Advance Hightech Solutions
Material Pioneer, Technology Navigator

12.1 inch TFT LCD
Without Touch Panel
SPECIFICATION

MODEL NAME: LMWW5121BX81

Date: 2025/01/13

Customer Signature		
Customer		
Approved Date	**Approved By**	**Reviewed By**

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Advance Hightech Solutions

RECORD OF REV

DATE	REV.	PAGE	SUMMARY

3. General specifications

3.1 General specifications

It is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses the amorphous silicon TFT as a switching devices. This model is composed of a Transmissive type TFT-LCD Panel, a driver circuit and a back-light unit and a Capacitive Touch Panel.

3.2 Features

- High image quality a-Si TFT LCD module.
- 16.7M color number.
- High contrast, high brightness.
- Low power consumption.

4. Mechanical data

No	Item	Specification	Remark
1	Type	Transmissive	-
2	Display Mode	Normally Black	-
3	Pixel Element	a-Si TFT	-
4	Screen Size	12.1inch	-
5	Interface	LVDS	-
6	Resolution	1024(RGB) x 768	-
7	Active Area	245.76(W) x 184.32(L) (mm)	-
8	Color Number	16.7M	-
9	Pixel Size	0.24(W) x 0.24(L) (mm)	-
10	Color Arrangement	RGB-stripe	-
11	Assembly Type	COG	-
12	Back Light	LED	-
13	Viewing Direction	Free	-
14	Weight	(TBD)	g
15	Module Dimension	277.8(W) x 226.2(L) x13.7(H) (mm)	-
16	TP Input Mode	Five fingers detection and Touch	-
17	TP Interface	USB	-

5. Absolute maximum ratings

5.1 Electrical absolute maximum ratings

(a) TFT-LCD Panel Absolute Maximum Ratings

Ta=25℃

Item	Symbol	Condition	Standard Value		Unit	Remark
			Min.	Max.		
Power supply voltage	VDD	GND=0V	-0.3	3.8	V	-
Power supply voltage	V_{LED}	GND=0V	-0.3	25	V	

- If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.

(b) Back-Light Unit

Ta=25℃

Item	Symbol	Min.	Max.	Unit	Remark
Current	I_{LED}	--	900	mA	-

(c)Touch Panel Controller IC

Ta=25℃

Item	Symbol	Min.	Max.	Unit	Remark
Supply Voltage	VDD	-0.3	6.0	V	-

If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.

5.2 Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit	Remark
Operation temperature range	Top	-30	85	℃	Ambient
Storage temperature range	Tst	-30	85	℃	Ambient

(a) Corrosive gas environment is not acceptable.
(b) TFT-LCD color will change slightly depending on environment temperature. This phenomenon is reversible.

6. Electrical characteristics

6.1 TFT-LCD Module

Ta =25℃

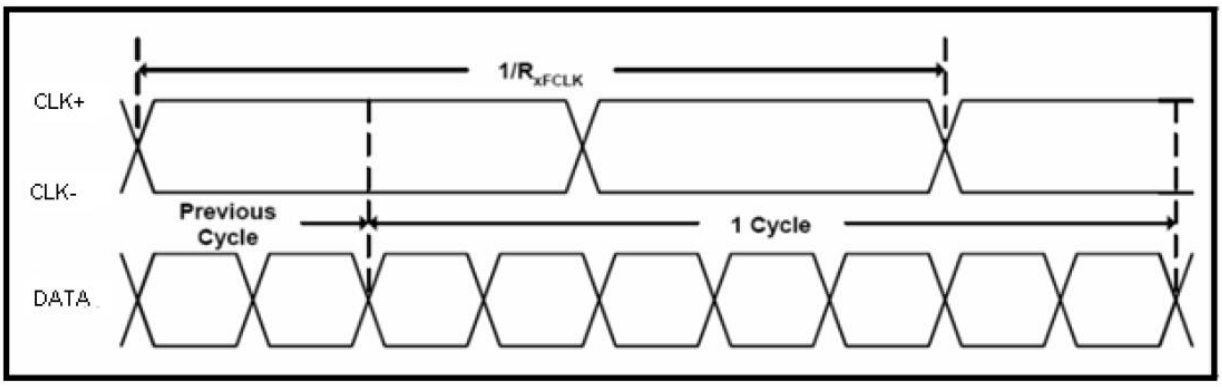
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	VDD	3.0	3.3	3.6	V	-
Logic Supply Current	IDD	-	(350)	(410)	mA	NOTE(1)
Hight level input voltage	VIH	0.7VDD	-	VDD	V	-
Low level input voltage	VIL	GND	-	0.3VDD	V	-

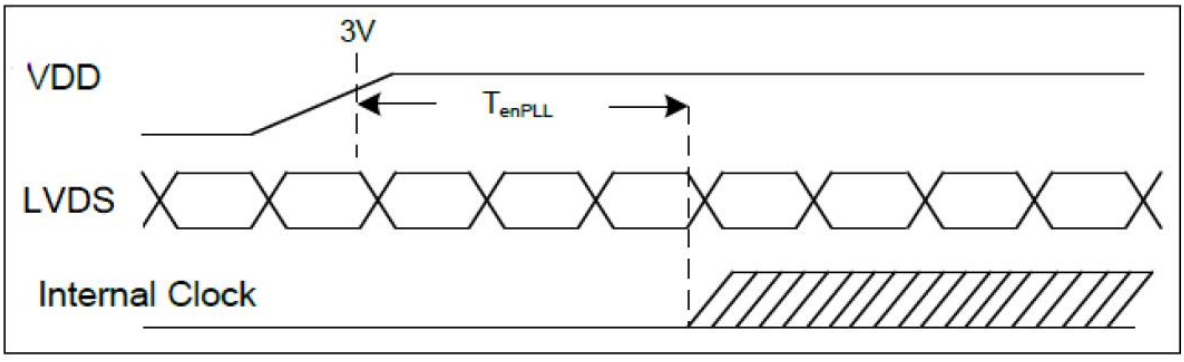
NOTE(1): Test Pattern of power supply current: Black pattern

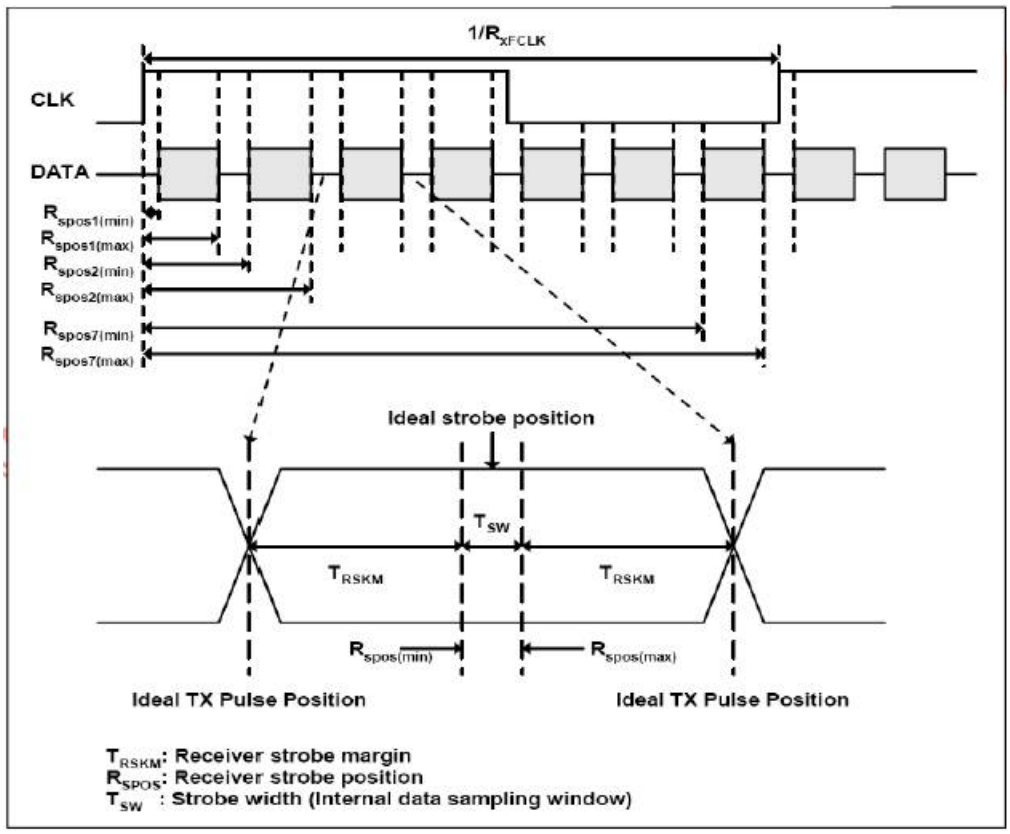
6.2 LVDS Receiver

Ta =25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	RxFCLK	26.2	-	71	MHz	VCM=1.2V
Input data skew margin	TRSKM	500	-	-	ps	| VID | = 400mV RxVCM=1.2V RxFCLK=71MHz -
Clock high time	TLVCH		4/(7xRxFCLK)		ns	-
Clock low time	TLVCL		3/(7xRxFCLK)		ns	-
PLL wake-up time	TenPLL		-	150	us	-







6.3 Touch Panel Controller IC

Ta =25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply	VBUSIN	4.75	5	5.25	V	-

6.4 Back-Light Unit

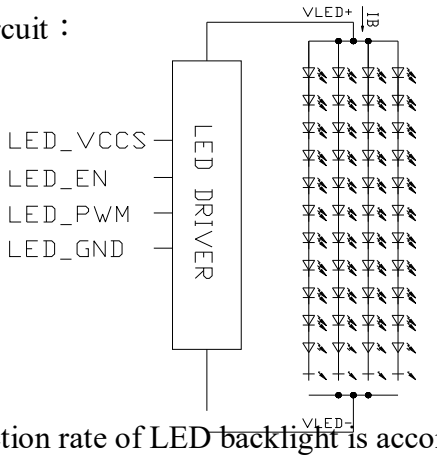
Ta =25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage for LED Driver	LED_VCCS	11	12	13	V	GND=0V
	ILED_VCC	(600)		(630)	mA	LED_VCC=12V
ADJ Voltage	High Level	3.0	-	3.3	V	-
	Low Level	-	-	0.3	V	
ADJ Frequency	fPWM	1K	-	20K	Hz	-
LED Life Time	Lf	30000	50000	--	hrs	-

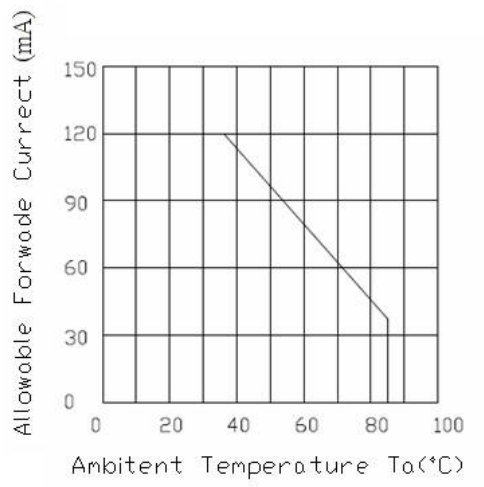
NOTE(2): The LEDs is Series and Parallel type.

NOTE(3): The “LED life time” is defined as the module brightness decreases to 50% of original brightness that the ambient temperature is 25℃ and I_{LED}=600mA .The LED lifetime could be decreased if operating I_{LED} is lager than 600mA.

NOTE(4): Back-light circuit：



NOTE(5): Current reduction rate of LED backlight is according to the graph indicated below：

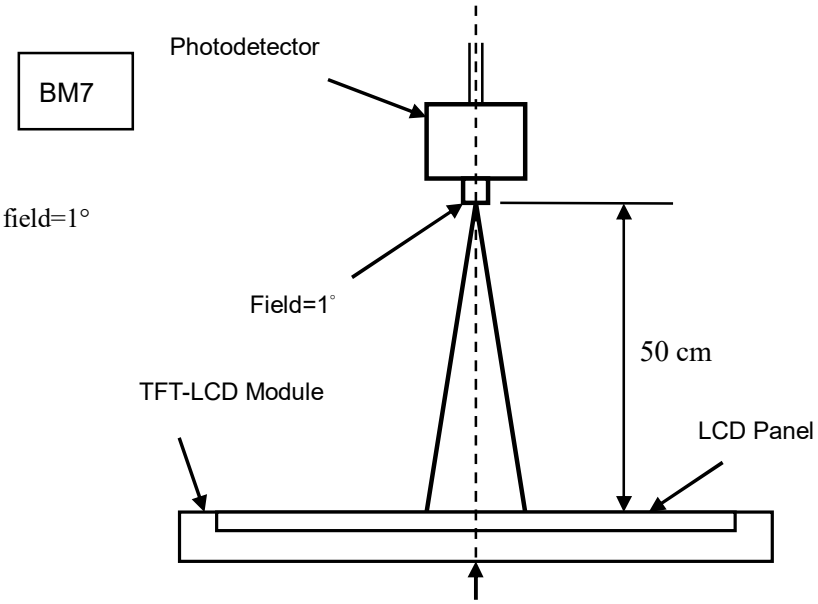


7. Optical characteristics

Ta=25°C , ILED=600mA

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		B	θ=0° Normal viewing angle At the center of panel	750	800	-	cd/m^2	(1)
Contrast Ratio		C/R		700	1000	-	-	(2)
Response Time		Tr+Tf		-	25	35	ms	(3)
Color chromaticity	White	Wx		(0.27)	(0.31)	(0.35)	-	-
		Wy		(0.28)	(0.32)	(0.36)		
	Red	Rx			(TBD)		-	-
		Ry			(TBD)			
	Green	Gx			(TBD)		-	-
		Gy			(TBD)			
	Blue	Bx			(TBD)		-	-
		By			(TBD)			
Viewing Angle	Top	θ_U	C/R≧10 Backlight On	80	85	-	Deg.	(4)
	Bottom	θ_D		80	85	-		(4)
	Left	θ_L		80	85	-		(4)
	Right	θ_R		80	85	-		(4)
Uniformity		Un	θ=0° Normal viewing angle	70	-	-	%	(5)

Note (1): The brightness test equipment setup

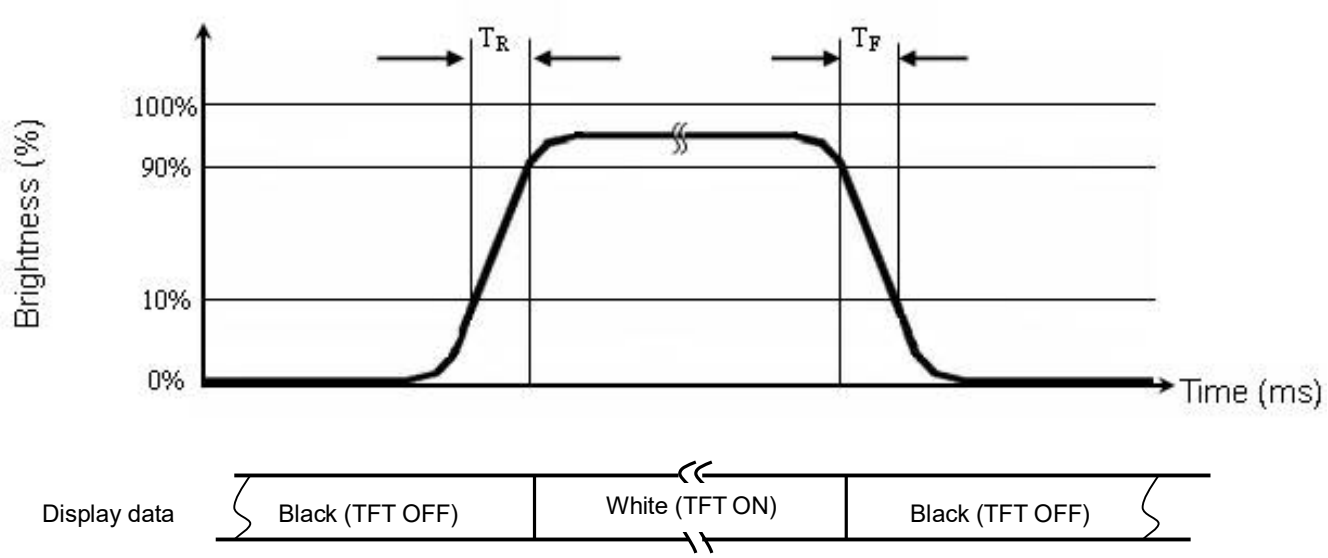


I_{LED}=600mA, Field=1°
(As measuring "black" image, field=1°
Is the best testing condition.)

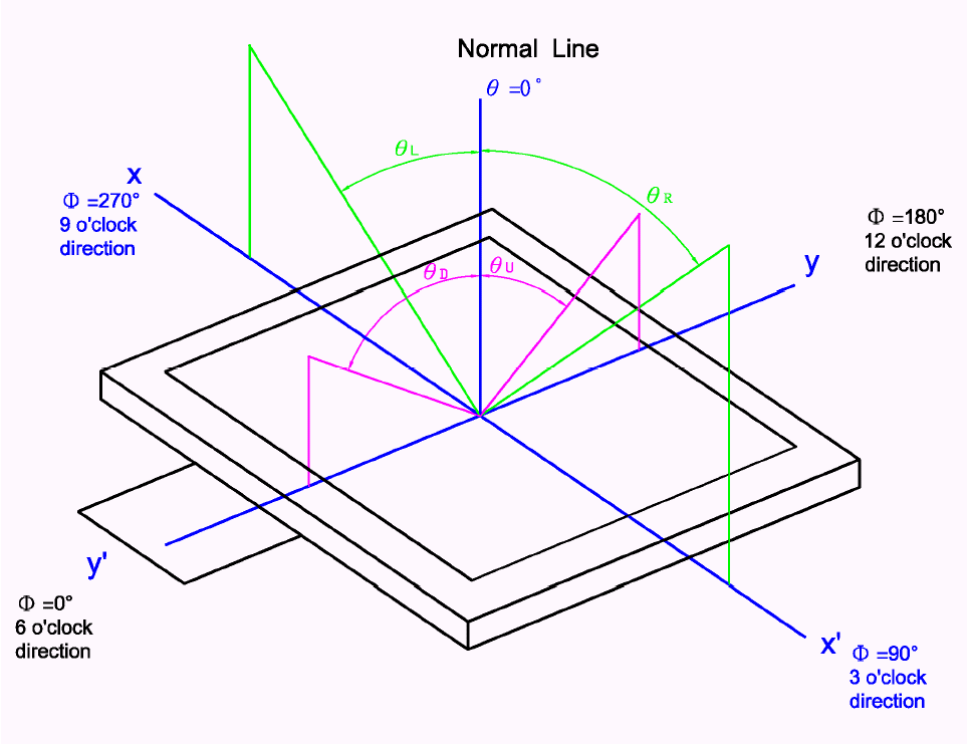
Note (2): Definition of contrast Ratio (C/R)

$$C/R = \frac{\textbf{Brightness When LCD is at "White" State}}{\textbf{Brightness When LCD is at "Black" State}}$$

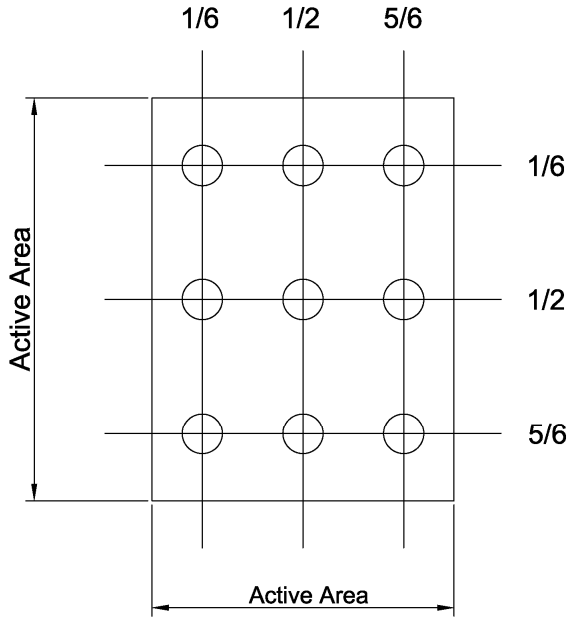
Note (3): Definition of response time



Note (4): Definition of viewing angle

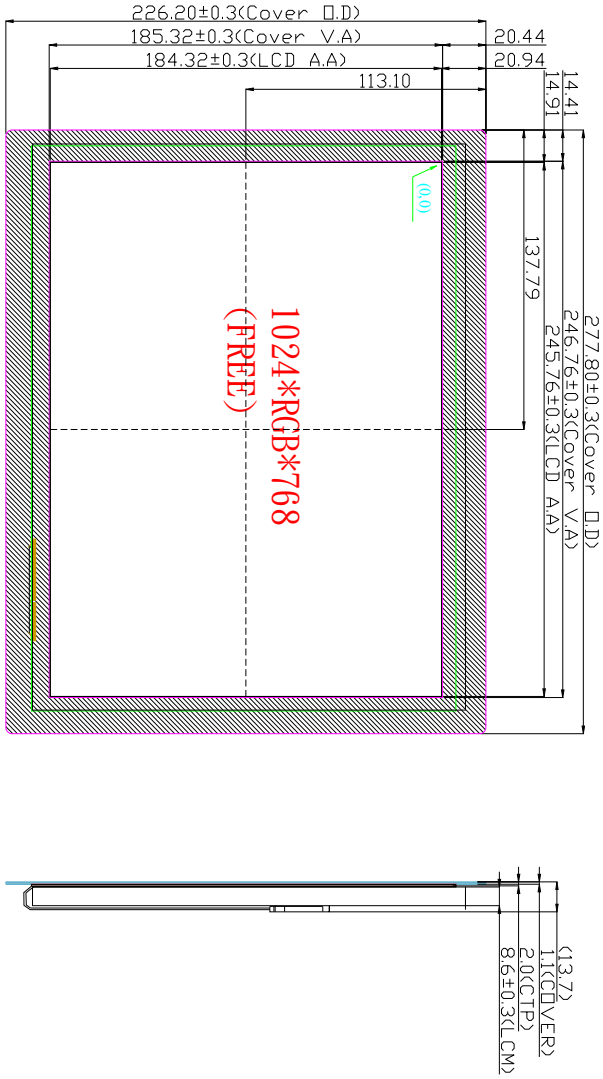


Note (5): Definition of uniformity (Un)



$$Un = \frac{\mathbf{Bmin}}{\mathbf{Bmax}} x100\%$$

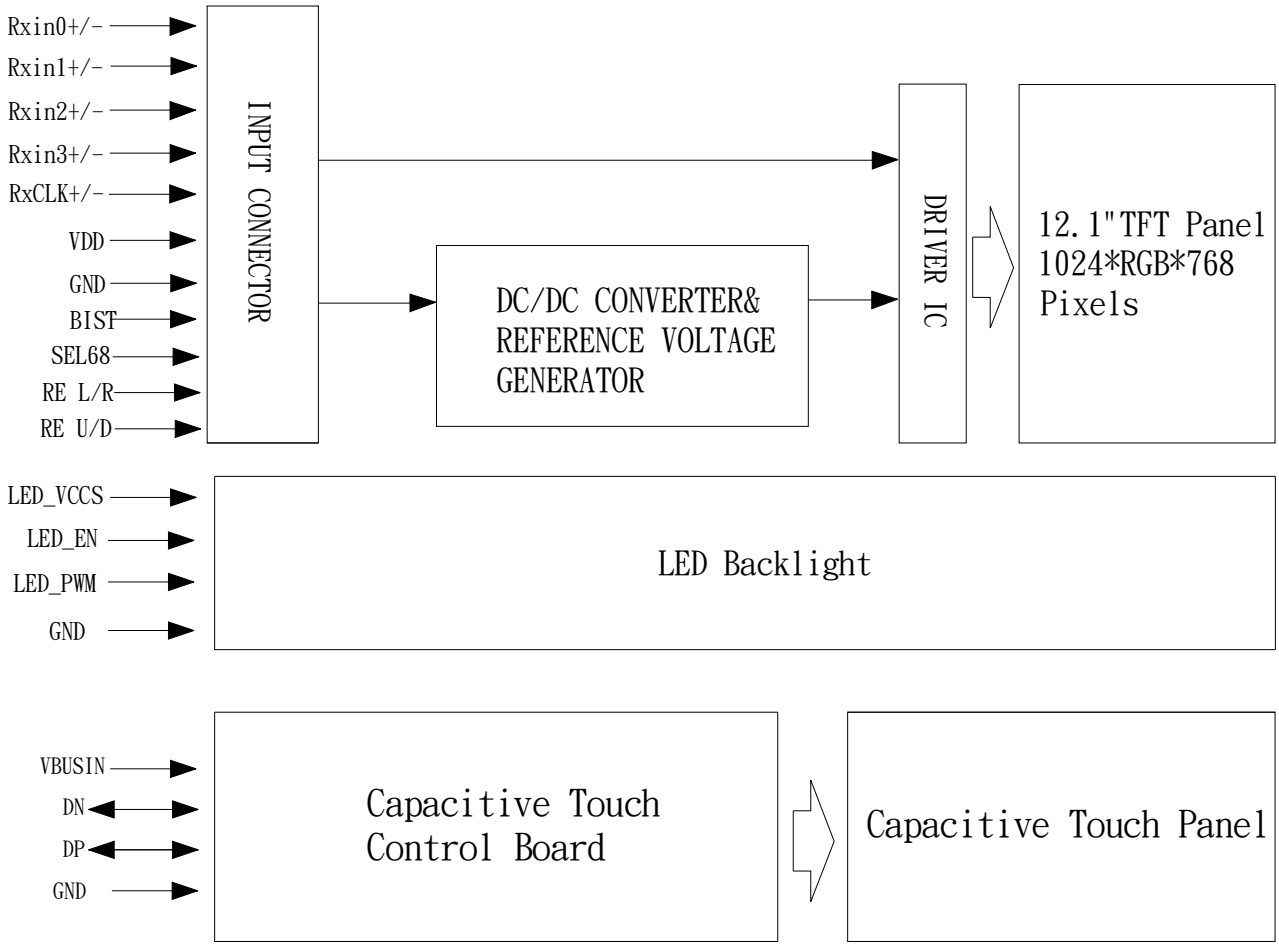
8. Outline dimension



Note :
1.CON1 : P-TWO 187191-20101-3 or equivalent
2.CON2 : ACES 91208-01001-H01 or equivalent
3.CON3 : WC2504-HC1100P or equivalent
4.UNIT : mm
5.SCALE : NTS
6.THE TOLERANCE UNLESS CLASSIFIED:0.3mm

9.Block diagram

9.1 TFT-LCD Module (Interface System Structure)



10. Input Terminal Pin Assignment

10.1 Input Signal & Power

Pin no	Symbol	Description	Remark
1	Rxin3+	LVDS CH3 Data (+)	-
2	Rxin3-	LVDS CH3 Data (-)	-
3	BIST	Normal operation/BIST pattern select BIST=0: Normal operation BIST=1: BIST mode	-
4	SEL68	LVDS 6/8 bit select function control, SEL68=1: LVDS input data is 6 bit SEL68=0: LVDS input data is 8 bit	-
5	GND	Power Ground	-
6	RxCLK+	LVDS CLK Data (+)	
7	RxCLK-	LVDS CLK Data (-)	
8	GND	Power Ground	
9	Rxin2+	LVDS CH2 Data (+)	
10	Rxin2-	LVDS CH2 Data (-)	
11	GND	Power Ground	
12	Rxin1+	LVDS CH1 Data (+)	
13	Rxin1-	LVDS CH1 Data (-)	
14	GND	Power Ground	
15	Rxin0+	LVDS CH0 Data (+)	
16	Rxin0-	LVDS CH0 Data (-)	
17	RE L/R	Left or right display control LR=1: Left-->Right LR=0: Right--> Left	
18	RE U/D	Up or Down display control LR=1: Up-->Down LR=0: Down--> Up	
19	VDD	Power supply for digital circuit	
20	VDD	Power supply for digital circuit	-

10.2 Input Signal & Power for CTP

Pin No	Symbol	scription	Remark
1	VBUSIN	Power supply +5V	Power
2	DN	Data (-)	Input/Output
3	DP	Data (+)	Input/Output
4	GND	Power Ground	Power

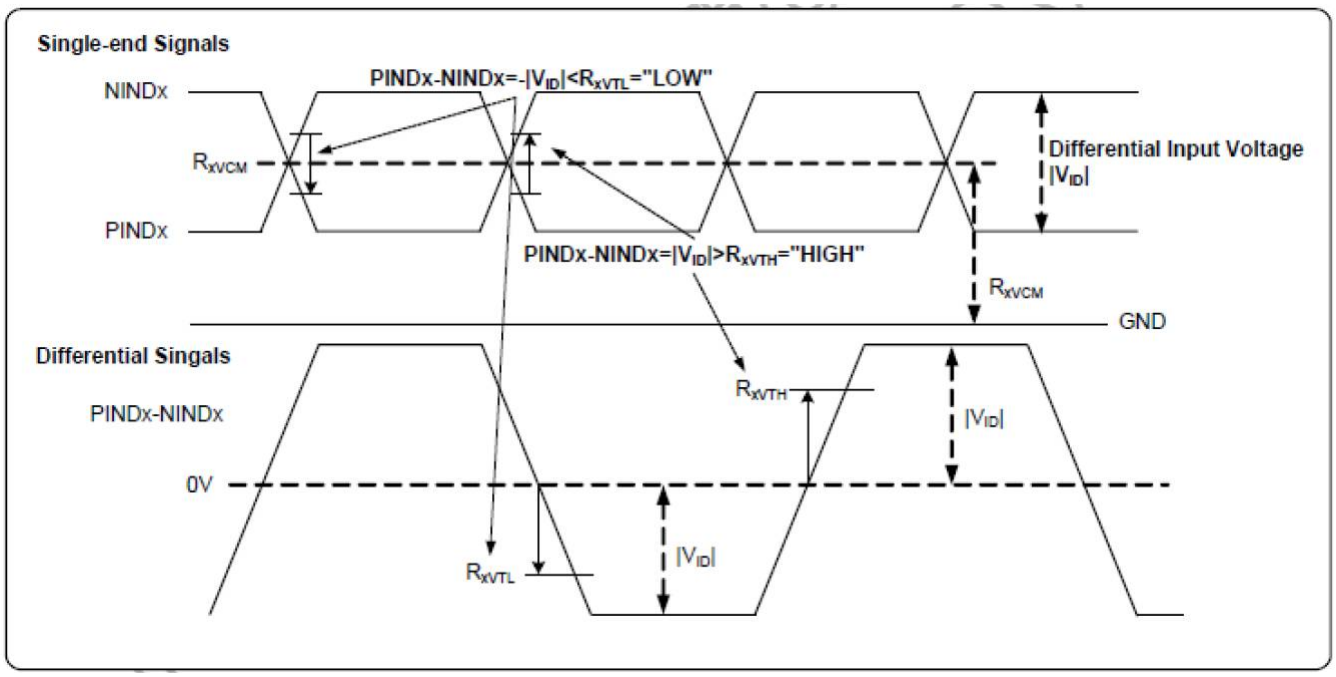
10.3 Input Signal & Power for Backlight

Pin No	Symbol	scription	Remark
1	LED_VCCS	LED positive pole	
2	LED_VCCS	LED positive pole	
3	LED_VCCS	LED positive pole	
4	LED_VCCS	LED positive pole	
5	GND	Power Ground	
6	GND	Power Ground	
7	GND	Power Ground	
8	GND	Power Ground	
9	LED_EN	Converter power IC output Enable (Active High)	
10	LED_PWM	PWM control signal for LED convertor	

11. Timing characteristics

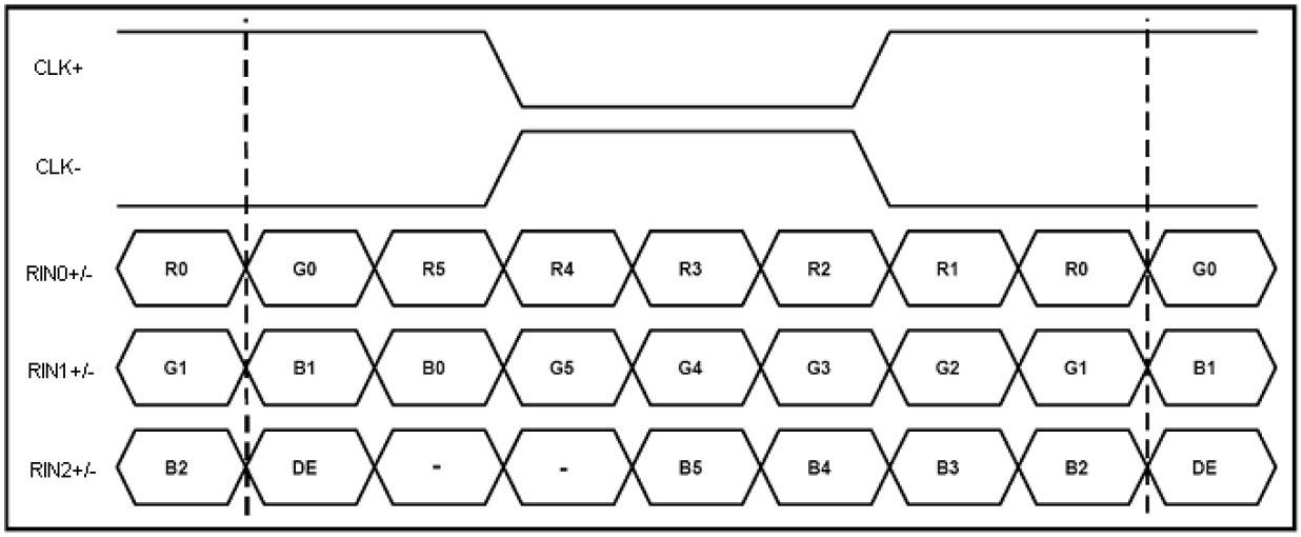
11.1 DC Electrical characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	R_{XVCM}=1.2V
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
Input Voltage range (Singled-end)	R_{xVIN}	0	-	2.4	V	
LVDS Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$	-	$2.4-\|V_{ID}\|/2$	V	
LVDS Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	

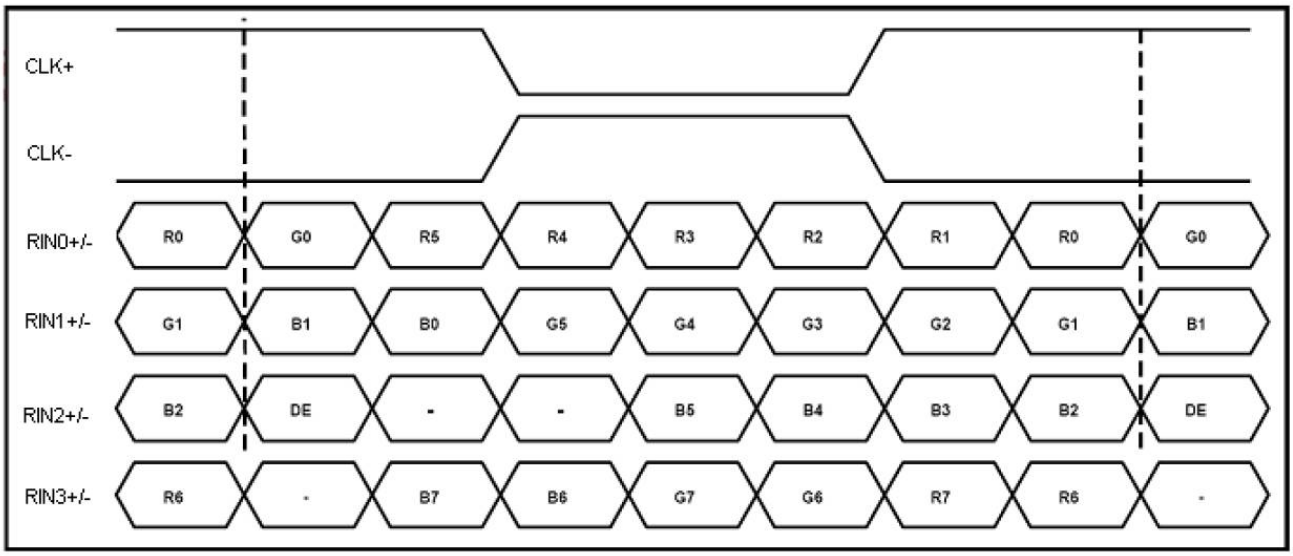


11.2 Data Input Format for LVDS

SEL68 = "High" for 6 bits LVDS Input



SEL68 = "Low" for 8 bits LVDS Input

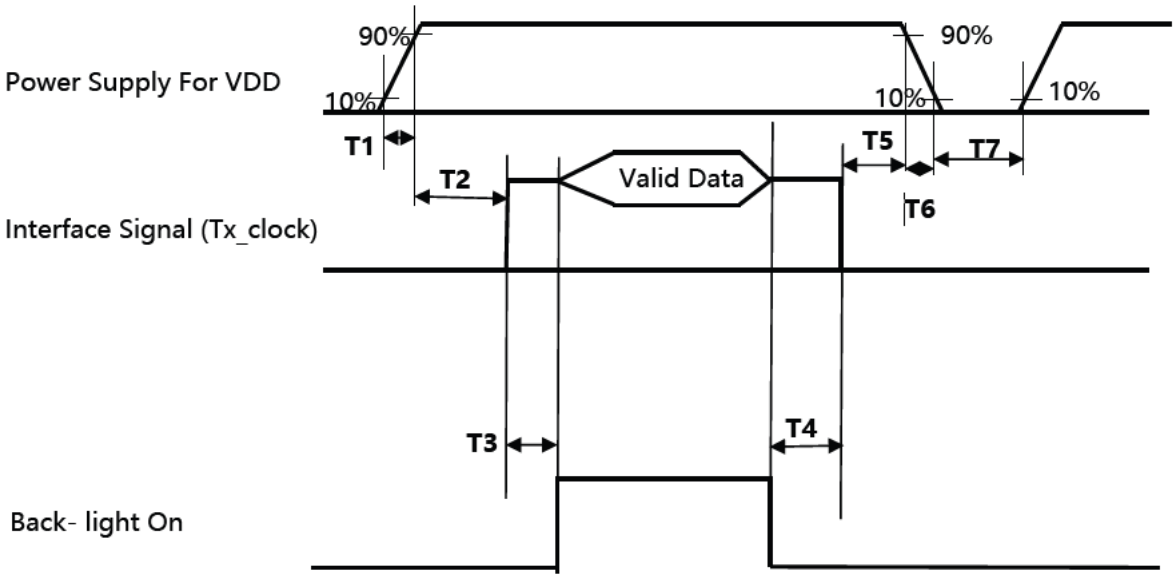


11.3 LVDS input Timing Table

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	52	65	71	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		768		T_H
VSD period	tv	778	806	845	T_H
VSD blanking	tvbp+tvfp	10	38	77	T_H

11.5 Power on/off Sequence

To prevent a latch-up or DC operation of the Open Cell, the power on/off sequence shall b e as shown in below



Parameter	Values			Units
	Min	Typ	Max	
T1	0.1	-	10	ms
T2	0.1	-	50	ms
T3	300	-	-	ms
T4	200	-	-	ms
T5	0.1	-	50	s
T6	0.1	-	10	ms
T7	500	-	-	ms

Note:

1: Even though T1 is over the specified value, there is no problem if the rush current is within Spec.

2: When the power supply VDD is 0V, keep the level of input signals on the low or high impedance；

※ Please avoid floating state of interface signal at invalid period.

※ When the power supply for LCD (VDD) is off, be sure to pull down the valid and invalid data to 0V.

3: The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

4: T6: Voltage of VDD must decay smoothly after power-off , there should be none re-bounding voltage.(customer system decide this value)

5：T7 should be measured after the Module has been fully discharged between power off and on period.

12. Driver IC Control Algorithms

Refer to the data sheet of LCD driver IC IN512-NO03 or equivalent.

Refer to the data sheet of CTP driver IC ILI2511 or equivalent.

13. Reliability Test Items

No.	Test items	Conditions	Remark
1	High temperature operation	85°C , 240hours	--
2	Low temperature operation	-30°C , 240hours	--
3	High temperature storage	85°C , 240hours	--
4	Low temperature storage	-30°C , 240hours	--
5	High temperature & high humidity storage	40°C , 90% RH , 240hours	--
6	Thermal Shock storage	-20°C , 30min. ~ 70°C , 30min. , 100 Cycles	--
7	Vibration test	Sweep frequency :10~55~10 Hz, Amplitude : 0.75mm Test direction : X, Y, Z 3 axis, and duration Test time : 0.5hr for each axis	Non-operation
Criterion: There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.			

14. General Precautions

Please pay attentions to the followings as using the LCD module.

14.1 Handling

(a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.

(b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.

(c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.

(d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

(e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the polarizer permanently. The recommended solvents are water and Isopropyl alcohol.

(f) Wipe off water droplets or oil immediately.

(g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.

(h) Do not touch the output pins directly with bare hands.

(i) Do not disassemble the LCD module.

14.2 Storage

(a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.

(b) Do not expose the LCD modules to sunlight directly.

(c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.

(d) Avoid condensation of water. It may cause improper operation.

(e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

14.3 Operation

(a) When mounting or dismounting the LCD modules, turn the power off.

(b) Protect the LCD modules from electric shock.

(c) The Driver IC control algorithms should always obeyed to avoid damaging the LSI and electronic circuit.

(d) Be careful to avoid mixing up the polarity of power supply for backlight.

(e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.

(f) When a static image is displayed for a long time, remnant image is likely to occur.

(g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

14.4 Others

(a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

(b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.

(c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

15. Quality and reliability

15.1 Test condition

Test should be conducted under the following conditions:

(a) Ambient temperature: 25 ± 5°C

(b) Humidity: 55 ± 10% RH

15.2 Sampling plan

Sampling method shall be in accordance with MIL-STD-105D, inspection level II, normal inspection, and single sampling plan tables for normal tightened and reduced inspection.

15.3 Acceptable quality level

A major defect is a defect that could result in failure or materially reduce that the usability of the unit of product for its intended purpose.

A minor defect is one that does not materially reduce the usability of the unit of product for its intended purpose or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

15.4 Appearance

Appearance test is to be conducted by human eyes at approximately 30cm distance from LCD module under the single fluorescent light without reflection.

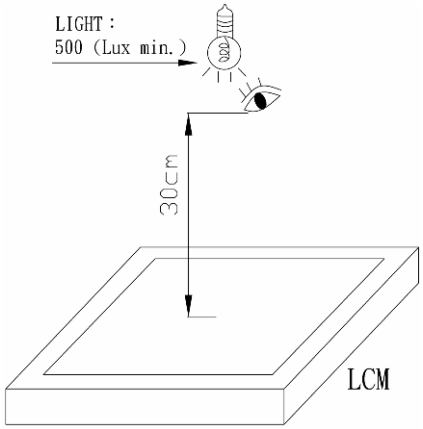
Condition:

(a) Illumination: 500 Lux min

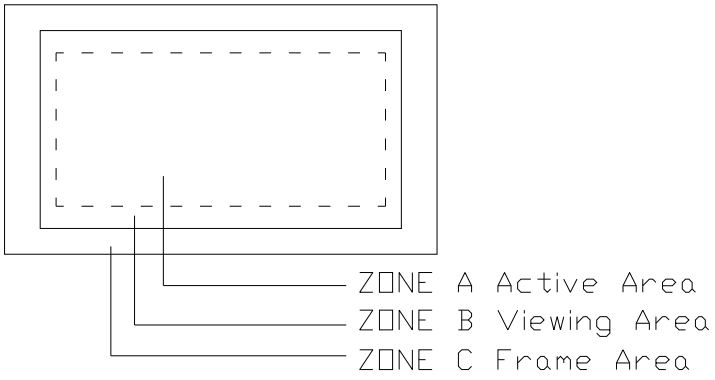
(b) Inspect determination: 30cm

(c) Inspect direction: above the LCM

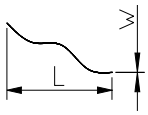
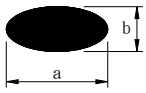
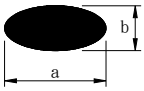
(d) View angle: ±30°



The inspection area of LCD panel shall be within the range of following limits.



15.5 Inspection quality criteria for TFT LCM

<table>
<tr><th>ITEM</th><th>DESCRIPTION OF DEFECTS</th><th>Zone</th><th>Acceptable level (%)</th></tr>
<tr><td>DIMENSION</td><td>Refer to individual acceptance specification</td><td>A,B,C</td><td>2.5</td></tr>
<tr><td>LINE DEFECT ON SURFACE (SCRATCHES, BLACK/ WHITE LINE)</td><td>(a) L ≦ 5mm & W≦ 0.05mm, disregard
(b) L ≦5mm & 0.05mm < W ≦0.1mm, N ≦ 3,
Distance≧10mm, ACC
(c) L > 5mm or W > 0.1mm, REJ
  </td><td>A</td><td>2.5</td></tr>
<tr><td>SPOT DEFECT ON SURFACE (BLACK/ WHITE SPOT)</td><td>Average diameter, D
(a) D≦0.2mm, disregard
(b) 0.2mm < D ≦0.5mm, N ≦ 4,
Distance≧10mm, ACC
(c) D> 0.5mm, REJ
  $D=\frac{a+b}{2}$</td><td>A</td><td>2.5</td></tr>
<tr><td>PROTRUDE DOT/ DENT ON SURFACE</td><td>Average diameter D
(a) D≦0.3mm, disregard
(b) 0.3mm < D ≦ 0.5mm, N ≦ 4,
Distance≧10mm, ACC
(c) D> 0.5mm, REJ
  $D=\frac{a+b}{2}$</td><td>A</td><td>2.5</td></tr>
<tr><td>POLARIZER EDGE</td><td>BUBBLES、DENTS、RESIDUAL GLUE、DECKLE EDGE：
(a) Extended polarizer edge outside area don’t care.
(b) Extended inside depth ≦ 0.5mm, ACC.
(c) Extended inside depth > 0.5mm, refer item PROTRUDE DOT/DENTON SURFACE for judgment</td><td>A,B</td><td>2.5</td></tr>
<tr><td>BRIGHT/ DARK POINT</td><td>
<table>
<tr><th colspan="2">Item</th><th>Allow number in Area A</th></tr>
<tr><td rowspan="4">(a) Bright point</td><td>Single point</td><td>2</td></tr>
<tr><td>Two adjacent point</td><td>0</td></tr>
<tr><td>Three adjacent point</td><td>0</td></tr>
<tr><td>Total point</td><td>2</td></tr>
<tr><td rowspan="4">(b) Dark point</td><td>Single point</td><td>5</td></tr>
<tr><td>Two adjacent point</td><td>0</td></tr>
<tr><td>Three adjacent point</td><td>0</td></tr>
<tr><td>Total point</td><td>5</td></tr>
</table>
※ Point：A sub pixel 1R or 1G or 1B
※ The distance of bright or dark point ≧ 5mm</td><td>A</td><td>2.5</td></tr>
<tr><td>CHROMA MURA</td><td>Mura and leak are defined through transmission ND 6% filter</td><td>A</td><td>2.5</td></tr>
<tr><td>DISPLAY ABNORMAL</td><td>(a) Non display (b) Line defect
(c) Water ripple (d) Flicker
(e) Response time, contrast ratio, brightness or viewing angle abnormal</td><td>A</td><td>0.65</td></tr>
</table>

NOTE：(1) ACC：Accept (2) REJ：Reject

■ Inspection Specifications

The buyer (customer) shall inspect the modules within twenty calendar days since the delivery date (the "inspection period") at its own cost. The results of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to the seller.

The buyer may, under commercially reasonable reject procedures, reject an entire lot in the delivery involved if, within the inspection period, such samples of modules within such lot show an unacceptable number of defects in accordance with this incoming inspection standards, provided however that the buyer must notify the seller in writing of any such rejection promptly, and not later than within three business days of the end of the inspection period.

Should the buyer fail to notify the seller within the inspection period, the buyer's right to reject the modules shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

■ Warranty

AHS warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for one year from the date of purchase.

AHS will be limited to replace or repair any of its module which is found and confirmed defective electrically or visually when inspected in accordance with AHS general module inspection standard.

This warranty does not apply to any products which have been on customer's production line, repaired or altered by persons other than repair personnel authorized AHS, or which have been subject to misuse, abuse, accident or improper installation. AHS assumes no liability under the terms of this warranty as a consequence of such events.

If an AHS product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. In returning the modules, they must be properly packaged with original package; there should be detailed description of the failures or defect.

■ RMA

Products purchased through AHS and under warranty may be returned for replacement. Contact sales@advancehightech.com for RMA number and procedures.

Office Locations

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