

OV5640 5-megapixel product brief



1/4-inch, 5-megapixel SOC image sensor optimized for high-volume mobile markets



available in
a lead-free
package

The OV5640 delivers a complete 5-megapixel camera solution on a single chip, aimed at offering cost efficiencies that serve the high-volume autofocus (AF) camera phone market. The system-on-a-chip (SOC) sensor features OmniVision's 1.4 micron OmniBSI™ backside illumination architecture to deliver excellent pixel performance and best-in-class low-light sensitivity, while enabling ultra compact camera module designs of 8.5 mm x 8.5 mm with less than 5 mm z-height. The OV5640 provides the full functionality of a complete camera, including anti-shake technology, AF control, and MIPI while being easier to tune than two-chip solutions, making it an ideal choice in terms of cost, time-to-market and ease of platform integration.

The OV5640 enables 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 720p/60 HD video is captured in full field of view (FOV) with 2 x 2 binning, which doubles the sensitivity and improves the signal-to-noise ratio (SNR). Additionally, 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. To further improve camera performance and user experience, the OV5640 features an internal anti-shake engine for image stabilization, and it supports Scalado tagging for faster image preview and zoom.

The OV5640 offers a digital video port (DVP) parallel interface and a high-speed dual lane MIPI interface, supporting multiple output formats. An integrated JPEG compression engine simplifies data transfer for bandwidth-limited interfaces. The sensor's automatic image control functions include automatic exposure control (AEC), automatic white balance (AWB), automatic band filter (ABF), 50/60 Hz automatic luminance detection, and automatic black level calibration (ABLC). The OV5640 delivers programmable controls for frame rate, AEC/AGC 16-zone size/position/weight control, mirror and flip, cropping, windowing, and panning. It also offers color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel canceling, and noise canceling to improve image quality.

Find out more at www.ovt.com.

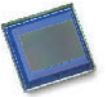
Applications

- Mobile Phones
- Digital Still Cameras
- PC Multimedia
- Entertainment Multimedia, Games and Toys

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)
- support horizontal binning and vertical sub-sampling
- optical size of 1/4"
- resampling artifacts on binned images
- embedded JPEG compression
- automatic image control functions:
 - automatic exposure control (AEC)
 - automatic white balance (AWB)
 - automatic band filter (ABF)
 - automatic 50/60 Hz luminance detection
 - automatic black level calibration (ABLC)
- support for anti-shake
- standard serial SCCB interface
- programmable controls for frame rate, AEC/AGC 16-zone size/position/weight control, mirror and flip, cropping, windowing, and panning
- digital video port (DVP) parallel output interface and dual lane MIPI output interface
- embedded 1.5V regulator for core power
- programmable I/O drive capability, I/O tri-state configurability
- image quality controls: color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel canceling, and noise canceling
- black sun cancellation
- embedded arbitrary scalar supporting any size from 5 MP and below
- support for output formats: RAW RGB, RGB565/555/444, CCIR656, YUV422/420, YCbCr422, and compression
- auto focus control (AFC) with embedded AF VCM driver
- support for video or snapshot operations
- embedded microcontroller
- support for LED and flash strobe mode
- suitable for module size of 8.5 x 8.5 x $\lt; 6\text{mm}$ with both CSP and RW packaging
- support for internal and external frame synchronization for frame exposure mode

OV5640



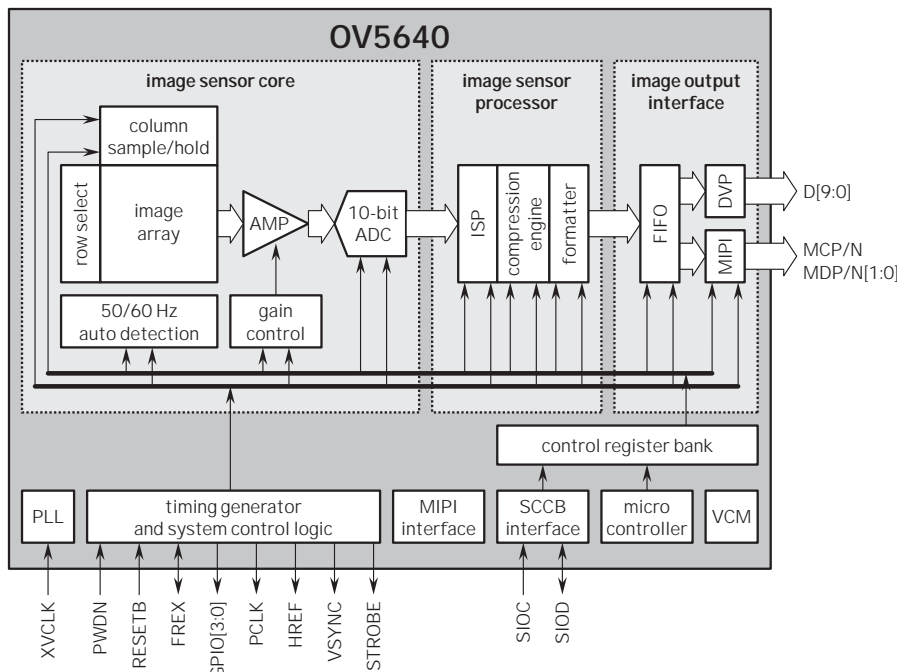
Ordering Information

- OV05640-A71A (color, lead-free, 71-pin CSP3)
- OV05640-G04A (color, chip probing, 200 μm backgrinding, reconstructed wafer)

Product Specifications

- active array size: 2592 x 1944
- maximum image transfer rate:
 - QSXGA (2592x1944): 15 fps
 - 1080p: 30 fps
 - 1280 x 960: 45 fps
 - 720p: 60 fps
 - VGA (640x480): 90 fps
 - QVGA (320x240): 120 fps
- power supply:
 - core: 1.5 V $\pm 5\%$ (with embedded 1.5 V regulator)
 - analog: 2.6 - 3.0 V (2.8 V typical)
 - I/O: 1.8 V / 2.8 V
- power requirements:
 - active: 150 mA
 - standby: 40 μA
- temperature range:
 - operating: -30°C to 70°C
 - stable image: 0°C to 50°C
- output formats: 8/10-bit RAW RGB
- lens size: 1/4"
- lens chief ray angle: 24°
- input clock frequency: 6 - 27 MHz
- shutter: rolling shutter / frame exposure
- sensitivity: 600 mV/(lux-sec)
- maximum exposure interval: 1964 x t_{row}
- S/N ratio: 36 dB
- dynamic range: 68 dB
- pixel size: 1.4 μm x 1.4 μm
- well capacity: 4300 Ke⁻
- dark current: 6 mV/sec @ 50°C
- image area: 3673.6 μm x 2738.4 μm
- package dimensions:
 - CSP3: 5985 μm x 5835 μm
 - COB: 6000 μm x 5850 μm

Functional Block Diagram



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