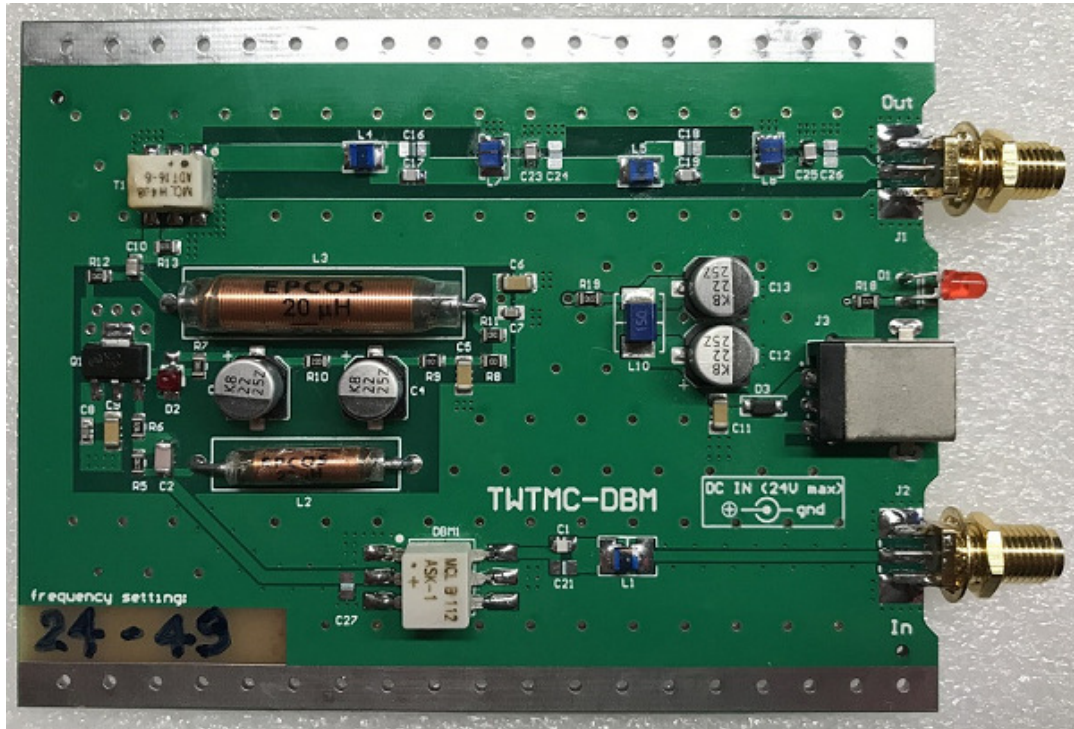


# TWTMC-DBM Frequency doubler



It's a frequency multiplier that duplicate the input frequency. It's a state of the art device because the phase noise added for each duplication is exactly 6dB (even less very close to the carrier) as expected from the theory. It can be used with base oscillators from 5.6448 MHz up to 24.576 MHz to get the output up to 98.304 MHz. The output of this frequency doubler 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:

**Base Oscillator type:** any

**Base Oscillator Frequencies:** 5.6448 MHz, 6.144 MHz, 11.2896 MHz, 12.288 MHz, 22.5792 MHz, 24.576 MHz

**Output:** 50 Ohm sine wave (+10 dBm to +15 dBm)

**Output Frequencies:** base oscillator frequency x 2 or x 4 (series of 2) up to 98.304 MHz

**Board size:** 99mm x 75mm (excluding SMA connectors)

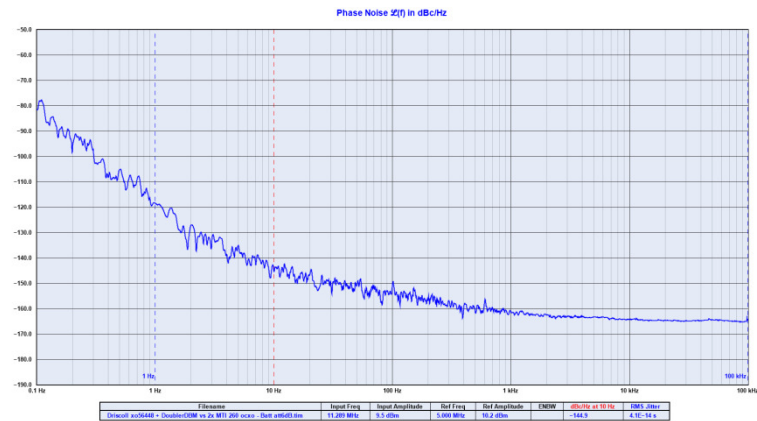
**Power supply:** 12-24 Vdc 30 mA

**Suitable box:** Hammond 1455J1201 (Mouser part 546-1455J1201)

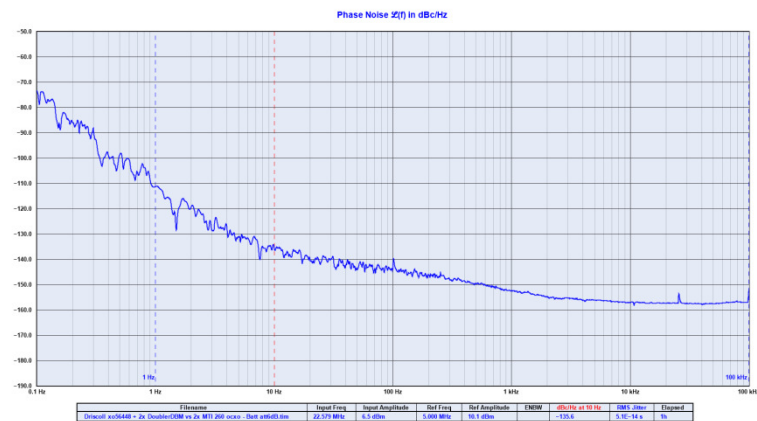
**Board options:** finished and semi-finished

**Note:** max 2 doublers in series, supplied without box

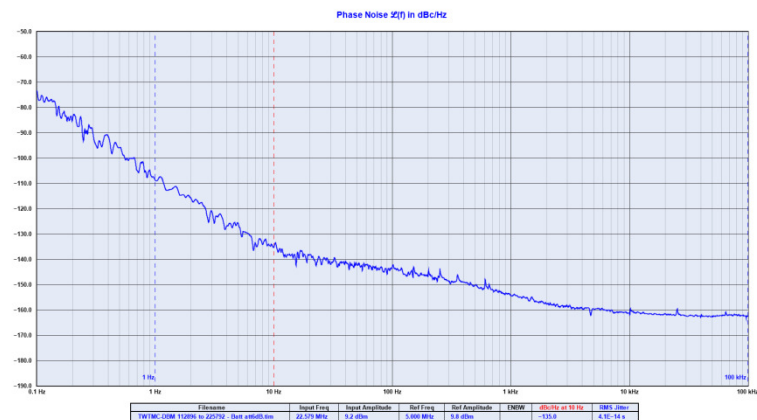
Measured phase noise of the frequency doubler at different output frequencies: 11.2896 MHz, 22.5792 MHz (base oscillator TWTMC-DRIXO at 5.644 MHz and 11.2896 MHz)



**TWTMC-DBM 5.6448 to 11.2896 MHz phase noise**



**TWTMC-DBM 5.6448 to 22.5792 MHz phase noise**



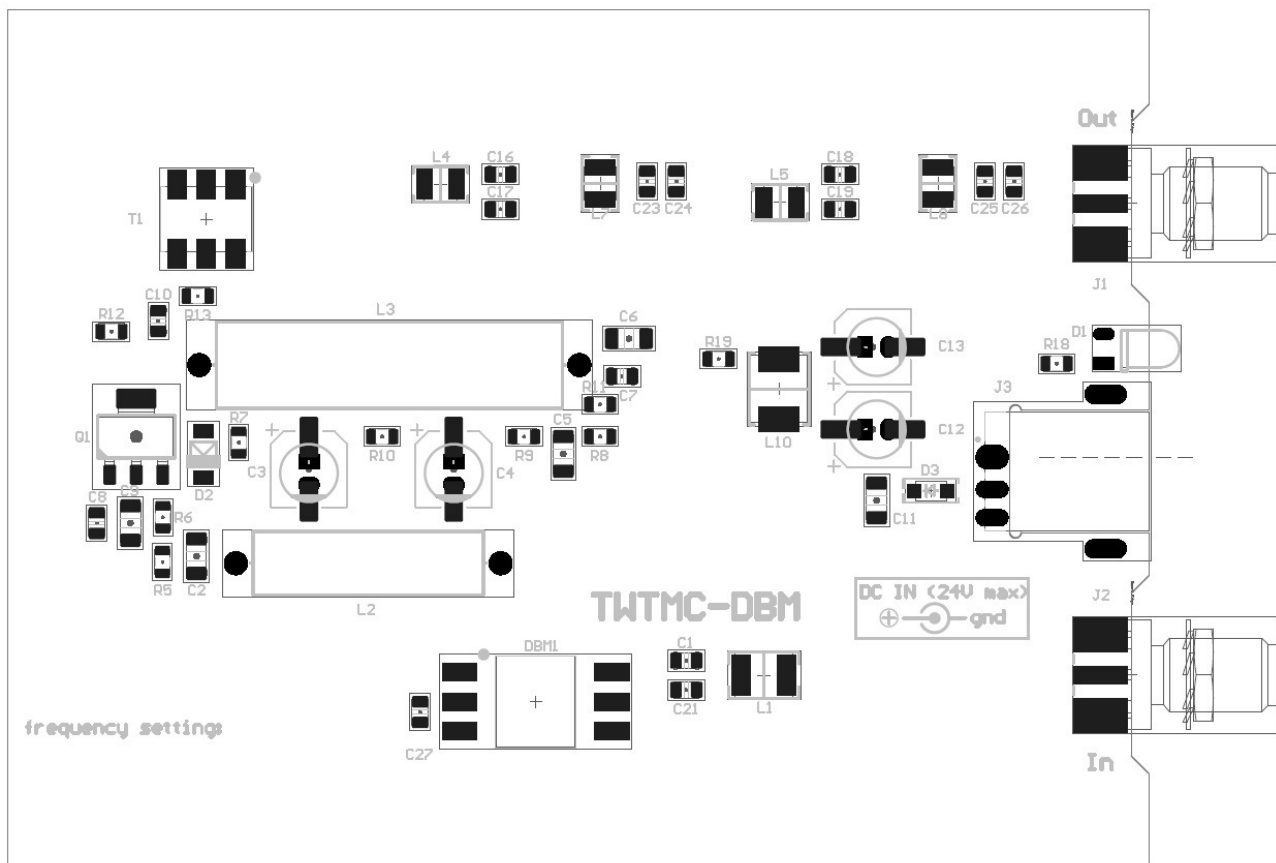
**TWTMC-DBM 11.2896 to 22.5792 MHz phase noise**

There are 2 available options for this board:

- 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 #3015 on the diyaudio.com thread: The Well Tempered Master Clock - Building a low phase noise/jitter crystal oscillator.

## PCB layout



## Connectors

**J3:** DC power supply (12 to 24 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.




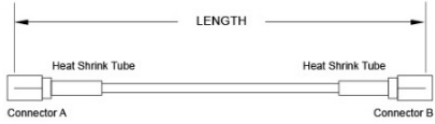
**J1:** RF output. SMA plug connector and RG400 semi-rigid cable should be used to connect the board to other devices.

**J2:** RF input (connect to the oscillator). SMA plug connector and RG400 semi-rigid cable should be used to connect the board to other devices.

## Custom Cable Assemblies

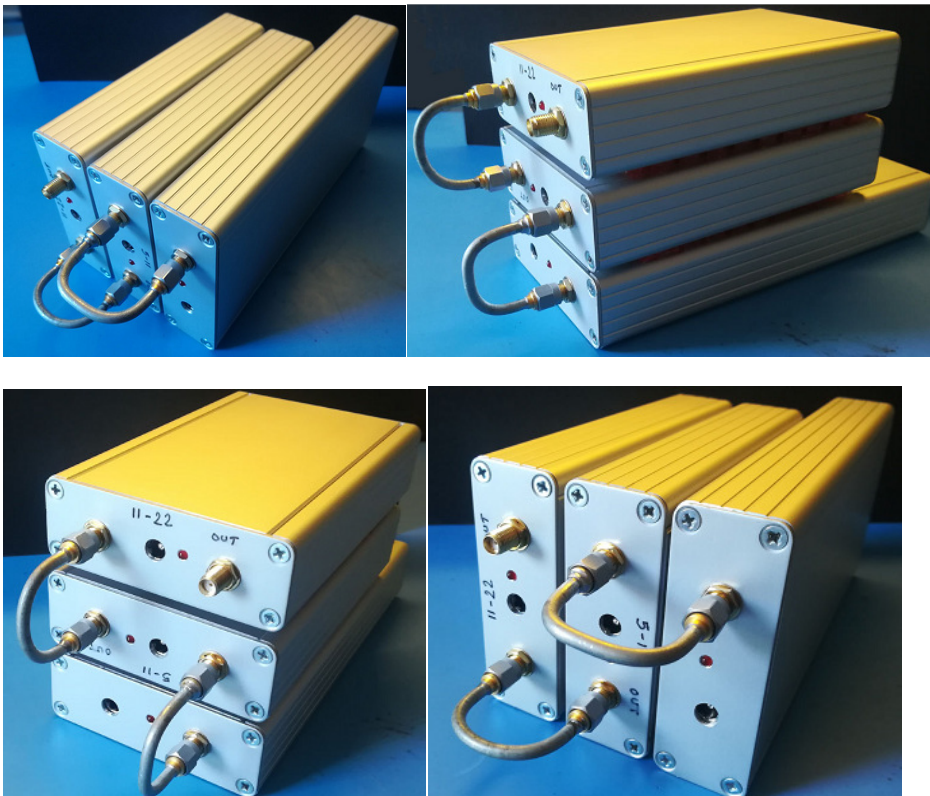
Design your Cable Assembly from any combination compatible connectors and cables.

### + Instructions

|   |  |  |
|---|--|--|
| <p>Cable Type:</p> <p>RG400</p>    | <p>Connector 1:</p> <p>SMA Straight Plug</p>  | <p>Connector 2:</p> <p>SMA Straight Plug</p>  |
| <p>Cable Length:</p> <p>50 cm or</p> <p>19.69 inch(s)</p> <p>1 inch = 2.54 cm</p>  |  |  |

## 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 frequency doubler 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