

RutAdaptBoard-TextToSpeech User Manual



VERSION 1.1
September 2020

Table of Contents

Version history.....	3
Introduction.....	3
Features.....	3
Overview of the board layout	4
Functional block diagram	4
Board power source select.....	5
USB connectivity.....	5
Audio amplifier	5
Audio output	6
Clock source.....	7
Interface selection.....	8
Board LED’s.....	8
Demo firmware	9
GPIO Ports	9
Solder Bridge configuration.....	11
Mechanical Layout	15
Bill of Materials.....	17

Version history

Table 1. Version history

Version	Date	Rationale
0	August 20, 2020	First draft.
1.0	September 03 , 2020	Rev. 1 Release.
1.1	September 25 , 2020	Rev. 2 Release.

Introduction

RutAdaptBoard–TextToSpeech is a Voice/Audio evaluation board to familiarize with Epson Text To Speech solution and let customers develop their own solutions. It enables faster Time-to-Market for products with voice guidance functions. RutAdaptBoard–TextToSpeech was designed by Rutronik to promote outstanding products selected only from its suppliers. RutAdaptBoard–TextToSpeech designed as Arduino compatible shield board. It is stackable

Features

The board have the following features:

- EPSON Voice/Sound ASIC: S1V3G340.
- Cypress Semiconductor USB to SPI Bridge CY7C65215.
- Cypress Semiconductors NOR flash 64MBit memory S25FL064L.
- STMicroelectronics Class D 2.8W audio amplifier.
- Adam-Tech 3.5 Stereo Jack connector.
- Adam-Tech Arduino compatible headers.
- STMicroelectronics USB ESD protectors.
- Keystone test point.
- Omron slide switch for mode Select.
- Murata Inductors.
- Quartz Oscillators from Epson.

Overview of the board layout

Figure 1 shows the main board's elements.

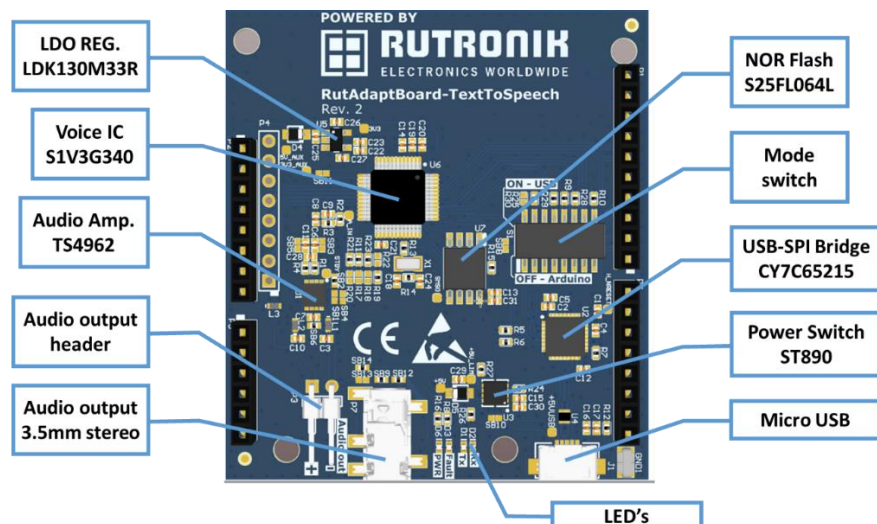


Fig. 1. RutAdaptBoard-TextToSpeech Evaluation Board's Layout.

Functional block diagram

Figure 2 shows the functional block diagram.

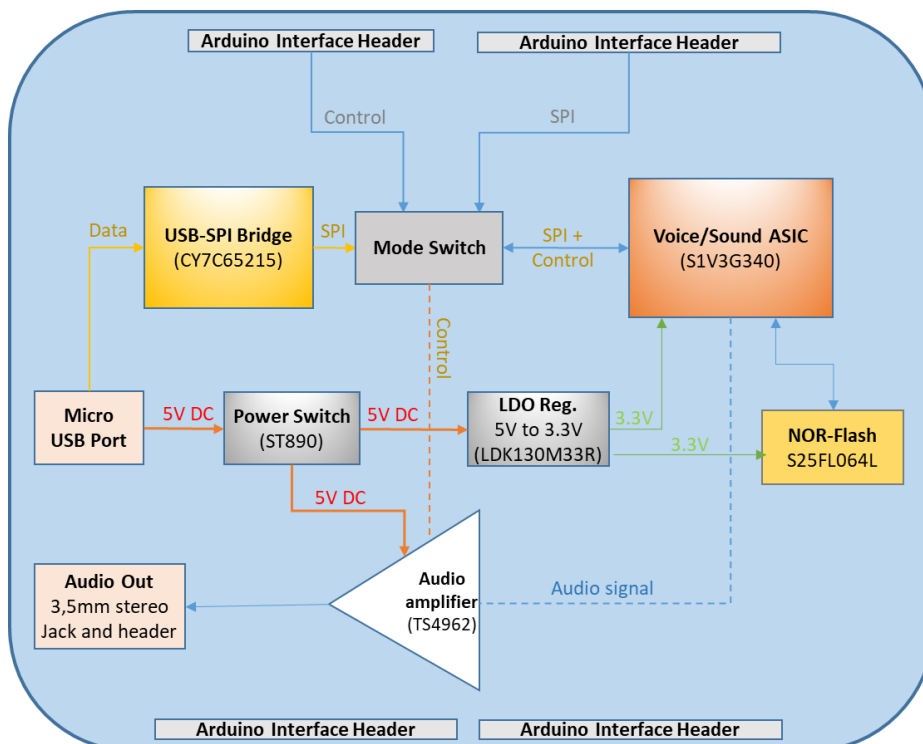


Fig. 2. RutAdaptBoard–TextToSpeech.

Board power source select

RutAdapBoard-TextToSpeech board can be powered from USB when it is connected cable for programming purposes or from Arduino socket from 5V DC. Alternatively, it can be powered from 3.3V DC from Arduino socket. To do this following solder bridge configuration should be changed.

Table 2. Power source configuration

Solder No.	Default configuration	3.3 V operation
SB4	OPEN	CLOSED
SB6	CLOSED	OPEN
SB11	OPEN	CLOSED

USB connectivity

To upload new audio files there is needed to connect the board via micro USB port to the computer. To start work with the board it is necessary to install drivers, which can be found <https://www.cypress.com/file/135701/download> (requires registration). Detailed information how to prepare the computer and how to work with software is described in the document "[Rutronik Epson Tool GuideLine](#)".

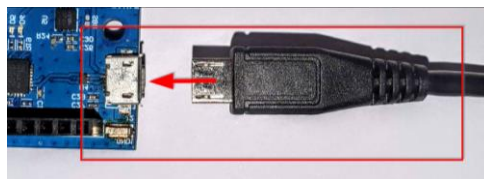


Fig. 3. USB cable connection

Audio amplifier

The board have a Class D audio amplifier. On the input, there is a low pass input filter circuit to reduce high frequency. The gain is controlled by two resistors R1 and R4. The amplifier provides low on/off switch noise with 5ms delay. A standby function current consumption 10nA. The amplifier is powered by 5V, it can be powered also from 3.3V for battery-powered evaluations.

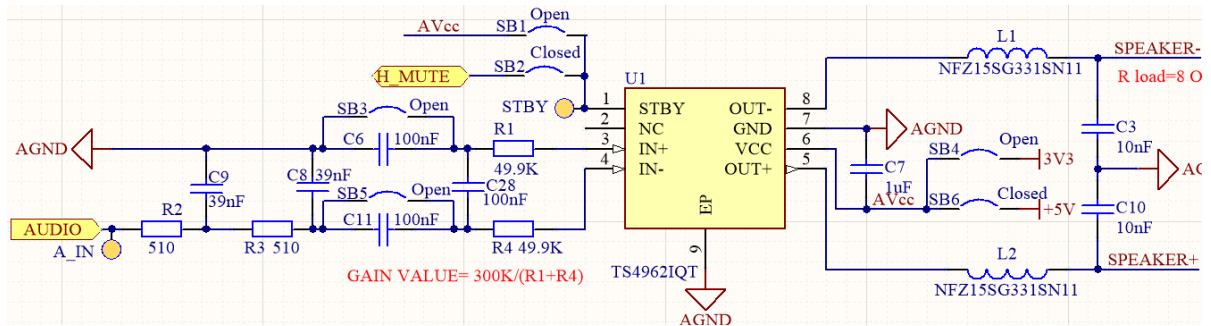


Fig. 3. Low pass filter.

The audio amplifier peripheral are provided for reference only and do not provide a performance guarantee. The exact values of components must be tuned to the specific speaker to get the best performance of audio quality.

Audio output

On the board, there are two audio output connectors, one 2.54mm header and audio jack for. Audio output is optimized for 8Ohms load speaker. Audio jack output P7 can be configured for in various series or parallel connections. Default configurations are parallel Right and Left channel. To configure for series configuration Solder bridges SB9, SB12, SB13 and SB14 must be reconfigured, see table XX for detailed configuration of solder bridges.

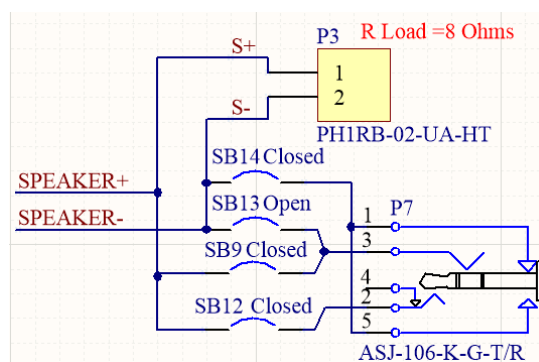


Fig. 5. Audio output configuration.

Table 3. Audio Jack output configuration

Solder bridge No.	Default configuration (Parallel R and L channel output)	Series R and L channel output
SB9	Closed	Open
SB12	Open	Closed
SB13	Open	Closed
SB14	Closed	Open

Figure 6 shows the audio output connections.

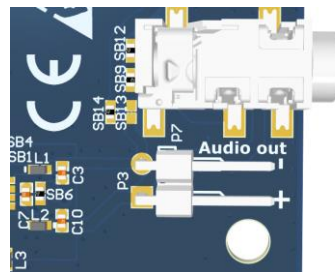


Fig. 6. Audio output configuration.

Clock source

The S1V3G340 system clock source is set from oscillator 32.768kHz. The clock source can be set to be direct input from CLKI pin.

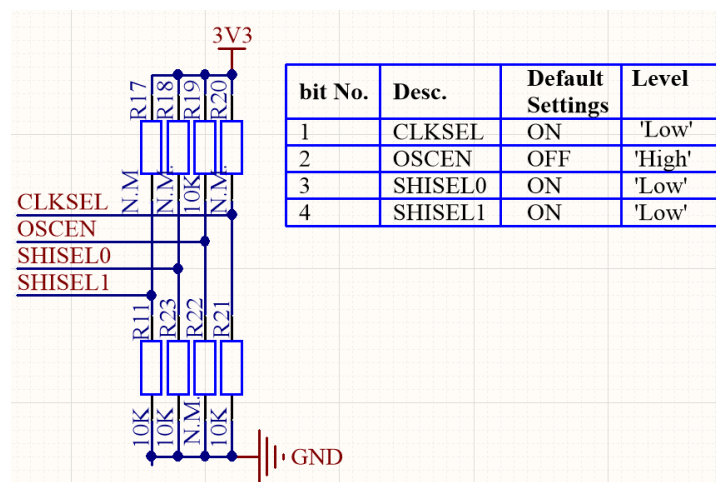


Fig. 7. Clock source configuration.

Interface selection

To work with Rutronik Epson Tool, the interface switch “S1” should be in “ON” position. The default position is USB mode as shown in figure 8. To work with Arduino interface S1 should be turned off.. To do this all “S1” switches should be in the “OFF” position to disable USB and leave Arduino only.

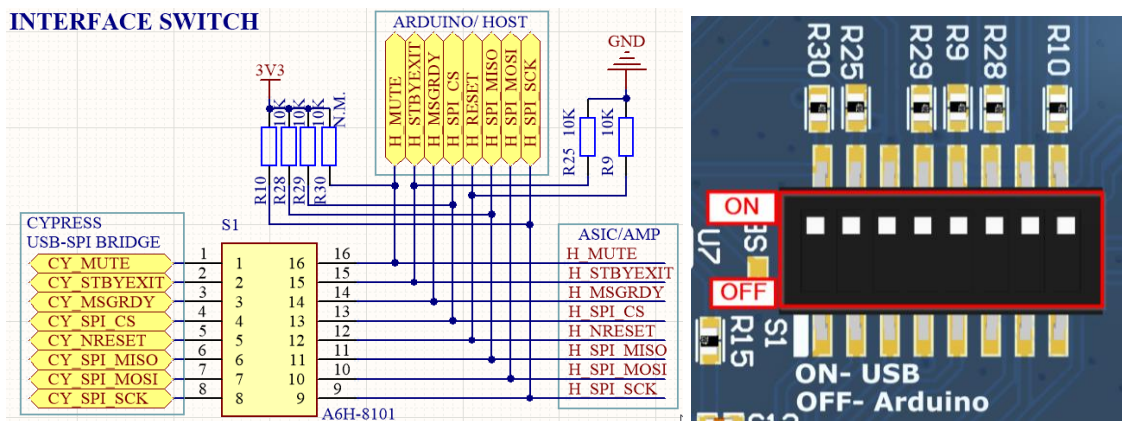


Fig. 8. Interface selection switch S1 schematic and placement on the board.

Board LED's

On the board near the Audio Jack, there is four indication LED's to indicate boards state. Indication LED's description and colour from top to bottom:

1. D2 Green LED communication Rx LED of USB-SPI Bridge.
2. D1 Green LED communication Rx LED of USB-SPI Bridge.
3. D3 Red LED indicates overcurrent of the power switch (more the 500mA) when powered from the USB port.
4. D6 Green LED indicates power on the board 3.3V present on board.

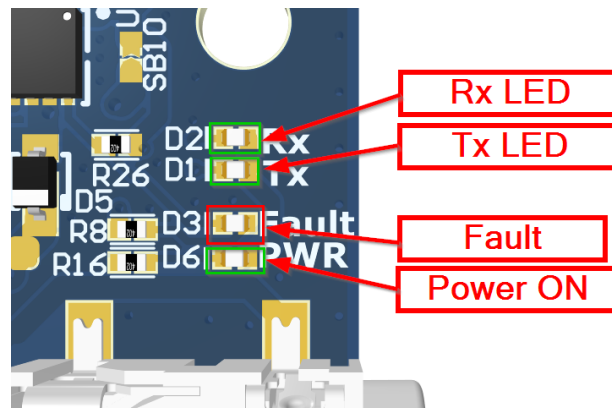


Fig. 9. Indication LED's location on the board.

Demo firmware

The RutAdapBoard–TextToSpeech comes with pre-programmed demonstration files in the flash memory. There are 10 phrases in the flash memory to run evaluation. Evaluation can be executed from a computer using Rutronik Epson Tool or directly from microcontroller for example RutDevKitL5.

GPIO Ports

The S1V3G340 features general-purpose output ports for flexible system design. All functions are controlled by commands over a serial interface. All GPIOs of S1V3G340 are available at socket P4. The pin configuration is described in table 2.

Table 4. Epson GPIO socket P4 pinout

<i>Socket P4 Pinout</i>		
Pin No.	Name	Description
1	GP05	General-purpose output
2	GP04	General-purpose output
3	GP01	General-purpose output
4	GP03	General-purpose output
5	GP02	General-purpose output
6	GP06	General-purpose output
7	GP00	General-purpose output
8	GND	Ground connection

The board provides Arduino connectors for open-source electronics prototyping platforms.

Table 5. Arduino headers pinout

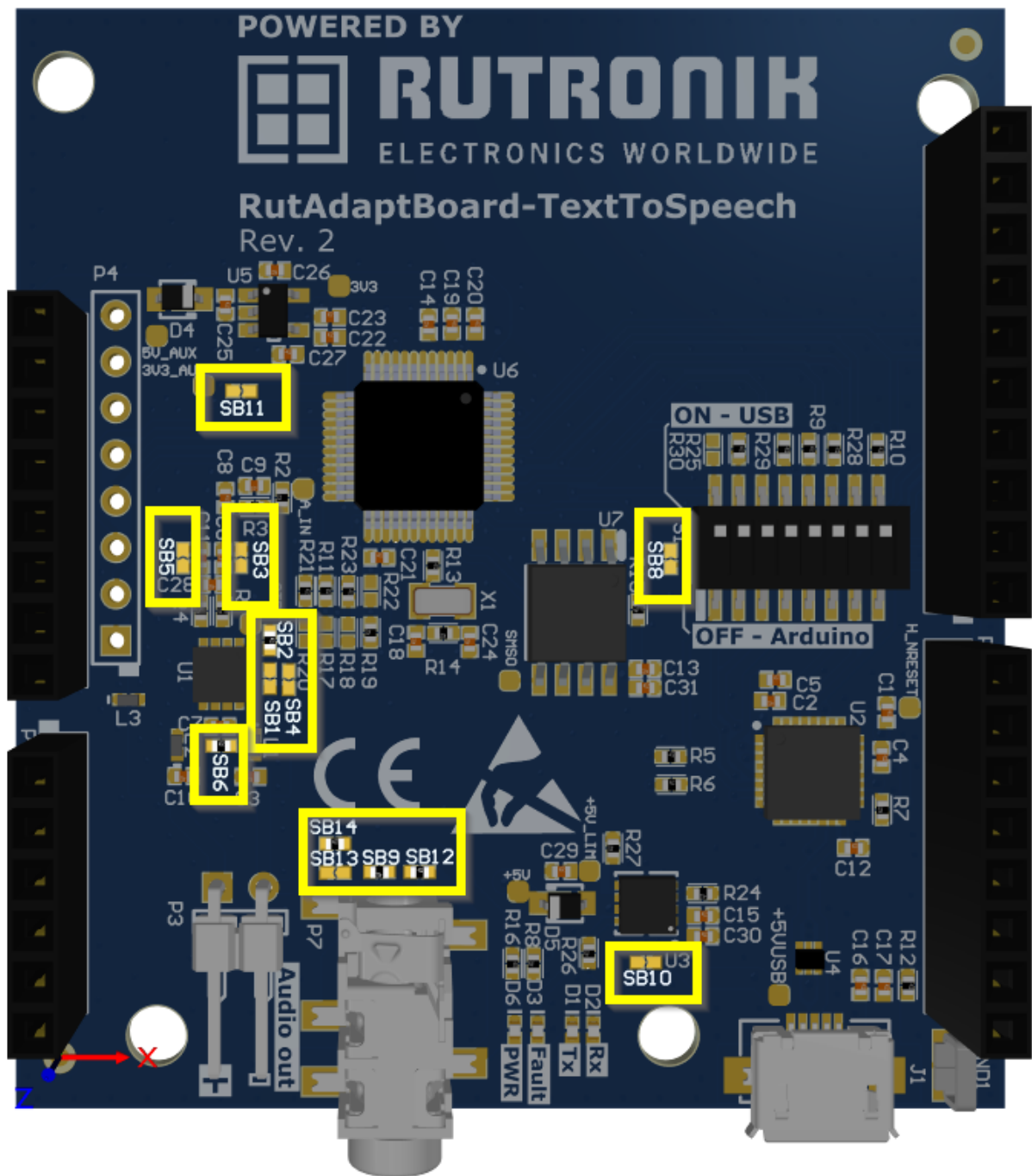
<i>P1 Pinout</i>		
Pin No.	Name	Description
1	-	-
2	H_MUTE	Audio amplifier mute signal
3	CLKI	Clock source input
4	H_SPI_MOSI	A serial data output signal
5	H_SPI_MISO	A serial data input signal
6	H_SPI_SCK	Serial clock signal
7	GND	Ground connection
8	-	-
9	-	-
10	-	-
<i>P2 Pinout</i>		
Pin No.	Name	Description
1	-	-
2	-	-
3	-	-
4	3.3V DC	3.3 V DC power input (for low power operation)
5	5V DC	5 V DC power input
6	GND	Ground connection
7	GND	Ground connection
8	-	-
<i>P5 Pinout</i>		

Pin No.	Name	Description
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
<i>P6 Pinout</i>		
Pin No.	Name	Description
1	-	-
2	-	-
3	-	-
4	H_MSGRDY	Serial Output Data Ready
5	H_STBEXIT	STANDBY mode exit control Input
6	-	-
7	H_RESET	The hardware reset input (active low)
8	H_SPI_CS	Slave Device Select Input

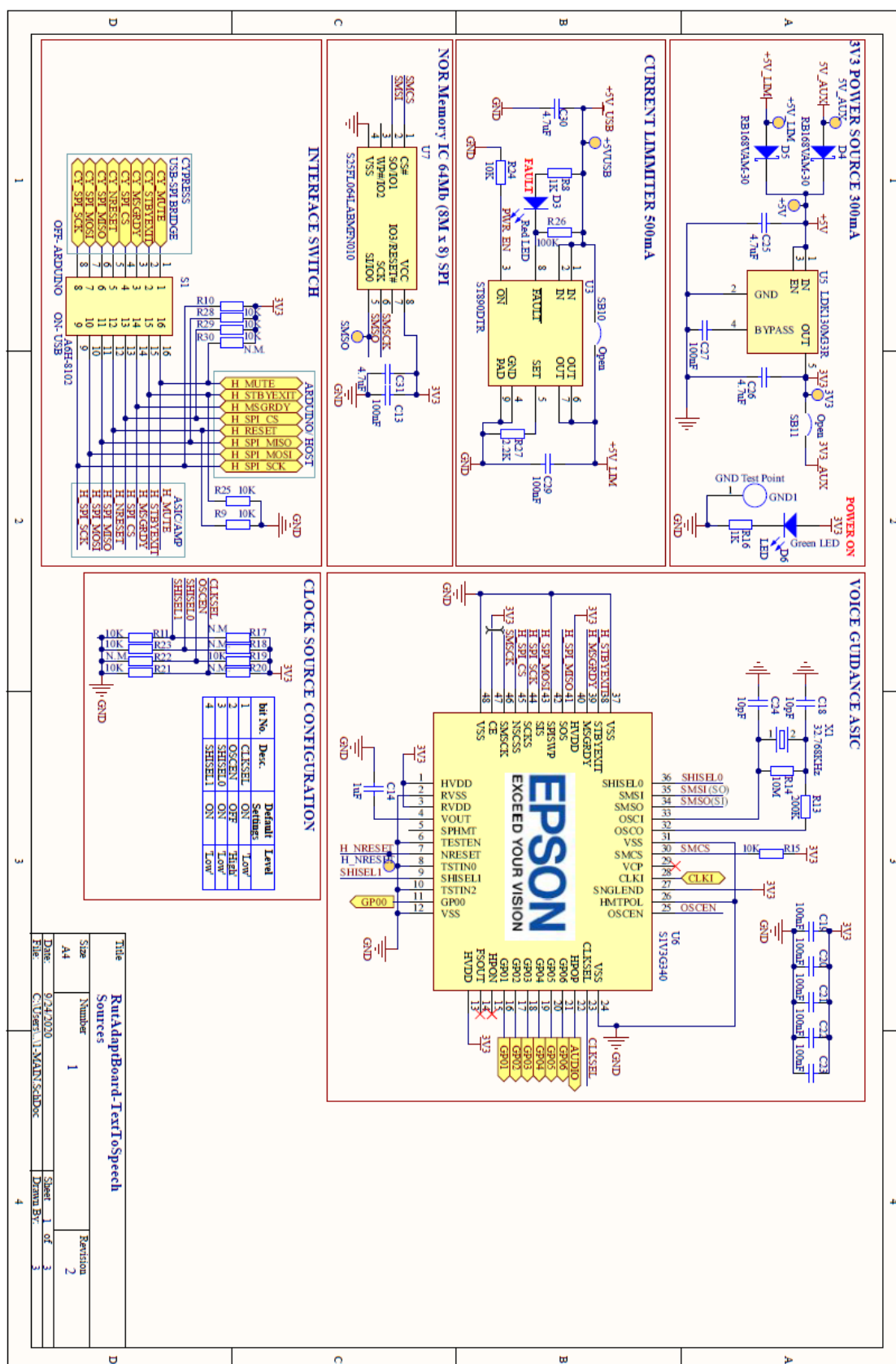
Solder Bridge configuration

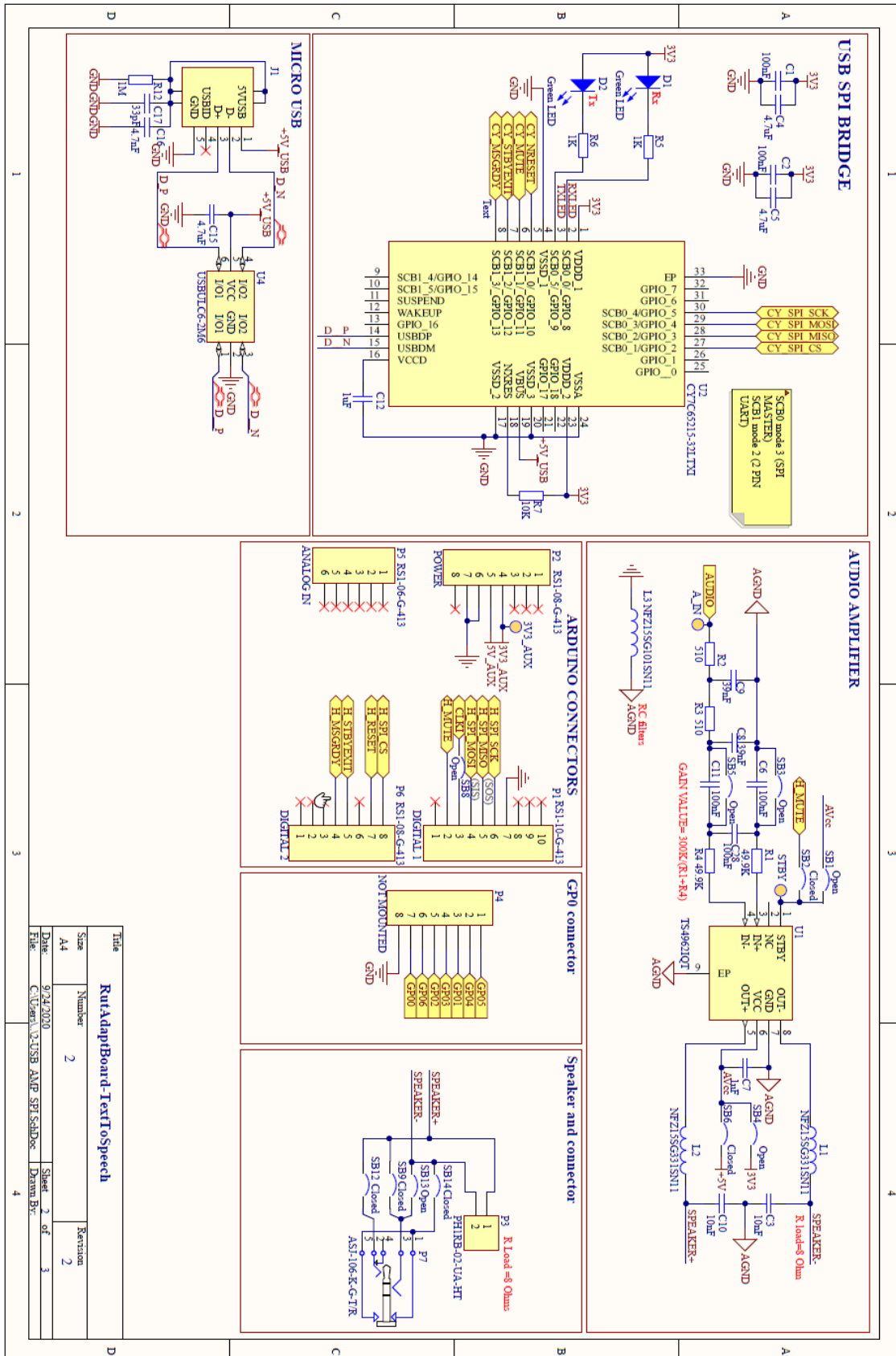
Table 6 Solder bridge configuration

Solder Bridge	Circuit	Default
SB1	Permanent amplifier standby connect to AVcc	Open
SB2	Arduino/USB controlled amplifier standby	Closed
SB3	Amplifier non-inverting input capacitor bypass	Open
SB4	Amplifier power from 3.3V DC	Open
SB5	Amplifier inverting input capacitor bypass	Open
SB6	Amplifier power from +5 DC	Closed
SB8	CLKI clock source Arduino header	Open
SB9	Audio jack output configuration	Closed
SB10	Current limit switch ST890 bypass	Open
SB11	3.3V DC power only	Closed
SB12	Audio jack output configuration	Closed
SB13	Audio jack output configuration	Open
SB14	Audio jack output configuration	Closed



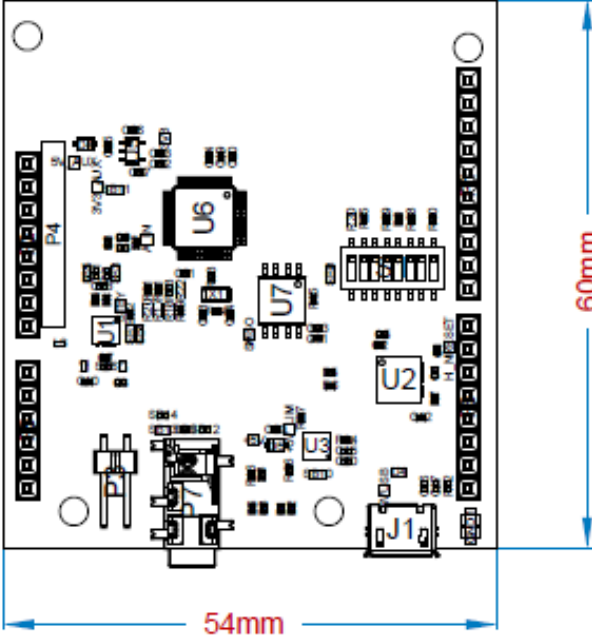
SCHEMATIC



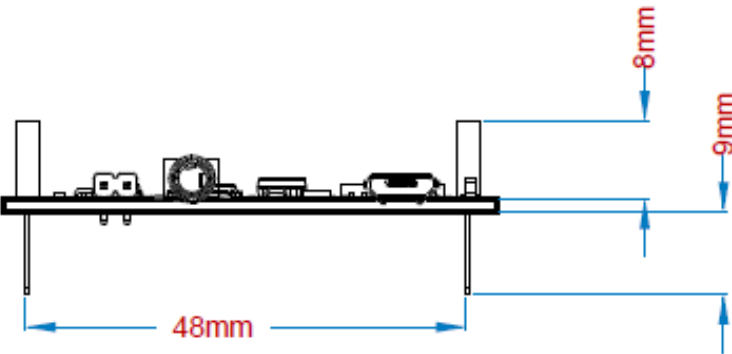
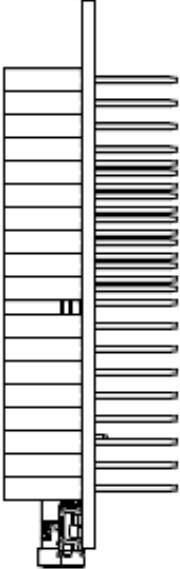


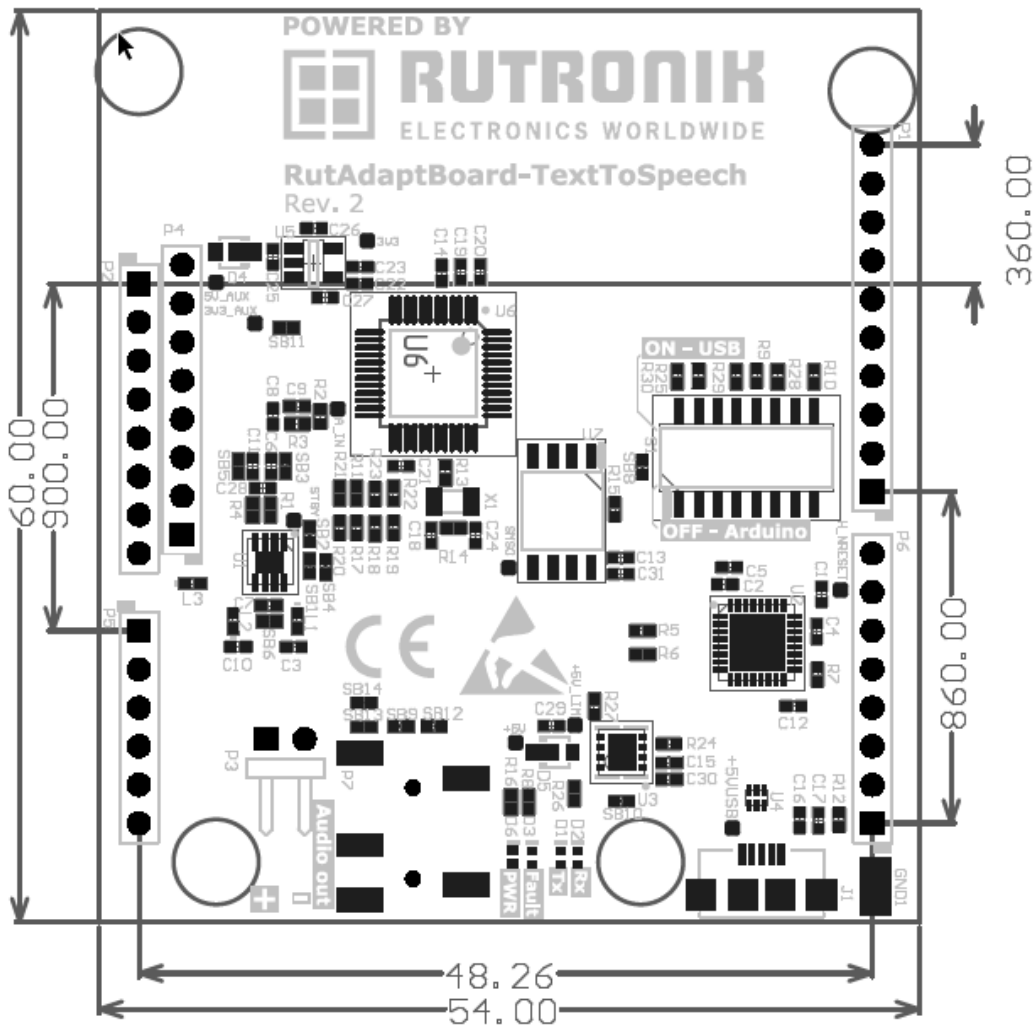
Mechanical Layout

View from Top side (Scale 1:1)



View from Right side (Scale 1:1)





Bill of Materials

Item #	Designator	Part Description	Value	Footprint	Specification	Quantity	Manufacturer	Manufacturer Part	Supplier	Supplier part number
1	C20, C21, C22, C23, C27, C28,	Ceramic Capacitor	100nF	CO402	XTR, 16V, 10%	13	Samsung EM	CL05B104K05NN	Rutronik	KKK21419
2	C3, C10	Ceramic Capacitor	100pF	CO402	XTR, 16V, 10%	2	Samsung EM	CL05B103K05NN	Rutronik	KKK22033
3	C4, C5, C15, C25, C26, C30,	Ceramic Capacitor	4.7uF	CO402	XTR, 6.3V, 20%	7	Samsung EM	CL05A475M03NN	Rutronik	KKK31042
4	C7, C12, C14	Ceramic Capacitor	1uF	CO402	XTR, 16V, 10%	3	Samsung EM	CL05B104K05NN	Rutronik	KKK21419
5	C8, C9	Ceramic Capacitor	39nF	CO402	XTR, 16V, 10%	2	Samsung EM	CL05B104K05NN	Rutronik	KKK21419
6	C16	Ceramic Capacitor	4.7nF	CO402	XTR, 50V, 10%	1	Yageo	CC0402K827R96	Rutronik	KKK17246
7	C17	Ceramic Capacitor	33pF	CO402	NPO, 50V, 5%	1	Yageo	CC0402JRNPO9	Rutronik	KKK14557
8	C18, C24	Ceramic Capacitor	10pF	CO402	NPO, 50V, 5%	2	Yageo	CC0402JRNPO9	Rutronik	KKK15647
9	D1, D2, D6	Typical SMD LED	LI-OH95-0200-25-224Y	0402	Green, 5mA	3	OSRAM	LI-OH95-0200-25-224Y	Rutronik	LED22416
10	D3	Typical SMD LED	VLS1500-6S08	0402	Red, 5mA	1	Vishay	VLS1500-6S08	Rutronik	LED24641
11	D4, D5	Low VF Schottky Barrier Rectifier	RSX20T1LAMB30TR	SOD323	30V, 2A	2	ROHM	RSX20T1LAMB30TR	Rutronik	RB168VAM150TR
12	GN1	SMT Test Point	5019	KeyStone	3.81*2.03	1	KeyStone Electrm	5019	Rutronik	BA12950
13	J1	Micro USB Connector	MCR-B-S-RA-TSMT-CS4A-T/R	5019, Keystone	Type B	1	ADAM TECH	MCR-B-S-RA-TSMT-CS4A-T/R	Rutronik	CCNO1874
14	L1, L2	noise suppression inductor	NFZ15SG331SN11	0402-A	DCR0.30, 0.65A, 1.1A, 1	2	Murata	NFZ15SG331SN11	Rutronik	NEZ15SG101SN11D
15	L3	noise suppression inductor	NFZ15SG101SN11	0402-A	DCR0.10, 1.1A, 1	1	Murata	NFZ15SG101SN11	Rutronik	NEZ15SG101SN11D
16	P1	Arduino Connector	RS1-10-G-413	HDR1X10	10 pos, 2.54mm	1	ADAM TECH	RS1-10-G-413	Rutronik	CCNN1443
17	P3	2.54mm header right angle	PH1RB-02-UA-HT	HDR1X24 TE	2 pos, right angle	1	ADAM TECH	PH1RB-02-UA-HT	Rutronik	PH1RB02UA
18	P7	AUDIO JACK	ASJ-106-K-G-T/R	ASJ-106-K-T/R	3.50mm (0.141")	1	ADAM TECH	ASJ-106-K-G-T/R	Rutronik	WVF106K3TR
19	R1, R4	Thick Film Resistor	49.9K	RO402	1% 0.063W	2	Yageo	MF0207FTE52-49	Rutronik	WVF13633
20	R2, R3	Thick Film Resistor	510	RO402	5% 0.063W	2	Yageo	RC0402JR-071M	Rutronik	WRC33904
21	R5, R6, R8, R16	Thick Film Resistor	1K	RO402	5% 0.063W	4	ASJ, Yageo	CR10-221-JK, RC	Rutronik	WRC35108, WRC33833
22	R23, R24, R25, R28, R29	Thick Film Resistor	10K	RO402	5% 0.063W	11	ASJ, Yageo	CR10-103-JK, RC	Rutronik	WRC40976, WRC33854
23	R12	Thick Film Resistor	1M	RO402	5% 0.063W	1	Yageo	RC0402JR-071M	Rutronik	WRC33904
24	R13	Thick Film Resistor	200K	RO402	5% 0.063W	1	ASJ	CR10-103-JK	Rutronik	WRC40976
25	R14	Thick Film Resistor	10M	RO402	5% 0.063W	1	ASJ	CR10-103-JK	Rutronik	WRC40976
26	R21	Thick Film Resistor	N.M.	RO402	5% 0.063W	1	ASJ	CR10-103-JK	Rutronik	WRC40976
27	R26	Thick Film Resistor	100K	RO402	5% 0.063W	1	Yageo	RC0402JR-071M	Rutronik	WRC33855
28	R27	Thick Film Resistor	2.2K	RO402	5% 0.063W	1	Yageo	RC0402JR-072K	Rutronik	WRC33840
29	S1	SWITCH SLIDE DIP SPST 25MA 24V	AgH-8102	SOIC127P670X195-18 pos, 2.54mm	1/16W	1	Omron	AgH-8102	Rutronik	ABH8102
30	SB2, SB6, SB9, SB12, SB14	JUMPER	0R	SB, 0402	5V, 2.8W x 1 @	5	Yageo	RC04020R	Rutronik	WRC5534
31	U1	Amplifier IC Class D	DFN8	SON6P-P00X300X06	5.5V, 2.8W x 1 @	1	STMicroelectronic	TS4962DQ1	Rutronik	IC062631
32	U2	USB Bridge, USB to PC USB 2.0 UART interface	-	DFN8, 3x3	2.7 .. 5.5V, 1.2A	1	Cypress Semiconductor	CY7C65215-32L1	Rutronik	CY7C65215-32L1TX1
33	U3	1.2 A current limited high-side power switch with the ST990DTR	-	DFN8L, 3x3	6V, 0.6pF	1	STMicroelectronic	ST990DTR	Rutronik	ST990DTR
34	U4	Ultra large bandwidth ESD protection	USBUIC6-2M6	Micro QFN 6L	3.3V, 300mA	1	STMicroelectronic	USBUIC6-2M6	Rutronik	IC5PR9313
35	U5	300 mA low quiescent current very low noise LDO	LDK130M33R	SOIC123-5L	64mV (6M x 8)	1	STMicroelectronic	LDK130M33R	Rutronik	IC5PR9313
36	U7	IC FLASH 64M SPI 108MHz	-	SOIC127P800X216-8	32 768 MHz, 12.5u	1	Cypress Semiconductor	S25FL064L-ABMF	Rutronik	IC5PR9313
37	X1	XTAL 3.2M 1.5mm	X1A000141000312	XTAL, 3215	32 768 MHz, 12.5u	1	Epson Electronics	X1A000141000312	Rutronik	QJAR26278