

Shenzhen Leadtek Electronics Co.,Ltd

PRODUCT SPECIFICATION

TFT-LCD MODULE

Module No: LTK121WXBCT13-V0

☒ Preliminary Specification

☐ Approval Specification

Designed by	Checked by	Approved by
<i>jona</i>	<i>tom</i>	<i>lan</i>

Final Approval by Customer

Approved by	Comment

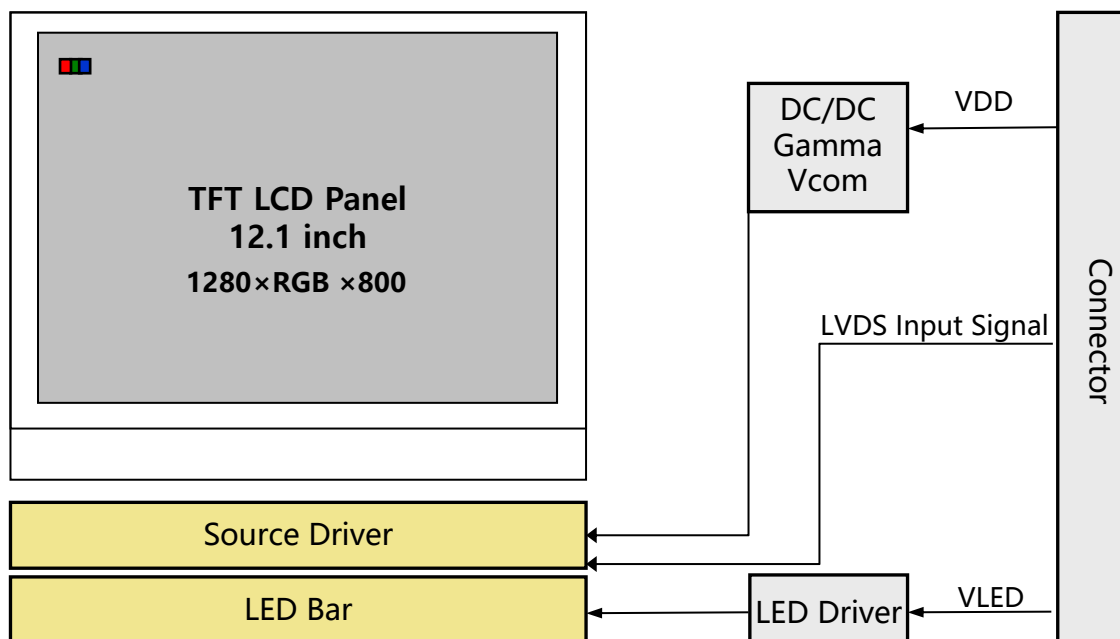
1.0 Document Revision History

Version	Contents	Date	Note
V0	First Specification Release	2023.06.16	

1.1 GENERAL DESCRIPTION

1.0.1 Introduction

LTK121WXBCT13-V0 is a color active matrix TFT LCD panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This panel has a 12.1 inch diagonally measured active area with XGA resolutions (1280 horizontal by 800 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M(8bits) colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



1.0.2 Features

- 8-bit color depth, display 16.7M colors
- LVDS Interface with 1pixel / clock
- DE (Data Enable) only
- Reverse Type
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS Compliant
- 7*24hrs usage support with dynamic video 或者 7*18hrs
- Landscape and Portrait usage support

1.0.3 Application

- For industrial control white Treadmill
- Portable display white refrigerator
- Washing machine and coffee-machine etc. white goods

1.0.4 General Specification

<Table 1. General Specifications>

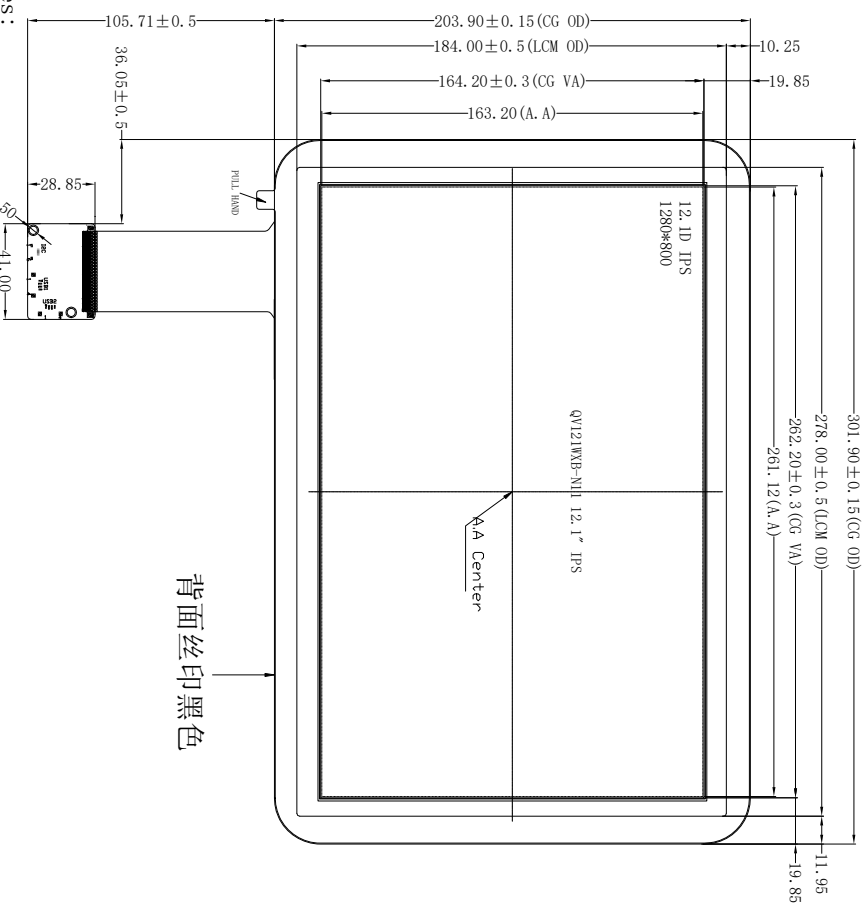
Parameter	Specification	Unit	Remarks
Active Area	261.12 (H) × 163.20(V)	mm	
Number Of Pixels	1280(H) × 800(V) (1 pixel = R + G + B dots)	pixels	
Pixel Pitch	0.204(H) × 0.204(V)	mm	
Pixel Arrangement	RGB Vertical stripe		
Display Mode	Normally Black		
Display Colors	16.7M	colors	
Surface Treatment	AG42		
Contrast Ratio	1200 typ		
Viewing Angle(CR>10)	U/D/L/R Tpy: > 85/85/85/85	deg.	
Response Time	30typ/35max	ms	
Color Gamut	NTSC 72%typ		
Transmittance	Typ. 5.0%	%	基于12.1WX BLU
Power Consumption	1.122	W	
Outline Dimension	301.90 (H) × 203.90(V)×9.73(T)	mm	
Weight	TBD	g	

2.0 Mechanical Drawing

Front View

Side View

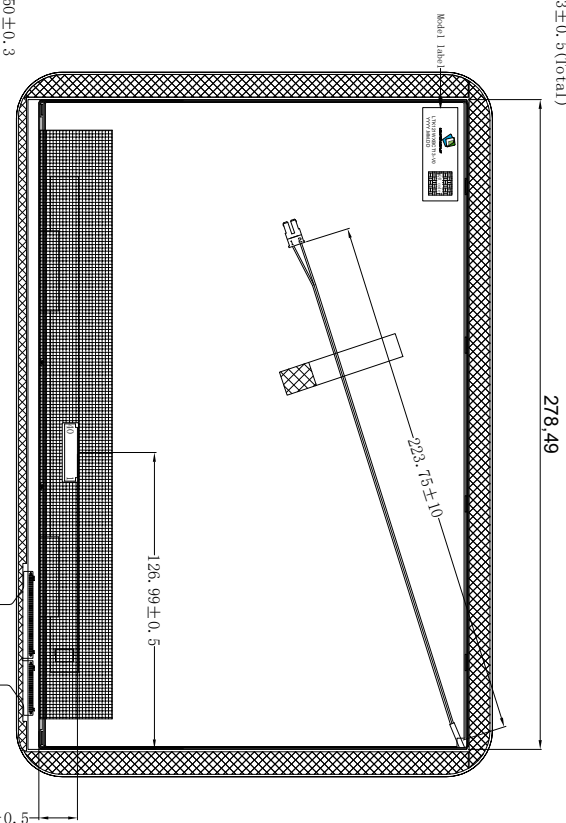
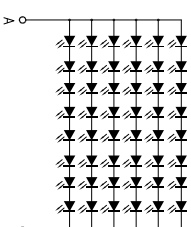
Back View



背面丝印黑色

Technical parameters				
1	TP Structure	Glass/Glass	7	10 points of touch
2	TP type	OTG	8	> 85%
3	IC resolution	1125x1	9	low heat and
4	channel number	T32ARXU1	10	resistance to wear and tear
5	channel type	IS88	11	surface hardness
6	working voltage	4.75V ~ 6.25V	12	work environment
7	working voltage		13	storage environment
				-20°C ~ +70°C

IF=360mA, VF=24.8V (TYP)



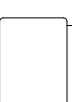
PNV NUMBER	NAME
1	NC
2	VO
3	VO
4	VO
5	NC
6	NO
7	NO
8	NO
9	NO
10	NO
11	RI+1
12	RI+1
13	NO
14	RI+2
15	RI+2
16	NO
17	LV5 L&K
18	LV5 C&K
19	NO
20	RI+3
21	RI+3
22	NO
23	NC
24	NC
25	NO
26	NO
27	SL
28	NO
29	NC
30	NC
31	NO
32	NO
33	NO
34	NC
35	NC
36	NC
37	NC
38	NC
39	NC
40	NC

Notes:

1. Display : 12.1", 6 TFT
2. Resolution: 1280xRGBx800
3. LCD Viewing Direction: ALL
5. Display Mode: Normally Black
6. LCM+CTP Brightness: 600cd/m² (TYP)
7. umark Tolerance: ± 0.2
8. OPERATING TEMP: -20°C ~ +70°C
9. STORAGE TEMP: -30°C ~ +80°C
10. Requirements on Environmental Protection: ROHS

3		
2		
1		
0	NEW	
REV	DESCRIPTION	DATE NAME
		2024.07.17 IAN

USB	
Pin No.	Pin Name
1	VBUSIN
2	DN
3	DP
4	EGND



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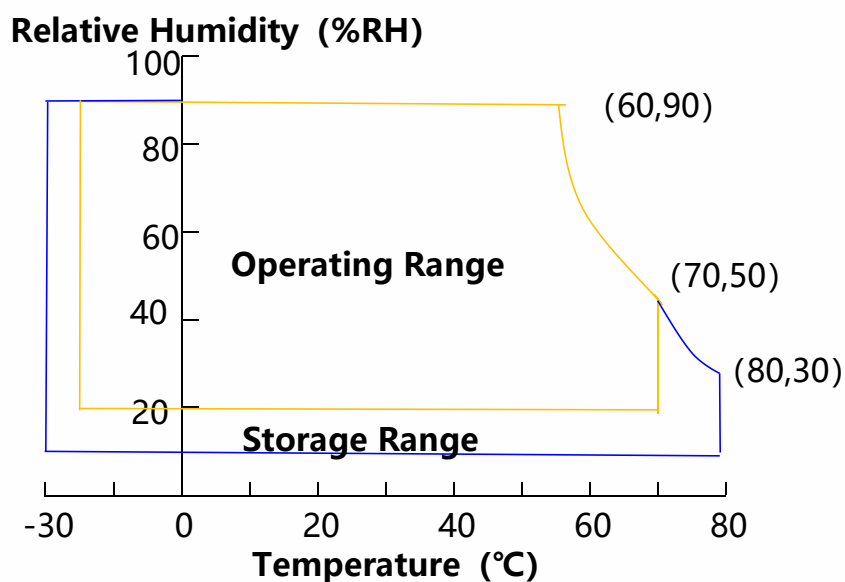
3.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Environment Absolute Maximum Ratings> [Ta =25±2 °C]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	3.0	3.6	V	Ta = 25 °C
Operating Temperature	T _{OP}	-20	+70	°C	Note 1
Storage Temperature	T _{ST}	-30	+80	°C	
Operating Ambient Humidity	H _{op}	10	90	%RH	
Storage Humidity	H _{st}	10	90	%RH	

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C max. and no condensation of water.



4.0 ELECTRICAL SPECIFICATIONS

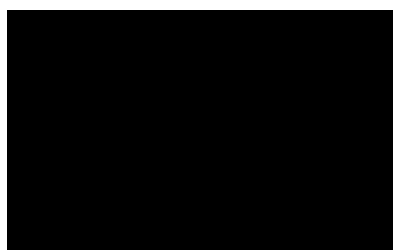
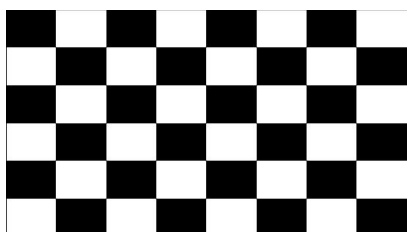
4.0.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications >

[Ta =25±2 °C]

Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
Power Supply Voltage		VDD	3.0	3.3	3.6	V	Note 1
Power Supply Ripple Voltage		VRP	-	-	100	mV	
Power Supply Current		IDD	100	130	160	mA	
Rush current		IRUSH	-	-	1	A	Note 2
LVDS Interface	Main link swing voltage	V _{ID}	200	-	600	mV	
	Common mode voltage	V _{cm}	1	1.2	1.4	V	
Power Consumption		P _D	0.33	0.429	0.528	W	Note 1

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VBAT=3.3V, Frame rate f_v=60Hz and Clock frequency = 72.4MHz. Test Pattern of power supply current
a) Typ : Mosaic 8 x 6 Pattern(L0/L255) b) Max : Black



2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

4.0.2 Back-light Unit:

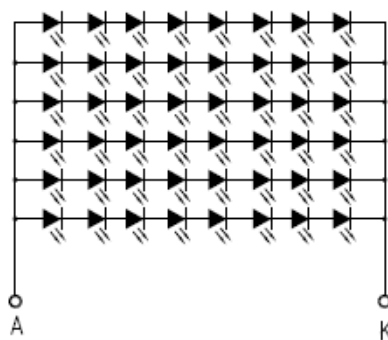
PARAMETE	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
LED Current	IF	—	360	—	mA	—	—
LED Voltage	VF	—	24.8	—	V	I=280mA	—
Luminous	IV		600	—	Cd/m ²	I=280mA	—
Life Time		—	30000	—	Hr.	I=280mA	—
Color	White						

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation

should be restricted to the conditions described under normal operating conditions.

(2) Ta=25±2°C

(3) Test condition: LED Current
180mA.



IF=360mA, VF=24.8V (TYP)

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

The connector interface pin assignments are listed in Table 4

<Table 4 Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
1	NC	No Connection.
2-4	VDD	Power Supply For LCD,VDD=3.3V.
5	NC	No Connection.
6-7	GND	Ground.
8	RIN0-	LVDSData differential signal input pins.
9	RIN0+	LVDS Data differential signal input pins.
10	GND	Ground.
11	RIN1-	LVDS Data differential signal input pins.
12	RIN1+	LVDS Data differential signal input pins.
13	GND	Ground.
14	RIN2-	LVDS Data differential signal input pins.
15	RIN2+	LVDS Data differential signal input pins.
16	GND	Ground.
17	LVDS_CLK-	LVDS CLOCK differential signal input pins.
18	LVDS_CLK+	LVDS CLOCK differential signal input pins.
19	GND	Ground.
20	RIN3-	LVDSData differential signal input pins.
21	RIN3+	LVDS Data differential signal input pins.
22	GND	Ground.
23-24	NC	No Connection.
25	GND	Ground.
26	SDA	Serial data input/output for I2C Interface.
27	SCL	Clock Input for I2C interface.
28	GND	Ground.
29-30	NC	No Connection.
31-33	GND	Ground.
34	NC	No Connection.
35	PWM	PWM dimming control input.
36	LED_EN	Chip enable (active high).
37	NC	No Connection.
38-40	VLED	LED Power supply input,VLED=5V-24V,12V TYP.

Rear view of LCM

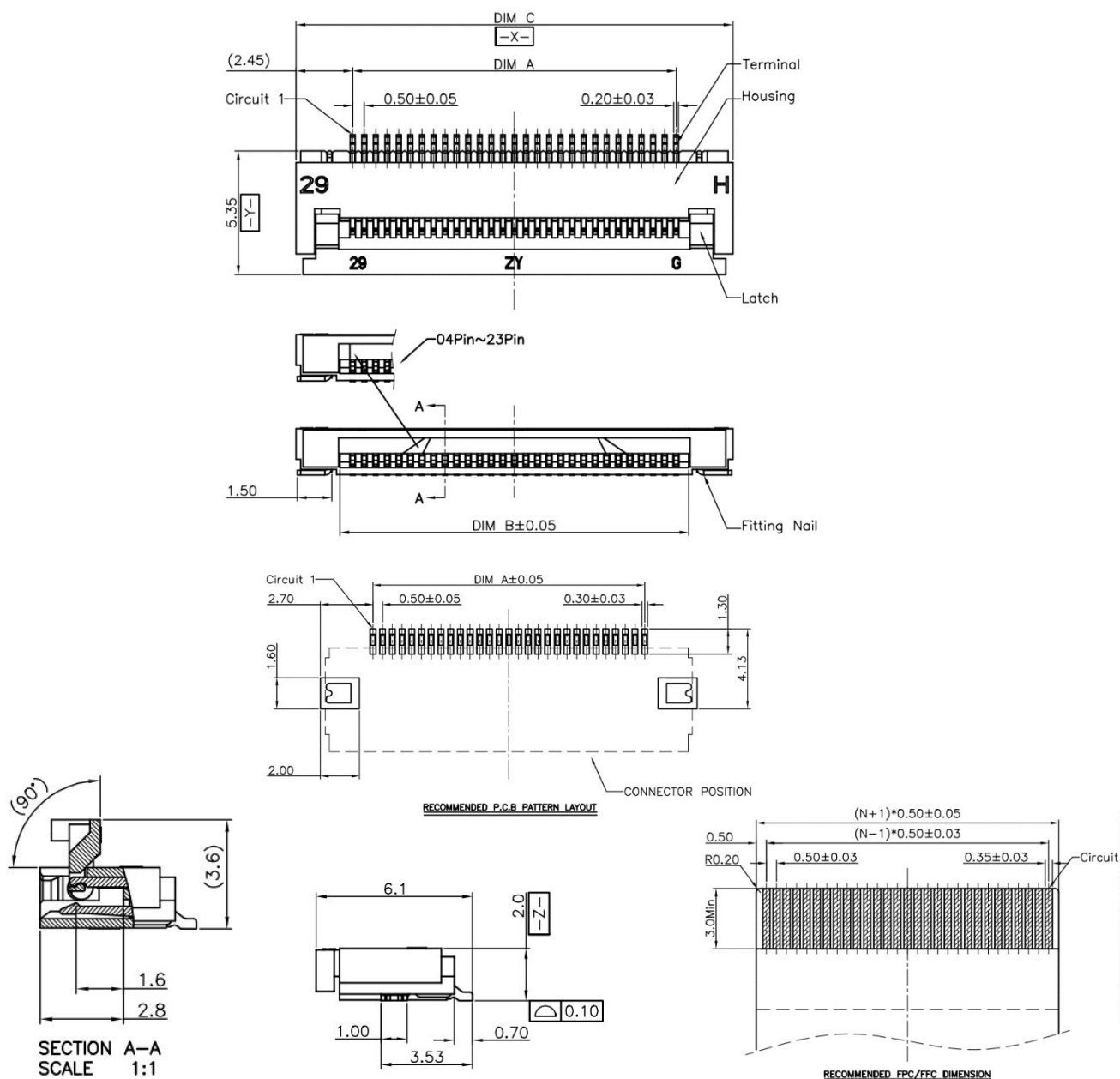
AFC01-S40FCA-00(0.5inch , 2.0mm)



5.2 Dimension

CNT Dimension

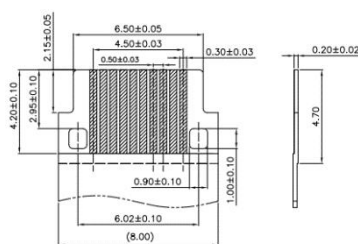
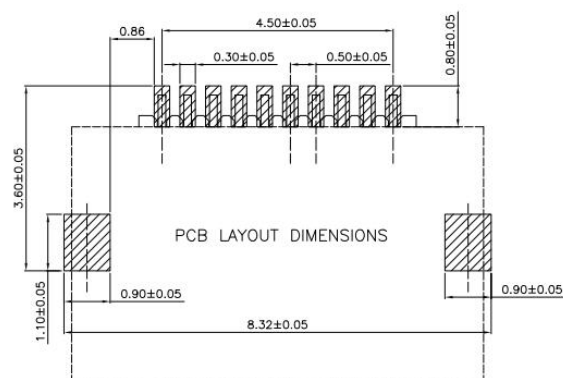
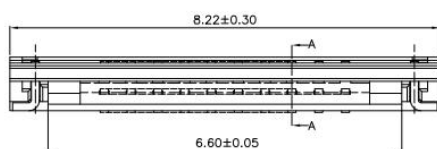
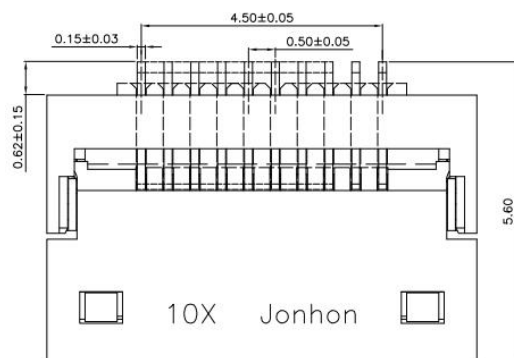
-40pin Connector : AFC01-S40FCA-00(0.5inch , 2.0mm)



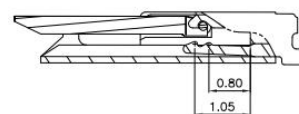
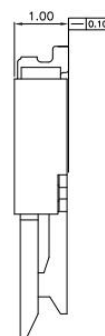
5.3 Dimension

CNT Dimension

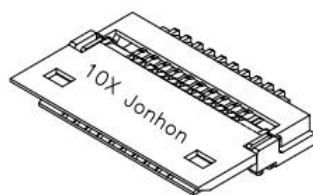
-10pin Connector : MSK24022P10A



RECOMMENDED FFC DIMENSIONS
SCALE 0.5:1



SECTION A-A
SCALE 1:1



5.4 LVDS Interface

- LVDS Receiver : Timing Controller (LVDS Rx merged) / LVDS Data : Pixel Data
< Table 7. LVDS Input Data Mapping >

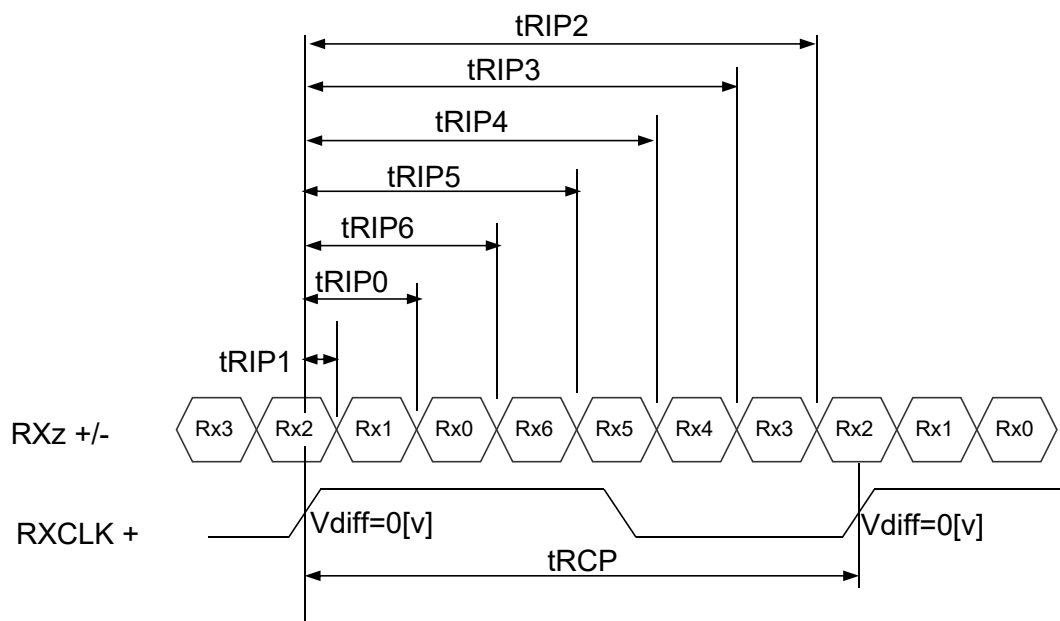
Channel No.	Data No.	8-bit LVDS Type
		VESA
0	Bit-0	R0
	Bit-1	R1
	Bit-2	R2
	Bit-3	R3
	Bit-4	R4
	Bit-5	R5
	Bit-6	G0
1	Bit-0	G1
	Bit-1	G2
	Bit-2	G3
	Bit-3	G4
	Bit-4	G5
	Bit-5	B0
	Bit-6	B1
2	Bit-0	B2
	Bit-1	B3
	Bit-2	B4
	Bit-3	B5
	Bit-4	HS
	Bit-5	VS
	Bit-6	DE
3	Bit-0	R6
	Bit-1	R7
	Bit-2	G6
	Bit-3	G7
	Bit-4	B6
	Bit-5	B7
	Bit-6	-

5.5 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 8.

<Table 8. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCP	10	T	40	nsec	
Receiver Data Input Margin	tRMG	-0.45	-	+0.45	nsec	fCLKIN=80.9MHz
		-0.60	-	+0.60	nsec	fCLKIN=75MHz
Input Data 0	tRIP1	- tRMG	0.0	tRMG	Clock	
Input Data 1	tRIP0	T/7- tRMG	T/7	T/7+ tRMG	Clock	
Input Data 2	tRIP6	2 T/7- tRMG	2T/7	2T/7+ tRMG	Clock	
Input Data 3	tRIP5	3T/7- tRMG	3T/7	3T/7+ tRMG	Clock	
Input Data 4	tRIP4	4T/7- tRMG	4T/7	4T/7+ tRMG	Clock	
Input Data 5	tRIP3	5T/7- tRMG	5T/7	5T/7+ tRMG	Clock	
Input Data 6	tRIP2	6T/7- tRMG	6T/7	6T/7+ tRMG	Clock	



$$* V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$$

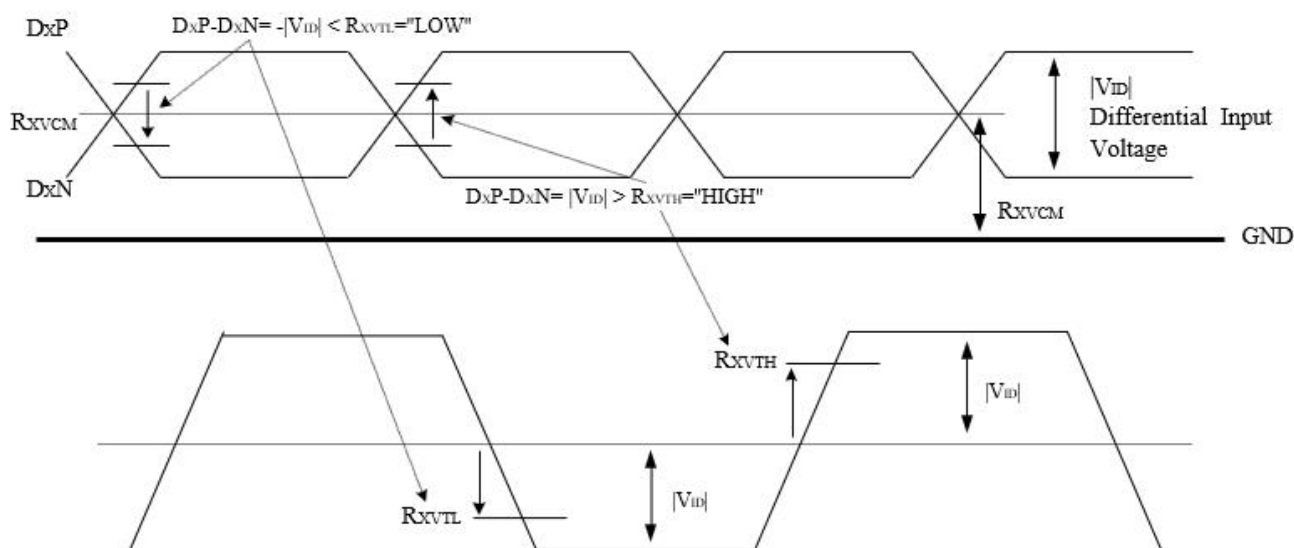
5.6 DC Specification

- LVDS Receiver Differential Input (DC Characteristics

< Table 9-1. LVDS Rx DC Characteristics >

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential Input High Threshold Voltage	V _{TH}	-	-	+100	mV	V _{CM} =1.2V
Differential Input Low Threshold Voltage	V _{TL}	-100	-	-	mV	
Differential Input Common Mode Voltage	V _{CM}	1	1.2	1.4	V	
Differential Input Voltage	V _{ID}	200	-	600	mV	

Single-end Signals

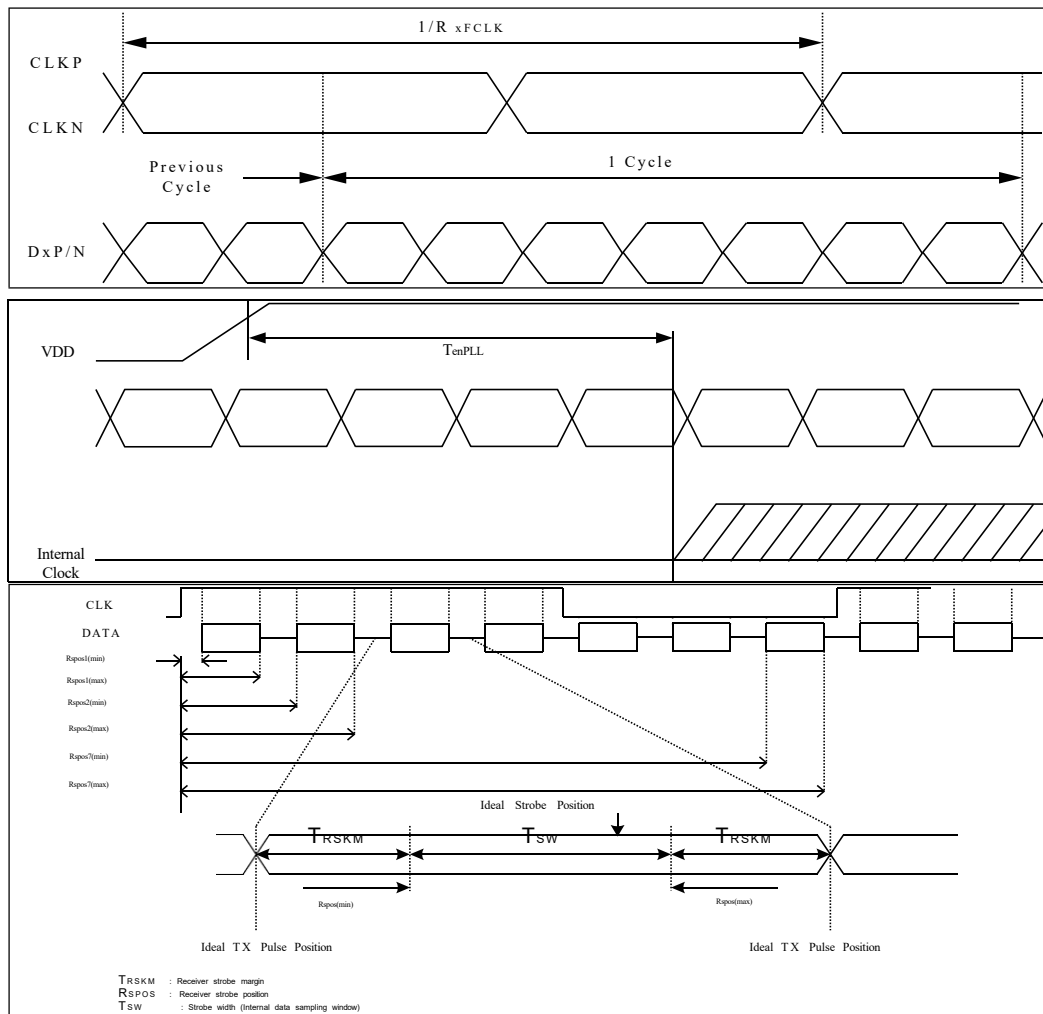


5.7 AC Specification

- LVDS Receiver Differential Input (AC Characteristics)

< Table 9-2. LVDS Rx AC Characteristics >

Parameter	Symbol	Min	Typ	Max	Unit	Notes
LVDS Strobe Width	t_{SW}	200	-	-	ps	V _{cm} =1.2V VID = 200mV @81MHz
LVDS Receiver Skew Margin	t_{RSM}	500	-	-	ps	



6.0 Interface timing Parameter

6.1 Timing Parameters (DE only mode)

For 1280RGBx800

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60Hz (LVDS)	F _{DCLK}	66.3	72.4	78.9	MHz
HSYNC period time	T _H	1380	1440	1500	DCLK
Horizontal display area	T _{HD}	1280			DCLK
HSYNC pulse width	T _{HPW}	Min.	2		
		Typ.	-		
		Max.	40		
HSYNC back porch(with pulse width)	T _{HBP}	88	88	88	DCLK
HSYNC front porch	T _{HFP}	12	72	132	DCLK
VSYNC period time	T _V	824	838	872	H
Vertical display area	T _{VD}	800			H
VSYNC pulse width	T _{VPW}	Min.	2		H
		Typ.	-		
		Max.	20		
VSYNC back porch(with pulse width)	T _{VBP}	23	23	23	H
VSYNC front porch	T _{VFP}	1	15	49	H

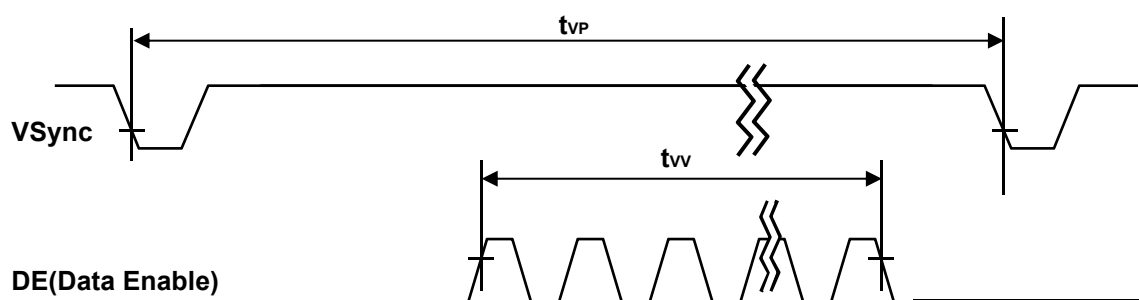
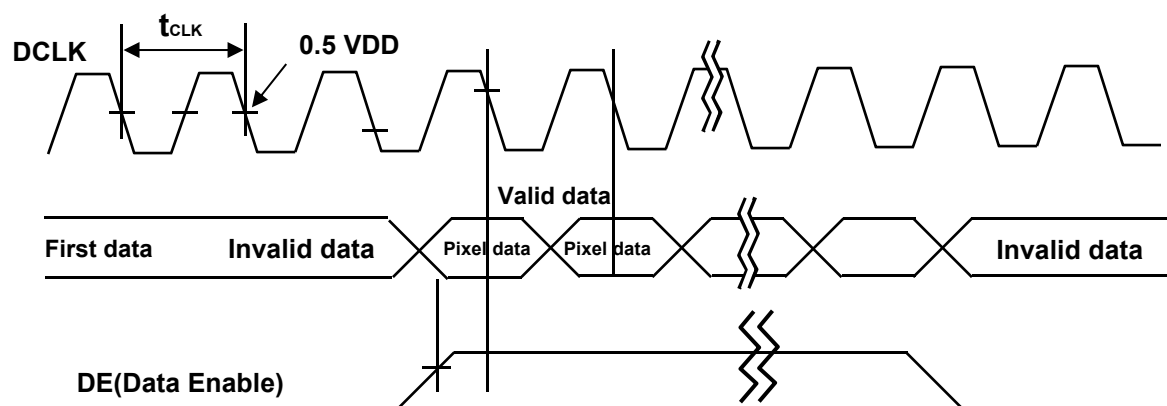
For 1280RGBx800 DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60Hz (LVDS)	F _{DCLK}	69.7	75	80.9	MHz
Horizontal display area	T _{HD}	1280			DCLK
HSYNC period time	T _H	1380	1440	1500	DCLK
HSYNC blanking	T _{HBP} +T _{HFP}	100	160	220	DCLK
Vertical display area	T _{VD}	800			H
VSYNC period time	T _V	842	838	872	H
VSYNC blanking	T _{VBP} +T _{VFP}	24	38	72	H

Note

1. DE Only Mode, While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation.
2. Best operation clock frequency is 75Mhz.
3. Frequency] = [H Total] * [V Total] * [vertical Frame rate]
H Total, V Total and Frame rate]should operate within the range between Frequency_Min and Frequency_Max
4. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.
5. Main frequency Max is 80.9Mhz MHz without spread spectrum

6.2 Signal Timing Waveform



6.3 Input Signals, Basic Display Colors and Gray Scale of Colors

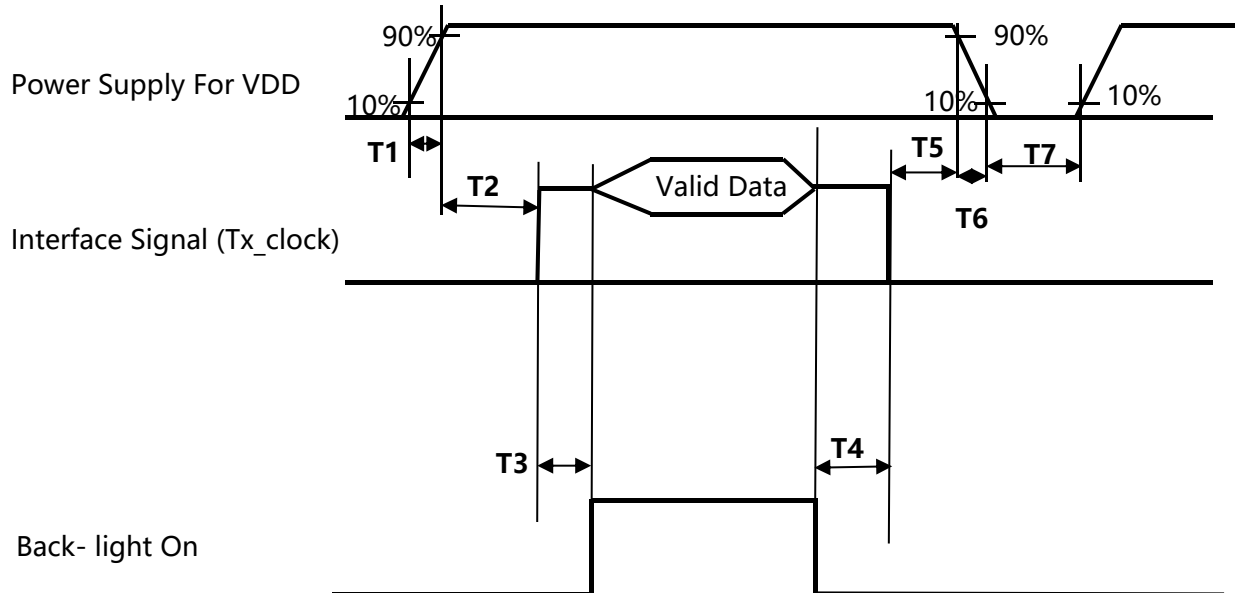
< Table 12. Input Signal and Display Color Table >

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

7.0 POWER SEQUENCE

[Ta =25±2 °C]

To prevent a latch-up or DC operation of the Open Cell, the power on/off sequence shall be 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.

Note 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.

Note 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.

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

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

8.0 OPTICAL SPECIFICATION

8.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance $\leq 1\text{lux}$ and temperature = $25\pm 2^{\circ}\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta\phi=0$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta\phi=90$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta\phi=180$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta\phi=270$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or ϕ , the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be $3.3 \pm 0.3\text{V}$ at 25°C . Optimum viewing angle direction is 6 'clock.

<Table 7. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	1000	1200	-		Note 2
Luminance of White	Center	Y_w	$\Theta = 0^\circ$	--	--	-	cd/m ²	Note 3
White Lumina nce uniformity	9 Points	ΔY_9		-	-	-	%	Note 4
Color Gamut	NTSC	CIE1931	$\Theta = 0^\circ$	68	72	-	%	Note 5
Reproduction of color	White	W_x	$\Theta = 0^\circ$	Typ -0.03	TBD	Typ +0.03		
		W_y			TBD			
Response Time		Tr+Td	Ta= 25° C $\Theta = 0^\circ$	-	30	35	ms	Note 6

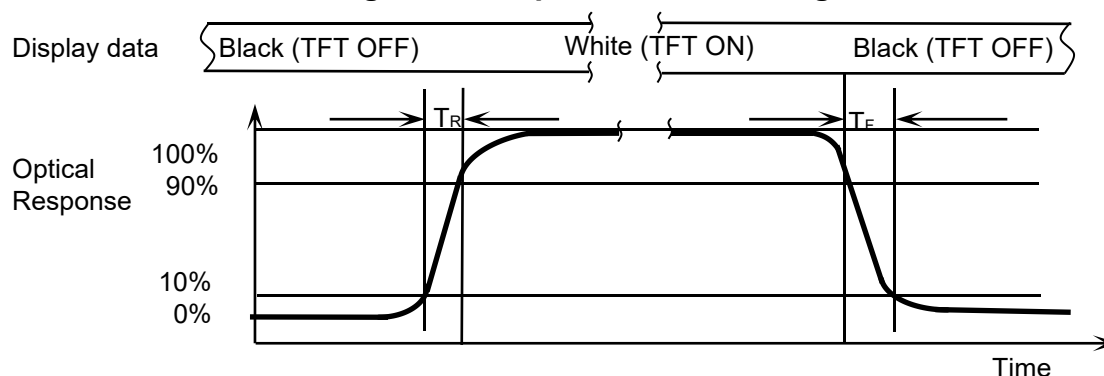
Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 2).

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

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

3. Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 3 for a total of the measurements per display. The luminance is measured by CS2000/CA310 when the LED current is set at 60mA.
4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 9 Points points} / \text{Maximum Luminance of 9 Points points}$ (See FIGURE 3).
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_R and 90% to 10% is T_d .

9.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 9. Reliability test>

Test Item	Test conditions	Remark
High Temperature Storage	+8 °C, 8h	
Low Temperature Storage	-30°C, 8h	
High Temperature Operation	+70°C, 8	
Low Temperature Operation	-20°C, 8h	
High Temperature & Humidity Operation Test	0°C, 90%RH , 8h	
Temperature Shock Test storage	-30°C~7 °C, 1hr/cycle, 100cycle	
Image Sticking	Chess 10*10 Pattern 1hrs Room temperature Gray 127 no image sticking	
ESD	150pF+330Ω, Air : +/- 1 kV, Contact :+/- kV , Class B	
Packing VIB	1.47G, 1-200hz, X, Y, ±Z, 30min/Axis	

Note : After the reliability test, the product only guarantee function normally without any fatal defect (non-display, line defect, abnormal display etc). All the cosmetic specification is judged before the reliability test.

10.0 Precautions

Please pay attention to the followings when you use this TFT LCD Panel.

10.1 Mounting Precautions

- (1) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (2) You must mount a module using specified mounting holes (Details refer to the drawings).
- (3) Please make sure to avoid external forces applied to the Source PCB or FPC and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.
- (4) Note that polarizers are very fragile and could be easily damaged. Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (5) Do not pull or fold the source D-IC which connect the source PCB or FPC and the panel.
- Do not pull or fold the LED wire.
- (6) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water.
- Do not strong polar solvent because they cause chemical damage to the polarizer.
- (7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (8) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (9) Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- (10) Do not disassemble the module.
- (11) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- (12) If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- (13) Do not drop water or any chemicals onto the LCD's surface.

10.2 Operating Precautions

- (1) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (2) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- (3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.
- (4) The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- (5) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (6) Design the length of cable to connect between the connector for back-light and the converter as short as possible and the shorter cable shall be connected directly.
The longer cable between that of back-light and that of converter may cause the luminance of LED to lower and need a higher startup voltage(Vs).
- (7) Connectors are precise devices for connecting PCB and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.
- (8) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.
- (9) When the module is operating, do not lose CLK, ENAB signals. If any one these signals is lost, the LCD panel would be damaged.
- (10) Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- (11) Do not re-adjust variable resistor or switch etc.
- (12) Long Side LED Bar design is recommended when using E-LED type Back Light.

10.3 Electrostatic Discharge Control

- (1) Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly. Keep products as far away from static electricity as possible.
- (2) Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

10.4 Precautions for Strong Light Exposure

It is not allowed to store or run directly in strong light or in high temperature and humidity for a long time; Strong light exposure causes degradation of polarizer and color filter.

10.5 Storage Precautions

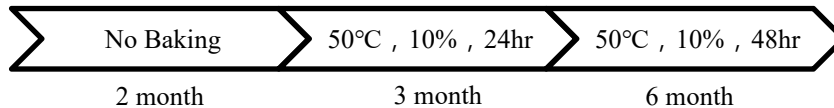
When storing modules as spares for a long time, the following precautions are necessary.

- (1) The polarizer surface should not come in contact with any other object.

It is recommended that they be stored in the container in which they were shipped.

Temperature : 5 ~ 40 °C

- (2) Humidity : 35 ~ 75 %RH
- (3) Period : 6 months
- (4) Control of ventilation and temperature is necessary.
- (5) Please make sure to protect the product from strong light exposure, water or moisture.
Be careful for condensation.
- (6) Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
- (7) Do not store the LCD near organic solvents or corrosive gasses.
- (8) Please keep the Modules/OC/FOG at a circumstance shown below Fig.



10.6 Precautions for Protection Film

- (1) Remove the protective film slowly, keeping the removing direction approximate

30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.

- (2) In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.7 Appropriate Condition for Display

- (1) Normal operating condition

- Temperature: 0 ~ 40°C
- Operating Ambient Humidity : 10 ~ 90 %
- Display pattern: dynamic pattern (Real display)
- Suitable operating time: under XX hours a day. (Please contract Leadtek in advance for 7*24hrs or more than suggested Operating time)
- Long-term lighting products recommended regular shutdown

- (2) Special operating condition

If the product will be used in extreme conditions such as high temperature, humidity, display patterns or 7*24hrs operation time etc., It is strongly recommended to contact Leadtek for Application engineering advice. Otherwise, its reliability and function may not be guaranteed.

- (3) Black image or moving image is strongly recommended as a screen save.

- (4) Lifetime in this spec. is guaranteed only when commercial display is used according to operating usages.
- (5) Please contract Leadtek in advance when you want to switch between portrait and landscape screen
- (6) Please contact Leadtek in advance for outdoor operation.
- (7) Please contact Leadtek in advance when you display the same pattern for a long time.
- (8) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.
- (9) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (10) Dew drop atmosphere should be avoided.
- (11) The storage room should be equipped with a good ventilation facility and avoid to expose to corrosive gas , which has a temperature controlling system.
- (12) When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- (13) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

10.8 Cleaning at the end user customer environment

- IPA (Isopropyl Alcohol) wipes, Lysol wipes, Clorox wipes, and other general Hospital disinfectants (on a cloth, not sprayed directly on equipment) which may include ingredients such as IPA, Ammonium Chloride, or Accelerated Hydrogen Peroxide can be used on the LCD glass surface.

10.9 Others

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

10.0 PACKING INFORMATION

TBD



深圳市丽台电子有限公司

Shenzhen Leadtek Electronics Co.,Ltd

Quality Inspection Standards

品质允收标准

Model No. / 产品型号: Applies More than 10.0 Inches Touch Display Screen

Updated Date /生效日期: 2022-05-20

Version / 版本: A0

Customer confirmation : _____

Record of Revision /修订履历

Version /版本	Revision Record /修订内容	Reviser /修订人	Revision Date /修订日期
V0	首发 / Starting	Green	2022.05.20

1.Scope of application /适用范围.

This document shall be applied to more than 10.0 inches touch display screen.

本文件适用于5.5~10.0 寸触摸显示屏.

2.Inspection conditions and environment /检验条件与环境.

2. 1 Inspection Conditions /检验条件:

(1) Inspection Distance /检测距离: 35cm $\pm$ 5cm.

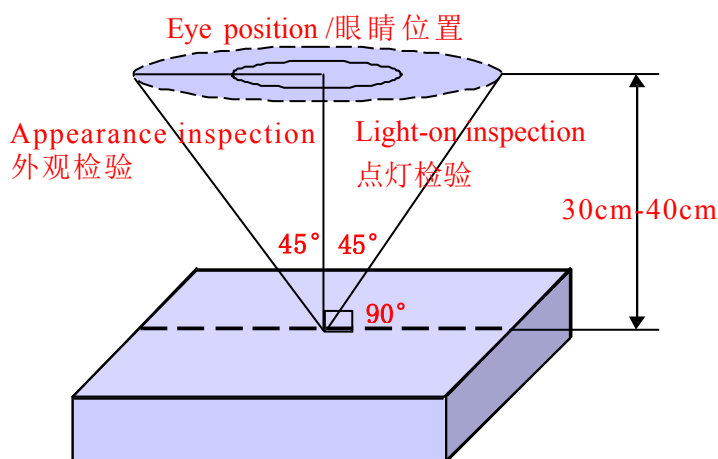
(2) Check time /检验时间:

Displays performance test /功能测试: 3~5S /Image, Cosmetic Inspection /外观检验:12~15S.

(3) Check the viewing angle /检验视角:

Light-on Inspection Angle /点灯检验角度: $\pm 45^\circ$.

Cosmetic Inspection Angle /外观检验角度: $\pm 45^\circ$.



(Perpendicular to LCD panel surface /垂直于LCD表面)

2.2 Inspection environment /检验环境:

Ambient Temperature 温度		25°C $\pm$ 5°C
Ambient Humidity 湿度		55 $\pm$ 5%RH
Ambient Illumination 亮度	Cosmetic Inspection 外观检验	800-1000 Lux
	Functional Inspection 点灯检验	200~300Lux

2.3 Sampling Conditions /抽样条件:

(1) Quantity to be inspected /批量: Quantity of shipment lot per model /单次运送单一型号数量.

(2) Sampling method /抽样方法:

Sampling Plan /抽样计划		GB/T 2828.1- 2003
		Normal Inspection , Single Sampling 正常检验、单次抽样
		General inspection level: II 一般检验水平: 二级
AQL	Major Defect /主要缺陷	0.65
	Minor Defect /次要缺陷	1.0

(3) The classification of Major(MA) and Minor(MI) defects is shown as “3.1 Classification of defects” .
主缺(MA)及次缺(MI)定义于”3.1缺陷分类”.

3.Terms And Definitions /术语和定义

3.1 Classification of defects / 缺陷分类 :

(1) Major defects /主要缺陷:

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

可导致产品功能失效或减少产品可用性的缺陷.

(2) Minor defects /次要缺陷:

It will not cause the product to fail and reduce the defects in the effective use and operation of the product.

不会导致产品功能失效和减少产品的有效使用与操作的缺陷.

3.2 Point defects /点状缺陷:

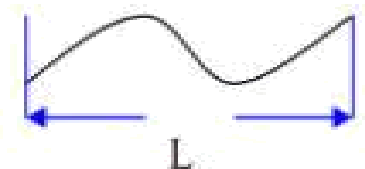
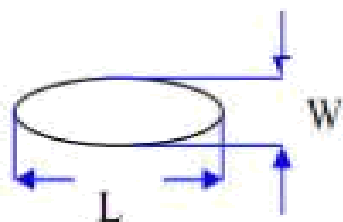
The size of the point defect is defined by the diameter D, and the average diameter of the defect is $D=1/2 (W+L)$.

点状缺陷的大小是由直径 D 定义的, 缺陷的平均直径 $D=1/2(W+L)$.

3.3 Linear defects /线状缺陷:

When defect size $L \geq 2W$, the defect count as liner type defect. Size of linear defect is defined by length (L) and the maximum width (W).

当缺陷尺寸 $L \geq 2W$ 时, 被视为线状缺陷, 线状缺陷是由长度 (L) 和最大宽度 (W) 定义的.



3.4 LCD sub-pixel dot /LCD子像素点

(1) Definition /定义 : The point defect area is greater than 50% of the LCD sub-pixel area, and is visible through ND5% filter masking .

子像素点缺陷面积大于 50% LCD子像素面积, 且透过 ND5%遮盖是可见的.

(2) The drawing of 1/2 area sub-pixel definition / 1/2 面积的子像素定义绘图:

The 1/2 area sub-pixel can be defined as below one or more of specific shapes

1/2 面积的子像素可以定义为如下一个或多个特定形状图:



3.5 Small bright dot /细碎亮点 :

Point defects smaller than "LCD sub-pixels" /小于“LCD子像素点”的点缺陷.

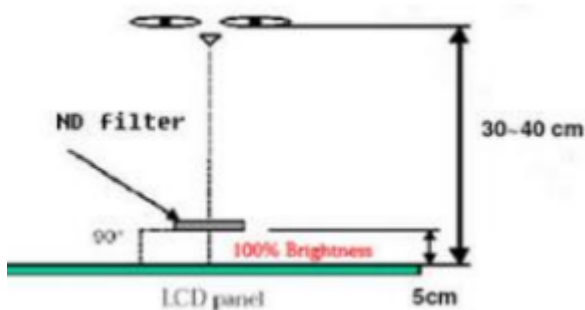
(Ratio of Zone I to Zone O /I 区与 O 区比例: 1: 2: 1)



3.6 ND filter inspection method /ND卡的检验方法:

Hold the ND filter about 5cm above the display area, with your eyes 30-40cm away from the panel, and observe for 2~3 seconds.

在显示区域上方大约 5cm 处握住 ND 卡, 眼睛距离面板 30-40cm, 观察2~3 秒.



3.7 Any FPC surface problems that do not leak copper on the surface and do not cause functional failure are acceptable.

任何 FPC 表面问题, 表面未露铜和不造成功能失效是可以接受.

3.8 Extraneous substances that can be wiped out , like Finger point,Particles are not considered as a defect .

可以被擦拭干净的表面物质不视为缺陷 (如手指印, 尘粒) .

3.9 Defects that can be covered by the material and are not visible in appearance are not considered defects.

能被物料覆盖，外观不可见的缺陷不视为缺陷。

3.10 Panel damage /面板损伤:

Glass damage outside the AA display area that does not affect the effective wiring is acceptable.

AA 显示区域以外的玻璃损伤，不影响有效线路是可以接受的。

3.11 Issues not specified or defined in this acceptance standard shall be handled through friendly negotiation between the two parties.

本允收标准中未规定或定义的问题，双方友好协商处理。

4. Inspection standards /检验标准

4.1 Structural Dimensions /结构尺寸规格

Serial Number 序号	Measurement items /测量项目		Specification /规格	Remark /备注
	名称 /Name	Unit /单位	Tolerance /公差	
1	Outside dimension: Length 尺寸: 长	mm /毫米	0.15mm~0.30mm	Please refer to the product specification for detailed dimensions and tolerances 详细的尺寸规格和公差请参考产品规格书
2	Outside dimension: Width 尺寸: 宽	mm /毫米	0.15mm~0.30mm	
3	Outside dimension: Thickness 尺寸: 高	mm /毫米	0.30mm~0.50mm	

4.2 Appearance Inspection Specification /外观检验规格

(D : diameter, W : width, L : length, N : quantity, DS : spacing)

Inspection area 检验区域	Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
Glass 玻璃	Wire(on Array) 线路	Can't be damaged 不能损伤	MA	
	Chipping/corner breaking 崩边/破角	Can't affect the effective lines and functions 不能影响有效线路和功能	MA	
	Edge 边缘	There must be no extensional cracks 不可有延伸性裂纹	MA	
Silicone 硅胶	Silicone coating 硅胶涂布	The height must not exceed the LCD CF surface 高度不能超过LCD CF面		MI
	Glue overflow 溢胶	Can't cover FPC, POL, etc 不能覆盖到FPC、POL等		MI

Inspection area 检验区域	Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
PCBA FPC Connector 连接器	Appearance 外观	Scratches or injuries are not allowed to cause copper exposure 划伤或损伤不允许表面出现露铜		MI
	Component 元器件	Can't be damaged and lack 不能损伤和缺少	MA	
	Goldfinger oxidation 金手指氧化	Not allowed 不允许		MI
	Connection status 连接状况	The connection must be accurate and stable 必须准确稳定连接	MA	
	Break 破裂	Not allowed 不允许	MA	
	Soldering, false soldering/tinning/tin beads 假焊/连锡/锡珠	Not allowed 不允许	MA	
POL 偏光片	Scratches 划伤	1. $W \leq 0.10\text{mm}$; $L \leq 5\text{mm}$, Ignore (忽略) 2. $0.10\text{mm} < W \leq 0.15\text{mm}$; $L \leq 5\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.15\text{mm} < W$; $5\text{mm} < L$, Not allowable (不允许)		MI
	Dent 凹凸印	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Bubbles 气泡	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Point defects 点状不良	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Edge bubbles 边缘气泡	1. Within 1/2BM of the display area, it is not allowed 显示区往外 1/2BM 区域内, 不允许 2. The display area is 1/2 outside the BM area, and it is not controlled 显示区往外1/2BM区域以外, 不管控		MI
	Dirty/watermarked 脏污/水印	No dirt/water lines/finger marks are allowed, and must be wiped clean 不允许有脏污/水印/手指印, 须擦拭干净方可		MI
	Warping 起翘	Not allowed 不允许		MI
	Attaching offset 贴偏	It is necessary to completely cover the display area outward, within the 1/2BM area, or without leaking POL edges after TP is attached 需完整覆盖显示区往外、1/2BM区以内或贴合TP后不会出现漏偏光片边缘		MI
	Mixture 混料	Mixing different types of POL or not using POL as required by the BOM, not allowed 不允许混贴不同型号的POL或未按BOM要求使用POL	MA	

Inspection area 检验区域	Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
TP&CG	Point defects 点状不良	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
	Scratches 划伤	1. $W \leq 0.10\text{mm}$; $L \leq 5\text{mm}$, Ignore (忽略) 2. $0.10\text{mm} < W \leq 0.15\text{mm}$; $L \leq 5\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.15\text{mm} < W$; $5\text{mm} < L$, Not allowable (不允许) 4. There is a feeling scratch, Not allowable 有感划伤, 不允许		MI
	Edges and corners cracked 崩角/崩边	1. Product front / 产品正面: Edge and corner chipping is not allowed 崩角、崩边不允许 2. Product back / 产品背面: $X \leq 0.5$, $Y \leq 0.5$, $Z \leq 1/2T$; $N \leq 5$; $DS \geq 10\text{mm}$		MI
	Silk screen 丝印	The silk screen is clear, complete and correct 丝印清晰、完整、内容正确		MI
	Dirty 脏污	Non-wipeable dirt, not allowed 不可擦拭的脏污, 不允许		MI
	Broken 破损	Not allowable 不允许	MA	
	Ink color aberration 油墨色差	$\Delta E > 1$, Not allowable (不允许)		MI
	Cover pinholes 针孔	1. $D \leq 0.20\text{mm}$, $N \leq 5$, $DS \geq 10\text{mm}$, allowable 2. $D > 0.20\text{mm}$, intensive pinholes (密集型针孔), Not allowable (不允许)		MI
	IR holes IR孔	Dirt, deviation, color difference, etc. are not allowed 不允许脏污、偏位、色差等		MI
BL 背光	Backlight separation 背光分离	Not allowable 不允许		MI
	Deformation of rubber iron and rubber frame 胶铁、胶框变形	Use the plug gauge 0.3mm on the flat surface and can snap in and judge NG 在平面上使用塞规0.3mm卡翘曲位置, 能卡进判定NG		MI
	The iron frame is oxidized and not tightened 铁框氧化、卡不紧	Not allowable 不允许		MI
	Backlight sticky solder beads, glue, etc 背面粘锡珠、残胶等	Not allowable 不允许		MI
	Lnkjet coding, Barcode, QR code 喷码/条码/二维码	The lmkjet coding is clear and complete, the barcode and QR code can be scanned normally, and the content and format match 喷码清晰完整、条码和二维码可正常扫描, 内容和格式相符		MI
	Accessories (protective film, double-sided tape, insulating adhesive, etc.) 辅料(保护膜、双面胶、绝缘胶等)	Defects such as missing pastes, sticking deviations, defects, and fractures are not allowed 不允许有漏贴、贴偏、残缺、断裂等缺陷		MI

4.3 Electrical test specifications /电性检查规格

(D : diameter, W : width, L : length, N : quantity, DS : spacing)

Inspection items 检验项目	Inspection specifications 检验规格	Defect category 缺陷类别	
Glass bright spots/dark spots 玻璃亮点/暗点	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
Mura	Use ND5% filter masking, visual invisibility is OK, 200~300Lux 使用ND5%遮盖, 目视不可见即为OK, 200~300Lux		MI
Small bright dot 细碎亮点	Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK		MI
Light leakage 漏光	1. Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK 2. If necessary, sign off on the sample 必要时, 签限定样		MI
Backlight black/white dots 背光黑点/白点	1. $D \leq 0.25\text{mm}$, Ignore (忽略) 2. $0.25\text{mm} < D \leq 0.50\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.50\text{mm} < D$, Not allowable (不允许)		MI
Linear foreign bodies 线状异物 (异物毛丝等)	1. $W \leq 0.10\text{mm}$; $L \leq 5\text{mm}$, Ignore (忽略) 2. $0.10\text{mm} < W \leq 0.15\text{mm}$; $L \leq 5\text{mm}$; $N \leq 5$; $DS \geq 10\text{mm}$ 3. $0.15\text{mm} < W$; $5\text{mm} < L$, Not allowable (不允许)		MI
Black/White Print 黑印/白印	Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK		MI
The display is uneven 显示不均匀	Use ND5% filter masking, visual invisibility is OK 使用ND5%遮盖, 目视不可见即为OK		MI
The brightness is uneven 亮度不均匀	Brightness uniformity $< 85.0\%$, Not allowable 亮度均匀性 $< 85.0\%$, 不允许		MI
Displacement of the membrane 膜材移位	Not allowable 不允许		MI
Interference pattern/Newtonian pattern 干涉纹/牛顿纹	Not allowable 不允许		MI
Display abnormal 显示异常	Not allowable 不允许	MA	
No display 无显示	Not allowable 不允许	MA	
Line/Missing Drawing 线条/缺画	Not allowable 不允许	MA	
Splash screen 闪屏	Not allowable 不允许	MA	
LCD grid LCD网格	Not allowable 不允许	MA	
Afterimage 残影	Not allowable 不允许	MA	
Wrong viewing angle 视角错误	Not allowable 不允许	MA	
No touch 无触摸	Not allowable 不允许	MA	
Touch the jump point 触摸跳点	Not allowable 不允许	MA	
Not sensitive 触摸不灵敏	Not allowable 不允许	MA	