Solenoid & Motor Driver

H1 MountingHole
H2 MountingHole
H3 MountingHole
H4 MountingHole
H5 MountingHole

+12V
J1 JST NC Valve
TP4 NC−
R8 68k
D3 SOD4007
D2 LED
Q1 BSS138
R7 160
R6 100k
NC_VALVE
GND

+12V
J2 JST NO Valve
TP7 NO−
R10 68k
D9 SOD4007
D7 LED
Q2 BSS138
R15 160
R9 100k
NO_VALVE
GND

1x7002
(g)

+12V
J4 JST 3 Way Valve
TP9 3W−
R12 68k
D10 SOD4007
D8 LED
Q3 BSS138
R17 160
R11 100k
3_WAY_VALVE
GND

DC MOTOR
+12V
BM04B−SRSS−TBT(LF)(SN)
J9
MOTOR_PWM
BEMF
GND
(i)

RP2040

+1V1
C12 100n
C13 100n
GND
Place as close to pin 44 as possible
Place as close to pin 45 as possible
1u C15
1u C14
+3V3
C16 100n
C17 100n
C18 100n
C19 100n
C20 100n
C22 100n
C23 100n

Raspberry Pi RP2040
DVDD DVDD VREG_VOUT VREG_IN IOVDD IOVDD IOVDD IOVDD IOVDD IOVDD USB_VDD ADC_AVDD
USB_DP USB_DM
QSPI_SS QSPI_SD0 QSPI_SD1 QSPI_SD2 QSPI_SD3 QSPI_SCLK
XIN XOUT RUN SWCLK SWD
GPIO0 UART0_TX
GPIO1 UART0_RX
GPIO2 NO_VALVE
GPIO3 NC_VALVE
GPIO4 3_WAY_VALVE
GPIO5 MOTOR_PWM
GPIO6 FOOTPEDAL
GPIO7 FOOTPEDAL_AUX
GPIO8 Lift Btn
GPIO9 Drop Btn
GPIO10 High Btn
GPIO11 Low Btn
GPIO12 Reverse Btn
GPIO13 Trigger Btn
GPIO14 UI LED Data
GPIO15
GPIO16 I2C0_SDA
GPIO17 I2C0_SCL
GPIO18 SPI0_CLK
GPIO19 SPI0_MOSI
GPIO20 SPI0_MISO
GPIO21 SPI0_CS
GPIO22
GPIO23
GPIO24
GPIO25
GPIO26_ADC0 BEMF
GPIO27_ADC1
GPIO28_ADC2
GPIO29_ADC3
TESTEN
U4 RP2040

Power Management

+12V
C1 10u 25V
GND
U2 TPS62112RSAR
VIN_2 VIN VINA FB LBI SYNC EN EP GND_2 GND AGND PGND_2 PGND SW_2 SW LBO PG
C2 1u
+5V
+12V
GND
L1 6.8uH
R14 1M
1n
C4 22u 10V
+5V
GND
J5 Jack−DC
F1 1812L075PR
Phoenix Contact 1733570
J6
+12V
R20 10k
C5 10u 25v
REV POL PROTECT BYPASS
R19 0 DNP
Q4 STN4NF20L
GND
(k)
Add TVS
(a)
(j)

+5V
TP16
Ground TP
TP19
GND
TP13
GND
+12V
TP10 +12V
+3V3
TP11 3v3

+5V
U1 LD1117S33TR
VI VO GND
+3V3
C3 100n
C11 10u
GND

FLASH

QSPI_SS
R26 1k
SW1 BOOTSEL
GND
(f)
+3V3
R28 10k DNP
U3 W25Q128JVS
C10 100n
QSPI_SS QSPI_SCLK
CS CLK DI(IO0) DO(IO1) IO2 IO3 VCC GND
QSPI_SD0 QSPI_SD1 QSPI_SD2 QSPI_SD3

Foot Pedal

(e)
FOOTPEDAL TP31 FPEDAL
FOOTPEDAL_AUX TP20 FPEDAL
J3 6P4C
+3V3
FPATVS
R23 220
R24 220
FOOTPEDAL_AUX
FOOTPEDAL
GND

PWR_FLAG PWR_FLAG GND +12V
PWR_FLAG PWR_FLAG +3V3 +5V

UART / SWD

J11 UART/SWD DNP
UART0_RX UART0_TX SWDIO SWCLK
GND
UART0_RX TP22 UARTRX
UART0_TX TP23 UARTTX
SWDIO TP24 SWDIO
SWCLK TP12 SWCLK

USB−C

Place close to the RP2040
DP DN
R4 27.4
R5 27.4
D+ D−
J12 TYPE−C−31−M−12
CC1 DP1 DN1 SBU1 VBUS SBU2 DN2 DP2 CC2 SHIELD GND
R1 5.1k
5.1k R2
R3 1M
1n C21
TP1 USB D+
TP2 USB D−
(c)
(b)

If you are making a Device that needs power, it's called an Upstream Facing Port (UFP).
Configuring a UFP is quite simple. Just use a 5.1kΩ resistor to pull down CC1 and CC2 to GND.
That will make the Host see this as a device.
This board will let me test if this is sufficient to supply power.
https://flashgamer.com/blog/comments/implementing-usb-type-c-and-usb-3-1

ESD Protection

D1 SP0502BAHT
FPTVS FPATVS GND
D4 SP0502BAHT
DN DP GND

UI Board Level Shifting

+3V3 +5V
R25 10k
R29 10k
Q5 BSS138
UI LED Data
LED_DATA
3v3 <> 5v Logic Level Shift

Expansion Port Test Pins

I2C0_SCL TP14 I2C0 SCL
I2C0_SDA TP15 I2C0 SDA
SPI0_CS TP25 SPI0 CS
SPI0_CLK TP26 SPI0 CLK
SPI0_MISO TP27 SPI0 MISO
SPI0_MOSI TP28 SPI0 MOSI

Clock

27p C6
27p C7
Y1 ABMM2−12.000MHZ−E2−T
GND
OSC_IN
OSC_OUT
1k R27

User Interface

BM10B−SRSS−TB(LF)(SN) J10
SHIELD
Lift Btn Drop Btn Low Btn High Btn Reverse Btn Trigger Btn
+5V
C24 100n
+3V3
C25 100n
R13 100 Place close to the RP2040
LED_DATA
GND
(d)

Expansion Ports

+3V3
R21 2.2k
R22 2.2k
J7 BM04B−SRSS−TBT(LF)(SN)
I2C0_SCL I2C0_SDA
C26 100n
SPI0_CS SPI0_CLK SPI0_MISO SPI0_MOSI
100n C27
J8 SPI

Sheet: /
File: pixel−pump−mainboard.kicad_sch
Title: Pixel Pump Mainboard
Size: A3 | Date: 2020−12−18 | **Rev: 2**
KiCad E.D.A. kicad (6.0.0−rc1−63−g802cfc1a7d) | Id: 1/1