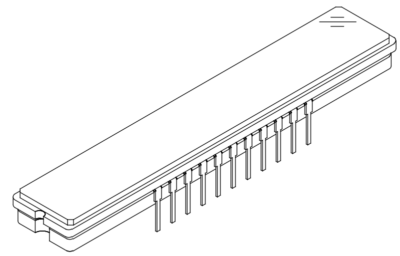
5150-pixel CCD Linear Sensor (B/W)

Description

The ILX510 is a reduction type CCD linear sensor developed for high resolution copiers. This sensor reads A3-size documents at a density of 400 DPI, and A4-size documents at a density of 600 DPI at high speed.

22-pin DIP (CERDIP)



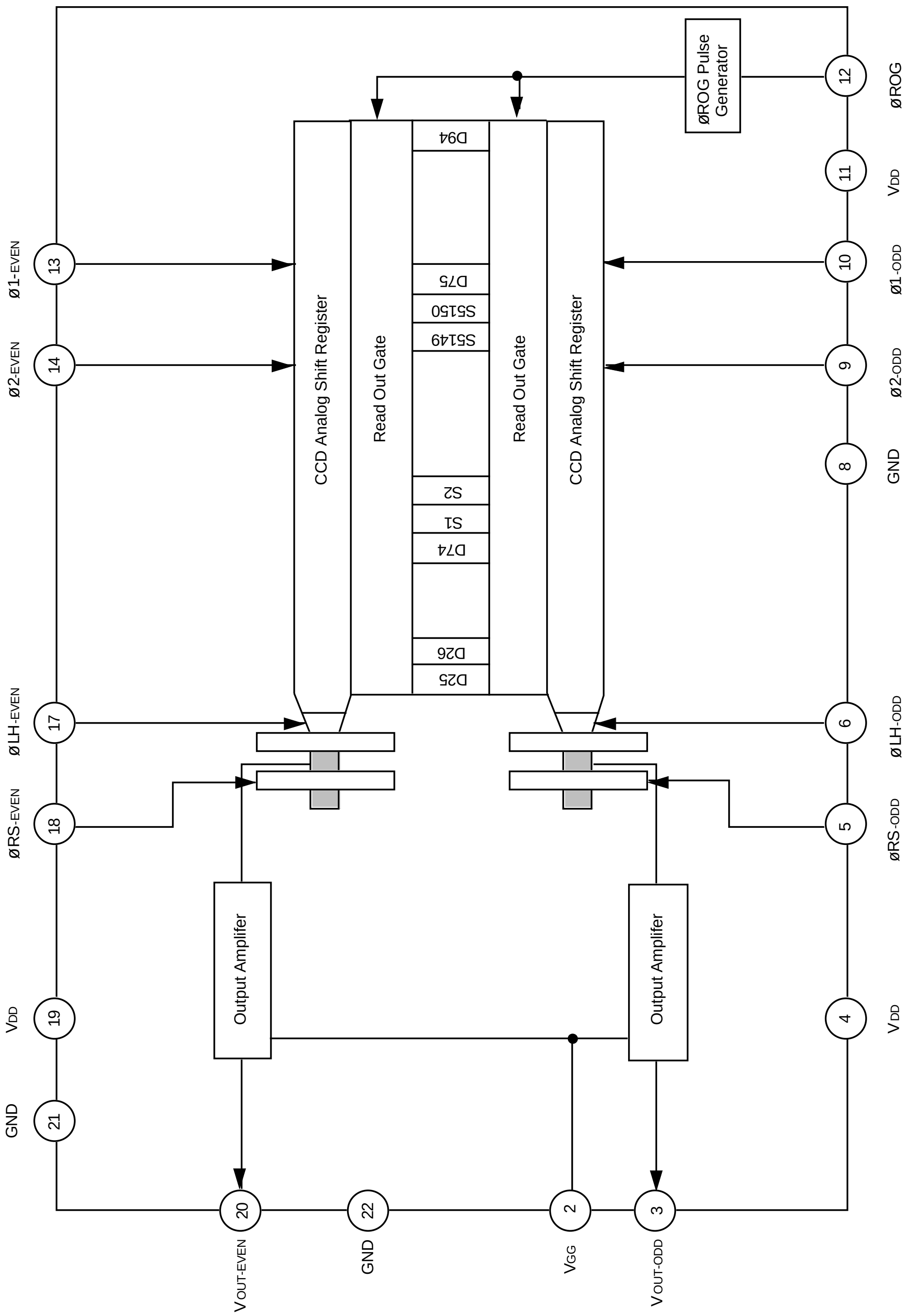
Features

- Number of effective pixels: 5150 pixels
- Pixel size: 7µm × 7µm (7µm pitch)
- Signal output phase of two-output simultaneous-output (alternate-output is available)
- Ultra high sensitivity/ultra low lag
- Max Data Rate: 40 MHz
- Single 12V power supply
- Input Clock Pulse: CMOS 5V drive
- Package: 22-pin CERDIP (400 mil)

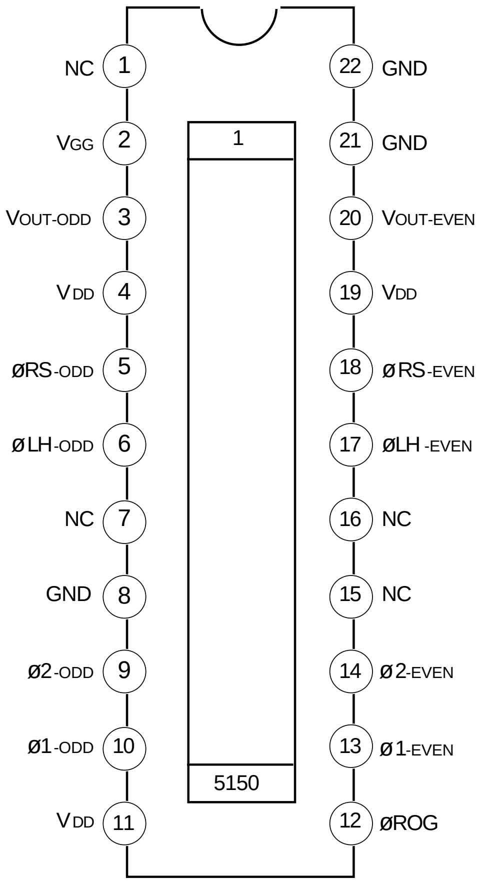
Absolute Maximum Ratings

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

Block Diagram



Pin Configuration (TOP VIEW)



Pin Description

Pin No	Symbol	Description	Pin No	Symbol	Description
1	NC	NC	12	øROG	Readout gate clock pulse input
2	VGG	Output circuit gate bias	13	ø1-EVEN	Clock pulse input (even pixel)
3	VOUT-ODD	Signal out (odd pixel)	14	ø2-EVEN	Clock pulse input (even pixel)
4	VDD	12V power supply	15	NC	NC
5	øRS-ODD	Clock pulse input (odd pixel)	16	NC	NC
6	øLH-ODD	Clock pulse input (odd pixel)	17	øLH-EVEN	Clock pulse input (even pixel)
7	NC	NC	18	øRS-EVEN	Clock pulse input (even pixel)
8	GND	GND	19	VDD	12V power supply
9	ø2-ODD	Clock pulse input (odd pixel)	20	VOUT-EVEN	Signal out (even pixel)
10	ø1-ODD	Clock pulse input (odd pixel)	21	GND	GND
11	VDD	12V power supply	22	GND	GND

Recommended Supply Voltage

Item	Min.	Typ.	Max.	Unit
V_{DD}	11.4	12	12.6	V

Clock Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Input capacity of ø1*, ø2*	Cø1, Cø2	—	400	—	pF
Input capacity of øLH*	$Cø_{LH}$	—	10	—	pF
Input capacity of øRS*	$Cø_{RS}$	—	10	—	pF
Input capacity of øROG	$Cø_{ROG}$	—	10	—	pF

*It indicates that ø1-ODD, ø1-EVEN as ø1, ø2-ODD, ø2-EVEN as ø2, øLH-ODD, øLH-EVEN as øLH, øRS-ODD, øRS-EVEN as øRS.

Clock Frequency

Item	Symbol	Min.	Typ.	Max.	Unit
ø1, ø2, øLH, øRS	fø1, fø2, føLH, føRS	—	1	20	MHz
Data rate	$fø_R$	—	2	40	MHz

Input Clock Pulse Voltage Condition

Item		Min.	Typ.	Max.	Unit
ø1, ø2, øLH, øRS, øROG pulse voltage	High level	4.75	5.0	5.25	V
	Low level	—	0	0.1	V

Electro-optical Characteristics (Note 1)
(Ta = +25°C, V_{DD} = 12V, Data Rate $f_{\phi R}$ = 2MHz, Simultaneous Output, Input Clock = 5Vp-p
Light Source = 3200K, IR Cut Filter CM-500S (t = 1.0mm)

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Sensitivity 1	R1	9	12	15	V/(lx • s)	Note 2
Sensitivity 2	R2	—	27.4	—	V/(lx • s)	Note 3
Sensitivity nonuniformity	PRNU	—	4	10	%	Note 4
Saturation output voltage	V_{SAT}	1.0	1.5	—	V	Note 5
Saturation exposure	SE	0.067	0.125	—	lx • s	Note 6
Register imbalance	RI	—	2	7	%	Note 7
Dark voltage average	V_{DRK}	—	0.3	2.0	mV	Note 8
Dark signal nonuniformity	DSNU	—	0.6	3.0	mV	Note 9
Image lag	IL	—	0.02	—	%	Note 10
Supply current	I_{VDD}	—	30	60	mA	—
Total transfer efficiency	TTE	92	98	—	%	—
Output impedance	Z_O	—	150	—	Ω	—
Offset level	V_{OS}	—	6.5	—	V	Note 11
Dynamic range	DR	500	5000	—	—	Note 12

Note

1) In accordance with the given electro-optical characteristics, the even black level is defined as the average value of D6, D8 to D24. The odd black level is defined as the average value of D5, D7 to D23.

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 Note 2. V_{OUT} = 500mV (typ.)

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

Where the 5150 pixels are divided into blocks of 103, even and odd pixels, respectively. 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: $SE = \frac{V_{SAT}}{R1}$

7) RI is defined as indicated follows. V_{OUT} = 500mV (typ.) $RI = \frac{|V_{ODD\text{-}AVE} — V_{EVEN\text{-}AVE}|}{\left(\frac{V_{ODD\text{-}AVE} + V_{EVEN\text{-}AVE}}{2}\right)} \times 100\ (\%)$

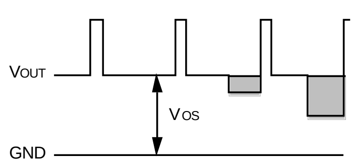
Where average of odd pixels output is set to $V_{ODD\text{-}AVE}$, even pixels to $V_{EVEN\text{-}AVE}$.

8) Optical signal accumulated time τ int stands at 10ms.

9) The difference between the maximum and average 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.)

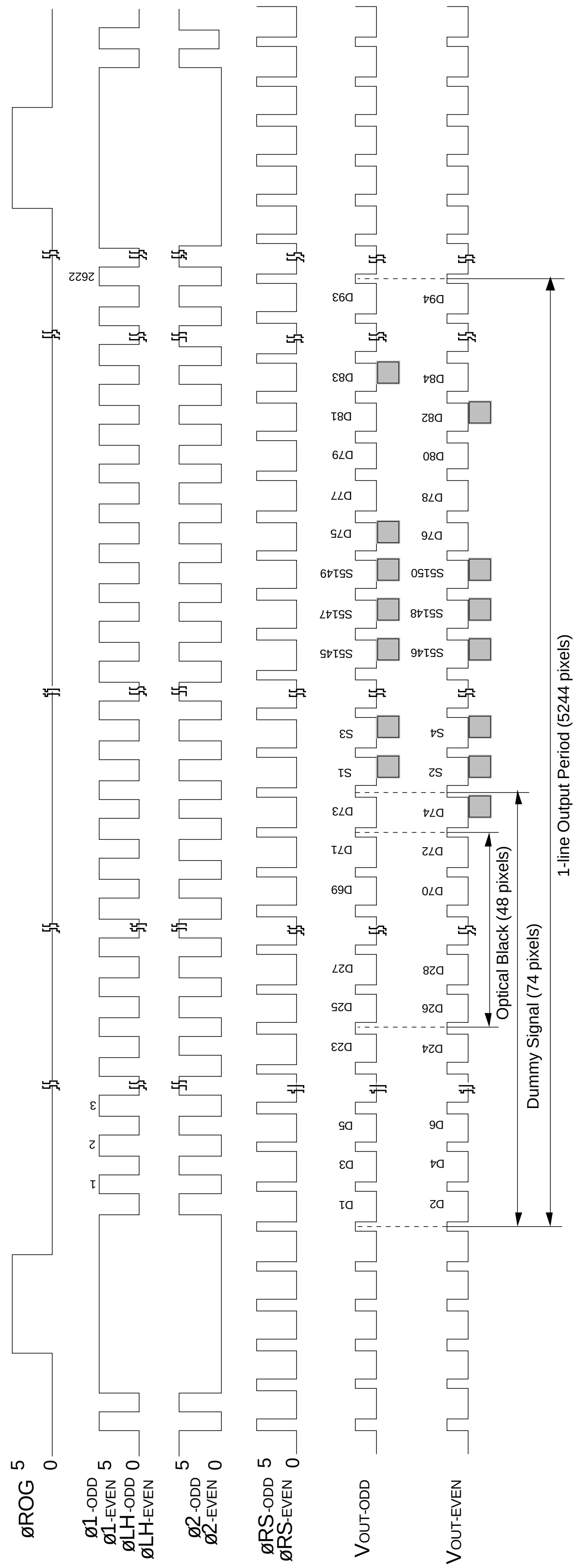
11) V_{OS} is defined as indicated:



12) Dynamic range is defined as follows: $DR = \frac{V_{SAT}}{V_{DRK}}$

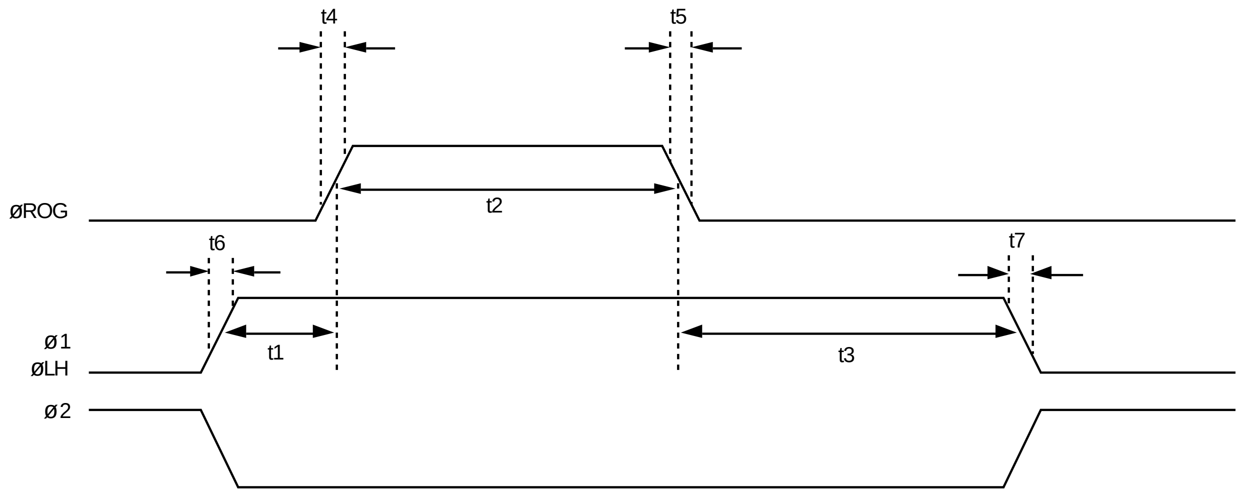
When the optical signal accumulated time is shorter, the dynamic range gets wider because the optical signal accumulated time is in proportion to the dark voltage.

Clock Timing Chart 1 (Simultaneous Output)

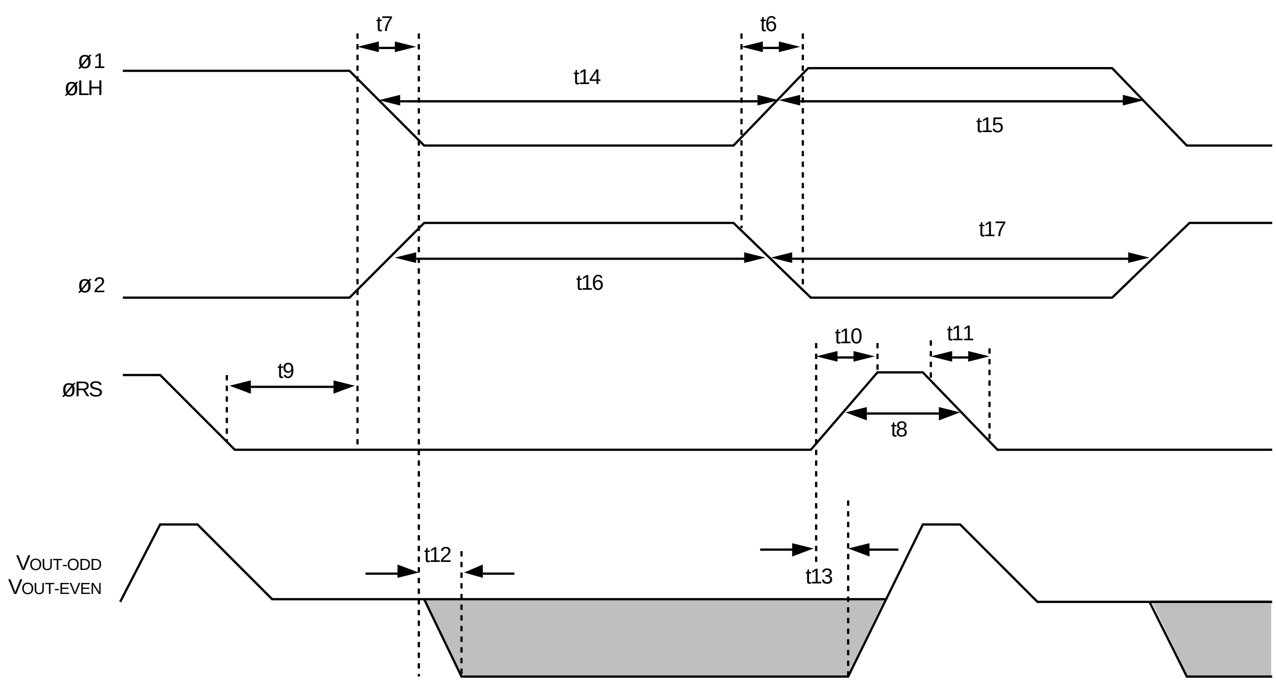


Note: The transfer pulses (ø1, ø2, øLH) must have more than 2622 cycles.

Clock Timing Chart 2



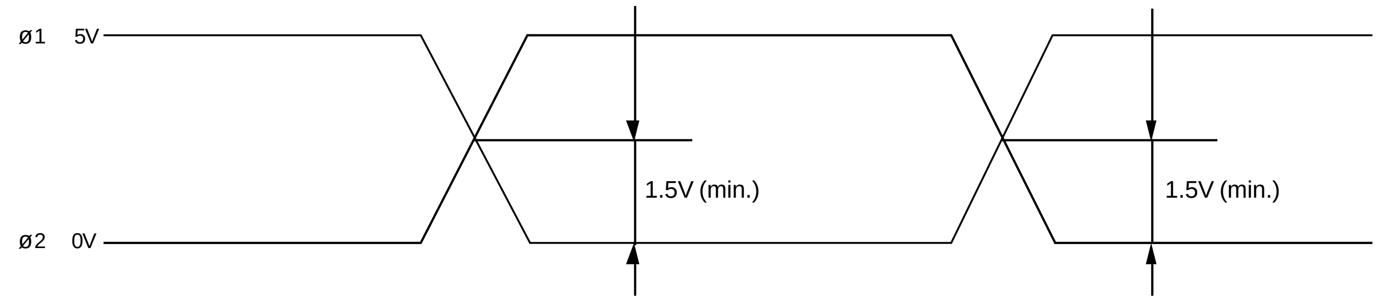
Clock Timing Chart 3



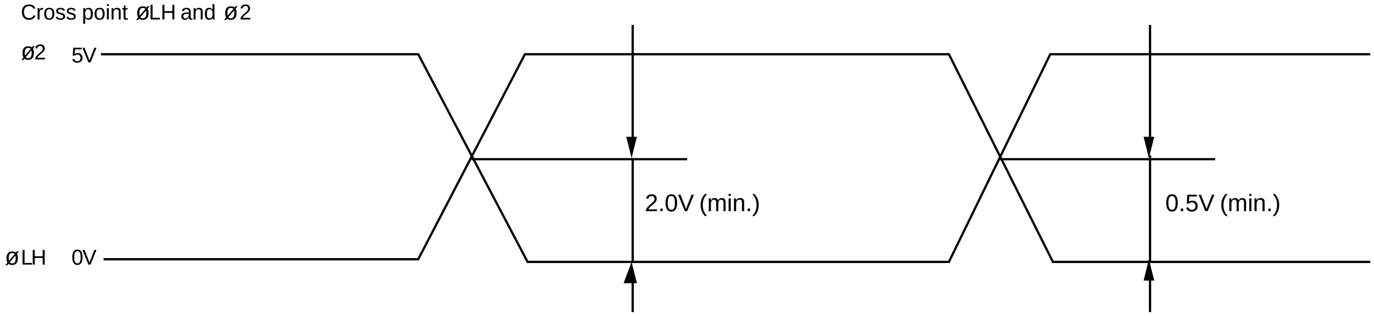
Clock timing of ø1, ø2, øLH, øRS, and VOUT at odd or even are the same as Timing Chart 3 in the case of alternate output.

Clock Timing Chart 4

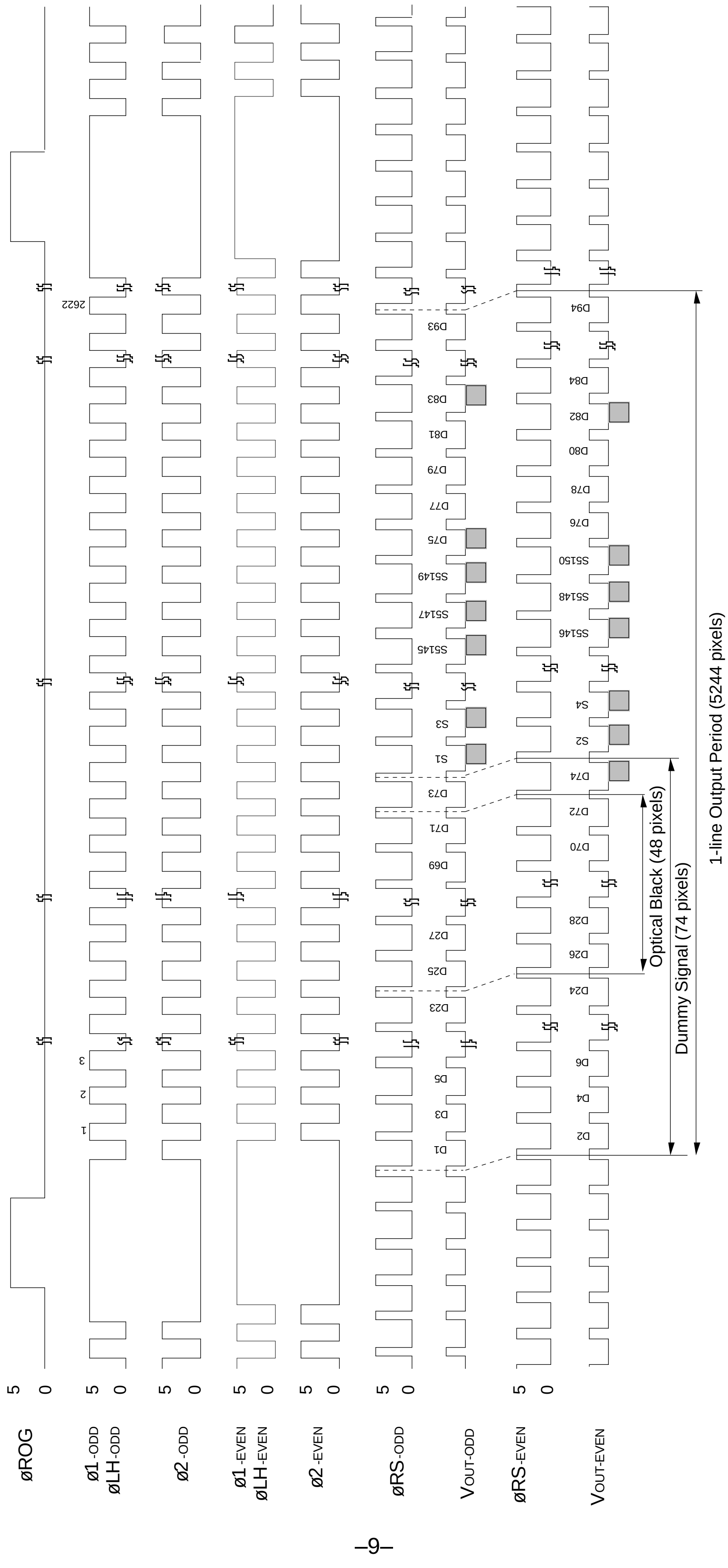
Cross point ø1 and ø2



Cross point øLH and ø2



Clock Timing Chart 5 (Alternate Output)



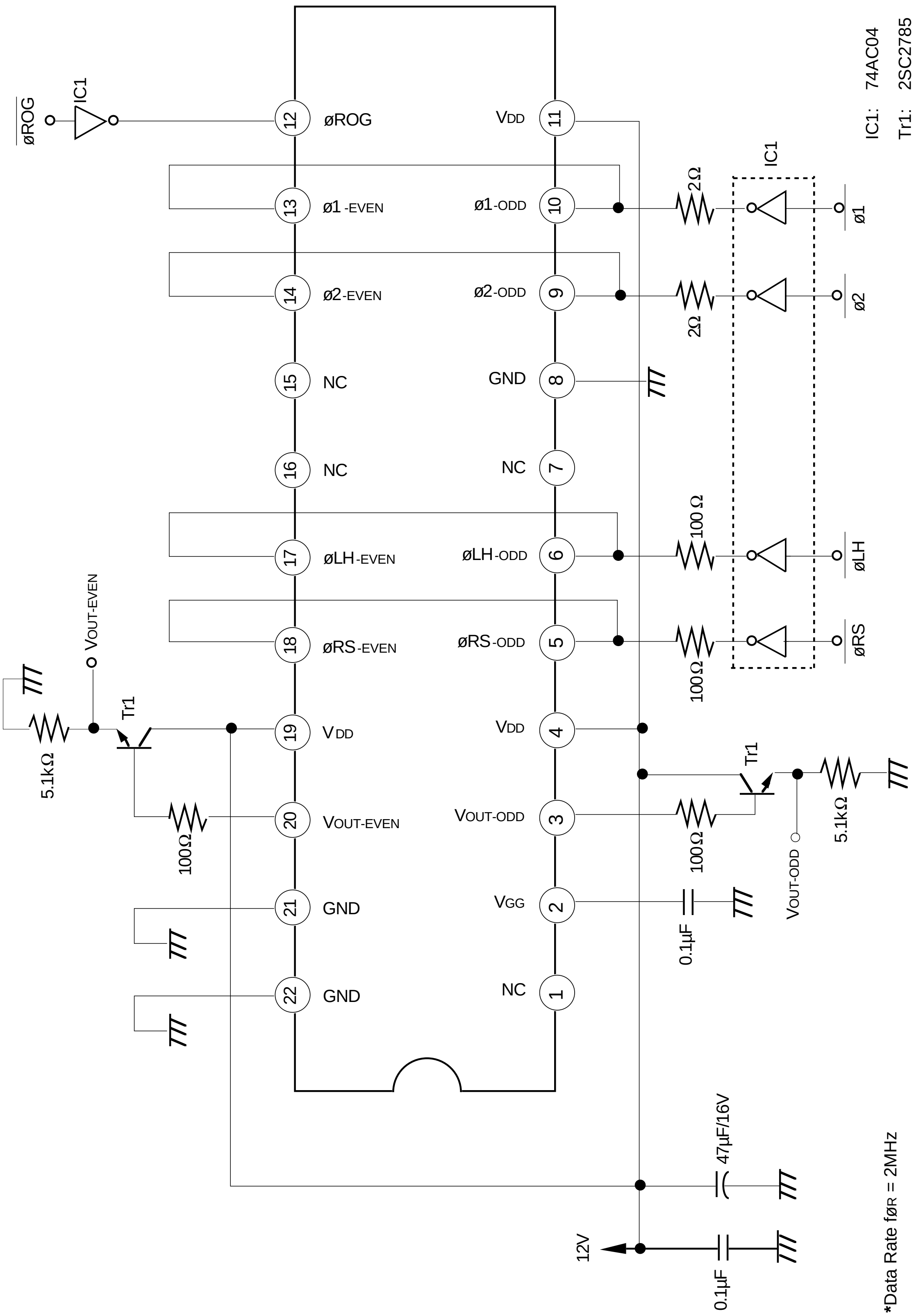
Note: The transfer pulses (ø1, ø2, øLH) must have more than 2622 cycles.
*Alternate output is available by making ø1-EVEN, ø2-EVEN, øLH-EVEN, øRS-EVEN delayed to ø1-ODD, ø2-ODD, øLH-ODD, øRS-ODD for half a cycle.

Clock Pulse Recommended Timing

	Symbol	Min.	Typ.	Max.	Unit
øROG, ø1pulse timing	t1	50	100	—	ns
øROG pulse high level period	t2	600	1000	—	ns
øROG, ø1 pulse timing	t3	400	1000	—	ns
øROG pulse rise time	t4	0	5	10	ns
øROG pulse fall time	t5	0	5	10	ns
ø1 pulse rise time/ø2 pulse fall time	t6	0	20	60	ns
ø1 pulse fall time/ø2 pulse rise time	t7	0	20	60	ns
øRS pulse high level period	t8	20	250*	—	ns
øRS, øLH pulse timing	t9	0	250*	—	ns
øRS pulse rise time	t10	0	10	30	ns
øRS pulse fall time	t11	0	10	30	ns
Signal output delay time	t12	—	8	—	ns
	t13	—	8	—	ns
ø1, øLH pulse low level period/ø2 pulse high level period	t14, t16	25	500*	—	ns
ø1, øLH pulse high level period/ø2 pulse low level period	t15, t17	25	500*	—	ns

(*) This timing is the recommended condition under fø1 = 1MHz.

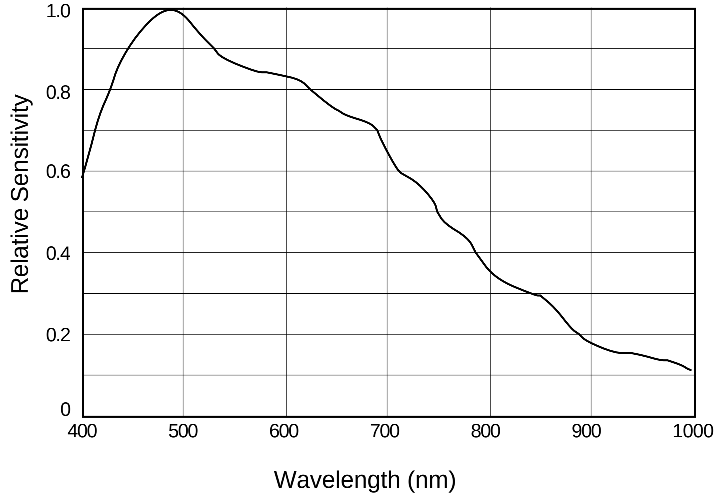
Application Circuit * (Inphase Output)



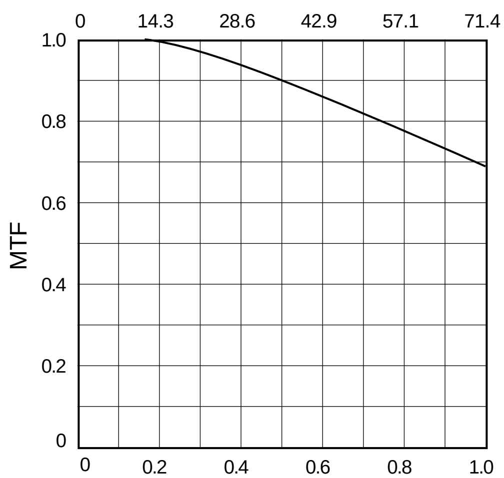
Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party and other right due to same.

Example of Representative Characteristics (VDD = 12V, Ta = +25°C)

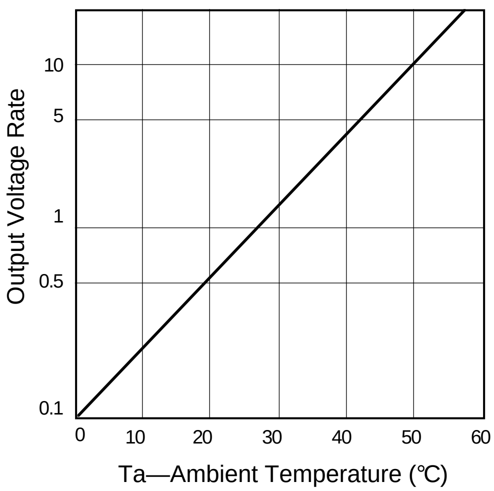
Spectral Sensitivity Characteristics (Standard Characteristics)



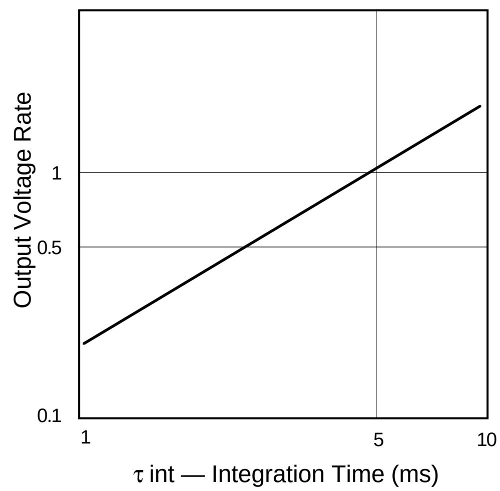
MTF of Main Scanning Direction (Standard Characteristics)
Spatial Frequency (cycles/mm)



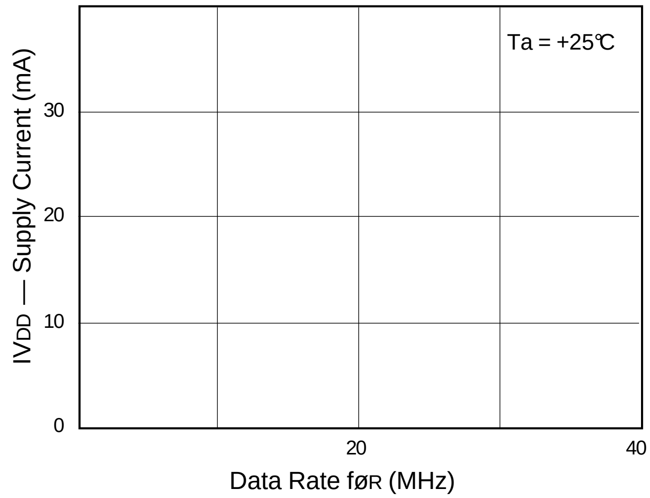
Dark Signal Output Temperature Characteristics
(Standard Characteristics)



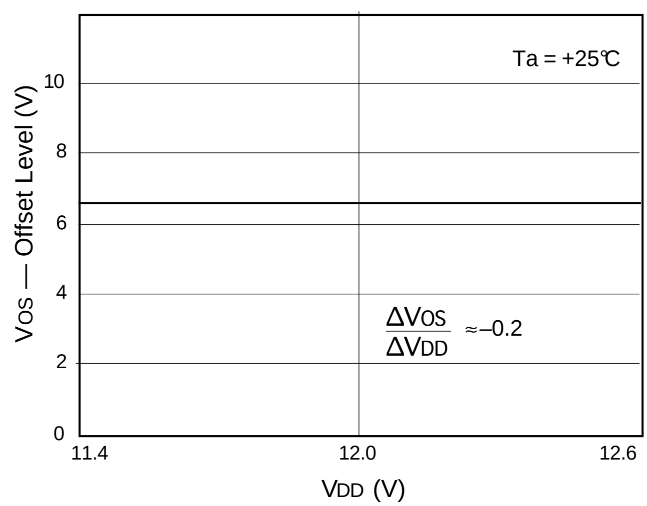
Integration Time Output Voltage Characteristics
(Standard Characteristics)



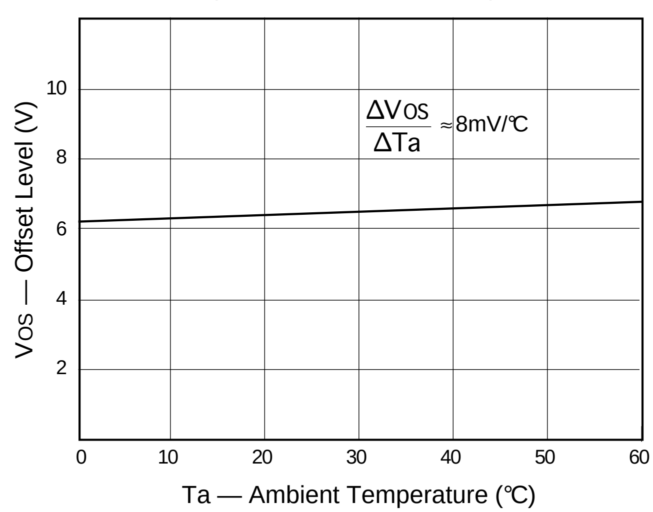
Operational Frequency Response of Supply Current
(Standard Characteristics)



Offset Level vs. VDD Characteristics
(Standard Characteristics)



Offset Level vs. Temperature Characteristics
(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 a grounded 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 prevention of static charges.

2) Notes on handling CCD CERDIP packages

The following points should be observed when handling and installing CERDIP packages:

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

(1) Compressive strength: 39 N/surface (do not apply load more than 0.7 mm inside the outer perimeter of the glass portion)

(2) Shearing strength: 29 N/surface

(3) Tensile strength: 29 N/surface

(4) Torsional strength: 0.9 Nm

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

(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

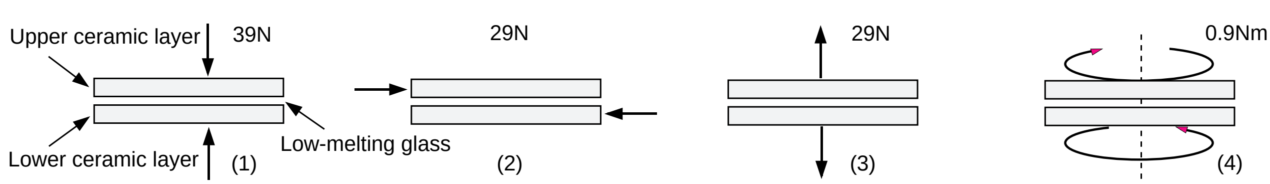
Note that the preceding notes should also be observed when removing a component from a board after it has already been soldered.

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 as well as 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 solder suction equipment. When using an electric desoldering tool, ground the controller. For the control system, use a zero cross type.

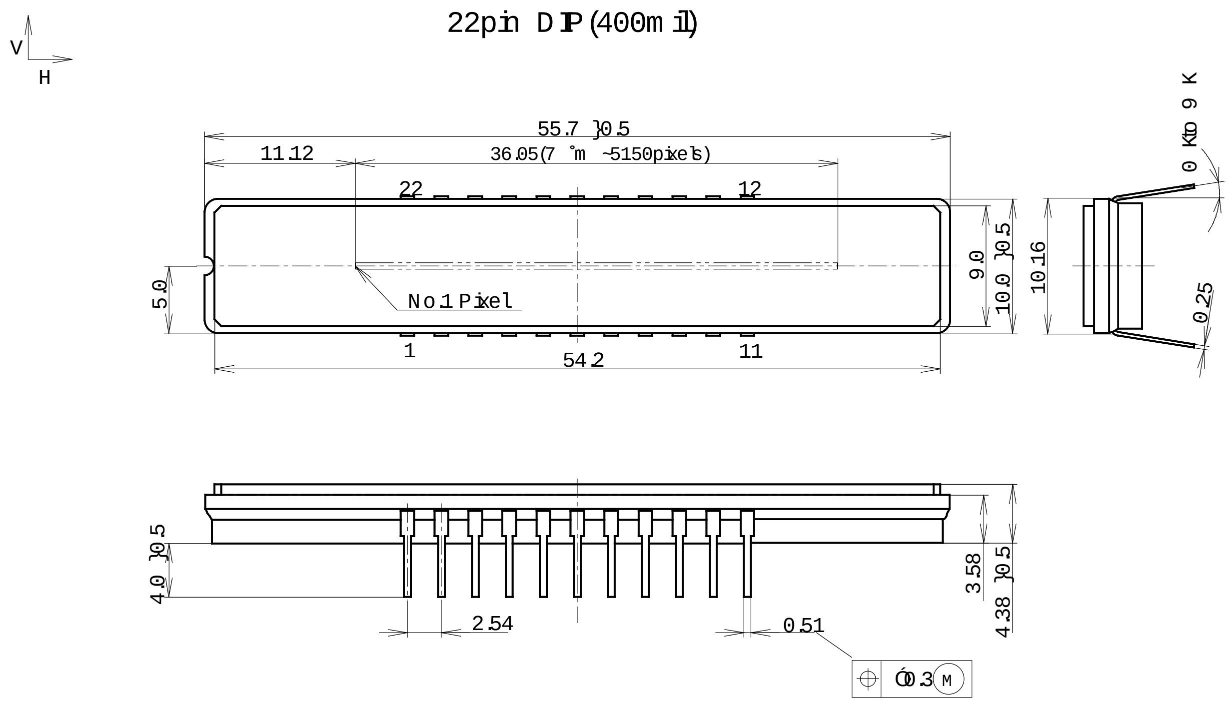


4) Dust and dirt protection
   a) Operate in clean environments.
   b) Do not touch glass plates either by hand or have any object come in contact with glass surfaces. Should dirt stick to a glass surface, blow it off with an air blower. (For dirt stuck through static electricity, ionized air is recommended.)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

Package Outline Unit: mm



PACKAGE STRUCTURE

PACKAGE MATERIAL	Cer DIP
LEAD TREATMENT	TIN PLATING
LEAD MATERIAL	42ALLOY
PACKAGE WEIGHT	7.1g

1. Distance of the first pixel: (H, V) = (11.12 ± 0.5mm, 5.0 ± 0.5mm)
2. Distance of the sensor surface from the base: 2.38 ± 0.3mm
3. Thickness of the glass: t = 0.8 (refractive index = 1.5)