

AccessionIndex: TCD-SCSS-T.20251216.007

Accession Date: 16-Dec-2025

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Object name: Arduino shield for Zilog Z80

Vintage: 2025

Synopsis: A board that enables execution of software by the Z80, Zilog's superset of the Intel 8080 microprocessor.

Description:

This Retroschild Z80 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 Z80 [2] is a daughter card that plugs into an Arduino Mega [3] or Teensy [4], see Fig.1. The Zilog Z80 microprocessor [5] executes native Z80 code while the Arduino emulates Z80 system hardware. The choice of emulated Z80 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 Zilog Z80 was designed by Masatoshi Shima and Federico Faggin (who designed Intel's 4004 chips and led their 8008 team). The design history of the Z80 is well known and undisputed, see [5][6]. It was designed to be binary compatible with Intel's 8080, but with an alternate register set for faster interrupt handling, two 16-bit index registers like Motorola's 6800, and additional and enhanced instructions (e.g. shifts/rotates on memory and registers, subtraction of BCD numbers, rotates for packed BCD, relative branches, block copy, block I/O, etc). It was designed for the then new nMOS process (but subsequently redesigned for CMOS), had just one 5V power supply, TTL compatibility, a single-phase 5V clock, built-in DRAM refresh,

non-multiplexed busses, plus non-maskable and vectored interrupts. All of these were attractive features. It was an extremely successful product, and it and a variety of support chips were made by Zilog and numerous second sources (although it included layout traps that behaved differently than expected to deter unlicensed copying), and continued to be made for nearly 50 years. The Retroschild Z80 design files are at [7].

The Retroschild Z80 can execute *Microsoft Basic v4.7* (Modified by Grant Searle) [8], and the *Efex* monitor [9]. The Retroschild Z80 software is at [10].

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/>
Click '*Accession Index*' (1st column listed) for related folder, or '*About*' for further guidance.
Some of the items below may be more properly part of other categories of this catalog, but are listed here for convenience.

Accession Index	Object with Identification
TCD-SCSS-T.20251216.007	Arduino shield for Zilog Z80. A board that enables execution of software by the Z80, Zilog's superset of the Intel 8080 microprocessor, 2025.
TCD-SCSS-T.20250918.007	Zilog Z80 microprocessor and associated chips. Zilog's superset of the Intel 8080 microprocessor. 1976.
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 16-Dec-2025.
2. Erturk Kocalar, *Retrosshield Z80*, see:
<https://www.tindie.com/products/8bitforce/retrosshield-z80-for-arduino-mega/>
Last browsed to on 16-Dec-2025.
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/>
Last browsed to on 16-Dec-2025.
5. Wikipedia, *Zilog Z80*, see:
https://en.wikipedia.org/wiki/Zilog_Z80
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6. Federico Faggin, *Silicon*, pp.304, ISBN: 978-1949003413, Waterside Productions, 2021, see:
<https://www.amazon.com.au/Silicon-Invention-Microprocessor-Science-Consciousness/dp/1949003418>
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7. Erturk Kocalar, *Retrosshield-HW Design Files*, see:
<https://gitlab.com/8bitforce/retrosshield-hw>
Last browsed to on 16-Dec-2025.
8. Grant Searle, *NASCOM_BASIC_4.7*, see:
https://github.com/feilipu/NASCOM_BASIC_4.7
Last browsed to on 16-Dec-2025.
9. mk.peker, *Efex V4*, see:
<https://mkpeker.wixsite.com/efex>
Last browsed to on 16-Dec-2025.
10. Erturk Kocalar, *Retrosshield Z80 Source Code*, see:
<https://gitlab.com/8bitforce/retrosshield-teensy/-/tree/master/z80>
Last browsed to on 16-Dec-2025.

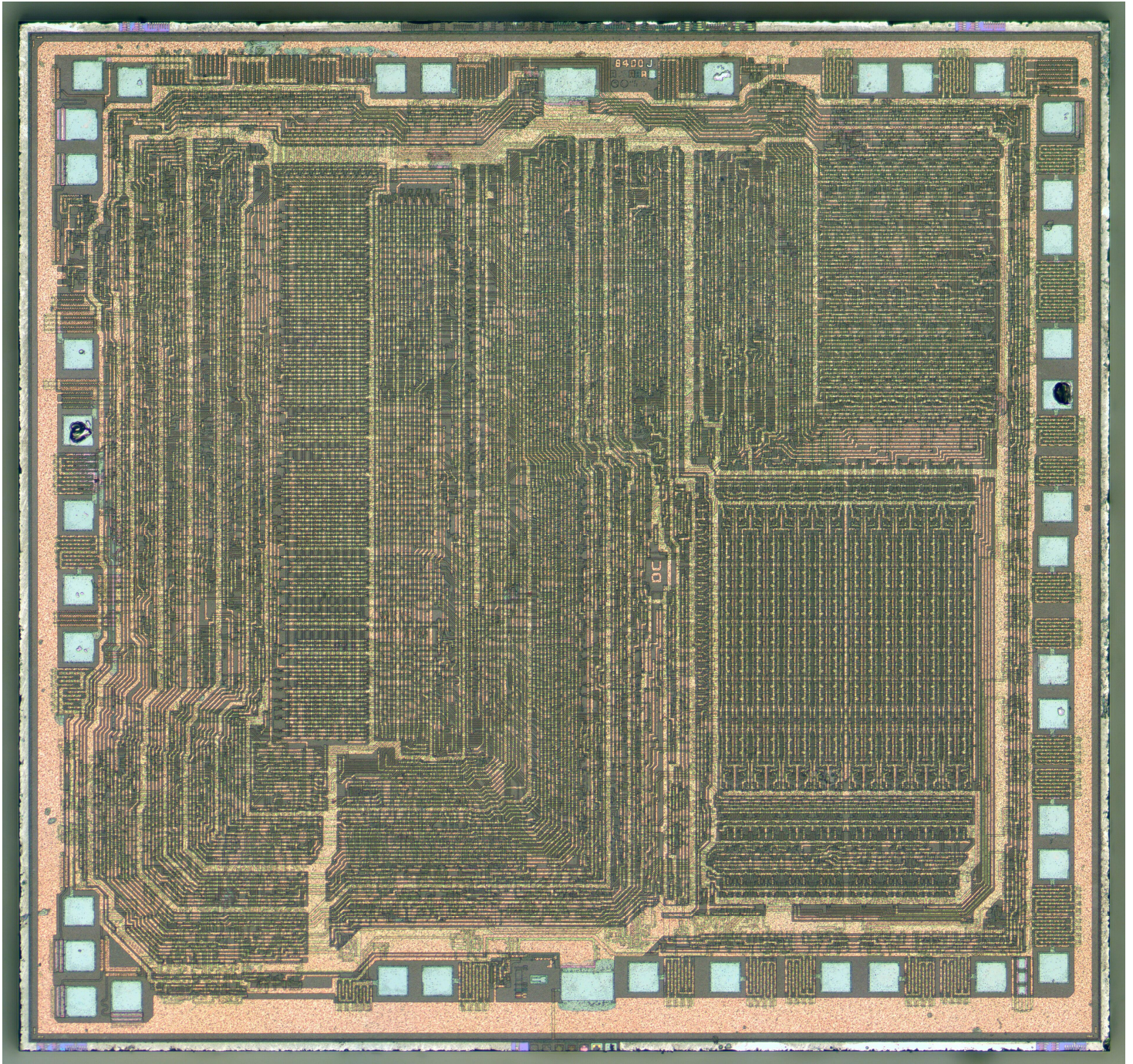


Figure 1: Zilog Z80 chip die micrograph (from Wikipedia).

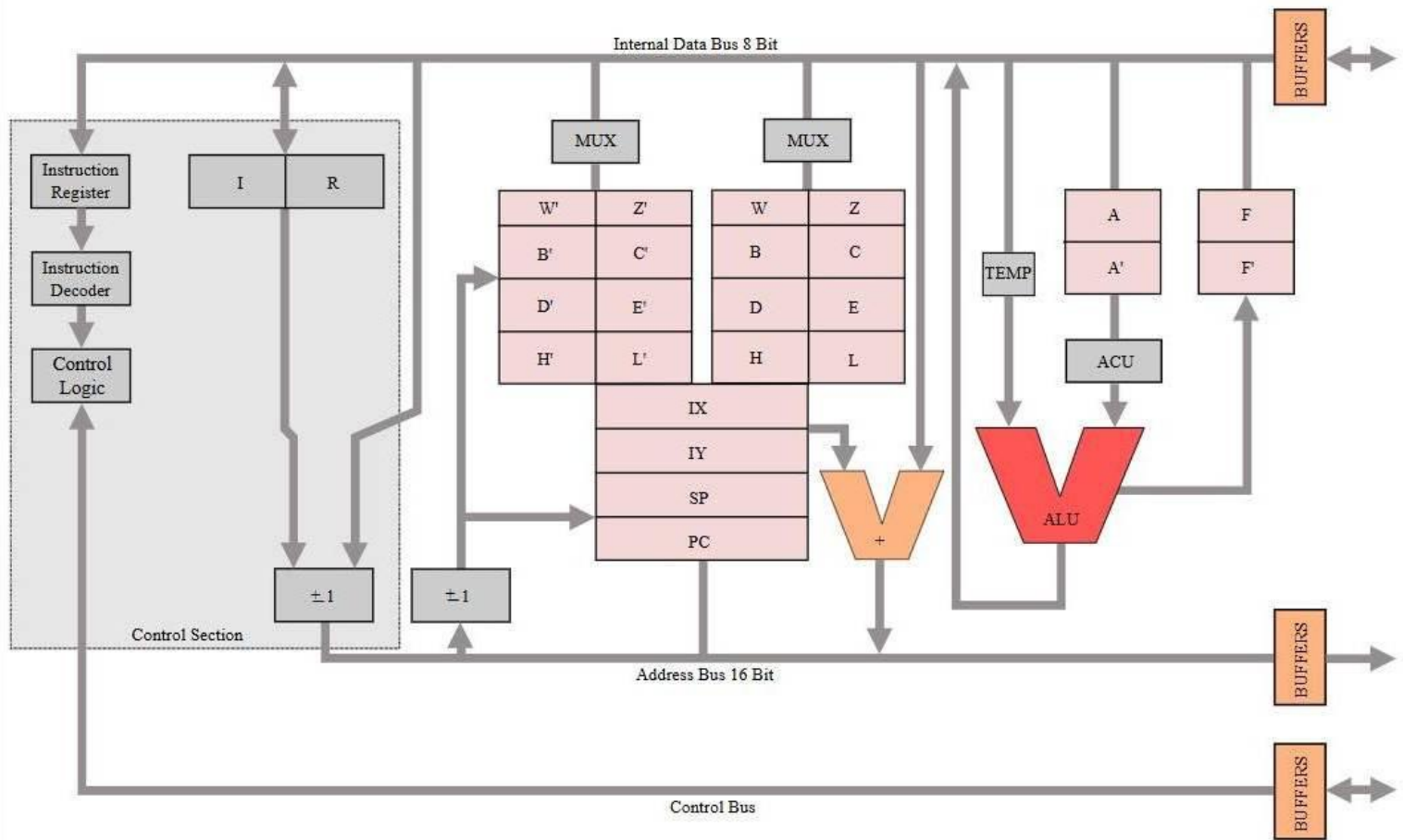


Figure 2: Zilog Z80 architecture (from Wikipedia).

Zilog Z80 registers

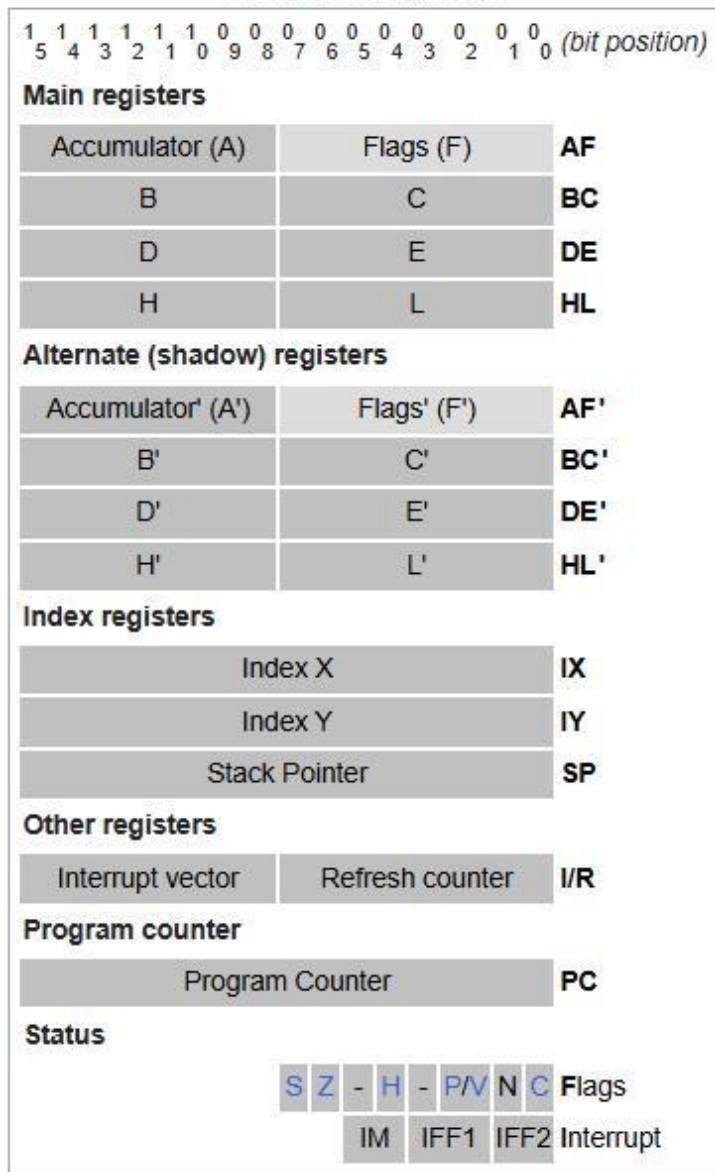


Figure 3: Zilog Z80 registers (from Wikipedia).

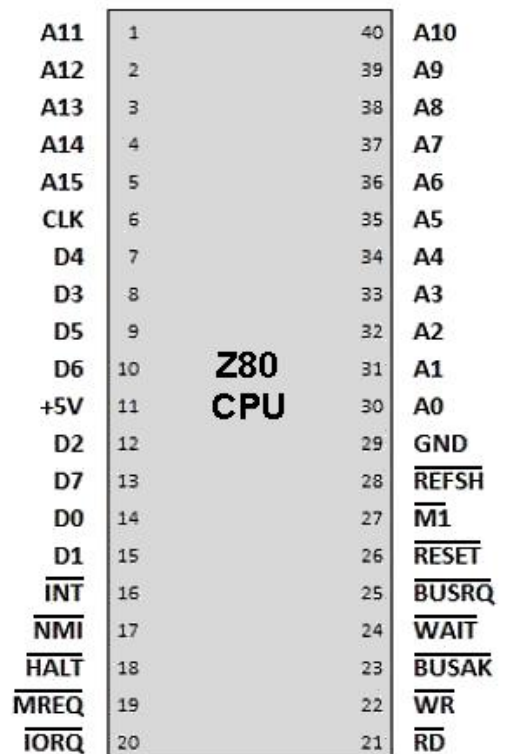


Figure 4: Zilog Z80 pinout.

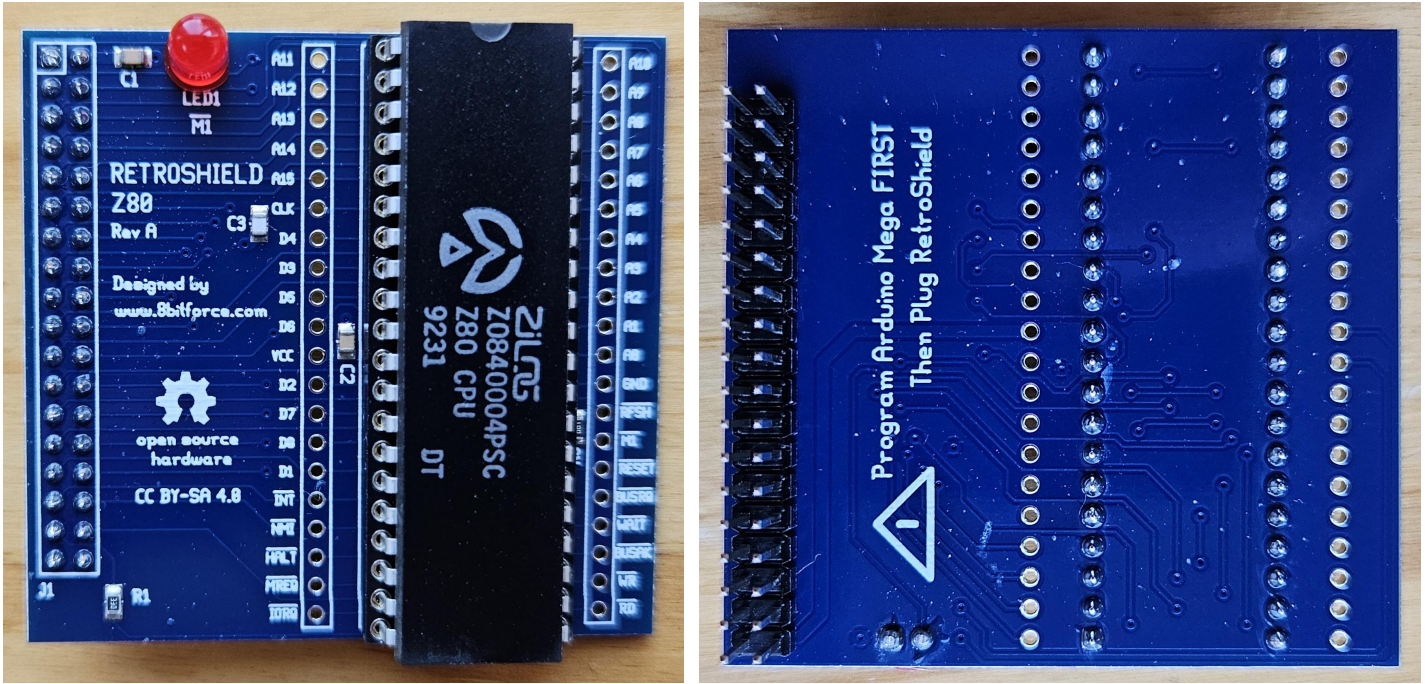


Figure 5: 8bitforce Retroschild Z80.

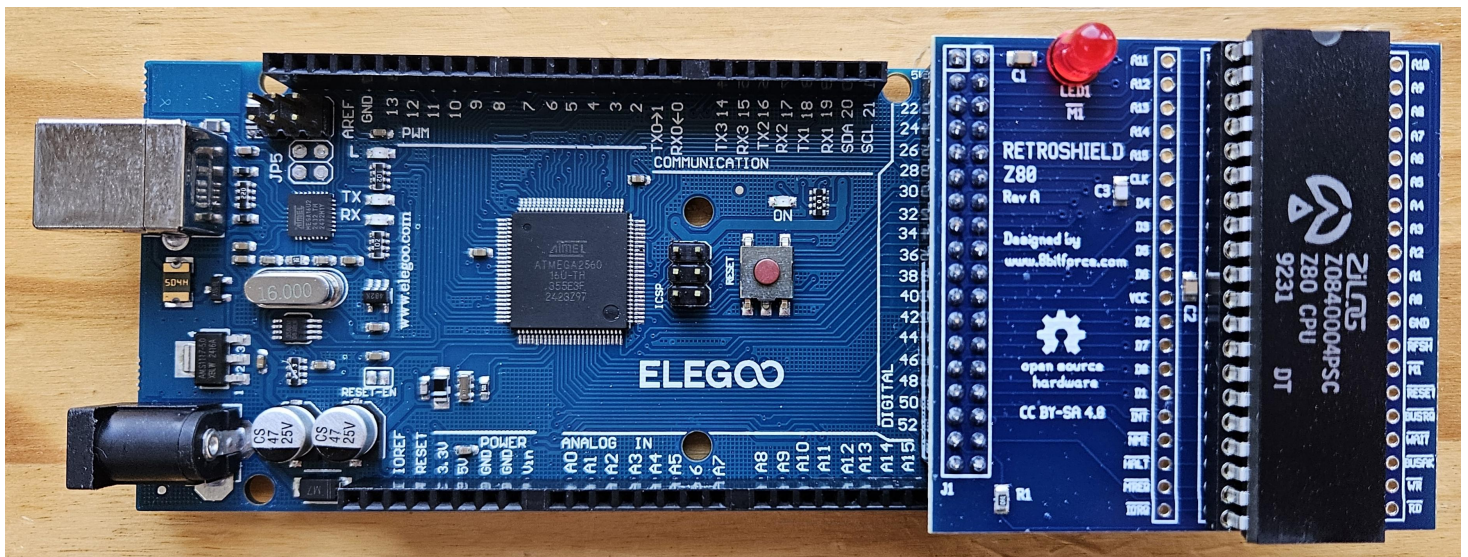


Figure 6: 8bitforce Retroschild Z80 coupled to an Arduino Mega.

RetroShield Z80 Assembly Instructions

Rev A, 2019/03/08

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Z80:

Solder parts in this order:

C1 = 100nF

C2 = 100nF

C3 = 22pF

R1 = 33 ohm

R2 = does not exist

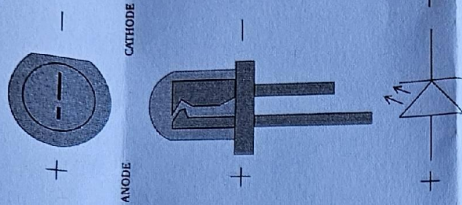
R3 = 680 ohm

U1 socket

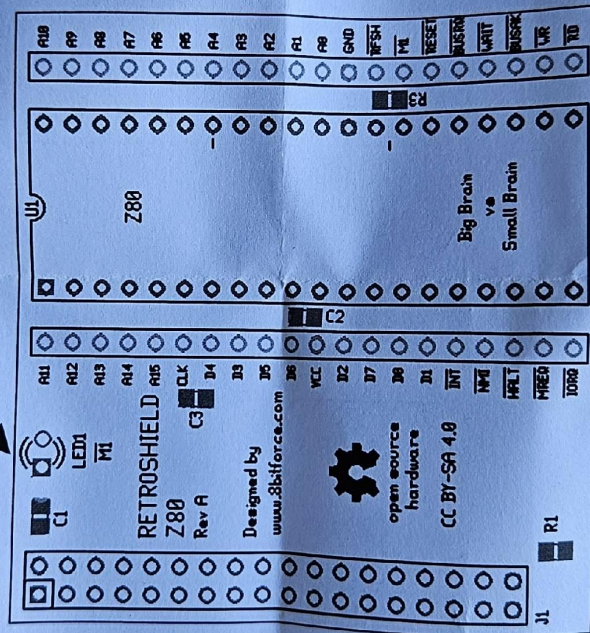
J1 header

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 7: 8bitforce Retroshield Z80 assembly instructions (from 8bitforce).

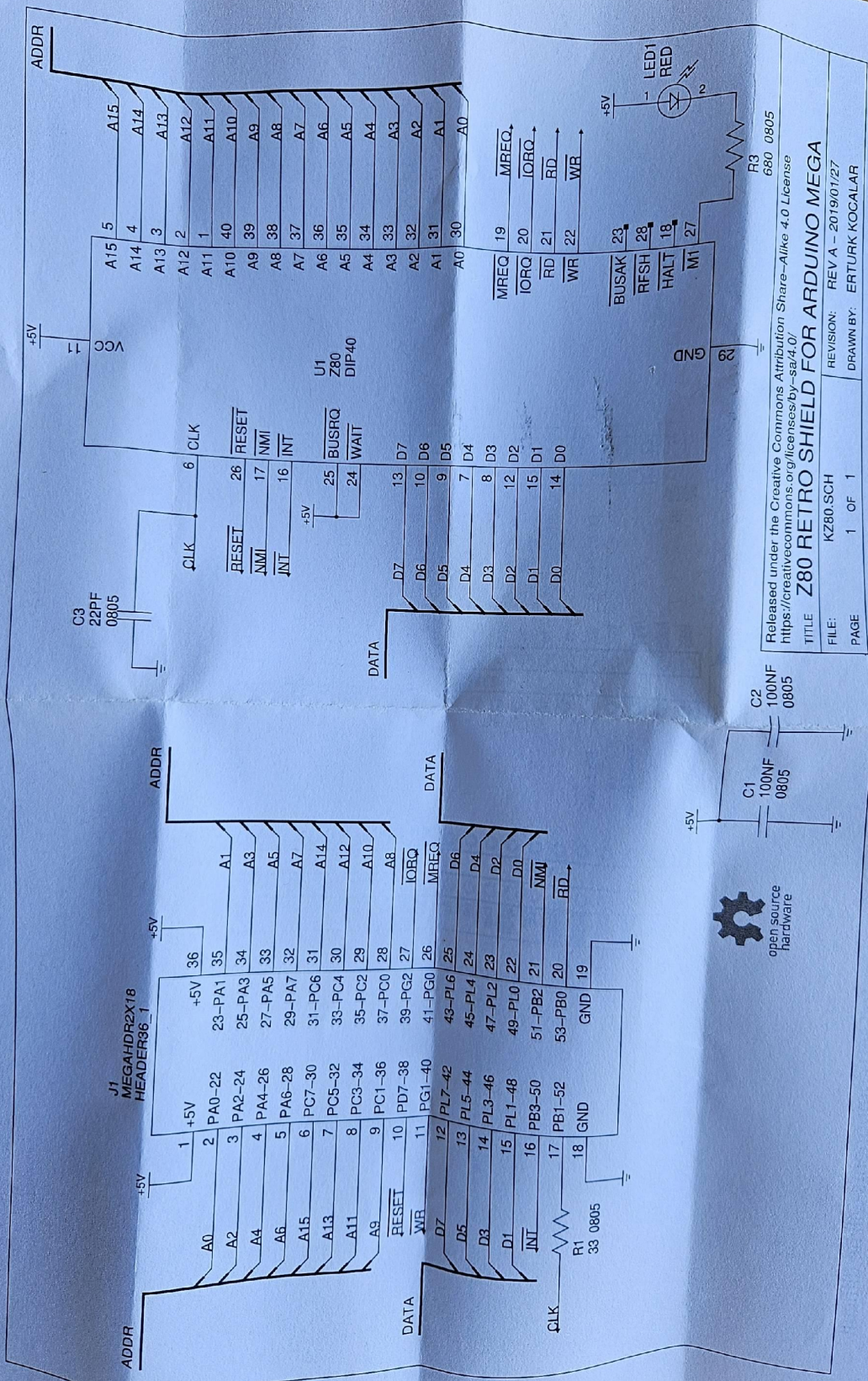


Figure 8: 8bitforce Retrosshield Z80 circuit diagram (from 8bitforce).