The Tuna Tiny Spy Radio Transmitter

A companion transmitter for the *Sauteur de Bayou* regen receiver

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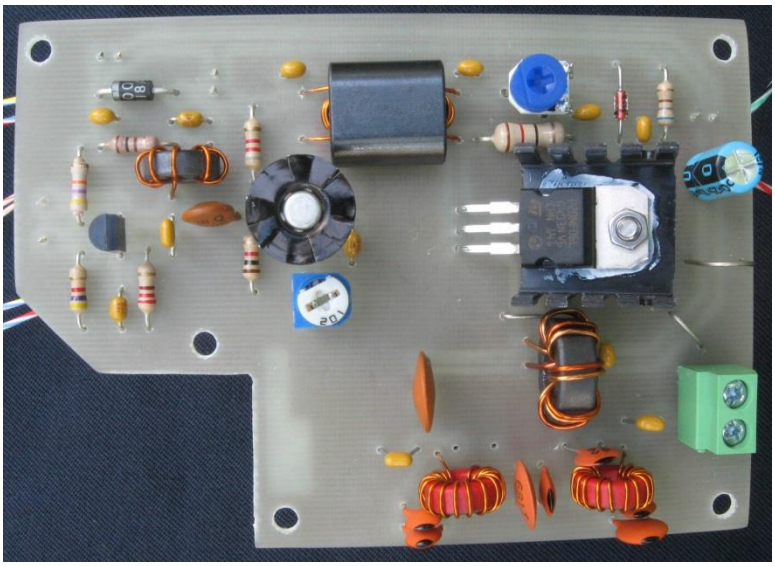
This transmitter is comprised of Doug DeMaw's classic *Tuna Tin 2* [1] crystal oscillator and amplifier, followed by a MOSFET power amplifier in the fashion of Chuck Carpenter's *Texas Topper*. [2]
A potentiometer has been added in the emitter circuit of the TT2's output stage to allow for adjusting the drive to the MOSFET power amplifier. The TT2's usual 2:1 broadband output transformer (4:1 impedance) has been replaced by a binocular core transformer with a 9:2 turns ratio (20:1 impedance ratio) to match the TT2 output stage to the low resistance load at the gate of the MOSFET.

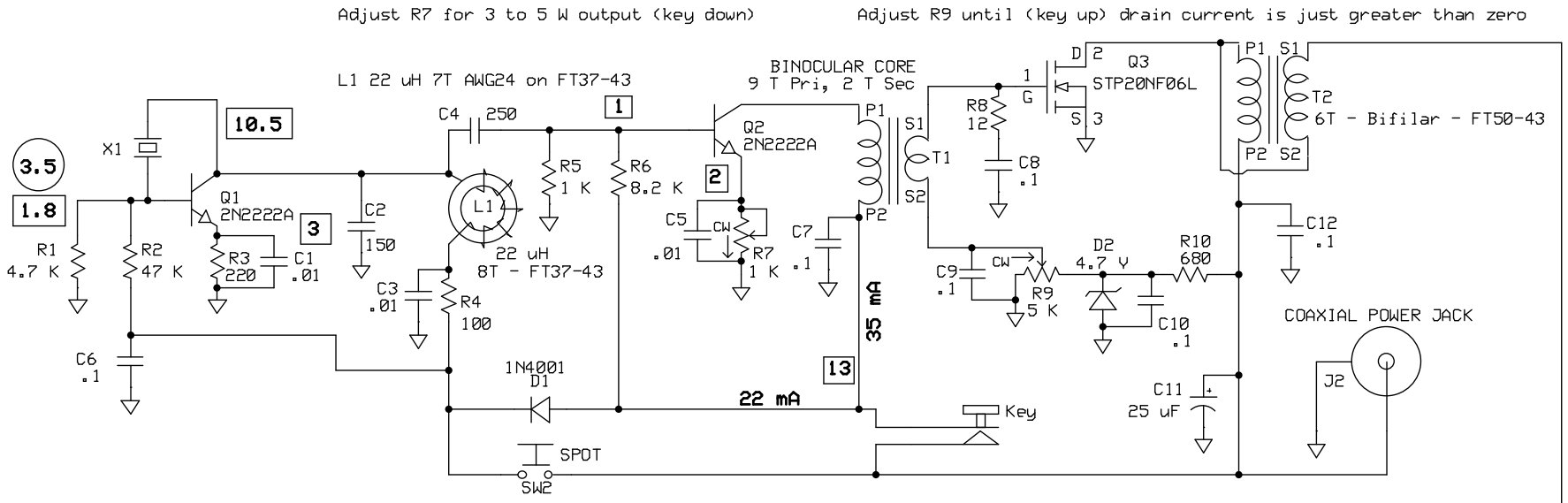
The transmitter was built as a companion to a regenerative receiver, the *Sauteur de Bayou*, in order to create a solid state realization of one of the classic spy radios, the *Paraset*. Composed of a two-tube regenerative receiver and a single tube, crystal-controlled transmitter, the *Paraset* was supplied by the British to agents in occupied Europe and Asia. While in no way intended to be a re-creation, this Rx/Tx duo gives a bit of the feel of what it must have been like to operate a simple low-power radio set.
http://n5ib.net/Sauteur%20de%20Bayou%20Overview.pdf

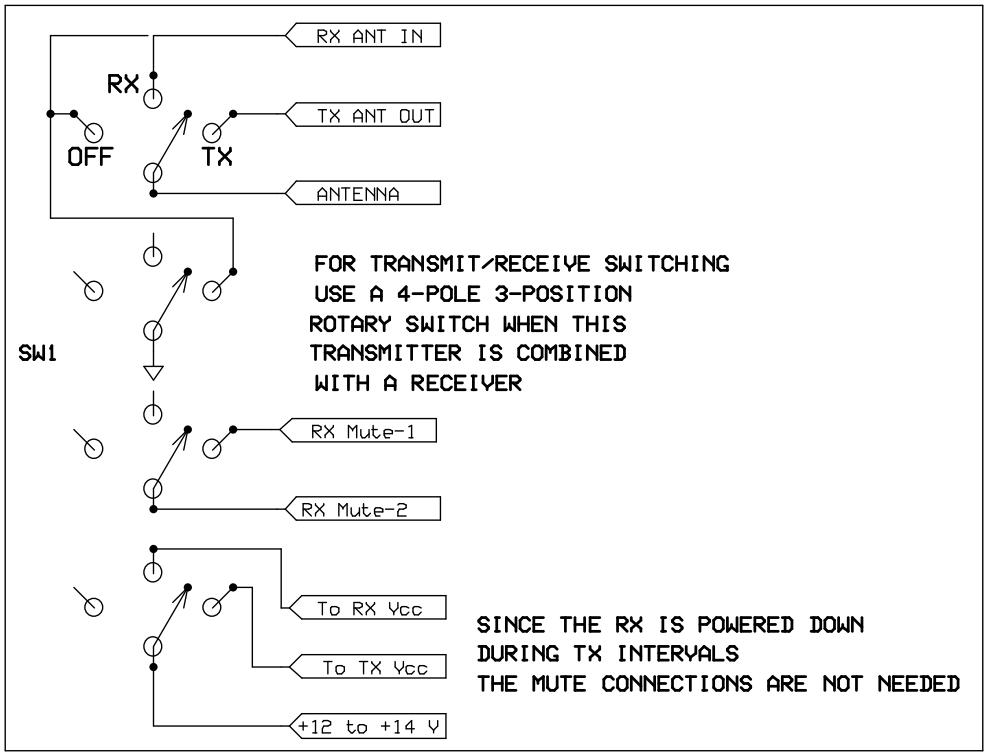
The photo below of the prototype, done using the toner transfer PC board method, is approximately actual size. The odd shape of the board is due to the necessity of fitting within an existing enclosure that already contained the receiver. Note the heat sink for Q3, which is tilted upwards to allow airflow all around.

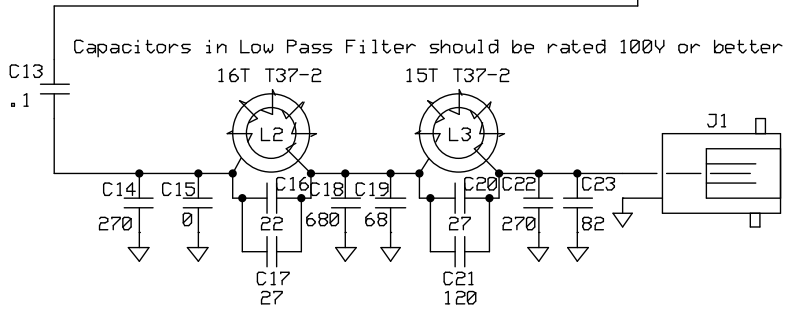


The photos at right are of the ultimate destination of this transmitter, joining its regen receiver and Morse key companions in a wood "mini suitcase." Pictured with the accessories every British secret agent needs.

Based on designs by Doug DeMaw (Tuna Tin 2), Chuck Carpenter (Texas Topper), Jim Kortge, Wes Hayward, and others



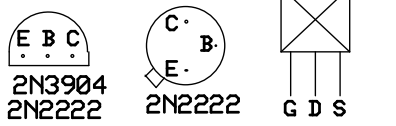




Modifications for 30 m band
(10.100 - 10.15 MHz)

- C15, C16, C19, C20, C23 - omit
- C14 & C22 - 220 pF
- C17 - 27 pF
- C18 - 470 pF
- C21 - 82 pF
- L2 - 16T T37-2
- L3 - 14T T37-2
- C2 - 100 pF
- C4 - 180 pF

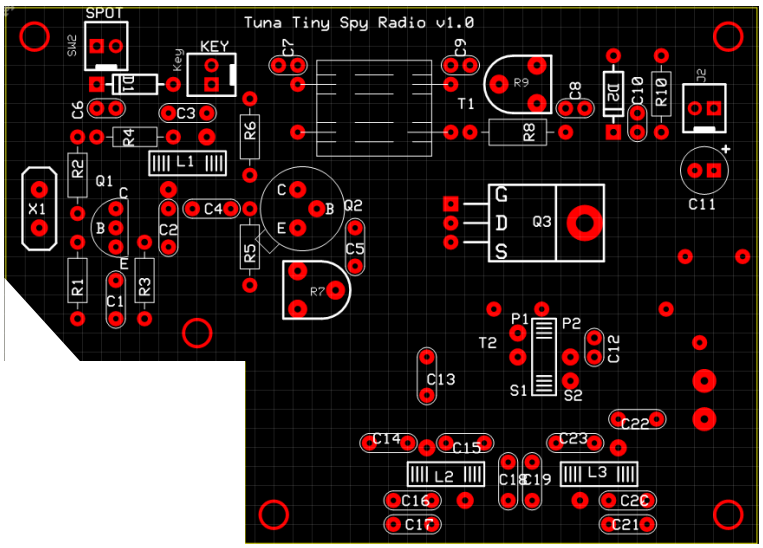
TOP VIEWS



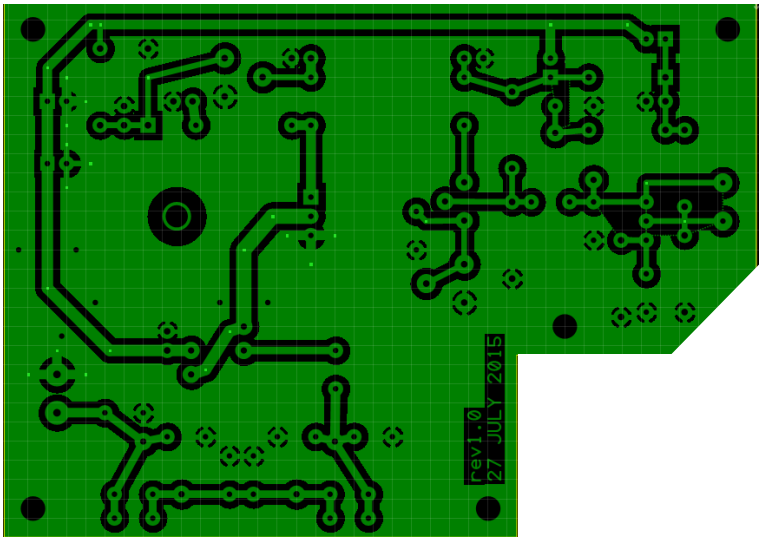
E&M Solutions, LLC		
Tuna Tiny Spy Radio Transmitter MATCHES rev1.5 and rev1.6 PC BOARDS		
drawn: J Giammanco, N5IB	Rev 1.6 17 April 2016	Page 1 of 1

PC board layout, designed for toner transfer method and single-sided board

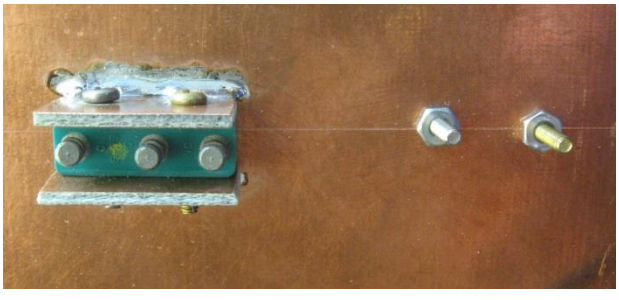
Top copper and silk screen, approximately actual size.
For parts placement only – not used for home-brew etched single-sided board.



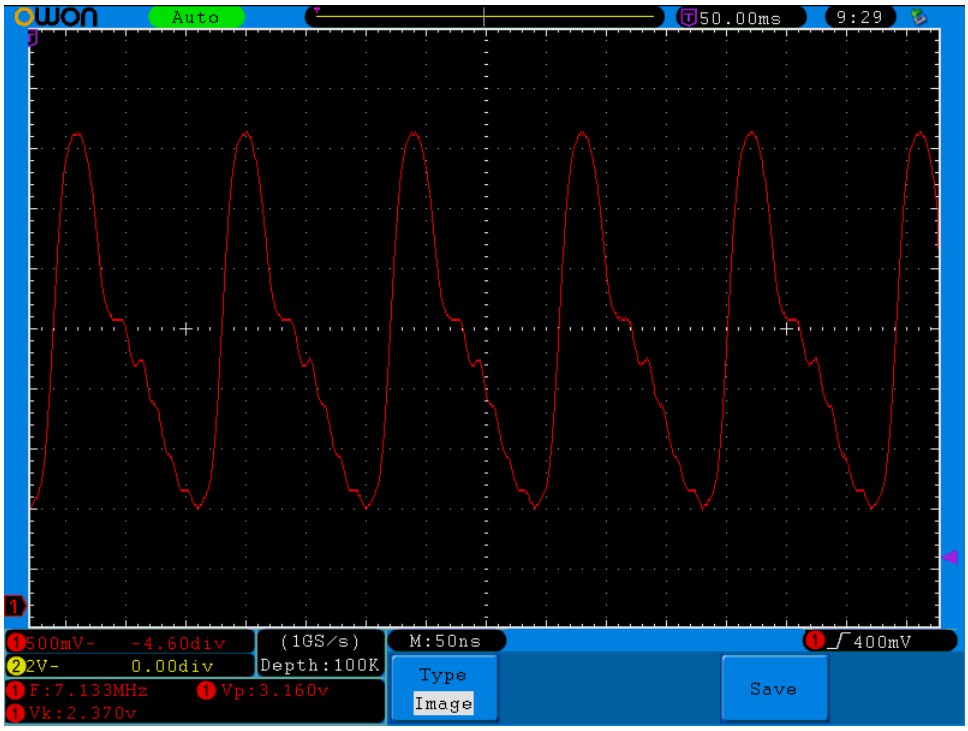
Bottom copper, approximately actual size



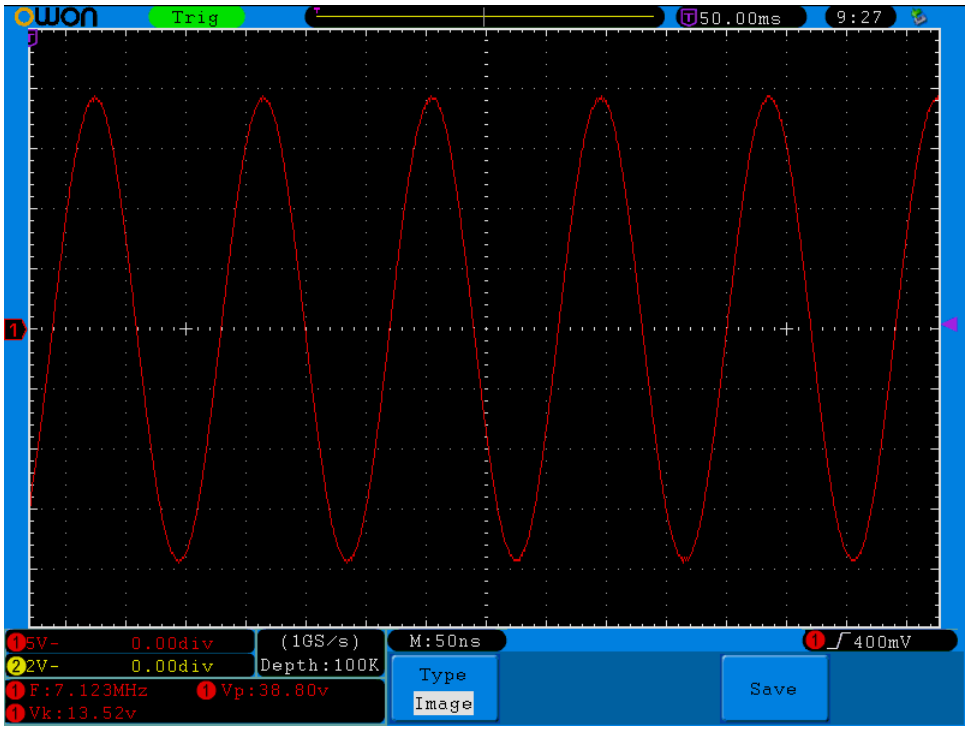
Some details of the Morse key built onto the panel of the Rx/Tx enclosure.
A Microswitch® is attached to the underside of the panel.



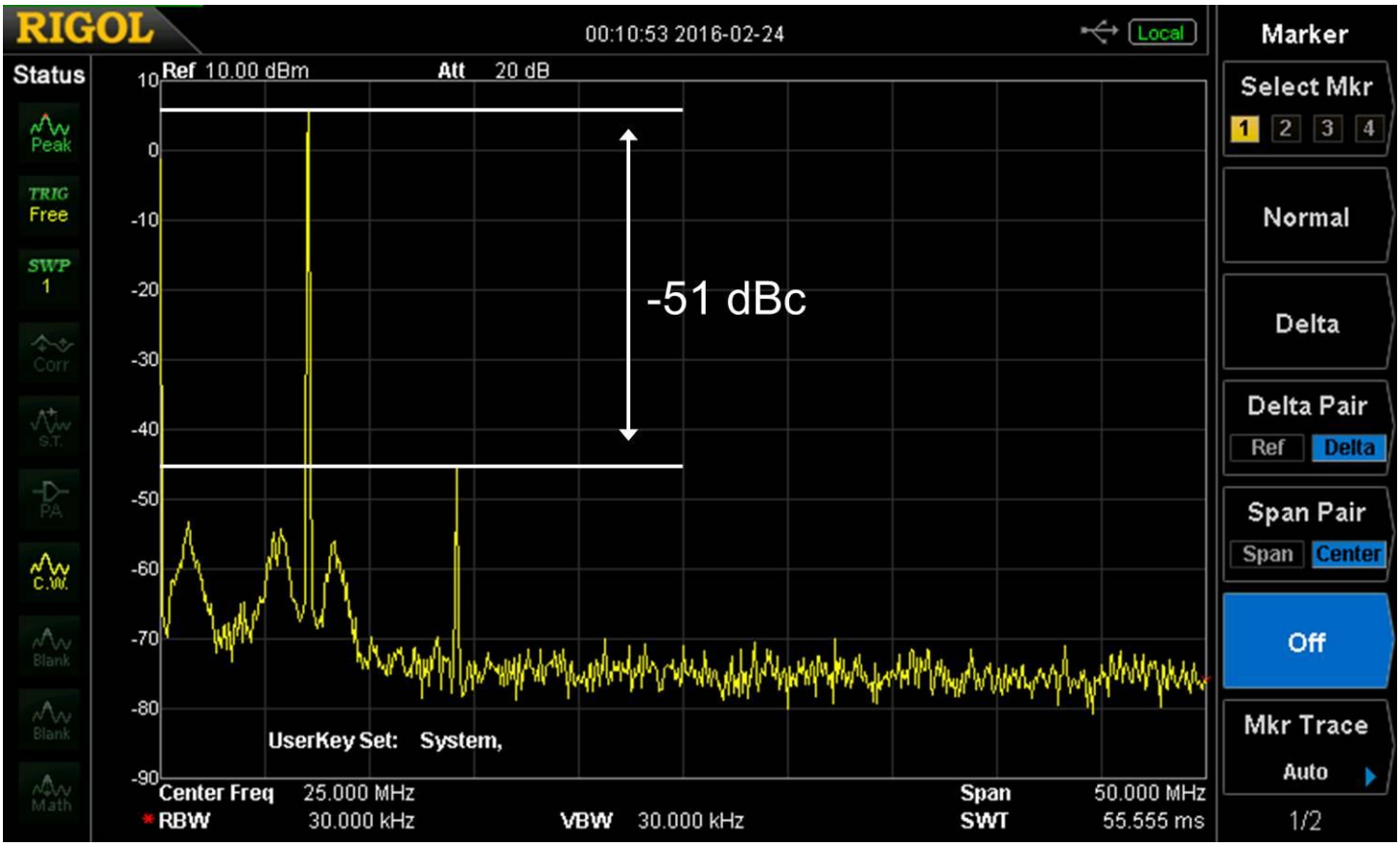
The oscilloscope image below shows the waveform at the gate of Q3, the STP20NF06L MOSFET power amplifier, taken across the 12 ohm gate resistor. While by no means a sine wave, the 2.6 Vpp can be used to estimate that about 70 mW is being delivered to the 12 ohm load. The gate of the MOSFET is biased slightly positive, so that about 10 mA flows in the drain circuit with no input signal.



This next ‘scope trace shows the output of the power amplifier and low pass filter, taken across a 50 ohm resistive dummy load. The nice 38.6 Vpp sine wave allows a calculation of the output power as approximately 3.7 watts. Thus the gain of the final stage is about 17 dB! Power supply voltage, measured on the PCB, was 12.5 V, and total current draw was 630 mA (~ 50 mA for the TT2 portion) for about 50% efficiency of the PA.



This spectrum analyzer display shows that all of the spurious signals are at least 51 dB below the fundamental – exceeding the FCC requirement of 43 dB below the fundamental.



Tuna Tiny Spy Radio Transmitter	
Bill of materials for rev1.0	
29-Jul-15	
C1, C3, C5	0.01 uF 50 V ceramic, 0.2" lead spacing
C2	150 pF 50 ceramic, NP0/C0G preferred, 0.2" lead spacing
C4	250 pF 50 V ceramic, 0.2" lead spacing
C6, C7, C8, C9, C10, C12	0.1 uF 50 V ceramic, 0.1" lead spacing
C11	25 uF 25 V electrolytic, 0.1" lead spacing
C13	0.1 uF 100V ceramic disk, 0.2" lead spacing
C14, C22	270 pF NP0/C0G ceramic, 0.2" lead spacing
C15	0 (not used in 40 meter version)
C16, C20	22 pF NP0/C0G ceramic, 0.2" lead spacing
C17	27 pF NP0/C0G ceramic, 0.2" lead spacing
C18	680 pF NP0/C0G ceramic, 0.2" lead spacing
C19	68 pF NP0/C0G ceramic, 0.2" lead spacing
C21	120 pF NP0/C0G ceramic, 0.2" lead spacing
C23	82 pF NP0/C0G ceramic, 0.2" lead spacing
D1	1N4001 or other common rectifier diode
D2	4.7 V 1/2 W zener diode
L1	22 uH choke, 7 turns #24 on FT37-43
L2	1.02 uH, 16 turns #26 on T37-2
L3	0.90 uH, 15 turns #26 on T37-2
Q1	2N2222A TO-92 package OK
Q2	2N2222A TO-18 package preferred
Q3	STP20NF06L enhance mode, N-channel MOSFET TO-220
R1	4.7 K 1/4 W 5% carbon film
R2	47 K 1/4 W 5% carbon film
R3	220 1/4 W 5% carbon film
R4	100 1/4 W 5% carbon film
R5	1 K 1/4 W 5% carbon film
R6	8.2 K 1/4 W 5% carbon film
R7	1 K 1/4 W trimmer potentiometer
R8	12 ohm 1/2 W carbon film or metal oxide film
R9	5 K 1/4 W trimmer potentiometer
R10	680 1/4 W 5% carbon film
SW2	SPST momentary switch
T1	BN-43-1502 binocular core, 9 turn primary, 2 turn secondary
T2	6 turns bi-filar wound on FT50-43 toroid
X1	40 fundamental meter crystal - HC49 or FT-243 type

Notes:
[1] Since debuting in May 1976 QST (and its March 2000 QST reprise), the *Tuna Tin 2* has been offered at various times by the NorCal QRP club and the Ft. Smith QRP club.
At present QRPME has them: *http://www.qrpme.com/?p=product&id=TT2*

[2] Chuck Carpenter's *Texas Topper* page: *http://w5usj.com/TxTopperQRPAmp.html*

Photo Gallery