



DFK 22BUC03

Technical Reference Manual



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1 Quick Facts

General	
Dynamic Range	8 bit
Resolution	744x480
Frame Rate at Full Resolution	76
Pixel Formats	8-Bit Bayer (GB)

Optical Interface	
IR-Cut filter	Yes
Sensor Type	Aptina MT9V024
Shutter Type	Global
Sensor Format	1/3 inch
Pixel Size	6 µm
Lens Mount	C/CS

Electrical Interface	
Interface	USB 2.0
Supply voltage	4.75 VDC to 5.25 VDC
Current consumption	approx 250 mA @ 5 VDC
I/O Connector	4-pin connector for trigger and strobe or general purpose input/output

Mechanical Data	
Dimensions	H: 36 mm, W: 36 mm, L: 25 mm
Mass	70 g

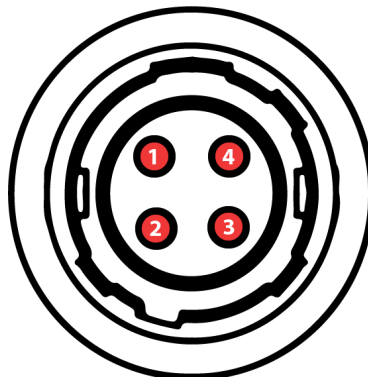
Adjustments	
Shutter	100 µs to 0.25 s
Gain	16 to 63

Environmental	
Temperature (operating)	-5 °C to 45 °C
Temperature (storage)	-20 °C to 60 °C
Humidity (operating)	20 % to 80 % (non-condensing)
Humidity (storage)	20 % to 95 % (non-condensing)



3 I/O Connector

3.1 4-pin I/O Connector



Rear view of camera

Pin	Signal	I/O	Remarks	Characteristics			
				Min	Typ	Max	Unit
1	GND_I/O	G ³	External Ground	-	-	-	-
2	STROBE_OUT	O ³	Open drain	-	-	24.0 ¹	V
3	TRIGGER_IN (-)	I ³	Optocoupler ground	-	-	-	-
4	TRIGGER_IN (+)	I ³	Optocoupler signal	3.3 ²	-	24.0 ²	V

¹ max. 0.2A (ID) for open drain MOSFET!

² min. 3.5 mA driver strength required!

³ G: Ground O: Output I: Input

The part number of this Hirose connector is HR10A-7R-4P. To create an I/O cable you need a Hirose connector HR10A-7P-4S.

3.1.1 TRIGGER_IN

The *TRIGGER_IN* line can be used to synchronize the start of the exposure time with external events. The [Trigger](#) section describes in detail how the image sensor's behavior can be controlled.

The current input signal can also be read directly through the [General Purpose Input](#) feature.

3.1.2 STROBE_OUT

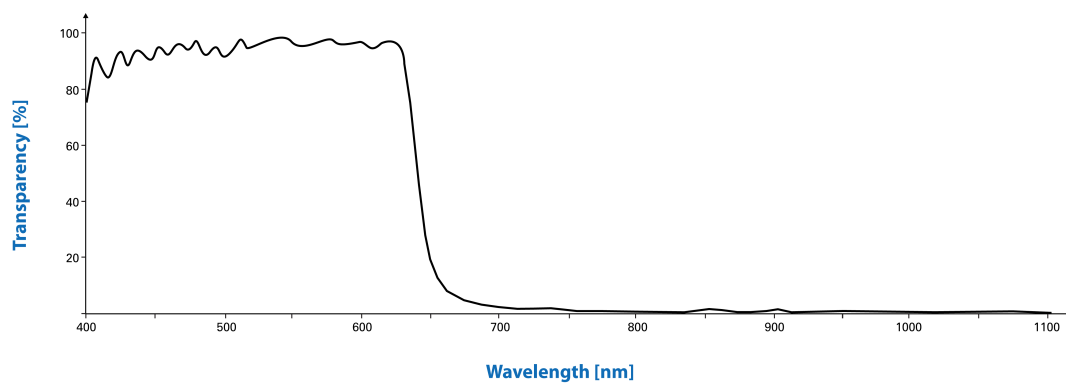
The *STROBE_OUT* line's main usage is to indicate the integration time of the image sensor which allows flashes, strobes or other light sources to be synchronized with camera operation. The line's behavior can be controlled through the [Strobe](#) controls.



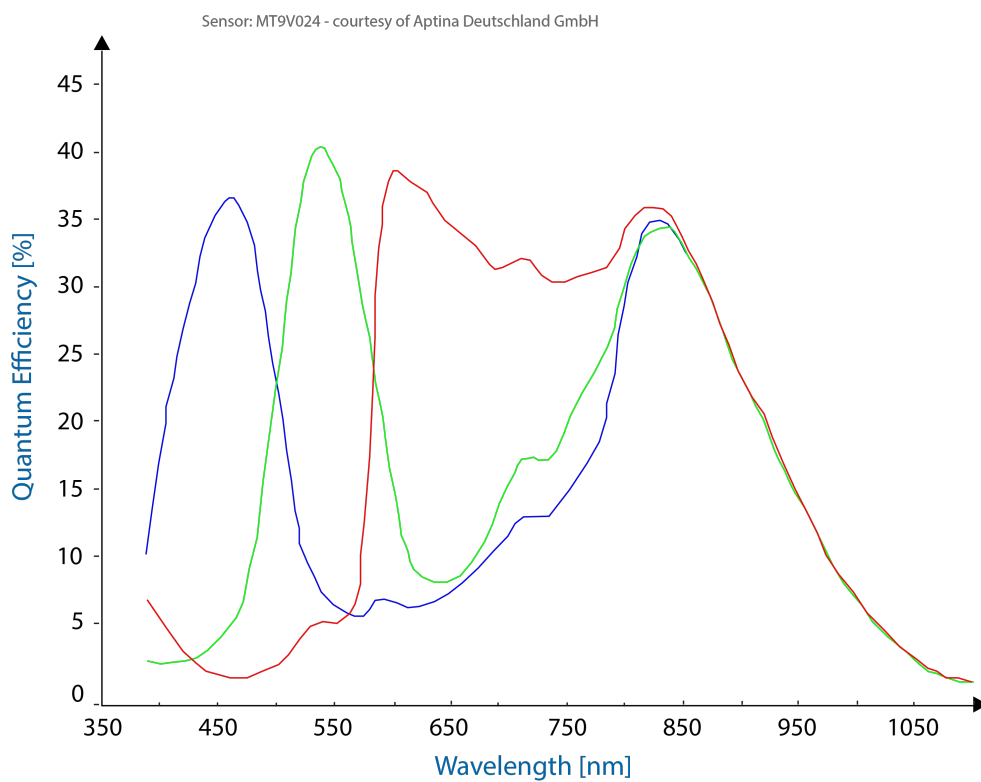
The output signal can also be directly controlled through the [General Purpose Output](#) feature.

4 Spectral Characteristics

4.1 IR-Cut Filter



4.2 Spectral Sensitivity - MT9V024





5 Camera Controls

This section describes the parameters available for the DFK 22BUC03 camera.

The actual name of the parameter depends on the driver technology used to access the camera. Parameter names are listed for the most common ways to access the cameras:

- UVC/V4L2 (on Linux, via `uvcdm`)
- *IC Imaging Control* (on Windows, via *Device Driver for USB Cameras*)

5.1 Sensor Readout Control

5.1.1 Pixel Format

The pixel format defines the data type of the pixels transmitted to the computer. The bits per pixel needed for a particular pixel format influence the required bandwidth.

The driver technology used to access the camera significantly impacts the way the pixel format is controlled:

- When using the `uvcdm` driver on Linux, the pixel format is defined by `video4linux2`.
- When using *IC Imaging Control*, the pixel format is part of the video format - a parameter which combines pixel format, resolution and readout mode. For more information, refer to the *IC Imaging Control* documentation sections on `VideoFormat` and `VideoFormatDesc`.

The DFK 22BUC03 color camera supports multiple pixel formats with variable bits-per-pixel settings. The names of the pixel formats and the way to select them depends on the driver used to control the camera. The following table contains a short overview of all possible formats followed by a more detailed description.

Pixel Format	Bits Per Pixel	UVC	TIS UVC Driver
8-Bit Bayer (GB)	8	GRBG	RGB32, Y800

5.1.1.1 8-Bit Bayer Raw

This format transmits data using one byte for each pixel.

UVC drivers see it with the *FourCC* `GRBG`, `RGGB`, `GBRG` or `BA81`.

The *Device Driver for USB Cameras* simplifies this variety of possible pixel formats and offers two video formats instead: `RGB32` and `Y800`. The `RGB32` format results from the driver's automatic debayering of the raw image data, while the `Y800` format contains the raw data which is reinterpreted as monochrome.

5.1.2 Frame Rate

The frame rate is specified in frames per second and determines the camera's operating speed.

The way the frame rate is controlled depends greatly upon which driver technology is used to access the camera:

- When using `uvcdvideo` on Linux, the frame rate is selected from a list of available frame rates.
- When using IC Imaging Control, the frame rate is selected from a list of available frame rates through APIs such as `Grabber::setFPS` or `ICImagingControl.DeviceFrameRate`.

The range of available frame rates depends upon other camera settings such as well, pixel format, resolution and readout modes.

Parameter	Frame Rate
Minimum	Depending on Pixel Format, Resolution, and Readout Mode
Maximum	Depending on Pixel Format, Resolution, and Readout Mode

The following tables show the maximum frame rate for some combinations of pixel format and resolution.

8-Bit Bayer Raw

Width	Height	Maximum Frame Rate
744	480	76
640	480	87
320	240	160

5.2 Image Sensor Control

5.2.1 Exposure Time

The *Exposure Time* parameter defines the time the camera opens its (electronic) shutter when it is taking an image.

Parameter	Exposure Time
Minimum	100 μ s
Maximum	0.25 s
Default	auto
Video4Linux2	Exposure (Absolute)
	The V4L2 Exposure (Absolute) control is using 100 μ s units
VCD Property	VCDID_Exposure\VCDElement_Value



5.2.2 Gain

The *Gain* parameter defines the amplification that is applied to the image at sensor level.

Parameter	Gain
Minimum	16
Maximum	63
Default	auto
Video4Linux2	Gain
VCD Property	VCDID_Gain\VCDElement_Value

5.3 Trigger

The trigger mode can be used to take images at very specific points in time which are specified by an electrical signal connected to the [TRIGGER_IN](#) pin of the I/O connector of the camera.

5.3.1 Trigger Mode

The *Trigger Mode* parameter enables the trigger mode.

Parameter	Trigger Mode
On	Enable Trigger Mode
True	
Off	Disable Trigger Mode
False	
Video4Linux2	Trigger Mode
VCD Property	VCDID_Trigger\VCDElement_Value

5.3.2 Software Trigger

The *Software Trigger* function can be used to simulate a trigger pulse, in turn causing one image to be exposed and delivered to the host computer.

Parameter	Software Trigger
Execute	Simulate one trigger pulse
Video4Linux2	Software Trigger
VCD Property	VCDID_Trigger\VCDElement_SoftwareTrigger



5.4 Digital I/O

The One4All series has one digital input and one digital output. The digital input can be used as a [Trigger](#) input but the current status can also be examined directly.

The digital output can be configured as a [Strobe](#) output to signal the exact moment when the image sensor is sensitive to light so that external light sources can be synchronized to its operation cycle.

5.4.1 General Purpose Input

The *General Purpose Input* parameter allows the current status of the [TRIGGER_IN](#) pin.

Parameter	General Purpose Input
True	TRIGGER_IN line status is low
1	
False	TRIGGER_IN line status is high
0	
Video4Linux2	ExtIO[1]
VCD Property	VCDID_GPIO\VCDElement_GPIORead VCDID_GPIO\VCDElement_GPIOIn

5.4.2 General Purpose Output

The *General Purpose Output* parameter controls the status of the [STROBE_OUT](#) pin.

Parameter	General Purpose Output
True	Drive the STROBE_OUT line high
1	
False	Drive the STROBE_OUT line low
0	
Video4Linux2	ExtIO[0]
VCD Property	VCDID_GPIO\VCDElement_GPIOWrite VCDID_GPIO\VCDElement_GPIOOut

5.5 Strobe

The strobe function controls the automatic generation of output pulses on the [STROBE_OUT](#) pin which is synchronized to the image sensor's exposure time.

5.5.1 Strobe Enable

The *Strobe Enable* parameter enables the automatic generation of strobe pulses.

Parameter	Strobe Enable
On	Strobe enabled
True	
Off	Strobe disabled
False	
Video4Linux2	Strobe[0]
VCD Property	VCDID_Strobe\VCDElement_Value

5.5.2 Strobe Polarity

The *Strobe Polarity* parameter can be used to invert the strobe pulse output.

Parameter	Strobe Polarity
ActiveHigh	The STROBE_OUT pin is logically high during the exposure time
True	
ActiveLow	The STROBE_OUT pin is logically low during the exposure time
False	
Video4Linux2	Strobe[1]
VCD Property	VCDID_Strobe\VCDElement_StrobePolarity



6 Revision History

Date	Version	Description
2018/12/07		Initial release of this document



DFK 22BUC03 Technical Reference Manual

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All weights and dimensions are approximate. Unless otherwise specified, the lenses shown in the context of cameras are not shipped with these cameras.

Headquarters:

*The Imaging Source Europe GmbH
Überseetor 18, D-28217 Bremen, Germany
Phone: +49 421 33591-0*

North & South America:

*The Imaging Source, LLC
6926 Shannon Willow Rd, S 400, Charlotte, NC 28226, USA
Phone: +1 704-370-0110*

Asia Pacific:

*The Imaging Source Asia Co., Ltd.
2F., No.8, Xinhua 1st Road
Taipei City 114, Neihu District, Taiwan
Phone: +886 2-2792-3153*

www.theimagingsource.com