

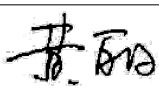
PRODUCT SPECIFICATION

CDTECH Model: **S046QWV11HS-DR02**

CUSTOMER Model: **-**

Description: **4.6" TFT-LCD Module with RTP**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2022.6.15	2022.6.15	2022.6.15

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	4.6	inch
Number of Pixels	800(H) RGB x 320(V)	pixels
Display Mode	Normally White	-
Viewing Direction	12 O'clock	o'clock
Interface	RGB	-
Display Colors	16.7M	colors
Outline Dimension	120.70(H) x56.16(V) x4.30(D)	mm
Active Area	108.00(H) x 43.20 (V)	mm
Pixel Pitch	0.1350(H) x 0.1350(V)	mm
Driver IC	ILI6122+ILI5960	-
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

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	VIH	0.7*IOVCC	-	IOVCC	V	
	VIL	GND	-	0.3*IOVCC	V	

3.2 Recommended Driving Condition for Backlight

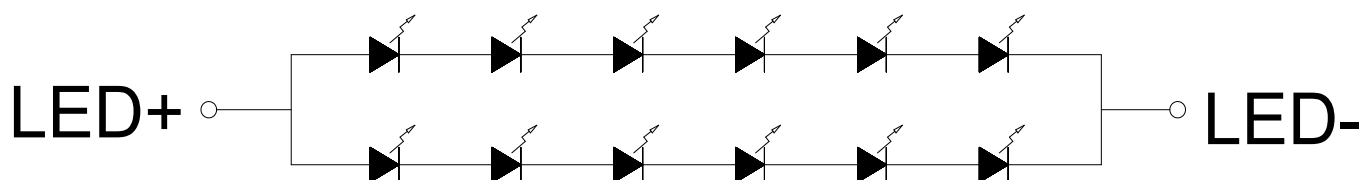
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I _F	-	40	-	mA	
Driving Voltage	V _F	16.2	-	20.4	V	
Power consumption	W _{BL}	0.648	-	0.816	W	
LED Life-Time	N/A	30,000	-	-	Hours	Ta=25℃ Note 1

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 :



4. Interface Pin Assignment

4.1 LCM Pin Assignment

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

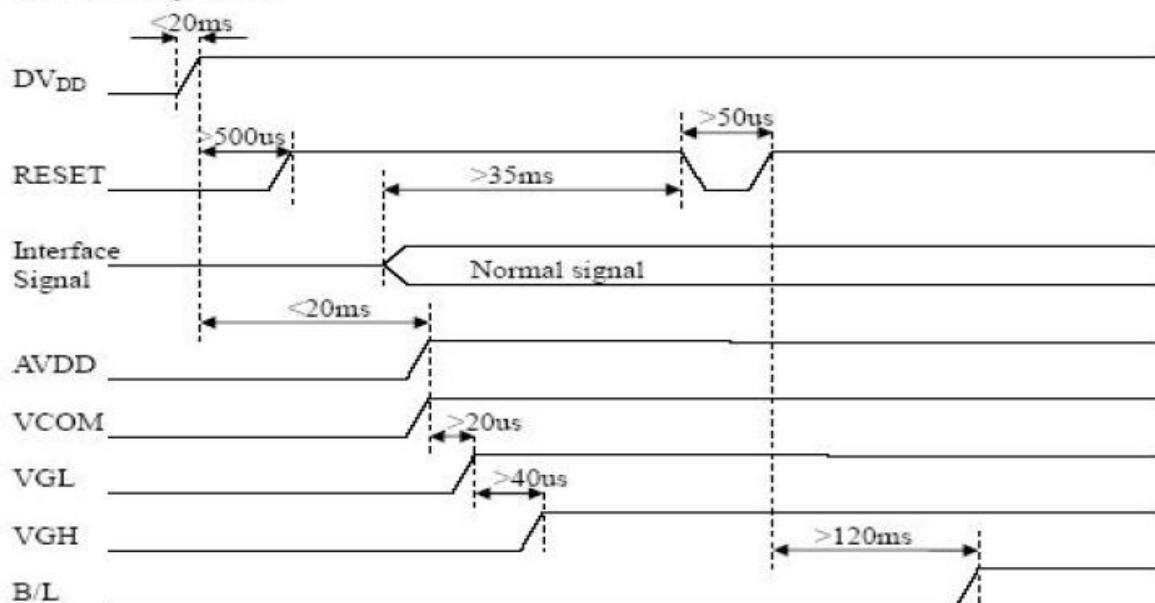
No.	Symbol	Description
1	VLED-	Backlight LED Cathode
2	VLED+	Backlight LED Anode.
3	GND	Ground
4	VDD	Power supply
5~12	R0~R7	Data bus
13~20	G0~G7	Data bus
21~28	B0~B7	Data bus
29	GND	Ground
30	DCLK	Dot clock signal input. Latching input data at its rising edge.
31	DISP	Display on/off control
32	HSYNC	Horizontal Sync signal
33	VSYNC	Vrtical Sync signal
34	DE	Data enable input. Active high to enable the input data bus under “DE Mode.”
35	NC	No connect
36	GND	System Ground
37	XR	The right side signal of TP
38	YD	The down side signal of TP
39	XL	The left side signal of TP
40	YU	The up side signal of TP

5. Interface Characteristics

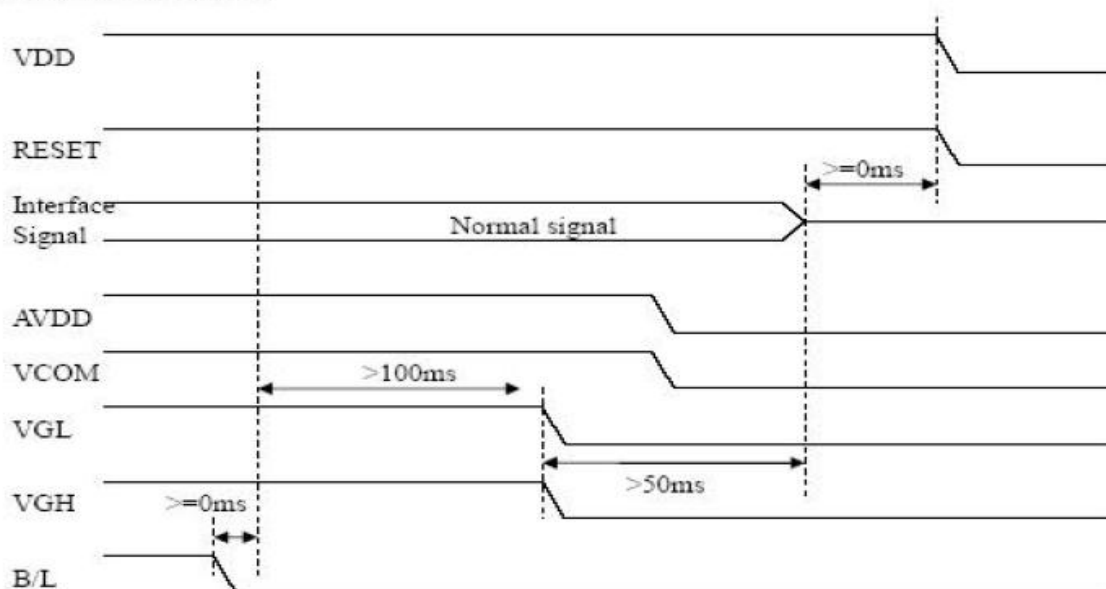
5.1 Power sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.

a. Power on sequence:



b. Power off sequence:



5.2 Timing Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T _{hst}	8	-	-	ns	
HS hold time	T _{hhd}	8	-	-	ns	
VS setup time	T _{vst}	8	-	-	ns	
VS hold time	T _{vhd}	8	-	-	ns	
Data setup time	T _{dsu}	8	-	-	ns	
Data hole time	T _{dhd}	8	-	-	ns	
DE setup time	T _{esu}	8	-	-	ns	
DE hole time	T _{ehd}	8	-	-	ns	
DV _{DD} Power On Slew rate	T _{POR}	-	-	20	ms	From 0 to 90% DV _{DD}
RESET pulse width	T _{Rst}	1	-	-	ms	
DCLK cycle time	T _{coh}	20	-	-	ns	
DCLK pulse duty	T _{cwh}	40	50	60	%	

For Example:

DE 模式:

```
#define LCD_SIZE_X    800
#define LCD_SIZE_Y    480
#define HDP LCD_SIZE_X-1 //Hsync Display period    320-1
#define HT (HDP+HPS)    //Horizontal total period = (HT + 1) pixels
#define HPS 210    //Horizontal Sync Pulse Start Position = (HPS + 1) pixels
#define LPS 42    //Horizontal Display Period Start Position = LPS pixels
#define HPW 1    //Horizontal Sync Pulse Width = (HPW + 1) pixels

#define VDP LCD_SIZE_Y - 1//LCD_SIZE_Y-1-132
#define VT (VDP+VPS)    //Vertical Total = (VT + 1) lines
#define VPS 22//Vertical Sync Pulse Start Position = VPS lines
#define FPS 23 //Vertical Display Period Start Position = FPS lines
#define VPW 1    //Vertical Sync Pulse Width = (VPW + 1) lines
```

HV 模式:

```
#define LCD_SIZE_X    800
```

```
#define LCD_SIZE_Y    320
```

```
#define HDP LCD_SIZE_X-1 //Hsync Display period    320-1
```

```
#define HT  (HDP+HPS)    //Horizontal total period = (HT + 1) pixels
```

```
#define HPS 86          //Horizontal Sync Pulse Start Position = (HPS + 1) pixels
```

```
#define LPS 40          //Horizontal Display Period Start Position = LPS pixels
```

```
#define HPW 0           //Horizontal Sync Pulse Width = (HPW + 1) pixels
```

```
#define VDP LCD_SIZE_Y-1
```

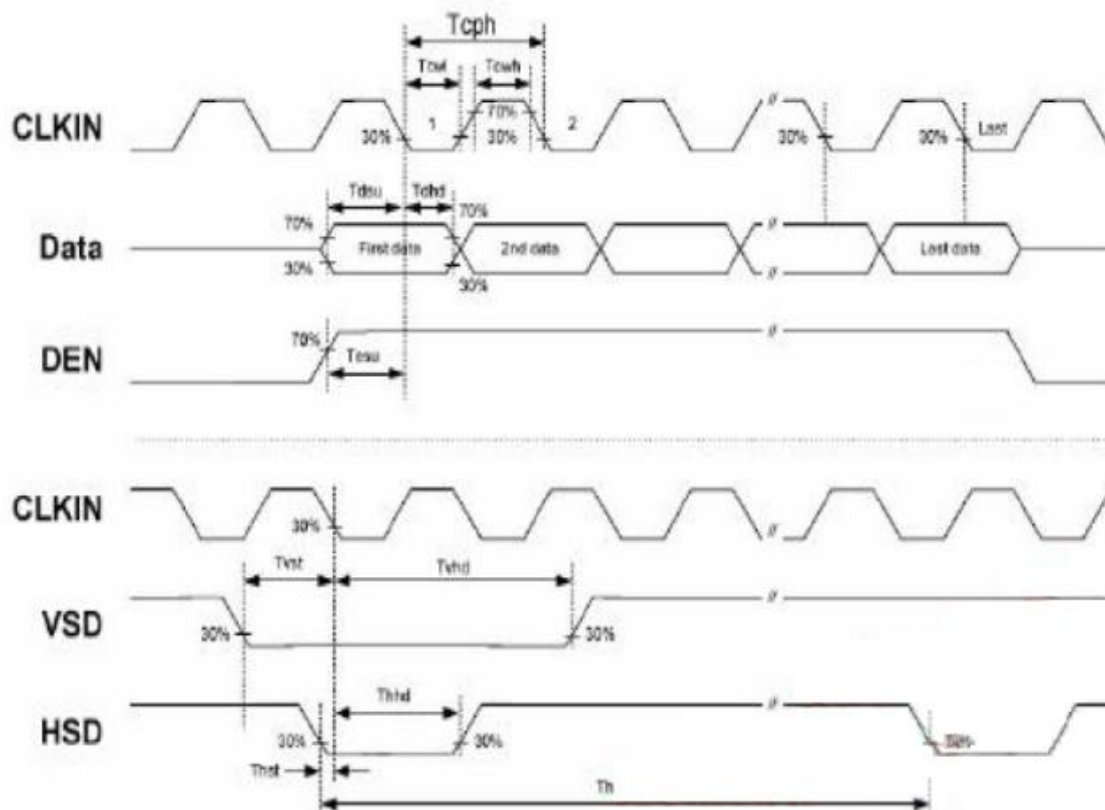
```
#define VT  525          //Vertical Total = (VT + 1) lines
```

```
#define VPS 202          //Vertical Sync Pulse Start Position = VPS lines
```

```
#define FPS 23           //Vertical Display Period Start Position = FPS lines
```

```
#define VPW 1            //Vertical Sync Pulse Width = (VPW + 1) lines
```

5.3 Timing Diagram



5.4 Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tv	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

5.5 Data Input Format

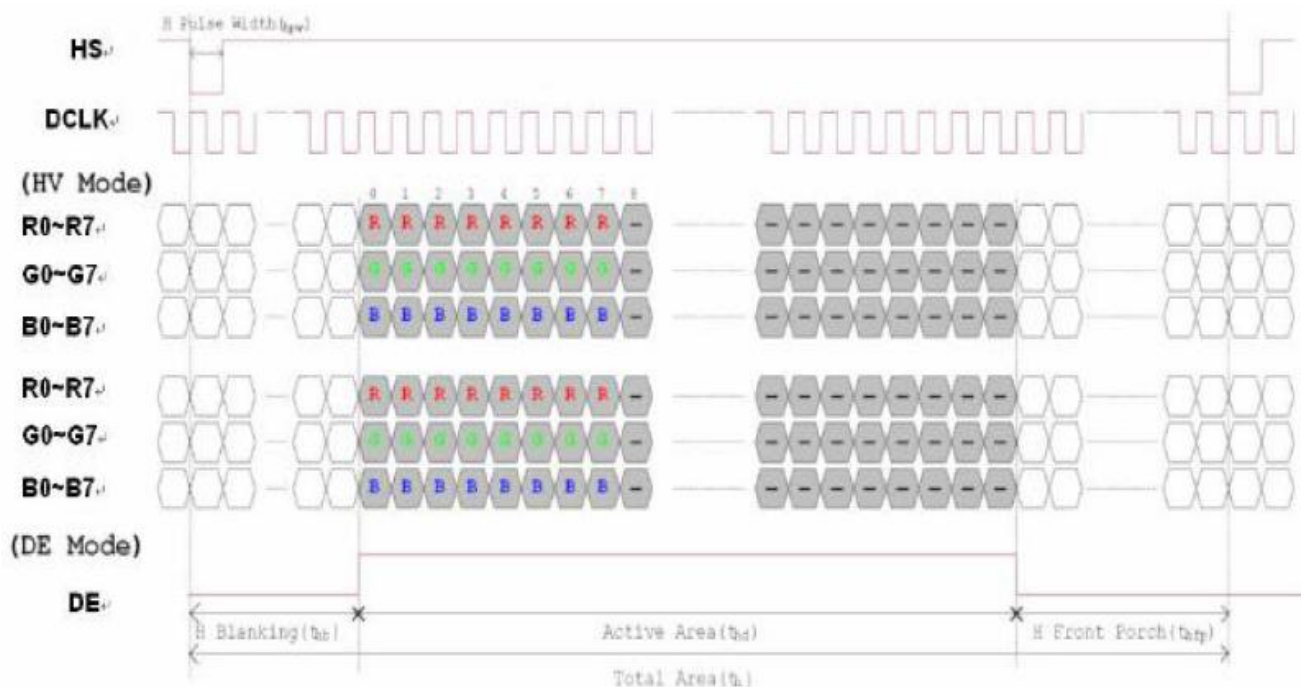


Figure 3. 1 Horizontal input timing diagram.

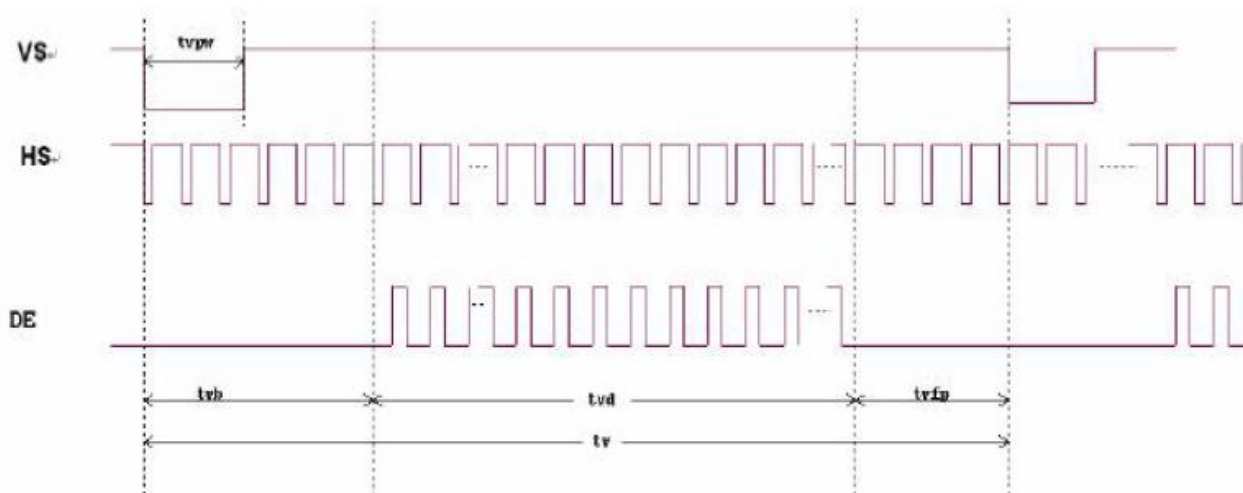


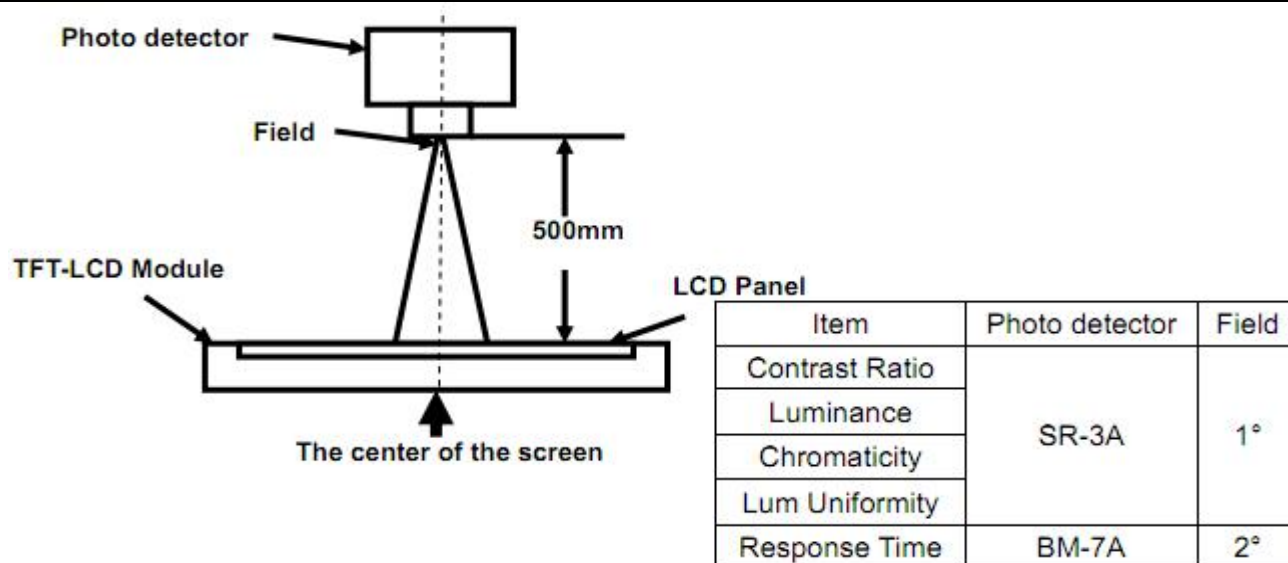
Figure 3. 2 Vertical input timing diagram.

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)	45	55	-	deg	Note2
	θ_B	$\Phi=270^\circ$ (6 o'clock)	55	65	-	deg	Note2
	θ_L	$\Phi=180^\circ$ (9 o'clock)	55	65	-	deg	Note2
	θ_R	$\Phi=0^\circ$ (3 o'clock)	55	65	-	deg	Note2
Response Time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	15	msec	Note4
	T_{OFF}		-	10	15	msec	Note4
Contrast Ratio	CR		500	600	-	-	Note1 Note3
Color Chromaticity	W_X		0.238	0.288	0.338	-	Note1 Note5
	W_Y		0.258	0.308	0.358	-	Note1 Note5
Luminance	L		320	370	-	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).

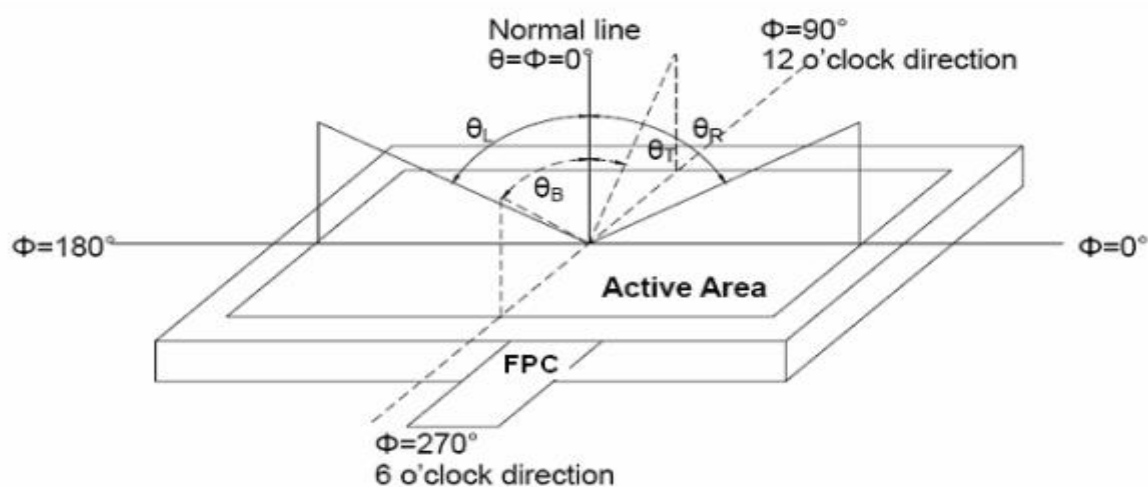


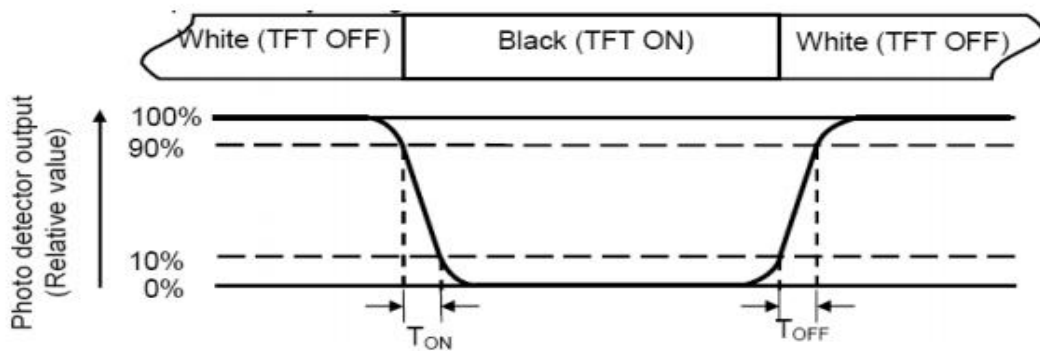
Fig. 1 Definition of viewing angle

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

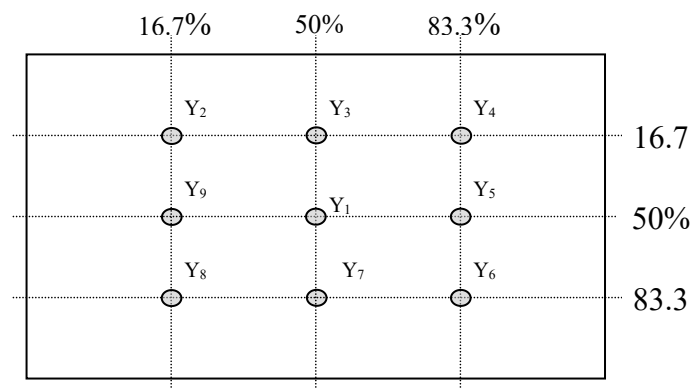


Fig. 2 Definition of points

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

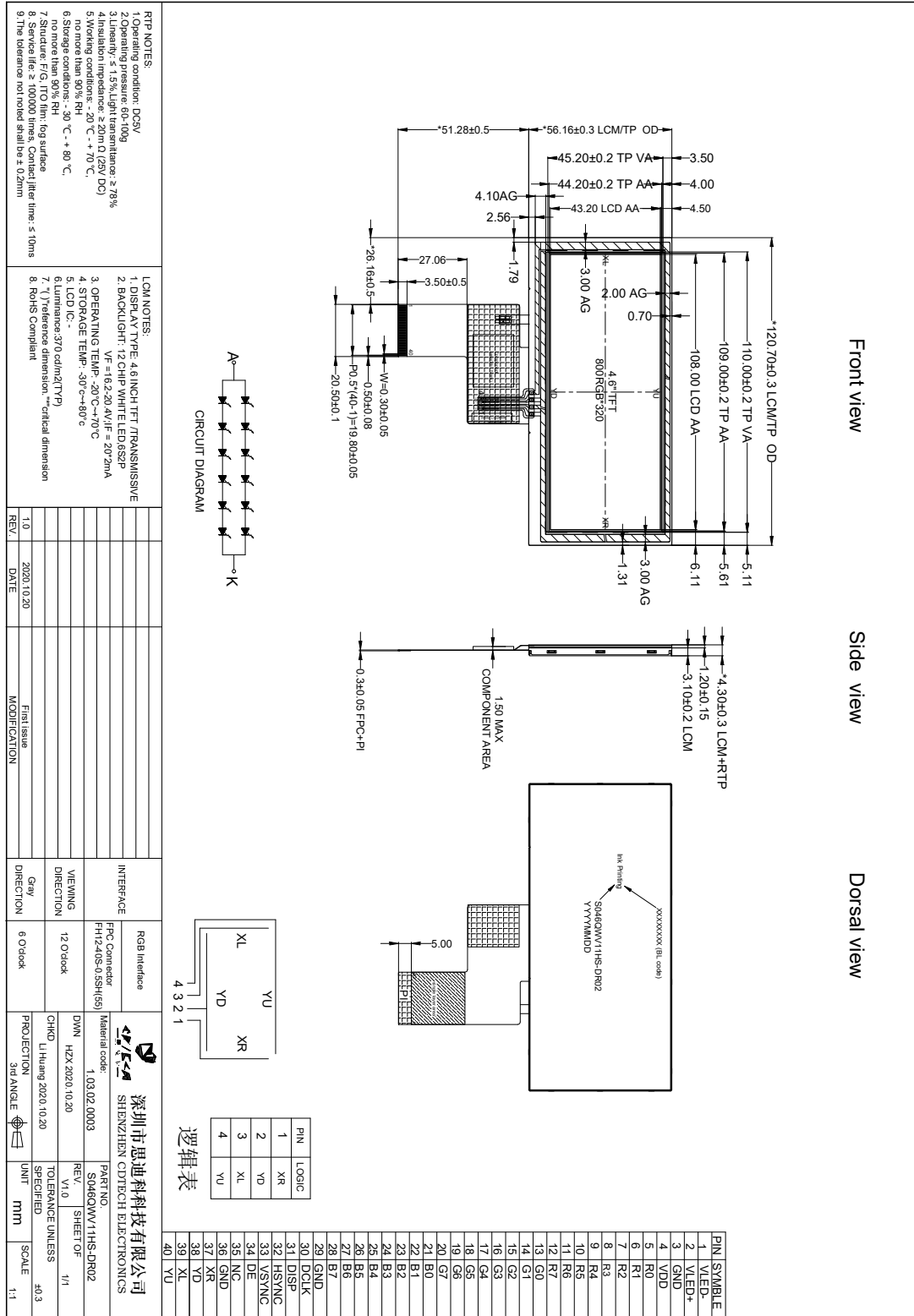
Test Item	Test Conditions
High Temperature Storage	Ta= +80℃ 96hrs
Low Temperature Storage	Ta= -30℃ 96hrs
High Temperature Operation	Ta= +70℃ 96hrs
Low Temperature Operation	Ta= -20℃ 96hrs
High Temperature and Humidity Operation	Ta= +60℃, 90% RH 96hrs
Thermal Shock (Non-operation)	-30℃/30 min ~ +80℃/30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

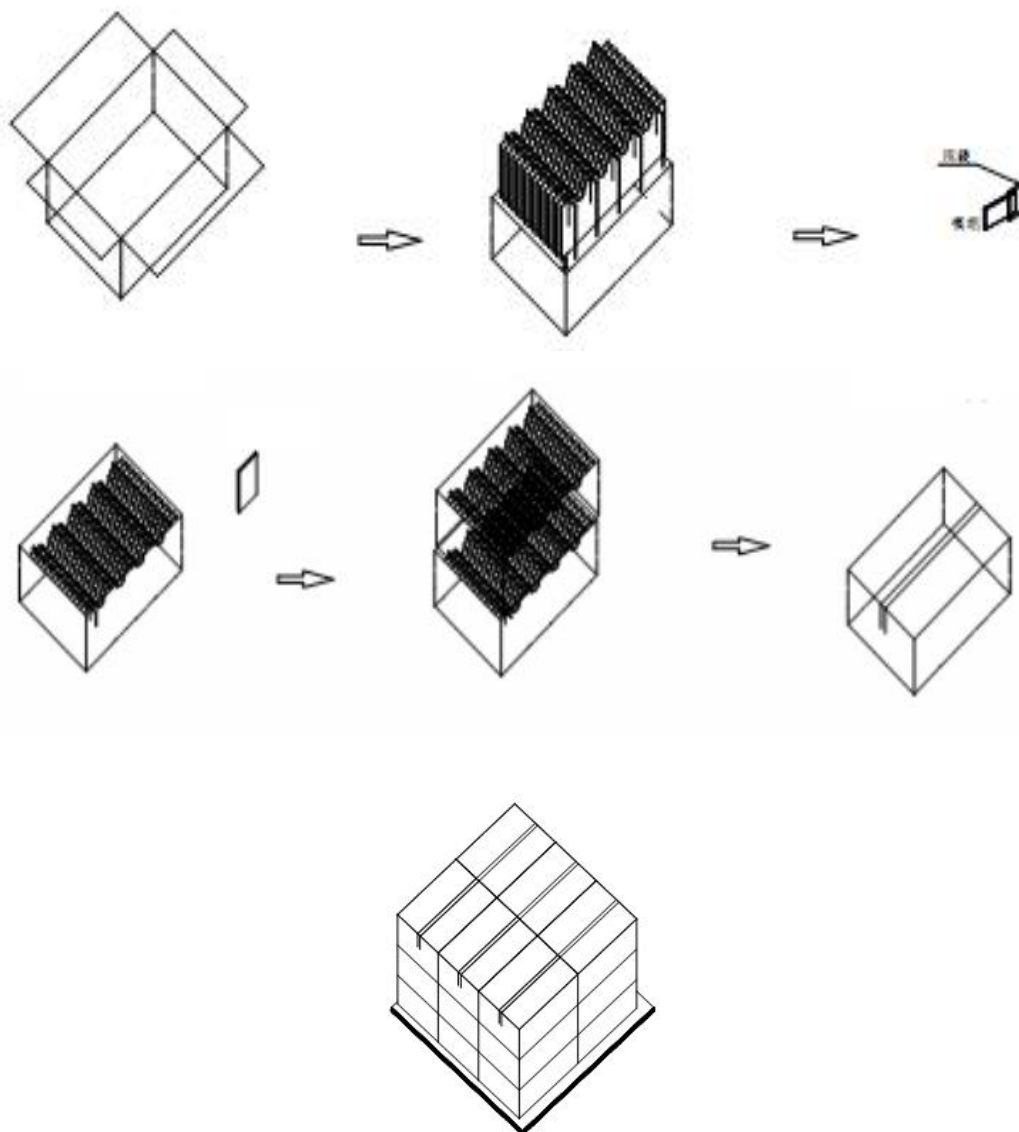
- 1).Air bubble in the LCD;
- 2).Seal leak or Glass crack
- 3).Non display or abnormal display
- 4).Brightness reduction >50%

8. Mechanical Drawing



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

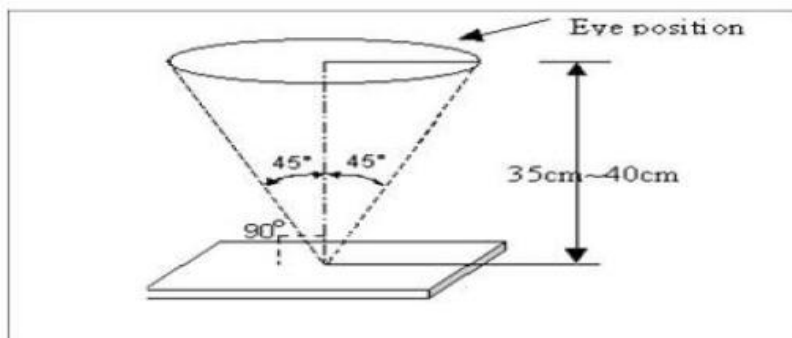
The customer shall inspect the modules within twenty calendar days of the delivery date (the "inspection period") at its own cost. The result of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to The seller, If the results of the 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 $25\pm 5^{\circ}\text{C}$
 - b. Humidity: $(60\pm 10)\% \text{RH}$
 - 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 $35\pm 5\text{ cm}$.
- 10.4.3 Viewing Angle
U/D: $45^{\circ}/45^{\circ}$, L/R: $45^{\circ}/45^{\circ}$



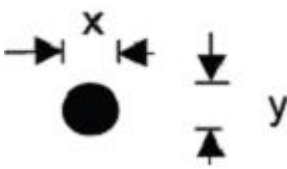
10.5 Inspection Criteria

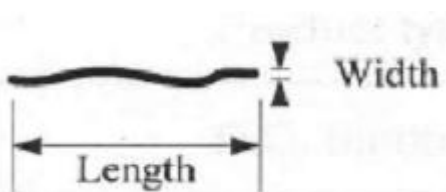
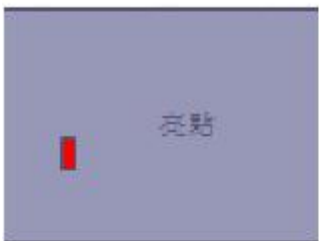
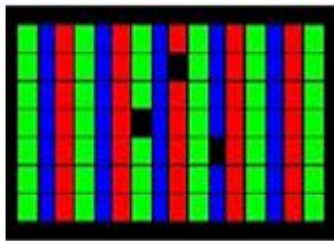
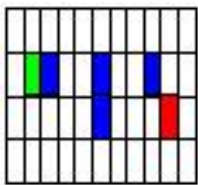
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined herein.

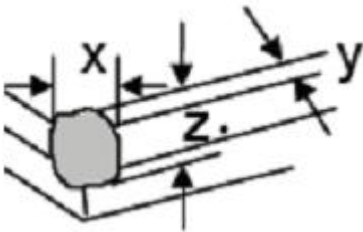
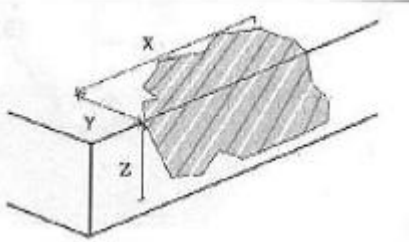
10.5.1 Major defect

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

Item No	Items to be inspected	Inspection standard	
5.2.1	Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt	For dark/white spot is defined $\varphi = (x+y) / 2$ 	
		Size φ (mm)	Acceptable Quantity
		$\varphi \leq 0.2$	Ignore
		$0.2 < \varphi \leq 0.3$	3
		$0.3 < \varphi$	Not allowed

5.2.2	Line Defect Including Black line White line Scratch	Define: 	
		Width(mm) Length(mm)	Acceptable Quantity
		$W \leq 0.05$	Ignore
		$0.05 < W \leq 0.1$ $L \leq 2.5$	3
		$0.1 < W, \text{ or } L > 2.5$	Not allowed
5.2.3	Polarizer Dent/Bubble	Size ϕ (mm)	Acceptable Quantity
		$\phi \leq 0.2$	Ignore
		$0.2 < \phi \leq 0.3$	2
		$0.5 < \phi$	Not allowed
		Total QTY	3
5.2.4	Electrical Dot Defect	Bright and Black dot define:  and   Two Adjacent Dot	
		Inspection pattern: Full white 、 Full black 、 Red 、 green and blue screens	
		Item	Acceptable Quantity
		Black dot defect	2
		Bright dot defect	1
		Two Adjacent Dot	1
		There or more Adjacent Dot	Not allowed
		Total Dot	2

5.2.5	Glass defect	 <p>1. Corner Fragment:</p>	
		Size(mm)	Acceptable Quantity
		$X \leq 3\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: thickness
		 <p>2. Side Fragment:</p>	
		Size(mm)	Acceptable Quantity
		$X \leq 5.0\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	T: Glass thickness X: Length Y: Width Z: thickness

- 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.