Contents

1.0 General Descriptions Introduction

1.1 Introduction

The M101GWN9 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 backlight system, column driver and row driver circuit. This TFT LCD has a 10.1-inch diagonally measured active display area with WSVGA resolution (1024 horizontal by 600 vertical pixels array).

1.2 Features

- 10.1” TFT LCD Panel
- LED Backlight System
- Supported 1024x600 pixels resolution
- Compatible with RoHS standard

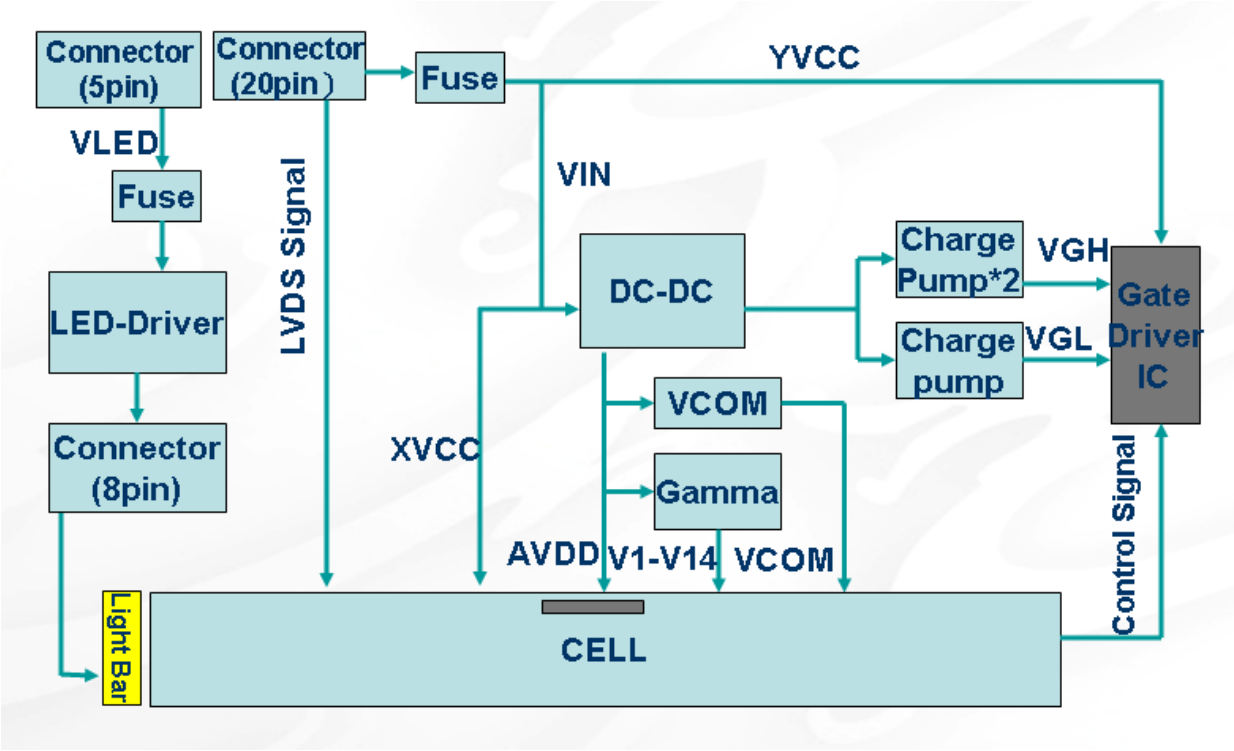
1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	10.1	Inch
Active Area	222.72(H) x 125.28(V)	mm
Pixels H x V	1024(RGB) x600	-
Pixel Pitch	0.2175(H) x 0.2088(V)	mm
Pixel Arrangement	RGB Vertical Stripe	-
Display Mode	Normally White	-
White Luminance	500 (Typ.)	cd /m^2
Contrast Ratio	500 : 1 (Typ.)	-
Response Time	TBD	msec
Input Voltage	3.3 (Typ.)	V
Weight	(440) (Max)	g
Outline Dimension	244.0(H) x 143.0(V) x12.4(D) Typ.	mm
Electrical Interface (Logic)	LVDS	-
Support Color	262K	-
Surface Treatment	Anti-glare, Hard-Coating (3H)	-

1.4 Functional Block Diagram

Shows the functional block diagram of the LCD module.

Figure 1 Block Diagram



2.0 Absolute Maximum Ratings

Table 1 Electrical Absolute Rating

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Supply Voltage	V_{IN}	3.0	3.6	V	Logic power supply voltage
		8	16	V	LED Driver Vin
Power Supply Fuse Current Setting	I_{FUSE}	-	1.5	A	Vin from10% ～ 90%，rise time 500us
Input Signal	V_S	-	3.6	V	LVDS signals
PWM Voltage	V_{PWM}	0.8	5.0	V	PWM Dimming Voltage

Table 2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	-30	85	℃	(1),(2)
Operating Humidity	HOP	10	85	%RH	
Storage Temperature	TST	-30	85	℃	
Storage Humidity	HST	10	95	%RH	
Vibration(non-operating)	VB	-	1.5	G	(3)
Shock(non-operating)	Shock	-	100	G	(4)

Note (1) There is no display function fail occurred, all the cosmetic specification is judged before the reliability stress. The criteria is fit by PVO provided IIS.

(2) The storage /operating temperature. Maximum Wet-Bulb should be 39 degree C. There is no condensation on the panel surface.

(3) 10-500Hz, random vibration, 30min for X, Y, Z axis

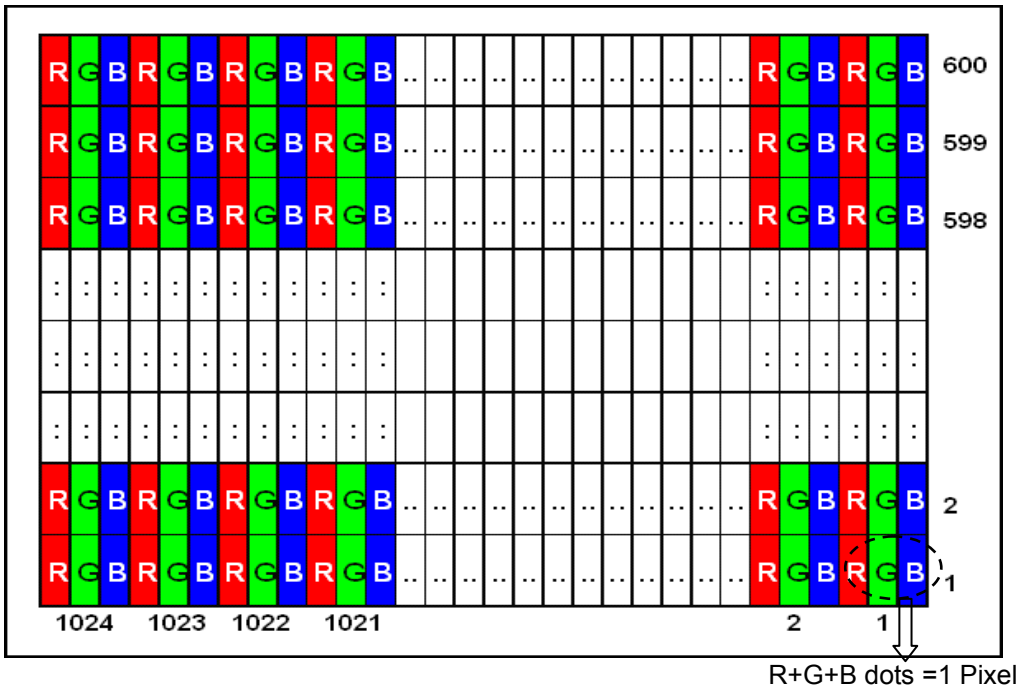
(4) 6ms, half sine wave, one time for X, Y, Z axis

3.0 Pixel Format Image

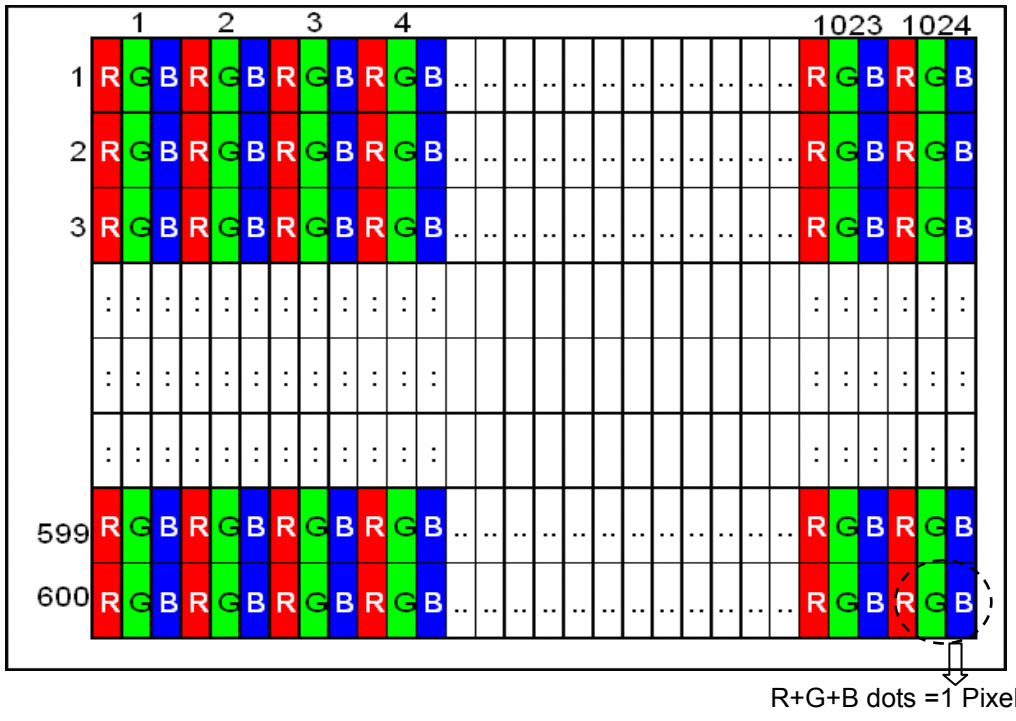
Figure 2 shows the relationship of the input signals and LCD pixel format image.

Figure 2 Pixel Format

REV=H



REV=L



4.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes

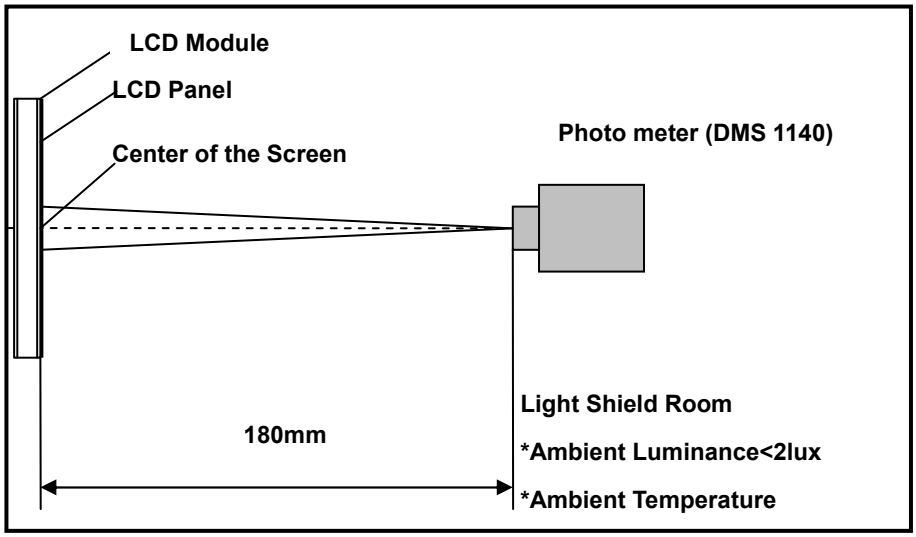
Table 3 Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle （CR>10）	Horizontal	θ_L	(70)	(80)	-	degree	(1),(2),(3)
		θ_R	(70)	(80)	-		
	Vertical	θ_T	(70)	(80)	-		
		θ_B	(70)	(80)	-		
Contrast Ratio	Center		(400)	(500)	-	-	(1),(2),(4)
Response Time	Rising		-	-	-	ms	(1),(2),(5)
	Falling		-	-	-	ms	
	Rising + Falling		-	TBD	-	ms	
Color Chromaticity (CIE1931)	NTSC		-	(45)	-	%	(1),(2)
	Red x		Typ. -0.03	TBD	Typ. +0.03	-	(1),(2)
	Red y			TBD		-	
	Green x			TBD		-	
	Green y			TBD		-	
	Blue x			TBD		-	
	Blue y			TBD		-	
	White x		(0.255)	(0.305)	(0.355)	-	
	White y		(0.275)	(0.325)	(0.375)	-	
White Luminance	Center		(400)	(500)	-	cd/m^2	(1),(2),(6)
Luminance Uniformity	9Points		(75)	(80)	-	%	(1),(2),(6)

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.

Figure 3 Measurement Setup



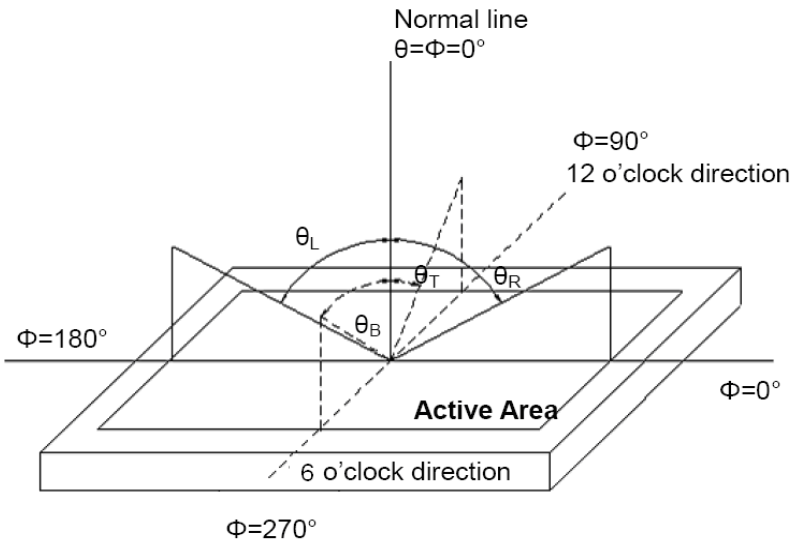
Note (2) The LED input parameter setting as:

VLED: 12V;

PWM_LED: Duty 100 %

Note (3) Definition of Viewing Angle

Figure 4 Definition of Viewing Angle



Note (4) Definition Of Contrast Ratio (CR)

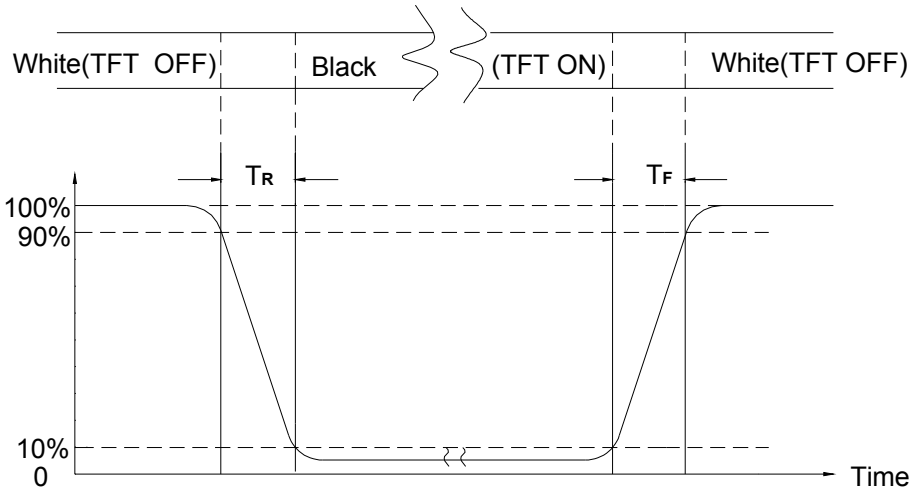
The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255, L0: Luminance of gray level 0

Note (5) Definition Of Response Time (T_R, T_F)

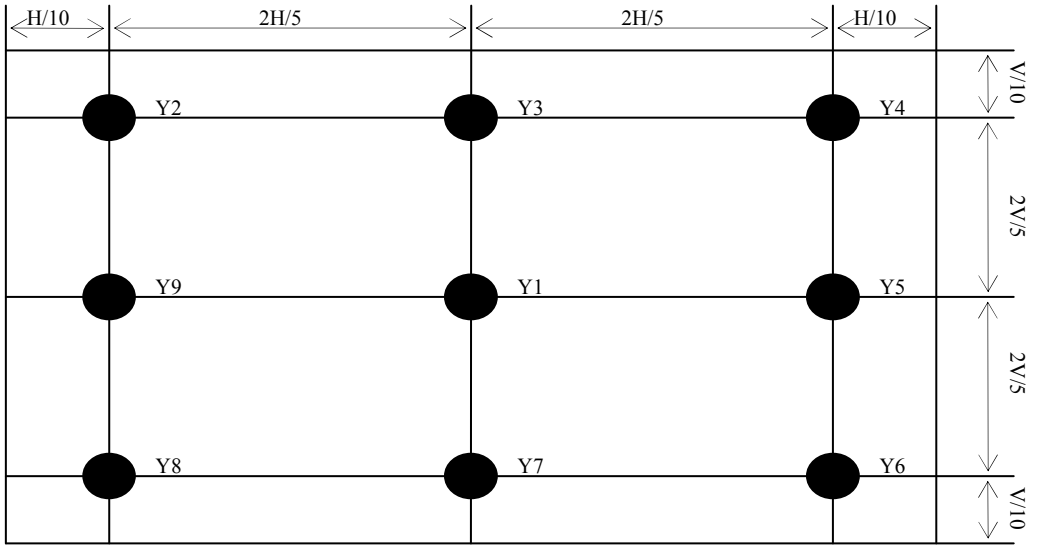
Figure Definition of Response Time



Note (6) Definition Of Brightness Luminance

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

Figure 6 Measurement Locations



5.0 Backlight Characteristics

Table 4 LED driver Input and Output Specifications

ITEM		UNIT	MIN	TYP	MAX	CONDITION
VIN_LED		V	8	12	16	DUTY=100%
I_{VIN_LED}		mA	-	-	543	
F_{DIM}		HZ	100	-	1K	
DUTY		%	5		100	
CTRL	VIH	V	2	3.3	5	
	VIL	V	0	-	0.8	
Vout		V	-	(22.4)	-	
I_{OUT}		mA	-	(160)		
效率		%	(85)			
L_T		Hours	50,000	-	-	LED Life Time

Note : The LED life time define as the estimated time to 50% degradation of initial luminous.

6.0 Electrical Characteristics

Table 5 Signal Pin Assignment

Pin #	Signal Name	Description	Remarks
1	VDD	Power Supply, 3.3V (typical)	
2	VDD	Power Supply, 3.3V (typical)	
3	VSS	Ground	
4	REV	Reverse Scan selection	
5	Rin1-	-LVDS differential data input	
6	Rin1+	+LVDS differential data input	
7	VSS	Ground	
8	Rin2-	-LVDS differential data input	
9	Rin2+	+LVDS differential data input	
10	VSS	Ground	
11	Rin3-	-LVDS differential data input	
12	Rin3+	+LVDS differential data input	
13	VSS	Ground	
14	CIkIN-	-LVDS differential clock input	
15	CIkIN+	+LVDS differential clock input	
16	GND	Ground	
17	NC	Not connection	
18	NC	Not connection	
19	VSS	Ground	
20	NC	Not connection	High Active

Table 6 B/L Pin Assignment

Pin #	Signal Name	Description	Remarks
1	VCC	Power Supply, 12V (typical)	
2	GND	Ground	
3	EN	3.3V (typical)	
4	PWM	3.3V (typical)	
5	NC	Not Connection	

Table 7 Electrical Characteristics

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
System Power Supply						
Input Power Supply Voltage	V_{IN}	3.0	3.3	3.6	V	
Input Power Supply Current	I_{VIN}	-	-	153	mA	Black pattern ,60Hz
Input Inrush Current	I_{RUSH}	-	-	1.5	A	0.5ms rise time (10%~90%)
Input Power Voltage Ripple	V_{RPL}	-	-	200	mV	Vp-p
REV	VH	2.0	3.3	5.0	V	
	VL	-	-	0.8	V	
LED Power Supply						
Input Power Supply Voltage	V_{LED-IN}	8	12	16	V	
Input Power Supply Current	I_{IN}	-	-	543	mA	
EN/PWM	VH	2.0	3.3	5.0	V	
	VL	-	-	0.8	V	
LVDS Signals						
Differential Input High Threshold	V_{th}	-	-	+100	mV	V_{cm}=+1.2V
Differential Input Low Threshold	V_{tl}	-100	-	-	mV	V_{cm}=+1.2V
Magnitude Differential Input Voltage	$\|V_{id}\|$	200	-	600	mV	
Common Mode Voltage	V_{cm}	1.0	1.2	1.4	V	V_{th} - V_{tl} = 200mV
Common Mode Voltage Offset	ΔV_{cm}	-50	-	+50	mV	V_{th} - V_{tl} = 200mV

Note: A. Input signals shall be low or Hi-Z state when VIN is off.

B. All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

C. White Pattern at 3.3V driving voltage.

7.0 Interface Timings

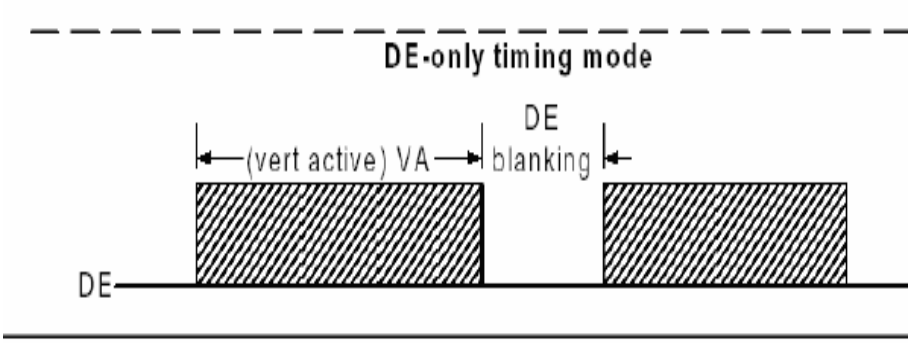
7.1 Timing Characteristics

Table 8 Interface Timings

Synchronization Method : DE only

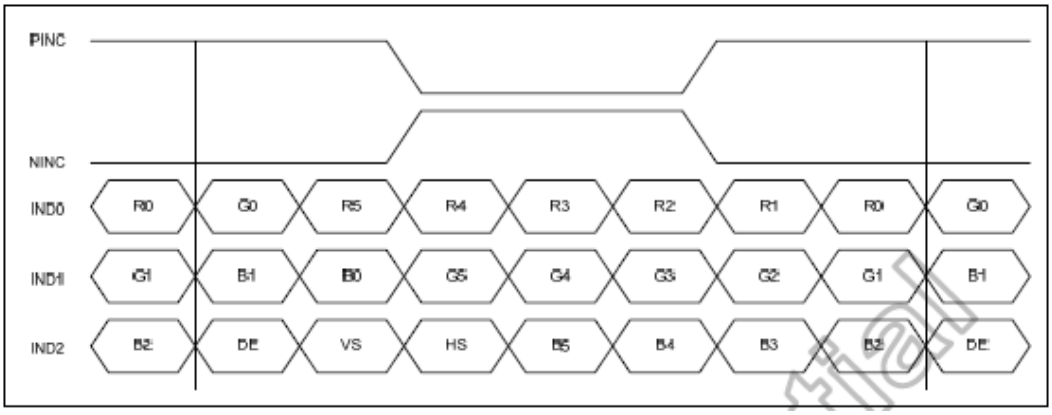
Parameter	Symbol	Unit	Min.	Typ.	Max.
LVDS Clock Frequency **<single>**	f_{dck}	MHz	45	51.2	57
H Total Time	T_{hp}	clocks	1,324	1,344	1,364
H Active Time	HA	clocks	1,024	1,024	1,024
H Blanking Time	TH_{BLANK}	clocks	300	320	340
V Total Time	T_{vp}	lines	625	635	645
V Active Time	VA	lines	600	600	600
V Blanking Time	TV_{BLANK}	lines	25	35	45
V Frequency	f_v	Hz	55	60	65

Figure 7 DE-only timing mode



7.2 Timing Diagram of Interface Signal

Figure 8 LVDS Data Mapping



8.0 Power Consumption

Input power specifications are as follows.

Table 9 Power Consumption

Item	Symbol	Min.	Typ.	Max.	Units	Note
Input Power Supply Voltage	V_{IN}	3.0	3.3	3.6	V	
Input Power Supply Current	I_{VIN}	-	-	153	mA	Black pattern，60Hz
Input Inrush Current	I_{RUSH}	-	-	1.5	A	0.5ms rise time (10%~90%)
Input Power Voltage Ripple	V_{RPL}	-	-	200	mV	Vp-p

9.0 Power ON/OFF Sequence

Figure 9 Power Sequence

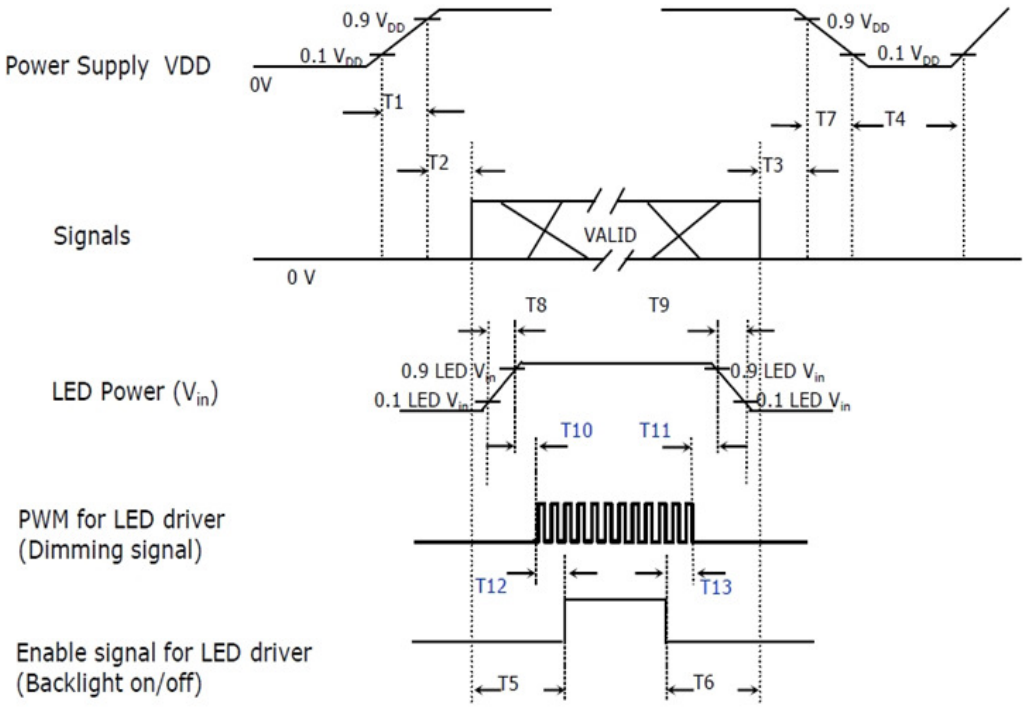


Table 10 Power Sequencing Requirements

Parameter	Symbol	Unit	min	typ	max
VDD rising Time from 10% to 90%	T1	ms	0.5	--	10
Delay from VDD to valid data at power ON	T2	ms	0	--	50
Delay from valid data OFF to VDD OFF at power OFF	T3	ms	0	--	50
VDD OFF time for Windows restart	T4	ms	500	--	--
Delay from valid data to B/L enable at power ON	T5	ms	200	--	--
Delay from valid data off to B/L disable at power OFF	T6	ms	200	--	--
VDD falling time from 90% to 10%	T7	ms	0	--	10
LED Vin rising time from 10% to 90%	T8	ms	0.5	--	10
LED Vin falling time from 90% to 10%	T9	ms	0.5	--	10
Delay from LED driver Vin rising time 90% to PWM ON	T10	ms	0	--	10
Delay from PWM Off to LED Driver Vin falling time 10%,Must Keep rule	T11	ms	0	--	--
Delay from PWM ON to B/L Enable ON, Must Keep rule	T12	ms	0	--	--
Delay from B/L Enable Off to PWM Off	T13	ms	0	--	--

10.0 Mechanical Characteristics

10.1 Outline Drawing

Figure 10 Reference Outline Drawing (Front Side)

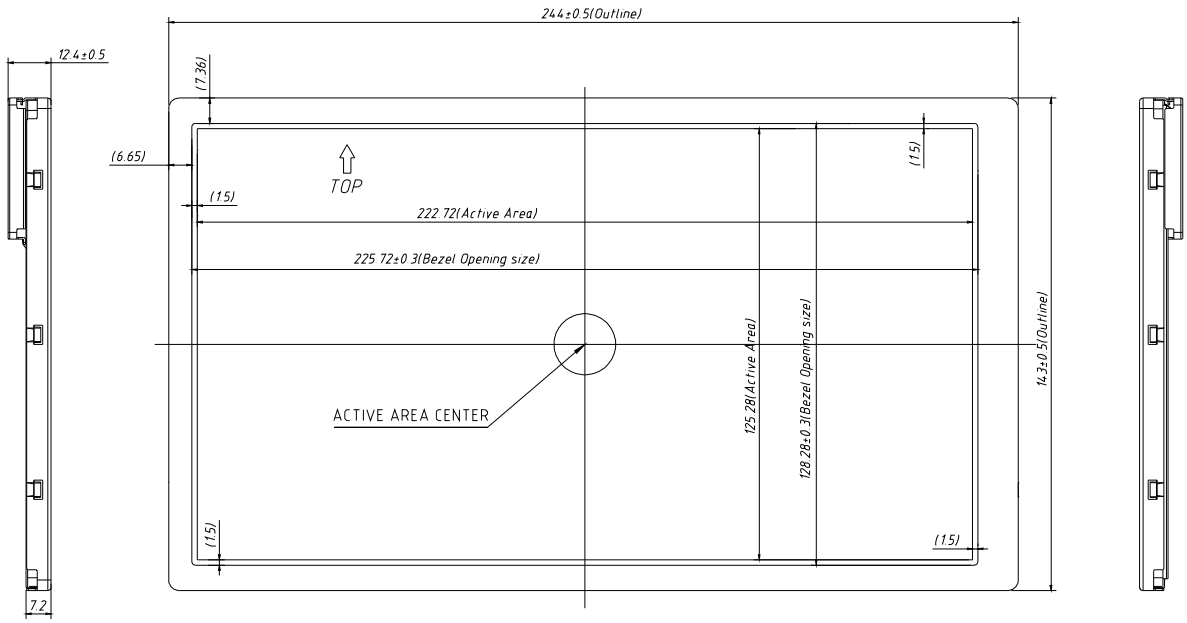
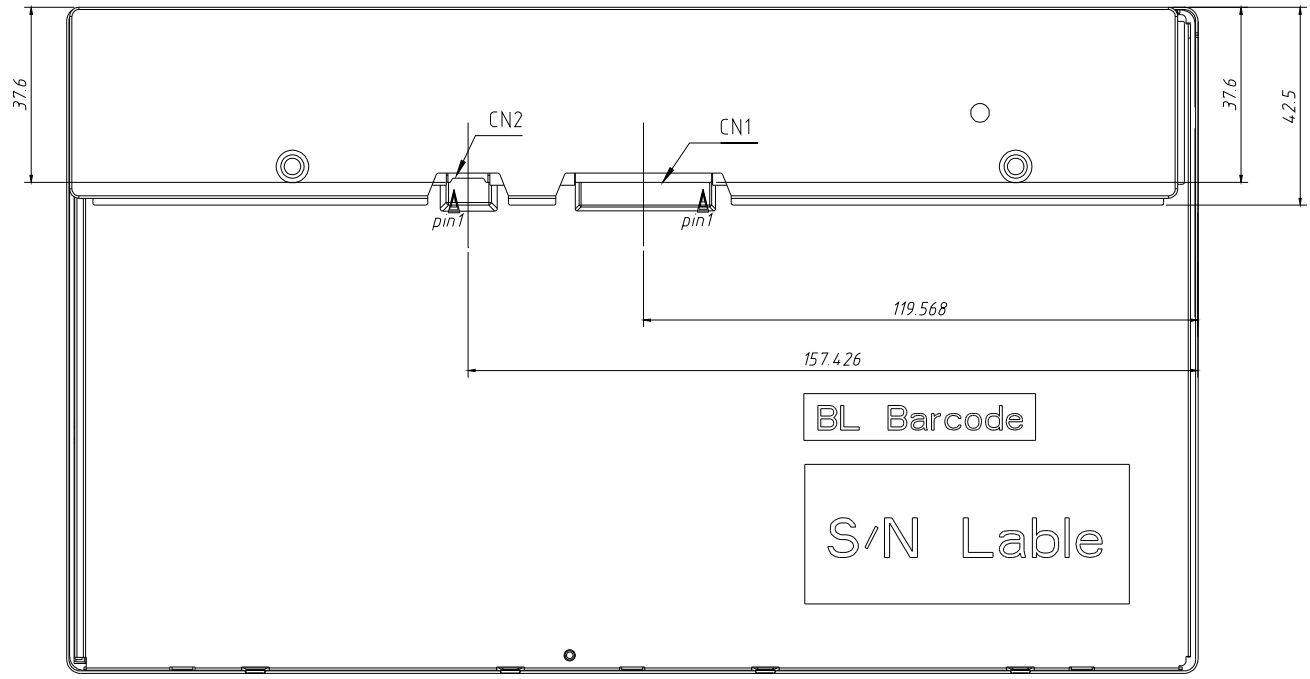


Figure 11 Reference Outline Drawing (Back Side)

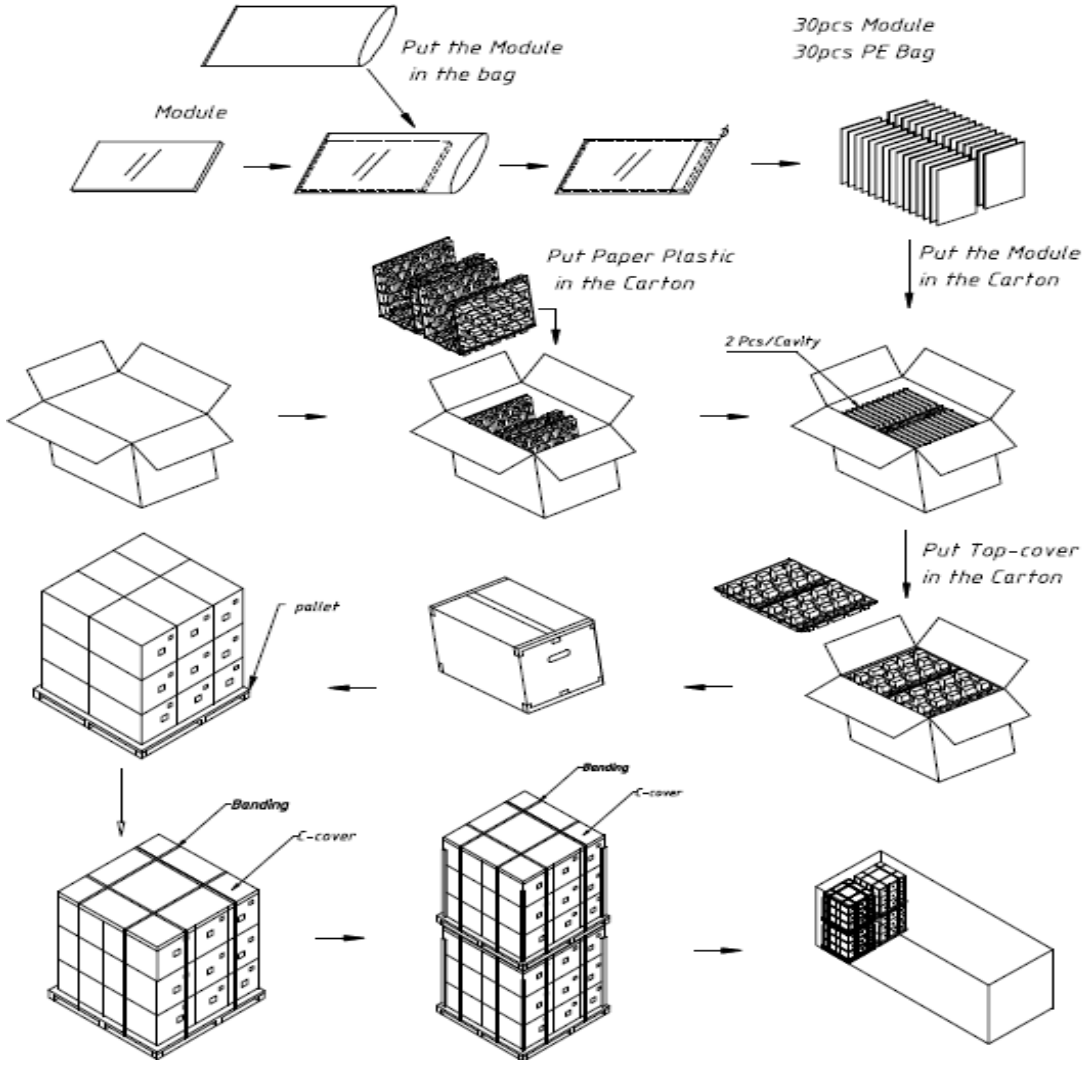


10.2 Dimension Specifications

Table 11 Module Dimension Specifications

Item	Min.	Typ.	Max.	Units
Width	243.5	244	244.5	mm
Height	142.5	143	143.5	mm
Thickness	-	12.4	12.9	mm
Weight	-	(400)	(440)	g

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 do not 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.