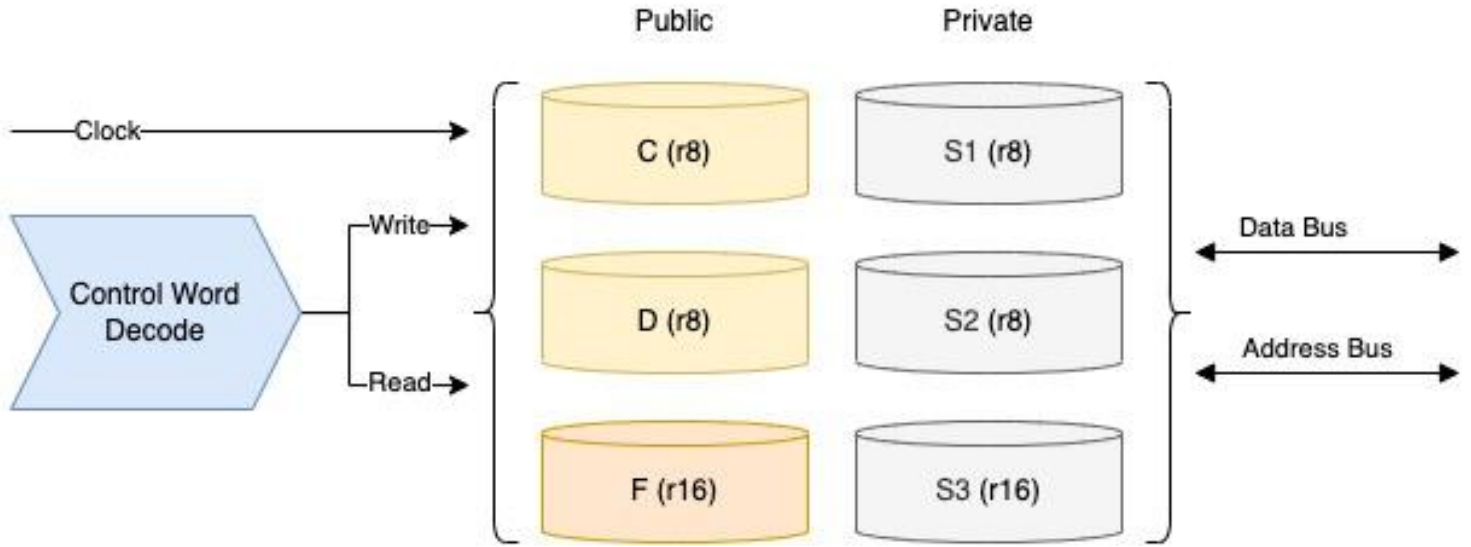
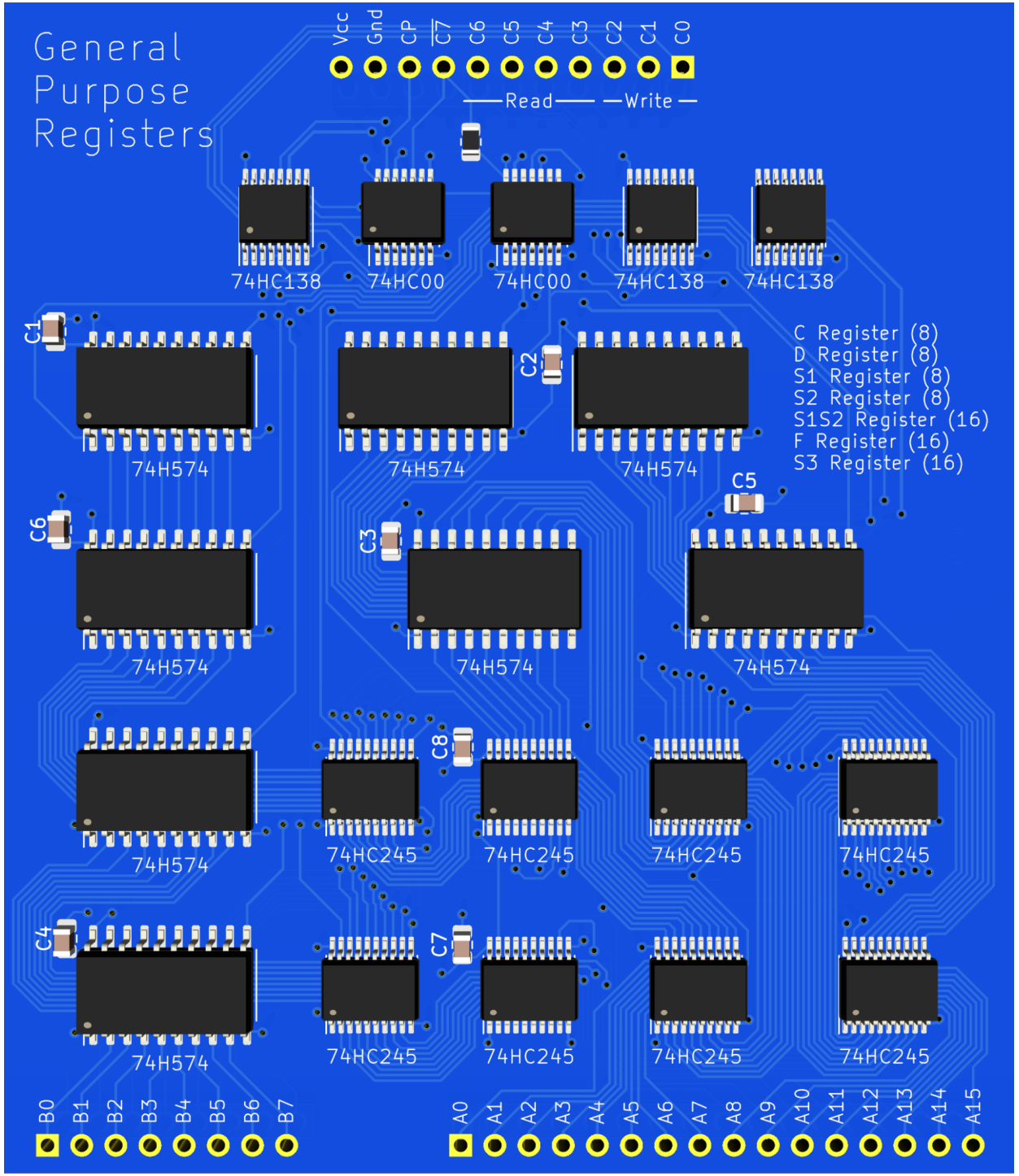
General Purpose Registers (GPR)

The Trilobyte CPU contains **two 8-bit general-purpose registers** and **one 16-bit general-purpose counter register** that is available for user control. The GPR module itself contains an additional two 8-bit scratch registers and one 16-bit scratch register.

Power: **5V Vcc**




General
Purpose
Registers
Vcc
Gnd
CP
C7
C6
C5
C4
C3
C2
C1
C0
Read
Write
74HC138
74HC00
74HC00
74HC138
74HC138
C1
C2
C3
C4
C5
C6
C7
C8
74H574
74H574
74H574
74H574
74H574
74H574
74H574
74HC245
74HC245
74HC245
74HC245
74HC245
74HC245
74HC245
74HC245
C Register (8)
D Register (8)
S1 Register (8)
S2 Register (8)
S1S2 Register (16)
F Register (16)
S3 Register (16)
B0
B1
B2
B3
B4
B5
B6
B7
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15

Register

Name	Size	Visibility	Mnemonic
C	8-bit	PUBLIC	r, r8
D	8-bit	PUBLIC	r, r8
F	16-bit	PUBLIC	r, r16
S1	8-bit	PRIVATE	r, r8
S2	8-bit	PRIVATE	r, r8
S3	16-bit	PRIVATE	r, r16

Bus Connections

- C, D: Loads and asserts data from/to the 8-bit data bus
- F: Loads and asserts data from/to the 16-bit data bus
- S1: Loads and asserts data from/to the 8-bit data bus, as well as, asserts its data to the LSB of the 16-bit address bus.
- S2: Loads and asserts data from/to the 8-bit data bus, as well as, asserts its data to the MSB of the 16-bit address bus.
- S3: Loads and asserts data from/to the 16-bit data bus, as well as, asserts its MSB, or LSB to the 8-bit data bus.
- S1S2: Asserts register-pair to the 16-bit data bus

Control & Instructions

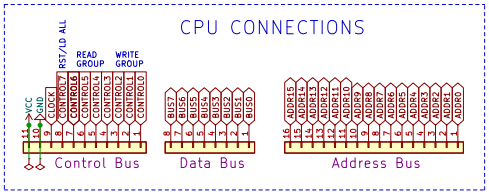
Description	C7	Control [0..6]	Hex Code
Reset / Load ALL	0	0000_000	0x0
Load C	1	0000_001	0x81
Load D	1	0000_010	0x82
Load S1	1	0000_011	0x83
Load S2	1	0000_100	0x84
Load F	1	0000_101	0x85
Load S3	1	0000_110	0x86
Assert C	1	0001_000	0x88
Assert D	1	0010_000	0x90
Assert S1	1	0011_000	0x98
Assert S2	1	0100_000	0xa0
Assert S1S2	1	0101_000	0xa8
Assert F	1	0110_000	0xb0

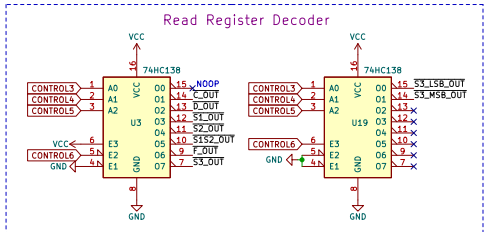
Assert S3	1	0111_000	0xb8
Assert S3L	1	1000_000	0xc0
Assert S3H	1	1001_000	0xc8
MOV C, D	1	0010_001	0x91
MOV C, S1	1	0011_001	0X99
MOV C, S2	1	0100_001	0xa1
MOV C, S3L	1	1000_001	0xc1
MOV C, S3H	1	1001_001	0xc9
MOV D, C	1	0001_010	0x8a
MOV D, S1	1	0011_010	0x9a
MOV D, S2	1	0100_010	0xa2
MOV D, S3L	1	1000_010	0xc2
MOV D, S3H	1	1001_010	0xca
MOV S1, C	1	0001_011	0x8b
MOV S1, D	1	0010_011	0x9a

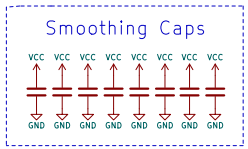
MOV S1, S2	1	0100_011	0x93

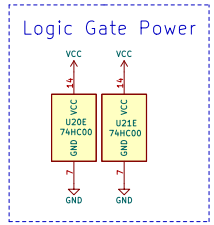
GENERAL PURPOSE REGISTER ARRAY

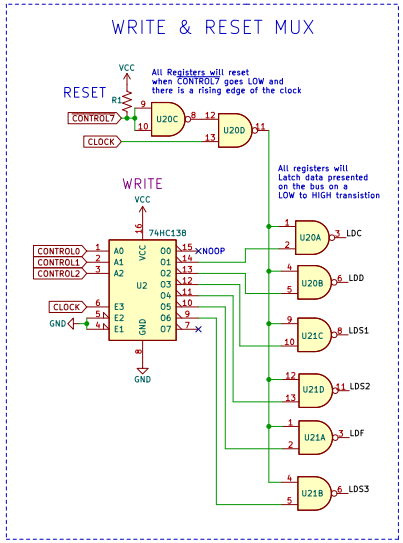
8bit & 16bit C^8, D^8, $S1^8$, $S2^8$, $S1S2^{16}$, F^{16}, $S3^{16}$

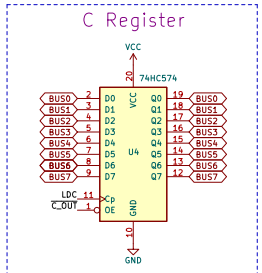


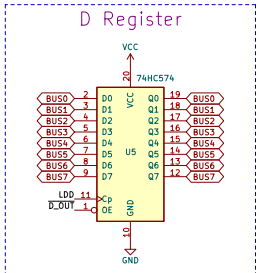


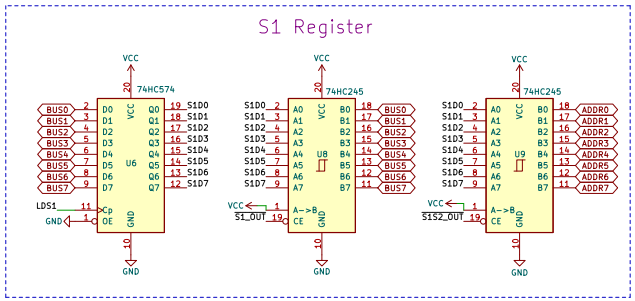


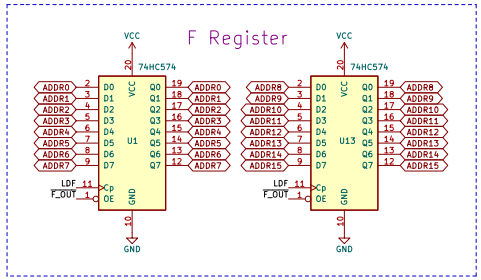


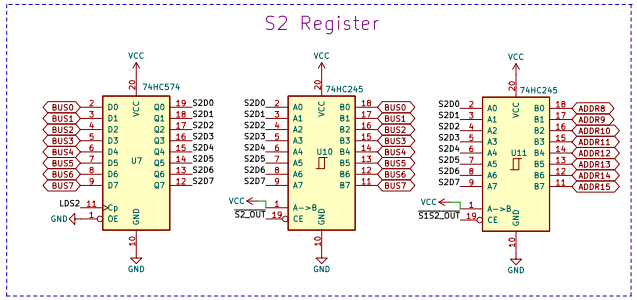


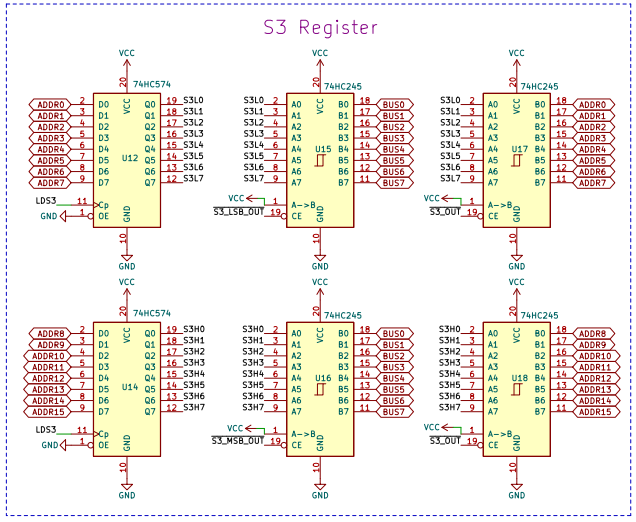












Control Word Truth Table

To just ASSERT or LOAD a value to the data bus to be used with external modules, just select a single value from either READ or WRITE

To do a GPR to GPR transfer just select a READ and WRITE control word and then OR them together.

To do a RESET, $\overline{\text{CONTROL7}}$ is set LOW and all data buses are set to 0x0, which causes each register to load the value presented on their data bus.

GPR <-> External

MOV R, *

0x81: LDC
0x82: LDD
0x83: LDS1
0x84: LDS2
0x85: LDF
0x86: LDS3

MOV *, R

0x80: NOOP
0x88: CO
0x90: DO
0x98: S1OB
0xa0: S2OB
0xa8: S1S2OA
0xb0: FO
0xb8: S3O
0xc0: S3LOB
0xc8: S3HOB

GPR to GPR Control Words

MOV C, D – 0x91 (0b1_0010_001)
MOV C, S1 – 0x99 (0b1_0011_001)
MOV C, S2 – 0xa1 (0b1_0100_001)
MOV C, S3LSB – 0xc1 (0b1_1000_001)
MOV C, S3MSB – 0xc9 (0b1_1001_001)
MOV D, C – 0x8a (0b1_0001_010)
MOV D, S1 – 0x9a (0b1_0011_010)
MOV D, S2 – 0xa2 (0b1_0100_010)
MOV D, S3LSB – 0xc2 (0b1_1000_010)
MOV D, S3MSB – 0xca (0b1_1001_010)
MOV S1, C – 0x8b (0b1_0001_011)
MOV S1, D – 0x9a (0b1_0010_011)
MOV S1, S2 – 0x93 (0b1_0100_011)
MOV S1, S3LSB – 0xc3 (0b1_1000_011)
MOV S1, S3MSB – 0xcb (0b1_1001_011)
MOV S2, C – 0x8c (0b1_0001_100)
MOV S2, D – 0x94 (0b1_0010_100)
MOV S2, S1 – 0x9c (0b1_0011_100)
MOV S2, S3LSB – 0xc4 (0b1_1000_100)
MOV S2, S3MSB – 0xcc (0b1_1001_100)
MOV F, S3 – 0xbd (0b1_0111_101)
MOV F, S1S2 – 0xad (0b1_0101_101)
MOV S3, F – 0xb6 (0b1_0110_110)
MOV S3, S1S2 – 0xae (0b1_0101_110)

theWickedWebDev/8-bit-computer
Sheet: /
File: Minified-Gpr.kicad_sch

Title: General Purpose Register Array

Size: User	Date: 2022-02-10	Rev: v2
KiCad E.D.A. kicad (6.0.0-0)		Id: 1/1

Parts & Components List

Digital Logic, IC's

Part #	Description	Qty	Datasheet	Link
74HC574	8-Bit, Edge-Triggered, flip-flops	7	DATA	Mouser
74HC245	8-bit, Tri-State Transceiver	8	DATA	Mouser
74HC00	Quad, 2-input NAND gates	2	DATA	Mouser
74HC138	3 to 8 line, decoder	2	DATA	Mouser
-	Ceramic Capacitor	8	-	-
-	Resistor (Pull U/D)	1	-	-
-	Header Pins	-	-	-