

96Boards Consumer Edition - Camera Module Interface Addendum

Abstract

This document is targeted to provide a reference for a recommended CSI Camera module connection with 96Boards Consumer Edition hardware.

This document describes a pin pitch (in conjunction with the usage of flexible cable) and pinout specification for the 96Boards CE.

This is provided as the preferred functional specification for a camera module direct cabled interface to a 96Boards baseboard, mezzanine or module.

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1. Introduction

This document specifies an onboard connector suitable for interface of a MIPI camera module to hardware, compliant to the 96Boards CE specification.

The intention is to specify a connector placeholder with size and pinout information, but does not constrain the particular component selection for the connector itself.

The document also lists the signals that **shall** be on the connector.

2. Design

2.1. Available Camera Interface Support

In the current 96Boards CE specification up to 2 MIPI-CSI2 interfaces may be provided on the high speed expansion bus via the 60 Pin High Speed Expansion Connector with 0.8mm 50 ohm high speed receptacle. This is listed in Table 1.

1 or 2 MIPI CSI-2 ports may be provided on the expansion bus interface. If 1 port is provided it shall be located on the CSI0 port interface. From 1-4 lanes may be implemented on the CSI0 port interface. From 1-2 lanes may be implemented on the CSI1 port interface.

An implementation may support dual (stereo) cameras through the CSI interface(s) if the SoC provides the necessary functionality.

Cameras/Sensors can require additional control signals including RST, PWRDN and MCLK. Separate signals are available for these functions.

Signal	Description	V	Type	Spec.	If not used
CSI[0-1]_C[+-]	Differential CSI Clock	1.2V	Output	Optional	NC
CSI[0-1]_D[0-1][+-]	Differential CSI data channel	1.2V	IO	Optional	NC
CSI0_D[2-3][+-]	Differential CSI data channel	1.2V	IO	Optional	NC

Table 1 MIPI-CSI2 Pins on High Speed Expansion Connector

2.2. Constraints

The signal through the MIPI-CSI2 is a low level signal (100mV at 1.5GHz) and has tight impedance and length matching requirements.

For the intended camera module, a flexible cable is often required as developers need to be able to direct the camera field of view to where it is required in the system.

A high resolution MIPI camera supporting up to 4 data lanes is supported.

2.3. Addendum to [96Boards CE Spec](#)

This addendum provides recommendations for a standard connector interface for camera connection to 96Boards mezzanines or modules. It may also be used for providing camera connections directly on 96Boards hardware.

If a direct camera cable connection is supported on a 96Boards product, including on mezzanines and modules, it is **strongly recommended** that the connector meet the following specifications. This will enable interoperability of camera modules designed for the 96Boards ecosystem. Note that software support will be required for any particular 96Boards processor product and camera module.

- Connection type - the connection **shall** be made using a 30 pin FFC with a 0.5mm pin pitch. The board designer is free to choose the actual connector, but should ensure that technical requirements for impedance, speed etc. required by the board design are met.
- An example connector is: [Omron XF3M-3015-1B](#). Many other options are available from multiple manufacturers.

The following table shows the required pinout for the connector.

- All logic signals are specified as 1.8V levels
- CSI signals are at MIPI PHY levels

CSI Connect or Pin	CSI Connector Pin name	96Boards H.S. Connector Interface (for reference only)	Notes
1	GND	GND (crosstalk isolation)	
2	CSI0_CN0	CSI0_C-	
3	CSI0_CP0	CSI0_C+	
4	GND	GND (crosstalk isolation)	
5	CSI0_DN1	CSI0_D1-	Used by 2+ lane cameras
6	CSI0_DP1	CSI0_D1+	
7	GND	GND (crosstalk isolation)	

8	CSI0_DN0	CSI0_D0-	
9	CSI0_DP	CSI0_D0+	
10	GND	GND (crosstalk isolation)	
11	CSI0_MCLK	CSI0_MCLK	
12	VGND	GND (SCL/MCLK isolation)	Or 3.3V*
13	CSI0_SCL	I2C2_SCL	
14	CSI0_SDA	I2C2_SDA	
15	CSI0_STANDBY	GPIO_J	
16	GND	GND	
17	5.0V	5.0V	Max 200mA
18	GND	GND (return for 5.0V)	
19	LED_FLASH	GPIO_A	LED Flash
20	CSI0_RESET	GPIO_I	
21	1.8V	1.8V	Max 50mA
22	DC_IN	12V ** Supply for LED Flash or IR LEDs	96Boards DC_IN, nominal +12V
23	GND	GND (return for 12V)	
24	GND	GND (crosstalk isolation)	
25	CSI0_DP2	CSI0_D2+	Used by 3 lane cameras
26	CSI0_DN2	CSI0_D2-	
27	GND	GND (crosstalk isolation)	
28	CSI0_DP3	CSI0_D3+	Used by 4 lane cameras
29	CSI0_DN3	CSI0_D3-	
30	GND	GND (crosstalk isolation)	

Table 2 CSI Connector Pinout for 1 to 4-lane interface to camera modules

* Virtual ground pin, optional 3.3V supply.

** Flash consumes a high current for a very short amount of time, resulting in noise on the power line. additional filtering is recommended.

On board DC_IN provides voltage ranges from 6.5 - 18V (may vary from boards). In cases the range is not supported, DC-DC converter might be required to produce regulated 12V supply.