PRODUCT SPECIFICATION

CDTECH Model: **S040HWV15NN-FC13**

CUSTOMER Model: -

Description: **4.0 ” TFT-LCD Module with CTP**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2023.9.7	2023.9.7	2023.9.7

CUSTOMER APPROVAL	SIGNATURE	DATE

Record of Revisions

Version	Revise Date	Description	Page
1.0	2023-9-7	First Release	-

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1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	3.95	inch
Number of Pixels	480 (H) RGB x 480 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	o' clock
Interface	MIPI	-
Display Colors	16.7M	colors
Outline Dimension	85.99 (H) x 86.00 (V) x 3.23 (D)	mm
Active Area	70.18 (H) x 71.86 (V)	mm
Pixel Pitch	0.1462 (H) x 0.1497 (V)	mm
Driver IC	ST7701S	-
Operation Temperature	-20~60	℃
Storage Temperature	-30~70	℃

1.2 Touch Panel Information

Item	Specification
Touch Structure	G+FF
Bonding Type with LCM	OCA Optical Bonding
Driver IC	CF1133
Interface	I²C
Touch Count Max	5 Points
Surface treatment	-
Surface hardness	6H
I2C slave address	0x55
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
Digital supply voltage	IOVCC	-0.3	3.6	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

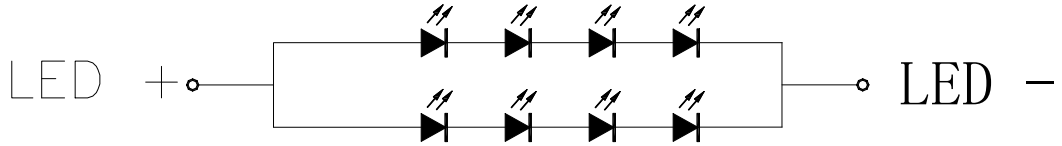
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	3.0	3.3	3.6	V	
Analog supply current	I_{VDD}	-	TBD	-	mA	VDD=3.3V
Logic supply voltage	IOVCC	1.65	1.8	3.3	V	
Logic supply current	I_{IOVCC}	-	TBD	-	mA	IOVCC=1.8V
Logic input voltage	VIH	0.7*IOVCC	-	IOVCC	V	
	VIL	GND	-	0.3*IOVCC	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	-	40	-	mA	
Driving Voltage	V_F	10.8	-	13.6	V	
Power consumption	W_{BL}	0.432	-	0.544	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	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

No.	Symbol	Description
1	TP_SDA	I2C data input and output for CTP
2	TP_SCL	I2C clock input for CTP
3	TP_RESETB	Reset Pin for CTP
4	TP_INTB	Interrupt signal for CTP
5	TP_VDD3.3V	Power supply for CTP (3.3V)
6	IOVCC	Power supply
7	GND	Ground
8	VCI	Power supply
9	GND	Ground
10	VCI	Power supply
11	GND	Ground
12	LEDK	Power for LED backlight (Cathode)
13	LEDA	Power for LED backlight (Anode)
14	RST	Global reset pin
15	GND	Ground
16	D1P	MIPI Positive data signal(+)
17	D1N	MIPI Negative data signal(-)
18	GND	Ground
19	CLKP	MIPI Positive clock signal(+)
20	CLKN	MIPI Negative clock signal(-)
21	GND	Ground
22	D0P	MIPI Positive data signal(+)
23	D0N	MIPI Negative data signal(-)
24	GND	Ground
25	VCC	Power supply
26	LCD_ID0	LCD_ID0
27	GND	Ground

28	LCD_ID1	LCD_ID1
29	LCD_ID2	LCD_ID2
30	GND	Ground

4.2 Touch FPC Pin Assignment

No.	Symbol	Description
1	TP_SDA	I2C data input and output for CTP
2	TP_SCL	I2C clock input for CTP
3	TP_RESETB	Reset Pin for CTP
4	TP_INTB	Interrupt signal for CTP
5	TP_VCC 3.3V	Power supply for CTP (3.3V)
6	GND	Ground

5. Interface Characteristics

5.1 POWER ON/OFF SEQUENCE

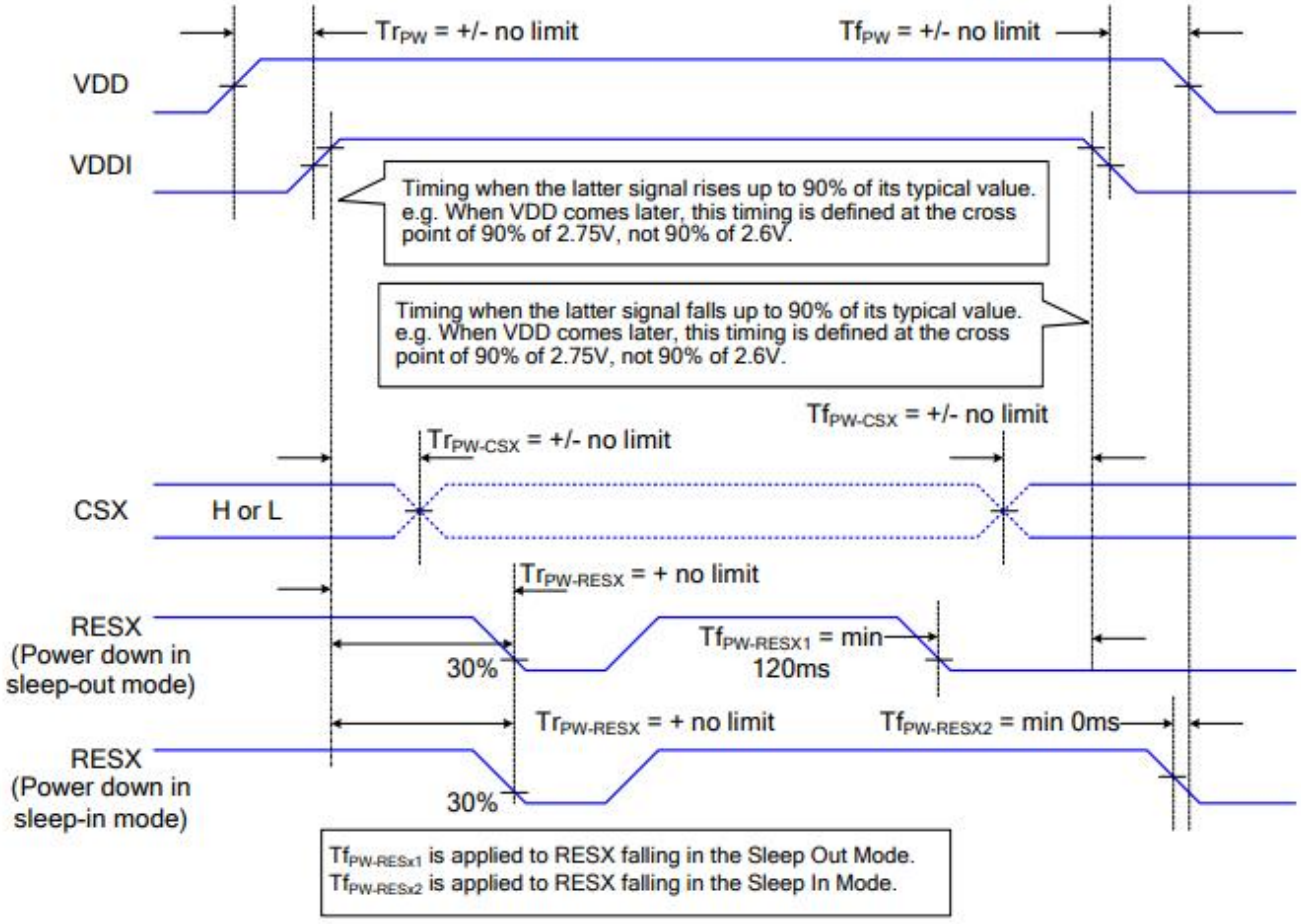
VDDI and VDDA can be applied or powered down in any order. During the Power Off sequence, if the LCD is in the Sleep Out mode, VDDA and VDDI must be powered down with minimum 120msec. If the LCD is in the Sleep In mode, VDDA and VDDI can be powered down with minimum 0msec after the RESX is released.

CSX can be applied at any timing or can be permanently grounded. RESX has high priority over CSX.

Notes:

1. There will be no damage to the ST7701S if the power sequences are not met.
2. There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.
3. There will be no abnormal visible effects on the display between the end of Power On Sequence and before receiving the Sleep Out command, and also between receiving the Sleep In command and the Power Off Sequence.
4. If the RESX line is not steadily held by the host during the Power On Sequence as defined in Sections 9.1 , then it will be necessary to apply the Hardware Reset (RESX) after the completion of the Host Power On Sequence to ensure correct operations. Otherwise, all the functions are not guaranteed.
5. When VDDA is in power off State , the MIPI must set in Ultra Low Power Mode (GND Level).

The power on/off sequence is illustrated below



5.2 AC Characteristics

5.2.1 Serial Interface Characteristics (3-line serial):

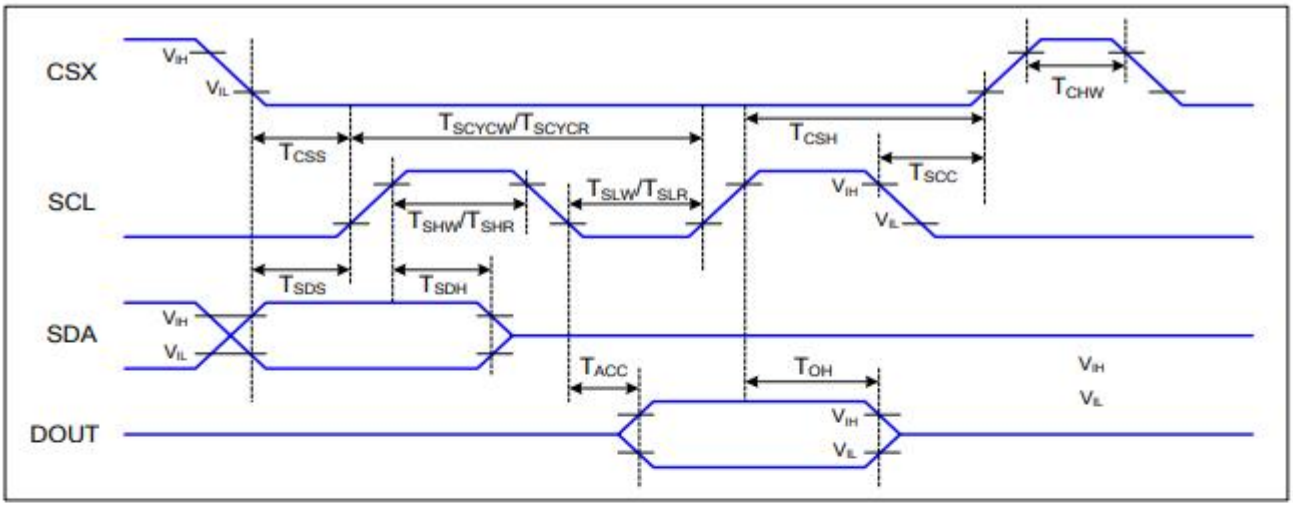


Figure 1 3-line serial Interface Timing Characteristics

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25℃

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

Table 4 3-line serial Interface Characteristics

5.2.2 MIPI Interface Characteristics:

5.2.2.1 High Speed Mode



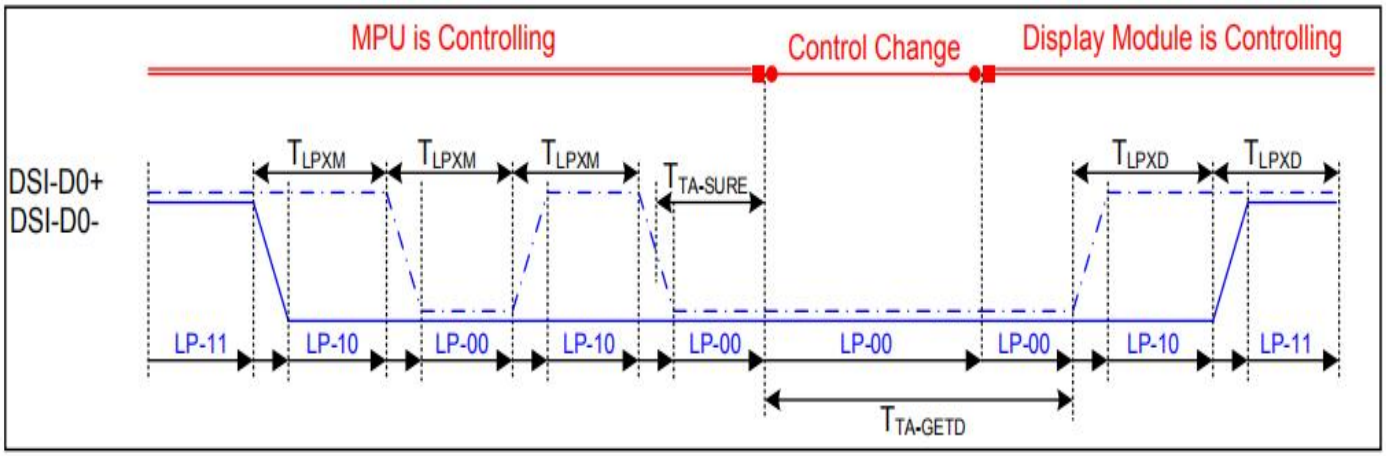
DSI clock channel timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

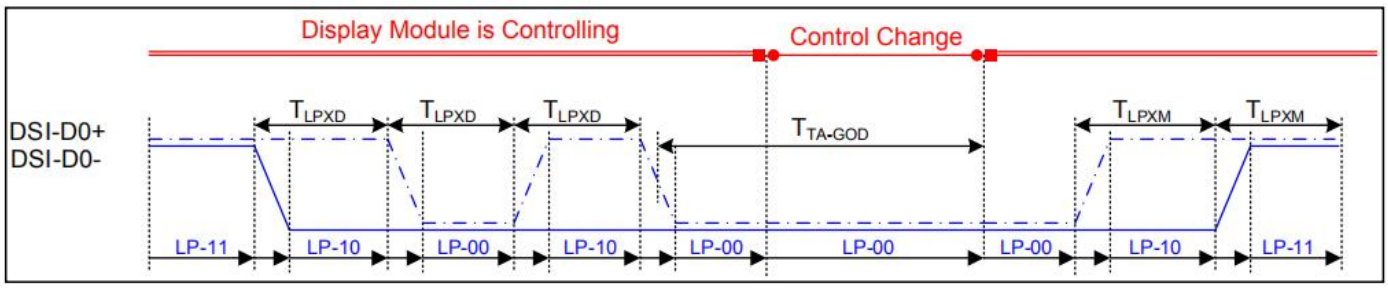
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2xUI_{INSTA}$	Double UI instantaneous	2.5	25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halfs	1.25	12.5	ns	UI = UI_{INSTA}= UI_{INSTB}
DSI-Dn+/-	tDS	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	tDH	Data to clock hold time	0.15	-	UI	

Mipi Interface- High Speed Mode Timing Characteristics

5.2.2.2 Lowe Power Mode



Turnaround (BTA) from display module to MPU Timing

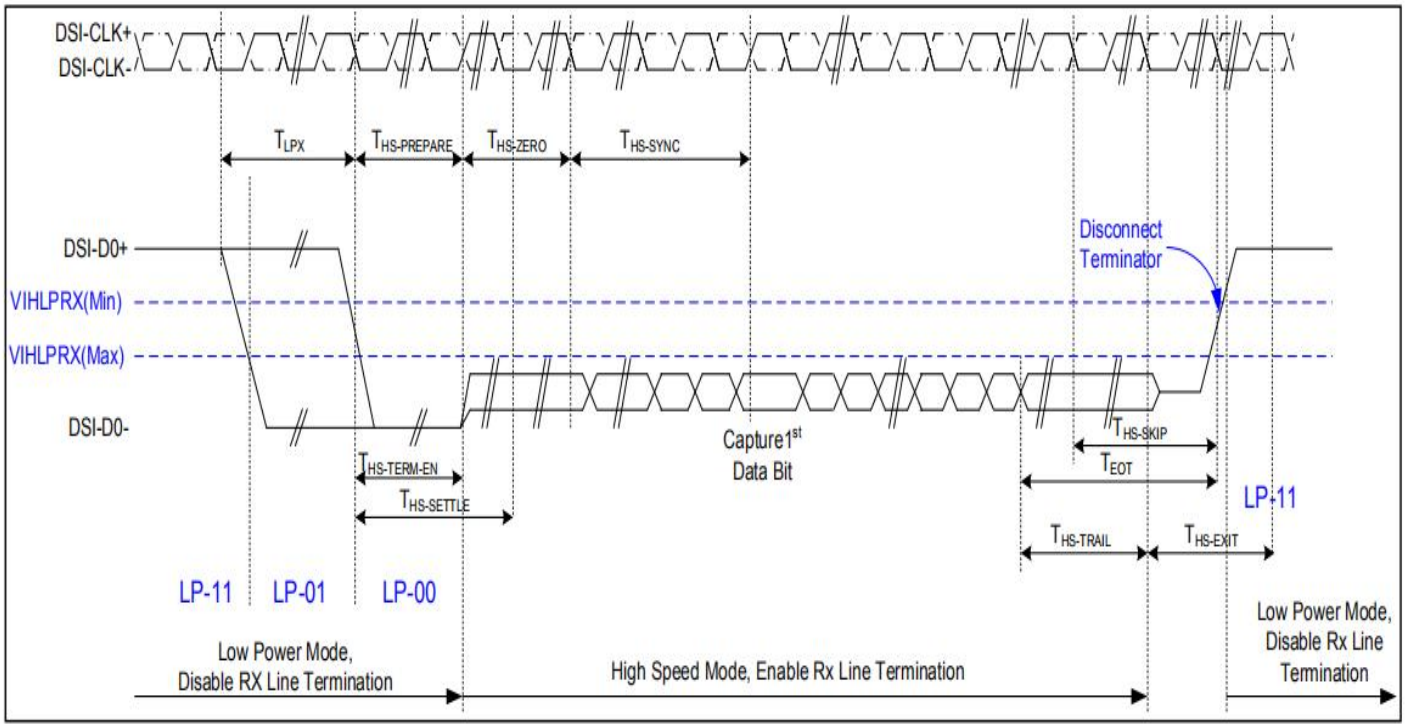


Turnaround (BTA) from MPU to display module Timing

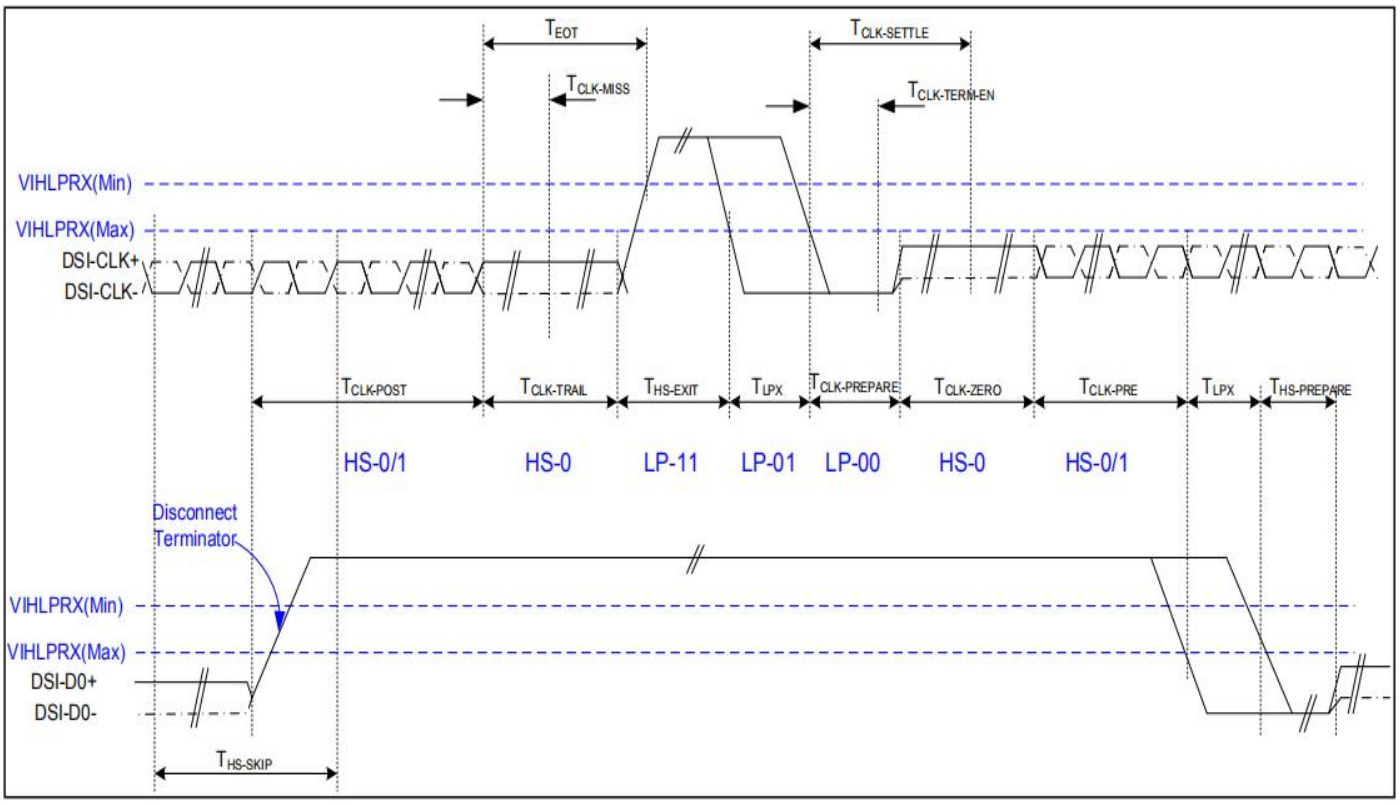
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	T_{LPXD}	$2xT_{LPXD}$	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	$5xT_{LPXD}$		ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request-MPU	$4xT_{LPXD}$		ns	Output

MIPI Interface Low Power Mode Timing Characteristics

5.2.2.3 DSI Bursts Mode



Data lanes-Low Power Mode to/from High Speed Mode Timing



Clock lanes- High Speed Mode to/from Low Power Mode Timing

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
Low Power Mode to High Speed Mode Timing						
DSI-Dn+/-	TLPX	Length of any low power state period	50	-	ns	Input
DSI-Dn+/-	THS-PREPARE	Time to drive LP-00 to prepare for HS transmission	40+4 UI	85+6 UI	ns	Input
DSI-Dn+/-	THS-TERM-EN	Time to enable data receiver line termination measured from when Dn crosses VILMAX	-	35+4 UI	ns	Input
DSI-Dn+/-	THS-PREPARE + THS-ZERO	THS-PREPARE + time to drive HS-0 before the sync sequence	140+ 10UI	-	ns	Input
High Speed Mode to Low Power Mode Timing						
DSI-Dn+/-	THS-SKIP	Time-out at display module to ignore transition period of EoT	40	55+4 UI	ns	Input
DSI-Dn+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-Dn+/-	THS-TRAIL	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60+4 UI	-	ns	Input
High Speed Mode to/from Low Power Mode Timing						
DSI-CLK+/-	TCLK-POS	Time that the MPU shall continue sending HS clock after the last associated data lane has transition to LP mode	60+5 2UI	-	ns	Input
DSI-CLK+/-	TCLK-TRAIL	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns	Input
DSI-CLK+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-CLK+/-	TCLK-PREPARE	Time to drive LP-00 to prepare for HS transmission	38	95	ns	Input
DSI-CLK+/-	TCLK-TERM-EN	Time-out at clock lan display module to enable HS transmission	--	38	ns	Input
DSI-CLK+/-	TCLK-PREPARE + TCLK-ZERO	Minimum lead HS-0 drive period before starting clock	300	-	ns	Input
DSI-CLK+/-	TCLK-PRE	Time that the HS clock shall be driven prior to any associated data lane beginning the transition from LP to HS mode	8UI	-	ns	Input
DSI-CLK+/-	TEOT	Time form start of TCLK-TRAIL period to start of LP-11 state	-	105n s+12 UI	ns	Input

5.2.2.4 Reset Timing

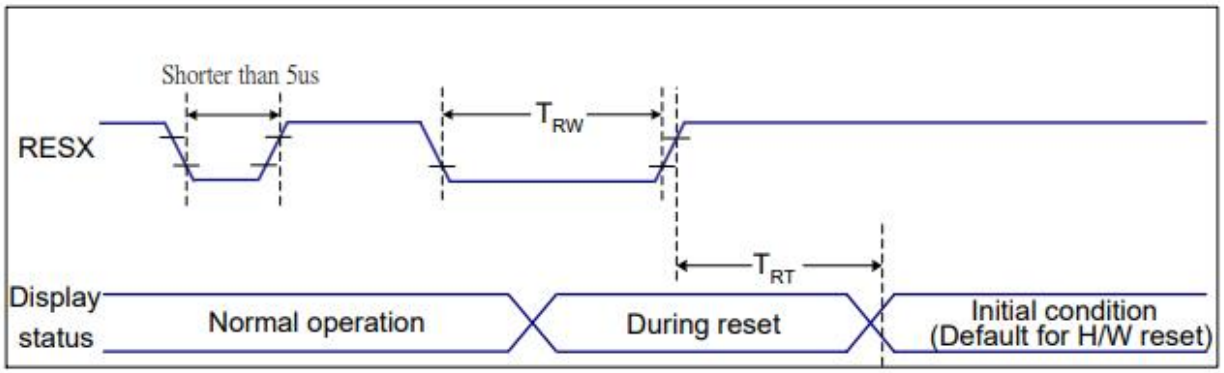


Figure 9 Reset Timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120(Note 1, 6, 7)	ms

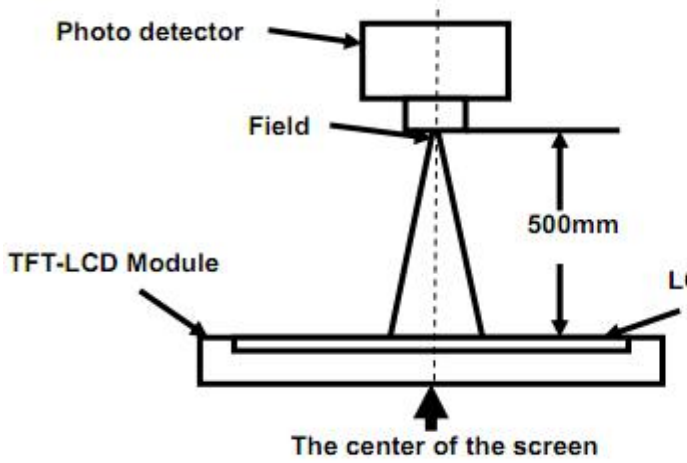
Table 9 Reset Timing

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)	70	80	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	70	80	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	70	80	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	70	80	-	deg	Note2
Response Time	T_{ON}	Normal θ=Φ=0°	-	12	17	msec	Note4
	T_{OFF}		-	12	17	msec	Note4
Contrast Ratio	CR		640	800	-	-	Note1 Note3
Color Chromaticity	W_X		0.252	0.302	0.352	-	Note1 Note5
	W_Y		0.275	0.325	0.375	-	Note1 Note5
Luminance	L		300	350	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		55	60	-	%	-

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).

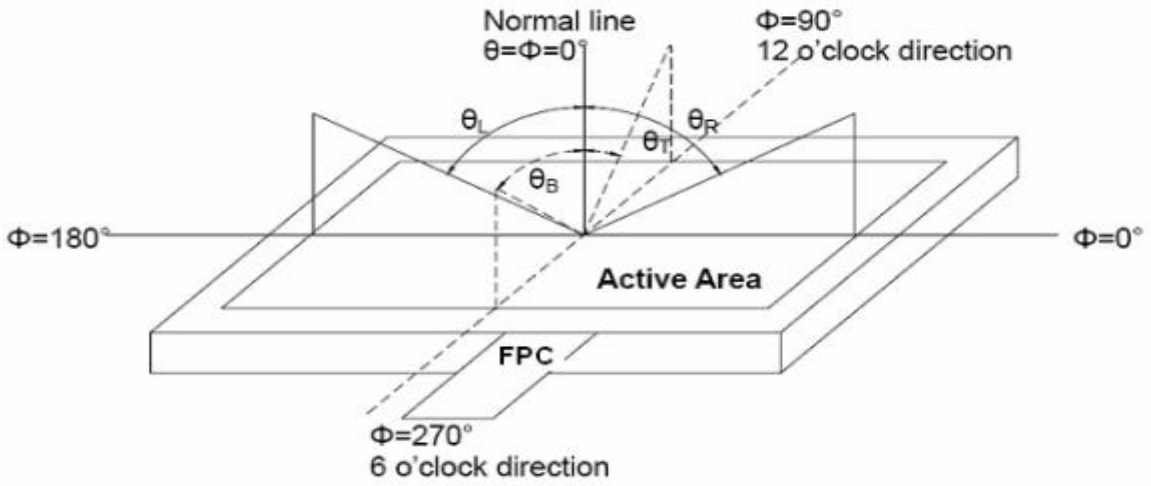


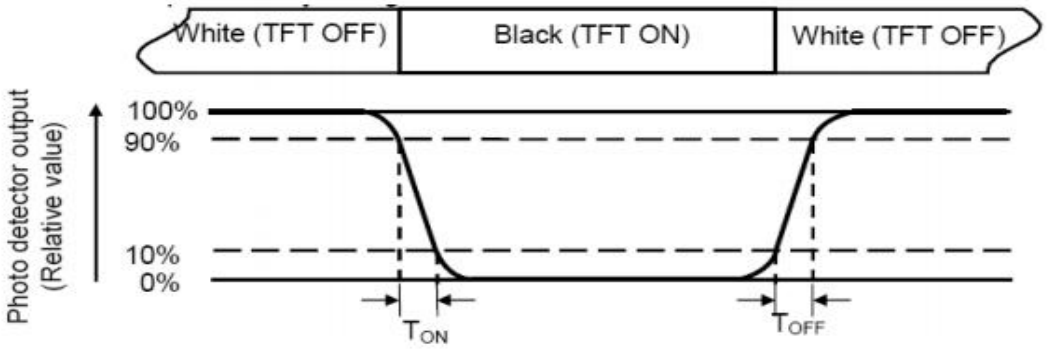
Fig. 1 Definition of viewing angle

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.

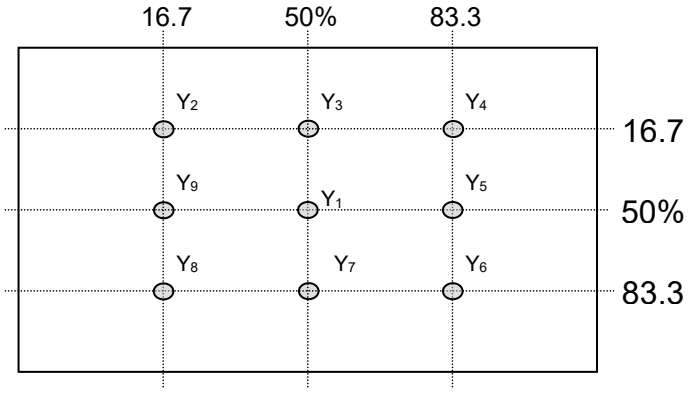


Fig. 2 Definition of points

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).

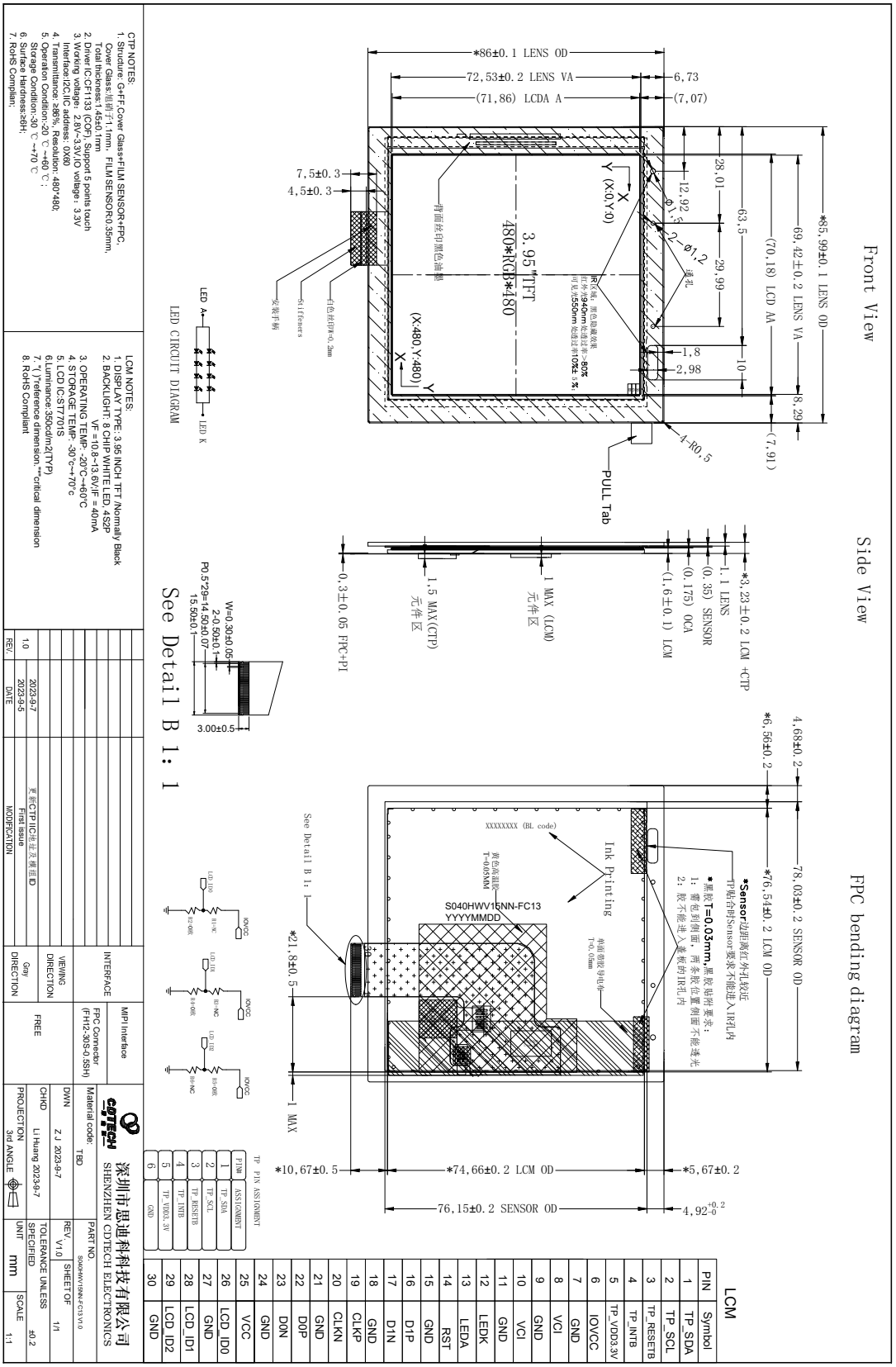
7. Reliability Test Items

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



PIN	Symbol
1	TP_SDA
2	TP_SCL
3	TP_RESETB
4	TP_INTB
5	TP_VDD3.3V
6	IOVCC
7	GND
8	VCI
9	GND
10	VCI
11	GND
12	LEDK
13	LEDA
14	RST
15	GND
16	D1P
17	D1N
18	GND
19	CLKP
20	CLKN
21	GND
22	D0P
23	D0N
24	GND
25	VCC
26	LCD_ID0
27	GND
28	LCD_ID1
29	LCD_ID2
30	GND

PIN	ASSIGNMENT
1	TP_SDA
2	TP_SCL
3	TP_RESETB
4	TP_INTB
5	TP_VDD3.3V
6	GND

CTP NOTES:
1. Structure: G+FF,Cover Glass+FILM SENSOR+FPC,
Cover Glass: 玻璃干1.1mm; FILM SENSOR:0.35mm,
Total thickness:1.45±0.1mm
2. Driver IC:CF1133 (COF), Support 5 points touch
3. Working voltage: 2.8V~3.3V,IO voltage: 3.3V
Interface:I2C,IIC address: 0X60
4. Transmittance: ≥86%, Resolution: 480*480;
5. Operation Condition:-20 ℃~+60 ℃;
Storage Condition:-30 ℃~+70 ℃
6. Surface Hardness:≥6H;
7. RoHS Complian;

LCM NOTES:
1. DISPLAY TYPE: 3.95 INCH TFT /Normally Black
2. BACKLIGHT: 8 CHIP WHITE LED, 4S2P
VF =10.8~13.6V/IF = 40mA
3. OPERATING TEMP: -20°C~+60°C
4. STORAGE TEMP: -30°C~+70°C
5. LCD IC:ST7701S
6.Luminance:350cd/m2(TYP)
7. "( )"reference dimension; "*"critical dimension
8. RoHS Compliant

REV.	DATE	MODIFICATION
1.0	2023-9-7	更新CTP IIC地址及 模组ID
	2023-9-5	First issue

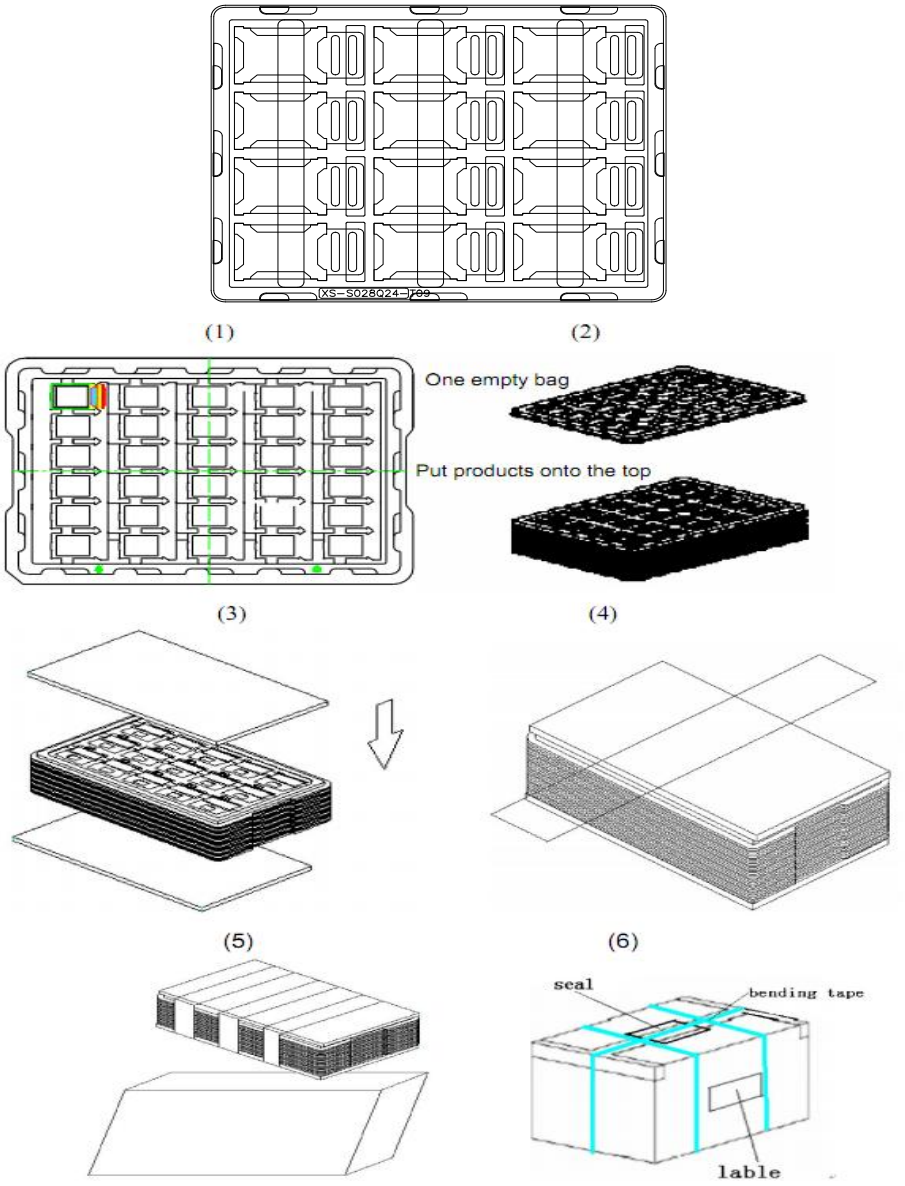
INTERFACE	MIPI Interface
	FPC Connector: (FH12-30S-0.5SH)
VIEWING DIRECTION	FREE
Gray DIRECTION	

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

Material code:	TBD
PART NO.	S040HWV15NN-FC13-V1.0
DWN	ZJ 2023-9-7
REV.	V1.0
CHKD	Li Huang 2023-9-7
SHEET OF	1/1
PROJECTION	3rd ANGLE
TOLERANCE UNLESS SPECIFIED	±0.2
UNIT	mm
SCALE	1:1

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.