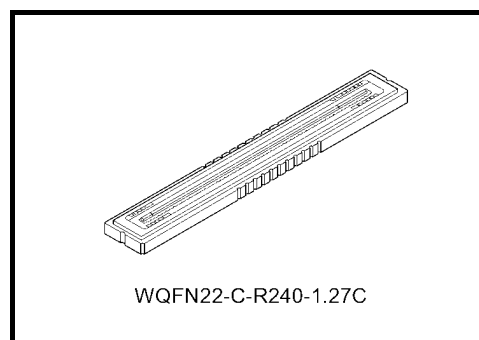


TOSHIBA CCD Linear Image Sensor CCD (charge coupled device)

TCD2563BFG

The TCD2563BFG is a high sensitive and low dark current 5340 elements \times 3 line CCD color image sensor with 5340 elements \times 1 line CCD B/W image sensor. The sensor is designed for scanner.

The device contains a row of 5340 elements \times 4 line photodiodes which provide a 24 lines/mm (600 dpi) across a A4 size paper. The device is operated by 5.0 V pulse and 12 V power supply.



WQFN22-C-R240-1.27C

Weight: 2.0g (typ.)

Features

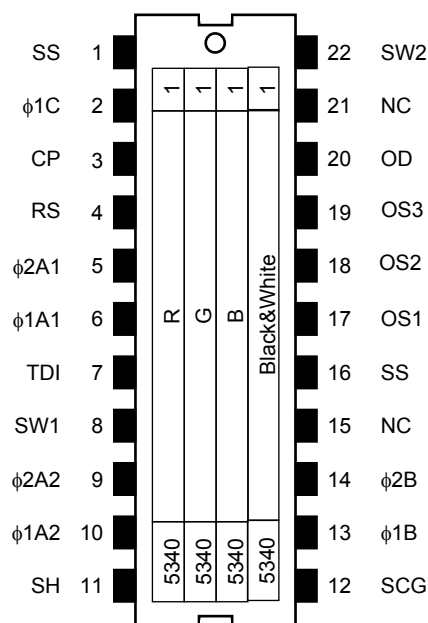
- Number of Image Sensing Elements: 5340 elements \times 3 line for Color
5340 elements \times 1 line for B/W
- Image Sensing Element Size: 5.25 μ m by 8.4 μ m on 5.25 μ m centers
- Photo Sensing Region: High sensitive and low dark current PN photodiode
- Distanced Between Photodiode Array: 63 μ m (12 lines) R array – G array, G array – B array
57.75 μ m (11 lines) B array – B/W array
- Clock: 2 phase (5.0 V)
- Power Supply: 12 V Power Supply Voltage
- Internal Circuit: Clamp Circuit
- Package: 22 pin CLCC Package
- Color Filter: Red, Green, Blue
- Time Delay Integration

Maximum Ratings (Note1)

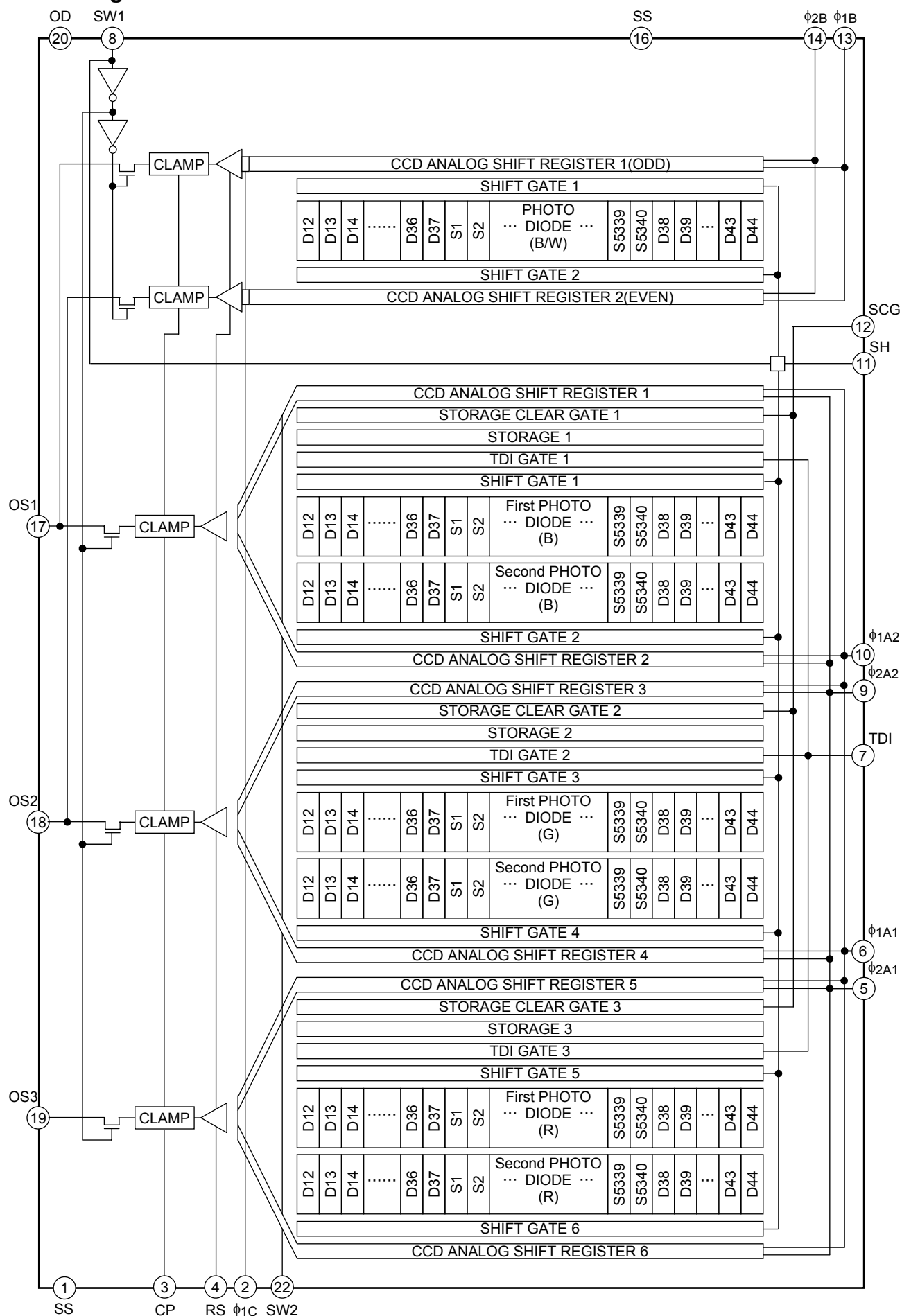
Characteristic	Symbol	Rating	Unit
Clock pulse voltage	V_{ϕ}	-0.3~8.0	V
Shift pulse voltage	V_{SH}		
Reset pulse voltage	V_{RS}		
Clamp pulse voltage	V_{CP}		
Switch pulse voltage	V_{SW}		
Time delay integration pulse voltage	V_{TDI}		
Storage clear pulse voltage	V_{SCG}		
Power supply voltage	V_{OD}	-0.3~15	V
Operating temperature	T_{opr}	0~60	$^{\circ}$ C
Storage temperature	T_{stg}	-25~85	$^{\circ}$ C

Note 1: All voltage are with respect to SS terminals (ground).

Pin Connections (top view)



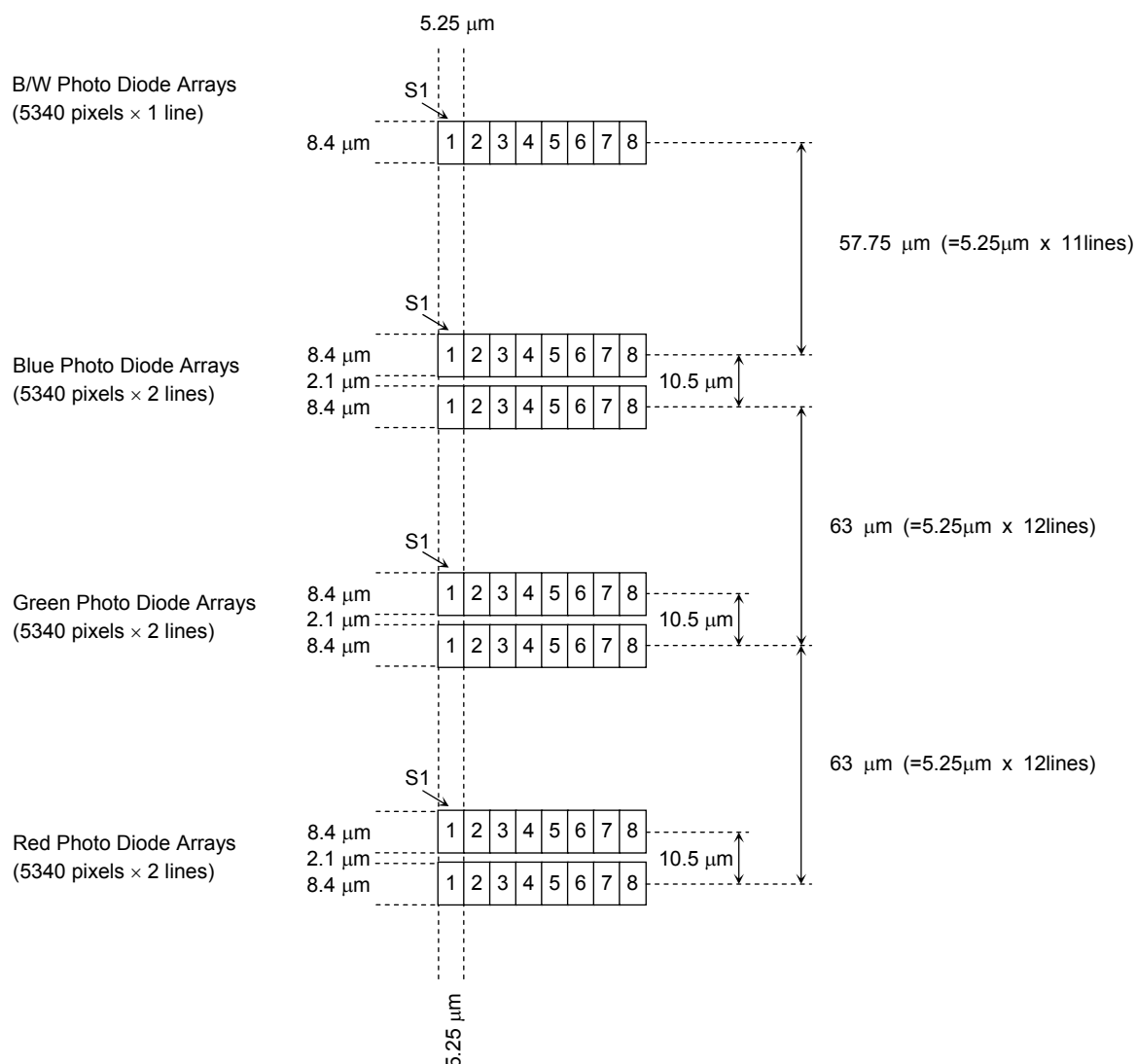
Block Diagram



Pin Names

Pin No.	Symbol	Name	Pin No.	Symbol	Name
1	SS	Ground	22	SW2	Switch Gate 2 for TDI function
2	$\phi 1C$	Last stage transfer Clock C (phase 1)	21	NC	Non Connection
3	CP	Clamp Gate	20	OD	Power
4	RS	Reset Gate	19	OS3	Signal Output 3 (red)
5	$\phi 2A1$	Clock A1 (phase 2) for Color	18	OS2	Signal Output 2 (green or B/W)
6	$\phi 1A1$	Clock A1 (phase 1) for Color	17	OS1	Signal Output 1 (blue or B/W)
7	TDI	TDI Gate	16	SS	Ground
8	SW1	Switch Gate 1 for Color or B/W	15	NC	Non Connection
9	$\phi 2A2$	Clock A2 (phase 2) for Color	14	$\phi 2B$	Clock B (phase 2) for B/W
10	$\phi 1A2$	Clock A2 (phase 1) for Color	13	$\phi 1B$	Clock B (phase 1) for B/W
11	SH	Shift Gate for Color and B/W	12	SCG	Storage Clear Gate

Arrangement of The 1st Effective Pixel (S1)



Optical/Electrical Characteristics (Color Mode, TDI"ON")

(Ta = 25°C, V_{OD} = 12 V, V_φ = V_{RS} = V_{CP} = 5.0V (pulse), V_{SH} = V_{TDI} = V_{SCG} = 3.3V(pulse), f_φ = 5 MHz, f_{RS} = 5 MHz, t_{INT} = 11 ms, light source = a light source + CM500S filter (t = 1 mm), load resistance = 100 kΩ)

Characteristics		Symbol	Min	Typ.	Max	Unit	Note
Sensitivity	Red	R (R)	15.8	22.6	29.4	V/lx·s	(Note2)
	Green	R (G)	19.6	28.0	36.4		
	Blue	R (B)	11.9	17.0	22.1		
Photo response non uniformity		PRNU (1)	—	10	20	%	(Note3)
		PRNU (3)	—	3	12	mV	(Note4)
Saturation output voltage		V _{SAT}	2.4	3.0	—	V	(Note5)
Saturation exposure		SE	—	0.10	—	lx·s	(Note6)
Dark signal voltage		V _{DRK}	—	1.6	4.0	mV	(Note7)
Dark signal non uniformity		DSNU	—	27.5	40.0	mV	
DC power dissipation		PD	—	600	780	mW	
Total transfer efficiency		TTE	92	98	—	%	
Output impedance		Z _O	—	80	250	Ω	
DC output voltage		V _{OS}	5.3	6.3	7.3	V	(Note8)
Reset noise		V _{RSN}	—	0.6	—	V	
Random noise		N _{Dσ}	—	1.6	—	mV	(Note9)

Optical/Electrical Characteristics (Color Mode, TDI"OFF")

(Ta = 25°C, V_{OD} = 12 V, V_φ = V_{RS} = V_{CP} = 5.0V (pulse), V_{SH} = V_{TDI} = V_{SCG} = 3.3V(pulse), f_φ = 5 MHz, f_{RS} = 5 MHz, t_{INT} = 11 ms, light source = a light source + CM500S filter (t = 1 mm), load resistance = 100 kΩ)

Characteristics		Symbol	Min	Typ.	Max	Unit	Note
Sensitivity	Red	R (R)	7.8	11.2	14.6	V/lx·s	(Note2)
	Green	R (G)	9.8	14.0	18.2		
	Blue	R (B)	6.0	8.6	11.2		
Photo response non uniformity		PRNU (1)	—	10	20	%	(Note3)
Dark signal voltage		V _{DRK}	—	0.3	4.0	mV	(Note7)
Dark signal non uniformity		DSNU	—	5.5	10.0	mV	
Random noise		N _{Dσ}	—	1.0	—	mV	(Note9)

Optical/Electrical Characteristics (B/W Mode)

(Ta = 25°C, V_{OD} = 12 V, V_φ = V_{RS} = V_{CP} = 5.0 V (pulse), V_{SH} = V_{TDI} = V_{SCG} = 3.3 V (pulse), f_φ = 5 MHz, f_{RS} = 5 MHz, t_{INT} = 11 ms, light source = a light source + CM500S filter (t = 1 mm), load resistance = 100 kΩ)

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Sensitivity	R (B/W)	28.8	41.2	53.6	V/lx·s	(Note2)
Photo response non uniformity	PRNU (1)	—	10	20	%	(Note3)
	PRNU (3)	—	3	12	mV	(Note4)
Saturation output voltage	V _{SAT}	2.4	3.0	—	V	(Note5)
Saturation exposure	SE	—	0.26	—	lx·s	(Note6)
Dark signal voltage	V _{DRK}	—	0.6	4.0	mV	(Note7)
Dark signal non uniformity	DSNU	—	6.0	20.0	mV	
DC power dissipation	PD	—	600	780	mW	
Total transfer efficiency	TTE	92	98	—	%	
Output impedance	Z _O	—	80	250	Ω	
DC signal output voltage	V _{OS}	5.3	6.3	7.3	V	(Note 8)
Reset noise	V _{RSN}	—	0.6	—		
Random noise	N _{Dσ}	—	1.0	—	mV	(Note9)

Note 2: Sensitivity is defined for each color of signal outputs average when the photosensitive surface is applied with the light of uniform illumination and uniform color temperature.

Note 3: PRNU (1) is defined for each color on a single chip by the expressions below when the photosensitive surface is applied with the light of uniform illumination and uniform color temperature.

$$\text{PRNU (1)} = \frac{\Delta \bar{X}}{\bar{X}} \times 100(\%)$$

Where \bar{X} is average of total signal output and $\Delta \bar{X}$ is the maximum deviation from \bar{X} . The amount of incident light is shown below.

Red = 1/2 · SE

Green = 1/2 · SE

Blue = 1/4 · SE

Note 4: PRNU (3) is defined as maximum voltage with next pixel, where measured approximately 50mV of signal output.

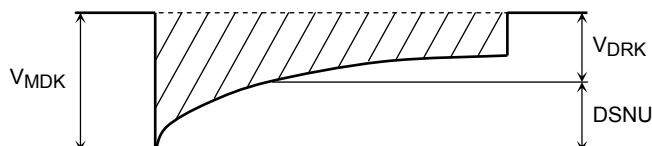
Note 5: V_{SAT} is defined as minimum saturation output of all effective pixels.

Note 6: Definition of SE

$$\text{SE}_{(B/W)} = \frac{V_{SAT}}{R_{(B/W)}} (lx \cdot s) \quad \text{SE}_{(Color)} = \frac{V_{SAT}}{R_{(G)}} (lx \cdot s)$$

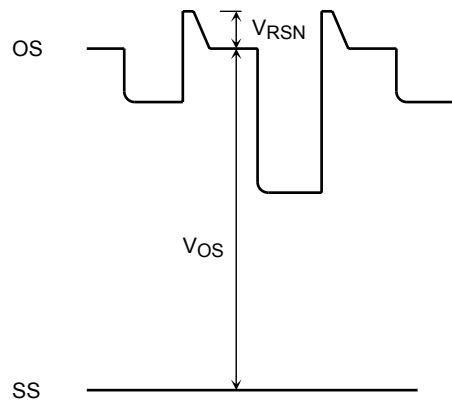
Note 7: V_{DRK} is defined as average dark signal voltage of all effective pixels.

DSNU is defined as different voltage between V_{DRK} and V_{MDK} when V_{MDK} is maximum dark signal voltage.

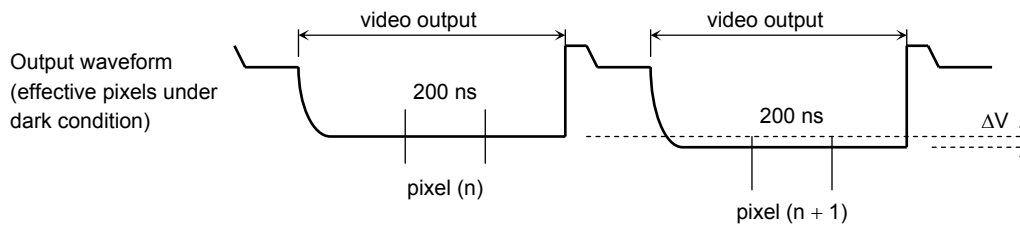


Note 8: DC signal output voltage is defined as follows.

Reset Noise Voltage is defined as follows.



Note 9: Random noise is defined as the standard deviation (sigma) of the output level difference between two adjacent effective pixels under no illumination (i.e. dark conditions) calculated by the following procedure.



- (1) Two adjacent pixels (pixel n and n + 1) after reference level clamp in one reading are fixed as measurement points.
- (2) Each of the output level at video output periods averaged over 200 ns period to get V (n) and V (n + 1).
- (3) V (n + 1) is subtracted from V (n) to get ΔV.

$$\Delta V = V(n) - V(n + 1)$$
- (4) The standard deviation of ΔV is calculated after procedure (2) and (3) are repeated 30 times (30 readings).

$$\overline{\Delta V} = \frac{1}{30} \sum_{i=1}^{30} |\Delta V_i| \quad \sigma = \sqrt{\frac{1}{30} \sum_{i=1}^{30} (|\Delta V_i| - \overline{\Delta V})^2}$$

- (5) Procedure (2), (3) and (4) are repeated 10 times to get sigma value.
- (6) 10 sigma values are averaged.

$$\overline{\sigma} = \frac{1}{10} \sum_{j=1}^{10} \sigma_j$$

- (7) $\overline{\sigma}$ value calculated using the above procedure is observed $\sqrt{2}$ times larger than that measured relative to the ground level. So we specify random noise as follows.

$$N_{D\sigma} = \frac{1}{\sqrt{2}} \overline{\sigma}$$

Operating Condition

Characteristics		Symbol	Min	Typ.	Max	Unit
Clock pulse voltage	"H" Level	$V_{\phi A}, V_{\phi B}$	4.5	5.0	5.5	V
	"L" Level		0	0	0.3	
Final Stage Clock pulse voltage	"H" Level	$V_{\phi 1C}$	4.5	5.0	5.5	V
	"L" Level		0	0	0.3	
Shift pulse voltage	"H" Level	V_{SH}	2.7	3.3	5.5	V
	"L" Level		0	0	0.8	
Storage Clear pulse voltage	"H" Level	V_{SCG}	2.7	3.3	5.5	V
	"L" Level		0	0	0.8	
TDI pulse voltage	"H" Level	V_{TDI}	2.7	3.3	5.5	V
	"L" Level		0	0	0.8	
Reset pulse voltage	"H" Level	V_{RS}	4.5	5.0	5.5	V
	"L" Level		0	0	0.5	
Clamp pulse voltage	"H" Level	V_{CP}	4.5	5.0	5.5	V
	"L" Level		0	0	0.5	
Switch pulse voltage	"H" Level	V_{SW}	2.7	3.3	5.5	V
	"L" Level		0	0	0.8	
Power supply voltage		V_{OD}	11.4	12.0	12.6	V

Clock Characteristics (Ta = 25°C)

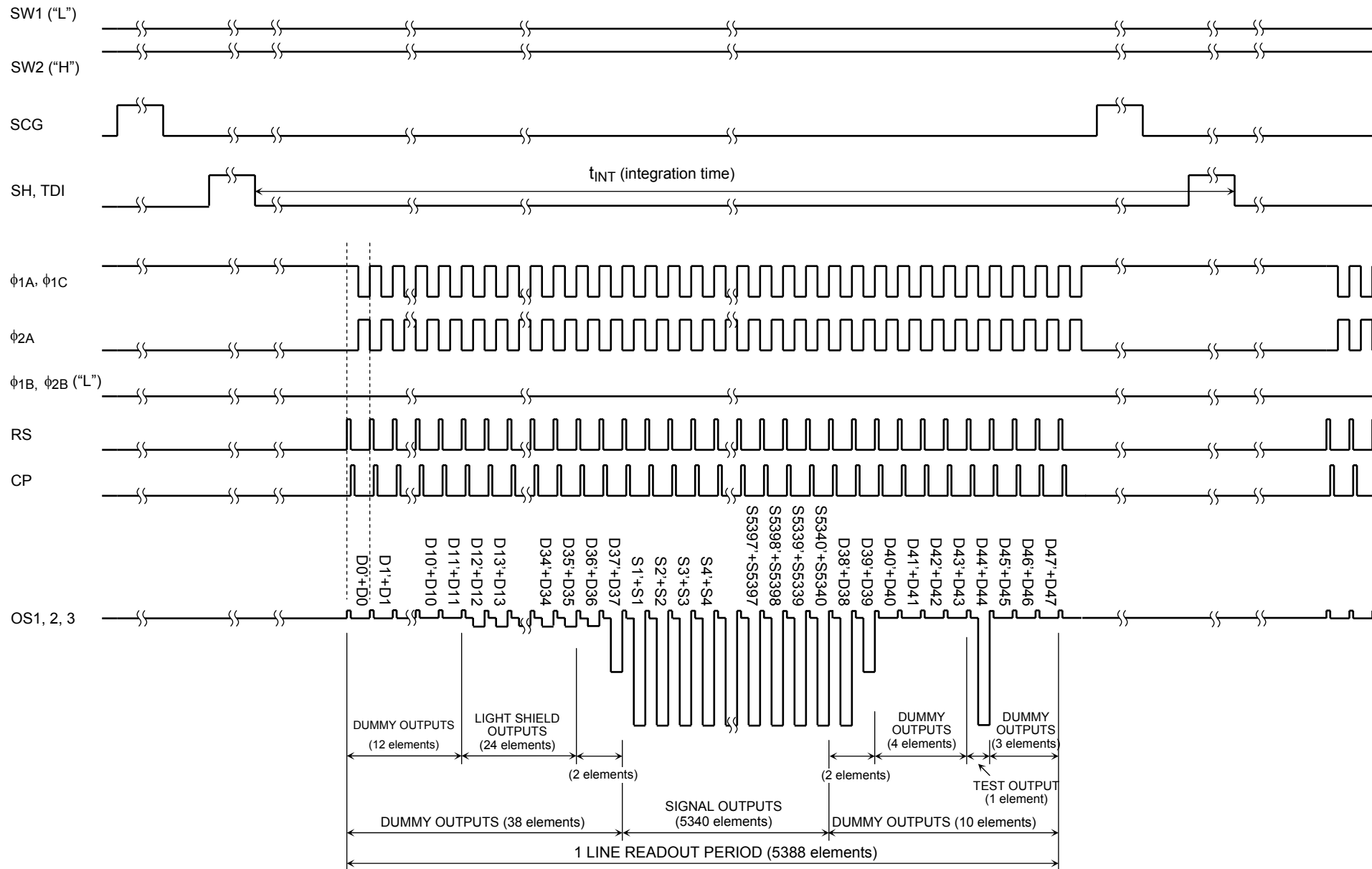
Characteristics	Symbol	Min	Typ.	Max	Unit
Clock pulse frequency	f_{ϕ}	0.2	5.0	25.0	MHz
Reset pulse frequency	f_{RS}	0.2	5.0	25.0	MHz
Clamp pulse frequency	f_{CP}	0.2	5.0	25.0	MHz
Clock (1A) capacitance for Color (Note 11)	$C_{\phi 1A1}, C_{\phi 1A2}$	—	175	—	pF
Clock (2A) capacitance for Color (Note 11)	$C_{\phi 2A1}, C_{\phi 2A2}$	—	160	—	pF
Final Stage Clock capacitance (Note 11)	$C_{\phi 1C}$	—	12	—	pF
Clock (1B) capacitance for B/W (Note 11)	$C_{\phi 1B}$	—	115	—	pF
Clock (2B) capacitance for B/W (Note 11)	$C_{\phi 2B}$	—	115	—	pF
Shift gate capacitance	C_{SH}	—	18	—	pF
Storage Clear gate capacitance	C_{SCG}	—	10	—	pF
TDI gate capacitance	C_{TDI}	—	9	—	pF
Reset gate capacitance	C_{RS}	—	14	—	pF
Clamp gate capacitance	C_{CP}	—	14	—	pF
Switch gate capacitance	C_{SW}	—	15	—	pF

Note 11: $V_{OD} = 12\text{ V}$

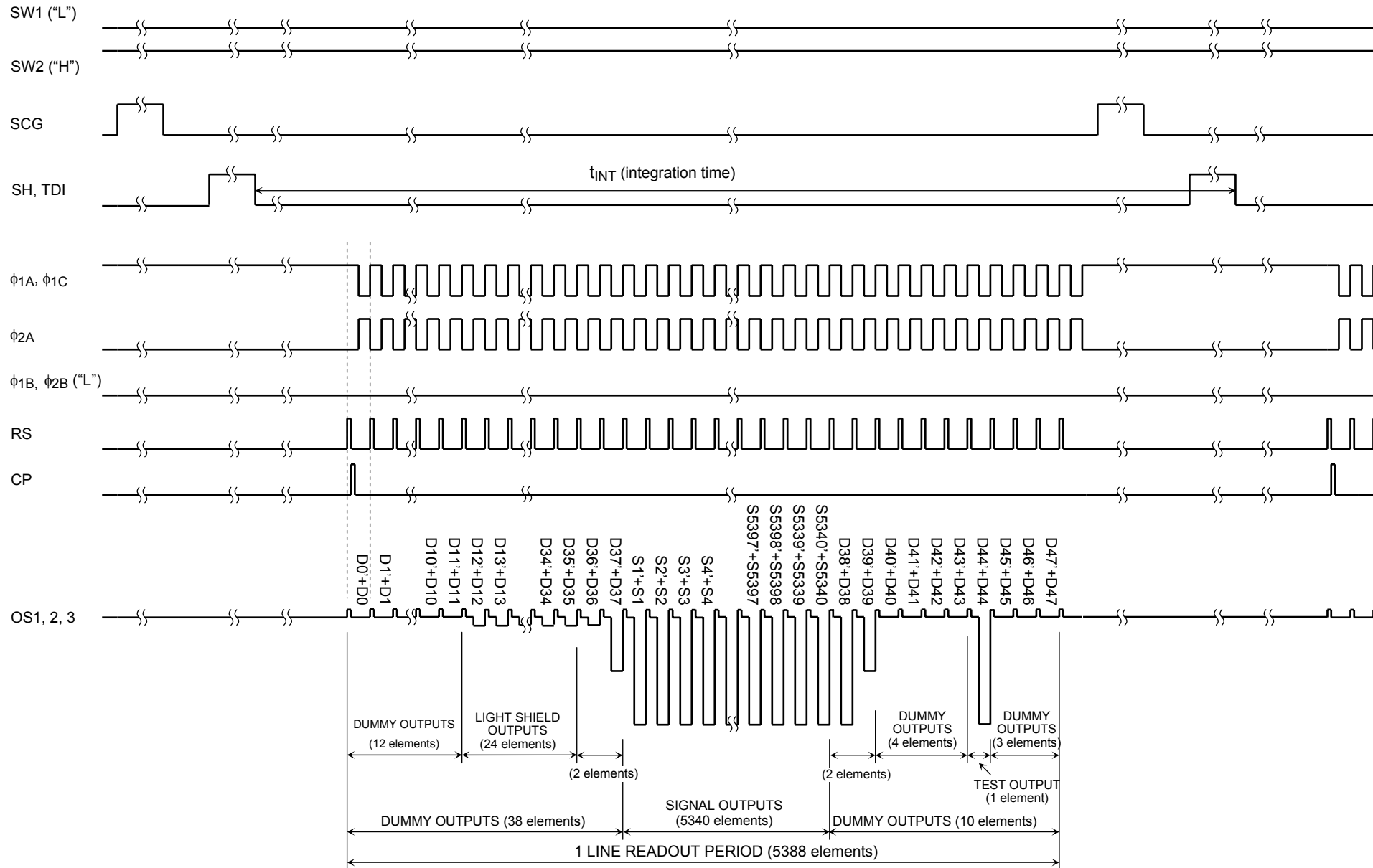
Clocking Mode

Mode			SW1	SW2	SCG	SH, TDI	φ1A, φ2A	φ1B, φ2B	φ1C	RS	CP
Color	TDI	ON	"L"	"H"	Pulse	Pulse	Pulse	"L"	Pulse	Pulse	Pulse
		OFF		"L"							
B/W			"H"	"L"	"H"		"L"	Pulse			

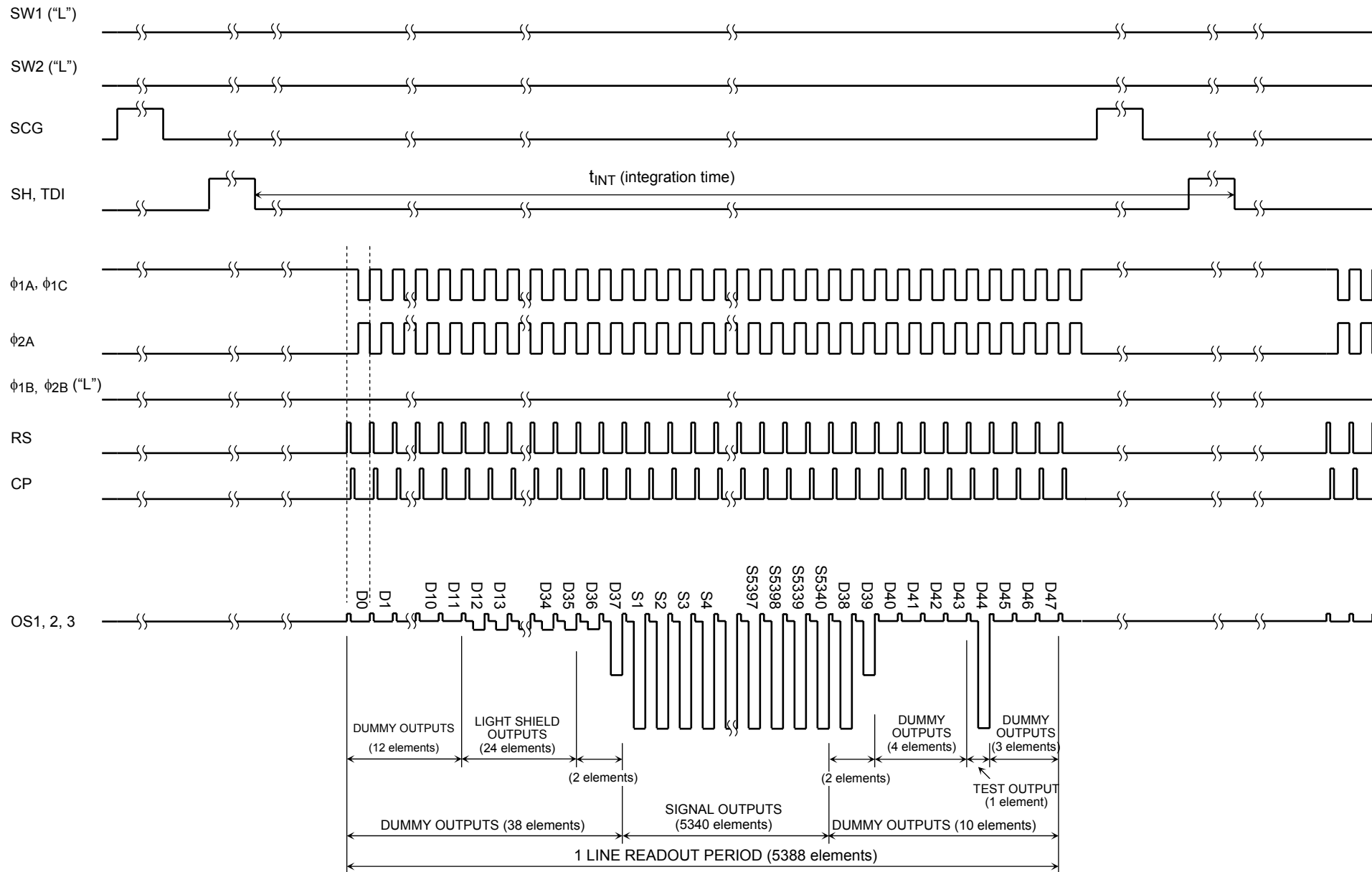
Timing Chart 1: Color 600DPI Mode / TDI"ON" (Bit Clamp Mode)



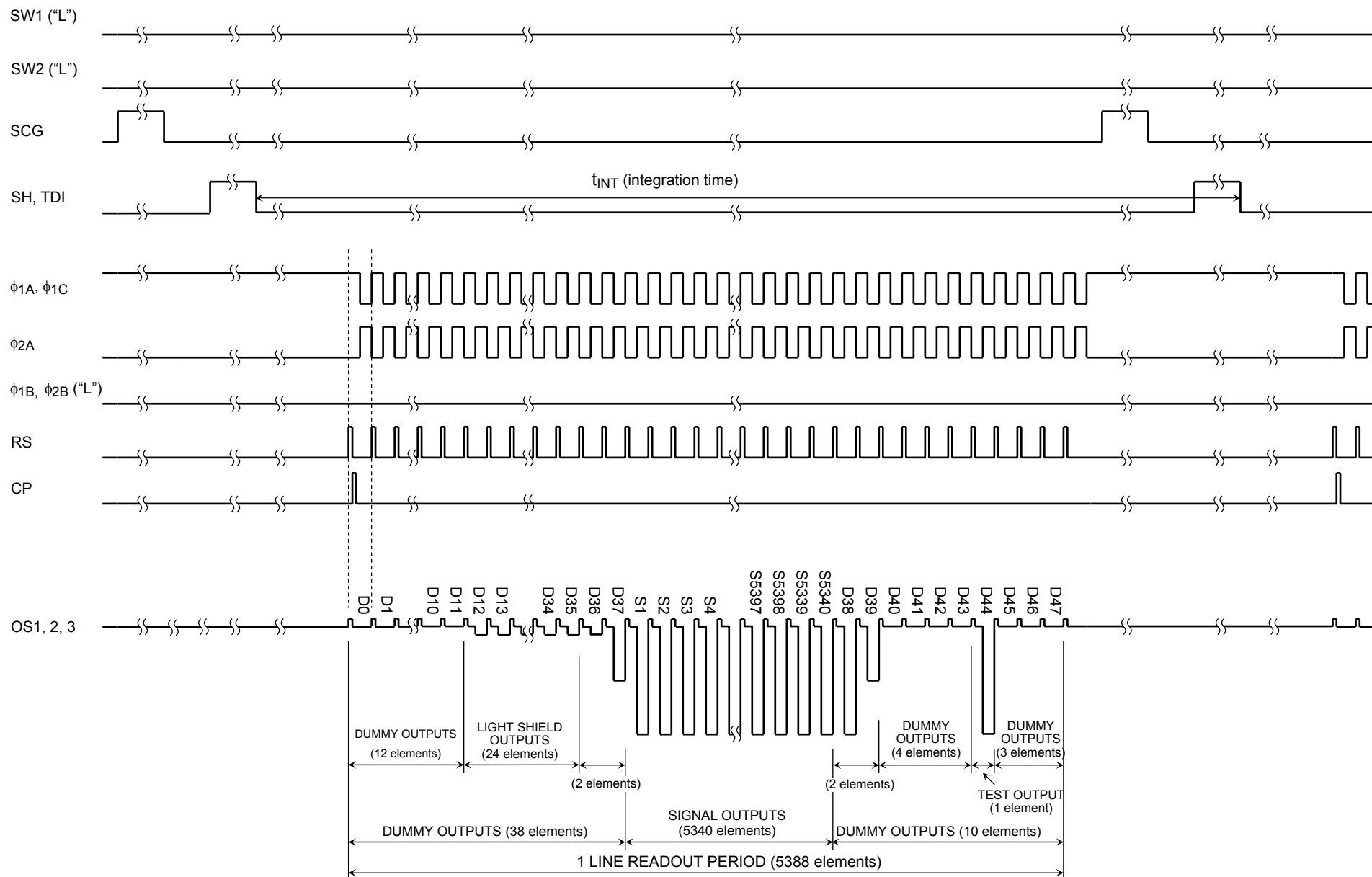
Timing Chart 2: Color 600DPI Mode / TDI"ON" (Line Clamp Mode)



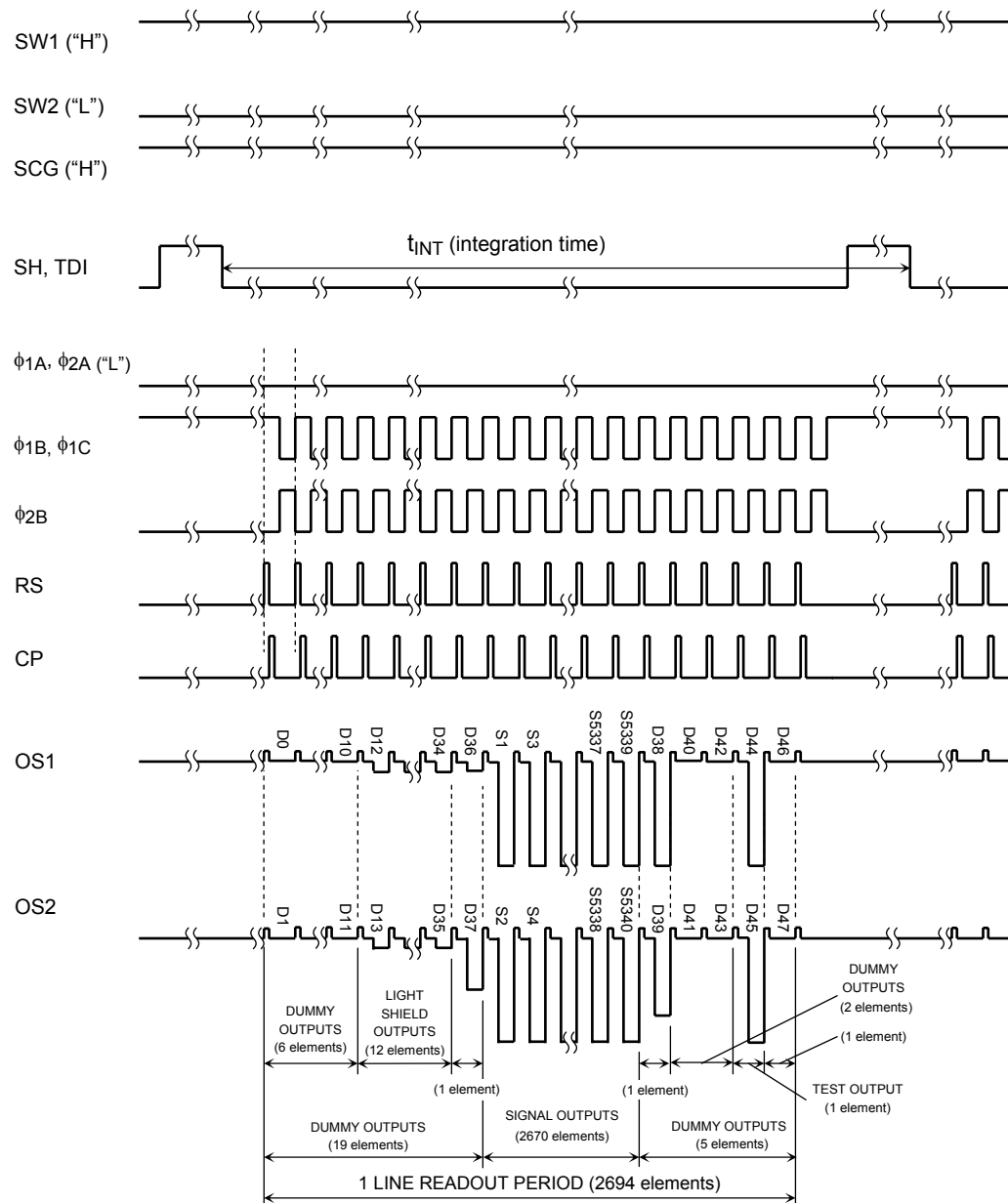
Timing Chart 3: Color 600DPI Mode / TDI"OFF" (Bit Clamp Mode)



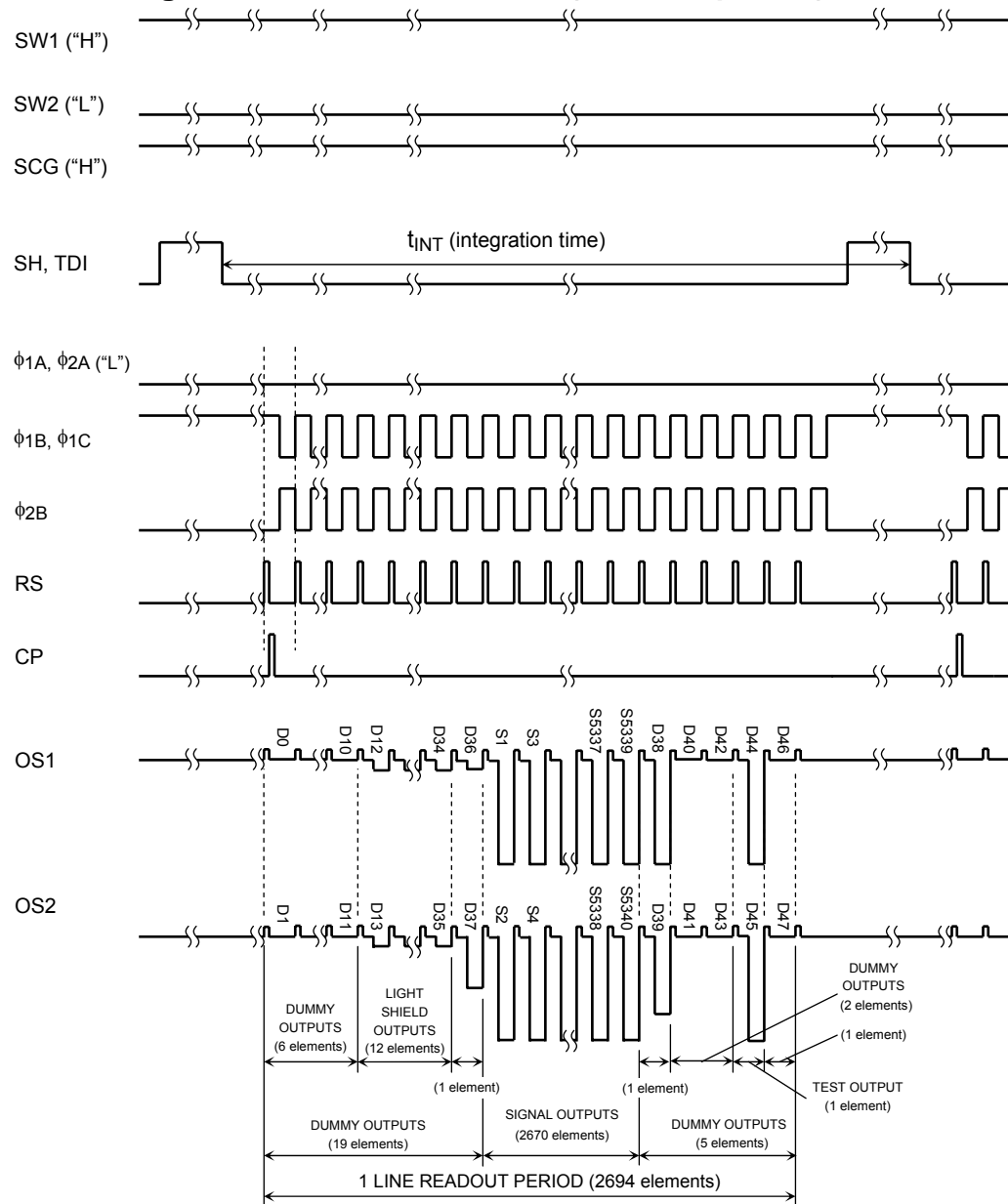
Timing Chart 4: Color 600DPI Mode / TDI"OFF" (Line Clamp Mode)



Timing Chart 5: B/W 600DPI Mode (Bit Clamp Mode)

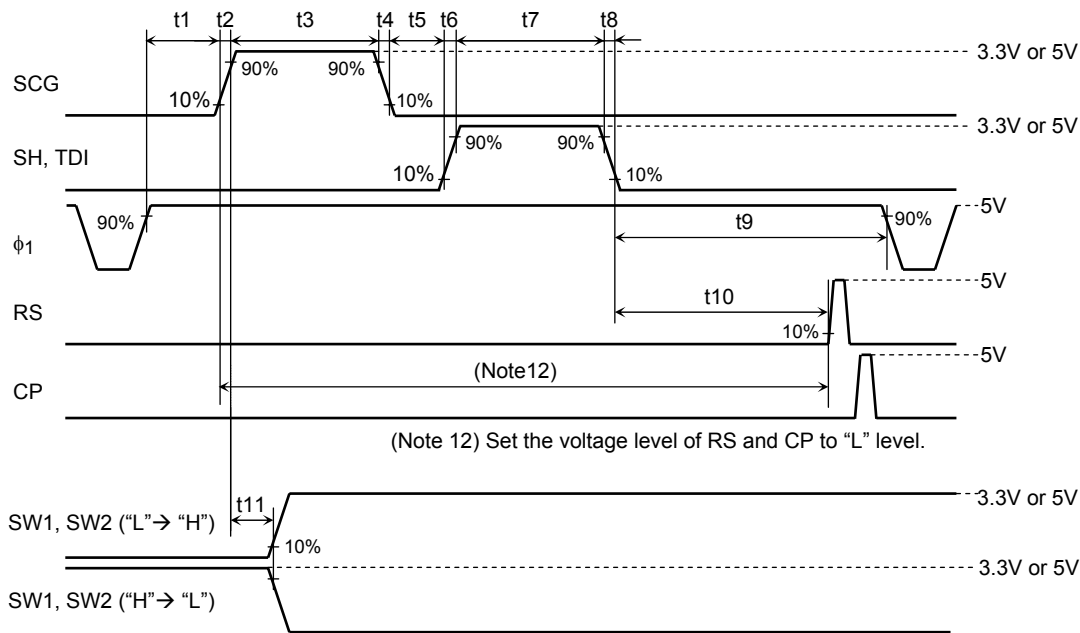


Timing Chart 6: B/W 600DPI Mode (Line Clamp Mode)

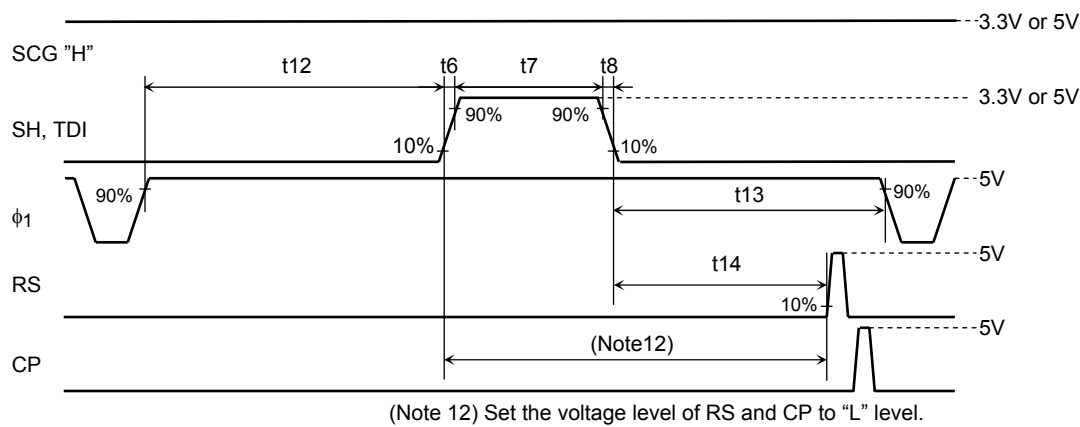


Timing Requirements

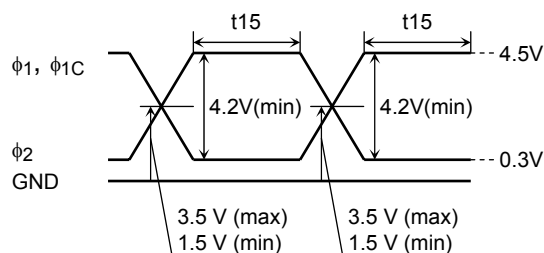
Color Mode (TDI "ON", TDI"OFF")



B/W Mode

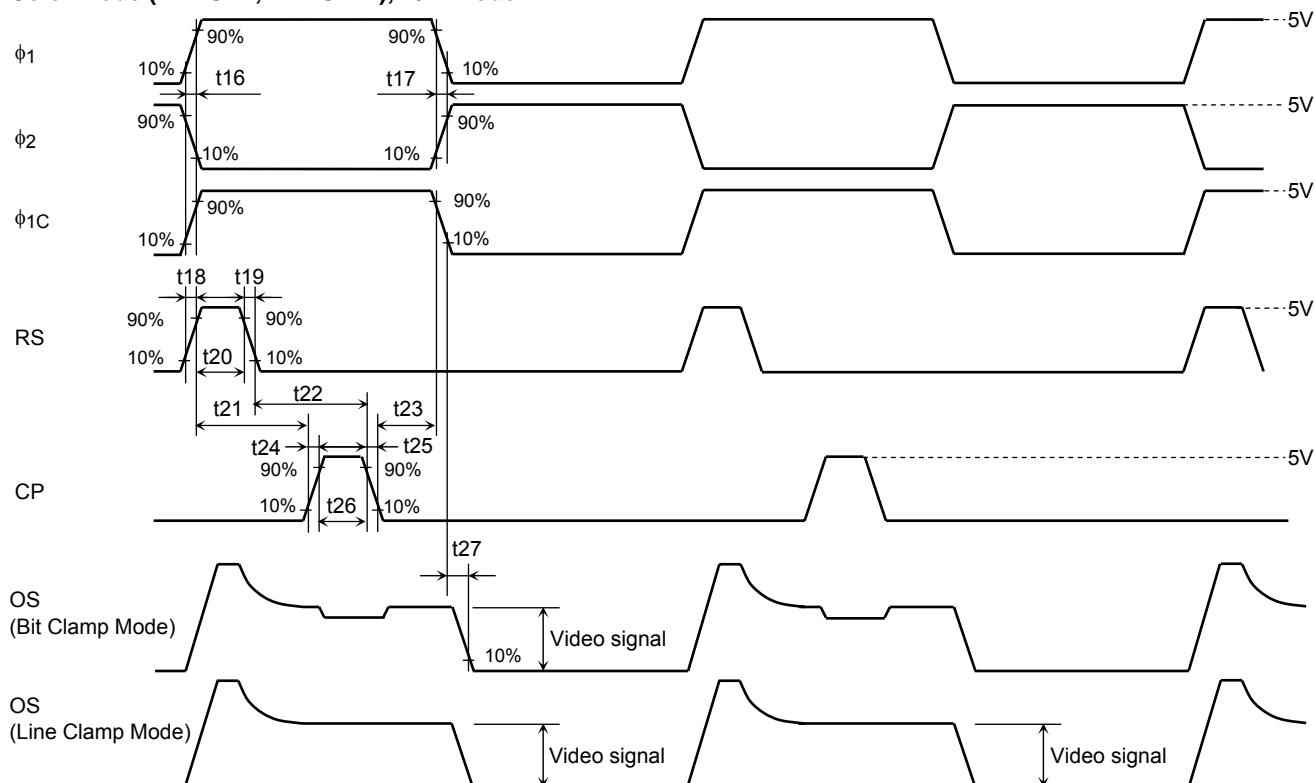


ϕ_1 (ϕ_1C), ϕ_2 Cross point



Timing Requirements (cont.)

Color Mode (TDI"ON", TDI"OFF"), B/W Mode



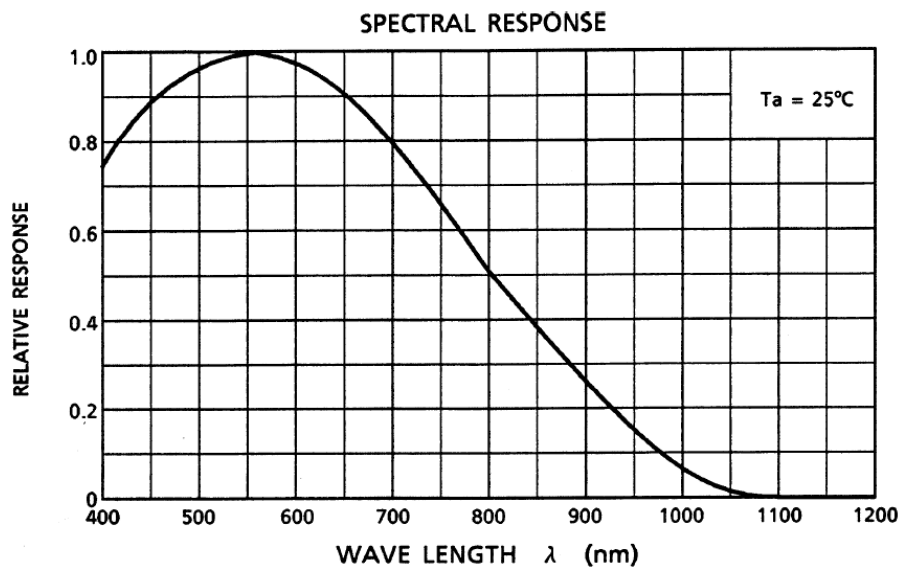
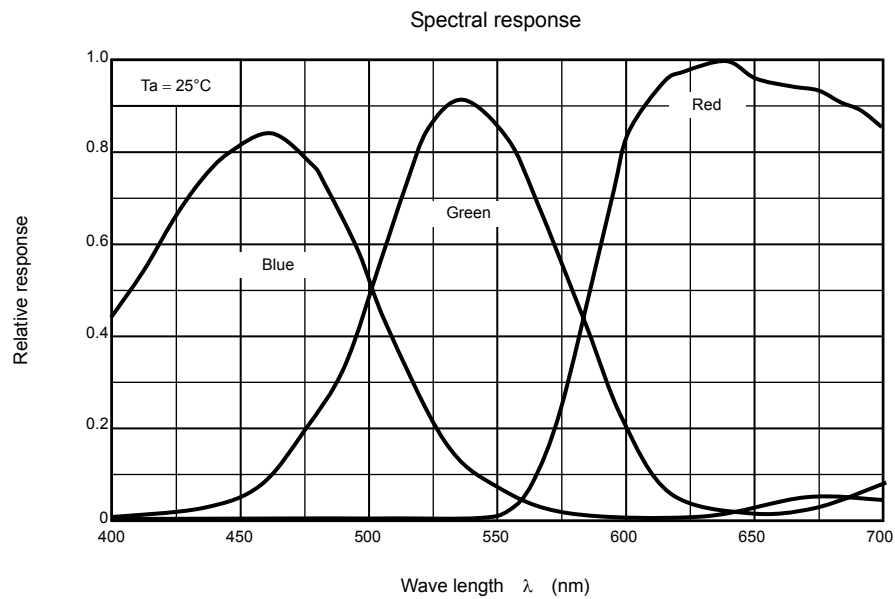
Characteristics	Symbol	Min	Typ. (Note 13)	Max	Unit
Pulse timing of SCG and $\phi 1$ (Color mode)	t_1	120	200	2500	ns
Pulse timing of SH, TDI and $\phi 1$ (B/W mode)	t_{12}				
Pulse timing of SCG and SH, TDI	t_5	1000	1075	2500	ns
SCG, SH, TDI pulse rise time, fall time	t_2, t_4, t_6, t_8	0	10	—	ns
SCG, SH, TDI pulse width	t_3, t_7	3000	3500	—	ns
Pulse timing of SH, TDI and $\phi 1$ (Color mode)	t_9	1000	1075	2500	ns
Pulse timing of SH, TDI and $\phi 1$ (B/W mode)	t_{13}				
Pulse timing of SH, TDI and RS (Color mode)	t_{10}	975	—	—	ns
Pulse timing of SH, TDI and RS (B/W mode)	t_{14}				
Pulse timing of SCG and SW1/SW2	t_{11}	100	500	t_3-100	ns
$\phi 1, \phi 2$ pulse width (Note 14)	t_{15}	10	90	—	ns
$\phi 1, \phi 2$ pulse rise time, fall time	t_{16}, t_{17}	0	15	—	ns
RS, CP pulse rise time, fall time	$t_{18}, t_{19}, t_{24}, t_{25}$	0	10	—	ns
RS pulse width	t_{20}	10	15	—	ns
Pulse timing of RS and CP	t_{21}	0	0	—	ns
	t_{22}	10	50	—	ns
Pulse timing of $\phi 1C$ and CP	t_{23}	0	40	—	ns
CP pulse width	t_{26}	10	40	—	ns
Video data delay time (Note 15)	t_{27}	—	10	—	ns

Note 13: Typ. is the case of $f_{RS} = 5.0$ MHz.

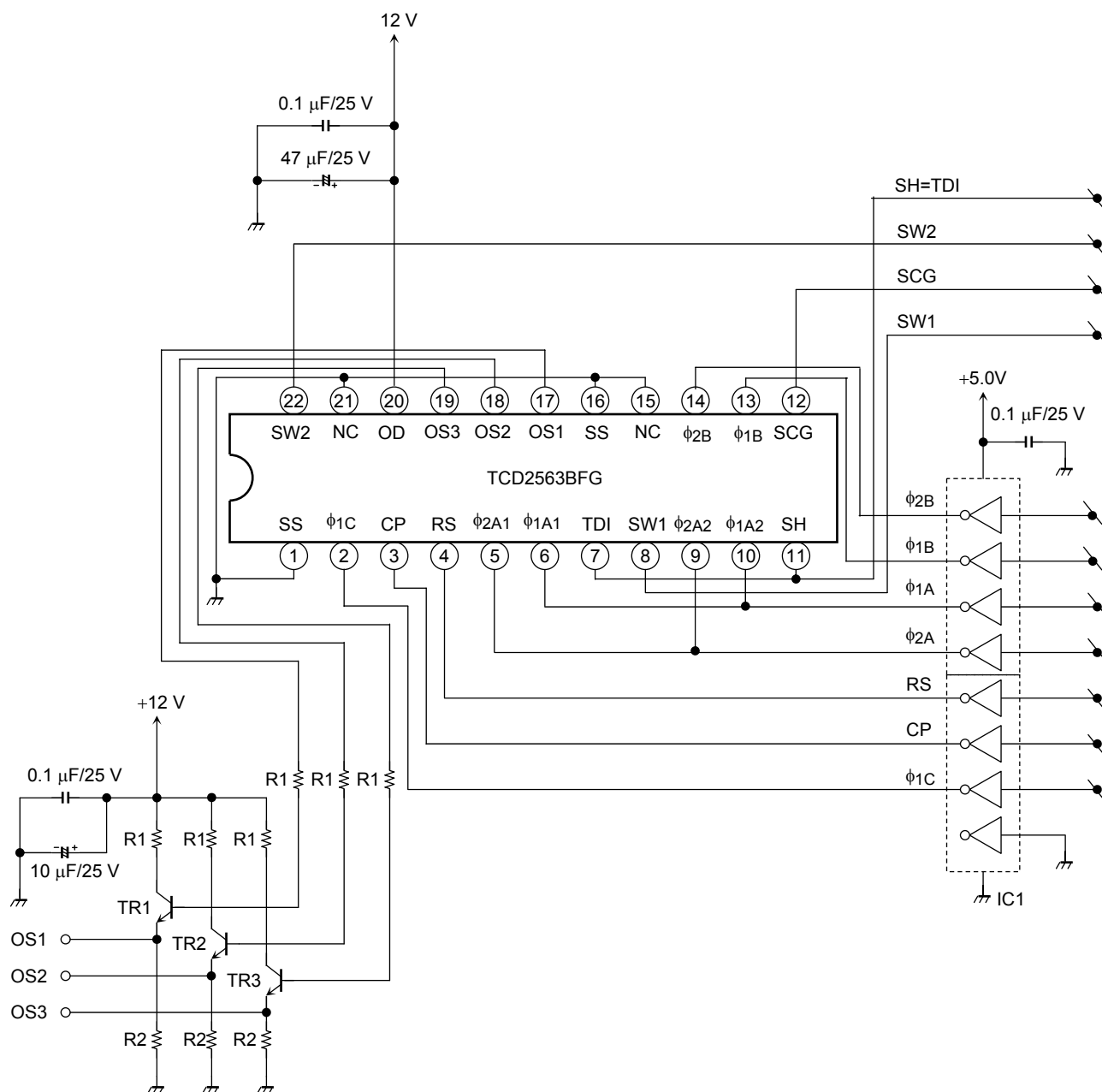
Note 14: Pulse width is the period when voltage difference between $\phi 1$ and $\phi 2$ is over 4.2V. Observe the specification strictly because of normal transfer efficiency.

Note 15: Load Resistance is 100 k Ω .

Typical Spectral Response



Typical Drive Circuit (at $f_{\phi}=20\text{MHz}$ or lower)



IC1: TC74ACT240
 TR1, 2, 3: 2SC1815-Y
 R1: 150 Ω
 R2: 1500 Ω

[illegible]

Caution**1. Electrostatic Breakdown**

Store in shorting clip or in conductive foam to avoid electrostatic breakdown.

CCD Image Sensor is protected against static electricity, but inferior puncture mode device due to static electricity is sometimes detected. In handling the device, it is necessary to execute the following static electricity preventive measures, in order to prevent the trouble rate increase of the manufacturing system due to static electricity.

- a. Prevent the generation of static electricity due to friction by making the work with bare hands or by putting on cotton gloves and non-charging working clothes.
- b. Discharge the static electricity by providing earth plate or earth wire on the floor, door or stand of the work room.
- c. Ground the tools such as soldering iron, radio cutting pliers of or pincer.

It is not necessarily required to execute all precaution items for static electricity.

It is all right to mitigate the precautions by confirming that the trouble rate within the prescribed range.

- d. Ionized air is recommended for discharge when handling CCD image sensors.

2. Incident Light

CCD sensor is sensitive to infrared light. Note that infrared light component degrades resolution and PRNU of CCD sensor.

3. Cloudiness of Glass Inside

CCD surface mount products may have a haze on the inside of glass, so be careful about following. Even if the haze arises inside of glass, when it is not on the pixel area, there is no problem in quality.

• Before the aluminum bag is opened, please keep the products in the environment below 30°C90%RH. And after the aluminum bag is opened, please keep the products in the environment below 30°C60%RH .

• Please mount the products within 12month from sealed date and within 6 month from opening the aluminum bag. (Sealed date is printed on aluminum bag.)

4. Ultrasonic Cleaning

Ultrasonic cleaning should not be used with such hermetically-sealed ceramic package as CCD because the bonding wires can become disconnected due to resonance during the cleaning process.

5. Mounting

In the case of solder mounting, the devices should be mounted with the window glass protective tape in order to avoid dust or dirt included in reflow machine.

6. Window Glass Protective Tape

The window glass protective tape is manufactured from materials in which static charges tend to build up. When removing the tape from CCD sensor after solder mounting, install an ionizer to prevent the tape from being charged with static electricity.

When the tape is removed, adhesives will remain in the glass surface. Since these adhesives appear as black or white flaws on the image, please wipe the window glass surface with the cloth into which the organic solvent was infiltrated. Then please attach CCD to a product.

Do not reuse the tape.

7. Soldering Temperature Profile for Pb free

Good temperature profile for each soldering method is as follows. In addition, in case of the repair work accompanied by IC removal, since the degree of parallel may be spoiled with the left solder, please do not carry out and in case of the repair work not accompanied by IC removal, carry out with a soldering iron or , in reflow, only one time.

- a. Using a soldering iron
Complete soldering within ten seconds for lead temperatures of up to 260°C, or within three seconds for lead temperatures of up to 350°C.
- b. Using long infrared rays reflow / hot air reflow
Please do reflow at the condition that the package surface (electrode) temperature is on the solder maker's recommendation profile. And that reflow profile is within below condition 1 to 3.

1. Peak temperature: 250°C or less.
2. Time to keep high temperature : 220~250°C, 30~40sec.
3. Pre. heat : 150~190°C, 60~120sec

8. Window Glass

The dust and stain on the glass window of the package degrade optical performance of CCD sensor.

Keep the glass window clean by saturating a cotton swab in alcohol and lightly wiping the surface, and allow the glass to dry, by blowing with filtered dry N₂. Care should be taken to avoid mechanical or thermal shock because the glass window is easily to damage.

9. Cleaning Method of the Window Glass Surface

Wiping Cloth

- a. Use soft cloth with a fine mesh.
- b. The wiping cloth must not cause dust from itself.
- c. Use a clean wiping cloth necessarily.

Recommended wiping cloth is as follow;

- MK cloth (Toray Industries)

Cleaner

Recommended cleaning liquid of window glass are as follow;

- EE-3310 (Olympus)

When using solvents, such as alcohol, unavoidably, it is cautious of the next.

- a. A clean thing with quick-drying.
- b. After liquid dries, there needs to be no residual substance.
- c. A thing safe for a human body.

And, please observe the use term of a solvent and use the storage container of a solvent to be clean.

Be cautious of fire enough.

Way of Cleaning

First, the surface of window glass is wiped with the wiping cloth into which the cleaner was infiltrated.

Please wipe down the surface of window glass at least 2 times or more.

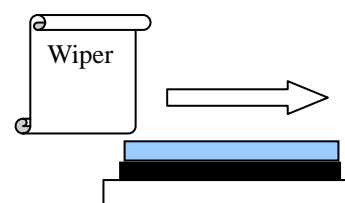
Next, the surface of window glass wipes with the dry wiping cloth. Please wipe down the surface of window glass at least 3 times or more.

Finally, blow cleaning is performed by dry N₂ filtered.

If operator wipes the surface of the window glass with the above-mentioned process and dirt still remains, Toshiba recommends repeating the clean operation from the beginning.

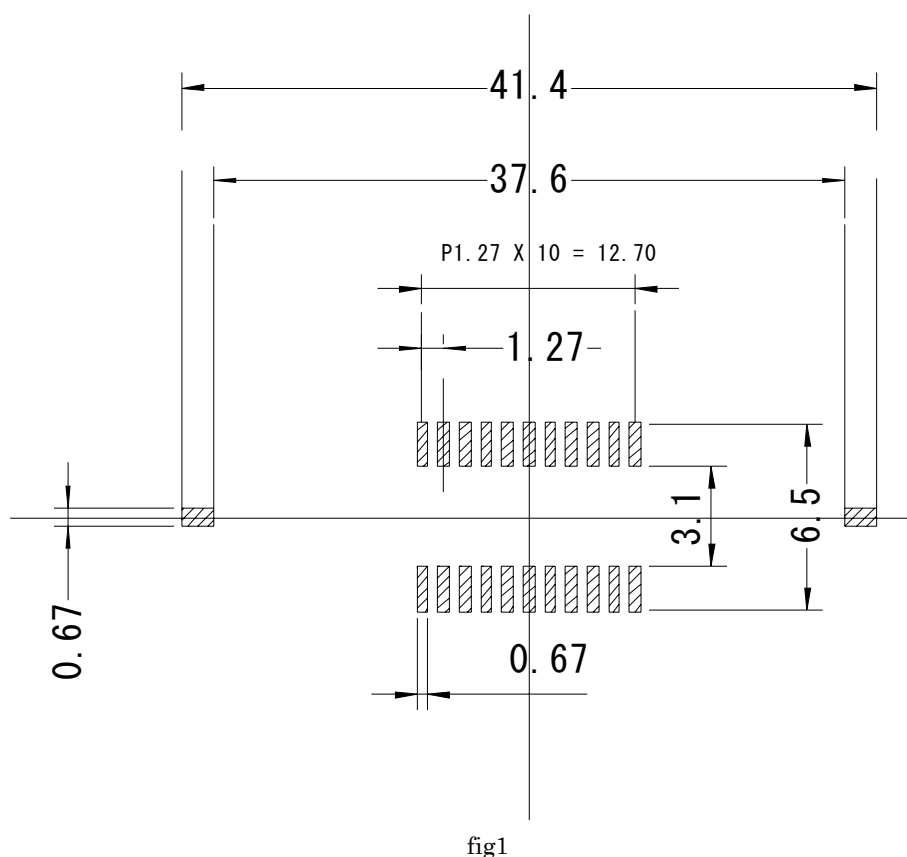
Be cautious of the next thing.

- a. Don't infiltrate the cleaner too much.
- b. A wiping portion is performed into the optical range and don't touch the edge of window glass.
- c. Be sure to wipe in a long direction and the same direction.
- d. A wiping cloth always uses an unused portion.



10. Foot Pattern on the PCB

We recommend fig1 's foot pattern for your PCB(Printed circuit Board).



11. Mask for Solder Paste Application

We recommend metal mask that have the following thickness.

·TCD****BFG(Pad material : Au) : a thickness of 0.2mm.

And we recommend that the size of the pattern of the metal mask is 95% to 100% of recommended foot pattern at fig1.

12. Temperature cycle

After mounting, if temperature cycle stress is too much, CCD surface mount products have a possibility that a crack may arise in solder. As a method of preventing a solder crack, underfil is effective

13. Reuse of a Tray

We reuse tray in order to reduce plastic waste as we can. Please cooperate with us in reusing for ecology.

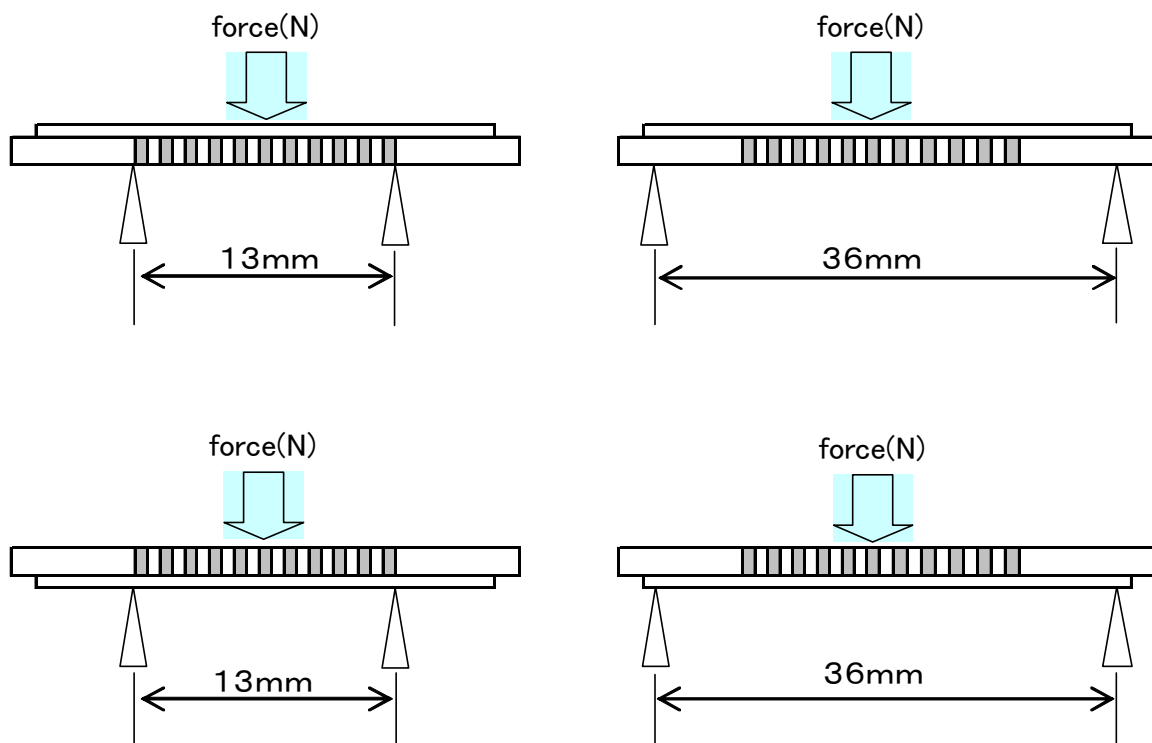
14. Caution for Package Handling

Over force on CCD products may cause crack and chip removing on the product. The three point bending strength of this product is the following. (Reference data)

If the stress is loaded far from a fulcrum, the stress on the package will be increase.

When you will treat CCD on every process, please be careful particularly. For example, soldering on PCB, cutting PCB, wiping on the glass surface, optical assemble and so on.

Bending Test



・22CLCC

Bearing length 13mm :

The force from upside : 300[N]

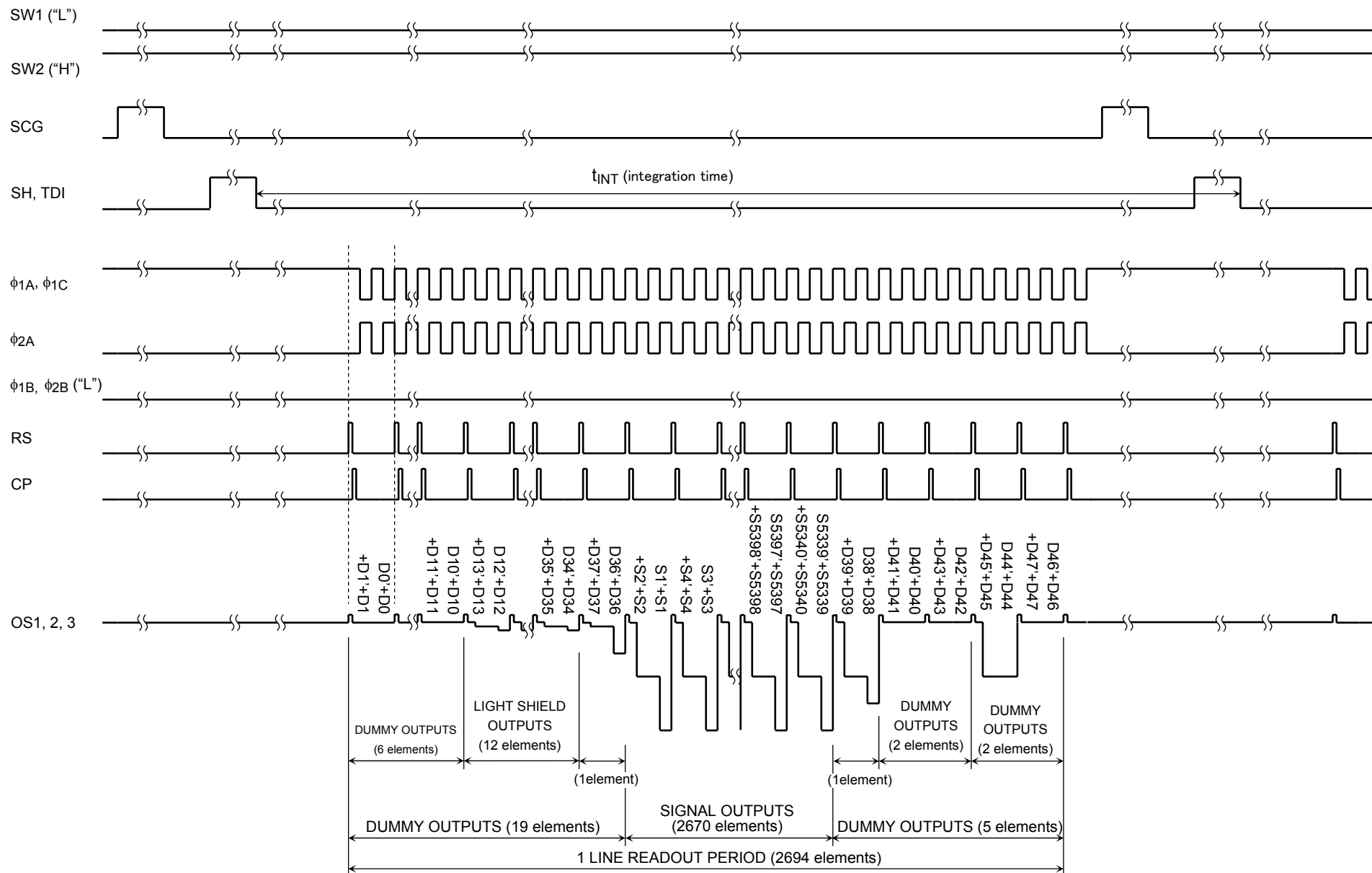
The force from downside : 200[N]

Bearing length 36mm :

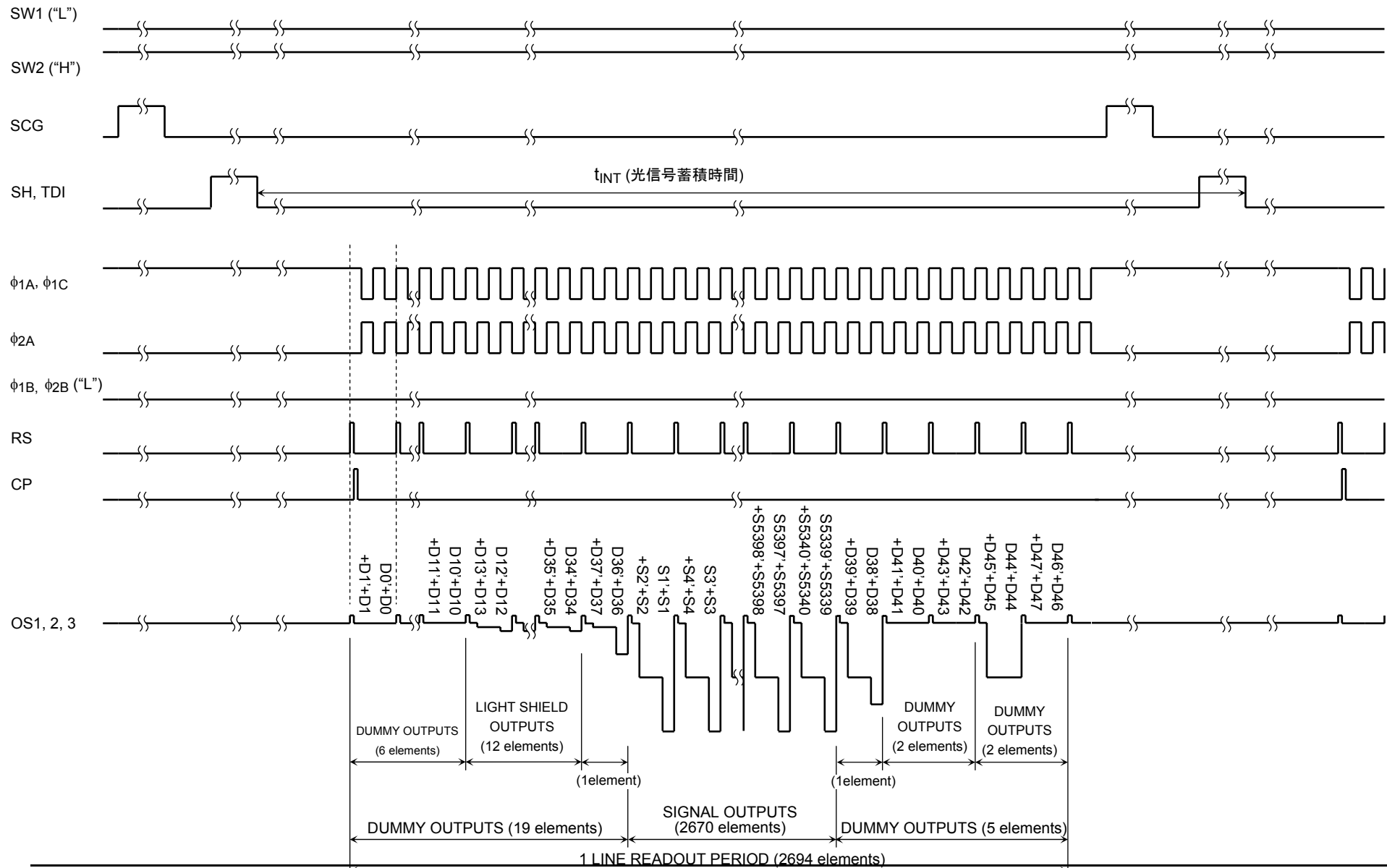
The force from upside : 150[N]

The force from downside : 80[N]

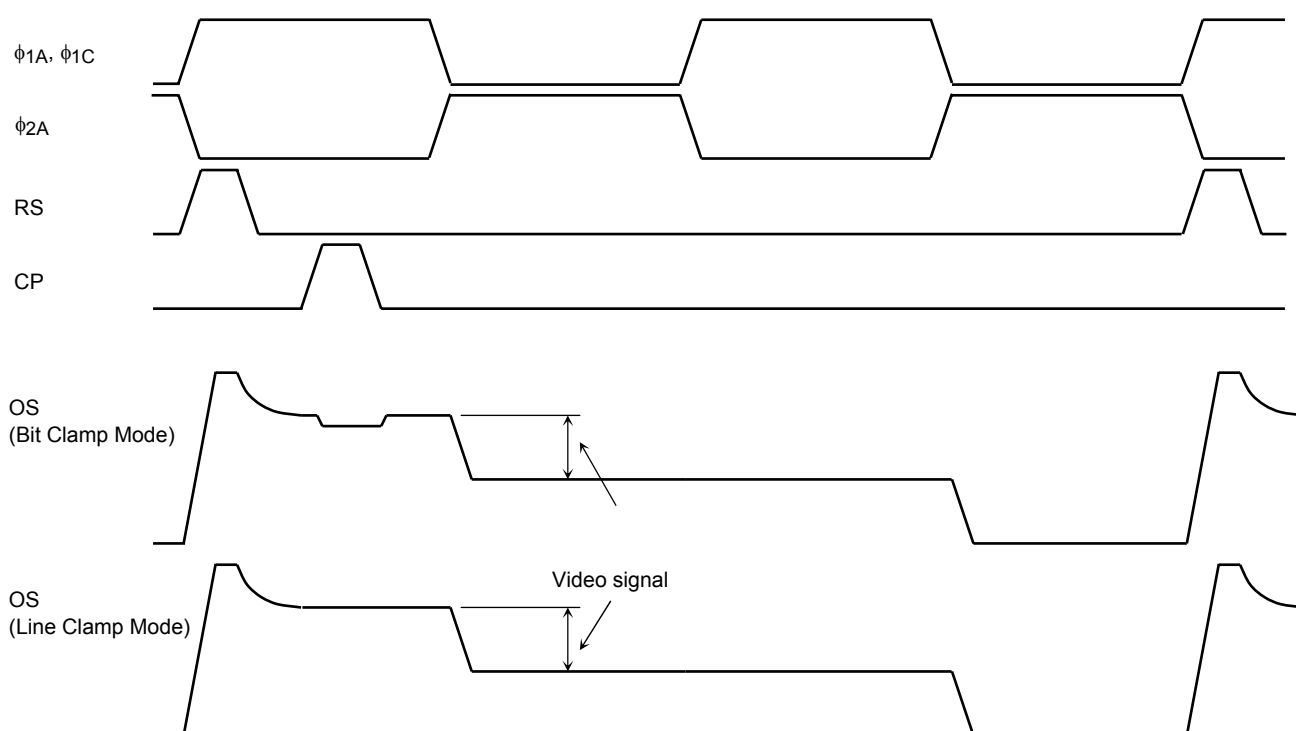
Application Note: Timing Chart (Color 300DPI Mode/TDI"ON": Bit Clamp Mode)



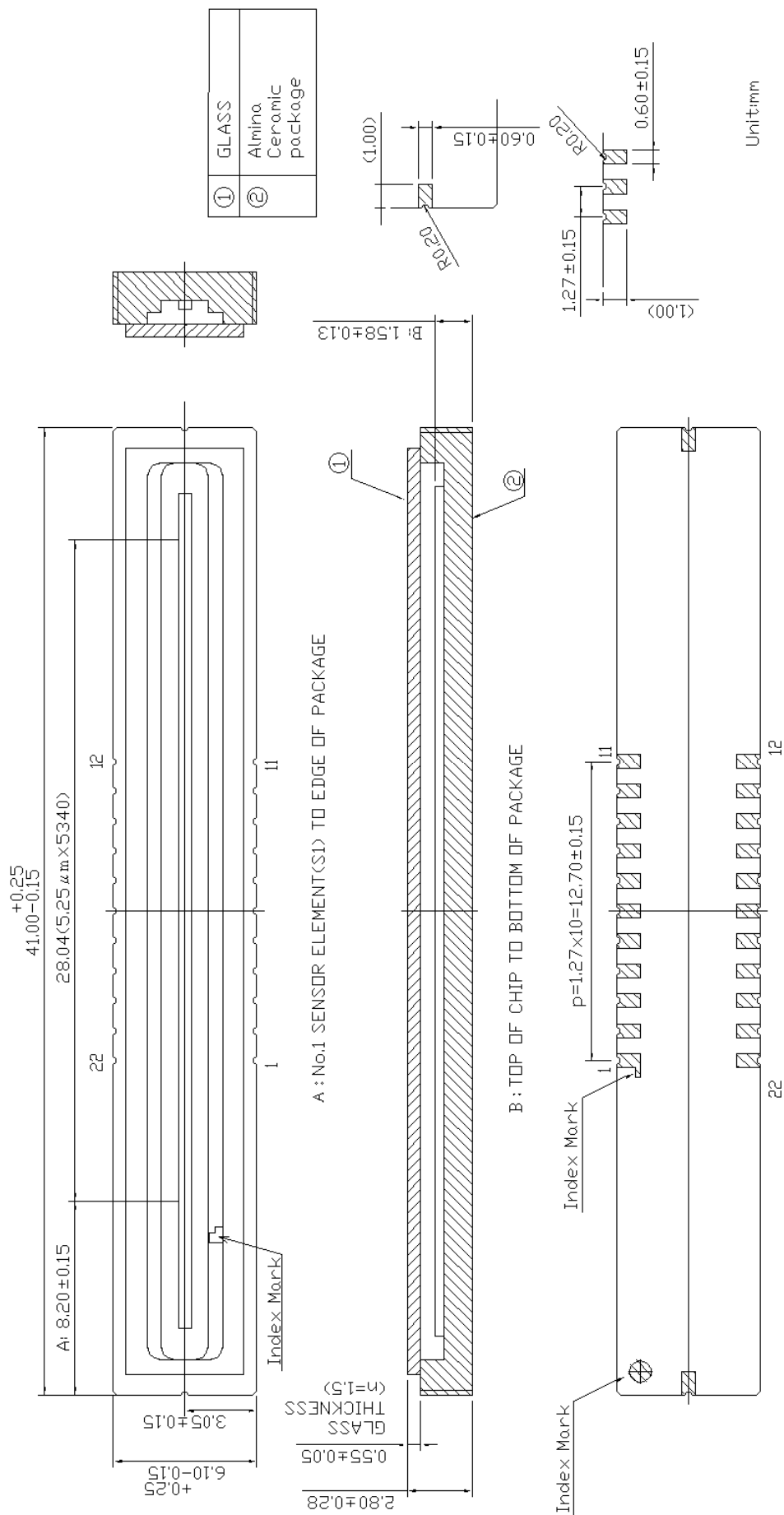
Application Note: Timing Chart (Color 300DPI Mode/TDI"ON": Line Clamp Mode)



Timing Example (Color 300dpi Mode)



Package Dimensions



Weight: 2.0g (typ.)

RESTRICTIONS ON PRODUCT USE

060925EBA_R6

- The information contained herein is subject to change without notice. 021023_D
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc. 021023_A
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk. 021023_B
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations. 060106_Q
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others. 021023_C
- Please use this product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances.
Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations. 060819_AF
- The products described in this document are subject to foreign exchange and foreign trade control laws. 060925_E