FixedSine

Function

This generator provides a pure sine signal with very little drift and phase noise. It sacrifices flexibility for stability, compactness and simplicity.

Options and Alternatives

The generator can be used with any square wave oscillator from the series AQO 7050 by Auris. Refer to the Bürklin catalogue for a list of available frequencies.

The resistors and inductors of the filter have to be adapted to the specific operation frequency. Refer to table 1 for values known to work. The filter design tool hosted at the university of York, UK is recommended to determine reasonable values from scratch.

Table 1: Filter values known to work for specific frequencies

Freq.	R3	L3	C14	L4	C16	R4	type
16.9 MHz	50 Ω	1.5µH	150 pF	2.2 µH	100 pF	300 Ω	chebychev

Performance

A generator configured for 20.00 MHz was characterized:

- frequency drift integrated over a few minutes is less than 1×10^{-8}.
- frequency drift integrated over approximately one second is less than 1×10^{-9}.
- according to the manufacturer the jitter of the oscillator is below 1 ps.

Timeline

- The project was started in July 2015
- The first prototype was operational in August 2015

Status

About ten devices are in use at Mg.

Developer

Nandan Jha

User

Mg

Principle of Operation

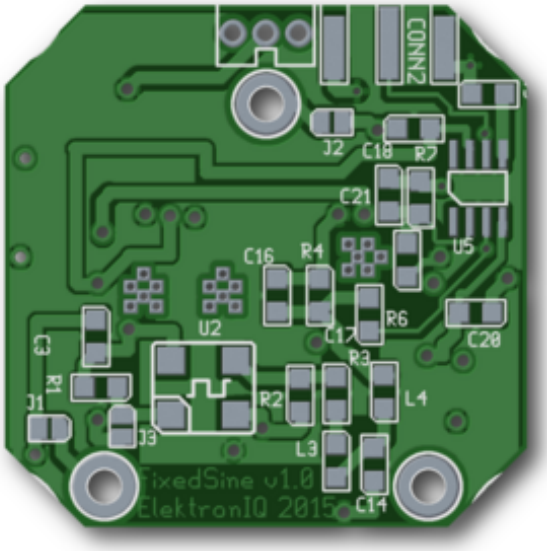
An integrated quartz oscillator provides a stable square wave signal. A passive four pole LC filter removes the higher harmonics to render a near perfect sine waveform. An amplifier is used on output to increase the amplitude and the ability to drive low impedance loads.

Schematic

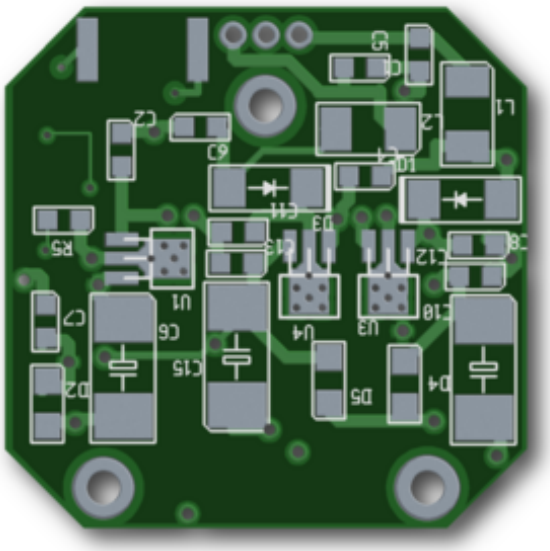
- The schematic im PDF-Format
- The source of the schematic can be found on the download page of the wiki.

Layout

- Size of the PCB: 40.5 x 40.5 mm
- Supply: JAE IL-G, 3Pin, +15 V, GND, -15 V
- Input: none
- Output: SMA
- Displays: none
- PDF of the layout: fixedsine_layout_v1.1.pdfDer Bestückungsdruck
- Bill of materials: fixedsine_v1.1_koll.pdf, fixedsine_v1.1_koll.xls
- A zip of the gerber files for pcb production
- The source of the layout in geda format is available at the download page of the wiki.



Layout (top view)



Layout (bottom view)

Enclosing

Hammond 1590LLBK

Mounting holes of the generator and connectors are compatible with the design of the photodiode amplifier PD-ac-dc.

Test

The oscillator should oscillate right out of the box.

Images

Cost

item	amount	value	total	remarks
4-layer PCB	1x	24.50 €	€	1/4 of 95.43 EUR (Basista-Prototyping)
enclosing	1x	8.20 €	€	Hammond 1590LLBBK
SMA connector	1x	1.60 €	€	
JAE IL-G connector, 3 pin	1x	0.30 €	€	
voltage regulator	2x	0.20 €	€	SOT89
100 µH inductor	2x	0.30 €	€	
10 µF tantalum cap	3x	0.80 €	€	
HF inductor	2x	0.50 €	€	Epcos B82498F
oscillator	1x	2.30 €	€	Auris AQO-7050
opamp AD817	1x	6.55 €	€	fast, high slew rate
resistors, caps, diodes	25x	0.02 €	€	all parts sized 0805
off-cuts			5.00 €	
total overall:			**€**	

When produced as a mini series of 60, the price for the PCB drops to 5.20 € per piece.

Todo

(Icons: :

nope, : in

the works, :
done in the schematic, not yet in layout,

: done)

1. Add a 1 nF capacitor in parallel to R5. This helps get rid of offset voltages (WTF?)
2. Use AD817 op-amp due to its fast slew rate. C19 and C21 are not needed for this op-amp.
3. Opamps aree borderline fast enough → Better use MMICs in the next version. E.g. ERA-8, or similar.
4. A polygon on top is not connected to ground.
5. Ground should be done more properly
6. Diode D3 is drawn in the wrong direction in the layout