◆ PRIME VIEW

PD121XL4

Version :1.0

TECHNICAL   SPECIFICATION
MODEL   NO. : PD121XL4

The content of this information is subject to be changed without notice.

Please contact PVI or its agent for further information.
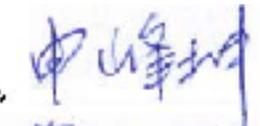
☐Customer's Confirmation

Customer _____

Date _____

By _____

☐PVI's Confirmation

FOR MORE INFORMATION:
AZ DISPLAYS, INC.
75 COLUMBIA, ALISO VIEJO, CA 92656
Http://www.AZDISPLAYS.com

Confirmed By

Prepared By

◈ PRIME VIEW

PD121XL4

Revision History

Rev.	Eng.	Issued Date	Revised Contents
0.1	Sarah Huang	July 18,2008	Preliminary
0.2	Sarah Huang	Sep 02,2008	Modify Page 5 4. Mechanical Drawing of TFT-LCD Module Modify Page 16 13. Optical Characteristics Horizontal View angle from 70 to 75 Vertical View angle from 50/40 to 75/45 Contrast Ratio from 400 to 600 nit
0.3	Sarah Huang	Nov 18,2008	Modify Page 5 4. Mechanical Drawing of TFT-LCD Module
0.4	Sarah Huang	Feb 5, 2009	Modify Page 5,6 4. Mechanical Drawing of TFT-LCD Module
1.0	Sarah Huang	Jan 07, 2010	Modify Page 7 5. Input / Output Terminals Modify Page 16 13. Optical Characteristics Vertical View angle from 75/45 to 65/55 Uniformity from 75% to 70% Add Page 21 16. Packing Diagram

◆ PRIME VIEW

PD121XL4

TECHNICAL   SPECIFICATION

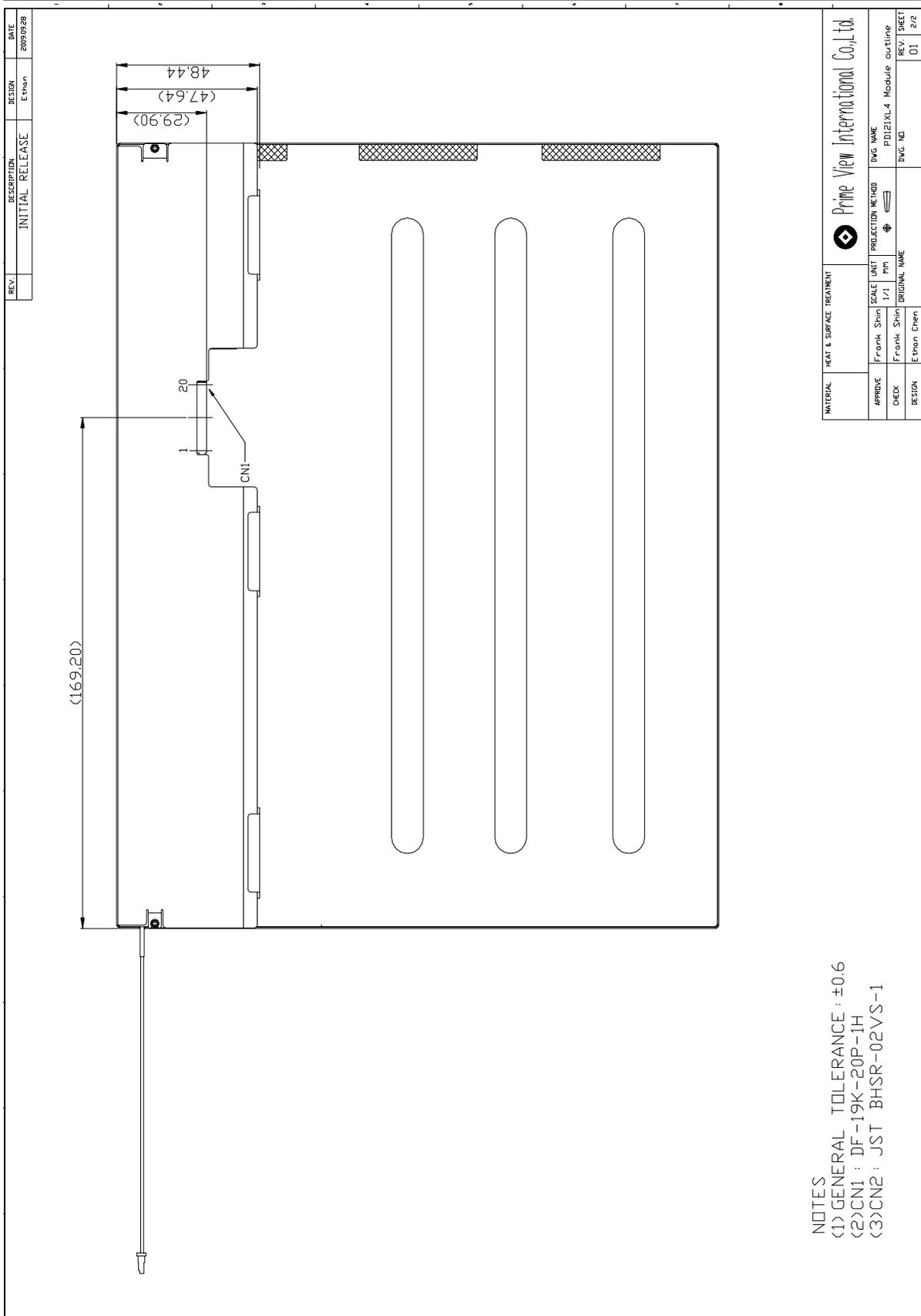# *CONTENTS*

◈ PRIME VIEW

PD121XL4

1. Application

The PD121XL4 is a 12.1" TFT-LCD module with LED B/L and a 20-pin LVDS interface. This module supports 1024 x768 XGA mode and displays 262,144 colors. This module can apply TFT-LCD monitor, TV, Factory application, Amusement Vehicle, and so on.

2. Features

- Wide viewing angle
- Fast response time
- High color saturation
- XGA (1024 x768 pixels) resolution
- Wide operating temperature
- DE (Data Enable) mode
- LVDS (Low Voltage Differential Signaling) interface
- RoHS Compliance

3. Mechanical Specifications

Parameter	Specifications	Unit
Screen Size	12.1 (diagonal)	inch
Display Format	1024×(R, G, B)×768	dot
Display Colors	262,144	
Active Area	245.76(H)×184.32(V)	mm
Pixel Pitch	0.240(H)×0.240(V)	mm
Pixel Configuration	RGB Vertical Stripe	
Outline Dimension	260.5(W)× 204(H)× 7.5(typ.) (D)	mm
Weight	473+20	g
Back-light	54-LED	
Surface treatment	Anti-glare	
Display mode	Normally White	
Gray scale inversion direction	12 O'clock	Note 13-2

PRIME VIEW

PD121XL4

4. Mechanical Drawing of TFT-LCD Module

NOTES
(1) GENERAL TOLERANCE : ±0.6
(2) CN1 : DF-19K-20P-1H
(3) CN2 : JST BHSR-02VS-1

MATERIAL	
HEAT & SURFACE TREATMENT	
APPROVE	Frank Shin
CHECK	Frank Shin
DESIGN	Ethan Chen

SCALE 1/1 UNIT mm
PROJECTION METHOD
Prime View International Co.,Ltd.
DWG. NAME PD121XL4 Module outline
DWG. NO.
REV 01 SHEET 1/2

REV	DESCRIPTION	DESIGN	DATE
	INITIAL RELEASE	Ethan	2009/09/28

◆ PRIME VIEW

PD121XL4

48.44
(47.64)
(29.90)

(169.20)

20
1

CN1

NOTES
(1) GENERAL TOLERANCE : ±0.6
(2) CN1 : DF-19K-20P-1H
(3) CN2 : JST BHSR-02VS-1

MATERIAL | HEAT & SURFACE TREATMENT

◆ Prime View International Co.,Ltd.

PROJECTION METHOD | DWG. NAME | PD121XL4 Module outline
SCALE 1/1 | UNIT mm
APPROVE | Frank Shin | ORIGINAL NAME
CHECK | Frank Shin
DESIGN | Ethan Chen
DWG. NO. | REV. 01 | SHEET 2/2

REV. | DESCRIPTION | DESIGN | DATE
| INITIAL RELEASE | Ethan | 2009.09.28

◈ PRIME VIEW

PD121XL4

5. Input / Output Terminals

5-1) TFT-LCD Panel Driving
  Connector type: DF19K-20P-1H

CN1	Interface connector	Hirose/DF19L-20P-1H or equivalent
	User side connector	Hirose/DF19G-20S-1C or equivalent

Pin No.	Symbol	Function	Remark
1	VSS	Ground	
2	VDD1	Power Supply: +3.3V	
3	VDD2	Power Supply: +3.3V	
4	NC	NC	
5	NC	NC	
6	NC	NC	
7	NC	NC	
8	RIN0-	LVDS Negative data signal (-)	Tx pin #48
9	RIN0+	LVDS Positive data signal (+)	Tx pin #47
10	VSS	Ground	
11	RIN1-	LVDS Negative data signal (-)	Tx pin #46
12	RIN1+	LVDS Positive data signal (+)	Tx pin #45
13	VSS	Ground	
14	RIN2-	LVDS Negative data signal (-)	Tx pin #42
15	RIN2+	LVDS Positive data signal (+)	Tx pin #41
16	VSS	Ground	
17	RCLKIN-	LVDS Negative clock signal (-)	Tx pin #40
18	RCLKIN+	LVDS Positive clock signal (+)	Tx pin #39
19	VSS	Ground	
20	VSS	Ground	

5-2) Backlight driving
  Connector type: JST BHSR-02VS-1, PIN No 2 pin

Pin No	Symbol	Description	Remark
1	+	Input terminal (Anode)	Wire color: Red
2	-	Input terminal (Cathode)	Wire Color: Black

◈ PRIME VIEW

5-3) LVDS Interface

LVDS Transmitter: THC63LVDM83A or equivalent

Input signal	Transmitter Pin No	Interface Pin No	System (Tx)	TFT-LCD (Rx)
R0	51			
R1	52			
R2	54			
R3	55	48 47	OUT0- OUT0+	IN0- IN0+
R4	56			
R5	3			
G0	4			
G1	6			
G2	7			
G3	11			
G4	12	46 45	OUT1- OUT1+	IN1- IN1+
G5	14			
B0	15			
B1	19			
B2	20			
B3	22			
B4	23			
B5	24	42 41	OUT2- OUT2+	IN2- IN2+
HSYNC	27			
VSYNC	28			
DE	30			
MCLK	31	40	CLKOUT-	CLKIN-
		39	CLKOUT+	CLKIN+

6. Absolute Maximum Ratings:

The followings are maximum values, which if exceeded, may cause faulty operation or damage to the unit.

GND=0V,Ta=25℃

Parameters	Symbol	MIN.	MAX.	Unit	Remark
Logic Power Supply	V_{DD}	VSS-0.3	+4.0	V	
Logic Input Voltage	V_{IN}	VSS-0.3	V_{DD}+0.3	V	Note 6-1

Note 6-1: Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

◈ PRIME VIEW

7. Electrical Characteristics

7-1) Recommended Operating Conditions:

Ta=25 ± 2℃

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note 7-1
Power Supply Current	I_{DD}	-	280	485	mA	
Power Consumption	P_{DD}	-	0.9	1.6	W	Note 7-2
LVDS differential voltage	V_{ID}	-100	-	+100	mV	
LVDS common input voltage	Vic	-	1.2	-	V	

Note7-1: The module is recommended to operate within specification ranges listed above for normal function.

Note 7-2: $P_{DD} = V_{DD} \times I_{DD}$

7-2) Recommended driving condition for LED backlight:

Ta = 25℃

| Parameter	Symbol	Min	TYP	MAX	Unit	Remark
Supply voltage of LED backlight	V_{LED1}	-	9.9	(10.8)	V	Note 7-3
Supply current of LED backlight	I_{LED1}	-	20	-	mA	Note 7-4
Backlight Power Consumption	P_{LED}	-	3.56	(3.89)	W	Note 7-3/7-5

Note 7-3: I_{LED} = 20mA, Constant Current.

Note 7-4: The LED driving condition is defined for each LED module. (3 LED Serial)
Input current = 360mA

Note 7-5: $P_{LED} = V_{LED1} * I_{LED1} + V_{LED2} * I_{LED2} + \ldots\ldots + V_{LED17} * I_{LED17} + V_{LED18} * I_{LED18}$
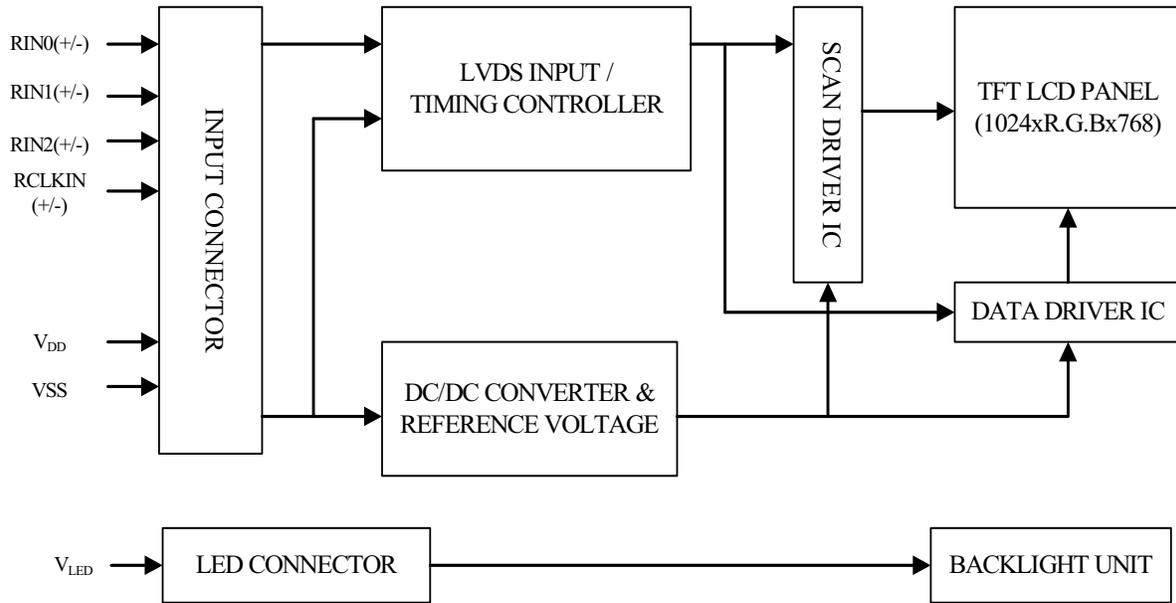
◇ PRIME VIEW
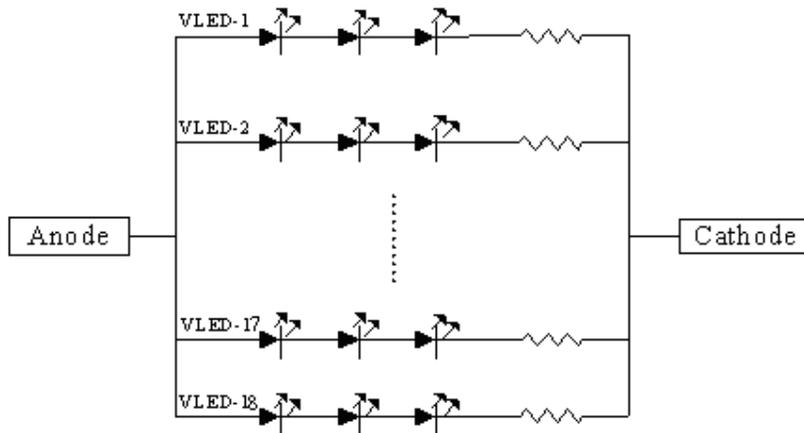
8. Pixel Arrangement

◈ PRIME VIEW
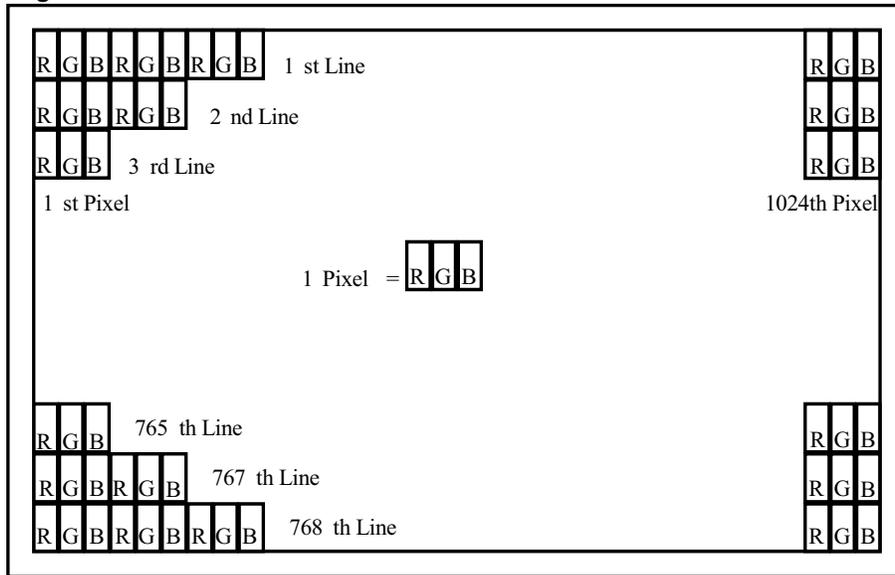
9. Display Color and Gray Scale Reference

Color		Data Signal																		
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Gray Scale Of Black	Black(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gray (1)	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
	Gray (2)	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Gray (61)	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1
	Gray (62)	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0
	White(63)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Note 9-1: 0: Low Level Voltage, 1: High Level Voltage

◆ PRIME VIEW

PD121XL4

10. Block Diagram
10-1) TFT-module Block Diagram

```
RIN0(+/-)  ─────►┐
                 │ INPUT         ┌──────────────────┐        ┌──────┐   ┌──────────────────┐
RIN1(+/-)  ─────►│ CONNECTOR ───►│ LVDS INPUT /     │───────►│ SCAN │──►│ TFT LCD PANEL     │
                 │               │ TIMING CONTROLLER│        │DRIVER│   │ (1024xR.G.Bx768)  │
RIN2(+/-)  ─────►│               └──────────────────┘        │ IC   │   │                   │
                 │                                           │      │   └──────────────────┘
RCLKIN     ─────►│                                           │      │
(+/-)            │                                           │      │   ┌──────────────────┐
                 │                                           │      │──►│ DATA DRIVER IC    │
                 │               ┌──────────────────┐        └──────┘   └──────────────────┘
VDD        ─────►│               │ DC/DC CONVERTER &│────────────────┘
                 │               │ REFERENCE VOLTAGE│
VSS        ─────►│           ───►└──────────────────┘
                 └─
```

V_{LED} ──────► ┌──────────────────┐ ──────────────── ┌──────────────────┐
                   │ LED CONNECTOR   │   │ BACKLIGHT UNIT   │
                   └──────────────────┘   └──────────────────┘

◈ PRIME VIEW

PD121XL4

11. Interface Timing

11-1) The 12.1" XGA LCM is operated by the only DE mode (LVDS Transmitter Input)

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	-	65	80	MHz
	High Time	Tch	4.5	-	-	ns
	Low Time	Tcl	4.5	-	-	ns
Data	Setup Time	Tds	2.7	-	-	ns
	Hold Time	Tdh	0	-	-	ns
Data Enable Setup Time		Tes	2.7	-	-	ns
Frame Period		Tv	772	806	1022	lines
Vertical Display Period		Tvd	768	768	768	lines
One Line Scanning Period		Th	1100	1344	2046	clocks
Horizontal Display Period		Thd	1024	1024	1024	clocks

11-2) LVDS Rx interface timing parameter

The specification of the LVDS Rx interface timing parameter

| Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	12.5	15.38		nsec	
Input Data 0	tRIP0	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP1	tRICP/7-0.4	tRICP/7	tRICP/7+0.4	nsec	
Input Data 2	tRIP2	2 × tRICP/7-0.4	2 × tRICP/7	2 × tRICP/7+0.4	nsec	
Input Data 3	tRIP3	3 × tRICP/7-0.4	3 × tRICP/7	3 × tRICP/7+0.4	nsec	
Input Data 4	tRIP4	4 × tRICP/7-0.4	4 × tRICP/7	4 × tRICP/7+0.4	nsec	
Input Data 5	tRIP5	5 × tRICP/7-0.4	5 × tRICP/7	5 × tRICP/7+0.4	nsec	
Input Data 6	tRIP6	6 × tRICP/7-0.4	6 × tRICP/7	6 × tRICP/7+0.4	nsec	
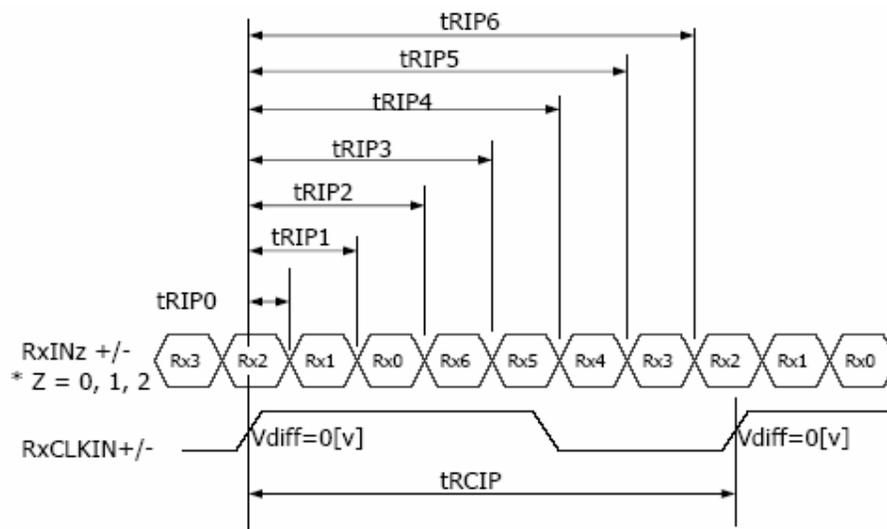
* Vdiff = (RINz+)-(RINz-), (RCLKIN+)-(RCLKIN-)

◈ PRIME VIEW

11-3) Signal Timing Waveforms of Interface Signal (DE Mode)
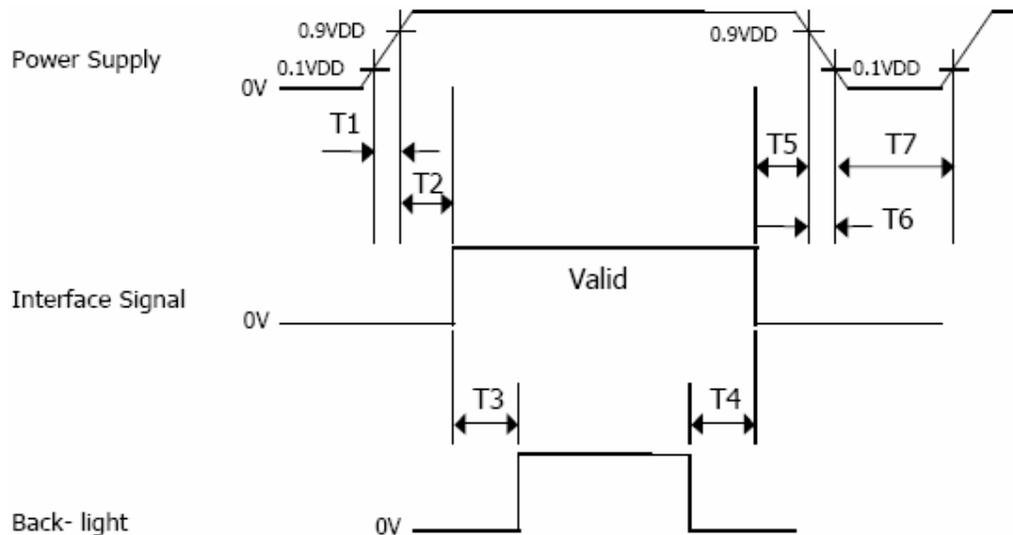
A) Vertical Timing Waveforms
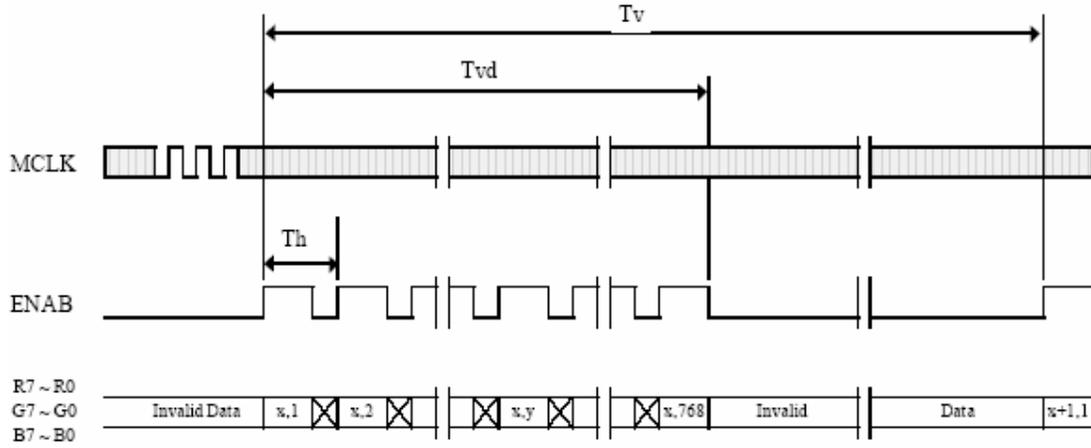
B) Horizontal Timing Waveforms

◆ PRIME VIEW
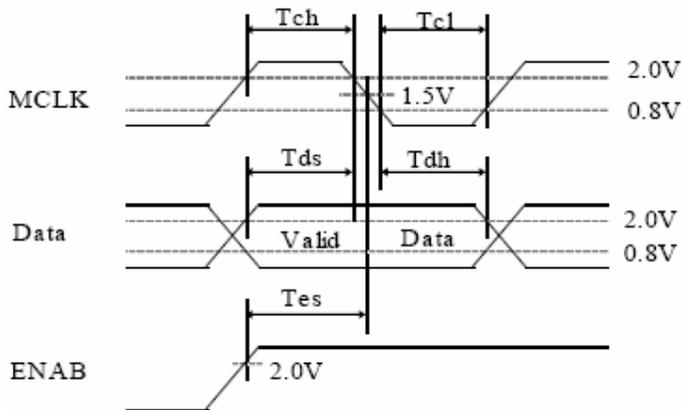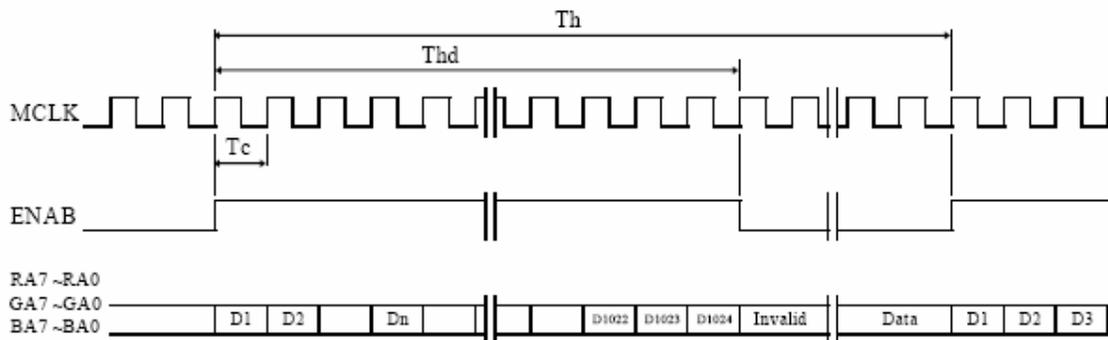
12. Power On Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below

- 0 < T1 ≤ 10 ms
- 0 < T2 ≤ 50 ms
- 200 ms ≤ T3
- 0 ms≤ T4, 0 ms≤ T5
- 0 ≤ T6 ≤ 10ms
- 150ms ≤ T7

Note 12-1: When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
Note 12-2: Do not keep the interface signal high impedance when power is on.
Note 12-3: Back Light must be turn on after power for logic and interface signal are valid.

PRIME VIEW

PD121XL4

13. Optical Characteristics

13.1) Specification:

Ta=25℃

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ	CR≥10	70	75	-	deg	Note 13-2
	Vertical	θ (to 12 o'clock)		60	65	-	deg	
		θ (to 6 o'clock)		50	55	-	deg	
Contrast Ratio		CR	θ =0°	500	600		-	Note 13-3
Response time	Rise	Tr	θ =0°	-	10	20	ms	Note 13-5
	Fall	Tf		-	20	40	ms	
Brightness		L	θ =0°/φ =0	400	550	-	cd/㎡	Note 13-1
LED Life Time		-	-	20000	30000	-	hrs	Note 13-4
White Chromaticity		x	θ =0°/φ =0	0.26	0.31	0.36	-	Note 13-1
		y	θ =0°/φ =0	0.29	0.34	0.39	-	
Uniformity		U	-	65	70	-	%	Note 13-6
Cross Talk Ratio		CTK	-	-	-	3.5	%	Note 13-7

Note 13-1: Topcon BM-5A or BM-7 fast luminance meter 1°field of view is used in the testing.

Note 13-2: The definitions of viewing angles are as follow
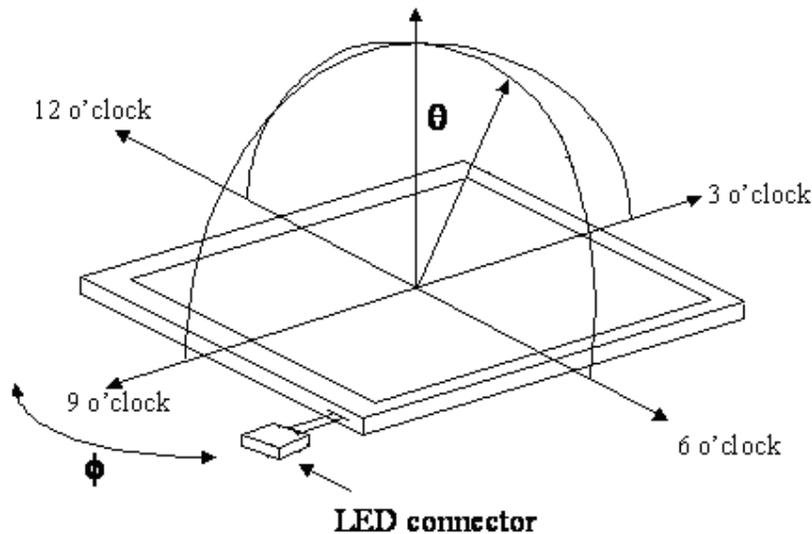
Note 13-3: The definition of contrast ratio $CR = \dfrac{\text{Luminance when Testing point is White}}{\text{Luminance when Testing point is Black}}$

Note 13-4: The "LED Life time " is defined as the module brightness decrease to 50% original Brightness that the ambient temperature is 25℃ and I_{LED} =360mA.

◆ PRIME VIEW

PD121XL4

Note 13-5: Definition of Response Time Tr and Tf

White   Black   White

100%
90%

Brightness

10%

0%

Tr   Tf
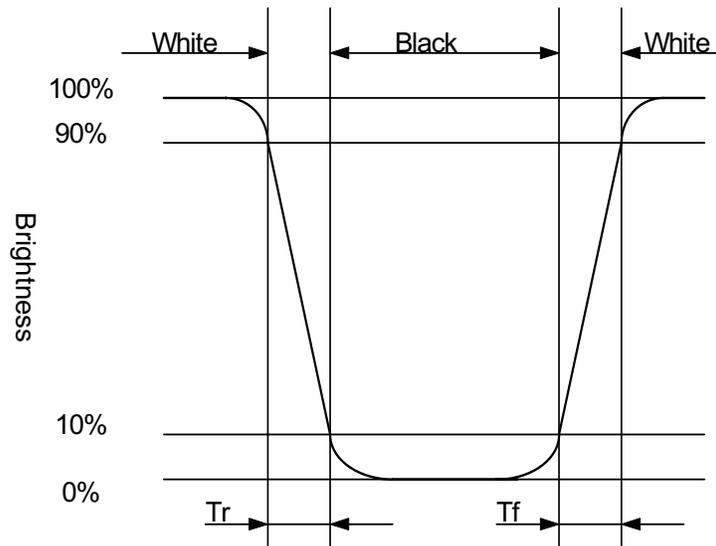
Note 13-6: The uniformity of LCD is defined as

$$U = \frac{\text{The Minimum Brightness of the 9 testing Points}}{\text{The Maximum Brightness of the 9 testing Points}}$$
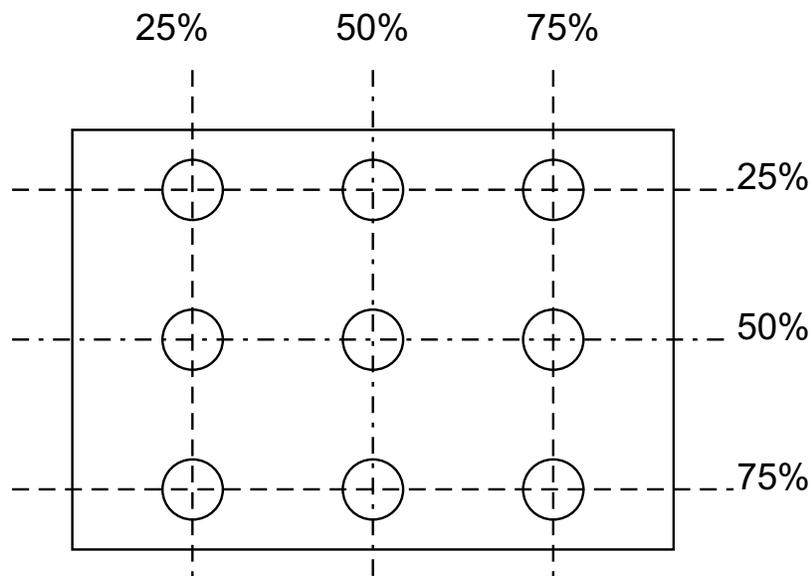
Luminance meter: BM-5A or BM-7 fast (TOPCON)
Measurement distance: 500 mm +/- 50 mm
Ambient illumination: < 1 Lux
Measuring direction: Perpendicular to the surface of module
The test pattern is white (Gray Level 63).

25%   50%   75%

25%

50%

75%

◈ PRIME VIEW

PD121XL4

Note 13-7: Cross Talk (CTK) = $\dfrac{|YA-YB|}{YA} \times 100\%$

YA: Brightness of Pattern A
YB: Brightness of Pattern B
Luminance meter: BM 5A (TOPCON)
Measurement distance: 500 mm +/- 50 mm
Ambient illumination: < 1 Lux
Measuring direction: Perpendicular to the surface of module
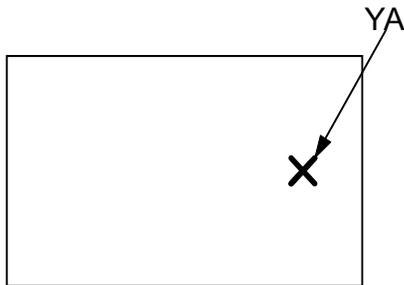
Pattern A   Pattern B

(Gray Level 31)   (Gray Level 31, central

black box exclusive)
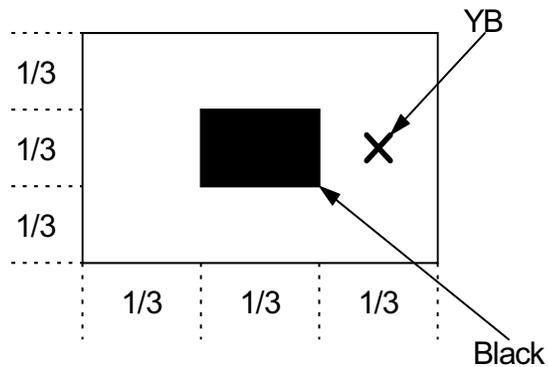
X: Measuring Point (A and B are at the same point.)

Black

(Gray Level 0)

◈ PRIME VIEW

PD121XL4

14. Handling Cautions

14-1) Mounting of module
- a) Please power off the module when you connect the input/output connector.
- b) Polarizer which is made of soft material and susceptible to flaw must be handled carefully.
- c) Protective film (Laminator) is applied on surface to protect it against scratches and dirt.
- d) Please following the tear off direction as figure 14-1 to remove the protective film as slowly as possible, so that electrostatic charge can be minimized.

14-2) Precautions in mounting
- a) When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth.
- b) Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
- c) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Please handle with care.
- d) Since CMOS LSI is used in the module. So take care of static electricity and earth yourself when handling.

14-3) Adjusting module
- a) Adjusting volumes on the rear face of the module have been set optimally before shipment.
- b) Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described may not be satisfied.

14-4) Others
- a) Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours.
- b) Store the module at a room temperature place.
- c) The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around.
- d) If LCD panel breaks, it is possibly that the liquid crystal escapes from the panel. Avoid putting it into eyes or mouth. When liquid crystal sticks on hands, clothes or feet. Wash it out immediately with soap.
- e) Observe all other precautionary requirements in handling general electronic components.
- f) Please adjust the voltage of common electrode as material of attachment by 1 module.
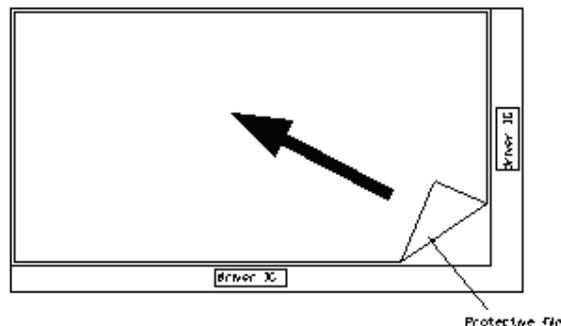

Figure 14-1 the way to peel off protective film

◆ PRIME VIEW

PD121XL4

15. Reliability Test

No	Test Item	Test Condition
1	High Temperature Storage Test	Ta = +80℃, 240 hrs
2	Low Temperature Storage Test	Ta = -40℃, 240 hrs
3	High Temperature Operation Test	Ta = +70℃, 240 hrs
4	Low Temperature Operation Test	Ta = -30℃, 240 hrs
5	High Temperature & High Humidity Operation Test	Ta = 60℃, 90%RH, 240 hrs
6	Thermal Cycling Test (non-operating)	-30℃(0.5hour) →+70℃(0.5hour), 100Cycles
7	Vibration Test (non-operating)	Frequency：10 ~ 57 H$_z$, Amplitude：0.15 mm,58~500Hz, 1G Sweep time: 11 min Test Period: 3 hrs (1 hr for each direction of X, Y, Z)
8	Shock Test (non-operating)	80G, 6ms, X,Y, Z 1 times for each direction
9	Electrostatic Discharge Test (Operation)	C=150pF,R=330Ω Contact=±8KV Air=±15KV 10 times/terminal

Ta: ambient temperature

[Criteria]
    In the standard conditions, there is not display function NG issue occurred. (including : line defect ,no image). All the cosmetic specification is judged before the reliability stress.

PRIME VIEW

16. Packing Diagram

ZONE	REV.	DOCUUMENT NO.	DESCRIPTION	DATE	REV.BY

50-0302471 ①

②

③

①

Tape

<u>NOTE:</u>
1.Q'TY: 15 pcs moudule /carton.
2.Dimension: 465*362*314mm
3.Weight: 11 Kg

④

4	50-0100291	CARTON	1	
3	50-0500391	抗靜電摺口袋	15	抗靜電
2	PD121XL4	12.1"XGA Module	15	
1	50-0302471	瓦楞隔板緩衝材	1	上蓋+底座
ITEM	PART NO.	DESCRIPTION	QTY	REMARK

MTL.SPEC.	UNSPECIFIED TOL'S		REMARK	
	ANGLE			
	ROUGHNESS			

元太科技工業股份有限公司
Prime View International Co., Ltd.

APPROVE	Patrick Lin	'09.12.25	SCALE	UNIT	SHEET	DWG.TITLE
CHECK	Patrick Lin	'09.12.25			1 OF 1	PD121XL4 Module Packing Draw
DRAWN	Ethan Chen	'09.12.25	MTL.NO.			DWG FILE:	REV. 02	A4 SIZE