LCM Specification

( )Preliminary Specification
(✓) Final Specification

PRODUCT TYPE: TFT MODULE

PRODUCT P/N: PY043BDPT40R45H

VERSION: V0

PY

DESIGNED BY	
CHECKED BY	
APPROVED BY	

Customer

INSPECTION RESULT	
TESTED BY	
APPROVED BY	

1、OTHERS：
APPROVAL FOR SPECIFICATIONS ONLY
APPROVAL FOR SPECIFICATIONS AND SAMPLE
NOTE: VERSION OF SPECIFICATIONS: 01

2、 OTHERS:

History of revision

Revision	Contents	Date	Note
01	**New Revision**	2016-11-12	1.0

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1. Introduction And General Specifications

Liquid crystal Displays (LCDS) have widely used in many applications such as industrial measurements, office mechanisms, and household electronic–equipment etc. LCM (LCD Module) integrates with LCD and driving circuit that is easily to be interfaced by user. This LCM contains a standard built-in dot –matrix font set.

1.1Applications of LCM

Telephone
Facsimile mechanism
Electronic Typewriter
Word processor
Electronic memo pads
Remote controller

1.2 Features of LCM

Compact, thin and light
Wide view angle
Low power consumption
High contrast image
Wide operating temperature
High reliability

1.2 General specification

Parameter	Value	Unit
Size	4.3” inch	
Module outline (W x HxD)	105.5X67.1X3.0	
Active area (WxH)	95.04 x 53.86	
Display Resolution	480*RGB*272	pixels
Pixel Arrangement	RGB-stripe	-
IC Package Type	COG	-
Suggesting IC	ILI6485	
Interface Type	RGB 24-bit	-
Power Supply Voltage	3.3	V
Back-light	White LED*7	pcs
Operation Temperature	-20~70 ℃	
Storage Temperature	-30~80 ℃	

1.3 Absolute Maximum Ratings

Item	Symbol	*Rating*	Unit
Power Supply Voltage	VCI	*- 0.3 ~ +4.6*	V
IO Supply Voltage	VDDI	*- 0.3 ~ +4.6*	V
Charge Pump Supply Voltage	VCIP	*- 0.3 ~ +4.6*	V
Logic Input Voltage Range	VIN	*-0.3 ~ VDDI + 0.3*	V
Logic Output Voltage Range	VO	*-0.3 ~ VDDI + 0.3*	V
Operating Temperature Range	TOPR	*-30 ~ +85*	℃
Storage Temperature Range	TSTG	*-40 ~ +125*	℃

Note:

1. That the stress exceeds the Limiting Value listed above it may cause the driver IC permanent damage. These values are for stress only. IC should be operated under the DC/AC Characteristic conditions for normal operation. If these conditions are not met, IC operation may be error and the reliability may be deteriorated.
2. Parameters are valid over operating temperature range unless otherwise specified. All voltages are with respect to VSS unless otherwise noted.
3. VIN should be less than or equal to 3.6V. (VIN ≤ 3.6V)

1.4 DC Characteristics

DC Electrical Characteristics (VCIP=VCI=VDDI= 3.3V, VSSA= 0V, TA=25°C).

1.4.1 Recommended Operating Range

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	VCI	3.0	3.3	3.6	V	
IO Supply Voltage	VDDI	3.0	3.3	3.6	V	VDDI<=VCI
Charge Pump Supply Voltage	VCIP	3.0	3.3	3.6	V	VCIP<=VCI
NVM Supply Voltage	VPP	10	10.25	10.5	V	

1.4.2 DC Characteristics for Digital Circuit

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic-High Input Voltage	Vih	0.7VDDI	-	VDDI	V	
Logic-Low Input Voltage	Vil	VSSD	-	0.3VDDI	V	
Logic-High Output Voltage	Voh	VDDI-0.4	-	VDDI	V	
Logic-Low Output Voltage	Vol	VSSD	-	VSSD+0.4	V	

1.4.3 DC Characteristics for Analog Circuit

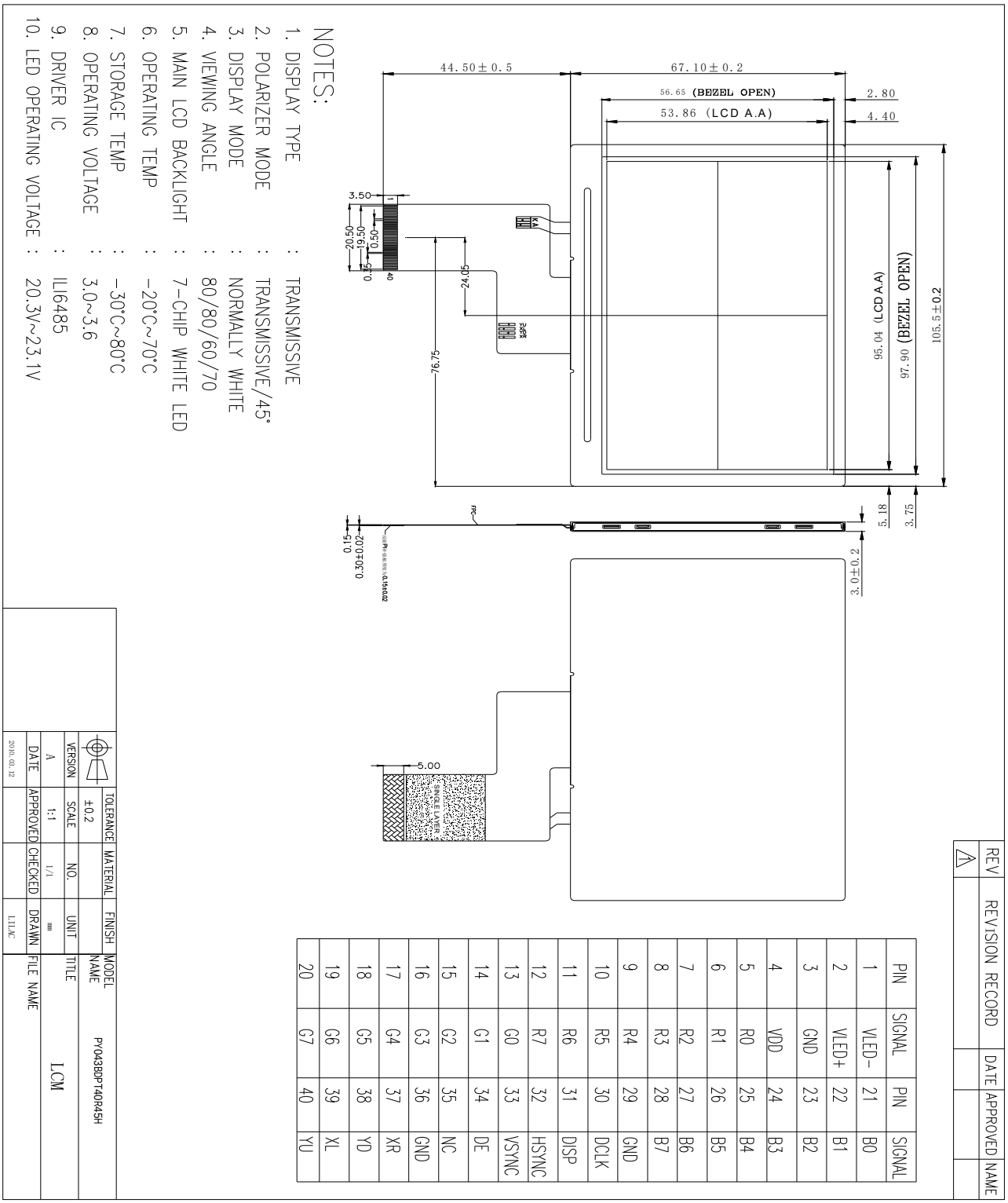
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Positive High-voltage power	VGH	10.16	15	18	V	
Negative High-voltage power	VGL	-13	-10	-7	V	
Output Voltage Deviation	Vod	-	±35	±45	mV	
Standby Current	Isc	-	-	50	uA	
Operation Current	Ioc	-	20	-	mA	No Load@ FR=60Hz

1.5 LCM And Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED forward voltage	VL	20.3	21	23.1	V	Note 2,3
LED forward current	IL	-	20	-	mA	Note 3
LCD forward current	IL	-	56	-	mA	
LED life time	-	20,000	-	-	Hr	Note 1
LED Luminance	Lv		9000	-	cd/㎡	
LCM Luminance	Lv		450		cd/㎡	

Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ and IL =20mA. The LED lifetime could be decreased if operating IL is lager than20 mA.
Note 2: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL =20mA. In the case of 7 pcs LED , VL=3.0*7=21V
Note 3: The LED driving condition is defined for each LED module (7LED Serial).

2. LCD&LCM Outline Drawing



PIN	SIGNAL	PIN	SIGNAL
1	VLED-	21	B0
2	VLED+	22	B1
3	GND	23	B2
4	VDD	24	B3
5	R0	25	B4
6	R1	26	B5
7	R2	27	B6
8	R3	28	B7
9	R4	29	GND
10	R5	30	DCLK
11	R6	31	DISP
12	R7	32	HSYNC
13	G0	33	VSYNC
14	G1	34	DE
15	G2	35	NC
16	G3	36	GND
17	G4	37	XR
18	G5	38	YD
19	G6	39	XL
20	G7	40	YU

REV	REVISION RECORD	DATE	APPROVED	NAME

TOLERANCE	±0.2	MATERIAL	FINISH
SCALE	1:1	NO.	1/1
VERSION	A	UNIT	mm
DATE	2010.02.12	APPROVED	
CHECKED			
DRAWN	LILAC		
FILE NAME		TITLE	LCM
		MODEL NAME	PY043BDPT40R45H

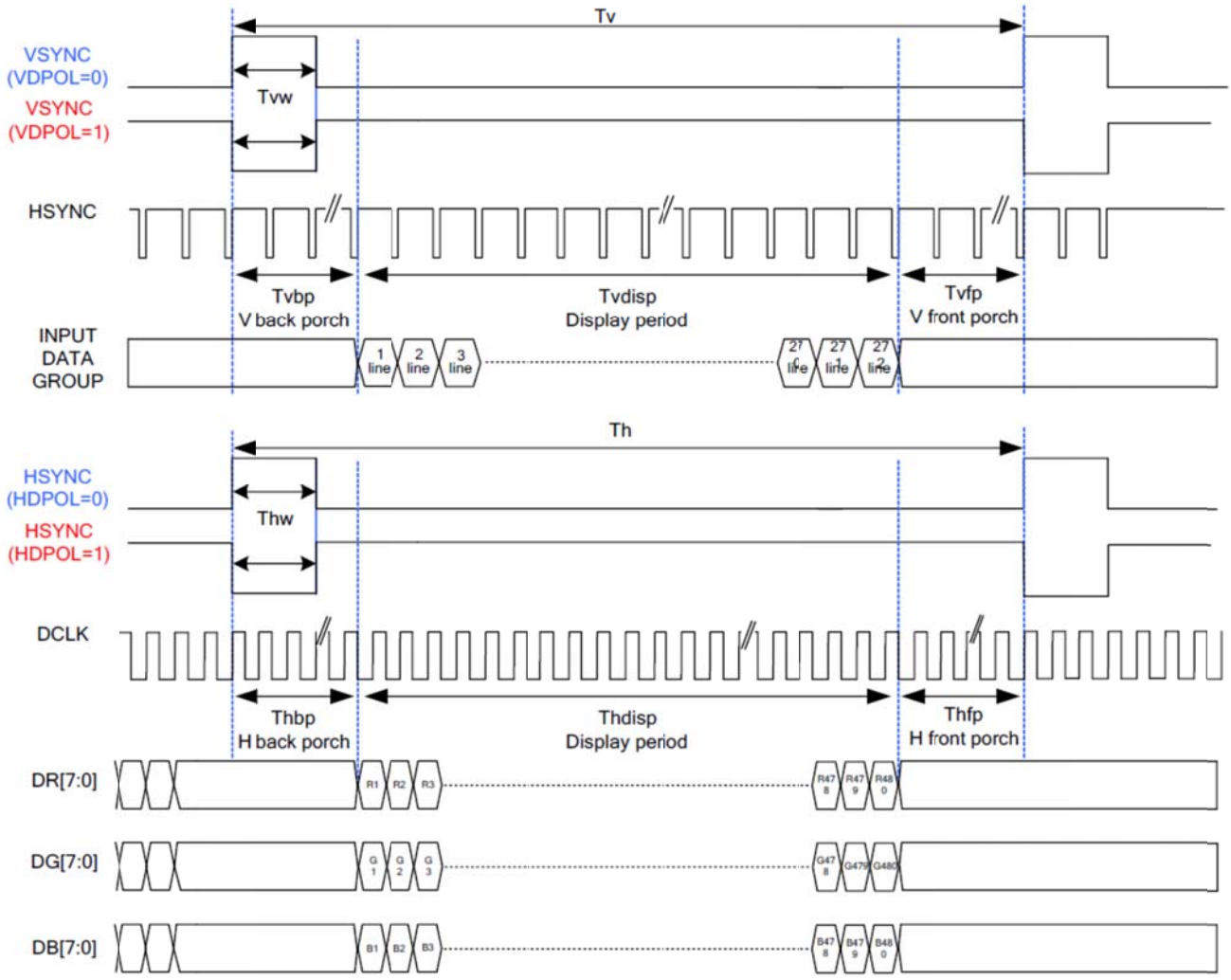
3. *INTERFACE PIN CONNECTIONS*

PIN NO.	SYMBOL	DESCRIPTION
1	VLED-	Backlight LED power supply (cathode)
2	VLED+	Backlight LED power supply (Anode)
3	GND	Ground
4	VDD	Power Supply
5-12	R0-R7	Red data bit line
13-20	G0-G7	Green data bit line,
21-28	B0-B7	Blue data bit line
29	GND	Ground
30	DCLK	Clock signal, The input data is latched on the rising edge of CLK.
31	DISP	Display control / standby mode selection. Internally pulled high. DISP = “Low” : Standby; DISP = “High” : Normal display
32	HSYNC	In esternal interface mode, served as a horizontal synchronizing signal input;
33	VSYNC	In external interface mode , served as a vertical synchronizing signal input;
34	DE	Data Enable
35	NC	Not Connected
36	GND	Ground
37	XR	Touch panel XR
38	YD	Touch panelYD
39	XL	Touch panel XL
40	YU	Touch panel YU

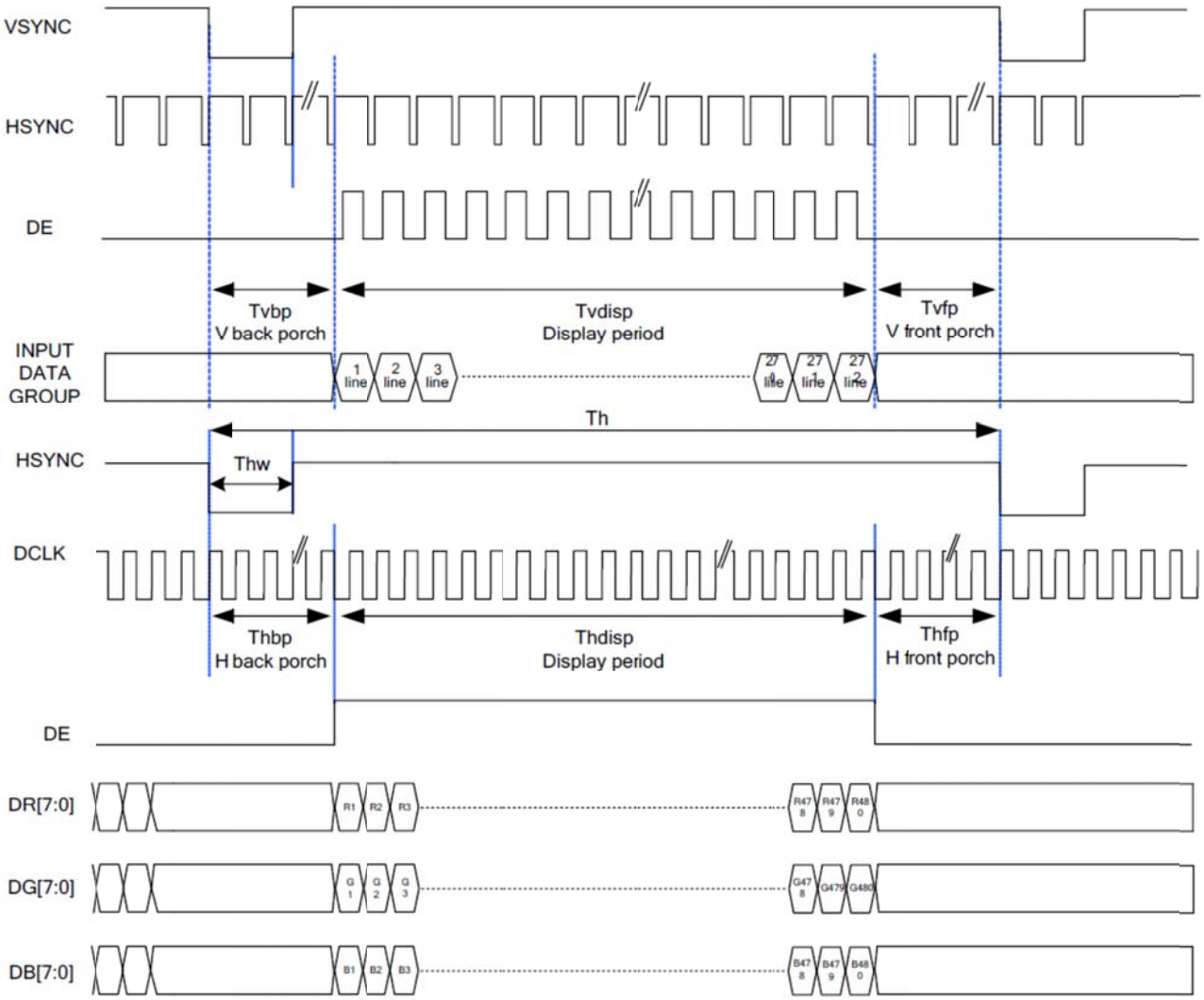
4. TIMING CHARACTERISTICS OF INPUT SIGNAL

4.1 RGB Interface

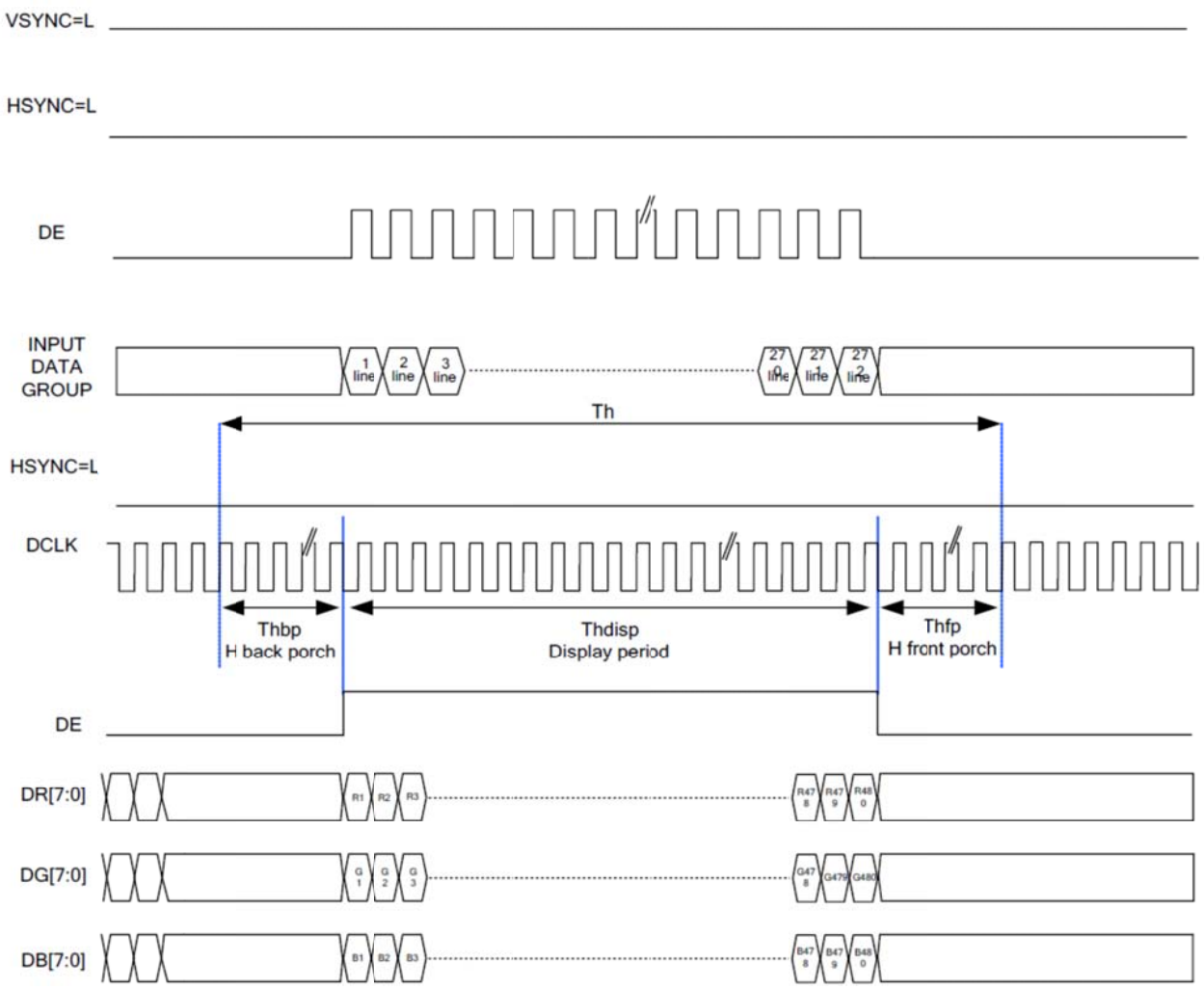
4.1.1 SYNC Mode



4.1.2 SYNC-DE Mode



4.1.3 DE Mode

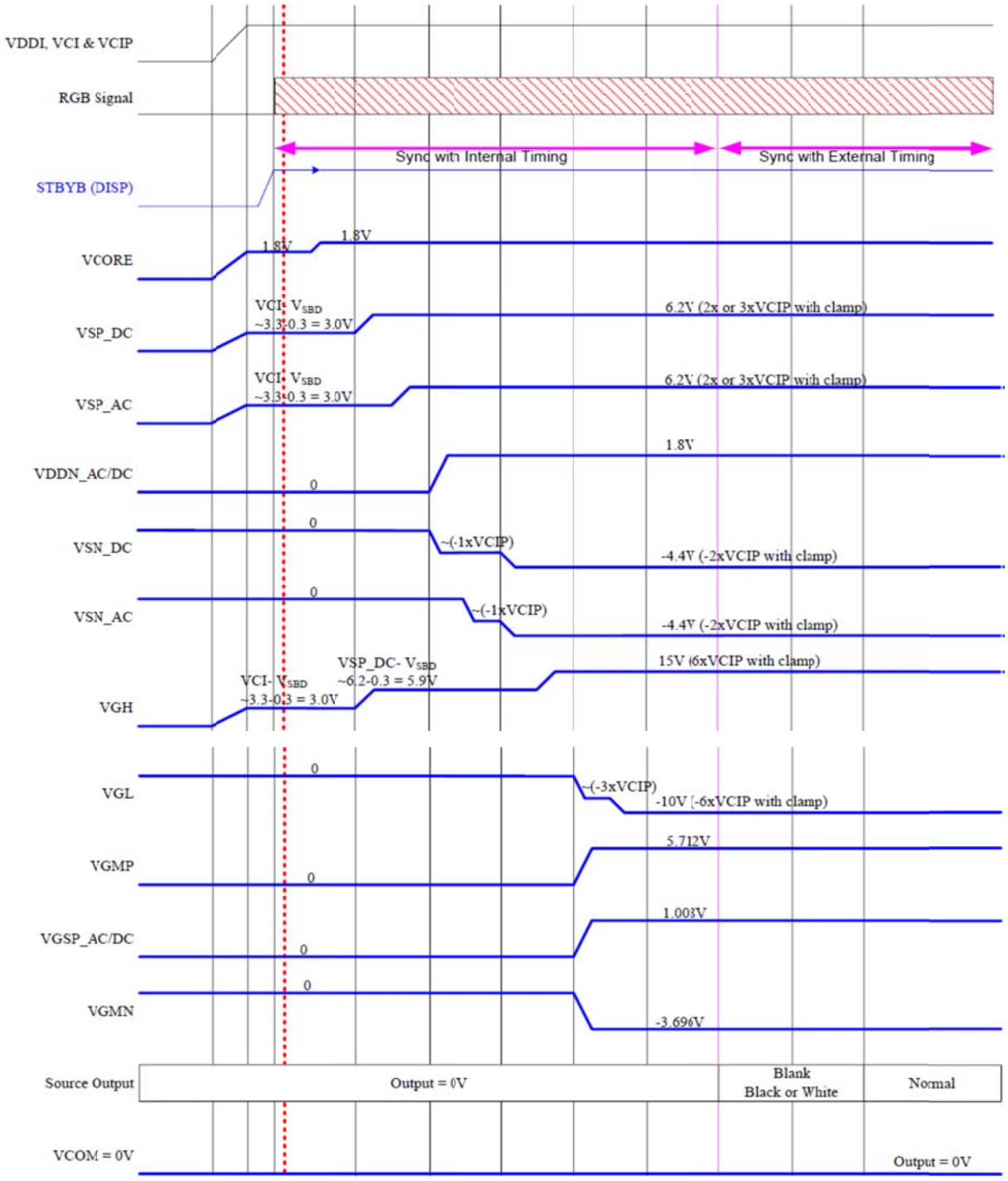

VSYNC=L
HSYNC=L
DE
INPUT DATA GROUP
1 line
2 line
3 line
270 line
271 line
272 line
Th
HSYNC=L
DCLK
Thbp
H back porch
Thdisp
Display period
Thfp
H front porch
DE
DR[7:0]
DG[7:0]
DB[7:0]

4.2 Parallel 24-bit RGB Timing Table

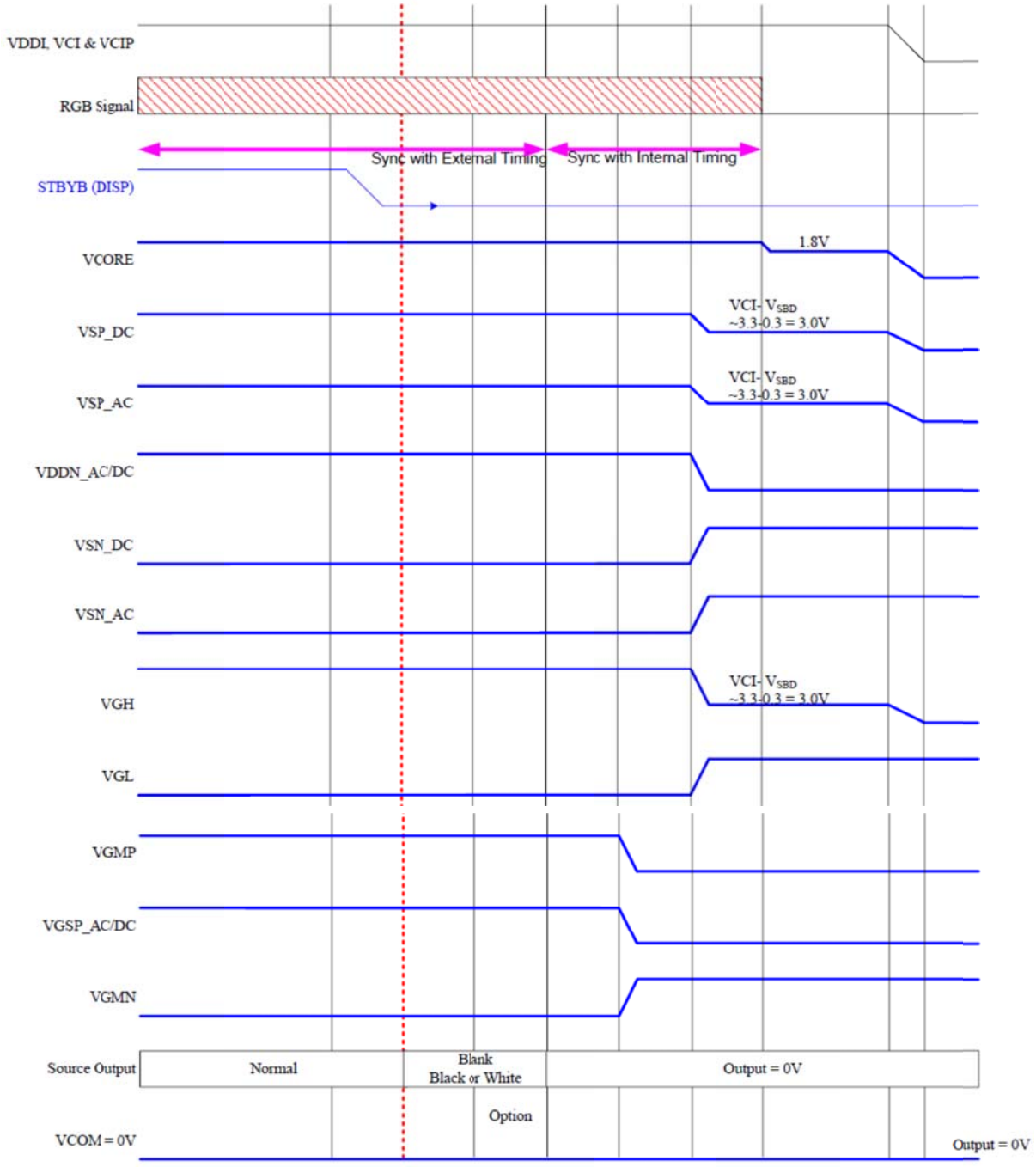
480RGB X 272 Resolution Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	125	111	83	ns	
HSYNC	Period Time	Th	487	531	598	DCLK	
	Display Period	Thdisp	-	480	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_Blanking setting
	Front Porch	Thfp	4	8	75	DCLK	
	Pulse Width	Thw	2	4	75	DCLK	
VSYNC	Period Time	Tv	276	292	321	H	
	Display Period	Tvdisp	-	272	-	H	
	Back Porch	Tvbp	2	12	12	H	By V_Blanking setting
	Front Porch	Tvfp	2	8	37	H	
	Pulse Width	Tvw	2	4	37	H	

4.3 POWER ON/OFF SEQUENCE

4.3.1 Power On Sequence



4.3.2 Power Off Sequence



4.4 AC Timing Diagram

AC Electrical Characteristics (VCIP=VCI=VDDI= 3.3V, VSSA= 0V, TA=25 C).

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VCI power source slew time	TPOR	-	-	20	ms	From 0V to 99% VCI
RESX pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	2	-	-	DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE setup time	Tdest	10	-	-	ns	
DE setup time	Tdehd	10	-	-	ns	
SD output stable time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD output rise and fall time	Tgst	-	-	6	ns	Output settled (5%~95%), Loading = 4.7k+29.8pF
3-wire serial communication						
Delay between CSX and VSYNC	Tcv	1	-	-	us	
CSX input setup time	Ts0	50	-	-	ns	
Serial data input setup time	Ts1	50	-	-	ns	
CSX input hold time	Th0	50	-	-	ns	
Serial data input hold time	Th1	50	-	-	ns	
SCL pulse high width	Twh1	50	-	-	ns	
SCL pulse low width	Twl1	50	-	-	ns	
CSX pulse high width	Tw2	400	-	-	ns	

5. *ELECTRO-OPTICAL CHARACTERISTICS*

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	70	80	-	Deg.	WV-Pol Note 1
		Θ_9		70	80	-	Deg.	
	Vertical	Θ_{12}		50	60	-	Deg.	
		Θ_6		60	70	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	500	700	-		Note 2
Cell Transmittance		Tr		-	6.85	-	%	Base on C Light Note 3
White Chromaticity		x_w		TYP. - 0.03	0.301	TYP. + 0.03		Note 4 Base on C Light
		y_w			0.337			
Reproduction of color (C light)	Red	R_x			0.605			
		R_y			0.324			
	Green	G_x			0.303			
		G_y			0.562			
	Blue	B_x			0.144			
		B_y			0.172			
Color Gamut (C light)				45	50	-	%	
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	20	30	ms	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with Polarizer.

4. The color chromaticity coordinates specified in Table 5 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

5. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

6. RELIABLITY TEST

The Reliability test items and its conditions are shown in below

No	Test Items	Conditions	
1	High temperature storage test	Ta = 80 ℃, 240 hrs	-
2	Low temperature storage test	Ta = -30 ℃, 240 hrs	
3	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240hrs	
4	High temperature operation test	Ta = 70 ℃, 240hrs	
5	Low temperature operation test	Ta = -20 ℃, 240hrs	
6	Thermal shock	Ta = -30 ℃ ↔ 80 ℃ (0.5 hr), 100 cycle	
7	Image Sticking	25°C，5*8 chess pattern，1hrs @L127灰阶下，5s消失	-

7. Inspection Standards

7.1 Inspection Conditions

7.1.1 Environmental conditions

The environmental conditions for inspection shall be as follows

Room temperature: 20±3°C; Humidity: 65±20%RH

7.1.2 The external visual inspection

With a single 20-watt fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes .

7.2 Classification of defects

7.2.1 Major defect

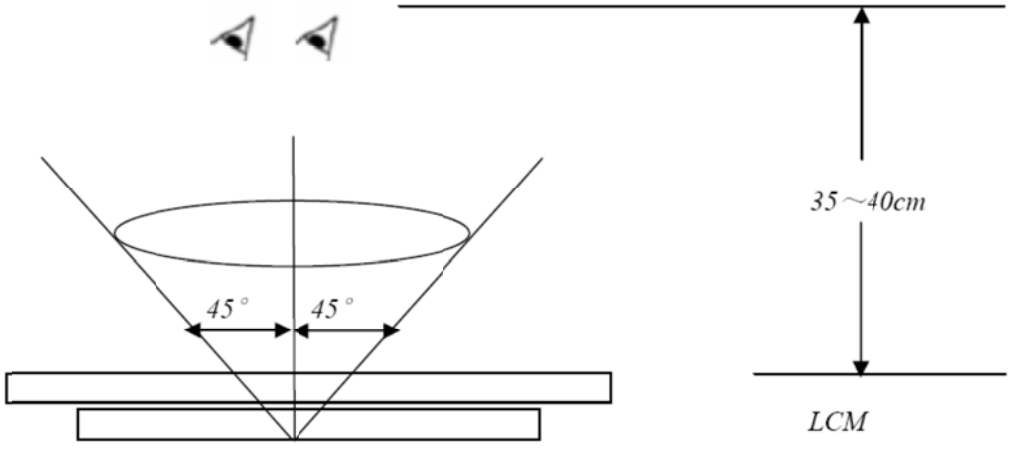
A major defect refers to a defect that may substantially degrade usability for product applications.

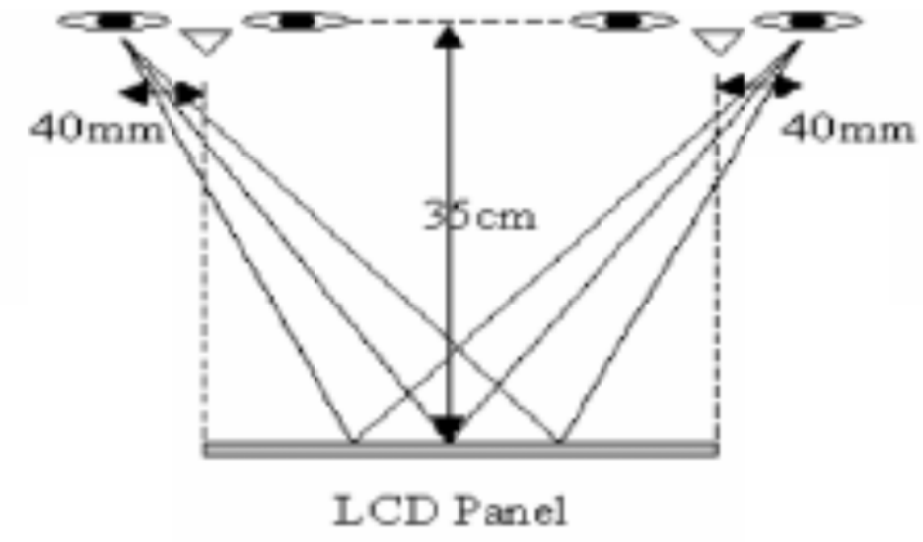
7.2.2 Minor defect

A minor defect refers to a defect which is not considered to be able substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.

7.3 检验条件

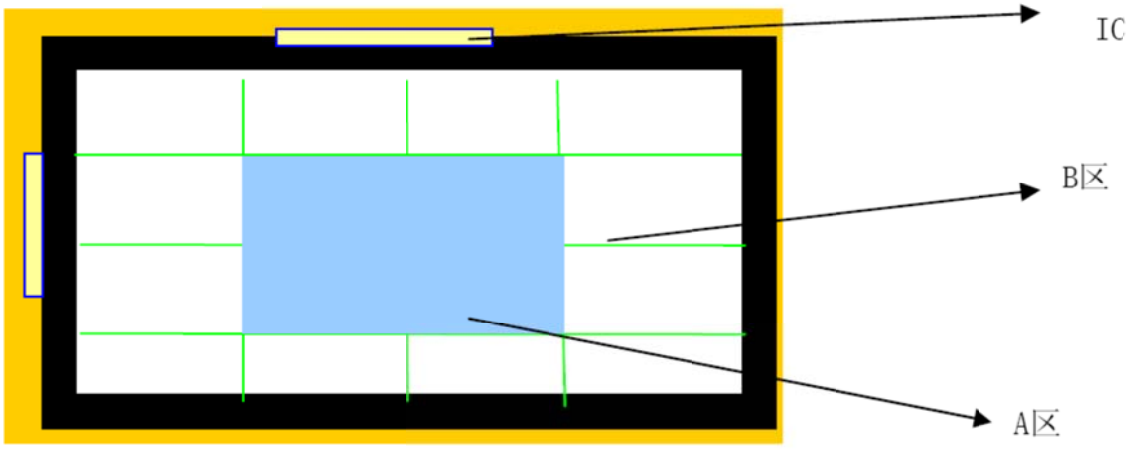
眼睛距离产品 35～40CM；以产品法线为中心上下左右 45° 进行检查，见下图：





7.4 显示区A 区与B 区的定义

A区：以屏四边为基准各向屏中心点延伸1/4区域，所剩下的中心区域视为A区（如下图所示）
B 区：以屏四边为基准各向屏中心点延伸 1/4 的区域，视为 B 区（如下图所示）



7.5 检验标准

项目	现象描述	判定标准	缺陷	备注
点缺陷	点状：LCD/TP/偏光片黑点，彩点，亮点	Φ=直径 Φ≤0.20mm 忽略不计 0.20mm<Φ≤0.40mm 可接收 3 个（间隔大于 10mm） Φ>0.40mm 不可接收	Maj	/

点状数要求	A 区	B 区	点数总计
亮点	N≤0	N≤2	N≤2
暗点	N≤2	N≤3	N≤3
合计点	N≤2	N≤3	N≤4
两个连点	N≤0	N≤1	N≤1

线缺陷	LCD/偏光片/TP/黑白点,线状划伤,线状异物	W≤0.05mm 忽略不计 0.05mm<W≤0.10mm L≤10mm 允许 3 个 W>0.10mm L>10mm 不接收	Maj	//
缺划	在任意画面看到的横线、纵线的缺失	Not Allowed	Maj	/
画面异常	所有的画面异常主要如下： ※ 横显与竖显不一致 ※ 部分不显示或显示部分出现闪动等	Not Allowed	Maj	/
残影/阴影	后一画面余留前一画面的影像（影像残留）	残影不良超过 5 秒不消失为 NG	Maj	/

画面闪烁	检验时出现画面忽亮忽暗或跳动现象	Not Allowed	Maj	/
静电线	影响画面或产品特性之静电线，一般表示为某个画面出现	Not Allowed	Maj	/
漏光	灯前有光斑或者光束	依客户签样为准	Min	/
	组合缝隙漏光	依客户签样为准	Min	/
灯眼	点亮后 LED 灯仔发光区域比其它区域要特别亮	Not Allowed	Maj	/
LED 亮	点亮时 LED 灯不亮	Not Allowed	Maj	/
	LED 灯点亮闪烁	Not Allowed	Maj	/