Hackaday link: <https://hackaday.com/2023/02/27/diy-stm32-scope-is-simple-cheap-and-featureful/>

Details found here: <https://github.com/tvlad1234/pillScopePlus/blob/main/README.md>

STM32 details: <https://stm32world.com/wiki/Black_Pill>

STM32 supplier: <https://www.st.com/en/microcontrollers-microprocessors/stm32-32-bit-arm-cortex-mcus.html>

Digikey link: <https://www.digikey.com/en/products/detail/dfrobot/DFR0864/14824968?utm_adgroup=&utm_source=google&utm_medium=cpc&utm_campaign=PMax%20Shopping_Product_Low%20ROAS%20Categories&utm_term=&utm_content=&utm_id=go_cmp-20243063506_adg-_ad-__dev-c_ext-_prd-14824968_sig-Cj0KCQiAmNeqBhD4ARIsADsYfTdYYcXOZ8Kv5Gb4WTHTx63hXoMCaEihIsbF92qegU7Zhxu1bXaAuSQaApotEALw_wcB&gad_source=1&gclid=Cj0KCQiAmNeqBhD4ARIsADsYfTdYYcXOZ8Kv5Gb4WTHTx63hXoMCaEihIsbF92qegU7Zhxu1bXaAuSQaApotEALw_wcB>

Digital Storage Oscilloscope built with:

* Microcontroller: STM32F401 Black Pill
* Screen: TFT (thin-film-transistor) LCD (liquid-crystal display)

Specs

* Input range: -3.3 to 3.3V (increased if using attenuation probes
* Sampling rate: 1.6 MSamples/second

Captured waveforms communication to computer:

* UART (universal asynchronous receiver/transmitter) protocol for data transmission
* Data sent in csv format
* Data from ADC pulled into the memory buffer. DMA (direct memory access of microcontoller) transfer every time ADC is triggered.

Required Parts

* STM32F401CC Black Pill development board
* 128x160 ST7735-based TFT display
* 3 pushbuttons
* LM358 dual op-amp (rail-to-rail opamps should work better in this context, but this is what I had on hand)
* 2x 68kOhm resistors (to create a 1.65V offset voltage)
* 2x 500kOhm resistors (to create the input attenuator)

Optional Parts

* a 5V power supply
* an opto-isolated (an electronic component that transfers electrical signals between two isolated circuits by using light) USB UART adapter
* a BNC connector, for using proper oscilloscope probes