USB 2.0

5V DC

USB 2.0 AND ETHERNET
MEGAPIXEL INDUSTRIAL
CAMERAS

Lumenera
corporation

EXAMPLE CAMERA APPLICATIONS

Lumenera's cameras are used in over 200 industrial vertical applications worldwide, including:

- Automated Optical Inspection
- Biomechanics
- Food and Beverage
- Barcode
- Robotics
- Military
- Metrology
- Pharmaceutical
- Aerospace
- Semiconductor
- 3-D Imaging
- Document Reading
- Packaging
- Automotive
- UAV
- Flat Panel Inspection
- Material Handling
- Traffic Management
- Photo ID
- Astro Imaging
- Biometrics

WHY MEGAPIXEL?

The superior image quality of megapixel resolution represents the new era of industrial imaging, providing:

- More precise measurement
- Detection of smaller defects
- Better location accuracy
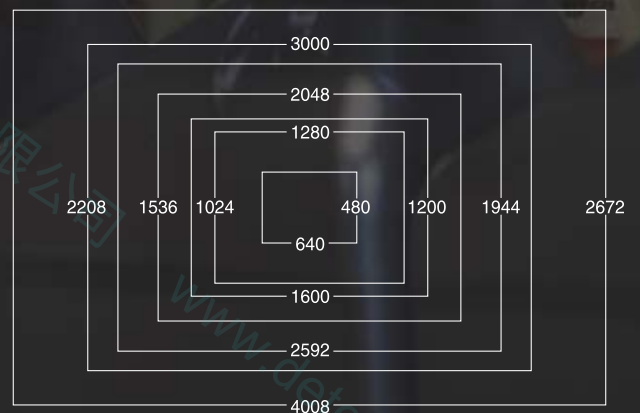- Faster scanning of large objects

WHY DIGITAL?

USB 2.0 and Ethernet represent a more efficient means to interface your vision system to a host computer. With all new computers providing native support for both USB 2 .0 and 10/100baseT Ethernet, there is no need for 3rd party framegrabbers and bulky cables. One USB 2.0 cable provides power, video, and camera control.

Additional benefits:

- Higher resolution for increased image detail
- Progressive scan for high-speed capture
- Lower system cost
- Time-to-market with ease of integration

CHOOSE YOUR RESOLUTION

Lumenera offers a variety of industrial cameras based on CCD and CMOS sensors, providing a wide range of resolutions to satisfy your imaging applications.

```
                3000
            2048
          1280
2208  1536 1024      480  1200  1944    2672
          640
          1600
          2592
          4008
```

Resolution Comparison
Standard VGA through 11 megapixel

Lumenera
Your Custom
Camera Provider

- Single board cameras with identical functionality of 2-board cameras
- Same physical mounting points
- 1, 2, 3 or 5 megapixel sensor options (Lu171C, Lu171M, Lu271C, Lu371C, Lu571M)
- ½" format CMOS sensors
- C-mount, CS-mount, M-12 microlens mount options
- Mini-USB connector, or locking 4-pin Molex cable for tethered USB and I/O cables
- Minimum quantity order may apply — contact us for more details

Contact us for more details on our cost-sensitive high volume solutions.

OEM CUSTOMIZATION

As an OEM customer you can leverage the success of Lumenera's line of high-performance USB 2.0 cameras.

Lumenera's custom cameras can be adapted to fit your application requirements whether simple or complex. Rely on Lumenera's expertise for timely modifications, ranging from small hardware and software adjustments such as private labeled enclosures, to complete made-to-spec solutions with alternate form-factors and unique mechanicals.

As a Lumenera OEM customer, leverage the success of our wide range of high performance USB 2.0 cameras and expect the following advantages:

• Improve time to market for megapixel cameras
• Reduce development costs/risks
• Differentiate from your competition
• Expertise in integrating peripheral components
 • Integration into your existing engineering project management

Satisfy your application and industry-specific requirements with Lumenera's "easy to do business with" practices.

CUSTOM CAMERAS

• Lumenera has designed over 80 custom camera models for unique OEM requirements
• Final assembly of complete product
• Our flexible architecture [sensor + image processing + digital output] allows for rapid prototyping and quick time to market
• CMOS, CCD, cooled CCD, IR bolometer sensors of all resolution and performance
• Mechanical enclosure design to meet a variety of environmental requirements
• Expertise integrating lighting, optics, pan/tilt, embedded computer, I/O, etc.
• Volume efficiencies to be leveraged in reaching target price points
• Manufacturing and quality controls you can count on
• Lumenera is the Industry's leading custom camera provider.

Contact us in determining how we can assist with your next camera project.

LuX72

- Mini-sensor head option for board-level cameras
- Tethered boards via flex cable for variable mounting options
- 1, 2, or 3 megapixel sensor options (Lu172C, Lu172M, Lu272C, Lu372C)
- ½" format CMOS sensors
- C-mount standard (call for CS-mount option)
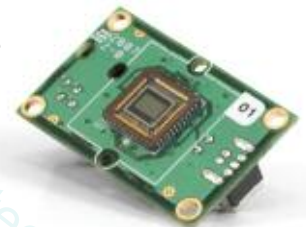- CCD sensor options can be made available — call for customization details

LuX73

- Slim 2-board camera design
- Identical performance and functionality of full sized cameras
- Tethered cable up to 15cm length for variable mounting options
- 1, 2, or 3 megapixel sensor options (Lu173C, Lu173M, Lu273C, Lu373C)
- ½" format CMOS sensors
- No lens mount available (intended for integration into OEM enclosure design)
- Mini-USB connector, or locking 4-pin Molex cable for tethered USB and I/O cables
- CCD sensor options can be made available — call for customization details

LcXXX

- Ultra-small single-board form factor
- Variety of CMOS image sensors available from 0.3 through 3 megapixel
- Vertical mini-USB connector and RJ-11 for I/O standard, custom cable and connectors available for production volumes
- M-12 microlens mount standard, C-mount and CS-mount available
- Motorized focus and motorized zoom lenses available — contact us for more details
- Minimum order quantity may apply

MEGAPIXEL CAMERAS

Lu100/Lu105

- 1280x1024 resolution
- $1/2$" CMOS 1.3 MP sensor
- 15 fps at full resolution
- Color or monochrome
- Board level or enclosed

The Lu100/Lu105 provide four times the resolution of VGA. Good sensitivity and half-global shutter are appropriate for still imaging.

Lu120/Lu125

- 1280x1024 resolution
- $2/3$" CMOS 1.3 MP sensor
- 15 fps at full resolution
- Color or monochrome
- Board level or enclosed

The Lu120/Lu125 use a global shutter for high-speed motion capture and also provide a rolling shutter. High dynamic range of +100dB with multi-slope integration mode. Additional lighting or LED strobes recommended for short exposures due to sensitivity.

Lu130/Lu135

- 1392x1040 resolution
- $1/2$" Sony CCD 1.4 MP sensor
- 15 fps at full resolution
- Color or monochrome
- Board level or enclosed

Global shutter with excellent sensitivity make the Lu130/Lu135 ideal for high-end industrial applications. Excellent replacements for any customer using Basler, Sony XCD series or similar cameras. Also offered in a scientific grade (Lw130/Lw135).

All of Lumenera's cameras feature an optional GPI/O connector for external synchronization of lighting and peripheral devices.

Lu160/Lu165

- 1392x1040 resolution
- $2/3$" Sony EXview HAD CCD 1.4 MP sensor
- 15 fps at full resolution, faster with binning
- Color or monochrome
- Board level or enclosed

The Lu160/Lu165 offer the highest sensitivity of all our industrial cameras. Coupled with increased sensitivity and excellent color reproduction, these camera models will satisfy the most demanding imaging applications. Other features include a global shutter and low dark current. Also offered in a scientific grade with optional cooling (Lw160/Lw165).

Lu170/Lu175

- 1280x1024 resolution
- $1/2$" CMOS 1.3 MP sensor
- 30 fps at full resolution
- Color or monochrome
- Board level or enclosed

The Lu170/Lu175 provide faster frame rates with smaller region of interest. Good sensitivity and very low noise make this sensor similar to CCD performance.

ETHERNET CAMERAS

Lumenera also offers several Ethernet interface camera models to compliment its digital USB 2.0 camera line. Available are 10/100baseT cameras for industrial applications that require longer cable length, as well as Power over Ethernet (PoE) and ruggedized enclosures. Please contact your Lumenera representative for more details on Intelligent camera models with on-board video analytics.

Camera models available:

Le045	720 x 480	30 fps
Le075	640 x 480	70 fps
Le165*	1376 x 1032	15 fps
Le175	1280 x 1024	30 fps
Le259	1920 x 1080	15 fps
Le275	1600 x 1200	20 fps
Le375	2048 x 1536	10 fps
Le575	2560 x 1920	6 fps
Le11059	4000 x 2656	3 fps

* The Le165 is highly recommended for traffic management applications. Contact us for further details at info@lumenera.com.

LU VS. LW CAMERAS

Several Lumenera camera models are now available with improved performance. The Lw series of cameras provide more image processing, faster throughput and increased on board FPGA and RAM:

- More power efficient with no need for external power supply (with the exception of the Lw1105X)
- Increased RAM – 32MB versus 8MB standard
- Larger FPGA for implementing all auto features/functions across all cameras, including future features such as sharpening/smoothing and darkfield subtraction.

MINI FORM FACTOR

Address your most demanding space constraints with our family of mini CCD and CMOS cameras. Measuring 44 x 44 x 56mm, this compact camera line provides:

- Same performance as our standard USB camera line
- NEW Locking industrial mini USB and RJ45 GPI/O connector
- Multiple mounting points
- Adjustable back focus
- Versatile SDK for easy integration
- Board level models available

Lumenera's mini CCD USB 2.0 cameras are designed for industrial and scientific applications, particularly those with low light conditions and tight space constraints.

Camera models available:

Lm075	640 x 480	CCD	$1/3$" format
Lm085	752 x 480	CMOS	$1/3$" format
Lm135	1392 x 1040	CCD	$1/2$" format
Lm165	1392 x 1040	CCD	$2/3$" format

MULTI-MEGAPIXEL CAMERAS

Lu200B/Lu205B

- 1600x1200 UXGA resolution
- $1/2$" CMOS 2.0 MP sensor
- 10 fps at full resolution
- Color only
- Board level or enclosed

Similar performance as the Lu100. Fine all-around performance and excellent price point for these 2.0 megapixel cameras.

Greatly increase measurement accuracy and reduce camera counts with Lumenera's 11 megapixel Lw11059

Lw230/Lw235

- 1616x1216 resolution
- $1/1.8$" Sony CCD 2.0 MP sensor
- 12 fps at full resolution
- Color or monochrome
- Board level or enclosed

The Lw230/Lw235's high-speed and excellent sensitivity are ideal for high end imaging applications, while global shutter captures fast motion events and objects without any smear effect.

Lu270/Lu275

- 1600x1200 resolution
- $1/2$" CMOS 2.0 MP sensor
- 20 fps at full resolution
- Color only
- Board level or enclosed

Provide faster frame rates with smaller region of interest. Ideal for applications requiring high-fidelity color and high resolution. Similar to CCD performance with good sensitivity and low noise.

Lw290/Lw295

- 1920 x 1080 resolution
- $2/3$" CMOS 2.1 MP sensor
- 20 fps at full resolution
- Color
- Board level or enclosed

New HD 1080p sensor format. Full ROI and subsampling capabilities make these cameras ideal for high-speed capture at resolution of your choice.

Lu370/Lu375

- 2048x1536 resolution
- $1/2$" CMOS 3.1 MP sensor
- 12 fps at full resolution
- Color only
- Board level or enclosed

Low noise CMOS sensor. Ideal for your high resolution needs. Also offered in a scientific grade.

Lw570/Lw575

- 2592x1944 resolution
- $1/2.5$" CMOS 5.0 MP sensor
- 7 fps at full resolution
- Color or monochrome
- Board level or enclosed

Excellent price per pixel ratio. The Lw570/Lw575 is ideal for applications requiring faster frame rates and better color response. Also offered in a scientific grade.

Lw620/Lw625

- 3000x2208 resolution
- $> 2/3$" CMOS 6.6 MP sensor
- 5 fps at full resolution
- Color or monochrome
- Board level or enclosed

The Lw620/Lw625's multi-megapixel resolution is ideal for off-line inspection where increased image detail is required.

Lw11059/Lw11058/Lw11057

- 4008x2672 resolution
- 35mm CCD 10.7 MP sensor
- 3.5 fps at full resolution
- Color or monochrome
- Board level or enclosed
- Canon EF-mount, Nikon F-mount, Pentax K-mount variants available

Incredible resolution, 12-bit image quality and high sensitivity in this large format sensor camera. Faster frame rates available with vertical blanking. SLR Canon mount for auto focus and iris control built in.

COMMON SOFTWARE DEVELOPER'S KIT

All Lumenera's USB 2.0 cameras are designed on a common Software Developer's Kit (SDK). This powerful tool eliminates design risk and allows for easy integration and camera exchange.

VGA CAMERAS

Lu070/Lu075

- 640x480 resolution
- 60 fps at full resolution
- $1/3$" Sony CCD sensor
- Color or monochrome
- Board level or enclosed

The Lu070/Lu075's high-speed and excellent sensitivity are ideal for high quality and price sensitive imaging applications. Also available in a scientific grade (Lw070/Lw075).

Lumenera's Technical Assistance Centre

Lumenera's Technical Assistance Centre (TAC) is committed to fully supporting your vision needs through product development, design, integration, deployment and post-sales support. Expect our trained professionals to work closely with your Project Managers and Engineering Teams to better meet your application requirements, and to assist with integration of our standard and customized imaging solutions.

CAMERA SPECIFICATIONS

Board Level/ Enclosed	Resolution	Frame Rate	Bit Depth	Pixel Pitch	Optical Format	Shutter Type	Sensor Type	Color/Mono	Lens Mount	General Purpose I/O
Lu070/Lu075	640 x 480	60	8 or 12	7.4 µm	1/3"	Global	CCD	Color or Mono	C or CS	4 IN & 4 OUT
Lm075	640 x 480	60	8 or 12	7.4 µm	1/3"	Global	CCD	Color or Mono	C or CS	1 IN & 1 OUT/3 BI-DIR*
Lm085	752 x 480	60	8 or 10	6 µm	1/3"	Global	CMOS	Color or Mono	C or CS	1 IN & 1 OUT/3 BI-DIR*
Lu100/Lu105	1280 x 1024	15	8 or 10	5.2 µm	1/2"	Rolling & Half Global	CMOS	Color or Mono	C or CS	4 IN & 4 OUT
Lu120/Lu125	1280 x 1024	15	8 or 10	6.7 µm	2/3"	Rolling & Global	CMOS	Color or Mono	C or CS	4 IN & 4 OUT
Lu130/Lu135	1392 x 1040	15	8 or 12	4.65 µm	1/2"	Global	CCD	Color or Mono	C or CS	4 IN & 4 OUT
Lm135	1392 x 1040	15	8 or 12	4.65 µm	1/2"	Global	CCD	Color or Mono	C or CS	1 IN & 1 OUT/3 BI-DIR*
Lu160/Lu165	1392 x 1040	15	8 or 12	6.45 µm	2/3"	Global	CCD	Color or Mono	C or CS	4 IN & 4 OUT
Lm165	1392 x 1040	15	8 or 12	6.45 µm	2/3"	Global	CCD	Color or Mono	C or CS	1 IN & 1 OUT/3 BI-DIR*
Lu170/Lu175	1280 x 1024	30	8 or 10	5.2 µm	1/2"	Rolling	CMOS	Color or Mono	C or CS	4 IN & 4 OUT
Lu200B/Lu205B	1600 x 1200	10	8 or 10	4.2 µm	1/2"	Rolling & Half Global	CMOS	Color	C or CS	4 IN & 4 OUT
Lw230/Lw235	1616 x 1216	12	8 or 12	4.4 µm	1/1.8"	Global	CCD	Color or Mono	C or CS	4 IN & 4 OUT
Lu270/Lu275	1600 x 1200	20	8 or 10	4.2 µm	1/2"	Rolling	CMOS	Color	C or CS	4 IN & 4 OUT
Lw290/Lw295	1920 x 1080	20	8 or 10	5.0 µm	2/3"	Rolling	CMOS	Color	C or CS	4 IN & 4 OUT
Lu330/Lu335	2080 x 1536	6	8 or 12	3.45 µm	1/1.8"	Global (interlaced)	CCD	Color	C or CS	4 IN & 4 OUT
Lu370/Lu375	2048 x 1536	12	8 or 10	3.2 µm	1/2"	Rolling	CMOS	Color	C or CS	4 IN & 4 OUT
Lw570/Lw575	2592 x 1944	7	8 or 12	2.2 µm	1/2.5"	Rolling & Half Global	CMOS	Color or Mono	C or CS	4 IN & 4 OUT
Lw620/Lw625	3000 x 2208	5	8 or 10	3.5 µm	> 2/3"	Rolling & Half Global	CMOS	Color or Mono	C or CS	4 IN & 4 OUT
Lw11059	4008 x 2672	3.5	8 or 12	9.0 µm	35mm	Global	CCD	Color or Mono	Canon EF	3 IN & 4 OUT
Lw11058	4008 x 2672	3.5	8 or 12	9.0 µm	35mm	Global	CCD	Color or Mono	Pentax K	3 IN & 4 OUT
Lw11057	4008 x 2672	3.5	8 or 12	9.0 µm	35mm	Global	CCD	Color or Mono	Nikon F	3 IN & 4 OUT

* Software programmable direction

3RD PARTY PARTNERS

Lumenera cameras are quickly integrated with support from the following partners:
• Bildanalyse Systeme–Vision Tools
• BitFlow–ImageWarp
• I/O Industries–Video Savant
• MontiVision Imaging Technologies–MontiVision
• MVTec–Halcon, ActiveTools
• National Instruments–LabView, Vision Builder AI
• Norpix–StreamPix
• Smart Imaging Technologies–SIMAGIS
• The MathWorks–MATLAB
• Tordivel AS–Scorpion Vision Software
• VISIONx INC.–VisionGauge

To better serve you, Lumenera has forged strategic partnerships with distributors and system integrators world wide. **Please contact us at 1.613.736.4077 or industrialsales@lumenera.com for details on how to order, or to join our partner program.**

CAMERA FEATURE SET

• Stable device drivers
• High-speed USB 2.0 (480 Mbits/sec)
• GPI/Os — control of peripherals/synchronization of lighting
• Adjustable C-mount
• General purpose I/O
• FCC Class B, CE (enclosed cameras)
• Select 8, 10 or 12-bit pixel data
• Simplified cabling – video/full camera control over a single USB cable
• DirectShow/DirectX compatible
• Software compatible with Windows 2000, Windows XP and Windows Vista operating sytems
• Complete SDK available
• Multiple cameras on one computer

Lumenera corporation

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