IMPORTANT: FOR USE WITH EchoPilot AI REV 1B OR NEWER

B2BConnector

File: B2BConnector.kicad_sch

MainPower

File: MainPower.kicad_sch

Connectors

File: Connectors.kicad_sch

M.2

File: M2.kicad_sch

External INS

File: external_ins_interface.kicad_sch

USB3

File: USB3.kicad_sch

J1 Conn_01x01
J2 Conn_01x01
J3 Conn_01x01
J4 Conn_01x01
GND GND GND GND

FID1 Fiducial
FID2 Fiducial
FID3 Fiducial
FID4 Fiducial
FID5 Fiducial
FID6 Fiducial

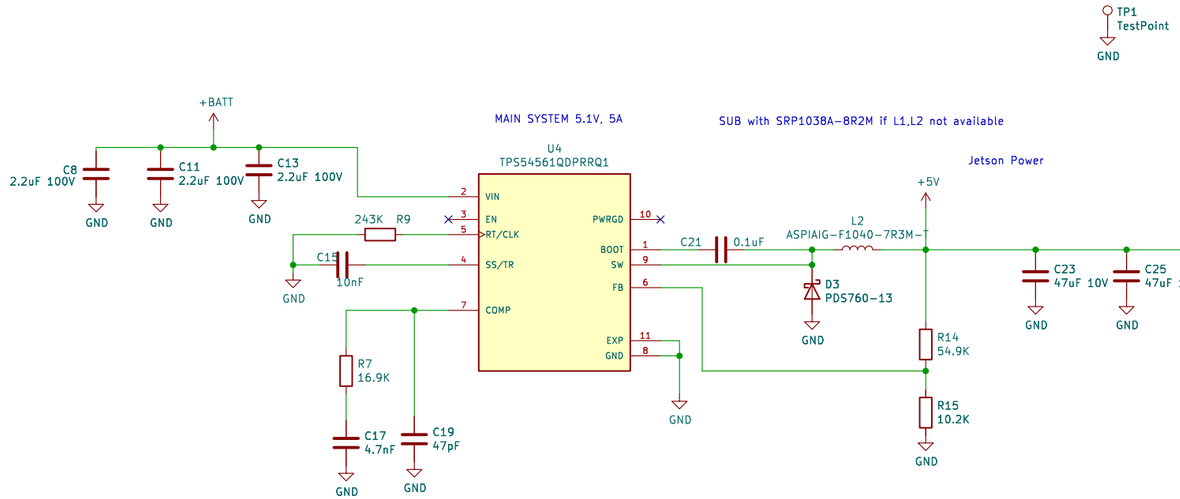
Echo MAV, LLC

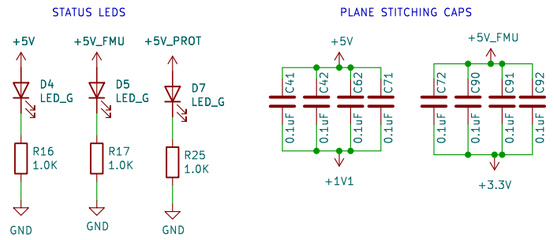
Sheet: /

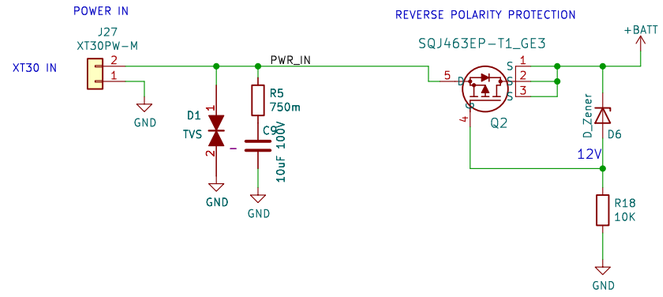
File: echopilot_ai_carrier.kicad_sch

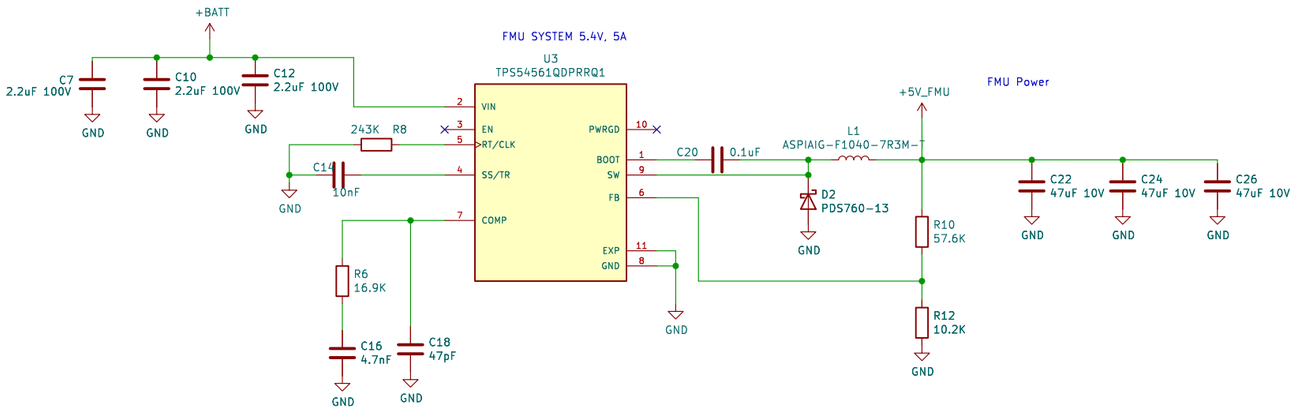
**Title: EchoPilot Carrier**

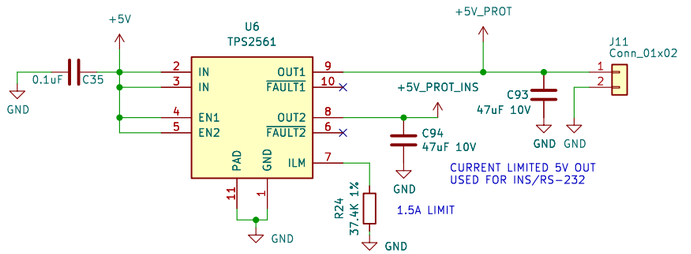
| | | |
|---|---|---|
| Size: B | Date: 2021-03-23 | **Rev: 1** |
| KiCad E.D.A. kicad 7.0.10 | | Id: 1/7 |

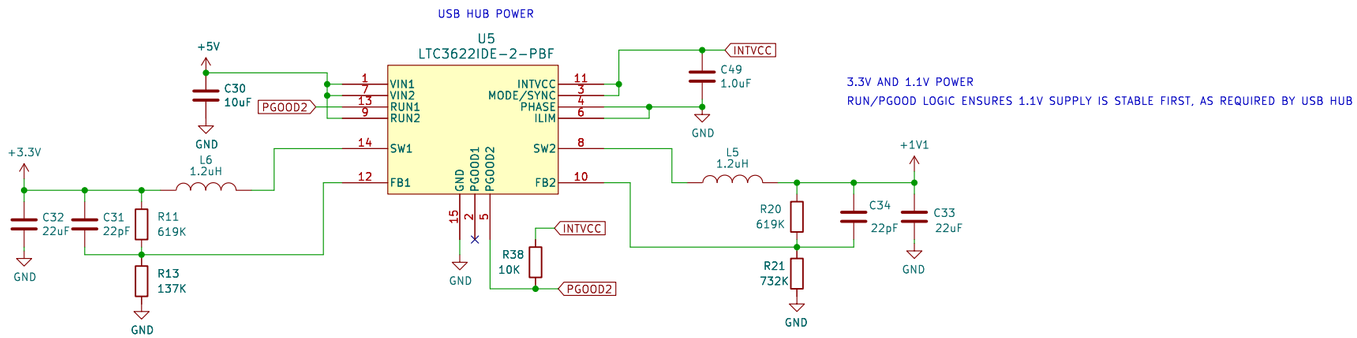



Echo MAV, LLC

Sheet: /MainPower/

File: MainPower.kicad_sch

**Title: EchoPilot Carrier**

| | | |
|---|---|---|
| Size: B | Date: 2023-10-25 | **Rev: 1B** |
| KiCad E.D.A. kicad 7.0.10 | | Id: 2/7 |

## ETHERNET MAGNETICS

U1
HX0068ANLT

ETH_RADIO_RX_P
ETH_RADIO_RX_N
ETH_RADIO_TX_P
ETH_RADIO_TX_N
RD+
RD−
TD+
TD−
RDCT
TDCT
RX+
RX−
TX+
TX−
RXCT
TXCT
ETH_RADIO_RX_POSTMAG_P
ETH_RADIO_RX_POSTMAG_N
ETH_RADIO_TX_POSTMAG_P
ETH_RADIO_TX_POSTMAG_N
R3
75
C1
0.1uF
C3
0.1uF
C5
1000pF
GND

U2
HX0068ANLT

ETH_SPARE_RX_P
ETH_SPARE_RX_N
ETH_SPARE_TX_P
ETH_SPARE_TX_N
ETH_SPARE_RX_POSTMAG_P
ETH_SPARE_RX_POSTMAG_N
ETH_SPARE_TX_POSTMAG_P
ETH_SPARE_TX_POSTMAG_N
R4
75
C2
0.1uF
C4
0.1uF
C6
1000pF

## JETSON CONNECTIONS

J8
2-1734592-2
MIPI CAM 1
4 LANE
CAM0_D0_N
CAM0_D0_P
CAM0_D1_N
CAM0_D1_P
CAM0_C_N
CAM0_C_P
CAM0_D2_N
CAM0_D2_P
CAM0_D3_N
CAM0_D3_P
CAM0_GPIO
CAM0_MCLK
CAM0_SCL0
CAM0_SDA0
+3.3V_MIPI
C28
0.1uF

ETH 2
J9
Conn_01x04
ETH_SPARE_RX_POSTMAG_P
ETH_SPARE_RX_POSTMAG_N
ETH_SPARE_TX_POSTMAG_P
ETH_SPARE_TX_POSTMAG_N

ETH 1
J15
Conn_01x04
ETH_RADIO_RX_POSTMAG_P
ETH_RADIO_RX_POSTMAG_N
ETH_RADIO_TX_POSTMAG_P
ETH_RADIO_TX_POSTMAG_N

JETSON GPIO/SLEEP
J33
Conn_01x04
GPIO02
nMOD_SLEEP
SLEEP/WAKE

JETSON CAN1
J7
Conn_01x04
+5V_PROT
JETSON_CAN+
JETSON_CAN−

MIPI CAM 2
J14
1-84952-5
CAM1_D0_N
CAM1_D0_P
CAM1_D1_N
CAM1_D1_P
CAM1_C_N
CAM1_C_P
CAM1_GPIO
CAM1_MCLK
CAM1_SCL0
CAM1_SDA0
C29
0.1uF

JETSON I2C
J34
Conn_01x04
XAVIER_I2C1_SCL
XAVIER_I2C1_SDA

USB 2.0 PORTS
J21
Conn_01x04
PORT_VBUS_2
USB2−
USB2+
J22
Conn_01x04
PORT_VBUS_3
USB3−
USB3+
J23
Conn_01x04
PORT_VBUS_4
USB4−
USB4+

IRIDIUM 9603 ROCKBLOCK COMPATIBLE
0532617010
J10
IRID_RX_OUT_3.3
IRID_NA_3.3
IRID_RING_3.3
IRID_TX_IN_3.3
IRID_ON_OFF_3.3

MAX 2A DUE TO TRACE WIDTH AND RP DIODE
ONLY REVERSE POLARITY PROTECTED!!

+BATT
B260S1F-7
D9
SPARE BATTERY POWER OUT
J12
Conn_01x04

## PIEZO BUZZER SUPPORT

+5V_FMU
C46
1.0uF
L3
47uH
U9
LT3469
VIN
SW
+IN
−IN
VCC
FB
GND
OUT
453K
R30
6.5K
R31
C48
0.47uF
BUZZER_1
R27
9.09K
BUZZER_OUT
R28
10K
R29
100K
C47
5600pF

U14
TPS25221
3V3_SYS
+3.3V
0.1uF
C95
IN
EN
OUT
FAULT
PAD
GND
ILM
+3.3V_MIPI
R55
27.4K

3V3_SYS ACTS AS AN ENABLE, LETTING US KNOW THE JETSON IS ON

## FMU CONNECTIONS

+VDD_5V_PERIPH
R47, R51, R53 AND R52 CAN BE USED FOR
RESISTOR DIVIDER AS NEEDED TO SCALE INPUTS
BATT_VOLTAGE_SENS_PROT
BATT_CURRENT_SENS_PROT
BATT2_VOLTAGE_SENS_PROT
BATT2_CURRENT_SENS_PROT
SPARE1_ADC1
SPARE2_ADC1
R47
0
R51
DNI
R52
DNI
R53
0
V/I SENSE
AND ANALOG IN
J13
Conn_01x08
NOTE: ANALOG INPUT UP TO 3.3V

NOTE: FMU CHANNELS 1-4 ARE DSHOT COMPATIBLE

+VDD_SERVO IS ONLY
FOR THE FMU TO MONITOR
THIS VOLTAGE. NOT TO POWER SERVO!
+VDD_SERVO
D10
D_Schottky
D11
IO-CH1-PROT
IO-CH2-PROT
IO-CH3-PROT
IO-CH4-PROT
IO-CH5-PROT
IO-CH6-PROT
IO-CH7-PROT
IO-CH8-PROT
FMU-CH1-PROT
FMU-CH2-PROT
FMU-CH3-PROT
FMU-CH4-PROT
TO PWM BREAKOUT BOARD
J28
Conn_01x14

+VDD_5V_RADIO
RADIO IN
RC_INPUT
J16
Conn_01x03

+VDD_5V_PERIPH
TELEM1
TELEM1_TX
TELEM1_RX
TELEM1_CTS
TELEM1_RTS
J18
Conn_01x06

+VDD_5V_PERIPH
FMU I2C_2
FMU_I2C_2_SCL
FMU_I2C_2_SDA
J25
Conn_01x04

+VDD_5V_PERIPH
FMU CAN2
CAN_2+
CAN_2−
J17
Conn_01x04

+VDD_5V_RADIO
S.BUS OUT/RSSI IN
S.BUS_OUT
J26
Conn_01x03

+VDD_5V_PERIPH
FMU CAN1
CAN_1+
CAN_1−
J19
Conn_01x04

+VDD_5V_PERIPH
GPS/COMPASS/SAFETY
GPS1_TX
GPS1_RX
FMU_I2C_1_SCL
FMU_I2C_1_SDA
SAFETY_SWITCH_IN
SAFETY_SWITCH_LED_OUT
R19
100
SAFETY_VDD
BUZZER_OUT
J20
Conn_01x10

ECHOMAV

Echo MAV, LLC
Sheet: /Connectors/
File: Connectors.kicad_sch
**Title: EchoPilot Carrier**
Size: B | Date: 2023-10-25 | **Rev: 1B**
KiCad E.D.A. kicad 7.0.10 | Id: 3/7

## JETSON

### J5A
FX23L-80P-0.5SV10

| | | |
|---|---|---|
| 1 | 1 | JETSON_CAN+ |
| 2 | 2 | JETSON_CAN- |
| 3 | 3 | GND |
| 4 | 4 | CAM0_SDA0 |
| 5 | 5 | CAM0_SCL0 |
| 6 | 6 | CAM0_MCLK |
| 7 | 7 | CAM0_GPIO |
| 8 | 8 | GND |
| 9 | 9 | CAM0_D1_P |
| 10 | 10 | CAM0_D1_N |
| 11 | 11 | GND |
| 12 | 12 | CAM0_C_P |
| 13 | 13 | CAM0_C_N |
| 14 | 14 | GND |
| 15 | 15 | CAM0_D0_P |
| 16 | 16 | CAM0_D0_N |
| 17 | 17 | GND |
| 18 | 18 | CAM1_SDA0 |
| 19 | 19 | CAM1_SCL0 |
| 20 | 20 | CAM1_MCLK |
| 21 | 21 | CAM1_GPIO |
| 22 | 22 | GND |
| 23 | 23 | CAM1_D1_P |
| 24 | 24 | CAM1_D1_N |
| 25 | 25 | GND |
| 26 | 26 | CAM1_C_P |
| 27 | 27 | CAM1_C_N |
| 28 | 28 | GND |
| 29 | 29 | CAM1_D0_P |
| 30 | 30 | CAM1_D0_N |
| 31 | 31 | GND |
| 32 | 32 | CAM0_D2_P |
| 33 | 33 | CAM0_D2_N |
| 34 | 34 | GND |
| 35 | 35 | CAM0_D3_P |
| 36 | 36 | CAM0_D3_N |
| 37 | 37 | I2S0_DIN |
| 38 | 38 | nMOD_SLEEP |
| 39 | 39 | SLEEP/WAKE |
| 40 | 40 | I2S0_FS |

### J5B
FX23L-80P-0.5SV10

| | | |
|---|---|---|
| 41 | 41 | ETH_SPARE_TX_N |
| 42 | 42 | ETH_SPARE_TX_P |
| 43 | 43 | ETH_SPARE_RX_N |
| 44 | 44 | ETH_SPARE_RX_P |
| 45 | 45 | GND |
| 46 | 46 | ETH_RADIO_RX_P |
| 47 | 47 | ETH_RADIO_RX_N |
| 48 | 48 | ETH_RADIO_TX_P |
| 49 | 49 | ETH_RADIO_TX_N |
| 50 | 50 | GND |
| 51 | 51 | USBSS_RX_P |
| 52 | 52 | USBSS_RX_N |
| 53 | 53 | GND |
| 54 | 54 | USBSS_TX_P |
| 55 | 55 | USBSS_TX_N |
| 56 | 56 | GND |
| 57 | 57 | PORT_VBUS_JETSON |
| 58 | 58 | JETSON_USB1_D_P |
| 59 | 59 | JETSON_USB1_D_N |
| 60 | 60 | GND |
| 61 | 61 | PORT_VBUS_4 |
| 62 | 62 | USB4+ |
| 63 | 63 | USB4- |
| 64 | 64 | GND |
| 65 | 65 | PORT_VBUS_3 |
| 66 | 66 | USB3+ |
| 67 | 67 | USB3- |
| 68 | 68 | GND |
| 69 | 69 | PORT_VBUS_2 |
| 70 | 70 | USB2+ |
| 71 | 71 | USB2- |
| 72 | 72 | GND |
| 73 | 73 | IRID_RING_3.3 |
| 74 | 74 | IRID_RX_OUT_3.3 |
| 75 | 75 | IRID_TX_IN_3.3 |
| 76 | 76 | I2S0_SCLK |
| 77 | 77 | XAVIER_I2C1_SDA |
| 78 | 78 | XAVIER_I2C1_SCL |
| 79 | 79 | GPIO02 |
| 80 | 80 | 3V3_SYS |

ADD MAGNETICS TO CARRIER BOARD

USED AS AN INDICATION JETSON IS UP

### J5C
FX23L-80P-0.5SV10

| | | |
|---|---|---|
| P1 | 81 | +5V |
| P2 | 82 | |
| P3 | 83 | |
| P4 | 84 | GND |
| MNT_1 | 85 | |
| MNT_2 | 86 | GND |

## FMU

### J6A
FX23L-80P-0.5SV10

| | | |
|---|---|---|
| 1 | 1 | FMU-CH6-PROT |
| 2 | 2 | FMU-CH5-PROT |
| 3 | 3 | FMU-CH4-PROT |
| 4 | 4 | FMU-CH3-PROT |
| 5 | 5 | FMU-CH2-PROT |
| 6 | 6 | FMU-CH1-PROT |
| 7 | 7 | IO-CH1-PROT |
| 8 | 8 | IO-CH2-PROT |
| 9 | 9 | IO-CH3-PROT |
| 10 | 10 | IO-CH4-PROT |
| 11 | 11 | IO-CH5-PROT |
| 12 | 12 | IO-CH6-PROT |
| 13 | 13 | IO-CH7-PROT |
| 14 | 14 | IO-CH8-PROT |
| 15 | 15 | |
| 16 | 16 | GND |
| 17 | 17 | +VDD_5V_PERIPH |
| 18 | 18 | FMU_I2C_2_SCL |
| 19 | 19 | FMU_I2C_2_SDA |
| 20 | 20 | GND |
| 21 | 21 | |
| 22 | 22 | CAN_2+ |
| 23 | 23 | CAN_2- |
| 24 | 24 | GND |
| 25 | 25 | |
| 26 | 26 | CAN_1+ |
| 27 | 27 | CAN_1- |
| 28 | 28 | GND |
| 29 | 29 | |
| 30 | 30 | TELEM1_RTS |
| 31 | 31 | TELEM1_CTS |
| 32 | 32 | TELEM1_RX |
| 33 | 33 | TELEM1_TX |
| 34 | 34 | GND |
| 35 | 35 | BATT_CURRENT_SENS_PROT |
| 36 | 36 | BATT_VOLTAGE_SENS_PROT |
| 37 | 37 | +VDD_SERVO |
| 38 | 38 | GND |
| 39 | 39 | GND |
| 40 | 40 | |

RC IN

FMU POWER

ONLY USED TO
SENSE VSERVO VOLTAGE

### J6B
FX23L-80P-0.5SV10

| | | |
|---|---|---|
| 41 | 41 | +VDD_5V_PERIPH |
| 42 | 42 | SPI5_SCK_EXTERNAL1 |
| 43 | 43 | SPI5_MISO_EXTERNAL1 |
| 44 | 44 | SPI5_MOSI_EXTERNAL1 |
| 45 | 45 | SPI5_CS1_EXTERNAL1 |
| 46 | 46 | SPI5_CS2_EXTERNAL1 |
| 47 | 47 | GND |
| 48 | 48 | |
| 49 | 49 | GPS1_TX |
| 50 | 50 | GPS1_RX |
| 51 | 51 | FMU_I2C_1_SCL |
| 52 | 52 | FMU_I2C_1_SDA |
| 53 | 53 | GND |
| 54 | 54 | SAFETY_SWITCH_IN |
| 55 | 55 | SAFETY_SWITCH_LED_OUT |
| 56 | 56 | SAFETY_VDD |
| 57 | 57 | BUZZER_1 |
| 58 | 58 | GND |
| 59 | 59 | +VDD_5V_RADIO |
| 60 | 60 | RC_INPUT |
| 61 | 61 | GND +5V_FMU |
| 62 | 62 | |
| 63 | 63 | |
| 64 | 64 | |
| 65 | 65 | |
| 66 | 66 | |
| 67 | 67 | |
| 68 | 68 | |
| 69 | 69 | GND |
| 70 | 70 | VDD_POWERA_VALID |
| 71 | 71 | VDD_POWERB_VALID |
| 72 | 72 | S.BUS_OUT |
| 73 | 73 | UART4_TX |
| 74 | 74 | UART4_RX |
| 75 | 75 | GND |
| 76 | 76 | BATT2_CURRENT_SENS_PROT |
| 77 | 77 | BATT2_VOLTAGE_SENS_PROT |
| 78 | 78 | SPARE1_ADC1 |
| 79 | 79 | SPARE2_ADC1 |
| 80 | 80 | |

OPTIONAL SPI EXTERNAL SENSOR

EXT GPS/COMPASS

NO B POWER SOURCE ON THIS BOARD, THE FMU WILL PULL THIS UP

VDD_POWERA_VALID

R2
220

+5V_FMU

Q1
Q_NMOS_GSD

R1
10K

GND

### J6C
FX23L-80P-0.5SV10

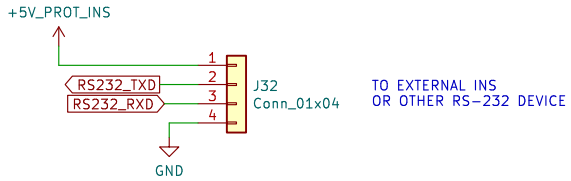
| | | |
|---|---|---|
| P1 | 81 | +5V |
| P2 | 82 | |
| P3 | 83 | |
| P4 | 84 | GND |
| MNT_1 | 85 | |
| MNT_2 | 86 | GND |

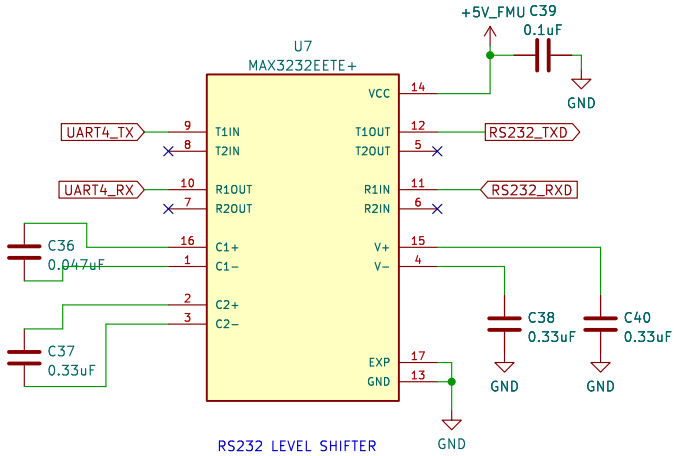
Echo MAV, LLC
Sheet: /B2BConnector/
File: B2BConnector.kicad_sch

**Title: EchoPilot Carrier**

| | | |
|---|---|---|
| Size: B | Date: 2023-10-25 | **Rev: 1B** |
| KiCad E.D.A. kicad 7.0.10 | | Id: 4/7 |

PER R1, ONLY EXTERNAL INS ARE SUPPORTED VIA J32. E.G. VECTORNAV VN-100, 200, 300, 110, 210, 310
CUSTOM CABLE SOLUTIONS WILL BE REQUIRED



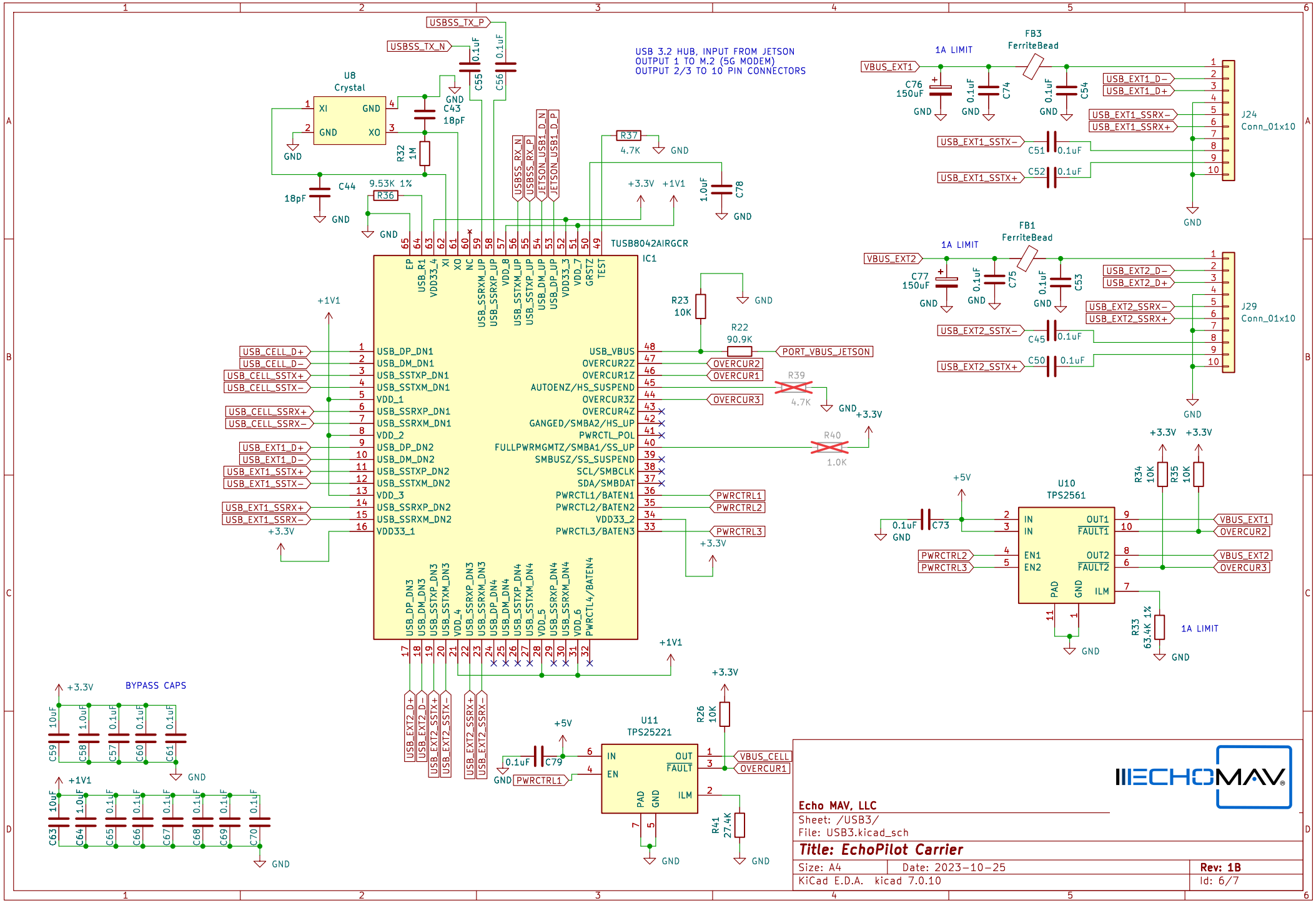

ECHOMAV®

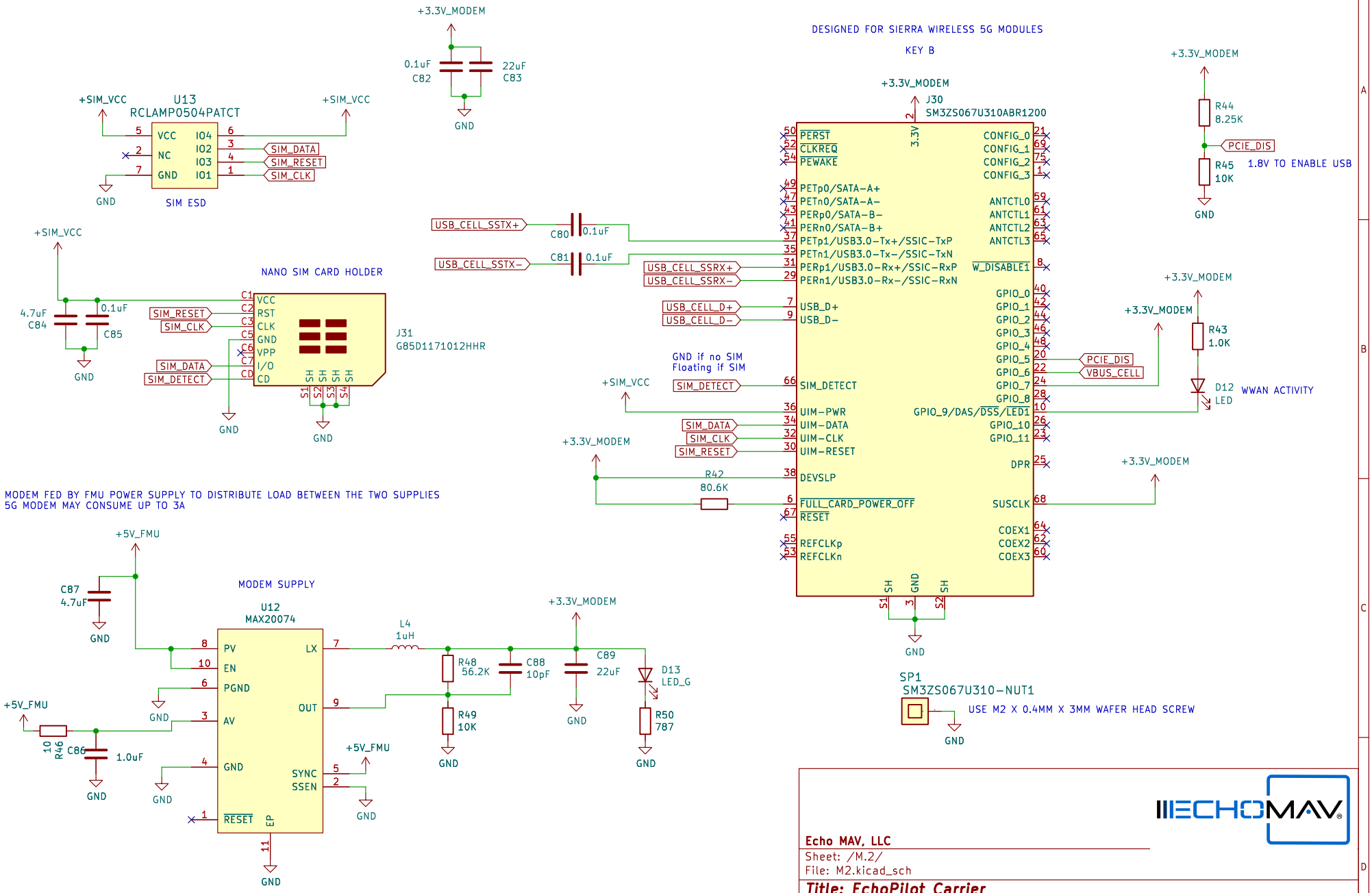
**Echo MAV, LLC**

Sheet: /External INS/
File: external_ins_interface.kicad_sch

***Title: EchoPilot Carrier***

| Size: A4 | Date: 2023-06-25 | **Rev: 1** |
|---|---|---|
| KiCad E.D.A. kicad 7.0.10 | | Id: 5/7 |


USB 3.2 HUB, INPUT FROM JETSON
OUTPUT 1 TO M.2 (5G MODEM)
OUTPUT 2/3 TO 10 PIN CONNECTORS
TUSB8042AIRGCR
IC1
U8
Crystal
U10
TPS2561
U11
TPS25221
FB3
FB1
FerriteBead
1A LIMIT
J24
J29
Conn_01x10
BYPASS CAPS
Echo MAV, LLC
Sheet: /USB3/
File: USB3.kicad_sch
Title: EchoPilot Carrier
Size: A4
Date: 2023-10-25
Rev: 1B
KiCad E.D.A. kicad 7.0.10
Id: 6/7




| | |
|---|---|
| Echo MAV, LLC | |
| Sheet: /M.2/ | |
| File: M2.kicad_sch | |
| **Title: EchoPilot Carrier** | |
| Size: A4 | Date: 2023-10-25 |
| KiCad E.D.A. kicad 7.0.10 | Id: 7/7 |

**Rev: 1B**