

# Driver circuit for CCD image sensor



C11165

## Driver circuit for CCD image sensor (S11155/S11156-2048)

The C11165 is a driver circuit designed for HAMAMATSU CCD image sensor S11155/S11156-2048. The C11165 can be used in spectrometers when combined with the S11155/S11156-2048.

The C11165 holds a CCD driver circuit, analog video signal processing circuit (16-bit A/D converter), timing generator, control circuit and power supply. The C11165 converts analog video signals from a CCD into digital signals and outputs them. The USB connector (USB 2.0) provided as a standard feature easily connects to a PC for the C11165 control and data acquisition. The C11165 also has a BNC connector for external trigger input and pulse output. The C11165 is compact, lightweight and very easy to handle.

Application software (DCam-USB) that comes with the C11165 allows easy operation from a PC running on Windows 2000/XP. A function library (DCamUSB.DDL) included with the application software helps you to develop your own software. This software is available with DLL to help you develop your own software programs under various developmental environments.

### Features

- Built-in 16-bit A/D converter
- Adjustable offset
- Adjustable gain
- Interface of computer: USB 2.0
- Power supply: DC+5 V

### Applications

- Spectrometer
- Control of CCD image sensor (S11155/S11156-2048) and data acquisition

The table below shows CCD image sensor applicable for the C11165. Since the C11165 does not include a CCD image sensor, so select the desired sensor and order it separately.

| Type no. | CCD area image sensor |                  |                         |                 |                               |
|----------|-----------------------|------------------|-------------------------|-----------------|-------------------------------|
|          | Type no.              | Number of pixels | Number of active pixels | Pixel size (μm) | Active area [mm (H) × mm (V)] |
| C11165   | S11155-2048           | 2068 × 1         | 2048 × 1                | 14 × 500        | 28.672 × 0.500                |
|          | S11156-2048           |                  |                         | 14 × 1000       | 28.672 × 1.000                |

### Absolute maximum ratings

| Parameter              | Symbol | Condition | Value      | Unit |
|------------------------|--------|-----------|------------|------|
| Supply voltage         | -      | Ta=25 °C  | +7         | V    |
| Operating temperature* | Topr   |           | 0 to +50   | °C   |
| Storage temperature*   | Tstg   |           | -20 to +70 | °C   |
| Operating humidity*    | -      |           | 70 max.    | %    |

\* No condensation

### ▣ Specifications (Typ. Ta=25 °C, unless otherwise noted)

| Parameter                 | Condition   | Specification   | Unit                |
|---------------------------|-------------|-----------------|---------------------|
| Scanning                  |             | 6               | MHz                 |
| Line readout time         |             | 377.5           | μs                  |
| Data transfer time        |             | 344.67          | μs                  |
| Total transfer time       |             | 722.17          | μs                  |
| A/D conversion resolution | 65535ADU    | 16              | bit                 |
| Conversion gain           |             | 3.6             | e <sup>-</sup> /ADU |
| Readout noise             | Gain=1      | 12              | ADU                 |
| Dynamic range             |             | 5461            | -                   |
| Interface                 |             | USB 2.0         | -                   |
| Supply voltage            | 950 mA typ. | DC + 4.5 to 5.5 | V                   |
| Dimension                 |             | 80 (H) × 80 (W) | mm                  |
| Weight                    |             | Approx. 65      | g                   |

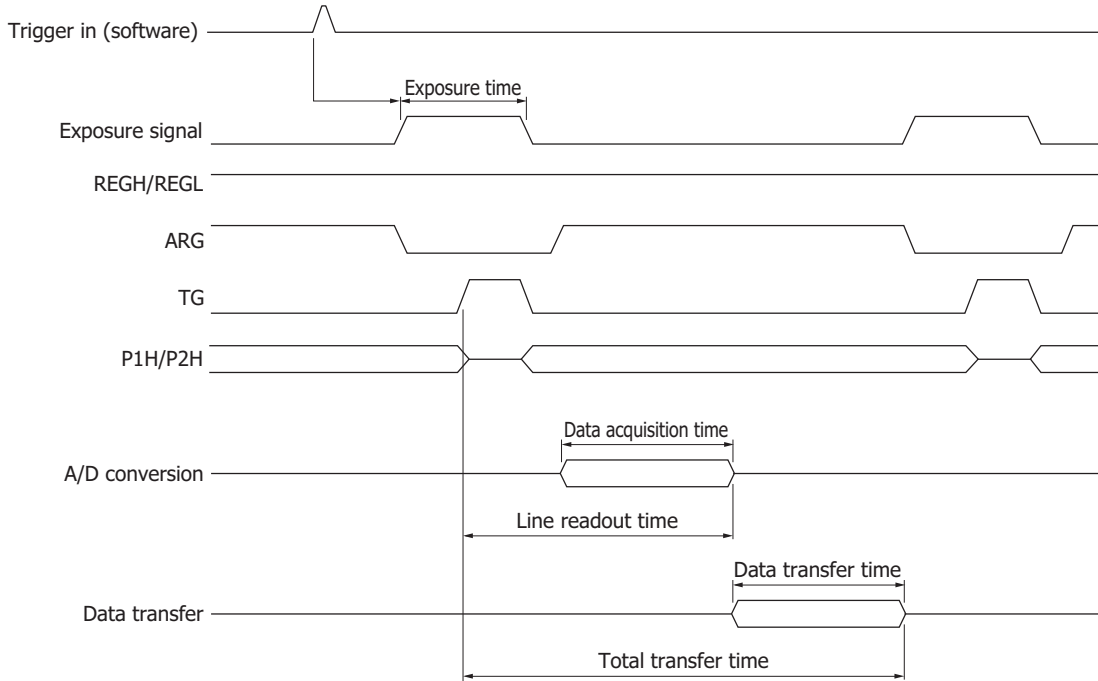
### ▣ Functions

| Parameter                         |  | Specification   |
|-----------------------------------|--|---|
| Operating mode setting            | Suspend mode (LED-off)                         | The power supply is turned off.   |
|                                   | Standby mode (LED-white)                       | It is Standby state, in which the data acquisition is possible.   |
|                                   | Data transfer mode (LED-green, aqua, blue)     | In this mode, the driver circuit sends the data to PC.  |
| Selectable data acquisition modes | Internal synchronous mode ("INT" mode)         | Data is acquired on the basis of the trigger timing generated by application software.  |
|                                   | External synchronous mode 1 ("EXT.EDGE" mode)  | Data is acquired in synchronization with the external trigger signal input from the BNC connector. In synchronization with an edge of the external trigger signal, data is accumulated for the set integration time and is then output. |
|                                   | External synchronous mode 2 ("EXT.LEVEL" mode) | Data is acquired in synchronization with the external trigger signal input from the BNC connector. Data is accumulated for a period equal to the pulse width of the external trigger signal and is then output.                         |
| Gain adjustment                   |  | The gain value can be varied in the range of "1 to 10" with the step of 1. Default value is "1".  |
| Offset adjustment                 |  | The offset value can be varied in the range of "0 to 1020" with the step of 4. Default value is "40".   |
| Pulse output signal setting       |  | It is possible to set the timing of the pulse output signal that is output from the "BNC connector for pulse output" of the driver circuit.   |

**Timing chart**

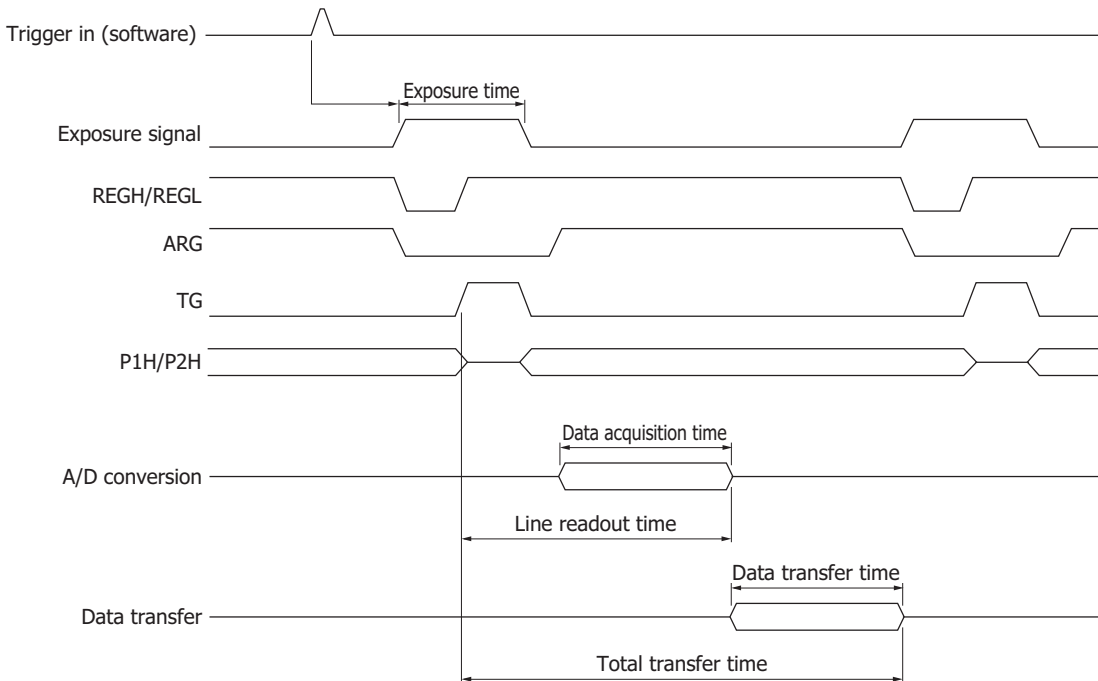
Internal synchronous mode ("INT" mode)

■ Non-MPP operation



KACCC0528EA

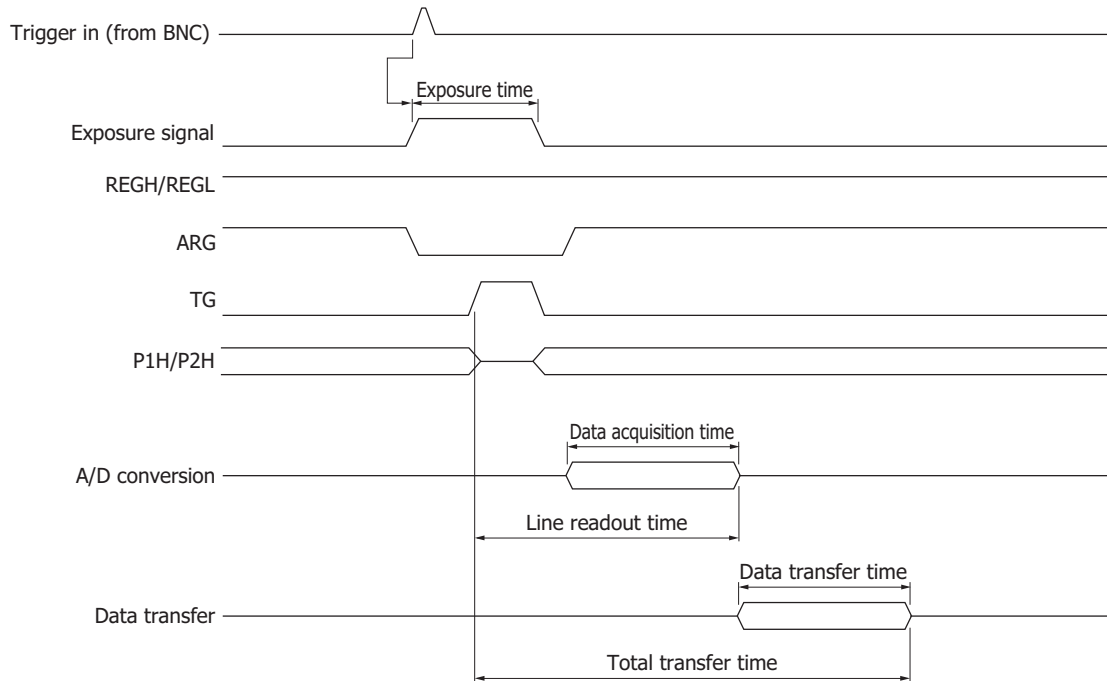
■ MPP operation



KACCC0529EA

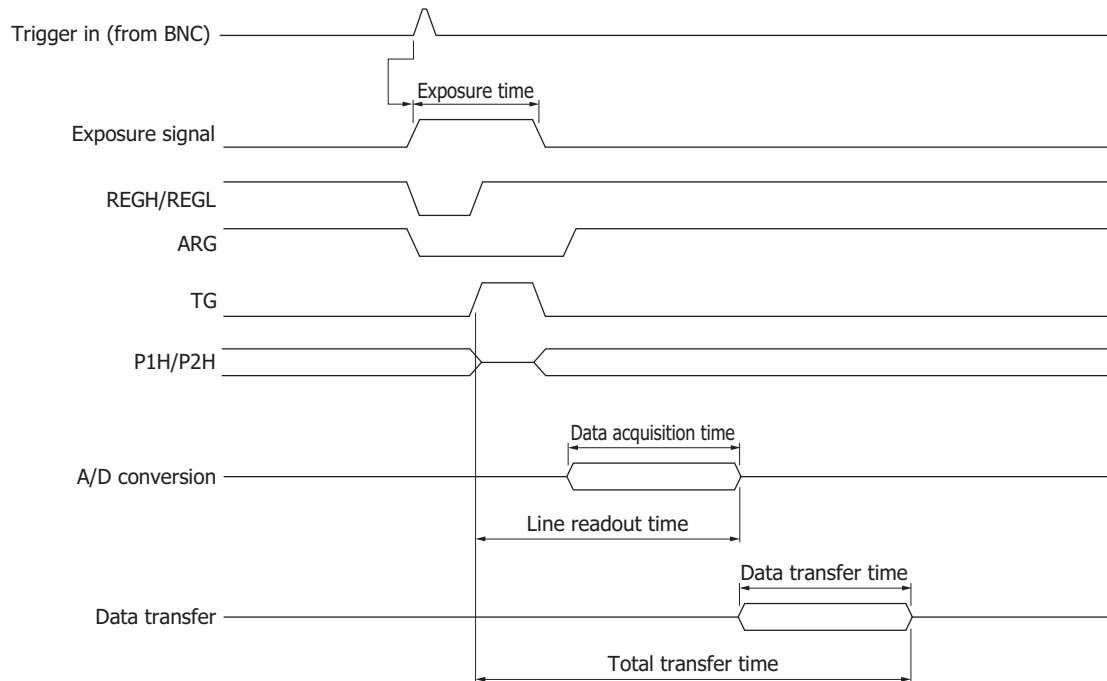
External synchronous mode 1 ("EXT.EDGE" mode)

■ Non-MPP operation



KACCC0530EA

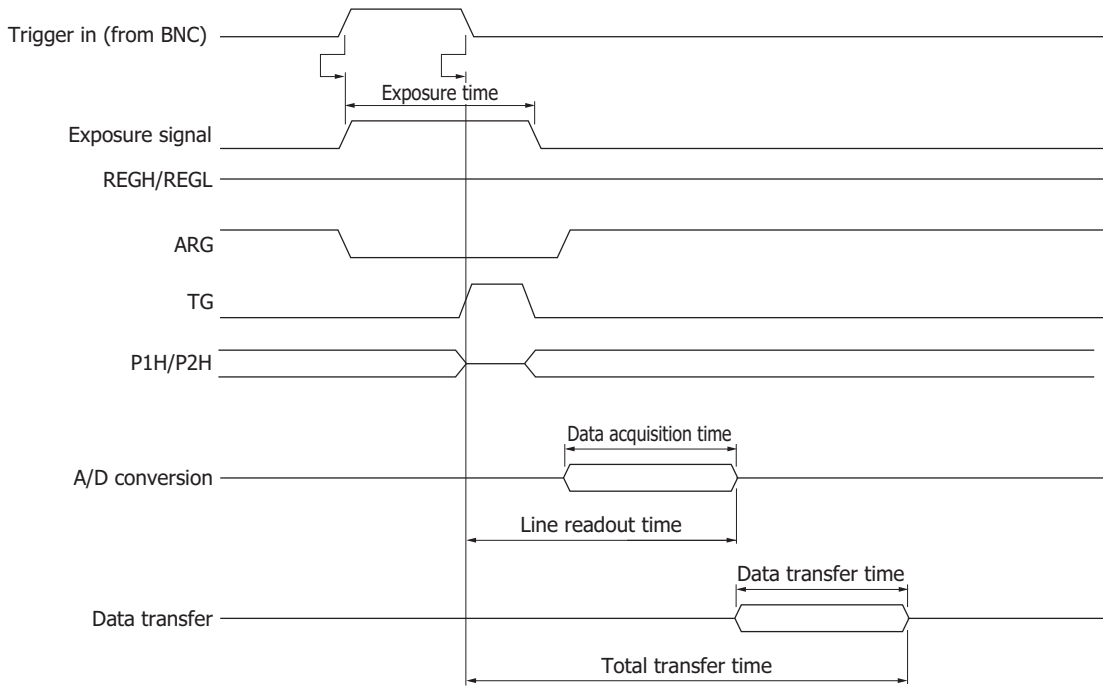
■ MPP operation



KACCC0531EA

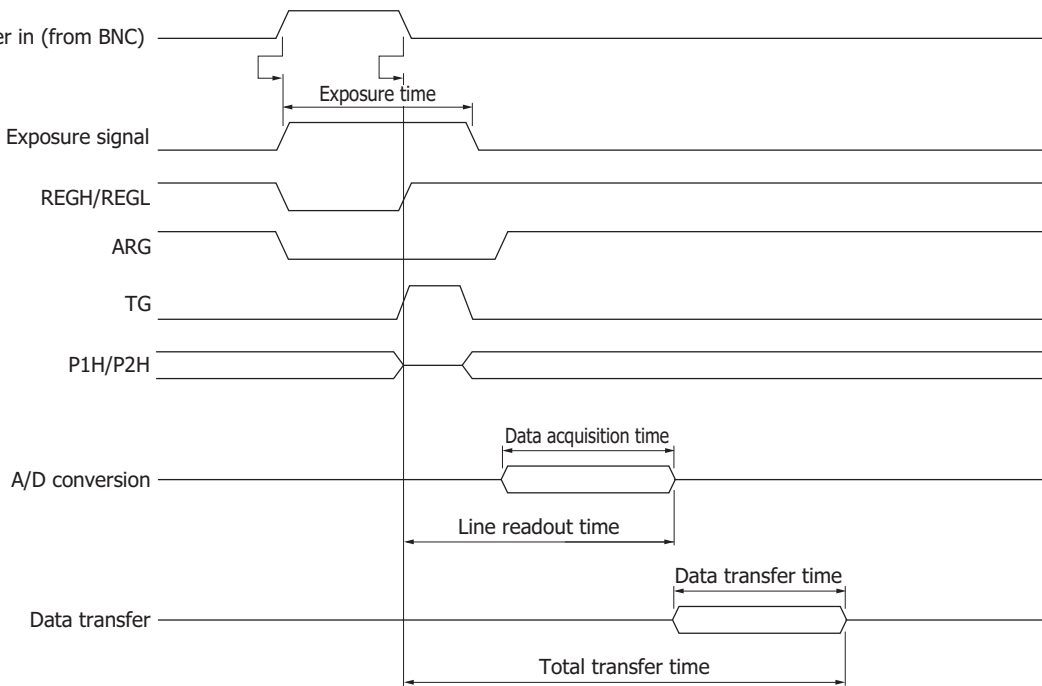
External synchronous mode 2 ("EXT.LEVEL" mode)

■ Non-MPP operation



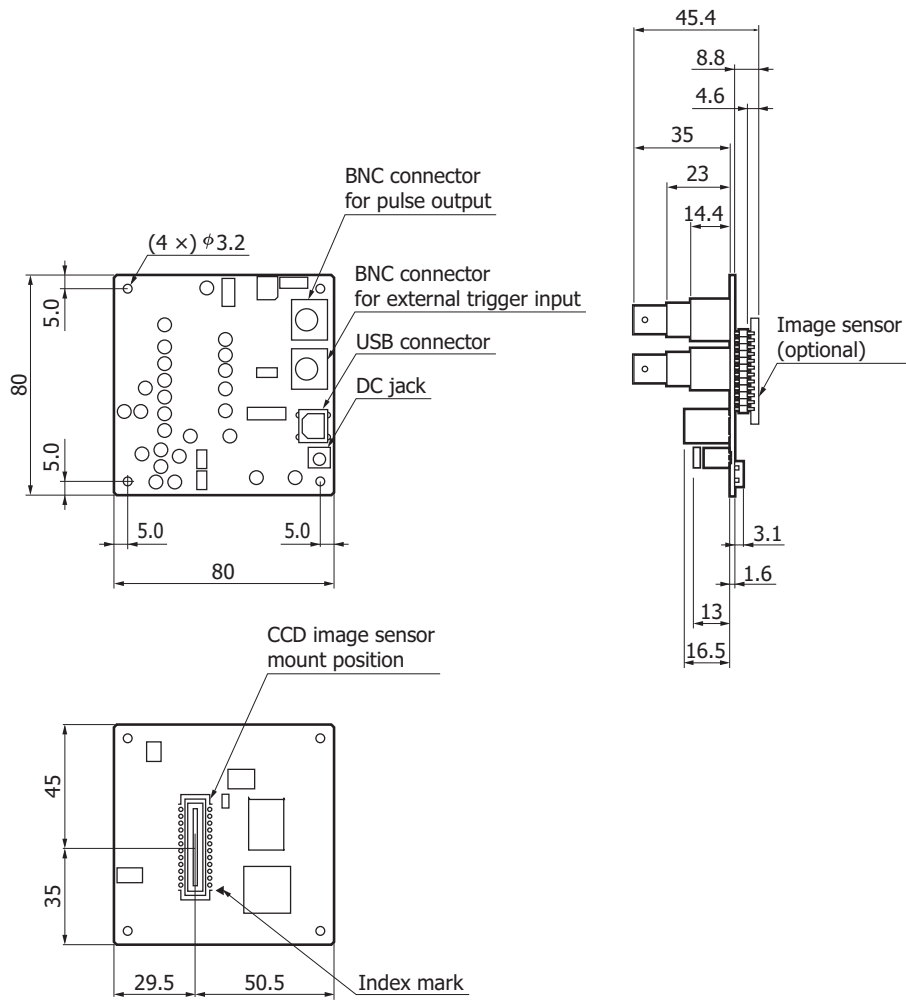
KACCC0532EA

■ MPP operation



KACCC0533EA

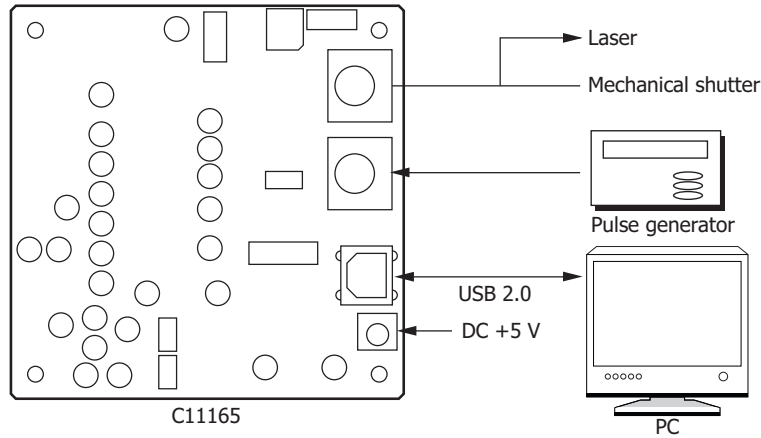
Dimensional outline (unit: mm)



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### Connection examples

Refer to the following diagram to connect hardware peripherals.



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### Accessories

- CD-ROM (includes C11165 instruction manual, application software, SDK)
- USB cable
- AC adapter

### Related information

- CCD linear image sensors S11155-2048, S11156-2048  
[http://jp.hamamatsu.com/resources/products/ssd/pdf/s11155-2048\\_etc\\_kmpd1118e03.pdf](http://jp.hamamatsu.com/resources/products/ssd/pdf/s11155-2048_etc_kmpd1118e03.pdf)
- Characteristics and use of resistive gate type CCD linear image sensors with electronic shutter  
[http://jp.hamamatsu.com/sp/ssd/CCD\\_e.html](http://jp.hamamatsu.com/sp/ssd/CCD_e.html)

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Type numbers of products listed in the specification sheets or supplied as samples may have a suffix "(X)" which means tentative specifications or a suffix "(Z)" which means developmental specifications. ©2010 Hamamatsu Photonics K.K.

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