

AccessionIndex: TCD-SCSS-T.20251216.009

Accession Date: 16-Dec-2025

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Object name: Arduino shield for Intel 8085

Vintage: 2025

Synopsis: A board that enables execution of software by the 8085, Intel's second-generation 8-bit microprocessor.

Description:

This Retroschild 8085 is one a series of Arduino shields (*retroschild*s) designed by Erturk Kocalar [1] to not only host early microprocessors but also to execute their original native software, an approach he has termed "Breadboarding in Software".

The RetroShield 8085 [2] is a daughter card that plugs into an Arduino Mega [3] or Teensy [4], see Fig.1. The Intel 8085 microprocessor [5] executes native 8085 code while the Arduino emulates 8085 system hardware. The choice of emulated 8085 system hardware is done by uploading relevant Arduino code. This enables the experience of old computer systems, the learning of low-level aspects of the early microprocessors, the keeping of valuable historical software alive, and even changing original native software simply by changing C code in the Arduino IDE, and use with other Arduino shields and libraries.

The Arduino Mega is an inexpensive platform with a 16MHz CPU that allows the retroschild's early microprocessor to run at about up to 400kHz, with over 200kB of emulated ROM and about 6kB of emulated RAM (reserving 2kB for the Arduino stack/heap). Peripherals like a UART, PIA, Timer, etc. can be emulated by the Arduino, and other Arduino *shields* can be used to add new features. The Arduino Mega operates at 5V TTL levels. The retroschild plugs into the Arduino Mega digital input/output connector.

The Teensy is a more expensive but faster platform with a 600MHz CPU that allows the retroschild's early microprocessor to run at full speed (e.g. 1MHz), with over 512kB of emulated ROM. Emulated RAM capacity depends on the Teensy version, 256kB for Teensy 3.5 or 3.6, 1MB for Teensy 4.1. It includes a microSD slot that can be used to emulate disk drives. Other peripherals like a UART, PIA, Timer, etc. can be emulated by the Arduino, and other Arduino *shields* can be used to add new features. The Teensy operates at 3.3V, but plugs into a Teensy daughter card designed by Erturk Kocalar that provides onboard 3.3V-to-5V TTL level shifting & vice-versa. The retroschild then plugs into that daughter card in the same way that it would into an Arduino Mega digital input/output connector.

The 8085 replaced Intel's 8080, which despite being fabricated in nMOS, required +5V, -5V, and +12 V power supplies. The 8085 was again fabricated in nMOS, but only needed a single +5V power supply.

The 8085 had the same register set as the 8080, and was binary compatible with it, but had a slightly different architecture, including a serial communications interface, an internal clock generator, and two new instructions to ease interrupt handling. But apart from the power supplies, the major difference was that it freed up 8 pins by multiplexing the 8-bit data bus with the lower 8-bits of the address bus. Hence it was

able to use those 8 pins plus the 2 pins that had served -5V and +12V for 10 new signals: ALE, TRAP, RST7.5, RST6.5, RST5.5, SID, SOD, S0, S1, IO/M. The 8085 also replaced the signals INTE, DBIN, SYNC, WAIT with /INTA, RESOUT, /RD, HLDA. In general it was simpler to design with and much faster. The Retroschild 8085 design files are at [6].

The Retroschild 8085 can execute the native Intellec 8/Mod 8 ROM-resident monitor [7][8] that supports memory, a PROM programmer, a tape/punch, and a Teletype. An Editor/Assembler for this appears to have been lost. It can also execute native SCELBAL (SCientific ELementary BAsic Language) [9], which is documented in book form [10] and has floating point mathematical functions (sin, cos, exp, log, atn, and strings and arrays). The Retroschild 8085 software is at [11].

Many thanks to Erturk Kocalar and Brian Coghlan for donating this item.

The homepage for this catalog is at: <https://www.scss.tcd.ie/SCSSTreasuresCatalog/>
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TCD-SCSS-T.20250918.001	Intel 8080 microprocessor and associated chips. Intel's second and very successful early 8-bit microprocessor. 1974.
TCD-SCSS-T.20251216.001	Arduino shield for Intel 8080. A board that enables execution of software by the 8080, Intel's second and very successful early 8-bit microprocessor, 2025.
TCD-SCSS-X.20250916.001	Dr.Brian Coghlan's Collection of Early Microprocessors. An extensive and nearly complete set of unused 1970s microprocessor chips, most accompanied with documentation, some with demonstration boards. 1971.

References:

1. Erturk Kocalar, *8bitforce*, erturkk@8bitforce.com, see:
<https://8bitforce.com/>
Also: <https://gitlab.com/8bitforce>
Last browsed to on 18-Sep-2025.
2. Erturk Kocalar, *Retrosshield 8085*, see:
<https://www.tindie.com/products/8bitforce/retrosshield-8085-for-arduino-mega/>
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3. Arduino, *Arduino MEGA*, see:
<https://store-usa.arduino.cc/products/arduino-mega-2560-rev3>
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4. PJRC, *Arduino Teensy*, see:
<https://www.pjrc.com/teensy/>
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5. Wikipedia, *Intel 8085*, see:
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6. Erturk Kocalar, *Retrosshield-HW Design Files*, see:
<https://gitlab.com/8bitforce/retrosshield-hw>
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7. Wikipedia, *Intellec*, see:
<https://en.wikipedia.org/wiki/Intellec>
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8. Herb Johnson, *Intel MON-80 PROMs and systems*, 2024, see:
https://www.retrotechnology.com/restore/mon80_proms.html
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9. SCELBI Computer Museum, *SCELBI*, see:
<https://www.scelbi.com/>
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10. Mark Arnold and Nat Wadsworth, *SCELBAL: A Higher Level Language for 8008/8080 Systems*, pp.372, Scelbi Computer Consulting, 1976, see:
<https://www.scelbi.com/>
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11. Erturk Kocalar, *Retrosshield 8008 Source Code*, see:
<https://gitlab.com/8bitforce/retrosshield-teensy/-/tree/master/t8085>
Last browsed to on 18-Sep-2025.

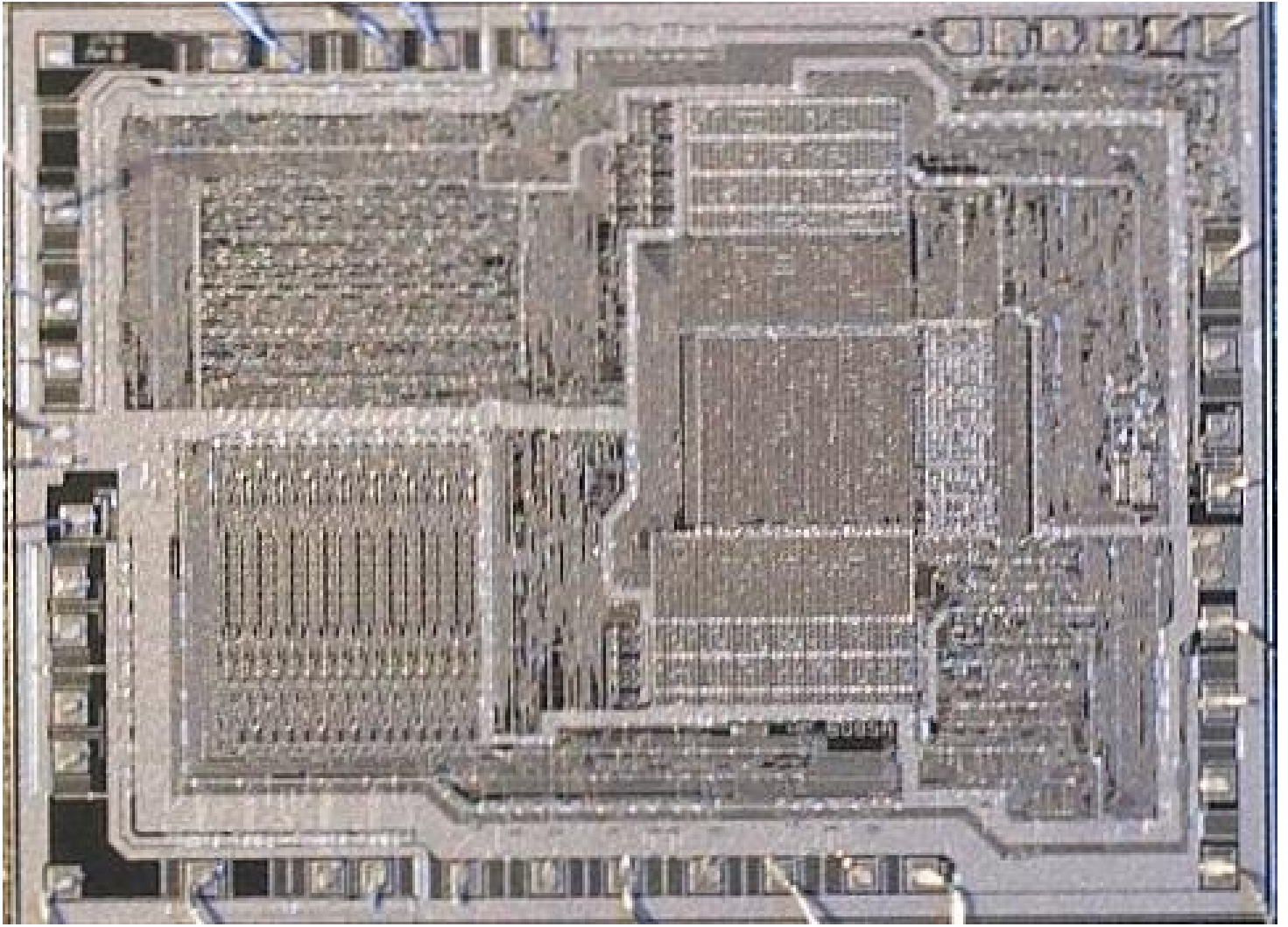


Figure 1: Intel 8085 chip die micrograph (from Wikipedia).

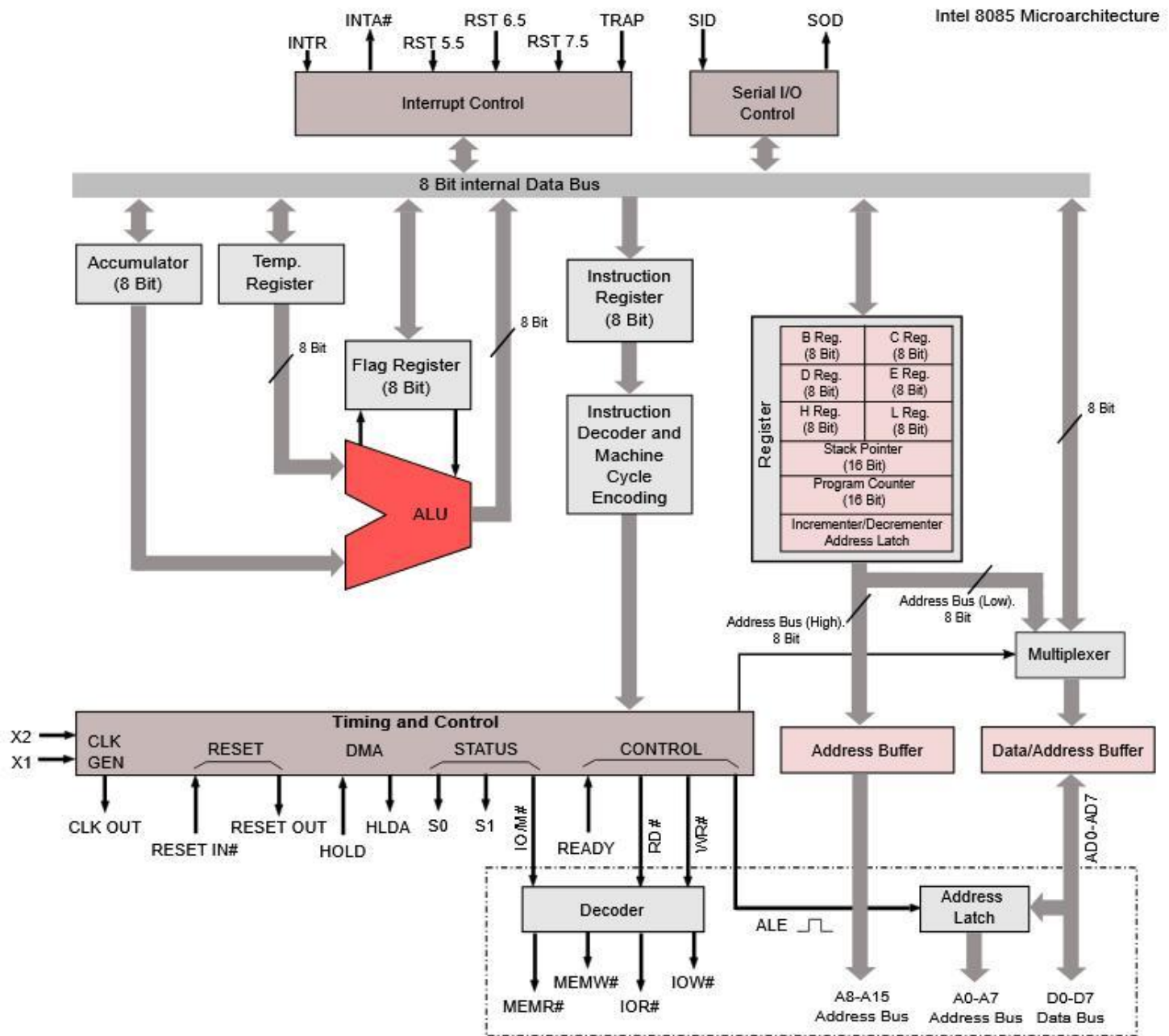


Figure 2: Intel 8085 architecture (from Wikipedia).

Intel 8085 registers



Figure 3: Intel 8085 registers (from Wikipedia).

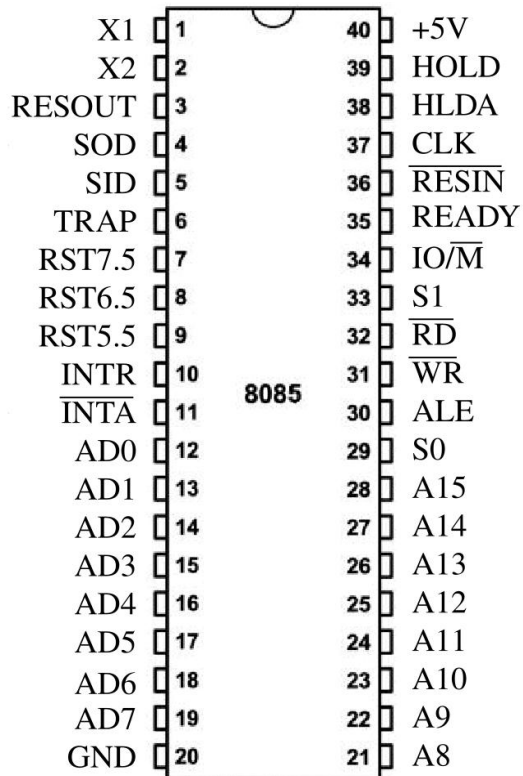


Figure 4: Intel 8085 pinout (from Wikipedia).

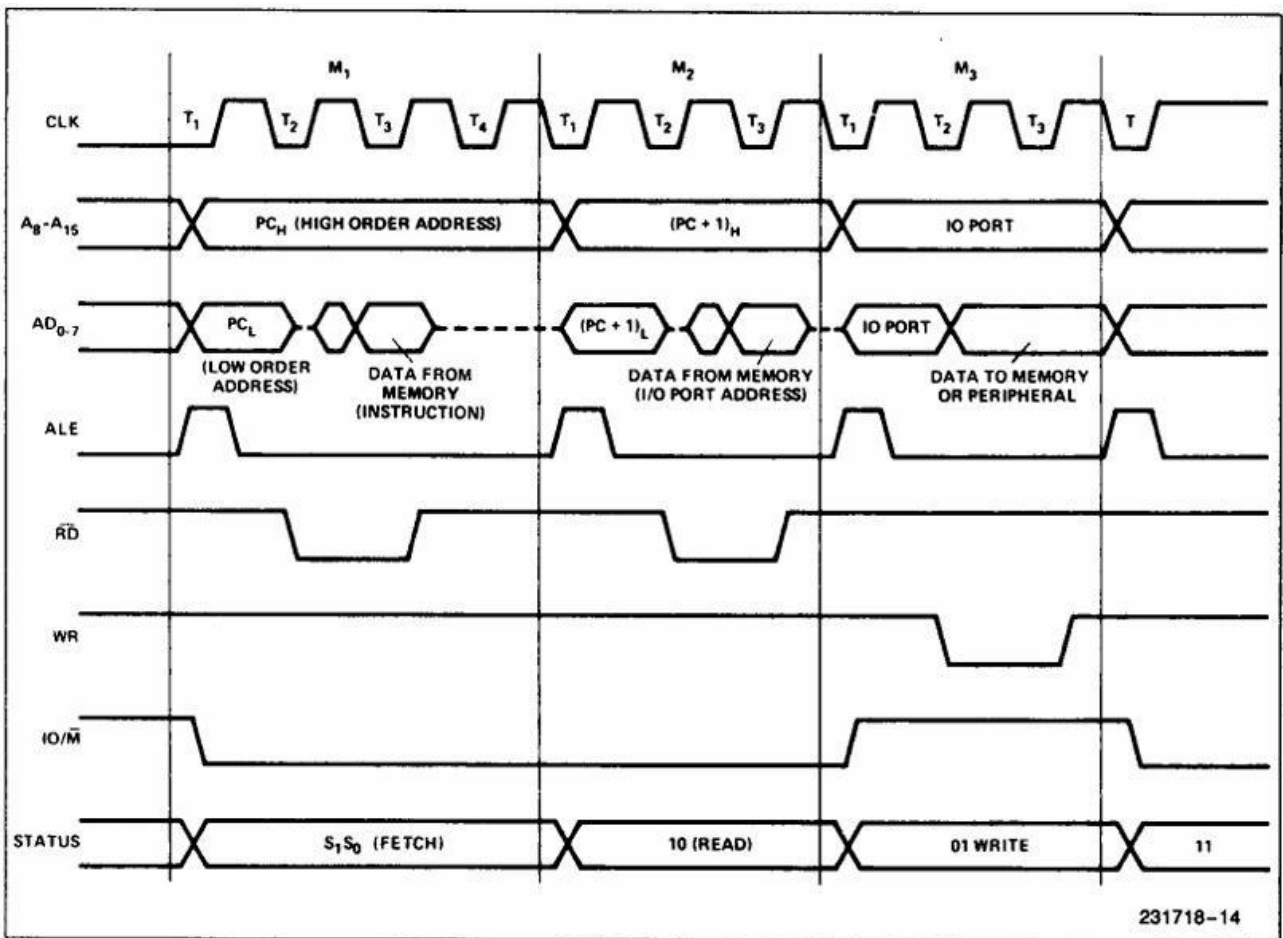


Figure 5: Intel 8085 instruction cycle (from Intel datasheet).

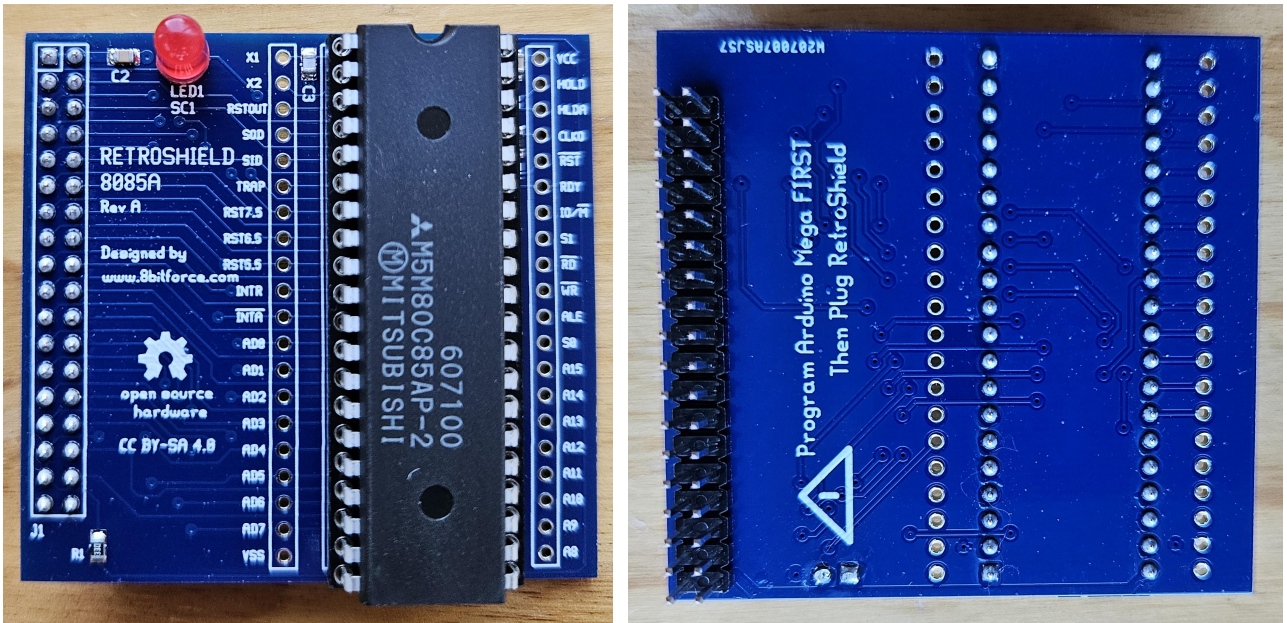


Figure 6: 8bitforce RetrosShield 8085 (from 8bitforce).

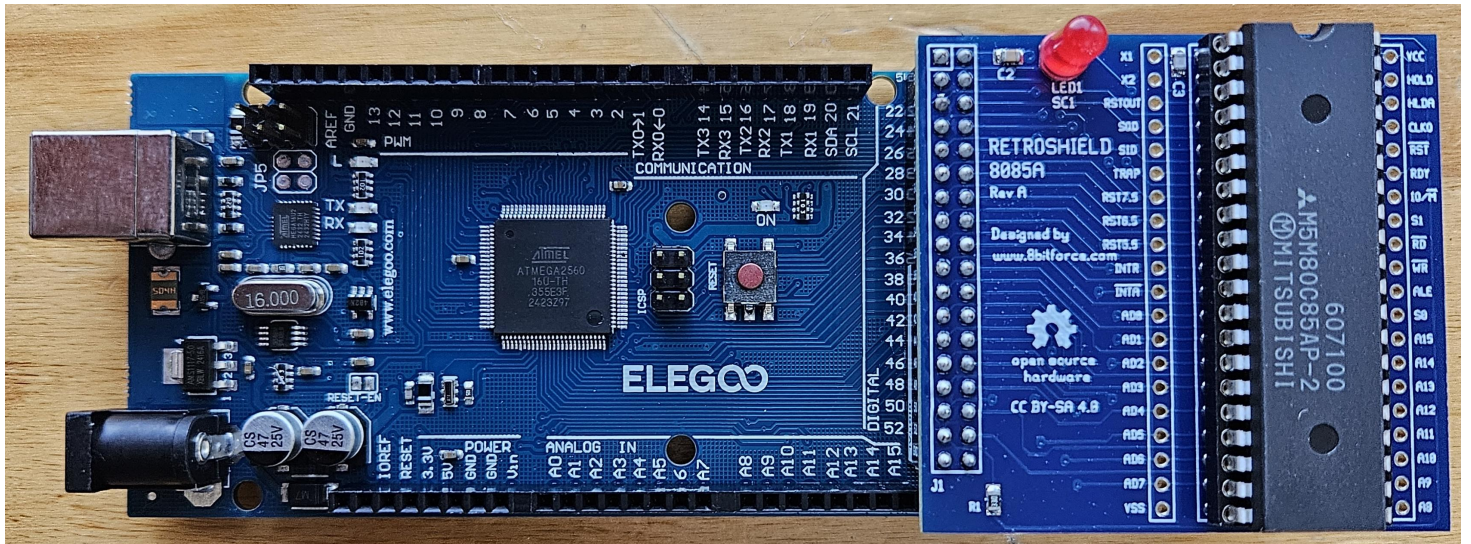


Figure 7: 8bitforce RetrosShield 8085 coupled with Arduino Mega.

RetroShield 8085 Assembly Instructions

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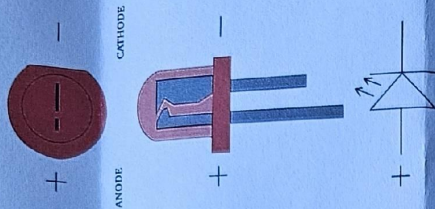
8085:

Solder parts in this order:

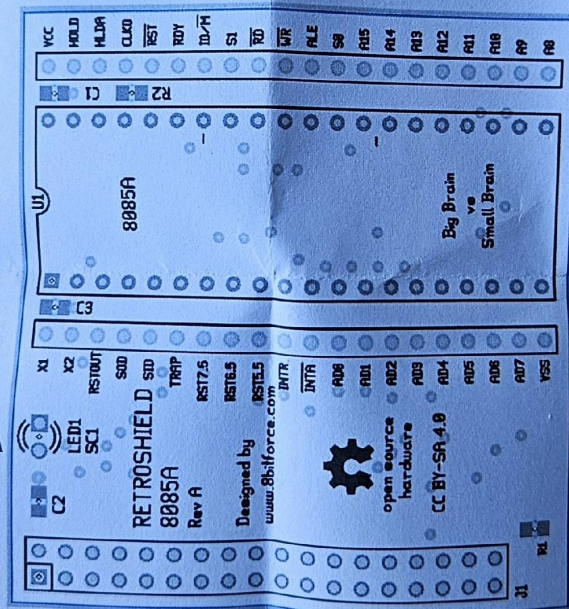
- C1 = 100nF
- C2 = 100nF
- C3 = 22pF
- R1 = 33 ohm
- R2 = 680 ohm

- U1 socket
- J1 header
- LED1 = Red

LED (+) pin goes to square hole.



https://commons.wikimedia.org/wiki/File:%2B_of_LED_2.svg



Probe points

If you want to attach headers, then be careful b/c access to SMD components will be difficult.

Figure 8: 8bitforce Retroshield 8085 assembly instructions.

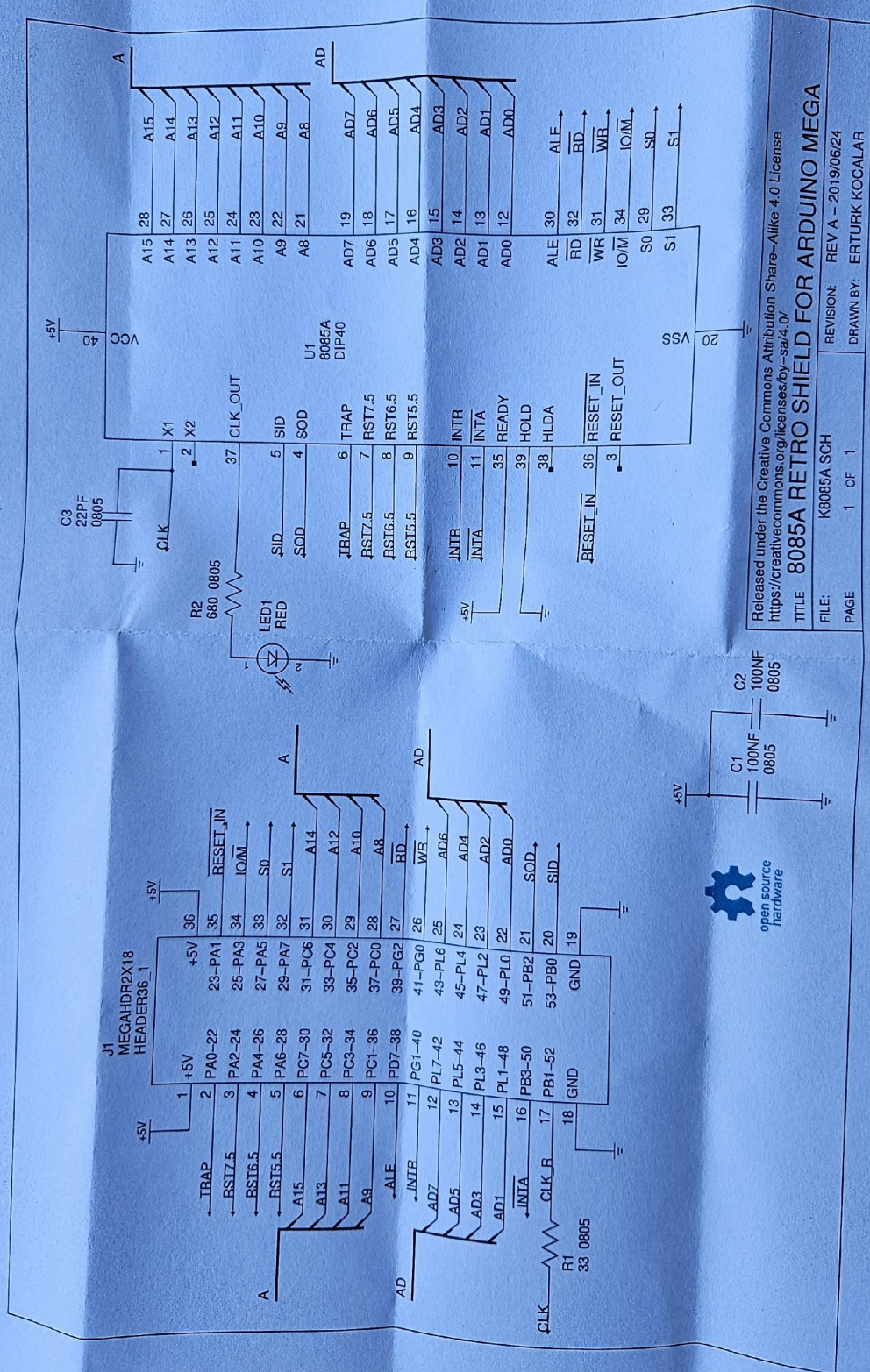


Figure 9: 8bitforce Retrosshield 8085 schematic.