Oven Controlled Crystal Oscillator

While operating on the 5,7 - 10 - 24 GHz bands over the past few years, I Have often been given skeeds with a hundred as end point. Indeed, the corresponding value found to be lower o higher than 10, 20, 30 Khz or even more.

So, it is easy to imagine what such a gross mistake implies, because in addition to the accurate aim and propagation issues, a third problem arises, namely the need to look for the correspondent on the range.

So I have thought of an oscillator that might solve this inconvenient.

The results is the OVEN oscillator shown in the photos 1 and 2, which is completely made up of SMD components.

Photo 1

The oscillator, which has thus been developed, is an OVEN with an stability of $\pm 1 \times 10^{-8}$ per day, which means that stability is higher than or equal to 200 Hz per day in the 10 GHz band.

Photo 2

Fig. 1 shows the oscillator circuit. It uses a 29 x 43 mm double-sided plated PCB, drilled with holes.

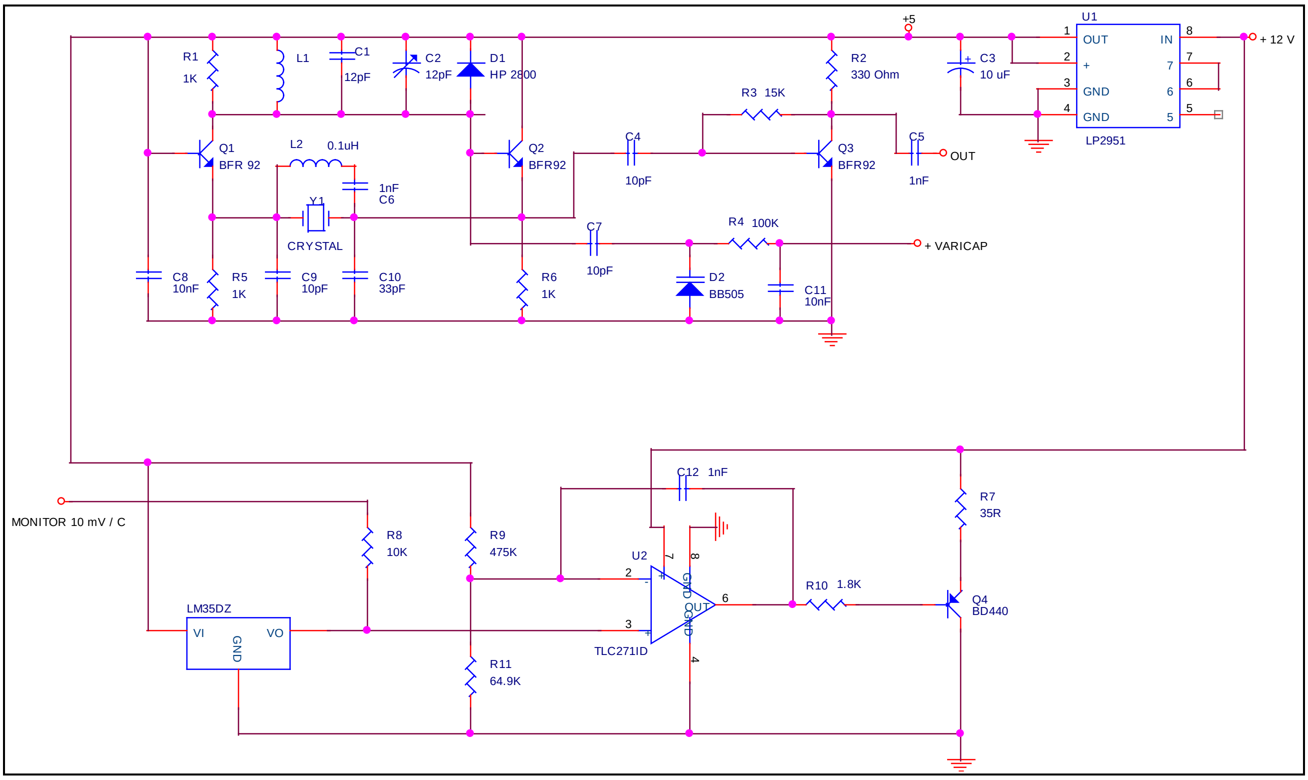

Fig. 1

The critical part is the termal coupling between quartz, heating unit (BD440) and temperature sensor (LM35). Furthermore, the circuit has bee enclosed into a 31 x 45 mm copper box to protect it from temperature varations. A 10 Ohm/ml constantan wire is wound around the box to achieve R7 resistance, whose aim is to bring the internal temperature to approx. 45 degrees. The whole unit is then inserted into a 74 x 55 x 50 polystyrene coated sheet tin box.

The reference voltage and input for the LM35 integrated circuit (temperature sensor) is provided by a positive voltage regulator adjustable at low nominal values for the dark current and for the drop-out voltage with the LP2951 cn integrated circuit.

Table 1 shows the list of components. Table 2 shows the most important data.

The oscillator can operate a traditional 2556 MHz oscillator, using the first stage usually with fet U310. It is an easy modification as shown by the diagram in Fig. 2 and as illustrated by I8CVS on RR 5/97.

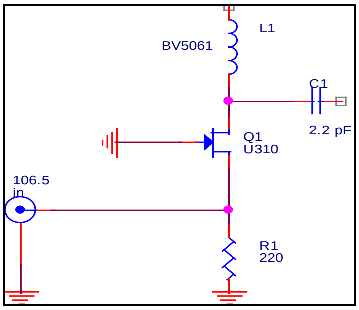

fig. 2

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Item	Quantity	Reference	Part	
1	2	C2,C1	12pF	
2	1	C3	10 uF	
3	2	C9,C4	10pF	
4	3	C5,C6,C12	1Nf	
5	1	C7	10pf	
6	2	C11,C8	10nF	
7	1	C10	33pF	
8	1	D1	HP 2800	
9	1	D2	BB505	
10	1	L1	9 Spire d.=3.5mm filo 0.5	
11	1	L2	0.1uH	
12	1	Q1	BFR 92	
13	2	Q2,Q3	BFR92	
14	1	Q4	BD440	
15	1	REF1	LM35DZ	
16	3	R1,R5,R6	1K	
17	1	R2	330 pF	
18	1	R3	15K	
19	1	R4	100K	

20	1	R7	35R filo di costantana	
21	1	R8	10K	
22	1	R9	475K	
23	1	R10	1.8K	
24	1	R11	64.9K	
25	1	U1	LP2951	
26	1	U2	TLC271ID	
27	1	Y1	CRYSTAL	

Tab. 1

Given the complex assembling procedures and the use of proffesional materials, you can contact me to have the oscillator available “ready to operate”.

Fig. 3

The Instruments used for the measure are following:

1) Frequency counter HP5342
2) Frequency counter HP5340
3) Frequency counter HP5328 opz. High stability with HPIB interface
4) Network Analyzer HP 8505-8501-8503
5) Spectrum Analyzer HP8569B
6) Power Meter HP 435A

My special thanks go to Enry, ex I1AJS, for his encouragement and the many experiments.

73 de

Silvano, I0LVA

References:

QEX 10/94 “Low-Phase-Noise Oscillators” KA2WEO
Radio Rivista I4BER
R.R. 9/94-3/95 “ Master Oscillator 5-8 GHz” I2SG