Project Documentation

C64 WiFi-Modem for User Port

Project number: 120

Revision: 0

Date: 29.03.2019

C64 WiFi-Modem for User Port Rev. 0

Module Description

This board is a WiFi modem for the User Port of the Commodore C64. It is based on the project "Build your own 9600 Baud C64 WiFi Modem For $10" of "1200BAUD" (https://1200baud.wordpress.com/2017/03/04/build-your-own-9600-baud-c64-wifi-modem-for-20/).

The WiFi functionality is implemented in the NODEMCU V3 development board/module, which contains an Espressive ESP8266 WiFi and RISC processor. This module can be programmed with free software via a micro USB cable.

The board contains status and activity LEDs and connects to the User Port of the Commodore C64.

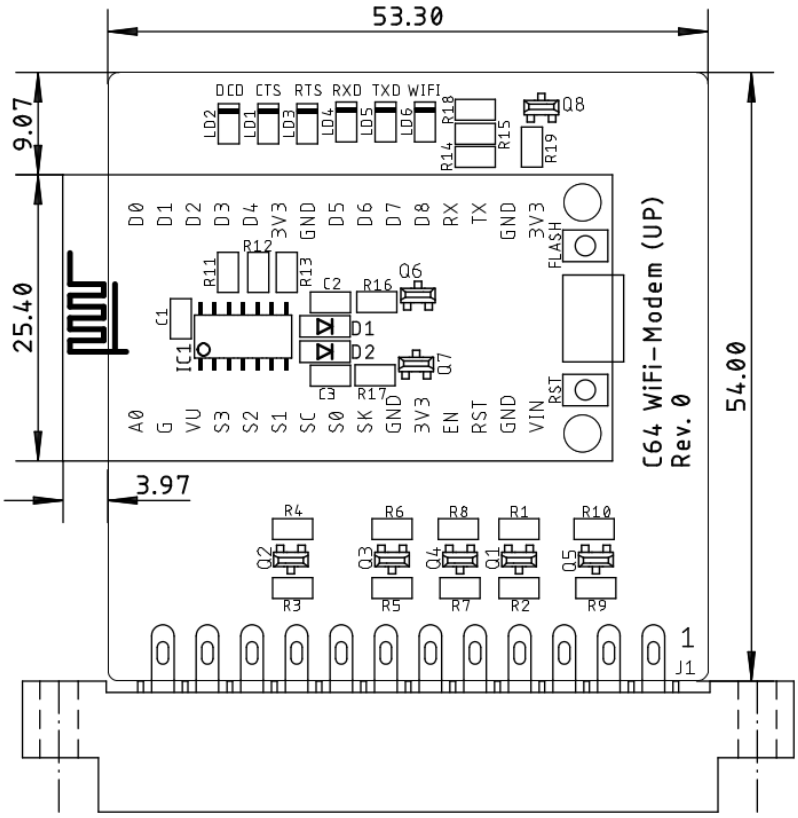


Figure 1: Dimensions of the WiFi modem board

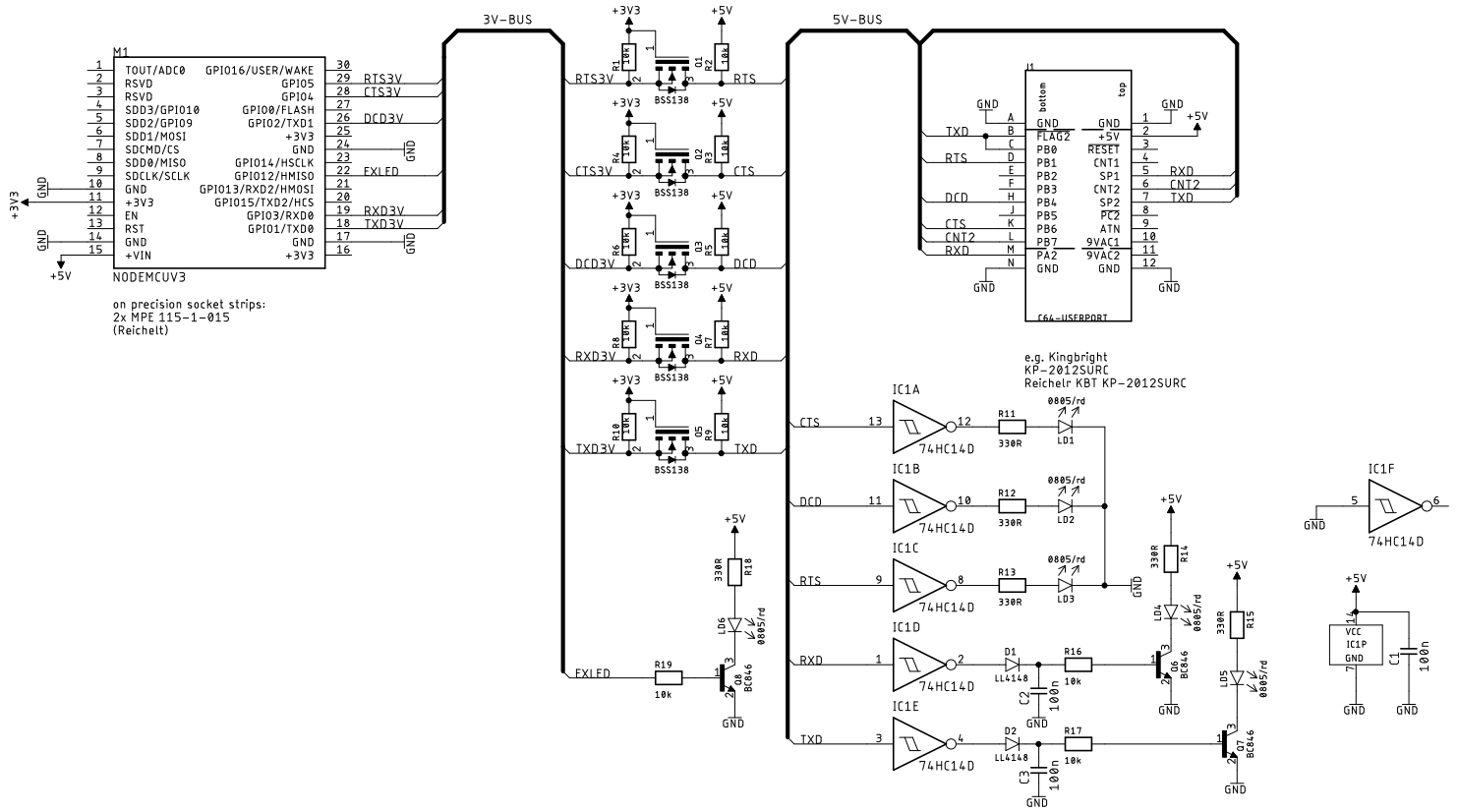
For the NodeMCU V3 programming and the required C64 software, refer to the article mentioned above.

Logic connections

3.3V level			5V level	
Pin	NodeMCU V3	Signal	User Port	Pin
29	GPIO5 (D1)	RTS	PB1	D
28	GPIO4 (D2)	CTS	PB6	K
26	GPIO2 (D4)	DCD	PB4	H

3.3V level			5V level	
Pin	NodeMCU V3	Signal	User Port	Pin
22	GPIO12 (D6)	WiFi-LED*	-	-
19	RXD0 (RX)	RXD	PA2, SP1	M, 5
18	TXD0 (TX)	TXD	/FLAG2, PB0, SP2	B, C, 7
-	-		PB7, CNT2	L, 6

*The function of the WiFi-LED is not implemented in the original software.



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File: C64-Wifi_UserP			
			A3

Sven Petersen 2019	Doc.-No.: 120-2-01-00	
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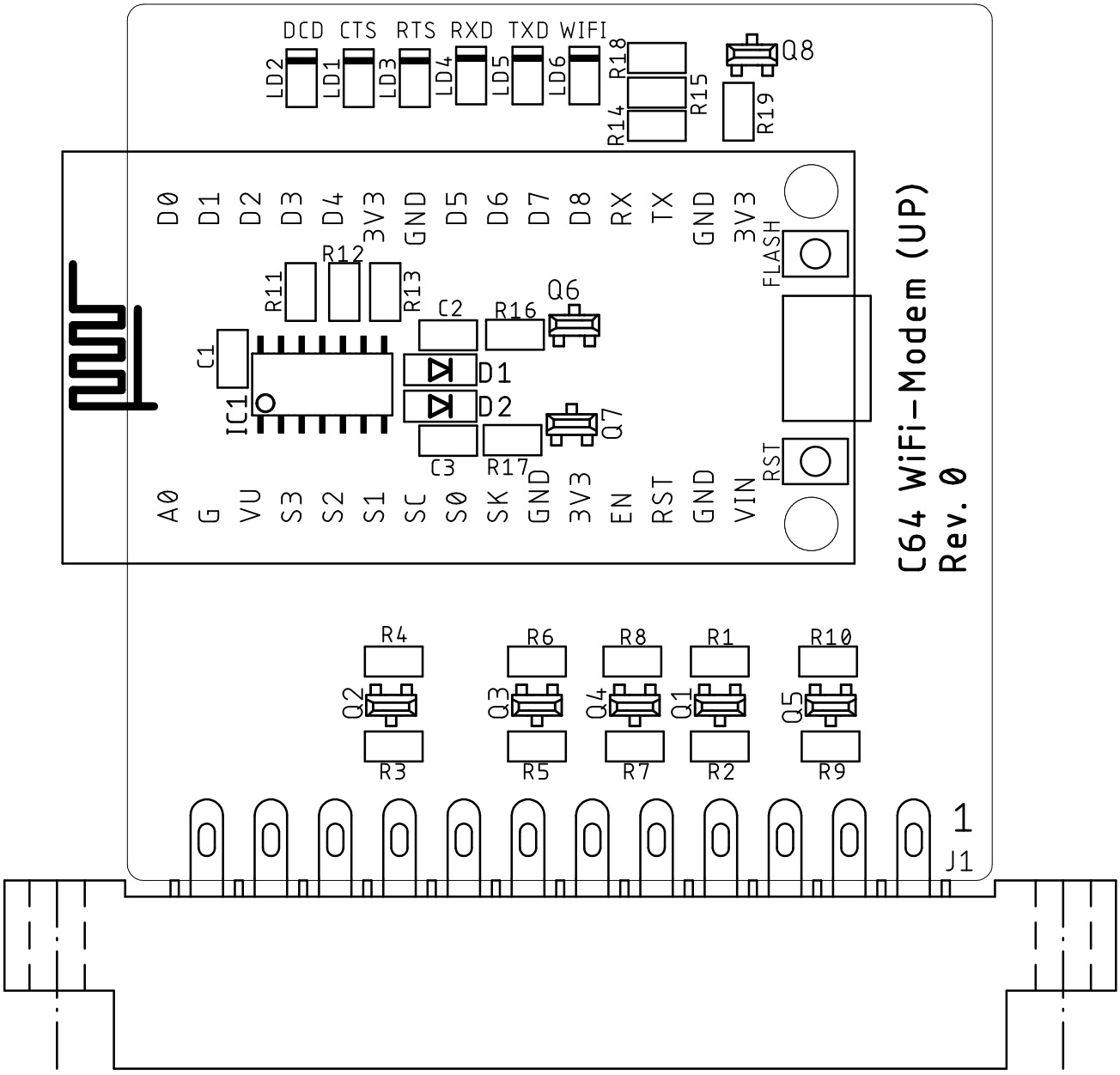
C64-Wifi_UserP		
29.03.2019 08:07		Rev.: 0
placement component side		



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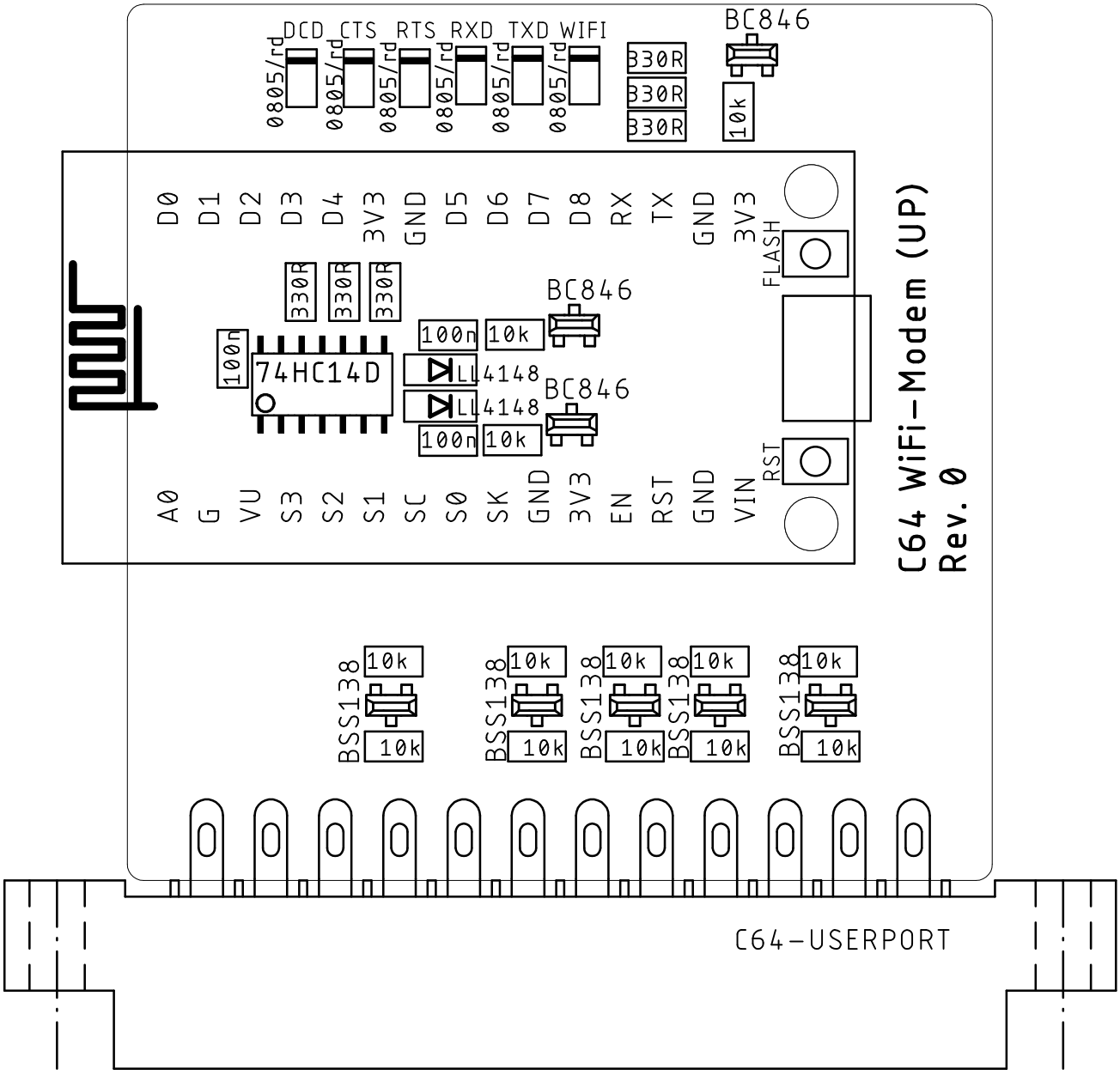

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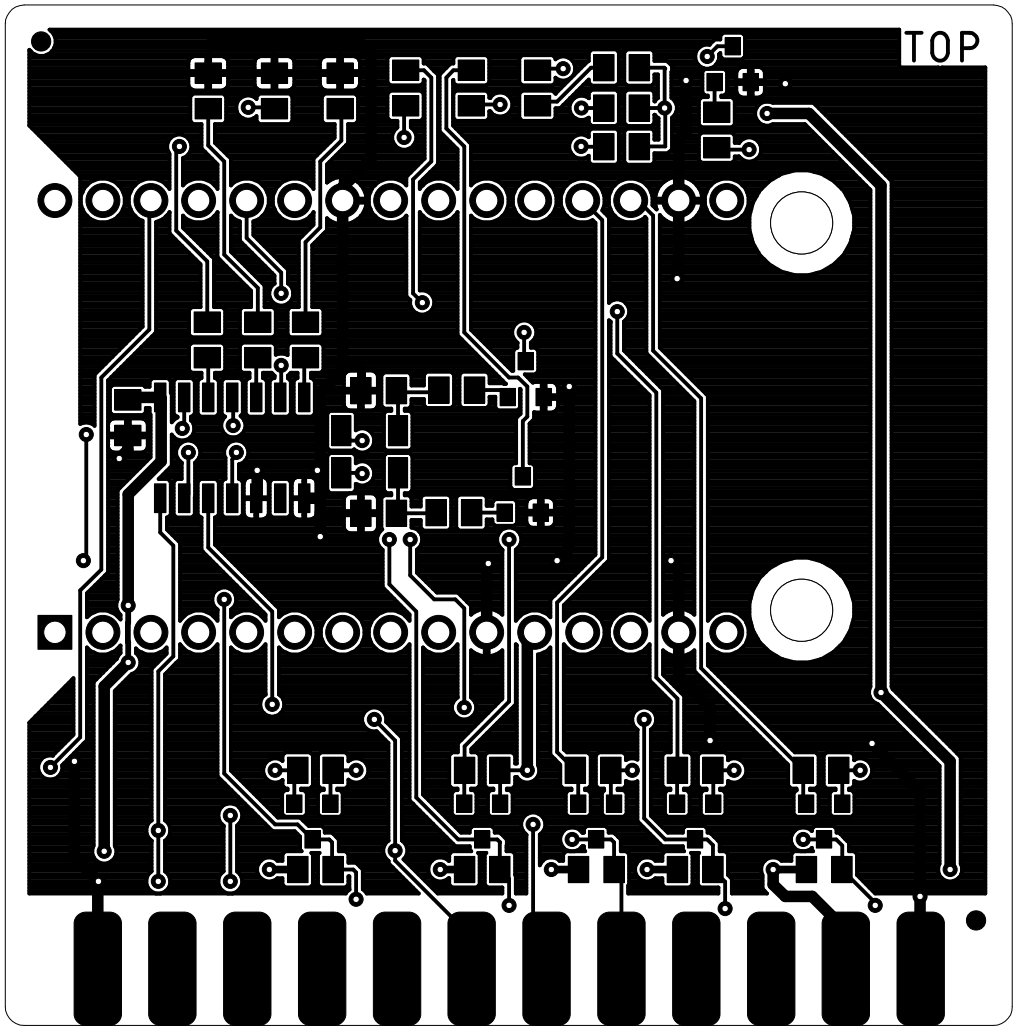

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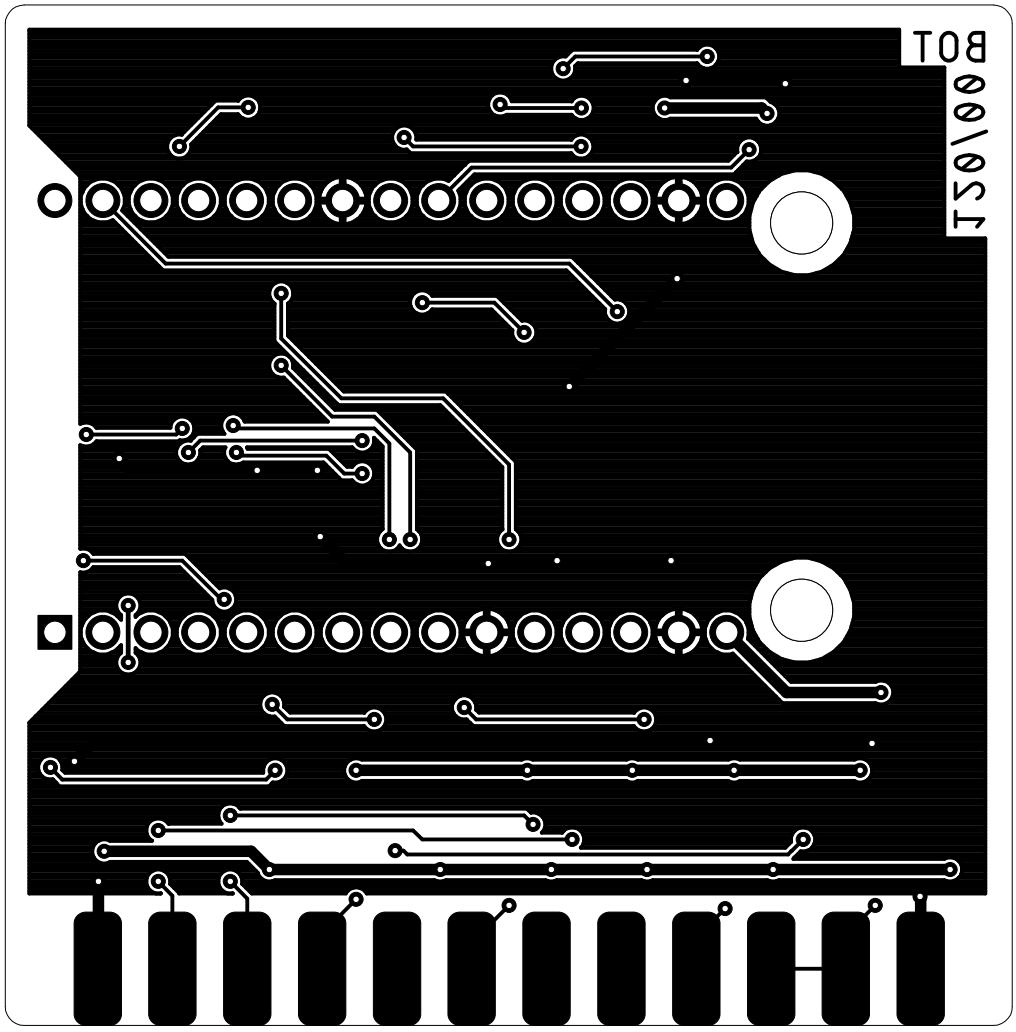

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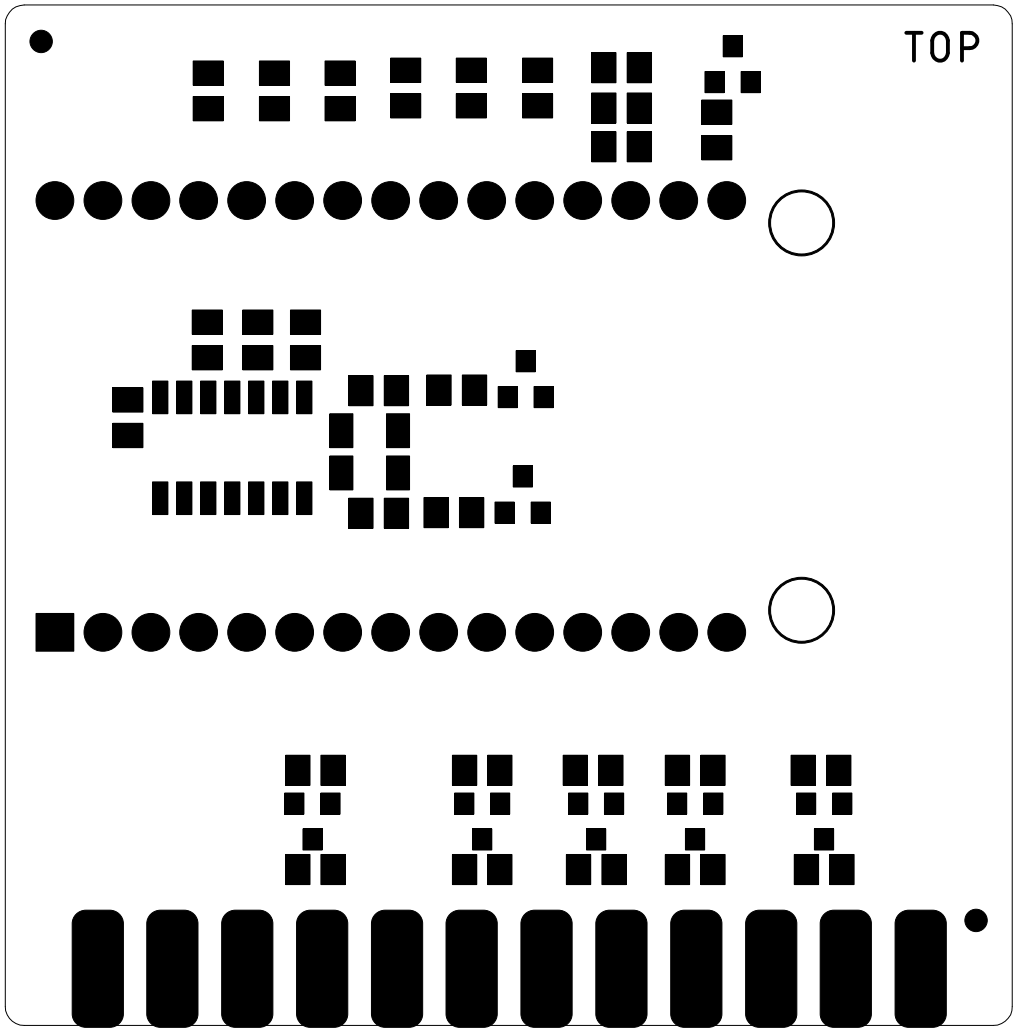
stopmask component side		



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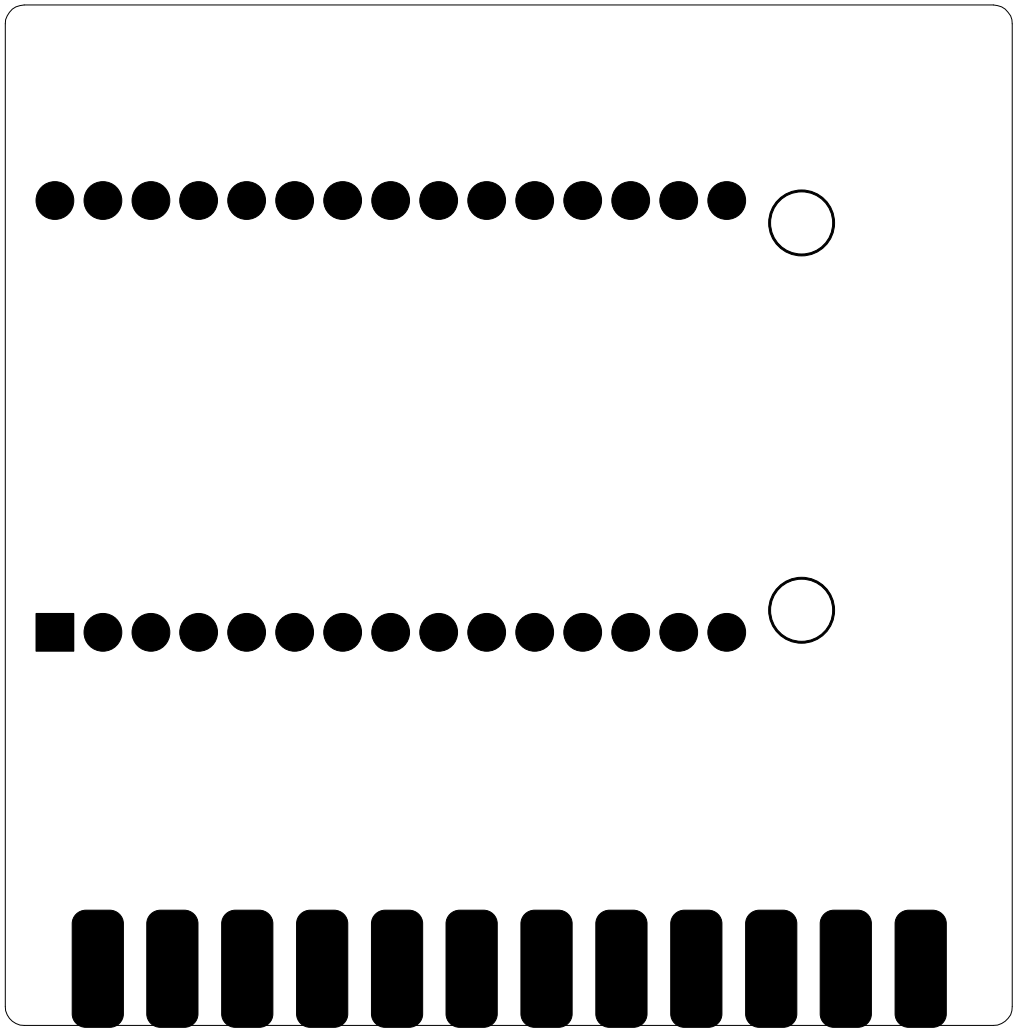

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C64-Wifi_UserP		
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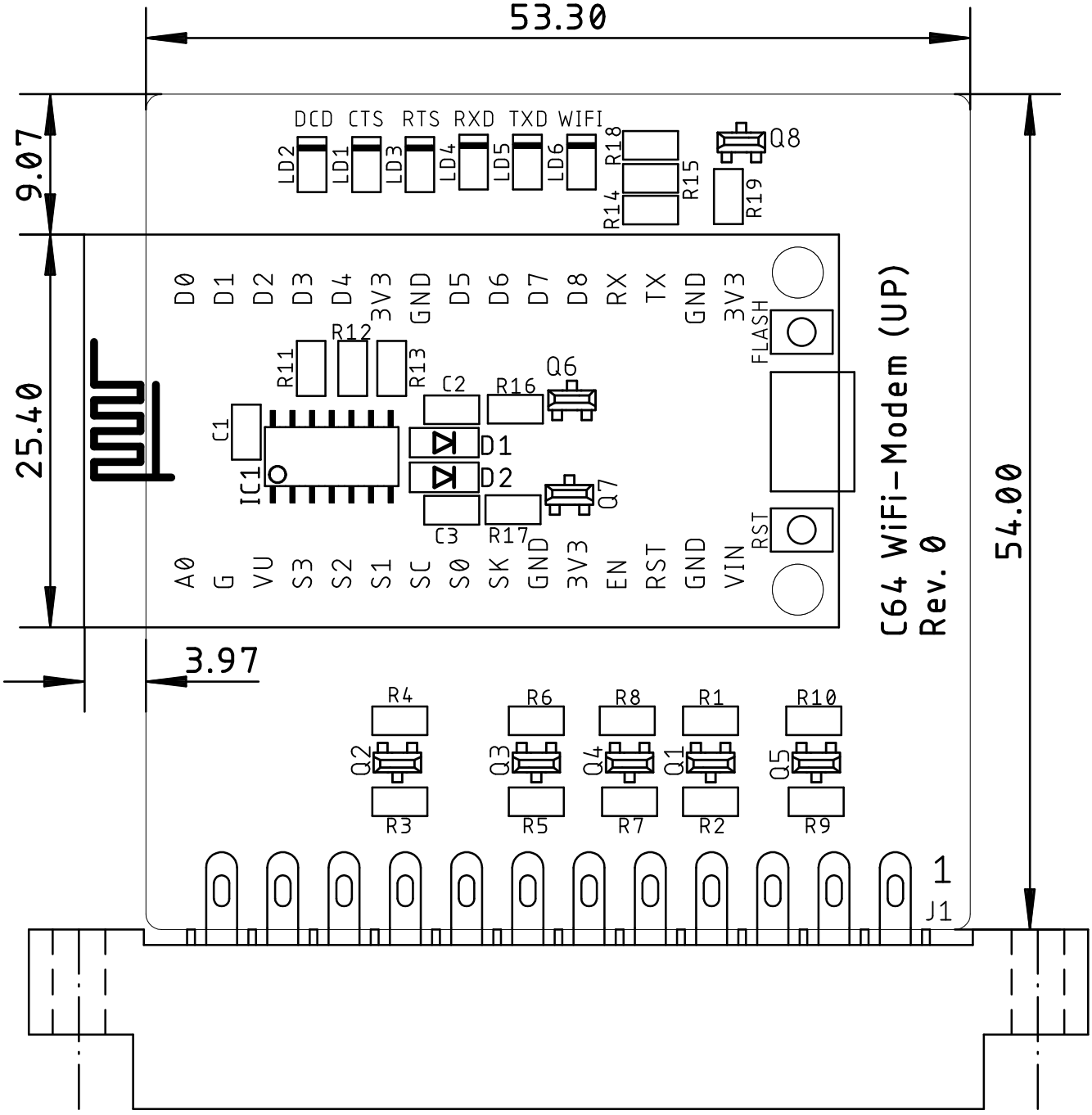
placement component side measures		



C64 WiFi-Modem for User Port Rev. 0

Functional Description

J1 is connecting to the C64 user port. The logic levels are TTL (5V)-levels. The NodeMCU v3 (M1) contains all functionality, WiFi included. Its signal level is 3.3V, so level shifters are required. Those are implemented in the MOSFETs (Q1 – Q5).

The modem signals are active low. The inverters (IC1) are used to drive LEDs. The RxD and TxD lines might toggle often. To obtain a good LED brightness, the output of the inverters IC1D and IC1E are buffered in a capacitor, which is charged via a diode and discharged via the base resistor and the base of a transistor, which is then driving an LED.

The last LED (LD6) is driven by the signal EXLED from the NodeMCU. It can serve as a status LED (e.g. for WiFi), which needs to be implemented in the NodeMCU's software, otherwise the behavior of the LED is not defined.

C64 WIFI Modem (User Port) Rev. 0

Testing

Setup

The C64 WiFi Modem Rev. 0 is driven by a C64 (Mainboard: ASSY250469 with ARMSID), which also connects to an Ultimate II+. The NodeMCU's firmware was installed and running.

Current consumption

The current is measured with a Fluke 89 IV multimeter, which is connected between the power supply and the Power jack of the C64.

First the maximum current of the C64 setup mentioned before is determined without the DUT being connected to the user port. CCGMS 2017 v6 was loaded from the Ultimate II+.

The measured result I_{MAX} is 998.7mA.

In the next step, the DUT was connected and the measurement was repeated. This time, the result is 1095.5mA.

The current consumption of the Modem board might vary depending on the operations/state. It can eb assumed, that is it approximately 100mA.

Connection Test

With the CCGMS software, the Modem was set up, three different WiFi connections were established:

- An iPad Pro acting as an access point
- A WAP (wireless access point)
- A Router

The connections to the WiFi networks could be established, repeatedly. The WAP did not connect anymore after a few days. Since the WAP was far away and all other connections continued working, it was assumed, that either the settings or the distance of the WAP were causing the problem.

After setting up the dialer with several BBS connections and Port numbers, the Wifi-Modem and CCGMS software could connect to those BBSes and exchange data and hold the connection in a stable behavior.

The Status LED was normally on, it turned out to be inverted in the NodeMCU's firmware. On receive, the TxD LED is blinking. TxD refers to the NodeMCU's perspective. On Transmit, the RxD LED is blinking.

Conclusion

The functionality of Rev. 0 is given, the labeling of the LEDs needs to be changed. The Status LED needs to be inverted.

C64 WiFi-Modem for User Port Rev. 0
Bill of Material Rev. 0.0

Pos.	Qty	Value	Footprint	Ref.-No.	Comment
1	1	120-2-01-00	2 Layer	PCB Rev. 0	2 layer, Cu 35µ, HASL, 54.0 x 53.3, 1.6mm FR4
2	6	0805/rd	0805	LD1, LD2, LD3, LD4, LD5, LD6	LED, 0805, red, e.g. Kingbright KP-2012SURC, Reichelt KBT KP-2012SURC
3	3	100n	0805	C1, C2, C3	ceramic cap, 0805, 25V or better
4	13	10k	0805	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R16, R17, R19	chip resistor, 0805, 5% or better
5	6	330R	0805	R11, R12, R13, R14, R15, R18	chip resistor, 0805, 5% or better
6	1	74HC14D	SO-14	IC1	ST micro, NXP, TI etc. e.g. Reichelt SMD HC 14
7	3	BC846B	SOT23	Q6, Q7, Q8	SMD NPN transistor, e.g. Reichelt BC 846B NXP
8	5	BSS138	SOT23	Q1, Q2, Q3, Q4, Q5	SMD MOSFET, e.g. Reichelt BSS 138 SMD
9	1	2x12, 3.96mm pitch	USERPORT	J1	edge connector for C64 user port, ebay or online shops
10	2	LL4148	SOD80C	D1, D2	diode SMD, e.g. Reichelt LL4148
11	1	NodeMCU V3	NODEMCUV3	M1	e.g. WeMOS NodeMCU v3. ebay or online shops or Reichelt DEBO JT ESP8266