CMOS OV5642 Camera Module

1/4-Inch 5-Megapixel Module Datasheet

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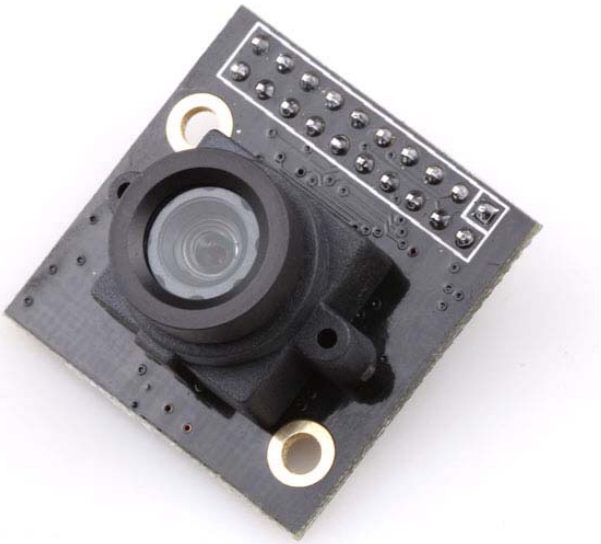

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1 Introduction

The OV5642 (color) 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 using OmniBSI™ technology in a small footprint package. It provides full-frame, sub-sampled, windowed or arbitrarily scaled 8-bit/10-bit images in various formats via the control of the Serial Camera Control Bus (SCCB) interface or MIPI interface. The OV5642 has an image array capable of operating at up to 15 frames per second (fps) in 5 megapixel resolution with complete user control over image quality, formatting and output data transfer. All required image processing functions, including exposure control, gamma, white balance, color saturation, hue control, defective pixel canceling, noise canceling, etc., are programmable through the SCCB interface, MIPI interface or embedded microcontroller. The OV5642 also includes a compression engine for increased processing power. In addition, Omnivision image sensors use proprietary sensor technology to improve image quality by reducing or eliminating common lighting/electrical sources of image contamination, such as fixed pattern noise, smearing, etc., to produce a clean, fully stable, color image. The OV5642 has an embedded microcontroller, which can be combined with an internal autofocus engine and programmable general purpose I/O modules (GPIO) for external autofocus control. It also provides an anti-shake function with an internal anti-shake engine. For identification and storage purposes, the OV5642 also includes a one-time programmable (OTP) memory. Compared to its predecessor, the OV5642 has embedded TrueFocus™ Lite that enables extended depth of field (EDoF). The OV5642 supports both a digital video parallel port and a serial MIPI port. The MIPI and ISP interface can be used for a second camera sensor without requiring a dual serial port camera system.

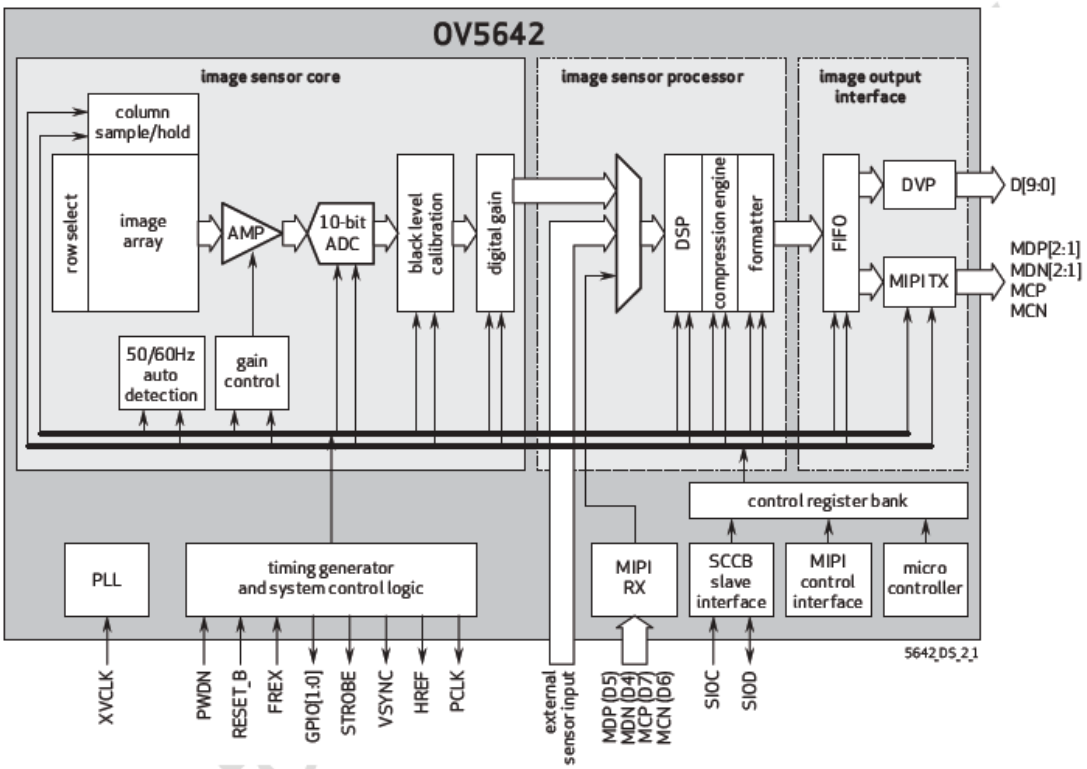
2 Features

- ultra high performance
- automatic image control functions: automatic exposure control (AEC), automatic white balance (AWB), automatic band filter (ABF), automatic 50/60 Hz luminance detection, and automatic black level calibration (ABLC)
- programmable controls for frame rate, AEC/AGC 16-zone size/position/weight control, mirror and flip, scaling, cropping, windowing, and panning
- 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, CCIR656, YUV422/420, YCbCr422, and compression
- support for images sizes: 5 megapixel, and any arbitrary size scaling down from 5 megapixel
- embedded TrueFocus™ light, enabling extended depth of field (EDoF)
- support for auto focus control (AFC)
- support for video or snapshot operations
- support for horizontal and vertical sub-sampling
- support for binning
- support for data compression output
- support for anti-shake
- support for external frame synchronization in frame exposure mode
- support for LED and flash strobe mode
- standard serial SCCB interface
- digital video port (DVP) parallel output interface
- MIPI serial input and output interface
- support for second camera chip-sharing ISP and MIPI interface
- embedded microcontroller
- embedded one-time programmable (OTP) memory for part identification, etc.
- on-chip phase lock loop (PLL)
- programmable I/O drive capability
- support for mechanical shutter, ND filter and IRIS control
- built-in 1.5V regulator for core

3 Key Specifications

- **active array size:** 2592 x 1944
- **power supply:**
  core: 1.5VDC ± 5% (internal regulator)
  analog: 2.6 ~ 3.0V
  I/O: 1.7 ~ 3.0V
- **power requirements:**
  active: TBD
  standby: TBD
- **temperature range:**
  operating: -30°C to 70°C (see **table 8-1**)
  stable image: 0°C to 50°C (see **table 8-1**)
- **output formats (8-bit):** YUV(422/420) / YCbCr422, RGB565/555/444, CCIR656, 8-bit compression data, 8/10-bit raw RGB data
- **lens size:** 1/4"
- **lens chief ray angle:** 24° non-linear (see **table 10-1**)
- **input clock frequency:** 6 ~ 27 MHz
- **shutter:** rolling shutter
- **maximum image transfer rate:**
  5 megapixel (2592x1944): 15 fps
  (and any size scaling down from 5 megapixel)
  1080p (1920x1080): 30 fps
  720p (1280x720): 60 fps
  VGA (640x480): 60 fps
  QVGA (320x240): 120 fps
- **sensitivity:** TBD
- **S/N ratio:** TBD
- **dynamic range:** TBD
- **scan mode:** progressive
- **maximum exposure interval:** 1968 x t_{ROW}
- **gamma correction:** programmable
- **pixel size:** 1.4 µm x 1.4 µm
- **well capacity:** TBD
- **dark current:** TBD
- **fixed pattern noise (FPN):** TBD
- **image area:** 3673.6 µm x 2738.4 µm
- **package dimensions:** 6945 µm x 6695 µm

4 Block Diagram



Note: OV5642 camera module only support DVP interface, it doesn't support MIPI interface.

5 Application

- Cellular phones
- PDAs
- Toys
- Other battery-powered products
- Can be used in Arduino, Maple, ChipKit, STM32, ARM, DSP, FPGA platforms

6 Pin Definition

Pin No.	PIN NAME	TYPE	DESCRIPTION
1	VCC	POWER	3.3v Power supply
2	GND	Ground	Power ground
3	SCL	Input	Two-Wire Serial Interface Clock
4	SDATA	Bi-directional	Two-Wire Serial Interface Data I/O
5	VSYNC	Output	Active High: Frame Valid; indicates active frame
6	HREF	Output	Active High: Line/Data Valid; indicates active pixels
7	PCLK	Output	Pixel Clock output from sensor
8	XCLK	Input	Master Clock into Sensor
9	DOUT9	Output	Pixel Data Output 9 (MSB)
10	DOUT8	Output	Pixel Data Output 8
11	DOUT7	Output	Pixel Data Output 7
12	DOUT6	Output	Pixel Data Output 6
13	DOUT5	Output	Pixel Data Output 5
14	DOUT4	Output	Pixel Data Output 4
15	DOUT3	Output	Pixel Data Output 3
16	DOUT2	Output	Pixel Data Output 2 (LSB)
17	PWDN	Input	Power down
18	RSV	NC	Reserved
19	DOUT1	Output	Pixel Data Output 1(10bit mode)
20	DOUT0	Output	Pixel Data Output 0 (10bit mode)