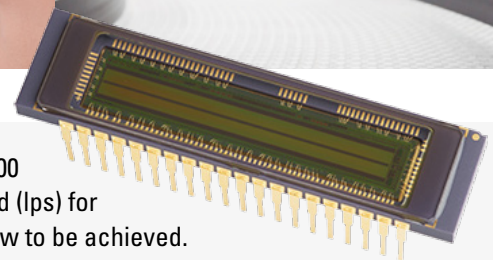


## 4K, 7 $\mu\text{m}$ PIXEL, 18 klps & 2K, 14 $\mu\text{m}$ PIXEL, 33 klps LINE SCAN CMOS SENSOR



The **LS4k** is a high speed CMOS System on Chip (SoC) line scan image sensor optimized for applications requiring short exposure times and high accuracy line rates. It incorporates on chip two pixel arrays consisting of 2 rows with 4,096 7  $\mu\text{m}$  pitch pixels and 4 rows with 2,048 14  $\mu\text{m}$  pitch pixels respectively, a high accuracy (12-bit) high speed (84 MHz) analog-to-digital conversion (ADC), and sophisticated on chip optical calibration for PRNU, DSNU, and lens shading correction.

The line sensor array utilizes active CMOS pixels with pinned photodiodes to deliver high image quality whilst maintaining size, cost, and integration advantages of the CMOS process. The readout path permits pixel binning, increasing response and line rate. Windowing or sub-sampling allows a maximum

line rate of 82,400 lines per second (lps) for 512-pixel window to be achieved.

The line rate, image sub-sampling, windowing, binning, exposure time, gain, and other image processing features are controlled via the sensor configuration registers. The LS4k incorporates an SPI port to communicate with an external host device and three high speed LVDS ports for data output. The reference voltages are generated on chip from an internal band gap reference. No external components are required and a power down mode is available for low current consumption when the device is inactive.

### KEY BENEFITS

- High speed CMOS System on Chip (SoC) with dual pixel array
  - 7  $\mu\text{m}$  active pixel resolution: 2 rows x 4,096 pixels
  - 14  $\mu\text{m}$  active pixel resolution: 4 rows x 2,048 pixels
- Electronic global shutter with programmable exposition time
- Maximum line rate: 18,180 lps at 4k resolution, 32,870 lps at 2k resolution
- 65 dB dynamic range (DR)
- SNRmax: 45 dB (7  $\mu\text{m}$  pixel), 48 dB (14  $\mu\text{m}$  pixel)
- 0 dB to 30 dB programmable gain in 1 dB steps
- Pixel binning for increased SNR
- Line windowing and sub-sampling with faster line rate
- On chip PRNU, DSNU, and lens shading correction
- 700 mW maximum power consumption

### TYPICAL APPLICATIONS

- Printed circuit board inspection
- High performance document scanning
- Flat panel display inspection
- General machine vision & food sorting
- OCT, medical



## Sensor Characteristics

|  |   |
|--|---|
| <b>Optical format – mm</b>                 | 35  |
| <b>Active imager size – mm</b>             | 28.672  |
| <b>Active pixel</b>                        | 2 rows x 4,096<br>4 rows x 2,048  |
| <b>Pixel size</b>                          | 7 $\mu\text{m}$ active pixel resolution: 2 rows x 4,096 pixels<br>14 $\mu\text{m}$ active pixel resolution: 4 rows x 2,048 pixels   |
| <b>Pixel type</b>                          | 4T with pinned photodiode   |
| <b>Shutter type</b>                        | Electronic global shutter   |
| <b>Frame rate – lps</b>                    | 18,180 at 4k resolution<br>32,870 at 2k resolution<br>54,850 at 1k resolution<br>82,400 at 0.5k resolution                          |
| <b>Sensing modes</b>                       | PWC, pre-programmed<br>trigger, continuous  |
| <b>Dynamic range – dB</b>                  | 65  |
| <b>SNRmax – dB</b>                         | 45 (7 $\mu\text{m}$ pixel)<br>48 (14 $\mu\text{m}$ pixel)<br>53.5 (14 $\mu\text{m}$ pixel,<br>4 rows binning)                       |
| <b>PRNU – %</b>                            | 0.65  |
| <b>DSNU – %</b>                            | 0.03  |
| <b>QE (@550nm)</b>                         | 61% 14 $\mu\text{m}$ pixel<br>93% 7 $\mu\text{m}$ pixel   |
| <b>Pixel response</b>                      | 157 DN ( $\text{nJ}/\text{cm}^2$ )<br>for 7 $\mu\text{m}$ pixel<br>197 DN ( $\text{nJ}/\text{cm}^2$ )<br>for 14 $\mu\text{m}$ pixel |
| <b>MISCELLANEOUS</b>                       |   |
| <b>Power supply – V</b>                    | Dual 3.3/1.8  |
| <b>Maximum power consumption – mW</b>      | 700   |
| <b>Operating junction temperature – °C</b> | -30 to +70  |
| <b>Packages</b>                            | 40 pin dual in-line ceramic   |