

256-pixel CCD Linear Image Sensor (B/W)

Description

The ILX521A is a rectangular reduction type CCD linear image sensor designed for image scanner sensor. A built-in timing generator and clock driver ensure single 5V power supply for easy use.

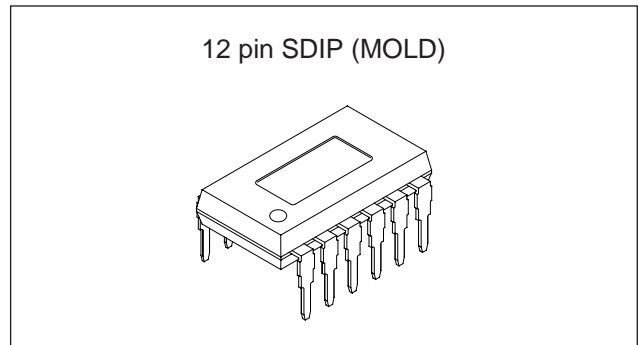
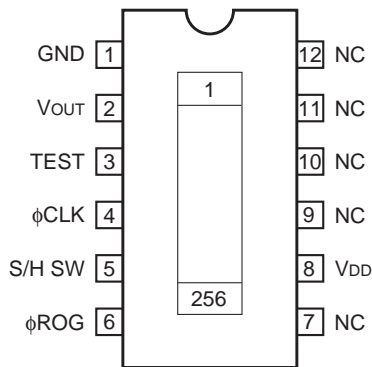
Features

- Number of effective pixels: 256 pixels
- Pixel size: 14µm × 14µm (14µm pitch)
- Built-in timing generator and clock driver
- Built-in S/H circuit
- Maximum data rate: 2MHz
- Single 5V power supply
- Clear mold package (12-pin SDIP)

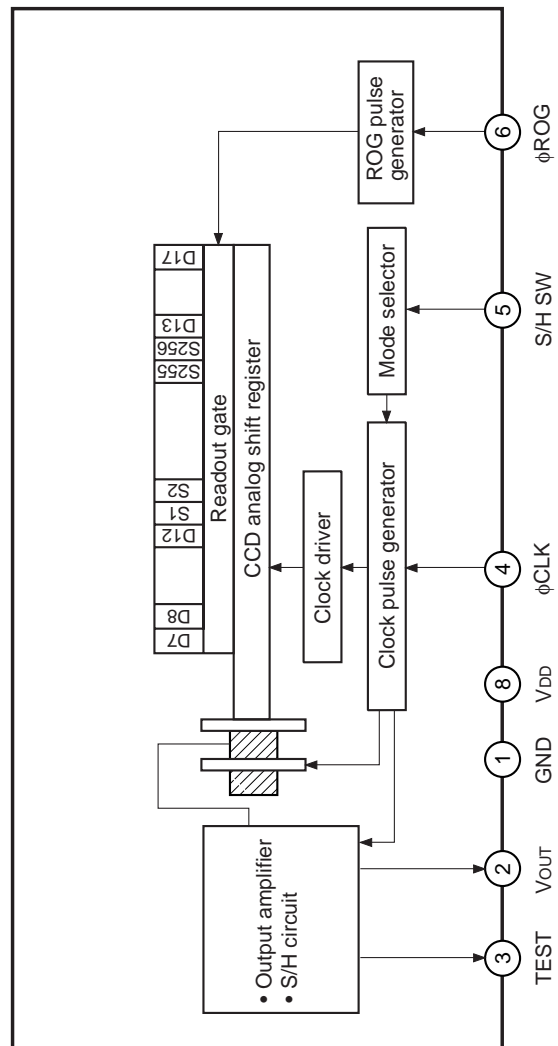
Absolute Maximum Ratings

- Supply voltage  $V_{DD}$  6 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
1	GND	GND
2	V <sub>OUT</sub>	Signal output
3	TEST	Test (open)
4	φCLK	Clock pulse input
5	S/H SW	Switching of with S/H or without S/H
6	φROG	Readout gate pulse input
7	NC	NC
8	V <sub>DD</sub>	5V power supply
9	NC	NC
10	NC	NC
11	NC	NC
12	NC	NC

**Recommended Voltage**

Item	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	4.75	5.0	5.25	V

**Mode Description**

Used mode	Pin 5 S/H SW
with S/H	GND
without S/H	V <sub>DD</sub>

**Input Clock Voltage Condition\*1**

Item	Symbol	Min.	Typ.	Max.	Unit
High level	V <sub>IH</sub>	4.5	V <sub>DD</sub>	V <sub>DD</sub> + 0.5	V
Low level	V <sub>IL</sub>	0	—	0.5	V

\*1 This is applied to the all external pulses. (φCLK, φROG)

**Input Pin Capacity**

Item	Symbol	Min.	Typ.	Max.	Unit
Input capacity of φCLK pin	C <sub>φCLK</sub>	—	10	—	pF
Input capacity of φROG pin	C <sub>φROG</sub>	—	10	—	pF

**Electrooptical Characteristics**

(Ta = 25°C, VDD = 5V, Data rate = 1MHz, Without S/H mode, Light source = 3200K, IR cut filter CM-500S (t = 1mm))

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Sensitivity	R	13.3	19.0	24.7	V/(lx · s)	Note 1
Sensitivity nonuniformity	PRNU	—	5.0	12.0	%	Note 2
Saturation output voltage	VSAT	0.6	0.8	—	V	—
Dark voltage average	VDRK	—	0.3	2.0	mV	Note 3
Dark signal nonuniformity	DSNU	—	0.5	3.0	mV	Note 3
Image lag	IL	—	0.02	—	%	Note 4
Dynamic range	DR	—	2666	—		Note 5
Saturation exposure	SE	—	0.042	—	lx · s	Note 6
Current consumption	IVDD	—	5.0	10.0	mA	—
Total transfer efficiency	TTE	92.0	98.0	—	%	—
Output impedance	Zo	—	350	—	Ω	—
Offset level	Vos	—	3.8	—	V	Note 7

**Note)**

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.

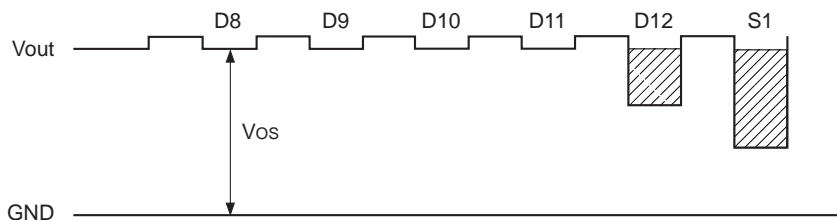
$$PRNU = \frac{(V_{MAX} - V_{MIN})/2}{V_{AVE}} \times 100 [\%]$$

The maximum output of the 256 pixels is set to V<sub>MAX</sub>, the minimum output to V<sub>MIN</sub> and the average output to V<sub>AVE</sub>.

3. Integration time is 10ms.
4. V<sub>OUT</sub> = 500mV.
5. DR = VSAT/VDRK

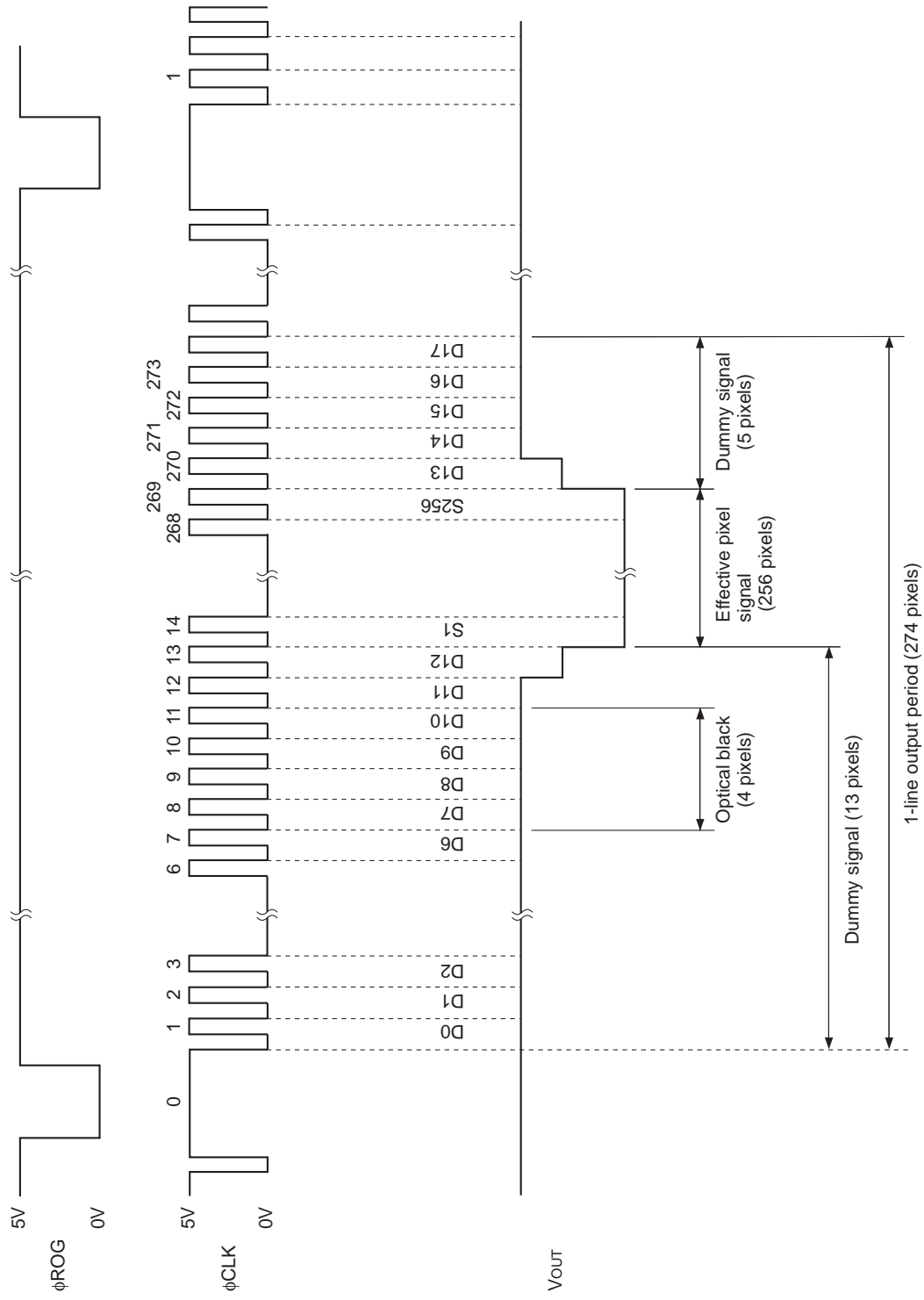
When optical integration time is shorter, the dynamic range sets wider because dark output voltage is in proportion to optical integration time.

6. SE = VSAT/R1
7. Vos is defined as indicated below.



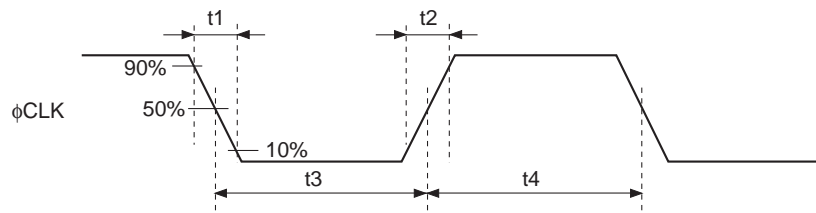


**Clock Timing Diagram (with internal S/H mode)**



Note) 280 or more clock pulses are required.

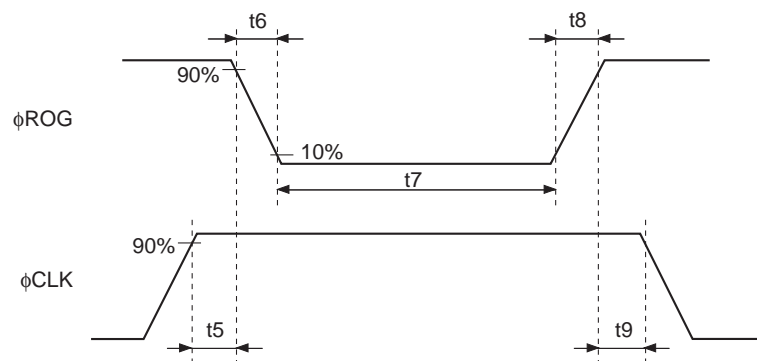
$\phi$ CLK Timing (For all modes)



Item	Symbol	Min.	Typ.	Max.	Unit
$\phi$ CLK pulse rise/fall time	t1, t2	0	10	100	ns
$\phi$ CLK pulse Duty*1	—	40	50	60	%

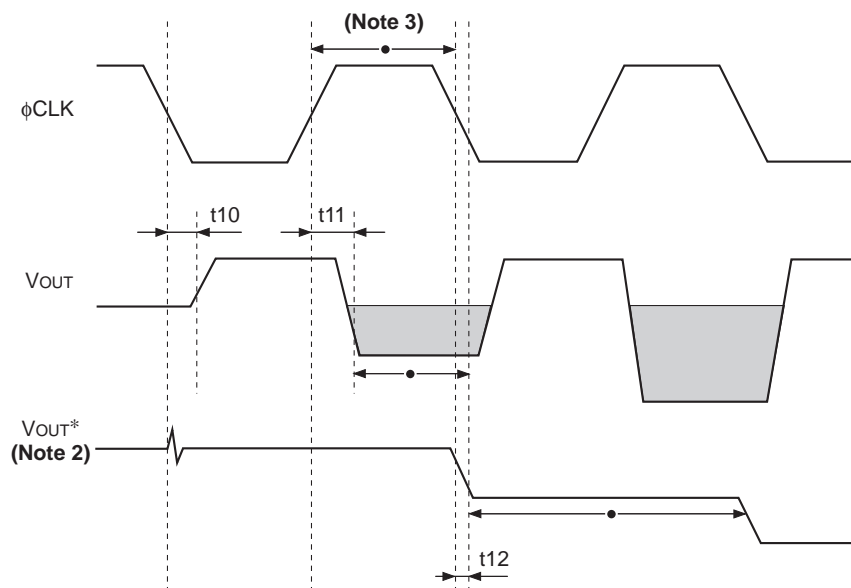
\*1  $100 \times t_4 / (t_3 + t_4)$

$\phi$ ROG,  $\phi$ CLK Timing



Item	Symbol	Min.	Typ.	Max.	Unit
$\phi$ ROG, $\phi$ CLK pulse timing 1	t5	500	1000	—	ns
$\phi$ ROG, $\phi$ CLK pulse timing 2	t9	500	1000	—	ns
$\phi$ ROG pulse rise/fall time	t6, t8	0	10	—	ns
$\phi$ ROG pulse period	t7	500	1000	—	ns

**$\phi$ CLK Output Signal Timing (Note 1)**



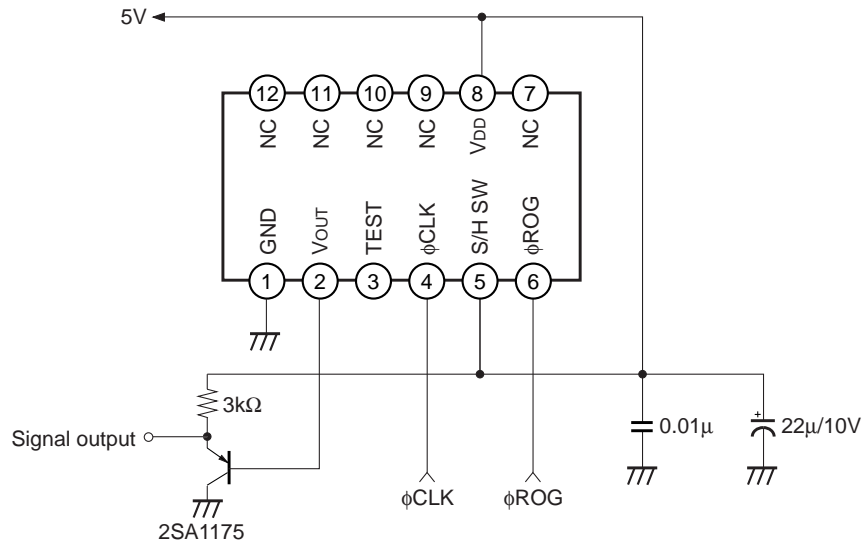
Item	Symbol	Min.	Typ.	Max.	Unit
$\phi$ CLK – $V_{OUT}$ output delay time 1	t10	—	150	—	ns
$\phi$ CLK – $V_{OUT}$ output delay time 2	t11	—	220	—	ns
$\phi$ CLK – $V_{OUT}^*$ (with S/H) output delay time	t12	—	110	—	ns

**Note 1)**  $f_{clk} = 1\text{MHz}$ ,  $\phi$ CLK pulse Duty = 50%,  $\phi$ CLK pulse rise/fall time = 10ns

**Note 2)** Output waveform when internal S/H circuit is used.

**Note 3)** • is data period.

Application Circuit (without internal S/H mode)

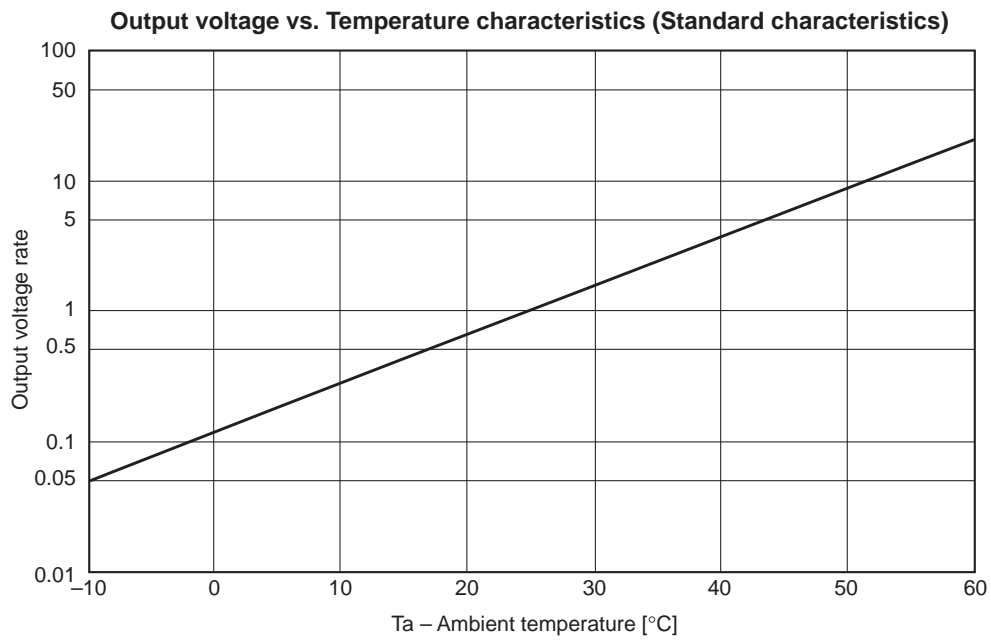
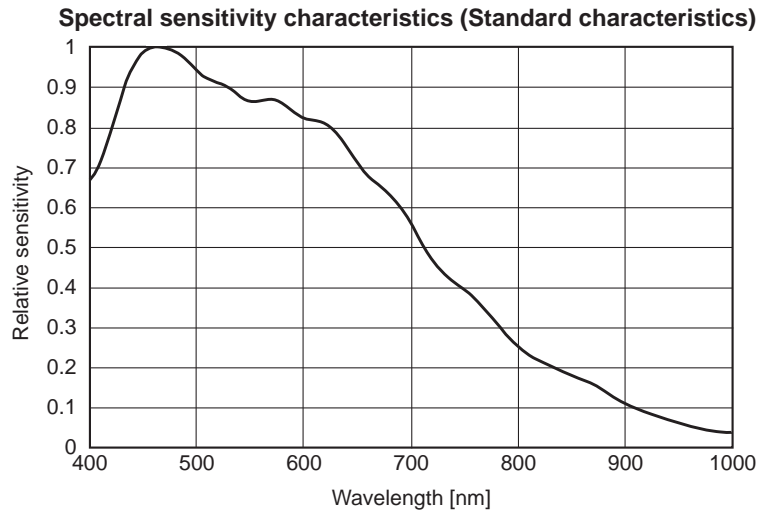


Note) This circuit diagram is the case when internal S/H mode is not used.  
Connect Pin 5 to GND when internal S/H mode is used.

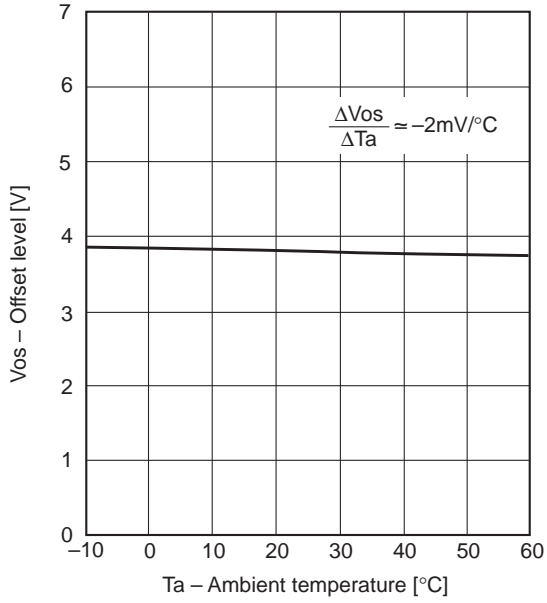
Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.



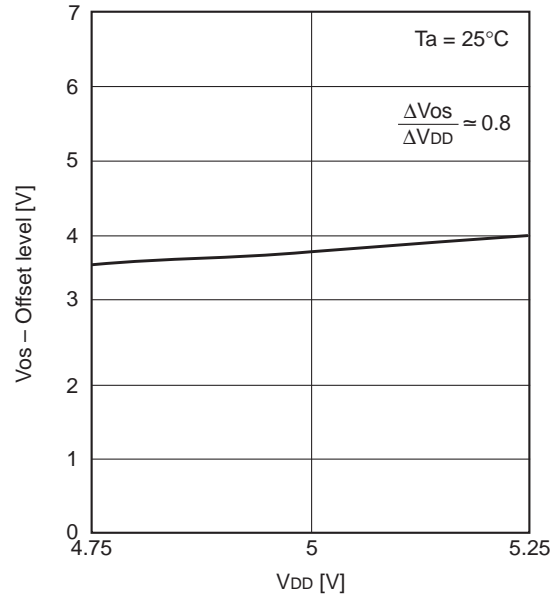
Example of Representative Characteristics



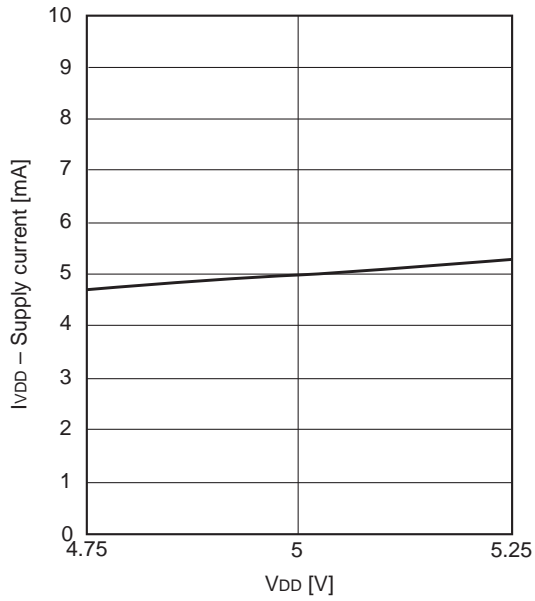
**Offset level vs. Temperature characteristics  
(Standard characteristics)**



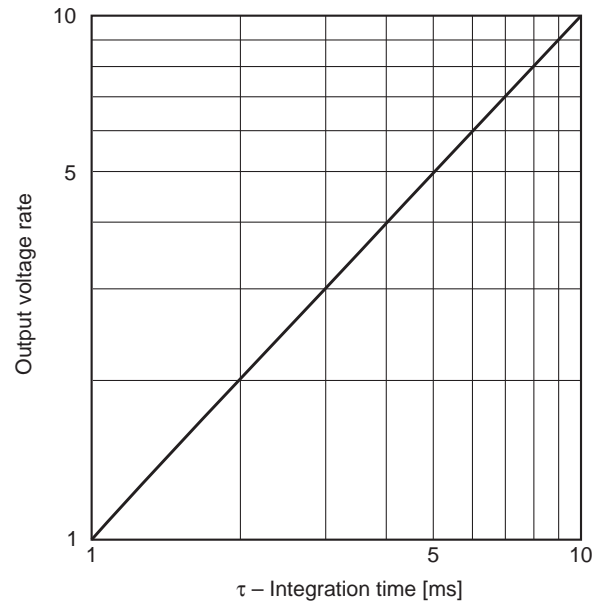
**Offset level vs. VDD characteristics  
(Standard characteristics)**



**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 sensors.
- e) For the shipment of mounted substrates, use boxes treated for the prevention of static charges.

## 2) Soldering

- a) Make sure the package temperature does not exceed 80°C.
- b) 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 image sensor, do not use solder suction equipment. When using an electric desoldering tool, ground the controller. For the temperature control system, use a zero-cross type.

## 3) Dust and dirt protection

- a) Operate in clean environments.
- b) Do not either touch mirror surfaces by hand or have any object come in contact with mirror surfaces. Should dirt stick to a mirror 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 mirror surfaces are grease stained. Be careful not to scratch the mirror surfaces.
- d) Keep in a case to protect from dust and dirt. To prevent dew condensation on the mirror surfaces, preheat or precool when moving to a room with great temperature differences.

## 4) Do not expose to intense light for long periods.

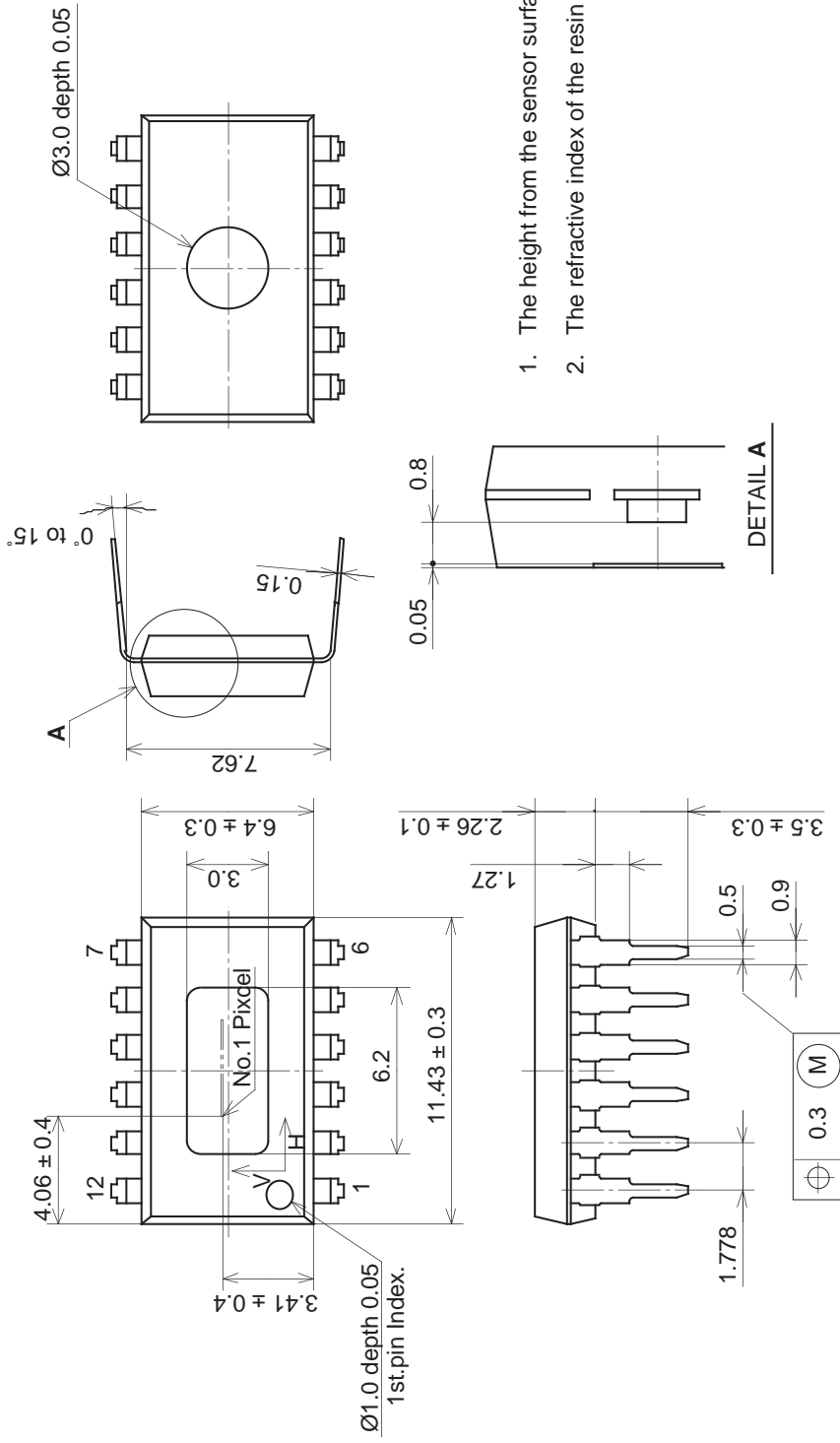
## 5) Exposure to high temperatures or humidity will affect the characteristics. Accordingly avoid storage or usage in such conditions.

## 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

12pin DIP (300mil)



1. The height from the sensor surface is  $1.41 \pm 0.3$ mm.
2. The refractive index of the resin is 1.57.

PACKAGE STRUCTURE

PACKAGE MATERIAL	Plastic
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	42ALLOY
PACKAGE MASS	0.28g
DRAWING NUMBER	LS-F5(E)