SONY

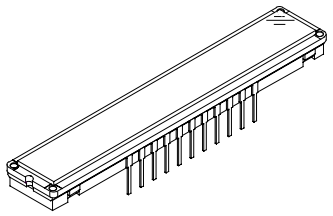
# ILX518K

## 5363-pixel × 3 line CCD Linear Sensor (Color)

### Description

The ILX518K is a reduction type CCD linear sensor developed for color image scanner. This sensor reads legal-size documents at a density of 600 DPI, and A3-size documents at a density of 400 DPI.

22 pin DIP (Plastic)



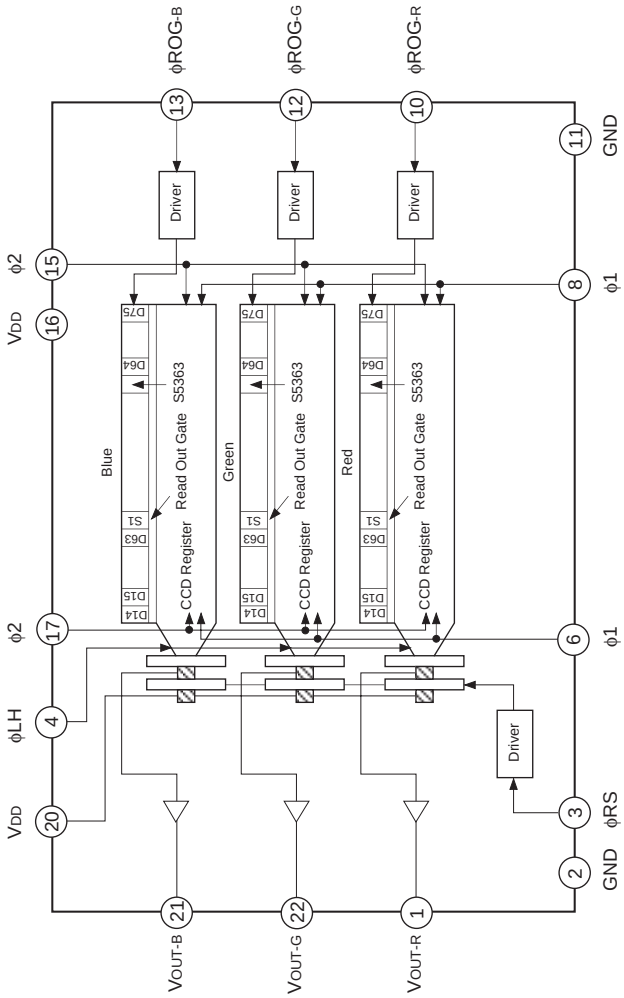
### Features

- Number of effective pixels: 16089 pixels (5363 pixels × 3)
- Pixel size: 8µm × 8µm (8µm pitch)
- Distance between line: 64µm (8 Lines)
- Single-sided readout
- Ultra low lag / High sensitivity
- Single 12V power supply
- Input clock pulse: CMOS 5V drive
- Number of output 3 (R, G, B)
- Package: 22 pin Plastic-DIP (400 mil)

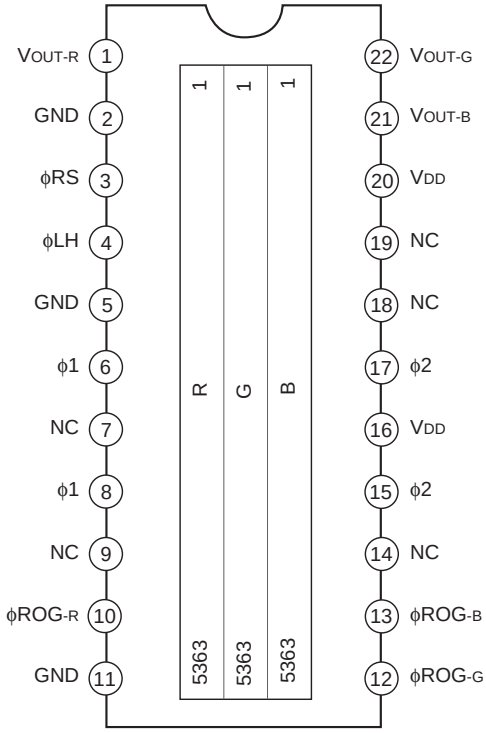
### Absolute Maximum Ratings

| | | | |
|---|---|---|---|
| • Supply voltage | $V_{DD}$ | 15 | V |
| • Operating temperature | | –10 to +55 | °C |
| • Storage temperature | | –30 to +80 | °C |

### Block Diagram




### Pin Configuration (Top View)

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E95814B9X-PS

**Pin Description**

| Pin No. | Symbol | Description | Pin No. | Symbol | Description |
|---|---|---|---|---|---|
| 1 | $V_{OUT-R}$ | Signal out (red) | 12 | $\phi ROG-G$ | Clock pulse input |
| 2 | GND | GND | 13 | $\phi ROG-B$ | Clock pulse input |
| 3 | $\phi RS$ | Clock pulse input | 14 | NC | NC |
| 4 | $\phi LH$ | Clock pulse input | 15 | $\phi 2$ | Clock pulse input |
| 5 | GND | GND | 16 | $V_{DD}$ | 12V power supply |
| 6 | $\phi 1$ | Clock pulse input | 17 | $\phi 2$ | Clock pulse input |
| 7 | NC | NC | 18 | NC | NC |
| 8 | $\phi 1$ | Clock pulse input | 19 | NC | NC |
| 9 | NC | NC | 20 | $V_{DD}$ | 12V power supply |
| 10 | $\phi ROG-R$ | Clock pulse input | 21 | $V_{OUT-B}$ | Signal out (blue) |
| 11 | GND | GND | 22 | $V_{OUT-G}$ | Signal out (green) |

**Recommended Supply Voltage**

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

**Clock Characteristics**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input capacity of $\phi 1$, $\phi 2$ | $C\phi 1$, $C\phi 2$ | — | 850 | — | pF |
| Input capacity of $\phi LH$ | $C\phi_{LH}$ | — | 10 | — | pF |
| Input capacity of $\phi RS$ | $C\phi_{RS}$ | — | 10 | — | pF |
| Input capacity of $\phi ROG$* | $C\phi_{ROG}$ | — | 10 | — | pF |

* It indicates that $\phi ROG-R$, $\phi ROG-G$, $\phi ROG-B$ as $\phi ROG$.

**Clock Frequency**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $\phi 1$, $\phi 2$, $\phi LH$, $\phi RS$ | $f\phi 1$, $f\phi 2$, $f\phi_{LH}$, $f\phi_{RS}$ | — | 1 | 5 | MHz |

**Input Clock Pulse Voltage Condition**

| Item | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| $\phi 1$, $\phi 2$, $\phi LH$, $\phi RS$, $\phi ROG$ pulse voltage | High level | 4.75 | 5.0 | 5.25 | V |
| | Low level | — | 0 | 0.1 | V |

**Electrooptical Characteristics** (Note 1)

Ta = 25°C, $V_{DD}$ = 12V, $f_{\phi RS}$ = 1MHz, Input clock = 5Vp-p, Light source = 3200K, IR cut filter CM-500S (t = 1.0mm)

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| Sensitivity | Red | $R_R$ | 1.3 | 2.0 | 2.7 | V/(lx · s) | Note 2 |
| | Green | $R_G$ | 2.1 | 3.2 | 4.3 | | |
| | Blue | $R_B$ | 1.6 | 2.5 | 3.4 | | |
| Sensitivity nonuniformity | | PRNU | — | 4 | 20 | % | Note 3 |
| Saturation output voltage | | $V_{SAT}$ | 2 | 3.2 | — | V | Note 4 |
| Saturation exposure | Red | $SE_R$ | 0.74 | 1.6 | — | lx · s | Note 5 |
| | Green | $SE_G$ | 0.46 | 1 | — | | |
| | Blue | $SE_B$ | 0.58 | 1.28 | — | | |
| Dark voltage average | | $V_{DRK}$ | — | 0.3 | 2 | mV | Note 6 |
| Dark signal nonuniformity | | DSNU | — | 1.5 | 5 | mV | Note 6 |
| Image lag | | IL | — | 0.02 | — | % | Note 7 |
| Supply current | | $I_{VDD}$ | — | 26 | 50 | mA | — |
| Total transfer efficiency | | TTE | 92 | 98 | — | % | — |
| Output impedance | | $Z_O$ | — | 250 | — | Ω | — |
| Offset level | | $V_{OS}$ | — | 6.5 | — | V | Note 8 |
| Dynamic range | | DR | 1000 | 10670 | — | — | Note 9 |

**Note**

1) In accordance with the given electrooptical characteristics, the black level is defined as the average value of D2, D3 to D12.
2) For the sensitivity test light is applied with a uniform intensity of illumination.
3) PRNU is defined as indicated below. Ray incidence conditions are the same as for Note 2.

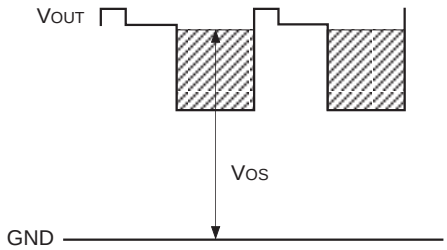
   $V_{OUT-G}$ = 500mV (Typ.)

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

   Where the 5363 pixels are divided into blocks of 114 (Last block is 119 pixel). The maximum output of each block is set to $V_{MAX}$, the minimum output to $V_{MIN}$ and the average output to $V_{AVE}$.
4) Use below the minimum value of the saturation output voltage.
5) Saturation exposure is defined as follows.

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

   Where R indicates $R_R$, $R_G$, $R_B$, and SE indicates $SE_R$, $SE_G$, $SE_B$.
6) Optical signal accumulated time τint stands at 10ms.
7) $V_{OUT-G}$ = 500mV (Typ.)
8) Vos is defined as indicated bellow.
   $V_{OUT}$ indicates $V_{OUT-R}$, $V_{OUT-G}$, and $V_{OUT-B}$.

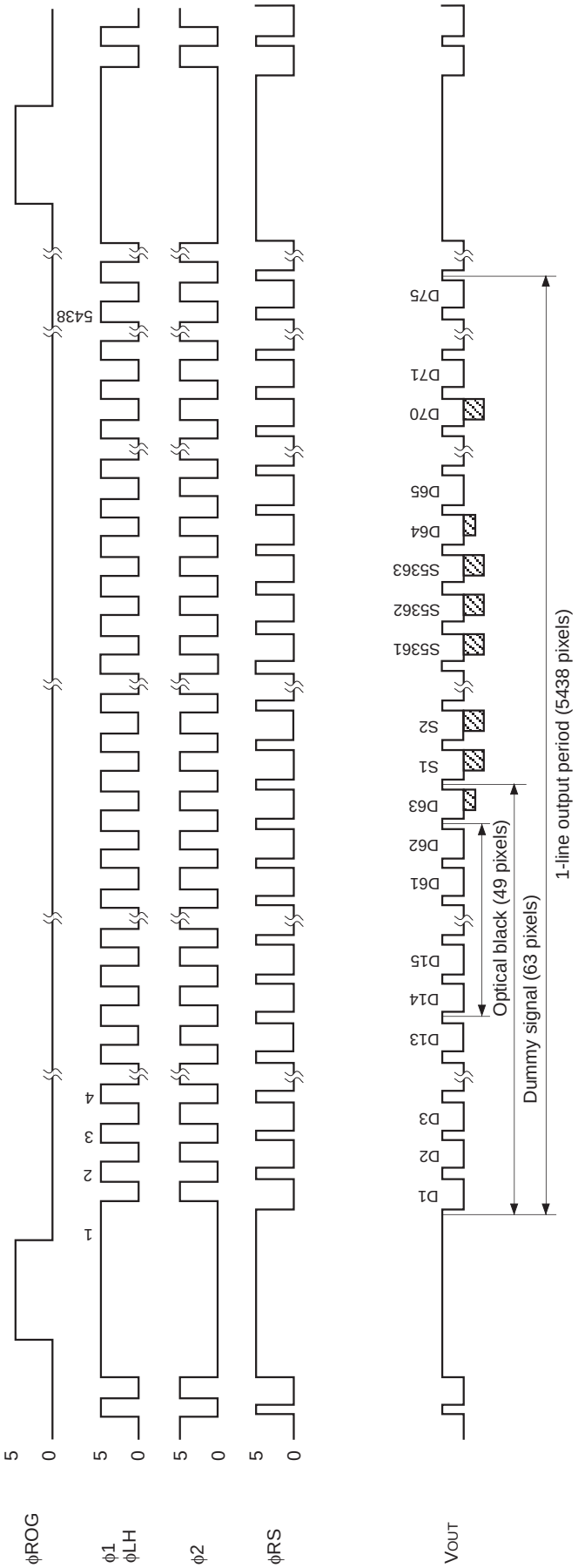



9) Dynamic range is defined as follows.

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

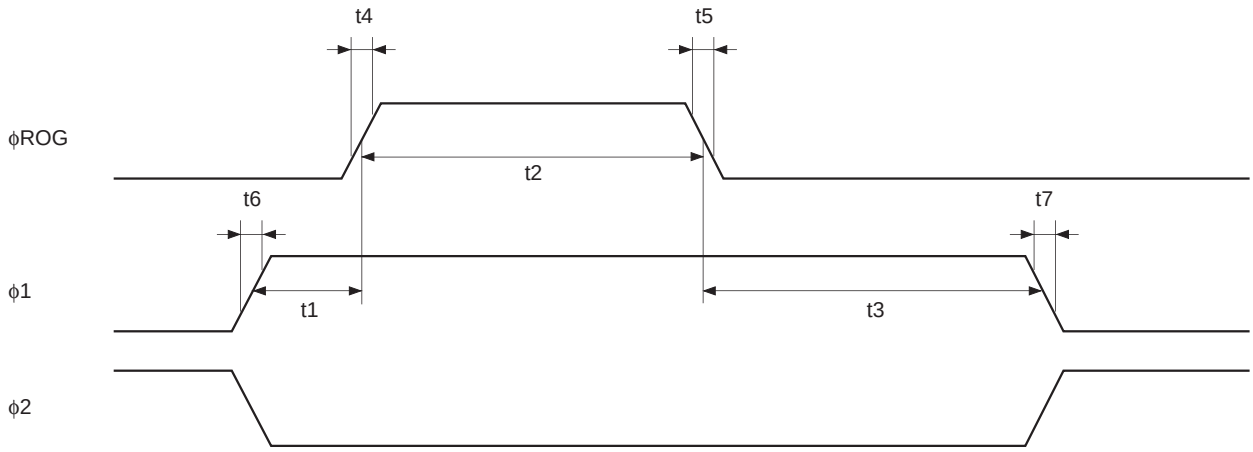
   When the optical signal accumulated time is shorter, the dynamic range gets wider because the optical signal accumulated time is in proportion to the dark voltage.

## Clock Timing Chart 1

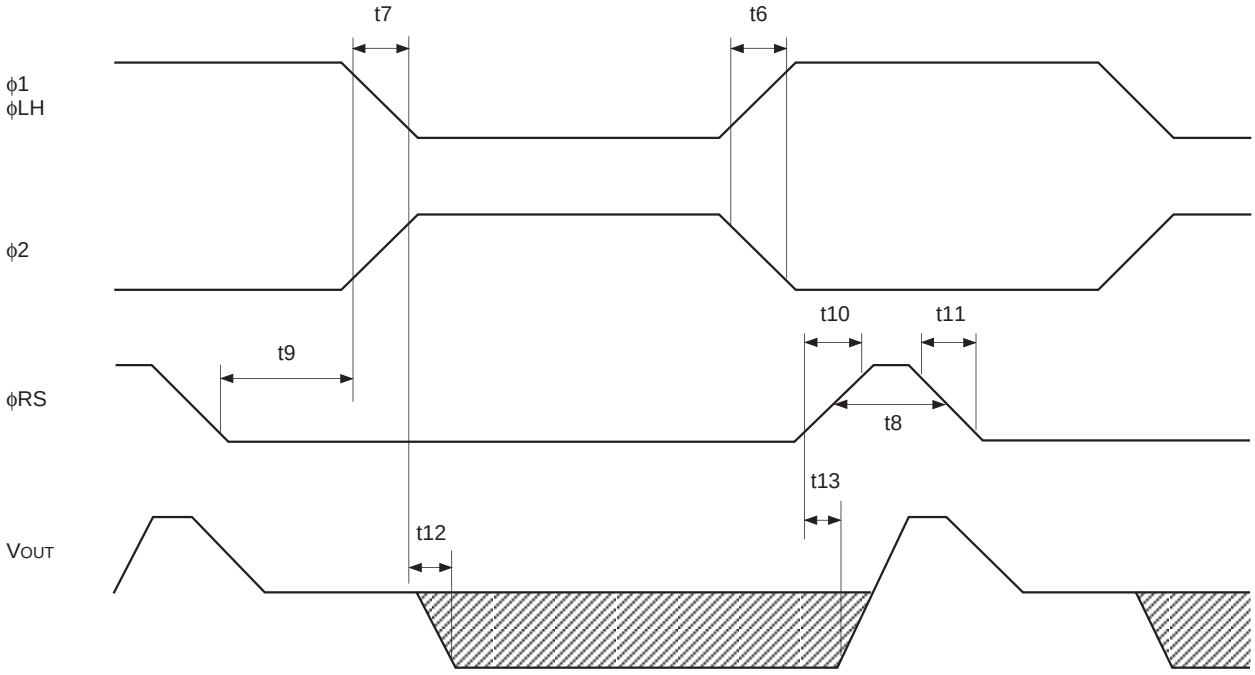



Note) The transfer pulses (φ1, φ2, φLH) must have more than 5438 cycles.
VOUT indicates VOUT-R, VOUT-G, VOUT-B.

## Clock Timing Chart 2




## Clock Timing Chart 3

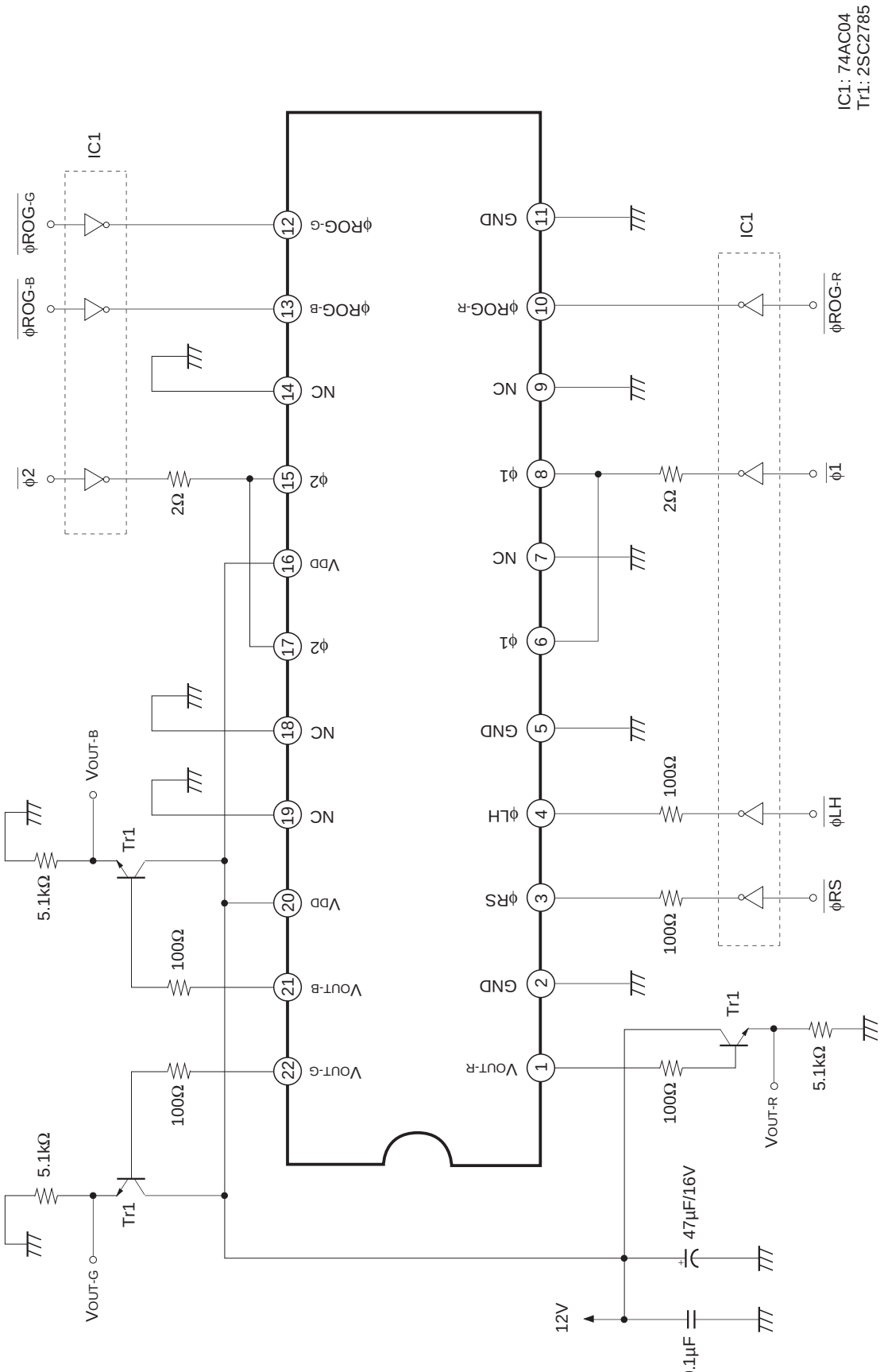


**Clock Pulse Recommended Timing**

| Item | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| φROG, φ1 pulse timing | t1 | 50 | 100 | — | ns |
| φROG pulse high level period | t2 | 800 | 1000 | — | ns |
| φROG, φ1 pulse timing | t3 | 800 | 1000 | — | ns |
| φROG pulse rise time | t4 | 0 | 5 | 10 | ns |
| φROG pulse fall time | t5 | 0 | 5 | 10 | ns |
| φ1 pulse rise time/φ2 pulse fall time | t6 | 0 | 20 | 60 | ns |
| φ1 pulse fall time/φ2 pulse rise time | t7 | 0 | 20 | 60 | ns |
| φRS pulse high level period | t8 | 45 | 250* | — | ns |
| φRS, φLH pulse timing | t9 | 45 | 250* | — | ns |
| φRS pulse rise time | t10 | 0 | 10 | 30 | ns |
| φRS pulse fall time | t11 | 0 | 10 | 30 | ns |
| Signal output delay time | t12 | — | 10 | — | ns |
| | t13 | — | 10 | — | ns |

* These timing is the recommended condition under $f_{\phi RS}$ = 1MHz.

## Application Circuit*

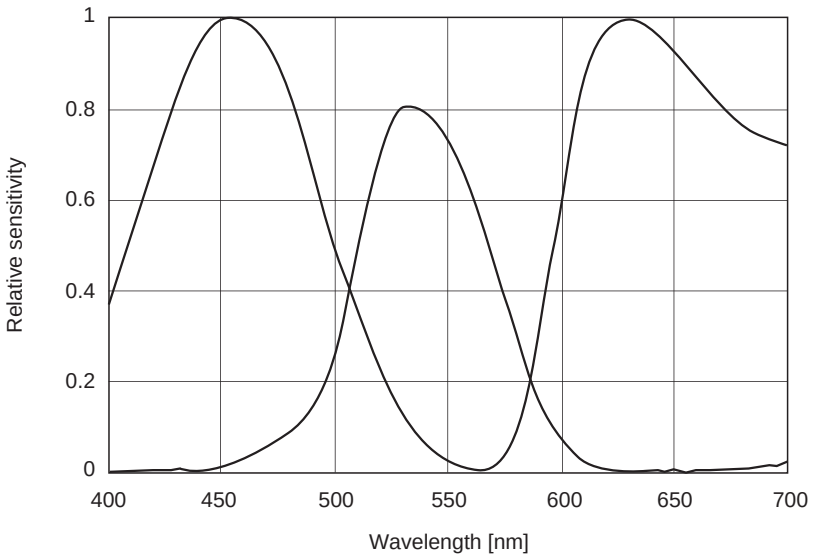



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

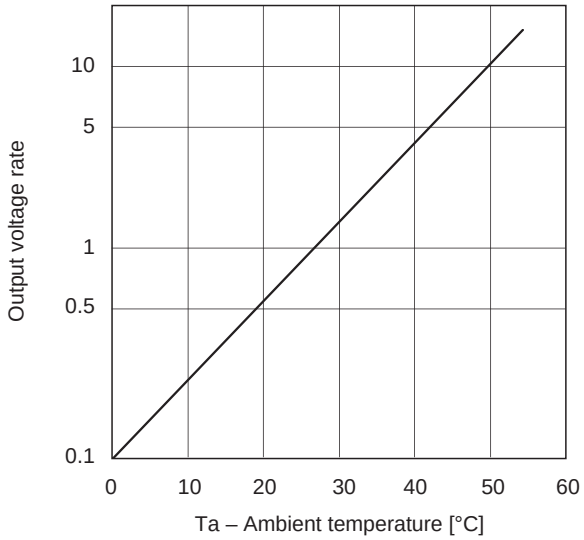
* Data rate $f_{\phi RS}$ = 1MHz.

**Example of Representative Characteristics** ($V_{DD}$ = 12V, Ta = 25°C)

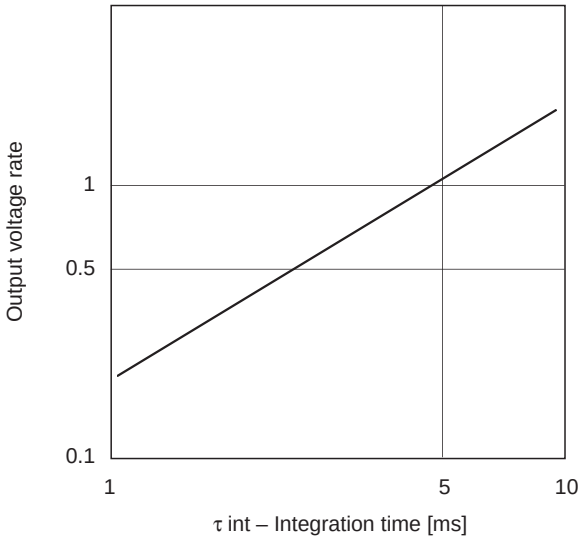
**Spectral sensitivity characteristics (Standard characteristics)**



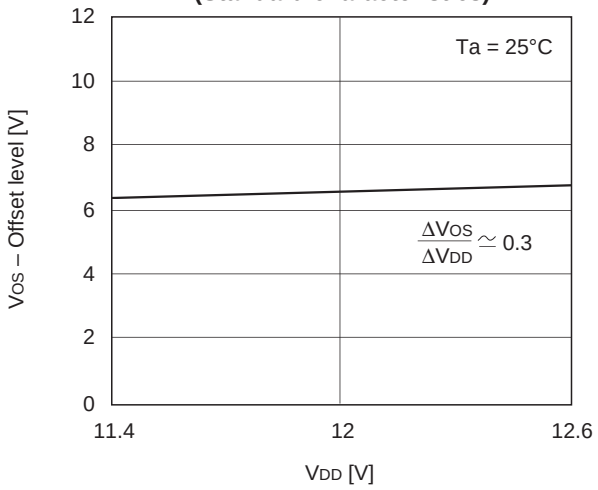

**Dark signal output temperature characteristics (Standard characteristics)**



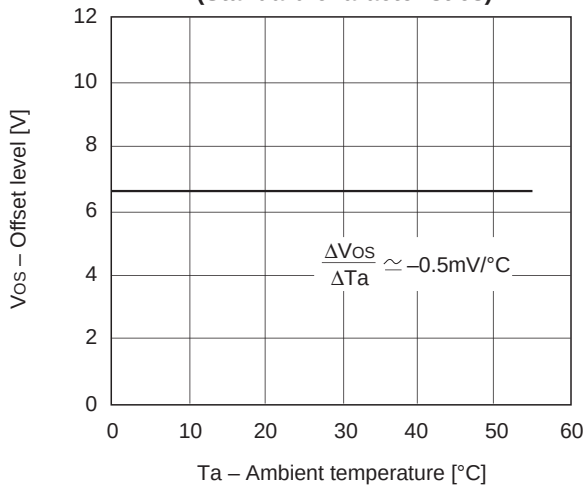

**Integration time output voltage characteristics (Standard characteristics)**




**Offset level vs. $V_{DD}$ characteristics (Standard characteristics)**




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



**Notes of Handling**

1) Static charge prevention

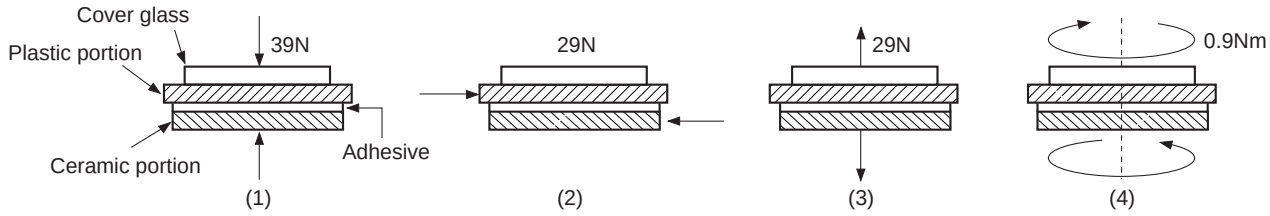
CCD image sensors are easily damaged by static discharge. Before handling be sure to take the following protective measures.

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 Packages

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

a) Remain within the following limits when applying static load to 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 package to crack or dust to be generated.
   (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) Prying the plastic portion and ceramic portion away at a support point of the adhesive layer.
   (5) Applying the metal a crash or a rub against the plastic portion.

   Note that the preceding notes should also be observed when removing a component from a board after it has already been soldered.
d) The notch of the plastic portion is used for directional index, and that can not be used for reference of fixing. In addition, the cover glass and seal resin may overlap with the notch or ceramic may overlap with the notch of the plastic portion.

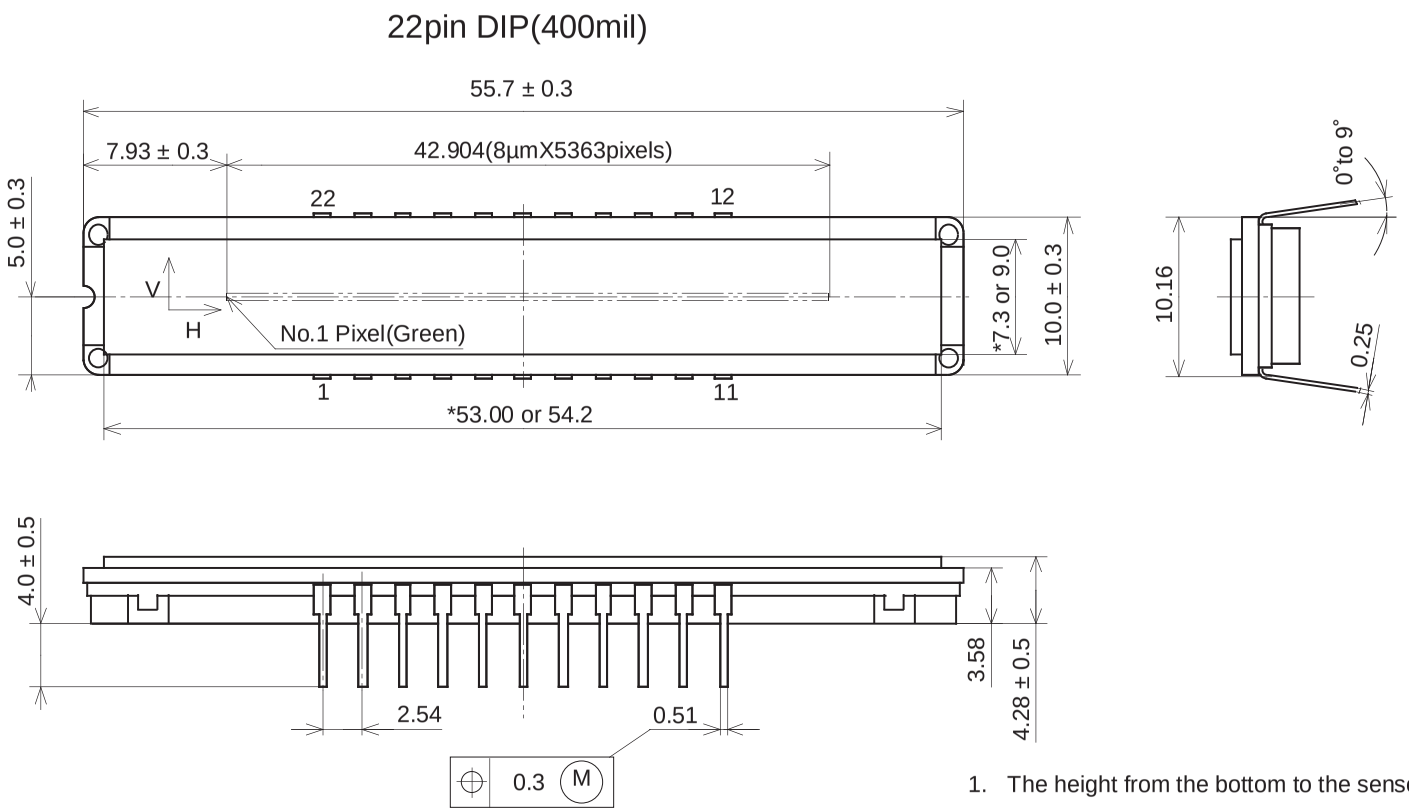
3) Soldering
   a) Make sure the package temperature does not exceed 80°C.
   b) Solder dipping in a mounting furnace causes damage to the glass and other defects. Use a grounded 30W soldering iron and solder each pin in less then 2 seconds. For repairs and remount, cool sufficiently.
   c) To dismount 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.

**Package Outline** Unit : mm




1. The height from the bottom to the sensor surface is 2.38 ± 0.3mm.
2. The thickness of the cover glass is 0.7mm, and the refractive index is 1.5.
   *The dimension of cover glass is 54.2 X 9.0mm or 53.0 X 7.3mm.

PACKAGE STRUCTURE

| | |
|---|---|
| PACKAGE MATERIAL | Plastic, Ceramic |
| LEAD TREATMENT | GOLD PLATING |
| LEAD MATERIAL | 42ALLOY |
| PACKAGE MASS | 5.43g |
| DRAWING NUMBER | LS-B21(E) |