TOSHIBA

Leading Innovation

BU132M

Users Guide

Rev.1.1

May 27th 2016

Doc. No. 4300-0316

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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USB3 Vision Camera
Product range

USB3 Vision Camera Product range

Model name				Sensor	Optical Size	Output Resolution	Frame Rate
Mono chrome		Color					
BU030	Available	BU030C/CF	Available	ICX424A	1/3 inch	640(H) x 480(V)	125fps
BU031	Available			ICX414A	1/2 inch	640(H) x 480(V)	125fps
BU080	Available			ICX204A	1/3 inch	1,024(H) x 768(V)	40fps
BU130	Available	BU130C/CF	Available	ICX445A	1/3 inch	1,280(H) x 960(V)	30fps
BU132M	**New**			**EV76C560**	**1/1.8 inch**	**1,280(H) x 1,024(V)**	**60fps**
BU205M	Available	BU205MC/MCF	Under study	CMV2000	2/3 inch	2,048(H) x 1,088(V)	170fps
BU238M	Available	BU238MC/MCF	Available	IMX174	1/1.2 inch	1,920(H) x 1,200(V)	165fps
BU302MG	New	BU302MCG/MCF	New	IMX252	1/1.8 inch	2,048(H) x 1,536(V)	120fps
BU406M	Available	BU406MC/MCF	Available	CMV4000	1 inch	2,048(H) x 2,048(V)	90fps
BU505MG	New	BU505MCG/MCF	New	IMX250	2/3 inch	2,448(H) x 2,048(V)	75fps
DU657M	Available	DU657MC	Available	Own CMOS	1.1 inch	2,560(H) x 2,560(V)	55fps
DU806M	In plan	DU806MC/MCF	In plan	IMX255	1.0 inch	4,096(H) x 2,160(V)	40fps
DU1207M	In plan	DU1207MC/MCF	In plan	IMX253	1.1 inch	4,000(H) x 3,000(V)	30fps
BU602M	In plan	BU602MC/MCF	In plan	IMX178	1/1.8 inch	3,072(H) x 2,048(V)	TBD
		BU1203MC/MCF	Available	IMX226	1/1.7 inch	4,000(H) x 3,000(V)	30fps

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.
- BU602, BU1203 : mounted Rolling shutter type CMOS sensor

xxx(M)C : without IR cut filter
xxx(M)CF : with IR cut filter
xxx(M)G/(M)CG : with Dust-proof glass

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Ordering information for B/D series camera

Model Signature

B : B (Standard) series
D : D (Deluxe) series

Interface

U : USB3.0
G : Gigabit Ethernet
C : Camera Link

Image Sensor Type

None : CCD Sensor
M : CMOS Sensor

Optical Filter Type

None : without Optical filter or glass
F : with IR cut filter
G : with dust-proof glass
L : with Optical low-pass filter
M : with Opt-LPF + IR cut filter

Lens Mount

None : C mount
BG205MC(F) only
-CS : CS mount

Color Type

None : Black/White(B/W)
C : Color

Total Pixel Numbers

03 : 0.3 mega pixels
08 : 0.8 mega pixels
13 : 1.3 mega pixels
20 : 2.0 mega pixels
23 : 2.3 mega pixels
30 : 3.0 mega pixels
40 : 4.0 mega pixels
50 : 5.0 mega pixels
60 : 6.0 mega pixels
65 : 6.5 mega pixels
80 : 8.8 mega pixels
120 : 12.0 mega pixels

Image Size

0.3 Mega Pixels Type
0 : 1/3 type
1 : 1/2 type
0.8 Mega Pixels Type
0 : 1/3 type
1.3 Mega Pixels Type
0 : 1/3 type
2 : 1/1.8 type
2.0 Mega Pixels Type
2 : 1/1.8 type
5 : 2/3 type
2.3 Mega Pixels Type
8 : 1/1.2 type
8L : 1/1.2 type, Low-fps
3.0 Mega Pixels Type
2 : 1/1.8 type
2L : 1/1.8 type, Low-fps
4.0 Mega Pixels Type
6 : 1.0 type
5.0 Mega Pixels Type
5 : 2/3 type
5L : 2/3 type, Low-fps
6.0 Mega Pixels Type
2 : 1/1.8 type
6.5 Mega Pixels Type
7 : 1.1 type
8.8 Mega Pixels Type
6 : 1.0 type
12.0 Mega Pixels Type
3 : 1/1.7 type
7 : 1.1 type

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Advanced features of BU132M

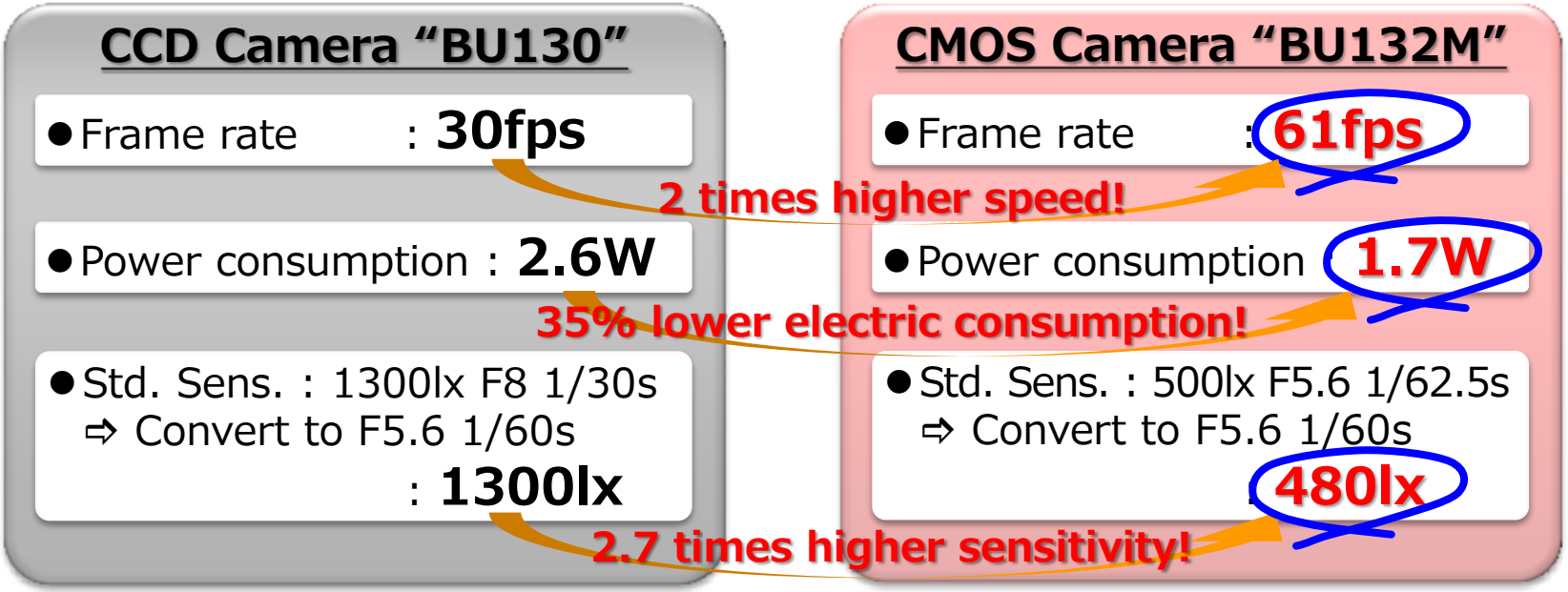
Advanced features

■ TELI original IP core “V4”

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

■ High frame rate, Low power consumption, High Sensitivity

- Adopting e2v’s EV76V560 (1.3M pixels) Global Shutter CMOS sensor
- Higher frame rate, higher sensitivity and lower electric consumption than previous model are achieved



Advanced features

■ Compared with BU-CCD model (Calculated)

Model	Opt. size	All pixels fps	Trans. band (8bit out) Mbyte/s	VGA size			XGA size		
				Opt. size	fps	Trans. band Mbyte/s	Opt. size	fps	Trans. band Mbyte/s
BU030	1/3″	125	38	(1/3″)	(125)	(38)	-	-	-
BU031	1/2"	125	38	(1/2″)	(125)	(38)	-	-	-
BU080	1/3″	40	31	1/4"	64	20	1/3″	40	50
BU130	1/3″	30	37	1/5″	60	18	1/3″	37	47
BU132M	1/1.8″	61	80	1/4"	130	40	1/2"	81	102

Model	All pixels fps	Trans. band (8bit out) Mbyte/s	1/2“ size			1/3” size		
			Opt. size	fps	Trans. band Mbyte/s	Opt. size	fps	Trans. band Mbyte/s
BU030	125	38	-	-	-	640x480	125	38
BU031	125	38	(640x480)	(125)	(38)	-	-	-
BU080	40	31	-	-	-	(1024x768)	(40)	(31)
BU130	30	37	-	-	-	(1280x960)	(30)	(37)
BU132M	61	80	1192x896	70	65	892x670	93	36

The calculated value in the table is included, so the value is different by product.

Specification comparison

Specification Comparison (vs. CCD monochrome model)

Model		BU030	BU031	BU080	BU130	BU132M
interface		USB3.0 (SuperSpeed)				**USB3.0 (SuperSpeed)**
Protocol		USB3 Vision Ver1.0				**USB3 Vision Ver1.0**
Imager		1/3" CCD ICX424AL	1/2" CCD ICX414AL	1/3" CCD ICX204AL	1/3" CCD ICX445AL	**1/1.8" CMOS EV76C560**
Pixels		0.3M	0.3M	0.8M	1.3M	**1.3M**
Resolution		640(H)x480(V)	640(H)x480(V)	1024(H)x768(V)	1280(H)x960(V)	**1280(H)x1024(V)**
Frame rate		125fps	125fps	40fps	30fps	**61fps**
Pixel size		7.4x7.4µm	9.9x9.9µm	4.65x4.65µm	3.75x3.75µm	**5.3x5.3µm**
Optical filter/Glass		X				**X**
Standard Sensitivity		1700lx, F5.6 (1/125s)	1700lx, F5.6 (1/125s)	1700lx, F5.6 (1/40s)	1250lx, F8 (1/30s)	**500lx, F5.6 (1/62.5s)**
Minimum sensitivity		7lx	7lx	7lx	3lx	**2lx**
Gain	Manual	0～+18dB (digital gain)				**0～+18dB (digital gain)**
	Auto	-				**O (Update by July/2016)**
Black level		-5～+25%				**-25～+25%**
Gamma		0.45～1.0				**0.45～1.0**
LUT		Input: 10[bit] Output: 10[bit				**Input: 10[bit] Output: 10[bit**
Sharpness		-				**O (Update by July/2016)**
Pixel defect correction		Max. 256 pixels				**By Median filter(3x3)**
Test pattern		O				**O**
Image memory (number of images)		-				**O (over 51 images)**
Image re-sending		X (Bulk transfer Retry only)				**X (Bulk transfer Retry only)**

Specification Comparison (vs. CCD monochrome model)

Model			BU030	BU031	BU080	BU130	BU132M
Exposure control	Manual		10µs～16s		30µs～16s		30µs～1s
	Auto		-				O (Update by July/2016)
Trigger shutter	Hardware		Edge, pulse width control (10µs~16s), +/- polarity		Edge, pulse width control (30µs~16s), +/- polarity		Edge control (30µs~1s), +/- polarity
	Software		USB3 Vision command				USB3 Vision command
Bulk trigger			Max. 255 times				Max. 255 times
Sequential shutter			-				Max. 16 entry
Trigger delay			0～2,000,000µs				0～2,000,000µs
Synchronizing method			Bus sync / Internal sync				Internal sync
Image output format			Mono8/10				Mono8/10
Reading mode	All pixels		640(H)x480(V)	640(H)x480(V)	1024(H)x768(V)	1280(H)x960(V)	1280(H)x1024(V)
	Partial	Min. unit size	160(H)x120(V)		256(H)x192(V)	160(H)x120(V)	64(H)x64(V)
		Offset setting unit	2(H)x2(V)				4(H)x2(V)
		Number of window(s)	1				1
		Window overlap	-				-
	Binning		2x2				2x2
	Decimation		-				1/2, 1/4, 1/8 (HV)
Image flip			-				Horizontal, Vertical
User memory	Set memory		15 channels				15 channels
	Optional memory		64 bytes				64 bytes

Specification Comparison (vs. CCD monochrome model)

Model		BU030	BU031	BU080	BU130	BU132M
GPIO	Connector	e-CON (4pin)				**e-CON (4pin)**
	Input(s)	1 system : TRIG(5V)				**2 system : TRIG(5V)** **(* 1 system: dual purpose I/O)**
	Output(s)	2 system : (5V) Arbitrary wave form/ EXPOSURE_ACTIVE/ FRAME_ACTIVE/ FRAME_TRANSFER/ FRAME_TRIGGER_WAIT/ UserOutput/ AcquisitionActive Switching				**2 system : (5V)** **(* 1 system: dual purpose I/O)** **Arbitrary wave form/** **EXPOSURE_ACTIVE/** **FRAME_ACTIVE/** **FRAME_TRANSFER/** **FRAME_TRIGGER_WAIT/** **UserOutput/** **AcquisitionActive** **Switching**
Anti-Chattering		-				**O**
Anti-Glitch		-				**O**
Event notification		U3V_EVENT_TEST/ FrameTrigger/ FrameTriggerError/ FrameTriggerWait/ FrameTransferStart/ FrameTransferEnd/ ExposureStart/ ExposureEnd/ Timer0Start/ Timer0End				**U3V_EVENT_TEST/** **FrameTrigger/** **FrameTriggerError/** **FrameTriggerWait/** **FrameTransferStart/** **FrameTransferEnd/** **ExposureStart/** **ExposureEnd/** **Timer0Start/** **Timer0End**
Chunk		-				**O (Update by July/2016)**
BERT		-				**O**

Specification Comparison (vs. CCD monochrome model)

Model		BU030	BU031	BU080	BU130	BU132M
Power supply		DC+5V±5% (from USB connector)				**DC+5V±5% (from USB connector)**
Power consumption		2.6W max.	2.6W max.	2.6W max.	2.6W max.	**1.7W max.**
Lens mount		C-mount				**C-mount**
Overall dimensions (exclude mount, protrusion)		29(W)x29(H)x13(D)mm				**29(W)x29(H)x16(D)mm**
Weight		27g				**32g**
Operation assurance	Operating temperature	0~40°C (below 50°C on cabinet surface)				**0~40°C (below 50°C on cabinet surface)**
	Storage temperature and humidity	Temperature : -20~60°C Humidity : below 90% (No dew)				**Temperature : -20~60°C Humidity : below 90% (No dew)**

Attention of camera function 1

- **Binning**
  - Binning combines 2(horizontal) x 2(vertical) pixels in a sensor.
  - Binning and scalable cannot be operated at the same time.
- **Decimation (Sub-sampling)**
  - 1/2, 1/4, 1/8 (horizontal and vertical) pixels are decimated in a sensor.
  - Decimation and scalable cannot be operated at the same time.
- **Defect pixel correction**
  - Pixel correction is conducted by median filter in a sensor for optimum performance while it is done by digital processing unit in previous model.
    Therefore, there is no pixel coordinate correction information and corrected pixel addition feature.
- **Frame synchronization**
  - Frame synchronization function (Bus synchronization) cannot be used due to exposure control specifications.
- **External trigger**
  - Pulse width exposure control cannot be used due to exposure control specifications.
- **Random trigger shutter**
  - Overlap exposure cannot be used due to exposure control specification of sensor when random trigger shutter is operated.

Attention of camera function 2

■ Exposure time

- While exposure time setting range of other BU camera is 30μs～16s, 30μs～1s can be set thanks to exposure control specification (register setting in a sensor) in case of this camera.

■ Image output format

- This camera correspond to mono8(bit) and mono10(bit) output. However, it does not correspond to mono12(bit) because image output of sensor is 10bit.

■ Vertical shading

- V shading (uneven brightness in vertical) is occurred in image output. This is not a malfunction of the camera but a specific phenomenon of the sensor.
- V shading occurs about ±7% of image sensor.

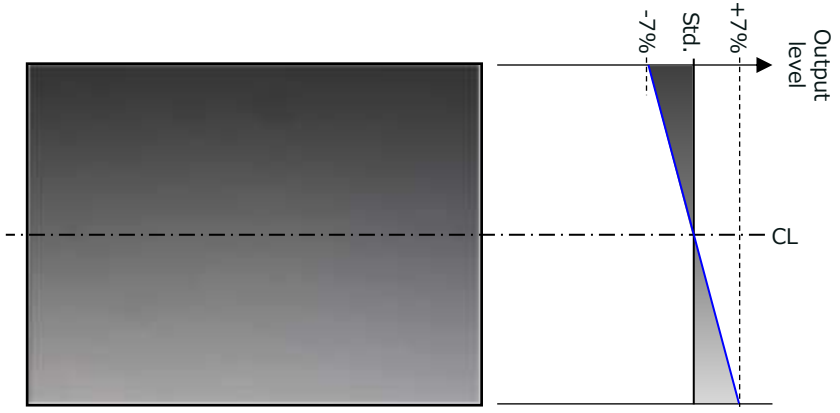


Image of Vertical shading

Advanced Function

Advanced function

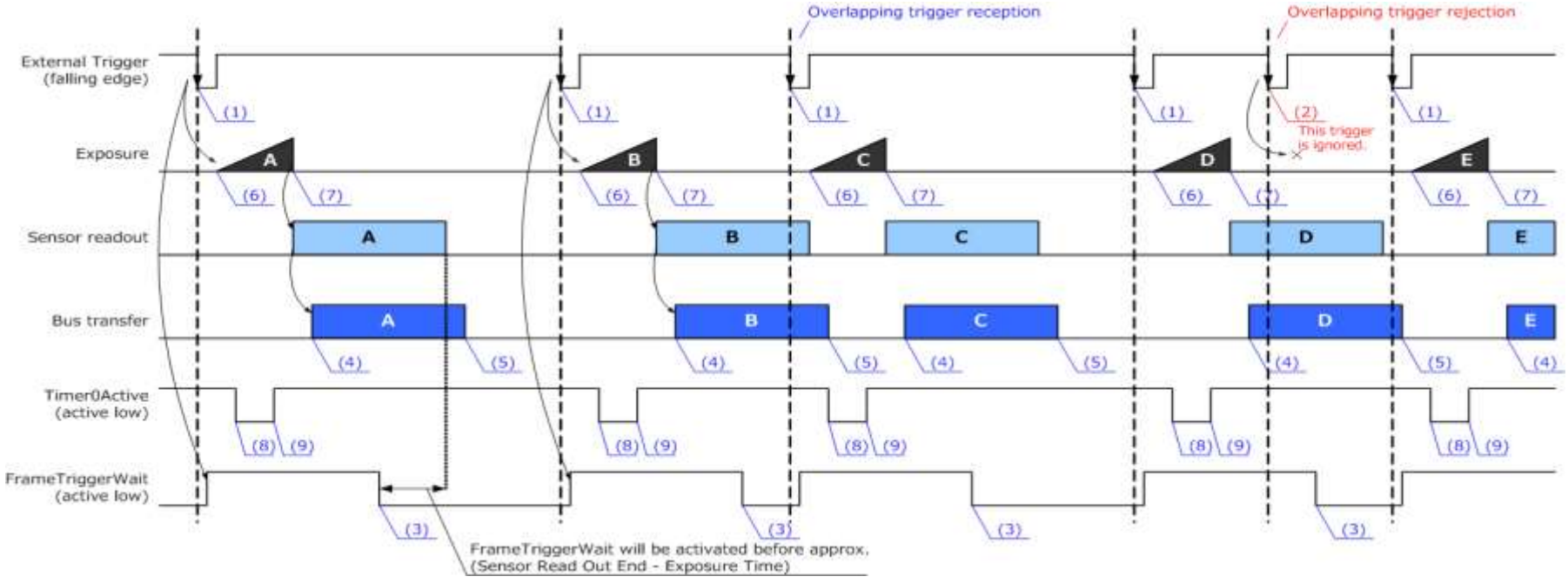
- **Event notice function・・** BU/DU series function
- **Bulk trigger ・・・・・・・・・・** BU/DU series function
- **Sequential shutter ・・・・** CMOS model
- **Image buffer ・・・・・・・・・** CMOS model
- **Defect pixel correction・** CMOS model
- **BERT function ・・・・・・・・** CMOS model

Advanced function (1)

■ Event notification function :

- Camera status can be referred through USB3 by using event packet of USB3 Vision

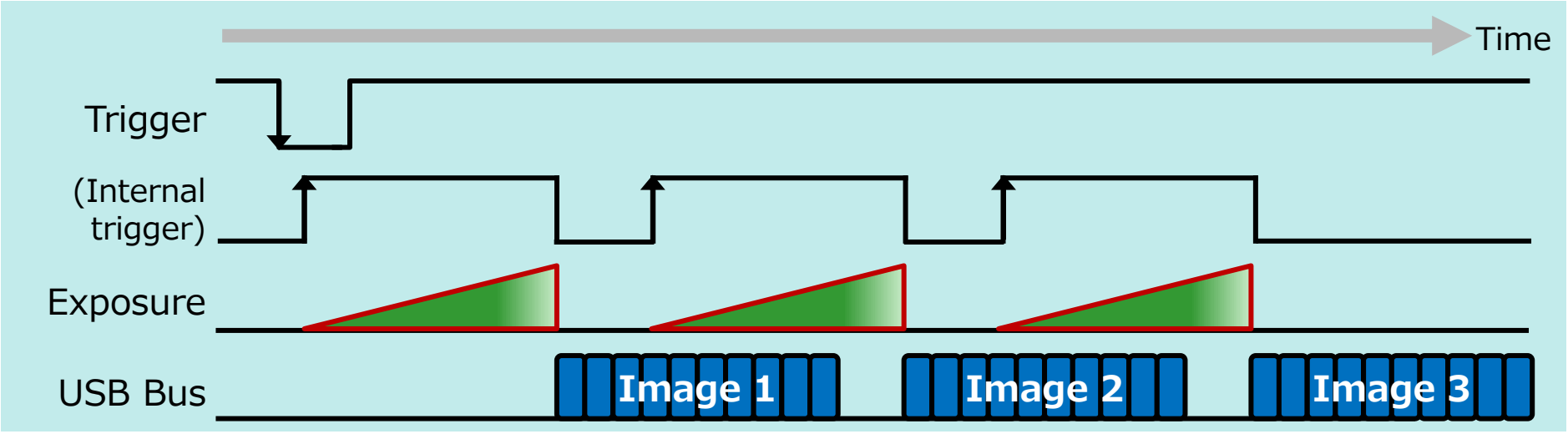
(1) Frame Trigger : Reception of Frame Start Trigger
(2) Frame Trigger Error : Rejection of Frame Start Trigger
(3) Frame Trigger Wait : Start of waiting for Frame Start Trigger
(4) Frame Transfer Start : Start of transferring Streaming data
(5) Frame Transfer End : End of Transferring Streaming data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

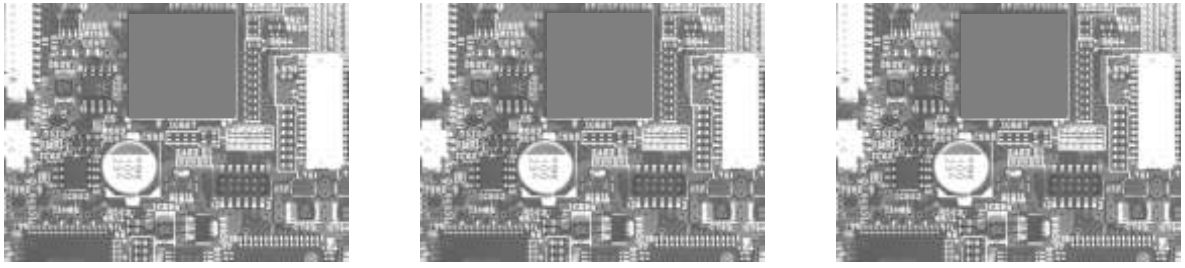


Advanced function (2)

■ Bulk trigger (Trigger burst) 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)

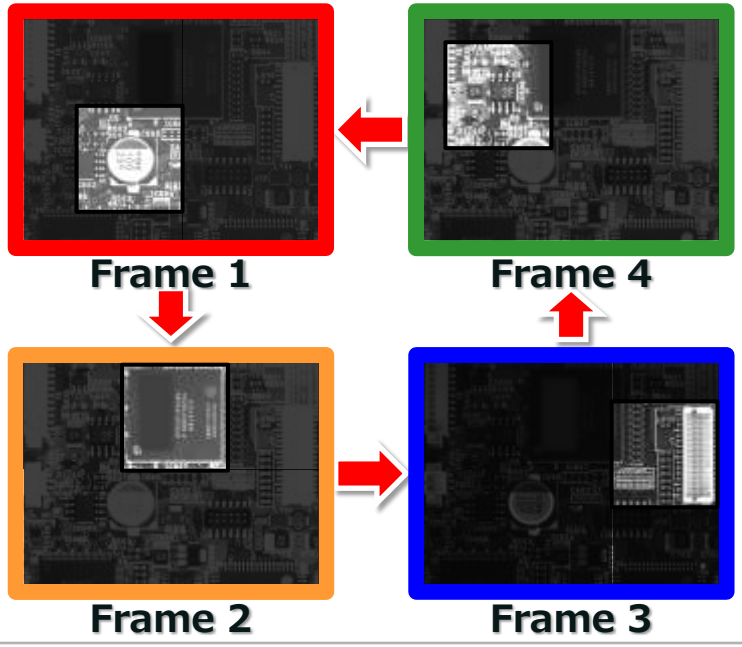
■ Sequential shutter mode

- Together with trigger mode, sequential shutter function of BU (CMOS) series can switch programed 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 ・Gain : 0dB ・Exposure : 2ms ・ROI Position :
Memory Bank2	
Memory Bank3	
Memory Bank4	
Memory Bank5	SEQ : Frame 3 ・Gain : 0dB ・Exposure : 1ms ・ROI Position :
Memory Bank6	
Memory Bank7	
Memory Bank8	
Memory Bank9	SEQ : Frame 2 ・Gain : +6dB ・Exposure : 2ms ・ROI Position :
Memory Bank10	
Memory Bank11	
Memory Bank12	
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 every time

Sequential Shutter Setting : 4 shots

Trigger
(3 times)

Image data output
(3 frames)

First Shot

Gain: 0.5dB
Exp: 0.7msec

Second Shot

Gain: 3dB
Exp: 0.7msec

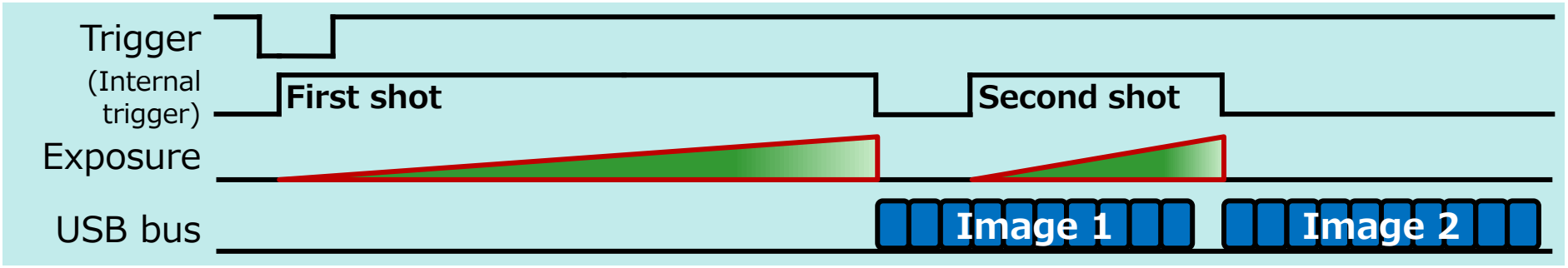
Third Shot

Gain: 8dB
Exp: 0.3msec

Advanced function (4)

■ Sequential shutter with Bulk trigger mode

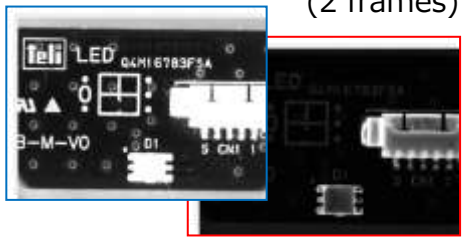
<Ex.3> Output multiple images of different shutter speed by one shot trigger



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

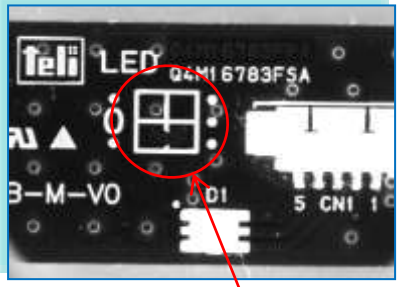
Trigger (1 time)

Image data output (2 frames)



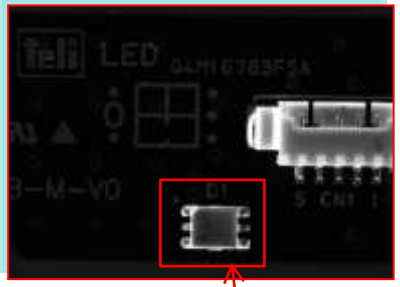
Inspection on multi items by one time trigger input !

First shot



Exposure time : 20msec

Second shot



Exposure time : 2msec

Silk inspection

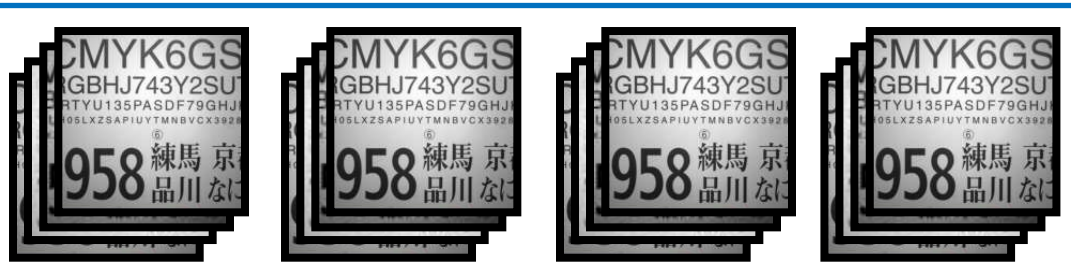
Appearance inspection of scratch or dent

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

Advanced function (5)

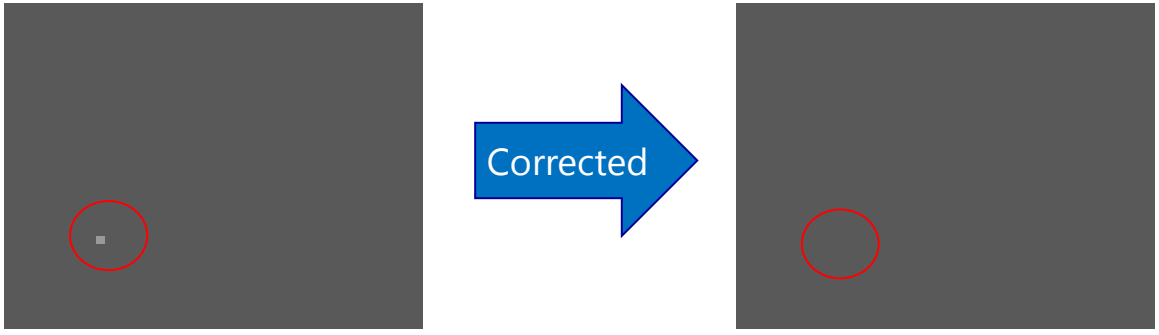
■ Image buffer

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



■ Defect pixel correction

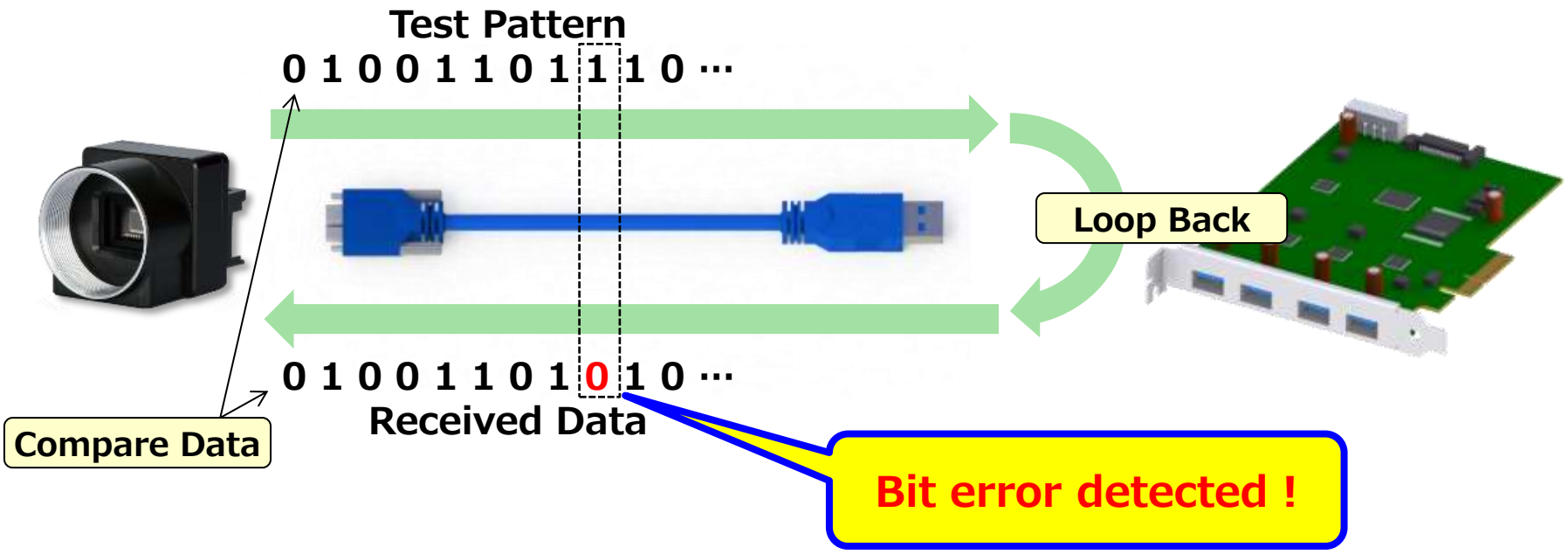
- Defect pixel correction function of BU132M is using the median filter of sensor built-in function.
- This function can be switched on and off depend on occasion.



Advanced function (6)

■ BERT (Bit Error Rate Test) = CMOS model

- "BERT Function" can easily check a signal quality including cable. With "BERT Function", signal quality can be checked under user's circumstances at starting up or change system.



Camera function list (all USB3.0 camera)

Color type		B/W	Color	B/W	B/W	B/W	Color	B/W	B/W	B/W	Color	B/W	Color	B/W	Color	B/W	Color	Color	B/W	Color
Resolution		0.3M	0.3M	0.3M	0.8M	1.3M	1.3M	**1.3M**	2.0M	2.3M	2.3M	3.0M	3.0M	4.0M	4.0M	5.0M	5.0M	12M	6.5M	6.5M
Imager		CCD	CCD	CCD	CCD	CCD	CCD	**CMOS**	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS	CMOS
TELI IP Core Version		V1	V1	V1	V1	V1	V1	**V4**	V2	V2	V2	V4	V4	V2	V2	V4	V4	V2	V3	V3
Category	**Function**	**BU030**	**BU030C BU030CF**	**BU031**	**BU080**	**BU130**	**BU130C BU130CF**	**BU132M**	**BU205M**	**BU238M**	**BU238MC BU238MCF**	**BU302MG**	**BU302MCG BU302MCF**	**BU406M**	**BU406MC BU406MCF**	**BU505MG**	**BU505MCG BU505MCF**	**BU1203MC BU1203MCF**	**DU657M**	**DU657MC**
USB3Vision	Bootstrap Registers	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
DeviceControl	DeviceControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
ImageFormatControl	ImageFormatSelector	O	-	O	O	O	-	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	Scalable	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	Binning	O	-	O	O	O	-	**O**	-	-	-	O	-	-	-	O	-	-	O	O
	Decimation	-	-	-	-	-	-	**O**	O	-	-	O	O	O	O	O	O	-	-	-
	Reverse	-	-	-	-	-	-	**O**	O	O	O	O	O	O	-	O	O	O	O	O
	PixelFormat	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	TestPattern	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
AcquisitionControl	AcquisitionControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	ImageBuffer	-	-	-	-	-	-	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	TriggerControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	ExposureControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
DigitalIOControl	DigitalIOControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
CounterAndTimerControl	TimerControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
AnalogControl	Gain	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	BlackLevel	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	Gamma	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	BalanceRatio	-	O	-	-	-	O	**-**	-	-	O	-	O	-	O	-	O	O	-	O
	BalanceWhiteAuto	-	O	-	-	-	O	**-**	-	-	O	-	O	-	O	-	O	O	-	O
	ColorCorrectionMatrix	-	O	-	-	-	O	**-**	-	-	-	-	-	-	-	-	-	-	-	-
LUTControl	LUTControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
UserSetControl	UserSetControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
EventControl	EventControl	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	FrameSynchronization	O	O	O	O	O	O	**-**	O	O	O	O	O	O	O	O	O	-	O	O
VenderUniqueControl	LEDIndicatorLuminance	O	O	O	O	O	O	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	AntiGlitch	O	-	O	O	O	-	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	AntiChattering	O	-	O	O	O	-	**O**	O	O	O	O	O	O	O	O	O	O	O	O
DPCControl	DPCControl	-	-	-	-	-	-	**O**	O	O	O	O	O	O	O	O	O	O	O	O
	SequentialShutterControl	-	-	-	-	-	-	**O**	O	O	O	O	O	O	O	O	O	-	O	O

Documents

Reference Documents

- **Product specifications**

  BU132M

- **Operation manual**

  BU132M

- **These documents are available in our HP to download;**

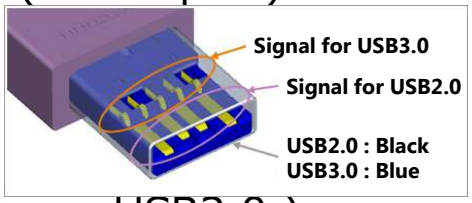
  http://www.toshiba-teli.co.jp/en/products/industrial/

[Appendix]
Introduction of USB3.0/USB3 Vision

About USB3.0/USB3 Vision

Outline of USB3.0 interface

- **Bit rate : 5Gbps max. (SuperSpeed)**
  - Can transfer Uncompressed HDTV (1920x1080) image in 60fps
- **Comm. Mode : Full duplex**
  - Improved in communication efficiency against USB2.0 (half duplex)
- **Bus power : 900mA max.**
  - Up to 4.5W with 5V supply
- **Lower compatibility**
  - USB3.0 device can be connected to USB2.0 port (works as USB2.0)
  - USB2.0 device can be connected to USB3.0 port



What's USB3 Vision?

- **Machine vision standard**
  - IEEE1394 by IIDC, Gig-E by GigE Vision
- **High band width of 5Gbps** (440MByte/s)
- **Easy connection with Plug & Play**
- **Standardized software interface with GenICam™**
- **Much improved robust than USB2.0**

High band width transfer

HIGH Bandwidth

- Full use of high speed image sensor's feature … USB3.0
- High band width transfer by burst … USB3.0

Sensor : Sony IMX174
Resolution : 1920 x 1200 (2.3MP)

Gig-E Vision Camera	USB3 Vision Camera
Max. frame rate: 50fps	Max. frame rate: 165fps
Data rate: 115MB/s	Data rate: 380MB/s

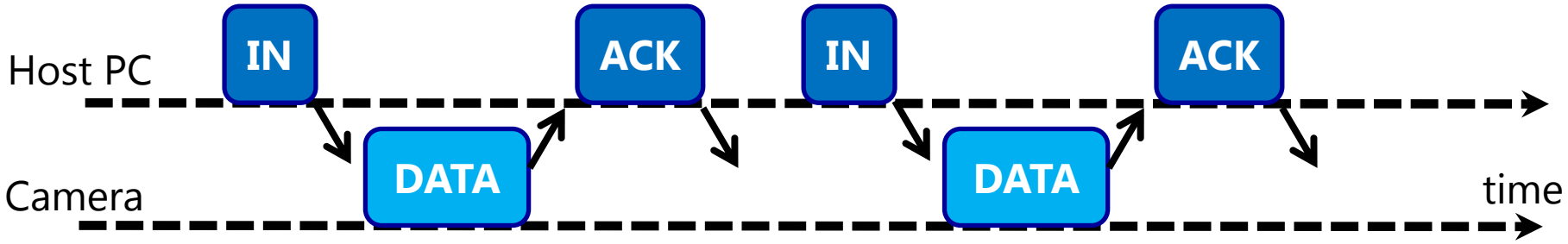
Sensor : CMOSIS CMV4000
Resolution : 2048 x 2048 (4.2MP)

Gig-E Vision Camera	USB3 Vision Camera
Max. frame rate: 25fps	Max. frame rate: 90fps
Data rate: 105MB/s	Data rate: 377MB/s

Burst transfer compliancy

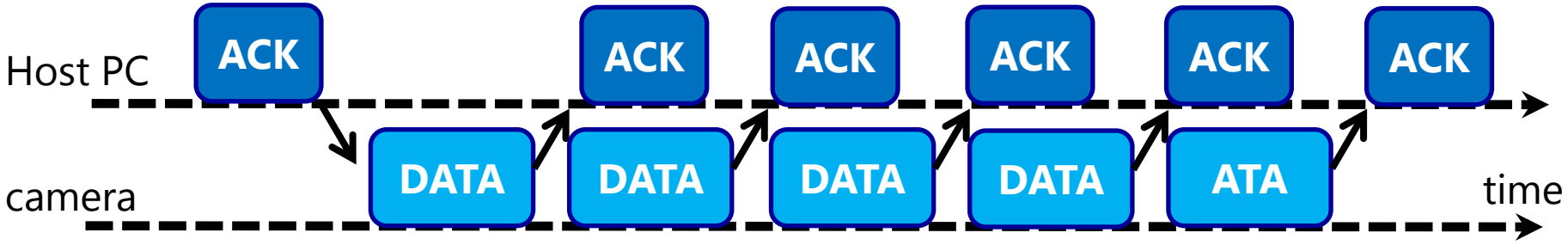
■USB2.0 : non compliancy to burst transfer

USB2.0 packet sequence cannot use bus band efficiently



■USB3.0 : compliancy to burst transfer

bus band can be used efficiently with burst transfer of USB3.0



System cost comparison

LOW COST

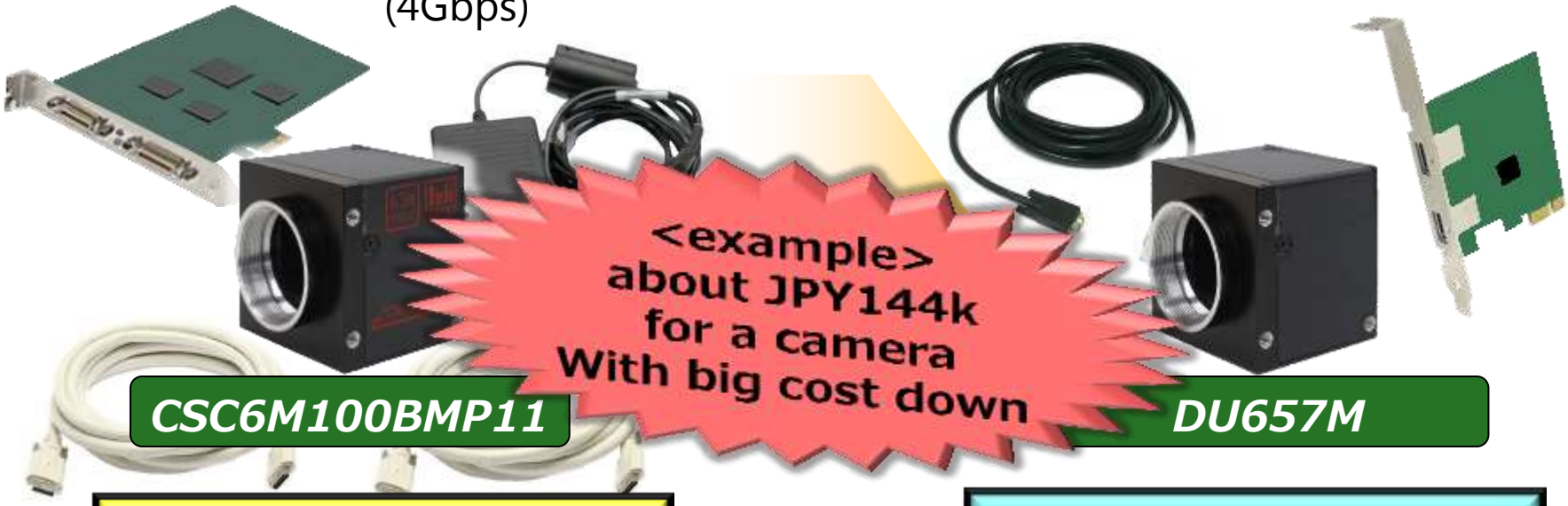
- Low cost accessories …USB3.0
- No power supply is needed …USB3.0

	USB3.0	Gig-E	1394.b	Camera Link
Frame grabber	Low	Low	Mid.	High
Cable	Low	Low	Mid.	High
Power supply	Bus	External/ PoE	Bus	External/ PoCL
Camera	Low	Mid.	Mid.	Low
System cost of 4 cameras	**Low**	**Mid.**	**Mid.**	**High**

Applicable range of USB3.0

CameraLink
Medium Configuration
(4Gbps)

USB3.0
(4Gbps)



A camera (CL-FullConfig)
About JPY420k

camera (6.5M)	: JPY280k
board	: JPY100k
cable	: JPY30k
(power)	: JPY10k

A camera (USB3 Vision)
About JPY276k

camera (6.5M)	: JPY260k
board	: JPY8k
cable	: JPY8k

Big cost down by replacing Camera Link system with USB3.0 system!

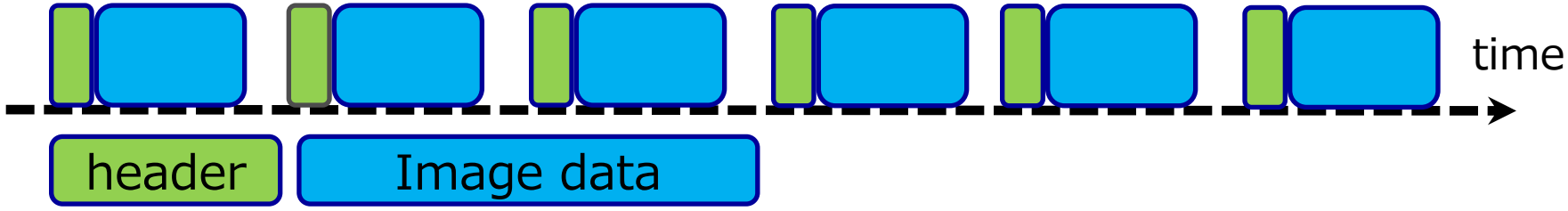
High reliability

HIGH Reliability

- Reliable data transfer is ensured ···USB3.0
- Packet format, Appropriate for DMA transfer ···USB3 Vision

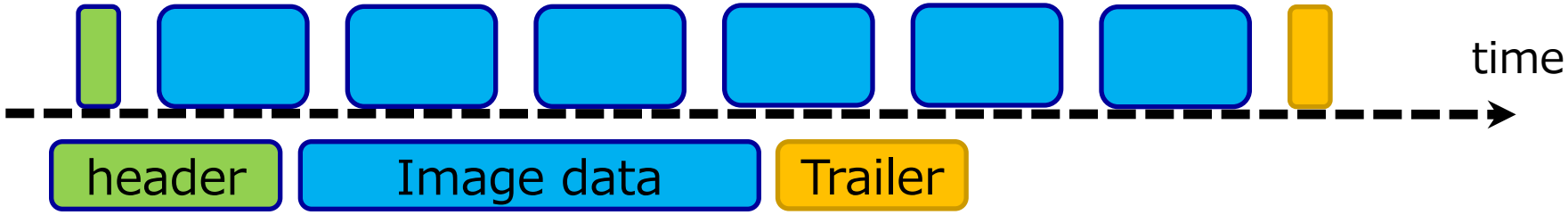
■UVC (USB Video Class) packet format

- CPU analyzes header, and separate it from image data.
- **Over head is bigger, CPU process and communication becomes unstable.**



■USB3 Vision packet format

- CPU processing and communication is stable because of less CPU load as image data is deployed on memory at one time by DMA transfer.

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