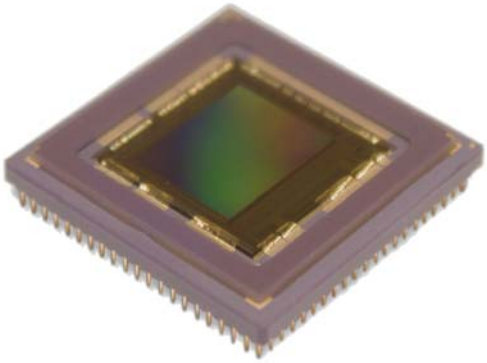
AnaFocus

LEADING ON-CHIP VISION SOLUTIONS



5.2 Megapixels, 1-inch, 250fps, global-shutter CMOS image sensor

Overview

Lince5M is a digital high-speed image sensor designed for excellent performance in a large variety of applications, ranging from low-noise high-dynamic range surveillance to high-speed high-resolution machine vision.

Lince5M incorporates a high-speed 5.2Mpxl CMOS active-pixel image sensor providing global electronic shutter and High Dynamic Range (HDR) features.

The sensor array utilizes active CMOS pixels with pinned photodiodes to deliver high image quality whilst maintaining the size, cost, and integration advantages of CMOS process.

The pixel response can be configured for either linear light response with 60dB, or for high-dynamic range piecewise-linear response, with more than 100dB dynamic range; both with global shutter operation.

Lince5M incorporates sophisticated on-chip functions, as:

- Pixel binning, windowing, and sub-sampling
- Linear / HDR-sensing
- FPN correction
- Defective pixel correction
- Per-colour selectable analog gain (in colour version)
- Per-colour fine digital gain and offset
- Microcontroller for high-level command interpretation and statistic-image-information-based sensor control

All these functions are programmable via on-chip microcontroller or standard Serial Peripheral Interface (SPI).

Lince5M includes 24 12-bit digital LVDS data outputs, each running at 691Mbps, plus 2 LVDS ports for clock recovery and image synchronization, respectively. Lince5M also offers a CMOS-output version, in which image data are transmitted via 48 CMOS output buffers, for those applications where LVDS receivers are not available

The whole system runs with an external clock of 9.6MHz. All the required timing and reference voltages are internally generated, thus minimizing the need for external components. It includes a power down capability for low power dissipation.

Lince5M is very versatile and can operate in a spread range of applications. Its configurability allows to work with very high frame rate and moderate power consumption as well as with low frame rate and very small power consumption.

Lince5M offers the possibility of reducing the number of active LVDS/CMOS ports when either the frame rate or the output word-length is reduced. This minimizes the complexity of the required external set-up.

Key features

- 2,560 x 2,048 active pixel
- 5µm pixel-pitch with pinned photodiode
- Optical Format: 1”
- Global-shutter with programmable exposition time
- Maximum frame rate: 250fps @ 2,560 x 2,048 in 12-bit mode
- 60dB dynamic range (DR)
- 43dB SNR_{MAX}
- 0.5% PRNU
- 0.1% FS DSNU
- 74% Fill Factor x Quantum Efficiency*1
- Sensitivity*2
  - 6.0 V/(lux-sec)
  - 102,800 $DN_{12\text{-}bit}$/(uJ/cm²)
- Sensitivity*3
  - 11.0 V/(lux-sec)
  - 95,500 $DN_{12\text{-}bit}$/(uJ/cm²)
- 16.6 Gbit/sec throughput
- High-speed data output via LVDS ports (x24) or CMOS buffers (x48)

*1 (λ =550mn, µ-lens)
*2 (λ =550mn, Monochromatic, gain x1, µ-lens)
*3 (3200K + CM500S IRCF, gain x1, µ-lens)

Programmability

- Per-colour programmable analog-digital gain & offset
- 2x2 and 4x4 CMOS pixel binning for increased SNR & DR
- On-chip vertical-horizontal FPN correction
- On-chip defective pixel correction
- Programmable per-colour look-up tables (LUT)
- 8/10/12-bit selectable digital output word-length
- Selectable active LVDS ports for a given frame-rate
- Sensor programming via SPI port and/or on-chip microcontroller with built-in command interpreter

Miscellaneous

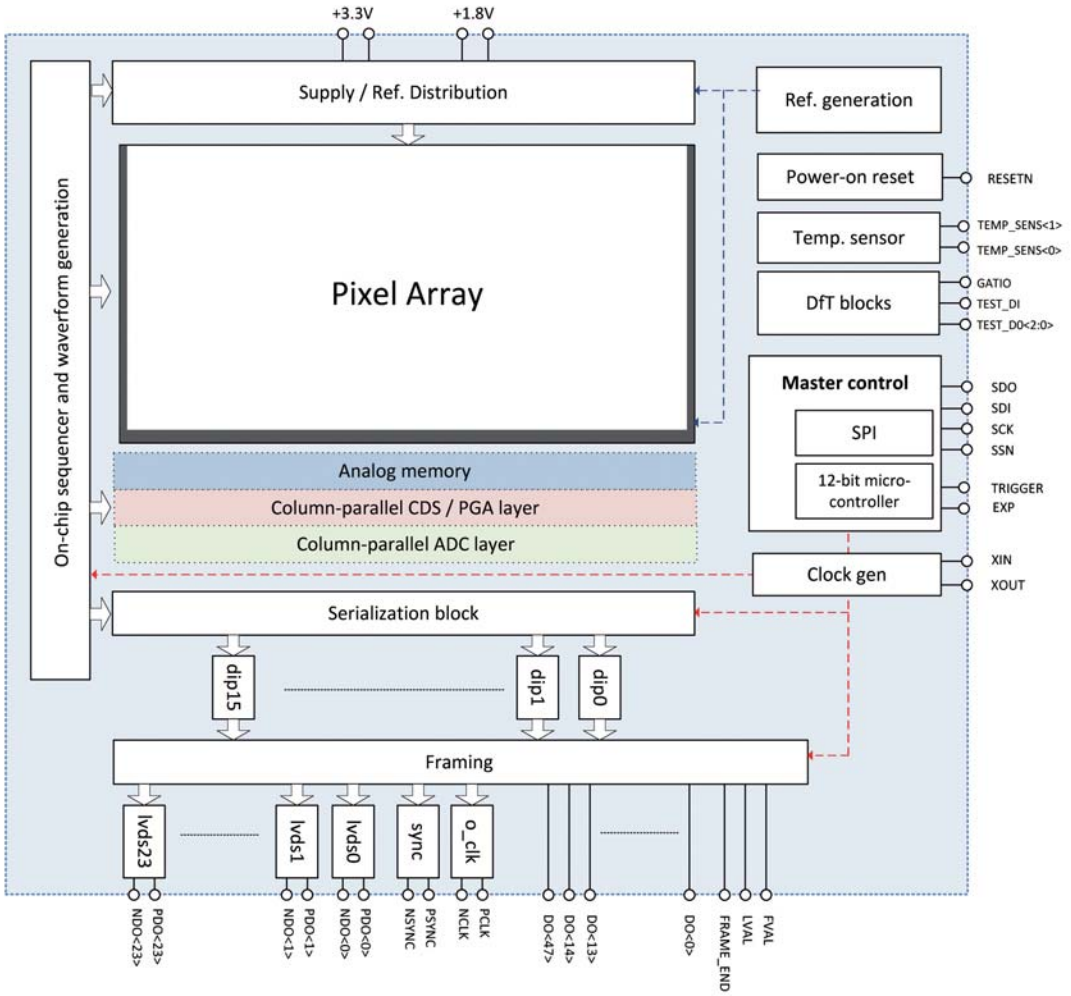
- 181-lead micro-PGA ceramic package
- Dual 3.3V/1.8V power-supply
- 2.8W maximum power consumption
- 9.6MHz external clock (XTAL) frequency
- Data output via 691Mbps LVDS ports (x24)
- -20°C to +70°C operating temperature

Applications

Generic high-speed high-resolution machine-vision inspection and intelligent transportation systems.

The complete camera reference-design, including fully-documented PCB schematics, PCB layout, FPGA firmware and communication and control software is available for customers willing to develop new cameras using the Lince5M Image Sensor.

Image sensor block diagram



Package drawings

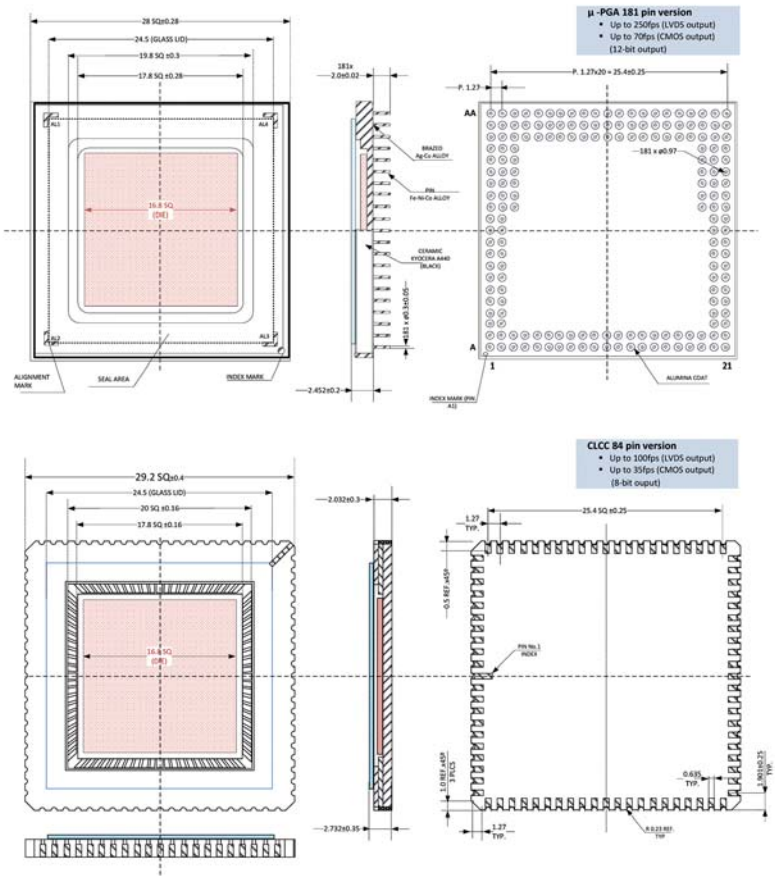
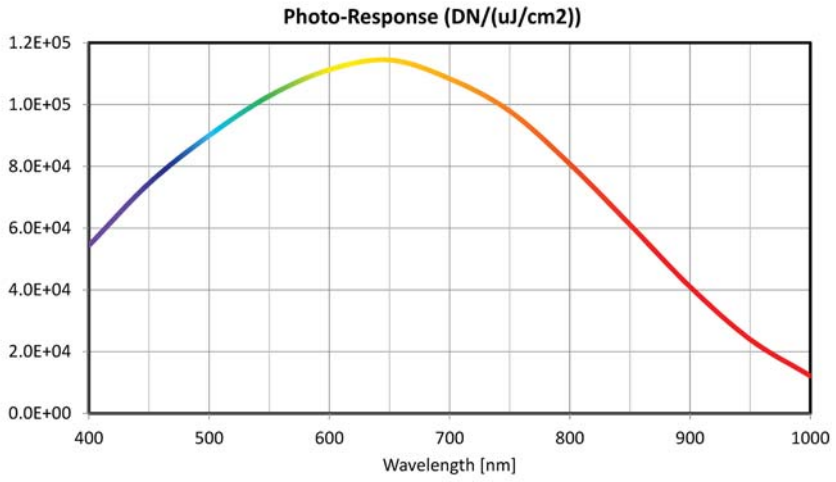
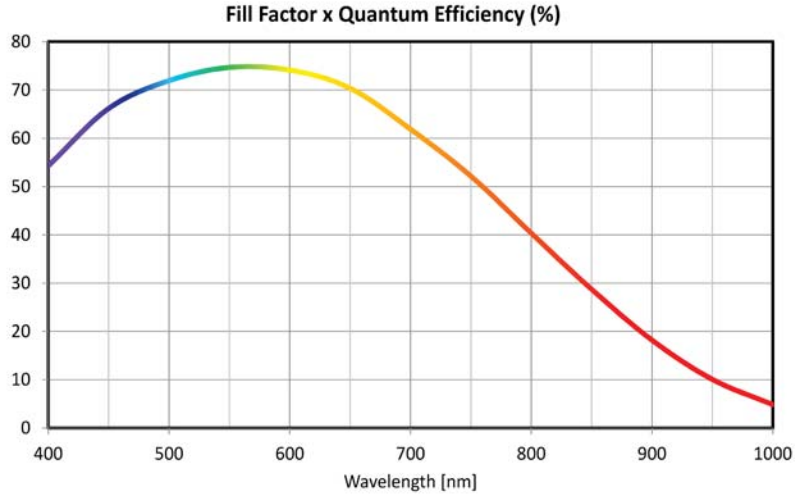


Photo-Response & Fill Factor x Quantum Efficiency





About AnaFocus

ANAFOCUS is a privately owned, pure-play supplier of standard off-the-shelf and customised high-performance, high-quality CMOS image-sensors and vision-sensors for the industrial, professional, scientific, medical and high-end surveillance markets.

ANAFOCUS started its operation in 2004. It is headquartered in the Scientific and Technological Park CARTUJA in Seville (SPAIN) where employs 50 engineers and technicians and occupies a total surface of 1,000m^2, one fourth dedicated to technical installations including optical test labs, qualification labs, and clean-room facilities for image-sensor wafer-sort and packaged-sample test.

ANAFOCUS provides commercial and technical support by own employees in Tokyo (Japan) since 2006. ANAFOCUS works for top-tier camera makers worlwide developing innovative image and vision-sensor solutions for various application sectors.

Carefully understanding customer needs and providing timely and fully satisfactory solutions is ANAFOCUS top priority and a great success thus far; all customers for custom image-sensor solutions in Japan and worldwide have repeated business in two or more occasions.

ANAFOCUS key competence is the ability to develop one-chip-solutions combining:

- High-sensitivity, low-noise pixels based on pinned photodiode technology; global and rolling shutter with linear and HDR sensing
- Advanced analog front-end circuits for reading & digitizing thepixels at high-speed and with very low noise.
- Area and power efficient digital processors performing optical corrections (FPN correction, shading correction, defective-pixel correction, colour-processing…) on the images, in real-time, before being outputted through high-speed LVDS ports or conventional CMOS ports.
- Sophisticated control logic, such as on-chip microcontrollers that simplify the communication with the sensor chip and provide great flexibility.

Besides its CMOS image sensor design and production capabilities, ANAFOCUS employs an experienced engineering team with over 15 members expert in the development of camera complex hardware, FPGA firmware and software and real-time image processing algorithms. This team, together with a dedicated project management and specialized product engineering team, closely work with customers engineering team in the whole camera development cycle: from concept to commercialization.

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