

Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 800480X VMH-PW-N

**5,0" TFT
IPS**

Product Specification

Ver.:2

14.06.2019

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00	28.05.2019	-	First Issue	JW
01	10.06.2019	ALL	Update Templates, Update Wrappers	JW
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1. Product Features

1.1 Introduction

This is a color active matrix Thin Film Transistor(TFT) Liquid Crystal Display(LCD) that uses TFT as a switching devise.The resolution of the panel is 800 (RGB) x 480 pixels and can display up to 16.7Million colors.

1.2 General Features

Parameter	Value	Unit
LCD Size	5.0	Inch
Panel Type	IPS TFT	-
Resolution	800 (RGB) x 480	pixel
Display Mode	Normally Black, Transmissive	-
Display Colors	16.7 Million	-
Best Viewing Direction	All	-
Luminance of LCD Surface	500 (Typ.)	cd/m2
Driver IC	ST7262	-
Light Source	18 White LEDs	-
Interface	RGB interface	-
Weight	TBD	g
Operating Temperature	-20°C ~ +70°C	°C
Storage Temperature	-30°C ~ +80°C	°C

2. Mechanical Specification

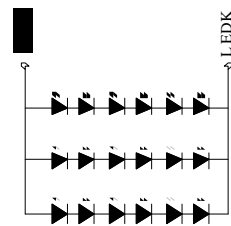
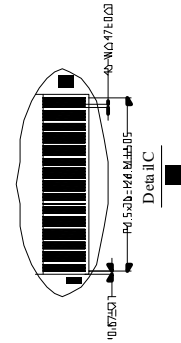
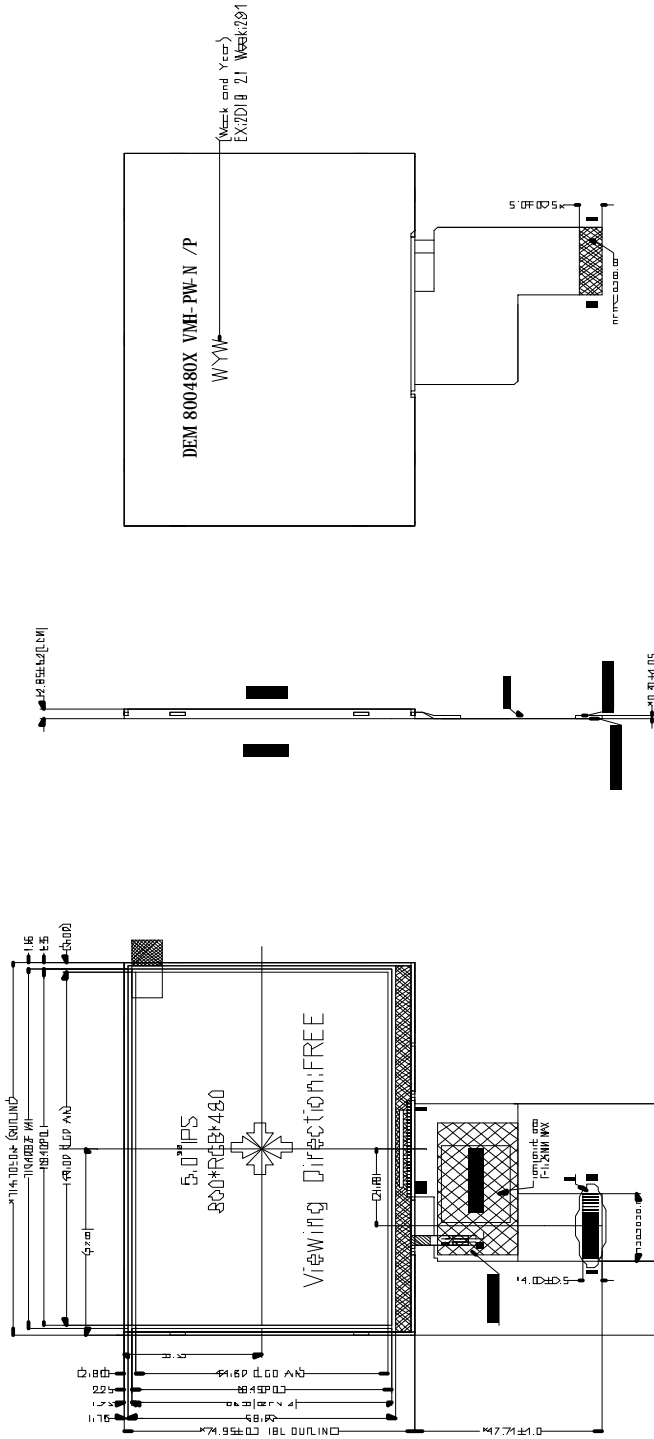
2.1 General Specification

Parameter	Value	Unit
LCM Module Size	114.10 x 74.95 x 2.85	mm
Active Area(A.A.)	108.00 x 64.80	mm
Pixel Pitch	135 x 135	um

2.2 Outline Dimension (Counter Drawing)

LCM PIN table

NO	NAME	NO	NAME
1	LEDK	21	BQ
2	LEDA	22	B1
3	GN0	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	BNP
10	R5	30	PLCK
11	R6	31	DISP
12	R7	32	HSYNP
13	S0	33	VSIND
14	S1	34	DE
15	S2	35	NC
16	G3	36	GN0
17	G4	37	NC
18	S5	38	NC
19	S6	39	NC
20	S7	40	NC



B.L. Circuitry Diagram (6x3pcs=18 pcs WhiteLEDs)

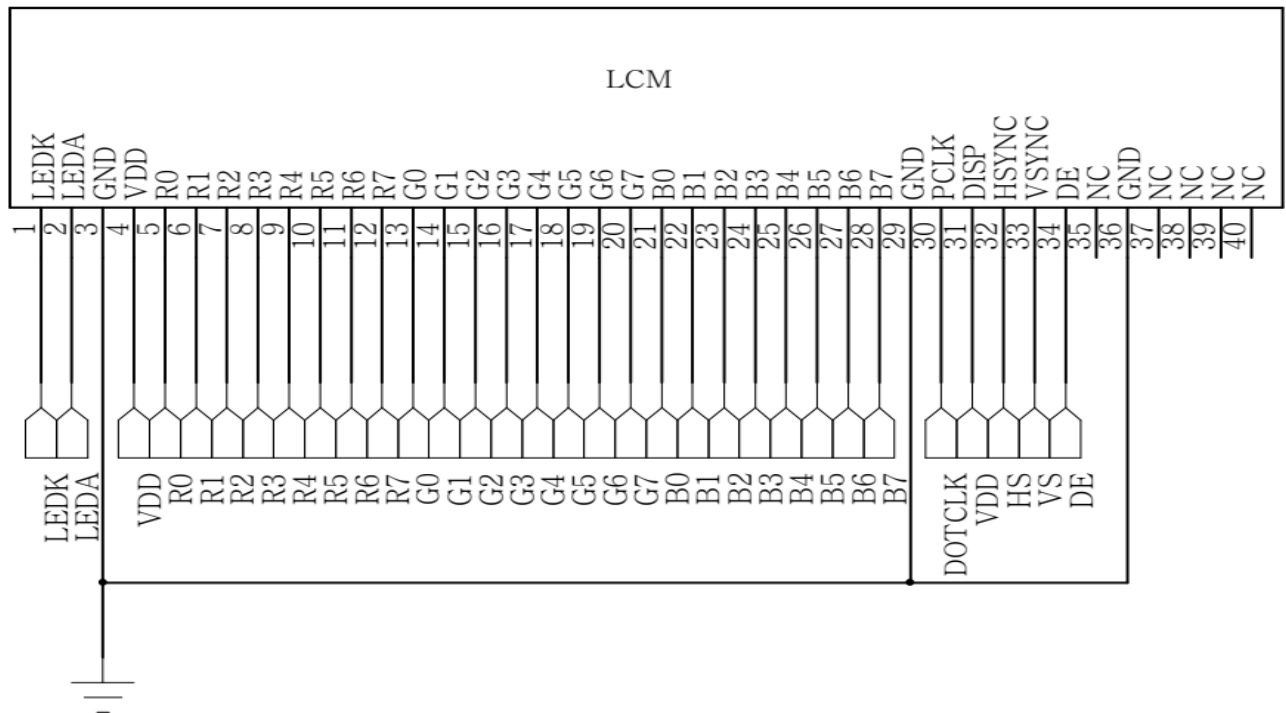
- SPECIFICATION:
- 1) Driving conditions: VDD: 3.3V;
 - 2) Viewing direction: All;
 - 3) Display mode: IPS, Normal Black, Transmissive;
 - 4) Operating temp.: -20° ~ +70°; Storage temp.: -30° ~ +80°;
 - 5) LCM IC: ST262;
 - 6) MVA; LCM: 500cd/m²
 - 7) Backlight: Colour: White (Normal, * 18 PCS LED), Constant IF=60 mA, Vf: 19.2V (Typ.);
 - 8) Dimensions with asterisk "*" are important. Dimensions in bracket () are for reference;
 - 9) RoHS Compliant.

3. Interface Assignment

Pin No.	Symbol	Function
1	LEDK	Cathode for Backlight Power Supply.
2	LEDA	Anode for Backlight Power Supply.
3	GND	Ground Pins.
4	VDD	Analog Power Supply 3.3V.
5-12	R0-R7	Red Pixel Data.
13-20	G0-G7	Green Pixel Data.
21-28	B0-B7	Blue Pixel Data.
29	GND	Ground Pins.
30	DCLK	Pixel Clock Input in RGB Interface
31	DISP	Sets the Display Mode
32	HSYNC	Horizontal Sync Input in RGB Interface
33	VSYNC	Vertical Sync Input in RGB Interface
34	DE	Data Enable Input in RGB Interface
35	NC	No Connect.
36	GND	Ground Pins.
37	NC	No Connect.
38	NC	No Connect.
39	NC	No Connect.
40	NC	No Connect.

4. Electrical Specification

4.1 Application Circuit



4.2 Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Note
Digital Voltage	VDDI	-0.3	4.0	V	-
Analog Voltage	VDD	-0.3	4.0	V	-
Gate Driver High Voltage	V _{GH}	-0.3	18	V	-
Gate Driver Low Voltage	V _{GL}	0.3	-18	V	-
Operation Temperature	T _{op}	-20	70	°C	-
Storage Temperature	T _{ST}	-30	80	°C	-

Note 1: The absolute maximum rating of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

4.3 Typical Operation Conditions

4.3.1 DC Characteristics

Item	Symbol	Min	Typ	Max	Unit	Note
Digital Voltage	VDDI	3.3	-	3.6	V	-
Analog Voltage	VDD	3.3	-	3.6	V	-
Gate Driver High Voltage	V _{GH}	-	15	-	V	-
Gate Driver Low Voltage	V _{GL}	-	-10	-	V	-
Input Signal Voltage	V _{COM}	-5.5	-	5.5	V	-
Input Logic High Voltage	V _{IH}	0.7VDDI	-	VDDI	V	-
Input Logic Low Voltage	V _{IL}	DGND	-	0.3VDDI	V	-
Output Logic High Voltage	V _{OH}	VDDI-0.4	-	VDDI	V	-
Output Logic Low Voltage	V _{OL}	DGND	-	DGND+0.4	V	-

Note 1: V_{GH} is TFT gate operating voltage.

Note 2: V_{GL} is FTF gate operating voltage.

The storage structure of this mode is Cst (Storage on common)

Note 3: V_{COM} must be adjusted to optimize display quality of Cross talk, Contrast ratio and etc.

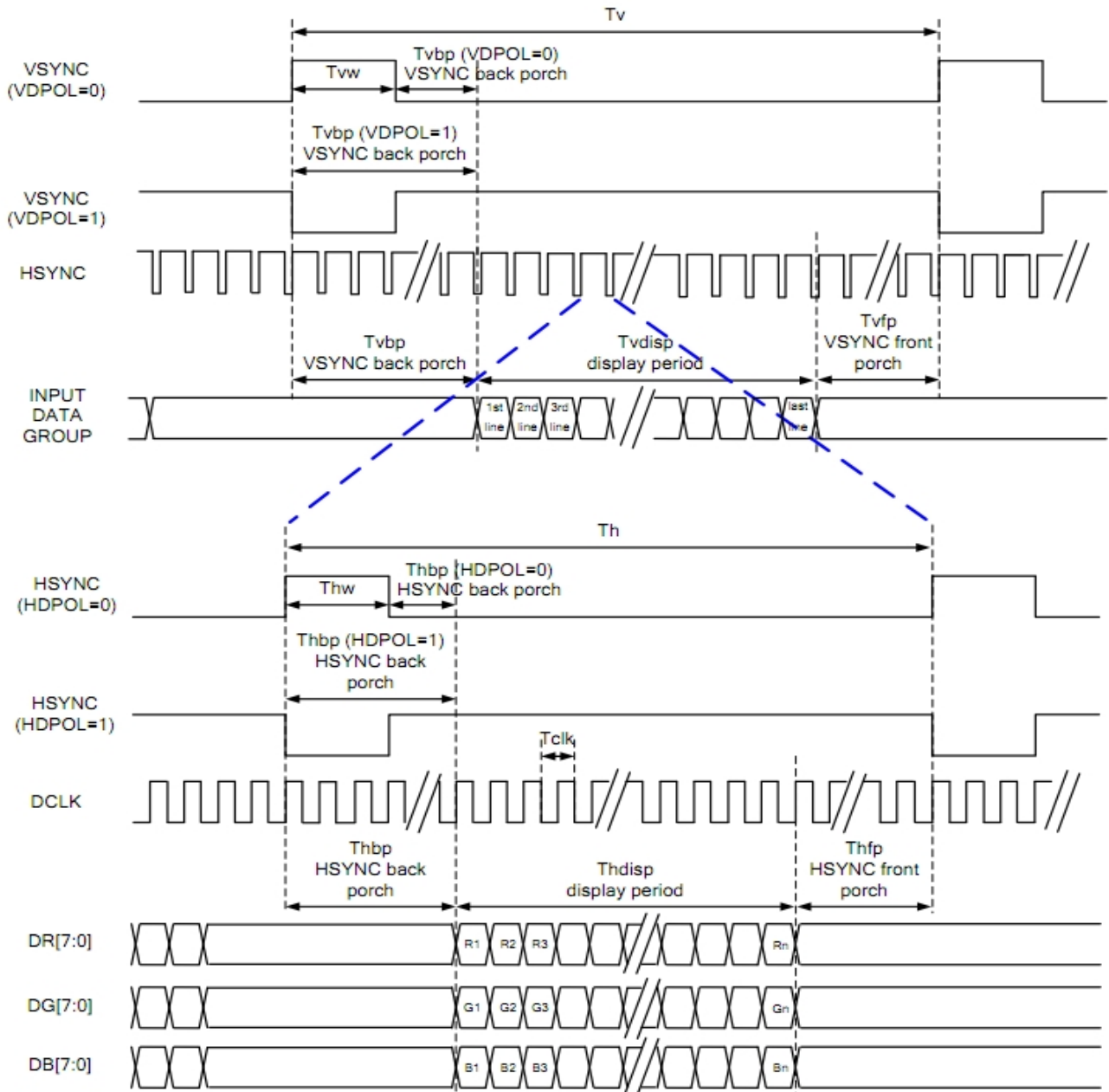
4.3.2 AC Characteristics

4.3.2.1 RGB Interface Characteristics

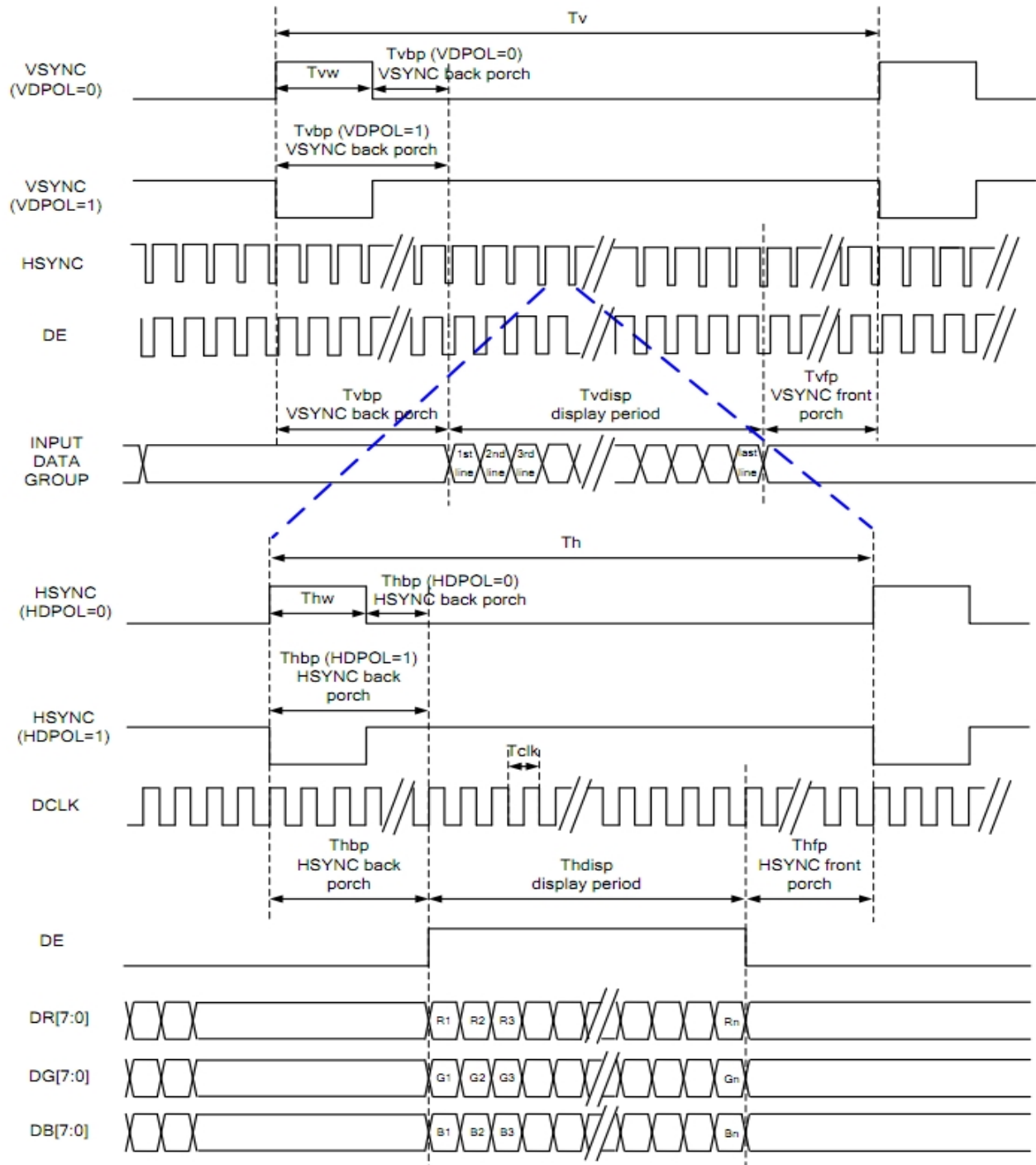
RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: "Input" means these signals are driven by host side

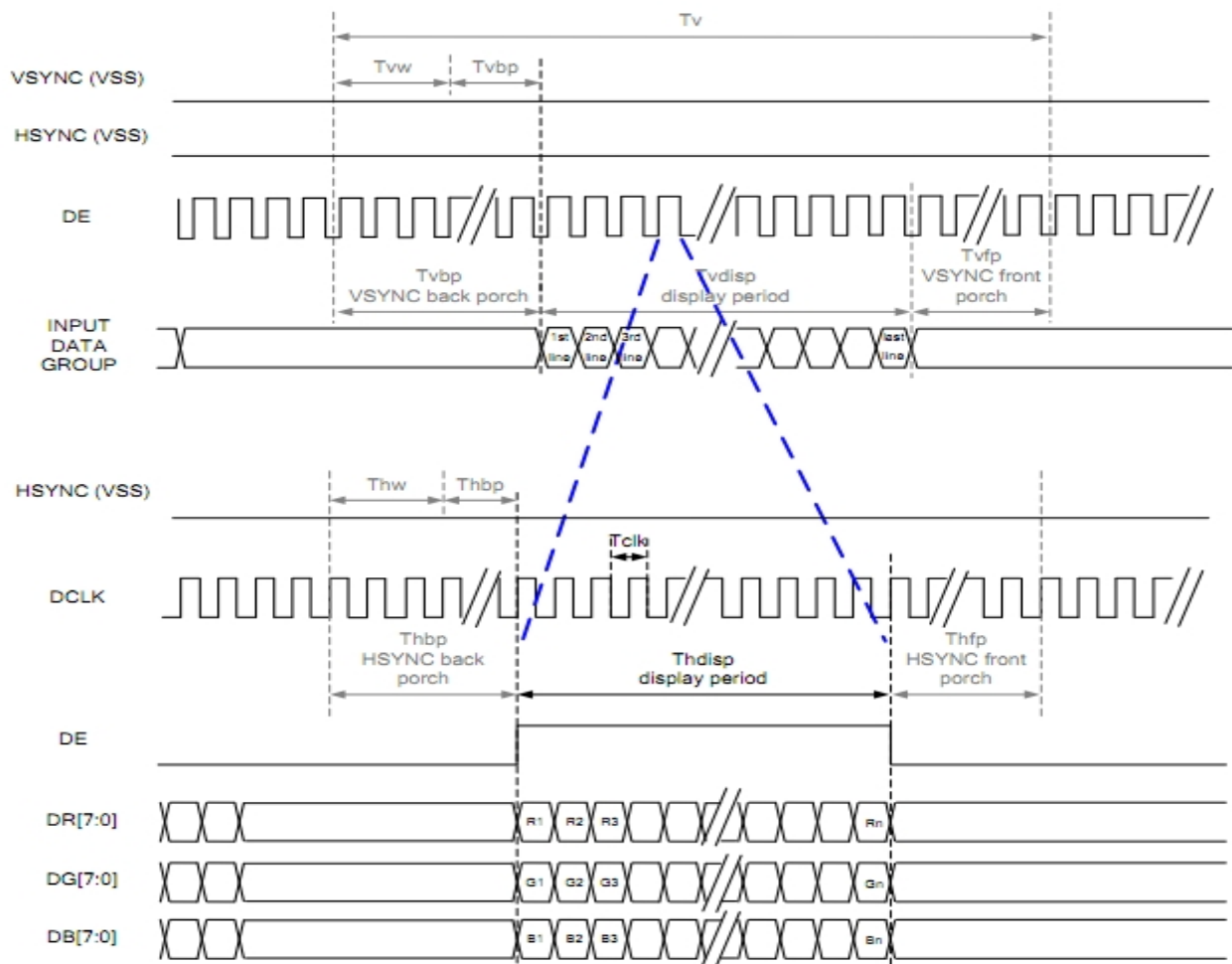
4.3.2.1.1 SYNC Mode



4.3.2.1.2 SYNC-DE Mode



4.3.2.1.3 DE Mode

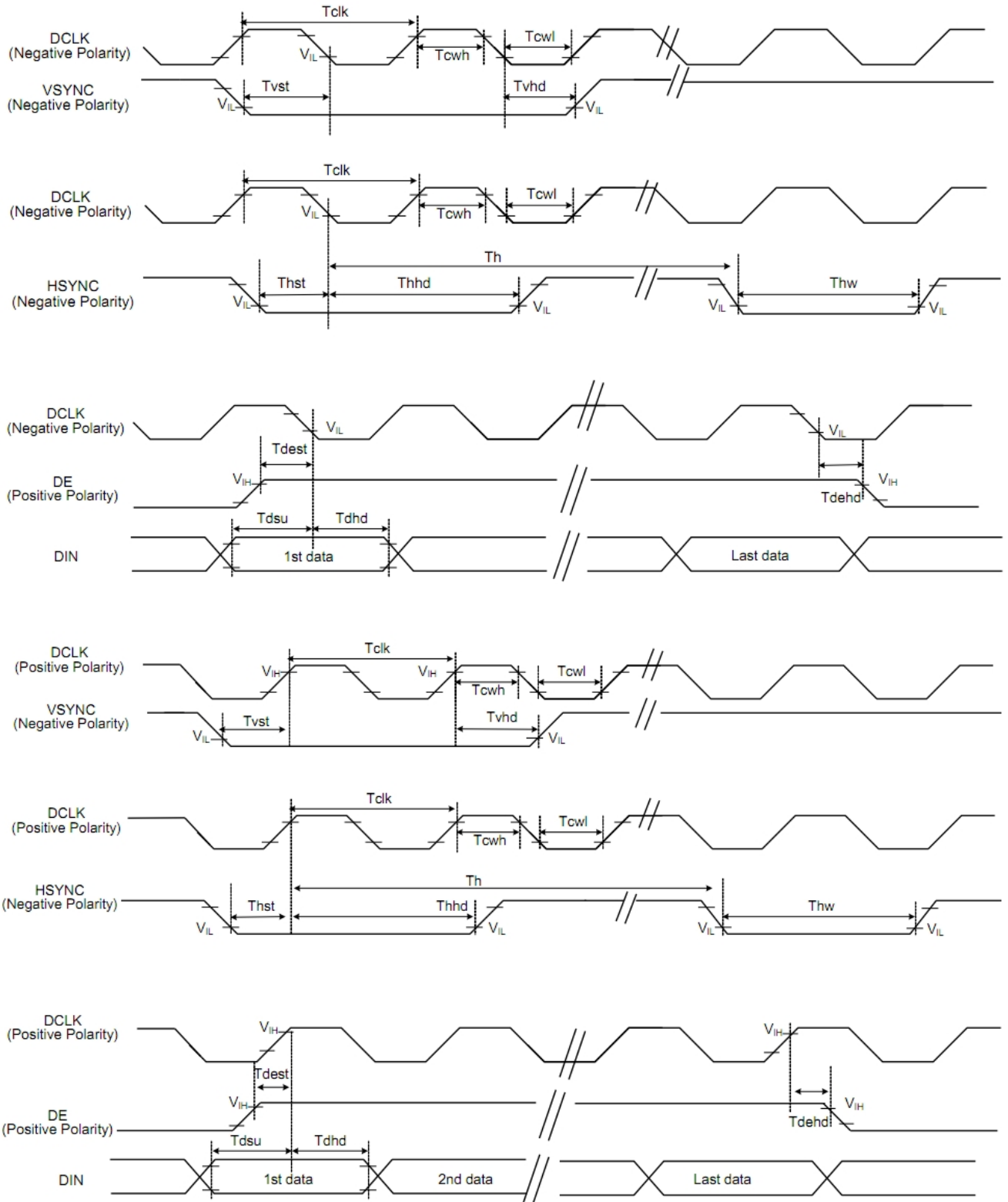


4.3.2.1.4 Parallel 24-bit RGB Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Interface Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	23	25	27	MHz	
HSYNC	Period Time	Th	808	816	896	DCLK
	Display Period	Thdisp	800			DCLK
	Back Porch	Thbp	4	8	48	DCLK
	Front Porch	Thfp	4	8	48	DCLK
	Pulse Width	Thw	2	4	8	DCLK
VSYNC	Period Time	Tv	488	496	504	HSYNC
	Display Period	Tvdisp	480			HSYNC
	Back Porch	Tvbp	4	8	12	HSYNC
	Front Porch	Tvfp	4	8	12	HSYNC
	Pulse Width	Tvw	2	4	8	HSYNC

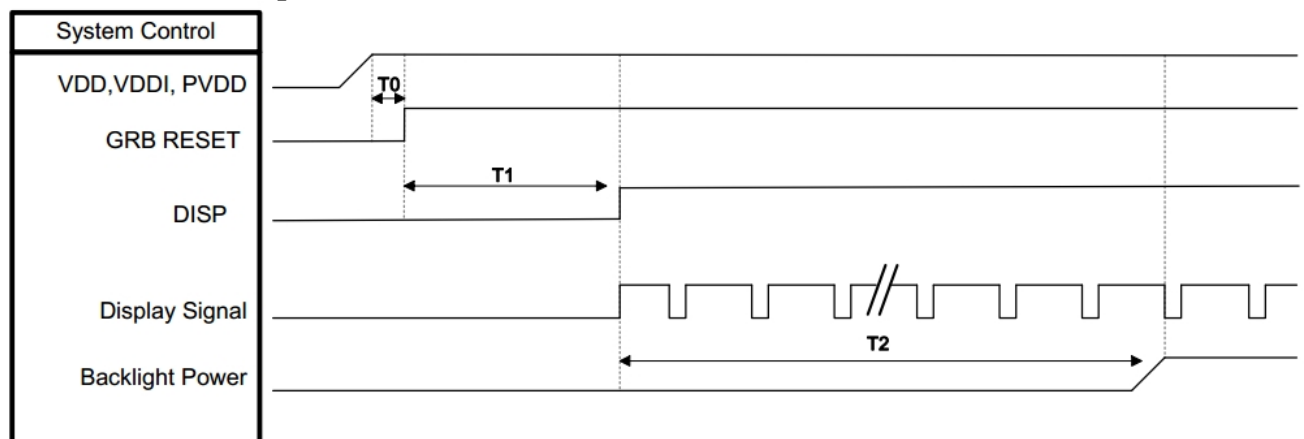
4.3.2.1.5 System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
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	12	-	-	ns	
DE Hold Time	Tdehd	12	-	-	ns	

4.3.3 Power ON/OFF Sequence

4.3.3.1 Power On Sequence

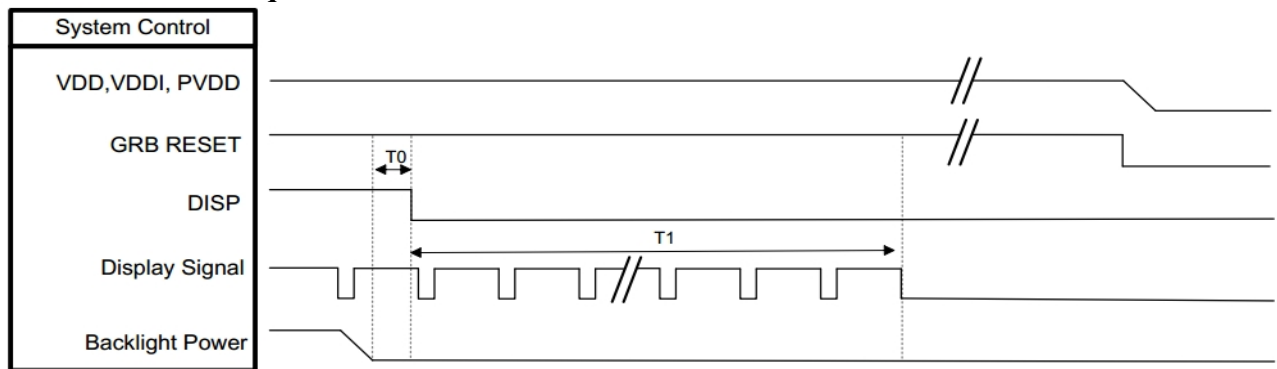


Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Note: LVDS interface Display signal: DCLK P/N; RX[3:0]P/N

4.3.3.2 Power Off Sequence



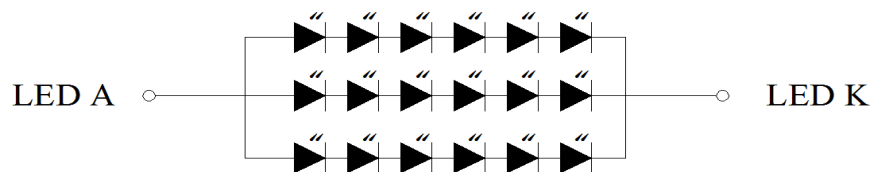
Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	100	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Note: LVDS interface Display signal: DCLK P/N; RX[3:0]P/N

4.3.4 Backlight Specification

4.3.4.1 Backlight Circuit



4.3.4.2 Absolute Ratings

Parameter	Symbol	Specifications	Unit
Power Dissipation	Pd	1152	mW
Forward Current(Single Chip)	Ifm	20	mA
Reverse Voltage	Vr	5	V

4.3.4.3 Electrical Characteristics

Item	Symbol	Min	Typ	Max	Unit	Conditions	Note
Voltage for Backlight	V _L	18	19.2	20.4	V	I _F =60mA	Note 1
Current for Backlight (Single Chip)	I _L	-	20	-	mA	Constant	-
Luminance (with LCD)	L	-	500	-	Cd/m ²	I _L =60mA	-
LED Lifetime	-	-	50000	-	Hr	-	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and I_L=60mA.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and I_L=60mA. The LED lifetime could be decreased if operating I_L is large than 60mA.5.

5. Optical Characteristics (T=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	
Contrast Ratio	CR	$\theta=0^\circ, \phi=0^\circ$	800	1000	-	-	Note1	
Surface Luminance	L	$\theta=0^\circ, \phi=0^\circ$	400	500	-	Cd/m2	Note2	
Luminance Uniformity	U_L	$\theta=0^\circ, \phi=0^\circ$	70	75	-	%	Note3	
Response Time	T_r+T_f	$\theta=0^\circ, \phi=0^\circ$	45	50	-	ms	Note4	
Color Chromaticity (CIE1931)	Red	R_x	VDD=3.3V VDDI=3.3V $I_L=60mA$ $\theta=0^\circ, \phi=0^\circ$	-	0.629	-	-	Note5
		R_y		-	0.326	-		
	Green	G_x		-	0.337	-		
		G_y		-	0.546	-		
	Blue	B_x		-	0.136	-		
		B_y		-	0.143	-		
	White	W_x		-	0.320	-		
W_y		-	0.345	-				
Color Gamut	NTSC	CIE1931	45	50	-	%	Note5	
Viewing Angle	$\phi=90^\circ$	θ_T	$Cr \geq 10$	70	80	-	Degree	Note6
	$\phi=270^\circ$	θ_B		70	80	-	Degree	
	$\phi=180^\circ$	θ_L		70	80	-	Degree	
	$\phi=0^\circ$	θ_R		70	80	-	Degree	

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula.
For more information see FIG.2.

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

Measured at the center area of the LCD

Note2. Definition of surface luminance

Surface luminance is the luminance with all pixels displaying white.

For more information see FIG.2.

L_v = Average Surface Luminance with all white pixels(P1,P2,P3, ,Pn)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

$$Y_u = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}$$

Note4. Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position P5. For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on TOPCON's BM-5or BM-7 photo detector or compatible.

Note: For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of response Time

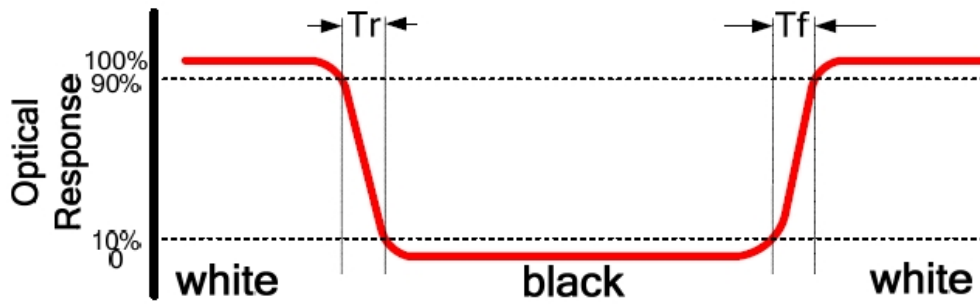


FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity

Size : $S \leq 5"$ (see Figure a)

A : 5 mm B : 5 mm

H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

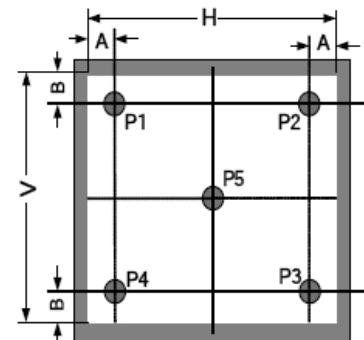


Figure a

Size : $5" < S \leq 12.3"$ (see Figure b)

H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

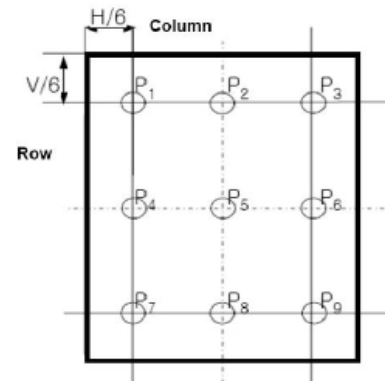


Figure b

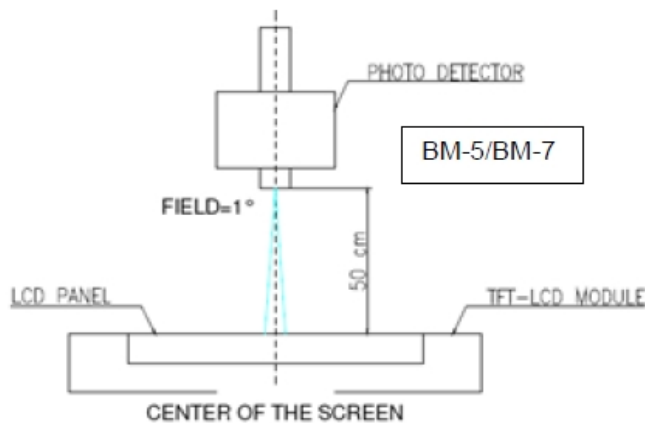
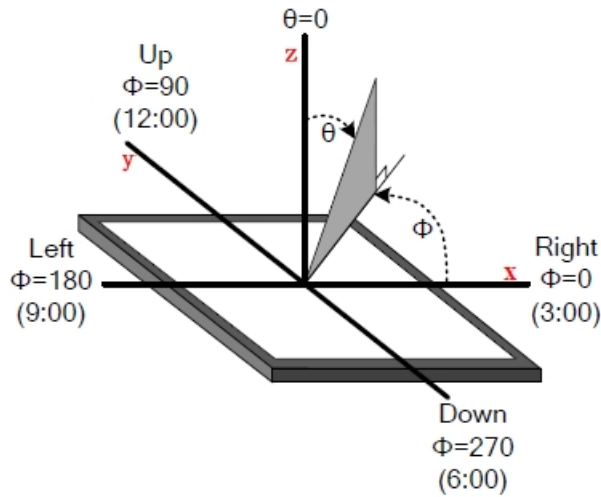


Figure c

FIG.3. The definition of viewing angle

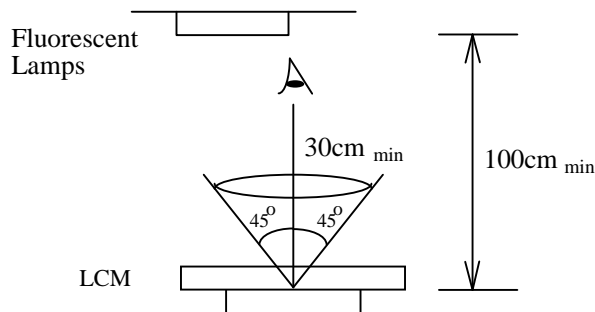


6. Quality Specifications

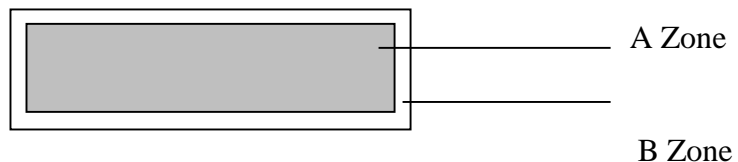
6.1 Condition for product appearance inspection

Manner of appearance test: The inspection should be performed in using 20W x 2 fluorescent lamps.
 Distance between LCM and fluorescent lamps should be 100 cm or more. Distance between LCM and inspector eyes should be 30 cm or more.

Viewing direction for inspection is 45° from vertical against LCM.



Definition of zone:



A Zone: Active display area (minimum viewing area).

B Zone: Non-active display area (outside viewing area).

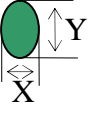
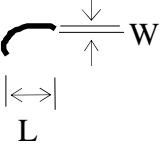
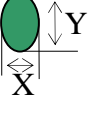
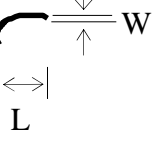
6.2 Function Inspection

Inspecting items	Inspecting criterion	Classification of defects
All functional defects	No display Display abnormally Missing vertical,horizontal segment Short circuit Back-light no lighting or abnormal lighting,and abnormally lighting. Obvious striation Current consumption exceeds limit	Major
Missing	Missing component	
Outline Dimension	Referred to counter drawing	

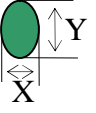
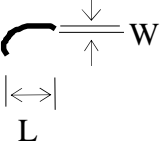
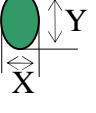
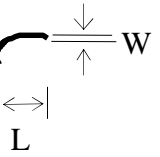
6.3 TFT - LCD Pixel Inspection

Items	Judgment striation		
	$S \leq 5.0inch$	$5.0 < S \leq 7.0inch$	$7.0 < S \leq 12.1inch$
Bad dot-bright dot(R、 G、 B)	1	2	3
Two adjacent bright point	0	1	2
Three or more adjacent bright point	0	0	0
Total points for bad dot-bright dot	1	3	5
Bad dot-dark dot	2	4	5
Two adjacent bright point	1	2	3
Three or more adjacent bright point	0	1	1
Total points for bad dot-dark dot	3	7	9

6.4 TFT Module Dot And Line Inspection

Item	Judgment criterion				Figure	
	LCD Size	S≤5.0 inch	5.0<S≤7.0 inch	7.0<S≤12.1 inch		
Dot Inspection	D≤0.1		allowed	allowed	allowed	 $D=(X+Y)/2$
	0.1<D≤0.2		4	allowed	allowed	
	0.3<D≤0.3		0	5	6	
	0.3<D≤0.5		0	0	6	
	D>0.5		0	0	0	
	The distance between two defect dot:DS≥5mm					
Line Inspection	L(mm)	W(mm)	Judgment criterion			
	disregard	W≤0.05	allowed	allowed	allowed	
	L≤5	0.05<W≤0.1	4	5	7	
	L>5	W>0.1	0	0	0	
Concave Point and Air Bubble for Polarizer	LCD size(mm)		Judgment criterion			 $D=(X+Y)/2$
	D≤0.3		allowed	allowed	allowed	
	0.3<D≤1.0		3	4	5	
	01.0<D≤1.5		1	2	3	
	D>1.5		0	0	0	
Fold Mark、Linear Scar for Polarizer	L(mm)	W(mm)	Judgment criterion			
	disregard	W≤0.05	allowed	allowed	allowed	
	1<L≤5	0.05<W≤0.2	3	4	5	
	L>5	W>0.2	0	0	0	

6.5 TFT +PCAP Module Dot And Line Inspection

Item	Judgment criterion					Figure
	TFT Module Size		S≤5.0 inch	5.0<S≤7.0 inch	7.0<S≤12.1 inch	
Dot Inspection	D≤0.1		allowed	allowed	allowed	 D=(X+Y)/2
	0.1<D≤0.2		6	allowed	allowed	
	0.3<D≤0.3		0	8	9	
	0.3<D≤0.5		0	0	6	
	D>0.5		0	0	0	
	The distance between two defect dot:DS≥5mm					
Line Inspection	L(mm)	W(mm)	Judgment criterion			
	disregard	W≤0.05	allowed	allowed	allowed	
	L≤5	0.05<W≤0.1	6	7	8	
	L>5	W>0.1	0	0	0	
	The distance between two defect dot:DS≥20mm					
Concave Point and Air Bubble for Polarizer	LCD size(mm)		Judgment criterion			 D=(X+Y)/2
	D≤0.3		allowed	allowed	allowed	
	0.3<D≤1.0		5	6	7	
	1.0<D≤1.5		3	4	5	
	D>1.5		0	0	0	
Fold Mark、Linear Scar for Polarize	L(mm)	W(mm)	Judgment criterion			
	disregard	W≤0.05	allowed	allowed	allowed	
	1<L≤5	0.05<W≤0.2	3	4	5	
	L>5	W>0.2	0	0	0	

6.6 Module Cosmetic Criteria

Item	Judgment Criterion
Difference in Spec	None allowed
Pattern Peeling	No substrate pattern peeling and floating
Soldering Defects	No soldering missing No soldering bridge No cold soldering
Stain	No stain to spoil cosmetic badly
Plate Discoloring	No plate fading, rusting and discoloring
Newton Ring	Referring to limited sample
Mura	Invisible with 5%ND,allowed
Light Leaks	Referring to limited sample

7. Reliability Test

Test Item	Conditions		Criteria
	Temperature	Time (hrs)	
High Temp. Storage	+80°C	240	/
High Temp. Operating	+70°C	240	/
Low Temp. Storage	-30°C	240	/
Low Temp. Operating	-20°C	240	/
High Temperature & High Humidity Operation	60°C/ 90%RH	240	/
Thermal Shock , Storage	-40°C ← 25°C → +85°C (30 min ← 3 min → 30min)	20cycles	/
Package Drop Test	Heigh:60cm 1 corner,3edges,6surfaces	/	/
ESD Test (Non-operation)	150pF,330 Ω , Contact ± 4KV,Air : ± 8KV.Note 1	/	/
	200pF,0 Ω , ± 200V Contact test.Note 2	/	/

Note:Measure Point:

Note 1: LCD glass and metal bezel

Note 2: IF connector pins

Note3: 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 don't guarantee all of the cosmetic specification.

Note4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

8. PRECAUTIONS

8.1 Handling

- 8.1.1** Polarizer Cleaning, Petroleum ether (or N-hexane) is recommended for cleaning the front/rear polarizers and reflectors, acetone, toluene and ethanol are not allowed to avoid damaging the surface.
- 8.1.2** Body grounding, must wear Anti-ESD wrist strap while pick up LCDs.
- 8.1.3** FPC Soldering, less than 300°C/3S, solder must be grounding on grounding bench.
- 8.1.4** If use electric Screwdriver to do assembly, screwdriver must be grounding.

8.2 Storage

- 8.2.1** Keep in a sealed polyethylene bag.
- 8.2.2** Keep in a dark place.
- 8.2.3** Keep in temperature between 0 °C and 35 °C.
NOT allowed at 70 °C for more than 160 Hours, or at -20 °C for more than 48 Hrs.

8.3 Safety

If liquid crystal leak out of a damaged glass cell, **DO NOT** put it in your mouth or touch eyes, if the liquid crystal touch your skin or clothes, please wash it off immediately using soap and water.

9. Limited Warranty

As per agreements

9.1 RETURNING LCM UNDER WARRANTY – TERMS AND CONDITIONS

- 9.1.1** No warranty can be granted if the precautions stated above have been disregarded.
The typical examples of violations are :
 - Broken LCD glass.
 - Circuit modified in any way, including addition of components.
- 9.1.2** Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB' s eyelet, conductors and terminals.