

Title			BikeIt System Architecture		
Size	Number			Revision	
A3					
Date:	4/25/2021		Sheet of		
File:	C:\Users\...System Block Diagram_SchDx		Drawn By: Madhukar Arora		

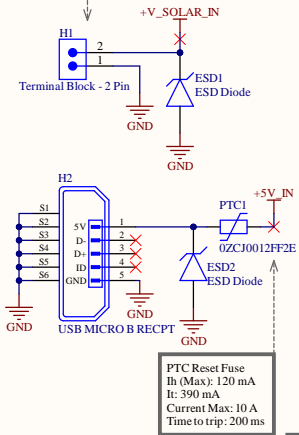
Bike It Power Management



Power Input → Input Source Selection → Input Regulation → Storage Element

Power Input

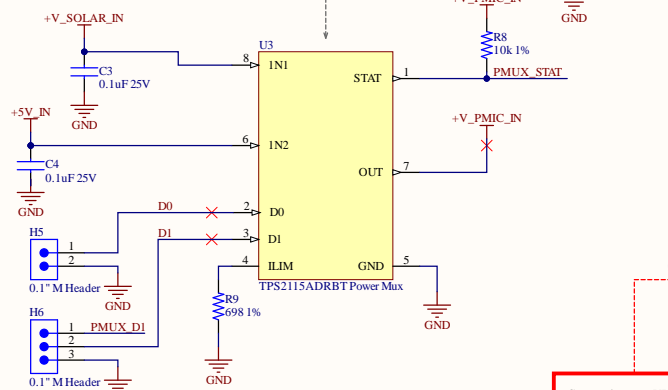
Input from Solar Panel
0V in darkness, 4.15V in sunlight



Auto (Default) H5 (D0): 1-2 = NO H6 (D1): 2-3 = NC	Manual (GPIO Controlled) H5 (D0): 1-2 = NC H6 (D1): 1-2 = NC
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Input Source Selection

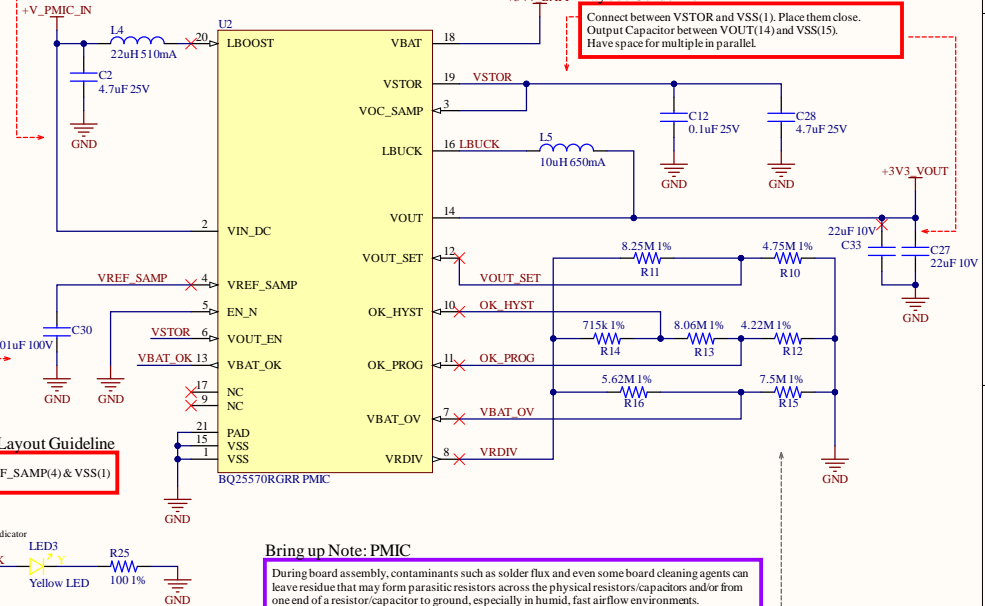
D0 and D1 have internal 1uA pull up.
For automatic operation, D1 is logic 0 and D0 is logic 1.
If IN1 falls below 0.8V, automatic selection takes place.
STAT is open drain O/P. Hi-Z if IN2, low if IN1.



Layout Guideline

Input Cap between VIN_DC(2) & VSS(1)
Reduce the area of the loop

Input Regulation



Bring up Note: PMIC

During board assembly, contaminants such as solder flux and even some board cleaning agents can leave residue that may form parasitic resistors across the physical resistors/capacitors and/or from one end of a resistor/capacitor to ground, especially in humid, fast airflow environments. This can result in the voltage regulation and threshold levels changing significantly from those expected per the installed components. The datasheet recommends carefully cleaning the boards with de-ionized water to prevent this.

C33 is unpopulated in case extra decoupling is required

Passive selection for PMIC

1. Boost Inductor between LBOOST and VIN. DC: Nominal inductance of 22uH±20%. Used suggested part from spec.
2. Buck Inductor between LBUCK and VOUT. Chosen lower bound suggested in spec - 4.7uH with peak current capability > 200mA
3. VIN_DC Capacitance - Suggested minimum capacitor at input 4.7uF
4. VSTOR Capacitance - high frequency bypass of 0.01uF. In addition, low ESR capacitance of at least 4.7uF in parallel
5. VOUT Capacitance - atleast 22uF
6. VOUT_SMP Capacitance - 100nF, 10nF(typ), 11nF(max), X7R or C0G low leakage cap. Our choice 10nF.
7. No MPPT resistors needed, VSC_SAMP used by VSTOR to give 80mV COV
8. Other feedback resistors for power management calculated using Excel Sheet provided by TI
9. Rechargeable storage element with at least 1000F capacitance between VBAT and either VSS pin

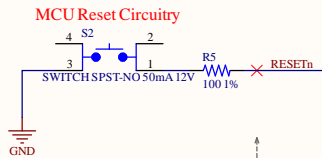
VBAT_OV=4.2V, VBAT_OK=3.5V, VBAT_OK_HYST=3.7V, VOUT=3.3V

Title			
Bike It Power Management			
Size	Number	Revision	
A3	2	1	
Date:	4/25/2021	Sheet of	
File:	C:\Users\ALPEDT_revA1_bikeit_POWERMANAGEMENT\BikeIt By: Madhukar Arora		

MCU Power and Decoupling

Referred EFR32BG13 Reference Schematic

MCU Reset Circuitry



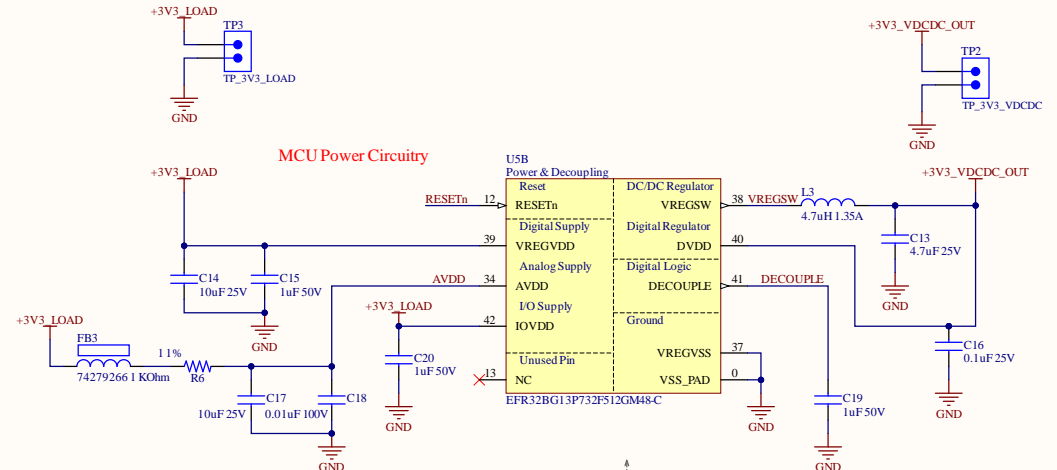
Design Notes

A weak internal pull-up device holds the RESETn pin high, allowing it to be left unconnected if no external reset source is required. MCU can be reset using a PB. RESETn also has a low pass filter to prevent noise glitches from causing unintended resets. **Note: RESETn should not be connected through an external pull-up to an active supply or driven high as it can damage the device.**

Bring up Note: MCU revision

As we possessed two revision C MCU chips, we decided to use those along with one revision B MCU chip. No defects that would adversely affect bring up and operation were found in the errata between revision C and revision B.

MCU Power Circuitry



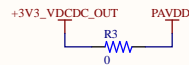
Design Notes

1. AVDD - include one bulk capacitor of 10uF, as well as one 10nF per each AVDD pin. In addition, a ferrite bead and series 1 Ohm resistor provides additional power supply filtering and isolation.
2. Configured device to use DC-DC converter to power DVDD supply. +3V3_VDCDC_OUT is connected to DVDD. 4.7uH capacitor suggested (behaviour over temperature & bias voltage critical)
3. This is the EFR32xG12/13/14 Power Configuration 2 where the DC-DC converter powers DVDD

MCU Antenna and Radio Interface

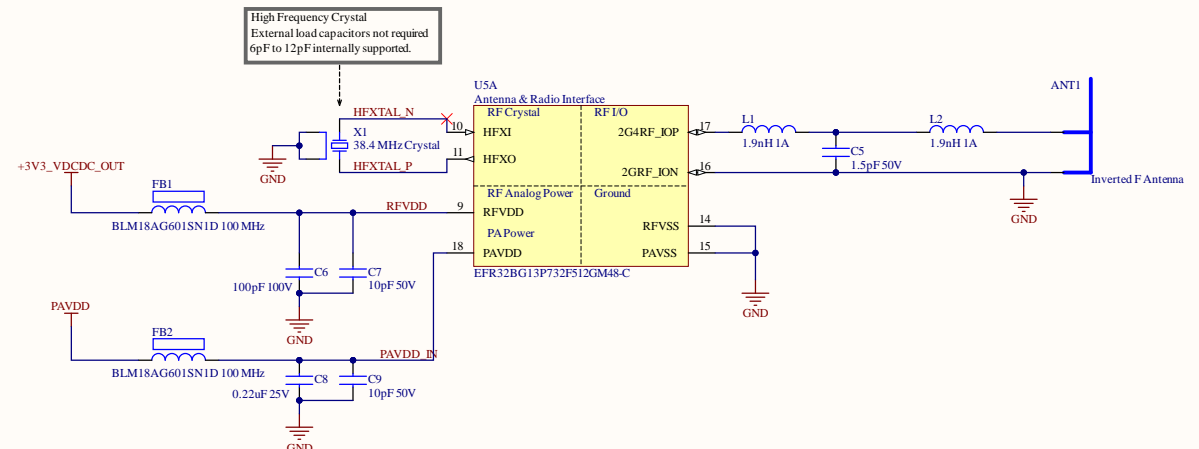
Referred EFR32BG13 Reference Schematic

PAVDD Config



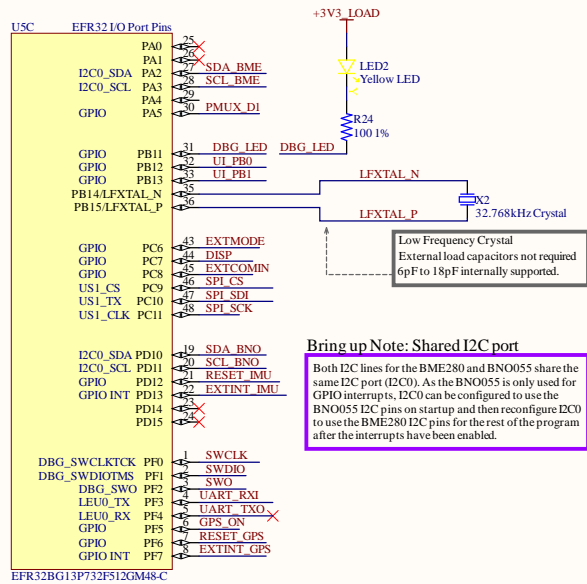
Design Notes

Configured for low power operation. RFVDD & PAVDD powered from DC-DC converter OP. Maximum transmit power is limited to 13dBm when PAVDD powered from DC-DC converter.

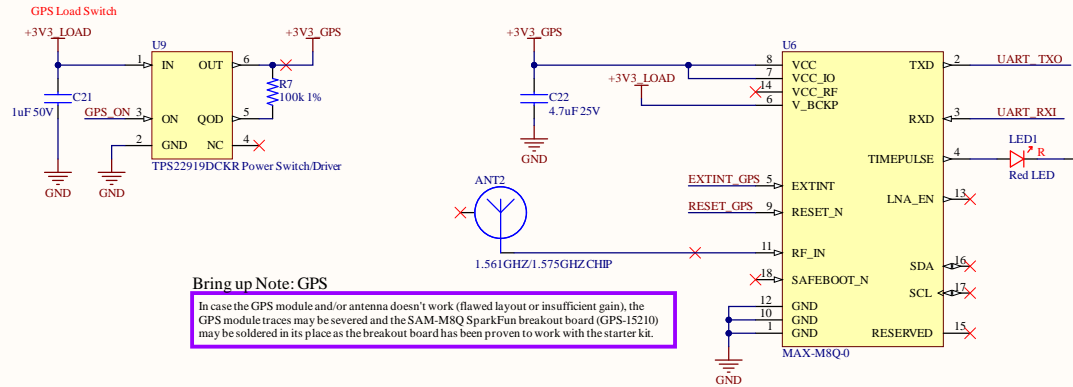


Title		
MCU Power and Reset Circuitry		
Size	Number	Revision
A3	3	1
Date:	4/25/2021	Sheet of
File: C:\Users\...LPEDT_revA1_bikeit_MCU_Power\B_RESET.SchDoc Dhruva Koley		

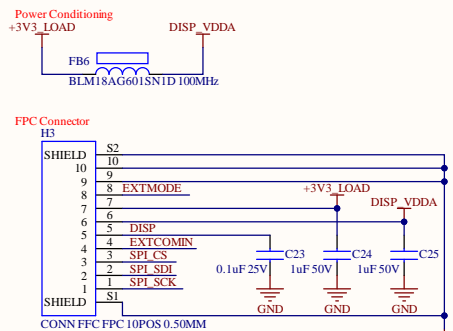
MCU I/O



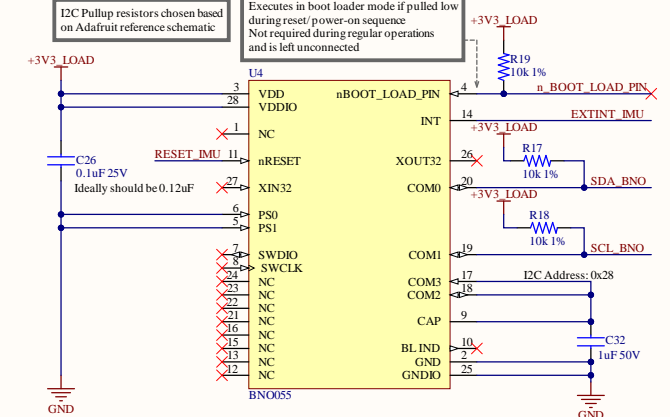
MAX-M8Q GPS Module



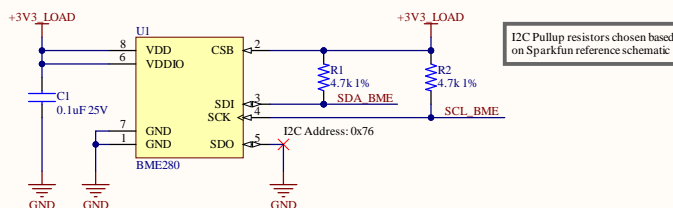
SHARP Memory LCD Display Module



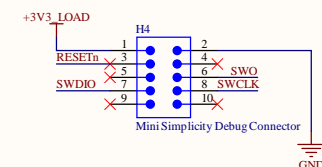
BNO055 IMU Module



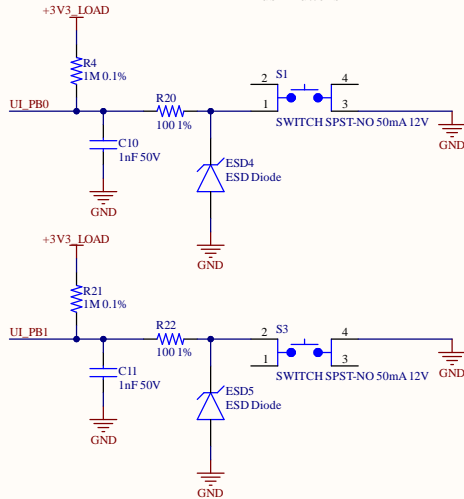
BME280 Pressure/Temperature/Altitude Module



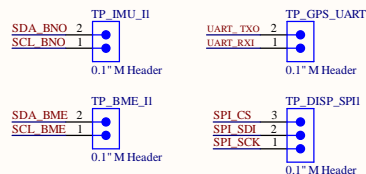
MINI Debug Connector



Push Buttons



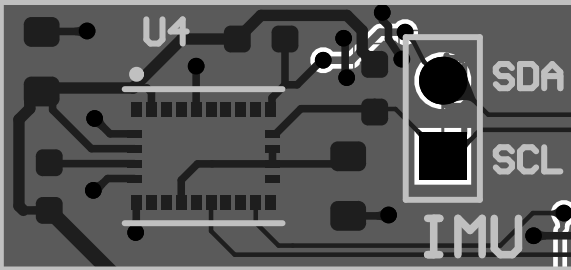
Test Points



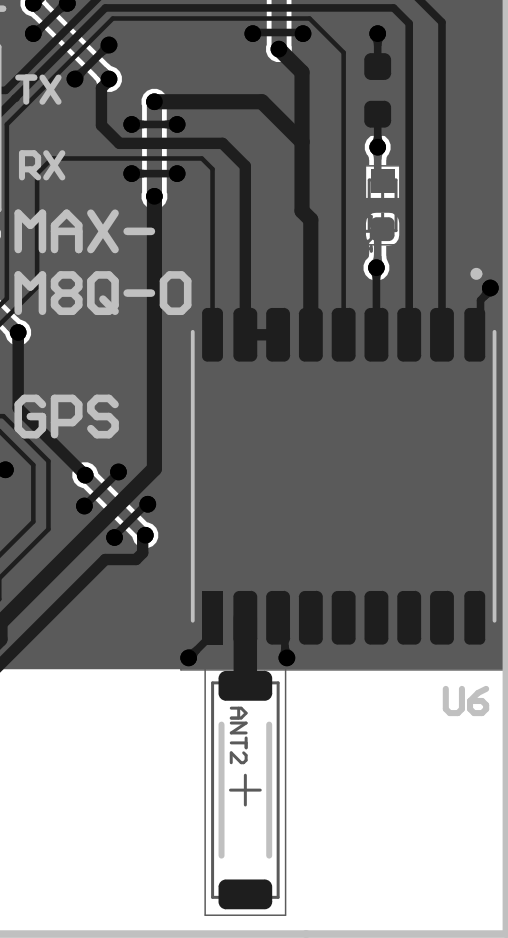
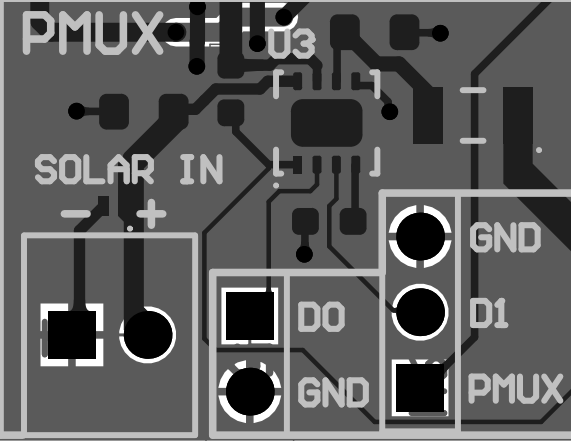
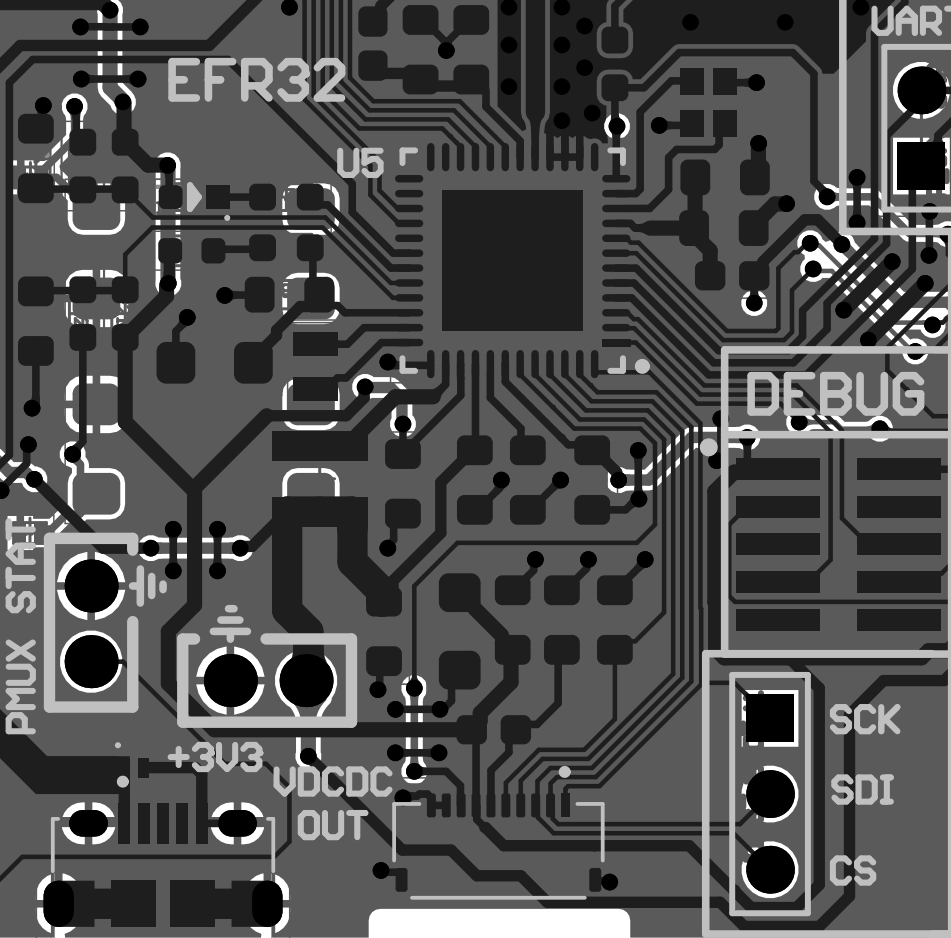
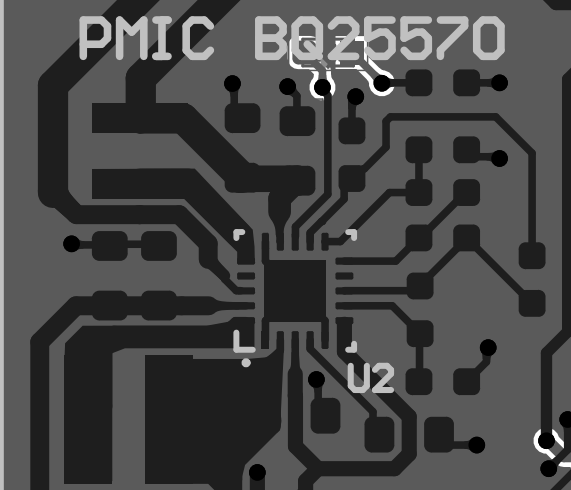
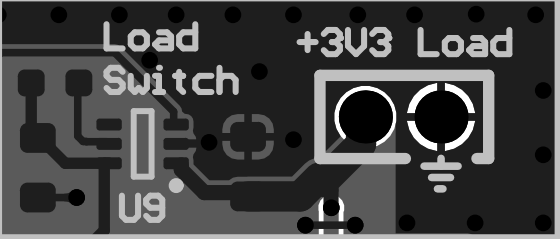
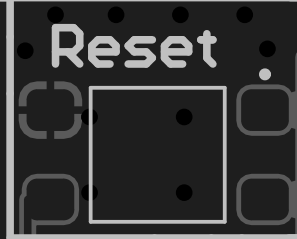
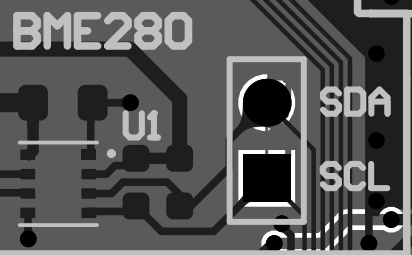
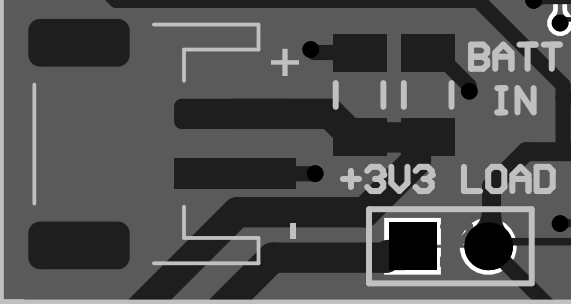
Bring up Note: BME280

In case the BME280 sensor doesn't work, the BME280 sensor traces may be severed and the BME280 SparkFun breakout board (SEN-13676) may be soldered in its place as the breakout board has been proven to work with the starter kit.

Title			
MCU I/O			
Size	Number		Revision
A3	4		1
Date:	4/25/2021	Sheet of	
File:	C:\Users\JLPEDT_revA1_bikeit_MCU	D:\Users\JLPEDT_revA1_bikeit_MCU	
Dhruva Koley			



Bike It!
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Dhruva Koley
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ECEN 5833 CU-B



PCB END