TOSHIBA

Leading Innovation

CMOS Camera
BU406M Series
BU205M

User's Guide

Rev.4.0

Aug. 1st 2018

Doc. No. 4000-0195

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
BU040M	**New**	**BU040MC/MCF**	under development	IMX287	1/2.9 inch	720(H) x 540(V)	436fps
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	Available	**BU132MC/MCF**	In plan	EV76C560	1/1.8 inch	1,280(H) x 1,024(V)	60fps
BU160M	**New**	**BU160MC/MCF**	under development	IMX273	1/2.9 inch	1,440(H) x 1,080(V)	226fps
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	Available	**BU302MCG/MCF**	Available	IMX252	1/1.8 inch	2,048(H) x 1,536(V)	120fps
BU406M/MN	Available/ **New**	**BU406MC/MCF**	Available	CMV4000	1 inch	2,048(H) x 2,048(V)	90fps
BU505MG	Available	**BU505MCG/MCF**	Available	IMX250	2/3 inch	2,448(H) x 2,048(V)	75fps
BU1207MG	**New**	**BU1207MCG/MCF**	**New**	IMX253	1.1 inch	4,000(H) x 3,000(V)	31fps
DU657M	Available	**DU657MC**	Available	Own CMOS	1.1 inch	2,560(H) x 2,560(V)	55fps
DU806MG	In plan	**DU806MCG/MCF**	In plan	IMX255	1.0 inch	4,096(H) x 2,160(V)	40fps
DU1207MG	**New**	**DU1207MCG/MCF**	**New**	IMX253	1.1 inch	4,000(H) x 3,000(V)	32fps
DDU1207MG	**New**	**DDU1207MCG/MCF**	under development	IMX253	1.1 inch	4,000(H) x 3,000(V)	60fps
BU602M	**New**	**BU602MC/MCF**	**New**	IMX178	1/1.8 inch	3,072(H) x 2,048(V)	60fps
		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 series : 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 xxx(M)N: Improved NIR sensitivity

August 2018

Ordering information for B/D series camera

Interface

U : USB3.0
DU : Dual USB3.0
G : Gigabit Ethernet
C : Camera Link
X : CoaXPress

Image Sensor Type

None : CCD Sensor
M : CMOS Sensor

Low fps Output

None : Normal model
L : Low fps model

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

Revision

None : First release
B : Rev. B

Model Signature

B : B (Standard) series
D : D (Deluxe) series
I : I (for ITS) series
None : Board type

Total Pixel Numbers

03 :	0.3 Mp	40 :	4 Mp
04 :	0.4 Mp	50 :	5 Mp
08 :	0.8 Mp	60 :	6 Mp
13 :	1.3 Mp	65 :	6.5 Mp
16 :	1.6 Mp	80 :	8.8 Mp
20 :	2 Mp	120 :	12 Mp
23 :	2.3 Mp	200 :	20 Mp
30 :	3.1 Mp		

Sensor Spectral Sensitivity

None : Normal
N : NIR

Color Type

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

Lens Mount

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

Image Size

0.3 Mp Type
0 : 1/3 type
1 : 1/2 type
0.4 Mp Type
0 : 1/2.9 type
0.8 Mp Type
0 : 1/3 type
1.3 Mp Type
0 : 1/3 type
2 : 1/1.8 type
1.6 Mp Type
0 : 1/2.9 type
2 Mp Type
2 : 1/1.8 type
5 : 2/3 type
2.3 Mp Type
8 : 1/1.2 type
3.1 Mp Type
2 : 1/1.8 type
4 Mp Type
6 : 1.0 type
5 Mp Type
5 : 2/3 type
6 Mp Type
2 : 1/1.8 type
6.5 Mp Type
7 : 1.1 type
8.8 Mp Type
6 : 1.0 type
12 Mp Type
3 : 1/1.7 type
7 : 1.1 type
20 Mp Type
6 : 1.0 type

Rev.1.30

Ordering information

Model	Specification				
	B/W / Color	Pixels	Image sensor	Opt. filter / Glass	Lens mount
BU205M	B/W	2Mp	CMV2000-3E5M	w/o	C-mount
BU406M	B/W	4.2Mp	CMV4000-3E5M	w/o	C-mount
BU406MN	B/W	4.2Mp	CMV4000-3E12M (Higher sensitivity to NIR)	w/o	C-mount
BU406MC	Color	4.2Mp	CMV4000-3E5C	w/o	C-mount
BU406MCF	Color	4.2Mp	CMV4000-3E5C	IR cut filter	C-mount

Advantage of BU406M/BU205M

Advanced features of BU406M / BU205M

■ With TELI's original IP "TELI Core Technology"

- Innovative technology by original development achieves high integration and super high speed response.

■ High speed

- High speed feature of 4Mp / 90fps, 2Mp / 170fps

Higher speed by scalable, binning and decimation feature

■ High sensitivity

- Equivalent to CCD

Equivalent to our 6.5Mp camera / 1.5 times of 2Mp-CCD

■ Image quality

- Remarkably less scratches comparing with conventional CMOS sensor

Just a few scratches without pixel defect compensation

Advanced features of BU406M / BU205M

■ Spectral characteristics

- **As these cameras, even they are ordinary products, have high sensitivity to near infra-red beam, they are expected to be applied in the field other than FA purpose.**

Comparing with conventional sensors, this has wide sensitivity in the peak around 600 nm.

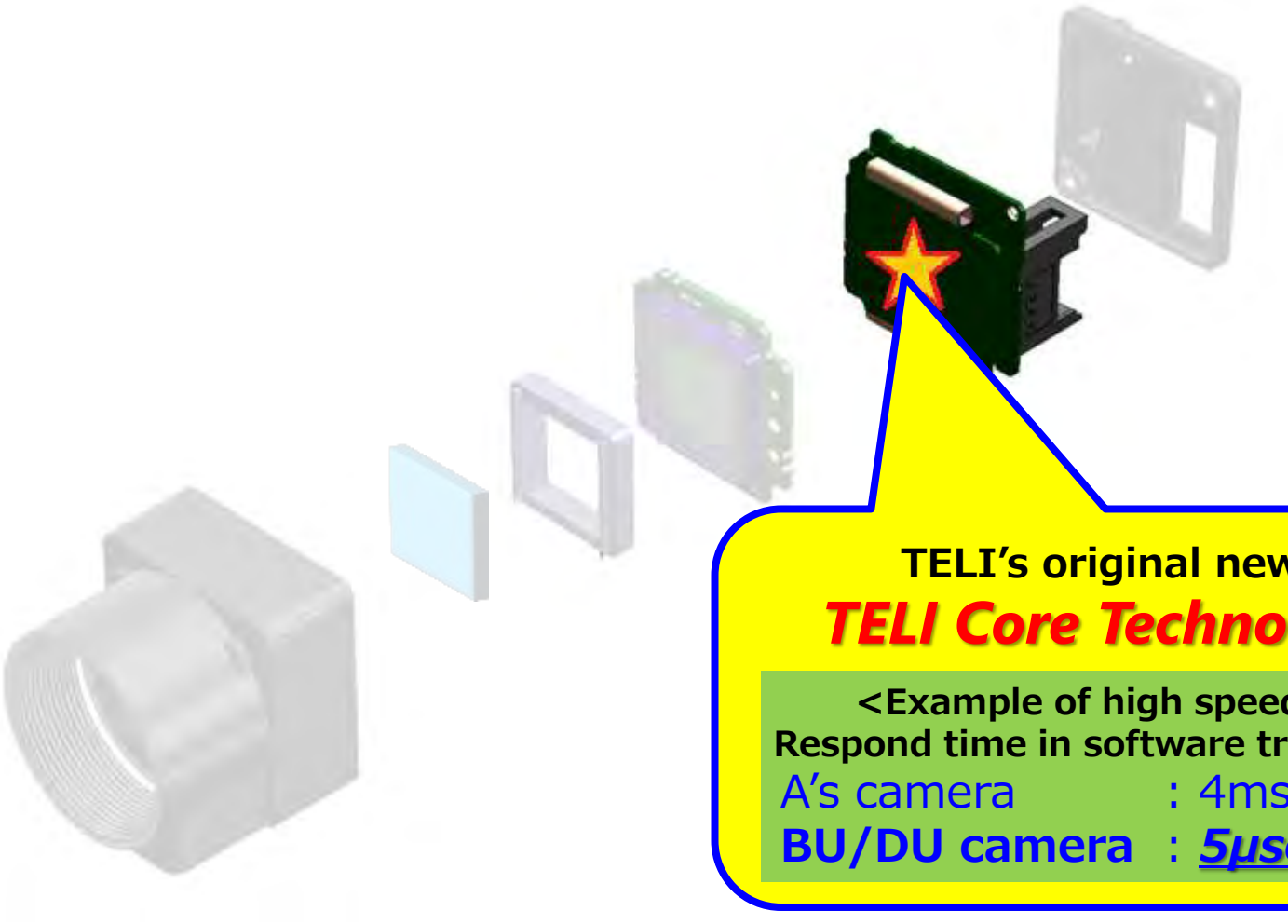
- **BU406MN has higher sensitivity to near infra-red beam among them and it is expected to replace the infra-red cameras.**

■ Advanced features

- **Sequential shutter, bulk trigger, scalable, event notice, features by image buffer and more**

Advanced features of BU406M / BU205M

■ With TELI's original IP "TELI Core Technology"



TELI's original new IP core

TELI Core Technology **in it !**

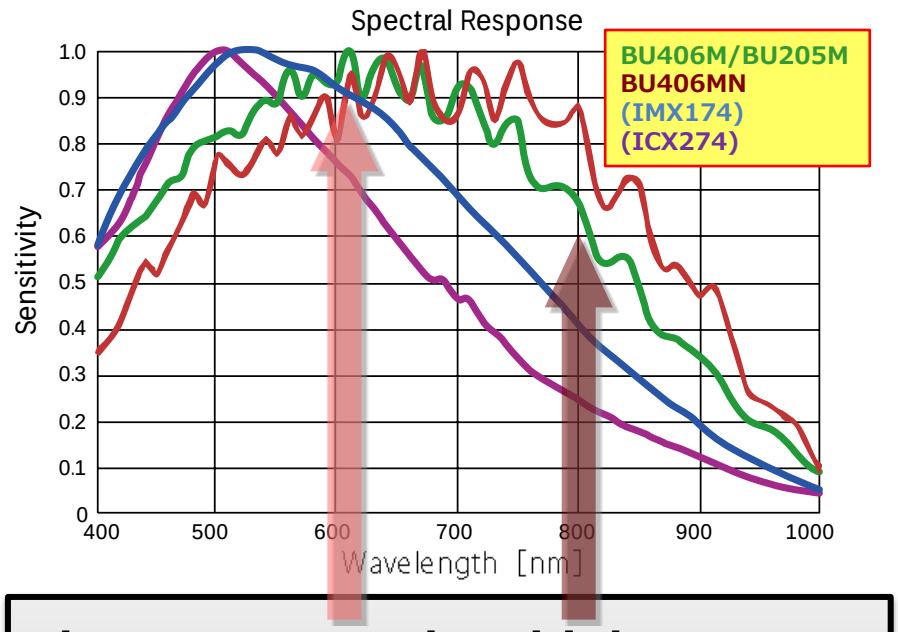
<Example of high speed response>
Respond time in software trigger processing

A's camera : 4msec

BU/DU camera : *5µsec* (average)

Spectral sensitivity characteristic (relative sensitivity)

BU406M/BU205M

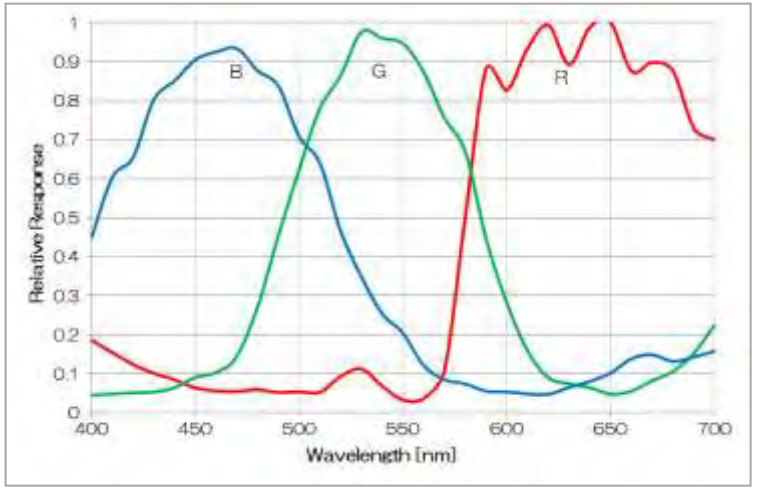


These cameras has higher NIR sensitivity than the camera with 2M-CCD (ICX274) or IMX174.

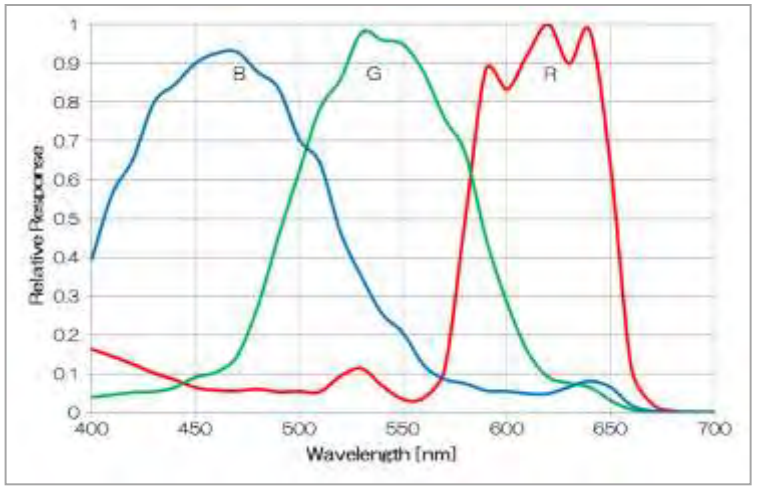
BU406MN has even higher sensitivity.

The peak is around 600~660nm in visible light range.

BU406MC



BU406MCF

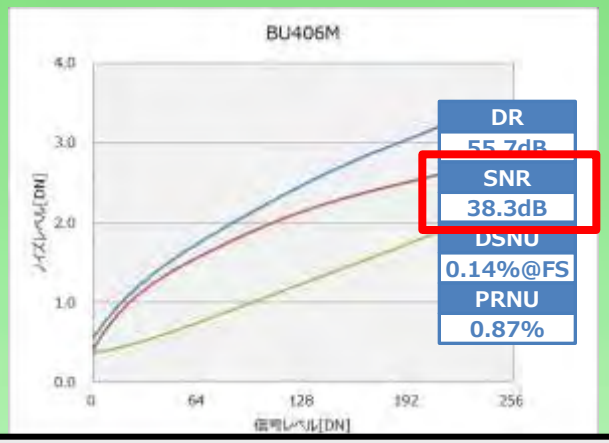


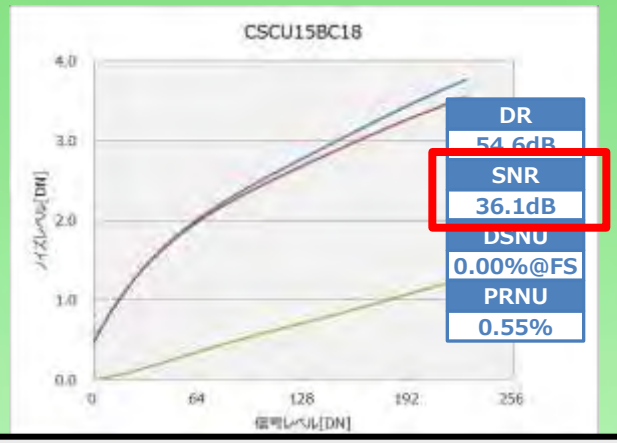
Comparison with 2Mp-CCD in sensitivity and noise

CMV4000

ICX274

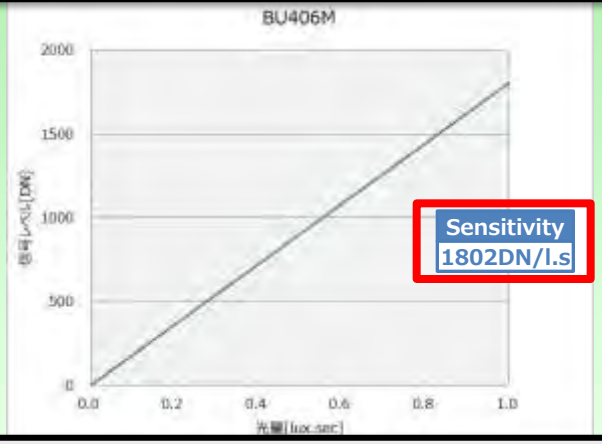
Noise

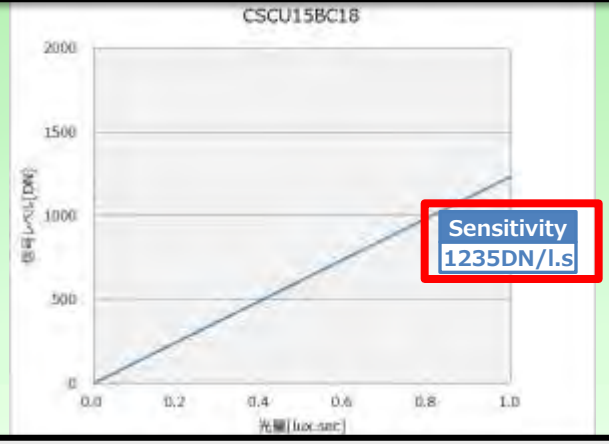




Low noise as a little over SNR2dB against 2Mp-CCD

Sensitivity





About 1.5 times sensitivity comparing with 2Mp-CCD

Specification summary

Model	BU205M	BU406M	BU406MN	BU406MCF
Image sensor	2/3 type GS-CMOS CMV2000-3E5M	1. 1 type GS-CMOS CMV4000-3E5M	1. 1 type GS-CMOS CMV4000-3E12M	1.1 type GS-CMOS CMV4000-3E5C
Resolution (max)	2048x1088	2048x2048	=>	=>
Frame rate	170 fps	90 fps	=>	=>
Output format	Mono 8 / 10	=>	=>	Bayer 8 / 10
GPIO	Input:1ch(trig), Output:1ch, Bidir:1ch	=>	=>	=>
Lens mount	C mount	=>	=>	=>
Image Buffer (64MB)	30	16	=>	=>
Features (common)	Scalable, Binning, Decimation, Reverse (Flip, Mirror), Event Notification, Test Pattern, Sequential Shutter, Bulk Trigger, Gamma, LUT, etc.			
Image adjustment features	Black level, Gain (Manual), Exposure Time (Manual), WB (OPWB, Manual)			

Sensor comparison

Model	CMV4000	ICX625	CMV2000	ICX274
Vendor	CMOSIS	SONY	CMOSIS	SONY
Type	CMOS	CCD	CMOS	CCD
Pixel Number	2,048(H)×2,048(V)	2,456(H)×2,058(V)	2,048(H)×1,088(V)	1,600(H)×1,200(V)
	4M	5M	2M	UXGA/2M
Pixel Size	5.5um(H)×5.5um(V) 	3.45um(H)×3.45um(V) 	5.5um(H)×5.5um(V) 	4.4um(H)×4.4um(V) 
Image Size	11.26mm(H)×11.26mm(V) Diagonal : 15.93mm 	8.47mm(H)×7.1mm(V) Diagonal : 11.016mm 	11.26mm(H)×5.98mm(V) Diagonal : 12.75mm 	7.04mm(H)×5.28mm(V) Diagonal : 8.80mm 
Optical Format	1.1 type	2/3 type	2/3 type	1/1.8 type
Aspect Ratio	1:1	6:5	2:1	4:3
Frame Rate	180 fps	15 fps	340 fps	15 fps
Camera	**BU406M/MN/MC**	**CSCQS15BC23**	**BU205M**	**BG202**

Spec. revision

Spec. revision

RENEW

FG-SG connection

- **Connection between frame ground (FG : cabinet) and signal ground (SG : circuit ground) is changed.**

FG-SG connection

BU406M (old)	BU406M (new) / BU406MN
Separated	**Connected**

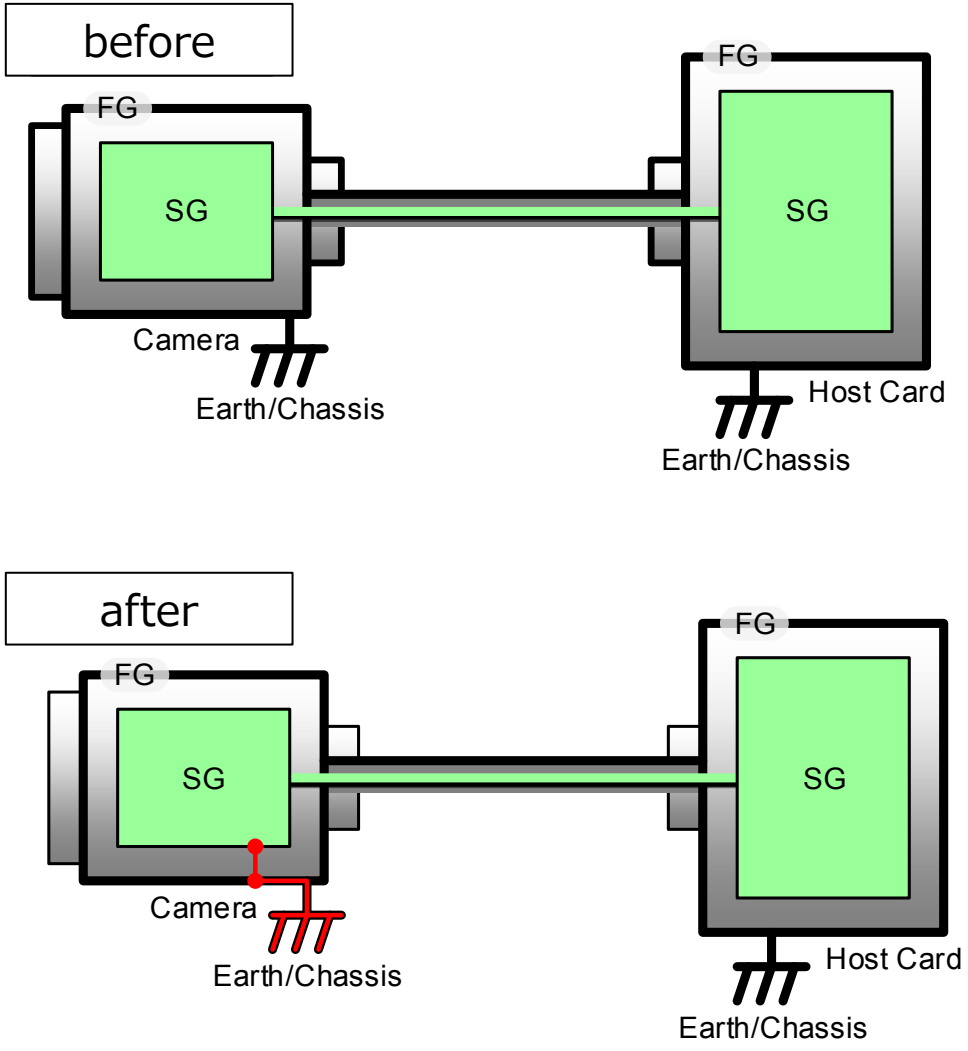
Improvements

- **USB connectivity will be improved by reducing communication error under static electricity noise.**
- **Durability of camera under static electricity noise will be improved, and this helps stable USB connection.**

Spec. revision

RENEW

About FG-SG connection (detail chart)



Spec. revision

Model name of products remain unchanged

- Product code will be changed for our internal management.
  Product code is described on name plate on the camera.

Model	Old	=>	New
BU205M	BJ0038A3 ROHS	=>	BJ0524A4 ROHS
BU406M	BJ0037A0 ROHS	=>	BJ0525A7 ROHS
BU406MN	-----	=>	BJ0614A3 ROHS
BU406MC	BJ0101A7 ROHS	=>	BJ0526A0 ROHS
BU406MCF	BJ0102A0 ROHS	=>	BJ0527A3 ROHS

Revision schedule

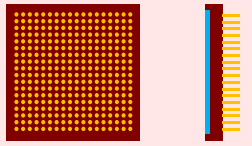
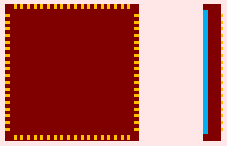
- BU205M・・・・・・・・・・・・・・・・・・・・・・・・・ Dec. 2017
- BU406M, BU406MC, U406MCF・・・・ Dec. 2017
- BU406MN ・・・・・・・・・・・・ Applied from the first unit

Major revision on BU406M

RENEW

Sensor

* BU406MN: µPGA package

BU406M (old)	BU406M (new)
CMV4000 µPGA Package	**CMV4000 LCC Package**
	

Auto gain

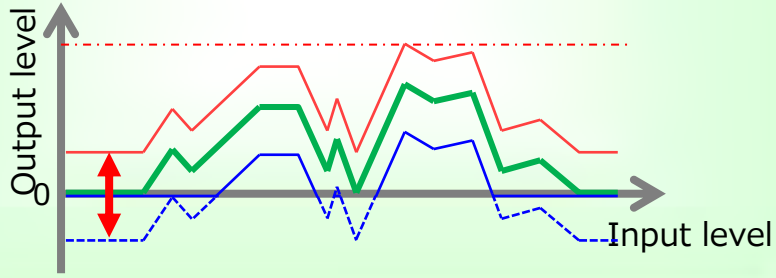
BU406M (old)	BU406M (new)
nil	**0 ~ 18 dB**

Auto exposure

BU406M (old)	BU406M (new)
nil	**30µs ~ 16s**

Black level calibration

Func.	BU406M (old)	BU406M (new)
Manual	-25 ~ +25%	**-25 ~ +25%**
Auto	no	**yes**



Binning

BU406M (old)	BU406M (new)
nil	**x2, x4, x8 (H/V independent)**

BU406M (old)	BU406M (new)
no	**yes**

* BU406MN will have the same specifications as BU406M (new) unless otherwise instructed.

Major addtion & revision on BU406

RENEW

Sharpness

BU406M (old)	BU406M (new)
nil	**0 (off) ~ 7 (max)**

Pixel format

BU406M (old)	BU406M (new)
8 bit	**8 / 10 bit**

Chunk

BU406M (old)	BU406M (new)
nil	**ExposureTime, Gain, LineStatus, UserArea, BlockID**

GPIO

Func.	BU406M (old)	BU406M (new)
Input	5V CMOS 1ch (Ext.trigger)	**5V CMOS 1ch (Ext. trigger)**
Output	5V CMOS 2ch	**5V CMOS 1ch**
Bidir.	nil	**5V CMOS 1ch**

* BU406MN will have the same specifications as BU406M (new) unless otherwise instructed.

Advanced Function

Advanced function

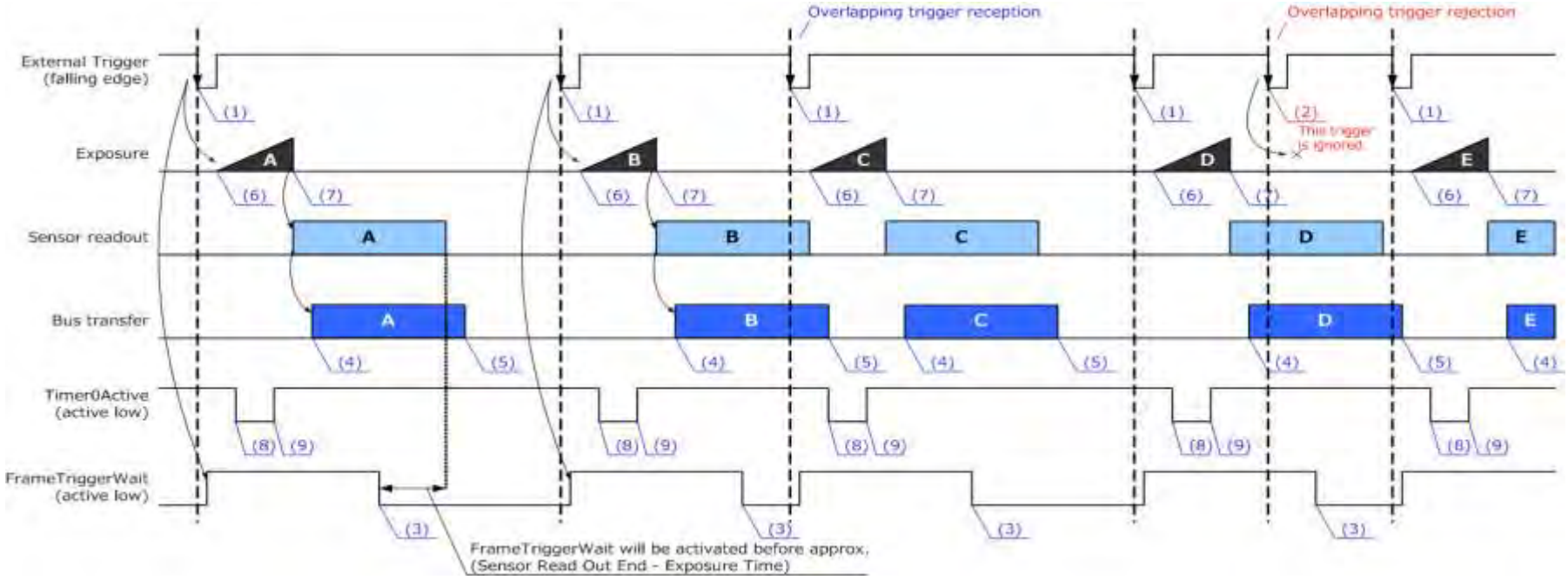
- **Event notice function** ･ **BU/DU series function**
- **Bulk trigger** ･････････ **BU/DU series function**
- **Sequential shutter** ･･･ **CMOS model**
- **Image buffer** ････････ **CMOS model**
- **Pixel defect correction** **CMOS model**
- **Bus synchronization** ･･ **CCD/CMOS-GS model**
- **BERT function** ･･･････ **CMOS model**

Advanced function (1)

■ Event notification function :

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

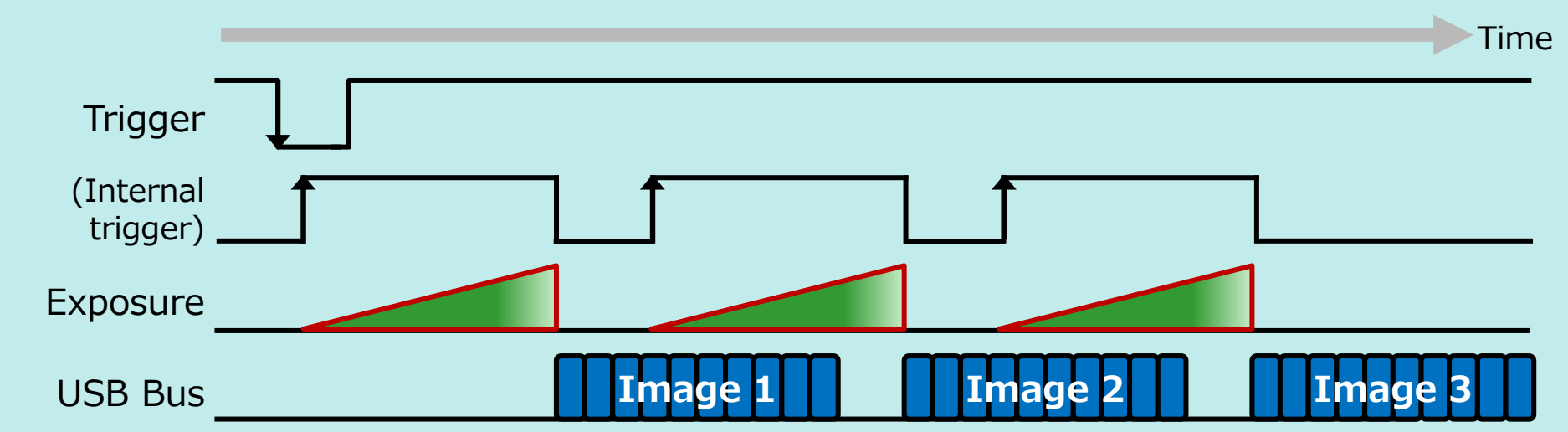
(1) Frame Trigger	: Reception of Frame Start Trigger
(2) Frame Trigger Error	: Rejection of Frame Start Trigger
(3) Frame Trigger Wait	: Start of waiting for Frame Start Trigger
(4) Frame Transfer Start	: Start of transferring Streaming data
(5) Frame Transfer End	: End of Transferring Streaming data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

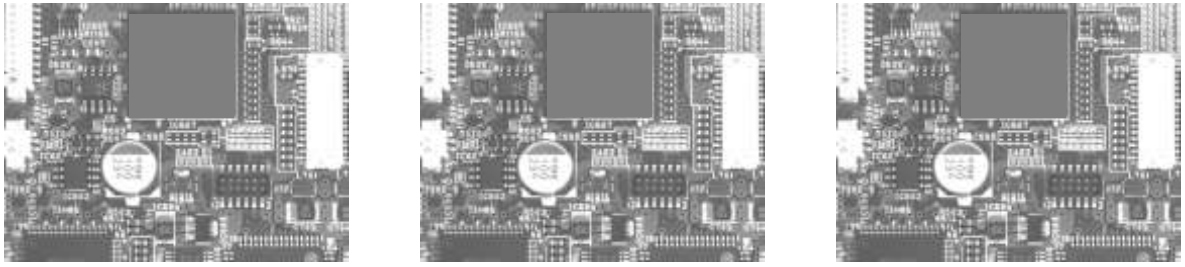


Advanced function (2)

■ Bulk trigger 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)

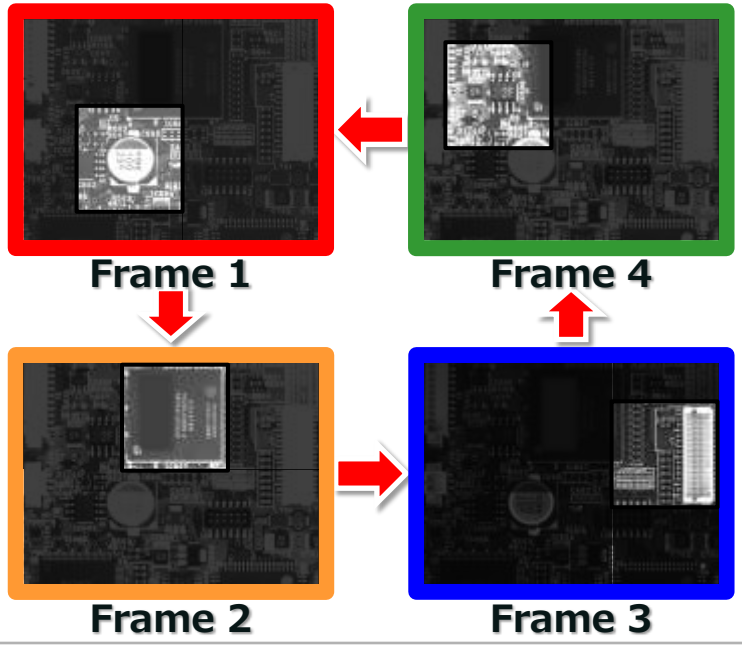
■ Sequential shutter mode

- 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 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

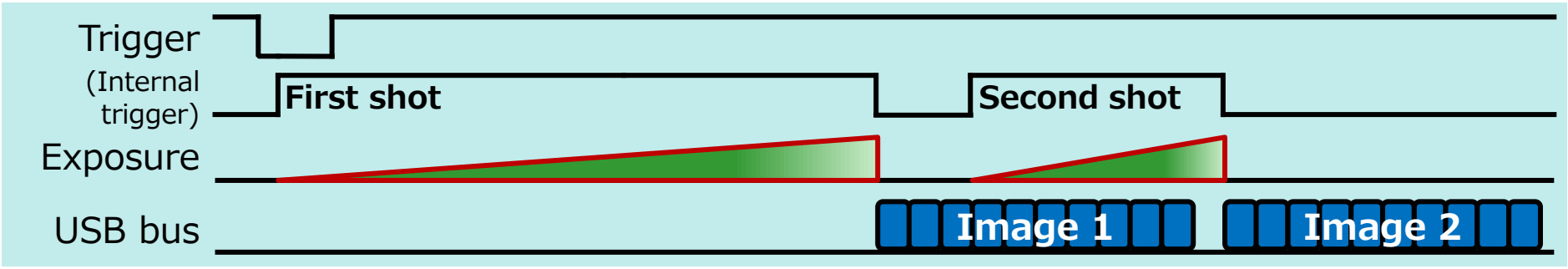
Third Shot

Gain: 8dB
Exp: 0.3msec

Advanced function (4)

■ Sequential shutter with Bulk trigger mode

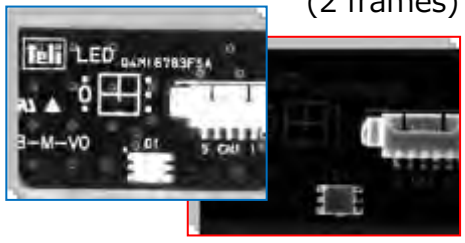
<Ex.3> Output multiple images of different shutter speed by one shot trigger



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

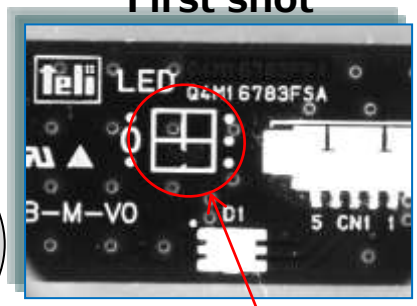
Trigger (1 time)

Image data output (2 frames)



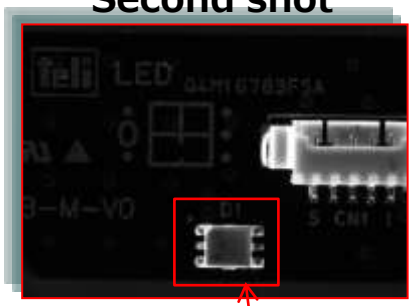
Inspection on multi items by one time trigger input !

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

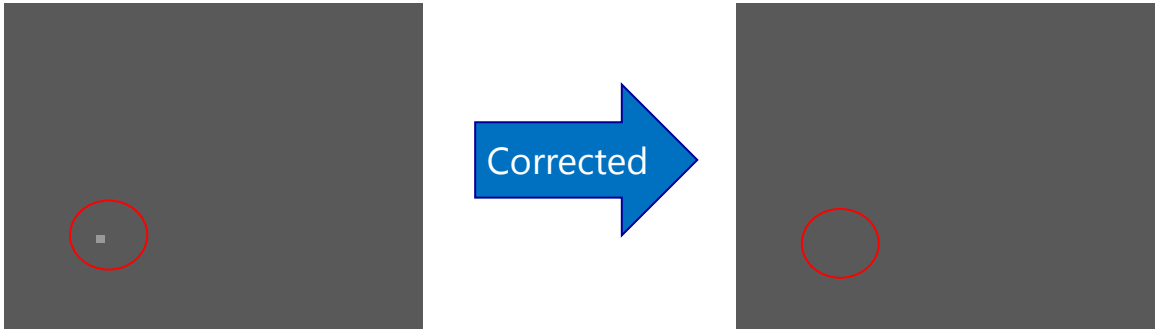
Advanced function (5)

■ 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.

■ Pixel defect correction

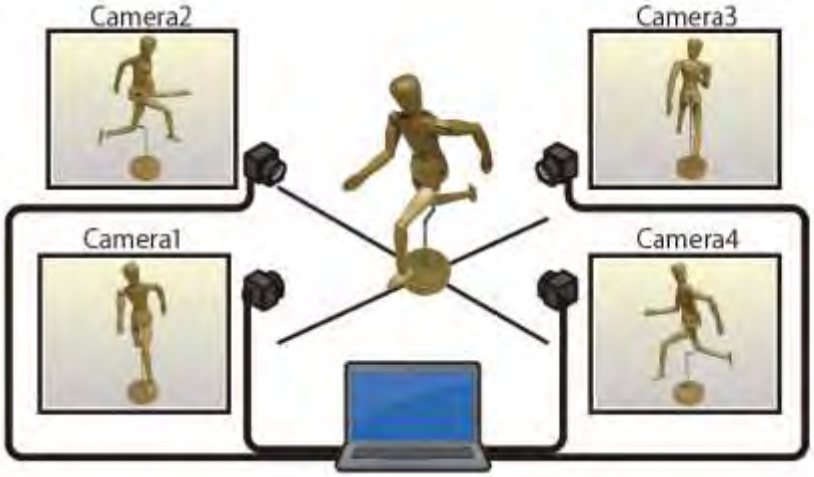
- BU(CMOS) series have correction function of pixel defect. This function can be switched on and off depend on occasion.



Advanced function (6)

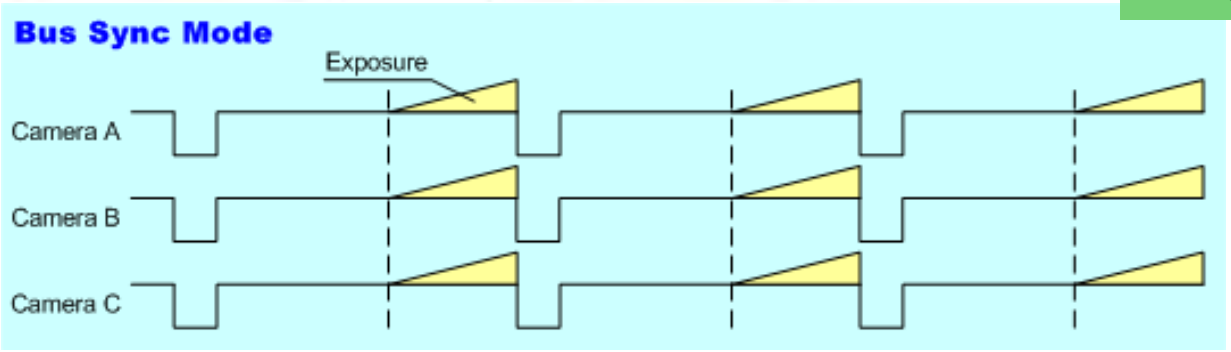
■ Bus synchronization

- Fully synchronized exposure timing among several cameras.



No cable needed for 'Trigger in' !

Applications:
Stereo camera
Motion capture

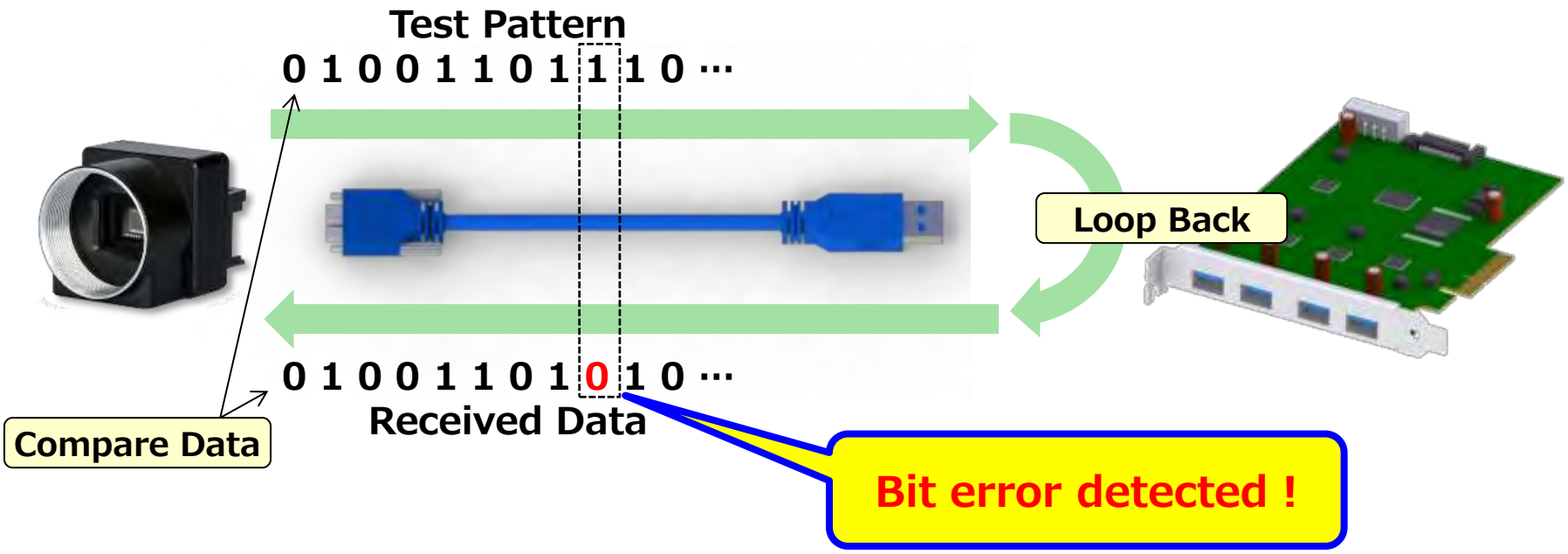


- Technical information of BERT function can download from following web site;
  http://www.toshiba-teli.co.jp/en/products/industrial/info/

Advanced function (7)

■ 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 (USB3.0 camera)

Series		BU-B/W CCD				BU-B/W CMOS								DUB/W CMOS			BU Color CCD		BU Color CMOS							DU Color CMOS		
Pixels		0.3M	0.3M	0.8M	1.3M	0.4M	1.3M	1.6M	2M	2.3M	3M	4M	5M	6.5M	8M	12M	0.3M	1.3M	0.4M	1.3M	2.3M	3M	4M	5M	12M	6.5M	8M	12M
Category	Function	BU030	BU031	BU080	BU130	BU040M	BU132M	BU160M	BU205M	BU238M	BU302MG	BU406M BU406MN	BU505MG	DU657M	DU806MG	DU1207MG	BU030C BU030CF	BU130C BU130CF	BU040MCG BU040MCF	BU160MCG BU160MCF	BU238MC BU238MCF	BU302MCG BU302MCF	BU406MC BU406MCF	BU505MCG BU505MCF	BU1203MC BU1203MCF	DU657MC	DU806MCG DU806MCF	DU1207MCG DU1207MCF
USB3Vision	Bootstrap Registers	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
DeviceControl	DeviceControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
ImageFormatControl	ImageFormatSelector	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Scalable	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Binning	✔	✔	✔	✔	✔	✔	✔	✔	-	✔	✔	✔	✔	✔	✔	-	-	-	-	-	✔	✔	✔	-	✔	✔	✔
	Decimation	-	-	-	-	✔	✔	✔	✔	-	✔	✔	✔	-	✔	✔	-	-	✔	✔	-	✔	✔	✔	-	-	✔	✔
	Reverse	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	PixelFormat	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	TestPattern	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
AcquisitionControl	AcquisitionControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	ImageBuffer	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	TriggerControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	ExposureControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
DigitalIOControl	DigitalIOControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
CounterAndTimerControl	TimerControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
AnalogControl	Gain	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	BlackLevel	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Gamma	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	BalanceRatio	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	BalanceWhiteAuto	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	ColorCorrectionMatrix	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✔	✔	✔	✔	-	✔	-	✔	-	-	✔	✔
LUTControl	LUTControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
UserSetControl	UserSetControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
EventControl	EventControl	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	FrameSynchronization	✔	✔	✔	✔	✔	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	✔	✔	✔
VenderUniqueControl	LEDIndicatorLuminance	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	AntiGlitch	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	AntiChattering	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
DPCControl	DPCControl	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
SequentialShutterControl	SequentialShutterControl	-	-	-	-	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	-	-	✔	✔	✔	✔	✔	✔	-	✔	✔	✔
Other	ColorSpaceCorrection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✔	✔	-	✔	-	✔	-	-	✔	✔

Related documents, etc.

Reference Documents

- **Product specifications**

  (New BU406M/MC/MCF, BU205M)

  D4222897J or later (Japanese)
  D4222901J or later (English)

- **Operation manual**

  (New BU406M/MC/MCF, BU205M)

  D4223110J or later (Japanese)
  D4223121J or later (English)

* Letter J of D4xxxxxJ is document revision.

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

http://www.toshiba-teli.co.jp/en/products/industrial/usb/index.htm#bkm4
http://www.toshiba-teli.co.jp/en/support/catalog_pro.htm

Reference Documents

- **Thermal design guide line**

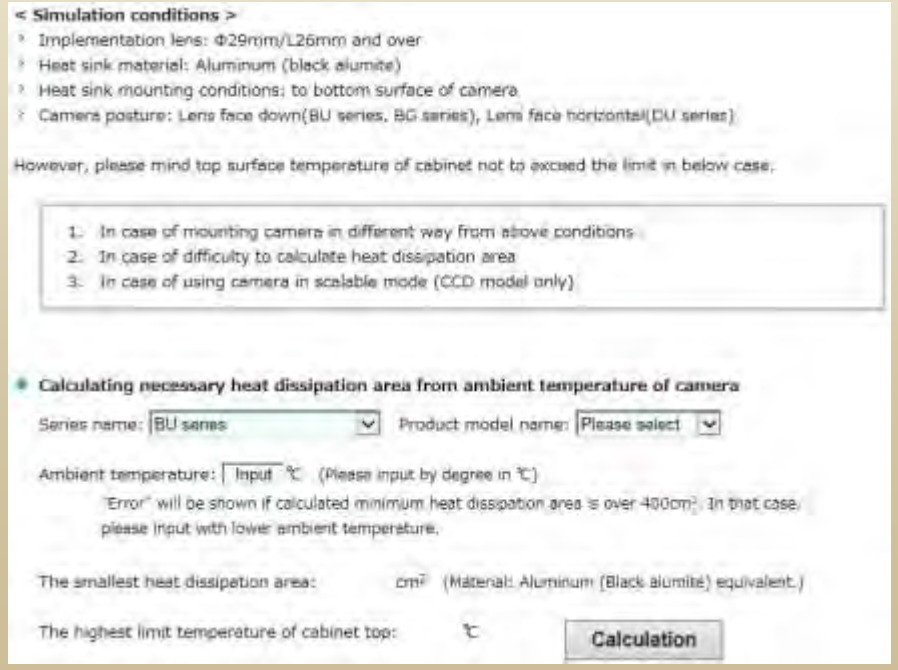
  Structure design with consideration of below guide line is recommended for appropriate use of USB3 Vision camera BU/DU series and GigE Vision camera BG series.

<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



Reference Documents

- **3D CAD model (STEP file)**

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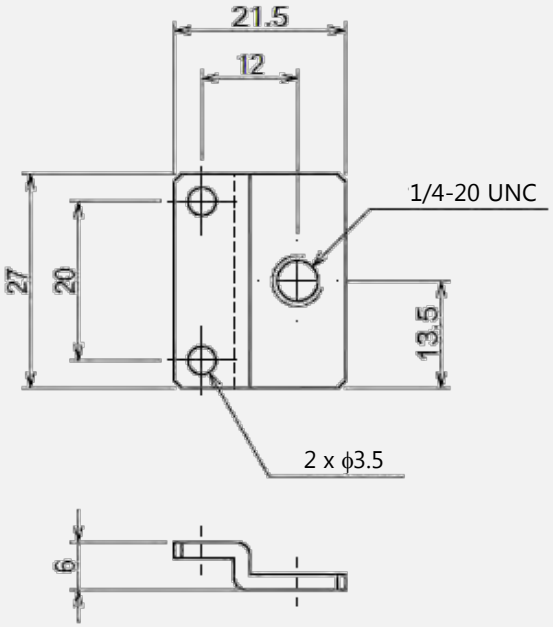
Options

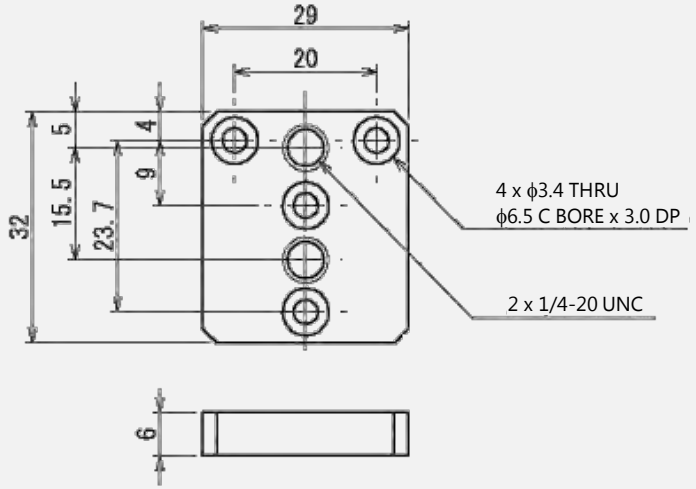
■ Tripod mounting bracket

➢ **CPTBU**(for BU series)



■ Tripod mounting bracket

➢ **CPTBUBG**(for BU･BG series)

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