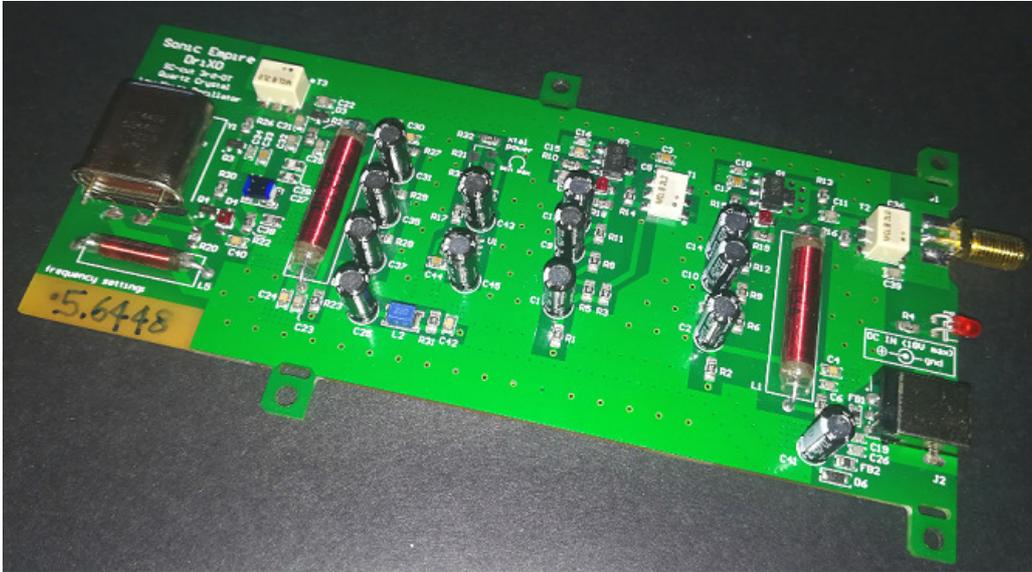


TWTMC-DRIXO Driscoll oscillator



The TWTMC-DRIXO is a state of the art oscillator to be used as the master clock for digital to analog conversion.

The output of this oscillator is sine wave therefore it needs a sine to square converter to be connected to digital devices such as FIFO or DAC (for example the TWTMC-STS).

Features:

Oscillator type: Driscoll

Frequencies: 5.6448 MHz, 6.144 MHz, 11.2896 MHz, 12.288 MHz, 16.9344 MHz, 22.5792 MHz, 24 MHz, 24.576 MHz, 25 MHz

Output: 50 Ohm sine wave (+16 dBm to +18 dBm)

Crystals: SC-Cut overtone only

Board size: 151mm x 75mm (excluding SMA connector)

Power supply: 12-18 Vdc 60 mA (15-16.5 Vdc suggested)

Suitable box: Hammond 1455J1601 (Mouser part 546-1455J1601)

Board options: finished and semi-finished

Note: supplied without crystal and box

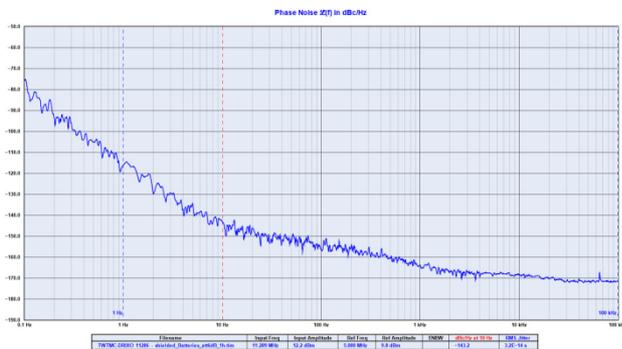
Measured phase noise of the Driscoll oscillator at different crystal frequencies: 5.6448 MHz, 6.144 MHz, 11.2896 MHz, 22.5792 MHz, 24.576 MHz.



TWTMC-DRIXO 5.6448 MHz phase noise



TWTMC-DRIXO 6.144 MHz phase noise



TWTMC-DRIXO 11.2896 MHz phase noise



TWTMC-DRIXO 22.5792 MHz phase noise



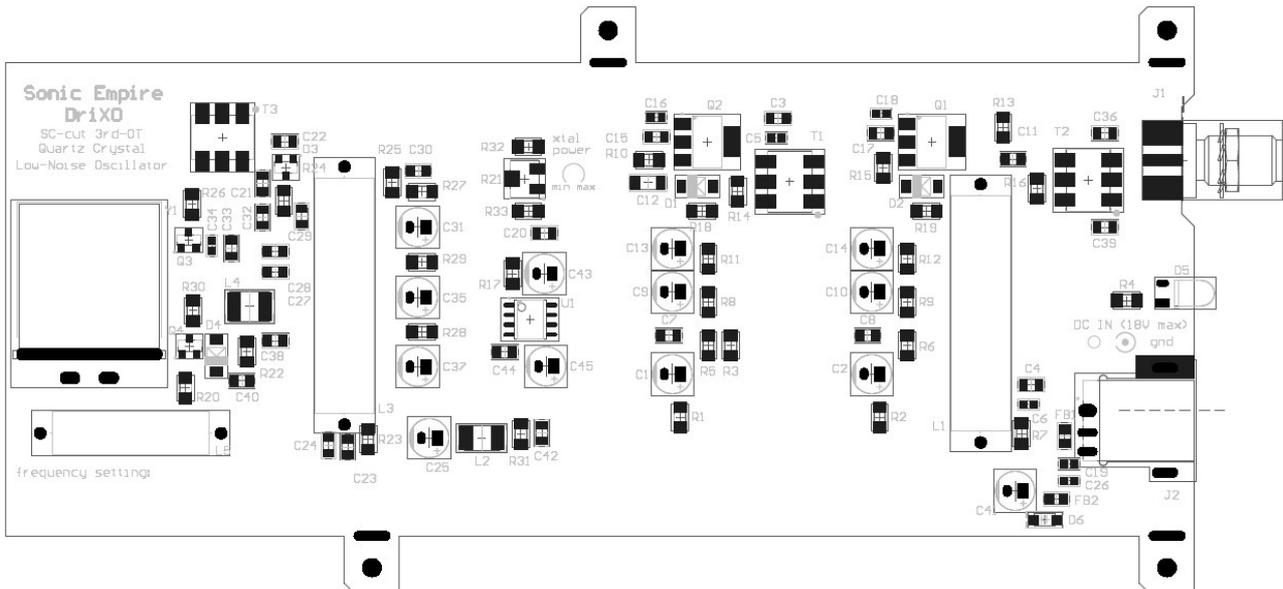
TWTMC-DRIXO 24.576 MHz phase noise

There are 2 available options for this oscillator:

- finished boards (fully assembled and tested)
- semi-finished boards (users have to solder a few parts, mostly TH)

The BOM for semi-finished board is available at post #3008 on the diyaudio.com thread: The Well Tempered Master Clock - Building a low phase noise/jitter crystal oscillator.

PCB layout



Connectors

J2: DC power supply (12 to 18 Vdc). Suitable plug connector CUI PP3-002B Mouser part 490-PP3-002B (internal is +V, external is ground). The circuit is protected against power supply polarity inversion.

J1: RF output. SMA plug connector and RG400 semi-rigid cable should be used to connect the board to other devices.

The screenshot shows the Superbat website interface for configuring custom cable assemblies. The configuration includes:

- Cable Type:** RG400
- Connector 1:** SMA Straight Plug
- Connector 2:** SMA Straight Plug

Below the configuration, there are options for Cable Length:

- 50 cm or
- 19.69 inch(s)
- 1 inch = 2.54 cm

A diagram illustrates the cable assembly with Connector A and Connector B, showing the length and the placement of Heat Shrink Tube.

Crystal: the crystal is supplied separately so it has to be soldered to the oscillator board. It's a good practice to install the crystal with thermal and vibration decoupling in order to achieve the best phase noise performance.

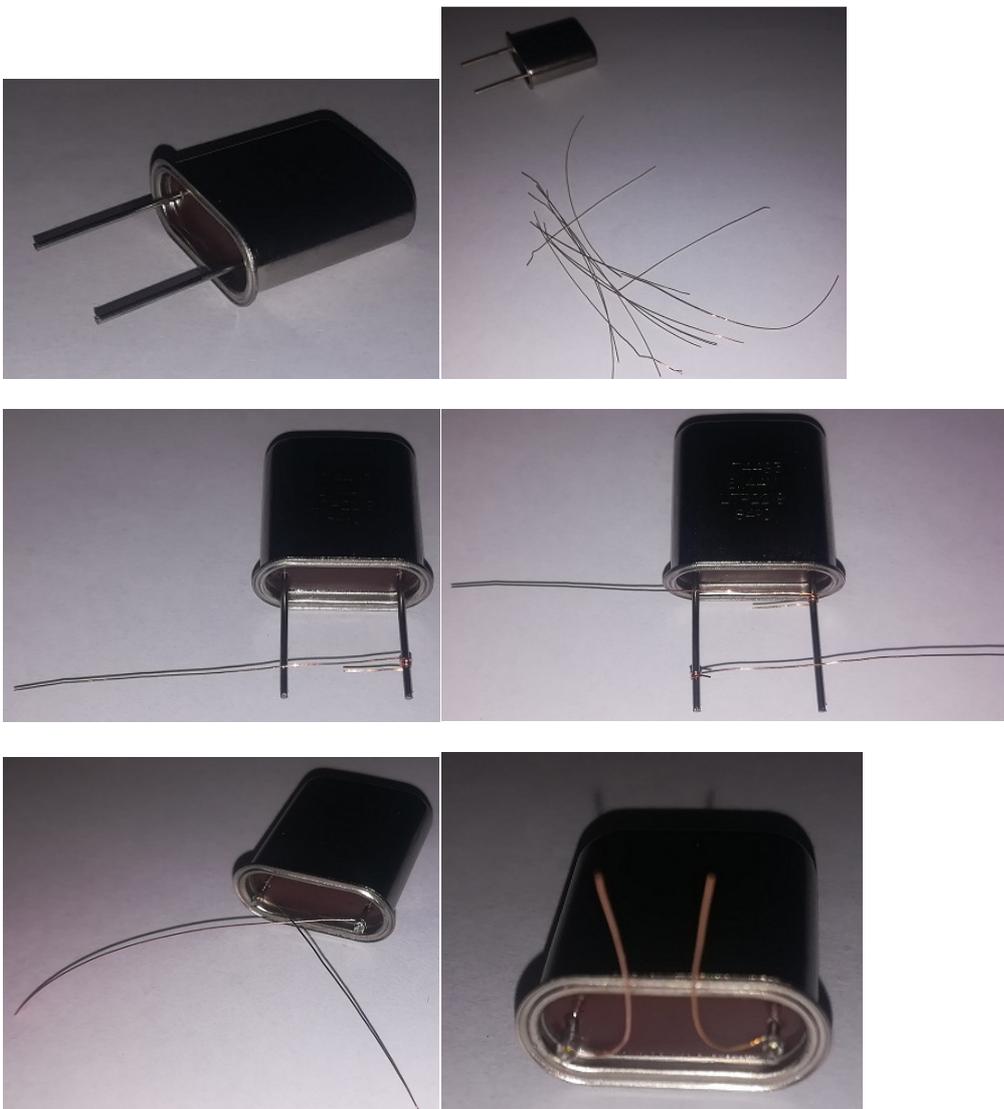
Soldering the crystal

The following figures show how to properly install the crystal on the oscillator board.

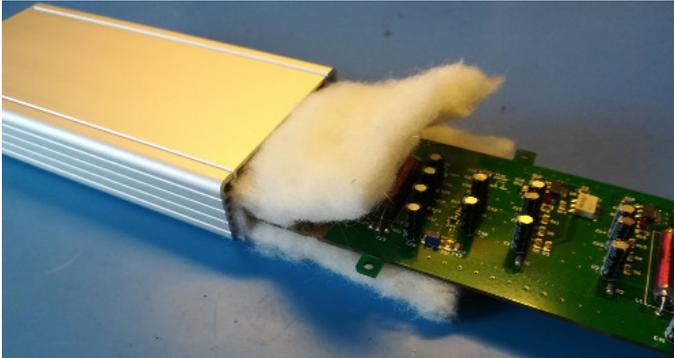
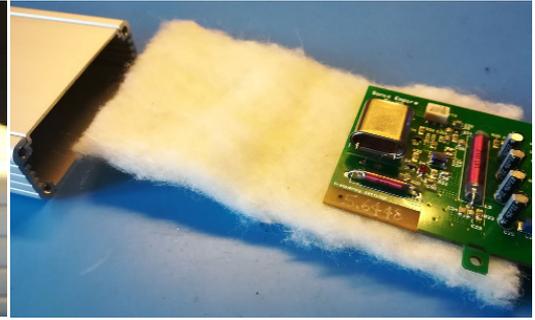
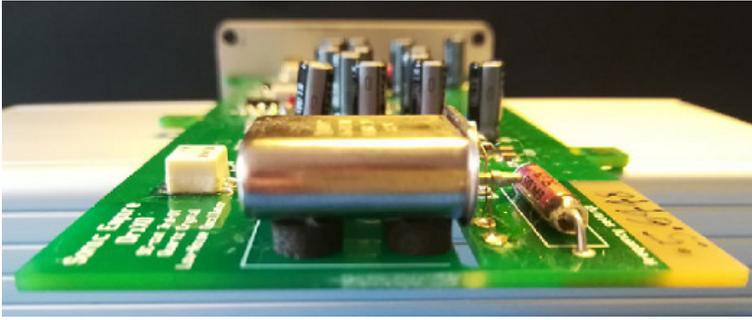
This way helps to reduce the effect of vibrations that can affect the phase noise performance of the oscillator.

Moreover this way also provides a little thermal stability to the oscillator circuit.

You can use a pair of neoprene cylinders to decouple the crystal from the board, then you can wrap the oscillator section with a polyester fiber or wool foil.



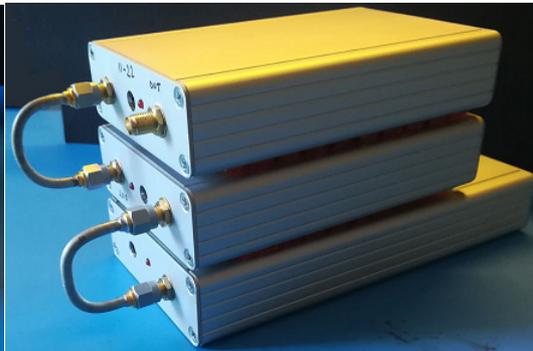
Soldering copper wires to the crystal legs.



Vibrations and thermal coupling

Shield and connect oscillators and frequency doublers

The following pictures show the best way to shield and connect oscillator and frequency doublers. The longer box is the oscillator, the shorter boxes are the frequency doublers.



Notes on semi-finished board

The semi-finished board option needs some parts to be soldered (most are through hole, a few are SMD parts).

There are two things to pay the maximum attention:

- be careful selecting the right component value (incorrect component values will get the oscillator not working and it could be tricky finding the error without removing all the installed capacitors and inductors)
- be careful installing polarized components, the component orientation is clearly visible on the PCB overlay

5.6448 MHz and 6.144 MHz crystals have very high Q (more than 2M) and high ESR. With some crystals the oscillator needs long time to start and sometimes it doesn't even start. In this case you can replace R24 (1K) with 1.2K, 1.5K or 1.8K resistor so it will start faster. The increased value of R24 does not affect the phase noise performance.