PRODUCT SPECIFICATION

CDTECH Model: **S090BWS05ED-DC01**

CUSTOMER Model: -

Description: **9.0” TFT-LCD Module with CTP**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2022.6.7	2022.6.7	2022.6.7

	SIGNATURE	DATE
CUSTOMER APPROVAL		

Record of Revisions

Version	Revise Date	Description	Page
1.0	2022-06-07	First Release	-

Contents

1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	9.0	inch
Number of Pixels	1024(H) RGB x 600(V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	o' clock
Interface	LVDS	-
Display Colors	16.7M	colors
Outline Dimension	210.7(H) x 126.5(V) x 7.45(D)	mm
Active Area	196.61(H) x 114.15 (V)	mm
Pixel Pitch	0.1920(H) x 0.1902(V)	mm
Driver IC	HX8696-A01+HX8282-A11	-
Operation Temperature	-20~70	℃
Storage Temperature	-30~80	℃

1.2 Touch Panel Information

Item	Specification
Touch Structure	G+G
Bonding Type with LCM	Perimeter Bonding
Driver IC	GT928
Interface	I²C
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. Elecrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

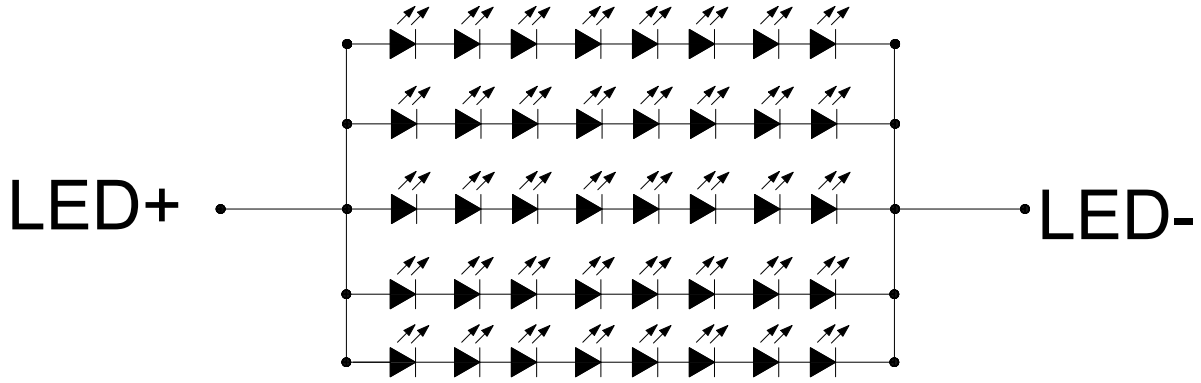
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	3.0	3.3	3.6	V	
Analog supply current	I_{VDD}	-	TBD	-	mA	VDD=3.3V
	AVDD	9.6	10.2	13.5	V	
	VGH	16.0	18.0	20	V	
	VGL	-10	-8.0	-6.8	V	
	VCOM	4.0	4.4	4.6	V	
Logic input voltage	VIH	0.7*IOVCC	-	IOVCC	V	
	VIL	GND	-	0.3*IOVCC	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	-	200	-	mA	
Driving Voltage	V_F	21.6	-	27.2	V	
Power consumption	W_{BL}	4.32	-	5.44	W	
LED Life-Time	N/A	30,000	-	-	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

Recommended connector：FH12-40S-0.5SH manufactured by HIROSE

No.	Symbol	Description
1	VCOM	Common Voltage
2	DVDD	Power Voltage for digital circuit
3	DVDD	Power Voltage for digital circuit
4	NC	No connection
5	RESET	Global reset pin
6	U/D	Vertical inversion ,normally pull low
7	L/R	Horizontal inversion ,normally pull high
8	STBYB	Standby mode Normally pulled high STBYB=1,normal operation STBYB=0,timing contrller,source Driver will turn off,all output are High-Z
9	GND	Ground
10	RXCLKIN-	-LVDS differential clock input
11	RXCLKIN+	+LVDS differential clock input
12	GND	Ground
13	RXIN0-	- LVDS differential data input
14	RXIN0+	+ LVDS differential data input
15	GND	Ground
16	RXIN1-	- LVDS differential data input
17	RXIN1+	+ LVDS differential data input
18	GND	Ground
19	RXIN2-	- LVDS differential data input
20	RXIN2+	+ LVDS differential data input
21	GND	Ground
22	RXIN3-	- LVDS differential data input
23	RXIN3+	+ LVDS differential data input
24	GND	Ground
25	SELB	6bit/8bit mode select (Note1)
26	GND	Ground
27	AVDD	Power for Analog Circuit
28	GND	Ground
29	VGH	Gate ON Voltage
30	NC	No connection
31	NC	No connection
32	VGL	Gate oFF Voltage

33	GND	Ground
34	NC	No connection
35	LED-	Power for LED backlight (Cathode)
36	LED-	Power for LED backlight (Cathode)
37	NC	No connection
38	NC	No connection
39	LED+	Power for LED backlight (Anode)
40	LED+	Power for LED backlight (Anode)

Note 1: if LVDS input data is 6bit,selb must be set to high;
if LVDS input data is 8bit,selb must be set to low;

4.2 Touch FPC Pin Assignment

Recommended connector：FH12-6S-0.5SH manufactured by HIROSE

No.	Symbol	Description
1	RST	Reset Pin for CTP
2	VCC	Power supply
3	GND	Ground
4	INT	Interrupt request to the host
5	SDA	I2C data input and output
6	SCL	I2C clock input

5. Interface Characteristics

5.1 Power seqence

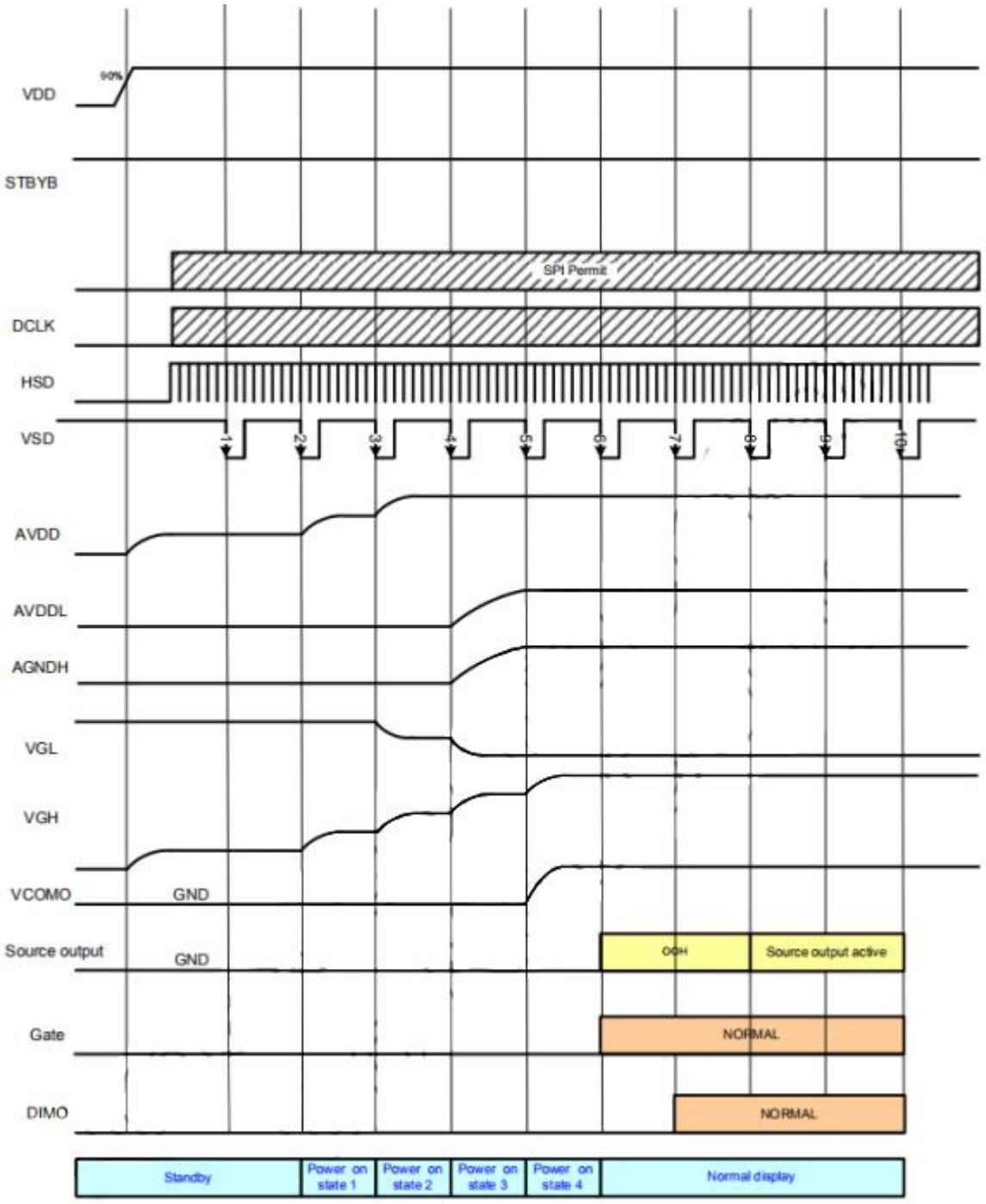
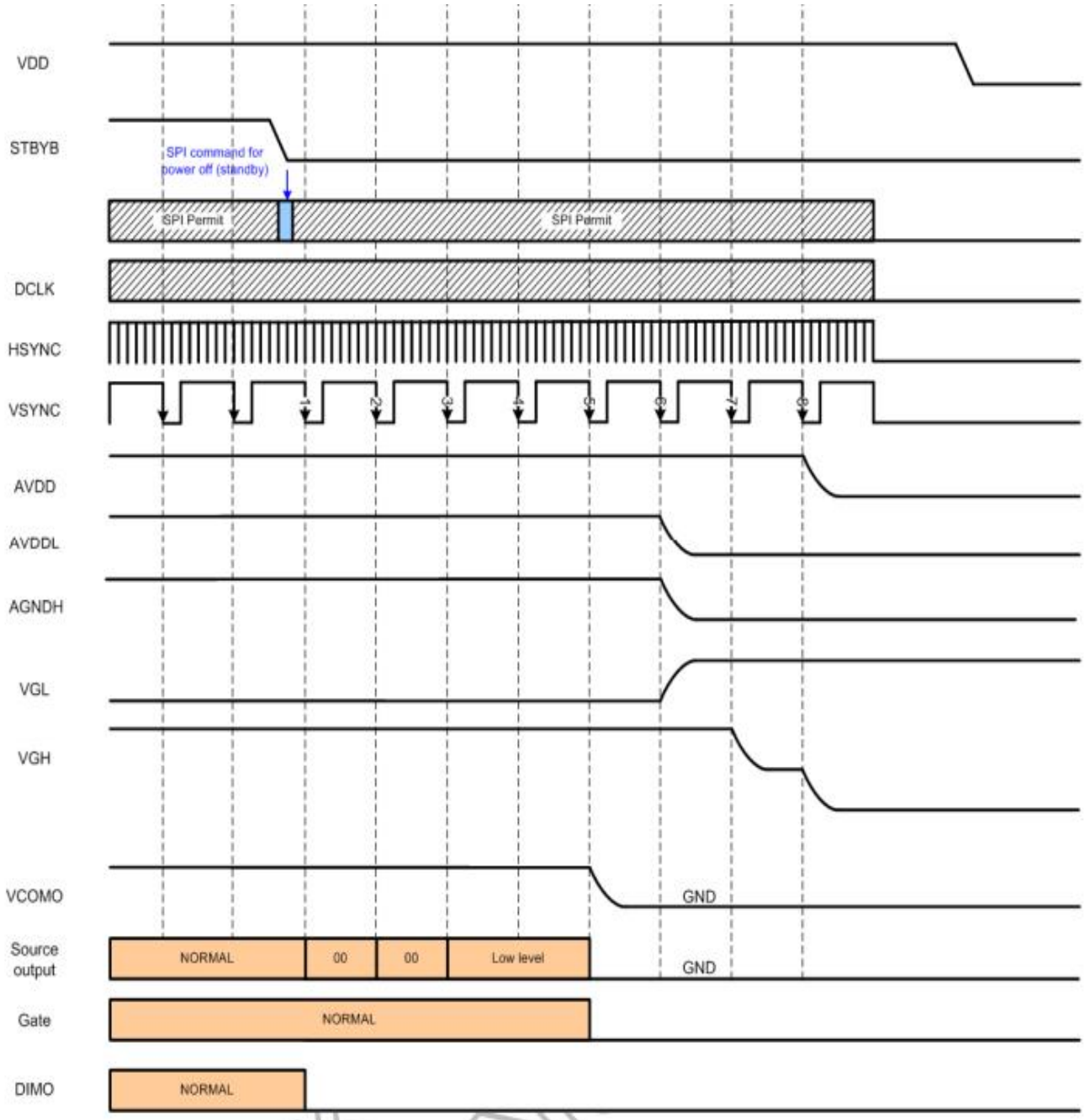


Figure 8.1: Power on timing sequence



Note: (1) Low level=3FH, when NBW=L. **(Normally white)**
(2) Low level=00H, when NBW=H. **(Normally black)**

Figure 8.2: Power off timing sequence

5.2 Timing Characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Clock frequency	R_{XFCLK}	-	20	-	71	MHz
Input data skew margin	T_{RSKM}	$\|V_{ID}\|$=400mV R_{XVCM}=1.2V R_{XFCLK}=71MHz	500	-	-	pS
Clock high time	T_{LVCH}	-	-	4/(7xR_{XFCLK})	-	ns
Clock low time	T_{LVCL}	-	-	3/(7xR_{XFCLK})	-	ns
PLL wake-up time	T_{enPLL}	-	-	-	150	μs

Table 10.2: LVDS mode AC electrical characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		600		T_H
VSD period	tv	610	635	800	T_H
VSD blanking	tvbp+tvfp	10	35	200	T_H

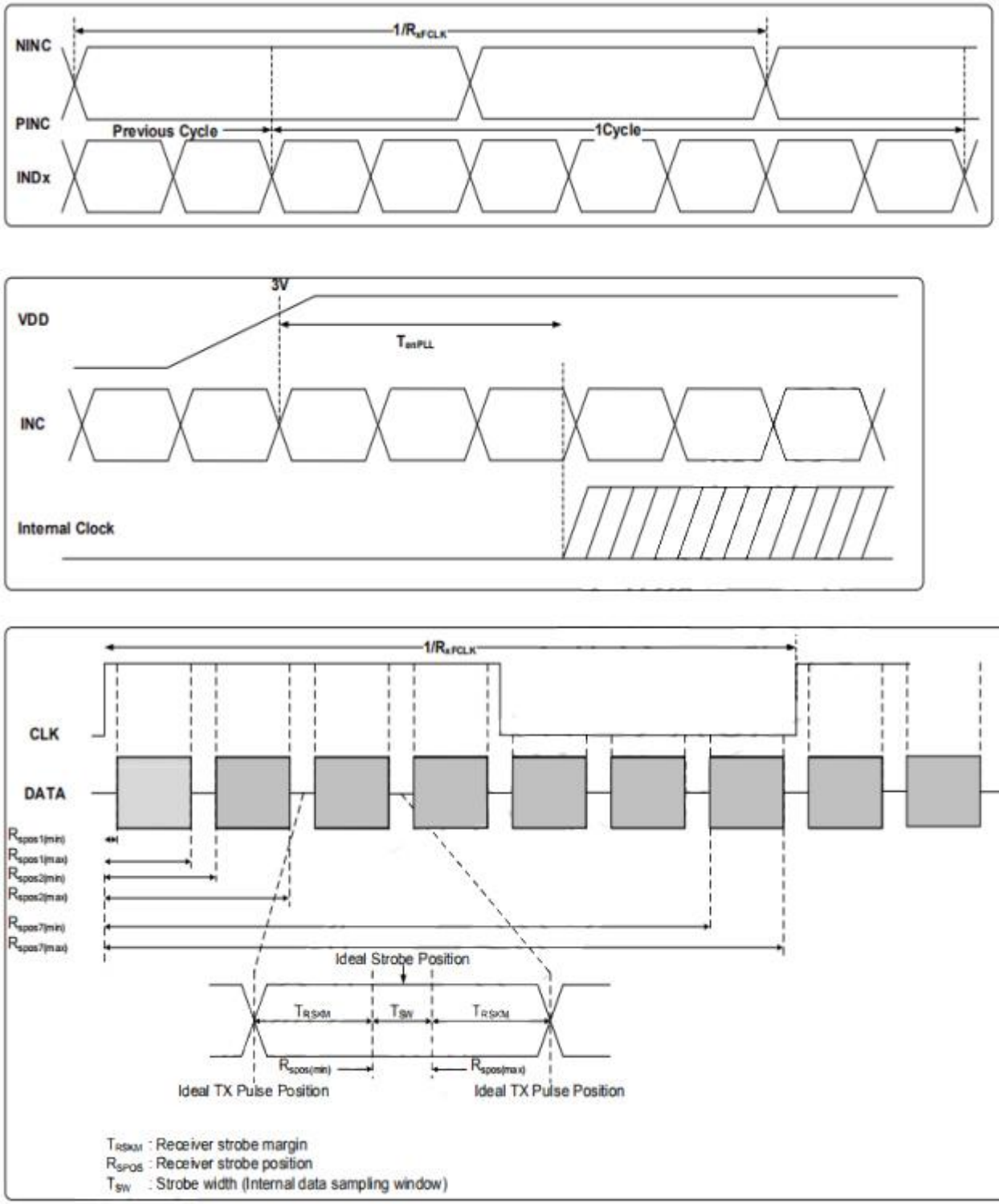


Figure 10.1: LVDS figure

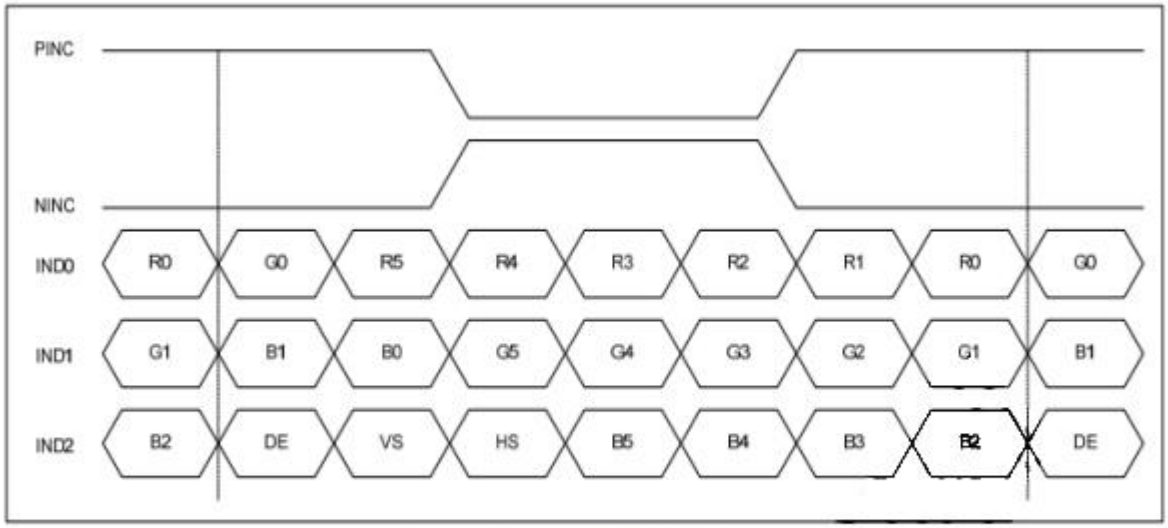


Figure 10.4: 6-bit LVDS input

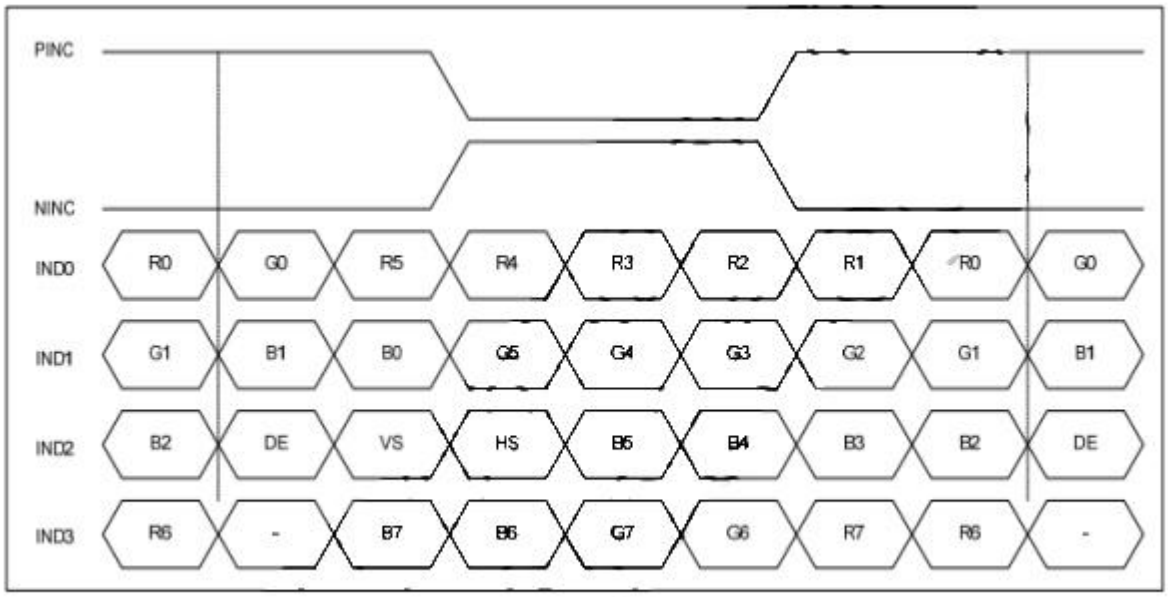
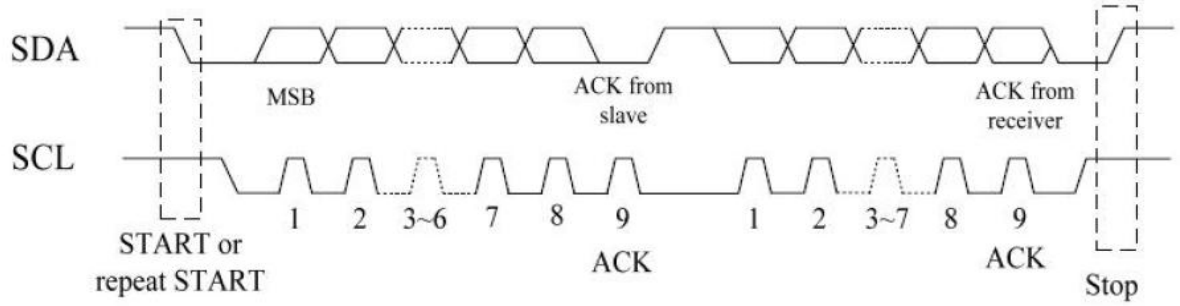


Figure 10.5: 8-bit LVDS input

5.3 Capacitive touch panel Specification

I2C

The I2C is always configured in the Slave mode. The data transfer format is shown in Figure 2-4.



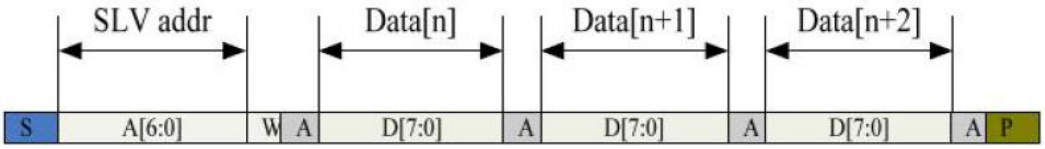


Figure 2-5 I2C master write, slave read

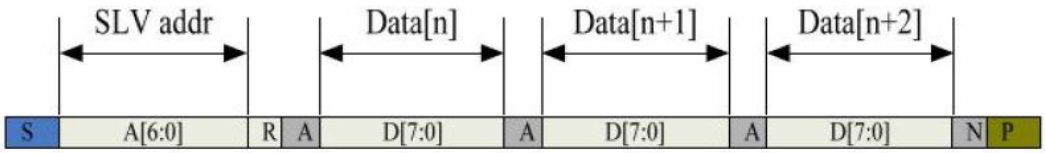


Figure 2-6 I2C master read, slave write

Table 2-1 lists the meanings of the mnemonics used in the above figures.

Table 2-1 Mnemonics Description

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:4]: 3'b011 A[3:0]: data bits are identical to those of I2CCON[7:4] register.
W	1'b0: Write
R	1'b1: Read
A(N)	ACK(NACK)
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

I2C Interface Timing Characteristics is shown in Table 2-2.

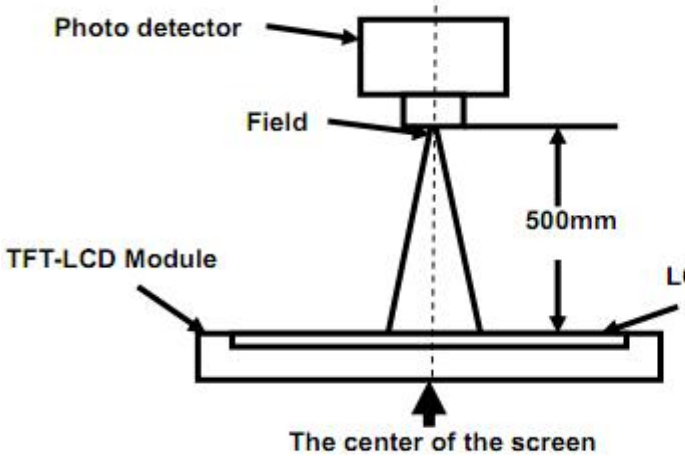
Table 2-2 I2C Timing Characteristics

Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\

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)	-	85	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	-	85	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	-	85	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	-	85	-	deg	Note2
Response Time	T_{ON}	Normal θ=Φ=0°	-	15	20	msec	Note4
	T_{OFF}		-	15	20	msec	Note4
Contrast Ratio	CR		-	800	-	-	Note1 Note3
Color Chromaticity	W_X		0.270	0.320	0.370	-	Note1 Note5
	W_Y		0.300	0.350	0.400	-	Note1 Note5
Luminance	L		900	1000	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		75	85	-	%	Note1 Note6
NTSC	-		-	50	-	%	-

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°

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).

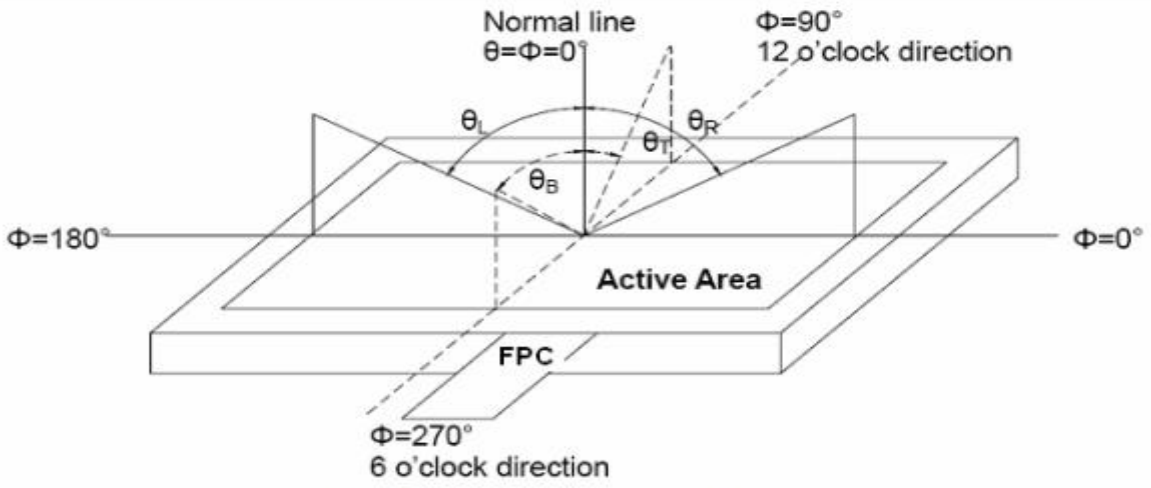


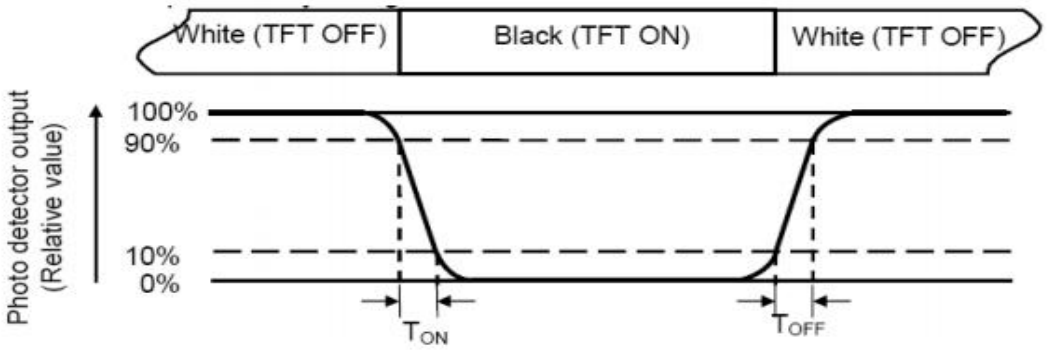
Fig. 1 Definition of viewing angle

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.

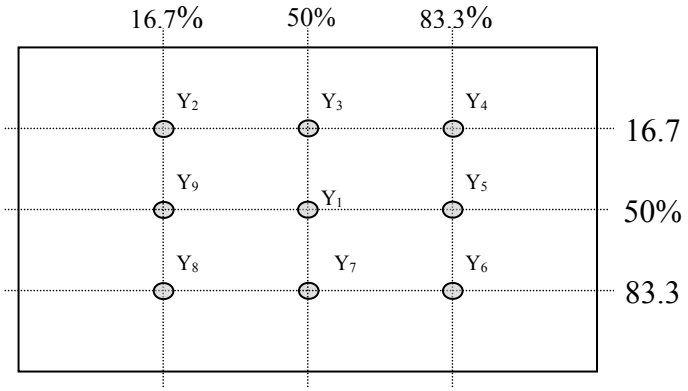


Fig. 2 Definition of points

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

Surface luminance is the luminance with all pixels displaying white.

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

7. Reliability Test Items

Test Item	Test Conditions	
High Temperature Storage	Ta= +80℃	96hrs
Low Temperature Storage	Ta= -30℃	96hrs
High Temperature Operation	Ta= +70℃	96hrs
Low Temperature Operation	Ta= -20℃	96hrs
High Temperature and Humidity Operation	Ta= +60℃, 90% RH	96hrs
Thermal Shock (Non-operation)	-30℃/30 min ~ +80℃/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:

1. 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:

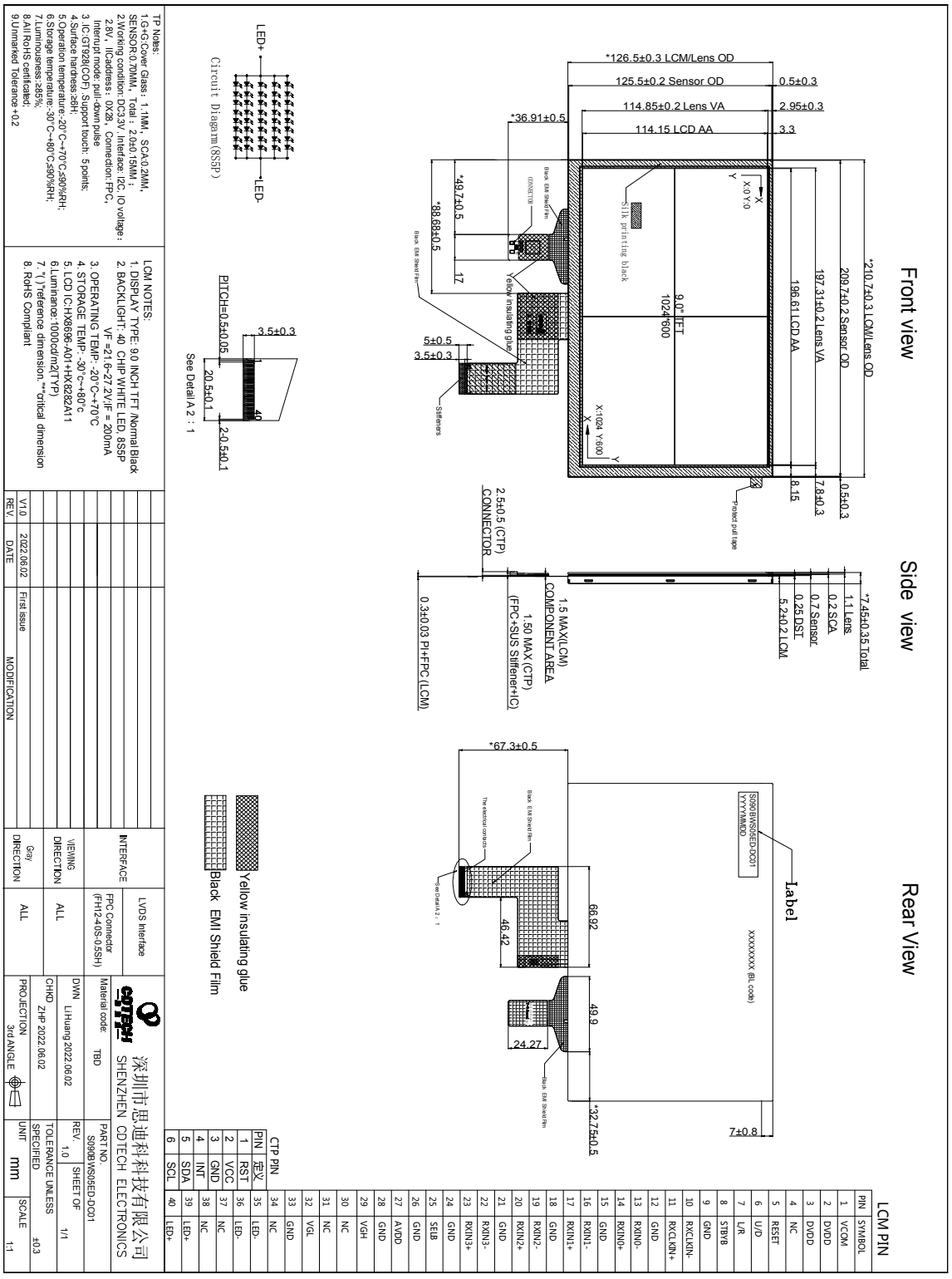
1).Air bubble in the LCD

2).Seal leak or Glass crack

3).Non display or abnormal display

4).Brightness reduction >50%

8. Mechanical Drawing



TP Notes:
1.G+G:Cover Glass ; 1.1MM , SCA:0.2MM,
SENSOR:0.70MM, Total : 2.0±0.15MM ;
2.Working condition: DC3.3V, Interface: I2C, IO voltage : 2.8V, IICaddress : 0X28, Connection: FPC, Interrupt mode: pull-down pulse
3.IC:GT928(COF) ,Support touch: 5 points;
4.Surface hardness:≥6H;
5.Operation temperature:-20°C~+70°C;≤90%RH;
6.Storage temperature:-30°C~+80°C;≤90%RH;
7.Luminousness:≥85%;
8.All RoHS certificated;
9.Unmarked Tolerance +0.2

LCM NOTES:
1. DISPLAY TYPE: 9.0 INCH TFT /Normal Black
2. BACKLIGHT: 40 CHIP WHITE LED 8S5P VF =21.6~27.2V,IF = 200mA
3. OPERATING TEMP: -20°C~+70°C
4. STORAGE TEMP: -30°C~+80°C
5. LCD IC:HX8696-A01+HX8282A11
6.Luminance:1000cd/m2(TYP)
7. *(): reference dimension, **: critical dimension
8. RoHS Compliant

REV.	DATE	MODIFICATION
V1.0	2022.06.02	First issue

INTERFACE		
LVDS Interface	FPC Connector (FH12-40S-0.5SH)	VIEWING DIRECTION
ALL	ALL	Gray

深圳市思迪科科技有限公司
SHENZHEN CDTECH ELECTRONICS

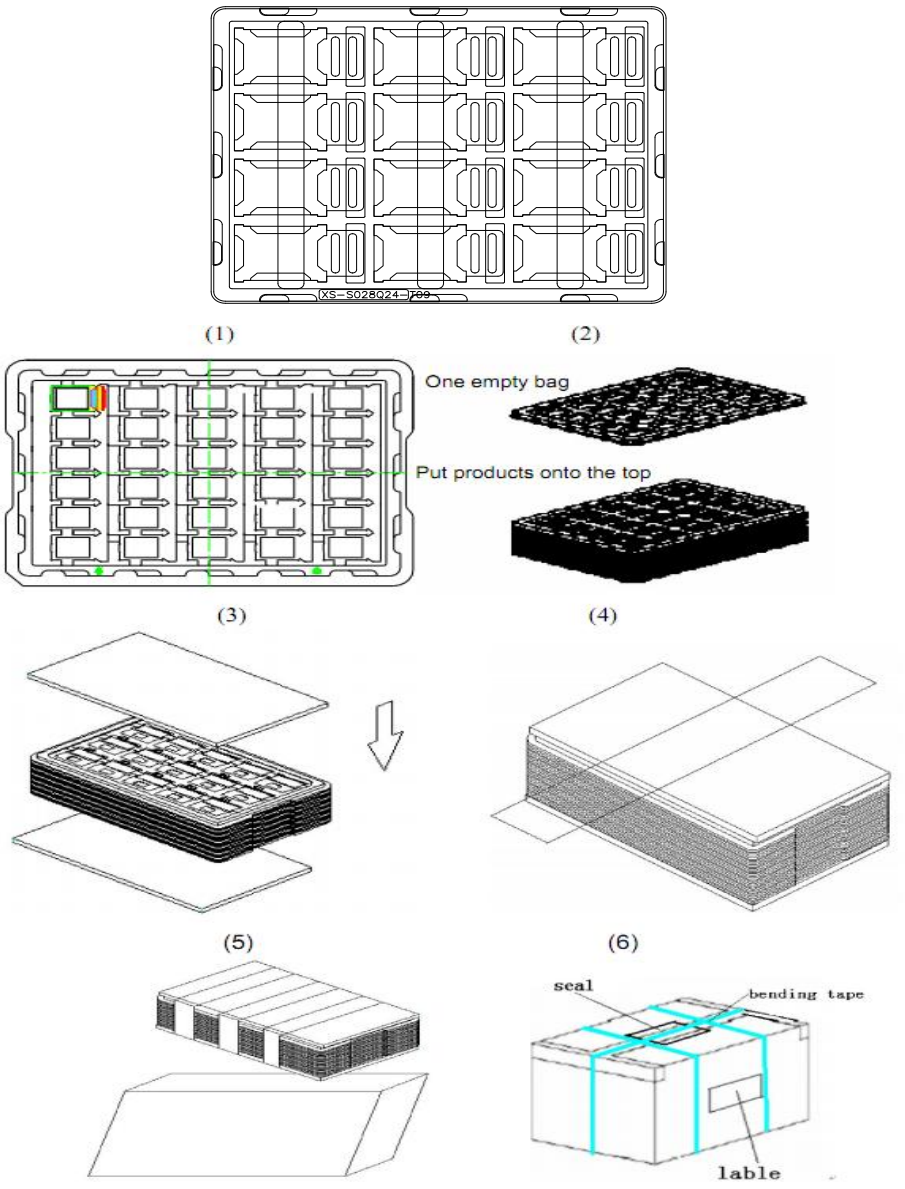
Material code:	TBD
DWN	LiHuang 2022.06.02
CHKD	ZHP 2022.06.02
PROJECTION	3rd ANGLE
PART NO.	S090BNS05ED-DC01
REV.	1.0
SHEET OF	1/1
TOLERANCE UNLESS SPECIFIED	±0.3
UNIT	mm
SCALE	1:1

PIN	SYMBOL	LCM PIN
1	VCOM	
2	DVDD	
3	DVDD	
4	NC	
5	RESET	
6	U/D	
7	L/R	
8	STBYB	
9	GND	
10	RXCLKIN-	
11	RXCLKIN+	
12	GND	
13	RXIN0-	
14	RXIN0+	
15	GND	
16	RXIN1-	
17	RXIN1+	
18	GND	
19	RXIN2-	
20	RXIN2+	
21	GND	
22	RXIN3-	
23	RXIN3+	
24	GND	
25	SELB	
26	GND	
27	AVDD	
28	GND	
29	VGH	
30	NC	
31	NC	
32	VGL	
33	GND	
34	NC	
35	LED-	
36	LED-	
37	NC	
38	NC	
39	LED+	
40	LED+	

CTP PIN	
PIN	定义
1	RST
2	VCC
3	GND
4	INT
5	SDA
6	SCL

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. TFT-LCD Module Inspection Criteria

10.1 Scope

The incoming inspection standards shall be applied to TFT –LCD Modules (hereinafter Called "Modules") that supplied by CDTech.

10.2 Incoming Inspection

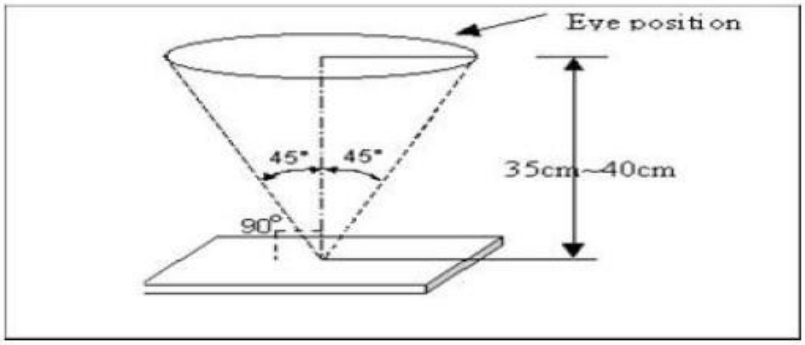
The customer shall inspect the modules within twenty calendar days of the delivery date（the “inspection period）at its own cost. The result of the inspection（acceptance or rejection）shall be recorded in writing, and a copy of this writing will be promptly sent to The seller, If the results of the inspecting from buyer does not send to the seller within twenty Calendar days of the delivery date. The modules shall be regards as acceptance. Should the customer fail to notify the seller within the inspection period, the buyers Right to reject the modules shall be lapsed and the modules shall be deemed to have Been accepted by the buyer

10.3 Inspection Sampling

10.3.1. Lot size: Quantity per shipment lot per model
10.3.2. Sampling type: Normal inspection, Single sampling
10.3.3. Inspection level: II
10.3.4. Sampling table: MIL-STD-105E
10.3.5. Acceptable quality level （AQL ）
Major defect: AQL=0.65
Minor defect: AQL=1.00

10.4 Inspection Conditions

10.4.1 Ambient conditions:
a. Temperature: Room temperature 25±5℃
b. Humidity: (60±10) ％RH
c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)
10.4.2 Viewing distance
The distance between the LCD and the inspector’s eyes shall be at least 35±5 ㎝.
10.4.3 Viewing Angle
U/D: 45 °/45°, L/R: 45°/45°



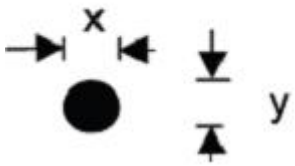
10.5 Inspection Criteria

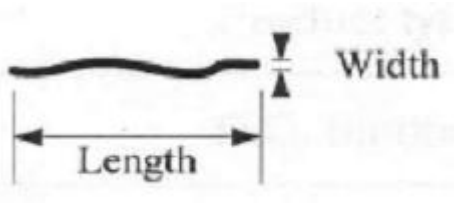
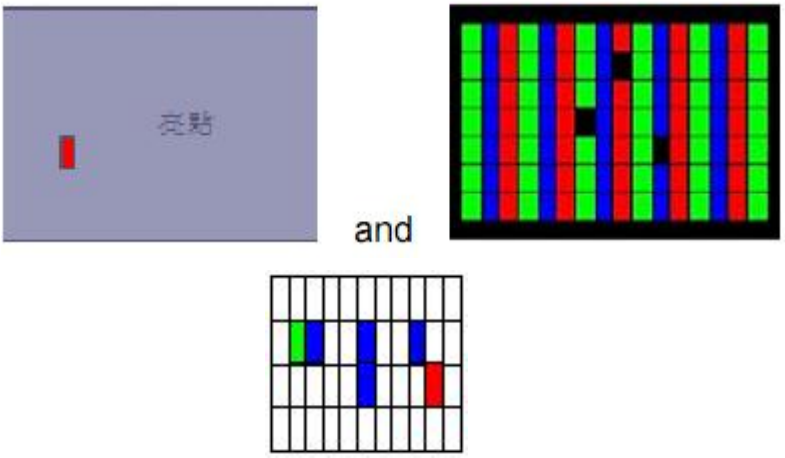
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined here in.

10.5.1 Major defect

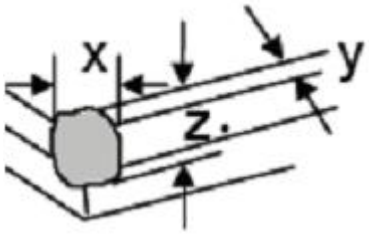
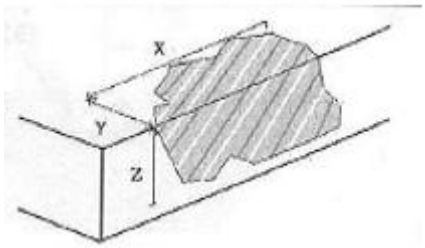
Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
5.1.2	Missing	Missing function component
5.1.3	Crack	Glass Crack

10.5.2 Minor defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th colspan="2">Inspection standard</th></tr>
<tr><td rowspan="4">5.2.1</td><td rowspan="4">Spot Defect
Including Black spot White spot
Pinhole
Foreign particle
Polarizer dirt</td><td colspan="2">For dark/white spot is defined
$\varphi = (x+y) / 2$
 
</td></tr>
<tr><td>Size φ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>φ≤0.1</td><td>Ignore</td></tr>
<tr><td>0.1 < φ≤0.3</td><td>2</td></tr>
<tr><td></td><td></td><td>0.3<φ</td><td>Not allowed</td></tr>
</table>

<table>
<tr><td rowspan="4">5.2.2</td><td rowspan="4">Line Defect
Including Black line White line
Scratch</td><td colspan="2">Define:
 
</td></tr>
<tr><td>Width(mm)
Length(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>W≤0.03</td><td>Ignore</td></tr>
<tr><td>0.03 < W≤0.1
L≤3.0</td><td>2</td></tr>
<tr><td>5.2.3</td><td>Polarizer
Dent/Bubble</td><td>0.1 < W,or L>3.0</td><td>Not allowed</td></tr>
<tr><td rowspan="5">5.2.3</td><td rowspan="5">Polarizer
Dent/Bubble</td><td>Sizeφ(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>φ≤0.1</td><td>Ignore</td></tr>
<tr><td>0.1 < φ≤0.3</td><td>2</td></tr>
<tr><td>0.3 <φ</td><td>Not allowed</td></tr>
<tr><td>Total QTY</td><td>2</td></tr>
<tr><td rowspan="6">5.2.4</td><td rowspan="6">Electrical Dot
Defect</td><td colspan="2">Bright and Black dot define:
 

Two Adjacent Dot</td></tr>
<tr><td colspan="2">Inspection pattern: Full white、 Full black、 Red、 green and blue screens</td></tr>
<tr><td>Item</td><td>Acceptable Quantity</td></tr>
<tr><td>Black dot defect</td><td>3</td></tr>
<tr><td>Bright dot defect</td><td>1</td></tr>
<tr><td>Total Dot</td><td>3</td></tr>
<tr><td></td><td></td><td colspan="2">3% Bright Dot is allowed</td></tr>
</table>

<table>
<tr><td rowspan="5">5.2.5</td><td rowspan="5">Glass defect</td><td colspan="2">1.Corner Fragment:
 
</td></tr>
<tr><td>Size(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>X≤3mm
Y≤1mm
Z≤T</td><td>Ignore
T: Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
<tr><td colspan="2">2. Side Fragment:
 
</td></tr>
<tr><td>Size(mm)</td><td>Acceptable Quantity</td></tr>
<tr><td>X≤5.0mm
Y≤1mm
Z≤T</td><td>T: Glass thickness
X: Length
Y: Width
Z: thickness</td></tr>
</table>

Note: 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

2). The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.

3). The distance between black dot defects or black and bright dot defects should be more than 5mm apart.

4). Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

10.6 Mechanics specification

As for the outside dimension, weight of the modules, please refer to product specification For more details.

11. Precautions for Use of LCD modules

11.1 Handling Precautions

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

11.1.2. 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.

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

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

11.1.5. 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

11.1.6. Do not attempt to disassemble the LCD Module.

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

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

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

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

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

11.1.8.4. 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.

11.2 Storage Precautions

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

11.2.2. 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%

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

11.3 Transportation Precautions

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