

P42 Pico2 M.2

Rev 3

Designed by Pier42 Electronics Design

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<https://lectronz.com/stores/pier42design>

<https://www.tindie.com/stores/pier42/>

<https://hackaday.io/project/199091-rp2040-rp2350-m2-pico>

https://github.com/wolfgangfriedrich/P42-Pico_Mdot2



Table of Contents

Table of Contents.....	2
Introduction	3
Hardware	3
M.2 Port Interface.....	4
Castellated GPIO Pin Interface.....	7
Control/Status Interface	7
QWIIC Connector	8
μSD Card Connector.....	8
Software.....	9
Assembly Drawing.....	10
Schematics	12
M.2 Pin Reference.....	13
Revision Control.....	13

Introduction

A RPi Pico RP2350A microcontroller board in m.2 3024 size form factor with A and E key. The m.2 interface has USB, UART, I2C and control IO connectivity. Voltage levels for the m.2 specification are obeyed as some of the interfaces run on 1.8 V. Externally, +3.3 V, GND, the SWD interface and 16 IOs are accessible on castellated pins. A footprint for a QWIIC connector is on the top side of the board, not populated to have the board as low profile as possible. Power rail LEDs and a user controlled LED is on board, as well as a solder bridge for configuration options. Bottom side has a micro-SD card slot for data storage.

A microcontroller could give any host computer flexible and excellent real-time IO and data processing capabilities. The RPi Pico with its programmable PIO interface has excellent timing resolution.

Full Feature List:

- M.2 2230-D5-AE card (22 mm x 30 mm; D5 = 1.5mm on top and bottom side violated by the QWIIC connector and the bottom SD card holder; A and E key)
- Used interfaces on the M.2: USB, UART, I2C, ALERT, WAKE, DISABLE1/2, LED 1/2, VENDOR_DEFINED
- 1.8V regulator for level-shifters
- Power LEDs for 3.3 V and 1.1 V
- RP2040/RP2350 peripherals: 2 MB Flash, SWD debug access, RESET and BOOTSEL button,
- QWIIC connector, 1 LED, 1 solder bridge for configuration, 16 GPIOs on castellated pins
- castellated pins on 25.4 mm/0.1" raster (almost with a 22 mm board)
- optional uSD card holder on the bottom side
- optional pull-down resistors on castellated IOs to mitigate the E9 Erratum

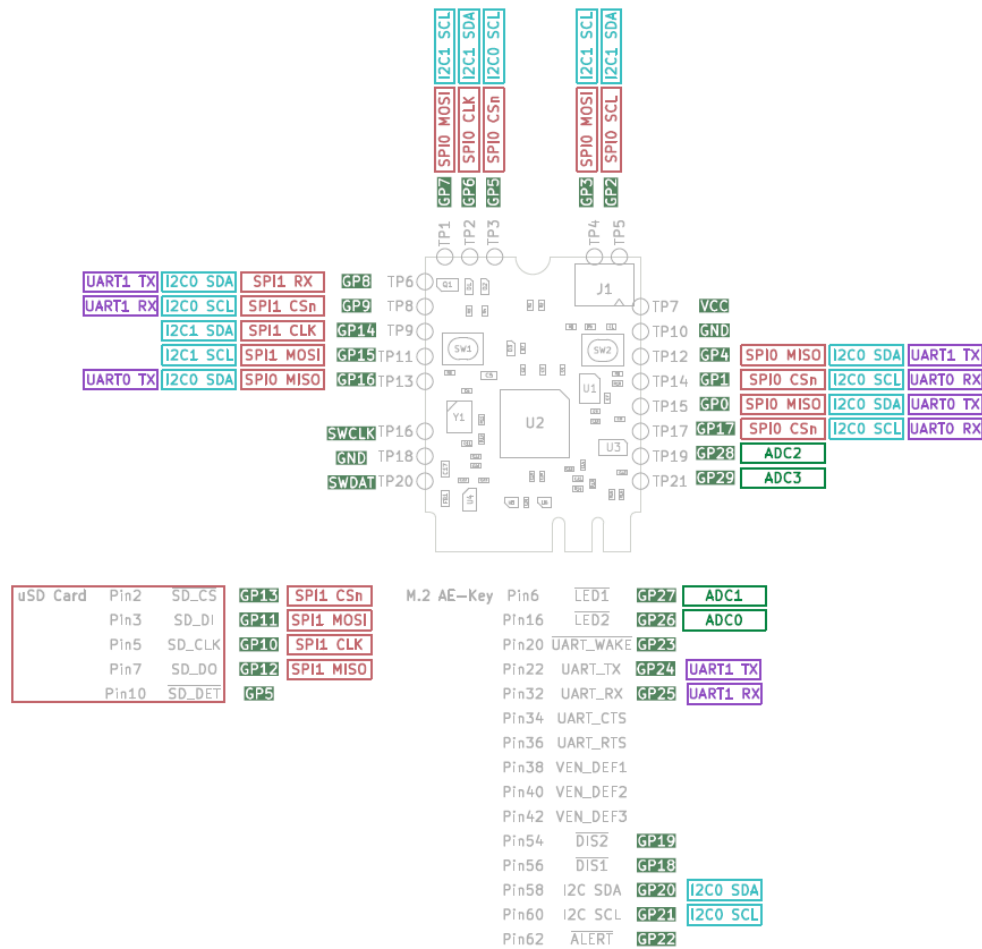
Main Components

- Microcontroller RaspberryPi RP2350A
- 16Mbit QSPI Flash W25Q16
- 12 MHz Crystal SMD_3225-4Pin_3.2x2.5mm
- MicroSD card holder Molex 104031-0811
- 1.8V-3.3V High Speed level shifter Texas Instruments TXS0102

Hardware

The board is a standard M.2 2230-D5-AE card (22 mm x 30 mm; 0.8mm thickness; D5 = 1.5mm on top and bottom side violated by the QWIIC connector and the bottom SD card holder; A and E key). The M.2 card edge connector is ENIG plated. Castellated pins are on a 2.54mm (0.1") raster per side. The mechanical constraints did not work out to have all pins on a global 2.54mm (0.1") raster.

Pico2 M.2 Pinout



M.2 Port Interface

I2C interface on pins 60 (SCL) and 58 (SDA) has address 0x42.

Only the connected pins of this board are listed in this interface table. This is not a full port specification

Pin Nr	Name	IO	Description	Voltage
1	GND	Power	Return current path	0 V
2	3.3V	Power	3.3 V source	3.3 V
3	USB+	IO	USB Data ± Differential serial data interface compliant to the USB 2.0 Specification	
4	3.3V	Power	3.3 V source	3.3 V
5	USB-	IO	USB Data ± Differential serial data interface compliant to the USB 2.0 Specification	
6	nLED1	OUT	Open drain, active low signal. These signals are used to allow the add-in card to provide status indicators via LED devices that will be provided by the system. These LED devices should be tied to +3.3V through a current limiting resistor. Current should be limited to 9mA when LED is On.	3.3 V

7	GND	Power	Return current path	0 V
8	A Key	-		
9	A Key	-		
10	A Key	-		
11	A Key	-		
12	A Key	-		
13	A Key	-		
14	A Key	-		
15	A Key	-		
16	nLED2	OUT	Open drain, active low signal. These signals are used to allow the add-in card to provide status indicators via LED devices that will be provided by the system. These LED devices should be tied to +3.3V through a current limiting resistor. Current should be limited to 9mA when LED is On.	
17	n.c.			
18	GND	Power	Return current path	0 V
19	n.c.			
20	nWAKE	OUT	Sideband Wake. Open Drain, Active Low. Require pull up on the host side (recommended 15K to 100K)	3.3 V
21	n.c.			
22	TxD	OUT	UART Transmit Data connected to RXD on the platform.	1.8 V
23	n.c.			
24	E Key	-		
25	E Key	-		
26	E Key	-		
27	E Key	-		
28	E Key	-		
29	E Key	-		
30	E Key	-		
31	E Key	-		
32	RxD	IN	UART Receive Data connected to TXD on the platform.	1.8 V
33	GND	Power	Return current path	0 V
34	CTS	OUT	Can be connected to RTS through a 0402 resistor footprint. No connection on the module.	
35	n.c.			
36	RTS	IN	Can be connected to CTS through a 0402 resistor footprint. No connection on the module.	
37	n.c.			
38	VEN DEF1	OUT	May be pulled up to +3.3V through a resistor on the board.	
39	GND	Power	Return current path	0 V
40	VEN DEF2	OUT	May be pulled down to GND through a resistor on the board.	
41	n.c.			

42	VEN DEF3	OUT	May be pulled down to GND through a resistor on the board.	
43	n.c.			
44	n.c.			
45	GND	Power	Return current path	0 V
46	n.c.			
47	n.c.			
48	n.c.			
49	n.c.			
50	n.c.			
51	GND	Power		
52	n.c.			
53	n.c.			
54	nDISABLE2	IN	Active low, debounced signal when applied by the system it will disable radio operation on the add-in cards that implement radio frequency applications. When implemented, these signals require a pull-up resistor on the card.	3.3 V
55	n.c.			
56	nDISABLE1	IN	Active low, debounced signal when applied by the system it will disable radio operation on the add-in cards that implement radio frequency applications. When implemented, these signals require a pull-up resistor on the card.	3.3 V
57	GND	Power	Return current path	0 V
58	SDA	IO	I2C data	3.3 V
59	n.c.			
60	SCL	IN	I2C clock input from host	3.3 V
61	n.c.			
62	nALERT	OUT	IRQ line to host processor; Active Low	3.3 V
63	GND	Power	Return current path	0 V
64	n.c.			
65	n.c.			
66	n.c.			
67	n.c.			
68	n.c.			
69	GND	Power	Return current path	0 V
70	n.c.			
71	n.c.			
72	+3.3V	Power	3.3 V source	3.3 V
73	n.c.			
74	+3.3V	Power	3.3 V source	3.3 V
75	GND	Power	Return current path	0 V

Table 1: M.2 Port Interface Pins

- 1) All IO directions are from the module point of view.

Castellated GPIO Pin Interface

Pin Nr	Name	IO	Pico2 GP port	Description
1	TP1		GP7	LED
2	TP2			EN
3	TP3			nSD_DET
4	TP4			QWIIC SCL
5	TP5			QWIIC SDA
6	TP6			
7	TP7			
8	TP8			
9	TP9			
10	TP10			
11	TP11			
12	TP12			
13	TP13			
14	TP14			
15	TP15			
16	TP16			
17	TP17			
18	TP18			
19	TP19			
20	TP20			
21	TP21			

Control/Status Interface

Pin Nr	Name	IO	Description
	EN	IN	
	LED	OUT	
	SD_DET	IN	
	SWCLK		
	GND		
	SWD		

QWIIC Connector

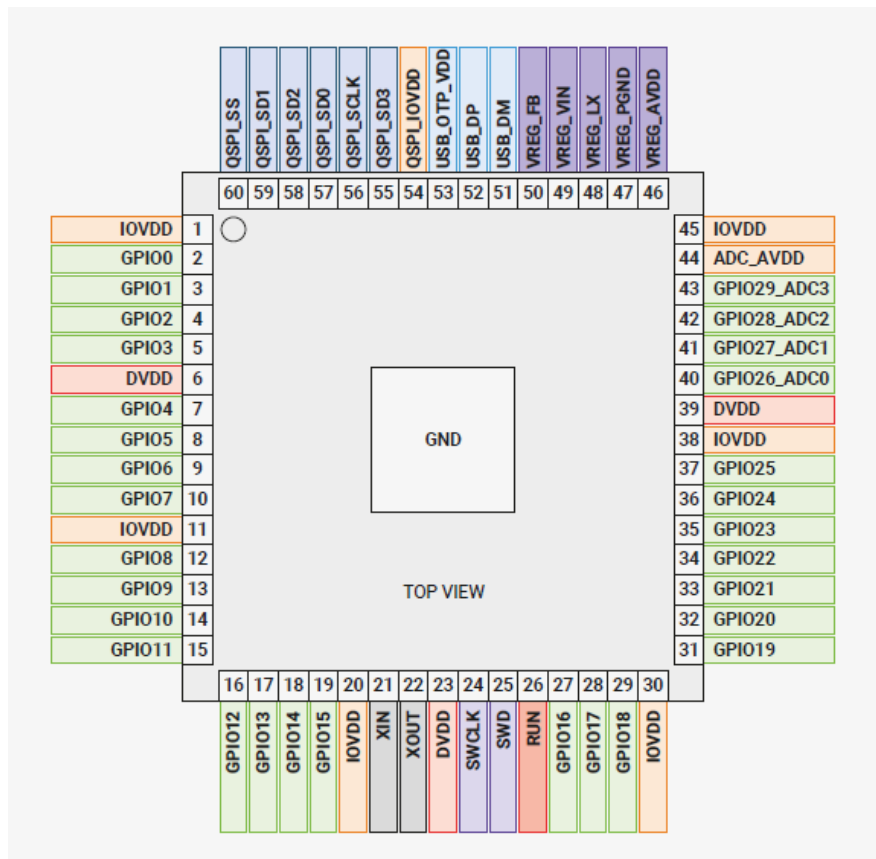
A right angle QWIIC connector (part number JST SH-SM04B_SRSS_TB 1x4 1mm pitch).

Pin Nr	Name	IO	Description
1	GND	Power	Reference return, because ground is where the potatoes grow.
2	Vcc	Powe	+3.3V
3	SDA	IO	I2C data signal with 47 KΩ pull-up.
4	SCL	IO	I2C clock signal with 47 KΩ pull-up.

μSD Card Connector

A Molex 104031-0811 usd Card adapter, connected though standard SPI (not SDIO), which limits the data transfer rate to ~180 Kbyte/sec.

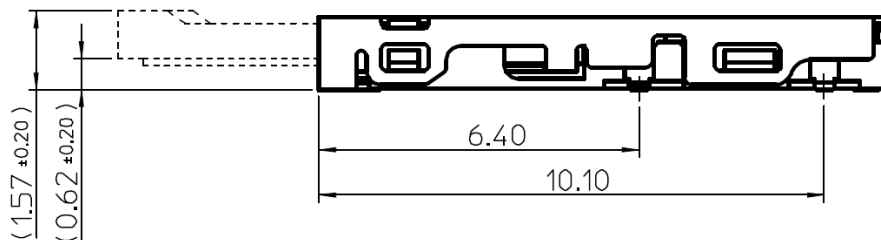
RP Pico2 pin-port map



Mechanical Dimensions

The SD card holder on the bottom side has a thickness of 1.57mm with inserted SD card. Some M.2 configurations have less clearance on the bottom side. The SD card holder without an inserted card is 1.42mm high.

Also, if the SD card is used together with TP9, TP11, TP13 or TP16; make sure that no solder or wire is protruding on the bottom side, to not interfere with the SD card insertion area.



Software

A test software is available, that implements a simple command line on the integrated USB-UART port.

The source code is written in Arduino and available on the project GitHub.

Command Description

Command v – Version

Command ? – Help

Command l – LED

Command u – UART

Command I – I2C

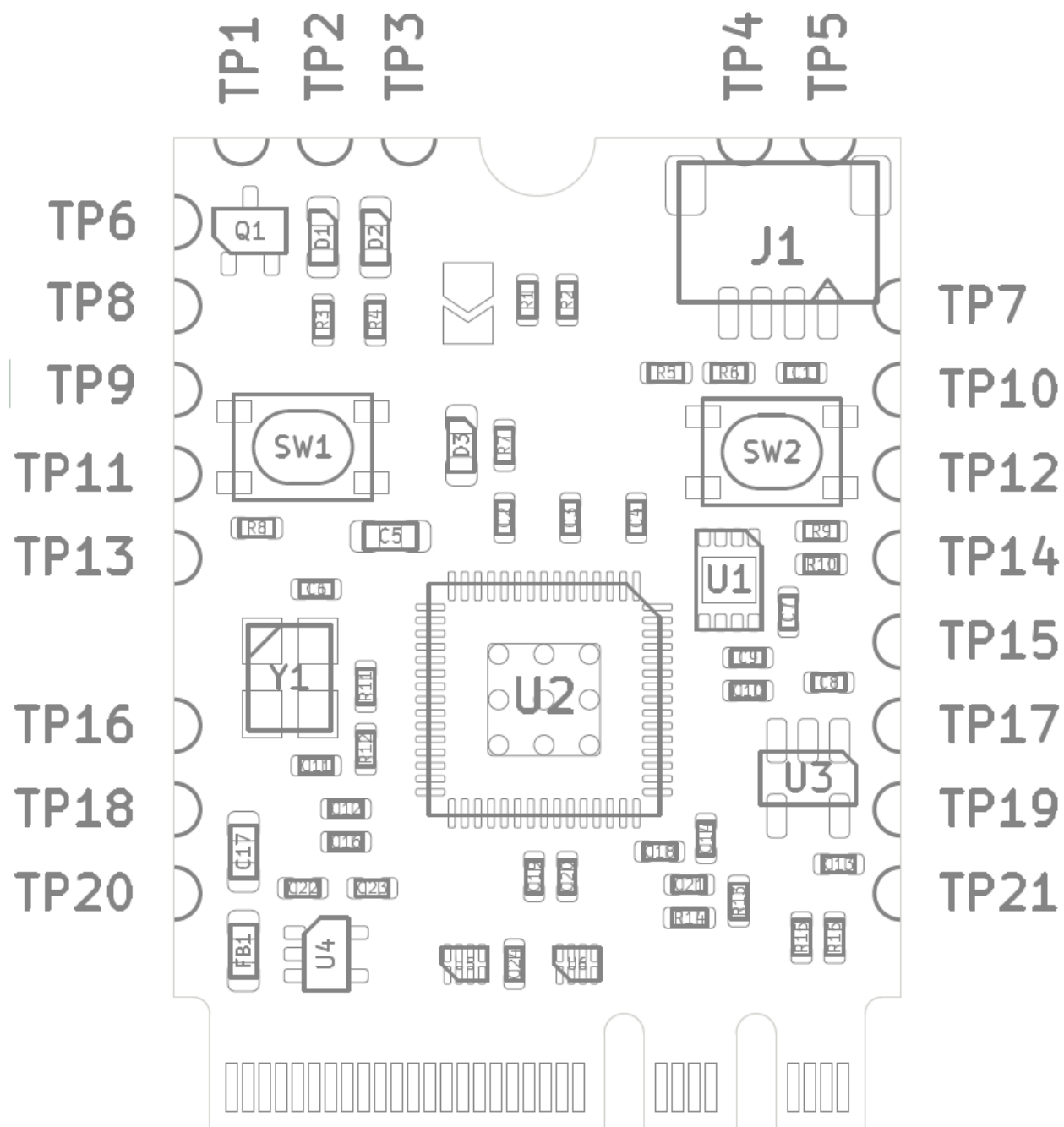
Command g – GPIO

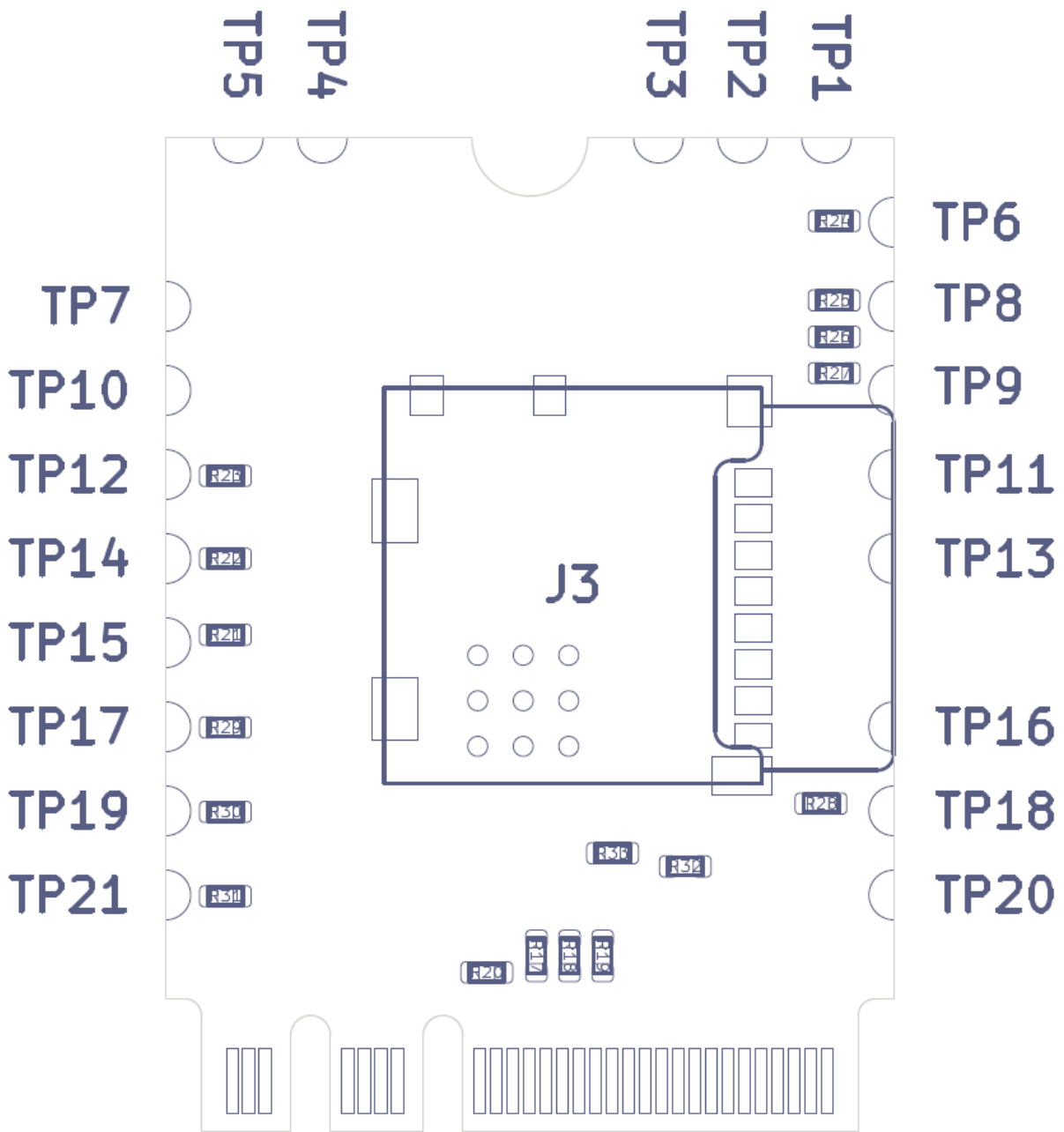
Command s – SDcard test

Command d – SDcard directory

Command t – Test function

Assembly Drawing





Schematics

M.2 Pin Reference

This is a living document. Any missing content will be added as required.

Revision Control

Version	Data	Changes
1.0	23. Feb 2025	Initial Release Rev 3 Madman Chicken-Scratch Manifesto