Project: BW1098OBC
Current Revision: R1M0E1

BW1098OBC Revision History:

Date	Revision	Reason for Change	Changes Implemented
10/21/2019	Initial release		
11/27/2019	R0M0E0 –> R1M0E1	1) Decoupling capacitors too close to OV9282 camera module body 2) Overlay on OV9282 camera module body too wide and should match outline of module body 3) Left/Right camera convention doens't match verbiage in schematic	1) Moved C7, C8, C9 and C12 a bit farther from the J3 (Left) camera module. Moved C23 and C25 a bit farther away from J9 (Right) camera module. 2) Updated the overlay for right and left OV9282 camera modules so that it outlined the 3D Body layer. This should match the camera module body outline and make it easier to mount and aligne the modules. 3)

Luxonis Holding
1925 Harmony Park Drive
Westminster, CO
80234
United States

Sheet: /U_BW1098OBC_Project_Information/
File: BW1098OBC_Project_Information.sch

Title: BW1098OBC_Project_Information—SchDoc

Size: B	Date: 14 12 2020	**Rev:**
KiCad E.D.A. kicad (5.1.9)-1		Id: 7/8

Sheet: Power Supply

File: ../BW1098ABC/BW1098ABC_Power.sch

Leave as is unless using another BW1099
compatible camera/connector set.
Power req.'s and other things may change.
This design uses ON BOARD CCMs, from
sunny optical

SEE CAMERA AND CONNECTORS GUIDE FOR MORE INFO

Sheet: U_BW1098OBC_IMX378

File: BW1098OBC_IMX378.sch

Sheet: U_BW1098OBC_LEFT_OV9282

File: BW1098OBC_LEFT_OV9282.sch

Sheet: U_BW1098OBC_RIGHT_OV9282

File: BW1098OBC_RIGHT_OV9282.sch

USBC is recommended in all designs. Leave this as is.

Sheet: U_BW1098OBC_USB

File: BW1098OBC_USB.sch

Sheet: U_BW1098OBC_Connector

Except where noted, leave current contents
of this sheet as-is and add in peripherals or uC

A system on module (SoM) is the basis of
every design. The BW1099 uses a 100 pin
interface to communicate. The SPI0
interface with the SoM provides easy
peripheral configuration. I2C3 UART and
QSPI available.

File: BW1098OBC_Connector.sch

Sheet: U_BW1098OBC_Project_Information

File: BW1098OBC_Project_Information.sch

H?
MountingHole_M2.5

H?
MountingHole_M2.5

H?
MountingHole_M2.5

H?
MountingHole_M2.5

FID?
Fiducial

FID?
Fiducial

FID?
Fiducial

FID?
Fiducial

FID?
Fiducial

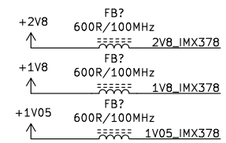
FID?
Fiducial

Luxonis Holding
1925 Harmony Park Drive
Westminster, CO
80234
United States

Sheet: 2/8
File: BW1098OBC_TopLevel.sch

Title: BW1098OBC_TopLevel-SchDoc

Size: B	Date: 14 12 2020	Rev:
KiCad E.D.A. kicad (5.1.9)-1		Id: 1/8

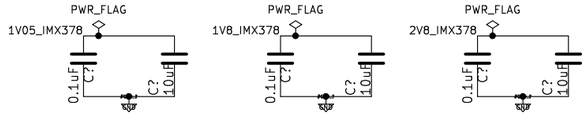


Place FBs and caps close to their associated camera connector.

MODULE & SENSOR INFORMATION			
MODULE	TG161B-201 OR AN01V32-0JG	I2C Clock Rate	400 kHz Max
SENSOR	OV09282-GA4A B&W 1 Mega pixel CMOS 1/4 inch	I2C Address (8 bits)	0xC0(W) 0xC1(R)
MAX RESOLUTION 1280X800		Sensor Clock Input	6 – 64 MHz (24 MHz typ.)

Supply Information

Supply Name		Voltage	Max Current
Module	Sensor		
DOVDD	VDD-IO	1.8V	2.5mA
DVDD	VDD-D	1.2V	52mA
AVDD	VDD-A	2.8V	24mA

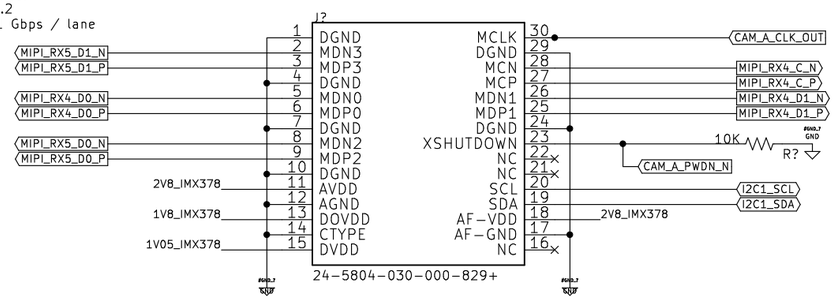


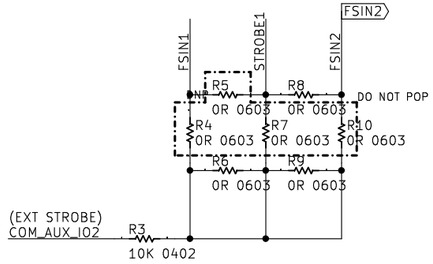
IMX378 MODULE CONNECTOR

MODULE & SENSOR INFORMATION			
MODULE	A12N02A-201	I2C Clock Rate	1000 kHz Max
SENSOR	IMX378-AAQH5-C 12.3 Mega pixel CMOS 1/2.3 inch	I2C Address (8 bits)	0x34 (Sensor) 0x18 (VCM driver) 0xA0 (EEPROM driver)
MAX RESOLUTION 4056x3040		Sensor Clock Input	6 – 27 MHz

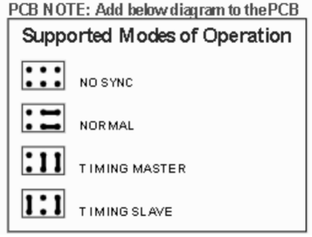
MIPI CAM A

MIPI Lanes:
DPHYv1.2
Max 2.1 Gbps / lane





PCB NOTE: Add below diagram to the PCB



Jumper configuration for FSIN and STROBE pins

Used for configuring the STROBE signal direction between the camera boards by using jumpers. A strobe signal may drive FSIN signal for waking up a sensor from its low power mode. See the "Supported Modes of Operation" note for supported jumper settings.

– "NO SYNC" is the mode in which none of the camera modules is excited by any strobe signal.

– "NORMAL" mode means STROBE mechanism works only among the stereo cameras themselves. In this mode, CAM1 strobe is connected to the CAM2 FSIN input.

– "TIMING MASTER" mode means CAM1 STROBE signal drives the EXT_STROBE signal as well as the CAM2 FSIN input. EXT_STROBE signal circulates among the other camera ports so that one camera module can manage the timing of all cameras within the system.

– "TIMING SLAVE" mode uses external strobe signal which is driven externally by another camera. In this mode, CAM1 and CAM2 are excited by the EXT_STROBE signal. Note that, at most only one camera can be in the "TIMING MASTER" mode at a time. STROBE generation and FSIN reception should be configured via software.

Because the stereo pair of OV9282 modules hard wired to CAM_B no additional reset cirucitry is required to account for different conditions. This means that "CAM1" (Left) is reset via CAM_PWDN, and "CAM2" (Right), is reset via CAM_PWM. This also means that the signal CAM_AUX_IO1 is no longer required here, as that was only possible if the stereo pair were connected to CAM_C or CAM_D

OV9282 sensor I2C address may be changed via I2C protocol. Therefore, in order to assign different I2C address to the sensors on the same I2C bus, one needs to hold the reset the all sensors except one and assign a unique I2C address to the active sensor. This routine should be applied for all sensors in the initialization routine.

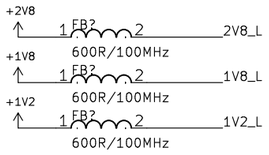
CAMERA CONNECTOR RESET CONNECTION TABLE

CAM NO	CAMERA CONNECTOR			
	CAM_A	CAM_B	CAM_C	CAM_D
CAM_1	CAM_PWDN	CAM_PWDN	CAM_PWDN	CAM_PWDN
CAM_2	CAM_PWM	CAM_PWM	CAM_AUX_IO1	CAM_AUX_IO1

Sheet: /U_BW1098OBC_LEFT_OV9282/
File: BW1098OBC_LEFT_OV9282.sch

Title: BW1098OBC_LEFT_OV9282-SchDoc

Size: B	Date: 12 12 2020	Rev:
KiCad E.D.A. kicad (5.1.9)-1		Id: 2/8



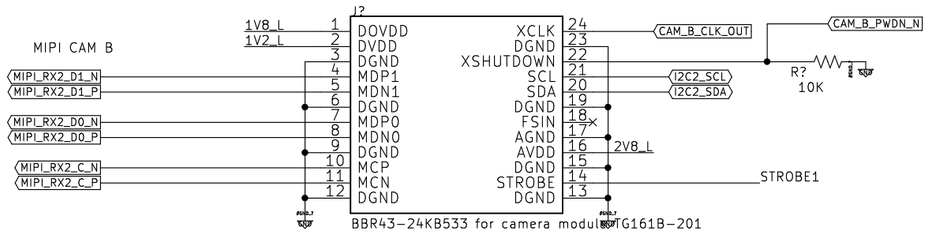
Supply Information

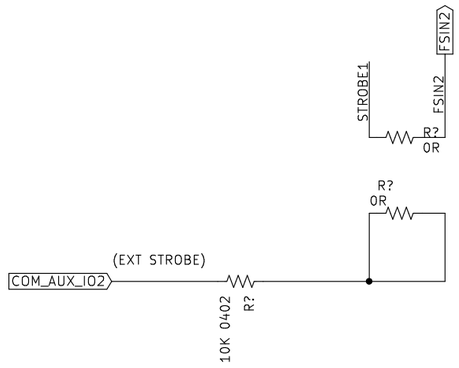
Supply Name		Voltage	Max Current
Module	Sensor		
AVDD	VANA	2.8V ± 0.1	55mA
DOVDD	VIF	1.8V ± 0.1	2.5mA
DVDD	VDIG	1.05V ± 0.1	446mA

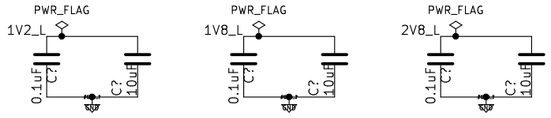
On the BW1097, the IMX378 camera module is hardwired into the "Cam-A" logical position. This means the logic which used to be required to support the module being plugged into different physical connectors (and different logical positions) is no longer needed and can be removed.

Note: It is still a limitation that the clock source for the cameras must be shared between CAMA/C and CAMB/D.

Mark "LEFT" on PCB
Place so that is the module's left camera.





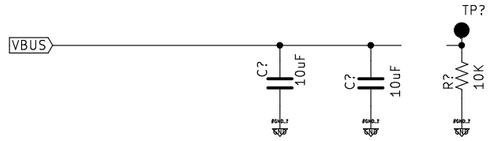


Luxonis Holding
1925 Harmony Park Drive
Westminster, CO
80234
United States

Sheet: /U_BW1098OBC_IMX378/
File: BW1098OBC_IMX378.sch

Title: BW1098OBC_IMX378-SchDoc

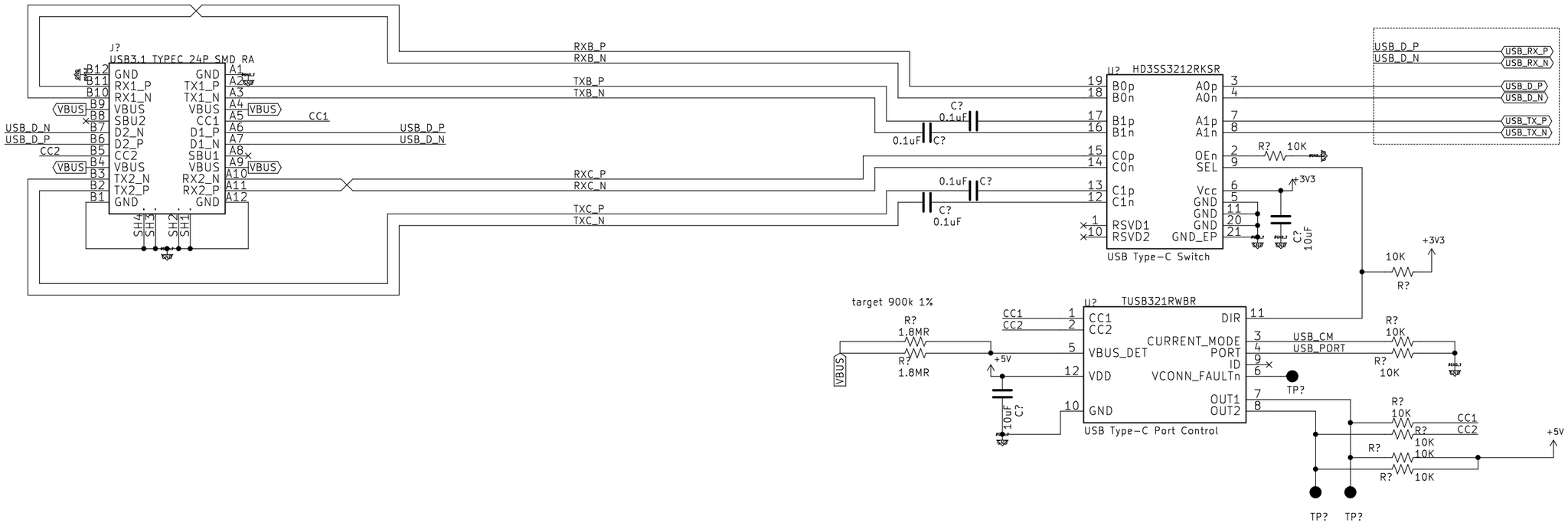
Size: B	Date: 12 12 2020	Rev:
KiCad E.D.A. kicad (5.1.9)-1		Id: 3/8



Current Mode:
L – Low(500–900mA) current. (Default) Pull–down to GND or leave unconnected.
M – Medium (1.5A) current. Pull–up to VDD with 500–kO resistor.
H – High (3.0A) current. Pull–up to VDD with 10–kO resistor.

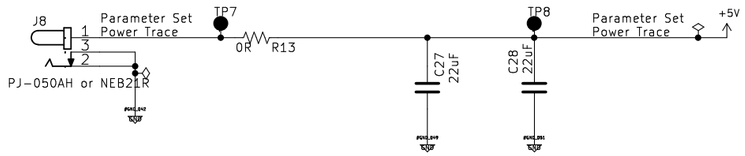
DIR pin:
DIR of plug. This open drain output indicates the detected plug orientation:
Type–C plug position 2 (H) connectos Port A to Port C on U61;
Type–C plug position 1 (L) connects port A to Port B on U61.

Port:
H – DFP (Pull–up to VDD if DFP mode is desired)
NC – DRP (Default) (Leave unconnected if DRP mode is desired)
L – UFP (Pull–down or tie to GND if UFP mode is desired)

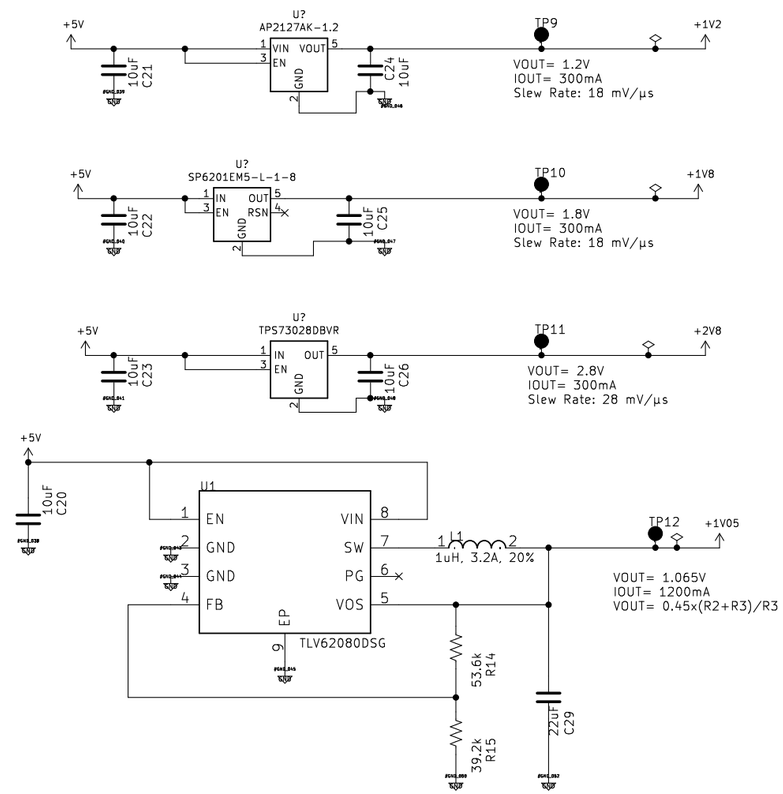


Luxonis Holding 1925 Harmony Park Drive Westminster, CO 80234 United States	
Sheet: /U_BW1098OBC_USB/ File: BW1098OBC_USB.sch	
Title: BW1098OBC_USB–SchDoc	
Size: B	Date: 12 12 2020
KiCad E.D.A. kicad (5.1.9)–1	Id: 4/8

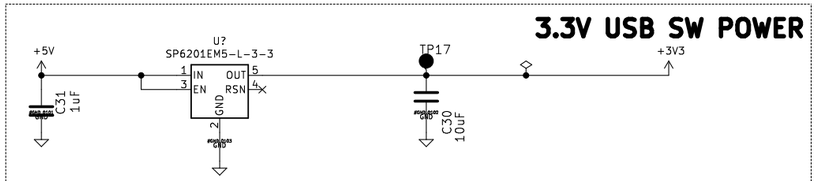
POWER INPUT



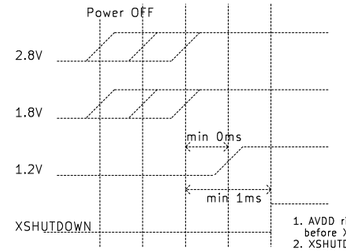
POWER SUPPLIES FOR CAMERA MODULES



3.3V USB SW POWER



OV9282 POWER REQUIREMENTS

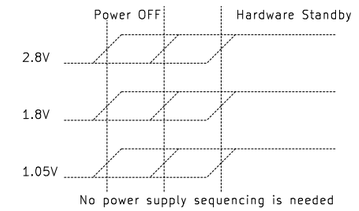


Supply Information

Supply Name Module	Sensor	Voltage	Max Current
DOVDD	VDD-IO	1.8V	2.5mA
DVDD	VDD-D	1.2V	52mA
AVDD	VDD-A	2.8V	24mA

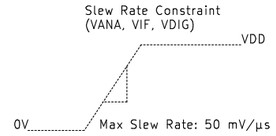
1. AVDD rising can occur before or after DOVDD rising as long as they are rising before XSHUTDOWN rising
2. XSHUTDOWN is pulled up after AVDD and DOVDD are stable
3. DVDD rises after DOVDD, but before XSHUTDOWN is pulled high

IMX378 POWER REQUIREMENTS



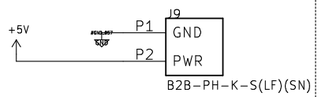
Supply Information

Supply Name Module	Sensor	Voltage	Max Current
AVDD	VANA	2.8V ± 0.1	55mA
DOVDD	VIF	1.8V ± 0.1	2.5mA
DVDD	VDIG	1.05V ± 0.1	446mA



POWER SEQUENCING REQUIREMENTS:
The BW1099 module handles it's own power sequencing on-board.
The camera modules have their own power sequencing requirements.
The OV9282 have requirements for sequencing, and the IMX378 has a max slew rate requirement. See above.

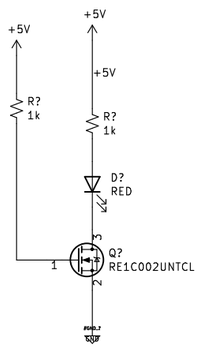
FAN CONTROLLER



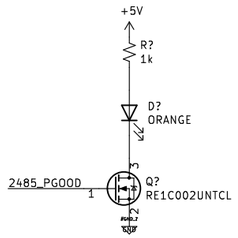
TP13 TP14 TP15 TP16

Sheet: /Power Supply/	
File: BW1098ABC_Power.sch	
Title:	
Size: A3	Date:
KiCad E.D.A. kicad (5.1.9)-1	Id: 5/8

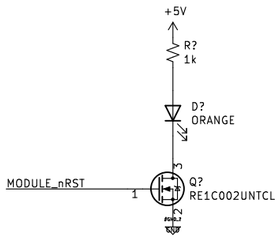
VDD_5V drawn by BW1099 can
be up to 1A VBUS on BW1099
is only sense input



Mark "5V" on PCB



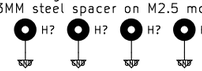
Mark "2485_PGOOD" on PCB



Mark "nRST" on PCB

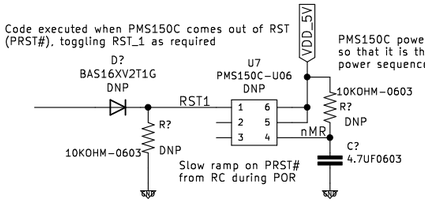
2485_PGOOD and MODULE_nRST both have pull ups to 1.8V
on 1099 module. 2485_PGOOD is held low by open-drain output
on 1099 PMIC until power is good. MODULE_nRST rises with
1.8V at POR, but can be held low by user button or 1099 JTAG.

SMT mounting standoffs for module
M2, 3MM steel spacer on M2.5 mounting pad



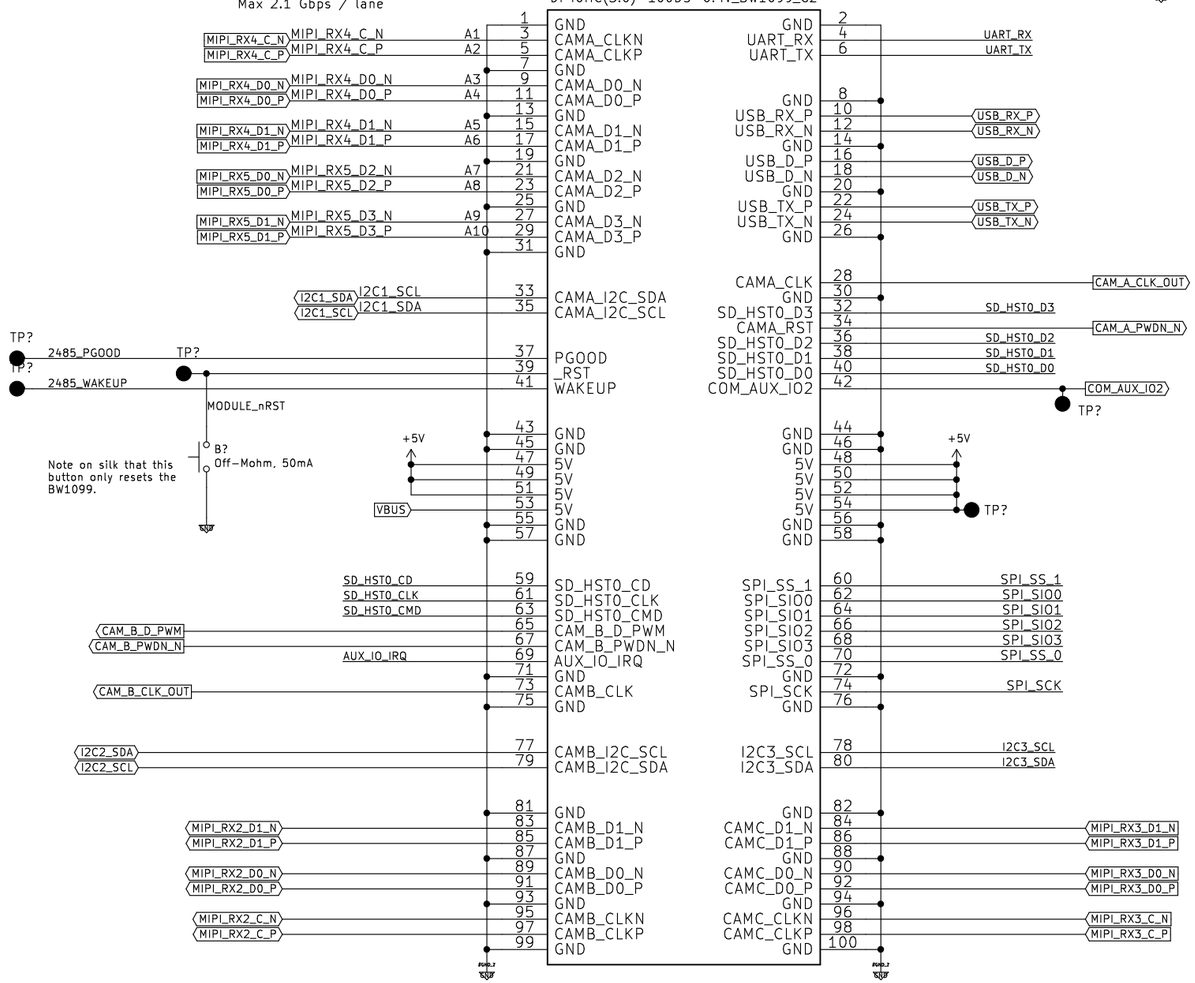
Code executed when PMS150C comes out of RST
(PRST#), toggling RST_1 as required

PMS150C powered by 5V
so that it is the first in the
power sequence to turn on

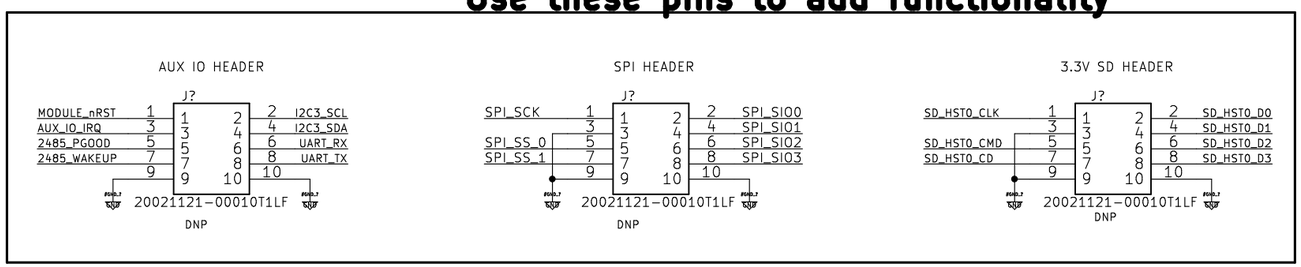


MIPI Lanes:

DPHYv1.2
Max 2.1 Gbps / lane



Use these pins to add functionality

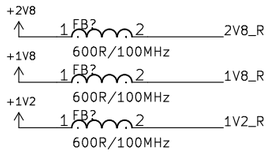


Luxonis Holding
1925 Harmony Park Drive
Westminster, CO
80234
United States

Sheet: /U_BW1098OBC_Connector/
File: BW1098OBC_Connector.sch

Title: BW1098OBC_Connector-SchDoc

Size: B	Date: 14 12 2020	Rev:
KiCad E.D.A. kicad (5.1.9)-1		Id: 6/8



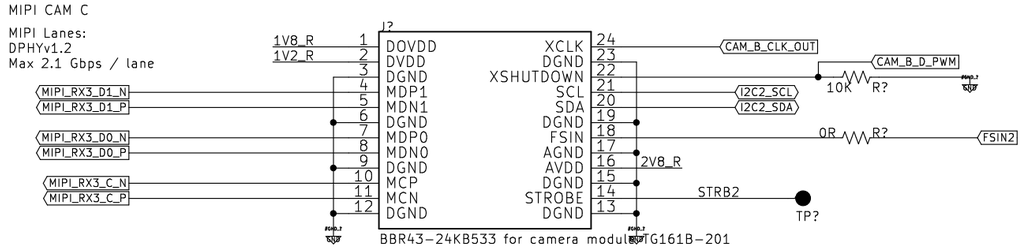
Place FBs and caps close to their associated camera connector.

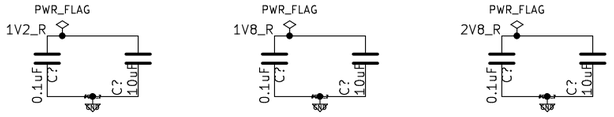
MODULE & SENSOR INFORMATION			
MODULE TG161B-201 OR AN01V32-0JG		I2C Clock Rate	400 kHz Max
SENSOR	OV09282-GA4A B&W 1 Mega pixel CMOS 1/4 inch	I2C Address (8 bits)	0xC0(W) 0xC1(R)
MAX RESOLUTION 1280X800		Sensor Clock Input	6 - 64 MHz (24 MHz typ.)

Supply Information

Supply Name		Voltage	Max Current
Module	Sensor		
DOVDD	VDD-IO	1.8V	2.5mA
DVDD	VDD-D	1.2V	52mA
AVDD	VDD-A	2.8V	24mA

Mark "RIGHT" on PCB
Place so that this is the module's right camera.





Because the stereo pair of OV9282 modules hard wired to CAM_B (below) no additional reset cirucitry is required to account for different conditions. This means that "CAM1" (Left) is reset via CAM_PWDN, and "CAM2" (Right), is reset via CAM_PWM. This also means that the signal CAM_AUX_IO1 is no longer required here, as that was only possible if the stereo pair were connected to CAM_C or CAM_D

OV9282 sensor I2C address may be changed via I2C protocol. Therefore, in order to assign different I2C address to the sensors on the same I2C bus, one needs to hold the reset the all sensors except one and assign a unique I2C address to the active sensor. This routine should be applied for all sensors in the initialization routine.

CAMERA CONNECTOR RESET CONNECTION TABLE				
CAM NO	CAMERA CONNECTOR			
	CAM_A	CAM_B	CAM_C	CAM_D
CAM_1	CAM_PWDN	CAM_PWDN	CAM_PWDN	CAM_PWDN
CAM_2	CAM_PWM	CAM_PWM	CAM_AUX_IO1	CAM_AUX_IO1

Luxonis Holding
1925 Harmony Park Drive
Westminster, CO
80234
United States

Sheet: /U_BW1098OBC_RIGHT_OV9282/
File: BW1098OBC_RIGHT_OV9282.sch

Title: BW1098OBC_RIGHT_OV9282-SchDoc

Size: B	Date: 12 12 2020	**Rev:**
KiCad E.D.A. kicad (5.1.9)-1		Id: 8/8