



VARISCITE LTD

CAMERA EXTENSION BOARD FOR DART-SD410 KIT

Variscite PN: VAR-EXT-CB410

Camera Modules included:

1. KLT JAL-IMX135-A178B with SONY IMX135 13MP Sensor
2. KLT JAL-OV5645-Y660B with OMNIVISION OV5645 5MP Sensor





1 General Information

1.1 Overview

The VAR-EXT-CB410 is a camera extension board for VAR-SD410CustomBoard provided with the kits to allow evaluation and easy integration between different camera modules and Variscite DART-SD410 SoM.

VAR-EXT-CB410 Features:

- 1 x 13 Mega Pixel Camera module, based on IMX135 sensor.
- 1 x 5 Mega Pixel Camera module, based on OV5645 sensor.

1.1.1 Supporting Variscite products

- VAR-SD410CustomBoard
- VAR-STK-SD410
- VAR-DVK-SD410

1.1.2 Supporting O.S

- Android
- Linux TBD
- Windows 10 IOT TBD

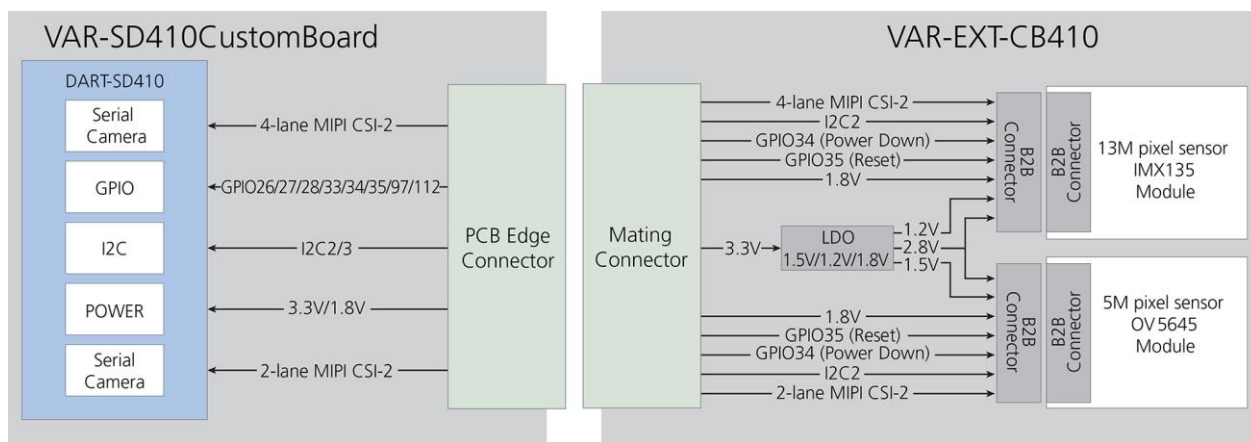
1.1.3 Additional information

Board schematics is available to download at www.variscite.com,
For further information contact Variscite support at <mailto:support@variscite.com>.

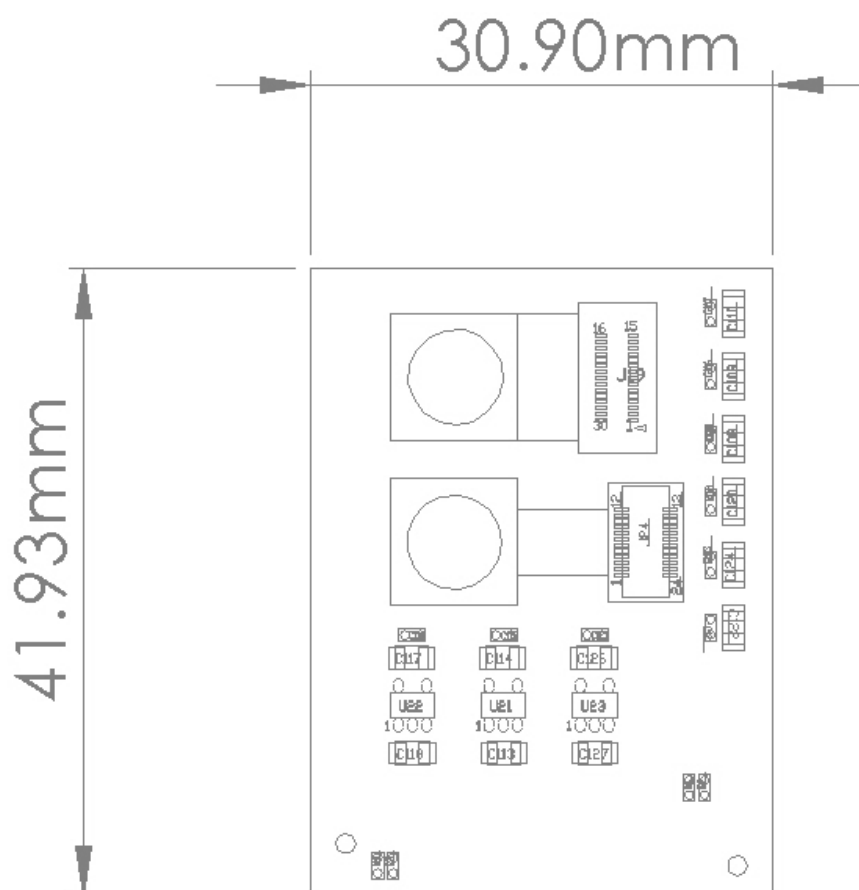
1.2 VAR-EXT-CB410 features summary

- 1 x 30 PIN Card Edge Connector compatible with VAR-SD410CustomBoard.
- 1 x JAL-IMX135-A178B camera module
- 1 x JAL-OV5645-Y660B camera module

1.3 Block Diagram



1.4 Board Physical Dimensions



Detailed CAD files are available for download at www.variscite.com.

1.5 VAR-EXT-CB410 connectors

The below table lists all available connectors on the VAR-SD410CustomBoard, refer to chapter 2 for a more detailed description and Pin-out of each connector.

Reference	Function	Type
J23	VAR-SD410CustomBoard Edge mating connector	HSEC8-130-01-SM-DV-A
J19	JAL-IMX135-A178B module connector	24-5804-030-000-829
J24	JAL-OV5645-Y660B module connector	BBR43-24KB533

Table 1-1 VAR-EXT-CB410 connectors

2 Detailed Description

2.1 Overview

This chapter details the VAR-EXT-CB410 external interfaces.
Please refer to the DART-SD410 data sheet for more information regarding those interfaces.

The following list describes this chapter table's column header:

Pin#:

Pin Number of the specific connector

VAR-EXT-CB410 Signal:

VAR-EXT-CB410 schematic signal name

Type:

Pin Type & Direction:

- I – In
- O – Out
- DS – Differential Signal
- P – Power
- A – Analog

Description:

Short Pin functionality description

2.2 VAR-EXT-CB410 Interfaces

2.2.1 Camera Board PCB connector

The VAR-SD410CustomBoard exports the DART-SD410 2-lane MIPI CSI & a 4-lane MIPI CSI serial camera interfaces to a 60POS 0.8mm PCB connector. Mating Edge connector is Samtec P/N: HSEC8-130-01-SM-DV-A

Pin #	VAR-EXT-CB410 Signal	Type	Description
1	VCC_3V3	P	Camera Power supply 3.3V
2	DGND	P	Camera Digital Ground
3	VCC_3V3	P	Camera Power supply 3.3V
4	I2C3_SDA	IO	Camera 0 I2C3 Data
5	VCC_1V8	P	Camera Power supply 1.8V
6	I2C3_SCL	O	Camera 0 I2C3 Clock
7	VCC_1V8	P	Camera Power supply 1.8V
8	DGND	P	Camera Digital Ground
9	DGND	P	Camera Digital Ground
10	CSI1_PWDN	O	Camera 1 Power Down
11	MIPI_CSI0_DATA0_P	DSI	Camera 0 Data 0 Positive
12	CSI1_RST	O	Camera 1 Reset
13	MIPI_CSI0_DATA0_M	DSI	Camera 0 Data 0 Negative
14			
15	DGND	P	Camera Digital Ground
16			
17	MIPI_CSI0_DATA1_P	DSI	Camera 0 Data 1 Positive
18	DGND	P	Camera Digital Ground
19	MIPI_CSI0_DATA1_M	DSI	Camera 0 Data 1 Negative
20	CSI1_MCLK	O	Camera 1 Clock

21	DGND	P	Camera Digital Ground
22	DGND	P	Camera Digital Ground
23	MIPI_CSIO_DATA2_P	DSI	Camera 0 Data 2 Positive
24			
25	MIPI_CSIO_DATA2_M	DSI	Camera 0 Data 2 Negative
26			
27	DGND	P	Camera Digital Ground
28	DGND	P	Camera Digital Ground
29	MIPI_CSIO_DATA3_P	DSI	Camera 0 Data 3 Positive
30			
31	MIPI_CSIO_DATA3_M	DSI	Camera 0 Data 3 Negative
32			
33	DGND	P	Camera Digital Ground
34	DGND	P	Camera Digital Ground
35	MIPI_CSIO_DATA4_P	DSI	Camera 0 Data 4 Positive
36	MIPI_CSI1_DATA2_M	DSI	Camera 1 Data 2 Negative
37	MIPI_CSIO_DATA4_M	DSI	Camera 0 Data 4 Negative
38	MIPI_CSI1_DATA2_P	DSI	Camera 1 Data 2 Positive
39	DGND	P	Camera Digital Ground
40	DGND	P	Camera Digital Ground
41	CSIO_MCLK	O	Camera 0 Clock
42	MIPI_CSI1_DATA1_M	DSI	Camera 1 Data 1 Negative
43	DGND	P	Camera Digital Ground
44	MIPI_CSI1_DATA1_P		Camera 1 Data 1 Positive
45			
46	DGND	P	Camera Digital Ground

47			
48	MIPI_CSI1_DATA0_M	DSI	Camera 1 Data 0 Negative
49	CSI0_RST	O	Camera 0 Reset
50	MIPI_CSI1_DATA0_P	DSI	Camera 1 Data 0 Positive
51	CSI0_PWDN		Camera 0 Power Down
52	DGND	P	Camera Digital Ground
53	DGND	P	Camera Digital Ground
54	VCC_1V8	P	Camera Power supply 1.8V
55	I2C2_SCL		Camera 1 I2C2 Clock
56	VCC_1V8	P	Camera Power supply 1.8V
57	I2C2_SDA		Camera 1 I2C2 Data
58	VCC_3V3	P	Camera Power supply 3.3V
59	DGND	P	Camera Digital Ground
60	VCC_3V3	P	Camera Power supply 3.3V

Table 2-1 PCB Camera Connector Pin-out (J23)

2.2.2 13 Mega Pixel camera module connector

The VAR-EXT-CB410 features a 13 Mega Pixel camera module KLT JAL-IMX135-A178B (datasheet attached in chapter 4 below) based on Sony IMX135 sensor. The mating connector is Kyocera 24-5804-030-000-829.

Pin #	VAR-EXT-CB410 Signal	Type	Description
1	DGND	P	Camera Digital Ground
2	AFVDD 2.8V	P	Camera Power supply 2.8V
3	DVDD 1.2V	P	Camera Power supply 1.2V
4	DOVDD 1.8V	P	Camera Power supply 1.8V
5	NC		
6	AVDD_GND	P	Camera Analog Ground
7	AVDD 2.8V	P	Camera Power supply 2.8V
8	DGND	P	Camera Digital Ground
9	I2C-SDA	IO	Camera I2C Data
10	I2C-SCL	O	Camera I2C Clock
11	RST	O	Camera Reset
12	PWDN1	O	Camera Power Down
13	GND	P	Camera Digital Ground
14	MCLK	O	Camera Master Clock
15	GND	P	Camera Digital Ground
16	MDP3	DSI	Camera Data 3 Positive
17	MDN3	DSI	Camera Data 3 Negative
18	GND	P	Camera Digital Ground
19	MDP2	DSI	Camera Data 2 Positive
20	MDN2	DSI	Camera Data 2 Negative
21	GND	P	Camera Digital Ground

22	MDP1	DSI	Camera Data 1 Positive
23	MDN1	DSI	Camera Data 1 Negative
24	GND	P	Camera Digital Ground
25	CLKP	DSI	Camera Clock Positive
26	CLKN	DSI	Camera Clock Negative
27	GND	P	Camera Digital Ground
28	MDP0	DSI	Camera Data 0 Positive
29	MDN0	DSI	Camera Data 0 Negative
30	GND	P	Camera Digital Ground

Table 2-2 13 Mega Pixel Camera Module connector (J19)

2.2.3 5 Mega Pixel camera module connector

The VAR-EXT-CB410 features a 5 Mega Pixel camera module KLT JAL-OV5645-Y660B (see datasheet in chapter 4 below) based on Omnivision OV5645 sensor. The mating connector is Acon BBR43-24KB533 connector.

Pin #	VAR-EXT-CB410 Signal	Type	Description
1	MCLK	O	Camera Master Clock
2	PWDN	O	Camera Power Down
3	GND	P	Camera Digital Ground
4	DATAN0	DSI	Camera Data 0 Negative
5	DATAP0	DSI	Camera Data 0 Positive
6	CLKN	DSI	Camera Clock Negative
7	CLKP	DSI	Camera Clock Positive
8	GND	P	Camera Digital Ground
9	LOVDD(1.8V)	P	Camera Power supply 1.8V
10	AVDD(1.8)	P	Camera Power supply 1.8V
11	GND	P	Camera Digital Ground
12	RESET	O	Camera Reset
13	SCL	O	Camera I2C Clock
14	SDA	IO	Camera I2C Data
15	GND	P	Camera Digital Ground
16	DATAN1	DSI	Camera Data1 Negative
17	DATAP1	DSI	Camera Data 1 Positive
18	AGND	P	Camera Analog Ground
19	NC1		
20	NC2		
21	NC3		
22	DVDD(1.5V)	P	Camera Power supply 1.5V

23	AFVDD(2.8V)	P	Camera Power supply 2.8V
24	NC4		

Table 2-3 5 Mega Pixel Camera Module connector (J24)

3 Environmental specifications

	Min	Max
Commercial operating temperature range	0°C	+70°C
Shock resistance	50G / 20 ms	
Relative humidity, Operational	10%	90%
Relative humidity, Storage	5%	95%

Table 3-1 Environmental specifications



4 Reference Camera Modules

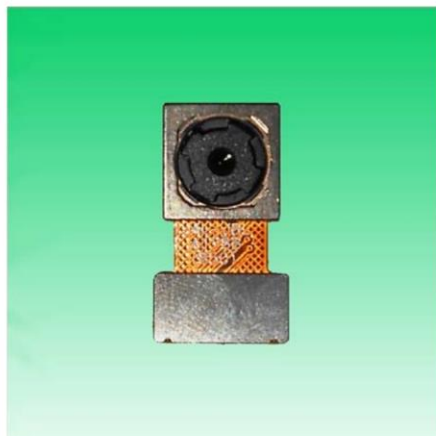
The VAR-EXT-CB410 includes the following reference camera modules:

- KLT JAL-IMX135-A178B with SONY IMX135 13MP Sensor
- KLT JAL-OV5645-Y660B with OMNIVISION OV5645 5MP Sensor

Datasheets of both modules are attached below.

JAL-IMX135-A178B

SONY IMX135 MIPI Interface Auto Focus 13MP Camera Module



Camera Module No.	JAL-IMX135-A178B
Image Sensor	IMX135
EFL	2.94 mm
F.NO	2.4
Pixel	3136 x 4224
View Angle	77.6°
Lens Type	1/3.06 inch
Lens Dimensions	8.6 x 8.5 x 5.25 mm
Module Size	17.77 x 10 mm
Module Type	Auto Focus
Interface	4-Lane MIPI

Mating Connector Part No. 24-5804-030-000-829



Mating Connector On Main Board. Sold Separately.

www.KaiLapTech.com sales@KaiLapTech.com Tel: (852) 6908 1256 Fax: (852) 3017 6778

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SONY

[Product Brief]

Ver.1.0

IMX135

Diagonal 5.867 mm (Type 1/3.06) 13M Pixel CMOS Image Sensor with Square Pixel
for Color Cameras

Description

IMX135 is a diagonal 5.867 mm (Type 1/3.06) 13M pixel CMOS active pixel type stacked image sensor with a square pixel array. It adopts Exmor RS™ technology to achieve high speed image capturing by column parallel A/D converter circuits and high sensitivity and low noise image (comparing with conventional CMOS image sensor) through the backside illuminated imaging pixel structure. R, G, and B pigment primary color mosaic filter is employed. High sensitivity, low dark current and smear-free features are achieved. It equips an electronic shutter with variable integration time. It operates with three power supply voltages: analog 2.7 V, digital 1.05 V and 1.8 V for input/output interface and achieves low power consumption (comparing with CCD sensors).

In addition, this product is designed for use in cellular phone and Tablet PCs. When using this for another application, Sony does not guarantee the quality and reliability of product. Therefore, don't use this for applications other than cellular phone and Tablet PCs. Consult your Sony sales representative if you have any questions.

Functions and Features

- ◆ Back-illuminated and stacked type CMOS image sensor Exmor RS
- ◆ 2-wire serial communication circuit on chip
- ◆ CSI-2 serial data output (2Lane/4Lane selectable) on chip
- ◆ Timing generator, horizontal (H) and vertical (V) driver circuits on chip
- ◆ CDS/PGA on chip
- ◆ 10-bit A/D converter on chip
- ◆ Automatic optical black (OB) clamp circuit on chip
- ◆ High sensitivity, low dark current, no smear, excellent anti-blooming characteristics
- ◆ Variable-speed shutter function (Minimum unit: One horizontal sync signal period)
- ◆ R, G, B primary color pigment mosaic filters on chip
- ◆ Supports external mechanical shutter
- ◆ Flash control pulse generation function
- ◆ Max. 24 frame/s in all-pixel scan mode
- ◆ Pixel rate: 360 MHz (all pixels, 4Lane, 24 frame/s)
- ◆ Supports 720/60 p, 1080/30 p, 1080/60 p drive *NOTE
- ◆ Up/down and/or right/left inversed readout function
- ◆ Pixel binning readout function
- ◆ Image cutout function
- ◆ OTP ROM (One Time Programmable Read Only Memory) 8 K-bit for user, 10 K-bit as a whole
- ◆ Power-on reset function
- ◆ Image compensation processing functions (defect correction, noise reduction)
- ◆ High Dynamic Range (HDR) and tone reproduction in movie mode

NOTE) Please ask about the details of a required register.

Device Structure

◆ CMOS image sensor	
◆ Image size	: Diagonal 5.867 mm (Type 1/3.06)
◆ Total number of pixels	: 4224 (H) × 3176 (V) approx. 13.42 M pixels
◆ Number of effective pixels	: 4224 (H) × 3136 (V) approx. 13.25 M pixels
◆ Number of active pixels	: 4208 (H) × 3120 (V) approx. 13.13 M pixels
◆ Chip size	: 5.940 mm (H) × 4.280 mm (V)
◆ Unit cell size	: 1.12 μm (H) × 1.12 μm (V)
◆ Substrate material	: Silicon

Functional Description

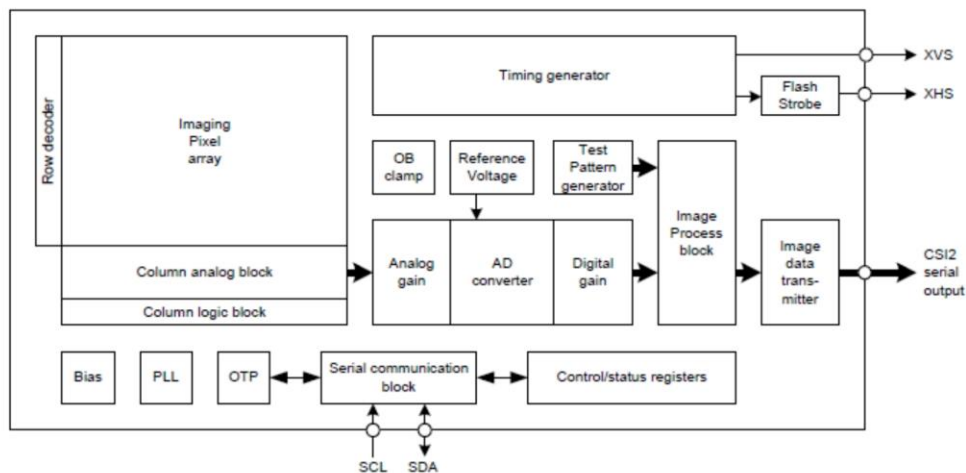
System Outline

IMX135 is a CMOS active pixel type image sensor which adopts the Exmor RS™ technology to achieve high sensitivity, low noise, and high speed image capturing. It is embedded with backside illuminated imaging pixel, low noise analog amplifier, column parallel A/D converters which enables high speed capturing, digital amplifier, image binning circuit, timing control circuit for imaging size and frame rate, CSI2 image data high speed serial interface, PLL oscillator, and serial communication interface to control these functions.

Several additional image processing functions and peripheral circuits are also included for easy system optimization by the users.

A onetime programmable memory is embedded in the chip for storing the user data. It has 8 K-bit for users, 10 K-bit as a whole.

Overview of functional block diagram



Exmor RS

* Exmor RS is a trademark of Sony Corporation. The Exmor RS is a Sony's CMOS image sensor with high-resolution, high-performance and compact size by replacing a supporting substrate in Exmor R™ which changed fundamental structure of Exmor™ pixel adopted column parallel A/D converter to back-illuminated type, with layered chips formed signal processing circuits.

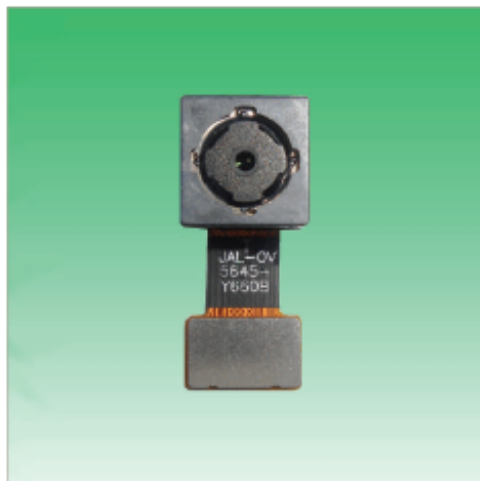
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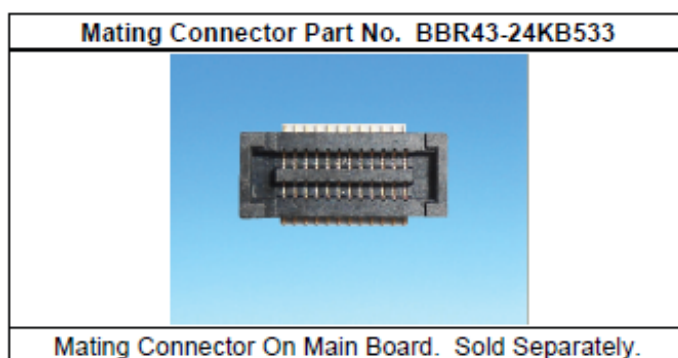
Application circuits shown, if any, are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits.

JAL-OV5645-Y660B

OmniVision OV5645 MIPI Interface Auto Focus 5MP Camera Module



Camera Module No.	JAL-OV5645-Y660B
Image Sensor	OV5645
EFL	3.37 mm
F.NO	2.8
Pixel	2468 x 1944
View Angle	70°
Lens Type	1/4 inch
Lens Dimensions	8.5 x 8.5 x 5.2 mm
Module Size	19.57 x 8.5 mm
Module Type	Auto Focus
Interface	MIPI



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ROHS

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(1)	
(2)	
(3)	



TOP VIEW

SIDE VIEW

BOTTOM VIEW

CONNECTION RECEPTION	
TIME	NAME
1	MOCK
2	pre-1st
3	
4	2nd-3rd
5	4th-5th
6	6th-8th
7	Class
8	Class
9	Class
10	Class
11	Class
12	Class
13	Class
14	Class
15	Class
16	Class
17	Class
18	Class
19	Class
20	Class
21	Class
22	Class
23	Class
24	Class

厚板	
厚度(TH)	3.37
力圈(F.M)	2.8
视场角(View angle)	70°
畸变(Distortion)	< 1%
镜头类型(Lens Size)	1/4 inch
像素(Pixel Size)	2468×1944
感光芯片(Chip Type)	OV5645

SELECT		✓		
level	A	B	C	D
dfm.				
5	±0.03	±0.05	±0.08	±0.10
5-10	±0.05	±0.08	±0.10	±0.15
10-50	±0.08	±0.10	±0.15	±0.20
50-100	±0.10	±0.15	±0.20	±0.25
100-	±0.10%	±0.15%	±0.20%	±0.30%

1/0	All	First Release	Peter	09-01-14
REV.	Zone	Description	Approved	Date

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Kai Lap Technologies Group Ltd

Designed by petar	Client Name MIP Interface
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09-01-14	Model Name: JAL-OV5645-Y660B
Directed By: Feng Liu	

09-01-14

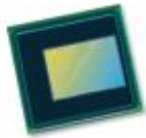
Approved By: Aouly_Yan

 Third Angle |

1000

Methods:

.....



OV5645 5-megapixel product brief



available in
a lead-free
package

High Quality 5-Megapixel Photography and HD Video for Low-Cost Mobile Devices

OmniVision's OV5645 is a high performance, 5-megapixel system-on-chip (SOC) ideally suited for the cost-sensitive segment of the mobile handset market. The CameraChip™ sensor's single MIPI port replaces both a bandwidth-limited DVP interface and a costly embedded JPEG compressor, allowing the new OV5645 sensor to save significant silicon area and cost. An embedded autofocus control with voice coil motor driver offers further cost savings for the end user, making the OV5645 a highly attractive alternative to other 5-megapixel sensors currently on the market.

The OV5645 also features a new picture-in-picture (PIP) architecture that offers an easy-to-implement, low-cost dual camera system solution for mobile handsets and smartphones. The feature is based on a master/slave configuration where a front-facing camera (OV7965) can be connected through the OV5645 master camera, enabling a two-camera system with PIP functionality without the need for an additional MIPI interface into the baseband processor.

Built on OmniVision's 1.4-micron OmniBSI™ pixel architecture, the OV5645 offers high performance 5-megapixel photography and 720p HD video at 60 frames per second (FPS) and 1080p HD video at 30 FPS with complete user control over formatting and output data transfer. The sensor's 720p HD video is captured in full field-of-view with 2 x 2 binning, which doubles the sensitivity and improves the signal-to-noise ratio (SNR). A unique post-binning, re-sampling filter function removes zigzag artifacts around slant edges and minimizes spatial artifacts to deliver even sharper, crisper color images.

Find out more at www.ovt.com.

OmniVision.

Applications

- Cellular Phones
- Toys
- PC Multimedia
- Digital Still Cameras

Product Features

- 1.4 μm x 1.4 μm pixel with OmniBSI+™ technology for high performance (high sensitivity, low crosstalk, low noise, improved quantum efficiency)
- optical size of 1/4"
- automatic image control functions: automatic exposure control (AEC), automatic white balance (AWB), automatic band filter (ABF), automatic 50/60 Hz luminance detection, and automatic blacklevel calibration (ABLC)
- image quality controls: color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel canceling, and noise canceling
- support for output formats: RAW RGB, RGB565/555/444, YUV422/420, YCbCr422
- support for video or snapshot operations
- support for internal and external frame synchronization for frame exposure mode
- support for LED and flash strobe mode
- support for horizontal and vertical sub-sampling, binning
- support for minimizing artifacts on binned image
- support for data compression output
- support for anti-shake
- standard serial SCCB interface
- dual lane MIPI output interface
- embedded 1.5V regulator for core power
- programmable I/O drive capability, I/O tri-state configurability
- support for black sun cancellation
- support for images sizes: 5 megapixel, and any arbitrary size scaling down from 5 megapixel
- support for auto focus control (AFC) with embedded AF VCM driver
- embedded microcontroller
- suitable for module size of 8.5 x 8.5 x $\leq 6\text{mm}$ with both CSP and RW packaging

0V5645

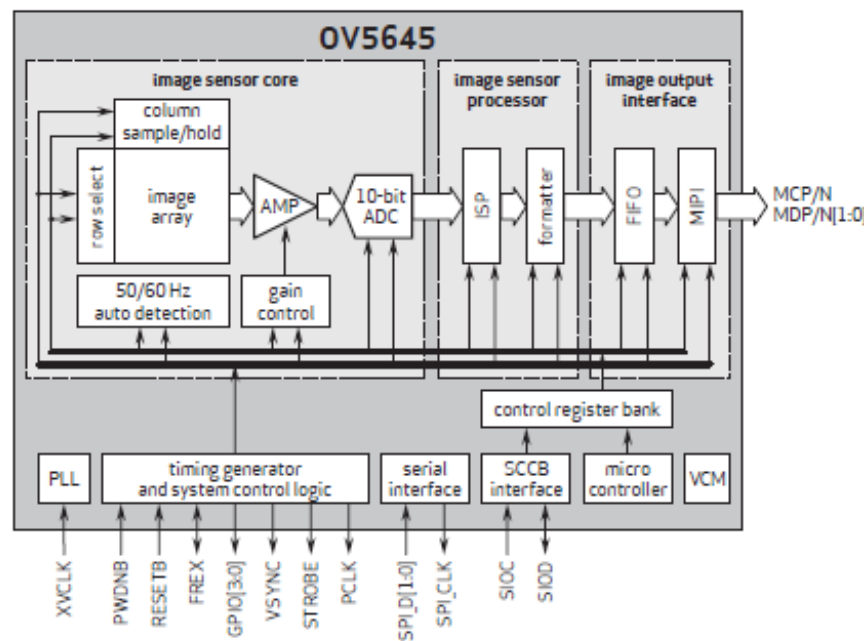


- OV05645-A66A
(color, lead-free, 66-pin CSP3)
- OV05645-G04A
(color, chip probing, 200 μ m
backgrinding, reconstructed wafer)

Product Specifications

- active array size: 2592 x 1944
- power supply:
 - core: 1.5V ±5%
 - (with embedded 1.5 regulator)
 - analog: 2.6 ~ 3.0V (2.8V typical)
 - I/O: 1.5V / 2.8V
- temperature range:
 - operating: -30°C to 70°C junction temperature
 - stable image: 0°C to 50°C junction temperature
- output formats: 8-/10-bit RGB RAW, RGB565/555/444, YUV422/420, YCbCr422 output
- lens size: 1/4"
- lens chief ray angle: 29.1°
- input clock frequency: 6 ~ 27 MHz
- max 5/f/N ratio: 36 dB
- maximum image transfer rate:
 - Q5XGA (2592X1944): 15 fps
 - 1080p: 30 fps
 - 1280x960: 45 fps
 - 720p: 60 fps
- shutter: rolling shutter / frame exposure
- maximum exposure interval: $1964 \times t_{\text{row}}$
- pixel size: 1.4 μm x 1.4 μm
- image area: 3673.6 μm x 2738.4 μm
- package/die dimensions:
 - CSP3: 6200 μm x 4860 μm
 - COB: 6190 μm x 4850 μm

Functional Block Diagram



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Version 1.0, October, 2012

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