

GENERAL PURPOSE PROGRAMMABLE LO

for

TRANSVERTERS and BEACONS

10 MHz to 1.62 GHz

HOW IT WORKS

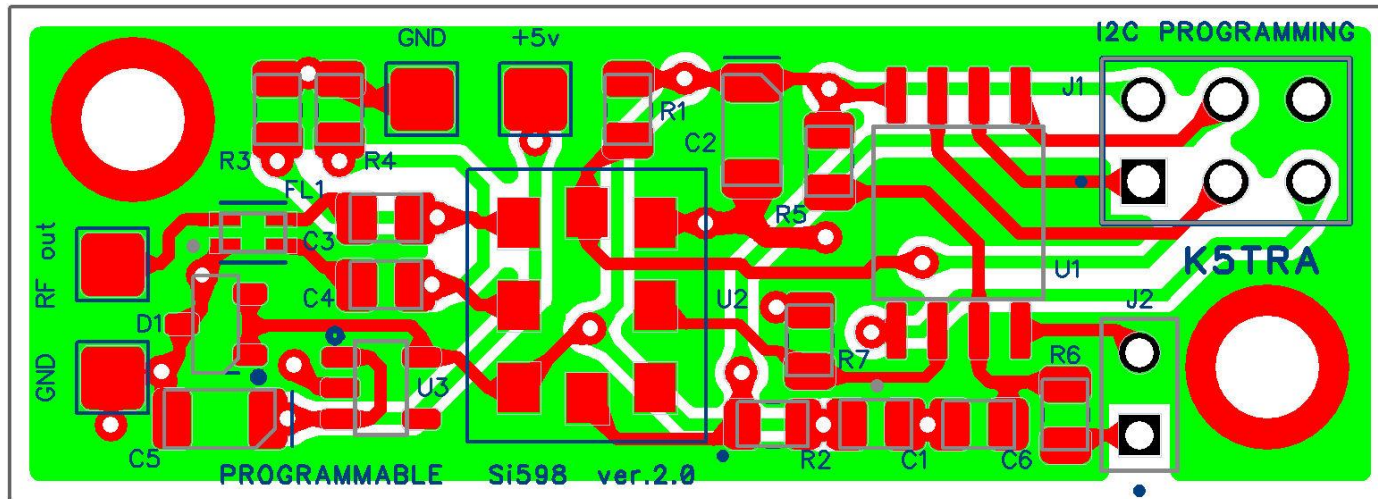
- Si598 programmable oscillator
- When powered, the Si598 must be programmed to the desired frequency.
- ATtiny85-20 microcontroller communicates via I2C with the Si598
- Set the frequency and then go to sleep
- A second frequency can be programmed and selected on control line.

EVOLUTION OF THE LO BOARD

- John Maca (**AB5SS**) deserves huge props for the original idea of using an ATtiny85-20 MCU and a Si598 programmable LO for the 902 MHz RMG transverter, as an alternative to the factory programmed Si530.
- The original prototype board was done by John (using Eagle) and the original code to program it, in Arduino IDE.
- ATtiny85 MCU programming can be done with either Arduino IDE or Atmel/Microchip Studio.
- The AVR ISP MKII programmer can be setup to work with either IDE or Studio; not both on the same PC.
- Joe Haas (**KE0FF**) has written code for the Atmel (Microchip) Studio to program the ATtiny85-20 and Si598 circuit. Joe did an outstanding job.
- Tom Apel (**K5TRA**) has created several boards (using DipTrace). The same ports on the MCU were used for I2C lines to Si598 (SDA and SCL) as in John's prototype board; so, Joe's code in Studio will work with all of the boards. That code also controls the Si598 'Output-Enable' and provides for a second frequency.

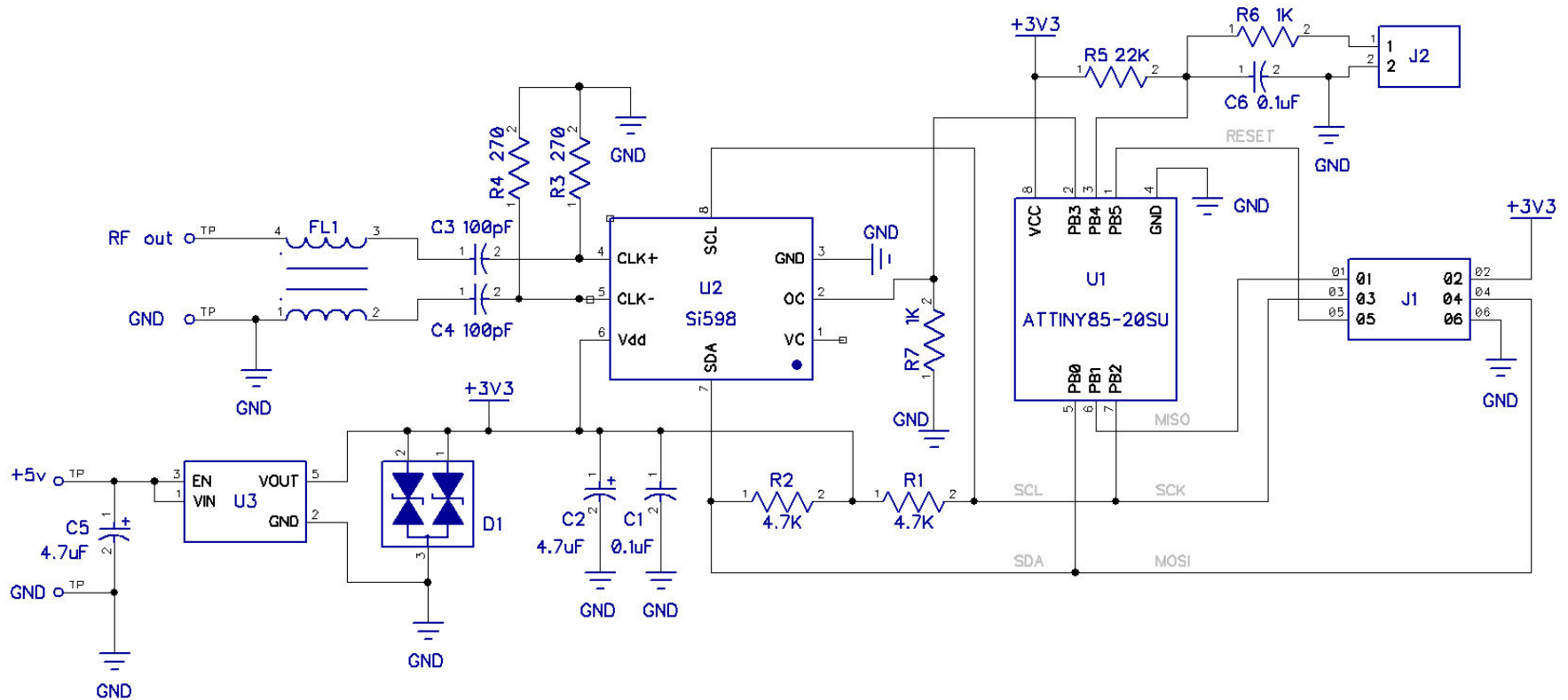
GENERAL PURPOSE 2-FREQUENCY BOARD

- Differential output is coupled to single-ended output with DC blocking capacitors and balun.
- Onboard LDO (and very quiet) 3.3v regulator. This will be low dissipation when powered from external +5v.
- ESD protection on +3.3v bus.
- Two mounting holes for 4-40 standoffs.
- Si598 Output-Enable is also controlled by MCU (PB3).
- A selectable second frequency provided through PB4. Additional RC filtering on control interface (J2, 2-pin header) to assist software de-bounce.

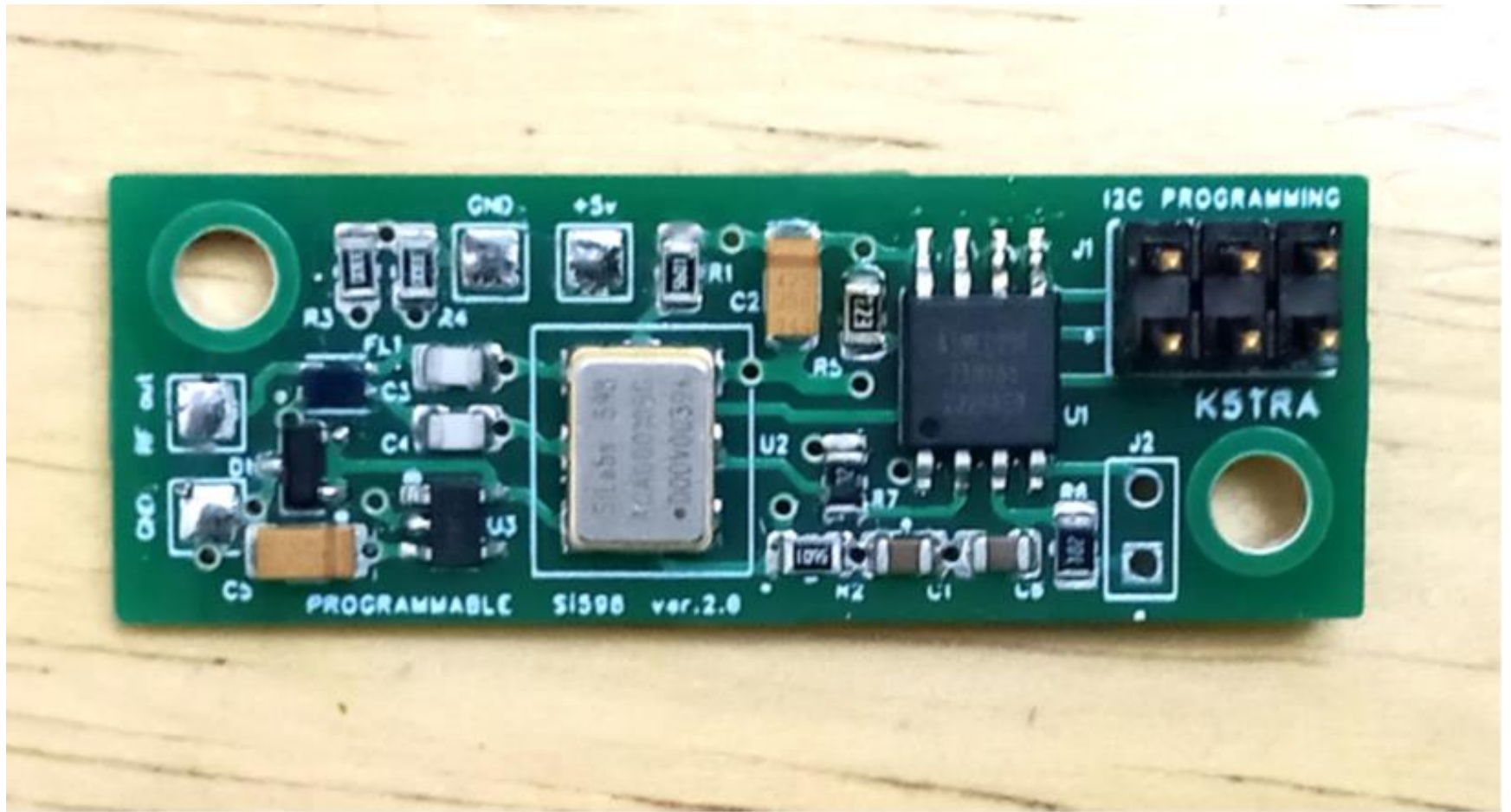


(1.675" x0.600")

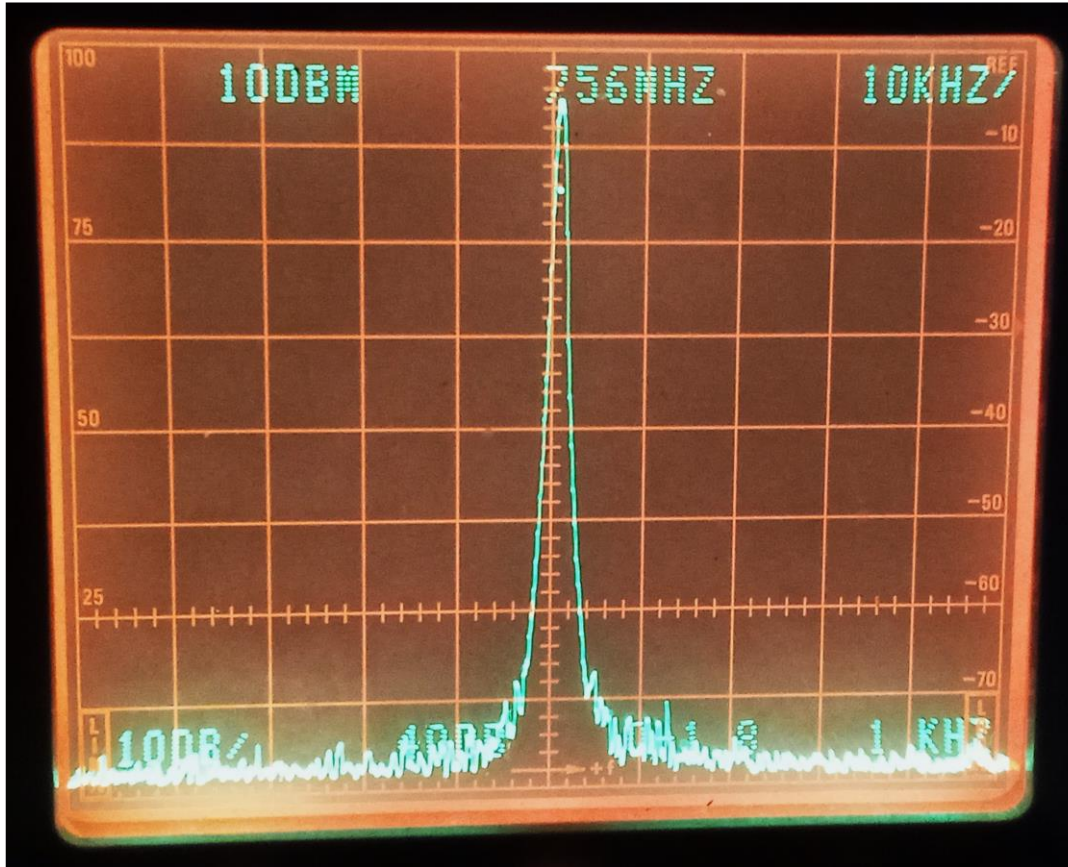
GENERAL PURPOSE BOARD SCHEMATIC



COMPLETED BOARD (ver.2.0)



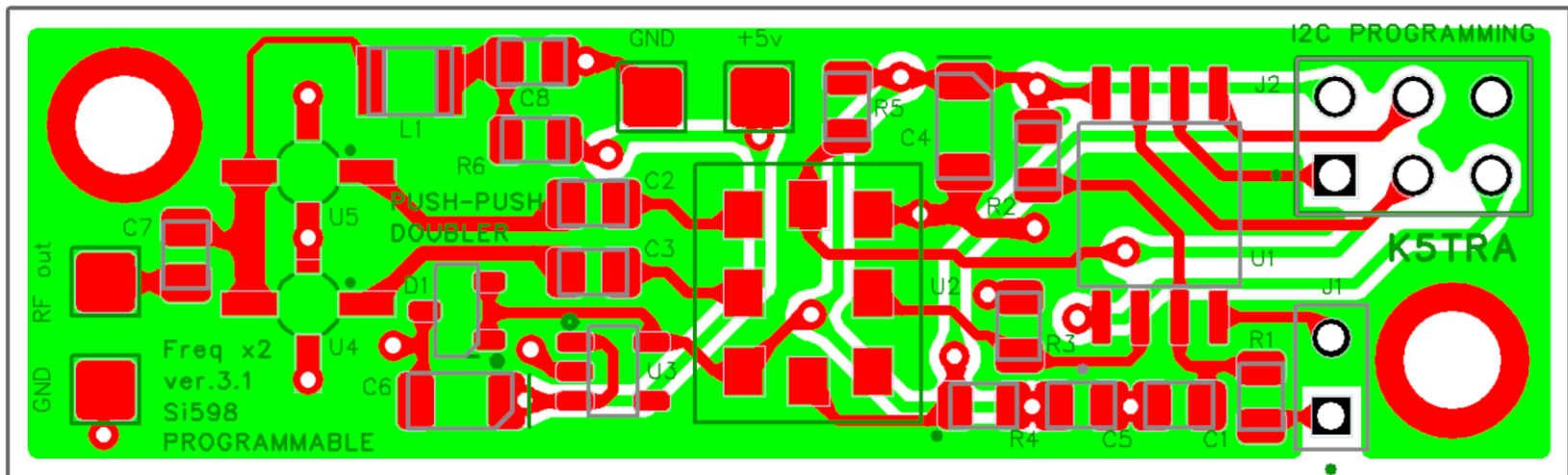
TEST BREADBOARD OUTPUT SPECTRUM



- Version 2 board yields +4 dBm single-ended.
- Version 1 board yields +0 dBm single-ended output on each side of differential output
- Programming can be “tweaked” to tune the frequency to very tight tolerance

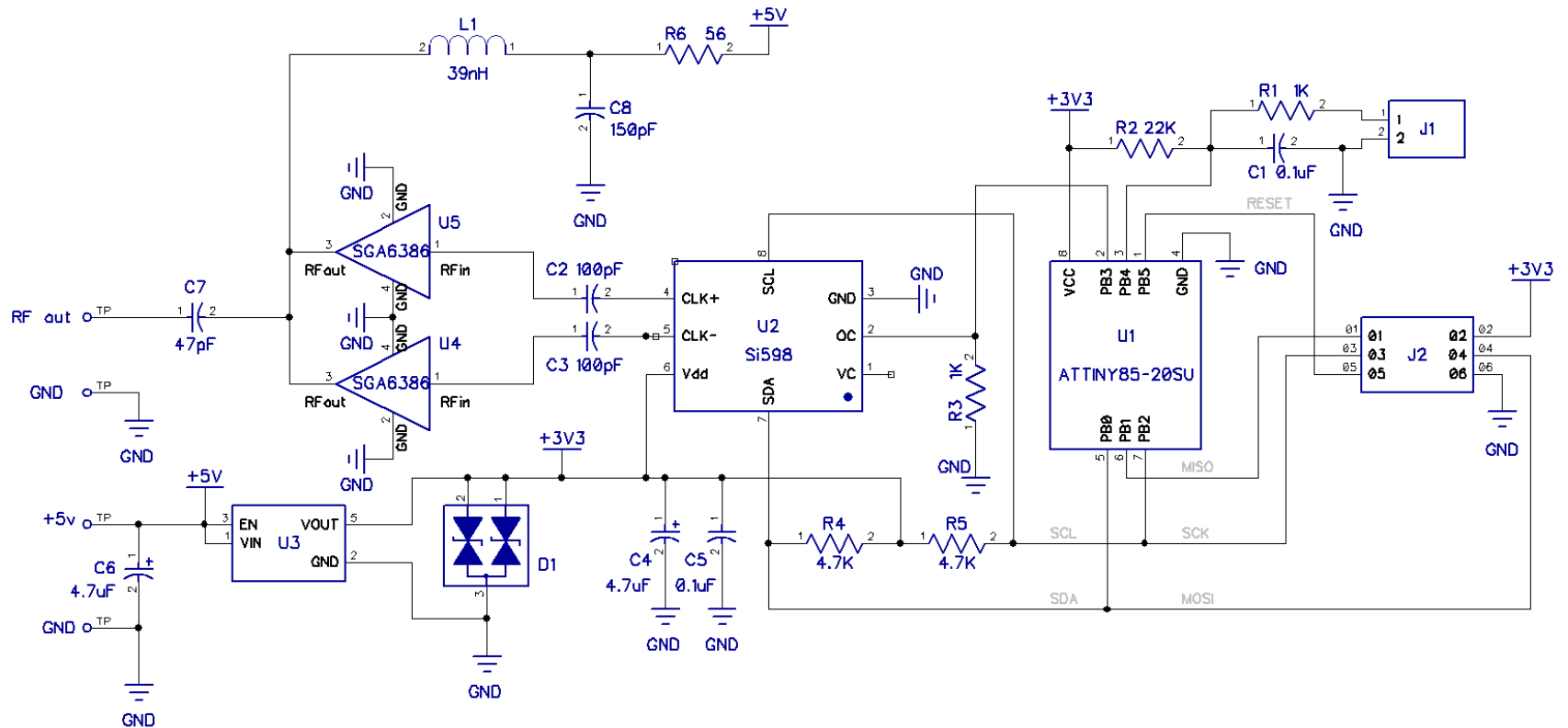
LO BOARD WITH FREQUENCY DOUBLER

- Differential output drives a pair of SGA-6386 SiGe amplifiers in a push-push doubler. This extends the upper limit of the Si598 to 1.62 GHz.
- Onboard LDO (and very quiet) 3.3v regulator. This will be low dissipation when powered from external +5v.
- ESD protection on +3.3v bus.
- Two mounting holes for 4-40 standoffs.
- Si598 Output-Enable is also controlled by MCU (PB3).
- A selectable second frequency provided through PB4. Additional RC filtering on control interface (J2, 2-pin header) to assist software de-bounce.

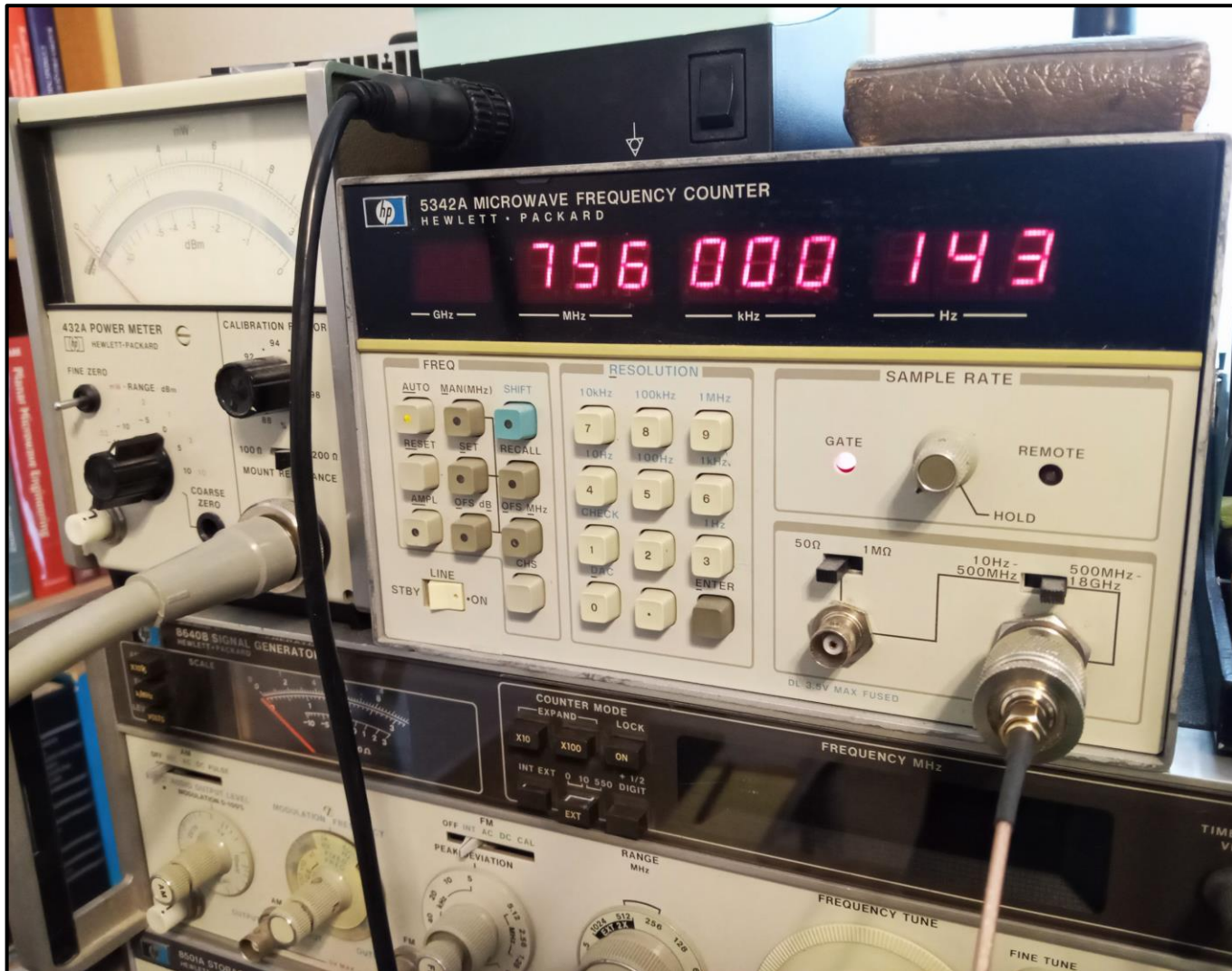


(2.000" x0.600")

GENERAL PURPOSE BOARD SCHEMATIC



TEST BREADBOARD OUTPUT FREQUENCY



I2C SERIAL PROGRAMMING

756 MHz - CHANNEL 1 (902 MHz to 146 MHz)



758 MHz - CHANNEL 0 (902 MHz to 144 MHz)



ATtiny85 FUSE SETTINGS

AVRISP mkII (00B018070B86) - Device Programming

Tool: AVRISP mkII | Device: ATtiny85 | Interface: ISP | Device signature: 0x1E930B | Target Voltage: 3.2 V

Interface settings
Tool information
Device information
Oscillator calibration
Memories
Fuses
Lock bits
Production file

| Fuse Name | Value |
|--------------------|--|
| EXTENDED.SELFPRGEN | <input type="checkbox"/> |
| HIGH.RSTDISBL | <input type="checkbox"/> |
| HIGH.DWEN | <input type="checkbox"/> |
| HIGH.SPIEN | <input checked="" type="checkbox"/> |
| HIGH.WDTON | <input type="checkbox"/> |
| HIGH.EESAVE | <input checked="" type="checkbox"/> |
| HIGH.BODLEVEL | Brown-out detection disabled |
| LOW.CKDIV8 | <input checked="" type="checkbox"/> |
| LOW.CKOUT | <input type="checkbox"/> |
| LOW.SUT_CKSEL | Int. RC Osc. 8 MHz; Start-up time PWRDWN/RESET: 6 CK/14 CK + 64 ms |

| Fuse Register | Value |
|---------------|-------|
| EXTENDED | 0xFF |
| HIGH | 0xD7 |
| LOW | 0x62 |

☒ Auto read
☒ Verify after programming

Copy to clipboard

Program Verify Read

Starting operation verify registers
Verify register EXTENDED...OK
Verify register HIGH...OK
Verify register LOW...OK
Verify registers ... OK

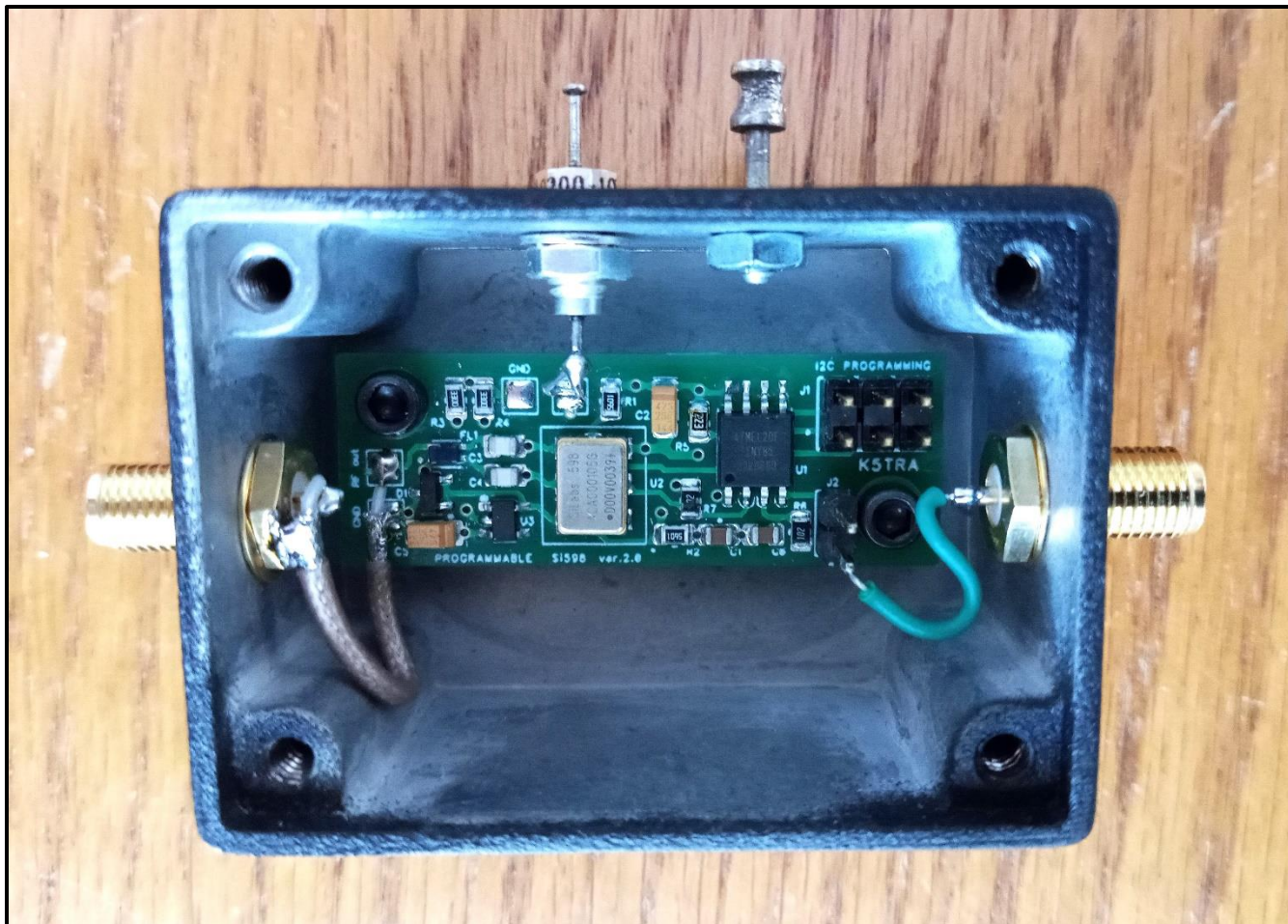
Verify registers ... OK

THESE ARE DESIRED (DEFAULT) SETTINGS

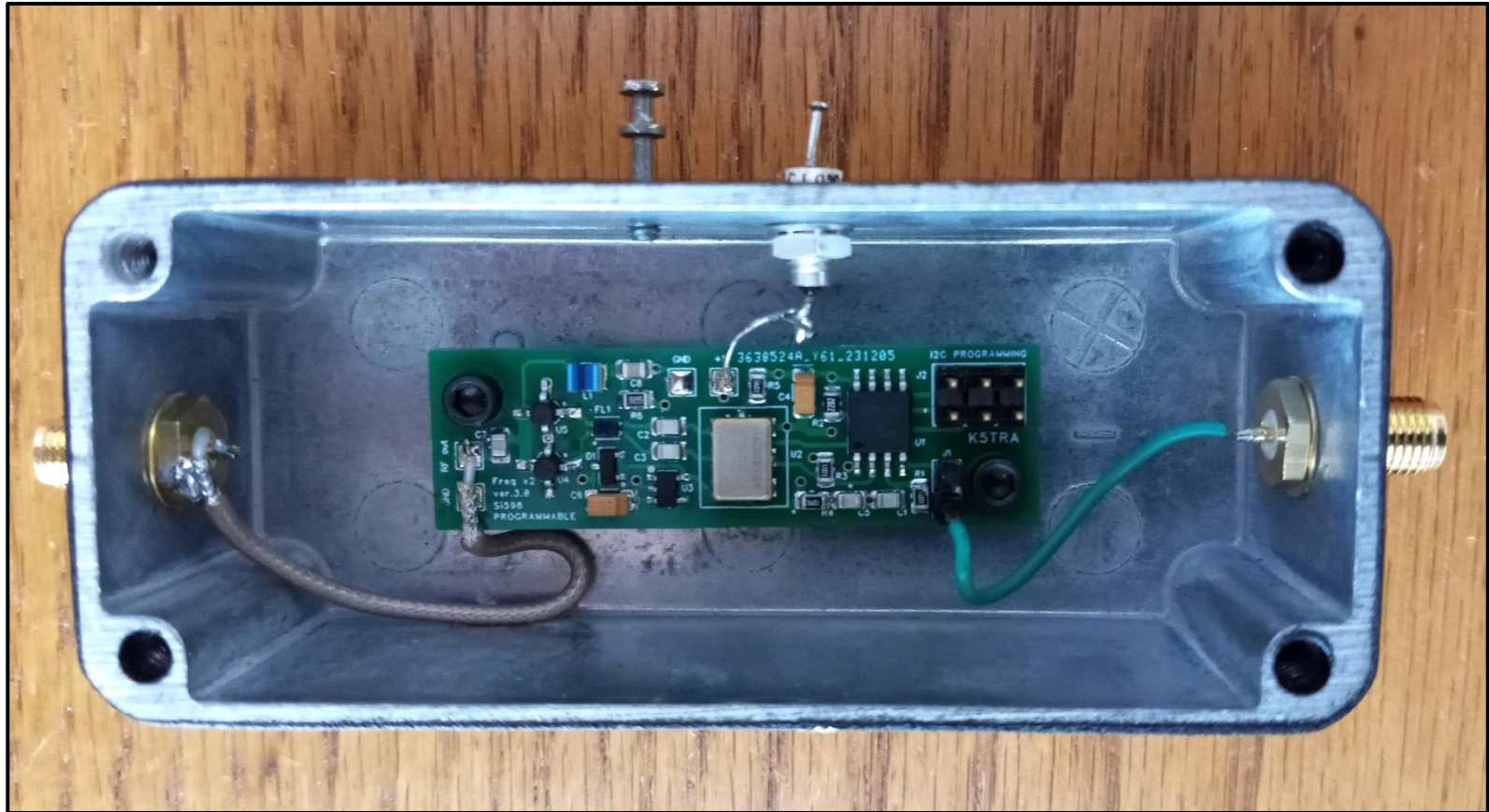
PROGRAMMABLE LO MODULES (both: 2 Frequency)



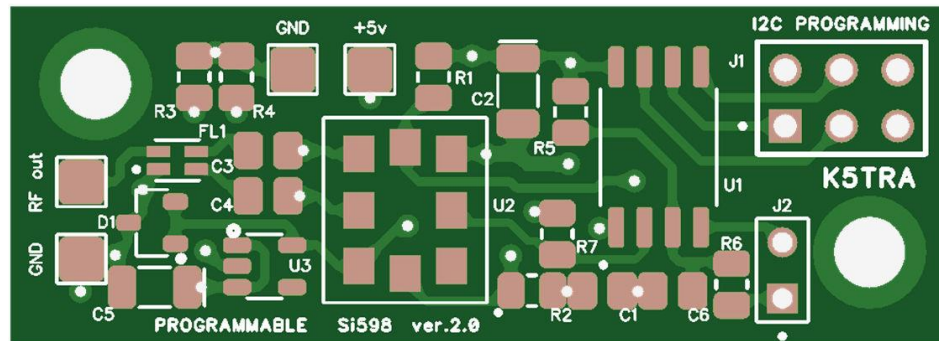
10 MHz to 810 MHz PROGRAMMABLE LO



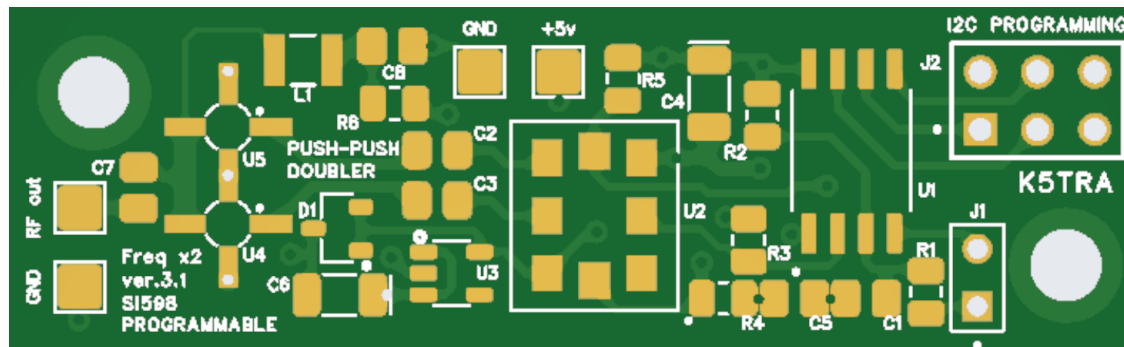
20 MHz to 1620 MHz PROGRAMMABLE LO



QUESTO E' TUTTO



10 MHz to 810 MHz PROGRAMMABLE (2-FREQ)



10 MHz to 1.62 GHz PROGRAMMABLE (2-FREQ)