

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LSC062I01-MP-V5

Module Type: COG+FPC+B/L+CTP

APPROVED SIGNATURE

- ☒ Approved Product Specification only
- ☐ Approved Product Specification and Samples

For Customer's Acceptance

Approved by	Comment

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1. General Description

LSC062I01-MP-V5 is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit and a backlight unit. The panel size is 6.2 inch and the resolution is 360(RGB)*960, the panel can display up to 16.7 M colors.

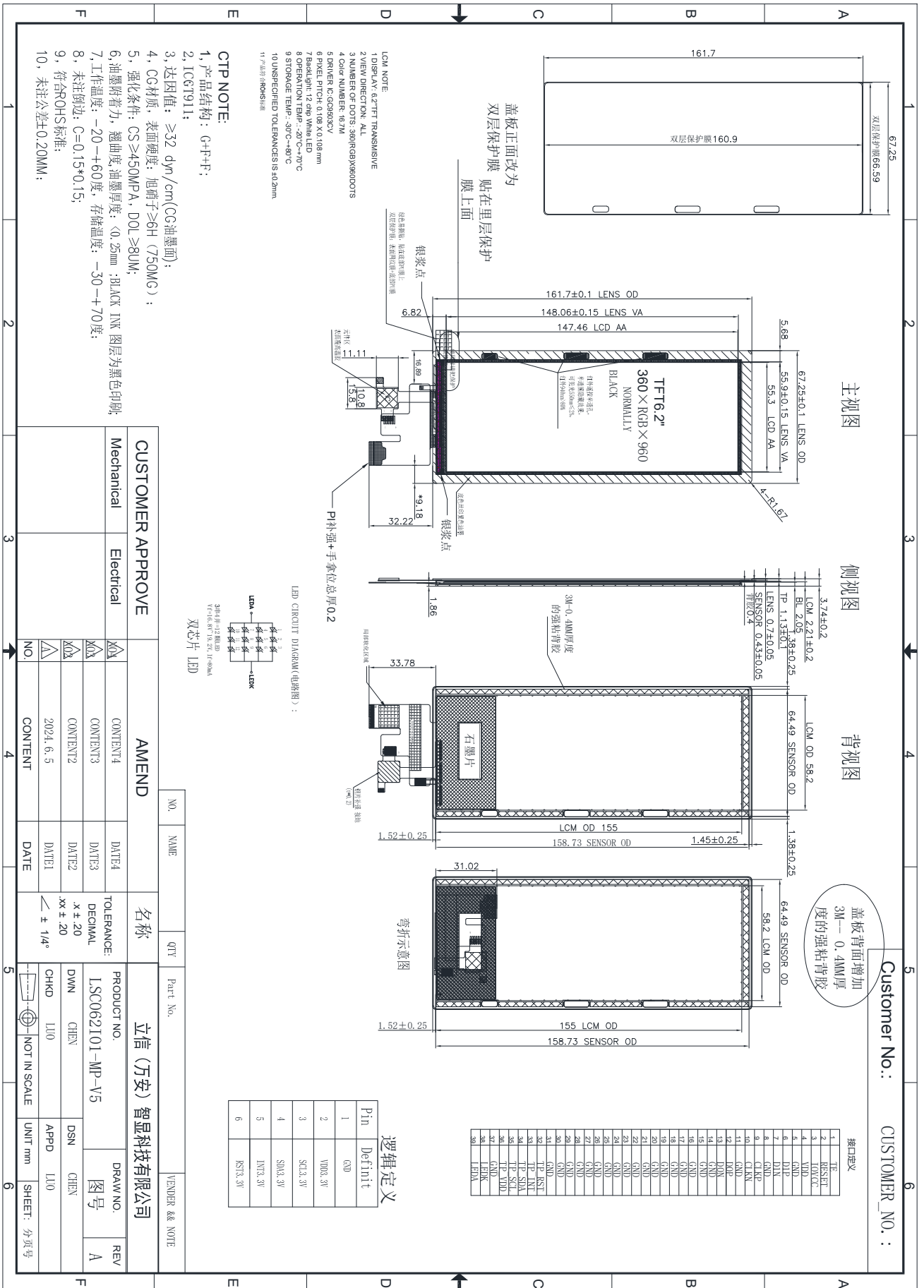
2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 360(RGB)×960 Dot-matrix
Input Data	MIPI input
Viewing Direction (Grayscale Inversion)	Free (IPS)
Drive	GC9503CV

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	67.25 ×161.7 ×3.74	mm
Number of dots	360(RGB) ×960	pixel
Active area (H×V)	55.3×147.46	mm

4. Outline Dimension



5. Absolute Maximum Ratings

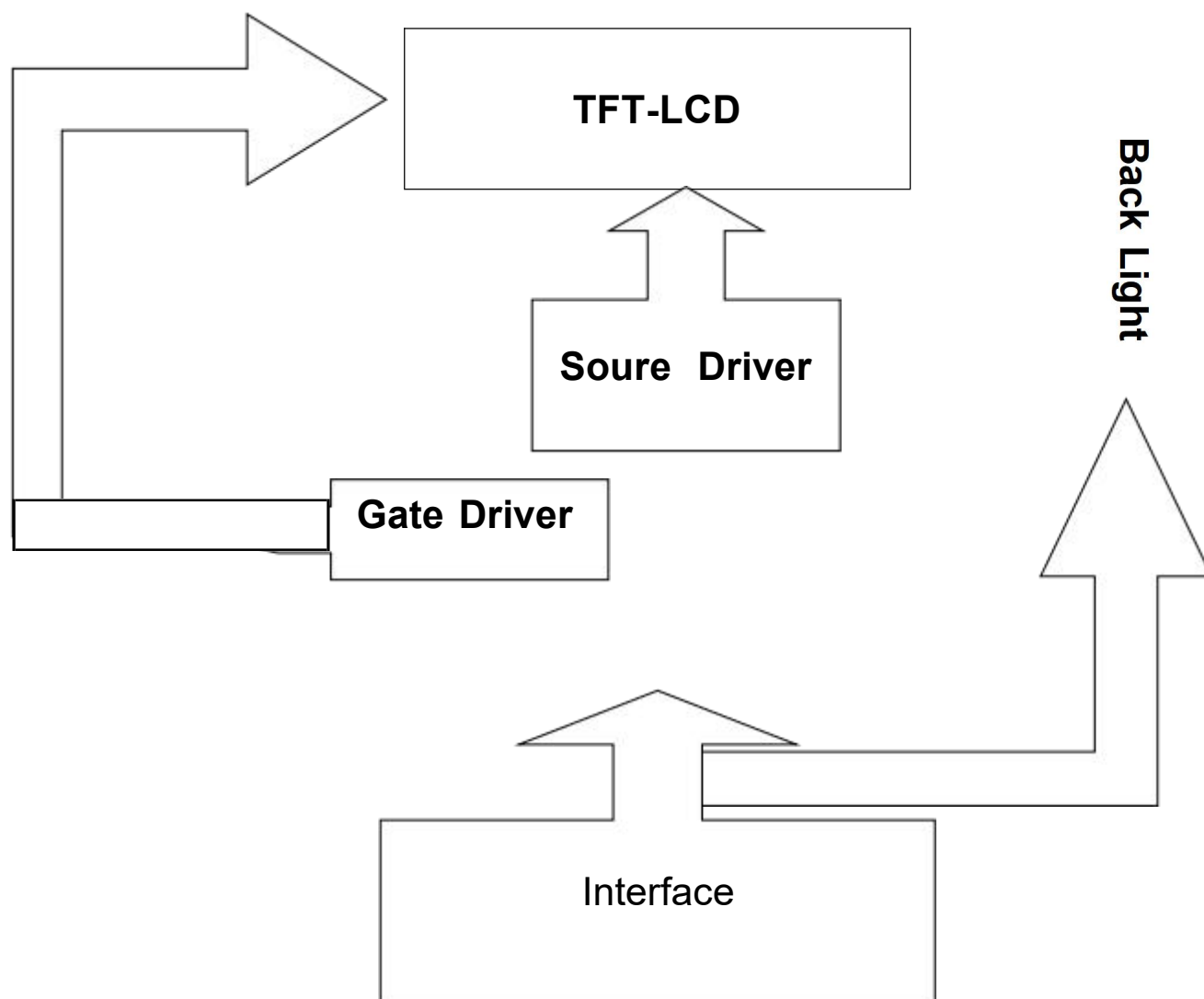
Item	Symbol	Min	Max	Unit	Remark
Supply voltage	VCC	-0.3	4.6	V	Note1 Note2
Supply voltage	IOVCC	-0.3	4.6	V	
Operating temperature	TOPR	-20	70	°C	
Storage temperature	TSTR	-30	80	°C	

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Supply voltage		VCC	2.5	2.8	3.6	V	Note1
Supply voltage		IOVCC	1.65	1.8	3.3	V	
Input Voltage	L level	VIL	VSS	---	0.3*IOVCC	V	
	H level	VIH	0.7*IOVCC	---	IOVCC	V	

7. Module Function Description

7- 1. Block Diagram Of LCM



7-2. Pin Description

PIN NO.	Symbol	I/O	Description
1	NC		
2	RESET	I	Global reset pin
3	IOVCC	P	Power voltage
4	VDD	P	Power voltage
5	GND	P	GND
6	D1P	I	Negative MIPI differential data inputs
7	D1N	I	Negative MIPI differential data inputs
8	GND	P	GND
9	CLKP	I	Negative MIPI differential clock inputs
10	CLKN	I	Negative MIPI differential clock inputs
11	GND	P	GND
12	D0P	I	Negative MIPI differential data inputs
13	D0N	I	Negative MIPI differential data inputs
14	GND	P	GND
15	GND	P	GND
16	GND	P	GND
17	GND	P	GND
18	GND	P	GND
19	GND	P	GND
20	GND	P	GND
21	GND	P	GND
22	GND	P	GND
23	GND	P	GND
24	GND	P	GND
25	GND	P	GND
26	GND	P	GND
27	GND	P	GND
28	GND	P	GND
29	GND	P	GND
30	GND	P	GND
31	GND	P	GND
32	TP_RST	I	Reset signal for TP
33	TP_INT	I	Interrupt request to the host, or Wakeup request from the host.
34	TP_SDA	I	12C Data input & Output
35	TP_SCL	I	12C Clock input
36	TP_VDD	P	Power voltage
37	GND	P	GND
38	LEDK	P	Backlight LED Cathode.
39	LEDA	P	Backlight LED Anode.

7-3 Timing Characteristics

8.8.3.1 High Speed Mode – Clock Channel Timing

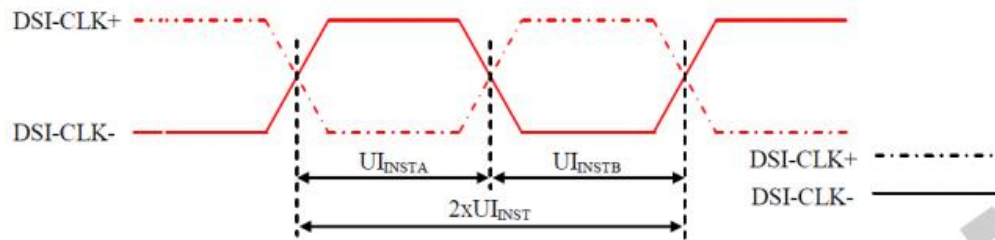


Figure 114 DSI Clock Channel Timing

Table 45 DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
DSI-CLK+/-	2xUI_INST	Double UI instantaneous	4	25	ns
DSI-CLK+/-	UI_INSTA, UI_INSTB	UI instantaneous Half	2	12.5	ns

Note: UI = UI_INSTA = UI_INSTB

8.8.3.2 High Speed Mode – Data Clock Channel Timing

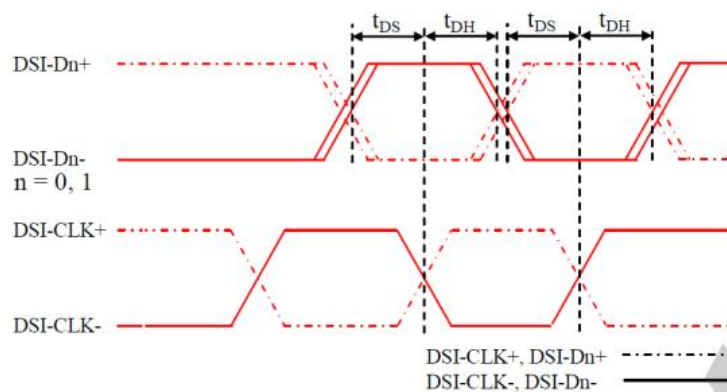


Figure 115 DSI Data to Clock Channel Timings

Table 46 DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DSI-Dn+/- , n=0 and 1	t_DS	Data to Clock Setup time	0.15x UI	-
	t_DH	Clock to Data Hold Time	0.15x UI	-

8.8.3.3 High Speed Mode – Rise and Fall Timings

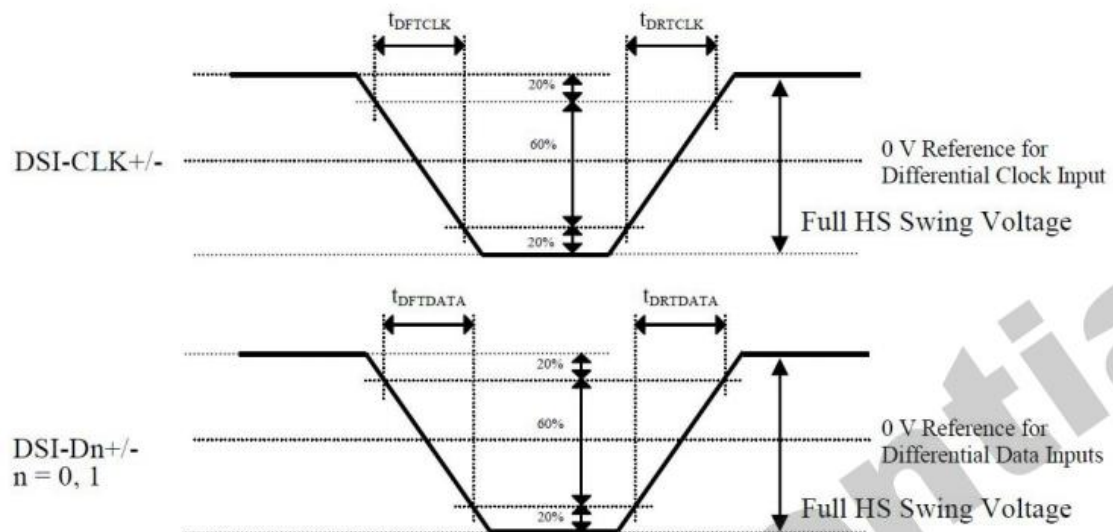


Figure 116 Rise and Fall Timings on Clock and Data Channels

Table 47 Rise and Fall Timings on Clock and Data Channels

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Differential Rise Time for Clock	t_{DRTCLK}	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Rise Time for Data	$t_{DRTDATA}$	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps
Differential Fall Time for Clock	t_{DFTCLK}	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Fall Time for Data	$t_{DFTDATA}$	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps

Note: The display module has to meet timing requirements, what are defined for the transmitter (MPU) on MIPI D-Phy standard

8.8.3.5 Data Lanes from Low Power Mode to High Speed Mode

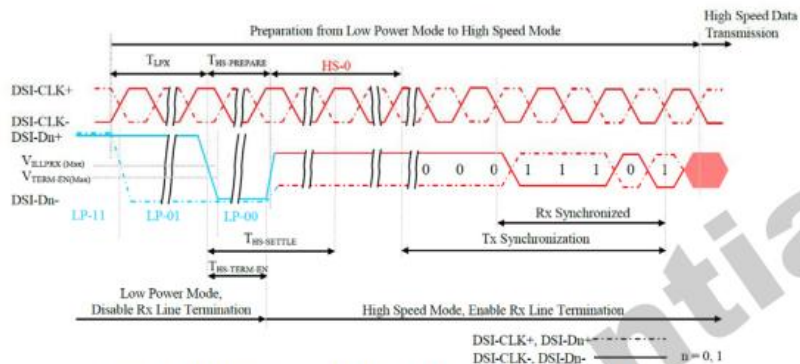


Figure 119 Data Lanes – Low Power Mode to High Speed Mode Timings

Table 50 Data Lanes – Low Power Mode to High Speed Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-Dn+/-, n=0 and 1	TL PX	Length of any Low Power State Period	50	-	ns
DSI-Dn+/-, n=0 and 1	THS-PR EPARE	Time to drive LP-00 to prepare for HS Transmission	40+4xUI	85+6xUI	ns
DSI-Dn+/-, n=0 and 1	THS-TE RM-EN	Time to enable Data Lane Receiver line termination measured from when Dn crosses VILMAX	-	35+4xUI	ns

8.8.3.6 Data Lanes from High Speed Mode to Low Power Mode

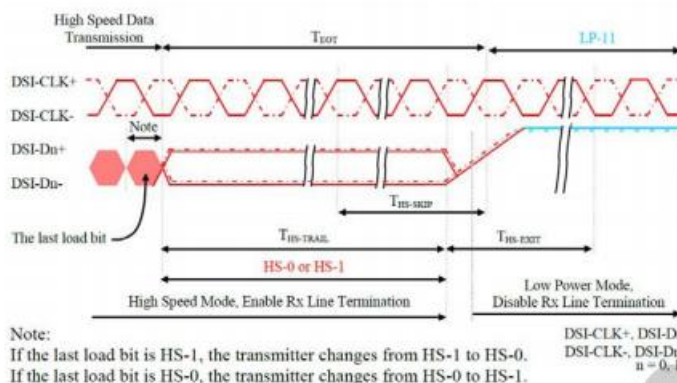


Figure 120 Data Lanes – High Speed Mode to Low Power Mode Timings

Table 51 Data Lanes – High Speed Mode to Low Power Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-Dn+/-, n=0 and 1	THS-SK IP	Time-Out at Display Module (GC9503CV) to ignore transition period of EoT	40	55+4xUI	ns
DSI-Dn+/-, n=0 and 1	THS-EX IT	Time to driver LP-11 after HS burst	100	-	ns

8.8.3.7 DSI Clock Burst – High Speed Mode to/from Low Power Mode

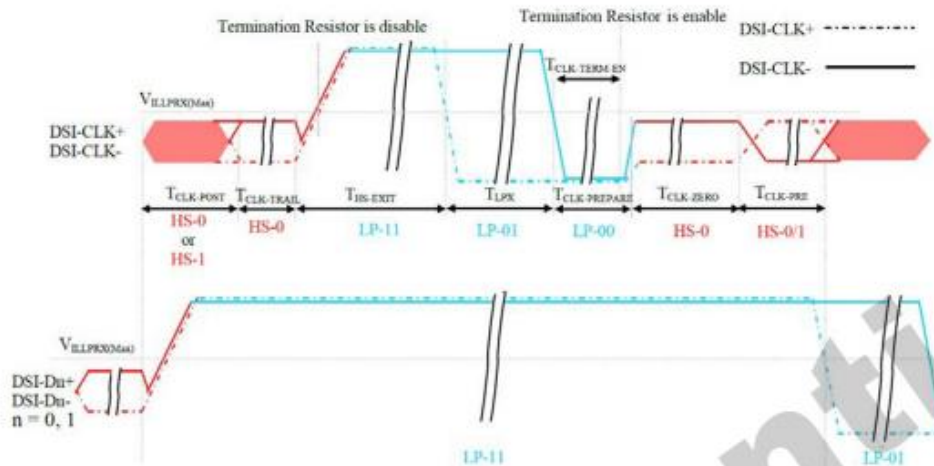


Figure 121 Clock Lanes – High Speed Mode to/from Low Power Mode Timings

Table 52 Clock Lanes – High Speed Mode to/from Low Power Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-CLK+/-	TCLK-POST	Time that the MPU shall continue sending HS clock after the last associated Data Lanes has transitioned to LP mode	$60+52xUI$	-	ns
DSI-CLK+/-	TCLK-TRAIL	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns
DSI-CLK+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns
DSI-CLK+/-	TCLK-PREPAR E	Time to drive LP-00 to prepare for HS transmission	38	95	ns
DSI-CLK+/-	TCLK-TERM-EN	Time-out at Clock Lane to enable HS termination	-	38	ns
DSI-CLK+/-	TCLK-PREPAR E	Minimum lead HS-0 drive period before starting Clock	300	-	ns
DSI-CLK+/-	TCLK-PRE	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	8xUI	-	ns

8. Electro-Optical Characteristics

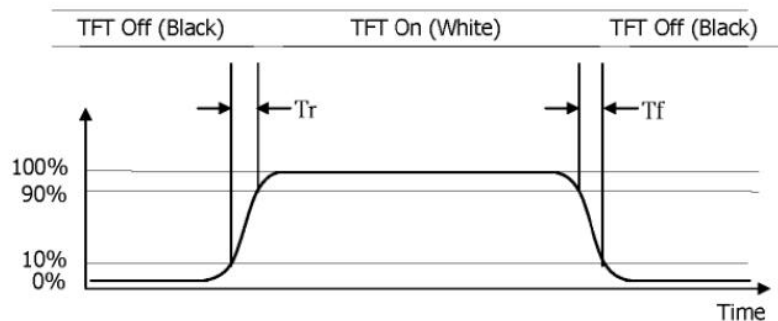
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Tr +Tf	$\theta_x = \theta_y = 0$	---	35	40	ms	Note 1
Contrast Ratio	CR		500	1000	---	---	Note 2
Transmittance	T%		2.7	3.0	---	%	
Color Chromaticity (CIE1931)	White	W x	$\theta_x = \theta_y = 0$	0.286	---	---	
		W y		0.318	---	---	
Viewing angle	θ_T	CR > 10	80	89	---	Deg.	Note 3
	θ_B		80	89	---		
	θ_L		80	89	---		
	θ_R		80	89	---		

Note :

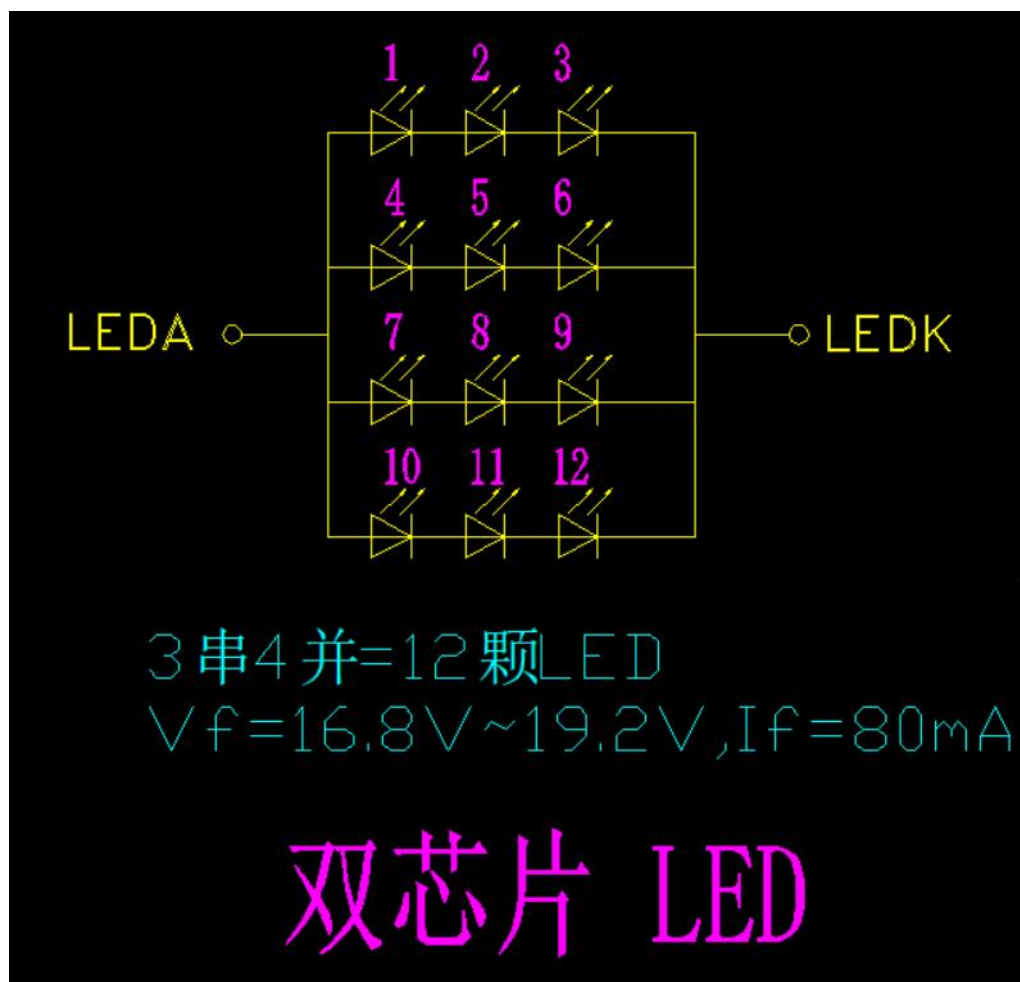
1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 4 for a total of the measurements per display.
4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \frac{\text{Minimum Luminance of 9 Points or 5 points}}{\text{Maximum Luminance of 9 Points or 5 points}}$ (See FIGURE 2).
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with C light. Measurements shall be made at the center of the panel.
6. The electro-optical response time measurements shall be made as FIGURE 5 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td, and 90% to 10% is Tr.



Note(4) Backlight circuit



9. Inspection Standards

1. AQL(Acceptable Quality Level)

AQL of major and minor defect

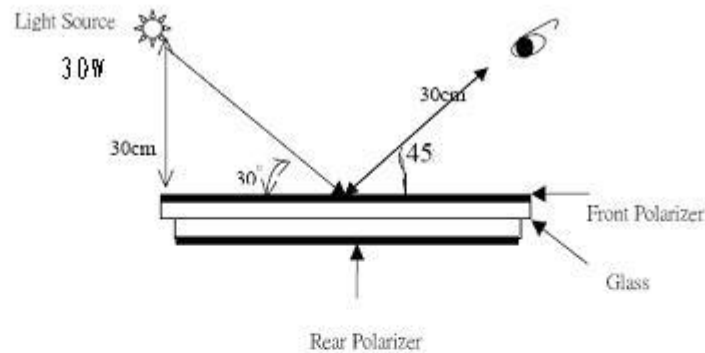
According to GB/T 2828-2003 ; , normal inspection, Class II

MAJOR DEFECT	MINOR DEFECT
0.65	1.5

2. Basic conditions for inspection

The LCM face to us, in normal environment, About an angle of incidence 30°, a distance of 30cm with normal eye, with an angle of 45° degree to check the products without uncovering the film!

(As shown below)

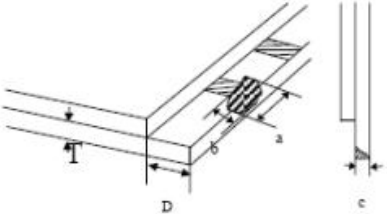
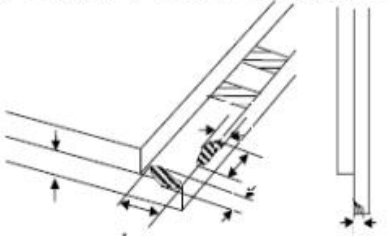


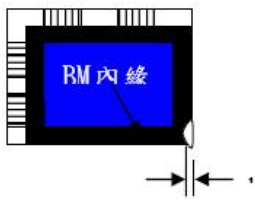
3. Inspection item and criteria

3.1 Visual inspection criterion in immobility

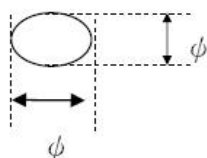
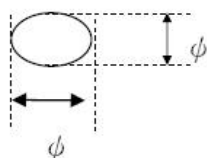
3.1.1 Glass defect

No	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	

No	Defect item	Criteria	Remark
2	Cracks (Major defect)	1.Linear cracks on panel 【Reject】 2. Nonlinear crack contrast by limited sample	
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage 1) $b \leq 1/3$ Pin width(non bonding area) 【Accept】 2) bonding area $\leq 0.5\text{mm}$ 【Accept】	a:Length, b:Width
4	Pin-side , conductive area damaged (minor defect)	(a c : disregards) $b \leq 1/3$ of effective length for bonding electrode 【Accept】	a:Length, b: Width, c: Thickness  The diagram shows a 3D perspective of a rectangular panel with a grid of pins. A rectangular area on the side of a pin is shaded to represent damage. Dimensions are labeled: 'a' for the length of the damaged area along the pin, 'b' for the width of the damaged area across the panel, and 'c' for the thickness of the panel. A cross-section view on the right shows the panel thickness 'c' and the pin diameter 'D'.
5	Pin-side , non-conductive area damaged (minor defect)	1) Damage area don't touch the ITO (Inclueing contraposition mark,except scribing mark) 【Accept】 2) $c < T$ $b \leq BM$ 1/3 of width 【Accept】 3) $c = T$ b not touch the seal glue 【Accept】 4) a disregards	a:Length, b: Width, c: Thickness  The diagram shows a 3D perspective of a rectangular panel with a grid of pins. A rectangular area on the side of a pin is shaded to represent damage. Dimensions are labeled: 'a' for the length of the damaged area along the pin, 'b' for the width of the damaged area across the panel, and 'c' for the thickness of the panel. A cross-section view on the right shows the panel thickness 'c' and the pin diameter 'D'.

No	Defect item	Criteria	Remark
6	Non-pin-side damage (minor defect)	$c < T$ 1) b exceeds 1/3 BM $c = T$ b not touch the seal glue 【Reject】 【Reject】	c : Thickness b: width of damage 

3.1.2 LCD appearance defect (View area)

No	Defect item	Criteria		Remark
1	Fiber 、 glass cratch 、 polarizer scratch/folded (minor defect)	Specification	Allowable	note1: L : Length , W : Width note2: disregard if out of AA 
		$0.05\text{mm} < W \leq 0.1\text{mm};$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	
2	Polarizer bubble 、 concave and convex (minor defect)	$\psi \leq 0.2\text{mm}$	disregard	note 1: $\psi = (L+W)/2$; L : Length , W : Width note2: disregard if out of AA 
		$0.2\text{mm} < \psi \leq 0.3\text{mm}$	2	
		$0.3\text{mm} < \psi \leq 0.5\text{mm}$	1	
		$0.5\text{mm} < \psi$	0	
3	Black dots 、 dirty dots 、 impurities 、 eyewinker (Major defect)	$\psi \leq 0.15\text{mm}$	disregard	note2: disregard if out of AA 
		$0.15\text{mm} < \psi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \psi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \psi$	0	
4	Polarizer prick (Major defect)	$\psi \leq 0.1\text{mm}$	disregard	note1: $\psi = (L+W)/2$; L= Length , W=Width note2: the distance between two dots > 5mm
		$0.1\text{mm} < \psi \leq 0.25\text{mm}$	3	
		$\psi > 0.25\text{mm}$	0	

3.1.3 .FPC

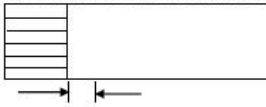
No	Defect item	Criteria		Remark
1	Copper screen peel (Major defect)	Copper screen peel 【 Reject】		
2	No release tape or peel (Major defect)	No release tape or peel 【 Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	note1: Cannot have stride ITO impurities
		$\psi \leq 0.25\text{mm}$	2	
		$\psi > 0.25$	0	

3.1.4 Black tape & Mara tape

1	FPC or H/S black tape shift (minor defect)	1.shift spec: 1)glue to the polarize 【 Reject】 2) IC bare 【 Reject】 2. left-and-right spec: 1) exceed of FPC edge or H-S edge 【 Reject】 2)IC bare 【 Reject】	
2	No black tape (Major defect)	No black tape 【 Reject】	
3	Tape position mistake (minor defect)	Not by engineering drawing 【 Reject】	
4	Mara tape defect (minor defect)	Peel before pulling the protecting film. 【 Reject】	

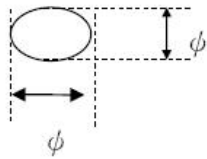
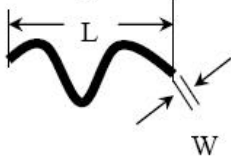
3.1.5 Silicon and Tuffy glue

No	Defect item	Criteria	Remark
1	Quantity of silicon (minor defect)	Uncover the ITO and circuit area. 【 Reject】	note: compared by engineering drawing.

No	Defect item	Criteria	Remark
2	Tuffy glue (minor defect)	1. Uncover the reveal copper area 【 Reject】 2. Cover layer 0.3mm(Min) ~ 3.0mm(Max) 【 accept】	note:if customer has special requirement , refer to the technical document. 
3	Depth of glue covering (minor defect)	Depth of glue covering overtop front Polarizer 【 Reject】	Except of the special requirement °

3.2 Electrical criteria

No	Defect item	Criteria	Remark
1	No display (Major defect)	No display 【 Reject】	
2	Missing line (Major defect)	Missing line 【 Reject】	
3	Seg-com light and dark (Major defect)	Seg-com light and dark 【 Reject】	ND filter 2% test
4	No display in immobility (Major defect)	No display in immobility 【 Reject】	
5	Flicker of Pattern (Major defect)	Flicker of Pattern 【 Reject】	
6	Mura (Major defect)	ND filter 2% test	
7	Over current (Major defect)	Over current 【 Reject】	
8	Voltage out of specification (Major defect)	Voltage out of specification 【 Reject】	
9	Pattern blur ,error code (Major defect)	Pattern blur ,error code 【 Reject】	
10	Dark light, Flicker (Major defect)	Dark light, Flicker 【 Reject】	

No	Defect item	Criteria	Remark	
11	Black/White dots 、 Dirty dots 、 eyewinker (Major defect)	Specification	Allowable	Note1: disregard if out of AA 
		$\psi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm} < \psi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \psi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \psi$	0	
12	Fiber 、 glass cratch 、 polarizer scratch/folded (minor defect)	$W \leq 0.03\text{mm}$	disregard	note1: L : Length 、 W : Width note2: disregard if out of AA 
		$0.03\text{mm} < W \leq 0.05\text{mm} ;$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm} ;$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm} ; L > 3.0\text{mm}$	0	

10.Records Of Version

Version	Revise Date	Page	Content
00	2025-5-15	all	New released