photon focus

Swiss innovation in CMOS image sensors and CMOS cameras

CMOS Image Sensors CMOS Cameras OEM Camera Modules Board Level Cameras

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CMOS Image Sensor

A1312 SERIES

1.4 Megapixel Photonfocus monochrome CMOS image sensor

Features

- 1312 x 1082 pixel resolution
- 8 µm x 8 µm square pixel
- All sensors within the series (NIR, colour, -40, -160) are fully pin compatible
- Global shutter
- Over 60 % fill factor without microlenses
- Good NIR spectral response
- Exceptional SNR up to 370:1
- Multiple HDR Features, dynamic range up to 120 dB via LinLog[®]
- Up to 165 fps @ full resolution⁽⁵⁾
- Sequential, simultaneous or nondestructive read out
- Horizontal and vertical windowing
- Flexible ROI and Multiple ROI
- Integrated test pattern, temperature sensor and black level reference

Spectral response of the Photonfocus A1312 CMOS image sensor









	Image	Sensor
Technology	CMOS activ	
Scanning system		sing • Region of Interest (ROI) in X and Y
		n Y • Multiple nondestructive readout
		t exposure time and response curve
Optical format / diagonal		I) maximum resolution
	2/3" (11.6 mm diagonal	
Resolution		tels (active pixels)
Pixel size	8 µm :	
Active optical area		4 mm (maximum)
Output swing		al application)
Random noise (RMS)		mV
FPN (RMS, uncorrected)		5 mV
Dark current		el @ 27°C ⁽¹⁾ NR > 370:1 ⁽²⁾
Full well capacity / SNR		
Spectral range		0 % of peak responsivity) ///m ² ⁽³⁾
Responsivity Quantum Efficiency	> 50	
Sensitivity (for 10dB SNR)		/% ² ⁽³⁾
Shutter efficiency		5 % ⁽⁴⁾
Optical fill factor	99.63 > 60	
Dynamic range	60 dB in linear mode:	
Colour format		hrome
Characteristic curve		, odd/even HDR
Shutter mode	Global	
Read out mode		d out (read out during exposure)
Analog taps	1	4 (1 or 4 taps active)
Pixel clock		1Hz (5)
Maximum frame rate	27 fps @ max. resolution	108 fps @ max. resolution ⁽⁵⁾
Maximum marie rate	37 fps @ 1024 x 1024 resolution	145 fps @ 1024 x 1024 resolution (5)
Supply voltages	3.1 V 3.3	3 V, 4.6 V
Power consumption	< 480 mW during full-speed read out	< 600 mW during full-speed read out
Operating temperature range	Industrial (-20	
Package		n CQFP
Cover glass		er glass

⁽¹⁾ Varies strongly with temperature
 ⁽²⁾ When configured for 1.1 V output swing
 ⁽³⁾ Under red illumination (625 nm)
 ⁽⁴⁾ Under white LED illumination
 ⁽⁶⁾ 60 MHz possible with slightly reduced image quality (165 fps @ full resolution, 216 fps @ 1024²)



CMOS Image Sensor

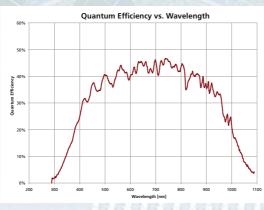
A1312I SERIES

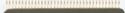
Near Infrared (NIR) 1.4 Megapixel monochrome CMOS image sensor

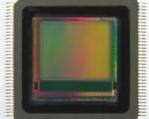
Features

- 1312 x 1082 pixel resolution
- 8 µm x 8 µm square pixel
- All sensors within the series (NIR, colour, -40, -160) are fully pin compatible
- Global shutter
- Over 60% fill factor without microlenses
- Excellent NIR spectral response
- Exceptional SNR up to 370:1
- Multiple HDR Features, dynamic range up to 120 dB via LinLog[®]
- Up to 165 fps @ full resolution⁽⁵⁾
- Sequential, simultaneous or nondestructive read out
- Horizontal and vertical windowing
- Flexible ROI and Multiple ROI
- Integrated test pattern, temperature sensor and black level reference

Spectral response of the Photonfocus A1312I CMOS image sensor











	lucero	
		Sensor
Technology	CMOS activ	
Scanning system		ing • Region of Interest (ROI) in X and Y
		n Y • Multiple nondestructive readout
Outies I forment / discound	Odd/even rows with independent	t exposure time and response curve
Optical format / diagonal		I) maximum resolution
Resolution	2/3" (11.6 mm diagonal	els (active pixels)
Pixel size	1312 x 1082 μx 8 μm :	
Active optical area		t ο μm 1 mm (maximum)
Output swing		al application)
Random noise (RMS)		mV
FPN (RMS, uncorrected)	1.1	
Dark current		el @ 27°C (1)
Full well capacity		ke ⁻⁽²⁾
Spectral range		0 % of peak responsivity)
Responsivity		/J/m ² ⁽³⁾
Quantum Efficiency	> 50	
Sensitivity (for 10dB SNR)		/m² ⁽³⁾
Shutter efficiency		% ⁽⁴⁾
Optical fill factor	> 60	% (3)
Dynamic range	60 dB in linear mode;	120 dB with LinLog ^{® (3)}
Colour format	Monoo	throme
Characteristic curve	Linear, LinLog®,	odd/even HDR
Shutter mode	Global	shutter
Read out mode	Sequential or simultaneous read	l out (read out during exposure)
Analog taps	1	4 (1 or 4 taps active)
Pixel clock		Hz ⁽⁵⁾
Maximum frame rate	27 fps @ max. resolution	108 fps @ max. resolution
	37 fps @ 1024 x 1024 resolution	145 fps @ 1024 x 1024 resolution
Supply voltages	3.1 V, 3.3	
Power consumption	< 480 mW during full-speed read out	< 600 mW during full-speed read out
Operating temperature range	Industrial (-20	
Package		n CQFP
Cover glass	No cov	er glass

⁽¹⁾ Varies strongly with temperature
 ⁽²⁾ When configured for 1.1 V output swing
 ⁽³⁾ Under red illumination (625 nm)
 ⁽⁶⁾ Under white LED illumination
 ⁽⁶⁾ 60 MHz possible with slightly reduced image quality (165 fps @ full resolution, 216 fps @ 1024²)



CMOS Image Sensor

A1312IE SERIES

1.4 Megapixel Photonfocus monochrome (NIR) CMOS image sensor

Features

- 1312 x 1082 pixel resolution
- 8 µm x 8 µm square pixel
- All sensors within the series (NIR, colour, -40, -160) are fully pin compatible
- Global shutter
- Over 60 % fill factor without microlenses
- Very good NIR spectral response
- Exceptional SNR up to 370:1
- Multiple HDR Features, dynamic range up to 120 dB via LinLog[®]
- Up to 165 fps @ full resolution⁽⁵⁾
- Sequential, simultaneous or nondestructive read out
- Horizontal and vertical windowing
- Flexible ROI and Multiple ROI
- Integrated test pattern, temperature sensor and black level reference

Spectral response of the Photonfocus A1312IE CMOS image sensor





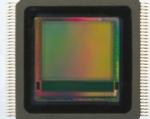






Image Sensor Technology CMOS active pixel (APS) Scanning system • Progressive scan • Arbitrary row adressing • Region of Interest (ROI) in X and Y • Multiple Region of Interest (MROI) in X • Multiple Roomsdut • Odd/even rows with independent exposure lime and response curve Optical format / diagonal 2/3 * (11.6 mm diagonal) 1024 × 1024 × rouget resolution Resolution 2/3 * (11.6 mm diagonal) 1024 × 1024 × rouget resolution Active optical area 10.48 mm x 8.64 mm (maximum) Output swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FPN (RMS, uncorrected) 1.35 rmV Dark current 0.65 fAp/pixel 0 2**C ⁽¹⁰ Full well capacity 84 mm * 36.4 mm (maximum) Quantum Efficiency 2.35 mV Spectral range 4.37 to 1050 nm (to 10% of peak responsivity) Responsivity 819 V///m ^{2 (10)} Quantum Efficiency > 45 % ⁽⁶⁾ Optical fill factor 260 dB in linear mode; 120 dB with LinLog ⁽⁶⁾				
Technology CMOS active pixel (APS) Scanning system • Progressive scan • Arbitrary row adressing • Region of Interest (ROI) in X and Y Optical format / diagonal • Odd/even nows with independent exposure time and response curve Optical format / diagonal 1° (13.6 mm diagonal) maximum resolution 2/3° (11.6 mm diagonal) 1024 x 102				
Scanning system • Progressive scan • Arbitrary row adressing • Region of Interest (R0I) in X and Y • Multiple Region of Interest (MRO) in Y • Multiple nondestructive readout Optical format / diagonal • Odd/even rows with independent exposure time and response curve Optical format / diagonal • Odd/even rows with independent exposure time and response curve Resolution • 2/3* (11.6 mm diagonal) To 2/4 x 1024 x rozd x resolution Resolution • 1/312 x 1082 pixels (active pixels) Pixel size • 0.48 mm x 8.64 mm (maximum) Output swing • 10.54 (Vipcial application) Random noise (RMS) • 11 mV FPN (RMS, uncorrected) • 13.5 mV Dark current • 0.65 (Apixel @ 27°C (1) Full well capacity • 140 ke ⁻⁽²⁾ / SNR > 370.1 ²⁰ Spectral range • 370 to 1050 nm (to 10 % of peak responsivity) Responsivity • 99.85 % ⁽ⁱ⁾ Optical fill factor • 60 % ⁽ⁱ⁾ Dynamic range • 60 dB in linear mode; 120 dB with LinLog [®] Colour format • Monochrome Characteristic curve		Image	Sensor	
	Technology			
• Odd/even rows with indegenelent exposure time and response curve Optical format / diagonal 1" (13.6 mm diagonal) 1024 x 1024 resolution Resolution 1312 x 1082 pixels (active pixels) Pixel size 8 µm x 8 µm Active optical area 10.48 mm x 8.64 mm (maximum) Output swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FPM (RMS, uncorrected) 13.5 mV Dark current 0.65 fA/pixel @ 27°C (0) Full well capacity 140 ke ⁻⁽²⁾ / SNR > 370.1 (2) Spectral range <370 to 1050 nm (2000 mm colored)	Scanning system			
Optical format / diagonal 1" (13.6 mm diagonal) maximum resolution 2/3" (11.6 mm diagonal) 1024 x 1024 x 1024 resolution Resolution 1312 x 1082 pixels (active pixels) Pixel size 8 µm x 8 µm Active optical area 10.48 mm x 8.64 mm (maximum) Output swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FPN (RMS, uncorrected) 13.5 mV Dark current 0.65 1A/pixel @ 27°C ⁽¹⁾ Full Well capacity 370 to 1050 nm (to 10% of peak responsivity) Spectral range < 370 to 1050 nm (to 10% of peak responsivity)				
2/3" (11.6 mm diagonal) 1024 x 1024 resolution Resolution Pixel size 0utput swing Active optical area 0utput swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FPN (RMS, uncorrected) Dark current 0.65 fApixel@ 27°C ⁽¹⁰) Full well capacity Spectral range esopositivty Quantum Efficiency Sensitivty (for 10d5 SNR) Shutter efficiency Solution file factor Optical fill factor Dynamic range Colour format Chormat Colour format Chormat Colour format Characteristic curve Shutter efficiency Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel cock Poixel cock Optical fill factor Dynamic range Colour format Characteristic curve Shutter efficiency S		 Odd/even rows with independen 	t exposure time and response curve	
Resolution 1312 x 1082 pixels (active pixels) Pixel size 8 µm x 8 µm Active optical area 10.48 mm x 8.64 mm (maximum) Output swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FNN (RMS, uncorrected) 0.65 (Apixel @ 27°C (1) Dark current 0.65 (Apixel @ 27°C (1) FUII well capacity 140 ke ⁻¹⁰ / S MR > 370:1 ¹⁰) Spectral range < 370 to 1050 nm (to 10 % of peak responsivity)	Optical format / diagonal			
By Jum x 8 Jum Active optical area Output swing Random noise (RMS) FM (RMS, uncorrected) Dark current FW (RMS, uncorrected) Dark current Full well capacity Spectral range <				
Active optical area 10.48 mm x 8.64 mm (maximum) Output swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FPN (RMS, uncorrected) 13.5 mV Dark current 0.65 fA/pixel @ 27°C (*) Full well capacity 140 ke ^{-(b)} / SNR > 370:1 ⁽²⁾ Spectral range < 370 to 1050 mm (to 10 % of peak responsivity)				
Output swing 1.05 V (typical application) Random noise (RMS) 1.1 mV FPN (RMS, uncorrected) 13.5 mV Dark current 0.65 f (Akpixel @ 27°C ⁽¹⁾) FUII well capacity 370 to 1050 nm (to 10 % of peak responsivity) Spectral range < 370 to 1050 nm (to 10 % of peak responsivity)				
Random noise (RMS) 1.1 mV PPN (RMS, uncorrected) 1.3.5 mV Dark current 0.65 fA/pixel @ 27°C ⁽¹⁾ Full well capacity 140 ke ⁻¹⁰ / SNR > 370:1 ⁽²⁾ Spectral range <370 to 1050 nm (to 10 % of peak responsivity)				
FPN (RMS, uncorrected) 13.5 mV Dark current 0.65 fA/pixel @ 27°C (1) Full well capacity 140 ke ⁻⁶ / SNR > 370:1 ²⁰ Spectral range < 370 to 1050 nm (to 10 % of peak responsivity)				
Dark current 0.65 Kp/skel @ 27°C (*) Full well capacity 140 ke ⁻⁽²⁾ / SNR > 370:1 (*) Spectral range < 370 to 1050 nm (to 10% of peak responsivity)				
Full well capacity 140 ke ^{- (D)} / SNR > 370:1 ^(D) Spectral range < 370 to 1050 m (to 10 % of peak responsivity)				
Spectral range < 370 to 1050 nm (to 10% of peak responsivity)				
Responsivity 819 WJ/m ^{2 (B)} Quantum Efficiency > 45 % (B) Sensitivity (for 10dB SNR) 985 % (B) Shutter efficiency 99 85 % (B) Optical fill factor > 60 % (B) Dynamic range 60 dB in linear mode; 120 dB with LinLog [®] Colour format Monochrome Characteristic curve Shutter mode Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 27 fps @ max. resolution 108 fps @ max. resolution ^(S) Supply voltages 3.1 V, 3.3 V, 4.6 V < 600 mW during full-speed read out				
Quantum Éfficiency > 45 % ⁽³⁾ Sensitivity (for 10dB SNR) 4.0 µJ/m2 ⁽³⁾ Shutter efficiency 99.85 % ⁽⁶⁾ Optical fill factor 99.85 % ⁽⁶⁾ Dynamic range 60 dB in linear mode; 120 dB with LinLog [®] Colour format Monochrome Characteristic curve Linear, LinLog [®] , odd/even HDR Shutter efficiency Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 27 fps @ max. resolution 145 fps @ 1024 x 1024 resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Sensitivity (for 10dB SNR) 4.0 µJ/m² ^(b) Shutter efficiency 99.85 % ^(b) Optical fill factor > 60% ^(b) Dynamic range 60 dB in linear mode; 120 dB with LinLog [®] Colour format Monochrome Characteristic curve Linear, LinLog [®] , odd/even HDR Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 27 fps @ max. resolution 145 fps @ 1024 x 1024 resolution ⁽⁵⁾ Maximum frame rate 3.7 fps @ 1024 x 1024 resolution 145 fps @ 1024 x 1024 resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 480 mW during full-speed read out				
Shutter efficiency 99.85 % ⁽⁶⁾ Optical fill factor > 60 % ⁽³⁾ Dynamic range 60 dB in linear mode; 120 dB with LinLog [®] Colour format Monochrome Characteristic curve Linear, LinLog [®] , odd/even HDR Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 27 fps @ max. resolution 108 fps @ max. resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Optical fill factor > 60 % ⁽³⁾ Dynamic range 60 dB in linear mode; 120 dB with LinLog [®] Colour format Monochrome Characteristic curve Linear, LinLog [®] , odd/even HDR Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 40 MHz ⁽³⁾ Maximum frame rate 27 fps @ max. resolution 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Dynamic range 60 dB in linear mode; 120 dB with LinLog® Colour format Monochrome Characteristic curve Linear, LinLog®, odd/even HDR Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 27 fps @ max. resolution 108 fps @ max. resolution® Supply voltages 37 fps @ 1024 x 1024 resolution 145 fps @ 1024 x 1024 resolution® Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 480 mW during full-speed read out				
Colour format Monochrome Characteristic curve Linear, LinLog®, odd/even HDR Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 40 MHz ⁽⁵⁾ Maximum frame rate 27 fps @ max. resolution 108 fps @ max. resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Characteristic curve Linear, LinLog®, odd/even HDR Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 40 MHz ^(s) 108 fps @ max. resolution ^(s) Maximum frame rate 27 fps @ max. resolution 145 fps @ 1024 x 1024 resolution ^(s) Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Shutter mode Global shutter Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 40 MHz ⁽⁵⁾ 108 fps @ max. resolution ⁽⁵⁾ Maximum frame rate 37 fps @ 1024 x 1024 resolution 145 fps @ 1024 x 1024 resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Read out mode Sequential or simultaneous read out (read out during exposure) Analog taps 1 4 (1 or 4 taps active) Pixel clock 40 MHz ⁽⁵⁾ 9 Maximum frame rate 27 fps @ max. resolution 108 fps @ max. resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V 9 Power consumption < 600 mW during full-speed read out				
Analog taps 1 4 (1 or 4 taps active) Pixel clock 40 MHz ^(S) Maximum frame rate 27 fps @ max. resolution 37 fps @ 1024 x 1024 resolution 108 fps @ max. resolution ^(S) Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out				
Pixel clock 40 MHz (%) Maximum frame rate 27 fps @ max. resolution 108 fps @ max. resolution(%) Supply voltages 37 fps @ 1024 x 1024 resolution 145 fps @ 1024 x 1024 resolution(%) Power consumption < 480 mW during full-speed read out		1		
Maximum frame rate 27 fps @ max. resolution 108 fps @ max. resolution ⁽⁵⁾ Supply voltages 37 fps @ 1024 x 1024 resolution 145 fps @ 1024 x 1024 resolution ⁽⁵⁾ Power consumption < 800 mW during full-speed read out		1 40 M		
37 fps @ 1024 x 1024 resolution 145 fps @ 1024 x 1024 resolution ⁽⁵⁾ Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 480 mW during full-speed read out				
Supply voltages 3.1 V, 3.3 V, 4.6 V Power consumption < 600 mW during full-speed read out	Maximum marie rate			
Power consumption < 600 mW during full-speed read out	Supply voltages			
Operating temperature range Industrial (-20°C +85°C) Package 144-pin CQFP				
Package 144-pin CQFP				
	Cover glass			

⁽¹⁾ Varies strongly with temperature
 ⁽²⁾ When configured for 1.1 V output swing
 ⁽³⁾ Under red illumination (780 nm)
 ⁽⁴⁾ Under white LED illumination
 ⁽⁶⁾ 60 MHz possible with slightly reduced image quality (165 fps @ full resolution, 216 fps @ 1024²)



CMOS Image Sensor

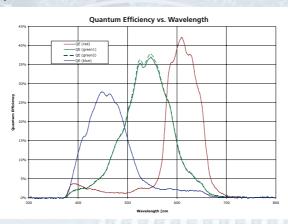
A1312C SERIES

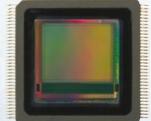
1.4 Megapixel Photonfocus colour CMOS image sensor

Features

- 1312 x 1082 pixel resolution
- 8 µm x 8 µm square pixel
- All sensors within the series (NIR, colour, -40, -160) are fully pin compatible
- Global shutter
- Over 60 % fill factor without microlenses
- Integrated NIR cut-off filter⁽⁵⁾
- Exceptional SNR up to 370:1
- Multiple HDR Features
- Up to 165 fps @ full resolution⁽⁶⁾
- Sequential, simultaneous or nondestructive read out
- Horizontal and vertical windowing
- Flexible ROI and Multiple ROI
- Integrated test pattern, temperature sensor and black level reference

Spectral response of the Photonfocus A1312C CMOS image sensor







	Imago	Sensor	
Technology		e pixel (APS)	
Scanning system		sing • Region of Interest (ROI) in X and Y n Y • Multiple nondestructive readout	
		t exposure time and response curve	
Optical format / diagonal	Odd/even rows with independent 1" (13.6 mm diagona	I) maximum resolution	
optical format? diagonal) 1024 x 1024 resolution	
Resolution		tels (active pixels)	
Pixel size		x 8 µm	
Active optical area		4 mm (maximum)	
Output swing		al application)	
Random noise (RMS)		mV	
FPN (RMS, uncorrected)	13.5	mV	
Dark current	0.65 fA/pix	el @ 27°C (1)	
Full well capacity / SNR	140 ke ^{- (2)} / S	NR > 370:1 (2)	
Spectral range	390 to 670 nm (to 10 %	6 of peak responsivity) (5)	
Responsivity	745 V.	/J/m ^{2 (3)}	
Quantum Efficiency	> 40	% (3)	
Sensitivity (for 10dB SNR)		J/m ² ⁽³⁾	
Shutter efficiency		5 % ⁽⁴⁾	
Optical fill factor		% (3)	
Dynamic range		near mode	
Colour format		yer (raw)	
Characteristic curve		ear	
Shutter mode		shutter	
Read out mode	Sequential or simultaneous read out (read out during exposure)		
Analog taps	1	4 (1 or 4 taps active)	
Pixel clock		1Hz ⁽⁶⁾	
Maximum frame rate	27 fps @ max. resolution	108 fps @ max. resolution ⁽⁶⁾	
	37 fps @ 1024 x 1024 resolution	145 fps @ 1024 x 1024 resolution ⁽⁶⁾	
Supply voltages		3 V, 4.6 V	
Power consumption	< 480 mW during full-speed read out	< 600 mW during full-speed read out	
Operating temperature range		0°C +85°C)	
Package		n CQFP	
Cover glass	Integrated Nik	t cut-off filter ⁽⁵⁾	

⁽¹⁾ Varies strongly with temperature
 ⁽²⁾ Maximum, when configured for 1.1V output swing
 ⁽²⁾ Under red illumination (625 nm)
 ⁽⁴⁾ Under white LED illumination
 ⁽³⁾ A1312C image sensor available without NIR cut-off filter on request
 ⁽⁶⁾ 60 MHz possible with slightly reduced image quality (165 fps @ full resolution, 216 fps @ 1024²)



CMOS Image Sensor

A2080 SERIES

4.3 Megapixel Photonfocus monochrome CMOS image sensor

Features

- 2080 x 2080 pixel resolution
- 8 µm x 8 µm square pixel
- All sensors within the series are fully pin compatible
- Monochrome
- Global shutter
- Over 60 % fill factor without microlenses
- Good NIR spectral response
- Exceptional SNR up to 370:1
- Multiple HDR Features, dynamic range up to 120 dB via LinLog[®]
- Up to 210 fps @ full resolution⁽⁵⁾
- Sequential, simultaneous or nondestructive read out
- Vertical windowing
- Flexible ROI and Multiple ROI in Y direction
- Integrated test pattern, temperature sensor and black level reference

Spectral response of the Photonfocus A2080 CMOS image sensor









	Image	Sensor	
Technology		e pixel (APS)	
Scanning system		ressing • Region of Interest (ROI) in Y	
		n Y • Multiple nondestructive readout	
Optical format / diagonal	Odd/even rows with independen	t exposure time and response curve olution (< 25 mm image circle)	
Resolution		els (active pixels)	
Pixel size		x 8 μm	
		4 mm (maximum)	
Active optical area		al application)	
Output swing Random noise (RMS)		mV	
PN (RMS, uncorrected)		mV	
Dark current		el @ 27°C (1)	
ull well capacity		NR > 370:1 (2)	
pectral range		0% of peak responsivity)	
lesponsivity			
Quantum Efficiency	819 V/J/m ² ⁽³⁾		
ensitivity (for 10dB SNR)		J/m ² ⁽³⁾	
hutter efficiency		5 % ⁽⁴⁾	
Dotical fill factor		9 / (3)	
Dynamic range		; 120 dB with LinLog®	
olour format		"hrome	
haracteristic curve		, odd/even HDR	
hutter mode			
lead out mode	Global shutter Seguential or simultaneous read out (read out during exposure)		
	4		
Analog taps		16 (4 or 16 taps active) Hz ⁽⁵⁾	
Aaximum frame rate			
	35 fps @ max. resolution	140 fps @ max. resolution ⁽⁵⁾	
upply voltages			
Power consumption	TBD mW during full-speed read out	TBD mW during full-speed read out	
Operating temperature range			
Package		n CQFP	
Cover glass	NO COV	er glass	

⁽¹⁾ Varies strongly with temperature
 ⁽²⁾ When configured for 1.1 V output swing
 ⁽³⁾ Under red illumination (625 nm)
 ⁽⁶⁾ Under white LED illumination
 ⁽⁶⁾ 60 MHz possible with slightly reduced image quality (210 fps @ full resolution)



CMOS Image Sensor

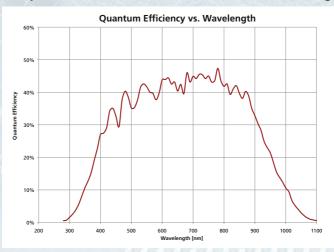
A2080IE SERIES

4.3 Megapixel Photonfocus monochrome (NIR) CMOS image sensor

Features

- 2080 x 2080 pixel resolution
- 8 µm x 8 µm square pixel
- All sensors within the series are fully pin compatible
- Monochrome
- Global shutter
- Over 60% fill factor without microlenses
- Very good NIR spectral response
- Exceptional SNR up to 370:1
- Multiple HDR Features, dynamic range up to 120 dB via LinLog®
- Up to 210 fps @ full resolution(5)
- Sequential, simultaneous or nondestructive read out
- Vertical windowing
- Flexible ROI and Multiple ROI in Y direction
- Integrated test pattern, temperature sensor and black level reference

Spectral response of the Photonfocus A2080IE CMOS image sensor



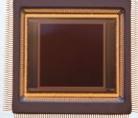




	Image	' Sensor	
Technology		e pixel (APS)	
Scanning system		Iressing • Region of Interest (ROI) in Y	
canning system		n Y • Multiple nondestructive readout	
		nt exposure time and response curve	
Optical format / diagonal	23.5 mm diagonal @ max. res	olution (< 25 mm image circle)	
esolution	2080 x 2080 pix	(active pixels)	
ixel size	8 µm :	x 8 µm	
ctive optical area	16.64 mm x 16.6	4 mm (maximum)	
utput swing	1.05 V (typic	al application)	
andom noise (RMS)	1.1	mV	
PN (RMS, uncorrected)	13.5	5 mV	
ark current	0.65 fA/pix	el @ 27°C (1)	
ull well capacity / SNR	140 ke ^{- (2)} / S	NR > 370:1 (2)	
pectral range	< 370 to 1050 nm (to 1	0 % of peak responsivity)	
esponsivity	819 V.	/J/m ^{2 (3)}	
uantum Efficiency	> 45 % (3)		
ensitivity (for 10dB SNR)	4.0 μ.	J/m ² ⁽³⁾	
hutter efficiency		5 % (4)	
ptical fill factor		% (3)	
ynamic range	60 dB in linear mode	; 120 dB with LinLog®	
olour format	Mono	chrome	
haracteristic curve	Linear, LinLog®	, odd/even HDR	
hutter mode	Global	shutter	
ead out mode	Sequential or simultaneous read	d out (read out during exposure)	
nalog taps	4	16 (4 or 16 taps active)	
ixel clock	40 N	1Hz (5)	
laximum frame rate	35 fps @ max. resolution	140 fps @ max. resolution ⁽⁵⁾	
upply voltages	3.1 V, 3.1	3 V, 4.6 V	
ower consumption	< 1.2 W during full-speed read out	< 1.6 W during full-speed read out	
Derating temperature range	Industrial (-20	D°C +85°C)	
ackage	240-pi	n CQFP	
over glass	No cov	er glass	

⁽¹⁾ Varies strongly with temperature
 ⁽²⁾ When configured for 1.1 V output swing
 ⁽³⁾ Under red illumination (625 nm)
 ⁽⁶⁾ Under white LED illumination
 ⁽⁶⁾ 60 MHz possible with slightly reduced image quality (210 fps @ full resolution)



OEM Camera Modules

OEM CAMERA MODULES

Perfect Fit For Embedded Solutions

For OEM that prefer to design their own camera solution but do not want to spend time on the sensor integration we offer all standard cameras as OEM camera modules.

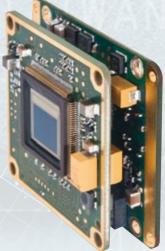
All of the features and technical data are identical to the standard cameras except for the interface board which is not included. Thus making it a perfect solution to interface to your own embedded system.

Customized OEM camera modules with different dimensions, components and features are another interesting option for OEM's. This option enables you to further speed up your time to market.

Please ask Photonfocus for solutions!



OEM-D1024E-160-LC-12



OEM-D1312-160-LC-12



Board Level Cameras

BOARD LEVEL CAMERAS

Compact Solution For Application-Specific Systems

For easier integration into tailored customer applications and especially where space or weight is a limiting factor we offer all our standard cameras as "Board Level" models.

All of the features and technical data are identical to the standard cameras except for the mechanical dimensions. The footprint of these cameras is as small as 46 mm x 46 mm. The depth varies depending on the product type and chosen interface.



BL1-D1312-160-CL-12



BL1-D1024E-40-CL-12



BL1-D1024E-80-CL-12



PHOTONFOCUS CMOS CAMERA PLATFORM

		optim	ized for	
	Low I	ight	HDR /	SNR
	2		1.0 Mpix A1024B	B/W
	1.3 Mpix	B/W	1.4 Mpix	B/W
	76C560	Colour	A1312	Colour
	76C660	NIR	4/6	NIR
	2.0 Mpix	B/W		
	CMV2000	Colour	1/42/22/2	
	76C570	NIR		
	4.0 Mpix	B/W	4.3 Mpix	B/W
×	CMV4000	Colour	A2080	NIR
	1× Alter	NIR		



FPGA real time Pre-Processing in Xilinx FPGAs

3x3 and 5x5 convolver morphologic operations histogram, min, max operations image substraction peak detector for laser triangulation custom operators

DSP Processing

C6415 @ 1 GHz and C6455 @ 1.2GHz da Vinci DM6435 Black Fin BF527, BF537 and BF561

Interfaces

CameraLink PoCL Fiber Optic* GigE (GigE Vision & GenlCam compliant) CoaXPress* Embedded platforms with: GigE interface Ethernet interface EtherCat Interface SercosIII* USB2.0 Host interface* USB3.0 Host interface* RS485 Interface RS232 Interface isolated I/Os



DS1-D1024 SERIES

1 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A1024B CMOS image sensor
- 1024 x 1024 pixel resolution
- Dynamic range up to 60 dB
- Up to 150 fps @ full resolution
- Global shutter
- Monochrome
- Standard features
- CameraLink[®] and PoCL interface
- 10 bit greyscale resolution



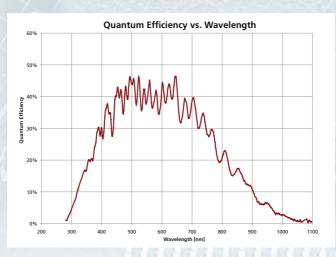
Compatible with



🔛 LabVIEW

MATROX IMAGING

Spectral response of the Photonfocus A1024B CMOS image sensor





	DS1-D1024-40-CL-10 DS1-D1024-40-PC-10		
		Image Sensor	
Image sensor		Photonfocus A1024B (2. Generation)	
Technology		CMOS active pixel (APS)	
Scanning system		Progressive scan	
Optical format / diagonal		1" (15.42 mm diagonal)	
Resolution		1024 x 1024 pixels	
Pixel size		10.6 µm x 10.6 µm	
Active optical area		10.9 mm x 10.9 mm (maximum)	
Dark current		2 fA/pixel @ 30°C	
Full well capacity	~200 ke ⁻		
Spectral range	< 400 to 900 nm		
Responsivity	120 x 10 ³ DN / (J/m ²) @ 610 nm / 8 bit / gain = 1		
	(approxi	mately 350 DN / (lux s) @ 610 nm / 8 bit .	/ gain = 1)
Quantum Efficiency	45 % @ 550 nm		
Optical fill factor	35 % (geometrical)		
Dynamic range	Up to 60 dB		
Colour format	Monochrome		
Characteristic curve	Linear		
Shutter mode	Global shutter		
Read out mode	Sequential read out		ultaneous read out
		(read out dur	ing exposure)

Exposure time	10 µs 0.41 s / 25 ns steps	10 μs 0.83 s / 50 ns steps	10 µs 0.41 s / 25 ns steps	
Frame rate	37 fps	75 fps	150 fps	
Pixel clock	40 1	MHz	80 MHz	
Camera taps	1		2	
Greyscale resolution		8 bit / 10 bit		
Fixed pattern noise (FPN)		< 1 DN RMS @ 8 bit / gain = 1		
Analogue gain		1		
Digital gain		1		
Configuration interface		CL SERIAL (9600 Baud)		
Trigger modes	Free running (non triggered) • Interface trigger • Exter	nal trigger input	
Features	 Region of Interest (ROI) • Image correction • Image information 			
	 Standard trigger input and strobe output functionality 			
Interface	CameraLink® Base	CameraL	ink® Base	
	PoCL - Power over CameraLink [®] Base		CameraLink [®] Base	
Operating temperature		0°C +60°C		
Power supply		+12 V DC (±10%)		
Power consumption	1.6 W	3.0 W	3.2 W	
Lens mount	C-Mount (CS-Mount optional)			
Dimensions (H x W x L)	55 x 55 x 32 mm ³ (CL) 55 x 55 x 40 mm ³			
Mass	200 g 210 g			
Conformity	CE / RoHS / WEEE			
Specials		Adjustable backfocus; Opto-isolated I/O	5	
-				

 Camera control
 PFRemote™ graphical user interface (GUI) and PFLib (SDK)

 OS
 CL: Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request



MV-D1024E SERIES

1 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A1024B CMOS image sensor
- 1024 x 1024 pixel resolution
- Dynamic range up to 120 dB via LinLog®
- Up to 150 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink[®] and PoCL interface
- 12 bit greyscale resolution
- Boardlevel or OEM solution available

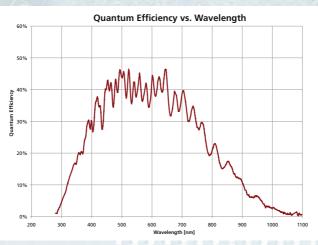


Compatible with

HALCON

LabVIEW MATROX

Spectral response of the Photonfocus A1024B CMOS image sensor





	MV-D1024E-40-CL-12 MV-D1024E-40-PC-12	MV-D1024E-80-CL-12 MV-D1024E-80-PC-12	MV-D1024E-160-CL-12 MV-D1024E-160-PC-12
		Image Sensor	
mage sensor		Photonfocus A1024B (2. Generation)	
Technology		CMOS active pixel (APS)	
canning system		Progressive scan	
Optical format / diagonal		1" (15.42 mm diagonal)	
Resolution		1024 x 1024 pixels	
Pixel size		10.6 µm x 10.6 µm	
Active optical area		10.9 mm x 10.9 mm (maximum)	
Dark current		2 fA/pixel @ 30°C	
ull well capacity	~200 ke ⁻		
pectral range	< 400 to 900 nm		
Responsivity	12	0 x 103 DN / (J/m2) @ 610 nm / 8 bit / gair	1 = 1
	(approxi	mately 350 DN / (lux s) @ 610 nm / 8 bit /	' gain = 1)
Quantum Efficiency		45 % @ 550 nm	
Optical fill factor	35 % (geometrical)		
Dynamic range	60 dB in linear mode; 120 dB with LinLog®		
Colour format	Monochrome		
Characteristic curve	Linear, LinLog®, Skimming		
Shutter mode	Global shutter		
Read out mode	Sequential read out	Sequential or simu	Iltaneous read out
		(read out dur	ing exposure)

Exposure time	10 µs 0.41 s / 25 ns steps	10 µs 0.83 s / 50 ns steps	10 µs 0.41 s / 25 ns steps	
Frame rate	37 fps	75 fps	150 fps	
Pixel clock	40 N	ИНz	80 MHz	
Camera taps	1			
Greyscale resolution		8 bit / 10 bit / 12 bit		
ixed pattern noise (FPN)	< 1 DN	RMS @ 8 bit / gain = 1 / offset correct	on ON	
Analogue gain		1		
Digital gain		1/2/4		
Configuration interface	CL SERIAL (9600 Baud)		00 Baud, user selectable)	
Trigger modes	Free running (r	non triggered) • Interface trigger • Exter	nal trigger input	
Features	 Region of Interest (ROI) 	16 Multiple ROI (MROI) • Decimation X	1) and Y • Image correction	
	 Look-up table (LUT) Constant frame rate Image information 			
	 Extended trigger input and strobe output functionality 			
nterface	CameraLink [®] Base	CameraLink® Base		
	PoCL – Power over CameraLink [®] Base		CameraLink [®] Base	
Operating temperature		0°C +60°C		
Power supply		+12 V DC (±10 %)		
Power consumption	1.6 W	3.0 W	3.2 W	
ens mount		C-Mount (CS-Mount optional)		
Dimensions (H x W x L)	55 x 55 x 32 mm ³	55 x 55 x 40 mm ³		
Mass	200 g	21	Dg	
Conformity		CE / RoHS / WEEE		
	Adjustable backfocus; Opto-isolated I/Os			

	Software
Camera control	PFRemote™ graphical user interface (GUI) and PFLib (SDK) CL: Windows and Linux (32 & 64 Bit): other OS (ONX. etc) on request

(1) Feature only available for MV-D1024E-40 cameras



CAMERA

CMOS Camera

DS1-D1312 SERIES

1.4 Megapixel resolution with Photonfocus sensor

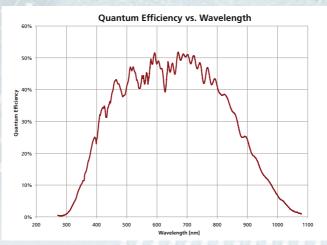
Features

- Photonfocus A1312 CMOS image sensor
- 312 x 1082 pixel resolution
- Good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 60 dB
- Up to 108 fps @ full resolution
- Global shutter
- Monochrome
- Standard features
- CameraLink® interface
- 10 bit greyscale resolution

Compatible with



Spectral response of the Photonfocus A1312 CMOS image sensor





	DS1-D1312-40-CL-10		
		Image Sensor	
Image sensor		Photonfocus A1312 (3. Generation)	
Technology		CMOS active pixel (APS)	
canning system		Progressive scan	
Optical format / diagonal		" (13.6 mm diagonal) maximum resoluti	
	2/3*	" (11.6 mm diagonal) 1024 x 1024 resol	ution
Resolution		1312 x 1082 pixels	
Pixel size		8 µm x 8 µm	
Active optical area		10.48 mm x 8.64 mm (maximum)	
Dark current		0.65 fA/pixel	
ull well capacity / SNR		~90 ke ⁻ / 300:1	
pectral range		70 to 1000 nm (to 10% of peak respons	
Responsivity	210 x 10 ³ DN / (J/m ²) @ 625 nm / 8 bit / gain = 1		
	(approximately 620 DN / (lux s) @ 625 nm / 8 bit / gain = 1)		
Quantum Efficiency		> 50 %	
Optical fill factor		> 60 %	
Dynamic range		Up to 60 dB	
Colour format		Monochrome	
haracteristic curve		Linear	
hutter mode		Global shutter	
Read out mode	Sequential read	out or simultaneous read out (read out	during exposure)
		Camera	
Exposure time	10 µs 1.68 s / 100 ns steps	10 µs 0.83 s / 50 ns steps	10 µs 0.41 s / 25 ns steps
Frame rate	27 fps	55 fps	108 fps
Pixel clock	40	MHz	80 MHz

ridine idle	27 ips	20 ID2	100 105
Pixel clock		40 MHz	80 MHz
Camera taps	1		2
Greyscale resolution	8 bit / 10 bit		
Fixed pattern noise (FPN)		< 1 DN @ 8 bit / correction ON	
Analogue gain		1	
Digital gain		1	
Configuration interface		CL SERIAL (9600 Baud)	
Trigger modes	 Free runr 	ning (non triggered) • Interface trigger • Exte	ernal trigger input
Features		 Region of Interest (ROI) Image correct 	tion
	• 9	Standard trigger input and strobe output fun	ctionality
Interface		CameraLink [®] Base	
Operating temperature		0°C +50°C	
Power supply		+12 V DC (±10 %)	
Power consumption	2.5 W	< 3.0 W	< 3.3 W
Lens mount		C-Mount (CS-Mount optional)	
Dimensions (H x W x L)		60 x 60 x 45 mm ³	
Mass		265 g	
Conformity		CE / RoHS / WEEE	
Specials		Adjustable backfocus; Opto-isolated I/C)s

	Soltware
Camera control	PFRemote [™] graphical user interface (GUI) and PFLib (SDK)
OS	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request



CAMERA

CMOS Camera

MV1-D1312 SERIES

1.4 Megapixel resolution with Photonfocus sensor

Features

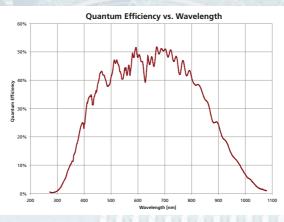
- Photonfocus A1312 CMOS image sensor
- 1312 x 1082 pixel resolution
- Good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog®
- Up to 170 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink[®] and GigE interface
- 12 bit greyscale resolution
- Boardlevel or OEM solution available

Compatible with

HALCON



Spectral response of the Photonfocus A1312 CMOS image sensor



MV1-D1312-40-CL-12 MV1-D1312-80-CL-12 MV1-D1312-160-CL-12 MV1-D1312-240-CL-8

	MV1-D1312-40-G2-12		MV1-D1312-100-G2-12	
Image sensor		Photonfocus A13	12 (3. Generation)	
Technology	-	CMOS activ	e pixel (APS)	
Scanning system	·	Progress	sive scan	
Optical format / diagonal			l) maximum resolution	
) 1024 x 1024 resolution	
Resolution		1312 x 1082 pixels		1248 x 1082 pixels
Pixel size		8 µm	x 8 µm	
Active optical area		10.48 mm x 8.6	4 mm (maximum)	
Dark current		0.65 f	A/pixel	
Full well capacity / SNR	-	~90 ke ⁻ / 300:1		
Spectral range	< 370 to 1000 nm (to 10 % of peak responsivity)			
Responsivity	210 x 10 ³ DN / (J/m ²) @ 625 nm / 8 bit / gain = 1			
	(approximately 620 DN / (lux	s) @ 625 nm / 8 bit / gain = 1)
Quantum Efficiency	> 50 %			
Optical fill factor		> 6	0%	
Dynamic range		60 dB in linear mode	; 120 dB with LinLog®	
Colour format		Mono	chrome	
Characteristic curve	Linear, LinLog®			
Shutter mode	·	Global shutter		
Read out mode	Sequential read out or simultaneous read out (read out during exposure only in linear mode) for higher frame rate			node) for higher frame rates
		Car	nera	
Exposure time	10 µs 1.68 s / 100 ns steps			

Frame rate			10 µs 0.41 s / 25 ns steps (CL)	
riameiate	27 fps	55 fps	68 fps (GigE) / 108 fps (CL)	170 fps
Pixel clock	40 MH;	Z	50 MHz (GigE) /	80 MHz (CL)
Camera taps	1	1 (G	igE) / 2 (CL)	3
Greyscale resolution		8 bit / 10 bit / 12 bit		8 bit
Fixed pattern noise (FPN)		< 1 DN @ 8	bit / correction ON	
Analogue gain			1	
Digital gain		0.1 to 15	.99 (Fine Gain) ⁽¹⁾	
Configuration interface	CL SEI	RIAL (Baudrate user sele	ectable) (CL); Gigabit Ethernet (GigE)
Trigger modes	 Free running (nor 	n triggered) • Interface 1	trigger • External trigger input • So	ftware trigger
Features	 Region of Interest (ROI) 	2 Multiple ROI (MROI)	 Decimation Y • Image correction 	 2 Look-up tables (LUT)
	 Constant frame rate Crosshair Convolver 3x3 Temperature Image information 			
	 Extended trigger input and strobe output functionality 			
Interface	CameraLink [®] Base or GigE (GigE Vision & GenlCam compliant)			
Operating temperature	0°C +50°C			
Power supply			12 V +24 V DC (±10 %) (GigE)	
Power consumption	2.5 W (CL) / < 4.5 W (GigE) < 3	3.0 W (CL) / < 5.0 W (Gi	gE) < 3.3 W (CL) / < 5.2 W (GigE)	< 5.2 W
Lens mount	C-Mount (CS-Mount optional)			
Dimensions (H x W x L)	60 x 60 x 45 mm ³ (CL) / 60 x 60 x 51 mm ³ (GigE)			
Mass	265 g (CL) / 310 g (GigE)			
Conformity	CĒ / RoHS / WĒEĒ			
Specials	Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs (GigE)			E)

	Software
Camera control	PFRemote™ graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK;
	All 3rd party tools providing full support for GigE Vison and GenICam
OS	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request

 $^{\scriptscriptstyle (1)}$ Some models may support only digital gain 1/2/4/8



MV1-D1312C SERIES

1.4 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A1312C CMOS image sensor
- 1312 x 1082 pixel resolution
- Integrated NIR cut-off filter⁽¹⁾
- Exceptional SNR up to 300:1
- Dynamic range up to 60 dB
- Up to 170 fps @ full resolution
- Global shutter
- Colour (RGB Bayer)
- Standard features
- CameraLink[®] and GigE interface
- 12 bit output format
- Boardlevel or OEM solution available





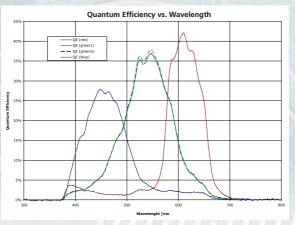
CAMERA

Compatible with



LabVIEW MATROX

Spectral response of the Photonfocus A1312C CMOS image sensor





	MV1-D1312C-40-CL-12 MV1-D1312C-40-G2-12*		MV1-D1312C-160-CL-12 MV1-D1312C-100-G2-12*		
		Image	sensor		
Image sensor		Photonfocus A131	2C (3. Generation)		
Technology		CMOS activ	e pixel (APS)		
Scanning system		Progress	sive scan		
Optical format / diagonal	1" (13.6 mm diagonal) maximum resolution				
) 1024 x 1024 resolution		
Resolution		1312 x 1082 pixels		1248 x 1082 pixels	
Pixel size			x 8 µm		
Active optical area			4 mm (maximum)		
Dark current			A/pixel		
Full well capacity / SNR			/ 300:1		
Spectral range		390 to 670 nm (to 10 9	% of peak responsivity)(1)		
Responsivity			625 nm / 8 bit / gain = 1		
Quantum Efficiency		(approximately 560 DN / (lux	s) @ 625 nm / 8 bit / gain = 1 0 %)	
Optical fill factor			0%		
Dynamic range			near mode		
Colour format			ver (raw)		
Characteristic curve			ear		
Shutter mode			shutter		
Read out mode	Sequential o	r simultaneous read out (read		or framo ratos	
		Simulaticous read out (read	out during exposure, for high	er frame faces	
		Can	nera		
Exposure time	10 µs 1.68 s / 100 ns steps	10 µs 0.83 s / 50 ns steps	10 μs 0.67 s / 40 ns steps (GigE) 10 μs 0.41 s / 25 ns steps (CL)	10 µs 0.279 s / 16.67 ns steps	
Frame rate	27 fps	55 fps	68 fps (GigE) / 108 fps (CL)	170 fps	
Pixel clock	40	MHz		50 MHz (GigE)	
Camera taps	1	1 (GigE) / 2 (CL)	3	
Greyscale resolution		8 bit / 10 bit / 12 bit		8 bit	
Fixed pattern noise (FPN)		< 1 DN @ 8 bit	/ correction ON		
Analogue gain			1		
Digital gain			9 (Fine Gain)		
Configuration interface		SERIAL (Baudrate user selecta			
Trigger modes	Free running	(non triggered) • Interface trig	ger • External trigger input •	Software trigger	
Features	Free running (non triggered) = Interface trigger = External trigger input = Software trigger Region of Interest (ROI) = 512 Multiple ROI (MROI) = Decimation Y = Image correction = 2 Look-up tables (LUT) Constant frame rate < Crosshair < Convolver 328 = Temperature = Image information				
	Constant fi			je information	
Interface		• Extended trigger input an CameraLink® Base or GigE (Gio	d strobe output functionality	at)	
Operating temperature			+50°C	10	
Power supply		+12 V DC (±10%) (CL) / +12)	
Power consumption	2.5 W (CL) / < 4.5 W (GigE)	< 3.0 W (CL) / < 5.0 W (GigE)	< 3.3 W (CL) / < 5.2 W (GigE)	< 5.2 W (CL)	
Lens mount			Mount optional)	(3.2 11 (62)	
Dimensions (H x W x L)			60 x 60 x 51 mm ³ (GigE)		
Mass			310 g (GigE)		
Conformity			IS / WEEE		
Specials	Adj	ustable backfocus; Opto-isolat	ed I/Os; Dual RS-422 Inputs (C	GigE)	
		C{t	ware		
Commented 1	DED			free CEV Plana and CEV	
Camera control	PFRemote™ graphical us	er interface (GUI) and PFLib (S	UK); GIGE: graphical user inter	Tace GEV Player and SDK;	
OS		All 3rd party tools providing full support for GigE Vison and GenICam Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request			

⁽¹⁾A1312C image sensor available without NIR cut-off filter on request * Model available upon request



MV1-D1312I SERIES

1.4 Megapixel resolution with proprietary Photonfocus sensor

Features

- Photonfocus A1312I CMOS image sensor
- 1312 x 1082 pixel resolution
- Excellent NIR response
- Dynamic range up to 120 dB via LinLog®
- Up to 108 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink® and GigE interface
- 12 bit greyscale resolution



Compatible with

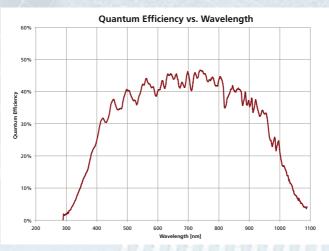
HALCON

LabVIEW

Spectral response of the Photonfocus A1312I CMOS image sensor

ATROX

MAGING





	MV1-D1312I-40-CL-12				
	MV1-D1312I-40-GB-12				
		Image Sensor			
Image sensor		Photonfocus A1312I (3. Generation)			
Technology		CMOS active pixel (APS)			
Scanning system		Progressive scan			
Optical format / diagonal	1	" (13.6 mm diagonal) maximum resoluti	on		
	2/3	" (11.6 mm diagonal) 1024 x 1024 resolution	ution		
Resolution		1312 x 1082 pixels			
Pixel size		8 µm x 8 µm			
Active optical area	10.48 mm x 8.64 mm (maximum)				
Dark current	1.15 fA/pixel				
Full well capacity	~100 ke ⁻				
Spectral range	< 370 to 1100 nm (to 10 % of peak responsivity)				
Responsivity	300	300 x 10 ³ DN / (J/m ²) @ 850 nm / 8 bit / gain = 1			
Quantum Efficiency		> 50 %			
Optical fill factor		> 60 %			
Dynamic range		50 dB in linear mode; 120 dB with LinLoo	2 [®]		
Colour format		Monochrome			
Characteristic curve		Linear, LinLog®			
Shutter mode	Global shutter				
Read out mode	(read out during exposure only in linear mode) for higher frame rates				

		Camera		
Exposure time	10 µs 1.68 s / 100 ns steps	10 µs 0.83 s / 50 ns steps	10 μs 0.67 s / 40 ns steps (GigE) 10 μs 0.41 s / 25 ns steps (CL)	
Frame rate	27 fps	55 fps	68 fps (GigE) / 108 fps (CL)	
Pixel clock	40	MHz	50 MHz (GigE) / 80 MHz (CL)	
Camera taps	1		2	
Greyscale resolution		8 bit / 10 bit / 12 bit		
Fixed pattern noise (FPN)		< 1 DN @ 8 bit / correction ON		
Analogue gain		1		
Digital gain		1/2/4/8		
Configuration interface	Gigabit Ethernet /	Gigabit Ethernet / CL SERIAL (9600, 57600 or 115'200 Baud, user selectable)		
Trigger modes	 Free running (non triggered) Interface trigger External trigger input Software trigger 			
Features	 Region of Interest (ROI) 512 Multiple ROI (MROI)⁽¹⁾ Decimation Y⁽¹⁾ Image correction 2 Look-up tables (LUT)⁽¹⁾ 			
	 Constant frame rate Crosshair⁽¹⁾ Convolver 3x3 Temperature⁽¹⁾ Image information 			
	Extend	ded trigger input and strobe output fun	ctionality	
Interface	CameraLink [®] Base or GigE			
Operating temperature		0°C +50°C		
Power supply		+12 V DC (±10%)		
Power consumption	2.5 W (CL) / < 4.5 W (GigE)	< 3.0 W (CL) / < 5.0 W (GigE)	< 3.3 W (CL) / < 5.2 W (GigE)	
Lens mount		C-Mount (CS-Mount optional)		
Dimensions (H x W x L)	60 x	60 x 45 mm3 (CL) / 60 x 60 x 99 mm3	(GigE)	
Mass		265 g (CL) / 465 g (GigE)		
Conformity	CE / RoHS / WEEE			
Specials		Adjustable backfocus; Opto-isolated I/C	ls	

	Software	
Camera control	PFRemote™ graphical user interface (GUI) and PFLib (SDK)	
	GigE: graphical user interface GEV Player and SDK	
OS	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request	

(1) Features only available for CameraLink® cameras (for GigE cameras on request)



MV1-D1312IE SERIES

1.4 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A1312IE CMOS image sensor
- 1312 x 1082 pixel resolution
- Very good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog®
- Up to 170 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink[®] and GigE interface
- 12 bit greyscale resolution
- Boardlevel or OEM solution available





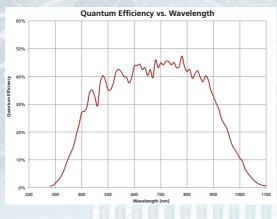
HALCON

LabVIEW

Spectral response of the Photonfocus A1312IE CMOS image sensor

MATROX

IMAGING





	MV1-D1312IE-160-CL-12	
	MV1-D1312IE-160-CL-12 MV1-D1312IE-100-G2-12	

Image sensor	Photonfocus A1312IE (3. Generation)		
Technology	CMOS active pixel (APS)		
Scanning system	Progressive scan		
Optical format / diagonal	1" (13.6 mm diagonal) maximum resolution		
	2/3" (11.6 mm diagonal) 1024 x 1024 resolution		
Resolution	1312 x 1082 pixels	1248 x 1082 pixels	
Pixel size	8 μm x 8 μm		
Active optical area	10.48 mm x 8.64 mm (maximum)		
Dark current	0.65 fA/pixel		
Full well capacity / SNR	~90 ke ⁻ / 300:1		
Spectral range	< 370 to 1050 nm (to 10% of peak responsivity)		
Responsivity	280 x 10 ³ DN / (J/m ²) @ 850 nm / 8 bit / gain = 1		
Quantum Efficiency	> 45 %		
Optical fill factor	> 60 %		
Dynamic range	60 dB in linear mode; 120 dB with LinLog®		
Colour format	Monochrome		
Characteristic curve	Linear, LinLog®		
Shutter mode	Global shutter		
Read out mode	Sequential read out or simultaneous read out (read out during exposure only in linear mode) for higher frame rates		

Exposure time	10 µs 1.68 s / 100 ns	10 µs 0.83 s / 50 ns steps	10 µs 0.67 s / 40 ns steps (GigE)	10 µs 0.279 s / 16.67 ns
	steps		10 µs 0.41 s / 25 ns steps (CL)	steps
Frame rate	27 fps	55 fps	68 fps (GigE) / 108 fps (CL)	170 fps
Pixel clock	40	MHz	80 MHz (CL) /	50 MHz (GigE)
Camera taps	1) / 2 (CL)	3
Greyscale resolution		8 bit / 10 bit / 12 bit		8 bit
Fixed pattern noise (FPN)		< 1 DN @ 8 bit / correction ON		
Analogue gain			1	
Digital gain		0.1 to 15.99 (Fine Gain)		
Configuration interface	CL	SERIAL (Baudrate user selecta	ble) (CL) / Gigabit Ethernet (Gi	gE)
Trigger modes	Free running	Free running (non triggered) • Interface trigger • External trigger input • Software trigger		
Features	 Region of Interest (ROI) 	Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • Image correction • 2 Look-up tables (LUT)		
	 Constant fr 	rame rate • Crosshair • Convol	lver 3x3 • Temperature • Imag	e information
			d strobe output functionality	
Interface	CameraLink [®] Base or GigE (GigE Vision & GenICam compliant)			
Operating temperature	0°C +50°C			
Power supply	+12 V DC (±10 %) (CL) / +12 V +24 V DC (±10 %) (GigE)			
Power consumption	2.5 W (CL) / < 4.5 W (GigE)	< 3.0 W (CL) / < 5.0 W (GigE)	< 3.3 W (CL) / < 5.2 W (GigE)	< 5.2 W (CL)
Lens mount	C-Mount (CS-Mount optional)			
Dimensions (H x W x L)	60 x 60 x 45 mm ³ (CL) / 60 x 60 x 51 mm ³ (GigE)			
Mass	265 g (CL) / 310 g (GigE)			
Conformity		CE / RoHS / WEEE		
Specials	Adj	Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs (GigE)		

	Software	
Camera control	PFRemote™ graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK;	
	All 3rd party tools providing full support for GigE Vison and GenICam	
OS	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request	

* Model available upon request



MV1-D2080 SERIES

4.3 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A2080 CMOS image sensor
- 2080 x 2080 pixel resolution
- Good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog®
- Up to 51 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink[®] and GigE interface
- Up to 12 bit greyscale resolution
- Configuration via register based ASCII protocol
- Boardlevel or OEM solution available







Compatible with

HALCON

🔛 LabVIEW

MATROX IMAGING

Spectral response of the Photonfocus A2080 CMOS image sensor





MV1-D2080-160-CL-12 MV1-D2080-160-G2-12

MV1-D2080-240-CL-83

	Image Sensor
Image sensor	Photonfocus A2080 (3. Generation)
Technology	CMOS active pixel (APS)
Scanning system	Progressive scan
Optical format / diagonal	23.5 mm diagonal @ max. resolution (< 25 mm image circle)
Resolution	2080 x 2080 pixels
Pixel size	8 µm x 8 µm
Active optical area	16.64 mm x 16.64 mm (maximum)
Dark current	0.65 fA/pixel
Full well capacity / SNR	~90 ke ⁻ (Max SNR > 300:1)
Spectral range	< 370 to 1000 nm (to 10 % of peak responsivity)
Responsivity	210 x 10 ³ DN / (J/m ²) @ 625 nm / 8 bit / gain = 1
	(approximately 620 DN / (lux s) @ 625 nm / 8 bit / gain = 1)
Quantum Efficiency	> 50 %
Optical fill factor	> 60 %
Dynamic range	60 dB in linear mode; 120 dB with LinLog®
Colour format	Monochrome
Characteristic curve	Linear, LinLog®
Shutter mode	Global shutter
Read out mode	Sequential read out or simultaneous read out (read out during exposure only in linear mode) for higher frame rates

	Cam			
Exposure time	10 µs 0.41 s / 25 ns steps	10 µs 0.279 s / 16.67 ns steps		
Frame rate	25 fps sustained, 34 fps for 5 frames, (GigE) / 34 fps (CL)	51 fps		
Pixel clock	80 N	MHz		
Camera taps	1 (GigE) / 2 (CL)	3		
Greyscale resolution	8 bit / 10 bit / 12 bit	8 bit		
Fixed pattern noise (FPN)	< 1 DN @ 8 bit	/ correction ON		
Analogue gain	1			
Digital gain	0.1 to 15.99	9 (Fine Gain)		
Configuration interface	CL SERIAL (Baudrate user selectab	CL SERIAL (Baudrate user selectable) (CL) / Gigabit Ethernet (GigE)		
Trigger modes	 Free running (non triggered) Interface triggered 	 Free running (non triggered) Interface trigger External trigger input Software trigger 		
Features	Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • Image correction • 2 Look-up tables (LUT)			
	 Constant frame rate Convolver Crosshair Temperature & Image information 			
	 Extended trigger input and strobe 			
Interface	CameraLink® Base or GigE (GigE Vision & GenlCam compliant)			
Operating temperature	0°C +50°C			
Power supply	+12 V DC (±10 %) (CL) / +12 V +24 V DC (±10 %) (GigE)			
Power consumption	< 3.3 W (CL) / < 5.2 W (GigE)	< 5.2 W (CL)		
Lens mount	M42x1, F-Mount, C-Mount 1.3"			
Dimensions (H x W x L)	60 x 60 x 38 mm ³ (CL) / 60 x 60 x 47 mm ³ (GigE)			
Mass	222 g (CL) / 294 g (GigE)			
Conformity	CE / RoHS / WEEE			
Specials	Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs (GigE)			

	JOILWale
	PFRemote™ graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK;
Camera control	All 3rd party tools providing full support for GigE Vison and GenICam
ŌS	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request

* Model available upon request



MV1-D2080IE SERIES

4.3 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A2080IE CMOS image sensor
- 2080 x 2080 pixel resolution
- Very good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog®
- Up to 51 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink[®] and GigE interface
- Up to 12 bit greyscale resolution
- Configuration via register based ASCII protocol
- Boardlevel or OEM solution available





Spectral response of the Photonfocus A2080IE CMOS image sensor











MV1-D2080IE-160-CL-12 MV1-D2080IE-160-G2-12

	Image Sensor
Image sensor	Photonfocus A2080IE (3. Generation)
Technology	CMOS active pixel (APS)
Scanning system	Progressive scan
Optical format / diagonal	23.5 mm diagonal @ max. resolution (< 25 mm image circle)
Resolution	2080 x 2080 pixels
Pixel size	8 μm x 8 μm
Active optical area	16.64 mm x 16.64 mm (maximum)
Dark current	0.65 fA/pixel
Full well capacity / SNR	~90 ke ⁻ (Max SNR > 300:1)
Spectral range	< 370 to 1050 nm (to 10% of peak responsivity)
Responsivity	280 x 10 ³ DN / (J/m ²) @ 850 nm / 8 bit / gain = 1
Quantum Efficiency	> 50 %
Optical fill factor	> 60 %
Dynamic range	60 dB in linear mode; 120 dB with LinLog®
Colour format	Monochrome
Characteristic curve	Linear, LinLog®
Shutter mode	Global shutter
Read out mode	Sequential read out or simultaneous read out (read out during exposure only in linear mode) for higher frame rates

	Came	era		
Exposure time	10 µs 0.41 s / 25 ns steps	10 µs 0.279 s / 16.67 ns steps		
Frame rate	25 fps sustained, 34 fps for 5 frames (GigE) / 34 fps (CL)	51 fps		
Pixel clock	80 M	Hz		
Camera taps	1 (GigE) / 2 (CL)	3		
Greyscale resolution	8 bit / 10 bit / 12 bit	8 bit		
Fixed pattern noise (FPN)	< 1 DN @ 8 bit /	correction ON		
Analogue gain	1			
Digital gain	0.1 to 15.99	(Fine Gain)		
Configuration interface	CL SERIAL (Baudrate user selectable	e) (CL) / Gigabit Ethernet (GigE)		
Trigger modes	 Free running (non triggered) Interface triggered 	er • External trigger input • Software trigger		
Features	 Region of Interest (ROI) 512 Multiple ROI (MROI) December 2014 	cimation Y • Image correction • 2 Look-up tables (LUT)		
	 Constant frame rate Convolver Crossi 	hair • Temperature & Image information		
	 Extended trigger input and strobe output functionality Status line 			
Interface	CameraLink [®] Base or GigE (GigE Vision & GenICam compliant)			
Operating temperature	0°C +50°C			
Power supply	+12 V DC (±10%)(CL) / +12 V	+24 V DC (±10 %) (GigE)		
Power consumption	< 3.3 W (CL) / < 5.2 W (GigE)	< 5.2 W (CL)		
Lens mount	M42x1, F-Mount, C-Mount 1.3"			
Dimensions (H x W x L)	60 x 60 x 38 mm ³ (CL) / 6	0 x 60 x 47 mm³ (GigE)		
Mass	222 g (CL) / 2	222 g (CL) / 294 g (GigE)		
Conformity	CE / RoHS	/ WEEE		
Specials	Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs (GigE)			
	Softw	are		
Camera control	PFRemote™ graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK; All 3rd party tools providing full support for GiqE Vison and GeniCam			
OS	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request			

* Model available upon request



MV1-D1280 SERIES

1.3 Megapixel resolution with CMOS image sensor

Features

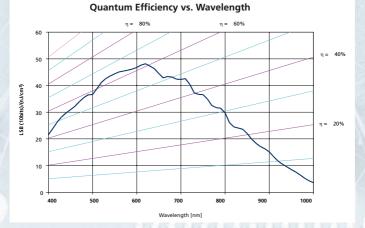
- E2V EV76C560 and EV76C660 CMOS image sensors
- 1280 x 1024 pixel resolution
- Good NIR spectral response
- Suitable for standard and low light applications
- Up to 60 fps @ full resolution
- Global shutter
- Monochrome
- Extended features
- CameraLink® and GigE interface
- 10 bit greyscale resolution
- Binning possibility
- Configuration via register based ASCII protocol possible
- Boardlevel or OEM solution available







Spectral response of the EV76C560 CMOS image sensor





	MV1-D1280-120-CL-10 MV1-D1280-80-G2-10	MV1-D1280I-120-CL-10 MV1-D1280I-80-G2-10	MV1-D1280C-120-CL-10 MV1-D1280C-80-G2-10	
		Image Sensor		
Image sensor Technology	EV76C560	EV76C660 CMOS active pixel (APS)	EV76C560 Colour	
Scanning system		Progressive scan		
Optical format / diagonal		1/1.8" (8.7 mm diagonal)		
Resolution		1280 x 1024 pixels		
Pixel size		5.3 µm x 5.3 µm		
Active optical area	6.9 mm x 5.5 mm (maximum)			
Dark current	< 420 LSB ₁₀ / s @ ta 25°C			
Full well capacity / SNR		~12 ke ⁻ / 109:1		
Spectral range	< 370 to 930 nm (1)	< 370 to 1000 nm ⁽¹⁾	< 370 to 670 nm (1)	
Responsivity	6600 LSB ₁₀ / (Lux.s)			
Quantum Efficiency	> 47 %			
Optical fill factor	TBD			
Dynamic range	~ 60 dB			
Colour format	Monochrome	enhanced NIR	Colour	
Characteristic curve	Linear, HDR			
Shutter mode	Global shutter			
Read out mode	Sequential read out or simultaneous read out (read out during exposure) for better SNR and dynamic range			

		Camera	
Exposure time	TBD	TBD	TBD
Frame rate		60 fps (CL) / 40 fps (GigE)	
Pixel clock		60 MHz (CL) / 80 MHz (GigE)	
Camera taps		2 (CL) / 1 (GigE)	
Greyscale resolution		8 bit / 10 bit	
Fixed pattern noise (FPN)		< 1 DN @ 8 bit	
Analogue gain		1	
Digital gain		0.1 to 15.99 (Fine Gain)	
Configuration interface	CL SERIAL (B	audrate user selectable) (CL) / Gigabit Et	hernet (GigE)
Trigger modes	 Free running (non trigge 	ered) • Interface trigger • External trigge	er input • Software trigger
Features	tures • Region of Interest (ROI) • binning • Image correction •		
	 Constant frame rate Crosshair Temperature Image information 		
	 Extended trigger input and strobe output functionality 		
Interface	CameraLink [®] Base or GigE (GigE Vision & GenICam compliant)		
Operating temperature	0°C +50°C		
Power supply	+12 V DC (±10 %) (CL) / +12 V +24 V DC (±10 %) (GigE)		
Power consumption	TBD W (CL) / < TBD W (GigE)		
Lens mount	C-Mount (CS-Mount optional)		
Dimensions (H x W x L)	55 x 55 x 32 mm³ (CL) / 55 x 55 x 44 mm³ (GigE)		
Mass	TBD g (CL) / TBD g (GigE)		
Conformity	CE / RoHS / WEEE		
Specials	Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs (GigE)		

Camera control

PFRemote™ graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK; All 3rd party tools providing full support for GigE Vison and GenlCam Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request

OS

 $^{\scriptscriptstyle (1)}$ to 10 % of peak responsivity



MV1-D2048x1088 SERIES

2.2 Megapixel resolution with CMOS image sensor

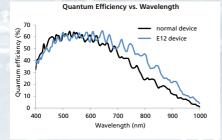
Features

- CMOSIS CMV2000 CMOS image sensor
- 2048 x 1088 pixel resolution
- Available in monochrome, enhanced NIR and color
- Suitable for standard and low light applications
- Up to 105 fps @ full resolution
- Global shutter
- Extended features
- Global shutter
- CameraLink[®] and GigE interface
- 10 bit greyscale resolution
- Configuration via register based ASCII protocol possible
- Boardlevel or OEM solution available

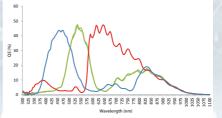




Spectral response of the CMOSIS CMV2000 CMOS image sensor monochrome (left) and color (right)



Quantum Efficiency vs. Wavelength



40



	DR1-D2048x1088-G2-192-8	MV1-D2048x1088-G2-80-12	MV1-D2048x1088-160-CL-12 MV1-D2048x1088-96-G2-12	MV1-D2048x1088-240-CL-8
		Image	Sensor	
Image sensor		CMOSIS	CMV2000	
Technology			e pixel (APS)	
Scanning system			sive scan	
Optical format / diagonal			mm diagonal)	
Resolution		2048 x 1088 pixels	inin diagonaly	2046 x 1088 pixels
Pixel size			x 5.5 µm	2040 x 1000 pixels
Active optical area			4 mm (maximum)	
Dark current			© @ 25℃	
Full well capacity / SNR			5 ke ⁻	
Spectral range			0% of peak responsivity)	
Sensitivity			//lux.s	
Ouantum Efficiency			with micro lenses	
Optical fill factor			t micro lenses	
Dynamic range			near mode	
Colour format			lour, enhanced NIR	
Characteristic curve			ewise linear	
Shutter mode			shutter	
Read out mode			ead out during exposure)	
Exposure time	Camera 12.56 us 0.349 s 14.87 us 0.419 s 14.87 us 0.419 s(CL) 12.56 us 0.349 s			
		·	12.56 µs 0.349s (GigE)	
Frame rate	85	35 fps	42 fps (GigE) / 70 fps (CL)	105 fps
Pixel clock	48 MHz	40 MHz	80 MHz (CL) / 48 MHz (GigE)	
Camera taps	1) / 2 (CL)	3
Greyscale resolution	8 bit / 10 bit ⁽¹⁾		10 bit	8 bit
Fixed pattern noise (FPN)		< 1 DN @ 8 bit	/ correction ON	
Analogue gain			1	
Digital gain			(Fine Gain) ⁽¹⁾	-
Configuration interface			ble) (CL) / Gigabit Ethernet (Gi	
Trigger modes	Free running (non triggered) Interface trigger External trigger input Software trigger			
Features	Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • 2 Look-up tables (LUT) Constant frame rate • Crosshair • Convolver 3x3 • Temperature • Image information			
	 Extended trigger input and strobe output functionality 			
	 Modulation can be disabled to transmit original image data⁽²⁾ 			
Interface	CameraLink® Base or GigE (GigE Vision & GenICam compliant)			t)
Operating temperature	0°C +50°C			
Power supply	+12 V DC (±10 %) (CL) / +12 V +24 V DC (±10 %) (GigE)			
Power consumption		< 4.	2 W	
Lens mount		C-Mount (CS-N	Nount optional)	
Dimensions (H x W x L)	60 x 60 x 42 mm ³ (CL) / 60 x 60 x 51.5 mm ³ (GigE)			
Mass	230 g (CL) / 265 g (GigE)			
Conformity	CE / ROHS / WEE			
Specials	Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs (GigE);			igE);
		Evaluation software for th	e Double Rate Technology	
		Soft	ware	
Camera control	PFRemote [™] graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK; All 3rd party tools providing full support for GigE Vision and GenlCam Demodulator DLL for implementation in GigE Vision and <u>GenlCam compatible image processing platforms^o</u> ; <u>HALCON extension package with demodulator sample^{cb}</u> Windows and Linux (32 & 64 Bit); other OS (QNK); etc) on request			

 $^{\scriptscriptstyle (1)}$ If DR Mode active, 8 bit greyscale output only; 10 bit via LUT $^{\scriptscriptstyle (2)}$ Appplicable for DR Camera only



MV1-D2048 SERIES

4.2 Megapixel resolution with CMOS image sensor

Features

- CMOSIS CMV4000 CMOS image sensors
- 2048 x 2048 pixel resolution
- Available in monochrome, enhanced NIR and color
- Suitable for standard and low light applications
- Up to 56 fps @ full resolution
- Global shutter
- Extended features
- Global shutter
- CameraLink® and GigE interface
- 10 bit greyscale resolution
- Configuration via register based ASCII protocol
- Boardlevel or OEM solution available

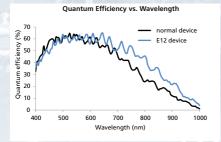


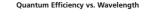


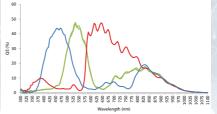
Advantages

Special readoutmodes for highest possible framerates

Spectral response of the CMOSIS CMV4000 CMOS image sensor monochrome (left) and color (right)









	DR1-D2048-G2-192-8	MV1-D2048-G2-80-12	MV1-D2048-160-CL-12 MV1-D2048-96-G2-12	MV1-D2048-240-CL-8	
		Image	Sensor		
Image sensor		3	CMV4000		
Technology			e pixel (APS)		
Scanning system			sive scan		
Optical format / diagonal			im diagonal)		
Resolution		2048 x 2048 pixels	alagonal)	2046 x 2048 pixels	
Pixel size			x 5.5 µm		
Active optical area			6 mm (maximum)		
Dark current			@ 25°C		
Full well capacity / SNR		~13.	5 ke		
Spectral range		< 350 to 900 nm (to 10	0% of peak responsivity)		
Sensitivity			//lux.s		
Quantum Efficiency			with micro lenses		
Optical fill factor		42 % withou	t micro lenses		
Dynamic range		60 dB in li	near mode		
Colour format		Monochrome, Co	our, enhanced NIR		
Characteristic curve		Linear, Piec	ewise linear		
Shutter mode		Global	shutter		
Read out mode		Simultaneous read out (r	ead out during exposure)		
		Can	nera		
			28.7 µs 0.419 s (CL)		
Exposure time	24.1 µs 0.349 s	28.7 µs 0.419 s	24.1 µs 0.349s (GigE)	28.7 µs 0.349 s	
Frame rate	45	19 fps	37 fps (CL); 22 fps (GigE)	45 fps (56 fps (3)	
Pixel clock Camera taps	48 MHz	40 MHz	80 MHz (CL) / 48 MHz (GigE)) / 2 (CL)	80 MHz	
Greyscale resolution	8 bit / 10 bit ⁽¹⁾		10 bit	3 8 bit	
Fixed pattern noise (FPN)	8 DIL 7 TU DIL ⁶⁷		/ correction ON	8 DIL	
Analogue gain		< 1 DN @ 8 DIL	7 correction ON		
Digital gain		0.1 to 15.00	(Fine Gain)(1)		
Configuration interface			ble) (CL) / Gigabit Ethernet (Gi	~F)	
Trigger modes			ger • External trigger input • :		
Features			MROI) • Decimation Y • 2 Loo		
reatures					
	 Constant frame rate Crosshair Convolver 3x3 Temperature Image information Extended trigger input and strobe output functionality 				
	 Extended trigger input and strobe output functionality Modulation can be disabled to transmit original image data⁽²⁾ 				
Interface		ameral ink® Base or GigE (Gig	E Vision & GenICam complian	t)	
Operating temperature		0°C +50°C			
Power supply		+12 V DC (±10 %) (CL) / +12 V +24 V DC (±10 %) (GigE)			
Power consumption		+ 12 V DC (± 10 %) (CL) / + 12 V + 24 V DC (± 10 %) (GigE) < 4.2 W			
Lens mount			Aount optional)		
Dimensions (H x W x L)			50 x 60 x 51.5 mm ³ (GigE)		
Mass			265 g (GigE)		
Conformity		CE / RoHS / WEEE			
Specials	Adiu		ed I/Os ; Dual RS-422 Inputs (C	igE):	
	, 10,0	Evaluation software for the Double Rate Technology			
		Soft	ware		
Camera control	PERemote™ graphical user in		GigE: graphical user interface	GEV Player and SDK: All 3rd	
	party tools providing full supr	ort for GigE Vison and GenIC	am Demodulator DLL for imple	ementation in GigE Vision and	
	GenlCam compatible in	age processing platforms ⁽²⁾ . H	ALCON extension package wit	h demodulator sample ⁽²⁾	
ŌŚ	Wi	ndows and Linux (32 & 64 Bit); other OS (QNX, etc) on requ	lest	

⁽¹⁾ If DR Mode active, 8 bit greyscale output only; 10 bit via LUT
 ⁽²⁾ Appplicable for DR Camera only
 ⁽³⁾ Model available upon request



MAGO

CMOS Smart Camera

SM1 SERIES

1.0 or 1.3 or 2.2 Megapixel smart camera with programmable DSP

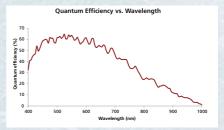
Features

- Available with multiple image sensors
- Programmable Texas Instruments DSP
- Exceptional SNR up to 427:1
- Dynamic range up to 120 dB via LinLog®
- Global shutter
- Monochrome, Enhanced NIR and Colour variants
- Ethernet 100 interface
- 12 bit greyscale resolution
- Internal microSD card

Compatible with



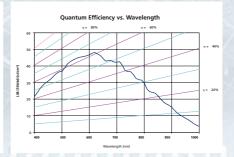
Spectral response of the CMOSIS CMV2000 CMOS image sensor



Spectral response of the Photonfocus A1024B CMOS image sensor



Spectral response of the EV76C560 CMOS image sensor





	SM1-D1024-40*		SM1-D2048x1088*
		Image sensor	
	Photos (compatible)		Chapter Charleson
Image sensor Technology	Photonfocus A1024B (2. Generation)	EV76C560 CMOS active pixel (APS)	CMOSIS CMV2000
Scanning system		Progressive scan	
Optical format / diagonal	1"	1/1.8"	2/3"
Resolution	1024 x 1024 pixels	1280 x 1024 pixels	2048 x 1088 pixels
Full well capacity / SNR	~200 ke ⁻ / 447:1	~12 ke ⁻ / 109:1	~13.5 ke / 116:1
Dynamic range	60 dB in linear mode; 120 dB with LinLog®	60 dB	60 dB
Colour format	Monochrome	Monochrome, colour, enhanced NIR	Monochrome, colour, enhanced NIR
Characteristic curve	Linear, LinLog®	Linear	Linear, piecewise linear
Frame rate	TBD	TBD	TBD
		Processor	
Processor frequency		600 MHz	
Calculation power of the		4800 MIPS	
processor			
Processor manufacturer, type	Texas Instruments DM6435		
SDRAM (DDR2)	256 Mbyte		
Flash Memory	2 Gbyte (internal microSD card)		
		Outputs	
Ethernet TCP/IP, FTP		100 Mbit/s	
Serial interface		RS232 and RS485	
Optocoupled Digital Inputs		2	
Optocoupled Digital Outputs		4	
		Mechanical-Electrical	
Lens mount	C-Mount (CS-Mount optional)		
IO-Connector	C-Mount (CS-Mount optional)		
Ethernet Connector		M12 - 4 Pin	
Power supply		24 VDC / (1130V)	
Dimensions (H x W x L)	55 x 55 x 48 mm ³		
Mass		230 g	
Conformity	CE / RoHS / WEEE		
DSP Development tools	Texas Instruments Code Composer Studio		

* Model available upon request



CMOS Smart Camera

SM2-D1024 SERIES



1 Megapixel smart camera with programmable DSP

Features

- Photonfocus A1024B CMOS image sensor
- 1024 x 1024 pixel resolution
- Programmable Texas Instruments DSP
- HALCON Embedded compatible
- Dynamic range up to 120 dB via LinLog[®]
- Up to 75 fps @ full resolution
- Global shutter
- Monochrome
- GigE interface
- 12 bit greyscale resolution



Compatible with



Spectral response of the Photonfocus A1024B CMOS image sensor



	Image sensor
Image sensor	Photonfocus A1024B (2. Generation)
Technology	CMOS active pixel (APS)
Scanning system	Progressive scan
Optical format / diagonal	1" (15.42 mm diagonal)
Resolution	1024 x 1024 pixels
Pixel size	10.6 µm x 10.6 µm
Active optical area	10.9 mm x 10.9 mm (maximum)
Dark current	2 fA/pixel @ 30°C
Full well capacity	~200 ke"
Spectral range	< 400 to 900 nm
Responsivity	120 x 10 ³ DN / (J/m ²) @ 610 nm / 8 bit / gain = 1
	(approximately 350 DN / (lux s) @ 610 nm / 8 bit / gain = 1)
Quantum Efficiency	45 % @ 550 nm
Optical fill factor	35 % (geometrical)
Dynamic range	60 dB in linear mode; 120 dB with LinLog®
Colour format	Monochrome

Colour format	Monochrome
Characteristic curve	Linear, LinLog®, Skimming
Shutter mode	Global shutter
Read out mode	Sequential or simultaneous read out (read out during exposure)

	canicia
Exposure time	10 µs 0.83 s / 50 ns steps
Frame rate	75 fps
Pixel clock	40 MHz
Camera taps	2 (internal)
Greyscale resolution	8 bit / 10 bit / 12 bit
Fixed pattern noise (FPN)	< 1 DN RMS @ 8 bit / gain = 1 / offset correction ON
Analogue gain	1
Digital gain	1/2/4
Configuration interface	Built-in Webserver
Trigger modes	 Free running (non triggered) Interface trigger External trigger input
Features	Region of Interest (ROI) • 16 Multiple ROI (MROI) • Decimation Y • Image correction • Look-up table (LUT)
	Constant frame rate Image information Realtime clock FTP Server
	 Extended trigger input and strobe output functionality
CPU / RAM / Storage	Texas Instruments TMS320 C6415 @ 1GHz, 8000 MIPS / 256 MB SDRAM / 2 GB SD Card
Interface	GigE
Operating temperature	0°C +50°C
Power supply	+12 V DC (±10 %)
Power consumption	8.0 W
Lens mount	C-Mount (CS-Mount optional)
Dimensions (H x W x L)	60 x 60 x 127 mm ³
Mass	532 g
Conformity	CE / RoHS / WEEE
Specials	Adjustable backfocus; Opto-isolated I/Os; JTAG, RS232 Interface, RS422 Interface

	Software
Camera control	Built-in webserver
DSP Development tools	Texas Instruments Code Composer Studio 3.3, HALCON Embedded

* Product name used by Imago Technologies



CMOS Smart Camera

SM2-D1312 SERIES



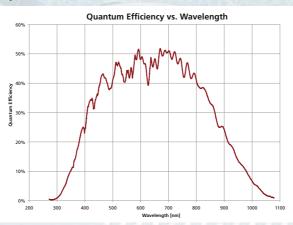
1.4 Megapixel smart camera with programmable DSP

Features

- Photonfocus A1312 CMOS image sensor
- 1312 x 1082 pixel resolution
- Programmable Texas Instruments DSP
- HALCON Embedded compatible
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog[®]
- Up to 108 fps @ full resolution
- JPEG compression @ 68 fps⁽¹⁾
- Global shutter
- Monochrome
- GigE interface
- 12 bit greyscale resolution

Compatible with

Spectral response of the Photonfocus A1312 CMOS image sensor







	SM2-D1312-80-GB-12 VisionCam PS Type 2*				
		Image sensor			
Image sensor	Photonfocus A1312 (3. Generation)				
Technology		CMOS active pixel (APS)			
Scanning system		Progressive scan			
Optical format / diagonal		1" (13.6 mm diagonal) maximum resolution			
		2/3" (11.6 mm diagonal) 1024 x 1024 resolution			
tesolution		1312 x 1082 pixels			
ixel size		8 um x 8 um	-		
Active optical area		10.48 mm x 8.64 mm (maximum)			
Dark current		0.65 fA/pixel			
ull well capacity / SNR		~90 ke ⁻ / 300:1			
pectral range	< 37	70 to 1000 nm (to 10 % of peak respons	ivity)		
esponsivity		x 10 ³ DN / (J/m ²) @ 625 nm / 8 bit / gair			
esponsivity		nately 620 DN / (lux s) @ 625 nm / 8 bit /			
Quantum Efficiency	(approxim	> 50 %	gain = 1)		
Detical fill factor		> 60 %			
Dynamic range		50 dB in linear mode; 120 dB with LinLog	.0		
Colour format	0				
		Monochrome			
haracteristic curve		Linear, LinLog®			
hutter mode	Global shutter				
ead out mode		Sequential or simultaneous read out			
	(read out durin	ng exposure only in linear mode) for high	ner frame rates		
		Camera			
xposure time	10 µs 0.83 s / 50 ns steps	10 µs 0.67 s / 40 ns steps	10 µs 0.41 s / 25 ns steps		
rame rate	55 fps	68 fps	108 fps		
ixel clock	40 MHz	50 MHz	80 MHz		
amera taps		2 (internal)			
reyscale resolution		bit / 12 bit	8 bit		
xed pattern noise (FPN)	< 1 DI	N RMS @ 8 bit / gain = 1 / offset correcti	on ON		
nalogue gain		1			
ligital gain		1/2/4/8			
onfiguration interface		Built-in Webserver			
rigger modes	Free running (not	n triggered) • DSP controlled trigger • Ex	ternal trigger input		
eatures	Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • Image correction • 2 Look-up tables (LUT)				
catales	Constant frame rate • Crosshair • Convolver 3x3 • Temperature • Image information • Realtime clock				
	JPEG Compression ⁽¹⁾ • FTP Server • Extended trigger input and strobe output functionality				
PU / RAM / Storage	Texas Instruments TMS32	20 C6415 @ 1GHz, 8000 MIPS / 256 MB	SDRAM / 2 GB SD Card ⁽²⁾		
nterface		GigE	SDIAM / 2 GD SD Card		
perating temperature		0°C +50°C			
ower supply					
ower supply	+12 V DC (±10%) 10 W				
ens mount	C-Mount (CS-Mount optional)				
imensions (H x W x L)		60 x 60 x 137 mm ³			
Mass		572 g			
Conformity	CE / RoHS / WEEE				
pecials	Adjustable backfocu	is; Opto-isolated I/Os; JTAG, RS232 Interf	ace, RS422 Interface		
		Software			
amore control					
Camera control	Built-in webserver Texas Instruments Code Composer Studio 3.3, HALCON Embedded				
DSP Development tools	lexas instrum	ients code composer Studio 3.3, HALCC	JN EINDeadea		

Product name used by Imago Technologies
 Feature only available for SM2-D1312-JPEG-100-GB-12 camera (for other cameras on request)
 DSP TI TMS320 C6455 @ 1.2GHz, 9600 MIPS / 512 MB SDRAM (available on request)



CMOS Smart Camera

IMAGO

SM2-D2048X1088 SERIES

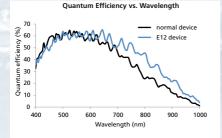
2.0 Megapixel smart camera with programmable DSP

Features

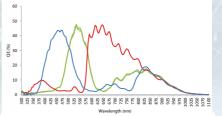
- CMOSIS CMV2000 CMOS image sensor
- 2048 x 1088 pixel resolution
- Programmable Texas Instruments DSP
- Available in monochrome, NIR an colour
- Up to 70 fps @ full resolution
- Highspeed linescan mode with 25700 fps (2048 x 2 pixel, colour and monochrome)
- Global shutter
- GigE interface
- 10 bit greyscale resolution
- Suitable for standard and low light applications

Compatible with

Spectral response of the CMOSIS CMV2000 CMOS image sensor monochrome (left) and color (right)



Quantum Efficiency vs. Wavelength







SM2-D2048x1088(I)-80-GB-12 VisionCam PS Type 2*

Image sensor	CMOSIS CMV2000		
Technology	CMOS active pixel (APS)		
Scanning system	Progressive scan		
Optical format / diagonal	2/3" (12.76 mm diagonal)		
Resolution	2048 x 1088 pixels		
Pixel size	5.5 μm x 5.5 μm		
Active optical area	11.26 mm x 5.984 mm (maximum)		
Dark current	125 e [°] /s @ 25°C		
Full well capacity / SNR	~13.5 ke ⁻		
Spectral range	< 350 to 900 nm (to 10% of peak responsivity)		
Responsivity	5.56 V / lux.s		
Quantum Efficiency	60 % @ 550 nm with micro lenses		
Optical fill factor	42 % without micro lenses		
Dynamic range	60 dB in linear mode		
Colour format	Monochrome, enhanced NIR		
Characteristic curve	Linear, Piecewise linear		
Shutter mode	Global shutter		
Read out mode	Simultaneous read out (read out during exposure)		

Exposure time	12.56 µs 0.349 s		
Frame rate	42 fps		
Pixel clock	80 MHz		
Camera taps	2		
Greyscale resolution	8 bit / 10 bit		
Fixed pattern noise (FPN)	< 1 DN RMS @ 8 bit / gain = 1 / offset correction ON		
Analogue gain	1		
Digital gain	0.1 to 15.99 (Fine Gain) ⁽¹⁾		
Configuration interface	Built-in Webserver		
Trigger modes	 Free running (non triggered) DSP controlled trigger External trigger input 		
Features	Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • Image correction • 2 Look-up tables (LUT)		
	Constant frame rate • Crosshair • Convolver 3x3 • Temperature • Image information • Realtime clock		
	 FTP Server Extended trigger input and strobe output functionality 		
	Highspeed linescan mode		

 Highspeed linescan mode 		
CPU / RAM / Storage	Texas Instruments TMS320 C6415 @ 1GHz, 8000 MIPS / 256 MB SDRAM / 2 GB SD Card ⁽¹⁾	
Interface	GigE	
Operating temperature	0°C +50°C	
Power supply	+12 V DC (±10 %)	
Power consumption	10 W	
Lens mount	C-Mount (CS-Mount optional	
Dimensions (H x W x L)	60 x 60 x 137 mm ³	
Mass	572 g	
Conformity	CE / RoHS / WEEE	
Specials	Adjustable backfocus; Opto-isolated I/Os; JTAG, RS232 Interface, RS422 Interface	

Camera control DSP Development tools

Built-in webserver Texas Instruments Code Composer Studio 3.3, HALCON Embedded

* Product name used by Imago Technologies ⁽¹⁾ DSP TI TMS320 C6455 @ 1.2GHz, 9600 MIPS / 512 MB SDRAM (available on request)



CMOS 3D Camera

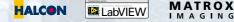
MV-D1024E-3D01-160-CL-12

1 Megapixel 3D camera for laser triangulation applications

Features

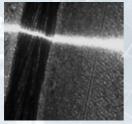
- Photonfocus A1024B CMOS image sensor
- 1024 x 1024 pixel resolution
- Realtime laserline Peak Detection algorithm on camera
- Dynamic range up to 120 dB via LinLog[®]
- Up to 2500 profiles/s @ 1024 x 32 pixel resolution
- Global shutter
- Monochrome
- CameraLink[®] interface
- 12 bit greyscale resolution

Compatible with

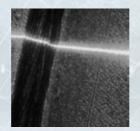


Advantages

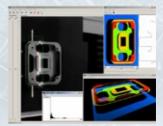
- No additional calculations on CPU
- Reduction of vision system computer CPU load
- PF 3D Suite, a free GUI for an easy system set up and visualisation of 3D scans
- Higher accuracy and robustness through new Peak Detection algorithm



Standard camera with linear response (< 60 dB) 52



Photonfocus CMOS camera with LinLog[®] response (120 dB)



PF 3D Suite





MV-D1024E-3D01-160-CL-12

	Image sensor		
Image sensor	Photonfocus A1024B (2. Generation)		
Technology	CMOS active pixel (APS)		
Scanning system	Progressive scan		
Optical format / diagonal	1" (15.42 mm diagonal)		
Resolution	1024 x 1024 pixels		
Pixel size	10.6 μm x 10.6 μm		
Active optical area	10.9 mm x 10.9 mm (maximum)		
Dark current	2 fA/pixel @ 30°C		
Full well capacity	~200 ke ⁻		
Spectral range	< 400 to 900 nm		
Responsivity	120 x 10 ³ DN / (J/m ²) @ 610 nm / 8 bit / gain = 1		
	(approximately 350 DN / (lux s) @ 610 nm / 8 bit / gain = 1)		
Quantum Efficiency	45 % @ 550 nm		
Optical fill factor	35 % (geometrical)		
Dynamic range	60 dB in linear mode; 120 dB with LinLog®		
Colour format	Monochrome		
Characteristic curve	Linear, LinLog®, Skimming		
Shutter mode	Global shutter		
Read out mode	Sequential or simultaneous read out (read out during exposure)		

Camera			
Exposure time	10 µs 0.41 s / 25 ns steps		
Frame rate	150 fps @ full resolution / 2500 fps @ 1024 x 32 resolution / 3900 fps @ 512 x 32 resolution		
Pixel clock	80 MHz		
Camera taps	2		
Greyscale resolution	8 bit / 10 bit / 12 bit		
ixed pattern noise (FPN)	< 1 DN RMS @ 8 bit / gain = 1 / offset correction ON		
Analogue gain	1		
Digital gain	1/2/4		
Configuration interface	CL SERIAL (9600 or 57600 Baud, user selectable)		
Trigger modes	 Free running (non triggered) • Interface trigger • External trigger input 		
eatures • Region of Interest (ROI) • 16 Multiple ROI (MROI) • Decimation Y • Image correction •			
	 Constant frame rate Image information Peak Detector 		
	 Extended trigger input and strobe output functionality 		
nterface	CameraLink® Base		
Operating temperature	0°C +50°C		
Power supply	+12 V DC (±10%)		
Power consumption	3.7 W		
ens mount	C-Mount (CS-Mount optional)		
Dimensions (H x W x L)	55 x 55 x 40 mm³		
Mass	210 g		
Conformity	CE / RoHS / WEEE		
Specials	Adjustable backfocus; Opto-isolated I/Os		

	Software
Camera control	PF 3D Suite graphical user interface (GUI) and PF3DLib (SDK)
OS	win2k; winxp; winvista; other OS (Linux, QNX, etc) on request



CMOS 3D Camera

MV1-D1312-3D02-160-G2-8

1.4 Megapixel 3D camera for laser triangulation applications

Features

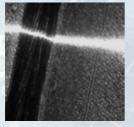
- Photonfocus A1312 CMOS image sensor
- 1312 x 1082 pixel resolution
- Realtime laserline Peak Detection algorithm on camera
- Dynamic range up to 120 dB via LinLog[®]
- Up to 3266 profiles/s @ 1312 x 16 pixel resolution
- Global shutter
- Monochrome
- Gigabit Ethernet interface
- 12 bit greyscale resolution
- Halcon toolkit available



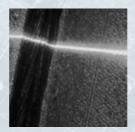


Advantages

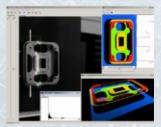
- No additional calculations on CPU
- Reduction of vision system computer CPU load
- PF 3D Suite, a free GUI for an easy system set up and visualisation of 3D scans
- Higher accuracy and robustness through new Peak Detection algorithm



Standard camera with linear response (< 60 dB)



Photonfocus CMOS camera with LinLog® response (120 dB)



PF 3D Suite



MV1-D1312-3D02-160-G2-8

	Image sensor			
Image sensor	Photonfocus A1312 (3. Generation)			
Technology	CMOS active pixel (APS)			
Scanning system	Progressive scan			
Optical format / diagonal	1" (13.6 mm diagonal) maximum resolution			
	2/3" (11.6 mm diagonal) 1024 x 1024 resolution			
Resolution	1312 x 1082 pixels (1312 x 1009 for 3D measurement)			
Pixel size	8 µm x 8 µm			
Active optical area	10.48 mm x 8.64 mm (maximum)			
Dark current	0.65 fA/pixel			
Full well capacity / SNR	~90 ke ⁻ / 300:1			
Spectral range	< 370 to 1000 nm (to 10 % of peak responsivity)			
Responsivity	210 x 10 ³ DN / (J/m ²) @ 625 nm / 8 bit / gain = 1			
	(approximately 620 DN / (lux s) @ 625 nm / 8 bit / gain = 1)			
Quantum Efficiency	> 50 %			
Optical fill factor	> 60 %			
Dynamic range	60 dB in linear mode; 120 dB with LinLog®			
Colour format	Monochrome			
Characteristic curve	Linear, LinLog®			
Shutter mode	Global shutter			
Read out mode	Sequential read out or simultaneous read out (read out during exposure only in linear mode) for higher frame rates			

Camera			
Exposure time	10 µs 0.41 s / 25 ns steps		
Frame rate (3D mode)	113 fps @ full resolution / 3266 fps @ 1312 x 16 resolution / 5500 fps @ 544 x 16 resolution		
Pixel clock	80 MHz		
Camera taps	2		
Greyscale resolution	8 bit / 10 bit / 12 bit		
Fixed pattern noise (FPN)	< 1 DN RMS @ 8 bit / gain = 1 / offset correction ON		
Analogue gain	1		
Digital gain	0.1 to 15.99 (Fine Gain)		
Configuration interface	Gigabit Ethernet		
Trigger modes	 Free running (non triggered) • Interface trigger • External trigger input 		
Features	Region of Interest (ROI) Constant frame rate		
	• A/B RS-422 shaft encoder interface		
	 Decimation Y • Image correction • Look-up table (LUT) 		
	Image information Peak Detector		
	 Extended trigger input and strobe output functionality 		
Interface	GigE (GigE Vision & GenlCam compliant)		
Operating temperature	0°C +50°C		
Power supply	+12 V +24 V DC (±10%)		
Power consumption	< 6 W		
Lens mount	C-Mount (CS-Mount optional)		
Dimensions (H x W x L)	60 x 60 x 51 mm ³		
Mass	310 g		
Conformity	CE / RoHS / WEEE		
Specials	Adjustable backfocus; Opto-isolated I/Os		
<u> </u>			
	Software		
	SUTLWATE		

PF 3D Suite graphical user interface (GUI) and PF3DLib (SDK); Graphical user interface GEV Player and SDK; All 3rd party tools providing full support for GigE Vison and GenlCam⁽¹⁾ Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request

Camera control

nera	control		

OS

(1) 3D and 2D data extraction must be done by the user



MV1-D2048X1088-3D03-760-G2-8

2.2 Megapixel 3D camera for laser triangulation applications

Features

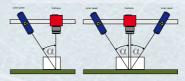
- CMOSIS CMV2000 CMOS image sensor
- 2048 x 1088 pixel resolution
- Realtime DUAL laserline Peak Detection algorithm on camera
- Additional peak information (width and quality) for scatter measurements
- Combined 3D and linescan mode
- Up to 8450 profiles/s @ 2048 x 32 resolution
- Global shutter
- Monochrome
- Gigabit Ethernet Interface
- 8 bit greyscale resolution with subpixel accuracy
- Boardlevel or OEM solution available
- Halcon toolkit available

Advantages

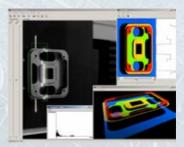
- Dual Peak eliminates the need of a 2nd camera for various setups
- Scatter measurement with additional peak information possible
- Dual 2D single line for 2D surface inspection and overlay
- No additional calculations on CPU
- Reduction of vision system computer CPU load
- PF 3D Suite a free GUI for an easy system set up and visualisation of 3D scan
- Higher accuracy and robustness through new Peak Detection algorithm



GIGE VISION GENKI>CAM



triangulation setups



PF 3D Suite



	Image Sensor		
Image sensor	CMOSIS CMV2000		
Technology	CMOS active pixel (APS)		
Scanning system	Progressive scan		
Optical format / diagonal	2/3" (12.76 mm diagonal)		
Resolution	2048 x 1088 pixels (2048 x 1009 for 3D measurement)		
Pixel size	5.5 μm x 5.5 μm		
Active optical area	11.26 mm x 5.984 mm (maximum)		
Dark current	125 e7/s @ 25°C		
Full well capacity / SNR	~13.5 ke ⁻		
Spectral range	< 350 to 900 nm (to 10 % of peak responsivity)		
Sensitivity	5.56 V / lux.s		
Quantum Efficiency	60 % @ 550 nm with micro lenses		
Optical fill factor	42 % without micro lenses		
Dynamic range	60 dB in linear mode		
Colour format	Monochrome		
Characteristic curve	Linear, Piecewise linear		
Shutter mode	Global shutter		
Read out mode	Simultaneous read out (read out during exposure)		

Camera		
12.56 µs 0.349		
348 fps ⁽²⁾ @ full resolution / 8450 fps ⁽²⁾ @ 2048 x 32 resolution		
48 MHz		
1		
8 bit / 10 bit		
< 1 DN RMS @ 10 bit / gain = 1 / offset correction ON		
1		
0.1 to 15.99 (Fine Gain)		
GigE (GigE Vision & GenlCam compliant)		
Free running (non triggered) • Interface trigger • External trigger input		
Region of Interest (ROI) Decimation Y		
 Constant frame rate Extended trigger input and strobe output functionality 		
 Dual Peak Detector with dual 2D single line for 2D surface inspection 		
 A/B RS-422 shaft encoder interface 		
Gigabit Ethernet		
0°C +50°C		
+12 V +24 V DC (±10 %)		
< 5 W		
C-Mount (CS-Mount optional)		
55 x 55 x 51.5 mm ³		
265 g		
CE / RoHS / WEEE		

Conformity Specials

Adjustable backfocus; isolated I/Os; A/B RS-422 shaft encoder interface; dual peak; combined 3D and linescan mode

Camera control

ŌS

PF 3D Suite graphical user interface (GUI) and PF3DLib (SDK); Graphical user interface GEV Player and SDK; All 3rd party tools providing full support for GigE Vison and GenlCam⁽¹⁾ Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request

⁽¹⁾ 3D and 2D data extraction must be done by the user ⁽²⁾ Output 3D only with additional 2D line (max. 2048 x 1009)



HD1 SERIES

1.4 or 4.3 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A1312 or A2080 CMOS image sensor
- 1312 x 1082 or 2080 x 2080 pixel resolution
- Odd/even rows with independent exposure time and response curve
- Good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog[®], extended dynamic range with odd/even HDR
- Up to 108 fps (1.4 MP), 577 fps (VGA) or 34 fps (4MP) @ full resolution over single standard GigE Interface
- Global shutter
- Monochrome
- Extended features
- CameraLink[®] and GigE interface
- 12 bit greyscale resolution
- Configuration via register based ASCII protocol possible
- Boardlevel or OEM solution available

Advantages

- Odd/even HDR results in a linear response curve







Odd image

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Even image

Combined image



VISION GEN(I)CAM



Photonfocus A1312 (3. Generation) Photonfocus A2080 (3. Generation) Image senso CMOS active pixel (APS) Technology Scanning system Progressive scan Optical format / diagonal 1" (13.6 mm diagonal) maximum resolution 23.5 mm diagonal @ max. resolution 2/3" (11.6 mm diagonal) 1024 x 1024 resolution 1312 x 1082 pixels (< 25 mm image circle) 2080 x 2080 pixels Resolution Pixel size 8 µm x 8 µm Active optical area 10.48 mm x 8.64 mm (maximum) 16.64 mm x 16.64 mm (maximum) Dark current 0.65 fA/pixel ~90 ke⁻ (Max SNR > 300:1) Full well capacity / SNR < 370 to 1000 nm (to 10 % of peak responsivity) Spectral range 210 x 103 DN / (J/m2) @ 625 nm / 8 bit / gain = 1 Responsivity (approximately 620 DN / (lux s) @ 625 nm / 8 bit / gain = 1) Quantum Efficiency > 50 % Optical fill factor > 60 % Dynamic range 60 dB in linear mode; 120 dB with LinLog® Colour format Monochrome Characteristic curve Linear or LinLog® can be set for for odd/even rows independent Global shutter Shutter mode Read out mode Sequential read out 10 μs ... 0.33 s / 2015 3... 34 fps (full resolution) Exposure time 10 µs ... 0.41 s / 25ns steps 108 fps (CL); 55fpd (GigE) . 0.33 s / 25ns steps Frame rate Pixel clock 40 MHz Camera taps 4 8 bit / 10 bit⁽¹⁾ / 12 bit⁽¹⁾ Greyscale resolution Fixed pattern noise (FPN) < 1 DN @ 8 bit / correction ON Analogue gain 0.1 to 15.99 (Fine Gain) Digital gain CL SERIAL (Baudrate user selectable) Configuration interface • Free running (non triggered) • Interface trigger • External trigger input • Software trigger Trigger modes Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • Image correction • 2 Look-up tables (LUT) Features Constant frame rate Crosshair Convolver 3x3 Temperature Image information · Extended trigger input and strobe output functionality Modulation can be disabled to transmit original image data CameraLink® Base Interface Operating temperature 0°C ... +50°C +12 V DC (±10%) < 3.3 W Power supply Power consumption C-Mount (CS-Mount optional) M42x1, F-Mount, C-Mount 1.3 Lens mount Dimensions (H x W x L) 60 x 60 x 45 mm³ 60 x 60 x 47 mm³ Mass 265 g 222 g CE / RoHS / WEEE Specials Adjustable backfocus; Opto-isolated I/Os Application example software for the HD1 technology PFRemote™ graphical user interface (GUI) and PFLib (SDK); GigE: graphical user interface GEV Player and SDK; All 3rd party tools providing full support for GigE Vison and GenlCam Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request Camera control OS

(1) If DR Mode active, 8 bit greyscale output only

* Model available upon request



DR1 SERIES WITH PHOTONFOCUS SENSOR

1.4 or 4.3 Megapixel resolution with Photonfocus sensor

Features

- Photonfocus A1312 or A2080 CMOS image sensor
- 1312 x 1082 or 2080 x 2080 pixel resolution
- Good NIR spectral response
- Exceptional SNR up to 300:1
- Dynamic range up to 120 dB via LinLog®
- Up to 135 fps (1.4 Mp), 42 fps (4Mp), 600 fps (544 x 544 pixel)
- Photonfocus Double Rate technology
- Global shutter
- Monochrome
- GigE interface (GigE Vision and GenICam compatible with standard single cable connection)
- 8 bit greyscale resolution
- Boardlevel or OEM solution available

LabVIEW

Compatible with

HALCON

Advantages

- ~100 % faster than standard GigE cameras
- Modulation can be disabled to transmit original image data

1ATROX

IMAGING

- No Link-Aggregation



Original image



Modulated-demodulated image



Detailed view







Photonfocus A1312 (3. Generation) Photonfocus A2080 (3. Generation) Image senso Technology CMOS active pixel (APS) Scanning system Progressive scan Optical format / diagonal 1" (13.6 mm diagonal) maximum resolution 23.5 mm diagonal @ max. resolution 2/3" (11.6 mm diagonal) 1024 x 1024 resolution 1312 x 1082 pixels (< 25 mm image circle) 2080 x 2080 pixels Resolution Pixel size 8 µm x 8 µm Active optical area 10.48 mm x 8.64 mm (maximum) 16.64 mm x 16.64 mm (maximum) Dark current 0.65 fA/pixel ~90 ke (Max SNR > 300:1) Full well capacity / SNR < 370 to 1000 nm (to 10 % of peak responsivity) Spectral range 210 x 103 DN / (J/m2) @ 625 nm / 8 bit / gain = 1 Responsivity (approximately 620 DN / (lux s) @ 625 nm / 8 bit / gain = 1) Quantum Efficiency > 50 % Optical fill factor > 60 % 60 dB in linear mode; 120 dB with LinLog® Dynamic range Colour format Monochrome Characteristic curve Linear, LinLog Global shutter Shutter mode Read out mode Sequential read out or simultaneous read out (read out during exposure only in linear mode) for higher frame rates Exposure time 10 µs ... 0.33 s / 25ns steps 135 fps (full resolution), 577 fps (VGA) 10 µs . 0.33 s / 25ns steps 42 fps (full resolution) Frame rate Pixel clock 50 MHz Camera taps Greyscale resolution 8 bit / 10 bit(1) / 12 bit(1) Fixed pattern noise (FPN) < 1 DN @ 8 bit / correction ON Analogue gain 0.1 to 15.99 (Fine Gain) Digital gain Configuration interface GigE Trigger modes Free running (non triggered) • Interface trigger • External trigger input • Software trigger Region of Interest (ROI) • 512 Multiple ROI (MROI) • Decimation Y • Image correction • 2 Look-up tables (LUT) Features Constant frame rate Crosshair Convolver 3x3 Temperature Image information · Extended trigger input and strobe output functionality Modulation can be disabled to transmit original image data Interface GigE Operating temperature 0°C +50°C Power supply +12 V . .. +24 V DC (±10%) < 5.2 W Power consumption C-Mount (CS-Mount optional) M42x1, F-Mount, C-Mount 1.3 60 x 60 x 47 mm³ Dimensions (H x W x L) 60 x 60 x 51 mm³ Mass 294 g CE / RoHS / WEEE Adjustable backfocus; Opto-isolated I/Os; Dual RS-422 Inputs Specials Evaluation software for the Double Rate Technology

Camera control

GUI (GEVPlayer) and Pleora SDK for image acquisition and development of applications Demodulator DLL for implementation in GigE Vision and GenICam compatible image processing platforms HALCON extension package with demodulator sample Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request

OS

(1) If DR Mode active, 8 bit greyscale output only

* Model available upon request



DR1 SERIES WITH CMOSIS SENSOR

2.2 or 4.1 Megapixel resolution with CMOSIS sensor

Features

- CMOSIS CMV2000 or CMV4000 CMOS image sensor
- 2048 x 1088 or 2048 x 2048 pixel resolution
- Standard, NIR and colour versions
- SNR up to 110:1
- Up to 135 fps (1.4 Mp), 45 fps (4Mp), 709 fps (512 x 512 pixel), 570 fps (rot. VGA)
- Photonfocus Double Rate technology
- Global shutter
- Monochrome, enhanced NIR and Colour
- GigE interface (GigE Vision and GenICam compatible with standard single cable connection)
- 8 bit greyscale resolution
- Boardlevel or OEM solution available

Advantages

- ~100 % faster than standard GigE cameras
- Modulation can be disabled to transmit original image data
- No Link-Aggregation
- Single standard GigE cable



Original image



Modulated–demodulated image





Colour version awailable



Detailed view



Image Sensor				
mage sensor	CMOSIS CMV2000 CMOSIS CMV4000			
Technology	CMOS active			
canning system	Progressive scan			
Optical format / diagonal	2/3" (12.76 mm diagonal) 1" (16 mm diagonal)			
Resolution	2048 x 1088 pixels	2048 x 2048 pixels		
ixel size	5.5 µm >			
Active optical area	11.26 mm x 5.984 mm (maximum)	, 11.26 mm x 11.26 mm (maximum)		
Dark current	125 e7/s			
ull well capacity / SNR	~13.			
pectral range	< 350 to 900 nm (to 10			
esponsivity	5.56 V			
Quantum Efficiency	60 % @ 550 nm			
ptical fill factor	42 % without			
lynamic range	60 dB in lin			
colour format	Monoc			
haracteristic curve	Linear. Piece			
hutter mode	Global			
tead out mode	Simultaneous read out (re			
	Carr	nera		
xposure time				
rame rate	12.56 µs 0.349 s / 20.8 ns steps 135 fps (full resolution), 709 fps (rot. VGA)	24.1 µs 0.349 s / 20.8 ns steps 45 fps (full resolution), 709 fps (rot. VGA)		
xel clock	135 lps (ruii lesolution), 709 lps (rot. VGA) 48 N			
	48 M	VIHZ		
amera taps	0.134.44			
ireyscale resolution ixed pattern noise (FPN)	8 bit / 1 < TBD DI			
naloque gain		16901		
ligital gain	0.1 to 15.99	(Fine Cain)		
onfiguration interface				
rigger modes	GigE (Gigab			
eatures	Free running (non triggered) Interface triggered) Region of Ir			
eatures				
	 Constant frame rate Temperature Image information Extended trigger input and strobe output functionality 			
	Modulation can be disabled 1 Gigab			
nterface				
perating temperature	0°C			
ower supply	+12 V +24			
ower consumption	< TB			
ens mount	C-Mount (CS-Mount optional)	C-Mount (CS-Mount optional)		
Dimensions (H x W x L)	55 x 55 x 51.5 mm ³	60 x 60 x 47 mm ³		
Aass	260 g	260 g		
onformity	CE / RoH			
pecials	Adjustable backfocus; Opto-isc			
	Evaluation software for the Double Rate Technology			
	Softv	ware		
Camera control		GUI (GEVPlayer) and Pleora SDK for image acquisition and development of applications		
	Demodulator DLL for implementation in GigE Vision and GenlCam compatible image processing platforms HALCON extension package with demodulator sample			
DS	Windows and Linew (22.9.64 Bit)	e with demodulator sample		
د <i>ر</i>	Windows and Linux (32 & 64 Bit); other OS (QNX, etc) on request			

⁽¹⁾ If DR Mode active, 8 bit greyscale output only * Model available upon request



Accessories

CAMERALINK® REPEATER

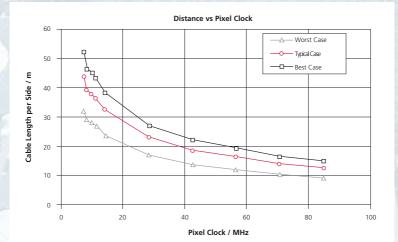
Link to the Success

Features

- CameraLink[®] extension up to 40 m
- 100% CameraLink[®] compatible
- Compact & robust industrial housing
- Active clock and data regeneration
- With "zero skew"
- Bridging of long distances with
- CameraLink[®] interface
- No cable insertion losses
- Automatic stand-by mode
- Power-up failsafe
- Plug and play



Range of CameraLink® with AWG 28 standard cable





Digipeater[®] CLB26

Cable length	Up to 20 m per side @ 20 MHz		
Digital interface	CameraLink® Base and Medium Configuration		
Max. pixel clock	85 MHz @ 8 m cable length (with AWG 28 cable)		
Min. pixel clock	20 MHz @ 20 m cable length (with AWG 28 cable)		
Features	 Power-up failsafe Active clock and data regeneration with "zero skew" 		
	 Hot swappable plug Automatic stand-by mode 		
Operating temperature	0 °C + 60 °C		
Power supply	+ 5 V + 8 V DC (+/-10 %)		
Power consumption	1.0 W		
Interface connector	MDR26 (CameraLink®)		
Power connector	Binder connector series 712		
Dimensions	57 x 36 x 107 mm ³		
Mass	160 g		
Conformity	CE / RoHS / WEE		











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