

# LUPA 3000 485 FPS, 13.3 Gbit High Speed Image Sensor

# CYILSN3000AA Product Brief

## Features

- 1696 x 1710 active pixels
- 8 μm X 8 μm square pixels
- 1" optical format
- Monochrome or color digital output
- 485 fps frame rate
- 64 On-chip 8-bit ADCs
- 32 LVDS serial outputs
- Random programmable ROI readout
- Pipelined, Triggered and Snapshot shutter
- Serial to Parallel Interface (SPI)
- Limited supplies: Nominal 2.5V (some supplies require 3.3V)
- 0°C to 60°C operational temperature range
- 399-pin BGA package
- Power dissipation: 1.1W

## Applications

- High speed machine vision
- Holographic data storage
- Motion analysis
- Intelligent traffic system
- Medical imaging
- Industrial imaging

## Description

The LUPA 3000 is a high speed CMOS image sensors with an image resolution of 1696 by 1710 pixels. The pixels are 8 μm x 8 μm in size and consist of high sensitivity 6T pipelined snapshot shutter capability where integration during readout is possible. The LUPA 3000 delivers 8-bit color or monochrome digital images with a 3.0-megapixel resolution at 485 fps which makes this product ideal for high speed vision machine, intelligent traffic system and holographic data storage. The LUPA 3000 captures complex high-speed events for traditional machine vision applications as well as various high-speed imaging applications.

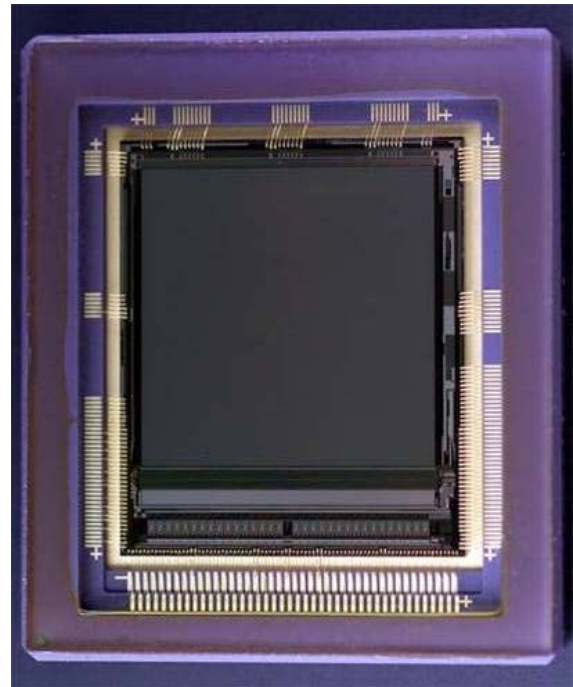
The sensor contains 64 on-chip 8 bit ADCs operating at 25.75 Msamples/s each, resulting in an aggregate pixel rate of 1.4 Gpix/s. The outputs of the 64 ADCs are multiplexed onto 32 LVDS serial links operating at 412 Mbit/s each resulting in an aggregate data rate of 13.3Gbit/s. The 32 data channel LVDS interface allows a very high data rate with a limited number of pins. Each channel runs at 51.5 MSPS pixel rate which results

in 485 fps frame rate at full resolution. Higher frame rates can be achieved by windowing which is programmable over the SPI interface.

All required clocks, control and bias signals are generated on-chip. The incoming high speed clock is divided to generate the different low speed clocks required for the operation of the sensor. The sensor generates all its bias signals from an internal bandgap reference. An on-chip sequencer generates all the required control signals for the image core, the ADCs and the on chip digital data processing path. The settings of the sequencer are stored in registers that can be programmed through the serial command interface. The sequencer supports windowed readout at frame rates up to 10000 fps.

The LUPA 3000 is housed in a 399-pin ceramic BGA package and is available in a monochrome version or Bayer (RGB) patterned color filter array with micro lens.

**LUPA 3000 Die Photo**



## Ordering Information

| Marketing Part Number (ES Samples) | Mono/Color                  | Package             |
|------------------------------------|-----------------------------|---------------------|
| CYL1SN3000AA-BDCES                 | Micro-lens mono with glass  | 399 pin ceramic BGA |
| CYL1SE3000AA-BDCES                 | Micro-lens color with glass |                     |

**General Specifications**

| Parameter       | Specifications  |
|-----------------|---|
| Active Pixels   | 1696 (H) x 1710 (V)   |
| Pixel Size      | 8 μm x 8μm.)  |
| Pixel Type      | Pipelined shutter pixel   |
| Data Rate       | 412 Mbps (32 serial LVDS outputs)   |
| Shutter Type    | 485 fps at 3.0 Mpixel (Can be boosted by subsampling and windowing.)                                      |
| Frame Rate      | 485 fps at 3.0 Mpixel (Can be boosted by sub sampling and windowing.)                                     |
| Master Clock    | 206 MHz   |
| Windowing (ROI) | Randomly programmable ROI read out. Implemented as scanning of lines or columns from an uploaded position |
| Read Out        | Windowed, flipped, mirrored, and subsampled read out.   |
| ADC Resolution  | 8-bit, on-chip  |
| Sensitivity     | 3.81 V/lux.s @ 550nm  |

**General Specifications**

| Parameter              | Specifications                                     |
|------------------------|--|
| Extended Dynamic Range | Multiple slope (up to 80 dB optical dynamic range) |

**Electro-Optical Specifications**

| Parameter                   | Specifications                       |
|-----------------------------|--------------------------------------|
| Conversion gain             | 39.2uV/e                             |
| Full well charge            | 27000e                               |
| Sensitivity                 | 2800 V.m2/W.s @600nm with micro-lens |
| Fill factor                 | 36%                                  |
| Parasitic light sensitivity | < 1/5000                             |
| Dark noise                  | 21e <sup>-</sup>                     |
| QE x FF                     | 37% @ 680nm                          |
| FPN                         | 1.7% of V <sub>sat</sub>             |
| PRNU                        | 2.2% of V <sub>signal</sub>          |
| Dark signal                 | 250 mV/s @25°C                       |
| Power dissipation           | 1.1W @485 fps                        |

**Document History Page**

| Document Title: LUPA 3000, 485 FPS, 13.3 Gbit High Speed Image Sensor |         |                 |                  |                           |
|---|---------|-----------------|------------------|---------------------------|
| Document Number:  |         |                 |                  |                           |
| REV.  | ECN     | Orig. of Change | Submission Date  | Description Of Change     |
| **  | 2598180 | VED             | October 29, 2008 | New image sensor document |

**Sales, Solutions, and Legal Information**

**Worldwide Sales and Design Support**

Cypress maintains a worldwide network of offices, solution centers, manufacturer’s representatives, and distributors. For more information on Image sensors, please contact at [imagesensors@cypress.com](mailto:imagesensors@cypress.com).

Cypress offers standard and customized CMOS image sensors for consumer as well as industrial and professional applications. Consumer applications include the fast growing high volume cell phone, digital still cameras as well as automotive applications. Cypress’ customized CMOS image sensors are characterized by very high pixel counts, large area, very high frame rates, large dynamic range, and high sensitivity.

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