ST-Link ISP for MI and Electrosmith Projects

RG – 28th Dec 2023 (rev2)

This note collects together some options and details for flashing firmware into STM32 microcontrollers used by Mutable Instruments and Electrosmith.

ISP Hardware

Electrosmith recommends the ST-Link V3: https://www.electro-smith.com/daisy/stlink-v3mini. ST-Link V3 is by far the best option unless you already have some other type of STM32 ISP at hand.

Apparently MI used to use the STM32F0DISCOVERY board in its production process. For info on the DISCOVERY boards see:

https://www.st.com/en/evaluation-tools/stm32f0discovery.html or see Mouser: STM32F0DISCOVERY STMicroelectronics | Mouser United Kingdom. STM32DISCOVERY boards include a ST-Link V2 which can be used to flash other target hardware by removing a jumper.

Alternately there is available various ST-Link V2 products and clones (e.g. from eBay).

SWD Adaptor

SWD is 'Serial Wire Debugger'. It uses a Mini JTAG 10-pin connector with pins on a 1.27 mm pitch to flash and debug target hardware.

ST-Link V3 has a Mini JTAG 10-pin connector with pins on a 1.27 mm pitch. The DISCOVERY boards and the ST-Link V2 have pins on a 2.54 mm (0.1") pitch so an adaptor is needed to connect these pins to a target such as Electrosmith Patch SM or an MI Rings clone. Options include:

https://www.adafruit.com/product/2743

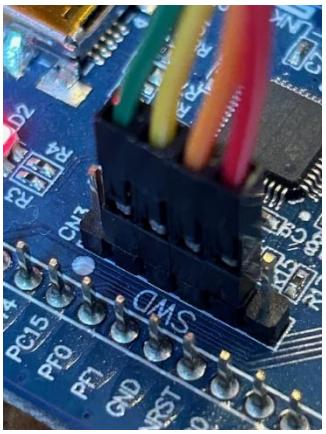
https://www.digikey.co.uk/en/products/detail/adafruit-industries-llc/2094/6618718

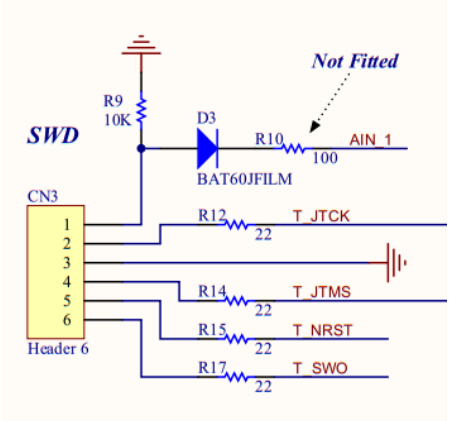
Also a 1.27 mm pitch, 10-way mini SWD cable is needed with these options. See:

https://www.digikey.co.uk/en/products/detail/adafruit-industries-llc/1675/6827142

ISP and SWD Adaptor Pins

On the STM32F0DISCOVERY board the SWD header has six pins and is designated CN3. The pinout is given on page 38 of the user manual (Pin 1 is the end marked CN3 on the silkscreen).



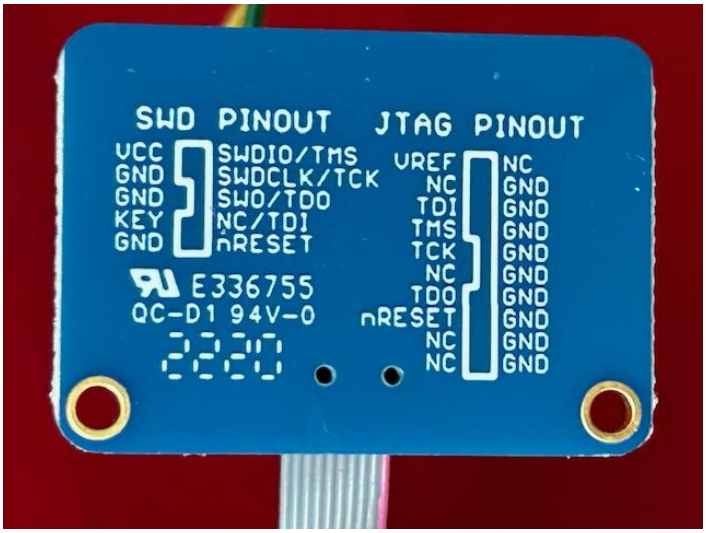


On this SWD connector, pins 2, 3, 4 and 5 are needed for flashing firmware. These are CLK, GND, IO and RESET. The pins are designated T_JTCK, GND, T_JTMS, T_NRST on the schematic.

The ST-Link V2 ISP has a 10-pin header. The pinout is printed on the side of the device.

Pins 1, 2, 3 and 6 are needed for flashing firmware. These are marked: RST, SWDIO, GND and SWCLK.

On the JTAG-SWD adaptor, the pinout is printed on the silkscreen at the back of the board:



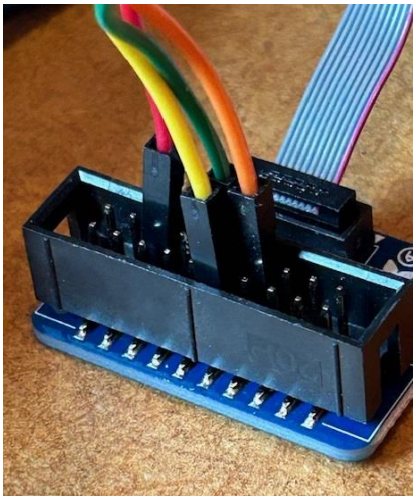
The 2.45 mm (0.1”) pitch pins are on the 20-way JTAG connector. The four pins needed for flashing firmware are marked TMS, TCK, nRESET and GND. The connections from STM32F0DISCOVERY to these pins are:

T_JTCK (2)	TCK
GND (3)	GND
T_JTMS (4)	TMS
T_NRST (5)	nRESET

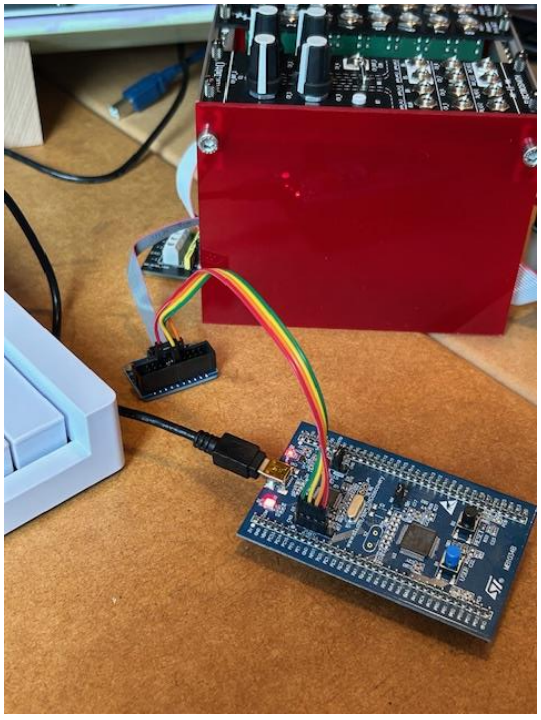
The connections from the ST-Link V2 to the adaptor's 20-way header are:

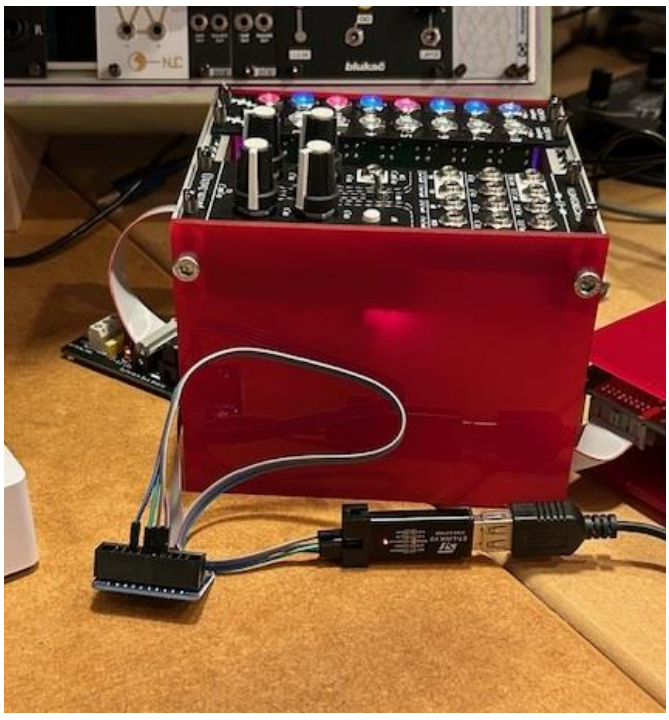
SWCLK (6)	TCK
GND (3 or 4)	GND
SWDIO (2)	TMS
RST (1)	nRESET

The connected adaptor board might look like this:



The whole setup might look like this (a) DISCOVERY or (b) ST-Link V2:





Both setups work fine! Note the USB-to-USB extension which is convenient for the ST-Link V2. And in contrast to the options above, a bonus of using the ST-Link V3 is one less board flying around.