C-Cam Technologies
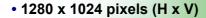
BCi₅ CMOS Camera

- **1280 x 1024 pixels (H x V)**
- **Synchronous Shutter**
- **Monochrome or Colour**
- **Area-scan operation**
- **8 bit, 10 bit or 12 bit digital output**
- **Multi-Slope Exposure for Extended Dynamic Range**
- **Serial LVDS, USB 2.0, IEEE-1394 or Camera Link interface**

The BCi5 camera is a very compact, high-resolution CMOS camera. The camera is equipped with the Ibis5a image sensor with 6.7 µm square pixels. The user can define any Window Of Interest within a 1280 x 1024 pixel area, also known as the SXGA format. The sensor has a remarkably good signal-to-noise ratio in combination with excellent contrast performance

The image sensor has a Multi-Slope Exposure, mode that prevents over-exposure of brighter parts of an image while preserving excellent contrast in the darker areas of the image. In this way the dynamic range is extended from 60 dB up to 100 dB. The BCi5 camera can be switched between normal and Multi-Slope mode.

The digital camera operates in single shot mode, which makes it ideal for machine vision applications. In this mode, the user has the freedom to decide when the camera has to capture an image, not the other way around as is the case with most analogue camera systems. Continuous capture mode is also supported.

The in-camera memory of 8 Mbytes is used as image FIFO in USB2.0 and IEEE-1394 interfaces and can be used with custom camera logic for other purposes, such as reference image, camera calibration data…

C-Cam Technologies supply several standard interfaces: Serial LVDS, USB 2.0, IEEE-1394 or Camera Link. The Camera Link and Serial LVDS interfaces allow for remote triggering via the interface cable. They also have a local trigger input and output. The IEEE-1394 and USB 2.0 versions have local trigger input and output.

The BCi5 comes with Drivers and DLL files and sample code in Visual C (Windows 98,Me, 2000, XP and NT4.0). Software engineers can easily adapt the code to integrate into their own applications. Include-files for Visual Basic and Delphi are supplied.

The IEEE-1394 version is DCAM 1.3 compliant.

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Sensor Specifications

Imager type	CMOS integrating active pixel sensor (APS) IBIS5a designed by FillFactory with on-chip non-uniformity correction
Sensor types	Monochrome or colour, Bayer pattern
Total light-sensitive pixels	1,310,720 (1280H x 1024V)
Window Of Interest (WOI)	Any rectangle or line image format specified by the user
Active image area	8.58mm (H) x 6.86mm (V)
Pixel pitch	6.7 x 6.7 µm
Fill factor	50% (no microlenses)
Spectral response	Better than 30%
Temporal noise	Rolling shutter: 30 electrons Synchronous shutter: 60 electrons
Well capacity	more than 63,000 linear range 100,000 full saturation
Enhanced Full Well	t.b.d.
Dark current signal	750 electrons/second @ 21°C
Avg. auto-saturation time	60 seconds @ 21°C
Dark current	app. 2100 pA/cm² @ 21°C
Blooming suppression	t.b.d.
Smear	None
Standard dynamic range	67dB (60,000/25 = 2400:1) linear
High dynamic range	100 dB in Multi-Slope Exposure
Multislope Exposure	up to 4 slopes, external reset voltages, fully programmable
Grey level	resolution 8, 10 or 12 bits
MTF	t.b.d. @ 450 nm t.b.d. @ 650 nm
PRNU	10 %p/p with 1/2 saturation
Pixel rate	40 MHz
Frame speed full resolution	Approx. 27.5 frames/second (Rolling shutter mode)
Shutter	On-chip electronic shutter, synchronous type (snapshot) and rolling curtain type.
Shutter synchronisation	remote via software or via cable, local via I/O interface
Maximum Exposure time	107 seconds
Minimum exposure time	10 µsec

In-camera Resources

Memory	8 Mbytes
FPGA Logic	100,000 gates

Interface Specifications

Interface type	Serial LVDS, USB 2.0 IEEE-1394, Camera Link
Interface connector	
LVDS	Binder 712 series 7-pole,
USB 2.0	Binder 712 series 4-pole,
IEEE-1394	standard 6-pole
Camera Link	MDR26p
Cable length	
LVDS	3m, 5m, 7m
USB 2.0	0.5m, 1m, 2m, 3m, 5m
IEEE-1394	max 4.5m
Camera Link	3m, 5m, 7m, 10 m
Remote Trigger	via LVDS or Camera Link interface
Local Trigger	Isolated, 1 input, 1 output
Local Trigger Connector	Binder 712 series 3-pole

Mechanical Specifications

Dimensions	(not incl. lens)
LVDS, CameraLink, USB	50 x 50 x 53 mm
IEEE-1394	50 x 50 x 62 mm
Weight	< 200 grams (not incl. lens)
Housing	Aluminium
Lens adapter	C-mount standard
Tripod mount	1/4 inch mount (1 off)
Machine mount	M6 x 1 (2 x 2 off)

Environmental Requirements

Operating temperature	0°C to +50°C
Storage temperature	-30°C to +80°C in non-condensing conditions

Power Requirements

LVDS, IEEE, USB	Power supply through interface cable
Camera Link	8 - 12 Volts via separate Binder 712 series 2-pole
Power consumption	<2 Watt

Ordering Information

BCI5		Mono-chrome	Color Bayer	40MHZ	Local triggering
Interface	**Code**	**M**	**B**	**40**	✔
LVDS	**LS**	✔	✔	✔	Isolated
Camera Link	**CL**	✔	✔	✔	Isolated
IEEE-1394	**1394**	✔	✔	✔	Isolated
USB 2.0	**U**	✔	✔	✔	Isolated

E.g. BCI5-U-M-40 specifies a Monochrome BCi5 with 40 MHz pixel rate and USB 2.0 interface.