# CosmicWatch UD PCB populating reference

If populating for the first time, do these in order to hone your skill before attempting the more difficult components.

Main PCB
SiPM PCB

| Component | Value | Component | Discription | Notes |
|---|---|---|---|---|
| We can start by breaking off the SiPM PCB from the Main PCB. | | | | |
| R9,R8,R18 | 100Ω | | RES SMD 100 OHM 1% 1/8W 0805 | |
| R10,R15,R24, R25 | 1kΩ | | RES SMD 1K OHM 1% 1/8W 0805 | |
| C18 | Short (0 Ω) | | RES SMD 0 OHM 1% 1/8W 0805 | We short this connection |
| C12,C20 | 1uF | | CAP CER 1UF 50V Y5V 0805 | |
| C4,C16,C28 | 20nF | | CAP CER 20000PF 50V X7R 0806 | |
| C17,C6 | 3.7nF | | CAP CER 3.7nF 50V X7R 0806 | |
| C3 | 10uF | | CAP CER 10UF 6.3V X5R 0805 | |
| L2 | Ferrite Bead | | FERRITE BEAD 2.5 KOHM 0805 1LN | This is a component to reduce noise on the power line, |
| Q1,Q2 | 2N7002 | | Mosfet transistor | |
| U2, U5 | LT1807 | | 325MHz, Dual, Rail-to-Rail Input and Output, Precision Op Amps | Has direction. Pin 1 is beside the 1 in 1807. |
| U7 | TPS6040X | | | Generates the -5V power supply |
| C21,C25,C22 | 1uF | | CAP CER 1UF 50V Y5V 0805 | |
| U3 | RP Pico | In Bag | RASPBERRY PI PICO RP2040 | Microcontroller (front side of board) |
| Plug RP Pico in via the Micro USB cable into the power meter + battery, and check that you get -5V across C21. If yes, unplug and continue. | | | | |
| U1 | MAX5026 | | IC REG BOOST ADJ 260MA SOT6 | Supplies +28.6V to SiPM. Has direction. Dot on IC indicates pin 1. |
| R1 | 6.49kΩ | | RES SMD 6.49K OHM 1% 1/8W 0805 | |
| R2 | 147kΩ | | RES SMD 147K OHM 1% 1/8W 0805 | |
| C1,C13,C14 | 1uF | | CAP CER 1UF 50V Y5V 0805 | |
| D3 | Schottky Diode | | DIODE SCHOTTKY 40V 500MA SOD123 | Diode, has a direction (align lines on component with footprint). 3D rendering may help. |
| C2 | 10nF | | CAP CER 10nF 50V X7R 0806 | |
| L1 | 15uH | | 15 µH Shielded Multilayer Inductor 250 mA 950mOhm | |
| 6-pin header | 2.54mm 2x3 pin | In Bag | SOCKET 7 MM SOLDER TAIL DOUBLE | Make sure you put it on the correct side of the board. Top side of board with RP Pico. |
| Plug RP Pico in via the Micro USB cable with the power meter, Check voltage is 28.6V +/- 0.5V across C14. If yes, Unplug and continue. | | | | |
| R6,R7,R19,R20 | 100kΩ | | RES SMD 100K OHM 1% 1/8W 0805 | |
| R4,R16,R3 | 49.9Ω | | RES SMD 49.9 OHM 1% 1/8W 0805 | |
| R5 | 2.32kΩ | | RES SMD 2.32k OHM 1% 1/8W 0805 | |
| R22 | No Stuff (NS) | | Do not populate | |
| C7,C5 | 15pF | | CAP CER 15 PF 50V X7R 0805 | |
| C19,C29,C11 | 0.1uF | | CAP CER 0.1UF 50V X7R 0805 | |

| | | | | |
|---|---|---|---|---|
| R21 | 150Ω | | RES SMD 150 OHM 1% 1/8W 0805 | |
| R12,R17 | 0Ω | | RES SMD 0 OHM 1% 1/8W 0805 | We short this connection |
| D1,D2,D4,D5 | Schottky Diode | | DIODE SCHOTTKY 40V 500MA SOD123 | Diode, has a direction (align lines on component with footprint). 3D rendering may help. |
| TP1/TP2, TP3/TP4 | 2.54mm 2x1 pin | | 2.54mm 2x1 header | Make sure you put it on the correct side of the board. Put the short legs through the top of the board. |
| BNC receptacle | BNC header | In Bag | CONN BNC JACK R/A 50 OHM PCB | Top side of board. |
| Borrow working SiPM board from a Prof, plug into your main PCB. Plug RP Pico in via the Micro USB cable. Plug BNC connection into oscilloscope. Can you find some 10mV 100ns pulses? Use an oscilloscope proble to connect to TP1, what do you see? | | | | |
| Reset Button | Reset Button | In Bag | SWITCH TACTILE SPST-NO 0.02A 15V | Top side of board. |
| Coincidence connector | RJ45 connector | In Bag | MODULAR JACK RJ45 8P8C | Top side of board. See example board. |
| Buzzer | Buzzer | In Bag | 5V Active Buzzer | Top side or board. |
| Temp/Pressure sensor | BMP280 | In Bag | BMP280 sensor | Top side of board. See example board for orientation |
| LED 3mm | LEDlight 3mm | In Bag | Blue 3mm LED | Top side of board. See example board. |
| LED 5mm | LEDlight 5mm | In Bag | White 5mm LED | Top side of board. See example board. |
| OLED screen | 0.96" OLED | In Bag | 128X64 OLED Display | Top side of board. See example board. |
| U8 | SD card socket | In Bag | SMT SMD TF Micro SD Memory Card Slot Holder Sc | Bottom of board |
| Finally, let's finish up with the SiPM Board. | | | | |
| C9,C15 | 10nF | | CAP CER 10nF 50V X7R 0806 | SiPM PCB |
| C23,C10 | 10pF | | CAP CER 10pF 50V X7R 0806 | SiPM PCB |
| C8,C24 | 100nF | | CAP CER 0.1UF 50V X7R 0805 | SiPM PCB |
| R11,R13 | 10Ω | | RES SMD 10 OHM 1% 1/8W 0805 | SiPM PCB |
| 6 pin SMT (on SiPM board) | 2x3 pins | In Bag | | SiPM PCB, align it well with the footprint. |
| SiPM | MicroFJ-60035 | In Bag | See Prof. We'll do this one together. | Expensive! Carefull. We will help! |
| Standoff to Main PCB | 1/8" standoff | In Bag | 1/8" Hex Size, 7/16"" Length, 0-80 Thread Size | Put on side opposite to SiPM. See example board. |
| Wrap scintillator in aluminum foil from Bag, leaving a hole for the SiPM. Add a single layer of tape, just to hold it in place. Add optical gel to SiPM surface. Screw PCB board in place with #2 screws from bag. Optically isolate the scintillator using the black electrical tape. Please do the best job you can! | | | | |