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SPEC. NUMBER  
AM-0500044A

PRODUCT GROUP  
TFT- LCM

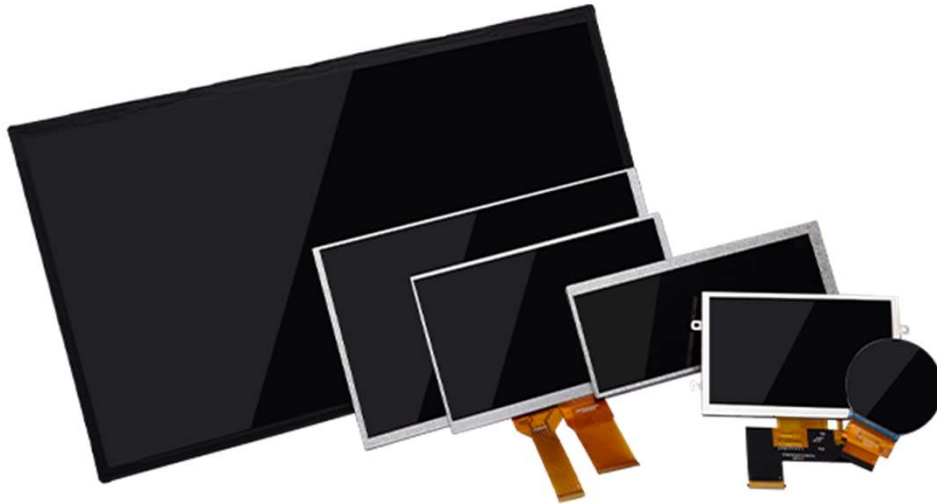
REV.  
V1

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2023-11-02

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**FN0500D044A**


**Product Specification Rev.V1**



- Preliminary Specification
- Final Specification

ITEM	BUYER SIGNATURE	DATE
Quality	_____	_____
R&D	_____	_____
Approved	_____	_____

ITEM	SUPPLIER SIGNATURE	DATE
Prepared	DONG	2023-11-02
Reviewed	XIONG	2023-11-02
Approved	JACK	2023-11-02


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## REVISION HISTORY


REV.	Page.	DESCRIPTION OF CHANGES	DATE	PREPARED
V0		Initial Release	2023-08-11	JACK
V1	P4/P6/P25	The electrical parameters and optical data after updating the sample	2023-11-02	JACK



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## 1.0 General Description/总描述

### 1.1 Application/应用

- |  |  |   |
|--|--|---|
| <input checked="" type="checkbox"/> Industrial | <input type="checkbox"/> Fitness equipment   | <input type="checkbox"/> POS                |
| <input checked="" type="checkbox"/> Automotive | <input type="checkbox"/> Rail traffic        | <input type="checkbox"/> Digital & Consumer |
| <input type="checkbox"/> Medical               | <input type="checkbox"/> Military-industrial | <input checked="" type="checkbox"/> Outdoor |

### 1.2 General Specification

Parameter	Specification	Unit
LCD size	5.0(Diagonal)	inch
Resolution Ratio	800(H)×480(V)	pixels
Pixel Pitch	0.135(H)x0.135(V)	mm
Active Area	108.0(H)×64.8(V)	mm
Module Size	121.0(W)×78.8(H)×7.0(D) Without pillar	mm
Display Mode	Normally Black, Transmissive	
Interface	RGB 24-bit	
Pixel Arrangement	RGB-Vertical Stripe	
View Direction	ALL	O'clock
Power Supply	3.3	V
Power Consumption	LCD:0.28(Typ.) At ACC=3.3V BL:1.9(Typ.) At IBL=90mA	W
Weight	82(Typ.)	g
Luminance	1000 (Typ.)	cd/m <sup>2</sup>
Driver IC	RM53052-5110	



### 3.0 ABSOLUTE MAXIMUM RATINGS/极限参数

The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Parameter	Symbol	Min.	Max.	Unit	Remarks
Digital Supply Voltage	VDD	-0.5	5.0	V	
Analog Supply Voltage	AVDD	-0.5	15	V	
Operating Temperature	T <sub>OP</sub>	-30	+85	°C	
Storage Temperature	T <sub>ST</sub>	-40	+90	°C	
Humidity	RH	--	≤95	%	Ta ≤ 40°C
		--	≤85	%	40°C < Ta ≤ 50°C
		--	≤55	%	50°C < Ta ≤ 60°C
		--	≤36	%	60°C < Ta ≤ 70°C
		--	≤24	%	70°C < Ta ≤ 80°C
Absolute Humidity	AH	--	≤70	g/m <sup>3</sup>	Ta > 70°C

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, there fore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

## 4.0 ELECTRICAL SPECIFICATIONS/电气规格

### 4.1 TFT LCM Module

[Ta =25±2 °C]

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	2.9	3.3	3.6	V	
Power Supply current	IVCC	-	85	120	mA	
Low Level Input Voltage	Vil	0	-	0.3VDD	V	
High Level Input Voltage	Vih	0.7VDD	-	VDD	V	
High Level Output Voltage	Voh	VDD-0.4	-	-	V	
Low Level Output Voltage	Vol	GND	-	GND+0.4	V	


### 4.2 Backlight Driving Conditions

[Ta =25±2 °C]

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Forward Voltage	V <sub>F</sub>	18.9	21.0	22.4	V	Note 1
Forward Current	I <sub>f</sub>	-	90	-	mA	
Power Consumption	W <sub>bl</sub>	-	1.89	-	W	
LED Lifetime	-	30000	-	-	Hrs	Note 2

Note1: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note2: Optical performance should be evaluated at Ta=25°C. if LED is driven by high current, high ambient temperature & Humidity condition. The lifetime of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating lifetime is estimated data.

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## 5.0 Interface Description/接口描述

Connector Name/Designation	Interface Connector/Interface Card
Type Part Number	FPC 0.5Pitch 50PIN
Mating Housing Part Number	FH28D-50S-0.5SH

### 5.1 Pin assignment for LCM module

Pin No.	Symbol	I/O	Description	Note.
1-2	NC	-	No connection.	
3	LEDK2	P	Backlight cathode.	
4	LEDK1	P	Backlight cathode.	
5-6	LEDA	P	Backlight anode.	
7	GND	P	Power ground.	
8	VDD_MTP	-	Please Open in customer's PCB board side.	
9	CSB	I	Please connect to ground.	
10	SDA	I	Clock signal input for I2C interface; If the driver has been MTP the initial code, please open.	
11	SCL	I	Data signal input for I2C interface; If the driver has been MTP the initial code, please open.	
12	LR	I	Source driver Left/Right scan sequence LR=L: Shift left, Last data=S1←S2←S3... ←S1284=First data LR=H: Shift right, First data=S1→S2→S3...→S1284=Last data	
13	UD	I	Gate UP or Down scan selection UD=L: STV2 output vertical start pulse and UD pin output logical "0" to Gate driver UD=H: STV1 output vertical start pulse and UD pin output logical "1" to Gate driver.	
14-15	VCC	P	Input power 3.3V.	
16	DE	I	Data enable signal(DE) for DE mode or latch signal (LD)for source driver mode.	
17	HSYNC	I	Line synchronous signal (HS) for SYNC mode.	
18	VSYNC	I	Frame synchronous signal (VS) for SYNC mode or polarity (POL) for source driver mode.	
19	GND	P	Ground.	
20	CLK	I	Pixel clock input.	
21	GND	P	Ground.	
22-29	B07-B00	I	Display data inputs for blue color.	



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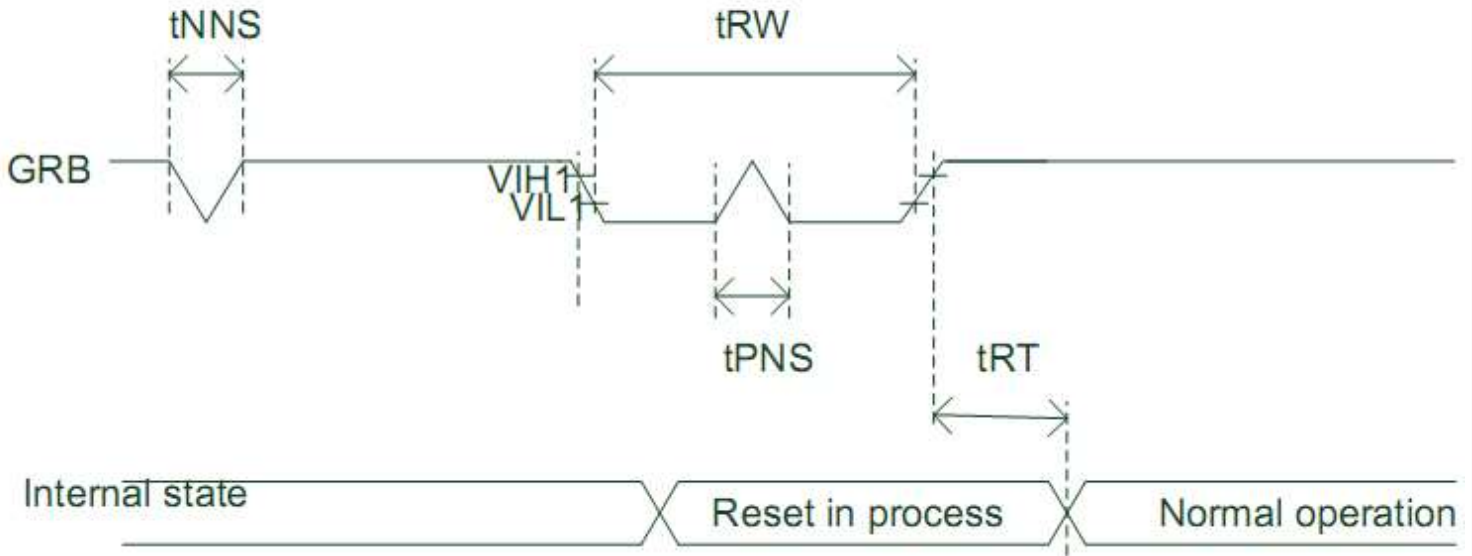
Pin No.	Symbol	I/O	Description	Note.
30	GND	P	Ground.	
31-38	G07-G00	I	Display data inputs for green color.	
39	GND	P	Ground.	
40-47	R07-R00	I	Display data inputs for red color.	
48	GND	P	Ground.	
49	RESET	I	Reset pin H: normal operation L: reset state, suggest to connecting with an RC circuit for stability.	
50	STBYB	I	Standby mode H: normal operation L: TCON, SD, power circuit and temp sensor will turn off	

## 5.2 AC Electrical Characteristics

(SD Only, TTL mode VDD = 2.9V to 3.6V, AVDD = 8V to 13.5V, AVSS=GND=0V, TA= -40 to +105°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK frequency	Fclk	-	50	55	MHz	
CLK pulse width	Tcw	40%	-	60%	Tcph	
Data set-up time	Tsu	8	-	-	ns	D00 ~ D27, REV and DIO1 <sub>1</sub> to CLK
Data hold time	Thd	8	-	-	ns	D00 ~ D27, REV and DIO1 <sub>1</sub> to CLK
Propagation delay of DIO2/1	Tphl	6	10	15	ns	CL=15pF ( Output )
Time that the last data to LD	Tld	5	-	-	Tcph	
Pulse width of LD	Twld	21	-	-	Tcph	
Pulse width of DIO	DPW	-	1	-	Tcph	
Time that LD to DIO1/2	Tlds	5	-	-	Tcph	
POL set-up time	Tpsu	8	-	-	ns	POL to LD
POL hold time	Tphd	8	-	-	ns	POL to LD
Output stable time	Tst	-	-	9	us	10% or 90% target voltage. CL=40pF, R=5Kohm
Repair output delay stable time	Tst1	-	-	20	us	CL=190pF, R=5.5Kohm

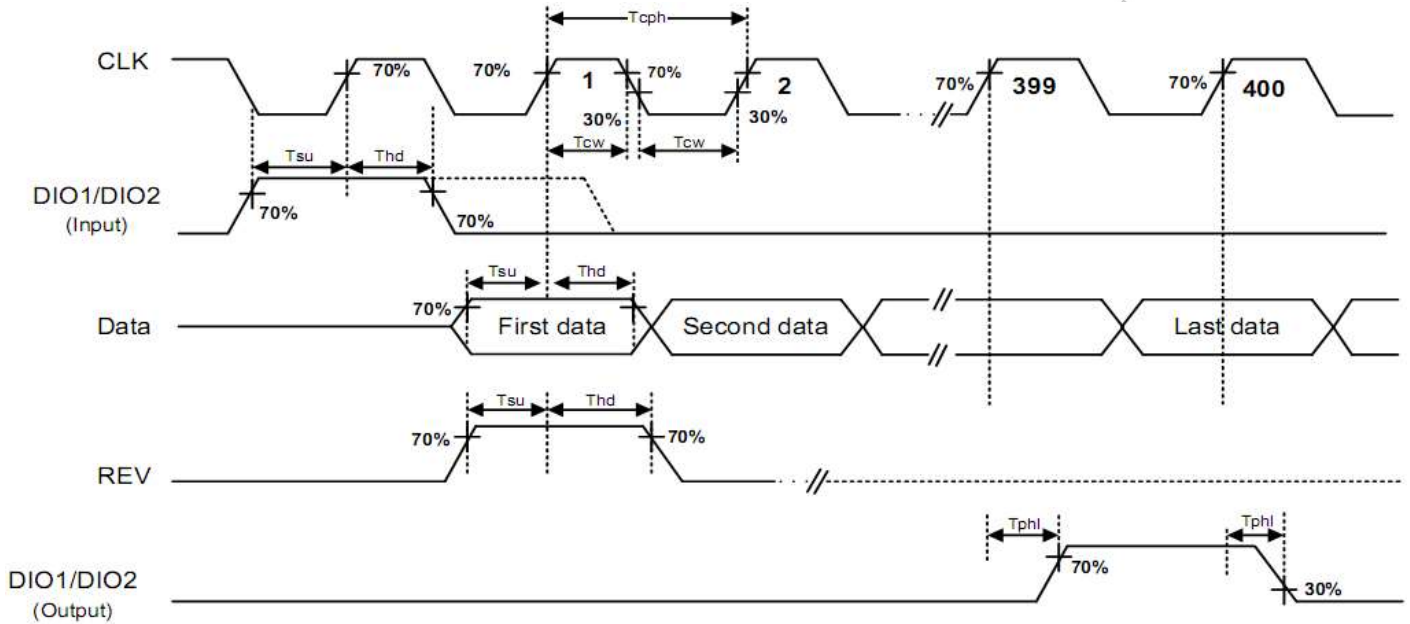
**GRB Timing :**



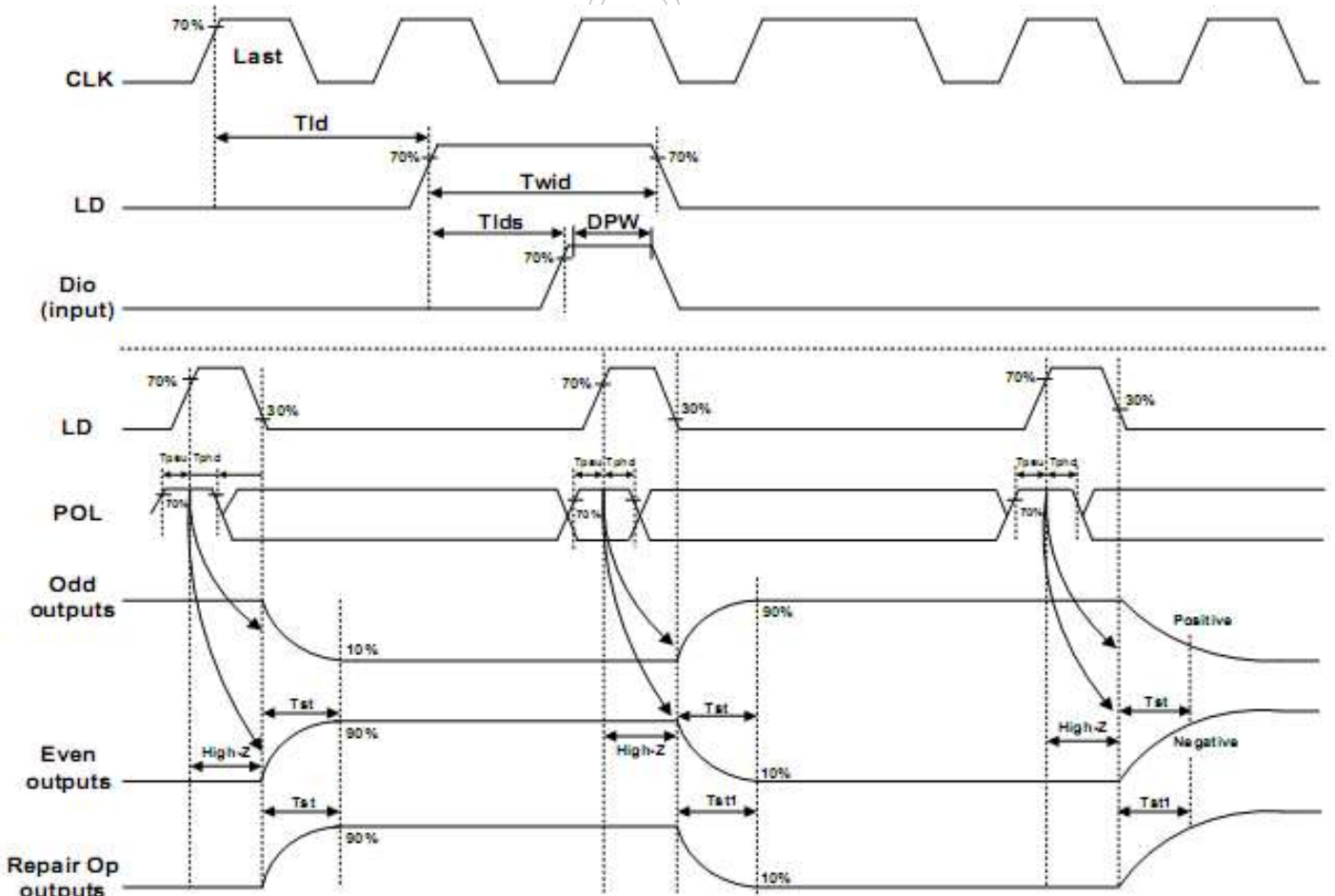
Signal	Parameter	Symbol	Spec.			unit
			min	typ	max	
GRB	GRB pulse width	$t_{RW}$	40	-	-	us
	GRB complete time	$t_{RT}$	-	-	40	us
	Positive spike noise width	$t_{PNS}$	-	-	2	us
	Negative spike noise width	$t_{NNS}$	-	-	2	us

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### 5.3 TTL mode Timing Diagram

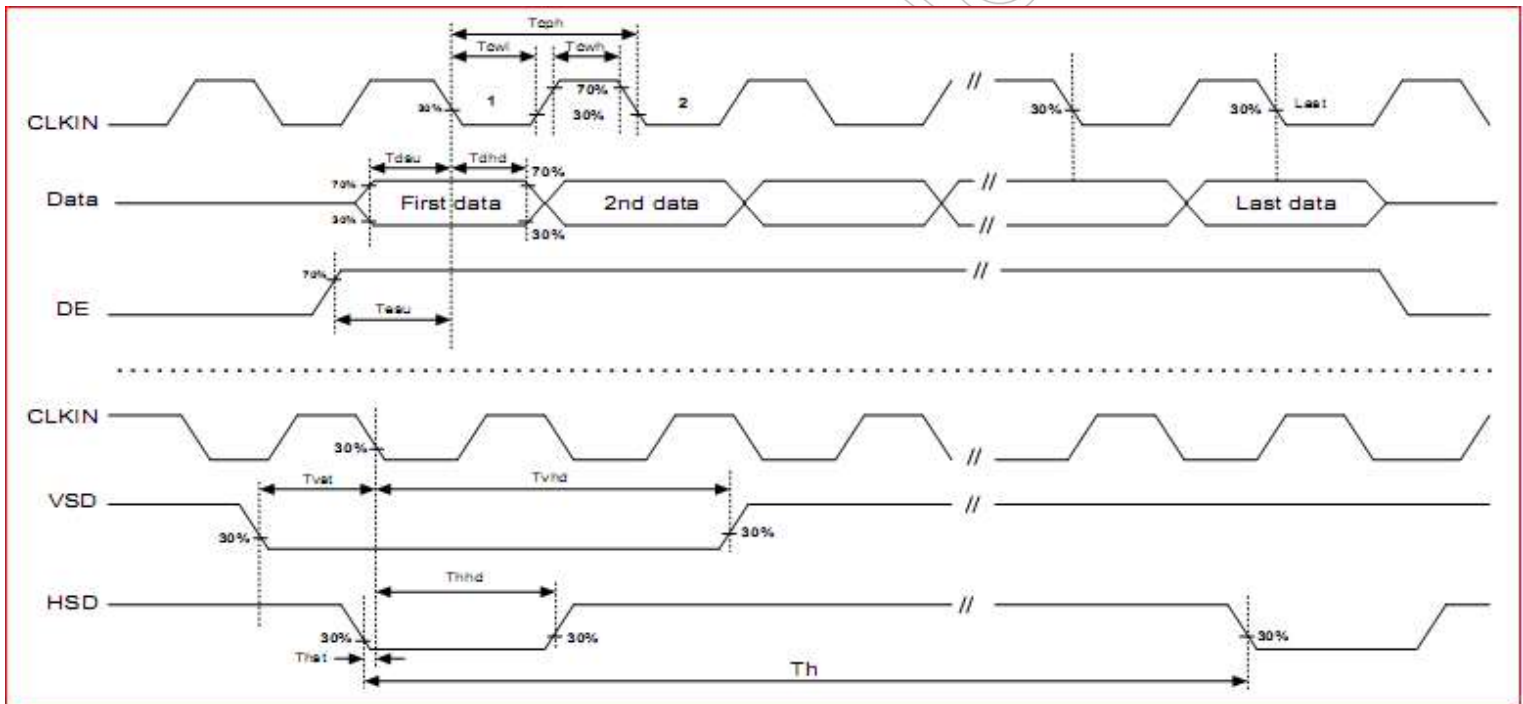
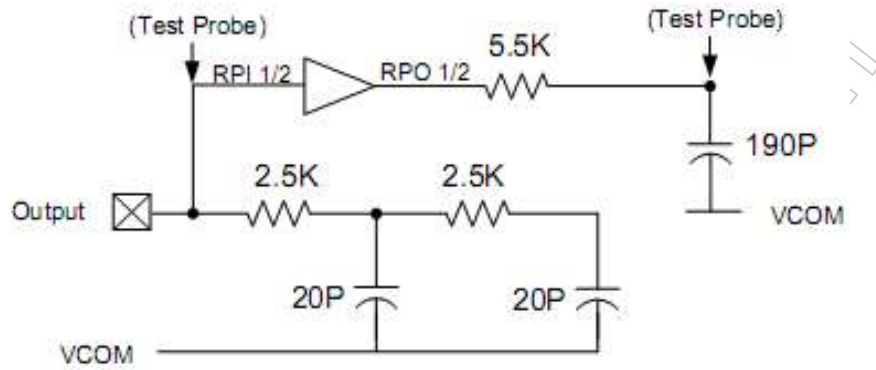


### Clock and data input timing diagram



### output timing diagram

Output load condition:



Input clock and data timing diagram for IC with TTL input interface



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Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLKIN Frequency	Fclk	-	40	50	MHz	
CLKIN Cycle Time	Tclk	20	25	-	ns	
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	118	-	CLKIN	
Time from HSD to LD	Thld	-	38	-	CLKIN	
Time from HSD to STV	Thstv	-	Hdisp*3/4	-	CLKIN	
Time from HSD to CKV	Thckv	-	32	-	CLKIN	
Time from HSD to OEV	Thoev	-	4	-	CLKIN	
LD Pulse Width	Twld	-	80	-	CLKIN	
CKV Pulse Width	Twckv	-	Htotal-32-112	-	CLKIN	
OEV Pulse Width	Twoev	-	128	-	CLKIN	

**Vertical timing table**



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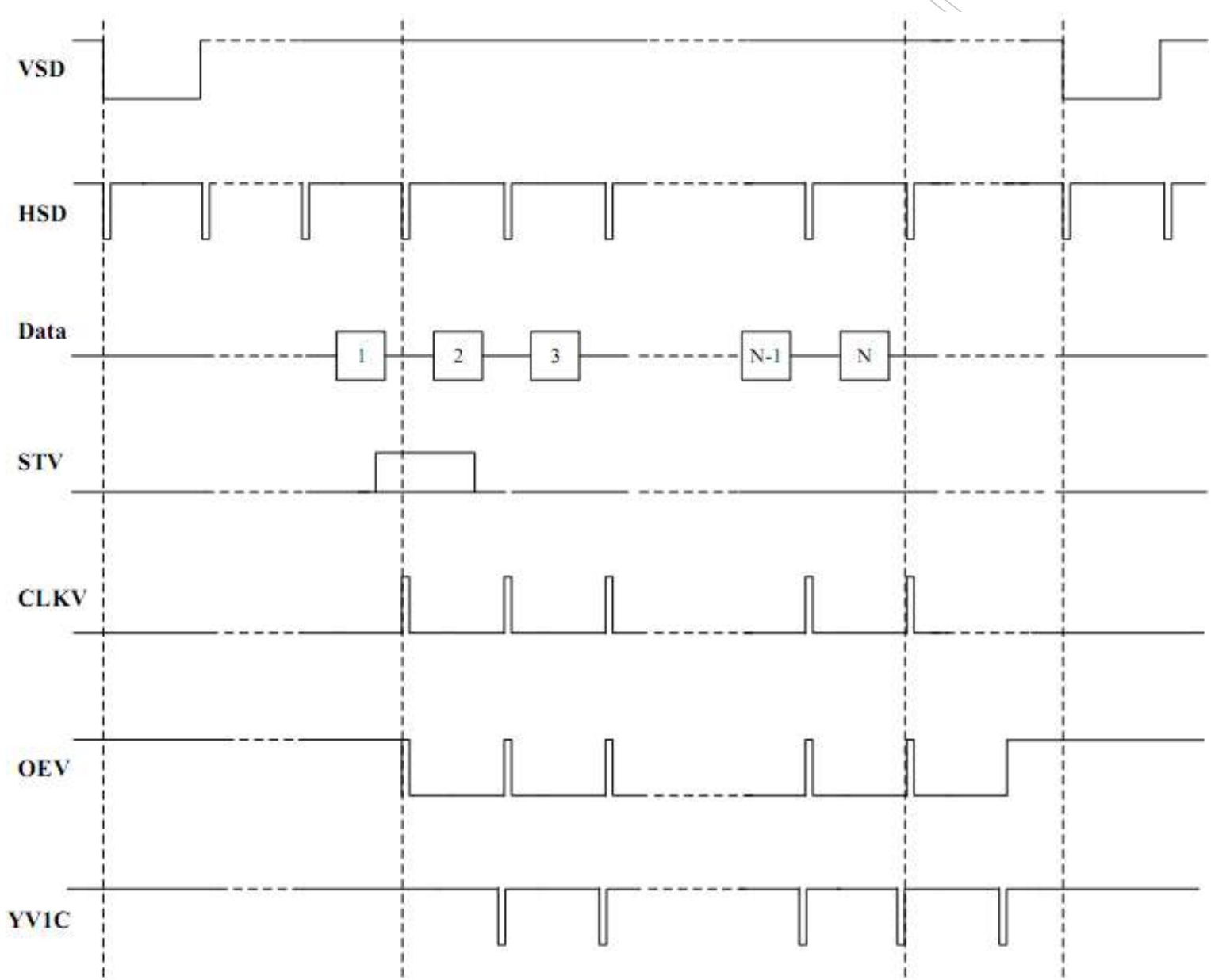
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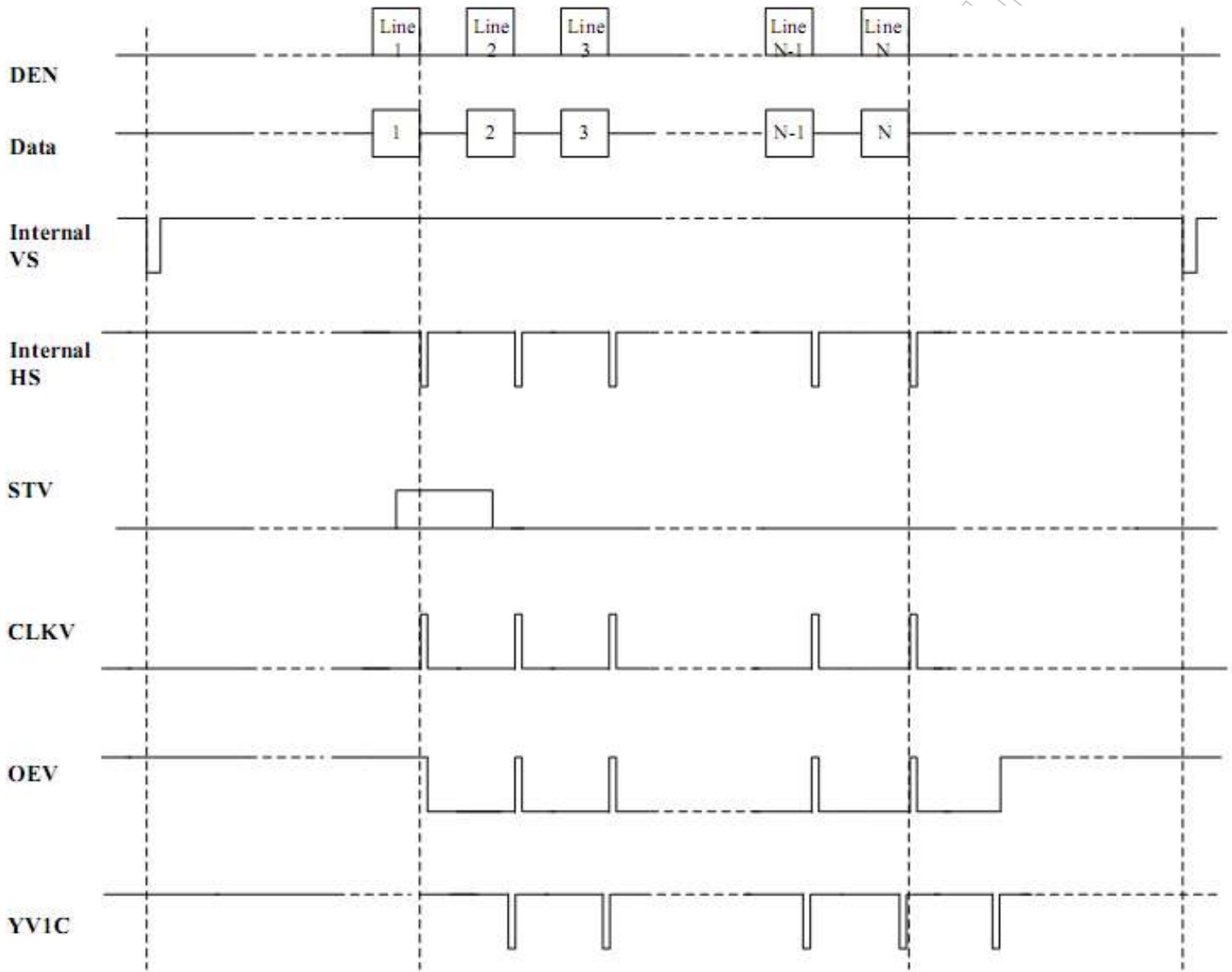
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Vertical Timing Diagram HV (Cascade)

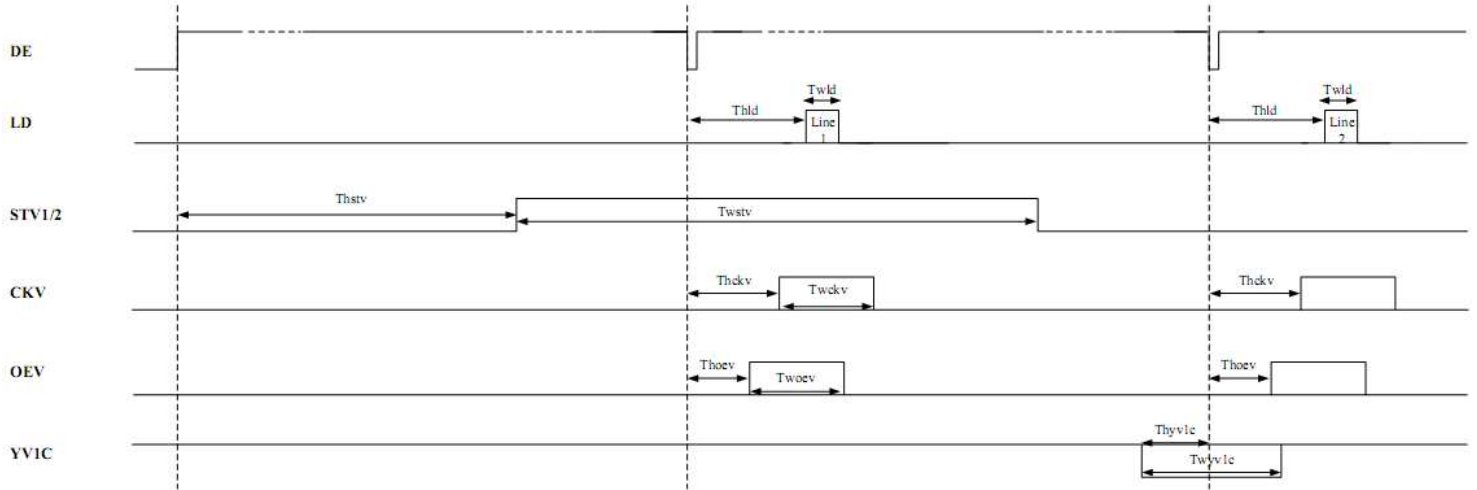
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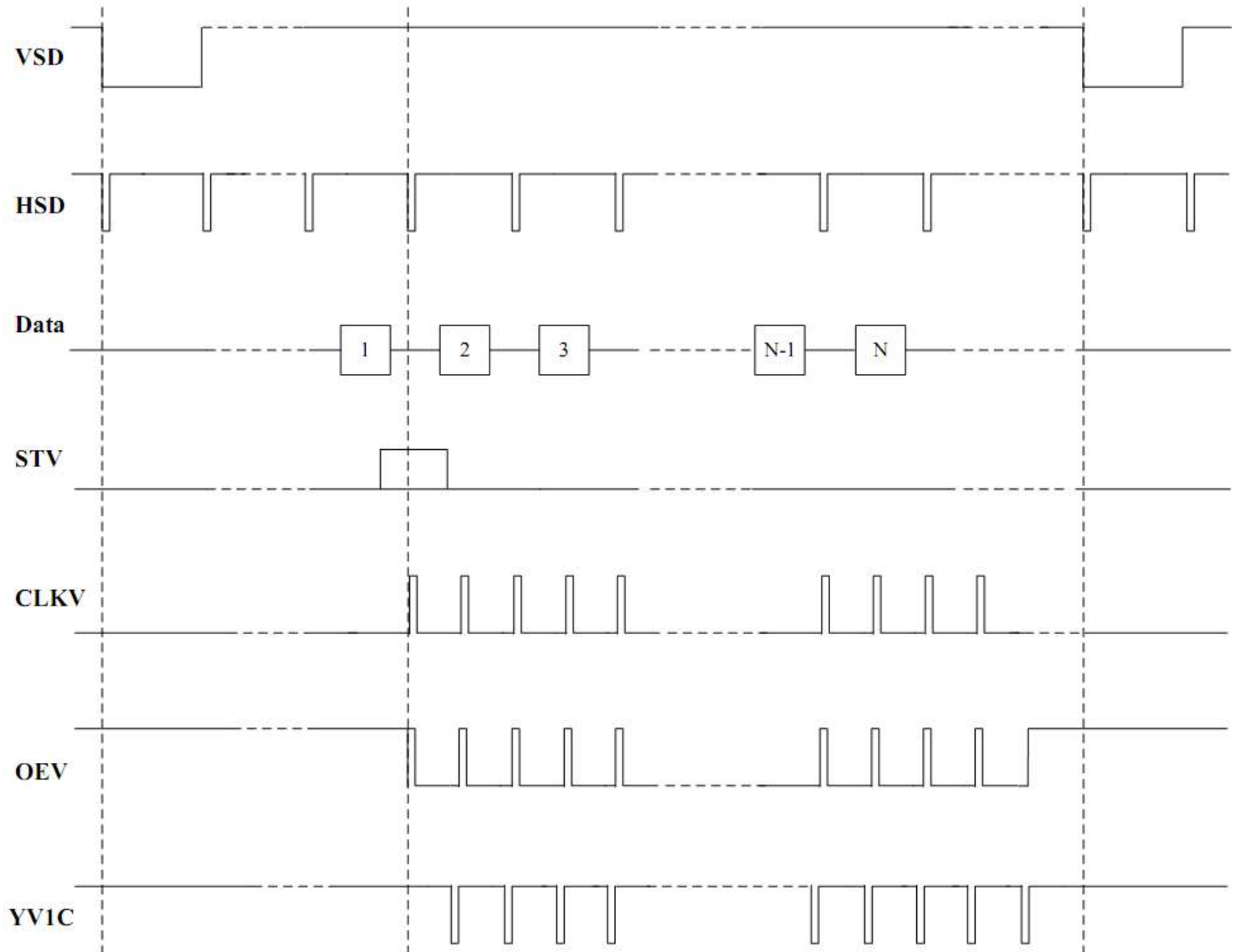
Vertical Timing Diagram DE (Cascade)

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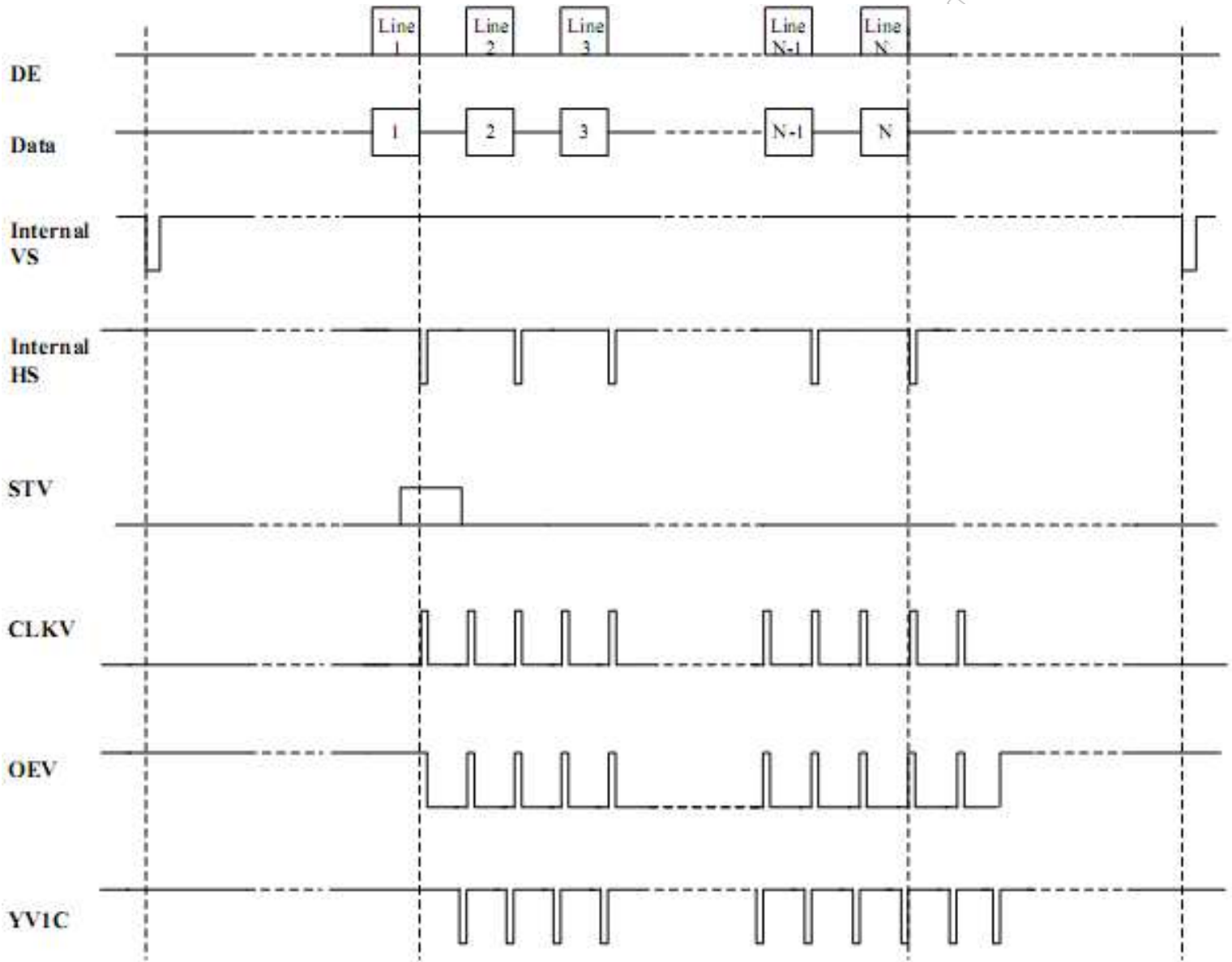




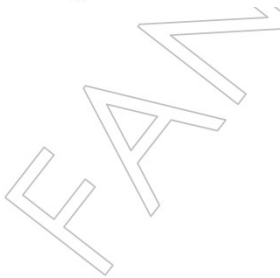
Gate output diagram (Cascade)

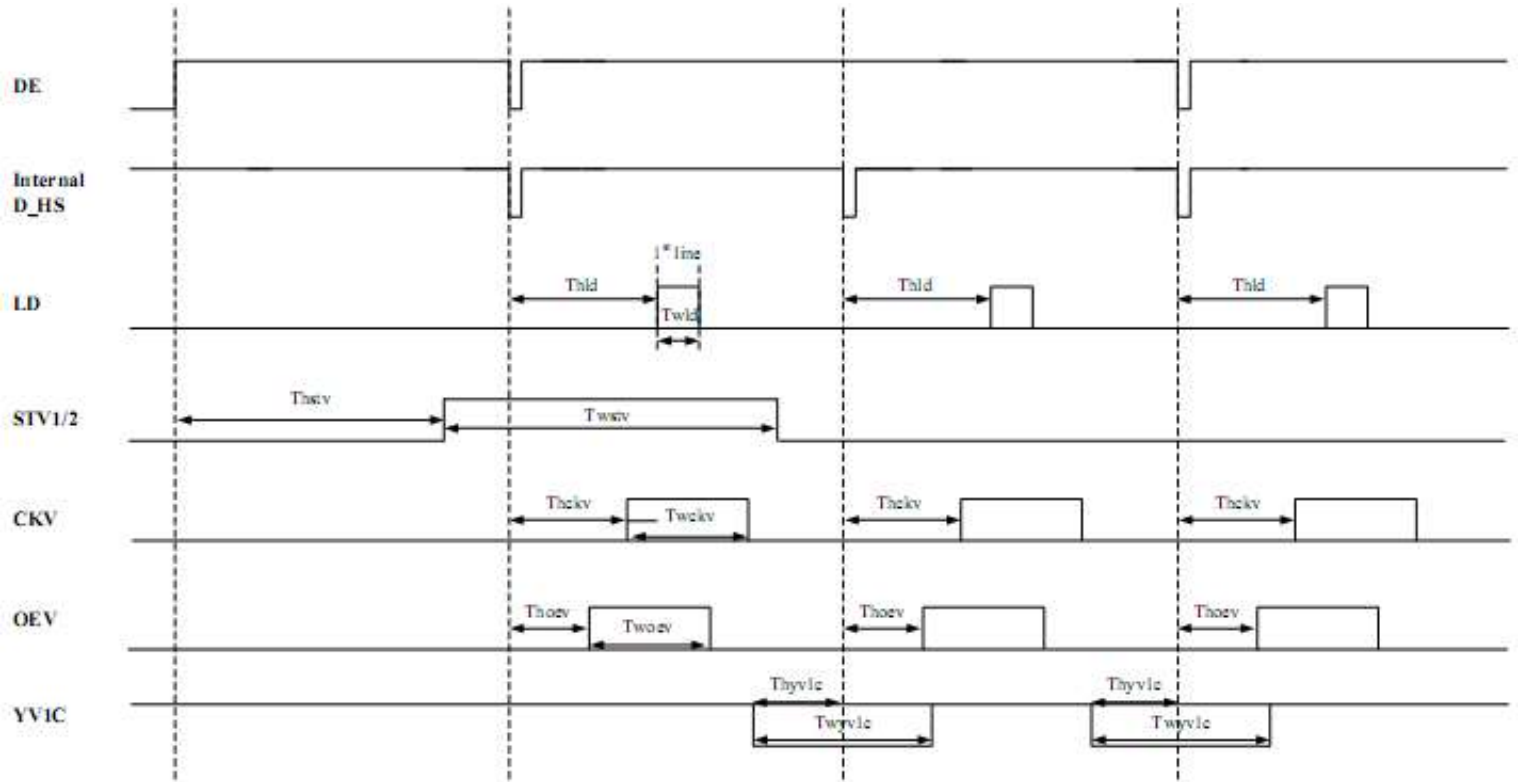


Vertical timing diagram HV (Dual gate)

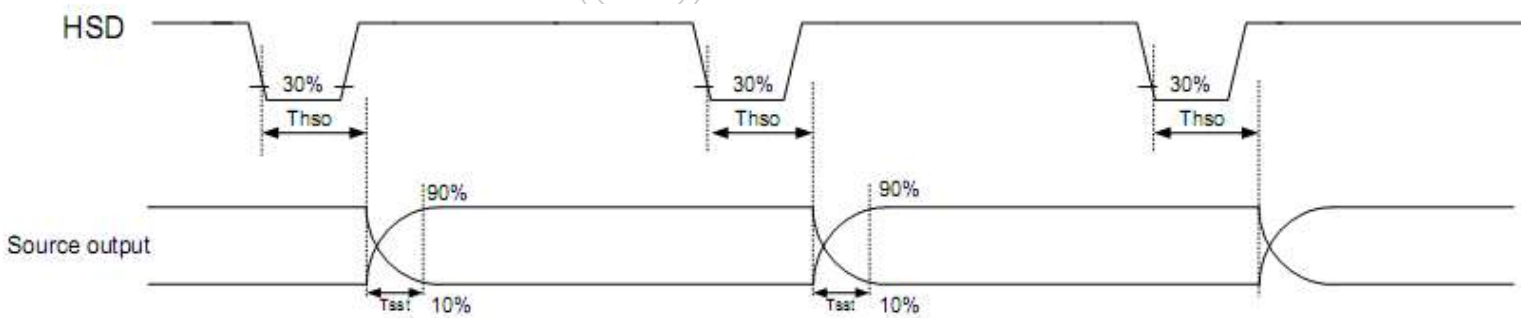


Vertical timing diagram DE (Dual gate)



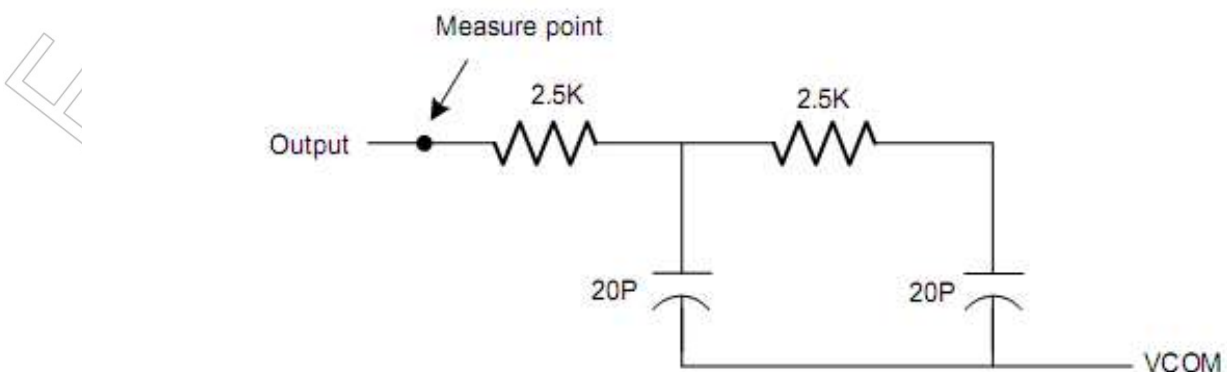


Gate output timing diagram (Dual gate)

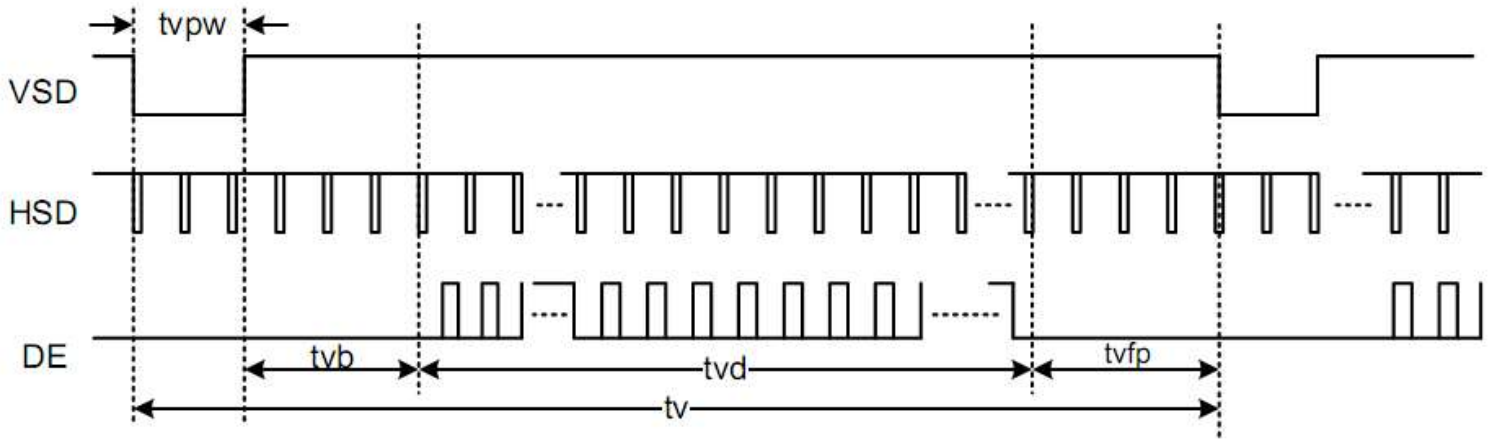


Source Output timing diagram

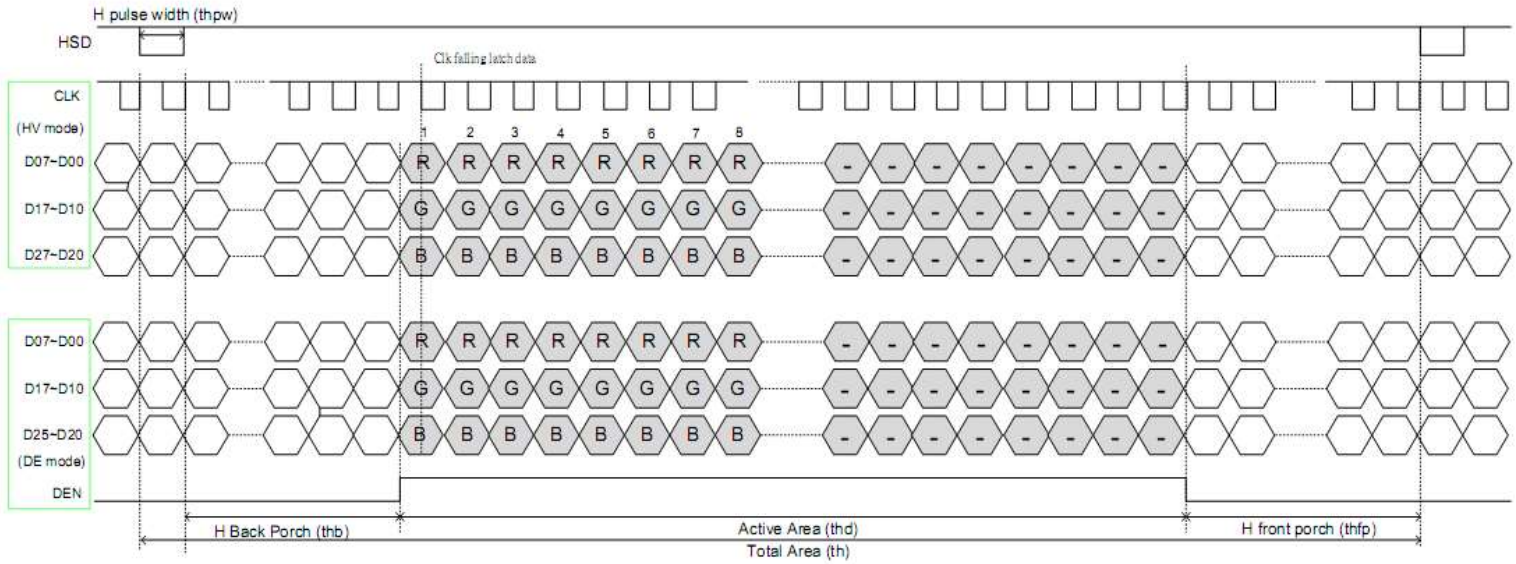
Output load condition:



Vertical input timing

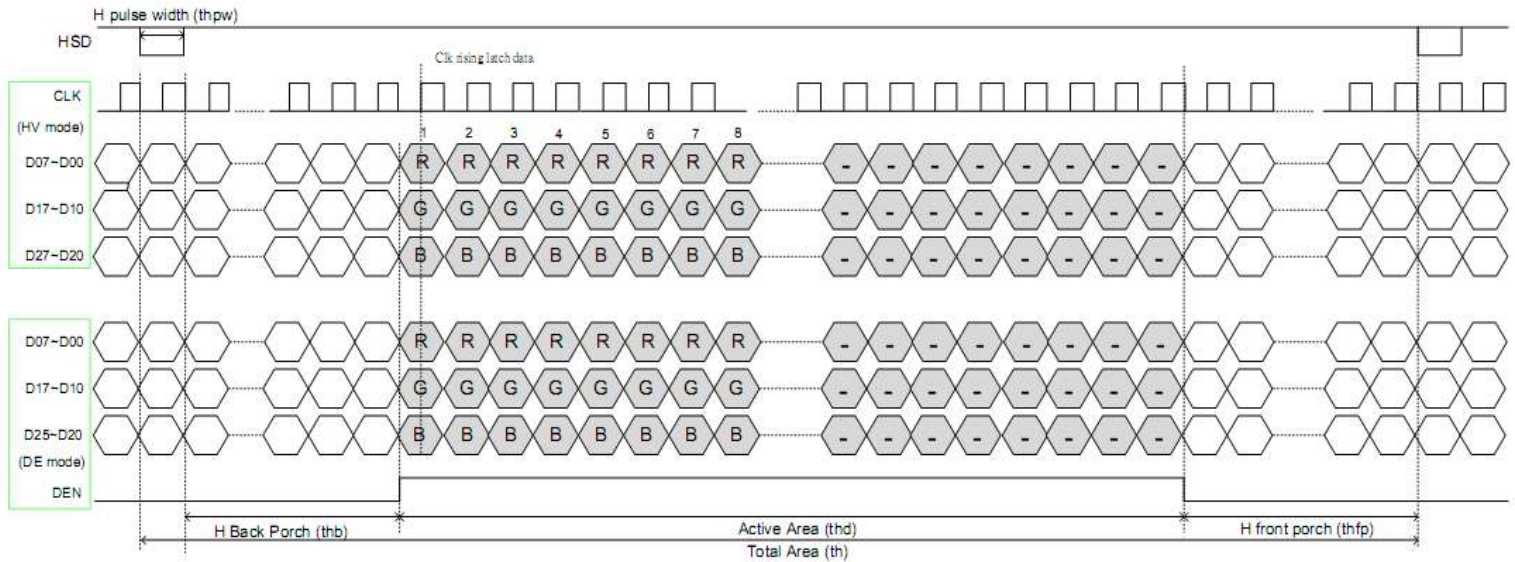


Horizontal input timing  
when CLKPOL = LO:





when CLKPOL = HI:

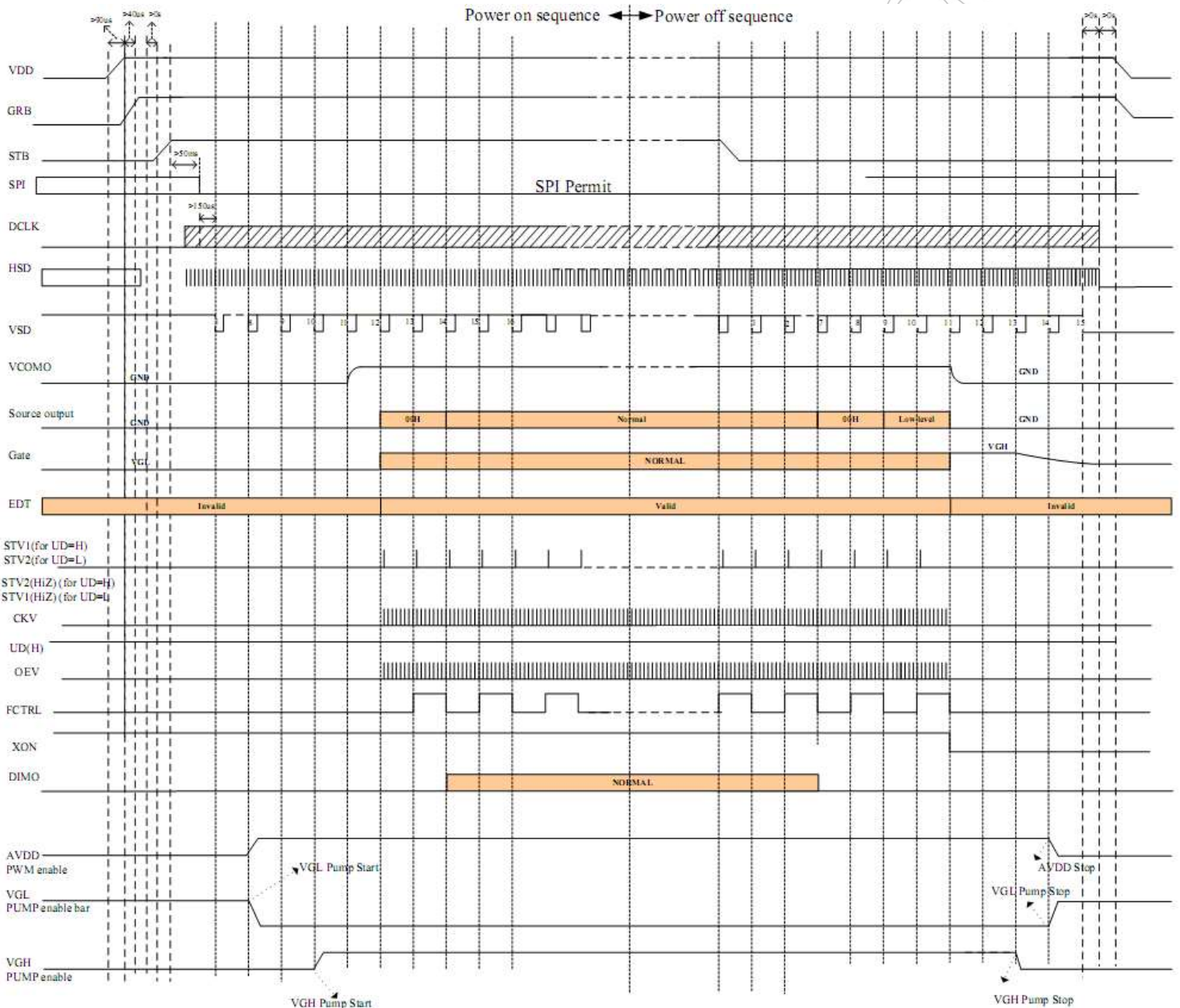


### 5.4 Timing Characteristic

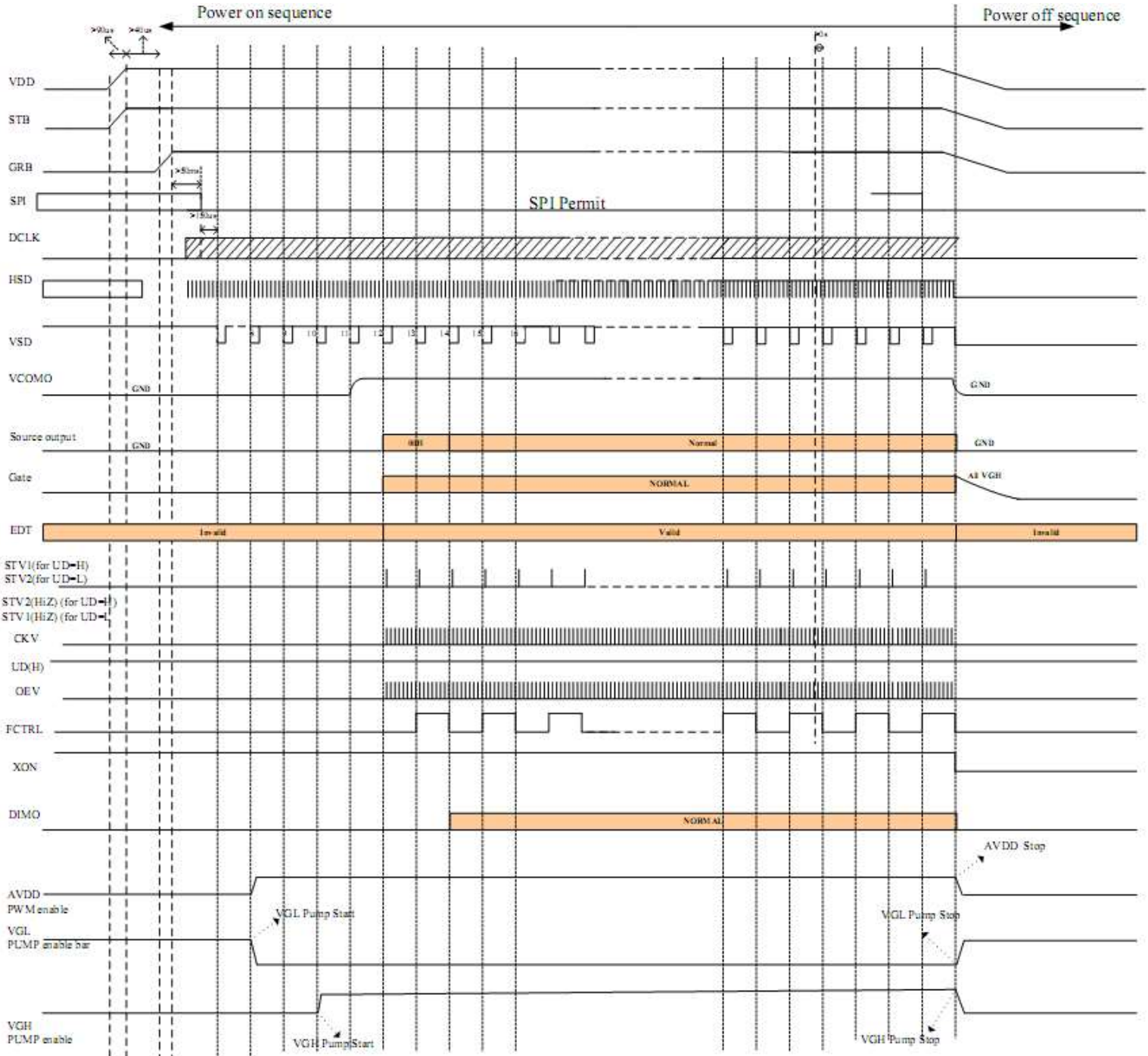
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
DCLK frequency	fclk	20	33.3	42.8	MHz	
Horizontal display area	thd	800			DCLK	
1 Horizontal Line	th	908	928	1178	DCLK	
HSD pulse width	thpw	1	28	47	DCLK	thb+thpw=48 DCLK is fixed.
HSD Back Porch (Blanking)	thb	47	20	1	DCLK	
HSD Front Porch	thfp	60	80	330	DCLK	

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Vertical display area	tvd	480			H	
VSD period time	tv	517	525	606	H	
VSD pulse width	tvpw	1	1	3	H	Tvpw+tvb=5 H is fixed
VSD Back Porch (Blanking)	tvb	4	4	2	H	
VSD Front Porch	tvfp	32	40	121	H	

### 5.5 Power On / Off sequence



**Power -on /off timing sequence (STBYB Active)**



Power -on /off timing sequence (STBYB Fixed to VDD)



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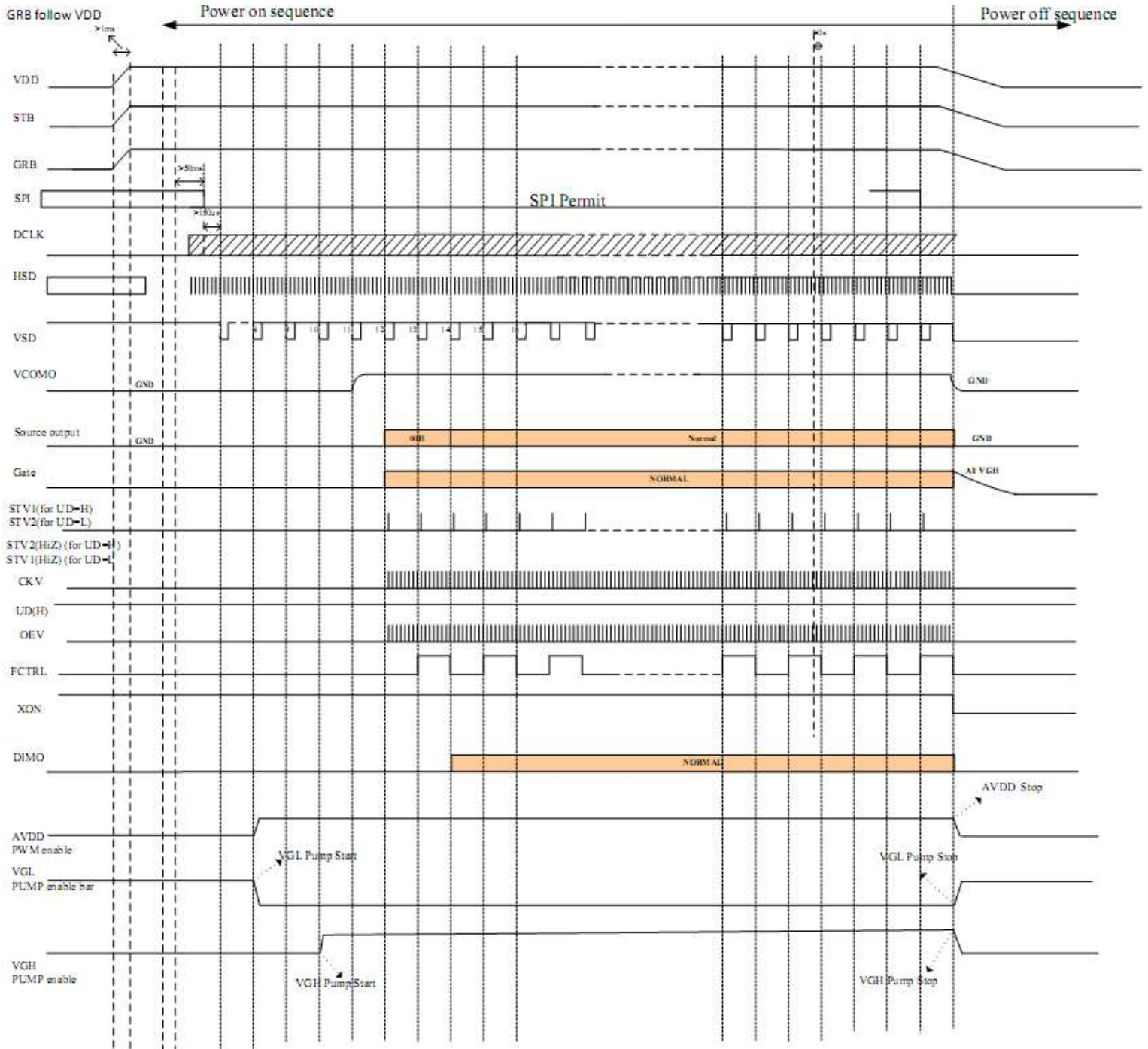
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## 6.0 OPTICAL SPECIFICATIONS/光学规格

### 6.1 Overview/概述

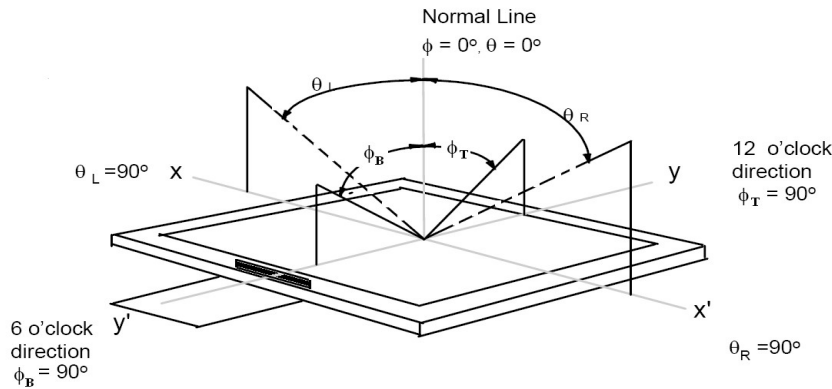
The test of optical specifications shall be measured in a dark room (ambient luminance  $\leq 1$  lux and temperature =  $25 \pm 2^\circ\text{C}$ ) with the equipment of the Luminance meter system (Goniometer system and TOPCON BM-5) and the test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of  $\theta$  and  $\phi$  equal to  $0^\circ$ . We refer to  $\theta=0$  ( $=\theta_3$ ) as the 3 o'clock direction (the "right"),  $\theta=90$  ( $=\theta_{12}$ ) as the 12 o'clock direction ("upward"),  $\theta=180$  ( $=\theta_9$ ) as the 9 o'clock direction ("left") and  $\theta=270$  ( $=\theta_6$ ) as the 6 o'clock direction ("bottom"). While scanning  $\theta$  and/or  $\phi$ , the center of the measuring spot on the display surface shall stay fixed.

### 6.2 Optical Specifications/光学规格

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Viewing Angle	$\theta_L$	$Cr \geq 10$	80	85	-	deg	Note 1
	$\theta_R$		80	85	-		
	$\psi_T$		80	85	-		
	$\psi_B$		80	85	-		
Contrast Ratio	Cr	$\theta=0^\circ$	1000	1500	-	-	Note 2
Response Time	Tr+Tf	FF=0°	--	20	30	ms	Note 3
Color Coordinate of CIE1931	Wx	$\theta=0^\circ$	0.275	0.305	0.335	-	Note 4
	Wy		0.313	0.343	0.373		
	Rx		0.610	0.640	0.670		
	Ry		0.310	0.340	0.370		
	Gx		0.270	0.300	0.330		
	Gy		0.598	0.628	0.658		
	Bx		0.125	0.155	0.185		
	By		0.047	0.077	0.107		
Uniformity	U		80	--	--	%	
Color Gamut			65	70	--	%	Note 5
Luminance	L		800	1000	--	cd/m <sup>2</sup>	

**Note 1: The definition of Viewing Angle**

Refer to the graph below marked by  $\theta$  and  $\phi$ .



**Note 2: The definition of Contrast Ratio**

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

**Note 3: Definition of Response time.** (Test LCD using RD80S or similar equipments):

The output sign also photo detector are measured when the input sign also are changed from "black" to "white" (Voltage falling time) and from "white" to "black" (Voltage rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figures below.

**Note 4: Color Coordinates of CIE 1931**

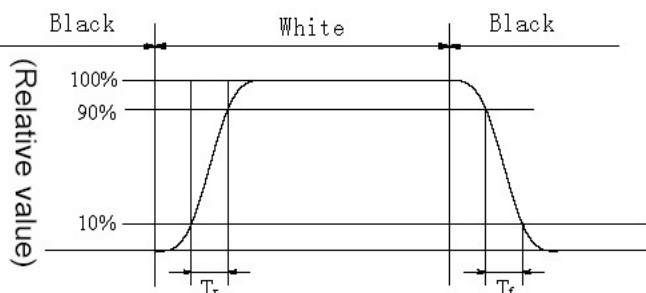
The test condition is at ILED=20mA and measured on the surface of LCD module at 25°C.

Measurement equipment: CA-410 or similar equipments

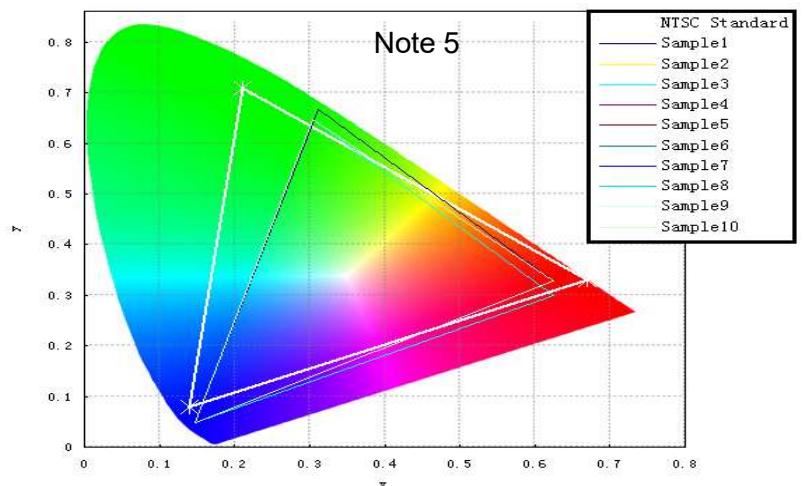
The Color Coordinate (CIE 1931) is the measurement of the center of the display shown in below figure.

**Note 5: Definition of Color of CIE Coordinate and NTSC Ratio.**

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



Note 3



Note 5


## 7.0 RELIABILITY TEST/可靠性测试

The Reliability test items and its conditions are shown in below.

No	Test Items	Conditions	Testing standard
1	High temperature storage Test	Ta= +90°C, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low temperature storage Test	Ta=-40°C, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High temperature operation Test	Ta= +85°C, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low temperature operation Test	Ta=-30°C, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	High temperature & humidity (storage Test)	Ta= +60°C, 90%RH max, 240 hours	IEC60068-2-78:2001 GB/T2423.3-2006
6	Thermal shock Test	-40°C 30min~90°C 30min, Change time:5min 100cycle	Start with cold temperature End with high temperature IEC60068-2- 14:1984,GB2423.22-2002
7	Vibration Test	Frequency range:10Hz-300Hz 1.5G Sweep:10Hz~300Hz~10Hz 2 hours for each direction of X.Y.Z (6 hours for total)	IEC60068-2-6 GB/T17626.2
8	Mechanical shock	Half Sine Wave 100G 6ms,+X,+Y,+Z 3times for each direction	IEC60068-2-27 GB/T2423.5
9	Dropping Test	Height: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8-1995
10	ESD Test	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5times; (Environment:15°C~35°C, 30%~60%RH,86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006 Class C

### Notes:

- 1、 Maximum acceleration 20g, 1g=9.8m/s<sup>2</sup>
- 2、 Maximum amplitude 5mm
- 3、 Maximum acceleration =0.002 x F<sup>2</sup> (frequency Hz) x D (amplitude p-pmm)

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## 8.0 Precautions/注意事项

Please pay attention to the following when you use this TFT LCD Panel.

### 8.1 Mounting Precautions/安装注意事项

- (1) Use finger stalls with soft gloves in order to keep the display clean during the incoming inspection and assembly process.
- (2) You must mount a module using specified mounting holes (Details refer to the drawings).
- (3) Please make sure to avoid external forces applied to the Source PCB or FPC and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.
- (4) Note that polarizers are very fragile and could be easily damaged. 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.
- (5) Do not pull or fold the source D-IC which connects the source PCB or FPC and the panel. Do not pull or fold the LED wire.
- (6) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water. Do not strong polar solvents because they cause chemical damage to the polarizer.
- (7) Wipe off saliva or water drops as soon as possible. Their long-time contact with polarizer Causes deformations and color fading.
- (8) Protection film for the polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (9) Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- (10) Do not disassemble the module.
- (11) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- (12) If the customer's set presses the main parts of the LCD, the LCD may show an abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by way of mutual agreement.
- (13) Do not drop water or any chemicals onto the LCD's surface.




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## 8.2 Operating Precautions/操作注意事项

- (1) Be careful of condensation at sudden temperature changes. Condensation makes damage to The polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (2) Module has high-frequency circuits. Sufficient suppression of electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize interference.
- (3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.
- (4) The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly area, and assembly equipment to protect against static electricity.
- (5) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (6) Design the length of cable to connect between the connector for the back-light and the converter As short as possible and the shorter cable shall be connected directly. The longer cable between that of the backlight and that of the converter may cause the luminance of the LED to lower and need a higher startup voltage(Vs).
- (7) Connectors are precise devices for connecting PCB and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.
- (8) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.
- (9) When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- (10) Obey the supply voltage sequence. If the wrong sequence is applied, the module would be damaged.
- (11) Do not re-adjust the variable resistor or switch etc.
- (12) For the Q/Single/OC Product, If the LED designed side view, the LED bar should be put in the Long/short side; Otherwise, its reliability and function may not be guaranteed.

## 8.3 Electrostatic Discharge Control/静电控制

- (1) Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through the wrist band etc. And don't touch the interface pin directly. Keep products as far away from static electricity as possible.
- (2) Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

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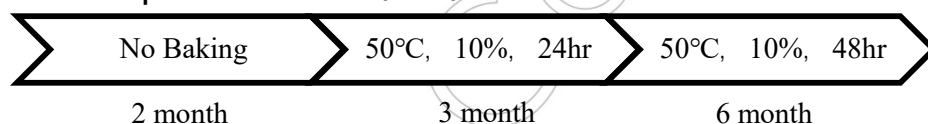
#### 8.4 Precautions for Strong Light Exposure/强光照射注意事项

It is not allowed to store or run directly in strong light or in high temperature and humidity for a long time; Strong light exposure causes degradation of polarizer and color filter.

#### 8.5 Storage Precautions/存储注意事项

When storing modules as spares for a long time, the following precautions are necessary.

- (1) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.  
Temperature: 5 ~ 40 °C
- (2) Humidity: 35 ~ 75 %RH.
- (3) Period: 6 months .
- (4) Control of ventilation and temperature is necessary.
- (5) Please make sure to protect the product from strong light exposure, water or moisture.
- (6) Store in a polyethylene bag sealed so as not to enter fresh air outside in it.
- (7) Do not store the LCD near organic solvents or corrosive gasses.
- (8) Please keep the Modules/OC/FOG at a circumstance shown below Fig.




#### 8.6 Precautions for Protection Film/保护膜注意事项

- (1) Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertically from panel surface, If possible, under ESD control device like an ion blower, and the humidity of the working room should be kept over 50%RH to reduce the risk of static charge.
- (2) In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary

#### 8.7 Appropriate Condition for Display/适当的显示条件

- (1) Normal operating condition.
  - Temperature: 0 ~ 40°C
  - Operating Ambient Humidity: 10 ~ 90 %
  - Display pattern: dynamic pattern (Real display)
  - Suitable operating time: under 12 hours a day.
- (2) Special operating condition If the product will be used in extreme conditions such as high temperature, humidity, display patterns or 7\*24hrs operation time, etc., It is strongly recommended to contact us for Application engineering advice. Other wise, its reliability and function may not be guaranteed.
- (3) Black image or moving image is strongly recommended as a screen save.

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- (4) Lifetime in this spec. is guaranteed only when the commercial display is used according to operating usages.
- (5) Please contact us in advance when you display the same pattern for a long time.
- (6) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked " or "turn off" to the screen. To avoid image sticking, it is recommended to use a screen saver.
- (7) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (8) Dewdrop atmosphere should be avoided.
- (9) The storage room should be equipped with a good ventilation facility and avoid to expose to corrosive gas, which has a temperature-controlling system.
- (10) The LCD should be avoided to expose to corrosive gas for a long time, the LCD may be affected by the gas as SO<sub>2</sub>, H<sub>2</sub>S, etc.
- (11) When expose to drastic fluctuations of temperature (hot to cold or cold to hot) , the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- (12) ) Response time will be extremely delayed at a lower temperature than the operating temperature range and on the other hand at higher temperatures LCD may turn black at temperatures above its operational range. However, those phenomena do not mean malfunction or out-of-order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

## 8.8 Others/其它

### A. LC Leak/漏液晶

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- In case of contact with hands, skin, or clothes, it has to be washed away thoroughly with soap.
- If LC in the mouth, the mouth needs to be washed, drink plenty of water to induce vomiting, and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water for at least 15 minutes.

### B. Rework/返工

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.
- In order to prevent potential problems, flicker should be adjusted by optimizing the Vcom.

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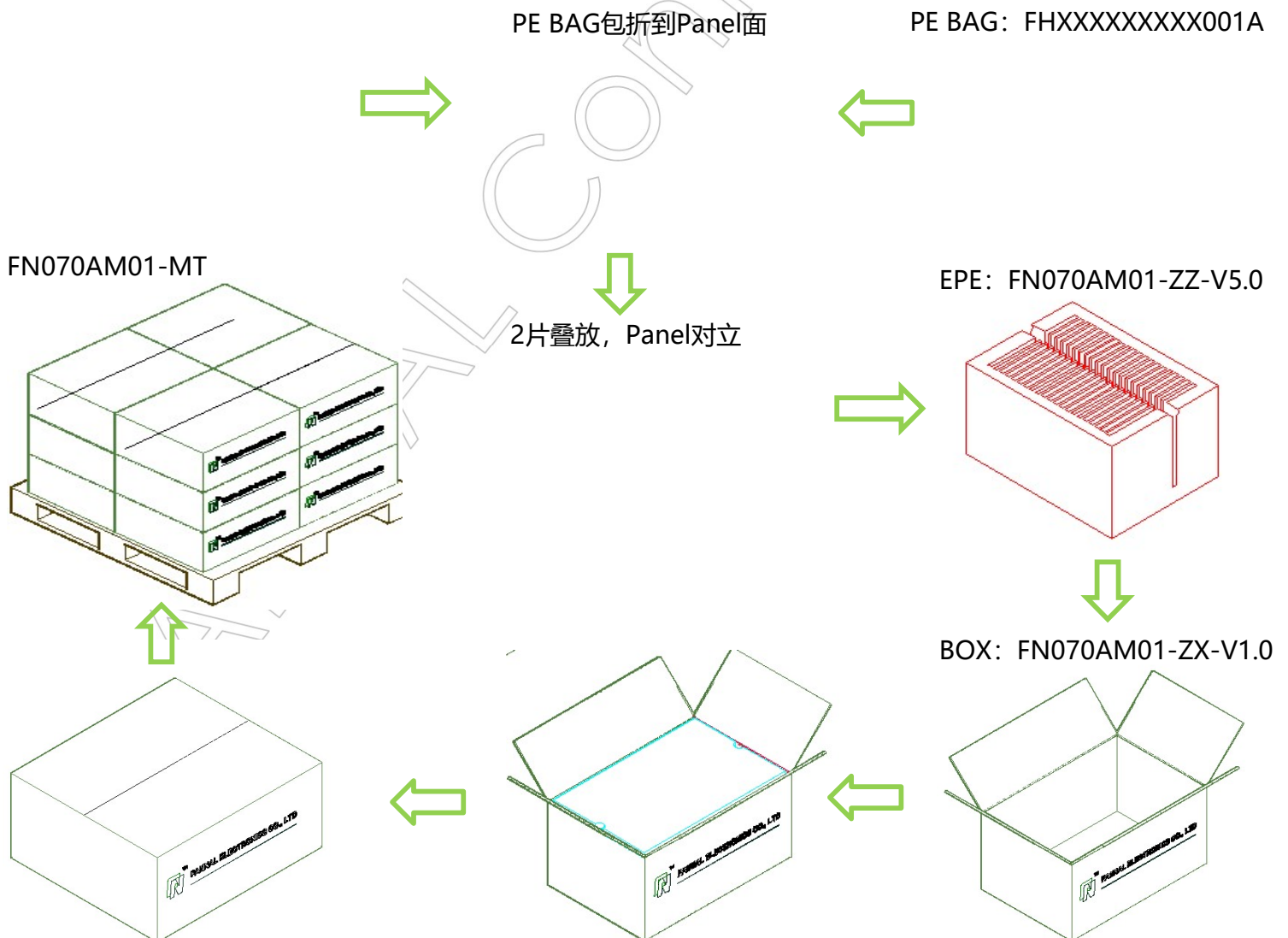
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**9.0 PACKING INFORMATION/包装信息**

LCM MODEL	LCM Qty. in the Box	Carton Size(mm)	LCM Qty. in the Pallet
TBD			

材料名称Name	物料规格型号Models	物料规格描述Description	用量Qty
PE BAG			
EPE			
BOX			
Pallet			





## 10.0 VISUAL INSPECTION CRITERIA FOR ALL CUSTOMERS/视觉检验标准

### 10.1 Sampling Method/抽样方法

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customers incoming inspection.

- 10.1.1 Lot size: 1 pallet per same model
- 10.1.2 Sampling type: Random sampling
- 10.1.3 Inspection level: II
- 10.1.4 Sampling table: GB/T2828.1-2003

### 10.2 Inspection Environment/检验环境

#### 10.2.1 Ambient conditions环境条件

- a. Ambient Temperature:  $25 \pm 3^{\circ}\text{C}$
- b. Relative Humidity:  $65 \pm 20\% \text{RH}$
- c. Ambient Illumination: 300-700LUX (Normal: 500LUX)

#### 10.2.2 Viewing Distance观察距离

The distance between the LCM and the inspector's eyes shall be at least 30cm-50cm

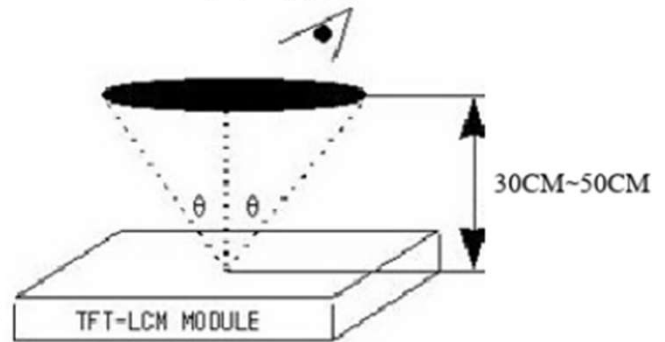
#### 10.2.3 Viewing Angle观察角度

performing in front of the panel

- [Vertical]:  $\pm 25^{\circ}$
- [Horizontal]:  $\pm 40^{\circ}$

#### 10.2.4 Inspection Area:检测区

Display Area (Active Area)



### 10.3 Definitions/定义

#### 10.3.1 Dark / Bright Spots暗/亮点

Points on display which appear dark/bright and usually result from the contamination. These defects do not vary in size or intensity (contrast) when contrast is varied.

#### 10.3.2 Dark / Bright Lines暗/亮线

Lines on display which appear dark/bright and usually result from the contamination.

#### 10.3.3 Polarizer Scratch偏光片划伤

Lines on display which are seen across a darker background and do not vary in size.

#### 10.3.4 Polarizer Dent偏光片凹痕

White spots on display which appear against a darker background and do not vary in size.

#### 10.3.5 Bright Dot Defects亮点缺陷

Dots (sub-pixels) on display which appear bright in the display area and visible through the 5%ND filter at Black Pattern.

10.3.6 Dark Dot Defects暗点缺陷

Dots(sub-pixels)on display which appear dark in the display area at R.G.B Color Pattern.

10.3.7 Line Defects线缺陷

All line defects on display which appear bright/dark such as vertical, horizontal, or cross lines.

10.3.8 Mura不均匀

Mura on display which appears darker/brighter against background brightness on parts of the display area.

10.3.9 BM Defects黑色矩阵缺陷

Bright(white)Points on display which are off BM(Black Matrix).

10.3.10 Visual Inspection目视检查

Inspection for LCM when the unit turns on.

10.3.11 Appearance Inspection外观检查

External inspection for LCM when the unit turns off.

10.3.12 Other

Defects which cannot be classified into the above defect definitions.

Note 1: Bright& Dark dots are not smaller than a sub-pixel(Dots smaller than a sub-pixel are not counted as defect dots)

**10.4 Inspection Criteria/检验标准**

10.4.1 Definition of dot defect induced from the panel inside面板内部引起的点缺陷

a) Full Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying Under black pattern.

b) Full Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying Under pure red, green, blue picture.

c) 2 dot adjacent=1 pair=2dots

Picture:



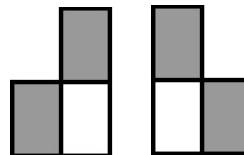
2 dot adjacent




2 dot adjacent



2 dot adjacent(vertical)




2 dot adjacent(slant)

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### 10.4.2 Display Inspection 显示检查


Item	Criterion		AQL
Full Bright dot 全亮点	Random	$N \leq 2$	1.0
	2 dots adjacent	$N \leq 0$	
	3 dots adjacent	$N \leq 0$	
Full Dark dot 全暗点	Random	$N \leq 2$	
	2 dots adjacent	$N \leq 0$	
	3 dots adjacent	$N \leq 0$	
Total bright and dark dot	$N \leq 4$		
Distance 距离	Minimum distance between full bright / full dark dots	5mm	
Display failure (V-line/ H-line/Cross line etc.)		Not allowable	0.4
Mura	Not visible through 5% ND filter in 59% gray or judge by limit sample if necessary		1.0
Foreign Bright Spot 外来亮点	Size(mm)	Acceptable Q'ty	1.0
	$D \leq 0.15$	Ignore	
	$0.15 < D \leq 0.25$	$N \leq 2$	
	$D > 0.25$	$N \leq 0$	
	Distance $\geq 5\text{mm}$ ; It is shown in Fig. 2.		
Foreign Black/White spot 外来黑白点	$D \leq 0.15$	Ignore	1.0
	$0.15 < D \leq 0.25$	$N \leq 2$	
	$D > 0.25$	$N \leq 0$	
	Distance $\geq 5\text{mm}$ ; It is shown in Fig. 2.		
Foreign Black/White/Bright Line 外来黑/白/亮线	$W \leq 0.07$	Ignore	1.0
	$0.07 < W \leq 0.1 \quad L \leq 5.0$	$N \leq 2$	
	$W > 0.1 \quad L > 5.0$	$N \leq 0$	
	It is shown in Fig. 3.		

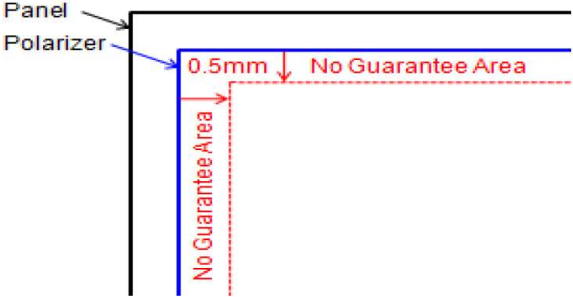
\*Note: Defect which is on the Black Matrix(outside of Active Area) are not considered as a defect.

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### 10.4.3 Appearance & Display inspection外观及显示检查

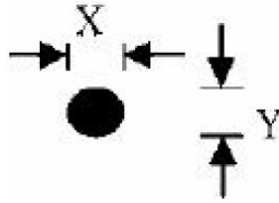
Item	Criterion		AQL
Polarizer Dent/Bubble 偏光片凹点/气泡	Size(mm)	Acceptable Q'ty	1.0
	D≤0.2	Ignore	
	0.2 < D≤0.3	N≤2	
	D > 0.3	N≤0	
	Distance≥5mm; It is shown in Fig. 2.		
Polarizer Scratches 偏光片划伤	W≤0.07	Ignore	1.0
	0.07 < W≤0.1 L≤5.0	N≤2	
	W > 0.1 L > 5.0	N≤0	
	It is shown in Fig. 3.		
Panel Crack面板裂纹	Not allowable. It is shown in Fig. 4.		1.0
Broken CF/Non-lead Side Of TFT CF破损	Min. distance between the broken and dot area		1.0
	d1≥1.0	Ignore	
	d1 < 1.0	N≤0	
	D1:Minimum distance between the broken and dot Area, It is shown in Fig.5.		
Broken of TFT Lead Side TFT端子侧破损	W≤1.5	L is Ignore, but the lead can't been damaged.	1.0
	Sconchoidal breakage: W≤1.5mm, Depth(D) ≤1/2 one layer of glass thickness		
	It is shown in Fig. 6.		
Corner Broken Lead Side 角破损	The cross mark can' t been damaged. W≤1.5mm, L ≤5mm It is shown in Fig. 7.		1.0
Burr of TFT/CF Edge TFT/CF边缘毛刺	The distance of burr from the edge of TFT /CF, d2≤0.2mm . It is shown in Fig. 8. d2: The distance of burr from the edge of TFT/CF		1.0
Polarizer Protective Film 偏光片保护膜	Neglect any defect on the Polarizer Protective Film, such as protective film scratches, protective film bubbles, and particles on protective film.		/

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Item	Criterion	AQL
No Guarantee Area for Polarizer	From the edge $\leq 0.5\text{mm}$ . 	1.0
Backlight Elements 背光	1、 Illumination source flickers when lit. Spots or scratches that appear when lit must be judged. 2、 Using LCD spot, lines, and contamination standards. 3、 Backlight doesn't light or the color is wrong.	1.0 1.0 0.4
Bezel铁框	No scratches with $W > 0.1$ and $\text{Length} > 2.5\text{mm}$ .	1.0
PCBA	PCBA damage per IPC guidelines.(IPC-A-610) 1、 There may not be more than 2mm of sealant outside the seal area on PCBA. And there should be no more than three places. 2、 Parts on PCBA must be the same as on the production characteristic chart, There should be no wrong parts, missing parts, or excess parts. 3、 The jumper on the PCBA should conform to the product characteristic chart.	1.0 0.4 0.4
FPCA	FPCA damage per IPC guidelines.(IPC-A-610) Nicks or damage along the edges of the flexible printed circuitry and cutouts, providing the penetration does not exceed 50% of the distance from the edge to the nearest conductor to 2.5mm [0.1in], Whichever is less.	1.0
Soldering 焊锡	Soldering per IPC guidelines.(IPC-A-610) 1、 No cold solder joints, missing solder connections, oxidation or icicle. 2、 No short circuits in components on PCB or FPC.	1.0 0.4

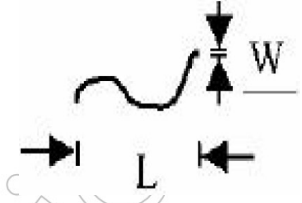
Notes: 1. All the angle of the broken must be larger than  $90^\circ$ . It is shown in Fig. 9 ( $R > 90^\circ$ ).  
 2. If any specific defect is not included in the above defect table, this defect should be judged by Fannal/ Panel manufacturer/Customer discussion.

1. W : Width
2. L : Length
3. D : Average Diameter
4. N : Count



$$D = (X + Y) / 2$$

Fig.2



W: width, L: length

Fig.3

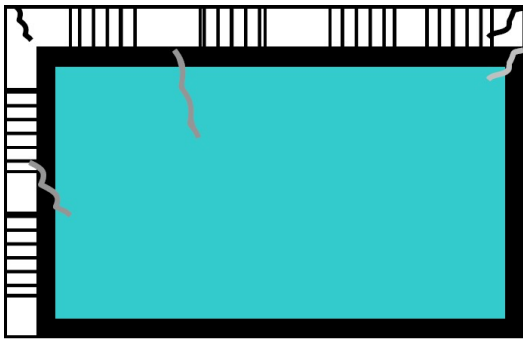


Fig.4

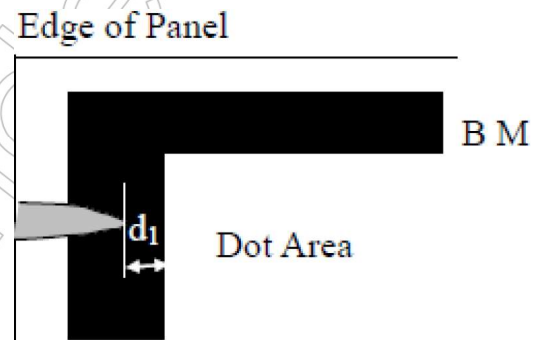


Fig.5

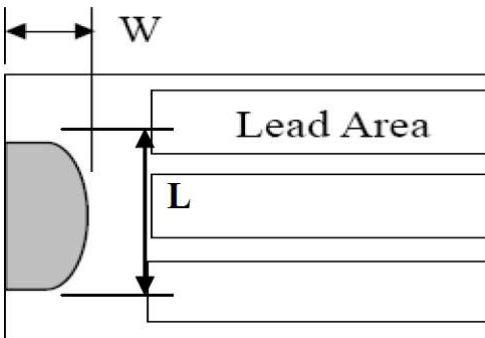


Fig.6

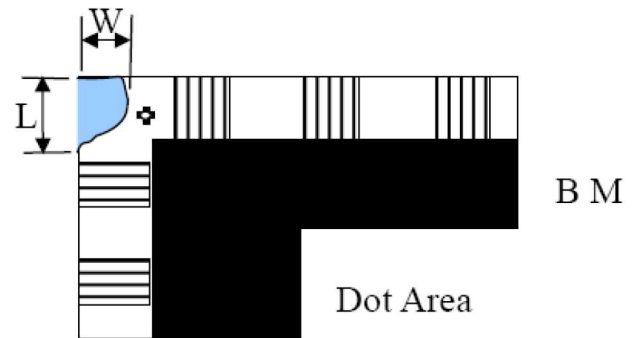


Fig.7

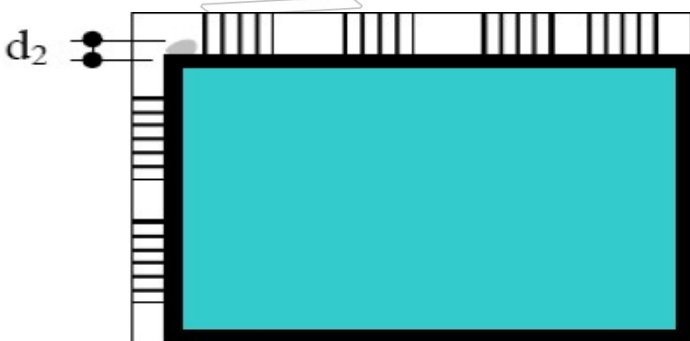


Fig.8

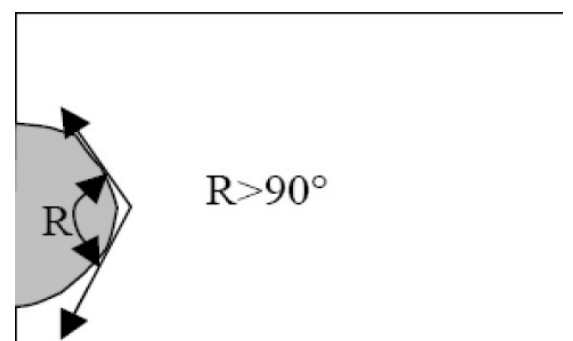



Fig.9



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### 10.5 Verification/验证

The Fannal can verify the defective LCMs to segregate the responsibilities at customer's facility or can request the Customer to ship the defective LCMs to the assigned place for Verification.

This verification result shall be agreed upon mutually by the Customer and Fannal. This result can be corrected/changed after a detailed failure analysis at Fannal's facilities.

### 10.6 Fannal Induced Defects/FN导致的缺陷

All of the Fannal induced defective LCMs shall be returned to the Fannal for repair or replacement.

Before returning the defective LCMs, the Customer needs the Fannal's confirmation with Lot Number.

All of the returned LCMs shall be returned to the Customer within the agreed time period.

### 10.7 Customer Induced Defects/客户导致的缺陷

The Customer can return the customer-induced defective LCMs to the Fannal for repair.

The repair cost for Customer induced defective LCMs shall be agreed upon with both parties, Customer and Fannal.

### 10.8 Warranty Period/保质期

The in-warranty period is Eighteen(18) Months from the manufacturing month of LCM

Note:

a. Eighteen months are composed of twelfth months in-warranty period and sixth months distribution period

b. The manufacturing Month is on the LCMs as Fannal's serial No.

### 10.9 Repair Warranty/保修

The repair warranty is Twelve(12)Months from repaired month for repaired LCMs

Note: a. The Label for repair will be added after repair.

### 10.10 Warranty avoidance/免责保修

The warranty will be avoided in cases of below:

a. When the warranty period is expired.

b. The Customer induced defective LCMs.

c. When the LCMs were repaired by 3rd party without Fannal's approval.

d. When the LCMs were treated like Disassemble and Rework by the Customer and/or Customer's representatives without Fannal's approval.

### 10.11 Others/其它

If any problems arise with the LCMs supplied by the Fannal, the customer and Fannal will cooperate and make efforts to solve it with mutual confidence and respect.