

# CIS

**USB 3.0 I/F**  
**RGB(Quad-VGA) + ToF(VGA)**

# DCC-RGBD1

**Product Specification**  
**& Operational Manual**

**CIS Corporation**

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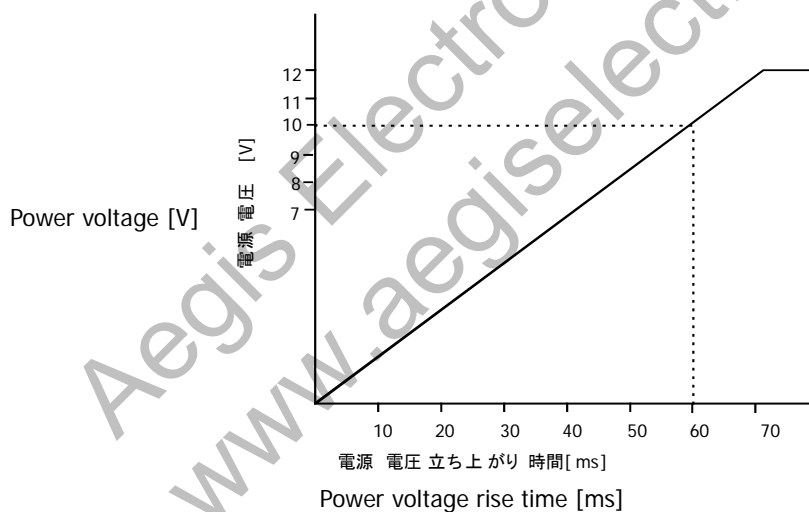
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## 1. Handling Precautions

### 1.1. Camera Handling Precautions

- Do not use or store the camera in dusty or humid places.
- Do not apply excessive force, vibration, or static electricity that could damage the camera. Please handle camera with care.
- Do not shoot direct images that are extremely bright (e.g., light source, sun, etc.) When extremely strong light source was shot, smear or blooming may occur. Put the lens cap on when camera is not in use.
- Follow the instructions in [Chapter 3.2. External Connector Pin Assignment](#) for connecting the camera module. Improper connection may cause damages not only to the camera module but also to the connected devices.
- Confirm mutual ground potential carefully before connecting camera to other equipment. Any AC leak from the connected devices may cause damages or destroy the camera.
- Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera module.
- Voltage ripple of camera power DC+12V±10% must be within ±50mV. Improper power supply voltage may cause noises on video signals.
- Rise time of camera power supply voltage must be less than +10V, Max. 60ms. Please avoid noises like chattering.

**Our warranty does not apply to damage or defects caused by neglecting the instructions and precautions explained in this manual.**



### 1.2. Restrictions on Applications

- The camera must not be used for any nuclear equipment or aerospace equipment with which mechanical failure or malfunction could result in serious bodily injury or loss of human life.
- The camera must not be used under conditions or environments other than those specified in this manual. This product is a module kit to evaluate ToF function. CIS will not take any responsibilities in case of damages or losses are caused by the use other than the purpose.

### 1.3. Disclaimers (Exception Clause)

CIS should not be liable for any damages or losses if;

- damages or losses are caused by earthquake, lightning strike, fire, flood, or other acts of God.
- damages or losses are caused by deliberate or accidental misuse by user, or failure to observe information and instructions explained in this manual.
- damages or losses are caused by repair or modification conducted by user or any unauthorized party.

#### **WARNINGS!**

- To avoid the risk of getting burned, please note that the laser diode may become extremely hot during or immediately after the camera is operated.
- The laser diode used for this camera complies with Class 1. However, do not look at the laser diode directly for a long time.

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## 2. Product Outline

DCC-RGBD1 is a ToF camera development kit with USB 3.0 interface. 1/3", 1.2M pixels RGB color CMOS image sensor (Quad-VGA) and 1/4" ToF sensor (VGA) are used. This model is a module kit to evaluate ToF function. ROS driver, sample program for Linux and SDK (.dll), and viewer software for Windows are available. (Please refer to the DCC-RGBD1 Viewer User Guide and Library User Guide for Windows/Linux for details.) Suitable for applications such as robot vision, logistics, security, and medical care, etc.

### 2.1. Features

#### <RGB sensor>

- Global shutter type CMOS image sensor (Quad-VGA : 1280 x 960)
- M12 (S mount) lens installed
- Outputs RGB data
- Simple AE (Gain control / Exposure control) / OnePushWB

#### <ToF sensor>

- CCD (ToF) sensor (VGA : 640 x 480)
- M12 (S mount) lens installed
- Outputs Depth (Distance) data and IR (Near-infrared) data

#### <ToF light source>

- LD(LaserDiode) 850nm wavelength, Equipped with Two lights

#### <USB output>

- USB 3.0 (USB3.0 micro B connector: Not complied to USB power supply.)
- Outputs YUV image, Depth image, and IR image

### 2.2. Accessories

- Standard Accessory
  - Power supply cable (loose end cable)
- Optional Accessory (Commercial products for system configuration for your reference.)
  - USB 3.0 cable
    - USB3-AMBF20BK : USB A – USB Micro B type 2m with ferrite core (ELECOM Co., Ltd.)
    - NU3MBASU3B3m : USB A – USB Micro B type 3m with screw lock (Nissei Electric Co., Ltd.)
  - A stabilized power supply or AC adaptor outputs 36W (DC12V, 3A) or more is needed.
    - ※ The maximum current is needed for LD lighting (pulse drive).

- Free control software
  - Viewer software (for evaluation purpose), SDK (for development purpose)
    - ※To use the software, please contact our Sales division or download it via our website.

#### [Related information]

- ROS driver and sample program are provided by Tokyo Opensource Kyokai Association (TORK).
  - ※ ROS driver and sample are downloadable via our website.

- Supported OS
  - Windows10 Pro Version 1803 64bit

## 3. Specifications

## 3.1. General Specifications

<b>Electrical Specifications</b>			
Image sensor (RGB)	Sensor type	1/3", global shutter type CMOS sensor (Color)	
	Effective pixels	1280(H) × 960(V)	
	Unit cell size	3.75μm(H) × 3.75μm(V)	
Image sensor (ToF)	Sensor type	1/4", CCD (ToF) sensor	
	Effective pixels	640(H) × 480(V)	
	Unit cell size	5.6μm(H) × 5.6μm(V)	
Light source		NIR laser diode, Wavelength: 850nm x 2 Class1	
I/F		USB3.0 UVC (Not complied to USB power supply.)	
Frame rate		30 fps	
Sync system		Internal sync.	
Video output size (Max. size)		1920(H) x 960(V) (Output by combining three images of YUV image, Depth image, and IR image.)	
Video signals (RGB)	White clip level	255dig (when gain is 0dB)	
	Set up level	0dig (when gain is 0dB)	
Gain variable range (RGB)		x1.0 ~ x10.67	
Shutter speed (RGB)		1/100 ~ 1/10,000	
Gamma (RGB)		0.45 fixed	
Power requirements		DC+12V±10%	
Power consumption		7.0W(Typ) ※Max36W	
<b>Mechanical Specifications</b>			
Dimensions		H:50mm W:55mm D:35mm excluding projection.	
Weight		Approx. 110g	
Lens 1 (RGB)		Dedicated lens installed. ( FOV: H 96° / V 71°)	
Lens 2 (ToF)		Dedicated lens installed. ( FOV: H 90° / V 69°)	
<b>Environmental Specifications</b>			
Durability	Vibration	Acceleration	: 98m/s <sup>2</sup> (10G)
		Frequency	: 20 ~ 200Hz
		Direction	: X, Y, and Z 3 directions
		Testing time	: 120min for each direction
	Shock	No malfunction with 980m/s <sup>2</sup> (100) G for ±X, ±Y, and ±Z, 6 directions without packaging.	
Operational temperature		0 ~ +45°C Humidity: 20 ~ 80%RH with no condensation.	
Storage temperature		-25 ~ +60°C Humidity: 20 ~ 80%RH with no condensation.	

[Note]

- It takes approx. 4 seconds from turn ON the power to start operating normally.
- Connect the camera to the host with USB 3.0 cable, turn ON the host, and then turn ON the camera power.
- Please be careful of loose connection of USB 3.0 cable connector. Especially, connector of PC side might be loosen.
- When the USB port is connected for the first time, USB driver installation may not be completed normally and the camera may not be recognized when start Viewer while USB driver is being installed at the host side. In this case, please turn OFF the power of the camera and the host, and start over from the beginning to finish the installation of USB driver correctly.

- Operation of the camera may be unstable or image acquisition may not be executed depends on the USB 3.0 cable and the host device to use. In this case, changing to the shorter cable (1m or less) or changing USB connection port (from the front side to the rear of the host etc.) may solve the problem. However, it does not mean to guarantee the connection with all host devices.

3.2. External Connector Pin Assignment

3.2.1 2pins Power Supply Connector S2B-XH-A (J.S.T. Mfg. Co., Ltd.) (Rear of laser diode: CN1)

Pin No.	Signal
1	+12V (Red)
2	GND (Black)

※ Please use the loose end cable of the bundled item to supply power.

3.2.2 USB 3.0 (USB 3.0 microB Connector)

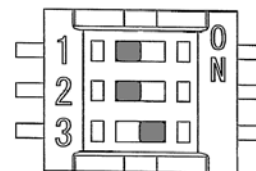


Pin No.	Signal Name	Description
1	VBUS	Power Input DC 5V±5%
2	D-	Differential pair for USB2.0
3	D+	
4	ID	OTG Recognition signal
5	GND	GND for VBUS
6	SSTX-	USB3.0 Differential pair for transmission
7	SSTX+	
8	GND	GND for USB3.0
9	SSRX-	USB3.0 Differential pair for reception
10	SSRX+	

3.2.3 DIP Switch (Rear USB Board: SW1)

Do not change factory setting data.

Switch No.	Factory setting data
1	OFF
2	OFF
3	ON



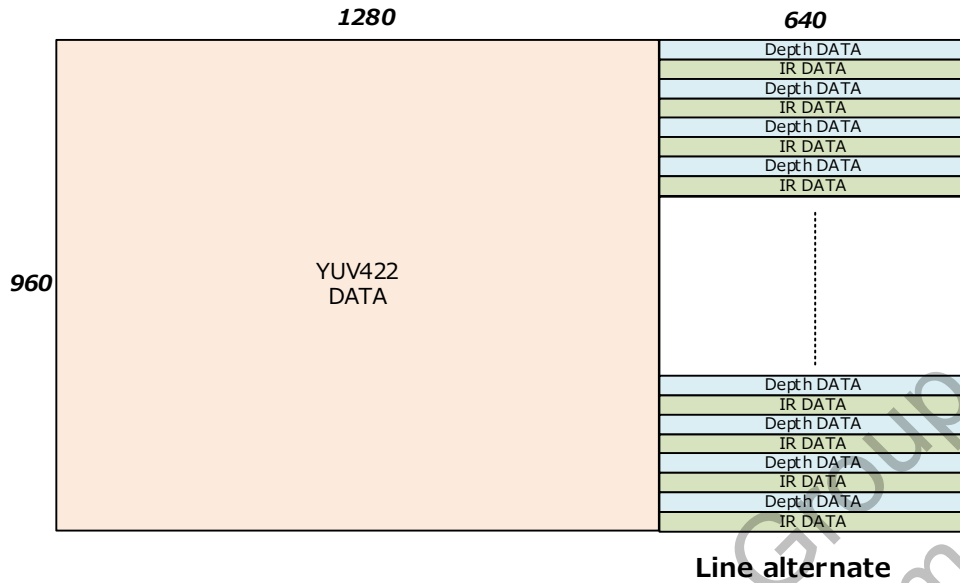
3.2.4 LED Indicator (Rear USB Board:LED1) 2-color lighting LED

- Red lighting: When the power is supplied.
- Orange blinking: While obtaining images.

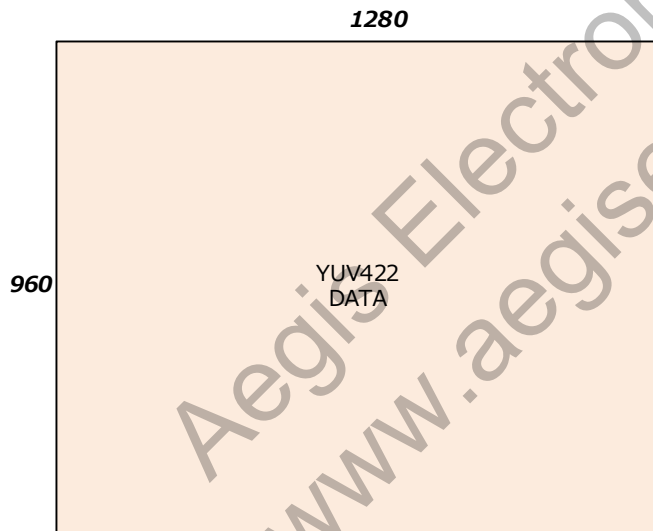
3.3. Video Output Format

There are four types of video output format for DCC-RGBD1.

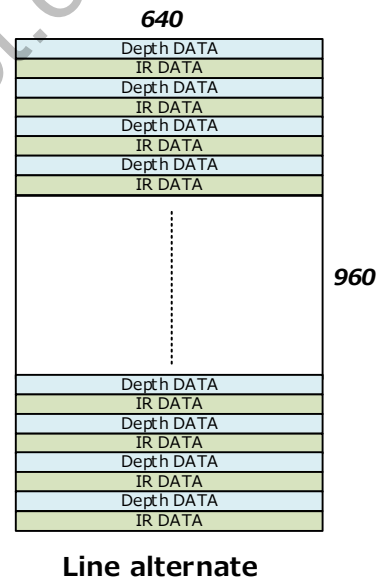
1)YUV+D(Depth+IR) OUTPUT



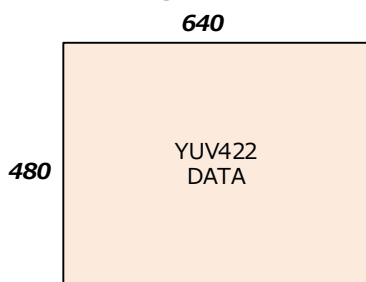
2)YUV OUTPUT



3)D(Depth+IR) OUTPUT



4)YUV Binning OUTPUT



## 4. Camera Functions

## 4.1. Selection of Output Format (Output Type)

Setting	Description
0	YUV+D (Depth+IR)
1	YUV
2	D (Depth+IR)
3	YUV Binning(640x480)

## 4.2. ToF Ranging Mode ( Depth Range )

Setting	Description	Range (Target value)	Standard deviation ratio (%) (Target value)
0	Wide (wide range)	Approx. 300mm~5000mm	2.0% or less
1	SuperNear	Approx. 150mm~700mm	1.5% or less

<Referential formula> Average value =  $(X_1 + \dots + X_n) / n$        $X_1 \sim X_n$ : Measured data

Dispersion =  $((X_1 - \text{Average value})^2 + \dots + (X_n - \text{Average value})^2) / n$

Standard deviation [mm] =  $\sqrt{\text{Dispersion}}$

Standard deviation ratio [%] = Standard deviation / Actual measured distance [mm]  $\times$  100

※CIS measures data in our temperature controlled clean room, under the conditions that there is no wall so that no multipath should occur.

※The absolute distance accuracy is affected by usage conditions and the objects to measure distance. Ranging criteria is the center of the tripod mount. Also, it takes about 25 minutes for Wide mode and about 15 minutes for SuperNear mode from turn ON the camera power to warm up until the distance stabilizes.

※This camera is for indoor use only.

## 4.3. RGB OnePush White Balance Settings (RGB settings OnePush WB )

Metering operation (whole area metering) and white balance setting will be performed only once by executing.

## 4.4. RGB AE Mode (RGB Settings AE)

Setting	Operation	Description
0	Manual	This is to set RGB luminance gain and RGB shutter manually.
1	Gain Auto	This is to set RGB luminance gain automatically and set RGB shutter manually.
2	Shutter Auto	This is to set RGB luminance gain manually and set RGB shutter automatically.
3	Full Auto	This is to set RGB luminance gain and RGB shutter automatically.

## 4.5. RGB Luminance Gain Control (RGB settings Gain (Manual setting))

&lt;Setting value range&gt; 100~1067 (0x00000064~0x0000042B)

&lt;Setting examples&gt;

Setting value	Multiple of
100(0x00000064)	1.0
200(0x000000C8)	2.0
400(0x00000190)	4.0
800(0x00000320)	8.0
1000(0x000003E8)	10.0
1067(0x0000042B)	10.67

※ Setting will not be changed if the setting value is 0.

※ Due to 0.45 gamma correction, change of luminance is not linear.

&lt;Formula&gt; Setting value = Magnification × 100

## 4.6. RGB Shutter Control (RGB settings Shutter (Manual setting))

&lt;Setting value range&gt; 105~10486(0x00000069~0x000028F6)

&lt;Setting examples&gt;

Setting value	Exposure time
10486(0x000028F6)	1/100s
5243(0x0000147B)	1/200s
2621(0x00000A3D)	1/400s
1049(0x00000419)	1/1,000s
524(0x0000020C)	1/2,000s
262(0x00000106)	1/4,000s
105(0x00000069)	1/10,000s

※ Setting will not be changed if the setting value is 0.

※ Due to 0.45 gamma correction, change of luminance is not linear.

&lt;Formula&gt; Setting value = Exposure time × 0x00100000 (Round off)

## 4.7. RGB Color Correction Settings (RGB Settings Color Correction)

Setting	Operation	Description
0	OFF	This is to output the image without color correction.
1	Standard	This is to output the image with color correction.

## 4.8. Obtaining Board Temperature

Temperature 1	Temperature on the laser diode (Front board) Unit :°C
Temperature 2	Temperature on the sensor board (Center board) Unit :°C

## 4.9. How to Save and Initialize Settings (Init / Save)

Setting	Description
0	Init: This is to restore settings for ToF and RGB to factory setting data.
1	Save: This is to save settings for ToF and RGB.

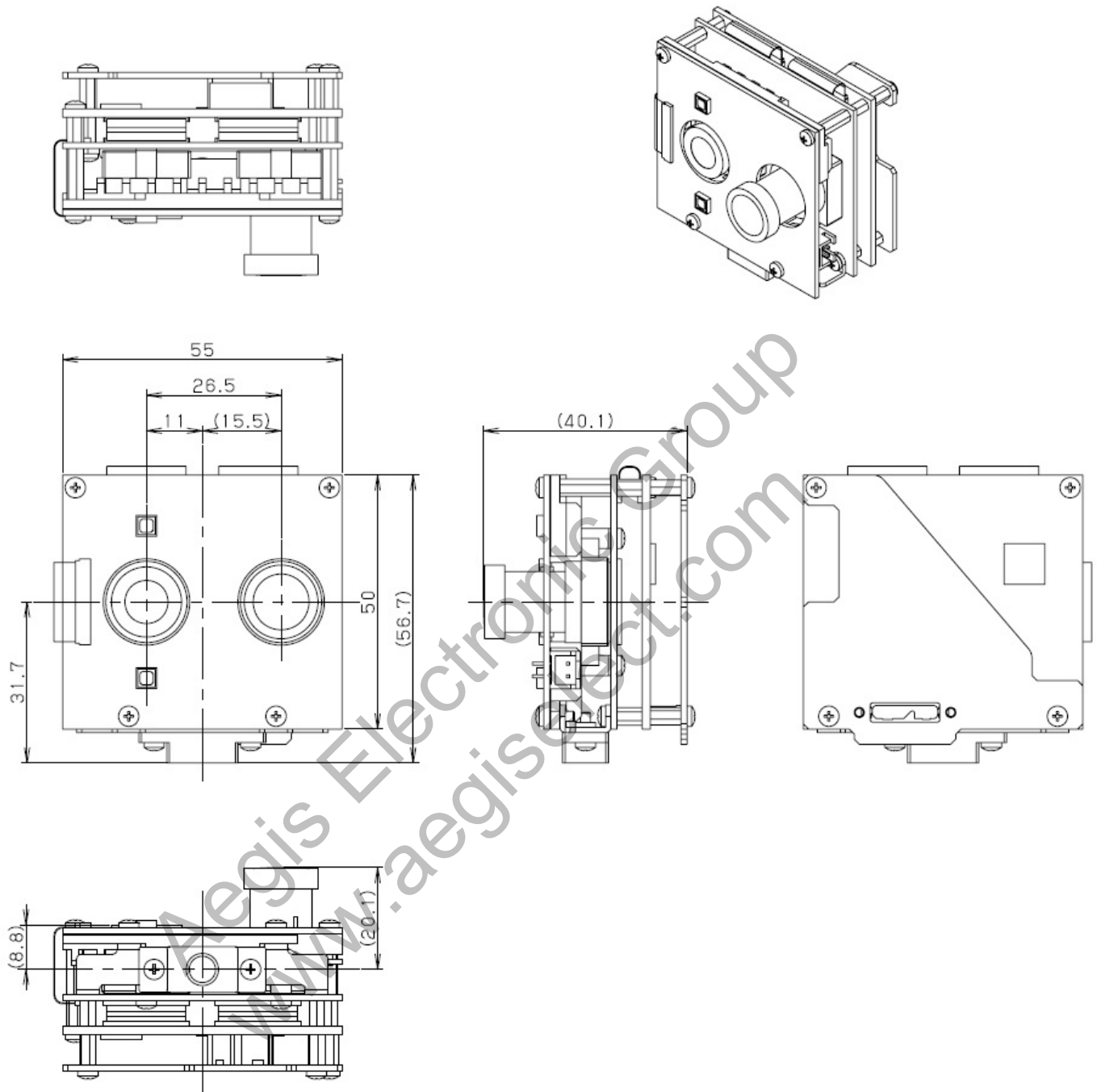
## 5. Factory Settings

Function		Setting	Description
ToF function	Depth Range	Wide range (Wide)	This is to switch ToF ranging mode.
RGB function	OnePush WB	Gr channel gain 0x0400 Gb channel gain 0x0400	RGB OnePush White Balance
	AE	Manual	This is to switch RGB AE mode.
	Gain	x1.0 (0x00000064)	This is to switch RGB manual gain.
	Shutter	1/100s (0x000028F6)	This is to switch RGB manual exposure time.
	Color Correction	Off	This is to switch RGB color correction table.

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6. Dimensions

6.1. Camera Dimensions



935-0160-00  
(Unit: mm)

## 7. Case for Indemnity (Limited Warranty)

### 7.1. Product Warranty

The term of warranty of this product is within a year from the date of shipping out from our factory.

If you use the product properly and discover a defect during the warranty period, and if that was caused by designing or manufacturing, CIS Corporation, at its option, repairs or replaces it at no charge to you. Products out of warranty period will be subject to charge.

CIS should not hold responsible for damages or losses if;

- damages or losses are caused by earthquake, lightning strike, fire, flood or other acts of God.
- damages or losses are caused by deliberate or accidental misuse by user, or failure to observe the information contained in the instructions in this Product Specification and Operational Manual.
- damages or losses are caused by repair or modification conducted by customer or any unauthorized party.

### 7.2. CMOS Defective Pixels

DCC-RGBD1 does not install defective pixel correction function.

### 7.3. Product Support

Should you have any problems in function of the product you purchased, and if you need our further analysis and/or repair, please contact your local distributor.

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