Product information

To:

Product Name: M190MWW4 R0

Document Issue Date: 2012/03/30

Customer	InfoVision Optoelectronics
SIGNATURE _____ _____ _____ – Please return 1 copy for your confirmation with your signature and comments.	**SIGNATURE** **REVIEWED BY** **QA** _____ **PREPARED BY** **FAE** _____

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2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by IVO for any intellectual property claims or other problems that may result from application based on the module described herein.

FQ-7-30-0-009-03D

Revision	Date	Page	Old Description	New Description	Remark
00	2012/03/30	-	-	First issued.	-

Contents

1. General Descriptions

1.1 Introduction

The M190MWW4 is a Color Active Matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) module, which 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 18.95 inch (diagonally measured) active display area with resolution (1,440 vertical by 900 horizontal pixel array).

1.2 Features

- 19” TFT LCD Panel
- CCFL Backlight System
- Supports (V:1,440 lines, H:900 pixels) Resolution
- Compatible with RoHS Standard

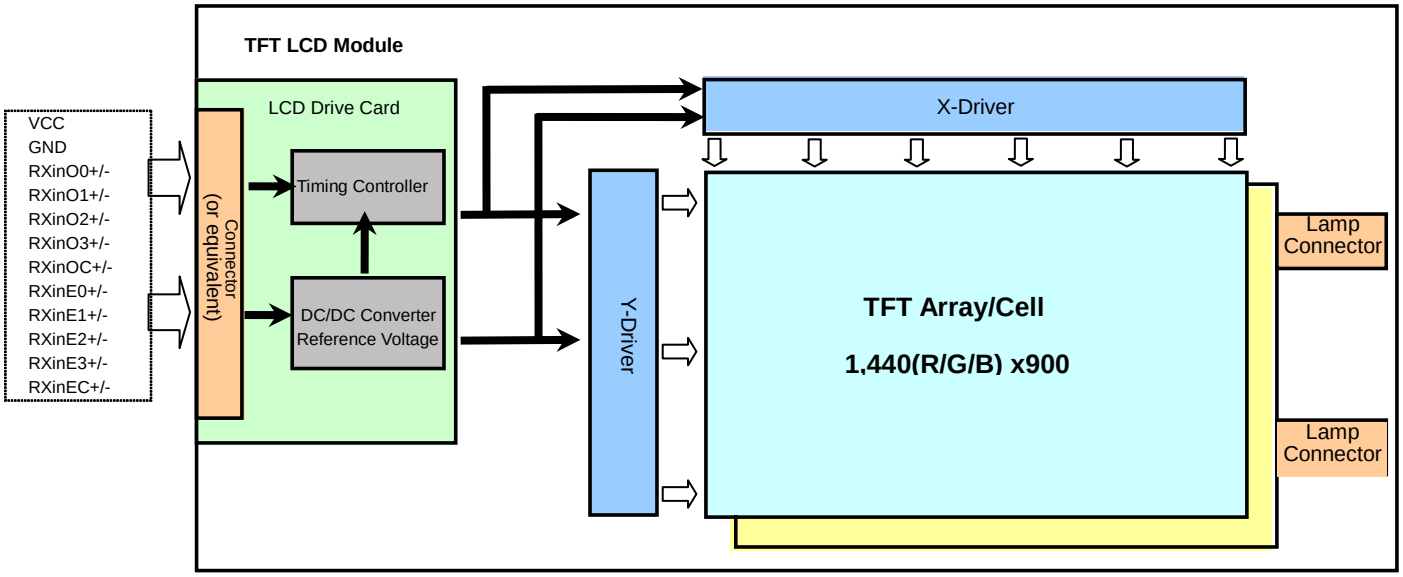
1.3 Product Summary

Items	Specifications	Unit	Remark
Screen Diagonal	18.95	inch	
Active Area	408.24 (H) x 255.15 (V)	mm	
Pixels(H x V)	1,440(x3) x900	-	
Pixel Pitch	0.2835 (per one triad) x 0.2835	mm	
Pixel Arrangement	R.G.B. Vertical Stripe	-	
Display Mode	TN Mode, Normally White	-	
White Luminance	250 (Typ.)	cd/ m^2	CCFL@ 7.5mA
Contrast Ratio	1,000 : 1 (Typ.)	-	
Response Time	5 (Typ.)	ms	
View Angle(L/R/U/D)	85/85/80/80 (Typ.)	-	
Input Voltage	+5.0 (Typ.)	V	
Power Consumption	15.5	Watt	Black Pattern
Module Weight	2135 (Typ.)	g	
Outline Dimension(H x V x D)	428 .0x 278.0x16.5 (Typ.)	mm	
Electrical Interface (Logic)	LVDS	-	
Support Color	16.7M	-	
NTSC	72 (Typ.)	%	
Luminance Uniformity	80 (Typ.)	%	Average of 9 points
Optimum Viewing Direction	6 o’clock	-	
Surface Treatment	Anti-Glare	-	

1.4 Functional Block Diagram

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

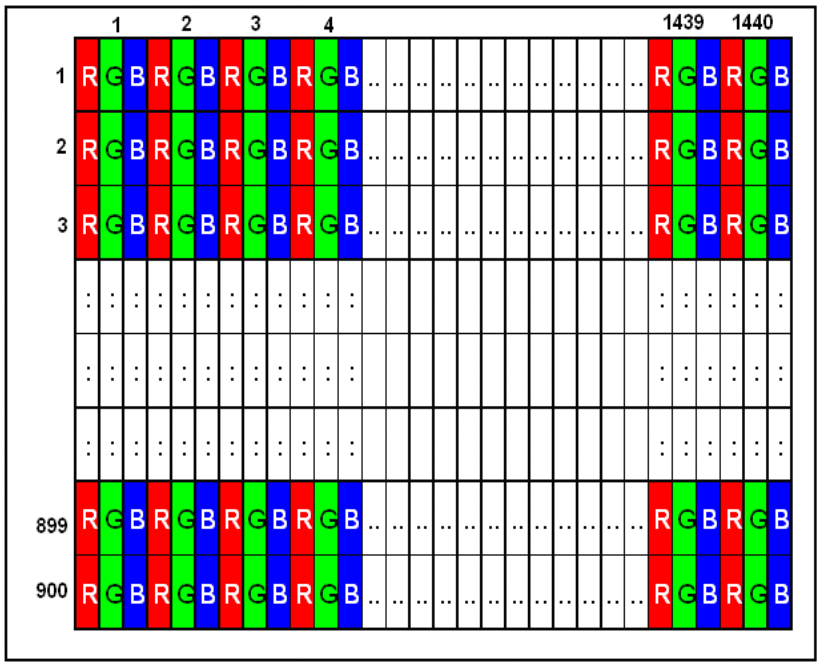
Figure 1 Block Diagram



1.5 Pixel Format Image

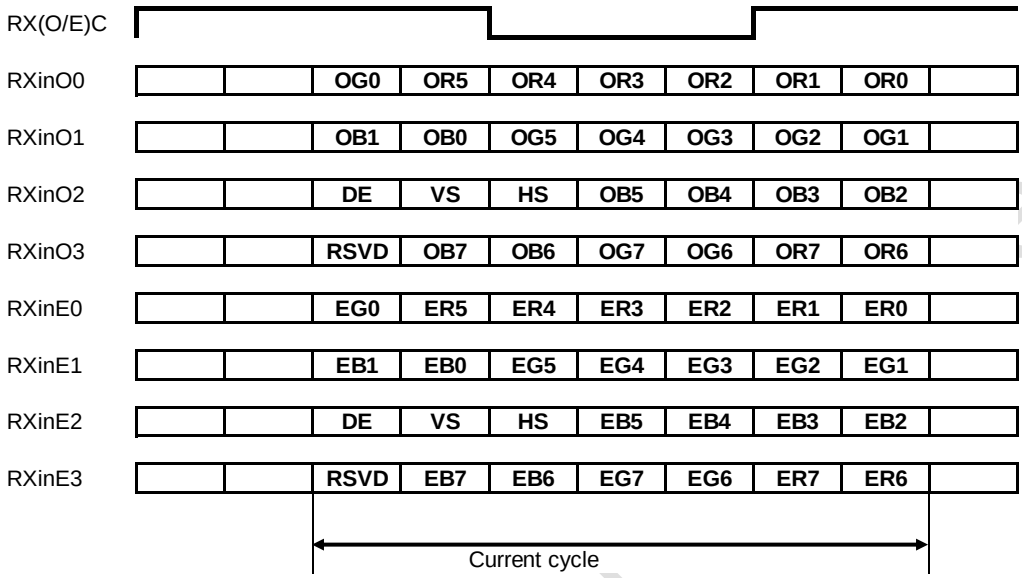
Figure 2 shows the relationship of the input signals and LCD pixel format image.

Figure 2 Pixel Format



1.6 The input data format

Figure 3 Data mapping



2. Absolute Maximum Ratings

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

Table 1

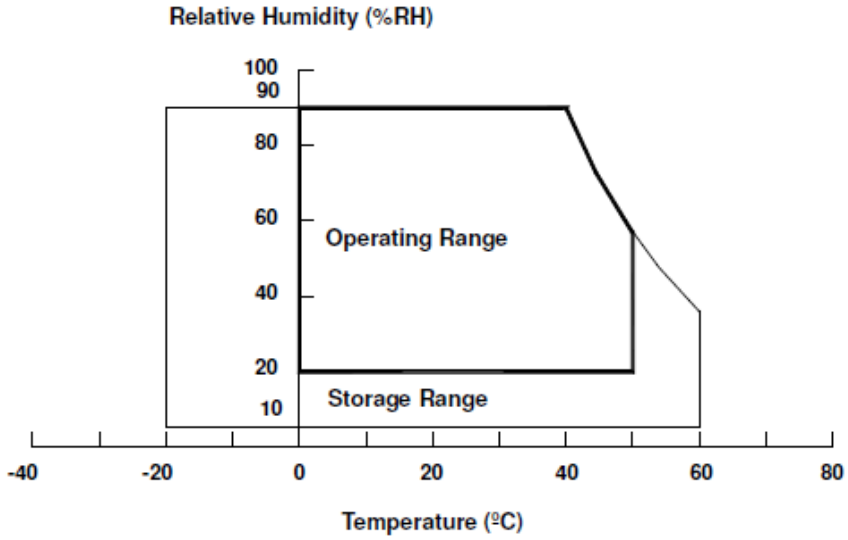
Item	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	V_{DD}	-0.3	6.0	V	-
Input Signal	-	-0.3	2.5	V	LVDS Signals
Operating Temperature	TOP	0	50	℃	Note(3)
Operating Humidity	HOP	10	80	%RH	Note(3)
Storage Temperature	TST	-20	60	℃	Note(3)
Storage Humidity	HST	10	90	%RH	Note(3)
Vibration	Level	-	1.5	G	30min. for X, Y, Z axis
	Bandwidth		10～500Hz	Hz	
Shock	Level	-	50	G	Half Sine Waveform, 20ms
CCFL Current	$I_{\_CCFL}$	3	8	mA	Per CCFL Lamp

Note

(1)Maximum Wet-Bulb should be 39℃ and No condensation.

(2)When you apply the LCD module for OA system, please make sure to keep the temperature of LCD module under 60℃.

(3)Storage /Operating temperature & humidity:



3. Electrical Specification

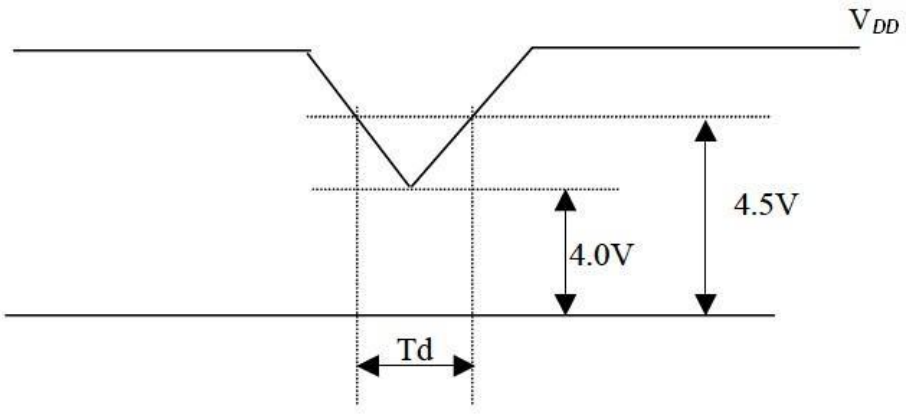
3.1 Electrical Characteristics

Table 2 Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Condition
V_{DD}	Logic/LCD Drive Voltage	4.5	5.0	5.5	V	Note (1)
I_{DD}	V_{DD} Current	-	450	500	mA	V_{DD} =5V, Black Pattern, 60Hz
P_{DD}	V_{DD} Power	-	2.25	2.5	W	V_{DD} =5V, Black Pattern, 60Hz
Irush	Rush Current	-	-	3.0	A	Note (2)
V_{DD}rp	Allowable Logic/LCD Drive Ripple Voltage	-	-	300	mVp-p	-
I_{CCFL}	CCFL current	7	7.5	8	mA	Note (3)
F_{CCFL}	CCFL Frequency	40	50	80	[kHz]	Ta=25℃ (Note 4)
V_{CCFLi}	Inverter Ignition Voltage	1,550	--	---	[Vrms]	Ta=0℃(Note 5)
		1,190	--	---		Ta=25℃(Note 5)
V_{CCFL}	CCFL Forward Voltage	630	700	770	V	ICCFL=7.5mA Ta=25℃
P_{CCFL}	CCFL Power Consumption	9.5	10.5	11.5	W	-
Lamp life	CCFL	-	50,000	-	Hours	Note (6)

Note: (1)V_{DD} Power Dip Condition

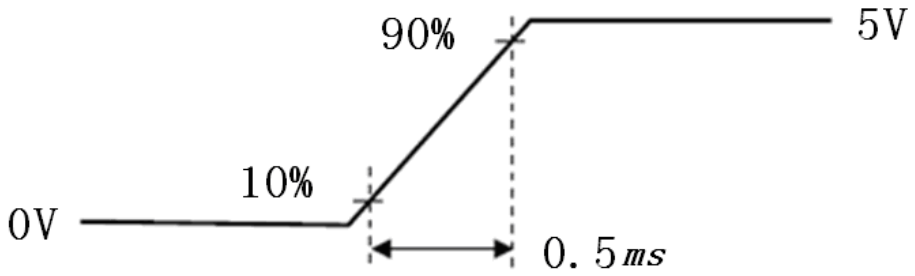
Figure 4 V_{DD} Power Dip



If VTH＜VDD≤V_{min} and td≤10ms, our panel must revive automatically when the voltage returns to normal.

(2)Measure Condition

Figure 5 V_{DD} rising time



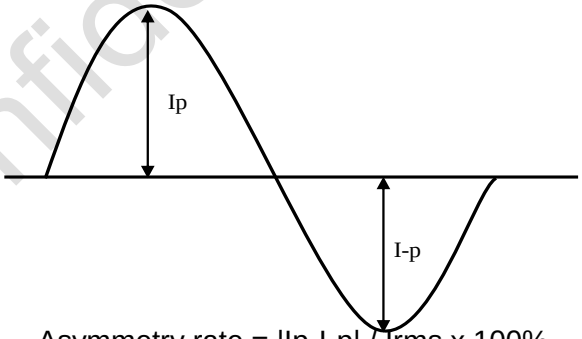
(3) If it exceeds MIN/MAX values, then "ON/OFF Cycle", and "SAFETY" will not be guaranteed

(4) CCFL Frequency should be carefully determined to avoid interference between inverter and TFT LCD

(5) The voltage over specified value (VCCFLi) should be applied to the lamp more than 1 second after startup. Otherwise, the lamp may not be turned on. The used lamp current is the lamp Typ. current. The inverter should be able to give out a power that has a generating capacity of over 1,550V. Lamp units need to over 1,550V for ignition.

(6) Ta=25+/-3degC and ICCFL=7.5 mA, brightness becomes lower than 50% of initial value.

(7) The distortion tae of the waveform should be within $\sqrt{2}$ ±10%.
The inverter output waveform should be better similar to the ideal sine wave.



Asymmetry rate = |Ip-I-p| / Irms x 100%
Distortion rate = Ip (or I-p) / Irms

Recommendation of Lighting Waveform

3.2 Interface Connector

Table 3 Connector Name / Designation

Manufacturer	UJU/Starconn (or equivalent)
Type / Part Number	IS100-L30R-C23(UJU)/093G30-B2001A-M4 (Starconn)
Mating Receptacle /Part Number	HS100-L30N-N23（UJU）/107J30-100000-00(STARCONN locked type) /093E30-000220-G4-N（STARCONN un-locked type）

Table 4 Signal Pin Assignment

Pin #	Signal Name	Description	Remarks
1	RXinO0-	LVDS differential data input	
2	RXinO0+	LVDS differential data input	
3	RXinO1-	LVDS differential data input	
4	RXinO1+	LVDS differential data input	
5	RXinO2-	LVDS differential data input	
6	RXinO2+	LVDS differential data input	
7	GND	Ground	
8	RXOC-	LVDS differential data input	
9	RXOC+	LVDS differential data input	
10	RXinO3-	LVDS differential data input	
11	RXinO3+	LVDS differential data input	
12	RXinE0-	LVDS differential data input	
13	RXinE0+	LVDS differential data input	
14	GND	Ground	
15	RXinE1-	LVDS differential data input	
16	RXinE1+	LVDS differential data input	
17	GND	Ground	
18	RXinE2-	LVDS differential data input	
19	RXinE2+	LVDS differential data input	
20	RXEC-	LVDS differential data input	
21	RXEC+	LVDS differential data input	
22	RXinE3-	LVDS differential data input	
23	RXinE3+	LVDS differential data input	
24	GND	Ground	
25	NC	No Connection	
26	NC	Reserved for LCD manufacturer.	
27	NC	No Connection	
28	VDD	Power Supply	5V(Typ.)

29	VDD	Power Supply	5V(Typ.)
30	VDD	Power Supply	5V(Typ.)

Note: All input signals shall be at low or Hi-Z state when V_{DD} is off.

3.3 LVDS Receiver

3.3.1 Signal Electrical Characteristics For LVDS Receiver

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

Table 5 LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Magnitude Differential Input	$\|V_{id}\|$	100	-	600	mV	
Common Mode Voltage	V_{cm}	1.0	1.2	1.4	V	Vth - Vtl
Logic High Input Voltage	VIH	2.64	-	3.6	V	
Logic Low Input Voltage	VIL	0	-	0.66	V	

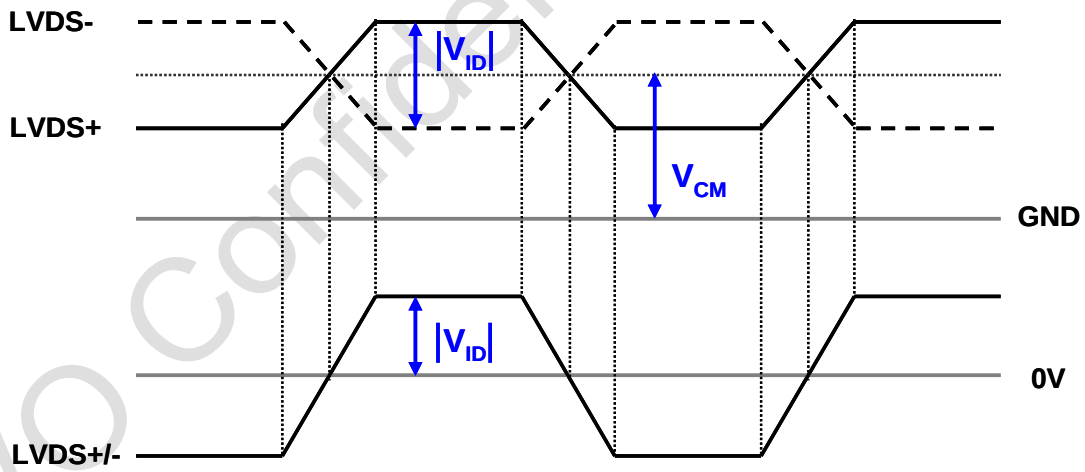
Note:

(1)Input signals shall be at low or Hi-Z state when V_{DD} is off.

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

(3)All values are measured at condition of V_{DD} =5V and Ta=25℃.

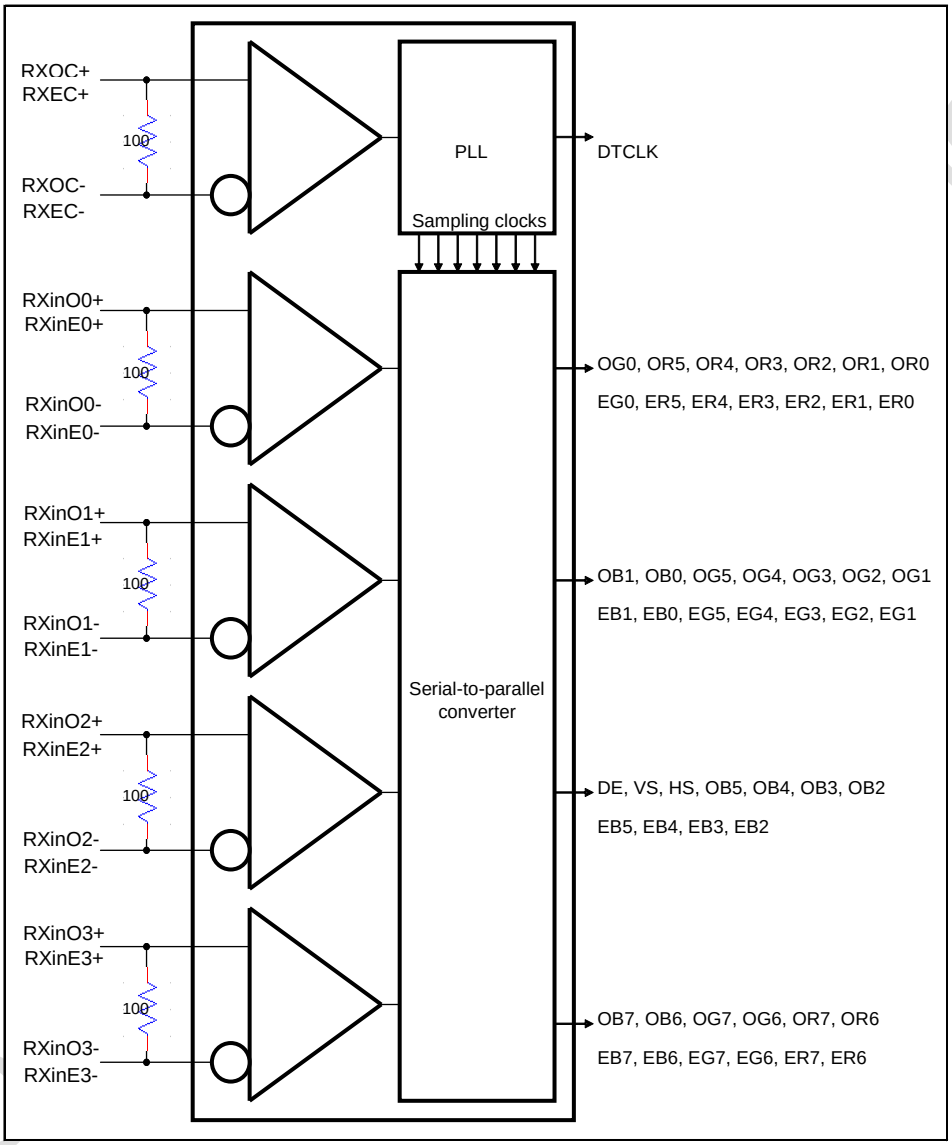
Figure 6 Voltage Definitions



3.3.2 LVDS Receiver Internal Circuit

Figure 7 LVDS Receiver Internal Circuit shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link.

Figure 7 LVDS Receiver Internal Circuit



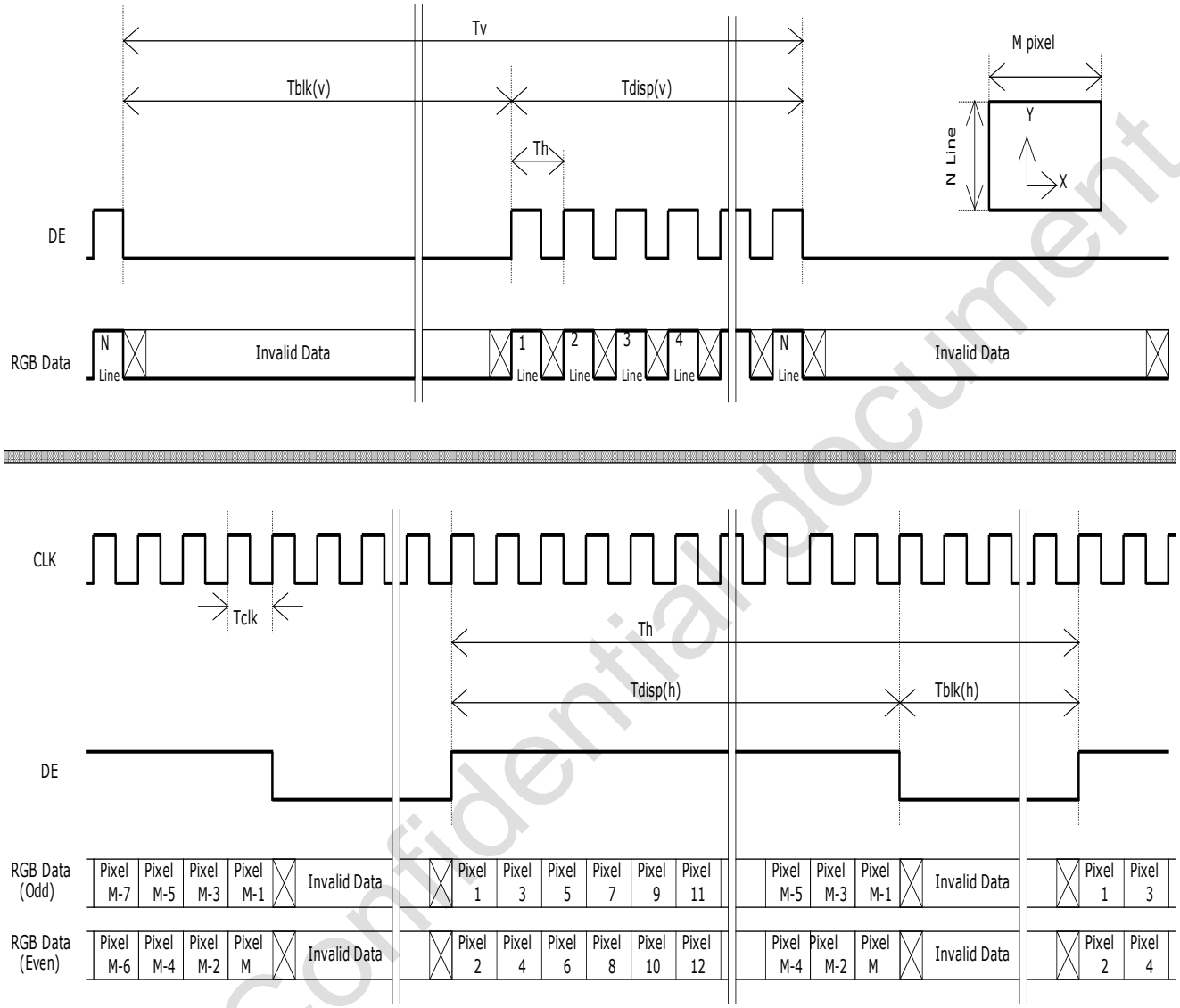
3.4 Interface Timings

Table 6 Interface Timings

Signal	Item	Symbol	Min	Typ	Max	Unit
Vertical Section	Period	Tv	918	926	1400	Th
	Active	Tdisp(v)	900	900	900	Th
	Blanking	Tbp(v)+Tfp(v)+PWvs	18	26	500	Th
Horizontal Section	Period	Th	770	800	1023	Tclk
	Active	Tdisp(h)	720	720	720	Tclk
	Blanking	Tbp(h)+Tfp(h)+PWhs	50	80	303	Tclk
Clock	Period	Tclk		22.6	-	ns
	Frequency	Freq	41.5	44.3	67.5	MHz
Frame rate	Frame rate	F	55	60	75	Hz

Note：DE mode only

Figure 8 Timing Characteristics

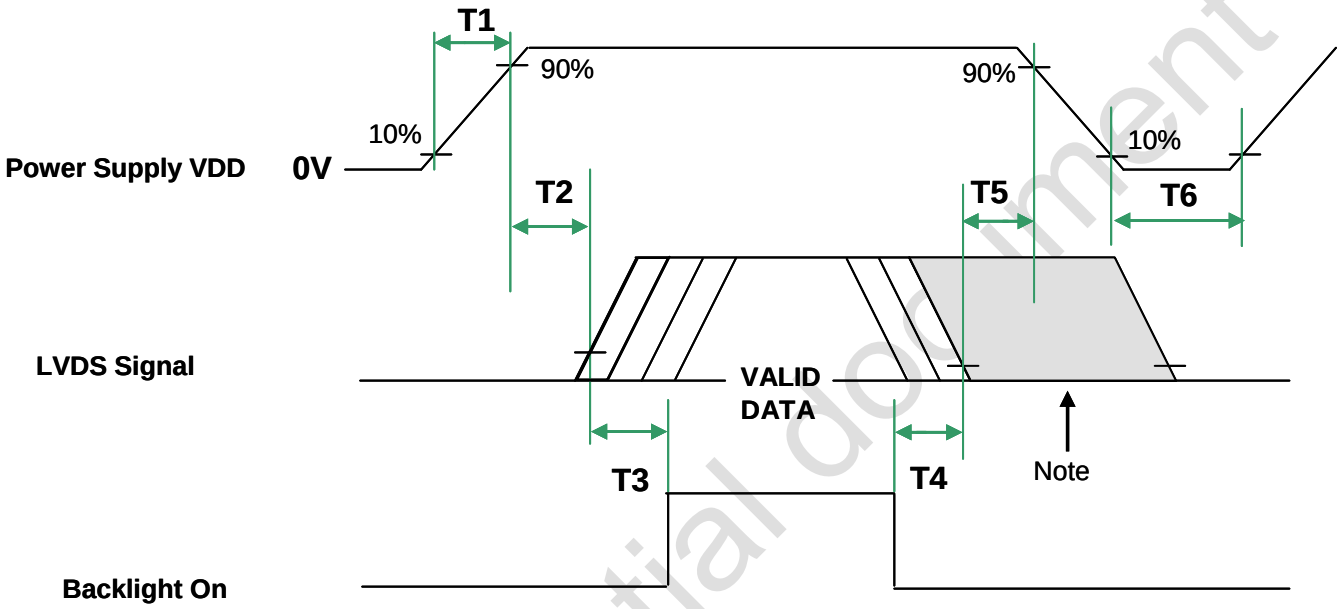


3.5 Power ON/OFF Sequence

V_{DD} power, interface signals, and lamp on/off sequence are showing on Figure 9.

Signals shall be Hi-Z state or low level when V_{DD} is off.

Figure 9 Power Sequence



Note : Insert a white pattern after valid data and last until VDD falls to 10%

Table 7 Power Sequencing Requirements

Symbol	Unit	Min.	Max.
T1	ms	0.5	10
T2	ms	0	50
T3	ms	500	-
T4	ms	200	-
T5	ms	40	-
T6	ms	1000	-

4. Optical Characteristics

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

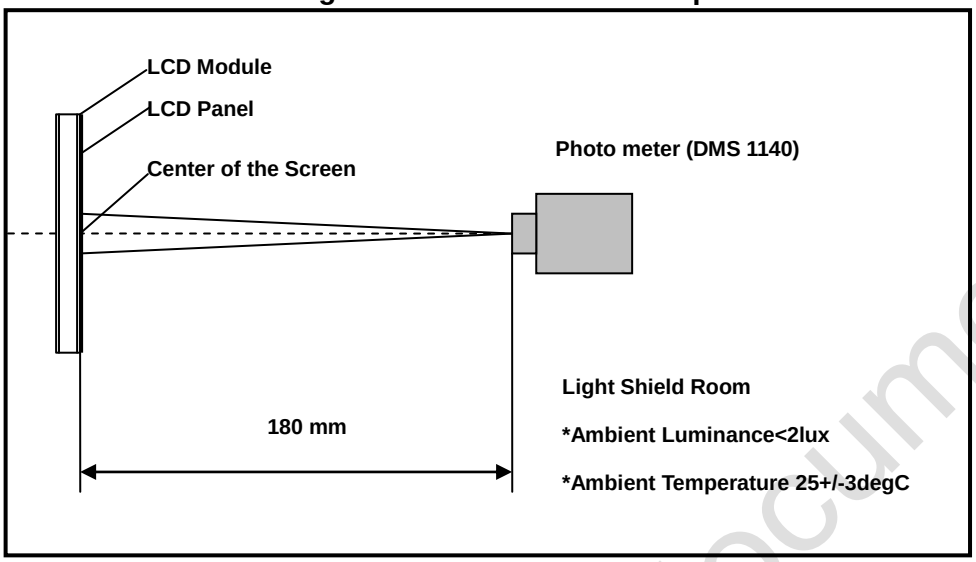
Table 8 Optical Characteristics

Item	Conditions		Specification				
			Min.	Typ.	Max.	Unit	Note
Viewing Angle [degrees] K=Contrast Ratio>10	Horizontal	Left	75	85	-	Deg.	(1),(2)
		Right	75	85	-	Deg.	
	Vertical	Up	70	80	-	Deg.	
		Down	70	80	-	Deg.	
Contrast Ratio	Center		600	1000	-	-	(1),(3)
Response Time	Rising		-	1.4	2.3	ms	
	Falling		-	3.6	5.7	ms	
	Rising + Falling		-	5	8	ms	(1),(4)
Color Chromaticity (CIE1931)	Red x		Typ. -0.03	0.648	Typ. +0.03	-	(1)
	Red y			0.339		-	(1)
	Green x			0.289		-	(1)
	Green y			0.610		-	(1)
	Blue x			0.145		-	(1)
	Blue y			0.067		-	(1)
	White x			0.313		-	(1)
	White y			0.329		-	(1)
White Luminance	ICCFL=7.5mA		200	250	-	[cd/m^2]	(1), (5)
Luminance Uniformity	ICCFL=7.5mA, 9points		75	80	-	[%]	

Note: (1)Measurement Setup

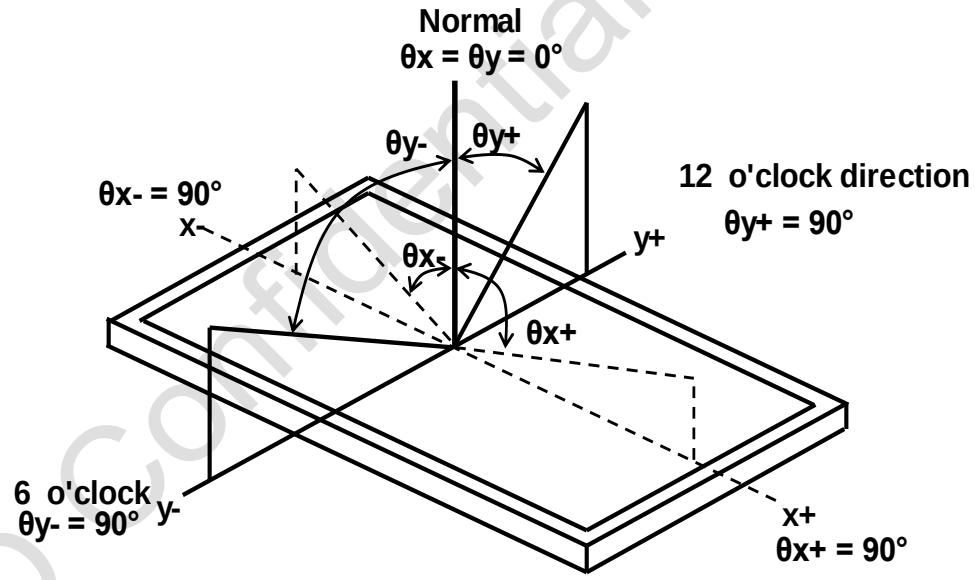
The LCD module should be stabilized at 25℃ for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in a windless room.

Figure 10 Measurement Setup



(2)Definition of Viewing Angle

Figure 11 Definition of Viewing Angle



(3)Definition of Contrast Ratio (CR)

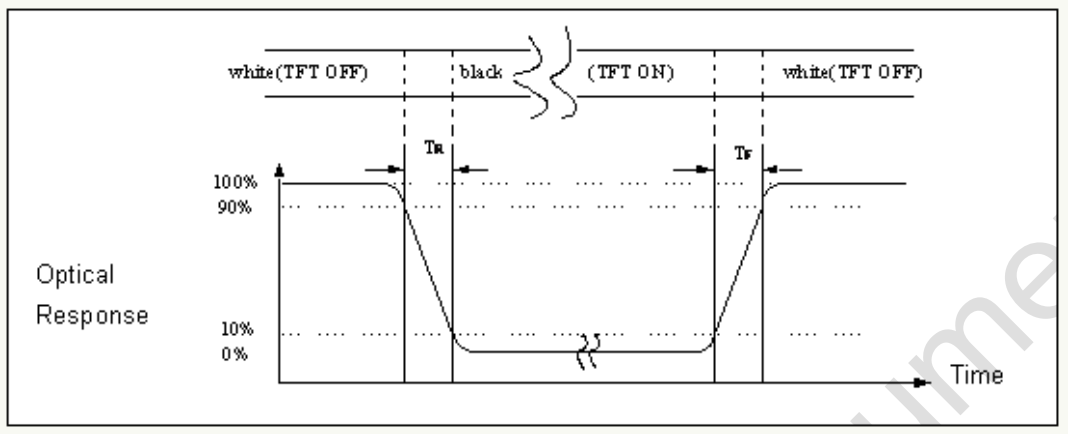
The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L255 / L0

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

(4)Definition of Response Time (T_R, T_F)

Figure 12 Definition of Response Time

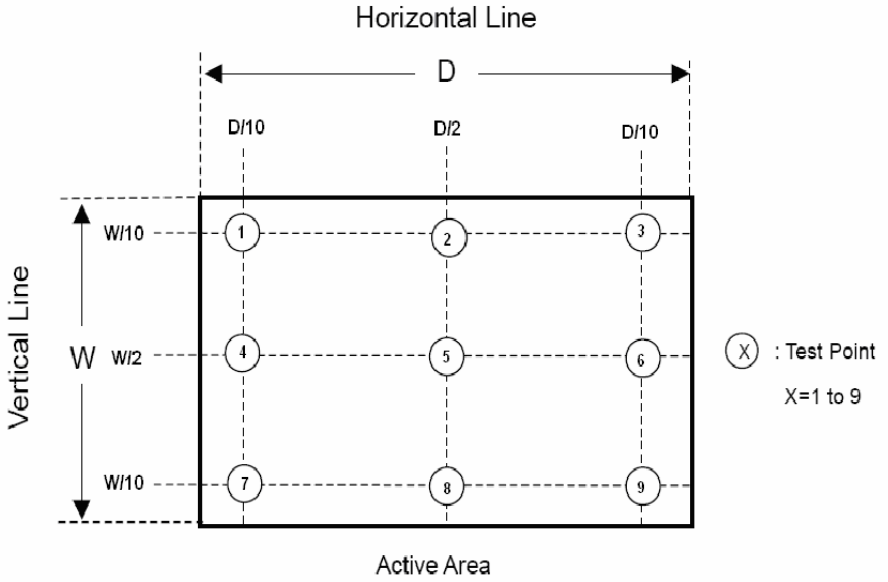


(5)Definition of White Luminance and Luminance Uniformity:

Measure the luminance of gray level 255 at point 5 (Fig.14).

$$\text{Luminance Uniformity} = \frac{\text{Minimum Brightness of nine points (P1~P9)}}{\text{Maximum Brightness of nine points (P1~P9)}}$$

Figure 13 Measurement Locations of 9 Points



5. Mechanical Characteristics

Figure 14 Reference Outline Drawing (Front Side)

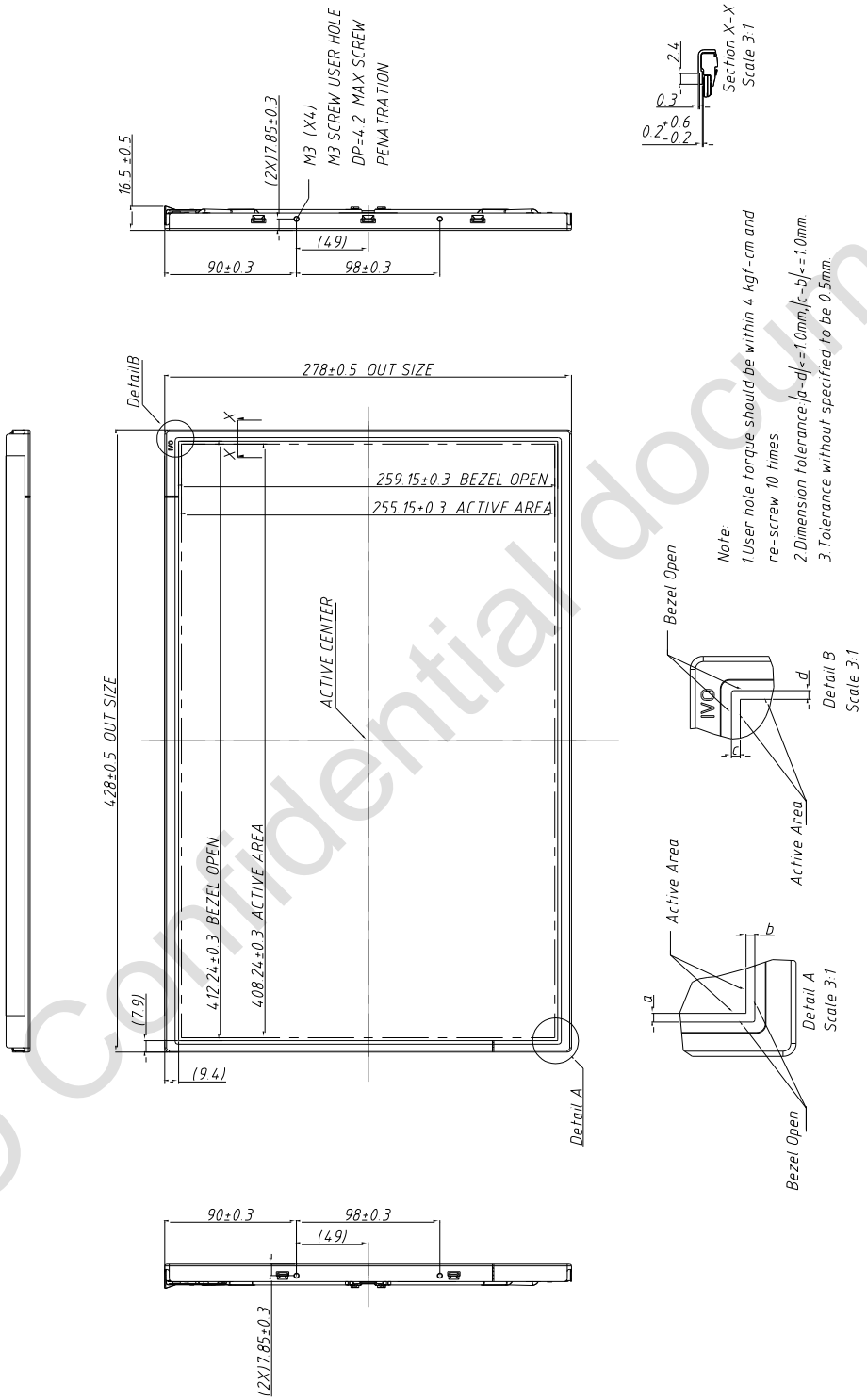
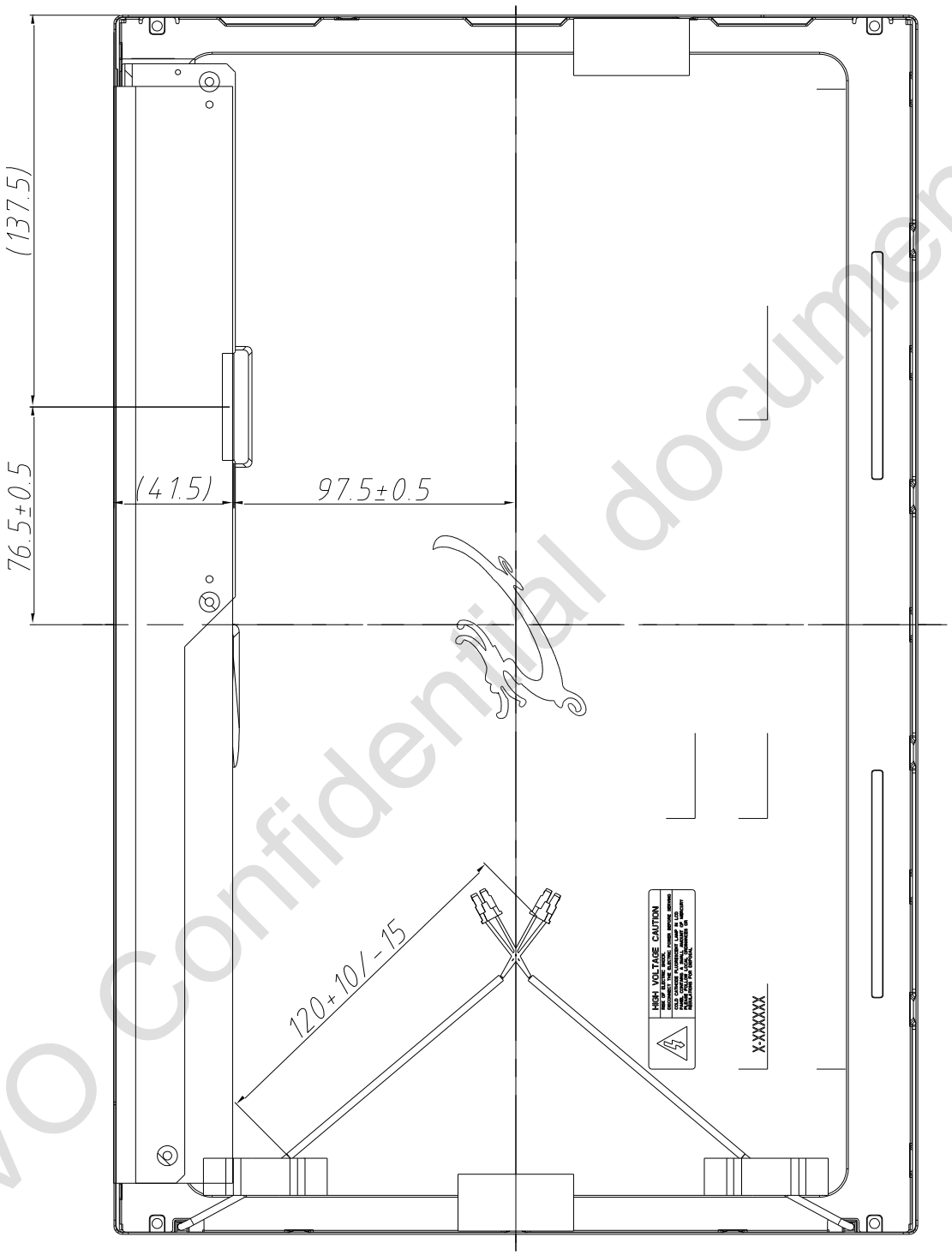


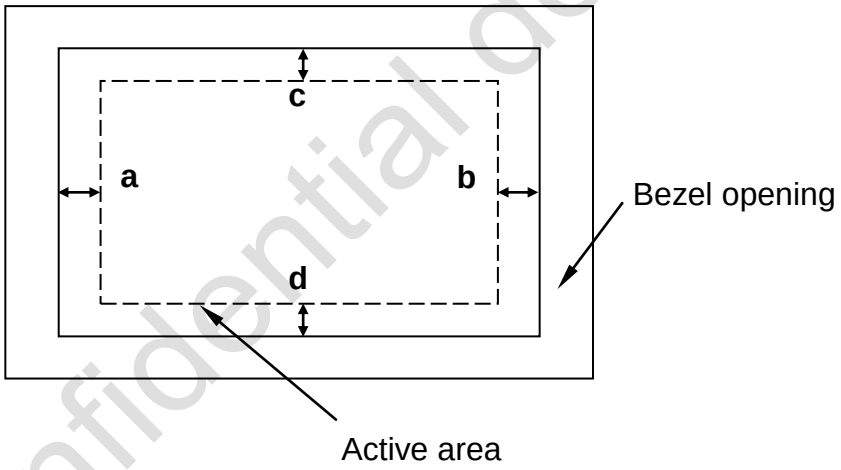
Figure 15 Reference Outline Drawing (Back Side)



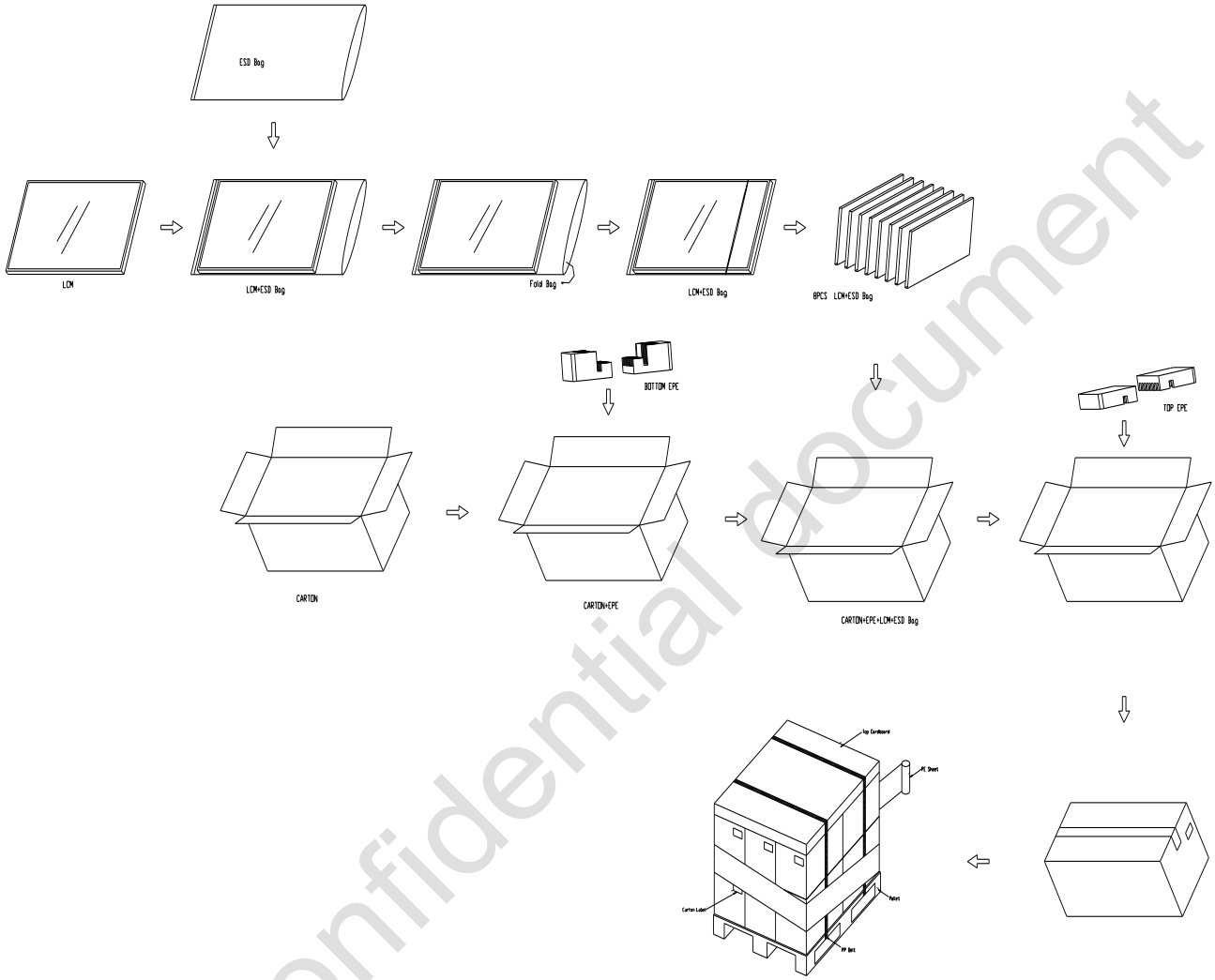
5.1 Dimension Specifications

Table 9

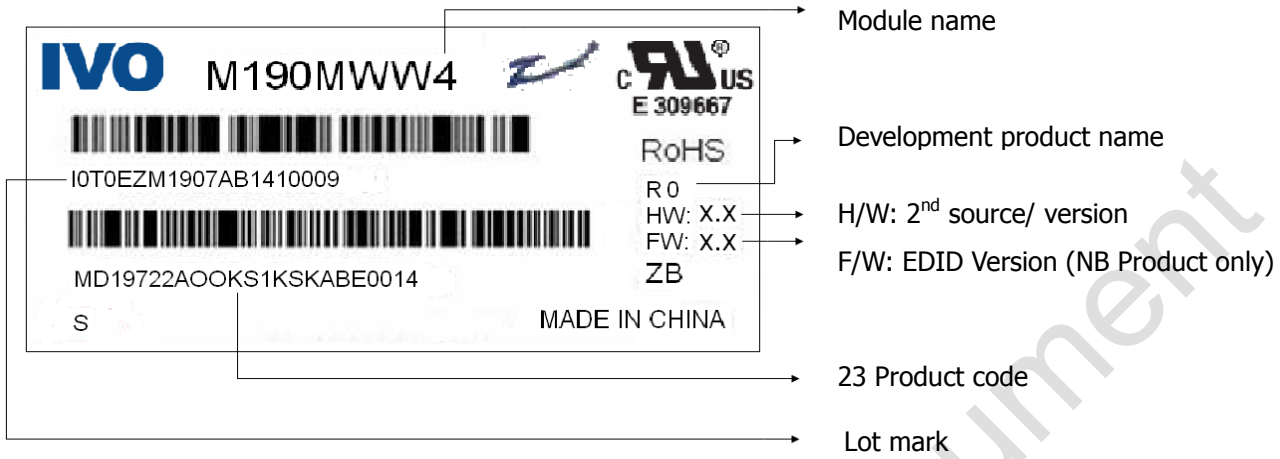
Item		Value	Unit
Width		428±0.5	mm
Height		278±0.5	mm
Thickness		16.5±0.5	mm
Bezel Opening	X	412.24±0.3	mm
	Y	259.15±0.3	mm
Weight		2,135±50	g
BM Width	| a-b | & | c-d |	≤1.0	mm



6. Package Specification



7. Lot Mark



7.1 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 Date.
- Code 17,18,19,20: Serial Number.
- Note (1) Production Year

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mark	6	7	8	9	A	B	C	D	E	F

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

7.2 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: MD Module Domain.

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” is defined as “SZ”.

Code 14 ,15: Module line “kunshan” is defined as” KS”.

Code 17,18,19 : Year, Month, Day Refer to IVO Barcode Note(1),Note(2) in Page22.

Code 20~23 : Serial Number.

8. General Precaution

8.1 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.

8.2 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. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
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. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizer. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
9) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
10) Protection film must be removed 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.

8.3 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.

8.4 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.

8.5 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 on the rear side and should be handled carefully in order not to be stressed.

8.6 Disposal

When disposing LCD module, obey the local environmental regulations.