



Product Specification

Customer: _____
Model Name: H035SVG30I8088
Date: 2023-03-29
Version: A0

Preliminary Specification

Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by



Revision Record

REV NO.	REV DATE	CONTENTS	Note
A0	2023.03.29	NEW ISSUE	



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1. LCM Specification

1.1 Description

H035SVG30I8088 is a transmissive type color active matrix liquid crystal display(LCD) which uses amorphous thin film transistor(TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a FPC and a LED-backlight unit. The active display area is 3.5 inches diagonally measured and the native resolution is 640*RGB*480. Features of this product are listed in the following table.

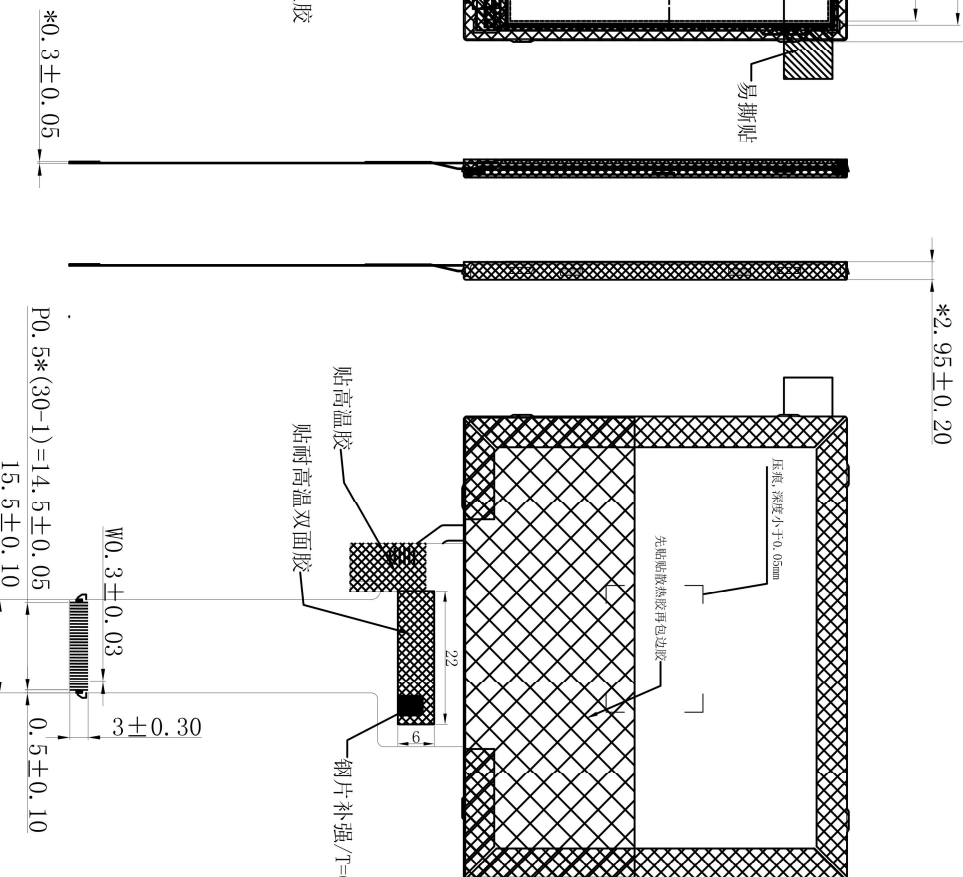
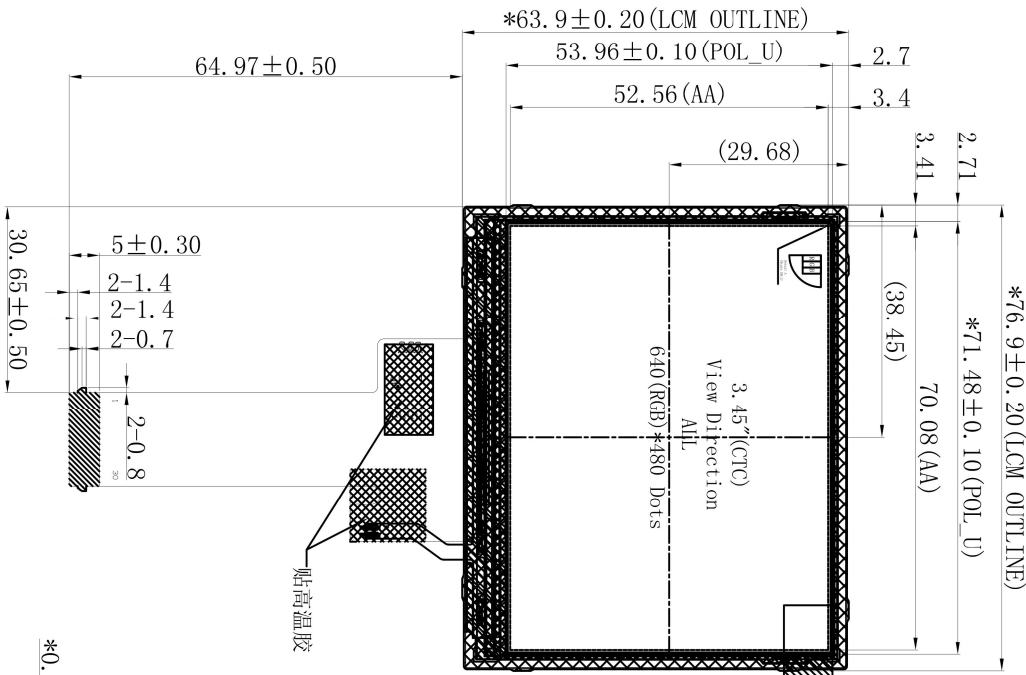
1.2 Functions & Features

Table 1.1 Module Functions & Features

Parameter	Value	Unit
LCD Mode	TFT/Transmissive	-
Color Depth	16.7M	-
Display Resolution	640RGB*480	pixels
Module Size	74.80(H)*94.08(W)*2.95(T)(Exclude FPC)	mm
Active Area (A.A)	52.56(H)*70.08(W)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	Full	
Display Mode	Normally Black	
LCD Controller/Driver	ST7703/ST7703I	-
IC Package Type	COG	-
Interface	4 Lane MIPI	-
Power Supply Voltage	-	V
Back-light	White LED*6	PCS

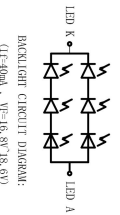
2. Mechanical Specification

装配基准：FOG左上角对位



30	END
29	NC
28	NC
27	NC
26	NC
25	NC
24	GND
23	DEN
22	D2P
21	GND
20	D2N
19	D2P
18	GND
17	CLKP
16	CLKP
15	GND
14	D1N
13	D1P
12	GND
11	D0N
10	D0P
9	GND
8	DM
7	NC
6	RESIST
5	DMCC
4	VCT
3	LEDK
2	LEDK
1	LEDP

- NOTES:
1. Display mode: 3.45"TF/Normally Black/Transmissive
 2. OPERATING TEMP: -20° C~+70° C
 3. STORAGE TEMP: -30° c~+80° c
 4. Backlight color: 6 CHIP WHITE LED
 5. RESOLUTION: 640xRGBx480
 6. LCD IC: ST7703/ST7703I
 7. "()" reference dimension. "*" critical dimension
 8. RoHS Compliant
 9. LCM+LENS luminance(centre): 800cd/m2 (MIN), 900cd/m2 (TYP)
Chromaticity(centre point): 0.31+/-0.03; 0.32+/-0.03
 10. Uniformity(9 AVG): 80% (Min)



INTERFACE	MIP1 Interface	MODEL NAME		
VIEWING DIRECTION	EPIC Connector	DIM	REV.	PART NO.
Grey Scale DIRECTION	ALL	CHRD	A0	103535(C30)8088
	FREE	PROJECTION	SHEET OF	1/1
		3RD ANGLE	UNIT	±0.2
			mm	SCALE
				1:1



3. Pin Descriptions

Pin No.	Symbol	I/O	Functional	Remark
1	LEDA	P	LED Power supply +	
2~3	LEDK	P	LED Power supply -	
4	VCI	P	Power supply for analog circuit	
5	IOVCC	P	Power supply for logic circuit.	
6	RESET	I	Reset pin	
7	NC	-	No Connection.	
8	PWM	O	LED driver	open
9	GND	P	System ground.	
10~11	D0P / D0N	I/O	Data differential signal input / output pins.	
12	GND	P	System ground.	
13~14	D1P / D1N	I	Data differential signal input pins	
15	GND	I	System ground.	
16~17	CLKP / CLKN	I	Clock differential signal input pins.	
18	GND	P	System ground.	
19~20	D2P / D2N	I	Data differential signal input pins.	
21	GND	P	System ground.	
22~23	D3P / D3N	I	Data differential signal input pins	
24	GND	I	System ground.	
25~29	NC		No Connection.	
30	GND	PI	System ground.	



4. Electrical Units

4.1 Absolute Maximum Ratings

The absolute maximum ratings are list on Table 4.1. When used out of the absolute maximum ratings, the LCM may be permanently damaged. Using the LCM within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LCM will malfunction and cause poor reliability.

Table 4.1 Module Absolute Maximum Ratings

Item	Symbol	Unit	Spec.		
			Min.	Typ.	Max.
Power Supply Voltage 1	IOVCC~VSSD	V	-0.3	-	+5.5
Power Supply Voltage 2	VCI ~ VSSA	V	-0.3	-	+6.6
Power Supply Voltage 3	VSP ~ VSSA	V	-0.3	-	+6.6
Power Supply Voltage 4	VSSA ~ VSN	V	-0.3	-	+6.6
Power Supply Voltage 5	VGH ~ VGL	V	-0.3	-	+35
Logic Input Voltage	V _{IN}	V	-0.3	-	IOVCC+0.3
Logic Output Voltage	V _o	V	-0.3	-	IOVCC+0.3
Differential Input Voltage	DSI_CP/DSI_CN DSI_D0P/DSI_D0P, DSI_D1P/DSI_D1N	V	-	-	2.0
Operating Temperature	Topr	°C	-20	-	+70
Storage Temperature	Tstg	°C	-30	-	+80

4.2 Electrical characteristics (T_a=25°C)

Table 4.2:DC Characteristic

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Power & Operating Voltages						
Logic Operating voltage	IOVCC	I/O supply voltage	1.65	1.8	2.0	V
Analog Operating voltage	VCI	Operation voltage	2.5	-	6.2	
Input / Output						
Logic High level input voltage	V _{IH}	-	0.7IOVCC	-	IOVCC	V
Logic Low level input voltage	V _{IL}	-	VSSD	-	0.3IOVCC	
Logic High level output voltage	V _{OH}	I _{OH} = -1.0mA	0.8IOVCC	-	IOVCC	
Logic Low level output voltage	V _{OL}	I _{OL} = +1.0mA	VSSD	-	0.2IOVCC	
Input leakage current	I _{IL}	-	-1	-	1	µA
DC/DC Converter Operation						
VSP booster voltage	VSP	I _{VSP} =1mA	4.5		6.2	V
VSN booster voltage	VSN	I _{VSN} =-1mA	-6.2		-4.5	
VGH booster voltage	VGH	I _{vgh} =1mA	10		20	
VGL booster voltage	VGL	I _{vgl} =-1mA	-15		-7.5	
VGH and VGL difference	VGH-VGL	-	-	-	32	
Oscillator tolerance	OSC	25°C	-3		3	%
Source Driver						
Gamma reference voltage	VSPR	-	3.3		5.6	V
	VSNR	-	-5.6		-3.3	
Output voltage deviation	DVOS	VSSD+1.0 ~ VSPROUT-1.0	-	-	+/- 20	mV
		VSSD+0.1V ~ VSSD+1.0	-	-	+/- 50	mV
		VSPR-1.0 ~ VSPR-0.1V	-	-	+/- 50	mV
Output offset voltage	Voff	-			+/-50	mV



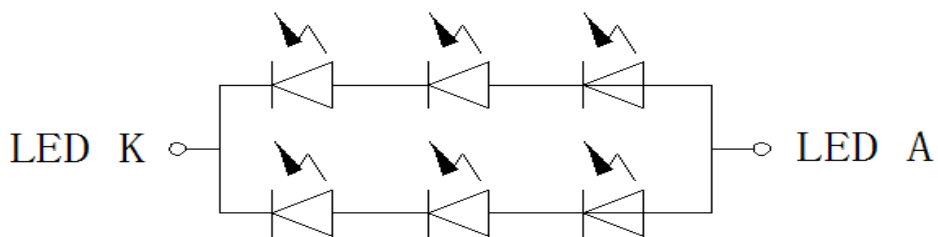
4.3 Back-light Specification

Table 4.3 Back-light Characteristics

Item	Symbol	Conditions	Min.	Type.	Max.	Unit
Supply Voltage	VF	Only Backlight	16.8	17.7	18.6	
Supply Current	IF		40			mA
Average Brightness	IV	Backlight Center IF=40mA	11500	-	-	Cd/ m ²
CIE Color Coordinate (Without LCD)	X	Backlight Center IF=40mA	0.28	0.31	0.34	-
	Y		0.27	0.30	0.33	
Uniformity	B	Backlight Center IF=40mA	--	80%	-	%
Color	White					

Note: 3LEDs in series 2 parallel connection.

电路图：



BACKLIGHT CIRCUIT DIAGRAM:

(If=40mA , VF=16.8V~18.6V)



5. AC Characteristics

5.1 DSI Interface Timing Characteristics (High Speed)

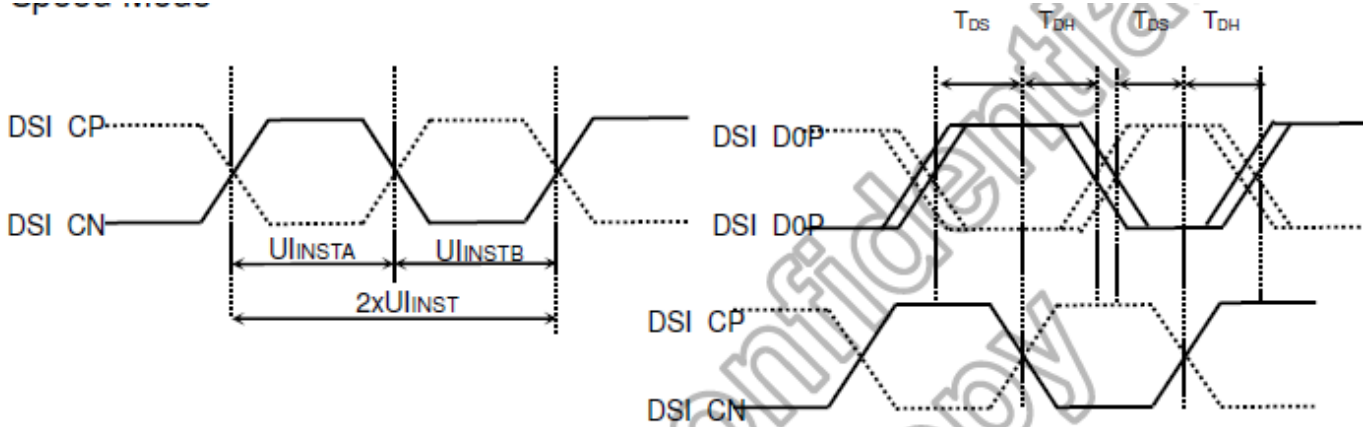
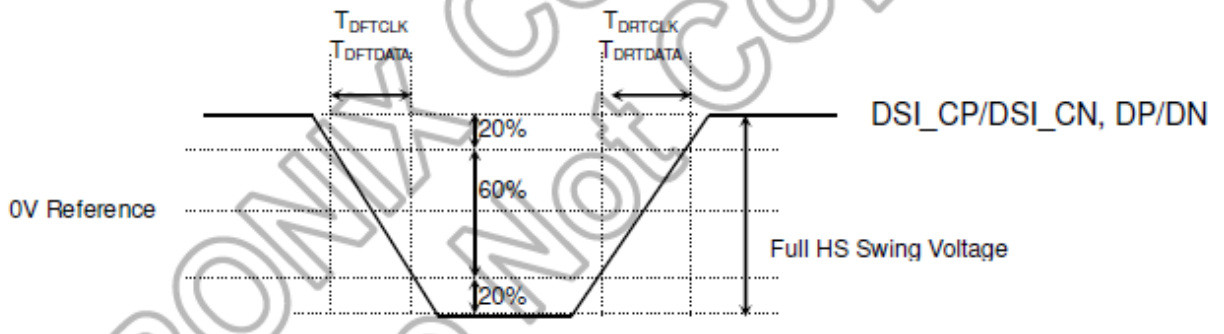


Figure 7.4: DSI clock timing Characteristics

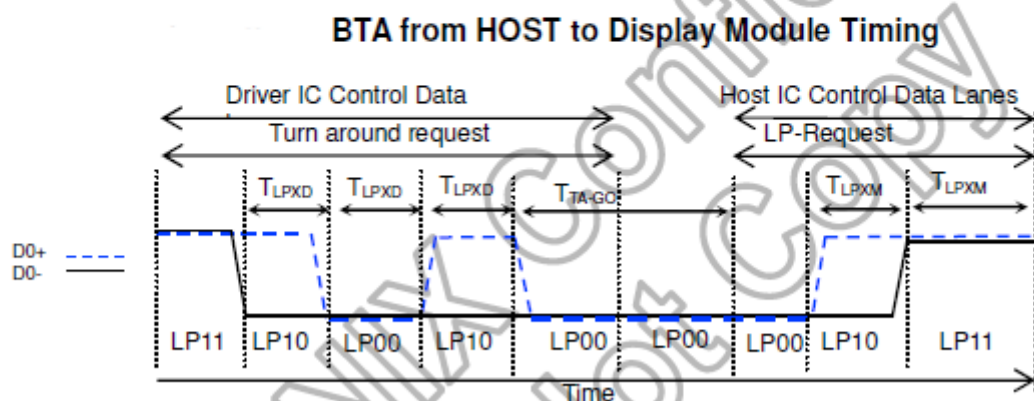
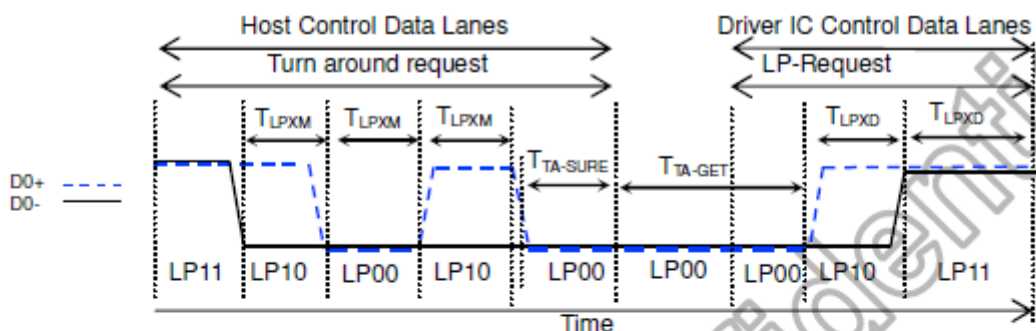


(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, T_A = -30 to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Double UI instantaneous	2xUIINST	TBD	-	25	ns
	UI instantaneous	UIINSTA UIINSTB	TBD	-	12.5	ns
DP/DN	Data to clock setup time	T _{DS}	0.15xUI	-	-	ps
	Data to clock hold time	T _{DH}	0.15xUI	-	-	ps
DSI_CP/ DSI_CN	Differential rise time for clock	T _{DRTCLK}	150	-	0.3UI	ps
	Differential fall time for clock	T _{DFTCLK}	150	-	0.3UI	ps
DP/DN	Differential rise time for data	T _{DRTDATA}	150	-	0.3UI	ps
	Differential fall time for data	T _{DFTDATA}	150	-	0.3UI	ps



5.2 DSI Interface Timing Characteristics (Low Power mode)



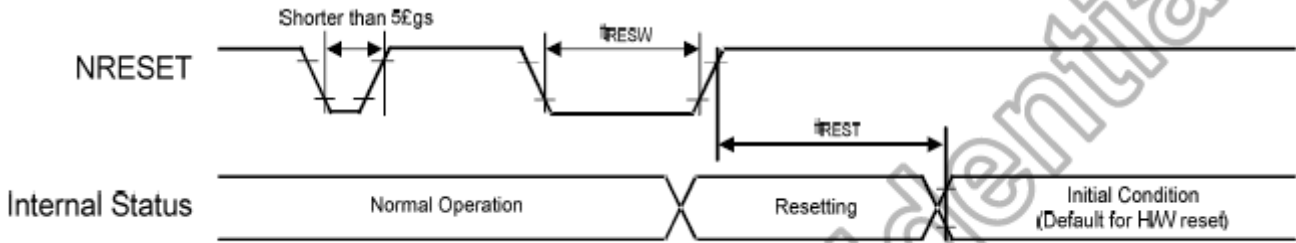
BTA from Display Module Timing to HOST

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, T_A = -30 to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Length of LP-00/LP01/LP10/LP11 Host → Display module	T _{LPXM}	50	-	-	ns
	Length of LP-00/LP01/LP10/LP11 Display module → Host	T _{LPXD}	50	-	-	ns
	Time-out before the MPU start driver	T _{TA-SURE}	T _{LPXD}	-	2xT _{LPXD}	ns
	Time to drive LP-00 by display module	T _{TA-GET}	5xT _{LPXD}	-	-	ns
	Time to drive LP-00 after turnaround request Host	T _{TAGO}	4xT _{LPXD}	-	-	ns



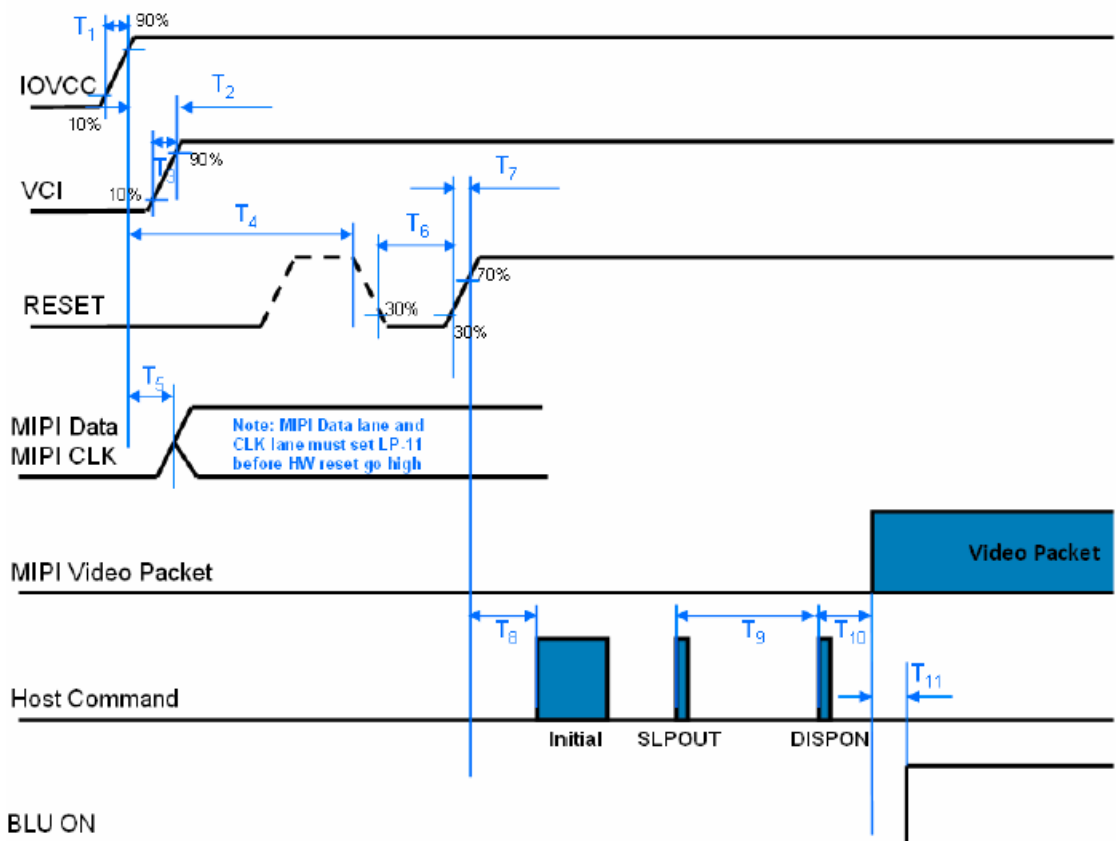
5.3 Reset input timing



Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width ⁽¹⁾	NRESET	10	-	-	-	μs
tREST	Reset complete time ⁽²⁾	-	15	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

6. Power On/Off Sequence

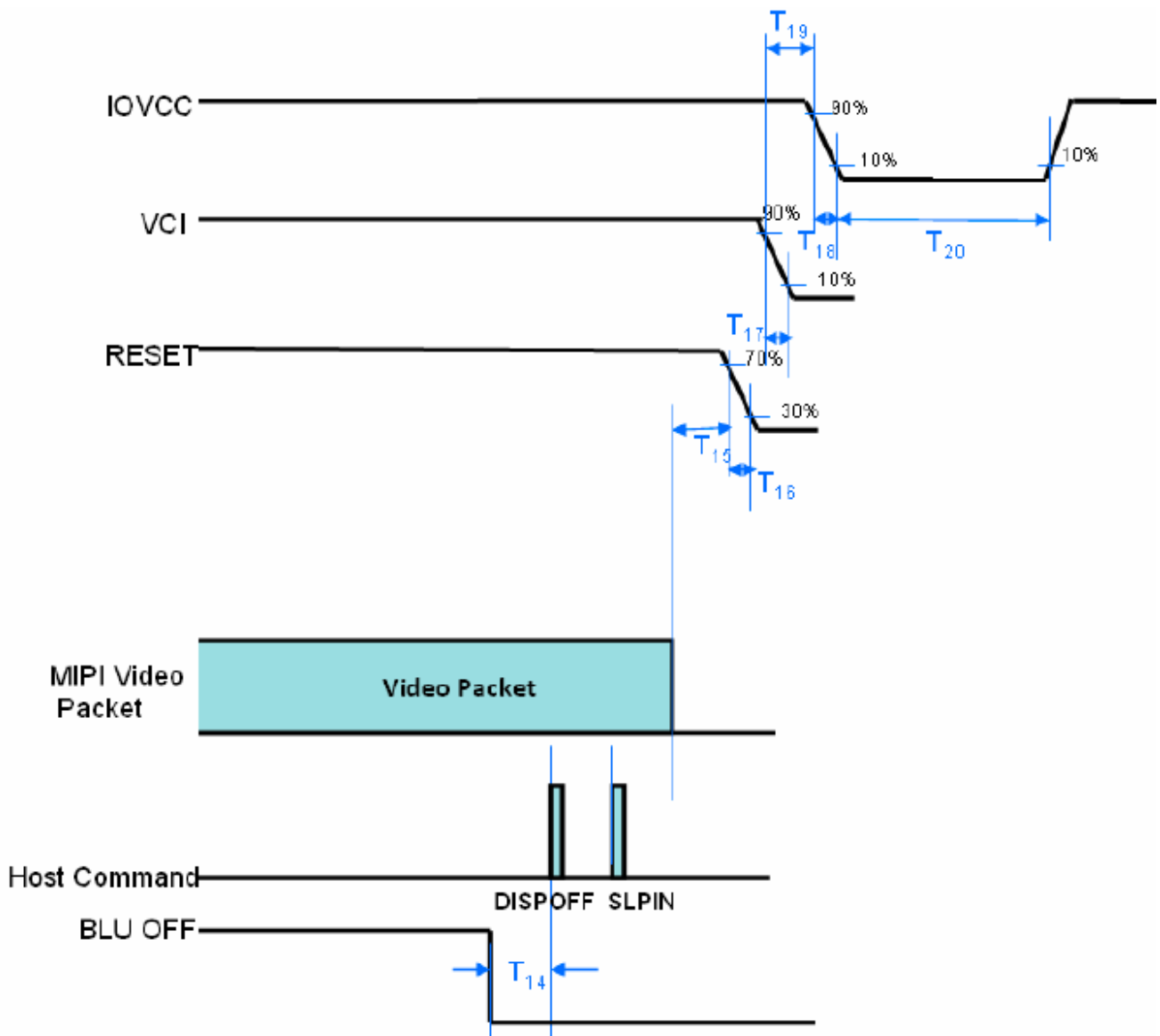
6.1 Power On Timing





	Min.	Typ.	Max.	Unit
T1	0.01	-	10	ms
T2	No Limit			ms
T3	0.01	-	10	ms
T4	1	-	-	ms
T5	1	-	-	ms
T6	10	-	-	us
T7	No Limit			ns
T8	15	-	-	ms
T9	120	-	-	ms
T10	No Limit			ms
T11	100	150	-	ms

6.2 Power Off Timing





	Min.	Typ.	Max.	Unit
T14	40	100	-	ms
T15	10	-	-	ms
T16	No Limit			ms
T17	No Limit			ms
T18	No Limit			ms
T19	No Limit			ms
T20	500			ms

7. Optical Specifications Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of Φ and θ equal to 0° .

Measurement condition: Refer to next pages (C-light source, Halogen Lamp)

*2): without Polarizer

Item	Symbol	Condition	Specification			Unit
			Min.	Typ.	Max.	
Response time	Tr+Tf	$\theta=0^\circ$	-	25	50	ms
Contrast ratio	CR	$\theta=0^\circ$	600	800	-	
Viewing angle	Top	CR \geq 10	75	85	-	deg.
	Bottom		75	85	-	
	Left		75	85	-	
	Right		75	85	-	
Color chromaticity (CF only with C light, CIE 1931)	Wx	$\theta=0^\circ$	-0.015	0.297	+0.015	
	Wy		-0.015	0.318	+0.015	
Color Gamut (CF only with C light, CIE 1931)	NTSC	CIE1931	45	50	-	%
Trasmittance (with Polarizer)	Trans	$\theta=0^\circ$	3.7	4.4	-	%



Notes : 1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the TFT-LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.
3. Response time is the time required for the display to transition from white to black(Rise Time, Tr) and from black to white(Falling Time, Tf). For additional information see FIG 3.
4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the TFT-LCD surface. For more information see FIG 4.
5. Optimum contrast is obtained by adjusting the TFT-LCD Threshold voltage(Vth & Vsat)

FIG. 1 Optical Characteristic Measurement Equipment and Method

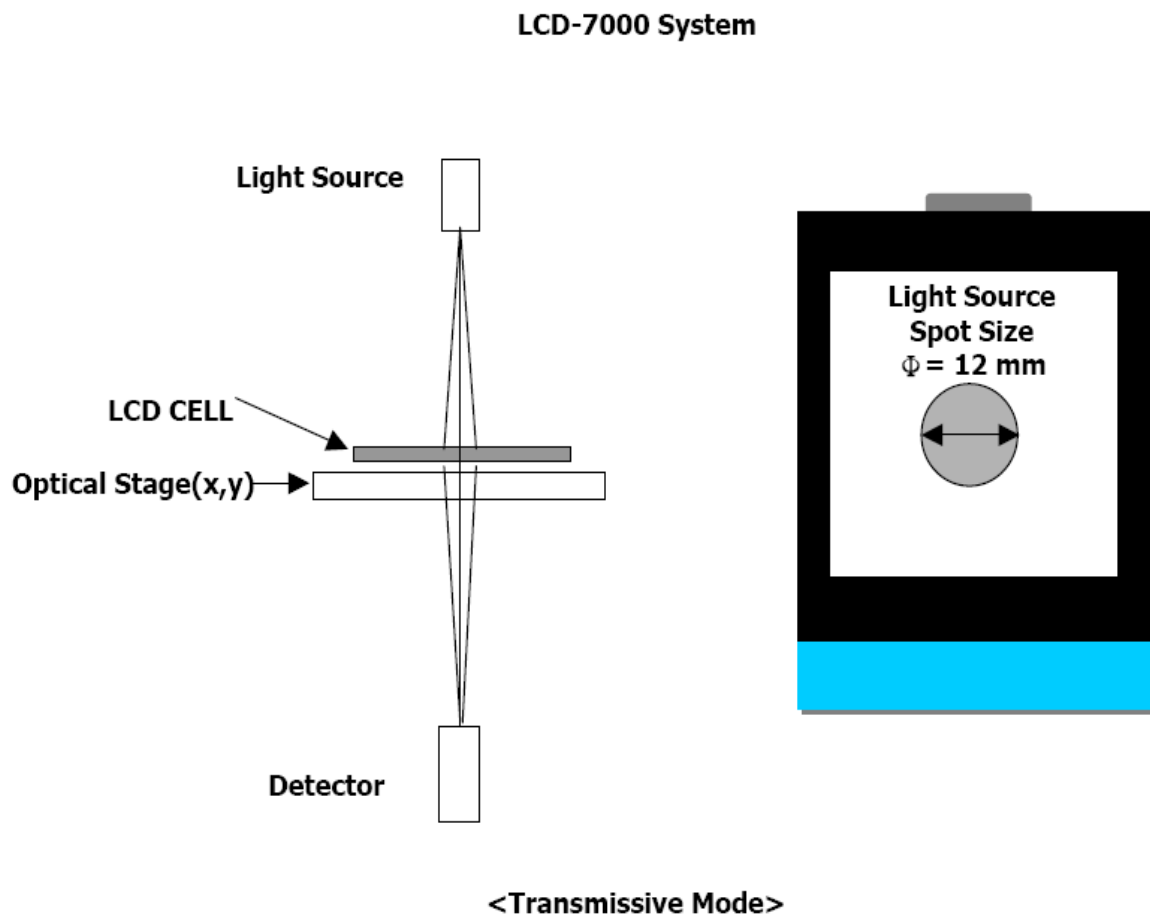




FIG. 2 The definition of V_{th} and V_{sat}

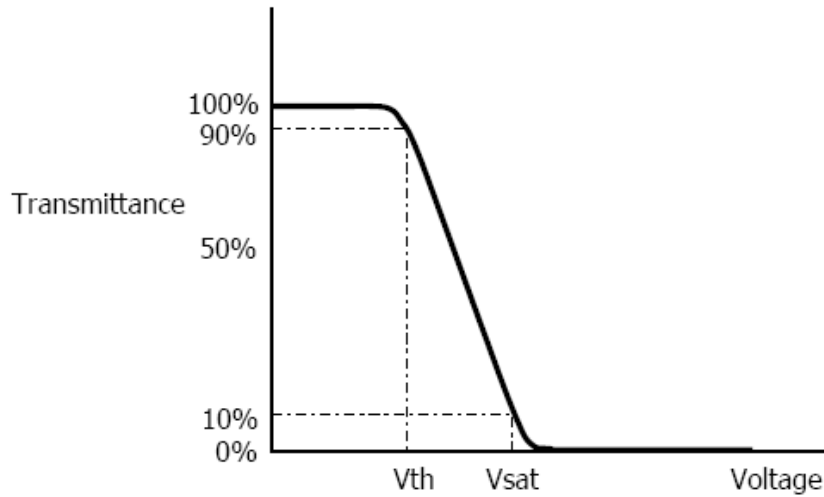
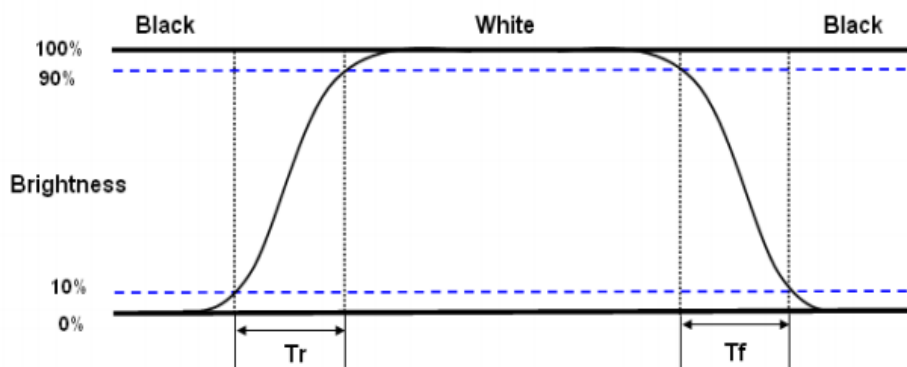


FIG. 3 The definition of Response Time

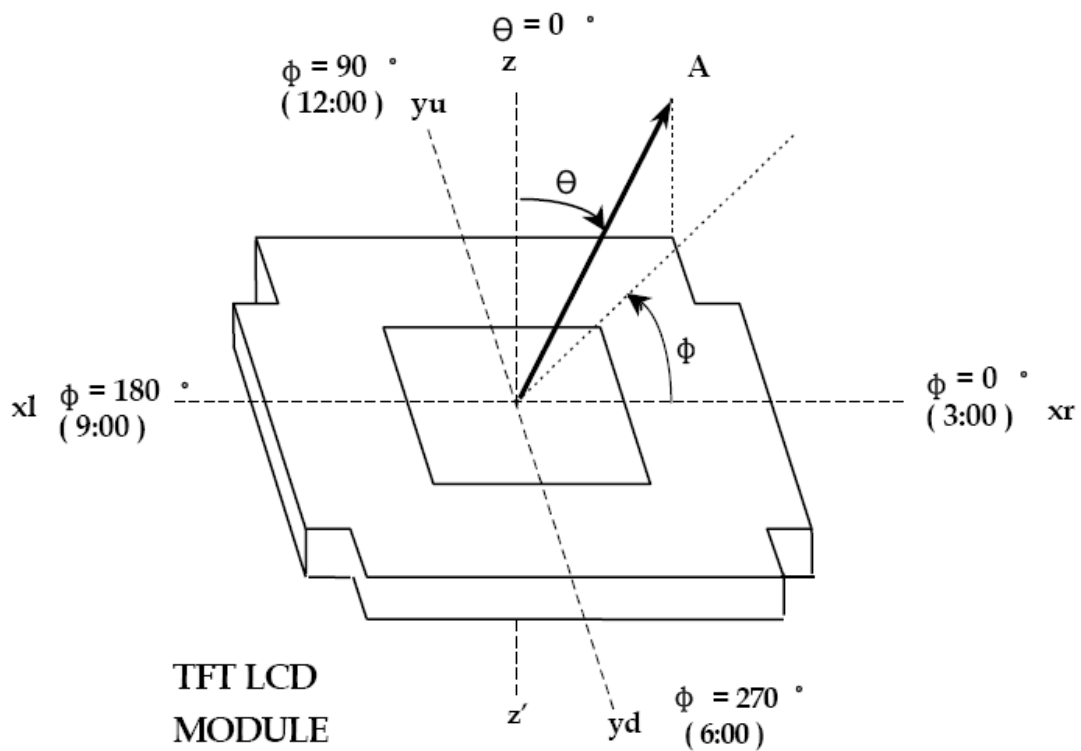
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



* Voltage conditions for Response time
 V_{gate} : 19V DC
 V_{data} : 0V~3.3V DC
 V_{com} : 0V (Ground)



FIG. 4 The definition of viewing angle
<dimension of viewing angle range>





8. Reliability Test Items

No.	Test Item	Test Condition	Check Time
1	High temp storage	T=80°C	72Hrs
2	Low temp storage	T=-30°C	72Hrs
3	High temp operation	T=70°C	72Hrs
4	Low temp operation	T=-20°C	72Hrs
5	High temp & high humidity	T=50°C H=90%	72Hrs

Reliability Test Criteria:

Display function should be no change under normal operating condition.



9. Handling Precautions

9.1 Safety

The liquid crystal in the LCD is poisonous. Keep away from your mouth and eyes. If the liquid crystal contacts with your skin, mouse or clothes, use soap to wash it off immediately.

9.2 Handling

- i. The LCD panel is made of very thin glass. Mechanical impact or extrusion to the surface should be prevented.
- ii. The polarizer attached on the display is very easy to be damaged, handle it with special attention.
- iii. To avoid contamination on the display surface, do not touch the display surface with bare hands.
- iv. The transparent electrodes may be disconnected if you use the LCD panel under dew-condensing environment.
- v. The characteristics of the semiconductor devices may be affected when they are exposed to light, possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, make sure the application and the mounting of the panel are designed so that the IC is not exposed to light.

9.3 Static Electricity

Ground soldering iron tips, tools and testers when you operate. Also ground your body when handling the products and store the products in an anti-electrostatic container.

9.4 Storage

Store the products in a dark place where the temperature is within the range of $25\pm 10^{\circ}\text{C}$ and with low humidity (60%RH or less). Do not store the LCD product in an atmosphere containing organic solvents or corrosive gases.

9.5 Cleaning

Do not wipe the polarizer with dry cloth, as it might cause scratching. Wipe the polarizer with a soft cloth soaked with petroleum IPA. Other chemical might damage the panel.



10. QC

10.1 Purpose

To ensure the stability of our product and standardize our inspection

10.2 Application Range

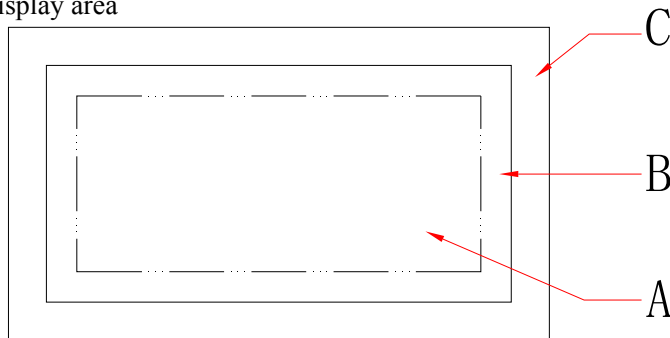
This standard is applied to all 4.3 inch and smaller sized LCM product from Elsun Technology Co.Ltd

10.3 Definition of inspection area

C area: The area covered after installation

B area: visible area

A area: display area

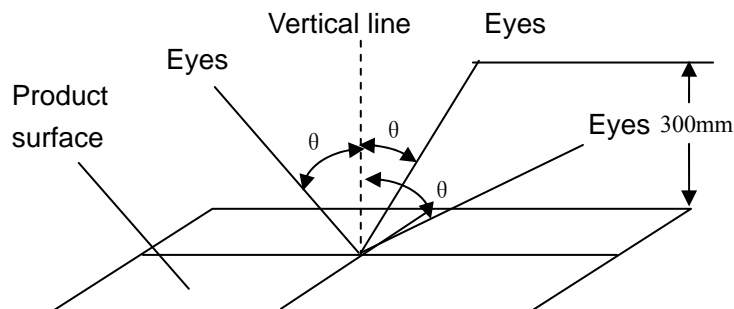


10.4 The environmental condition of inspection

Lighting conditions should be 20 ~ 40W fluorescent lamp (illumination at 1000 ± 200 lux)

Test ambient temperature should be 23 ± 5 °C, humidity at $50 \pm 20\%$ RH

The tested products should be placed 300mm away from the examiner's eye, and 30 degrees in the vertical direction observed within the region



10.5 Identification

10.5.1 Bright dot: dots appearing bright and unchanged in size when the LCD panel is under black pattern.

10.5.2 Dark dot: dots appearing dark and unchanged size when the LCD panel is under RGB picture.

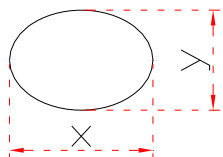
10.6 Inspection items and criteria



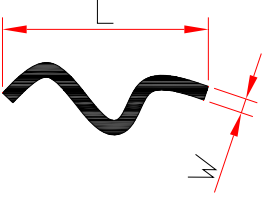
10.6.1 Serious defect

No	inspection item	inspection criteria	defect grade
10.6.1.1	function failure	1) Non-display not allowed 2) Line missing not allowed 3) Invalid touch and drift not allowed (if need)	main defect
10.6.1.2	break	broken display not allowed	main defect
10.6.1.3	dimension	Dimension tolerance out of specified in the drawing not allowed.	main defect

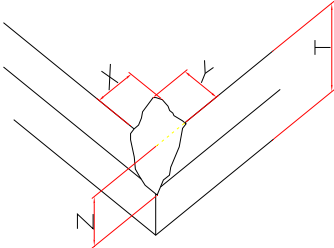
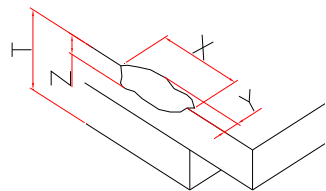
10.6.2 Appearance defect

No	Inspection item	inspection criteria	defect grade																							
10.6.2.1	Dot defect black dot, white dot, dirt on surface, stain, bubble	1. dot defect identification:	Minor defect																							
		$\Phi = \frac{(\chi + \gamma)}{2}$ 																								
		2. inspection criteria range																								
		<table border="1"> <thead> <tr> <th rowspan="2">Area and quantit y dimension(mm)</th> <th colspan="3">quantity allowed</th> </tr> <tr> <th>A area</th> <th>B area</th> <th>C area</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="3">ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.20$</td> <td colspan="3">2 (spacing $\geq 10\text{mm}$)</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Area and quantit y dimension(mm)	quantity allowed			A area	B area	C area	$\Phi \leq 0.15$	ignore			$0.15 < \Phi \leq 0.20$	2 (spacing $\geq 10\text{mm}$)			$0.20 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			
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$\Phi > 0.3$	0																									



No	Inspection item	inspection criteria	defect grade																																	
10.6.2.2	line defect visible black/white line	1. identification of line dimension L: length W: width 	Minor defect																																	
		2. inspection criteria <table border="1"> <thead> <tr> <th colspan="2">dimension(mm)</th> <th colspan="3">quantity allowed (total 3 pcs)</th> </tr> <tr> <th rowspan="2">L (length)</th> <th rowspan="2">W (width)</th> <th colspan="3">area</th> </tr> <tr> <th>A area</th> <th>B area</th> <th>C area</th> </tr> </thead> <tbody> <tr> <td>ignore</td> <td>$W \leq 0.03$</td> <td colspan="3">ignore</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.03 < W \leq 0.05$</td> <td colspan="3">2</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.05 < W \leq 0.08$</td> <td colspan="3">1</td> </tr> <tr> <td></td> <td>$W > 0.08$</td> <td colspan="3">count according to dot defect</td> </tr> </tbody> </table>		dimension(mm)		quantity allowed (total 3 pcs)			L (length)	W (width)	area			A area	B area	C area	ignore	$W \leq 0.03$	ignore			$L \leq 3.0$	$0.03 < W \leq 0.05$	2			$L \leq 3.0$	$0.05 < W \leq 0.08$	1				$W > 0.08$	count according to dot defect		
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$L \leq 3.0$	$0.05 < W \leq 0.08$	1																																		
	$W > 0.08$	count according to dot defect																																		
10.6.2.3	scratch	1-If the scratch is visible after installation or at work, refer to 10.6.2.2 2-If the scratch is visible at special angel or at non-working status, refer to the following standards <table border="1"> <thead> <tr> <th colspan="2">dimension (mm)</th> <th colspan="3">Quantity allowed</th> </tr> <tr> <th rowspan="2">L (length)</th> <th rowspan="2">W (width)</th> <th colspan="3">area</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>ignore</td> <td>$W \leq 0.03$</td> <td colspan="3">ignore</td> </tr> <tr> <td>$5.0 < L \leq 10.0$</td> <td>$0.03 < W \leq 0.05$</td> <td colspan="3">2</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.05 < W \leq 0.08$</td> <td colspan="3">1</td> </tr> <tr> <td></td> <td>$W > 0.08$</td> <td colspan="3">Not allowed</td> </tr> </tbody> </table>	dimension (mm)		Quantity allowed			L (length)	W (width)	area			A	B	C	ignore	$W \leq 0.03$	ignore			$5.0 < L \leq 10.0$	$0.03 < W \leq 0.05$	2			$L \leq 5.0$	$0.05 < W \leq 0.08$	1				$W > 0.08$	Not allowed			Minor defect
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No	Inspection item	inspection criteria	defect grade
10.6.2.4	Glass defect	<p>1. broken angle</p> <p>X 不计 Y ≤ 2.0mm or X ≤ 2.0mm Y 不计 Meanwhile Z < T ignore</p>  <p>2. other broken part</p> <p>X ≤ 5.0mm Y ≤ 0.8mm Meanwhile Z ≤ T ignore</p> 	Minor defect



NO	Inspection item	inspection criteria	defect grade
10.6.2.6	FPC	1. copper foil off, warping, crack and oxidation are not allowed 2. FPC crack, break, serious scratch and crease are not allowed	main defect
		3. if no special requirements, no release paper on double-sided adhesive FPC is not allowed. 4. Slight creases and scratches not exposed from the copper foil and with no affect to appearance and function are allowed. 5. if no special requirements, no insulating tape at welding part on backlight and touch-screen is not allowed.. 6. Parts off, breakage and deform are not allowed. 7. print on the surface should be clear and correct.	Minor defect
10.6.2.7	basic appearance requirements	1. clean appearance, no dirt, fingerprints and other traces. 2. ITO circuit on COG coating area should not be exposed. 3. Rust, sever scratch, deformation, obvious burrs and color dirt are not allowed. 4. Mis-assembly, part missing are not allowed. 5. Bubble caused by mis-pasted polaroid refers to 10.6.2.1 6. For watermark, the criteria is upon agreed by both parties.	Minor defect



10.6.3 electric defect

No	Inspection item	inspection criteria	defect grade
10.6.3.1	picture defect	Non-display, more or less image and display defect are not allowed.	main defect
10.6.3.2	bright/dark line	Not allowed.	main defect
10.6.3.3	display dot defect	<ol style="list-style-type: none">one dot is acceptable.Under bright status, 2 dark dots with more than 5mm distance is allowed.Totally 2 bright or dark dots are acceptable.The other defect under bright status refers to 10.6.2.1 <p>Note: Electric bright/dark dot means one pixel; less than 1/2 of 1 pixel can be ignored.</p>	Minor defect
10.6.3.4	connected dot/line defect	<ol style="list-style-type: none">Two continuous defect pixel connected dots are not allowed.Line defect refers to 10.6.2.2	Minor defect
10.6.3.5	wrong view direction	Wrong view directions, such as opposite view angle, are not allowed.	main defect
10.6.3.6	back light defect	<ol style="list-style-type: none">Backlight off are not allowed.Uneven light, dead light, flicker light, dark angle, light leakage are not allowed.Brightness should comply with drawing	main defect