



**SPECIFICATION  
FOR  
LCD Module  
PV05021T0240X**

<b>MODULE:</b>	<b>TS8050FW007-D</b>
<b>CUSTOMER:</b>	

<b>KT</b>	<b>INITIAL</b>	<b>DATE</b>
<b>PREPARED BY</b>	Yangrongwu	2021.4.21
<b>CHECKED BY</b>	Chenzhiwen	2021.4.21
<b>APPROVED BY</b>	Luojiaoping	2021.4.21

<b>CUSTOMER</b>	<b>INITIAL</b>	<b>DATE</b>
<b>APPROVED BY</b>		



## REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2021.4.21	-	First Issued.	YANG



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# 1. General Description

## \* DESCRIPTION

PV05021T0240X 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 5.0" TFT-LCD contains 480 x 854 pixels, and can display up to 16.7M colors.

## \* Features

- Low Input Voltage: IOVCC: 1.65~3.3V;VCC: 2.5~3.6V
- Display Colors of TFT LCD: 16.7M colors
- Interface: RGB-24BIT
- Internal Power Supply Circuit.

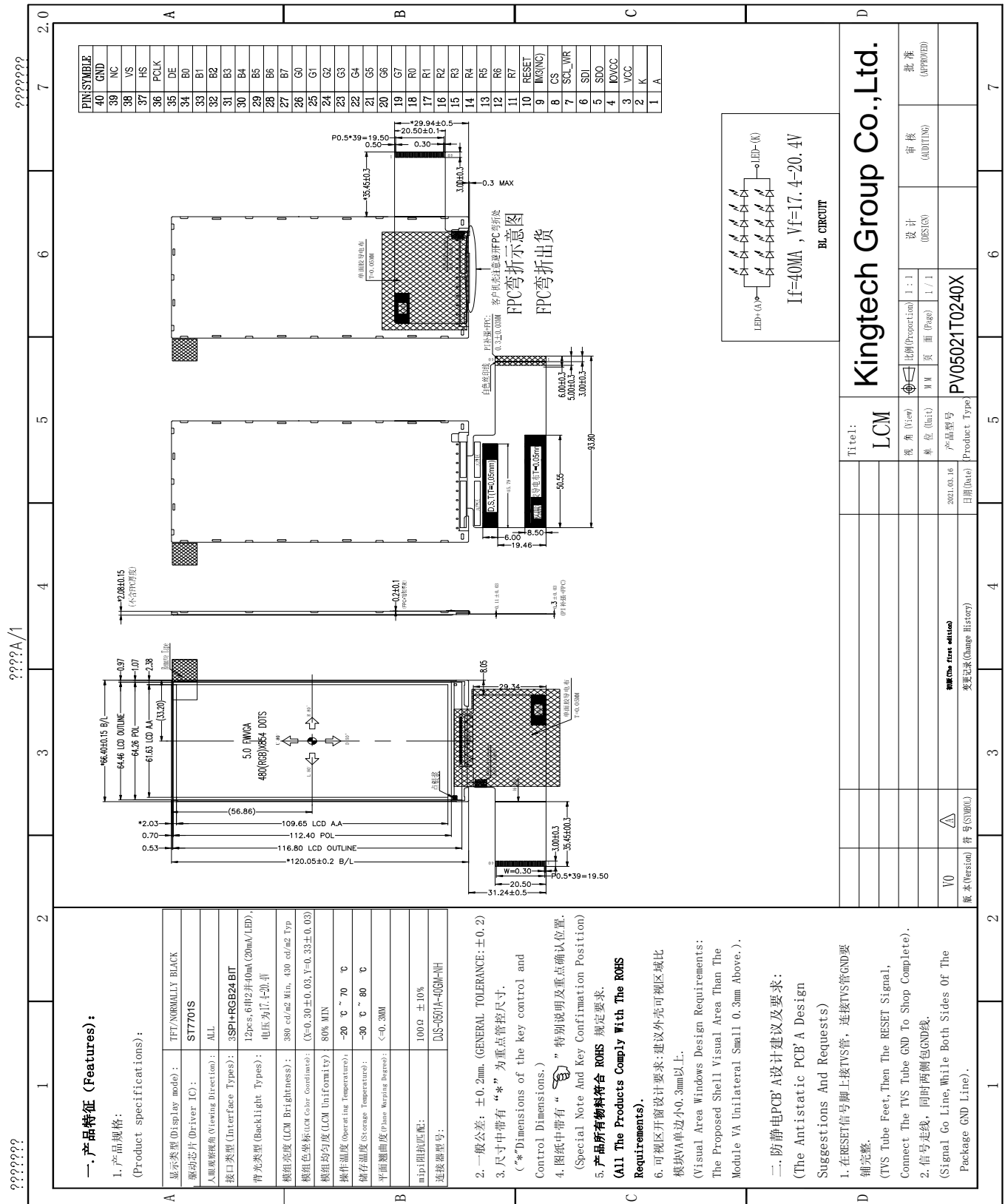
General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	61.56(H) *109.53 (V)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	480(RGB) *854	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.12825 (H) *0.12825 (V)	mm	-
Viewing angle	All	o'clock	-
Drive IC	ST7701S	-	-
Display mode	Normally black	-	-
Operating temperature	-20~+70	°C	-
Storage temperature	-30~+80	°C	-

## Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	66.4	-	mm	±0.15
	Vertical(V)	-	120.05	-	mm	±0.2
	Depth(D)	-	2.08	-	mm	±0.15
Weight		-	TBD	-	g	-



## 2. MECHANICAL SPECIFICATION



### 一. 产品特征 (Features):

- 产品规格: (Product specifications):
  - 显示类型 (Display mode): TFT/NORMALLY BLACK
  - 驱动芯片 (Driver IC): ST7701S
  - 人眼观察视角 (Viewing Direction): ALL
  - 接口类型 (Interface Types): 3SP+RGB24 BIT
  - 背光类型 (BackLight Types): 12pins, 6H/2并(0mA (20mA/LED), 电压为1.2V, 1.0V)
  - 模组亮度 (LCM Brightness): 380 cd/m<sup>2</sup> Min., 430 cd/m<sup>2</sup> Typ.
  - 模组色域 (Color Contrast): (X=0.30±0.03, Y=0.33±0.03)
  - 模组均匀度 (LCM Uniformity): 80% MIN
  - 操作温度 (Operating Temperature): -20 °C ~ 70 °C
  - 储存温度 (Storage Temperature): -30 °C ~ 80 °C
  - 平面翘曲度 (Plane Warpage Degree): <0.3MM
  - mipi 阻抗匹配: 100Ω ± 10%
  - 连接器型号: DJS-0501H-05GM-HH
- 一般公差: ±0.2mm. (GENERAL TOLERANCE: ±0.2)
- 尺寸中带有“\*”为重点管控尺寸. (\*"Dimensions of the key control and Control Dimensions.")
- 图纸中带有“ ”特别注明及重点确认位置. (Special Note And Key Confirmation Position)
- 产品所有物料符合 ROHS 规定要求. (All The Products Comply With The ROHS Requirements).
- 可视区开窗设计要求: 建议外壳可视区域比模组VA单边小0.3mm以上. (Visual Area Windows Design Requirements: The Proposed Shell Visual Area Than The Module VA Unilateral Small 0.3mm Above.)

### 二. 防静电PCB A设计建议及要求:

- (The Antistatic PCB A Design Suggestions And Requests)
- 在RESET信号脚上接TVS管, 连接TVS管GND要铺完整. (TVS Tube Feet, Then The RESET Signal, Connect The TVS Tube GND To Shop Complete).
  - 信号走线, 同时两侧包GND线. (Signal Go Line, While Both Sides Of The Package GND Line).

Title: Kingtech Group Co., Ltd.

LCM

审核 (AUDITING)	设计 (DESIGN)	比例 (Proportion) 1:1	页码 (Page) 1/1
批准 (APPROVED)			

单位 (Unit)	产品型号 (Product Type)
PV05021T0240X	PV05021T0240X
日期 (Date)	变更记录 (Change History)
2021.03.16	

1

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### 3. Pin Description

Pin NO.	Symbol	Level	Remark
1	A	H	Backlight Anode
2	K	L	Backlight Cathode
3	VCC	H	A supply voltage
4	IOVCC	L	A supply voltage
5	SDO	H/L	Serial data output pin
6	SDI	H/L	Serial data input pin
7	SCL_WR	H/L	Write enable clock input pin
8	CS	H/L	Chip select input pin
9	IM(NC)	/	Not connect
10	RESET	H/L	Reset pin
11-18	R7-R0	H/L	Data BUS
19-26	G7-G0	H/L	Data BUS
27-34	B7-B0	H/L	Data BUS
35	DE	H/L	Data enable signal
36	PCLK	H/L	RGB clock
37	HS	H/L	Horizontal synchronizing signal
38	VS	H/L	Vertical synchronizing signal
39	GND(ID)	/	Not connect
40	GND	L	Ground



## 4. ELECTRICAL CHARACTERISTICS

### 4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Supply Voltage for Logic circuit	VDDIO	1.65	3.3	V	
Supply Voltage for analog circuit	Vcc	2.5	3.6	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	Vcc	2.5	2.8	3.6	V	
Power Supply	VDDIO	1.65	1.8	3.3	V	
Normal mode Current consumption	Icc	-	-	50	mA	VCC=2.8V
TFT Gate ON Voltage	VGH	-	15	-	V	
TFT Gate OFF Voltage	VGL	-	-10	-	V	

#### 4.2.2 BACKLIGHT UNIT (GND=0V)

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max.		
Forward supply Voltage	Vf	17.4	-	20.4	V	
Forward supply Current	If	-	40	-	mA	
LCM Luminance	Lv	380	430	-	cd/m2	I <sub>B</sub> =40mA
Uniformity	/	80			%	-



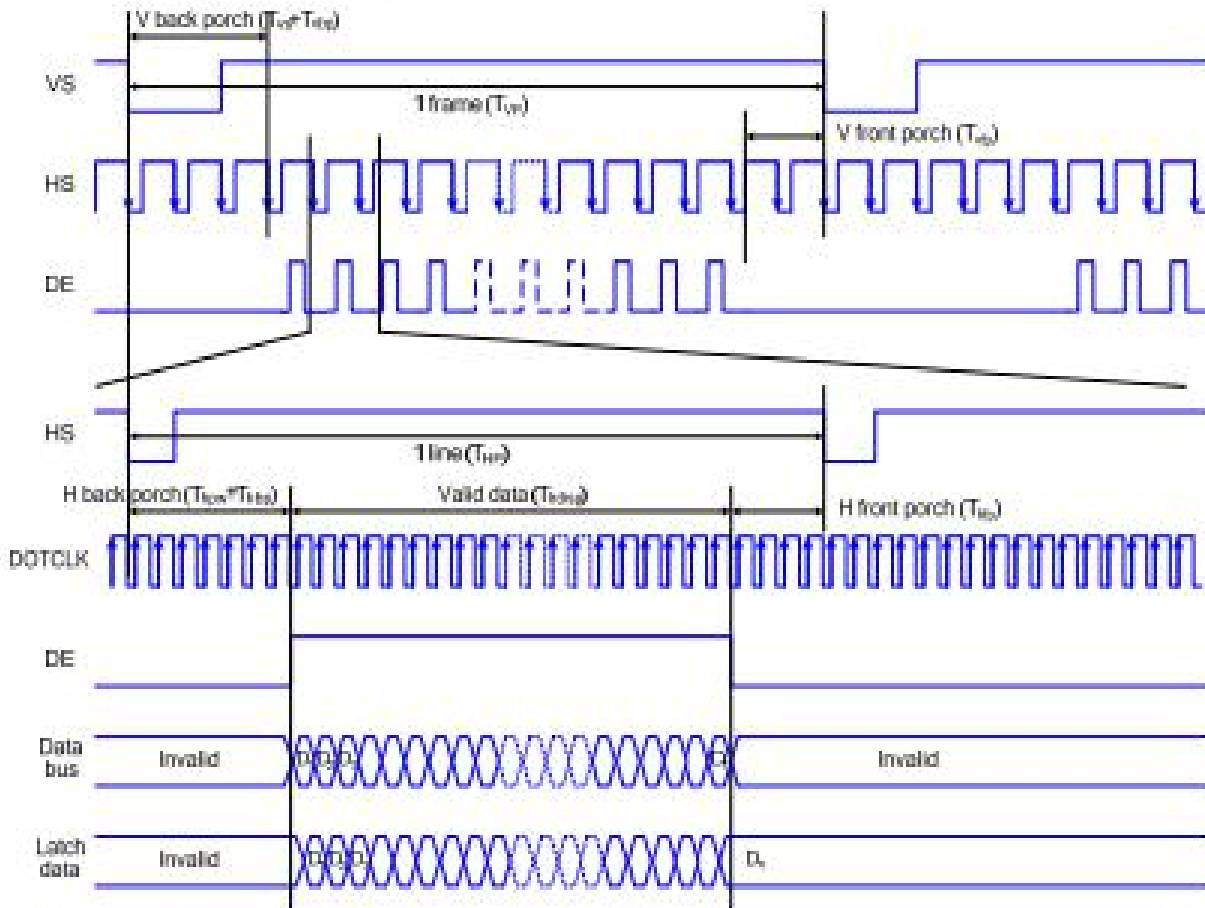
### 4.3 RGB Interface Characteristics

ST7701S supports two kinds of RGB interface, DE mode and HV mode. The table shown below uses command C3h to select RGB interface mode.

DE/Sync	RGB Mode
0	DE mode
1	HV mode

#### 8.6.4 RGB Interface Timing

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

Figure 23 Timing Chart of Signals in RGB Interface DE Mode





The timing chart of RGB interface HV mode is shown as follows.

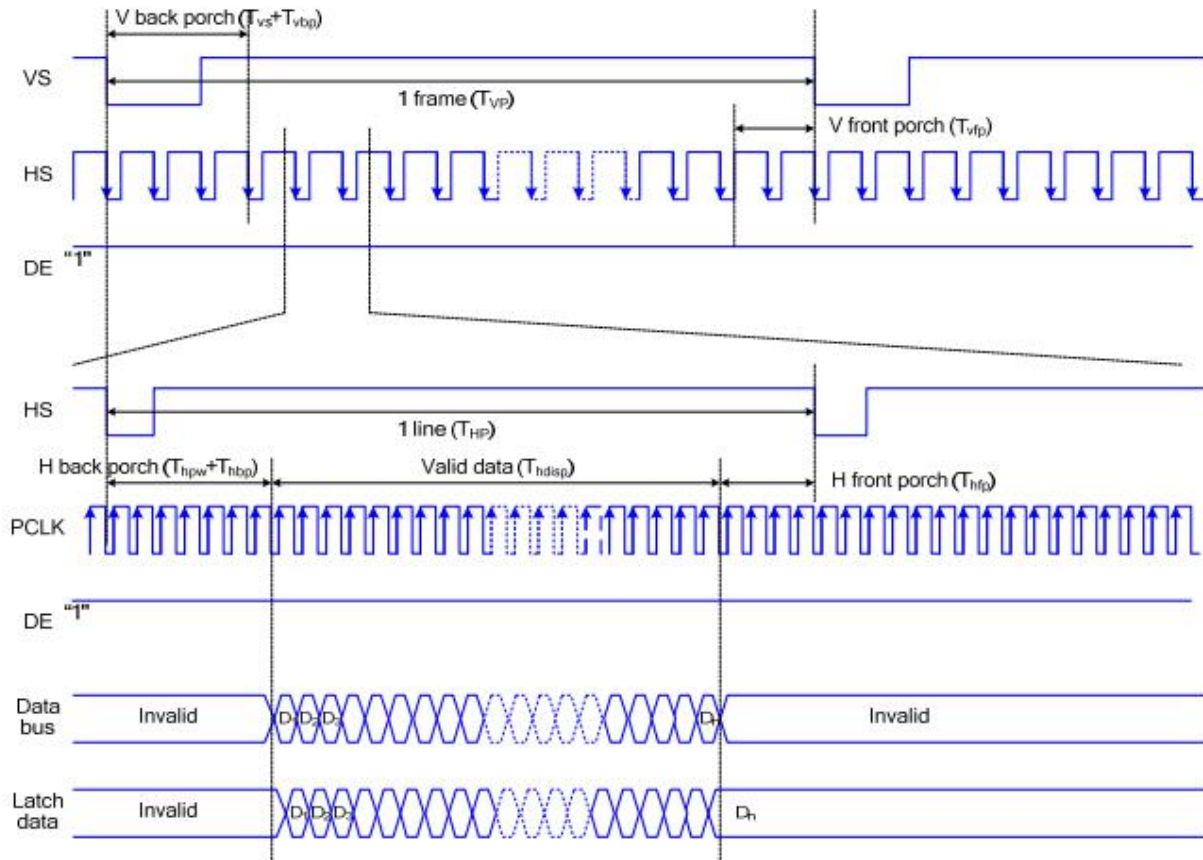


Figure 24 Timing chart of RGB interface HV mod



## 5. OPTICAL CHARACTERISTICS

(LCD optical characteristics)

### 4.0 OPTICAL CHARACTERISTICS

#### 4.1 Optical specification

90801908		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer)		T (%)	Θ=0 Normal viewing angle	—	4.47	—	%	Measuring with Polarizer · Reference Only
Transmittance (without Polarizer)		T (%)		—	14.2	—	%	
Contrast		CR		640	800	—	—	(1)(2)
Response time	Rising	T <sub>R</sub>		—	16	21	msec	(1)(3)
	Falling	T <sub>F</sub>		—	19	24		
Color gamut (%)				—	70	—	%	C-light
Color chromaticity (CIE1931)	White	W <sub>x</sub>	-0.02	+0.02	0.305	—	(1)(4) CF glass	
		W <sub>y</sub>			0.340			
	Red	R <sub>x</sub>			0.665			
		R <sub>y</sub>			0.327			
	Green	G <sub>x</sub>			0.276			
		G <sub>y</sub>			0.594			
	Blue	B <sub>x</sub>			0.134			
		B <sub>y</sub>			0.118			
Viewing angle	Hor.	Θ <sub>L</sub>	—	80	—	—	(1)(4) Measuring with Polarizer · Reference Only	
		Θ <sub>R</sub>	—	80	—			
	Ver.	Θ <sub>U</sub>	—	80	—			
		Θ <sub>D</sub>	—	80	—			
Optima View Direction		Free					(5)	

#### 4.2 Measuring Condition

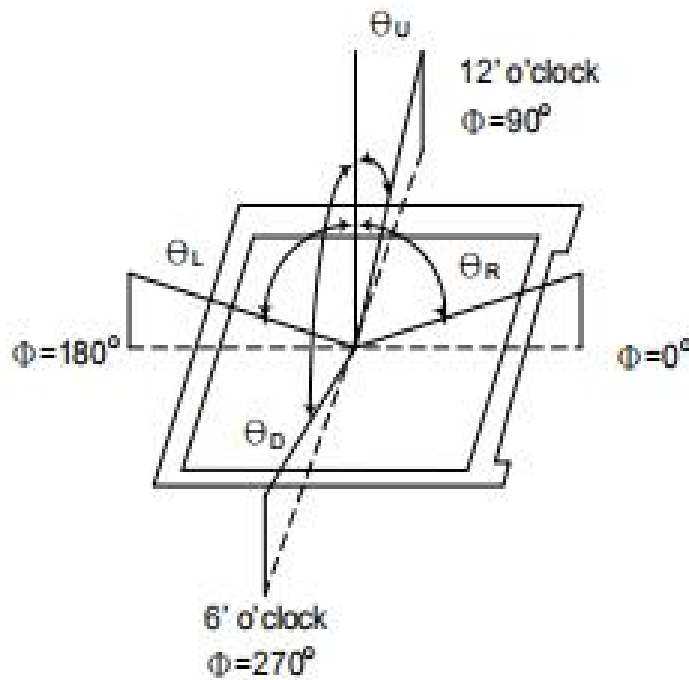
- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.



**4.3 Measuring Equipment**

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

Note (1) Definition of Viewing Angle:



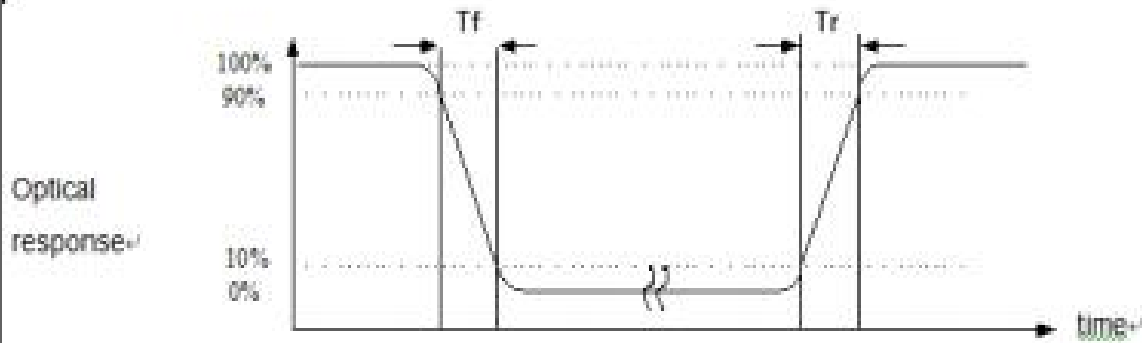
Note (2) Definition of Contrast Ratio (CR) :

measured at the center point of panel

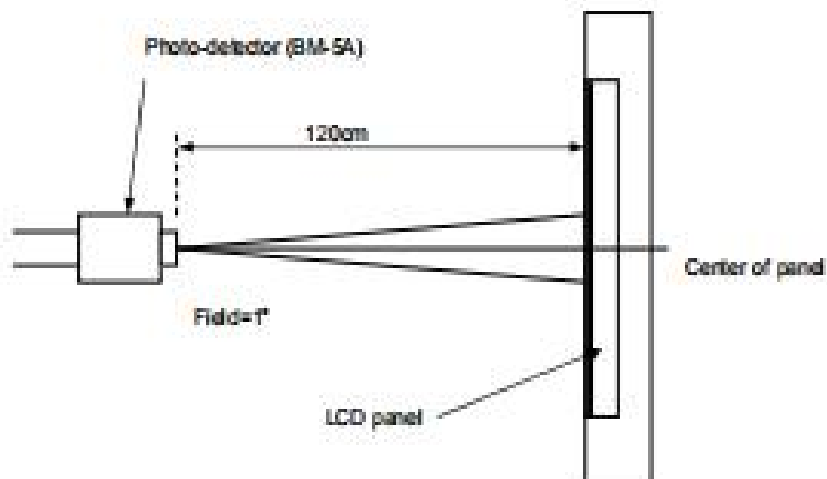
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



Note (3) Definition of Response Time : Sum of  $T_R$  and  $T_F$



Note (4) Definition of optical measurement setup



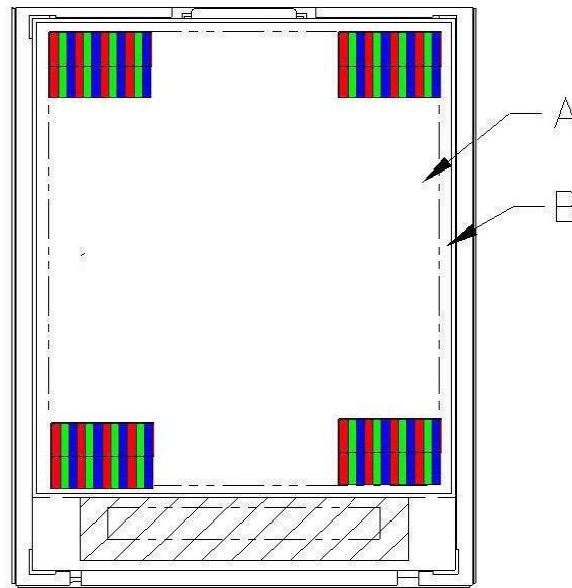


## 6. QUALITY SPECIFICATIONS

### 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

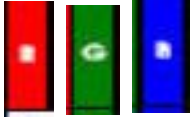



A Area : Viewing area.

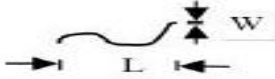
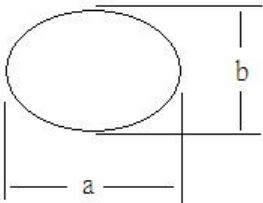
B Area : Out of viewing.(outside viewing area)



**6.3 INSPECTION SPECIFICATION**

NO	Item	Acceptable specification	Judgment Criterion
1	Electrical Testing	<p><b>1-1 sub pixel classification</b></p> <ul style="list-style-type: none"> <li>● Sub Pixel: Number of sub pixel doesn't exceed one dot.</li> </ul> <div style="display: flex; align-items: center; margin: 10px 0;">  <div style="margin-left: 10px;">Sub Pixel (Dot)</div> </div> <p>a&gt; Dark dot ----one Allowed b&gt; Bright dot ---- one Allowed</p> <ul style="list-style-type: none"> <li>● Pixel : Three dots link together doesn't exceed ones</li> </ul> <div style="display: flex; align-items: center; margin: 10px 0;">  <div style="margin-left: 10px;">Pixel</div> </div> <p><b>1-2 Leakage to light</b></p> <ul style="list-style-type: none"> <li>● Leakage to light be not allowed.</li> </ul> <p><b>1-3 Picture to shake</b></p> <ul style="list-style-type: none"> <li>● Picture had shake, twinkle and noise etc. instable of defect that be not allowed.</li> </ul> <p><b>1-4 Function</b></p> <ul style="list-style-type: none"> <li>● No display or No function.</li> <li>● Source Line, Gate Line.</li> <li>● Contrast Ratio</li> <li>● Current consumption exceeds product specifications.</li> <li>● Display malfunction.</li> </ul>	<p>N ≦ 2</p> <p>N ≦ 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>	N=0



NO	Item	Acceptable specification	Judgment Criterion																		
3	Cosmetic Inspection	<p><b>3-1 Blemish: Line shapes of defect</b></p> <table border="1"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable number</th> <th>Mini. space</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.05</math></td> <td>Ignore</td> <td rowspan="3">5 m m</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.05 &lt; W \leq 0.08</math></td> <td>4</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.08 &lt; W \leq 0.15</math></td> <td>3</td> </tr> <tr> <td>--</td> <td><math>W &gt; 0.15</math></td> <td>Not allowed</td> <td>---</td> </tr> </tbody> </table> <p>L: length(mm) W: width(mm)</p> 	Length	Width	Acceptable number	Mini. space	---	$W \leq 0.05$	Ignore	5 m m	$L \leq 3.0$	$0.05 < W \leq 0.08$	4	$L \leq 3.0$	$0.08 < W \leq 0.15$	3	--	$W > 0.15$	Not allowed	---	
		Length	Width	Acceptable number	Mini. space																
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		$L \leq 3.0$	$0.05 < W \leq 0.08$	4																	
		$L \leq 3.0$	$0.08 < W \leq 0.15$	3																	
		--	$W > 0.15$	Not allowed	---																
		<p><b>3-2 Blemish: dot shapes of defect.</b></p> <table border="1"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. Space</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.15</math></td> <td>Ignore</td> <td>---</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.20</math></td> <td>3</td> <td rowspan="2">5 m m</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.30</math></td> <td>2</td> </tr> <tr> <td><math>\Phi &gt; 0.30</math></td> <td>1</td> <td>---</td> </tr> </tbody> </table>	Dimension	Acceptable number	Mini. Space	$\Phi \leq 0.15$	Ignore	---	$0.15 < \Phi \leq 0.20$	3	5 m m	$0.20 < \Phi \leq 0.30$	2	$\Phi > 0.30$	1	---					
		Dimension	Acceptable number	Mini. Space																	
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$0.20 < \Phi \leq 0.30$	2																				
$\Phi > 0.30$	1	---																			
<p><b>3-3 Polarizer Bubble</b></p> <table border="1"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Mini. Space</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.25</math></td> <td>Ignore</td> <td>---</td> </tr> <tr> <td><math>0.25 &lt; \Phi \leq 0.35</math></td> <td>3</td> <td>15 m m</td> </tr> <tr> <td><math>\Phi &gt; 0.35</math></td> <td>1</td> <td>---</td> </tr> </tbody> </table>	Dimension	Acceptable number	Mini. Space	$\Phi \leq 0.25$	Ignore	---	$0.25 < \Phi \leq 0.35$	3	15 m m	$\Phi > 0.35$	1	---									
Dimension	Acceptable number	Mini. Space																			
$\Phi \leq 0.25$	Ignore	---																			
$0.25 < \Phi \leq 0.35$	3	15 m m																			
$\Phi > 0.35$	1	---																			
<p>Foreign Substances</p>  <p style="text-align: right;"><math>\Phi = (a+b)/2</math></p>																					



NO	Item	Acceptable specification	Judgment Criterion			
3	Cosmetic Inspection	<b>3-4 Scratch</b> ● Sensate scratch not allowed. ● Impassive scratch as below. <div style="text-align: right; color: red;">Unit:mm</div>				
		Length		Width	Acceptable number	Mini. space
		-----		$W \leq 0.05$	Ignore	5 m m
		$L \leq 3.0$		$0.05 < W \leq 0.08$	4	
		$L \leq 3.0$		$0.08 < W \leq 0.15$	3	
		----		$0.15 < W$	Not allowed	---
		$L > 3.0$		----	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.