

Images courtesy of University of Washington and ThorLabs GmbH

Fine Resolution + Better Sensitivity + SWIR = Deeper OCT Imaging

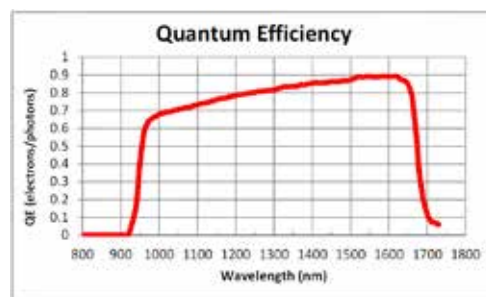
## 2048L InGaAs Linescan Camera

### 2048 Pixels for OCT or Machine Vision

The high-resolution linescan Sensors Unlimited 2048L offers square pixels (10 x 10  $\mu\text{m}$ ) for machine vision or tall pixels (10 x 210  $\mu\text{m}$ ) for ease of alignment with spectrometers. The cameras deliver line rates from 100 to >76,000 per second via Base Camera Link<sup>®</sup> interfaces providing flexibility. The 2048's deliver the high-resolution, stability and reliability needed for Optical Coherence Tomography (OCT) or industrial machine vision. High uniformed sensitivity is provided over the short-wave infrared (SWIR) wavelengths from 0.98 to 1.65  $\mu\text{m}$ . The simultaneous acquisition across all pixels delivers the superior repeatability, and long operating life needed for vital medical and industrial machine vision.

#### APPLICATIONS

- Optical Coherence Tomography at: 1.04, 1.31, 1.55  $\mu\text{m}$
- High-resolution spectroscopy of transient spectra in the 0.94 to 1.68  $\mu\text{m}$  wavelength range
- Silicon wafer or integrated circuit microscopy
- SWIR machine vision (MV) of moving objects
- Thermal MV imaging > 150 °C through glass windows



#### FEATURES

- 2048 x 1 pixel array with 10  $\mu\text{m}$  pitch
- Square (10x10  $\mu\text{m}$ ) or tall (10x210) pixel options
- High QE from 0.98  $\mu\text{m}$  to 1.65  $\mu\text{m}$
- Solid-state FPA with snapshot exposure
- User controlled exposure and line period
- Line rates from 0.1 k to 76 k lines per second
- >1200 : 1 dynamic range in high gain
- 4 sensitivity choices
- External triggering of line and exposure via Camera Link CC1 line
- Enclosed body < 136  $\text{cm}^3$  (< 8.3  $\text{in}^3$ )
- Low power < 3.6 W over 6-12 V
- Acquires and saves user non-uniformity corrections
- Base12-bit Camera Link<sup>®</sup> interfaces
- Meets FCC and CE requirements for radiated and conducted emissions, for immunity from such emissions and for ESD resistance
- The GL2048 cameras are compliant with EU RoHS and Directives

# P R E L I M I N A R Y

ENVIRONMENTAL & POWER	
Operating Case Temperature	+10 °C to +35 °C
Storage Temperature	-10 °C to 60 °C
Humidity	Up to 95% and non-condensing
<b>Power Requirements:</b>	
AC Adapter Supplied	100–240 VAC, 47–63 Hz
DC Voltage	+6 to 12 VDC (Maximum: 13.1 VDC)
Typical Power	3.6 W at 30 °C case temp <sup>1</sup>
In-rush Current	1.25 A @ 12 VDC

INTERFACES	
<b>Control: &amp; Data</b>	GL2048L: Single SDR 26-pin connector
<b>Power Connector</b>	CUI Inc. PJ-056, 1.0mm X 3.8mm power jack
<b>Trigger: Input</b>	Via Camera Link CC1 line
<b>Status LED:</b>	Green: Power on
<b>Tested Framegrabbers</b>	Nat. Instruments PCIe-1429, -1433, Matrox Solios eV-CL PCIe-X4

REGULATORY COMPLIANCE	
<b>CE:</b>	Meets class A for emission, immunity & ESD standards, RoHS
<b>FCC:</b>	Meets requirements for Part 15, Subpart B, Class A, 2006

MECHANICAL	
<b>Width x Height x Depth:</b>	8.3 cm x 10.2 cm x 1.6 cm (excludes I/O connectors, and lens adapter) 3.25 in x 4 in x 0.64 in (excludes I/O connectors, and lens adapter)
<b>Weight:</b>	< 240 g or 8.6 oz (no lens or adapter)
<b>Threaded Lens Mount</b>	M42x1-6H (focus point -6 mm from camera surface)
<b>Optional Lens Mount Adapters</b>	C-Mount adapter or adjustable distance F-Mount adapter (see ordering info)
<b>Spectrometer Mount</b>	4 tapped 8-32 holes in 2 inch square pattern, 2 tapped 8-32 holes in-line with image axis, O-Ring light seal, 1.9 inch diameter, 1/16 <sup>th</sup> thickness
<b>Camera Tripod Mount</b>	2 tapped ¼-20 holes, one on bottom, one on side wall.

OPTO-ELECTRONIC PERFORMANCE								
<b>Sensor format</b> <sup>1</sup>	2048 pixels with 2048 readout ADCs on 10 µm pitch							
<b>Optical aperture (pixel height)</b> <sup>1</sup>	210 µm or 10 µm							
<b>Quantum efficiency</b> <sup>1</sup>	> 60% over 0.98 µm-1.65 µm; > 70% peak response @ 1.55 µm							
Gain setting	High		Medium High		Medium Low		Low	
	Typical	Specification	Typical	Specification	Typical	Specification	Typical	Specification
<b>Temporal noise (rms counts)</b> <sup>1,2</sup>	3.1	< 3.4	2.2	< 2.8	1.9	< 2.3	1.7	< 1.9
<b>Dynamic range</b> <sup>1,2</sup>	> 1200:1		> 1450:1		> 1750:1		> 2100:1	
<b>Differential non-linearity</b> <sup>1,2</sup>	+/- 1.1	< +/- 2.5%	+/- 1.5	< +/- 2.5%	+/- 1.5	< +/- 2.5%	+/- 1.5	< +/- 2.5%
<b>Bad pixel specification</b>	White, dark, noisy or pixels exceeding +/- 20 % of the mean value when illuminated at 50% of full well. Number of bad pixels limited to a maximum of 1% of array total; on-board pixel replacement function							
<b>Exposure time</b> <sup>1,3</sup>	5.5 µs to 10 ms, user programmed in pixel clock cycles or via the width of the ext. trigger							
<b>Trigger modes</b> <sup>3</sup>	Free run, single line per trigger (exposure set by camera), or variable exposure							
<b>External trigger</b> <sup>3</sup>	Via CC1 signal line in Camera Link cable							
<b>External variable ET</b>	User set by the duration of trigger input signal (minimum exposure time pulse: 5.5 µs)							
<b>External trigger jitter</b>	+/-2.5 clock cycles: nominally 63 ns variation							
<b>Pixel rate</b>	2048L:157 Mpix/s with 2 x 12-bit words transferred on each Camera Link strobe clock at 80 MHz							
<b>Digital output format</b>	12-bit base Camera Link®; recommend NI PCIe-1433 or frame grabber with throughput of > 313 Mbytes/s to PC motherboard (minimum of 4 bi-directional PCIe express lanes in PC)							
<b>Readout mode</b>	Integrate-While-Read, differential double sampling							
<b>Corrections (preset OPR)</b>	Factory calibrated gain, offset, and bad pixel replace.							

<sup>1</sup> Actual formats and performance governed by pixel size options (dark current may limit longest usable ET, especially at high gain);

<sup>2</sup> Camera readout noise limited for low & medium gain settings; dark shot noise limited for high gain settings at longer exposure times

<sup>3</sup> Modes are user selectable by command over Camera Link® serial lines

ORDERING INFORMATION							
Camera Model	Part number	Max. Line rate	Pitch	Pixels	FPA length	Aperture (height)	Classification
GL2048L-10A-ENC-STD-210	8000-0596	76,263 lps	10 µm	2048	20.48 mm	210 µm	EAR99
GL2048L-10A-ENC-STD-010	8000-0597	76,263 lps	10 µm	2048	20.48 mm	10 µm	6A003.b.4.a

**Included items in qty 1-4:** Power supply, lens cap, ESD foam-lined shipping box, mini-CD with manual and SUI Image Analysis software for National Instruments IMAQ environment.

Order lens adapters separately for additional charge:

Part Numbers: Adjustable F-mount adapter: 8000-0171. C-mount adapter: 3800-0002

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