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Custom Display

PCAP

Mechanical design

Production Custom designs Installation



SPECIFICATION FOR LCM Module

MODULE No:	ET090HW20-K
CUSTOMER:	

YOURITECH	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



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* Description

This is a color active matrix LTPS LCD using Low Temperature Poly-silicon TFT's (Thin Film Transistors) as an active switching devices. This module is composed of a Transmissive type LTPS-LCD Panel, driver circuit, back-light unit. The resolution of a 9.0" LTPS-LCD contains 1280X720 pixels, and can display up to 16.7M colors.

* Features

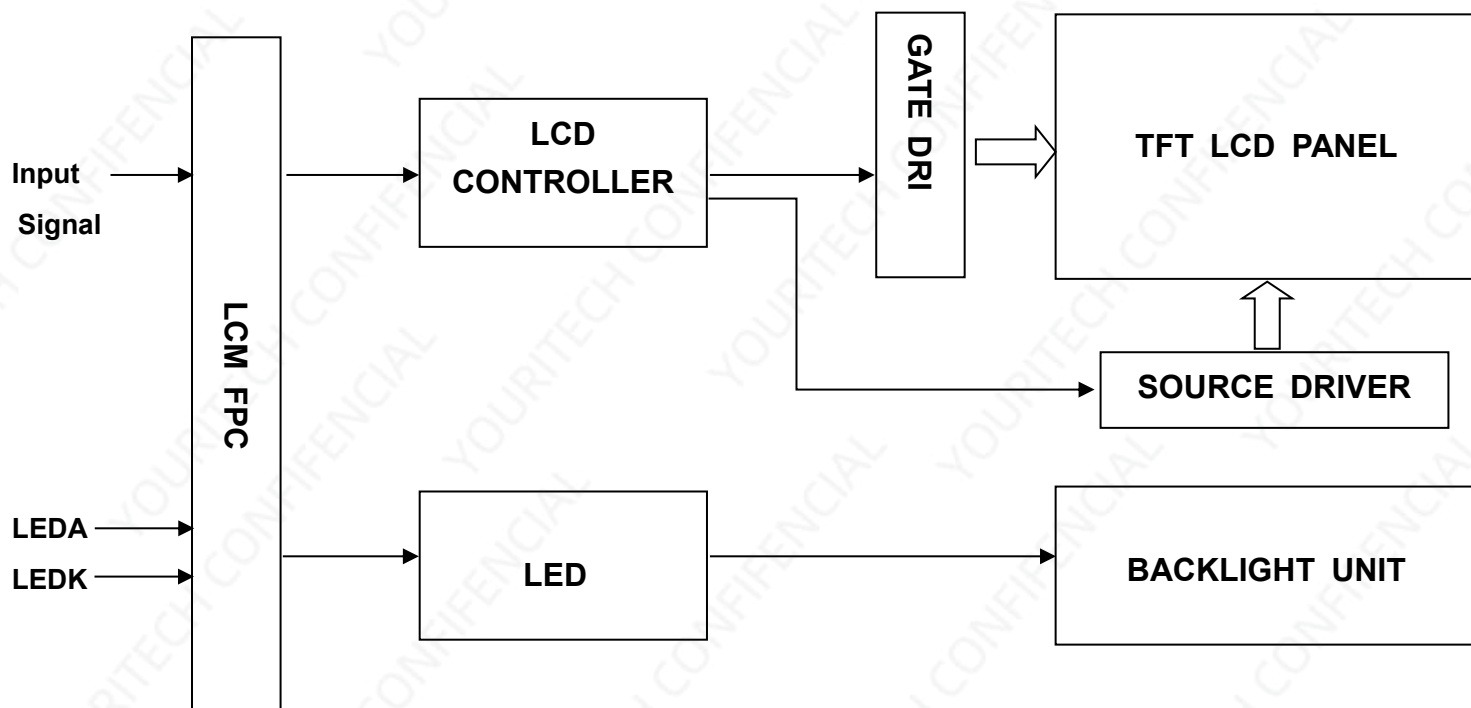
General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	198.912(H)*111.888(V) (9.0inch)	mm	
Driver element	LTPS TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	1280(RGB)*720	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.1554(H)*0.1554(V)	mm	
Viewing angle	ALL	o'clock	
Display mode	Transmissive /Normally Black	-	
LCM Interface	LVDS	-	
Operating temperature	-30~+85	°C	-
Storage temperature	-30~+85	°C	-

* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		210.70		mm	-
	Vertical(V)		124.15		mm	-
	Depth(D)		6.20		mm	-
Weight			227		g	-



1. Block Diagram



[illegible]

3. Input terminal Pin Assignment

3.1 TFT Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	AGND	Analog ground	P
2	AVDD	Analog power	P
3	DVDD	Digital power	P
4	GND	Digital ground	P
5	NC	--	--
6	DVDD	Digital power	P
7	GND	Digital ground	P
8	NC	--	--
9	NC	Ground	P
10	NC	--	--
11	NC	--	--
12	NC	Ground	P
13	NC	--	--
14	NC	--	--
15	GND	Digital ground	P
16	DVDD_LVDS	LVDS power	P
17	GND	Digital ground	P
18	PIND3	Positive LVDS differential data input	I
19	NIND3	Negative LVDS differential data input	I
20	GND	Digital ground	P
21	PINC	Positive LVDS differential clock input	I
22	NINC	Negative LVDS differential clock input	I
23	GND	Digital ground	P
24	PIND2	Positive LVDS differential data input	I
25	NIND2	Negative LVDS differential data input	I



26	GND	Digital ground	P
27	PND1	Positive LVDS differential data input	I
28	NIND1	Negative LVDS differential data input	I
29	GND	Digital ground	P
30	PIND0	Positive LVDS differential data input	I
31	NIND0	Negative LVDS differential data input	I
32	GND	Digital ground	P
33	GD_LVDS	Digital ground	P
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ, C=0.1μF)	I
35	STBYB	Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are high-Z	I
36	SHLR	Left or right display control	
37	DVDD	Digital power	P
38	UPDN	Up / down display control	I
39	AGND	Analog ground	P
40	AVDD	Analog power	P
41	NC	--	--
42	NC	--	--
43	GND	Digital ground	P
44	DVDD	Digital power	P
45	GND	Digital ground	P
46	NC	--	--
47	NC	--	--
48	NC	--	--
49	NC	--	--



50	NC	--	--
51	NC	--	--
52	NC	--	--
53	GND	Digital ground	P
54	DVDD	Digital power	P
55	SELB	6bit/8bit mode select, SELB = "1", LVDS input data is 8bits SELB = "0", LVDS input data is 6bits	I
56	VGH	Positive power for TFT	I
57	DVDD	Digital power	P
58	VGL	Negative power for TFT	I
59	GND	Digital ground	P
60	BIST	Normal operation/BIST pattern select. BIST="1": BIST mode. BIST="0": Normal operation.	I

Note1:

When L/R="0",set right to left scan direction

When L/R="1",set left to right scan direction

When U/D="0",set bottom to top scan direction

When U/D="1",set top to bottom scan direction

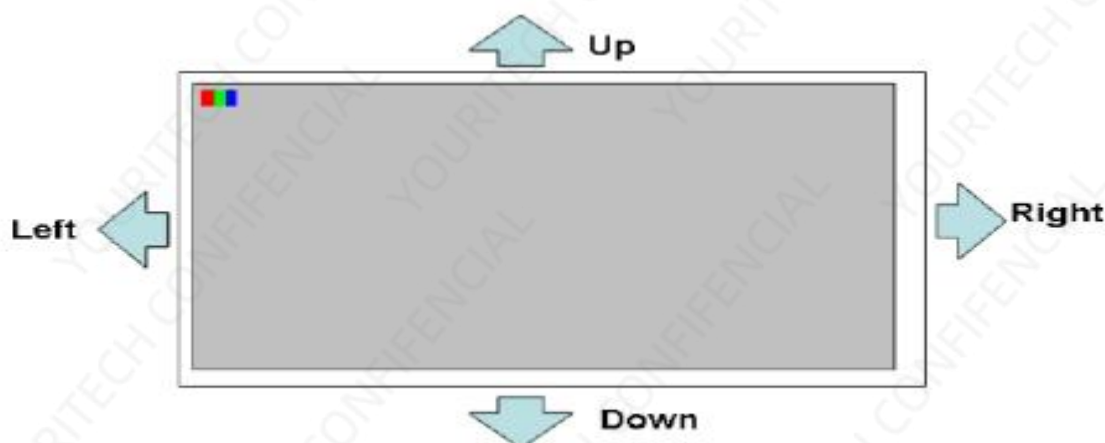
Note1:

If LVDS input data is 8 bits,SELB must be set to High

If LVDS input data is 6 bits,SELB must be set to Low



SHLR	UPDN	Data shifting
DVDD	GND	Left→Right→Down→Up
GND	GND	Right→Left; Down→Up
DVDD	DVDD	Left→Right; Up→Down(default)
GND	DVDD	Right→Left; Up→Down



3.2 LED Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	A	Anode pin of backlight.	P
2	A	Anode pin of backlight.	P
3	A	Anode pin of backlight.	P
4	NC	--	--
5	NC	--	--
6	NC	--	--
7	K1	Cathode pin of backlight.	P
8	K2	Cathode pin of backlight.	P
9	K3	Cathode pin of backlight.	P
10	NC	---	--



4. LCD Optical Characteristics

4.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	$\Theta=0$	1000	1200	--		(1)(2)
Response time	Rising	T_R+T_F	Normal viewing angle	--	35	45	msec	(1)(3)
	Falling							
Color gamut		S(%)		60	66.78		%	(1)
Color Filter Chromaticity	White	W_X		-0.04	0.2909	+0.04		(1)(4)
		W_Y			0.3091			
	Red	R_X			0.6342			
		R_Y			0.3423			
	Green	G_X			0.2900			
		G_Y			0.5755			
	Blue	B_X			0.1463			
		B_Y			0.0590			
Viewing angle	Hor.	Θ_L	CR>10	75	85	--		(1)(4)
		Θ_R		75	85	--		
	Ver.	Θ_U		75	85	--		
		Θ_D		75	85	--		
		Option View Direction		ALL				

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

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

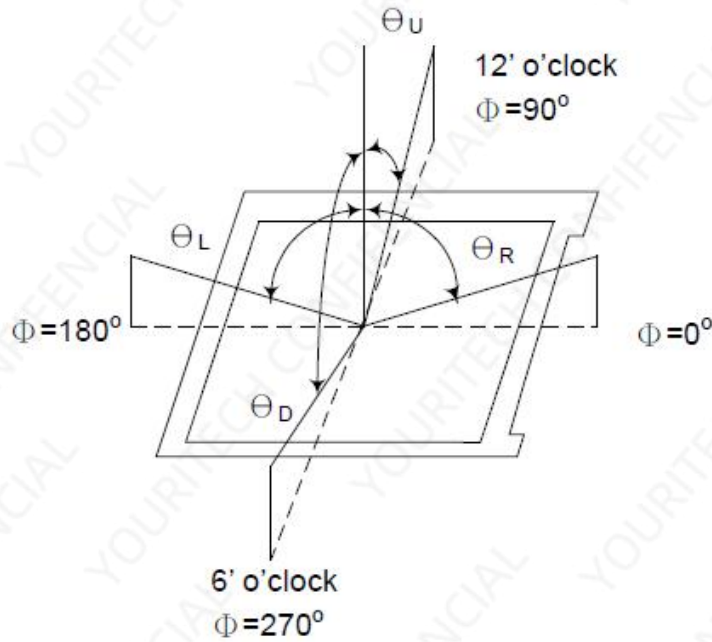
15min. warm-up time.

Measuring Equipment

FPM520 , which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.



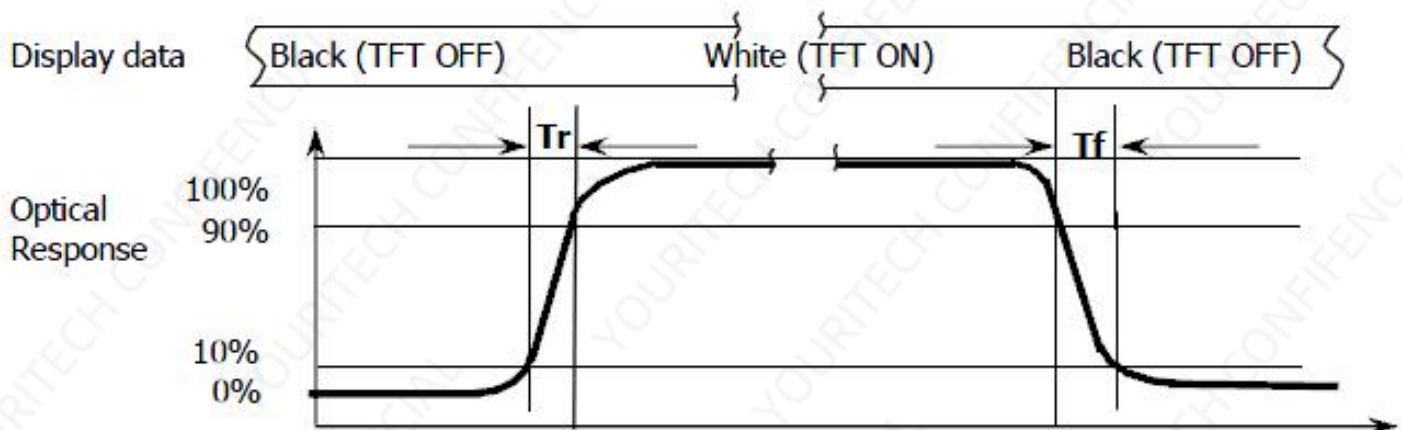
Note (1): Definition of Viewing Angle :



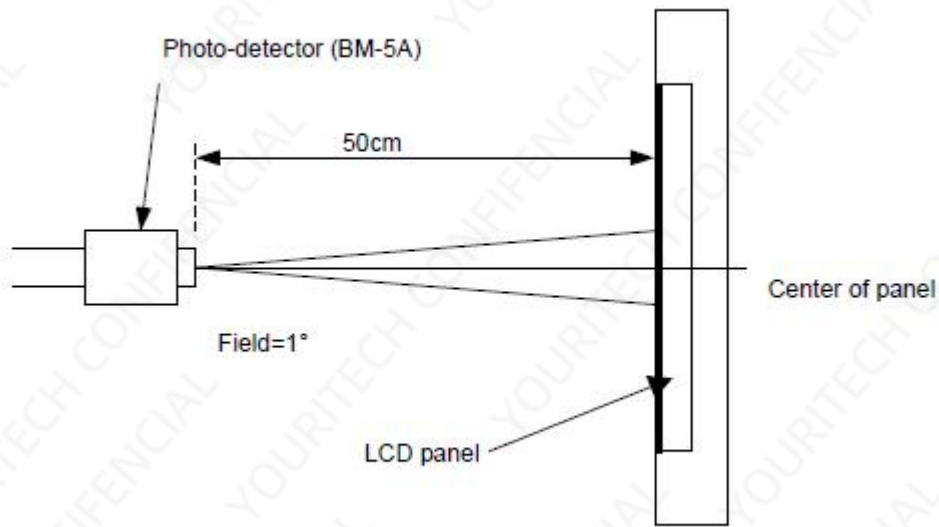
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

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

Note (3): Response Time



Note (4): Definition of optical measurement setup



5. TFT Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VDD	-0.3	5.5	V
Operating temperature	T _{OP}	-30	+85	°C
Storage temperature	T _{ST}	-30	+85	°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, 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
Supply Voltage (Logic)	VDD	3.0	3.3	3.6	V	--
	VGH	19	20	21	V	--
	VGL	-11	-10	-9	V	--
	AAVDD	12.3	12.4	12.5	V	--
Normal mode Current consumption	I _{VCI}	--	164	300	mA	--
Level input voltage	V _{IH}	0.7I _{OVCC}	--	I _{OVCC}	V	--
	V _{IL}	GND	--	0.3 I _{OVCC}	V	--
Level output voltage	V _{OH}	0.8I _{OVCC}	--	I _{OVCC}	V	--
	V _{OL}	GND	--	0.2I _{OVCC}	V	--



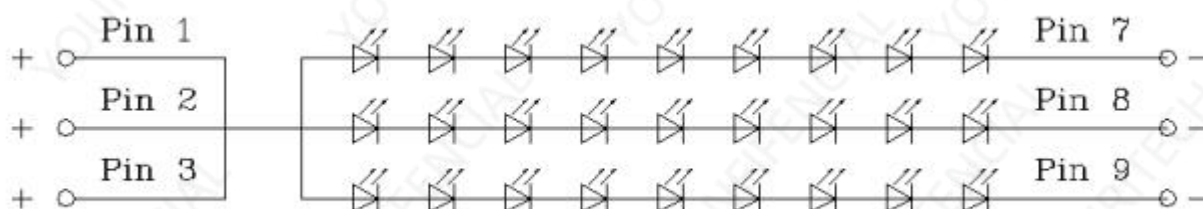
5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 27 chips White LED

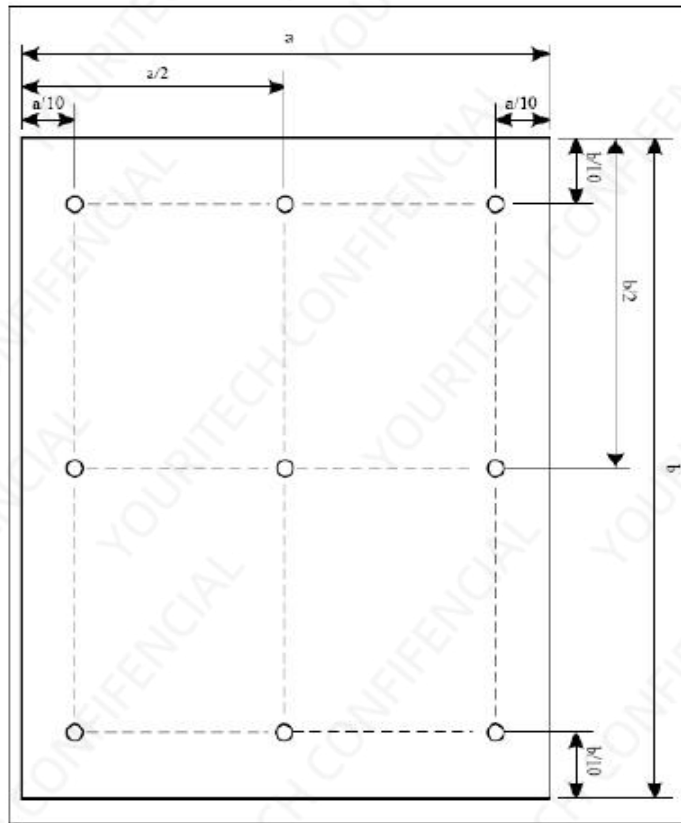
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	240	--	mA	--
Forward Voltage	V_F	--	--	30.6	V	--
LCM Luminance	L_v	900	1000	--	cd/m2	Note3
LED life time	Hr	30000			Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

Note (1) 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 $I_L=240\text{mA}$. The LED lifetime could be decreased if operating IL is larger than 240mA. The constant current driving method is suggested.



NOTE 3: Luminance Uniformity of these 9 points is defined as below:



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

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

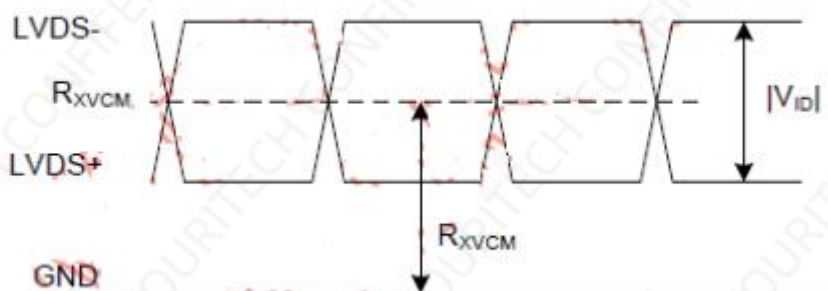


6. ELECTRICAL CHARACTERISTICS

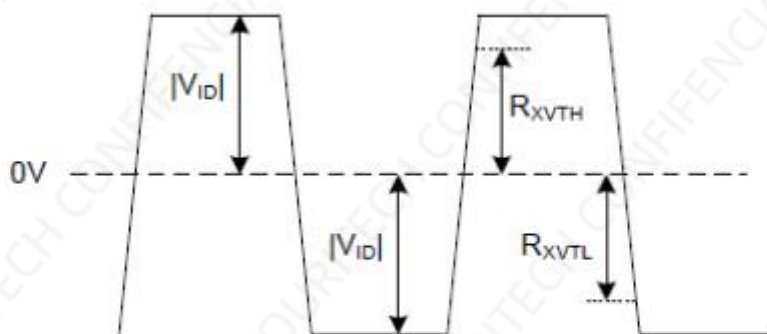
6.1 LVDS Interface DC Characteristic

Item	Symbol	Min.	Typ.	Max.	Unit
Differential Input High Threshold Voltage	R _{XVTH}	-	-	200	mV
Differential Input Low Threshold Voltage	R _{XVTL}	-200	-	-	mV
Differential Input Common Mode Voltage	R _{XVCM}	1.0	1.2	$1.7 - V_{ID} / 2$	V
Differential input Voltage	V _{ID}	200	-	600	mV

Single-end Signal



Differential Signal

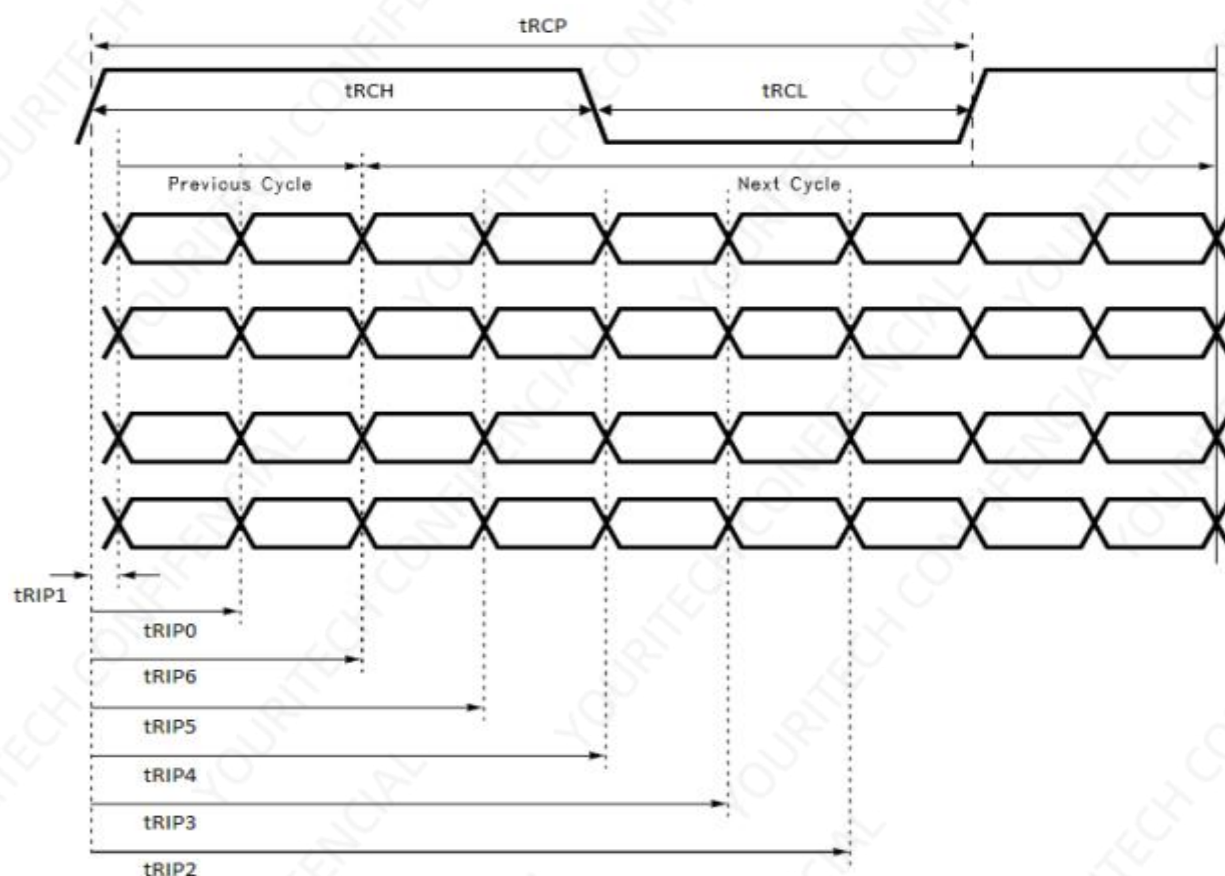


LVDS DC Diagram

6.2 LVDS Input Timing



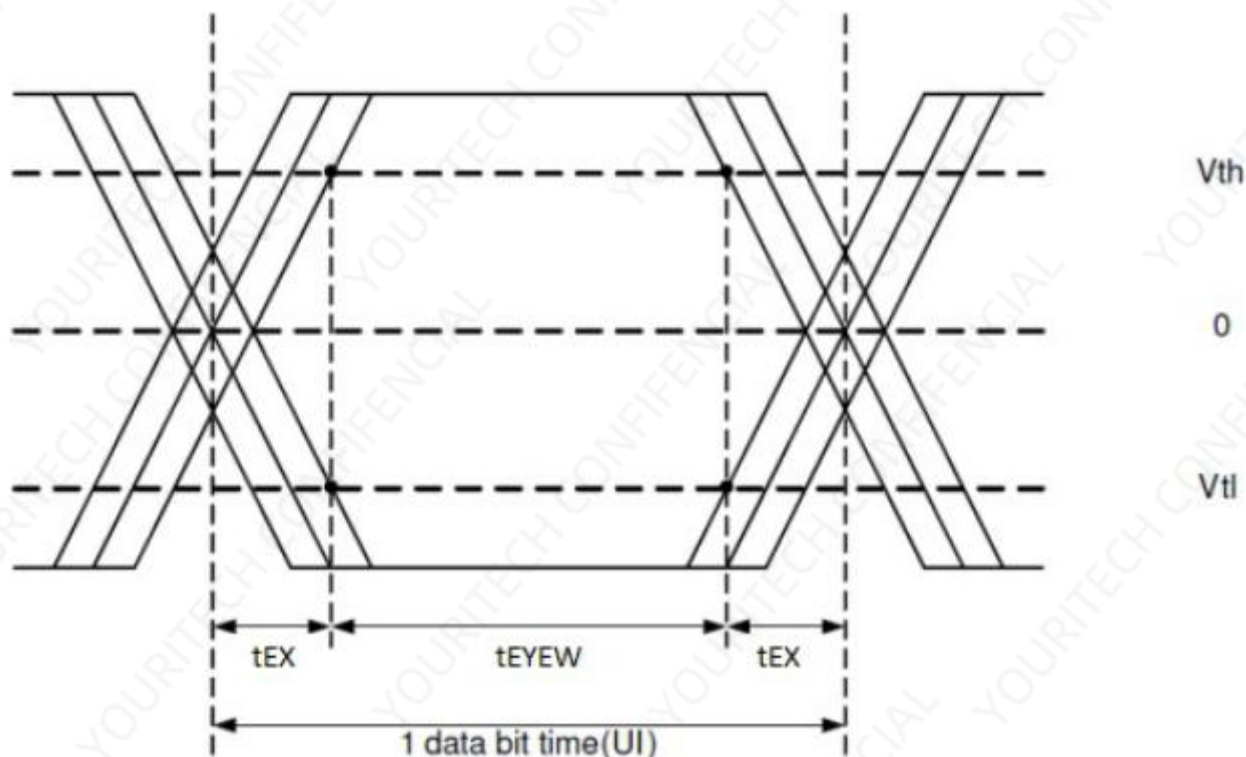
Item	Symbol	Min.	Typ.	Max.	Unit
Clock Period	tRCP	Refer to input timing table			
1 data bit time	UI	-	1/7	-	tRCP
Clock high time	tRCH	-	4	-	UI
Clock low time	tRCL	-	3	-	UI
Input Position 1	tRIP1	-0.25	0	0.25	UI
Input Position 0	tRIP0	0.75	1	1.25	UI
Input Position 6	tRIP6	1.75	2	2.25	UI
Input Position 5	tRIP5	2.75	3	3.25	UI
Input Position 4	tRIP4	3.75	4	4.25	UI
Input Position 3	tRIP3	4.75	5	5.25	UI
Input Position 2	tRIP2	5.75	6	6.25	UI



6.3 LVDS Data Skew



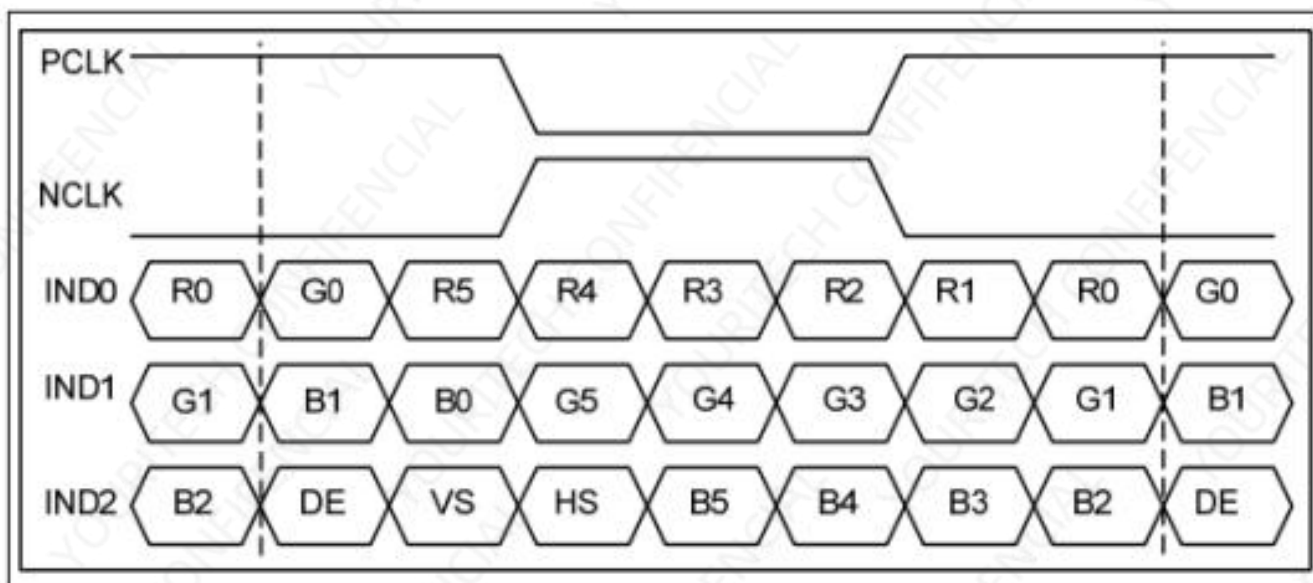
Item	Symbol	Min.	Typ.	Max.	Unit
Strobe width	tEYEW	0.5		-	UI
Input data skew margin	tEX	-		0.25	UI



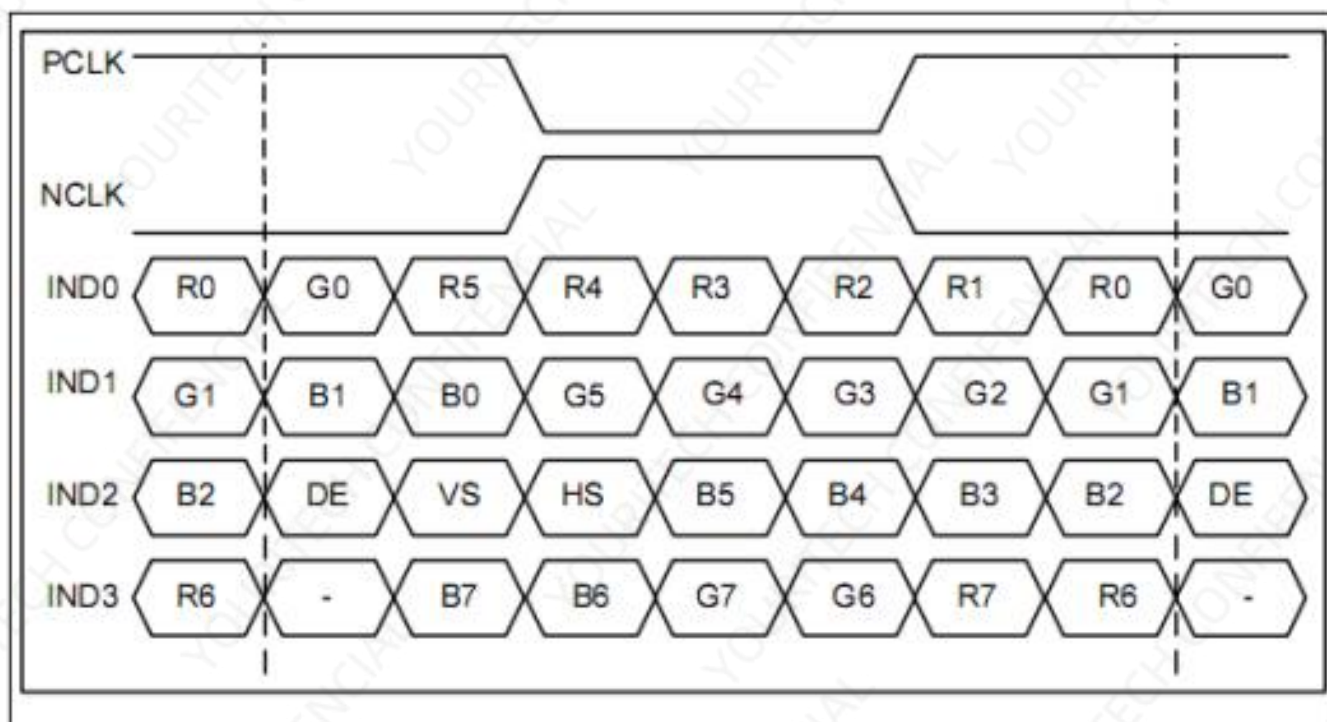
6.4 Bit LVDS input



6.4.1 6bit LVDS input



6.4.2 8bit LVDS input

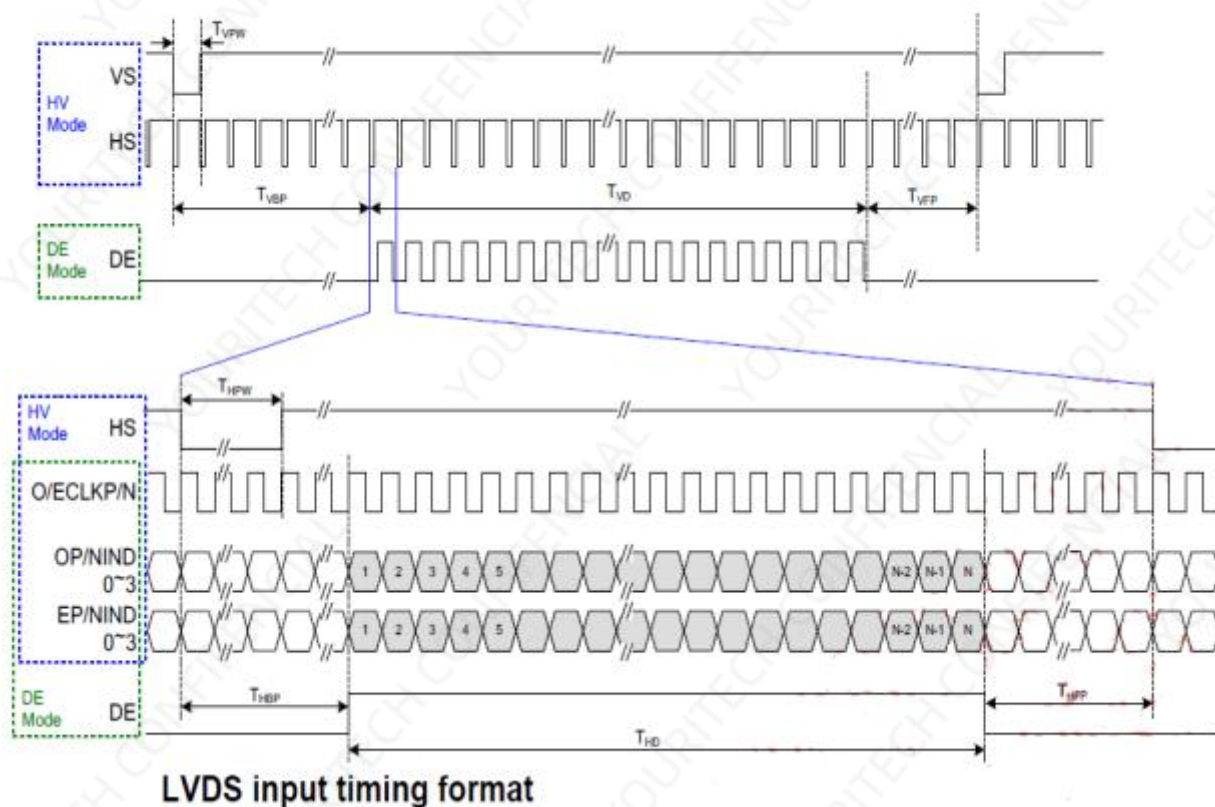


6.5 Interface Timing(DE mode)



Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	58	60	62	Hz
Vertical Total Time	TV	738			line
Vertical Display Time	TVD	720			line
Vertical Blanking Time	TVBP+TVFP	18			line
Horizontal Total Time	TH	1344			clock
Horizontal Display Time	THD	1280			clock
Horizontal Blanking Time	THBP+THFP	64			clock
Clock Rate	1/ TClock	57.5	59.5	61.5	MHz

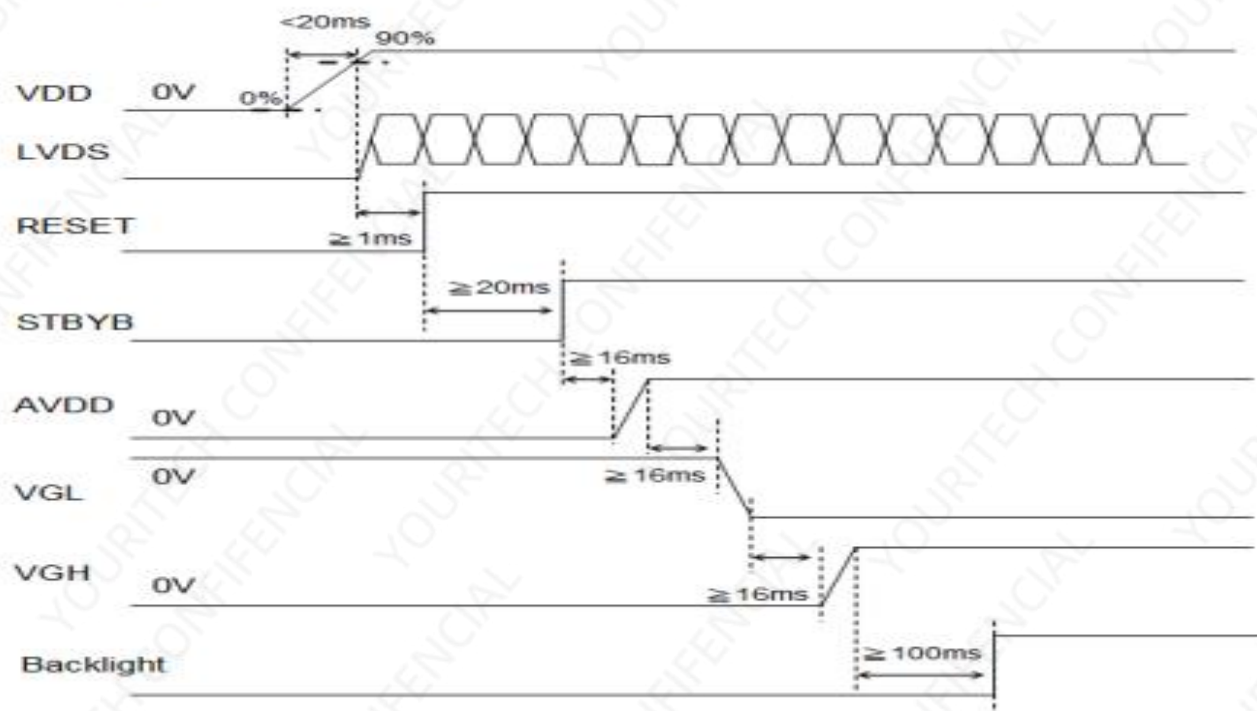
Timing Diagram of Interface Signal (DE mode)



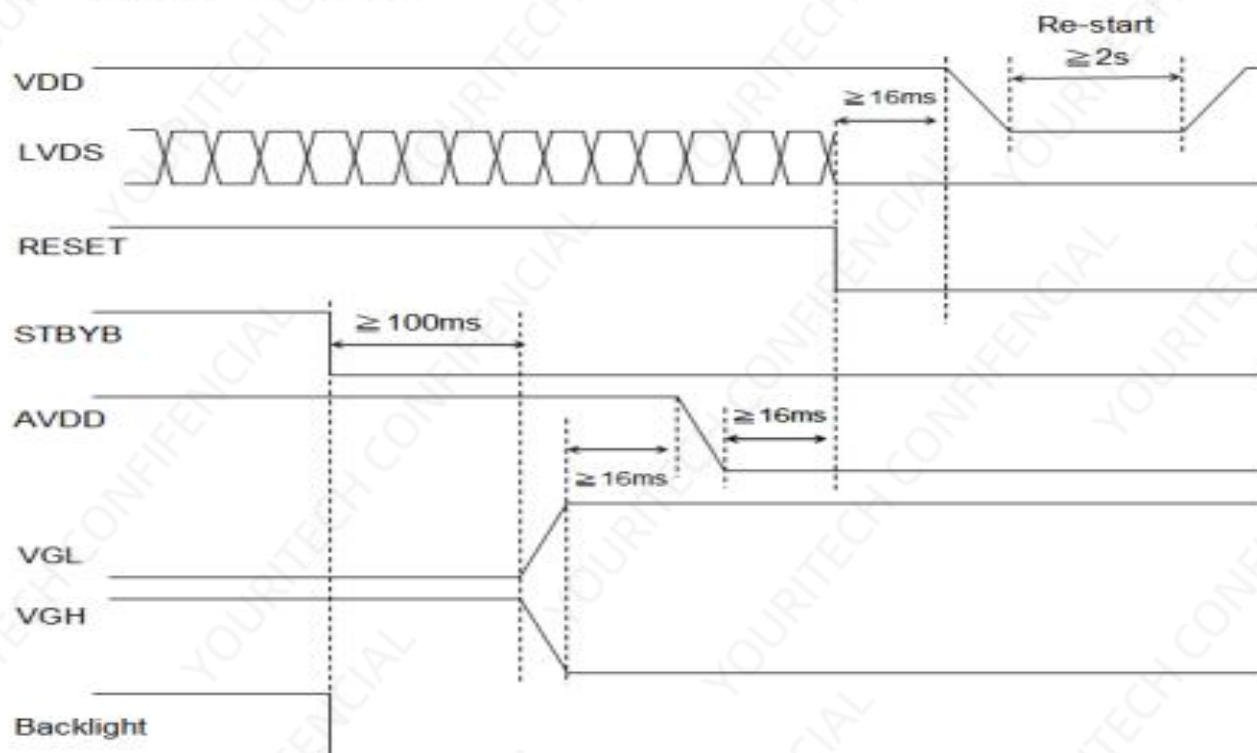
6.6 Power On/Off Sequence



Power on Sequence



Power off Sequence



7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

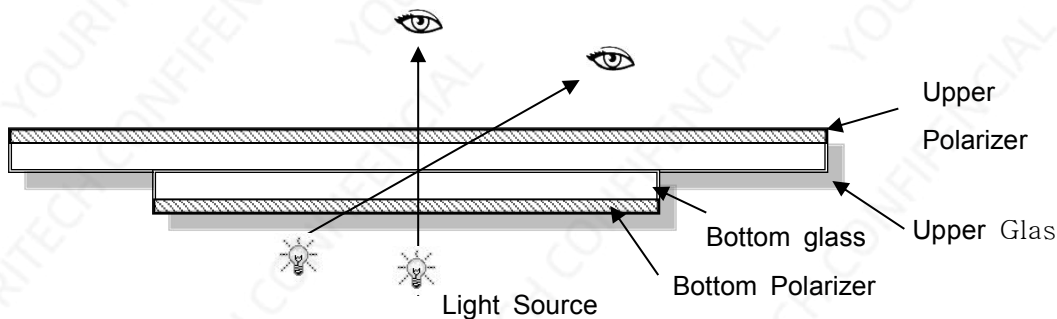
Temperature : $25\pm 5^{\circ}\text{C}$

Humidity : $65\%\pm 10\%\text{RH}$

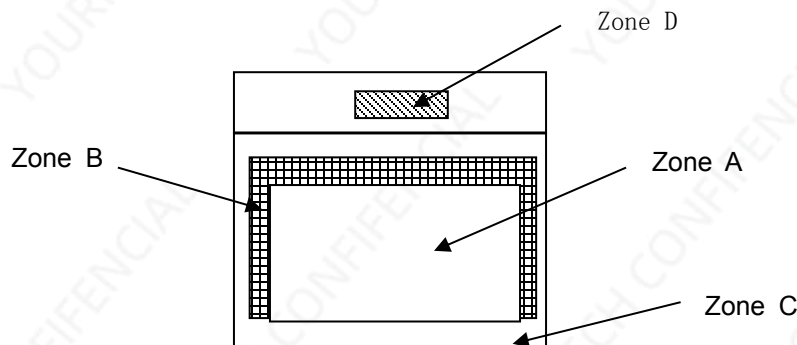
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



7.1.2 Definition



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

Zone B : Viewing Area except Zone A

Zone C Cover (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



7.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

AQL:

Major defect	Minor defect
0.65	1.5

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

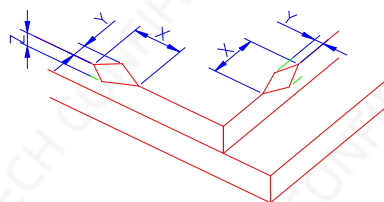
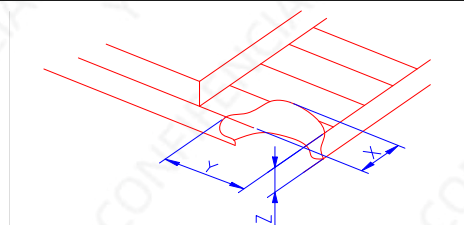
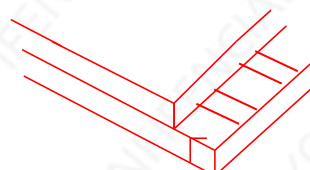
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting.	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed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

Note1: a) Light dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

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



7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of IT O, T: Height of LCD	(1) The edge of LCD broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2)LCD corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) LCD crack	 Crack Not allowed							



Spot defect

2.0

Y

X

$\Phi=(X+Y)/2$

① light dot (black/white spot , pinhole, stain, etc.)

Zone Size (mm)	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		

② Dim spot (light leakage、dent、dark spot, etc)

Zone Size (mm)	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		

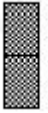
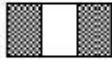
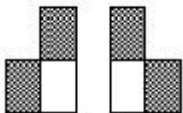
③ Polarizer accidented spot

Zone Size (mm)	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		

④Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		Ignore
$0.2 < \Phi \leq 0.4$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	0		



3.0	LCD Pixel defect	Pixel bad points <table data-bbox="539 309 1497 1059"> <tr> <th data-bbox="539 309 730 365">Item</th><th data-bbox="730 309 1241 365">Zone A</th><th data-bbox="1241 309 1497 365">Acceptable Qt</th></tr> <tr> <td data-bbox="539 365 730 521" rowspan="3">Bright dot</td><td data-bbox="730 365 1241 421">Random</td><td data-bbox="1241 365 1497 421">$N \leq 2$</td></tr> <tr> <td data-bbox="730 421 1241 477">2 dots adjacent</td><td data-bbox="1241 421 1497 477">$N \leq 0$</td></tr> <tr> <td data-bbox="730 477 1241 521">3 dots adjacent</td><td data-bbox="1241 477 1497 521">$N \leq 0$</td></tr> <tr> <td data-bbox="539 521 730 689" rowspan="3">Dark dot</td><td data-bbox="730 521 1241 577">Random</td><td data-bbox="1241 521 1497 577">$N \leq 3$</td></tr> <tr> <td data-bbox="730 577 1241 633">2 dots adjacent</td><td data-bbox="1241 577 1497 633">$N \leq 0$</td></tr> <tr> <td data-bbox="730 633 1241 689">3 dots adjacent</td><td data-bbox="1241 633 1497 689">$N \leq 0$</td></tr> <tr> <td data-bbox="539 689 730 1003">Distance</td><td data-bbox="730 689 1241 1003"> 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. </td><td data-bbox="1241 689 1497 1003">5mm</td></tr> <tr> <td colspan="2" data-bbox="539 1003 1241 1059">Total bright and dark dot</td><td data-bbox="1241 1003 1497 1059">$N \leq 4$</td></tr> </table> 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 (vertical)  2 dot adjacent  2 dot adjacent (slant)	Item	Zone A	Acceptable Qt	Bright dot	Random	$N \leq 2$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Dark dot	Random	$N \leq 3$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	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		$N \leq 4$
Item	Zone A	Acceptable Qt																							
Bright dot	Random	$N \leq 2$																							
	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
Dark dot	Random	$N \leq 3$																							
	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
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		$N \leq 4$																							



4.0	Line defect (LCD /Polarizer backlight black/white line, scratch, stain)  W: width, L : length N : Count	Width(mm)	Length(m)	Acceptable Qty		
				A	B	C
		$\Phi \leq 0.05$	Ignore	Ignore		Ignore
		$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$		
		$0.06 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$		
	$W > 0.08$	Define as spot defect				
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.	1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. 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.				

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	CTP no function	Not allowed

8. Reliability Test Result



Remark:

1.The test samples should be applied to only one test item.

High Temperature Operating	70℃,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20℃, 96HR	
High Temperature Storage	80℃, 96HR	
Low Temperature Storage	-30℃, 96HR	
High Temperature & High Humidity Storage	+60℃, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-30℃,30 min ↔ 80℃,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).	
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)	

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.

9. Cautions and Handling Precautions

9.1 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

9.2 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.

