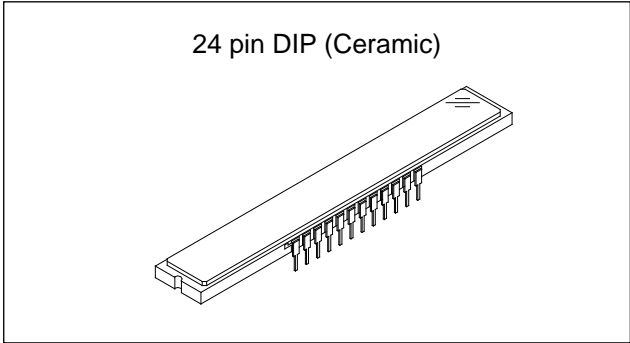


7926-pixel CCD Linear Image Sensor (B/W)

Description

The ILX508A is a reduction type CCD linear sensor developed for high resolution copiers. This sensor reads A3-size documents at a density of 600 DPI (Dot Per Inch). A built-in timing generator and clock-drivers ensure direct drive at 5V logic for easy use. In addition reset pulse can switch between internal generation and external input.



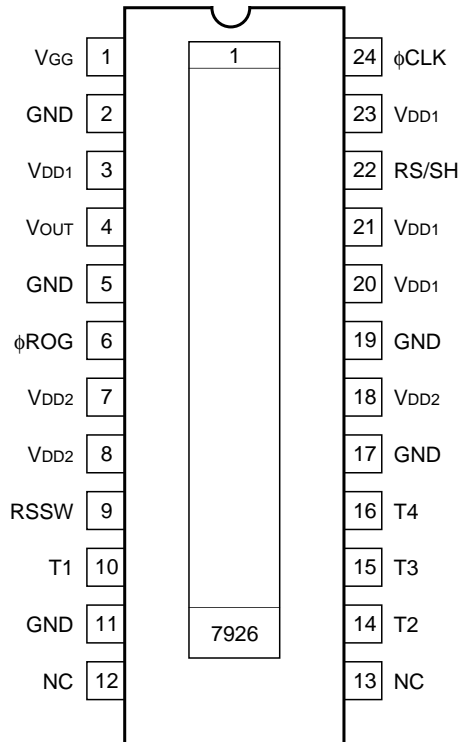
Features

- Number of effective pixels: 7926 pixels
- Pixel size: 7µm × 7µm (7µm pitch)
- Built-in timing generator and clock-drivers
- Ultra high sensitivity
- Ultra low lag/low dark voltage
- Output method
- Maximum operating frequency: 12.5MHz

Absolute Maximum Ratings

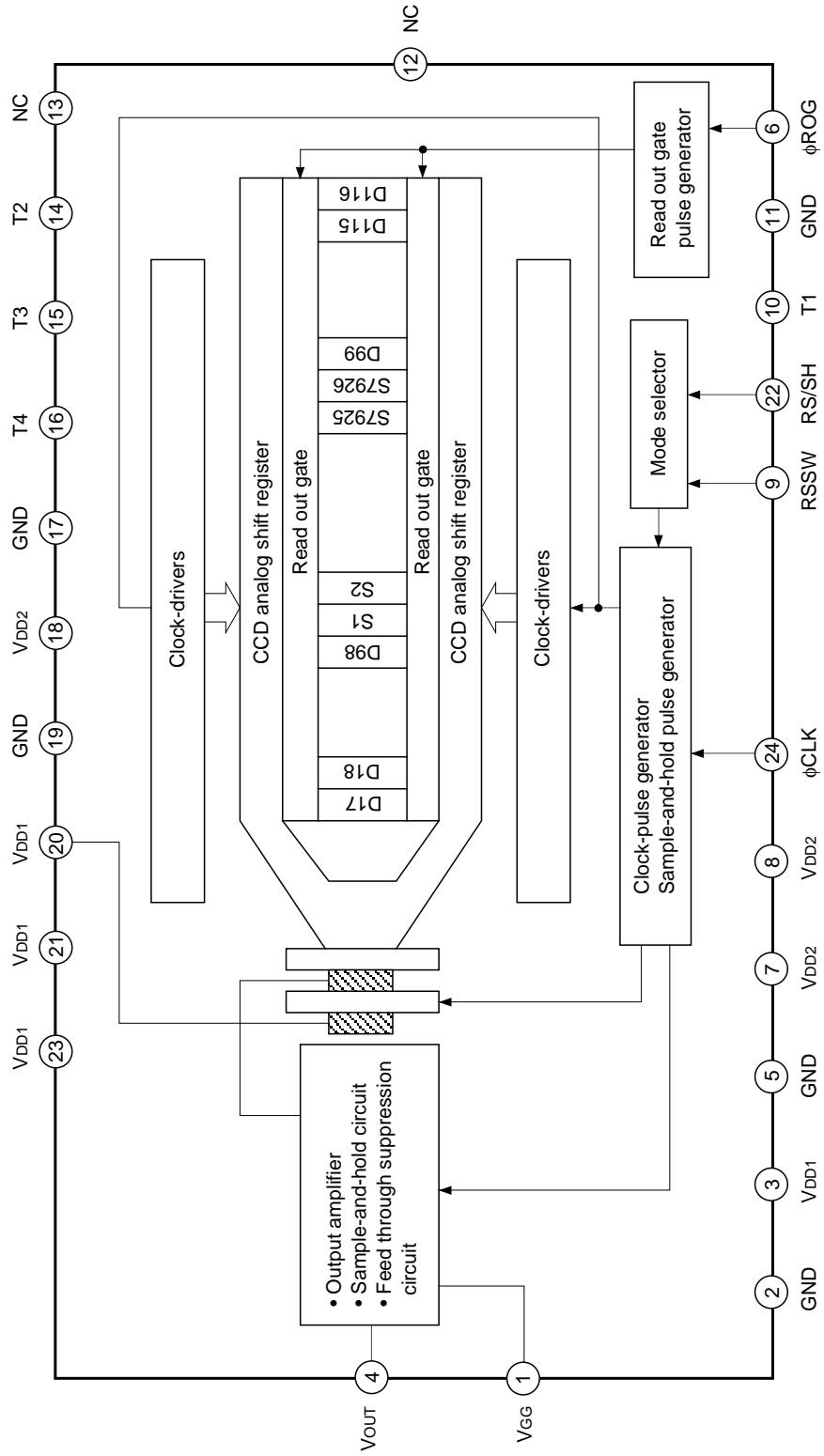
- Supply voltage V_{DD1} 11 V
 V_{DD2} 6 V
- Operation temperature -10 to +60 °C
- Storage temperature -30 to +80 °C

Pin Configuration (Top View)



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Block Diagram



Pin Description

Pin No.	Symbol	Description
1	V _{GG}	Output circuit gate bias
2	GND	GND
3	V _{DD1}	9V power supply
4	V _{OUT}	Signal output
5	GND	GND
6	φ _{ROG}	Clock pulse
7	V _{DD2}	5V power supply
8	V _{DD2}	5V power supply
9	RSSW*	RS pulse external, internal selection (External RS → V _{DD1} , Internal RS → GND)
10	T1	Test pin (5V)
11	GND	GND
12	NC	NC
13	NC	NC
14	T2	Test pin (GND)
15	T3	Test pin (5V)
16	T4	Test pin (GND)
17	GND	GND
18	V _{DD2}	5V power supply
19	GND	GND
20	V _{DD1}	9V power supply
21	V _{DD1}	9V power supply
22	RS/SH*	Clock pulse or S/H switch
23	V _{DD1}	9V power supply
24	φ _{CLK}	Clock pulse

* Output mode is changeable as follows.

22pin 9pin	GND	V _{DD1}	φ _{RS}
GND	Internal RS without S/H	Internal RS with S/H	—
V _{DD1}	—	—	External RS without S/H

Recommended Voltage

Item	Min.	Typ.	Max.	Unit
V _{DD1}	8.5	9.0	9.5	V
V _{DD2}	4.75	5.0	5.25	V

Note) Rules for raising and lowering power supply voltage.

To raise power supply voltage, first raise V_{DD1} (9V) and then V_{DD2} (5V).

To lower voltage, first lower V_{DD2} (5V) and then V_{DD1} (9V).

Clock Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Input capacity of ϕ CLK	C ϕ CLK	—	10	—	pF
Input capacity of ϕ ROG	C ϕ ROG	—	10	—	pF
Input capacity of RS/SH	C RS/SH	—	10	—	pF
ϕ CLK frequency	f ϕ CLK	—	1	12.5	MHz
ϕ RS frequency	f ϕ RS	—	1	12.5	MHz

Electrooptical Characteristics*1

(Ta = 25°C, V_{DD1} = 9V, V_{DD2} = 5V, Light source = 3200K, φCLK = 1MHz, Internal φRS mode without S/H,
IR cut filter, CM-500S (t = 1.0mm))

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Sensitivity1	R1	7.5	10.8	13.9	V/(lx · s)	*2
Sensitivity2	R2	—	24.6	—	V/(lx · s)	*3
Sensitivity nonuniformity	PRNU	—	5	12.5	%	*4
Saturation output voltage	V _{SAT}	1.0	1.5	—	V	*5
Saturation exposure	SE	0.072	0.139	—	lx · s	*6
Even and odd black level DC difference	ΔV	—	1.0	10.0	mV	*7
Dark voltage average	V _{DRK}	—	0.3	2	mV	*8
Dark signal nonuniformity	DSNU	—	0.6	5	mV	*9
Image lag	IL	—	0.02	—	%	*10
9V supply current	I _{VDD1}	—	16	32	mA	—
5V supply current	I _{VDD2}	—	5	16	mA	—
Total transfer efficiency	TTE	90	97	—	%	—
Output impedance	Z _o	—	600	—	Ω	—
Offset level	V _{OS}	—	3.0	—	V	*11
Dynamic range	DR	500	5000	—	—	*12

*1 In accordance with the given electrooptical characteristics, the even black level is defined as the mean value of D8, D10, D12, D14, and D16.

*2 For the sensitivity test light is applied with a uniform intensity of illumination.

*3 W lamp (2854K).

*4 PRNU is defined as indicated below. Ray incidence conditions are the same as for *2.

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

Where the 7926 pixels are divided into blocks of 102, even and odd pixels, respectively (Even and odd last blocks are 87.) The maximum output of each block is set to V_{MAX}, the minimum output to V_{MIN} and the average output to V_{AVE}.

*5 Use below the minimum value of the saturation output voltage.

*6 Saturation exposure is defined as follows.

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

*7 Indicates the DC difference in value between odd black level and even black level.

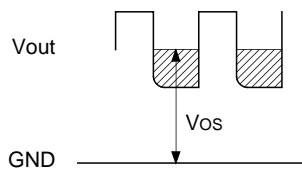
*8 optical signal accumulated time τ int stands at 10ms.

*9 The difference between the maximum and mean values of the dark output voltage is calculated for even and odd respectively. The larger value is defined as the dark signal nonuniformity.

Optical signal accumulated time τ int stands at 10ms.

*10 V_{OUT} = 500mV (Typ.)

*11 Vos is defined as indicated below.

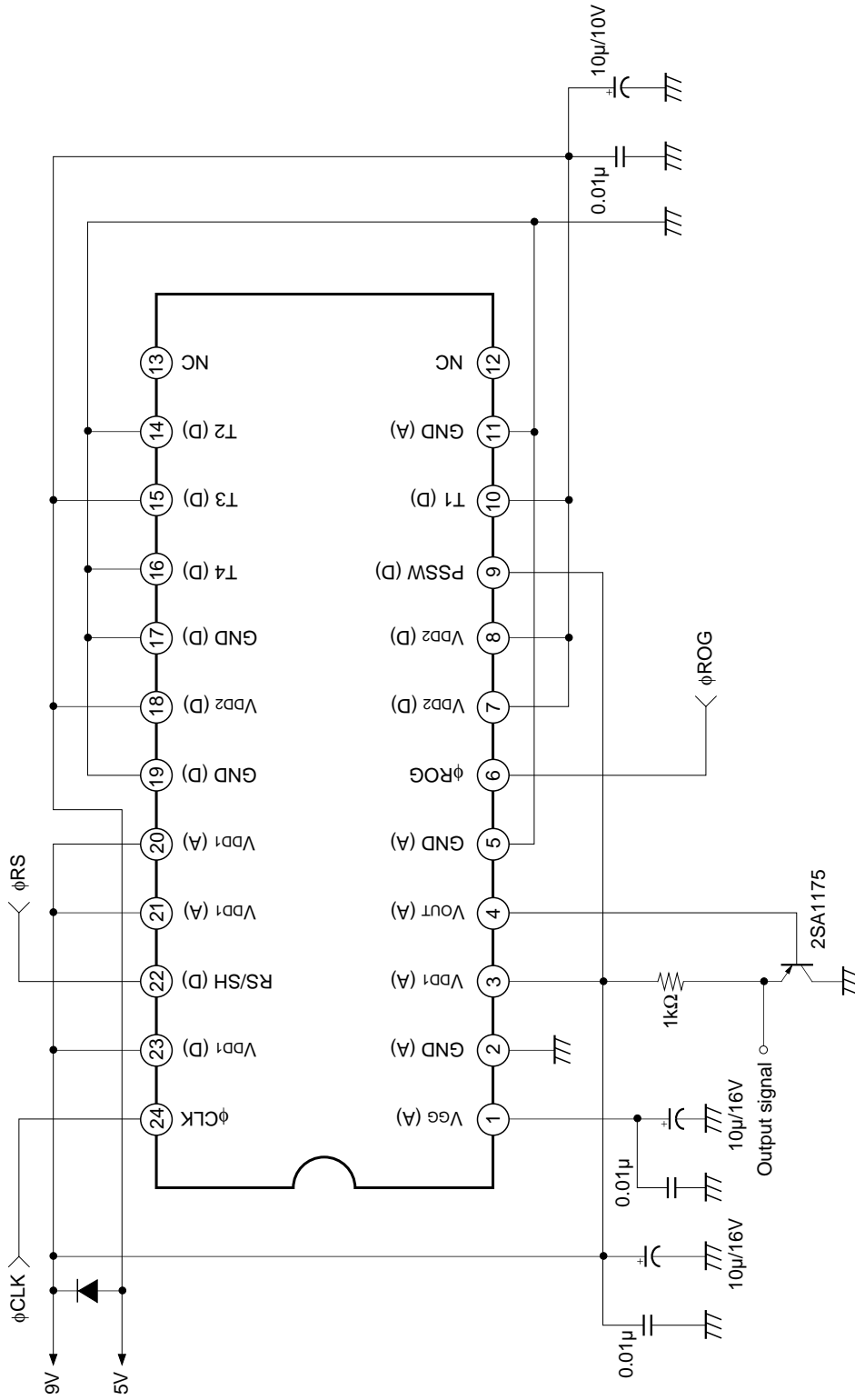


*12 Dynamic range is defined as follows.

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

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.

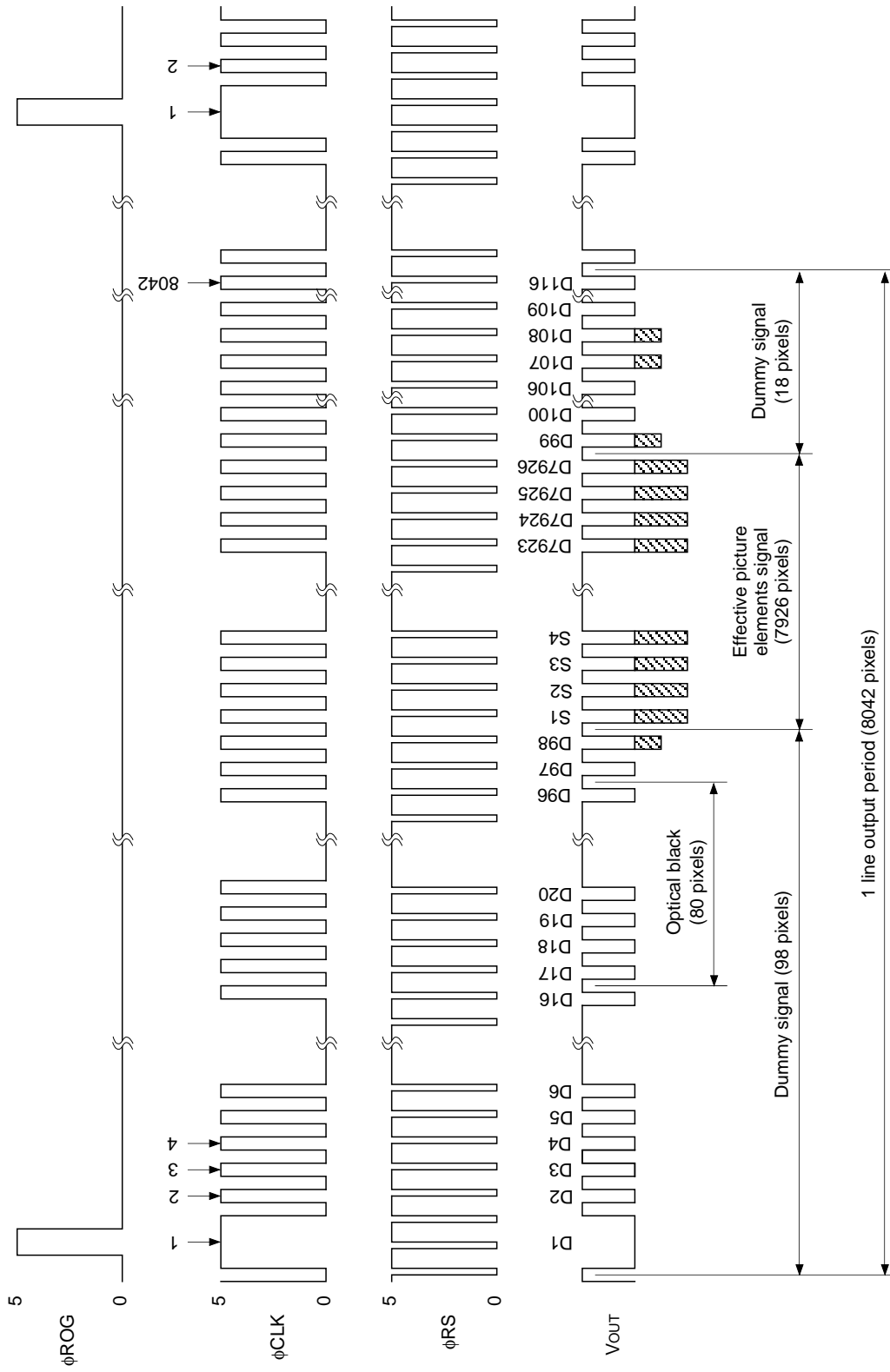
Application Circuit (External ϕ RS)



* When noise influence into output signal is large, connect pins indicated by (A) to the analog power supply and pins indicated by (D) to the digital power supply, and also use a decoupling capacitor of large capacitance.

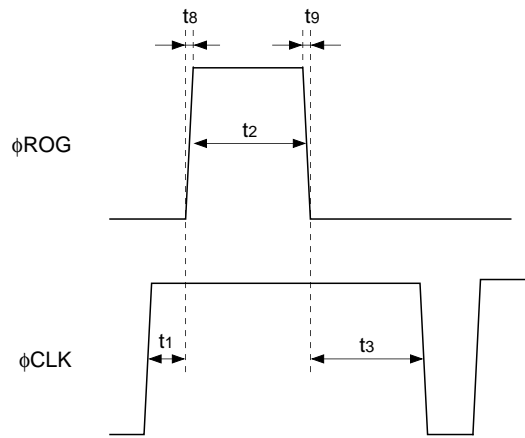
Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Clock Timing Diagram (External ϕRS)

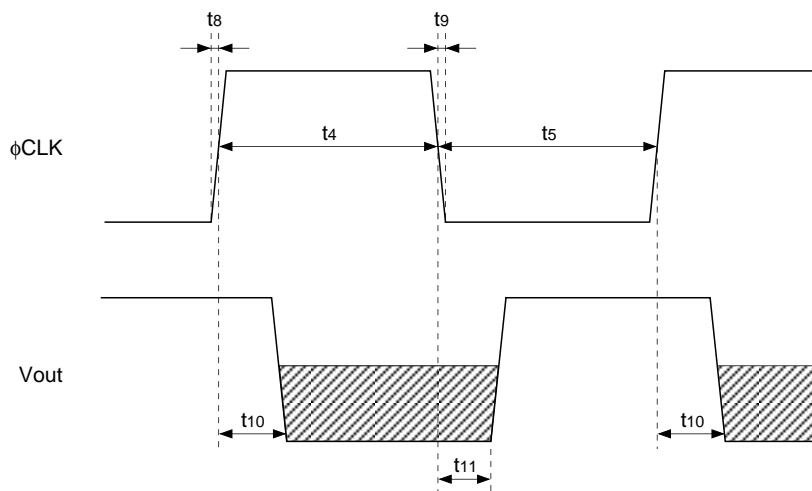


Clock pulse Waveform Conditions

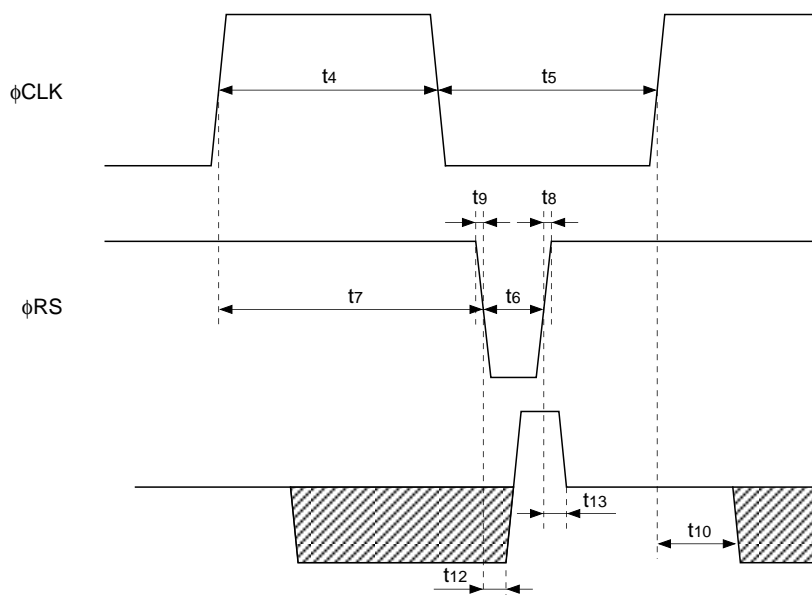
ϕ CLK, ϕ ROG pulse related



Internal ϕ RS mode



External ϕ RS mode

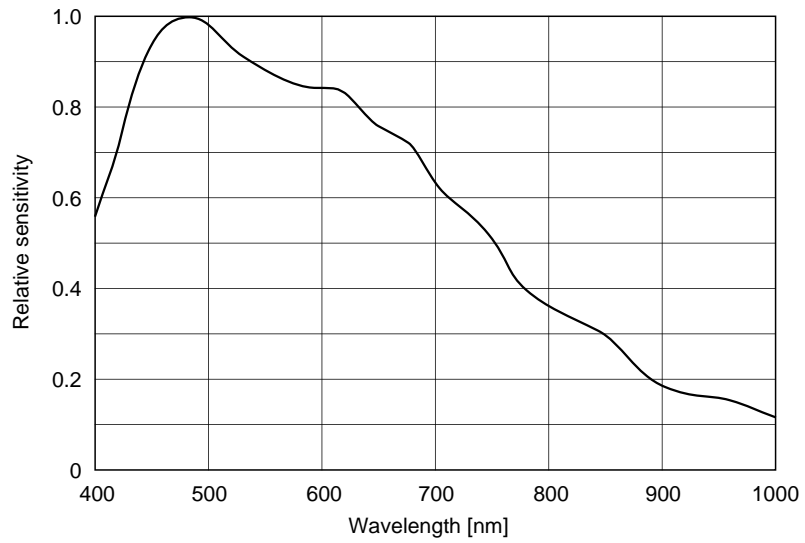


Item		Symbol	Min.	Typ.	Max.	Unit
ϕ ROG, ϕ CLK pulse timing		t ₁	200	300	—	ns
ϕ ROG, ϕ CLK pulse timing		t ₃	1200	1500	—	ns
ϕ ROG pulse high level period		t ₂	1200	1500	—	ns
ϕ CLK pulse high level period		t ₄	40	500* ¹	—	ns
ϕ CLK pulse low level period		t ₅	40	500* ¹	—	ns
ϕ RS pulse low level period		t ₆	25	100* ¹	—	ns
ϕ CLK, ϕ RS pulse timing		t ₇	60	550* ¹	10 + t ₄ + t ₅	ns
Input clock pulse rise/fall time		t ₈ , t ₉	—	5	10	ns
Input clock pulse voltage	High level	V ϕ CLK, V ϕ ROG	4.5	5.0	5.5	V
	Low level	V ϕ RS	0	—	0.5	V
Signal output delay time	Internal ϕ RS	t ₁₀	—	95	—	ns
		t ₁₁	—	70	—	ns
	External ϕ RS	t ₁₂	—	45	—	ns
		t ₁₃	—	60	—	ns

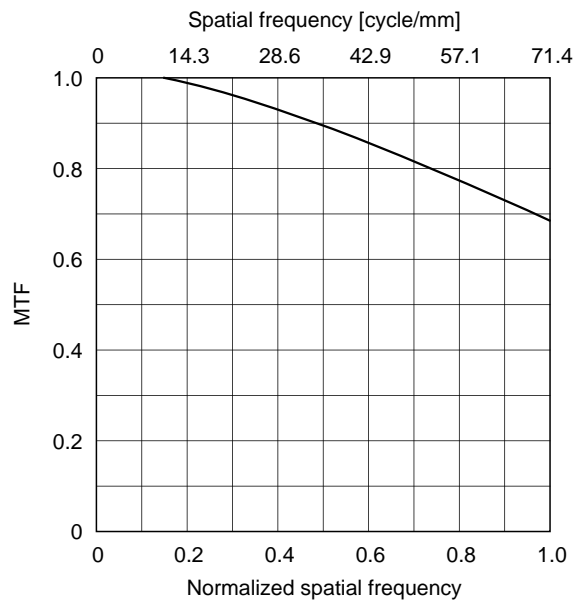
*¹ The frequency of ϕ CLK is 1MHz.

Example of Representative Characteristics ($V_{DD1} = 9V$, $V_{DD2} = 5V$, $T_a = 25^\circ C$)

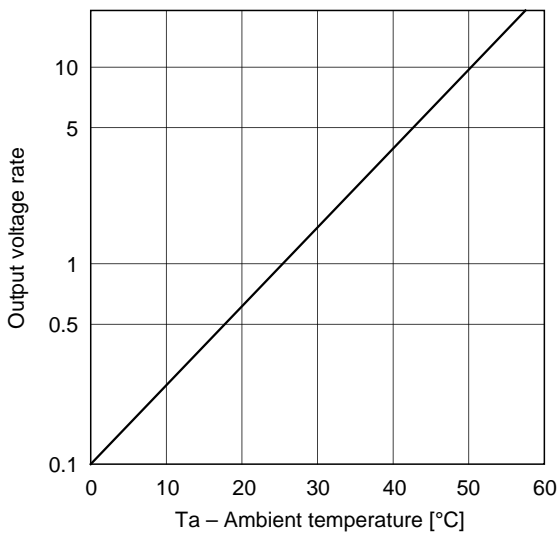
Spectral sensitivity characteristics (Standard characteristics)



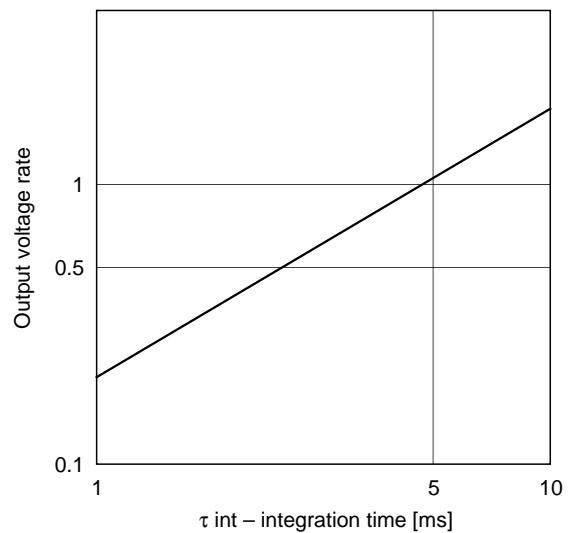
MTF of main scanning direction (Standard characteristics)



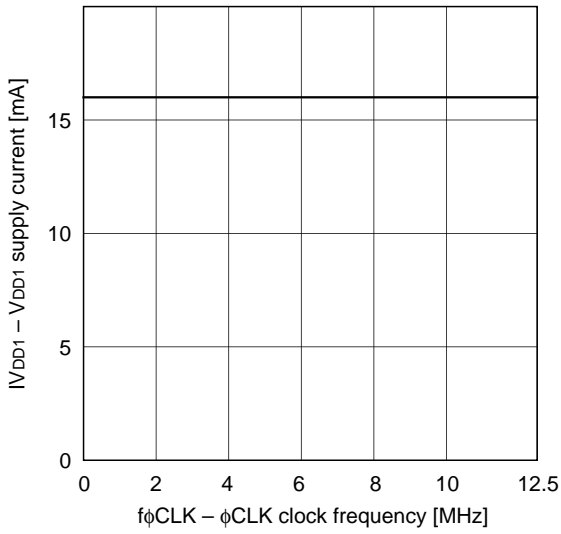
Dark signal output temperature characteristics (Typical characteristics)



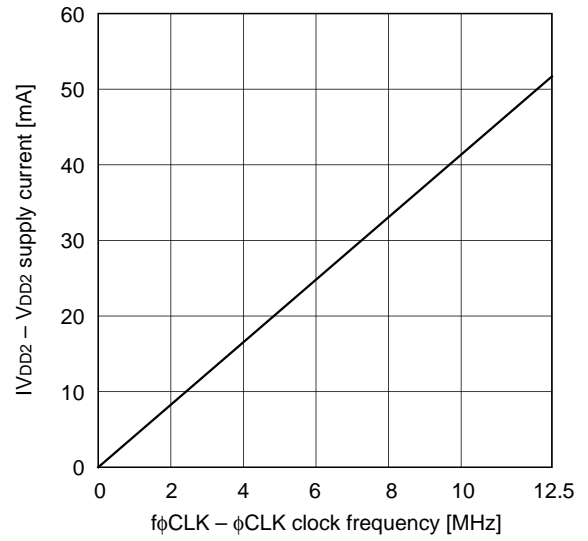
Integration time output voltage characteristics (Typical characteristics)



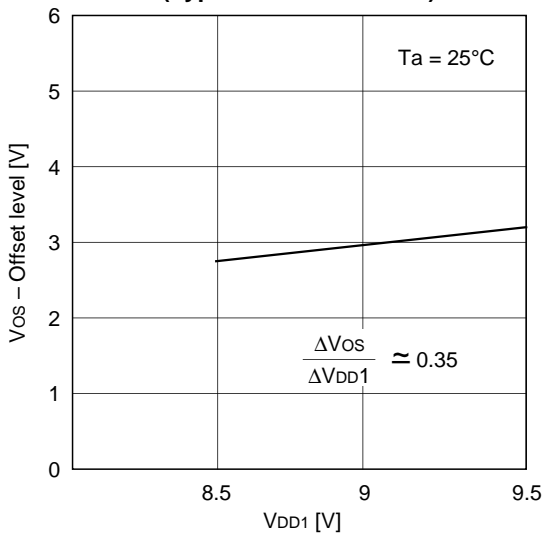
Operational frequency characteristics of the VDD1 supply current (Typical characteristics)



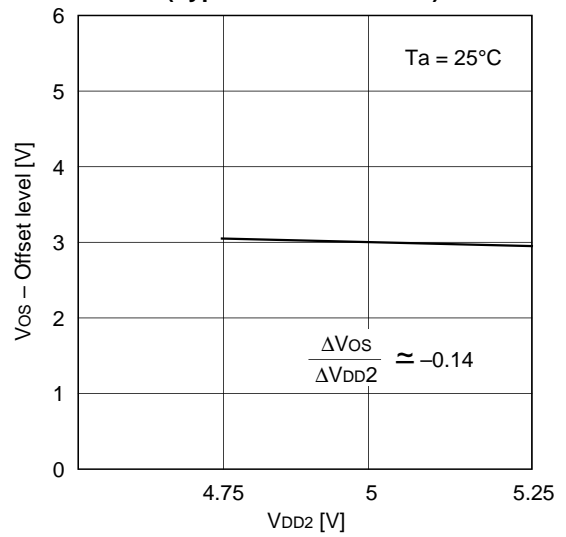
Operational frequency characteristics of the VDD2 supply current (Typical characteristics)



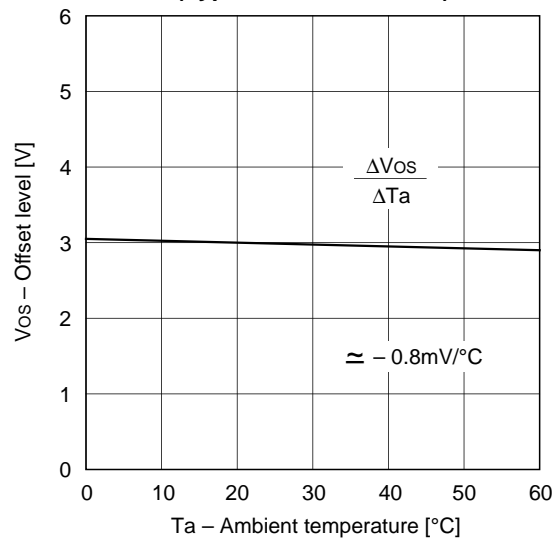
Offset level vs. VDD1 characteristics (Typical characteristics)



Offset level vs. VDD2 characteristics (Typical characteristics)



Offset level vs. Temperature characteristics (Typical 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 the prevention of static charges.

- 2) Regulation for raising and lowering the power supply voltage.
When raising the supply voltage, first raise V_{DD1} (9V) and then V_{DD2} (5V).
Similarly, lower V_{DD2} (5V) first and then V_{DD1} (9V).

- 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.

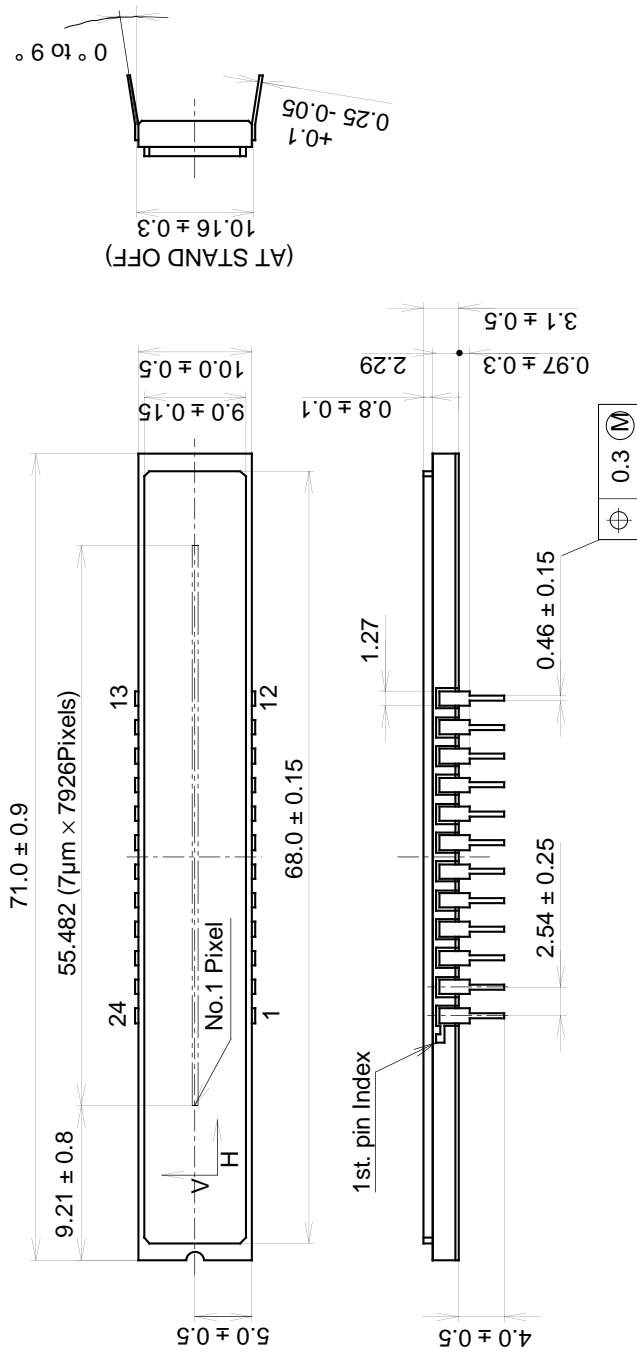
- 4) Dust and dirt protection
 - a) Operate in clean environments.
 - b) Do not either touch glass plates by hand or have any object come in contact with glass surfaces. Should dirt stick to a glass surface blow it off with an air blow. (For dirt stuck through static electricity ionized air is recommended.)
 - 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

24Pin DIP (400mil)



1. The height from the bottom to the sensor surface is 1.42 ± 0.3mm.
2. The thickness of the cover glass is 0.8mm, and the refractive index is 1.5.

PACKAGE STRUCTURE

PACKAGE MATERIAL	Ceramic
LEAD TREATMENT	GOLD PLATING
LEAD MATERIAL	42ALLOY
PACKAGE WEIGHT	5.8g