SPECIFICATION FOR APPROVAL

DESCRIPTION: 15" LCD Module

CUSTOMER:

Product No: P150GNN2M R3A

Released Date: 2018. JUN

Revision: 1.1

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APPROVED SIGNATURES			

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Revision History

Version	Date	Modified Page	Description
1.0	2018.03.14	-	initial release
1.1	2018.06.04	4, 19	Update product summary table and drawing

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Table of Contents

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1.0 General Descriptions

1.1 Introduction

The P150GNN2M is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a timing controller, voltage reference, common voltage, column driver, and row driver circuit. This TFT LCD has a 15-inch diagonally measured active display area with resolution (1024 horizontal by 768 vertical pixels array).

1.2 Features

- 15" TFT-LCD Panel
- LED Backlight System
- LVDS Interface
- Compatible with RoHS standard

1.3 Product Summary

Item	Specification	Unit
Screen Diagonal	15" (Diagonal)	Inch
Active Area	304.128(H) x 228.096(V)	mm
Pixels (H x V)	1024XRGBX768	-
Pixel Pitch	0.297 x 0.297	mm
Pixel Arrangement	Vertical Stripe	-
Display Mode	Normally white	-
Weight	1040(Max)	g
Outline Dimension	326.5(H) x253.5(V) x11.35 max(D)	mm
Support Color	16.2M (6 bit + FRC)	-
Surface treatment	Glare	-

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1.4 Function Block Diagram

Figure 1 Function Block Diagram
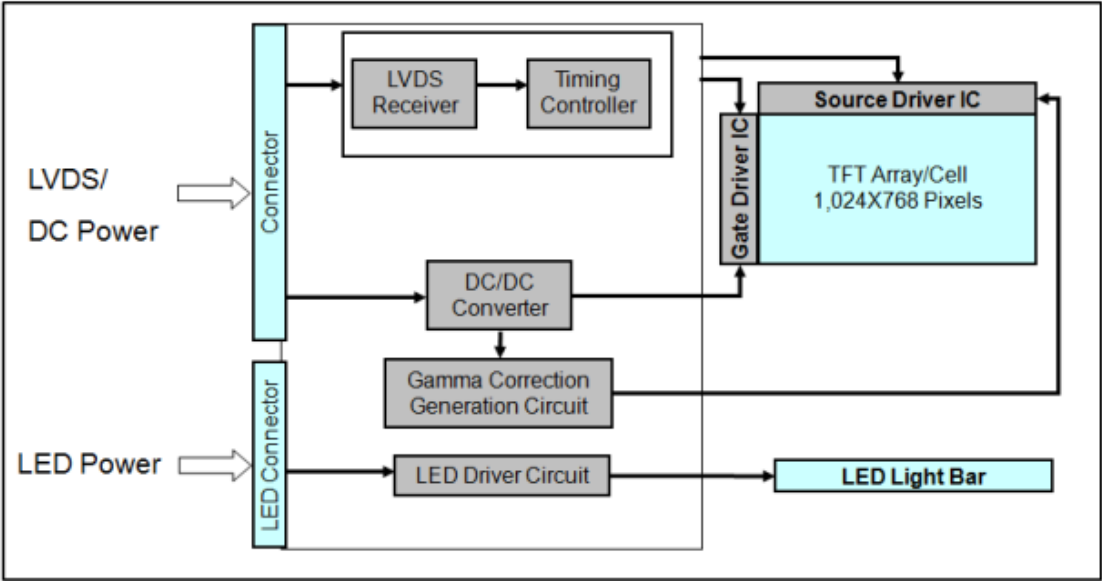
2.0 Absolute Maximum Ratings

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

Table 1 Absolute Rating

| Item	Symbol	Min.	Max.	Unit	Note
Logic Supply Voltage	V_{DD}	-0.5	5.0	V	
Operating Temperature	T_{gs}	-20	70	℃	(1),(2),(3),(4)
Storage Temperature	T_a	-30	80	℃	

Note (1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded. It is recommended to follow the typical value.

Note (2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. All the display fineness should be inspected under normal conditions. Normal conditions are defined as follow: Temperature: 25t, Humidity: 55± 10%RH.

Note (3) Unpredictable results may occur when it was used in extreme conditions. Ta= Ambient Temperature, Tv= Glass Surface Temperature. All the display fineness should be inspected under normal conditions.

Note (4) Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be lower than 39t, and no condensation of water. Besides, protect the module from static electricity.

Table 2 Absolute ratings of environment

Pro Vision Optoelectronics Inc.
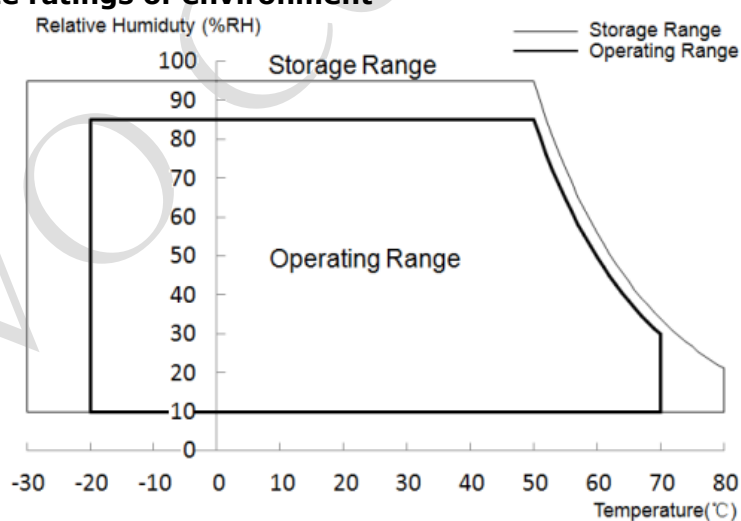
3.0 Pixel Format Image

Figure 3 Pixel Format
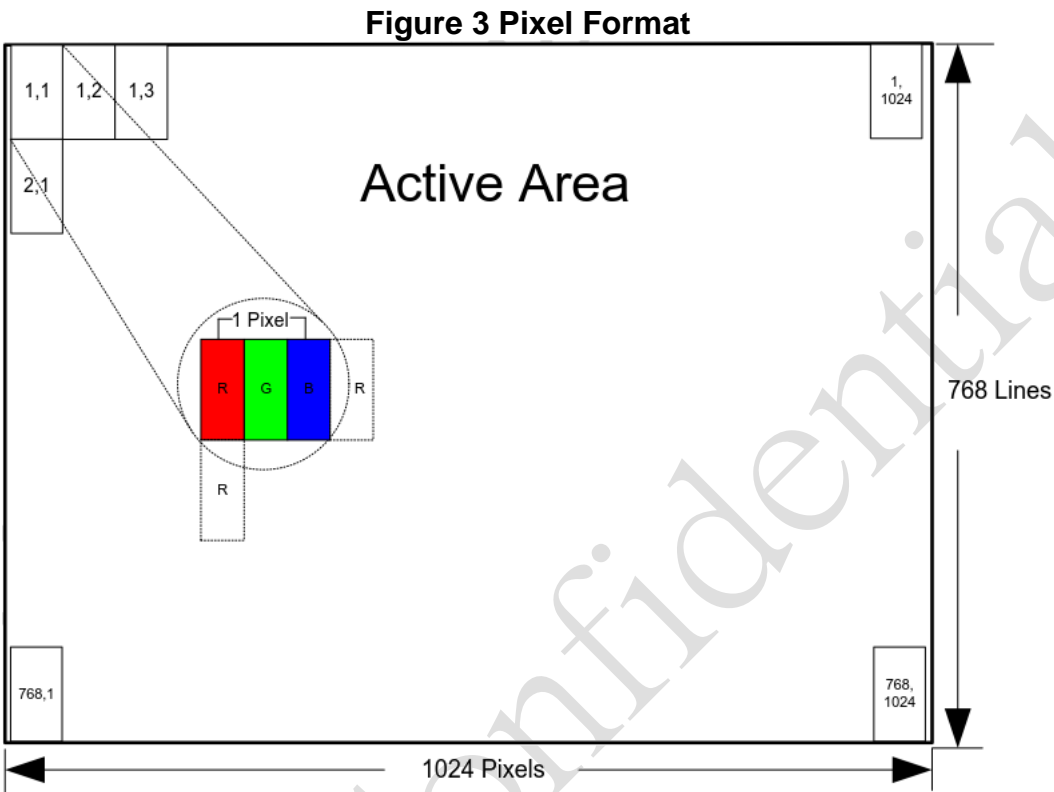
4.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes.

Table 2 Optical Characteristics

| Item	Condition		Min.	Typ.	Max.	Unit	Note
View angle (CR>10)	Left	Θ_L	-	80	-	Degree	(1)
	Right	Θ_R	-	80	-		
	Top	Θ_T	-	80	-		
	Bottom	Θ_B	-	80	-		
Contrast ratio	Center		400	700	-	-	(1)
Response time	Rising + Falling		-	8	12	ms	
Color chromaticity	W_x		Typ -0.03	0.313	Typ +0.03	-	(1)
	W_y			0.329		-	
Luminance	Center		250	300	-	cd/m²	(1) (2) (3)
Luminance uniformity	9 points		75	80		%	(3)

Note (1) Measurement Setup:

The LCD module should be stabilized at given temperature (25℃) for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

Pro Vision Optoelectronics Inc.
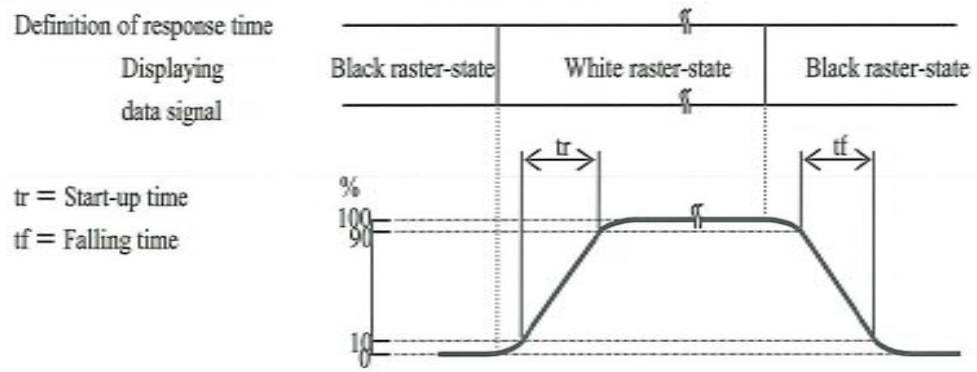
Figure 4 Measurement Setup
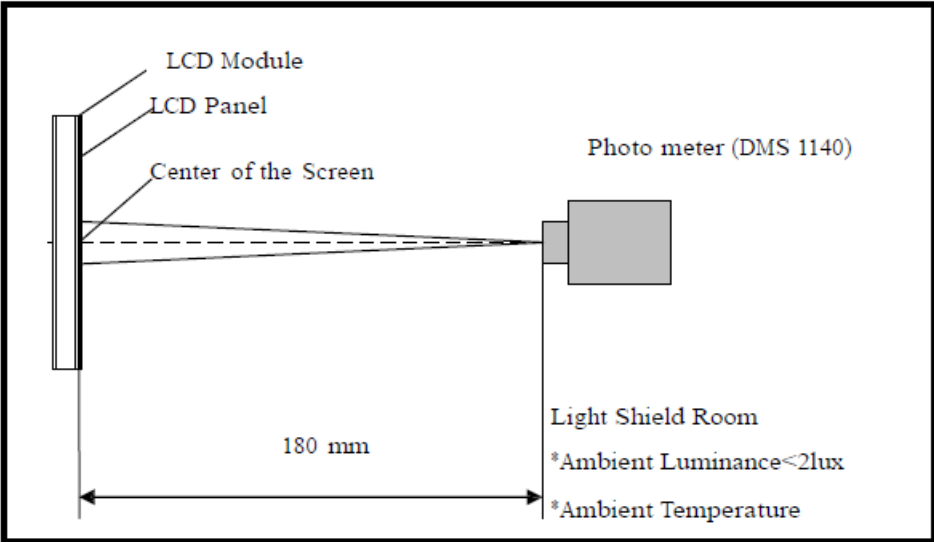
The LED input parameter setting as:

I_LED:180mA;

PWM_LED: Duty 100 %
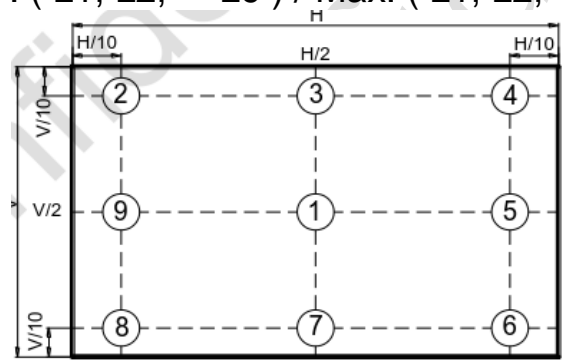
Figure 5 Definition of Viewing Angle
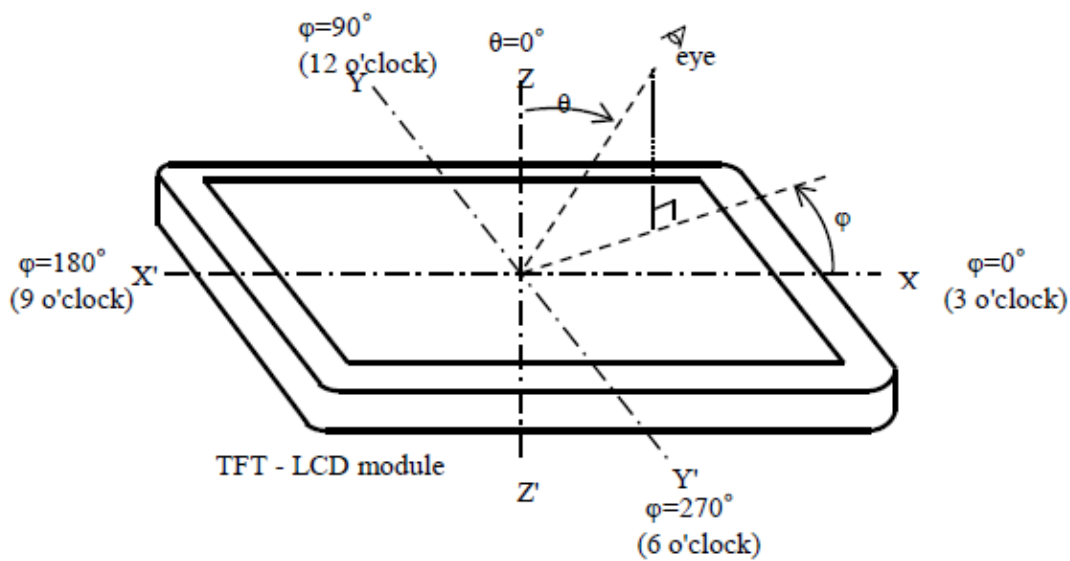
Note (2) Definition Of Response Time (TR, TF)

Figure 6 Definition of Response Time

Note (3) Definition Uniformity

Measure the luminance of gray level 63 at 9 points.

$$YU= Min. . (L1, L2, \sim L9) / Max. (L1, L2, \sim L9) \times 100\%$$

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5.0 Backlight Characteristics

Table 3. LED Driving guideline specifications   Ta = 25 +/- 2 ˚C

Parameter			Min.	Typ.	Max.	Unit	Remarks
LED Life-Time		N/A	30,000	-	-	Hour	IF = 60mA Note 2
Power supply voltage for Back light		V_{LED}	23.2	24.8	27.2	V	
Power supply Current for Back light		I_{LED}	-	200	-	mA	
Power supply for Back light		P_{LED}	5.3	5.6	6.2	W	Note 1
EN Control Level	Backlight on	V_{ENH}	2	-	-	V	EN logic high voltage
	Backlight off	V_{ENL}	-	-	0.6	V	EN logic low voltage
PWM Control Level	PWM High Level	V_{PML}	2	-	-	V	
	PWM Low Level	V_{PML}	-	-	0.6	V	
PWM Control Frequency		F_{PWM}	0.12	-	1	KHz	
Duty Ratio		-	5	-	100	%	

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25t, Humidity: 55± 10%RH.

Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.

Note (5) The power consumption of LED Driver are under the VIED = 12.0V, Dimming of Max luminance.

Note (6) Although acceptable range as defined, the dimming ratio is not effective at all conditions. The PWM frequency should be fixed and stable for more consistent luminance control at any specific level desired.

Note (7) The operation of LED Driver below minimum dimming ratio may cause flickering or reliability issue.

Note (8) The life time is determined as the sum of the lighting time till the luminance of LCD at the typical LED current reducing to 50% of the minimum value under normal operating condition.

6.0 Electrical Characteristics

6.1 Interface Connector

Table 4 Connector Name / Designation

Manufacturer	STM(or equivalent)
Type / Part Number	MSB240420HD

Table 5 Signal Pin Assignment

Pin No.	Symbol	Description	Remarks
1	VDD	Power Supply, 3.3V (typical)	-
2	VDD	Power Supply, 3.3V (typical)	-
3	VSS	Ground	-
4	REV	Reverse Scan selection	Note(1)
5	Rini-	-LVDS differential data Input (RO-R5,G0)	-
6	Rini+	+LVDS differential data Input (RO-R5,G0)	-
7	VSS	Ground	-
8	Rin2-	-LVDS differential data Input (G1-65,80-131)	-
9	Rin2+	+LVDS differential data input (G1-G5,130-	-
10	VSS	Ground	-
11	Rin3-	-LVDS differential data Input (132-	-
12	RIn3+	+LVDS differential data Input (62-	-
13	VSS	Ground	-
14	CIkIN-	-LVDS differential clock input	-
15	CikiN+	+LVDS differential clock Input	-
16	GND	Ground	-
17	NC	Not connect	-
18	NC	Not connect	-
19	VSS	Ground	-
20	SEL 6/8	LVDS 6/8 bit select function control High -> 6bit input mode Low -> 8bit input mode	-

Note(1) REV=LOW/NC

REV=HIGH

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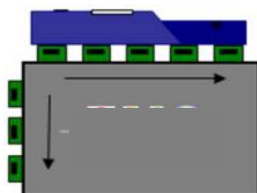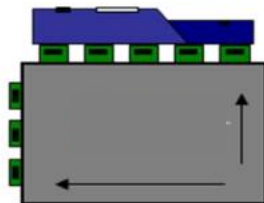
LED Connector Name / Designation

| Item	Description
Connector Name/Designation	LED Driver Connector
Manufacturer	STM or compatible
Connector Model Number	MSB24038P5A or compatible
Mating Model Number	P24038P5A or compatible

LED Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	Vcc	12V	
2	GND	GND	
3	Enable	5V-On / OV-Off	-
4	Dimming	PWM Dimming	-
5	NC	NC	-

6.2 Signal Electrical Characteristics

Signal Electrical Characteristics For LVDS Receiver
The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	-	-	+100	mV	Vcm=+1.2V
Differential Input Low Threshold	Vtl	-100	-	-	mV	Vcm=+1.2V
Magnitude Differential Input Voltage	IV$_{ID}$I	200	-	600	mV	-
Common Mode Voltage	Vcm	-	1.	1.85-IVIDI/2	V	-
Input Leakage Current	/	-10	-	10	mV	Vcm=+1.2V
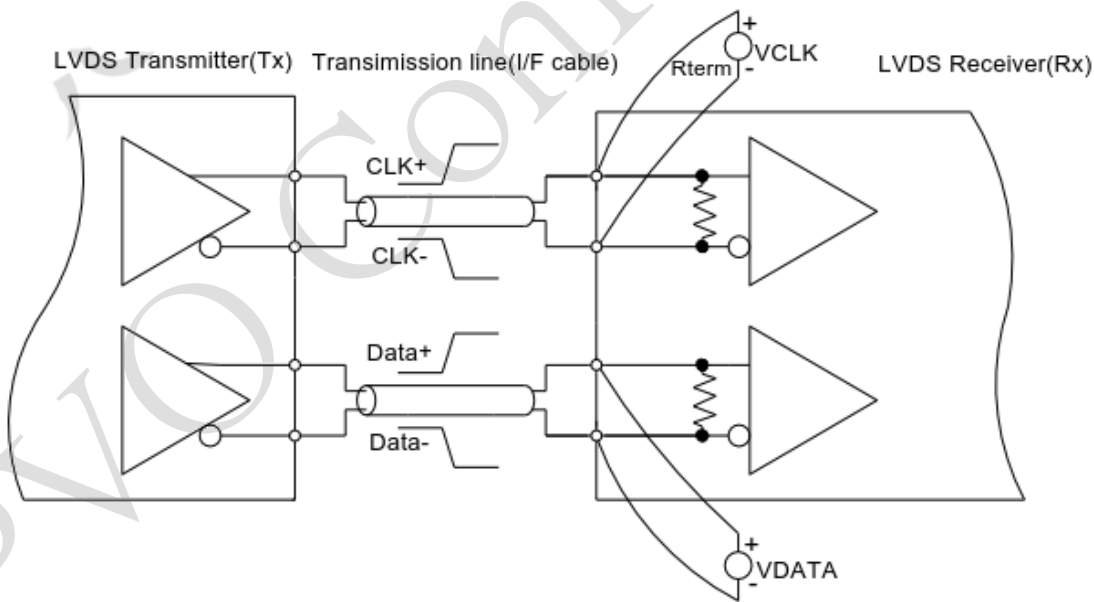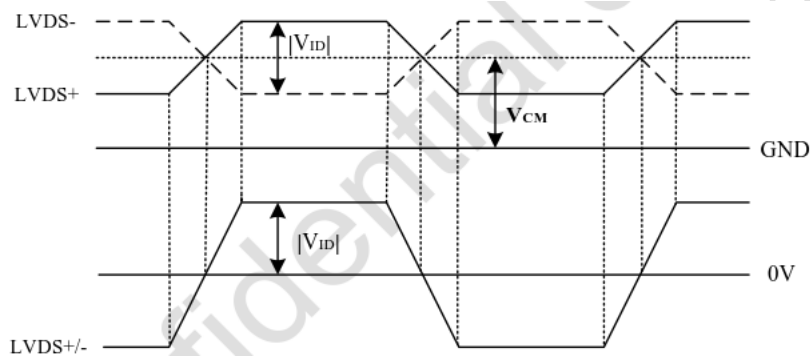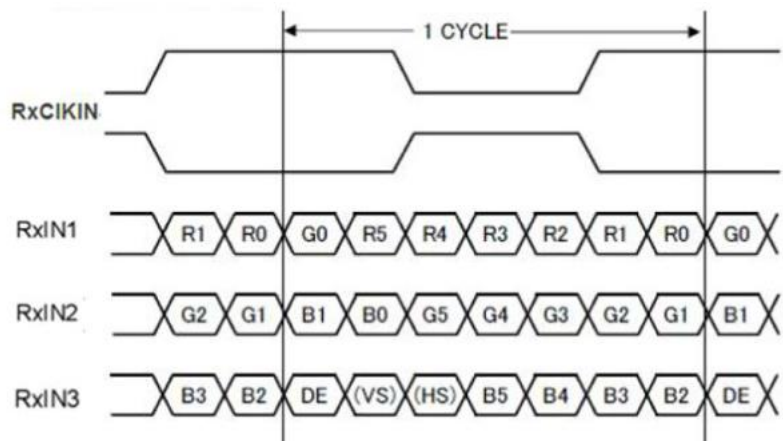
LVDS Receiver circuit
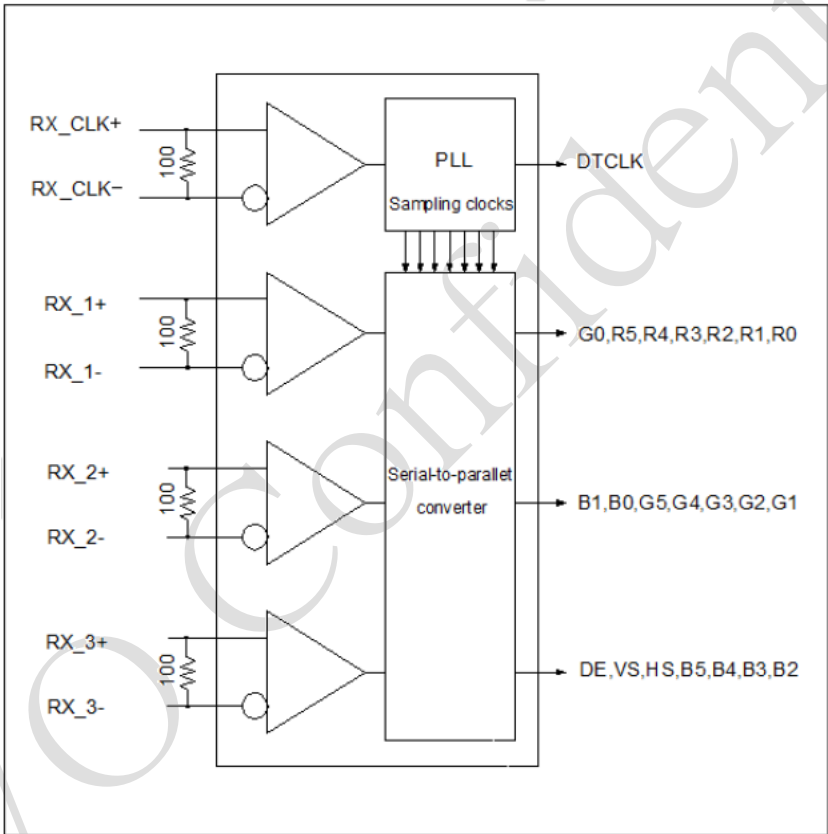
7.0 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	50	65	80	MHz
H Total Time	HT	1,056	1,344	1,720	Clocks
H Active Time	HA		1,024		Clocks
V Total Time	VT	772	806	990	Lines
V Active Time	VA		768		Lines
Frame Rate	FV	55	60	70	Hz

Note (1) Synchronization Method: DE only

Note (2) H Blank area and V Blank area can not be changed at every frame.

8.0 Power Consumption

Input power specifications are as followings.

| Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Power Supply Current	I_{DD}	-	520	700	mA	
LED Driver Power Supply Voltage	H_{VDD}	10.8	12	12.6	V	Note 2
LED Driver Power Supply Current	I_{HVDD}	-	480	560	mA	
LED Power Consumption	P_{LED}	5.3	5.6	6.2	W	
Positive-going Input Threshold Voltage	V_{IT+}	-		+100	mV	Vcom = 1.2V typ.
Negative-going Input Threshold Voltage	V_{IT-}	-100		-	mV	
Differential input common mode voltage	V_{com}		1.2		V	V_{IH}=100mV, V_{IL}=-100mV

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 2511, Humidity: 55± 10°/0RH.
Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.
Note (3) The specified VDD current and power consumption are measured under the VDD = 3.3 V. Fv = 60 Hz condition and Black Pattern. Note (4) The figures below is the measuring condition of VDD Rush current can be measured when TRUSH is 0.5 ms.

V_{DD} Rising Time
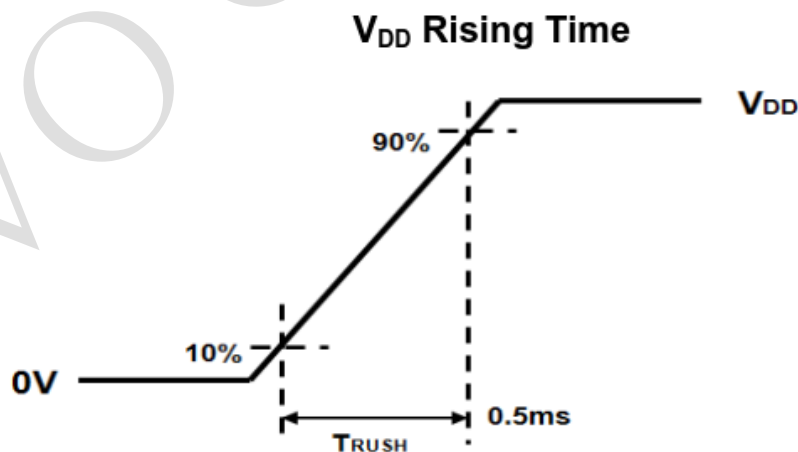
9.0 Power ON/OFF Sequence
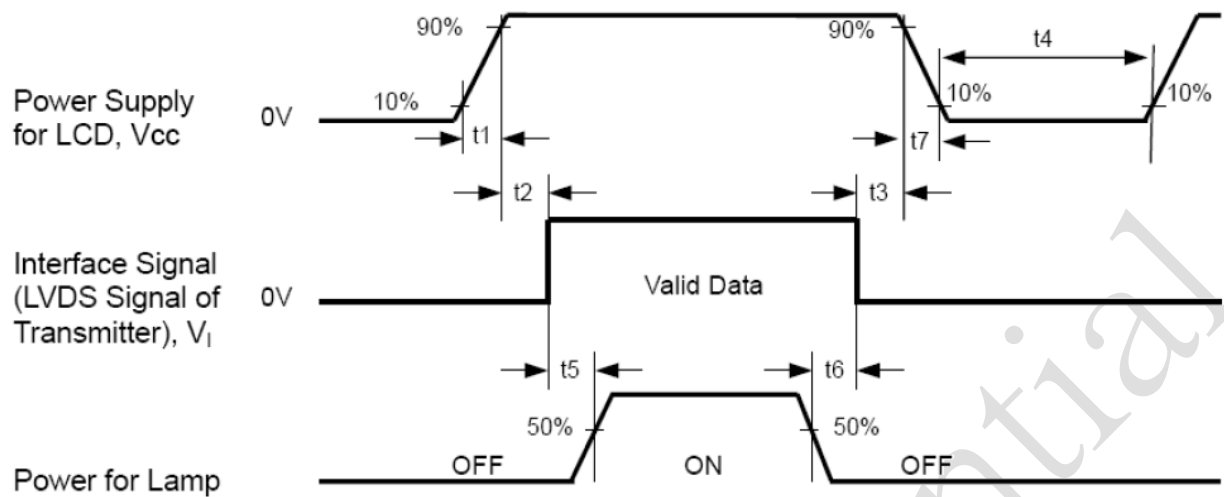
Parameter	Symbol	Min.	Typ.	Max.	Unit
VDD Rise Time	T1	0.5	-	10	ms
VDD Good to Signal Valid	T2	0	-	20	ms
Signal Disable to Power Down	T3	0	-	1000	ms
Power Off	T4	1000	-		ms
Signal Valid to Backlight On	T5	300	-		ms
Backlight Off to Signal Disable	T6	200	-		ms
VDD Fall Time	T7	0	-	100	ms

10.0 Mechanical Characteristics

10.1 Outline Drawing

P150GNN2M R3A

Center Of Active Area

MDL LABEL

BLU LABEL

P150GNN2M R3A

LOT No.

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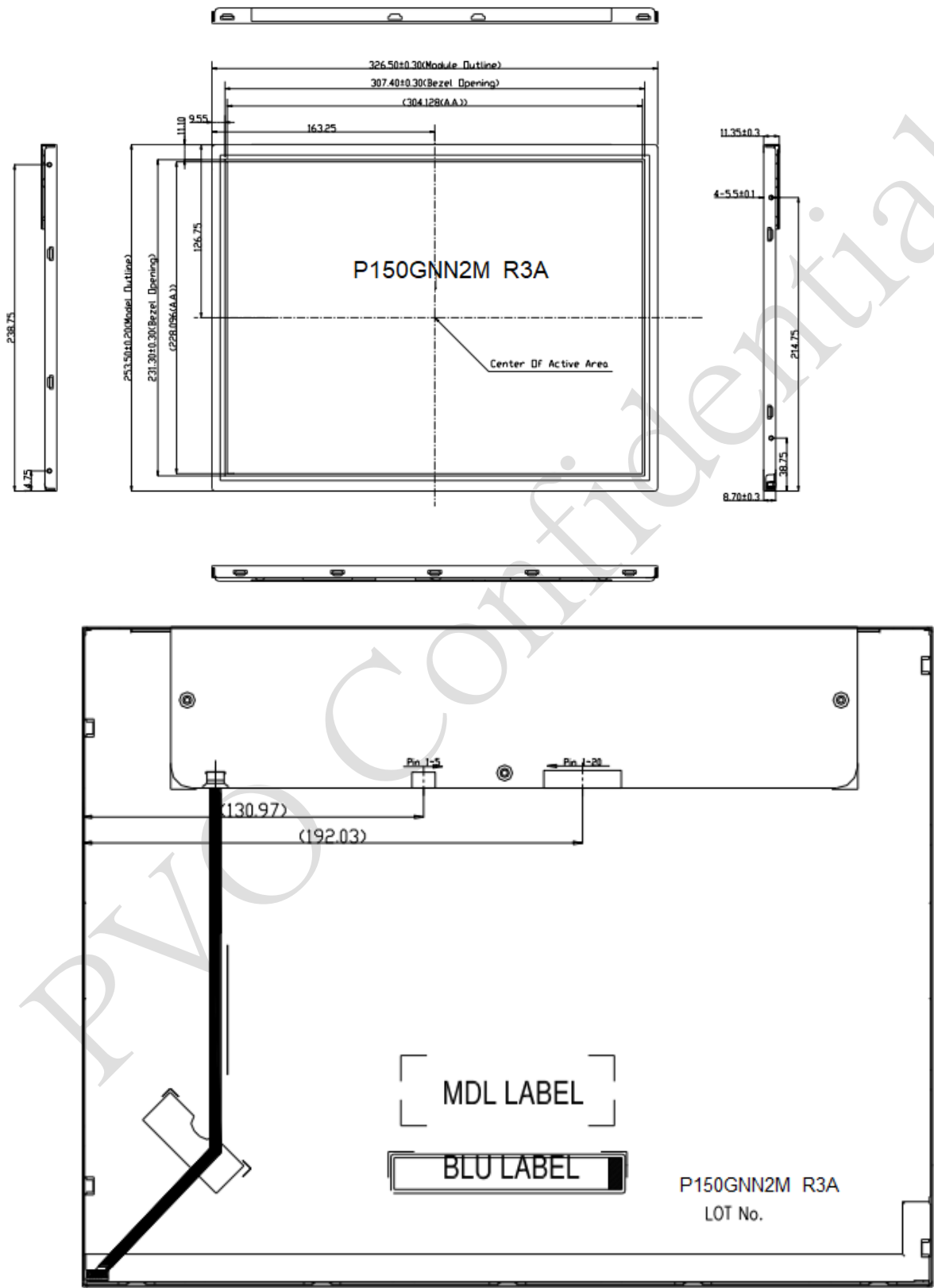
10.2 Dimension Specifications

Table 10 Module Dimension Specifications

Item	Min.	Typ.	Max.	Units
Width	326.0	326.5	327.0	mm
Height	253.0	253.5	254.0	mm
Thickness	11.5	12.0	12.5	mm
Weight		930	960	g

Measure instrument: Vernier caliper

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11.0 Package Specification

12.0 Lot Mark
TBD

13.0 General Precaution

13.1 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.

13.2 Handling Precaution

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

(2) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. PVO does not warrant the module, if customers disassemble or modify the module.

(3) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid Crystal, and don't contact liquid crystal with skin. If liquid crystal contacts mouth or eyes, rinse out with water immediately. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and Rinse thoroughly with water.

(4) Disconnect power supply before handling LCD module

(5) Refrain from strong mechanical shock and /or any force to the module.

(6) 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. It's recommended employing protection circuit for power supply.

(7) Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when Persons handle the LCD module for incoming inspection or assembly.

(8) When the surface is dusty, please wipe gently with absorbent cotton or other soft material. When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

(9) 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.

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

(11) Because LCD module uses 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.

(12) Do not adjust the variable resistor located on the module.

13.3 Storage Precaution

(1) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

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

(3) The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

13.4 Operation Precaution

(1) Do not connect or disconnect the module in the "Power On" condition.

(2) Power supply should always be turned on/off by 9.0 "Power on/off sequence"

(3) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(4) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

13.5 Others

(1) Ultra-violet ray filter is necessary for outdoor operation.

(2) Avoid condensation of water which may result in improper operation or disconnection of electrode.

(3) If the module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.

(4) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

13.6 Disposal

When disposing LCD module, obey the local environmental regulations.

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