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Product Information

To:

Product Name: M101GWT9 R3

Document Issue Date: 2016/05/20

Customer	InfoVision Optoelectronics
<u>SIGNATURE</u> _____ _____ Please return 1 copy for your confirmation with your signature and comments.	<u>SIGNATURE</u> QA _____ PREPARED BY FAE _____

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Revision	Date	Page	Old Description	New Description	Remark
00	2016/05/20	ALL	-	First Issue	-

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1.0 General Descriptions

1.1 Introduction

The M101GWT9 R3 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 driver circuit and a backlight system. This TFT LCD has a 10.1 inch diagonally measured active display area with WSVGA resolution (1,024 horizontal by 600 vertical pixels array).

1.2 Features

- Supported WSVGA Resolution
- LVDS Interface
- Compatible with RoHS Standard

1.3 Product Summary

Items		Specifications	Unit	Note
Screen Diagonal		10.1	inch	-
Active Area (H x V)		222.72 x 125.28	mm	-
Number of Pixels (H x V)		1,024 x600	-	-
Pixel Pitch (H x V)		0.2175 x 0.2088	mm	-
Pixel Arrangement		R.G.B. Vertical Stripe	-	-
Display Mode		Normally White	-	-
White Luminance		640 (Typ.)	cd /m ²	-
Contrast Ratio		800 (Typ.)	-	-
Response Time		16 (Typ.)	ms	-
Input Voltage		3.3 (Typ.)	V	-
Power Consumption		4.85 (Max.)	W	-
Weight		440 (Max.)	g	-
Outline Dimension (H x V x D)	with PCBA	244.0(Typ.)x 143.0(Typ.)x12.9(Max)	mm	-
	without PCBA	244.0(Typ.)x 143.0(Typ.)x7.7(Max)		-
Electrical Interface (Logic)		LVDS	-	-
Support Color		262K/16.7M	-	-
NTSC		50 (Typ.)	%	-
Viewing Direction		12 o'clock	-	(2)
Flicker (Centre Point)		≤5%	-	(1)
Surface Treatment		Anti-glare, Hard-Coating (3H)	-	(3)

Note 1 The Data of Flicker is based on TM-672 Test.

Note 2 The gray inversion will be happened at 12 o'clock.

Note 3 The 3H According to JIS K5600 pencil test.

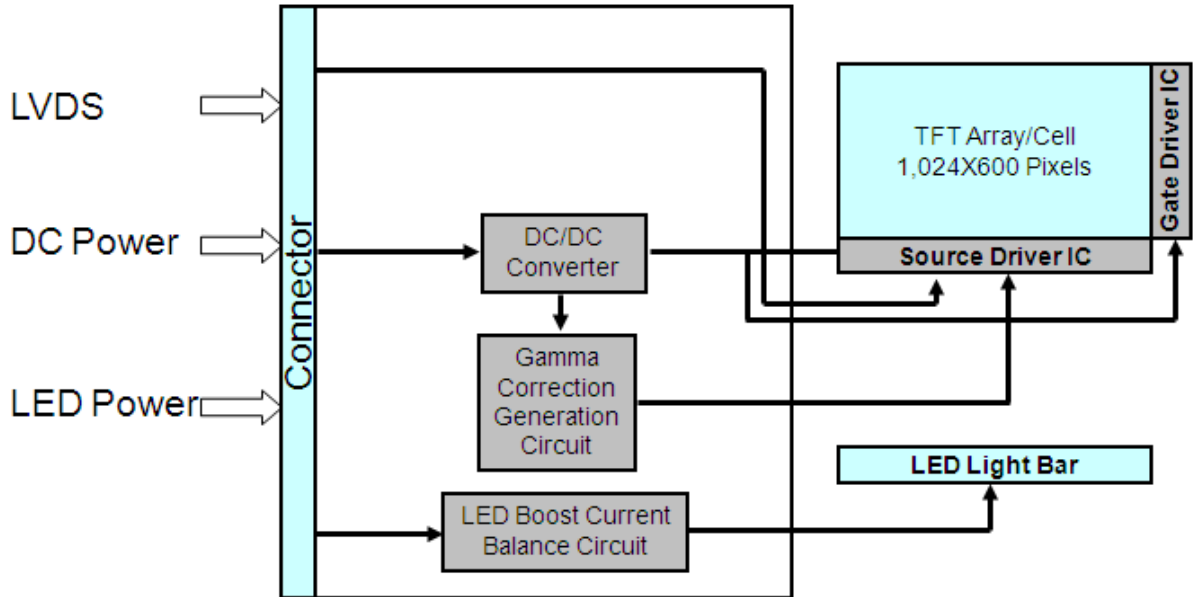
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1.4 Functional Block Diagram

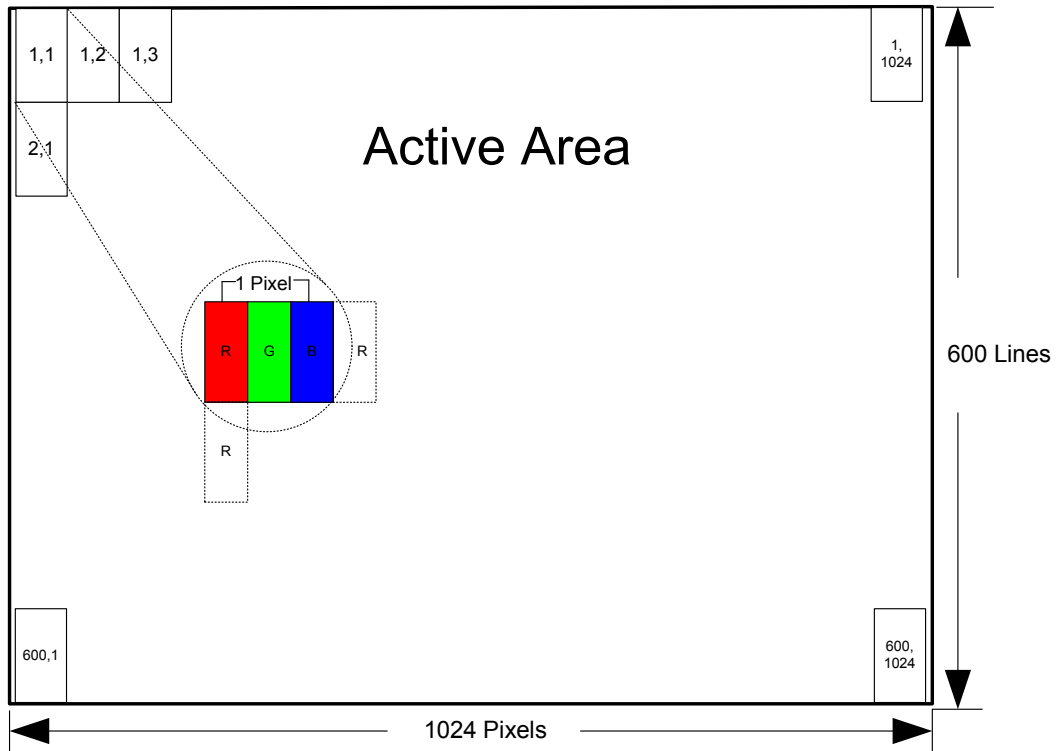
Figure 1 shows the functional block diagram of the LCD module.

Figure 1 Block Diagram



1.5 Pixel Mapping

Figure2 Pixel Mapping



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2.0 Absolute Maximum Ratings

Table 1 Electrical & Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply Voltage	V_{DD}	-0.3	5.0	V	(1),(2)
Logic Input Signal Voltage	V_{Signal}	-	3.6	V	
Operating Temperature	T_{OP}	-30	85	°C	(3),(4),(5),(6)
Storage Temperature	T_{ST}	-40	95	°C	
Vibration(Non-operating)	VB	-	2.9	G	(7)
Shock(Non-operating)	Shock	-	100	G	(8)

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.

Note (2) Operating temperature 25°C, humidity 55%RH.

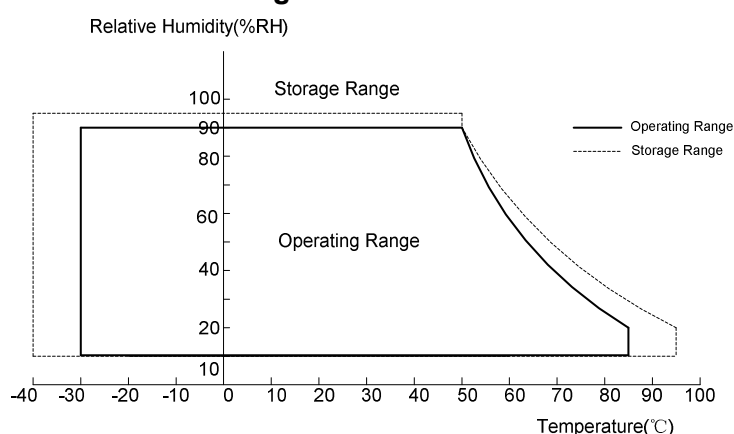
Note (3) ($T \leq 40^{\circ}\text{C}$) Note static electricity. Maximum wet bulb temperature at 39°C or less. ($T > 40^{\circ}\text{C}$) No condensation.

Note (4) There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at 85~95°C or -40~-30°C.

Note (5) There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60%RH or more).

Note (6) All the temperature items are the ambient temperature regulations.

Figure 3 Absolute Ratings of Environment of the LCD Module



Note (7) Frequency range:8~33.3Hz; Stoke:1.3mm; Sweep:2.9G,33.3~400Hz; Cycle:15min; 2 hours for each direction of X, Z;4 hours for Y direction

Note (8) 100G,6ms,Half Sine Wave, ($\pm X, \pm Y, \pm Z$), 3 times for each direction

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3.0 Optical Characteristics

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

Table 2 Optical Characteristics

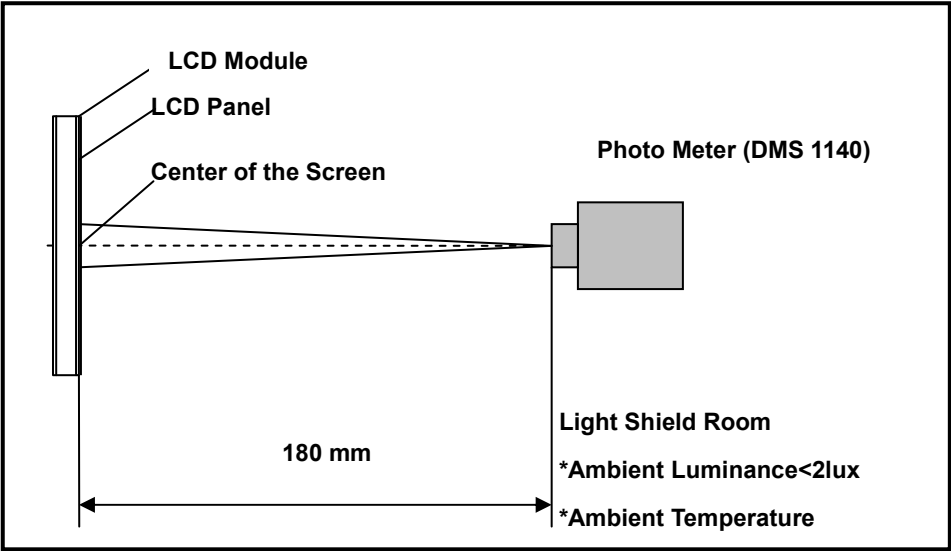
Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_{x+}	70	80	-	degree	(1),(2),(3)
		θ_{x-}	70	80	-		
	Vertical	θ_{y+}	70	80	-		
		θ_{y-}	70	80	-		
Contrast Ratio	Center		640	800	-	-	(1),(2),(4) $\theta_x=\theta_y=0^\circ$
Response Time	Rising + Falling (25℃)		-	16	25	ms	(1),(2),(5) $\theta_x=\theta_y=0^\circ$
	Rising + Falling (-30℃)		-	323	550	ms	(2),(5) $\theta_x=\theta_y=0^\circ$
Color Chromaticity (CIE1931)	Red	x	Typ. -0.03	0.579	Typ. +0.03	-	(1),(2),(3) $\theta_x=\theta_y=0^\circ$
	Red	y		0.344		-	
	Green	x		0.326		-	
	Green	y		0.591		-	
	Blue	x		0.159		-	
	Blue	y		0.131		-	
	White	x	0.255	0.305	0.355	-	
	White	y	0.275	0.325	0.375	-	
NTSC	-		45	50	-	%	(1),(2),(3) $\theta_x=\theta_y=0^\circ$
White Luminance	Center		580	640	-	cd/m ²	(1),(2),(6) $\theta_x=\theta_y=0^\circ$
Luminance Uniformity	9 Points		75	80	-	%	(1),(2),(7) $\theta_x=\theta_y=0^\circ$

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.

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Figure 4 Measurement Setup

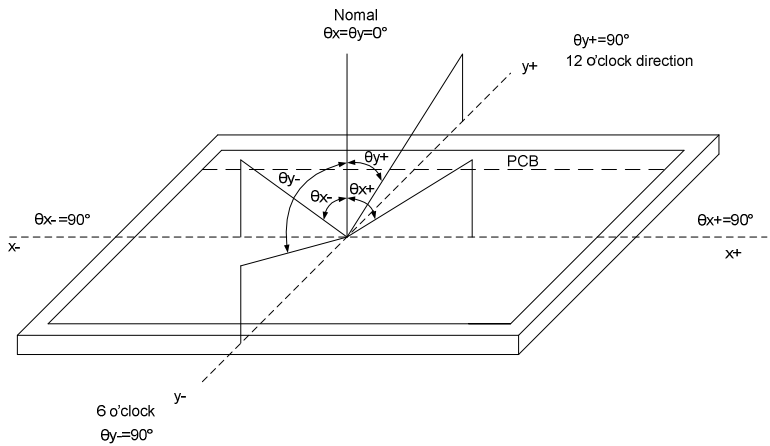


Note (2) The LED input parameter setting as:

I_LED: 160mA
PWM_LED: Duty 100 %

Note (3) Definition of Viewing Angle

Figure 5 Definition of Viewing Angle



Note (4) Definition Of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression:

$$\text{Contrast Ratio (CR)} = L_{63} (L_{255}) / L_0$$

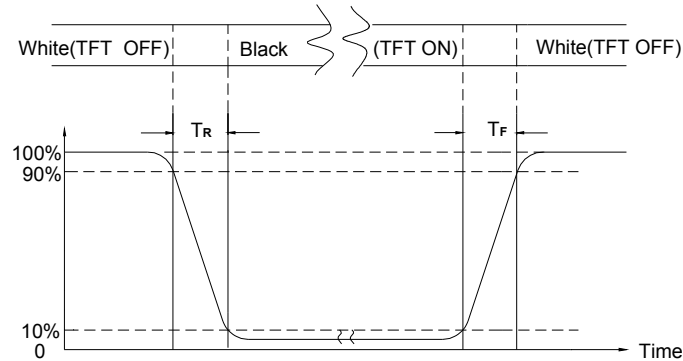
L63 (L255): Luminance of gray level 63(6bit) or level 255(8bit), L0: Luminance of gray level 0

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

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Figure 6 Definition of Response Time



Note (6) Definition Of Luminance White

Measure the luminance of gray level 63(6bit) or level 255(8bit) at center.

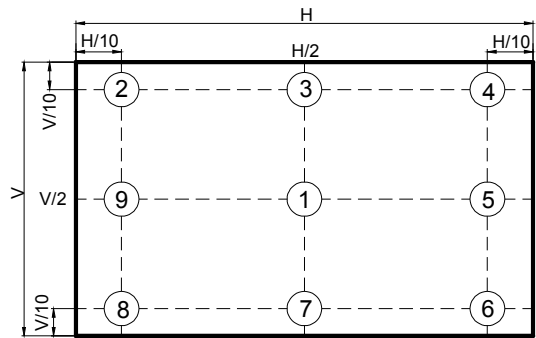
Note (7) Definition Of Luminance Uniformity (Ref.: Active Area)

Measure the luminance of gray level 63(6bit) or level 255(8bit) at 9 points.

Luminance Uniformity= $\text{Min.}(L_1, L_2, \dots L_9) / \text{Max.}(L_1, L_2, \dots L_9)$

H—Active Area Length, V—Active Area Width, L—Luminance

Figure 7 Measurement Locations of 9 Points



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4.0 Electrical Characteristics

4.1 Interface Connector

Table 3 Signal Connector Type

Item	Description
Manufacturer / Type	STM / MSB240420HD
Mating Receptacle / Type (Reference)	STM / P240420H or Compatible

Table 4 Signal Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	VDD	Power Supply, 3.3V (Typ.)	-
2	VDD	Power Supply, 3.3V (Typ.)	-
3	VSS	Ground	-
4	REV	Reverse Scan selection	-
5	Rin1-	-LVDS differential data input (R0-R5,G0)	-
6	Rin1+	+LVDS differential data input (R0-R5,G0)	-
7	VSS	Ground	-
8	Rin2-	-LVDS differential data input (G1-G5,B0-B1)	-
9	Rin2+	+LVDS differential data input (G1-G5,B0-B1)	-
10	VSS	Ground	-
11	Rin3-	-LVDS differential data input (B2-B5,HS,VS,DE)	-
12	Rin3+	+LVDS differential data input (B2-B5,HS,VS,DE)	-
13	VSS	Ground	-
14	CIkIN-	-LVDS differential clock input	-
15	CIkIN+	+LVDS differential clock input	-
16	GND	Ground	-
17	Rin4-	-LVDS differential data input (R6-R7,G6-G7,B6-B7)	-
18	Rin4+	+VDS differential data input (R6-R7,G6-G7,B6-B7)	-
19	SEL68	6/8 bits LVDS data input	Table 5
20	NC	Not connection	-

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Table 5 SEL68 Power Voltage Specifications

Signal Name	SYMBOL	MIN.	TYP.	MAX.	UNIT
SEL68	VH	2.0	3.3	5.0	V
	VL	-	-	0.8	V

Table 6 LED Connector Name / Designation

Item	Description
Manufacturer / Type	STM / MSB24038P5A
Mating Receptacle / Type (Reference)	STM / P24038P5 or Compatible

Table 7 LED Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	VCC	Power Supply, 12V (Typ.)	-
2	GND	Ground	-
3	EN	3.3V (Typ.)	-
4	PWM	3.3V (Typ.)	-
5	NC	Not Connection	-

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4.2 Signal Electrical Characteristics

4.2.1 Signal Electrical Characteristics For LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

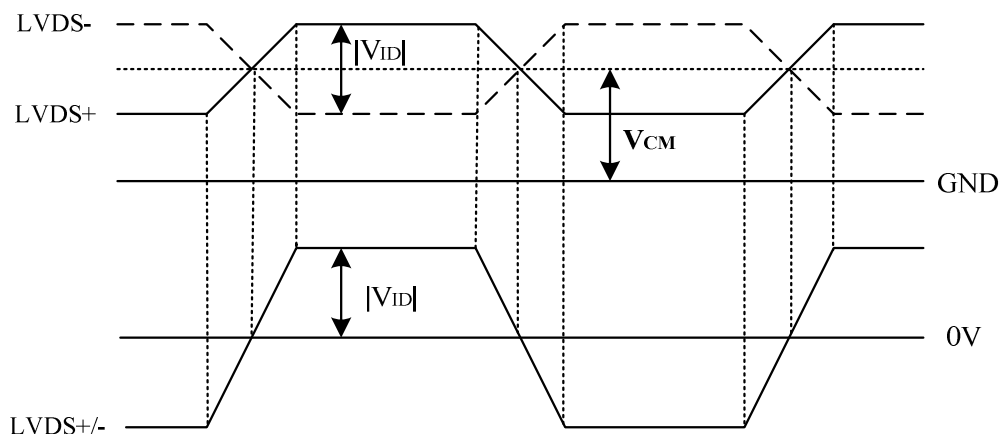
Table 8 LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
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	$ 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 (1) Input signals shall be low or Hi- resistance state when VDD is off.

Note (2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

Figure 8 Voltage Definitions



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Figure 9 Measurement System

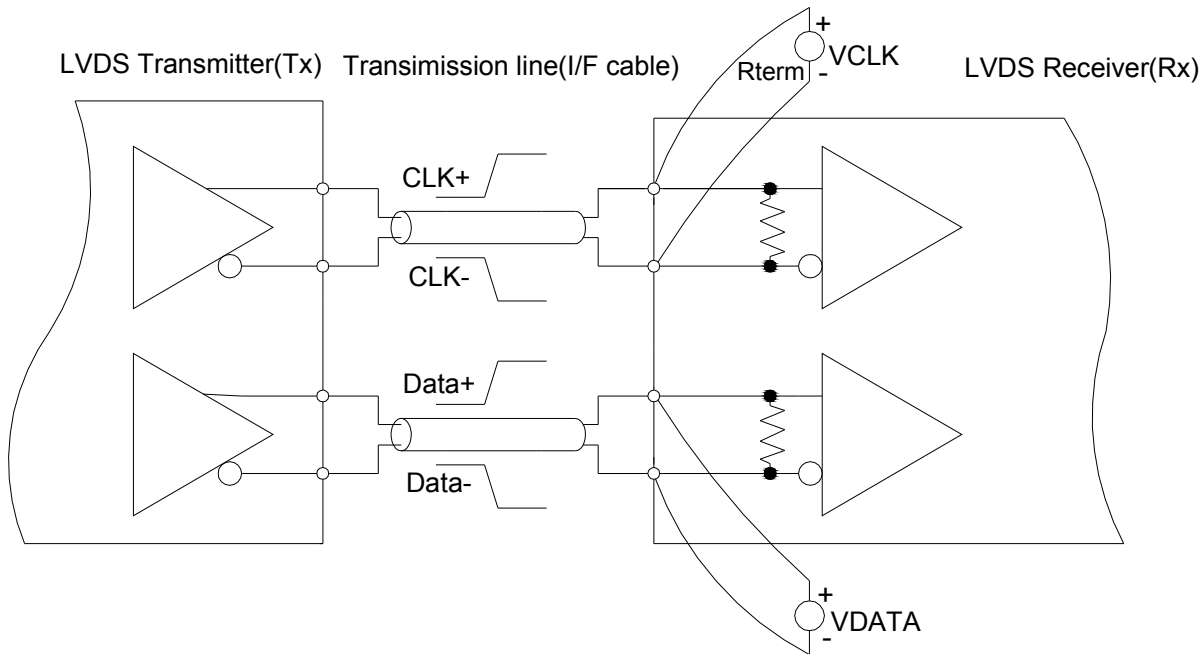
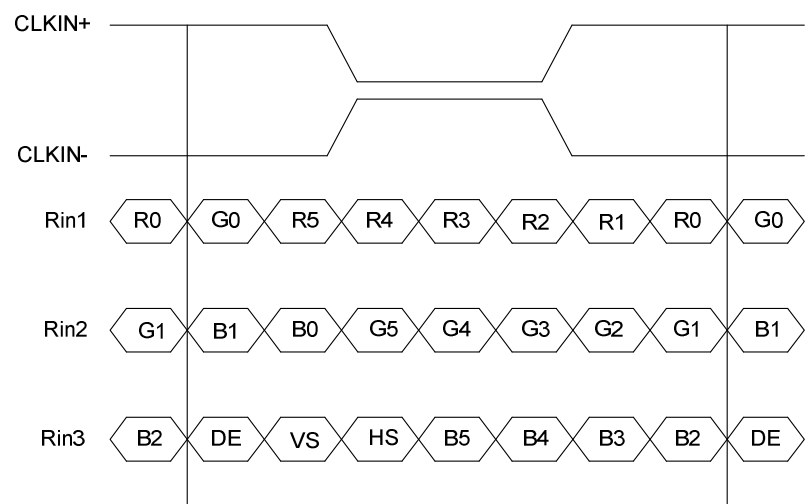


Figure 10 Data Mapping

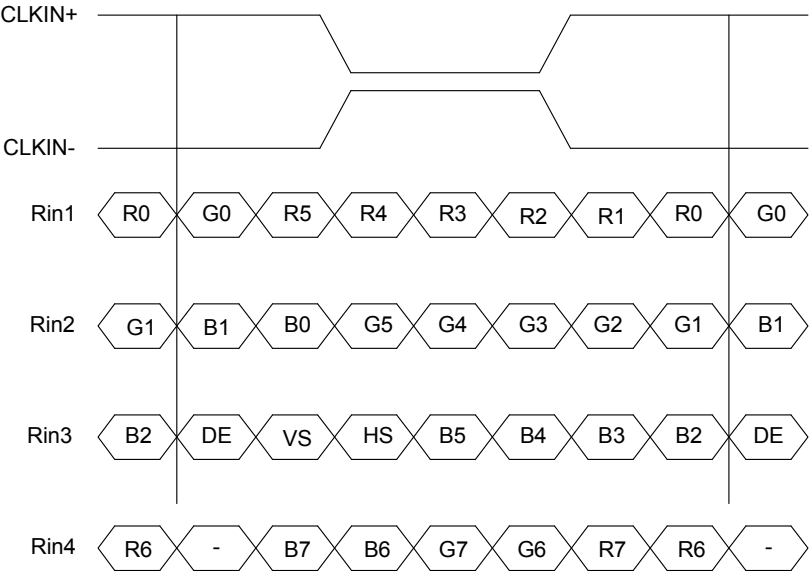
6 bit LVDS input:



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8 bit LVDS input:



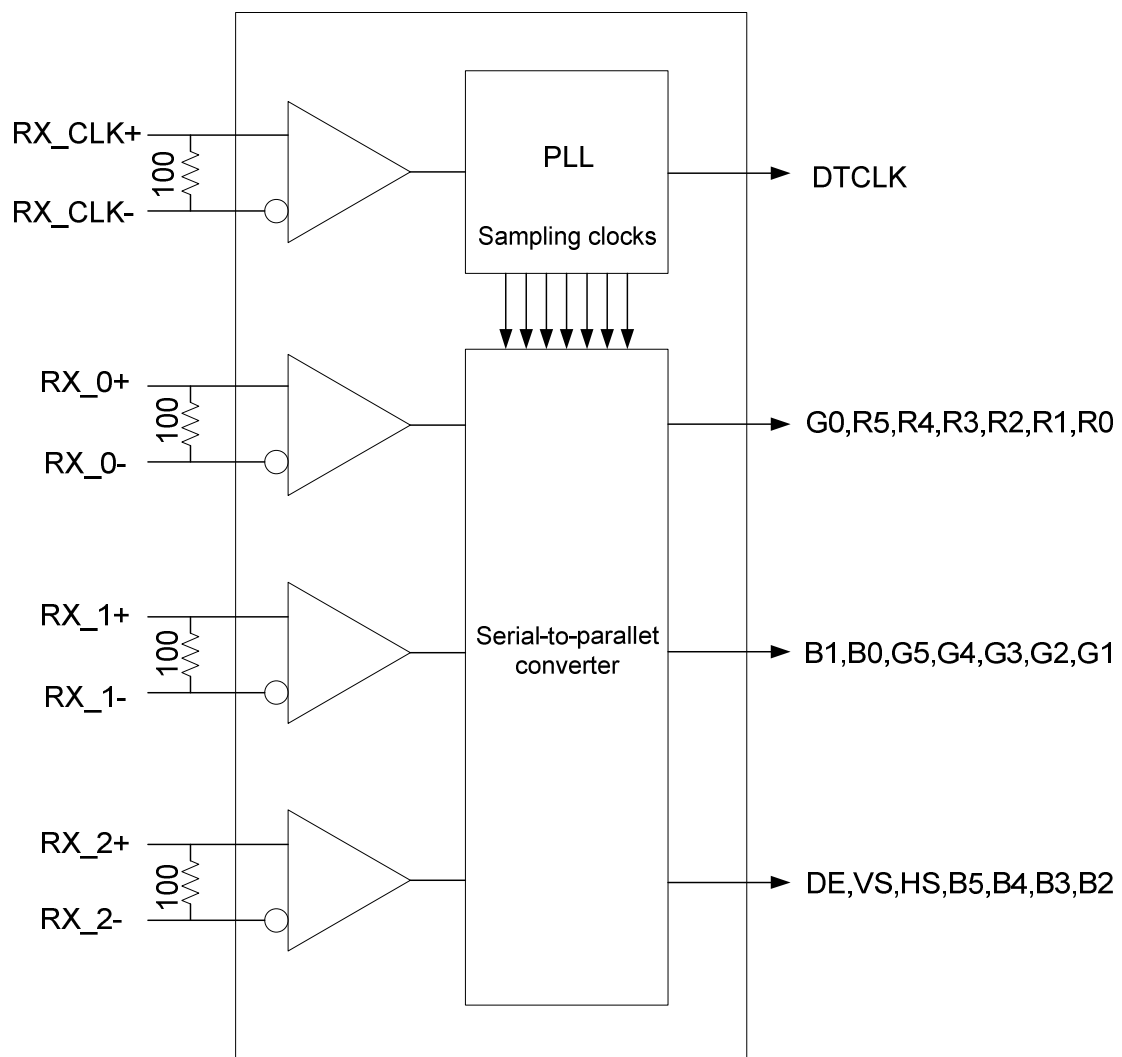
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4.2.2 LVDS Receiver Internal Circuit

Figure 11 shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link.

Figure 11 LVDS Receiver Internal Circuit

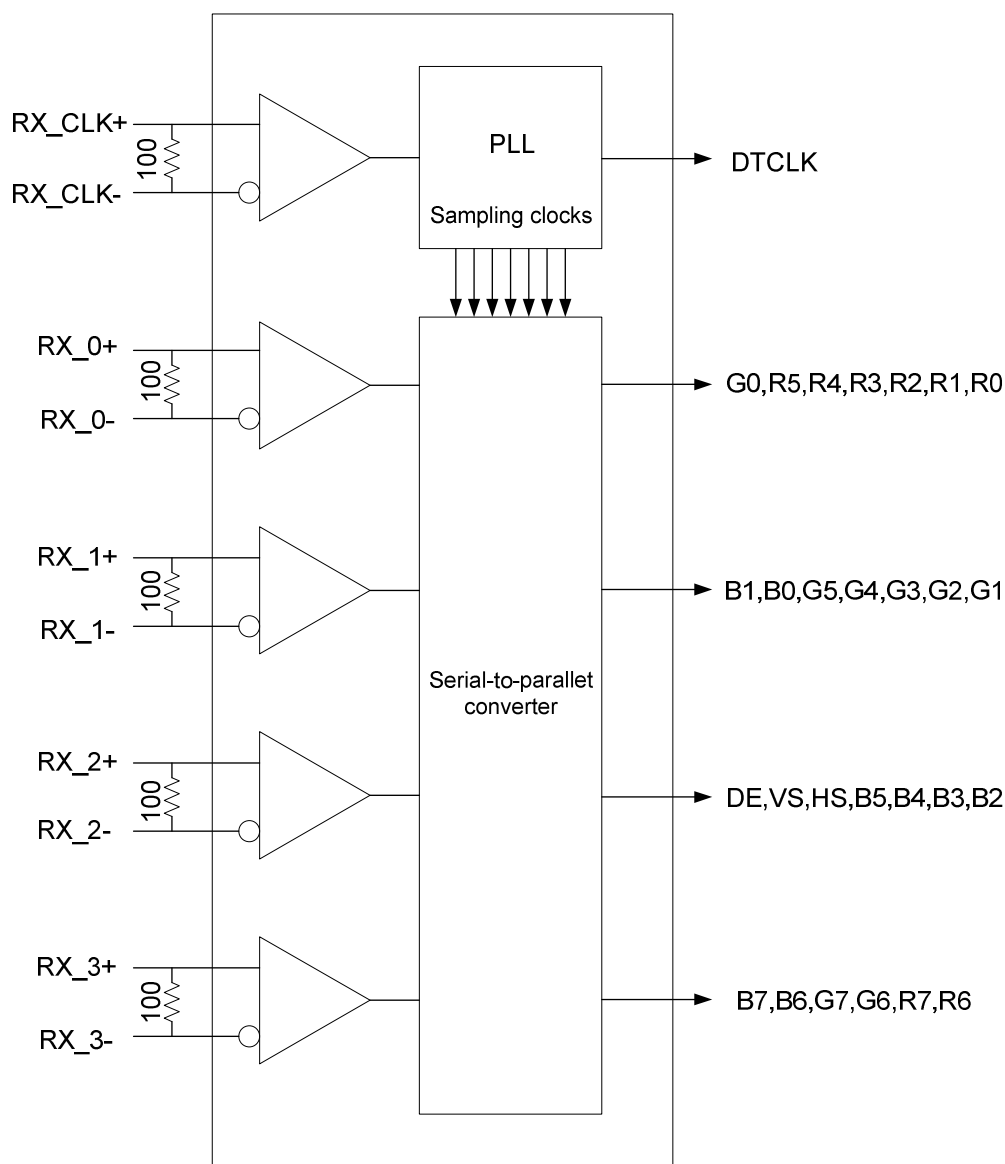
6 bit:



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8 bit:



4.3 Interface Timings

Table 9 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	45	51.2	57	MHz
H Total Time	HT	1,324	1,344	1,364	Clocks
H Active Time	HA	1,024	1,024	1,024	Clocks
V Total Time	VT	625	635	645	Lines
V Active Time	VA	600	600	600	Lines
Frame Rate	FV	55	60	65	Hz

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4.4 Input Power Specifications

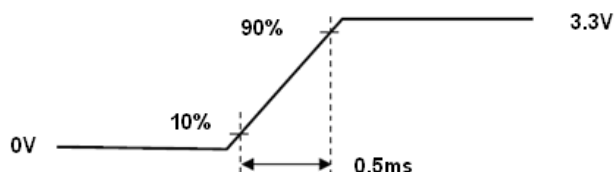
Input power specifications are as follows.

Table 10 Input Power Specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply							
LCD Drive Voltage (Logic)		V _{DD}	3.0	3.3	3.6	V	(2), (4)
Vcom Voltage		Vcom	3.52	-	4.99	V	
VDD Current	Black Pattern	I _{DD}	-	-	0.19	A	(3),(4)
VDD Power Consumption	Black Pattern	P _{DD}	-	-	0.63	W	
Rush Current		I _{Rush}	-	-	1.5	A	(1),(4),(5)
Allowable Logic/LCD Drive Ripple Voltage		V _{VDD-RP}	-	-	200	mV	(4)
LED Power Supply							
LED Input Voltage		V _{LED}	8	12	16	V	(4),(6)
LED Power Consumption		P _{LED}	-	-	4.22	W	(4),(6)
LED Forward Voltage		V _F	2.8	3.2	3.6	V	(4)
LED Forward Current		I _F	-	80	-	mA	
EFFICIENCY		EFF	85	-	-	%	
PWM Signal Voltage	High	V _{PWM}	2.0	3.3	5.0	V	
	Low		-	-	0.8		
LED Enable Voltage	High	V _{LED_EN}	2.0	3.3	5.0	V	
	Low		-	-	0.8		
Input PWM Frequency		F _{PWM}	100	-	1,000	Hz	
Duty Ratio		PWM	5	-	100	%	
LED Life Time		LT	50,000	-	-	Hours	(4),(7),(8)

Note (1) Measure Condition

Figure 12 VDD Rising Time



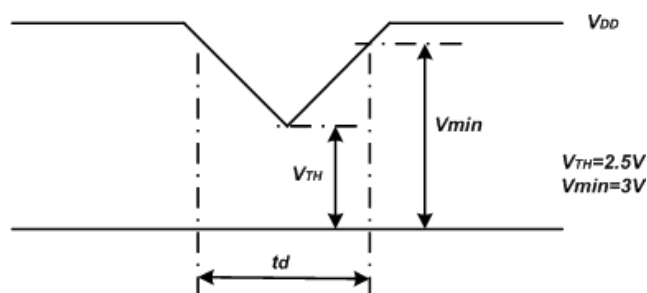
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Note (2) VDD Power Dip Condition

$V_{TH} < V_{DD} \leq V_{min}$, $t_d \leq 10ms$ (a time of the voltage return to normal), our panel can revive automatically.

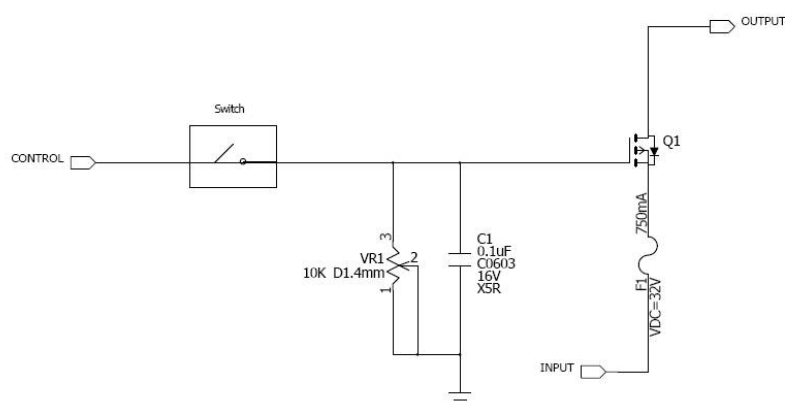
Figure 13 VDD Power Dip



Note (3) Frame Rate=60Hz, VDD=3.3V, DC Current.

Note (4) Operating temperature 25°C, humidity 55%RH.

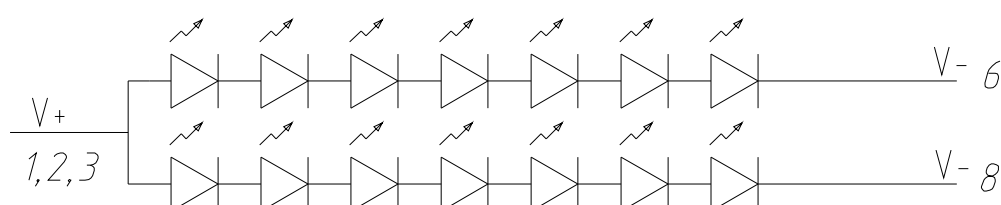
Note (5) The reference measurement circuit of rush current.



Note (6) Definition of V_{LED} and P_{LED}

$$V_{LED} = V_F \times 7 \quad P_{LED} = V_{LED} \times I_F \times 2$$

Figure 14 LED Light Bar Structure

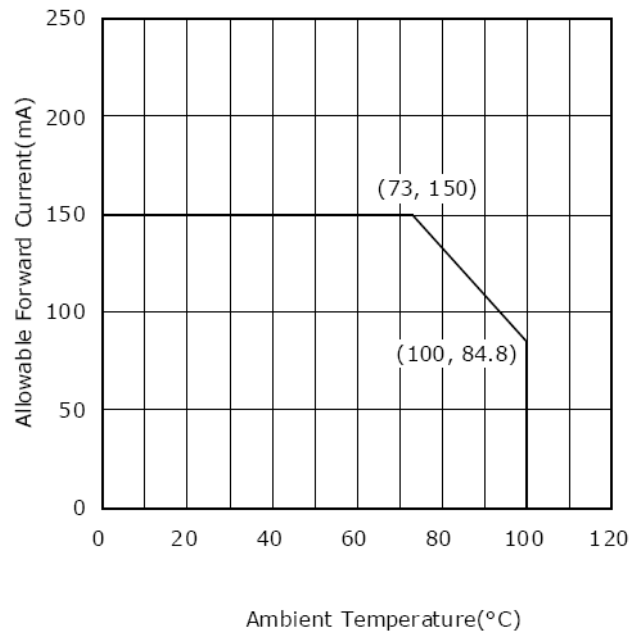


Note: Pad 4, 5, 7 are NC.

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Figure 15 Ambient Temperature VS Allowable Forward Current



Note (7) The LED life time define as the estimated time to 50% degradation of initial luminous.

Note (8) The LED type is NSSW150BT.

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4.5 Power ON/OFF Sequence

Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VDD voltage is off.

Figure 16 Power Sequence

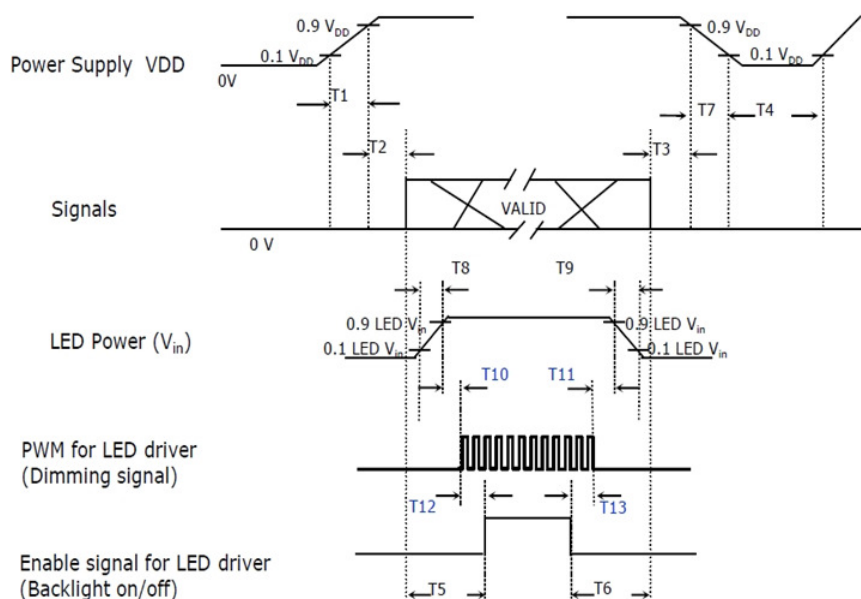


Table 11 Power Sequencing Requirements

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	-	-

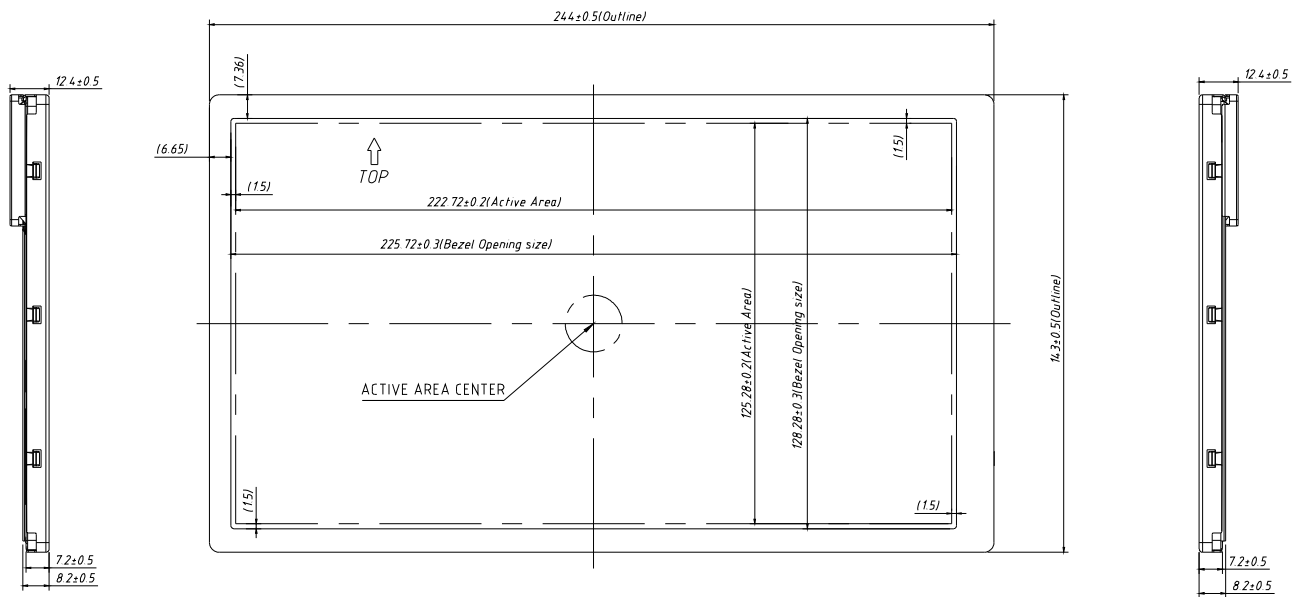
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5.0 Mechanical Characteristics

5.1 Outline Drawing

Figure 17 Reference Outline Drawing (Front Side)

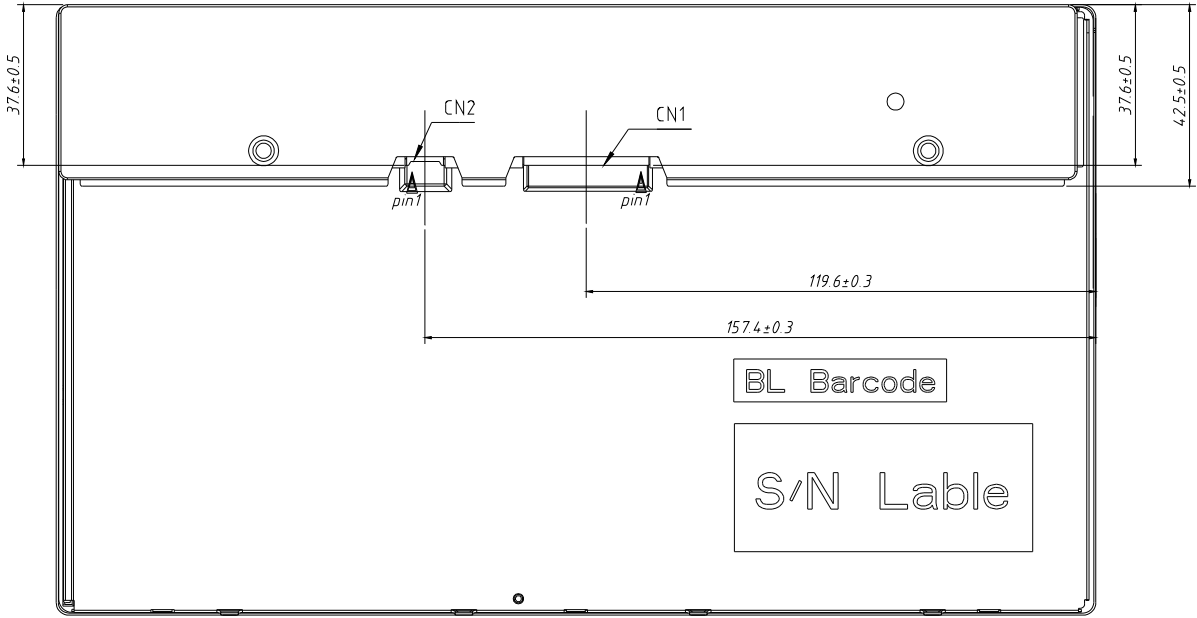


Unit: mm

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Figure 18 Reference Outline Drawing (Back Side)



Unit: mm

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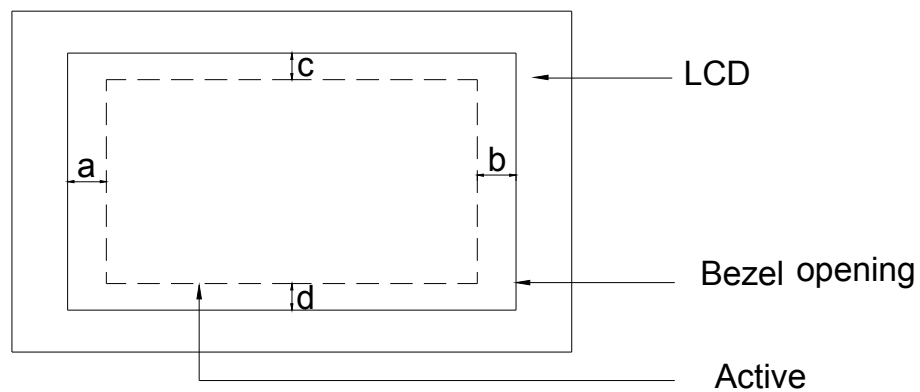
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5.2 Dimension Specifications

Table 12 Module Dimension Specifications

Item		Min.	Typ.	Max.	Unit
Width		243.7	244	244.3	mm
Height		142.7	143	143.3	mm
Thickness	with PCBA	-	-	12.9	mm
	without PCBA	-	-	7.7	mm
Weight		-	400	440	g

Figure 19 BM Area



Note: The a, b, c and d mean distance from Active Area to Bezel opening.

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6.0 Reliability Conditions

Item		Package	Test Conditions		Note
High Temperature Operating Test		Module	85℃, 300 hours		(1),(2),(3),(4)
Low Temperature Operating Test		Module	-30℃, 300 hours		
High Temperature Storage Test		Module	95℃, 300 hours		(1),(2),(4)
Low Temperature Storage Test		Module	-40℃, 300 hours		
High Temperature/High Humidity Operating Test		Module	60℃, 90%RH, 300 hours		(1),(2),(3),(4)
Shock Non-operating Test		Module	3 shock in each direction Peak acceleration:981m/s2 Duration of norminal shock; 6ms Wave form saw-tooth with slow rise(2.04m/s)		(4)
Vibration Non-operating Test		Module	1.5G, 10~500 Hz , x、 y、 z each axis/1hour.		
ESD Test	Operating	Module	Contact	± 8 KV, 150pF(330Ohm)	(5)
			Air	± 15 KV, 150pF(330Ohm)	
	Non-operating	Module	Contact	± 10KV, 150pF(330Ohm)	
			Air	±20KV, 150pF(330Ohm)	
Package Vibration Test		Module	0.015G2/Hz from 5~200Hz, -6dB/Octave from 200~500Hz		-
Package Drop test		Module	65cm, 1corner,3 arris,6 side		(6)

Note (1) All the judgments are under room temperature and the sample need to be static more than 2 hours in the room temperature before judge.

Note (2) During measurement, the condensation water or remains shall not be allowed.

Note (3) In operating test, the backlight voltage and current must be in specification.

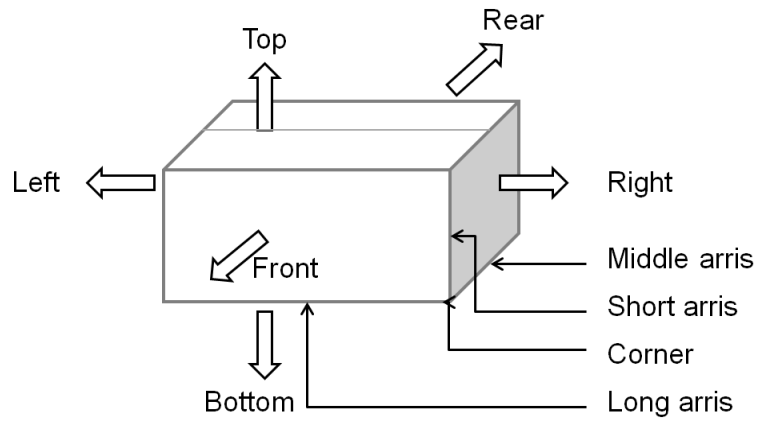
Note (4) There is no display function issue occurred, all the cosmetic specification is judged before the reliability stress.

Note (5) In case of malfunction defect caused by ESD damage. If it would be recovered to normal state after resetting, it would be judge as pass.

Note (6) Package Drop Test Location as below:

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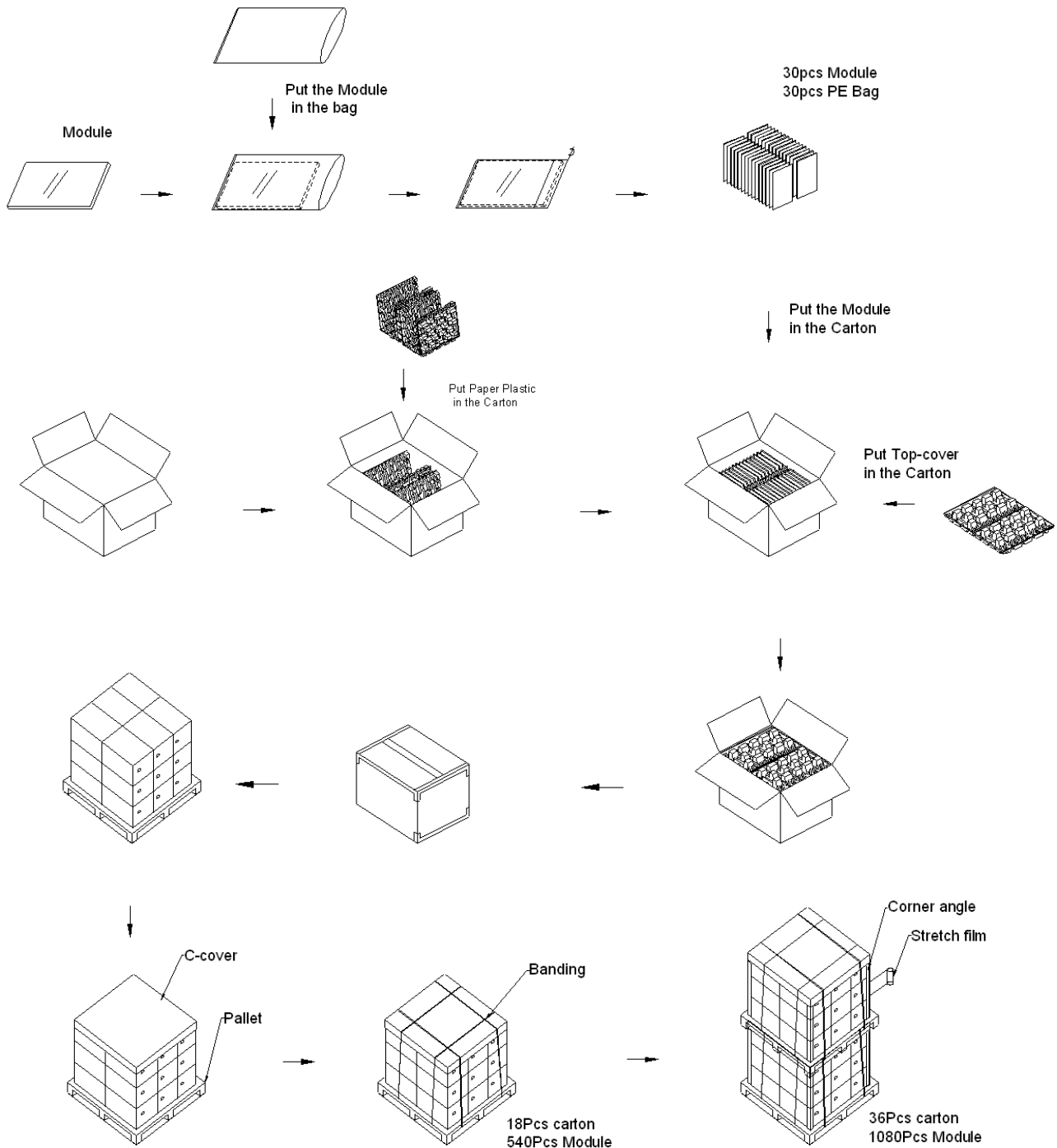


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7.0 Package Specification

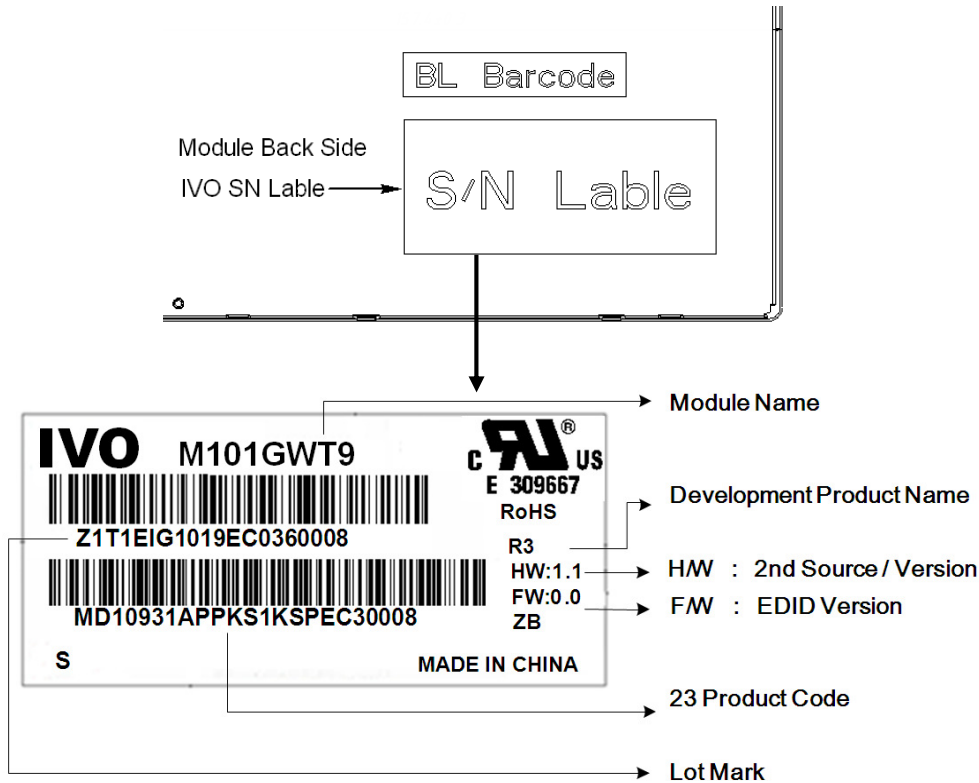
Figure 20 Packing Method



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8.0 Lot Mark



Note: This picture is only an example.

8.1 20 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

Code 1,2,4,5,6,7,8,9,10,11,16: IVO internal flow control code.

Code 3: Production Location.

Code 12: Production Year.

Code 13: Production Month.

Code 14,15: Production Day.

Code 17,18,19,20: Serial Number.

8.2 23 Product Barcode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Code 1,2: Manufacture District.

Code 3,4,5,6,7: IVO internal module name.

Code 8,9,10,13,16: IVO internal flow control code.

Code 11,12: Cell location Suzhou, China defined as "KS".

Code 14,15: Module location Kunshan, China defined as "KS"; Yangzhou, China defined as "YZ"; Shenzhen, China defined as "SE"; Zhuhai, China defined as "ZH"; Suzhou, China defined as "SZ".

Code 17,18,19 : Year, Month, Day refer to Note(1), Note(2) and Note(3).

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Note (1) Production Year

Year	2006	2007	2008	2009	2010	2011	2012	2013		2035
Mark	6	7	8	9	A	B	C	D		Z

Note (2) Production Month

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

Note (3) Production Day: 1~V.

Code 20~23: Serial Number.

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 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. IVO 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.

9.3 Storage Precaution

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- (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.

9.4 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 "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.

9.5 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.

9.6 Disposal

When disposing LCD module, obey the local environmental regulations.