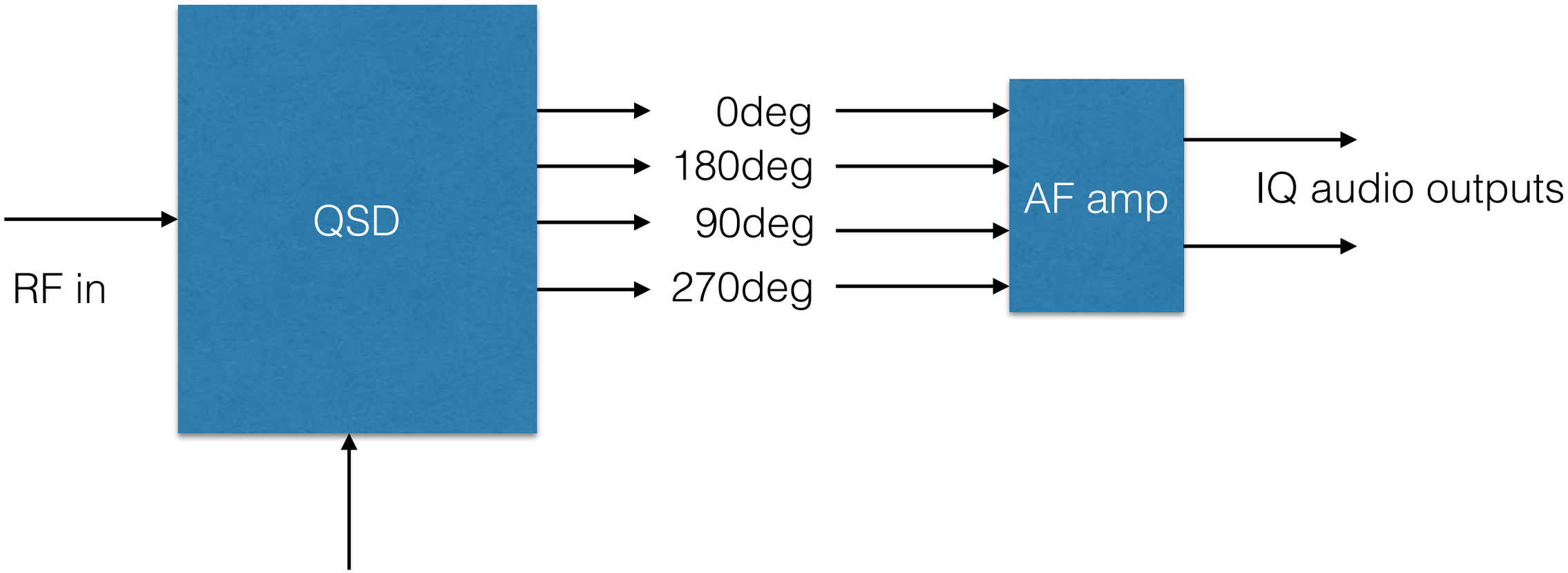
Transmitter



QSE = Quadrature Sampling Exciter

QRP-RIG

Receiver



QSD = Quadrature Sampling Detector

Choice of ICs

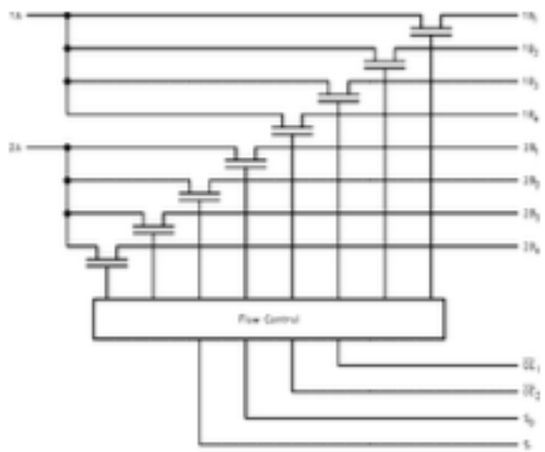
- Mixer must have low Ron and high speeds (needs to switch at 14MHz (20m).
    - FST3253 is the choice
- Audio amps need low noise, balanced inputs for RX, and low output impedance to drive the TX mixer
    - Ideal part is the relatively unknown SSM2135 Dual op-amp

ICs

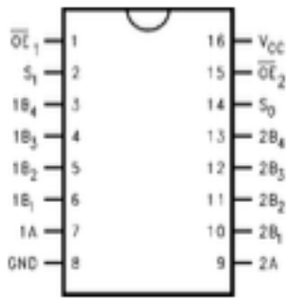
Mixer

Dual mixer, so can use balanced input

Logic Diagram



Connection Diagram



Pin Descriptions

Pin Name	Description
$\overline{OE}_1$, $\overline{OE}_2$	Bus Switch Enables
S_0, S_1	Select Inputs
A	Bus A
B_1, B_2, B_3, B_4	Bus B

Truth Table

S_1	S_0	$\overline{OE}_1$	$\overline{OE}_2$	Function
X	X	H	X	Disconnect 1A
X	X	X	H	Disconnect 2A
L	L	L	L	A = B_1
L	H	L	L	A = B_2
H	L	L	L	A = B_3
H	H	L	L	A = B_4

Op-amps

Dual op-amps. Use 2 for TX, one for RX

PIN CONNECTIONS

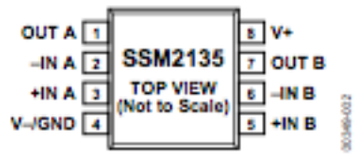


Figure 1. 8-Lead Narrow Body SOIC (R Suffix)

FUNCTIONAL BLOCK DIAGRAM

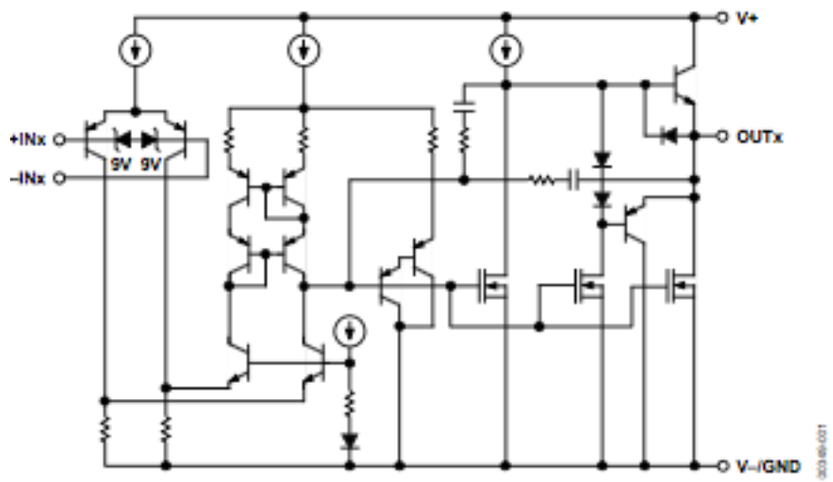


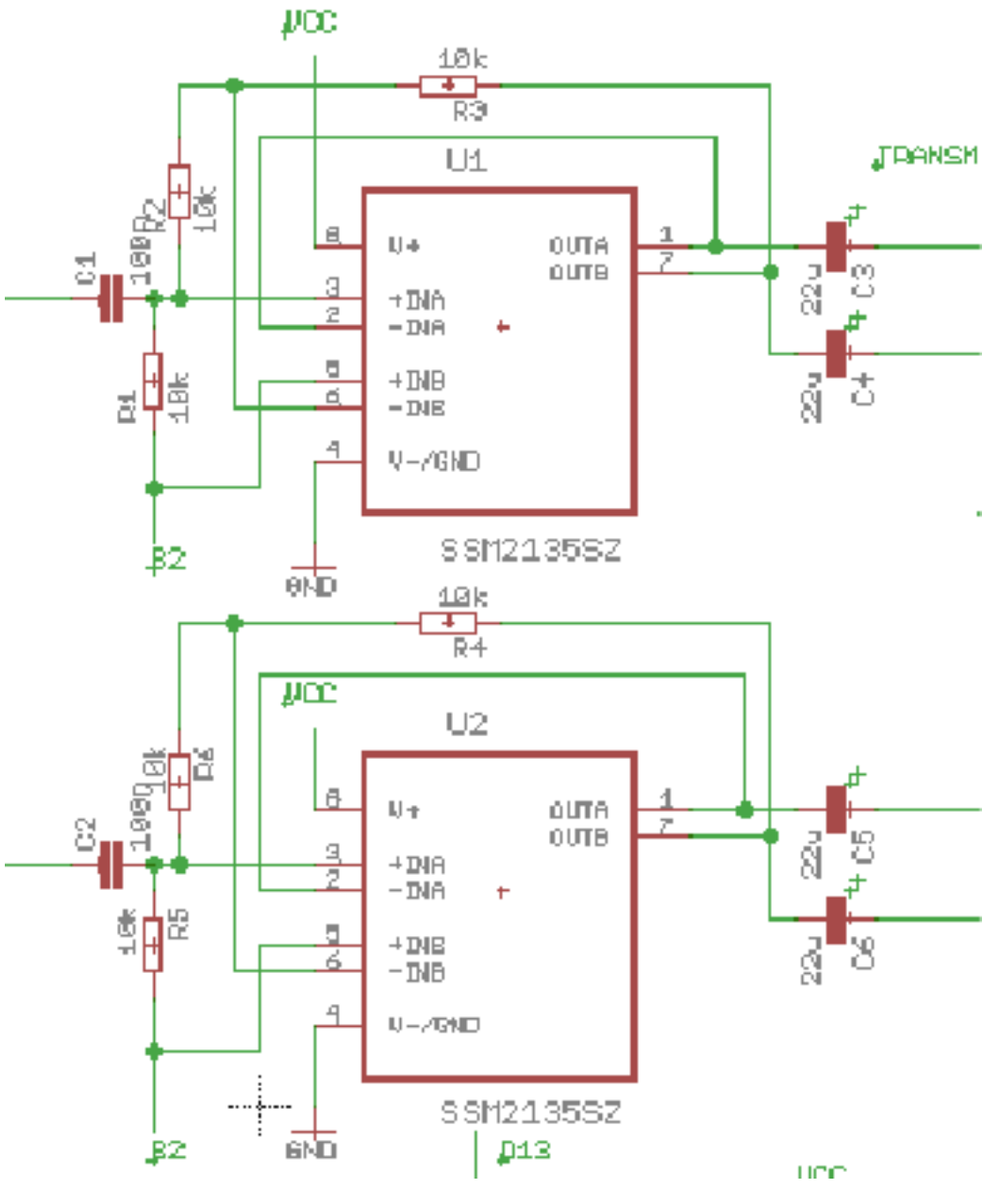
Figure 2.

Surface mount devices save space on PCB

Circuit details

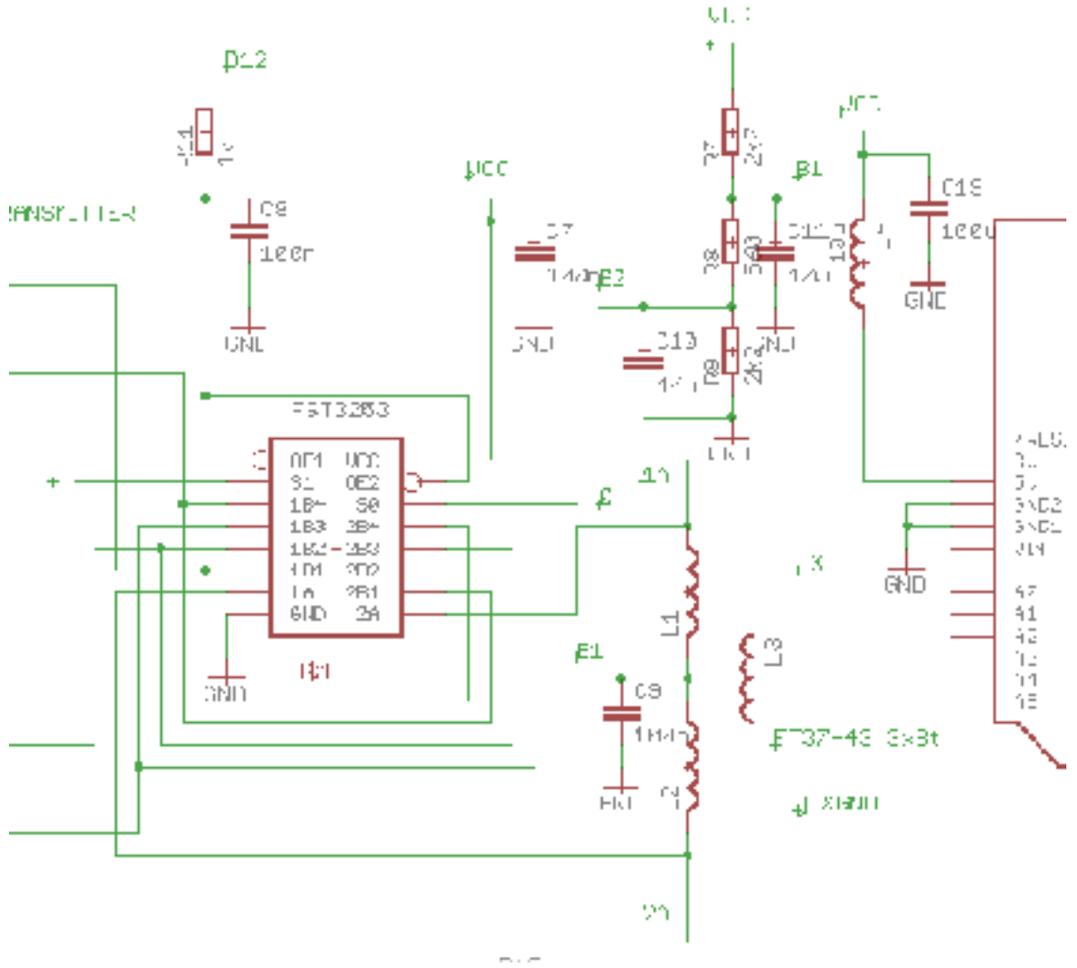
- TX amplifiers.
- Each SSM2135 has
  - 0 and 180deg outputs
  - 90 and 270deg outputs

    from I & Q audio inputs
- Able to drive >2Vp-p into 50R loads



Circuit details

- TX Mixer
  - Balanced transformer output 50+50R impedance
  - I&Q phase RF switch inputs from DDS
- BIAS provided at B1=2.5V for mixer, B2=2V for op-amps

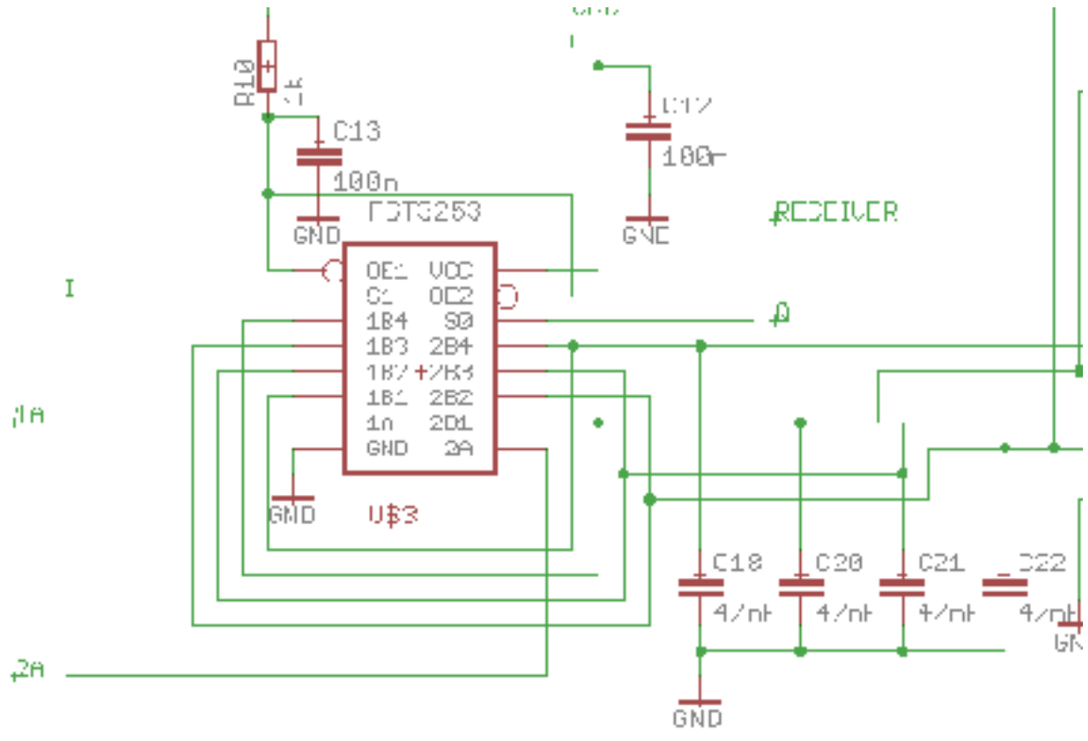


Circuit details

- RX Mixer
  - Inputs in parallel with TX, only one active at a time!
  - Filter caps give > 48kHz bandwidth (+/-48kHz tuning range, for 96kHz ADC)

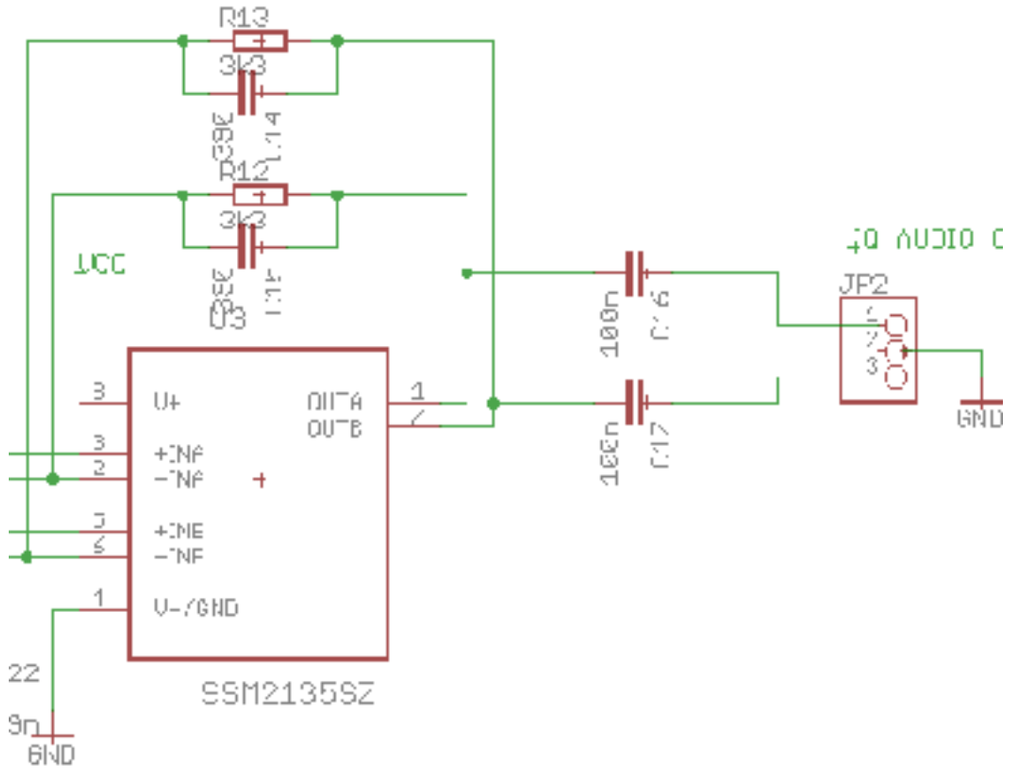
    BW = 1/n*pi*R*C

    n = 2 for balanced input
    R = 50R
    C = 47nF



Circuit details

- RX op-amps
  - 0-180-90-270deg inputs
  - I&Q audio outputs
  - 3k3/100 = x330 gain (50dB)



Status

- Verifying schematic, de-coupling etc
- PCB layout done, to be checked