PRODUCT SPECIFICATION

CDTECH Model: **S050QWQ87ED-DR05**

CUSTOMER Model: -

Description: **5.0 ” TFT-LCD Module with RTP**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2025.2.7	2025.2.7	2025.2.7

	SIGNATURE	DATE
CUSTOMER APPROVAL		

Record of Revisions

Version	Revise Date	Description	Page
1.0	2025-2-7	First Release	-

Contents

1. General Specifications

1.1 LCM General Information

Item	Specification	Unit
LCD Size	5.0	inch
Number of Pixels	480 (H) RGB x 272 (V)	pixels
Display Mode	Normally White	-
Viewing Direction	12 o' clock	-
Interface	RGB	-
Display Colors	16.7M	colors
Outline Dimension	120.70 (H) x 75.80 (V) x 4.00 (D)	mm
Active Area	110.88 (H) x 62.83 (V)	mm
Pixel Pitch	0.231 (H) x 0.231 (V)	mm
Driver IC	ILI6480	-
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

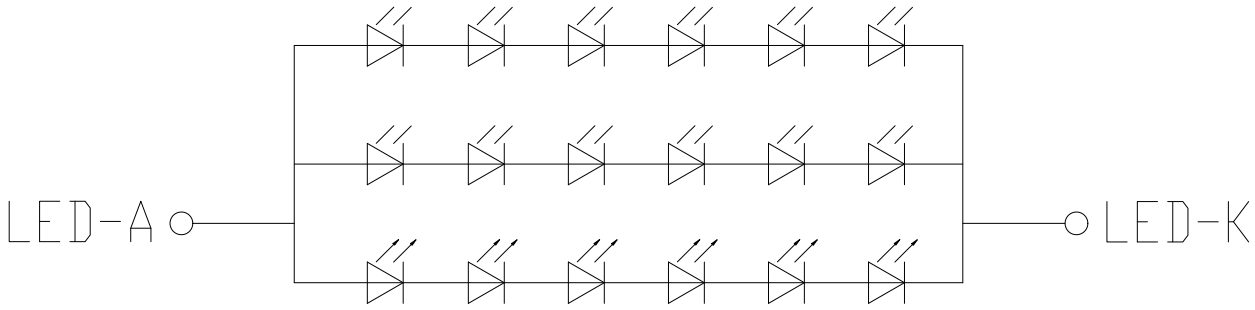
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	3.0	3.3	3.6	V	
Analog supply current	I_{VDD}	8	15	20	mA	VDD=3.3V (red)
Logic input voltage	VIH	0.7*VDD	-	VDD	V	
	VIL	GND	-	0.3*VDD	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I_F	-	60	-	mA	
Driving Voltage	V_F	16.2	-	20.4	V	
Power consumption	W_{BL}	0.972	-	1.224	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

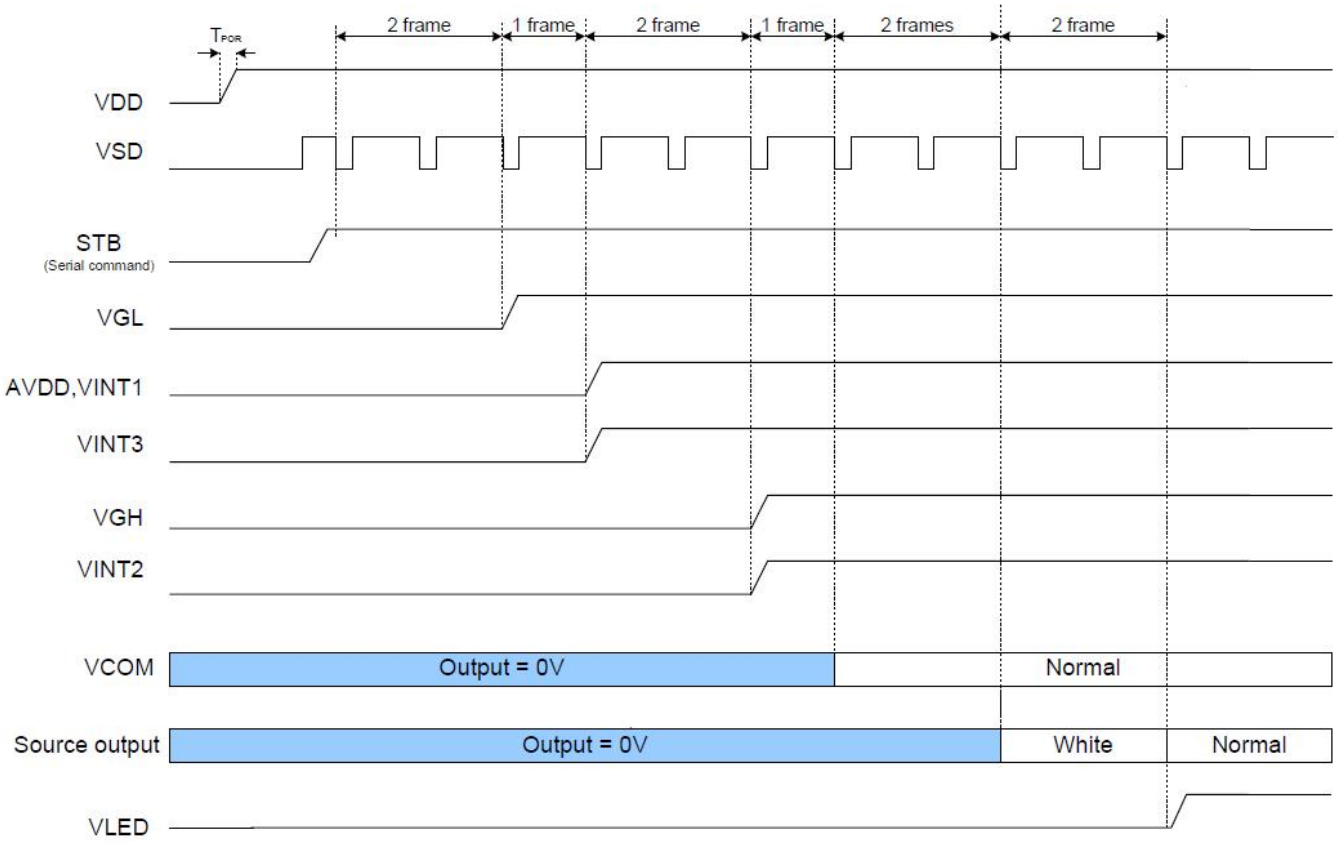
4.1 LCM Pin Assignment

No.	Symbol	Description
1	LEDK	Power for LED backlight (Cathode)
2	LEDA	Power for LED backlight (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	Clock signal. Latching data at the rising edge
31	DISP	Standby mode. Normally pulled high. DISP="1": Normally operation (Default) DISP="0": Timing controller, source driver will turn off ,all output are High-Z.
32	HS	Horizontal Sync input. Negative polarity.
33	VS	Vertical Sync input. Negative polarity.
34	DE	Data input Enable. Active High to enable the data input Bus under "DE Mode".
35	NC	No connection
36	GND	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

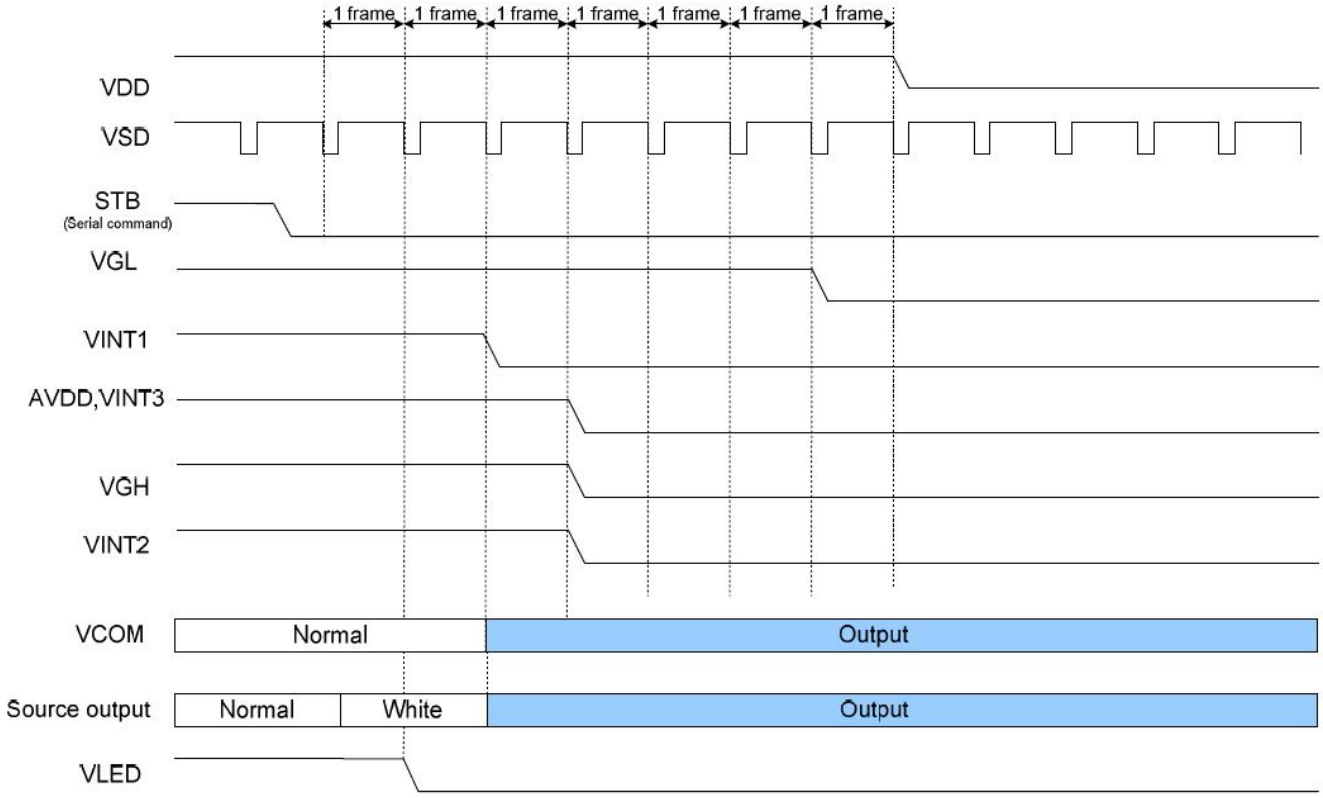
5. Interface Characteristics

5.1 Power Sequence

5.1.1 Power On Sequence



5.1.2 Power Off Sequence



5.2 DC Characteristics

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
Digital Block Circuit						
Low Level Input Voltage	Vil	GND	-	0.3xVDDIO	V	Digital input pins
High Level Input Voltage	Vih	0.7xVDDIO	-	VDDIO	V	Digital input pins
Input Leakage Current	Ii	-	-	±1	uA	Digital input pins
Pull-high/low Impedance	Rin	-	200K	-	ohm	Digital control input pins VDDIO=3.3V
High Level Output Voltage	Voh	VDDIO-0.4	-	-	V	Digital input pins Ioh=400uA
Low Level Output Voltage	Vol	GND	-	GND+0.4	V	Digital output pins Iol=-400uA
Digital Stand-by Current	Idst	-	-	50	uA	Output are High-Z, all pins are default
Digital Operating Current	Icc	-	4	-	mA	DCLK=9MHz, Fld=17.28KHz (@ 24bit RGB mode), no load

Analog Block Circuit						
Analog Supply Voltage	AVDD	-	5.2	5.6	V	
GAMMA reference voltage	VDDA	-	5	-	V	
Step-up Circuit 1 Output Voltage	VINT1	5.8	-	-	V	
VCOMH Output Level	VCOMH	2.46		5	V	By VCOMH[6:0] setting
VCOML Output Level	VCOML	-3		-0.46	V	By VCOML[6:0] setting; VCOML>VINT3
Feed back voltage for PWM	VFB	0.25	0.6	0.8	V	DC-DC operating.
Base drive current for PWM	IDRV	-	20	-	mA	VDD=3.3V
Voltage Deviation of Outputs	Vvd	-	±20	±35	mV	Vo=0.1V ~ 0.5V & AVDD-0.5 ~ AVDD-0.1
		-	±15	±20	mV	Vo=0.5V ~ AVDD-0.5V
Dynamic Range of Ouput	Vdr	0.1	-	AVDD-0.1	V	S1 to S720
Low-level Output Current of VCOM	IOLC	-	18	-	mA	VCOMH=4V, VCOML=-1V VCOM output=-1V V.S. -0.1V
High-level Output Current of VCOM	IOHC	-	-18	-	mA	VCOMH=4V, VCOML=-1V VCOM output=4V V.S. 3.1V
Source Low-level Output Current	IOLS	-	100	-	uA	S1 to S720; VO=0.1 V.S. 1V
Source High-level Output Current	IOHS	-	-100	-	uA	S1 to S720; VO=4.9 V.S 4.0
Gate Low-level Output Current	IOLG	100	-	-	uA	G1 to G544; VO=VGL V.S. VGL+0.5
Gate High-level Output Current	IOHG	-100	-	-	uA	G1 to G544; VO=VGH V.S. VGH-0.5
Analog Stand-by Current	Iast	-	-	100	uA	STB="L", all function are shutdown
Analog Operating Current	IDD	-	15	-	mA	DCLK=9MHz, Fld=17.28KHz (@ 24bit RGB mode), No load

5.3 AC Characteristics

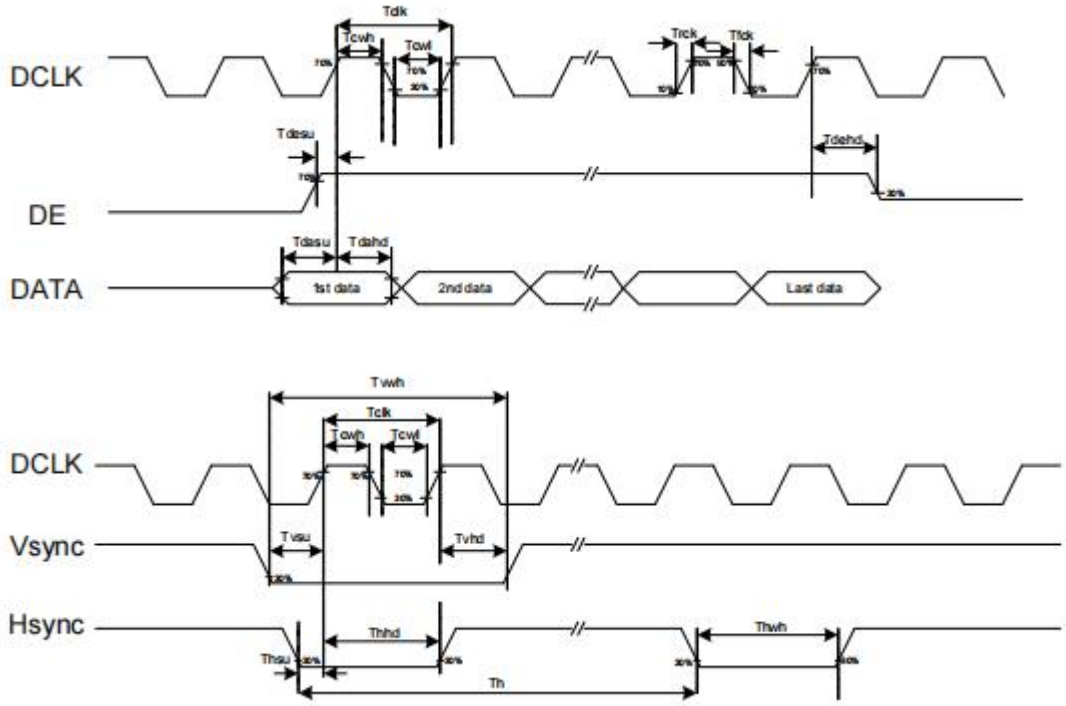
5.3.1 Input signal characteristics

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input Output timing						
DCLK clock time	Tclk	33.3	-	-	ns	DCLK=30MHz
DCLK clock low period	Tcwl	40	-	60	%	
DCLK clock high period	Tcwh	40	-	60	%	
Clock rising time	Trck	9	-	-	ns	
Clock falling time	Tfck	9	-	-	ns	
HSD width	Thwh	1	-	-	DCLK	
HSD period time	Th	55	60	65	us	
HSD setup time	Thsu	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
VSD width	Tvwh	1	-	-	Th	
VSD setup time	Tvsu	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
Data setup time	Tdasu	12	-	-	ns	
Data hold time	Tdahd	12	-	-	ns	
DE setup time	Tdesu	12	-	-	ns	
DE hold time	Tdehd	12	-	-	ns	
Source output setting time	Tsst	-	-	12	us	10% to 90% CL=60pF, RL=2Kohm
Gate output setting time	Tgst	-	-	1200	ns	10% to 90%, CL=60pF
VCOM output setting time	Tcst	-	-	12	us	10% to 90%, CL=40nF, RL=50ohm
Time from VSD to 1st line data input	Tvs	3	8	31	Th	HV mode By HDL[4:0] setting

3-wire serial communication AC timing						
Serial clock	Tsck	200	-	-	ns	For SCL pin
SCL pulse low period	Tckl	40	-	60	%	
SCL pulse low period	Tckh	40	-	60	%	
Serial data setup time	Tisu	50	-	-	ns	
Serial data hold time	Tihd	50	-	-	ns	
Serial clock high/low	Tssw	50	-	-	ns	
CSB to VSD	Tcv	1			us	
CSB distinguish time	Tcd	400	-	-	ns	
CSB input setup time	Tcsu	50	-	-	ns	
CSB input hold time	Tchd	50	-	-	ns	

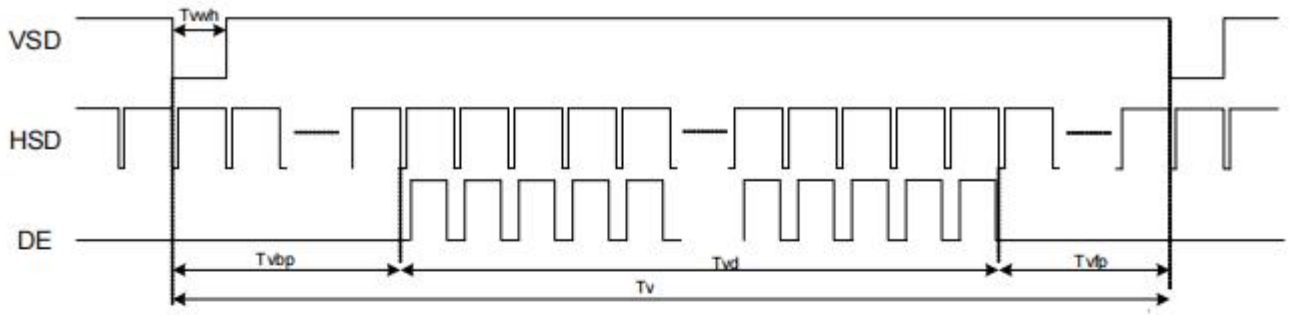
5.4 Timing Chart

5.4.1 Clock and Data Input Waveforms

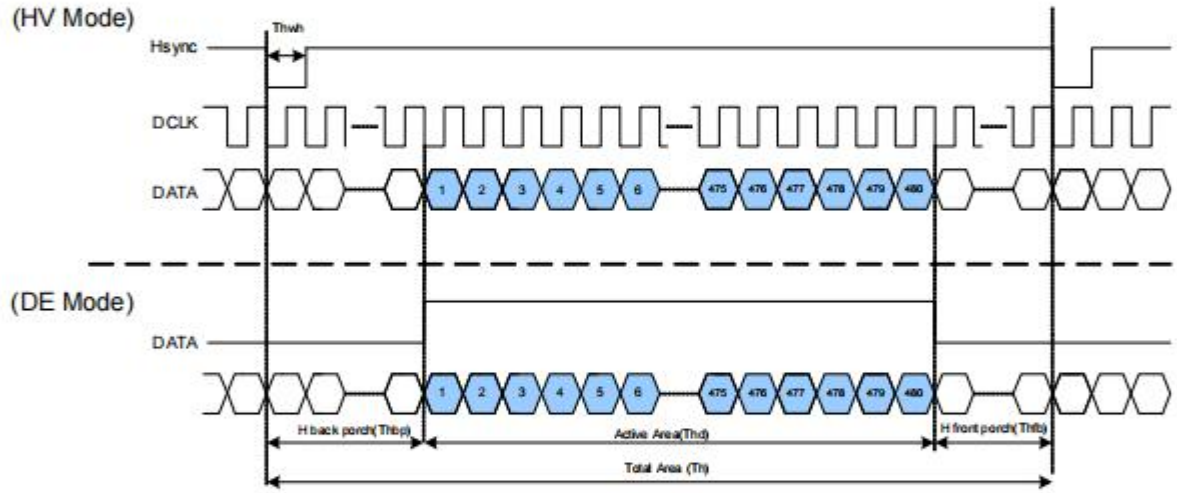


5.4.2 Data Input Format

Vertical input timing

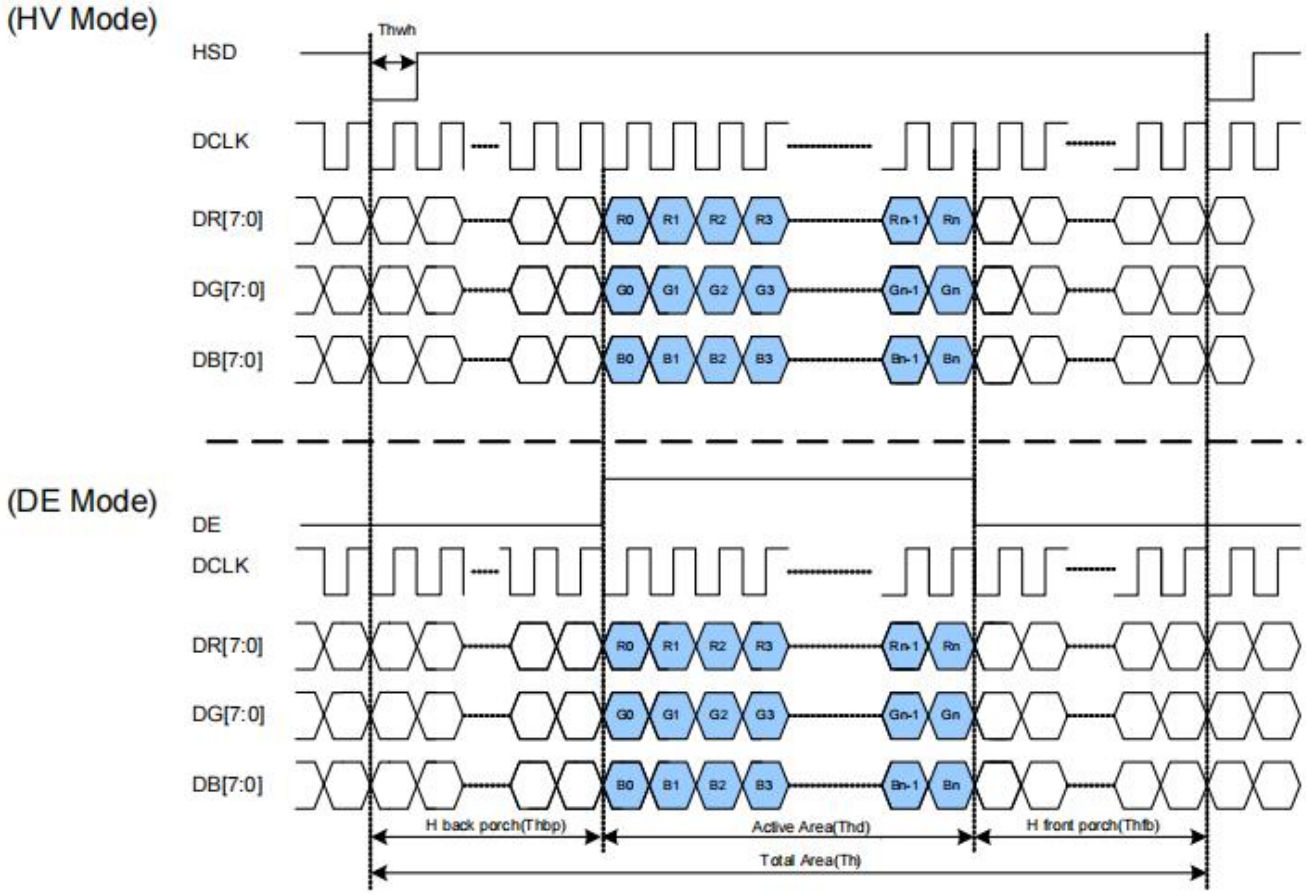


Serial 8-bit RGB Mode Data format



Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
DCLK frequency	Fclk	24	27	30	MHz	
DCLK cycle time	Tclk	83	110	200	ns	
DCLK pulse duty	Tcwh	40	50	60	%	
Time from HSD to source output	Thso	-	13	-	DCLK	
Time from HSD to gate output	Thgo	-	27	-	DCLK	
Time from HSD to gate output off	Thgz	-	3	-	DCLK	
Time from HSD to VCOM	Thvc	-	12	-	DCLK	

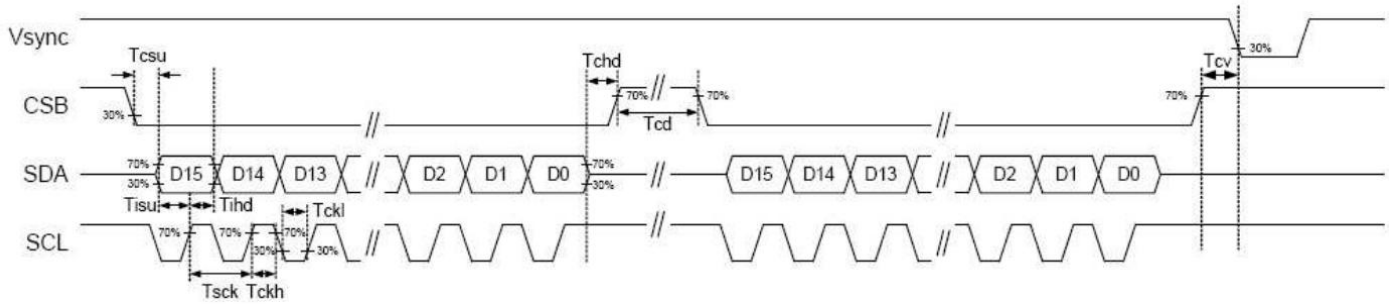
Parallel RGB Mode Data format



Parallel RGB input timign table

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	5	9	12	MHz
VSD period time	Tv	277	288	400	H
VSD display area	Tvd		272		H
VSD back porch	Tvb	3	8	31	H
VSD front porch	Tvfp	2	8	97	H
HSD period time	Th	520	525	800	DCLK
HSD display area	Thd		480		DCLK
HSD back porch	Thbp	36	40	255	DCLK
HSD front porch	Thfp	4	5	65	DCLK

5.4.3 3-wire Timing Diagram

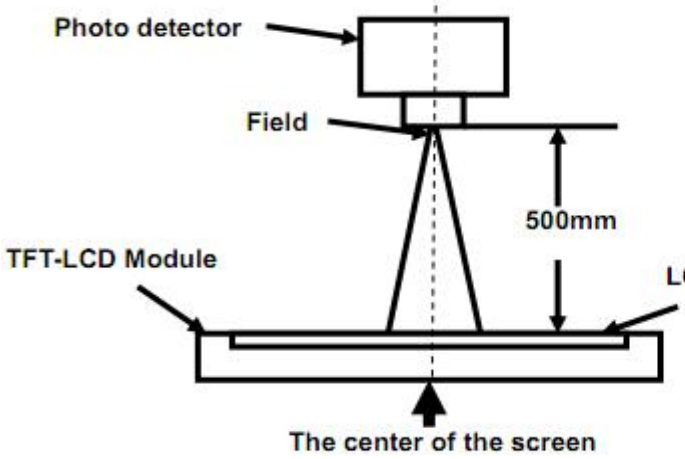


6. Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10) B/L ON	θ_T	Φ=90°(12 o'clock)	40	50	-	deg	Note2
	θ_B	Φ=270°(6 o'clock)	60	70	-	deg	Note2
	θ_L	Φ=180°(9 o'clock)	60	70	-	deg	Note2
	θ_R	Φ=0°(3 o'clock)	60	70	-	deg	Note2
Response Time	T_{ON}	Normal θ=Φ=0°	-	12	25	msec	Note4
	T_{OFF}		-	12	25	msec	Note4
Contrast Ratio	CR		400	500	-	-	Note1 Note3
Color Chromaticity	W_X		TBD	TBD	TBD	-	Note1 Note5
	W_Y		TBD	TBD	TBD	-	Note1 Note5
Luminance	L		650	750	-	cd/m²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		-	-	-	%	-

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°

Fig 1

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).

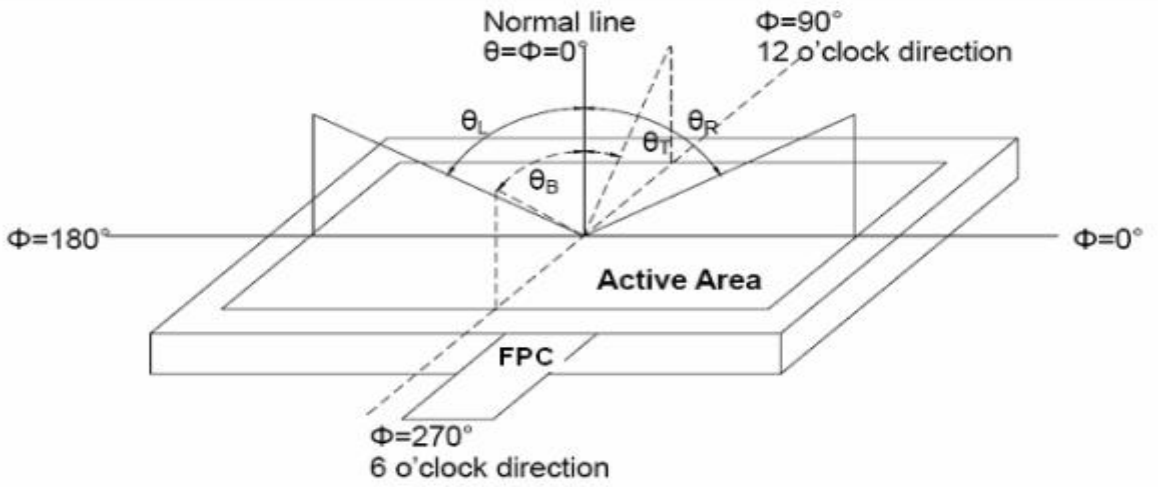


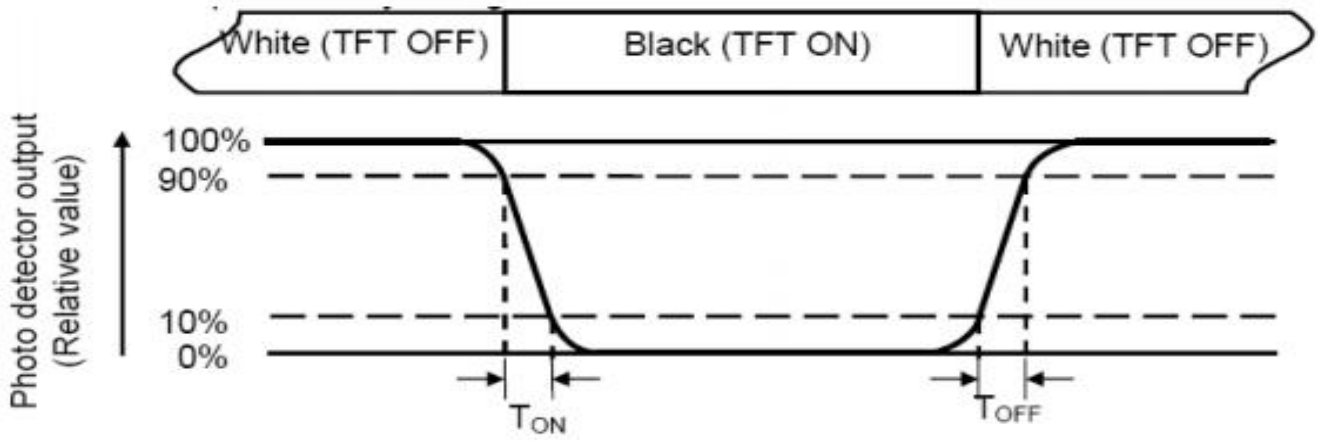
Fig 2 Definition of viewing angle

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.3-a/b

Note 7:Surface luminance is the luminance with all pixels displaying white.

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

For more information see FIG.3-a/b

Note 8:

H,V : Active area(see Figure a)

Light spot size ⌀ =5mm(BM-5) or ⌀ =7.7mm (BM-7)50cm distance or test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter SR-3A or BM-7 or compatible (see Figure 1).

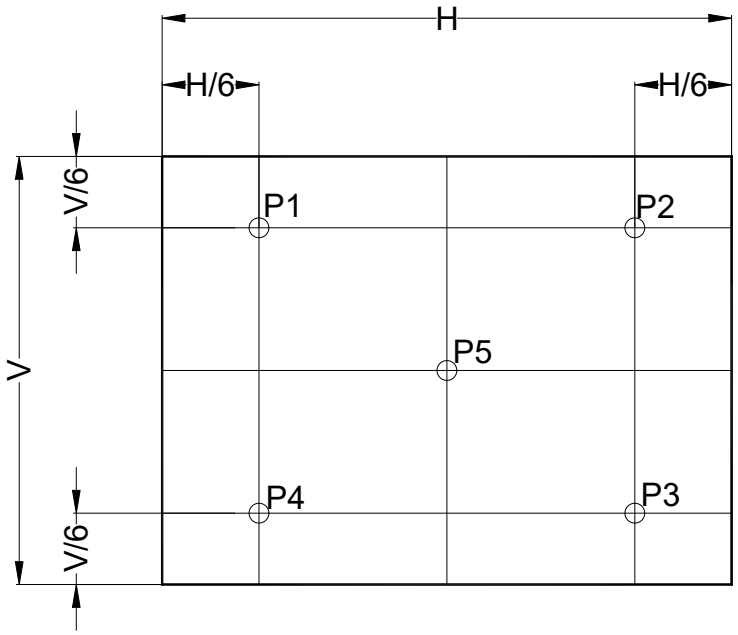


Fig. 3-a Definition of points

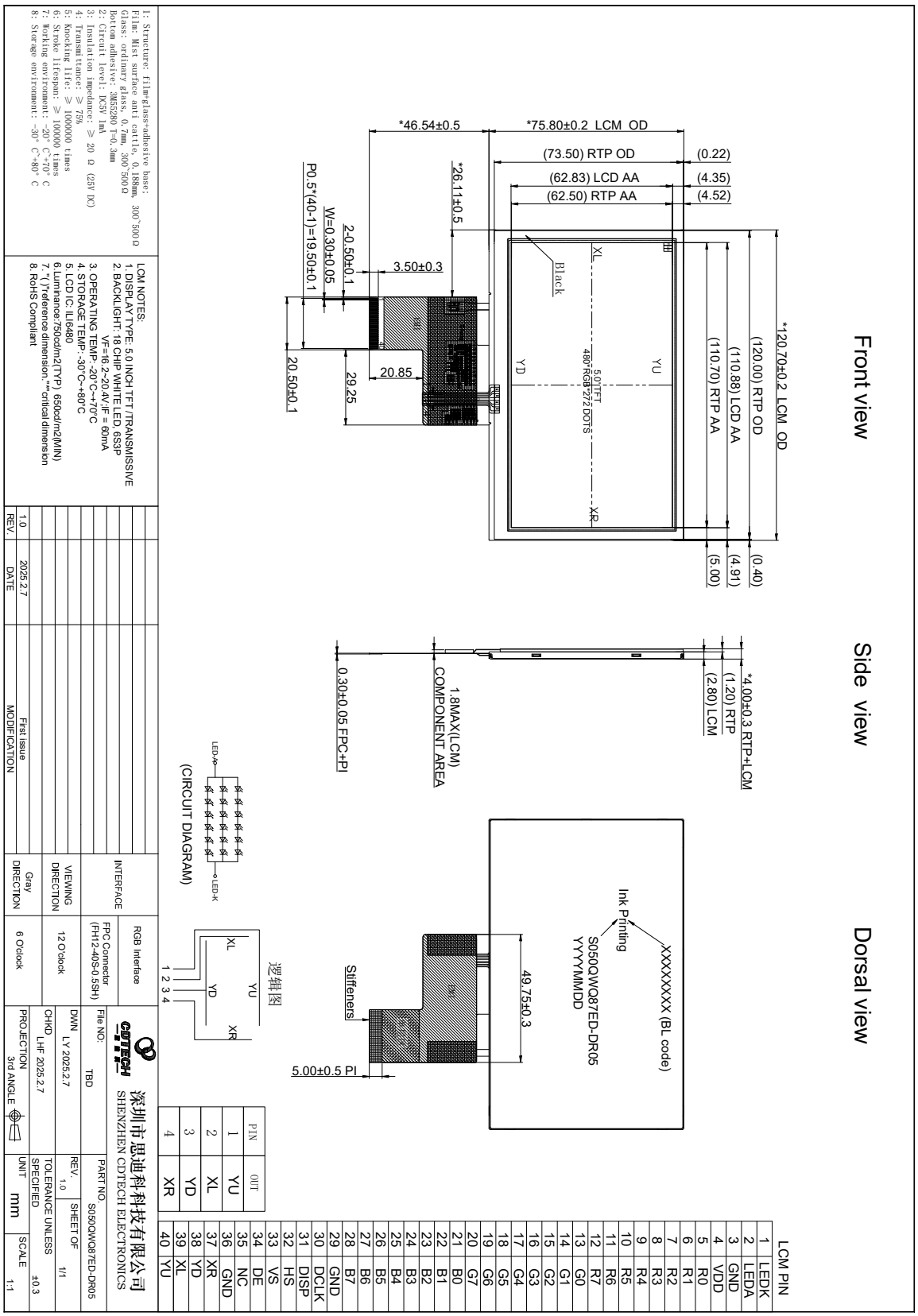
7. Reliability Test Items

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:

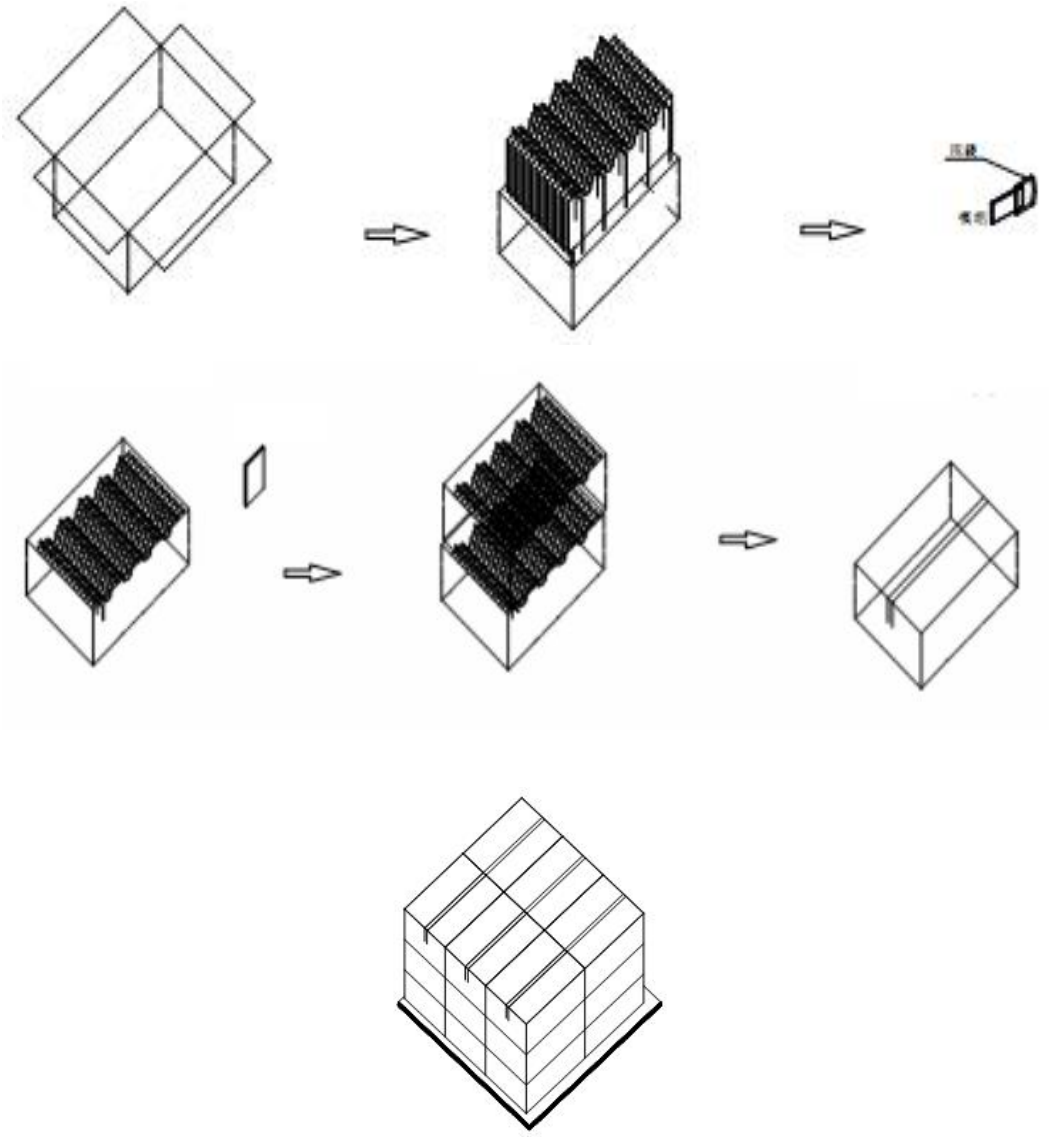
1). Air bubble in the LCD
2). Seal leak or Glass crack
3). Non display or abnormal display
4). Brightness reduction >50%

8. Mechanical Drawing



9. Packing

Packing Method



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.

10.4 Packaging instructions

When the customers using trays, they have to stack the adjacent trays in a 180° staggered to prevent pressure that could cause product damage.