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DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC0700NIG

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Record of Revision

Date	Revision No.	Summary
2009 12 15	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0700NIG active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 7.0'' display area contains 800X3(RGB) x 480pixels.

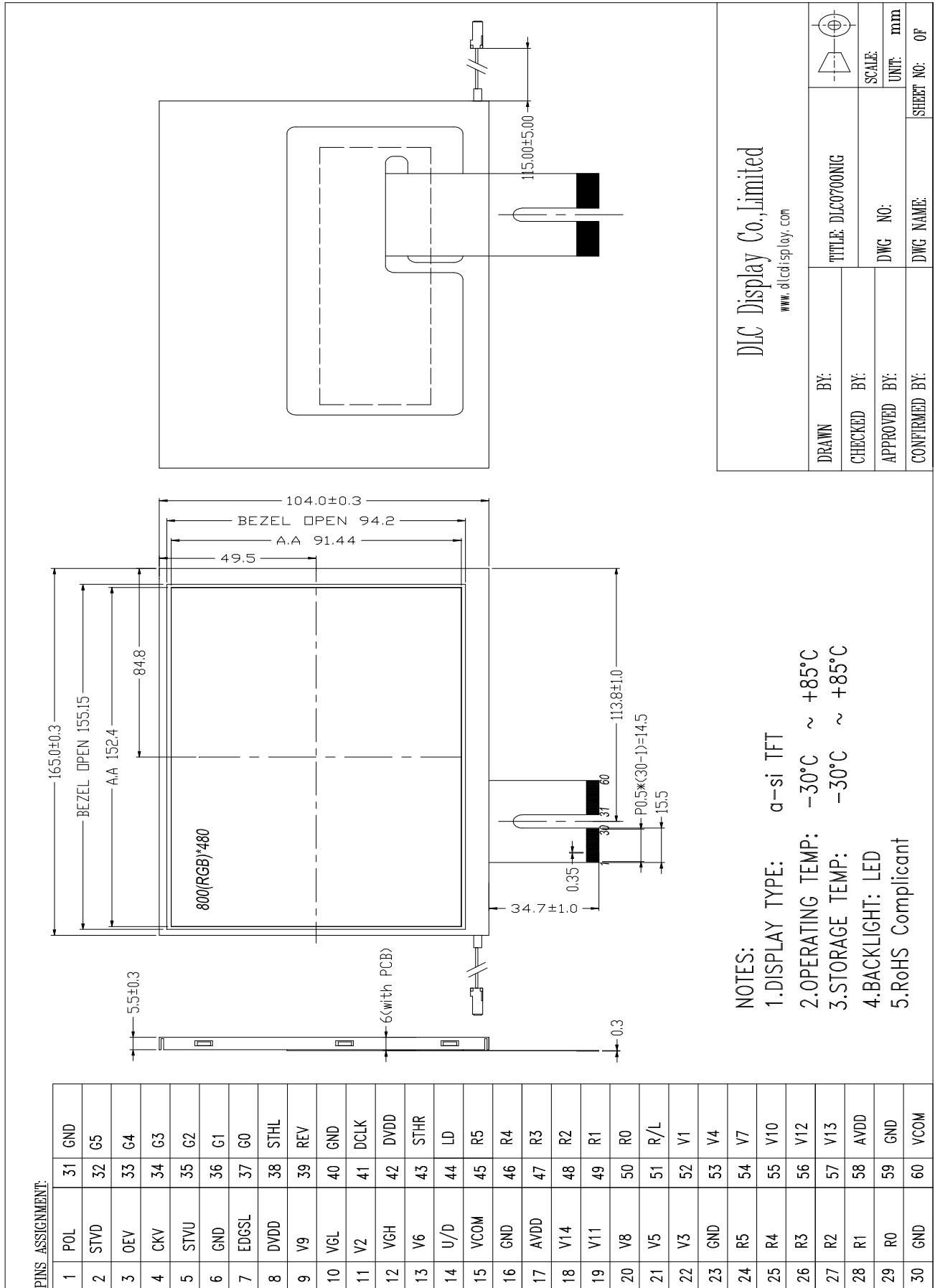
2. Application

Digital equipments which need color display, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	7.0	inch
Resolution	800x 3(RGB) x 480	/
Interface	Digital	/
Technology type	a-Si TFT	/
Pixel pitch	0.0635x0.1905	mm
Pixel Configuration	RGB stripes	
Outline Dimension (W x H x D)	165x104x5.5	mm
Active Area	152.4 x 91.44	mm
Display Mode	Transmissive, Normally white	/
Backlight Type	LED	/

4. Outline Drawing



5. Interface signals

5.1 Connector is used for the module electronic interface. The recommended model is P-TWO “AF 730L-A2G1T” manufactured by P-TWO.

Pin No.	Symbol	I/O	Function	Remark
1	POL	I	Polarity selection	
2	STVD	I/O	Vertical start pulse input when U/D= H	
3	OEV	I	Output enable	
4	CKV	I	Vertical clock	
5	STVU	I/O	Vertical start pulse input when U/D= L	
6	GND	P	Power ground	
7	EDGSL	I	Select rising edge or falling edge	
8	DVDD	P	Power Voltage for Digital Circuit	
9	V9	I	Gamma voltage level 9	
10	VGL	P	Gate OFF voltage	
11	V2	I	Gamma voltage level 2	
12	VGH	P	Gate ON voltage	
13	V6	I	Gamma voltage level 6	
14	U/D	I	Up/down selection	
15	VCOM	I	Comm on voltage	
16	GND	P	Power ground	
17	AVDD	P	Power Voltage for Analog Circuit	
18	V14	I	Gamma voltage level 14	
19	V11	I	Gamma voltage level 11	
20	V8	I	Gamma voltage level 8	
21	V5	I	Gamma voltage level 5	
22	V3	I	Gamma voltage level 3	
23	GND	P	Power ground	
24	R5	I	Red data input(MSB)	
25	R4	I	Red data input	
26	R3	I	Red data input	
27	R2	I	Red data input	

28	R1	I	Red data input	
29	R0	I	Red data input(LSB)	
30	GND	P	Power ground	
31	GND	P	Power ground	
32	G5	I	Green data input(MSB)	
33	G4	I	Green data input	
34	G3	I	Green data input	
35	G2	I	Green data input	
36	G1	I	Green data input	
37	G0	I	Green data input(LSB)	
38	STHL	I/O	Horizontal start pulse input when R/L = L	
39	REV	I	Control signal are inverted or not	
40	GND	P	Power ground	
41	DCLK	I	Sample clock	
42	DVDD	P	Power Voltage for Digital Circuit	
43	STHR	I/O	Horizontal start pulse input when R/L =H	
44	LD	I	Latches the polarity of outputs and Switches the new data to outputs	
45	B5	I	Blue data input (MSB)	
46	B4	I	Blue data input	
47	B3	I	Blue data input	
48	B2	I	Blue data input	
49	B1	I	Blue data input	
50	B0	I	Blue data input(LSB)	
51	R/L	I	Right/ left selection	
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	AVDD	P	Power Voltage for Analog Circuit	
59	GND	P	Power ground	
60	VCOM	I	Comm on voltage	

I: input, O: output, P: Power

Note1: 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

5.2 LED Light Bar Connector is used for the integral backlight system.

The recommended model is BHSR-02VS-1 manufactured by JST.

Pin No.	Symbol	Function	Remark
1	V _{LED+}	Power for LED backlight anode	Pink
2	V _{LED-}	Power for LED backlight cathode	Black

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power voltage	DVDD	-0.5	5.0	V	
	AVDD	-0.5	13.5	V	
	VGH	-0.3	20.0	V	
	VGL	-13.0	0.3	V	
	VGH-VGL	-	33.0	V	
Input signal voltage	V1~V7	0.4AVDD	AVDD -0.1	V	
	V8~V14	0.1	0.6 AVDD	V	

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	85	°C	
Storage Temperature	TSTG	-30	85	°C	

6.3. LED Backlight Absolute max. ratings

Item	Symbol	MIN	MAX	Unit	Remark
LED Reverse Voltage	Vr	--	1.2	V	Each LED
LED Forward Current	IF		25	mA	Each LED

7. Electrical Specifications

7.1 Electrical characteristics

Ta=25°C

Parameter	Symbol	Values			Unit	Remark
		MIN	Typ.	MAX		
Power voltage	DVDD	3.0	3.3	3.6	V	
	AVDD	10.2	10.4	10.6	V	
	VGH	15.3	16.0	16.7	V	
	VGL	-7.7	-7.0	-6.3	V	
Input signal voltage	V _{COM}	3.9	4.1	4.3	V	
	V1~V7	0.4AVDD	-	AVDD -0.1	V	
	V8~V14	0.1	-	0.6 AVDD	V	
Input logic high voltage	V _{IH}	0.7 DV _{DD}	-	DV _{DD}	V	
Input logic low voltage	V _{IL}	0	-	0.3 DV _{DD}	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: POL, STVD, OEV, CKV, STVU, EDGSL, U/D, STHL, REV, DCLK, STHR, LD, R/L, R0~R5, G0~G5, B0~B5.

7.2 Current Consumption

Parameter	Symbol	Values			Unit	Remark
		MIN	Typ.	MAX		
Current for Driver	IGH	-	0.2	0.5	mA	VGH=16V
	IGL	-	0.2	1.0	mA	VGL=-7.0V
	IDVDD	-	5.0	10.0	mA	DVDD=3.3V
	IAVDD	-	40	50	mA	AVDD=10.4V

7.3 LED Backlight
Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Voltage for LED Backlight	VL	9.3	9.9	10.5	V	
Current for LED Backlight	IL	170	180	200	mA	
LED life time	-	20.000	-	-	Hr	

Note 1: The Voltage for LED Backlight is defined at Ta=25°C and IL =180mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =180mA. The LED lifetime could be decreased if operating IL is larger than 180 mA.

8. Command/AC Timing

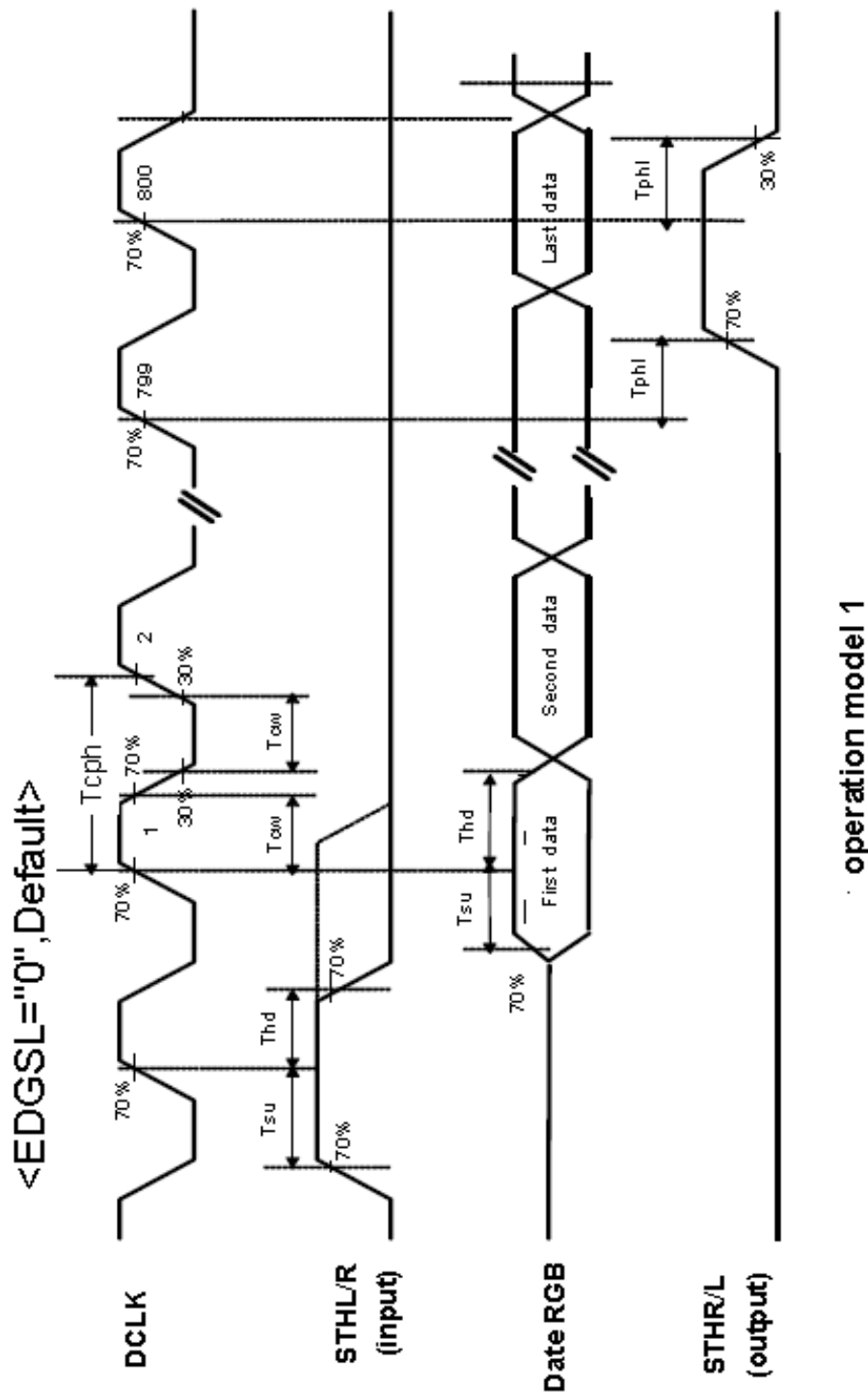
8.1 Timing Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK frequency	Fdclk	-	40	50	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	

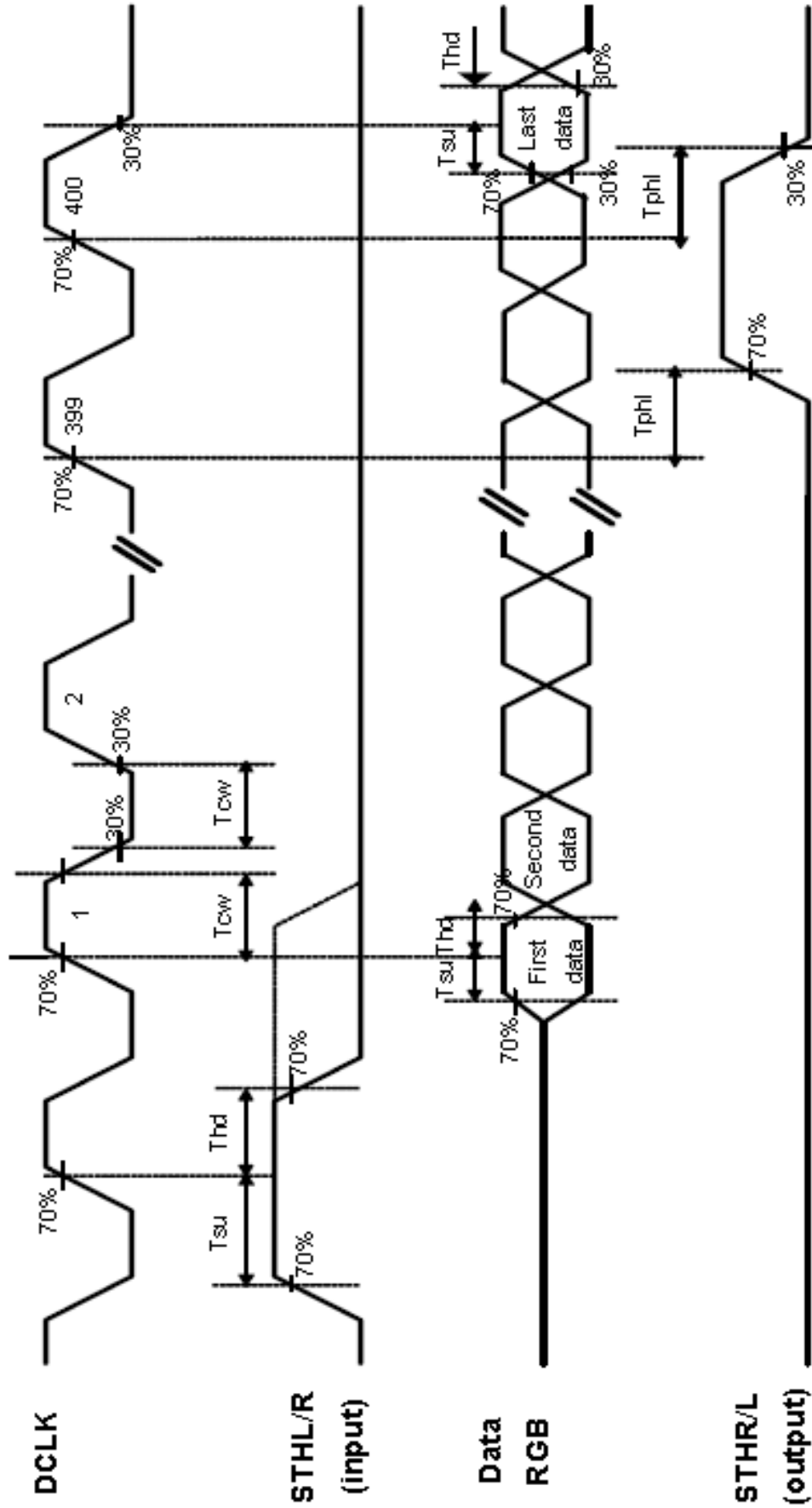
Output falling time	Tthl	-	400	800	ns	
OEV pulse width	Twcl	1	-	-	us	
OEV to Driver output delay time	Toe	-	-	900	ns	
Horizontal lines per field	Tv	512	525	610	Tdh	
Vertical display timing range	Tvd	-	480	-	Tdh	

8.2 Timing Diagram

Timing Diagram1 (CHNSL="1", Default)

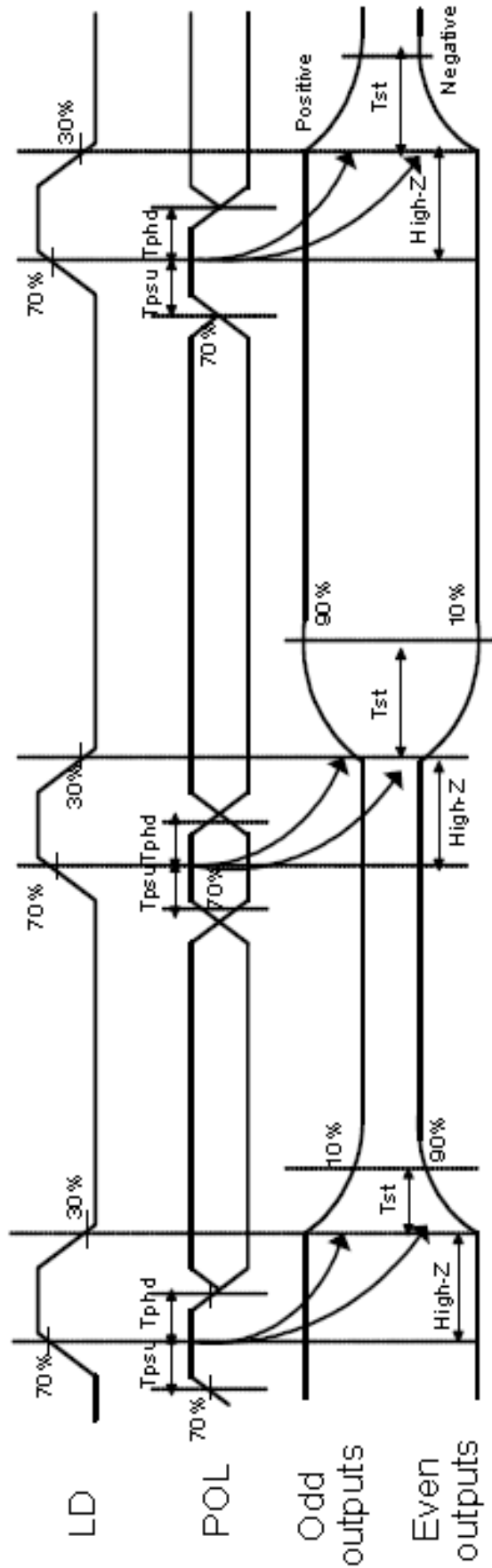
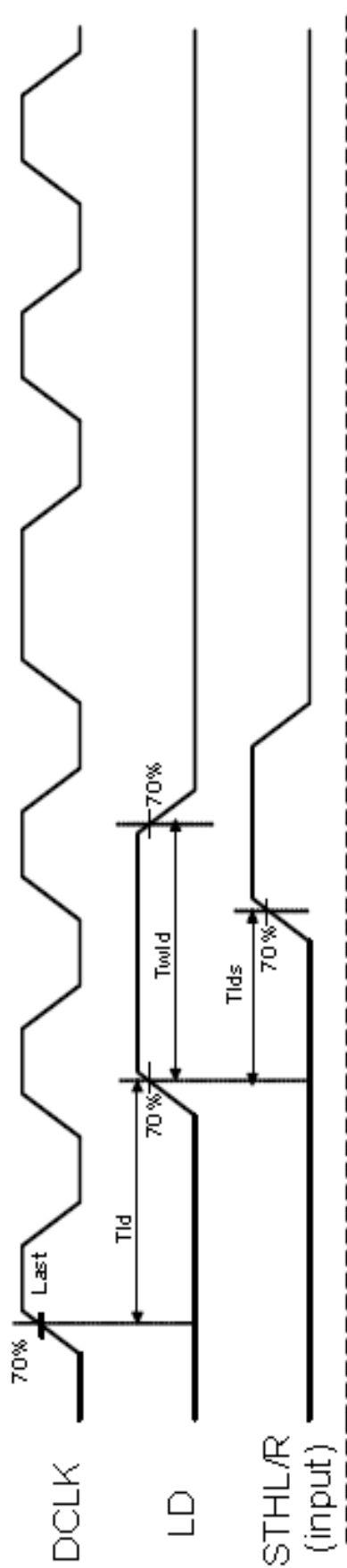


< EDGSL = "1" >

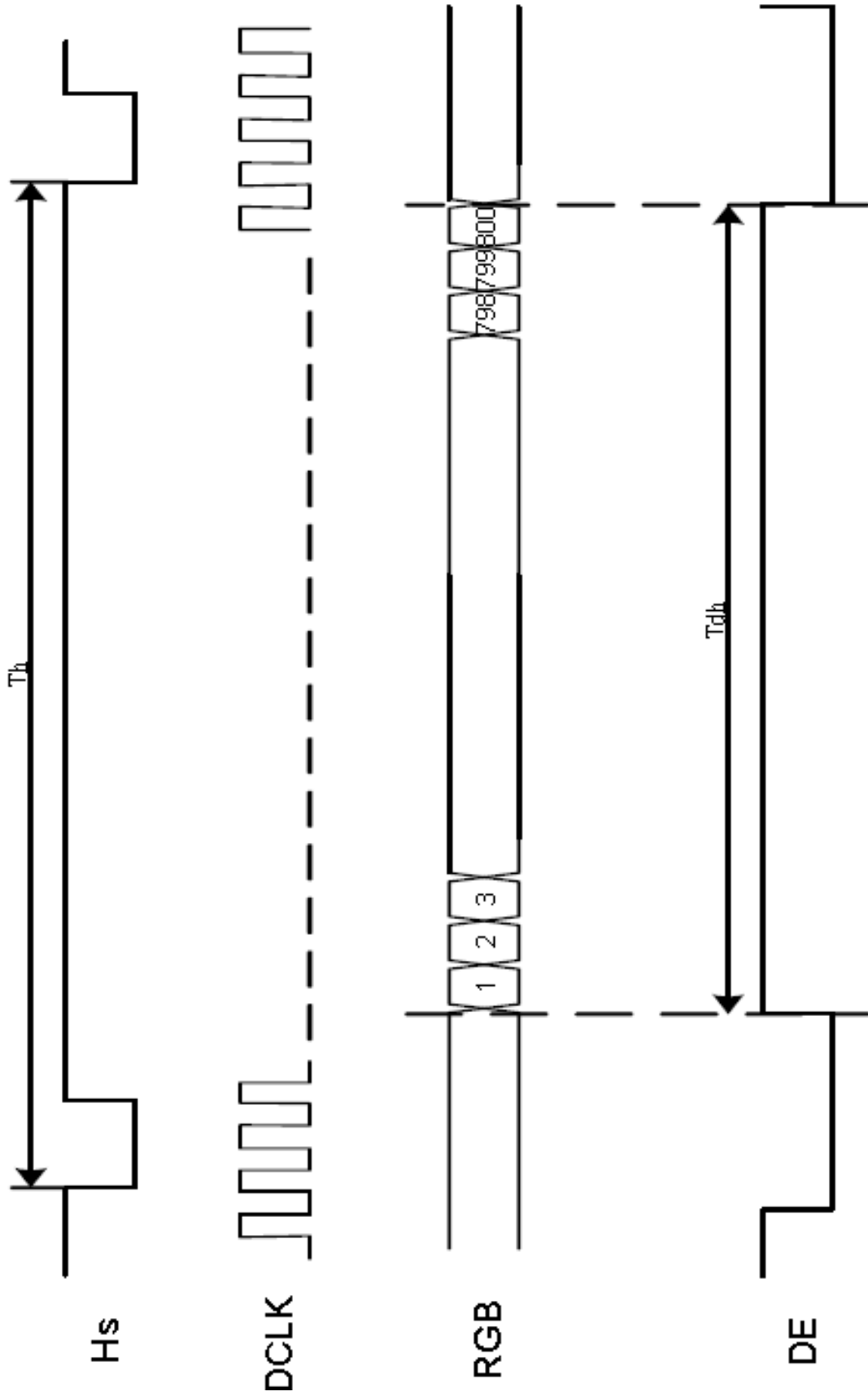


operation model 2

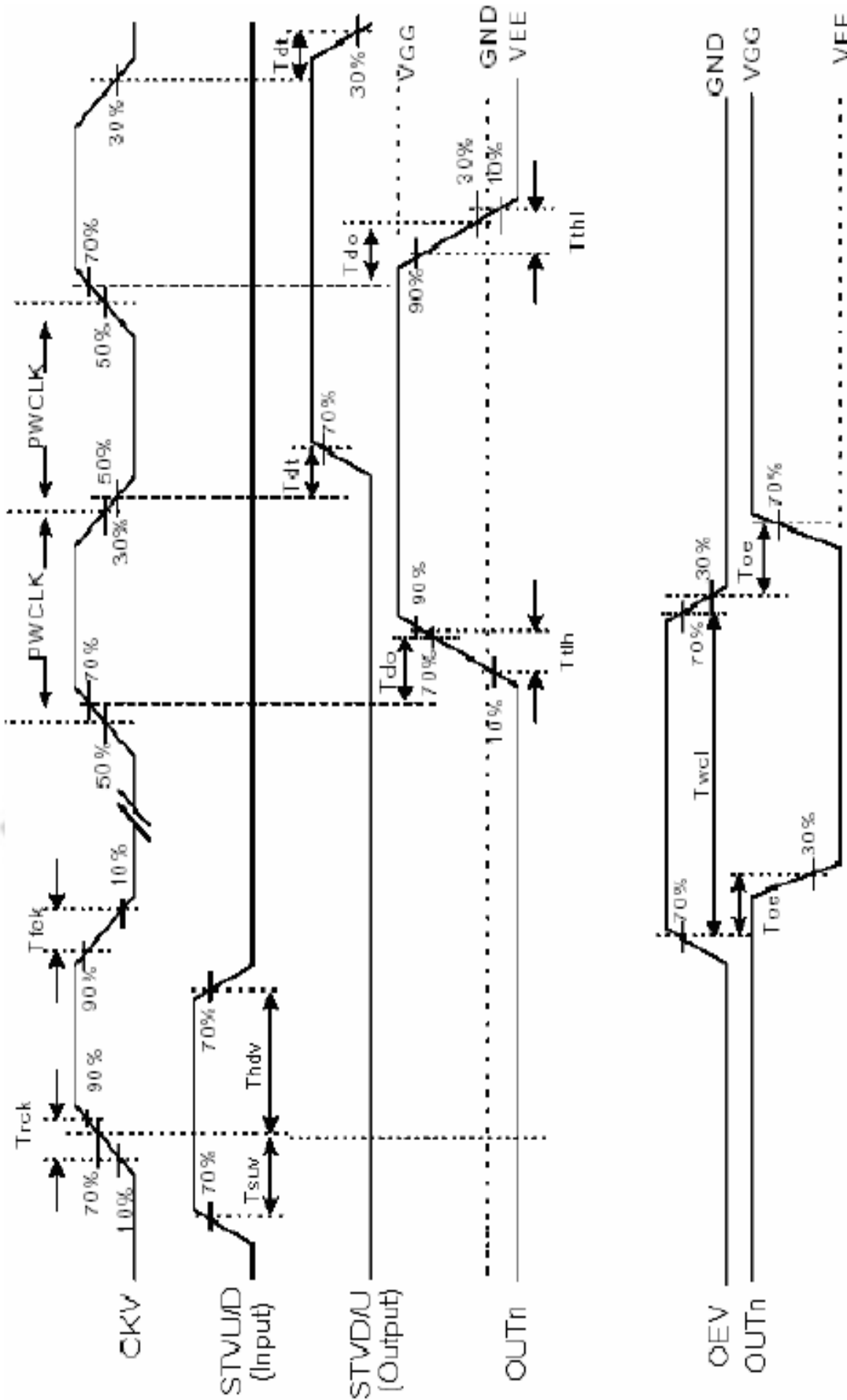
Timing Diagram 2



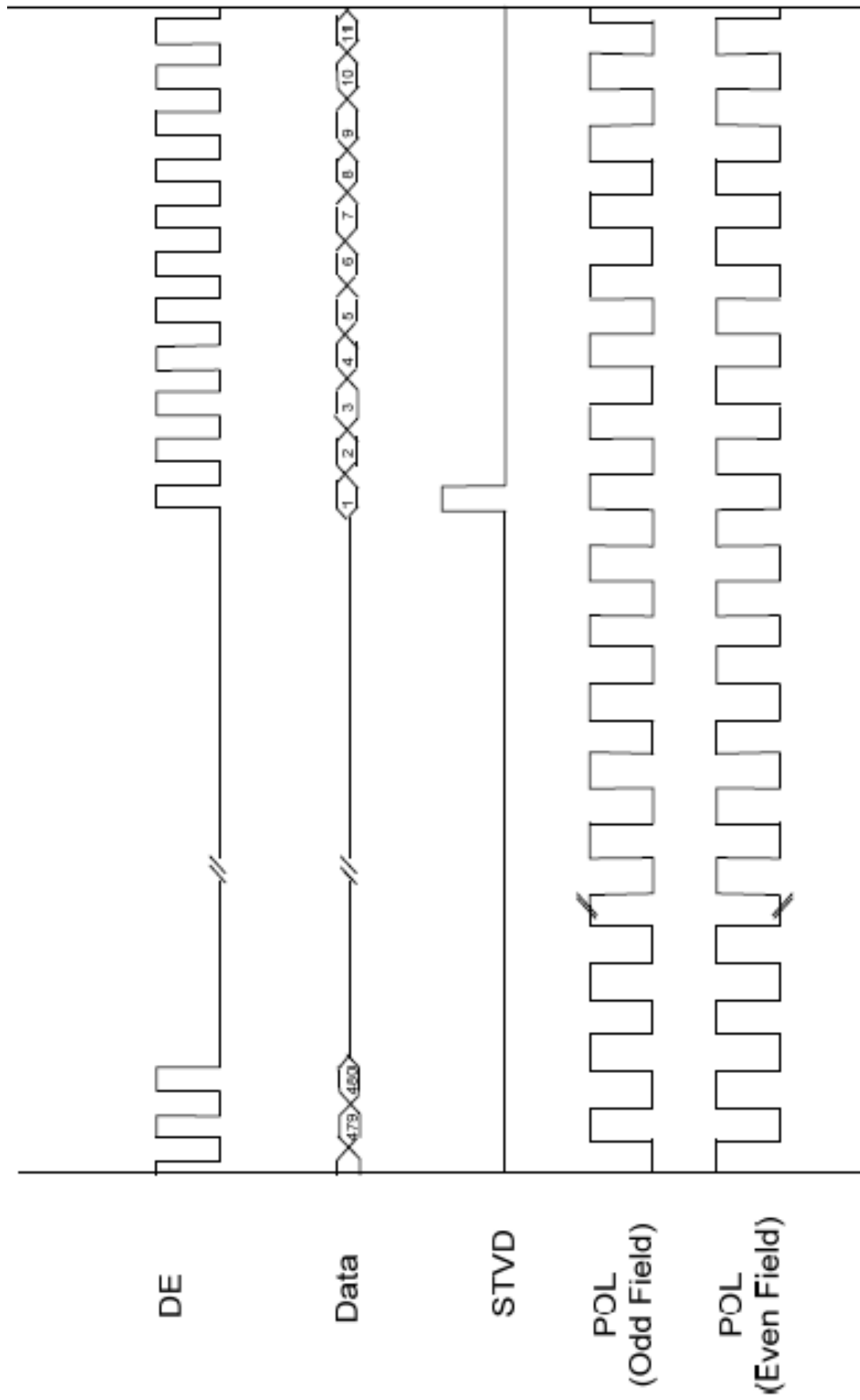
Horizontal timing 1



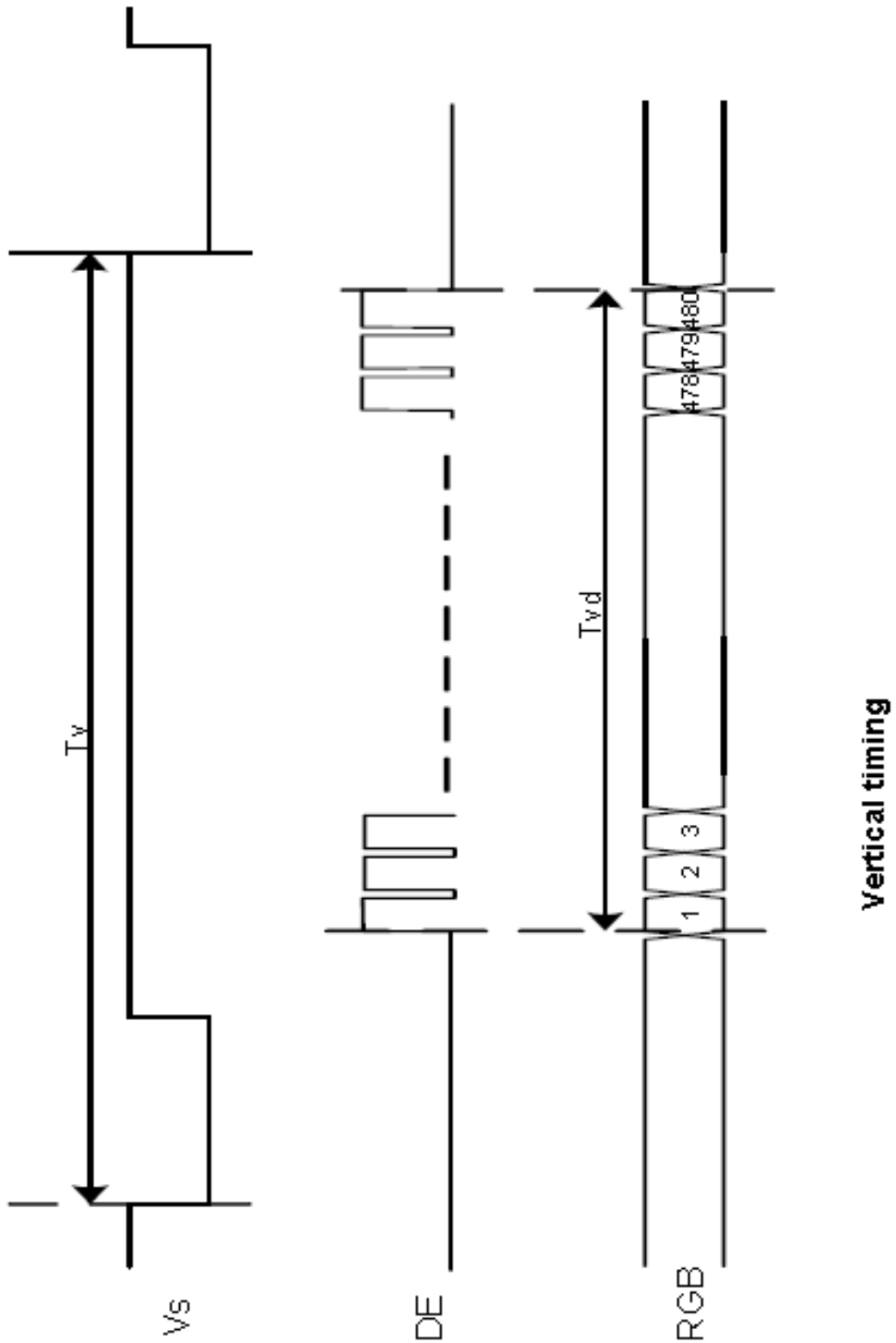
Horizontal timing 2



Vertical shift clock timing

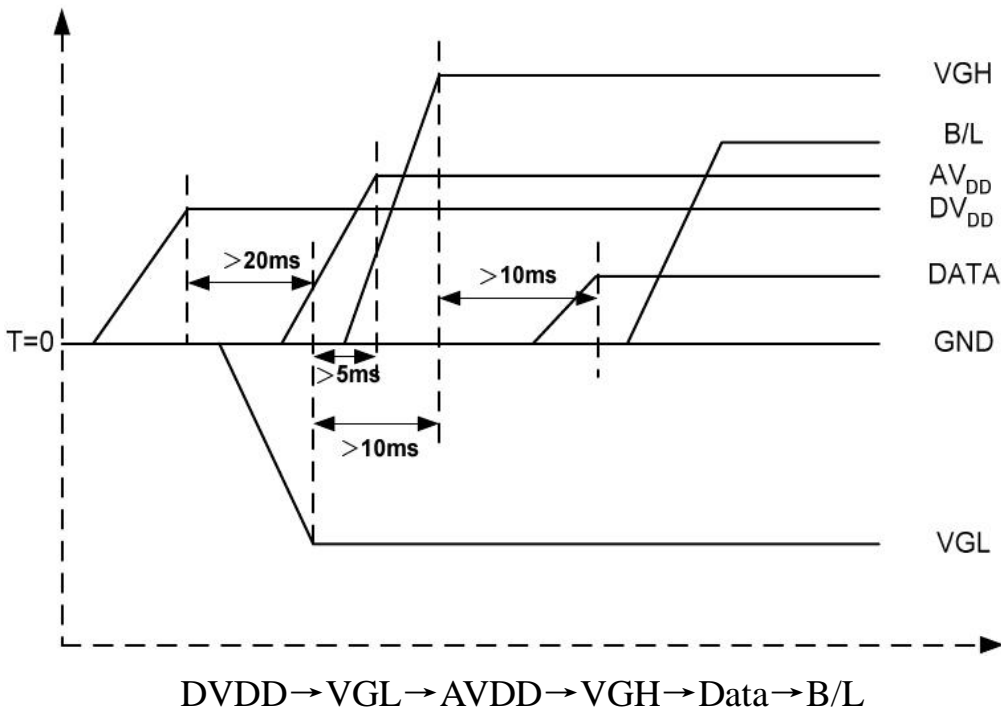


Vertical timing (from up to down)

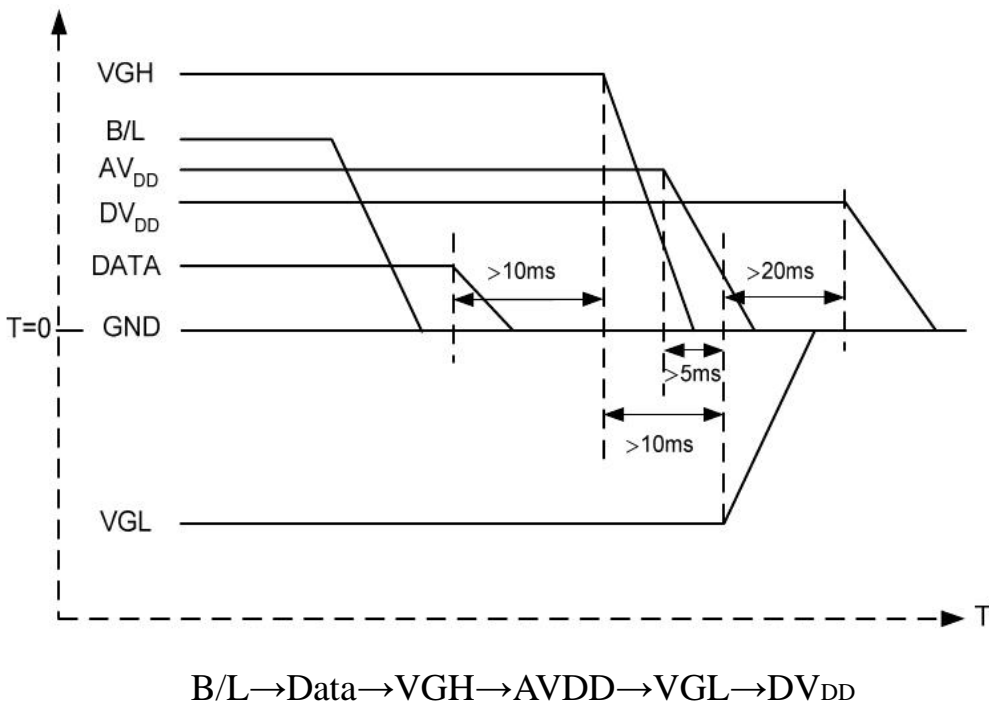


8.3 Power Sequence

1. Power on



2. Power off



Note: Data include DCLK, POL, OEV, CKV, STVU, STVD, STHL, STHR, LD, R0~R5, G0~G5, B0~B5

9. Optical Specification

Ta=25°C

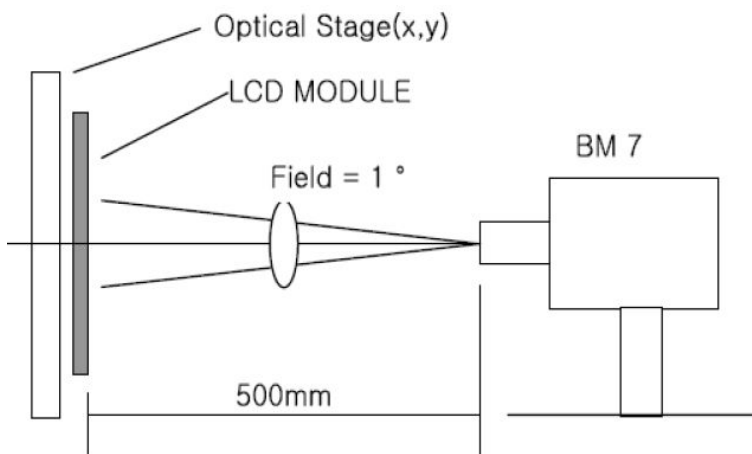
Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=\Phi=0^\circ$	400	500			Note1 Note2
Response Time	Ton/ Toff	25°C		10	20	ms	Note1 Note3
				15	30		
View Angles	θT	$CR \geq 10$	40	50		Degree	Note 4
	θB		60	70			
	θL		60	70			
	θR		60	70			
Chromaticity	White	x	Brightness is on	0.26	0.31	0.36	Note5, Note1
		y		0.28	0.33	0.38	
Luminance	L		360	450		cd/m ²	Note1 Note6
Uniformity	U		70	75		%	Note1 Note7

Test condition: DV_{DD}=3.3V, I_L =180mA (Backlight current), the ambient temperature is 25°C.

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

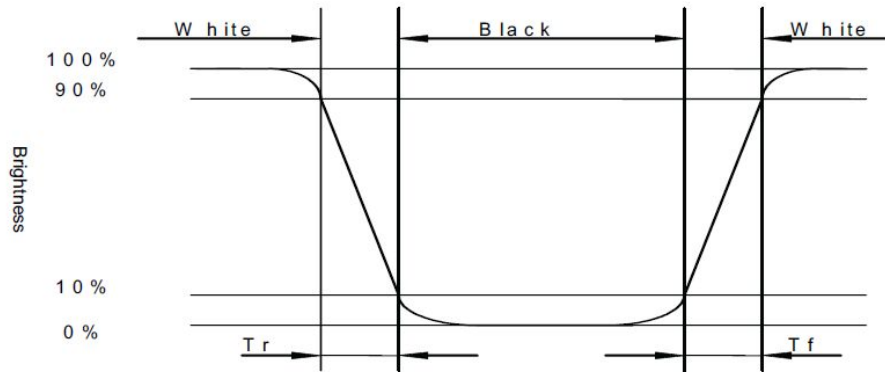


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

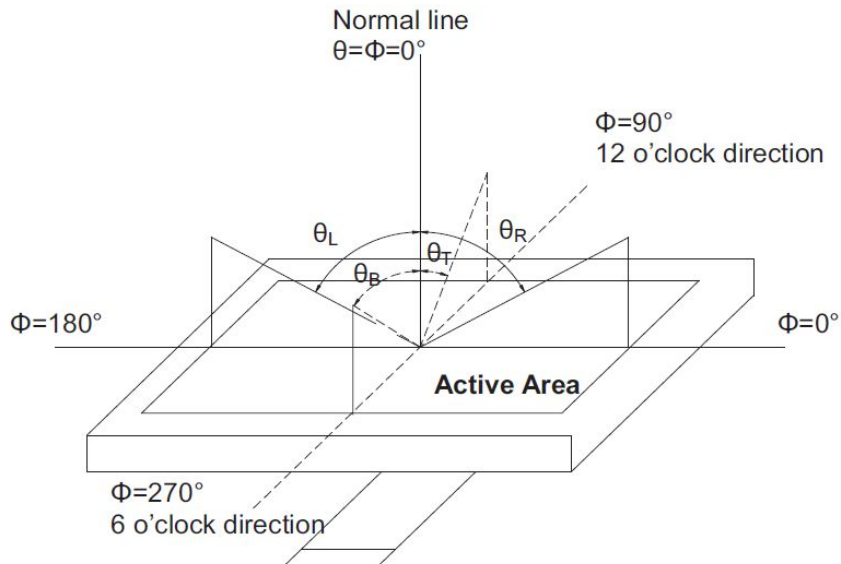
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, T_r) and from white to black(Decay Time, T_f).



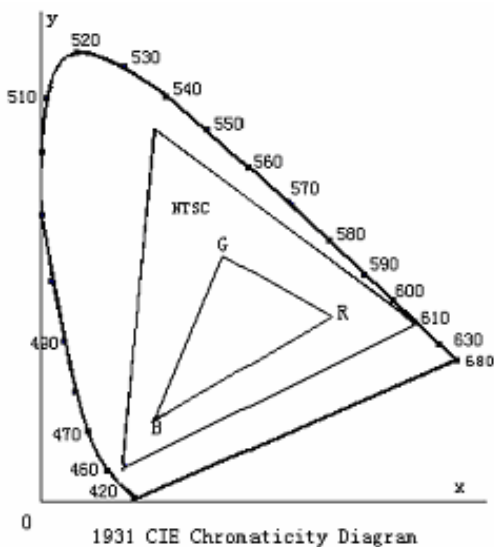
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels “White” at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

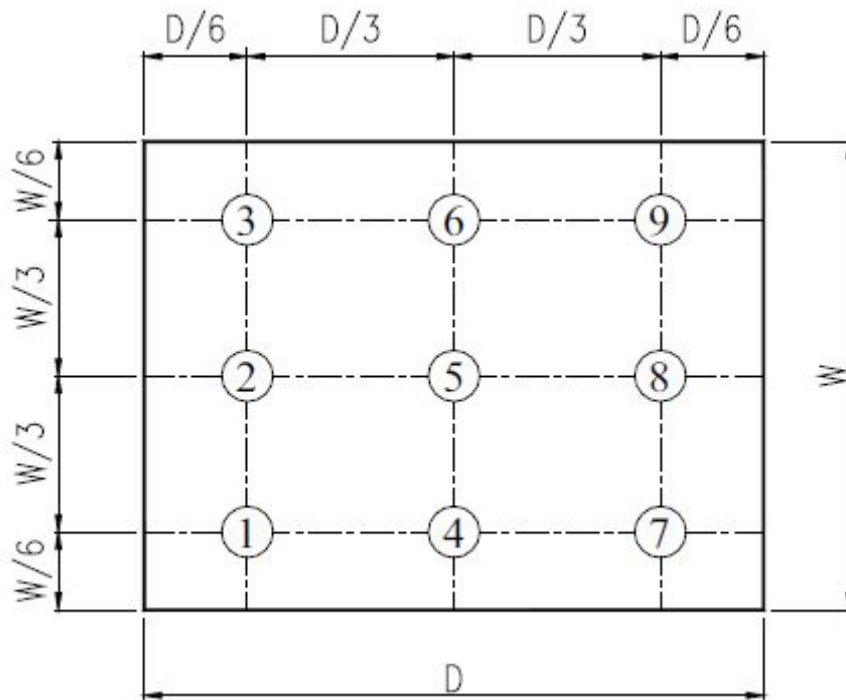


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+85°C, 240hrs	Per table in below
2	Low Temp Operation	Ta= 30°C, 240hrs	Per table in below
3	High Temp Storage	Ta=+85°C, 240hrs	Per table in below
4	Low Temp Storage	Ta= 30°C, 240hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH max 240 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non operation)	30°C 30 min~+85°C 30 min, Change time:5min, 100 Cycles	Per table in below
7	ESD (Operation)	± 2KV, Human Body Mode, 100pF/1500Ω	Per table in below
8	Vibration (Non operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non operation)	100G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:60 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

- A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability
- C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
- D. Provide a space so that the panel does not come into contact with other components.
- E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
- F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
- G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
- H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

- A. Ground soldering iron tips, tools and testers when they are in operation.
- B. Ground your body when handling the products.
- C. Power on the LCD module before applying the voltage to the input terminals.
- D. Do not apply voltage which exceeds the absolute maximum rating.
- E. Store the products in an anti-electrostatic bag or container.

11.4 Storage

- A. Store the products in a dark place at $+25^{\circ}\text{C} \sim 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

- A. Do not wipe the touch panel with dry cloth, as it may cause scratch.
- B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

