



SPECIFICATION FOR LCD Module

MODULE:	PV03519T0230S-CO
CUSTOMER:	

KINGTECH	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2019.7.23	-	First Issued.	xiao



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1. General Description

* DESCRIPTION

PV03519T0230S-CO is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 3.45" TFT-LCD contains 640 x480 pixels, and can display up to 16.7M colors.

* Features

- Low Input Voltage: IOVCC 1.65~2.0V; VCI 2.5~3.3V
- Display Colors of TFT LCD:16.7M colors
- CPU Interface: MIPI VIDEO MODE
- Internal Power Supply Circuit.

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	70.08(H) *52.56(V) (3.45 inch)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	640(RGB) *480	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.1095(H) *0.1095(V)	mm	-
Viewing angle	ALL	o'clock	-
Drive IC	ST7703	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-20~+70	°C	-
Storage temperature	-30~+80	°C	-

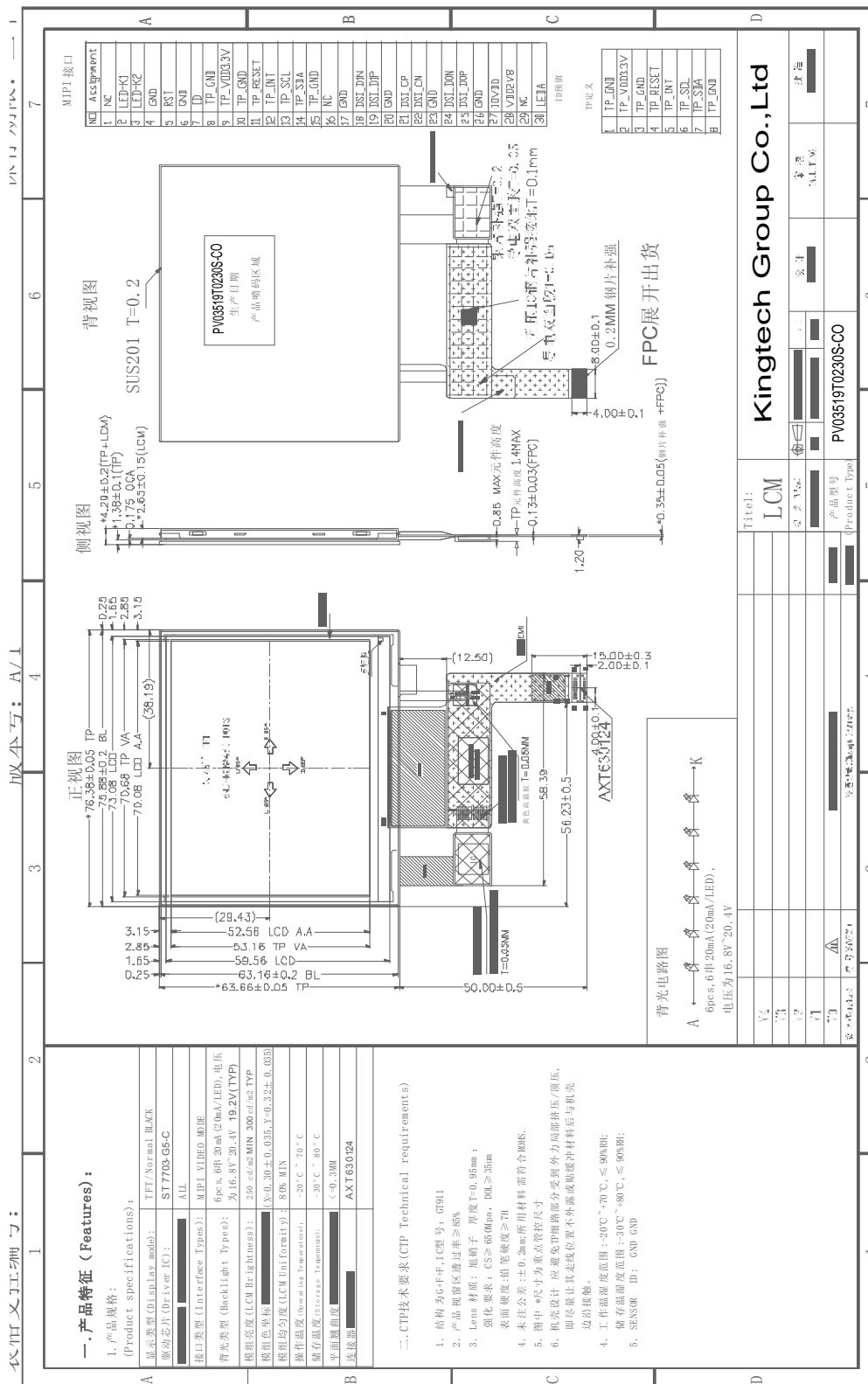
Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	76.38	-	mm	±0.05
	Vertical(V)	-	63.66	-	mm	±0.05
	Depth(D)	-	4.29	-	mm	±0.2
Weight		-	TBD	-	g	-



2. MECHANICAL SPECIFICATION

LCM Drawing





3. PIN DESCRIPTION

Pin NO.	Symbol	Level	Function
1	NC	/	Not connect
2	LEDK1	L	Backlight Cathode
3	LEDK2	L	Backlight Cathode
4	GND	L	Ground
5	RST	H/L	Reset pin
6	GND	L	Ground
7	ID	H/L	Read ID
8	TP_GND	L	Ground
9	TP_VDD3.3V	H	Power supply
10	TP_GND	L	Ground
11	TP_RESET	H/L	TP Reset pin
12	TP_INT	H/L	TP interrupt pin
13	TP_SCL	H/L	TP serial clock pin
14	TP_SDA	H/L	TP serial data pin
15	TP_GND	L	Ground
16	NC	/	Not connect
17	GND	L	Ground
18	DSI_D1N	H/L	MIPI data signal line
19	DSI_D1P	H/L	MIPI data signal line
20	GND	L	Ground
21	DSI_CP	H/L	MIPI clock signal line
22	DSI_CN	H/L	MIPI clock signal line
23	GND	L	Ground
24	DSI_D0N	H/L	MIPI data signal line
25	DSI_D0P	H/L	MIPI data signal line
26	GND	L	Ground
27	IOVDD	H	Power supply
28	VDD2V8	H	Power supply
29	NC	/	Not connect
30	LEDA	H	Backlight Anode



4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Logic circuit	IOVCC	-0.3	5.5	V	
Supply Voltage for analog circuit	VCI	-0.3	6.6	V	

4.2 DC ELECTRICAL CHARACTERISTICS

4.2.1 OPERATING CONDITIONS

Typical Operating Conditions (Ta=25°C)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Power Supply	IOVCC	1.65	1.8	2.0	V	
Power Supply	VCI	2.5	-	3.3	V	
LCM current	Icc	-	-	50	mA	
TFT Gate ON Voltage	V _{GH}	10		20	V	
TFT Gate OFF Voltage	V _{GL}	-15		-7.5	V	

4.2.2 BACKLIGHT UNIT (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Forward supply Voltage	V _f	16.8	-	20.4	V	
Forward supply Current	I _f	-	20	-	mA	
LCM Luminance	L _v	250	300	-	cd/m ²	I _B =20mA
Uniformity	/	80			%	-



4.3 TIMING CHARACTERISTICS

Power On Timing of External Power IC

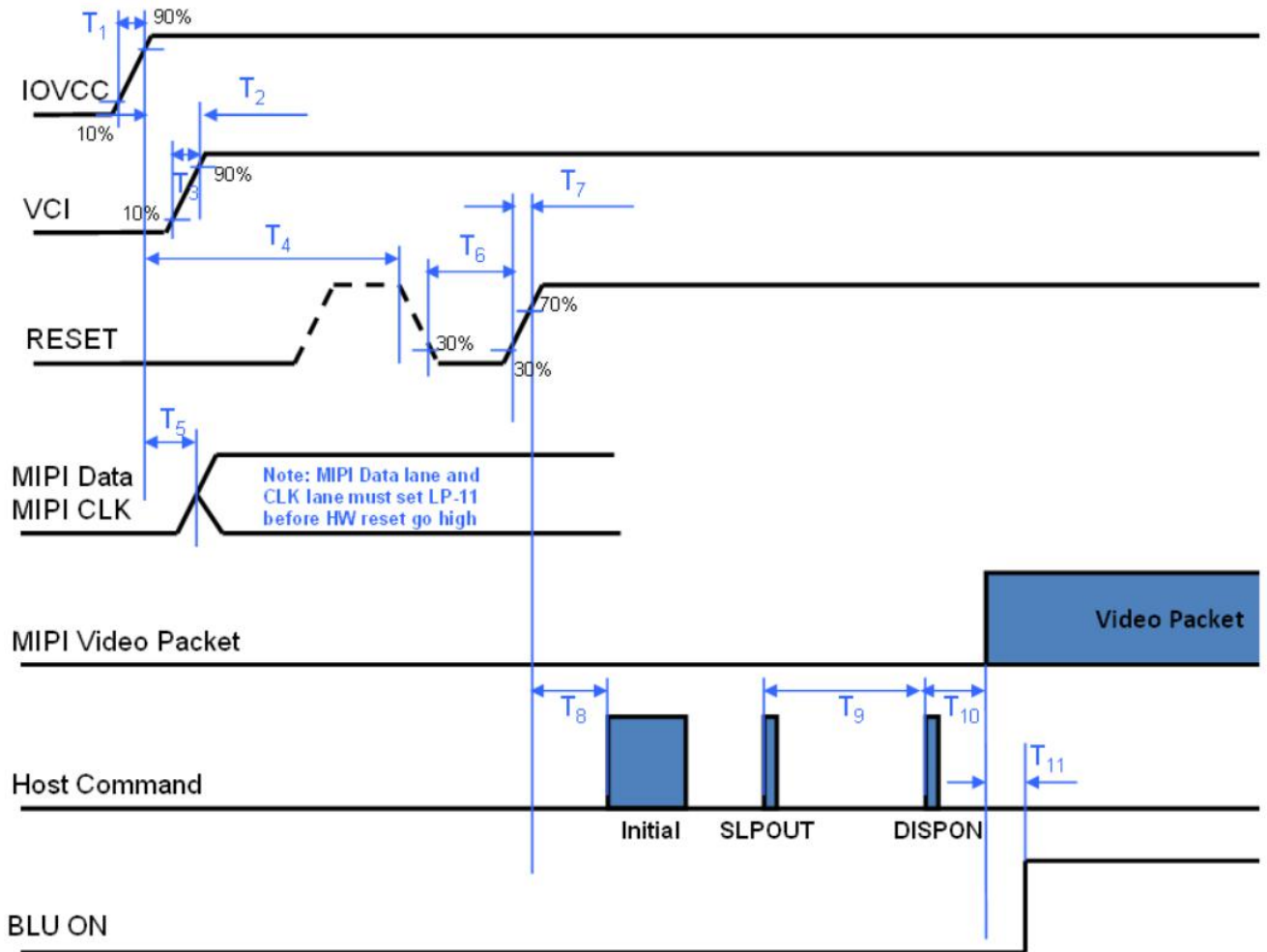


Figure 8-6: DSI Power On Sequence of Power IC Mode

	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

Table 8-1: DSI Power On Timing of Power IC Mode



Power Off Timing of External Power IC

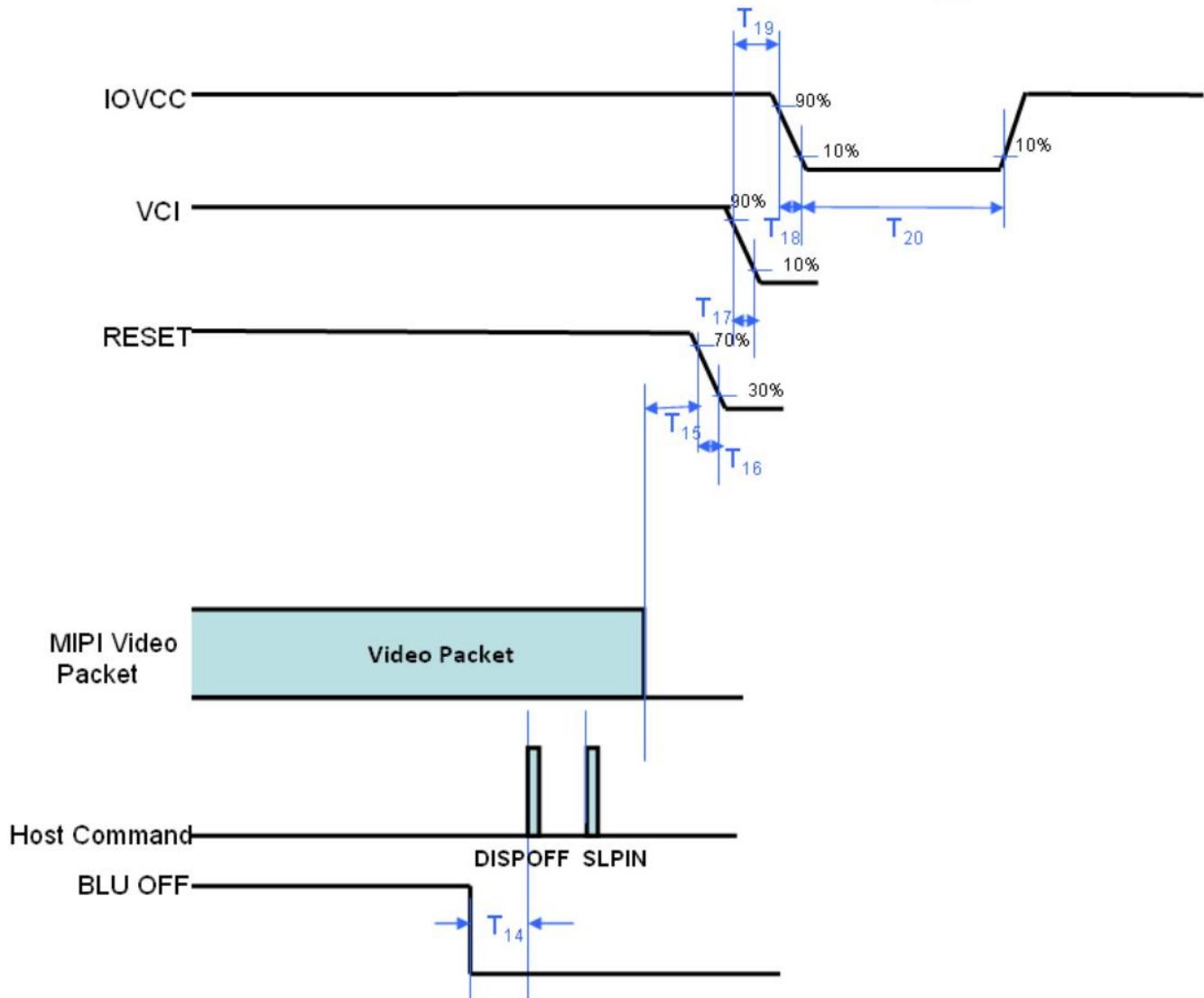


Figure 8-7: DSI Power Off Sequence of Power IC Mode

	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

Table 8-2: DSI Power Off Timing of Power IC Mode



5.OPTICAL CHARACTERISTICS

(LCD optical characteristics)

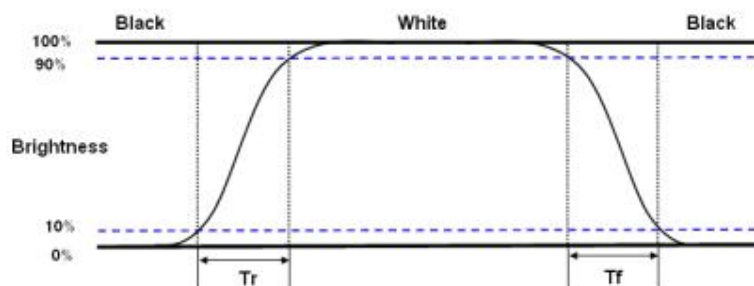
Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time	Tr+Tf	$\theta = 0^\circ$	-	25	50	ms	Note 1,2
Contrast ratio	CR	$\theta = 0^\circ$	600	800	-		Note 1,3
Viewing angle	Top	CR \geq 10	75	85	-	deg.	Note 1,4
	Bottom		75	85	-		
	Left		75	85	-		
	Right		75	85	-		
Color chromaticity (CF only with C light, CIE 1931)	Wx	$\theta = 0^\circ$	-0.015	0.297	+0.015		Note 1,5,6 CF glass
	Wy		-0.015	0.318	+0.015		
Color Gamut (CF only with C light, CIE 1931)	NTSC	CIE1931	45	50	-	%	Note 1,5,6 CF glass
Transmittance (with Polarizer)	Trans	$\theta = 0^\circ$	3.7	4.4	-	%	Normal POL

Note 1: Measuring Conditions:

The optical characteristics are determined after the unit has been 'ON' and stable at the maximum brightness, in a dark environment at an ambient temperature at $25^\circ\text{C} \pm 2^\circ\text{C}$.

Note 2: Definition of response time:

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time is the time between photo detector output intensity changed from 10% to 90%. And fall time is the time between photo detector output intensity changed from 90% to 10%.

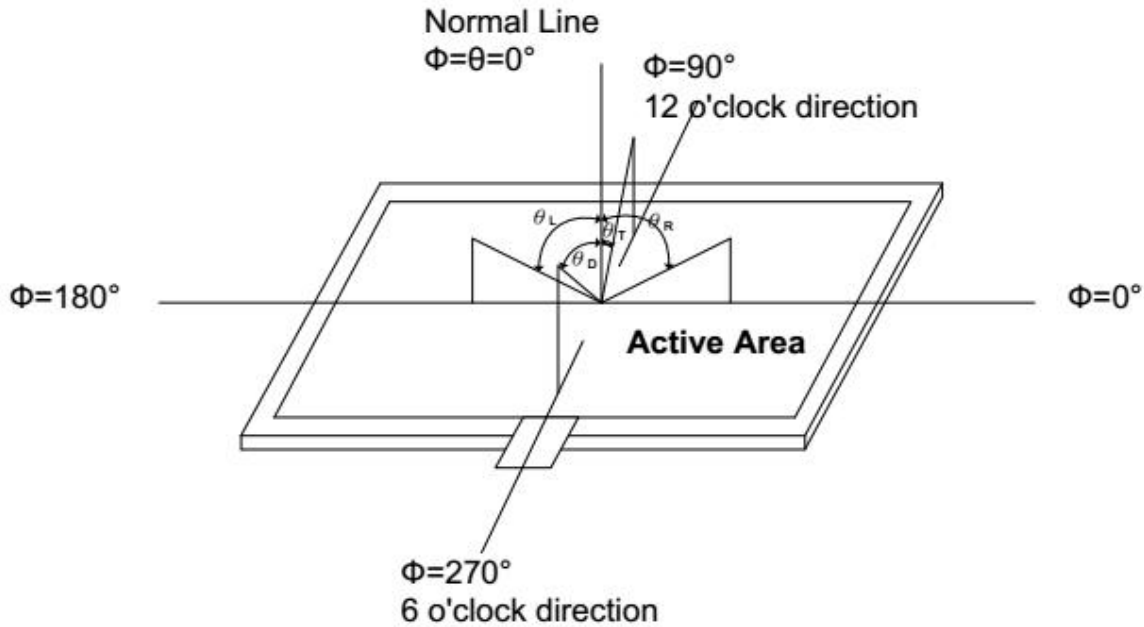




Note 3: Definition of contrast ratio:

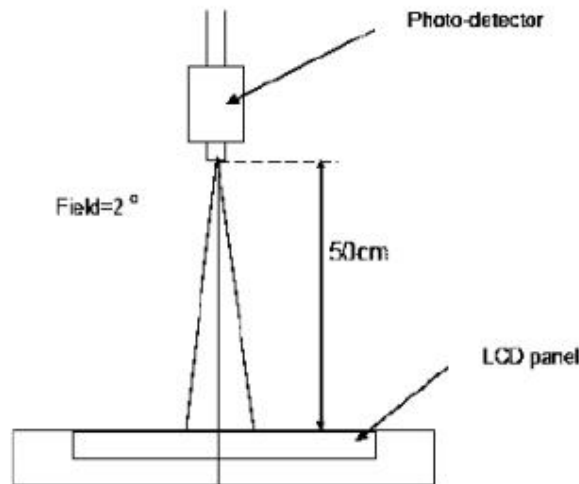
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 4: Definition of viewing angle



Note 5: Optical characteristic measurement setup.

The LCD module should be stabilized at given temperature for 10 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 10 minutes in a windless room.



Note 6: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

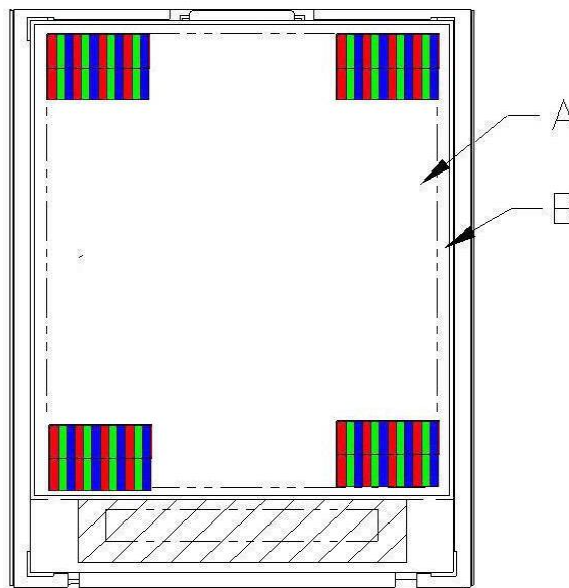


6. QUALITY SPECIFICATIONS

6.1 INSPECTION CONDITION

- (1) Inspect under 300~500Lux fluorescent light, leaving 30~35cm between panels and eyes, and between panels and lights.
- (2) Inspection condition is $23\pm 5^{\circ}\text{C}$, $50\pm 20\%\text{RH}$ maximum.

6.2 DEFINITION OF AREA





A Area : Viewing area.

B Area : Out of viewing. (outside viewing area)



6.3 INSPECTION SPECIFICATION

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing	<p>1-1 sub pixel classification</p> <ul style="list-style-type: none"> ● Sub Pixel: Number of sub pixel doesn't exceed one dot. <div style="text-align: center;">  <p>Sub Pixel (Dot)</p> </div> <p>a> Dark dot ----one Allowed b> Bright dot ---- one Allowed</p> <ul style="list-style-type: none"> ● Pixel : Three dots link together doesn't exceed ones <div style="text-align: center;">  <p>Pixel</p> </div> <p>1-2 Leakage to light</p> <ul style="list-style-type: none"> ● Leakage to light be not allowed. <p>1-3 Picture to shake</p> <ul style="list-style-type: none"> ● Picture had shake, twinkle and noise etc. instable of defect that be not allowed. <p>1-4 Function</p> <ul style="list-style-type: none"> ● No display or No function. ● Source Line, Gate Line. ● Contrast Ratio ● Current consumption exceeds product specifications. ● Display malfunction. 	<p>$N \leq 1$</p> <p>$N \leq 0$</p> <p>$N=0$</p> <p>$N=0$</p> <p>$N=0$</p>
2	Mechanical Dimension	<p>2-1 Mechanical Dimension exceeds product specifications.</p> <p>2-2 Out of frame and boss of plastic changed shape that be not allowed.</p>	<p>$N=0$</p>

NO	Item	Acceptable specification	Judgment Criterion
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3-1 Blemish: Line shapes of defect

Length	Width	Acceptable number	Mini. space
---	$W \leq 0.03$	Ignore	5 m m
$L \leq 2.5$	$0.03 < W \leq 0.05$	3	
$L \leq 2.5$	$0.05 < W \leq 0.1$	2	
--	$W > 0.1$	Not allowed	---

L: length(mm)

W: width(mm)



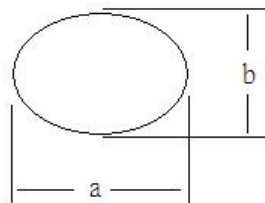
3-2 Blemish: dot shapes of defect.

Dimension	Acceptable number	Mini. Space
$\Phi \leq 0.10$	Ignore	---
$0.10 < \Phi \leq 0.15$	2	5 m m
$0.15 < \Phi \leq 0.25$	1	
$\Phi > 0.25$	0	---

3-3 Polarizer Bubble

Dimension	Acceptable number	Mini. Space
$\Phi \leq 0.20$	Ignore	---
$0.20 < \Phi \leq 0.30$	2	15 m m
$\Phi > 0.30$	0	---

Foreign Substances



$$\Phi = (a+b)/2$$

3

Cosmetic Inspection



NO	Item	Acceptable specification				Judgment Criterion
3	Cosmetic Inspection	3-4 Scratch ● Sensate scratch not allowed. ● Impassive scratch as below. Unit:mm				
		Length	Width	Acceptable number	Mini. space	
		-----	$W \leq 0.03$	Ignore	5 m m	
		$L \leq 2.5$	$0.03 < W \leq 0.05$	3		
		$L \leq 2.5$	$0.05 < W \leq 0.1$	2	---	
		----	$0.1 < W$	Not allowed		
		$L > 2.5$	----	Not allowed		
4	Package	4-1 Mixed product types 4-2 Shipping q'ty should be the same as "shipping notice form" q'ty. 4-3 Outer box can't broken.				N=0
5	LCD Mura	LCD Mura according to ND 5% keep out to determine, if keep out distance at 30cm be seen by eyes is NG, otherwise will be ok if invisible.				



7. RELIABILITY

Test Item	Test Condition
High Temperature Operation	70°C for 96 hours
Low Temperature Operation	-20°C for 96 hours
High Temperature Storage	80°C for 96 hours
Low Temperature Storage	-30°C for 96 hours
High Temperature Operation Humidity Operation	60°C, 90%RH for 72 hours
Thermal Shock	-10°C (30min) ~+25°C (5min)~ +60°C (30min) for 10 cycles
Vibration Test (No Operation)	Frequency: 10~55Hz Amplitude:1.0mm Sweep Time: 11min Test Period: 6 Cycles for each direction of X, Y, Z
Static electricity test	Touch ±4KV,air touch ±8KV



8. HANDLING PRECAUTION

8.1 SAFETY

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

8.2 STORAGE CONDITIONS

- (1) Store the panel or module in a dark place where the temperature is $23\pm 5^{\circ}\text{C}$ and the humidity is below $50\pm 20\% \text{RH}$.
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.

8.3 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.

8.4 WARRANTY

- 1) The period is within twelve months since the date of shipping out under normal using and storage conditions.
- 2) According to Kingtech TFT LCD quality standard, Kingtech will rework or exchange for functional defect goods since within one year.