PRODUCT SPECIFICATION

CDTECH Model: **S021BWV01HN**

CUSTOMER Model: -

Description: **2.1 ” TFT-LCD Module**

Version: **2.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
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DATE	2023.4.23	2023.4.23	2023.4.23

	SIGNATURE	DATE
CUSTOMER APPROVAL		

Record of Revisions

Version	Revise Date	Description	Page
2.0	2023-4-23	First Release	-

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1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	2.1	inch
Number of Pixels	480 (H) RGB x 480 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	o' clock
Interface	RGB	-
Display Colors	16.7M	colors
Outline Dimension	56.18 (H) x 59.71 (V) x 2.22 (D)	mm
Active Area	53.28 (H) x 53.28 (V)	mm
Pixel Pitch	0.111 (H) x 0.111 (V)	mm
Driver IC	ST7701	-
Operation Temperature	-20~70	℃
Storage Temperature	-30~80	℃

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

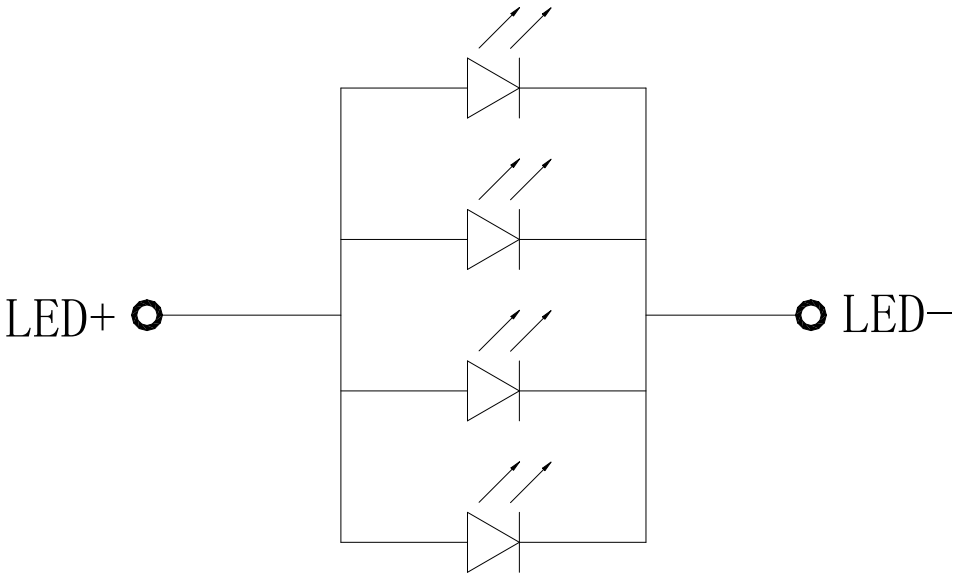
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VCC	2.5	2.8	3.3	V	
Analog supply current	I_{VCC}	-	TBD	-	mA	VCC=2.8V
Logic input voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	-	80	-	mA	
Driving Voltage	V_F	2.7	-	3.4	V	
Power consumption	W_{BL}	0.216	-	0.272	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 :



4. Interface Pin Assignment

4.1 LCM Pin Assignment

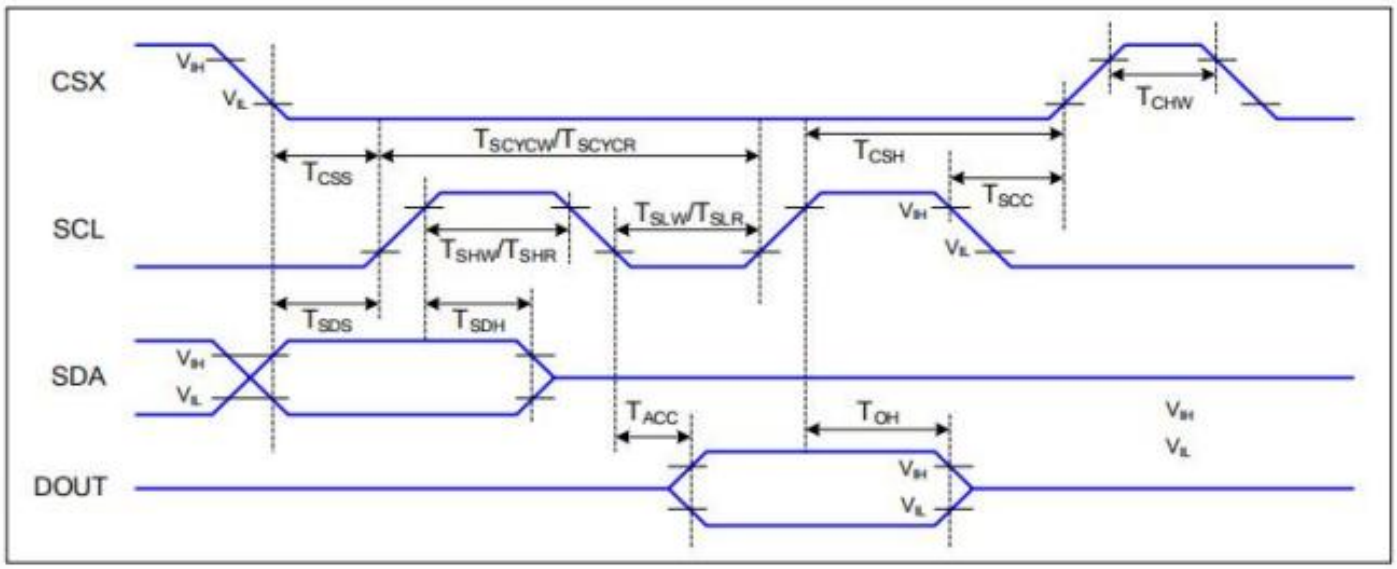
Recommended connector：TF31-40S-0.5SH manufactured by HIROSE

No.	Symbol	Description
1	LED_A	Power for LED backlight (Anode)
2	LED_K1	Power for LED backlight (Cathode)
3	LED_K2	Power for LED backlight (Cathode)
4	GND	Ground
5	VCC	Power supply
6	RESET	Global reset pin
7-8	NC	No connection
9	SDA	Serial data input/output signal
10	SCK	Serial clock signal
11	CS	Chip select pin
12	PCLK	Dot clock signal input. Latching input data at its rising edge
13	DE	Display enable pin for controller
14	VSYNC	Frame synchronous signal
15	HSYNC	Line synchronous signal
16	DB0	Data bus
17	DB1	Data bus
18	DB2	Data bus
19	DB3	Data bus
20	DB4	Data bus
21	DB5	Data bus
22	DG0	Data bus
23	DG1	Data bus
24	DG2	Data bus
25	DG3	Data bus
26	DG4	Data bus
27	DG5	Data bus
28	DR0	Data bus
29	DR1	Data bus
30	DR2	Data bus
31	DR3	Data bus

32	DR4	Data bus
33	DR5	Data bus
34	GND	Ground
35	NC	No connection
36	NC	No connection
37	NC	No connection
38	NC	No connection
39	NC	No connection
40	GND	Ground

5. Interface Characteristics

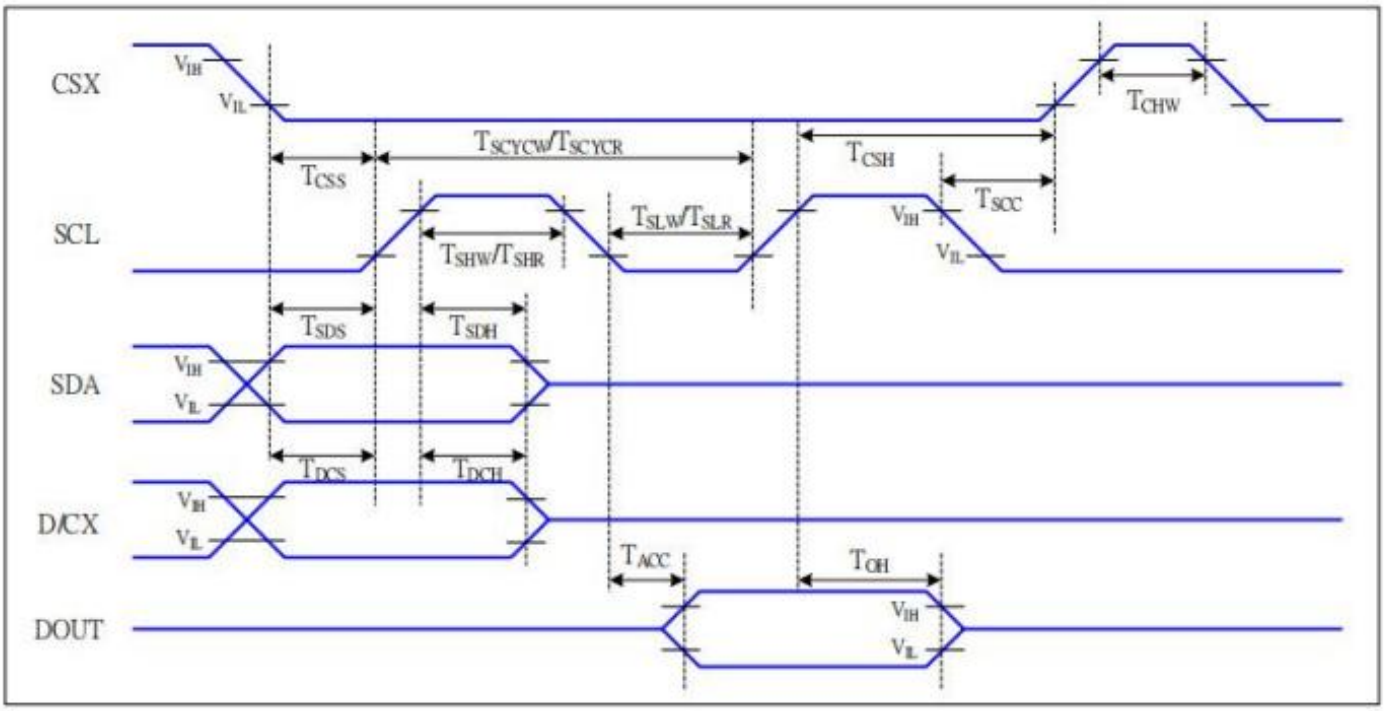
5.1 Serial Interface Characteristics (3-line serial)



3-line serial Interface Timing Characteristic

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	

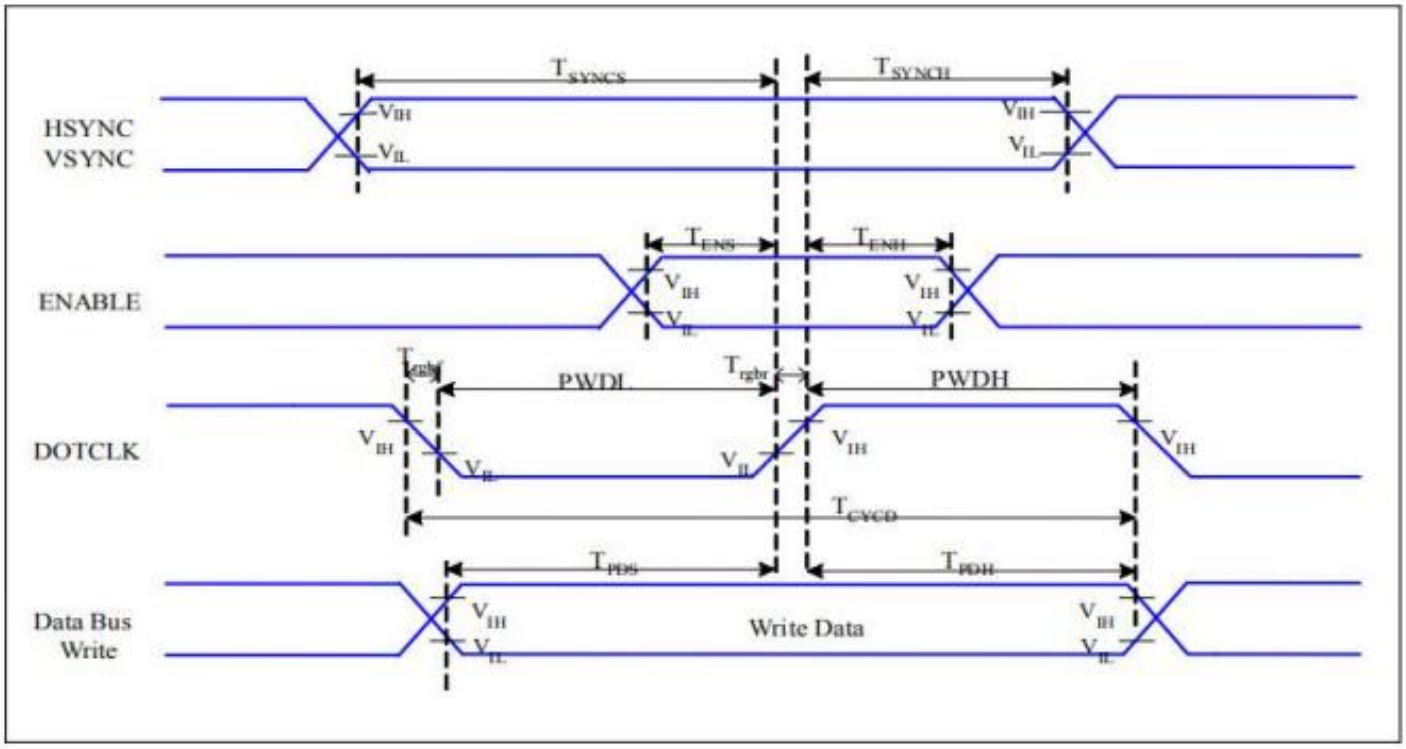
5.2 Serial Interface Characteristics (4-line serial）



4-line serial Interface Timing Characteristics

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)	65		ns	
	T_{CHW}	Chip select “H” pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	-write command & data ram
	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	-read command & data ram
	T_{SHR}	SCL “H” pulse width (Read)	60		ns	
	T_{SLR}	SCL “L” pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

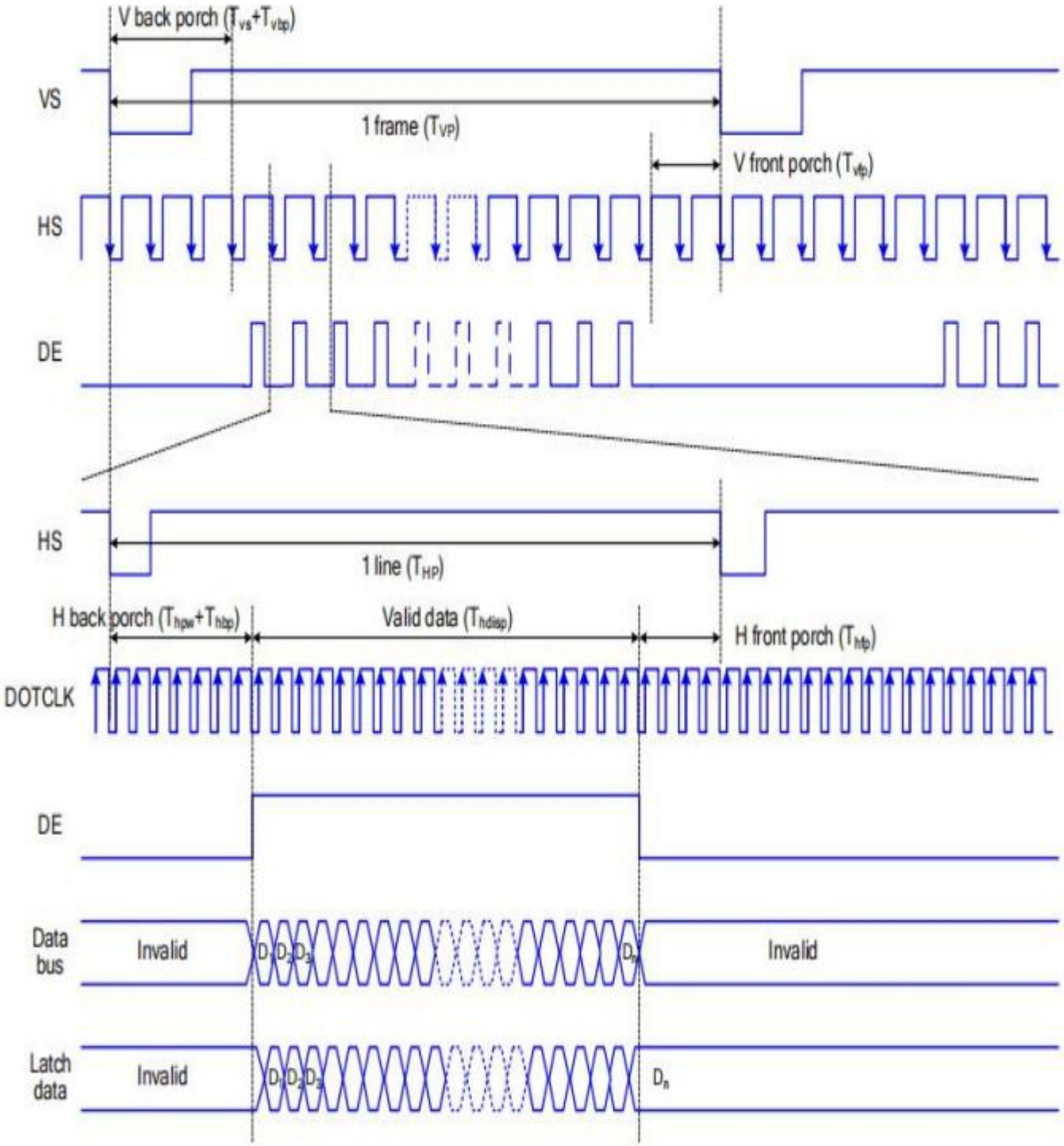
5.3 RGB Interface Characteristics



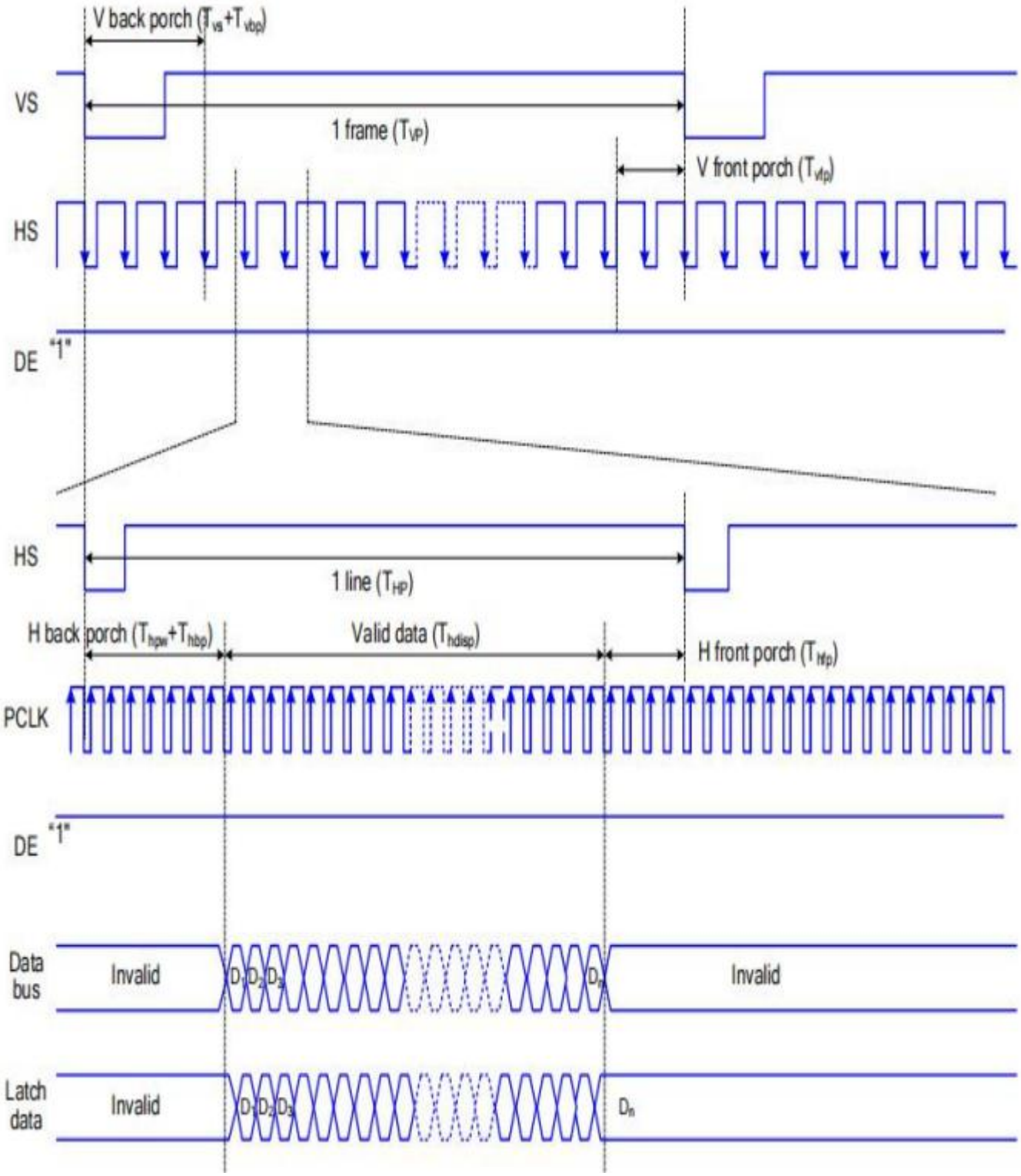
RGB Interface Timing Characteristics

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	Tsyncs	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	Tens	Enable Setup Time	5	-	ns	
	Tenh	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	Tcycd	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	Tpds	PD Data Setup Time	5	-	ns	
	Tpdh	PD Data Hold Time	5	-	ns	

5.4 The timing chart of RGB interface DE mode is shown as follows



5.5 The timing chart of RGB interface HV mode is shown as follows

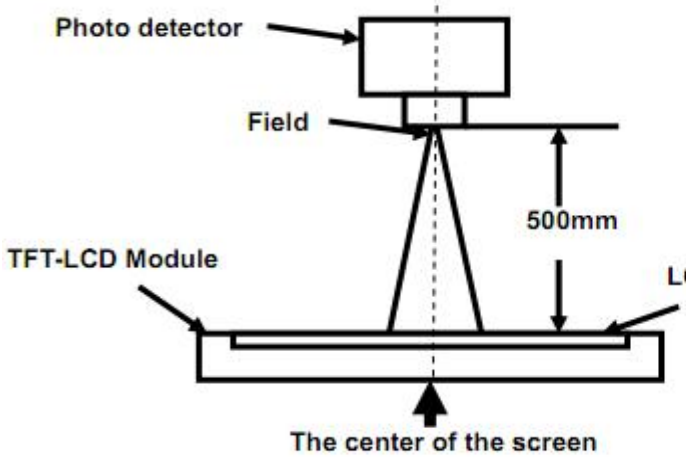


6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	Φ=90°(12 o'clock)	80	85	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	80	85	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	80	85	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	80	85	-	deg	Note2
Response Time	T_{ON}	Normal θ=Φ=0°	-	15	17	msec	Note4
	T_{OFF}		-	15	17	msec	Note4
Contrast Ratio	CR		800:1	1000:1	-	-	Note1 Note3
Color Chromaticity	W_X		0.250	0.300	0.350	-	Note1 Note5
	W_Y		0.276	0.326	0.376	-	Note1 Note5
Luminance	L		450	500	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		64	69	-	%	-

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).

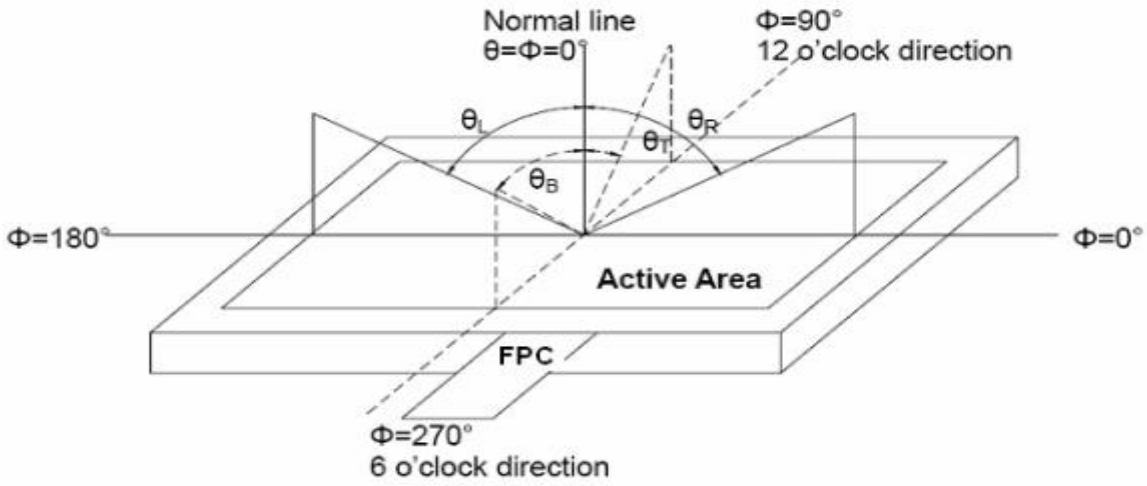


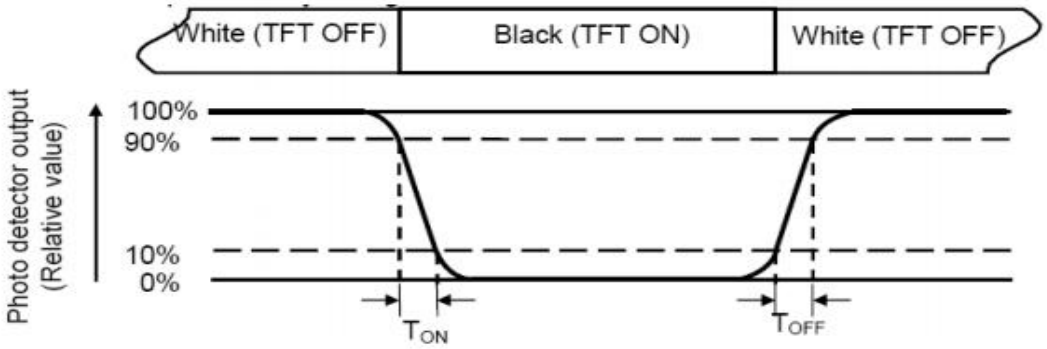
Fig. 1 Definition of viewing angle

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.

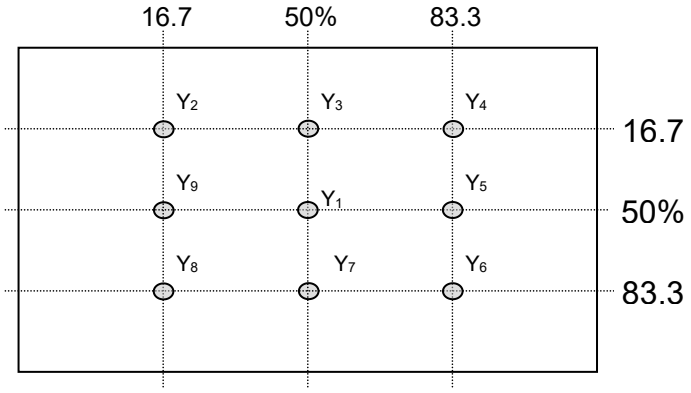


Fig. 2 Definition of points

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).

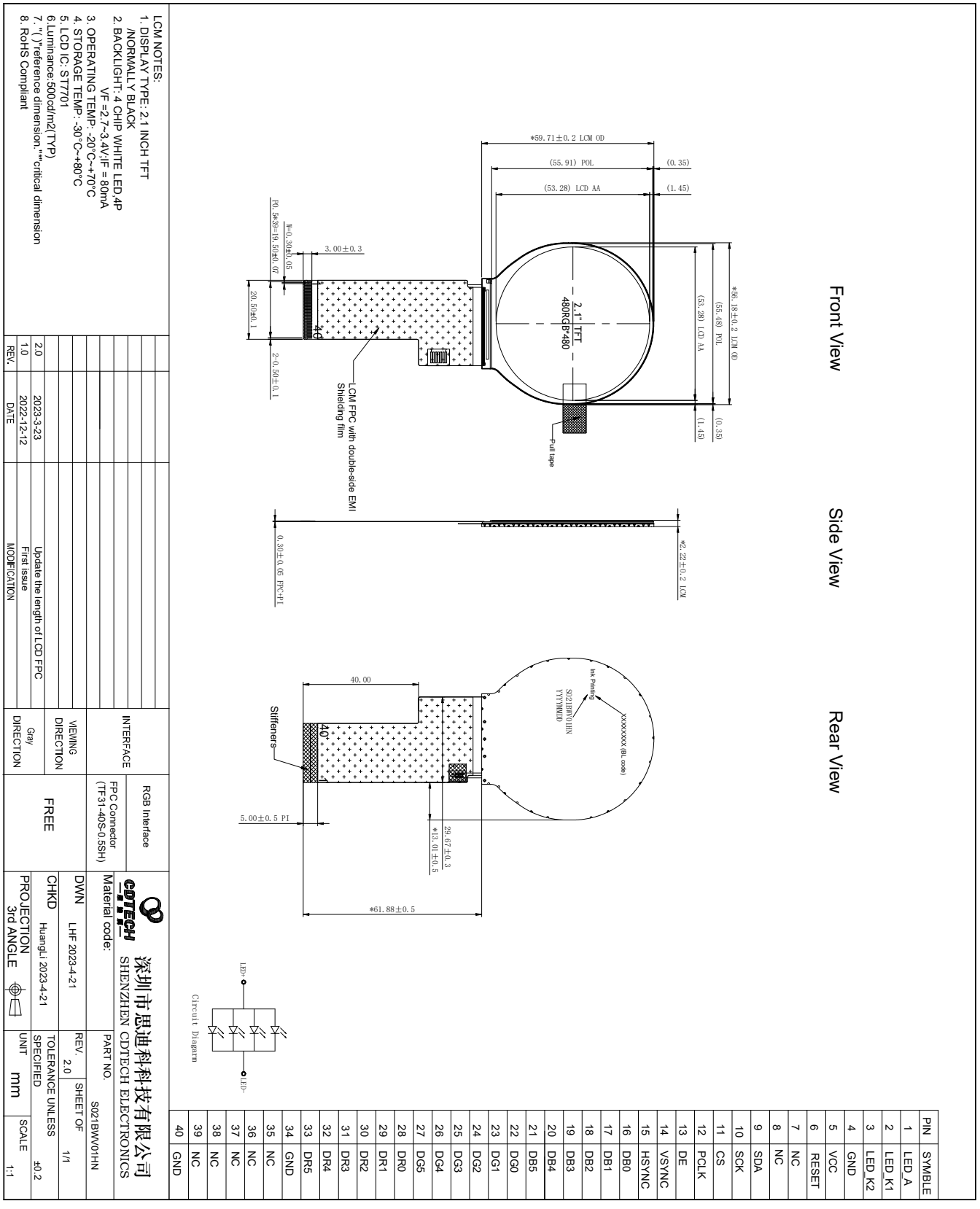
7. Reliability Test Items

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 Storage	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: 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	SYMBLE
1	LED_A
2	LED_K1
3	LED_K2
4	GND
5	VCC
6	RESET
7	NC
8	NC
9	SDA
10	SCK
11	CS
12	PCLK
13	DE
14	VSYNC
15	HSYNC
16	DB0
17	DB1
18	DB2
19	DB3
20	DB4
21	DB5
22	DG0
23	DG1
24	DG2
25	DG3
26	DG4
27	DG5
28	DR0
29	DR1
30	DR2
31	DR3
32	DR4
33	DR5
34	GND
35	NC
36	NC
37	NC
38	NC
39	NC
40	GND

LCM NOTES:
1. DISPLAY TYPE: 2.1 INCH TFT /NORMALLY BLACK
2. BACKLIGHT: 4 CHIP WHITE LED,4P VF =2.7~3.4V;IF = 80mA
3. OPERATING TEMP: -20°C~+70°C
4. STORAGE TEMP: -30°C~+80°C
5. LCD IC: ST7701
6.Luminance:500cd/m2(TYP)
7. "( )"reference dimension."*"critical dimension
8. RoHS Compliant

REV.	DATE	MODIFICATION
1.0	2022-12-12	First issue
2.0	2023-3-23	Update the length of LCD FPC

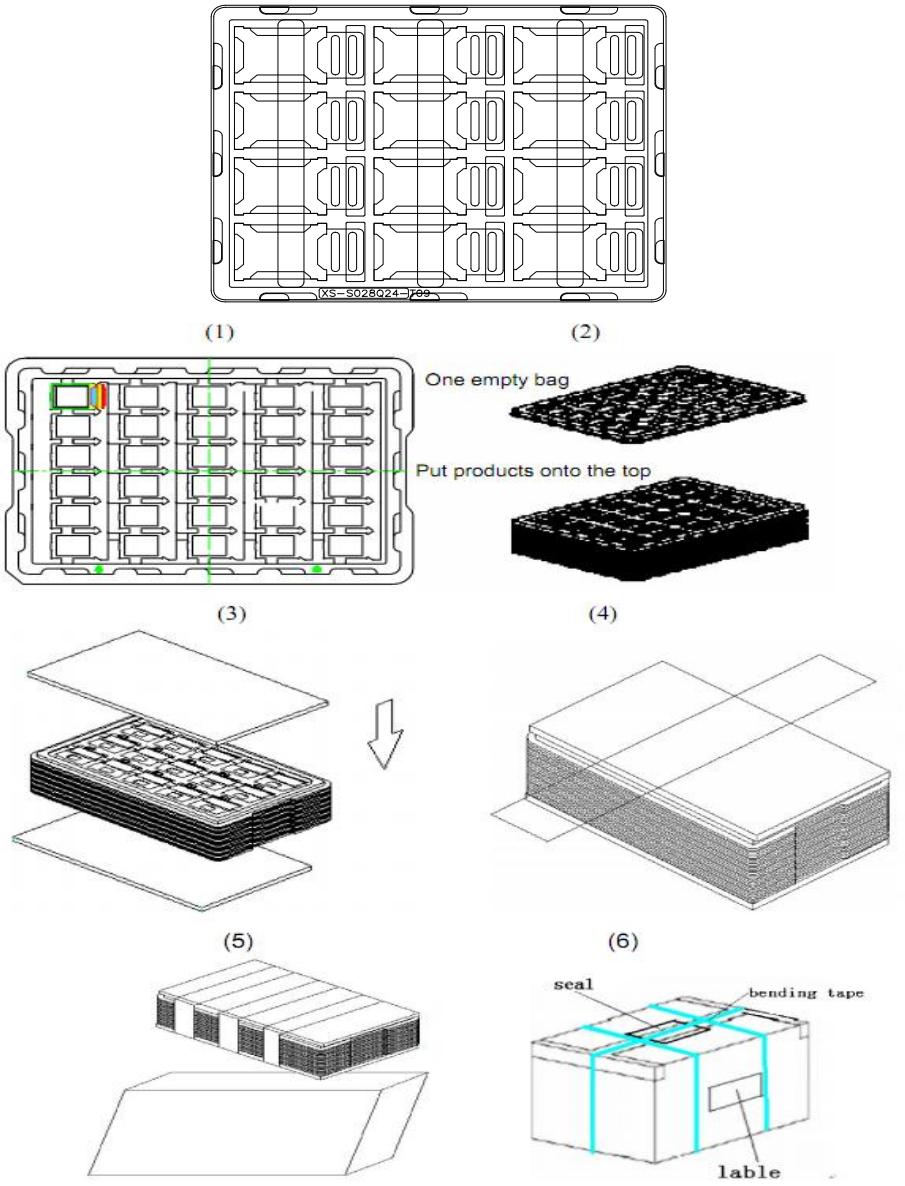
INTERFACE	RGB Interface
	FPC Connector (TF31-40S-0.5SH)
FREE	
VIEWING DIRECTION	
Gray DIRECTION	

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

Material code:	PART NO. S021BWV01HN
DWN LHF 2023-4-21	REV. 2.0 / SHEET OF 1/1
CHKD HuangLi 2023-4-21	TOLERANCE UNLESS SPECIFIED ±0.2
PROJECTION 3rd ANGLE	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.