FULL HD Color Camera
CSDW2M60CM28

SPECIFICATIONS

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TOSHIBA TELI CORPORATION
Printed On Recycled Paper.
### RESTRICTION FOR USE

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:
  1. Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
  2. Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.

- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.

- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.

  (*1): Equipment directly concerned with human life refers to:
  - Medical equipment such as life-support systems, equipment for operating theaters.
  - Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
  - Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law.
  - Equipment related to the above

  (*2): Equipment relating to maintenance of public services/functions involving factors of safety refers to:
  - Traffic control systems for air transportation, railways, roads, or marine transportation.
  - Equipment for nuclear power generation.
  - Equipment related to the above.
## CASES FOR INDEMNITY

- In the case damage or losses are caused by fire, earthquake, or other acts of God, acts by a third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.

- In the case of indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.

- In the case damage or losses are caused by failure to observe the information contained in the instructions in this instruction manual and specifications.

- In the case damage or losses are caused by use contrary to the instructions in this instruction manual and specifications.

- In the case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.

- In the case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).

- Expenses we bear on this product shall be limited to the individual price of the product.

- The item that is not described in specifications of this product is off the subject of the guarantee.
<table>
<thead>
<tr>
<th><strong>USAGE PRECAUTIONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>● Handle carefully</td>
</tr>
<tr>
<td>Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage connected cables, since this may cause wire breakage.</td>
</tr>
<tr>
<td>● Environmental operating conditions</td>
</tr>
<tr>
<td>Do not use the product in locations where the ambient temperature or humidity exceeds the specifications. Otherwise, image quality may be degraded or internal components may be adversely affected. In particular, do not use the product in areas exposed to direct sunlight. Moreover, during shooting under high temperatures, vertical stripes or white spots (noise) may be produced, depending on the subject or camera conditions (such as increased gain). However, such phenomena are not malfunctions.</td>
</tr>
<tr>
<td>● About lens mount</td>
</tr>
<tr>
<td>As for the C-mount lens used combining this camera, the projection distance from bottom of the screw should use 8.8 mm or less.</td>
</tr>
<tr>
<td><img src="image.png" alt="Diagram" /></td>
</tr>
<tr>
<td>● Combination check with the lens</td>
</tr>
<tr>
<td>This camera might from a ghost to image area depending on the combination of a lens and an illumination with this camera. But this is not a failure of this camera. Therefore, Please check the combination of the lens and the illumination with this camera when you use.</td>
</tr>
<tr>
<td>● Combination check with the monitor</td>
</tr>
<tr>
<td>Depending on a used monitor and the combination of the DVI-D cable, there is the case that is not displayed normally by a monitor. Please confirm the combination of a monitor and DVI-D cable and this camera beforehand.</td>
</tr>
<tr>
<td>● Do not apply image pickup surface to the direct sun or intense light</td>
</tr>
<tr>
<td>The color filter of the sensor fades when I guess strong light right for a long time.</td>
</tr>
<tr>
<td>● Occurrence of moiré</td>
</tr>
<tr>
<td>If you shoot thin stripe patterns, moiré patterns (interference fringes) may appear. This is not a malfunction.</td>
</tr>
<tr>
<td>● Occurrence of noise on the screen</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>If an intense magnetic or electromagnetic field is generated near the camera or connected cables, noise may be generated on the screen. If this occurs, move the camera or the cable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>● If the equipment is not to be used for a long duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn off power to the camera for safety and attach the lens cap to the camera to protect the image pickup surface.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>● Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn off power to the equipment and wipe it with a dry cloth.</td>
</tr>
<tr>
<td>If it becomes severely contaminated, gently wipe the affected areas with a soft cloth dampened with diluted neutral detergent. Never use alcohol, benzene, thinner, or other chemicals because such chemicals may damage or discolor the paint and indications.</td>
</tr>
<tr>
<td>If the image pickup surface becomes dusty, contaminated, or, scratched, consult your sales representative.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>● Precaution in the power supply from camera control connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is the case that noise appears depending on a PC. Then please use the DC12V supply from a power supply connector.</td>
</tr>
<tr>
<td>There is a possibility that the camera malfunction according to falling supply voltage depending on a Mini-USB cable for camera control to use.</td>
</tr>
<tr>
<td>In that case, please use the DC12V supply from a power supply connector.</td>
</tr>
<tr>
<td>When you use Auto Iris control, please use the power supply from the AC adapter.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>● Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>When disposing of the camera, it may be necessary to disassemble it into separate parts, in accordance with the laws and regulations of your country and/or municipality concerning environmental contamination.</td>
</tr>
</tbody>
</table>

| “This symbol is applicable for EU member states only” |
1. INTRODUCTION
This HD color camera is a unit type medical camera utilized 1/2.8 inch sensor.
A picture output is DVI-D, so that you can get high-speed and high-resolution picture.
Because this camera can connect a monitor directly, it is suitable for use of observation.

2. FEATURES
(1) High-frame rate
This camera output a picture size of the FULL HD with 1920×1080/60p or 1920×1080/60i.

(2) Color reproduction characteristics
This camera is superior in color reproduction characteristics because the sensor is adopted a primary color mosaic filter.

(3) DVI-D
The picture output is possible just to be connected to the monitor directly because the picture output is DVI-D.

(4) Small and light
This camera is small and light.

(5) Camera control
It is possible to control this camera from camera control connector.

(6) Electronic lines
It is possible to show a monitor screen electronic lines by two vertical and horizontal.

(7) Grid
It is possible to show a monitor screen grid lines.

(8) Auto Iris control
It is possible to control the auto Iris lens through the EIAJ RC-5204 connector.

(9) RoHS compliant
3. **COMPONENT**

   (1) Camera body .................................................. × 1

   (2) Accessories
      
      • Intentional Manual(Japanese) ................................. × 1
      • Intentional Manual(English) ................................. × 1

※No application software attached to this camera.
※No DVI-D cable, Mini-USB cable for camera control and Lens attached to this camera.

4. **OPTIONAL PARTS**

   • AC Adapter           SPU16A-105-ASN
   • AC Cable            APC1025-01P (Only in Japan)

※Please contact our business charge for detail of option unit.

<Connection example>
5. FUNCTION  

(1) Setup-level setting
It is possible to set the setup-level. A setting range is -16LSB～+16LSB. (Factory setting: 8LSB)

(2) Gain setting
There are 2 modes of MANU (manual) mode and AUTO mode. (Factory setting: AUTO)
A setting range is -6dB～+12dB.
AUTO mode always regulates gain depending on the brightness of an object.
It is possible to setting max gain of this time.

(3) Electronic shutter
There are 2 modes of MANU (manual) and AUTO. (Factory setting: AUTO)
- MANU mode
  It is possible to select the shutter speed with 9 phases.
- AUTO mode
  AUTO mode always regulates shutter speed to the brightness of the subject.
  It is possible to setting max gain of this time.

※It is possible to change detect ratio (Peak: Average) in AUTO mode.

(4) White balance
There are 4 kinds of modes of MWB (Manual White Balance), OPWB (One Push White Balance),
AWB (Auto White Balance) and PresetWB (Preset White Balance).
It is possible to choose it to a subject, a use. (Factory setting: OPWB)
- MWB (Manual White Balance)
  R-gain and B-gain can be set independently.
  Setting range: 0dB～12dB
- OPWB (One Push White Balance)
  It is regulated by one push so that RGB of the center of image area become equal.
- AWB (Auto White Balance)
  It is always reproduced kept images of the balance and pursue the change of the source of light automatically.
- PresetWB (Preset White Balance)
  It is possible to select the white balance value which the color temperature of the source of light.
(5) Aperture
   It is possible to set aperture correction revision of the output picture.
   A setting range is 8 phases (0~7) each High frequency and Low frequency. (Factory setting : 3)
   • Phase up  : Picture’s edge is emphasized.

(6) Gamma correction
   It is possible to set gamma correction of the output picture with 17 phases(0~16). (Factory setting : 5)
   • Phase up  : The shading of the shade become clear.

(7) Auto Iris control
   Regulate Lens Iris automatically to the brightness of the subject reasonable photography.
   ※When you use Auto Iris control, please use the power supply from the AC adapter.
   ※It is possible to work with DC control lens only (Recommendation lens : DV10x8SA-SA1L  FUJIFILM)

(8) Mirror mode
   It is possible to turn over the output picture.
   It is possible to change ON/OFF each Horizontal and Vertical.

(9) Electronic line
   Because it is possible to show a monitor screen electronic lines by two vertical and horizontal, it is
convenience to align and measure the images.
   You can move the line by one pixel of unit and set the following items.
   • Line type
     Fill / Translucent
   • Line width
     1 pixel / 2 pixels
   • Line color
     changeable
   • Setting range
     Vertical  : 0～1919
     Horizontal : 0～1079
(10) Grid

It is possible to show a monitor screen grid lines.

You can regulate the grid interval by one pixel of unit and set the following items.

- Grid type
  - Translucent
- Grid interval
  - Vertical : 4～1920
  - Horizontal : 4～1080
- Grid Width
  - 1 pixel
- Grid color
  - Changeable

(11) Color matrix

It is possible to adjust the color masking manually. The adjustment method is changing possibility in RGB and YUV. (Factory setting : RGB)

- RGB
  - The variable parameter is R-G, R-B, G-B, G-R, B-R and B-G.
- YUV
  - The variable parameter is hue, and saturation(u / v).
6. SPECIFICATION

[Electronic Specification]

(1) Image sensor 1/2.8 type CMOS sensor
   ・ Total pixels 2144(H)×1588(V)
   ・ Valid pixels 2096(H)×1561(V)
   ・ Valid number of output pixels 1920(H)×1080(V)
   ・ Pixel size 2.5µm(H)×2.5µm(V)
   ・ Scanning area 1/2.8 type

(2) Scanning system Progressive

(3) Synchronization system Internal synchronization

(4) Aspect ratio 16 : 9

(5) Video output Color 8 bit each RGB (Factory setting : 1920×1080/60p)
   ・ 1920×1080/60p
     Output clock rate 148.352 MHz
     Horizontal 67.43 kHz
     Vertical 59.94 Hz
   ・ 1920×1080/60i
     Output clock rate 74.176MHz
     Horizontal 33.72 kHz
     Vertical 29.97 Hz

(6) Standard sensitivity 2000lx, F4, 5000K

(7) Minimum sensitivity 24 lx (F1.4, gain : +12dB, gamma : 16, video level : 50%)

(8) Gain MANU / AUTO change (Factory setting : AUTO)
   ・ MANU(Manual gain control)
     Corrective range -6dB～+12dB(Factory setting : 0dB)
   ・ AUTO(Auto gain control)
     Detection area Full screen
     Corrective range -6dB～+12dB
     (It is possible to setting max gain. (Factly setting : 12dB))
     Detection ratio (Peak : Average) 100:0, 75:25, 50:50, 25:75, 0:100 (Factly setting : 100:0)

(9) Set up -16LSB～+16LSB (Factory setting : 8LSB)
(10) White balance  
MWB / OPWB / AWB / PresetWB change (Factory setting: OPWB)

- MWB (Manual white balance)
  Corrective range 3000K ~ 6500K
  Setting method R-gain and B-gain can be set independently. (0~+12dB each R and B)
- OPWB (One push white balance)
  Corrective range 3000K ~ 6500K
  Detection area Center of the screen
- AWB (Auto white balance)
  Corrective range 3000K ~ 6500K
  Detection area Full screen
- PresetWB (Preset White Balance)
  Color temperature 3000K / 3700K / 4000K / 4500K / 5500K / 6500K

(11) Gamma  
17 step Change (Factory setting: 5)

- 0 Correction OFF ($\gamma=1$)
- 1~16 Correction ON

(12) Aperture  
8 Step change each High frequency and Low frequency.
(Factory setting: 3)

- 0 Correction OFF
- 1~7 Correction ON

(13) Mirror mode
- Horizontal turn ON / OFF change (Factory setting: OFF)
- Vertical turn ON / OFF change (Factory setting: OFF)

(14) Electronic line
- ON / OFF change (Factory setting: OFF)
- Number Vertical, Horizontal each 2 lines
- Type Fill / Translucent change
- Width 1 pixel / 2 pixels change
- Color Changeable
- Setting range Vertical : 0 ~ 1919
  Horizontal : 0 ~ 1079

(15) Grid
- ON / OFF change (Factory setting: OFF)
- Type Translucent
- Interval Vertical : 4 ~ 1920
  Horizontal : 4 ~ 1080
- Width 1 pixel
- Color Changeable
(16) Power source

- DC connector supply  DC 12V± 10% (Ripple voltage 50mV_{p-p})
- Camera control connector supply  DC 5V± 5% (Ripple voltage 50mV_{p-p})

※When both DC cable and Mini-USB cable for camera control were connected, +12V from DC cable is given priority.

※A note

There is a possibility that the camera malfunction according to falling supply voltage depending on a Mini-USB cable for camera control to use.

In that case, please use the DC12V supply from a power supply connector.

(17) Power consumption  Approx. 2.5W
[Internal sync specification]
(1) Pixel clock rate 148.500/1.001MHz±100ppm
(2) Scanning rate
  Horizontal 67.433kHz
  Vertical 59.94Hz

[Electronic shutter specification]
(1) Shutter system Rolling shutter
(2) Shutter speed MANU / AUTO change (Factory setting : AUTO)
  • MANU(9 phase)
    PRESET setting 1/60s , 1/100s , 1/120s , 1/250s , 1/500s , 1/1000s ,
    1/2000s , 1/4000s , 1/10,000s (Factory setting : 1/60s)
  • AUTO
    Corrective range 1/60s ～ 1/10,000s
    (It is possible to setting max gain. (Factly setting : 1/10,000s))
    Detection area Full screen
    Detection ratio(Peak : Average) 100:0, 75:25, 50:50, 25:75, 0:100 (Factly setting : 100:0)

[Camera control]
Please confirm communication specifications about a control method and the communication specifications.
[Machine externals specification]
(1) Dimensions
44mm(W) × 34mm(H) × 77mm(D)
(Protruding portions such as screws and connectors are not included.)
(2) Weight
Approx. 100g
(3) Lens mount
C-mount
(4) Camera body grounding
Conductive between circuit GND and camera body

/Ambient condition
(1) Performance assurance
Temperature
0°C ～ 40°C
Humidity
10% ～ 90% (no condensation)
(2) Operation assurance
Temperature
0°C ～ 40°C
Humidity
90% or less (no condensation)
(3) Storage assurance
Temperature
-20°C ～ 60°C
Humidity
90% or less (no condensation)

/Safety standards
EMC standard (Electro-Magnetic Compatibility)
・EMI (Electro-Magnetic Interference)
EN61000-6-3
FCC Part 15 Subpart B class A
・EMS (Electro-Magnetic Susceptibility)
EN61000-6-2

A request about adaptability of EMC standard
The adaptability of the safety standard of this camera is assured in the condition of combination with the Optional parts.
Please confirm the EMC adaptability when it combines with parts other than them.
[Connecter Description]

(1) DVI-D connector
Picture output connector
  - Connector model (Camera side) XM4M-2432-1312 (OMRON)
  - Pin assignment

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>I/O</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O</td>
<td>TX2-</td>
</tr>
<tr>
<td>2</td>
<td>O</td>
<td>TX2+</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>TX2/4 Shield</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>TX4-(N.C.)</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>TX4+(N.C.)</td>
</tr>
<tr>
<td>6</td>
<td>O</td>
<td>DDC Clock</td>
</tr>
<tr>
<td>7</td>
<td>O</td>
<td>DDC Data</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
<td>N.C.</td>
</tr>
<tr>
<td>9</td>
<td>O</td>
<td>TX1-</td>
</tr>
<tr>
<td>10</td>
<td>O</td>
<td>TX1+</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>TX1/3 Shield</td>
</tr>
<tr>
<td>12</td>
<td>-</td>
<td>TX3-(N.C.)</td>
</tr>
<tr>
<td>13</td>
<td>-</td>
<td>TX3+(N.C.)</td>
</tr>
<tr>
<td>14</td>
<td>-</td>
<td>+5V</td>
</tr>
<tr>
<td>15</td>
<td>-</td>
<td>GND</td>
</tr>
<tr>
<td>16</td>
<td>I</td>
<td>Hot Plug Detect</td>
</tr>
<tr>
<td>17</td>
<td>O</td>
<td>TX0-</td>
</tr>
<tr>
<td>18</td>
<td>O</td>
<td>TX0+</td>
</tr>
<tr>
<td>19</td>
<td>-</td>
<td>TX0/5 Shield</td>
</tr>
<tr>
<td>20</td>
<td>-</td>
<td>TX5-(N.C.)</td>
</tr>
<tr>
<td>21</td>
<td>-</td>
<td>TX5+(N.C.)</td>
</tr>
<tr>
<td>22</td>
<td>O</td>
<td>TX Clock Shield</td>
</tr>
<tr>
<td>23</td>
<td>O</td>
<td>TX Clock+</td>
</tr>
<tr>
<td>24</td>
<td>O</td>
<td>TX Clock-</td>
</tr>
</tbody>
</table>

(2) Camera control connector
  - Connector model (Camera side) UX60SC-MB-5ST(80) (HIROSE ELECTRIC)
  - Pin assignment

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>I/O</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>POWER</td>
</tr>
<tr>
<td>2</td>
<td>I/O</td>
<td>USB D-</td>
</tr>
<tr>
<td>3</td>
<td>I/O</td>
<td>USB D+</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>N.C.</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>USB_GND</td>
</tr>
</tbody>
</table>
(3) Power supply connector
This is a connector for +12V power supply.
- Connector model (Camera side) LGP3831-0200F (SMK)
- Conformity plug standard EIAJ RC-5320A voltage category 4

(4) Lens control Connector
This is a connector for control auto Iris lens.
- Control system DC control
- Connector model (Camera side) D4-157J-250 (TECHNICAL ELECTRON)
- Conformity plug standard EIAJ RC-5204

[Spectral Sensitivity Characteristic]
※The lens characteristics and light source characteristics is not reflected in table.
※It includes an IR cut filter characteristic.
7. **GUARANTEE**

The period of guarantee is 12 months after the product delivery.

If any trouble because of responsibility of our company occurred during the period, we repair it free of charge according to [SERVICE].

But in the case of following, guarantee becomes inapplicable.

- The trouble because of an error in use and unfair repair and remodeling.
- The trouble because of a fall after the purchase and transportation.
- The trouble because of fire, natural calamity(earthquake, storm and flood damage, thunderbolt), damage from salty breeze, gas harm and abnormal voltage.

8. **SERVICE**

(1) Condition for repair

When the user requests us to repair product, please return it our factory and we repair it.

But user bear overheads(travel expenses, a cost of camera disassembly charge) and return cost.

(2) A period to accept repair

1️⃣ Repair for free  Refer to [GUARANTEE].

2️⃣ Charged repair  7 years after the production end.
9. APPEARANCE

Specification

- Material: Aluminum die-cast
- Lens mount: ABS
- Cover: Aluminum alloy sheet
- Treatment: Powder coating (pearl white)
- Rear panel: Corton electro-painting (black)
- Cover: Corton electro-painting (black)

Dimensions:

- Rear panel: 92 mm
- Cover: 25 mm
- Lens mount: 13 mm
- 4-M3 Depth 3.5
- 4-M4 Depth 5.5

Unit: mm
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Distributor

- This product must be classified for disposal according to the laws of each country and municipal laws.
- Information contained in this document is subject to change without prior notice.