

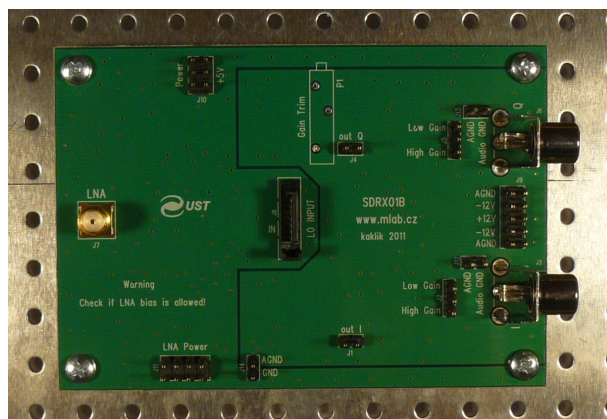
Software Defined Receiver SDRX01B not only for radioastronomy

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Abstract

The goal of this project is design of Software Defined Receiver suitable for radioastronomy purposes. The receiver which has been developed replacing the old analog construction such as RadioJOVE and others.



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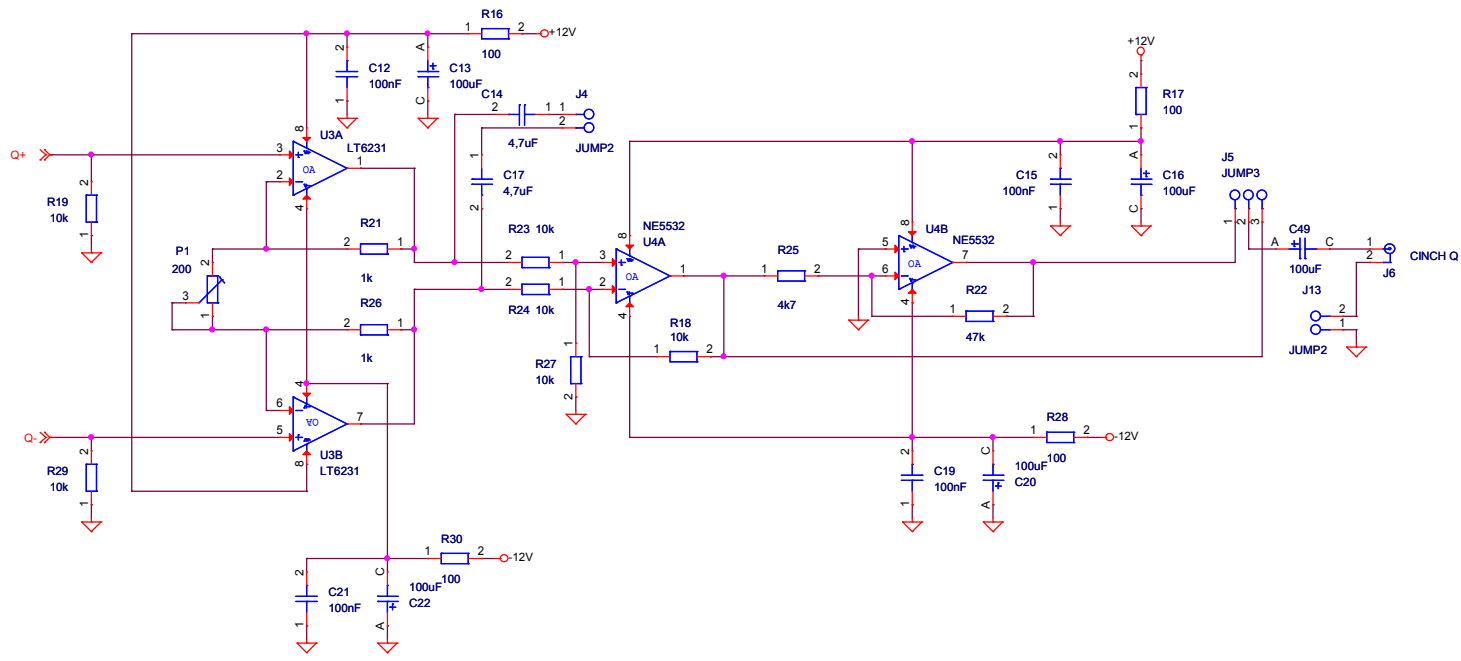
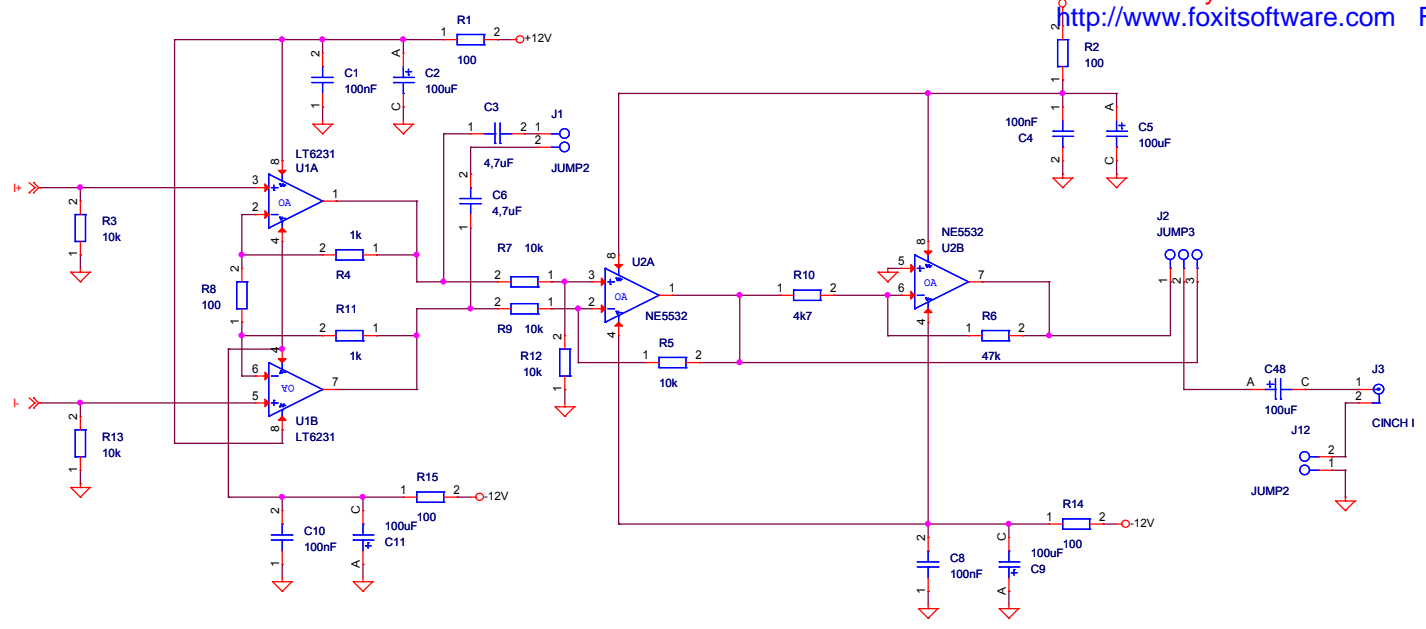
1 Technical parameters

Parameter	Value	Note
Powering voltage for analogue part	$\pm 10V$	100mA
Powering voltage for digital part	+5V	300mA
Bias of optional LNA	up to +20V	max 500mA
Frequency range	0,5 - 200 MHz	With populating by chosen parts even up 450MHz
IIP3	> 0dB	Preliminary
Gain	40-60dB	Selectable by jumper
Self noise number	< 30dB	

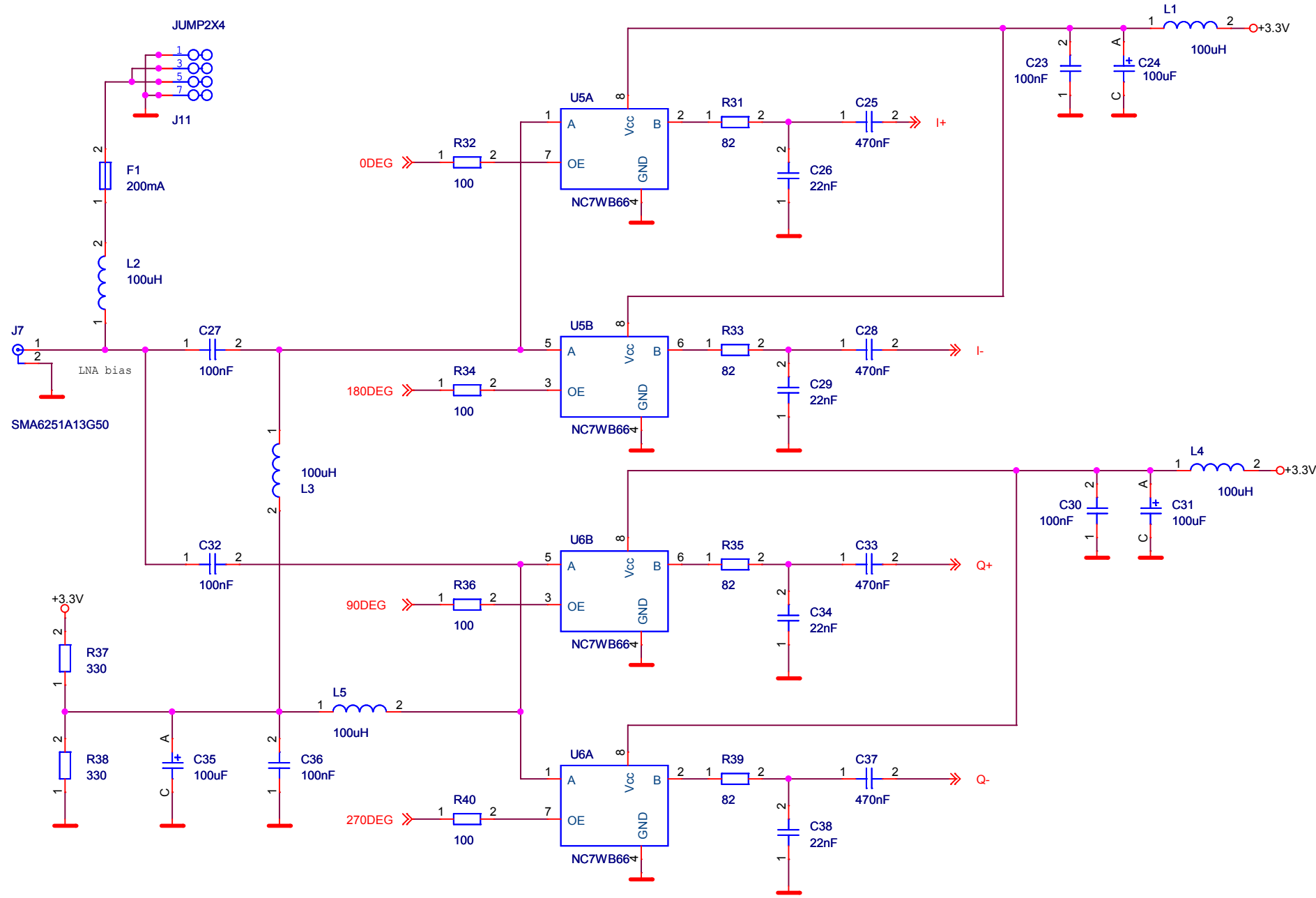
2 Description of construction

2.1 Circuit

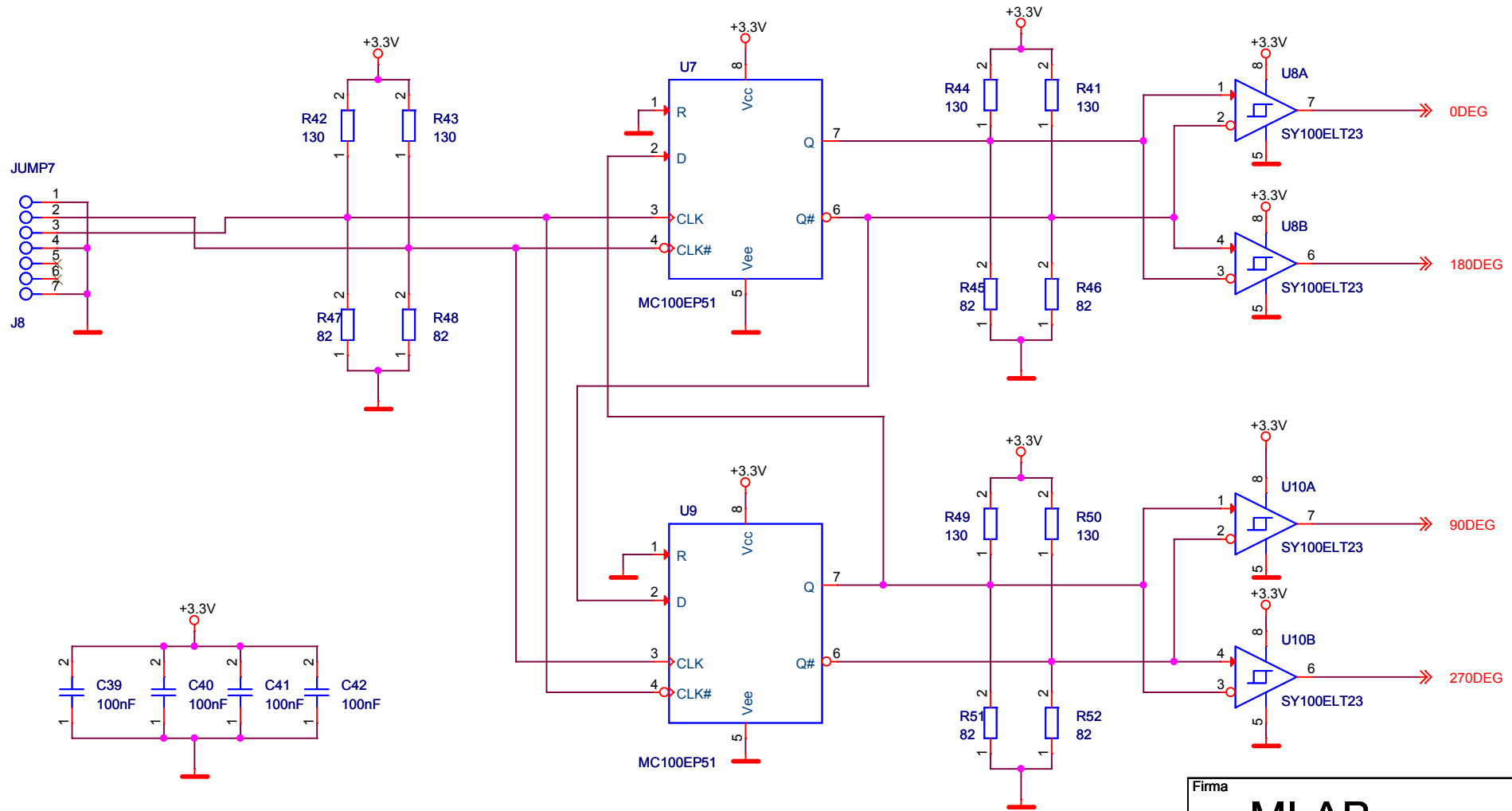
Construction of the receiver is delivered from the DR2G receiver [1] which uses CMOS components completely. The main change is on the local oscillator input which allow to receiver works at higher frequencies, because do not divide input frequency by 4, such as original construction but only by 2. In addition there was be replaced switches in sampling mixer by faster type and board layout was more optimized to higher frequencies and noise rejection.



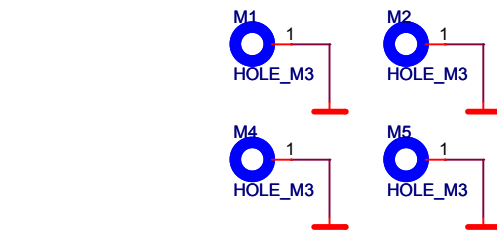
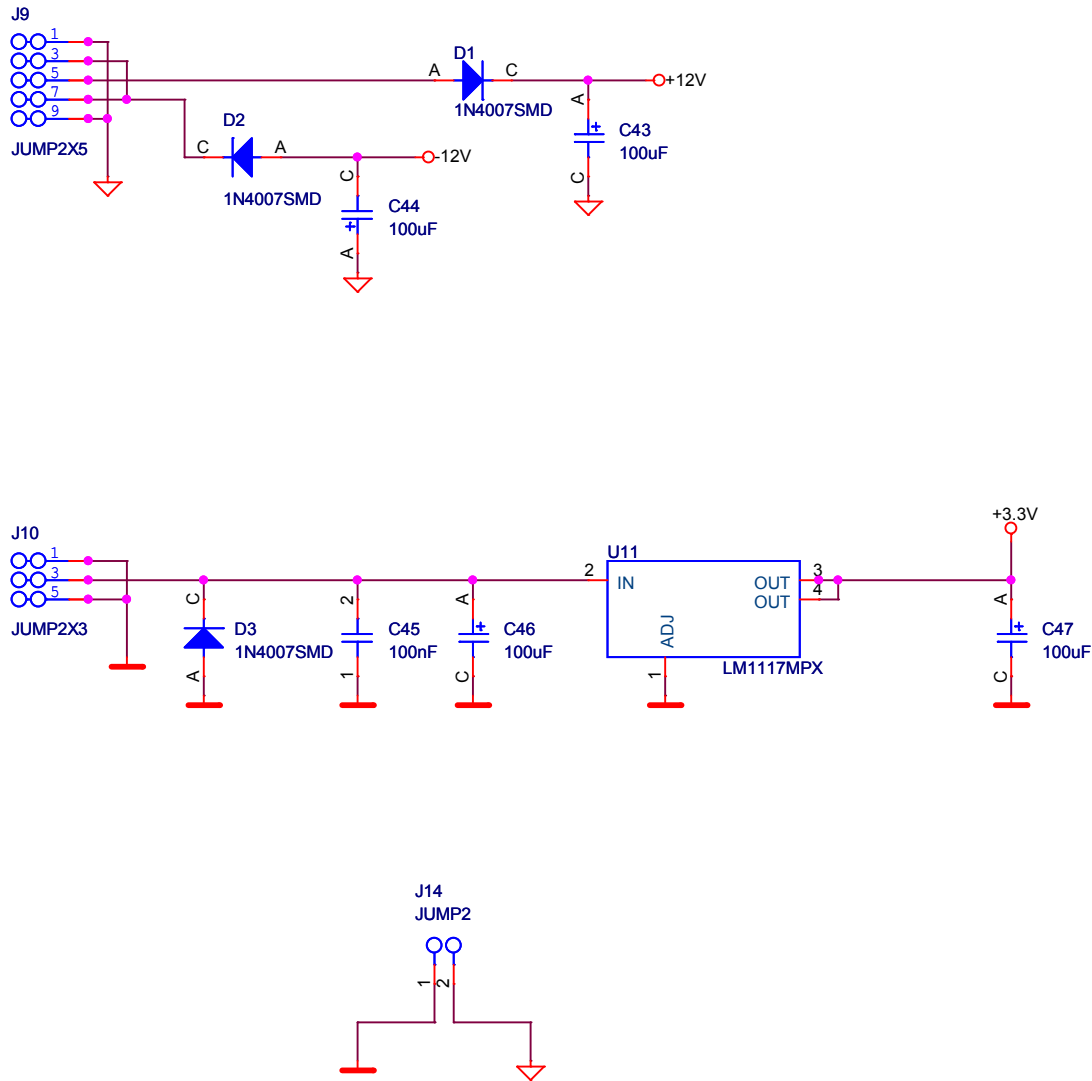
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Firma		MLAB		Author KAKLIK	
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Firma			Author
MLAB			Kaklik
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Firma		MLAB		Author		KAKLIK	
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The necessary part of the receiver is a local oscillator which must be connected to receiver via SATA cable. The LO may be a CLKGEN01B module populated 570ABB000107DG. SATA cable should be as short as possible to minimize ground loop.

2.2 EMI suppression

For proper function of receiver is necessary to use proper low noise symmetric power supply (classical PC power supply is unacceptable). There is need for proper routing of grounding wires, which must be routed in star topology. In addition there is few jumpers on the board of receiver to allow proper selection of ground connection.

2.3 Mechanical construction

Mechanická konstrukce je řešena na dvouvrstvé desce s geometrií se základovou deskou MLAB (Pro lepší odstínění přijímače je vhodné použít duralovou desku ALBASE). Dvouvrstvý plošný spoj je zvolen hlavně kvůli kvalitnímu odstínění okolního rušení horní měděnou vrstvou. To umožňuje přijímače instalovat i velmi blízko sebe případně i nad sebe avšak všechny konektory kromě NF audio výstupu předpokládají přivedení kabelu kolmo na rovinu desky. SMA konektor je možné osadit i úhlový s přivedením kabelu do boku, ale za cenu nepatrně vyššího útlumu úhlového konektoru. Při těsné montáži je potřeba počítat i s určitou teplotní stabilizací, neboť digitální část okolo spínaného směšovače má poměrně velký příkon a způsobuje zahřívání zhruba o 15°C nad okolní teplotu. A pokud je od přijímače vyžadována dlouhodobá stabilita je ho vhodné umístit do termostatovaného boxu společně s LO.

2.3.1 Setting

There is one easy step for proper setting of the receiver. The trimmer P1 must be tuned to value where the strength of mirror frequencies is minimized or zero. This can be achieved by tuning the receiver to some strength AM transmitter and slowly turning by P1 until the mirror of signal in frequency spectrum is minimized.

3 Software tools

The basic software tools for this receiver are all programs designed to work with sound card as I/Q input. Such as Winrad, WinradHD or Spectrum Lab. There is usually request to add a LO library for tuning Si570, but tuning the LO by separate software is acceptable too.

References

- [1] The original construction of DR2G http://yu1lm.qrpradio.com/SMT_SDR_RX_DR2G-YU1LM.pdf