

**SPECIFICATION
FOR
LCM+RTP Module**

MODULE No:	KDG043WQFPA12401-RT
CUSTOMER:	

GEMINI	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

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* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, 4 wires resistance touch screen, back-light unit. The resolution of a 4.3''TFT-LCD contains 480X272 pixels, and can display up to 65K/262K/16.7M colors.

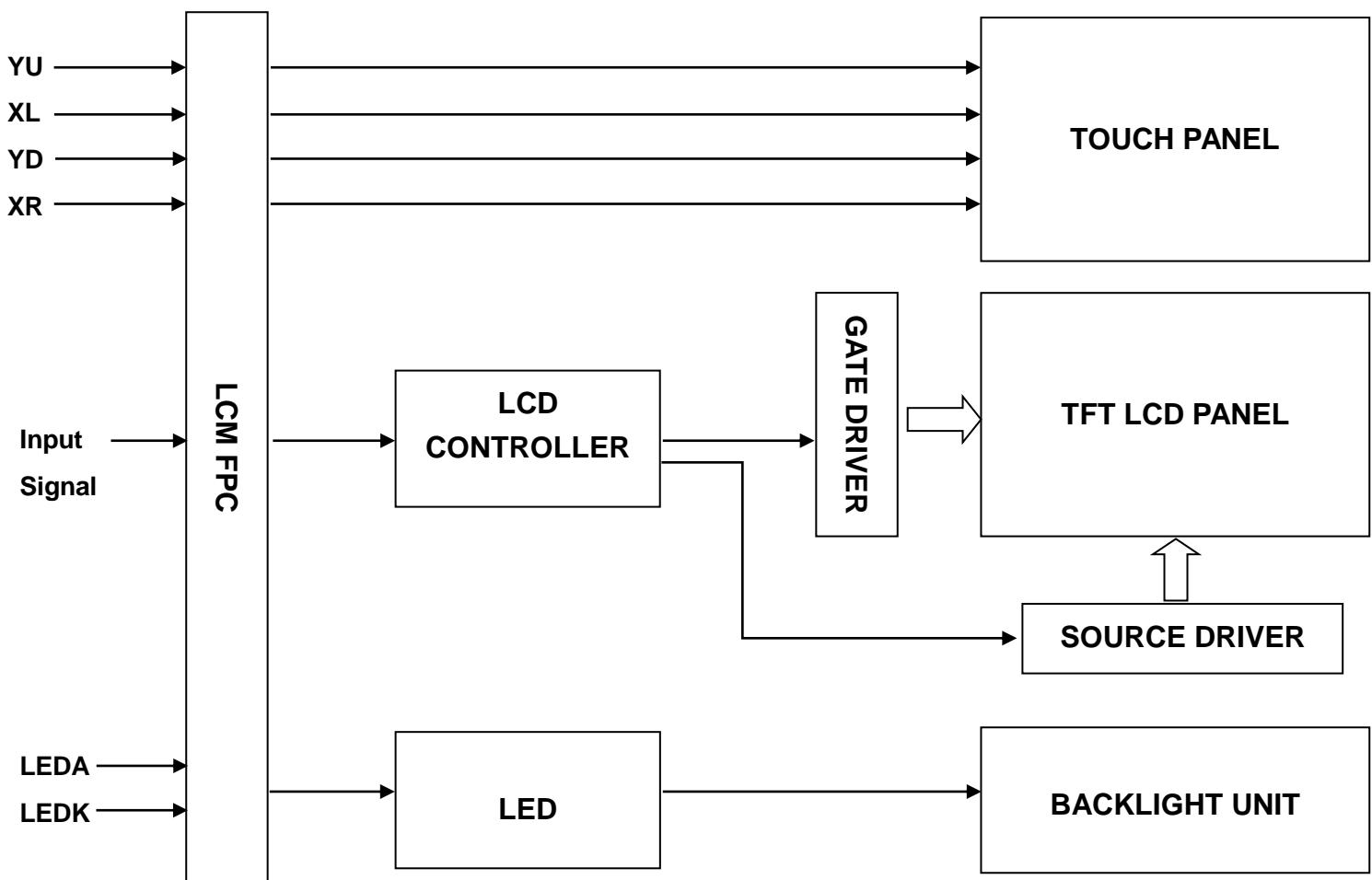
* Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	95.04(H)*53.86(V) (4.3inch)	mm	
Driver element	TFT active matrix	-	
Display colors	65K/262K/16.7M	colors	
Number of pixels	480(RGB)*272	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.198(H)*0.198(V)	mm	
Viewing angle	FREE	o'clock	
Controller IC	ST7283	-	
LCM Interface	24/8 BIT RGB	-	
Display mode	Transmissive /Normally black	-	
Operating temperature	-30~+85	°C	
Storage temperature	-30~+85	°C	

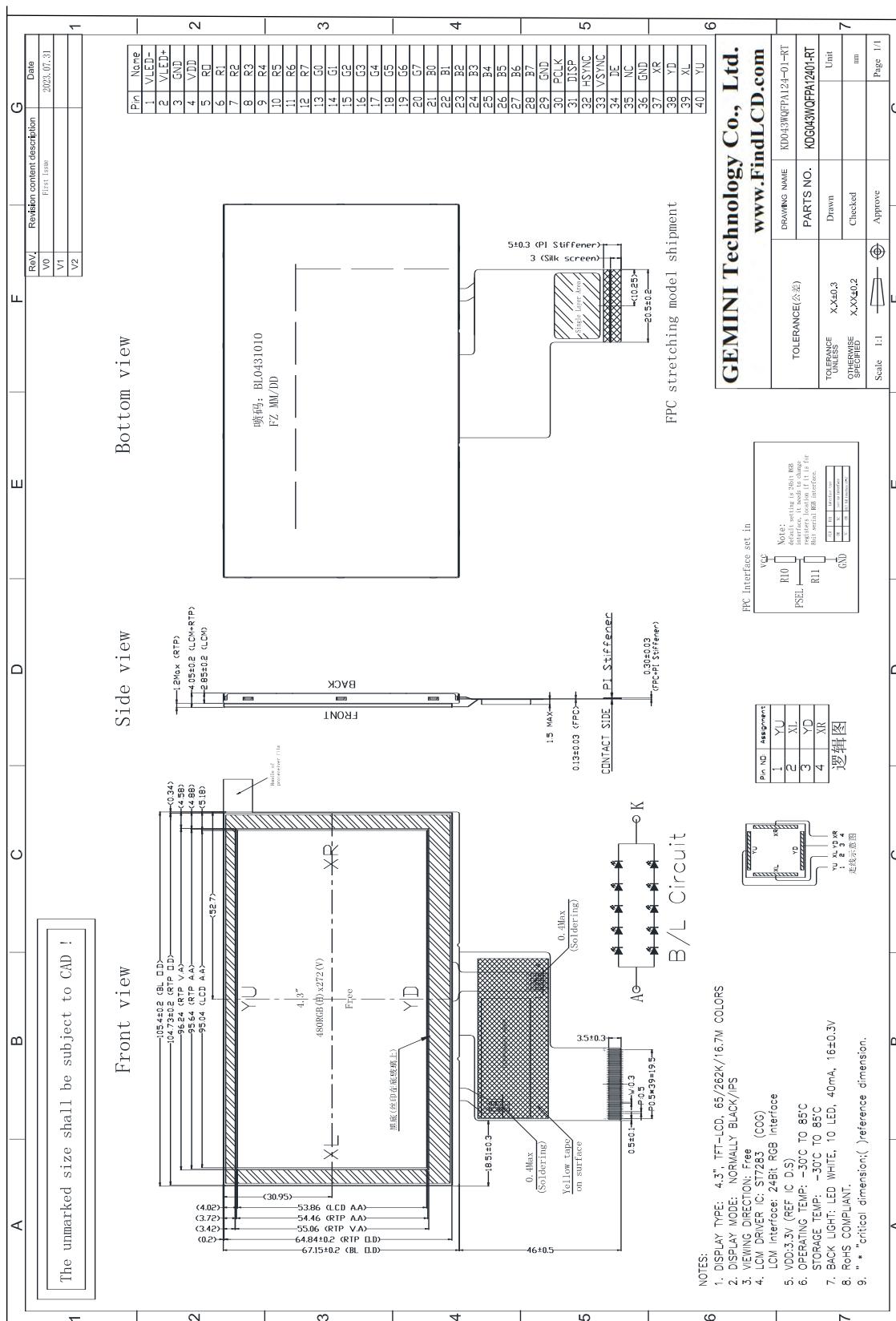
* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	105.4	-	mm	
	Vertical(V)	-	67.15	-	mm	
	Depth(D)	-	4.05	-	mm	
Weight		-	55	-	g	

1. Block Diagram



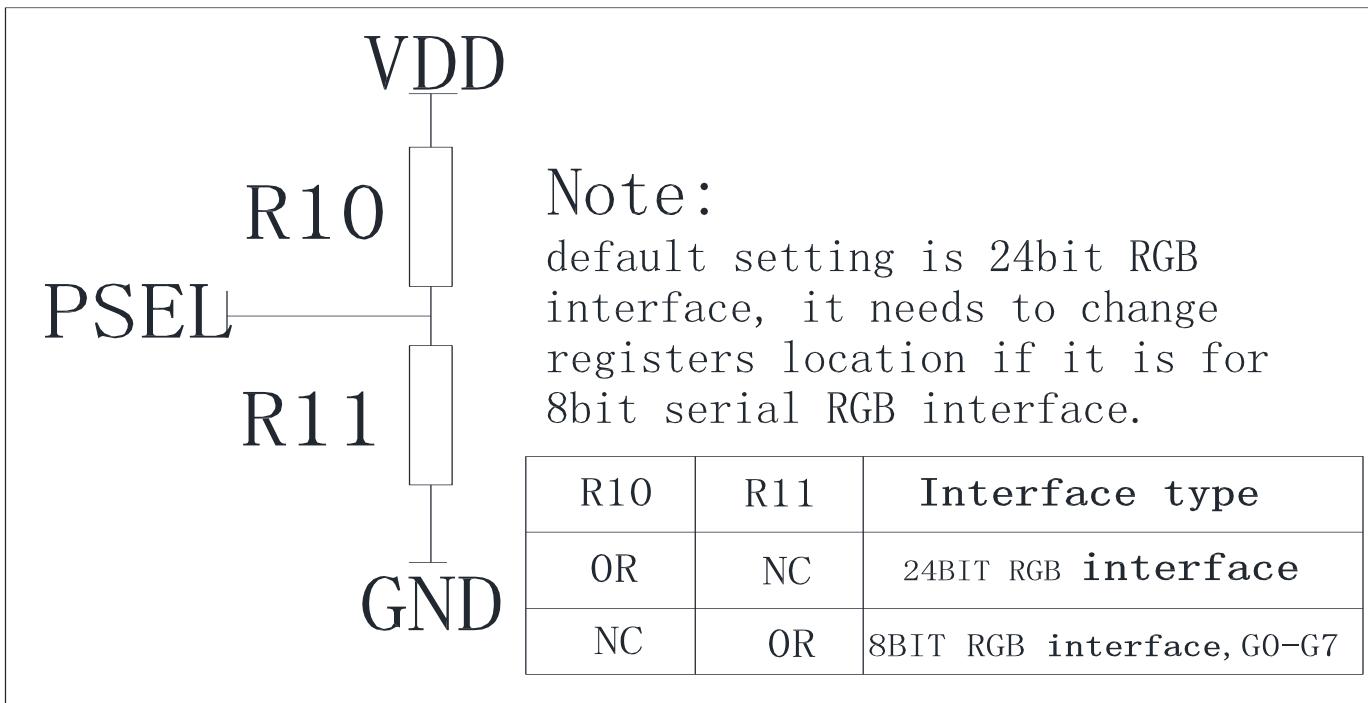
2. Outline dimension



3. Input terminal Pin Assignment

NO.	SYMBOL	DESCRIPTION	I/O
1	VLED-	Cathode pin of backlight	P
2	VLED+	Anode pin of backlight	P
3	GND	Ground.	P
4	VDD	Supply voltage(3.3V).	P
5-12	R0-R7	8-bit digital Red data input	I
13-20	G0-G7	8-bit digital Green data input. Serial 8-bit RGB interface and input through DG[7:0].	I
21-28	B0-B7	8-bit digital Blue data input	I
29	GND	Ground.	P
30	PCLK	Clock signal; latching data at the falling edge	I
31	DISP	Display control / standby mode selection. DISP = “Low” : Standby; (Default) DISP = “High” : Normal display	I
32	H SYNC	Horizontal sync signal; negative polarity	I
33	V SYNC	Vertical sync signal; negative polarity	I
34	DE	Data input enable. Active High to enable the data input When not used in SYNC mode, user should connect it to “Low”.	I
35	NC	--	--
36	GND	Ground.	P
37	XR	Touch panel Right Glass Terminal	A/D
38	YD	Touch panel Bottom Film Terminal	A/D
39	XL	Touch panel Left Glass Terminal	A/D
40	YU	Touch panel Top Film Terminal	A/D

FPC Interface set in



4. LCD Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note	
Contrast Ratio		CR	$\Theta=0$ Normal viewing angle	1000	1200	--		(1)(2)	
Response time	Rising	T_{R+T_F}		--	30	35	msec	(1)(3)	
	Falling			40	46.4	--	%	C-light	
Color Gamut		S(%)	$\Theta=0$ Normal viewing angle	0.307				(1)(4) CA- 310	
Color Filter Chromacity	White	W _X		0.342					
		W _Y		0.576					
	Red	R _X		0.335					
		R _Y		0.348					
	Green	G _X		0.567					
		G _Y		0.155					
	Blue	B _X		0.119					
		B _Y							
Viewing angle	Hor.	Θ_L	CR>10	80	85	--		(1)(4)	
		Θ_R		80	85	--			
	Ver.	Θ_U		80	85	--			
		Θ_D		80	85	--			
Option View Direction		FREE							

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

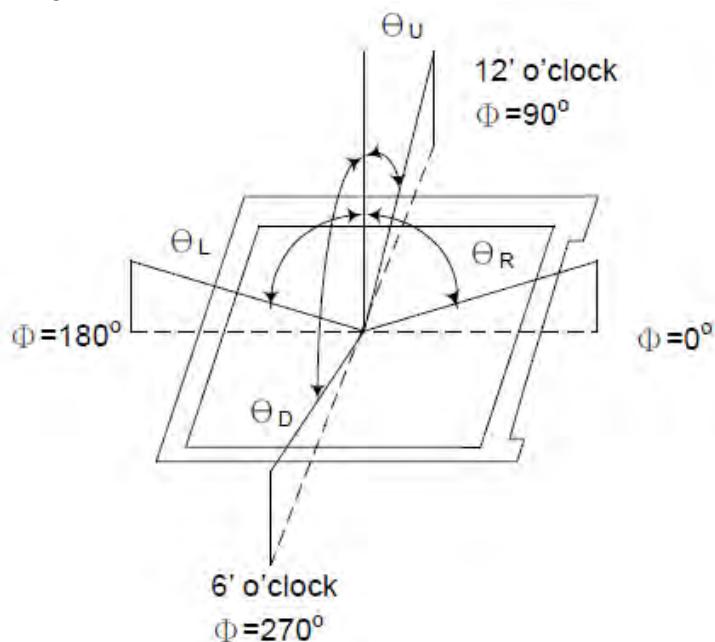
Ambient temperature : $25 \pm 2^\circ\text{C}$

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

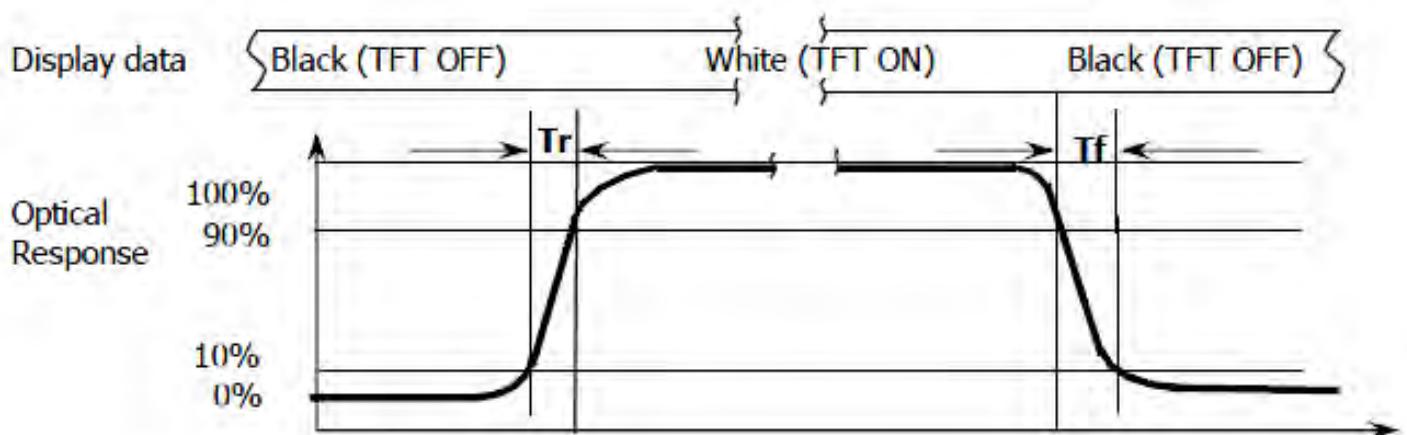
Note (1): Definition of Viewing Angle :



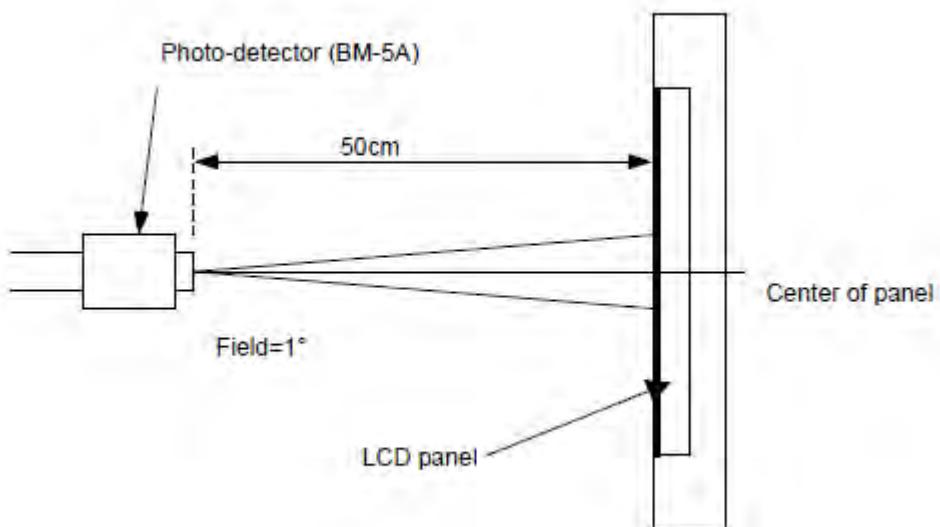
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



Note (4): Definition of optical measurement setup



5. Electrical Characteristics

5.1 Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VDD	-0.3	4.6	V	Note1
Operating temperature	T _{OP}	-30	+85	°C	
Storage temperature	T _{ST}	-30	+85	°C	

NOTE1: 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, therefore, 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.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Normal mode Current	IDD	--	25	50	mA	
Level input voltage	V _{IH}	0.7VDD	--	VDD	V	
	V _{IL}	GND	--	0.3VDD	V	
Level output voltage	V _{OH}	VDD-0.4	--	--	V	
	V _{OL}	GND	--	GND+0.4	V	

5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 10 chips LED

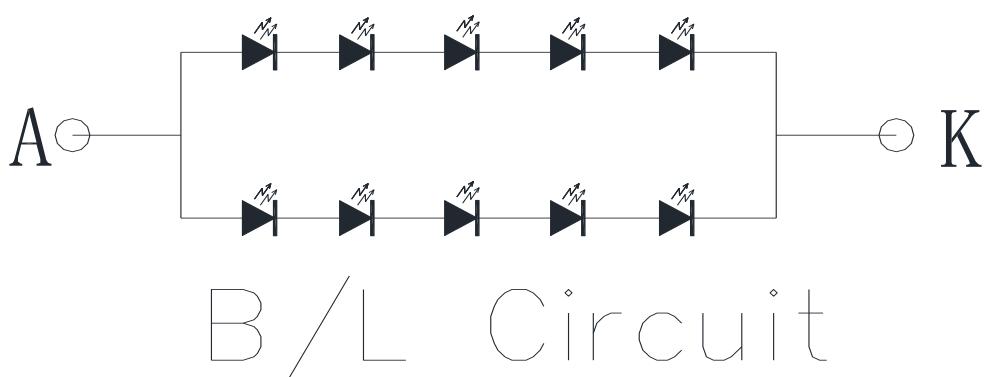
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	35	40	--	mA	
Forward Voltage	V_F	14.0	16.0	17.0	V	
LCM Luminance ($I_F=40\text{mA}$)	LV	650	750	--	cd/m ²	Note3
LED life time	Hr	50000		--	Hour	Note1,2
Uniformity	Avg	80	--	--	%	Note3

Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

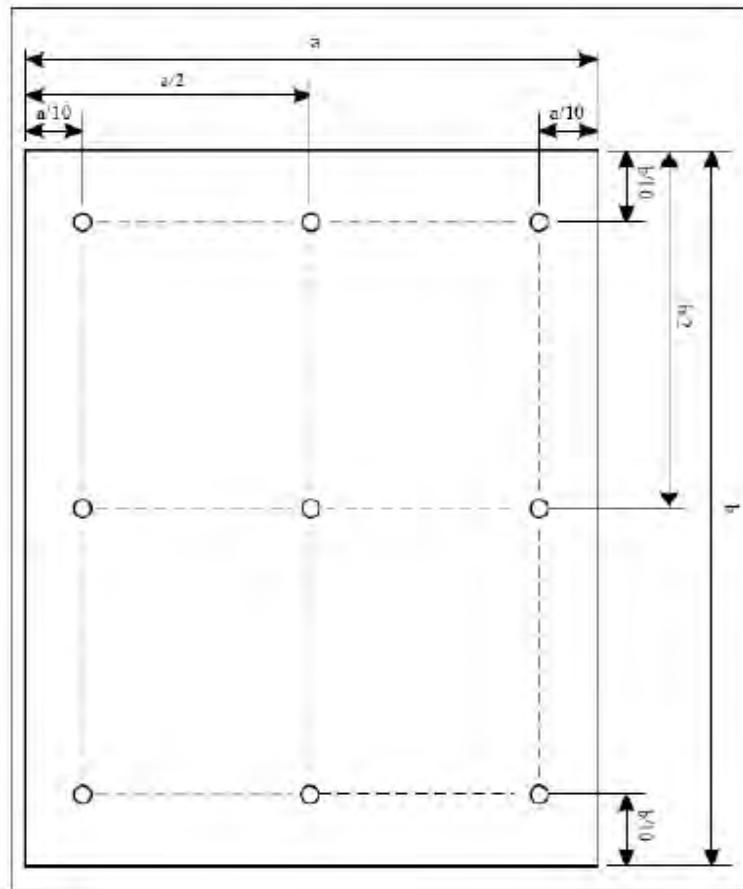
$T_a=25\pm3\text{ }^{\circ}\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at

$T_a=25^{\circ}\text{C}$ and $IL=40\text{ mA}$. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.



Note (3) Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

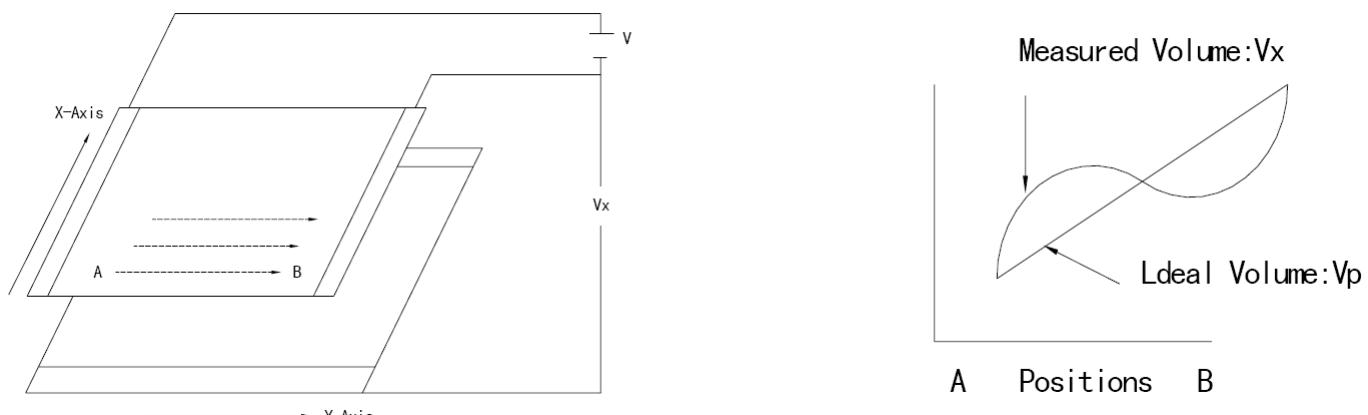
6. TP Feature

6.1 Conditions of use and storage

Item	Value(condition)	Note
Temperature range upon operation	Humidity: 20%~90% non dew, condensation -30°C~85°C	In a simple substance
Temperature range upon storage	Humidity: 20%~90% non dew, condensation -30°C~85°C	In a simple substance

6.2 Electrical property

Item	Value	Note
Maximum voltage	DC5V	
Resistance between terminals	X direction[Film side]:200-600Ω	
	Y direction [Glass side]:300-900Ω	
Insulation resistance	DC 25V 20MΩor above	Connect X + ~X- and Y+ ~Y-, apply 25VDC Between X and Y for perform measurements
Chattering	10 msec or below	
Rating	Voltage is DC 5V	



6.3 Mechanical property

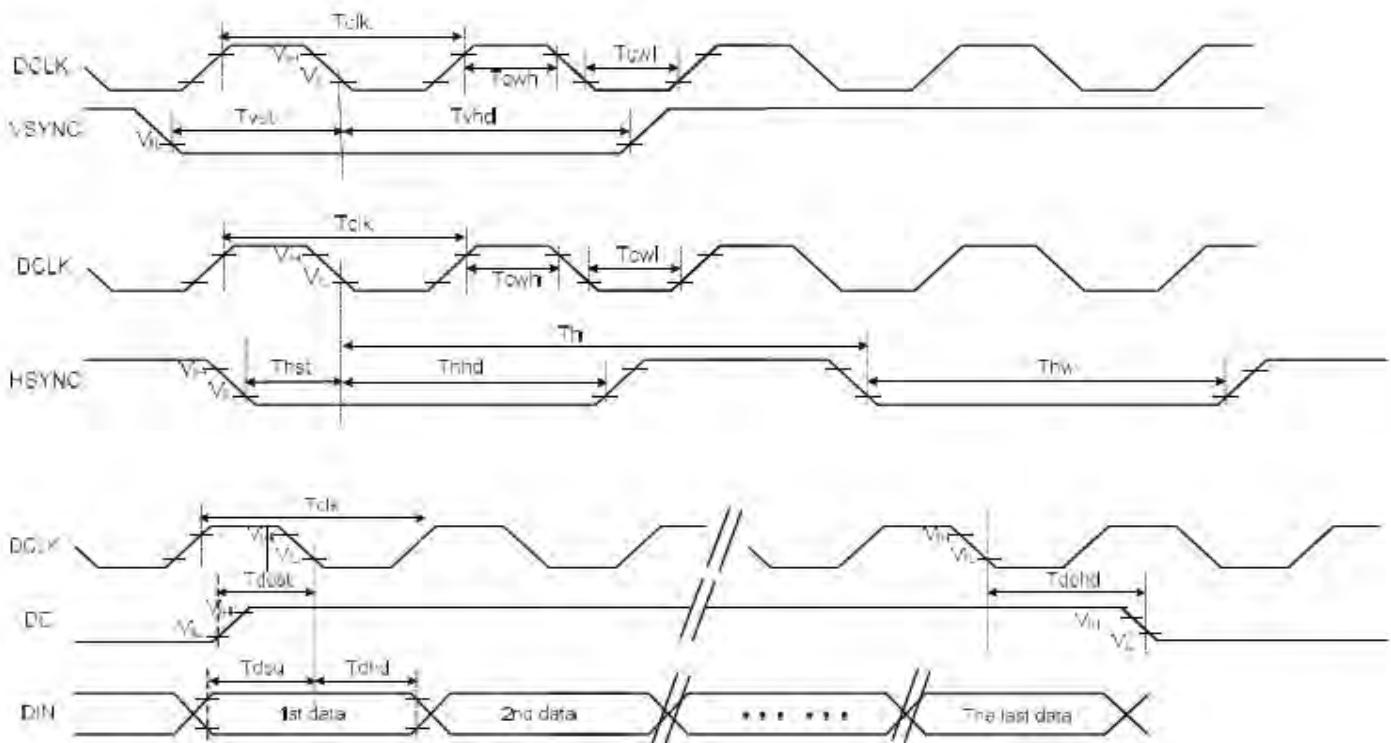
Item	Performance		Note
Input method	Used of an exclusive pen or finger		
Load upon operation	Exclusive pen	60-100g or below	Operation and measurement with a pen must be carried out under the following tip conditions: Stylus pen material : POM(ployacetal) . Tip : Diameter 3.0mm, SR 0.8 mm
	Finger	60-100g or below	Operations and measurement methods simulated for a finger must be carried out under the following tip conditions. Material :Silicon rubber (Hardness : 30°Hs) Tip : Diameter 12.0 mm, SR 12.5mm
Surface hardness	Pencil hardness : 3H or above		It complies with the way of test method JIS K5400.

6.4 Optical property

Item	Performance	Note
Total light transmittance	80% or above	JIS K7105
Haze	5% or below	JIS K7136
Film specification	Polished type with hard coated surface	

7. AC Characteristic

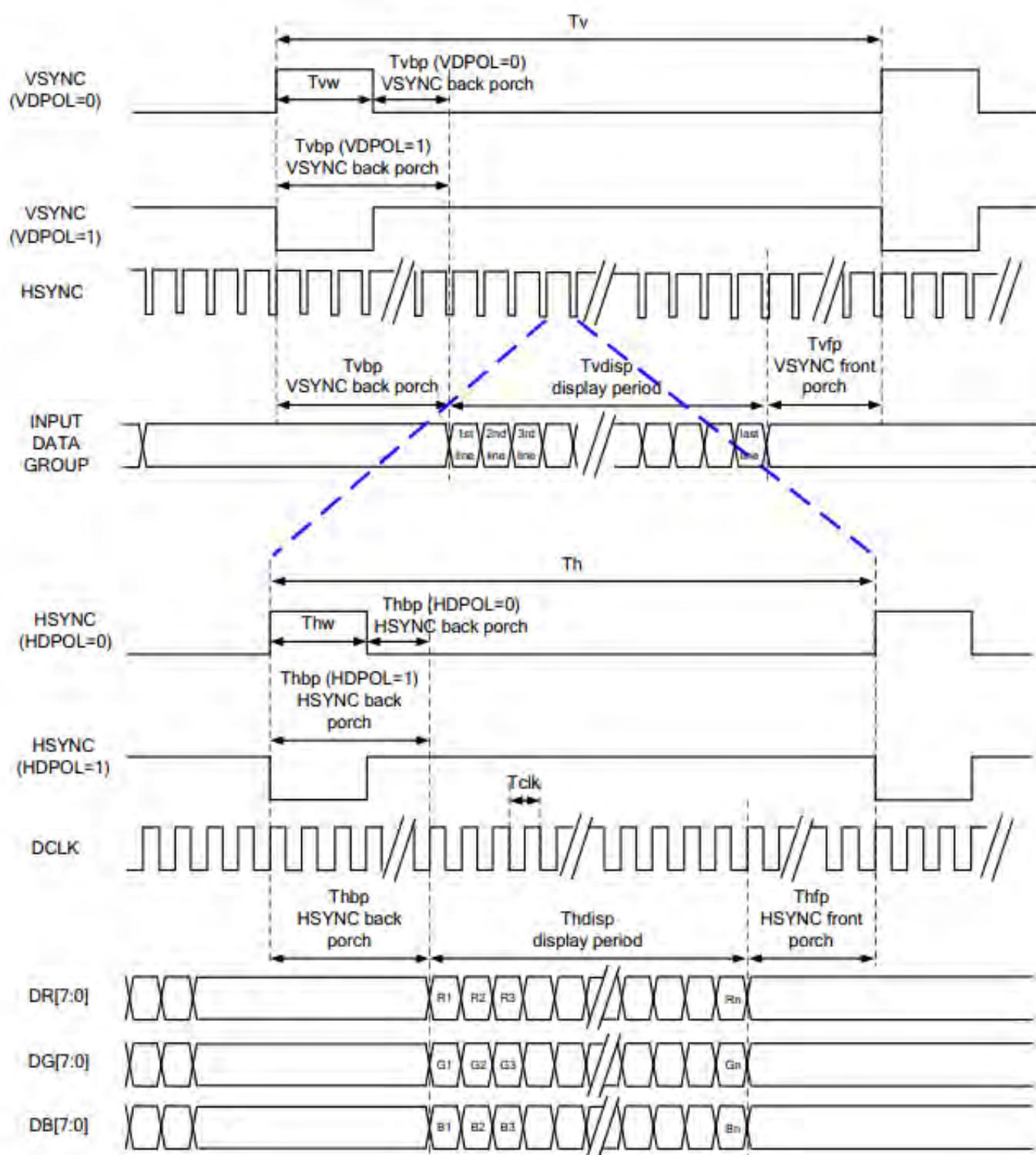
7.1 System Bus Timing for RGB Interface



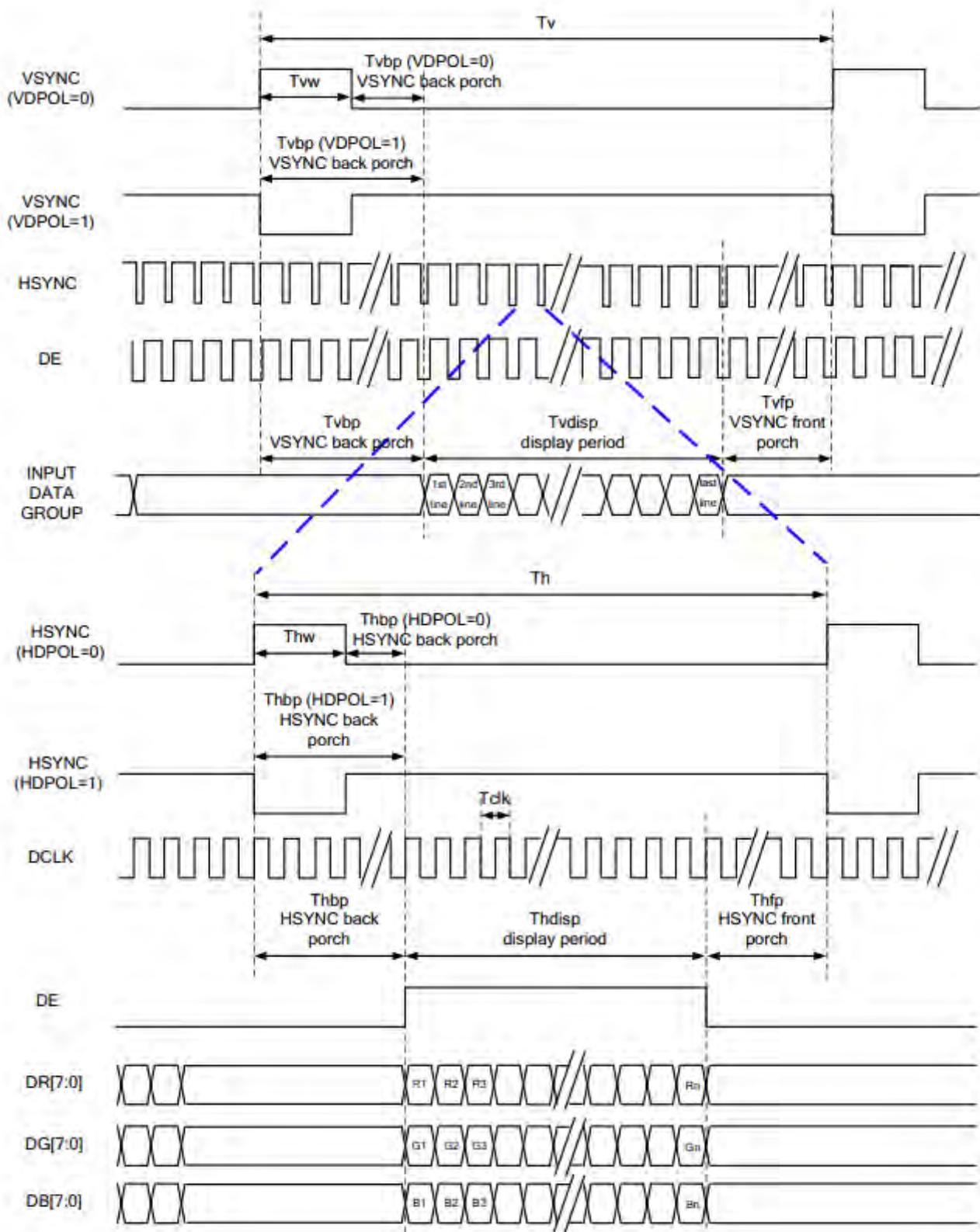
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	T_{cw}	40	50	60	%	
HSYNC Width	T_{hw}	2	-	-		DCLK
HSYNC Period	T_h	55	60	65	us	
VSYNC Setup Time	T_{vst}	12	-	-	ns	
VSYNC Hold Time	T_{vh1}	12	-	-	ns	
HSYNC Setup Time	T_{hst}	12	-	-	ns	
HSYNC Hold Time	T_{hhd}	12	-	-	ns	
Data Setup Time	T_{dsu}	12	-	-	ns	
Data Hold Time	T_{dhd}	12	-	-	ns	
DE Setup Time	T_{dest}	12	-	-	ns	
DE Hold Time	T_{dehd}	12	-	-	ns	

7.2 RGB Interface

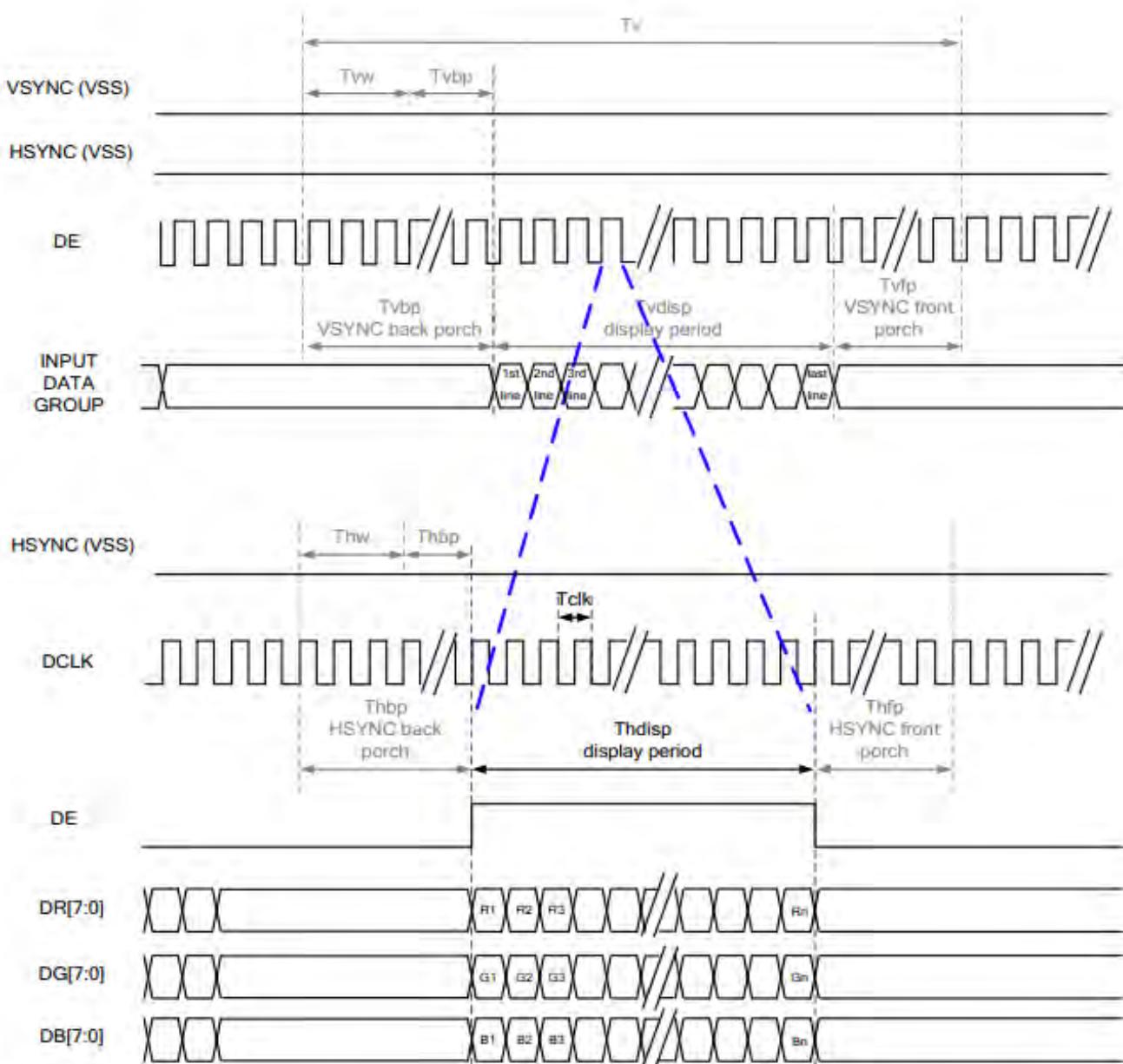
7.2.1 SYNC Mode



7.2.2 SYNC-DE Mode



7.2.3 DE Mode



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.

7.3 RGB Input Timing Table

7.3.1 Parallel 24-bit RGB Timing Table

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

480RGB X 272 Resolution Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	8	9	12	MHz	
DCLK Period	Tclk	83	111	125	ns	
Hsync	Period Time	Th	485	531	598	DCLK
	Display Period	Thdisp		480		DCLK
	Back Porch	Thbp	3	43	43	DCLK
	Front Porch	Thfp	2	8	75	DCLK
	Pulse Width	Thw	2	4	43	DCLK
Vsync	Period Time	Tv	276	292	321	Hsync
	Display Period	Tvdisp		272		Hsync
	Back Porch	Tvbp	2	12	12	Hsync
	Front Porch	Tvfp	2	8	37	Hsync
	Pulse Width	Tvw	2	4	12	Hsync

Note: It is necessary to keep $Tvbp = 12$ and $Thbp = 43$ in sync mode. DE mode is unnecessary to keep it.

7.3.2 Series 8-bit RGB Timing Table

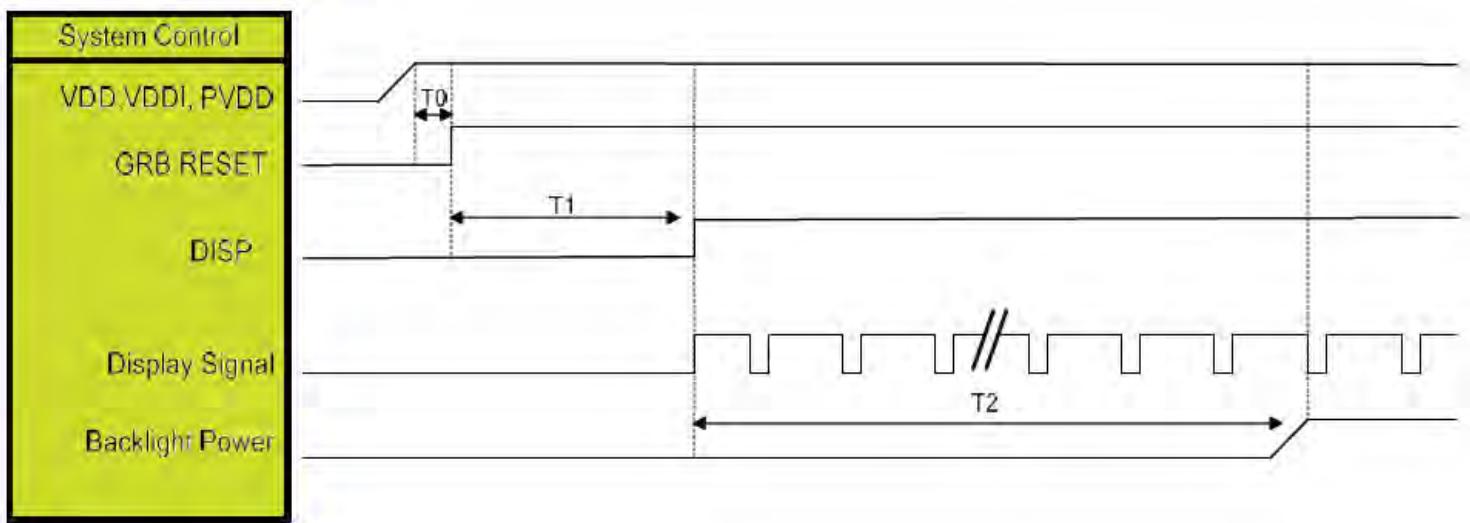
Serial 8-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

480RGB X 272 Resolution Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	24	27	30	MHz	
DCLK Period	Tclk	33	37	42	ns	
Hsync	Period Time	Th	1445	1491	1558	DCLK
	Display Period	Thdisp		1440		DCLK
	Back Porch	Thbp	3	43	43	DCLK
	Front Porch	Thfp	2	8	75	DCLK
	Pulse Width	Thw	2	4	43	DCLK
Vsync	Period Time	Tv	276	292	321	Hsync
	Display Period	Tvdisp		272		Hsync
	Back Porch	Tvbp	2	12	12	Hsync
	Front Porch	Tvfp	2	8	37	Hsync
	Pulse Width	Tvw	2	4	12	Hsync

Note: It is necessary to keep $Tvbp = 12$ and $Thbp = 43$ in sync mode. DE mode is unnecessary to keep it.

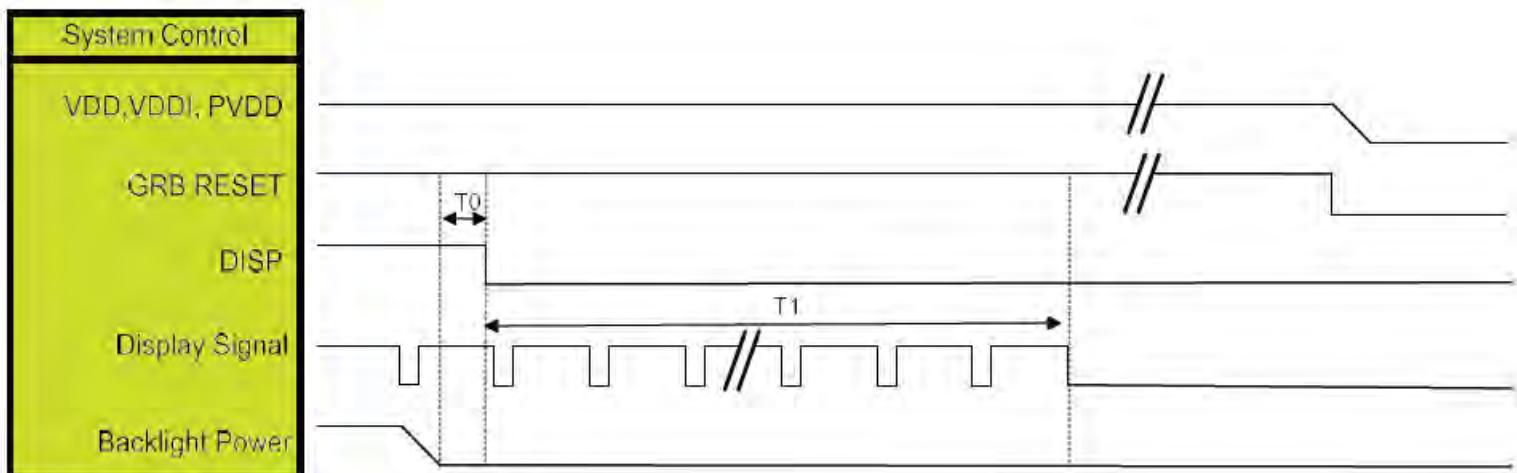
8. POWER ON/OFF SEQUENCE

8.1 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

8.2 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	80	ms

9. LCD Module Out-Going Quality Level

9.1 VISUAL & FUNCTION INSPECTION STANDARD

9.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

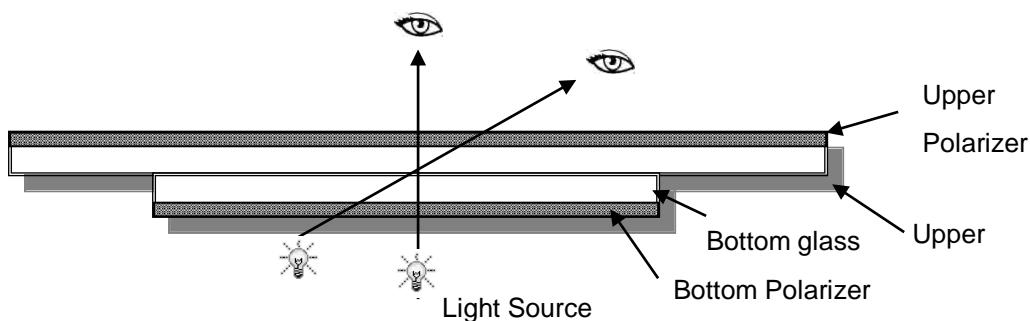
Temperature : $25\pm5^{\circ}\text{C}$

Humidity : $65\%\pm10\%\text{RH}$

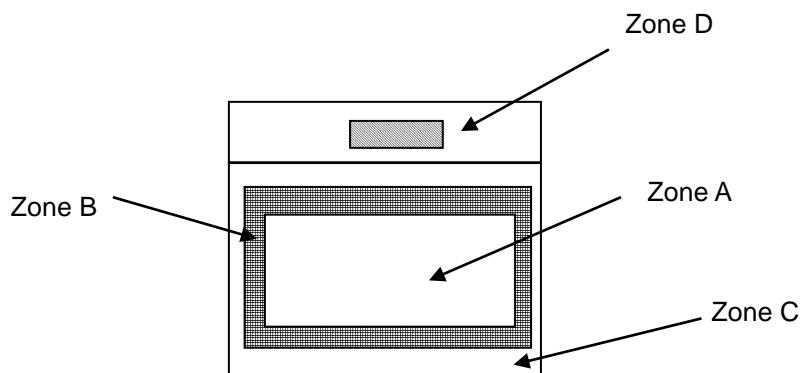
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



9.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note: As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

9.1.3 Sampling Plan

According to GB/T 2828.1-2003 ; , normal inspection, Class II

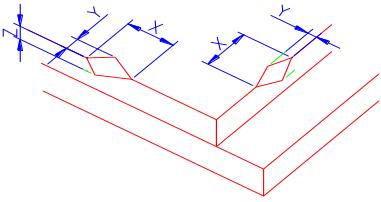
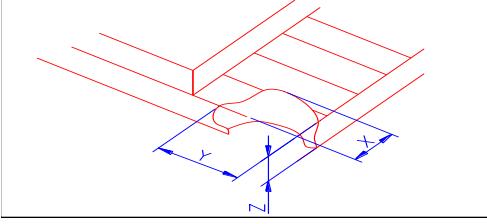
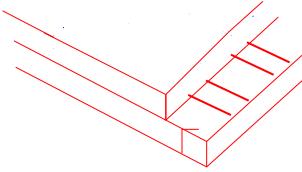
AQL:

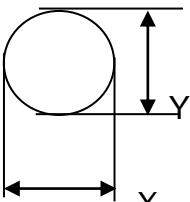
Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	
5	Spot Line defect	Light dot, Dim spot, Polarizer Bubble ; Polarizer accidented spot.	Minor
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

9.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th>X</th><th>Y</th><th>Z</th></tr> <tr> <td>$\leq 3.0\text{mm}$</td><td><Inner border line of the seal</td><td>$\leq T$</td></tr> </table>	X	Y	Z	$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$
X	Y	Z						
$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$						
	(2)LCD corner broken	 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th>X</th><th>Y</th><th>Z</th></tr> <tr> <td>$\leq 3.0\text{mm}$</td><td>$\leq L$</td><td>$\leq T$</td></tr> </table>	X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$
X	Y	Z						
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$						
	(3) LCD crack	 <p>Crack Not allowed</p>						

2.0	<p>Spot defect</p>  $\Phi = (X+Y)/2$	<p>① light dot (black/white spot , pinhole, stain, etc.)</p> <table border="1"> <thead> <tr> <th rowspan="2">Size (mm)</th> <th colspan="3">Zone</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="3">Ignore</td> <td colspan="3" rowspan="3">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.25$</td> <td colspan="3">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.4$</td> <td colspan="3">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.4$</td> <td colspan="3">0</td> <td colspan="3"></td> </tr> </tbody> </table> <p>② Dim spot (light leakage、dent、dark spot, etc)</p> <table border="1"> <thead> <tr> <th rowspan="2">Size (mm)</th> <th colspan="3">Zone</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="3">Ignore</td> <td colspan="3" rowspan="3">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.25$</td> <td colspan="3">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.4$</td> <td colspan="3">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.4$</td> <td colspan="3">0</td> <td colspan="3"></td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1"> <thead> <tr> <th rowspan="2">Size (mm)</th> <th colspan="3">Zone</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> <td colspan="3" rowspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td colspan="3">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.5$</td> <td colspan="3">0</td> </tr> </tbody> </table> <p>④Polarizer Bubble</p> <table border="1"> <thead> <tr> <th rowspan="2">Size (mm)</th> <th colspan="3">Zone</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> <td colspan="3" rowspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="3">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td>$\Phi > 0.4$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Size (mm)	Zone			Acceptable Qty			A	B	C	$\Phi \leq 0.15$	Ignore			Ignore			$0.15 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)			$0.25 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.4$	0						Size (mm)	Zone			Acceptable Qty			A	B	C	$\Phi \leq 0.15$	Ignore			Ignore			$0.15 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)			$0.25 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.4$	0						Size (mm)	Zone			Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			Ignore			$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0			Size (mm)	Zone			Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			Ignore			$0.2 < \Phi \leq 0.4$	3(distance $\geq 10\text{mm}$)			$\Phi > 0.4$	0		
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Part. No	KDG043WQFPA12401-RT	REV	V1.0	Page 27 of 34																																																																																																																

3.0	LCD Pixel defect	Pixel bad points		
		Item	Zone A	Acceptable Qty
		Bright dot	Random	N≤2
			2 dots adjacent	N≤0
			3 dots adjacent	N≤0
		Dark dot	Random	N≤2
			2 dots adjacent	N≤0
			3 dots adjacent	N≤0
		Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm
		Total bright and dark dot		N≤4

Note:

- A) Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
- B) 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 = 2 dots

Picture:



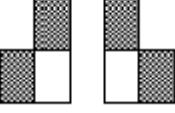
2 dot adjacent



2 dot adjacent



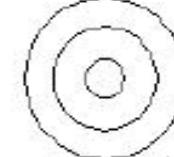
2 dot adjacent (vertical)

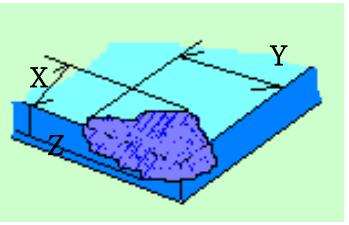
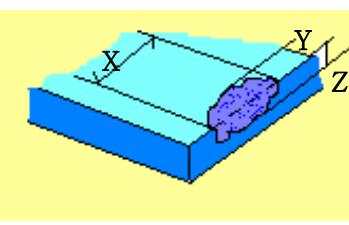


2 dot adjacent (slant)

4.0	<p>Line defect (LCD /Polarizer backlight black/white line, scratch, stain)</p>  <p>W: width, L : length</p> <p>N : Count</p>	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(m) m)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.05$</td> <td>Ignore</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.05 < W \leq 0.06$</td> <td>$L \leq 4.0$</td> <td colspan="2">$N \leq 3$</td> </tr> <tr> <td>$0.06 < W \leq 0.08$</td> <td>$L \leq 3.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$W > 0.08$</td> <td colspan="3">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(m) m)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore		Ignore	$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$		$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$		$W > 0.08$	Define as spot defect		
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5.0	Electronic Components SMT.	Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite																									
6.0	Display color& Brightness.	<ol style="list-style-type: none"> Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples. 																									
7.0	LCD Mura/Waving/ Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.																									

7.0	RTP Related	TP film bubble/ accidented spot	Size Φ (mm)	Acceptable Qty		
				A	B	C
			$\Phi \leq 0.1$	Ignore		
			$0.1 < \Phi \leq 0.25$	4 (distance $\geq 10\text{mm}$)		
			$0.25 < \Phi \leq 0.35$	3		
			$\Phi > 0.4$	0		

		TP film scratch	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th><th rowspan="2">Length(mm)</th><th colspan="3">Acceptable Qty</th></tr> <tr> <th>A</th><th>B</th><th>C</th></tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.05$</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr> <tr> <td>$0.05 < W \leq 0.06$</td><td>$L \leq 5.0$</td><td colspan="3">$N \leq 3$</td></tr> <tr> <td>$0.07 < W \leq 0.08$</td><td>$L \leq 4.0$</td><td colspan="3">$N \leq 2$</td></tr> <tr> <td>$0.08 < W$</td><td colspan="3">Define as spot defect</td><td></td></tr> </tbody> </table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore		Ignore	$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$			$0.07 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$			$0.08 < W$	Define as spot defect			
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		Assembly deflection	beyond the edge of backlight $\leq 0.2\text{mm}$																												
		Bulge (undulation included)	The ITO film plumped below 0.40mm, it's ok. 																												
		Newton Ring	<p>Newton Ring area $> 1/3$ TP area NG</p> <p>Newton Ring area $\leq 1/3$ TP area OK</p>																												
			 1. 规律性  2. 非规律性  似牛顿环																												

		<p>TP corner broken X : length Y : width Z : height</p> <table border="1"> <thead> <tr> <th>X</th><th>Y</th><th>Z</th></tr> </thead> <tbody> <tr> <td>$X \leq 3\text{mm}$</td><td>$Y \leq 3\text{mm}$</td><td>$Z < \text{COVER}$ thickness S</td></tr> </tbody> </table> <p>*Circuitry broken is not allowed.</p>	X	Y	Z	$X \leq 3\text{mm}$	$Y \leq 3\text{mm}$	$Z < \text{COVER}$ thickness S	
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X	Y	Z							
$X \leq 4\text{mm}$	$Y \leq 2\text{mm}$	$Z < \text{COVER}$ thickness							

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

10. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	85°C, 96H	
Low Temperature Operating	-30°C, 96HR	
High Temperature Storage	85°C, 96HR	
Low Temperature Storage	-30°C, 96HR	
High Temperature & High Humidity Operating	+60°C, 90% RH ,96 hours.	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects:
Thermal Shock (Non-operation)	-10°C,30 min ↔ +60°C,30 min, Change time:5min 20CYC.	1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack;
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15°C ~35°C, 30%~60%).	5.Current IDD is twice higher than initial value.
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX)	

Remark:

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 5~10pcs.
- 3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.
6. The color fading mura of polarizing filter should not care.

11. Cautions and Handling Precautions

11.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

11.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

12. Packing

