

CIS301/302 CMOS SENSOR Monochrome

9Kx9K, 10 μ m Pixel Pitch

KEY FEATURES

- Selectable 12 bit or 14 bit operation
- Extendable range by HDR
- High frame rates from 12 CML outputs (2Gbit/s)
- High Quantum Efficiency – Back side Illuminated
- Silicon Carbide and Ceramic precision package
- Designed for use over a wide range of temperatures
- Onboard Temperature Sensors
- 10 μ m x 10 μ m pixel pitch
- CIS302 provides high Quantum Efficiency at NIR
- Wavelengths

SYSTEM INTEGRATION

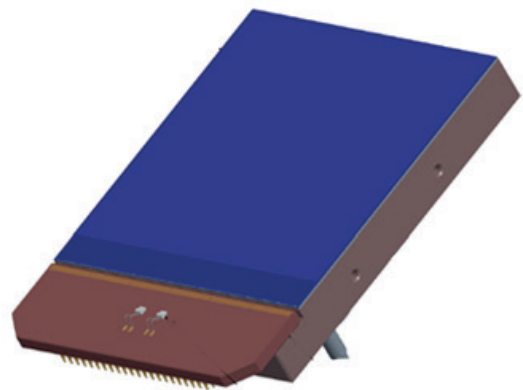
- SPI control interface
- 3 side buttable package with alignment capability

TYPICAL APPLICATIONS

- Ground based Astronomy – including butted focal plane arrays
- UV/VIS/NIR possibly X-Ray

POTENTIAL VARIANTS

- Hyperspectral – larger pixels
- Space science – rad hard version
- Multispectral – high speed
- Lightning imagers
- Scientific earth observation
- Options for Smaller array sizes



INTRODUCTION

The CIS301 and CIS302 are large area CMOS image sensors designed for high end performance applications in fields such as astronomy and scientific imaging. The particular format features a 9,000 x 8,600 switchable dual gain 10 μ m x 10 μ m pixels. These enable a low gain with high full well or a high gain low noise modes of operation.

The non-destructive read capability also allows for a High Dynamic Range Mode (HDR) of operation which can extend the effective bit count compared to standard selectable 12 bit or 14 bit available in non HDR operation. There are also multiple read out modes available including- Rolling Shutter and Simple Global Shutter. The 12 Common Mode Logic (CML) can each output data at 2Gbit/s allowing for full image area frame rates of up to 8 frames per second. Faster frame rates are possible by selecting smaller regions of interest. High sensitivity of over 90% is achieved using Teledyne's world leading back thinning capability.

The CIS302 also features Teledyne's HiRho technology enhancing the NIR wavelength response. The package design is 3 side buttable allowing multiple sensors to be mosaiced together to form even larger area pixel arrays with minimal dead space between individual sensors. All this make the CIS301 and CIS302 highly flexible, large area imagers with outstanding performance for demanding applications.

Table 1 Predicted Typical Performance Parameters

Parameters	CIS301 and CIS302
Pixel pitch	10 μm
Array size	9000 x 8,600
Pixel type	Pinned Photodiode, Switchable dual gain
Operating Modes include	Rolling Shutter, Global Shutter (Simple global shutter and with Digital Double Sampling (DDS)), High Dynamic Range (HDR), Staircase (multiple non destructive reads)
ADC bits	Selectable 12 or 14 bits
Frame rate	8 fps @12 bits (Rolling shutter), 8 fps max @ 12 bits (Simple Global shutter), 4 fps max @ (Global Shutter with DDS)
Region of Interest	Capable of selecting region of interest in row and column directions <ul style="list-style-type: none"> • freedom to select any or all combinations of adjacent odd and even rows • can select which of the 12 outputs to use to select different groups of columns
Multiple Gain settings	Any combination of pixel and pre-amplifier gain: Pixel gain: x1, x10, Pre-Amplifier gain: x1, x3, x7, x15, x31
Full Well Capacity	> 140 ke- (lowest pixel gain setting), 15 ke- (highest pixel gain setting)
Noise	2 e- (high gain - pixel and pre-amp - rolling shutter), 5 e- (high gain global shutter with DDS), 30 e- (low gain rolling shutter)
Dynamic Range with HDR operation	95dB typical
QE @550nm	95%. This is dependent on anti reflection coating. Please discuss with Teledyne e2v on other coating options to meet your needs.
Dark Current	0.01e-/s @-50°C, Dark current halves for every reduction of 5-6°C
Interface	12 CML outputs, 50 MHz Master Clock, SPI
Package/chip format	Three side buttable, silicon carbide package

PACKAGE

Figure 1 shows dimensioned drawings of the CIS301 detector assembly in the 3 side buttable package. The connector contains 135 pins arranged on an interstitial array containing 3 pairs of 22 and 23 row pins and allow the inputs to be provided to the die and for the outputs to be read from the die. There are two temperature sensors attached to the connector. More detail of the specific parts can be provided upon request.

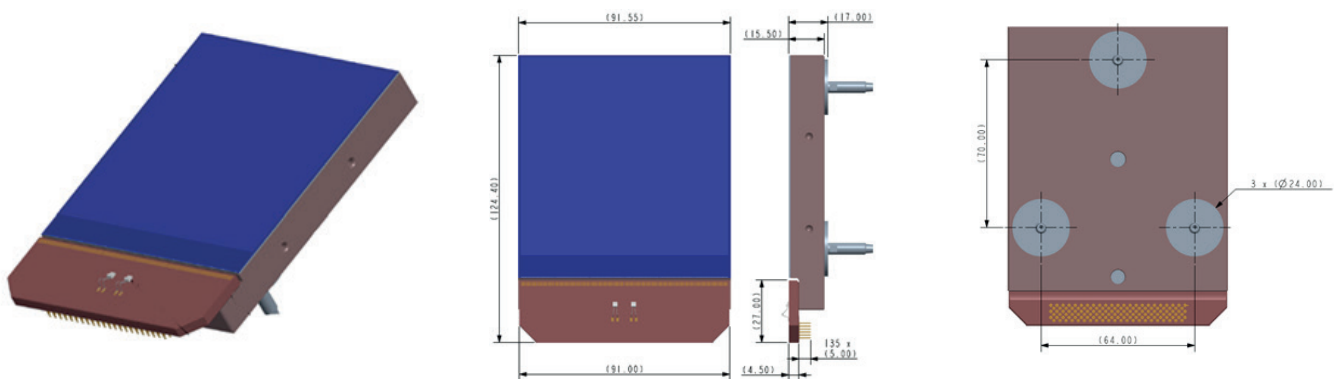


Figure 1 Detector Assembly in 3 side buttable package

OPERATING MODES

A preliminary list of operating modes are provided in Table 2.

The acronyms in the table have the following descriptions:

- RS – Rolling shutter
- GS – Global Shutter
- DDS – Digital Double Sampling
- HG – High Gain
- LG – Low Gain
- HDR – High Dynamic Range

Table 2 Derived Operating modes

#	Mode Name	Shutter	Bit Depth	Gain
1	RS- 12bit -HG	Rolling	12	High
2	RS- 12bit -LG	Rolling	12	Low
3	RS- 12bit -HDR	Rolling	12	HDR
4	RS- 14bit -HG	Rolling	14	High
5	RS- 14bit -LG	Rolling	14	Low
6	RS- 14bit -HDR	Rolling	14	HDR
7	GS with DDS - 12bit -HG	Global	12	High
8	GS with DDS - 12bit -LG	Global	12	Low
9	GS with DDS - 12bit -HDR	Global	12	HDR
10	GS with DDS - 14bit -HG	Global	14	High
11	GS with DDS - 14bit -LG	Global	14	High
12	GS with DDS - 14bit -HDR	Global	14	Low
13	Simple GS-12bit-HG	Global	12	HDR
14	Simple GS-12bit-LG	Global	12	High
15	Simple GS-14bit-HG	Global	14	Low
16	Simple GS-14bit-LG	Global	14	HDR
17	Staircase GS 12 bit HG	Global	12	High
18	Staircase GS 12 bit LG	Global	12	Low
19	Staircase GS 14 bit HG	Global	14	HDR
20	Staircase GS 14 bit LG	Global	14	High

The sensor can generate different line read out sequences based on the user defined Shutter_Mode parameter. User input SPI settings are used to select the different operating modes.

EXPORT UNCONTROLLED

Information subject to change – values typical unless stated.

For more information contact:

TDL_Sensorsystems@Teledyne.com

Europe: +44 (0)1245 493 493

Americas: +1 (845) 425 2000

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