



C-Cam
Technologies

BCi₅ CMOS Camera



- 1280 x 1024 pixels (H x V)
- Synchronous Shutter
- Monochrome or Colour
- Area or Line-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 Ibis5 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. A separate Line Scan Mode complements the operation of this versatile camera. The sensor has a remarkably good signal-to-noise ratio in combination with excellent contrast performance. Also the dark current of the sensor is much lower than in classical CMOS image sensors allowing longer exposure times.

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 66 dB to more than 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 for area-scan or line-scan is also supported. The on-board memory of 8Mbytes 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, SDI, 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 SDI interface makes distances of up to a 100 m between camera and processing equipment a reality.

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) IBIS5 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	t.b.d. (no microlenses)
Spectral response	better than 30 %
Temporal noise	Rolling shutter: 30 electrons Synchronous shutter: 60 electrons
Well capacity	more than 60,000 linear range
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. 250 pA/cm ² @ 21°C
Blooming suppression	t.b.d.
Smear	None
Standard dynamic range	67 dB (60,000/25 = 2400:1) linear
High dynamic range	100 dB in Multi-Slope Exposure
Grey level resolution	8 bits/10 bits or 12 bits
MTF	t.b.d. @ 450 nm , t.b.d. @ 650 nm
PRNU	10 %p/p with 1/2 saturation in

Image Specifications

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	2 seconds with negligible dark current effect @ 21°C 10 seconds with 20 % dark current effect @ 21°C longer, until sensor saturation (without dark current correction)

Minimum exposure time 310 µsec

On-Camera resources

On-board memory	8Mbytes
FPGA	Logic 50 to 100 k gates

Interface Specifications

Interface type	Serial Digital LVDS, SDI, USB 2.0, IEEE-1394 or Camera Link
Interface connector	LVDS Binder 712 series 7-pole, SDI Binder 712 series 8-pole, USB 2.0 Binder 712 series 4-pole, IEEE-1394 std. 6-pole, Camera Link MDR26p
Cable lengths	LVDS 3, 5, 7m - SDI up to 100m -USB 2.0 0.5, 1, 2, 3, 5m - IEEE-1394 max 4.5m - Camera Link 3, 5, 7, 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	LVDS, Camera Link, USB: 50 x 50 x 47 mm, IEEE: 50 x 50 x 62 mm (not incl. lens)
Weight	<200 grams (not incl. lens)
Housing	Aluminium black anodised
Lens adapter	C-mount standard black anodised with provision to carry a filter glass (22.5mm)
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, SDI, IEEE and USB	Power supply through interface cable
Camera Link	8 - 12 Volts via separate Binder 712 series 2-pole connector
Power consumption	<2 Watt

Ordering Information

BCi5		Mono-chrome	Color Bayer	40MHz	Local triggering
Interface	Code	M	B	40	.
LVDS	LS	.	.	.	Isolated
SDI	SDI	.	.	.	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 a USB 2.0 interface.

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