WildEDS

Wildfire Early Detection System

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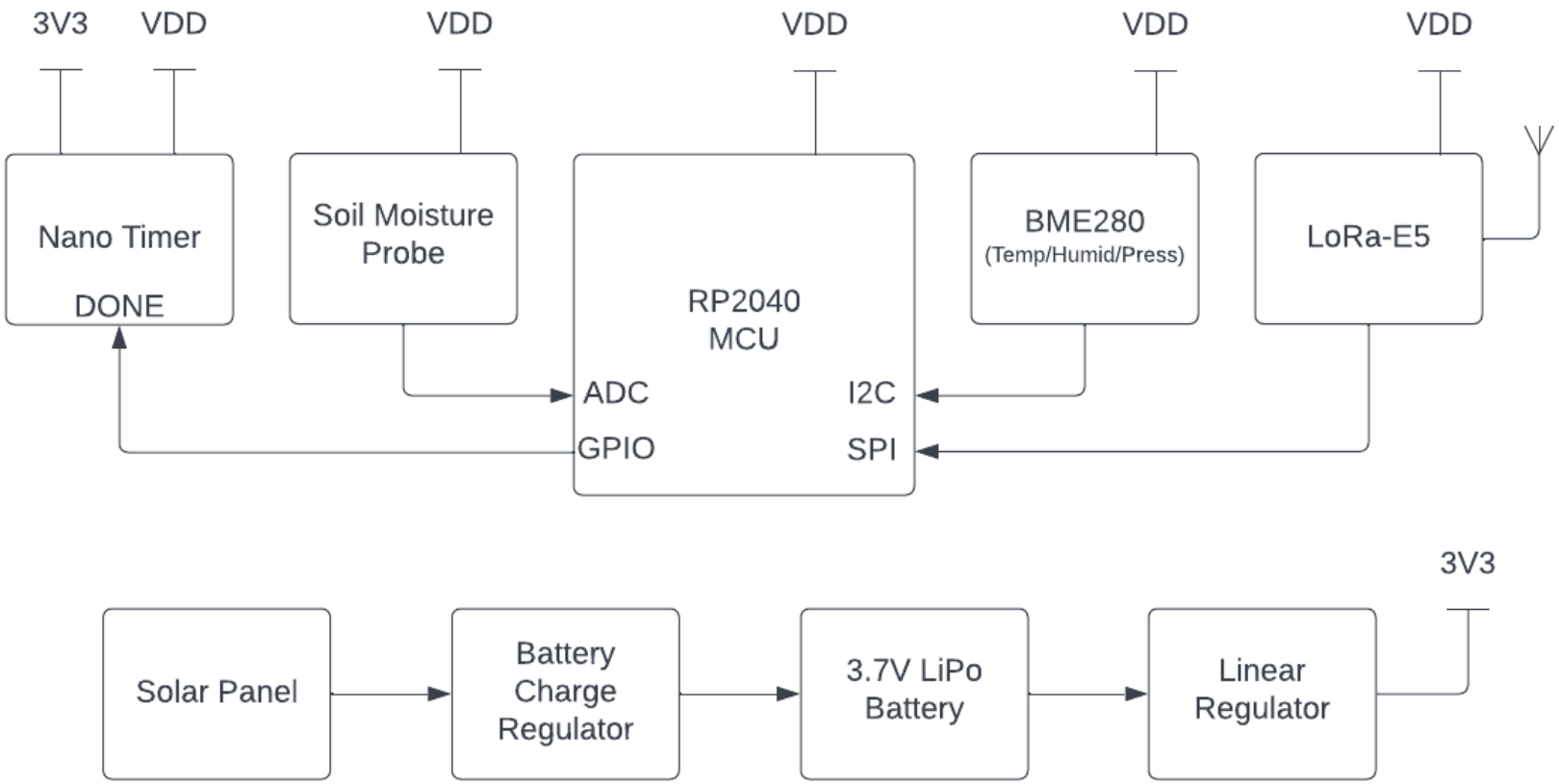
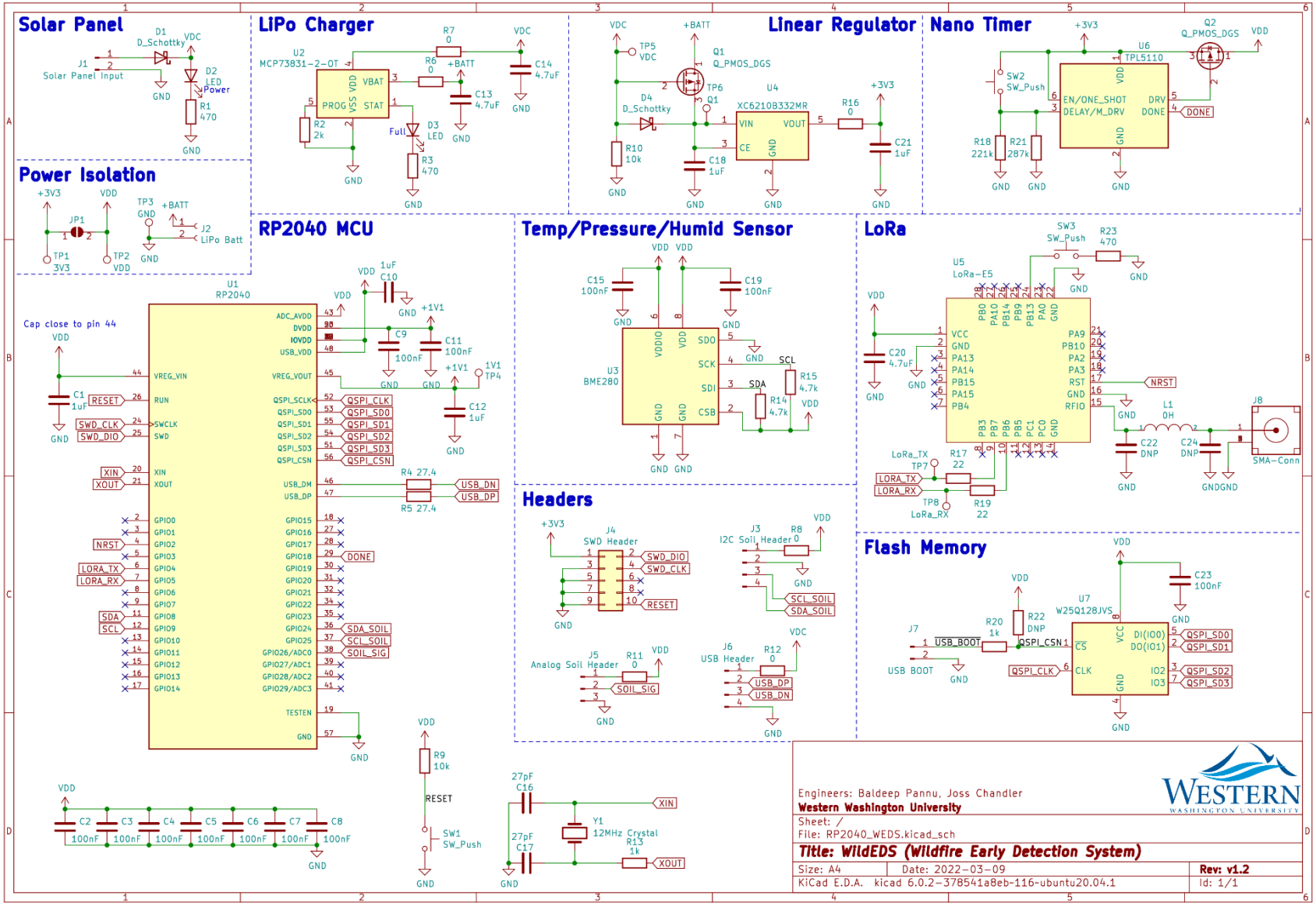
Table of Contents

System Design

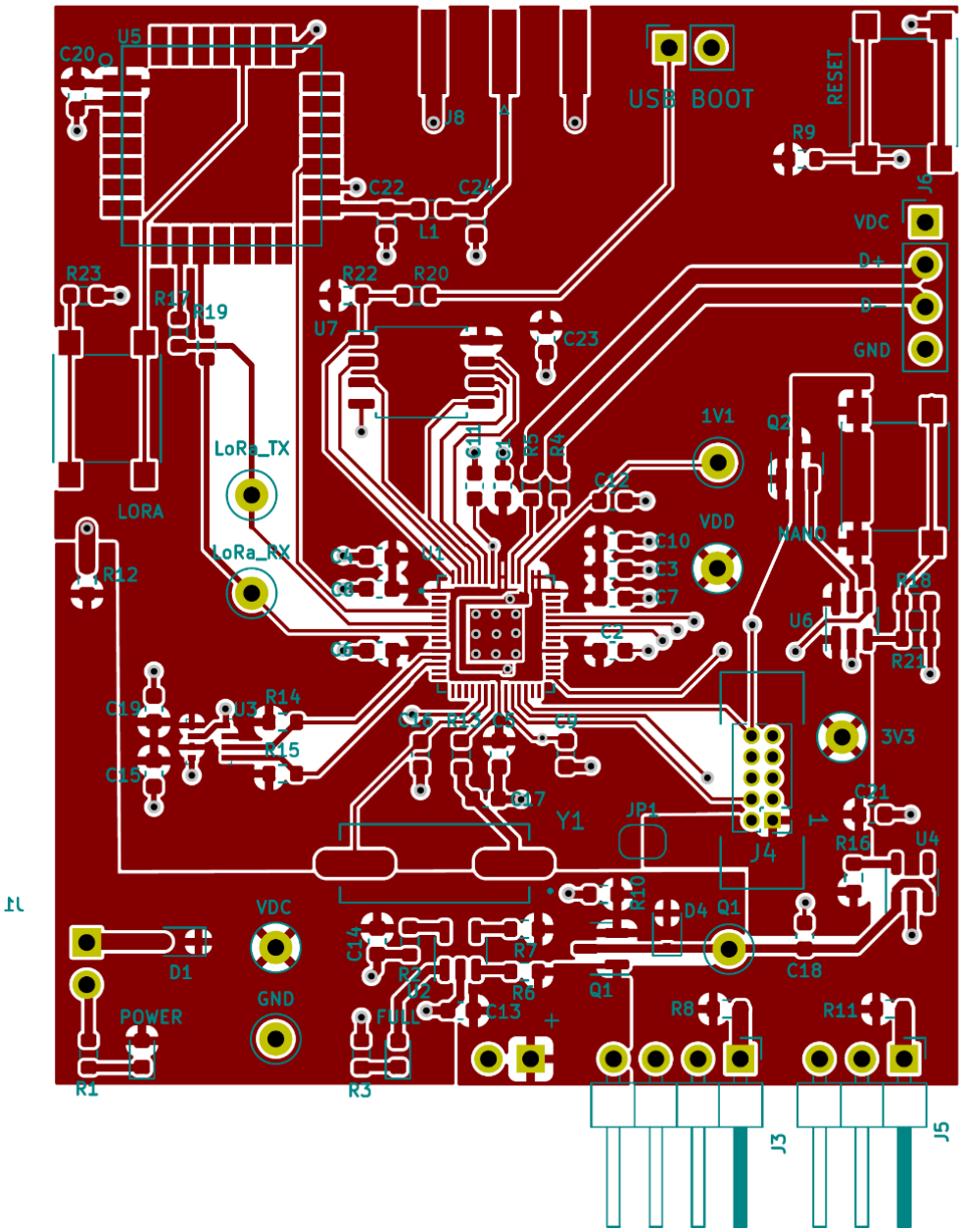


System Schematic

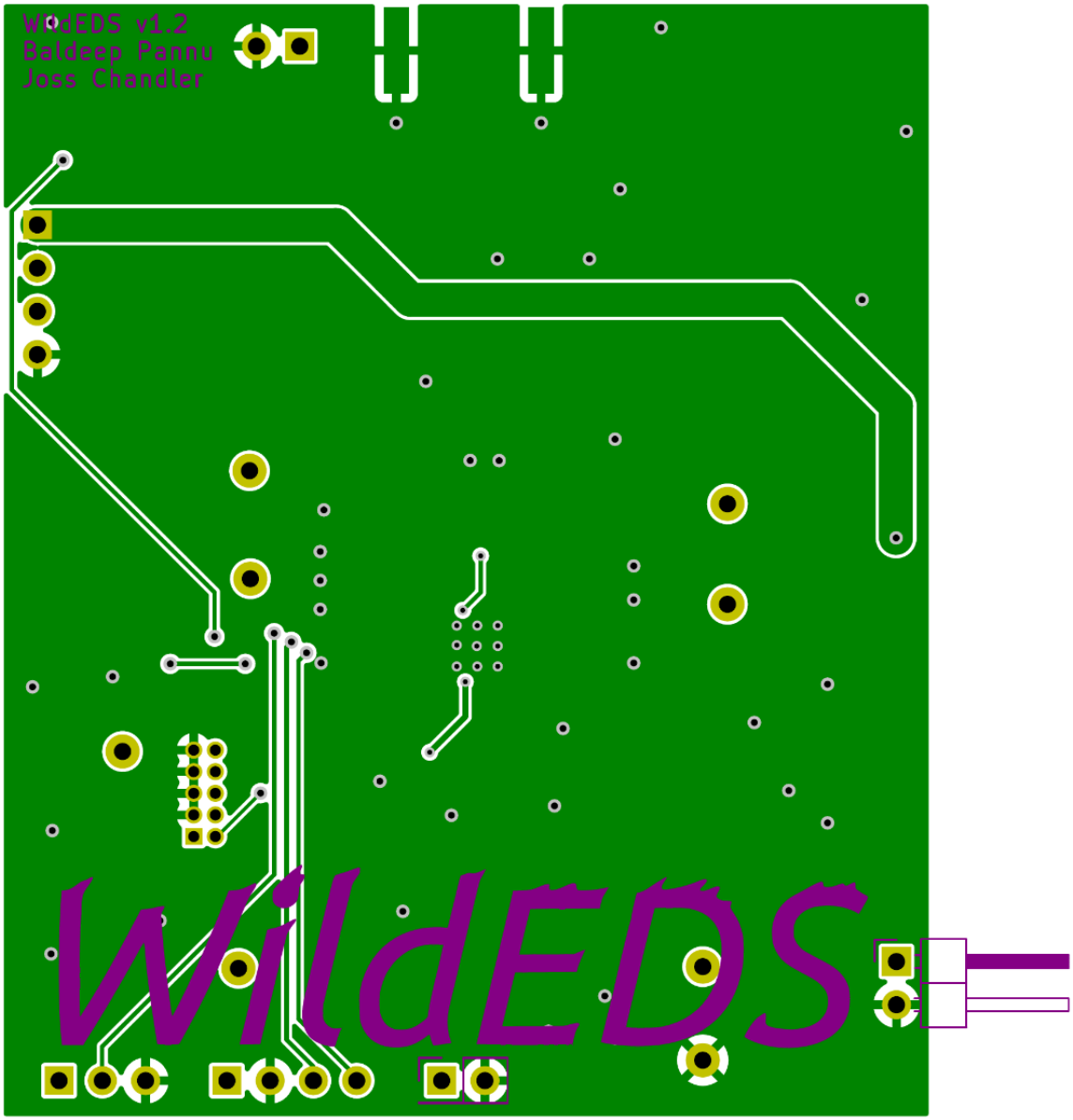


PCB Design

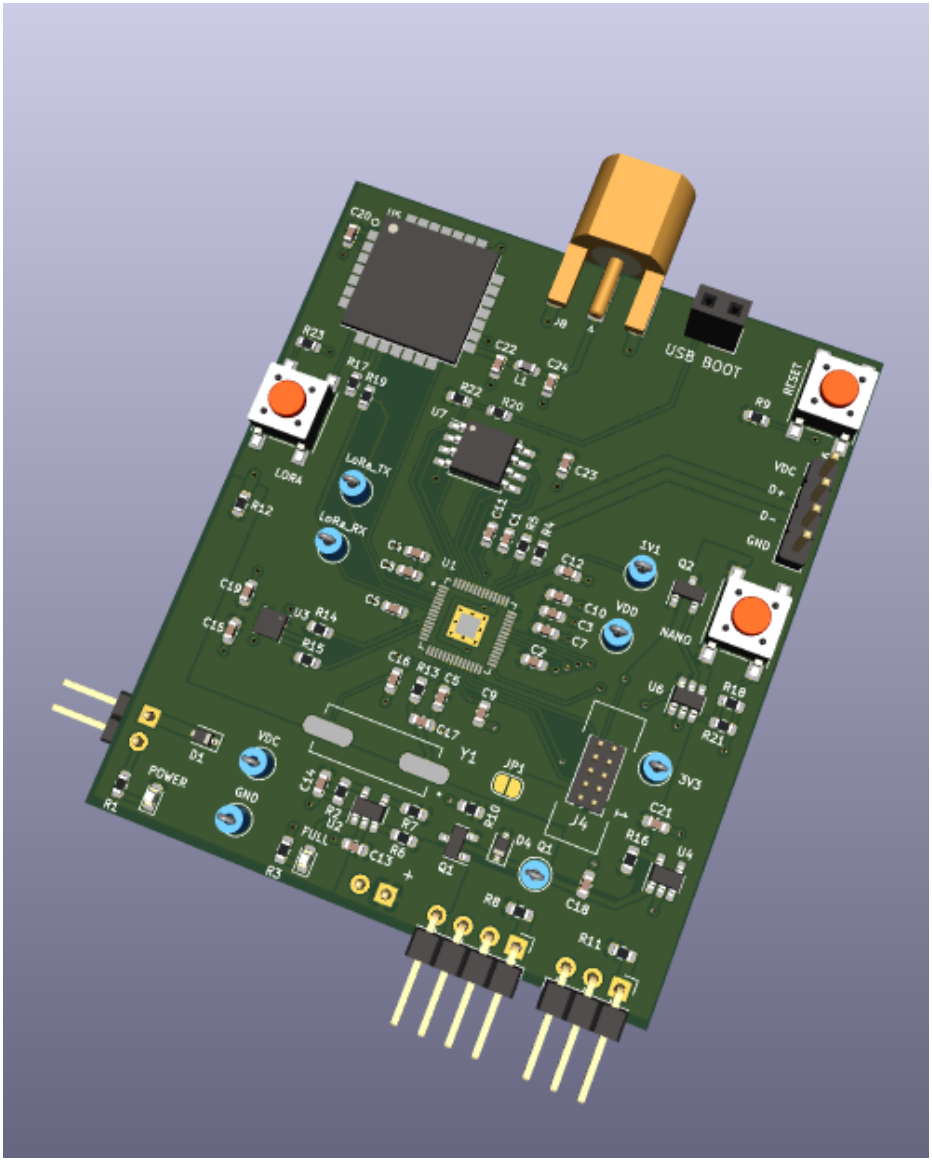
PCB Top



PCB Bottom



PCB 3D Viewer



Bill of Materials

References	Value	Footprint	MANUFACTURER	Quantity
C2, C3, C4, C5, C6, C7, C8, C9, C11, C15, C19, C23	100nF	C_0603_1608Metric		12
C1, C10, C12, C18, C21	1uF	C_0603_1608Metric		5
C13, C14, C20	4.7uF	C_0603_1608Metric		3
C16, C17	27pF	C_0603_1608Metric		2
C22, C24	DNP	C_0603_1608Metric		2
R6, R7, R8, R11, R12, R16	0	R_0603_1608Metric		6
R1, R3, R23	470	R_0603_1608Metric		3
R4, R5	27.4	R_0603_1608Metric		2
R9, R10	10k	R_0603_1608Metric		2
R13, R20	1k	R_0603_1608Metric		2
R14, R15	4.7k	R_0603_1608Metric		2
R17, R19	22	R_0603_1608Metric		2
R2	2k	R_0603_1608Metric		1
R18	221k	R_0603_1608Metric		1
R21	287k	R_0603_1608Metric		1
R22	DNP	R_0603_1608Metric		1
L1	0H	L_0603_1608Metric		1
D1, D4	D_Schottky	D_SOD-323		2
D2, D3	LED	LED_0603_1608Metric		2
U1	RP2040	QFN40P700X700X90-57N	Raspberry Pi	1
U2	MCP73831-2-OT	SOT-23-5	Microchip	1
U3	BME280	Bosch_LGA-8_2.5x2.5mm_P0.65mm_ClockwisePinNumbering	Bosch	1
U4	XC6210B332MR	SOT-23-5	Torex	1
U5	LoRa-E5	LoRa-E5	Seeed	1
U6	TPL5110	SOT-23-6	Texas Instruments	1
U7	W25Q128JVS	SOIC-8_5.23x5.23mm_P1.27mm	Winbond	1
Y1	12MHz Crystal	XTAL1140X470X420N	Abracon	1
SW1, SW2, SW3	SW_Push	SW_Push_1P1T_NO_6x6mm_H9.5mm		3
Q1, Q2	Q_PMOS_DGS	SOT-23		2
JP1	Power Isolation	SolderJumper-2_P1.3mm_Open_RoundedPad1.0x1.5mm		1
TP1	3V3	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP2	VDD	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP3	GND	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP4	1V1	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP5	VDC	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP6	Q1	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP7	LoRa_TX	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
TP8	LoRa_RX	TestPoint_Loop_D1.80mm_Drill1.0mm_Beaded		1
J1	Solar Panel Input	PinHeader_1x02_P2.54mm_Horizontal		1
J2	LiPo Batt	PinHeader_2x01_P2.54mm_Vertical		1
J3	I2C Soil Header	PinHeader_1x04_P2.54mm_Horizontal		1
J4	SWD Header	PinHeader_2x05_P1.27mm_Vertical		1
J5	Analog Soil Header	PinHeader_1x03_P2.54mm_Horizontal		1
J6	USB Header	PinHeader_1x04_P2.54mm_Vertical		1
J7	USB BOOT	PinSocket_1x02_P2.54mm_Vertical		1
J8	SMA-Conn	SMA_Amphenol_132289_EdgeMount_new	Samtec	1

Assembly and Test Procedures

Requirements:

The following are the required materials to assemble WildEDS:

- The design schematic
- Parts outlined on BOM
- Soldering station with:
    - Soldering Iron, Lead-Free Solder, Flux, Hot Air Soldering Station, Lead-Free Solder paste, Soldering oven, and Hot Plate

Procedure:

1. Solar Panel & LiPo Charger:
    a. Gather components: D1, D2, D3, R1, R2, R3, R6, R7, C13, C14, and U2
    b. Solder U2 then D1, D2, D3, R1, R2, R3, R6, R7, C13, and C14 using the preferred soldering method.
    c. Solder the solar panel in the J1 header using a soldering iron.
    d. Connect the LiPo battery using the J2 header.
2. Linear Regulator:
    a. Gather components: D4, Q1, R10, R16, C18, C21, and U4
    b. Solder U4 then D4, Q1, R10, R16, C18, and C21 using the preferred soldering method.
    c. Solder TP1, TP3, TP5, and TP6 using a soldering iron. Then solder the bridge at JP1.
    d. Use TP 1 to verify output of 3V3.
    e. Use TP 3 to verify the functionality of the ground.
    f. Use TP 5 to verify the functionality of the Solar Panel.
    g. Use TP 6 to verify the input to the linear regulator is between 3V5 and 4V2.
3. Nano Timer:
    a. Gather components: Q2, SW2, R18, R21, and U6.
    b. Solder U6 then Q2, R18, R21, and SW2 using the preferred soldering method.
    c. Solder TP2 using a soldering iron.
    d. Use SW2 and TP2 to verify the functionality of the nano timer.
4. RP2040 MCU:
    a. Gather components: SW1, R4, R5, R9, R13, C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C16, C17, Crystal oscillator, and U1.
    b. Solder U1 using the hot plate set to 200 degrees celsius and the hot air station.
    c. Solder SW1, R4, R5, R9, R13, C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C16, C17, and the Crystal oscillator using preferred soldering method.
    d. Solder TP1. will be used later to measure 1V1 from the MCU.

5. Flash Memory
    a. Gather components: R20, C23, and U7
    b. Solder U7 then R20 and C23 using the preferred soldering method. Do not populate R22.

    c. Solder J7, the USB connector using a soldering iron.
6. Lora Module:
    a. Gather components: SW3, R17, R19, R23, C20, the Antenna, and U5.
    b. Solder U5 using the hot plate set to 200 degrees celsius and the hot air station.
    c. Solder SW3, R17, R19, R23, and C20 using the preferred soldering method. Do not populate L1, C22, and C24.
    d. Attach the antenna to J8.
    e. TP7 and TP8 shall be used later to verify the proper functionality of the LoRa Module.
7. Temp/Pressure/Humid Sensor:
    a. Gather components: R14, R15, C15, C19, and U3.
    b. Solder U3 then solder R14, R15, C15, and C19 using the preferred soldering method.
8. Headers:
    a. Gather components: R8, R11, R12, J3, J4, J5, and J7.
    b. Solder R8, R11, 12 using the preferred soldering method.
    c. Solder J3, J4, J5, and J7 using a soldering iron.
    d. Connect a USB cable into J6 and verify the functionality of the MCU and LoRa module using software and TP1, TP7, and TP8.

Considerations:

Use caution when soldering the MCU and LoRa module as it may overheat.
Avoid using hot air near Headers to avoid melting header.
Practice good solder technique and safety.