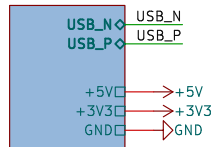


USB

The USB-C connector provides the GND reference and 5V power, which is then converted into 3V3. The whole power circuitry is in this USB sheet.

The USB data signals are routed to the WCH-LinkE probe.

USB



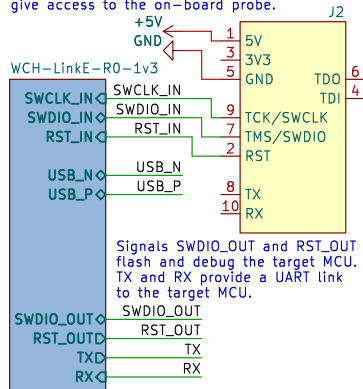
File: USB.kicad_sch

WCH-LinkE-R0-1v3

The WCH-LinkE-R0-1v3 on-board probe must be flashed when used for the first time with an external probe, through J2:

- SWCLK_IN
- SWDIO_IN
- RST_IN

From then onwards, the USB signals give access to the on-board probe.



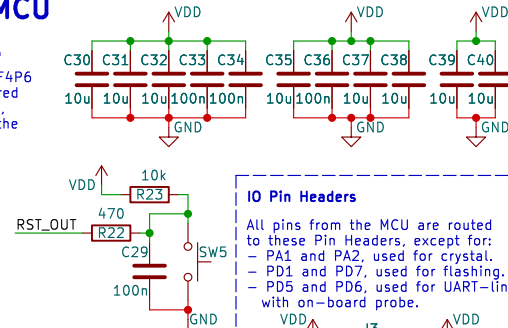
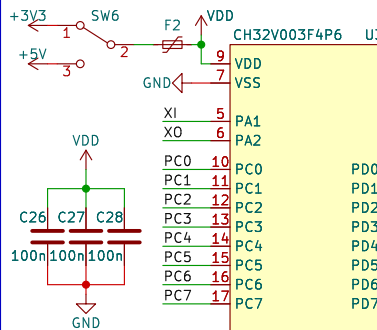
Signals SWDIO_OUT and RST_OUT flash and debug the target MCU. TX and RX provide a UART link to the target MCU.

File: WCH-LinkE-R0-1v3.kicad_sch

TARGET MCU

CH32V003F4P6

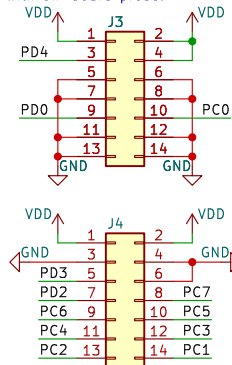
The CH32V003F4P6 target is powered with 3V3 or 5V, depending on the state of SW4.



IO Pin Headers

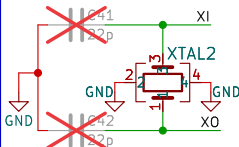
All pins from the MCU are routed to these Pin Headers, except for:

- PA1 and PA2, used for crystal.
- PD1 and PD7, used for flashing.
- PD5 and PD6, used for UART-link with on-board probe.



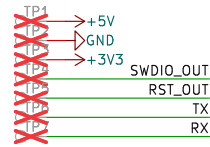
Crystal

24MHz crystal - the load capacitors might not be needed because the crystal provides the load itself (not 100% sure).



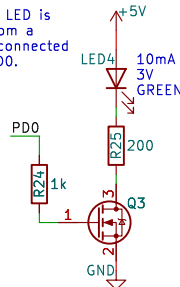
Test Pads

These Test Pads are located between the flash/debug probe and target MCU.



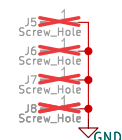
User LED

The User LED is driven from a MOSFET connected to pin PD0.



Screw Holes

Four screw holes at the board edges.



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Embeetle

Sheet: /

File: tiny-scarab.kicad_sch

Title: Tiny Scarab

Size: A5

Date: 2024-01-04

KiCad E.D.A. kicad 7.0.10

Rev: 0.1

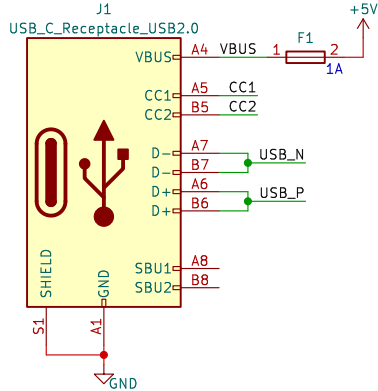
Id: 1/3

USB

Connector

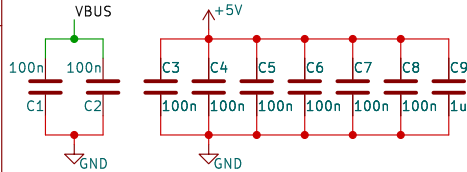
The USB4110-GF-A USB-C connector only provides the basic USB2.0 data signals.

We fuse the incoming VBUS supply at 1A.



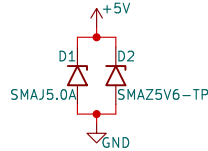
Capacitance

Provide plenty of capacitors on the 5V line.



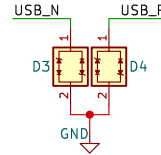
Power Supply Protection

Protect the 5V line against incoming voltage transients from the cable, with the SMAJ5.0A TVS diode. The SMAZ5V6-TP is a zener diode to protect against permanent overvoltage conditions (eg. a faulty USB-C charger outputs 20V). The zener shorts the 5V line to blow fuse F1.



Signal Protection

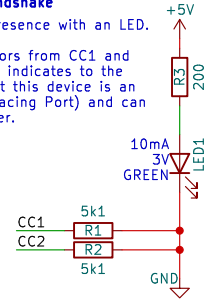
The CDS0D323-T05LC protects the USB data signals against voltage transients.



LED & Power Handshake

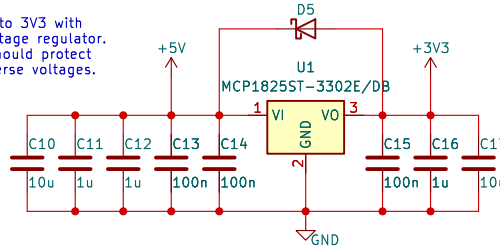
Indicate power presence with an LED.

Attach 5k1 resistors from CC1 and CC2 to GND. This indicates to the power source that this device is an UFP (Upstream Facing Port) and can thus receive power.



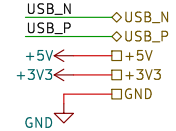
3V3 Conversion

Convert 5V to 3V3 with a linear voltage regulator. Diode D6 should protect against reverse voltages.



Sheet Output

Export the USB data signals from this sheet, as well as all the power lines (power lines are global symbols, so exporting them is not strictly needed)



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Embeetle

Sheet: /USB/

File: USB.kicad_sch

Title: Tiny Scarab

Size: A5

Date: 2024-01-04

KiCad E.D.A. kicad 7.0.10

Rev: 0.1

Id: 2/3

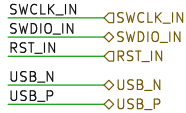
WCH-LinkE-R0-1v3

Sheet Input

The WCH-LinkE-R0-1v3 on-board probe must be flashed when used for the first time with an external probe, through these signals:

- SWCLK_IN
- SWDIO_IN
- RST_IN

From then onwards, the USB signals give access to the on-board probe.



CH32V305FBP6

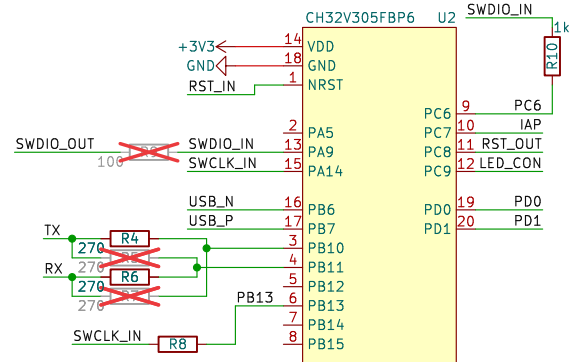
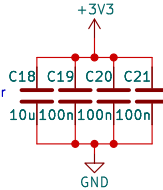
The CH32V305FBP6 is the heart of the WCH-LinkE-R0-1v3 on-board probe. It must be flashed through signals SWDIO_IN, SWDIO_OUT and RST_IN.

From then onwards, it gets its instructions from the USB signals USB_N and USB_P.

It outputs the following signals to flash and debug the target MCU:

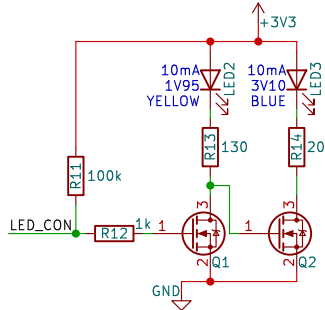
- SWDIO_OUT
- RST_OUT
- TX
- RX

Note: Resistor R9 must be mounted after flashing the CH32V305FBP6 MCU.



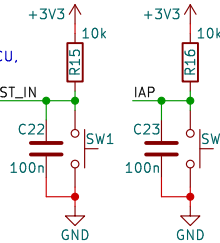
Mode LEDs

The CH32V305FBP6 MCU outputs the LED_CON signal to indicate if it works in ARM-mode or RISC-V-mode.



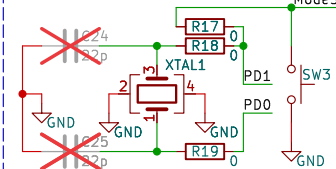
RST and IAP Buttons

The RST button resets the CH32V305FBP6 MCU, the IAP button brings it into IAP mode.



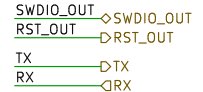
Crystal

12MHz crystal – the load capacitors might not be needed because the crystal provides the load itself (not 100% sure).



Sheet Output

Signals SWDIO_OUT and RST_OUT flash and debug the target MCU. TX and RX provide a UART link to the target MCU.



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Embee

Sheet: /WCH-LinkE-R0-1v3/

File: WCH-LinkE-R0-1v3.kicad_sch

Title: Tiny Scarab

Size: A5

Date: 2024-01-04

KiCad E.D.A. kicad 7.0.10

Rev: 0.1

Id: 3/3