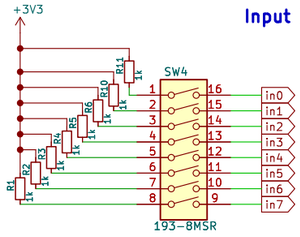
Tiny Tapeout 06+ Demo Board

User Input + Config

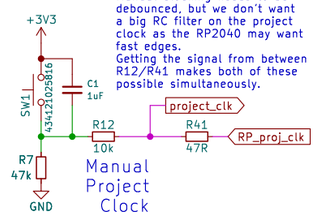
Input DIP

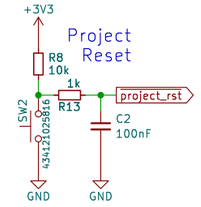


Alt: 76SB08ST

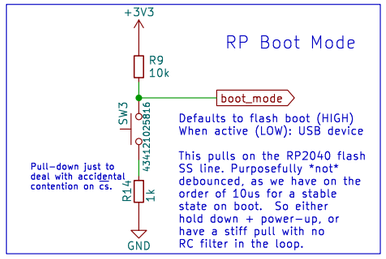
Momentary Switches (debounced)

Manual clocking needs to be debounced, but we don't want a big RC filter on the project clock as the RP2040 may want fast edges.
Getting the signal from between R12/R41 makes both of these possible simultaneously.





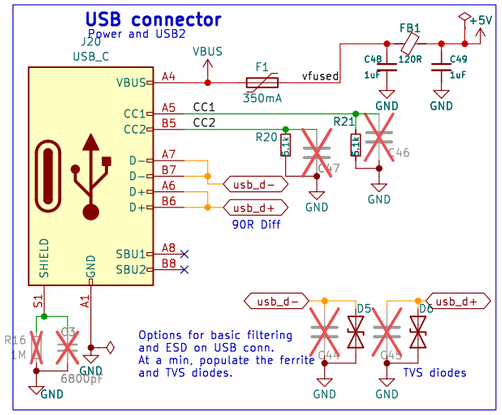
RP Boot Mode



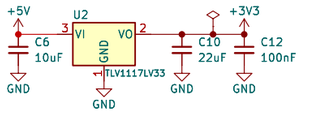
Power

USB connector

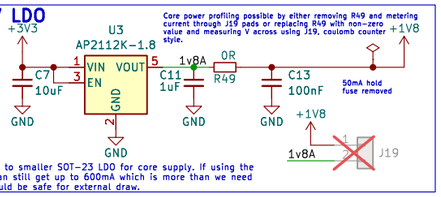
Power and USB2



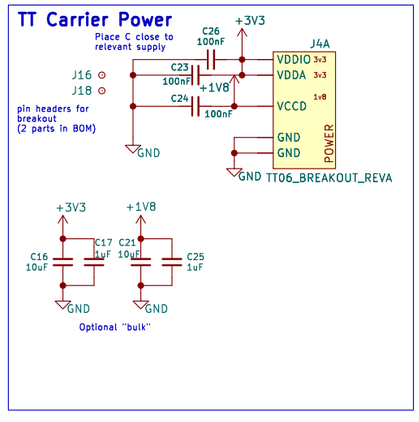
3V3 LDO

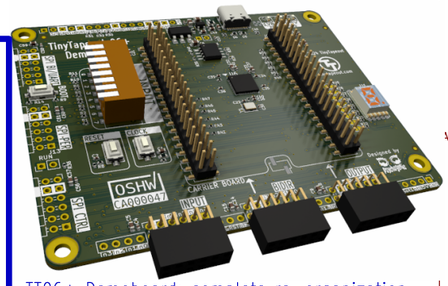


1.8V LDO



TT Carrier Power

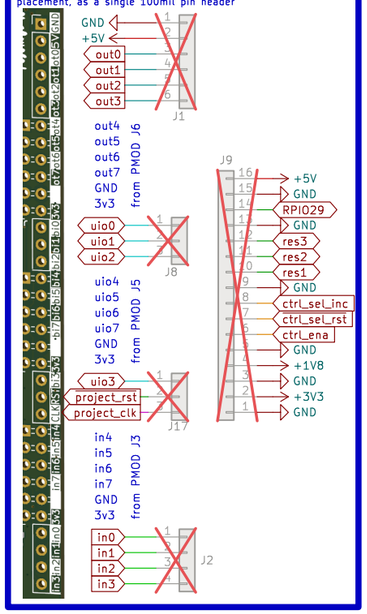




TT06+ Demoboard: complete re-organization, support for TT06+ new carrier pinout.
For users, main difference is the new piano DIP input and the fact no MUX is in the way on demoboards.
https://github.com/TinyTapeout/tt-demo-pcb

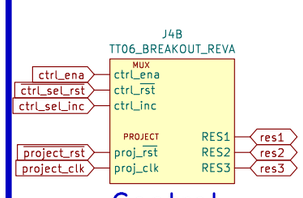
Board edge connectors (pinheaders)

I/O is available through standard PMODs or, with judicious placement, as a single 100mil pin header

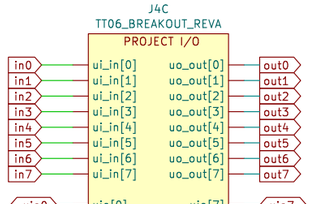


TT Carrier Logic

J4B TT06_BREAKOUT_REVA



J4C TT06_BREAKOUT_REVA

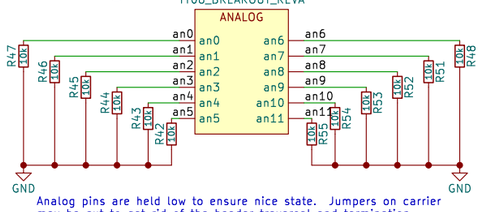


Control

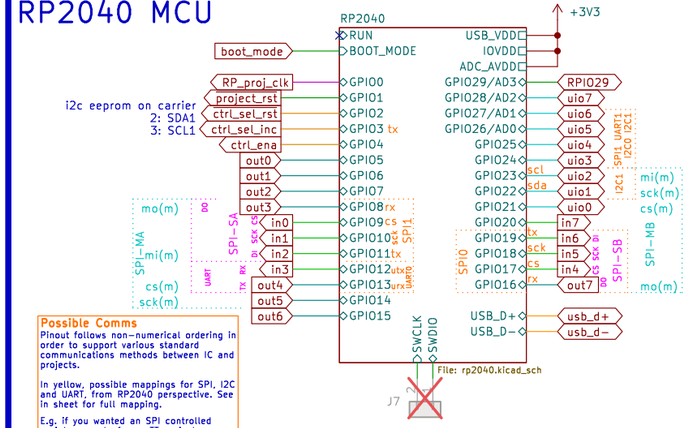
I/O

Analog

J4D TT06_BREAKOUT_REVA

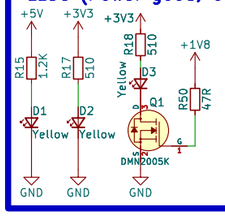


RP2040 MCU

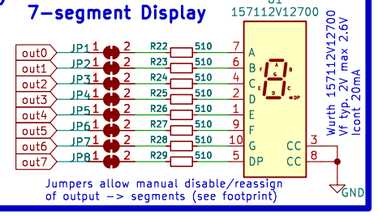


Indication

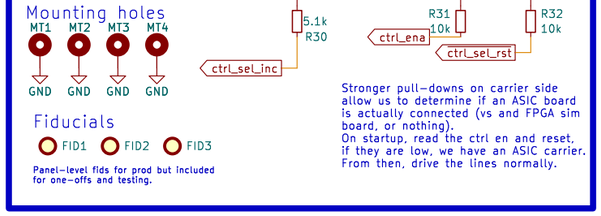
LEDs (Power good, GPIO)



7-segment Display

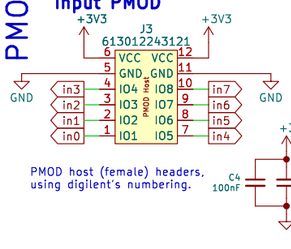


Misc Support

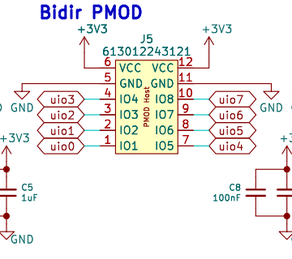


PMOD

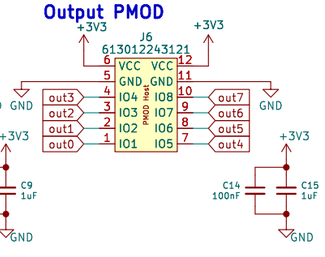
Input PMOD



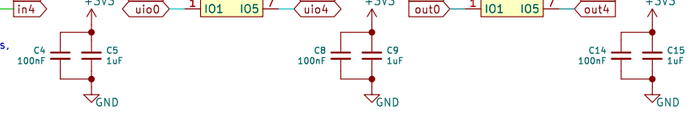
Bidir PMOD



Output PMOD

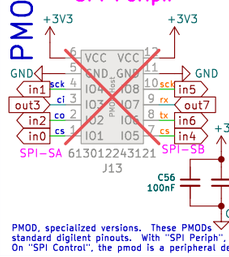


PMOD host (female) headers, using digilent's numbering.

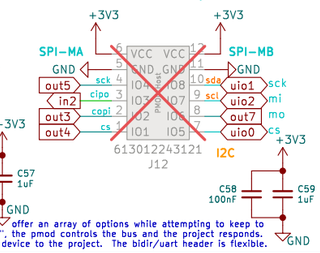


PMOD

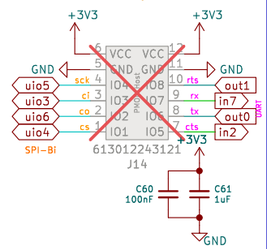
SPI Periph



SPI Control/I2C



SPI Bi/UART



PMOD, specialized versions. These PMODs offer an array of options while attempting to keep to standard digilent pinouts. With "SPI Periph", the pmod controls the bus and the project responds. On "SPI Control", the pmod is a peripheral device to the project. The bidir/uart header is flexible.

Psychogenic Technologies

Sheet: /
File: tinytapeout-demo.kicad_sch

Title: Tiny Tapeout 06+ Demo Board

Size: A3	Date: 2024-08-30	**Rev: 2.0.1**
KiCad E.D.A. 8.0.4		Id: 1/2

RP2040 Basic Support

IOVDD — Logic supply, nominally 3v3.

BOOT_MODE — QSPI_SS: When held low on powerup, flash SS determines boot mode (HIGH == flash boot, LOW == USB device)

USB_VDD supplies USB PHY, nominal 3v3. If IOVDD is 3v3, can share supply.

In fact, in this and many applications, IOVDD, USB_VDD and ADC_AVDD are all powered directly from a single 3v3 supply, with the 1v1 digital core being handle by on-board regulator.

VREG_VOUT: Int core regulator, 1.1V. Can supply DVDD. Place 1uF in/out bypass near pin.

C32 1uF 1v1 — C37 1uF

R36 10k — RUN async reset

J10 Short to hold in reset: RUN, GND

J11: +3V3, QSPI_SS, QSPI_CLK, QSPI_SD0, QSPI_SD1, GND

Flash program header
Note: should we replace 3v3 with RUN, to be able to reset/hold while updating flash?

WE 830108206909: CFPX-180 model, 10 ppm tol, 20ppm stab, CL 8pF

C29 6pF — Y1 12.0MHz — C30 6pF — R37 1k

Rule of thumb
C1, C2 = 2 * CL - 2 * Cstray
Using a stray cap of 5pF, gives Cn = 6pF

Into:
CL = (C1 * C2) / (C1 + C2) + Cstray
These Cn = 6p give CL = 8pF -- just what we need.

U6 RP2040

Pin	Net	GPIO
1	IOVDD	
2	GPIO0	GPIO0
3	GPIO1	GPIO1
4	GPIO2	GPIO2
5	GPIO3	GPIO3
6	GPIO4	GPIO4
7	GPIO5	GPIO5
8	GPIO6	GPIO6
9	GPIO7	GPIO7
11	GPIO8	GPIO8
12	GPIO9	GPIO9
13	GPIO10	GPIO10
14	GPIO11	GPIO11
15	GPIO12	GPIO12
16	GPIO13	GPIO13
17	GPIO14	GPIO14
18	GPIO15	GPIO15
19	TESTEN	Factory test mode: GND
20	XIN	GPIO16
21	XOUT	GPIO17
22	IOVDD	GPIO18
23	DVDD	GPIO19
24	SWCLK	GPIO20
25	SWD	GPIO21
26	RUN	GPIO22
27	GPIO16	GPIO23
28	GPIO17	GPIO24
29	GPIO18	GPIO25
30	GPIO19	GPIO26_ADC0 / GPIO26/AD0
31	GPIO20	GPIO27_ADC1 / GPIO27/AD1
32	GPIO21	GPIO28_ADC2 / GPIO28/AD2
34	GPIO22	GPIO29_ADC3 / GPIO29/AD3
35	GPIO23	
36	GPIO24	
37	GPIO25	
40	USB_VDD	
41	ADC_AVDD	
42	VREG_IN	
43	VREG_VOUT	
44	DVDD	
45	IOVDD	
46	USB_DM	USB_D-
47	USB_DP	USB_D+
48	IOVDD	
51	QSPI_SD3	QSPI_SD3
52	QSPI_SCLK	QSPI_CLK
53	QSPI_SD0	QSPI_SD0
54	QSPI_SD2	QSPI_SD2
55	QSPI_SD1	QSPI_SD1
56	QSPI_SS	QSPI_SS
57	GND	GND

Flash

U5 W25Q32JVSS

Note: SS pulled-up externally, from bootmode switch

R34 10k — C31 100nF — R35 10k — R38 10k — R39 10k — R40 10k

QSPI_SS, QSPI_CLK, QSPI_SD0, QSPI_SD1, QSPI_SD2, QSPI_SD3

Quad SPI requires QE bit in status register-2 to be set. In this case, WP becomes IO2 and HOLD becomes IO3.

Supply bypass, place near 1, 10, 22, 33, 42, 49

C33 100nF — C35 100nF — C38 100nF — C34 100nF — C36 100nF — C39 100nF

Supply bypass, near 23, 50

C40 100nF — C41 100nF

GPIO	Function								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
0	SPI0 RX	UART0 TX	I2C0 SDA	PWM0 A	SIO	PIO0	PIO1		USB OVCUR DET
1	SPI0 CSn	UART0 RX	I2C0 SCL	PWM0 B	SIO	PIO0	PIO1		USB VBUS DET
2	SPI0 SCK	UART0 CTS	I2C1 SDA	PWM1 A	SIO	PIO0	PIO1		USB VBUS EN
3	SPI0 TX	UART0 RTS	I2C1 SCL	PWM1 B	SIO	PIO0	PIO1		USB OVCUR DET
4	SPI0 RX	UART1 TX	I2C0 SDA	PWM2 A	SIO	PIO0	PIO1		USB VBUS DET
5	SPI0 CSn	UART1 RX	I2C0 SCL	PWM2 B	SIO	PIO0	PIO1		USB VBUS EN
6	SPI0 SCK	UART1 CTS	I2C1 SDA	PWM3 A	SIO	PIO0	PIO1		USB OVCUR DET
7	SPI0 TX	UART1 RTS	I2C1 SCL	PWM3 B	SIO	PIO0	PIO1		USB VBUS DET
8	SPI1 RX	UART1 TX	I2C0 SDA	PWM4 A	SIO	PIO0	PIO1		USB VBUS EN
9	SPI1 CSn	UART1 RX	I2C0 SCL	PWM4 B	SIO	PIO0	PIO1		USB OVCUR DET
10	SPI1 SCK	UART1 CTS	I2C1 SDA	PWM5 A	SIO	PIO0	PIO1		USB VBUS DET
11	SPI1 TX	UART1 RTS	I2C1 SCL	PWM5 B	SIO	PIO0	PIO1		USB VBUS EN
12	SPI1 RX	UART0 TX	I2C0 SDA	PWM6 A	SIO	PIO0	PIO1		USB OVCUR DET
13	SPI1 CSn	UART0 RX	I2C0 SCL	PWM6 B	SIO	PIO0	PIO1		USB VBUS DET
14	SPI1 SCK	UART0 CTS	I2C1 SDA	PWM7 A	SIO	PIO0	PIO1		USB VBUS EN
15	SPI1 TX	UART0 RTS	I2C1 SCL	PWM7 B	SIO	PIO0	PIO1		USB OVCUR DET
16	SPI0 RX	UART0 TX	I2C0 SDA	PWM0 A	SIO	PIO0	PIO1		USB VBUS DET
17	SPI0 CSn	UART0 RX	I2C0 SCL	PWM0 B	SIO	PIO0	PIO1		USB VBUS EN
18	SPI0 SCK	UART0 CTS	I2C1 SDA	PWM1 A	SIO	PIO0	PIO1		USB OVCUR DET
19	SPI0 TX	UART0 RTS	I2C1 SCL	PWM1 B	SIO	PIO0	PIO1		USB VBUS DET
20	SPI0 RX	UART1 TX	I2C0 SDA	PWM2 A	SIO	PIO0	PIO1	CLOCK GPIN0	USB VBUS EN
21	SPI0 CSn	UART1 RX	I2C0 SCL	PWM2 B	SIO	PIO0	PIO1	CLOCK GPOUT0	USB OVCUR DET
22	SPI0 SCK	UART1 CTS	I2C1 SDA	PWM3 A	SIO	PIO0	PIO1	CLOCK GPIN1	USB VBUS DET
23	SPI0 TX	UART1 RTS	I2C1 SCL	PWM3 B	SIO	PIO0	PIO1	CLOCK GPOUT1	USB VBUS EN
24	SPI1 RX	UART1 TX	I2C0 SDA	PWM4 A	SIO	PIO0	PIO1	CLOCK GPOUT2	USB OVCUR DET
25	SPI1 CSn	UART1 RX	I2C0 SCL	PWM4 B	SIO	PIO0	PIO1	CLOCK GPOUT3	USB VBUS DET
26	SPI1 SCK	UART1 CTS	I2C1 SDA	PWM5 A	SIO	PIO0	PIO1		USB VBUS EN
27	SPI1 TX	UART1 RTS	I2C1 SCL	PWM5 B	SIO	PIO0	PIO1		USB OVCUR DET
28	SPI1 RX	UART0 TX	I2C0 SDA	PWM6 A	SIO	PIO0	PIO1		USB VBUS DET
29	SPI1 CSn	UART0 RX	I2C0 SCL	PWM6 B	SIO	PIO0	PIO1		USB VBUS EN

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File: rp2040.kicad_sch

Title: Tiny Tapeout 4/5 Demo Board

Size: A4 | Date: 2024-04-12 | **Rev: 1.2.2**
KiCad E.D.A. 8.0.4 | Id: 2/2