mcHF - HF SDR QRP transceiver

S53DZ Status Report

Project: **mcHF** - HF SDR QRP RTX by Chris M0NKA

Modifications: FW: Chris M0NKA, Clint KA7OEI, Andreas DF8OE
                  HW: Clint KA7OEI, Paolo IZ6MAF, Andreas DF8OE

Date: 8. 4. 2016   Rev 13
Noted by: Bojan S53DZ

1. mcHF basic specifications (from KA7OEI)
- Frequency range: (1.8) 2.5 to 30MHz
- TX max RF power: 10W (nominal 5W)
- RX sensitivity: -126dBm (0,11uV) at BW 300Hz
- RX A/D clipping: -18dBm (co-channel)
- Modes: CW, SSB, PSK, AM, FM
- DC supply range: 11V - 16V
- DC consumption: rx/tx - 360mA/3A at 12V

2. HW (by M0NKA)
- RF PCB: rev0.4
- UI PCB: rev0.4 (ARM Cortex M4 STM32f407)
- LCD HY28B**:** paralell (jumpers **010** for 16-bit paralell) with SPI TouchScreen
- LCD HY28B**:** SPI (jumpers **100** for SPI) with SPI TouchScreen

3. FW (M0NKA, KA7OEI, DF8OE)
- version: xxx_**0_0_219_26_4 (KA7OEI)**
                    xxx_**0.0.219.27.10 (DF8OE - github-devel)**
- making from source: Eclipse, gccarm, make
- flashing: with **mcHFManager**

4. BOOT, FW Upgrade (M0NKA)
- DfuSeDemo.exe: BOOTLOADER "mcHF_boot_0.0.0.14.dfu", J6=on
- mcHF Windows driver: Device Manager "/Driver/mcHFb.inf"
- mcHFManager.exe: "mchf_firm_x_x_xxx_xx.bin" - Upgrade

5. Metal enclosure (from Artur SP3OSJ)
- with buttons and knobs
- for use with higher (7mm) SMD switches
- bottom metal half turned around to get deeper enclosure

6. mcHF modifications - HW RF/UI board

6.a Clint KA7OEI:

ok	RF	RX_sensitivity: **no Q2**, no R40, C64-->0R
ok	RF	TCXO: **thermal couple** the top of U8 and U10
todo	RF/UI	Interference: metal **shield** between RF/UI
ok	RF	LF_PA_osc: added **10uF/16V** Tantal! || C106
ok	RF	RX/TX: R53-->**220R**, R54-->**3k9**
ok	RF	DC_float: C71=C73-->**0R**
ok	RF	PA_stability: C94=C95 **remain 47nF**!
ok	RF	Regulator_bias_floating: **2k2** || C96, C96 --> **2x22uF/16V** (33uF ta)
ok	RF	P/SWR: R59=R60-->**0R**, R58=R62-->**2k2**, C82=C83-->**2u2**, R55=R56-->**47uH**
ok	RF	P/SWR: T2, T3 changed primary to **coax** (RG-178), sec. T2 c-clockwise!!!, sec. T3 clockwise
ok	RF	TX_Pwr: T5 changed to core **BN43-2402** (by **KA7OEI**)
ok	RF	TX: T6, **bifilar**
ok	RF	TX_Pwr: T7 changed/modified - **2x core BN43-202**, PRIM=2x1T, SEC=2x3T, 270pF across prim., 100nF from +Vcc to GND (by **S54AM)**
ok	RF	PA_Bias_reduction_in_RX_mode: R74=R76-->2k2, R73=R75-->from base of Q3,4 up and C=100nF to GND, this junction to near **PTT_5V at R7**
ok	RF	Drivers R77=R79=**47R**
ok	UI	U1 pin23,24 – R6,R7 --> **UI_3V_MCU** (C86+)
ok	RF	C104 || **10uF/16V**
ok	UI	PB1 --> R14 || 100nF, Q1 source --> **A_3V** (C13+)
ok	UI	Blocking ADC: PA2,3,6 on P1 **pin9,10,11 --> 1nF** to GND
ok	UI	RFC1,2,3 --> **47uH** (15uH)
ok	UI	U6 --> **KA78RM33** (LDO 0,6V)
ok	RF	U5 --> **KA78RM33** (LDO 0,6V)
todo	RF	To avoid PA osc.: RFC8 || **10R**

6.b Aleksandr LY3BD:

ok	UI	To avoid floating DC: C18=C19=C7a=C8a ---> **0R**

6.c Paolo IZ6MAF:

ok	RF	RFC5=RFC6=47uH: change to 6 turns on core BN43-2402

ok	UI	LCD_noise: 2 x 150uF tantal + 100nF in parallel to LCD pins 1-2, 100nF to LCD pins 39-40
ok	RF	CMOS_switch_bias, lower Rs: R1a=R1c=R2b=R2d=1k8, R50=390, **R69-->2k2**
ok	RF	SWR: move T3 primary cold tap to the RF output
todo	RF	TX_Pwr: **T7 one BN43-202, T6 removed, RFC8 changed, Q5/Q6 feedback added**, 10R parallel to new RFC8

6.d Andreas DF8OE:

ok	RF	TX_Pwr: changed driver transistors to **BFQ18A**
ok	RF/UI	MCU_ESD: add **2 x Zener 3V3** from P1 pin 12, 13 to GND for paddle conector J2
ok	UI	LCD: removed **R30, R31, R32**
ok	UI	LCD: added 5 lines for **Touchscreen** SPI LCD
ok	UI	LCD: added 3 lines for **LCD in SPI mode**
todo	UI	AF AMP: from +8Vreg **to +12V** via FET

6.e Bojan S53DZ:

ok	RF	TX_Pwr: **additional 10uF/35V** tantal to the middle tap of T7
ok	RF	RX_10m_mirror: **100nF** from the center pad of T1 to GND
ok	RF	RX_10m_mirror: additional **wire** from U15 pin 8 GND to C65 GND pad

7. mcHF SW Recomended setup for better S/N (around DC)

(**ok**) SW: +6kHz **Frequency Translate ON** / set to "**RX LO LOW**"

References:

1. M0NKA mcHF home page
http://www.m0nka.co.uk/?page_id=2
http://www.m0nka.co.uk/?page_id=569

2. KA7OEI mcHF FW and HW modifications
http://ka7oei.blogspot.si/
http://ka7oei.blogspot.si/2015/11/adding-fm-to-mchf-sdr-transceiver.html

3. M0NKA-mcHF yahoo group
https://uk.groups.yahoo.com/neo/groups/M0NKA-mcHF/info

4. DF8OE git-hub mcHF development
https://github.com/df8oe/mchf-github/tree/devel-DF8OE

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