

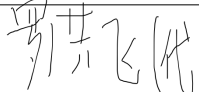
PRODUCT SPECIFICATION

CDTECH Model: **S070KWS127NP**

CUSTOMER Model: **-**

Description: **7.0" TFT-LCD Module**

Version: **1.0**

CDTECH	PREPARED BY	CHECKED BY	APPROVED BY
SIGNATURE			
DATE	2022.8.19	2022.8.19	2022.8.19

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	7.0	inch
Number of Pixels	600(H) RGB x 1024(V)	pixels
Display Mode	Normally Black	-
Viewing Direction	Free	o' clock
Interface	MIPI	-
Display Colors	16.7M	colors
Outline Dimension	94.96(H) x 163.16(V) x2.56(D)	mm
Active Area	89.28(H) x 152.37 (V)	mm
Pixel Pitch	0.1488(H) x 0.1488(V)	mm
Driver IC	JD9365DA-H3	-
Operation Temperature	-10~60	°C
Storage Temperature	-20~70	°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	VDDIO	-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

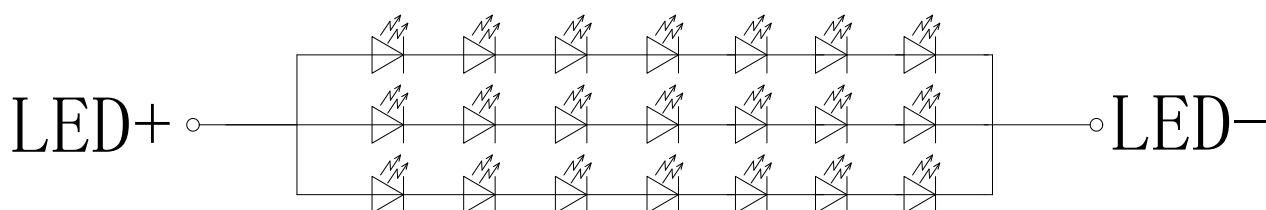
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VDD	3.0	3.3	3.6	V	
Analog supply current	I _{VDD}	-	TBD	-	mA	VDD=3.3V
Logic supply voltage	VDDIO	1.65	1.8	3.3	V	
Logic supply current	I _{VDDIO}	-	TBD	-	mA	VDDIO=1.8V
Logic input voltage	V _{IH}	0.7*VDDIO	-	VDDIO	V	
	V _{IL}	GND	-	0.3*VDDIO	V	

3.2 Recommended Driving Condition for Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Driving Current	I _F	-	60	-	mA	
Driving Voltage	V _F	18.9	-	23.8	V	
Power consumption	W _{BL}	1.134	-	1.428	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 :



4. Interface Pin Assignment

4.1 LCM Pin Assignment

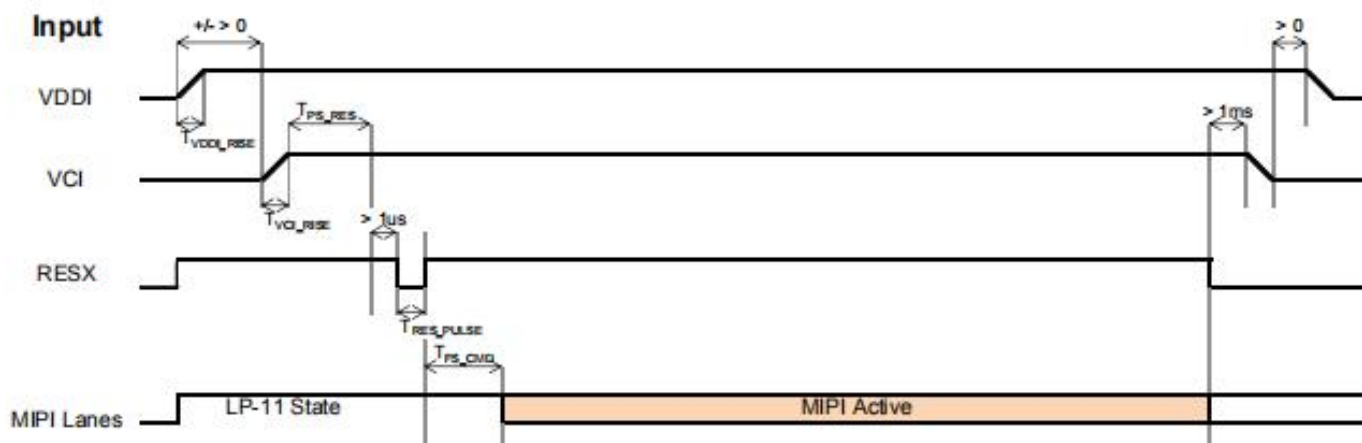
LCD Module connector: SFC-0331H10 manufactured by HIROSE

No.	Symbol	Description
1	LED A	Power for LED backlight (Anode)
2	LED A	Power for LED backlight (Anode)
3	LED A	Power for LED backlight (Anode)
4	NC	No connection
5	LED K	Power for LED backlight (Cathode)
6	LED K	Power for LED backlight (Cathode)
7	LED K	Power for LED backlight (Cathode)
8	LED K	Power for LED backlight (Cathode)
9	GND	Ground
10	GND	Ground
11	MIPI_TDP2	MIPI Positive data signal(+)
12	MIPI_TDN2	MIPI Negative data signal(-)
13	GND	Ground
14	MIPI_TDP1	MIPI Positive data signal(+)
15	MIPI_TDN1	MIPI Negative data signal(-)
16	GND	Ground
17	MIPI_TCP	MIPI Positive clock signal(+)
18	MIPI_TCN	MIPI Negative clock signal(-)
19	GND	Ground
20	MIPI_TDP0	MIPI Positive data signal(+)
21	MIPI_TDN0	MIPI Negative data signal(-)
22	GND	Ground
23	MIPI_TDP3	MIPI Positive data signal(+)
24	MIPI_TDN3	MIPI Negative data signal(-)
25	GND	Ground
26	ID (NC)	LCM ID pin (NC)
27	RESET	Device reset signal
28	NC	No connection
29	VDDIO	Power supply for the I/O circuit
30	VDD	Power supply
31	VDD	Power supply

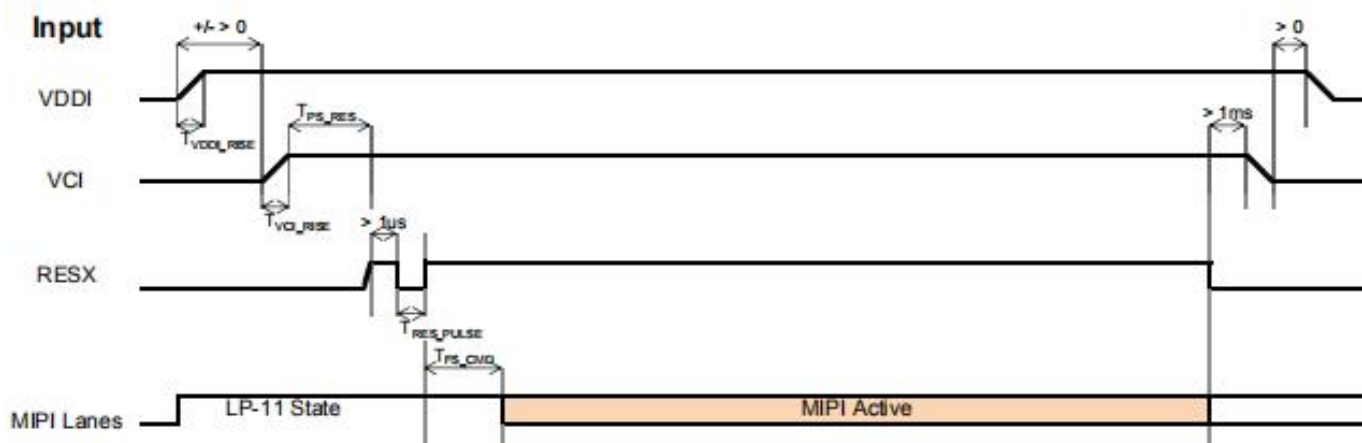
5. Interface Characteristics

5.1 Power On/Off Sequence

Case A:



Case B:



Symbol	Characteristics	Min.	Typ.	Max.	Units
T_{VDDI_RISE}	VDDI Rise time	10	-	-	us
T_{VCI_RISE}	Case A: VCI Rise time	130	-	-	us
	Case B: VCI Rise time	40			
T_{PS_RES}	VDDI/VCI on to Reset high	5	-	-	ms
T_{RES_PULSE}	Reset low pulse time	10	-	-	us
T_{FS_CMD}	Reset to first command	10	-	-	ms

Figure 93: Power on/off sequence with Power Mode 3

5.2 Reset Timing Characteristics

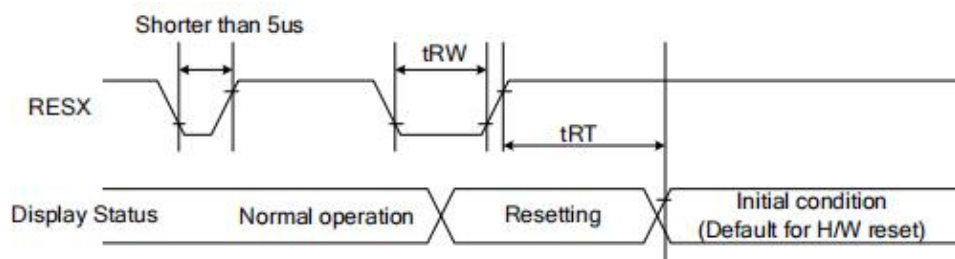


Figure 113: Reset Timing

Table 47: Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5) 120 (note 1,6,7)	mS

Notes:

1. The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from EEPROM to registers. This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the Table 48.

Table 48: Reset Descript

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

3. During the Resetting period, the display will be blanked (The display enters the blanking sequence, which maximum time is 120 ms, when Reset Starts in the Sleep Out mode. The display remains the blank state in the Sleep In mode.) and then return to Default condition for Hardware Reset.
4. Spike Rejection can also be applied during a valid reset pulse, as shown below:

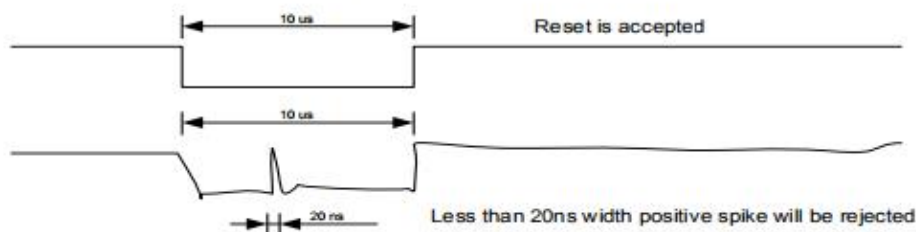


Figure 114: Positive Noise Pulse during Reset Low

5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

5.3 MIPI-DSI Characteristics

5.3.1 High Speed Mode - Data Clock Channel Timing

CLKP/N lanes can be driven to the High Speed Clock Mode (HSCM) when CLK lanes start to function between HS-0 and HS-1 State Codes. The only entering possibility is from the Low Power Mode (LPM, LP-11 State Code) => LP-01 => LP-00 => HS-0 => HS-0/1 (HSCM). This sequence is illustrated below.

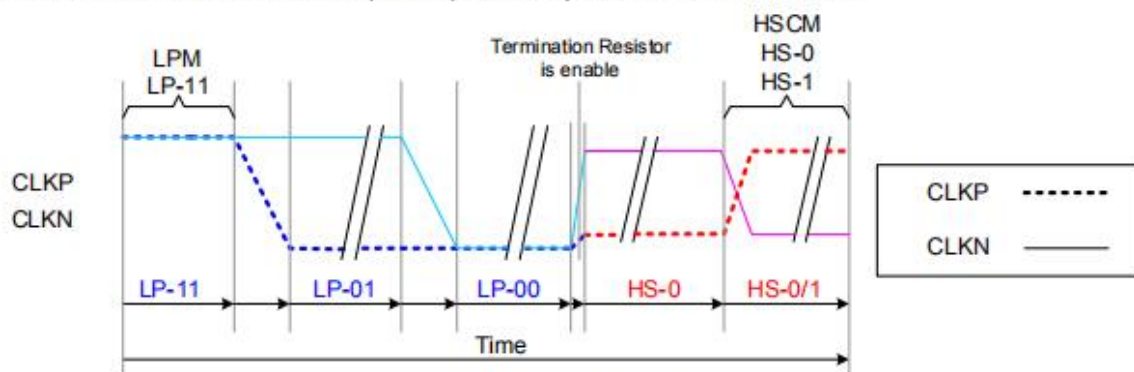


Figure 9: From LPM to HSCM

The mode change is also illustrated below.

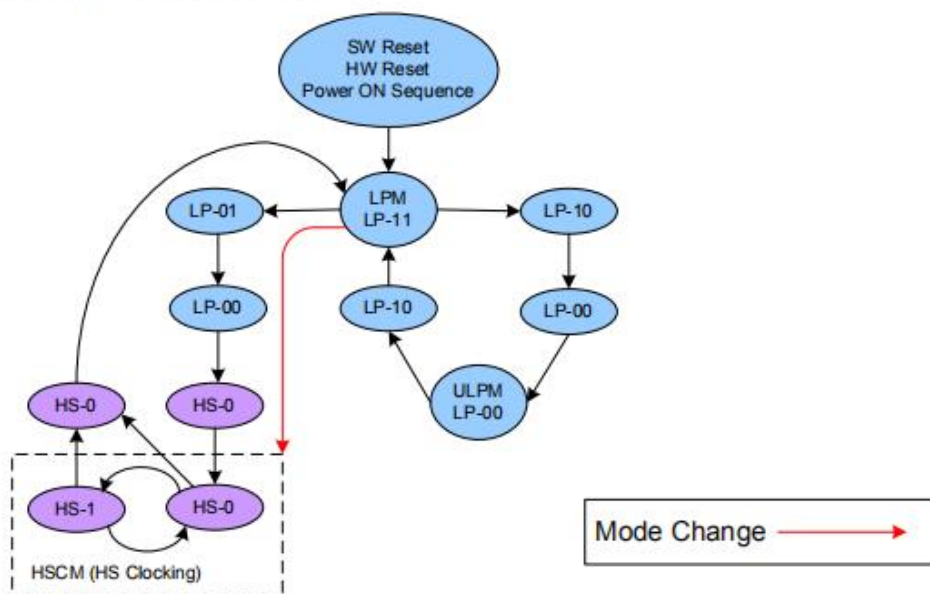


Figure 10: Mode Change from LPM to HSCM

The high speed clock (CLKP/N) starts before high speed data is sent via data lanes. The high speed clock continues clocking after the high speed data sending is stopped.

The burst of the high speed clock consists of:

- Even number of transitions
- Start state is HS-0
- End state is HS-0

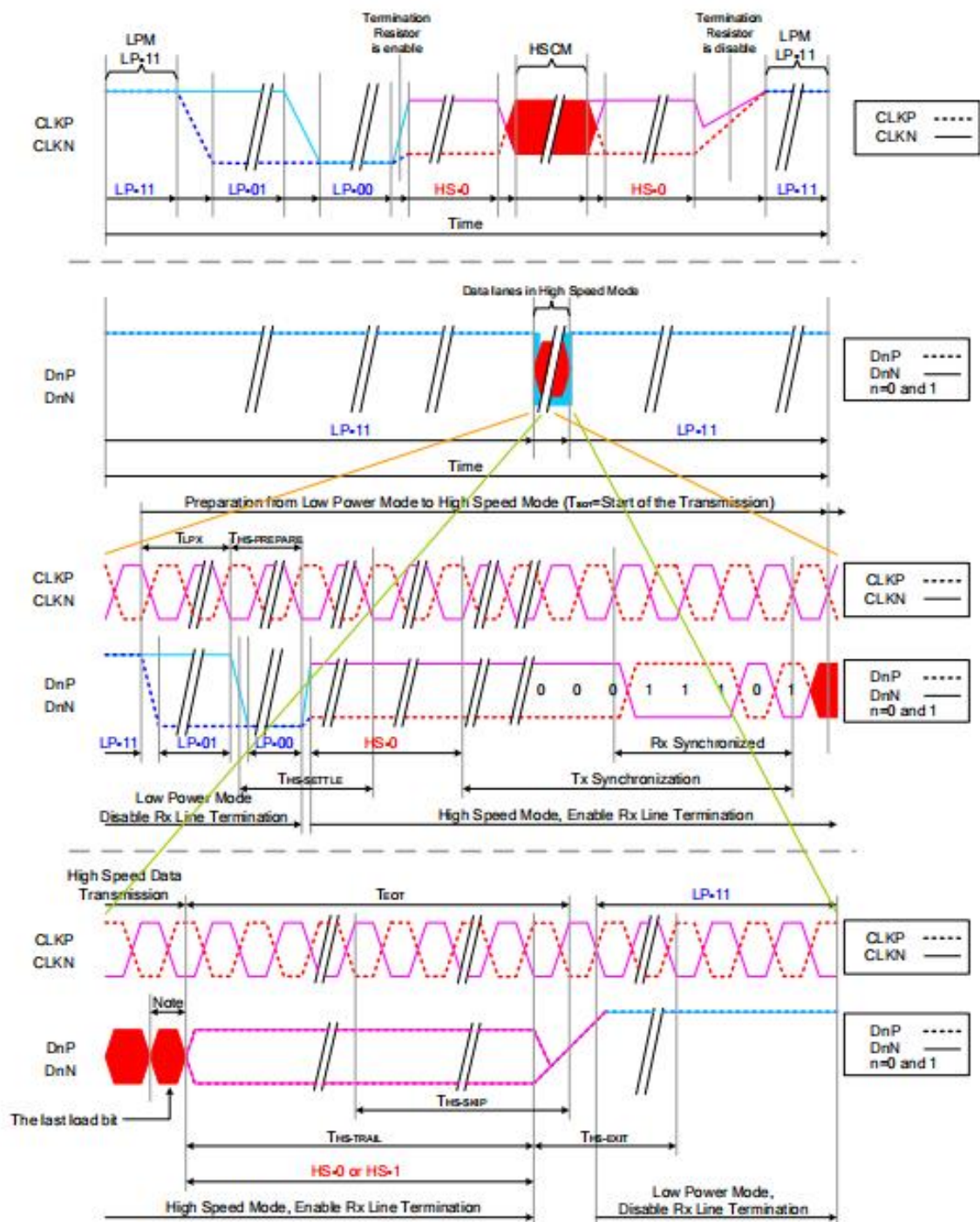
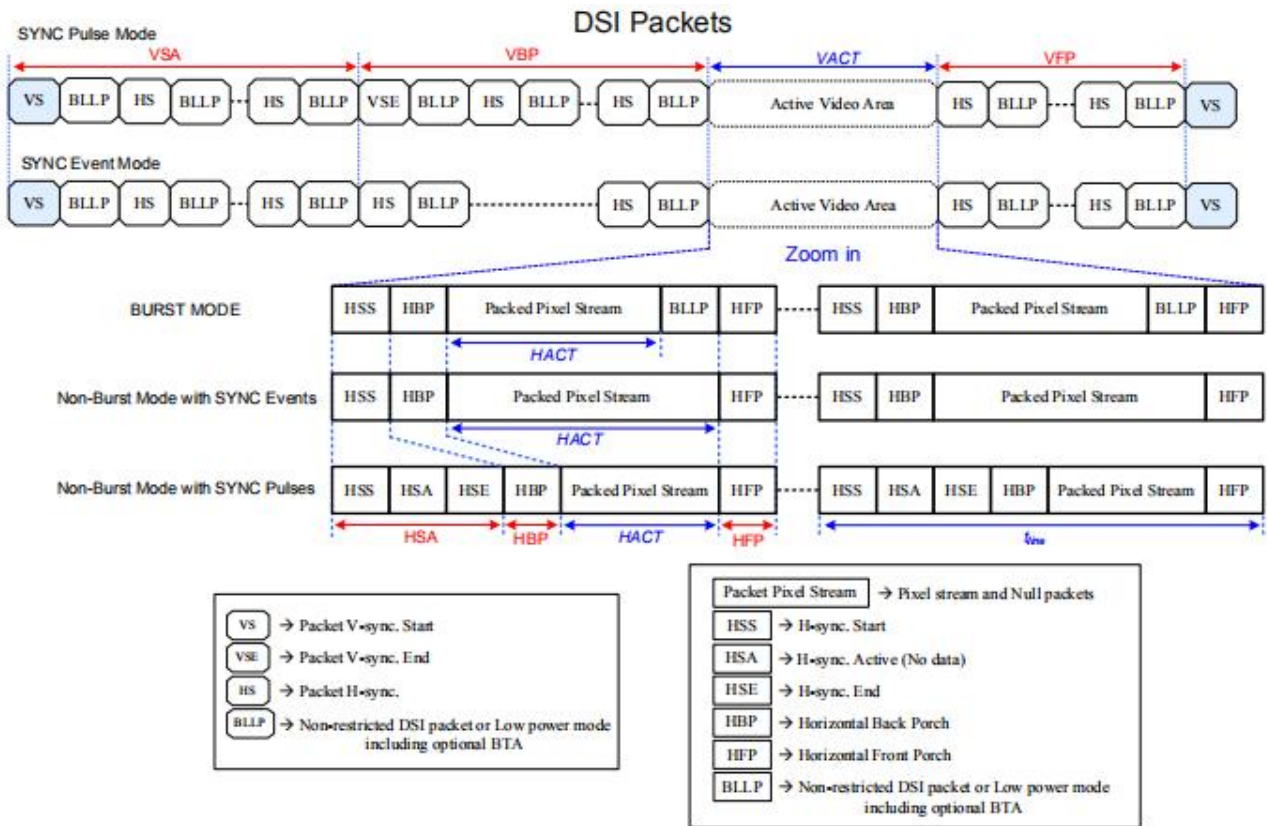


Figure 11: High Speed Clock Burst

Notes:

1. If the last load bit is HS-0, the transmitter changes from HS-0 to HS-1.
2. If the last load bit is HS-1, the transmitter changes from HS-1 to HS-0.

5.3.2 Timing for DSI video mode



Parameters	Symbols	Min.	Typ.	Max.	Units
Vertical sync. active	VSA	2 (Note 5)	-	-	Line
Vertical Back Porch	VBP	14 (Note 5)	-	-	Line
Vertical Front Porch	VFP	8 (Note 5)	-	-	Line
Active lines per frame	VACT	-	1280	-	Line
Horizontal sync. active	HSA	2	-	-	Pixel
Horizontal Porch period	HSA + HBP + HFP	1.6	-	-	us
Active pixels per line	HACT	-	720	-	Pixel
Bit rate	BR _{bps}	385		Note 5	Mbps/lane

1 UI=1/Bit rate

$HSA(\text{pixel}) = (tHSA \times \text{lane number}) / (UI \times \text{pixel format})$

$HBP(\text{pixel}) = (tHBP \times \text{lane number}) / (UI \times \text{pixel format})$

$HFP(\text{pixel}) = (tHFP \times \text{lane number}) / (UI \times \text{pixel format})$

$$\text{Frame Rate} = \frac{BR_{bps} \times \text{Lane}_{num}}{(VACT + VSA + VBP + VFP) \times (HACT + HSA + HBP + HFP) \times \text{Pixel Format}}$$

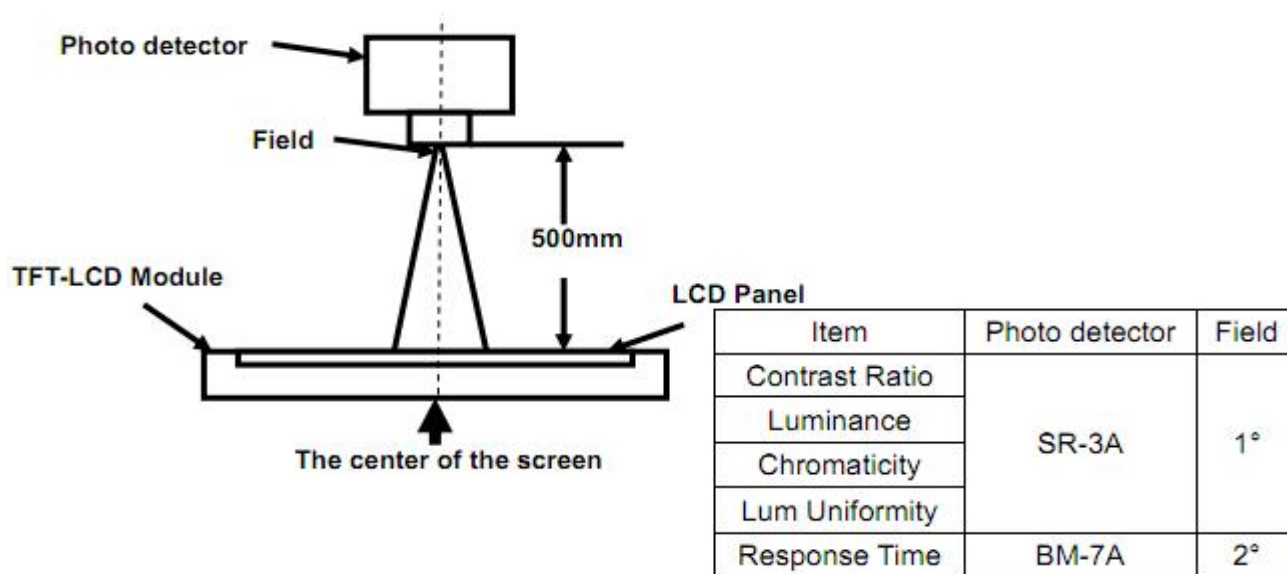
Example : BR_{bps} = 457Mbps/lane, 1UI=2.1883ns, Frame rate=60Hz, VACT=1280, VSA=2, VBP=30, VFP=20, HACT=720, HSA=33, HBP=100, HFP=100, Lane_{num}=4(lane), Pixel Format=24(bit).

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)	-	85	-	deg	Note2
	θ_B	$\Phi=270^\circ$ (6 o'clock)	-	85	-	deg	Note2
	θ_L	$\Phi=180^\circ$ (9 o'clock)	-	85	-	deg	Note2
	θ_R	$\Phi=0^\circ$ (3 o'clock)	-	85	-	deg	Note2
Response Time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	15	17	msec	Note4
	T_{OFF}		-	15	17	msec	Note4
Contrast Ratio	CR		800:1	1000:1	-	-	Note1 Note3
Color Chromaticity	W_X		0.272	0.302	0.332	-	Note1 Note5
	W_Y		0.312	0.342	0.372	-	Note1 Note5
Luminance	L		300	350	-	cd/m ²	Note1 Note7
Luminance Uniformity	Y_U		75	80	-	%	Note1 Note6
NTSC	-		45	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).

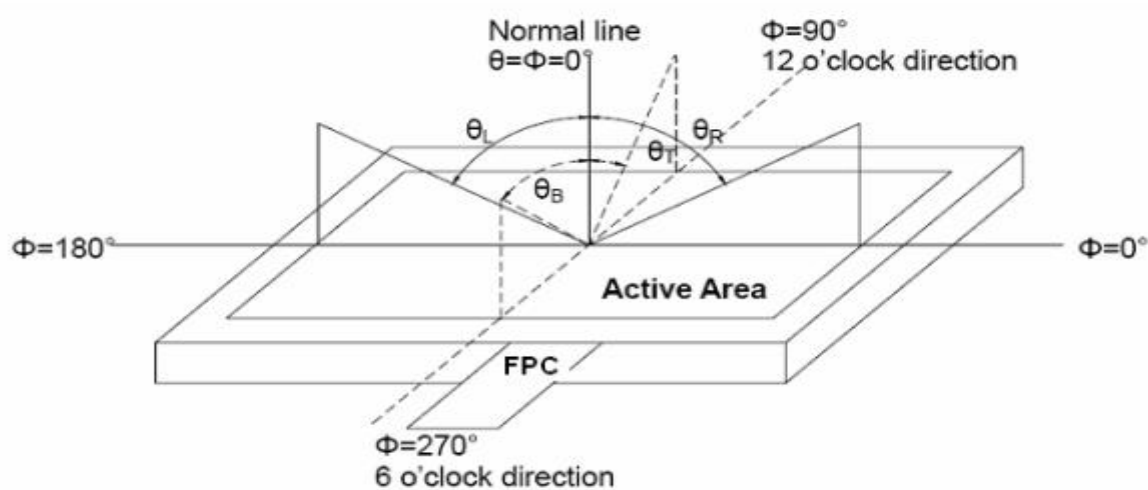


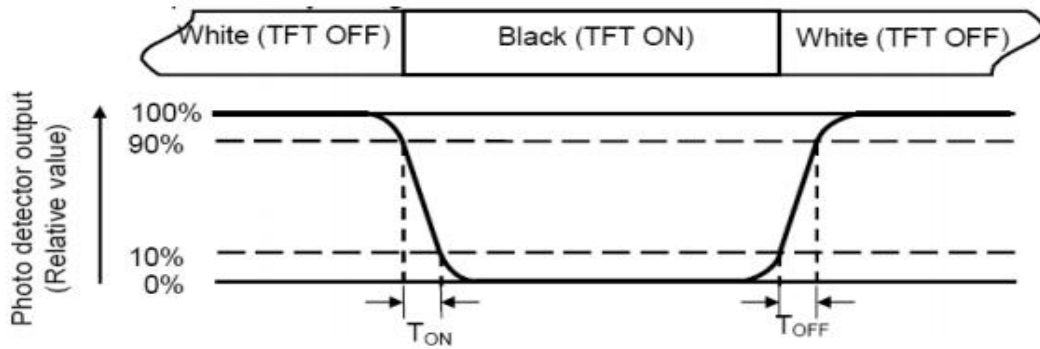
Fig. 1 Definition of viewing angle

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.

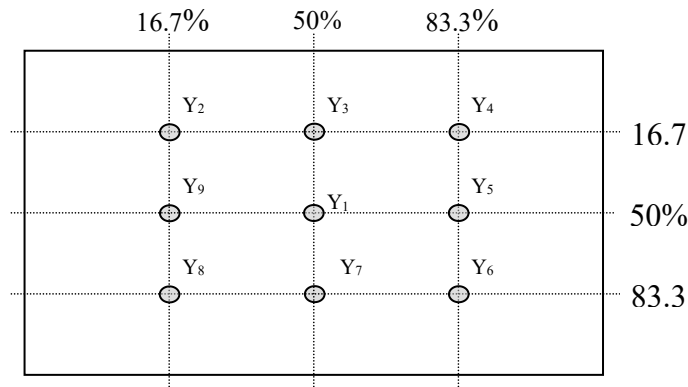


Fig. 2 Definition of points

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

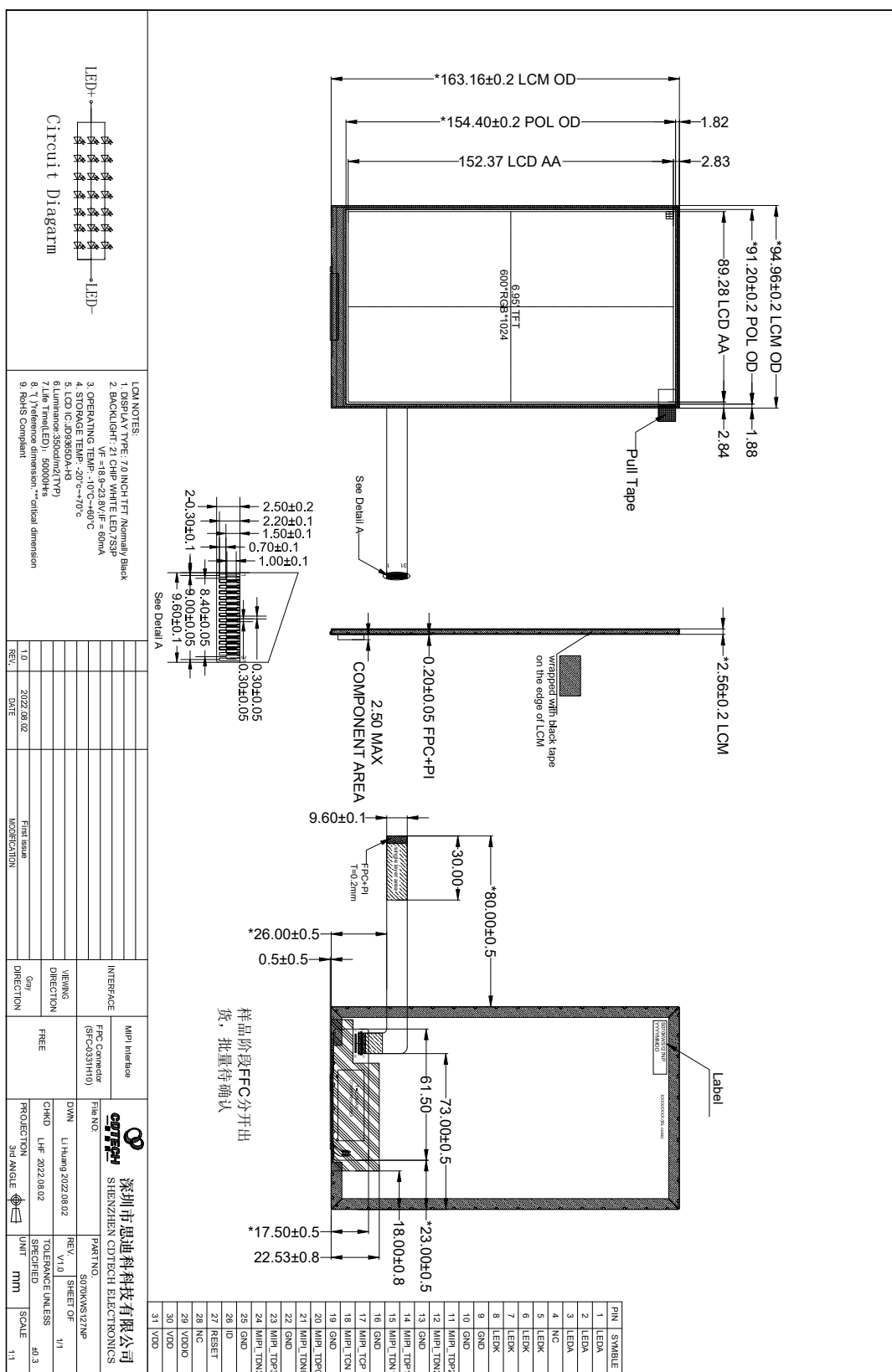
7. Reliability Test Items

Test Item	Test Conditions
High Temperature Storage	Ta= +70℃ 96hrs
Low Temperature Storage	Ta= -20℃ 96hrs
High Temperature Operation	Ta= +60℃ 96hrs
Low Temperature Operation	Ta= -10℃ 96hrs
High Temperature and Humidity Storage	Ta= +60℃, 90% RH 96hrs
Thermal Shock (Non-operation)	-20℃/30 min ~ +70℃/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

TBD

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 $25\pm5^{\circ}\text{C}$

b. Humidity: $(60\pm10)\ \%RH$

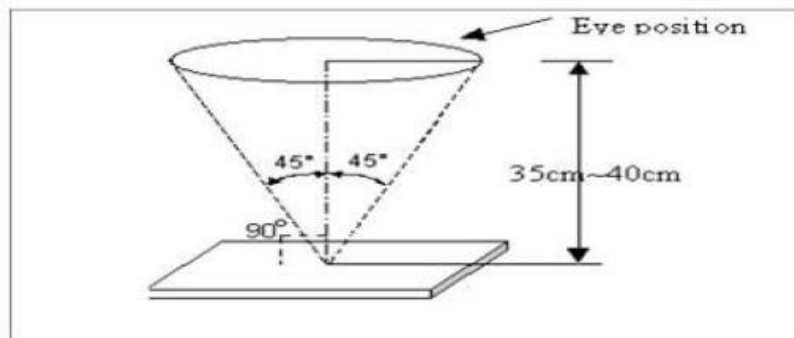
c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)

10.4.2 Viewing distance

The distance between the LCD and the inspector's eyes shall be at least $35\pm5\text{ cm}$.

10.4.3 Viewing Angle

U/D: $45^{\circ}/45^{\circ}$, L/R: $45^{\circ}/45^{\circ}$



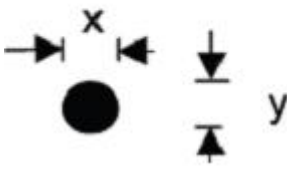
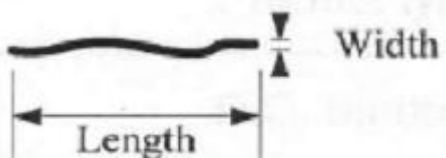
10.5 Inspection Criteria

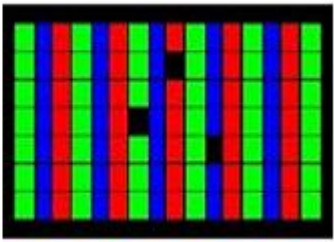
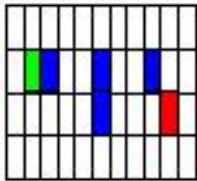
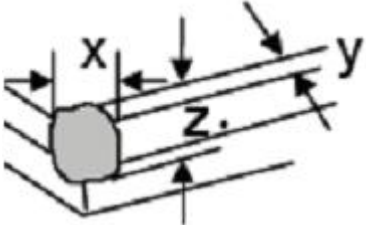
Defects are classified as major defects and minor defects according to the degree of defectiveness defined here in.

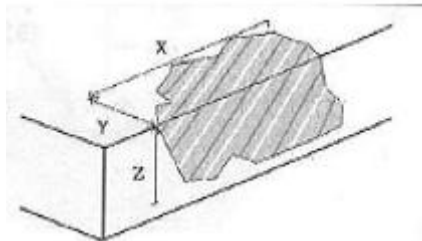
10.5.1. Major defect

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
		$0.2 < \varphi \leq 0.35$	3
		$0.35 < \varphi$	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

		$0.05 < W \leq 0.1$ $L \leq 2.5$	4
		$0.1 < W, \text{ or } L > 2.5$	Not allowed
5.2.3	Polarizer Dent/Bubble	Size ϕ (mm)	Acceptable Quantity
		$\phi \leq 0.2$	Ignore
		$0.2 < \phi \leq 0.35$	3
		$0.35 < \phi$	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
5.2.5	Glass defect	Black dot defect	3
		Bright dot defect	2
		Total Dot	3
			
		1. Corner Fragment:	
		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	
			
		2. Side Fragment:	
		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.