

7078 × 3pixel CCD Linear Sensor (Color)

Description

The ILX520K is a reduction type CCD linear sensor developing for color image scanner. This sensor reads A3-size documents at a density of 600 DPI.

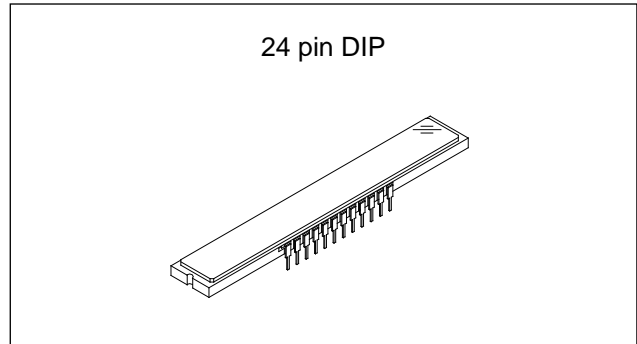
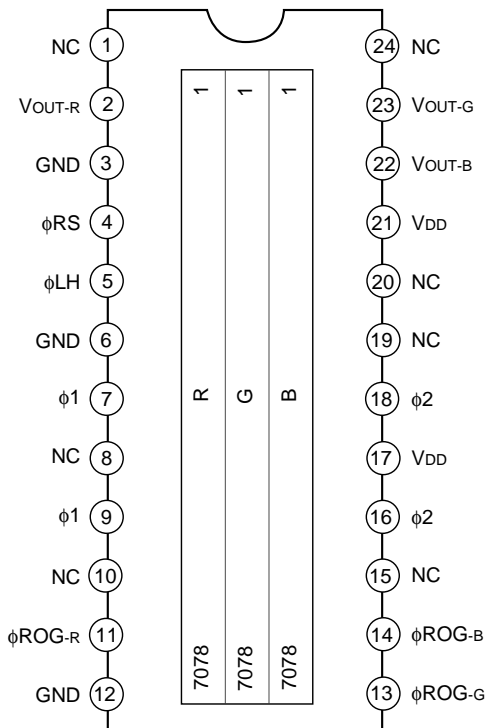
Features

- Number of effective pixels: 21234 pixels
(7078 pixels × 3)
- Pixel size: 8μm × 8μm (8μm pitch)
- Distance between line: 64μm (8 Lines)
- Single-sided readout
- Ultra low lag / Ultra high sensitivity
- Single 12V power supply
- Input clock pulse: CMOS 5V drive
- Number of output 3 (R, G, B)
- Package: 24 pin DIP (400 mil)

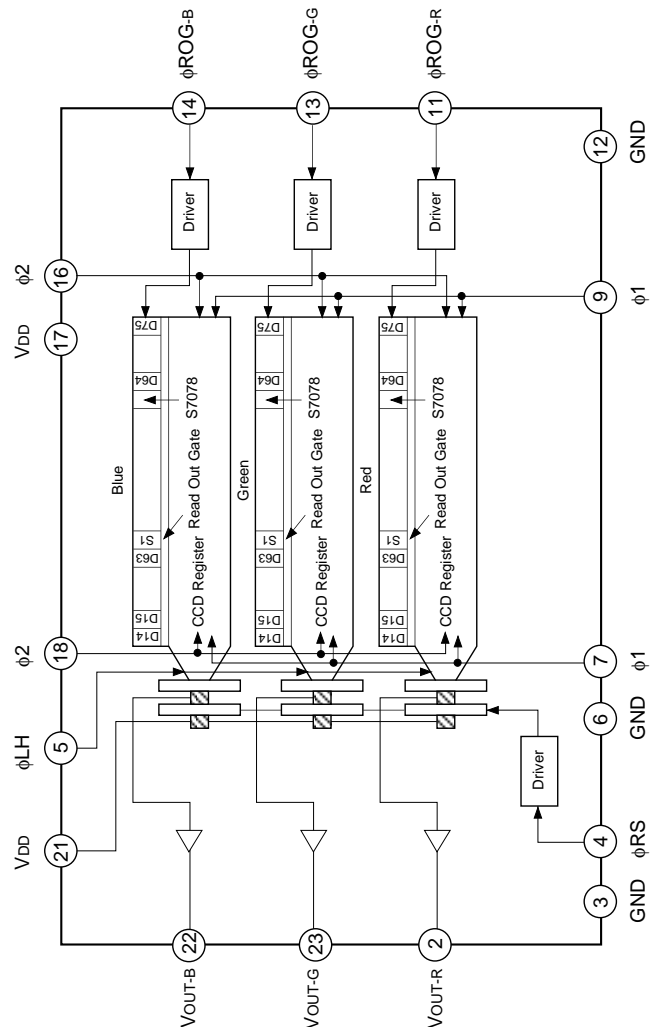
Absolute Maximum Ratings

- Supply voltage V_{DD} 15 V
- Operating temperature -10 to +55 °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	NC	NC	13	ϕ ROG-G	Clock pulse input
2	V _{OUT-R}	Signal out (red)	14	ϕ ROG-B	Clock pulse input
3	GND	GND	15	NC	NC
4	ϕ RS	Clock pulse input	16	ϕ 2	Clock pulse input
5	ϕ LH	Clock pulse input	17	V _{DD}	12V power supply
6	GND	GND	18	ϕ 2	Clock pulse input
7	ϕ 1	Clock pulse input	19	NC	NC
8	NC	NC	20	NC	NC
9	ϕ 1	Clock pulse input	21	V _{DD}	12V power supply
10	NC	NC	22	V _{OUT-B}	Signal out (blue)
11	ϕ ROG-R	Clock pulse input	23	V _{OUT-G}	Signal out (green)
12	GND	GND	24	NC	NC

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 ϕ 1, ϕ 2	C ϕ 1, C ϕ 2	—	1100	—	pF
Input capacity of ϕ LH	C ϕ LH	—	10	—	pF
Input capacity of ϕ RS	C ϕ RS	—	10	—	pF
Input capacity of ϕ ROG*	C ϕ ROG	—	10	—	pF

* It indicates that ϕ ROG-R, ϕ ROG-G, ϕ ROG-B as ϕ ROG.

Clock Frequency

Item	Symbol	Min.	Typ.	Max.	Unit
ϕ 1, ϕ 2, ϕ LH, ϕ RS	f ϕ 1, f ϕ 2, f ϕ LH, f ϕ RS	—	1	5	MHz

Input Clock Pulse Voltage Condition

Item	Min.	Typ.	Max.	Unit	
ϕ 1, ϕ 2, ϕ LH, ϕ RS, ϕ 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, VDD = 12V, fφRS = 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	RR	1.3	2.0	2.7	V/(lx · s)	Note 2
	Green	RG	2.1	3.2	4.3		
	Blue	RB	1.6	2.5	3.4		
Sensitivity nonuniformity	PRNU	—	4	20	%	Note 3	
Saturation output voltage	VSAT	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	VDRK	—	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	IVDD	—	26	50	mA	—	
Total transfer efficiency	TTE	92	98	—	%	—	
Output impedance	Zo	—	250	—	Ω	—	
Offset level	Vos	—	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.

$$V_{OUT} = 500\text{mV (Typ.)}$$

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

Where the 7078 pixels are divided into blocks of 114 (Last block is 124 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.

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

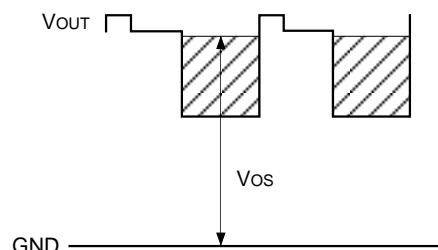
Where R indicates RR, RG, RB, and SE indicates SE_R, SE_G, SE_B.

- 6) Optical signal accumulated time τ int stands at 10ms.
- 7) V_{OUT} = 500mV (Typ.)
- 8) Vos is defined as indicated bellow.

V_{OUT} indicates V_{OUT-R}, V_{OUT-G}, and V_{OUT-B}.

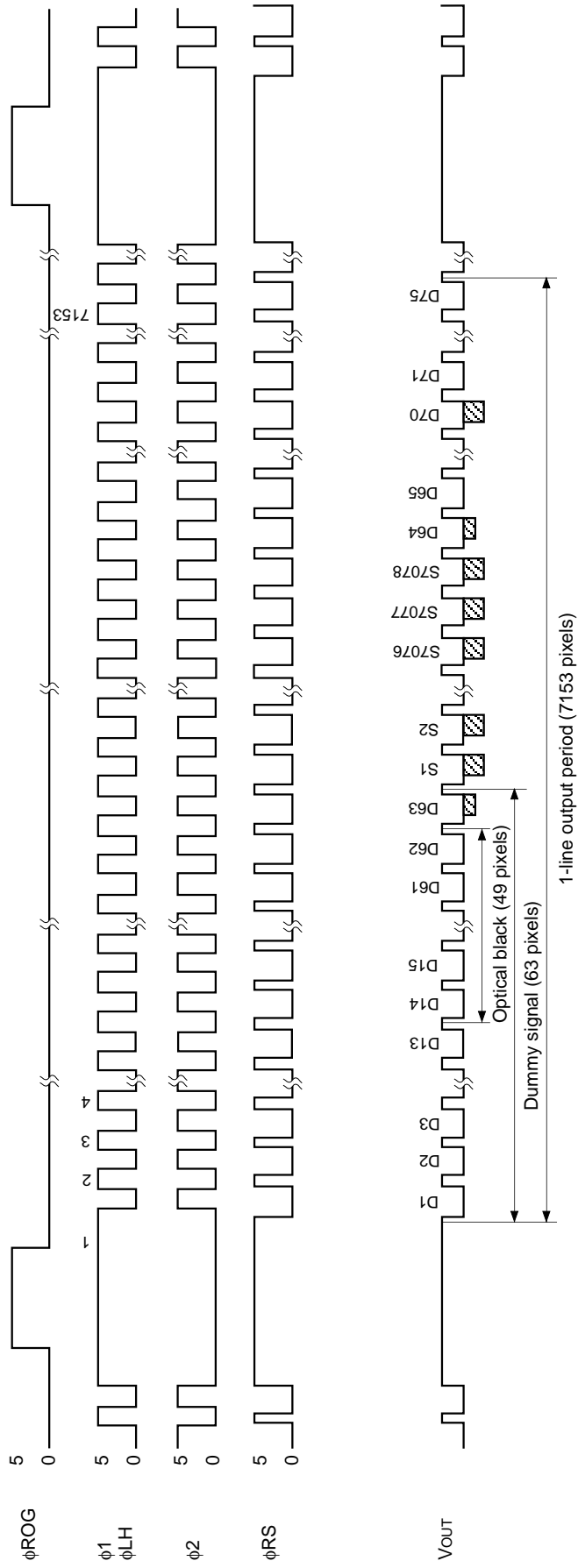
- 9) Dynamic range is defined as follows.

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



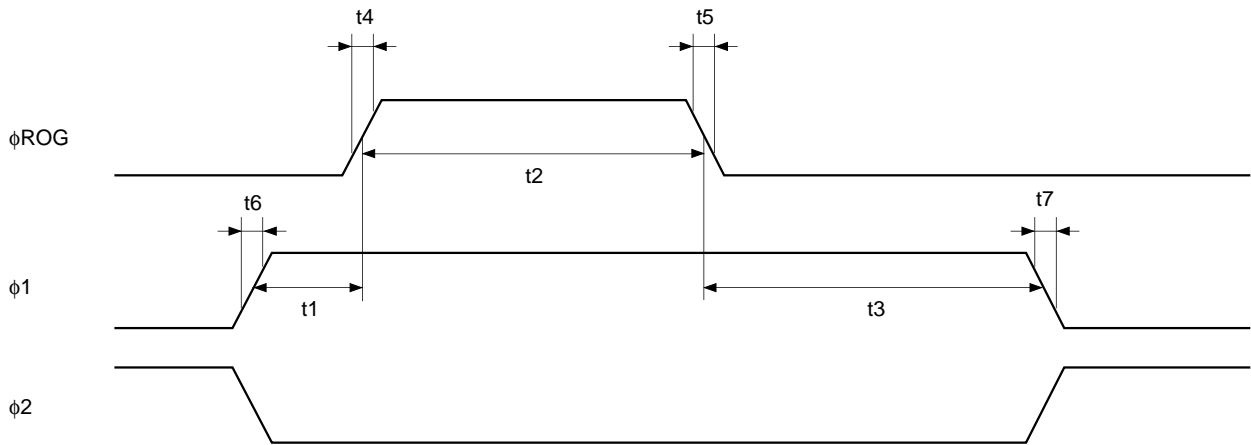
When the optical signal accumulated time is shorter, the dynamic range gets wider because the optical signal accumulated time is in proportion to the dark voltage.

Clock Timing Chart 1

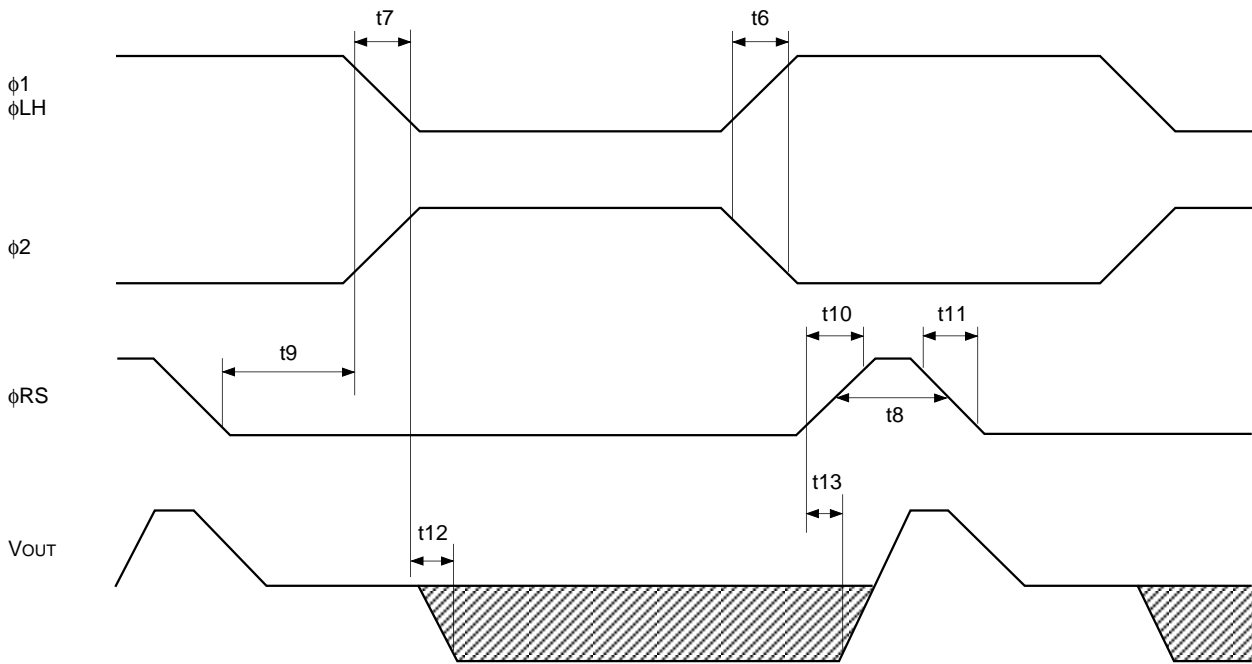


Note) The transfer pulses ($\phi1$, $\phi2$, ϕLH) must have more than 7153 cycles.

Clock Timing Chart 2



Clock Timing Chart 3

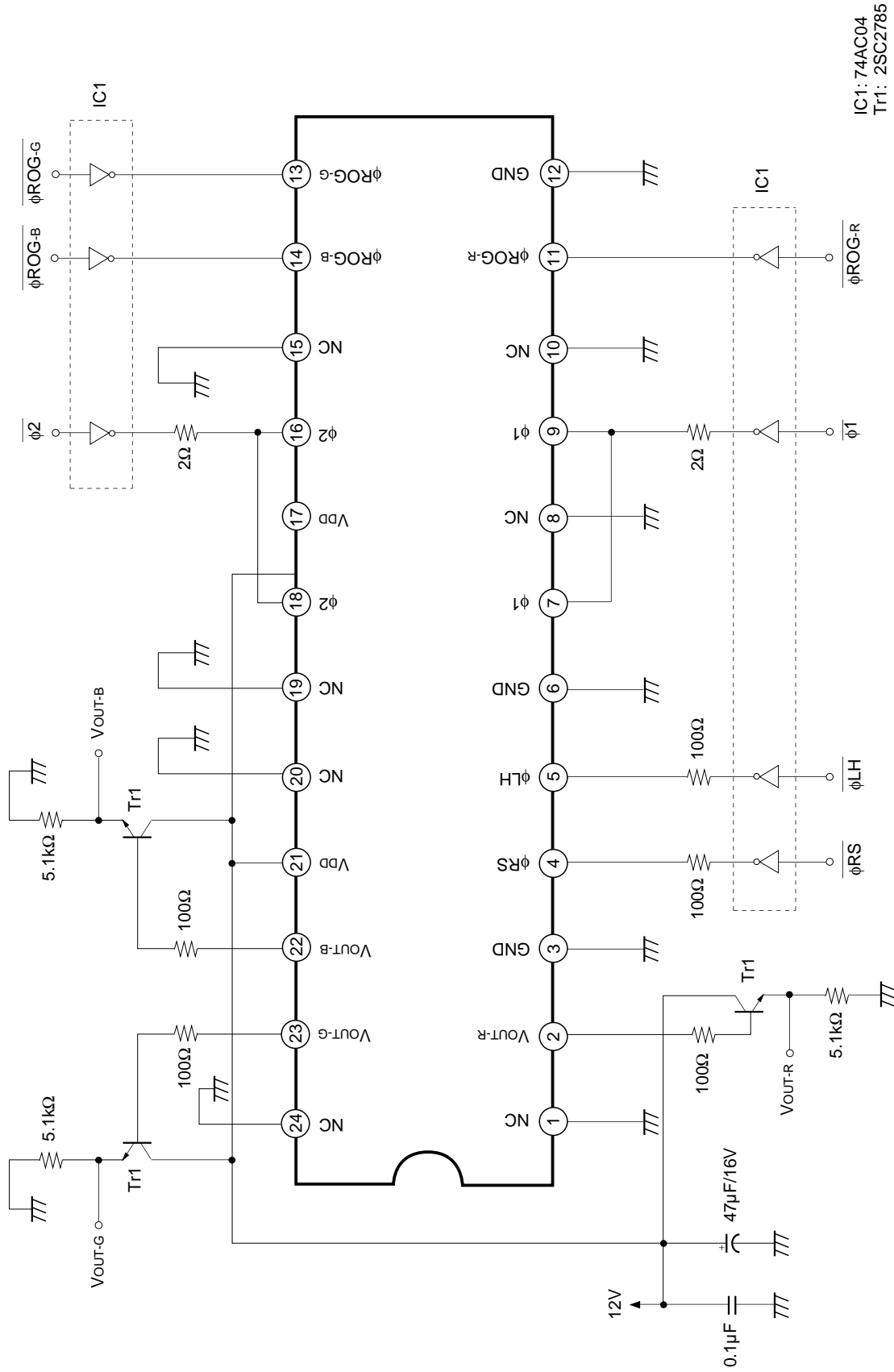


Clock Pulse Recommended Timing

Item	Symbol	Min.	Typ.	Max.	Unit
ϕ ROG, ϕ 1 pulse timing	t1	50	100	—	ns
ϕ ROG pulse high level period	t2	1200	1500	—	ns
ϕ ROG, ϕ 1 pulse timing	t3	1200	1500	—	ns
ϕ ROG pulse rise time	t4	0	5	10	ns
ϕ ROG pulse fall time	t5	0	5	10	ns
ϕ 1 pulse rise time / ϕ 2 pulse fall time	t6	0	20	60	ns
ϕ 1 pulse fall time / ϕ 2 pulse rise time	t7	0	20	60	ns
ϕ RS pulse high level period	t8	45	250*1	—	ns
ϕ RS, ϕ LH pulse timing	t9	45	250*1	—	ns
ϕ RS pulse rise time	t10	0	10	30	ns
ϕ RS pulse fall time	t11	0	10	30	ns
Signal output delay time	t12	—	10	—	ns
	t13	—	10	—	ns

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

Application Circuit*

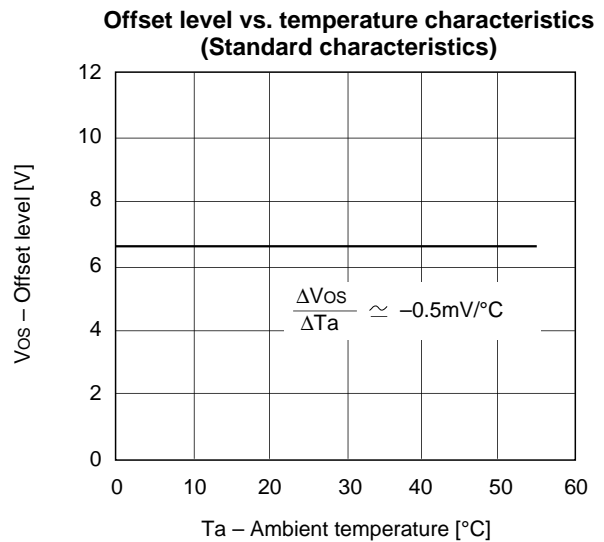
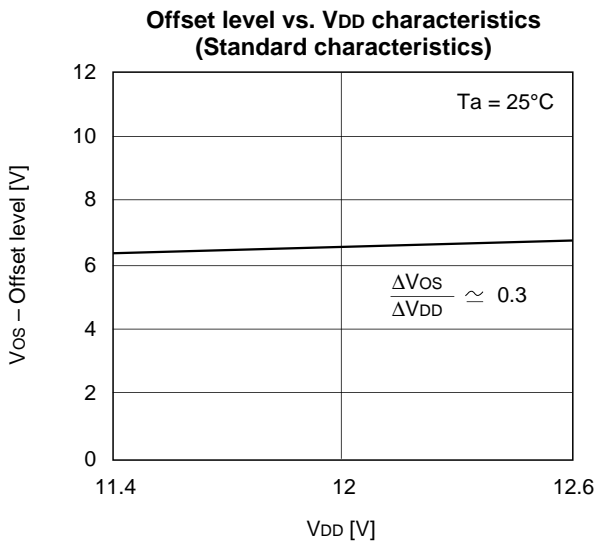
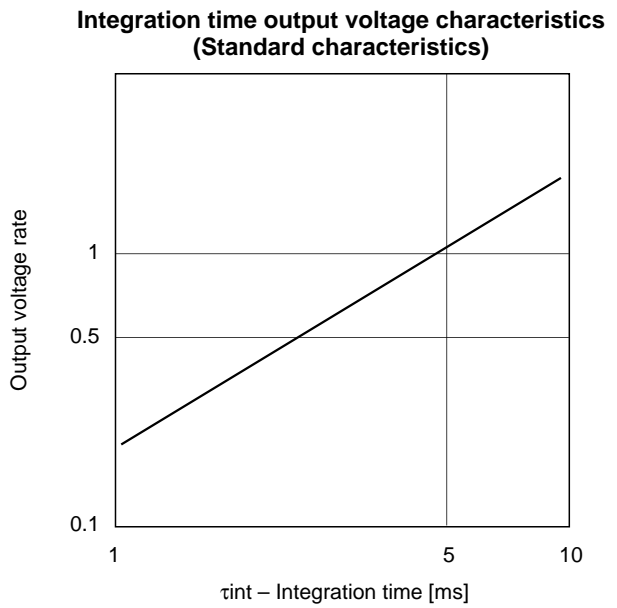
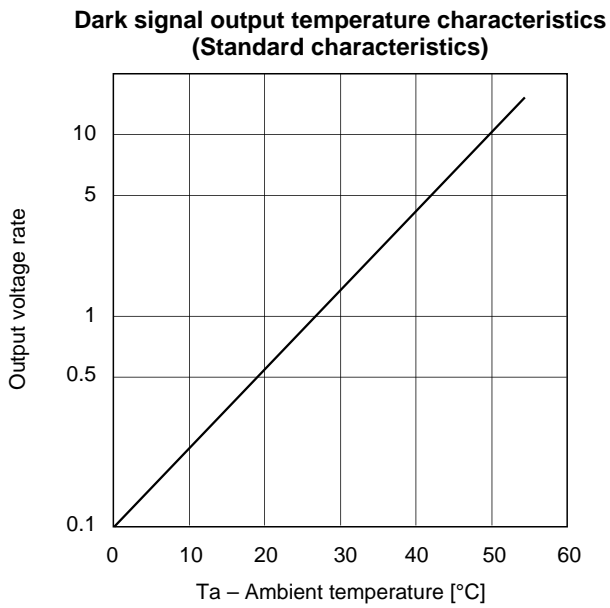
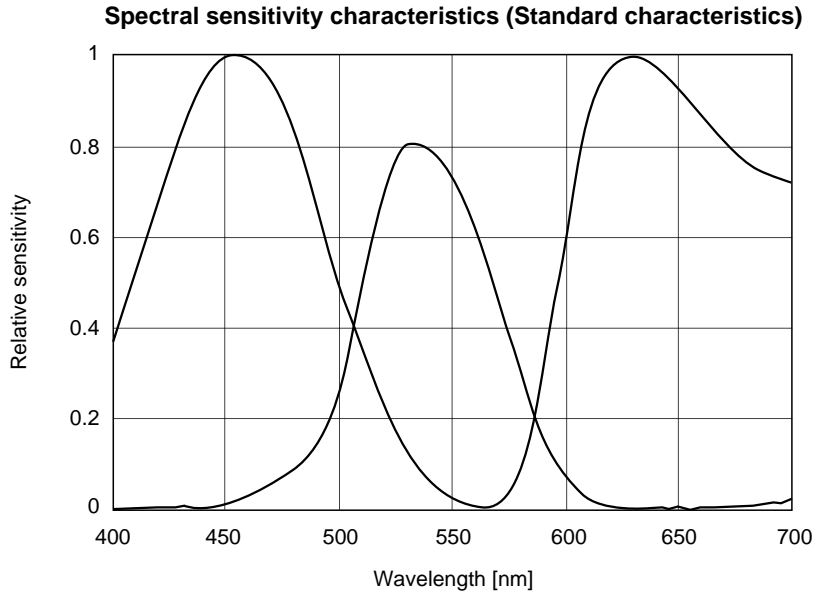


IC1: 74AC04
Tr1: 2SC2785

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

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



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) 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.

- 3) 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.

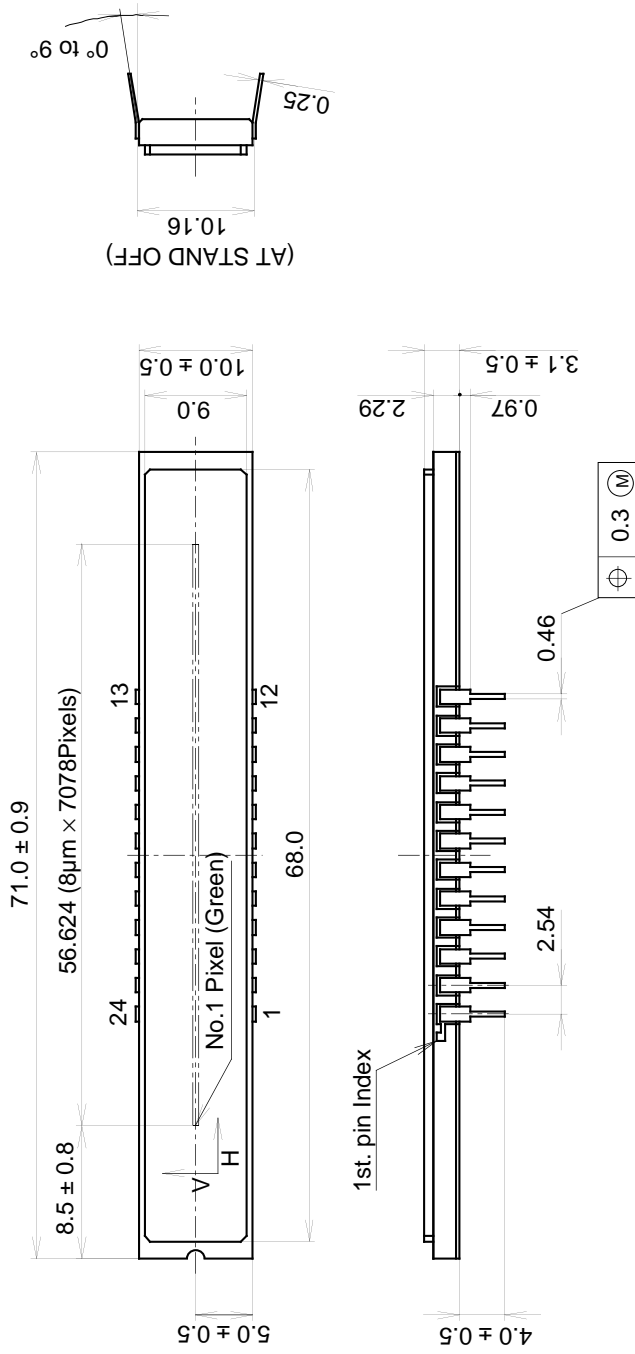
- 4) Exposure to high temperatures or humidity will affect the characteristics. Accordingly avoid storage or usage in such conditions.

- 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 $1.4 \pm 0.3\text{mm}$.
2. The thickness of the cover glass is 0.8mm , and the refractive index is 1.5 .

PACKAGE STRUCTURE

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