User Manual for Machine Vision Cameras

Contents

1 Introduction to ToupCam machine vision cameras

1.1 Product description

The cameras mentioned in this manual are imaging capture devices which use USB3.0 to transmit uncompressed images in real time. They support image acquisition and parameter setting (such as working mode, image parameter adjustment etc.) through client-side user-friendly software.

SWIR(Short-Wavelength Infrared) series are TE-Cooling USB3.0 InGaAs cameras;

IUX series is USB3.0 interface cameras for industrial applications. It includes IUA，IUB and IUC.

IUA is mainly for the 1/2.8”~1.1”sensor；

IUB is mainly for the GSENSE sensor with sensor size 1/1.1”~1.7”；

IUC is for the APS and full frame sensor(2.7”)；

I3ISPM series is USB3.0 interface color camera for industrial applications, having built-in hardware ISP to ensure color reproduction and higher video speed. The resolution coverage is from 0.5MP to 20MP;

I3CMOS series is USB3.0 interface monochrome camera for industrial applications. The resolution coverage is from 0.5MP to 20MP;

KMA means black/white camera and KPA means color camera which having built-in hardware ISP to ensure color reproduction and higher video speed. The resolution coverage is from 1.7MP to 43MP.

1.2 Characteristics

- Sony Exmor back-illuminated CMOS sensor;
- Two-step noise reduction technology;
- Ultra-high sensitivity and low noise;
- USB 3.0 data transmission interface compatible with USB2.0 protocol;
- Provides advanced video and image processing application software ToupView, compatible with Windows/Linux/OSX multi-platform SDK, support native C/C++, C#/VB.Net, DirectShow, Twain API;
- Supports external triggering, digital I/O and free-running modes;
- Supports ROI, flip, bit-depth switching and other features;
- Supports firmware worksite upgrading;
- Compliant with CE, FCC requirements.

1.3 SWIR series camera specifications(SWIR, 2)

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
SWIR1300KMA	1.3M/IMX990(M) 1/2”(6.40x5.12)	5 x5	121mV with 1/30s 1.0mV with 1/30s	132@1280x1024 253@640x512	1x1 1x1	50us~60s
SWIR330KMA	0.33M/IMX991(M) 1/4”(3.20x2.56)	5 x5	121mV with 1/30s 1.0mV with 1/30s	258.8@640x512 486.1@320x256	1x1 1x1	50us~60s

1.4 IUA series camera specifications(Moderate sensor size, general or special wavelength, 32)

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure

						Time
IUA390KMA	0.4M/IMX287LLR(M,GS) 1/2.9“ (4.97x3.73)	6.9x6.9	7320mv with 1/30s 0.76mv with 1/30s	101.5fps@720×540	1x1	6us~15s
IUA503KMA	0.5M/IMX426LLJ(M,GS) 1/1.7“ (7.2x5.58)	9.0x9.0	8100mv with 1/30s 0.3mv with 1/30s	79.8fps@800×620	1x1	6us~15s
IUA503KMB	0.5M/IMX433LLJ(M,GS) 1/1.7“ (7.2x5.58)	9.0x9.0	8100mv with 1/30s 0.3mv with 1/30s	79.8fps@800×620	1x1	6us~15s
IUA1500KMA	1.5M/IMX273LLR(C,GS) 1/2.9“ (4.97x3.73)	3.45×3.45	1830mv with 1/30s 0.15mv with 1/30s	155fps@1440×1080 523fps@720×540	1x1 1x1	15us~15s
IUA1500KPA	1.5M/IMX273LQR(C,GS) 1/2.9“ (4.97x3.73)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	155fps@1440×1080 523fps@720×540	1x1 1x1	15us~15s
IUA1700KMA	1.7M/IMX432LLJ(M,GS) 1.1“ (14.4x9.9)	9.0x9.0	8100mv with 1/30s 0.3mv with 1/30s	98.6fps@1600×1100	1x1	6us~15s
IUA1700KPA	1.7M/IMX432LQJ(C,GS) 1.1“ (14.4x9.9)	9.0x9.0	4910mv with 1/30s 0.3mv with 1/30s	98.6fps@1600×1100	1x1	6us~15s
IUA2300KMA	2.3M/IMX174LLJ(M,GS) 1/1.2 “ (11.25x7.03)	5.86x5.86	1650mv with 1/30s 0.15mv with 1/30s	164.5fps@1920×1200	1x1	15us~15s
IUA2300KPA	2.3M/IMX174LQJ(C,GS) 1/1.2 “ (11.25x7.03)	5.86x5.86	1016mv with 1/30s 0.15mv with 1/30s	164.5fps@1920×1200	1x1	15us~15s
IUA2300KMB	2.3M/IMX249LLJ(M,GS) 1/1.2“ (11.25x7.03)	5.86x5.86	1650mv with 1/30s 0.15mv with 1/30s	30fps@1920×1200	1x1	42us~15s
IUA2300KPB	2.3M/IMX249LQJ(C,GS) 1/1.2“ (11.25x7.03)	5.86x5.86	1016mv with 1/30s 0.15mv with 1/30s	30fps@1920×1200	1x1	42us~15s
IUA2800KMA	2.8M/IMX421LLJ(M,GS) 2/3“ (8.71x6.59)	4.5x4.5	3354mv with 1/30s 0.15mv with 1/30s	121fps@1936×1464 425fps@968×732	1x1 1x1	6us~15s
IUA2800KPA	2.8M/IMX421LQJ(C,GS) 2/3“ (8.71x6.59)	4.5x4.5	2058mv with 1/30s 0.15mv with 1/30s	121fps@1936×1464 425fps@968×732	1x1 1x1	6us~15s
IUA5000KMA	5.0M/IMX264LLR(M,GS) 2/3“ (8.45x7.07)	3.45×3.45	1830mv with 1/30s 0.15mv with 1/30s	35.6fps@2448×2048 87.6fps@1224×1024	1x1 1x1	15us~15s
IUA5000KPA	5.0M/IMX264LQR(C,GS) 2/3“ (8.45x7.07)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	35.6fps@2448×2048 87.6fps@1224×1024	1x1 1x1	15us~15s
IUA6300KMA	6.3M/IMX178LLJ(M,RS) 1/1.8“ (7.37x4.92)	2.4x2.4	760mv with 1/30s 0.15mv with 1/30s	59.9fps@3072×2048 59.9fps@1536×1024	1x1 2x2	17us~15s
IUA6300KPA	6.3M/IMX178LQJ(C,RS) 1/1.8“ (7.37x4.92)	2.4x2.4	425mv with 1/30s 0.15mv with 1/30s	59.8fps@3072×2048 59.5fps@1536×1024	1x1 2x2	17us~15s
IUA7100KMA	7.1M/IMX428LLJ(M,GS) 1.1“ (14.4x9.9)	4.5x4.5	3354mv with 1/30s 0.15mv with 1/30s	51.3fps@3200×2200 133.8fps@1584×1100	1x1 1x1	6us~15s
IUA7100KPA	7.1M/IMX428LQJ(C,GS) 1.1“ (14.4x9.9)	4.5x4.5	2058mv with 1/30s 0.15mv with 1/30s	51.4fps@3200×2200 133.8fps@1584×1100	1x1 1x1	6us~15s
IUA8300KPA	8.3M/IMX485LQJ-C(C,RS) 1/1.2“ (11.14x6.26)	2.9x2.9	2188mv with 1/30s 0.15mv with 1/30s	45fps@3840x2160 70fps@1920x1080	1x1 1x1	20us~15s
IUA20000KMA	20.0M/IMX183CLK(M,RS) 1”(13.06x8.84)	2.4x2.4	777mv with 1/30s 0.2mv with 1/30s	19.0fps@5440×3684 49.9fps@2736×1824 59.5fps@1824×1216	1x1 2x2 3x3	53us~15s
IUA20000KPA	20.0M/IMX183CQK(C,RS) 1“ (13.06x8.84)	2.4x2.4	462mv with 1/30s 0.2mv with 1/30s	19.0fps@5440×3684 48.8fps@2736×1824 59.4fps@1824×1216	1x1 2x2 3x3	53us~15s
IUA20400KMA	20.4M/IMX541-AAMJ-C(M,GS) 1.1“ (12.32x12.32)	2.74x2.74	2649mv with 1/30s 0.15mv with 1/30s	17.5fps@4496×4496 64.4fps@2240×2240 64.4fps@1120×1120	1x1 2x2 4x4	30us~15s
IUA20400KPA	20.4M/IMX541-AAQJ-C(C,GS) 1.1“ (12.32x12.32)	2.74x2.74	1574mv with 1/30s 0.15mv with 1/30s	17.5fps@4496×4496 64.4fps@2240×2240 64.4fps@1120×1120	1x1 2x2 4x4	30us~15s
IUA45000KMA	45M/IMX492(M) 4/3“ (19.11x13.00)	2.315x2.315	176mv with 1/30s 0.03mv with 1/30s	8.1@8176x5616 30.0@4080x2808 8.1@7408x5556 33.0@3696x2778 10.4@8176x4320 34.7@4096x2160 62.5@2048x1080 86.5@1360x720	1x1(3:2) 2x2(3:2) 1x1(4:3) 2x2(4:3) 1x1(17:9) 2x2(17:9) 3x3(17:9) 4x4(17:9)	0.1ms~15s
IUA-Special wavelength（UV， NIR）						
IUA2100KPA (NIR)	2.1M/IMX462LQR(C,RS,NIR) 1/2.8“ (5.57x3.13)	2.9x2.9	2376mv with 1/30s 0.15mv with 1/30s	120.3fps@1920 x 1080	1x1	11us~15s
IUA4100KPA (NIR)	4.1M/IMX464LQR(C,RS,NIR) 1/1.8“ (7.8x4.41)	2.9x2.9	2376mv with 1/30s 0.15mv with 1/30s	90fps@2688 x 1520	1x1	11us~15s
IUA1300KMA (GPixel UV)	1.3M/GLUX9701BSI(M,UV,RS) 1“(12.49x9.99)	9.76x9.76	$2.57x10^8$(e-/((W/m2).s)) QE89%@610nm 11(e-/s/pix)	30fps@1280×1024 30fps@640×512	1x1 2x2	21us~60s
IUA4200KMA (GPixel NIR)	4.2M/GSENSE2020e(M,NIR,RS) 1.2“(13.31x13.31)	6.5x6.5	$8.1x10^7$(e-/((W/m2).s)) QE73%@595nm 13(e-/s/pix)	45fps@2048×2048 45fps@1024×1024	1x1 2x2	21us~60s

IUA4200KMB (GPixel UV)	4.2M/GSENSE2020BSI (M,UV,RS) 1.2“(13.31x13.31)	6.5x6.5	1.1x108(e-/((W/m2).s)) QE93.7%@550nm 80(e-/s/pix)	32fps@2048×2048 32fps@1024×1024	1x1 2x2	21us~60s
IUA4200KME (GPixel UV)	4.2M/GSENSE400BSI(M,UV,RS) 2.0“(22.53x22.53)	11.0x11.0	3.25x108(e-/((W/m2).s)) QE95.3%@560nm 345(e-/s/pix)	37fps@2048×2048 37fps@1024×1024	1x1 2x2	21us~60s
IUA8000KMA (GS-UV)	8.0M/IMX487-AAMJ(M,UV,GS) 2/3“ (7.78x7.78)	2.74x2.74	145mv with 1/30s 0.15mv with 1/30s	45fps@2840×2840 198fps@1420×1420	1x1 2x2	30us~15s

M: Monochromatic; C: Color; UV: Ultra Violet; RS: Rolling Shutter; GS: Global Shutter; NIR: NIR Up.

1.5 IUB series camera specifications(End of life, not recommended 3)

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
IUB4200KMA EOL	4.2M/GSENSE2020e(M,RS) 1.2“ (13.31x13.3)	6.5x6.5	8.11x107e-/((W/m2)·s) 7e-/s/pix	45fps@2048×2046 45fps@1024×1022	1x1 2x2	TBD
IUB4200KMB NRND	4.2M/GSENSE2020BSI(M,RS) 1.2“ (13.31x13.3)	6.5x6.5	1.1x108 e-/((W/m2)·s) 80e-/s/pix	43.6fps@2048×2046 43.6fps@1024×1022	1x1 2x2	150us-60s
IUB43000KMA EOL	43.0M/GMAX0806 (M,GS) 1.7“ (22.13x15.21, APS-C)	2.8x2.8	1.19x107e-/((W/m2)·s) 1e-/s/pix	8.5fps@7904×5432	1x1 2x2	15us-15s

M: Monochromatic; C: Color; RS: Rolling Shutter; GS: Global Shutter.

EOL: End of life. NRND: Not recommended for new designs.

1.6 IUC series camera specifications(APS or full frame, 6)

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
IUC26000KMA	26.0M/IMX571BLR(M, RS) 1.8“ (23.48x15.67, APS-C)	3.76x3.76	870.9mv with 1/30s 0.07mv with 1/30s	14fps@6224×4168(16bit) 37fps@3104×2084 110fps@2064×1388	1x1 2x2 3x3	150us~15s
IUC26000KPA	26.0M/IMX571BQR(C, RS) 1.8“ (23.48x15.67, APS-C)	3.76x3.76	484.5mv with 1/30s 0.07mv with 1/30s	14fps@6224×4168(16bit) 37fps@3104×2084 110fps@2064×1388	1x1 2x2 3x3	150us~15s
IUC31000KMA	31.0M/IMX342LLA(M, GS) 1.8“ (22.3x16.74, APS-C)	3.45x3.45	1830mv with 1/30s 0.15mv with 1/30s	12.0fps@6464×4852 45.9fps@3216×2426	1x1 2x2	31us~15s
IUC31000KPA	31.0M/IMX342LQA(C,GS) 1.8“ (22.3x16.74, APS-C)	3.45x3.45	1146mv with 1/30s 0.15mv with 1/30s	12.0fps@6464×4852 45.9fps@3216×2426	1x1 1x1	31us~15s
IUC60000KMA	60.0M/IMX455 (M,RS) 2.7“ (35.96x23.99, Full Frame)	3.76x3.76	870.9mv with 1/30s 0.04mv with 1/30s	6.1fps@9568×6380(16bit) 24.6fps@4784×3190 55.8fps@3184×2124 191.0fps@1040×706	1x1 2x2 3x3 9x9	150us~15s
IUC60000KPA	60.0M/IMX455 (C,RS) 2.7“ (35.96x23.99, Full Frame)	3.76x3.76	484.5mv with 1/30s 0.07mv with 1/30s	6.1fps@9568×6380(16bit) 24.6fps@4784×3190 55.8fps@3184×2124 191.0fps@1040×706	1x1 2x2 3x3 9x9	15us~15s

M: Monochromatic; C: Color; RS: Rolling Shutter; GS: Global Shutter.

1.7 I3ISPM series camera specifications(Color, GS or RS, 9)

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
I3ISPM00500KPA IP800500A	0.5M/IMX433LQJ(C, GS) 1/1.7” (7.31x5.58)	9.0x9.0	4910mv with 1/30s 0.3mv with 1/30s	166.5fps@812×620	1x1	6us~15s
I3ISPM01500KPA IP801500A	1.5M/IMX273LQR(C, GS) 1/2.9”(4.97x3.73)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	227.2fps@1440×1080 382.7fps@720×540	1x1 1x1	15us~15s
I3ISPM02300KPA IP802300A	2.3M/IMX174LQJ(C,GS) 1/1.2“ (11.25x7.03)	5.86x5.86	1016mv with 1/30s 0.15mv with 1/30s	164.5fps@1920×1200	1x1	15us~15s
I3ISPM02300KPB IP802300B	2.3M/IMX249LQJ(C,GS) 1/1.2 “ (11.25x7.03)	5.86x5.86	1016mv with 1/30s 0.15mv with 1/30s	30fps@1920×1200	1x1	42us~15s
I3ISPM03100KPA IP803100A	3.1M/IMX252LQR(C, GS) 1/1.8” (7.07x5.30)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	115fps@2048×1536 230.3fps@1024×768	1x1 1x1	15us~15s
I3ISPM03100KPB IP803100B	3.1M/IMX265LQR(C, GS) 1/1.8”(7.07x5.30)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	55.4fps@2048×1536 115.1fps@1024×768	1x1 1x1	15us~15s
I3ISPM05000KPA IP805000A	5.0M/IMX250LQR(C, GS) 2/3” (8.45x7.07)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	71.2fps@2448×2048 175.2fps@1224×1024	1x1 1x1	15us~15s

I3ISPM05000KPB IP805000B	5.0M/IMX264LQR(C, GS) 2/3"(8.45x7.07)	3.45×3.45	1146mv with 1/30s 0.15mv with 1/30s	35.6fps@2448×1536, 87.6fps@1224×1024	1x1 1x1	15us~15s
I3ISPM06300KPA IP806300A	6.3M/IMX178LQJ(C, RS) 1/1.8" (7.37x4.92)	2.4x2.4	425mv with 1/30s 0.15mv with 1/30s	58.7fps@3072×2048 59.5fps@1536×1024	1x1 2x2	17us~15s

1.8 I3CMOS series camera specifications(Monochromatic, GS or RS,9)

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
I3CMOS00500KMA IM700500A	0.5M/IMX433LLJ(M, GS) 1/1.7" (7.31x5.58)	9.0x9.0	8100mv with 1/30s 0.30mv with 1/30s	166.5fps@812×620	1x1	6us~15s
I3CMOS01500KMA IM701500A	1.5M/IMX273LLR(M, GS) 1/2.9"(4.97x3.73)	3.45×3.45	1830mv with 1/30s 0.19mv with 1/30s	226.5fps@1440×1080 506fps@720×540	1x1 2x2	15us~15s
I3CMOS02300KMA IM702300A	2.3M/IMX174LLJ(M,GS) 1/1.2" (11.25x7.03)	5.86x5.86	1650mv with 1/30s 0.15mv with 1/30s	164.5fps@1920×1200	1x1	15us~15s
I3CMOS02300KMB IM702300B	2.3M/IMX249LLJ(M,GS) 1/1.2" (11.25x7.03)	5.86x5.86	1650mv with 1/30s 0.15mv with 1/30s	30fps@1920×1200	1x1	42us~15s
I3CMOS03100KMA IM703100A	3.1M/IMX252LLR(M, GS) 1/1.8"(7.07x5.30)	3.45×3.45	1830mv with 1/30s 0.15mv with 1/30s	110.6fps@2048×1536 233.8fps@1024×768	1x1 1x1	15us~15s
I3CMOS03100KMB IM703100B	3.1M/IMX265LLR(M, GS) 1/1.8"(7.07x5.30)	3.45×3.45	1830mv with 1/30s 0.15mv with 1/30s	55.4fps@2048×1536 115.1fps@1024×768	1x1 1x1	15us~15s
I3CMOS05000KMA IM705000A	5.0M/IMX250LLR(M, GS) 2/3"(8.45x7.07)	3.45×3.45	1830mv with 1/30s 0.15mv with 1/30s	70.9fps@2448×2048 175.2fps@1224×1024	1x1 1x1	15us~15s
I3CMOS05000KMB IM705000B	5.0M/IMX264LLR(M, GS) 2/3"(8.45x7.07)	3.45×3.45	1830mv with 1/30s 0.15mv with 1/30s	35.6fps@2448×2048 87.6fps@1224×768	1x1 1x1	15us~15s
I3CMOS06300KMA IM706300A	6.3M/IMX178LLJ(M, RS) 1/1.8" (7.37x4.92)	2.4x2.4	760mv with 1/30s 0.15mv with 1/30s	58.7fps@3072×2048 59.5fps@1536×1024	1x1 2x2	17us~15s

M: Monochromatic; C: Color; RS: Rolling Shutter; GS: Global Shutter.

2 SWIR series camera specification

2.1 Application of SWIR camera

SWIR series are TE-Cooling USB3.0 InGaAs SWIR cameras, which adopts Sony IMX990 / IMX991 Short-Wavelength Infrared (SWlR) Image Sensor. It is suitable to capture images in both visible range and SWlR range, covering 400nm to 1700nm. With smaller pixel size of 5um, imaging shows higher precision for quantitative researches.

Electronic board inspection, solar cellinspection， semiconduction inspection,transmission observation,produce inspec-tion, identifying and sorting, water visu-alization, temperature observation, surveil-lance, anti-counterfeiting Short wave infrared high-end night vision security applications are also the best choice.

2.2 SWIR1300KMA Specification

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
SWIR1300KMA	1.3M/IMX990(M) 1/2"(6.40x5.12)	5 x5	121mV with 1/30s 1.0mV with 1/30s	132@1280x1024 253@640x512	1x1 1x1	50us~60s

Model / Parameter	SWIR1300KMA
	1.31M pixels 1/2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX990-AABA-C
Sensor Type	InGaAs
Spectral Range	400nm-1700nm
Pixel size	5.0 μm x 5.0 μm
Sensor size	1/2"
ADC	12 Bit / 8 Bit
Frame rate	8 Bit: 132fps@1280 x 1024、253fps@640 x 512 12 Bit: 70fps@1280 x 1024、135fps@640 x 512
Image Buffer	512MByte
Conversion Gain	44.3e/ADU
Dynamic range	58.7dB
Readout Noise	211e
Full Well	181.6ke
SNRmax	52.6dB
Sensitivity	121mV
Dark current	383e/s(0C) 510e/s(10C) 638e/s(20C)
Gain range	1x-15x
Exposure time	50μs-60sec
Shutter	Global shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	Mono8 / Mono12
Cooling performance	25-30°C below ambient temperature
Optical filter	400-1800nm(default); 1030-1800nm(optional)
CRA	2.35 Deg
General specification	
Power supply	Power with USB3.0 or 12V Power adapter
Power consumption	<2.1W(without cooling) / <25W(cooling)
Temperature	Working temperature -20~60℃, storage temperature -40~85℃
Humidity	20%-80%, no condensation
Size	80mm×80mm×45.5mm
Weight	380g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 2-1 SWIR1300KMA camera specifications

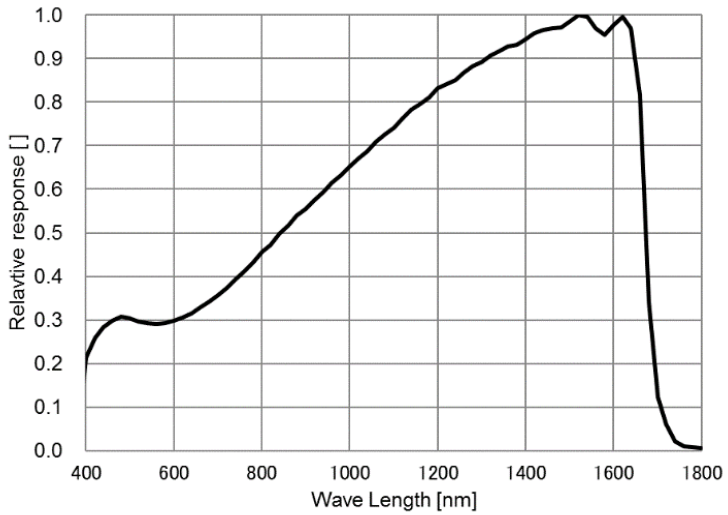


图 2-1 SWIR1300KMA spectral response curve

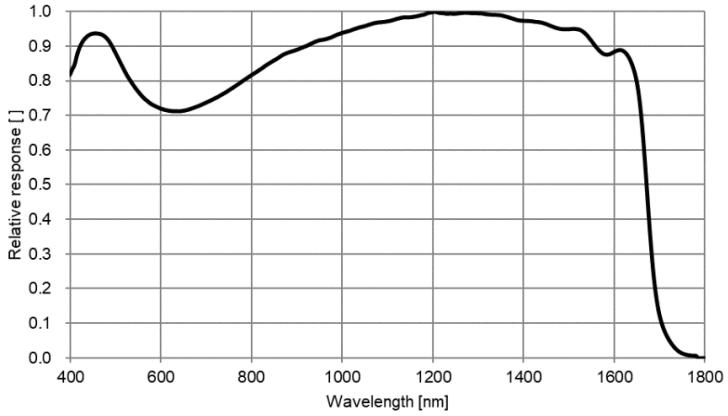


图 2-2 SWIR1300KMA relative quantum efficiency

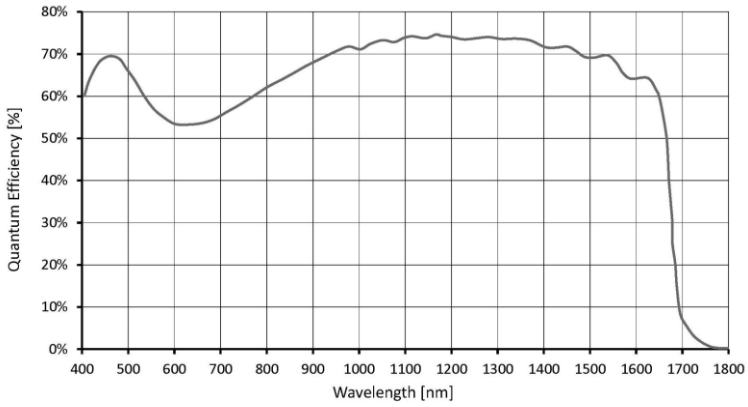


图 2-3 SWIR1300KMA absolute quantum efficiency

2.3 SWIR330KMA Specification

Model Number	Image Sensor	Pixel Size(μm)	G Sensitivity/Dark Signal	FPS/Resolution	Binning	Exposure Time
SWIR330KMA	0.33M/IMX991(M) 1/4"(3.20x2.56)	5 x5	121mV with 1/30s 1.0mV with 1/30s	258.8@640x512 486.1@320x256	1x1 1x1	50us~60s

Model / Parameter	SWIR330KMA
	0.33M pixels 1/4" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX991-AABA-C
Sensor Type	InGaAs
Spectral Range	400nm-1700nm
Pixel size	5.0 μm x 5.0 μm
Sensor size	1/2"
ADC	12 Bit / 8 Bit
Frame rate	8 Bit: 258.8fps@640 x 512、486.1fps@320 x 256 12 Bit: 137.3fps@640 x 512、258.0fps@320 x 256
Image Buffer	512MByte
Conversion Gain	44.3e/ADU
Dynamic range	58.7dB
Readout Noise	211e
Full Well	181.6ke
SNRmax	52.6dB
Sensitivity	121mV
Dark current	383e/s(0C) 510e/s(10C) 638e/s(20C)
Gain range	1x-15x
Exposure time	50μs-60sec
Shutter	Global shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	Mono8 / Mono12
Cooling performance	25-30°C below ambient temperature
Optical filter	400-1800nm(default); 1030-1800nm(optional)
CRA	2.35 Deg
General specification	
Power supply	Power with USB3.0 or 12V Power adapter
Power consumption	<2.1W(without cooling) / <25W(cooling)
Temperature	Working temperature -20~60℃, storage temperature -40~85℃
Humidity	20%-80%, no condensation
Size	80mm×80mm×45.5mm
Weight	380g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 2-2 SWIR330KMA camera specifications

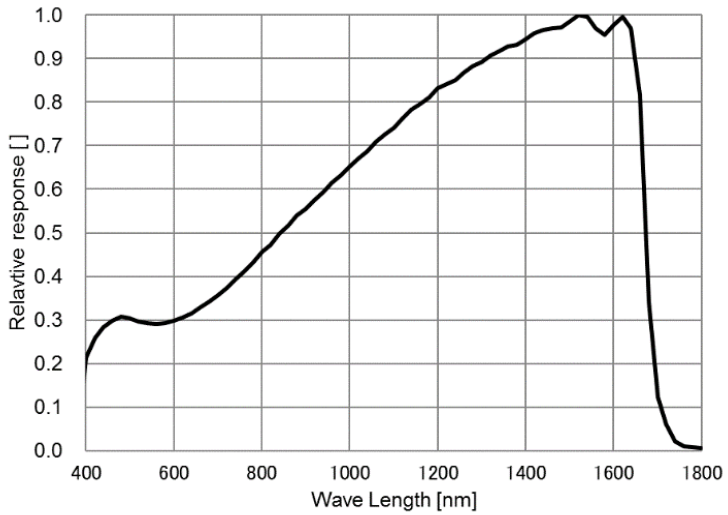


图 2-4 SWIR330KMA spectral response curve

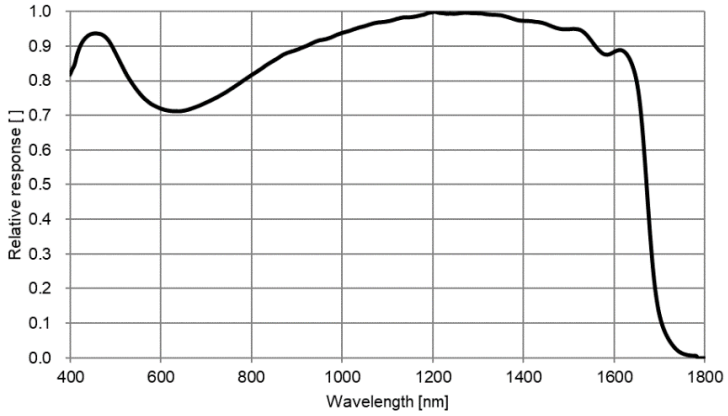


图 2-5 SWIR330KMA relative quantum efficiency

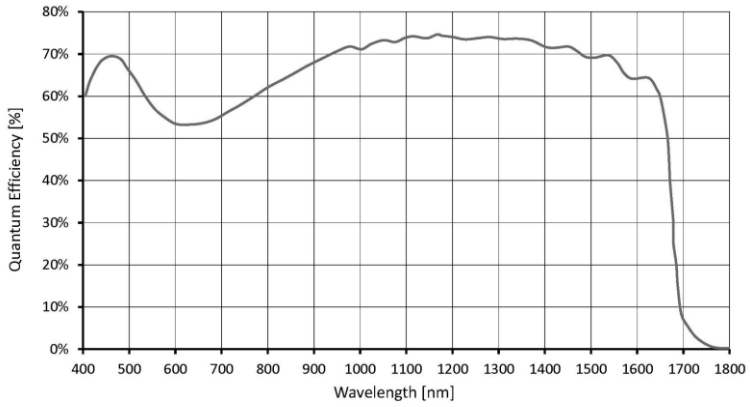


图 2-6 SWIR330KMA absolute quantum efficiency

2.4 Packing list of SWIR series camera

Standard Package	
B	3-A safety equipment case: L:28cm W:23cm H:15.5cm (1pcs, 2.8Kg/ box); Carton size: L:28.2cm W:25.2cm H:16.7cm(TBD)
C	One SWIR series camera(C-mount)
D	D1, D2, D3 and D4 are national standard, American Standard, European standard, and British standard power lines respectively
E	Power adapter: input: AC 100~240V 50Hz/60Hz, output: DC12 V 3A
F	High-Speed USB3.0 A male to B male gold-plated connectors cable /1.5m
G	One external trigger control cable
H	USB flash driver (Driver & utilities software)

3 IUA series technical specifications

3.1 IUA390KMA

Model / Parameter	IUA390KMA
	0.39M pixel 1/2.9 "CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX287LLR
Pixel size	6.9 μm x 6.9 μm
Sensor size	1/2.9”
Frame rate	101.5fps@720 x 540
Dynamic range	76.5dB
Signal-to-Noise ratio	43.2dB
Peak QE	71%@575nm
Sensitivity	7320mV
Dark current	0.76mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global Shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	Mono8 / Mono12
General Specifications	
Power supply	Power with USB3.0/ DC12V
Power consumption	<2.5W
Temperature	Working temperature -10~50℃; Storage temperature -30~70℃
Humidity	20% - 80% No condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-1 IUA390KMA camera specifications

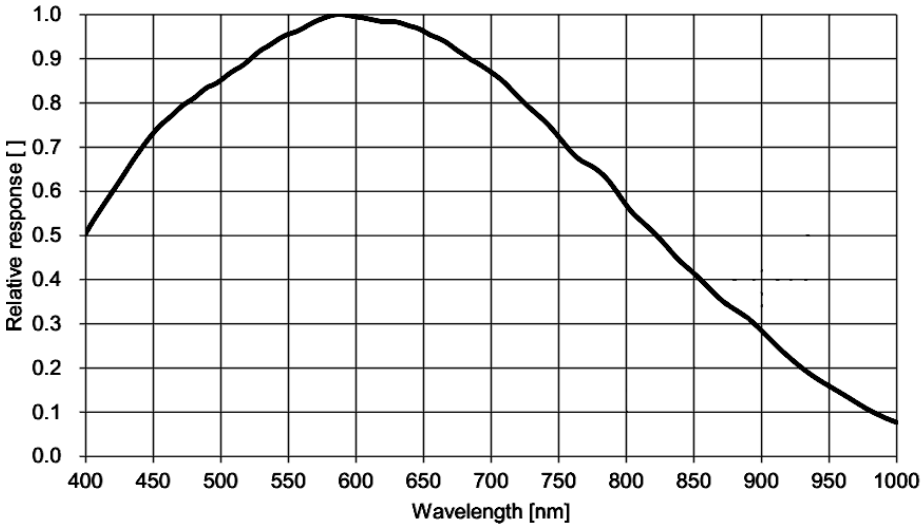


Figure 3-1 IUA390KMA spectral response curve

3.2 IUA503KMA

Model / Parameter	IUA503KMA
	0.5M pixel 1/1.7 "CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX426LLJ
Pixel size	9.0 μm x 9.0 μm
Sensor size	1/1.7”
Frame rate	79.8fps@800 x 620
Dynamic range	72.3dB
Signal-to-Noise ratio	50.0dB
Peak QE	78%@575nm
Sensitivity	8100mV
Dark current	0.3mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global Shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	Mono8 / Mono12
General Specifications	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.0W
Temperature	Working temperature -10~50℃; Storage temperature -30~70℃
Humidity	20% - 80% No condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-2 IUA503KMA camera specifications

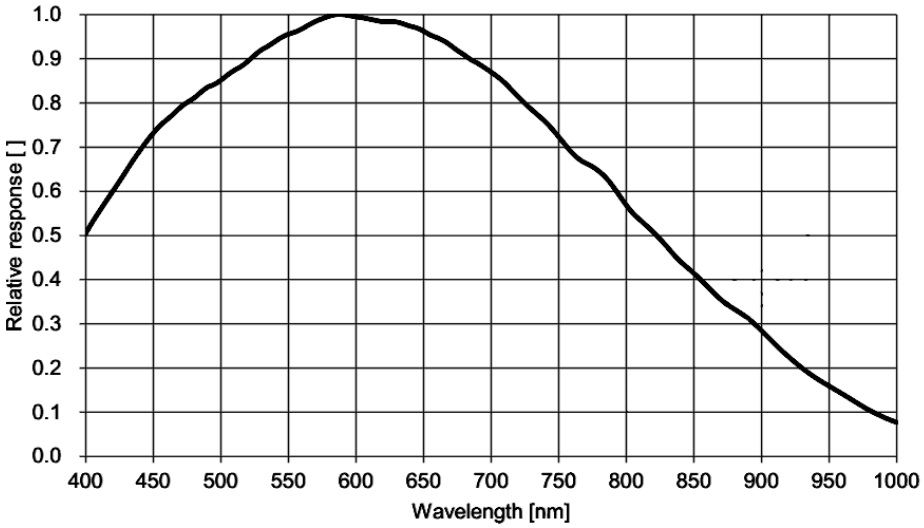


Figure 3-2 IUA503KMA spectral response curve

3.3 IUA503KMB

Model / Parameter	IUA503KMB
	0.5M pixel 1/1.7 "CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX433LLJ
Pixel size	9.0 μm x 9.0 μm
Sensor size	1/1.7”
Frame rate	79.8fps@800 x 620
Dynamic range	72.3dB
Signal-to-Noise ratio	50.0dB
Peak QE	78%@575nm
Sensitivity	8100mV
Dark current	0.3mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global Shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	Mono8 / Mono12
General Specifications	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.0W
Temperature	Working temperature -10~50℃; Storage temperature -30~70℃
Humidity	20% - 80% No condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-3 IUA503KMB camera specifications

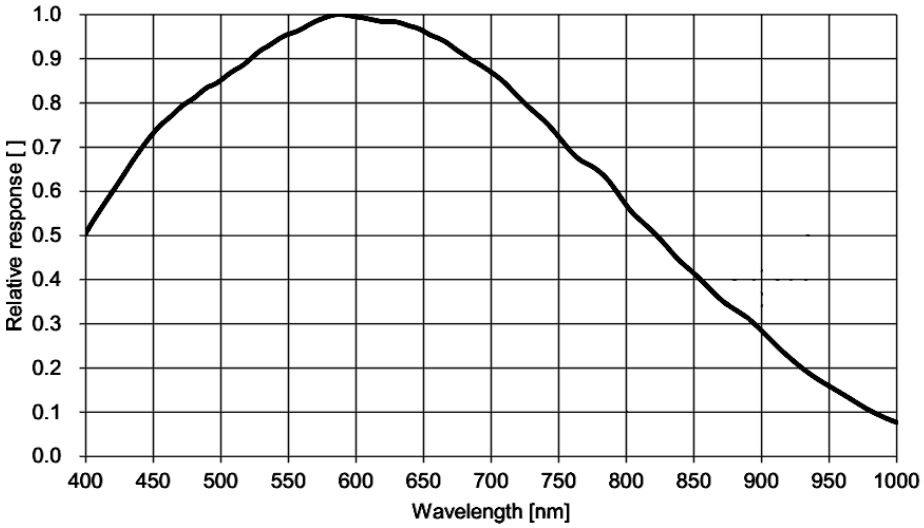


Figure 3-3 IUA503KMB spectral response curve

3.4 IUA1500KMA

Model / Parameter	IUA1500KMA
	1.5M pixels 1/2.9" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX273LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/2.9"
Frame rate	155fps@1440×1080，523fps@720×540
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	71%@575nm
Peak QE	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	219g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-4 IUA1500KMA camera specifications

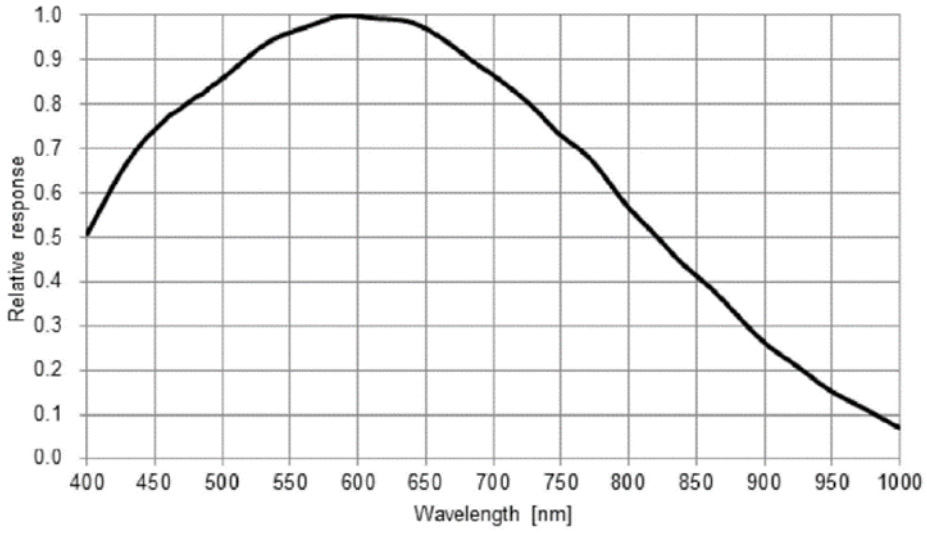


Figure 3-4 IUA1500KMA spectral response curve

3.5 IUA1500KPA

Model / Parameter	IUA1500KPA
	1.5M pixels 1/2.9" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX273LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/2.9"
Frame rate	155fps@1440×1080，523fps@720×540
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	219g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-5 IUA1500KPA camera specifications

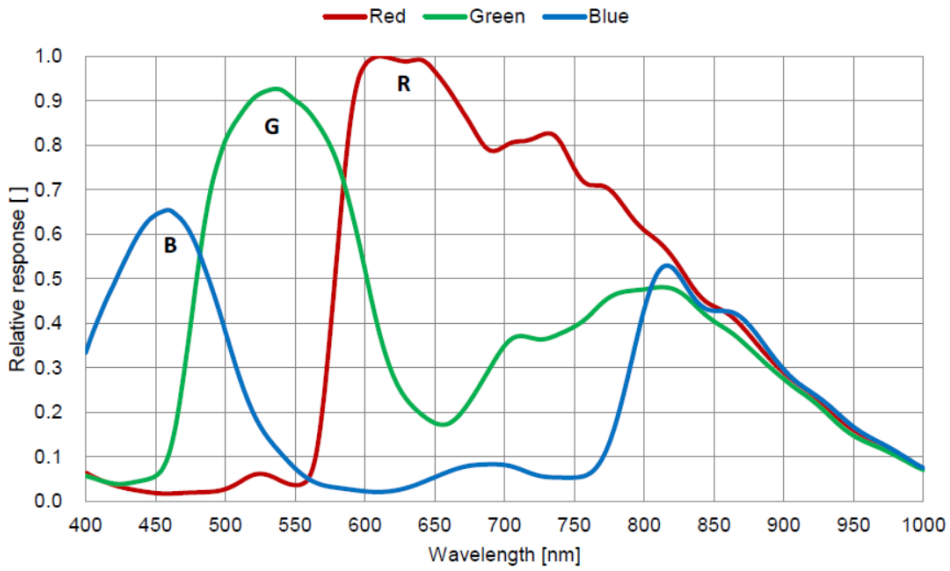


Figure 3-5 IUA1500KPA spectral response curve

3.6 IUA1700KMA

Model / Parameter	IUA1700KMA
	1.7M pixel 1.1 "CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX432LLJ
Pixel size	9.0 μm x 9.0 μm
Sensor size	1.1”
Frame rate	98.6fps@1600 x 1100
Dynamic range	72.3dB
Signal-to-Noise ratio	50.0dB
Peak QE	78%@575nm
Sensitivity	8100mV
Dark current	0.3mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global Shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	Mono8 / Mono12
General Specifications	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.1W
Temperature	Working temperature -10~50℃; Storage temperature -30~70℃
Humidity	20% - 80% No condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-6 IUA1700KMA camera specifications

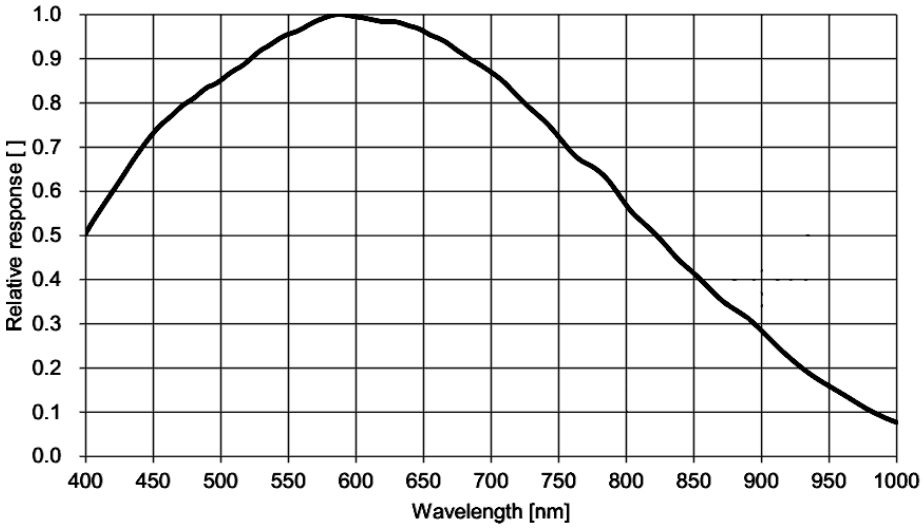


Figure 3-6 IUA1700KMA spectral response curve

3.7 IUA1700KPA

Model / Parameter	IUA1700KPA
	1.7M pixels 1.1" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX432LQJ
Pixel size	9.0 μm x 9.0 μm
Sensor size	1.1"
Frame rate	98.6fps@1600 x 1100
Dynamic range	72.3dB
Signal-to-Noise ratio	50.0dB
Sensitivity	4910mV
Dark current	0.3mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.1W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-7 IUA1700KPA camera specifications

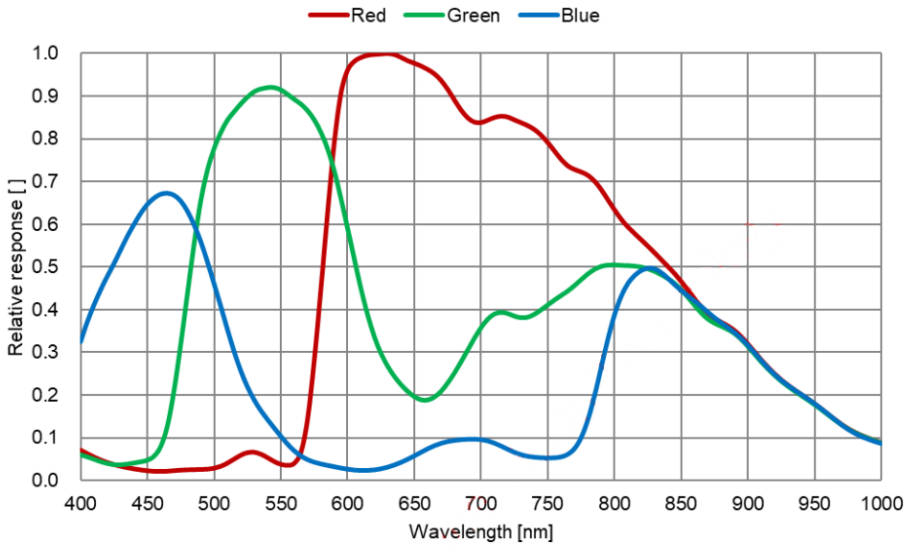


Figure 3-7 IUA1700KPA spectral response curve

3.8 IUA2300KMA

Parameter \ Model	IUA2300KMA
	2.3M pixels 1/1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX174LLJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	164.5fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Peak QE	78%@575nm
Sensitivity	1650mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	42μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.2W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	217g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-8 IUA2300KMA camera specifications

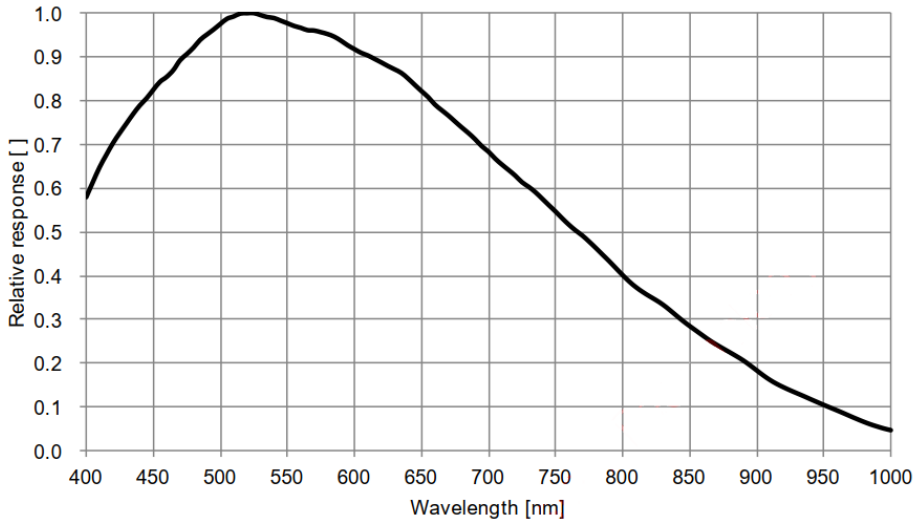


Figure 3-8 IUA2300KMA spectral response curve

3.9 IUA2300KPA

Parameter \ Model	IUA2300KPA
	2.3M pixels 1/1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX174LQJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	164.5fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Sensitivity	1016mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	42μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.2W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	217g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-9 IUA2300KPA camera specifications

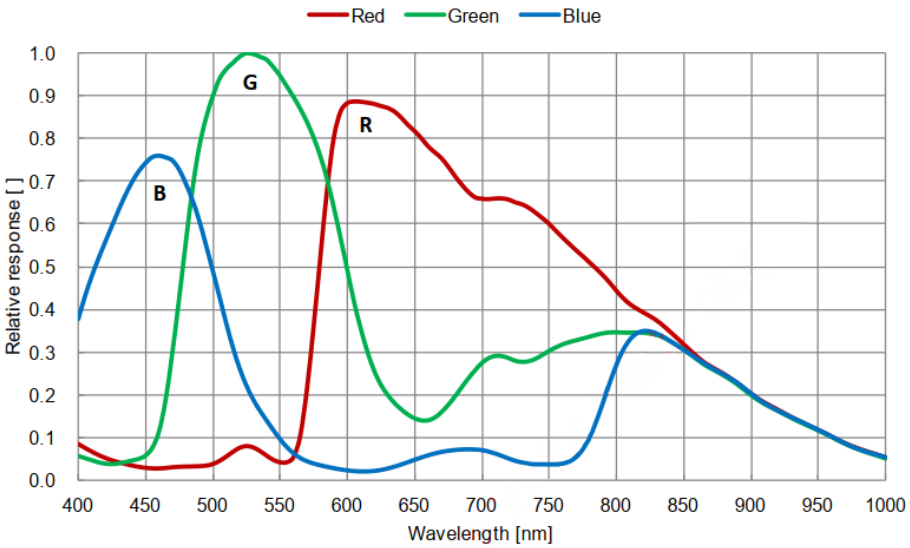


Figure 3-9 IUA2300KPA spectral response curve

3.10 IUA2300KMB

Parameter \ Model	IUA2300KMB
	2.3M pixels 1/1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX249LLJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	30fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Peak QE	78%@575nm
Sensitivity	1650mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	42μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.2W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	217g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-10 IUA2300KMB camera specifications

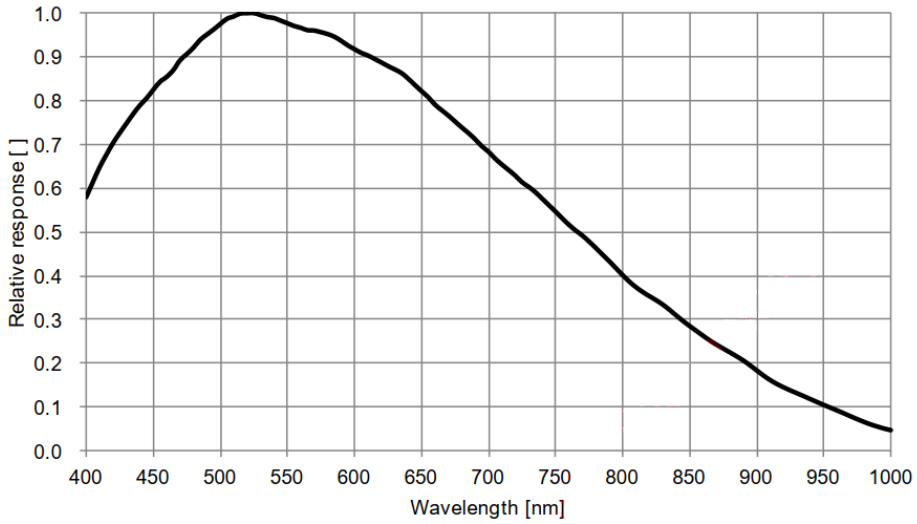


Figure 3-10 IUA2300KMB spectral response curve

3.11 IUA2300KPB

Parameter \ Model	IUA2300KPB
	2.3M pixels 1/1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX249LQJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	30fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Sensitivity	1016mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	42μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.2W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	217g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-11 IUA2300KPB camera specifications

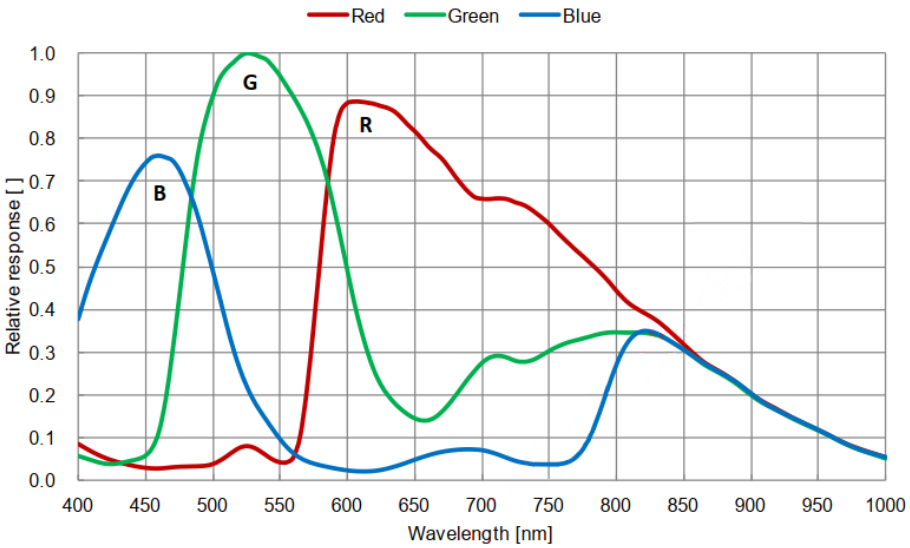


Figure 3-11 IUA2300KPB spectral response curve

3.12 IUA2800KMA

Parameter \ Model	IUA2800KMA
	2.8M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX421LLJ
Pixel size	4.5 μm x4.5 μm
Sensor size	2/3"
Frame rate	121fps@1936×1464，425fps@968×732
Dynamic range	72.3dB
Signal-to-Noise ratio	44.0dB
Peak QE	78%@575nm
Sensitivity	3354mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.9W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-12 IUA2800KMA camera specification

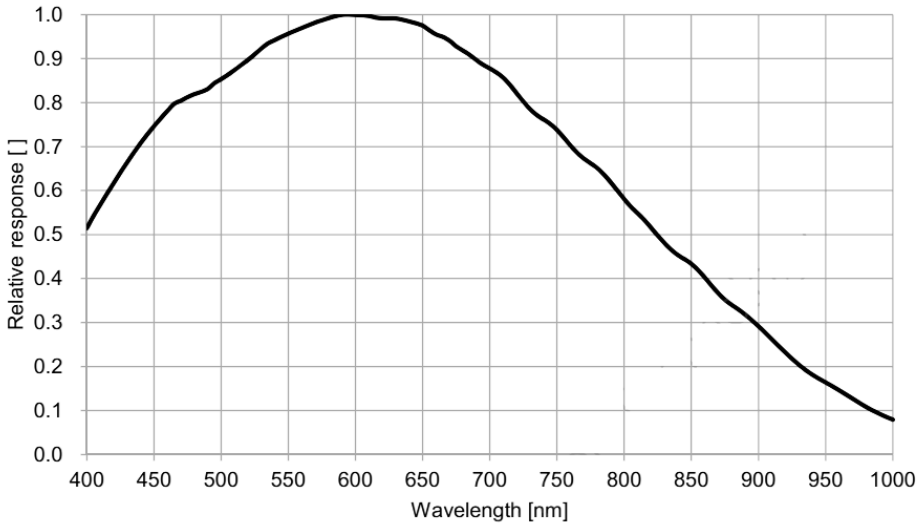


Figure 3-12 IUA2800KMA spectral response curve

3.13 IUA2800KPA

Parameter \ Model	IUA2800KPA
	2.8M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX421LQJ
Pixel size	4.5 μm x4.5 μm
Sensor size	2/3"
Frame rate	121fps@1936×1464，425fps@968×732
Dynamic range	72.3dB
Signal-to-Noise ratio	44.0dB
Peak QE	78%@575nm
Sensitivity	3354mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.9W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-13 IUA2800KPA camera specification

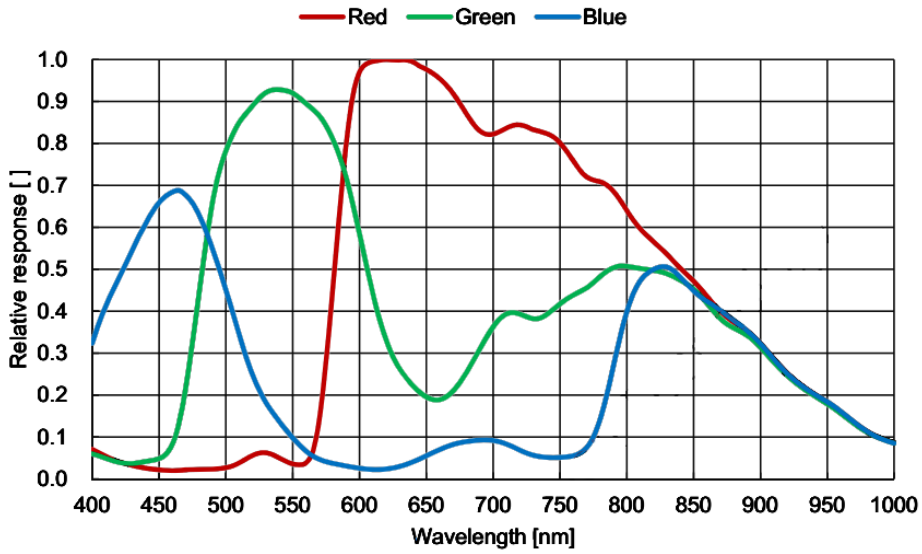


Figure 3-13 IUA2800KPA spectral response curve

3.14 IUA5000KMA

Model / Parameter	IUA5000KMA
	5.0M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX264LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	2/3"
Frame rate	35.6fps@2448×2048、87.6fps@1224×1024
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	71%@575nm
Peak QE	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	219g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-14 IUA5000KMA camera specifications

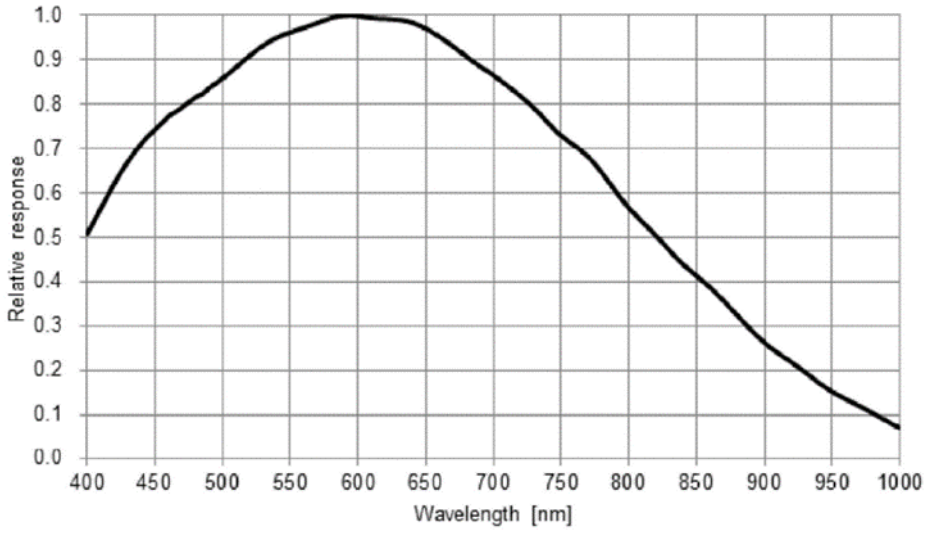


Figure 3-14 IUA5000KMA spectral response curve

3.15 IUA5000KPA

Model / Parameter	IUA5000KPA
	5.0M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX264LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	2/3"
Frame rate	35.6fps@2448×2048、87.6fps@1224×1024
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	219g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-15 IUA5000KPA camera specifications

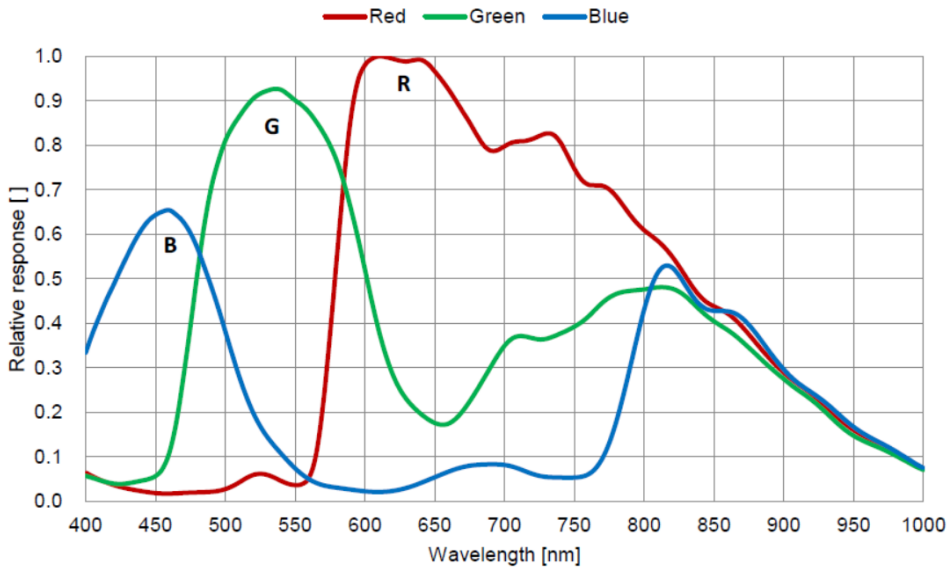


Figure 3-15 IUA5000KPA spectral response curve

3.16 IUA6300KMA

Parameter \ Model	IUA6300KMA
	6.3M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX178LLJ
Pixel size	2.4 μm x 2.4 μm
Sensor size	1/1.8"
Frame rate	59.9fps@3072 x 2048, 59.9fps@1536 x 1024
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	760mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	17μs-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.2W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	217g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-16 IUA6300KMA camera specifications

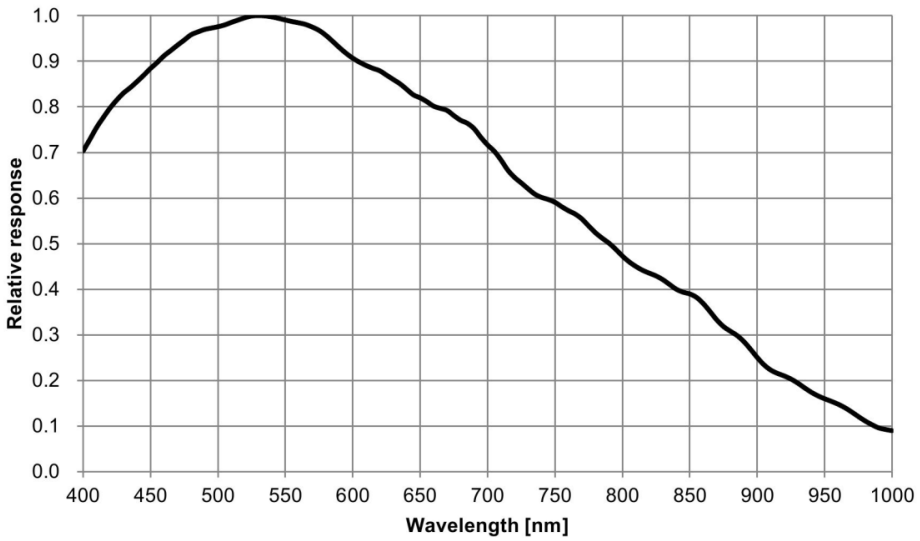


Figure 3-16 IUA6300KMA spectral response curve

3.17 IUA6300KPA

Parameter \ Model	IUA6300KPA
	6.3M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX178LQJ
Pixel size	2.4 μm x 2.4 μm
Sensor size	1/1.8"
Frame rate	59.8fps@3072 x 2048, 59.5fps@1536 x 1024
Dynamic range	75dB
Signal-to-Noise ratio	40dB
Sensitivity	425mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	17μs-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.2W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	217g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-17 IUA6300KPA specifications

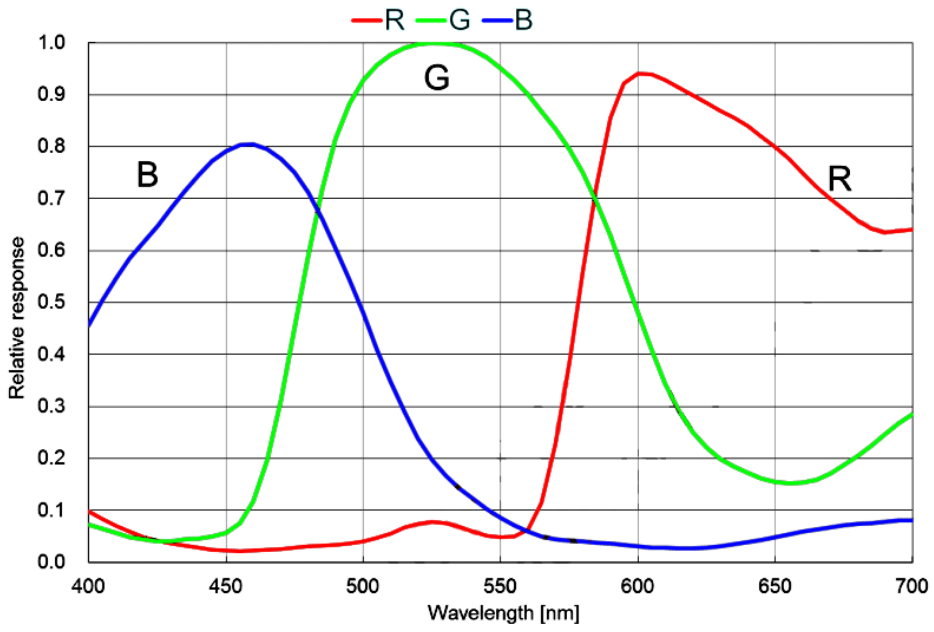


Figure 3-17 IUA6300KPA spectral response curve

3.18 IUA7100KMA

Parameter \ Model	IUA7100KMA
	7.1M pixels 1.1" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX428LLJ
Pixel size	4.5 μm x 4.5 μm
Sensor size	1.1"
Frame rate	51.3fps@3200 x 2200, 133.8fps@1584 x 1100
Dynamic range	72.3dB
Signal-to-Noise ratio	44.0dB
Peak QE	78%@575nm
Sensitivity	3354mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.9W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-18 IUA7100KMA camera specification

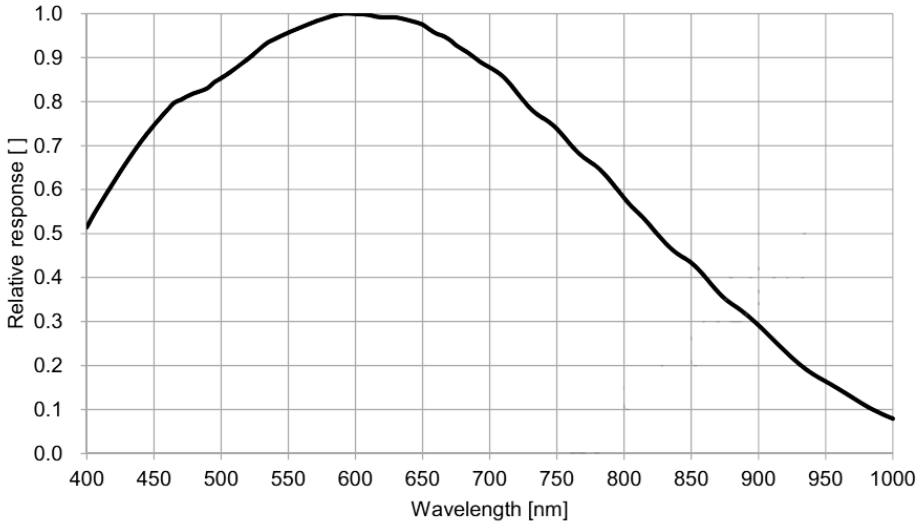


Figure 3-18 IUA7100KMA spectral response curve

3.19 IUA7100KPA

Parameter \ Model	IUA7100KPA
	7.1M pixels 1.1" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX428LQJ
Pixel size	4.5 μm x 4.5 μm
Sensor size	1.1"
Frame rate	51.4fps@3200 x 2200, 133.8fps@1584 x 1100
Dynamic range	72.3dB
Signal-to-Noise ratio	44.0dB
Sensitivity	2058mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.9W
Temperature	Working temperature -10~50℃, storage temperature 30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-19 IUA7100KPA camera specifications

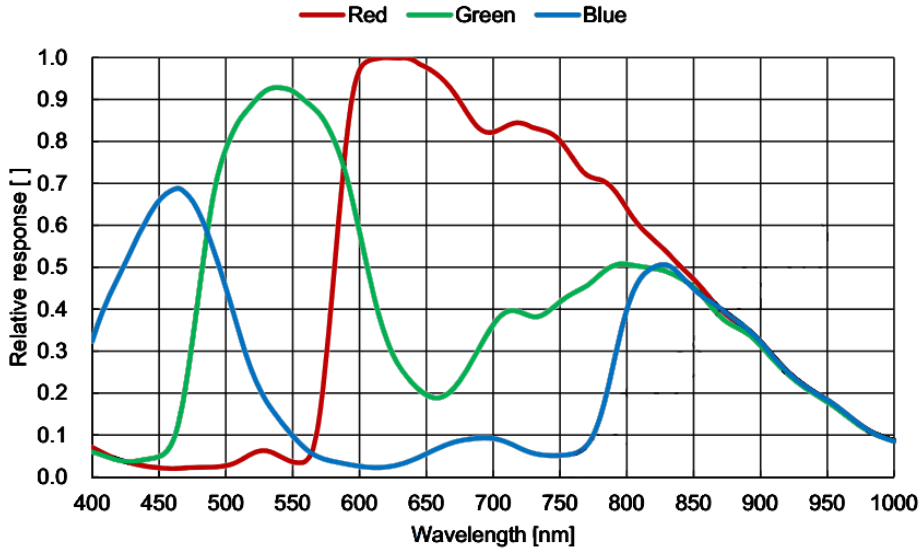


Figure 3-19 IUA7100KPA spectral response curve

3.20 IUA8300KPA

Parameter \ Model	IUA8300KPA
	8.3M pixels 1/1.2" CMOS USB3.0industrial camera
Camera	
Sensor model	Sony IMX485LQJ-C
Pixel size	2.9 μm x 2.9 μm
Sensor size	1/1.2"
Frame rate	45fps@3840 x2160、70fps@1920 x 1080
Dynamic range	70dB
Signal-to-Noise ratio	43dB
Sensitivity	2188mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	20μs-15sec
Shutter	Rolling shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	214g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-20 IUA8300KPA Camera Parameters Index

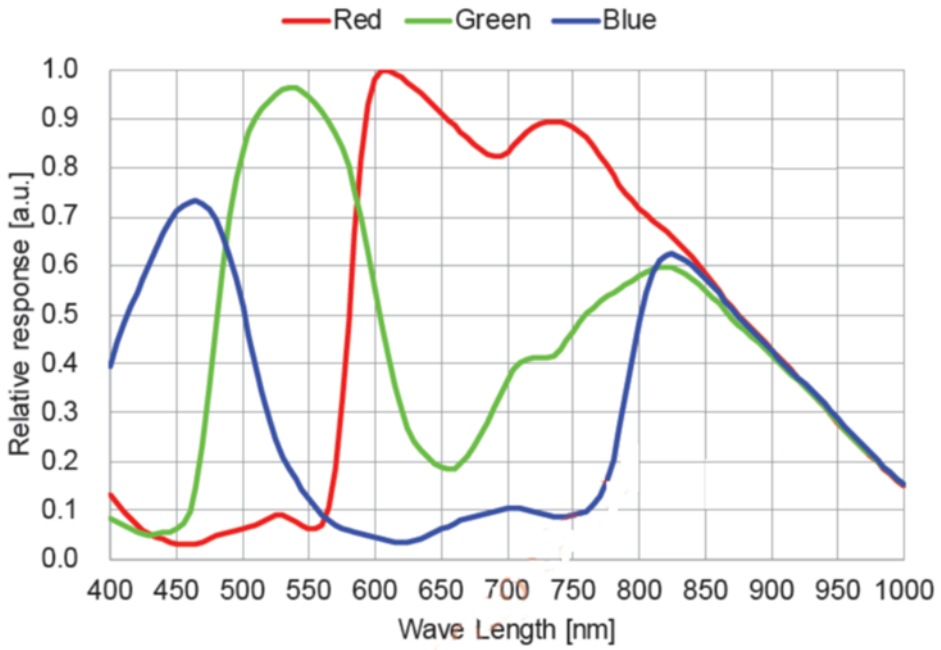


Figure 3-20 IUA8300KPA spectral response curve

3.21 IUA20000KMA

Parameter \ Model	IUA20000KMA
	20.0M 1" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX183CLK
Pixel size	2.4 μm x 2.4 μm
Sensor size	1"
Frame rate	19.0fps@5440 x 3684, 49.9fps@2736 x 1824, 59.5fps@1824 x 1216
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	777mV
Dark current	0.2mV
Gain range	1x-50x
Exposure time	53μs-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2, 3x3; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	214g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-21 IUA20000KMA camera specifications

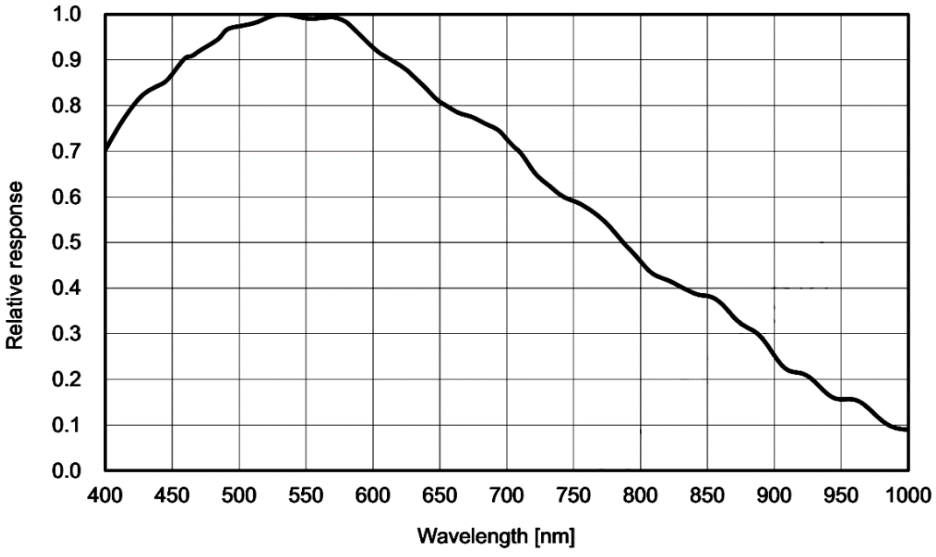


Figure 3-21 IUA20000KMA spectral response curve

3.22 IUA20000KPA

Parameter \ Model	IUA20000KPA
	20.0M pixels 1" CMOS USB3.0industrial camera
Camera	
Sensor model	Sony IMX183CQK
Pixel size	2.4 μm x 2.4 μm
Sensor size	1"
Frame rate	19.0fps@5440 x 3684,48.8fps@2736 x 1824,59.4fps@1824 x 1216
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	1874mV
Dark current	0.2mV
Gain range	1x-50x
Exposure time	53μs-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2, 3x3; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	214g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-22 IUA20000KPA Camera Parameters Index

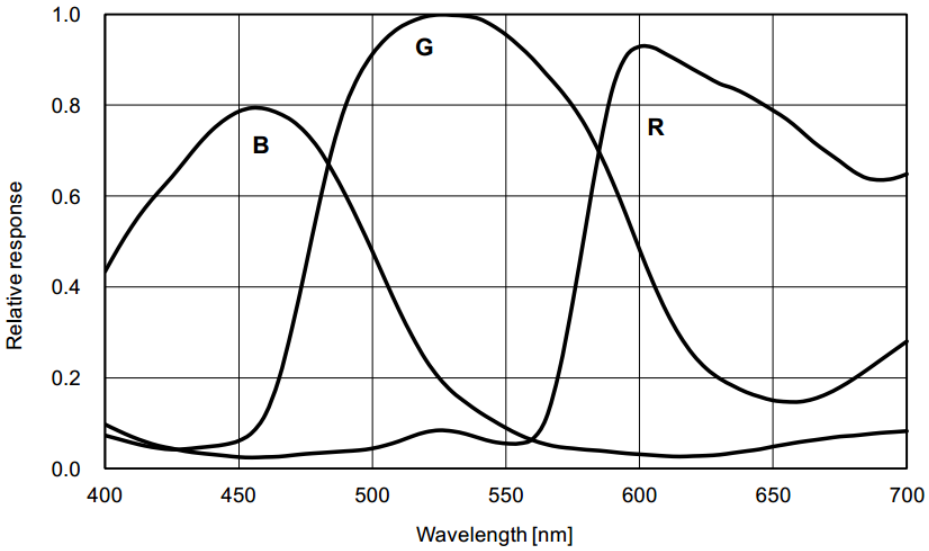


Figure 3-22 IUA20000KPA spectral response curve

3.23 IUA20400KMA

Parameter \ Model	IUA20400KMA
	20.4M pixels 1.1" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX541-AAMJ-C
Pixel size	2.74 μm x2.74 μm
Sensor size	1.1"
Frame rate	17.5fps@4496×4496，64.4fps@2240×2240，64.4fps@1120×1120
Dynamic range	72.0dB
Signal-to-Noise ratio	40.0dB
Peak QE	86%@520nm
Sensitivity	2649mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	30μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2, 4x4; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.8W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-23 IUA20400KMA camera specification

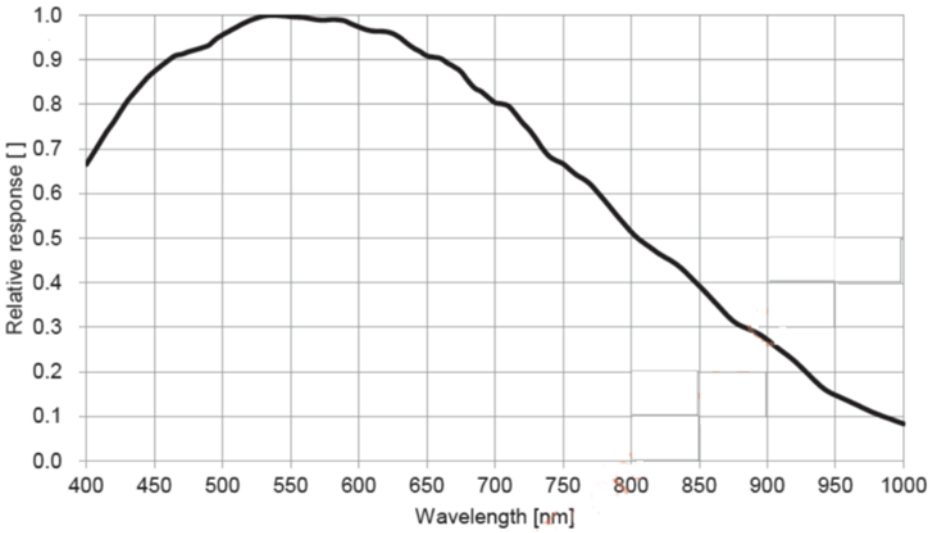


Figure 3-23 IUA20400KMA spectral response curve

3.24 IUA20400KPA

Parameter \ Model	IUA20400KPA
	20.4M pixels 1.1" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX541-AAQJ-C
Pixel size	2.74 μm x2.74 μm
Sensor size	1.1"
Frame rate	17.5fps@4496×4496，64.4fps@2240×2240，64.4fps@1120×1120
Dynamic range	72.0dB
Signal-to-Noise ratio	40.0dB
Sensitivity	1574mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	30μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2, 4x4; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.8W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-24 IUA20400KPA camera specifications

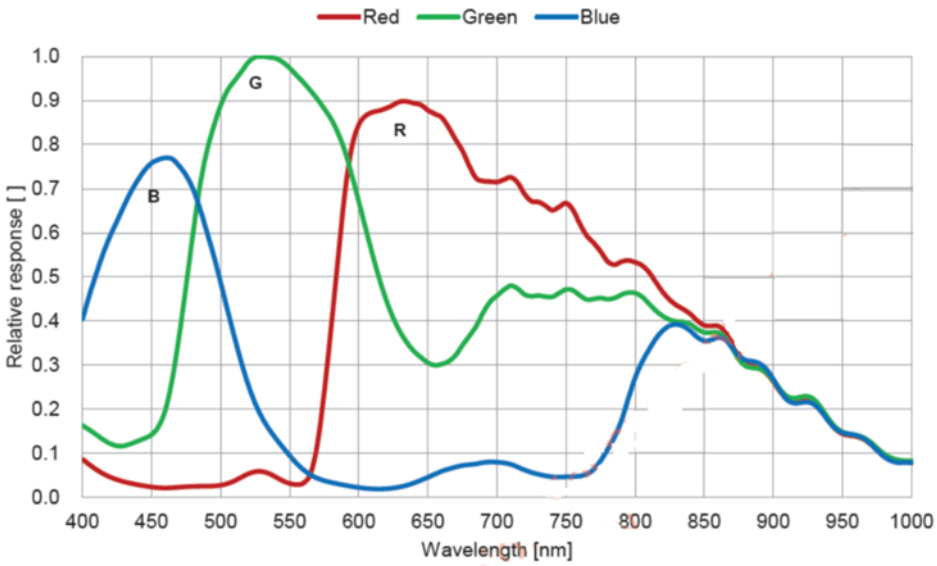


Figure 3-24 IUA20400KPA spectral response curve

3.25 IUA45000KMA

Parameter \ Model	IUA45000KMA
	45.0M 4/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX492LLJ-C
Pixel size	2.315 μm x 2.315 μm
Sensor size	4/3"
Frame rate	8.1@8176x5616(3:2)，30.0@4080x2808(3:2) 8.1@7408x5556(4:3)，33.0@3696x2778(4:3) 10.4@8176x4320(17:9)，34.7@4096x2160(17:9)，62.5@2048x1080(17:9)，86.5@1360x720(17:9)
Dynamic range	78.8dB
Signal-to-Noise ratio	48.2dB
Sensitivity	176mV
Dark current	0.03mV
Gain range	1x-50x
Exposure time	0.1ms-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2, 3x3, 4x4; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.6W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	214g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-25 IUA45000KMA camera specifications

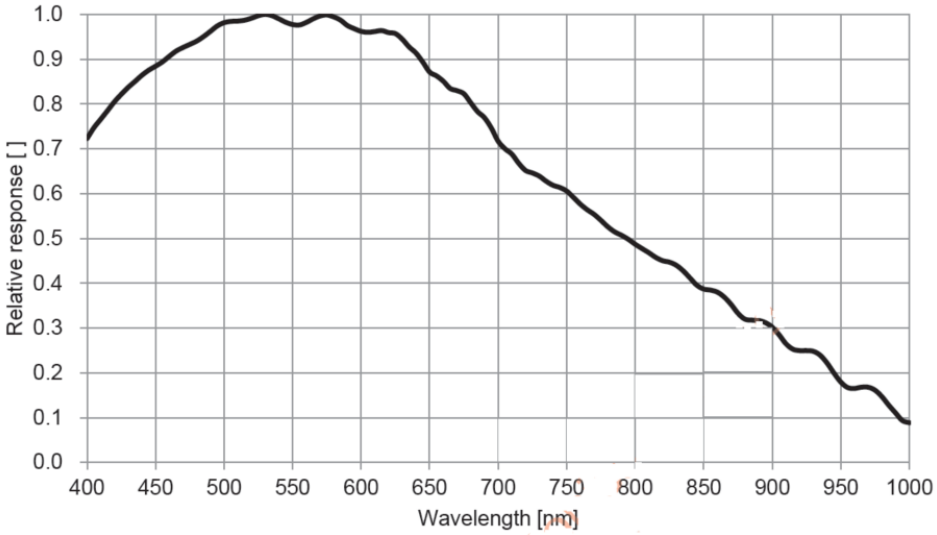


Figure 3-25 IUA45000KMA spectral response curve

3.26 IUA2100KPA(NIR)

Parameter \ Model	IUA2100KPA
	2.1M pixels 1/2.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX462LQR
Pixel size	2.9 μm x 2.9 μm
Sensor size	1/2.8"
Frame rate	120.3fps@1920 x 1080
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	2376mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	11μs-15sec
Shutter	Rolling shutter
Binning	Software2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data Format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<4.1W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-26 IUA2100KPA camera specifications

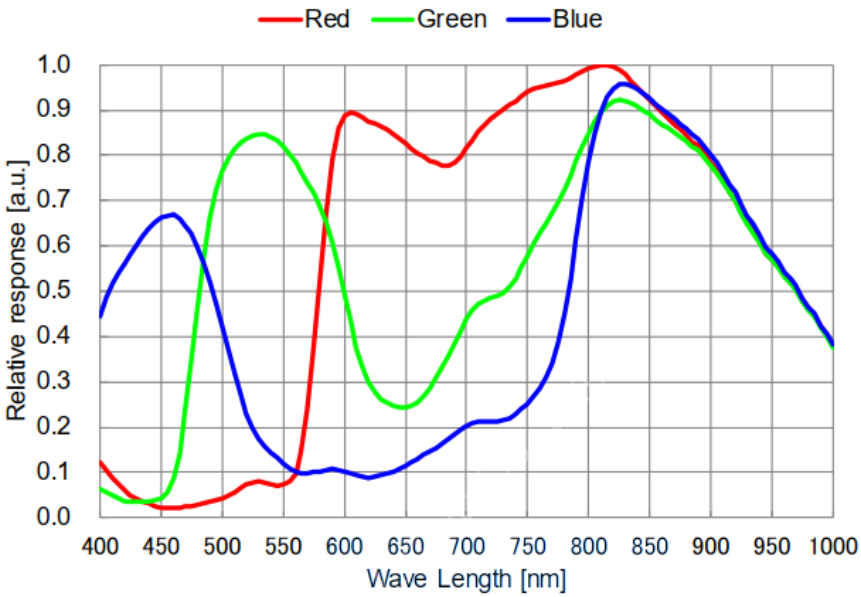


Figure 3-26 IUA2100KPA spectral response curve

3.27 IUA4100KPA(NIR)

Parameter \ Model	IUA4100KPA
	4.1M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX464LQR
Pixel size	2.9 μm x 2.9 μm
Sensor size	1/1.8"
Frame rate	90fps@2688 x 1520
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	2376mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	11μs-15sec
Shutter	Rolling shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.0W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	228g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-27 IUA2300KPB camera specifications

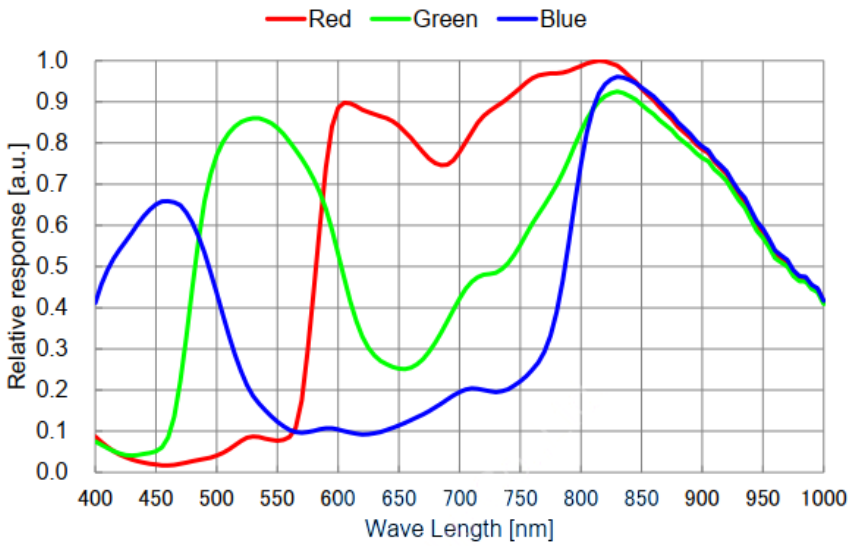


Figure 3-27 IUA4100KPA spectral response curve

3.28 IUA1300KMA(GPixel UV)

Model / Parameter	IUA1300KMA
	1.3M pixels 1" CMOS USB3.0 industrial camera
Camera	
Sensor model	GPixel GLUX9701BSI (UV)
Pixel size	9.76 μm x 9.76 μm
Sensor size	1"
Frame rate	30fps@1280 x 1024、30fps@640 x 512
Dynamic range	55dB（LG）、66dB（HG）、89.5dB（HDR）
Signal-to-Noise ratio	46.8dB（LG）、29.5dB（HG）
Sensitivity	2.57x108(e-/((W/m2).s))
Dark current	89%@610nm
Gain range	1x-8x
Exposure time	21μs-60sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<2.3W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	270g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-28 IUA1300KMA camera specifications

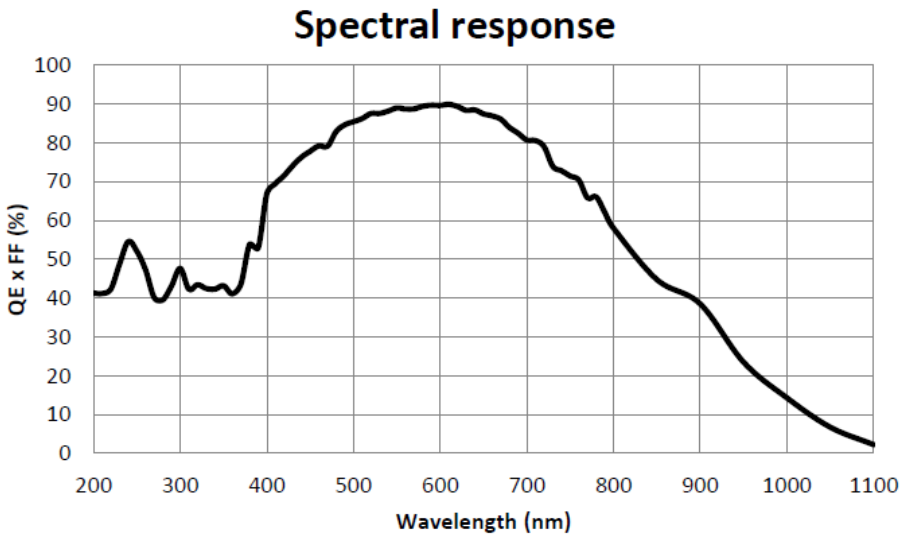


Figure 3-28 IUA1300KMA spectral response curve

3.29 IUA4200KMA(GPixel NIR)

Model / Parameter	IUA4200KMA
	4.2M pixels 1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	GPixel GSENSE2020e (NIR)
Pixel size	6.5 μm x 6.5 μm
Sensor size	1.2"
Frame rate	45fps@2048 x 2048、45fps@1024 x 1024
Dynamic range	66.6dB（LG）、59.5dB（HG）、87.5dB（HDR）
Signal-to-Noise ratio	46dB（LG）、32dB（HG）
Sensitivity	8.1x107(e-/((W/m2).s))
Dark current	73%@595nm
Gain range	1x-8x
Exposure time	21μs-60sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<2.3W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	270g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-29 IUA4200KMA camera specifications

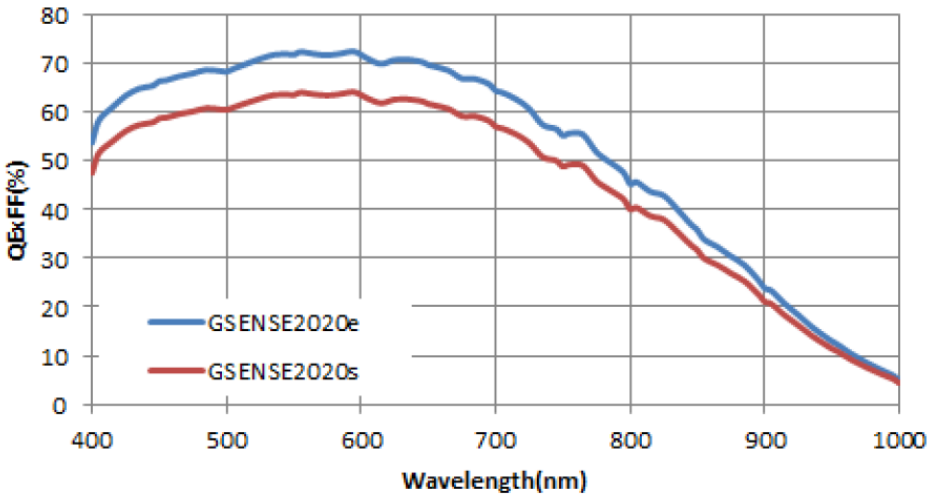


Figure 3-29 IUA4200KMA spectral response curve

3.30 IUA4200KMB(GPixel UV)

Model / Parameter	IUA4200KMB
	4.2M pixels 1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Gpixel GSENSE2020BSI -H (UV)
Pixel size	6.5 μm x 6.5 μm
Sensor size	1.2"
Frame rate	32fps@2048 x 2048、32fps@1024 x 1024
Dynamic range	67.5dB(LG), 61dB(HG), 90.5dB(HDR)
Signal-to-Noise ratio	47dB(LG), 32dB(HG)
Sensitivity	1.1x108(e-/((W/m2).s))
Dark current	93.7%@550nm
Gain range	1x-8x
Exposure time	21μs-60sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<2.3W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	270g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-30 IUA4200KMB camera specifications

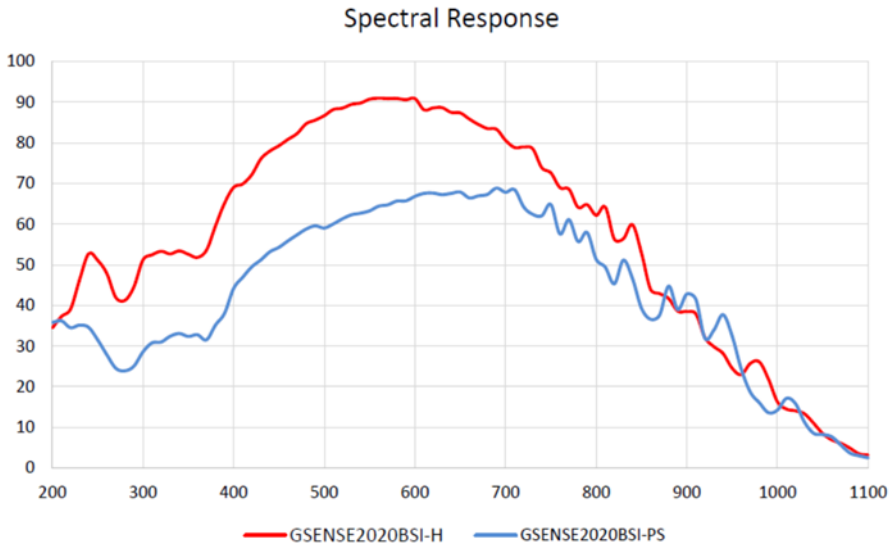


Figure 3-30 IUA4200KMB spectral response curve

3.31 IUA4200KME(GPixel UV)

Model / Parameter	IUA4200KME
	4.2M pixels 2.0" CMOS USB3.0 industrial camera
Camera	
Sensor model	Gpixel GSENSE400BSI (UV)
Pixel size	11 μm x 11 μm
Sensor size	2.0"
Frame rate	37fps@2048 x 2048、37fps@1024 x 1024
Dynamic range	64dB(LG), 68.5dB(HG), 94dB(HDR)
Signal-to-Noise ratio	50dB(LG), 33dB(HG)
Sensitivity	3.25x108(e-/((W/m2).s))
Dark current	345e-/s/pix
Gain range	1x-8x
Exposure time	21μs-60sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<2.3W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	270g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC, RoHS

Table 3-31 IUA4200KME camera specifications

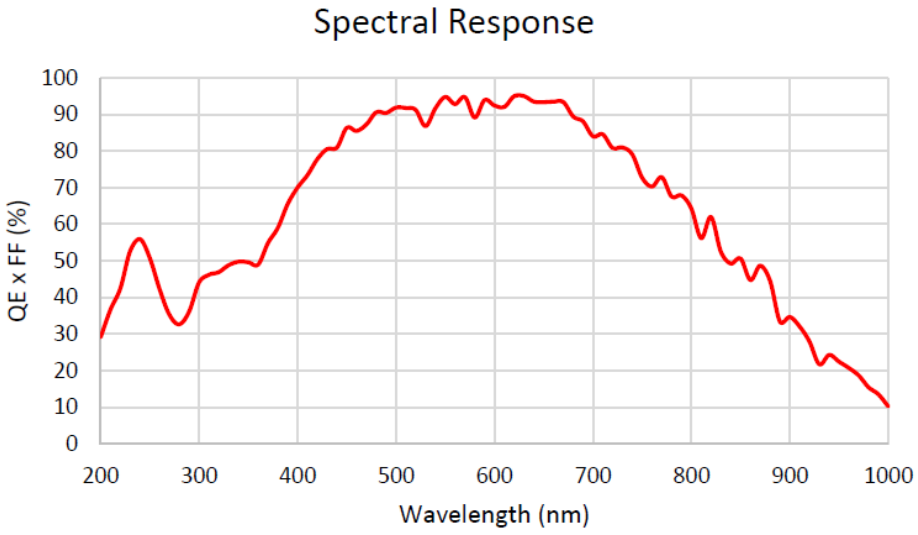


Figure 3-31 IUA4200KME spectral response curve

3.32 IUA8000KMA(GS-UV)

Parameter \ Model	IUA8000KMA
	8.0M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX487-AAMJ-C
Pixel size	2.74 μm x2.74 μm
Sensor size	2/3"
Frame rate	45fps@2840×2840，198fps@1420×1420
Dynamic range	72.0dB
Signal-to-Noise ratio	40.0dB
Peak QE	TBD
Sensitivity	145mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	30μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ DC12V
Power consumption	<3.8W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	68mmx68mmx28.1mm
Weight	227g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 3-32 IUA8000KMA camera specification

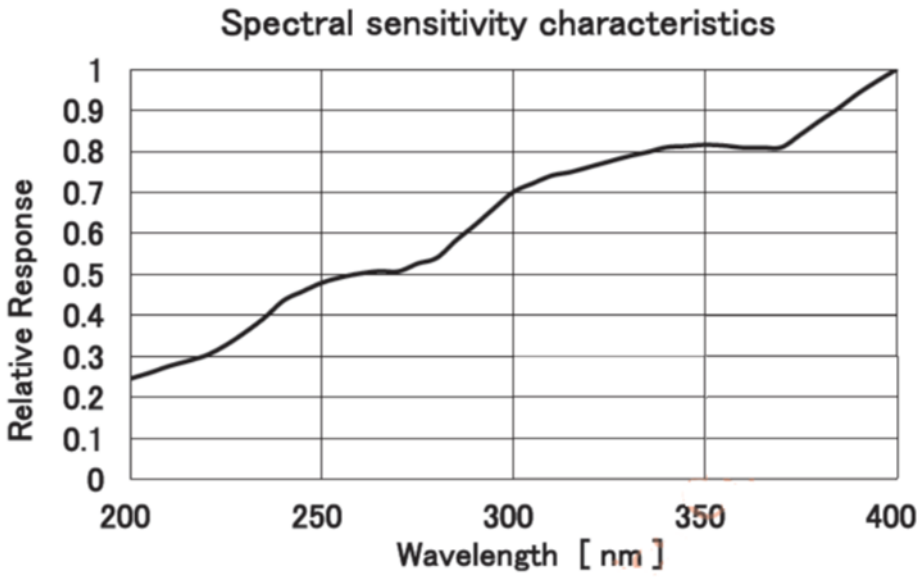


Figure 3-32 IUA8000KMA spectral response curve

4 IUB series technical specifications

4.1 IUB4200KMA

Parameter \ Model	IUB4200KMA
	4.2M pixels 1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	GSENSE2020e
Pixel size	6.5 μm x 6.5 μm
Sensor size	1.2"
Frame rate	45fps@2048 x 2046, 45fps@1024 x 1022
Dynamic range	66.6dB (LG), 59.5dB (HG), 87.5dB (HDR)
Signal-to-Noise ratio	46dB (LG), 32dB (HG)
Sensitivity	8.11x107e-/((W/m2)·s)
Dark current	7e-/s/pix
Gain range	1x-22x
Exposure time	150us-60sec
Shutter	Rolling shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ 12V Power adapter
Power consumption	<3.7W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	118mmx68mmx23.2mm
Weight	633g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 4-1 IUB4200KMA camera specifications

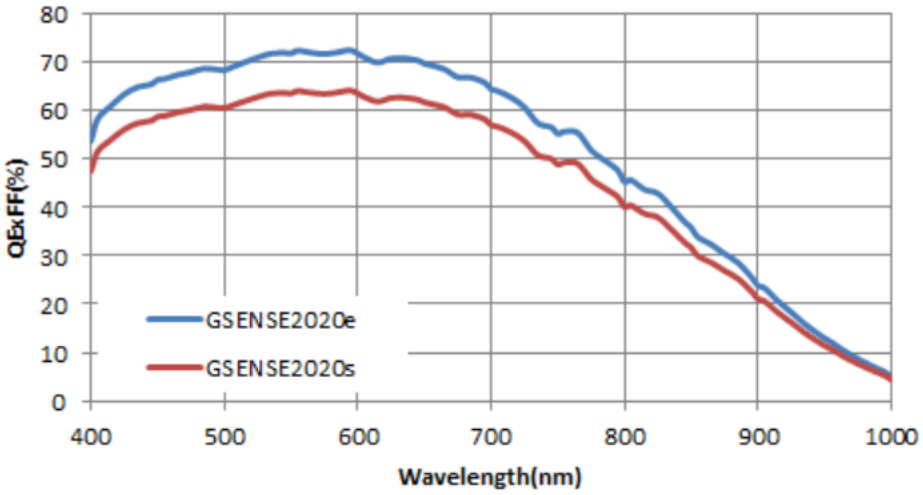


Figure 4-1 IUB4200KMA spectral response curve

4.2 IUB4200KMB

Parameter \ Model	IUB4200KMB
	4.2M pixels 1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	GSENSE2020BSI
Pixel size	6.5 μm x 6.5 μm
Sensor size	1.2"
Frame rate	43.6fps@2048 x 2046, 43.6fps@1024 x 1022
Dynamic range	67.5dB (LG), 61dB (HG), 90.7dB (HDR)
Signal-to-Noise ratio	47dB (LG), 32dB (HG)
Sensitivity	1.1x108 e-/((W/m2)·s)
Dark current	80e-/s/pix
Gain range	1x-50x
Exposure time	150us-60sec
Shutter	Rolling shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ 12V Power adapter
Power consumption	<3.7W
Temperature	Working temperature -10~50℃, storage temperature30~70℃
Humidity	20%-80%, no condensation
Size	118mmx68mmx23.2mm
Weight	633g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 4-2 IUB4200KMB camera specifications

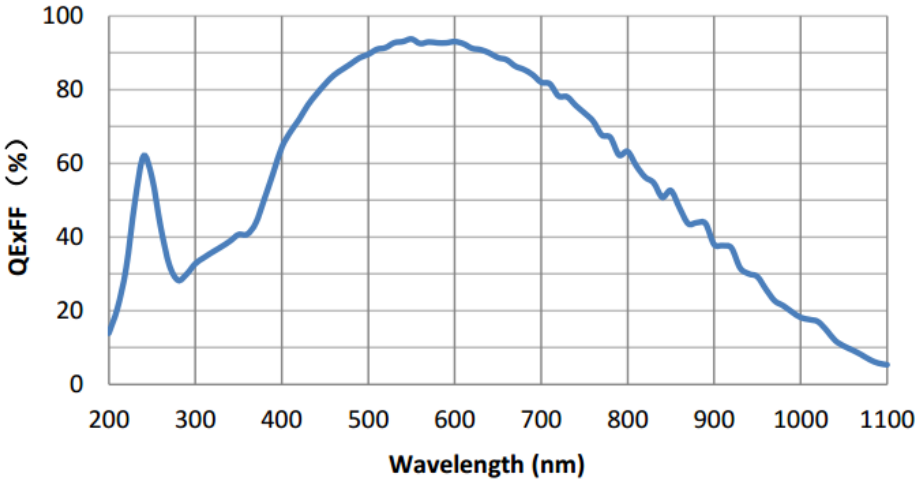


Figure 4-2 IUB4200KMB spectral response curve

4.3 IUB43000KMA

Parameter \ Model	IUB43000KMA
	43.0M pixels 1.7" (APS-C) CMOS USB3.0 industrial camera
Camera	
Sensor model	GMAX0806
Pixel size	2.8 μm x 2.8 μm
Sensor size	1.7" (APS-C)
Frame rate	8.5fps@7904x5432
Dynamic range	66dB (2G), 63dB (6G)
Signal-to-Noise ratio	38.5dB (2G), 34dB (6G)
Sensitivity	1.19x107 e-/((W/m2)·s)
Dark current	1e-/s/pix
Gain range	1x-6x
Exposure time	15us-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0/ 12V Power adapter
Power consumption	<5.0W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	118mmx68mmx23.2mm
Weight	633g
Lens mount	M42 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 4-3 IUB43000KMA camera specifications

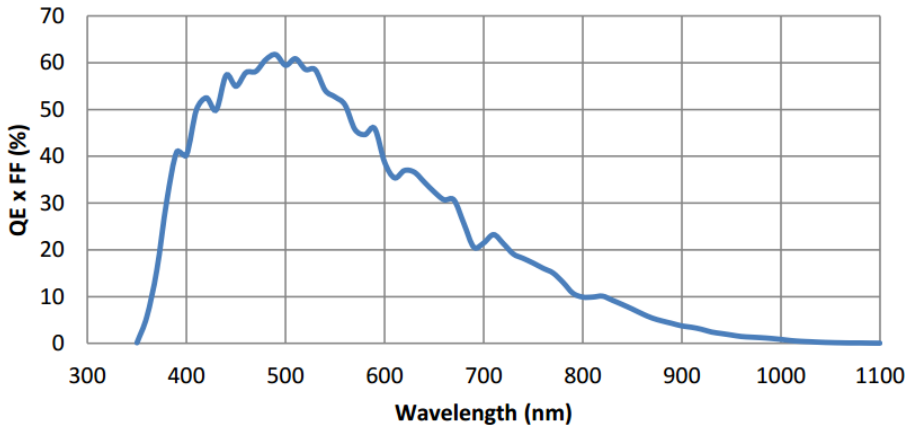


Figure 4-3 IUB43000KMA spectral response curve

5 IUC series technical specifications

5.1 IUC26000KMA

Parameter \ Model	IUC26000KMA
	26.0M pixels 1.8" (APS-C) CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX571BLR
Pixel size	3.76 μm x 3.76 μm
Sensor size	1.8" (APS-C)
Frame rate	14fps@6224 x 4168(16bit), 37fps@3104 x 2084, 110fps@2064 x 1388
Dynamic range	86.8dB
Signal-to-Noise ratio	47.1dB
Sensitivity	870.9mv
Dark current	0.07mv
Gain range	1x-50x
Exposure time	150us-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2，3x3；Software 2x2，3x3，4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8/Mono12/Mono14/Mono16
General specification	
Power supply	12V Power adapter
Power consumption	<5.0W
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	88mmx88mmx21.2mm
Weight	540g
Lens mount	M42 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 5-1 IUC26000KMA camera specifications

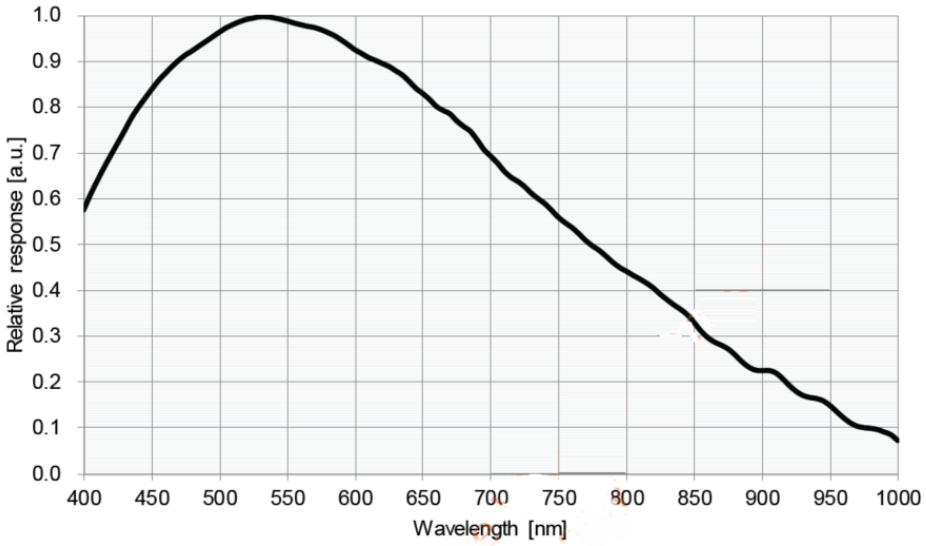


Figure 5-1 IUC26000KMA spectral response curve

5.2 IUC26000KPA

Parameter \ Model	IUC26000KPA
	26.0M pixels 1.8" (APS-C) CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX571BQR
Pixel size	3.76 μm x 3.76 μm
Sensor size	1.8" (APS-C)
Frame rate	14fps@6224 x 4168(16bit), 37fps@3104 x 2084, 110fps@2064 x 1388
Dynamic range	86.8dB
Signal-to-Noise ratio	47.1dB
Sensitivity	484.5mv
Dark current	0.07mv
Gain range	1x-50x
Exposure time	150us-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2，3x3；Software 2x2，3x3，4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RAW14/RAW16/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	12V Power adapter
Power consumption	<5.0W
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	88mmx88mmx21.2mm
Weight	540g
Lens mount	M42 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 5-2 IUC26000KPA camera specifications

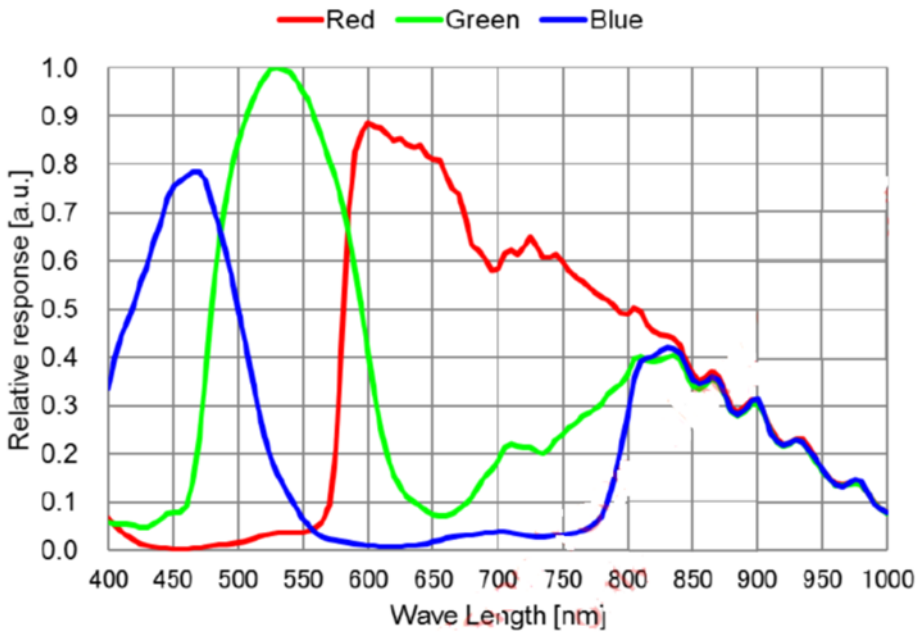


Figure 5-2 IUC26000KPA spectral response curve

5.3 IUC31000KMA

Parameter \ Model	IUC31000KMA
	31.0M pixels 1.8" (APS-C) CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX342LLA
Pixel size	3.45 μm x 3.45 μm
Sensor size	1.8" (APS-C)
Frame rate	12.0fps@6464 x 4852, 45.9fps@3216 x 2426
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Peak QE	71%@575nm
Sensitivity	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	31μs-15sec
Shutter	Global shutter
Binning	Hardware 2x2; Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8 / Mono12
General specification	
Power supply	12V Power adapter
Power consumption	<7.7w
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	88mmx88mmx21.2mm
Weight	545g
Lens mount	M42 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 5-3 IUC31000KMA camera specifications

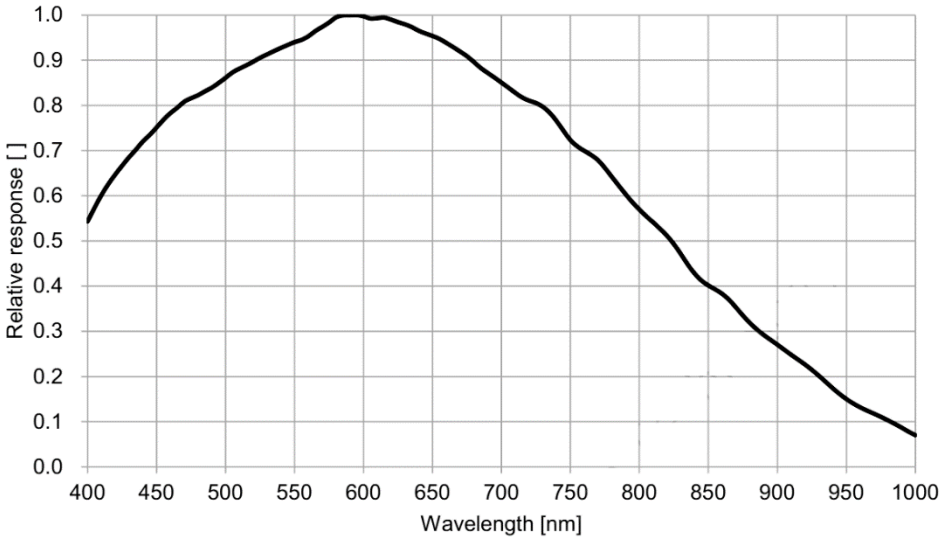


Figure 5-3 IUC31000KMA spectral response curve

5.4 IUC31000KPA

Parameter \ Model	IUC31000KPA
	31.0M pixels 1.8" (APS-C) CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX342LQA
Pixel size	3.45 μm x 3.45 μm
Sensor size	1.8" (APS-C)
Frame rate	12.0fps@6464 x 4852, 45.9fps@3216 x 2426
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	31μs-15sec
Shutter	Global shutter
Binning	Software 2x2, 3x3, 4x4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	12V Power adapter
Power consumption	<7.7w
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	88mmx88mmx21.2mm
Weight	545g
Lens mount	M42 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 5-4 IUC31000KPA camera specifications

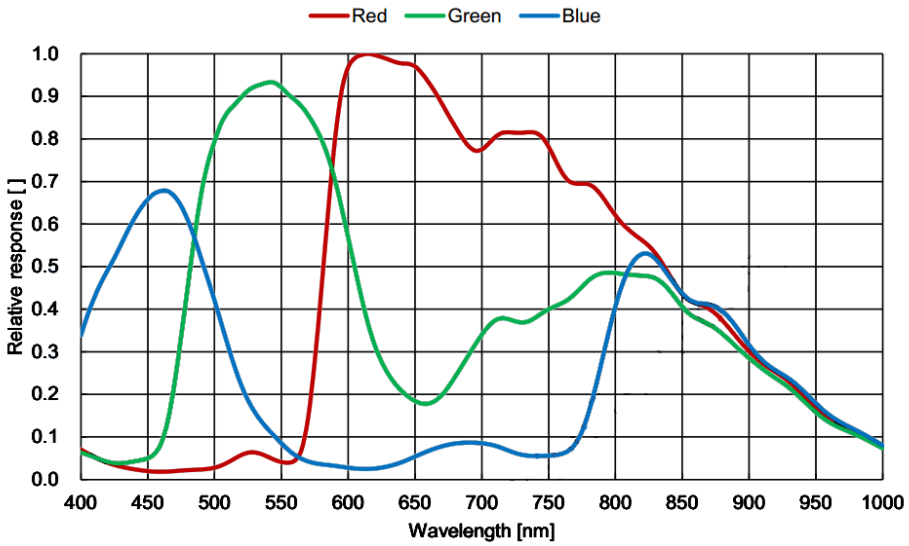


Figure 5-4 IUC31000KPA spectral response curve

5.5 IUC60000KMA

Parameter \ Model	IUC60000KMA
	60.0M pixels 2.7" (Full Frame) CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX455ALK
Pixel size	3.76 μm x 3.76 μm
Sensor size	2.7" (Full Frame)
Frame rate	6.1fps@9568 x 6380(16bit), 24.6fps@4784 x 3190, 55.8fps@3184 x 2124, 191.0@1040 x 706
Dynamic range	88.3dB
Signal-to-Noise ratio	47.1dB
Sensitivity	870.9mV
Dark current	0.04mV
Gain range	1x-50x
Exposure time	150us-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2, 3x3, 9x9; Software 2x2, 3x3, 9x9
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	Mono8/Mono12/Mono14/Mono16
General specification	
Power supply	12V Power adapter
Power consumption	<5.5W
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	88mmx88mmx21.2mm
Weight	540g
Lens mount	M52 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 5-5 IUC60000KMA camera specifications

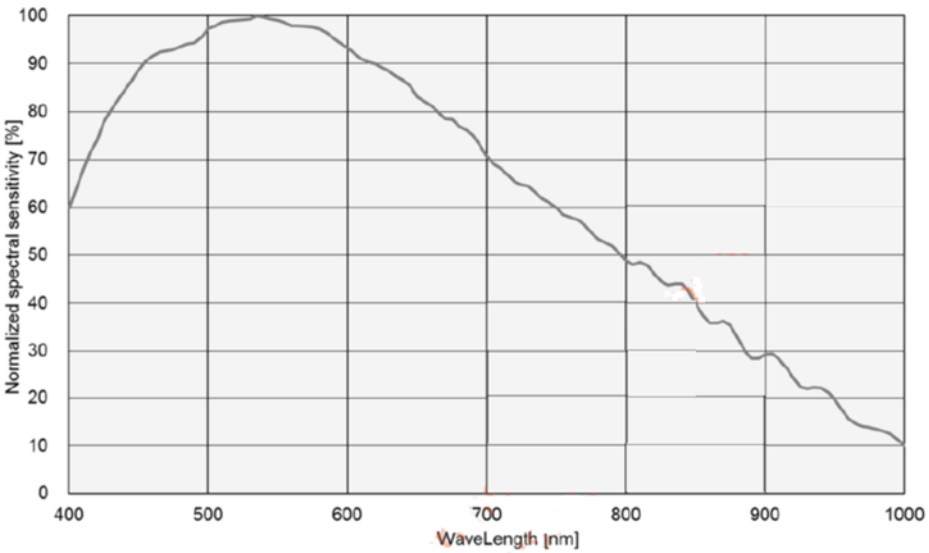


Figure 5-5 IUC60000KMA spectral response curve

5.6 IUC60000KPA

Parameter \ Model	IUC60000KPA
	60.0M pixels 2.7" (Full Frame) CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX455AQK
Pixel size	3.76 μm x 3.76 μm
Sensor size	2.7" (Full Frame)
Frame rate	6.1fps@9568 x 6380(16bit), 24.6fps@4784 x 3190, 55.8fps@3184 x 2124, 191.0@1040 x 706
Dynamic range	85.8dB
Signal-to-Noise ratio	47.0dB
Sensitivity	484.5mV
Dark current	0.07mV
Gain range	1x-50x
Exposure time	150us-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2, 3x3, 9x9; Software 2x2, 3x3, 9x9
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O	One optical-coupling isolated input, one optical-coupling isolated output, two non-isolated input and output
Data format	RAW8/RAW12/RAW14/RAW16/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	12V Power adapter
Power consumption	<5.5W
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	88mmx88mmx21.2mm
Weight	540g
Lens mount	M52 Interface
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 5-6 IUC60000KPA camera specifications

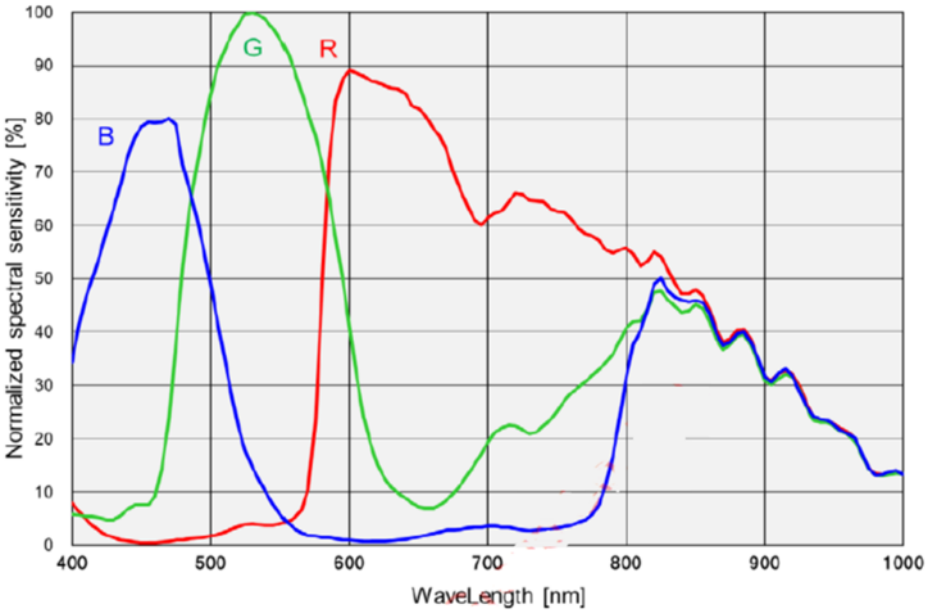


Figure 5-6 IUC60000KPA spectral response curve

6 I3ISPM series technical specifications

6.1 I3ISPM00500KPA

Parameter \ Model	I3ISPM00500KPA
	0.5M 1/1.7" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX433LQJ
Pixel size	9.0 μm×9.0 μm
Sensor size	1/1.7"
Frame rate	166.5fps@812×620
Dynamic range	72.3dB
Signal-to-Noise ratio	50.0dB
Sensitivity	4910mV
Dark current	0.3mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V1)	One optical-coupling isolated input, one optical-coupling isolated output, one non-isolated input, one non-isolated output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-1 I3ISPM00500KPA camera specifications

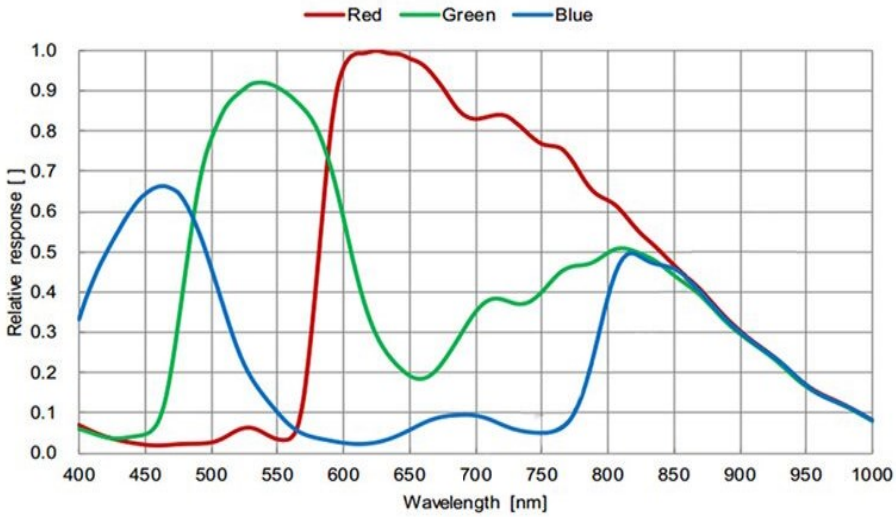


Figure 6-1 I3ISPM00500KPA spectral response curve

6.2 I3ISPM01500KPA

Parameter \ Model	I3ISPM01500KPA
	1.5M pixels 1/2.9" CMOS USB3.0industrial camera
Camera	
Sensor model	Sony IMX273LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/2.9"
Frame rate	227.2fps@1440×1080,382.7fps@720×540
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW10/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-2 I3ISPM01500KPA Camera Parameters Index

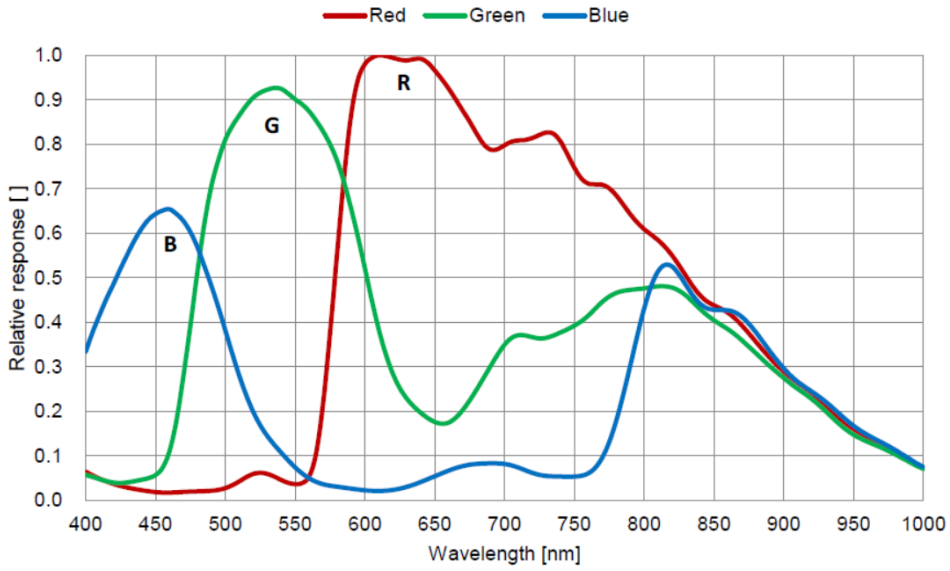


Figure 6-2 I3ISPM01500KPA spectral response curve

6.3 I3ISPM02300KPA

Parameter \ Model	I3ISPM02300KPA
	2.3M pixels 1/1.2" CMOS USB3.0industrial camera
Camera	
Sensor model	Sony IMX174LQJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	164.5fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Sensitivity	1016mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW10/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-3 I3ISPM02300KPA Camera Parameters Index

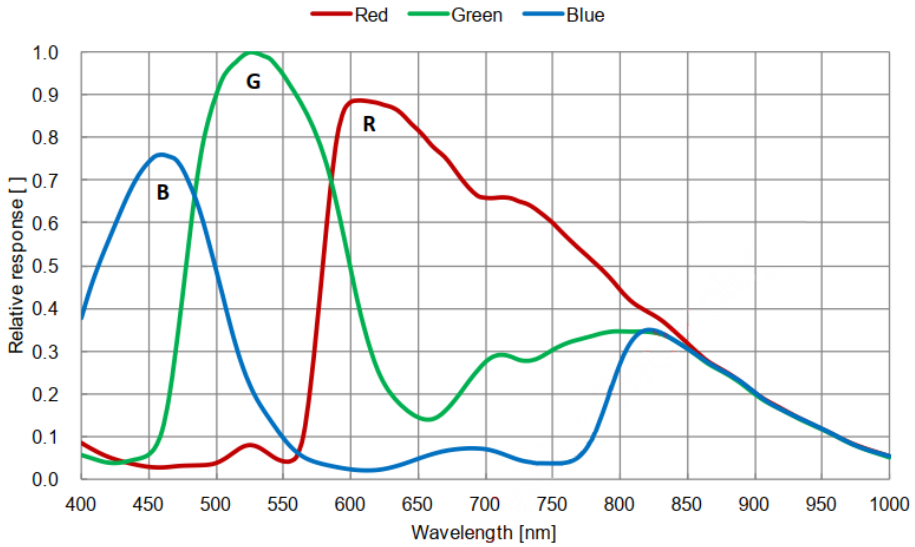


Figure 6-3 I3ISPM02300KPA spectral response curve

6.4 I3ISPM02300KPB

Parameter \ Model	I3ISPM02300KPB
	2.3M pixels 1/1.2" CMOS USB3.0industrial camera
Camera	
Sensor model	Sony IMX249LQJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	30fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Sensitivity	1016mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW10/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-4 I3ISPM02300KPB Camera Parameters Index

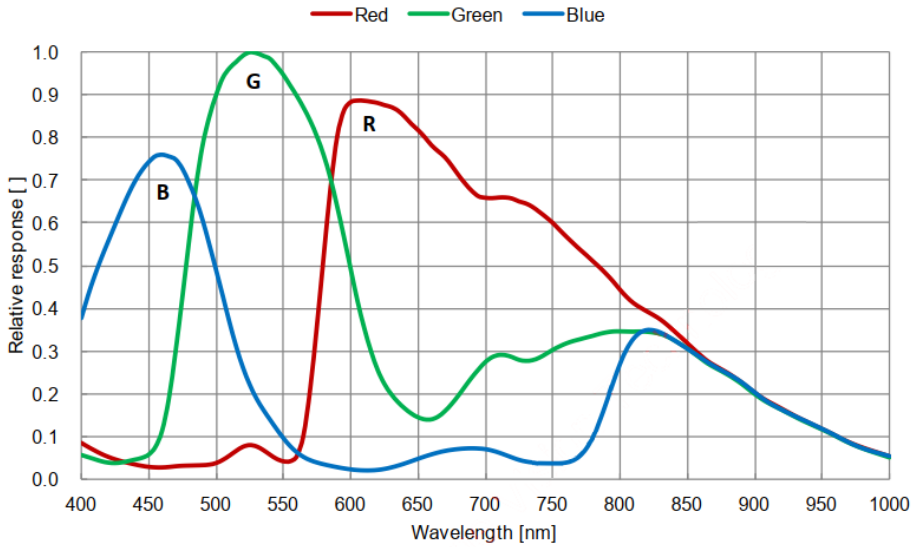


Figure 6-4 I3ISPM02300KPB spectral response curve

6.5 I3ISPM03100KPA

Parameter \ Model	I3ISPM03100KPA
	3.1M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX252LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/1.8"
Frame rate	115fps@2048×1536,230.3fps@1024×768
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-5 I3ISPM03100KPA camera specifications

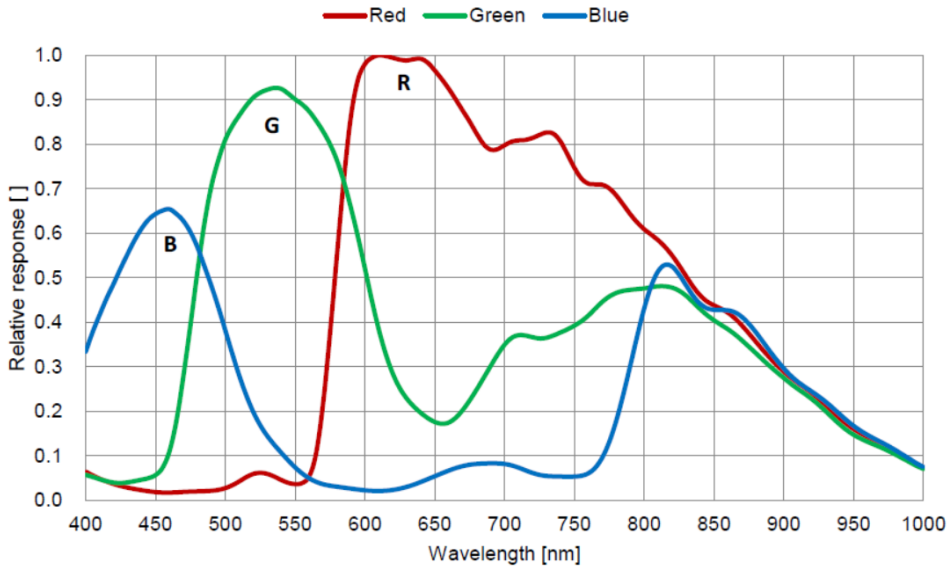


Figure 6-5 I3ISPM03100KPA spectral response curve

6.6 I3ISPM03100KPB

Parameter \ Model	I3ISPM03100KPB
	3.1M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX265LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/1.8"
Frame rate	55.4fps@2048×1536,115.1fps@1024×768
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-6 I3ISPM03100KPB camera specifications

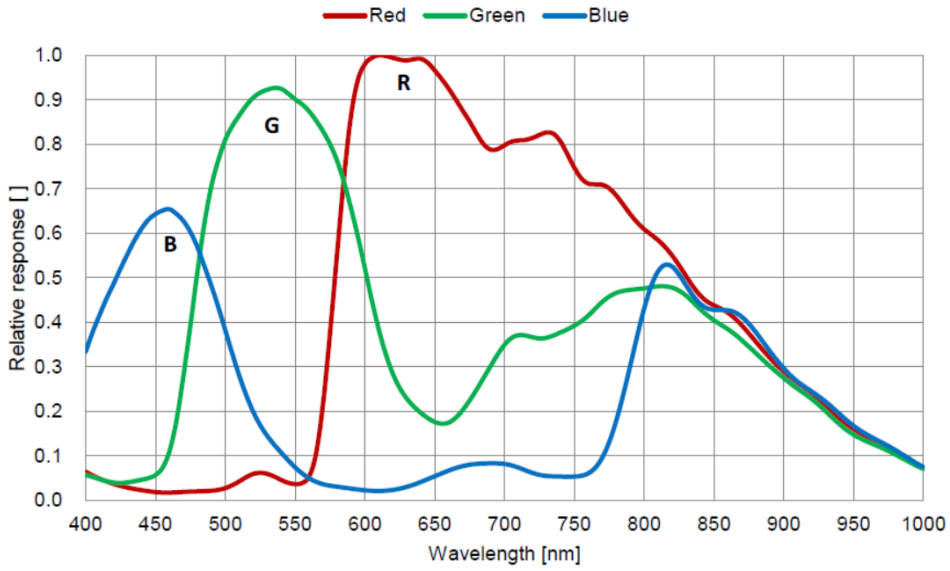


Figure 6-6 I3ISPM03100KPB spectral response curve

6.7 I3ISPM05000KPA

Parameter \ Model	I3ISPM05000KPA
	5M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX250LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	2/3"
Frame rate	71.2fps@2448×2048,175.2fps@1224×1024
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-7 I3ISPM05000KPA camera specifications

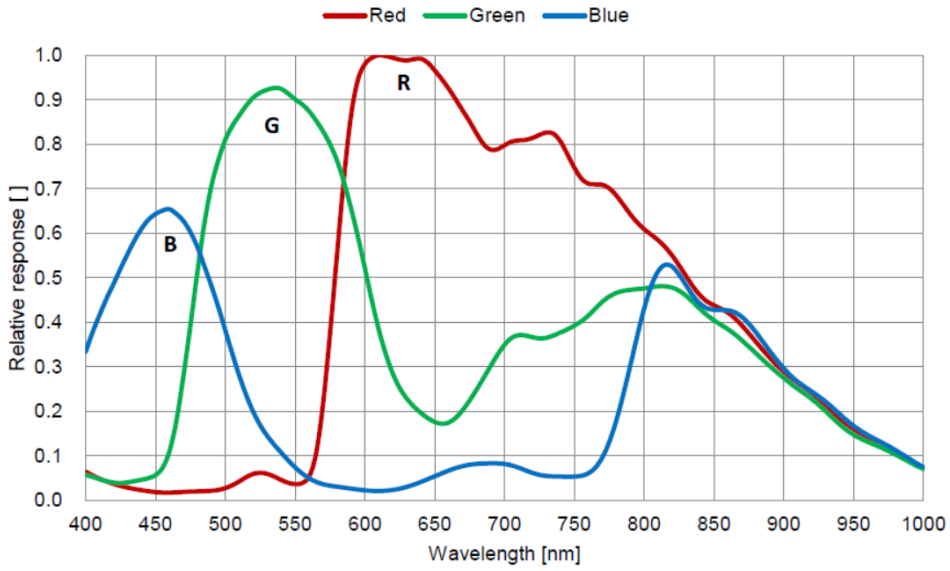


Figure 6-7 I3ISPM05000KPA spectral response curve

6.8 I3ISPM05000KPB

Parameter \ Model	I3ISPM05000KPB
	5M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX264LQR
Pixel size	3.45 μm×3.45 μm
Sensor size	2/3"
Frame rate	35.6fps@2448×2048, 87.6fps@1224×1024
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Sensitivity	1146mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-8 I3ISPM05000KPB camera specifications

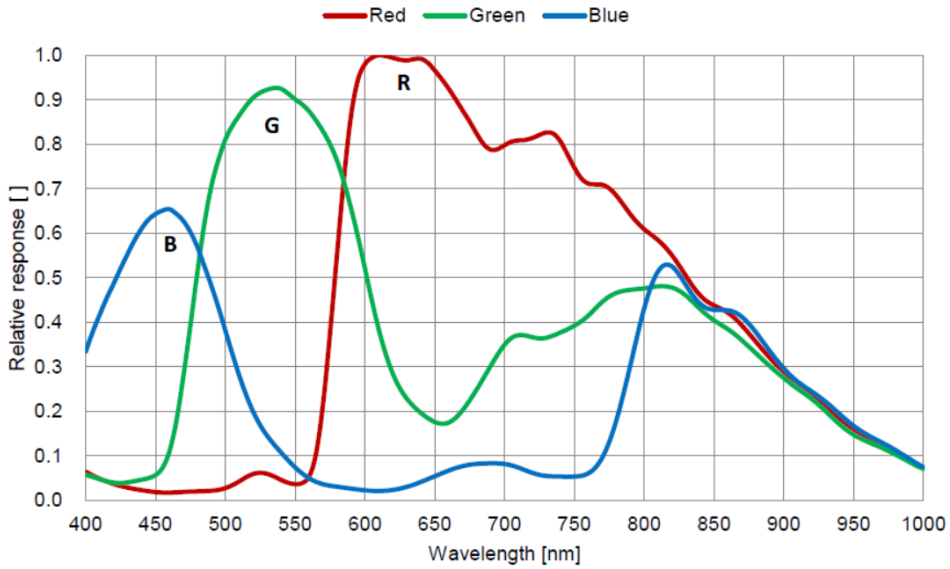


Figure 6-8 I3ISPM05000KPB spectral response curve

6.9 I3ISPM06300KPA

Parameter \ Model	I3ISPM06300KPA
	6.3M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX178LQJ
Pixel size	2.4 μm×2.4 μm
Sensor size	1/1.8"
Frame rate	58.7fps@3072×2048, 59.5fps@1536×1024
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	425mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	17μs-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2; Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	RAW8/RAW12/RGB8/RGB24/RGB32/RGB48
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperayure-10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 6-9 I3ISPM06300KPA camera specifications

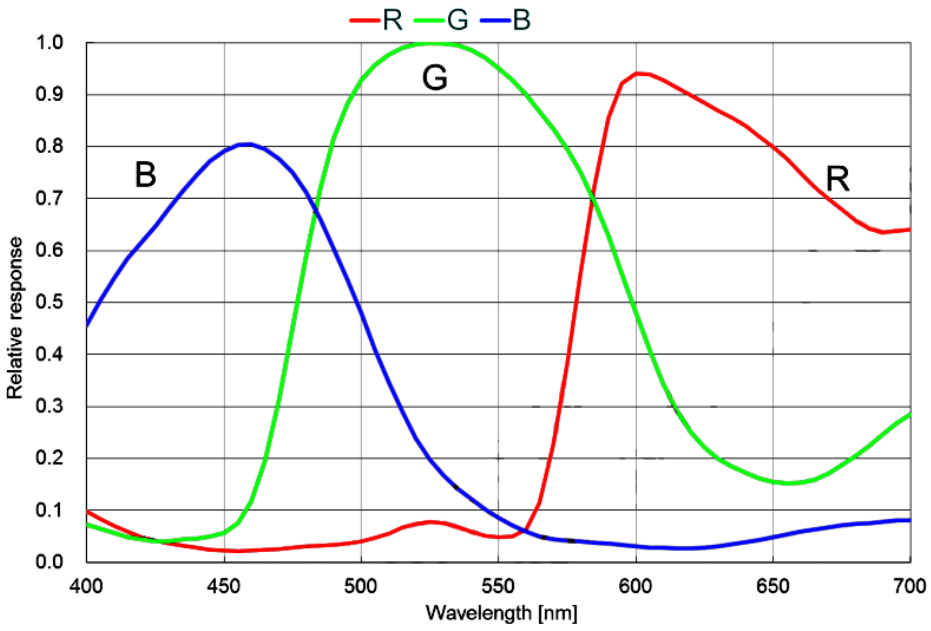


Figure 6-9 I3ISPM06300KPA spectral response curve

7 I3CMOS series technical specifications

7.1 I3CMOS00500KMA

Parameter \ Model	I3CMOS00500KMA
	0.5M pixel 1 / 1.7 "CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX433LLJ
Pixel size	9.0 μm×9.0 μm
Sensor size	1/1.7”
Frame rate	166.5fps@812×620
Dynamic range	72.3dB
Signal-to-Noise ratio	50.0dB
Peak QE	78%@575nm
Sensitivity	8100mV
Dark current	0.3mV
Gain range	1x-50x
Exposure time	6μs-15sec
Shutter	Global Shutter
Binning	software2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V1)	One optical-coupling isolated input, one optical-coupling isolated output, one non-isolated input, one non-isolated output
Data Format	Mono8 / Mono12
General Specifications	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃; Storage temperature -30~70℃
Humidity	20% - 80% No condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-1 I3CMOS00500KMA camera specifications

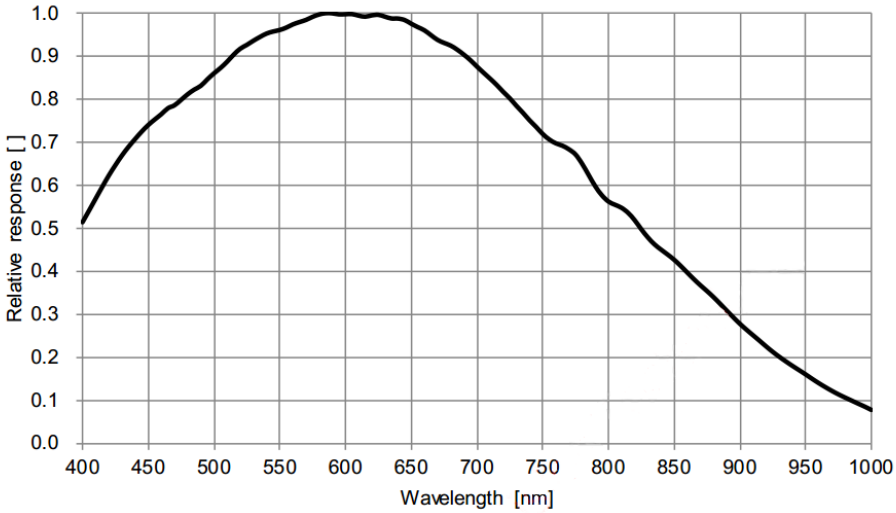


Figure 7-1 I3CMOS00500KMA spectral response curve

7.2 I3CMOS01500KMA

Parameter \ Model	I3CMOS01500KMA
	1.5M pixels 1/2.9" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX273LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/2.9"
Frame rate	226.5fps@1440×1080, 506fps@720×540
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Peak QE	71%@575nm
Sensitivity	1830mV
Dark current	0.19mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	hardware2×2; software2×2, 3×3, 4×4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data Format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-2 I3CMS01500KMA camera specifications

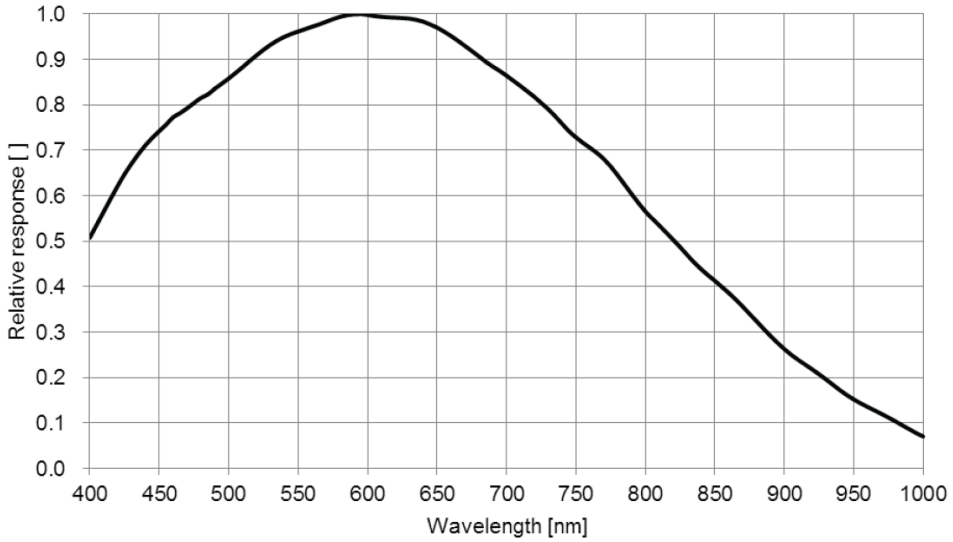


Figure 7-2 I3CMOS01500KMA spectral response curve

7.3 I3CMOS02300KMA

Parameter \ Model	I3CMOS02300KMA
	2.3M pixels 1/1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX174LLJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	164.5fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Peak QE	78%@575nm
Sensitivity	1650mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	software2×2, 3×3, 4×4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data Format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-3 I3CMS02300KMA camera specifications

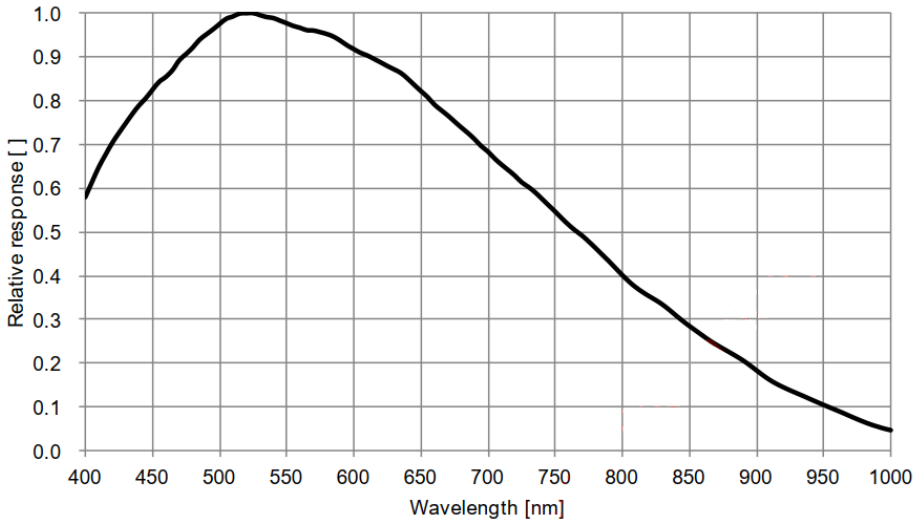


Figure 7-3 I3CMOS02300KMA spectral response curve

7.4 I3CMOS02300KMB

Parameter \ Model	I3CMOS02300KMB
	2.3M pixels 1/1.2" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX249LLJ
Pixel size	5.86 μm x 5.86 μm
Sensor size	1/1.2"
Frame rate	30fps@1920 x 1200
Dynamic range	73.6dB
Signal-to-Noise ratio	44.8dB
Peak QE	78%@575nm
Sensitivity	1650mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	software2×2, 3×3, 4×4
Data interface	USB3.0 (USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data Format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature -30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-4 I3CMS02300KMB camera specifications

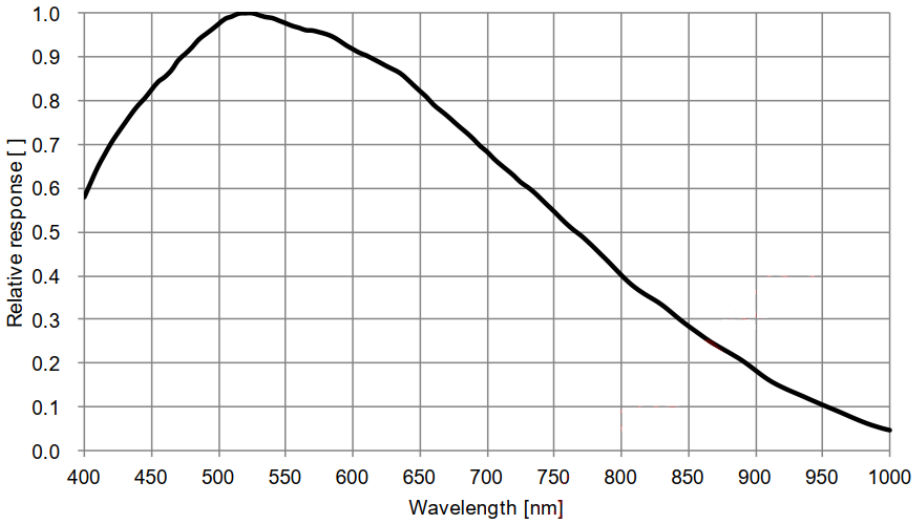


Figure 7-4 I3CMOS02300KMB spectral response curve

7.5 I3CMOS03100KMA

Parameter \ Model	I3CMOS03100KMA
	3.1M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX252LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/1.8"
Frame rate	110.6fps@2048×1536, 233.8fps@1024×768
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Peak QE	71%@575nm
Sensitivity	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-5 I3CMOS03100KMA camera specifications

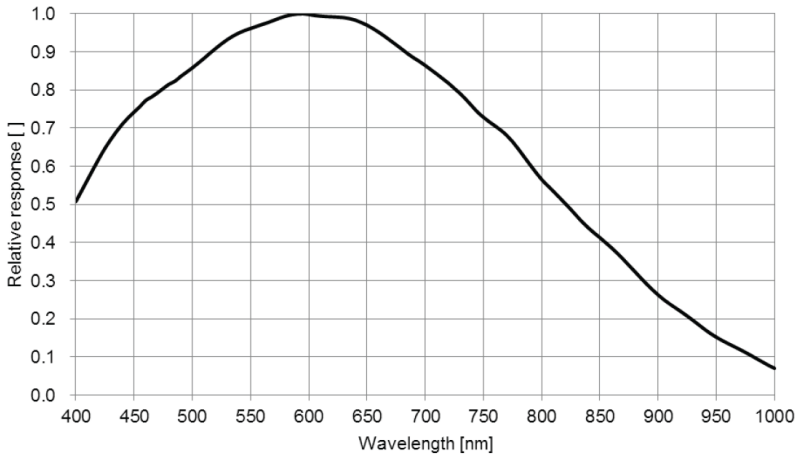


Figure 7-5 I3CMOS03100KMA spectral response curve

7.6 I3CMOS03100KMB

Parameter \ Model	I3CMOS03100KMB
	3.1M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX265LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	1/1.8"
Frame rate	55.4fps@2048×1536,115.1fps@1024×768
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Peak QE	71%@575nm
Sensitivity	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-6 I3CMOS03100KMB specifications

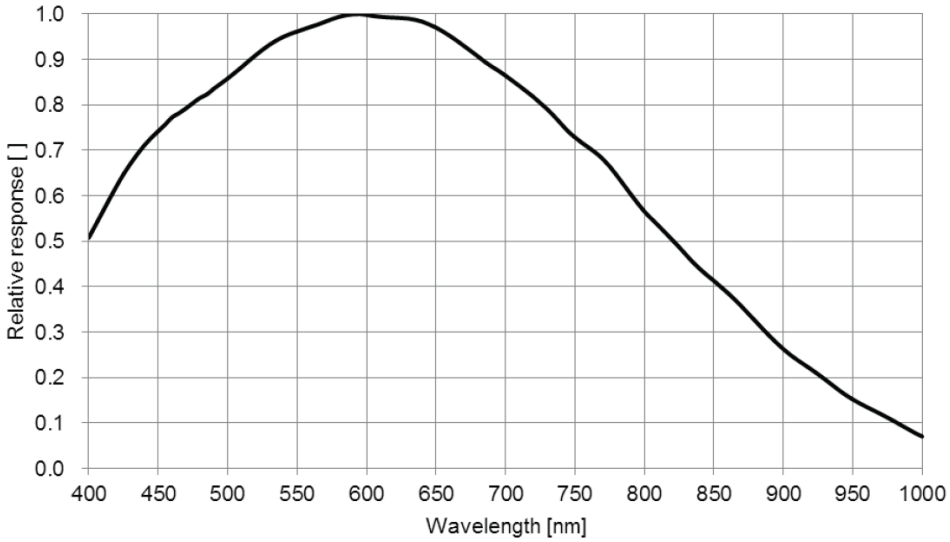


Figure 7-6 I3CMOS03100KMB spectral response curve

7.7 I3CMOS05000KMA

Parameter \ Model	I3CMOS05000KMA
	5M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX250LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	2/3"
Frame rate	70.9fps@2448×2048, 175.2fps@1224×1024
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Peak QE	71%@575nm
Sensitivity	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	global shutter
Binning	software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature-30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-7 I3CMOS05000KMA camera specification

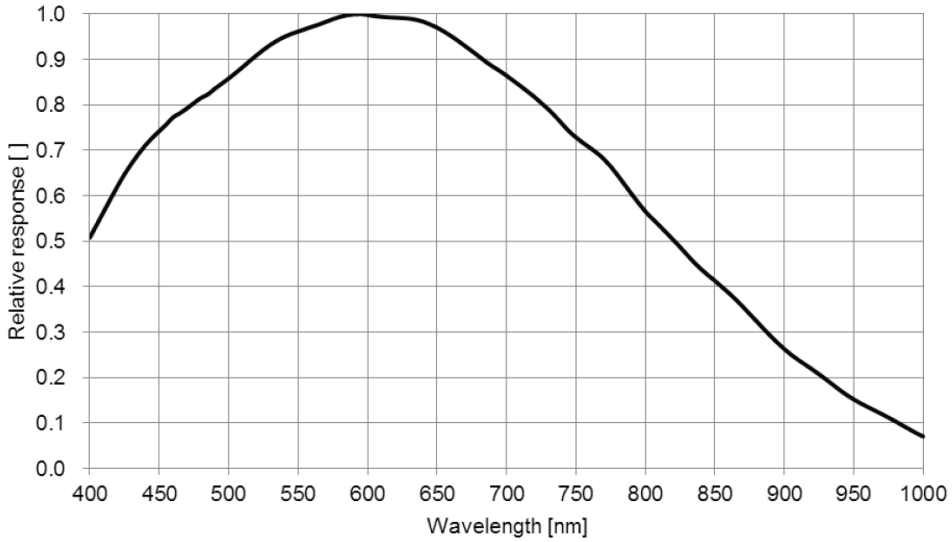


Figure 7-7 I3CMOS05000KMA spectral response curve

7.8 I3CMOS05000KMB

Parameter \ Model	I3CMOS05000KMB
	5M pixels 2/3" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX264LLR
Pixel size	3.45 μm×3.45 μm
Sensor size	2/3"
Frame rate	35.6fps@2448×2048,87.6fps@1224×1024
Dynamic range	73.6dB
Signal-to-Noise ratio	40.4dB
Peak QE	71%@575nm
Sensitivity	1830mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	15μs-15sec
Shutter	Global shutter
Binning	Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature 30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-8 I3CMOS05000KMB camera specifications

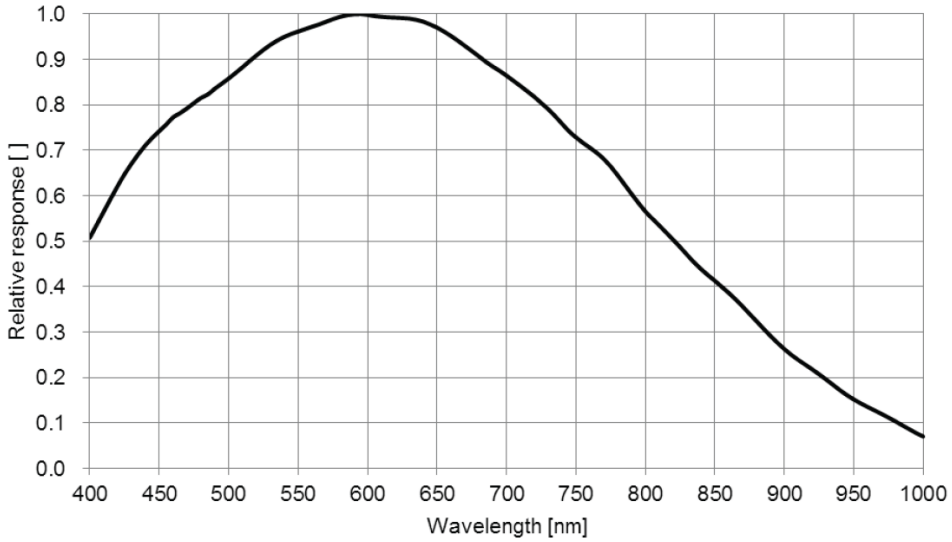


Figure 7-8 I3CMOS05000KMB spectral response curve

7.9 I3CMOS06300KMA

Parameter \ Model	I3CMOS06300KMA
	6.3M pixels 1/1.8" CMOS USB3.0 industrial camera
Camera	
Sensor model	Sony IMX178LLJ
Pixel size	2.4 μm×2.4 μm
Sensor size	1/1.8"
Frame rate	58.7fps@3072×2048,59.5fps@1536×1024
Dynamic range	71dB
Signal-to-Noise ratio	40dB
Sensitivity	760mV
Dark current	0.15mV
Gain range	1x-50x
Exposure time	17μs-15sec
Shutter	Rolling shutter
Binning	Hardware 2x2;Software 2×2, 3×3, 4×4
Data interface	USB3.0(USB3.1 GEN1)
Digital I/O (V2)	One opto-coupling isolated input, one opto-coupling isolated output, one non-isolated input/output
Data format	Mono8 / Mono12
General specification	
Power supply	Power with USB3.0
Power consumption	<3.5W
Temperature	Working temperature -10~50℃, storage temperature 30~70℃
Humidity	20%-80%, no condensation
Size	33mm×33mm×33mm
Weight	70g
Lens mount	C-mount
Software	ToupView/ SDK
Operating system	Win32/WinRT/Linux/macOS/Android
Certification	CE, FCC

Table 7-9 I3CMOS06300KMA camera specifications

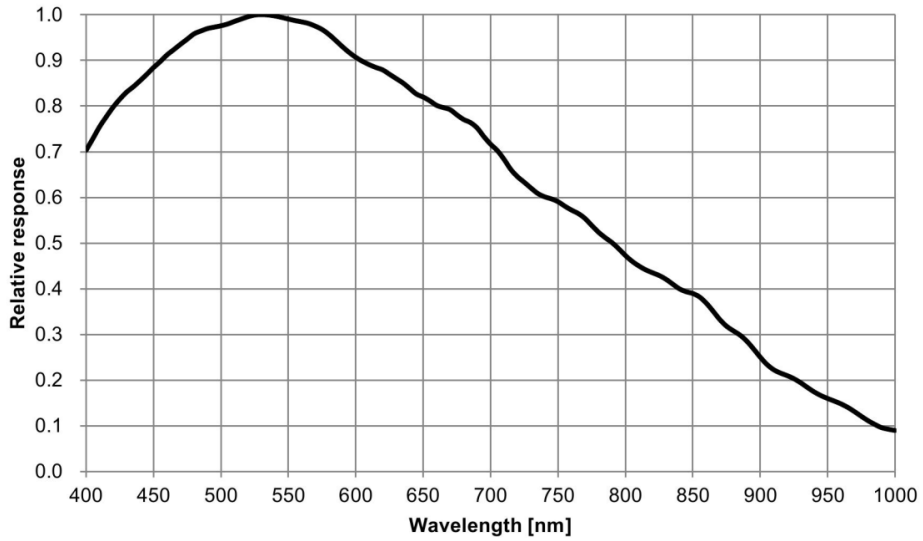


Figure 7-9 I3CMOS06300KMA spectral response curve

8 Camera Dimension and Interface

8.1 SWIR series camera dimensions

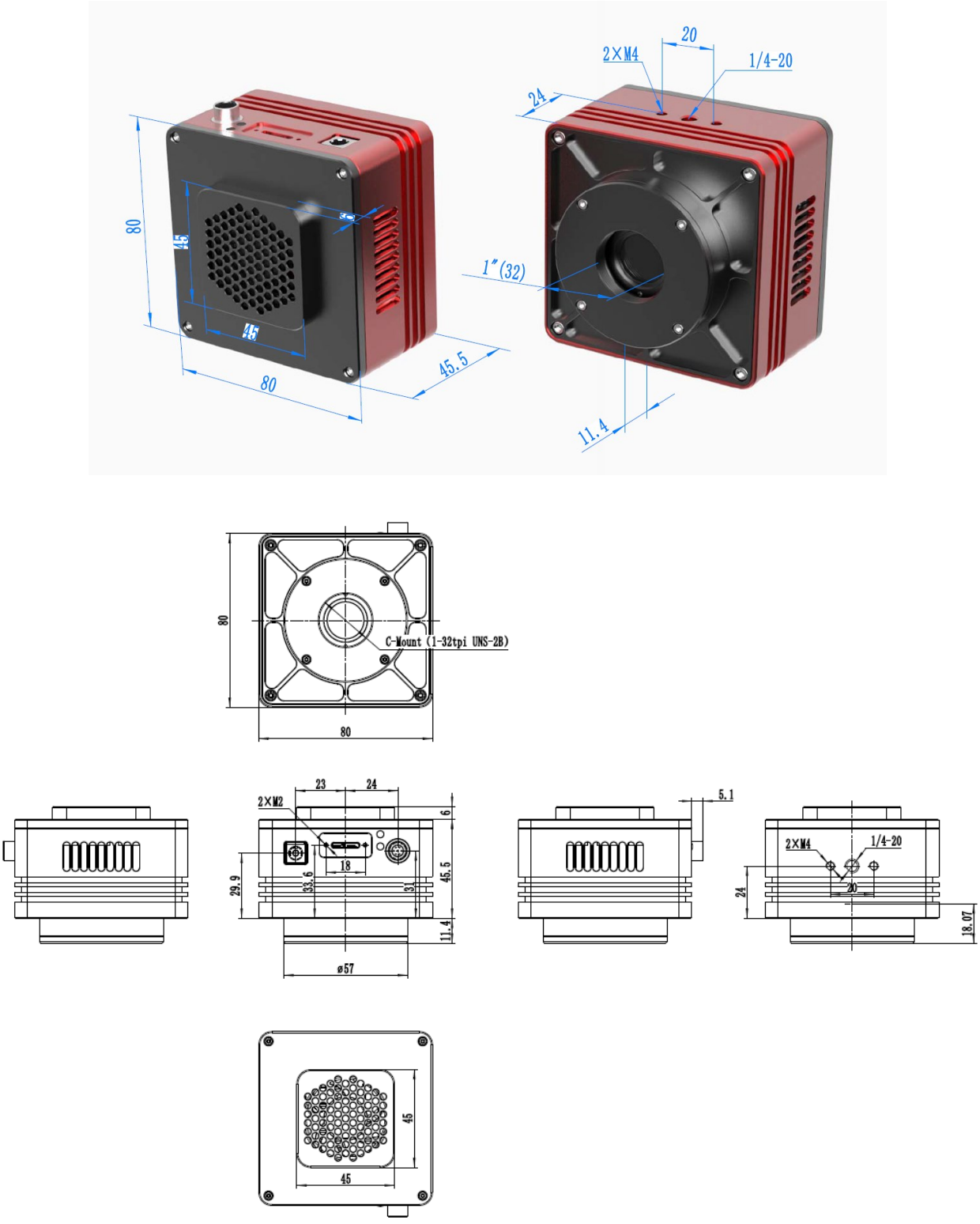


Figure 8-1 Dimension of SWIR series camera

8.2 IUA series camera dimensions and outputs

8.2.1 IUA series camera mechanical housing dimensions

Figure 8-2 IUA series camera

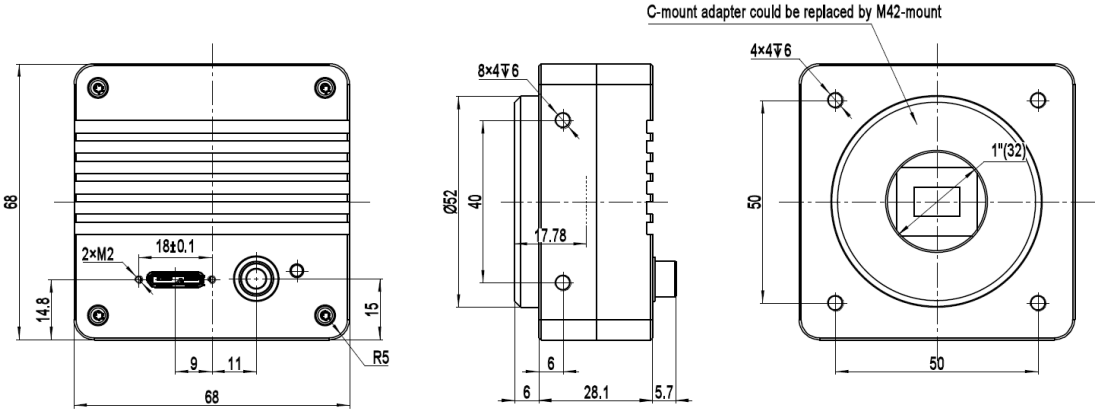


Figure 8-3 Dimensions of IUA camera housing (mm)

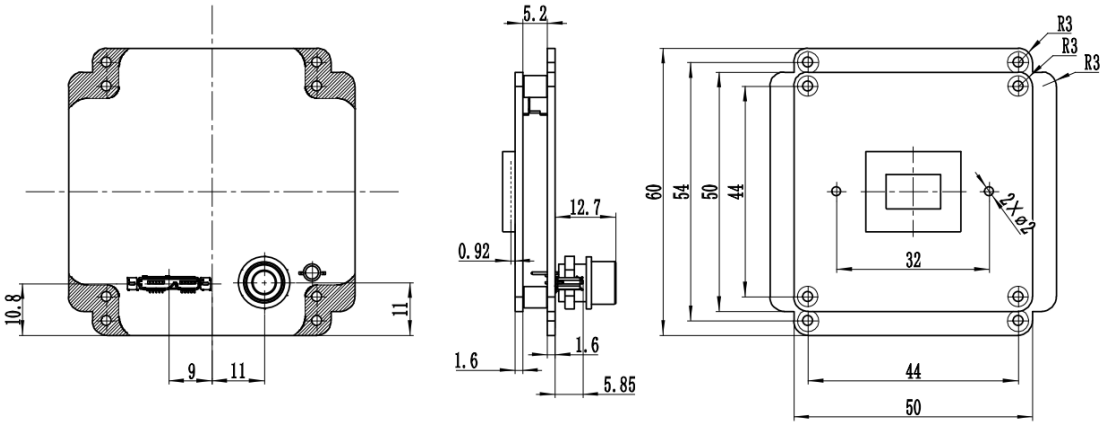


Figure 8-4 Dimensions of IUA circuit board (mm)

8.2.2 IUA series camera interface

The back of the industrial camera is shown in Figure 8-5. It has standard USB3.0 output, 7 Pin I/O port (aviation head) and on/off indicator. It has two M2 screw holes on both sides of USB 3.0 port to fix the cable. The holes reduce cable loosening caused by field vibration.

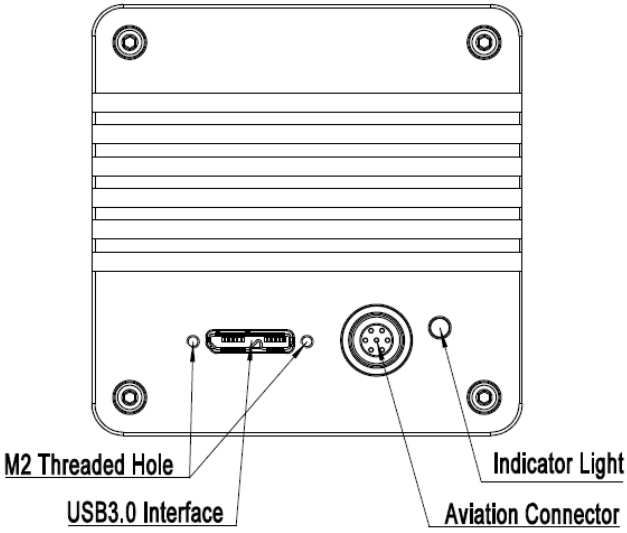
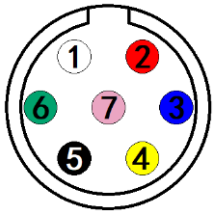


Figure 8-5 Schematic diagram of IUA camera back panel

8.2.3 IUA series camera power supply and I/O connector

The pin signal definition for the IUA series camera 7 Pin I/O connector is shown in Table 8-1.



Color	Pin	Signal	Signal description
White	1	GND	Direct-coupled signal ground
Red	2	5V	5VDC power input or output
Blue	3	OPTO_GND	Opto-isolated signal ground
Yellow	4	DIR_GPIO1	Direct-coupled General Purpose I/O (Software configurable input/output) (line2)
Black	5	DIR_GPIO2	Direct-coupled General Purpose I/O (Software configurable input/output) (line3)
Green	6	OPTO_IN	Opto-isolated input signal (line0)
Pink	7	OPTO_OUT	Opto-isolated output signal (line1)

Table 8-1 IUA series pin signal definition

8.2.4 IUA series camera packing information

For normal use of industrial cameras, please prepare the required accessories as shown in Table 8-2 before installation.

Order number	Accessories name	Quantity	Instruction
1	Camera	1	Camera referred in this manual
2	I/O cable	1	7 Pin cable or extended cable
3	USB3.0 cable	1	Suitable length of Micro USB3.0 cable
4	Lens (optional)	1	C-mount lens

Table 8-2 Recommended accessories for IUA series camera

8.3 IUB series camera dimensions and outputs

8.3.1 IUB series camera mechanical housing dimensions

Figure 8-6 IUB series camera

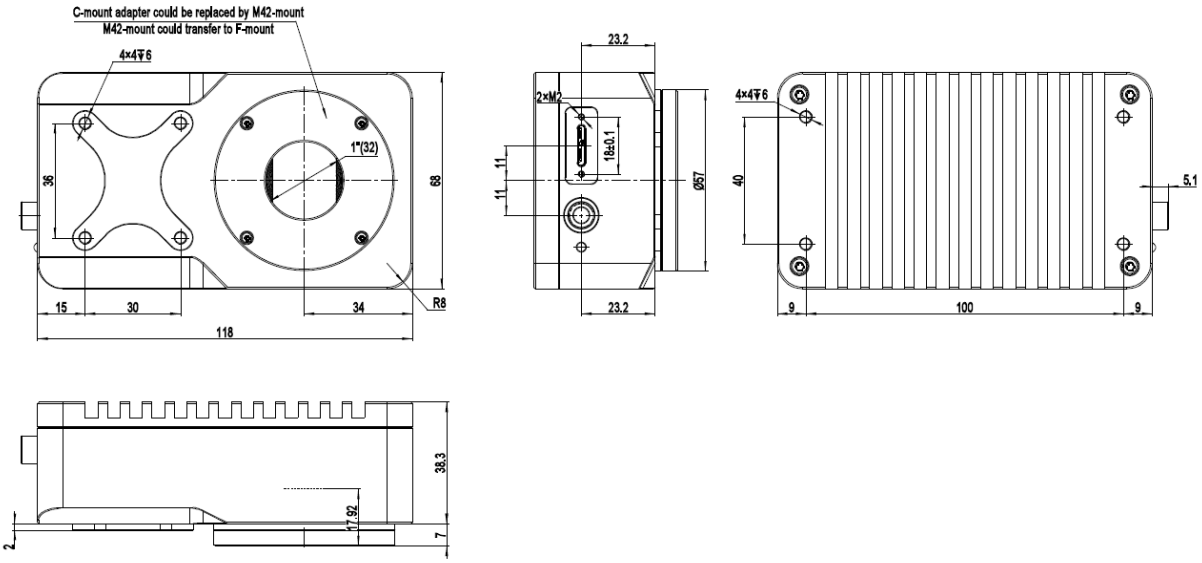


Figure 8-7 Dimensions of IUB camera housing (mm)

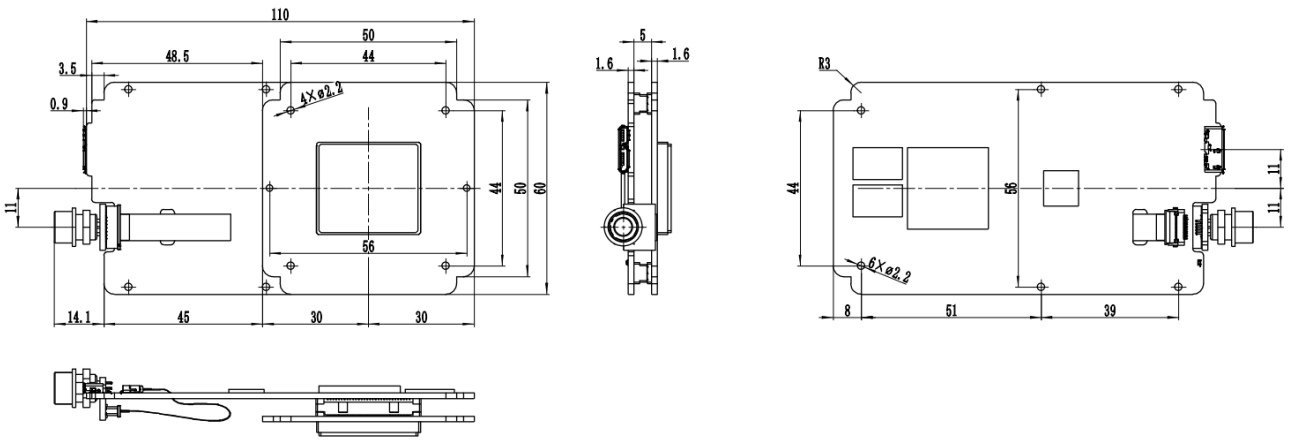


Figure 8-8 Dimensions of IUB circuit board (mm)

8.3.2 IUB series camera interface

The back of the industrial camera is shown in Figure 8-9. It has standard USB3.0 output, 7 Pin I/O port (aviation head) and on/off indicator. It has two M2 screw holes on both sides of USB 3.0 port to fix the cable. The holes reduce cable loosening caused by field vibration.

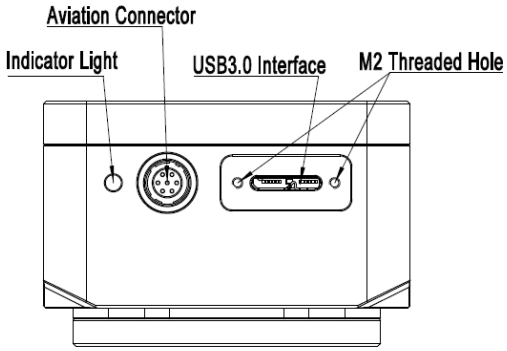
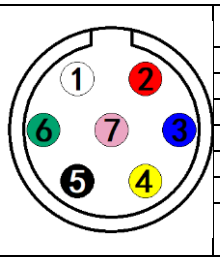


Figure 8-9 Schematic diagram of IUB camera back panel

8.3.3 IUB series camera power supply and I/O connector

The pin signal definition for the IUB, IUC series camera 7 Pin I/O connector is shown in Table 8-3.



Color	Pin	Signal	Signal description
White	1	GND	Direct-coupled signal ground
Red	2	12V	12VDC power input or output
Blue	3	OPTO_GND	Opto-isolated signal ground
Yellow	4	DIR_GPIO1	Direct-coupled General Purpose I/O (Software configurable input/output) (line2)
Black	5	DIR_GPIO2	Direct-coupled General Purpose I/O (Software configurable input/output) (line3)
Green	6	OPTO_IN	Opto-isolated input signal (line0)
Pink	7	OPTO_OUT	Opto-isolated output signal (line1)

Table 8-3 IUB series pin signal definitions

8.3.4 IUB series camera packing information

For normal use of industrial cameras, please prepare the required accessories as shown in Table 8-4 before installation.

Order number	Accessories name	Quantity	Instruction
1	Camera	1	Camera referred in this manual
2	I/O cable	1	7 Pin cable or extended cable
3	USB3.0 cable	1	Suitable length of Micro USB3.0 cable
4	Power (IUB)	1	IUB series of power adapters
5	Lens (optional)	1	C-mount lens

Table 8-4 Recommended accessories for IUB series camera

8.4 IUC series camera dimensions and outputs

8.4.1 IUC series camera mechanical housing dimensions

Figure 8-10 IUC series camera

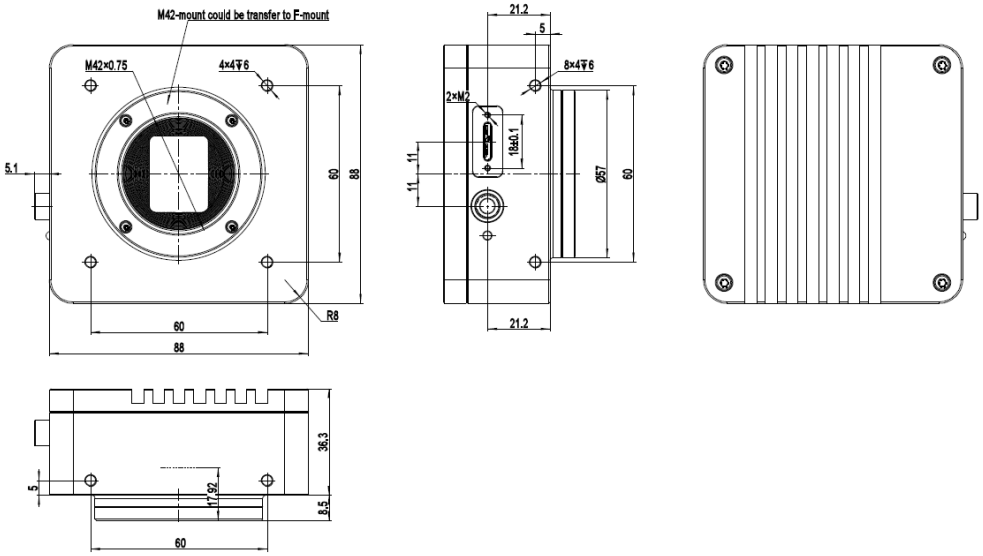


Figure 8-11 Dimensions of IUC camera housing (mm)

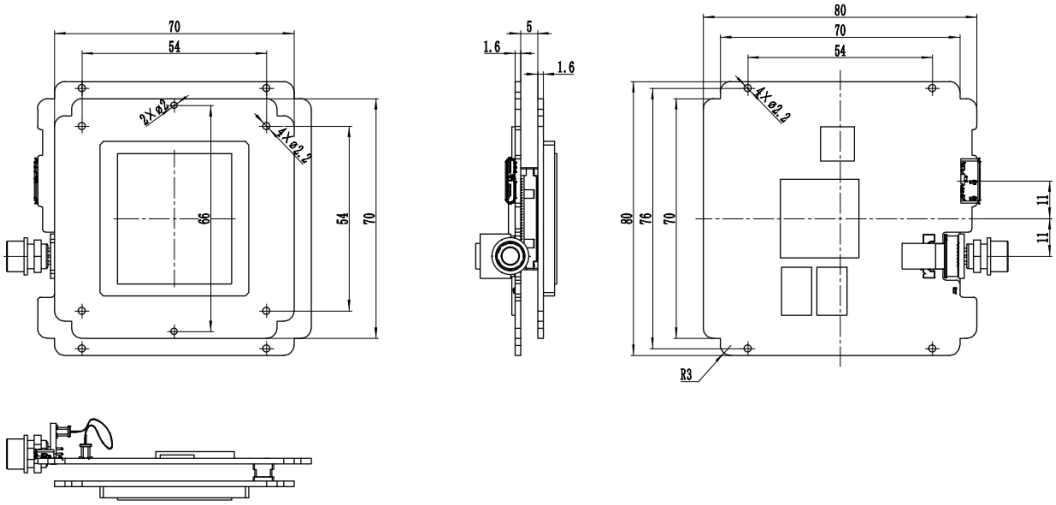


Figure 8-12 Dimensions of IUC circuit board (mm)

8.4.2 IUC series camera interface

The back of the industrial camera is shown in Figure 8-13. It has standard USB3.0 output, 7 Pin I/O port (aviation head) and on/off indicator. It has two M2 screw holes on both sides of USB 3.0 port to fix the cable. The holes reduce cable loosening caused by field vibration.

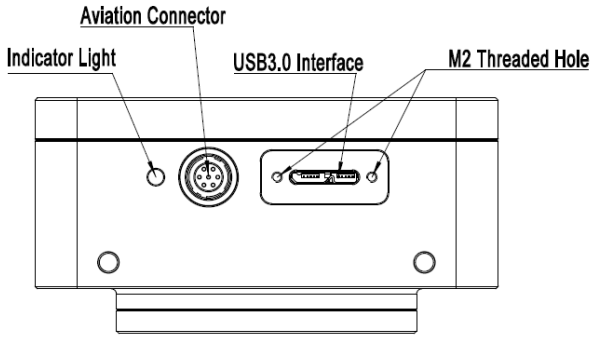
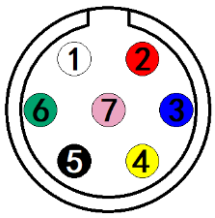


Figure 8-13 Schematic diagram of IUC camera back panel

8.4.3 IUC series camera power supply and I/O connector

The pin signal definition for the IUC series camera 7 Pin I/O connector is shown in Table 8-5.



Color	Pin	Signal	Signal description
White	1	GND	Direct-coupled signal ground
Red	2	12V	12VDC power input or output
Blue	3	OPTO_GND	Opto-isolated signal ground
Yellow	4	DIR_GPIO1	Direct-coupled General Purpose I/O (Software configurable input/output) (line2)
Black	5	DIR_GPIO2	Direct-coupled General Purpose I/O (Software configurable input/output) (line3)
Green	6	OPTO_IN	Opto-isolated input signal (line0)
Pink	7	OPTO_OUT	Opto-isolated output signal (line1)

Table 8-5 IUC series pin signal definitions

8.4.4 IUC series camera packing information

For normal use of industrial cameras, please prepare the required accessories as shown in Table 8-6 before installation.

Order number	Accessories name	Quantity	Instruction
1	Camera	1	Camera referred in this manual
2	I/O cable	1	7 Pin cable or extended cable
3	USB3.0 cable	1	Suitable length of Micro USB3.0 cable
4	Power (IUC)	1	Power adapter for IUC series
5	Lens (optional)	1	C-mount lens

Table 8-6 Recommended accessories for IUC series camera

8.5 I3CMOS and I3ISPM series camera dimensions and outputs

8.5.1 I3CMOS and I3ISPM series camera mechanical housing dimensions

Figure 8-14 I3CMOS or I3ISPM series camera

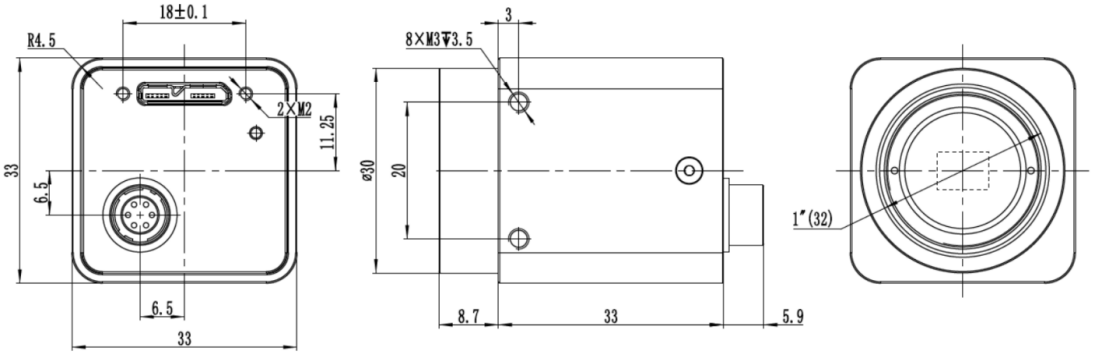


Figure 8-15 Dimensions of camera housing(mm)

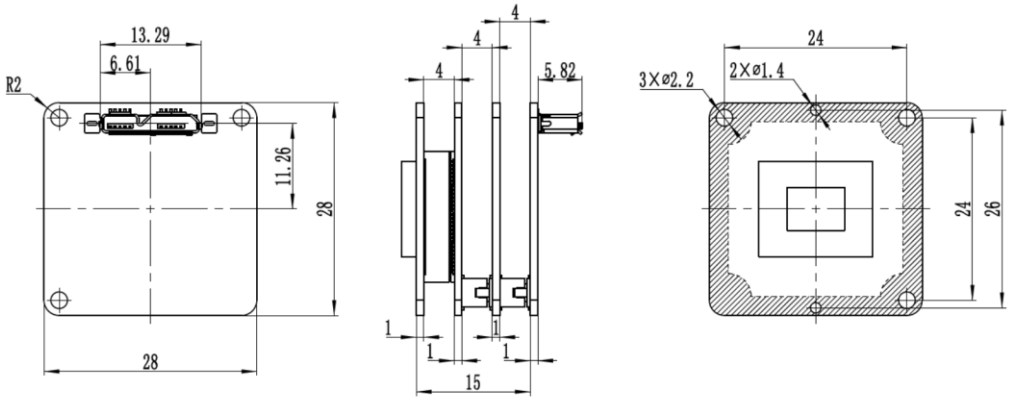


Figure 8-16 Dimensions of circuit board(mm)

8.5.2 I3CMOS and I3ISPM series camera interface

The back of the industrial camera is shown in Figure 8-17. It has standard USB3.0 output, 6 Pin I/O port (aviation head) and on/off indicator. It has two M2 screw holes on both sides of USB 3.0 port to fix the cable. The holes reduce cable loosening caused by field vibration.

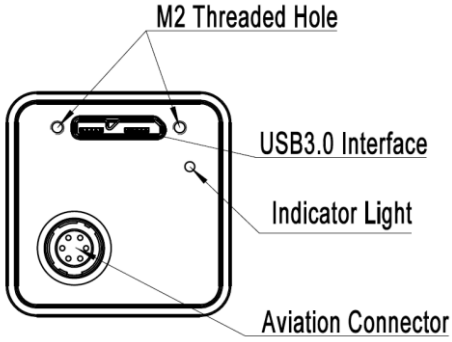
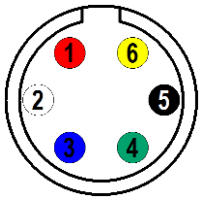


Figure 8-17 Schematic diagram of camera back panel

8.5.3 I3CMOS and I3ISPM series camera power supply and I/O connector

The hardware version number of model I3CMOS00500KMA and I3ISPM00500KPA is V1, and the other models is V2.

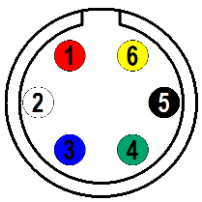
The pin signal definition for the camera 6 Pin I/O connector of hardware version V1 is shown in Table 8-7.



Color	Pin	Signal	Signal description
red	1	DIR_IN	Direct-coupled input signal (line2)
white	2	OPTO_GND	Opto-isolated signal ground
blue	3	OPTO_OUT	Opto-isolated output signal(line1)
green	4	OPTO_IN	Opto-isolated input signal(line0)
black	5	GND	Direct-coupled signal ground
yellow	6	DIR_OUT	Direct-coupled output signal(line3)

Table 8-7 Pin signal definition

The pin signal definition for the camera 6 Pin I/O connector with hardware version number V2 and above is shown in Table 8-8.



Color	Pin	Signal	Signal description
red	1	DIR_GPIO	Direct-coupled General Purpose I/O (Software configurable input / output) (line2)
white	2	OPTO_GND	Opto-isolated signal ground
blue	3	OPTO_OUT	Opto-isolated output signal(line1)
green	4	OPTO_IN	Opto-isolated input signal(line0)
black	5	GND	Direct-coupled signal ground
yellow	6	5V	5 VDC power input

Table 8-8 V2.0 and above pin signal definitions

8.5.4 I3CMOS and I3ISPM series camera packing Information

For normal use of industrial cameras, please prepare the required accessories as shown in Table 8-9 before installation.

Order number	Accessories name	Quantity	Instruction
1	Camera	1	Camera referred in this manual
2	I/O cable	1	6 Pin cable or extended cable

3	USB3.0 cable	1	Suitable length of Micro USB3.0 cable
4	Lens (optional)	1	C-mount lens

Table 8-9 Packing information and recommended accessories

9 Description of Software Development

9.1 SDK introduction

9.1.1 SDK support platform

- Win32:
  x86: XP SP3 and above versions; CPU needs to support the SSE2 instruction set at least
  x64: Win7 and above versions
  arm: Win10 and above versions
  arm64: Win10 and above versions
- WinRT: x86, x64, arm, arm64； Windows 10 or above versions
- macOS: x86 and x64 bundle； macOS 10.10 or above versions
- Linux: core 2.6.27 and above versions
  x86: CPU needs to support at least SSE3 instruction sets; GLIBC 2.8 and above
- x64: GLIBC 2.14 and above versions
- armel: GLIBC 2.17 and above versions. Compiled by toolchain arm-linux-gnueabi (version 4.9.2)
  armhf: GLIBC 2.17 and above versions; Compiled by toolchain arm-linux-gnueabihf (version 4.9.2)
  arm64: GLIBC 2.17 and above versions; Compiled by toolchain aarch64-linux-gnu (version 4.9.2)
- Android: arm, arm64, x86, x64; Compiled by android-ndk-r18b.

9.1.2 SDK content brief introduction

ToupCam series cameras support a variety of API, including: Native C/C++, NET / C#VB.NET, DirectShow, Twain, LabView and so on. Compared with the other API, as the low-level API, native C/C++ API is characterized by using pure C/C++ development, independent of other runtime libraries, having simple interface and flexible control. This SDK package contains all the resources and information you need to use, as follows:

- inc:
  toupcam.h, C/C++ Header file.
- win: Microsoft Windows Platform file
  - ✧ *dotnet:*

  toupcam.cs, Support for C#. toupcam.cs, use P/Invoke to call to toupcam.dll. Please copy toupcam.cs to your C # project.
  toupcam.vb, Support for VB.NET. toupcam.vb uses P/Invoke to call to toupcam.dll. Please copy toupcam.vb to your VB.NET project
  - ✧ *x86:*

  toupcam.lib, x86 lib file.
  toupcam.dll, x86 dynamic library files.
  democpp.exe, x86 C++ demo execute the procedure.
  - ✧ *x64:*

  toupcam.lib, x64 lib file.
  toupcam.dll, x64 dynamic library files.
  democpp.exe, x64 C++ demo execute the procedure.
  - ✧ *arm:*

toupcam.lib, arm lib file.

toupcam.dll, arm dynamic library files.

✧ *arm64:*

toupcam.lib, arm64 lib file.

toupcam.dll, arm64 dynamic library files.

✧ *winrt:*

They can be applied for Dynamic library files of WinRT/ UWP (Universal Windows Platform)/ Windows Store App. They are compatible with Windows Runtime and can be referenced by the Universal Windows Platform app. If you use C # to develop UWP, you can use the toupcam.cs to wrap class.

✧ *Please pay attention to the DeviceCapability of uwp. Refer to How to add USB device capabilities to the app manifest. (Microsoft seems to limit the Device entry under DeviceCapability to no more than 100) demouwp.zip is a simple example of uwp. Please modify vid and pid. under DeviceCapability in the file Package.appxmanifest before compiling the run example.*

✧ *drivers: (Cameras produced after 2017.1.1 support WinUSB. You no longer need to install drivers on Windows8 and above)*

The x86 folder contains the kernel state driver file for x86, including toupcam.cat, toupcam.inf and toupcam.sys.

The x64 folder contains the kernel state driver file for x64, including toupcam.cat, toupcam.inf and toupcam.sys

✧ *samples:*

1.democpp, take C++ for example. This example shows an enumeration device, an open device, a preview video, a snap image, a set resolution, a trigger and a wide variety of picture formats (bmp, jpg, png etc.) save the image to the file, wmv format video, trigger mode, I/O control, etc. This example uses the Pull Mode mechanism. In order to keep the code clean, the WTL library used by the example can be downloaded from this link http: //sourceforge.net/projects/wtl/

2.demopush, take C++ for example, using the Push Mode mechanism, StartPushModeV3

3.demomfc, A simple C++ example. it uses MFC as the GUI library, supports opening devices, previews video, captures images, sets resolution and saves images to files in a variety of image formats (.bmp, .jpg, .png, etc.). This example uses the Pull Mode mechanism.

4.demowinformcs1, take C# winform for example. It supports to open the device, preview video, capture images, save pictures to files and set white balance. This example uses the PullMode mechanism, called StartPullModeWithWndMsg.

5.demowinformcs2, take C# winform for example. It supports to open the device, preview video, capture images, save pictures to files, set white balance. This example uses the Pull Mode mechanism called StartPullModeWithCallback

6.demowinformcs3, take C# winform for example. It supports to open the device, preview video, capture images, save pictures to files, set white balance. This example uses the Push Mode mechanism called StartPushMode

7.demowinformvb, take VB.NET winform for example. It supports to open the device, preview video, capture images, save pictures to files and set white balance. This example uses the Pull Mode mechanism.

- linux: Linux platform file

Udev: 99-toupcam.rules, udev rule file

Please refer to: http: //reactivated.net/writing_udev_rules.html

✧ *c#: toupcam.cs, Support. Net Core C#. toupcam.cs calls to libtoupcam.so. using P/Invoke Please copy toupcam.cs to your C # project.*

✧ *x86: libtoupcam.so, X86 version of so file.*

✧ *x64: libtoupcam.so, x64 version of so file.*

- ✧ *armel: libtoupcam.so, armel version so file, toolchain is arm-linux-gnueabi*
- ✧ *armhf: libtoupcam.so, armhf version so file, toolchain isarm-linux-gnueabihf*
- ✧ *arm64: libtoupcam.so, Arm64 version so file, toolchain is aarch64-linux-gnu*

- android: Android platform. libtoupcam.so. for the four architectures of arm, arm64, x86, x64
- mac: macOS platform file
- python: toupcam.py and example code.
- java: toupcam.java and example code(Console and Swing)
- doc: SDK uses documentation, simplified Chinese, English.
- sample:
  - ✧ *demosimplest, the simplest example is about 60 lines of code.*
  - ✧ *demoraw, RAW data and static capture, about 120 lines of code.*
- extras:
  - ✧ *directshow: DirectShow SDK and demo programs.*
  - ✧ *twain: TWAIN SDK*
  - ✧ *labview: Labview SDK and demo programs.*
  - ✧ *MATLAB: MATLAB demo programs.*

9.2 Client democpp description

As shown in Figure 9-1, “1” is the control menu area and "2" is the video display area.

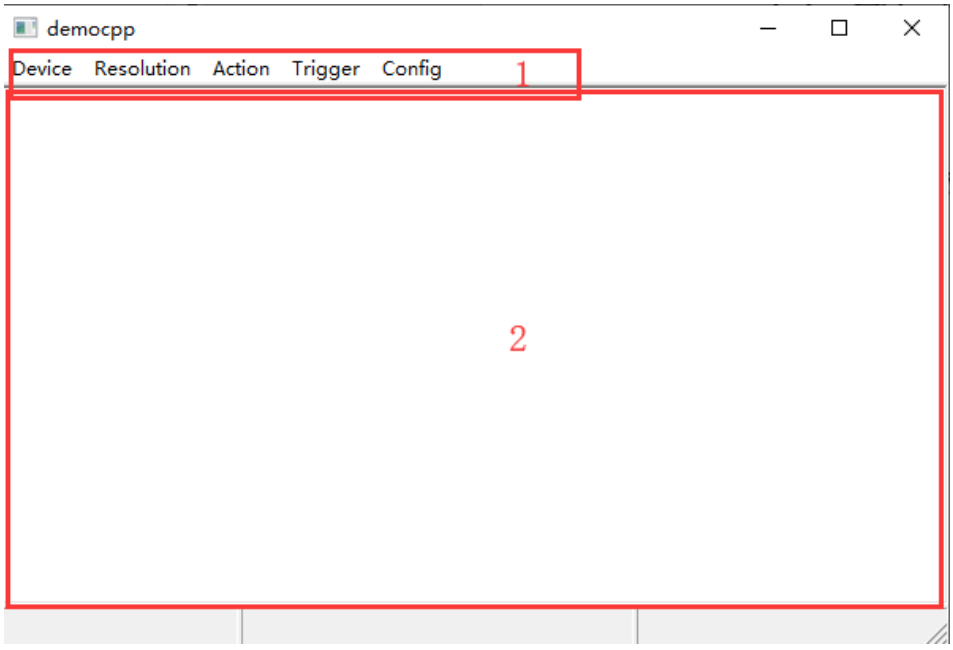


Figure 9-1 democpp interface

The main features of the control menu are:

Device: camera names installed are listed under this menu. Clicking the camera name to open the camera;

Resolution: switch the resolution and capture the image;

Action: Pause, ROI setting, test image, read firmware version number, hardware version number, production date, etc.

Trigger: Defining the trigger mode, the I/O port setting and the like;

Config: Set exposure, gain, white balance, frame rate, etc.

9.3 ToupView UI description

ToupView software fully controls all camera features and streams high-speed videos by USB port using Ultra Fine™ color engine. Ultra Fine™ color engine contains excellent procedure of processing RAW data and thus realizes the conversion of sensor detected data to image. Furthermore, ToupView also provides many advanced video and image processing features, such as image gray level correction, 2D measurement, stitching, depth of field extension, video watermarking, color synthesis, image segmentation and counting and so on. ToupView's multilingual environment can support any language and currently includes, but is not limited to, English, simplified Chinese, traditional Chinese, German, Japanese, Russian, French, Italian, Polish, Turkish, etc. The UI of ToupView is shown in Figure 9-2.

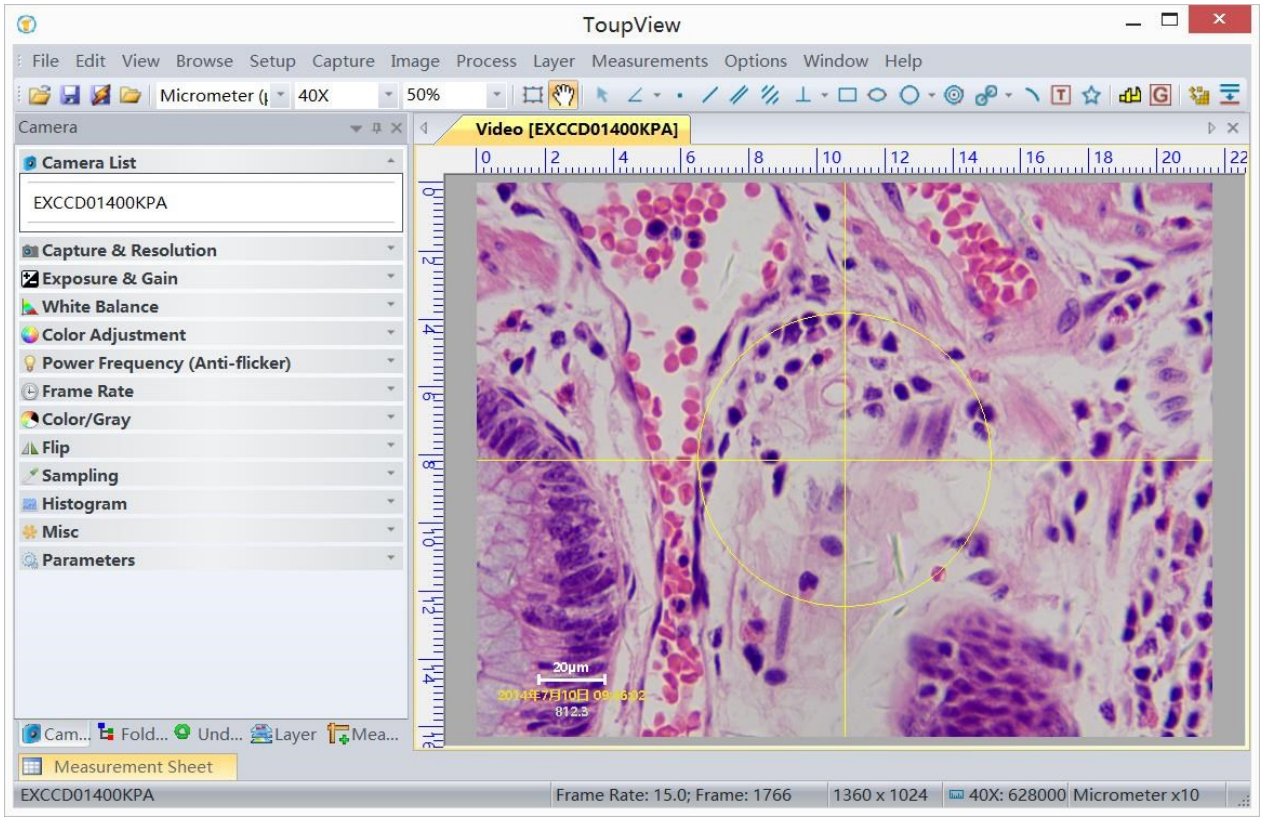


Figure 9-2 ToupView UI

The main features of ToupView are shown in Table 9-1.

Exposure and gain	Automatic exposure, manual exposure, gain up to 5x;
White balance	Automatic white balance; can be adjusted by manually setting the color temperature and color;
Color adjustment	Color, saturation, brightness, contrast, gamma value adjustment feature;
Frame rate control	According to the performance of different computers and USB, the compatibility of the camera can be realized by adjusting the frame rate;
Light source frequency control	Natural light / DC, AC50HZ, AC60HZ selection button eliminates video flicker;
Acoustic image	The direction of the adjustable sample can be adjusted by "horizontal" or "vertical" and is consistent with the direction of the visual system;
Sampling and neighborhood averaging and other features	Neighborhood average can improve the signal-to-noise ratio of video stream and sampling extraction mode can ensure the sharpness of video stream. Support video stream histogram expansion, image negative and positive film switching, gray calibration, clarity factor calculation to facilitate video focusing;
Parameter saving	Load, save, overwrite, load, export custom camera panel control;
Video feature	video broadcasting, timing capture, video recording, video watermarking, watermark movement alignment, watermark rotation alignment, video grid overlay, video measurement, video scaling, grayscale scaling calibration, video high dynamic (HDR), video depth of field expansion, video image stitching, video scale, the date and the like are superimposed;
Image processing and	Image contrast control and adjustment, image de-noising, various image filter algorithms, image mathematical

enhancement	morphology algorithm, image rotation, image scaling and image printing;
2D measurement	Convenient and practical video and image size calibration, a variety of video and image two-dimensional geometric measurements such as length, area, perimeter and angle, etc., the measurement results can be controlled according to image characteristics or preferences;
Image mosaicking	The image stitching can automatically splice the sequence image into a mosaic image. a video window, an image window and a browsing window splicing operation are supported;
EDF (Expansion of depth of field)	Depth of field expansion can get ultra-clear images beyond the conventional depth of field by focusing on different layers of images. ToupView supports EDF depth expansion in three windows: video window, image window and browsing window. For different images, ToupView also provides three different depth of field extension algorithms, such as maximum contrast, weighted average and FFDSSD. In addition, the translation, rotation and automatic depth of field expansion between different focus images are considered to ensure the accuracy and rapidity of EDF;
Professional segmentation and counting	The segmentation and counting of ToupView provides six image segmentation methods for users to call according to different image characteristics. The six segmentation methods are watershed, dark OTSU, bright OTSU, RGB histogram, HSV histogram, color segmentation and so on. Users can select any of the six segmentation methods for segmentation, but after selecting any segmentation method, other segmentation methods will be disabled. After the segmentation is completed, there may be the adhesion of the counting object, which can be manually segmented by manual segmentation and the counting results can be counted and analyzed by selecting the counting result menu after confirming the expected results;
Image superposition denoising	ToupView image superposition denoising feature introduces advanced image matching technology, users only need to record a small video of their own image to be superimposed, then they can superimpose and output high fidelity images under the condition of displacement, rotation and magnification of frame burst images, which is simple and easy to use;
Color synthesis	Color synthesis can use black and white fluorescent light source images to create and configure color composite images. Fluorescent probes and colors can be selected directly from predefined data. The dye database of special probe can also be built by the user himself;

Table 9-1 Main features of ToupView

10 Camera Installation and Operation

10.1 Installation steps

1. Fix the camera onto the installation position and attach appropriate C-mount lens to the camera.

2. Verify that the camera is properly connected to the industrial computer or PC using the Micro USB3.0 cable that comes with the camera. Tighten the cable by fastening screw at the camera side.

10.2 Driver check

The Operation Systems under Windows 7(Including WIN7) require a normal installation of the drive before the camera is used and if the drive installation fails, the camera will not be found by the client software.

After the installation is complete, in the **Device Manager**, you can see the new device type, such as I3CMS05000KMB and then right-click the mouse button to see if the device drive is properly installed or not, as shown in Figure 10-1.

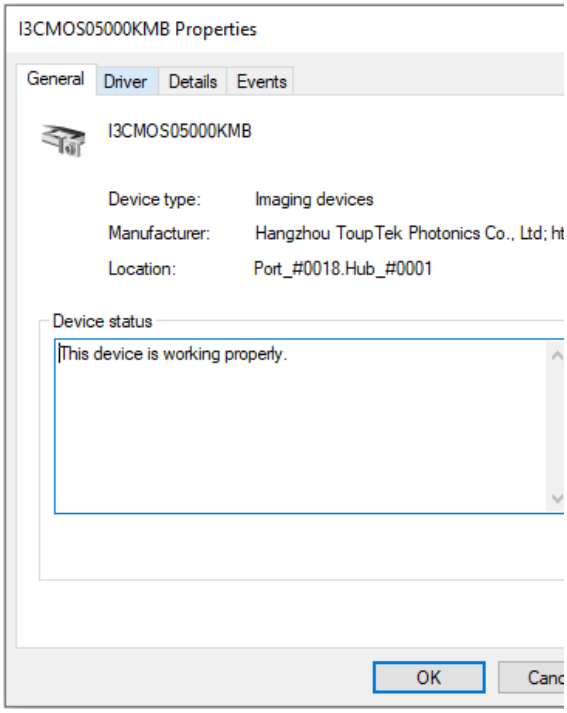


Figure 10-1 ToupTek driver attribute

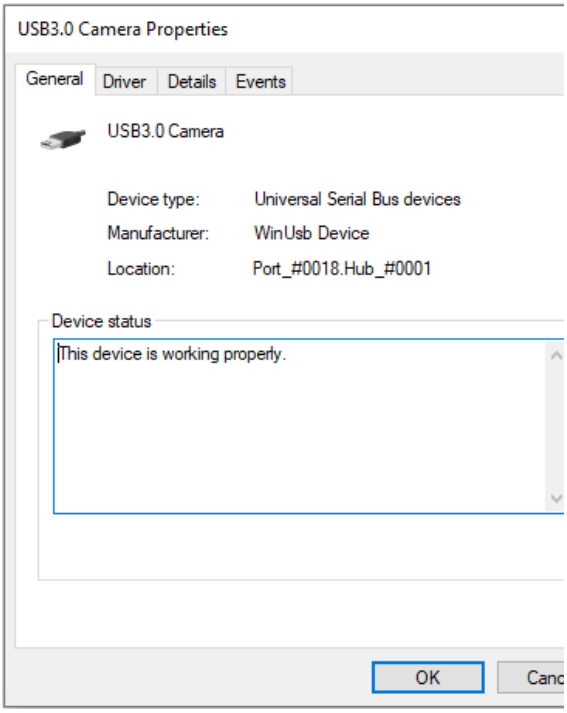


Figure 10-2 Win USB driver attribute

The operating systems above Windows 8(Including Windows 8) will install the driver automatically after the camera is connected and the driver name is USB3.0 Camera, as shown in Figure 10-2.

10.3 Setup and operation

As shown in Figure 10-3, open democpp.exe and click "Device" in the top control menu, where all connected cameras are displayed and click on the corresponding camera name to run the camera.

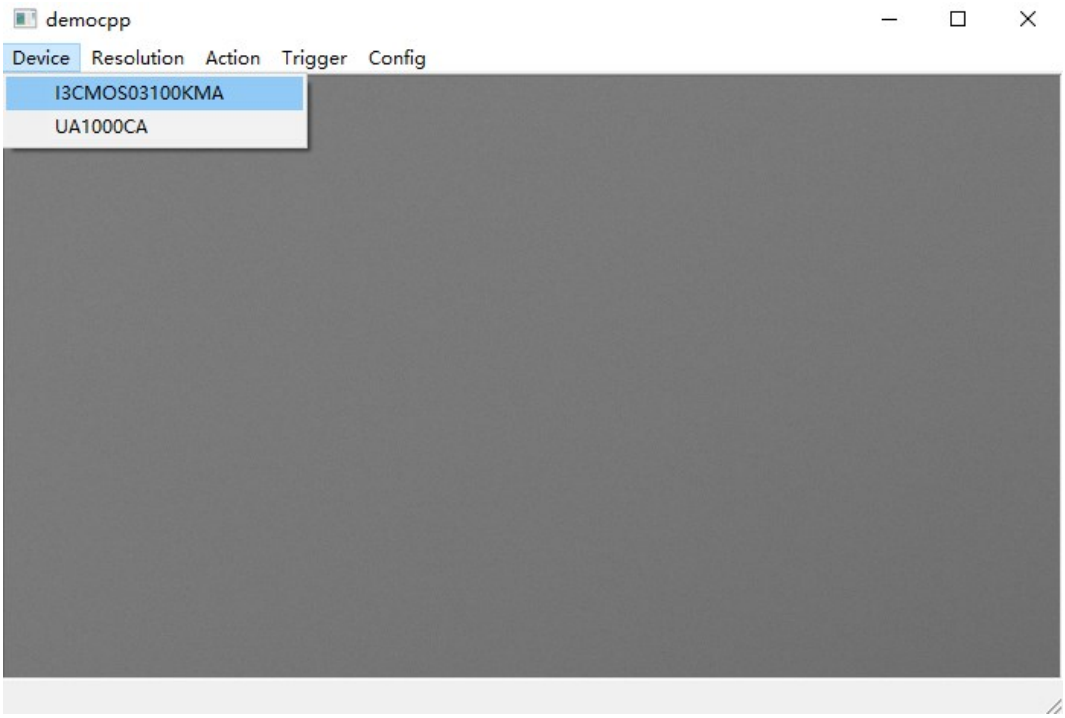


Figure 10-3 democpp UI

11 Main Features of democpp

11.1 Description of main features

As shown in Figure 11-1, in the **democpp**, click the "Resolution-> Preview" in the top control menu to select the resolution of the camera; "Resolution->Snap" captures image at current resolution; "Resolution->Snap Multiple" captures multiple images at the specified resolution.

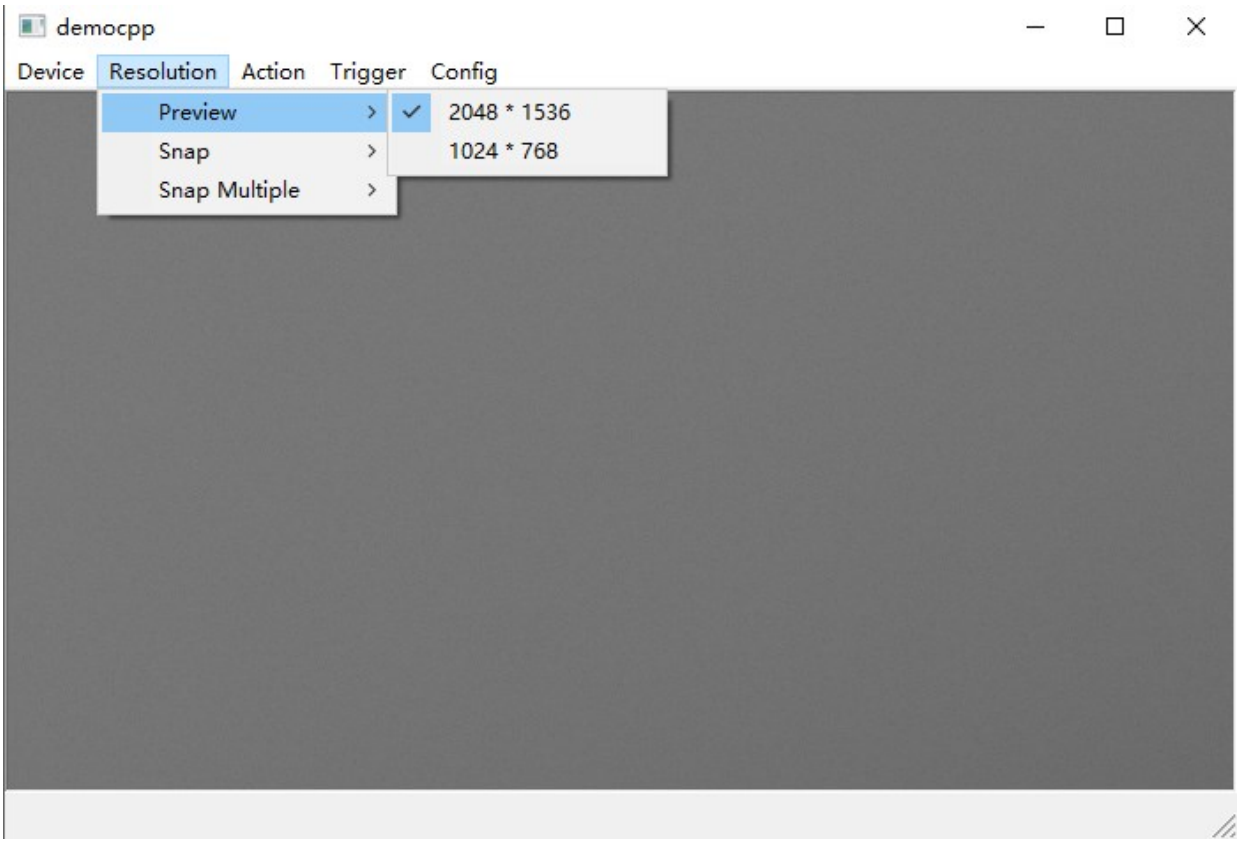


Figure 11-1 Acquisition and resolution

The following is the API code for the image capture operation:

```
//still image snap
Toupcam_Snap(HToupCam h, unsigned nResolutionIndex);
//multiple still image snap
Toupcam_SnapN (HToupCam h, unsigned nResolutionIndex, unsigned nNumber);
//The following is the API code that sets the resolution.:
Toupcam_put_Size(HToupCam h, int nWidth, int nHeight);
Toupcam_put_eSize(HToupCam h, unsigned nResolutionIndex);
```

11.2 Image format and frame rate

The camera supports a variety of image file formats and the setup of image region of interest. The smaller image ROI will have higher frame rate.

11.2.1 Camera data format

The list of pixel formats supported by the I3CMOS and I3ISPM series cameras are shown in Table 11-1. (“Y” for supported; “-” for not supported)

Format	RAW8	RAW10	RAW12	RAW14	RGB8	RGB24	RGB32	RGB48
I3CMOS00500KMA	Y	-	Y	-	Y	Y	Y	Y
I3CMOS01500KMA	Y	-	Y	-	Y	Y	Y	Y
I3CMOS03100KMA	Y	-	Y	-	Y	Y	Y	Y
I3CMOS03100KMB	Y	-	Y	-	Y	Y	Y	Y
I3CMOS05000KMA	Y	-	Y	-	Y	Y	Y	Y
I3CMOS05000KMB	Y	-	Y	-	Y	Y	Y	Y
I3CMOS06300KMA	Y	---	Y	---	Y	Y	Y	Y
I3ISPM00500KPA	Y	-	Y	-	Y	Y	Y	Y
I3ISPM01500KPA	Y	Y	-	-	Y	Y	Y	Y
I3ISPM03100KPA	Y	-	Y	-	Y	Y	Y	Y
I3ISPM03100KPB	Y	-	Y	-	Y	Y	Y	Y
I3ISPM05000KPA	Y	-	Y	-	Y	Y	Y	Y
I3ISPM05000KPB	Y	-	Y	-	Y	Y	Y	Y
I3ISPM06300KPA	Y	---	Y	---	Y	Y	Y	Y

Table 11-1 I3CMOS and I3ISPM series camera image data format

The list of pixel formats supported by the IUX series cameras are shown in Table 11-2 (“Y” for supported; “-” for not supported)

Format	RAW8	RAW10	RAW12	RAW14	RGB8	RGB24	RGB32	RGB48
IUA1700KMA	Y	---	Y	---	Y	Y	Y	Y
IUA1700KPA	Y	---	Y	---	Y	Y	Y	Y
IUA2100KPA	Y	---	Y	---	Y	Y	Y	Y
IUA2300KMB	Y	---	Y	---	Y	Y	Y	Y
IUA2300KPB	Y	---	Y	---	Y	Y	Y	Y
IUA4100KPA	Y	---	Y	---	Y	Y	Y	Y
IUA6300KMA	Y	---	Y	---	Y	Y	Y	Y
IUA6300KPA	Y	---	Y	---	Y	Y	Y	Y
IUA7100KMA	Y	---	Y	---	Y	Y	Y	Y
IUA7100KPA	Y	---	Y	---	Y	Y	Y	Y
IUA20000KMA	Y	---	Y	---	Y	Y	Y	Y
IUA20000KPA	Y	---	Y	---	Y	Y	Y	Y
IUB4200KMA	Y	---	Y	---	Y	Y	Y	Y
IUB4200KMB	Y	---	Y	---	Y	Y	Y	Y
IUB43000KMA	Y	---	Y	---	Y	Y	Y	Y
IUC26000KPA	Y	---	Y	Y	Y	Y	Y	Y
IUC31000KMA	Y	---	Y	---	Y	Y	Y	Y
IUC31000KPA	Y	---	Y	---	Y	Y	Y	Y
IUC60000KMA	Y	---	Y	Y	Y	Y	Y	Y
IUC60000KPA	Y	---	Y	Y	Y	Y	Y	Y

Table 11-2 IUX series camera Image data format

11.2.2 Frame rate

The maximum frame rate that the camera can achieve is determined by the following three factors:

- Frame readout time, the smaller the image height, the shorter the time required to read out, the higher the frame rate.
- Exposure time, the shorter the exposure time, the higher the frame rate.
- Bandwidth, the larger the bandwidth, the higher the frame rate that supports transmission.

As shown in Figure 11-2, in **democpp**, click "Config->Speed" in the top control menu and drag the slider bar in "Speed" dialog to set the frame rate.

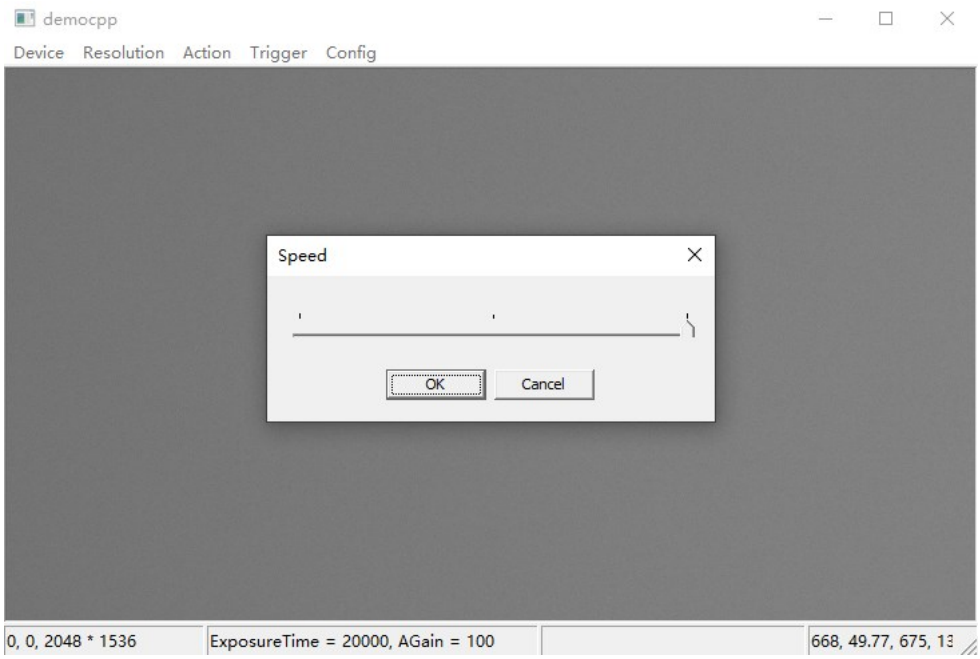


Figure 11-2 Frame rate setup

The following is the API code for the setup of the frame rate:

Toupcam_put_Speed(HToupCam h, unsigned short nSpeed);

11.2.3 Area of interest setup

When the user is only interested in some details of the image, the camera can output the image ROI according to the requirement. Setup the image ROI can reduce the transmission data bandwidth and improve the camera frame rate to a certain extent.

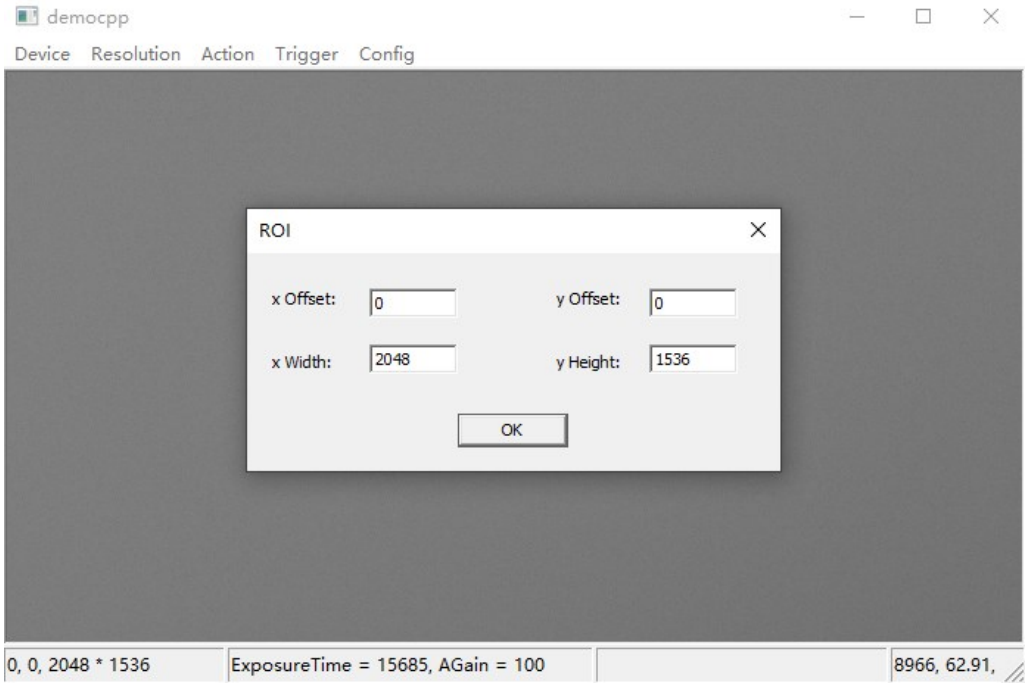


Figure 11-3 Area of interest setup

As shown in Figure 11-3, in **democpp**, click "Action->ROI" in the upper control menu and in "ROI" dialog, fill x Offset, y Offset, x Width, y Width to adjust the ROI, where the values in x Offset and y Offset represent the starting point of the ROI up left corner.

The following is the API code for the setup of the image ROI:

Toupcam_put_Roi(HToupCam h, unsigned xOffset, unsigned yOffset, unsigned xWidth, unsigned yHeight);

11.3 Global Shutter and Rolling Shutter

11.3.1 Global Shutter

For cameras that support global shutter, exposure starts in each line simultaneously. After the exposure, data is read out line by line, as shown in Figure 11-4.

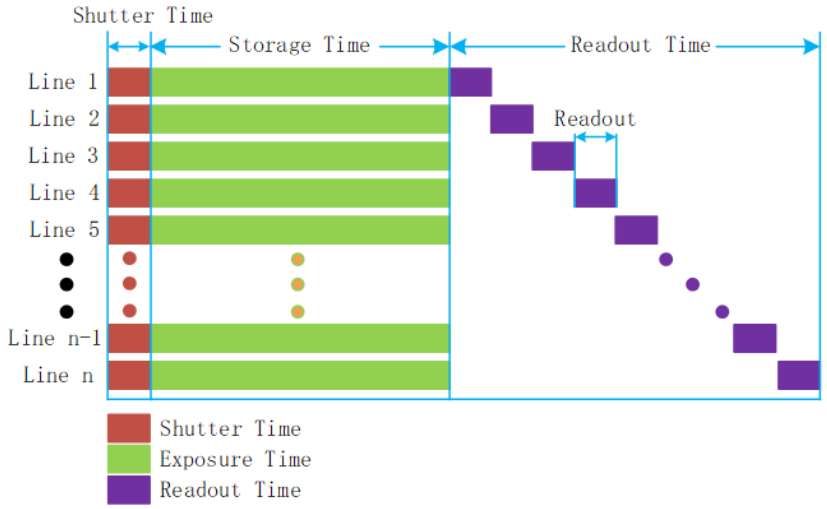


Figure 11-4 global shutter exposure principle

11.3.2 Rolling Shutter

For cameras that support rolling shutter, after the first line exposure, the next line begins to exposure, repeat in this way. Sensor receive exposure and data read the time length to be consistent, but the time of begin to receive exposure is inconsistent, as shown in Figure 11-5.

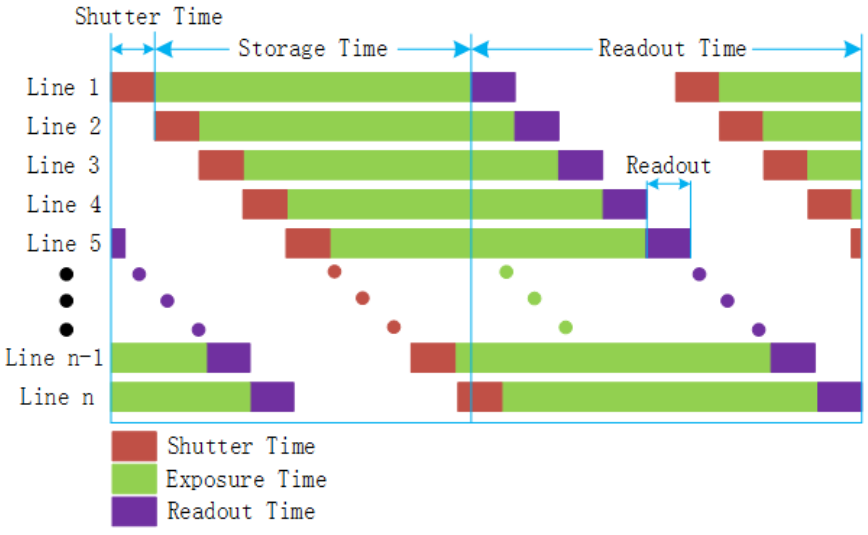


Figure 11-5 Rolling shutter exposure principle

11.4 Image acquisition and transmission

There are two image acquisition modes, free run mode and trigger mode. Among them, the free run mode is continuous acquisition mode and the trigger mode captures one or more frames of images according to the trigger signal. The trigger sources include software trigger and external trigger.

As shown in Figure 11-6, in democpp, the free run mode and trigger mode are switched by clicking on "Trigger" menu and choosing “Enter Trigger Mode” command. The "✔" checkmark indicates that the current mode is in trigger mode, otherwise free run mode.

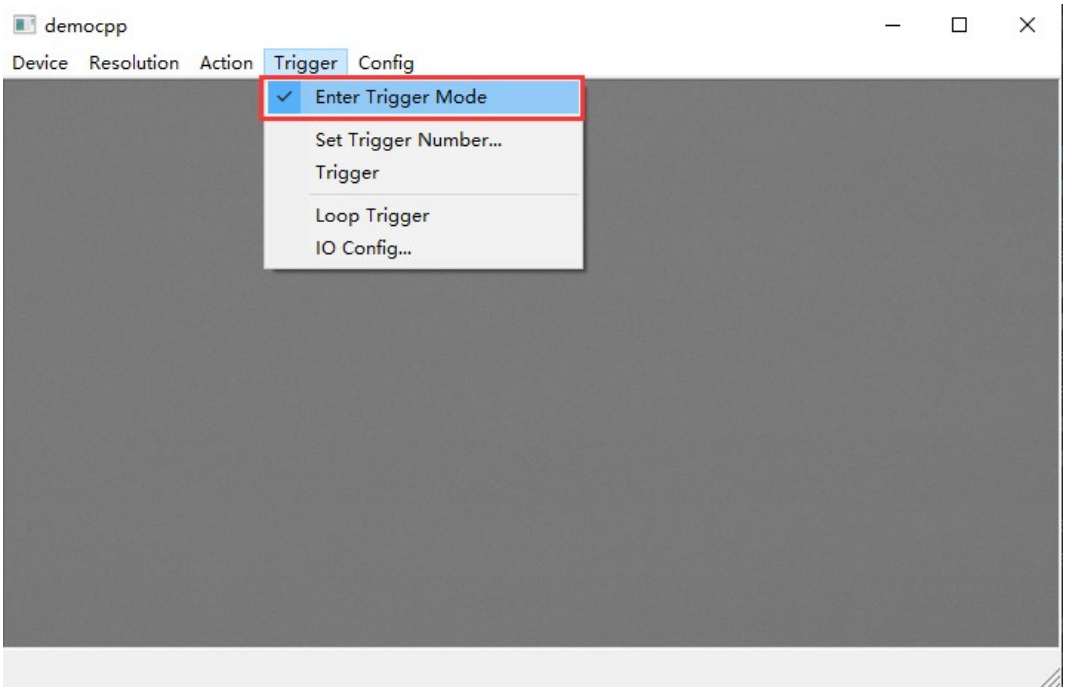


Figure 11-6 Image acquisition mode switching

The following are the API codes for the switching of the free run mode to trigger mode:

```
// 0 = video mode, 1 = software or simulated trigger mode, 2 = external trigger mode
Toupcam_put_Option(m_hCam, TOUPCAM_OPTION_TRIGGER, val);
```

11.4.1 Free run mode

Under free run mode, the user can control the camera to continuously output images. Starting the **democpp** software, connecting the camera and clicking run, the camera will run under free run mode by default. The camera continuously outputs the image according to the current setting.

11.4.2 Trigger mode

After the camera enters the trigger mode, it enters the waiting trigger state automatically. After receiving a trigger signal, the camera begins to expose and after the exposure is finished, the image data will be flashed out. Under trigger mode, image acquisition methods have single frame trigger, multi frame trigger, counter trigger and PWM trigger mode.

11.4.3 Trigger signal source selection

Under the trigger mode, trigger signal source is either from software trigger, or from external trigger. The external trigger signal is from either the pin isolated by opto-coupler or the non-isolated pin.

The following is the API code for the setup of the trigger source:

```
// Trigger Source:   0-> line0 , 1-> line2 , 2-> line3 , 3-> Counter , 4-> PWM , 5-> Software
Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_TRIGGERSOURCE, val, NULL);
```

- Software trigger

The camera supports software trigger mode. When a software trigger is executed, the client software will send the command through USB3.0 to activate the camera to acquire and transmit images.

As shown in Figure 11-7, in **democpp**, first click "Enter Trigger Mode" to enter trigger mode. Click "Set trigger Number" to define the number of triggers and finally click "Trigger" and the software will receive the number of triggers. If you click "Loop Trigger", you will enter a continuous trigger mode and clicking it again will exit the current trigger mode.

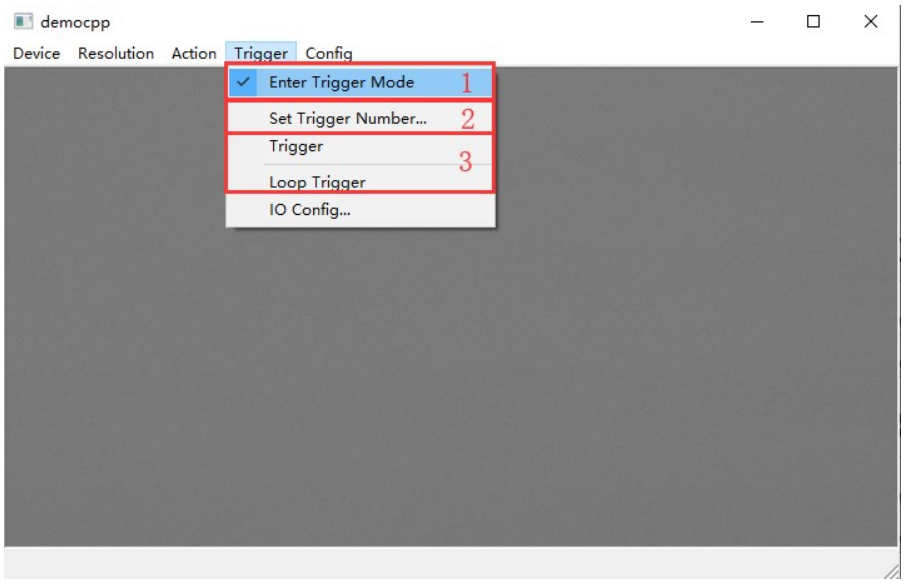


Figure 11-7 Software trigger setup

- External trigger

(For I3 series only)The camera has an opto-isolated input line “Opt_in” on the hardware and a direct GPI input line (the hardware version number V2.0 and above is configurable GPIO port). The user can select either line as the trigger source. Counter mode and PWM mode are also provided.

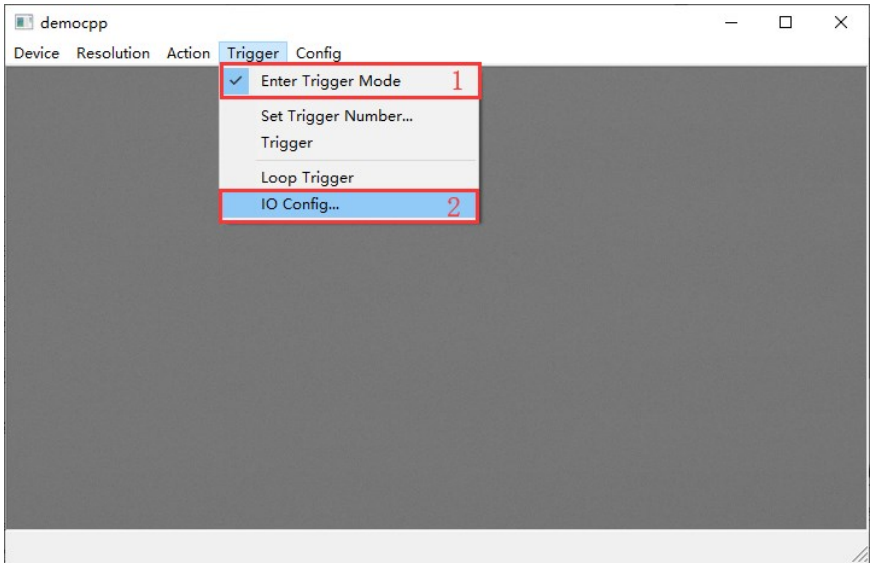


Figure 11-8 Set the external trigger source

Figure 11-8 shows the configuration of external trigger. First select "Enter Trigger Mode" to enter trigger mode. Then click "IO Config" and the I/O Control dialog will pop up as shown in Figure 11-9. The trigger source is selected in the "Trigger Source" and then click "OK". At this time a high pulse will trigger the camera on the corresponding line.

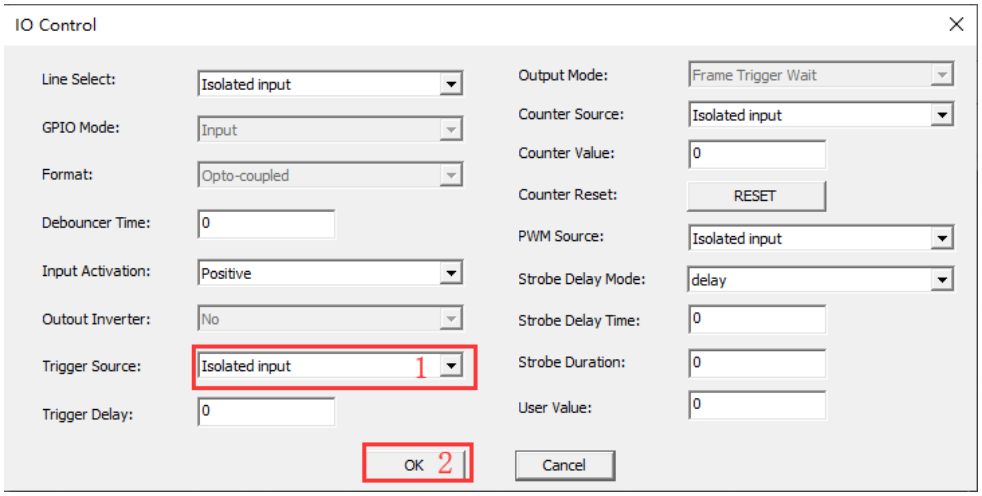


Figure 11-9 I/O control dialog

11.4.4 Frame burst mode

The camera provides a frame burst mode, that is, receiving one trigger signal and producing multiple burst images. The trigger frame value can range from 1 to 1023. “Burst Count = 1” means a one-frame image output, as shown in Figure 11-10, “Burst Count = 3” means a three-frame image output.

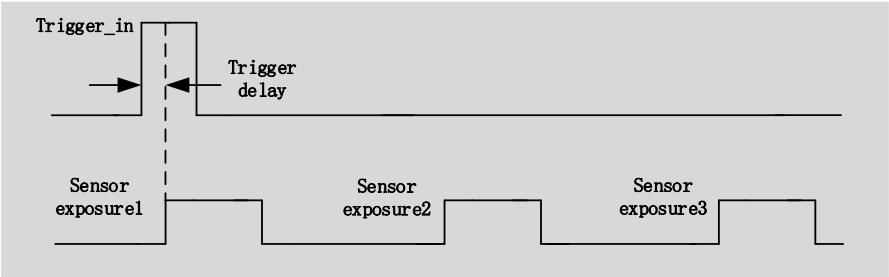


Figure 11-10 Frame burst trigger timing

Here is the API code for the setup of the trigger frame value

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_BURSTCOUNTER, val, NULL);

11.4.5 Counter trigger mode

Under this mode, trigger signal number is divided by user-defined counter value. For example, when you set the counter to 3, the camera needs to receive three trigger signals before it can begin exposure, as shown in Figure 11-11.

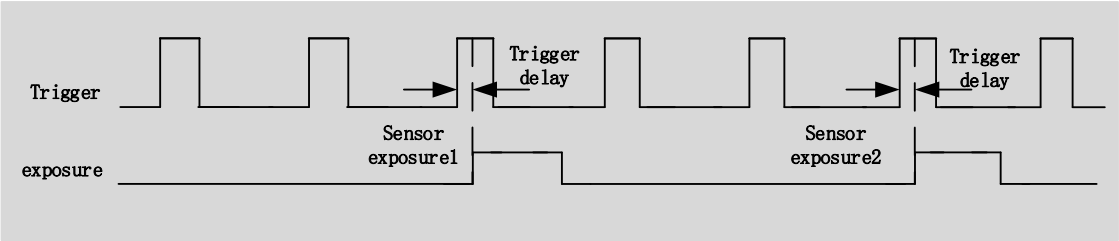


Figure 11-11 Counter trigger mode

The specific operation in **democpp** are shown in Figure 11-12. First, under "Trigger Source", select the trigger source as Counter, then click "Counter Source" to select the external trigger source that needs to be divided and configure the frequency division coefficient in "Counter Value" in the range of 1-1023. "Counter Reset" can clear the current frequency division counter to zero.

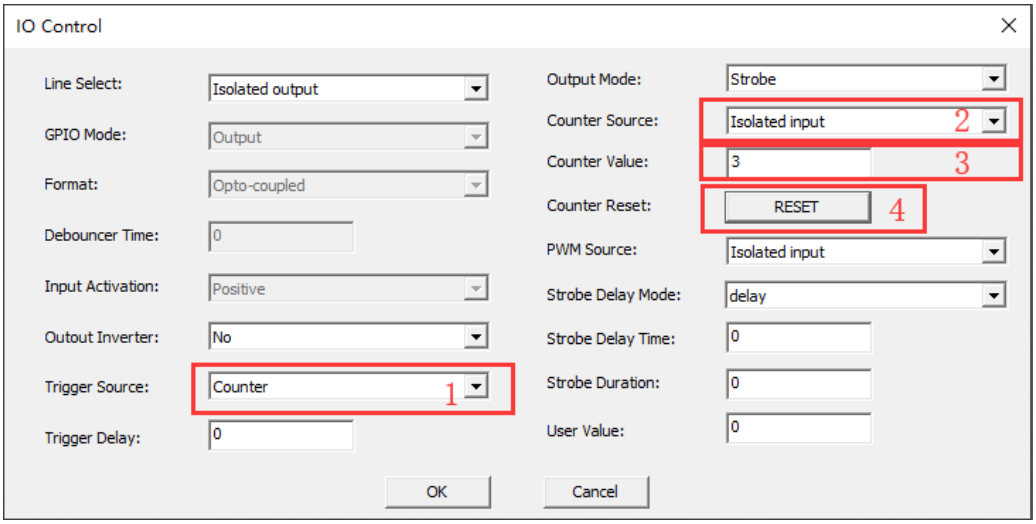


Figure 11-12 Counter trigger mode setup

The following is the API code for the setup of the counter trigger mode:

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_TRIGGERSOURCE, 3, NULL);

//Counter Source: 0-> line0 , 1-> line2 , 2-> line3

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_COUNTERSOURCE, val, NULL);

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_COUNTERVALUE, val, NULL);

11.4.6 PWM trigger mode

The camera provides Pulse Width Modulation (PWM) trigger mode, which controls exposure time by pulse width. The main difference between this mode and the standard single frame trigger mode is the exposure method. The exposure time per frame is determined by the trigger pulse width, as shown in Figure 11-13.

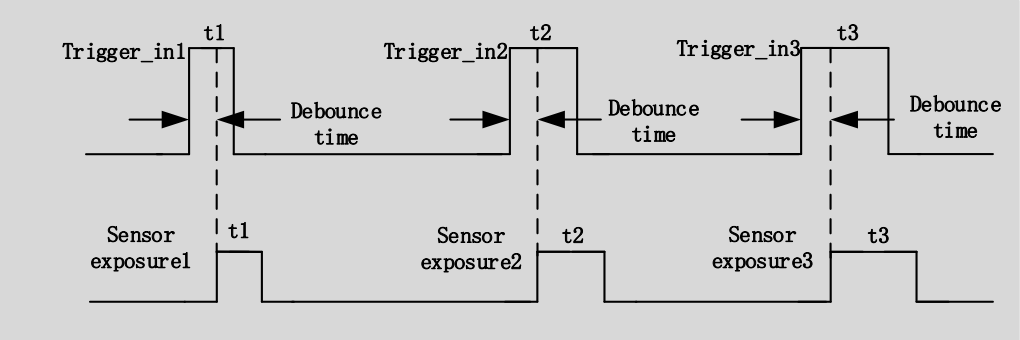


Figure 11-13 PWM mode timing

The following cameras with rolling shutter sensors do not support PWM trigger mode：

IUA6300KMA, IUA6300KPA; IUA20000KMA, IUA20000KPA;

IUB4200KMA, IUB4200KMB;

IUC26000KPA, IUC60000KMA, IUC60000KPA;

As shown in Figure 11-14 in **democpp**, select the trigger source as PWM, under "Trigger Source" and click "PWM Source" to select the external trigger source for input.

The following is the API code for the setup of the counter trigger mode:

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_TRIGGERSOURCE, 4, NULL);

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_PWMSOURCE, val, NULL);

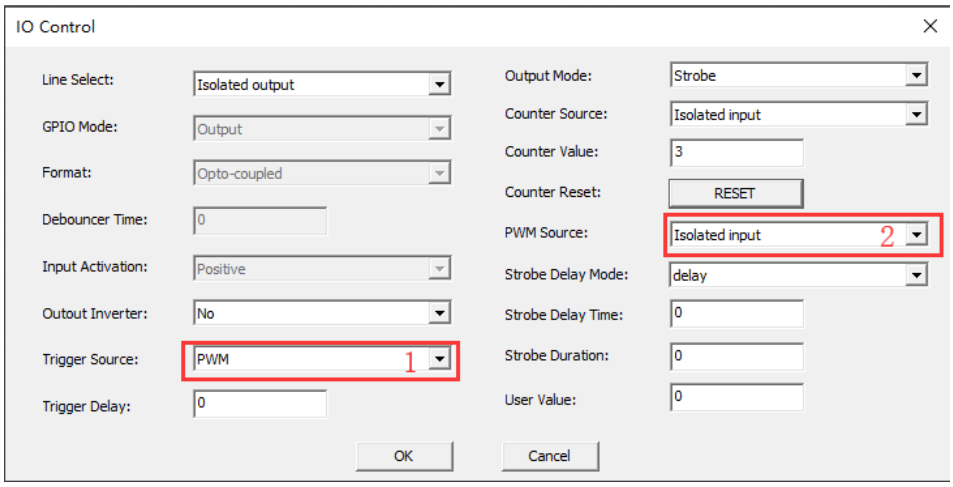


Figure 11-14 PWM mode parameter control

11.5 General Purpose I/O configuration

(This is for I3 series only)The camera with the hardware version number V2.0 and above has a configurable GPIO port, as shown in Figure 11-15, in the demo, enter the "IO Config" dialog, select the "Line Select" to be GPIO0 and then click the "GPIO Mode" to configure the input or output.

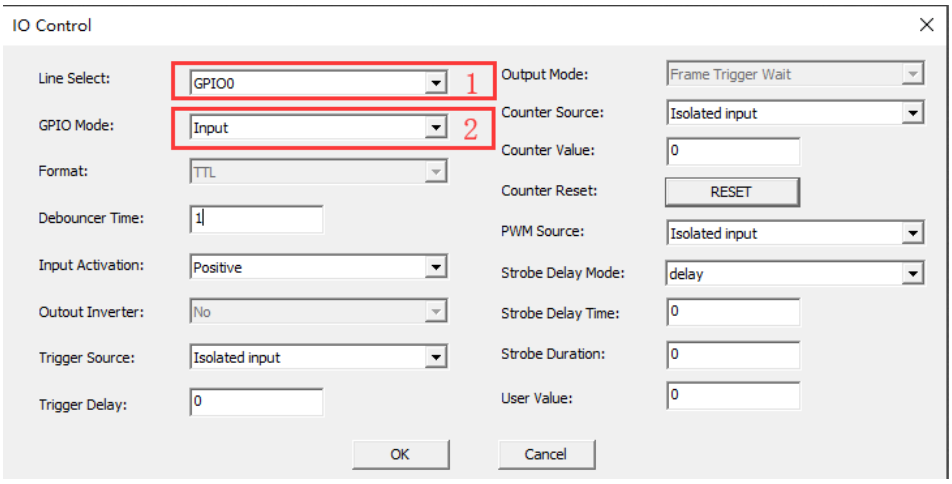


Figure 11-15 GPIO configuration

The following is the API code to configure the GPIO input and output direction:

Toupcam_IoControl(m_hCam, index, TOUPCAM_IOCONTROLTYPE_SET_GPIODIR, val, NULL);

11.6 Input signal

11.6.1 Signal debouncer

Because the external trigger input signal of the camera may have burr, if it goes directly into the internal logic of the camera, it will cause false trigger. The input trigger signal should be debounced. In addition, the effective pulse width of the trigger signal inputted by the user should be greater than the debouncer time, otherwise the trigger signal will be ignored. The timing is shown in Figure 11-16. If the effective pulse width of Trigger_in1 is less than the debouncer time, the trigger signal will be ignored.

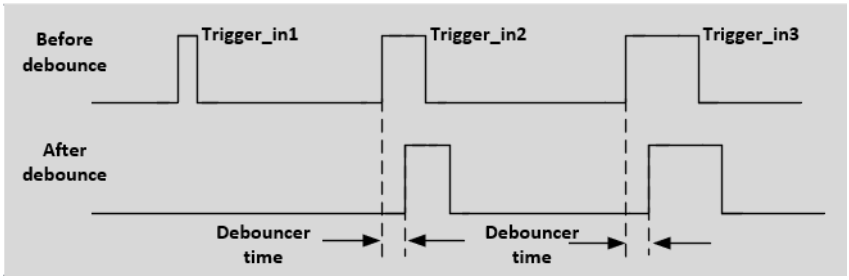


Figure 11-16 Signal debounce timing

As shown in Figure 11-17, in **democpp**, enter the "IO Config" dialog, click "Line Select" to select the input line and then set the debouncer time at "Debounce Time" in the range of 0≤20000 in microseconds.

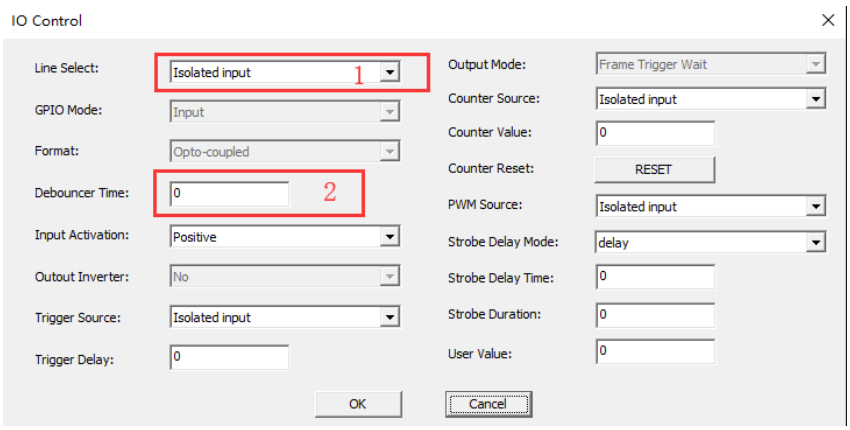


Figure 11-17 Signal Debounce setup

The following is the API code for the setup of the debouncer time:

Toupcam_IoControl(m_hCam, index, TOUPCAM_IOCONTROLTYPE_SET_DEBOUNCERTIME, val, NULL);

11.7 Output signal

The camera provides 4 output signal modes: Frame Trigger Wait, Exposure Active, Strobe and User Output.

As shown in Figure 11-18, in the "IO Config" dialog, first select the “Isolated output” in the "Line Select" combobox, then select the output signal mode in the "Output Mode" combobox, click "Output Inverter" to reverse the output signal.

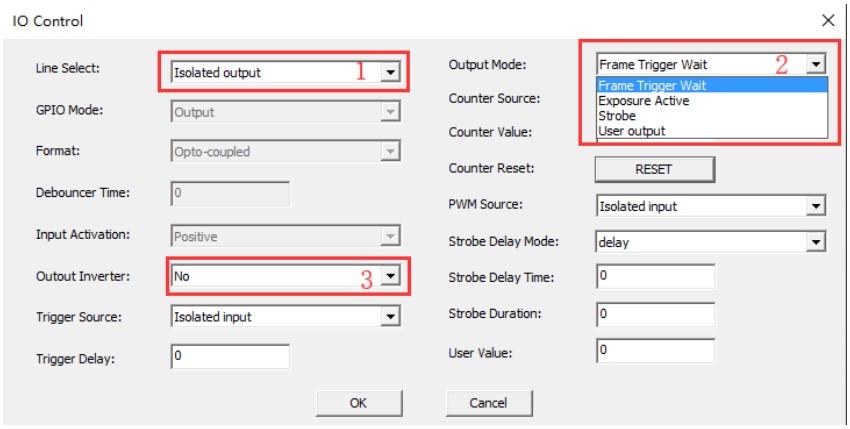


Figure 11-18 Output signal mode setup

The following is the API code for the setup of the output signal mode:

Toupcam_IoControl(m_hCam, index, TOUPCAM_IOCONTROLTYPE_SET_OUTPUTMODE, val, NULL);

// Output Mode: 0-> Frame Trigger Wait , 1-> Exposure Active , 2-> Strobe , 3-> User output

// index: 0-> line0 , 1-> line1, 2-> line2 , 3-> line3

11.7.1 Frame Trigger Wait

The “Frame Trigger Wait” signal is pulled low at the start of the exposure and is pulled high when the last frame of data is read out. The trigger signal inputted by the user should be in the valid period of the signal. If the user inputs a trigger signal when the signal is low, the trigger signal input at this time will be ignored. The following example is the case when Burst Count = 2, as shown in Figure 11-19.

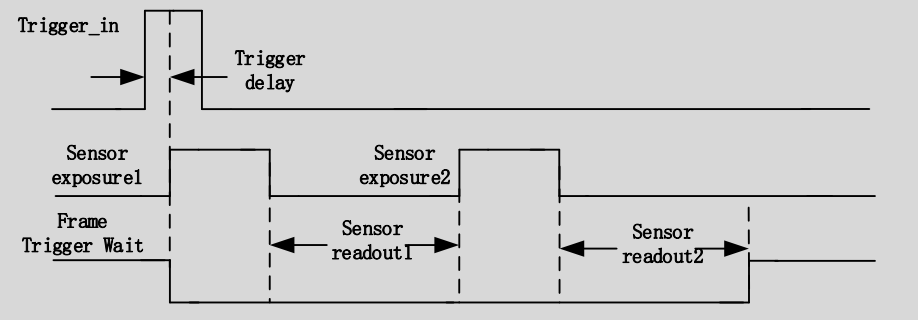


Figure 11-19 Frame Trigger Wait signal timing

11.7.2 Exposure Active

When “Exposure Active” signal is high, it indicates that the sensor is in the exposure process. This signal can be used as a flash trigger and is also useful when you are operating a system where either the camera or the object being imaged is movable. For example, assume that the camera is mounted on an arm mechanism and that the mechanism can move the camera to view different portions of a product assembly.

11.7.3 Strobe

Strobe can be used to control flash and other external devices. User can set the effective level duration, delay time and pre-delay time.

As shown in Figure 11-20, in the "IO Config" dialog of **democpp**, select the Output Mode as “Strobe”, click "Strobe Delay Mode" to select the “delay” or “pre-delay” and set the time in "Strobe Delay Time". "Strobe Duration" can set the effective level duration of Strobe.

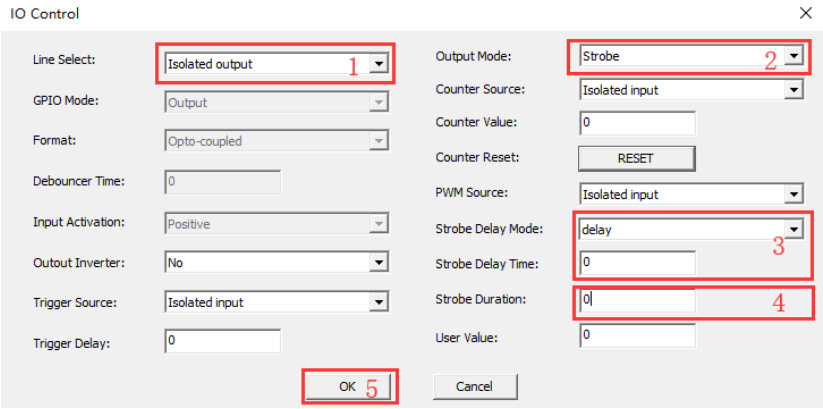


Figure 11-20 Strobe settings

The following is the API code for the setup of the output Strobe signal:

Toupcam_IoControl(m_hCam, index, TOUPCAM_IOCONTROLTYPE_SET_OUTPUTMODE, 2, NULL);

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_STROBEDURATION, val, NULL);

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_STROBEDELAYMODE, val, NULL);

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_STROBEDELAYTIME, val, NULL);

- Strobe effective electrical level duration

As shown in Figure 11-21, the Strobe signal is activated at a high level. When the shutter starts to expose, the Strobe signal’s high duration is determined by the "Strobe Duration" value: when the "Strobe Duration" value is 0, the high level duration of the Strobe signal is equal to the exposure time; if the "Strobe Duration" value is not 0, The Strobe signal’s high

continuity time is equal to the "Strobe Duration" value.

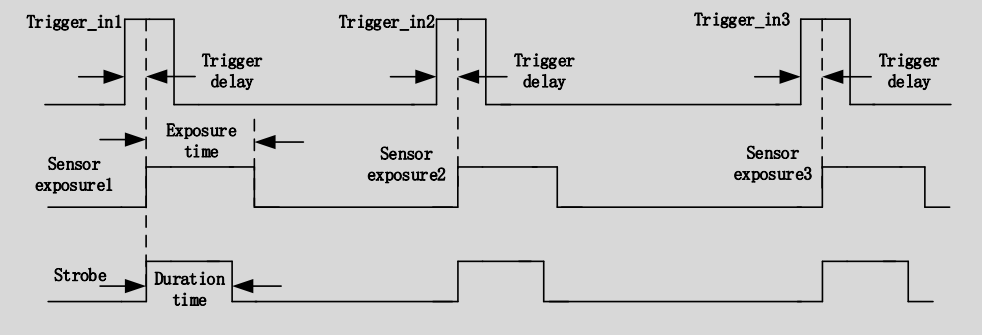


Figure 11-21 Strobe effective level duration

- Strobe output delay

The camera provides the feature of output delay to strobe signal to meet the special usage of users. When the exposure begins, the Strobe signal output does not immediately take effect, delayed according to the value set by "Strobe Delay Time". As shown in Figure 11-22.

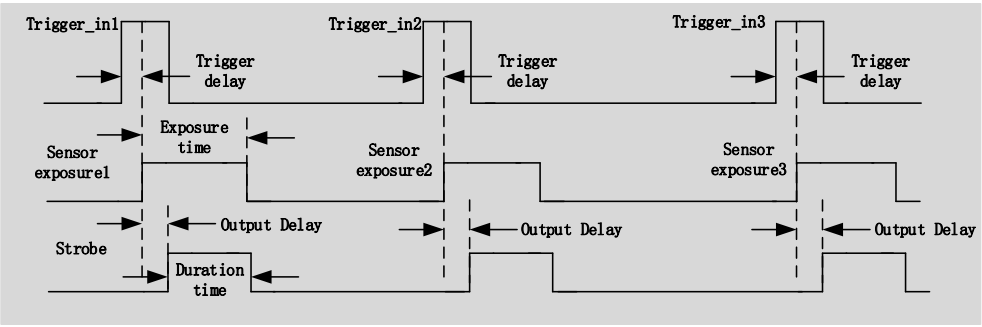


Figure 11-22 Strobe output delay

- Strobe Pre-output

The camera also provides a pre-output feature of the strobe signal, that is, the strobe signal takes effect earlier than the exposure begins.

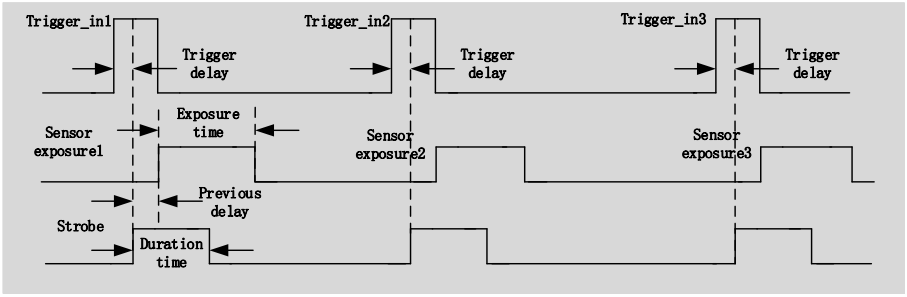


Figure 11-23 Strobe Pre-output

This feature can be applied to flash lamps with slow response. The pre-output time is set by "Strobe Delay Time". The timing is shown in Figure 11-23.

11.7.4 User Output

When choosing the "User Output" output mode, the user can enter a value after the "User Value" control to set the corresponding line output 0 or 1. The value here is only the low three bits of binary, for example when line1, line3 is set to the "User Output" output mode and the "User Value" is set to 4 (undefinedb100), then line3 outputs 1, line1 output 0. as shown in Figure 11-24

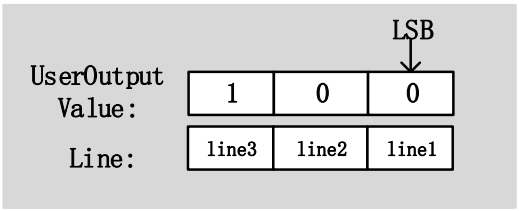


Figure 11-24 User-defined output schematic diagram

The following is the API code to set User Output:

Toupcam_IoControl(m_hCam, index, TOUPCAM_IOCONTROLTYPE_SET_OUTPUTMODE, 3, NULL);

Toupcam_IoControl(m_hCam, 0, TOUPCAM_IOCONTROLTYPE_SET_USERVALUE, val, NULL);

11.8 Camera control parameter configuration

11.8.1 Exposure time

The exposure time range is specified in the camera technical specifications section(Sec.1). Exposure time control supports manual control and automatic exposure control. When the camera is in trigger mode, the automatic control exposure feature will be disabled.

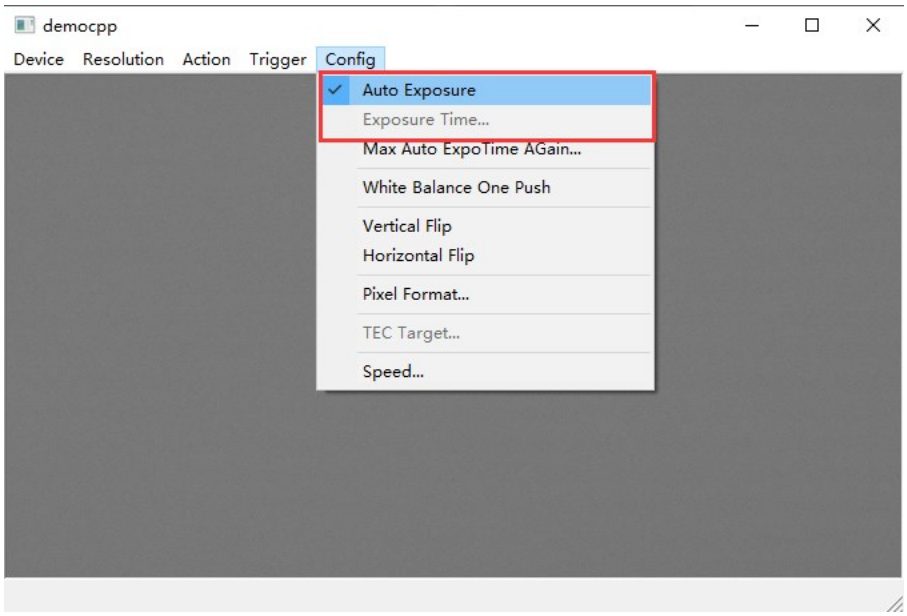


Figure 11-25 Exposure time setup

As shown in Figure 11-25, in **democpp**, click "Config" in the top control menu. Click "Auto Exposure" and the "✔" checkmark indicates that automatic control exposure mode is on. Click again to exit the current mode. Click "Exposure Time" menu and a dialog called Exposure Time will pop up and drag the slider in the new dialog to manually set the exposure time control.

Here is the API code for the setup the exposure time:

Toupcam_put_AutoExpoEnable(HToupCam h, int bAutoExposure);

Toupcam_put_AutoExpoTarget(HToupCam h, unsigned short Target);

Toupcam_put_ExpoTime(HToupCam h, unsigned Time); /* in microseconds */

11.8.2 Gain control

The gain value range is specified in the camera technical specifications section in Sec.1. When the gain increases, the image noise increases.

The following is the API code for the setup of the gain control:

Toupcam_put_ExpoAGain(HToupCam h, unsigned short AGain); /* percent */

11.8.3 White balance

White balance means that the camera performs color adjustment under different light source. The user can make the white area always white at different color temperatures by adjusting the “R”, “B” component’s gain on the image. Ideally, the ratio of R, G and B components in the white region is 1:1:1.

The white balance setting is shown in Figure 11-26. Click "Config" on the control menu at the top of democpp and click "White Balance One Push" to automatically balance white once.

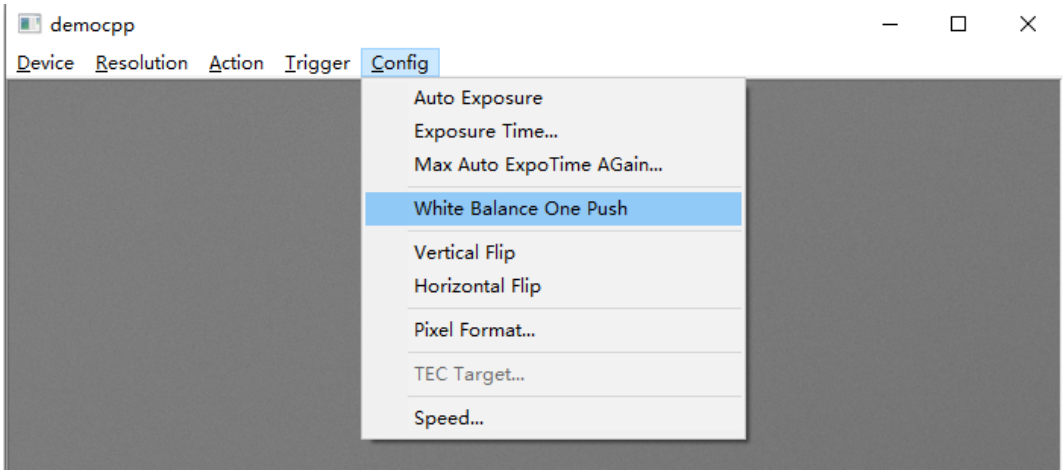


Figure 11-26 White balance setup

The following is the API code for the setup of the white balance one push:

//auto white balance "one push". This feature must be called AFTER Toupcam_StartXXXX

Toupcam_AwbOnePush(HToupCam h,PITOUPCAM_TEMPTINT_CALLBACK fnTTProc, void* pTTCtx);

11.8.4 Color adjustment

User can adjust hue, saturation, brightness, contrast and gamma value.

The following is the API code for the color adjustment:

Toupcam_put_Hue(HToupCam h, int Hue);

Toupcam_put_Saturation(HToupCam h, int Saturation);

Toupcam_put_Brightness(HToupCam h, int Brightness);

Toupcam_put_Contrast(HToupCam h, int Contrast);

Toupcam_put_Gamma(HToupCam h, int Gamma); / percent */*

11.8.5 Image flip

As shown in Figure 11-27, in **democpp**, click "Config" in the control menu. Click "Vertical Flip" to flip the image vertically and "Horizontal Flip" to flip horizontally.

The following is the API code to flip the image:

Toupcam_put_VFlip(HToupCam h, int bVFlip); / vertical flip */*

Toupcam_put_HFlip(HToupCam h, int bHFlip); / horizontal flip */*

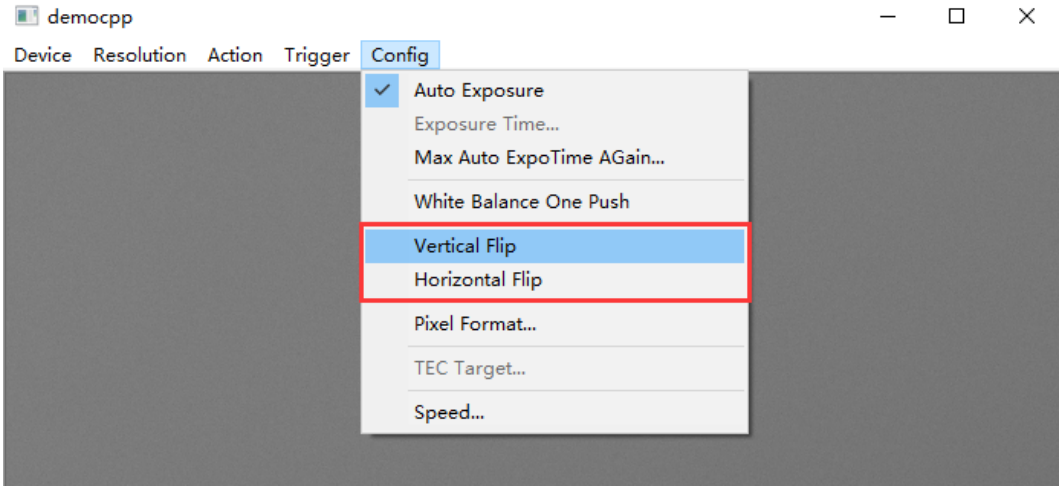


Figure 11-27 Image flip setup

11.8.6 Test pattern

In **democpp**, as shown in Figure 11-28, clicking "Action" in the control menu, then clicking “Test Pattern”. selecting "Normal" to display unaltered sensor captured image, "Test Pattern 1" a gray scale gradient oblique stripe showing the movement, "Test Pattern 2" a gray scale gradient vertical stripe showing the movement and "Test Pattern 3" a grayscale gradient horizontal stripe that shows the movement. The color camera can output a corresponding test pattern.

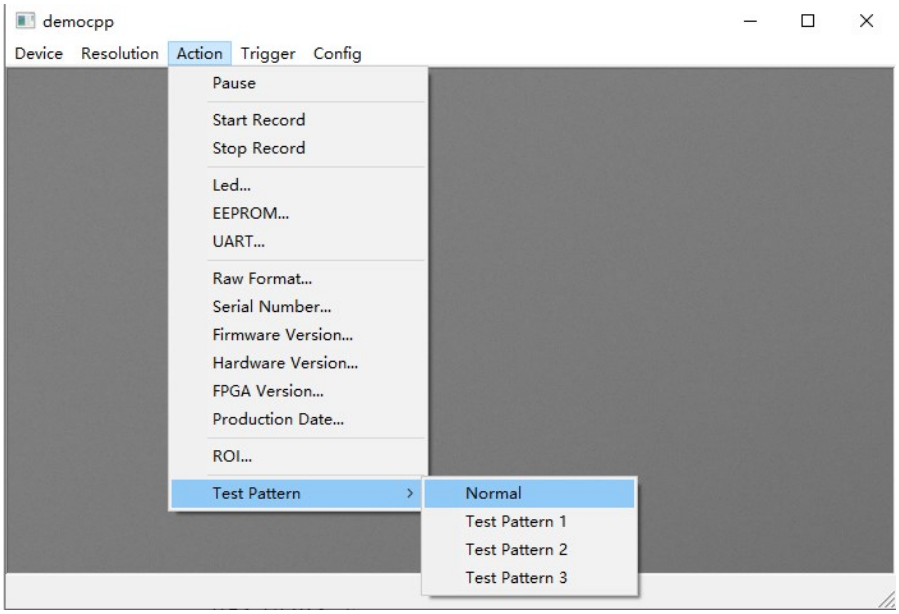


Figure 11-28 Set the test pattern

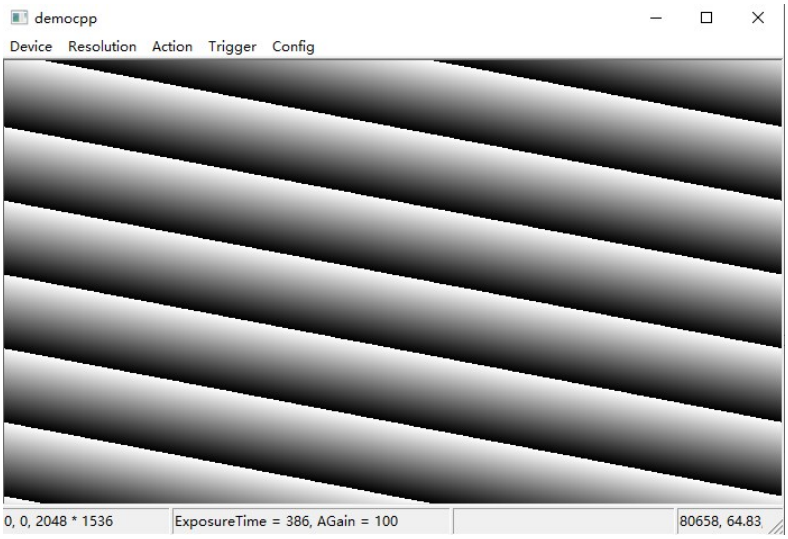


Figure 11-29 Grayscale gradient oblique stripes

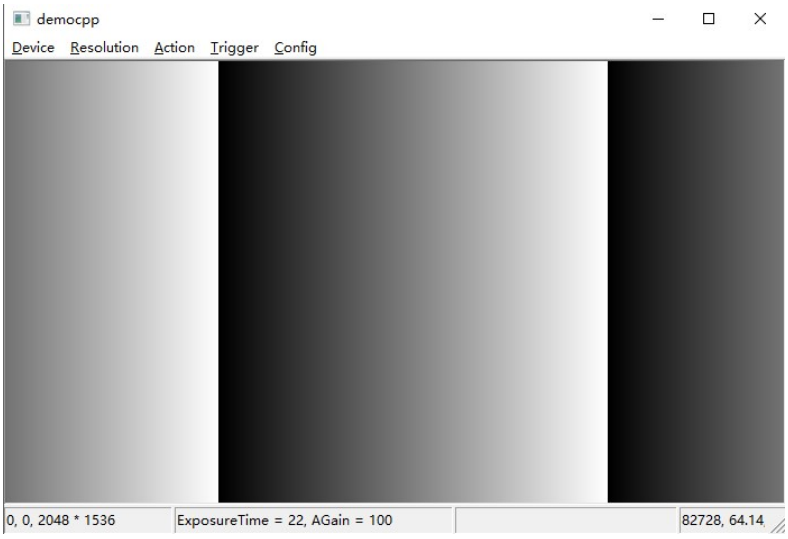


Figure 11-30 Grayscale gradient vertical stripes

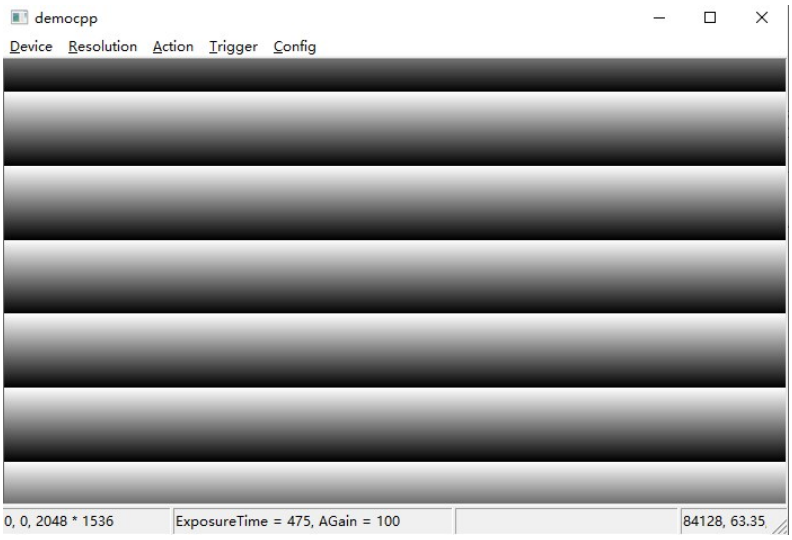


Figure 11-31 Grayscale gradient horizontal stripes

The following is the API code for the setup of the test pattern:

// TestPattern: 0-> TestPattern Off , 3-> Moving Diagonal Gray Gradient , 5-> Moving Vertical Gray Gradient , 7-> Moving Horizontal Gray Gradient , 9-> Moving Diagonal Chromatic Gradient

Toupcam_put_Option(m_hCam, TOUPCAM_OPTION_TESTPATTERN, val);

11.9 I3 series camera's I/ O electrical properties

11.9.1 I3 series camera's opto-isolated input circuit (line0)

In the camera I/O control, opto-isolated input circuit is shown in Figure 11-32.

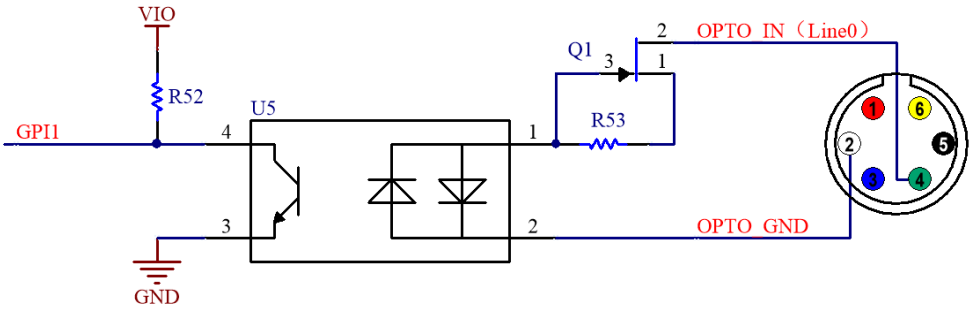


Figure 11-32 Opto-isolated input circuit

Logic 0 input level: 0~1.4VDC (OPTO_IN pin)

Logic 1 input level: 2.2~24VDC (OPTO_IN pin)

Maximum input current: 30mA

The input level is between 1.4V and 2.2V, the circuit action state is uncertain, please avoid the input voltage working in this range.

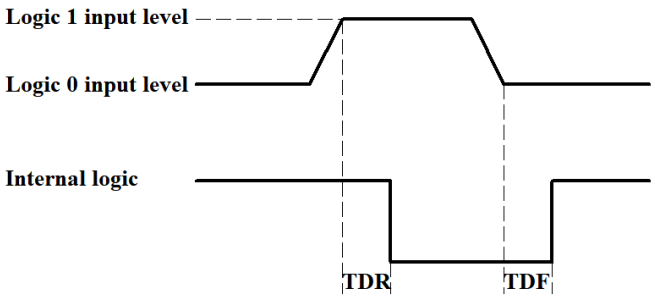


Figure 11-33 Input logic level

Input rise delay (TDR): 5us

Input drop delay (TDF): 25us

11.9.2 I3 series camera's opto-isolated output circuit(line1)

In camera I/O control, opto-isolated output circuit is shown in Figure 11-34.

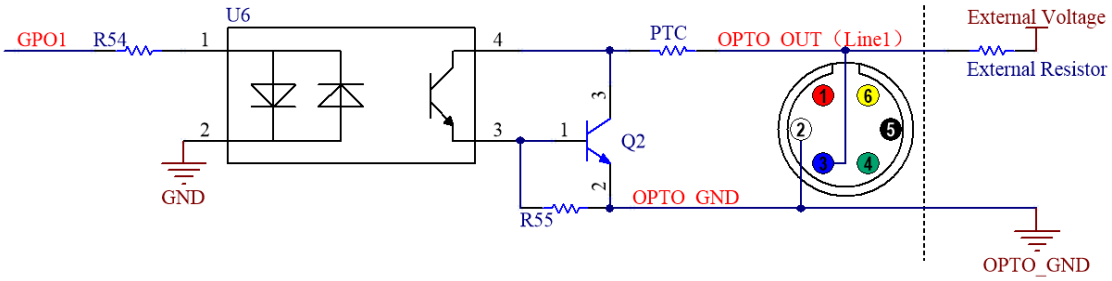


Figure 11-34 Opto-isolated output circuit

Opto-isolated output maximum current: 30mA

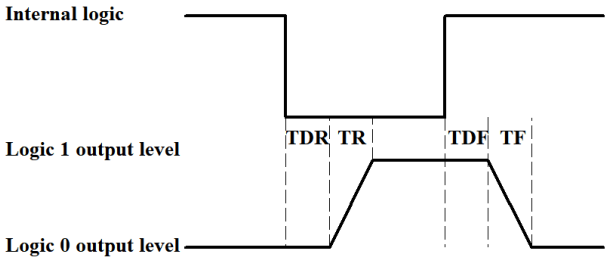


Figure 11-35 Output logic level

The electrical characteristics of the opto-isolated output signal (external voltage 5V, external resistor 1K) are shown in Table 11-3.

Parameter name	Parameter symbol	Parameter values
Output logic low level	VL	760mV
Output logic high	VH	5V
output rise time	TR	8.6us
Output downtime	TF	2.2us
Output rising delay	TDR	17.5us
Output drop delay	TDF	4.2us

Table 11-3 Opto-isolated output signal's electrical characteristics

The corresponding current and output logic low level parameters are shown in Table 11-4 when different voltage and resistors are used in external circuit.

External voltage	Non-essential resistance	VL	Output current
3.3V	1KΩ	668mV	2.82mA
5V	1KΩ	760mV	4.31mA
12V	2.4KΩ	798mV	4.68mA
24V	4.7KΩ	833mV	4.97mA

Table 11-4 Opto-isolated output logic's low level parameters

11.9.3 I3 series camera's input and output I/O circuit(line2/line3)

In camera I/O control with hardware version number V1.0, non-isolated input, output I/O circuit is shown in Figure 11-36.

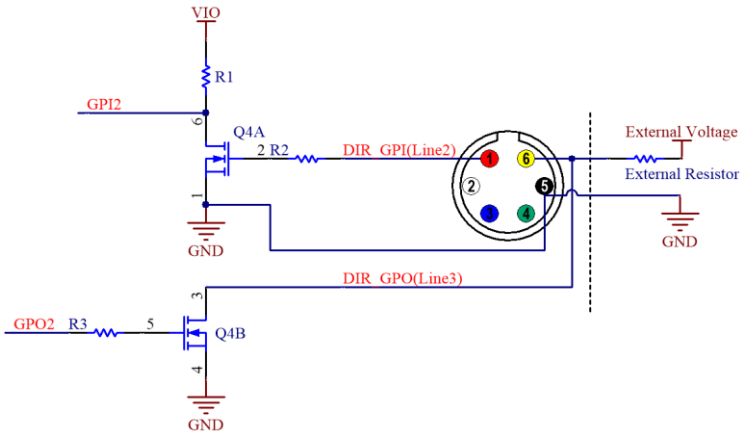


Figure 11-36 Non-isolated input, output I/ O circuit

1, GPI2 input level parameter:

Logic 0 input level: 0-0.9 VDC (DIR _ GPI pin)

Logic 1 input level: 1~20VDC (DIR_GPI pin)

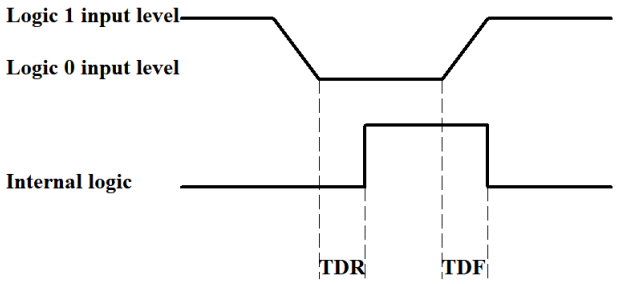


Figure 11-37 Input logic level

To prevent damage to the GPI pin, connect the GND pin before entering voltage to the DIR_GPI pin.

2, GPO2 output level parameter:

The maximum current allowed through this pin is 25 mA.

When the ambient temperature is 25 degrees Celsius, the relationships between the external voltage, resistance and output low level are shown in Table 11-5.

External voltage	Non-essential resistance	VL(GPO2)
3.3V	1KΩ	0V
5V	1KΩ	0V
12V	2.4KΩ	0V
24V	4.7KΩ	0V

Table 11-5 Non-isolated output logic's low level parameters

The external pull-up voltage 5V pull-up resistance 1K Ω, GPO2 output logic level, electrical characteristics are shown in Figure 11-38 and Table 11-6 respectively.

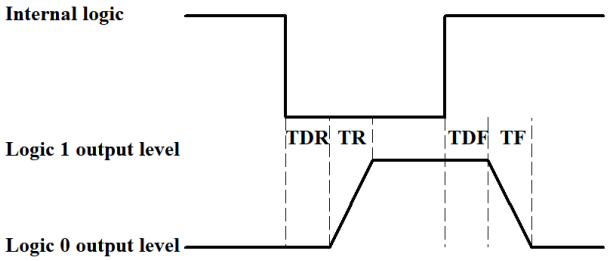


Figure 11-38 Output logic level

Parameter name	Parameter symbol	Parameter values
Output rise time	TR	0.01us
Output downtime	TF	0.01us
Output rising delay	TDR	0.02us
Output drop delay	TDF	0.04us

Table 11-6 Non-isolated output's electrical characteristics

11.9.4 I3 series camera's configurable input and output I/O circuits(line2)

Camera with hardware version V2.0 and above, its input and output I/O circuits are shown in Figure 11-39.

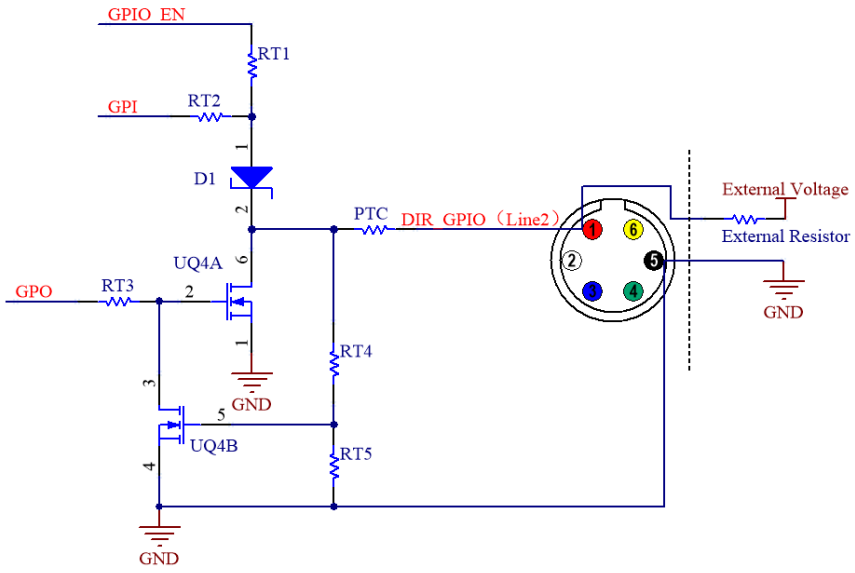


Figure 11-39 Non-isolated configurable input / output I/O circuits

- Line2 is set as input pin

Logic 0 input level: 0~0.6VDC (DIR_GPIO pin)

Logic 1 input level: 2~24VDC (DIR_GPIO pin)

Maximum input current: 25mA

When the input level is between 0.6 V and 2 V, the circuit action is uncertain. Please avoid the input voltage working in this range.

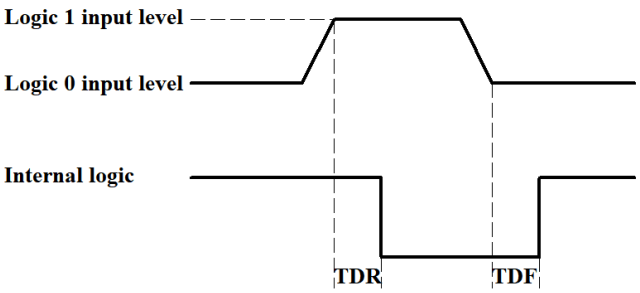


Figure 11-40 Input logic level

To prevent the GPIO pin from being damaged, first connect the ground pin GND and then input the voltage to the Line2 pin

Input rise delay (TDR): 0.02us

Input drop delay (TDF): 0.02us

- Line2 is set as output pin

The maximum current allowed through this pin is 25 mA.

When the ambient temperature is 25 degrees Celsius, the relationships between external voltage, resistance and output low level are shown in Table 11-7

External voltage	Non-essential resistance	VL(GPIO)
3.3V	1KΩ	0.11V
5V	1KΩ	0.167V
12V	2.4KΩ	0.184V
24V	4.7KΩ	0.385V

Table 11-7 Non-isolated output logic low level parameters

The external pull-up voltage is 5V, the pull-up resistance is 1K Ω, the GPIO is configured as the output logic level and the electrical characteristics are shown in Figure 11-41.

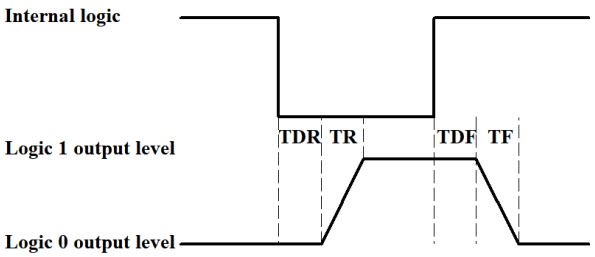


Figure 11-41 Output logic level

Parameter name	Parameter symbol	Parameter values
Output rise time	TR	0.08us
Output downtime	TF	0.02us
Output rising delay	TDR	0.1us
Output drop delay	TDF	0.04us

Table 11-8 Non-isolated output's electrical characteristics

11.10 IUX series camera's I/ O electrical properties

11.10.1IUX series camera's opto-isolated input circuit (line0)

In the camera I/O control, opto-isolated input circuit is shown in Figure 11-32.

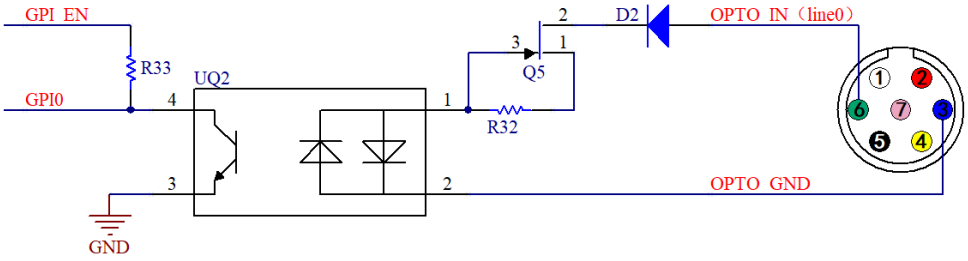


Figure 11-42 Opto-isolated input circuit

Logic 0 input level: 0~2.2VDC (OPTO_IN pin)

Logic 1 input level: 3.3~24VDC (OPTO_IN pin)

Maximum input current: 30mA

The input level is between 2.2V and 3.2V, the circuit action state is uncertain, please avoid the input voltage working in this range.

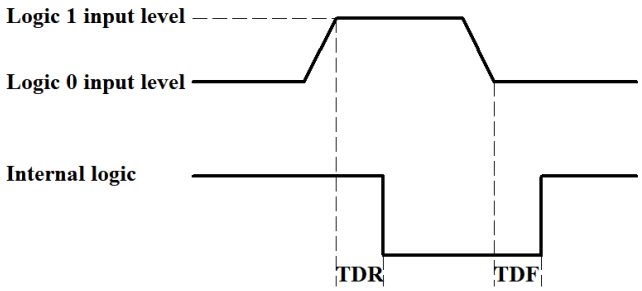


Figure 11-43 Input logic level

Input rise delay (TDR): 6us

Input drop delay (TDF): 6us

11.10.2IUX series camera's opto-isolated output circuit(line1)

In camera I/O control, opto-isolated output circuit is shown in Figure 11-34.

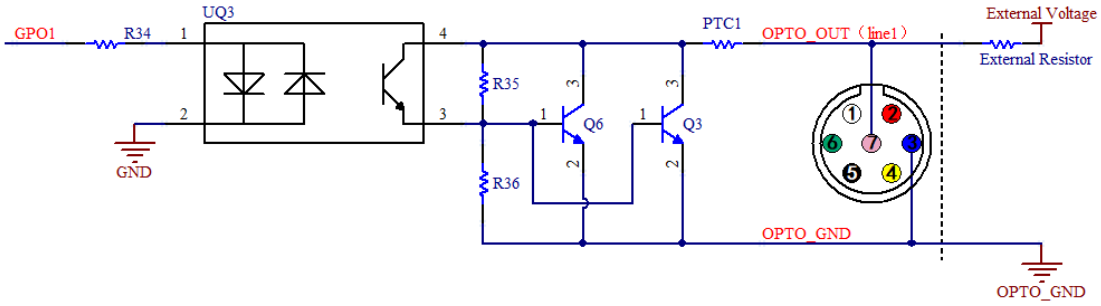


Figure 11-44 Opto-isolated output circuit

Opto-isolated output maximum current: 30mA

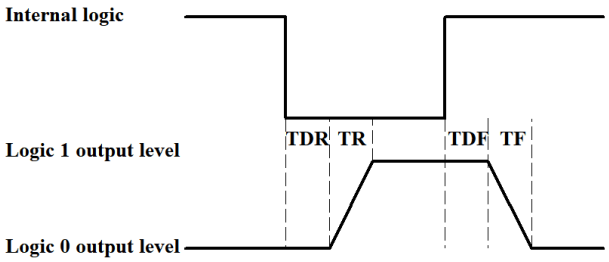


Figure 11-45 Output logic level

The electrical characteristics of the opto-isolated output signal (external voltage 5V, external resistor 1K) are shown in Table 11-9.

Parameter name	Parameter symbol	Parameter values
Output logic low level	VL	742mV
Output logic high	VH	4.134V
output rise time	TR	4us
Output downtime	TF	1.8us
Output rising delay	TDR	12us
Output drop delay	TDF	2us

Table 11-9 Opto-isolated output signal's electrical characteristics

The corresponding current and output logic low level parameters are shown in Table 11-10 when different voltage and resistors are used in external circuit.

External voltage	Non-essential resistance	VL	Output current
3.3V	1KΩ	510mV	2.82mA
5V	1KΩ	742mV	4.31mA
12V	2.4KΩ	795mV	4.68mA
24V	4.7KΩ	850mV	4.97mA

Table 11-10 Opto-isolated output logic's low level parameters

11.10.3IUX series camera's Input and output I/O circuit(line2/line3)

Non-isolated configurable input, output I/O circuit is shown in Figure 11-36, Figure 11-47.

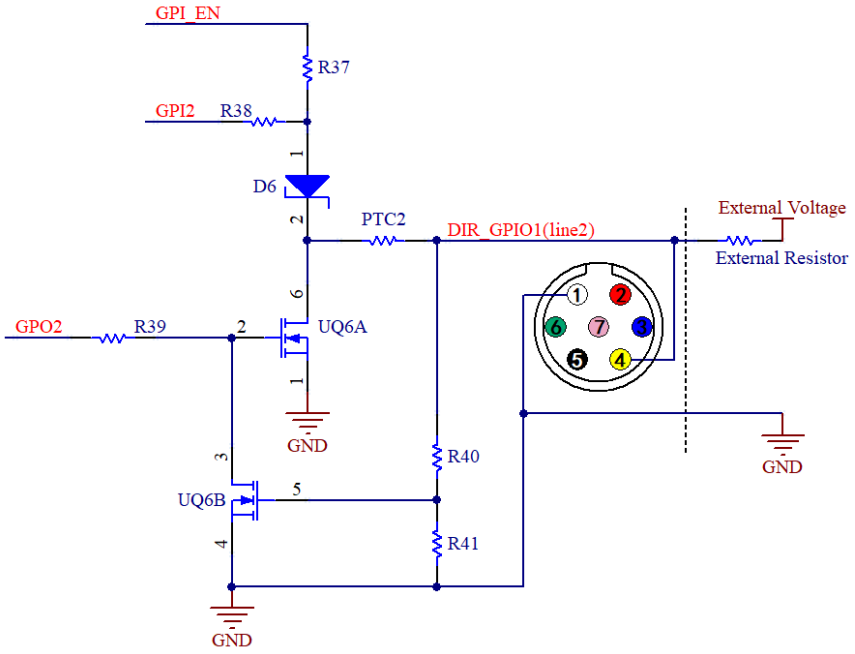


Figure 11-46 Non-isolated configurable input, output I/ O circuit (line2)

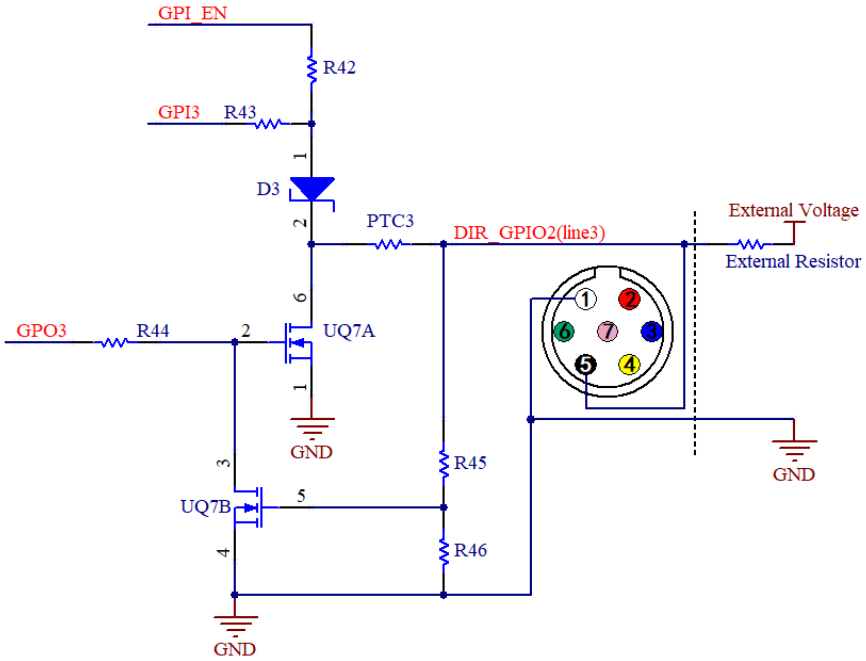


Figure 11-47 Non-isolated configurable input, output I/ O circuit (line3)

1, Line2/line3 set as input pin:

Logic 0 input level: 0-0.6 VDC (DIR_GPIO1/DIR_GPIO2 pin)

Logic 1 input level: 2.0~24VDC (DIR_GPIO1/DIR_GPIO2 pin)

Maximum input current: 25mA

The input level is between 0.6V and 2.0V, the circuit action state is uncertain. Please avoid the input voltage working in this range.

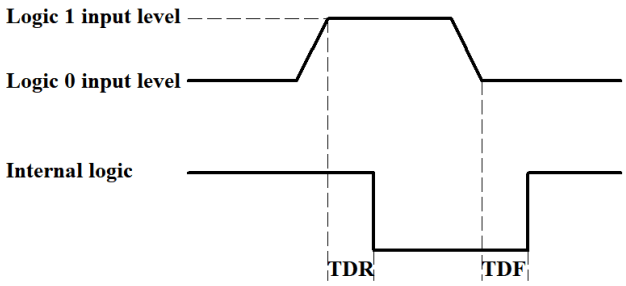


Figure 11-48 Input logic level

To prevent damage to the GPIO pin, connect the GND pin before entering voltage to the Line2 pin.

Input rise delay (TDR): 0.02us

Input drop delay (TDF): 0.02us

2, Line2/line3 set as output pin

The maximum current allowed through this pin is 25 mA.

When the ambient temperature is 25 degrees Celsius, the relationships between the external voltage, resistance and output low level are shown in Table 11-11.

External voltage	Non-essential resistance	VL (GPIO)
3.3V	1KΩ	0.11V
5V	1KΩ	0.167V
12V	2.4KΩ	0.184V
24V	4.7KΩ	0.385V

Table 11-11 Non-isolated output logic's low level parameters

The external pull-up voltage 5V pull-up resistance 1KΩ, GPIO output logic level, electrical characteristics are shown in Figure 11-38.

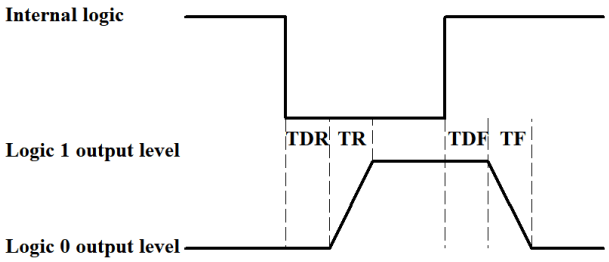


Figure 11-49 Output logic level

Parameter name	Parameter symbol	Parameter values
Output rise time	TR	0.08us
Output downtime	TF	0.02us
Output rising delay	TDR	0.1us
Output drop delay	TDF	0.04us

Table 11-12 Non-isolated output's electrical characteristics

11.11 Firmware upgrade

The I3 series industrial camera can use the updatefw.exe tool available in the SDK for firmware field upgrades. For the latest version of the firmware xxxxx.ufw file, please contact technical support.

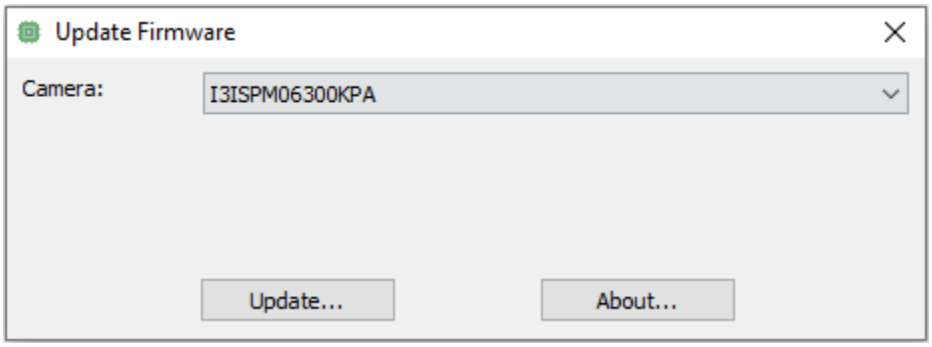


Figure 11-50 Firmware upgrade tool