Sheet: micro-rp2040

Microcontroller

File: micro-rp2040.sch

Sheet: IO-expand-595-mux

Peripherals

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Sheet: bpu-current_limiter

Adjustable power supply

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Sheet: bpu-iobufffer

IO buffer

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Sheet: leds

RGB LEDs

File: leds.sch

FCC

logo1
fcc_logo

FID1
Fiducial

FID2
Fiducial

FID3
Fiducial

FID4
Fiducial

FID5
Fiducial

H1
MountingHole

H2
MountingHole

H3
MountingHole

H4
MountingHole

Sheet: /
File: BusPirate-5-rev9.sch

Title:

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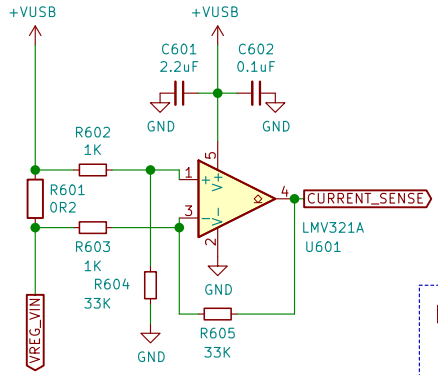
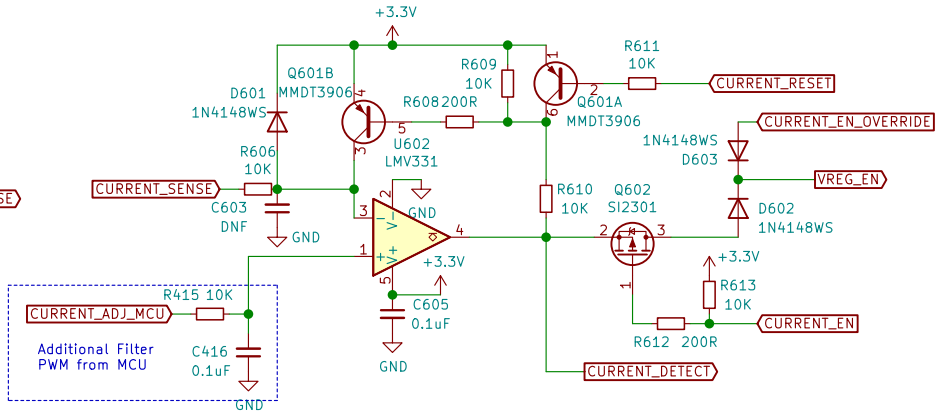
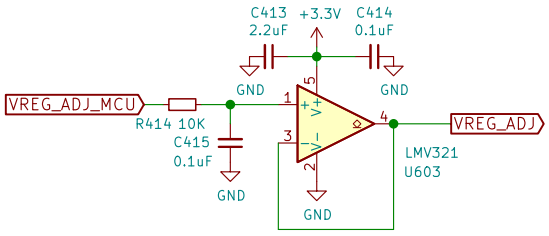


Current sense

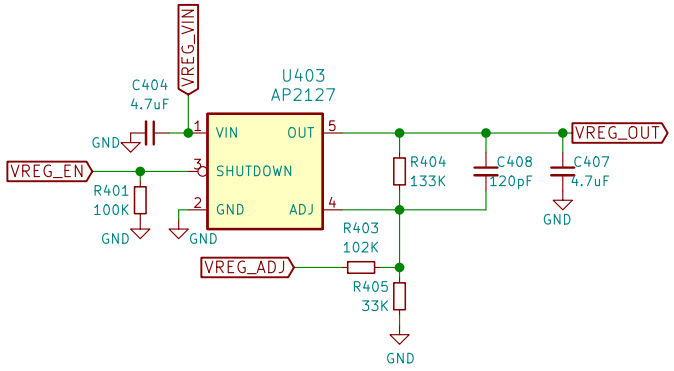


Current limit

Q601 is a general purpose dual PNP transistor with EBCEBC pinout.
Matched pair Q401 can be substituted here, but Q401 is more expensive.



Buffer circuit for Voltage Adjust, when using the MCU
to do PWM instead U406 as DAC

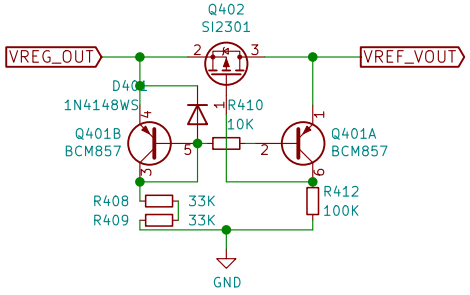


Adjustable voltage regulator

MCP1824 and AP2127 can be used, but have different reference voltages.

MCP1824: Ideal R403/R404/R405 = 77.96K/99.22K/10K
Closest values are 78K/100K/10K

AP2127: Ideal R403/R404/R405 = 31.25K/39.77K/10K
Closest values are 31.6K/40.2K/10K



Backflow prevention

Q401 is a matched PNP pair with EBCEBC pinout.
BCM857, BCM856, NST45010MW6T1G can be substituted.
The BCM part numbers are made by several manufacturers.
This part may be substituted in Q601, but it costs significantly more.

DMMT3906, PMP5201, PMP5501 are similar but have a BBCEEC pinout.
These can be substituted with minor changes to the PCB.

Sheet: /bpu-current_limiter/		
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Title:		
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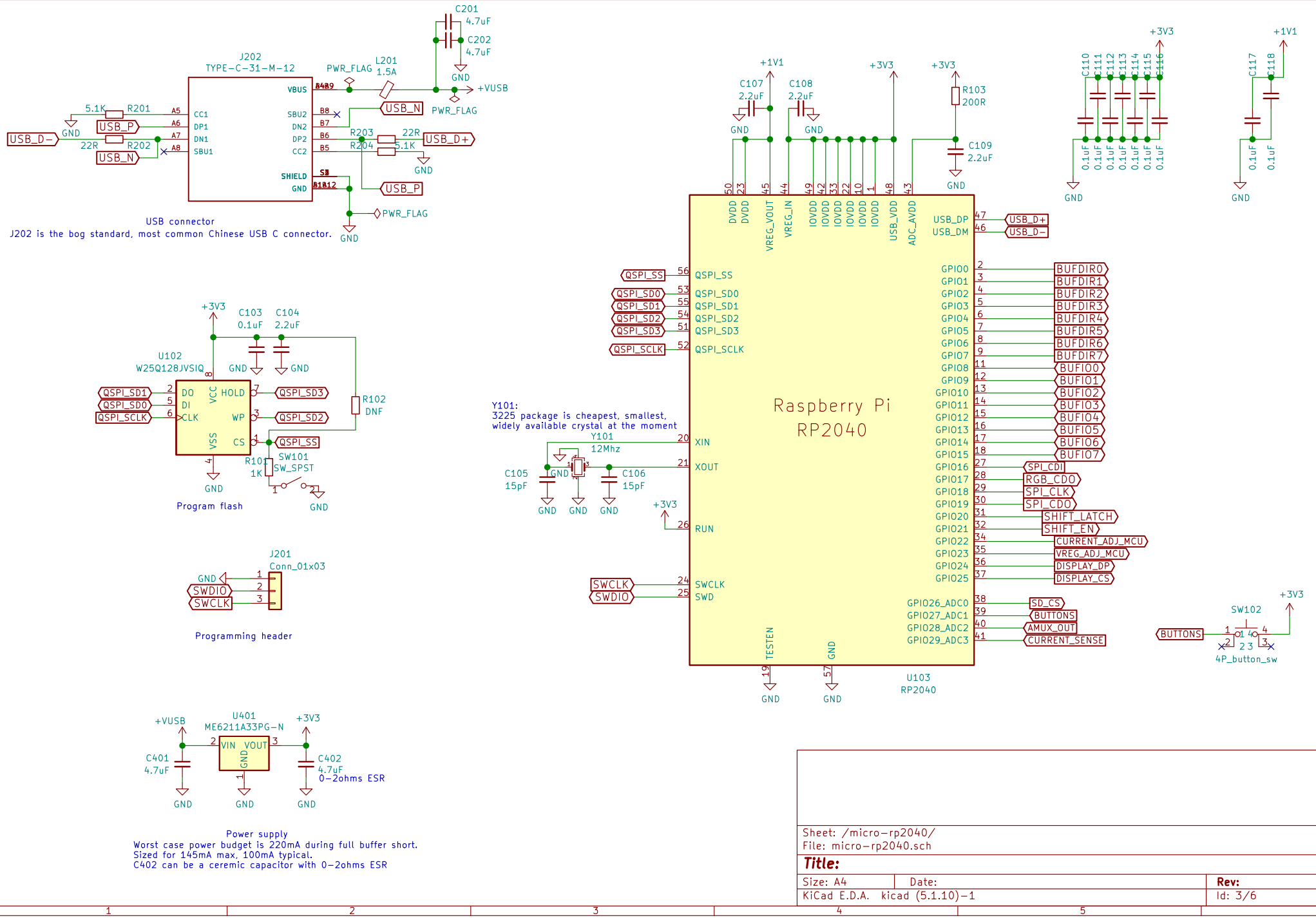
J202
TYPE-C-31-M-12
C201
4.7uF
C202
4.7uF
L201
1.5A
PWR_FLAG
+VUSB
USB_N
USB_P
USB_D+
USB_D-
5.1K
R201
22R
R202
R203
R204
22R
5.1K
SHIELD
GND
USB connector
J202 is the bog standard, most common Chinese USB C connector.
U102
W25Q128JVSIQ
+3V3
C103
0.1uF
C104
2.2uF
R102
DNF
QSPI_SD1
QSPI_SD0
QSPI_SCLK
QSPI_SD3
QSPI_SD2
QSPI_SS
R101
1K
SW101
SW_SPST
Program flash
J201
Conn_01x03
SWDIO
SWCLK
Programming header
U401
ME6211A33PG-N
C401
4.7uF
C402
4.7uF
0-2ohms ESR
Power supply
Worst case power budget is 220mA during full buffer short.
Sized for 145mA max, 100mA typical.
C402 can be a ceremic capacitor with 0-2ohms ESR
+1V1
C107
2.2uF
C108
2.2uF
R103
200R
C109
2.2uF
C110
C111
C112
C113
C114
C115
C116
C117
C118
0.1uF
Raspberry Pi
RP2040
U103
RP2040
DVDD
VREG_VOUT
VREG_IN
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
TESTEN
GPIO0
GPIO1
GPIO2
GPIO3
GPIO4
GPIO5
GPIO6
GPIO7
GPIO8
GPIO9
GPIO10
GPIO11
GPIO12
GPIO13
GPIO14
GPIO15
GPIO16
GPIO17
GPIO18
GPIO19
GPIO20
GPIO21
GPIO22
GPIO23
GPIO24
GPIO25
GPIO26_ADC0
GPIO27_ADC1
GPIO28_ADC2
GPIO29_ADC3
BUFDIR0
BUFDIR1
BUFDIR2
BUFDIR3
BUFDIR4
BUFDIR5
BUFDIR6
BUFDIR7
BUFIO0
BUFIO1
BUFIO2
BUFIO3
BUFIO4
BUFIO5
BUFIO6
BUFIO7
SPI_CDI
RGB_CDO
SPI_CLK
SPI_CDO
SHIFT_LATCH
SHIFT_EN
CURRENT_ADJ_MCU
VREG_ADJ_MCU
DISPLAY_DP
DISPLAY_CS
SD_CS
BUTTONS
AMUX_OUT
CURRENT_SENSE
Y101:
3225 package is cheapest, smallest, widely available crystal at the moment
Y101
12Mhz
C105
15pF
C106
15pF
SW102
4P_button_sw
GND
+3V3
+1V1
Sheet: /micro-rp2040/
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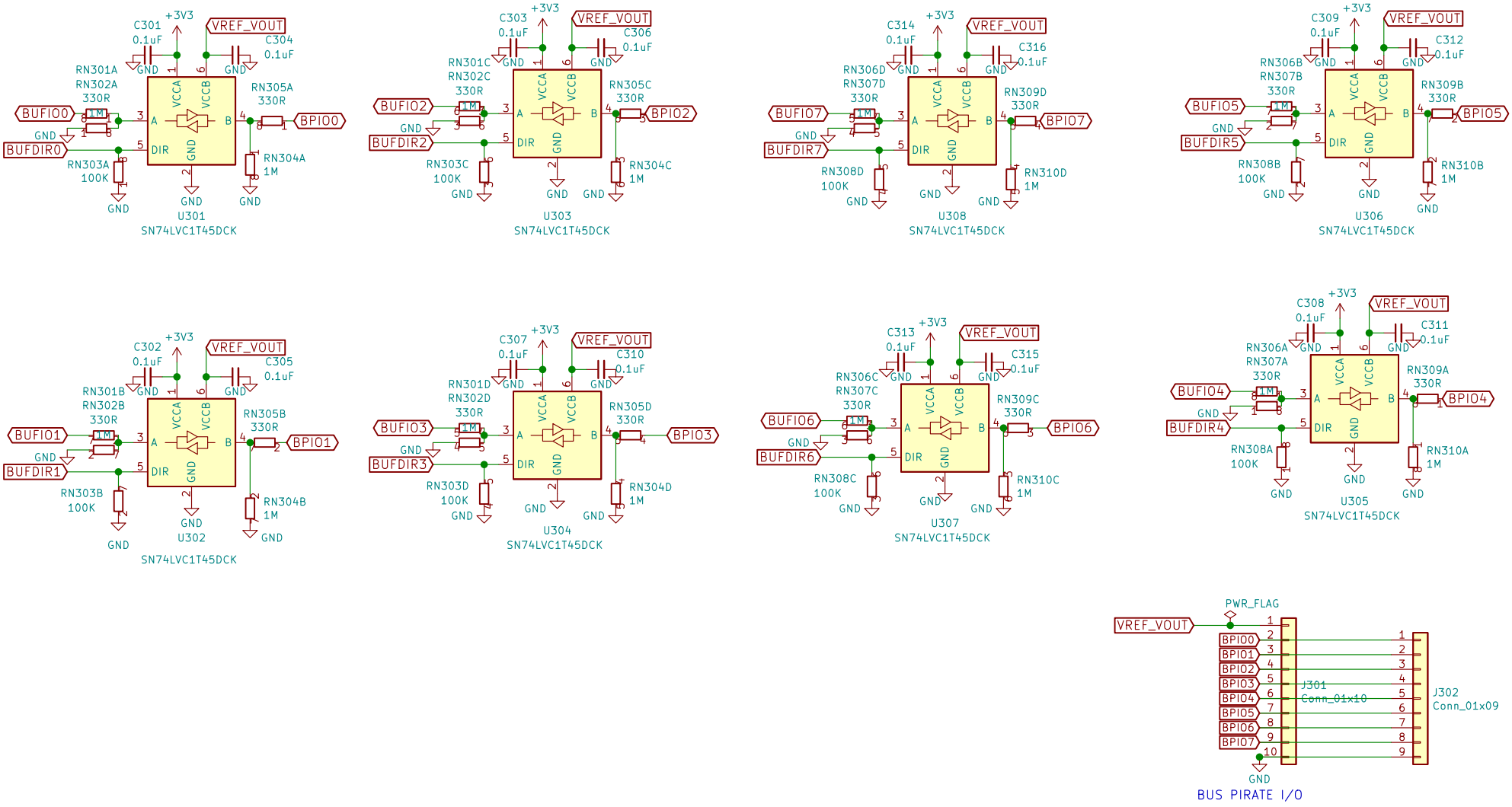
C301
0.1uF
+3V3
VREF_VOUT
C304
0.1uF
RN301A
RN302A
330R
BUFIO0
1M
GND
BUFDIR0
RN303A
100K
VCCA
VCCB
A
B
DIR
GND
RN305A
330R
BPIO0
RN304A
1M
U301
SN74LVC1T45DCK
C303
0.1uF
VREF_VOUT
C306
0.1uF
RN301C
RN302C
330R
BUFIO2
BUFDIR2
RN303C
100K
RN305C
330R
BPIO2
RN304C
1M
U303
SN74LVC1T45DCK
C314
0.1uF
VREF_VOUT
C316
0.1uF
RN306D
RN307D
330R
BUFIO7
BUFDIR7
RN308D
100K
RN309D
330R
BPIO7
RN310D
1M
U308
SN74LVC1T45DCK
C309
0.1uF
VREF_VOUT
C312
0.1uF
RN306B
RN307B
330R
BUFIO5
BUFDIR5
RN308B
100K
RN309B
330R
BPIO5
RN310B
1M
U306
SN74LVC1T45DCK
C302
0.1uF
VREF_VOUT
C305
0.1uF
RN301B
RN302B
330R
BUFIO1
BUFDIR1
RN303B
100K
RN305B
330R
BPIO1
RN304B
1M
U302
SN74LVC1T45DCK
C307
0.1uF
VREF_VOUT
C310
0.1uF
RN301D
RN302D
330R
BUFIO3
BUFDIR3
RN303D
100K
RN305D
330R
BPIO3
RN304D
1M
U304
SN74LVC1T45DCK
C313
0.1uF
VREF_VOUT
C315
0.1uF
RN306C
RN307C
330R
BUFIO6
BUFDIR6
RN308C
100K
RN309C
330R
BPIO6
RN310C
1M
U307
SN74LVC1T45DCK
C308
0.1uF
VREF_VOUT
C311
0.1uF
RN306A
RN307A
330R
BUFIO4
BUFDIR4
RN308A
100K
RN309A
330R
BPIO4
RN310A
1M
U305
SN74LVC1T45DCK
PWR_FLAG
VREF_VOUT
BPIO0
BPIO1
BPIO2
BPIO3
BPIO4
BPIO5
BPIO6
BPIO7
GND
J301
Conn_01x10
J302
Conn_01x09
BUS PIRATE I/O
Sheet: /bpu-iobufffer/
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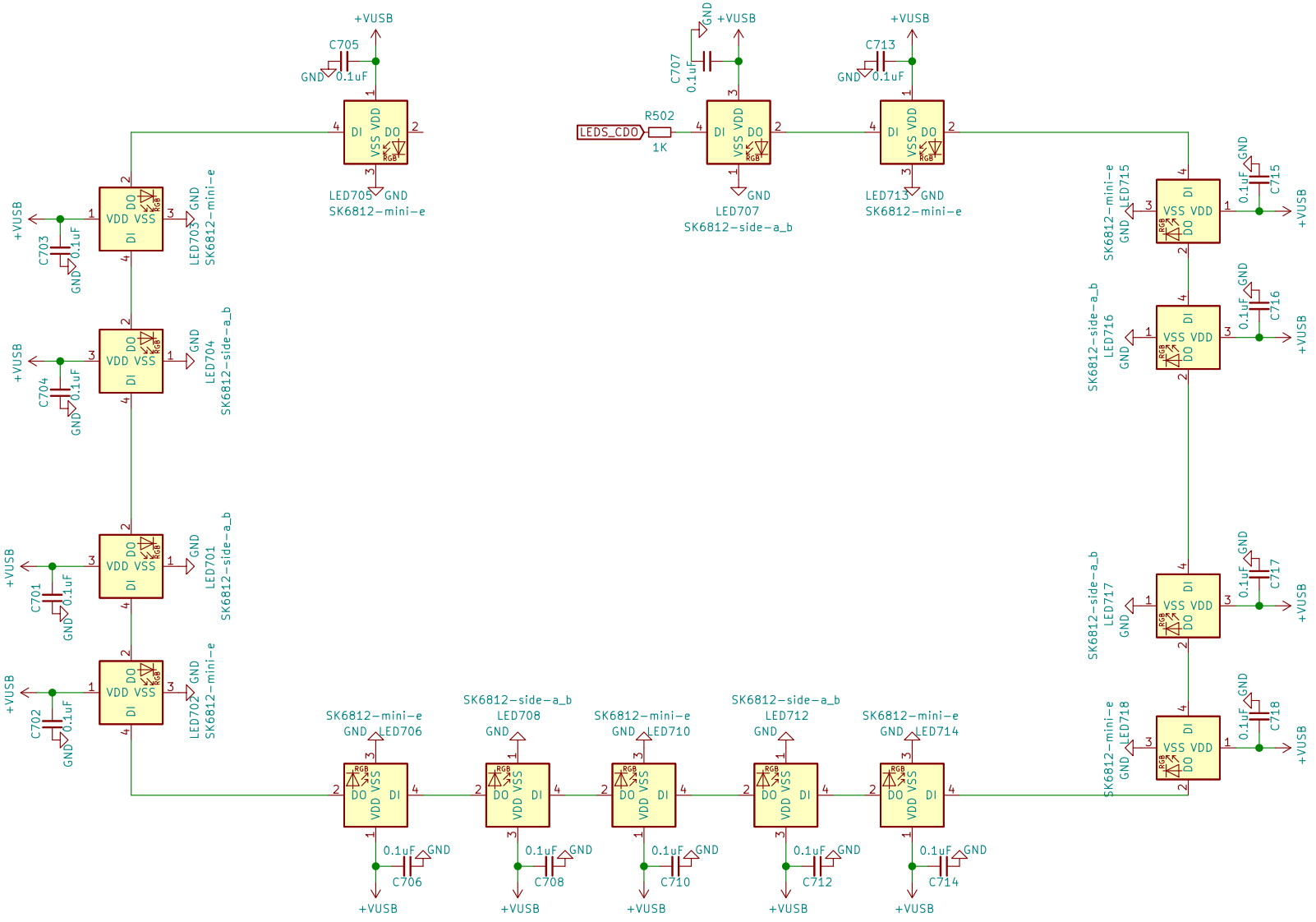

Sheet: /leds/		
File: leds.sch		
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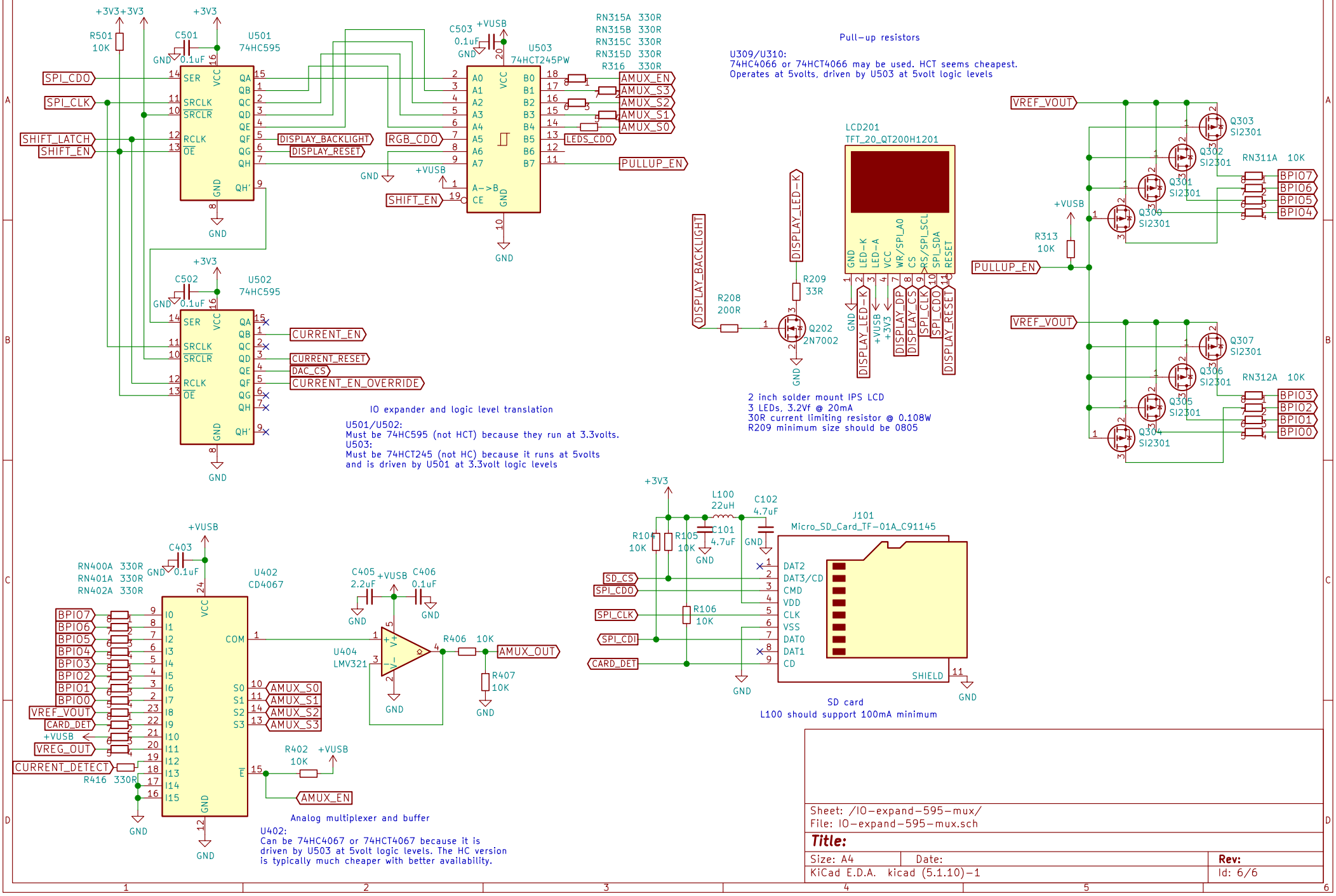
+3V3+3V3
+3V3
R501
10K
C501
0.1uF
U501
74HC595
SPI_CDO
SPI_CLK
SHIFT_LATCH
SHIFT_EN
SER
SRCLK
SRCLR
RCLK
OE
QA
QB
QC
QD
QE
QF
QG
QH
QH'
VCC
GND
DISPLAY_BACKLIGHT
DISPLAY_RESET
C503
+VUSB
0.1uF
U503
74HCT245PW
A0
A1
A2
A3
A4
A5
A6
A7
A->B
CE
B0
B1
B2
B3
B4
B5
B6
B7
RGB_CDO
SHIFT_EN
RN315A 330R
RN315B 330R
RN315C 330R
RN315D 330R
R316 330R
AMUX_EN
AMUX_S3
AMUX_S2
AMUX_S1
AMUX_S0
LEDS_CDO
PULLUP_EN
C502
U502
74HC595
CURRENT_EN
CURRENT_RESET
DAC_CS
CURRENT_EN_OVERRIDE
IO expander and logic level translation
U501/U502:
Must be 74HC595 (not HCT) because they run at 3.3volts.
U503:
Must be 74HCT245 (not HC) because it runs at 5volts
and is driven by U501 at 3.3volt logic levels
Pull-up resistors
U309/U310:
74HC4066 or 74HCT4066 may be used. HCT seems cheapest.
Operates at 5volts, driven by U503 at 5volt logic levels
LCD201
TFT_20_QT200H1201
GND
LED-K
LED-A
VCC
WR/SPI_A0
CS
RS/SPI_SCL
SPI_SDA
RESET
DISPLAY_LED-K
DISPLAY_DP
DISPLAY_CS
SPI_CLK
SPI_CDO
DISPLAY_RESET
R209
33R
R208
200R
Q202
2N7002
2 inch solder mount IPS LCD
3 LEDs, 3.2Vf @ 20mA
30R current limiting resistor @ 0.108W
R209 minimum size should be 0805
VREF_VOUT
Q303
SI2301
Q302
SI2301
Q301
SI2301
Q300
SI2301
RN311A 10K
BPIO7
BPIO6
BPIO5
BPIO4
R313
10K
PULLUP_EN
Q307
SI2301
Q306
SI2301
Q305
SI2301
Q304
SI2301
RN312A 10K
BPIO3
BPIO2
BPIO1
BPIO0
+VUSB
C403
0.1uF
RN400A 330R
RN401A 330R
RN402A 330R
U402
CD4067
I0
I1
I2
I3
I4
I5
I6
I7
I8
I9
I10
I11
I12
I13
I14
I15
COM
S0
S1
S2
S3
E
C405
2.2uF
C406
0.1uF
U404
LMV321
V+
V-
R406 10K
R407
10K
AMUX_OUT
AMUX_S0
AMUX_S1
AMUX_S2
AMUX_S3
BPIO7
BPIO6
BPIO5
BPIO4
BPIO3
BPIO2
BPIO1
BPIO0
VREF_VOUT
CARD_DET
VREG_OUT
CURRENT_DETECT
R416 330R
R402
10K
AMUX_EN
Analog multiplexer and buffer
U402:
Can be 74HC4067 or 74HCT4067 because it is
driven by U503 at 5volt logic levels. The HC version
is typically much cheaper with better availability.
L100
22uH
C102
4.7uF
C101
4.7uF
R104
10K
R105
10K
R106
10K
J101
Micro_SD_Card_TF-01A_C91145
DAT2
DAT3/CD
CMD
VDD
CLK
VSS
DAT0
DAT1
CD
SHIELD
SD_CS
SPI_CDO
SPI_CLK
SPI_CDI
CARD_DET
SD card
L100 should support 100mA minimum
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