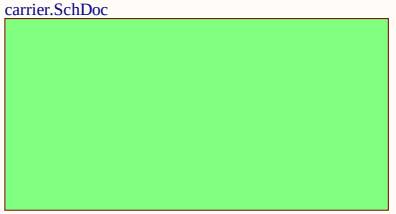
SAM Carrier

Variant: [No Variations]

CARRIER
carrier.SchDoc



MECHANICAL
mechanical.SchDoc

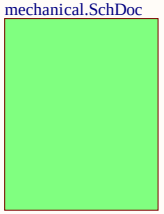


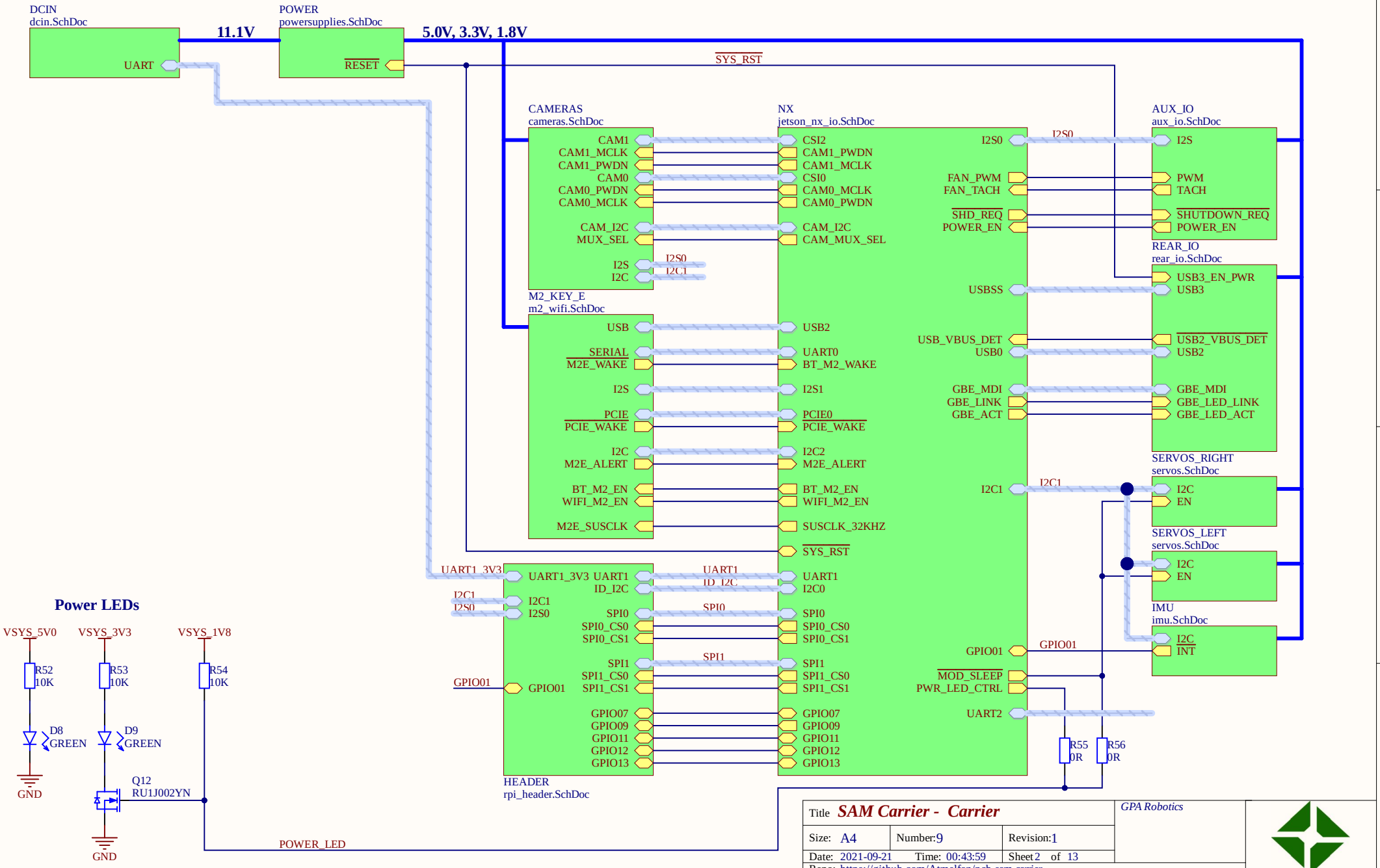
Table of content

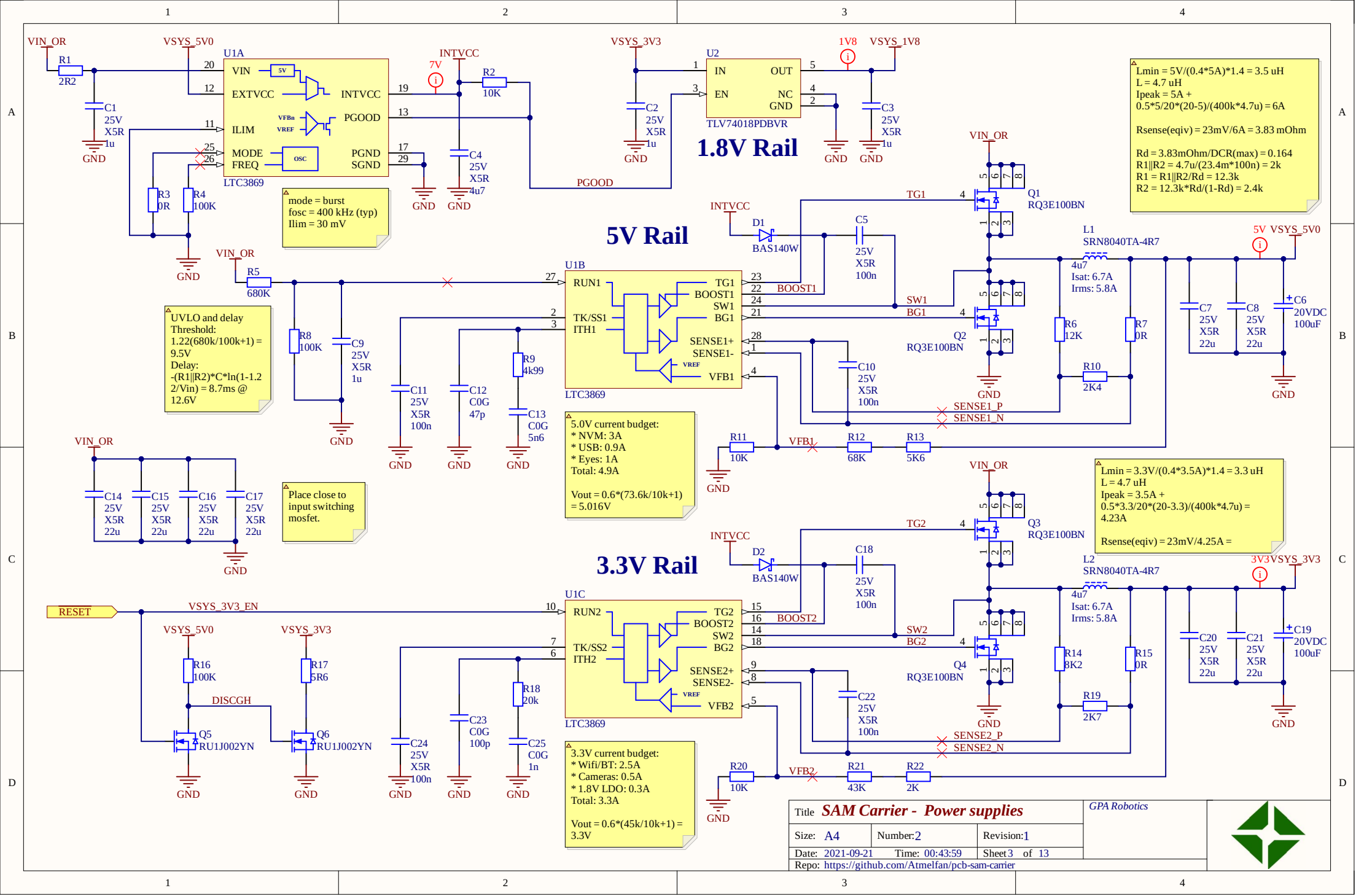
s.1 - Cover
s.2 - Carrier diagram
s.3 - Power supplies
s.4 - Rear I/O
s.5 - CSI cameras
s.6 - Jetson NX/Nano module
s.7 - Auxilliary I/O
s.8 - M.2 Wifi/BT module
s.9 - Servo drivers
s.10 - BNO055 IMU
s.11 - DC Input
s.12 - Raspberry Pi Header
s.13 - Mechanical details

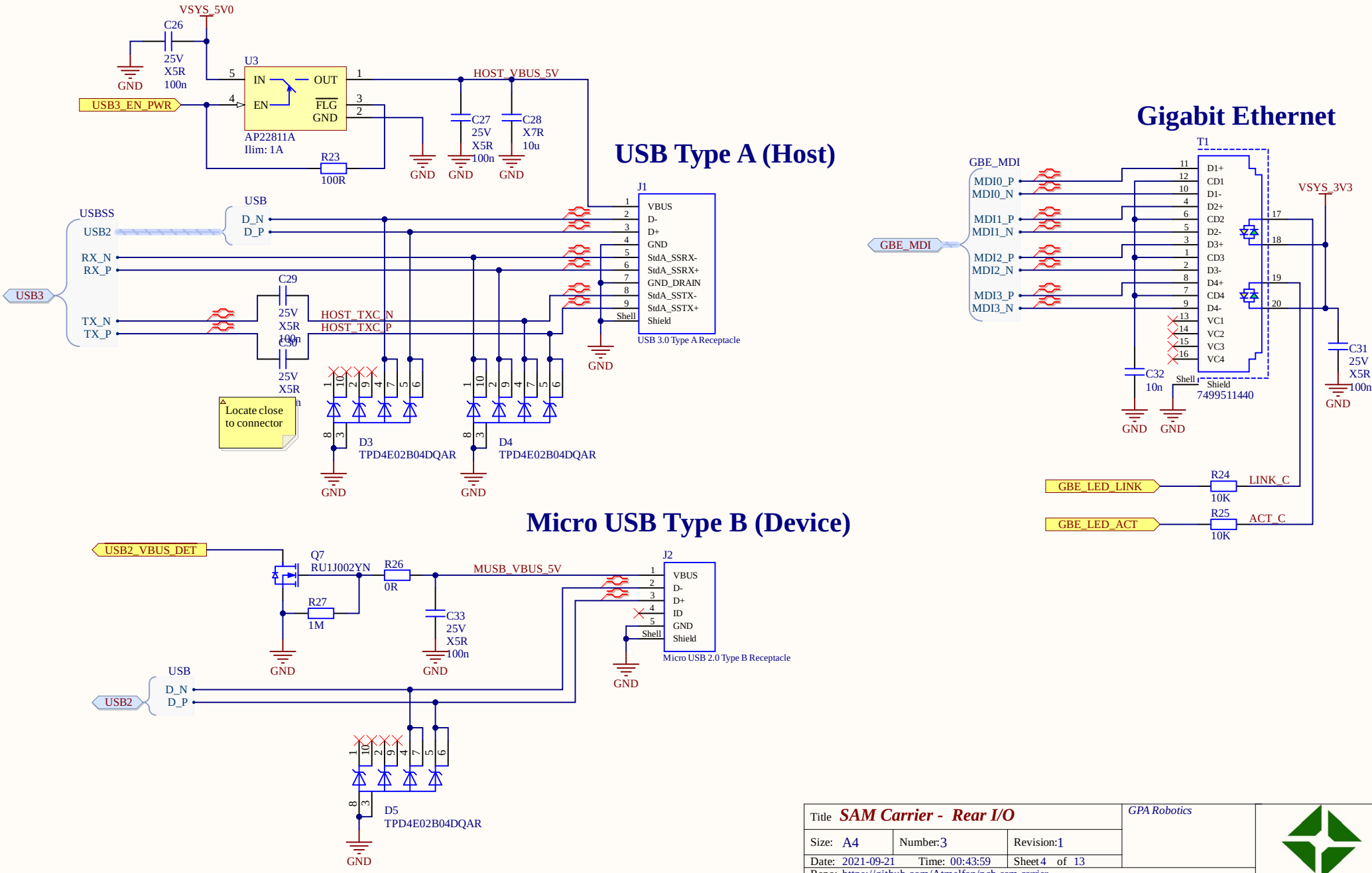
Introduction

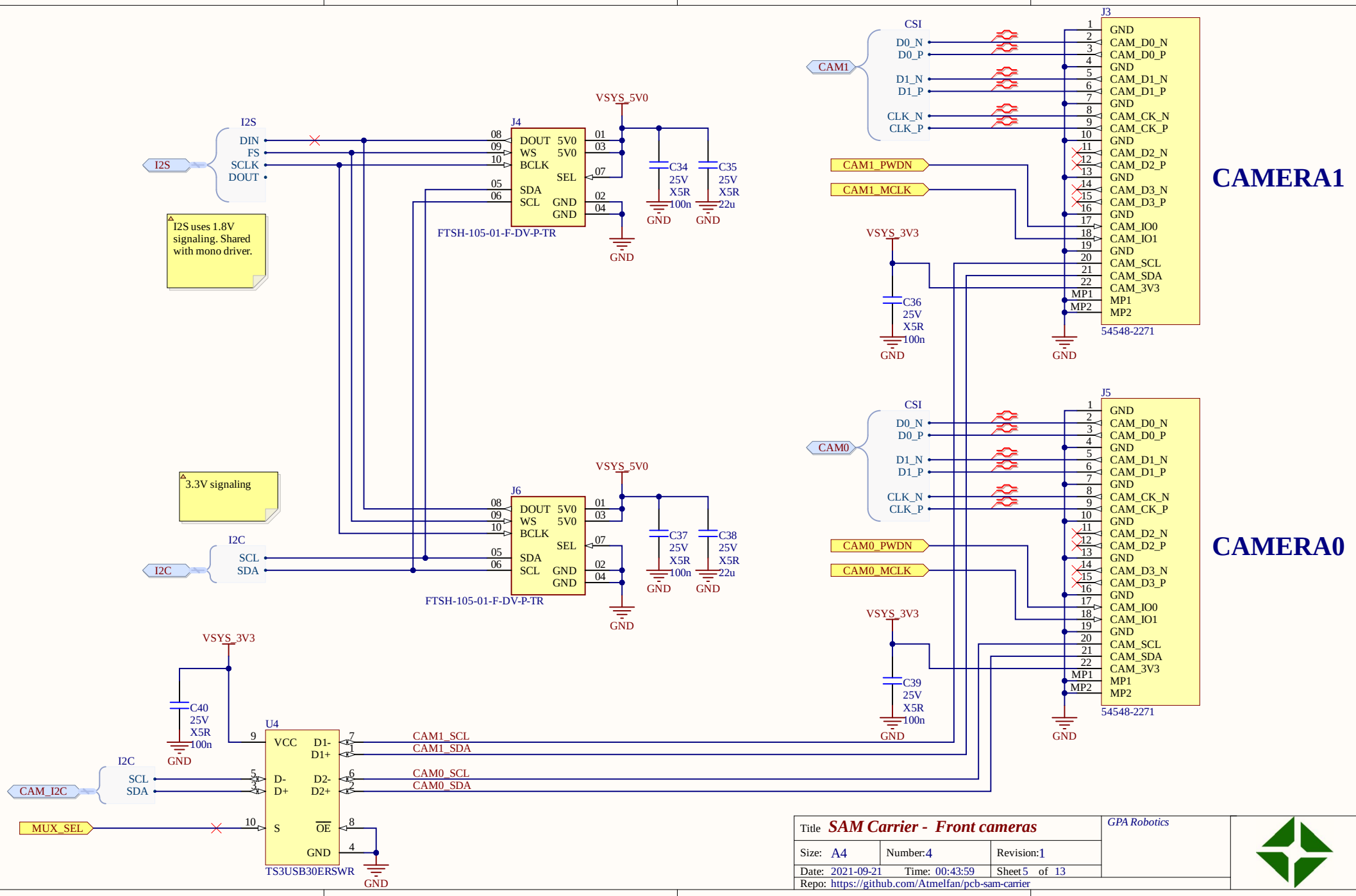
Custom Jetson NX/Nano carrier board for my octapod robot.

Title	***SAM Carrier - Cover***		*GPA Robotics*
Size: A4	Number: 1	Revision: 1	
Date: 2021-09-21	Time: 00:43:59	Sheet 1 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			

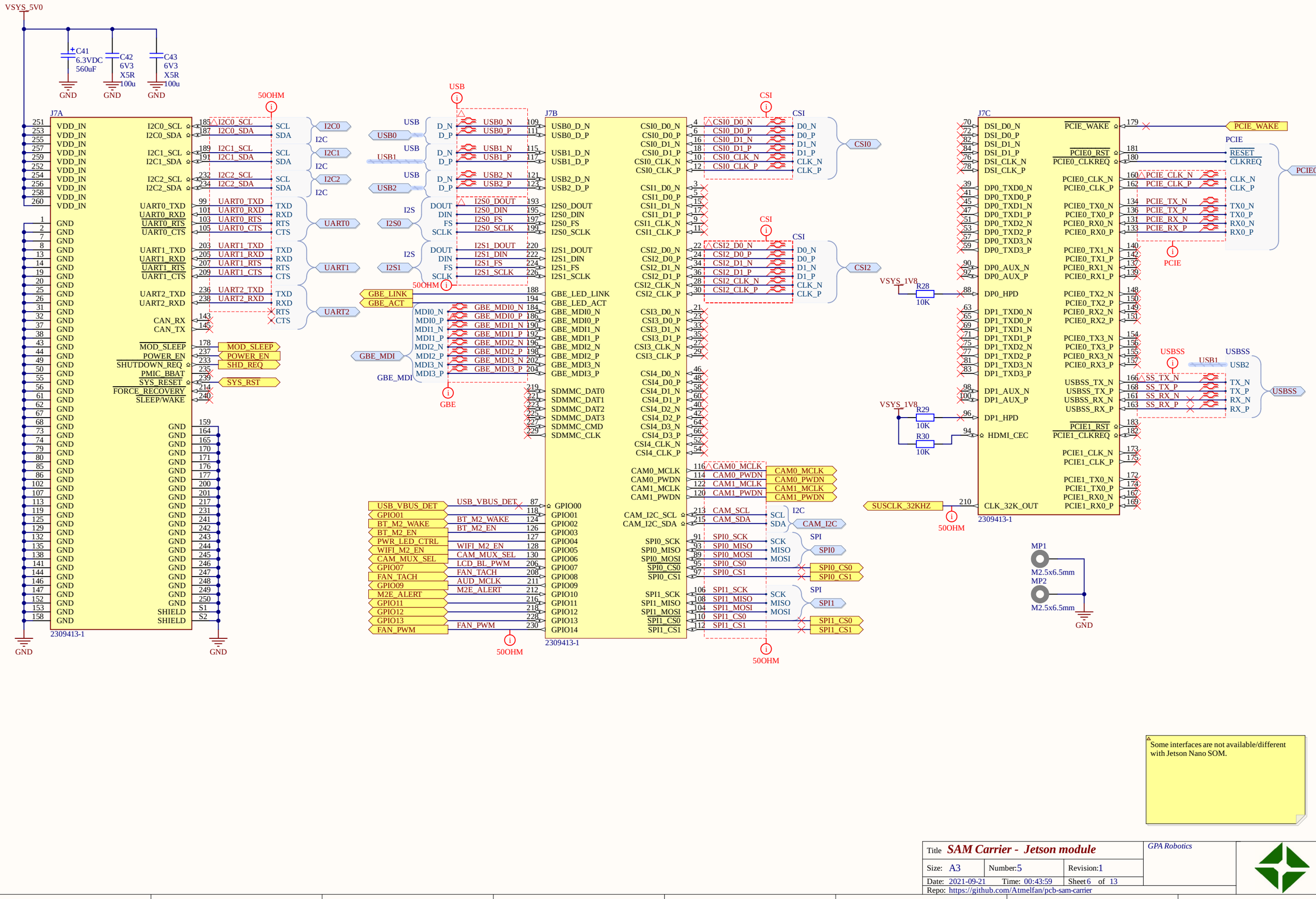

DCIN
dcin.SchDoc
UART
11.1V
POWER
powersupplies.SchDoc
RESET
5.0V, 3.3V, 1.8V
SYS_RST
CAMERAS
cameras.SchDoc
CAM1
CAM1_MCLK
CAM1_PWDN
CAM0
CAM0_PWDN
CAM0_MCLK
CAM_I2C
MUX_SEL
I2S
I2C
I2S0
I2C1
M2_KEY_E
m2_wifi.SchDoc
USB
SERIAL
M2E_WAKE
I2S
PCIE
PCIE_WAKE
I2C
M2E_ALERT
BT_M2_EN
WIFI_M2_EN
M2E_SUSCLK
NX
jetson_nx_io.SchDoc
CSI2
CAM1_PWDN
CAM1_MCLK
CSI0
CAM0_MCLK
CAM0_PWDN
CAM_I2C
CAM_MUX_SEL
USB2
UART0
BT_M2_WAKE
I2S1
PCIE0
PCIE_WAKE
I2C2
M2E_ALERT
BT_M2_EN
WIFI_M2_EN
SUSCLK_32KHZ
SYS_RST
I2S0
FAN_PWM
FAN_TACH
SHD_REQ
POWER_EN
USBSS
USB_VBUS_DET
USB0
GBE_MDI
GBE_LINK
GBE_ACT
I2C1
GPIO01
MOD_SLEEP
PWR_LED_CTRL
UART2
AUX_IO
aux_io.SchDoc
I2S
PWM
TACH
SHUTDOWN_REQ
POWER_EN
REAR_IO
rear_io.SchDoc
USB3_EN_PWR
USB3
USB2_VBUS_DET
USB2
GBE_MDI
GBE_LED_LINK
GBE_LED_ACT
SERVOS_RIGHT
servos.SchDoc
I2C
EN
SERVOS_LEFT
servos.SchDoc
I2C
EN
IMU
imu.SchDoc
I2C
INT
UART1_3V3
UART1_3V3 UART1
ID_I2C
UART1
ID_I2C
I2C0
I2C1
I2S0
SPI0
SPI0_CS0
SPI0_CS1
SPI1
SPI1_CS0
SPI1_CS1
GPIO01
GPIO07
GPIO09
GPIO11
GPIO12
GPIO13
HEADER
rpi_header.SchDoc
R55
0R
R56
0R
Power LEDs
VSYS_5V0
VSYS_3V3
VSYS_1V8
R52
10K
R53
10K
R54
10K
D8
GREEN
D9
GREEN
GND
Q12
RU1J002YN
GND
POWER_LED
Title SAM Carrier - Carrier
GPA Robotics
Size: A4
Number:9
Revision:1
Date: 2021-09-21
Time: 00:43:59
Sheet 2 of 13
Repo: https://github.com/Atmelfan/pcb-sam-carrier

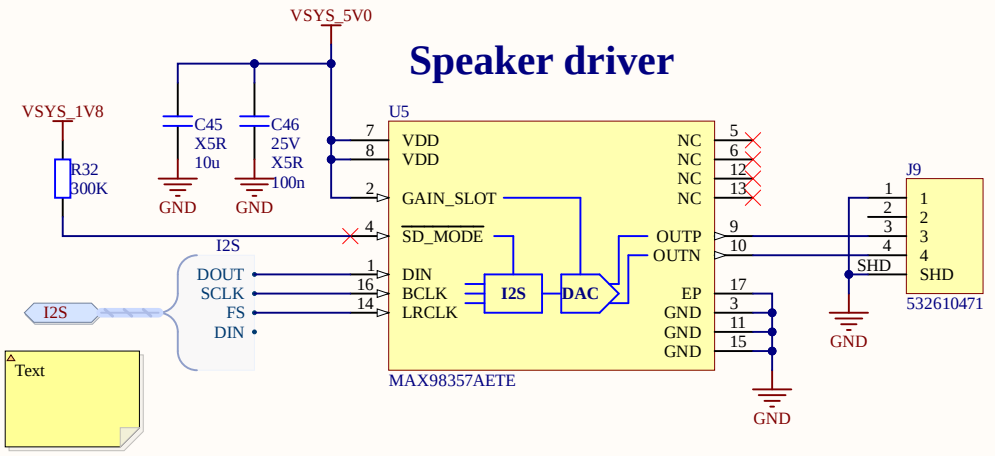

VIN_OR
VSYS_5V0
U1A
LTC3869
INTVCC
7V
R1
2R2
C1
25V
X5R
1u
R2
10K
C4
25V
X5R
4u7
R3
0R
R4
100K
mode = burst
fosc = 400 kHz (typ)
Ilim = 30 mV
PGOOD
VSYS_3V3
U2
TLV74018PDBVR
1V8
VSYS_1V8
C2
25V
X5R
1u
C3
25V
X5R
1u
1.8V Rail
Lmin = 5V/(0.4*5A)*1.4 = 3.5 uH
L = 4.7 uH
Ipeak = 5A +
0.5*5/20*(20-5)/(400k*4.7u) = 6A
Rsense(eqiv) = 23mV/6A = 3.83 mOhm
Rd = 3.83mOhm/DCR(max) = 0.164
R1||R2 = 4.7u/(23.4m*100n) = 2k
R1 = R1||R2/Rd = 12.3k
R2 = 12.3k*Rd/(1-Rd) = 2.4k
5V Rail
U1B
LTC3869
R5
680K
R8
100K
C9
25V
X5R
1u
UVLO and delay
Threshold:
1.22(680k/100k+1) =
9.5V
Delay:
-(R1||R2)*C*ln(1-1.2
2/Vin) = 8.7ms @
12.6V
C11
25V
X5R
100n
C12
C0G
47p
R9
4k99
C13
C0G
5n6
D1
BAS140W
C5
25V
X5R
100n
Q1
RQ3E100BN
Q2
RQ3E100BN
L1
SRN8040TA-4R7
4u7
Isat: 6.7A
Irms: 5.8A
C10
25V
X5R
100n
R6
12K
R7
0R
R10
2K4
C6
20VDC
100uF
C7
25V
X5R
22u
C8
25V
X5R
22u
SENSE1_P
SENSE1_N
R11
10K
R12
68K
R13
5K6
5.0V current budget:
* NVM: 3A
* USB: 0.9A
* Eyes: 1A
Total: 4.9A
Vout = 0.6*(73.6k/10k+1)
= 5.016V
C14
25V
X5R
22u
C15
25V
X5R
22u
C16
25V
X5R
22u
C17
25V
X5R
22u
Place close to
input switching
mosfet.
3.3V Rail
U1C
LTC3869
RESET
VSYS_3V3_EN
R16
100K
R17
5R6
DISCGH
Q5
RU1J002YN
Q6
RU1J002YN
C24
25V
X5R
100n
C23
C0G
100p
R18
20k
C25
C0G
1n
D2
BAS140W
C18
25V
X5R
100n
Q3
RQ3E100BN
Q4
RQ3E100BN
L2
SRN8040TA-4R7
4u7
Isat: 6.7A
Irms: 5.8A
C22
25V
X5R
100n
R14
8K2
R15
0R
R19
2K7
C19
20VDC
100uF
C20
25V
X5R
22u
C21
25V
X5R
22u
SENSE2_P
SENSE2_N
R20
10K
R21
43K
R22
2K
3.3V current budget:
* Wifi/BT: 2.5A
* Cameras: 0.5A
* 1.8V LDO: 0.3A
Total: 3.3A
Vout = 0.6*(45k/10k+1) =
3.3V
Lmin = 3.3V/(0.4*3.5A)*1.4 = 3.3 uH
L = 4.7 uH
Ipeak = 3.5A +
0.5*3.3/20*(20-3.3)/(400k*4.7u) =
4.23A
Rsense(eqiv) = 23mV/4.25A =
GND
Title SAM Carrier - Power supplies
GPA Robotics
Size: A4
Number: 2
Revision: 1
Date: 2021-09-21
Time: 00:43:59
Sheet 3 of 13
Repo: https://github.com/Atmelfan/pcb-sam-carrier

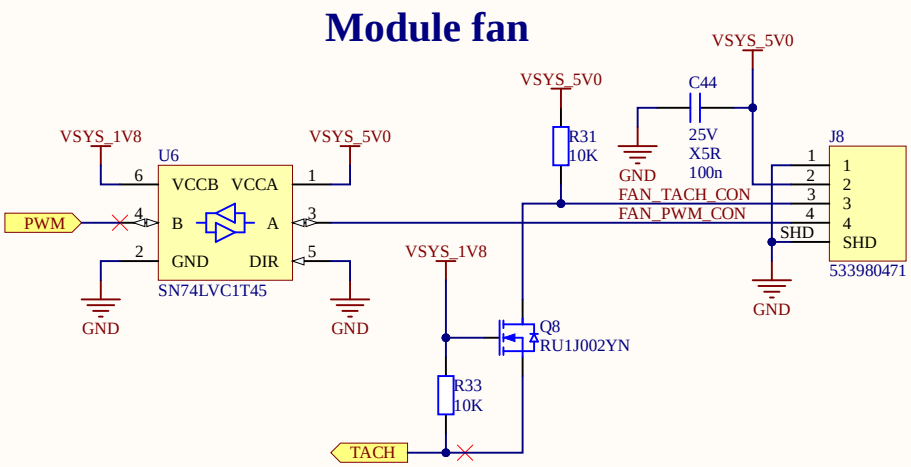

USB Type A (Host)
VSYS_5V0
C26
25V
X5R
100n
GND
U3
IN
OUT
EN
FLG
GND
AP22811A
Ilim: 1A
USB3_EN_PWR
R23
100R
HOST_VBUS_5V
C27
25V
X5R
100n
C28
X7R
10u
J1
VBUS
D-
D+
GND
StdA_SSRX-
StdA_SSRX+
GND_DRAIN
StdA_SSTX-
StdA_SSTX+
Shell
Shield
USB 3.0 Type A Receptacle
USB
USBSS
USB2
D_N
D_P
RX_N
RX_P
TX_N
TX_P
USB3
C29
C30
25V
X5R
HOST_TXC_N
HOST_TXC_P
Locate close
to connector
D3
TPD4E02B04DQAR
D4
TPD4E02B04DQAR
Gigabit Ethernet
T1
GBE_MDI
MDI0_P
MDI0_N
MDI1_P
MDI1_N
MDI2_P
MDI2_N
MDI3_P
MDI3_N
D1+
CD1
D1-
D2+
CD2
D2-
D3+
CD3
D3-
D4+
CD4
D4-
VC1
VC2
VC3
VC4
Shield
7499511440
VSYS_3V3
C31
25V
X5R
100n
C32
10n
GBE_LED_LINK
R24
10K
LINK_C
GBE_LED_ACT
R25
10K
ACT_C
Micro USB Type B (Device)
USB2_VBUS_DET
Q7
RU1J002YN
R26
0R
R27
1M
MUSB_VBUS_5V
C33
25V
X5R
100n
J2
VBUS
D-
D+
ID
GND
Shell
Shield
Micro USB 2.0 Type B Receptacle
USB
USB2
D_N
D_P
D5
TPD4E02B04DQAR
Title SAM Carrier - Rear I/O
GPA Robotics
Size: A4
Number:3
Revision:1
Date: 2021-09-21
Time: 00:43:59
Sheet 4 of 13
Repo: https://github.com/Atmelfan/pcb-sam-carrier

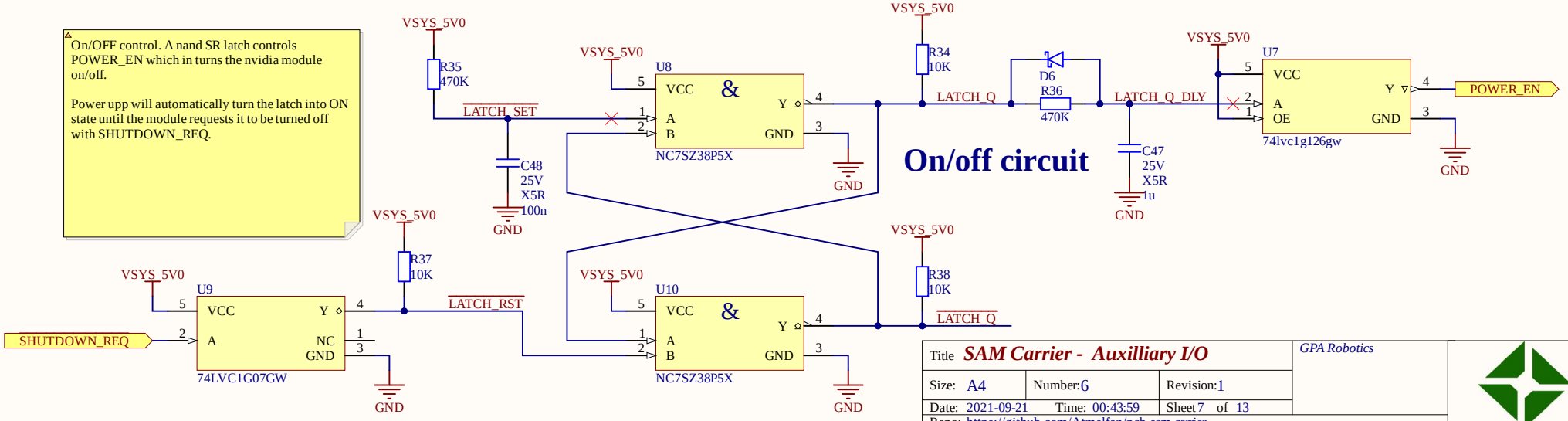


Title	***SAM Carrier - Front cameras***		*GPA Robotics*
Size: A4	Number:4	Revision:1	
Date: 2021-09-21	Time: 00:43:59	Sheet 5 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			


VSYS_5V0
C41
6.3VDC
560uF
C42
6V3
X5R
100u
C43
6V3
X5R
100u
GND
J7A
50OHM
I2C0_SCL
I2C0_SDA
I2C1_SCL
I2C1_SDA
I2C2_SCL
I2C2_SDA
UART0_TXD
UART0_RXD
UART0_RTS
UART0_CTS
UART1_TXD
UART1_RXD
UART1_RTS
UART1_CTS
UART2_TXD
UART2_RXD
CAN_RX
CAN_TX
MOD_SLEEP
POWER_EN
SHUTDOWN_REQ
PMIC_BBAT
SYS_RESET
FORCE_RECOVERY
SLEEP/WAKE
SHIELD
2309413-1
USB
USB0
USB1
USB2
I2S0
I2S1
GBE_LINK
GBE_ACT
GBE_MDI
J7B
USB0_D_N
USB0_D_P
USB1_D_N
USB1_D_P
USB2_D_N
USB2_D_P
I2S0_DOUT
I2S0_DIN
I2S0_FS
I2S0_SCLK
I2S1_DOUT
I2S1_DIN
I2S1_FS
I2S1_SCLK
GBE_LED_LINK
GBE_LED_ACT
GBE_MDI0_N
GBE_MDI0_P
GBE_MDI1_N
GBE_MDI1_P
GBE_MDI2_N
GBE_MDI2_P
GBE_MDI3_N
GBE_MDI3_P
SDMMC_DAT0
SDMMC_DAT1
SDMMC_DAT2
SDMMC_DAT3
SDMMC_CMD
SDMMC_CLK
GBE
CSI
CSI0_D0_N
CSI0_D0_P
CSI0_D1_N
CSI0_D1_P
CSI0_CLK_N
CSI0_CLK_P
CSI1_D0_N
CSI1_D0_P
CSI1_D1_N
CSI1_D1_P
CSI1_CLK_N
CSI1_CLK_P
CSI2_D0_N
CSI2_D0_P
CSI2_D1_N
CSI2_D1_P
CSI2_CLK_N
CSI2_CLK_P
CSI3_D0_N
CSI3_D0_P
CSI3_D1_N
CSI3_D1_P
CSI3_CLK_N
CSI3_CLK_P
CSI4_D0_N
CSI4_D0_P
CSI4_D1_N
CSI4_D1_P
CSI4_D2_N
CSI4_D2_P
CSI4_D3_N
CSI4_D3_P
CSI4_CLK_N
CSI4_CLK_P
CAM0_MCLK
CAM0_PWDN
CAM1_MCLK
CAM1_PWDN
CAM_I2C_SCL
CAM_I2C_SDA
CAM_SCL
CAM_SDA
SPI0_SCK
SPI0_MISO
SPI0_MOSI
SPI0_CS0
SPI0_CS1
SPI1_SCK
SPI1_MISO
SPI1_MOSI
SPI1_CS0
SPI1_CS1
D0_N
D0_P
D1_N
D1_P
CLK_N
CLK_P
I2C
SPI
USB_VBUS_DET
GPIO01
BT_M2_WAKE
BT_M2_EN
PWR_LED_CTRL
WIFI_M2_EN
CAM_MUX_SEL
LCD_BL_PWM
FAN_TACH
AUD_MCLK
M2E_ALERT
GPIO11
GPIO12
GPIO13
FAN_PWM
GPIO00
GPIO02
GPIO03
GPIO04
GPIO05
GPIO06
GPIO07
GPIO08
GPIO09
GPIO10
GPIO14
J7C
DSI_D0_N
DSI_D0_P
DSI_D1_N
DSI_D1_P
DSI_CLK_N
DSI_CLK_P
DP0_TXD0_N
DP0_TXD0_P
DP0_TXD1_N
DP0_TXD1_P
DP0_TXD2_N
DP0_TXD2_P
DP0_TXD3_N
DP0_TXD3_P
DP0_AUX_N
DP0_AUX_P
DP0_HPD
DP1_TXD0_N
DP1_TXD0_P
DP1_TXD1_N
DP1_TXD1_P
DP1_TXD2_N
DP1_TXD2_P
DP1_TXD3_N
DP1_TXD3_P
DP1_AUX_N
DP1_AUX_P
DP1_HPD
HDMI_CEC
PCIE_WAKE
PCIE0_RST
PCIE0_CLKREQ
PCIE0_CLK_N
PCIE0_CLK_P
PCIE0_TX0_N
PCIE0_TX0_P
PCIE0_RX0_N
PCIE0_RX0_P
PCIE0_TX1_N
PCIE0_TX1_P
PCIE0_RX1_N
PCIE0_RX1_P
PCIE0_TX2_N
PCIE0_TX2_P
PCIE0_RX2_N
PCIE0_RX2_P
PCIE0_TX3_N
PCIE0_TX3_P
PCIE0_RX3_N
PCIE0_RX3_P
PCIE1_RST
PCIE1_CLKREQ
PCIE1_CLK_N
PCIE1_CLK_P
PCIE1_TX0_N
PCIE1_TX0_P
PCIE1_RX0_N
PCIE1_RX0_P
USBSS_TX_N
USBSS_TX_P
USBSS_RX_N
USBSS_RX_P
SS_TX_N
SS_TX_P
SS_RX_N
SS_RX_P
CLK_32K_OUT
SUSCLK_32KHZ
PCIE
RESET
CLKREQ
USBSS
USB1
USB2
R28
R29
R30
10K
VSYS_1V8
MP1
MP2
M2.5x6.5mm
Some interfaces are not available/different with Jetson Nano SOM.
Title SAM Carrier - Jetson module
GPA Robotics
Size: A3
Number:5
Revision:1
Date: 2021-09-21
Time: 00:43:59
Sheet 6 of 13
Repo: https://github.com/Atmelfan/pcb-sam-carrier

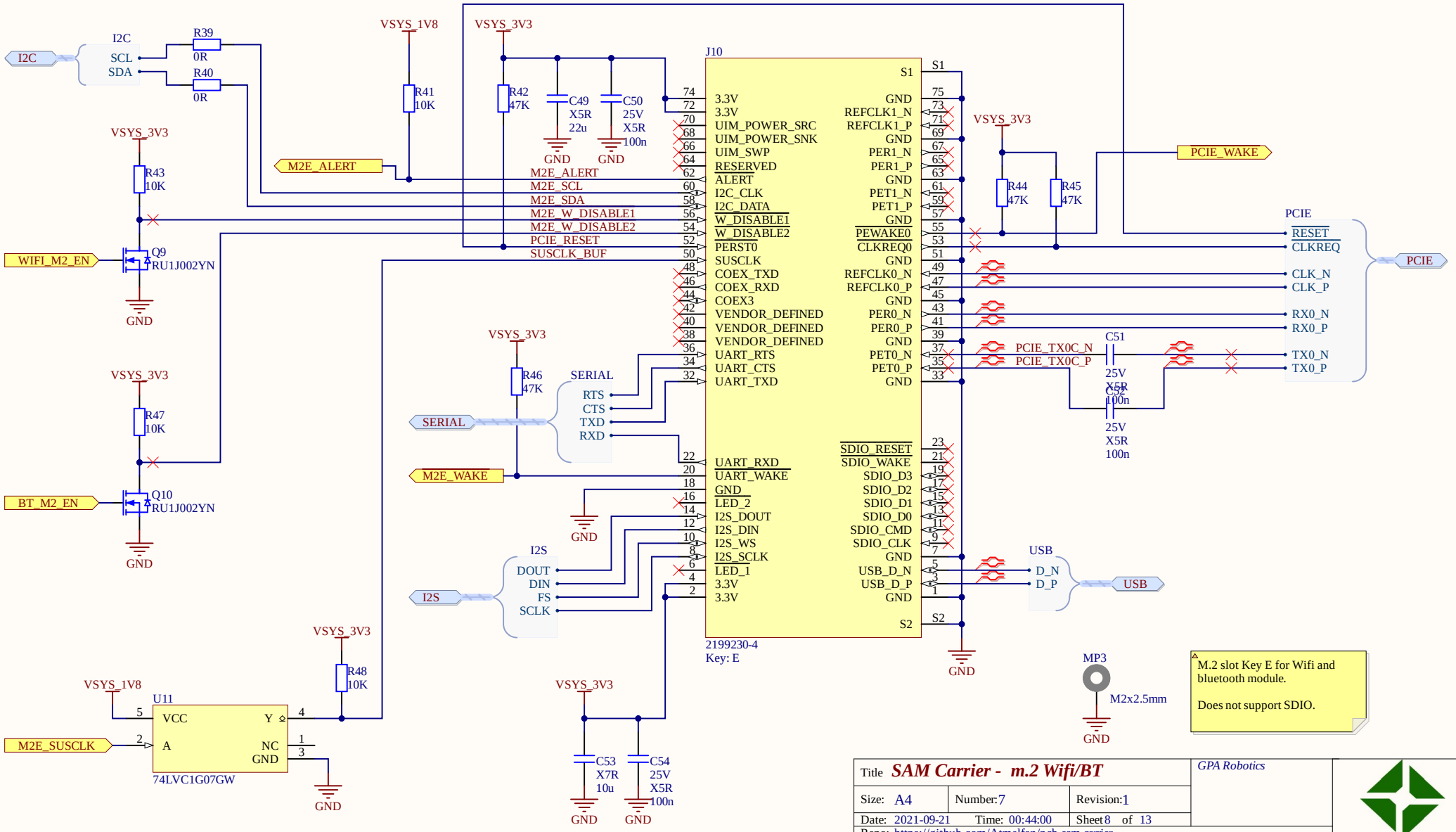




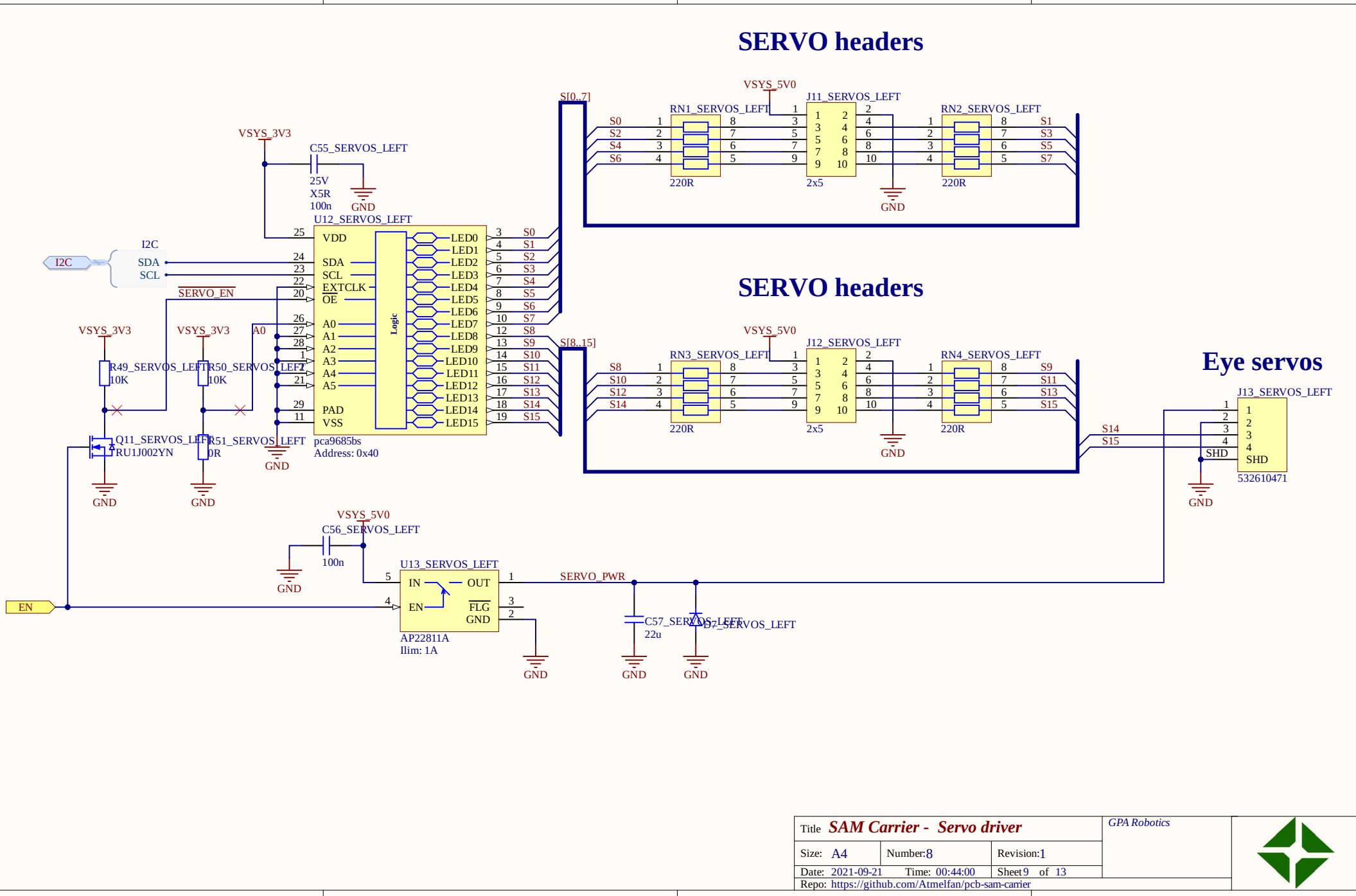


Title	*SAM Carrier - Auxilliary I/O*		*GPA Robotics*
Size: A4	Number:6	Revision:1	
Date: 2021-09-21	Time: 00:43:59	Sheet 7 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			

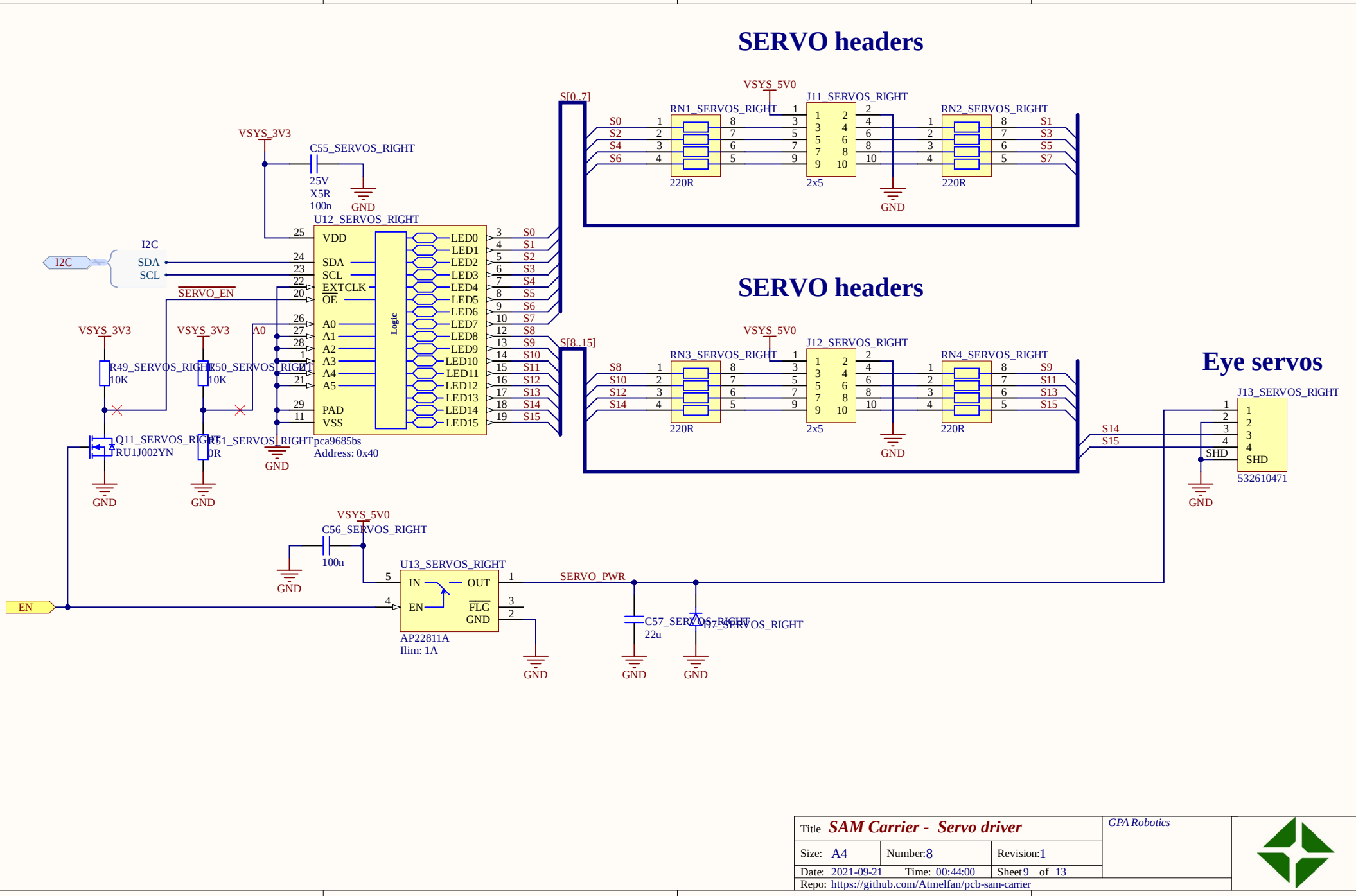
M.2 WIFI/Bluetooth Module

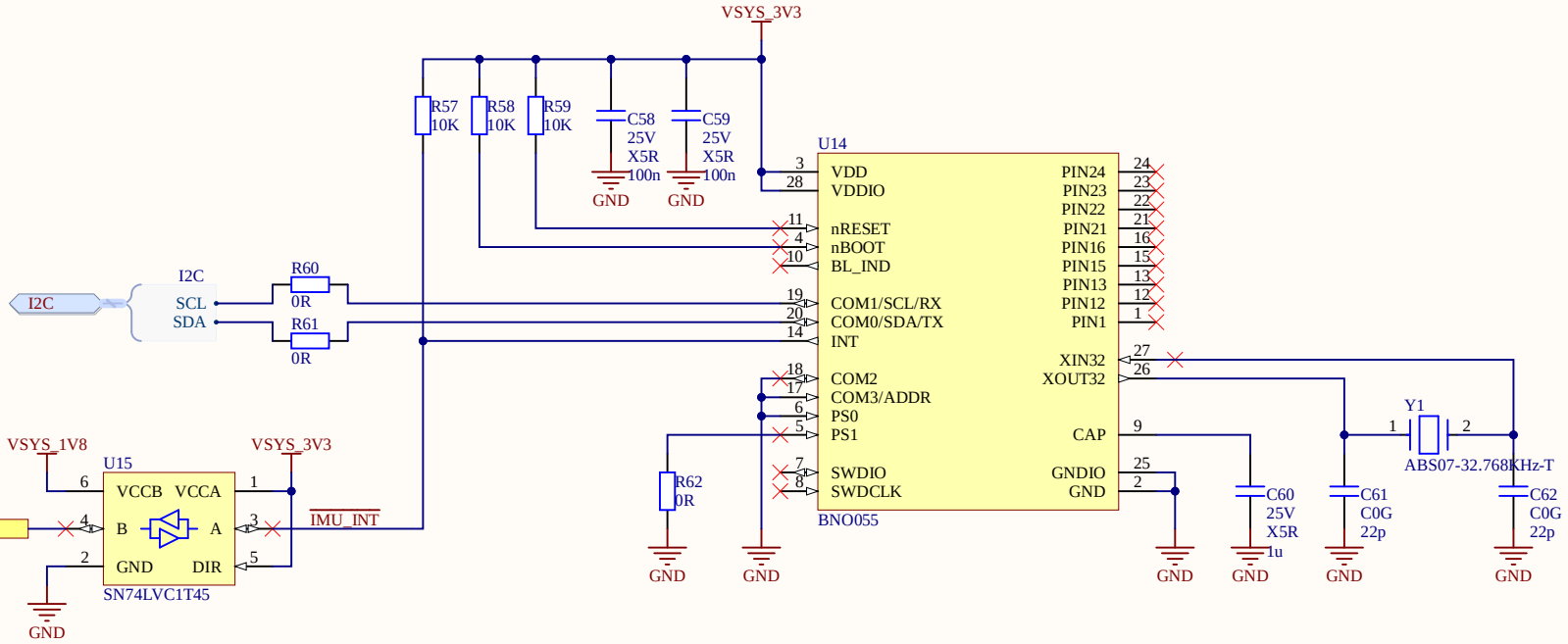


Title	*SAM Carrier - m.2 Wifi/BT*		*GPA Robotics*
Size: A4	Number:7	Revision:1	
Date: 2021-09-21	Time: 00:44:00	Sheet 8 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			

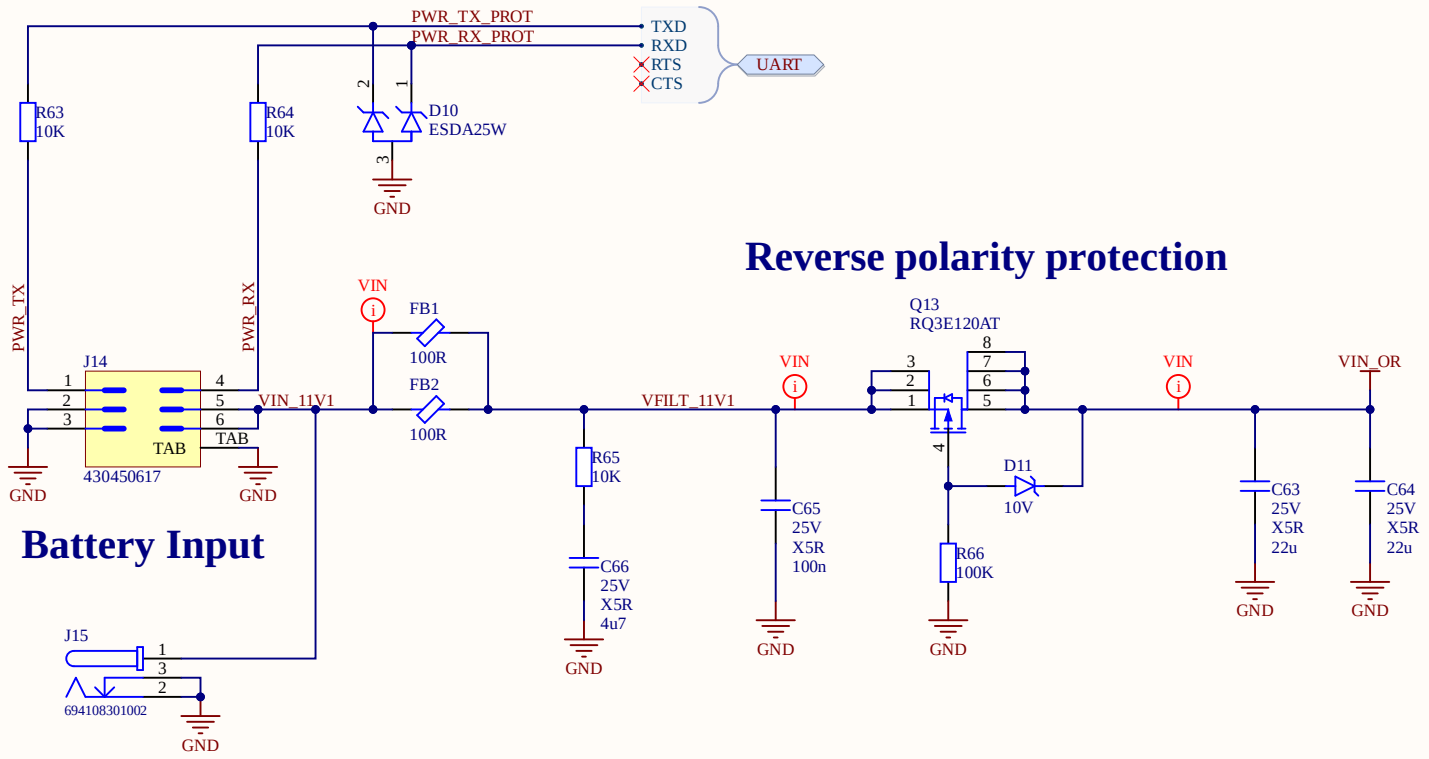


Title	*SAM Carrier - Servo driver*		*GPA Robotics*
Size: A4	Number: 8	Revision: 1	
Date: 2021-09-21	Time: 00:44:00	Sheet 9 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			

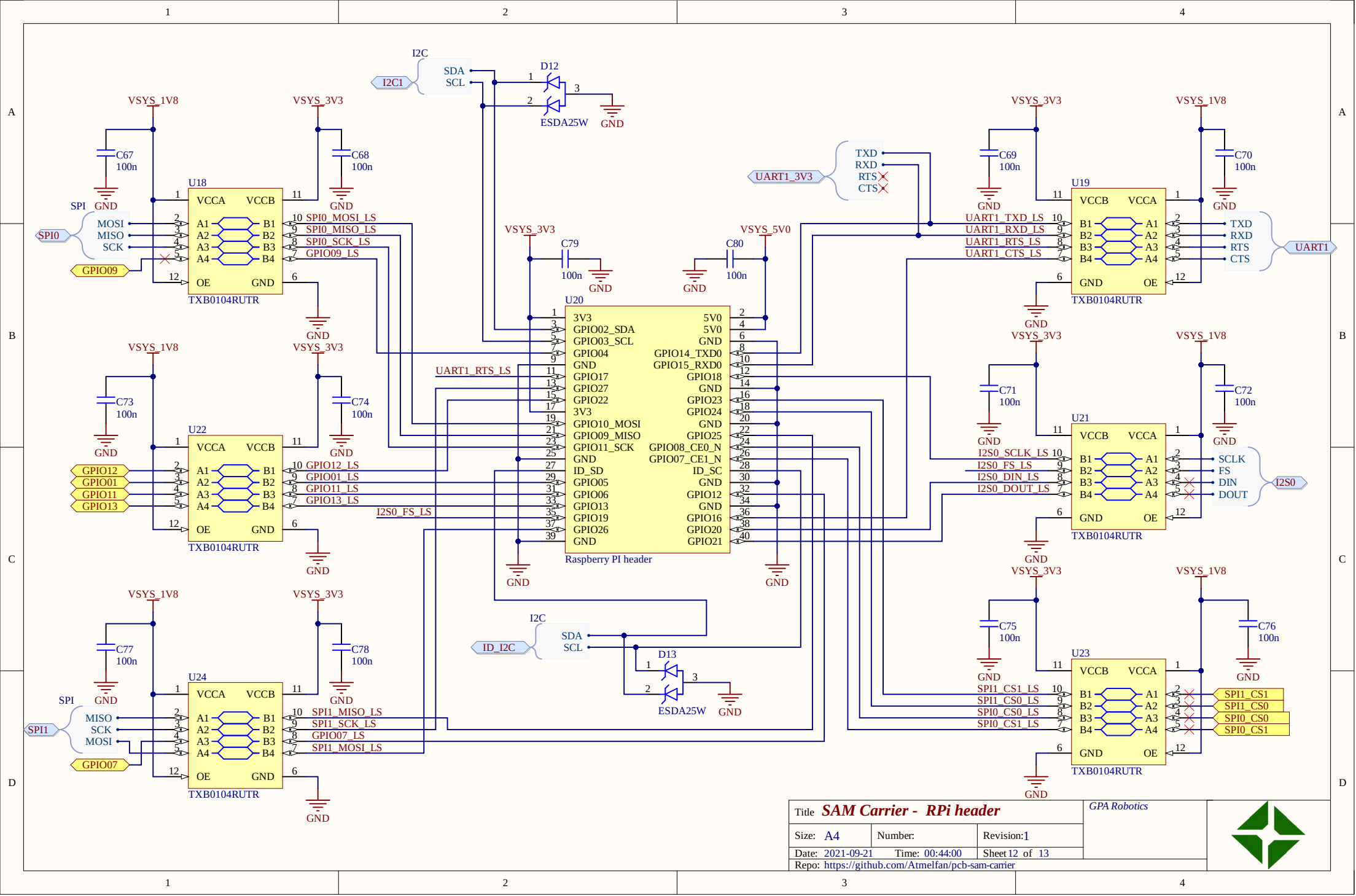

SERVO headers
VSYS_5V0
J11_SERVOS_RIGHT
RN1_SERVOS_RIGHT
RN2_SERVOS_RIGHT
S[0..7]
S0
S2
S4
S6
S1
S3
S5
S7
220R
2x5
GND
VSYS_3V3
C55_SERVOS_RIGHT
25V
X5R
100n
U12_SERVOS_RIGHT
I2C
SDA
SCL
SERVO_EN
VDD
EXTCLK
OE
A0
A1
A2
A3
A4
A5
PAD
VSS
Logic
LED0
LED1
LED2
LED3
LED4
LED5
LED6
LED7
LED8
LED9
LED10
LED11
LED12
LED13
LED14
LED15
pca9685bs
Address: 0x40
SERVO headers
S[8..15]
J12_SERVOS_RIGHT
RN3_SERVOS_RIGHT
RN4_SERVOS_RIGHT
S8
S10
S12
S14
S9
S11
S13
S15
Eye servos
J13_SERVOS_RIGHT
SHD
532610471
R49_SERVOS_RIGHT
10K
R50_SERVOS_RIGHT
10K
Q11_SERVOS_RIGHT
RU1J002YN
R51_SERVOS_RIGHT
0R
C56_SERVOS_RIGHT
100n
U13_SERVOS_RIGHT
IN
OUT
EN
FLG
AP22811A
Ilim: 1A
SERVO_PWR
C57_SERVOS_RIGHT
22u
D7_SERVOS_RIGHT
EN
Title SAM Carrier - Servo driver
GPA Robotics
Size: A4
Number:8
Revision:1
Date: 2021-09-21
Time: 00:44:00
Sheet 9 of 13
Repo: https://github.com/Atmelfan/pcb-sam-carrier



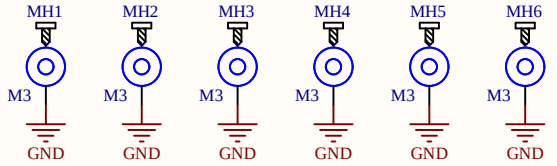
Title	***SAM Carrier - IMU sensor***		*GPA Robotics*
Size: A4	Number: 10	Revision: 1	
Date: 2021-09-21	Time: 00:44:00	Sheet 10 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			



Title	*SAM Carrier - DC Input*		*GPA Robotics*
Size: A4	Number:	Revision: 1	
Date: 2021-09-21	Time: 00:44:00	Sheet 11 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			


I2C
I2C1
SDA
SCL
D12
ESDA25W
GND
VSYS_1V8
VSYS_3V3
VSYS_5V0
C67
100n
C68
100n
C69
100n
C70
100n
C71
100n
C72
100n
C73
100n
C74
100n
C75
100n
C76
100n
C77
100n
C78
100n
C79
100n
C80
100n
U18
TXB0104RUTR
U19
TXB0104RUTR
U20
Raspberry PI header
U21
TXB0104RUTR
U22
TXB0104RUTR
U23
TXB0104RUTR
U24
TXB0104RUTR
SPI
SPI0
MOSI
MISO
SCK
GPIO09
SPI0_MOSI_LS
SPI0_MISO_LS
SPI0_SCK_LS
GPIO09_LS
UART1_3V3
TXD
RXD
RTS
CTS
UART1
UART1_TXD_LS
UART1_RXD_LS
UART1_RTS_LS
UART1_CTS_LS
I2S0
SCLK
FS
DIN
DOUT
I2S0_SCLK_LS
I2S0_FS_LS
I2S0_DIN_LS
I2S0_DOUT_LS
GPIO12
GPIO01
GPIO11
GPIO13
GPIO12_LS
GPIO01_LS
GPIO11_LS
GPIO13_LS
SPI1
GPIO07
SPI1_MISO_LS
SPI1_SCK_LS
GPIO07_LS
SPI1_MOSI_LS
ID_I2C
SPI1_CS1_LS
SPI1_CS0_LS
SPI0_CS0_LS
SPI0_CS1_LS
SPI1_CS1
SPI1_CS0
SPI0_CS0
SPI0_CS1
3V3
GPIO02_SDA
GPIO03_SCL
GPIO04
GPIO17
GPIO27
GPIO22
GPIO10_MOSI
GPIO09_MISO
GPIO11_SCK
ID_SD
GPIO05
GPIO06
GPIO13
GPIO19
GPIO26
5V0
GPIO14_TXD0
GPIO15_RXD0
GPIO18
GPIO23
GPIO24
GPIO25
GPIO08_CE0_N
GPIO07_CE1_N
ID_SC
GPIO12
GPIO16
GPIO20
GPIO21
Title SAM Carrier - RPi header
GPA Robotics
Size: A4
Number:
Revision:1
Date: 2021-09-21
Time: 00:44:00
Sheet 12 of 13
Repo: https://github.com/Atmelfan/pcb-sam-carrier

Mounting holes



Title	***SAM Carrier - Mechanical***		*GPA Robotics*
Size: A4	Number: 11	Revision: 1	
Date: 2021-09-21	Time: 00:44:00	Sheet 13 of 13	
Repo: https://github.com/Atmelfan/pcb-sam-carrier			