



PRODUCT SPECIFICATION

CDTECH Model:

S123IWU12EP-FC20

CUSTOMER Model:

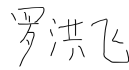
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Description:

12.3" TFT-LCD Module with CTP

Version:

1.0

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2023.3.31	2023.3.31	2023.3.31

CUSTOMER APPROVAL	SIGNATURE	DATE



Record of Revisions

[illegible]



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1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	12.3	inch
Number of Pixels	1920 (H) RGB x 720 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	o' clock
Interface	LVDS	-
Display Colors	16.7M	colors
Outline Dimension	320.33 (H) x 141.13 (V) x 7.80 (D)	mm
Active Area	292.03 (H) x 109.51 (V)	mm
Pixel Pitch	0.1520 (H) x 0.1520 (V)	mm
Driver IC	-	-
Operation Temperature	-30~85	°C
Storage Temperature	-30~85	°C

1.2 Touch Panel Information

Item	Specification
Touch Structure	G+G
Bonding Type with LCM	OCA Optical Bonding
Driver IC	GT9110
Interface	I ² C
Touch Count Max	5 Points
Surface treatment	-
Surface hardness	6H
I2C slave address	0x28
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	VDD	-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. Electrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

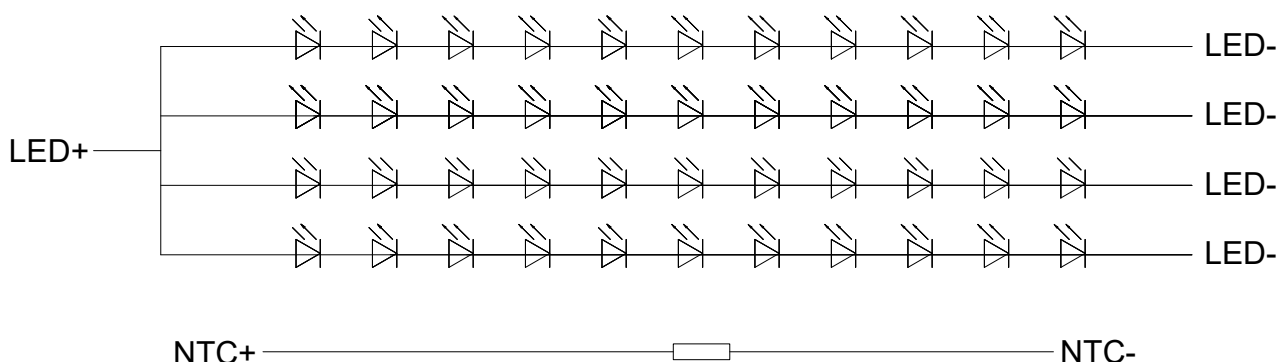
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	3.0	3.3	3.6	V	
Analog supply current	I _{VDD}	-	TBD	-	mA	VDD=3.3V
Logic input voltage	V _{IH}	0.7*VDD	-	VDD	V	
	V _{IL}	GND	-	0.3*VDD	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I _F	-	360	-	mA	
Driving Voltage	V _F	29.7	-	36.3	V	
Power consumption	W _{BL}	10.692	-	13.068	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	VDD	-	3.3	-	V	
Analog supply current	I _{VDD}	-	TBD	-	mA	VDD=3.3V
Input high-level voltage	VIH	0.7*VDD	-	VDD	V	
Input low -level voltage	VIL	GND	-	0.3*VDD	V	

4. Interface Pin Assignment

4.1 LCM Pin Assignment

Recommended connector: FH12-50S-0.5SH(55) manufactured by HIROSE

No.	Symbol	Description
1	GND	Ground
2	BIST	LCD Panel Self Test Enable, When it is not used, connecting to GND is recommended, don't floating
3	VCC	Power supply
4	VCC	Power supply
5	GND	Ground
6	GND	Ground
7	OTP	Serial interface OTP power (NOTE1)
8	NC	No connection
9	GND	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	Ground
31	FAULT	FAULT signal output(normal=H,abnormal=L)
32	RESET	Global reset pin
33	STBYB	Standby mode
34	CSB	Serial interface chip enable (NOTE1)

35	SCL	Serial interface clock input	(NOTE1)
36	SDAI	Serial interface data input	(NOTE1)
37	SDAO	Serial interface data output	(NOTE1)
38	GND	Ground	
39	GND	Ground	
40	NC	No connection	
41	LEDA	Power for LED backlight (Anode)	
42	LEDA	Power for LED backlight (Anode)	
43	LEDA	Power for LED backlight (Anode)	
44	NC	No connection	
45	LEDK	Power for LED backlight (Cathode)	
46	LEDK	Power for LED backlight (Cathode)	
47	LEDK	Power for LED backlight (Cathode)	
48	LEDK	Power for LED backlight (Cathode)	
49	NTC_A	NTC_Anode	
50	NTC_K	NTC_Cathode	

Note1: Pin 7, 34 - 37 only for IVO use

4.2 Touch FPC Pin Assignment

No.	Symbol	Description
1	GND	Ground
2	DP+	Data+ Input
3	DP-	Data- Input
4	VDD	Power supply

5. Interface Characteristics

5.1 Signal Electrical Characteristics for LVDS Receiver

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

Table 5 LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V_{th}	+150	-	-	mV	$V_{CM}=+1.2V$
Differential Input Low Threshold	V_{tl}	-	-	-150	mV	-
Magnitude Differential Input	$ V_{ID} $	150	-	600	mV	-
LVDS Input Voltage	V_{INLV}	0.7	-	1.7	V	-
Common Mode Voltage	V_{CM}	1.0	1.2	$1.7- V_{ID} /2$	V	-

Note (1) Input signals shall be low or Hi- resistance state when VCC is off.

Note (2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

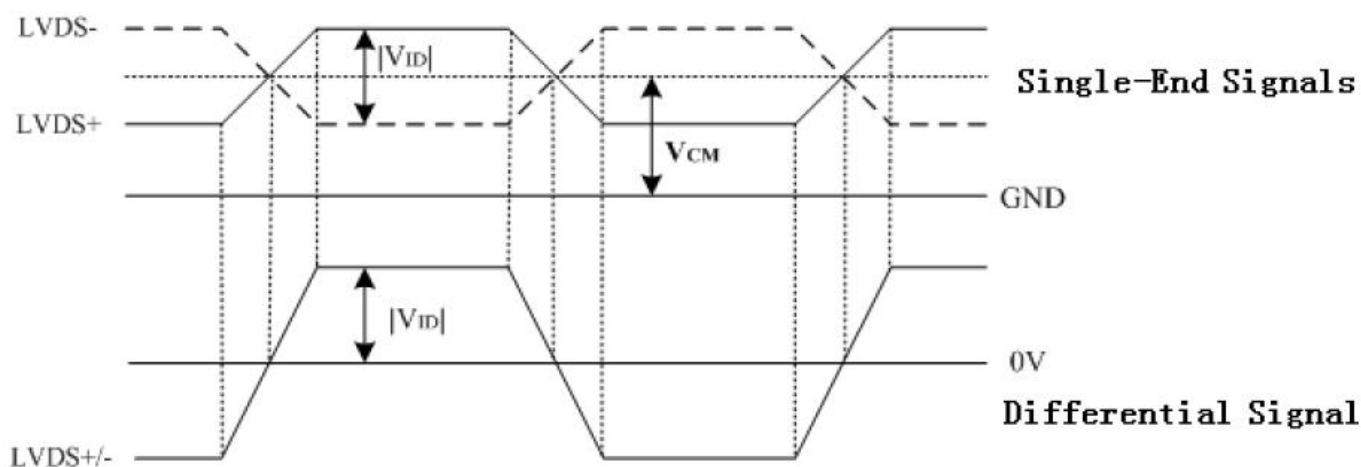


Figure 8 Voltage Definitions

Table 6 LVDS mode AC electrical characteristics

Parameter	Symbol	Spec			Unit
		Min	Typ	Max	
Clock frequency(1-port)	Flvcyc	40.8	-	48.2	MHz
Clock period(1-port)	Tlvcyc	20.7	-	-	ns
1 data bit time	UI	-	1/7	-	Tlvcyc
Clock high time	TLVHW	-	4	-	UI
Clock low time	TLVLW	-	3	-	UI
Position1	Tpos1	-0.2	0	0.2	UI
Position0	Tpos0	0.8	1	1.2	UI
Position6	Tpos6	1.8	2	2.2	UI
Position5	Tpos5	2.8	3	3.2	UI
Position4	Tpos4	3.8	4	4.2	UI
Position3	Tpos3	4.8	5	5.2	UI
Position2	Tpos2	5.8	6	6.2	UI
Input eye width	TEYEW	0.6	-	-	UI
Input eye border	TEX	-	-	0.2	UI
LVDS clock to clock skew	TSKEW_EO	-1	-	1	UI

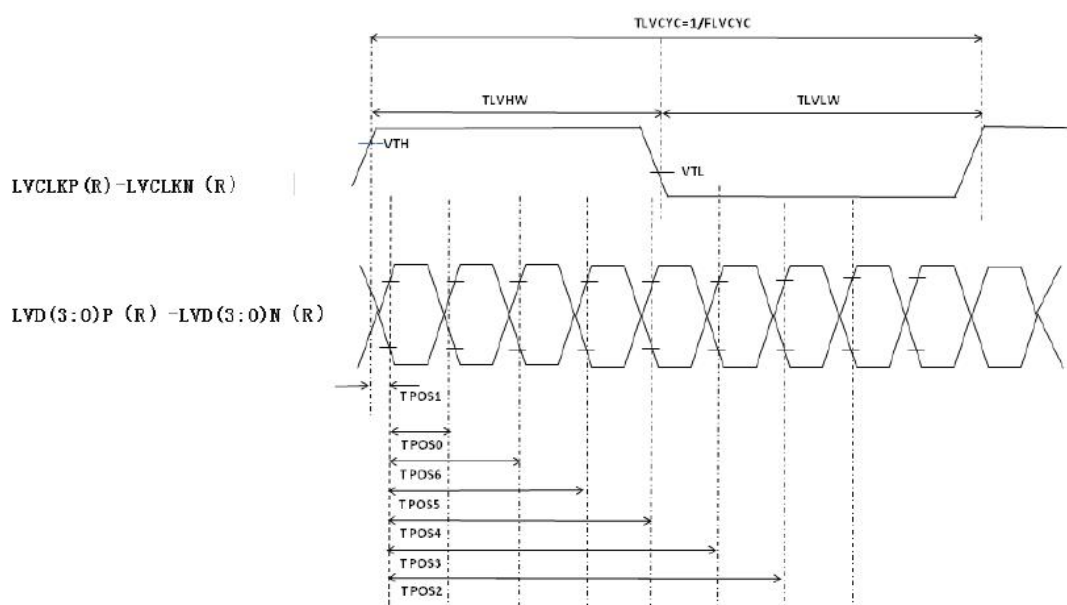


Figure 9 LVDS input timing

Single-ended:

LVDS[3:0]P,
LVDS[3:0]N

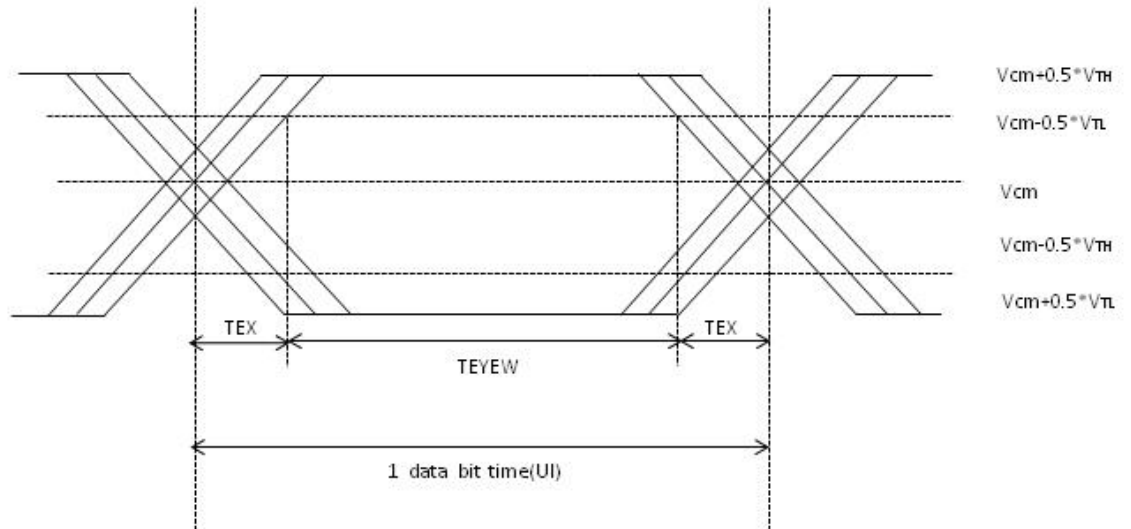


Figure 10 LVDS input eye diagram

Differential:

LVD[3:0]P-LVD[3:0]N

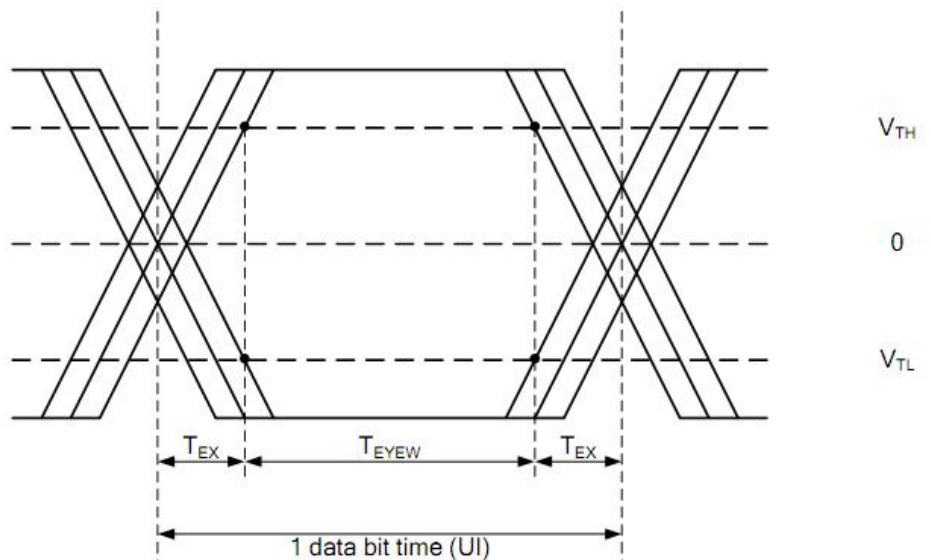


Figure 11 LVDS input eye diagram

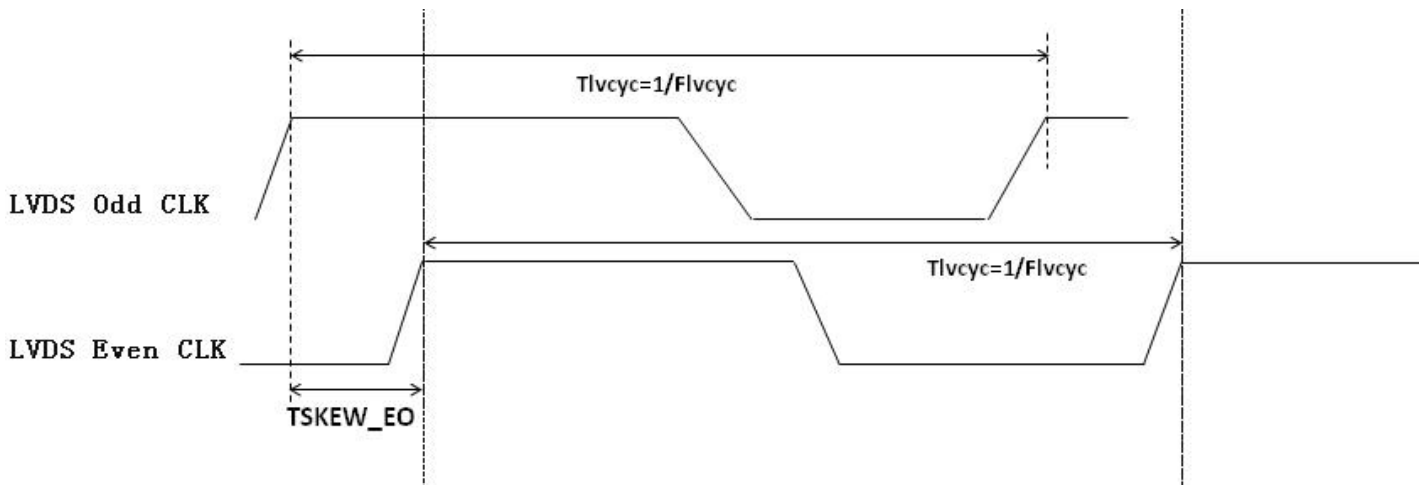


Figure 12 LVDS clock to clock skew

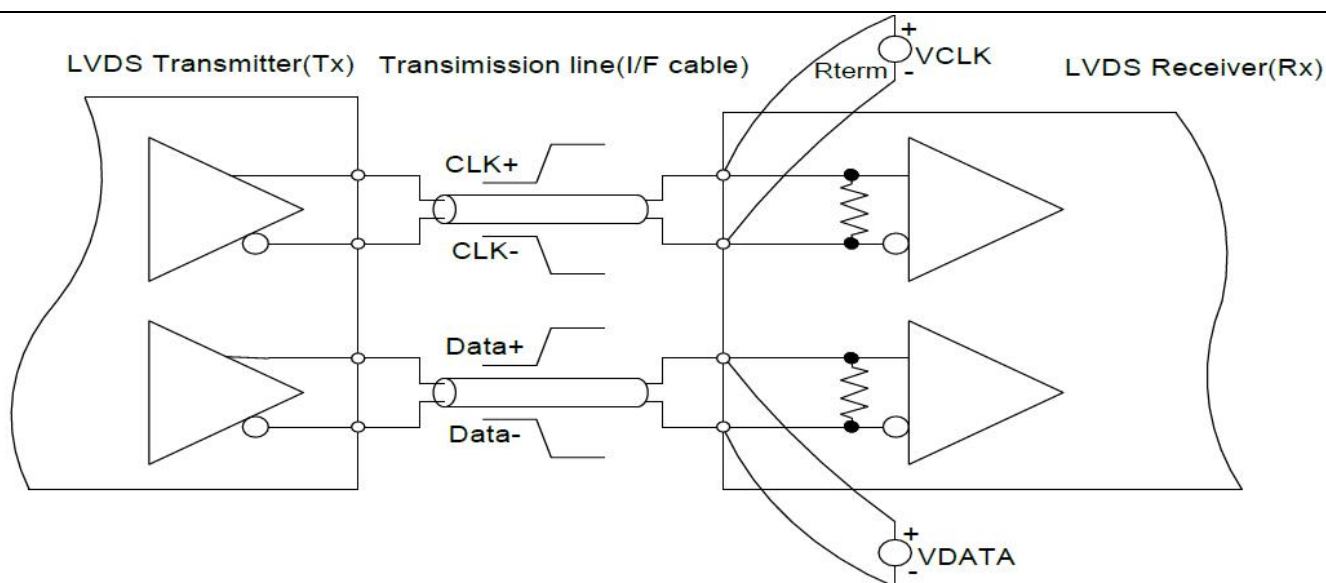


Figure 13 Measurement System

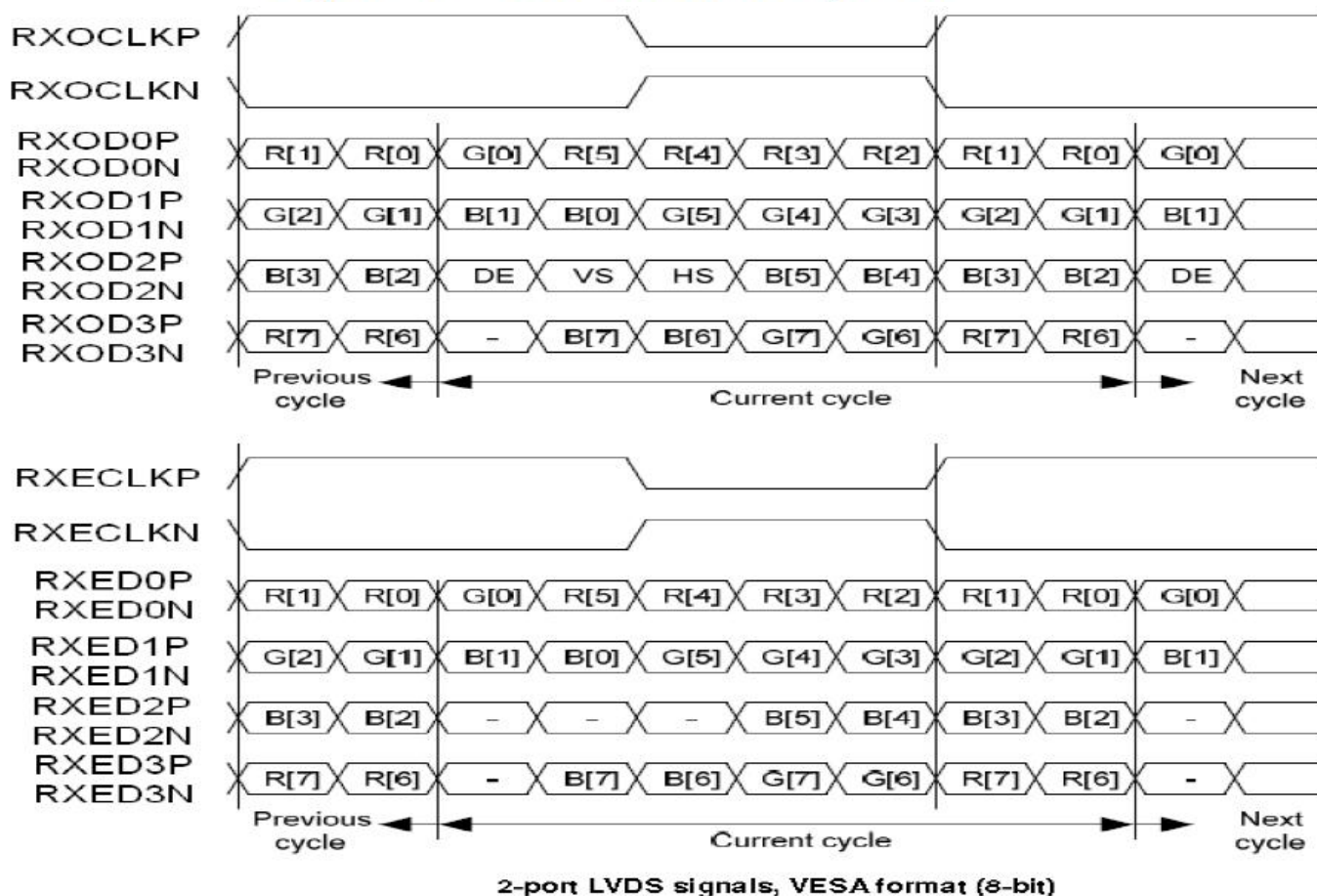


Figure 14 Data Mapping

5.2 Interface Timings

Table 7 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	81.6	89.0	96.5	MHz
H Total Time	HT	1,975	2030	2880	Clocks
H Active Time	HA	1920			Clocks
V Total Time	VT	728	731	1080	Lines
V Active Time	VA	720			Lines
Frame Rate	FV	55	60	65	Hz

Note1: This module actually uses 2-port.

Note2: $HT * VT * \text{Frame Frequency} \leq 48.25\text{MHz}$ (1-port) .

Note3: All reliabilities are specified for timing specification based on refresh rate of 60Hz.

DE Only Mode

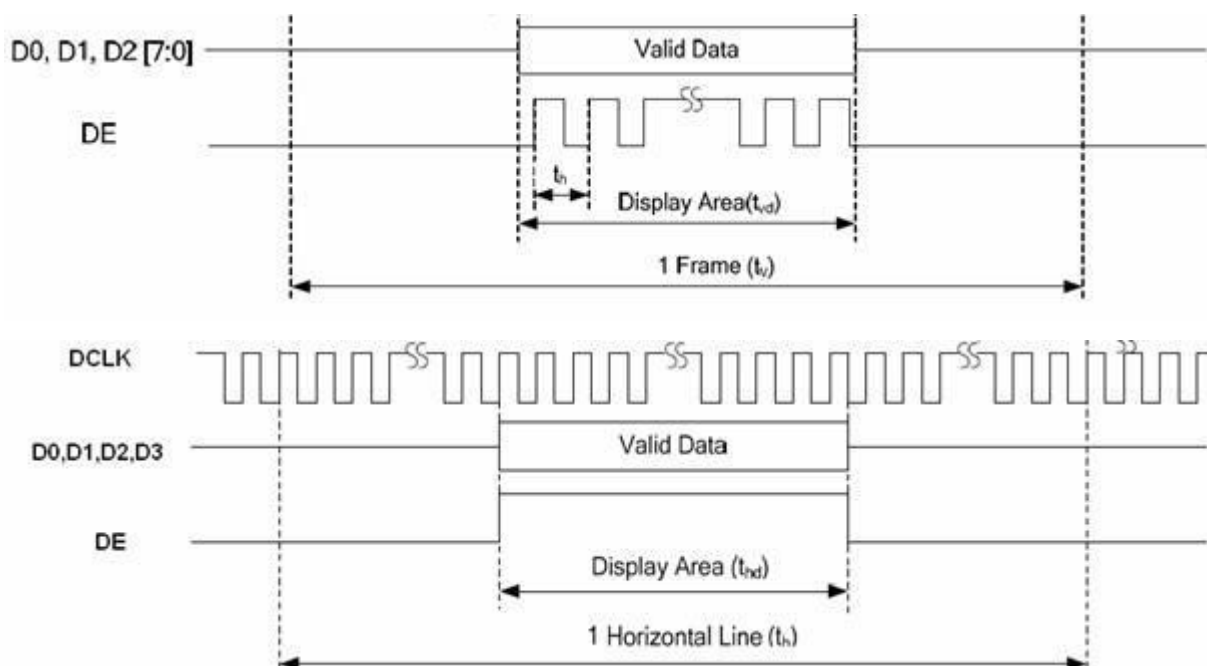


Figure 16 Timing Diagram

5.3 Power ON/OFF Sequence

1. Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VCC voltage is off.
2. When system first start up, should keep the VCC high time longer than 200ms, otherwise may cause image sticking when VCC drop off.

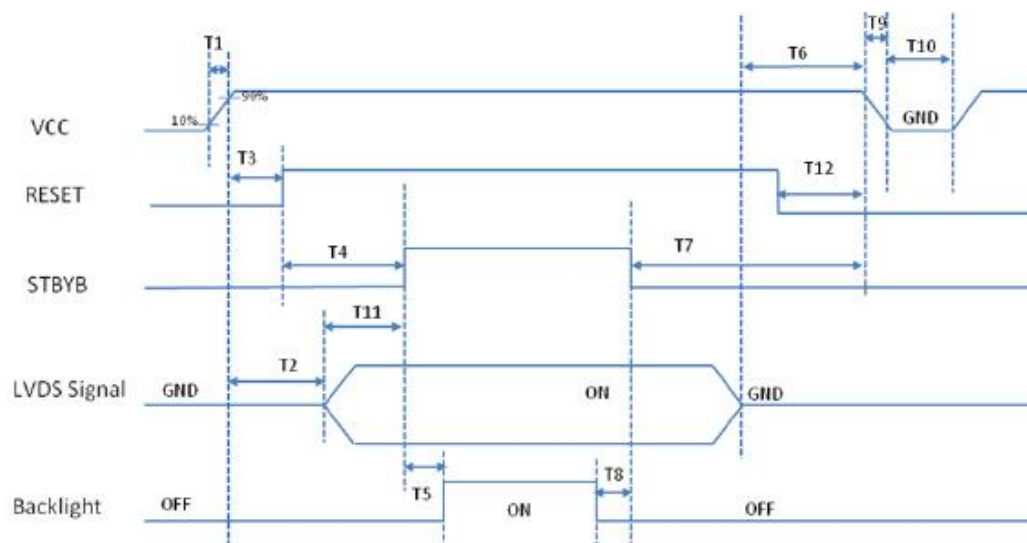


Figure 19 Power Sequence

Table 9 Power Sequencing Requirements

Parameter	Symbol	Unit	Min.	Typ.	Max.
VCC Rising Time	T1	ms	0.5	-	10
VCC to LVDS	T2	ms	0	-	50
VCC to RSTB	T3	us	10	-	-
RSTB to STBYB pull H	T4	ms	36	-	-
STBYB pull H to BL power On	T5	ms	200	-	-
BL power off to STBYB pull L	T8	ms	200	-	-
STBYB pull L to VCC Power off	T7	ms	50	67	83
LVDS Disable to VCC Power off	T6	ms	0	26	50
VCC Fall Time	T9	ms	0.5	-	30
VCC Power off	T10	s	0.5	14.2	-
LVDS Enable to STBYB pull high	T11	ms	0	10	-
RSTB pull high to BIST pull high	T12	ms	10	-	-

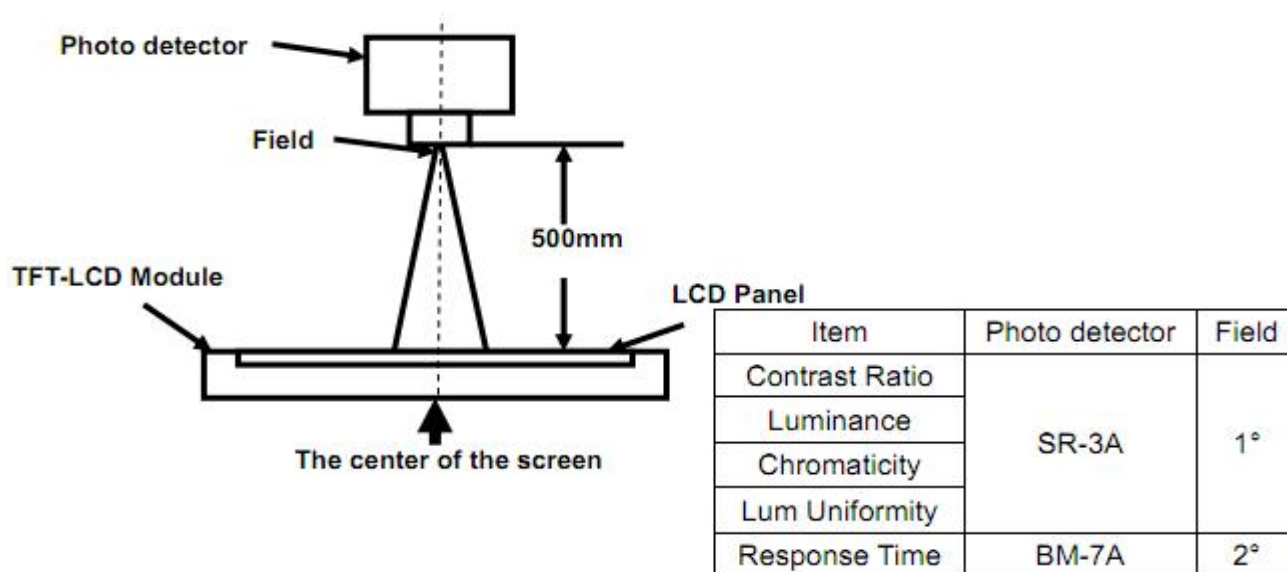
Note: IVO recommend T6, T7, T10, T11 to setting Typical value. There will be unknown risks if not.

6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	$\Phi=90^\circ$ (12 o'clock)	80	85	-	deg	Note2
	θ_B	$\Phi=270^\circ$ (6 o'clock)	80	85	-	deg	Note2
	θ_L	$\Phi=180^\circ$ (9 o'clock)	80	85	-	deg	Note2
	θ_R	$\Phi=0^\circ$ (3 o'clock)	80	85	-	deg	Note2
Response Time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	12	17	msec	Note4
	T_{OFF}		-	12	17	msec	Note4
Contrast Ratio	CR		800	1000	-	-	Note1 Note3
Color Chromaticity	W_X		0.250	0.300	0.35	-	Note1 Note5
	W_Y		0.27	0.320	0.37	-	Note1 Note5
Luminance	L		700	800	-	cd/m ²	Note1 Note7
Luminance Uniformity	Y_U		70	80	-	%	Note1 Note6
NTSC	-		-	75	-	%	-

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.



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).

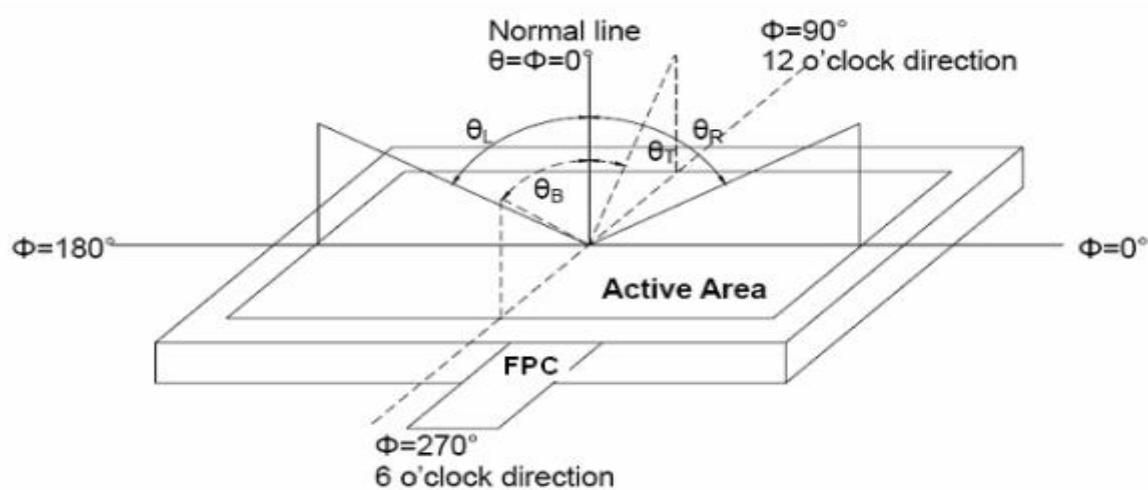


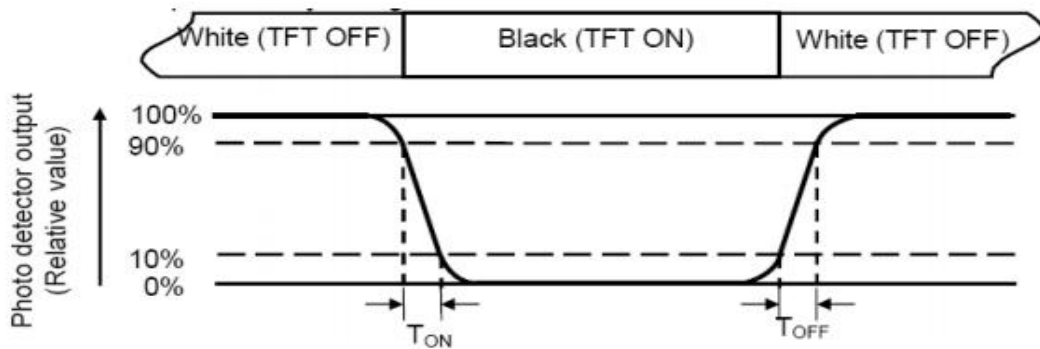
Fig. 1 Definition of viewing angle

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.2.

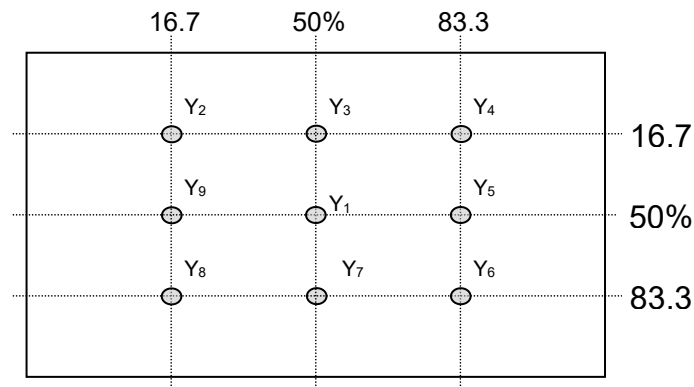


Fig. 2 Definition of points

Note 7: Definition of Luminance (Refer Fig. 2)

Surface luminance is the luminance with all pixels displaying white.

L_v = Average Surface Luminance with all white pixels($P_1, P_2, P_3, \dots, P_n$).

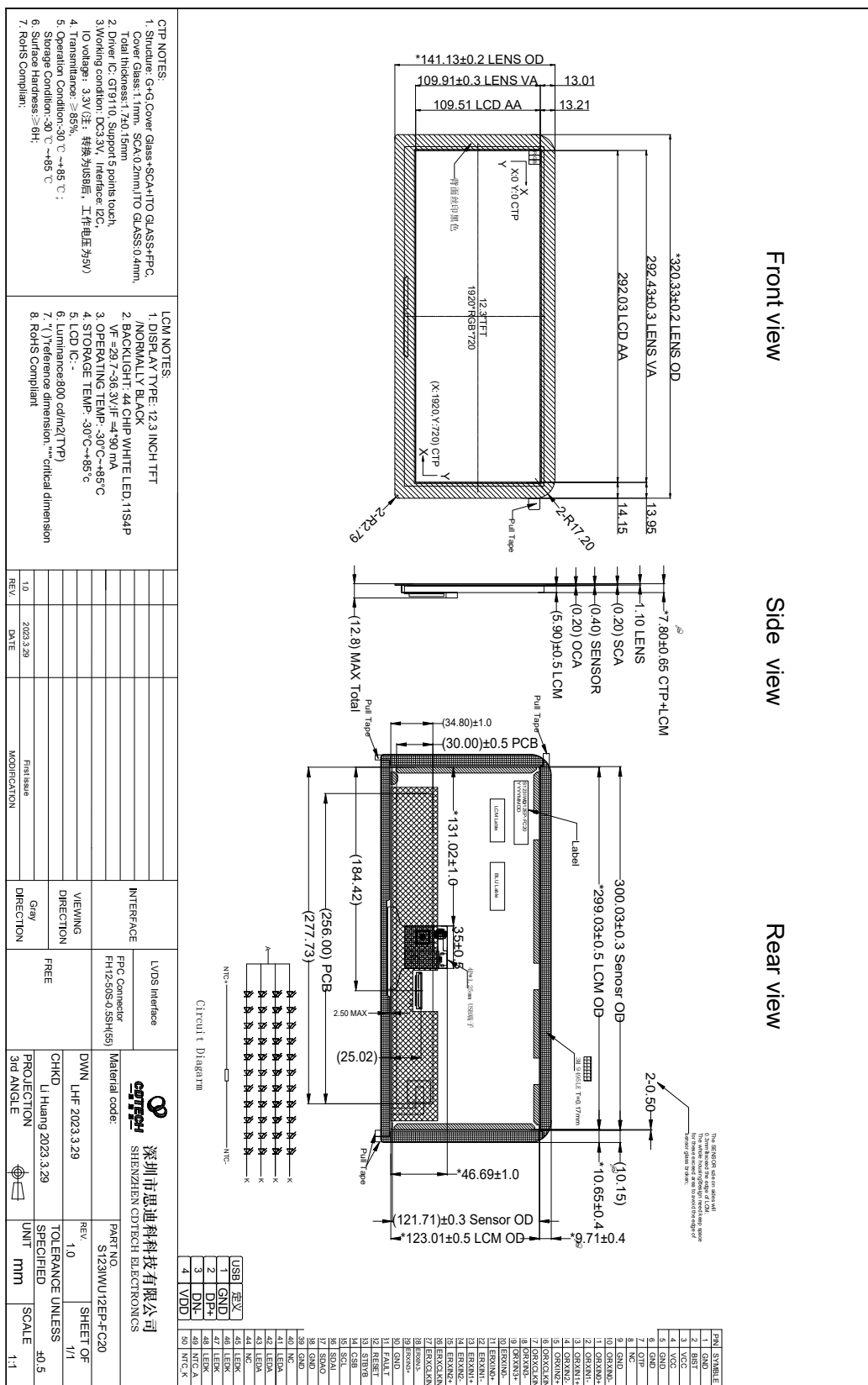
7. Reliability Test Items

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 = ± 4 kV, class B Air = ± 8 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:

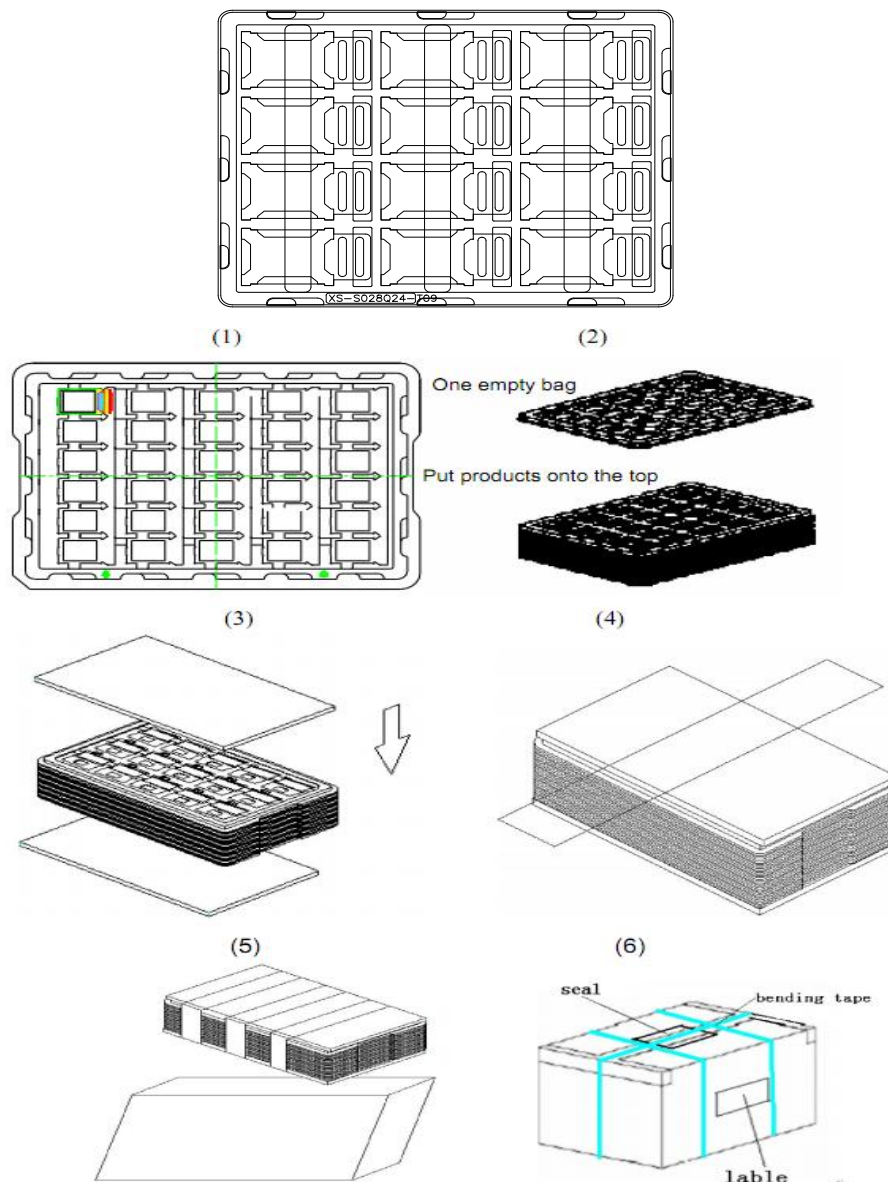
- 1). Air bubble in the LCD
- 2). Seal leak or Glass crack
- 3). Non display or abnormal display
- 4). Brightness reduction >50%

8. Mechanical Drawing



9. Packing

Packing Method



Steps:

1. Put module into tray cavity
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above
4. Fix the cardboard to the tray stack with adhesive tape
5. Put the tray stack into carton
6. Carton sealing with adhesive tape

10. Precautions for Use of LCD modules

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.