承 认 书

产品型号： PV014SQ-HTNA2401

产品规格：128 RGB * 128 TFT 液晶显示屏

送 承

制 订	审 查	核 准	公司印章

承 认 方：

研发部	工程部	品质部	核 准	公司印章

☐ 临时规格书

☐ 正式规格书

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Document Revision History

Version	Date	Page	Description	Changed By
V00	2019-08-13	-	Firstissue	

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1. LCM Specification

1.1 Description

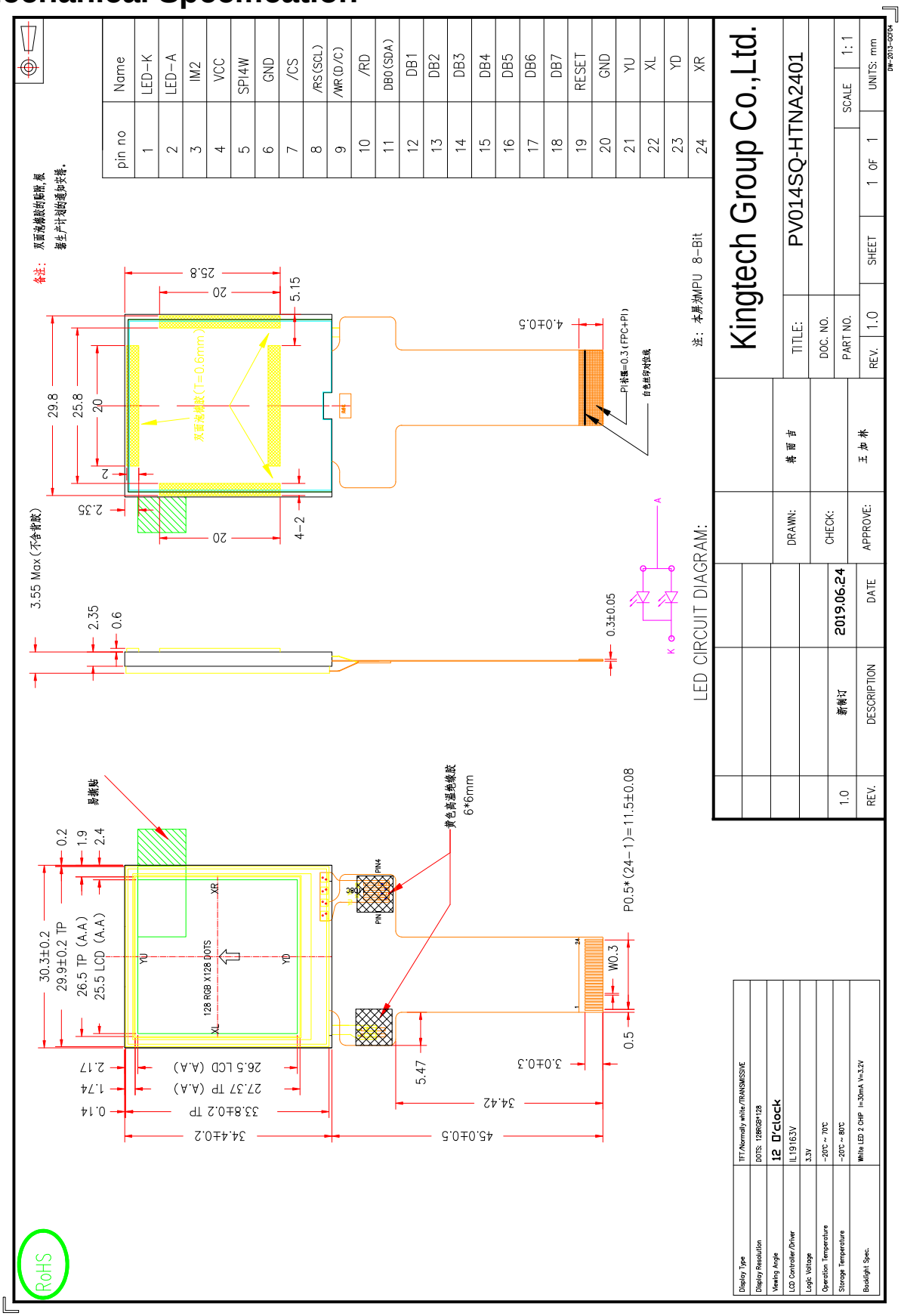
PV014SQ-HTNA2401 is a transmissive type color active matrix liquid crystal display(LCD) which uses amorphous thin film transistor(TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a RTP,a FPC and a LED-backlight unit. The active display area is 1.44 inches diagonally measured and the native resolution is 128*RGB*128.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	262 K color	-
Display Resolution	128RGB*128	pixels
Module Size	30.30(W)*34.4(H)*3.55(T)(Exclude FPC)	mm
Active Area (A.A)	25.50(W)*26.50(H)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	12 O'clock	
Display Mode	Normally Black	
LCD Controller/Driver	ILI9163V	-
IC Package Type	COG	-
Interface	SPI and 8bit parallel interface	-
Power Supply Voltage	2.8~3.3	V
Back-light	White LED*2	PCS

2. Mechanical Specification



3. Pin Descriptions

Pin No.	Symbol	I/O	Functional	Remark
1	LEDK	P	LED Power supply -	
2	LEDA	P	LED Power supply +	
3	IM2	I	MCU Parallel interface bus and Serial interface select - IM2='1';Parallel Interface - IM2='0';Serial Interface	
4	VCC	P	Power supply, 2.8~3.2V	
5	SP14W	I	SPI interface selection pin SPI4W='0': 3-wire SPI. (default) SPI4W='1': 4-wire SPI. This pin is internal pull low.	
6	GND	P	System ground.	
7	CS	I	Chip select input pin	
8	RS(SCL)	I	D Display data / Command selection pin in parallel and SCL in 3-pin SPI interface.	
9	WR(D/C)	I	Write enable in parallel interface D/CX: for 4-wire SPI	
10	RD	I	bus interface operation.	
11	DB0(SDA)	I/O	Data bus pin D0 is also the serial input/ output signal in SPI interface	
12~18	DB1~DB7	I/O	Date bus pin	
19	RESET	I	RESX pin	
20	GND	P	System ground.	
21	YU	I	Up electrode – differential analog (N.C)	
22	XL	I	Left electrode – differential analog (N.C)	
23	YD	I	Down electrode – differential analog (N.C)	
24	XR	I	Right electrode – differential analog (N.C)	

说明：模组根据客户要求自行设置接口

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	Value	Note
Input power supply	Vdd	V	-0.3 to +4.6	
Analog power supply	Avdd	V	-0.3 to +4.6	
Operating Temperature	Top	°C	-20 to +70	
Storage Temperature	Tst	°C	-30 to +80	
Operating Humidity	Hop	%(RH)	90	

(VSS=0V)

4.2 Electrical characteristics

Table 4.2:DC Characteristic

Item		Symbol	Condition	Min.	Type.	Max.	Unit
Analog power supply	Logic	VCC	---	2.6	2.8	3.0	V
Input Voltage	H level	V_{IH}	---	0.8Vcc	---	Vcc	V
	L level	V_{IL}		-0.3	---	0.2Vcc	
Supply current		Icc	Without LED VCC=2.8V	---	9	---	mA

4.3 Back-light Specification

Table 4.3 Back-light Characteristics

Item	Symbol	Conditions	Min.	Type.	Max.	Unit
Supply Voltage	VF	Only Backlight	-	3.2	-	V
Supply Current	IF		30			mA
Average Brightness	IV	Backlight Current IF=30mA	3000	3500	-	Cd/m^2
CIE Color Coordinate (Without LCD)	X	Backlight Current IF=30mA	0.260	--	0.320	–
	Y		0.270	--	0.330	
Uniformity	B	Backlight Current IF=30mA	--	80%	–	%
Color	White					

Note: 2 LEDs in Parallel connection.

4.4 RTP Specification

ITO Glass: T=0.7mm 500Ω/□ ±200Ω

ITO Film: T=0.188mm 270Ω/□ ±150Ω

Surface Hardness: 3H-Pressure 200gf, 45deg

Hitting Durability: 1,000,000 times (Tip R8mm)

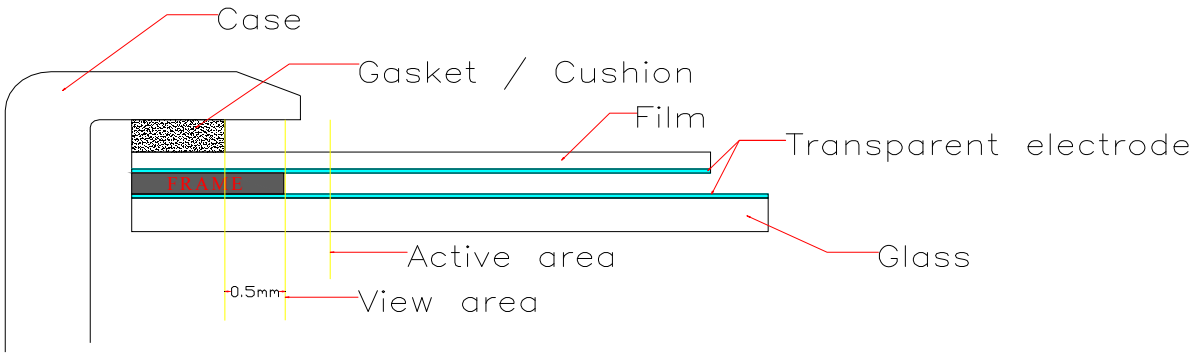
Pen Sliding Durability: 100,000 times (Tip R0.8mm)

Insulation Impedance: DC 25V min, 10MΩ↑

Light Transparency: 80% min

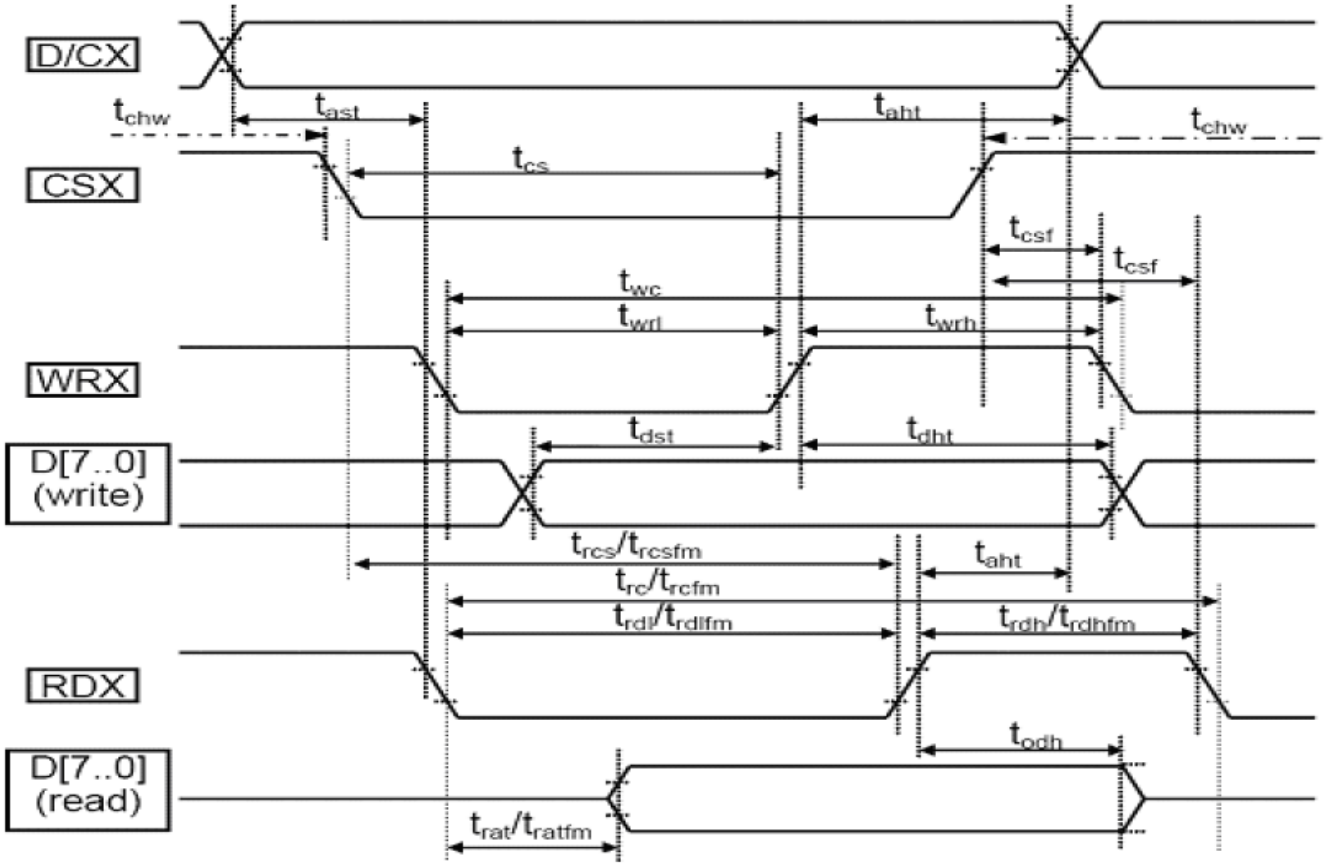
Operating Voltage: 5V DC ;

4.5 RTP Assembly sketch



5. AC Characteristics

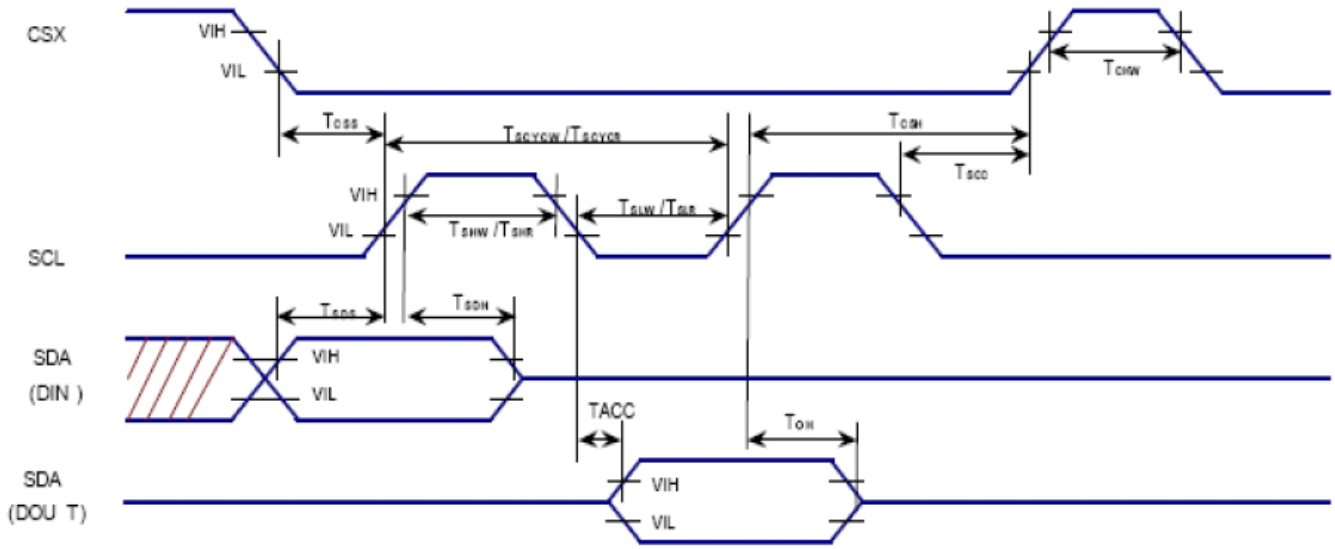
5.1 Parallel CPU 8-bit Bus



Signal	Symbol	Parameter	Min.	Max.	Unit	Description
DCX	Tast	Address setup time	0	-	ns	
	Taht	Address hold time (Write/Read)	10	-		
CSX	Tcs	Chip select setup time (Write)	10	-	ns	
	Trcs	Chip select setup time (Read register)	45	-		
	Trcsfm	Chip select setup time (GRAM)	355	-		
	Tcsf	Chip select wait time (Write/Read)	10	-		
WRX	Twc	Write cycle	60	-	ns	When read ID date
	Twrh	Control pulse “H” duration	15	-		
	Twrl	Control pulse “L” duration	15	-		
RDX	Trc	Read cycle (read register)	160	-	ns	When read from frame memory
	Trdh	Control pulse “H” duration	90	-		
	Trdl	Control pulse “L” duratio	45	-		
DB[7:0]	Tdst	Data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	Tdht	Data hold time	10	-		
	Trat	Read access time(read register)	-	40		
	Trat	Read access time(GRAM)	-	340		
	Todh	Output disable time	20	80		

Note 1: VDDI 1.65 to 3.3V, VPNL=2.6 to 3.3V, AGND=GND=0V, Ta=-30 to 70 °C (to +85°C no damage)
Note 2: This input signal rise time and fall time (tr, tf) is specified at 15 ns or less. Logic high and low levels are specified as 30% and 70%
of VDDI for input signals

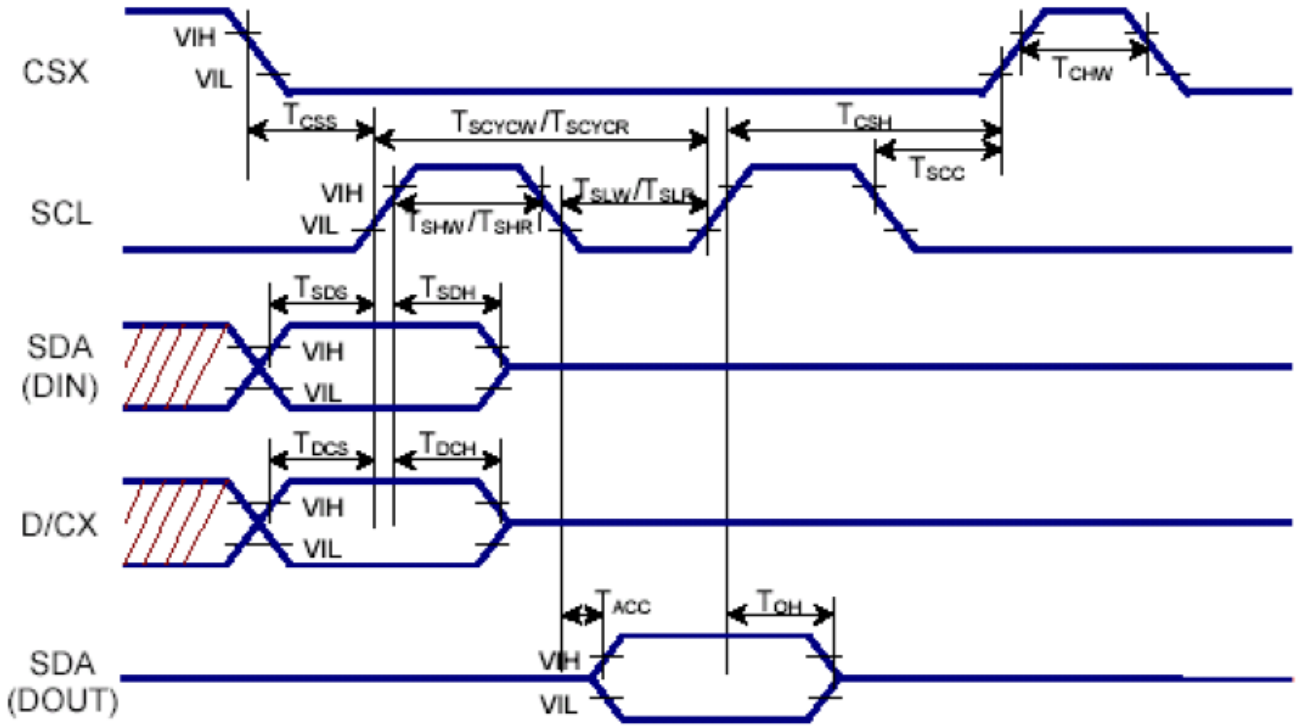
5.2 3-pin Serial Interface



Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	Tcss	Chip select setup time	10	-	ns	
	Tcsh	Chip select hold time	30	-		
	Tchw	Chip select “H” pulse width	30	-		
SCL	TSCYCW	Serial clock cycle(Write)	33	-	ns	
	TSHW	S “L” ″H″ pulse width(Write)	10	-		
	TSLW	S “L” ″L″ pulse width(Write)	10	-		
	TSCYCR	Serial clock cycle(Read)	100	-		
	TSHR	S “L” ″H″ pulse width(Read)	40	-		
	TSLR	S “L” ″L″ pulse width(Read)	40	-		
SDA(DIN) (DOUT)	TSDS	Data setup time	5	-	ns	For maximum CL=30pF For minimum CL=8pF
	TSDH	Data hold time	5	-		
	TACC	access time	5	25		
	TOH	Output disable time	10	-		

Note 1: VDDI=1.65 to 3.3V, VPNL=2.6 to 3.3V, AGND=GND=0V. Ta=-30 to 70℃ (to +85℃ no damage)
Note 2 : The input signal rise time and fall time(tr, tf) is specified at 15 ns or less. Logic high and low levels are specified as 10% and 90% of VDDI for Input signals.

5.3 4-pin Serial Interface



Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	Tcss	Chip select setup time	10	-	ns	
	Tcsh	Chip select hold time	30	-		
	Tchw	Chip select "H" pulse width	30	-		
SCL	TSCYCW	Serial clock cycle(Write)	33	-	ns	
	TSHW	S "L" "H" pulse width(Write)	10	-		
	TSLW	S "L" "L" pulse width(Write)	10	-		
	TSCYCR	Serial clock cycle(Read)	100	-		
	TSHR	S "L" "H" pulse width(Read)	40	-		
	TSLR	S "L" "L" pulse width(Read)	40	-		
DCX	TDCS	D/CX setup time	5			
	TDCH	D/CX hold time	5			
SDA(DIN) (DOUT)	TSDS	Data setup time	5	-	ns	For maximum CL=30pF For minimum CL=8pF
	TSDH	Data hold time	5	-		
	TACC	access time	5	25		
	TOH	Output disable time	10	-		

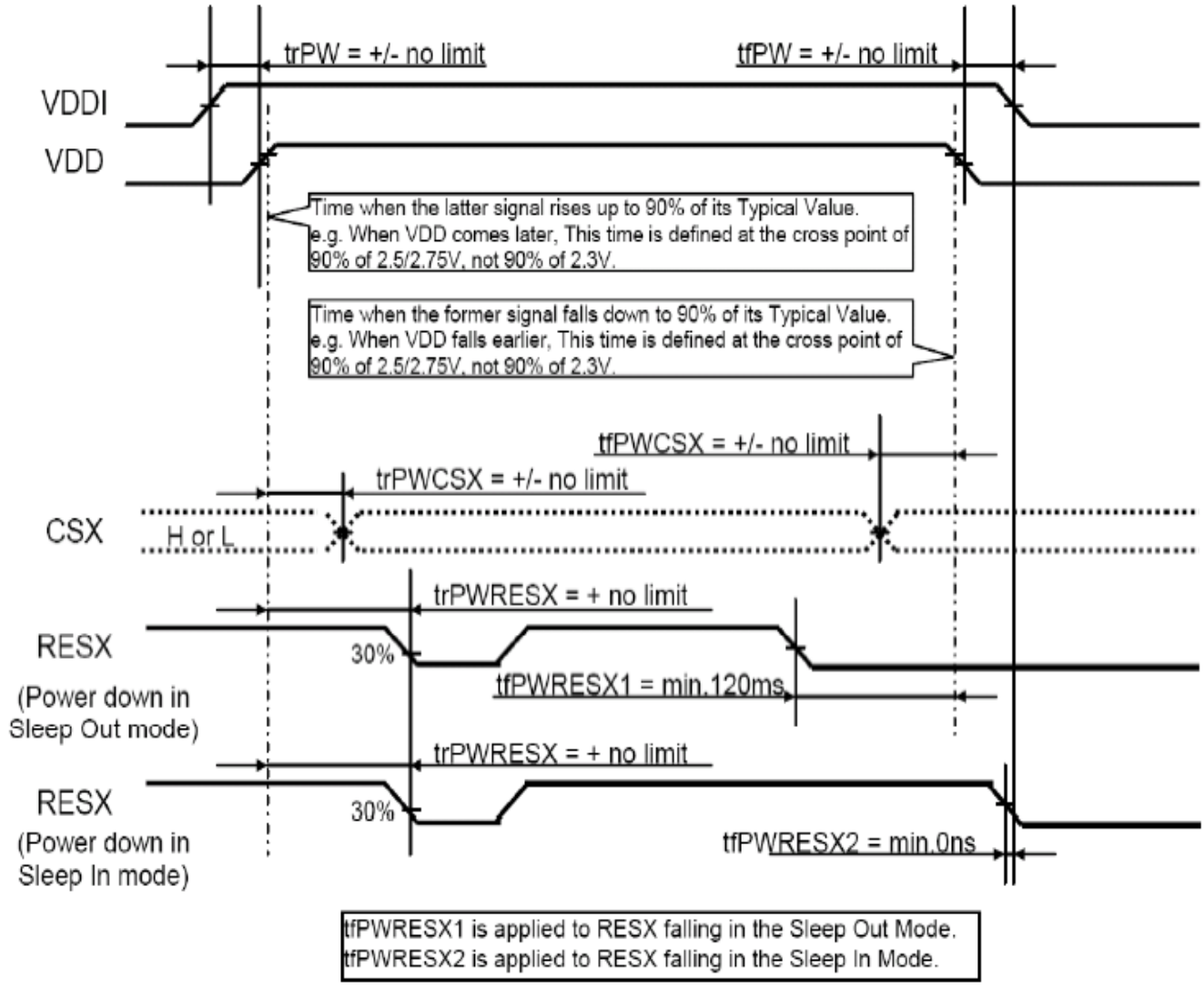
Note 1: VDDI=1.65 to 3.3V, VPNL=2.6 to 3.3V, AGND=GND=0V. Ta=-30 to 70℃ (to +85℃ no damage)

Note 2 : The input signal rise time and fall time(tr, tf) is specified at 15 ns or less. Logic high and low levels are specified as 10% and 90% of VDDI for Input signals.

6. Power On/Off Sequence

6.1 Case 1 – RESX line is held high or Unstable by Host at Power –On

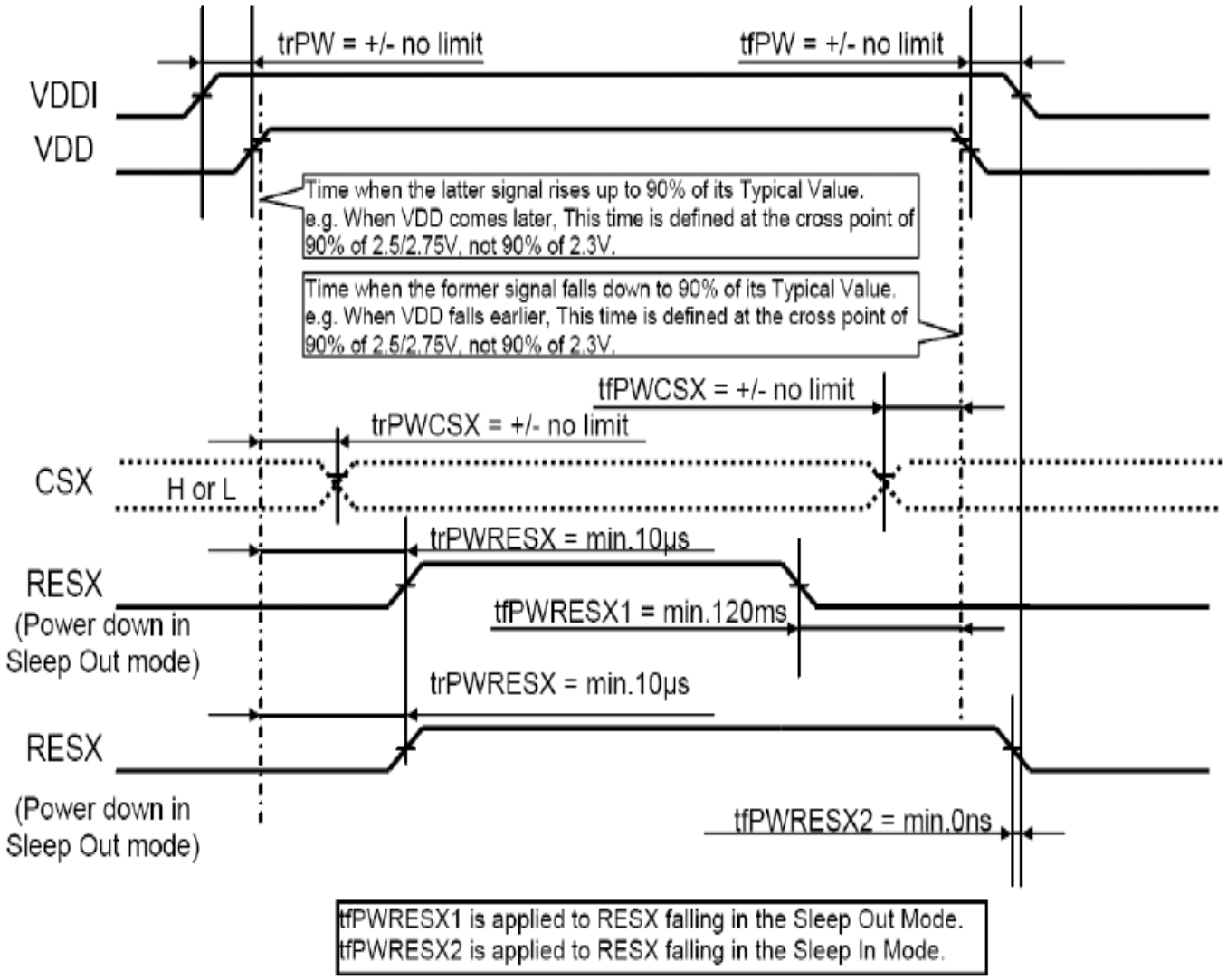
If RESX line is held high or unstable by the host during Power On, then a Hardware Reset must be applied afterboth VPNL and VDDI have been applied – otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.



Note: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

6.2 Case 2 – RESX line is held Low by Host at Power On

If RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for minimum 10µsec after both VPNL and VDDI have been applied.



Note: Unless otherwise specified, timings herein show cross point at 50% of signal/power level.

7. Optical Specification

7.1 Optical Specification

ITEM		SYMBOL	CONDITION	Min.	TYP.	Max.
Color Filter Chromacicity (Note.1)	White	x	θ=ϕ= 0°	0.285	0.305	0.325
		y		0.314	0.334	0.354
		Y		29.9	32.9	35.9
	Red	x	θ=ϕ= 0°	0.588	0.608	0.628
		y		0.296	0.316	0.336
		Y		17.8	20.8	23.8
	Green	x	θ=ϕ= 0°	0.285	0.305	0.325
		y		0.536	0.556	0.576
		Y		57.6	61.6	65.6
	Blue	x	θ=ϕ= 0°	0.115	0.135	0.155
		y		0.117	0.137	0.157
		Y		13.2	16.2	19.2
Transmittance(%) (Note.3)		T	θ=ϕ= 0°	--	6	--

Note.1 These items are measured by C light.
Note.2 Definition of Viewing Angle(θ, ϕ),refer to Fig.1 as below :

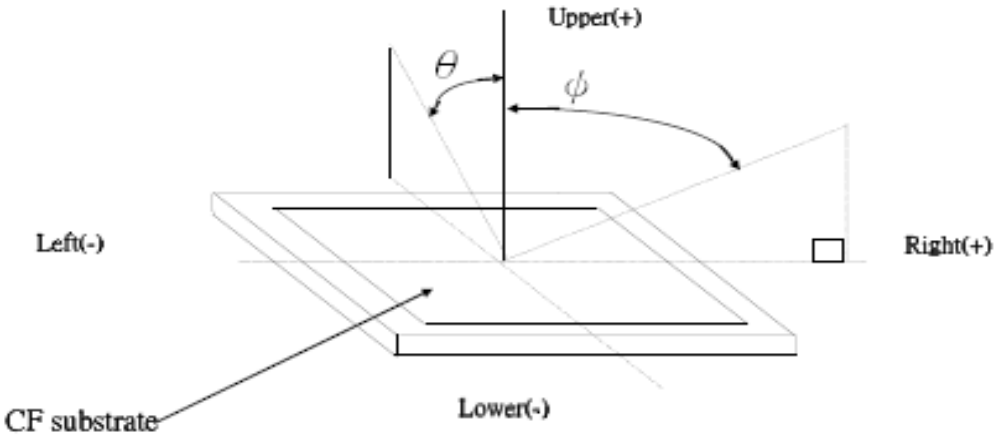
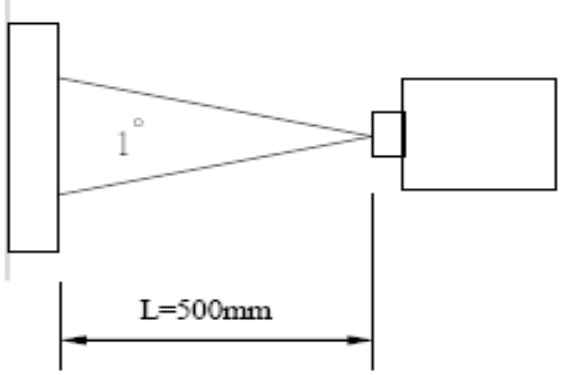


Fig.1 Definition of Viewing Angle

Note.3 Using CPT LC+ EWV Polarizer+Corresponding Backlight, reference only, Measure device：BM-5A (TOPCON)，viewing cone= 1°，I_L=20mA。



8. Reliability Test Items

No.	Test Item	Test Condition
1	High Temperature Operation	Ts = +70℃, 96 hours
2	ILow Temperature Operation	Ts = -20℃, 96 hours
3	High Temperature Storage	Ta = +80℃, 96 hours
4	Low Temperature Storage	Ta = -30℃, 96 hours
5	Storage at HighTemperature and Humidity	Ta = +50℃, 90% RH,72hours

NOTE :
1. All judgement of display are performed after temperature of panel return to room temperature.
2. Display function should be no change under normal operating condition.
3. Under no condensation of dew.
4. HSD only guarantee the above 5 test items, and without guarantee the others.

9.Handling Precautions

9.1. Refrain from strong mechanical shock and / or any force to the panel. In addition to damage, this may improper operation or damage to the panel.

9.2. Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.

9.3. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or month. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

9.4. Protect the panel from static; it may cause damage to the CMOS devices.

9.5. Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

9.6. Pins of I/F connector shall not be touched directly with bare hands.

10. QC

10.1 Purpose

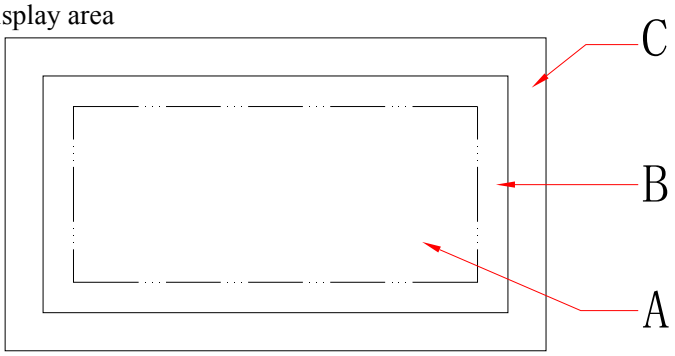
To ensure the stability of our product and standardize our inspection

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

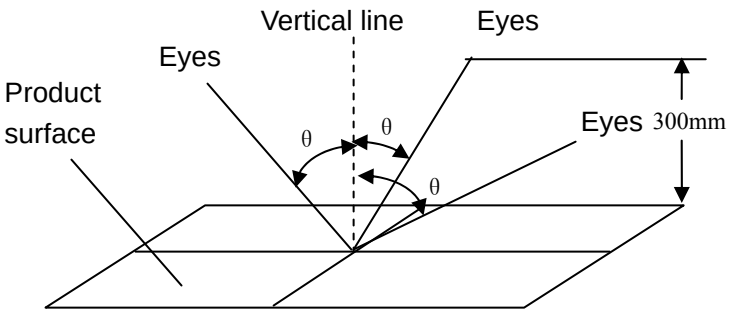


10.4 The environmental condition of inspection

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

Test ambient temperature should be 23 ± 5 ℃, humidity at 50 ± 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.

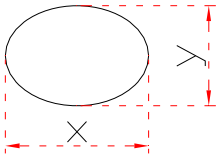
10.5.2 Dark dot: dots appearing dark and unchanged size when the LCD panel is under RGB picture.

10.6 Inspection items and criteria

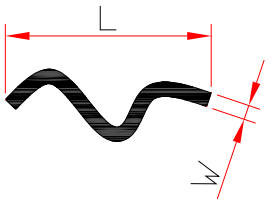
10.6.1 Serious defect

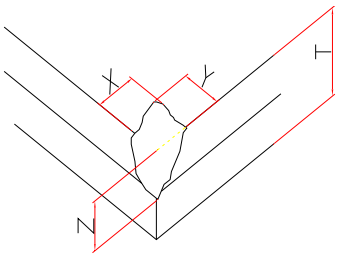
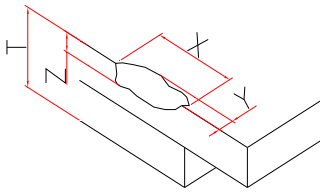
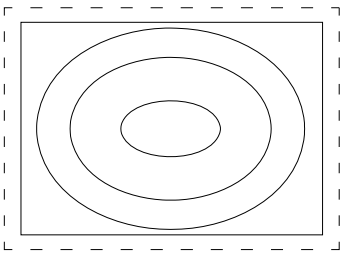
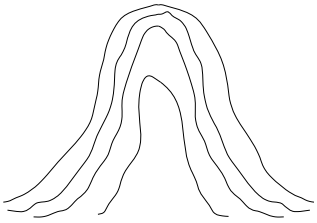
No	inspection item	inspection criteria	defect grade
10.6.1.1	function failure	1) Non-display not allowed 2) Line missing not allowed 3) Invalid touch and drift not allowed (if need)	main defect
10.6.1.2	break	broken display not allowed	main defect
10.6.1.3	dimension	Dimension tolerance out of specified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

10.6.2 Appearance defect

<table>
<tr><th>No</th><th>Inspection item</th><th>inspection criteria</th><th>defect grade</th></tr>
<tr><td rowspan="2">10.6.2.1</td><td rowspan="2">Dot defect
black dot, white dot, dirt on surface, stain, bubble</td><td>1. dot defect identification:
$\Phi = \frac{(X+Y)}{2}$  </td><td rowspan="2">Minor defect</td></tr>
<tr><td>2. inspection criteria range
<table>
<tr><th rowspan="2">Area and quantity / dimension(mm)</th><th colspan="3">quantity allowed</th></tr>
<tr><th>A area</th><th>B area</th><th>C area</th></tr>
<tr><td>Φ ≤0.15</td><td colspan="2">ignore</td><td rowspan="4">ignore</td></tr>
<tr><td>0.15＜ Φ ≤0.20</td><td colspan="2">2 （spacing>=10mm ）</td></tr>
<tr><td>0.20＜ Φ ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>Φ ＞0. 3</td><td colspan="2">0</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>No</th><th>Inspection item</th><th>inspection criteria</th><th>defect grade</th></tr>
<tr><td rowspan="2">10.6.2.2</td><td rowspan="2">line defect
visible
black/white line</td><td>1. identification of line dimension

L: length
W: width
  </td><td rowspan="2">Minor defect</td></tr>
<tr><td>2. inspection criteria
<table>
<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>
<tr><td>ignore</td><td>W≤0.03</td><td colspan="2">ignore</td><td rowspan="4">ignore</td></tr>
<tr><td>L≤3. 0</td><td>0.03＜W≤ 0. 05</td><td colspan="2">2</td></tr>
<tr><td>L≤3. 0</td><td>0.05＜W≤ 0. 08</td><td colspan="2">1</td></tr>
<tr><td></td><td>W＞0. 08</td><td colspan="2">count according to dot defect</td></tr>
</table></td></tr>
<tr><td>10.6.2.3</td><td>scratch</td><td>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>
<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>
<tr><td>ignore</td><td>W≤0.03</td><td colspan="2">ignore</td><td rowspan="4">ignore</td></tr>
<tr><td>5.0＜L≤10. 0</td><td>0.03＜W≤ 0. 05</td><td colspan="2">2</td></tr>
<tr><td>L≤5. 0</td><td>0.05＜W≤ 0. 08</td><td colspan="2">1</td></tr>
<tr><td></td><td>W＞0. 08</td><td colspan="2">Not allowed</td></tr>
</table></td><td>Minor defect</td></tr>
</table>

No	Inspection item	inspection criteria	defect grade
10.6.2.4	Glass defect	1. broken angle X 不计 Y≤2.0mm or X≤2.0mm Y 不计 Meanwhile Z＜T ignore  2. other broken part X≤5.0mm Y≤0.8mm Meanwhile Z≤T ignore 	Minor defect
10.6.2.5	Newton ring	1.regular Newton ring  ① Newton ring area>1/3 T/P area; not acceptable. ② Newton ring area≤1/3 T/P area and doesn't affect the display result and no line distortion; acceptable 2. Non-regular Newton ring  ① Newton ring area＞1/2 T/P area, or no matter how big as long as it affects the display result; not acceptable Newton ring area≤1/2 T/P area, and doesn't affect the display result and witouth line distortion; acceptable	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	1. one dot is acceptable. 2. Under bright status, 2 dark dots with more than 5mm distance is allowed. 3. Totally 2 bright or dark dots are acceptable. 4. The other defect under bright status refers to 10.6.2.1 Note: Electric bright/dark dot means one pixel; less than 1/2 of 1 pixel can be ignored.	Minor defect
10.6.3.4	connected dot/line defect	1. Two continuous defect pixel connected dots are not allowed. 2. 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	1. Backlight off are not allowed. 2. Uneven light, dead light, flicker light, dark angle, light leakage are not allowed. 3. Brightness should comply with drawing	main defect