9 MAY 2018 C – U3810-66501

REV	INFORMATION	APPROVED	DATE
F			

BeagleBone 6-Pin Female and 46-Pin Male Connectors

Connectors shown from top side of board to facilitate probing (connector is mounted on the bottom side)

Connector-Socket Vertical through-hole 6-POS 2.54mm 4.7A 1-Row
Note Swapped TXD0 and RXD0 7/16/18

BB J1 — 1254-3474 J1BB

RXD0 TXD0 TP91 TP90

BB P9 — Connector-Header Vertical through-hole 46-Pin 2.54mm 2-Row BBP9 — 1254-3758 TSW-123-07-T-D

0699-6825 0 R82 GP10_SPI_CS|GPIO0_7_SPI1_CS1

0 R80 SPI_MOSI_P|GPIO3_16_SPI1_MOSI
0 R88 SPI_CS_ADC|GPIO3_17_SPI1_CS0

0699-6825 0 R81 0 R89 SPI_CLK_P|GPIO3_14_SPI1_CLK
SPI_MISO_P|GPIO3_15_SPI1_MISO

P9		P9
DCOM	46 45	DCOM
	44 43	
	42 41	GP2|GPIO0_20
CPU_AIN1	40 39	CPU_AIN0
CPU_AIN3	38 37	CPU_AIN2
CPU_AIN5	36 35	CPU_AIN6
	34 33	CPU_AIN4
VDD_ADC	32 31	
	30 29	GP3|GPIO3_19
	28 27	GP4|GPIO3_21
RXD1	26 25	GP7|GPIO1_17
TXD1	24 23	TXD2
RXD2	22 21	I2C2_SCL
I2C2_SDA	20 19	I2C1_SCL|GPIO0_5_I2C1_SCL
I2C1_SDA|GPIO0_4_I2C1_SDA	18 17	GP8|GPIO1_16
GP5_PWM|GPIO1_19_PWM1B	16 15	GP9|GPIO0_31
GP6_PWM|GPIO1_18_PWM1A	14 13	GPB4|GPIO0_30
GPIO1_28	12 11	PWRBTN
SYS_RESET	10 9	
DCOM	8 7	DCOM
+5VRAW	6 5	
+3.3V	4 3	+3.3V
DCOM	2 1	+5VRAW

+5VSYS — 0.1u 50V C5 0161-1636 — DCOM

+5VSYS — J4 — 1253-6954 JP55

WARNING Do not connect voltages greater than 3.3 V to GPIO pins as this may damage the BeagleBone CPU. These over-voltage sources include +5VRAW and +5VSYS on JP55.

GPIO1_28 (BB P9 pin 12) is used to enable BLE on BBGW and so is not available as a GPIO.

Jumper connects +5VSYS to +5VRAW so that BB PMIC can power up and +5VRAW can be supplied from a 3.7V LiPo battery. BeagleBone has been demostrated to shutdown at approximately 3.5V. This jumper should be removed for normal operation on BeagleBone.

Raspberry Pi 40-Pin Male Connector and UART_SELector

together on Pi Board
J8Pi pins 2 and 4 are connected

+5VSYS — +5VRAW — 0.1u 50V C6 0161-1636 — DCOM

Pi JB — 1253-4064 ESQ-120-37-S-D — Connector-Socket Vertical through-hole 40-POS 2.54mm 550VAC 5.7A 2-Row J8Pi

Pi JB		Pi JB
+3.3V	1 2	
I2C1_SDA	3 4	
I2C1_SCL	5 6	PiP6GND
GP2|GPIO4	7 8	TXD|GPIO14
	9 10	RXD|GPIO15
PWRBTN|GPIO17	11 12	GP6_PWM|I2S_CLK|GPIO18_PWM0
GPIO27	13 14	
GP3|GPIO22	15 16	GP4|GPIO23
+3.3V	17 18	GP7|GPIO24
SPI_MOSI_P|GPIO10	19 20	
SPI_MISO_P|GPIO09	21 22	GP8|GPIO25
SPI_CLK_P|GPIO11	23 24	SPI_CS_ADC
	25 26	GP10_SPI_CS|GPIO7
I2C2_SDA|SDA0_ID	27 28	I2C2_SCL|SCL0_ID
UARTSEL0|GPIO5	29 30	
UARTSEL1|GPIO6	31 32	GP5_PWM|GPIO12_PWM0
GP9|GPIO13_PWM1	33 34	
I2S_WS|GPIO19	35 36	GP11|GPIO16
GPB4|GPIO26	37 38	SYS_RESET|GPIO20
	39 40	I2S_DATA|GPIO21

+3.3V — 0.1u 50V C7 0161-1636 — DCOM

R38 100K 0699-6771 — R39 100K 0699-6771 — +3.3V

U6 1827-2795 CD74HC4052PWR Pi UART SELector

VDD MUX DEMUX EN A S1A S2A S3A S4A S1B S2B S3B S4B DA DB VEE VSS

R68 10K 0699-3970

R34 100K 0699-6771 — TXD0
R35 100K 0699-6771 — TXD1
R36 100K 0699-6771 — TXD2

UARTSEL0|GPIO5
UARTSEL1|GPIO6

0699-3970 10K R69 — 0699-3970 10K R70 — DCOM

RXD0 RXD1 RXD2 NC
TXD0 TXD1 TXD2 NC

Pi UART SELector is disconnected when Pi is not installed.
When Pi is installed PiP6GND asserts /EN to enable selection.
When a new Pi powers up, UARTSEL0/1 are open circuits and address resistors pull down to select RXD0/TXD0 to enable console during bootup.

Connect this board to either BeagleBone or Raspberry Pi CPU, not both.
Connect USB to power U3810A at USB on CPU board for normal operation.
For certain exercises, you may be instructed to connect power directly to the U3810A PCA. In this case:
+5VRAW flows from Power Schematic (next sheet) to CPU Board, and may be as low as 3.7V from a battery supply. Connect either VIN, Battery or USB power (next sheet) or directly power the CPU from its USB connector, but not both.
+3.3V always flows from CPU Board to this schematic sheet.
+5VSYS flows from CPU Board to ths schematic sheet, and may be as low as 3.7V when battery powered.
A 3.7V battery supply is not sufficient to power a Raspberry Pi.

I2C2_SCL — I2C2_SDA — R31 26.1 — R32 26.1 — 0699-3911 — I2CP_SDA — I2CP_SCL — RN31 — RN32 — I2C1_SDA — I2C1_SCL

Selector for a future CPU connector with only a single I2C port

Private connection to Flash and LCD Display

Digital and Analog IO and Test Points

0699-3970 10K R50 R51 R52 R53 R54 R55 R56 — CPU_AIN0 CPU_AIN1 CPU_AIN2 CPU_AIN3 CPU_AIN4 CPU_AIN5 CPU_AIN6 VDD_ADC +1.8V — to BB P9

J3 — 1254-3476 SSW-110-06-F-S

WARNING 1.8Vmax on J3

GP2|GPIO0_20 — C92 47p — DCOM
GP3|GPIO3_19 — C93 47p — DCOM
GP4|GPIO3_21 — C94 47p — DCOM

A5 A4 A3 A2 A1 A0 — TP4 TP5 TP6 TP7 TP8 TP9 — 1480-1372

+3.3V — TP31
+5VRAW — TP51

WARNING 3.3Vmax on J7, J8, J9 Do not connect voltage sourcess greater than 3.3 V to GPIO pins as this may damage the BeagleBone CPU. These over-voltage sources include the VIN pin on the Arduino Shield connector and +5VRAW on TP51.

J5 — 1254-3475 — ANALOG IN POWER

J5	
A5	6
A4	5
A3	4
A2	3
A1	2
A0	1
VIN	8
GND	7
GND	6
3V3	5
RESET	4
3V3	3
AREF	2
	1

+VIN +5VSYS +3.3V +5V_RESET +3.3V — DCOM

+3.3VREF

SPI_MOSI_P SPI_MISO_P SPI_CLK_P SPI_CS_ADC

SPI_CS_ADC low (ADC I/O) disables ARDUINO SHIELD GP11-13 as outputs

Both SPI busses use the same 3 BB or Pi GPIOs for MOSI, MISO and CLK. Each SPI must be bit-banged after setting its CS. GP11/12/13 may be read anytime, but only writtten as outputs when the ADC is not being used.

ARDUINO-style SHIELD connections

DIGITAL (PWM*) — J9 — 1254-3475

J9	
0 Rx	1
1 Tx	2
2	3
3	4
4	5
5 PWM	6
6 PWM	7
7	8
8	9
9	10
10 CS	11
11 MOSI	12
12 MISO	13
13 CLK	14
GND	15
AREF	16
SDA	17
SCL	18

+3.3V — U10 — 1820-5788 MC74HC4066ADG — IC-Analog Switch QUAD CMOS 14-SOIC

Note: Labels on TP signals indicate additional connecteions:
TP10 and TP11 to XB Xbee Socket J106A
TP12 - TP 25 to BBBW and RPi CPUs

1480-1372 TP81

1480-1372															
TP10	TP11	TP12	TP13	TP14	TP15	TP16	TP17	TP18	TP19	TP20	TP21	TP22	TP23	TP24	TP25
GP0_RX_XB_DOUT	GP1_TX_XB_DIN	GP2	GP3	GP4	GP5_PWM	GP6_PWM	GP7	GP8	GP9	GP10_SPI_CS	GP11_SPI_MOSI	GP12_SPI_MISO	GP13_SPI_CLK	I2C1_SDA	I2C1_SCL
0 RX	1 TX	2	3	4	5 PWM	6 PWM	7	8	9	10 CS	11 MOSI	12 MISO	13 CLK	SDA	SCL

+3.3V — 10K R60 — GP10_SPI_CS

WARNING Do not connect voltages greater than 3.3 V to GPIO pins as this may damage the BeagleBone CPU. These over-voltage sources include +5VSYS on J10.

+3.3VREF — TP34 — 1480-1372

0700-1317 R33 0.1 — JP15 — TP33 — 1480-1372

V_SENSE — XJP15 0360-3164 — Jumper w Handle (default in place)

0699-3970 10K R13 — 10K R14 — I2C1_SDA — I2C1_SCL

+5VSYS — J10 — SSW-105-06-F-S 1254-3473 — +5V SYS A7 A6 A5 GND

+3.3VSENSOR SCL SDA GND — J11 — SSW-104-06-F-S 1254-3472

+3.3VSENSOR SPI_CS SPI_CLK SPI_MISO SPI_MOSI GND — J12 — SSW-106-06-F-S 1254-3474

GP10 SPI_CS GP13_SPI_CLK GP11_SPI_MOSI GP12_SPI_MISO

+3.3VSENSOR I2S_DATA I2S_WS I2S_CLK GND — J14 — SSW-105-06-F-S 1254-3473

1480-1372 TP80

Analog Regulator and ADC

IC Voltage Regulator low Dropout 3.3V 150mA 5-SOT-23
Reverse-protected VDO .2Vmax@10mA
TPS70933DBVR
1827-6584
U33

+5VSYS — 0161-3323 C52 X7R 25V 10% 1u — DCOM

R66 10K 0699-3970 RN66 — VR IN OUT EN NC GND — NC — C51 4.7u 0161-2203 — DCOM

+3.3VREF — C19 0161-1636 0.1u 50V — DCOM

1827-6510 MCP3208-CI/SL U7 ADC

VDD CH0 CH1 CH2 CH3 CH4 CH5 CH6 CH7 VREF AGND DGND CS/SHDN SCLK SDO SDI ADC

SPI_MOSI_P TP63 1480-1372
SPI_MISO_P TP62 1480-1372
SPI_CLK_P TP61 1480-1372
SPI_CS_ADC TP60 1480-1372

0.1u 50V C18 0161-1636 — DCOM

C33	C32	C17	C16	C15	C14	C13	C12
0.1u 50V	0.1u 50V	0.1u 50V	0.1u 50V	0.1u 50V	0.1u 50V	0.1u 50V	0.1u 50V
0161-1636	0161-1636	0161-1636	0161-1636	0161-1636	0161-1636	0161-1636	0161-1636

R5 33 0699-8895
R12 33 0699-8895
R8 33 0699-8895
R9 33 0699-8895
R10 33 0699-8895
R11 33 0699-8895
R18 33 0699-8895
R19 33 0699-8895

Buttons

Note B1 - B4 share GP7 - GP10 and a 100K pull up is connected to +3.3V on those pins.

+3.3V — 0699-3970 10K R21 — GP7 — 3101-4489 PTS641TK31SMTR2LFS B1 — DCOM
+3.3V — 0699-3970 10K R22 — GP8 — 3101-4489 PTS641TK31SMTR2LFS B2 — DCOM
+3.3V — 0699-3970 10K R23 — GP9 — 3101-4489 PTS641TK31SMTR2LFS B3 — DCOM
+3.3V — 0699-3970 10K R24 — GPB4 — 3101-4489 PTS641TK31SMTR2LFS B4 — DCOM

SYS RST — 3101-4489 PTS641TK31SMTR2LFS B6 — +3.3V — R6 100K 0699-6771 — SYS_RESET

SYS_RST is pulled up through 10K to +3.3V inside BeagleBone

PWR BTN — 3101-4489 PTS641TK31SMTR2LFS B7 — +3.3V — R7 100K 0699-6771 — PWRBTN

PWR_BTN is pulled up through 100K to +3.9V "always-on" inside BeagleBone

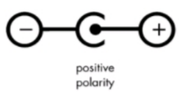
9 MAY 2018	SCHEMATIC, PWA	KEYSIGHT TECHNOLOGIES
START DATE	IOT EDUCATION KIT	
NARCISO, STEVE		
ENGINEER	TITLE	
DUEY, CHUCK	1	U3810-26501
DRAWN BY	BLOCKNAME	PART NUMBER
	1 OF 11	C – U3810-66501
	SHEET	DWG. NO.

CPU Console UARTSELect 0 and Education Kit Power

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

WARNING Do not connect voltages greater than 3.3 V to GPIO pins as this may damage the BeagleBone CPU. These over-voltage sources include VIN and DC Power connections.

VIN Connector Power



VIN from Arduino Shield

7 to 9 V Input at .5A

1253-6954
VIN DC Power 1
P1

Connector-DC Power Jack 3-POS Right-angle through-hole 16VDC 5A 1mm-Pin DIA
PJ-031CH
1253-8361
SOLAR/DC
J2

VIN DC Power 2.1mm-Pin DIA 1253-7634
Connector-DC Power Jack 3-Pin 13.5VDC 2.5A JAKDR-CNTT0210A
J1

Protect from reverse voltage
D2
1901-2271
B140-13-F

Iadj=130uAmax Iq=10mAmax
U1
1827-6509
NCP1117DT50G

C3 10u 0161-2112
C2 22u 0161-2111

1855-1690
P ENHANCEMENT MODE R(DS)_MIN=0.05
IRLML6401TRPBF Rds_max=.05ohm
Q1

R4 511K 0699-4010 1%

Triple Ideal Diode

! WARNING !
Supply power from one connection only.

Battery Power

1253-6954
P2
2.54mm BAT
3.7V LiPO Battery

2.0mm BAT
P3
PMH1
PMH2

0.1u 50V C1 0161-1636

NC NoConnU2
U2
PWR CONT
ENA STAT
INA OUTA
ENB
INB OUTB
GND
1827-6866
LTC4413EDD#PBF
Dual Ideal Diode .14ohm max w EN pulldowns

IC Power Supply Controller 2.5-5.5V input 2.6A dual 10-DFN

3.7/5V_TO_CPU

TP1 1480-1372
TP2 1480-1372
R1 0.1 0700-1317
JP1 1253-6954
XJP1 0360-3164 Black Jumper w Handle (default in place)

R2 1K
GREEN-SUPER BRIGHT LED 1990-3410
APT1608SGC LED1

C4 4.7u 0161-2203

TP3 1480-1372

+5VRAW

I2C EEPROMs

+3.3V
0.1u 50V C28 0161-1636
R61 10K
R62 10K
R63 10K
RN61 10K
RN62 10K
RN63 10K
I2CP_SCL
I2CP_SDA
U8
VCC
EEPROM 256K
SCL SDA
WP
A
GND
1819-0420
AT24C256C-SSHL-T
BB addr=010100111/57h

0.1u 50V C29 0161-1636
RN71 10K
RN72 10K
RN73 10K
R71 10K
R72 10K
R73 10K
U9
PI addr=01010000/50h

I2C LCD Display

+5VSYS
B140-13-F
D3
R217 220
Q17
SST3906T116
R227 10K 0699-3970
R41 10K
R42 10K
R3 10K
VDD
LCD MODULE
RST VOUT
SCL CAP1+
SDA CAP1-
A
K VSS
E2
C10 0161-0694
C11 1u
C30 0.1u 50V 0161-1636
addr=00111110/3Eh

Backlight LED ON threshold is 4.3V
Backlight LED Current
ILED = 0 for +5VRAW < 4.2V
ILED = 3mA for +5VRAW = 5V
2mA = (5 - .3 - .7 - .2 - 3.3)/220

Tri-Color LED

+3.3V
LED45
RED
GRN
BLU
R45 330 0699-7901
R46 330 0699-7901
R47 330 0699-7901
J45
1251-4670
68000-103HLF
1990-4140
HSMF-C118

LED Blue/Green/Red diffused 468nm/523nm/637nm IF-0.015A VF-3.9V BVR-5V SMT

USB Power (and Console UART)

Powering the U3810A from here instead of on the CPU board, permits current measurement of CPU and accessories at JP1. When this measurement is not required, the U3810A should be connected to the computer at the USB on the CPU instead, which then provides the RNDIS LAN connection.

Only one power connection is permitted.

Note: Some computer USB may not be able to supply sufficient current to power a Raspberry Pi.

E1

0.1u 50V C8 0161-1636

USB Power and Console UART 3
J15
PMH5 PMH6 PMH3 PMH4 PMH7 PMH8

TP41 USBD-
TP42 USBD+
TP43 1480-1372
1480-1372

C36 47p 0161-4666
C35 47p 0161-4666

R27 27
R26 27

0.1u 50V C9 0161-1636

CPU_Console_UART3.3V
U4
VCC
VCCIO
USB-UART
USBD
CBUS
RESET
3V3OUT
TXD
RXD
RTS
CTS
DTR
DSR
RI
DCD
GND
1822-5883
FT231XS-R

R15 330
R16 330
LED3 1990-3410 APT1608SGC GREEN-SUPER BRIGHT RX
LED4 1990-3417 APT1608YC YELLOW TX

RXD0
TXD0

To CPU Interface

MP2 LABEL 7121-8323
MP3 BARCODE SILK LBL 7121-7612

Taken from LTC's DC839 Demonstration Circuit, the Triple Input Ideal Diode features the LTC4413 dual Ideal Diode Controller with dual Integrated MOSFETs.

The circuit allows one of 3 sources to become the primary power source. Under certain circumstance, current sharing is possible among all power sources at any given time. However, only the 3.7V LiPo BAT and USB power inputs can share current equally given identical sources. Furthermore, only the 3.7V LiPo BAT and USB power inputs are protected from reverse current flow. The DC Power input FET Q1 is not driven as an Ideal Diode.

The DC Power input (Q1) will automatically come on when the voltage is high enough to pick up the load on Vout being supplied by the BAT input. The turn-on trip voltage will be Q1's internal diode drop above Vout. The LTC4413 will sense the drop in current the BAT input and turns on Q1 through it status output. Once Q1 is turned on, Q1's internal diode drop is eliminated creating a snap-on hysteresis effect. Likewise the snap action works in reverse once the WALL input voltage drops below the BAT input voltage allowing the BAT input to supply current to the load. The USB input has no influence over Q1's state unless the BAT input is reversed or disabled.

9 MAY 2018 START DATE	SCHEMATIC, PWA IOT EDUCATION KIT TITLE	KEYSIGHT TECHNOLOGIES
NARCISO, STEVE ENGINEER		
DUEY, CHUCK DRAWN BY	2 BLOCKNAME	U3810-26501 PART NUMBER
	2 OF 11 SHEET	C – U3810-66501 DWG. NO.

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

CPU XB Transceiver (UARTSELect 1)

+5VSYS
U101
R121 10K 0699-3970
RN121
DCOM
1827-6584 TPS70933DBVR
C102 4.7u 0161-2203
U102
0161-3323 C103 X7R 25V 10% 1u
R122 10K 0699-3970
RN122
TPS70933DBVR 1827-6584
IC Voltage Regulator low Dropout 3.3V 150mA 5-SOT-23
VDO .6Vmax Reverse Current Protection 100nAtyp

TP101 1480-1372
TP102 1480-1372
TP103 1480-1372
R101 0.1 0700-1317
JP101 XJP101 0360-3164 Jumper w Handle (default in place)
1253-6954
1571839-1

IC-Analog Switch QUAD CMOS 14-SOIC
MC74HC4066ADG IccX5<2uA at 25C
U105
1820-5788

3101-4489
PTS641TK31SMTR2LFS
RESETXB
B101
R111 100K 0699-6771 1%
XB_RESET

To CPU Interface
TXD1
RXD1

U104
MUXDX
4X1 4X2 4X3 EN4
1822-3858
R112 100K 0699-6771 1%
XB_3.3VCC

R102 220 0699-7887
LED102 1990-3417 APT1608YC YELLOW XB_RSSI
XB_USB_TXD
XB_USB_RXD
GP0_RX_XB_DOUT
GP1_TX_XB_DIN
to ARDUINO-style SHIELD connections

IccX4<8uA at 25C CD74HC4053M96
IC-Analog Multiplexer/Demultiplexer CMOS 16-SOIC

E101
9170-1585 MI0805K400R-10
0.1u C110 0161-1636
XB_5VUSB
R110 1K 0699-3947
LED110 1990-3410 APT1608SGC GREEN-SUPER BRIGHT
XB_VCC_AND_ENABLE_SERIAL
Discharge R
R107 100K 0699-6771 1%
R103 330 0699-7901
R104 330 0699-7901
LED103 1990-3410 APT1608SGC GREEN-SUPER BRIGHT XB_RX
LED104 1990-3417 APT1608YC YELLOW XB_TX
0.1u 50V C107 0161-1636
SQT-110-01-L-S 1254-3801 J106A
Xbee-style connections
Transceiver socket need associated part
J106B 1254-3801 SQT-110-01-L-S

J103
1254-2998 10103592-0001LF
R106 27 0699-7900
R105 27 0699-7900
C106 470 0161-4666
C105 470 0161-4666
Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row

U103
USB-UART
VCC VCCIO
USBD CBUS
RESET 3V3OUT
TXD RXD RTS CTS DTR DSR RI DCD GND
1822-5893 FT231XS-R
0.1u 50V C104 0161-1636

XB_USB_RTS
XB_USB_CTS
XB_USB_DTR
U105
1820-5788 MC74HC4066ADG

R115 220 0699-7887
XB_ASSOCIATE
LED115 1990-3408 APT1608SC RED - HIGH EFFICIENCY

XB_ON_SLEEP
XB_PWM1
XB_PWM0
XB_DTR-SLEEPREQ_DIO8
XB_DIO12
XB_CTS_DIO7
XB_RTS_DIO6
XB_DIO5
XB_AD3_DIO3
XB_AD2_DIO2
XB_AD1_DIO1
XB_AD0_DIO0
J107 1254-3475 SSW-108-06-F-S
J108 1254-3475 SSW-108-06-F-S

9 MAY 2018 START DATE	SCHEMATIC, PWA IOT EDUCATION KIT	KEYSIGHT TECHNOLOGIES
NARCISO, STEVE ENGINEER	TITLE	
DUEY, CHUCK DRAWN BY	3 BLOCKNAME	U3810-26501 PART NUMBER
	3 OF 11 SHEET	C – U3810-66501 DWG. NO.

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

CPU LoRa Transceiver (UARTSELect 2)

E206 8160-2081 SMS-458F — PMH1 PMH2 PMH3 PMH4 PMH5 PMH6 PMH7 PMH8 PMH9 PMH10 PMH11 PMH12 PMH13 PMH14 PMH15 PMH16 — DCOM

SMS-458C
XE206 8160-2082 — EMI Shield Cover

+5VSYS

U201 — VR — IN OUT EN GND NC — 1827-6584 TPS70933DBVR
R221 10K 0699-3970 — RN221 — DCOM
C202 4.7u 0161-2203 — DCOM

U202 — VR — IN OUT EN GND NC — TPS70933DBVR 1827-6584
IC Voltage Regulator low Dropout 3.3V 150mA 5-SOT-23
VDO .6Vmax Reverse Current Protection 100nAtyp
0161-3323 C203 X7R 25V 10% 1u — R222 10K 0699-3970 — RN222 — DCOM

TP201 1480-1372 — TP202 1480-1372 — TP203 1480-1372
R201 0.1 0700-1317
JP201 XJP201 0360-3164 — Jumper w Handle (default in place) 1252-6954 1571839-1

IC-Analog Switch QUAD CMOS 14-SOIC
MC74HC4066ADG IccL5<2uA at 25C
U205 — 1820-5788 — DCOM

3101-4489 PTS641TK31SMTR2LFS
RESETLoRa — B201 — LoRa_RESET — DCOM
R211 100K 0699-6771 1%

U206 NoConn 15 NC; 16 NC; 17 NC; 18 NC; 19 NC; 29 NC; 42 NC

To CPU Interface
TXD2
RXD2

U204 — MUXDX — 4X1 4X2 4X3 EN4 — 1/1 2/2 3/3 — 1822-3858
R212 100K 0699-6771 1%
LoRa_USB_TXD
LoRa_USB_RXD
LoRa_DIN
LoRa_DOUT
R202 220 0699-7887 — LED202 1990-3417 APT1608YC YELLOW LoRa_VIEWDL — DCOM
IccL4<8uA at 25C CD74HC4053M96
IC-Analog Multiplexer/Demultiplexer CMOS 16-SOIC

LoRa_3.3VCC

RFL — J433 — PMH1 PMH2 PMH3 PMH4 — 1250-4487 CONREVSMA003.062 — DCOM
R866 95.3 0699-7194 0603
RFH — J868 — PMH1 PMH2 PMH3 PMH4 — 1250-4487 CONREVSMA003.062 — DCOM
R865 82.5 0699-3922 0603 — DCOM
R867 82.5 0699-3922 0603 — DCOM

E201 — 9170-1585 MI0805K400R-10
0.1u C210 0161-1636 — DCOM
LoRa_5VUSB
R210 1K 0699-3947
LED210 1990-3410 APT1608SGC GREEN-SUPER BRIGHT — DCOM
LoRa_VCC_AND_ENABLE_SERIAL
R203 330 0699-7901 — LED203 1990-3410 APT1608SGC GREEN-SUPER BRIGHT LoRa_RX
R204 330 0699-7901 — LED204 1990-3417 APT1608YC YELLOW LoRa_TX
Discharge R
R207 100K 0699-6771 1% — DCOM

50V 0.1u C207 0161-1636 — DCOM
0.1u 50V C208 0161-1636 — DCOM

J203 — 1254-2998 10103592-0001LF — PMH5 PMH5 PMH4 PMH3 PMH2 PMH1
R206 27 0699-7900
R205 27 0699-7900
C206 470 0161-4666 — DCOM
C205 470 0161-4666 — DCOM
Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row

U203 — VCC VCCIO — USB-UART — USBD CBUS RESET 3V3OUT — TXD RXD RTS CTS DTR DSR RI DCD GND — 1822-5883 FT231XS-R
0.1u 50V C204 0161-1636 — DCOM

U205 — LoRa_USB_RTS — 1820-5788 MC74HC4066ADG
U205 — LoRa_USB_CTS — 1820-5788 MC74HC4066ADG
U205 — 1820-5788 MC74HC4066ADG — DCOM — DCOM
U205 — 1820-5788 MC74HC4066ADG
LoRa_AD11_DIO11
R215 220 0699-7887 — LED215 1990-3408 APT1608EC RED - HIGH EFFICIENCY — LoRa_DIO11 — DCOM

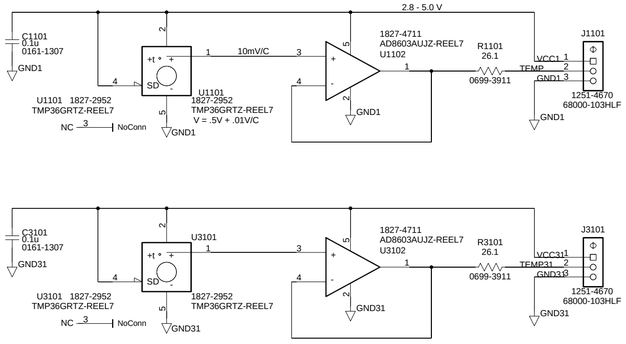
U206 IC Interface long-range-Transceiver-Module 47-SMT
RFH RFL VDD XCVR RESET PGC_INT PGD_INT UART_RX UART_TX UART_CTS UART_RTS RSVD1 RSVD2 GND GPIO
1822-6416 RN2483A-I/RM105 — DCOM
LoRa_VIEWDL_AD10_DIO10

J207 1254-3475 SSW-108-06-F-S — LoRa_3.3VCC LoRa_P6P_INT LoRa_P5C_INT LoRa_MOAUTISENS_AD13_DIO13 LoRa_MOOTMPSENS_AD12_DIO12 LoRa_WAKE_AD9_DIO11 LoRa_ADR_DO10 — DCOM
J208 1254-3475 SSW-108-06-F-S — LoRa_AD7_DIO7 LoRa_AD6_DIO6 LoRa_AD5_DIO5 LoRa_DIO4 LoRa_AD3_DIO3 LoRa_AD2_DIO2 LoRa_AD1_DIO1 LoRa_AD0_DIO0

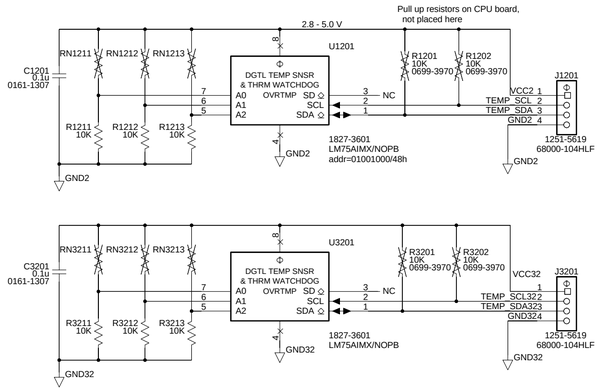
9 MAY 2018 (START DATE)	SCHEMATIC, PWA	KEYSIGHT TECHNOLOGIES
NARCISO, STEVE (ENGINEER)	IOT EDUCATION KIT (TITLE)	
DUEY, CHUCK (DRAWN BY)	4 (BLOCKNAME)	U3810-26501 (PART NUMBER)
	4 OF 11 (SHEET)	C – U3810-66501 (DWG. NO.)

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

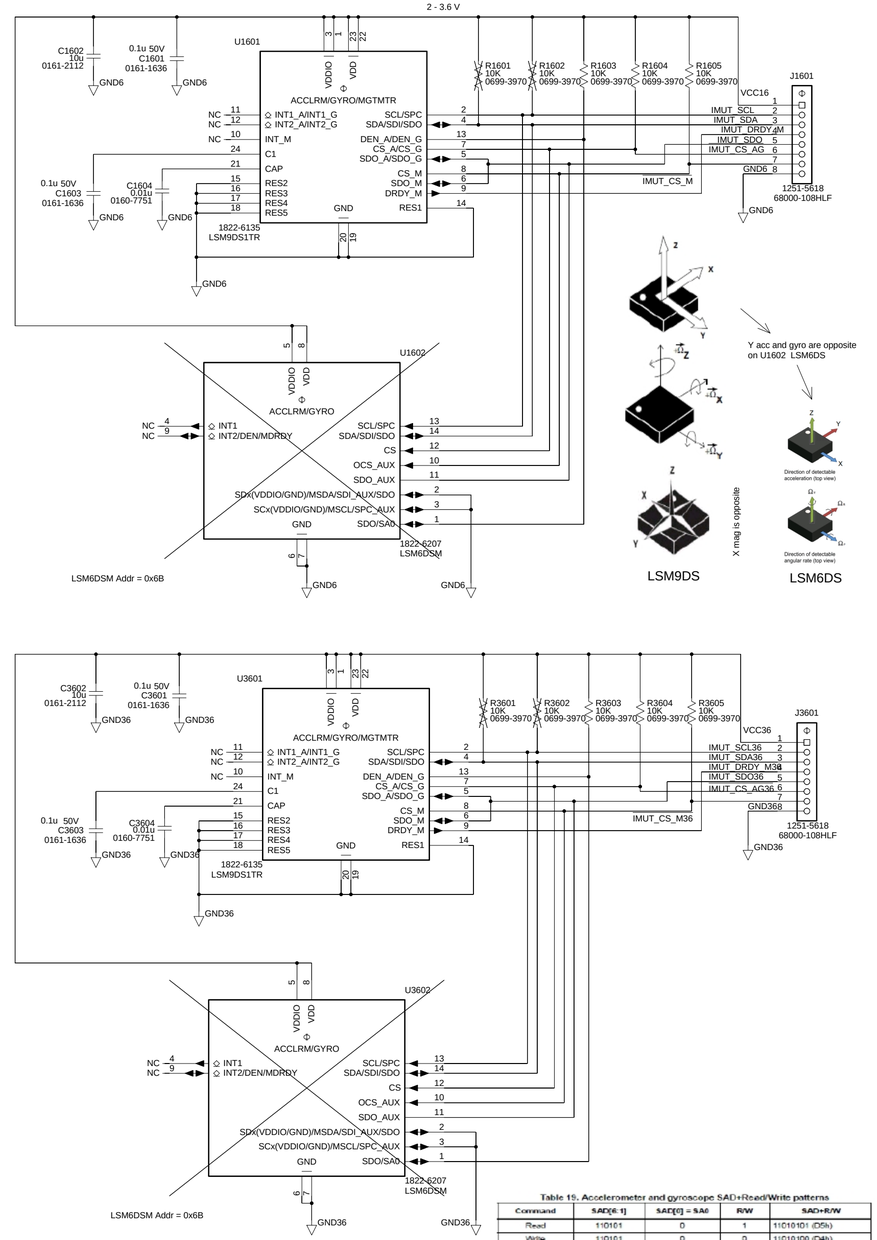
Analog Temperature Sensor



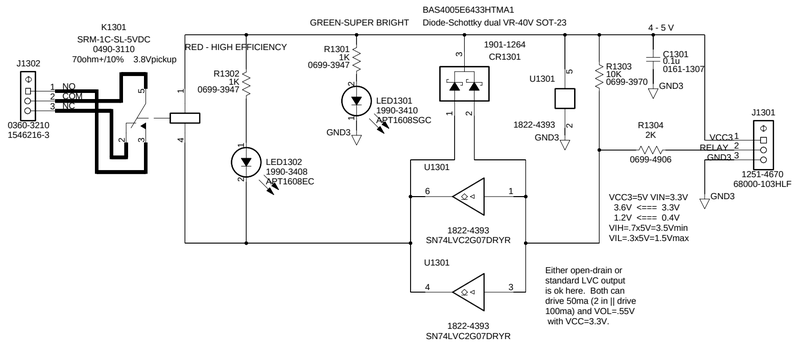
Digital Temperature Sensor



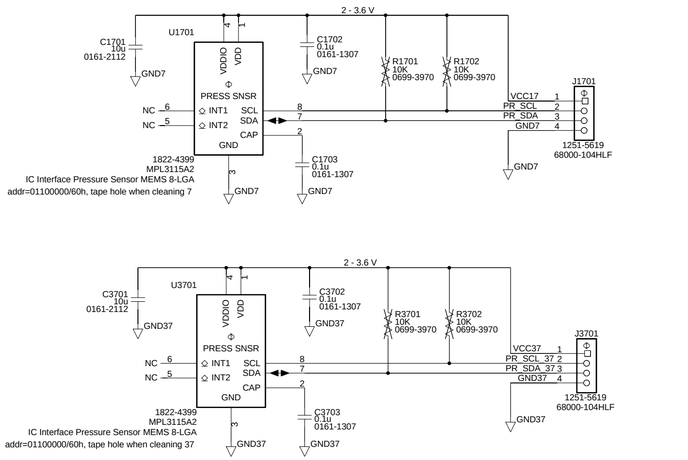
Inertial Measurement Unit (IMU)



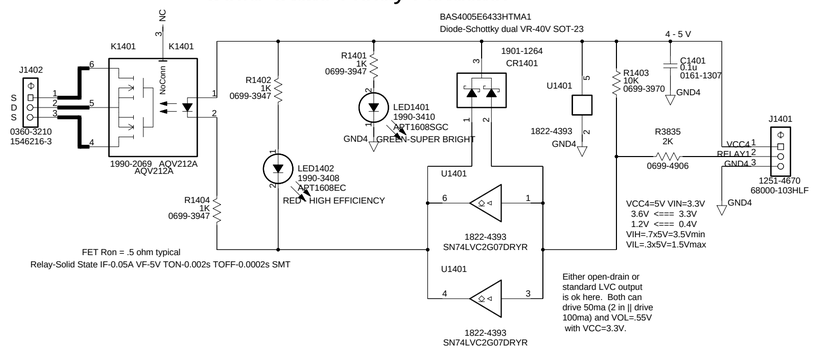
Relay Actuator



Digital Pressure Sensor



Solid-State Relay Actuator



PWM LPFs (fc = 160Hz)

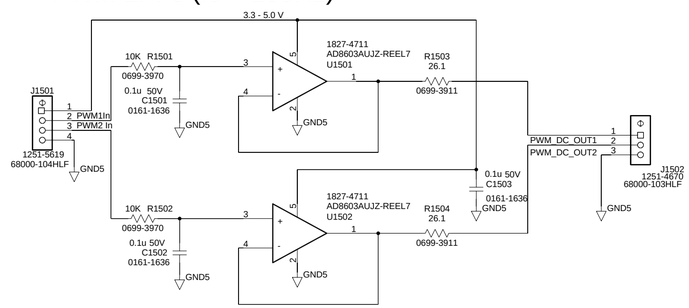


Table 19. Accelerometer and gyroscope SAD+Read/Write patterns

Command	SAD[6:1]	SAD[0] = SA0	R/W	SAD+R/W
Read	110101	0	1	11010101 (D5h)
Write	110101	0	0	11010100 (D4h)
Read	110101	1	1	11010111 (D7h)
Write	110101	1	0	11010110 (D6h)

Table 20. Magnetic sensor SAD+Read/Write patterns

Command	SAD[6:2]	SAD[1] – SDO/SA1	SAD[0]	R/W	SAD+R/W
Read	00111	0	0	1	00111001 (39h)
Write	00111	0	0	0	00111000 (38h)
Read	00111	1	0	1	00111101 (3Dh)
Write	00111	1	0	0	00111100 (3Ch)

9 MAY 2018 START DATE	SCHEMATIC, PWA IOT EDUCATION KIT	KEYSIGHT TECHNOLOGIES
NARCISO, STEVE ENGINEER	TITLE	
DUEY, CHUCK DRAWN BY	5 BLOCKNAME	U3810-26501 PART NUMBER
	5 OF 11 SHEET	C – U3810-66501 DWG. NO.

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

Current Sensor

Input

J1801
1254-3472
SSW-104-06-F-S
1 2 3 4
Iin
Iout
GND8

J1804
1251-4670
68000-103HLF
1 2 3
+VCC8
-VCC8
GND8

Iin

1A max

Iout

1A max
.1A max
10mA max
1mA max

200 / 20 / 2 / .2 Ohm Sense Resistor
(select shunt by removing resistors right-to-left)

R1803 200 0699-7585 0603 0.1% 0+-25ppm/deg C
R1802 22 0700-0836 0402 0.5% 0+-25ppm/deg C
R1801 2.2 0700-0880 0603 1% 0+-200ppm/deg C
R1800 0.22 0700-0433 0603 1% 0+-200ppm/deg C

RFI Suppression

R1811 200 0699-7585 0603 0.1% 0+-25ppm/deg C
R1812 200 0699-7585 0603 0.1% 0+-25ppm/deg C
C1801 47p 1% 0161-2119
C1800 470p 0160-7988
C1802 47p 1% 0161-2119
GND8

Instrumentation Amplifiers

Layout Note : Do not place under U1002

+VCC8
C1811 10u 0161-2112
C1812 0.1u 0161-1307
GND8

U1801
1827-6317
AD8227BRMZ
NC NC
Vout Offset max = .1mV x 5 = .5mV
G = 5

R1813 0700-0453 162 0.1% 0+-25ppm/deg C

U1802
1827-6317
AD8227BRMZ
G = 500

Vout Offset max
= .1mV x 500 = 50mV
(before adjustment)

Adjument Sensitivity =
1.5mV/150mVVcc or
3uV re Input

Offset Adjustment on High-Gain Amplifier

+VCC8
R1815 82K 0699-6248 1%
+50mV
R1816 1K 0699-3947 1%
R1819 10K 2100-4225
R1817 1K 0699-3947 1%
-50mV
R1818 82K 0699-6248 1%
GND8
1827-5204
OPA170AIDRLT
U1803
-VCC8

Output

Vout A = 5
Vout A = 500
J1802
1251-8626
67996-104HTLF
A1 A2 B1 B2
R1831 49.9 0.1% 0700-0582
R1832 49.9 0.1% 0700-0582

9140-2459
DCR_MAX=0.16
L1801
10uH
J1803
1 2 3 4 5
NC
PMH1 PMH2 PMH3 PMH4 PMH5 PMH6
1254-2998
10103592-0001LF
GND8

Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row

+5V to -4.5V Inverter

VOUT = – 1.22 V × (R1 + R2) / R2 = -1.22 x 370/100 = -4.5

1827-6313
LM27761DSGT
U1805
VOLT INV
VOUT VIN
VFB EN
CPOUT C1+
GND C1-
PMH1 PMH2

C1813 10u 0161-2112
C1814 0.1u 0161-1307
R1821 270K 0700-0268 1%
R1822 100K 0699-6771 1%
C1815 10u 0161-2112
C1820 1u 0161-0694
R1820 2.2 0700-0880 0603 1% 0+-200ppm/deg C
C1817 10u 0161-2112
C1818 0.1u 0161-1307
GND8

9 MAY 2018 (START DATE)	SCHEMATIC, PWA IOT EDUCATION KIT	KEYSIGHT TECHNOLOGIES
NARCISO, STEVE (ENGINEER)	(TITLE)	
DUEY, CHUCK (DRAWN BY)	6 (BLOCKNAME)	U3810-26501 (PART NUMBER)
	6 OF 11 (SHEET)	C – U3810-66501 (DWG. NO.)

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

2.4/20V, 600mA Buck-Boost DC/DC Converter with 1.6µA Quiescent Current and MPPC

Connector-DC Power Jack 3-POS Right-angle through-hole 16VDC 5A 1mm-Pin DIA
PJ-031CH
1253-8361
SOLAR/DC
P1902
GND191
2.4/20Vin
TP1901 1480-1372
TP1902 1480-1372
R1901 0.1
0700-1317
JP1901
1253-6954
1571839-1
Bulk Input Capacitor
0161-2111 C1901 X7R 25V 10% 22u GRM32ER71E226KE15L
C1902 22u
C1903 22u
C1904 22u
GND191
XJP1901 0360-3164 _ Jumper w Handle (default in place)
1571839-1
1253-6954
P1901
Protect from reverse voltage
D901
1901-2271
B140-13-F
DCDCIn
GND191
TP1903 1480-1372
GND191
J1902
NC
NC
NC
PMH6
PMH5
PMH4
PMH3
PMH2
PMH1
1254-2998
10103592-0001LF
GND191
Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row

long trace between capacitors and both capacitors should be placed near IC

R1902 2MEG 0699-8131
C1905 X7R 25V 10% 1u
C1906 1u
GND191
IC DC-DC Converter Buck-Boost 2.4-25V input 1-25V output 0.6A 20-QFN
LTC3130IUDC#PBF
1827-6494
U1901
XAL4030-682MEC
9140-6954
L1901 6.8uH
0161-1636 C1907 50V 0.1u
0161-1636 C1908 50V 0.1u
PVIN DC/DC BST1
VIN SW1
RUN SW2
MPPC BST2
MODE VOUT
ILIM EXTVCC
VCC FB
NC PGOOD
GND PGND
JP1902
RUN up
STOP down
DCDC_RUN
1251-4670
68000-103HLF
GND191
XJP1902 0360-3164 _ Jumper w Handle (default up)
DCDC_MODE
DCDC_VCCout
R1903 348K 0699-4006
R1904 1MEG 2100-4696
R1905 90.9K 0699-3992
DCDC_MPPC_OP
GND191
If the divider voltage drops below 1.0V, the inductor current will be reduced to serve VIN to the programmed minimum voltage, as set by the divider. Set divider to 75% of solar panel Voc (open circuit voltage).
MPPC Operating Point range:
1.13V up
16V down
R1906 1.21MEG 0700-2605 1%
JP1903
Mode:
FIXED FREQ up
BURST enable down
1251-4670
68000-103HLF
C1909 16V 4.7u 0161-2203
GND191
XJP1903 0360-3164 _ Jumper w Handle (default up)
DCDC_PGOOD
TP1904 DCDC_PGOOD 1480-1372
JP1904
Inductor Current Limit
660mA (min) up
250mA (min) down
DCDC_ilim
1251-4670
68000-103HLF
GND191
XJP904 0360-3164 _ Jumper w Handle (default up)
R1914 2MEG 0699-8131 1%
R1913 1.47MEG 0700-1155 1%
R1912 511K 0699-4010 1%
R1911 348K 0699-4006 1%
JP1906
Vout setting
3.7V up
5.0V open
11V down
1251-4670
68000-103HLF
XJP1906 0360-3164 _ Jumper w Handle (default open/pin 1 only)
DCDC_Vout
0161-3323 C1913 1u 10% 25V
C1910 22u
C1911 22u
0161-2111 C1912 22u 10% 25V
XP1906 0360-3164 Jumper w Handle (default in place)
XP1926 0360-3164 Jumper w Handle (default in place)
DCDCOut CHARGERIn
A1 A2 B1 B2
1251-8026
67996-104HTLF
P1906
2.7/20Vin
GND192

2.7/20V, 250mA Linear Charger with 4uA Quiescent Current

J1921
Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row
NC
NC
NC
PMH6
PMH5
PMH4
PMH3
PMH2
PMH1
1254-2998
10103592-0001LF
GND192
TP1921 1480-1372
TP1922 1480-1372
R1921 0.1
0700-1317
CHGR_IN
JP1921
1253-6954
1571839-1
XJP1921 0360-3164 _ Jumper w Handle (default in place)
R1920 3.09K 0700-2627
LED1921
1990-3410
APT1608SGC
GREEN-SUPER BRIGHT
0161-3323 C1921 X7R 25V 10% 1u
GND192
BTRY PROG
IN BAT
EN FB
CHRG FBG
TIMER NTCBIAS
GND NTC
CHGR_TIMER
Time Limit = 68nF/18.2nF/Hr = 4 Hr
C1922 0.068u
GND192
U1921
1827-6712
LTC4079EDD#TRPBF
IC Linear Charger 2.7-60V input 250mA single 10-DFN
GND192
TP1924 CHGR_MON 1480-1372
R1924 120K 0700-2393
JP1923
Charge Current CHGR_MON
up 100mA 12 mV/mA
open 2.5mA 480 mV/mA
down 250mA 4.8 mV/mA
1251-4670
68000-103HLF
XJP1923 0360-3164 _ Jumper w Handle (default up, 100 mA)
CHGR_PROG
R1925 120K 0700-2393
R1927 3.01K 0699-4746
R1926 1.21K 0699-3949
GND192
Keep this trace as short as possible
TP1925 TP1926 1480-1372 1480-1372
R1929 0.1 0700-1317
CHGR_BAT
CHGR_OUT
JP1922
1253-6954
1571839-1
XJP1922 0360-3164 _ Jumper w Handle (default in place)
1571839-1
1253-6954
P1926
Connector-Header Vertical through-hole 2-Pin 2.54mm 1-Row
BAT+
BAT -
2.54mm BAT
GND192
Connector-Header Vertical SMT 2-Pin 2mm 100V 2A 1-Row
2.0mm BAT 19
P1927
PMH1
PMH2
BAT+
BAT -
1253-6640
B2B-PH-SM4-TB(LF)(SN)
GND192
TP1927 1480-1372
GND192
R1934 2MEG 0699-8131 1%
R1933 825K 0699-4014 1%
R1932 715K 0700-4714 1%
R1931 383K 0699-4007 1%
CHGR_FB (1.17V)
CHGR_FBG
JP1924
Vchg setting
up 3.3V
open 4.2V
down 9.8V
1251-4670
68000-103HLF
XJP1924 0360-3164 _ Jumper w Handle (default open/pin1 only)
VCHG = 1.17V x (1 + R1/(R2+160))
NTCBIAS
R1922 100K 0699-6771
NTC
R1923 100K 0699-6771
GND192
CHGR_NTC TP1928 1480-1372
JP1925
NTC setting
up External NTC (100Kohm @ 25C)
down Charge without NTC connected
1251-4670
68000-103HLF
XJP915 0360-3164 _ Jumper w Handle (default down)

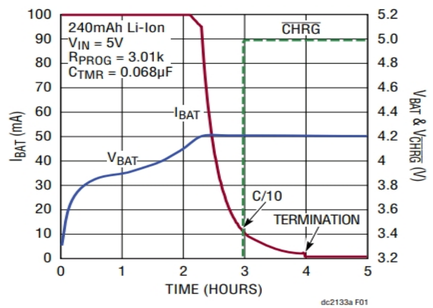


Figure 1. Typical Battery Charge Cycle

Note: DC/DC Converter Output Voltage JP1906 must be set higher than Charger Output JP1924

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THIS DOCUMENT AND ANY ASSOCIATED DATA CONTAIN CONFIDENTIAL INFORMATION THAT IS KEYSIGHT TECHNOLOGIES PROPERTY. ONLY DISCLOSE OR DUPLICATE FOR OTHERS AS AUTHORIZED BY KEYSIGHT TECHNOLOGIES.	START DATE	IOT EDUCATION KIT	
	NARCISO, STEVE ENGINEER	TITLE	
	DUEY, CHUCK DRAWN BY	7 BLOCKNAME	U3810-26501 PART NUMBER
		7 OF 11 SHEET	C – U3810-66501 DWG. NO.

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

XB1 Transceiver

Battery connections are provided to allow stand alone operation without a USB connection once the transceiver is configured. The Voltage Regulators (with reverse current protection) and Analog Switches disconnect USB power and serial circuits from the transceiver when the USB connection is removed to maximize battery life and so that accurate transceiver current consumption can be measured.

Battery Holder ASSY 3-VOLT LITHIUM CELL PCB-mounting 1.256-in-LG 630-mil-Wide 217-mil-HT Phosphor Bronze Nickel plated
J2101 BATTERY HOLDER
1400-3164
CR2032 Battery may be used when other supplies are disconnected

Connector-Header Vertical through-hole 2-Pin 2.54mm 1-Row
1571839-1
1253-6954
P2101
BAT+
BAT-
2.54mm BAT
C2101 0161-3323 1u 10% 25V X7R 08053C105KAT2A

2.0mm BAT 21
P2102
PMH1
PMH2
1253-6540
B2B-PH-SM4-TB(LF)(SN)
Connector-Header Vertical SMT 2-Pin 2mm 100V 2A 1-Row

3.7/4.2Vin
R2121 10K 0699-3970
RN2121
U2101 VR IN OUT EN GND NC
1827-6584 TPS70933DBVR

2.7/3.6VinXB1
TP2101 1480-1372
TP2102 1480-1372
TP2103 1480-1372
R2101 0.1 0700-1317
JP2101 1253-6954 1571839-1
XJP2101 _ 0360-3164 | Jumper w Handle (default in place)
TP2100 1480-1372
C2102 4.7u 0161-2203

IC-Analog Switch QUAD CMOS 14-SOIC MC74HC4066ADG IccX14<2uA at 25C
IC-Analog Switch QUAD CMOS 14-SOIC MC74HC4066ADG IccX15<2uA at 25C
U2104 1820-5788
U2105 1820-5788
Analog Switches disconnect serial communication to transceiver when USB connection is removed so that accurate transceiver current consumption can be measured.

3101-4489 PTS641TK31SMTR2LFS
RESETXB1
B2101
R2111 100K 0699-6771 1%
XB1_RESET

U2102 VR IN OUT EN GND NC
0161-3323 C2103 X7R 25V 10% 1u
R2122 10K 0699-3970
RN2122
TPS70933DBVR 1827-6584
IC Voltage Regulator low Dropout 3.3V 150mA 5-SOT-23
VDO .6Vmax Reverse Current Protection 100nAtyp

R2102 220 0699-7887
LED2102 1990-3417 APT1608YC YELLOW XB1_RSSI
R2112 100K 0699-6771 1%
XB1_DIN
XB1_USB_TXD
XB1_DOUT
XB1_USB_RXD
XB1_USB_RTS
XB1_USB_CTS
XB1_USB_DTR

E2101
9170-1585 MI0805K400R-10
XB1_5VUSB
0.1u 50V C2110 0161-1636
R2110 1K 0699-3947
LED2110 1990-3410 APT1608SGC GREEN-SUPER BRIGHT
XB1_VCC_AND_ENABLE_SERIAL
R2103 330 0699-7901
R2104 330 0699-7901
Discharge R
R2107 100K 0699-6771 1%
LED2103 1990-3410 APT1608SGC GREEN-SUPER BRIGHT XB1_RX
LED2104 1990-3417 APT1608YC YELLOW XB1_TX

XB1_3.3VCC
0.1u 50V C2107 0161-1636
SQT-110-01-L-S 1254-3801 J2106A
Xbee-style connections
J2106B 1254-3801 SQT-110-01-L-S
Transceiver socket need associated part
XB1_ON_SLEEP
XB1_PWM1
XB1_PWM0
XB1_DTR_SLEEPREQ_DIO8
XB1_DIO12
XB1_CTS_DIO7
XB1_RTS_DIO6
XB1_ASSO_DIO5
XB1_RSSI
XB1_ADC3_DIO3
XB1_ADC2_DIO2
XB1_ADC1_DIO1
XB1_ADC0_DIO0
J2107 1254-3475 SSW-108-06-F-S
J2108 1254-3475 SSW-108-06-F-S

J2103
1254-2998 10103592-0001LF
PMH6 PMH5 PMH4 PMH3 PMH2 PMH1
Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row
C2106 47p 0161-4666
C2105 47p 0161-4666
R2106 27 0699-7900
R2105 27 0699-7900
0.1u 50V C2104 0161-1636

U2103 USB-UART
VCC VCCIO USBD CBUS RESET 3V3OUT TXD RXD RTS CTS DTR DSR RI DCD GND
1822-5883 FT231XS-R

R2115 220 0699-7887
XB1_ASSOCIATE
LED2115 1990-3408 APT1608EC RED - HIGH EFFICIENCY

KEYSIGHT CONFIDENTIAL	9 MAY 2018	SCHEMATIC, PWA IOT EDUCATION KIT	KEYSIGHT TECHNOLOGIES
THIS DOCUMENT AND ANY ASSOCIATED DATA CONTAIN CONFIDENTIAL INFORMATION THAT IS KEYSIGHT TECHNOLOGIES PROPERTY. ONLY DISCLOSE OR DUPLICATE FOR OTHERS AS AUTHORIZED BY KEYSIGHT TECHNOLOGIES.	START DATE	TITLE	
	NARCISO, STEVE		U3810-26501
	ENGINEER		PART NUMBER
	DUEY, CHUCK	8	C – U3810-66501
	DRAWN BY	BLOCKNAME	DWG. NO.
		8 OF 11	
		SHEET	

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

XB2 Transceiver

Battery connections are provided to allow stand alone operation without a USB cobnnection once the transceiver is configured. The Voltage Regulators (with reverse current protection) and Analog Switches disconnect USB power and serial circuits from the transceiver when the USB connection is removed to maximize battery life and so that accurate transceiver current consumption can be measured.

Battery Holder ASSY 3-VOLT LITHIUM CELL PCB-mounting 1.256-in-LG 630-mil-Wide 217-mil-HT Phosphor Bronze Nickel plated
J2201
1400-3164
CR2032 Battery may be used when other supplies are disconnected

Connector-Header Vertical through-hole 2-Pin 2.54mm 1-Row
1571839-1
1253-6954
P2201
2.54mm BAT
C2201 0161-3323 1u 10% 25V X7R 08053C105KAT2A

2.0mm BAT 22
P2202
1253-6640
B2B-PH-SM4-TB(LF)(SN)
Connector-Header Vertical SMT 2-Pin 2mm 100V 2A 1-Row

U2201
VR
IN OUT EN GND NC
1827-6584
TPS70933DBVR

TP2201 TP2202 TP2203 TP2200 1480-1372
2.7/3.6VinXB2
R2201 0.1 0700-1317
JP2201 XJP2201 _ 0360-3164 Black Jumper w Handle (default in place)
1253-6954
1571839-1
C2202 4.7u 0161-2203

IC-Analog Switch QUAD CMOS 14-SOIC MC74HCC4066ADG IccX24<2uA at 25C
IC-Analog Switch QUAD CMOS 14-SOIC MC74HC4066ADG IccX25<2uA at 25C
U2204 U2205
1820-5788

Analog Switches disconnect serial communication to transceiver when USB connection is removed so that accurate transceiver current consumption can be measured.

3101-4489
PTS641TK31SMTR2LFS
RESETXB2
B2201
R2211 100K 0699-6771 1%
XB2_RESET

U2202
VR
IN OUT EN GND NC
TPS70933DBVR 1827-6584
IC Voltage Regulator low Dropout 3.3V 150mA 5-SOT-23
VDO .6Vmax Reverse Current Protection 100nAtyp
0161-3323 C2203 X7R 25V 10% 1u 08053C105KAT2A
R2222 10K 0699-3970
RN2222

R2202 220 0699-7887
LED2202 1990-3417 APT1608YC YELLOW XB2_RSSI
R2212 100K 0699-6771 1%
XB2_DIN

E2201
9170-1585 MI0805K400R-10
XB2_5VUSB
0.1u 50V C2210 0161-1636
R2210 1K 0699-3947
LED2210 1990-3410 APT1608SGC GREEN-SUPER BRIGHT

XB2_VCC_AND_ENABLE_SERIAL
R2203 330 0699-7901
R2204 330 0699-7901
Discharge R
R2207 100K 0699-6771 1%
LED2203 1990-3410 APT1608SGC GREEN-SUPER BRIGHT XB2_RX
LED2204 1990-3417 APT1608YC YELLOW XB2_TX

XB2_USB_TXD
XB2_USB_RXD
XB2_USB_RTS
XB2_USB_CTS
XB2_USB_DTR
XB2_DOUT
XB2_3.3VCC
0.1u 50V C2207 0161-1636

J2203
1254-2998 10103592-0001LF
PWR6 PWR5 PWR4 PWR3 PWR2 PWR1
R2206 27 0699-7900
R2205 27 0699-7900
C2206 47p 0161-4666
C2205 47p 0161-4666

U2203
VCC VCCIO
USB-UART
USBD CBUS
RESET
3V3OUT
TXD RXD RTS CTS DTR DSR RI DCD GND
1822-5883
FT231XS-R
0.1u 50V C2204 0161-1636

SQT-110-01-L-S 1254-3801 J2206A
Xbee-style connections
11 20
10 1
Transceiver socket need associated part
J2206B 1254-3801 SQT-110-01-L-S
NC

XB2_3.3VCC XB2_ON_SLEEP XB2_PWM1 XB2_PWM0 XB2_DTR_SLEEPREQ_DIO8 XB2_DIO12
XB2_CTS_DIO7 XB2_RTS_DIO6 XB2_Assoc_DIO5 XB2_DIO4 XB2_AD3_DIO3 XB2_AD2_DIO2 XB2_AD1_DIO1 XB2_AD0_DIO0
J2207 1254-3475 SSW-108-06-F-S
J2208 1254-3475 SSW-108-06-F-S

Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row

R2215 220 0699-7887
XB2_ASSOCIATE
LED2215 1990-3408 APT1608EC RED - HIGH EFFICIENCY

9 MAY 2018 START DATE	SCHEMATIC, PWA IOT EDUCATION KIT	KEYSIGHT TECHNOLOGIES
NARCISO, STEVE ENGINEER	TITLE	
DUEY, CHUCK DRAWN BY	9 BLOCKNAME	U3810-26501 PART NUMBER
	9 OF 11 SHEET	C – U3810-66501 DWG. NO.

LoRa1 Transceiver

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

Battery connections are provided to allow stand alone operation without a USB cobnnection once the transceiver is configured. The Voltage Regulators (with reverse current protection) and Analog Switches disconnect USB power and serial circuits from the transceiver when the USB connection is removed to maximize battery life and so that accurate transceiver current consumption can be measured.

Battery Holder ASSY 3-VOLT LITHIUM CELL PCB-mounting 1.256-in-LG 630-mil-Wide 217-mil-HT Phosphor Bronze Nickel plated
J2301 BATTERY HOLDER
1400-3164
CR2032 Battery may be used when other supplies are disconnected

Connector-Header Vertical through-hole 2-Pin 2.54mm 1-Row
1571839-1
1253-6954
P2301
BAT+ BAT-
2.54mm BAT
C2301 0161-3323 1u 10% 25V X7R 08053C105KAT2A

2.0mm BAT 23
P2302
PMH1 PMH2
BAT+ BAT-
1253-6640
B2B-PH-SM4-TB(LF)(SN)
Connector-Header Vertical SMT 2-Pin 2mm 100V 2A 1-Row

3.7/4.2VinLoRa1
R2321 10K 0699-3970
RN2321
U2301 VR IN OUT EN GND NC
1827-6584 TPS70933DBVR
2.7/3.6VinLoRa1
TP2301 TP2302 TP2303 1480-1372
R2301 0.1 0700-1317
JP2301 1253-6954 1571839-1
XJP2301 0360-3164 Jumper w Handle (default in place)
TP2300 1480-1372
C2302 4.7u 0161-2203

U2302 VR IN OUT EN GND NC
0161-3323 C2303 X7R 25V 10% 1u 08053C105KAT2A
R2322 10K 0699-3970
RN2322
TPS70933DBVR 1827-6584
IC Voltage Regulator low Dropout 3.3V 150mA 5-SOT-23
VDO .6Vmax Reverse Current Protection 100nAtyp

E2301
9170-1585 MI0805K400R-10
0.1u 50V C2310 0161-1636
R2310 1K 0699-3947
LED2310 1990-3410 APT1608SGC GREEN-SUPER BRIGHT
LoRa1_5VUSB

J2303
1254-2998 10103592-0001LF
Connector micro-USB Receptacle type-B Reverse Right-angle SMT 5-POS 0.65mm 100VAC 1-Row
R2306 27 0699-7900
R2305 27 0699-7900
C2306 47p 0161-4666
C2305 47p 0161-4666
0.1u 50V C2304 0161-1636

U2303 VCC VCCIO USB-UART USBD CBUS RESET 3V3OUT TXD RXD RTS CTS DTR DSR RI DCD GND
1822-5883 FT231XS-R
LoRa1_VCC_AND_ENABLE_SERIAL
R2303 330 0699-7901
R2304 330 0699-7901
LED2303 1990-3410 APT1608SGC GREEN-SUPER BRIGHT LoRa1_RX
LED2304 1990-3417 APT1608YC YELLOW LoRa1_TX
Discharge R
R2307 100K 0699-6771 1%

IC-Analog Switch QUAD CMOS 14-SOIC MC74HC4066ADG IccL14<2uA at 25C
IC-Analog Switch QUAD CMOS 14-SOIC MC74HC4066ADG IccL15<2uA at 25C
U2304 U2305 1820-5788 MC74HC4066ADG
Analog Switches disconnect serial communication to transceiver when USB connection is removed so that accurate transceiver current consumption can be measured.

3101-4489 PTS641TK31SMTR2LFS B2301
RESETLoRa1
R2311 100K 0699-6771 1%
LoRa1_RESET

R2302 220 0699-7887
LED2302 1990-3417 APT1608YC YELLOW LoRa1_VIEWDL
R2312 100K 0699-6771 1%
LoRa1_USB_TXD LoRa1_DIN
LoRa1_USB_RXD LoRa1_DOUT
LoRa1_USB_RTS
LoRa1_USB_CTS
LoRa1_VIEWDL_AD10_DIO10
LoRa1_AD11_DIO11
R2315 220 0699-7887
LED2315 1990-3410

U2306 NoConn 15 16 17 18 19 29 42 NC

LoRa1_3.3VCC
RFL1 J2433 PMH1 PMH2 PMH3 PMH4 1250-4487 CONREVSMA003.062
R2366 95.3 0699-7194 0603
R2365 82.5 0699-3922 0603
R2367 82.5 0699-3922 0603
RFL1 J2868 PMH1 PMH2 PMH3 PMH4 1250-4487 CONREVSMA003.062
50V 0.1u C2307 0161-1636
0.1u 50V C2308 0161-1636
IC Interface long-range-Transceiver-Module 47-SMT
U2306 RFH RFL RESET PGC_INT PGD_INT UART_RX UART_TX UART_CTS UART_RTS RSVD1 RSVD2 VDD XCVR GPIO GND
1822-6416 RN2483A-I/RM105
LoRa1_3.3VCC LoRa1_PGC_INT LoRa1_MODLTESENS_AD13_DIO13 LoRa1_MODTMPSNS_AD12_DIO12 LoRa1_WAKE_AD09_DIO9 LoRa1_AD8_DIO8
LoRa1_AD7_DIO7 LoRa1_AD6_DIO6 LoRa1_AD5_DIO5 LoRa1_AD4_DIO4 LoRa1_AD3_DIO3 LoRa1_AD2_DIO2 LoRa1_AD1_DIO1 LoRa1_AD0_DIO0
J2307 1254-3475 SSW-108-06-F-S
J2308 1254-3475 SSW-108-06-F-S

E2306 8160-2081 SMS-458F PMH1 PMH2 PMH3 PMH4 PMH5 PMH6 PMH7 PMH8 PMH9 PMH10 PMH11 PMH12 PMH13 PMH14 PMH15 PMH16 PMH17 PMH18 PMH19 PMH20
SMS-458C XE2306 8160-2082 EMI Shield Cover

3-Way RF Power Splitter with 30dB Loss

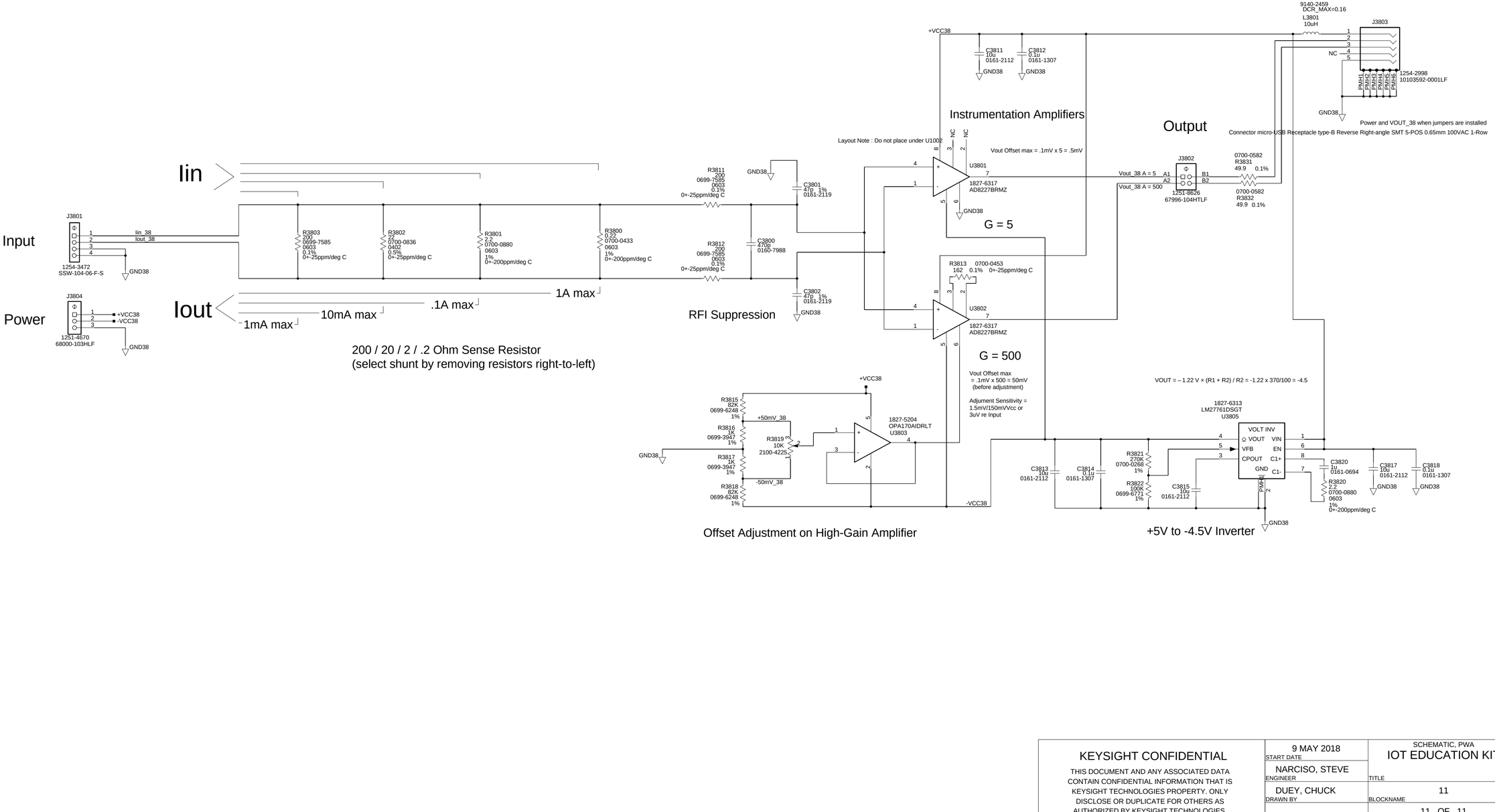
P2403 1250-2423 142-0801-811 Connector-RF SMA Plug Edge-mount SMT 50-Ohm 18GHz
R2431 82.5 0699-3922 0603
R2432 95.3 0699-7194 0603
R2433 82.5 0699-3922 0603
R2403 16.2 0699-3906 0603
R2412 95.3 0699-7194 0603
R2401 16.2 0699-3906 0603
R2402 16.2 0699-3906 0603
R2422 95.3 0699-7194 0603
P2401 P2402 PMH1 PMH2 PMH3 PMH4 1250-4487 CONREVSMA003.062
R2411 82.5 0699-3922 0603
R2413 82.5 0699-3922 0603
R2423 82.5 0699-3922 0603
R2421 82.5 0699-3922 0603

E2406 8160-2047 SMS-456F PMH1 PMH2 PMH3 PMH4 PMH5 PMH6 PMH7 PMH8 PMH9 PMH10 PMH11 PMH12 PMH13 PMH14 PMH15 PMH16 PMH17 PMH18 PMH19
EMI-Shield Frame 1.543X0.835X0.286-in SMT Steel Pre-tin plated finish information pending SHIELD-39.19X21.21-18
SMS-456C XE2406 8160-2048 EMI-Shield Cover

9 MAY 2018 START DATE	SCHEMATIC, PWA IOT EDUCATION KIT	KEYSIGHT TECHNOLOGIES	
NARCISO, STEVE ENGINEER	TITLE		
DUEY, CHUCK DRAWN BY	10 BLOCKNAME	U3810-26501 PART NUMBER	
	10 OF 11 SHEET	C – U3810-66501 DWG. NO.	

REVISIONS
SEE PAGE 1 FOR REVISION HISTORY

Current Sensor spare



9 MAY 2018 (START DATE)	SCHEMATIC, PWA		KEYSIGHT TECHNOLOGIES
NARCISO, STEVE (ENGINEER)	IOT EDUCATION KIT (TITLE)		
DUEY, CHUCK (DRAWN BY)	11 (BLOCKNAME)	U3810-26501 (PART NUMBER)	
	11 OF 11 (SHEET)	C – U3810-66501 (DWG. NO.)	