



# Display Module SPECIFICATION

## Model: PV101053W0240V-CO

<b>Customer</b>	
<b>Customer NO.</b>	
<b>Approve By</b>	

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

**Owner:**

**Version: V01**

**Document ID: PV101053W0240V-CO**

**Approved by**



## Record of Revisions

Rev	Date	Sub-Model	Description of change
V01	July. 4 <sup>th</sup> , 2023	PV101053W0240V-CO	Preliminary Product Specification was first issued.



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# 1. General description

## 1.1 Introduction

PV101053W0240V-CO 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 (10:16) inch diagonally measured active display area with FHD (1200horizontal by 1920 vertical pixel) resolution.

## 1.2 Features

10.1 (10:16 diagonal) inch configuration

16.7M color 4-lanes MIPI interface

RoHS Compliance

## 1.3 Applications

Mobile NB

Automotive

Multimedia applications and Other AV system

## 1.4 General information

Item	Specification	Unit
Outline Dimension	254.96*172.6*7.78 [233.42x 149.10 x 4.8(typ)]	mm
Display area	135.36(H) X 216.58(V)	mm
Number of Pixel	1200 x RGB(H) x 1920(V)	pixels
Pixel pitch	112.8 (H) x112.8(V)	um
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally Black	
Surface treatment	Antiglare, Hard-Coating with normal film	
Weight	400(max)	g
Back-light	Single LED (Side-Light type)	
Power Consumption	B/L System 6.0(typ)	w

## 1.5 Mechanical Information

item	Min.	Typ.	Max.	Unit	
Module Size	Horizontal(H)	254.76	254.96	255.16	mm
	Vertical(V)	172.40	172.60	172.80	mm
	Depth(D)	7.58	7.78	7.98	mm



## 2.0 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical Absolute Rating

#### 2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit.	Note
Power supply voltage	VDD	-0.3	5.5	V	GND=0

#### 2.1.2 Back-Light Unit

Item	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward voltage	Vf	14	14.3	14.5	V	(1)(2)
Forward current	If	--	420		mA	(1)(2) (3)
Power Consumption	PBL	--	6.0		W	

**Note:**

(1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2)  $T_a = 25 \pm 2^\circ\text{C}$

(3) Test Condition: NA

### 2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Remarks
Operating Temperature	Topa	-20	+70	°C	
Storage Temperature	Tstg	-30	+80	°C	



## 3.0 OPTICAL CHARACTERISTICS

### 3.1 Optical specification:

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Condition
Response Time(Tr+Tf)	Tr	25°C		30	--	msec	$\theta = 0^\circ, \varphi = 0^\circ$ (Note 1,3)
	Tf	25°C			--		
Contrast Rate	Cr	25°C	800	1000	--	--	$\theta = 0^\circ, \varphi = 0^\circ$ LED:ON, LIGHT:OFF(Note1,2)
Brightness	YL	25°C	750	850	--	Cd/m2	I=420mA(Note1,4)
Visual angle range front and rear	$\Theta$ U	25°C	80	85		De-gree	$\phi = 90^\circ, (12'$ clock) CR $\geq 10$ (Note 1,4)
	$\Theta$ D		80	85			$\phi = 270^\circ, (6'$ clock) CR $\geq 10$ (Note 1,4)
Visual angle range left and right	$\Theta$ L	25°C	80	85		De-gree	$\phi = 180^\circ, (9$ o'clock)CR $\geq 10$ (Note 1,4)
	$\Theta$ R		80	85			$\phi = 0^\circ, (3$ o'clock)CR $\geq 10$ , (Note 1,4)
Brightness uniformity	BUNI		75			%	$\Theta = 0$ (Note5,7)
Visual angle			All				(Note 6)
Item	Symbol	Transmissivity			Conditions		
		Min.	Typ.	Max.			
Red	XR	0.621	0.651	0.681	Reference: BOE Panel, CIE (x, y) chromaticity (Note 1,4)		
	YR	0.301	0.331	0.361			
Green	XG	0.245	0.275	0.305			
	YG	0.530	0.560	0.590			
Blue	XB	0.110	0.140	0.170			
	YB	0.065	0.095	0.125			
White	XW	0.270	0.300	0.330			
	YW	0.295	0.325	0.355			

### 3.2 Measuring Condition

Measuring surrounding: dark room ,LED current IL 420mA

Ambient temperature: 25±2oC

15min. warm-up time.

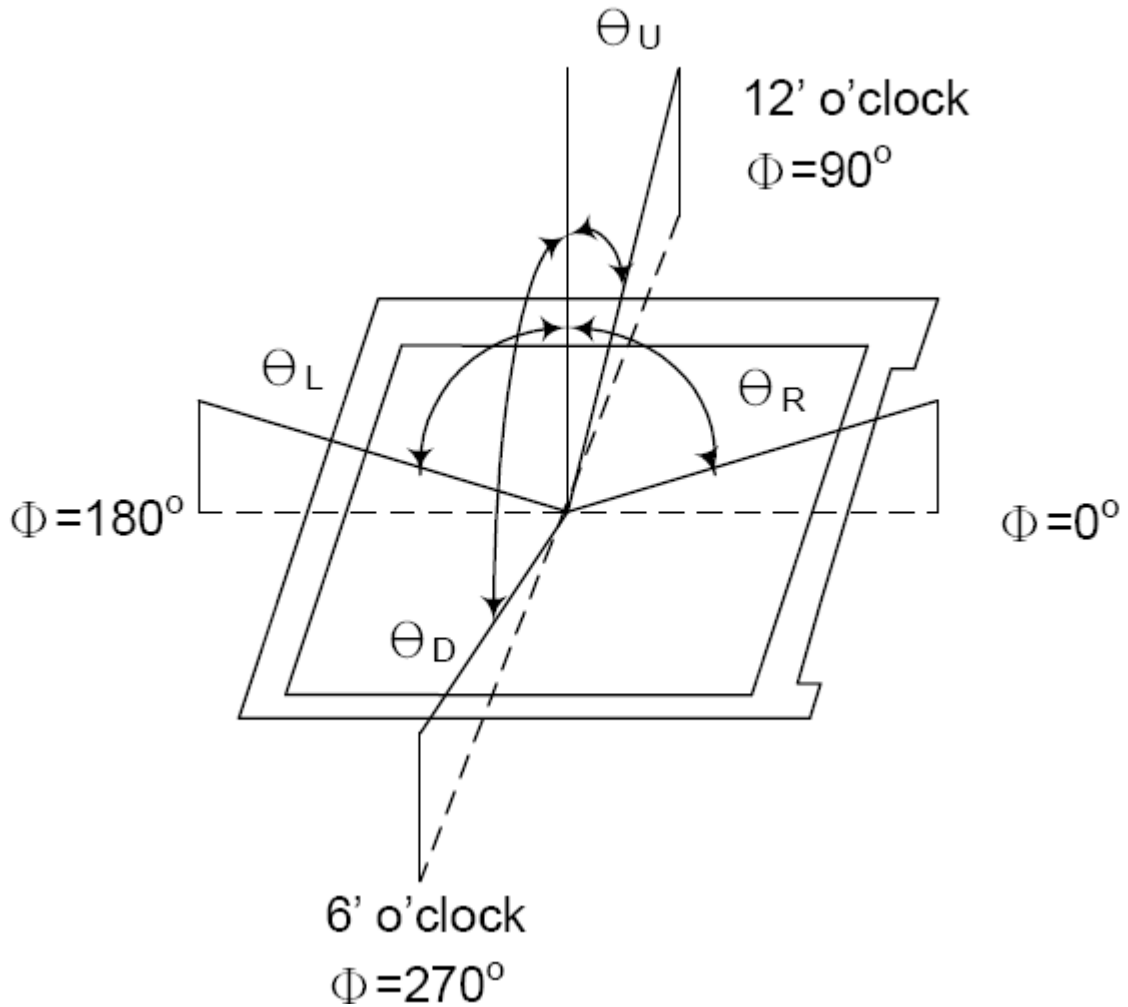
### 3.3 Measuring Equipment

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 :**



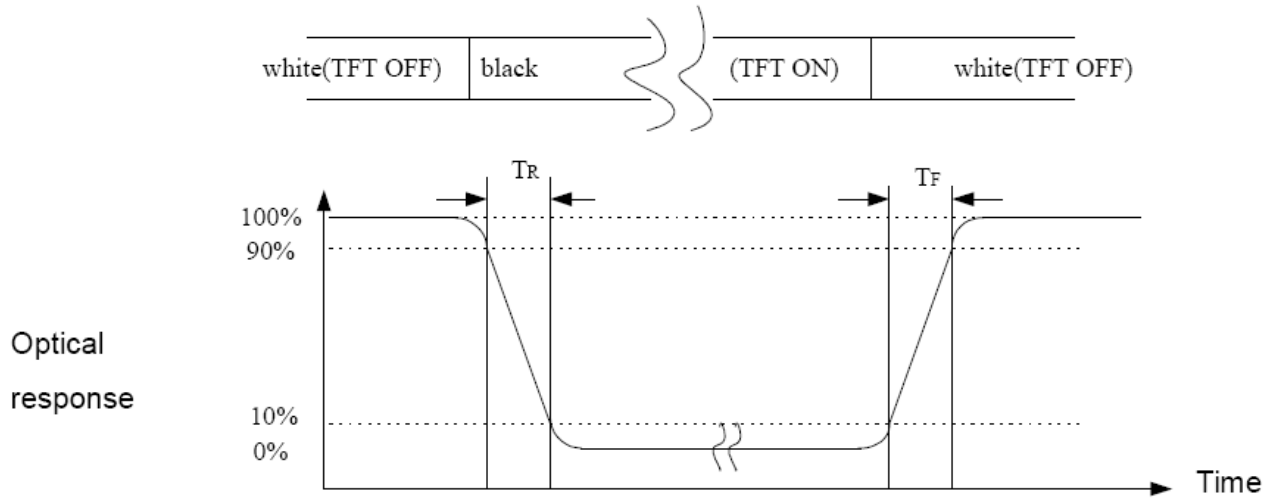
**Note (2) Definition of Contrast Ratio (CR):**

**Measured at the center point of panel**

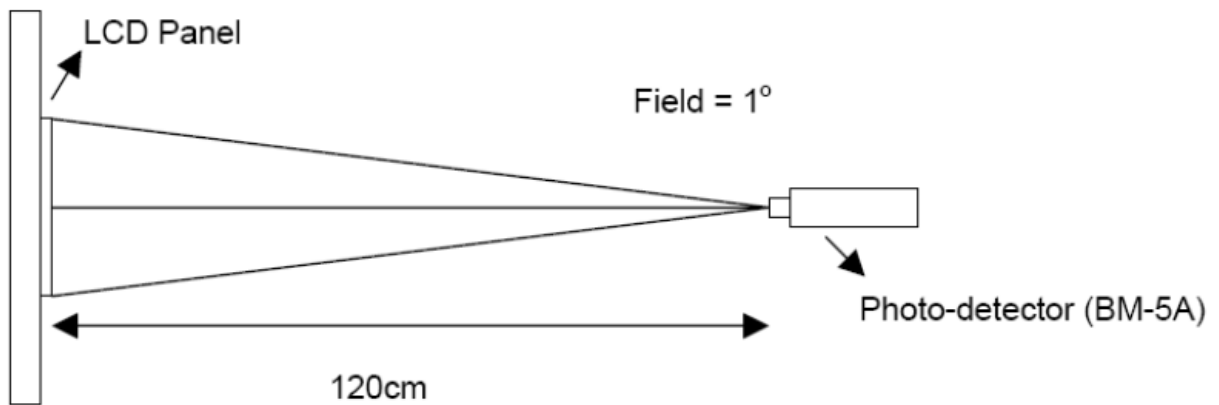
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



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



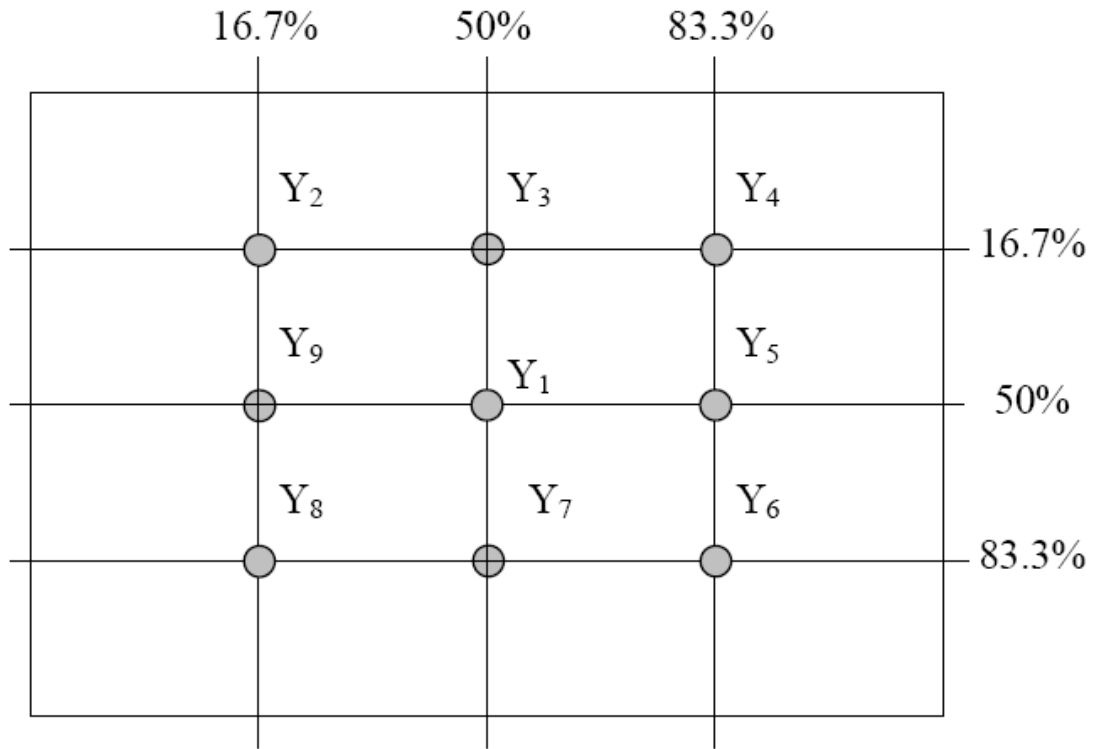
### Note (4) Definition of optical measurement setup







**Note (5) Definition of brightness uniformity**



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

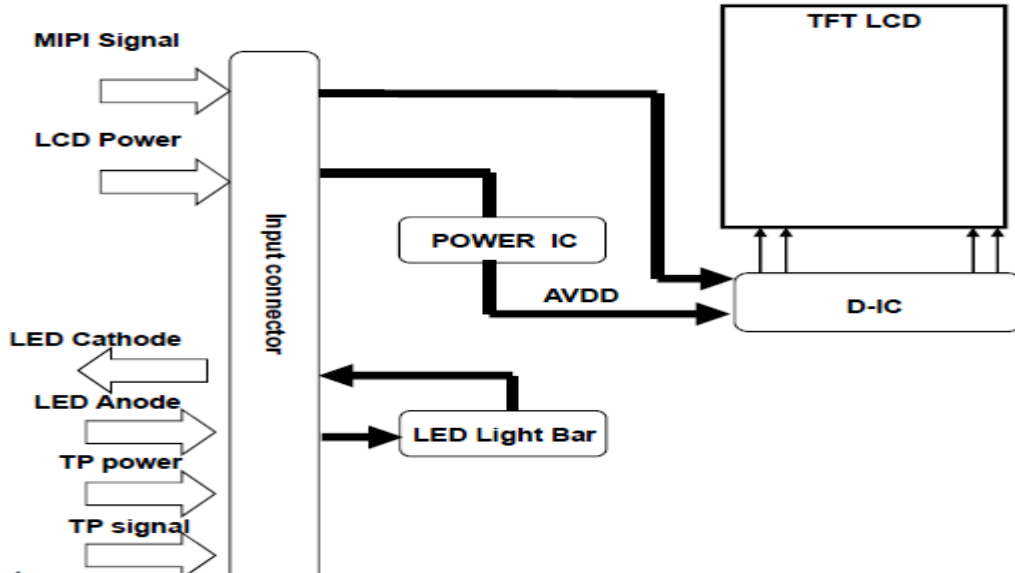
**Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction).**

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

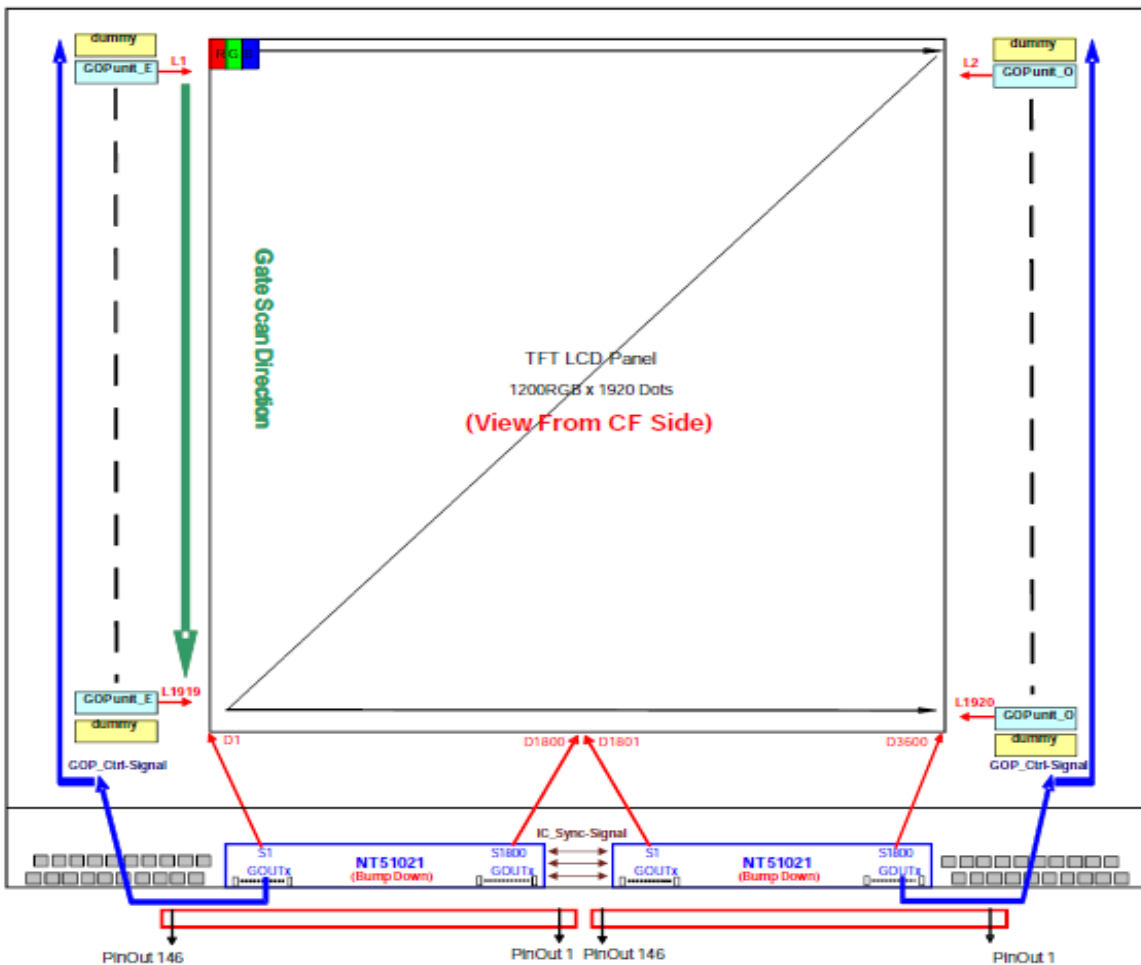


## 4.0 BLOCK DIAGRAM

### 4.1 TFT LCD Module



### 4.2 Pixel Format





## 5.0 INTERFACE PIN CONNECTION

### 5.1 The electronics interface connector is FH19SC-40S-0.5SH

Pin No.	Symbol	I/O	Function	Remark
1	NC	--	Not connected	
2	VDD	P	+3.3V power supply	
3	VDD	P	+3.3V power supply	
4	NC	--	Not connected	
5	NC	--	Not connected	
6	ID	O	Output Low level signal Low=GND	
7	GND	P	Ground	
8	MIPI_0N	I	MIPI data negative signal	
9	MIPI_0P	I	MIPI data positive signal	
10	GND	P	Ground	
11	MIPI_1N	I	MIPI data negative signal	
12	MIPI_1P	I	MIPI data positive signal	
13	GND	P	Ground	
14	MIPI_CLKN	I	MIPI clock negative signal	
15	MIPI_CLKP	I	MIPI clock positive signal	
16	GND	P	Ground	
17	MIPI_2N	I	MIPI data negative signal	
18	MIPI_2P	I	MIPI data positive signal	
19	GND	P	Ground	
20	MIPI_3N	I	MIPI data negative signal	
21	MIPI_3P	I	MIPI data positive signal	
22	GND	P	Ground	
23	NC	-	Not connected	
24	NC	-	Not connected	
25	GND	P	Ground	
26	SDA	-	Internal Setting; not connected	



27	PWMO	O	LED PWM Control output(not use is NC)	
28	ID	O	Output High signal High=VDD	
29	NC	-	Not connected	
30	GND	P	Ground	
31	VLED-	P	Power supply for BL(cathode)	
32	VLED-	P	Power supply for BL(cathode)	
33	SCL	-	Internal Setting ;Not connected	
34	WPN	-	Internal Setting ;Not connected	
35	NC	-	Not connected	
36	MTP	-	Internal Setting ;Not connected	
37	NC	-	Not connected	
38	NC	-	Not connected	
39	VLED+	P	Power supply for BL(Anode)	
40	VLED+	P	Power supply for BL(Anode)	

I: input O: output ,P: power

## 6.0 ELECTRICAL CHARACTERISTICS

### 6.1 TFT LCD Module

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V <sub>DD</sub>	3.0	3.3	3.6	V	
	V <sub>GH</sub>	--	21.0	--	V	
	V <sub>GL</sub>	--	-7	--	V	
Input signal voltage	V <sub>COM(DC)</sub>	--	3.57	--	V	
Input logic high voltage	V <sub>IH</sub>	0.7V <sub>DD</sub>	-	V <sub>DD</sub>	V	
Input logic low voltage	V <sub>IL</sub>	0	-	0.3 V <sub>DD</sub>	V	
Current of power supply	I <sub>VDD</sub>		145	166	mA	
	I <sub>HOVCC</sub>			10	mA	

Note 1: Be sure to apply V<sub>DD</sub> and V<sub>GL</sub> to the LCD first, and then apply V<sub>GH</sub>.

Note 2: V<sub>DD</sub> setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 4: Typical V<sub>COM</sub> is only a reference value, it must be optimized according to each LCM. Be sure to use V<sub>R</sub>.



## 6.2 Back-Light Unit

The backlight system is an edge-lighting type with 40 LED.

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

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	VL	14	14.3	14.5	V	(2)
LED Voltage	IL		420		mA	
Operating LED life time	Hr	50000	-	-	Hour	(1)(2)

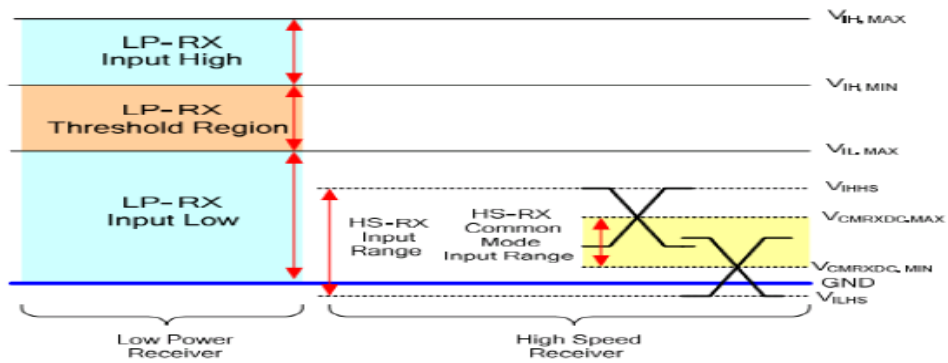
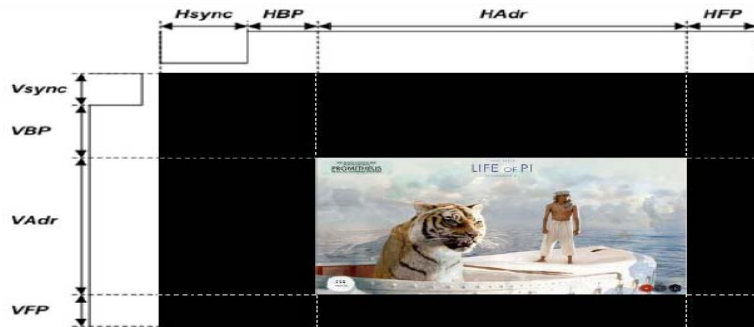
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3°C, typical IL 420mA value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C. The LED lifetime could be decreased if operating IL is larger 420mA. The constant current driving method is suggested.

## 6.3 DC and AC Characteristics

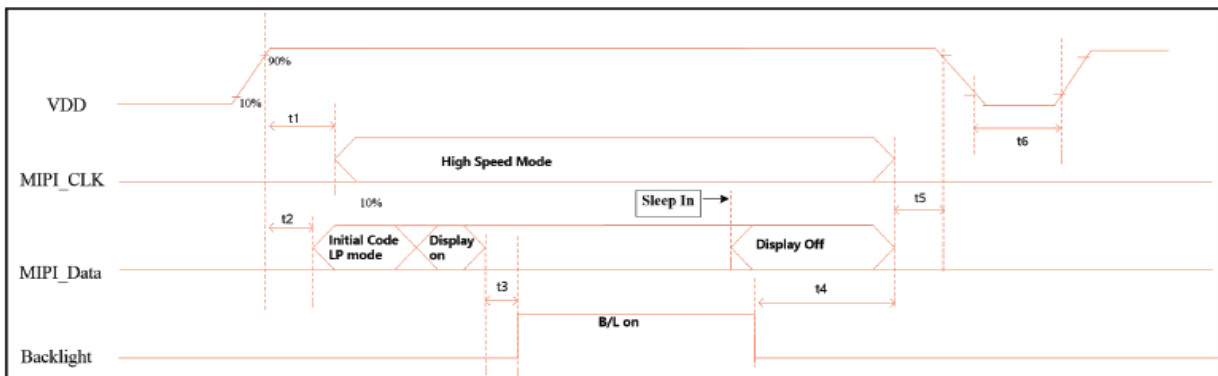
### 6.3.1:MIPI Input signal SPEC

ITEM		SYMBOL	min	typ	max	UNIT	
LCD	Frame Rate	-	-	60	-	Hz	
	Pixels Rate	-	156.8	156.8	159.9	MHz	
Timing	Mipi CLK	Frequency	fCLK	490	490	498	MHz
		Period	Tclk	2.01	2.04	2.04	ns
	Horizontal	Horizontal total time	tHP	1343	1343	1366	t <sub>CLK</sub>
		Horizontal Active time	tHadr	1200			t <sub>CLK</sub>
		Horizontal Pulse Width	tHsync	1	1	1	t <sub>CLK</sub>
		Horizontal Back Porch	tHBP	32	32	32	t <sub>CLK</sub>
		Horizontal Front Porch	tHFP	110	110	133	t <sub>CLK</sub>
	Vertical	Vertical total time	tvp	1946	1946	1951	t <sub>H</sub>
		Vertical Active time	tVadr	1920			t <sub>H</sub>
		Vertical Pulse Width	tVsync	1	1	1	t <sub>H</sub>
		Vertical Back Porch	tVBP	14	14	14	t <sub>H</sub>
		Vertical Front Porch	tVFP	11	11	16	t <sub>H</sub>
	Bit Rate		TX SPD (MBPS)	980	980	995	Mbps
	Lane			-	4	-	Lane



### 6.3.2: Power On/Off Sequence

(1). Power on Timing Sequence:  
VDD=3.3V



	Min.	Typ.	Max.	Unit
T1	30	-	60	ms
T2	30	-	60	ms
T3	100	-	-	ms
T4	80	-	-	ms
T5	0	-	-	ms
T6	300	-	-	ms



## 7.0 Reliability test items

NO.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C,240hrs	Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects
2	Low Temperature Storage	Ta=-30°C,240hrs	
3	High Temperature Operation	Ta=+70°C,240hrs	
4	Low Temperature Operation	Ta=-20°C,240hrs	
5	High Temperature and High Humidity(Operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal cycling Test (non operation)	-20°C(30min)→+70°C(30min),100cycles	1. Air bubble in the LCD 2. Seal leak 3. non-display 4. missing segments 5. glass crack 6. current idd is twice higher than initial value.
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



## 7.1 Capacitance Touch Panel Specification

### 7.1.1 PIN assignment for I2C

Terminal No.	Symbol	IO	Functions
1	RST	I	External restart Low is active (1.8V)
2	VDD	I	Power supply [2.8V]
3	GND	P	Power ground
4	INT	I	External interrupt to the host (1.8V)
5	SDA	I/O	I2C data input and output (1.8V)
6	SCL	I	I2C clock input (1.8V)

### 7.1.2 PIN assignment for USB

Terminal No.	Symbol	IO	Functions
1	VCC	I	Power supply [5.0V]
2	DN	I	USB Data input
3	DP	I	USB Data input
4	GND	P	Power ground

### 7.1.2 general features

General information Items	Specification	Unit	Note
Transmissivity	>86%		
Haze	<3%		
Screen	TX25*RX14		
Hardness	>6H		
Driver IC	ILI2511		
Interface	I2C&USB		
Touch type	Projective capacitive		
Simultaneous touch points	5 points		
Structure	G+G(cover glass +ITO glass )		



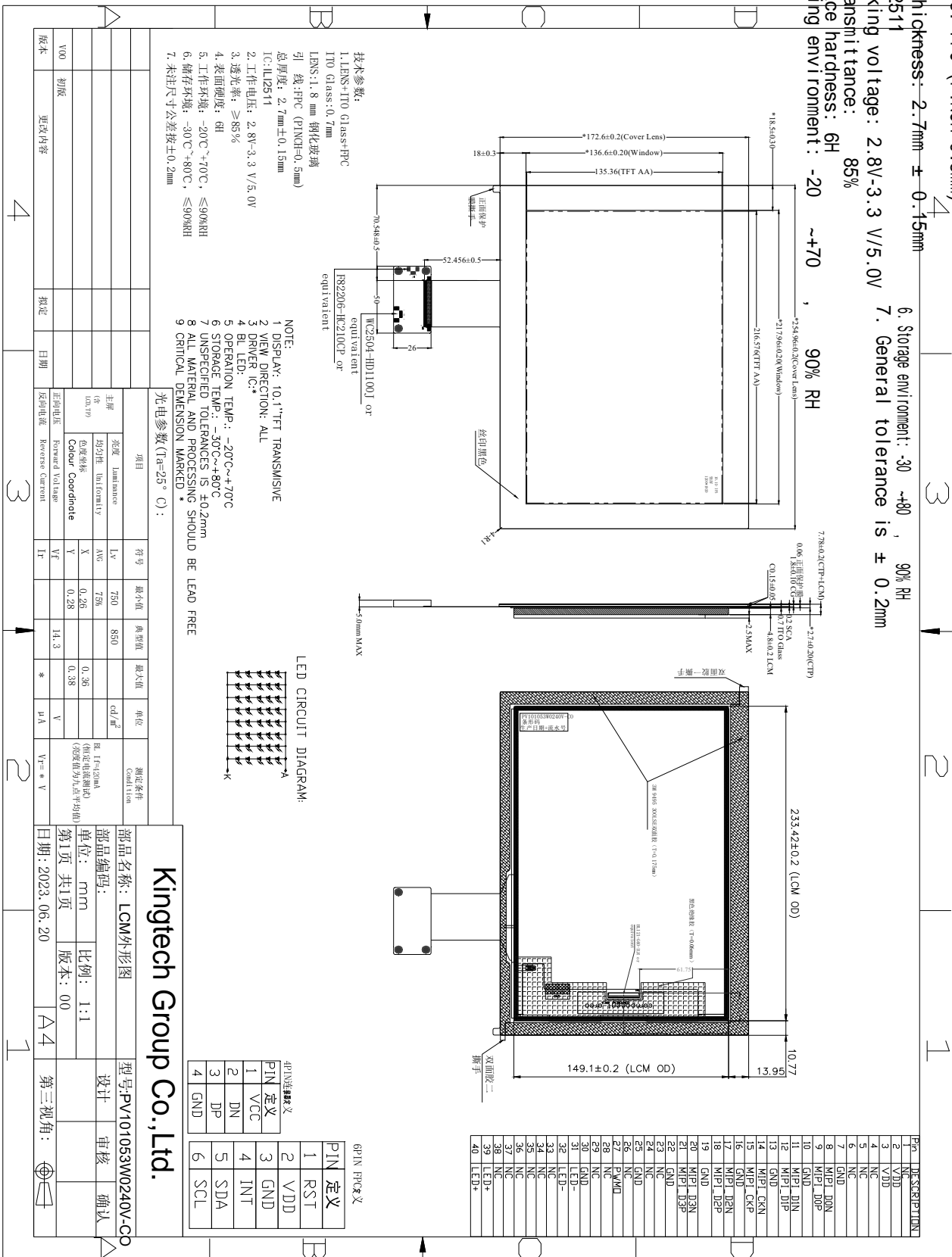


Technical parameters:

1. LENS+ITO Glass+FPC  
ITO Glass: 0.7mm  
LENS: 1.8 mm tempered glass  
Lead wire: FPC (PINCH=0.5mm)
2. Working voltage: 2.8V~3.3 V/5.0V
3. Transmittance: 85%
4. Surface hardness: 6H
5. Working environment: -20 ~+70 , 90% RH
6. Storage environment: -30 ~+80 , 90% RH
7. General tolerance is ± 0.2mm

## 8.0 OUTLINE DIMENSION

### Outline Dimension:





## **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. Kingtech 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.



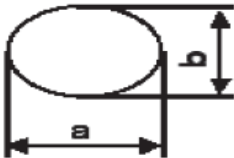
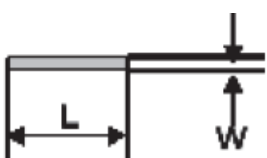
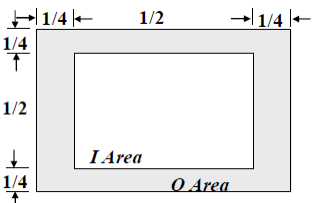
## **9.10 Disposal**

When disposing LCD module, obey the local environmental regulations.

## **10. Package Specification**



## 11. Visuals Specification: 1)Note

<p><b>General</b></p>	<p>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.</p> <p>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.</p> <p>3. Inspection conditions</p> <p>Luminance : 500 Lux min.</p> <p>Inspection distance : 300 mm.</p> <p>Temperature : 25±5°C</p> <p>Direction : Directly above</p>		
<p><b>Definition of inspection item</b></p>	<p><b>Dot defect</b></p>	<p><b>Bright dot defect</b></p>	<p>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.</p>  <p>dot defect</p>
		<p><b>Black dot defect</b></p>	<p>The dot is constantly “off” when power applied to the LCD, even when all “White” data sent to the screen.</p>
		<p><b>Adjacent dot</b></p>	<p>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.</p>  <p>dot defect</p>
<p><b>External inspection</b></p>	<p><b>Bubble ,scratch(foreign Particle polarizer, Cell, Backlight)</b></p>	<p>Visible operating (all pixels “Black” or “White”) and non operating.</p>	
	<p><b>Appearance inspection</b></p>	<p>Does not satisfy the value at the spec.</p>	
<p><b>Others</b></p>	<p><b>LED wires</b></p>	<p>Damaged to the LED wires, connector, pin, functional failure or appearance failure.</p>	
<p><b>Definition of Size</b></p>	<p><b>Definition of circle :</b>  <math>d = (a + b)/2</math></p> <p><b>definition of linear size</b> </p> <p><b>definition Area I/O</b> </p>		



## 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: 2		N≤2	
Dark dots (0.15mm<D≤0.3mm), D>0.3mm Not allowable		N≤4			
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≤4			
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%		