Display Module SPECIFICATION
Model: PV101048W0230P

Customer	
Customer NO.	
Approve By	

For Solution ---10.1 inch ;1920(W)×RGB×1200(H)

Approved by

Record of Revisions

Rev	Date	Sub-Model	Description of change
V01	**May. 19th 2023**	**PV101048W0230P**	**Preliminary Product Specification was first issued.**

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1. General description

1.1 Introduction

Kingtech Group Co.,Ltd PV101048W0230P is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 10.1 (16:10) inch diagonally measured active display area with FHD (1920horizontal by 1200 vertical pixel) resolution.

1.2 Features

10.1 (16:10 diagonal) inch configuration
16.7M color by 8bit R.G.B Signal input with EDP 1.4 interface
RoHS Compliance

1.3 Applications

Mobile NB, Machine
Automotive
Industrial Control Application

1.4 General information

Item		Specification	Unit
Outline Dimension		229.71x 150.30 x2.3(Max)	mm
Display area		216.576(W) x 135.36(H)	mm
Number of Pixel		1920 x RGB(H) x 1200(V)	pixels
Pixel pitch		0.1128(W) x 0.1128(H)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode/NTSC		Normally Black/50%	
Surface treatment		HC	
Weight		TBD(Max)	g
Back-light		Single LED (Side-Light type)	
Power Consumption	**Logic& Backlight Unit**	**4.0W(max):VDD=3.3V, white Pattern** **Logic:1.0W(Max); BLU:2.9W(Max)**	**W**

1.5 Mechanical Information

item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	229.41	229.71	230.016	mm
	Vertical(V)	150.00	150.30	150.60	mm
	Depth(D)	--	2.2	2.3	mm

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit.	Note
Logic Supply Voltage	LCD_VCC	-0.3	5.0	V	
LC O.P. Voltage	VOP	--	4.9	V	Note1,2
O.P. Ambient Humidity	HOP	10	*4	RH	Note 3
Storage Humidity	HST	10	*4	RH	Note 3

Note:

*1. At 25±5℃

*2. Due to the characteristics of LC Material, the Liquid Crystal driving voltage varies with environmental temperature.

*3. Non-condensation.

*4. Temp.≤ 60℃,90%RH Max.
Temp. > 60℃,Absolute humidity shall be less than 90%RH.

2.2 Environment Absolute Rating

Item	**Symbol**	**Min.**	**Max.**	**Unit**	**Remarks**
Operating Temperature	**Topa**	**-0**	**+50**	℃	
Storage Temperature	**Tstg**	**-20**	**+60**	℃	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification:

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Condition
Response Time(Tr+Tf)	Tr	25℃		30	35	msec	θ =0 °,φ=0 ° (Note 1,3)
	Tf	25℃					
Contrast Rate	Cr	25℃	800	1000	--	--	θ =0 °, φ=0 ° LED:ON, LIGHT:OFF(Note1,2)
Brightness	YL	25℃	270	310	--	Cd/m2	I=90mA(Note1,4)
Visual angle range front and rear	Θ U	25℃	80	85		De-gree	ϕ =90°,(12’clock) CR≧10 (Note 1,4)
	Θ D		80	85			ϕ =270°,(6’clock) CR≧10 (Note 1,4)
Visual angle range left and right	Θ L	25℃	80	85		De-gree	ϕ = 180°, (9 o’clock)CR≧ 10 (Note 1,4)
	Θ R		80	85			ϕ = 0°, (3 o’clock)CR≧10, (Note 1,4)
Brightness uniformity	BUNI		75			%	Θ =0(Note5,7)
Visual angle			free				(Note 6)

Item	Symbol	Transmissive			Conditions
		Min.	Typ.	Max.	
Red	XR	0.596	0.626	0.656	Reference: LCD Panel, CIE (x, y) chromaticity (Note 1,4)
	YR	0.301	0.331	0.361	
Green	XG	0.305	0.335	0.365	
	YG	0.514	0.544	0.574	
Blue	XB	0.113	0.143	0.173	
	YB	0.118	0.148	0.178	
White	XW	0.250	0.300	0.350	
	YW	0.290	0.340	0.390	

3.2 Measuring Condition

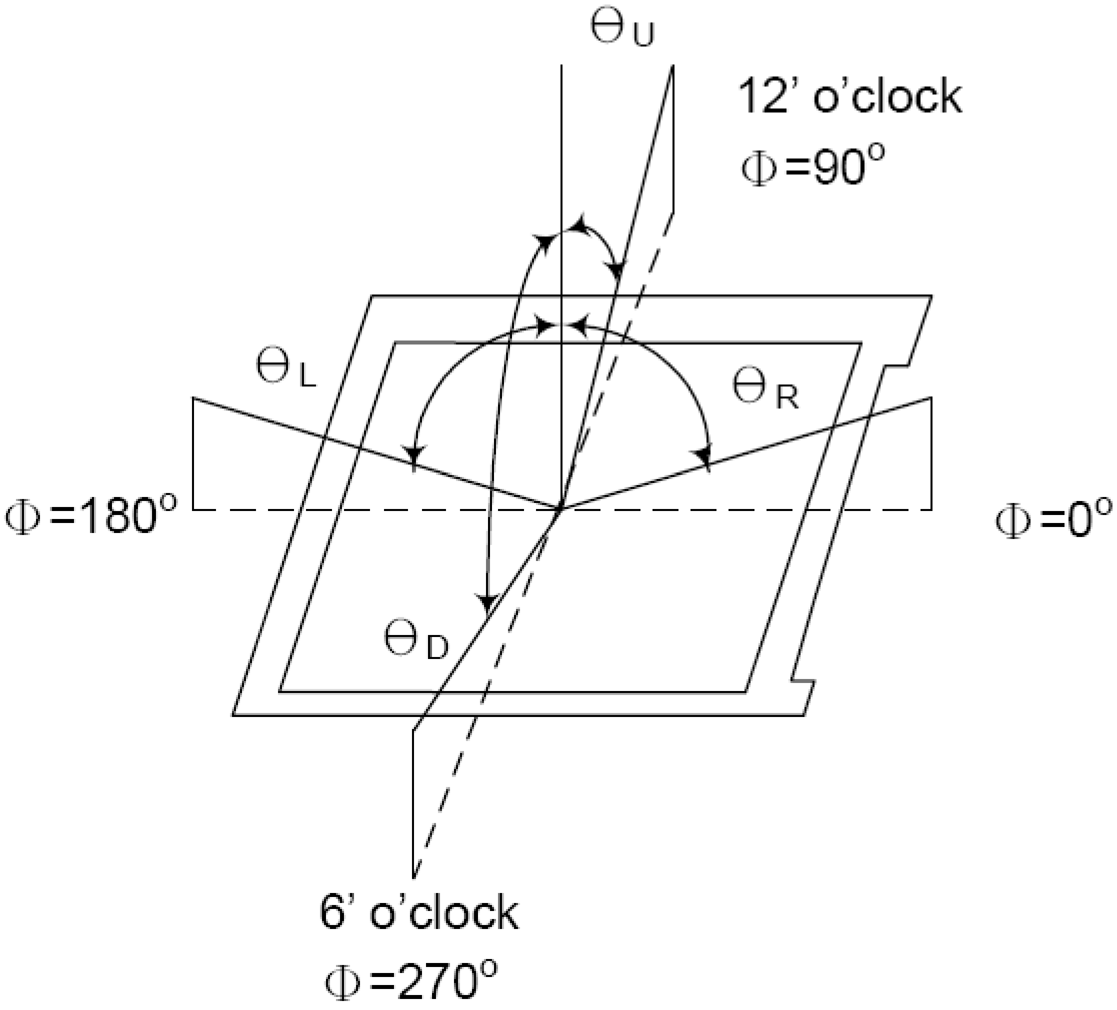
Measuring surrounding: dark room ,LED current IL=*mA

Ambient temperature: 25±2oC ;15min. warm-up time.

3.3 Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. Measuring spot size: 20～21 mm

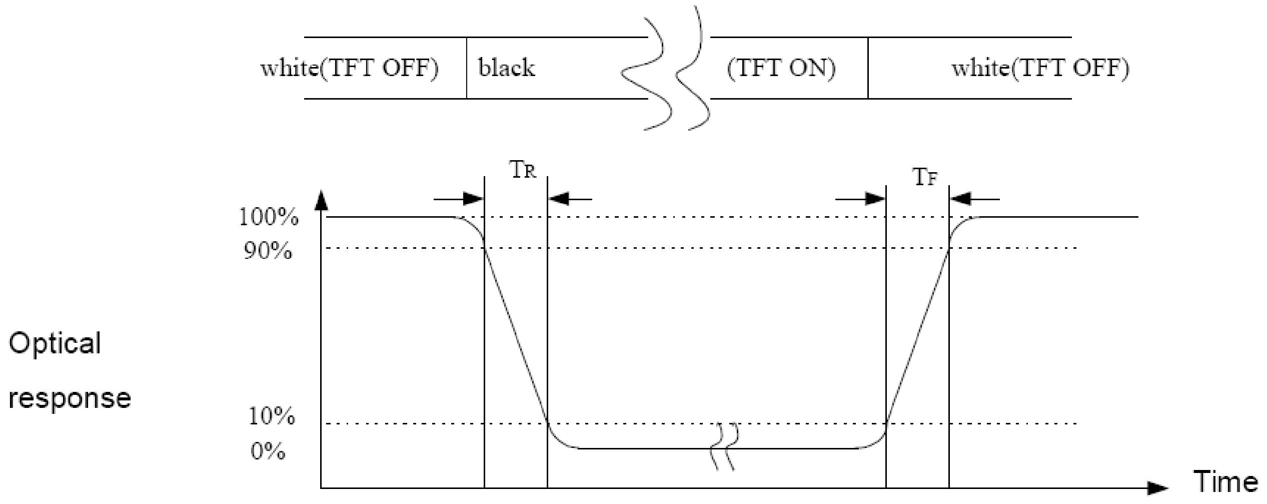
Note (1) Definition of Viewing Angle :


ΘU
12' o'clock
Φ=90°
ΘL
ΘR
Φ=180°
Φ=0°
ΘD
6' o'clock
Φ=270°

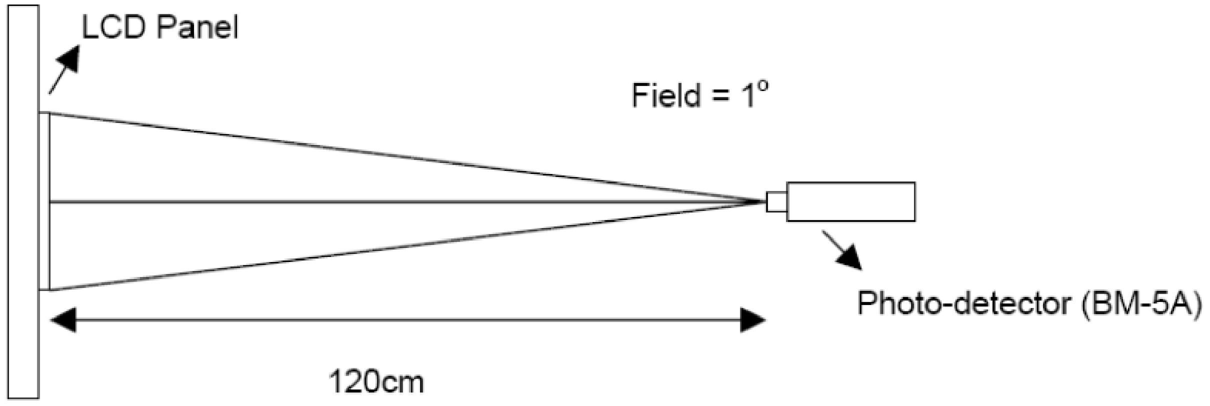
Note (2) Definition of Contrast Ratio (CR):
Measured at the center point of panel

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

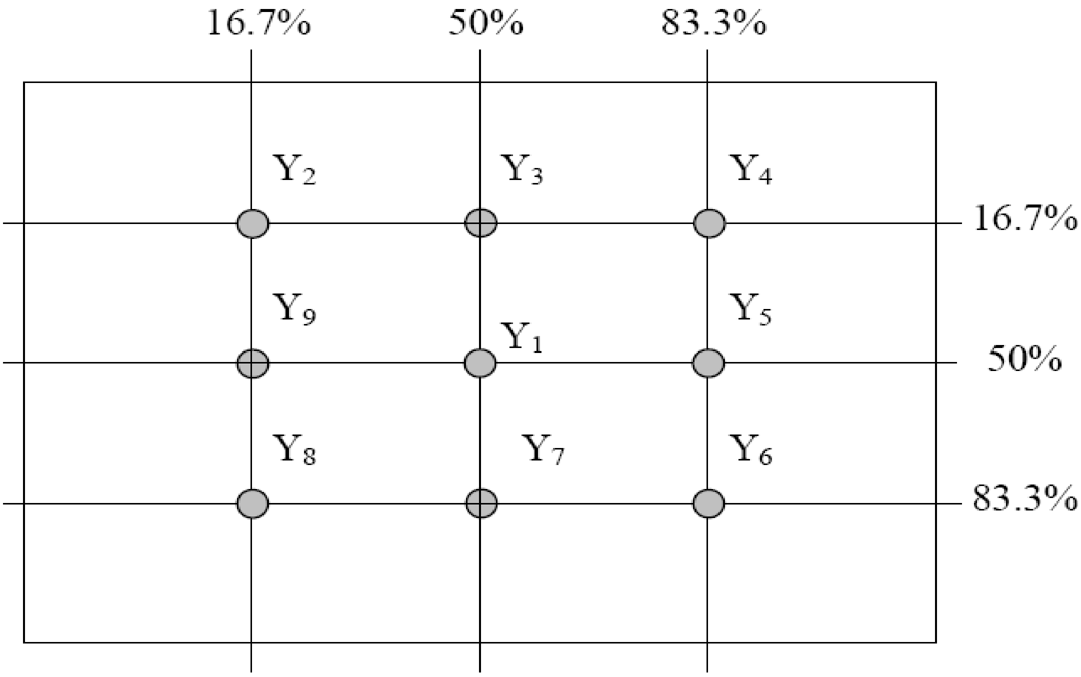
Note (3) Definition of Response Time: Sum of TR and TF



Note (4) Definition of optical measurement setup

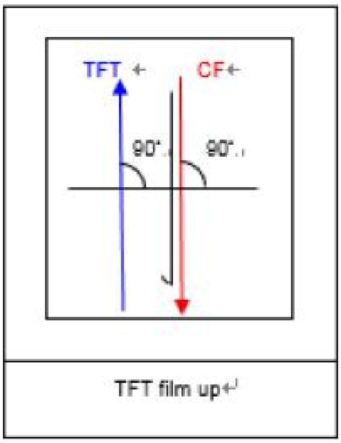

LCD Panel
Field = 1°
Photo-detector (BM-5A)
120cm

Note (5) Definition of brightness uniformity


16.7%
50%
83.3%
Y_2
Y_3
Y_4
16.7%
Y_9
Y_1
Y_5
50%
Y_8
Y_7
Y_6
83.3%

$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

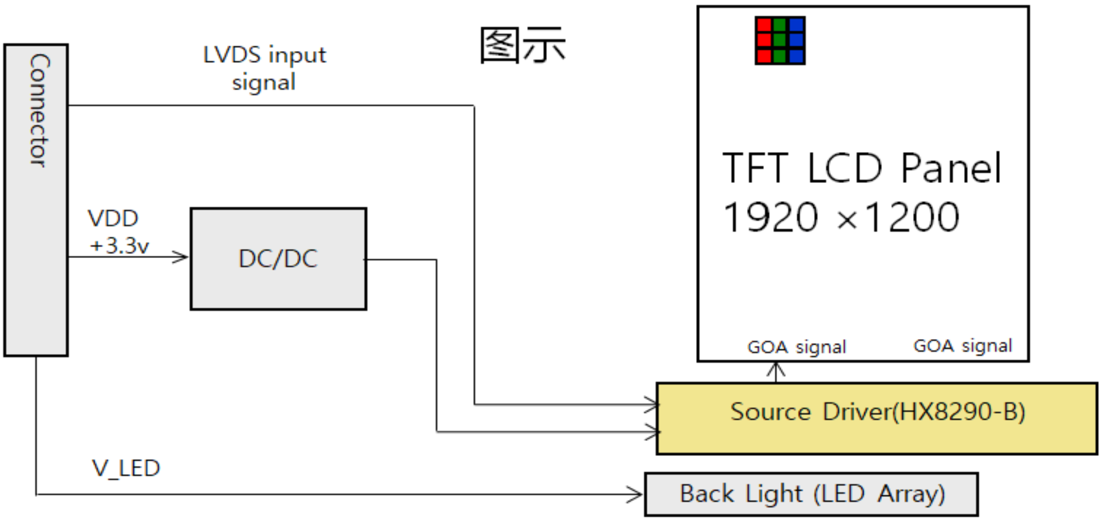
Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction).


TFT
CF
90°
90°
TFT film up

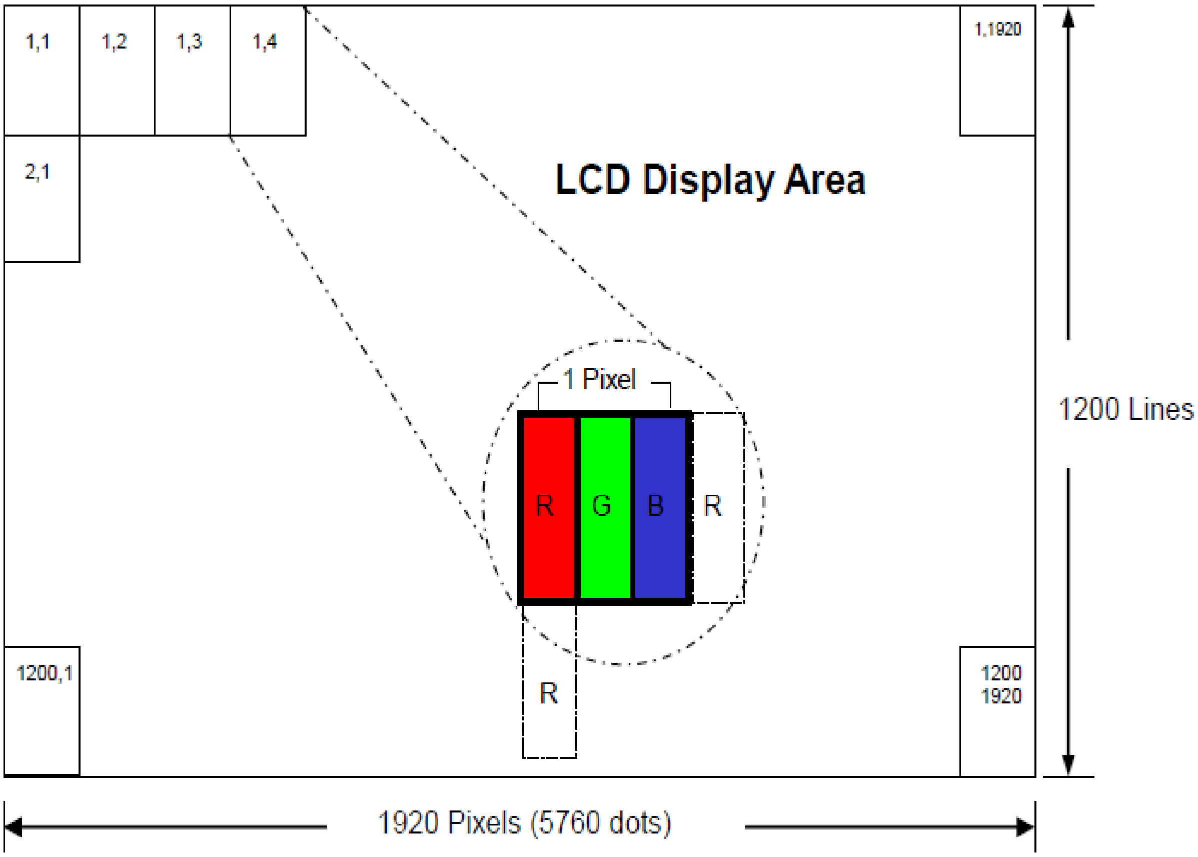
Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module


Connector
LVDS input signal
图示
VDD +3.3v
DC/DC
TFT LCD Panel 1920 ×1200
GOA signal
GOA signal
Source Driver(HX8290-B)
V_LED
Back Light (LED Array)

4.2:Pixel Format


1,1
1,2
1,3
1,4
1,1920
2,1
LCD Display Area
1 Pixel
R
G
B
R
R
1200,1
1200 1920
1200 Lines
1920 Pixels (5760 dots)

5.0 INTERFACE PIN CONNECTION

5.1: 30PIN connector is used for the module electronics interface the recommended model is 20525-30E-02(I-PEX 30Pin 0.4mm pitch) or equivalent

Terminal No.	Symbol	IO	Functions
1	NC	P	Not connected
2	H-GND	P	High Speed ground
3	Lane1_N	I	Complement signal link Lane1
4	Lane1_P	I	True signal Link Lane1
5	H-GND	P	High Speed ground
6	Lane0_N	I	Complement signal link Lane0
7	Lane0_P	I	True signal Link Lane0
8	H-GND	P	High Speed ground
9	AUX_CH_P	I	True signal Auxiliary channel
10	AUX_CH_N	I	Complement signal Auxiliary channel
11	H_GND	P	High Speed ground
12	LCD_VCC	P	LCD logic and driver Power
13	LCD_VCC	P	LCD logic and driver Power
14	NC	--	Not connected
15	LCD_GND	P	LCD logic and driver ground
16	LCD_GND	P	LCD logic and driver ground
17	HPD	O	Hpd signal Pin
18	LED_GND	P	Backlight Ground
19	LED_GND	P	Backlight Ground
20	LED_GND	P	Backlight Ground
21	LED_GND	P	Backlight Ground
22	BL_Enable	P	Backlight control on/off
23	BL_PWM	P	Backlight PWM control brightness
24	NC	P	Not connected
25	NC	P	Not connected
26	LED_PWR	P	Backlight anode
27	LED_PWR	P	Backlight anode
28	LED_PWR	P	Backlight anode
29	LED_PWR	P	Backlight anode
30	NC	P	Not connected

I: input O: output ,P: power

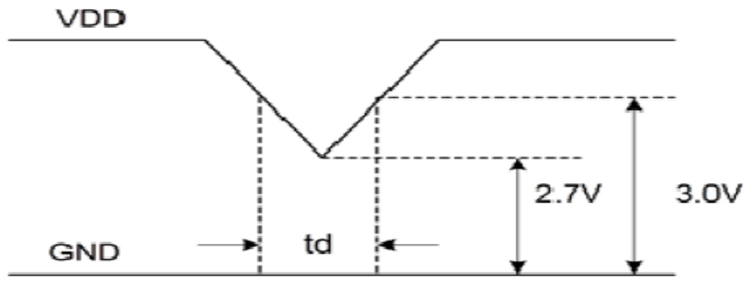
6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

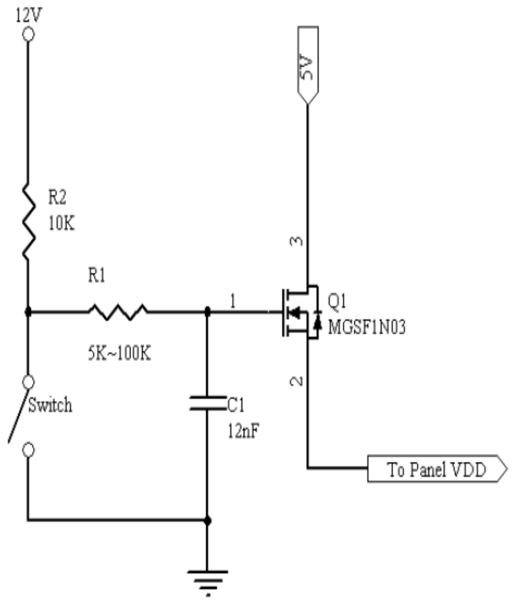
Item		Symbol	Min.	Type	Max.	Unit.	Note
Power supply voltage		LCD_VCC	3.0	3.3	3.6	V	GND=0
Power on gate voltage		VGH	--	18.0	--	V	GND=0
Power off gate voltage		VGL	--	-10	--	V	AGND=0
TFT Common voltage		VCOM	3.5		4.5	V	
Power Supply Current		IVDD	--	TBD	--	mA	
Power consumption		PLCD	--	--	1.0	W	
Rush Current		Iruch			2.0	A	
Data (R.G.B signal) Voltage		Vsig	-4.9		4.9	V	
Input logic high voltage		VIH	0.7VCC	--	VCC	mA	
Input logic low voltage		VIL	GND	--	0.3VCC	V	
PWM signal voltage/Enable	**High**	**VPWM**	**1.6**	**--**	**--**	**V**	
	Low		**--**	**--**	**0.8**	**V**	
Backlight Drivering	Input PWM Frequency	Fsw	280	350	420	KHZ	
		Duty Cycle	1	--	100	%	
		Range	200		20k	HZ	
		IBL_PWR	--	TBD	--	mA	
		VBL_PWR	**3.0**	**--**	**5.5**	**V**	
LED Reverse Voltage		Vr			5.0	V	Each LED
LED Forward Current		If			35.0	mA	Each LED

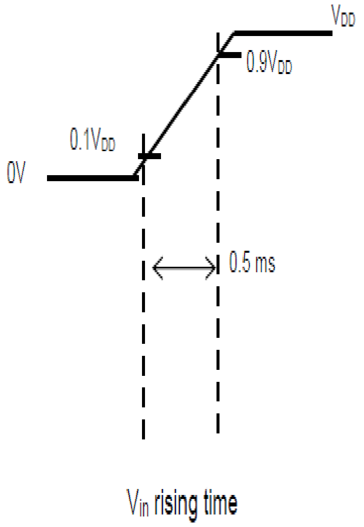
Note 1

When VDD operating within 2.7V ≦ VDD < 3.0V and td ≦10ms, the display may become abnormal. V_{DD} dip condition should also follow the power on/off conditions for supply voltage.



Note 2 power on inrush current circuit


12V
5V
R2
10K
R1
5K~100K
1
3
2
Q1
MGSF1N03
Switch
C1
12nF
To Panel VDD


V_{DD}
$0.9V_{DD}$
$0.1V_{DD}$
0V
0.5 ms
V_{in} rising time

6.2 Back-Light Unit

The backlight system is an edge-lighting type with 42LED.

The characteristics of the LED are shown in the following tables.

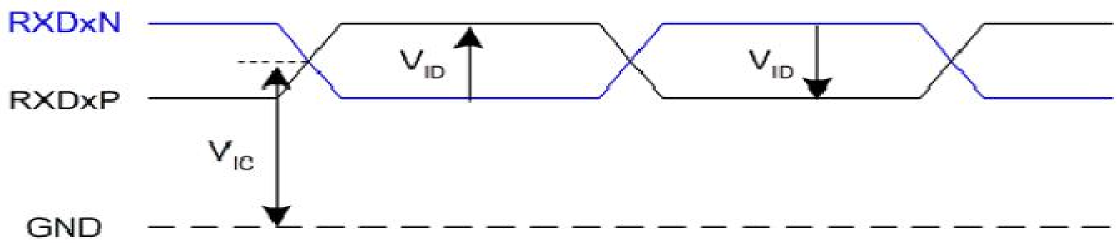
Item	**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit**	**Note**
LED current	**VL**	**18.0**	**19.2**	**21.0**	**V**	**(2)**
LED Voltage	**IL**		**90**		**mA**	
Operating LED life time	**Hr**	**50000**	**--**	**-**	**Hour**	**(1)(2)**

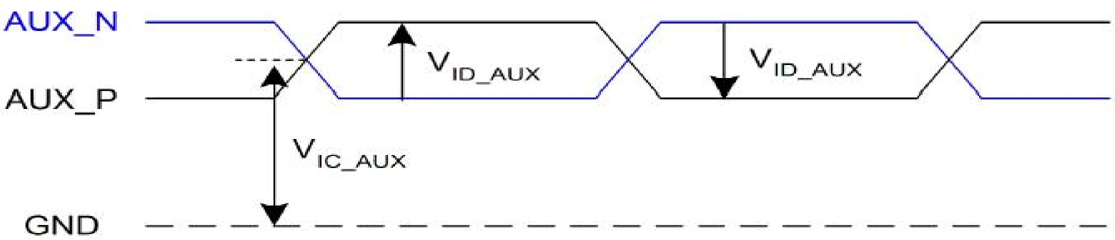
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃. The LED lifetime could be decreased if operating IL is larger. The constant current driving method is suggested.

6.3 Signal Timing Diagram of Interface Signal

Input signals shall be low or High-impedance state when VDD is off. Signal electrical characteristics are as follows;



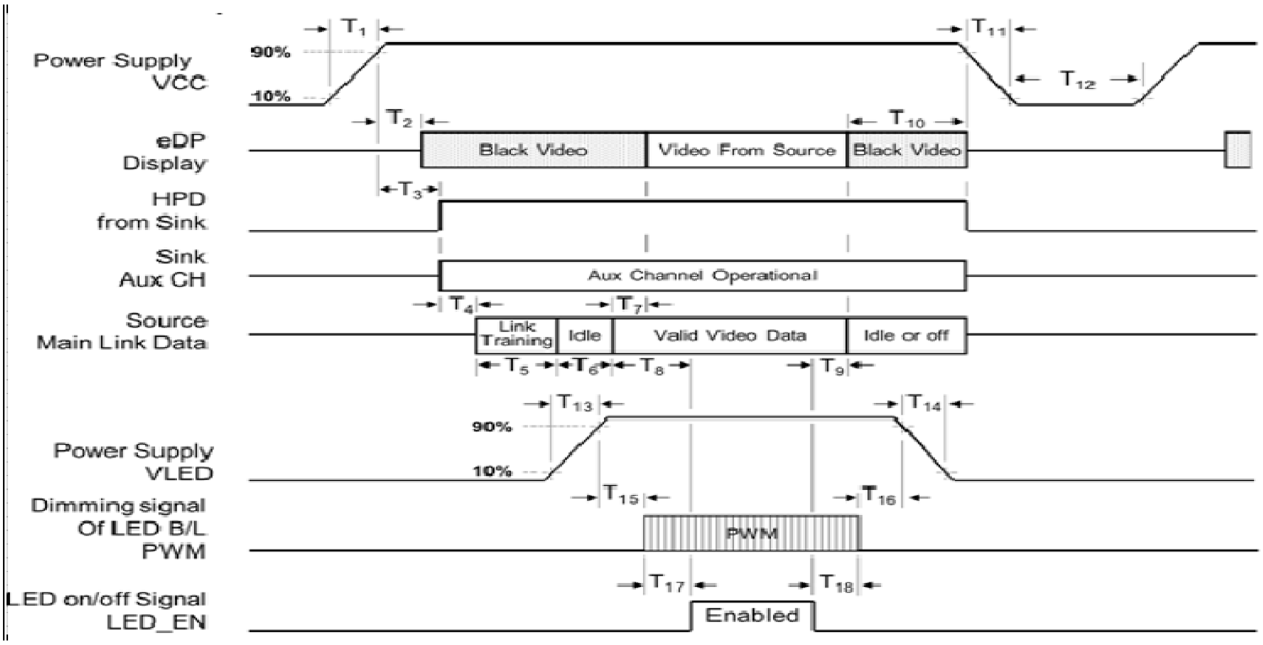


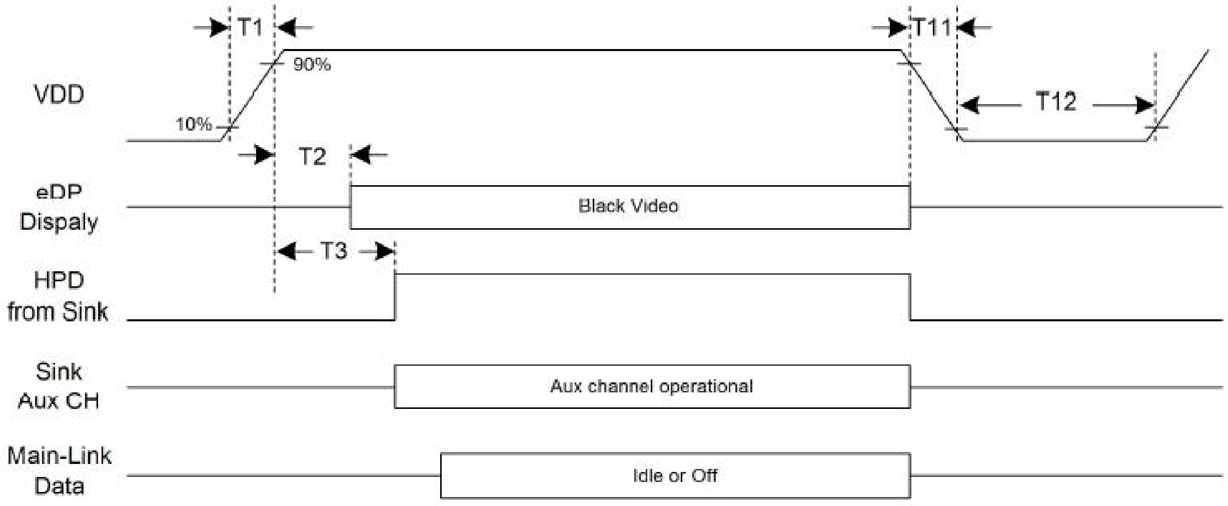
Parameter	Symbol	Condition	Min.	Max,	Unit
Main link common mode voltage	V_{IC}	---	0	2.0	V
Main link swing voltage	V_{ID}	2.7Gbps	±100	±600	mV
		1.62Gbps	±100	±600	mV
AUX common mode voltage	V_{IC_AUX}	---	0	2.0	V
AUX swing voltage	V_{ID_AUX}	Transmitting	±0.195	±0.69	V
		Receiving	±0.16	±0.68	V

6.4 Interface DE mode

Item	Min.	Typ.	Max.	Unit
Frame Rate	58	60	62	Hz
Frame Period	1230	1250	1270	line
Vertical Display Time		1200		line
Vertical Blanking Time	30	50	70	line
1 Line Scanning Time	2040	2060	2080	clock
Horizontal Display Time		1920		clock
Horizontal Blanking Time	120	140	160	clock
Clock Rate	153.21	154.5	155.57	MHz

6.5 Power Sequence Specifications


Power Supply VCC
90%
10%
T1
T11
T12
eDP Display
T2
T10
Black Video
Video From Source
Black Video
HPD from Sink
T3
Sink Aux CH
Aux Channel Operational
Source Main Link Data
T4
T7
Link Training
Idle
Valid Video Data
Idle or off
T5
T6
T8
T9
Power Supply VLED
T13
T14
90%
10%
Dimming signal Of LED B/L PWM
T15
T16
PWM
LED on/off Signal LED_EN
T17
T18
Enabled


VDD
T1
T11
90%
10%
T12
eDP Dispaly
T2
Black Video
HPD from Sink
T3
Sink Aux CH
Aux channel operational
Main-Link Data
Idle or Off

7.0 Reliability test items

NO.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+60℃,240hrs	Inspection after2～4 hours storage at room temperature, the sample shall be free from defects 1. Air bubble in the LCD 2. Sealleak 3. non-display 4. missing segmnents 5. glass crack 6. current idd is twice higher than initial value.
2	Low Temperature Storage	Ta=-20℃,240hrs	
3	High Temperature Operation	Ta=+50℃,240hrs	
4	Low Temperature Operation	Ta=-0℃,240hrs	
5	High Temperature and High Humidity(Operation)	Ta=+50℃, 90%RH, 240hrs	
6	Thermal cycling Test (non operation)	-0℃(30min)→+50℃(30min),100cycles	
7	Electrostatic discharge	200V 200pf(0ohm) 1time/each terminal	
8	Vibration	1. Random: 1.04 Grms,5～500HZ, X/Y/Z,30min/each direction 2. Sine: Freq. Range:8～33.3hz Stoke:1.3mm Sweep:2.9G,33.3～400HZ X/Z:2hr,Y:4hr,cyc:15min	
9	Shock	100G,6ms,±X, ±Y, ±Z 3 times for each direction	JIS C7021,A-10 (Condition)
10	Vibration(with carton)	Random:0.015G∧2/HZ, 5～200HZ -6dB/octave,200～400HZ XYZ each dirction:2hr	
11	Drop (with carton)	Height:60cm 1corner,3edges,6surfaces	JIS Z0202

Note:

1.There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

2.the test samples should be applied to only one test item

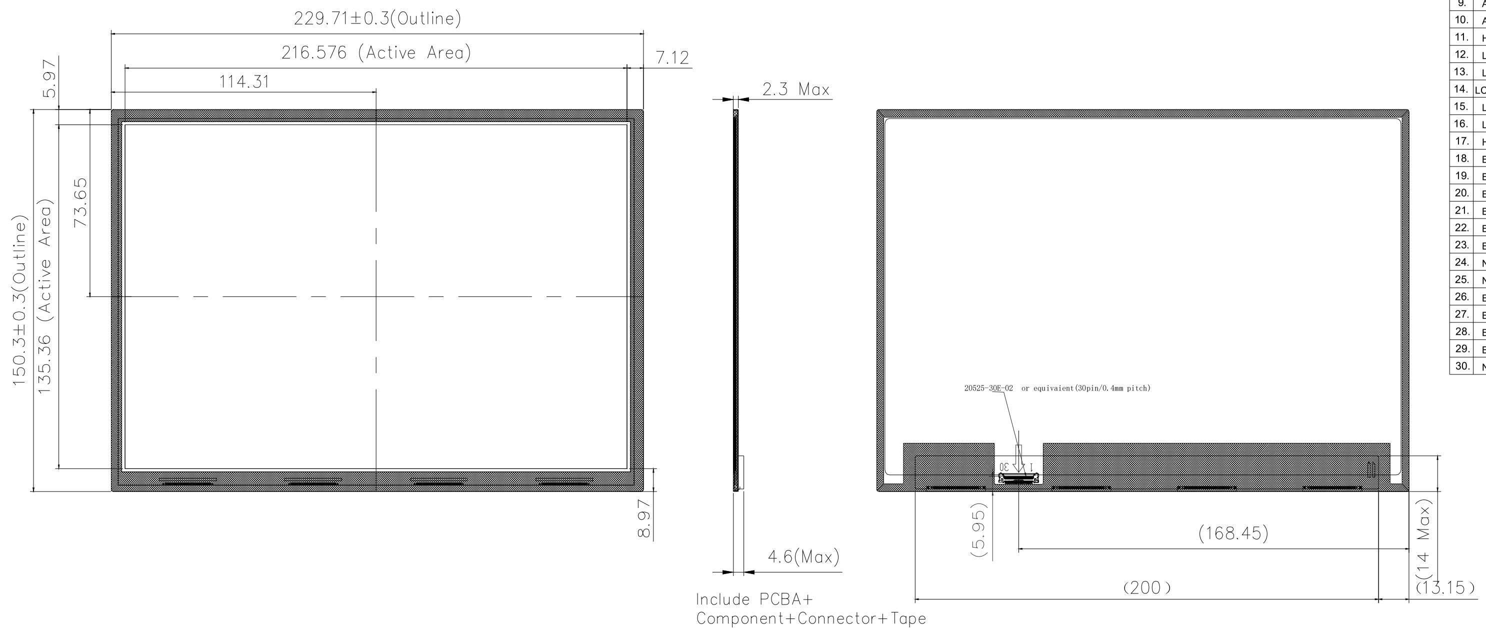
3.for damp proof test, Pure water(resistance>10M ohm)should be used

4.in case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part

5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Charateristic, Optical Characteristic

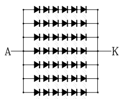
8.0 OUTLINE DIMENSION

Outline Dimension:


229.71±0.3(Outline)
216.576 (Active Area)
114.31
7.12
5.97
73.65
150.3±0.3(Outline)
135.36 (Active Area)
8.97
2.3 Max
4.6(Max)
Include PCBA+
Component+Connector+Tape
20525-30E-02 or equivaient(30pin/0.4mm pitch)
30
1
(5.95)
(168.45)
(200)
(14 Max)
(13.15)

PIN ASSIGNMENT	
1.	NC
2.	H_GND
3.	Lane1_N
4.	Lane1_P
5.	H_GND
6.	Lane0_N
7.	Lane0_P
8.	H_GND
9.	AUX_CH_P
10.	AUX_CH_N
11.	H_GND
12.	LCD_VCC
13.	LCD_VCC
14.	LCD_Self_Test or NC
15.	LCD_GND
16.	LCD_GND
17.	HPD
18.	BL_GND
19.	BL_GND
20.	BL_GND
21.	BL_GND
22.	BL_ENABLE
23.	BL_PWM
24.	NC-Reserved
25.	NC-Reserved
26.	BL_PWR
27.	BL_PWR
28.	BL_PWR
29.	BL_PWR
30.	NC-Reserved

LED CIRCUIT DIAGRAM:



NOTE:
1 DISPLAY: 10.1"TFT TRANSMISIVE
2 VIEW DIRECTION: ALL
3 DRIVER IC:***
4 BL LED:******
5 OPERATION TEMP.: 0°C~+50°C
6 STORAGE TEMP.: -20°C~+60°C
7 UNSPECIFIED TOLERANCES IS ±0.2mm
8 ALL MATERIAL AND PROCESSING SHOULD BE LEAD FREE
9 CRITICAL DEMENSION MARKED *

光电参数(Ta=25° C)：

项目		符号	最小值	典型值	最大值	单位	测定条件 Condition
主屏 (含 LCD, TP)	亮度 Luminance	Lv	270	310		cd/m^2	BL If= * mA (恒定电流测试) (亮度值为九点平均值)
	均匀性 Uniformity	AVG	75%				
	色度坐标 Colour Coordinate	X	0.25	0.30	0.35		
		Y	0.29	0.34	0.39		
正向电压	Forward Voltage	Vf	*	*		V	
反向电流	Reverse Current	Ir			*	μA	Vr= * V

版本	更改内容	拟定	日期
V01	初版		

Kingtech Group Co.,Ltd

部品名称：LCM外形图		型号: PV101048W0230P		
部品编码：		设计	审核	确认
单位：mm	比例：1:1			
第1页 共1页	版本：00			
日期：2023.05.16	A4	第三视角：		

9.0 GENERAL PRECAUTION

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 module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, 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 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the LED cable.

9.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. 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 module may be damaged. 9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time. 11.5.3. It's recommended to employ protection circuit for power supply.

9.6 Operation

9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

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

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

9.6.4 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.

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

9.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

9.8 Static Electricity

9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

9.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

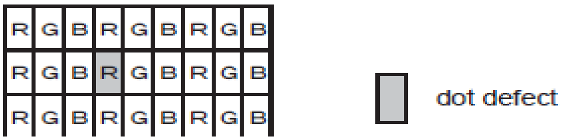
The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

9.10 Disposal

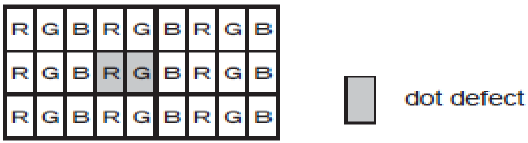
When disposing LCD module, obey the local environmental regulations.

10. Package Specification

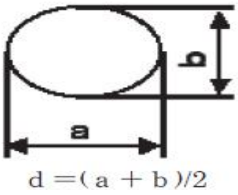
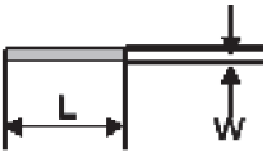
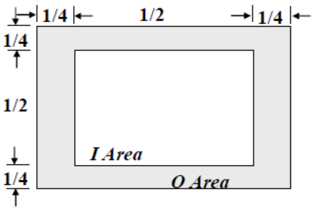
11.Visuals Specification: 1)Note

<table>
<tr><td>General</td><td colspan="3">1. Customer identified anomalies not defined within this inspection standard shall be reviewed by LowKey, and an additional standard shall be determined by mutual consent.
2. This inspection standard about the image quality shall be applied to any defect within the effective viewing area and shall not be applicable to outside of the area.
3. Inspection conditions
Luminance : 500 Lux min.
Inspection distance : 300 mm.
Temperature : 25±5°C
Direction : Directly above</td></tr>
<tr><td rowspan="7">Definition of inspection item</td><td rowspan="3">Dot defect</td><td>Bright dot defect</td><td>The dot is constantly “on” when power applied to the LCD, even when all “Black” data sent to the screen. Inspection tool: 5% Transparency neutral density filter.Count dot: If the dot is visible through the filter. Don’t count dot: If the dot is not visible through the filter.


R G B R G B R G B
R G B R G B R G B
R G B R G B R G B
dot defect

</td></tr>
<tr><td>Black dot defect</td><td>The dot is constantly “off” when power applied to the LCD, even when all “White” data sent to the screen.</td></tr>
<tr><td>Adjacent dot</td><td>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.


R G B R G B R G B
R G B R G B R G B
R G B R G B R G B
dot defect

</td></tr>
<tr><td rowspan="2">External inspection</td><td>Bubble ,scratch(foreign Particle polarizer, Cell, Backlight)</td><td>Visible operating (all pixels “Black” or “White”) and non operating.</td></tr>
<tr><td>Appearance inspection</td><td>Does not satisfy the value at the spec.</td></tr>
<tr><td>Others</td><td>LED wires</td><td>Damaged to the LED wires, connector, pin, functional failure or appearance failure.</td></tr>
<tr><td>Definition of Size</td><td colspan="2">Definition of circle : definition of linear size definition Area I/O


 </td></tr>
</table>

2) Standard

Classification		Inspection item		Judgment Standard	
Defect (in LCD glass)	Dot defect	Area		I	O
		Bright dots(Note: Visible under:ND5%) 1:D≤0.15mm:No count); D>0.15mm acceptable: 0		N≤2	
		Dark dots (0.15mm<D≤0.3mm), D>0.3mm Not allowable		N≤1	N≤2
		Bright dot-2Adjacent		N≤0	
		Dark dot-2Adjacent		N≤0	
		Dark or bright dots-3 and more adjacent(note6)		N≤0	
		Total bright and dark dots		N≤2	
		Minimum distance between bright dots		15mm	
		Minimum distance between dark dots		5mm	
		Minimum distance between bright and bright dots		5mm	
	Other	White dot ,dark dot (circle)	Size (mm)	Acceptable number	
			d≤0.2	Neglected	
			0.2mm<D≤0.3mm	N≤4	
			0.3mm<D≤0.4mm	N≤2	
			D>0.4mm	Not allowable	
Visual defect		Foreign partial	Circular foreign material: dark/bright sport	Visible under:ND5% 1:D≤0.15mm:No count 2:0.15mm<D≤0.3mm,N≤4 3:D>0.3mm:Not allowable	
			Linear foreign material: bright or dark line	Invisible under ND5% 0.1mm<W≤0.3mm, 0.3mm<L≤1.5mm,N≤2 Visible under ND5% 0.05mm≤w≤0.1mm, 0.3mm≤L≤0.7mm,N≤1	
		Polarizer	Linear scratch	1:BM:No Count 2:Pixel area 0.05mm≤w≤0.2mm, 1.0mm≤L≤5.0mm,N≤2	
			Bubble peeling	1:BM:No Count 2:Pixel area 0.15mm≤D<0.3mm,N≤4	
		Mura & leak		ND5%	