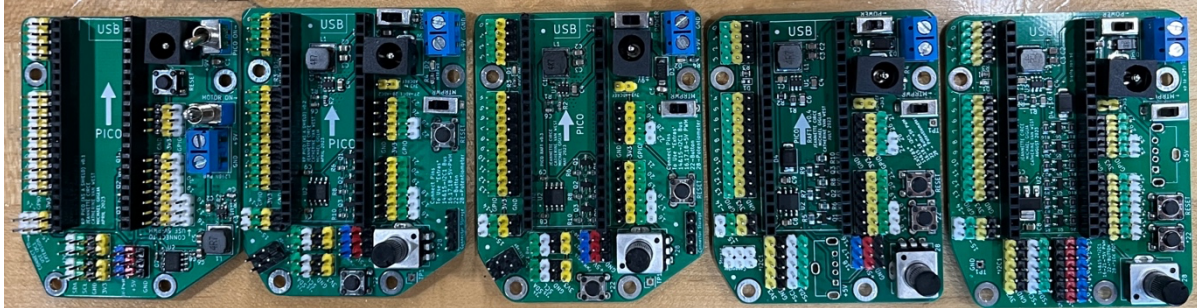# PICO RAFT
Datasheet
As of 9/2023

Robotics-Crash-Course

General Description:

As a member of Robotics-Crash-Course, the PICO RAFT is an expansion board for the Raspberry Pi Pico microcontroller. With just a barrel jack input, the board generates +5V to power the Pico and +3.3V to power peripheral devices. In addition to a RESET button, the v0.5 raft provides the ability to connect a potentiometer, an additional button, a 5 pin I2C1 breakout, and 6 level-shifters for +5V signals directly to the Pico. With its small footprint, the Raft is the best choice for any Pico development project.

Features:

Built in:
- Power distribution for +5V and +3.3V from barrel jack input up to +20V
- Screw Terminal for direct access to input voltage
- Two switches, one for the board and one for the screw terminal
- LED's indicators for the on/off switches
- USBA connected to +5V
- Access to all GPIO pins
- RESET button
- Test point (TP1): GND

Peripherals (v0.5):
- I2C Breakout for 5 devices on GPIO Pin 14&15
- 6 level shifters on GPIO16-18 or 16-21 to generate +5V signals
- 10kΩ Potentiometer connected to ADC2 (GPIO28)
- Button that pulls GPIO22 to GND
- Connection for ADC_VREF to +3.3V

Power Distribution

The Raft takes a barrel jack input of up to 20V. Recommended use is 9V. There is a reverse polarity diode in place to protect the board from inverted power inputs. When the power switch is on, led D1 will light up, indicating the +3.3V line is powered. The barrel jack input voltage is accessible through the screw terminal when the MTRPWR switch and led D2 is on. The voltage input is connected to the input of the +5V buck converter circuit. The +5V line powers the Pico, the USBA, and the red header pins. The +5V line is connected to a low dropout +3.3V regulator which powers all of the yellow header pins on the Raft. The maximum current ratings are listed below.

Voltage	Maximum Current Output
+5V	3A
+3.3V	1A
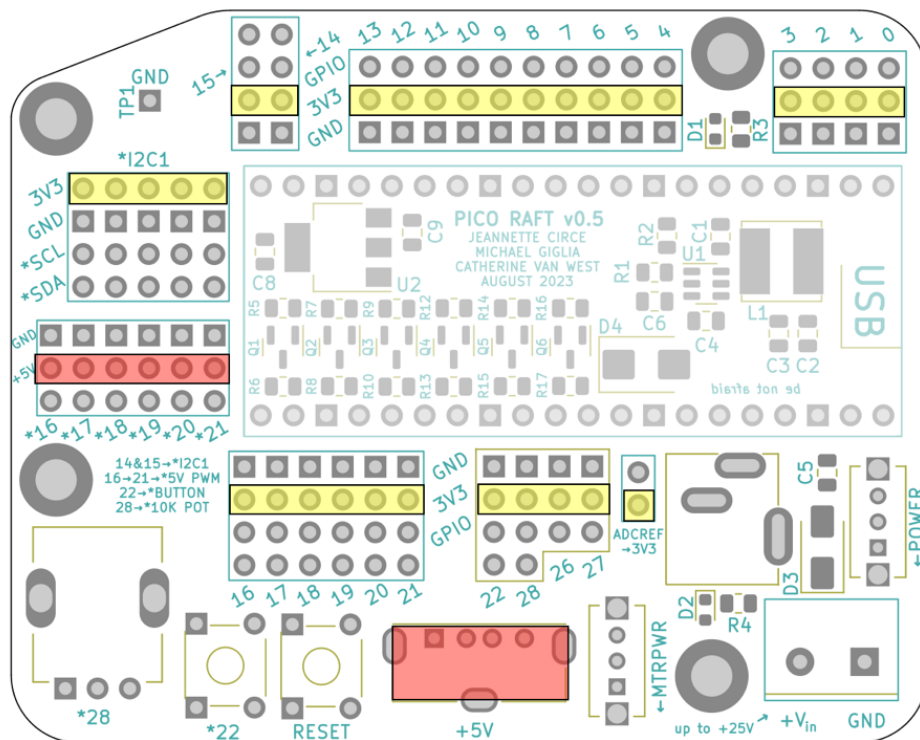
The red pins and USBA are +5V. The yellow pins are +3.3V

Pico Pinout

The Pico plugs into the board with the USB towards the outside (following the USB label on the raft). All the GPIO pins on the Pico microcontroller are assessable through the green pins on the Raft board. ADC_VREF is also broken out and can be connected to the Raft's +3.3V line.
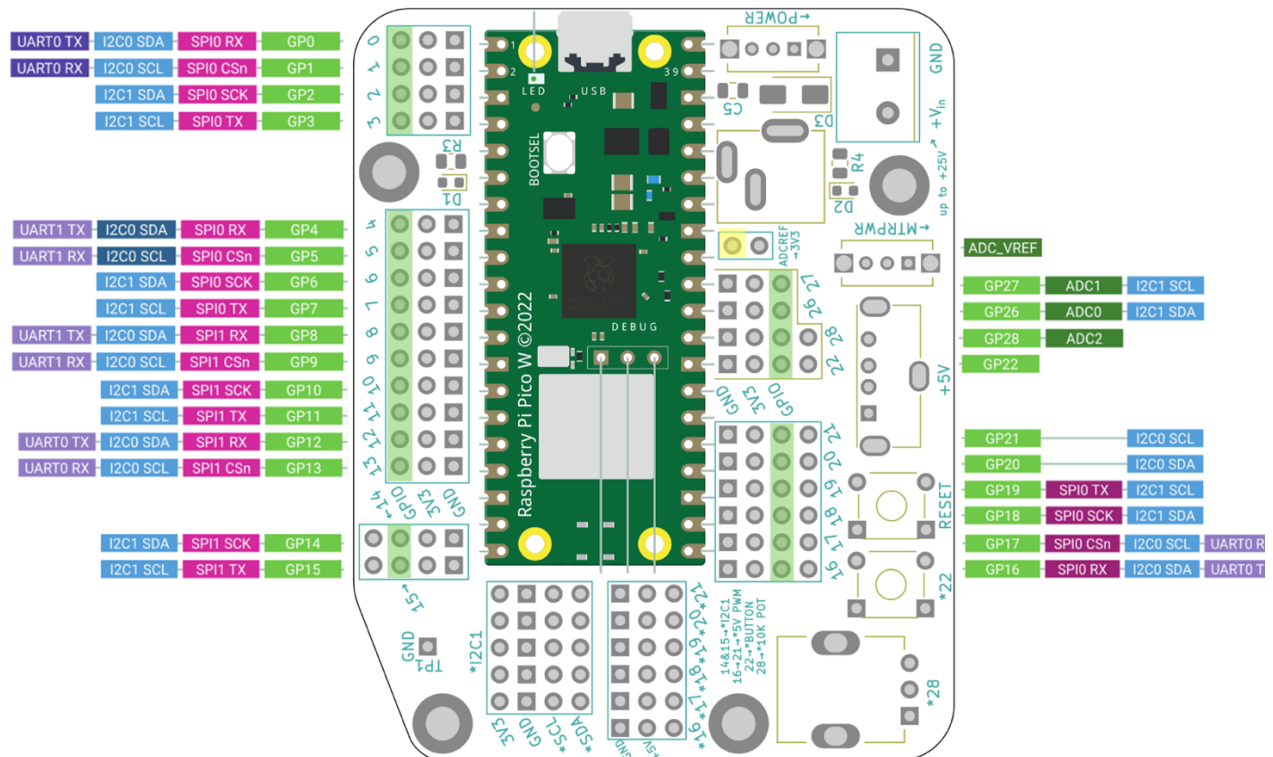
Activating Peripherals

The raft has four peripherals that can be connected to the Pico using shunts to connect the white peripheral pins to the green GPIO pins. The *I2C1 Bus is connected to SCL and SDA through pins 14&15. The 6 level shifters can be connected to GPIOs 16-21, and the level shifter signal is on the blue header pins labeled *16-*21. The extra button can be connected to GPIO 22 to connect to GND when pressed. The potentiometer can be connected to ADC2 on GPIO 28.

Photo of shunt used to connect green GPIO pins to the white peripheral pins
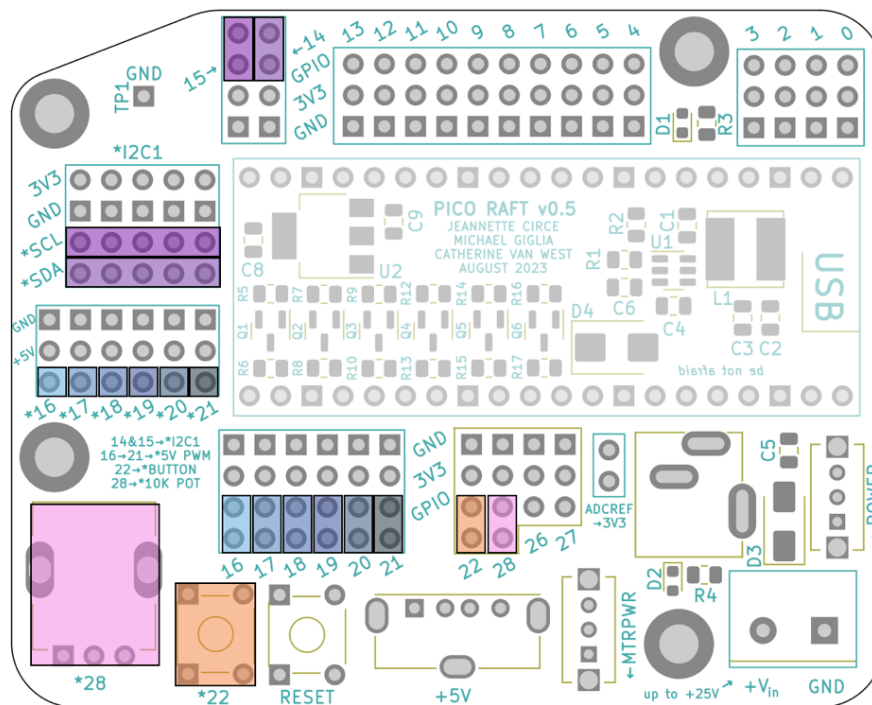

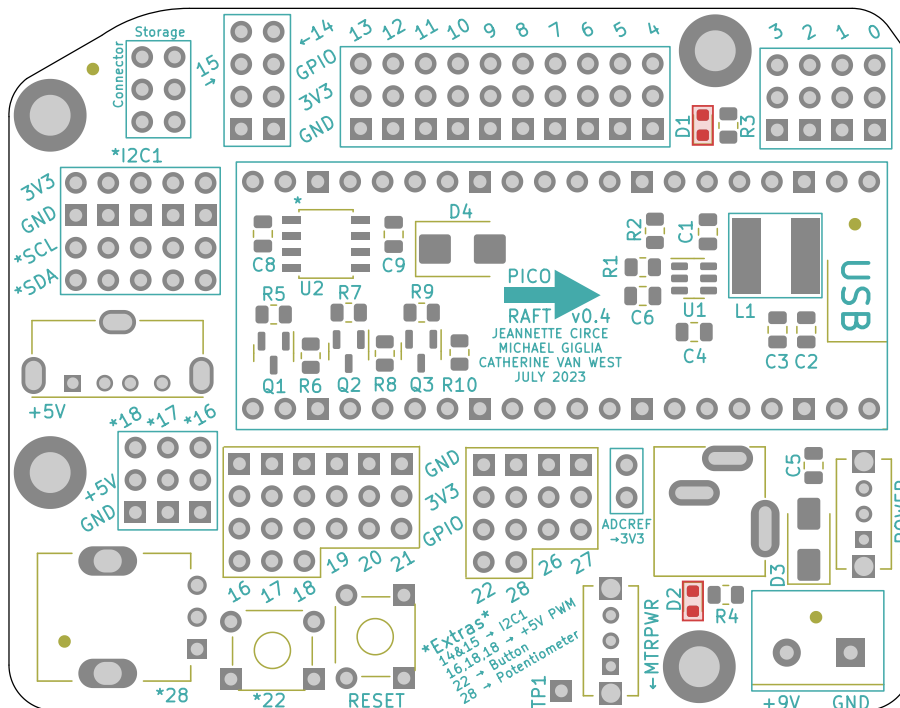Use shunts to connect peripherals to the GPIO pins on the Pico

Components (v0.5)

Designator	Description	Manufacturer Part #
U1	Buck Converter	AP63300WU-7
U2	LDO Regulator	TLV1117LV33DCYR
D1, D2	Red LED	KT-0603R
D3	20V Schottky Diode	SS32
D4	5.6V Zener Diode	3SMB5919B
Q1, Q2, Q3, Q4, Q5, Q6	N-Channel MOSFETs	BSS138
C1	0.1µF	CT41G-0805-2X1-50V-0.1µF-K(N)
C2, C3	22µF	GRM21BR61E226ME44L
C4, C5	10µF	0805X106M250NT
C6	47pF	0805CG470J500NT
C8, C9	1µF	CL21B105KBFNNNE
R1	158kΩ	TC0525B1583T5J
R2	30.1kΩ	HPCR0805F30K1K9
R3	470Ω	AC0805FR-7W470RL
R4	3kΩ	RK73H2ATTD3001F
R5, R6, R7, R8, R9, R10, R12, R13, R14, R15, R16, R17	10kΩ	MR08X1002FTL
R11	10kΩ Potentiometer	PT01-D120K2-B103
	Push Button	B3F-1020
	SPST Switch	OS102011MS2QN1
	Screw Terminal	TC0203620000G

*Note: C7 determined to be obsolete from v0.2 to v0.3
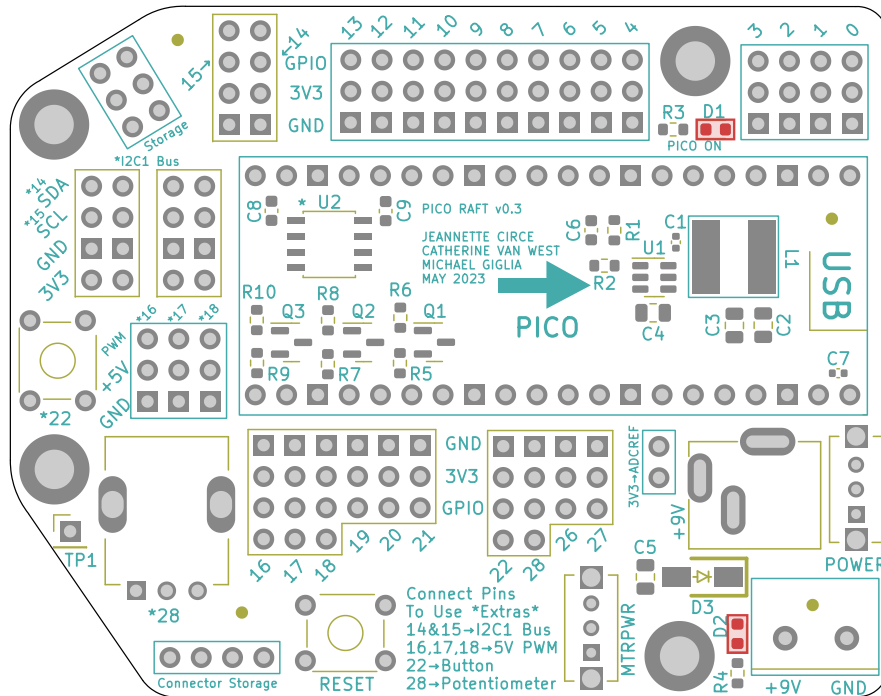
...ed; this was version used in Summer STEM

0.4 released, added D4 and USBA