Malta 40

A QRP CW transceiver for 40m by G3TXQ

Circuit Notes

This CW transceiver design was inspired by Rick Littlefield, K1BQT's, article in the January 1988 issue of Ham Radio - you can see a photograph of Rick's transceiver on page 23 of Sprat issue 64. My 40m transceiver fits comfortably into the same sized box (about 4"x4"x2"), but has improved receiver performance.

The receiver has a "strong" front end using a dual-gate mosfet with plenty of local oscillator drive from a separate VFO and buffer. The VFO tunes 3.240 - 3.170MHz, giving receiver coverage of 7 - 7.07MHz. A Chebyshev ladder filter using low cost 10.240MHz crystals follows the mixer and has a bandwidth of 1KHz with the capacitor values shown. Next comes the usual MC1350 / NE612 (or NE602) IF amplifier - product detector combination, with a VXO allowing the BFO to be adjusted over a wide range of frequencies.

The agc is the best design I have come across for this type of application. It is based on the circuit found in the Atlas 180 and performs very well for such a simple arrangement. The addition of R23 and C41 to the more usual circuit allows the agc to respond rapidly to noise spikes without "hanging" the receiver. R22 should be adjusted with no input signal so that IF noise just begins to quieten.

An optional audio filter and an LM386 output stage complete the Rx signal path. The receiver draws well under 100mA from a 13.5V supply

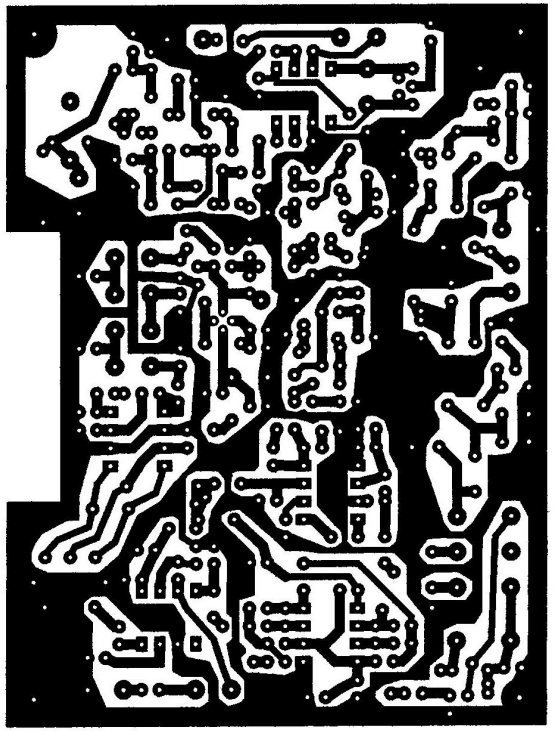
The transmit chain produces an output of well over 5W and draws about 600mA from a 13.5V supply. The drive level can be adjusted using R31 and should be reduced until the output power just begins to drop - this keeps the output spectrum nice and clean.

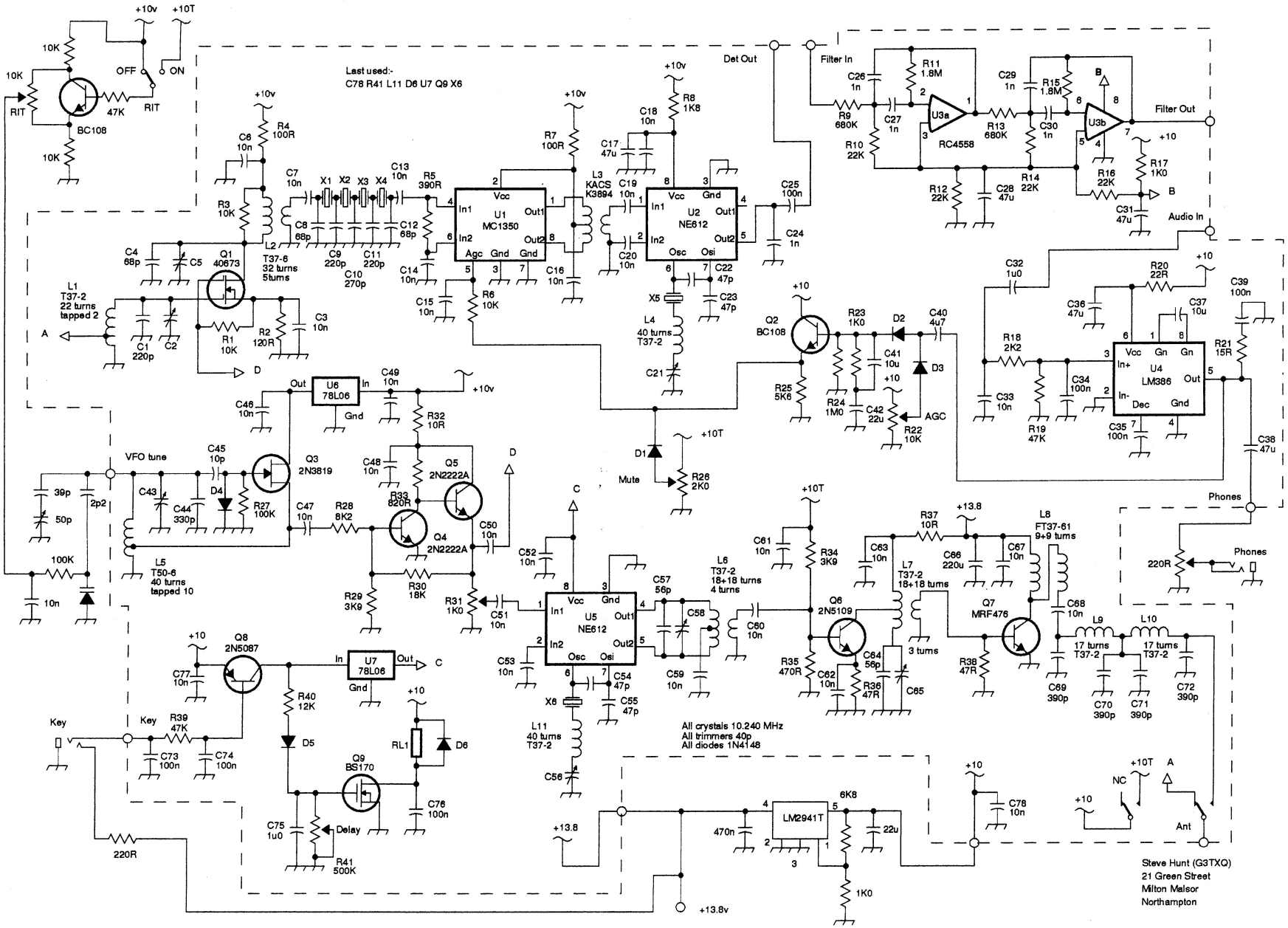
A VXO circuit around U5 allows the transmit frequency to be pulled into the middle of the crystal filter passband. On key down into a dummy load, with the audio filter switched in, C56 should be adjusted for maximum sidetone signal.

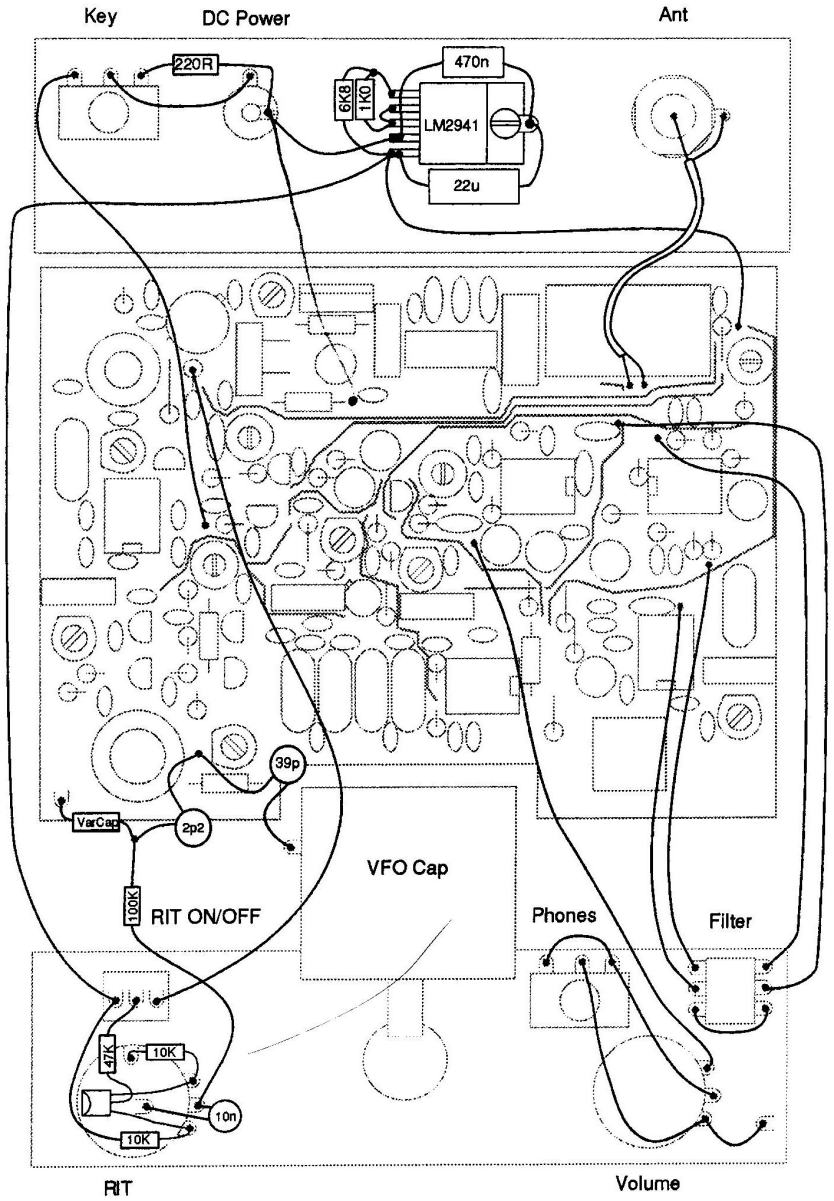
Sidetone level is adjusted with R26. Make sure that the sidetone level is being controlled by R26 and not the Rx agc circuit; otherwise there will be agc delay when switching from transmit to receive.

The RIT circuit components were assembled "ugly style" on the back of the RIT potentiometer. Almost any varactor diode can be used if the value of the 2p2 capacitor is chosen appropriately. The voltage regulator and Q7 are bolted to the rear of the transceiver case for heat sinking. The use of the relatively expensive LM2941 regulator allows stabilisation down to input voltages as low as 10.1V - very useful for battery operation.

I use a 3.5mm stereo jack for the key input - this allows me to feed power to the outboard iambic keyer (via a 220 Ohm resistor for protection). I use a similar jack for the audio output so that I can use readily available headphones



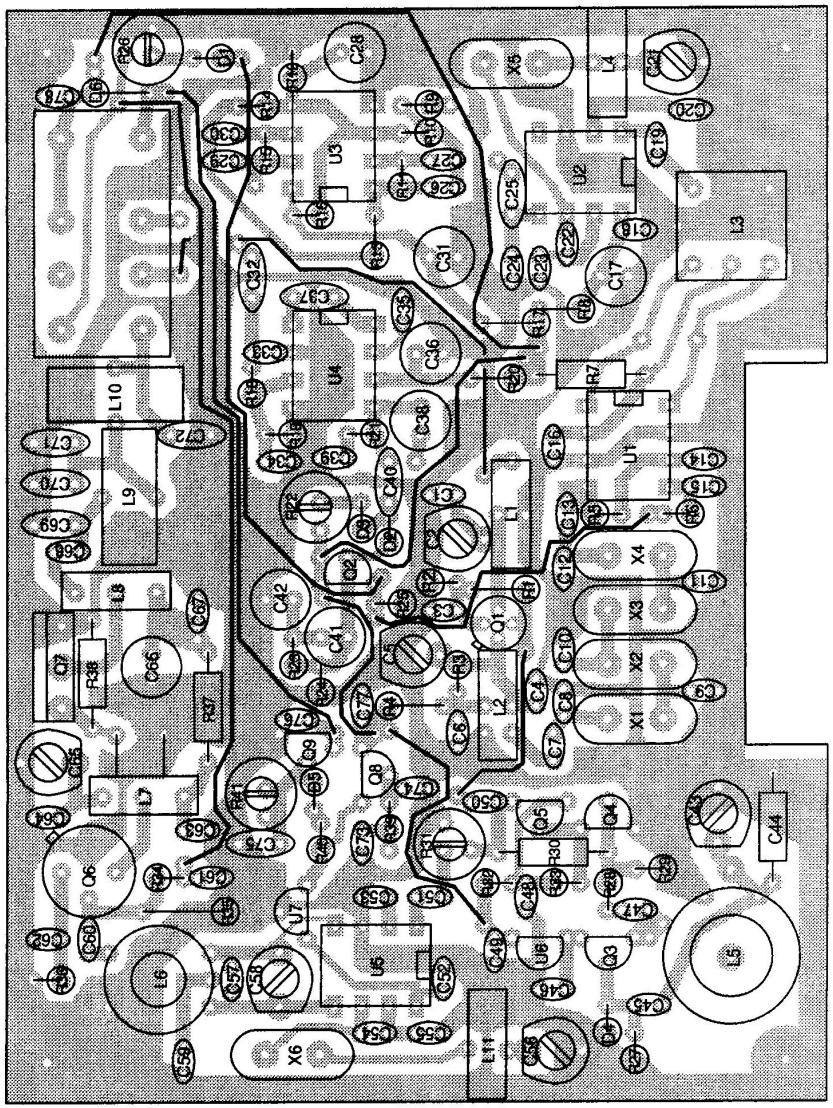

Last used:-
C78 R41 L11 D6 U7 Q9 X6
All crystals 10.240 MHz
All trimmers 40p
All diodes 1N4148
Steve Hunt (G3TXQ)
21 Green Street
Milton Malsor
Northampton



X1-X6	10.240MHz crystal		
RL1	12V DPDT	179-351	F
RIT circuit	BC108C	BC108C	F
	47K	229-878	F
	10K 2 off	229-799	F
	10K pot	P10KA	E
	100K	229-910	F
	10n ceramic	143-729	F
	2p2 NPO ceramic)		
	varactor diode) as required		
Regulator circuit	6K8	229-775	F
	1K0	229-672	F
	470n	108-958	F
	22u	148-840	F
	LM2941T	LM2941CT	F
Misc	Case		
	Jacks (Phones, Key, PWR)		
	220R pot (volume)	P220B	E
	DPDT switch (filter)		

Stockist B	Bonex (0753) 549502
Stockist C	Cirkit (0992) 444111
Stockist E	Electrovalue (0784) 442253
Stockist ED	Economic Devices, 32 Temple St., Wolverhampton, WV2 4AN
Stockist F	Farnell (0532) 636311

R8	1K8	229-702	F
R18	2K2	229-714	F
R29,R34	3K9	229-740	F
R25	5K6	229-763	F
R28	8K2	229-787	F
R1,R3,R6	10K	229-799	F
R40	12K	229-805	F
R30	18K	229-829	F
R10,R12,R14,R16	22K	229-830	F
R19,R39	47K	229-878	F
R27	100K	229-910	F
R9,R13	680K	230-017	F
R24	1M0	230-030	F
R11,R15	1M8	230-066	F
R26	2K0 trimpot	107-618	F
R22	10K trimpot	107-620	F
R41	500K trimpot	107-625	F
L1	22(2) on T37-2	55-00372	C
L2	32+5 on T37-6	55-00376	C
L3	IFT KACS K3894	35-38940	C
L4,L11	40 on T37-2	55-00372	C
L5	40(10) on T50-6	55-00506	C
L6 } Bifilar wound	36CT+4 on T37-2	55-00372	C
L7 }	36CT+3 on T37-2	55-00372	C
L8	9+9 on FT37-61		
L9,L10	17 on T37-2	55-00372	C
D1-D6	1N4148	12-41486	C
U1	MC1350		ED
U2,U5	NE612 or NE602	NE612AN	F
U3	RC4558	RC4558P	F
U4	LM386	LM386N1	F
U6,U7	78L06	LM78L62ACZ	F
Q1	40673 or 3N201	600201	B
Q2	BC108C	BC108C	F
Q3	2N3819	2N3819	F
Q4,Q5	2N2222A	2N2222A	F
Q6	2N5109 or 2N3866	58-13866	C
Q7	MRF476 + hardware	600476	B
Q8	2N5087	2N5087	F
Q9	BS170	BS170	F



Typical circuit voltages with 13.5 volt supply:-

	S	G1	G2	D	
Q1	0.6	0	0.6	9.5	LO 3v p/p at G2

	S	G	D	
Q3	0	-3.5	6.2	LO 7v p/p at gate

	E	B	C	
Q2	5.3	6	10	Rx
Q4	0	0.6	6.2	
Q5	4.4	5	10	LO 3v p/p at emitter
Q6	0.3	1	13.5	Tx Sig 18v p/p at collector
Q7	0	0	13.5	Tx Sig 3v p/p at base - 30v p/p at collector

	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8
U1	9	9	0	3	4.6	3	0	9
U2	1.3	1.3	0	4.7	4.7	5.7	5.1	5.8
U3	2.9	3.3	3.3	0	3.3	3.3	3	6.6
U4	1.4	0	0	0	5	10	5	1.4
U5	1.3	1.3	0	5	5	6.1	5.5	6.2

Component values and suggested stockists are shown below:-

Circuit reference	Value	Stock No.	Stockist
C45	10p NPO ceramic	236-925	F
C22,C23,C54,C55	47p ceramic	237-000	F
C57,C64	56p ceramic	237-012	F
C4,C8,C12	68p ceramic	237-024	F
C1,C9,C11	220p ceramic	237-085	F
C10	270p ceramic	237-097	F
C44	330p poly	105-063	F
C69,C70,C71,C72	390p ceramic	630-19391	F
C24,C26,C27,C29			
C30	1n0 ceramic	143-729	F
C3,C6,C7,C13,C14			
C15,C16,C18,C19			
C20,C33,C46,C47			
C48,C49,C50,C51			
C52,C53,C59,C60			
C61,C62,C63,C67			
C68,C77,C78	10n ceramic	146-224	F
C25,C34,C35,C39			
C73,C74,C76	100n ceramic	146-227	F
C32,C75	1u0 10v elec.	105-862	F
C40	4u7 10v elec.	105-865	F
C37,C41	10u 10v elec.	105-867	F
C42	22u 10v elec.	148-840	F
C17,C28,C31,C36			
C38	47u 10v elec.	148-842	F
C66	220u 15v elec.	148-844	F
C2,C5,C21,C43, C56,C58,C65 Tuning Cap	40p trimmer 50p var + 39p fixed or equivalent	108-222	F
R32,R37	10R	229-430	F
R21	15R	229-453	F
R20	22R	229-477	F
R36,R38	47R	229-519	F
R4,R7	100R	229-556	F
R2	120R	229-568	F
R5	390R	229-623	F
R35	470R	229-635	F
R33	820R	229-660	F
R17,R23,R31	1K0	229-672	F