



承认编码: CR _____

TFT LCD MODULE
4.3 inch 480RGB*272DOTS

MODULE NUMBER: PV043WQ-CTNC4001

REVISION: V00

Customer Approval:

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- Approved For Specifications**
- Approved For Specifications & Sample**

Prepared by	Checked by	Approved by



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1. LCM Specification

1.1 Description

PV043WQ-CTNC4001 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 4.3 inches diagonally measured and the native resolution is 480*RGB*272. Features of this product are listed in the following table.

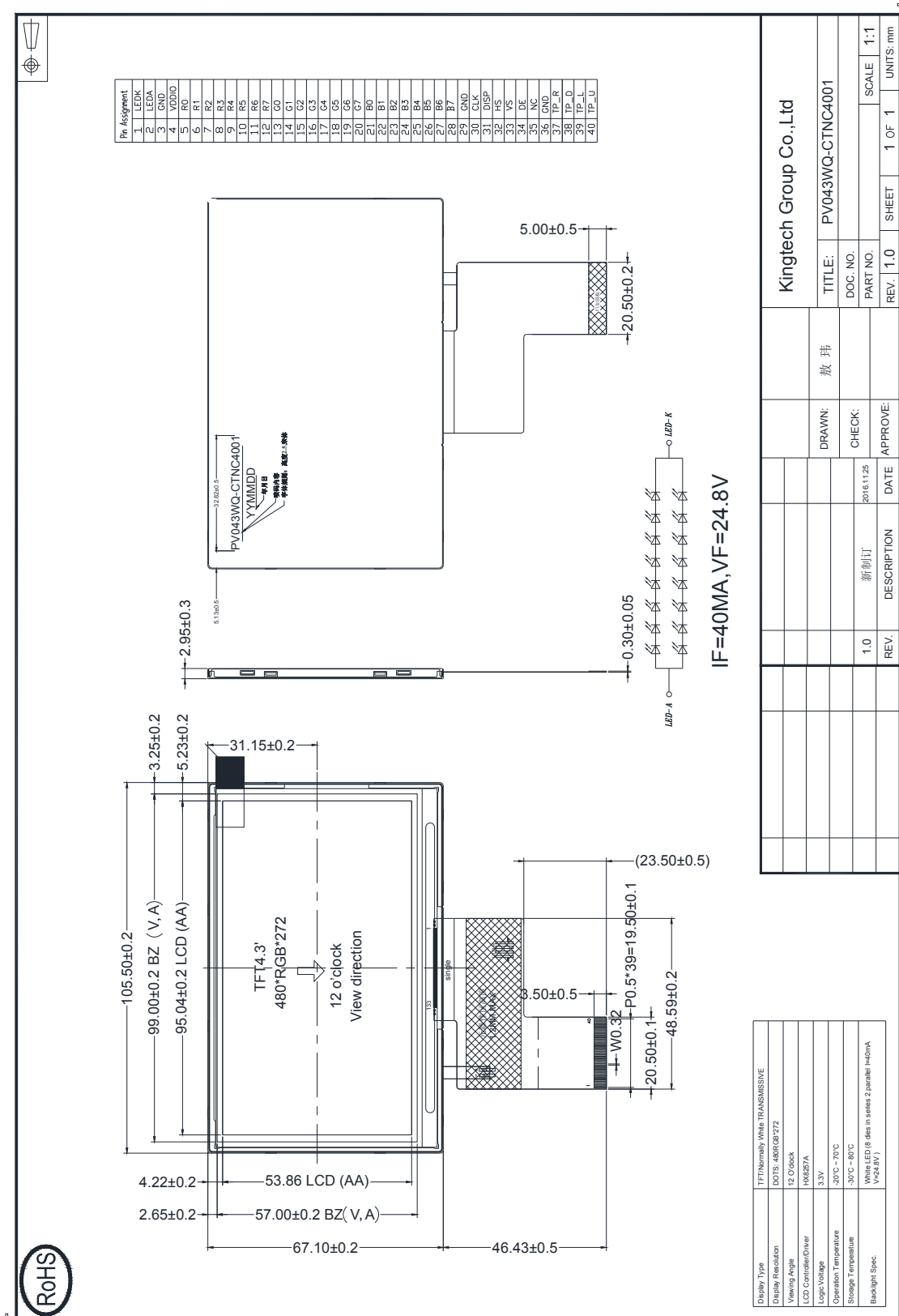
1.2 Functions & Features

Table 1.1 Module Functions & Features

Parameter	Value	Unit
LCD Mode	TFT/Transmissive	-
Color Depth	16.7M	-
Display Resolution	480RGB*272	pixels
Module Size	105.5(H)*67.1(W)*2.95 (T)(Exclude FPC)	mm
Active Area (A.A)	95.05(H)*53.86(W)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	12 O' clock	
Display Mode	Normally white	
LCD Controller/Driver	HX8257A	-
IC Package Type	COG	-
Interface	24-Bit Parallel RGB	-
Power Supply Voltage	3.0~3.6	V
Back-light	White LED*16	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	GND	P	System ground.	
4	VDDIO	P	Power supply, 3.0~3.6V	
5~12	R0~R7	I/O	RED Datas	
13~20	G0~G7	I/O	GREEN Datas	
21~28	B0~B7	I/O	BLUE Datas	
29	GND	P	System ground.	
30	CLK	I	Dot clock signal	
31	DISP	I	Display on/off mode control: Low: standby mode. High: normal display mode.	
32	HS	I	Horizontal synchronizing signal.	
33	VS	I	Vertical synchronizing signal.	
34	DE	I	Data ENABLE signal	
35	N.C	-	No Connection.	
36	GND	P	System ground.	
37	TP_R	I	Right electrode – differential analog	
38	TP_D	I	Down electrode – differential analog	
39	TP_L	I	Left electrode – differential analog	
40	TP_U	I	Up electrode – differential analog	

- 说明： 1. 根据需要可设置为24-Bit 并口RGB 和8-Bit 串口RGB，默认为并口RGB。
2. 显示图像可根据需要设置为正显和倒显，默认为正显。



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
Power Supply Voltage (1)	Vdd	V	-0.3 to +4.0	
Operating Temperature	Top	°C	-20 to +70	
Storage Temperature	Tst	°C	-30 to +80	
Operating Humidity	Hop	%(RH)	10~90	

(VSS=0V)

4.2 Electrical characteristics (Ta=25°C)

Table 4.2:DC Characteristic (Vcc = 3.0 ~ 3.6V)

Item		Symbol	Condition	Min.	Type.	Max.	Unit
Supply Voltage	Logic	Vdd	---	3.0	3.3	3.6	V
Input Voltage	H level	V _{IH}	---	0.7V _{dd} _{io}	---	V _{ddio}	V
	L level	V _{IL}		0	---	0.3V _{ddi} _o	
Current Consumption		I _{DD}	With internal voltage generation; VDD=3.3V; Tamb=25°C;	---	15	---	mA



4.3 Back-light Specification

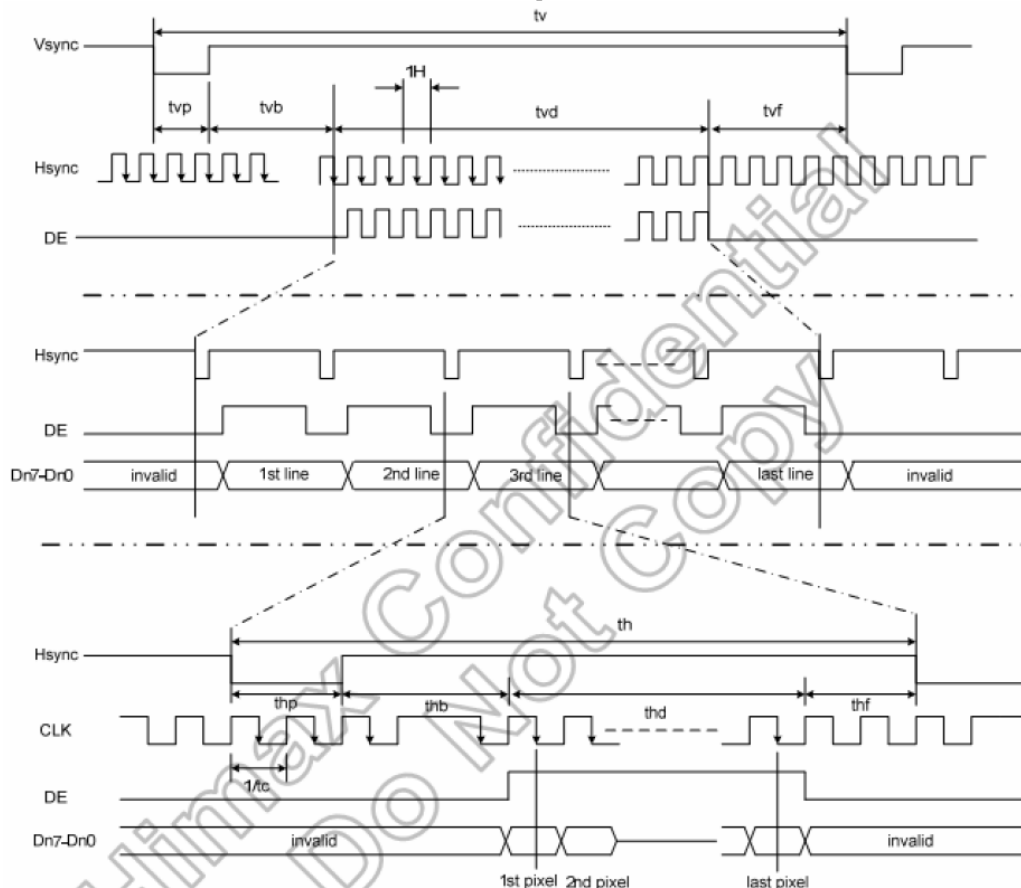
Table 4.3 Back-light Characteristics

Item	Symbol	Conditions	Min.	Type.	Max.	Unit
Supply Voltage	VF	Only Backlight	--	24.8	--	V
Supply Current	IF		40			mA
Average Brightness	IV	Backlight Current IF=40mA	--	800	-	Cd/ m ²
CIE Color Coordinate (Without LCD)	X	Backlight Current IF=40mA	0.26	--	0.32	-
	Y		0.26	--	0.32	
Uniformity	B	Backlight Current IF=40mA	--	80%	-	%
Color	White(正白偏蓝)					

Note: 8 LEDs in series 2 parallel connection.

5. AC Characteristics

5.1 Parallel RGB interface operation



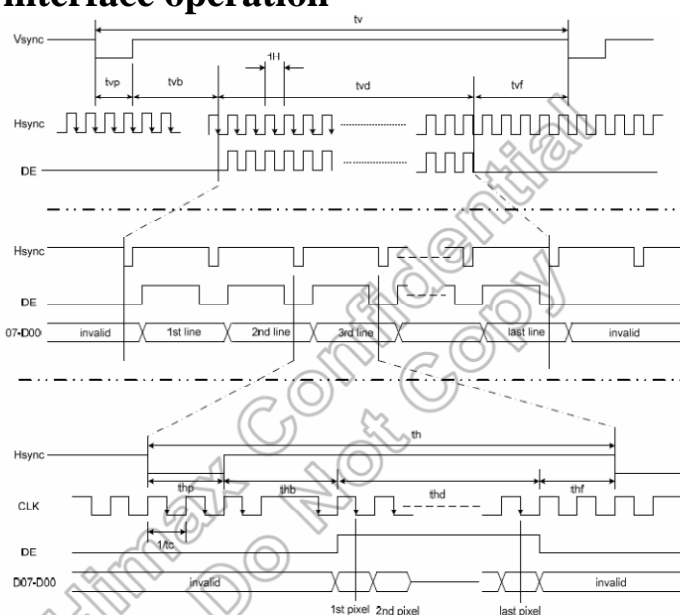

 (480RGBx272, $T_A=25^{\circ}\text{C}$, $V_{DDIO}=1.8\text{V}$ to 3.6V , $DVSS=0\text{V}$)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock cycle	$f_{\text{CLK}}^{(1)}$	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	thp ⁽²⁾	2	41	41	CLK
Horizontal back porch	thb ⁽²⁾	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	511	H ⁽¹⁾
Vertical display period	tvd	272	272	272	H ⁽¹⁾
Vertical front porch	tvf	1	2	227	H ⁽¹⁾
Vertical pulse width	tvp ⁽²⁾	1	10	11	H ⁽¹⁾
Vertical back porch	tvb ⁽²⁾	1	2	11	H ⁽¹⁾

 Note: (1) Unit: CLK=1/ f_{CLK} , H=th,

 (2) It is necessary to keep $tvp+tvb=12$ and $thp+thb=43$ in sync mode. DE mode is unnecessary to keep it.

5.2 Serial RGB interface operation


 (480RGBx272, $T_A=25^{\circ}\text{C}$, $V_{DDIO}=1.8\text{V}$ to 3.6V , $DVSS=0\text{V}$)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock cycle	$f_{\text{CLK}}^{(1)}$	-	27	33	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	1575	1575	1815	CLK
Horizontal display period	thd	1440	1440	1440	CLK
Horizontal front porch	thf	6	6	246	CLK
Horizontal pulse width	thp	6	123	123	CLK
Horizontal back porch	thb	6	6	123	CLK
Vertical Signal					
Vertical cycle	tv	285	286	511	H ⁽¹⁾
Vertical display period	tvd	272	272	272	H ⁽¹⁾
Vertical front porch	tvf	1	2	227	H ⁽¹⁾
Vertical pulse width	tvp	1	10	11	H ⁽¹⁾
Vertical back porch	tvb	1	2	11	H ⁽¹⁾

 Note: (1) Unit: CLK=1/ f_{CLK} , H=th



5.3 Input setup timing requirement

($T_A=25^{\circ}C$, $VDDIO=1.8V$ to $3.6V$, $DVSS=0V$, $t_r^{(1)}=t_f^{(1)}=2ns$)

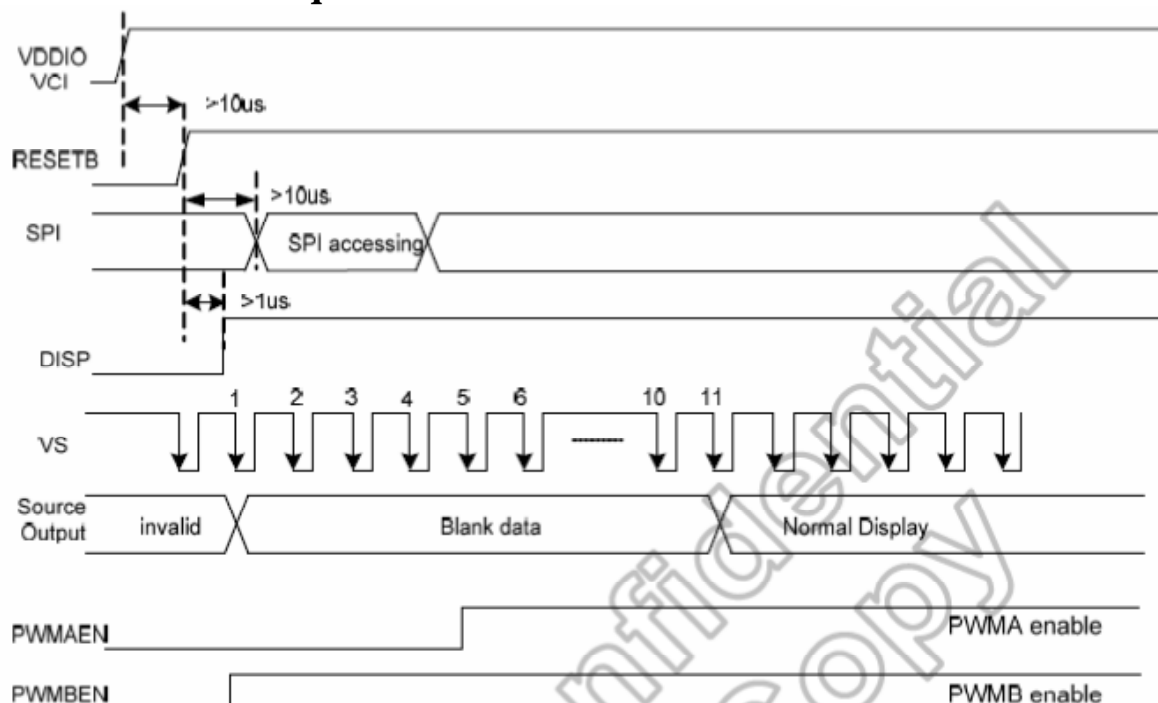
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DISP setup time	t_{diss}	10	-	-	ns
DISP hold time	t_{dish}	10	-	-	ns
Clock period	$PW_{CLK}^{(2)}$	66.7	-	-	ns
Clock pulse high period	$PWH^{(2)}$	26.7	-	-	ns
Clock pulse low period	$PWL^{(2)}$	26.7	-	-	ns
Hsync setup time	t_{hs}	10	-	-	ns
Hsync hold time	t_{hh}	10	-	-	ns
Data setup time	t_{ds}	10	-	-	ns
Data hold time	t_{dh}	10	-	-	ns
DE setup time	t_{des}	10	-	-	ns
DE hold time	t_{deh}	10	-	-	ns
Vsync setup time	t_{vhs}	10	-	-	ns
Vsync hold time	t_{vhh}	10	-	-	ns

Note: (1) t_r , t_f is defined 10% to 90% of signal amplitude.

(2) For parallel interface, maximum clock frequency is 15MHz.

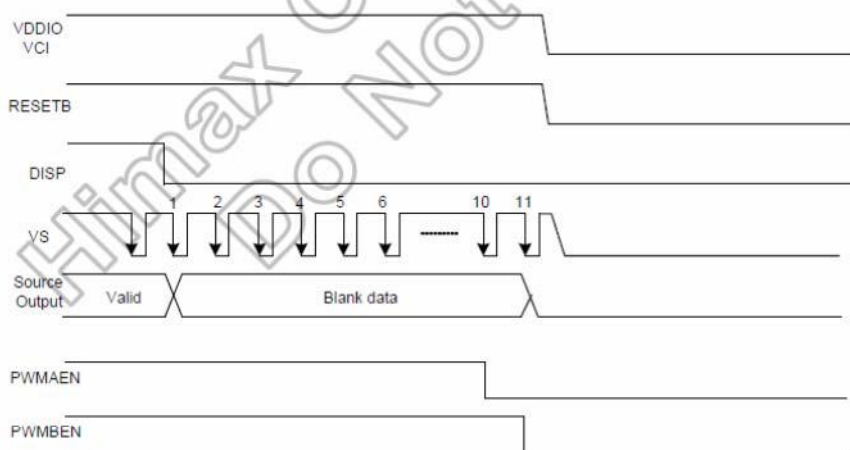
6. Power On/Off Sequence

6.1 Power On Sequence





6.2 Power Off Sequence



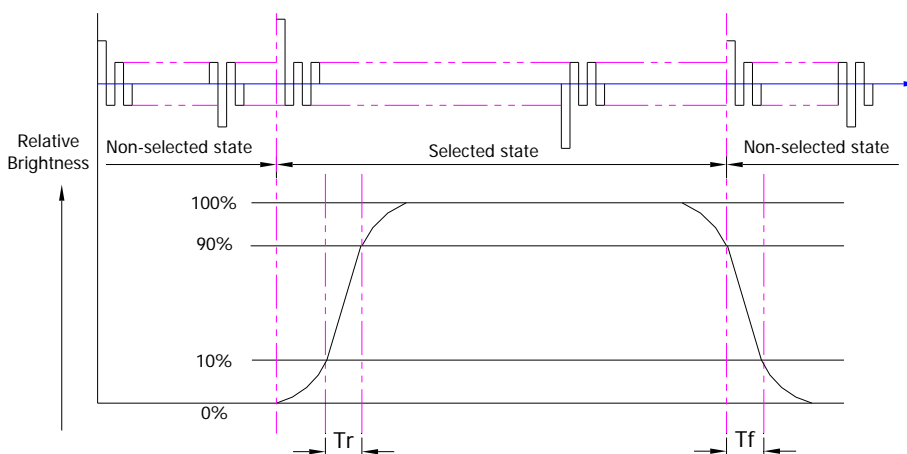
7. Optical Specifications

	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On (Transmissive Mode)	Luminance on TFT ($I_f = 20\text{mA/LED}$)	LV	Normally viewing angle $\theta_x = \phi_y = 0^\circ$	-	800	-	cd/m ²	
	Contrast ratio(See 7.2)	CR		400	500	-		
	Response time (See 7.1)	T_R+T_F		-	20	35	ms	
	Chromaticity Transmissive (See 7.4)	Red	X_R	Center CR ≥ 10	0.577	0.607	0.637	-
			Y_R		0.306	0.336	0.366	-
		Green	X_G		0.30	0.330	0.36	-
			Y_G		0.551	0.581	0.611	-
		Blue	X_B		0.112	0.142	0.172	-
			Y_B		0.067	0.097	0.127	-
	White	X_W	0.260	0.290	0.320	-		
Y_W		0.287	0.317	0.347	-			
Viewing Angle (See 7.3)	Horizontal	θ_{x+}	Center CR ≥ 10	65	75	-	Deg.	
		θ_{x-}		65	75	-		
	Vertical	ϕ_{y+}		50	60	-		
		ϕ_{y-}		60	70	-		
	NTSC Ratio(Gamut) (See 7.4)	-	-	-	50	-	%	



7.1 Definition of Response Time

7.1.1 Normally Black Type (Negative)

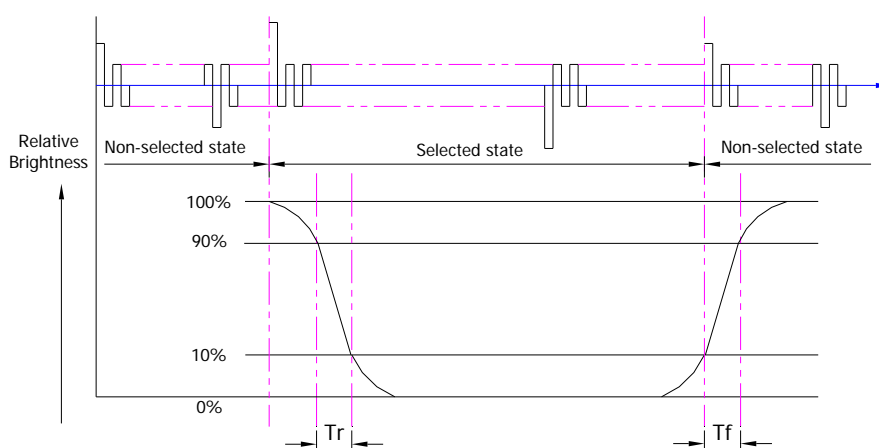


Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to non-selected state with relative luminance 10%.

Note : Measuring machine: LCD-5100

7.1.2 Normally White Type (Positive)



Tr is the time it takes to change form non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note : Measuring machine: LCD-5100 or EQUI

7.2 Definition of Contrast Ratio

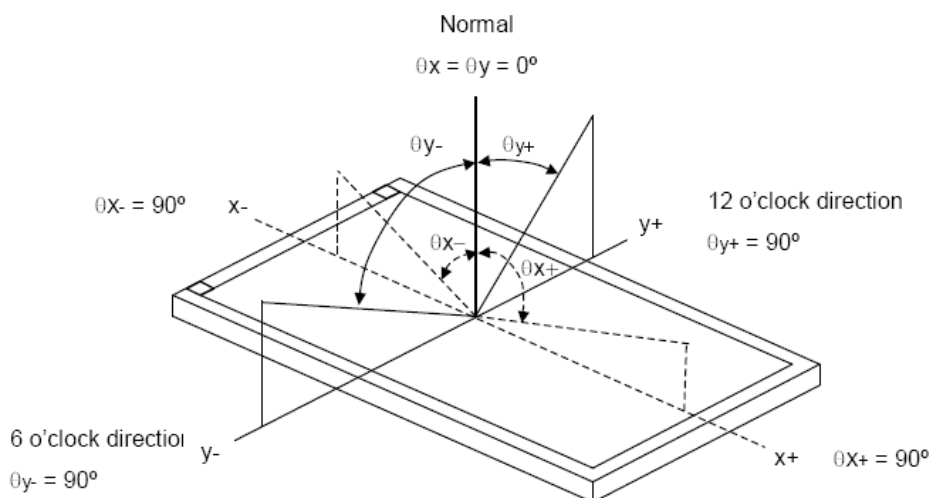
Contrast is measured perpendicular to display surface in reflective and transmissive mode. The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel



7.3 Definition of Viewing Angles



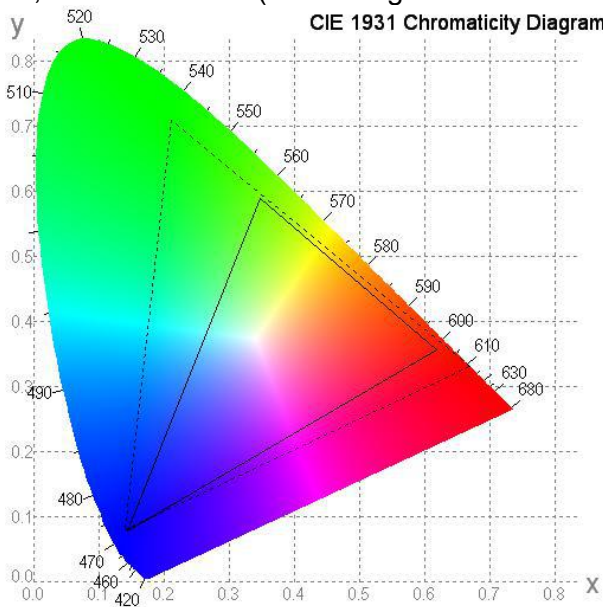
Measuring machine: LCD-5100 or EQUI

7.4 Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)





8. Reliability Test Items

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

Reliability Test Criteria:

Display function should be no change under normal operating condition.

9. Handling Precautions

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the LCD. It may damage sensitive parts inside LCD, and may cause scratches or dust on the display. HannStar does not warrant the LCD, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

- 9.3.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 9.3.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 9.3.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 9.3.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Absolute Maximum Ratings and Power Protection Circuit

9.4.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD may be damaged.

- 9.4.2 Please do not leave LCD in the environment of high humidity and high temperature for a long time.



9.4.3 It's recommended to employ protection circuit for power supply.

9.5 Operation

9.5.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead If the LCD attaches a polarizer.

9.5.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD for incoming inspection or assembly.

9.5.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

9.5.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

9.5.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.6 Static Electricity

9.6.1 Protection film must remove very slowly from the surface of LCD to prevent from electrostatic occurrence if the LCD attaches a polarizer.

9.6.2 Because TFT-LCD panel is very weak to electrostatic discharge, please be careful with electrostatic discharge.

Persons who handle the LCD should be grounded through adequate methods.

9.7 Strong Light Exposure

The LCD shall not be exposed under strong light such as direct sunlight. Otherwise display characteristics may be changed.

9.8 Disposal

When disposing LCD, obey the local environmental regulations.



10 QC

10.1 Purpose

To ensure the stability of our product and standardize our inspection

10.2 Application Range

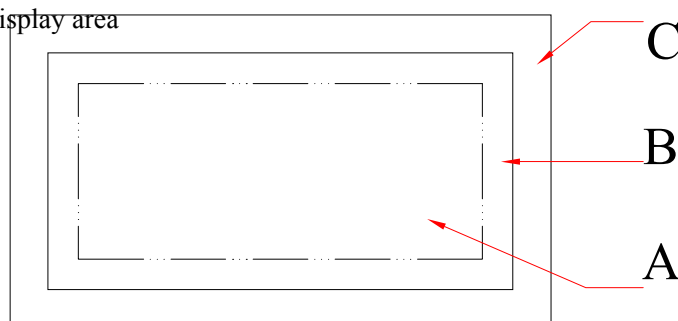
This standard is applied to all 4.3 inch and smaller sized LCM product from Elsun Technology Co.Ltd

10.3 Definition of inspection area

C area: The area covered after installation

B area: visible area

A area: display area

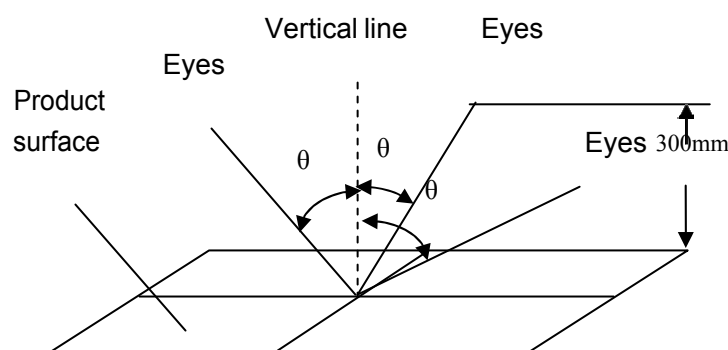


10.4 The environmental condition of inspection

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
		2. inspection criteria range	

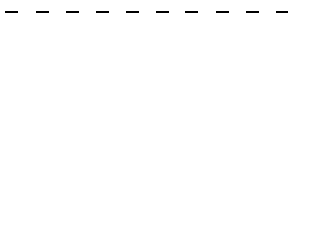
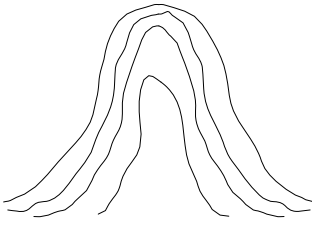
$$\Phi = \frac{(x+y)}{2}$$

Area and quantit y dimension(mm)	quantity allowed		
	A area	B area	C area
$\Phi \leq 0.15$	ignore		ignore
$0.15 < \Phi \leq 0.20$	2 (spacing $\geq 10\text{mm}$)		
$0.20 < \Phi \leq 0.3$	1		
$\Phi > 0.3$	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					
		dimension(mm)		quantity allowed (total 3 pcs)			
		L (length)		W (width)	area		
					A area	B area	C area
		ignore		$W \leq 0.03$	ignore		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					
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	Minor defect				
		dimension (mm)		Quantity allowed			
		L (length)		W (width)	area		
					A	B	C
		ignore		$W \leq 0.03$	ignore		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					



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 Newtonringarea≤1/2T/Parea,anddoesn'taffectthedisplaysresult andwitouthlinedistortion;acceptable	Minor defect



NO	Inspection item	inspection criteria	defect grade
10.6.2.6	FPC	<ol style="list-style-type: none"> 1. copper foil off, warping, crack and oxidation are not allowed 2. FPC crack, break, serious scratch and crease are not allowed 	main defect
		<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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

end.