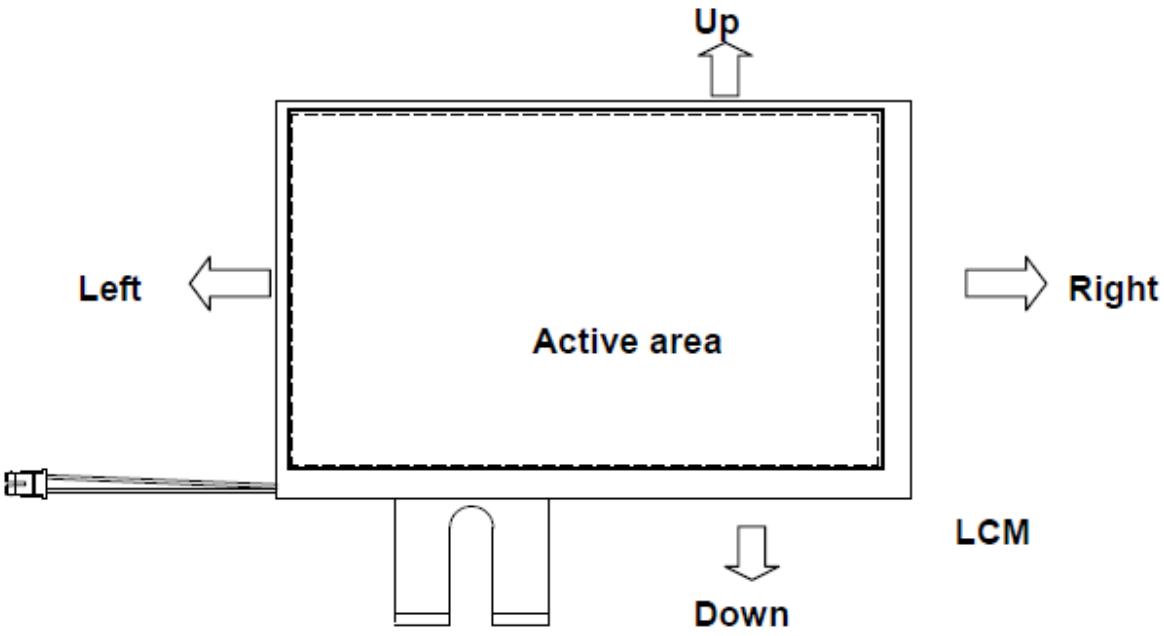
45	B5	I	Blue data (MSB)	
46	B4	I	Blue data	
47	B3	I	Blue data	
48	B2	I	Blue data	
49	B1	I	Blue data	
50	B0	I	Blue data(LSB)	
51	R/L	I	Right/ left selection	Note 1,2
52	V1	I	Gamma voltage level 1	
53	V4	I	Gamma voltage level 4	
54	V7	I	Gamma voltage level 7	
55	V10	I	Gamma voltage level 10	
56	V12	I	Gamma voltage level 12	
57	V13	I	Gamma voltage level 13	
58	AV_{DD}	P	Power Voltage for Analog Circuit	
59	GND	P	Power Ground	
60	V_{COM}	I	Common voltage	

I: input, O: output, P: Power

Note 1: Selection of scanning mode

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	R/L	STVD	STVU	STHR	STHL	
GND	DV_{DD}	O	I	I	O	Up to down, left to right
DV_{DD}	GND	I	O	O	I	Down to up, right to left
GND	GND	O	I	O	I	Up to down, right to left
DV_{DD}	DV_{DD}	I	O	I	O	Down to up, left to right

Note 2: Definition of scanning direction.
Refer to the figure as below:



Note 3: When REV="L", it's under normal operation.

When REV="H", these data will be inverted.

5.1 Backlight Unit Section

LED Light Bar Connector is used for the integral backlight system.
The recommended model is BHSR-02VS-1 manufactured by JST.

Pin No	Symbol	I/O	Function	Remark
1	VLED+	P	Power for LED backlight anode	Pink
2	VLED-	P	Power for LED backlight anode	Black

6. Timing Characteristics

6.1 Timing Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency	Fdclk	-	40	45	MHz	
DCLK cycle	Tcph	22	25	-	ns	
DCLK pulse width	Tcw	8	-	-	ns	
Data set-up time	Tsu	4	-	-	ns	
Data hold time	Thd	2	-	-	ns	
Time that the last data to LD	Tld	1	-	-	Tcph	
Pulse width of LD	Twld	2	-	-	Tcph	
Time that LD to STHL/R	Tlds	5	-	-	Tcph	
POL set-up time	Tpsu	6	-	-	ns	
POL hold time	Tphd	6	-	-	ns	
CKV frequency	Fvclk	-	-	200	KHz	
CKV rise time	Trck	-	-	100	ns	
CKV falling time	Tfck	-	-	100	ns	
CKV pulse width	PWCLK	500	-	-	ns	
Horizontal display timing range	Tdh	-	800	-	Tcph	
Horizontal timing range	Th	-	1056	-	Tcph	
STVU/D setup time	Tsuv	200	-	-	ns	
STVU/D hold time	Thdv	300	-	-	ns	
STVU/D delay time	Tdt	-	-	500	ns	
Driver output delay time	Tdo	-	-	900	ns	
Output rise time	Ttlh	-	500	1000	ns	
Output falling time	Tthl	-	400	800	ns	
OEV pulse width	Twcl	1	-	-	us	
OEV to Driver output delay time	Toe	-	-	900	ns	
Horizontal lines per field	Tv	512	525	610	Tdh	
Vertical display timing range	Tvd	-	480	-	Tdh	

6.2 Timing Diagram

Timing Diagram1 (CHNSL="1" , Default)
<EDGSL="0",Default>

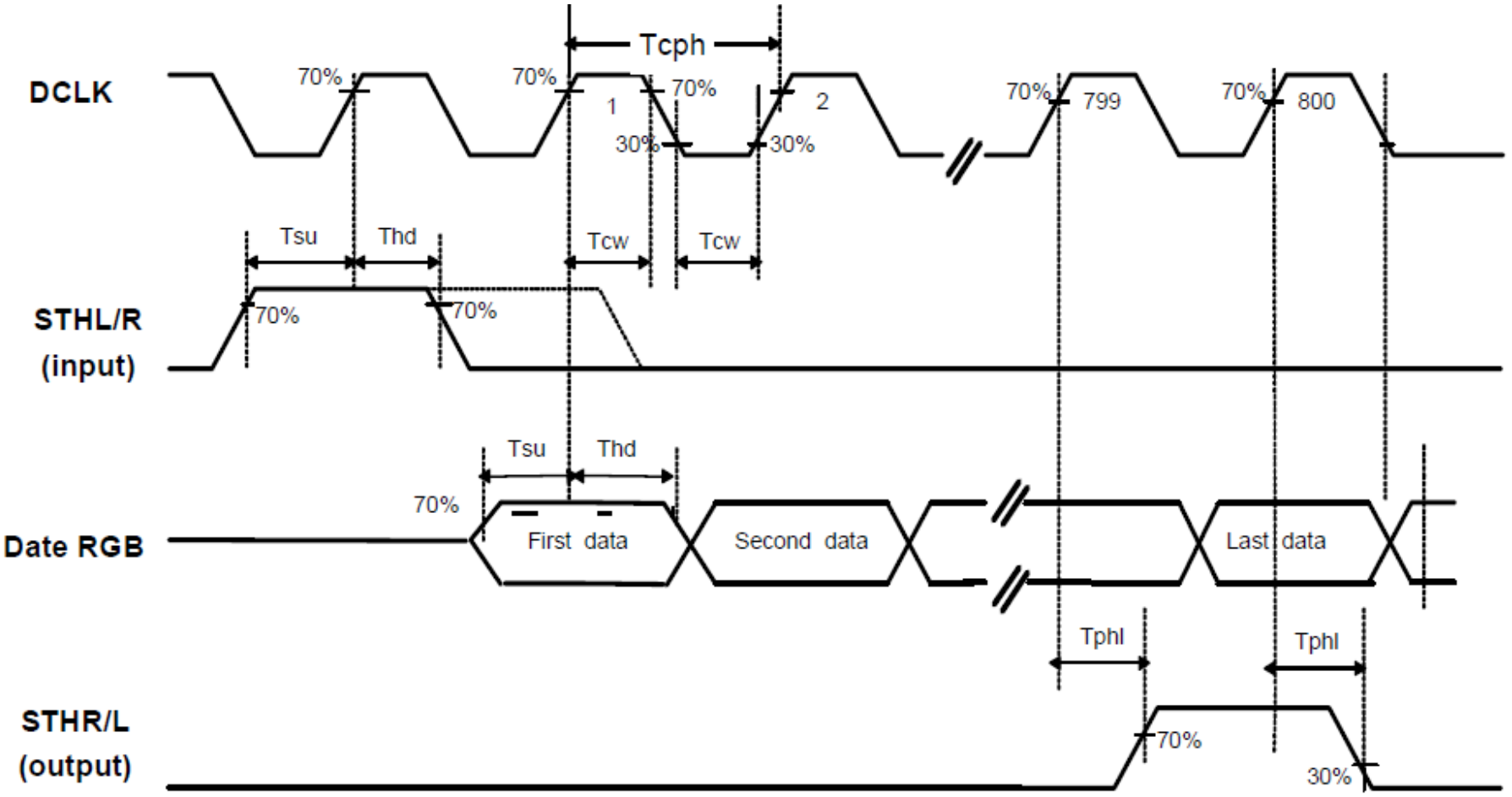


Fig.6-1 operation model 1

< EDGSL ="1">

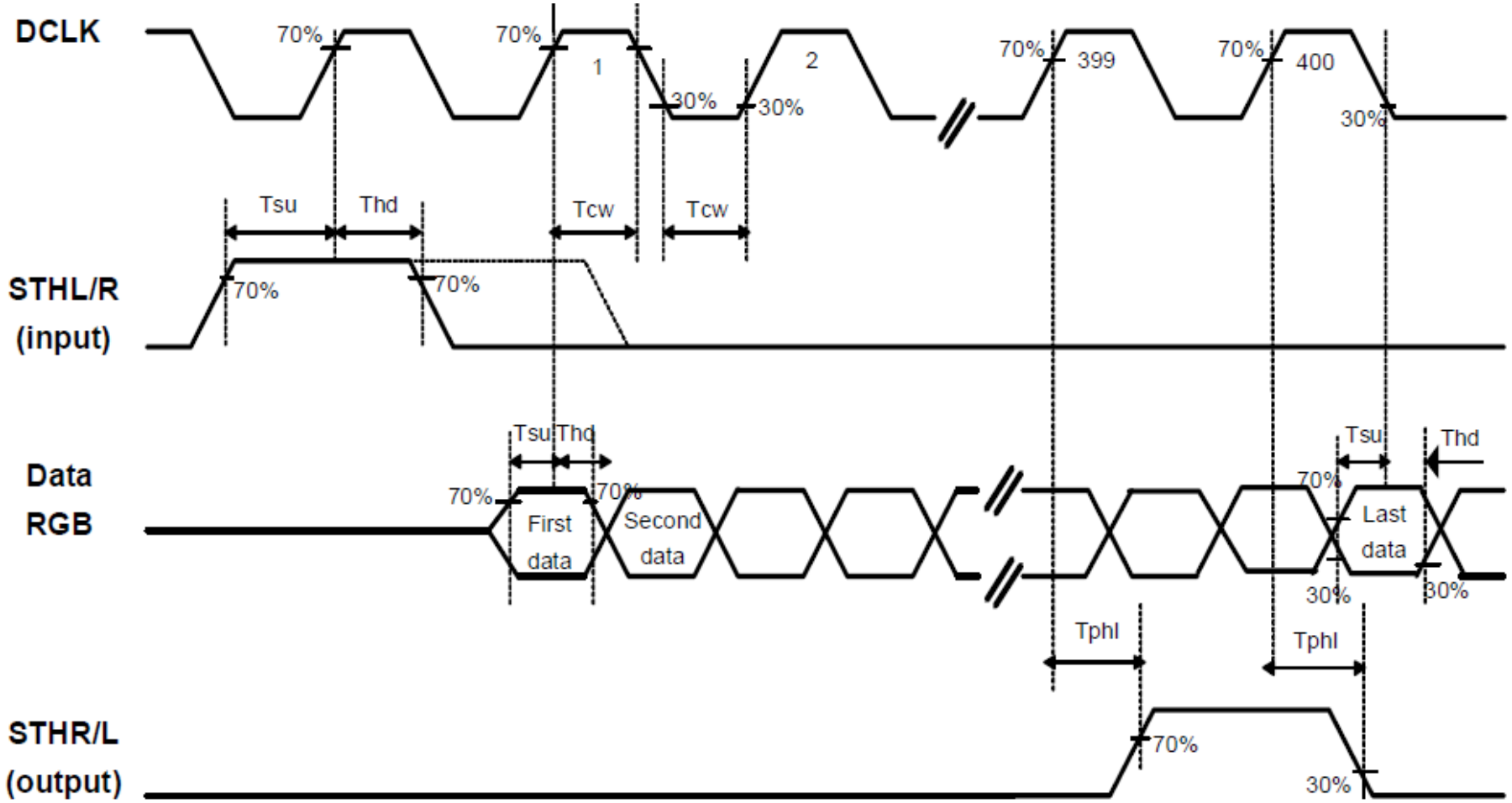


Fig.6-2 operation model 2

Timing Diagram 2

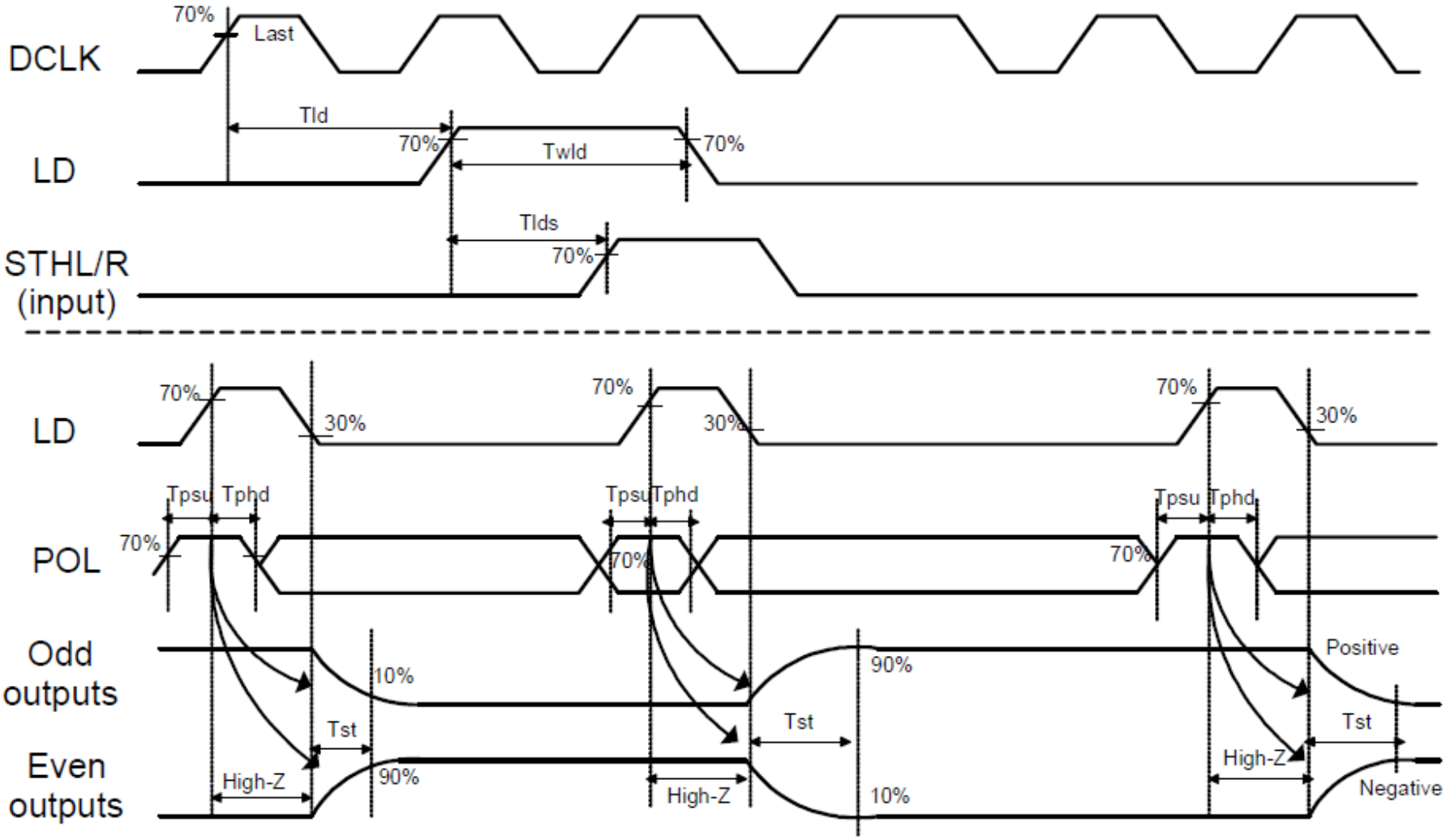


Fig.6-3 Horizontal timing 1

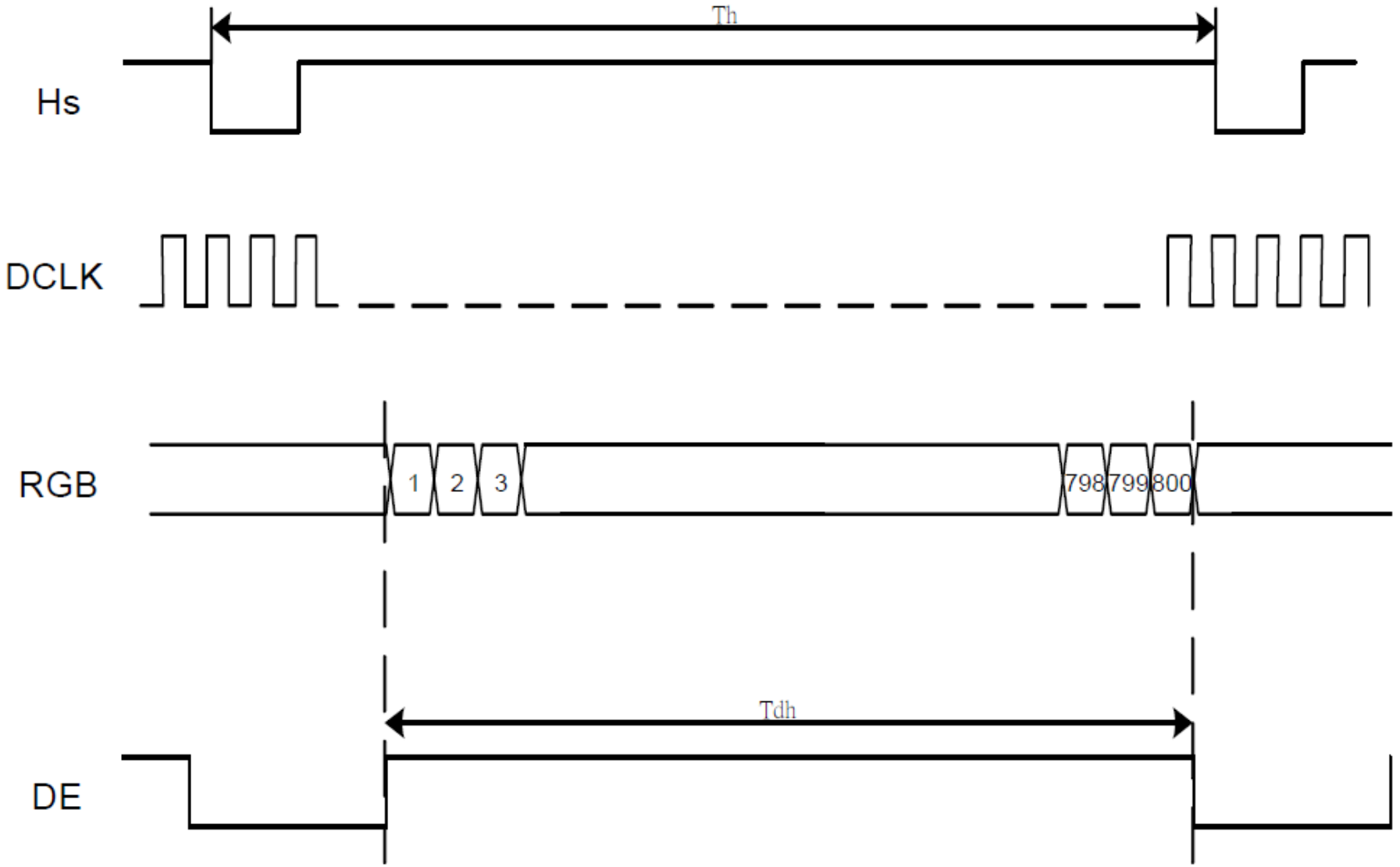


Fig.6-4 Horizontal timing 2

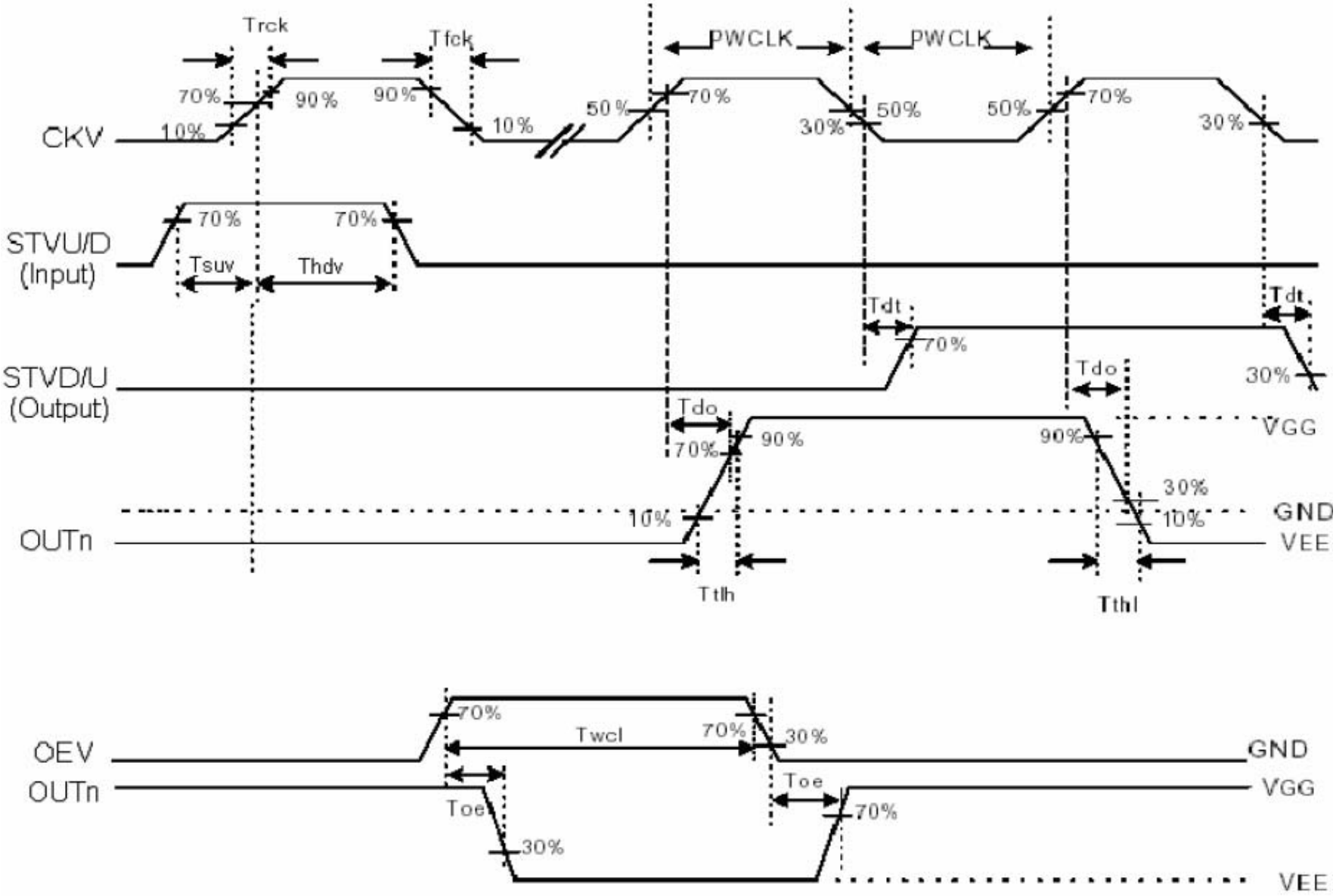


Fig.6-5 Vertical shift clock timing

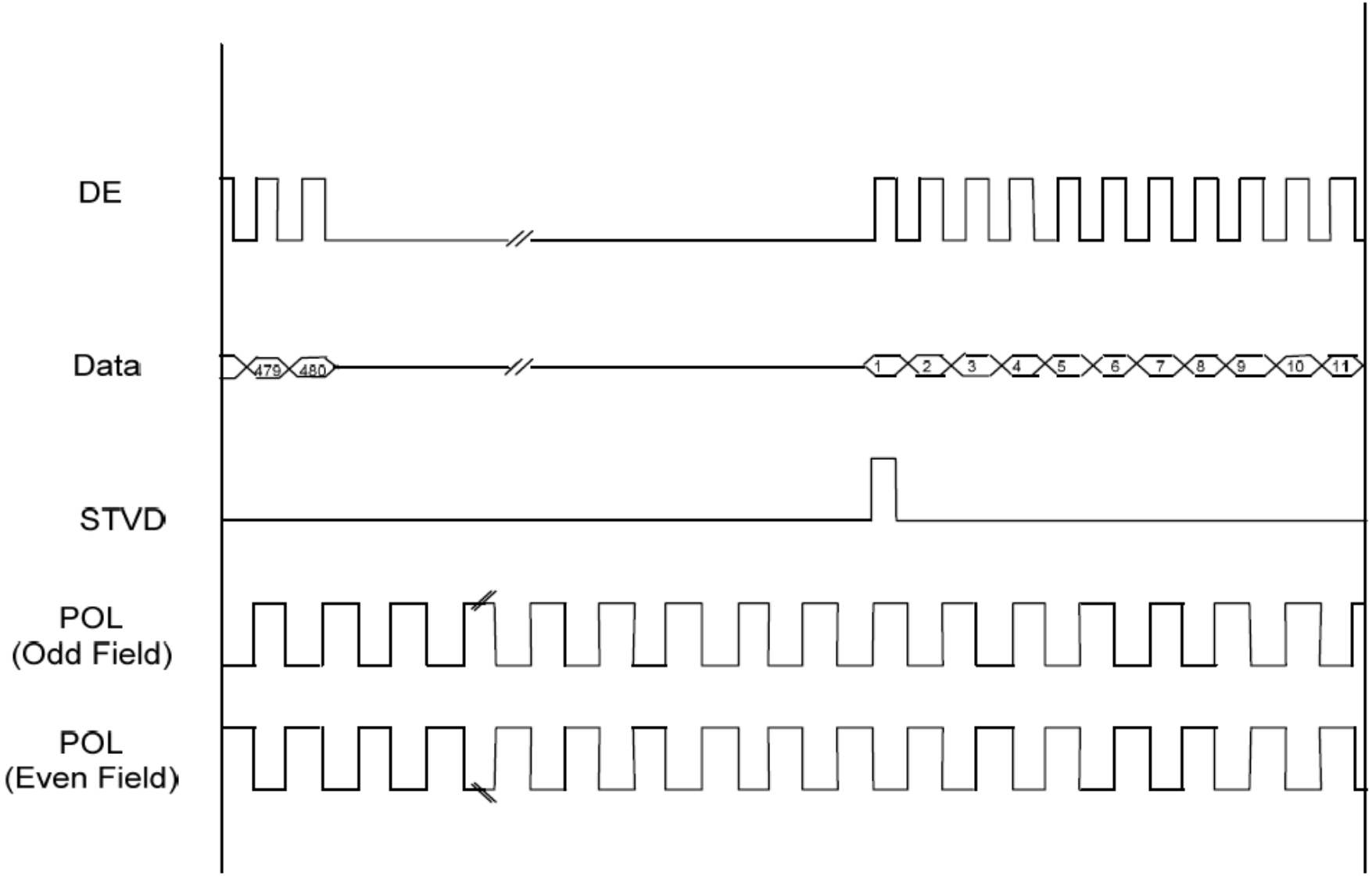


Fig.6-6 Vertical timing (from up to down)

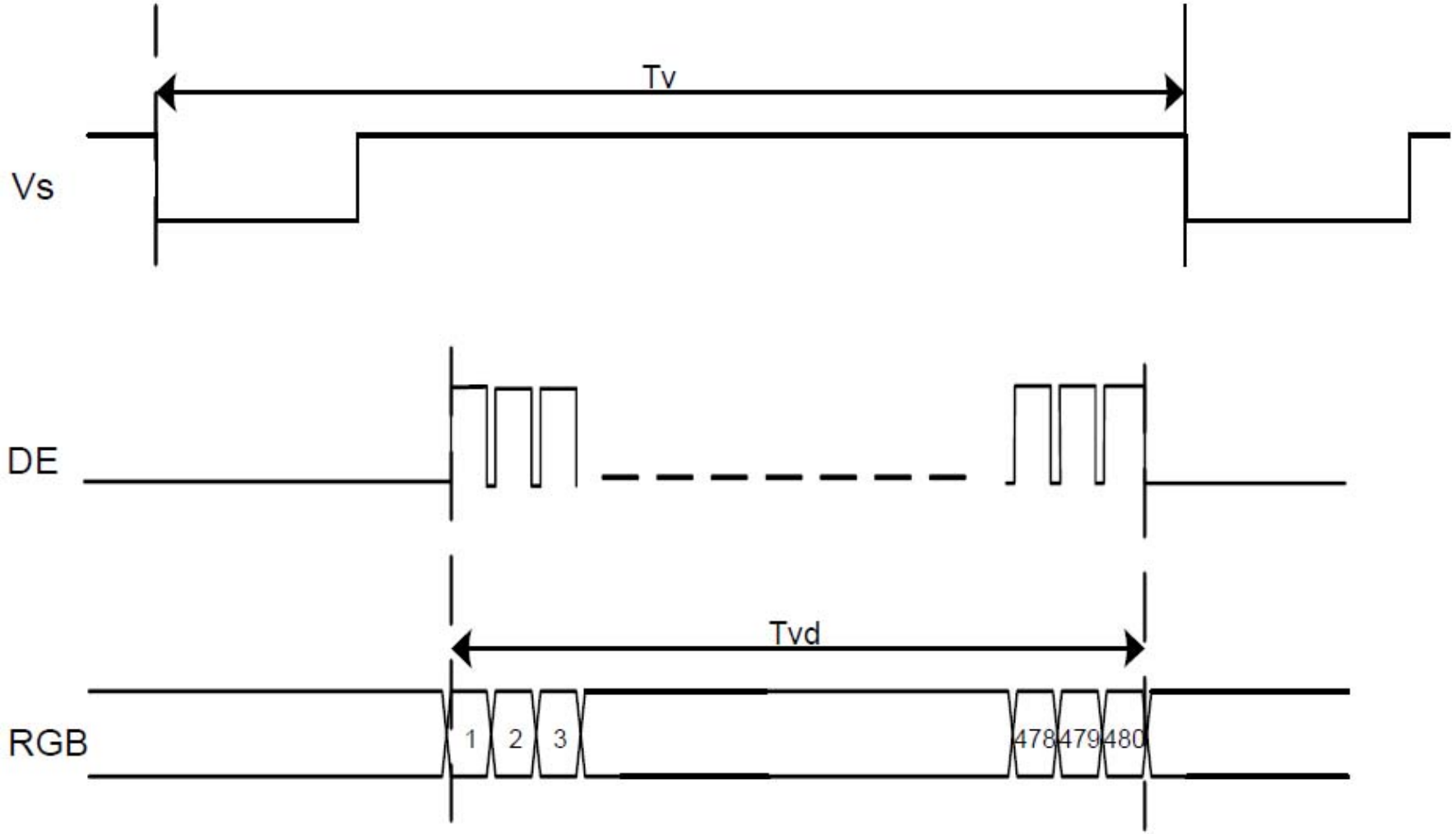


Fig.6-7 Vertical timing

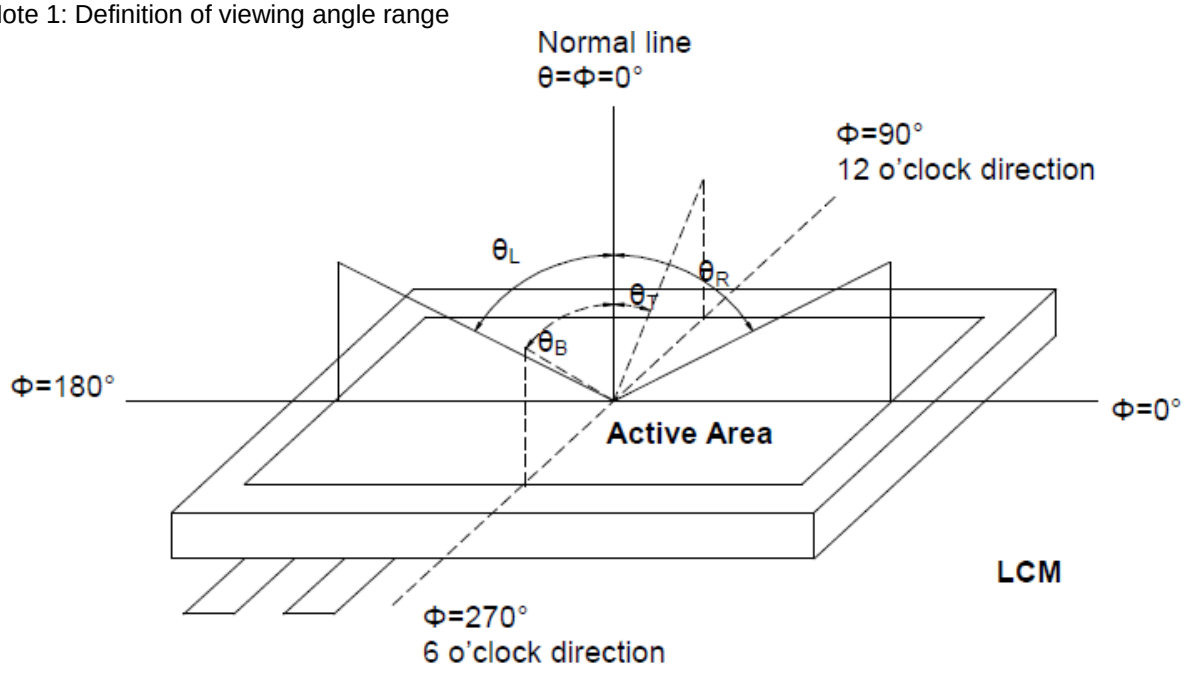
7. OPTICAL CHARACTERISTIC

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	60	70	-	degree	Note1
	θ_R	Φ=0°(3 o'clock)	60	70	-		
	θ_T	Φ=90°(12 o'clock)	40	50	-		
	θ_B	Φ=270°(6 o'clock)	60	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	10	20	msec	Note3
	T_{OFF}		-	15	30	msec	Note3
Contrast ratio	CR		400	500	-	-	Note4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note2 Note5 Note6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		360	450	-	cd/㎡	Note6
Luminance uniformity	Y_U		70	75	-	%	Note7

Test Conditions:

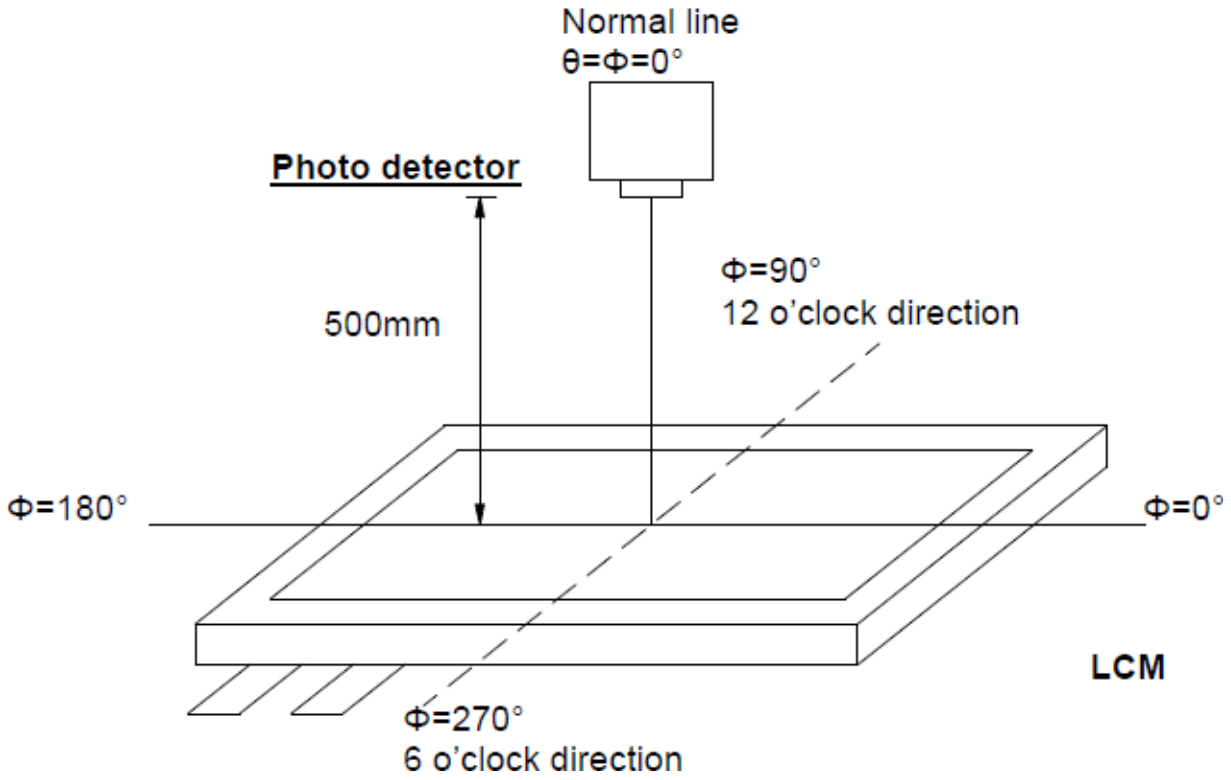
1. DV_{DD} =3.3V, IL =180mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range



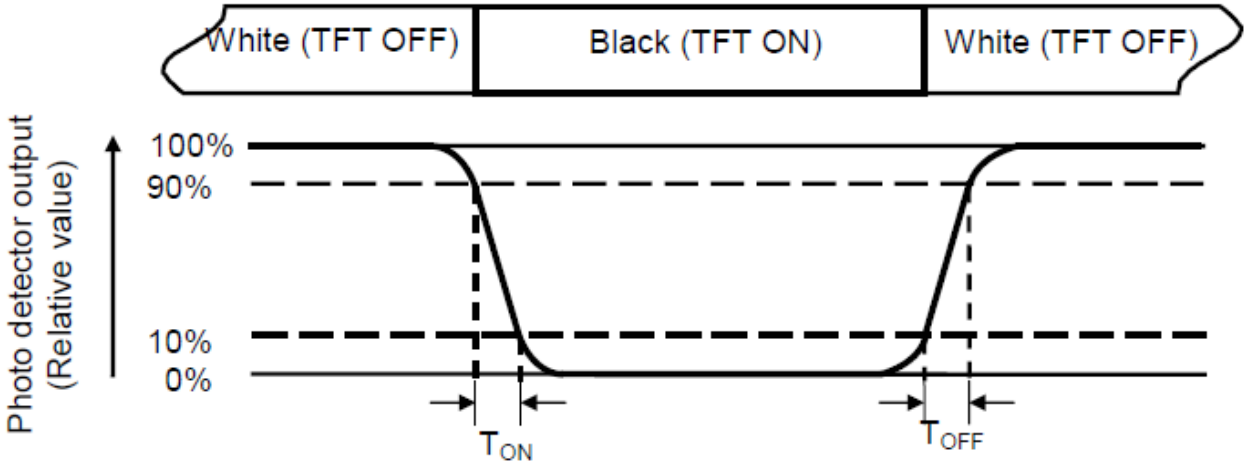
Definition of viewing angle

Note 2: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)



Optical measurement system setup

Note 3: Definition of Response time
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

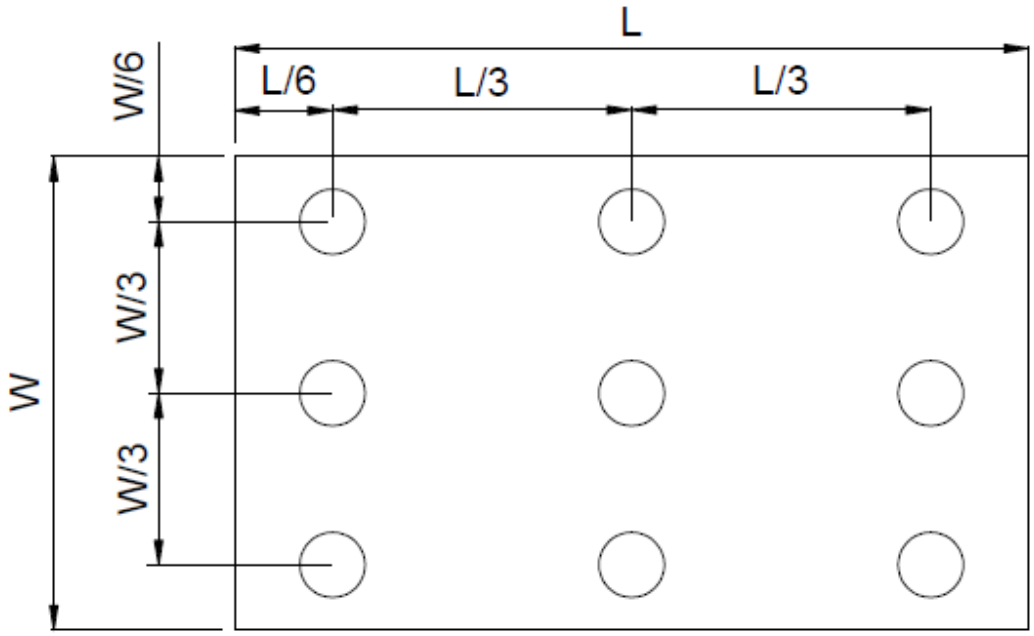
Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel.
The LED driving condition is IL=180mA .

Note 7: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer to Definition of measuring points).
Every measuring point is placed at the center of each measuring area.

$$Luminance\ \ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$

L-------Active area length W----- Active area width



Definition of measuring points

Bmax: The measured maximum luminance of all measurement position.
Bmin: The measured minimum luminance of all measurement position.

8. QUALITY ASSURANCE

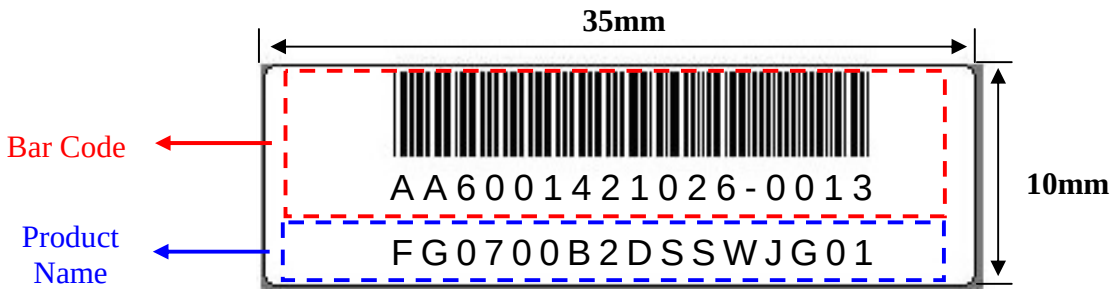
8.1 Reliability Test Items

No.	Reliability Test Item & Level	Test Level	Remark
1	High Temperature Storage	Ta = 85℃ 240 hrs	Note 1,Note 4
2	Low Temperature Storage	Ta = -30℃ 240hrs	Note 1,Note 4
3	High Temperature Operation	Ts = 85℃ 240hrs	Note 2,Note 4
4	Low Temperature Operation	Ta =-30℃ 240hrs	Note 1,Note 4
5	Operate at High Temperature and Humidity	+60℃, 90%RH max. 240 hrs	Note 4
6	Thermal Shock	-30℃/30 min ~ +85℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature	Note 4
7	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
8	Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
9	Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
10	Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
11	Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

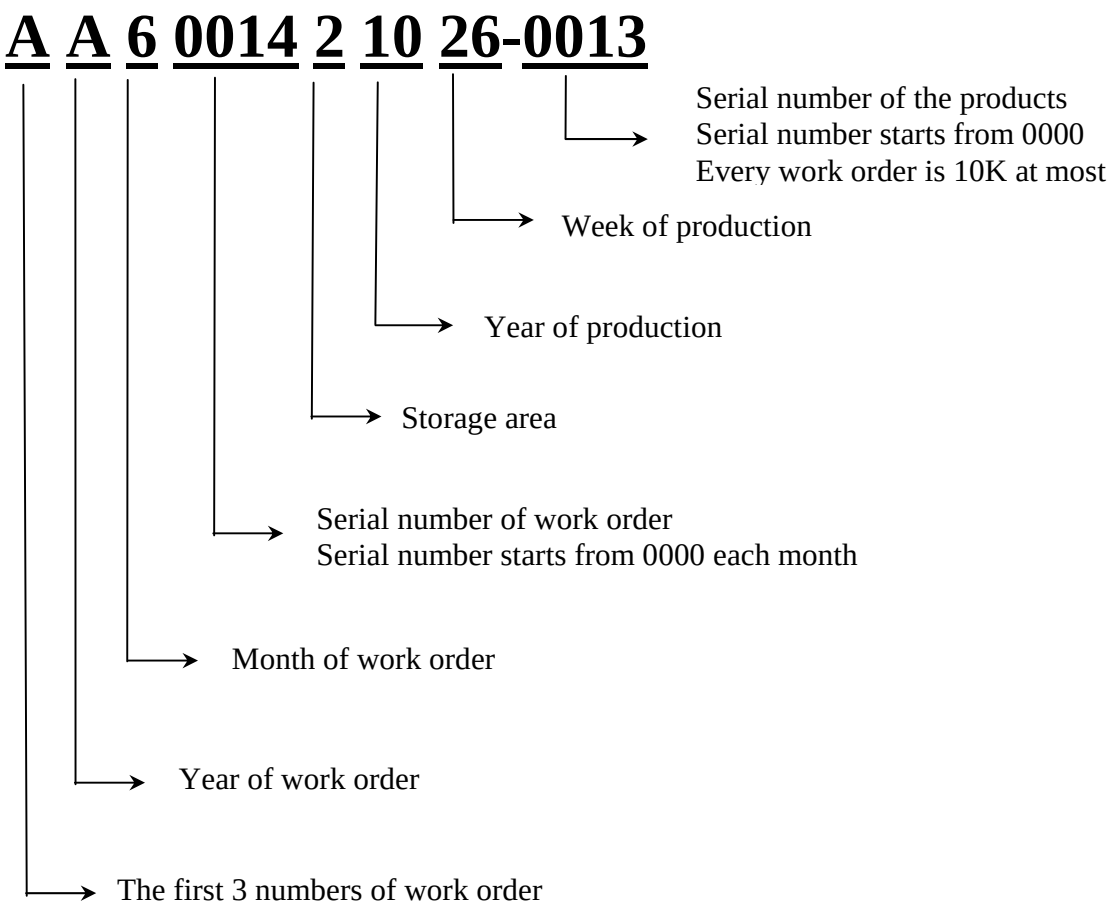
Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature.

9. LCM PRODUCT LABEL DEFINE

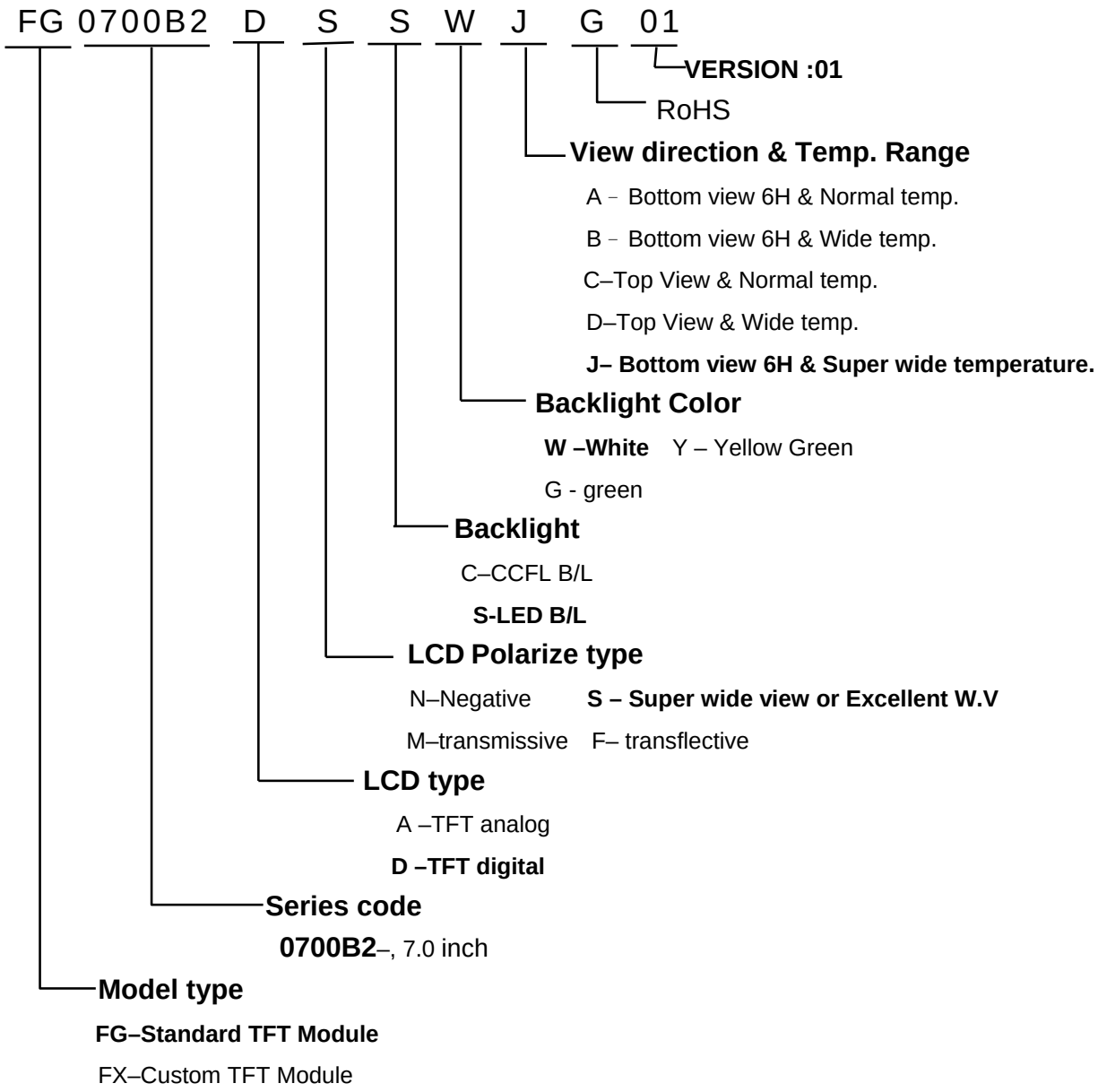
Product Label style:



BarCode Define:



Product Name Define:

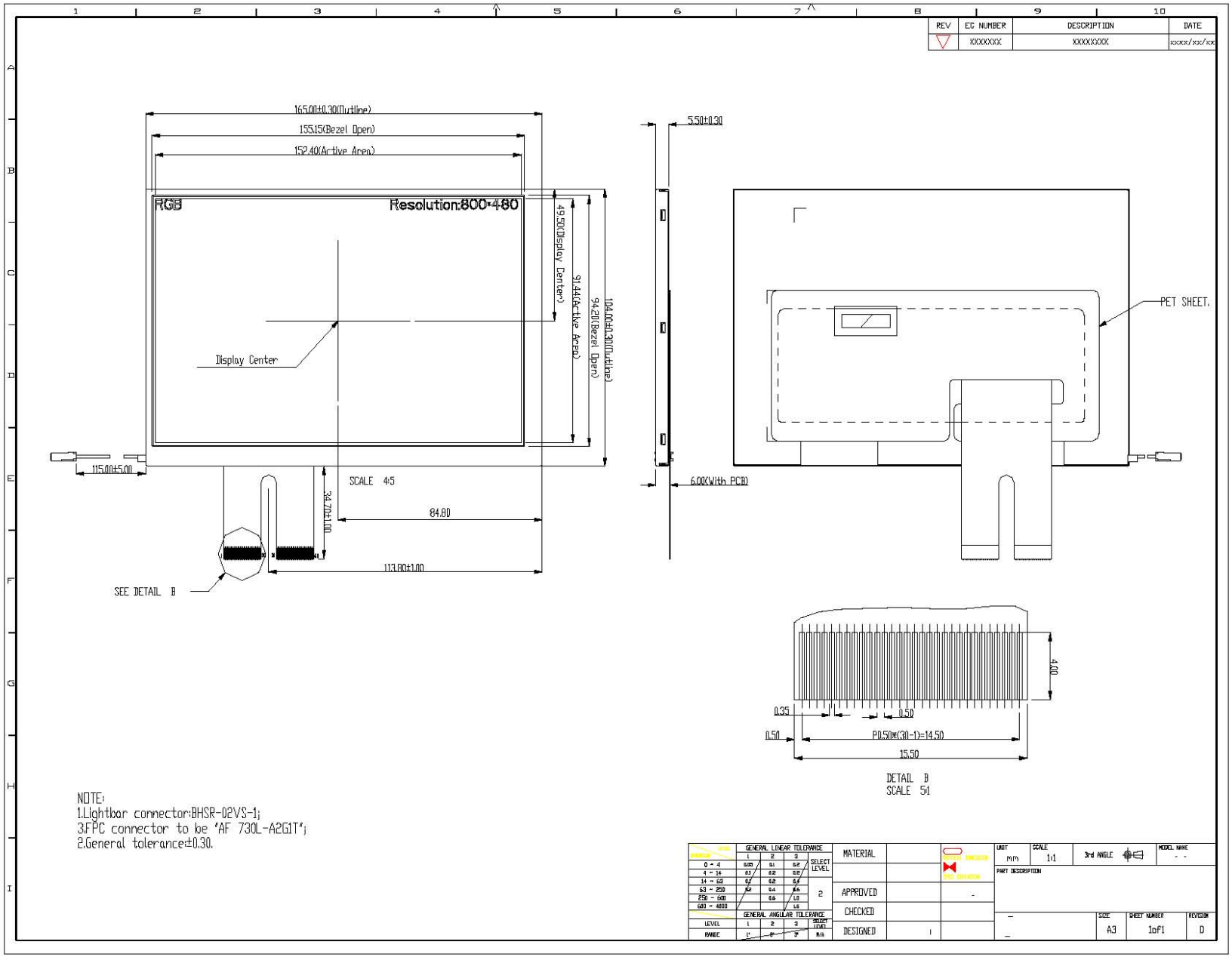


10. PRECAUTIONS IN USE LCM

1. ASSEMBLY PRECAUTIONS
   (1) You must mount a module using holes arranged in four corners or four sides.
   (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
   (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
   (4) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
   (5) Do not open the case because inside circuits do not have sufficient strength.
   (6) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
   (7) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
   (8) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.
2. OPERATING PRECAUTIONS
   (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
   (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification
   (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
   (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
   (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
   (6) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.
3. ELECTROSTATIC DISCHARGE CONTROL
   (1) The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such the copper leads on the PCB and the interface terminals with any parts of the human body.
   (2) The modules should be kept in antistatic bags or other containers resistant to static for storage.
   (3) Only properly grounded soldering irons should be used.
   (4) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
   (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
   (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.
4. STORAGE PRECAUTIONS
   (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
   (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C 90%RH
   (3) Please do not leave the LCDs in the environment of low temperature; below -20°C.
5. OTHERS
   (1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land strong UV rays
   (2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
   (3) For the packaging box, please pay attention to the followings:
      a. Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
      b. Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
      c. Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)
6. LIMITED WARRANTY

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

11. OUTLINE DRAWING



12. PACKAGE INFORMATION

TBD