

2700 pixel CCD Linear Sensor (B/W)

Description

The ILX523A is a reduction type CCD linear sensor designed for facsimile, scanner and OCR use. This sensor reads A3 size documents at a density of 200 DPI (Dot Per Inch).

In addition, this can be directly driven at 5V logic and operate on single 12V power supply for easy use.

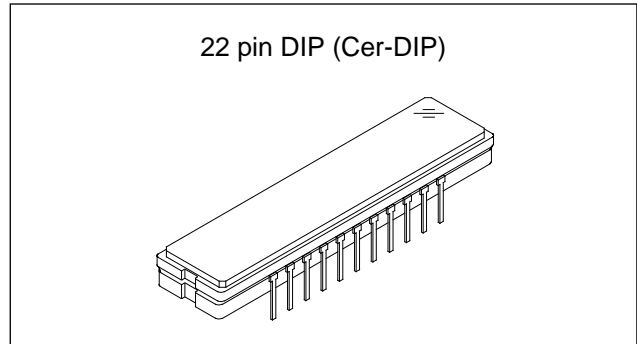
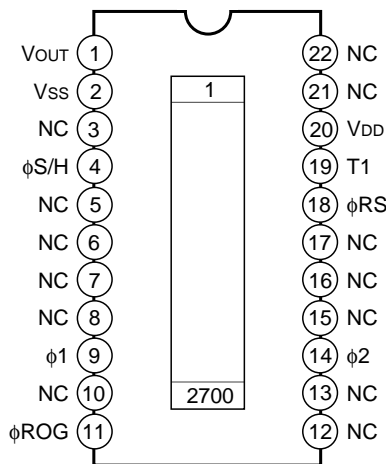
Features

- Number of effective pixels: 2700 pixels
- Pixel size: 11µm × 11µm (11µm pitch)
- Ultra low lag/High Sensitivity
- Built-in Feed through suppression circuit
- Built-in Sample-and-hold circuit
- Maximum data rate: 5MHz
- Single 12V power supply

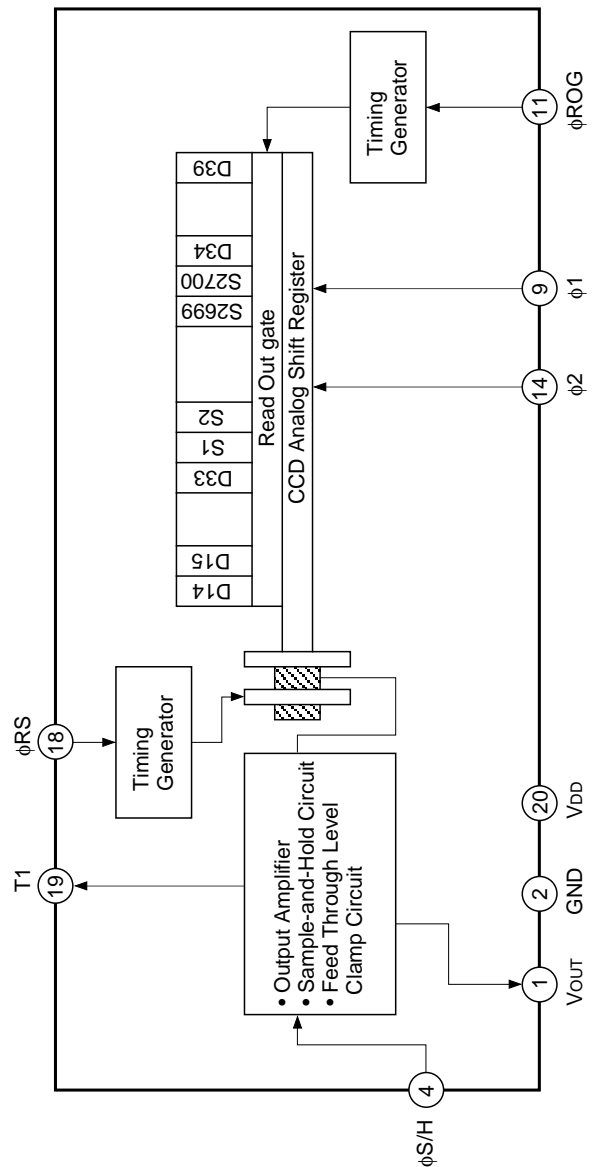
Absolute Maximum Ratings

- Supply voltage V_{DD} 15 V
- Operating temperature -10 to +60 °C
- Storage temperature -30 to +80 °C

Pin Configuration (Top View)



Block Diagram



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Pin Description

| Pin No. | Symbol | Description | Pin No. | Symbol | Description |
|---------|------------------|-----------------------|---------|-----------------|------------------|
| 1 | V _{OUT} | Signal output | 12 | NC | NC |
| 2 | GND | GND | 13 | NC | NC |
| 3 | NC | NC | 14 | ϕ 2 | Transfer pulse 2 |
| 4 | ϕ S/H | Sample-and-Hold pulse | 15 | NC | NC |
| 5 | NC | NC | 16 | NC | NC |
| 6 | NC | NC | 17 | NC | NC |
| 7 | NC | NC | 18 | ϕ RS | Reset gate pulse |
| 8 | NC | NC | 19 | T1 | Test pin (Open) |
| 9 | ϕ 1 | Transfer pulse 1 | 20 | V _{DD} | 12V power supply |
| 10 | NC | NC | 21 | NC | NC |
| 11 | ϕ ROG | Read out gate pulse | 22 | NC | NC |

Note) Connect Pin 4 to GND when not using internal sample-and-hold circuit.

Recommended Pin Voltage

| Item | Min. | Typ. | Max. | Unit |
|-----------------|------|------|------|------|
| V _{DD} | 11.4 | 12.0 | 12.6 | V |

Clock Characteristics

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---------------------------------|--------------|------|------|------|------|
| Input capacitance of ϕ 1 | C ϕ 1 | — | 300 | — | pF |
| Input capacitance of ϕ 2 | C ϕ 2 | — | 300 | — | pF |
| Input capacitance of ϕ ROG | C ϕ ROG | — | 10 | — | pF |
| Input capacitance of ϕ RS | C ϕ RS | — | 10 | — | pF |
| Input capacitance of ϕ S/H | C ϕ S/H | — | 10 | — | pF |
| Data Rate | — | — | 1.0 | 5.0 | MHz |

Electrooptical Characteristics

(Ta = 25°C, VDD = 12V, data rate = 1MHz, mode without S/H (Pin 4 = GND), light source = 3200K, IR cut filter CM-500S (t = 1.0mm) used)

| Item | Symbol | Min. | Typ. | Max. | Unit | Remarks |
|---------------------------|--------|------|------|-------|------------|---------|
| Sensitivity | R1 | 66.5 | 95 | 123.5 | V/(lx · s) | Note 1 |
| Sensitivity nonuniformity | PRNU | — | 2.0 | 10.0 | % | Note 2 |
| Saturation output voltage | VSAT | 2.0 | 2.5 | — | V | — |
| Dark voltage average | VDRK | — | 2.0 | 8.0 | mV | Note 3 |
| Dark signal nonuniformity | DSNU | — | 7.0 | 14.0 | mV | Note 3 |
| Image Lag | IL | — | 0.02 | — | % | Note 4 |
| Dynamic range | DR | — | 1250 | — | — | Note 5 |
| Saturation exposure | SE | — | 0.02 | — | lx · s | Note 6 |
| Supply current | IvDD | — | 15.0 | 25.0 | mA | — |
| Total transfer efficiency | TTE | 92.0 | 98.0 | — | % | — |
| Output impedance | Zo | — | 300 | — | Ω | — |
| Offset level | Vos | — | 7.4 | — | V | Note 7 |

Notes)

1. For the sensitivity test, light is applied with a uniform intensity of illumination.
2. PRNU is defined as indicated below. Ray incidence conditions are the same as for Note 1. The output signal amplitude for test is 1V.

$$PRNU = \frac{(V_{MAX} - V_{MIN})/2}{V_{AVE}} \times 100 [\%]$$

The maximum output of all the valid pixels is set to VMAX, the minimum output to VMIN and the average output to VAVE.

3. Optical signal accumulated time stands at 10ms.
4. Output signal amplitude VOUT = 500mV.
5. Dynamic range is defined as follows.

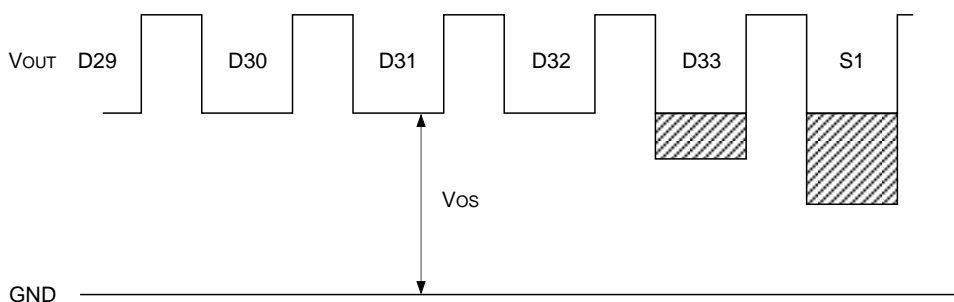
$$DR = \frac{V_{SAT}}{V_{DRK}}$$

When the optical signal accumulated time is shorter, the dynamic range gets wider because the optical signal accumulated time is in proportion to the dark voltage.

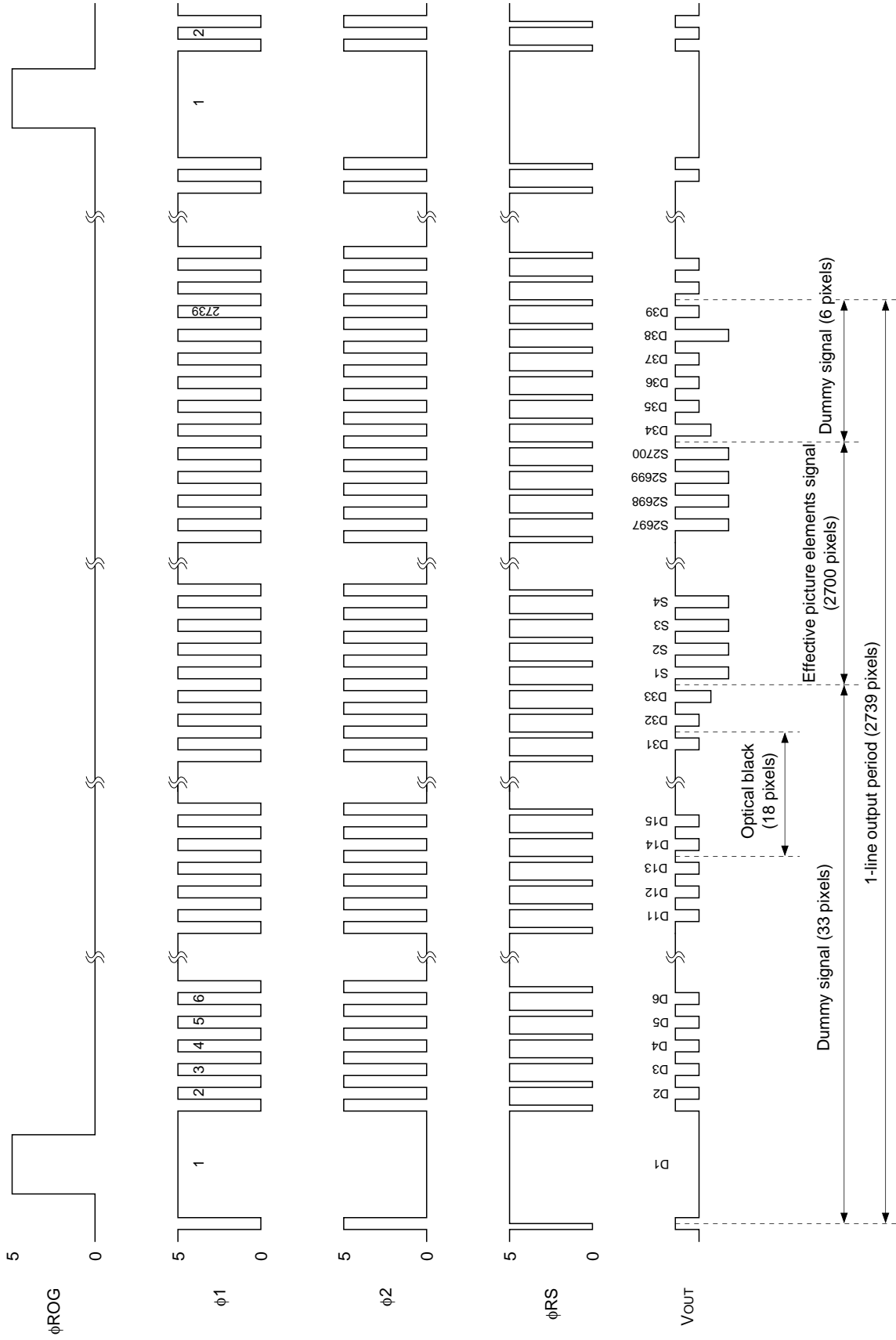
6. Saturation exposure is defined as follows.

$$SE = \frac{V_{SAT}}{R1}$$

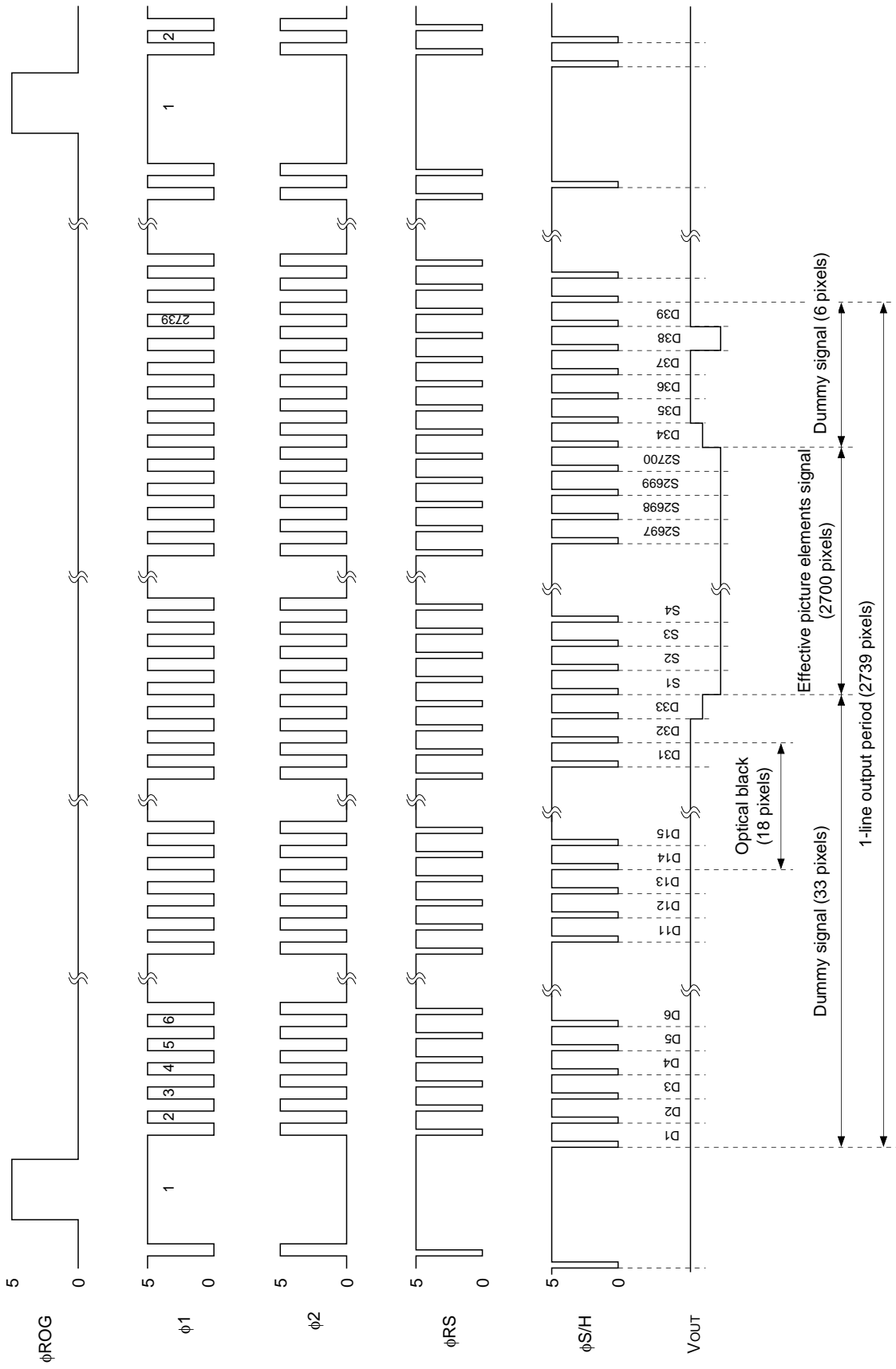
7. Vos is defined as indicated below.



Clock Timing Diagram (without internal sample-and-hold circuit)



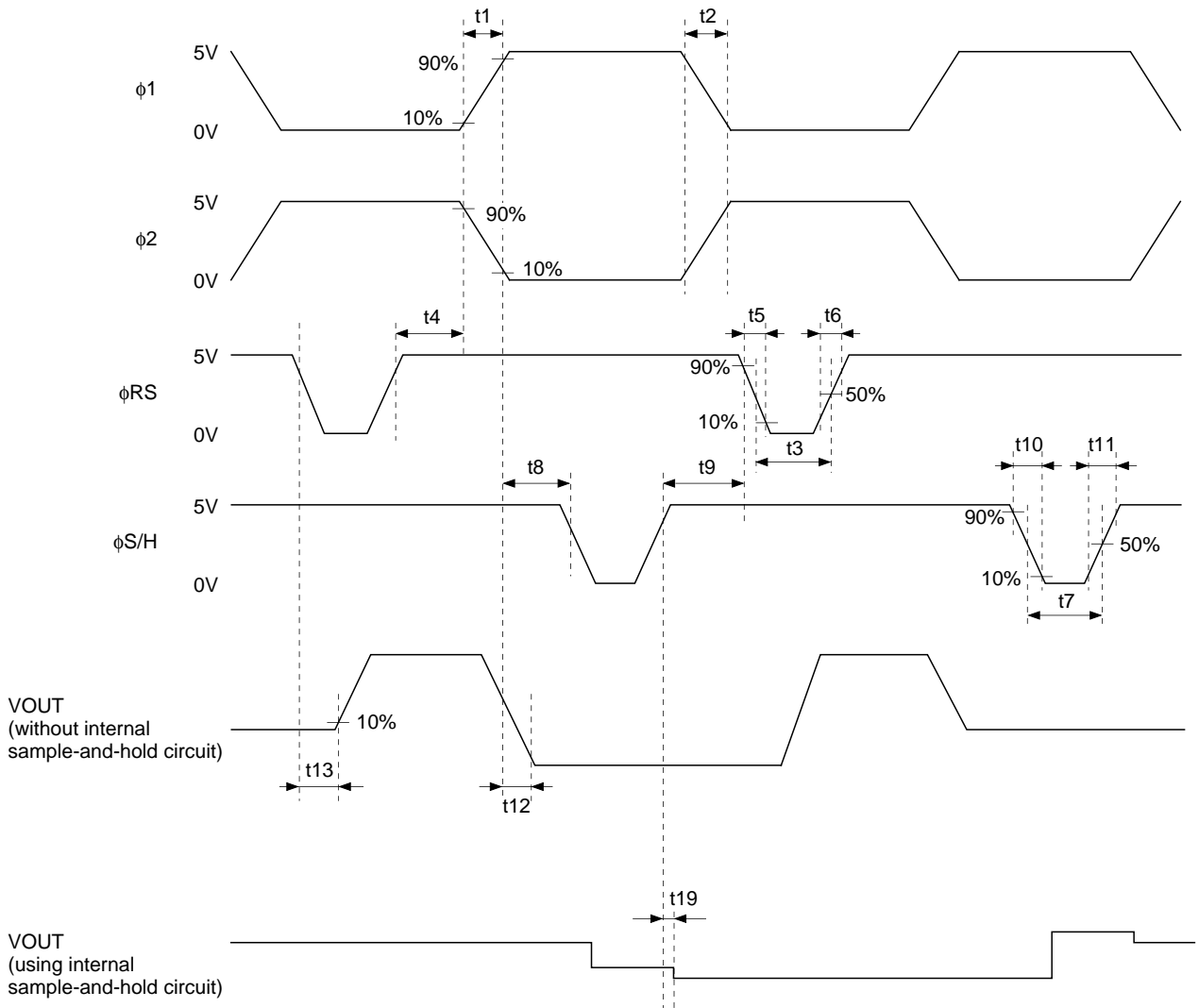
Clock Timing Diagram (using internal sample-and-hold circuit)



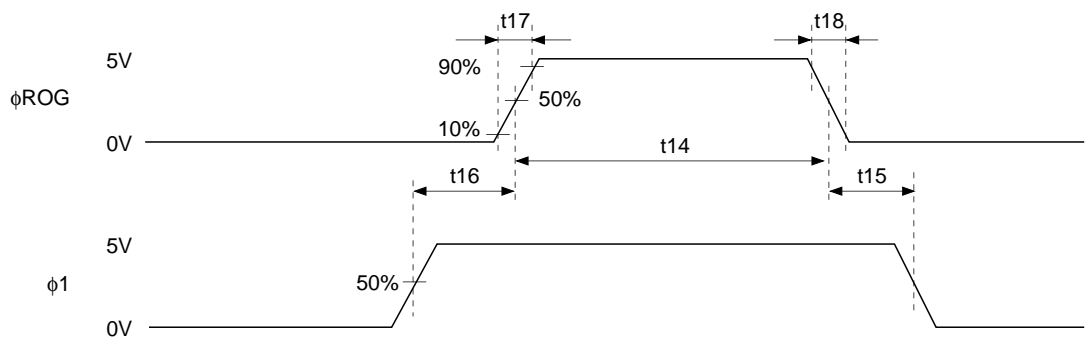
Note) 2750 or more clock pulses (ϕ 1, ϕ 2, ϕ RS, ϕ S/H) are required.

Input Clock Waveform Conditions

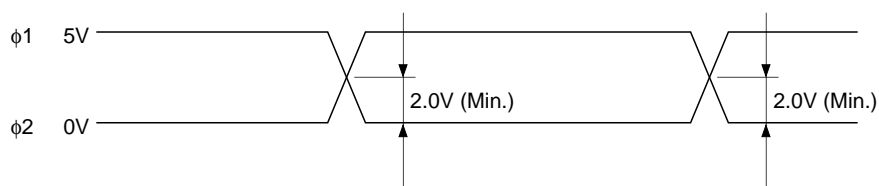
$\phi 1$, $\phi 2$, ϕRS , $\phi S/H$ pulses related



ϕROG , $\phi 1$ pulses related



Cross point $\phi 1$ and $\phi 2$

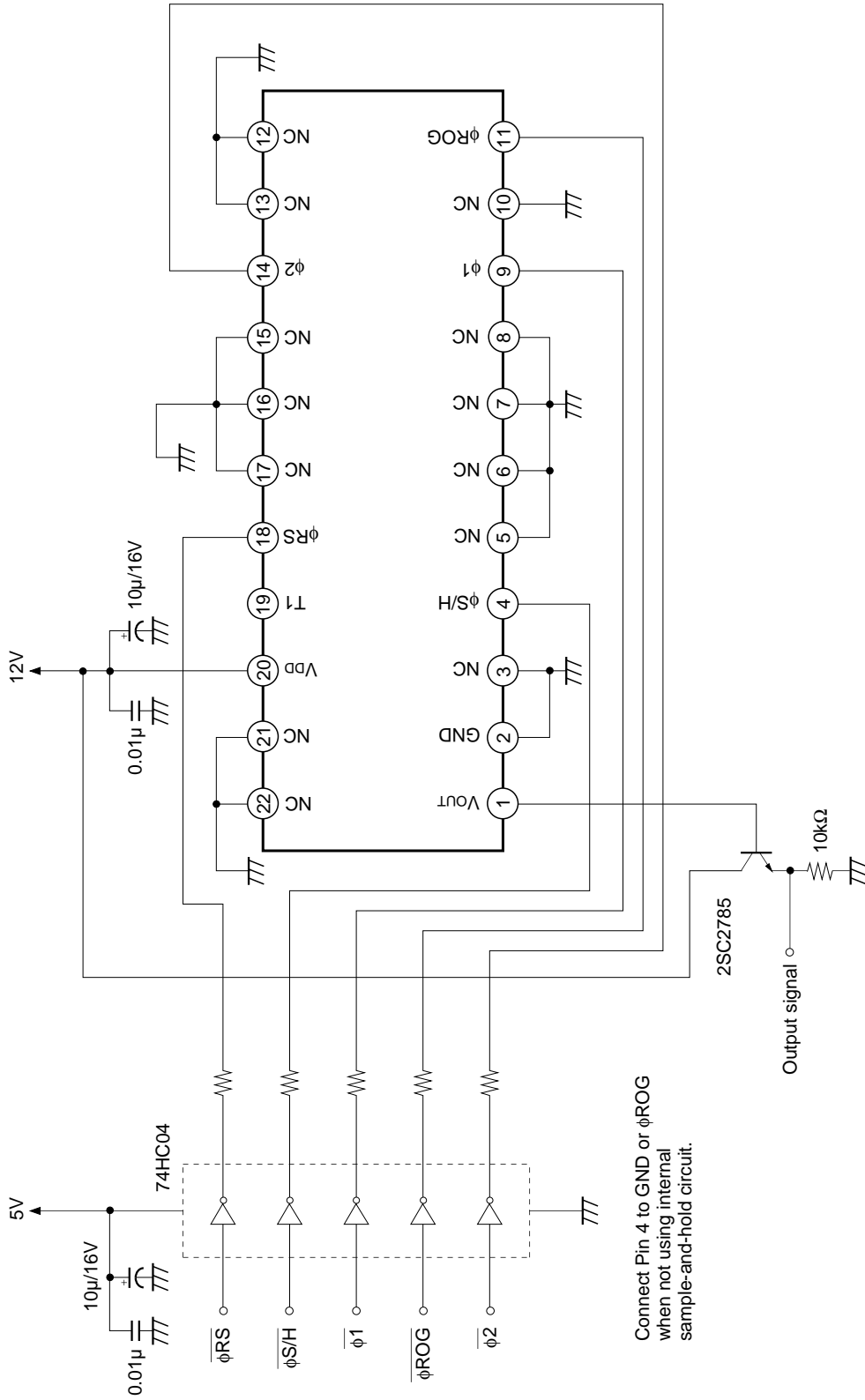


Input Clock Waveform Conditions

| Item | Symbol | Min. | Typ. | Max. | Unit |
|--|------------|------|-------|------|------|
| $\phi 1, \phi 2$ rise/fall time | t1, t2 | 0 | 50 | 100 | ns |
| ϕRS pulse low level period | t3 | 20 | 80*1 | 200 | ns |
| $\phi 1, \phi 2 - \phi RS$ pulse timing | t4 | 25 | 200*1 | 350 | ns |
| ϕRS rise/fall time | t5, t6 | 0 | 10 | 40 | ns |
| $\phi S/H$ pulse low level period | t7 | 20 | 80*1 | 200 | ns |
| $\phi 1, \phi 2 - \phi S/H$ pulse timing | t8 | 70 | 200*1 | 350 | ns |
| $\phi RS - \phi S/H$ pulse timing | t9 | 15 | — | — | ns |
| $\phi S/H$ rise/fall time | t10, t11 | 0 | 10 | 40 | ns |
| Signal output delay time | t12 | — | 40 | — | ns |
| | t13 | — | 20 | — | ns |
| | t19 | — | 20 | — | ns |
| ϕROG pulse high level period | t14 | 500 | 1000 | — | ns |
| $\phi 1 - \phi ROG$ pulse timing | t15, t16 | 500 | 1000 | — | ns |
| ϕROG rise/fall time | t17, t18 | 0 | 50 | 100 | ns |
| Input clock pulse voltage | High level | 4.5 | 5 | 5.5 | V |
| | Low level | 0 | — | 0.5 | V |

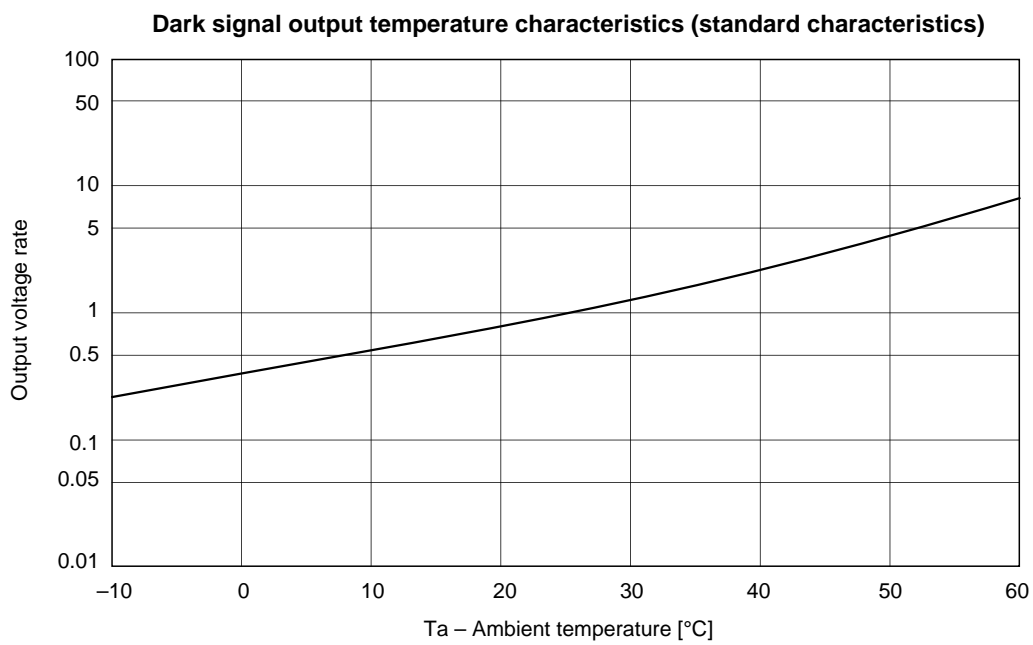
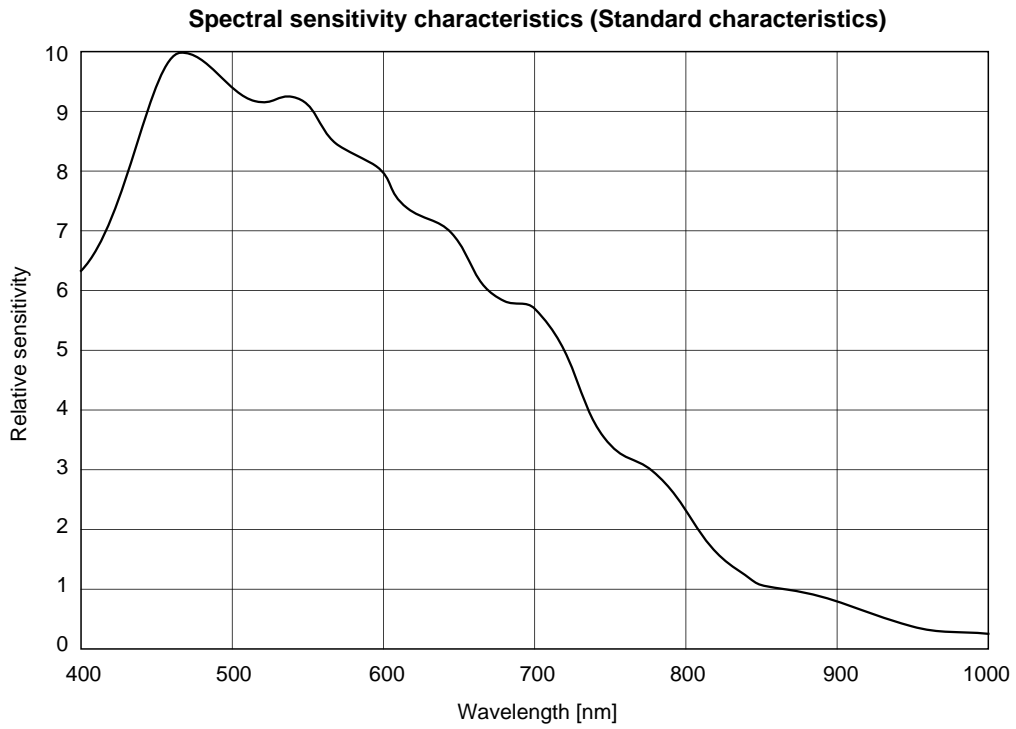
*1 Recommended conditions for data rate = 1MHz.

Application Circuit

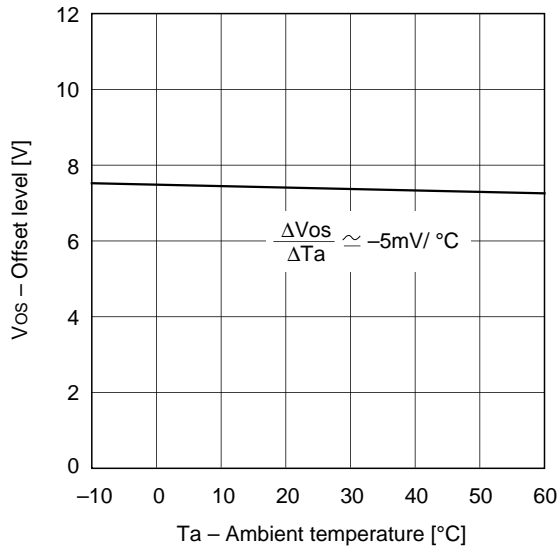


Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

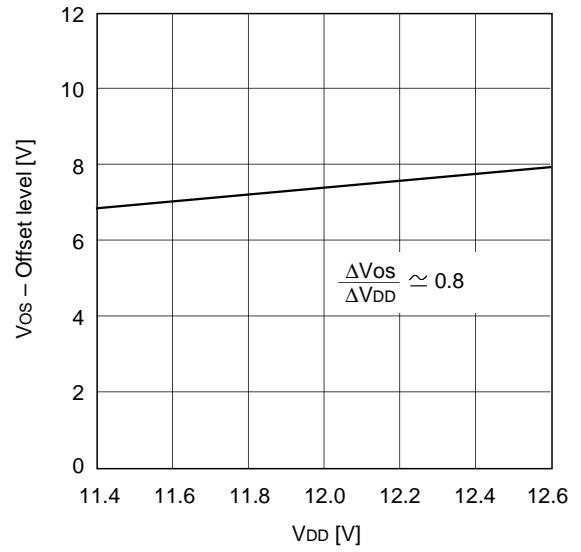
Example of Representative Characteristics ($V_{DD} = 12V$, $T_a = 25^\circ C$)



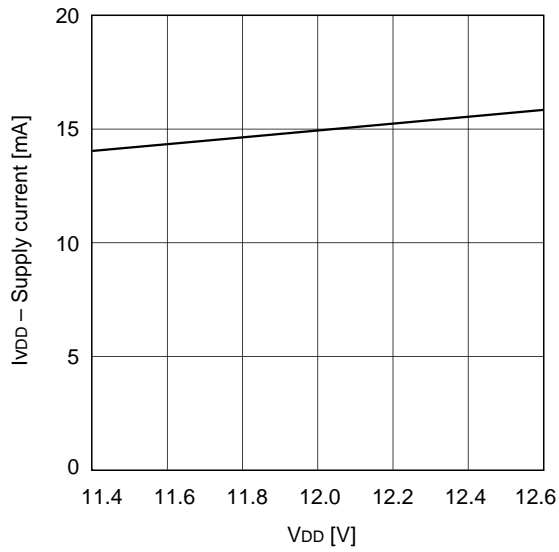
**Offset level vs. Temperature characteristics
(Standard characteristics)**



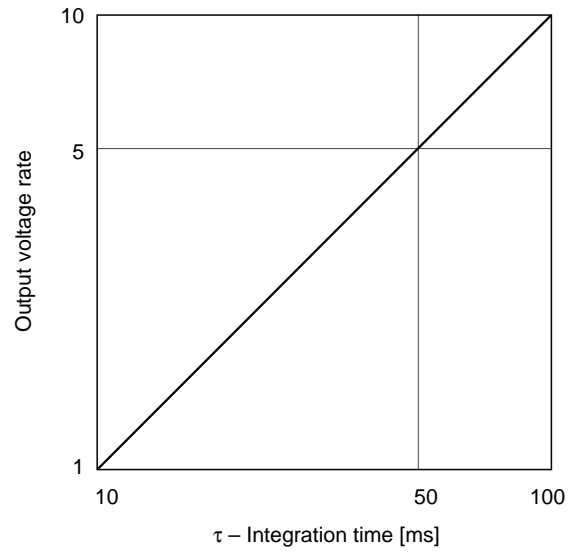
**Offset level vs. VDD characteristics
(Standard characteristics)**



**Supply current vs. VDD characteristics
(Standard characteristics)**



**Output voltage vs. Integration time
(Standard characteristics)**



Notes on Handling

1) Static charge prevention

CCD image sensors are easily damaged by static discharge. Before handling be sure to take the following protective measures.

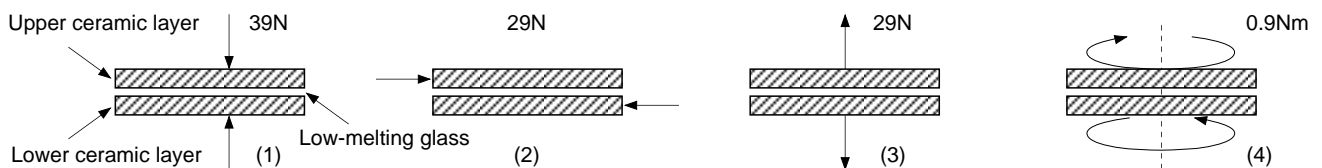
- a) Either handle bare handed or use non chargeable gloves, clothes or material.
Also use conductive shoes.
- b) When handling directly use an earth band.
- c) Install a conductive mat on the floor or working table to prevent the generation of static electricity.
- d) Ionized air is recommended for discharge when handling CCD image sensor.
- e) For the shipment of mounted substrates, use boxes treated for prevention of static charges.

2) Notes on Handling CCD Cer-DIP Packages

The following points should be observed when handling and installing Cer-DIP packages.

a) Remain within the following limits when applying static load to the ceramic portion of the package:

- (1) Compressive strength: 39N/surface (Do not apply load more than 0.7mm inside the outer perimeter of the glass portion.)
- (2) Shearing strength: 29N/surface
- (3) Tensile strength: 29N/surface
- (4) Torsional strength: 0.9Nm



b) In addition, if a load is applied to the entire surface by a hard component, bending stress may be generated and the package may fracture, etc., depending on the flatness of the ceramic portion. Therefore, for installation, either use an elastic load, such as a spring plate, or an adhesive.

c) Be aware that any of the following can cause the glass to crack: because the upper and lower ceramic layers are shielded by low-melting glass,

- (1) Applying repetitive bending stress to the external leads.
- (2) Applying heat to the external leads for an extended period of time with soldering iron.
- (3) Rapid cooling or heating.
- (4) Rapid cooling or impact to a limited portion of the low-melting glass with a small-tipped tool such as tweezers.
- (5) Prying the upper or lower ceramic layers away at a support point of the low-melting glass.

Note that the preceding notes should also be observed when removing a component from a board after it has already been soldered.

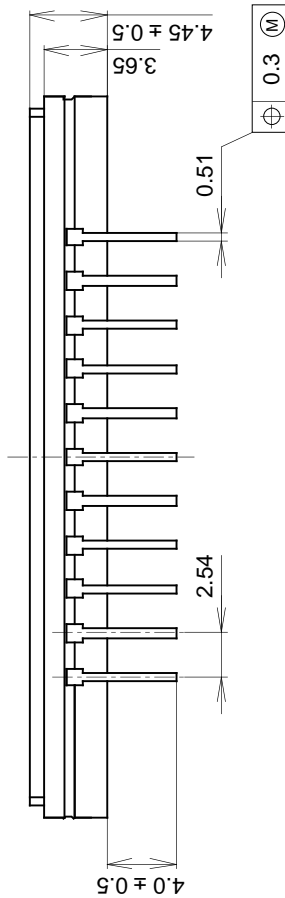
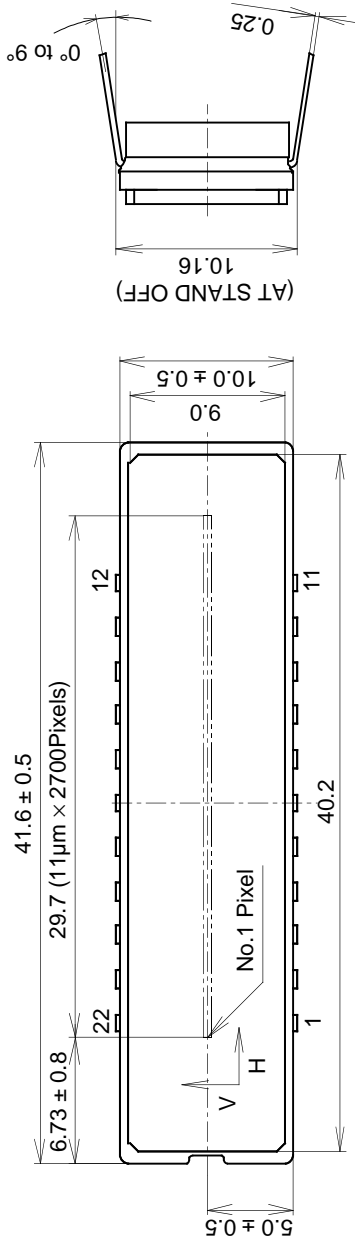
3) Soldering

- a) Make sure the package temperature does not exceed 80°C.
- b) Solder dipping in a mounting furnace causes damage to the glass and other defects. Use a grounded 30W soldering iron and solder each pin in less than 2 seconds. For repairs and remount, cool sufficiently.
- c) To dismount an imaging device, do not use a solder suction equipment. When using an electric desoldering tool, ground the controller. For the control system, use a zero cross type.

- 4) Dust and dirt protection
 - a) Operate in clean environments.
 - b) Do not either touch glass plates by hand or have any object come in contact with glass surfaces. Should dirt stick to a glass surface, blow it off with an air blower. (For dirt stuck through static electricity ionized air is recommended.)
 - c) Clean with a cotton bud and ethyl alcohol if the glass surface is grease stained. Be careful not to scratch the glass.
 - d) Keep in a case to protect from dust and dirt. To prevent dew condensation, preheat or precool when moving to a room with great temperature differences.
- 5) Exposure to high temperatures or humidity will affect the characteristics. Accordingly avoid storage or usage in such conditions.
- 6) CCD image sensors are precise optical equipment that should not be subject to mechanical shocks.
- 7) Normal output signal is not obtained immediately after device switch on.

Package Outline Unit: mm

22pin DIP (400mil)



1. The height from the bottom to the sensor surface is $2.45 \pm 0.3\text{mm}$.
2. The thickness of the cover glass is 0.8mm, and the refractive index is 1.5.

PACKAGE STRUCTURE

| | |
|------------------|-------------|
| PACKAGE MATERIAL | Cer-DIP |
| LEAD TREATMENT | TIN PLATING |
| LEAD MATERIAL | 42 ALLOY |
| PACKAGE WEIGHT | 5.2g |