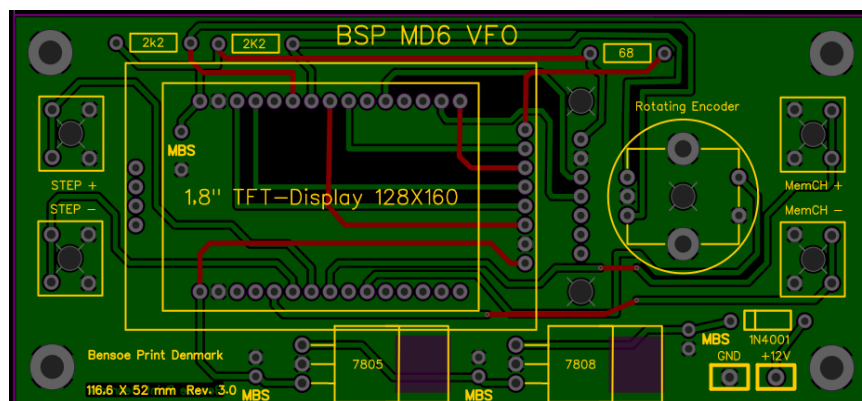
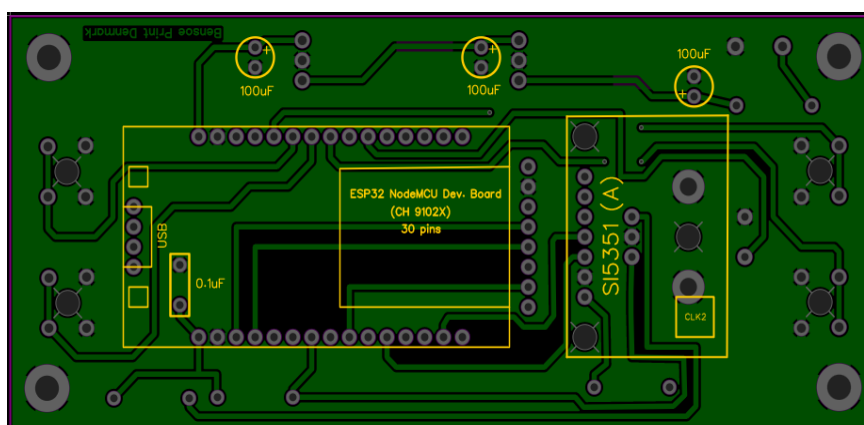


Instructions for mounting of the BSP module MD6 VFO (1)

Bensoe Print Denmark.



The PCB 'front page + Tracks' (116.6 X 52 mm).



The PCB 'back side'.

Description:

Our MD6 VFO is a so-called 'DDS VFO' (Data Distribution Service), which in our case means a frequency generating unit 'SI 5351(A)' (PLL), controlled by a small computer (CPU) 'ESP 32 DEV', which also controls a small 1.8" TFT display 'ST 7735' (128*160).

The original software originates from the Japanese radio amateur 'JF3HZB'.

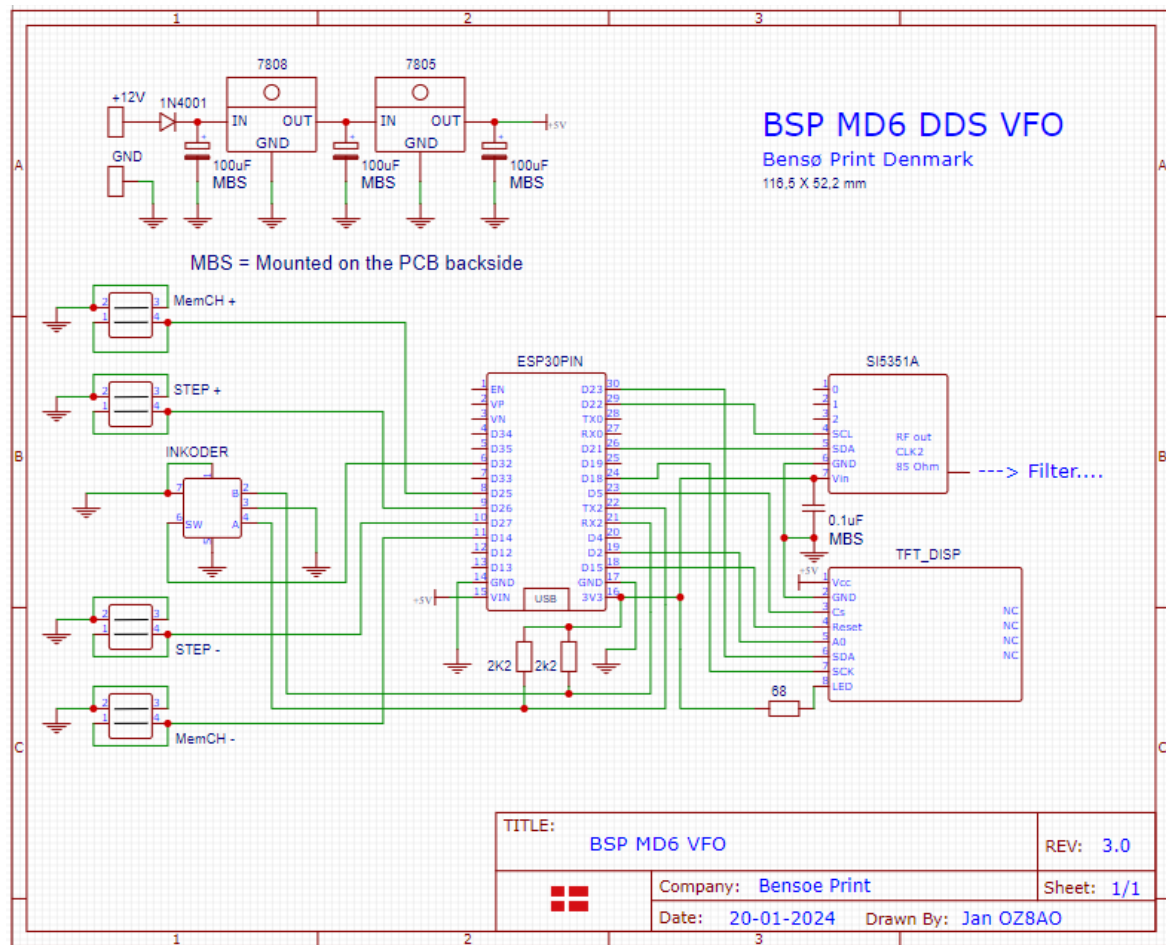
The CPU gets its inputs from 4 pcs. 'torque switches', as well as a 'rotary encoder' for the frequency setting. On the 4 switches, you can select frequency steps (10 Hz. to 10 MHz. + 12.5 kHz for 2 meter canal use) and 20 fixed frequencies (see table further on), plus by pressing the encoder's button, an own frequency which is saved and remembered at start-up.

The CPU supplied by us is pre-programmed as 'VFO' for a 10.7 MHz. IF frequency, which means that it emits a frequency of 10.7 MHz. higher than shown on the display.

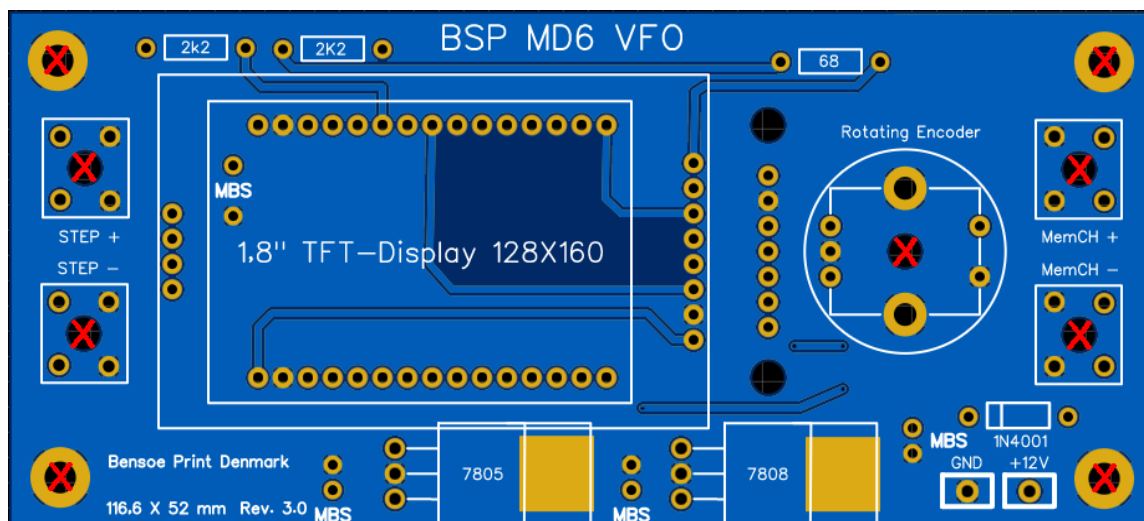
Since the 'PLL unit' outputs 'squares/not sine', it must be followed by a 'PLL filter', see our BSP catalog for details.

The VFO can also be supplied **for other IF frequencies**, e.g. 21.4 MHz, 9 MHz. and 455 kHz. or as a **'Signal generator'** directly on the frequency.

The VFO can also be supplied prepared for an external **'clock module'** to be connected to the 5351 PLL circuit, see more about our Mercury clock module in our catalogue. Our VFO can also be delivered in a 10 MHz clock version for precisions OCXOs. Remember this when you order your VFO.

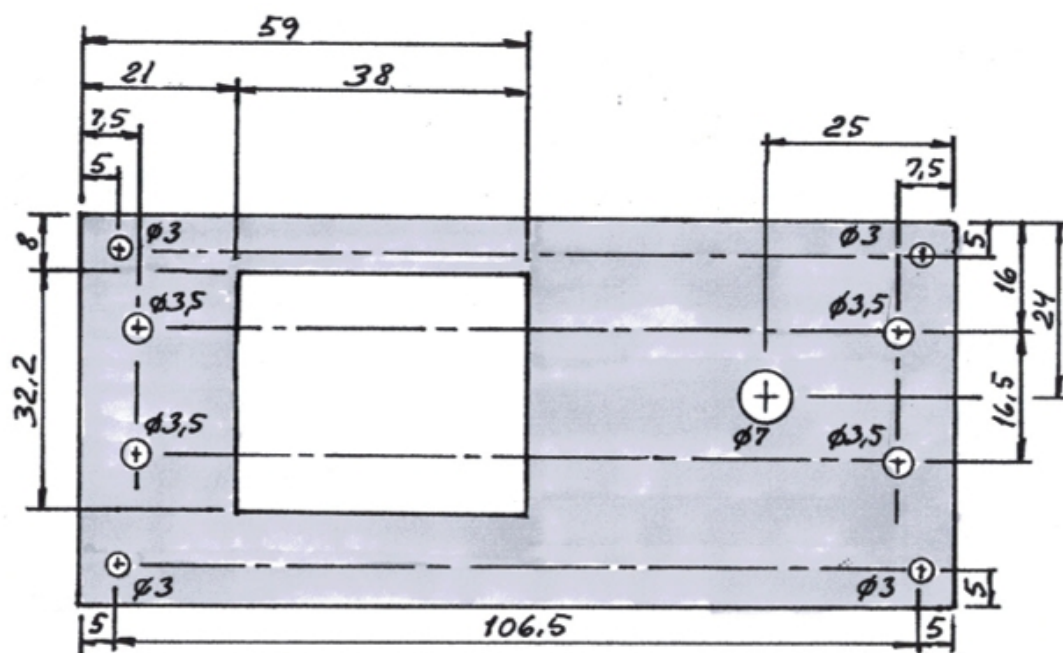


First step. Installation in the cabinet:



Why think of the cabinet as the first thing already now?

Because before you start putting components in the printed circuit board, you can use the printed circuit board directly as a 'drill jig / drilling template'. Place the print on the front plate of the cabinet and mark via the holes, which are marked with a red cross. Namely the four switches, the Encoder and the four mounting holes.



Here is the final assembly drawing for the front plate with hole for the display.

No, we do not use SMT here in the shop...



Assembling the PCB:

General: The components marked 'MBS' must be (Mounted on the BackSide) of the PCB board.

Start by mounting the two '15 PINs headers' on the back of the PCB. They are both soldered from the front of the PCB. (Save 7 PIN a little longer).

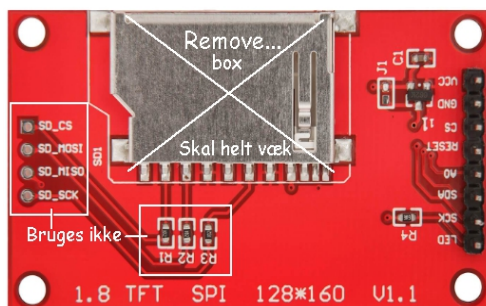
The length of the headers (PIN number) can be adjusted with a 'good wire cutter'.

Fit the 0.1 uF shown, also on the back of the PCB, soldered from the front.



Preparation of TFT display:

In order to get a good and neat cabinet mounting of the VFO, the display and control buttons must 'flush' and therefore the height of the display must be reduced.



The small 'metal box' shown on the back must therefore be removed. This is done with a soldering iron and needle nose pliers. Heat and lift (one at a time) the four small 'feet' the box is fitted with.

The 'plastic gizmo' which sits hidden inside the box is 'wiggled free' and removed completely. The mentioned '4 PINs header' is mounted with the short pin in the display PCB. has no electrical function, but is used to stabilize the display assembly mechanically.

PS: Normally there are PIN-Headers included with the display and the PLL, if not, you must use your own purchased as shown in the picture (male connector).

Now mount the display, make sure it is 'all the way down' and solder to the back of the PCB.

Install now

The '7 PINs header' for the PLL module on the back of the PCB, soldered from the front.

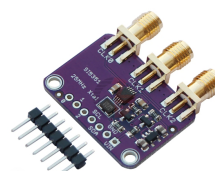
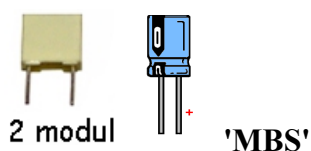
Then the rest of the components can be mounted:

Mount 7808 and 7805 on the front of the PCB. Bend the legs with a small flat-nose pliers from the 'thick point' down, solder the legs from the back side. Use the 'screw hole', to soldering the two regulators to the upper side of the print. Fit the soldering pins to the 12V voltage supply ('MBS' on the backside of the PCB).

Now mount the diode, resistors and the 3 X 100uF el-lytes (marked 'MBS') to the back of the PCB (solder from the front). Then fit the switches and the rotary Encoder.

The PLL module 'SI 5351' is now ready to be mounted:

ATTENTION... An antistatic connected soldering iron is strongly recommended.



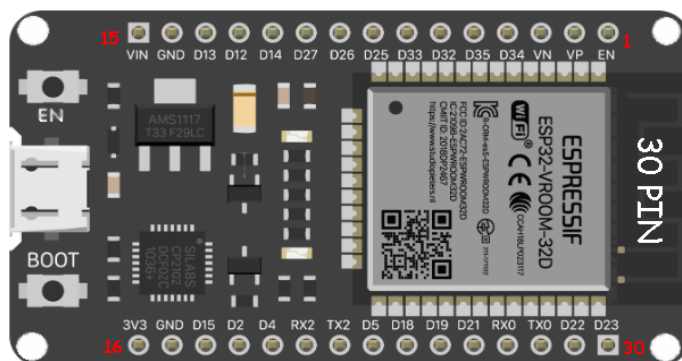
Start by drilling the 2 mounting holes with a 3.2 mm drill bit.

Now solder the supplied '7 PINs male header' (the short end) to the underside of the PLL board, solder from the top side. As shown, you can mount 'SMA plugs' on the outputs, but since we only use the CLK2 output, you only need to mount an 'SMA plug' there, or you can instead use e.g. RG178 and soldered it directly on the PCB.

Carefully 'drill out' the plastic stays mentioned in the parts list with a 3.2 mm drill bit. Turn the PLL module as shown in the illustration on the back side of the PCB. Fit the plastic stay and the 2 plastic screws while pressing it into place in the header connector. Finish with the 2 plastic nuts.

Important: During this entire 'operation', for 'anti-static reasons' it is a good idea (almost a requirement) that at the start of the handling, you simultaneously hold on to both the Encoder (the GND of the VFO) and the GND of the PLL (the SMA connector), this method is use to carry out 'static diversion'.

Mounting the 'ESP 32' CPU:



Flip the programmed 'ESP 32 Module' as shown in the illustration on the back of the PCB and press it into place in the 2 header connectors.

The test:

Connect 12 – 13.5V to the terminals 'GND and +12V'



After a boot image, the display will show up with 'something'.

The first time the VFO is switched on, the frequency will show 'something strange', this is because a 'custom' start-up frequency has not yet been loaded.

Try to display the fixed frequencies that are fixed in the system by pressing the switches 'MemCH + and -', 'STEP + and -', which indicate how much the VFO 'step in frequency' when the Encoder knob is turned (10 Hz – 10 MHz and 12,5 kHz). Select a frequency and press the Encoder button, it is now saved and the VFO will start fixed on this frequency when it is switched on again.

Embedded fixed frequencies:

Ham band:	Frontend module:
137,0 kHz. LW-band	'MD6 VLF-MB'
1,840 MHz. 160 Meter band	'MD6 VLF-MB'/'MD6 SW-KB'
3,600 MHz. 80 Meter band	'MD6 SW-KB'
5,300 MHz. 60 Meter band	'MD6 SW-KB'
7,040 MHz. 40 Meter band	'MD6 SW-KB'
10,130 MHz. 30 Meter band	'MD6 SW-KB'
14,100 MHz. 20 Meter band	'MD6 SW-KB'
18,120 MHz. 17 Meter band	'MD6 SW-KB'
21,100 MHz. 15 Meter band	'MD6 SW-KB'
24,940 MHz. 12 Meter band	'MD6 SW-KB'
28,500 MHz. 10 Meter band	'MD6 SW-KB'
50,100 MHz. 6 Meter band	'MD6 VHF6M'
70,100 MHz. 4 Meter band	'MD6 VHF'
144,000 MHz. 2 Meter band	'MD6 VHF'
Broadcast band:	
17,20 kHz. Grimeton	'MD6 VLF-MB'
198,0 kHz. BBC Radio 4	'MD6 VLF-MB'
648,0 kHz. Radio Caroline	'MD6 VLF-MB'
1,440 MHz. Radio 208	'MD6 VLF-MB'
6,055 MHz. Radio OZ-Viola	'MD6 SW-KB'
27,025 MHz. CB-band	'MD6 SW-KB'
Plus a user-selected start frequency.	

*** Parts list ***

Resistors (1/4 W 7 mm):

68 1 pcs. 2,2k 2 pcs.



Capacitors 2 module:

100nF 1 pcs.

2 modul

Electrolytes 1 module vertikal:

100uF (35V) 3 pcs.

Diode:

1N4001 1 pcs.

ICs:

7808 1 pcs. 7805 1 pcs.

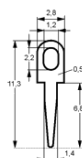
PIN-Headers:

15pin (female) 2 pcs. 7pin (female) 1 pcs.

4pin (male) 1 pcs.

Solder pins:

1,2mm hole 2 pcs.



Assembly, nylon parts: (2 pcs. of all).

Machine screw nylon M3x18mm.

Nut nylon 3mm H2.4mm.

Threaded struts nylon M3x12

Push buttons

Moment 4 pin mini for PCB med (high version) 4 pcs.

Encoder:

Rotary Encoder with Keyswitch (24 Impulse) 1 pcs.

TFT display:

1,8" ST 7735 (128*160) 1 pcs.

PLL modul:

SI 5351 (A) 1 pcs.

Programmed CPU:

ESP-32 NodeMCU Dev. Board 30 pins (CH9102X) 1 pcs..

PCB

BSP MD6 VFO 1 pcs.

When ordering a fully assembled and tested VFO, please provide the following information:

1. As a VFO for intermediate frequency. 10.7 MHz, 9 MHz or 455 kHz.
2. As a Signal Generator (directly on the frequency).
3. Should the order be for an '**external clock module, 10 or 25 MHz**' ?

Component purchase:**Bensø Print:**[Project2024](#)[Price List](#)**and****Your local dealers in your country...****[Projekt2024](#)**
