PRODUCT SPECIFICATION

CDTECH Model: **S128HWU04EP-FC04-GFR**

CUSTOMER Model: -

Description: **12.8 ” LCD Screen with Touch Controller**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2025.1.17	2025.1.17	2025.1.17

	SIGNATURE	DATE
CUSTOMER APPROVAL		

Record of Revisions

Version	Revise Date	Description	Page
1.0	2025-1-14	First Release	-
	2025-1-17	Update PIN positions from 1 to 68	7,20

Contents

1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	12.8	inch
Number of Pixels	1920 (H) RGB x 1080 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	-
Interface	LVDS	-
Display Colors	16.7M	colors
Outline Dimension	307.40 (H) x 188.00(V) x 9.0 (D)	mm
Active Area	283.39 (H) x 159.41 (V)	mm
Pixel Pitch	0.1476 (H) x 0.1476 (V)	mm
Driver IC	FL5893AD*3	-
Operation Temperature	-30~85	℃
Storage Temperature	-30~85	℃

1.2 Touch Panel Information

Item	Specification
Touch Structure	G+G
Bonding Type with LCM	OCA Optical Bonding
Driver IC	GA6572
Interface	I²C
Touch Count Max	10 Points
Surface treatment	AG+AR+AF(film)
Surface hardness	≥3H
I2C slave address	0x5D
Origin of coordinate	Top Left Corner

Note1:Requirements on environmental protection RoHS compliant.

2. Absolute Maximum Ratings

Item	Symbol	MIN.	MAX.	Unit	Note
Analog Supply voltage	VCC	-0.3	5.0	V	Note 1

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.

3. Elecrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

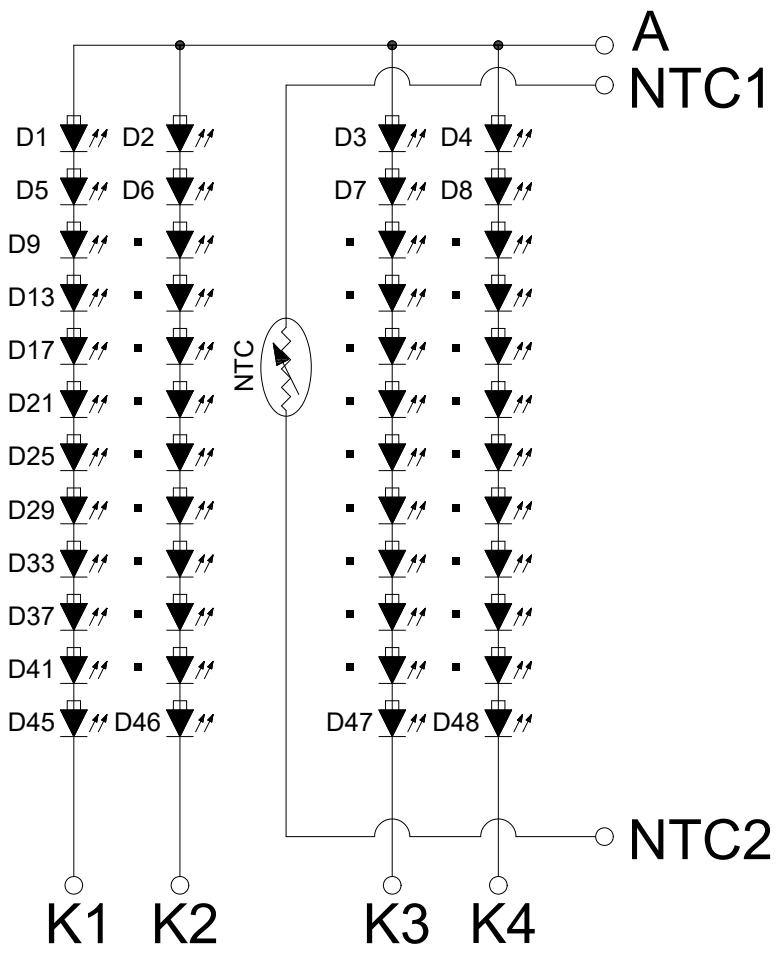
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VCC	3.0	3.3	3.6	V	
Analog supply current	I_{VCC}	-	TBD	-	mA	VCC=3.3V
Logic input voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	-	380	-	mA	
Driving Voltage	V_F	32.4	-	37.2	V	
Power consumption	W_{BL}	12.312	-	14.136	W	
LED Life-Time	N/A	-	50,000	-	Hours	Ta=25℃ Note 1

Note 1:LED lifetime is defined as the module brightness decay 50% of original brightness at Ta=25 degree, typical current.

Note 2:LED circuit :



3.3 Touch Panel

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply voltage	VCC	-	3.3	-	V	
Analog supply current	I_{VCC}	-	TBD	-	mA	VCC=3.3V
Input high-level voltage	VIH	0.7*VCC	-	VCC	V	
Input low -level voltage	VIL	GND	-	0.3*VCC	V	

4. Interface Pin Assignment

4.1 LCM Pin Assignment

No.	Symbol	Description
1	NC	No connection
2	BIST	Built-in self test function: 'H': Enable 'L': Disable (Default)
3	VCC(3.3V)	Power supply(3.3V)
4	VCC(3.3V)	Power supply(3.3V)
5	GND	Ground
6	GND	Ground
7	NC	No connection
8	GND	Ground
9	ORXIN0-	- LVDS differential data input(Odd data)
10	ORXIN0+	+ LVDS differential data input(Odd data)
11	GND	Ground
12	ORXIN1-	- LVDS differential data input(Odd data)
13	ORXIN1+	+ LVDS differential data input(Odd data)
14	GND	Ground
15	ORXIN2-	- LVDS differential data input(Odd data)
16	ORXIN2+	+ LVDS differential data input(Odd data)
17	GND	Ground
18	ORXCLKIN-	-LVDS differential clock input(Odd clock)
19	ORXCLKIN+	+LVDS differential clock input(Odd clock)
20	GND	Ground
21	ORXIN3-	- LVDS differential data input(Odd data)
22	ORXIN3+	+ LVDS differential data input(Odd data)
23	GND	Ground
24	ERXIN0-	- LVDS differential data input(Even data)
25	ERXIN0+	+ LVDS differential data input(Even data)
26	GND	Ground
27	ERXIN1-	- LVDS differential data input(Even data)
28	ERXIN1+	+ LVDS differential data input(Even data)
29	GND	Ground
30	ERXIN2-	- LVDS differential data input(Even data)
31	ERXIN2+	+ LVDS differential data input(Even data)
32	GND	Ground
33	ERXCLKIN-	-LVDS differential clock input(Even clock)
34	ERXCLKIN+	+LVDS differential clock input(Even clock)

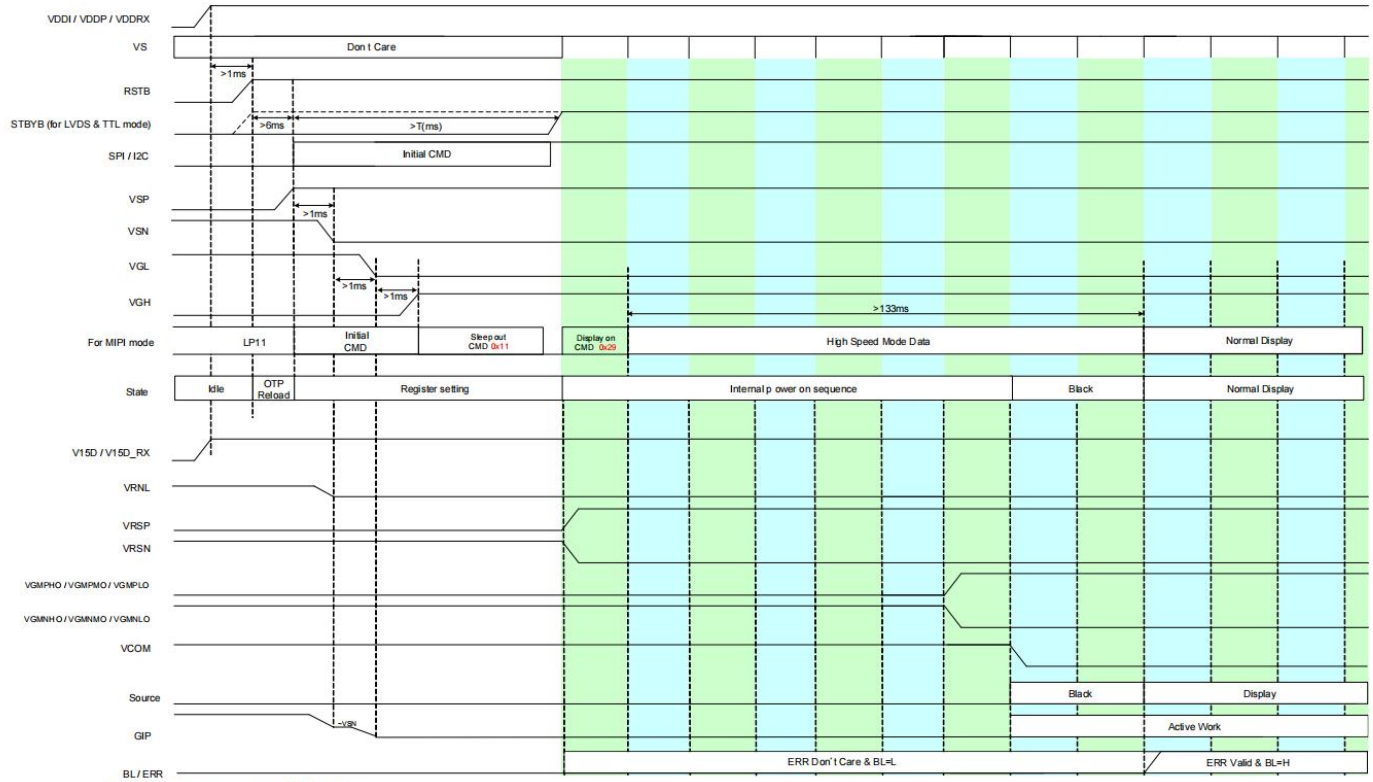
35	GND	Ground
36	ERXIN3-	- LVDS differential data input(Even data)
37	ERXIN3+	+ LVDS differential data input(Even data)
38	GND	Ground
39	FAULT	Output pin for error detection: (Reference “Error Detection” for detail) ‘H’: No error detected (External pull-high, if need) ‘L’ : An error detected
40	RESET	Global reset pin,active low
41	STBYB	Standby mode: ‘H’:Normal operation(Default) ‘L’: TCON, SD, power circuit and temp sensor will be turned off
42	GND	Ground
43	NC	No connection
44	NC	No connection
45	NC	No connection
46	NC	No connection
47	NC	No connection
48	LEDA	Power for LED backlight (Anode)
49	LEDA	Power for LED backlight (Anode)
50	LEDA	Power for LED backlight (Anode)
51	NC	No connection
52	LEDK1	Power for LED backlight (Cathode)
53	LEDK2	Power for LED backlight (Cathode)
54	LEDK3	Power for LED backlight (Cathode)
55	LEDK4	Power for LED backlight (Cathode)
56	NC	No connection
57	NTC_A	NTC_Anode
58	NTC_K	NTC_Cathode
59	GND	Ground
60	TP_SCL	I2C clock input for CTP
61	TP_SDA	I2C data input and output for CTP
62	TP_INT	Interrupt signal for CTP
63	GND	Ground
64	TP_RST	Reset Pin for CTP
65	GND	Ground
66	TP_VCC_3.3V	Power supply for CTP(3.3V)
67	TP_VCC_3.3V	Power supply for CTP(3.3V)
68	GND	Ground

5. Interface Characteristics

5.1 Power Sequence

5.1.1 Power onSequence

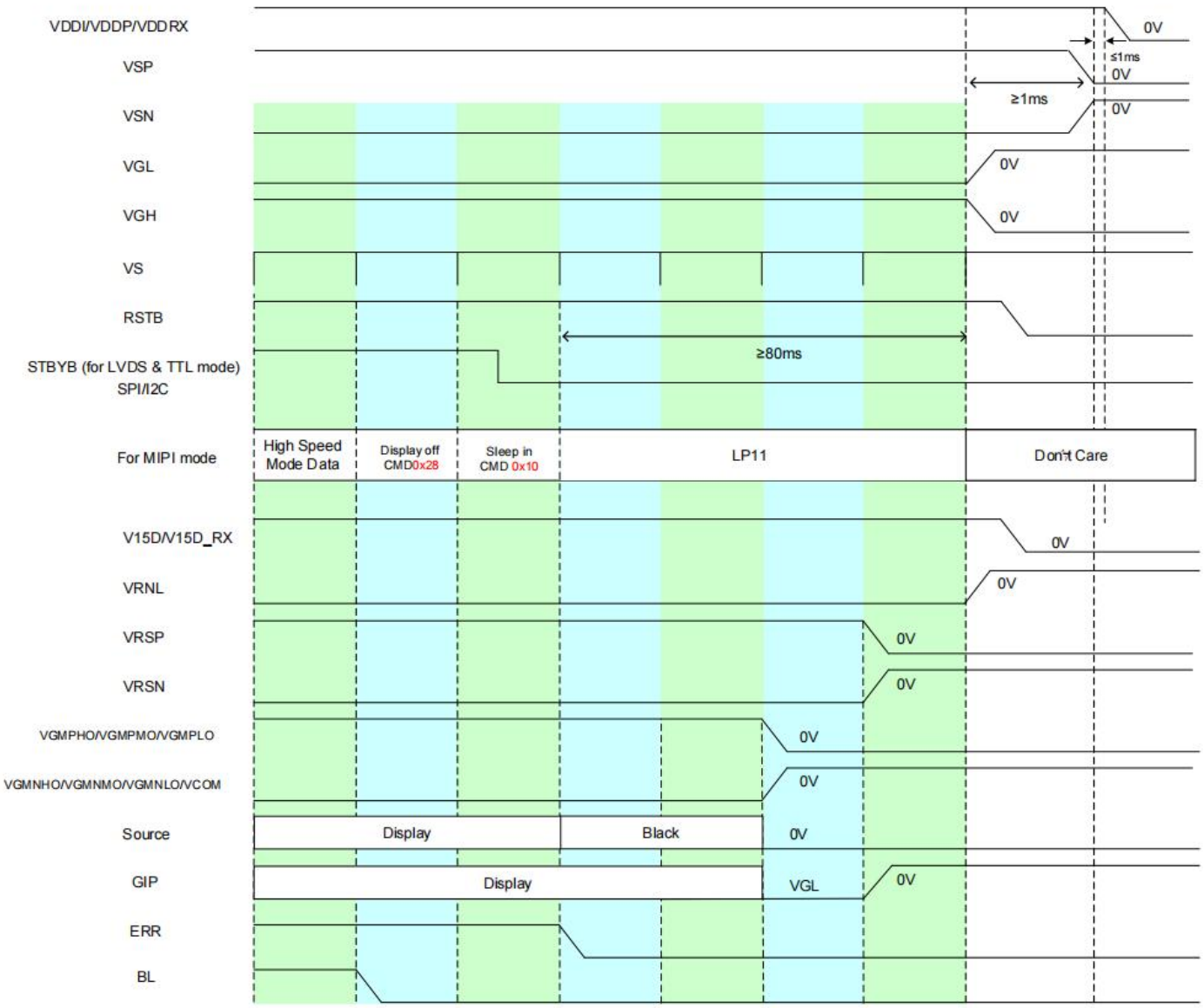
5 Power Mode



Note1: T(ms) is initial CMD time
Note2: User can set STBYB the same as RSTB when initial CMD is not needed.

5.1.2 Stand-by and Power-off Sequence

5 Power Mode



5.2 DC CHARACTERISTICS

Source Driver and LVDS

VSSI = VSSRX = VSSP = VSSA = VSS_PFM = 0V

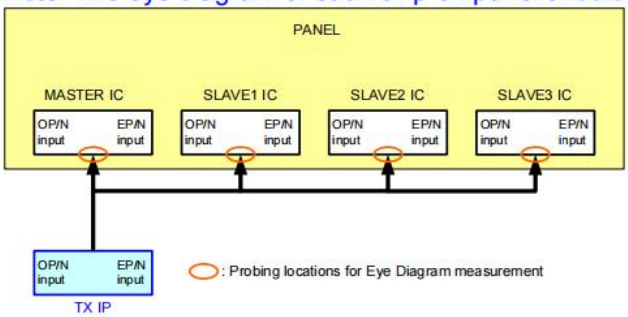
Item	Symbol	Condition	Rating			Unit	Applicable Pin
			Min.	Typ.	Max.		
Operating Voltage	VDDI	External Supply	3.0	3.3	3.6	V	VDDI
Operating Voltage	VDDRX	External Supply	3.0	3.3	3.6	V	VDDRX
Operating Voltage	VDDP	External Supply	3.0	3.3	3.6	V	VDDP
Operating Voltage	VDD_PFM	External Supply	3.0	3.3	3.6	V	VDD_PFM
Operating Voltage	VDD_OTP	External Supply	8.0	8.25	8.5	V	VDD_OTP
Operating Voltage	VSP	External Supply	5.1	-	6.6	V	VSP
Operating Voltage	VSN	External Supply	-6.6	-	-5.1	V	VSN
Operating Voltage	V15D	Built-In Power Supply	-	1.5	-	V	V15D
Operating Voltage	V15D_RX	Built-In Power Supply	-	1.5	-	V	V15D_RX
Operating Voltage	VRSP	Built-In Power Supply	4.9	-	6.4	V	VRSP
Operating Voltage	VRSN	Built-In Power Supply	-6.4	-	-4.9	V	VRSN
Operating Voltage	VRNL	Built-In Power Supply	-	-2.5	-	V	VRNL
Operating Voltage	VGMPHO	Built-In Power Supply	4.7	-	6.2	V	VGMPHO
Operating Voltage	VGMPMO	Built-In Power Supply	2.2		3.7	V	VGMPMO
Operating Voltage	VGMPLO	Built-In Power Supply	0.1	-	1.6	V	VGMPLO
Operating Voltage	VGMNHO	Built-In Power Supply	-6.2	-	-4.7	V	VGMNHO
Operating Voltage	VGMNMO	Built-In Power Supply	-3.7		-2.2	V	VGMNMO
Operating Voltage	VGMNLO	Built-In Power Supply	-1.6	-	-0.1	V	VGMNLO
Operating Voltage	VGH	Built-In Power Supply	7.0		22.5	V	VGH
Operating Voltage	VGL	Built-In Power Supply	-15.0	-	-7.0	V	VGL
Operating Voltage	VCOM	Built-In Power Supply	-2.00	-	0.55	V	VCOM
Input High-level Voltage	V_{IH}		0.7*VDDI	-	VDDI	V	SPI / RGB Interface
Input Low-level Voltage	V_{IL}		VSSI	-	0.3*VDDI	V	SPI / RGB Interface
Output High-level Voltage	V_{OH}	VDDI=3.3V, I_{OH}=-1mA	VDDI-0.4	-	VDDI	V	SPI / RGB Interface
Output Low-level Voltage	V_{OL}	VDDI=3.3V, I_{OL}=1mA	VSSI	-	VSSI+0.4	V	SPI / RGB Interface
Input Leakage Current	I_{LI}	V_{IN}=VDDI or VSSI	-1.0	-	1.0	μA	SPI / RGB Interface
Differential input high threshold voltage	R_{xVTH}	R_{xVCM} = 1.2V (Note1)	-	-	0.1	V	LVDS Interface
Differential input low threshold voltage	R_{xVTL}		-0.1	-	-	V	LVDS Interface
Input voltage range (singled-end)	R_{xVIN}	(Note1)	0	-	VDDI-1.2	V	LVDS Interface
Differential input common mode voltage	R_{xVCM}	(Note1)	0.8	1.2	1.4	V	LVDS Interface
Differential input voltage	$\|V_{ID}\|$	R_{xVT}= $\|R_{xVTH}\|$ or $\|R_{xVTL}\|$	> R_{xVT}	0.4	0.6	V	LVDS Interface
Differential input leakage current	RV_{xliz}	(Note1)	-10	-	10	uA	LVDS Interface
Output Voltage Deviation	V_{OD1}	SO ≥ VSP-1.5V, SO ≤ VSSA+1.5V	-	±20	±40	mV	Source Pad
	V_{OD2}	VSSA+1.5V < SO < VSP-1.5V	-	±15	±20	mV	
	V_{OD3}	SO ≥ VSSA-1.5V, SO ≤ VSN+1.5V	-	±20	±40	mV	
	V_{OD4}	VSSA+1.5V < SO < VSP-1.5V, VSSA-1.5V > SO > VSN+1.5V	-	±15	±20	mV	
Pull low/high resistor	R_{PULL}	VDDI=3.3V	200K	350K	500K	ohm	Digital input pin

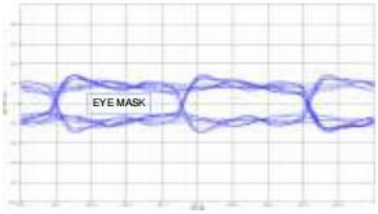
5.3 LVDS AC Timing

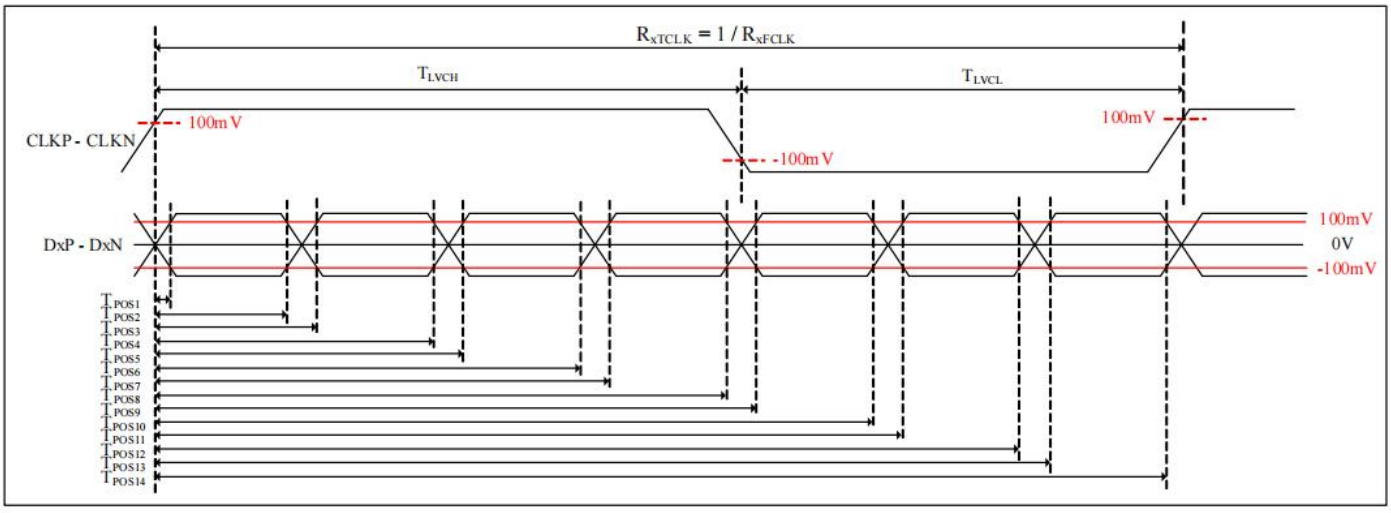
VSSI = VSSRX = VSSP = 0V, VDDI = VDDP= VDDRX = 3.0 ~ 3.6V

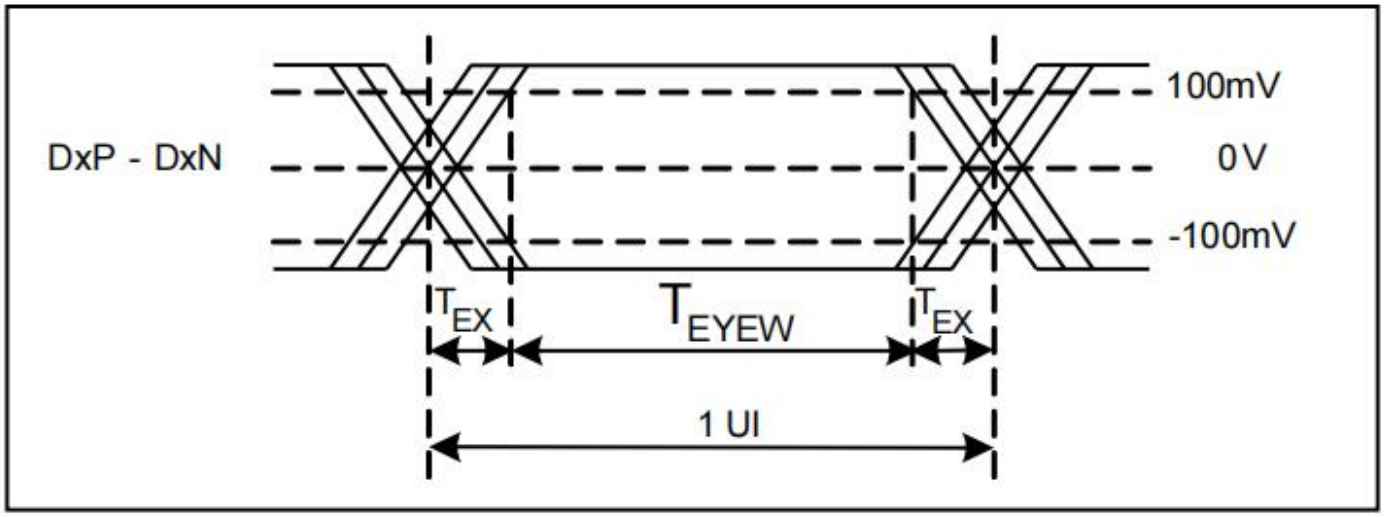
Item	Signal	Symbol	Rating			Unit
			Min.	Typ.	Max.	
Clock Frequency	CLK	R_{xFCLK}	20	-	100	MHz
Clock Period		R_{xTCLK}	10	-	50	ns
1 data bit time		UI	-	1/7	-	R_{xTCLK}
Clock high time	CLK	T_{LVCH}		4		UI
Clock low time		T_{LVCL}		3		UI
Position 1	DATA	T_{POS1}	-0.25	0	0.25	UI
Position 2		T_{POS2}	0.75	-	1.25	
Position 3		T_{POS3}	0.75	1	1.25	
Position 4		T_{POS4}	1.75	-	2.25	
Position 5		T_{POS5}	1.75	2	2.25	
Position 6		T_{POS6}	2.75	-	3.25	
Position 7		T_{POS7}	2.75	3	3.25	
Position 8		T_{POS8}	3.75	-	4.25	
Position 9		T_{POS9}	3.75	4	4.25	
Position 10		T_{POS10}	4.75	-	5.25	
Position 11		T_{POS11}	4.75	5	5.25	
Position 12		T_{POS12}	5.75	-	6.25	
Position 13		T_{POS13}	5.75	6	6.25	
Position 14		T_{POS14}	6.75	-	7.25	
Input eye width		T_{EYEW}	0.5	-	-	
Input eye border		T_{EX}	-	-	0.25	
PLL wake-up time		TenPLL	-	-	150	us

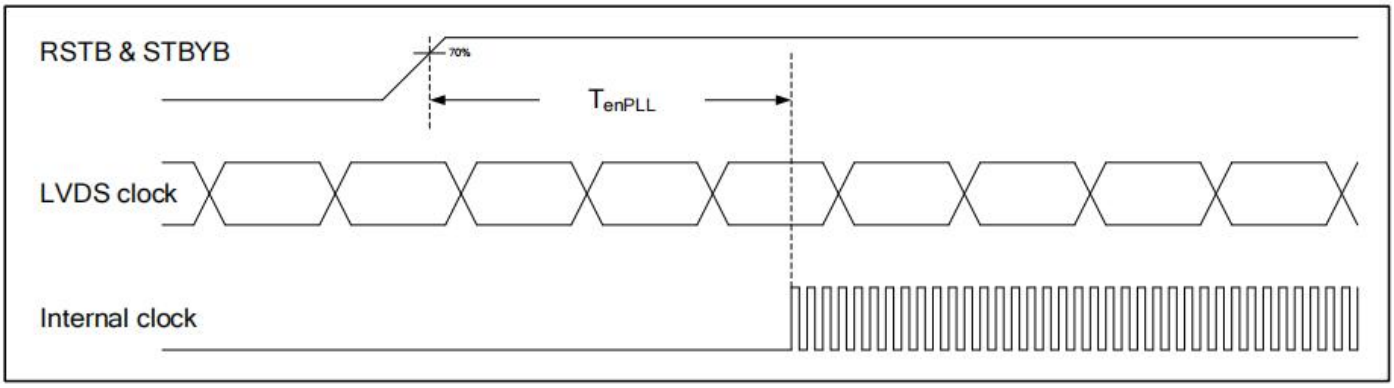
Note: The eye diagram of each chip on panel should satisfy the LVDS specification above.









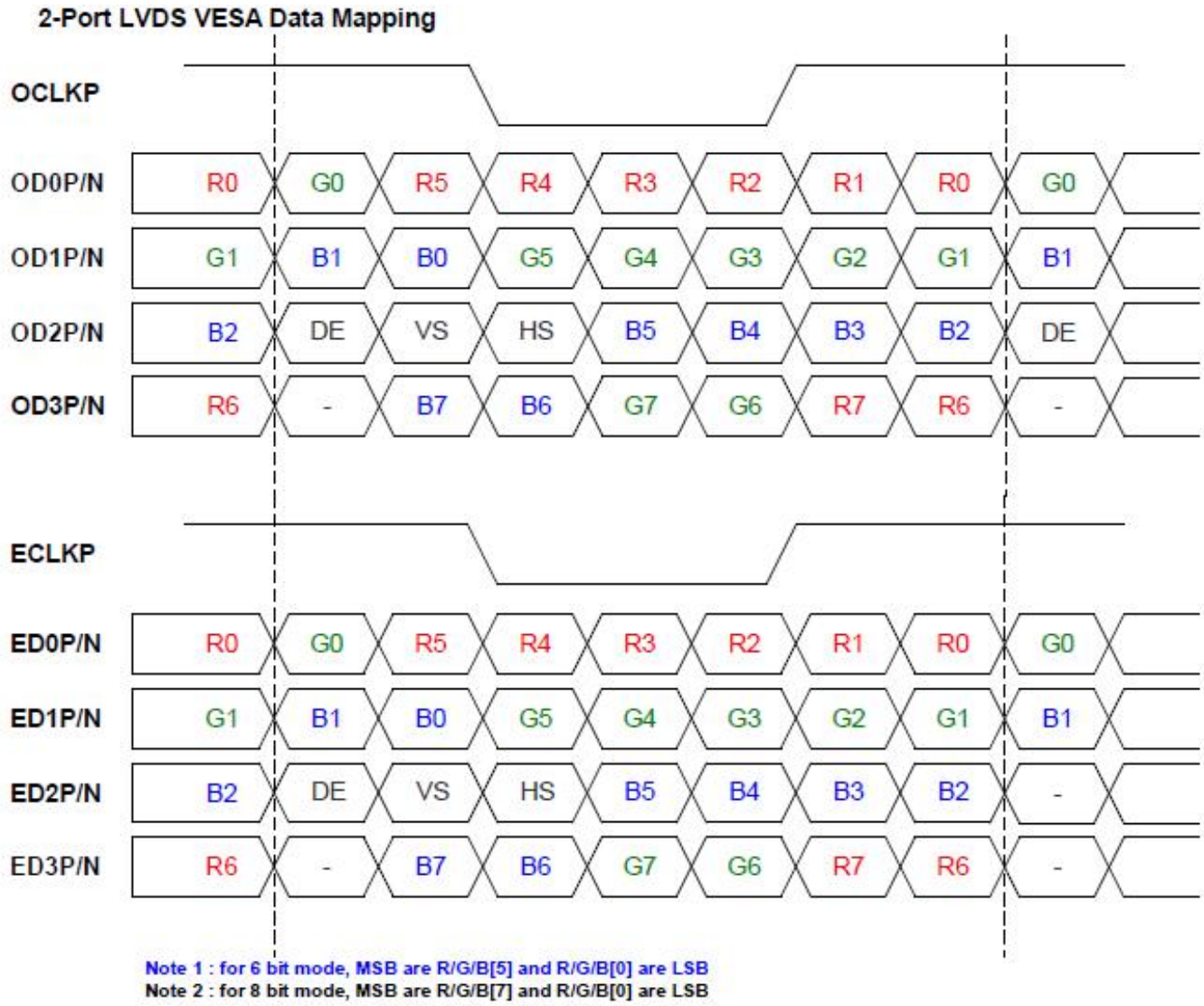


Spread Spectrum Clocking (SSC) tolerance of LVDS receiver

VSSI = VSSRX = VSSP = 0V, VDDI = VDDP= VDDRX = 3.0 ~ 3.6V

Item	Signal	Symbol	Condition	Rating		Unit
				Min.	Max.	
Modulation frequency		SSC_{MF}		1	100	kHz
Modulation rate		SSC_{MR}	R_{xFCLK}=70MHz		+/-3	%
			R_{xFCLK}=50MHz		+/-4	%

5.4 LVDS Interface



1920 x 1080 (Only 2-Port)

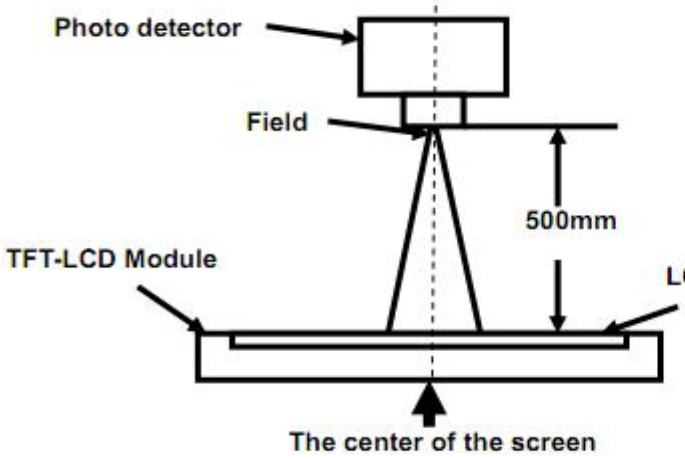
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	t_{CLK}	66.5	67.87	75	MHz	
Horizontal blanking time	t_{HBT}	48	50	99	t_{CLK}	$t_{HBP} + t_{HFP}$
Horizontal display area	t_{HD}		960		t_{CLK}	
Horizontal period	t_H	1008	1010	1059	t_{CLK}	
Horizontal pulse width	t_{HPW}	2	2	2	t_{CLK}	
Vertical blanking time	t_{VBT}	20	40	100	t_H	$t_{VBP} + t_{VFP}$
Vertical display area	t_{VD}		1080		t_H	
Vertical period	t_V	1100	1120	1180	t_H	
Vertical pulse width	t_{VPW}	2	2	2	t_H	
Frame rate	FR	60	60	60	Hz	

6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	Φ=90°(12 o'clock)	75	85	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	75	85	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	75	85	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	75	85	-	deg	Note2
Response Time	T_{ON+OFF}	25°C	-	-	22	msec	Note4
	T_{ON+OFF}	-20°C	-	-	200	msec	Note4
	T_{ON+OFF}	-30°C	-	-	400	msec	Note4
Contrast Ratio	CR	Perpendicular	-	1400:1	-	-	Note1 Note3
	CR	Area: A+	1200:1	-	-	-	Note1 Note3
	CR	Area: A	350:1	-	-	-	Note1 Note3
	CR	Area: B	250:1	-	-	-	Note1 Note3
Color Chromaticity	W_X	Normal θ=Φ=0°	0.280	0.310	0.340	-	Note1 Note5
	W_Y		0.300	0.330	0.360	-	Note1 Note5
Luminance	L		700	850	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		70	80	-	%	Note1 Note6
NTSC	-		-	70	-	%	-

Note 1:Definition of optical measurement system

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Fig 1

Note 2: Definition of viewing angle range and measurement system.
viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

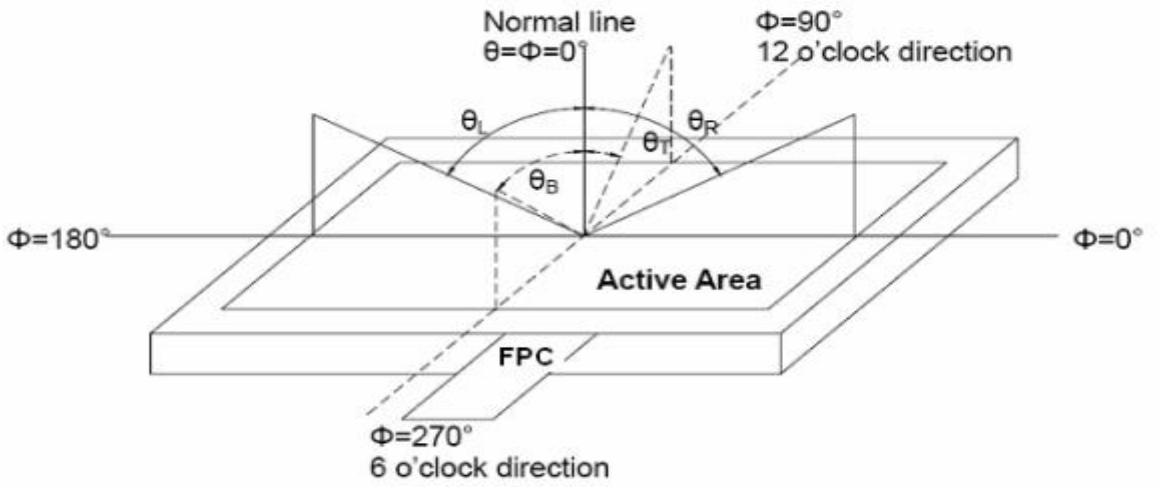


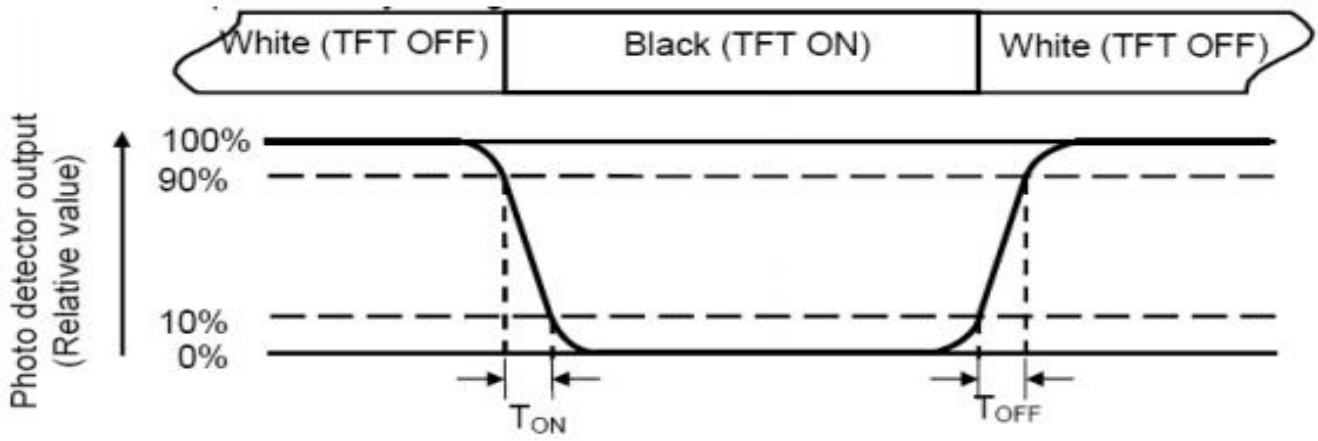
Fig 2 Definition of viewing angle

Note 3: Definition of contrast ratio

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

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.3-a/b

Note 7:Surface luminance is the luminance with all pixels displaying white.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, ...,Pn)

For more information see FIG.3-a/b

Note 8:H,V : Active area(see Figure b)

Light spot size ⌀ =5mm(BM-5) or ⌀ =7.7mm (BM-7)50cm distance or compatible distance from the LCD surface to detector lens. test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter SR-3A or BM-7 or compatible (see Figure 1).

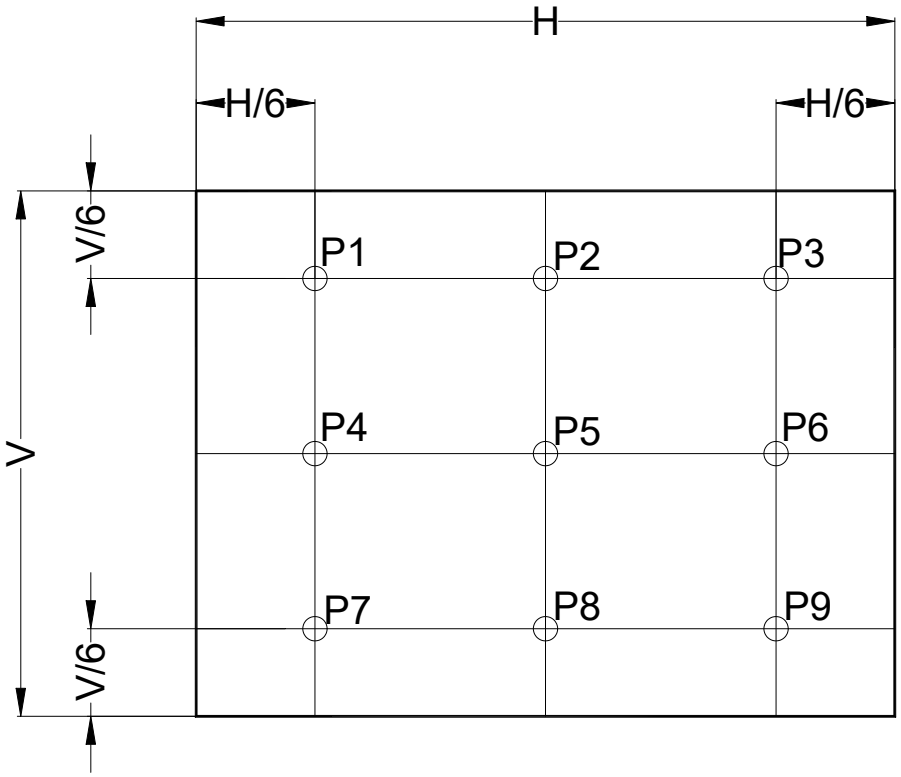


Fig. 3-b Definition of points

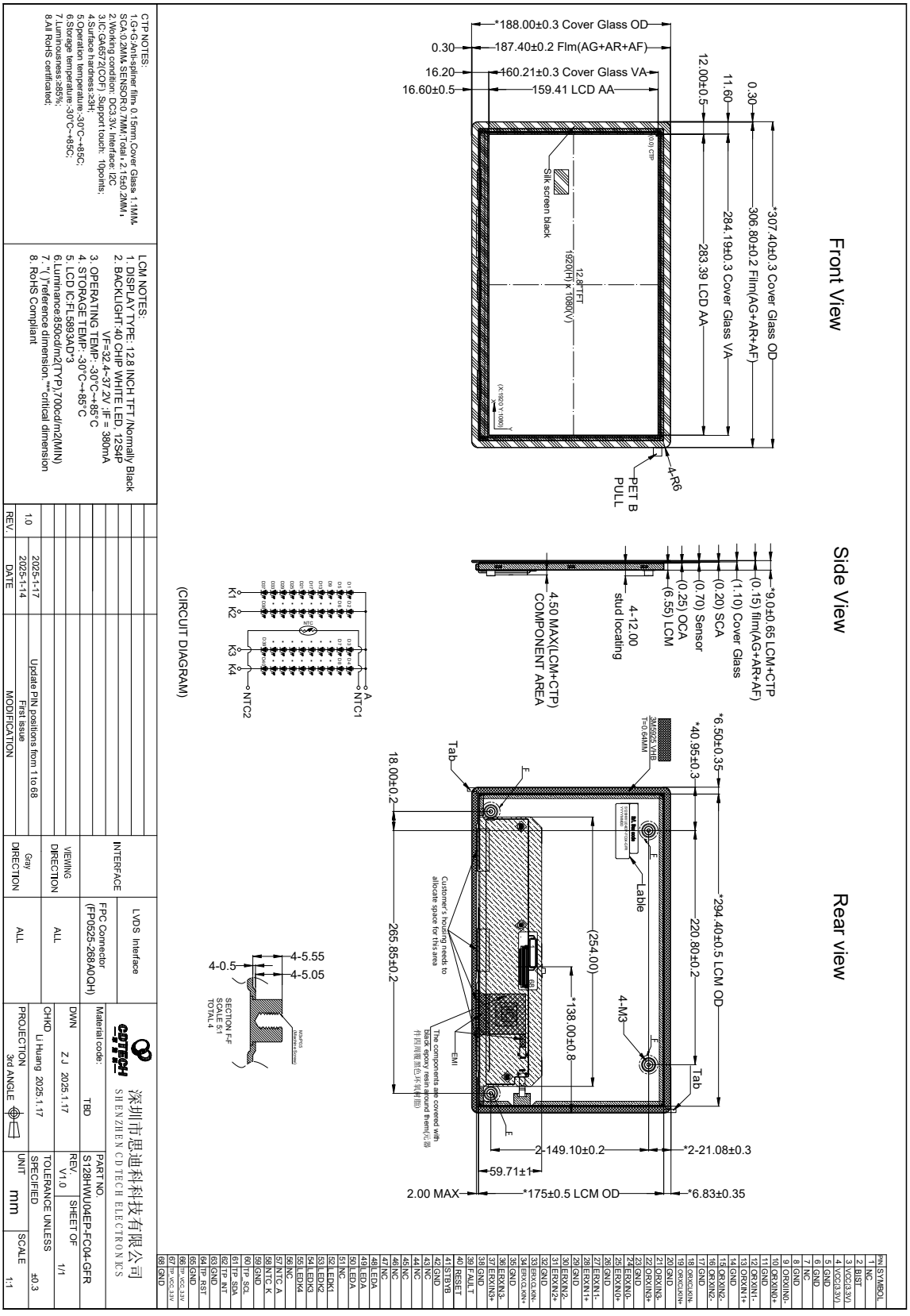
7. Reliability Test Items

Test Item	Test Conditions	
High Temperature Storage	Ta= +85℃	96hrs
Low Temperature Storage	Ta= -30℃	96hrs
High Temperature Operation	Ta= +85℃	96hrs
Low Temperature Operation	Ta= -30℃	96hrs
High Temperature and Humidity Storage	Ta= +60℃, 90% RH	96hrs
Thermal Shock (Non-operation)	-30℃/30 min ~ +85℃/30 min for 20 cycles Start with cold temperature end with high temperature	
Electro Static Discharge	Contact = ± 8 kV, class B Air = ± 15 kV, class B R=330Ω,C=150pF	
Vibration	Sweep: 10Hz~55Hz~10Hz Stroke: 1.5mm 2 hrs for each direction of X .Y. Z.	
Mechanical Shock	60G 6ms,±X,±Y,±Z 3 times for each direction	
Package Drop Test	Height: 60 cm 1 corner, 3 edges, 6 surfaces	

Notes: The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:

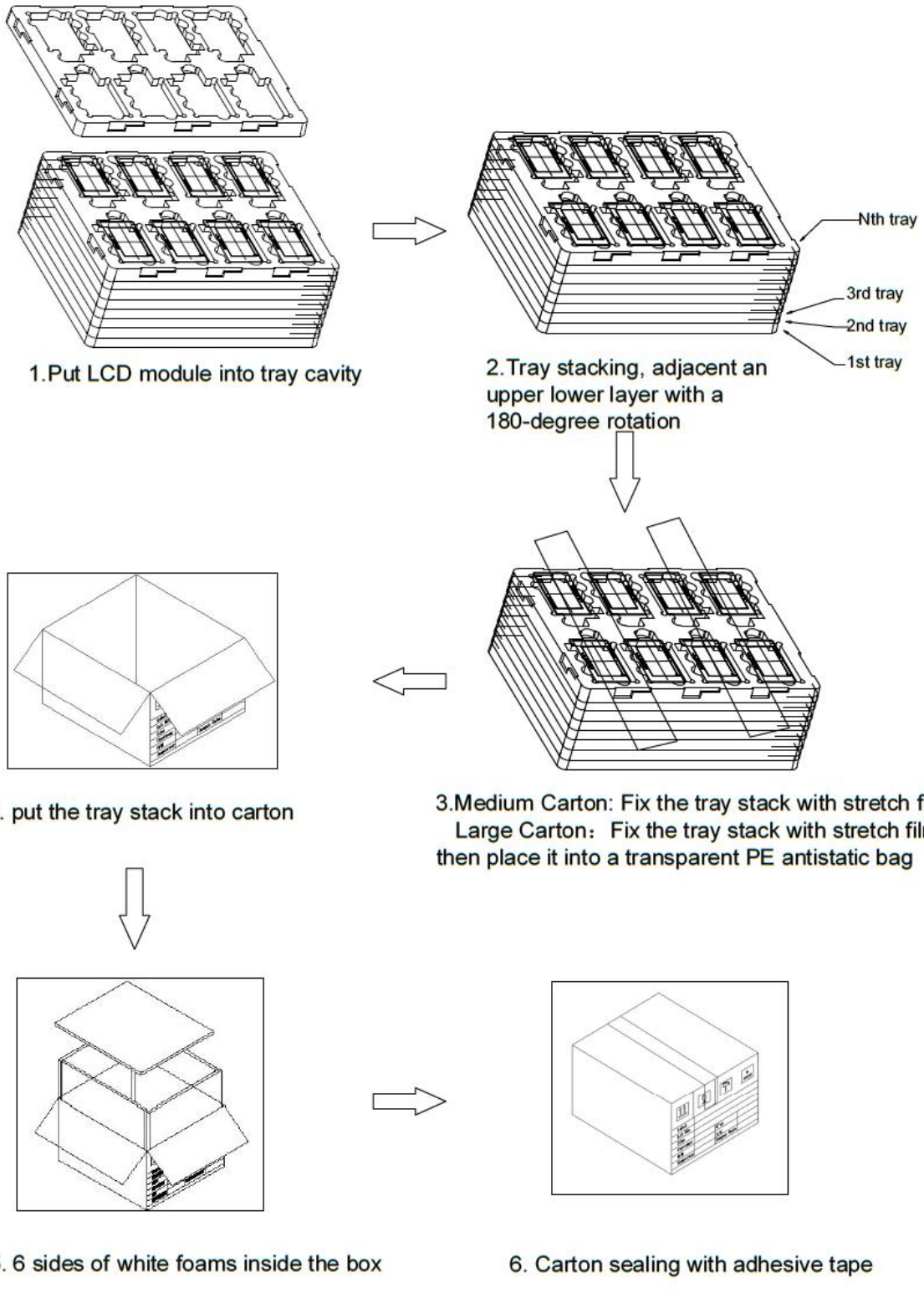
1). Air bubble in the LCD
2). Seal leak or Glass crack
3). Non display or abnormal display
4). Brightness reduction >50%

8. Mechanical Drawing



9. Packing

Packing Method



10. Precautions for Use of LCD Screen with Touch Controller

10.1 Handling Precautions

10.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

10.1.6. Do not attempt to disassemble the LCD Module.

10.1.7. If the logic circuit power is off, do not apply the input signals.

10.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1. Be sure to ground the body when handling the LCD Modules.

10.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage Precautions

10.2.1.When storing the LCD modules,avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2.The LCD modules should be stored under the storage temperature range if the LCD modules will be stored for a long time,the recommend condition is :

Temperature : 0℃ ~40℃ Relatively humidity: ≤80%

10.2.3.The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

10.4 Packaging instructions

when the customers using trays, they have to stack the adjacent trays in a 180° staggered to prevent pressure that could cause product damage.