

Product Specification

Customer	
Model Name	LS1025101-L-V1
Ver(HW)	Ver 1.0

Date: 27.Mar.2023

(√) Preliminary Specification

() Final Specification

Customer's Approval	MianYang HKC
Signature Date	Approved By RD Director Date: Name: Signature:
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Revision History

Version	Date	Page (New)	Section	Description	Revision by
01	2023/03/27	-	All	Preliminary Specification	

1. GENERAL DESCRIPTION

1.1 General Description

The specification is applied to 10.25 inch model (**LS1025101-L-V1**) TFT Liquid Crystal Display.

The matrix uses a-Si Thin Film Transistor as a switching device. This TFT LCD has a 10.25 inch diagonally measured active display area with FHD resolution (1920 horizontal by 720 vertical pixels array). All input signals are LVDS interface compatible.

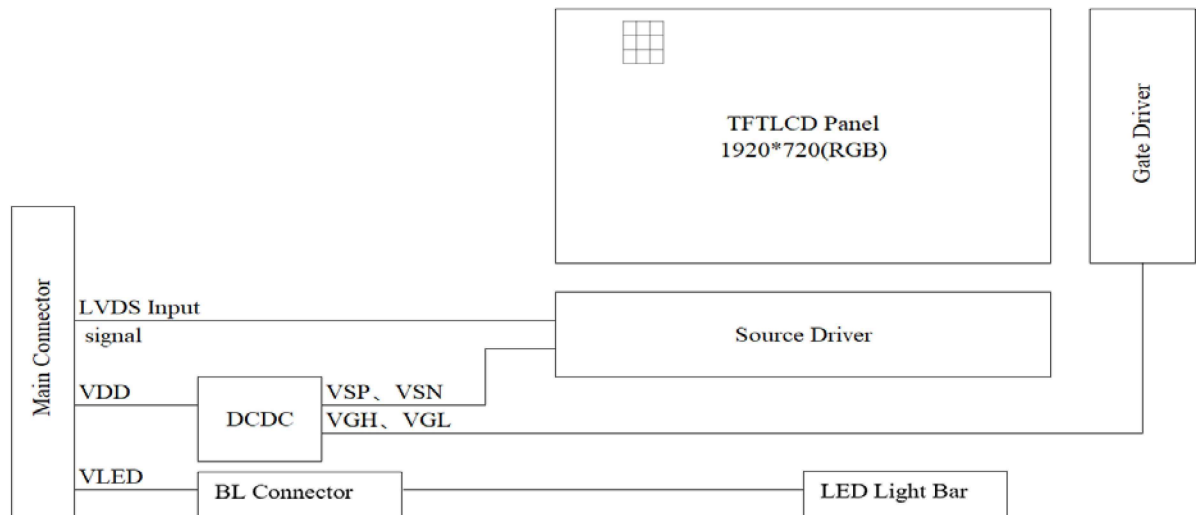


Figure 1. Drive Architecture

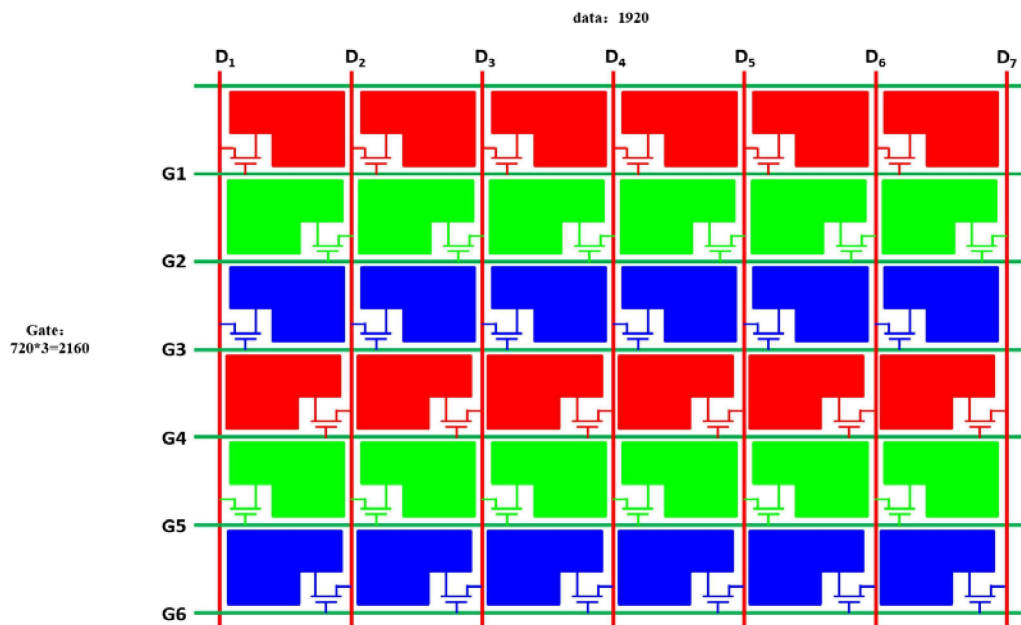


Figure 2. Pixel Mapping

1.2 Features

- (1) 2 Port LVDS interface
- (2) 16.7M (8bit) color depth, color gamut 70%
- (3) Green product (RoHS & Halogen free product)

1.3 General Specifications

The followings are general specifications at the model PV103CS01-1. (listed in Table 1)

Table 1. General Specifications

Item		Specification	Unit	Note
Active area		243.648 (H) ×91.368 (V)	mm	-
Number of pixels		1920(H) ×720(V)	pixels	-
Pixel pitch		0.1269 (H) ×0.1269 (V)	mm	-
Pixel arrangement		RGB Vertical stripe	-	-
Display colors		16.7M(8bits)	-	-
Color gamut		NTSC 70% min	-	-
Display mode		Normally black	-	-
Outline Dimension	Without PCBA	253.19±0.3(H)*106.05±0.3(V)*6.73±0.25	mm	Outline Dimension
	With PCBA	253.19±0.3(H)*106.05±0.3(V)*8.83±0.3	mm	
Surface treatment		HC	-	-
Surface hardness		3H	-	-
Logic Power Consumption		PD:0.5 (Max)	W	@Mosaic

2. ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Table 2. Absolute Maximum Ratings

$T_a=25\pm 5^{\circ}\text{C}$

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.3	4	V	(1),(2),(3),(4)
Logic Supply Voltage	V_{IN}	- 0.3	$V_{DD} + 0.3$	V	
Operating Temperature	T_{OP}	-30	85	$^{\circ}\text{C}$	
Storage Temperature	T_{ST}	-40	95	$^{\circ}\text{C}$	

Note (1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded.

Note (2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. All the display fineness should be inspected under normal conditions. Normal conditions are defined as follow: Temperature: 25°C , Humidity: $50\pm 10\%\text{RH}$.

Note (3) Unpredictable results may occur when it was used in extreme conditions. T_a = Ambient Temperature, T_{gs} = Glass Surface Temperature. All the display fineness should be inspected under normal conditions.

Note (4) Temperature and relative humidity range are shown in the figure below.

Relative Humidity (%RH)

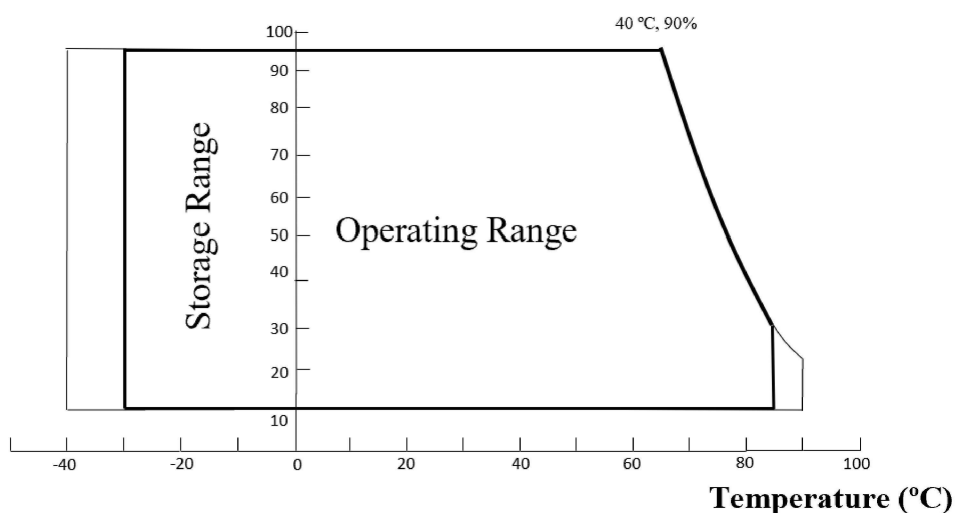


Figure 3. Absolute Ratings of Environment of the LCD Module

3. ELECTRICAL SPECIFICATIONS

3.1 Interface Connector

Table 3. Signal Connector Type

Item	Description
Manufacturer / Type	昶通/ F05047-50P-U

Table 4. Signal Connector Pin Assignment

PIN NO.	SIGNAL NAME	DESCRIPTION
1	GND	Digital ground
2	BIST	LCD Panel Self Test Enable, When it is not used, connecting to GND is recommended, don't floating
3	VCC	Digital Power/Vin =3.3V
4	VCC	Digital Power/Vin =3.3V
5	GND	Power ground
6	GND	Power ground
7	OTP	Serial interface OTP power
8	NC	No connector
9	GND	Power ground
10	ORXIN0-	Negative LVDS differential data input(Odd data)
11	ORXIN0+	Positive LVDS differential data input(Odd data)
12	ORXIN1-	Negative LVDS differential data input(Odd data)
13	ORXIN1+	Positive LVDS differential data input(Odd data)
14	ORXIN2-	Negative LVDS differential data input(Odd data)
15	ORXIN2+	Positive LVDS differential data input(Odd data)
16	ORXCLKIN-	Negative LVDS differential data input(Odd clock)
17	ORXCLKIN+	Positive LVDS differential data input(Odd clock)
18	ORXIN3-	Negative LVDS differential data input(Odd data)
19	ORXIN3+	Positive LVDS differential data input(Odd data)
20	ERXIN0-	Negative LVDS differential data input(Even data)
21	ERXIN0+	Positive LVDS differential data input(Even data)
22	ERXIN1-	Negative LVDS differential data input(Even data)

23	ERXIN1+	Positive LVDS differential data input(Even data)
24	ERXIN2-	Negative LVDS differential data input(Even data)
25	ERXIN2+	Positive LVDS differential data input(Even data)
26	ERXCLKIN-	Negative LVDS differential data input(Even clock)
27	ERXCLKIN+	Positive LVDS differential data input(Even clock)
28	ERXIN3-	Negative LVDS differential data input(Even data)
29	ERXIN3+	Positive LVDS differential data input(Even data)
30	GND	Power ground
31	FAULT	FAULT signal output(normal=H,abnormal=L)
32	RESET	Reset pin.(L:Reset H:Normal)
33	STBYB	Standby mode.(L:Stbyb H:Normal)
34	CSB	Serial interface chip enable
35	SCL	Serial interface clock input
36	SDAI	Serial interface data input
37	SDAO	Serial interface data output.
38	GND	Power ground
39	GND	Power ground
40	NC	No connector
41	LEDA	LED power(Anode)
42	LEDA	LED power(Anode)
43	LEDA	LED power(Anode)
44	NC	No connector
45	LEDK	Cathode1
46	LEDK	Cathode2
47	LEDK	Cathode3
48	LEDK	Cathode4
49	NTC_A	NTC_Anode
50	NTC_K	NTC_Cathode

3.2 Signal Electrical Characteristics

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

Table 5. LVDS mode DC electrical characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Differential input high Threshold voltage	V _{th}	V _{cm} =1.2V	+0.10	-	-	V
Differential input low threshold voltage	V _{tl}	V _{cm} =1.2V	-	-	-0.10	V
Differential input common Mode voltage	V _{CM}	-	1	1.2	1.7- V _{id} /2	V
LVDS input voltage	V _{INLV}	-	0.7	-	1.7	V
Differential input voltage	V _{id}	-	0.1	-	0.6	V
Differential input leakage Current	I _{lvleak}	-	-10	-	+10	μA

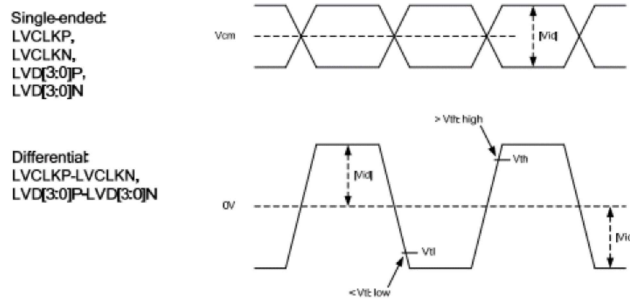


Figure 4. LVDS mode DC electrical characteristics

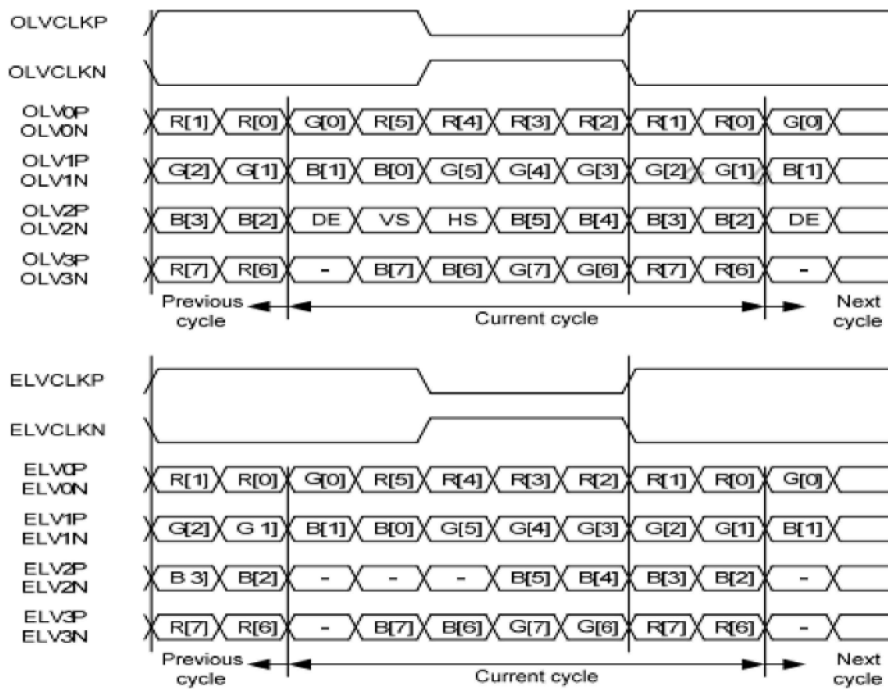


Figure 5. 2-port LVDS signals, VESA format (8-bit)

3.3 Interface Timings

Table 6. Interface Timings

Parameter	Symbols	Panel Resoiution			Unit
		1920RGB*720 (2 port)			
		Min	Typ.	Max	
DCLK frequency	Fdclk	-	45.3	-	MHz
Horizontal valid data	Thd	-	960	-	DCLK
1 horiaontal line	Th	1015	1026	1248	DCLK
Vertical valid data	Tvd	-	720	-	H
1 vertical field	Tv	730	736	756	H
Frame rate	FR	-	60	-	Hz

3.4 Input Power Specifications

Input power specifications are as follows.

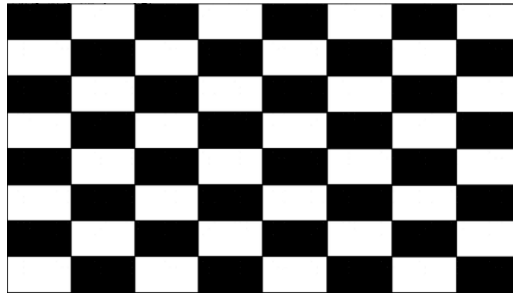
Table 7. Input Power Specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply							
LCD Drive Voltage (Logic)		V _{CC}	-	3.3	-	V	(1),(2)
V _{CC} Current	mosaic Pattern	I _{VCC}	-	-	0.150	A	(1),(3)
V _{CC} Power Consumption	mosaic Pattern	P _{VCC}	-	-	0.5	W	
Rush Current		I _{rush}	-	-	1.0	A	(1),(4)
Allowable Logic/LCD Drive Ripple Voltage		V _{VCC-RP}	-	-	200	mV	(1)

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25°C, Humidity: 50± 10%RH.

Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.

Note (3) The specified V_{CC} current and power consumption are measured under the $V_{CC} = 3.3V$, $F_V = 60Hz$ condition and 10×8 mosaic Pattern.



Note (4) The figures below is the measuring condition of V_{CC} Rush current can be measured when T_{rush} is 0.5ms.

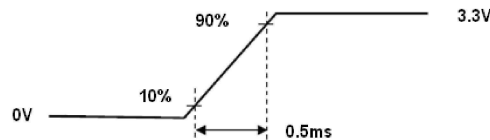
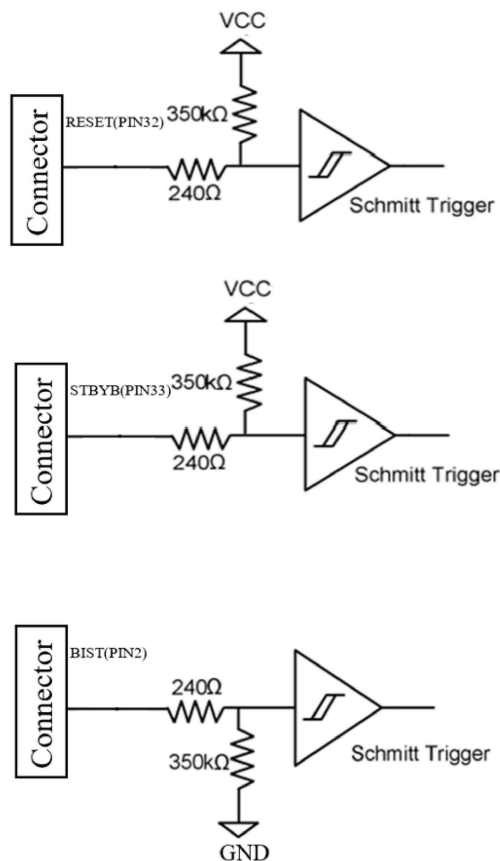


Figure 6. V_{CC} Rising Time

Note (5) Because there are voltage dividers on some control signal lines of the connector, please pay special attention to I/O structure when using it.



3.5 Power ON/OFF Sequence

Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when V_{CC} voltage is off.

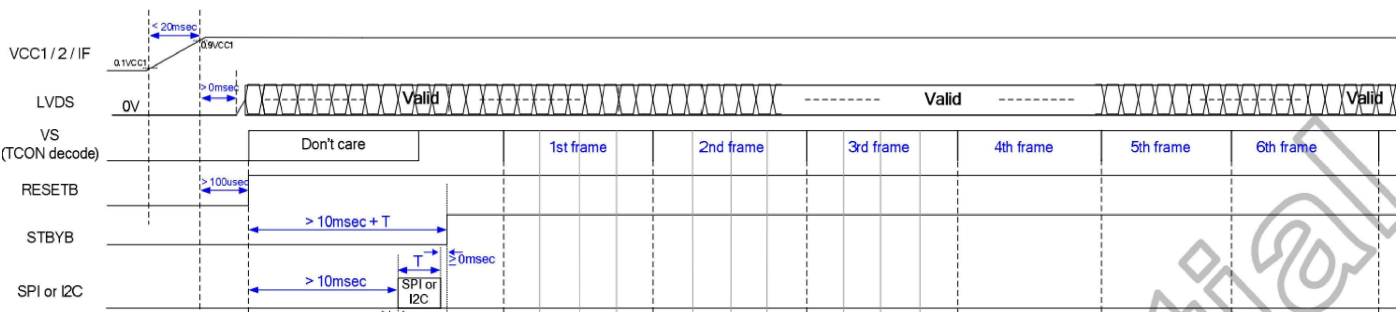


Figure 7. Power-on Sequence

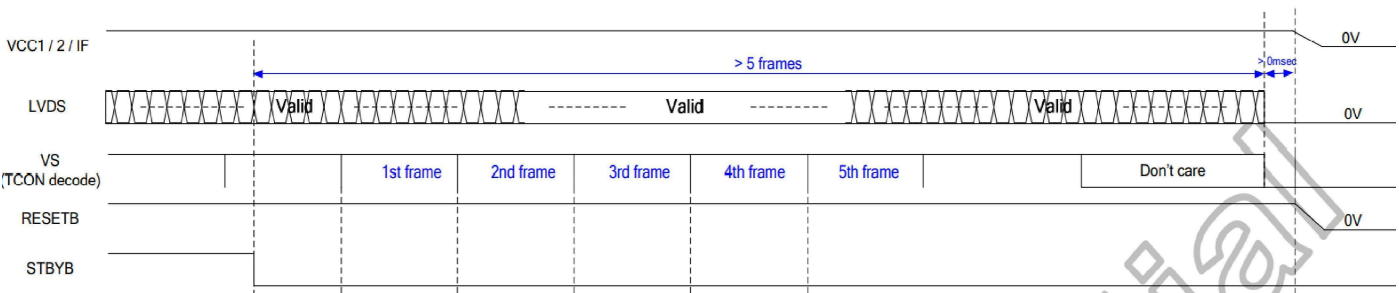


Figure 8. Power-off Sequence

3.6 Backlight Unit

Table 8. BL Signal Connector Type

Item	Description
Manufacturer / Type	昶通/ F05047-10P-U

Table 9. Pin Assignments Of BLU Connector

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	LEDA	LED power(Anode)	6	LEDK	Cathode2
2	LEDA	LED power(Anode)	7	LEDK	Cathode3
3	LEDA	LED power(Anode)	8	LEDK	Cathode4
4	NC	No connector	9	NTC_A	NTC_Anode
5	LEDK	Cathode1	10	NTC_K	NTC_Cathode

3.7 Backlight LED

LED 电路图

	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Condition
	Forward Voltage	Vf	19.8	21	23.1	V	If=90 mA*4=360 mA (恒定电流) 测量仪器：BM-7 测试高度500mm Ta=25° C
	Luminance(9 Points average)	Lv	--	--	--	cd/m ²	
BLU	Uniformity	Avg	--	--	--	%	
	Colour Coordinate	X	--	--	--		
	(Center Point)	Y	--	--	--		
	Luminance(9 Points average)	Lv	600	700	--	cd/m ²	
LCM	Uniformity	Avg	80	85	--	%	
	Colour Coordinate	X	0.215	0.255	0.295		
	(Center Point)	Y	0.220	0.260	0.300		
	Operating Temperature	Topr	-30	--	+85	° C	
	Storage Temperature	Tstg	-40	--	+90	° C	

4. OPTICAL SPECIFICATION

4.1 The table below is the test condition of optical measurement.

Table 10. Test condition of optical measurement

Item	Symbol	Value	Unit
Ambient Temperature	TA	23±5	°C
Ambient Humidity	HA	50±10	% RH
Supply Voltage	V _{CC}	3.3	V
Driving Signal	Refer to the typical value in Chapter 3: ELECTRICAL SPECIFICATIONS		
Vertical Refresh Rate	F _v	60	Hz
Warm up time	T _{warm}	>15 min	min
Dark room	ED	<1 lux	lux

4.2 Optical Specifications

Table 11. Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Only CF Color Chromaticity(CIE1931) Under C-light	Red	Rx	$\theta_x=0^\circ, \theta_y=0^\circ$	Typ. - 0.02	(0.657)	Typ. +0.02	-	(1)
		Ry			(0.320)			
	Green	Gx			(0.283)			
		Gy			(0.606)			
	Blue	Bx			(0.138)			
		By			(0.104)			
	White	Wx			(0.302)			
		Wy			(0.329)			
Color Gamut		CG		70	-	-	%	
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$	1200:1	1500:1	-	-	(2)
Response Time		Tg=25°C		-	-	20	ms	(3)
Viewing Angle	Horizontal	θ_{x+}	$CR \geq 10$ $\theta_x=0^\circ, \theta_y=0^\circ$	-	85	-	Deg.	(4)
		θ_{x-}		-	85	-		
	Vertical	θ_{y+}		-	85	-		
		θ_{y-}		-	85	-		
Transmittance		Tr	$\theta_x=0^\circ, \theta_y=0^\circ$	3.3	3.8	-	%	

Notes:

(1) The chromaticity coordinates specified in Table 5 should be calculated from the measurement spectrum of all pixels in red, green, blue, and white, which need to be converted to C-light standard light source, and should be measured at the center of the panel.

(2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression,

$$\text{Contrast Ratio (CR): } CR = \frac{CR_w}{CR_D}$$

CRW : Luminance of LCD module with full screen white pattern (255,255, 255) at center point.

CRD : Luminance of LCD module with full screen Dark pattern (0, 0, 0) at center point.

The measure point of the Contrast Ratio is the center of the panel.

(3) Definition of Response time (RT):

The response time is defined as the LCD optical switching time interval between “Bright state” and “Dark state”, TR is the rise time between Luminance rate changed from 10% to 90%, TF is the fall time between Luminance rate changed from 90% to 10%.

<Table 12. Switching time of luminance ratios matrix>

Measured Response time		To	
		10%	90%
From	10%		T _{10%to90%}
	90%	T _{90% to 10%}	

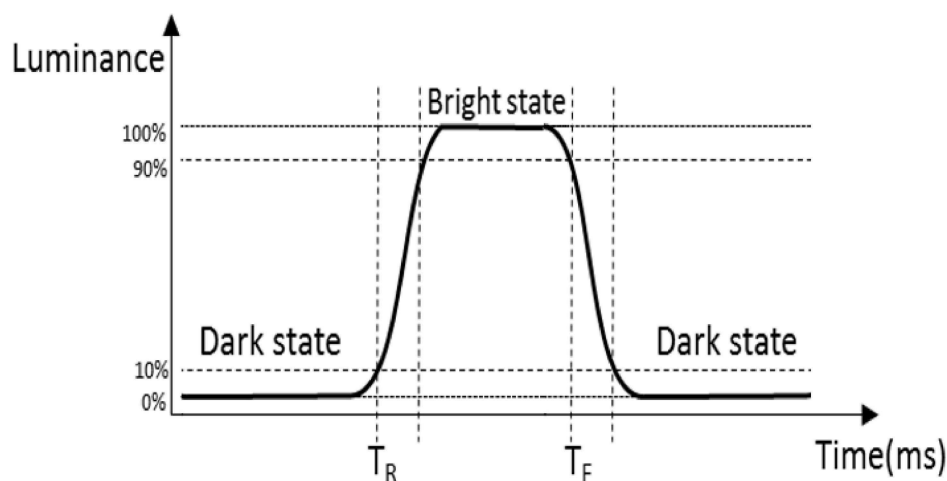


Figure 9. The definition of TR and TF

Measured response time is determined by rise time (TR) and fall time (TF) , and shown in Figure 9

(4) Definition of Viewing angle:

As CR definition is stated in Note(2), the viewing angles are defined when the viewing angle is larger than 10° in four directions relative to the perpendicular direction of the HKC's module (two vertical

angles: up θ_{y+} and down θ_{y-} ; and two horizontal angles: right θ_{x+} and left θ_{x-}). The standard setup of measurement is shown in Figure 10.

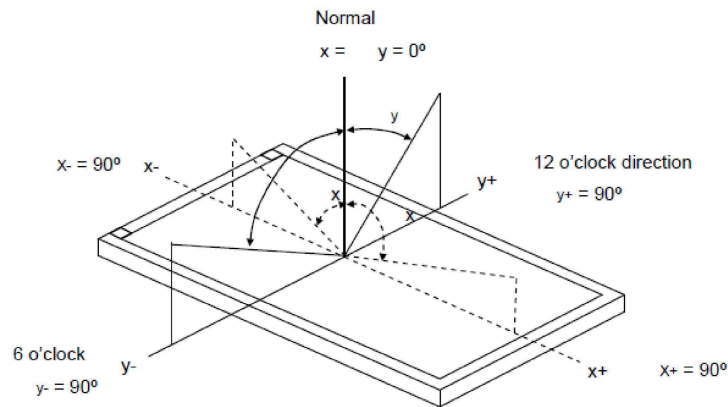


Figure 10. Definition of Viewing angle

4.3 Optical Measurements

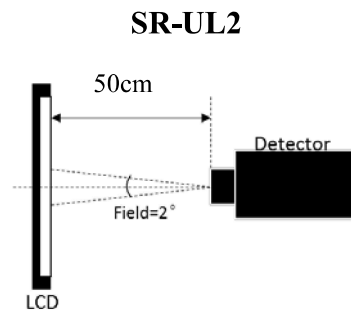
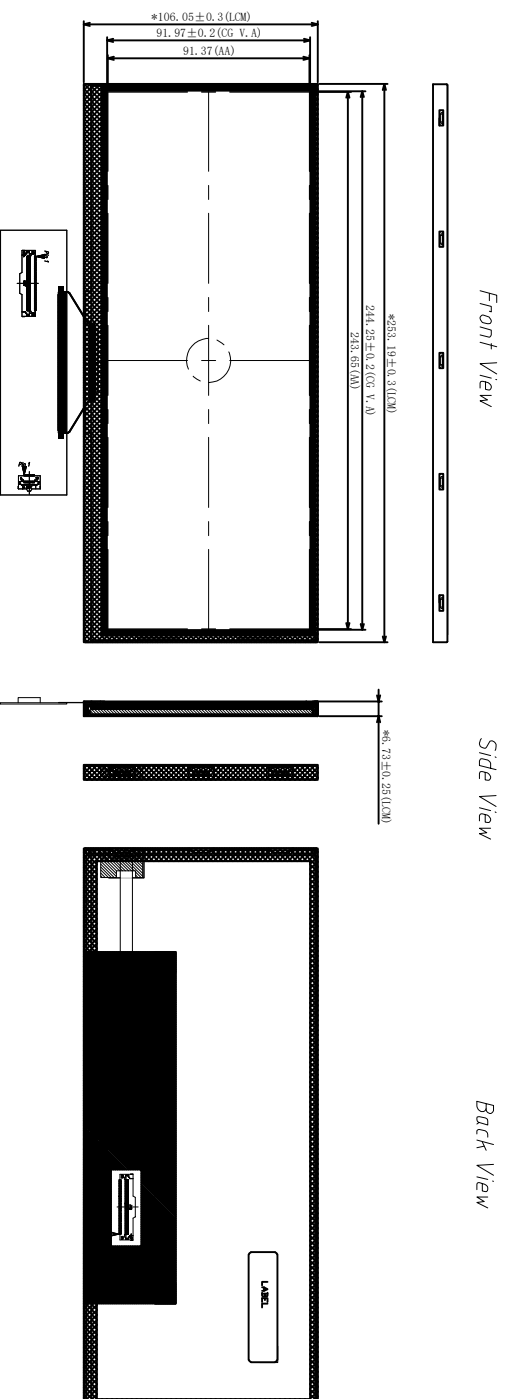
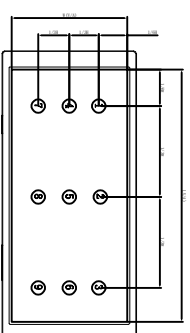
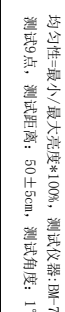


Figure 11. Measurement equipment



LCM Notes:	
Display Mode	10, 25°, 16, 7M Colors, Transmissive, Normal Black
Video Direction	A.L.
Driver IC	
Backlight LED	28 CHIP-WHITE LED, 75HP
Optical	600NM, 200PPI X:0.3±0.04, Y:0.32±0.04
Operating Temp.	-30°C to 70 85°C
Storage Temp.	-40°C to 90 85°C
FFC Connector	/
平面翘曲度	≤0.2MM
标注要求	Mark “*” 为重点标注尺寸，() 为参考尺寸， CPK≥1.33; 管控: 未标注公差±0.2;
环保要求	产品所有材料需符合环境物质管理标准: 包缠液晶 (有害物质管理规范) SJ-4020-028 A版
其它要求	无



				TITLE : LCM OUTLINE		Page No. : 1	
				PRODUCT MODEL : 10.2SLCM			
				DRW. NO.:		Ver : 0.1	SCALE : N. T.S.
				DRAWN BY		DATE	UNIT : mm
0.1	△	Set up for sample	2024.04.29	CNN	CHECKED BY	DATE	PRO. (3) : 
VER	MARK	REVISION RECORD	DATE	NAME	APPROVED BY	DATE	SHEET : 1/1

6. SPI Interface

In normal write mode, the read/write control bit must be set to 0, and SAI is address input and data pin.

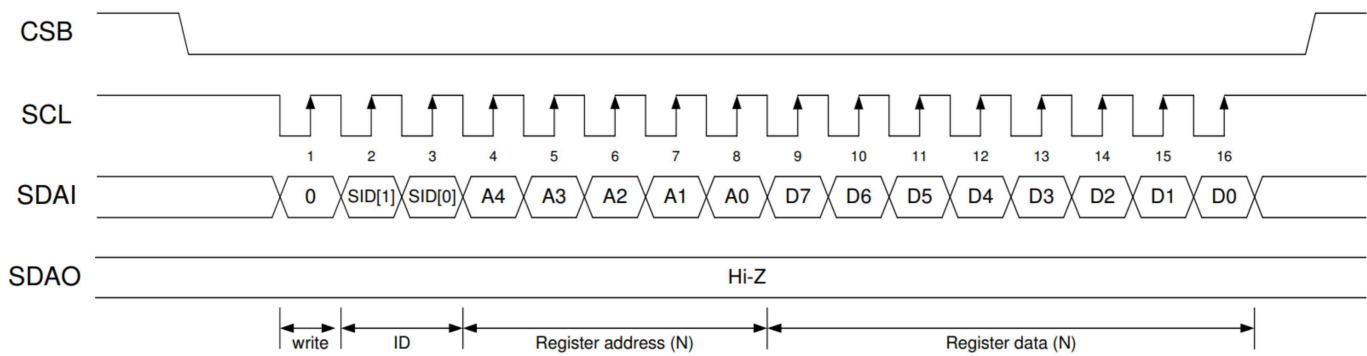


Figure 12. SPI Signals, normal write mode

In normal read mode, the read/write control bit must be set to 1. The SAI is address input pin and SDAO is data output pin

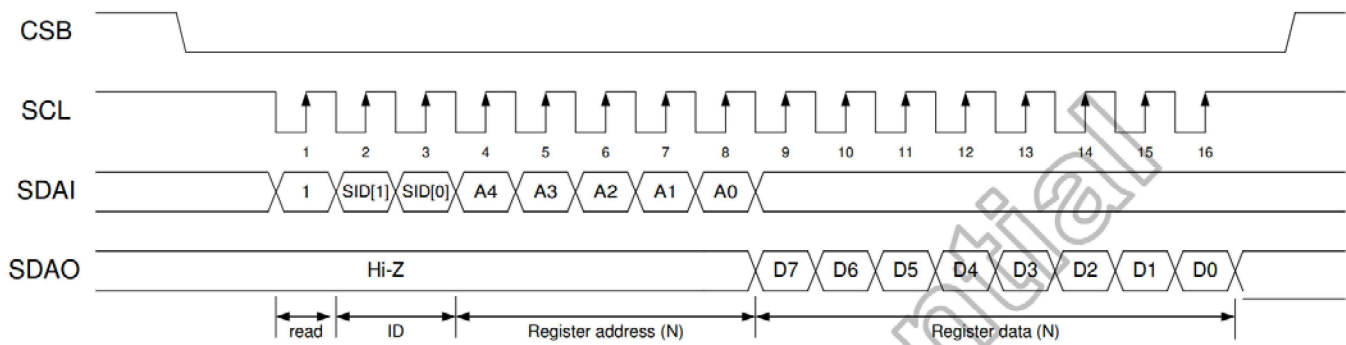


Figure 13. SPI Signals,normal read mode

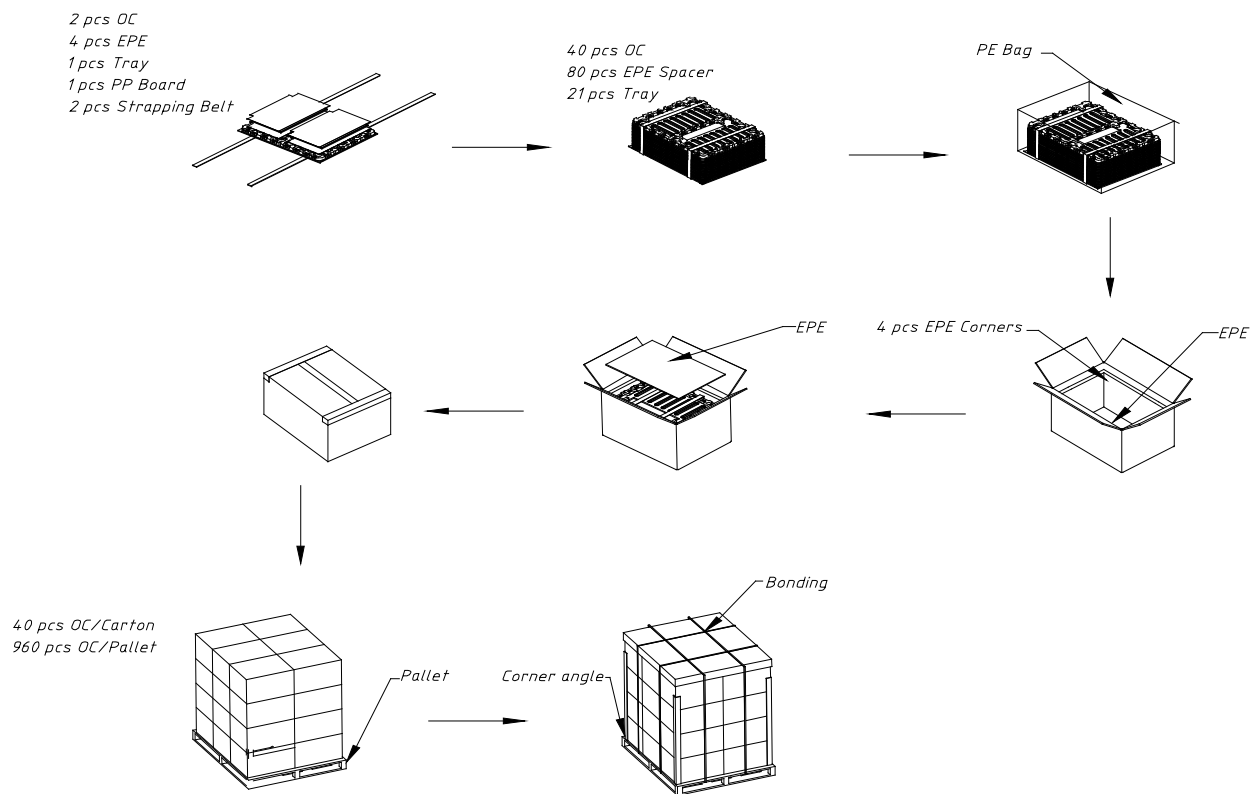
7. RELIABILITY TEST

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

Table 14. Reliability Test

No	Test Items	Conditions
1	High temperature storage test	90°C, 500hrs
2	Low temperature storage test	-40°C, 500hrs
3	High temperature operating test	85°C, 500hrs
4	Low temperature operating test	-30°C, 500hrs
5	High temperature & high humidity operation test	60°C, 90%RH, 500hrs
6	Thermal shock	-40°C (0.5hr)~85°C (0.5hr)C/100cycles

8. PACKAGE SPECIFICATION



10. GENERAL PRECAUTION

10.1 Using Restriction

This product is not authorized for using in life supporting systems, aircraft navigation control systems, military systems and any other appliance where performance failure could be life-threatening or lead to be catastrophic.

10.2 Operation Precaution

(1) The LCD product should be operated under normal conditions.

Normal conditions are defined as below:

Temperature: 25°C

Humidity: 50±10%

Display pattern: continually changing pattern (Not stationary)

(2) Brightness and response time depend on the temperature. (It needs more time to reach normal brightness in low temperature.)

(3) It is necessary for you to pay attention to condensation when the ambient temperature drops suddenly. Condensate water would damage the polarizer and electrical contacted parts of the module. Besides, smear or spot will remain after condensate water evaporating.

(4) If the absolute maximum rating value was exceeded, it may damage the module.

(5) Do not adjust the variable resistor located on the module.

(6) Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding may be important to minimize the interference.

(7) Image sticking may occur when the module displayed the same pattern for long time.

(8) Do not connect or disconnect the module in the “power on” condition. Power supply should always be turned on/off by the “power on/off sequence”

(9) Ultra-violet ray filter is necessary for outdoor operation.

10.3 Mounting Precaution

(1) All the operators should be electrically grounded and with Ion-blown equipment turning on when mounting or handling. Dressing finger-stalls out of the gloves is important for keeping the panel clean during the incoming inspection and the process of assembly.

(2) It is unacceptable that the material of cover case contains acetic or chloric. Besides, any other material that could generate corrosive gas or cause circuit break by electro-chemical reaction is not desirable.

(3) The case on which a module is mounted should have sufficient strength so that external force is not

transmitted to the module directly.

(4) It is obvious that you should adopt radiation structure to satisfy the temperature specification.

(5) It should be attached to the system tightly by using all holes for mounting, when the module is assembled. Be careful not to apply uneven force to the module, especially to the PCB on the back.

(6) A transparent protective film needs to be attached to the surface of the module.

(7) Do not press or scratch the polarizer exposed with anything harder than HB pencil lead. In addition, don't touch the pin exposed with bare hands directly.

(8) Clean the polarizer gently with absorbent cotton or soft cloth when it is dirty.

(9) Wipe off saliva or water droplet as soon as possible. Otherwise, it may cause deformation and fading of color.

(10) Desirable cleaners are IPA (Isopropyl Alcohol) or hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(11) Do not disassemble or modify the module. It may damage sensitive parts in the LCD module, and cause scratches or dust remains. HKC does not warrant the module, if you disassemble or modify the module.

10.4 Handling Precaution

(1) Static electricity will generate between the film and polarizer, when the protection film is peeled off. It should be peeled off slowly and carefully by operators who are electrically grounded and with Ion-blown equipment turning on. Besides, it is recommended to peel off the film from the bonding area.

(2) The protection film is attached to the polarizer with a small amount of glue. When the module with protection film attached is stored for a long time, a little glue may remain after peeling.

(3) If the liquid crystal material leaks from the panel, keep it away from the eyes and mouth. In case of contact with hands, legs or clothes, it must be clean with soap thoroughly.

10.5 Storage Precaution

When storing modules as spares for long time, the following precautions must be executed.

(1) Store them in a dark place. Do not expose to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.

(2) 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.

(3) It is recommended to use it in a short-time period, after it's unpacked. Otherwise, we would not guarantee the quality.

10.6 Others

When disposing LCD module, obey the local environmental regulations.