

TOSHIBA

Leading Innovation >>>

CMOS Camera BG505LM Series BG302LM Series

User's Guide

Rev.2.0



August 1st 2018

On the subject of this document

- This document is to introduce the development source and technical source tackled by TOSHIBA TELI CORPORATION.
- This article information described in this document contains an under development source and subject to change without notice.
- Please read operation manual carefully before you use the product at the first time, and use it properly. Product specifications, operation manual and other related documents are available in our HP to download. Please keep these materials in your hand so that you can read them at any time.

<http://www.toshiba-teli.co.jp/en/products/industrial/>

- Please refer our HP or contact our sales person for your enquiry and the latest information.

* Names and Logo might be trade mark or registered trade mark.

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GigE Vision Camera Product range



GigE Vision Camera Product range



Model name				Sensor	Optical Size	Output Resolution	Frame Rate
Mono chrome		Color					
BG030	Available	BG030C BG030CF	Available	ICX424A	1/3 inch	640(H) x 480(V)	125fps (Col.120fps)
BG031	Available			ICX414A	1/2 inch	640(H) x 480(V)	125fps (Col.120fps)
BG040M	under development	BG040MC BG040MCF	under development	IMX287	1/2.9 inch	720(H) x 540(V)	291fps
BG080	Available			ICX204A	1/3 inch	1,024(H) x 768(V)	40fps
BG130	Available	BG130C BG130CF	Available	ICX445A	1/3 inch	1,280(H) x 960(V)	30fps
BG160M	under development	BG160MC BG160MCF	under development	IMX273	1/2.9 inch	1,440(H) x 1,080(V)	72fps
BG202	Available	BG202C BG202CF	Available	ICX274A	1/1.8 inch	1,600(H) x 1,200(V)	20fps (Col.19fps)
BG205M-CS	Available	BG205MC-CS BG205MCF-CS	Available	CMV2000	2/3 inch	2,048(H) x 1,088(V)	50fps
BG302LMG	New	BG302LMCG BG302LMCF	New	IMX265	1/1.8 inch	2,048(H) x 1,536(V)	36fps
BG505LMG	New	BG505LMCG BG505LMCF	New	IMX264	2/3 inch	2,448(H) x 2,048(V)	22fps

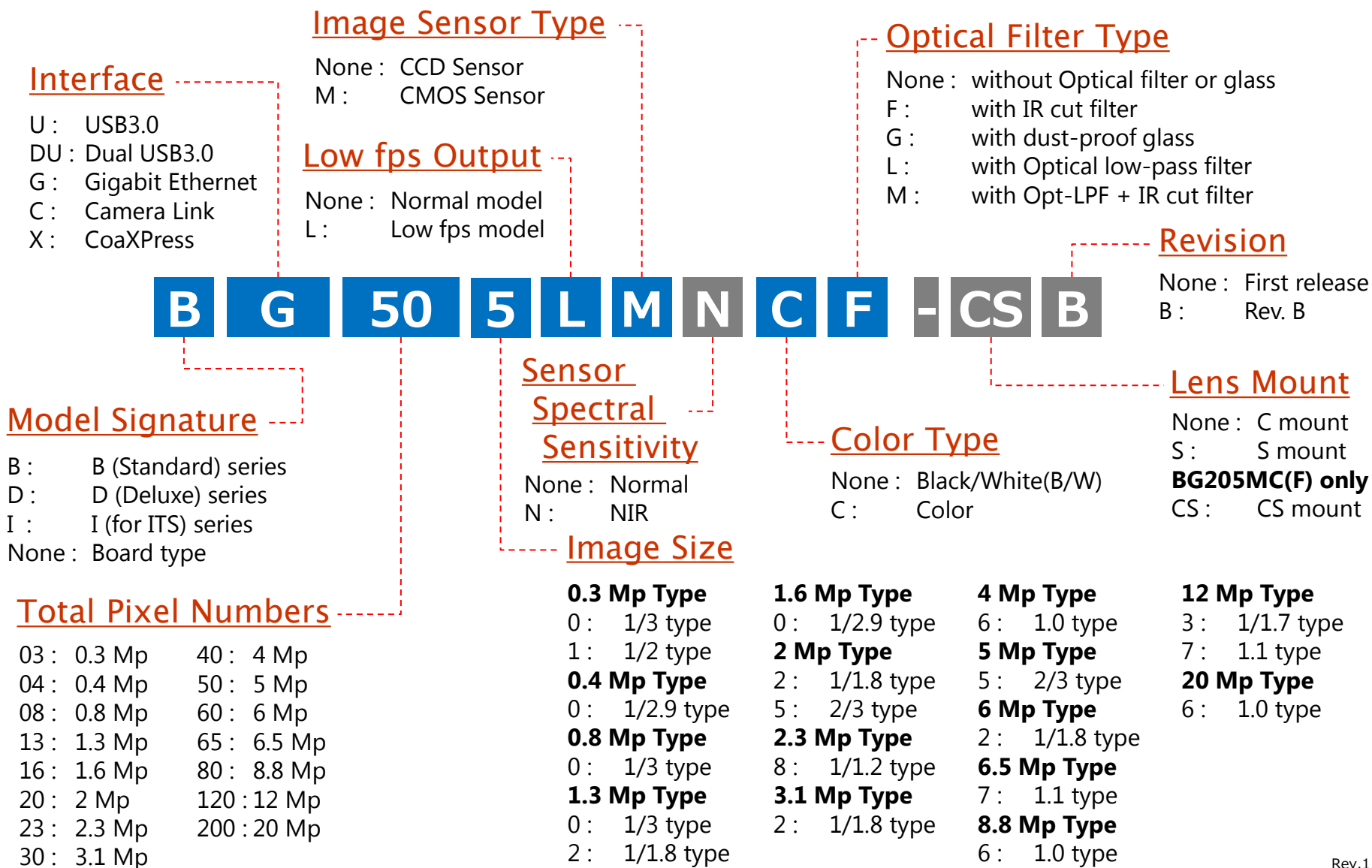
Note :

- This documents does not confirm product release schedule as information in development plan are included.
- Contact our persons in charge of sales for your enquiry.

***L** : Low fps model
 ***(M)C : without IR cut filter
 ***(M)CF : with IR cut filter
 ***(M)G/CG : with Dust-proof glass
 ***-CS : CS-mount

July 2018

Ordering information for B/D series camera



Rev.1.30

Advantage of BG505LM/BG302LM series



Advantage of BG505LM/BG302LM series

■ TELI original IP core

- High integration, by originally developed innovative technology, achieves super high speed response

➔ *“TELI Core Technology” inside*

■ High speed, High sensitivity and High quality image

- Adopting Sony's Global Shutter (GS) CMOS sensor
 - BG505LM series : IMX264(5Mp / 22fps)
 - BG302LM series : IMX265(3.1Mp / 36fps)
- High speed, high sensitivity and high image quality, surpassing CCD
- High **Mono mode** image quality with ACPI processing (only color model)

Pregius

* Pregius or Pregius logo are trade marks of Sony Corporation.

Advantage of BG505LM/BG302LM series

■ Gigabit Ethernet[®] Interface (GigE)

- High speed transfer of 1Gbps (max.) is achieved by Gigabit Ethernet Interface standard of IEEE802.3ab : 1000BASE-T
- Uncompressed image data can be output in high speed frame rate
- Cable powered (IEEE802.3af : Power over Ethernet : PoE)
- 100BASE-TX(IEEE802.3u) is also supported for various use

■ Supporting various International FA camera standard

- **GigE Vision (Ver 1.2)**
Camera I/F standard working on GigE
- **GenICam^{*1} (Ver 2.4, Ver 3.0)**
Standard of camera control with common API, free from I/F type
- **IIDC2 (Ver 1.1.0)** = Industrial & Instrumentation Digital Camera
Spec. of standard controlling protocol for FA camera

*1: Generic Interface for Cameras

Advantage of BG505LM/BG302LM series

■ **Advanced Function**

- **Function with Random trigger shutter, Sequential shutter, Bulk trigger, Scalable, Event notification, Image buffer and Chunk, etc.**

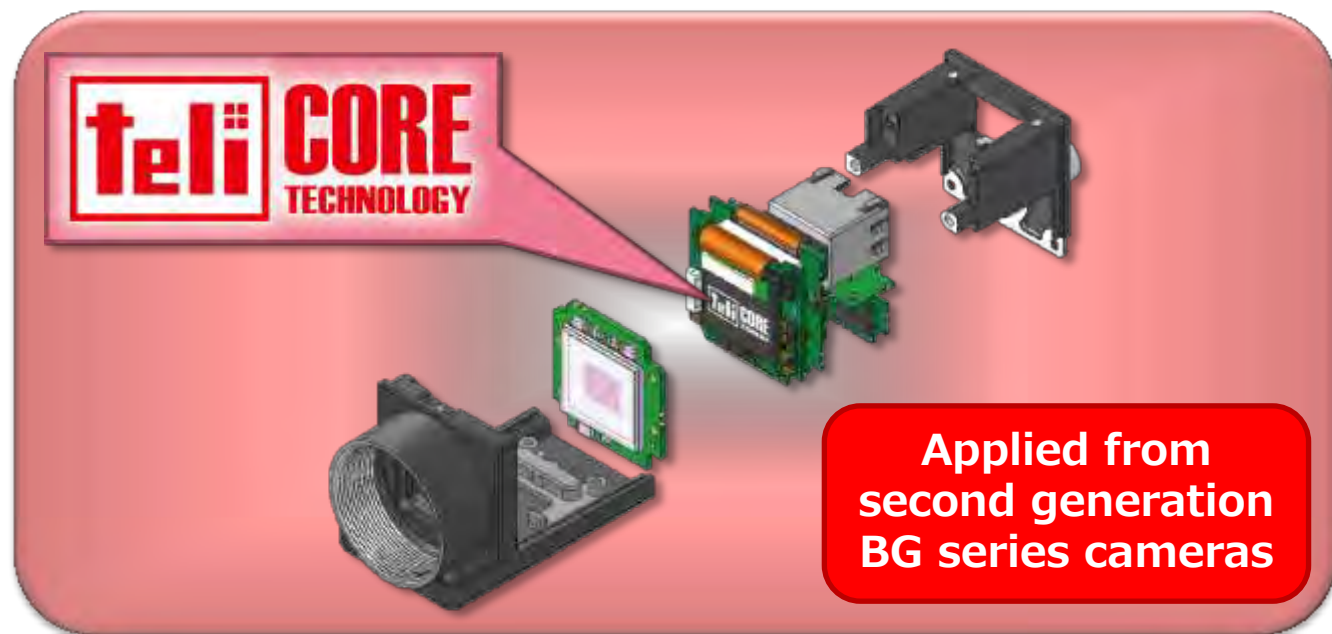
■ **Enclosure structure etc.**

- **Compact, light, vibration & impact resistance**
- **with optical glass as standard for easier cleaning of sensor surface**
- **Supporting RoHS directive**

TELI CORE TECHNOLOGY

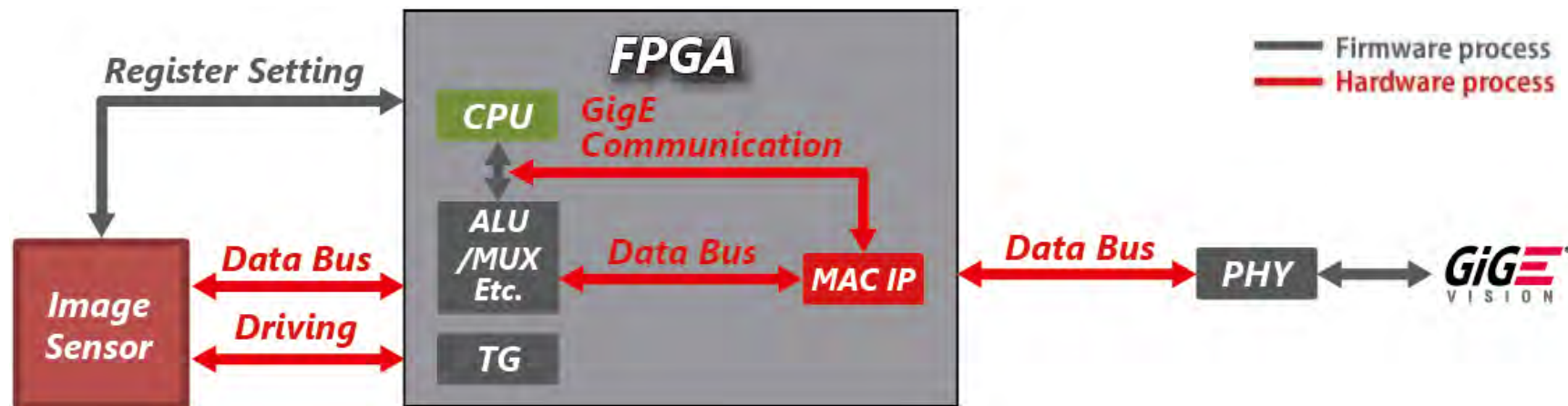
■ “Vision Professional” Toshiba Teli’s confident core technology!

- Innovative unique technology and latest FPGA achieved miniaturization and high integration.
- Completely hardware processing with no CPU and no firmware.
- Super fast response technology drastically reduces communication time.



TELI CORE TECHNOLOGY

Example of ordinary FPGA in use

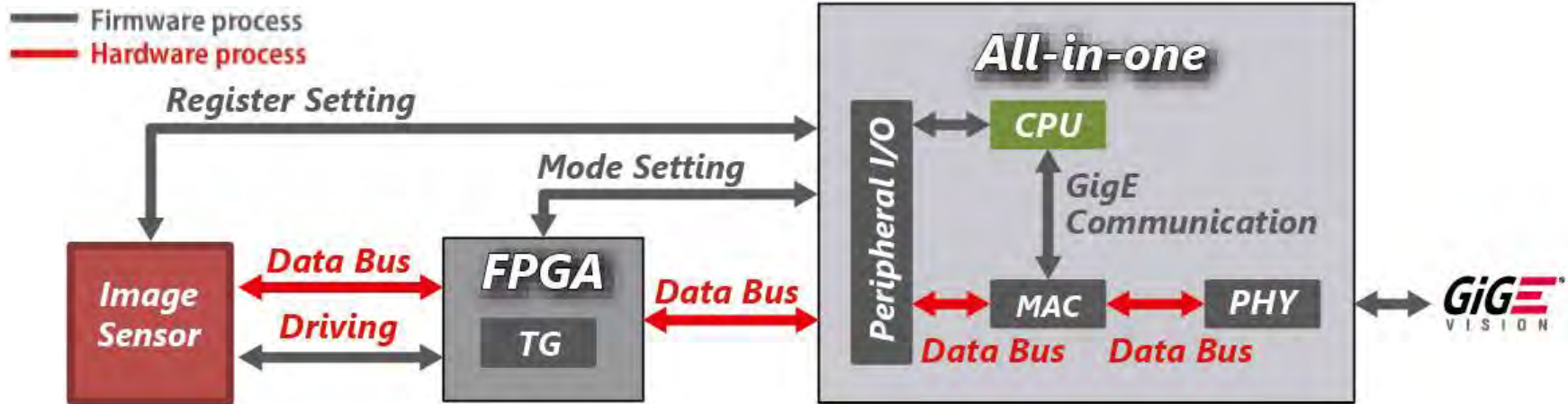


Architecture	Circuit scale	Cost	Processing speed	Response speed
FPGA (with CPU)	Average	Average	Average	Average

Most of other manufacturer's camera has this structure. Internal CPU(MPU) core can achieve optimal or efficient internal bus addition to size reduction. However, it inevitably takes longer time for host to receive camera response because command from host is set to main registers after interpretation by software.

TELI CORE TECHNOLOGY

Application example of FPGA & All in one chip

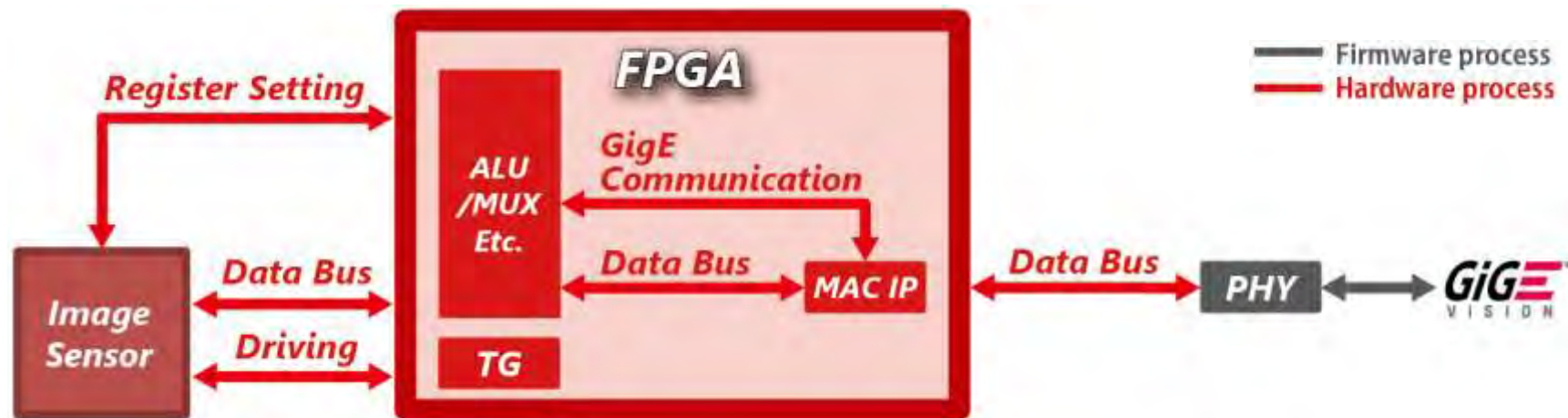


Architecture	Circuit Scale	Cost	Processing speed	Response speed
FPGA + "All-in-one"	Large	Bit higher	Average	Slow

Visual signal processing system and sensor drive timing are generated in FPGA. All in one chip makes it easier to transmit data to GigE bus by image data input. However, speed of processing and response is slower because it is not optimized for image data transfer.

TELI CORE TECHNOLOGY

TELI CORE TECHNOLOGY in use



Architecture	Circuit scale	Cost	Processing speed	Response speed
TELI CORE TECHNOLOGY	Small	Low	Very fast	Very fast

In this structure, it is shifted from software (firmware) processing to completely hardware processing in order to solve responsive problem in previous method. As command from host also interpreted by hardware, necessary time to set internal register in camera and time to send back a response to host can be drastically reduced.

Benchmark of response speed

- Applied software : Image processing library (VisionPro by Cognex)
- Object camera : GigE Vision camera
 - ①BG205M(by TELI) ②Competitor's product ③BG302LMG(by TELI)
- Benchmark : Comparison of processing time from start of software trigger to image capture

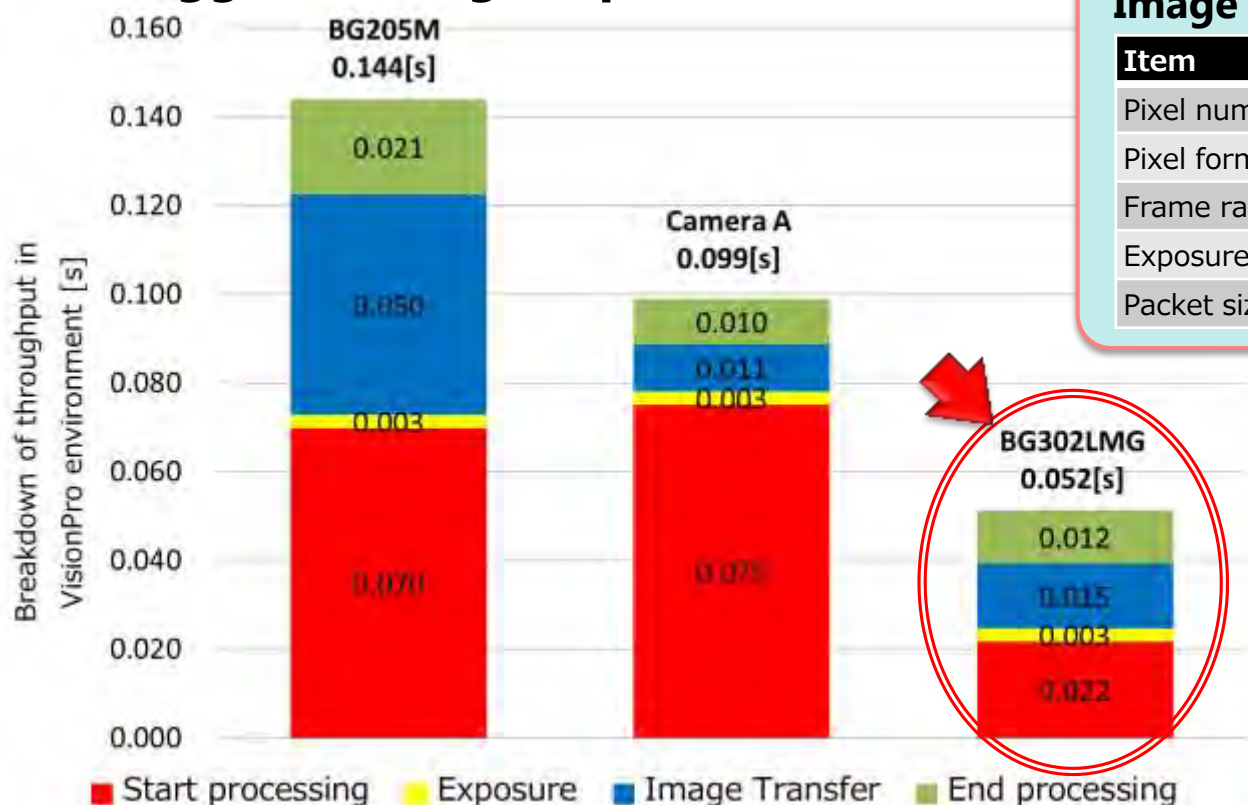


Image format & imaging conditions

Item	Setting
Pixel number	1.3MP (1280H x 960V)
Pixel format	Mono, 8 bit/pixel
Frame rate	20 fps
Exposure time	3 ms
Packet size	8,000 bytes

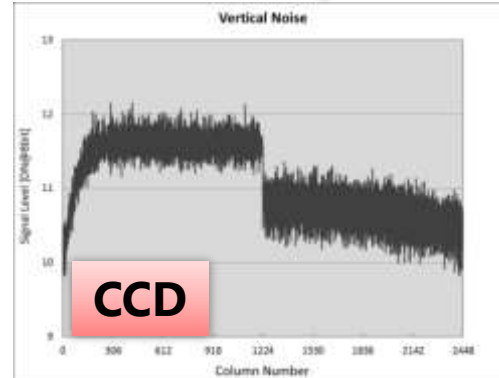
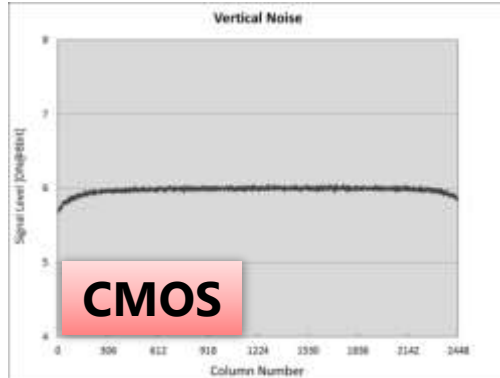
【Remark】

They are equivalent in case of comparison among the same sensors. Image transfer time of BG302 is longer than that of competing products because horizontal reading cannot be accelerated due to the sensor even ROI limits horizontal pixels of 2048 to 1280.

Advantage of BG505LM/BG302LM

■ Extreme low noise

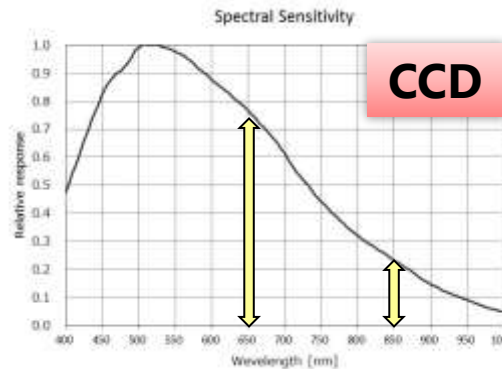
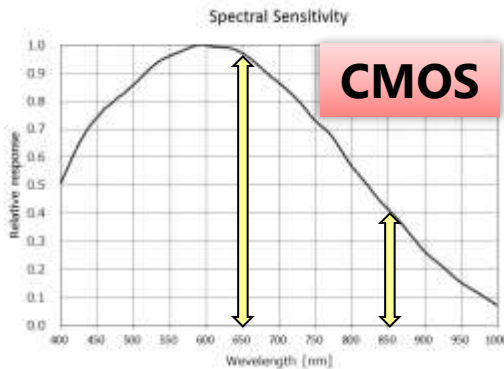
CMOS : BG505LMG
CCD : CSCQS15BC23



No bump between tap seen in case of 5Mp CCD, no fixed pattern noise of CMOS sensor. Low readout noise.

■ High IR sensitivity

CMOS : BG505LMG
CCD : CSCQS15BC23



Higher sensitivity in long wave comparing with 5Mp CCD. Advanced sensitivity with red LED and near IR applications.

■ Main applications

- Replacement 5M-CCD model with BG505M

BG302LM :
Equivalent capability!

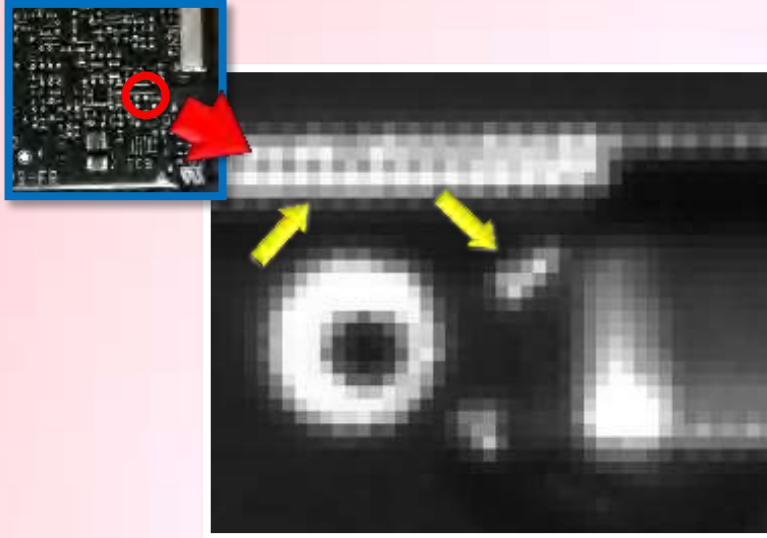
Advantage of BG505LM/BG302LM (for Color)

■ High **Mono mode** performance with ACPI processing

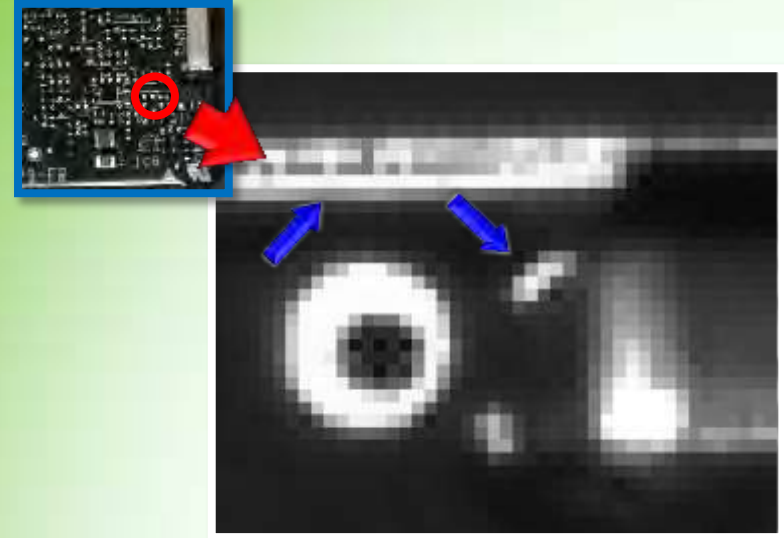
- False color in the brightness edge part reduces by ACPI processing

BG505LMCG/CF
BG302LMCG/CF

Using Linear Conversion



Using ACPI Processing



Part of PC Board

ACPI (Adaptive Color Plane Interpolation)

When RGB conversion (interpolation procedure) from Bayer pattern is in process, false color such as color shift and blur are likely to occur in edge part with general linear interpolation method. However, ACPI processing can reduce occurrence of these false color and improve a resolution. And also, it reduce noise at the same time.

Specification comparison



Specification Comparison

Model	BU302MG	BU505MG
Interface	Gigabit Ethernet IEEE802.3ab (1000BASE-T), IEEE802.3u (100BASE-TX)	
Protocol	GigE Vision Ver1.2	
Imaging element	1/1.8 type CMOS (IMX265)	2/3 type CMOS (IMX264)
Max. output pixels	3.1M	5M
Resolution	2,048(H) x 1,536(V)	2,448(H) x 2,048(V)
Max. frame rate (all pixels)	36 fps	22 fps
Pixel size	3.45 x 3.45 μm	3.45 x 3.45 μm
Protect glass / Optical filter	[G] : with Dust-proof glass	
Standard sensitivity	3,850 lx, F11 (1/36 s)	2,600 lx, F11 (1/22 s)
Minimum sensitivity	2 lx	2 lx
Gain	Manual	0 ~ +24 dB (Analog gain)
	Auto	✓
Black level correction	-25 ~ +25 %	
Gamma correction	0.45 ~ 1.0	
LUT	Input : 12 bit, Output : 12 bit	
Sharpness	✓	
Pixel defect correction	Max. 256 pixels	
Test pattern out	✓	
Image memory (number of images)	✓ (over 21 images)	✓ (over 13 images)
Image re-sending	✓	

Specification Comparison

Model		BU302MG	BU505MG	
Exposure control	Manual	30 μ s ~ 16 s	32 μ s ~ 16 s	
	Auto	✓		
Trigger shutter	Hardware	Edge (30 μ s ~ 16 s) / Pulse width control +/- polarity	Edge (32 μ s ~ 16 s) / Pulse width control +/- polarity	
	Software	GigE Vision command		
Bulk trigger		Max. 255 times		
Sequential shutter		Max. 16 entry		
Trigger delay		0 ~ 2,000,000 μ s		
Synchronizing method		Internal sync		
Pixel format		Mono 8 / 10 / 12		
Readout mode	All pixels	2,048(H) x 1,536(V)	2,448(H) x 2,048(V)	
	Partial	Min. unit size	64(H) x 64(V)	
		Offset setting unit	8(H) x 2(V)	
		Number of windows	1	
		Window overlap	-	
	Binning reading (Digital image reduction)	2x2 (H: Digital, V: Sensor)		
	Decimation	2x2		
Image flip		Horizontal, Vertical		
User memory	Set memory	15 Channel		
	Optional memory	64 bytes		

Specification Comparison

Model		BU302MG	BU505MG
GPIO	Connector	HIROSE connector (6 pin)	
	Input	1 system (Ext. trigger) : Photo-coupler (~ +24.0V)	
	Dual purpose	1 system (Ext. trigger when input) : LVTTL(+3.3V)	
	Output	1 system : Open-collector (~ +24.0V)	
	Output signals	TIMER0_ACTIVE / USER_OUTPUT / EXPOSURE_ACTIVE / FRAME_ACTIVE / FRAME_TRANSFER / FRAME_TRIGGER_WAIT	
Anti-chattering		✓	
Anti-glitch		✓	
Event notification		FrameTrigger / FrameTriggerError / FrameTriggerWait / FrameTransferStart / FrameTransferEnd / ExposureStart / ExposureEnd / Timer0Start / Timer0End	
Chunk		FrameID / ExposureTime / Gain / LineStatusAll / FrameBurstTriggerCount / SequentialShutterNumber / SequentialShutterElement etc.	
Power supply		PoE (RJ-45 connector) / DC +12V ±10 % (HIROSE connector)	
Power consumption		3.2 W (PoE) / 2.7 W (HIROSE connector)	3.2 W (PoE) / 2.7 W (HIROSE connector)
Lens mount		C mount	
Overall dimensions		29 (W) x 29 (H) x 40 (D) mm (exclude mount, protrusion)	
Weight		Approx. 60 g	
Operation assurance	Operating temperature	Temperature : 0 °C ~ 40 °C (below 60 °C on cabinet surface) Humidity : 10 % ~ 90 % (No dew)	
	Storage temperature and humidity	Temperature : -20 °C ~ 60 °C Humidity : below 90 % (No dew)	

Specification Comparison (major CMOS color models)

Model	BU302MCG/MCF	BU505MCG/MCF
Interface	Gigabit Ethernet IEEE802.3ab (1000BASE-T), IEEE802.3u (100BASE-TX)	
Protocol	GigE Vision Ver1.2	
Imaging element	1/1.8 type CMOS (IMX265)	2/3 type CMOS (IMX264)
Max. output pixel size	3.1M	5M
Resolution	2,048(H) x 1,536(V)	2,448(H) x 2,048(V)
Frame rate	36 fps	22 fps
Pixel size	3.45 x 3.45 μm	3.45 x 3.45 μm
Protect glass / optical filter	[CG] : with Dust-proof glass / [CF] : with IR cut filter	
Standard Sensitivity	CG : 2,500 lx, F8 (1/36 s), CF : 2,600 lx, F8 (1/36 s)	CG : 3,100 lx, F11 (1/22 s), CF : 3,200 lx, F11 (1/22 s),
Minimum sensitivity	CG : 3 lx, CF : 3 lx	CG : 2 lx, CF : 2 lx
Gain	Manual	0 ~ +24 dB (Analog gain) ✓
	Auto	
Black level correction	-25 ~ +25 %	
White balance	Manual gain	R/B gain set separately : 1 ~ 8 times All area [CG] : N/A / [CF] : 2,500 K ~ 6,500 K
	One push	
Gamma correction	0.45~1.0	
LUT	Input : 12 bit / Output : 12 bit	
Sharpness	-	
Color correction	-	
Saturation	-	
HUE	-	

Specification Comparison (major CMOS color models)

Model		BU302MCG/MCF	BU505MCG/MCF	
Pixel defect correction		Max. 256 pixels		
Test pattern output		✓		
Image memory (number of images)		✓ (over 21 images)	✓ (over 13 images)	
Image re-sending		✓		
Exp. cntrl	Manual	30 μ s ~ 16 s	32 μ s ~ 16 s	
	Auto	✓		
Trigger shutter	Hardware trigger	Edge (30 μ s ~ 16 s) / Pulse width control +/- polarity	Edge (32 μ s ~ 16 s) / Pulse width control +/- polarity	
	Software trigger	GigE Vision command		
Bulk trigger		Max. 255 times		
Sequential shutter		Max. 16 entry		
Trigger delay		0 ~ 2,000,000 μ s		
Synchro. Method		Internal sync		
Readout mode	All pixel scanning		2,048(H) x 1,536(V)	2,448(H) x 2,048(V)
	Partial reading	Min. unit size	64(H) x 64(V)	
		Offset setting unit	8(H) x 2(V)	
		Number of window	1	
		Window overlap	-	
	Binning reading (Digital image reduction)		2x2 (H : Digital, V : Sensor)	
	Decimation		2x2	
Pixel format		Bayer 8 / 10 / 12, Mono 8		
Image flip		Horizontal, Vertical		

Specification Comparison (major CMOS color models)

Model		BU302MCG/MCF	BU505MCG/MCF
User mem.	Value set memory	15 Channel	
	Optional memory	64 bytes	
GPIO	Connector	HIROSE connector (6 pin)	
	Input	1 system (Ext. trigger) : Photo-coupler (~ +24.0V)	
	Dual purpose	1 system (Ext. trigger when input) : LVTTTL(+3.3V)	
	Output	1 system : Open-collector (~ +24.0V)	
	Output signals	TIMER0_ACTIVE / USER_OUTPUT / EXPOSURE_ACTIVE / FRAME_ACTIVE / FRAME_TRANSFER / FRAME_TRIGGER_WAIT	
Anti-chattering		✓	
Anti-glitch		✓	
Event notification		FrameTrigger / FrameTriggerError / FrameTriggerWait / FrameTransferStart / FrameTransferEnd / ExposureStart / ExposureEnd / Timer0Start / Timer0End	
Chunk		FrameID / ExposureTime / Gain / LineStatusAll / FrameBurstTriggerCount / SequentialShutterNumber / SequentialShutterElement etc.	
Power supply		PoE (RJ-45 connector) / DC +12V ±10 % (HIROSE connector)	
Power consumption		3.2 W (PoE) / 2.7 W (HIROSE connector)	3.2 W (PoE) / 2.7 W (HIROSE connector)
Lens mount		C mount	
Overall dimensions		29 (W) x 29 (H) x 40 (D) mm (exclude mount, protrusion)	
Weight		Approx. 60 g	
Operation assurance	Operating temperature	Temperature : 0 °C ~ 40 °C (below 60 °C on cabinet surface) Humidity : 10 % ~ 90 % (No dew)	
	Storage temp. and humid.	Temperature : -20 °C ~ 60 °C Humidity : below 90 % (No dew)	

Operation Ambient conditions

■Camera housing temperature:

Operation assurance	Temperature: 0°C to +40 °C Camera housing temperature is less than the following temperature. Humidity: 10% to 90% (no condensation)		
Camera housing temperature	BG302LMG	Serial No. 0100001 to 0100039	less than 50 °C
		Serial No. 0100040 or later	less than 60 °C
	BG505LMG	Serial No. 0100001 to 0100225	less than 50 °C
		Serial No. 0100226 or later	less than 60 °C
BG302LMCG	Serial No. 0100001 or later	less than 60 °C	
BG505LMCG	Serial No. 0100001 or later	less than 60 °C	
Storage assurance	Temperature: -20°C to +60 °C Humidity: 90% or less (no condensation)		

Advanced Function



Advanced function

- **Event notice function** · **BG series**
- **Bulk trigger** ······ **BG(CMOS) series**
- **Sequential shutter** ··· **BG505/302LM series**
- **Image buffer** ······ **BG505/302LM series**
- **Pixel defect correction** **BG505/302LM series**

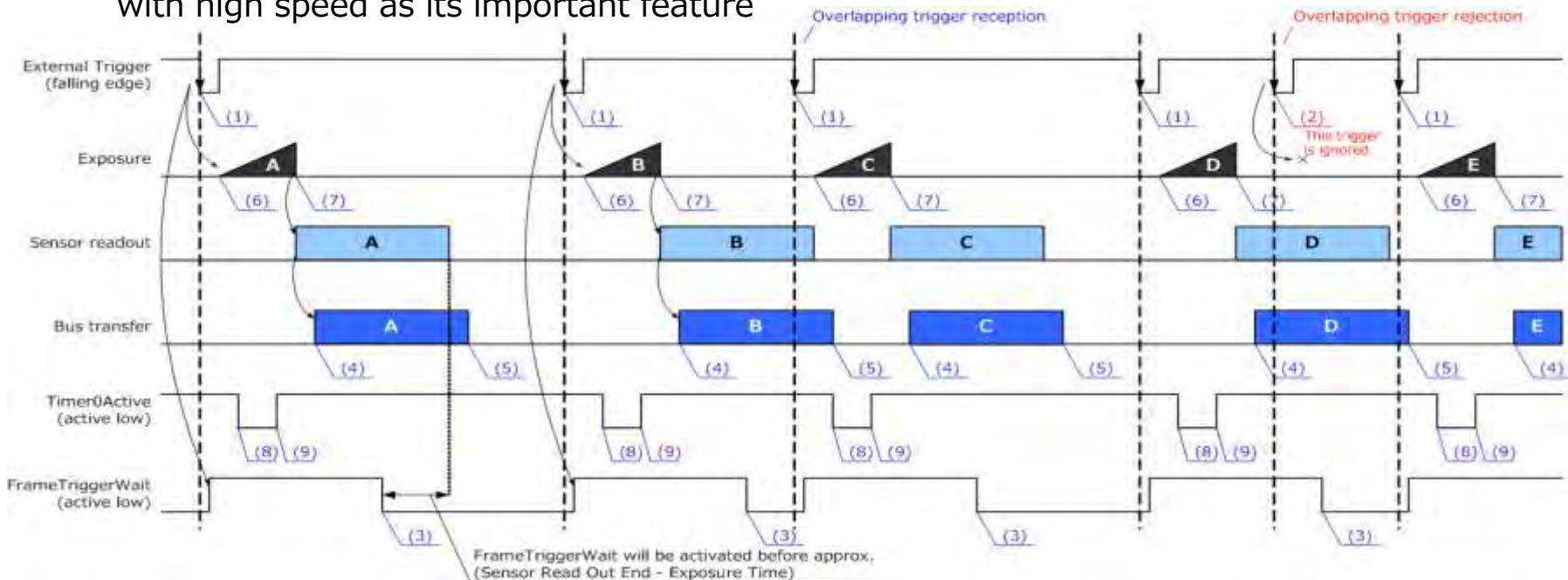
Advanced function (1)

■ Event notification function :

- Camera status can be referred through GigE by using event packet of GigE Vision
 - * **Some of the specifications of CCD models and BG205 series are not compatible with these**
- Event notice without delay by the latest IP core of BG series,
- Rendering great service to machine vision with high speed as its important feature

(1) Frame Trigger	: Reception of Frame Start Trigger
(2) Frame Trigger Error	: Rejection of Frame Start Trigger
(3) Frame Trigger Wait	: Start of waiting for Frame Start Trigger
(4) Frame Transfer Start	: Start of transferring Streaming data
(5) Frame Transfer End	: End of Transferring Streaming data
(6) Exposure Start	: Start of Exposure
(7) Exposure End	: End of Exposure
(8) Timer0Active	: Start of Timer0
(9) Timer0End	: End of Timer0

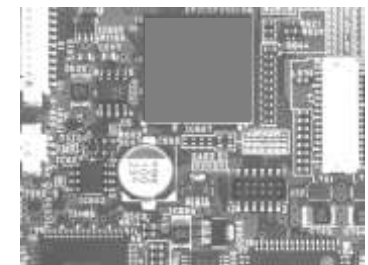
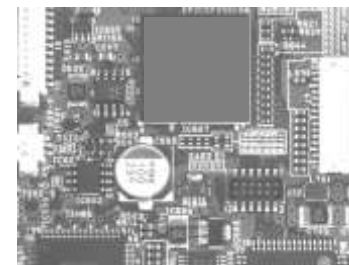
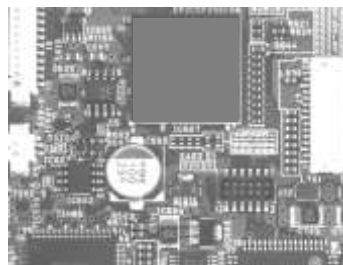
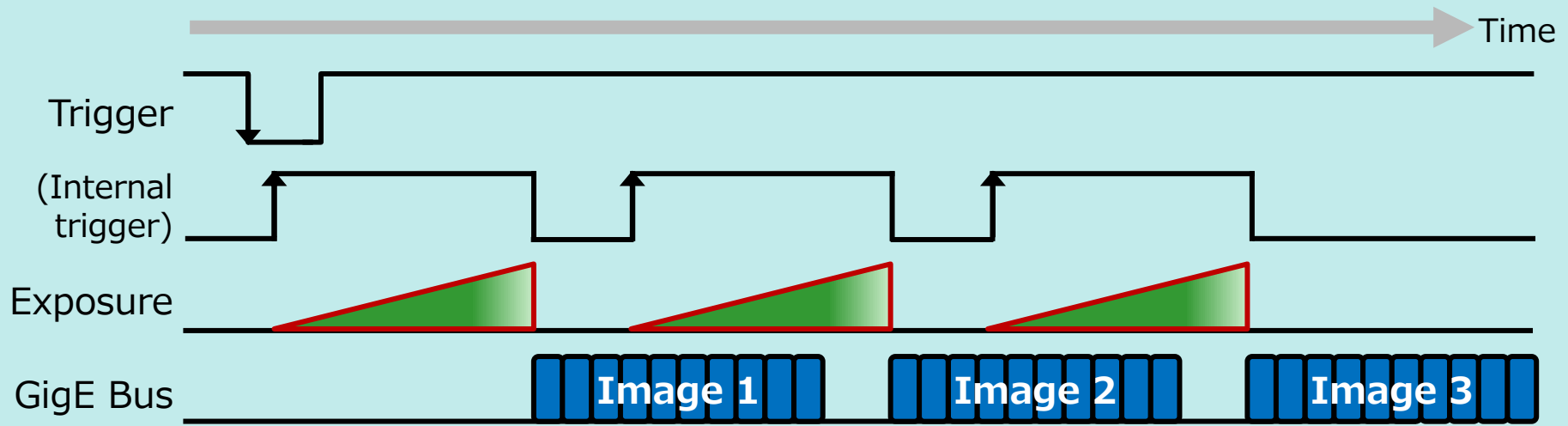
BG505/302 Series



Advanced function (2)

■ Bulk trigger mode :

- Exposure and image output of multiple times can be achieved by one time input of trigger signal
- Example of use :
selecting the best image among several frames, measuring moving distance etc.



Advanced function (3-1)

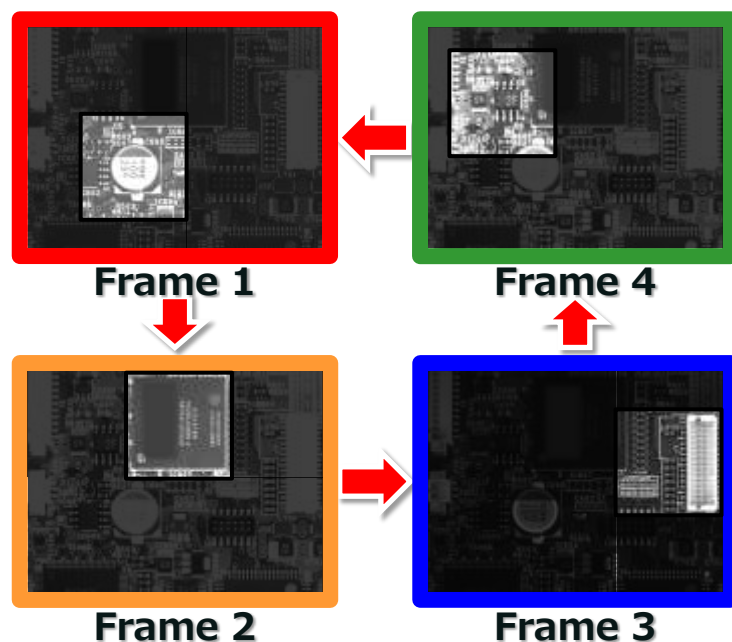
■ Sequential shutter mode

- Together with trigger mode, sequential shutter function of BU (CMOS) series can switch programmed settings such as gain, exposure, AOI trigger delay in each time of trigger input with each frame.

<Ex.1>

Changing ROI position, Gain and Exposure Time every time

Sequential Shutter Setting : 4 shots



Memory Bank1	SEQ : Frame 1
Memory Bank2	• Gain : 0dB
Memory Bank3	• Exposure : 2ms
Memory Bank4	• ROI Position :
Memory Bank5	SEQ : Frame 3
Memory Bank6	• Gain : 0dB
Memory Bank7	• Exposure : 1ms
Memory Bank8	• ROI Position :
Memory Bank9	SEQ : Frame 2
Memory Bank10	• Gain : +6dB
Memory Bank11	• Exposure : 2ms
Memory Bank12	• ROI Position :
Memory Bank13	
Memory Bank14	
Memory Bank15	SEQ : Frame 4
	• Gain : +3dB
	• Exposure : 2ms
	• ROI Position :

Advanced function (3-2)

■ Sequential shutter mode

<Ex.2>

Changing Gain and Exposure Time by shot

Sequential Shutter Setting : 3 shots



Trigger
(3 times)

Image data output
(3 frames)



First Shot



Gain: 0.5dB
Exp: 0.7msec

Second Shot



Gain: 3dB
Exp: 0.7msec

Third Shot

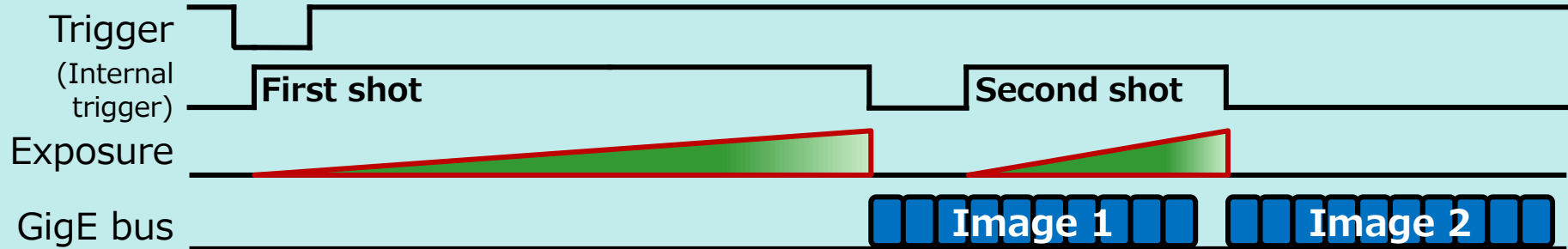


Gain: 8dB
Exp: 0.3msec

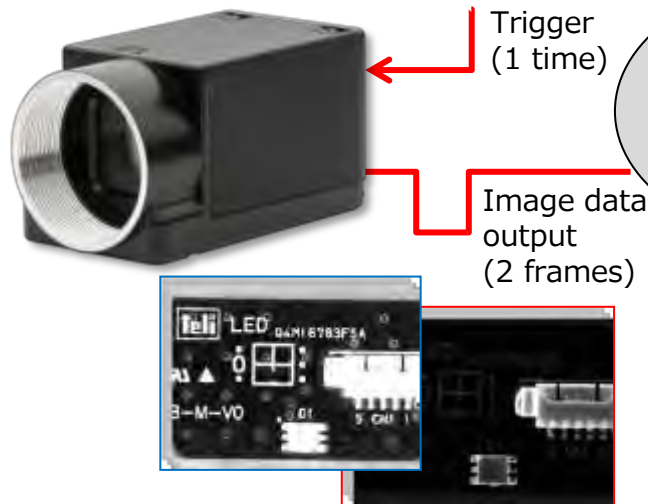
Advanced function (4)

■ Sequential shutter with Bulk trigger mode

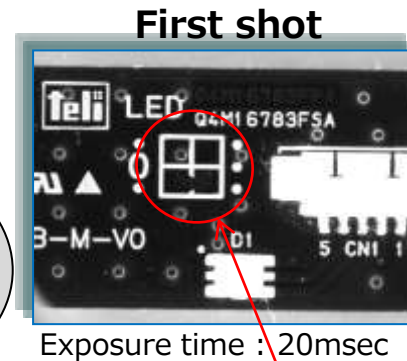
<Ex.3> Output multiple images of different shutter speed by one shot trigger



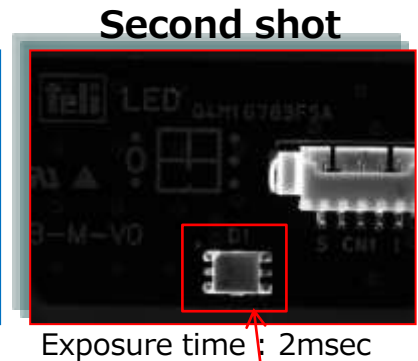
Bulk trigger setting : 2 shots
Sequential shutter setting : 2 sequences



Inspection on multi items by one time trigger input !



Silk inspection



Appearance inspection of scratch or dent

For example, appearance and silk lucking of parts can be inspected at the same time

Advanced function (5)

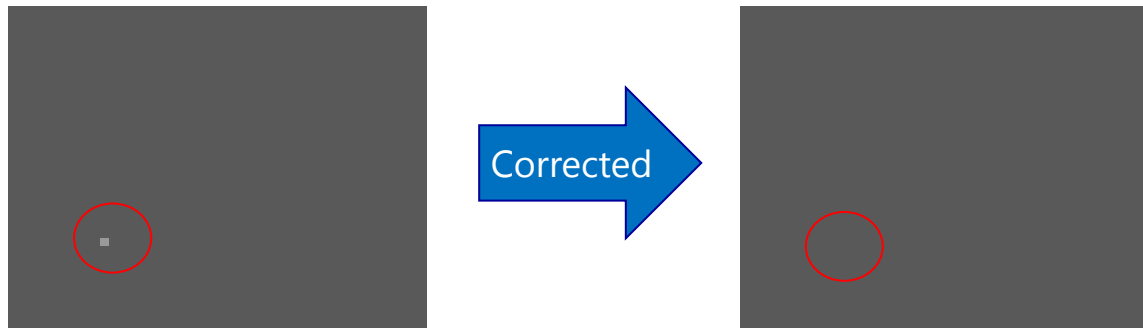
■ Image buffer

- As BG(CMOS) series have 64MB image buffer memory in it, recorded image data can be read from host PC at any time.



■ Pixel defect correction

- BG(CMOS) series have correction function of pixel defect. This function can be switched on and off depend on occasion.



Camera function list (all GigE Vision camera)

Series / Color type / Imager		BG B/W CCD					BG B/W CMOS					BG Color CCD			BG Color CMOS				
Resolution		0.3Mp	0.3Mp	0.8Mp	1.3Mp	1.3Mp	0.4Mp	1.6Mp	2Mp	3.1Mp	5Mp	0.3Mp	1.3Mp	2Mp	0.4Mp	1.6Mp	2Mp	3.1Mp	5Mp
Category	Function	BG030	BG031	BG080	BG130	BG202	BG040M	BG160M	BG205M-CS	BG302LMG	BG505LMG	BG030C BG030CF	BG130C BG130CF	BG202C BG202CF	BG040MC BG040MCF	BG160MC BG160MCF	BG205MC-CS BG205MCF-CS	BG302LMCG BG302LMCF	BG505LMCG BG505LMCF
TransportLayerControl	TransportLayerControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DeviceControl	DeviceControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ImageFormatControl	ImageFormatSelector	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Scalable	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Binning	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓
	Decimation	-	-	-	-	-	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
	Reverse	-	-	-	-	-	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓
	PixelFormat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	TestPattern	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	BayerProcessingMode	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AcquisitionControl	AcquisitionControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	ImageBuffer	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓
	TriggerControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	ExposureTime	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DigitalIOControl	DigitalIOControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VenderUniqueControl	AntiGlitch	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓
	AntiChattering	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CounterAndTimerControl	TimerControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AnalogControl	Gain	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	BalanceRatio	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓
	BalanceWhiteAuto	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓
	BlackLevel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Gamma	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	BlackLevelCorrection	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	✓	-	-
	Hue	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	-	-	-
	Saturation	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	-	-	-
	Sharpness	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	-	-	-
	ColorCorrectionMatrix	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	-	-	-
ALCCControl	ALCCControl	✓	✓	✓	✓	✓	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓	-	-
LUTControl	LUTControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SequentialShutterControl	SequentialShutterControl	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓
DPCCControl	DPCCControl	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓
UserSetControl	UserSetControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EventControl	EventControl	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ChunkDataControl	Chunk	-	-	-	-	-	✓	✓	-	✓	✓	-	-	-	✓	✓	-	✓	✓
その他	ColorSpaceCorrection	-	-	-	-	-	-	-	-	✓	✓	-	-	-	✓	✓	-	✓	✓

Documents



Reference Documents (released)

- **Product specifications**

Common in **BG505LM** series and **BG302LM** series

Japanese: **D4259311**



English: **D4259322**



- **Operation manual**

Common in **BG505LM** series and **BG302LM** series

Japanese: **D4259333**



English: **D4259344**



■ These documents are available in our HP to download;

<http://www.toshiba-teli.co.jp/en/products/industrial/gige/index.htm#bkm4>

http://www.toshiba-teli.co.jp/en/support/catalog_pro.htm



Reference Documents

• Thermal design guide line

Structure design with consideration of below guide line is recommended for appropriate use of USB3 Vision camera BU/DU series and GigE Vision camera BG series.

<Guide line>

http://www.toshiba-teli.co.jp/en/products/industrial/files/t-manu_bue.pdf



<Web Simulation>

<http://www.toshiba-teli.co.jp/en/products/industrial/info/t/t0001.htm>



< Simulation conditions >

- Implementation lens: $\Phi 29\text{mm}/L26\text{mm}$ and over
- Heat sink material: Aluminum (black alumite)
- Heat sink mounting conditions: to bottom surface of camera
- Camera posture: Lens face down(BU series, BG series), Lens face horizontal(DU series)

However, please mind top surface temperature of cabinet not to exceed the limit in below case.

- In case of mounting camera in different way from above conditions
- In case of difficulty to calculate heat dissipation area
- In case of using camera in scalable mode (CCD model only)

Calculating necessary heat dissipation area from ambient temperature of camera

Series name: BU series Product model name: Please select

Ambient temperature: Input °C (Please input by degree in °C)
Error will be shown if calculated minimum heat dissipation area is over 400cm². In that case, please input with lower ambient temperature.

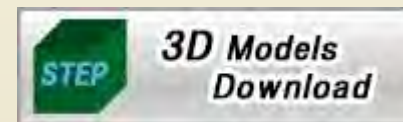
The smallest heat dissipation area: cm² (Material: Aluminum (Black alumite) equivalent.)

The highest limit temperature of cabinet top: °C

Calculation

Reference Documents

• 3D CAD model (STEP file)



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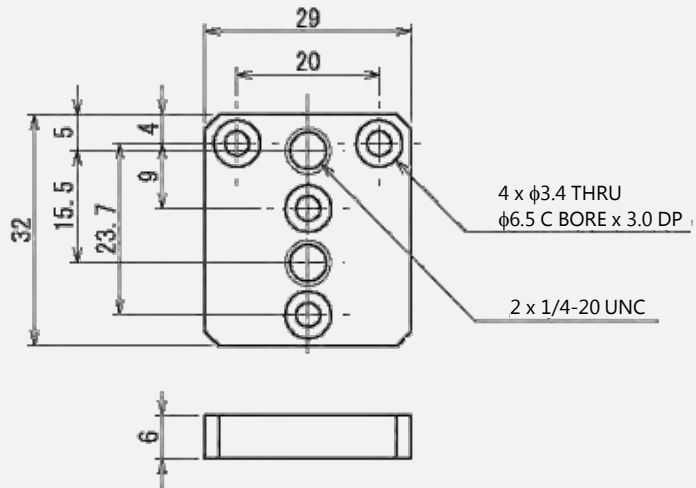
<http://www.toshiba-teli.co.jp/en/products/industrial/gige/index.htm#bkm4>



Options

■ Tripod mounting bracket

➤ CPTBUBG(for BU·BG series)

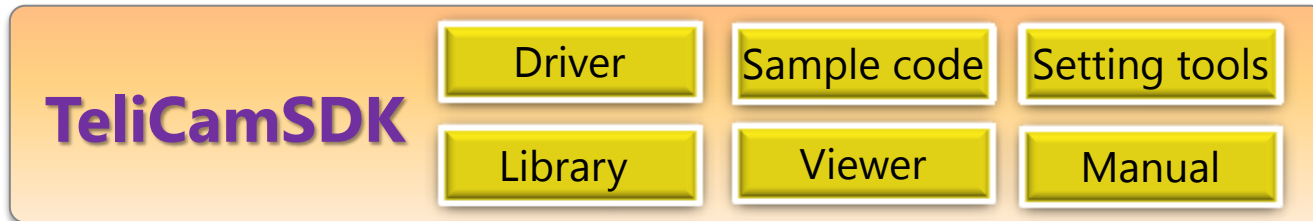


TeliCamSDK

TeliCamSDK

■ What's TeliCamSDK

- Our SDK (Software Development Kit) for USB3 Vision / GigE Vision camera.



(Useful components for application programming are contained)

TeliCamSDK for Linux
Compatible with ARM architecture

- Jetson TK1
- Jetson TX2
- Odroid XU4
- Raspberry pi 3

* Contact us for details.

■ Supporting OS

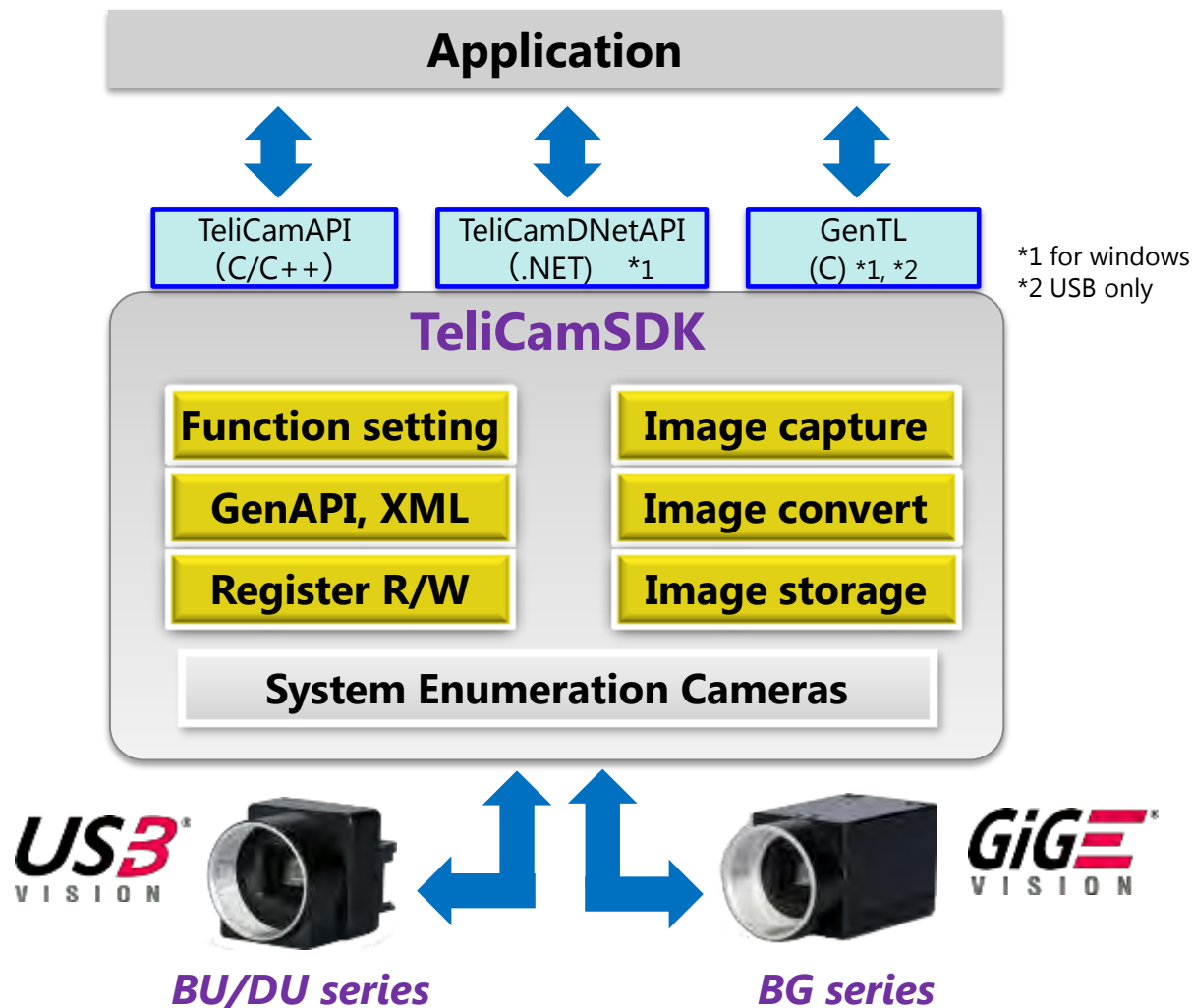
- for Windows : XP(SP3) / Vista / 7 / 8.1 / 10
- for Linux : Ubuntu14.04 / Debian8.1.0
Contact us for other distribution.

■ Supporting programming language & protocol

- C/C++, C#, VB.NET, C++/CLI (for Windows)
- GigE Vision, USB3 Vision, IIDC2, GenICam

TeliCamSDK

■ Functional diagram of TeliCamSDK



TeliCamSDK

■ Supporting various kinds of image processing libraries



National Instruments



MVTech



Cognex



Matrox

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