

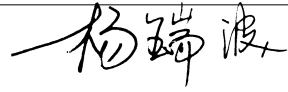
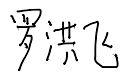
PRODUCT SPECIFICATION

CDTECH Model: **S101QWS91HD-DC89**

CUSTOMER Model: **-**

Description: **10.1 " TFT-LCD Module with CTP**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2024.12.24	2024.12.24	2024.12.24

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	10.1	inch
Number of Pixels	1024 (H) RGB x 600 (V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	-
Interface	MIPI	-
Display Colors	16.7M	colors
Outline Dimension	257.00 (H) x 160.00 (V) x 7.57 (D)	mm
Active Area	222.72 (H) x 125.28 (V)	mm
Pixel Pitch	0.2175 (H) x 0.2088 (V)	mm
Driver IC	EK79007+EK73217	-
Operation Temperature	-20~70	°C
Storage Temperature	-30~80	°C

1.2 Touch Panel Information

Item	Specification
Touch Structure	G+G
Bonding Type with LCM	Perimeter Bonding
Driver IC	ILI2132
Interface	I ² C
Touch Count Max	10 Points
Surface treatment	-
Surface hardness	6H
I2C slave address	0x82
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	VCC3.3V	-0.3	5.0	V	Note 1
Digital supply voltage	IOVCC1.8V	-0.3	2.0	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

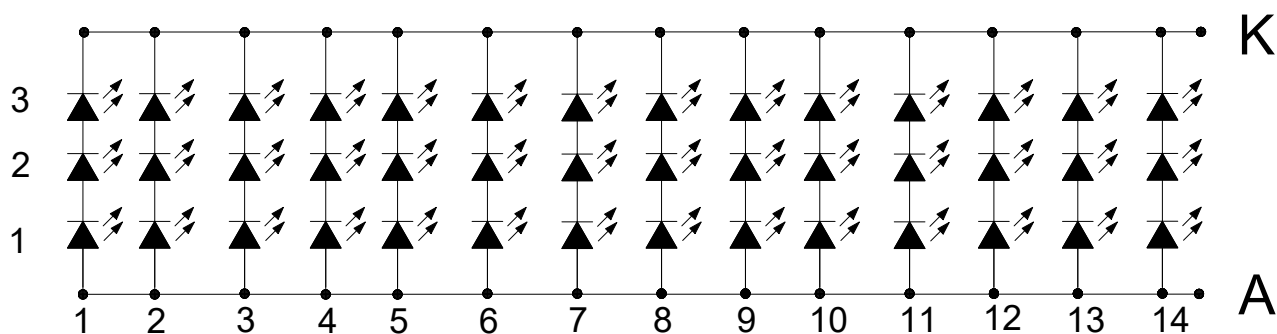
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VCC3.3V	3.0	3.3	3.6	V	
Analog supply current	I _{VCC3.3V}	100	150	200	mA	VCC3.3V=3.3V (Red, Green)
Logic supply voltage	IOVCC1.8V	1.71	1.8	1.89	V	
Logic supply current	I _{IOVCC1.8V}	10	15	20	mA	IOVCC1.8V=1.8V (Red, Green)
Logic input voltage	V _{IH}	0.7*IOVCC1.8V	-	IOVCC1.8V	V	
	V _{IL}	GND	-	0.3*IOVCC1.8V	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I _F	-	350	-	mA	
Driving Voltage	V _F	8.1	-	10.2	V	
Power consumption	W _{BL}	2.835	-	3.57	W	
LED Life-Time	N/A	-	50,000	-	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 :



3.3 Touch Panel

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply voltage	VDD	-	3.3	-	V	
Analog supply current	I _{VDD}	-	90	-	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	VCC3.3V	Power supply 3.3V
2	VCC3.3V	Power supply 3.3V
3	IOVCC1.8V	Power supply 1.8V
4	RESET	Global reset pin
5	GND	Ground
6	D0N	MIPI Negative data signal(-)
7	D0P	MIPI Positive data signal(+)
8	GND	Ground
9	D1N	MIPI Negative data signal(-)
10	D1P	MIPI Positive data signal(+)
11	GND	Ground
12	CLKN	MIPI Negative clock signal(-)
13	CLKP	MIPI Positive clock signal(+)
14	GND	Ground
15	D2N	MIPI Negative data signal(-)
16	D2P	MIPI Positive data signal(+)
17	GND	Ground
18	D3N	MIPI Negative data signal(-)
19	D3P	MIPI Positive data signal(+)
20	GND	Ground
21	NC	No connection
22	GND	Ground
23	GND	Ground
24	NC	No connection

25	GND	Ground
26	LEDK	Power for LED backlight (Cathode)
27	LEDK	Power for LED backlight (Cathode)
28	NC	No connection
29	LED A	Power for LED backlight (Anode)
30	LED A	Power for LED backlight (Anode)

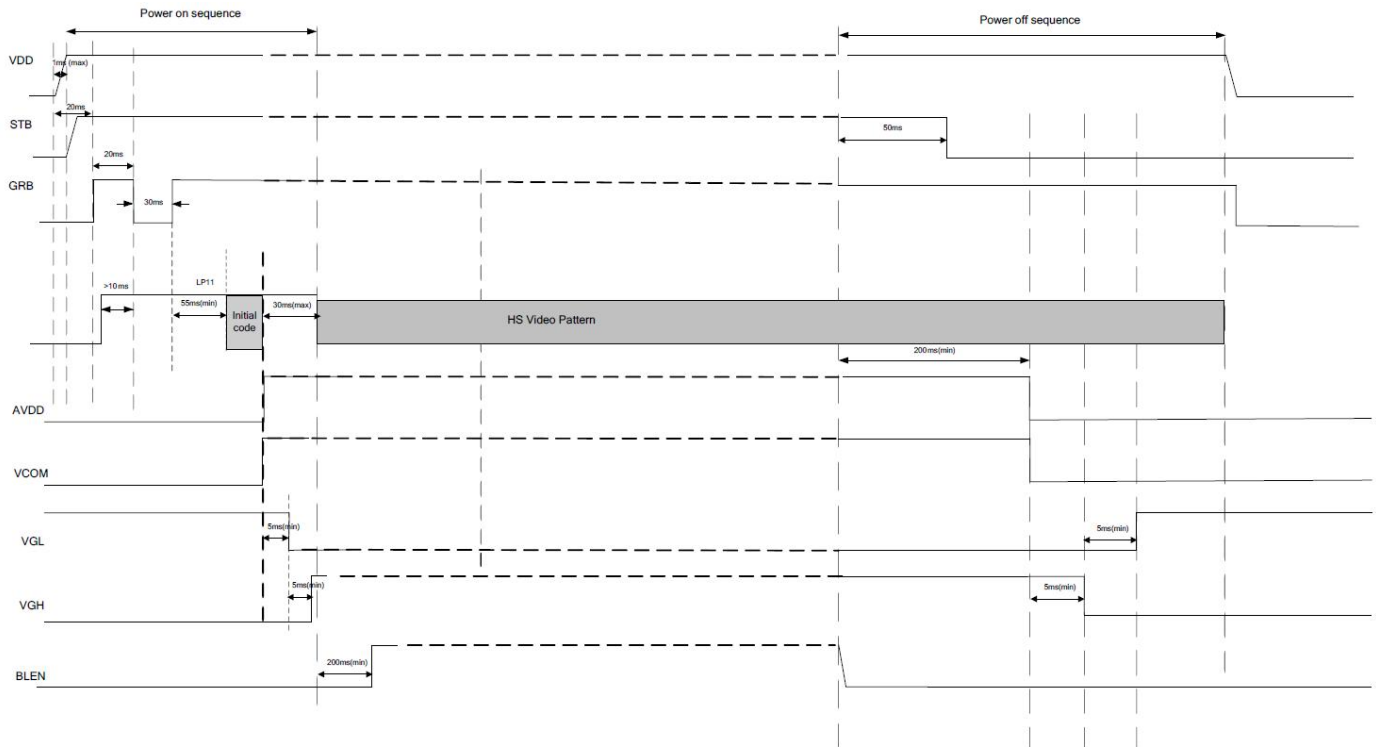
4.2 Touch FPC Pin Assignment

No.	Symbol	Description
1	GND	Ground
2	INT	Interrupt signal for CTP
3	RST	Reset Pin for CTP
4	SDA	I2C data input and output for CTP
5	SCL	I2C clock input for CTP
6	VDD	Power supply for CTP
7	VDD	Power supply for CTP
8	GND	Ground

5. Interface Characteristics

5.1 Power On/Off Sequence

In order to prevent IC from power on reset fail, the rising time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “AC Characteristics” for more detail on timing.



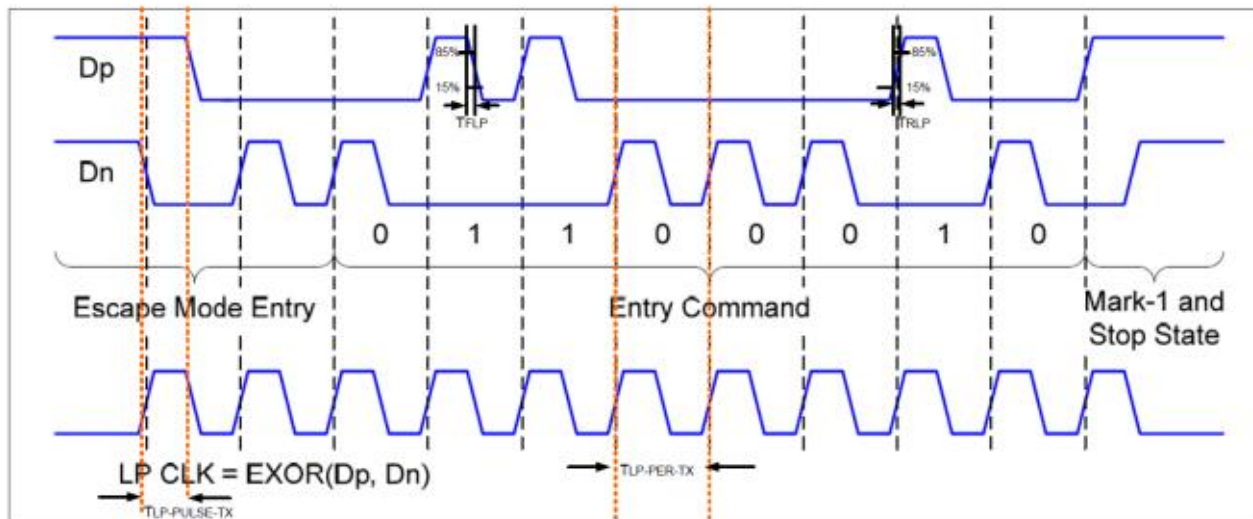
Note: CLK and Data Lanes should keep in LP11(stop state) before GRB

5.2 AC ELECTRICAL CHARACTERISTIC

5.2.1 MIPI AC Characteristic

LP Transmitter AC Specification

Parameter	Symbol	Min	Typ	Max	Units	Notes
15%~85% rising time and falling time	T_{RLP} / T_{FLP}	-	-	25	ns	-
30%~85% rising time and falling time	T_{REOT}	-	-	35	ns	-
Pulse width of LP exclusive-OR clock	$T_{LP-PULSE-TX}$	40	-	-	ns	-
		20	-	-	ns	-
Period of the LP EXOR clock	$T_{LP-PER-TX}$	90	-	-	mV/ns	-
Slew Rate @CLOAD =0pF	$\delta V / \delta t_{SR}$	30	-	500	mV/ns	-
Slew Rate @CLOAD =5pF		30	-	200	mV/ns	-
Slew Rate @CLOAD =20pF		30	-	150	mV/ns	-
Slew Rate @CLOAD =70pF		30	-	100	mV/ns	-
Load Capacitance	T_{RLP}	-	-	70	pF	-

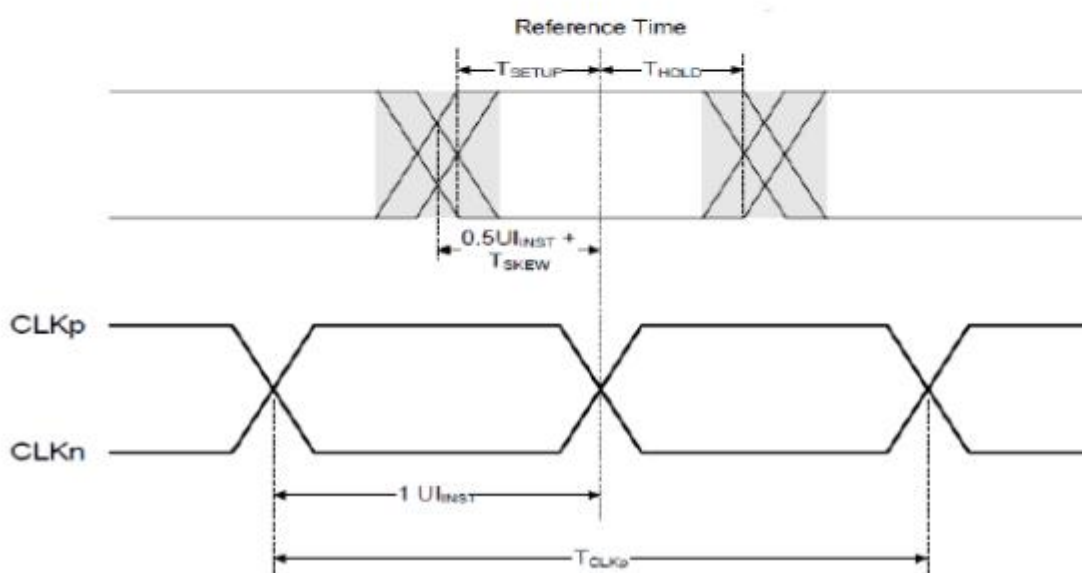


Turnaround Procedure Operation Timing Parameters

The diagram illustrates the timing of the LPX pin during a transition. It shows the signal state (LP-11, LP-10, LP-00) and the duration of various timing intervals: T_{LPX} (low pulse width), T_{TA-GO} (time to activate TA), $T_{TA-SURE}$ (time to ensure TA is active), T_{TA-GET} (time to get TA active), and T_{LPX} (low pulse width) again. A 'drive overlap' period is also indicated.

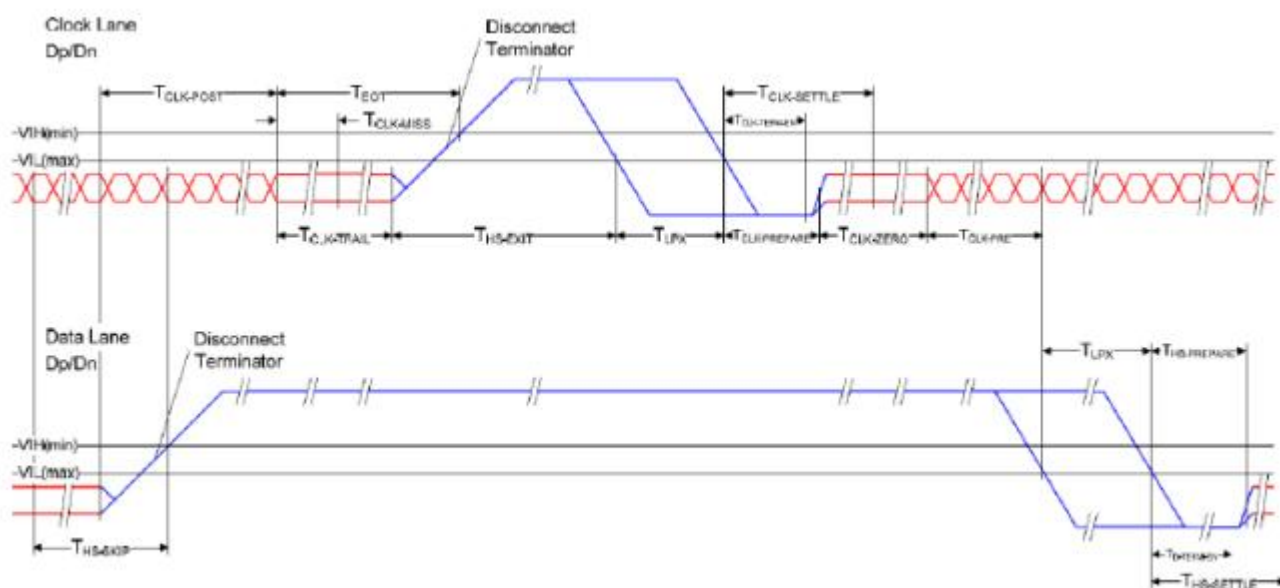
High speed transmission

Parameter	Symbol	Min	Typ	Max	Units
UI instantaneous	U_{INST}	2	-	12.5	ns
Data to Clock Skew(measured at transmitter)	$T_{SKEW(TX)}$	-0.15	-	0.15	U_{INST}
Data to Clock Setup time(measured at receiver)	$T_{SETUP(RX)}$	0.15	-	-	U_{INST}
Data to Clock Hold time(measured at receiver)	$T_{HOLD(RX)}$	0.15	-	-	U_{INST}
20%~80% rise time and fall time	T_R, T_F	150	-	-	ps
		-	-	0.3	U_{INST}

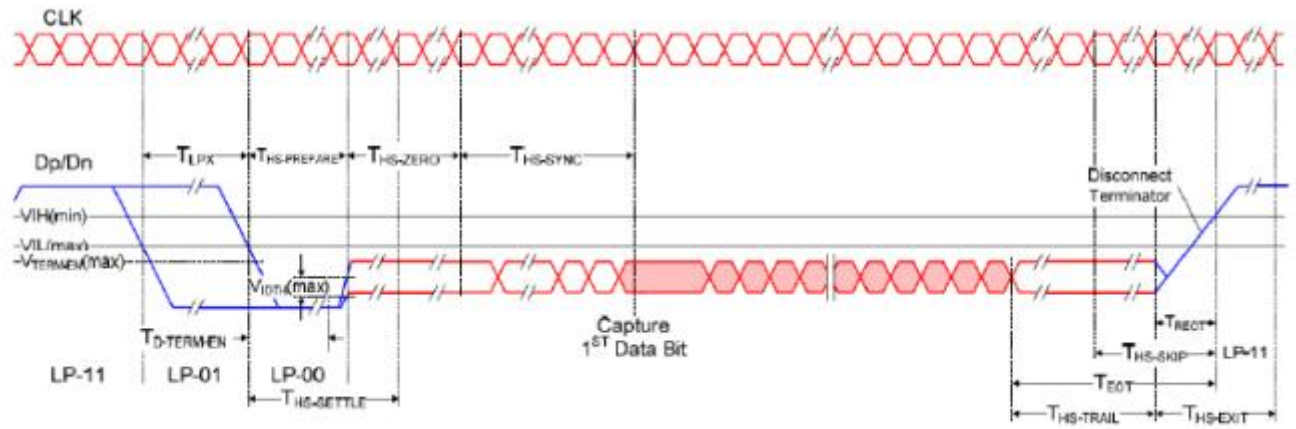


High Speed Clock Transmission

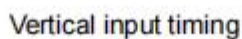
Parameter	Symbol	Min	Typ	Max	Units
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	TCLK-POST	60+52UI	-	-	ns
Detection time that the clock has stopped toggling	TCLK-MISS	-	-	60	ns
Time to drive LP-00 to prepare for HS clock transmission	TCLK-PREPARE	38	-	95	ns
Minimum lead HS-0 drive period before starting clock	TCLK-PREPARE + TCLK-ZERO	300	-	-	ns
Time to enable Clock Lane receiver line termination measured from when Dn cross $V_{IL,MAX}$	THS-TERM-EN	-	-	38	ns
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	TCLK-PRE	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	TCLK-TRAIL	60	-	-	ns



High Speed Data Transmission in Bursts



For 1024RGB x 600 panel



DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	Tvd	600			H
VSYNC period time	Tv	610	635	800	H
VSYNC blanking	Tvb+Tvfp	10	35	200	H

HV mode

Horizontal input timing

Parameter		Symbol	Value			Unit
Horizontal display area		thd	1024			DCLK
DCLK frequency@ Frame rate=60hz		fclk	Min.	Typ.	Max.	Mhz
			44.9	51.2	63	
1 Horizontal Line		th	1200	1344	1400	DCLK
HSYNC pulse width	Min.	thpw	1			
	Typ.		70			
	Max.		140			
HSYNC blanking		thb	160	160	160	
HSYNC front porch		thfp	16	160	216	

HV mode

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tpw	1	10	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

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)	80	-	-	deg	Note2
	θ_B	$\Phi=270^\circ$ (6 o'clock)	80	-	-	deg	Note2
	θ_L	$\Phi=180^\circ$ (9 o'clock)	80	-	-	deg	Note2
	θ_R	$\Phi=0^\circ$ (3 o'clock)	80	-	-	deg	Note2
Response Time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	12	17	msec	Note4
	T_{OFF}		-	12	17	msec	Note4
Contrast Ratio	CR		800	1000	-	-	Note1 Note3
Color Chromaticity	W_X		0.3098	0.3398	0.3698	-	Note1 Note5
	W_Y		0.3268	0.3568	0.3868	-	Note1 Note5
Luminance	L		370	420	-	cd/m ²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		-	50.81	-	%	-

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.

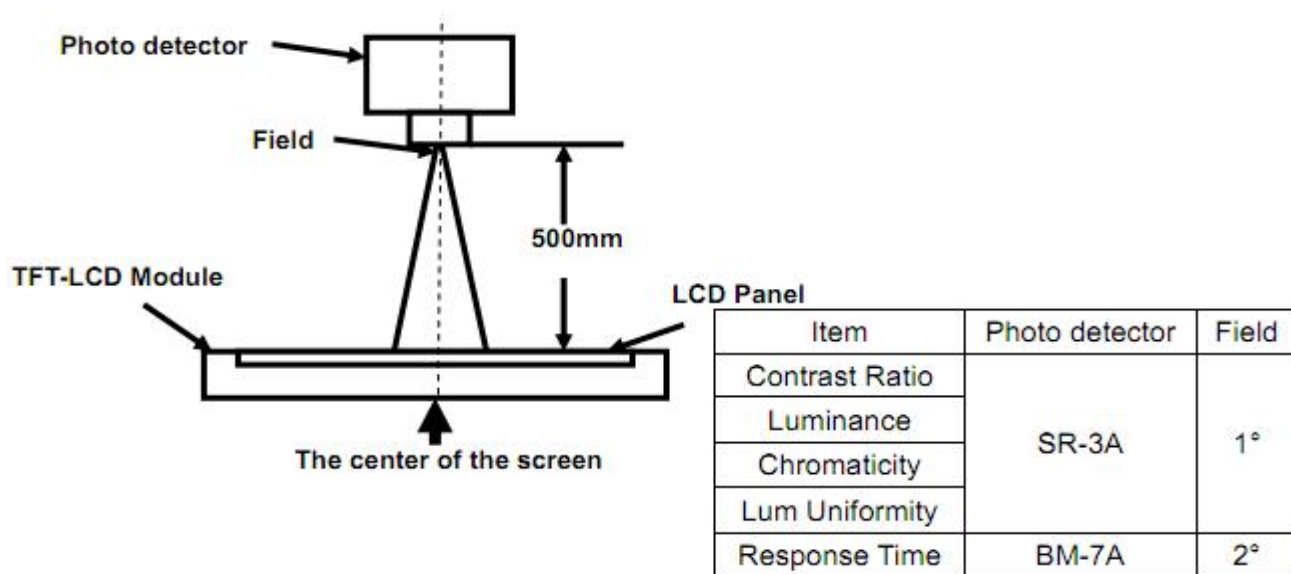


Fig 1

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).

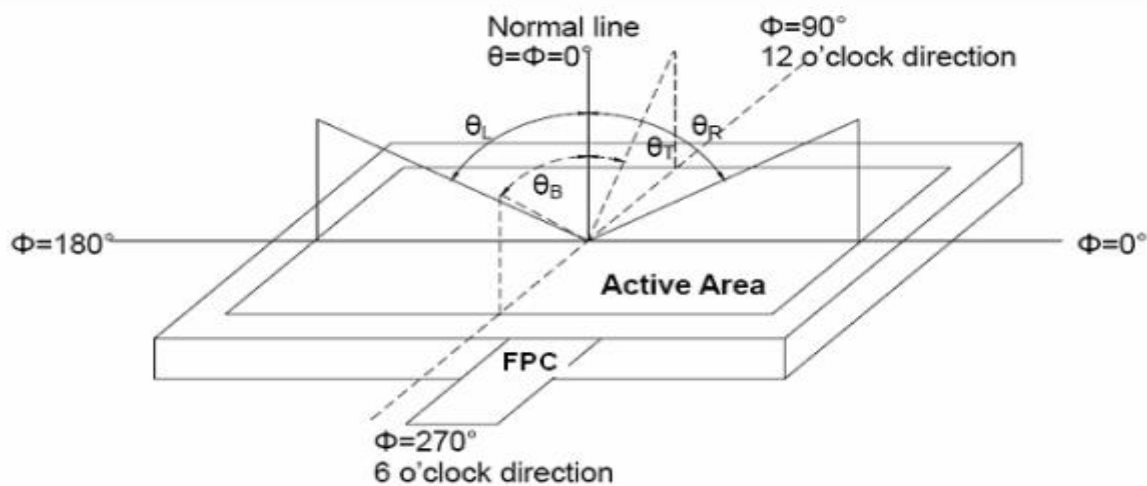


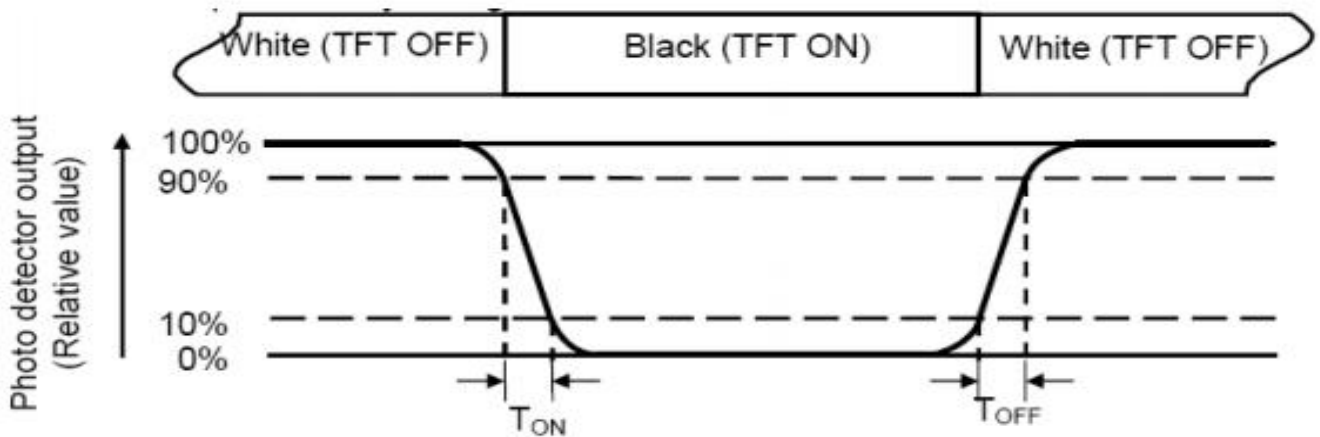
Fig 2 Definition of viewing angle

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.

L_v = Average Surface Luminance with all white pixels ($P_1, P_2, P_3, \dots, P_n$)

For more information see FIG.3-a/b

Note 8: Size : $S \leq 5"$ (see Figure a) H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (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).

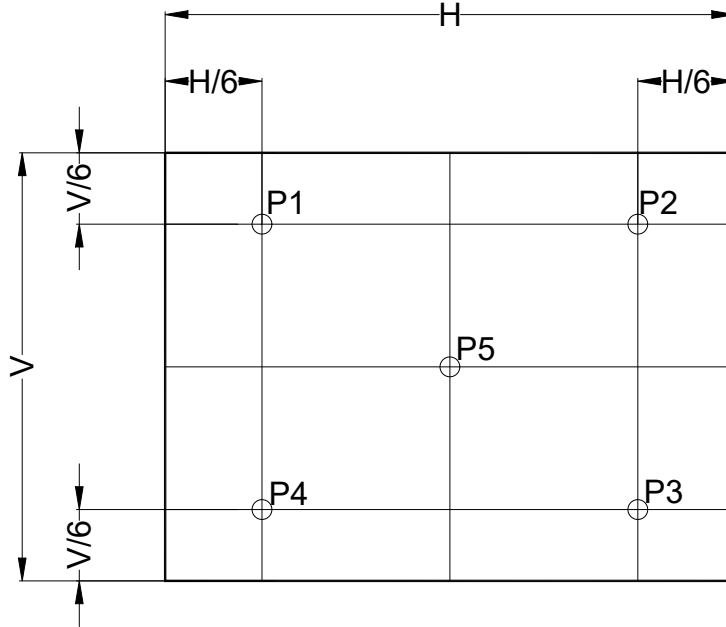


Fig. 3-a Definition of points

$5" < S \leq 12.3"$ (see Figure b) . H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens. test spot position : see Figure b.

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

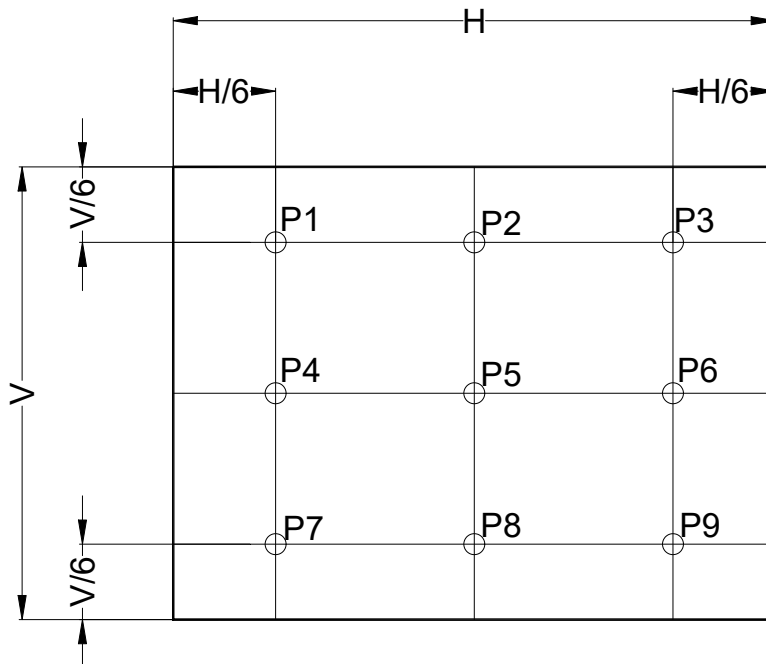


Fig. 3-b Definition of points

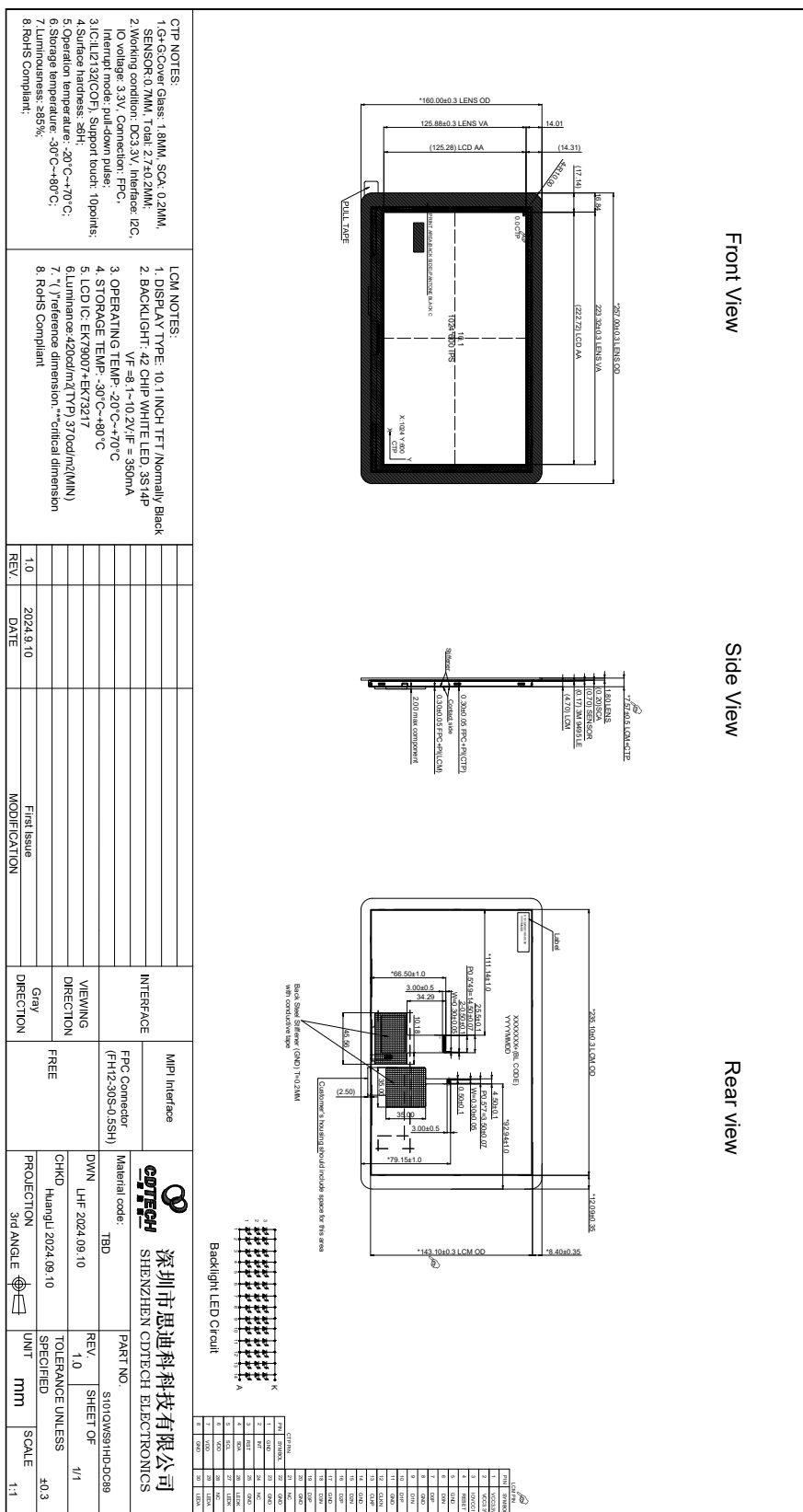
7. Reliability Test Items

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:

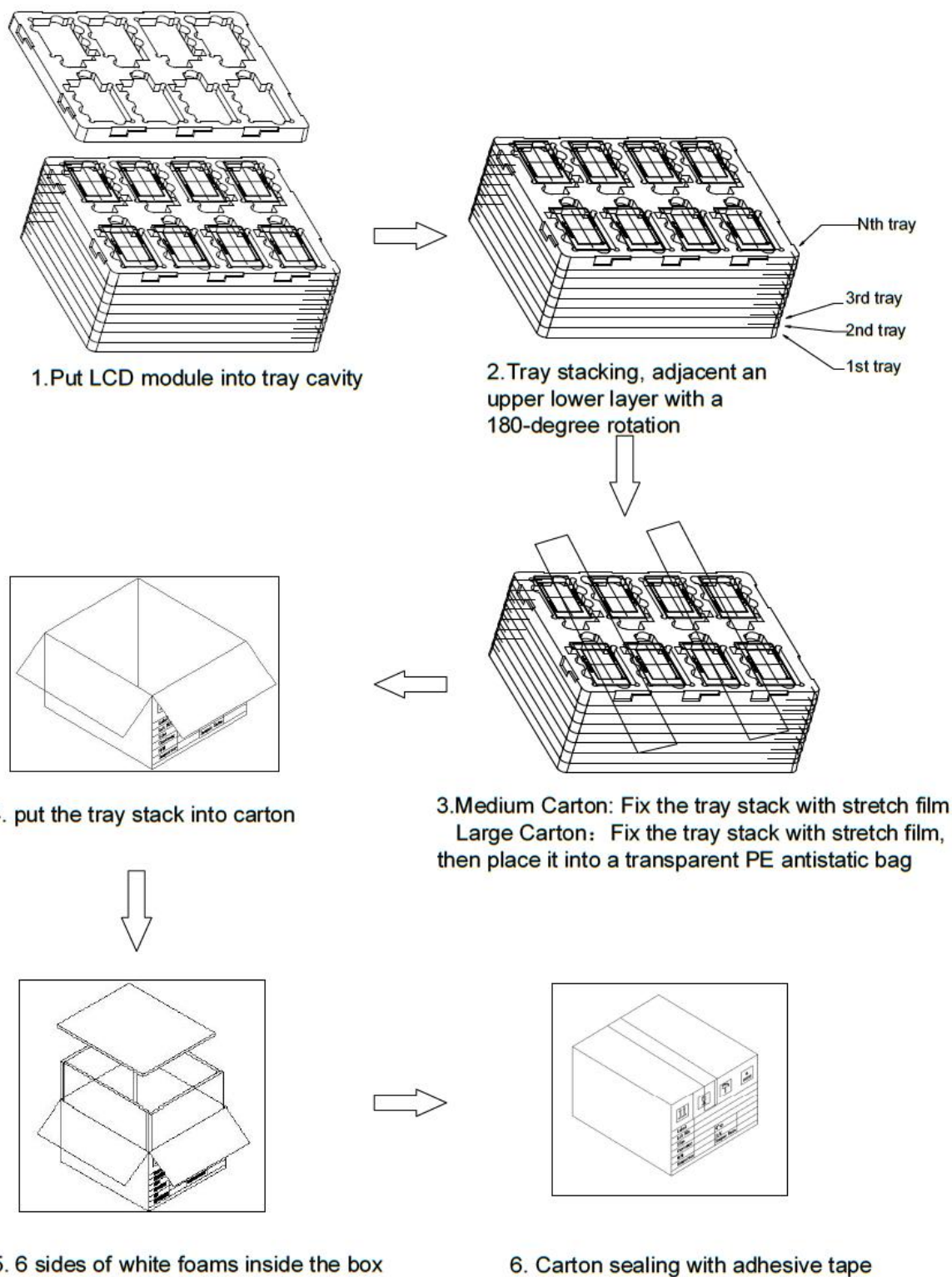
- 1). Air bubble in the LCD
- 2). Seal leak or Glass crack
- 3). Non display or abnormal display
- 4). Brightness reduction >50%

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.