CSI Camera Module 5MP OV5640

Datasheet

Revision History

Date	Doc. Rev.	Board Version	Changes
07-June-17	Rev. 1.0	V1.0	Internal Sample
26-June-17	Rev. 1.1	V1.1	Initial Release - Section 2.4.1, Top Side Connectors: updated figure 3 - Section 6.1, CSI Camera Module 5MP OV5640 Dimensions - Top Side: updated figure 5
25-Sept-17	Rev. 1.2	V1.1	- Updated cover page image
25-Sept-18	Rev. 1.3	V1.1	- Section 2.2, Hardware Architecture Block Diagram: updated block diagram, added note - Section 3.1, MIPI-CSI FFC Connector (X2): added note - Section 3.2, camera Module Connector (X1): added note - Section 4, Electrical Characteristics: updated electrical characteristics details
26-Jun-19	Rev. 1.4	V1.1	- Section 1.1.3 changed link to camera sensor - Section 1.1.4 correctly labelled the link for the Sensor

Contents

1. Introduction

The CSI Camera Module 5MP OV5640 is an add-on board for the Apalis computer-on-module which uses MIPI-CSI Interface. The CSI camera module uses OmniVision OV5640 camera sensor with built-in auto-focus. The OV5640 image sensor is a low voltage, high-performance, 1/4-inch 5 megapixel CMOS image sensor that provides the full functionality of a single chip 5 megapixel (2592x1944) camera.

The CSI Camera Module 5MP OV5640 can be connected to the MIPI-CSI connector on the Apalis carrier board using a 24 way 0.5mm pitch FFC cable.

1.1. Reference Documents

For detailed technical information on the suitable computer modules and other reference documents, please refer the following sections:

1.1.1 Apalis Computer Modules

An overview of the Apalis product family:

https://www.toradex.com/computer-on-modules/apalis-arm-family

1.1.2 Toradex Developer Website

http://developer.toradex.com/

1.1.3 OV5640 Camera Module Datasheet

http://www.trulyamerica.com/wp-content/uploads/CM8487-B500SA-E_V1.0.pdf

1.1.4 Camera Sensor Datasheet

https://docs1.toradex.com/103996-omnivision-ov5640-datasheet.pdf

1.1.5 4-Bit Dual-Supply Level Translator

http://www.onsemi.com/pub_link/Collateral/NLSX5014-D.PDF

1.1.6 SMBus / I2C Bus Voltage-Level Translator

http://www.ti.com/lit/ds/symlink/pca9306.pdf

1.1.7 Single Schmitt-Trigger Buffer

http://www.ti.com/lit/ds/symlink/sn74lvc1g17.pdf

2. Features

2.1. Overview

The CSI Camera Module 5MP OV5640 features:

- MIPI-CSI, Auto-focus, 5MP OV5640 camera sensor module
- Connects directly to the MIPI-CSI FFC connector on the Apalis carrier boards
- No external power supply required

2.2. Hardware Architecture Block Diagram
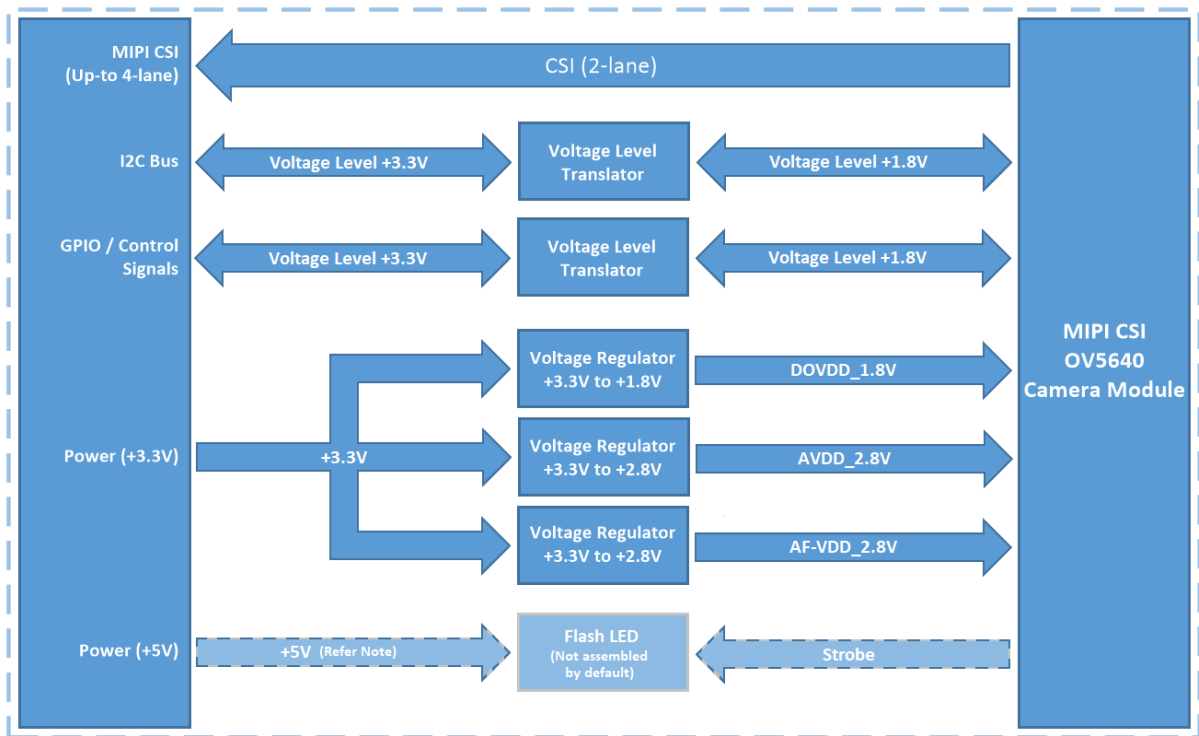
Note: +5V power is not required by the camera sensor. +5V power is only used to power the LED for the flash.

Fig.1 CSI Camera Module 5MP OV5640 Hardware Architecture

2.3. Hardware Setup

The following block diagram represents the set-up required to use/test a CSI Camera Module 5MP OV5640:

CSI Camera Module 5MP OV5640

FFC Cable

MIPI–CSI Connector

Apalis Computer Module

Apalis Carrier Board

Power Input

Monitor / Display

Keyboard and Mouse (via USB)
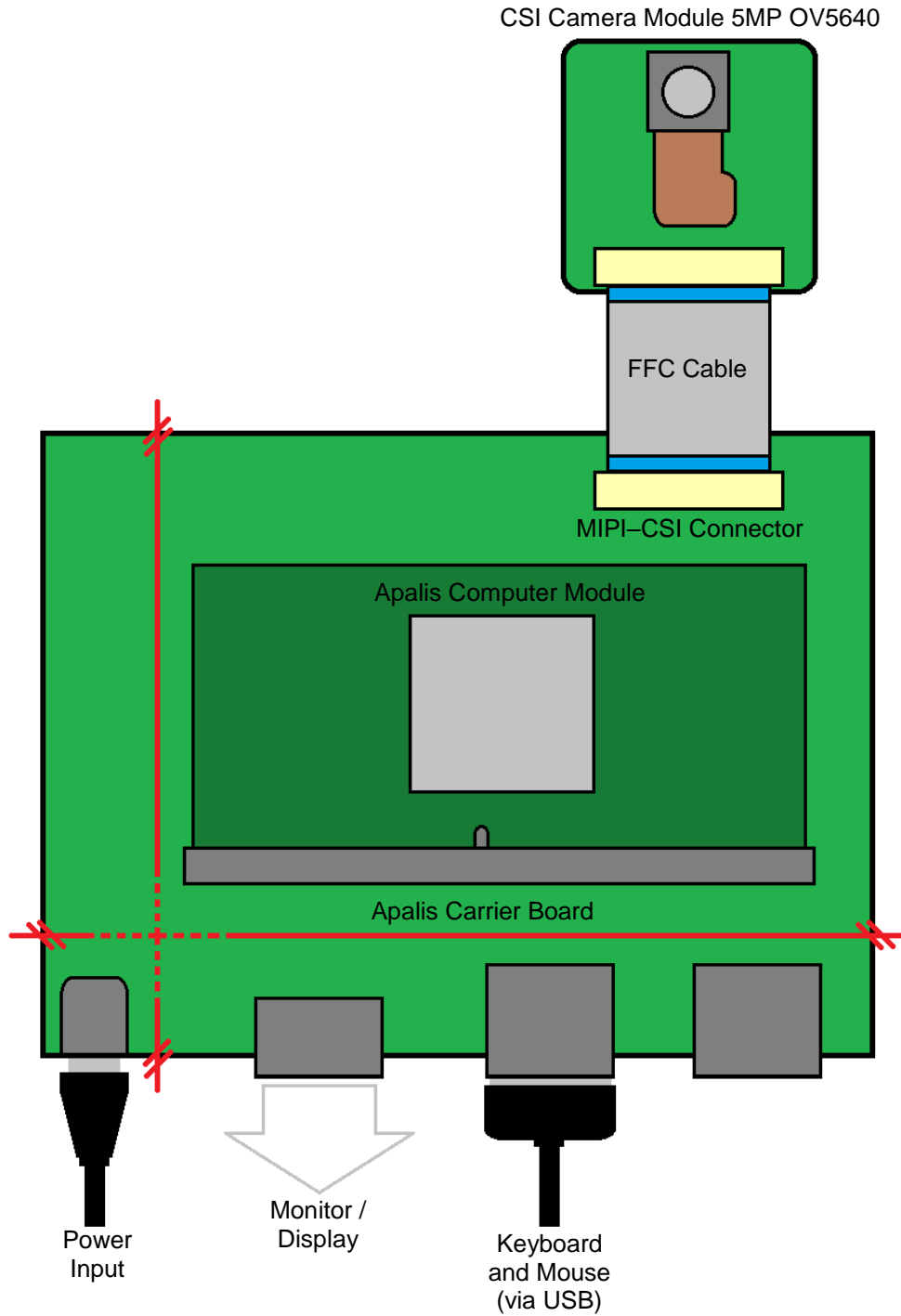
Fig.2 Hardware Set-up Block Diagram

2.4. Physical Drawings

2.4.1 Top Side Connectors
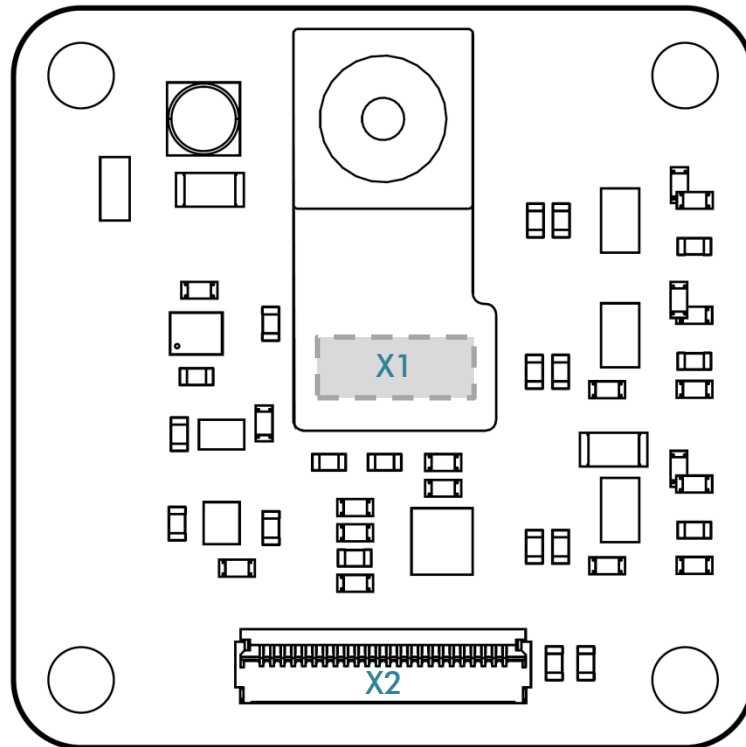
Fig.3 CSI Camera Module 5MP OV5640 Connectors – Top Side

Ref	Description	Remarks
X1	Camera Module Connector	
X2	MIPI-CSI FFC Connector	Top / Bottom contact, 24 Pins, Pitch 0.5mm

3. Interface Description

3.1. MIPI-CSI FFC Connector (X2)

Manufacturer: Wurth - 687124182122
Type: FFC connector, top/bottom side contact, 24 pin, pitch 0.5mm

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	GND	Ground			
2	CSI_D0_N	MIPI-CSI Data Lane 0 Negative	O		
3	CSI_D0_P	MIPI-CSI Data Lane 0 Positive	O		
4	GND	Ground			
5	CSI_D1_N	MIPI-CSI Data Lane 1 Negative	O		
6	CSI_D1_P	MIPI-CSI Data Lane 1 Positive	O		
7	GND	Ground			
8	CSI_CLK_N	MIPI-CSI Clock Lane Negative	O		
9	CSI_CLK_P	MIPI-CSI Clock Lane Positive	O		
10	GND	Ground			
11	CSI_GPIO0_RST	GPIO: Camera Sensor Reset	I/O	+3.3V	
12	CAM1_MCLK	Master Clock	I	+3.3V	
13	I2C_CAM1_SCL	DDC Serial Clock	I	+3.3V	
14	I2C_CAM1_SDA	DDC Serial Data	I/O	+3.3V	
15	+3.3V (Refer note below)	Power		+3.3V	
16	NC	Not connected			
17	NC	Not connected			
18	GND	Ground			
19	NC	Not connected			
20	NC	Not connected			
21	+5V (Refer note below)	Power		+5V	
22	CSI_GPIO1	GPIO: Camera Sensor Power Down	I/O	+3.3V	
23	CSI_GPIO2	GPIO: Camera Sensor Identification	I/O	+3.3V	
24	CSI_GPIO3	GPIO: Power Supply Control	I/O	+3.3V	

Note: All the voltages required by the CSI camera sensor are generated using +3.3V power on the CSI Camera Module. +5V power is only required by the LED for the flash; not by the CSI camera sensor.

3.2. Camera Module Connector (X1)

Manufacturer: Panasonic – AXT530124
Type: Socket connector for OV5640 camera sensor module

Pin	Name	Description	I/O Type	Voltage	Pullup/Pulldown
1	STROBE	Flash Strobe Output	O		
2	AF_GND	Ground (Auto-Focus)	PWR		
3	AF_VDD	Power (Auto-Focus)	PWR	+2.8V	
4	AGND	Analog Ground	PWR		
5	AVDD	Analog Power	PWR	+2.8V	
6	DGND	Digital Ground	PWR		
7	SIOC	SCCB Input Clock	I	+1.8V	4.7K to +1.8V
8	SIOD	SCCB Data	I/O	+1.8V	4.7K to +1.8V
9	RESET#	Reset (active low signal)	I	+1.8V	
10	NC	Not connected			
11	DGND	Digital Ground	PWR		
12	DGND	Digital Ground	PWR		
13	PWDN	Power Down (active high signal)	I	+1.8V	
14	DGND	Digital Ground	PWR		
15	DGND	Digital Ground	PWR		
16	MDP2	MIPI-CSI Data Lane 2 Positive	O		
17	MDN2	MIPI-CSI Data Lane 2 Negative	O		
18	DGND	Digital Ground	PWR		
19	MCP	MIPI-CSI Clock Lane Positive	O		
20	MCN	MIPI-CSI Clock Lane Negative	O		
21	DGND	Digital Ground	PWR		
22	MDP1	MIPI-CSI Data Lane 1 Positive	O		
23	MDN1	MIPI-CSI Data Lane 1 Negative	O		
24	DGND	Digital Ground	PWR		
25	XCLK [Refer note below]	Clock Input	I		
26	DGND	Digital Ground	PWR	+1.8V	
27	NC	Not connected			
28	DOVDD	Digital I/O Power	PWR	+1.8V	
29	DGND	Digital Ground	PWR		
30	IC	Camera Identification	O	+1.8V	

Note: Assembly option has been provided for XCLK (CAM_MCLK) source. Please refer the CSI Camera Module OV5640 schematics for more details. On CSI Camera Module OV5640 V1.1B, external clock OSC1 has been assembled by default.

4. Electrical Characteristics

4.1. Absolute Maximum Ratings

Item / Details	Specifications	Remarks
Connector X1 (DOVDD_1.8V, AVDD_2.8V, AF-VCC_2.8V, Signals)		
Rated current	0.3A/pin (max. 5A at total pin contact)	
Connector X2 (3.3V, 5V, Signals)		
Max. Voltage (Pin 15)	3.6V	
Max. Voltage (Pin 21)	5.5V	
Rated current	1A/pin	
Low Dropout Regulator IC1 (AP2127K-1.8TRG1), Vout = 1.8V		
Output current	Max. 0.45A	
Low Dropout Regulator: IC2, IC3 (AP2125K-2.8TRG1), Vout = 2.8V		
Output current	Max. 0.45A	

4.2. Electrical Specifications

Symbol	Description	Voltage	Min	Typ	Max	Unit
V_DOVDD_1.8V	Camera Module Digital Power	+1.8		+1.8		V
I_DOVDD_1.8V				TBD	140	mA
V_AVDD_2.8V	Camera Module Analog Power	+2.8		+2.8		V
I_AVDD_2.8V				TBD	42	mA
V_AF-VDD_2.8V	Camera Module Auto-Focus Power	+2.8		+2.8		V
I_AF-VDD_2.8V				TBD		A

For more details, please refer to the operating specification section in the OmniVision OV5640 image sensor datasheet.
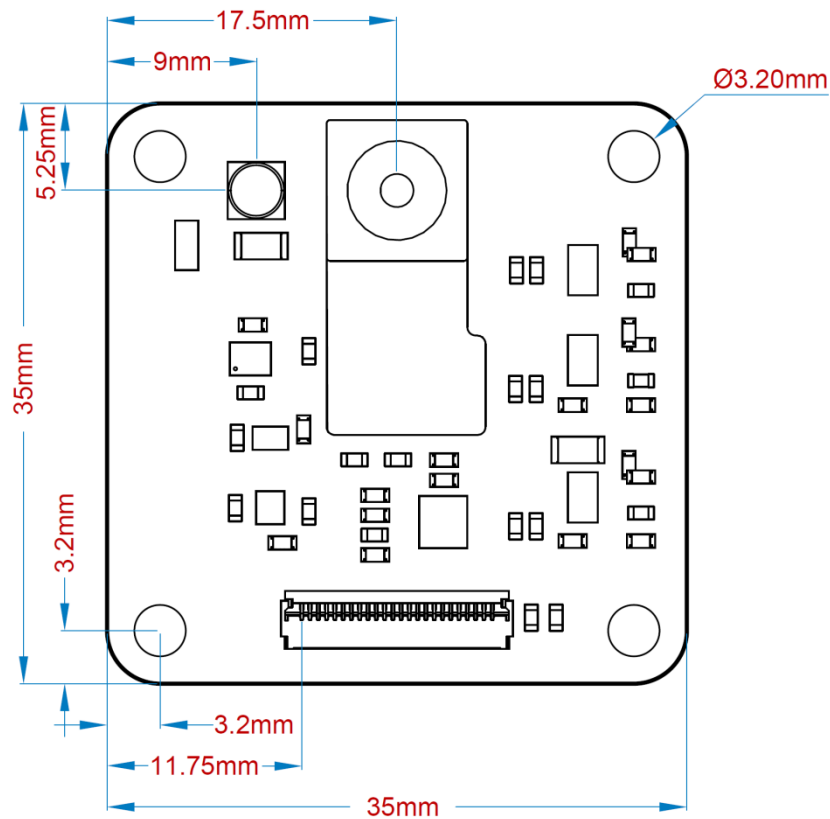
5. Temperature Range

5.1. Operating Temperature Range

- +0 to +70 °C

6. Mechanical Data

6.1. CSI Camera Module 5MP OV5640 Dimensions - Top Side

Fig.5 CSI Camera Module 5MP OV5640 Dimensions – Top Side
All dimensions are in millimeters (mm)

7. Design Data

The design data for the Toradex carrier boards and adapter boards are freely available in the Altium Designer format. The design data includes schematics, layout, and component libraries.

To download the board design data, please use the web-link below:

http://developer.toradex.com/carrier-board-design/reference-designs

8. Product Compliance

Up-to-date information about product compliance such as RoHS, CE, UL-94, Conflict Mineral, REACH etc. can be found on our website at: http://www.toradex.com/support/product-compliance