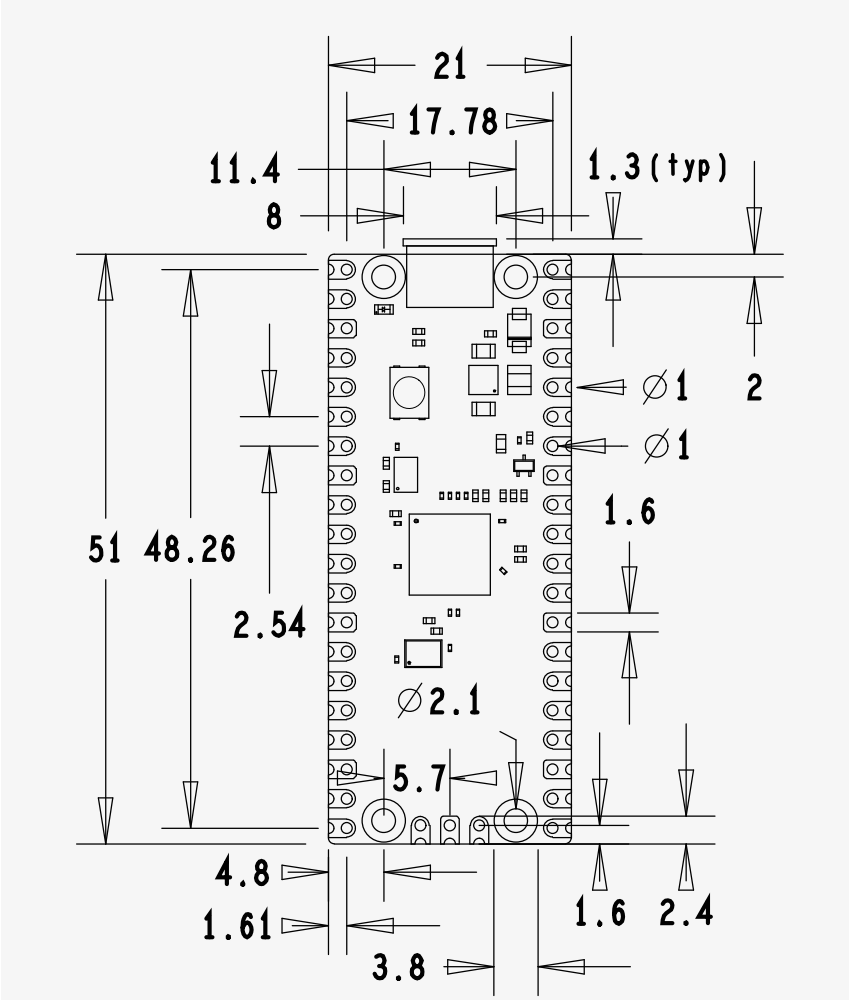
Chapter 2. Mechanical specification

The Raspberry Pi Pico is a single sided 51×21mm 1mm thick PCB with a micro-USB port overhanging the top edge and dual castellated/through-hole pins around the remaining edges. Pico is designed to be usable as a surface mount module as well as being in Dual Inline Package (DIP) type format, with the 40 main user pins on a 2.54mm (0.1") pitch grid with 1mm holes and hence compatible with veroboard and breadboard. Pico also has 4× 2.1mm (± 0.05mm) drilled mounting holes to provide for mechanical fixing, see Figure 3.

Figure 3. The dimensions of the Raspberry Pi Pico Rev3 board.



2.1. Raspberry Pi Pico pinout

The Pico pinout has been designed to directly bring out as much of the RP2040 GPIO and internal circuitry function as possible, while also providing a suitable number of ground pins to reduce EMI (Electro Magnetic Interference) and signal crosstalk. This is important in general but especially for RP2040 which is built on a modern 40nm silicon process and hence the digital IO edge rates are very fast.

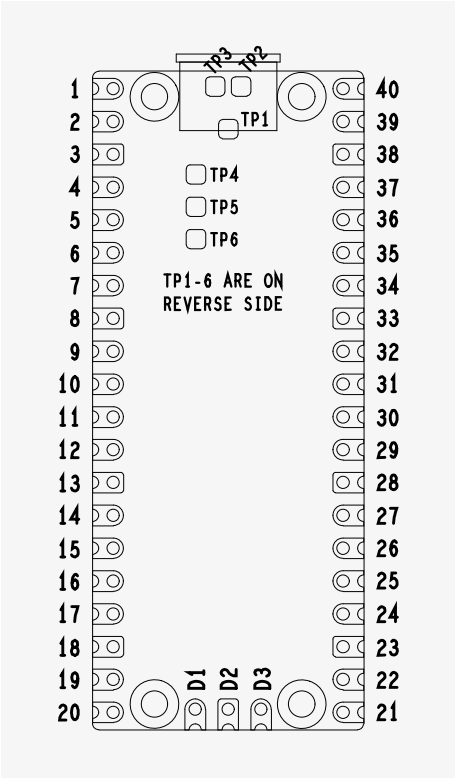


Figure 4. The pin numbering of the Raspberry Pi Pico Rev3 board.

NOTE

The physical pin numbering is shown in Figure 4, for the pin allocation see Figure 2 or the full Raspberry Pi Pico schematics in Appendix B.

A few RP2040 GPIO pins are used for internal board functions, these are:

GPIO29 IP Used in ADC mode (ADC3) to measure VSYS/3

GPIO25 OP Connected to user LED

GPIO24 IP VBUS sense - high if VBUS is present, else low

GPIO23 OP Controls the on-board SMPS Power Save pin (Section 4.4)

Apart from GPIO and ground pins, there are 7 other pins on the main 40-pin interface:

PIN40 VBUS

PIN39 VSYS

PIN37 3V3_EN

PIN36 3V3

PIN35 ADC_VREF

PIN33 AGND

PIN30 RUN

VBUS is the micro-USB input voltage, connected to micro-USB port pin 1. This is nominally 5V (or 0V if the USB is not connected or not powered).

VSYS is the main system input voltage, which can vary in the allowed range 1.8V to 5.5V, and is used by the on-board SMPS to generate the 3.3V for the RP2040 and its GPIO.

3V3_EN connects to the on-board SMPS enable pin, and is pulled high (to VSYS) via a 100kΩ resistor. To disable the 3.3V (which also de-powers the RP2040), short this pin low.

3V3 is the main 3.3V supply to RP2040 and its I/O, generated by the on-board SMPS. This pin can be used to power external circuitry (maximum output current will depend on RP2040 load and VSYS voltage, it is recommended to keep the load on this pin less than 300mA).

ADC_VREF is the ADC power supply (and reference) voltage, and is generated on Pico by filtering the 3.3V supply. This pin can be used with an external reference if better ADC performance is required.

AGND is the ground reference for GPIO26-29, there is a separate analog ground plane running under these signals and terminating at this pin. If the ADC is not used or ADC performance is not critical, this pin can be connected to digital ground.

RUN is the RP2040 enable pin, and has an internal (on-chip) pull-up resistor to 3.3V of about ~50kΩ. To reset RP2040, short this pin low.

Finally, there are also 6 Test Points (TP1-TP6) which can be accessed if required, for example if using as a surface mount module. These are:

TP1 Ground (close coupled ground for differential USB signals)

TP2 USB DM

TP3 USB DP

TP4 GPIO23/SMPS PS pin (do not use)

TP5 GPIO25/LED (not recommended to be used)

TP6 BOOTSEL

TP1, TP2 and TP3 can be used to access the USB signals instead of using the micro-USB port. TP6 can be used to drive the system into mass-storage USB programming mode (by shorting it low at power-up). Note that TP4 is not intended to be used externally, and TP5 is not really recommended to be used as it will only swing from 0V to the LED forward voltage (and hence can only really be used as an output with special care).

2.2. Surface-mount footprint

The following footprint (Figure 5) is recommended for systems which will be reflow-soldering Pico units as modules.