1

2

3

4

A

B

Designator
Microcontroller.SchDoc

Designator
Sensors.SchDoc

Designator
Power.SchDoc

ADC_SOLAR
ADC_BATT
FLOW

ADC_SOLAR
ADC_BATT
FLOW

GPS_TX
GPS_RX

GPS_TX
GPS_RX

CHG_STATUS

CTRL

I_SENSE

Battery Control

CHG_STATUS

CTRL

I_SENSE

BATT_CTRL

C

MH100

Exposed Mounting Hole M3
MH101

Exposed Mounting Hole M3
MH102

Exposed Mounting Hole M3
MH103

Exposed Mounting Hole M3

GND

D

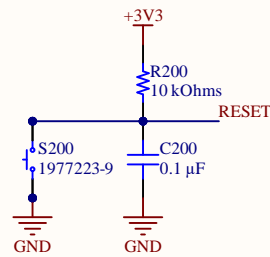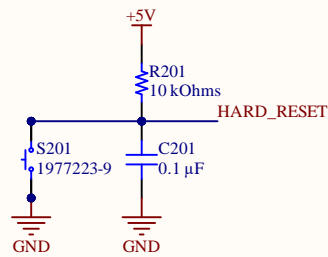| Title		
Size	Number	Revision
A4		
Date:	10-28-2022	Sheet of
File:	C:\Intelligent Tidal Energy Monitoring System\...\Master.SchDoc	Drawn By:

PICO has user LEDs for debugging

PICO is programmed through the USB connection, no buttons necessary
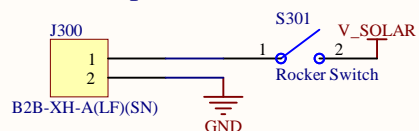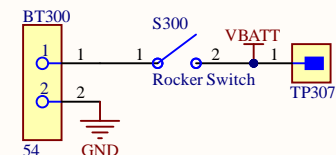
PICO regulates 5 to 3V3 on the board

U200

1	GP0	VBUS 40	+5V
2	GP1	VSYS 39
3	GND	GND 38
4	GP2	EN 37	HARD_RESET +3V3_PICO
5	GP3	3V3 36	AVREF
6	GP4	AVREF 35
7	GP5	GP28 34	I_SENSE
8	GND	GND 33
9	GP6	GP27 32	ADC_SOLAR
10	GP7	GP26 31	ADC_BATT
11	GP8	RUN 30	RESET
12	GP9	GP22 29	GP22
13	GND	GND 28
14	GP10	GP21 27	GP21
15	GP11	GP20 26	GP20
16	GP12	GP19 25	GP19
17	GP13	GP18 24	GP18
18	GND	GND 23
19	GP14	GP17 22	GP17
20	GP15	GP16 21	GP16

GPS_RX
GPS_TX

FLOW
CTRL
CHG_STATUS
GP5

GP6
GP7
GP8
GP9

GP10
GP11
GP12
GP13

GP14
GP15

GND

SWCLK GND SWDIO
41 42 43

SC0918

SWCLK   SWDIO

GND

GND

GND

MCU reset circuit

+3V3

R200
10 kOhms

S200
1977223-9

RESET

C200
0.1 µF

GND   GND

MCU hard reset circuit

+5V

R201
10 kOhms

S201
1977223-9

HARD_RESET

C201
0.1 µF

GND   GND

TP200
+3V3_PICO

1.5mm Test Point

J200   +3V3 +5V

GP6
GP7
GP8
GP9
GP10

GND

0022272081

J201

GP5
GP11
GP12
GP13
GP14
GP15
GP17
GP16

0022272081

J202

AVREF
GP22
GP21
GP20
GP19
GP18
SWCLK
SWDIO

0022272081

Solar Panel Input 5V/0.5A

J300
B2B-XH-A(LF)(SN)
1
2
GND

S301
Rocker Switch
1   2
V_SOLAR
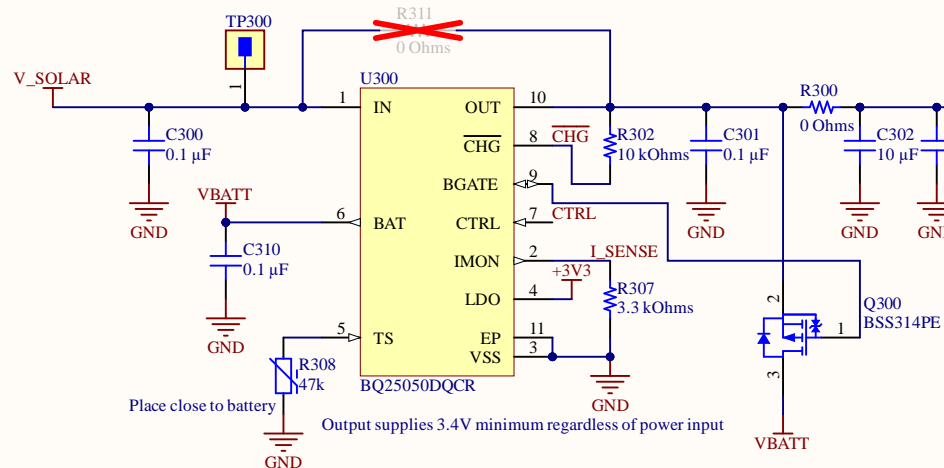
https://www.amazon.ca/gp/product/B074TYH68Z/ref=ox_sc_act_title_2?smid=A18M12GR6V2Z8F&psc=1
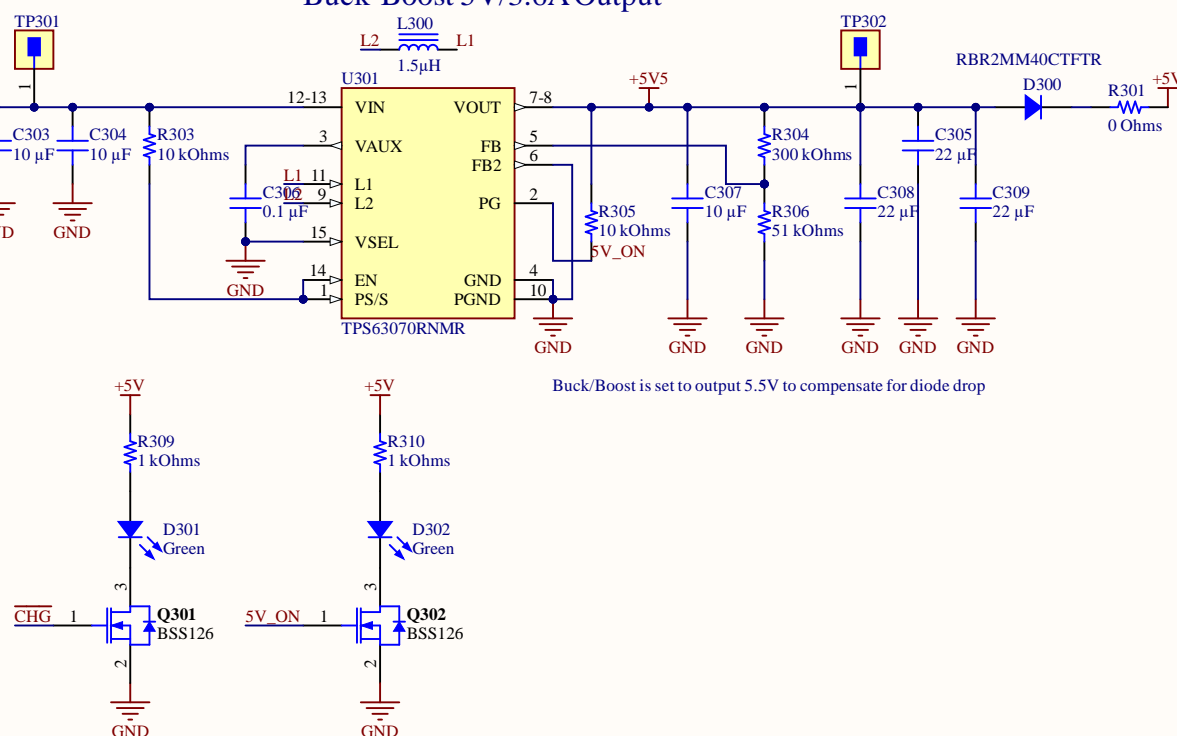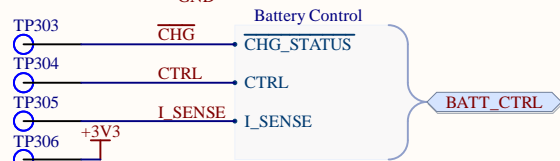
18650 Battery 3.6V 2500maH

BT300
1
2
54
GND

S300
Rocker Switch
1   1   2   1
VBATT
TP307

Note that BT1 requires 2 x 54 CNs

Battery Charger IC

TP300

R311
0 Ohms

V_SOLAR

C300
0.1 µF
GND

VBATT
C310
0.1 µF
GND

R308
47k

GND

Place close to battery

U300
BQ25050DQCR

1 IN
OUT 10
CHG 8
BGATE 9
6 BAT
CTRL 7
IMON 2
4 LDO
5 TS
EP 11
VSS 3

CHG
R302
10 kOhms
GND

CTRL

+3V3
R307
3.3 kOhms
GND

I_SENSE
Q300
BSS314PE
2 1
3
VBATT

Output supplies 3.4V minimum regardless of power input

TP301

R300
0 Ohms

C301
0.1 µF
GND

C302
10 µF
GND

C303
10 µF
GND

C304
10 µF
GND

R303
10 kOhms

Buck-Boost 5V/3.6A Output

L2 L300 L1
1.5µH

U301
TPS63070RNMR

12-13 VIN
VOUT 7-8
3 VAUX
FB 5
FB2 6
L1 11
L2 9
C306
0.1 µF
PG 2
15 VSEL
14 EN
1 PS/S
GND 4
PGND 10
GND

+5V5

RBR2MM40CTFTR
D300
R301
0 Ohms
+5V

R304
300 kOhms

C305
22 µF
GND

TP302

R305
10 kOhms
5V_ON
GND

C307
10 µF
GND

R306
51 kOhms
GND

C308
22 µF
GND

C309
22 µF
GND

Buck/Boost is set to output 5.5V to compensate for diode drop

Battery Control

TP303 CHG CHG_STATUS
TP304 CTRL CTRL
TP305 I_SENSE I_SENSE
TP306 +3V3

BATT_CTRL

I_SENSE is an output voltage of 0-3V3 as current goes from 0-1A

+5V
R309
1 kOhms
D301
Green
CHG 1
Q301
BSS126
3
2
GND

+5V
R310
1 kOhms
D302
Green
5V_ON 1
Q302
BSS126
3
2
GND

+3V3
C311
0.1 µF
Place close to LDO pin of batt charger IC
GND

Battery Voltage Sensor

+5V
C402
0.1 µF
GND

VBATT
R400
10 kOhms
TP400
+5V
GND
IC400
LMV601MGX/NOPB

C400
0.022 µF
R402
33 kOhms

GND
GND

ADC_BATT

TP402

Solar Panel Voltage Sensor

+5V
C403
0.1 µF
GND

V_SOLAR
R401
17.4 kOhms
TP401
+5V
GND
IC401
LMV601MGX/NOPB

C401
0.022 µF
R403
33 kOhms

GND
GND

ADC_SOLAR

TP403
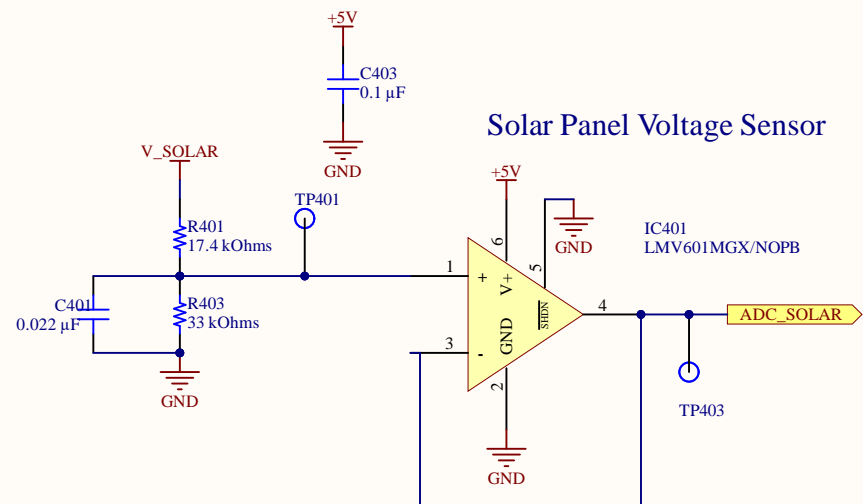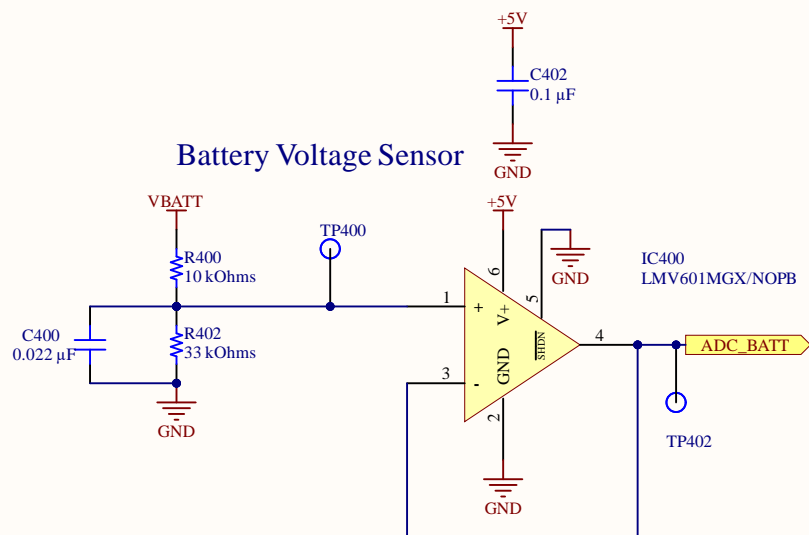
Flow Sensor Input 5V/15mA

J400
+5V
1
2
3
B3B-XH-A(LF)(SN)

FLOW
GND

GPS Header
TP404

TP405

+5V
J401
GPS_RX
1 VCC
2 RX
GPS_TX
3 TX
4 GND

GND
GY-GPS6MV2

TP406

Title		
Size	Number	Revision
A4		
Date:	10-28-2022	Sheet of
File:	C:\Intelligent Tidal Energy Monitoring System\...Sensors.SchDoc	Drawn By:

Line #	Name	Description	Designator	Revision ID	Revision State	Revision Status	Quantity	Manufacturer 1	Manufacturer Part Number 1	Manufacturer Lifecycle 1	Supplier 1	Supplier Part Number 1	Supplier Unit Price 1	Supplier Subtotal 1
54	Cylindrical Battery Contacts, Clips, Holders & Springs 16-19mm PC BATTERY CLIP	BT300		Unknown server		1							
0.1 µF	CAP CER 0.1UF 25V X7R 0603	C200, C201, C402, C403		Not managed		4				DigiKey	399-13148-1-ND		
0.1 µF	CAP CER 0.1UF 50V X7R 0603	C300, C301, C306, C310, C311		Not managed		5				DigiKey	399-7374-2-ND		
10 µF	CAP CER 10UF 25V X5R 0603	C302, C303, C304, C307		Not managed		4				DigiKey	490-12737-1-ND		
22 µF	CAP CER 22UF 16V X5R 0805	C305, C308, C309		Not managed		3				DigiKey	1276-2909-1-ND		
0.022 µF	CAP CER 0.022UF 16V X7R 0603	C400, C401		Not managed		2				DigiKey	311-1800-1-ND		
RBR2MM40CTFTR	DIODE (RECTIFIER FRD) 40V-VR 2A-	D300		Not managed		1				DigiKey	RBR2MM40CTFCT-ND		
Green	LED GREEN CLEAR 2SMD	D301, D302		Not managed		2				DigiKey	1497-1243-1-ND		
LMV601MGX/NOPB	IC OPAMP GP 1 CIRCUIT SC70-6	IC400, IC401		Not managed		2				DigiKey	296-46438-1-ND		
B2B-XH-A(LF)(SN)	CONN HEADER VERT 2POS 2.5MM	J300		Not managed		1				DigiKey	455-2247-ND		
B3B-XH-A(LF)(SN)	CONN HEADER VERT 3POS 2.5MM	J400		Not managed		1				DigiKey	455-2248-ND		
GY-GPS6MV2	NEO-6M GPS Module	J401		Unknown server		1							
1.5µH	FIXED IND 1.5UH 1.5A 70 MOHM SMD	L300		Not managed		1				DigiKey	CVH252009-1R5MCT-ND		
Exposed Mounting Hole M3	M3 Mounting Hole Exposed	MH100, MH101, MH102, MH103		Unknown server		4							
BSS314PE	P-Channel OptiMOS P3 Small-Signal-Transistor, -30 V VDS, -1.5 A ID, -55 to 150 degC, PG-SOT23, Reel, Green	Q300		Unknown server		1							
BSS126	N-Channel SIPMOS Small-Signal-Transistor, 600 V VDS, 0.021 A ID, -55 to 150 degC, PG-SOT23, Reel, Green	Q301, Q302		Unknown server		2							
10 kOhms	RES SMD 10K OHM 1% 1/10W 0603	R200, R201, R302, R303, R305, R400		Not managed		6				DigiKey	YAG2321CT-ND		
0 Ohms	RES 0 OHM JUMPER 1/10W 0603	R300, R301		Not managed		2				DigiKey	YAG5757CT-ND		
300 kOhms	RES 300K OHM 1% 1/10W 0603	R304		Not managed		1				DigiKey	311-300KHRCT-ND		
51 kOhms	RES SMD 51K OHM 1% 1/10W 0603	R306		Not managed		1				DigiKey	541-51.0KHCT-ND		
3.3 kOhms	RES 3.3K OHM 1% 1/4W 0603	R307		Not managed		1				DigiKey	A130422CT-ND		
47k	THERMISTOR NTC 47KOHM 4050K 0603	R308		Not managed		1				DigiKey	490-6942-2-ND		
1 kOhms	RES SMD 1K OHM 1% 1/10W 0603	R309, R310		Not managed		2				DigiKey	YAG2323CT-ND		
17.4 kOhms	RES 17.4K OHM 1% 1/10W 0603	R401		Not managed		1				DigiKey	311-17.4KHRCT-ND		
33 kOhms	RES SMD 33K OHM 1% 1/10W 0603	R402, R403		Not managed		2				DigiKey	YAG5959CT-ND		
1977223-9	SWITCH TACTILE SPST-NO 0.05A 24V	S200, S201		Not managed		2				DigiKey	1977223-9-ND		
Rocker Switch	12mm x 18.5mm Rocker Switch 6A 250VAC	S300, S301		Unknown server		2							
1.5mm Test Point	1.5mm Test Point 0.75mm hole size	TP200, TP303, TP304, TP305, TP306, TP400, TP401, TP402, TP403, TP404, TP405, TP406		Unknown server		12							
S2751-46R	Conn Test Point 1 POS Solder ST SMD 1 Port T/R	TP300, TP301, TP302, TP307		Unknown server		4							
SC0918	Raspberry Pi Pico W	U200		Unknown server		1							
BQ25050DQCR	1 A, Single-Input, Single Cell Li-Ion Battery Charger with 50 mA LDO, -40 to 85 degC, 10-pin WSON (DQC), Green (RoHS & no Sb/Br)	U300		Unknown server		1							
TPS63070RNMR	IC REG BCK BST ADJ 3.6A 15VQFN	U301		Unknown server		1							