# SENTECH

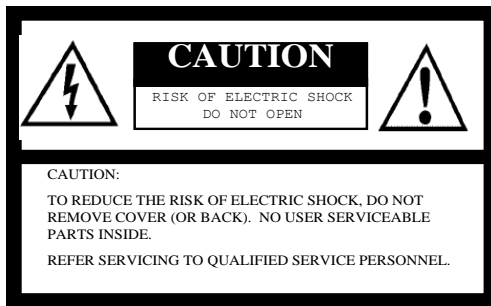# STC-HD133DV (Cased Type)
# STC-HD133DV-B (Board Type)
# Product Specification

## 16:9 Format 720p Color Camera

## Safety Precautions

```
+--------------------------------------+
|  /!\    CAUTION      /!\             |
| (fork) RISK OF ELECTRIC SHOCK (!)   |
|        DO NOT OPEN                   |
+--------------------------------------+
| CAUTION:                            |
| TO REDUCE THE RISK OF ELECTRIC      |
| SHOCK, DO NOT REMOVE COVER (OR      |
| BACK).  NO USER SERVICEABLE         |
| PARTS INSIDE.                       |
| REFER SERVICING TO QUALIFIED        |
| SERVICE PERSONNEL.                  |
+--------------------------------------+
```

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

For U.S.A.

Warning:

This equipment generates and uses radio frequency energy and if not installed and used properly, I.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications.  It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

Warning:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

## Product Precautions

- Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.
- Do not pull or damage the camera cable.
- During camera use, do not wrap he unit in any material. This will cause the internal temperature of the unit to increase.
- Do not expose the camera to moisture, or do not try to operate it in wet areas.
- Do not operate the camera beyond its temperature, humidity and power source ratings.
- While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the CCD or filter area and scratching or damaging this area.
- Do not keep the camera under the following conditions:
  - In wet, moist, and high humidity areas
  - Under hot direct sunlight
  - In high temperature areas
  - Near an object that releases a strong magnetic or electric field
  - Areas with strong vibrations
- Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.

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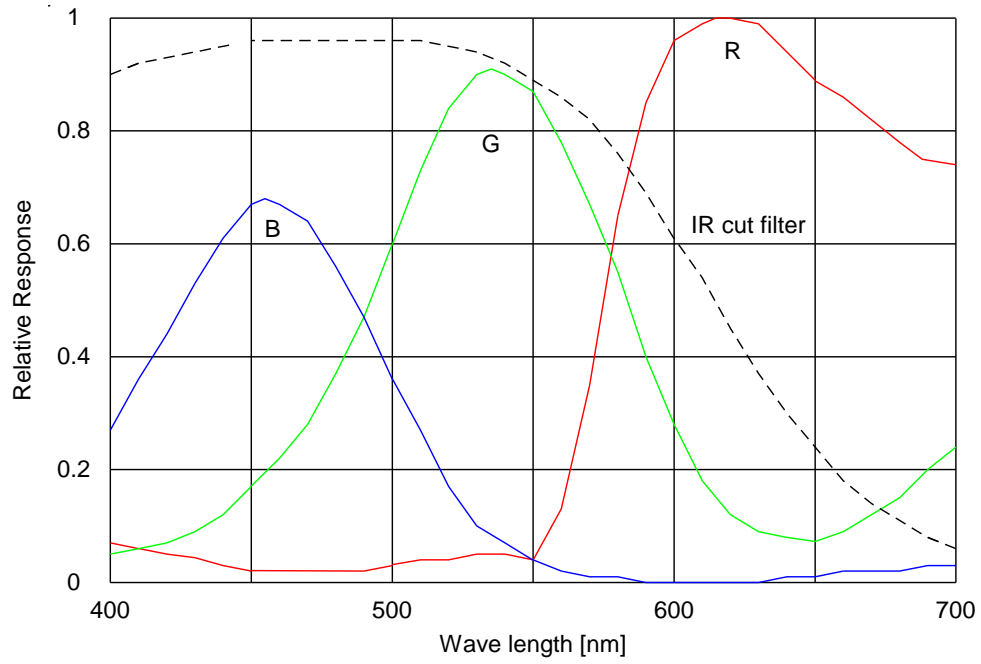Important Note: All specifications are subject to change without prior notice.

# Content

## I. Specifications

### A. Electronic Specifications / Mechanical Specifications / Environmental Specifications

| Product | | | STC-HD133DV (Case Type) | STC-HD133DV-B (Board Type) |
|---|---|---|---|---|
| Electronic Specifications | Imager | | 1/3" Interline SXGA CCD: ICX445AQA | |
| | HD Active Picture Elements | | 1280 (H) x 720 (V) | |
| | Chip Size | | 6.26 (H) x 5.01 (V) mm | |
| | Cell Size | | 3.75 (H) x 3.75 (V) µm | |
| | Minimum Scene Illumination | | 5 Lux at F1.2 at 50% IRE, AGC ON and 1/60 second shutter speed with IR cut filter | |
| | Resolution | | 600 TV Lines | |
| | Sync System | | Internal | |
| | Video Output | | DVI 1.0 conformity RGB, 1280 (H) x 720 (V), 60 Hz / 59.94 Hz / 50 Hz | |
| | Camera Functions | ALC | Can be configured via the UART communication With optical iris, auto electronic shutter and AGC | |
| | | Shutter Speed | Adjustable shutter speed via the UART communication Up to 1/100,000 seconds at 60 Hz or up to 1/83,947 seconds at 50Hz | |
| | | Gain | AGC or Fixed gain, selectable via the UART communication Gain range: 0 to 18.3 dB | |
| | | Digital Gain | Up to 5.9866 dB | |
| | | Gamma | 1.0, 0.9, 0.8, 0.7, 0.6, 0.5, 0.45, 0.3 or manual gamma Gamma selectable via the UART communication | |
| | | White Balance | Auto white balance / manual white balance / push-to-set white balance White balance selectable via the UART communication | |
| | | Mirror Image | Normal Image and Horizontal Flip are selectable via UART communication | |
| | | DSP Presets | 28 DSP presets; Selectable picture mode via the UART communication | |
| | | Line Generator | Both horizontal and vertical with all available colors Thickness adjustable via the UART communication | |
| | | Shadow Mask Generator | Horizontal and vertical w/ shading level adjustment via the UART communication | |
| | | Communication | +3.3V UART communication via 3.5φ stereo jack | |
| | | Character Generator | Built-in character generation function via the UART communication | |
| | | Pixel Blemish Collection | Up to 64 pixel blemish static collection | |
| | Power | Input Voltage | +9Vdc to +15Vdc (Typically: 12Vdc) | |
| | | Consumption | < 3.0 W | |
| Mechanical Specifications | Dimensions | | 40 (W) x 40 (H) x 45.8 (D) mm | 35 (W) x 35 (H) x 46.7 (D) mm |
| | Optical Filter | | Includes IR cut filter | |
| | Lens Mount | | C mount | |
| | Interface Connector | Video Output | HDMI connector | |
| | | Power Input | 12V power jack | |
| | | External Control | 3.5φ stereo jack with SW board | 3.5φ stereo jack with SW board, SM06B-SRSS (JST) 6-pin connector header for connectivity of up to 9 external switch; Functions are listed under "II-B: The Camera Control Functions" |
| | | Communication | 3.5φ stereo jack | |
| | Button | | Primary SW Initial press button function: push-to-set white balance Initial hold button function: Auto white balance (Function is selectable via the UART communication) | |
| | Weight | | Approximately 120 g | Approximately 50 g |
| Environmental Specifications | Temperature | Operational | 0°C to 40°C | |
| | | Storage | -30 to 65°C | |
| | Vibration | | 20Hz to 200Hz to 20Hz (5min./cycle), Acceleration: 10G, 30min., XYZ each direction | - |
| | Shock | | Acceleration: 38G, half amplitude 6ms, 3 times, XYZ each direction | - |
| | Standard Compliancy | | EMS: EN61000-6-2, EMI: 55011 | |
| | RoHS | | RoHS Compliant | |

Spectral Sensitivity Characteristics

## II. Camera Operations

### A. Shutter Settings

1. Formula for the moment of exposure

Setting value is 0 to 63:

$$\text{Exposure time (seconds)} = \left( \text{Vline} \times \text{Hclk} - \frac{\text{Vline} \times \text{Hclk} \times \text{Setting value}}{128} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 64 to 127:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{2} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 64)}{256} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 128 to 191:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{4} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 128)}{512} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 192 to 255:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{8} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 192)}{1{,}024} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 255 to 319:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{16} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 256)}{2{,}048} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 320 to 383:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{32} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 320)}{4{,}096} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 384 to 447:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{64} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 384)}{8{,}192} \right) \times \frac{1}{\text{Fclk}}$$

Setting vlaue is 448 to 551:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{128} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 448)}{16{,}384} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 552 to 575:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{256} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 512)}{32{,}768} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 640 to 690:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{512} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 576)}{65{,}536} \right) \times \frac{1}{\text{Fclk}}$$

Setting value is 576 to 639:

$$\text{Exposure time (seconds)} = \left( \frac{\text{Vline} \times \text{Hclk}}{1{,}024} - \frac{\text{Vline} \times \text{Hclk} \times (\text{Setting value} - 640)}{131{,}072} \right) \times \frac{1}{\text{Fclk}}$$

Vline: Number of lines for 1V   = 750
Fclk: Clock frequency   = 74.25 MHz = 74,250,000
Hclk: Number of clocks for 1H   = 1,650 (60 or 59.94 Hz) or 1,980 (50 Hz)

2. Examples of Exposure Time

    a.    720p – 60Hz, 720P-59.94Hz  Operations

| Value | High Speed Shutter | |
|---|---|---|
| 0 | 16.7 ms | 1/60 s |
| 64 | 8.33 ms | 1/120 s |
| 128 | 4.17 ms | 1/240 s |
| 192 | 2.08 ms | 1/480 s |
| 256 | 1.04 ms | 1/960 s |
| 320 | 520.8 us | 1/1,920 s |
| 384 | 260.4 us | 1/3,840 s |
| 448 | 130.2 us | 1/7,680 s |
| 512 | 65.1 us | 1/15,360 s |
| 576 | 32.6 us | 1/30,720 s |
| 640 | 16.3 us | 1/61,440 s |
| 690 | 10.0 us | 1/100,000 s |

    b.    720p – 50Hz Operations

| Value | High Speed Shutter | |
|---|---|---|
| 0 | 20.0 ms | 1/50 s |
| 64 | 10.0 ms | 1/100 s |
| 128 | 5.00 ms | 1/200 s |
| 192 | 2.50 ms | 1/400 s |
| 256 | 1.25 ms | 1/800 s |
| 320 | 625.0 us | 1/1,600 s |
| 384 | 312.5 us | 1/3,200 s |
| 448 | 156.25 us | 1/6,400 s |
| 512 | 78.13 us | 1/12,800 s |
| 576 | 39.06 us | 1/25,600 s |
| 640 | 19.53 us | 1/51,200 s |
| 690 | 12.0 us | 1/83,947 s |

## B. The Camera Control Functions

| | Function | | | Function |
|---|---|---|---|---|
| 1 | Display Menu | | 48 | Conceal maker (line maker and shadow mask) |
| 2 | DSP preset (+) | | 49 | Display maker (line maker and shadow mask) |
| 3 | DSP preset (-) | | 50 | Display/Conceal maker (line maker and shadow mask) |
| 4 | Contrast (+) | | 51 | Conceal line maker |
| 5 | Contrast (-) | | 52 | Display line maker |
| 6 | Shadow mask shading level (+) | | 53 | Display/Conceal line maker |
| 7 | Shadow mask shading level (-) | | 54 | Conceal shadow mask |
| 8 | Shadow mask top (+) | | 55 | Display shadow mask |
| 9 | Shadow mask top (-) | | 56 | Display/Conceal shadow mask |
| 10 | Shadow mask bottom (+) | | 57 | Save to EEPROM (Horizontal mirror OFF) |
| 11 | Shadow mask bottom (-) | | 58 | Save to EEPROM (Horizontal mirror ON) |
| 12 | Shadow mask top / bottom (+) | | 59 | Save to EEPROM (Horizontal mirror ON/OFF change) |
| 13 | Shadow mask top / bottom (-) | | 60 | Save to EEPROM (Manual white balance) |
| 14 | Shadow mask left (+) | | 61 | Save to EEPROM (Auto white balance) |
| 15 | Shadow mask left (-) | | 62 | Save to EEPROM (Push to set white balance) |
| 16 | Shadow mask right (+) | | 63 | Save to EEPROM (Auto/manual white balance change) |
| 17 | Shadow mask right (-) | | 64 | Save to EEPROM (Undisplay maker (line maker and shadow mask)) |
| 18 | Shadow mask left / right (+) | | | |
| 19 | Shadow mask left / right (-) | | 65 | Save to EEPROM (Display maker (line maker and shadow mask)) |
| 20 | Horizontal line maker color (+) | | | |
| 21 | Horizontal line maker color (-) | | 66 | Save to EEPROM (Display/Undisplay maker (line maker and shadow mask)) |
| 22 | Horizontal line maker size (+) | | | |
| 23 | Horizontal line maker size (-) | | 67 | Save to EEPROM (Conceal line maker) |
| 24 | Horizontal line maker position (+) | | 68 | Save to EEPROM (Display line maker) |
| 25 | Horizontal line maker position (-) | | 69 | Save to EEPROM (Display/Conceal line maker) |
| 26 | Vertical line maker color (+) | | 70 | Save to EEPROM (Conceal shadow mask) |
| 27 | Vertical line maker color (-) | | 71 | Save to EEPROM (Display shadow mask) |
| 28 | Vertical line maker size (+) | | 72 | Save to EEPROM (Display/Conceal shadow mask) |
| 29 | Vertical line maker size (-) | | 73 | Horizontal mirror ON/OFF change (Select: ON, unselect: OFF) |
| 30 | Vertical line maker position (+) | | | |
| 31 | Vertical line maker position (-) | | 74 | Auto/manual white balance change (Select: Auto, unselect: manual) |
| 32 | Horizontal mirror OFF | | | |
| 33 | Horizontal mirror ON | | 75 | Display/Undisplay maker (line maker and shadow mask) (Select: Display, unselect: Conceal) |
| 34 | Horizontal mirror ON/OFF change | | | |
| 35 | Manual white balance | | 76 | Display/Undisplay line maker (Select: Display, unselect: Conceal) |
| 36 | Auto white balance | | | |
| 37 | Push to set white balance | | 77 | Display/Undisplay shadow mask (Select: Display, unselect: Conceal) |
| 38 | Auto/manual white balance change | | | |
| 39 | ALC OFF | | | |
| 40 | ALC ON | | | |
| 41 | ALC ON/OFF change | | | |
| 42 | Fixed shutter | | | |
| 43 | Auto shutter | | | |
| 44 | Auto/fixed shutter change | | | |
| 45 | Fixed gain | | | |
| 46 | AGC ON | | | |
| 47 | Fixed gain/AGC change | | | |

## C. External Control Board Circuits

SW board circuits for 3.5 Φ stereo jack (External SW)
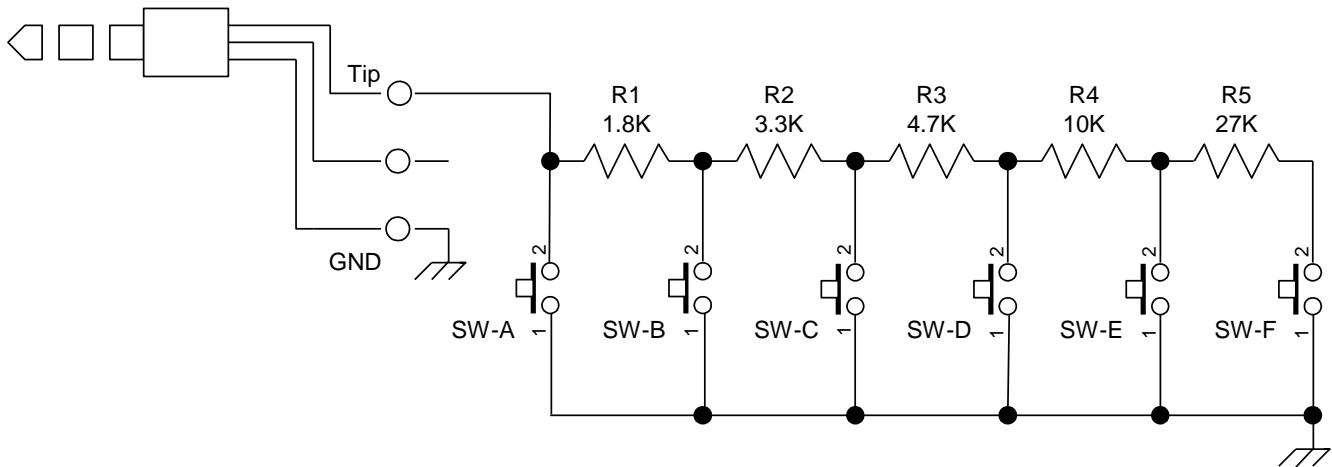


SW board circuits for SM06B-SRSS-TB (JST) on Board type (Board SW)
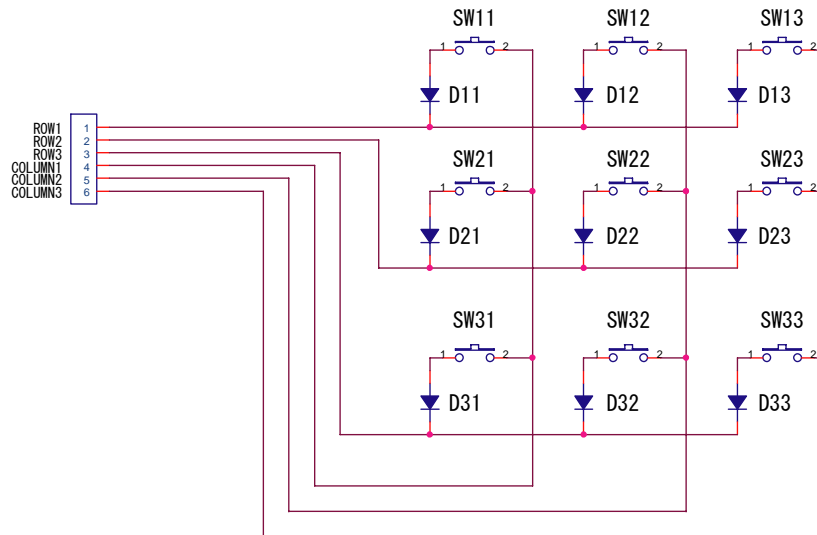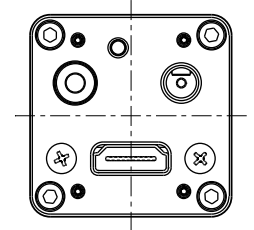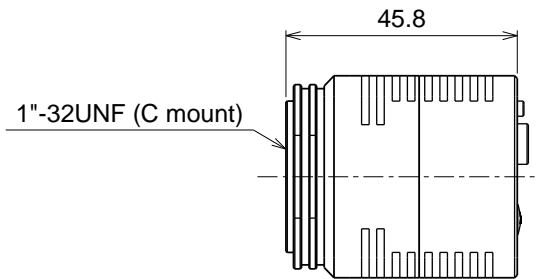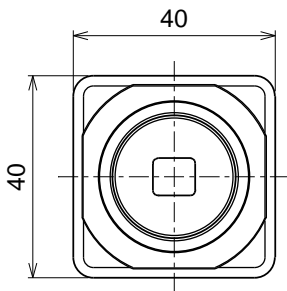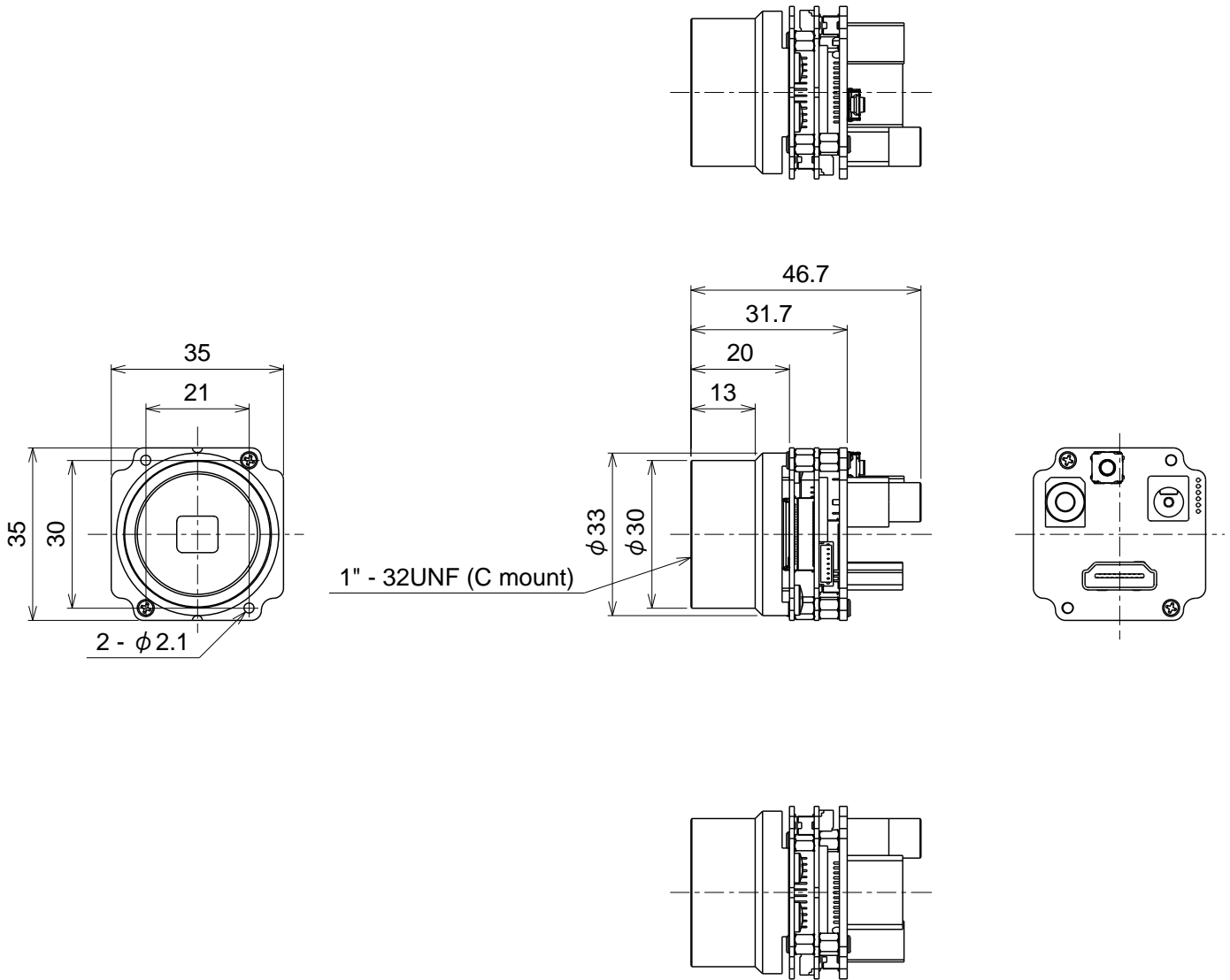
## III. Dimensions

A. STC-HD133DV

16
12.5   30
Tripod depth 5 (Top and bottom)
4-M4 depth 4 (Top and bottom)
28
14

40
40

45.8

1"-32UNF (C mount)

Unit: mm

B. STC-HD133DV-B

35

21

35

30

2 - φ2.1

1" - 32UNF (C mount)

46.7

31.7

20

13

φ33

φ30
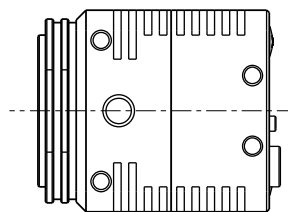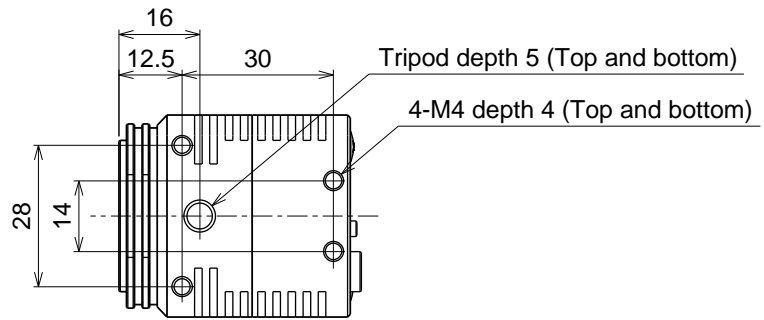
Unit: mm

**Revisions**

| Rev | Date | Changes | Note |
|---|---|---|---|
| 0.01 | 2009/12/29 | New document | |
| 0.02 | 2010/1/12 | Corrected:<br>Mirror Image – Only horizontal flip<br>DSP Preset – 28 settings | |
| 0.03 | 2011/3/1 | Updated<br>1. Revised the shutter speed for the 50Hz<br>2. Added the 59.94 Hz specifications<br>3. Change the minimum scene illumination<br>4. Change the power consumption<br>5. Change the mirror image specification<br>6. Added the control button for the display menu | |
| 1.0 | 2011/7/5 | Update<br>  1. Changed the dimensions (board version)<br>  2. Added the resolution<br>  3. Add the formula for shutter speed<br>  4. Added vibration spec<br>  5. Add the shock spec<br>  6. Revise the operational temperature<br>  7. Added spectral sensitivity | |

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