

AgonLight2

User Manual

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Table of Contents

Introduction.....	3
What is AgonLight2?.....	4
AgonLight references documents:.....	5
The difference between AgonLight and AgonLight2:.....	6
Order codes for AgonLight2 and accessories:.....	7
HARDWARE.....	8
AgonLight2 layout:.....	9
AgonLight2 schematic:.....	10
AgonLight2 power supply and consumption:.....	15
GPIO connector:.....	16
UEXT connector:.....	18
Access bus connector:.....	19
eZ80 programming connector:.....	20
Jumpers:.....	21
SOFTWARE:.....	22
AgonLight2 Firmware:.....	23
MOS commands:.....	24
LOAD “”.....	24
BBC Basic commands reference:.....	25
Software access to GPIOs:.....	26
Software access to I2C:.....	27
Software access to SPI:.....	28
Software access to VPU:.....	29
Revision History.....	30

Introduction



What is AgonLight2?

[AgonLight2](#) is re-design of the original AgonLight eZ80F92 retro computer, designed as hobby project by Bernardo Kastrup.

[AgonLight2](#) is complete Single Board Computer with VGA display output, PS2 keyboard and SD card (acting as external Disk), so to write programs and run them you do not need external computer like Arduino does.

[AgonLight](#) has GPIO connector with GPIO ports, I2C, SPI etc signals which are accessible and can be used to interact with other hardware, sensors etc.

AgonLight and [AgonLight2](#) are Open Source Hardware and officially [OSHWA certified](#).

All CAD source files are available at [AgonLight](#) and [AgonLight2](#) GitHub repositories. They are released under CERN Open Hardware Licence Version 2 - Strongly Reciprocal and allow users to learn, study, edit, modify, produce and sell same or derivative products based on these designs. The only requirements is to open source their work under the same licensee.

The firmware of AgonLight is written by Dean Belfield and reproduces BBC Basic for Z80. The firmware is also Open Source Software and available on [GitHub](#). The same firmware works on [AgonLight2](#) without any modifications.

[AgonLight2](#) is RoHS, REACH, CE and UKCA compliant.

AgonLight references documents:

Here we link original [AgonLight Hardware Manual](#), [QuickStart Guide](#) and [Firmware Installation Guide](#).

Note that [AgonLight2](#) will come to you completely assembled, tested and with programmed firmware, so you can use the above documents just for reference and completeness.

The difference between AgonLight and AgonLight2:

AgonLight2 has these differences from the original design:

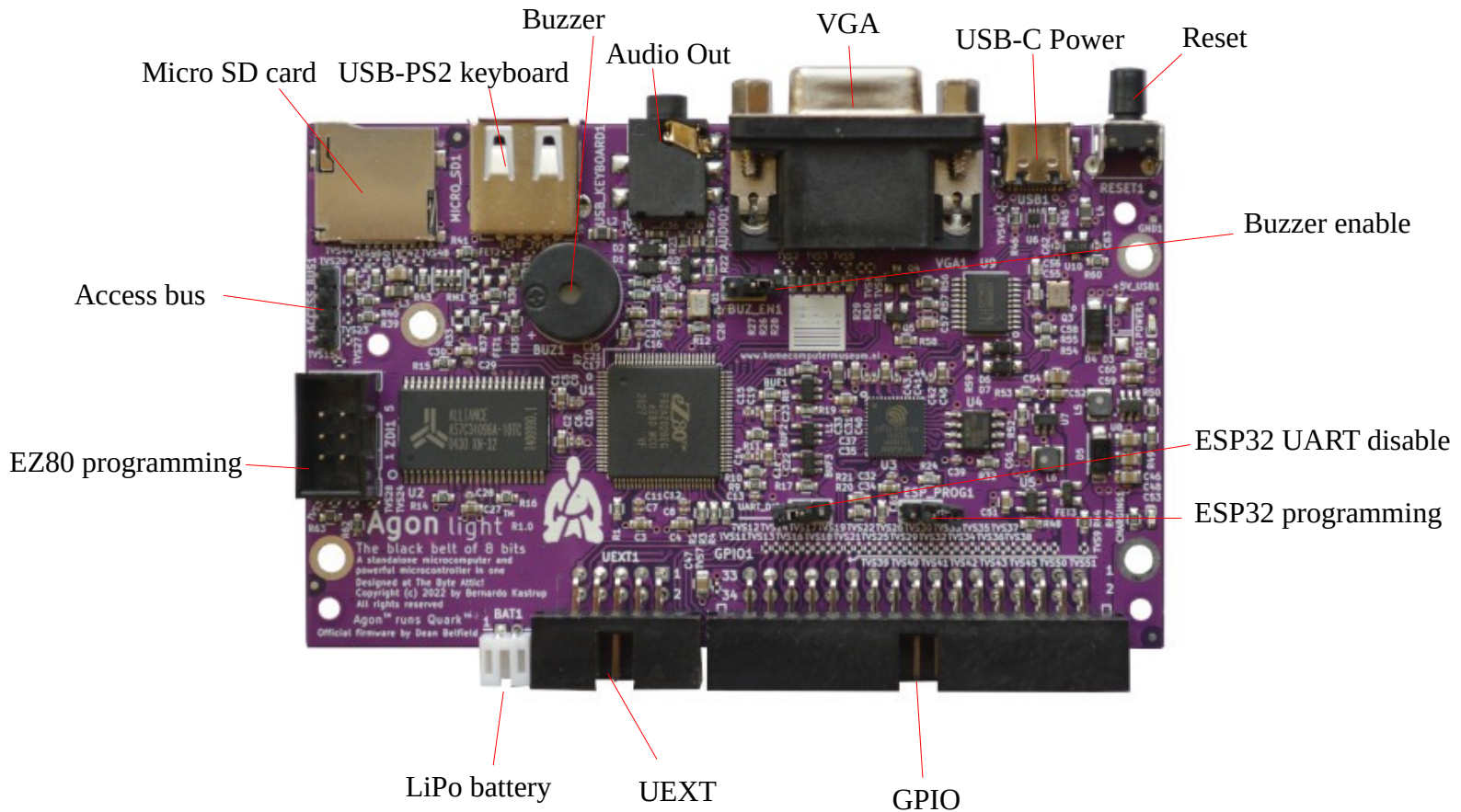
- KiCad is used as CAD instead of EasyEDA. KiCad is open source software free to download and use more proper for Open Source Hardware project;
- USB-C connector for power supply;
- DCDC power converter with up to 2A output instead of linear power converter;
- LiPo battery backup power supply, the battery acts like UPS and will power the computer even if the external power supply on USB-C connector is removed. The battery is charged automatically when external power supply is available;
- USB connector for keyboard (the keyboard must be PS2 compatible!!!);
- SRAM is routed with 40 ohm impedance as per part datasheet;
- Fixed some wrong signal naming on ESP32-PICO-D4 GPU co-processor;
- Fixed GPIO and Programming connector pin ordering;
- Replaced the naked header 32-pin connector with a plastic boxed 34-pin connector following the same layout and adding two additional signals Vbat and Vin which allow AgonLight2 to be powered by this connector too.
- Added a UEXT connector (<https://www.olimex.com/Products/Modules/>) which allows AgonLight2 to be connected to: temperature sensors, environmental air quality sensors, pressure, humidity, gyroscope, light, RS485, LCDs, LED matrix, relays, Bluetooth, Zigbee, Lora, GSM, RFID reader, GPS, Pulse, EKG, RTC etc;
- Added 4 grounded mount holes with 3mm diameter, but kept the original 2.5 mm mount holes;

Order codes for AgonLight2 and accessories:

AgonLight2	- Single Board BBC Basic Z80 Retro style Computer
AgonLight2-BOX	- Metal box for AgonLight2
CABLE-USB-A-C-1M	- USB-C power cable
BATTERY-LIPO1400mAh	- Lipo battery 3.7V 1400mAh – note these batteries can be shipped only by ground so we can deliver only to EU destinations.
USB-KEYBOARD-PS2	- USB keyboard which supports PS2 and can be used for AgonLight2
BREADBOARD-1	- Breadboard for experimenting with AgonLight2
JW-200x10-FM	- 10 pcs Female/Male Jumper Wires for breadboarding
JW-200x10	- 10 pcs Male/Male Jumper Wires for breadboarding
JW-200x10-FF	- 10 pcs Female/Female Jumper Wires for breadboarding
UEXT modules	- different sensors, relays, LCDs, RTC, GSM, GPS etc accessories which can be connected to AgonLight2 UEXT connector
MOD-Wii-UEXT-NUNCHUCK	- 3 axes joystick, 3 axes accelerometer, two buttons game controller

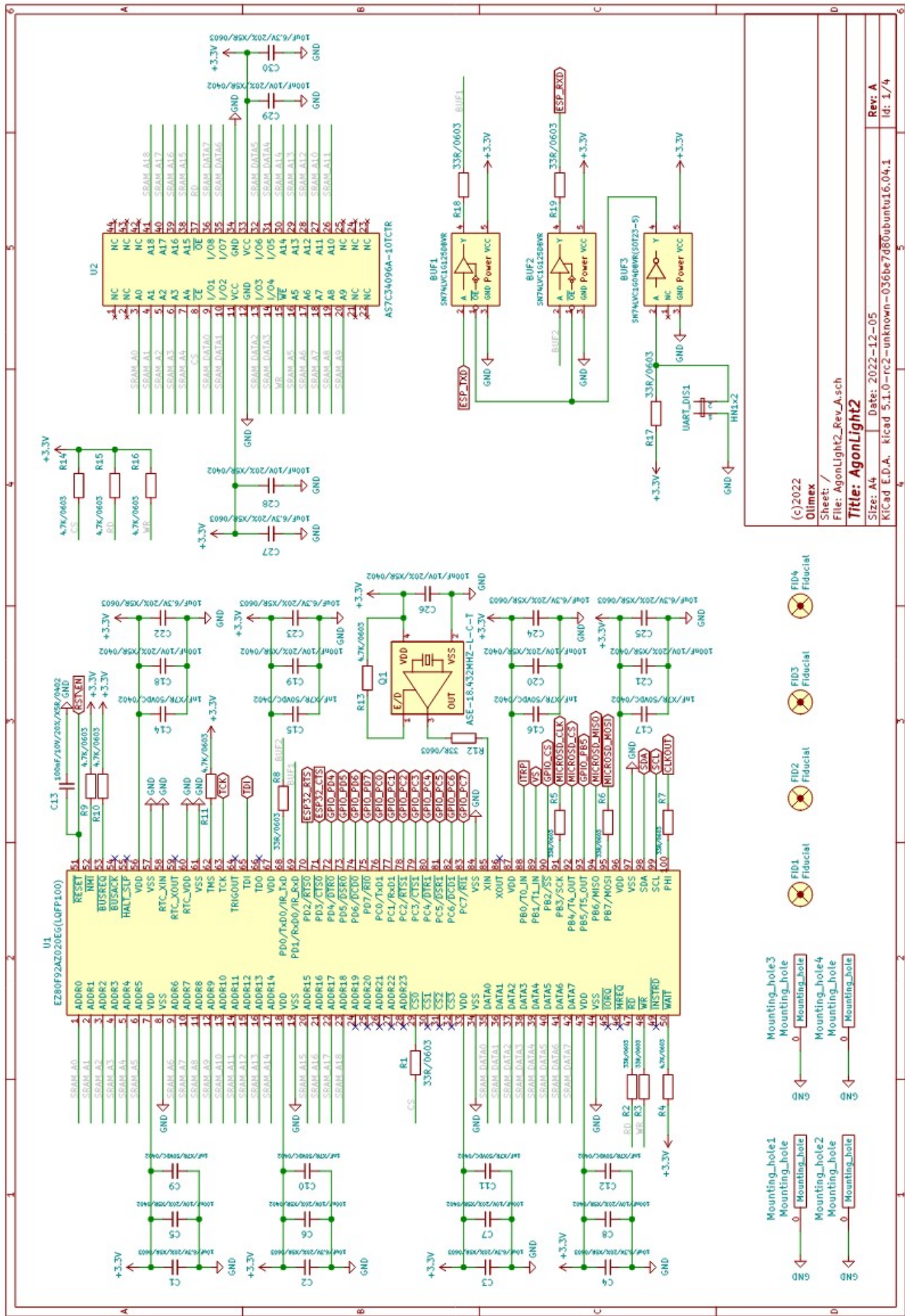
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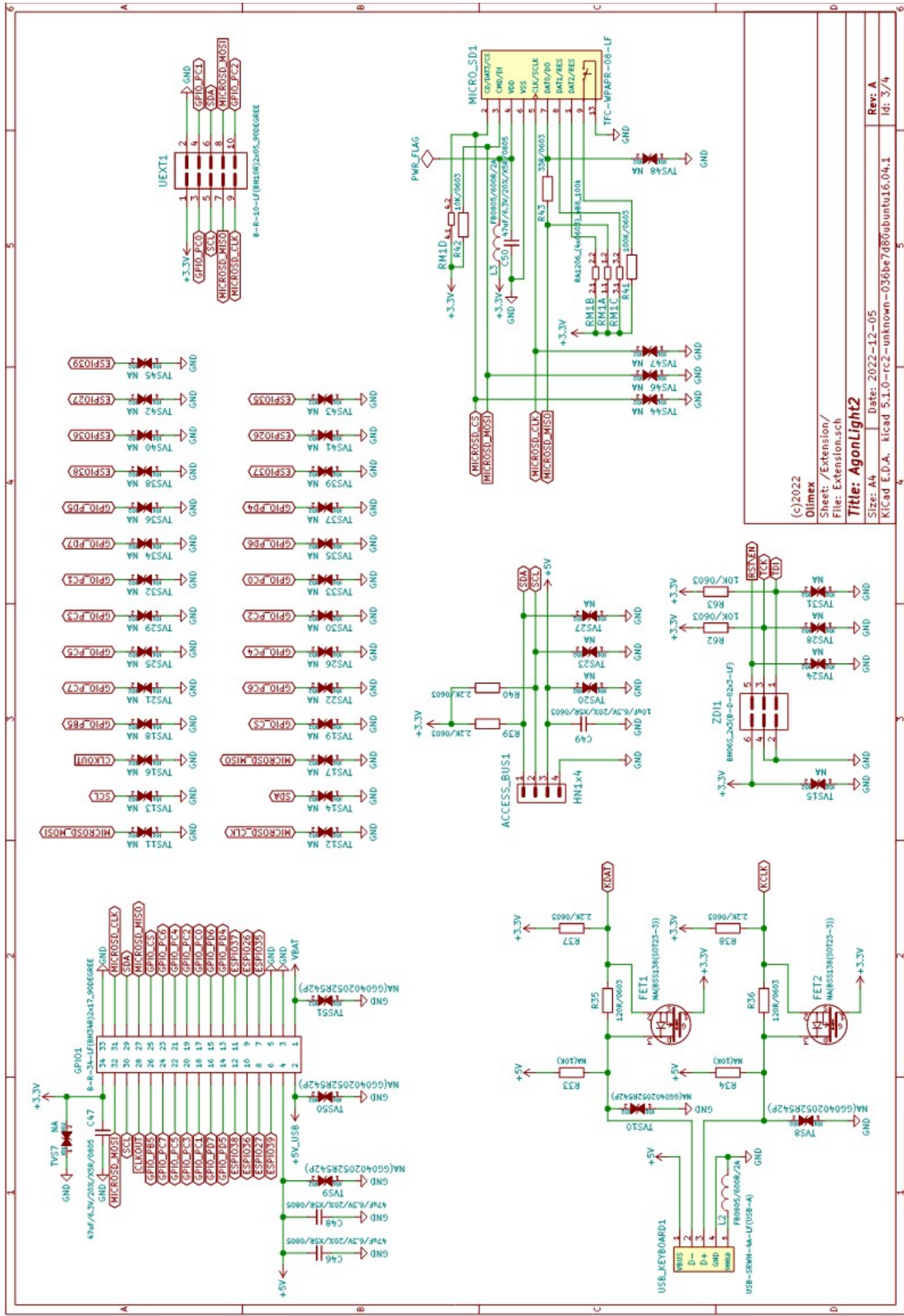
AgonLight2 layout:



AgonLight2 schematic:

The current [AgonLight2](#) schemaitc is available for download and print on [GuitHub](#)





The diagram shows a USB-to-UART module layout. Key components include:

- USB1**: USB connector module.
- TVS49**: TVS diode for ESD protection.
- USBLC6-2P6**: USB-to-LC module.
- CH340T(SOP20W)**: USB-to-UART bridge chip.
- ESP-CH340**: ESP module.
- Resistors**: R54, R55, R56, R57, R58, R61.
- Capacitors**: C55, C56, C57.
- Power Switch**: SW1.

The board is labeled with "USB to UART" and "USB-C-16P-(A40-00119-A52-12)".

Power Supply

The diagram illustrates a power supply circuit for a LiPo battery. The main components and their connections are as follows:

- Inputs:** +5V_USB, LED/YELLOW/0603, LED/RED/0603, PWR_FLAG, and GND.
- Charging:** The LiPo battery (BAT1) is connected to the CHRG pin of the DC-DC converter (U5). The battery is also connected to the VBAT pin of the voltage divider (U6).
- Voltage Regulation:** The DC-DC converter (U5) is configured to output 5V. The output is connected to the VOUT pin of the voltage divider (U6).
- Voltage Detection:** The voltage divider (U7) is used to detect the battery voltage. The output is connected to the VDET pin of the voltage detector (U8).
- Output:** The output of the voltage detector (U8) is connected to the PWR_FLAG pin.

Key components and their values:

- Capacitors: C1 (100k/0603), C2 (220k/0603), C3 (100k/0603), C4 (100k/0603), C5 (100k/0603), C6 (100k/0603), C7 (100k/0603), C8 (100k/0603), C9 (100k/0603), C10 (100k/0603).
- Resistors: R1 (10k/0603), R2 (10k/0603), R3 (10k/0603), R4 (10k/0603), R5 (10k/0603), R6 (10k/0603).
- Diode: D1 (1N4148).
- ICs: U5 (DC-DC converter), U6 (voltage divider), U7 (voltage detector), U8 (voltage divider).

Additional information:

- Recommended LiPo battery: <https://www.batterymart.com/Power/ARTN/US-455mAh/>
- Current: I(Bat) = 455mA
- Resistor values: R1 = 100k, R2 = 100k, R3 = 100k, R4 = 100k, R5 = 100k, R6 = 100k

Title: AgonLight2

Size: A4	Date: 2022-12-05	Rev: A
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AgonLight2 power supply and consumption:

[AgonLight2](#) can be powered by 3 sources:

- USB-C connector
- LiPo battery
- GPIO.pin2 (5V_USB) note that this signal is connected to USB 5V signal so when you power [AgonLight2](#) with this pin you should not connect it to the USB!!!

Power consumption of [AgonLight2](#) is approx 130mA without and 180mA with connected keyboard.

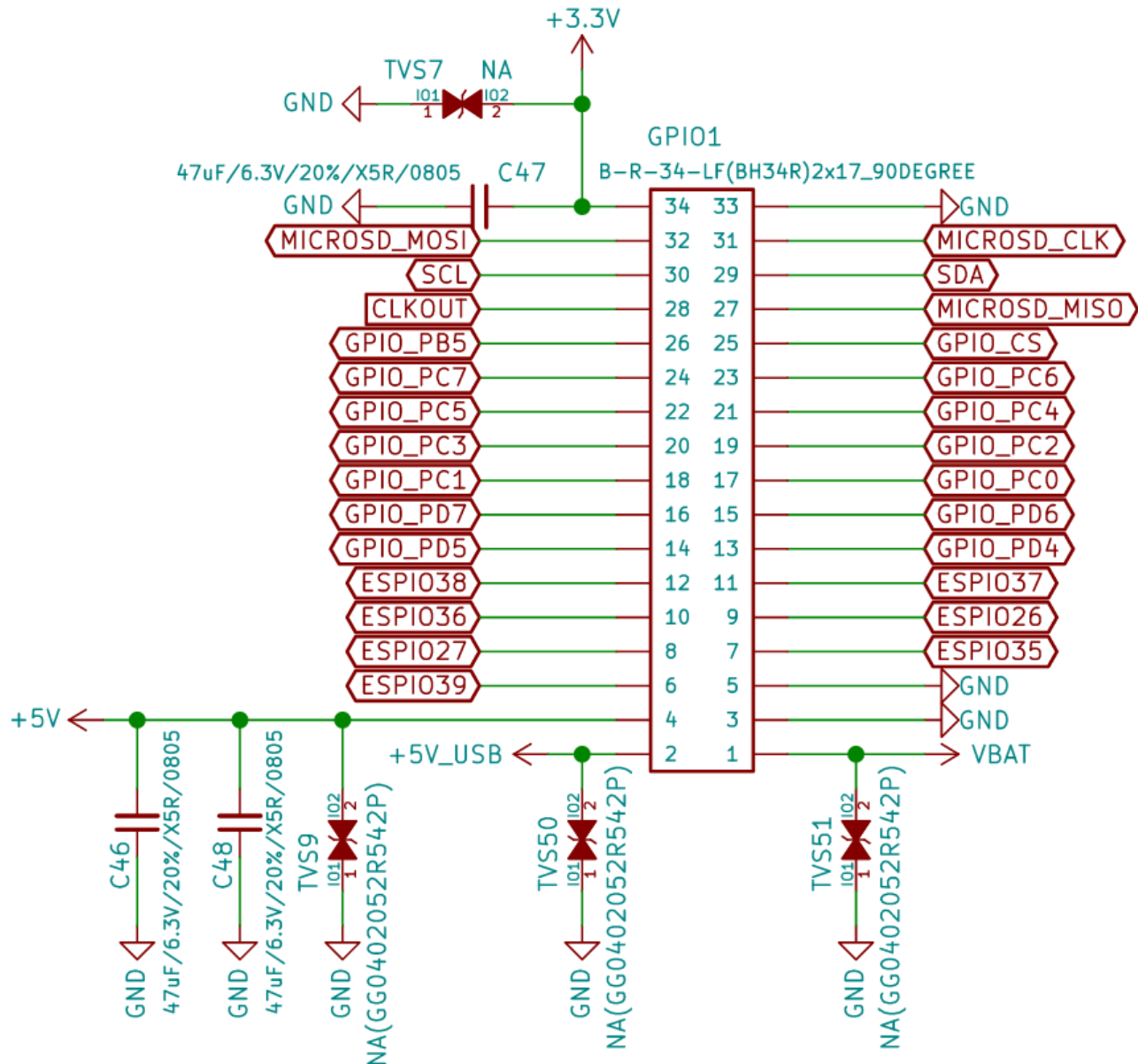
If LiPo battery is connected it's charged automatically when power supply is attached with about 100mA.

When the LiPo battery is attached and external power supply is missing internal DCDC step-up converter and switching circuit automatically powers [AgonLight2](#) from the battery. 1400mAh battery will provide about 8 hours of stand alone operation.



The LiPo battery connector is JST 2.0 mm connector and with Olimex's battery polarity. If you use batteries from other manufacturers please make PLUS and MINUS are connected properly as you may damage the board!!!

GPIO connector:



Pin.1 is connected to the LiPo battery PLUS you can connect external battery on this pin or to use battery voltage to external circuits.

Pin. 2 is 5V power supply connected to USB-C +5V signal, you can power the board from this signal if the USB-C is not connected. It must be regulated 5V power supply, applying more than 5V will damage the board.

Pin.3, Pin.5, Pin.33 are GND

Pin.34 is +3.3V output capable to source up to 2A note that 200mA are used by AgonLight2

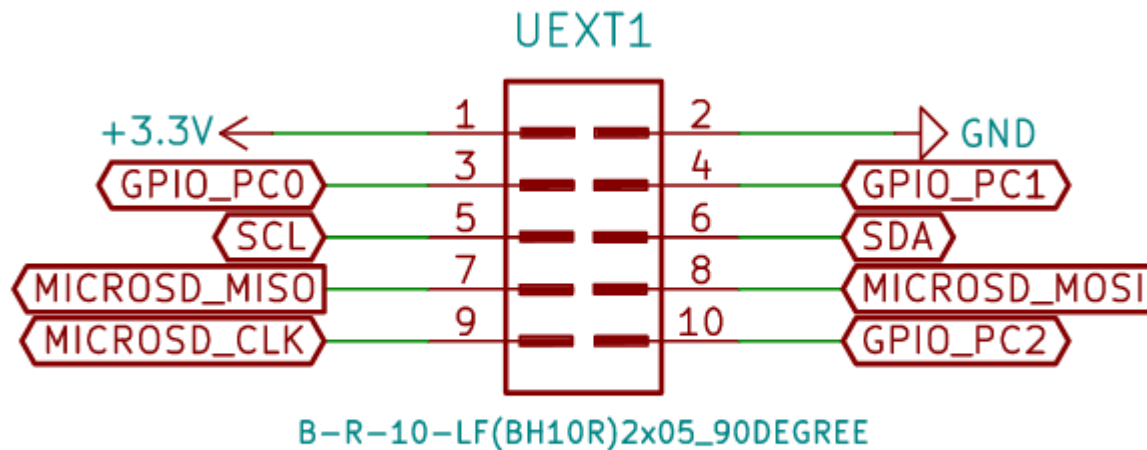
Pin.4 is +5V output capable to source up to 2A (1.8A + AgonLight2 0.2A), it's backed by LiPo UPS so even if there is interruption on power supply if LiPo battery is attached there will be 5V on this pin.

All GPIOs are operating on +3.3V. This means you should not connect signals above 3.3V on these ports as this will damage the board.

UEXT connector:

UEXT connector stands for Universal EXTension connector and contain +3.3V, GND, I2C, SPI, UART signals:

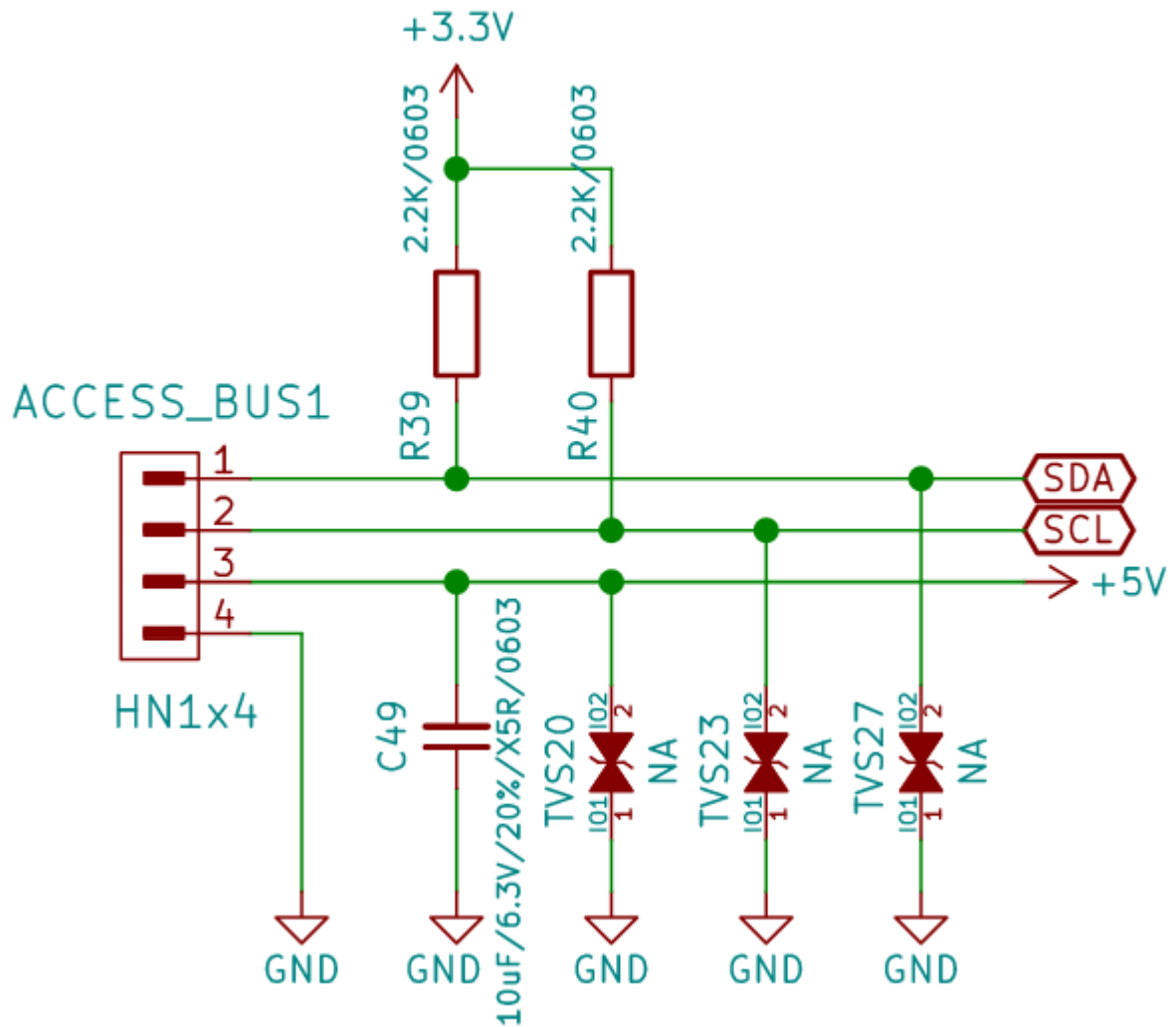
UEXT is 0.1" 2.54mm step boxed plastic connector. All signals are with 3.3V levels.



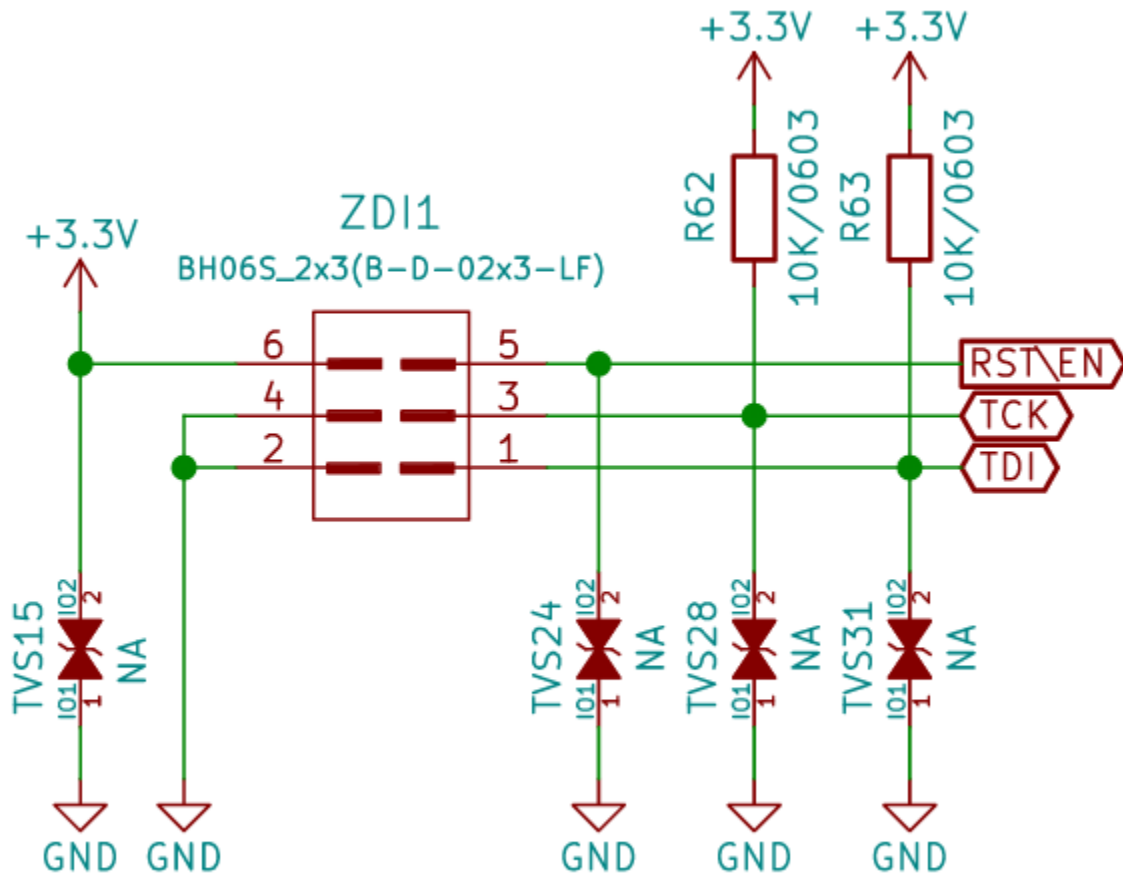
Olimex has developed number of [MODULES](#) with this connector. There are temperature, humidity, pressure, magnetic field, light sensors. Modules with LCDs, LED matrix, Relays, Bluetooth, Zigbee, WiFi, GSM, GPS, RFID, RTC, EKG etc.

Access bus connector:

This is I2C and power supply with 3.3V levels.



eZ80 programming connector:



This connector is used for initial programming of eZ80 microcontroller. AgonLight2 comes with pre-programmed firmware so you do not need to use this connector nor programmer for it.

If you want to develop your own firmware [Jeroen Venema wrote flash utility](#) which allows you to flash new firmware without need of external programmer.

Jumpers:



Buzzer enable jumper – when closed the buzzer plays the sound commands.



ESP programming enable when closed ESP32 enters bootloader mode at Reset and can be programmed over the USB-C connector



UART disable – when closed the UART connection between eZ80 and ESP32 is disconnected. This is necessary when ESP32 is programming.

SOFTWARE:



AgonLight2 Firmware:

The three modules of AgonLight2 official firmware, called Quark™, can be found here:

- [Quark™ BBC BASIC](#) – BBC Basic interpreter
- [Quark™ MOS](#) - command line machine operating system, similar to CP/M or DOS
- [Quark™ VDP](#) - The VDP is a serial graphics terminal that takes a BBC Basic text output stream as input. The output is via the VGA connector on the Agon.

MOS commands:

LOAD ""

SAVE ""

*CAT *DIR

*CD /

*MKDIR

*BYE *CPM

*ERA file

*ESC [ON OFF]

*EXEC file

*OPT

*REN oldfile ewfile

*SAVE file aaaa bbbb

*SPOOL file

*TYPE file

*| comment

BBC Basic commands reference:

Variables:

X – float
X% - integer
X\$ - string
&X - hex

Pressing ESC key breaks the code execution

This is list of the BBC Basic commands click on the command name for more info and use.

ABS	EOR	LOMEM	REPORT
ACS	ERL	MID\$	RESTORE
ADVAL	ERR	MOD	RETURN
AND	ERROR	MODE	RIGHT\$(
ASC	EVAL	MOVE	RND
ASN	EXP	NEW	RUN
ATN	EXT	NEXT	SAVE
AUTO	FALSE	NOT	SGN
BGET	FN	OFF	SIN
BPUT	FOR	OLD	SOUND
CALL	GCOL	ON ERROR	SPC
CHAIN	GET	ON ERROR OFF	SQR
CHR\$	GET()	ON X%	STEP
CLEAR	GET\$	OPENIN	STOP
CLG	GOSUB	OPENOUT	STR\$
CLOSE	GOTO	OPT	STRING\$(
CLS	HIMEM	OR	TAB(X)
COLOUR	IF	PAGE	TAB(X,Y)
COS	INKEY	PAGE	TAN
COUNT	INKEY\$	PI	THEN
DATA	INPUT	PLOT	TIME
DEF	INSTR(POINT(TO
DEG	INT	POS	TRACE
DELETE	LEFT\$	PRINT	TRUE
DIM	LEN	PROC	UNTIL
DIV	LET	PTR	USR
DRAW	LINE	PUT A, X	VAL
ELSE	LIST	RAD	VDU
END	LN	READ	VPOS
ENDPROC	LOAD	REM	WIDTH
ENVELOPE	LOCAL	RENUMBER	
EOF	LOG	REPEAT	

Software access to GPIOs:

eZ80 ports are described in the [eZ80-specification](#).

Port direction register set if the port is INPUT or OUTPUT. Upon RESET all GPIOs are set as Inputs.

Direction registers are 8 bit and each bit corresponds to port signal. If 1 is written on the corresponding port will be set as Input if 0 as Output.

Port B data direction register is at address: 009Bh = 153 decimal

Port C data direction register is at address: 009Fh = 159 decimal

Port D data direction register is at address: 00A3h = 163 decimal

If we read the Port C direction register we can PRINT GET(159) and it should return 255

If we want to set GPIO_PC0 as output we should write 0 in bit 0 with the command PUT 159,254.

Data registers are 8 bit and each bit corresponds to port signal. If 1 is written on the corresponding port will be set 3.3V if 0 is written 0V will be set.

Port B data register is at address: 009Ah = 152 decimal

Port C data register is at address: 009Eh = 158 decimal

Port D data register is at address: 00A2h = 162 decimal

If we read data register with GET() command, for instance PRINT GET(158) it will return the state of Port C.

We can write the data register with PUT command, for instance PUT 158,1 will set GPIO_PC0 to +3.3V and PUT 158,0 will set it to 0V.

Software access to I2C:

TBD

Software access to SPI:

TBD

Software access to VPU:

TBD

Revision History

Revision 1.0 January 2023