Introduction

This document is written to outline the technical specifications of the Maivin carrier board. The design details within this document are intended to highlight the high-level operation of the hardware architecture and design.

The Maivin Camara platform supports the Toradex Verdin System-on-Modules (SOMs) and supports multiple different image sensor modules with a rear connector board to provide a complete camera system. The system is split into several modules, allowing for customization of interfaces and features to match the specific product requirements.

Table of Contents

List of Figures

List of Tables

Features

The Maivin Carrier Board is intended to provide a base to create a full camera platform using various modular blocks. The proven hardware design with an optimized form factor may be used for rapid validation and field prototyping to lower the risk and minimize the design effort for an application specific design.

- Small, optimized form factor for easy deployment for true application testing with enclosure.
- 12-24V power input with protection for flexible installations.
- Support various image sensors to match end application requirements.
- Dual image sensor support when mated with an appropriate SOM (such as the Verdin iMX8M Plus).
- Flexible communications options including RS-485, CANBUS, Ethernet, Wi-Fi.
- Expansion connector for POE, second Ethernet port, or BroadR-Reach Ethernet options
- Wireless LAN modem support when using the M.2 expansion interface.
- Expansion memory support via SD Card or M.2 SSD Card
- JTAG debug connector.
- UART console interfaces.
- Protected Input and Outputs for connection to external devices.
- Modular design to allow for easy customization and support for various interfaces and image sensors.

TABLE 1 - SYSTEM COMPONENTS

Device	Description
SOM Module	Toradex Verdin System on Module
DCDC	12 to 24V input to 3.3V buck regulator
3.3V Load Switch	Current limited load switch for 3.3V peripherals
Temperature Sensor	I^2C Temperature Sensor
Rear Connector Interface	30 Pin 0.5mm FFC Connector
Debug Connector	10-pin JTAG connector
2 Image Sensor Connectors	4 Lane MIPI CMOS sensor interface
M.2 Socket	B key M.2 Socket intended for LAN wireless modem modules or SSD Memory modules.
SD Card Socket	microSD Socket for flash memory cards for mass storage applications
LED Driver	High Power LED driver for artificial illumination applications
EEPROM	EEPROMs located on Carrier and Rear Connector board to store board parameter information

Device	Description
LED Indicator	LED indicator on Rear Panel
Momentary Switch	Pinhole accessible button
2 Inputs	Opto-Isolated digital inputs Support 12 to 24 V inputs
2 Outputs	Open Drain Protected FET outputs
RS-485 Interface	Half-duplex RS-485 serial interface
CANBUS	CANBUS transceiver
Ethernet	100/1000 Mbit/s Ethernet port with RJ45
Injection Molded Enclosure with Heatsink	Supports mounted heatsink on Verdin module for processor cooling. ¼" thread mount for tripod. Modular slots for different image sensor and rear connector module options.
Reverse Voltage Protection	Camera is protected against incorrect connection of the input power.
Electronic Fuse	Over voltage, undervoltage and over current protection.

Electrical Specifications

TABLE 2 - ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Min	Typical	Max	Unit
Input Voltage	**V_{IN}**	**10**	**12**	**27**	**V**
Ambient Temperature	**T_A**[1]	**-40**		**60**	**°C**
Undervoltage lockout (UVLO)[1]	**UVLO**	**7.7**	**8**	**9.3**	**V**
Input Over Current	**I_{IN_MAX}**		**2**		**A**
I/O output Max Current	**OUT_I_{MAX}**		**1**		**A**
Discrete Input Drive Current	**IN_{ID}**	**2.3V**	**3**	**V_{IN}**	**mA**

1. Ambient temperature is dependent on Verdin SOM selection, and operating modes.

Recommended Operating Conditions

TABLE 3 - RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Typical Operating Voltage	Typical Power Consumption
Input Voltage	**V_{IN}**	**12V**	**4.8W**

Power Consumption

Power Consumption with 12V input and AR0521 image sensor.

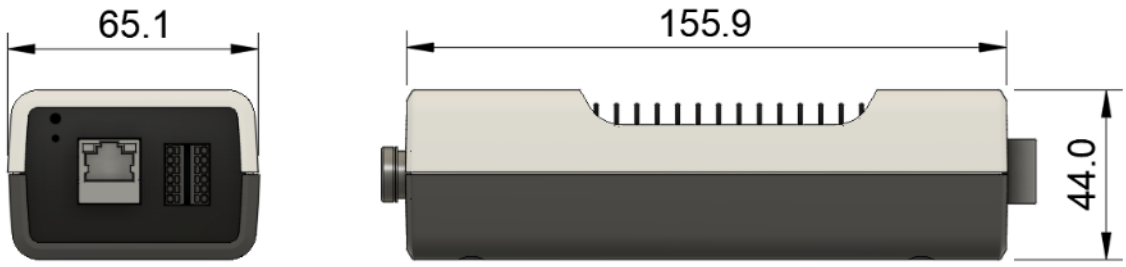
TABLE 4 - POWER CONSUMPTION

Operating Mode	Current (mA)	Power (W)
Idle, no image sensor	**250**	**3**
Running Inference with capturing images and detecting objects	**400**	**4.8**

Power consumption while running the classification/detection algorithms vary depending on the images captured, and items detected, and will also vary depending on the image sensor used, frame rate, and CPU operations.

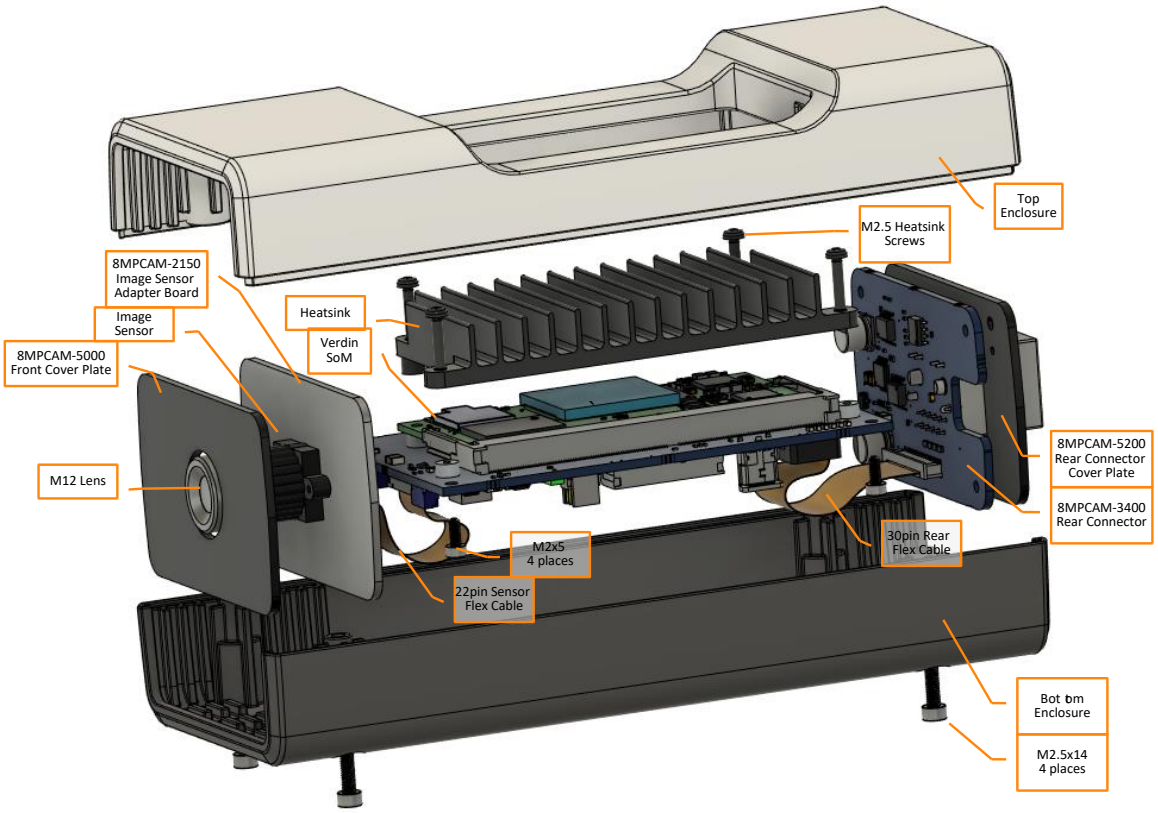
Mechanical Specifications

FIGURE 1 - DIMENSIONS



Note: all dimensions in mm.

FIGURE 2 - EXPLODED VIEW



Connector Pinouts

Rear Terminal Blocks

2 - Phoenix 1771130 6 pin terminal blocks

FIGURE 3 - REAR CONNECTOR PINOUT

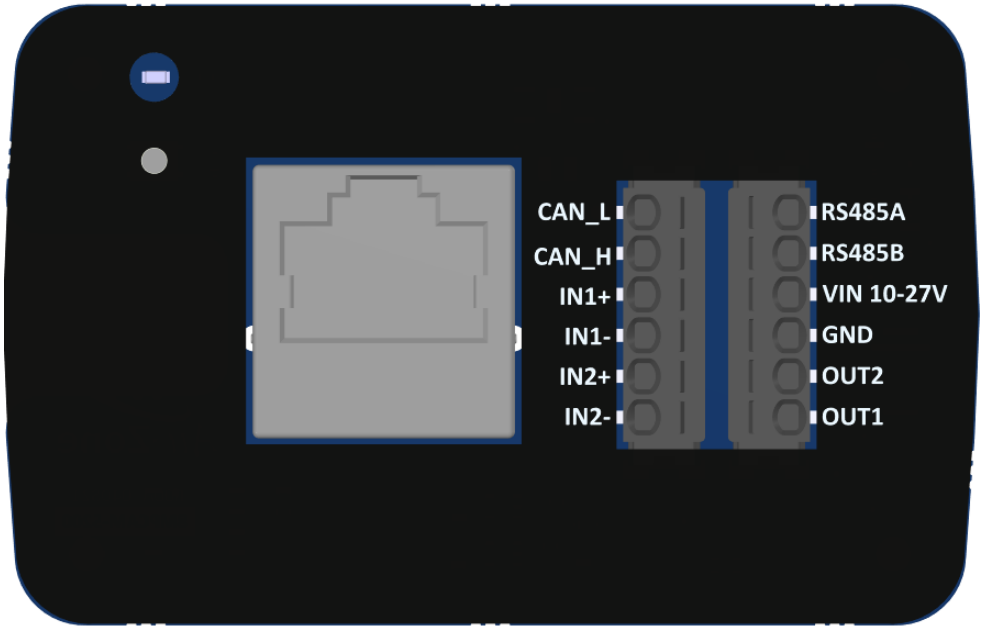


TABLE 5 – TERMINAL BLOCK PINOUT

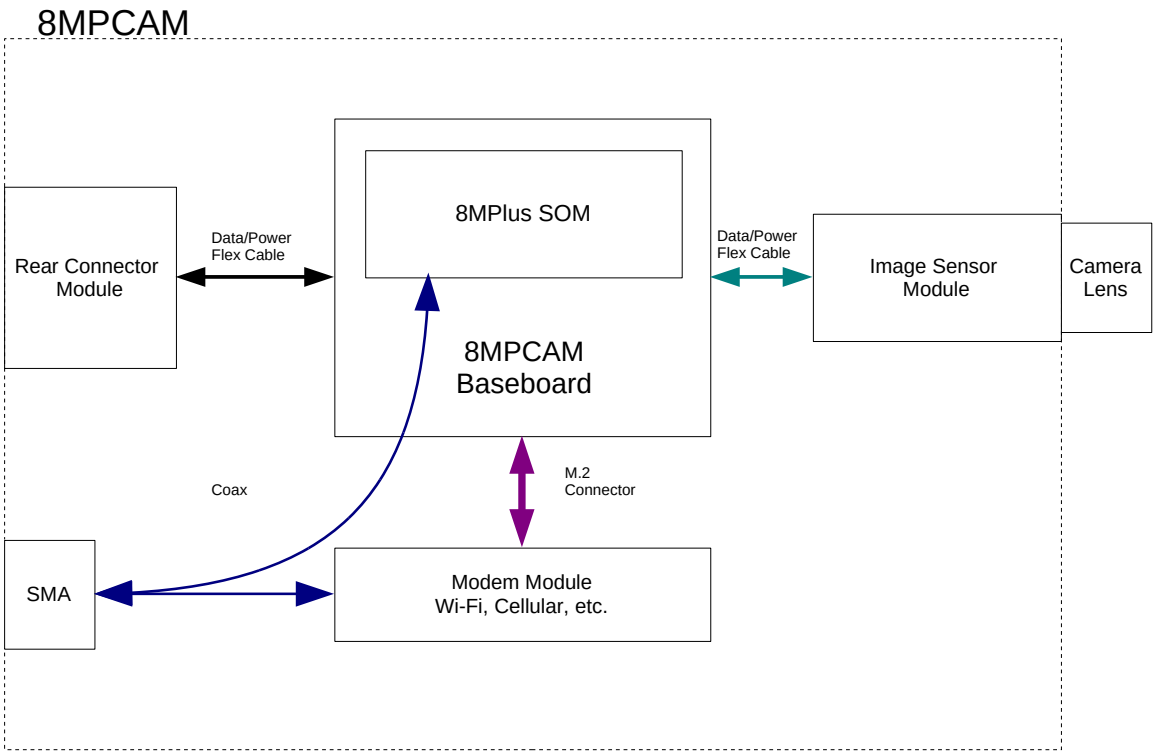
Name	Type	Function
CAN_L	**I/O**	**CANBUS L Signal**
CAN_H	**I/O**	**CANBUS H Signal**
IN1+	**Input**	**Opto-Isolated Input +**
IN1-	**Input**	**Opto-Isolated Input -**
IN2+	**Input**	**Opto-Isolated Input +**
IN2-	**Input**	**Opto-Isolated Input +**
RS-485A	**I/O**	**RS-485 Data Line A**
RS-485B	**I/O**	**RS-485 Data Line B**
VIN	**Power Input**	**Main power input**
Ground	**Power Ground**	**Ground**
OUT2	**Open Drain Output**	**Discrete Output**

Name	Type	Function
OUT1	**Open Drain Output**	**Discrete Output**

H/W Architecture

The figure below is a high-level block diagram of the complete Maivin camera. A four-board solution provides a complete modular camera consisting of the Verdin SOM CPU board, Carrier board, Image Sensor Module, and rear connector board. This modular approach allows for the customization of the camera features to meet specific requirements. Please refer to the schematics for implementation details.

FIGURE 4 – HIGH LEVEL CONNECTION DIAGRAM



8MPCAM-1100 Carrier Board

The 8MPCAM-1100 Carrier board is an assembly incorporating a SOM connector mount and all the necessary interface circuitry to create the fully functional camera platform.

FIGURE 5 – 8MPCAM-1100 CARRIER BOARD BLOCK DIAGRAM

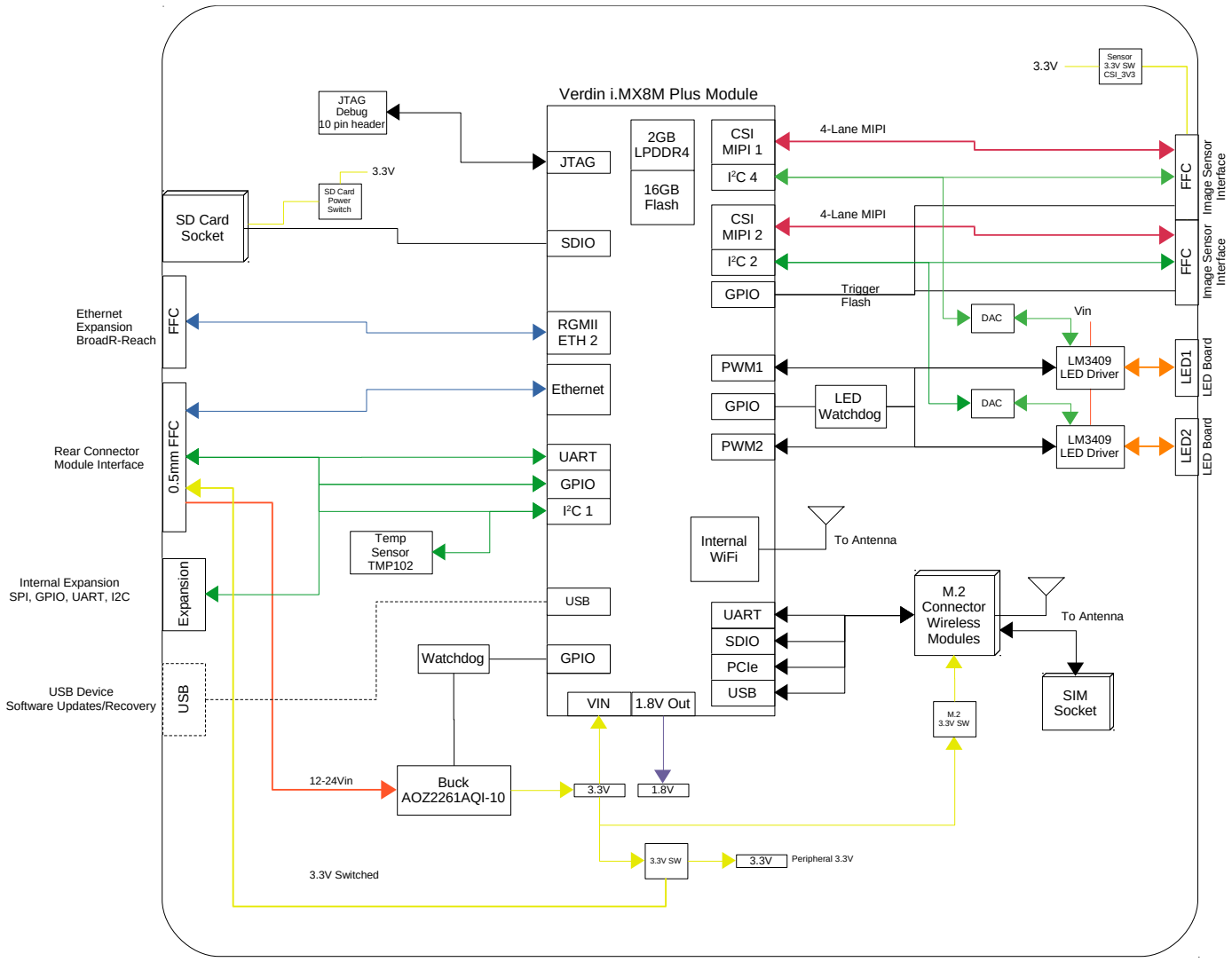


FIGURE 6 - CPU TOP COMPONENT BLOCKS

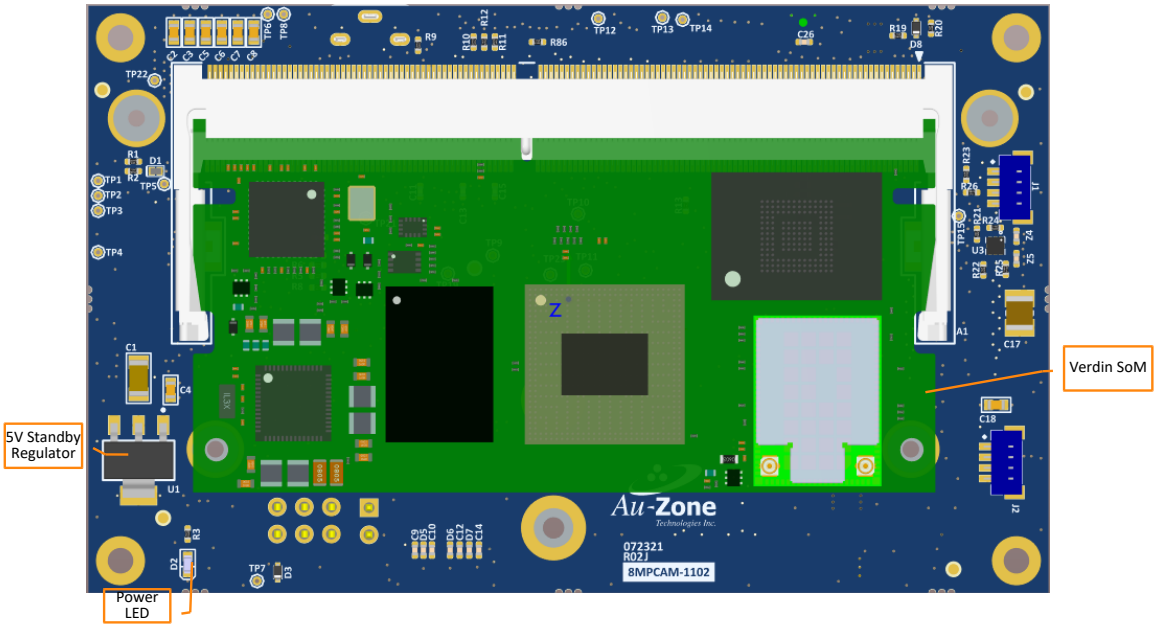


FIGURE 7 - CPU BOTTOM COMPONENT BLOCKS

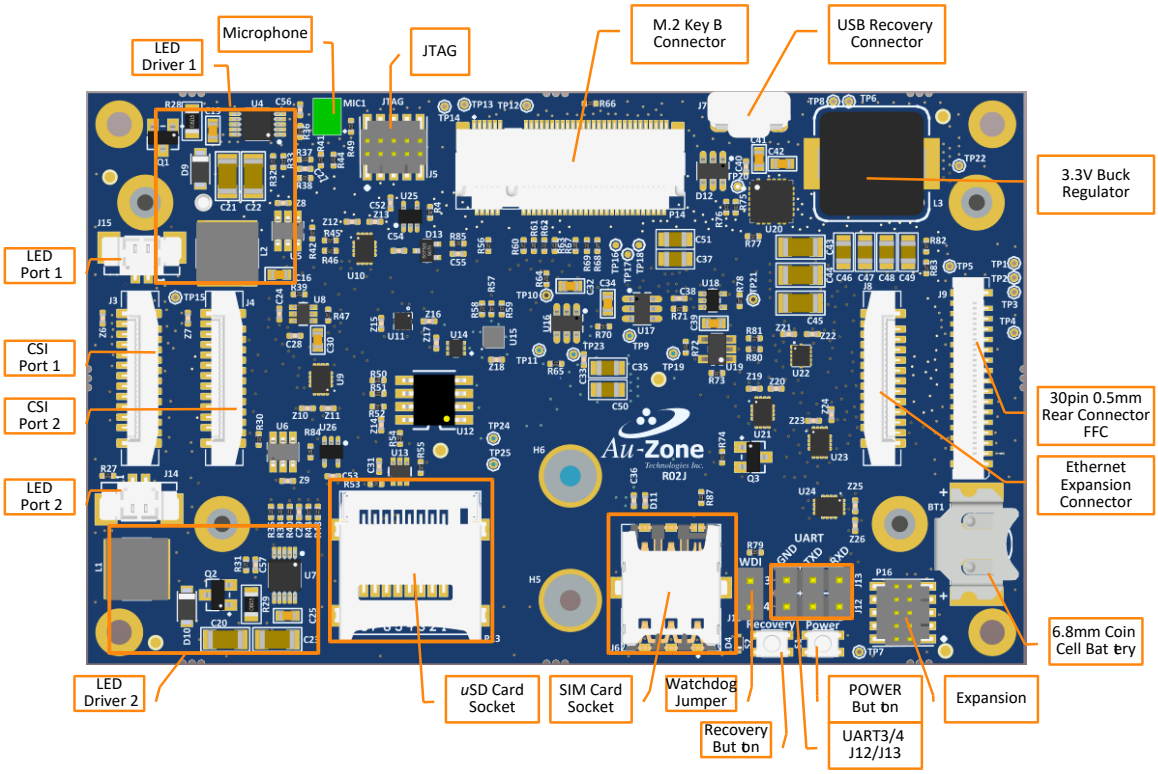


TABLE 6 - CONNECTOR DESCRIPTIONS

Ref	Description	Remarks
A1	Verdin SOM Connector	SODIMM DDR4
J7	USB Recovery Connector	USB Micro-B vertical Connector
J12	DEBUG UART 4	3.3V TTL UART Serial port
J13	DEBUG UART 3	3.3V TTL UART Serial port (default Linux Console)
J5	JTAG DEBUG	JTAG Header
P13	MicroSD Card Connector	
BT1	6.8mm rechargeable Battery Socket	For a 6.8mm 3V lithium rechargeable battery for Real Time Clock Backup.
J3	MIPI CSI Camera Connector Port 1	22pin 0.5mm FFC connector (default)
J4	MIPI CSI Camera Connector Port 2	22pin 0.5mm FFC connector (expansion)
J1	LED Connector Port 1	4-pin JST BM series. Direct Connection to LEDs in serial using on-board LED Driver.
J2	LED Connector Port 2	4-pin JST BM series. Direct Connection to LEDs in serial using on-board LED Driver.
J8	Ethernet Expansion	22pin 0.5mm FFC connector
J9	Rear Connector Interface	30pin 0.5mm FFC Connector. Input Power and Communication Interfaces (CAN, Serial, Ethernet etc.)
P14	M.2 Expansion Connector	Key B for wireless modem or memory card support
J6	nanoSIM Connector	SIM connector for M.2 connector

Verdin Module

The Verdin System on Module is a small form factor module using a standard DDR4 SODIMM edge connector. It is available in several different configurations with different processor options, memory configurations and wireless connectivity options. The Maivin Carrier board provides an interface to the Verdin module, specifically tailored for the Camera applications.

More detailed information about the Verdin Modules can be found in the Verdin Datasheets and Reference Manuals.

Power Supply

The 8MPCAM-1100 Carrier board receives 5-27V (12V nominal) power input from the rear connector board. This input supply is converted to 3.3V using an on-board DC-DC Buck regulator to supply the Verdin Module, and all the peripheral systems and interfaces.

The power rails for the carrier board are shown below.

TABLE 7 - POWER RAILS

Power Rail	Input Range	Nominal (V)	Source	Max Current	Enable Signal	Description
3V3	**5V-27.5V**[1]	**3.3**	**VIN**	**6A**	**Watchdog Circuit**	**Primary 3.3V supply**
3V3_SW	**3.3V**	**3.3**	**3V3**	**1.8A**	**PWR_EN_MOCI**	**3.3V switched supply for peripheral circuits. SOM will enable this supply once powered-up.**
5V_STB	**5V-27.5V**	**5**	**VIN**		**Always On**	**Standby 5V supply. Powers Primary 3.3V Buck regulator VCC (U20) and watchdog monitor.**
SD_VCC	**3.3V**	**3.3V**	**3V3_SW**		**SD_PWR_EN**	**Switched SD card supply**
CSI_3V3	**3.3V**	**3.3V**	**3V3**	**1A**	**CSI_EN**	**Switched 3.3V for Image Sensors**
M2_3V3	**3.3V**	**3.3V**	**3V3**	**2.4A**	**M2_PWR_EN**	**Switched 3.3V for M.2 Socket**

1. Input range may be reduced by rear connector power circuits.

Watchdog

U19 is an Analog Devices ADM6320CZ29ARJZ supervisory circuit with an integrated watchdog function. It has a timeout of ~25.6s. If the WDI input is not toggled within that timeframe, the /RESET output will be pulled low for the reset period of 200ms. If the WDI input is high impedance, then the watchdog function will no longer function. If the shunt jumper on J10 is not placed, the watchdog will be disabled.

GPIO

Several GPIO are used on the SOM for control lines for the various external components, LED indicators, as well as expansion features. The majority of the GPIO will use the various peripheral blocks such as CSI, Ethernet, UART, etc. The following table outlines the various GPIO used on the processor and their function.

TABLE 8 - GPIO TABLE

GPIO Name	Pin	Net Name	Direction	Function
QSPI_1_CLK	52	WDI	Output	Signal to pet the watchdog circuit to prevent board power cycle.
QSPI_1_CS#	54	M2_PWR_EN	Output	Power enable pin for M.2 power supply
QSPI_1_IO0	56	/CARD_PWR_OFF	Output	Power off signal for M.2 card
QSPI_1_IO1	58	CSI_EN	Output	Power enable for the CSI sensor interfaces and CSI_3V3
QSPI_1_IO2	60	LED_WDI	Output	LED Drivers watchdog signal. Must be toggled periodically to enable the LED drivers.
QSPI_1_IO3	62	/M2_RST	Output	Reset for the M.2 Modems
QSPI_1_CS2#	64	SW1	Input	User button input
QSPI_1_DQS	66	LED1	Output	Drive user LED1
I2S_2_BCLK	42	CSI_DIR1	Output	Direction control of CSI2_IO2
I2S_2_SYNC	44	CSI_DIR2	Output	Direction control of CSI2_IO1
I2S_2_D_OUT	46	CSI_DIR3	Output	Direction control of CSI1_IO2
I2S_2_D_IN	48	CSI_DIR4	Output	Direction control of CSI1_IO1

Important notes: Ensure the proper state of the pins is setup to ensure peripherals are controlled properly.

UARTs

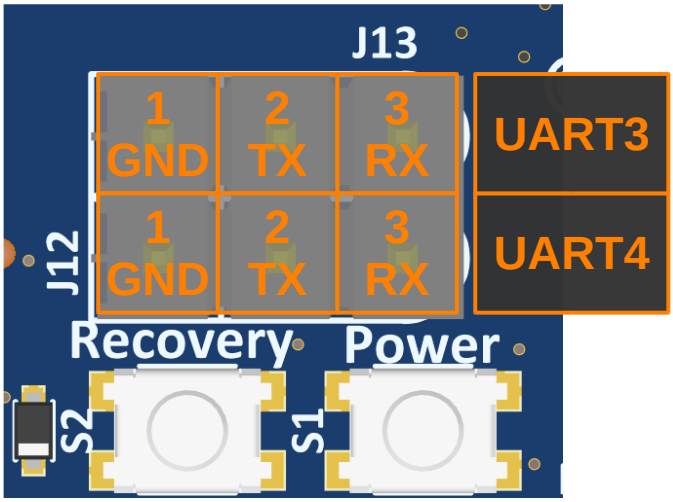
The following 3 UARTS are used in the design:

- UART 1 – Rear Connector Serial. This 4-pin port is connected to the rear connector where it may be used for external serial communications. The 8MPCAM-3400 board implements RS-485 to provide a balanced differential serial connection.
    - For RS-485, UART1_RTS can be used to signal the transceiver for half-duplex mode.
- UART 3 – 2 pin UART for debug – J13 – Default Toradex Linux debug console port
- UART 4 – 2 pin UART for expansion – J12

TABLE 9 – DEBUG CONNECTOR PINOUT UART3/UART4 (J13/J12)

Pin	Name	Function
1	GND	Ground
2	UART3_TX	Transmit output from module
3	UART3_RX	Receive Input from module

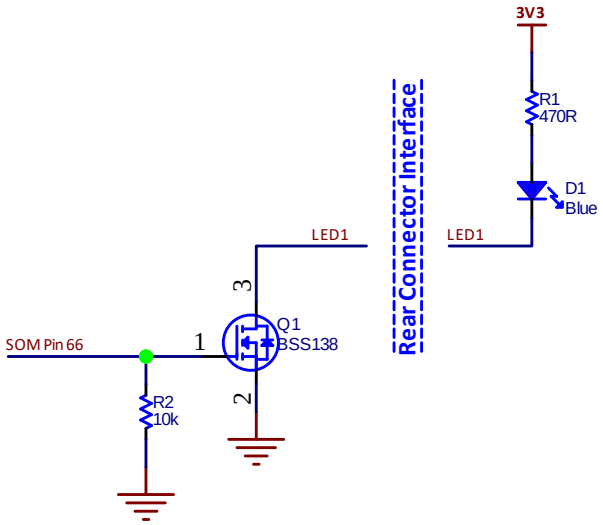
FIGURE 8 - UART CONNECTOR PINOUTS



LED Indicator

- Power LED – BLUE LED connected to 3V3_SW net. This LED will turn on once the SOM has started-up and turned on the 3V3_SW power switch.
- Indicator LED – Net LED1 is the output from and open drain nFET to control an indicator LED on the Rear Connector board. A typical connection would be as follows:

FIGURE 9 - LED INDICATOR



On-board Button Switches

There are two momentary switches on the carrier board:

Switch	Function

S1	Power button switch. Connected to the Verdin SOM power control model. Refer to SOM datasheet for functionality for the module in use.
S2	Recovery button switch. This switch is used to put the Verdin Module into recovery mode. The USB port can then be used to reload software onto the module. Refer to the module documentation for further information on proper use.

Rear Connector Interface

The rear connector interface is a 30 pin FFC connector to allow for customized modules to be connected to provide the physical interfaces for the camera. The interface supports several different interfaces, such as Serial, CAN, Ethernet, and is the primary power input for the carrier board. All interfaces have voltage translators to standardize to a 3.3V interface to the rear connector board, and the 1.8V logic of the Verdin SOM.

TABLE 10 – REAR CONNECTOR PINOUT

Amphenol ICC 62674-301121ALF

Pin	Name	Type	Voltage	Function
1	VIN	Power	5V-27.5V[1]	Input Supply
2	VIN	Power	5V-27.5V[1]	Input Supply
3	GND	Ground		Ground
4	GND	Ground		Ground
5	3V3_SW	Power Output	3.3	3.3V output to supply circuits on Rear Connector Board. Max 250mA
6	CAN1_TX	Output	3.3	CANBUS Port 1 Tx
7	CAN1_RX	Input	3.3	CANBUS Port 1 Rx
8	CAN2_TX	Output	3.3	CANBUS Port 2 Tx
9	CAN2_TX	Input	3.3	CANBUS Port 2 Rx
10	SW1	Input		Rear connector board switch input
11	LED1	Output		User LED output on Rear Connector
12	I2C1_SCL	Output	3.3	I2C Clock
13	I2C1_SDA	IO	3.3	I2C Data
14	UART1_RX	Input	3.3	UART 1 Rx Data
15	UART1_TX	Output	3.3	UART 1 Tx Data
16	UART1_RTS	Output	3.3	UART 1 RTS (used for RS-485 direction control)
17	UART1_CTS	Input	3.3	UART 1 CTS
18	IO1	IO	3.3	I/O signal 1
19	IO2	IO	3.3	I/O signal 2

Pin	Name	Type	Voltage	Function
20	IO3	IO	3.3	I/O signal 3
21	IO4	IO	3.3	I/O signal 4
22	GND	Power		Ground
23	ETH12_P	Ethernet		Ethernet Pair 1_2 +
24	ETH12_N	Ethernet		Ethernet Pair 1_2 -
25	ETH36_P	Ethernet		Ethernet Pair 3_6 +
26	ETH36_N	Ethernet		Ethernet Pair 3_6 -
27	ETH45_P	Ethernet		Ethernet Pair 4_5 +
28	ETH45_N	Ethernet		Ethernet Pair 4_5 -
29	ETH78_P	Ethernet		Ethernet Pair 7_8 +
30	ETH78_N	Ethernet		Ethernet Pair 7_8 -

1. Input range may be reduced by rear connector power circuits.

Ethernet Expansion

The Mavin Carrier Board provides a second expansion connector connected the Verdin SOM Ethernet Port 2. This allows a separate module to be developed and connected to the carrier board for functions such as a second Ethernet Port, or single pair Ethernet such as Broad-R-Reach. These connections are raw connections to the module, so the expansion module would have to include the PHY and support circuits.

TABLE 11 – ETHERNET EXPANSION PINOUT

Molex 52559-2234

Pin	Name	SOM Pin	Function
1	3V3_SW		3.3V switched supply
2	3V3_SW		3.3V switched supply
3	GND		Ground
4	ETH2_RXD0	201	RGMII Rx Data 0
5	ETH2_RXD1	203	RGMII Rx Data 1
6	ETH2_RXD2	205	RGMII Rx Data 2
7	ETH2_RXD3	207	RGMII Rx Data 3
8	ETH2_RXC	197	
9	ETH2_RX_CTL	199	
10	GND		Ground
11	ETH2_TXD3	215	RGMII Tx Data 3
12	ETH2_TXD2	217	RGMII Tx Data 2
13	ETH2_TXD1	219	RGMII Tx Data 1
14	ETH2_TXD0	221	RGMII Tx Data 0
15	ETH2_TXC	213	
16	ETH2_TX_CTL	211	
17	GND		Ground

Pin	Name	SOM Pin	Function
18	ETH2_MDC	193	
19	ETH2_MDIO	191	
20	/ETH2_INT	189	Interrupt
21	/RESET_MOCI	258	Reset output from SOM
22	GND		Ground

SD Card Socket

The Maivin carrier board features a 4-bit SDIO interface. Card detect is always pulled low, so the SD card is not removable, and must be installed at boot time. SD_1_PWR_EN signal allows for switching the SD card supply SD_VCC.

TABLE 12 - SD SOCKET PINOUT

Molex 47219-2001

Pin	Name	SOM Pin	Function
1	SD_D2	70	SD Data 2
2	SD_D3	72	SD Data 3
3	SD_CMD	74	SD Command
4	SD_VDD		3.3V SD Card Supply, switched.
5	SD_CLK	78	SD Clock
6	GND		Ground
7	SD_D0	80	SD Data 0
8	SD_D1	82	SD Data 1

JTAG Connector

J5 is a standard 10-pin 1.27 mm header, Samtec FTSH-105-01-L-DV-K. This is connected to the Verdin SOM for JTAG operations.

FIGURE 10 – JTAG SCHEMATICS

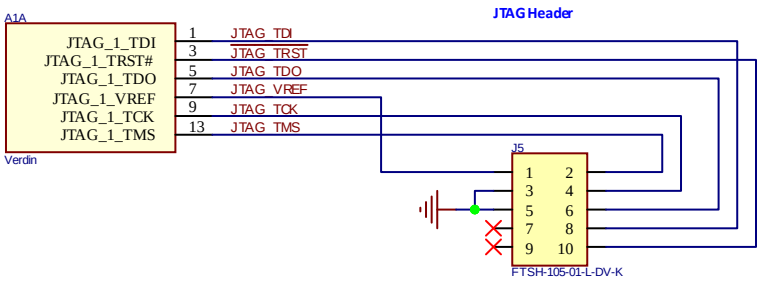


TABLE 13 - JTAG CONNECTOR PINOUT

Pin	Name	Function
1	JTAG_VREF	JTAG Reference connection. Used by debugger to indicate board is powered up.
2	JTAG_TMS	TMS
3	GND	Ground
4	JTAG_TCK	TCK - Clock
5	GND	Ground
6	JTAG_TDO	TDO – Data Out
7	N/C	No Connect
8	JTAG_TDI	TDI – Data in
9	N/C	No Connect
10	/JTAG_TRST	JTAG Reset

Image Sensor Interfaces

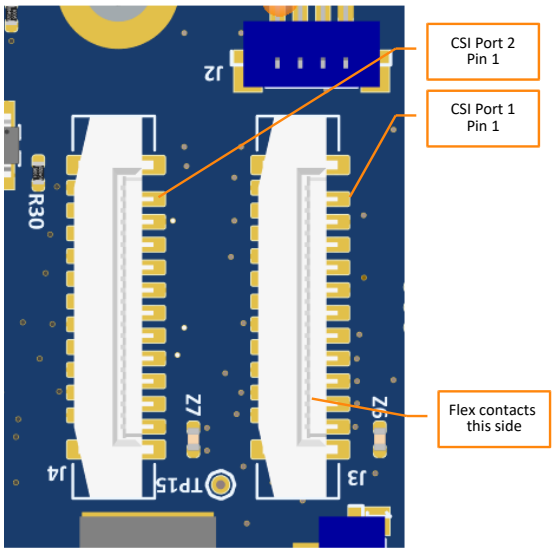
The Maivin Carrier provides two 4-lane MIPI interfaces for connections to sensor modules. Each interface uses a 22 pin 0.5mm pitch FFC vertical Molex 52559-2234 connector. This provides a full 4-lane MIPI interface, with 3.3V switched power, I2C and two control signals Flash and Trigger.

TABLE 14 - CPU IMAGE SENSOR CONNECTOR PINOUT

Pin	Name	Type	Function
1	VCC3V3	Power Output	Switched 3.3V supply
2	SDA	I/O	I^2C Data
3	SCL	Output	I^2C Clock
4	GND	Power	Ground
5	FLASH	Input	FLASH signal
6	TRIGGER	Input	Trigger Signal
7	GND	Power	Ground
8	CSI_DATA3_P	Input	MIPI Data Lane 3 +
9	CSI_DATA3_N	Input	MIPI Data Lane 3 -
10	GND	Power	Ground
11	CSI_DATA2_P	Input	MIPI Data Lane 2 +
12	CSI_DATA2_N	Input	MIPI Data Lane 2 -
13	GND	Power	Ground
14	CSI_CLK_P	Input	MIPI Clock +
15	CSI_CLK_N	Input	MIPI Clock -
16	GND	Power	Ground
17	CSI_DATA1_P	Input	MIPI Data Lane 1 +
18	CSI_DATA1_N	Input	MIPI Data Lane 1 -

Pin	Name	Type	Function
19	GND	Power	Ground
20	CSI_DATA0_P	Input	MIPI Data Lane 0 +
21	CSI_DATA0_N	Input	MIPI Data Lane 0 -
22	GND	Power	Ground

FIGURE 11 - CSI CONNECTOR ORIENTATION



The CSI interfaces are a 3.3V domain. I2C level translation is provided by FXMA2102L8X ICs to convert the 1.8V bus to 3.3V. All CSI interfaces are controlled with the CSI_EN signal. This active high signal will enable power to both interfaces.

CSI I2C interfaces

Each CSI interface uses a separate I2C bus on the Verdin module.

- CSI1 – I2C bus 4
- CSI2 – I2C bus 2

By using separate I2C buses, there are no conflicts with using the same sensor module on each interface.

Image sensor I/O

Some image sensors have triggering and flash inputs/outputs to allow for specific timing of the image sensor trigger, or when to start artificial illumination (flash). Maivin has one input and one output to each of the image sensor interfaces. These inputs and outputs are routed directly to the SoM for processing. High speed/low latency switching of the signals can be accomplished by using the co-processor on the 8M Plus (M7 core). Thus, it is possible to route the external inputs to the image sensor and the flash signals from the image sensors out for synchronization of multiple sensors.

I2C Devices

There are 4 I2C buses available on the module. They are used as follows.

I2C1

The following devices are on the I2C1 bus:

TABLE 15 - I²C DEVICE ADDRESSES

Device	Description	I2C Address
Temperature Sensor	TMP102 Temperature Sensor	1001011
EEPROM – Carrier Board	2k EEPROM M24C02-FMN6TP On Carrier board for board parameters	1010111
EEPROM – Rear Connector Board	2k EEPROM on the rear connector board. M24C02-FMN6TP	1010100
Expansion Connector	Connected to expansion connection P14 for connection to other devices.	

Note: There may be other devices on I2C1 bus on the Verdin module.

I2C2

Connected to CSI port 2 for image sensor communications.

I2C3

Not connected on Carrier board.

I2C4

Connected to CSI port 1 for image sensor communications.

LED Driver

2 LED drivers are available for powering external LED banks. An LM3409 Buck Controller is used to power the LED bank. The LED brightness is controlled using an I²C DAC. Full timing and triggering control are possible from the SoM.

TABLE 16 - LED DRIVER SPECIFICATIONS

Parameter	Symbol	Min	Typical	Max	Unit
Input Voltage	**V_{LED_IN}**	**10**		**27**	**V**

Parameter	Symbol	Min	Typical	Max	Unit
LED Drive Current	I_{LED}			**1.5**	**A**

The LED drive voltage is equal to the Input Voltage of the device.

TABLE 17 – LED 2-PIN CONNECTOR PINOUT

Pin	Name	Type	Function
1	VLED	Power Output	LED power +
2	Ground	Ground	Ground

Molex 53398-0271 2-pin connectors. J14 and J15.

TABLE 18 – LED 4-PIN CONNECTOR PINOUT

Pin	Name	Type	Function
1	LED_EN	Output	Active high signal to enable the LED for off board driver
2	LED_ADJ	Analog Output	DAC output for LED dimming
3	VLED	Power Output	LED power + from Driver
4	Ground	Ground	Ground

JST BM04B-SRSS-TB connectors. J1 and J2.

M.2 Expansion Socket

There is one M.2 expansion socket available on the Carrier Board. The M.2 Socket is a B Key socket, intended for modem expansion, or other similar devices.

Key interfaces include:

- Single Lane PCIe
- USB 2 and 3 interface
- UART
- SIM socket for Cell modem use
- I2C interface

A switched 3.3V supply provides power to the card. The switch is current limited with a 2.4A maximum current allotment.

TABLE 19 - M.2 SOCKET PINOUT

Pin	Name	Type	Description		Description	Type	Name	Pin
1	N/C		Not Connected		3.3V Supply	Power	3V3	**2**
3	GND	Power	Ground		3.3V Supply	Power	3V3	**4**
5	GND	Power	Ground		Card Power Off	Output	/CARD_PWR_OFF	**6**
7	D_P	I/O	USB Data +		Not Connected		N/C	**8**

Pin	Name	Type	Description		Description	Type	Name	Pin
9	D_N	I/O	USB Data -		Not Connected		N/C	**10**
11	GND	Power	Ground		M.2 Socket Key		KEY	**12**
13	KEY		M.2 Socket Key		M.2 Socket Key		KEY	**14**
15	KEY		M.2 Socket Key		M.2 Socket Key		KEY	**16**
17	KEY		M.2 Socket Key		M.2 Socket Key		KEY	**18**
19	KEY		M.2 Socket Key			Input	UART2_RX	**20**
21	N/C		Not Connected			Output	UART2_TX	**22**
23	/WAKE_MICO	Input	Wake-up signal			Output	UART2_RTS	**24**
25	N/C		Not Connected		Not Connected		N/C	**26**
27	GND	Power	Ground			Input	UART2_CTS	**28**
29	SSRX_N	Input	High Speed USB		SIM Card Reset	Output	SIM_RST	**30**
31	SSRX_P	Input	High Speed USB RX +		SIM Card Clock	Output	SIM_CLK	**32**
33	GND	Power	Ground		SIM Data	I/O	SIM_DATA	**34**
35	SSTX_N	Output	High Speed USB		SIM Power	Power	SIM_PWR	**36**
37	SSTX_P	Output	High Speed USB TX +				N/C	**38**
39	GND	Power	Ground		I2C Clock	Output	I2C1_SCL	**40**
41	PCIe_RX_N	Input	PCIe Rx -		I2C Data	I/O	I2C1_SDA	**42**
43	PCIe_RX_P	Input	PCIe Rx +		Not Connected		N/C	**44**
45	GND	Power	Ground		Not Connected		N/C	**46**
47	PCIe_TX_N	Output	PCIe Tx -		Not Connected		N/C	**48**
49	PCIe_TX_P	Output	PCIe Tx +		Not Connected		N/C	**50**
51	GND	Power	Ground		Not Connected		N/C	**52**
53	PCIe_CLK_N	Output	PCIe Clock -		Not Connected		N/C	**54**
55	PCIe_CLK_P	Output	PCIe Clock +		Not Connected		N/C	**56**
57	GND	Power	Ground		Not Connected		N/C	**58**
59	N/C		Not Connected		Not Connected		N/C	**60**
61	N/C		Not Connected		Not Connected		N/C	**62**
63	N/C		Not Connected		Not Connected		N/C	**64**
65	N/C		Not Connected		SIM Card Detect Not connected		SIM_DET	**66**
67	N/C		Not Connected		Not Connected		N/C	**68**
69	/M2_RST	Output	Reset to M.2 Module		3.3V Supply	Power	3V3	**70**

Pin	Name	Type	Description		Description	Type	Name	Pin
71	GND	Power	Ground		3.3V Supply	Power	3V3	**72**
73	GND	Power	Ground		3.3V Supply	Power	3V3	**74**
75	N/C		Not Connected					

8MPCAM-2150 eCAM-55 module interface

The 8MPCAM-2150 Image Sensor adapter board is used with the Econ e-CAM55_CUMI0521_MOD image sensor module.

- OnSemi AR0521 Image sensor with AP1302 ISP
- 5MP Colour camera with 2-lane/4-lane MIPI CSI-2 interface
- 1/2.5" Optical Form-factor
- Uncompressed UYVY streaming
- S-mount interchangeable lens holder

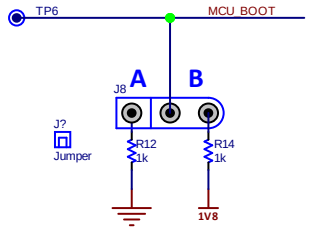
Supported Resolutions

Resolutions	2-lane MIPI (NANO)
VGA (640 x 480)	75 fps
HD (1280 x 720)	100 fps
960P (1280 x 960)	75 fps
FHD (1920 x 1080)	65 fps
QHD (2560 x 1440)	38 fps
5MP (2592 x 1944)	28 fps

Jumper Settings

Three jumpers on the 8MPCAM-2150 are used to set the mode and operation of the image interface. This is required to allow for selection of Reset/BootMode or Trigger/Flash operation.

Jumper	Position	Function
J6	Open Closed	CSI_IO1 – Trigger CSI_IO1 – Module Reset
J7	Open Closed	CSI_IO2 – Flash CSI_IO2 – Module Boot Mode
J8	A Position B Position	BootMode Pull-down BootMode Pull-up



Updating firmware in eCAM-55 module

The eCAM-55 sensor module may require a firmware upgrade. To do this, the sensor must be put into programming mode before reset is released.

Place the jumper J8 in the 'B' position for manual firmware update mode. Jumpers J6 and J7 can be removed. During boot-up several communications errors may be reported by the driver as the image sensor is in programming mode. The driver will update the firmware and continue to finish booting. However, the image sensor will not be functional at this point. Move Jumper J8 to the 'A' position, and power cycle the board. The image sensor should not work normally.

Image Sensor Lenses

The Maivin Starter Kit includes 2 lenses:

TABLE 20 - LENS SPECIFICATIONS

Focal Length (mm)	F #	Sensor Size	FOV	FOVH	FOVV
6.0	2	1/2.5"	67°	53.6°	40.2°
3.6	2	1/2.5"	135°	94.4°	65.7°

8MPCAM-3400 Rear Connector

The 8MPCAM-3400 Rear Connector board provides several interfaces and connects to the carrier board using the 30-pin flex cable.

Features:

- Two Terminal Blocks for direct wire connections, includes:
  - Two Opto-Isolated inputs
  - Two Open Drain Outputs
  - RS-485 Interface
  - CANBUS Interface

    - Protected Power Input
        - Over Voltage
        - Under Voltage
        - Reverse Voltage
        - Over Current
- RJ45
    - GigE Ethernet
- LED Indicator
- Momentary Switch

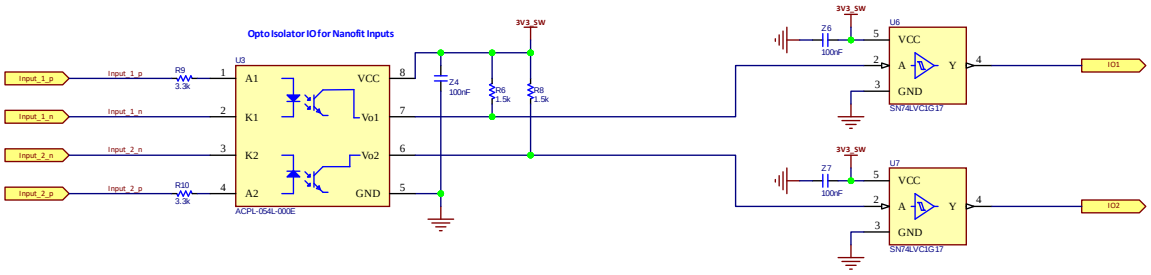
Discrete Inputs/Outputs

There are two discrete inputs and outputs available.

Inputs

- Two Inputs
- ACPL-054L-000E Opto-Isolation
- Buffered outputs of Opto-Isolator to IO1 and IO2 on connector to Carrier board
- Current limiter 3.3k resistor inline on IN1+ and IN2+
- Requires 3mA drive current, supporting 12 to 24V operation

FIGURE 12 - INPUT OPTO-ISOLATION SCHEMATIC



Outputs

- Protected Open Drain FET
- 1A max current
- Support full input voltage switching

CANBUS

Single CANBUS support using SN65HVD235DG4 transceiver.

RS-485

Includes one RS-485 half duplex serial interface. The transceiver is connected to UART1 for TX/RX and uses RTS for switching the direction of the transceiver for half-duplex operation.

RS-485 I/O include ESD and transient protection devices to protect the transceiver.

Ethernet

A RJ45 connector supporting full GigE Ethernet port with integrated magnetics. All signals are sent to the Carrier board, and directly to the Verdin SoM, where the gigE PHY is located.

Power Protection

The 8MPCAM-3400 includes an electronic fuse and reverse voltage protection to protect the camera from out-of-range voltages. Refer to Electrical Specifications for details.

Additional Information

Related Documents

TABLE 0 RELATED DOCUMENTS

Document	Description
8MPCAM-2111-02 - 8MPCAM-3400 RearConnector DataSheet	**Rear Connector Datasheet**
8MPCAM-2111-01 - 8MPCAM-1100 Maivin Carrier DataSheet	**Carrier Board Datasheet**

Revision History

TABLE 0 REVISION HISTORY

Version. No	Primary Author/s	Description of Version	Date	Reviewer
V1.0	Trevor Z	Initial Release	Nov 22, 2021	**Greg L.**
V1.1	Trevor Z	Minor wording updates.	Dec 21, 2021	
V1.2	Trevor Z	Block diagram and detail updates Add Lens Focal Lengths	Feb 17, 2022	

		Econ eCAM-55 module information added.		