

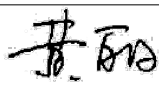
PRODUCT SPECIFICATION

CDTECH Model: **S035GV92ES**

CUSTOMER Model: **-**

Description: **3.5" TFT-LCD Module**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2022.10.17	2022.10.17	2022.10.17

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	3.5	inch
Number of Pixels	480 (H) RGB x 640 (V)	pixels
Display Mode	Normally White	-
Viewing Direction	6 O'clock	o' clock
Interface	RGB	-
Display Colors	16.7M	colors
Outline Dimension	64.00 (H) x 85.00 (V) x 2.90 (D)	mm
Active Area	53.28 (H) x 71.04 (V)	mm
Pixel Pitch	0.111 (H) x 0.111 (V)	mm
Driver IC	HX8363A	-
Operation Temperature	-20~70	°C
Storage Temperature	-30~80	°C

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. Electrical Characteristics

3.1 Recommended Operating Condition for TFT LCD

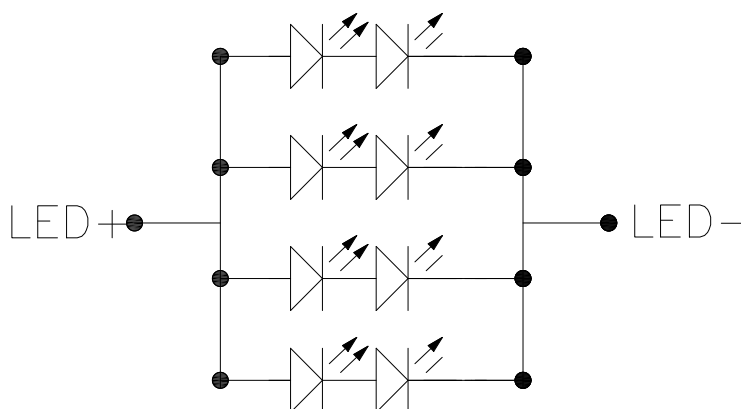
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	2.7	3.0	3.6	V	
Analog supply current	I _{VDD}	-	TBD	-	mA	VDD=3.0V
Logic supply voltage	VCCIO	1.7	1.8	VDD	V	
Logic supply current	I _{IOVCC}	-	TBD	-	mA	VCCIO=1.8V
Logic input voltage	VIH	0.7*VCCIO	-	VCCIO	V	
	VIL	GND	-	0.3*VCCIO	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I _F	-	80	-	mA	
Driving Voltage	V _F	11.2	-	12.8	V	
Power consumption	W _{BL}	0.896	-	1.024	W	
LED Life-Time	N/A	30,000	-	-	Hours	Ta=25°C 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: FH23-39S-0.3SH manufactured by HIROSE

No.	Symbol	Description
1-2	VSS	Ground
3	VDD	Power supply input
4	VCCIO	Logic interface power supply input
5	VSS	Ground
6	RESETB	System reset signal input (Lo: active)
7	HSYNC	Horizontal sync signal input (Negative polarity)
8	VSYNC	Vertical sync signal input (Negative polarity)
9	CLK	Clock input for display (Data Input on the falling edge)
10	VSS	Ground
11	D00	Display data input for (B) 00h for black display D00: LSB D05: MSB Driver IC carries out gamma conversion internally.
12	D01	
13	D02	
14	D03	
15	D04	
16	D05	
17	D10	Display data input for (G) 00h for black display D10: LSB D15: MSB Driver IC carries out gamma conversion internally
18	D11	
19	D12	
20	D13	
21	D14	
22	D15	
23	D20	Display data input for (R) 00h for black display D20: LSB D25: MSB Driver IC carries out gamma conversion internally
24	D21	
25	D22	
26	D23	
27	D24	
28	D25	
29	VSS	Ground
30	DE	Input data effective signal (It is effective for the period of "H")
31	NC	No connection
32	TEST1	Connect to Ground
33	NC/XR	No connection
34	NC/YD	No connection
35	NC/XL	No connection
36	NC/YU	No connection
37	TEST2	Connect to Ground
38	BLH	LED drive power source (Anode side)
39	BLL	LED drive power source (Cathode side)

5. Interface Characteristics

5.1 RGB Interface Timing

Vertical Timings for RGB I/F

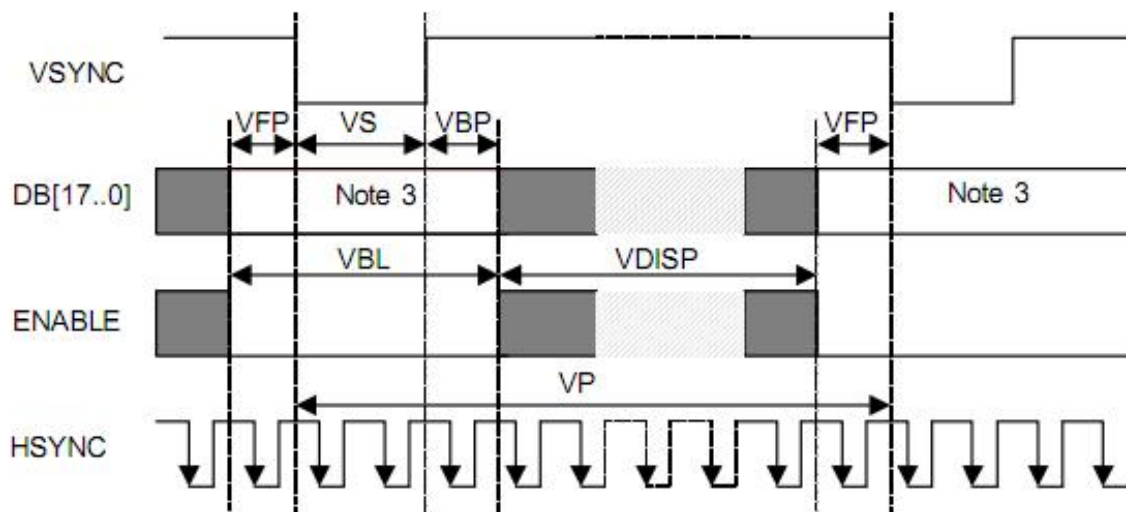


Figure 6.1: Vertical Timings for RGB I/F

(Resolution=480x640, VSSA=VSSD=0V, VDD1=1.65V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, $T_A = -30$ to 70°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle VP	-	-	646	-	650	Line
Vertical low pulse width	VS	-	2	-	4	Line
Vertical front porch	VFP	-	2	-	4	Line
Vertical back porch	VBP	-	2	-	4	Line
Vertical data start point	-	VS+VBP	4	-	8	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	10	Line
Vertical active area - VDISP	-	-	-	640	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

Note: (1) Signal rise and fall times are equal to or less than 20 ns.

(2) Input signals are measured by $0.30 \times VDD1$ for low state and $0.70 \times VDD1$ for high state.

(3) Data lines can be set to "High" or "Low" during blanking time – Don't care.

(4) VRR must keep from 50Hz to 70Hz when adjust other items

Table 6.1: Vertical Timings for RGB I/F

Horizontal Timings for RGB I/F

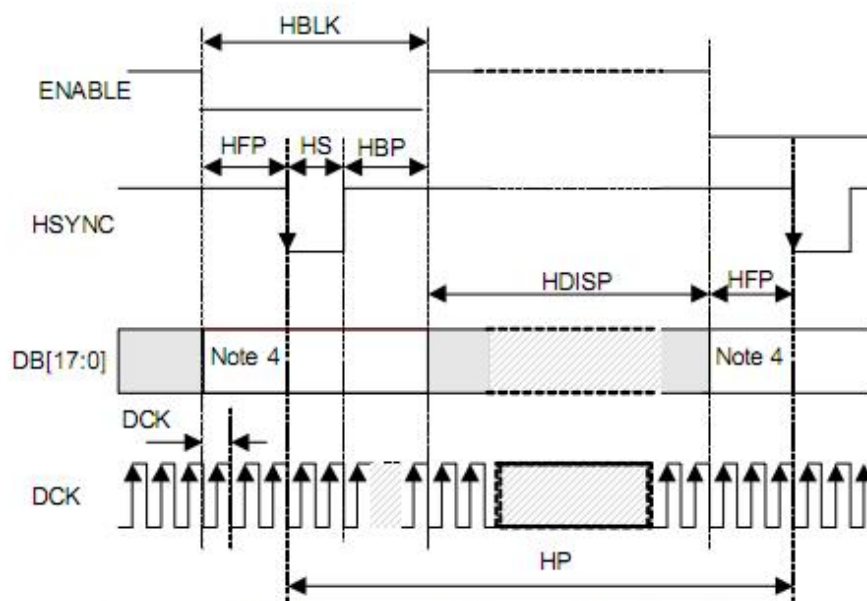


Figure 6.2: Horizontal Timing for RGB I/F

(Resolution=480x640, VSSA=VSSD=0V, VDD1=1.65V to 3.3V, VDD2=2.5 to 3.3V, VDD3=2.5 to 3.3V, T_A = -30 to 70°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Note ⁽³⁾	504	-	568	DCK
HS low pulse width	HS	-	5	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal data start point	-	HS+HBP	19	-	83	DCK
			700	-	-	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCK
Horizontal active area	HDISP	-	-	480	-	DCK
Pixel clock frequency	DCK	VRR = Min. 50Hz	20.3	-	32.2	MHz
When RGB I/F is running		- Max. 70Hz	31	-	49.2	ns

Note: (1) Signal rise and fall times are equal to or less than 20 ns.

(2) Input signals are measured by 0.30 x VDD1 for low state and 0.70 x VDD1 for high state.

(3) HP is multiples of eight DCK.

(4) Data lines can be set to "High" or "Low" during blanking time – Don't care.

(5) VRR must keep from 50Hz to 70Hz when adjust other items.

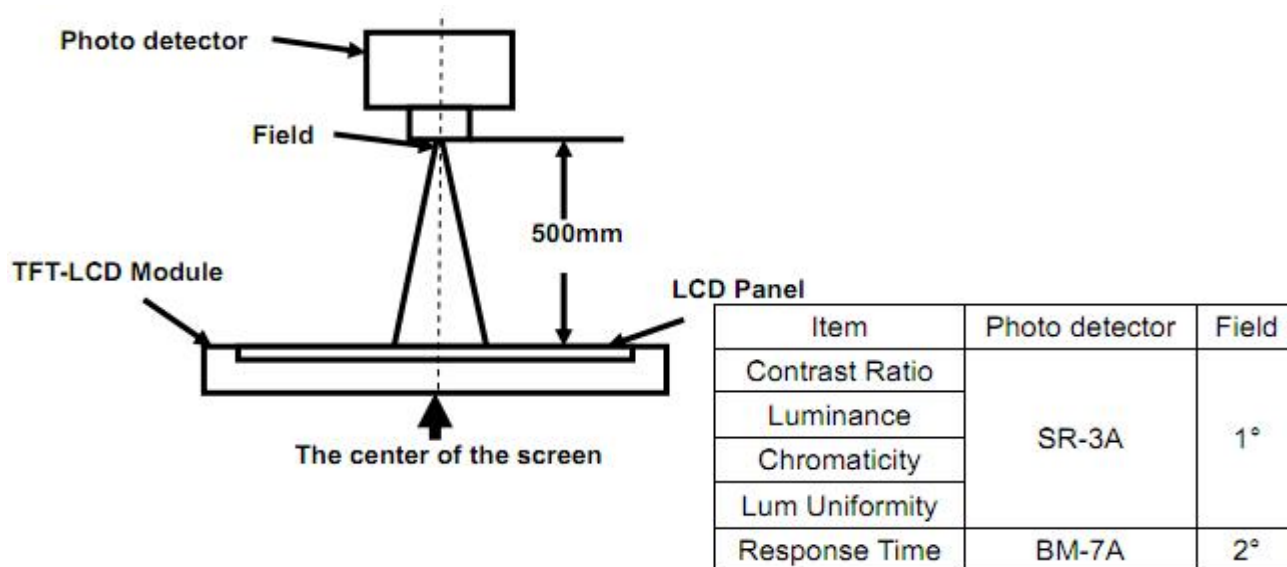
Table 6.2: Horizontal Timings for RGB I/F

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)	-	60	-	deg	Note2
	θ_B	$\Phi=270^\circ$ (6 o'clock)	-	60	-	deg	Note2
	θ_L	$\Phi=180^\circ$ (9 o'clock)	-	45	-	deg	Note2
	θ_R	$\Phi=0^\circ$ (3 o'clock)	-	55	-	deg	Note2
Response Time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	-	15	msec	Note4
	T_{OFF}		-	-	15	msec	Note4
Contrast Ratio	CR		400	-	-	-	Note1 Note3
Color Chromaticity	W_X		0.250	0.30	0.350	-	Note1 Note5
	W_Y		0.260	0.31	0.360	-	Note1 Note5
Luminance	L		900	1000	-	cd/m ²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	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.



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).

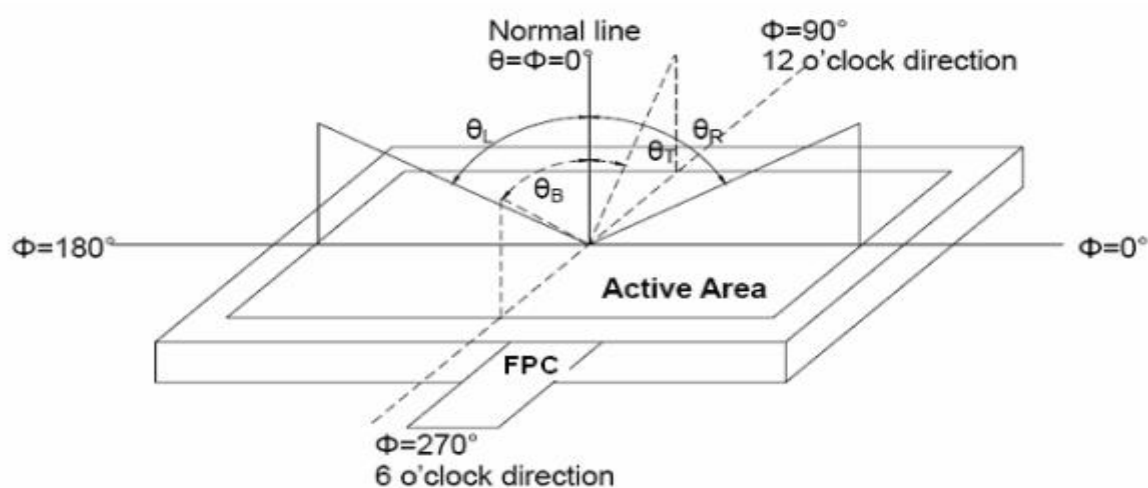


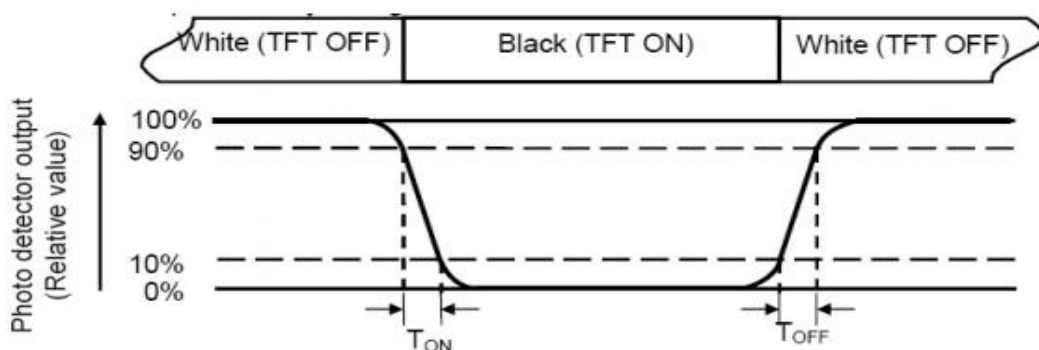
Fig. 1 Definition of viewing angle

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.

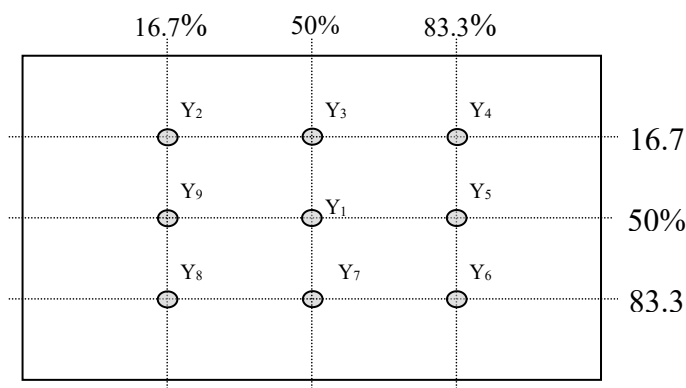


Fig. 2 Definition of points

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($P_1, P_2, P_3, \dots, P_n$).

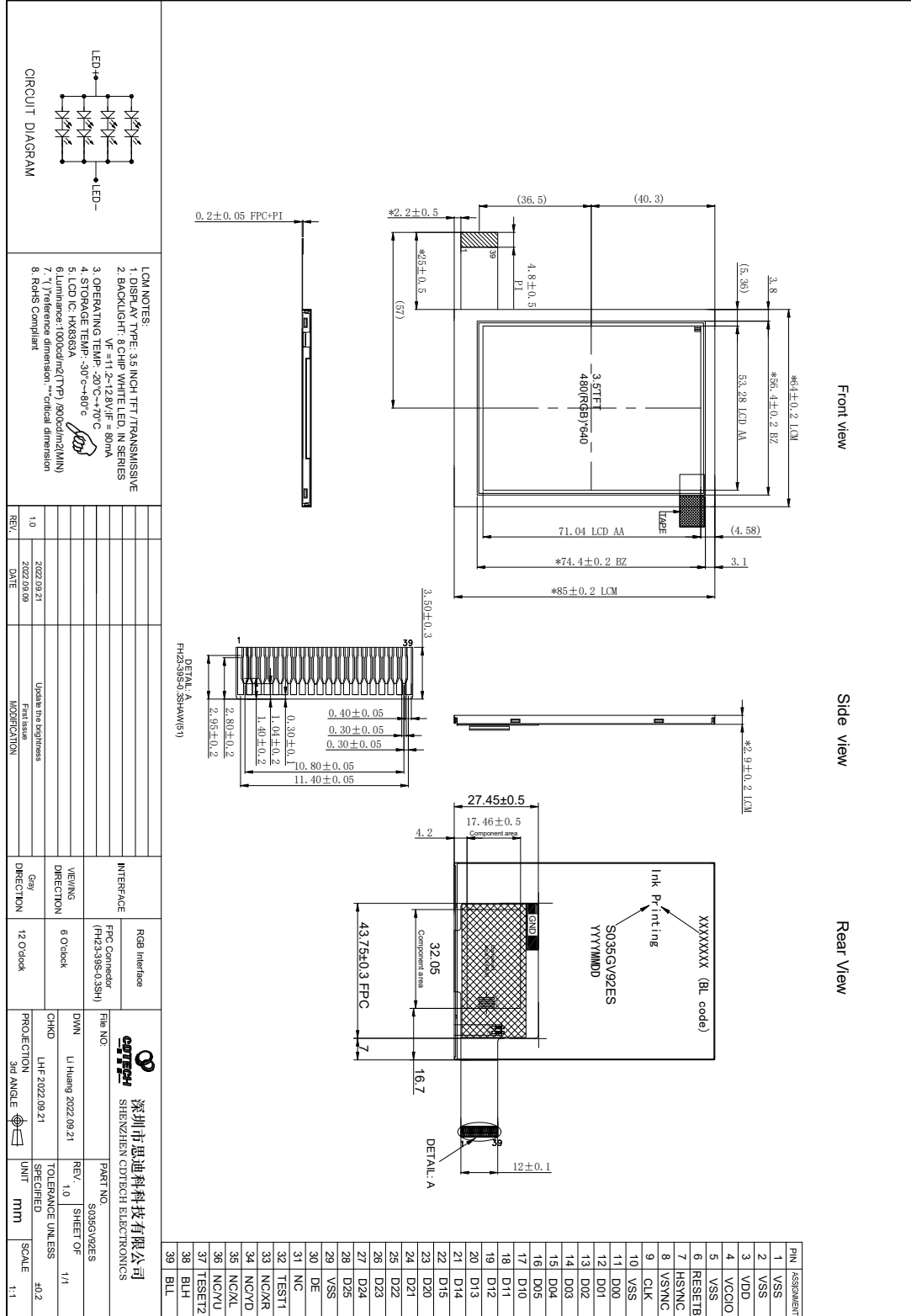
7. Reliability Test Items

Test Item	Test Conditions
High Temperature Storage	Ta= +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:

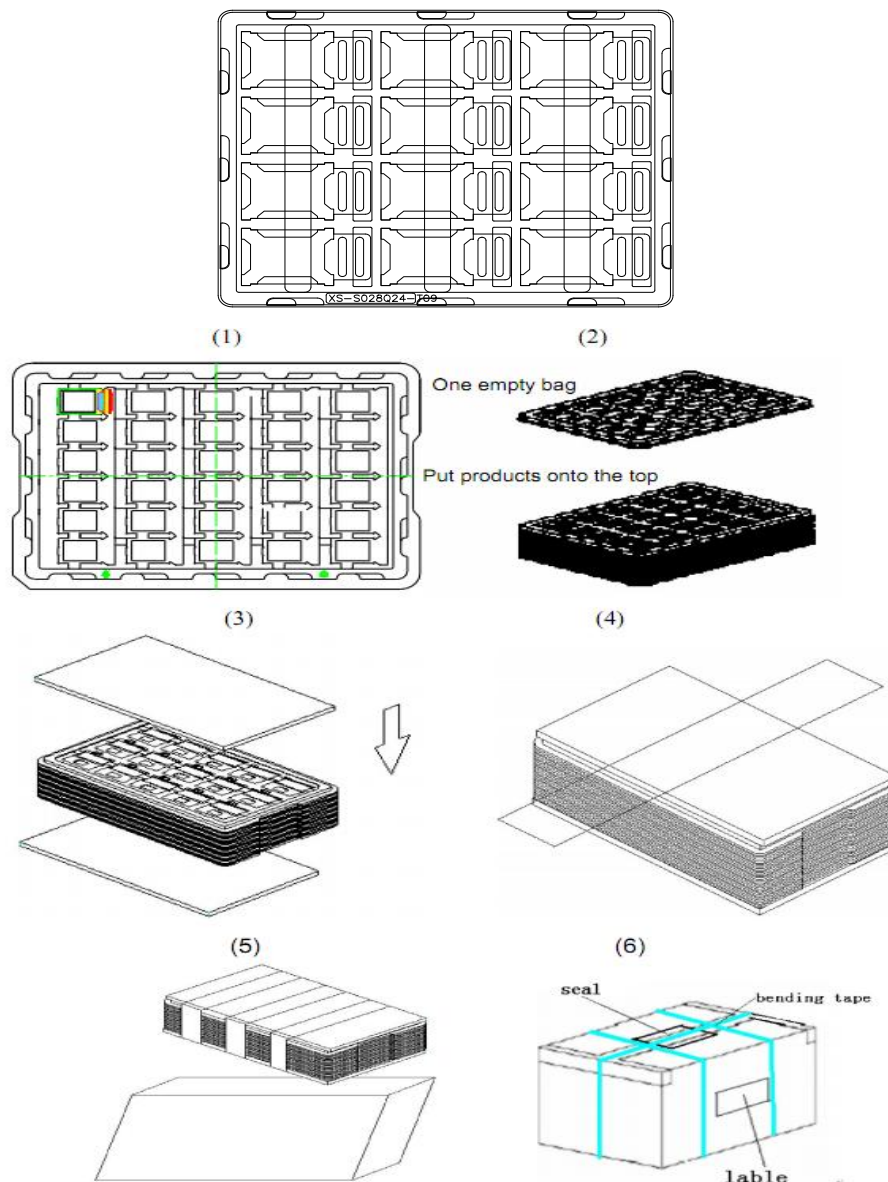
- 1). Air bubble in the LCD
- 2). Seal leak or Glass crack
- 3). Non display or abnormal display
- 4). Brightness reduction >50%

8. Mechanical Drawing



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.