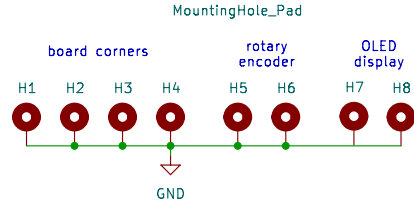
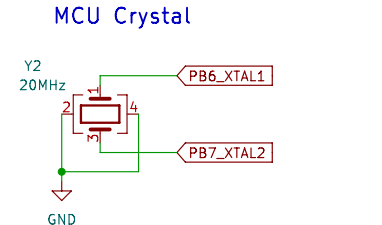
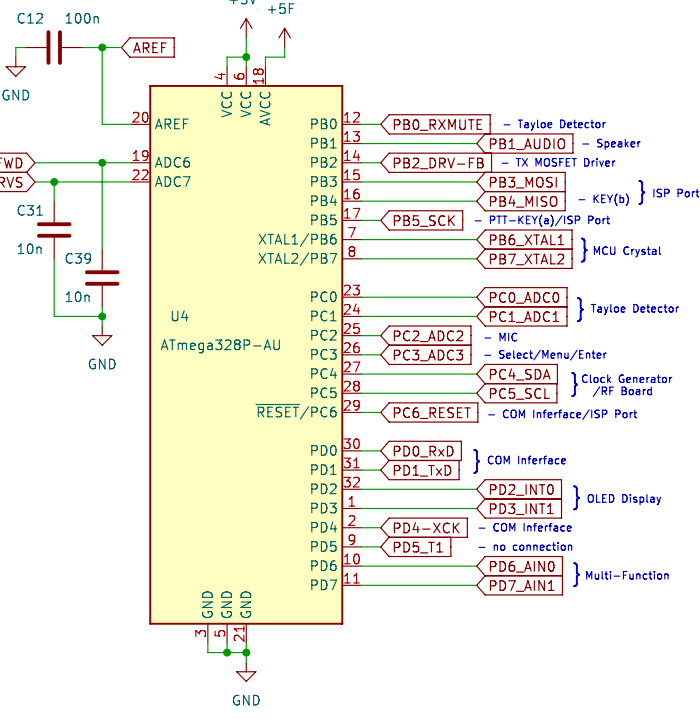
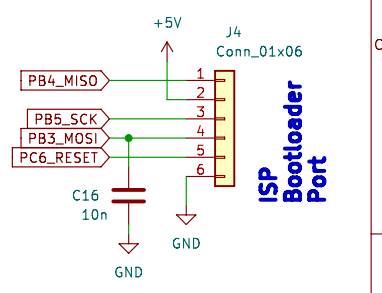
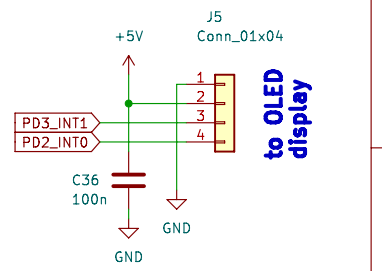
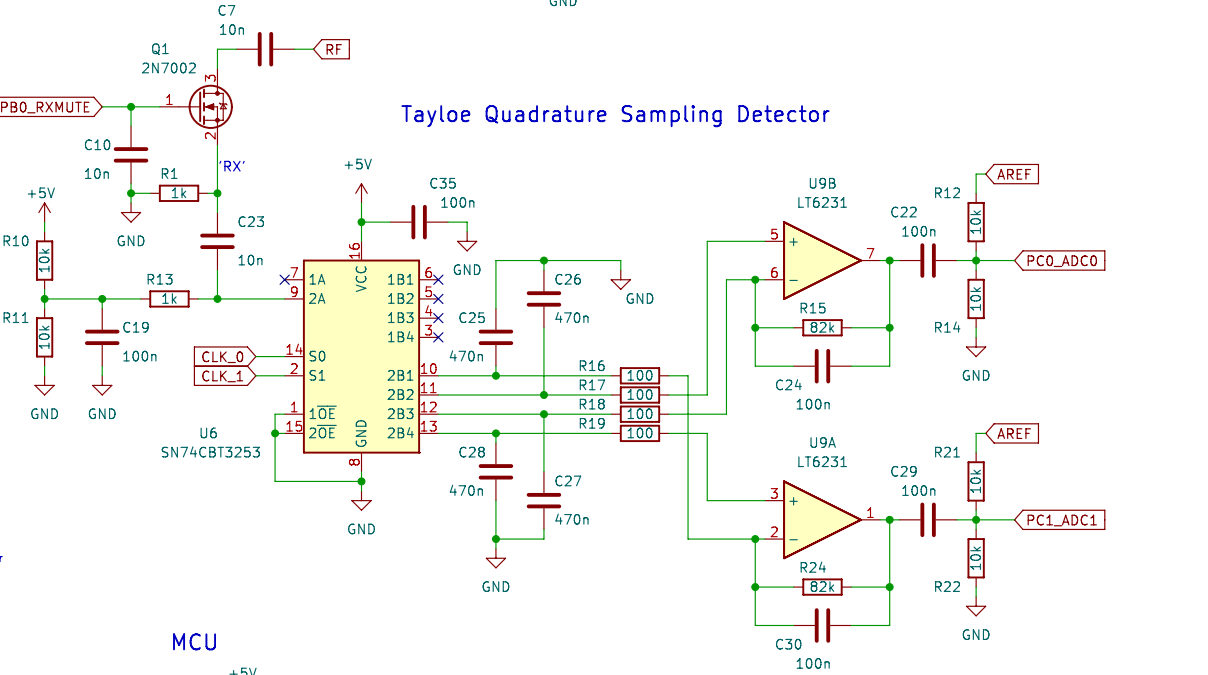
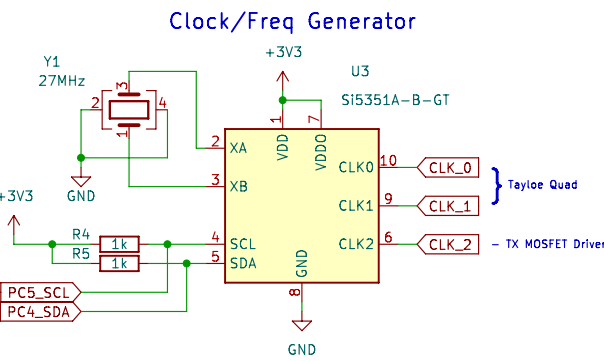


Suggested Mod to J3:
Rather than male; if the connector where female, it would reduce exposure of power pins and possibility of shorting power to other pins when the RF board is detached.



Optional Modifications

Audio Mod (<https://www.youtube.com/watch?v=j1murya750g>)
Original class II ceramic capacitors are known for their piezoelectric effects. They can act like a microphone, causing noise in the circuit.
Replacing C25, C26, C27 and C28 with a poly film type can solve most of the noise. There is still some noise in CW mode when using 100Hz/50Hz filters caused by C22 and C29.

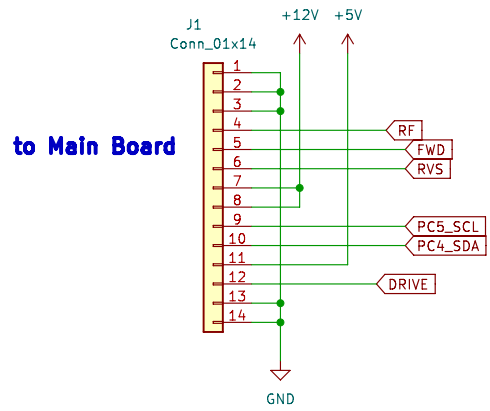
A few reasons for redrawing the schematic:

- Mainly to improve clarity and aid in troubleshooting by:
 - Combining parts into functional groups reducing the number of global labels used. A few label names were also modified for clarity of function. One or two were added as a result of grouping parts. This also makes it easier to better understand the design and functional blocks of the (tr)uSDX.
 - Power and grounds were changed from 'global labels' to 'power' labels. This helps separate power distribution from signal distribution; making it easier to follow the signal paths.
 - The ATmega328P symbol was modified to show the three hidden power pins. This can be relevant as the ATmega328PB (note the 'PB'), version changes two of the pins to signal pins.
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Original Schematic: 2021-11-27		
Redrawn & notes added: KD4SGE & WA4ITD {revision denoted by () after Rev: below}		
DL2MAN & PE1NNZ		
Sheet: /		
File: (tr)uSDX_Main_Board.kicad_sch		
Title: (tr)uSDX Main Board		
Size: A3	Date: 2022-06-11	Rev: 1.0(e)
KiCad E.D.A. kicad (6.0.5)	Id: 1/1	

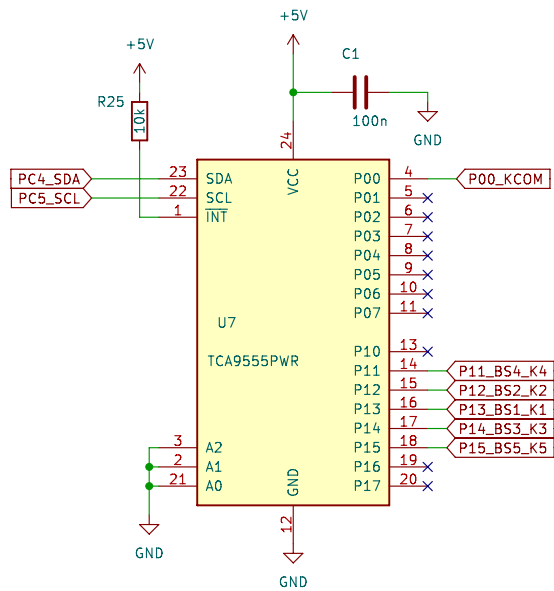
More Information:

Videos of the build, tuning and other (tr)uSDX information can be found at:
 * DL2MAN's website: <https://dl2man.de/>
 * The (TR)uSDX forum: <https://forum.dl2man.de/>
 * YouTube DL2MAN channel: <https://www.youtube.com/channel/UCqabnQWUjH4K3FJtxbmrIA>

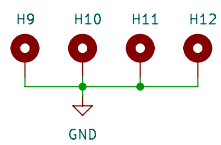


Suggested Mod for J1:
Rather than female; the connector should be male since there is not power on these pins when the RF board is not attached to the main board.

Latching Relay Control (Band Select)



MountingHole_Pad
pcb four corners



Latching Relay Notice:

The relays are latching types, the coil is only energized to toggle the relay mechanical force maintains the 'toggle'. However, strong vibrations or sudden impact(s) can cause a relay to 'toggle' changin the LPF configuration and, therefore, performance. This change is NOT detected by the software and will not be shown on the display. If such a condition is suspected it can be corrected by changing to another band and back, or by powering off/on the radio.

Capacitor/Toroid Notes:

For Band LPF Modules use only:
* NPO/COG Capacitors rated for at least 100V
* Toroids from Micrometals or Amidon

Winding the toroids; 0.4mm(18mil)[26ga] wire is specified. Smaller diameter wire will decrease the Q of the inductor and a larger wire will increase it.

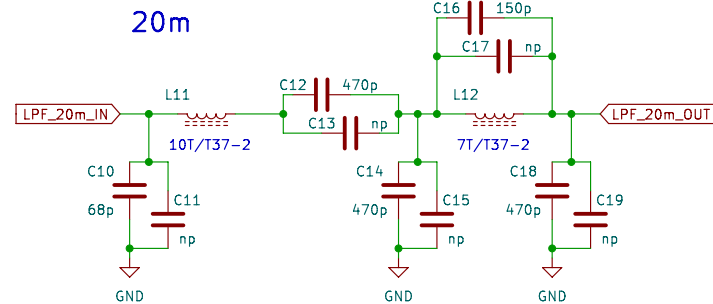
When winding the LPF toroids, the spacing between turns will affect the inductance slightly. Start with evenly spaced turns around the toroid. Avoid overlapping windings. After the build, the spacing can be adjusted to 'tune' the LPFs for each band using equipment such as a nanoVNA.

Band Slots – LPF Filters for 'Lo' bands (20/30/40/60/80m)

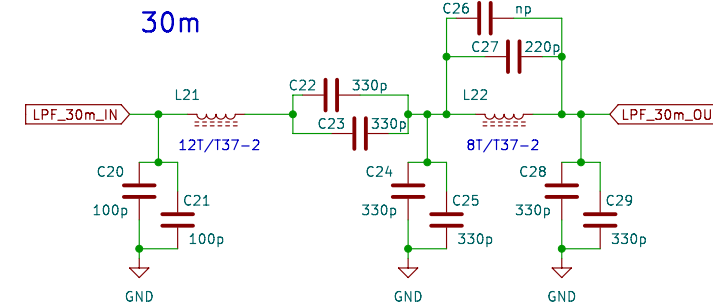
Using three BS170s (Q1, Q2 and Q3)
If using Q4 or Q5 or a different MOSFET output driver, the LPF values may need adjusting.

See sheet 2 and <https://dl2man.de> for more information.
*Capacitors not placed/installed are shown with a value of 'np'.

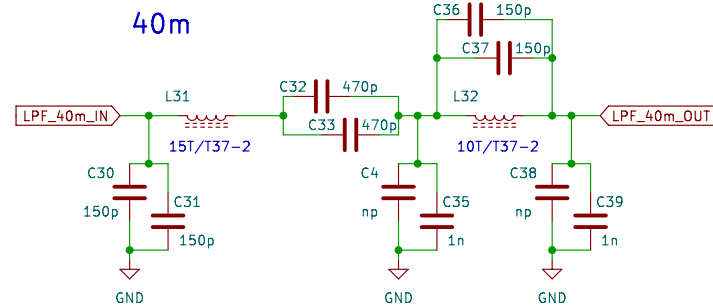
Band Slot 1



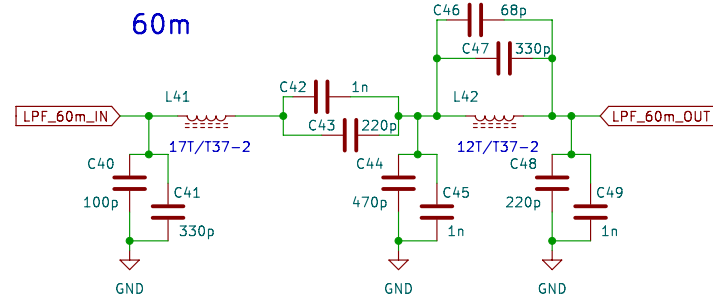
Band Slot 2



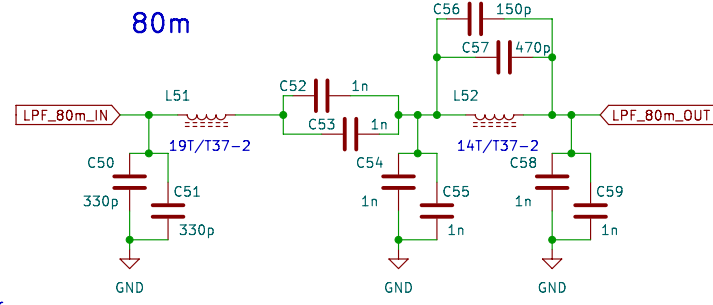
Band Slot 3



Band Slot 4



Band Slot 5

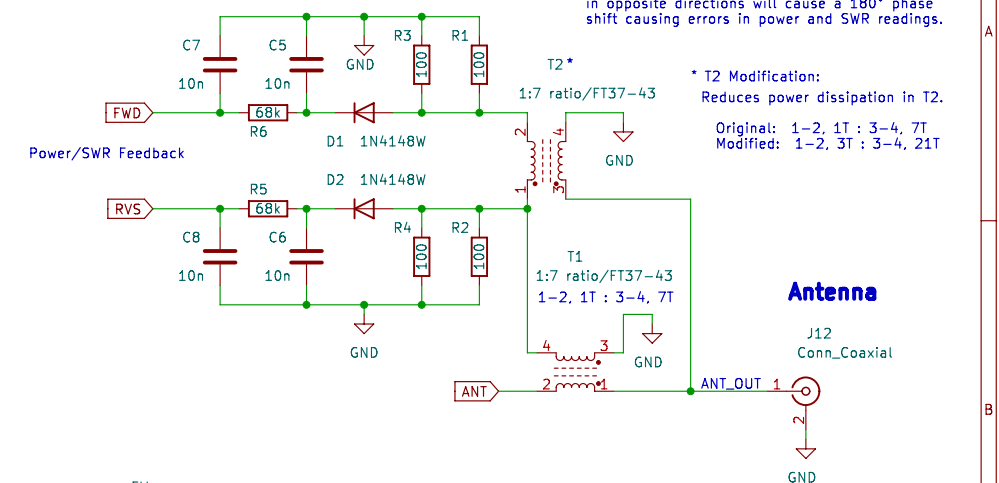


Note: The component numbering scheme in each band slot is as follows:

The first number is the slot and the second number is unique to the component. For example; capacitors are numbered 'Cny', where 'n' is the band slot and 'y' identifies the specific component within that slot. Same for 'Lny'.

Relays are simply 'Kn' where 'n' is the band slot.

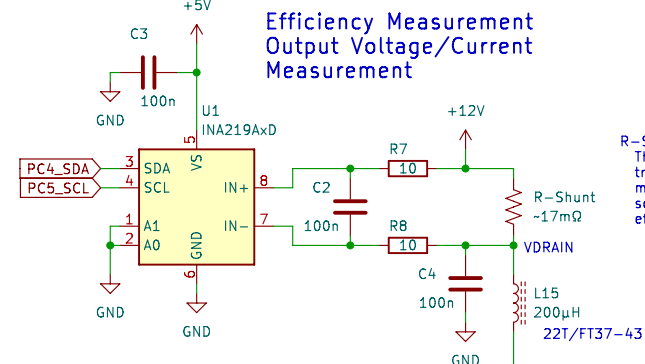
Power/SWR



T1, T2 NOTE:
Note the polarity of the windings of T1 and T2. Windings should be in the same direction so to have 0° phase between primary/secondary. Winding in opposite directions will cause a 180° phase shift causing errors in power and SWR readings.

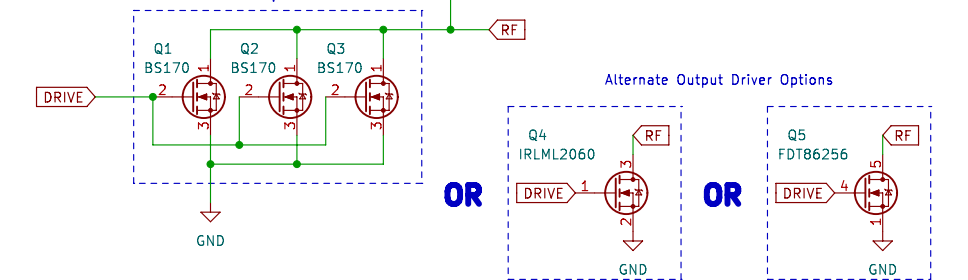
* T2 Modification:
Reduces power dissipation in T2.
Original: 1-2, 1T : 3-4, 7T
Modified: 1-2, 3T : 3-4, 21T

Efficiency Measurement Output Voltage/Current Measurement



R-Shunt
This value is due to resistance of the PCB trace resistance. This is intentional and may vary slightly from board to board. The software uses this value to calculate the efficiency. See menu '8.6 R Shunt'.

MOSFET Output Drivers



OR OR
Pads for these SMA transistors are placed on the opposite side of board from other components (relays, coils, etc).

More Information:

Videos of the build, tuning and other (tr)uSDX information can be found at:
* DL2MAN's website: <https://dl2man.de/>
* The (TR)uSDX forum: <https://forum.dl2man.de/>
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80m/60m/40m/30m/20m		
Serial resonance Class E with SWR measurement		
Original Schematic: 2021-11-27		
Redrawn & notes added: KD4SGE & WA4ITD {revision denoted by () after Rev: below}		
DL2MAN & PE1NNZ		
Sheet: /	File: (tr)uSDX_RF_Board.kicad_sch	
Title: (tr)uSDX RF Board		
Size: A3	Date: 2022-06-11	Rev: 1.0 (e)
KiCad E.D.A. kicad (6.0.5)	Id: 1/2	

Alternate RF Bands
KICAD link to second page.

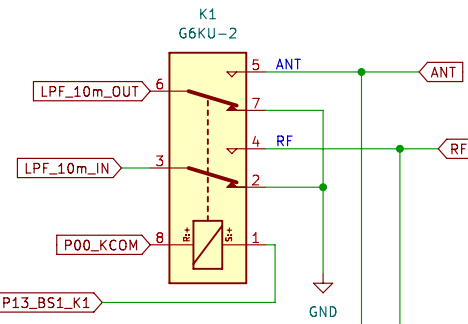
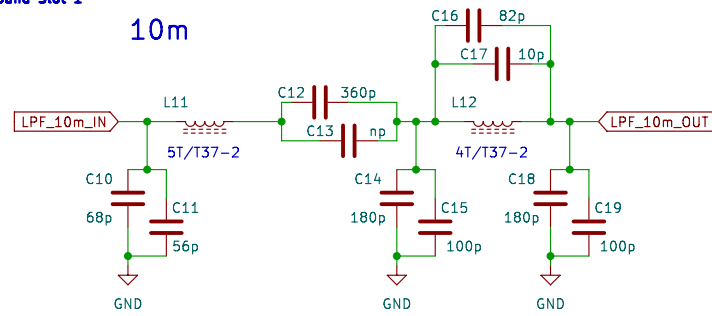
File: (tr)uSDX_RF_Board-AltBands.kicad_sch

Band Slots – LPF Filters
 for 'Classic' band (10/15/20/40/80m)
 Tested by DL2MAN (20 May 2022)
 Using Q5, FDT 86256 with a PA Bias of 160

More info: <https://dl2man.de/2-trusdx-assembly/>

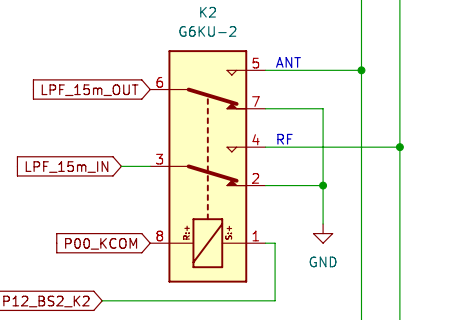
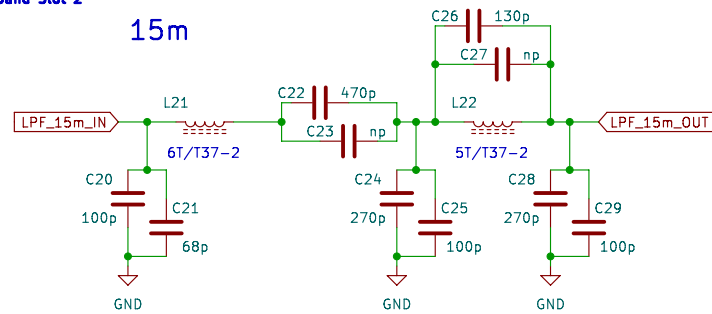
Band Slot 1

10m



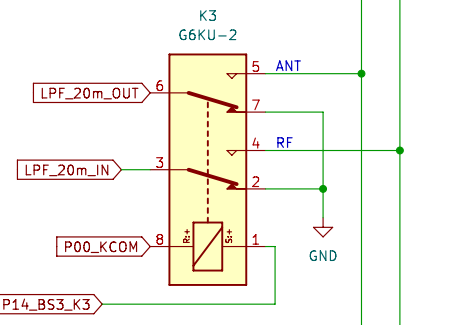
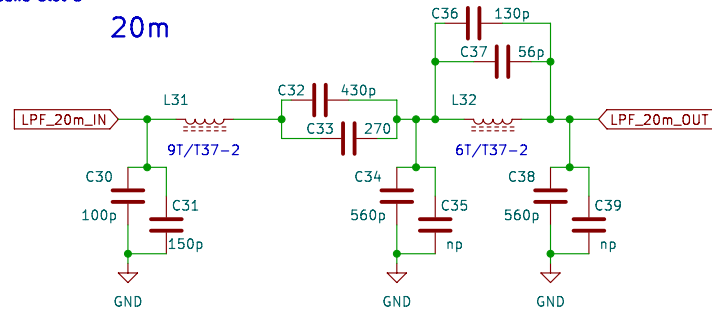
Band Slot 2

15m



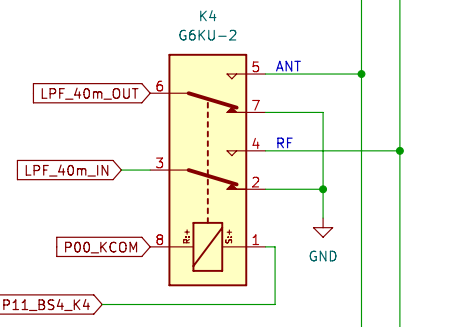
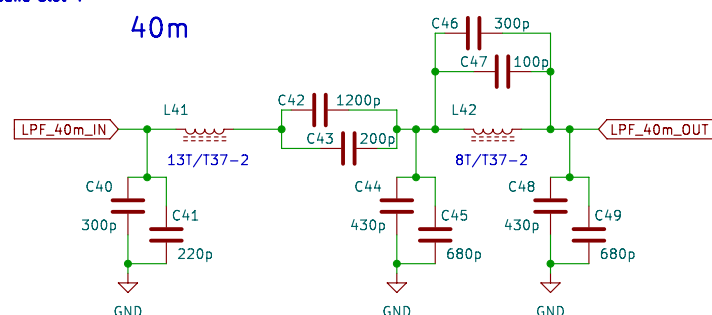
Band Slot 3

20m



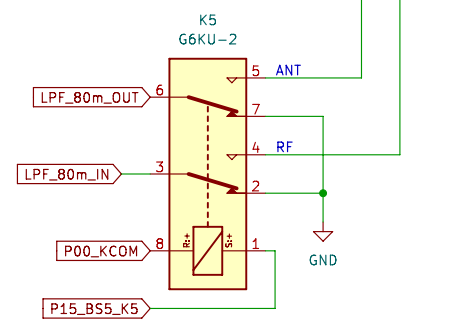
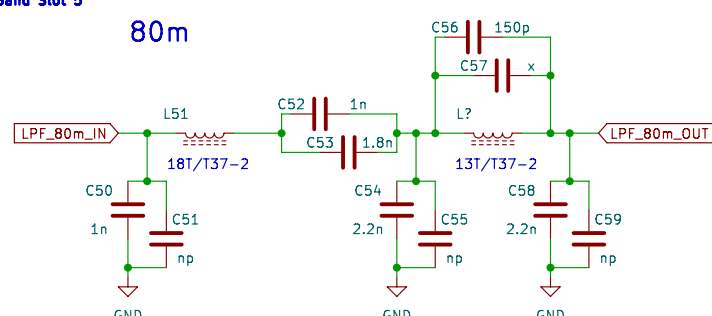
Band Slot 4

40m



Band Slot 5

80m



Generic Band LPF Design

LPF – Low Pass Filter

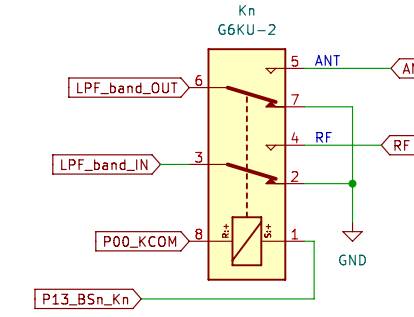
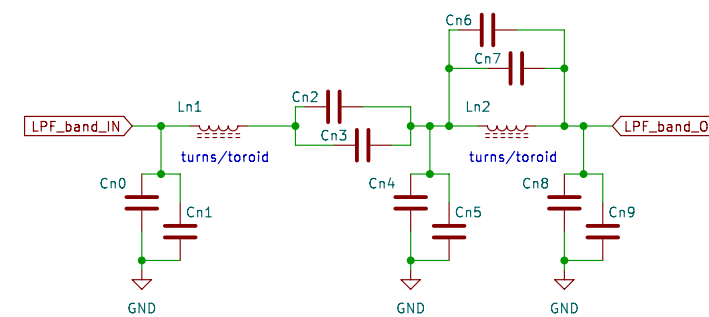
The LPF component reference number has the following pattern:

Simply, each component is referenced by a letter and two numbers. The first number is the band slot, 'n' and the second number, 'y' is the specific component.

For example, capacitors would be 'Cny'. There are ten capacitors in each LPF. So, in Band Slot 1 the reference for each capacitor would be C10, C11, C12...C19. In Band Slot 2 it would be C20, C21, C22... C29. And so on for Band Slots 3 to 5.

Inductors, Lny, follow the same scheme.

Relays are an exception as there is only one relay per LPF. So a relay, K, is simply 'Kn'.



LPF Design Note #1:

The values of the capacitors and inductors can vary for several reasons. Some of those reasons are as follows:

- * The PCB traces add stray capacitance and inductance.
- * Changing the output MOSFETs; either by switching from Q1,2,3 to Q5 to Q6 or installing a different MOSFET(s).
- * Whether T2 has been modified for 1:7 turns to 3:21 turns.

As a result, for a given band, the capacitance and inductor values may vary slightly from board to board and as MOSFETs are changed. So when using values given by other users, the MOSFET should be specified and even then, would simply be a starting point for tweaking the LPF.

The (tr)uSDX provides for only three bands configurations: Lo, Hi and Classic. Each configuration expects a given band LPF to be in a given band slot. So for the 'Lo' bands; the 20m band(LP) is expected to be in band slot 1, the 30m(LP) to be in band slot 2, and so on. Failing to follow this can result in unexpected results and transmission on unintended frequencies.

Band Slot	1	2	3	4	5
Relay Assignment	K1	K2	K3	K4	K5
Lo (current Standard)	20m	30m	40m	60m	80m
Hi (Only Hi Bands)	10m	12m	15m	17m	20m
Classic (Classical Bands w/o WARC)	10m	15m	20m	40m	80m

Alternate band and LPF information		
Serial resonance Class E with SWR measurement		
Original Schematic: 2021-11-27		
Redrawn & notes added: KD4SGE & WA4ITD {revision denoted by () after Rev: below}		
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Title: (tr)uSDX RF Board – Alternate Bands		
Size: A3	Date: 2022-06-12	Rev: 1.0 (e)
KiCad E.D.A. kicad (6.0.5)		Id: 2/2