

## 2 (tr)uSDX Assembly

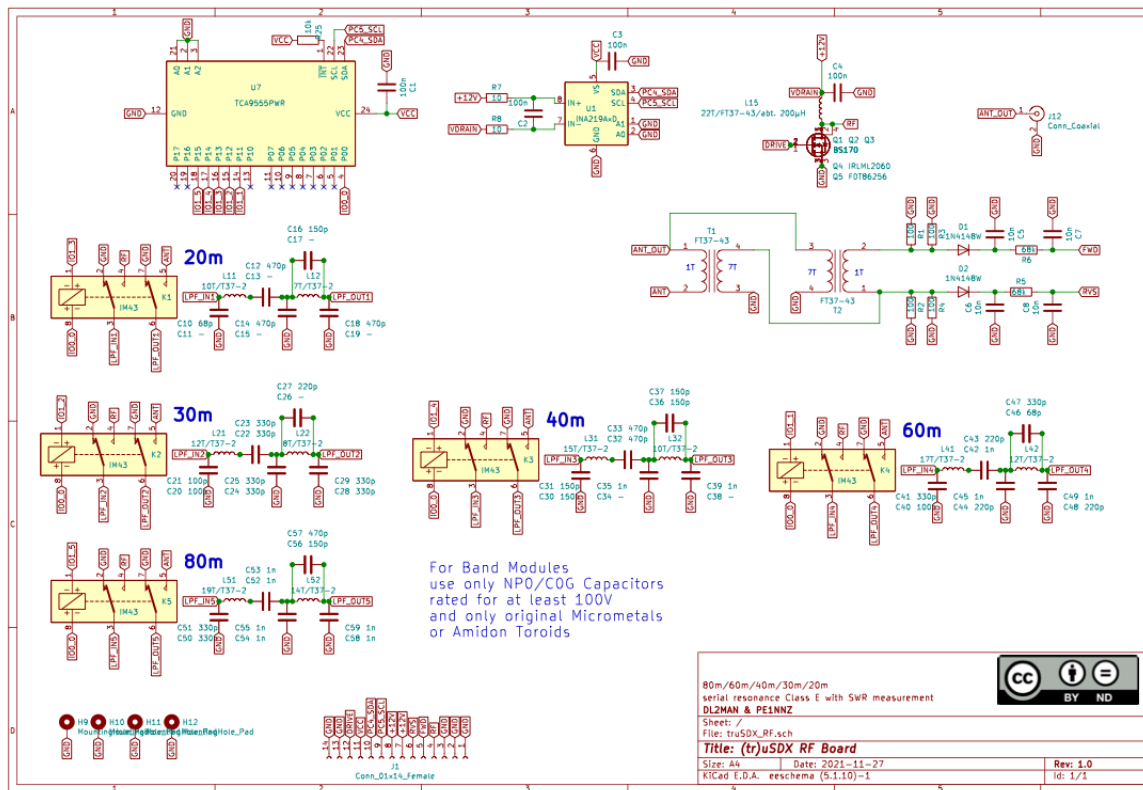
(tr)uSDX #2 - complete assembly Instructions



DOWNLOAD < [HTTPS://DL2MAN.DE/WP-CONTENT/UPLOADS/2021/12/TRUSDx\\_MAIN\\_SCHEMATIC\\_1.0.PDF](https://dl2man.de/wp-content/uploads/2021/12/TRUSDx_MAIN_SCHEMATIC_1.0.pdf) >

**truSDX\_Mainboard\_ibom\_1.0 < [https://dl2man.de/wp-content/uploads/2021/12/truSDX\\_Mainboard\\_ibom\\_1.0.html](https://dl2man.de/wp-content/uploads/2021/12/truSDX_Mainboard_ibom_1.0.html)>**

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truSDX\_RF\_Schematic\_1.0 < [https://dl2man.de/wp-content/uploads/2021/12/truSDX\\_RF\\_Schematic\\_1.0.pdf](https://dl2man.de/wp-content/uploads/2021/12/truSDX_RF_Schematic_1.0.pdf) f>

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**truSDX\_RF\_ibom\_1.0 < [https://dl2man.de/wp-content/uploads/2021/12/truSDX\\_RF\\_ibom\\_1.0.html](https://dl2man.de/wp-content/uploads/2021/12/truSDX_RF_ibom_1.0.html)>**

DOWNLOAD < [HTTPS://DL2MAN.DE/WP-CONTENT/UPLOADS/2021/12/TRUSDX\\_RF\\_IBOM\\_1.0.HTML](https://dl2man.de/wp-content/uploads/2021/12/truSDX_RF_ibom_1.0.html)>

Alternative, very comprehensive Schematic, drawn by KD<sub>4</sub>SGE  
& WA<sub>4</sub>ITD:

## (tr)uSDX – 5-Band / Multimode QRP Transceiver

efficient Class E PA and Supports CW/LSB/USB and AM/FM. It covers by default 80/60/40/30/20m (alternative Filter Setups possible)



The (tr)uSDX is a 5-Band / Multimode QRP Transceiver in Pocket Format (90x60x30mm – 140g). It features a highly efficient Class E PA and Supports CW/LSB/USB and AM/FM. It covers by default 80/60/40/30/20m (alternative Filter Setups possible)

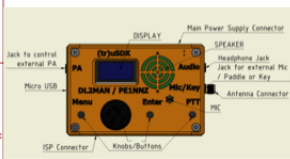
It is supplied with an OLED Display, onboard Mic, (tiny) onboard speaker and for improvised QSD onboard PTT-Key can be used as emergency CW-Key.

Further on, the (tr)uSDX has a (Micro)USB CAT and Programming Interface, and while it produces typically 5W @ 13.8V Power Supply. It can create 0.5W Output from 5V USB Supply alone.

Typically it draws 80mA on RX (with M55351 – less with S15351) and 500mA on TX @13.8V and typical 85% PA Efficiency.

It is supplied with OnBoard SWR Bridge and Voltage/Current measurement Hardware, to help in tuning and operation.

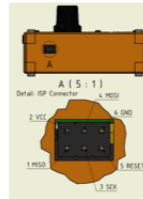
General Overview



External Connections



ISP Connection



## Programming

### Bootloader

The Bootloader needs to be installed only once, before the Firmware can be installed. Normally, for Group Buy or Kit Buy, the organizer would normally have installed the Bootloader. The Firmware cannot be loaded via the USB port without first installing the Bootloader. Installing the Bootloader requires an ISP programmer, while there are many ISP programmers that can be purchased, an Arduino Uno can be used as an ISP programmer.

More information about loading the Bootloader and using an Arduino Uno can be found here:

<https://dl2man.de/3a-trusdx-bootloader/>

If the Bootloader has been installed according to the instructions at the link above AND the Firmware has not been installed yet, then every time the (tr)uSDX is powered on, an 18 digit hexadecimal number will appear on the display. This hexadecimal number is the serial number, which must be written down and kept – once the Firmware is installed, this number will not be displayed anymore unless the EEPROM is erased when the Bootloader is reinstalled. And this number is required in order to download the Firmware from the (tr)uSDX website.

### Firmware

You will need the 18 digit hexadecimal 'serial number' to download the firmware, (see Bootloader instructions). Your Callsign is optional. Instructions and more information about loading the Firmware can be found at:

Firmware Page: <https://dl2man.de/3b-trusdx-firmware/>

Software updates will be announced in the (tr)uSDX Forum. <https://forum.dl2man.de/>

and provided on the Firmware page for download. An experimental beta, when available, is uploaded here:

Beta Firmware: <https://dl2man.de/wp-content/uploads/2022/01/wp.php/beta.html>

This is the top sheet in the schematic hierarchy. The idea is to organize the hierarchy such that when the sheets are printed, they maintain a grouping and order: all the sheets related to the main board are grouped together – in order followed by the RF board sheets. The assembly goes in to keep the wiring simple in the final build. Notice that every sheet has a unique ID: 1/1, 1/2, 1/3, 1/4, 2/1, 2/2, and so on, where '1' is the number of sheets.

Notice the hierarchical links to the main board and RF board schematics. The top sheets should be printed for these sheets: any sub-sheets for the main board should be at the main board sheet. Same for any sub-sheets for the RF board.

(tr)uSDX Main Board v1.0

This is a KICAD hierarchical link to the main board schematic.

(tr)uSDX RF Board v1.0

This is a KICAD hierarchical link to the RF board schematic.

### 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/UCqgmQWjUvKX3FJbkmr1A>

This Schematic is no modification to the Original work, and approved by DL2MAN/PE1MIZ

Retrieved with notes: K14566 & W14170 (revision denoted in ( ) after Rev 1.0 below)

Original Schematic: Rev 1.0 Date: 2021-11-27

DL2MAN & PE1MIZ

File: (tr)uSDX\_Main-RF\_Schematics\_v1.0.kicad.sch

Sheet: 1/1 Date: 2022-06-29

Rev: 1.0/1

IC: 1/1

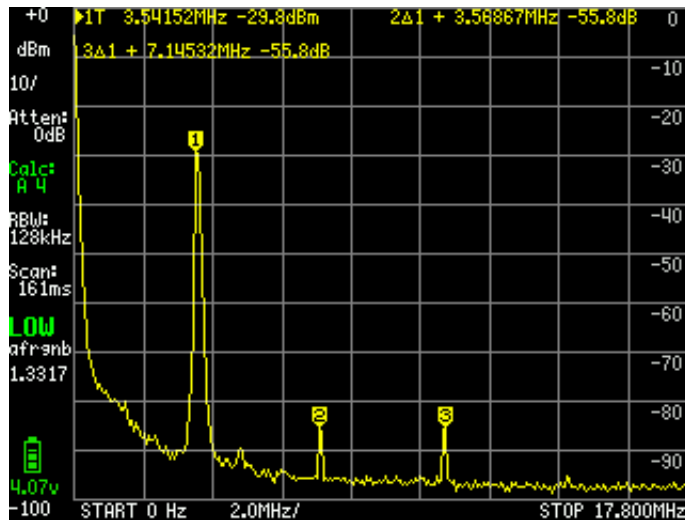
**truSDX\_Main-RF\_Boards\_with\_Notes\_v1.0k-1 <  
https://dl2man.de/wp-content/uploads/2022/07/truSDX\_Main-RF\_Boards\_with\_Notes\_v1.0k-1.pdf>**

DOWNLOAD < [HTTPS://DL2MAN.DE/WP-CONTENT/UPLOADS/2022/07/TRUSDX\\_MAIN-RF\\_BOARDS\\_WITH\\_NOTES\\_V1.0K-1.PDF](https://DL2MAN.DE/WP-CONTENT/UPLOADS/2022/07/TRUSDX_MAIN-RF_BOARDS_WITH_NOTES_V1.0K-1.PDF)>

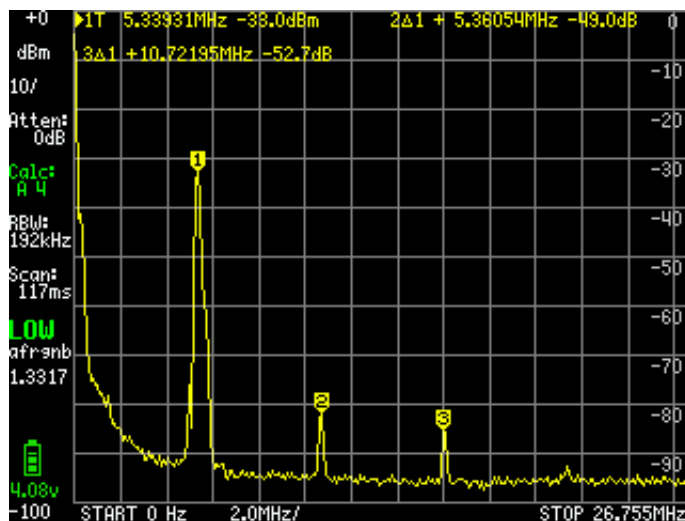
**After Assembly, you need to install Firmware <  
<https://dl2man.de/3b-trusdx-firmware/>>**

**[Klick here to get to the Group Buy Instructions < https://dl2man.de/r-trusdx-group-buy/>](https://dl2man.de/r-trusdx-group-buy/)**

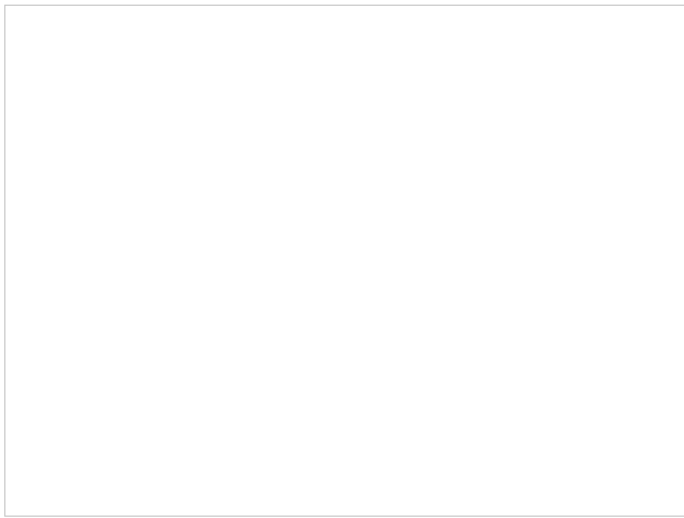
Here are the Results of the Harmonic measurements:



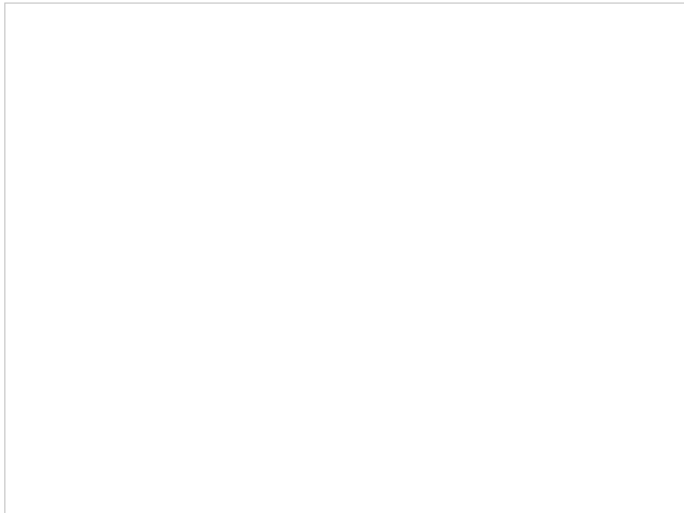
80m



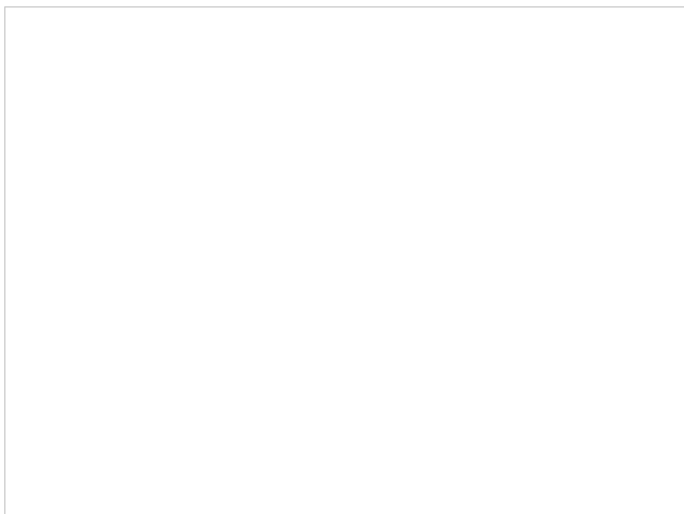
60m



40m



30m



20m



The TRX was un-tweaked, and built completely according to the Schematic Values of Capacitors and Toroids. Harmonic suppression is better than -43dB on ALL Bands.

(tr)uSDX - Tuning the RF Section for Output Power and Efficie...



A Video on Filter Tuning

UPDATE: 16. March 2022:

### **Alternative Bands Setups**

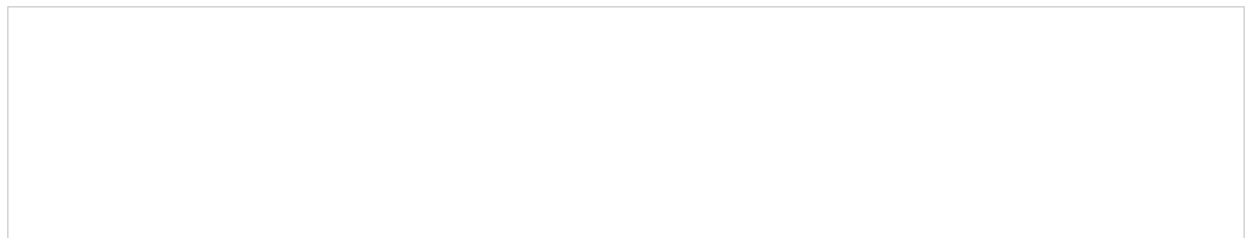
We've got many user requests for alternative Band Setup. Personally we're not really interested in that and lack the time to double- and triple check all the Information, but we wanted to give you -the user- the possibility to play around with it. Since (tr)uSDX is supposed to be a standardized rig, we cannot allow for totally custom Band Selection, but we've prepared 3 Options in Firmware for you:

Band-Slot Assignment	K1	K2	K3	K4	K5
<b>Lo</b> (current Standard)	20 m	30 m	40 m	60 m	80 m
<b>Hi</b> (Only Hi Bands)	10 m	12m	15m	17m	20 m
<b>Classic</b> (Classical Bands w/o WARC)	10 m	15m	20 m	40 m	80 m

Can be selected at in Menu 8.7 "Band Config"

UPDATE 08. May 2022:

Here are my Results with "Classic Bands" Setup, using the FDT 86256 FET: (Again UPDATED 20 May 2022)



< [https://dl2man.de/wp-content/uploads/2022/05/FDT\\_NEW\\_CLASSIC-2.jpg](https://dl2man.de/wp-content/uploads/2022/05/FDT_NEW_CLASSIC-2.jpg) >

Because of higher gate threshold value, this FET requires higher PA BIAS Max Setting of 160 for best performance. With PA Bias Max 160 it was possible to get at or above 80% up to 10m Band, even with Red Toroids.

I was using the Toroids and PCB provided by our official Supplier Sunny.

END Update

## **IMPORTANT !**

The below Tables represent **UNTESTED** Component Values !  
Use them with caution at your own Risk. The Values need to be tweaked for 5W@12V and Efficiency over 80%. Please report back in the forum about the Values that actually made it happen for you.

**ATTENTION: This Table are THEORETICAL Values for 1x FDT86256 (Install ONLY Q5 as PA FET)**

Band	80 m	60 m	40 m	30 m	20 m	17m	15 m	12m	10m
F (MHz)	3,6 0	5,3 5	7,10	10,1 0	14,1 5	18,0 8	21,1 0	24,9 0	28,1 0
CX0//C X1	104 1	697	523	36 4	257	199	169	142	125
CX2//C X3	276 5	186 0	140 2	985	703	550	472	400	354
LX1	1,3 4	0,9 0	0,6 8	0,4 8	0,3 4	0,27	0,2 3	0,19	0,17
CX4//C X5	221 2	148 8	112 1	788	563	440	377	320	283
CX8//C X9	221 2	148 8	112 1	788	563	440	377	320	283
LX2	0,6 6	0,4 5	0,3 4	0,2 4	0,17	0,13	0,11	0,10	0,0 9
CX6//C X7	737	496	374	263	188	147	126	107	94

**This Table is for 1x FDT86256 (All Inductances in  $\mu$ H – All Caps in pF)**

**ATTENTION: This Table are THEORETICAL Values  
for 3x BS170 (Install ONLY Q1,Q2 and Q3 as PA FET)**

Band	80 m	60 m	40 m	30 m	20m	17m	15m	12 m	10m
F (MHz)	3,5 6	5,3 5	7,0 5	10,1	14,0 5	18,0 8	21,0 5	24, 9	28,0 5
CX0//C X1	657	420	30 7	199	128	88	69	50	39
CX2//C X3	186 4	124 0	941	65 7	472	367	315	26 6	237
LX1	2,0 4	1,3 6	1,0 3	0,7 2	0,52	0,4	0,3 5	0,2 9	0,26
CX4//C X5	182 6	121 5	92 2	64 4	463	360	309	261	232
CX8//C X9	182 6	121 5	92 2	64 4	463	360	309	261	232
LX2	0,8 2	0,5 5	0,4 1	0,2 9	0,21	0,16	0,14	0,1 2	0,1
CX6//C X7	609	405	30 7	215	154	120	103	87	77

This Table is for 3xBS170 (All Inductances in  $\mu\text{H}$  – All Caps in pF)

Depending on your Setup, you only need to place the desired Component-Values to the Right Band-Slots together with the FET you want to use and Activate it in Firmware.

## FAQ:

$CX_O // CX_I$  ????

X Stands for Band slot (e.G. 1 for  $K_I$  -> so this would be then  $C_{I0} // C_{I1}$ )

“//” means: Those 2 are in Parallel. Putting Capacitors in Parallel is a simple Addition of Capacitance

### **Example:**

$CX_O // CX_I$  for FDT86256 and 80m is supposed to be 1041pF

So we need to find 2 (available) Capacitor-Values, that will result in a total Capacitance closest to 1041pF as possible.

470pF//560pF would be close = 1030pF

620pF//430pF would be close = 1050pF

680pF//360pF -> BINGO = 1040pF

but a lot of other combinations are possible. Just use what you can get or have available and try to get as close as possible.

There might also be cases where you can achieve it with just one Cap. In this case place it to one of the 2 available Cap-Footprints and leave the other one empty.

Remember: (tr)uSDX Filter Capacitors ALWAYS need to be CoG/NP0 Types, rated for at least 100V !

Use some online or offline tool, to calculate the amount of

Windings for your Toroids. I like this one:

[https://www.dlohst.de/mini-ringkern-rechner.htm#en < https://www.dlohst.de/mini-ringkern-rechner.htm#en>](https://www.dlohst.de/mini-ringkern-rechner.htm#en)

Depending on Frequency you can use either T37-2 (Red) or T37-6 (Yellow) Toroids.

Happy tuning !

[\(tr\)uSDX < https://dl2man.de/>](https://dl2man.de/)

[FORUM < https://forum.dl2man.de>](https://forum.dl2man.de/)

[uSDX Sandwich < https://dl2man.de/sample-page/>](https://dl2man.de/sample-page/)

[QCX Mini -> uSDX Mod < https://dl2man.de/qcx-mini-usdx-mod/>](https://dl2man.de/qcx-mini-usdx-mod/)

[Impressum < https://dl2man.de/imprint/>](https://dl2man.de/imprint/)