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SPECIFICATION

[] Preliminary Specification

[☒] Final Specification

Description **11.6” 1920(RGB)x1080 TFT-LCD Module**
Part Number **P1160FHF1MA00**

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1.1	2022-12-02	11	Update TBD items	Shuqin _Ai
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1. Summary

1.1 General Description

This is a 11.6 inch a-Si TFT-LCD module with Normal- Black technology. It is composed of a TFT-LCD panel, PCB, FPC and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle Super Fine TFT (SFT)
- High luminance
- Interface: LVDS
- Surface treatment: HC
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: E250878)
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

2. General Specifications

Feature		Spec	Unit
Display Spec	Size	11.6 inch	
	Resolution	1920(RGB)x1080	
	Pixel Pitch	0.1335 x 0.1335	mm
	TFT Active Area	256.32 x 144.18	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	HC	
	Viewing Direction	All	
Mechanical Characteristics	LCM (W x H x D)outline	273.50 x 166.50 x 7.80	mm
	Weight	530	g
Optical Characteristics	Luminance	1600 typ	cd/m ²
	Contrast Ratio	900 typ	
	NTSC	70 typ	%
	Viewing Angle	88/88/88/88 typ	degree
Electrical Characteristics	Interface	LVDS	
	Color Depth	16.7 Million	color
	Power Consumption	LCD:1597.2typ; Backlight:11712 typ.	mW

Table 2.1 General TFT Specifications.

Note 1: Requirements on Environmental Protection: Q/S0002+HF;

Note 2: LCM weight tolerance: ± 5%.

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	IPEX 20455-030E-76
Matching plug	IPEX 20453-230T-11

Table 3.1.1 Connector information

Pin No.	Symbol	I/O (Note1)	Description	Comment
1	DA0-	I	Odd pixel data 0	Note1
2	DA0+	I	Odd pixel data 0	Note1
3	DA1-	I	Odd pixel data 1	Note1
4	DA1+	I	Odd pixel data 1	Note1
5	DA2-	I	Odd pixel data 2	Note1
6	DA2+	I	Odd pixel data 2	Note1
7	GND	P	Ground	Note2
8	CLKA-	I	Odd pixel clock	Note1
9	CLKA+	I	Odd pixel clock	Note1
10	DA3-	I	Odd pixel data 3	Note1
11	DA3+	I	Odd pixel data 3	Note1
12	DB0-	I	Even pixel data 0	Note1
13	DB0+	I	Even pixel data 0	Note1
14	GND	P	Ground	Note2
15	DB1-	I	Even pixel data 1	Note1
16	DB1+	I	Even pixel data 1	Note1
17	GND	P	Ground	Note2
18	DB2-	I	Even pixel data 2	Note1
19	DB2+	I	Even pixel data 2	Note1
20	CLKB-	I	Even pixel clock	Note1
21	CLKB+	I	Even pixel clock	Note1
22	DB3-	I	Even pixel data 3	Note1
23	DB3+	I	Even pixel data 3	Note1
24	GND	P	Ground	Note2
25	GND	P	Ground	Note2
26	GND	P	Ground	Note2
27	GND	P	Ground	Note2
28	VCC	P	Power supply	Note2
29	VCC	P	Power supply	Note2
30	VCC	P	Power supply	Note2

Table 3.1.2 Pin Assignment for LCD Interface

I/O definition:

I----Input P----Power/Ground

Note1: Twist pair wires with 100Ω (characteristic impedance) should be used between LCD panel signal processing board and LVDS transmitter.

Note2: All GND and VCC terminals should be used without any non-connected lines.

3.2 CN2 Pin assignment (Back Light)

Connector Information	
Matching connector	Kyocera 04 6299 614 020 846+

Table 3.2.1 Connector information

Pin No.	Symbol	I/O (Note1)	Description	Comment
1	A1	P	Anode 1	Anode 1&2 must be separate from Anode 3&4 on the LED board.
2	A2	P	Anode 2	
3	A3	P	Anode 3	
4	A4	P	Anode 4	
5	NC	N	No Connection	-
6	NC	N	No Connection	-
7	K1	P	Cathode 1	-
8	K2	P	Cathode 2	-
9	K3	P	Cathode 3	-
10	K4	P	Cathode 4	-
11	K5	P	Cathode 5	-
12	K6	P	Cathode 6	-
13	K7	P	Cathode 7	-
14	K8	P	Cathode 8	-

Table 3.2.2 Pin Assignment for Back Light Interface

I/O definition:

P---- power(Anode/Cathode) NC—No connection

4. Absolute Maximum Ratings

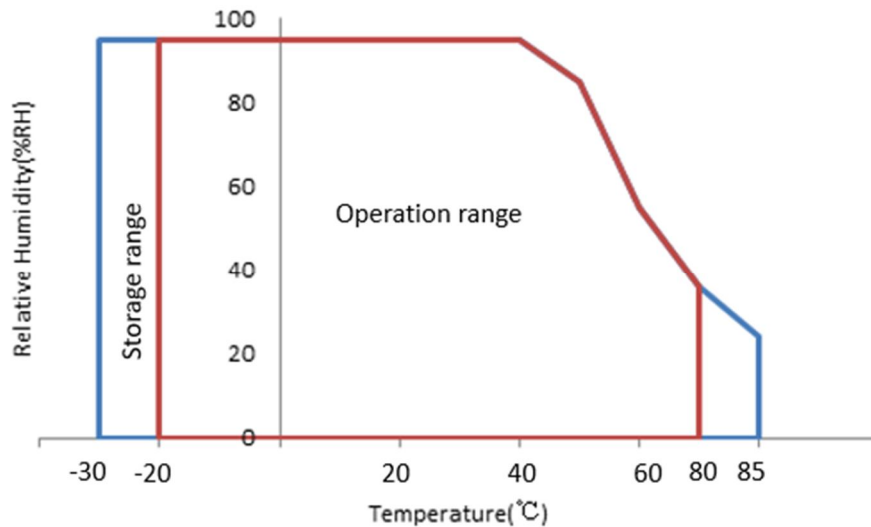
Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	5.0	V	
Input voltage	V _{LVDS}	-0.3	2	V	Note 1
Operating Temperature	Top	-20	80	°C	
Storage Temperature	Tst	-30	85	°C	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta≤50°C
		--	≤55	%	50°C < Ta≤60°C
		--	≤36	%	60°C < Ta≤70°C
		--	≤24	%	70°C < Ta≤80°C
Absolute Humidity	AH	--	≤70	g/m³	Ta > 70°C

Table 4.1 Absolute Maximum Ratings

Note1: LVDS voltage include DA0+/-,DA1+/-,DA2+/-, DA3+/-,CLKA+/-, CLKB+/-,DB0+/-,DB1+/-,DB2+/-,DB3+/-;

Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.

Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed



5. Electrical Characteristics

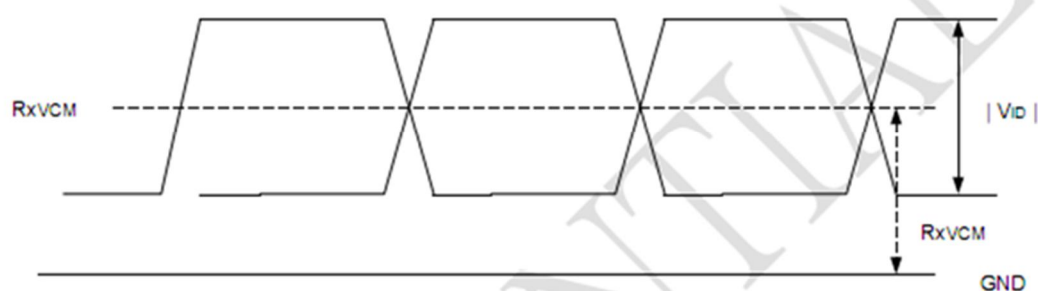
5.1 DC Characteristics for Panel Driving

 $T_a = 25^{\circ}\text{C}$

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage	VCC	3.0	3.3	3.6	V	
Power supply current	I_{VCC} (White pattern)	-	484		mA	VCC=3.3V
Permissible ripple voltage	VRP	-	-	200	mVp-p	VCC=3.3V
Terminating resistance	RT	-	100	-	Ω	
(Panel+ LSI) Power Consumption	White Mode (60Hz)	-	1597.2		mW	VCC=3.3V
Differential input common mode voltage	RxVCM	1.0	1.2	1.4	V	
Differential input voltage	$ V_{ID} $	0.1	-	$(1.5-Rxvcm)*2$	V	
Differential input leakage current	RvXliz	-10		10	μA	

Table 5.1 DC characteristic

Single-end signals



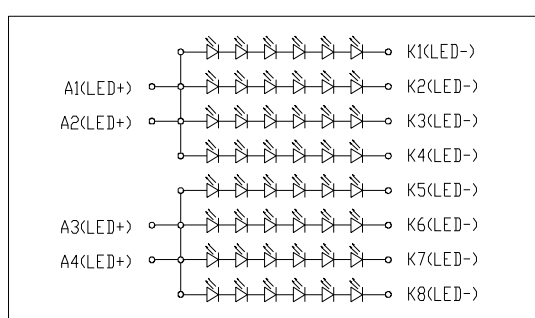
5.2 DC Characteristics for Backlight Driving

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current(per string)	I _F	-	40	-	mA	48LED(6LED Serial,8LED Parallel)
Forward Current Voltage (per string)	V _F	-	36.6	-	V	
Backlight Power Consumption	W _{BL}	-	11712	-	mW	
LED life time		10000	30000		Hrs	

Table 5.2 LED Backlight Characteristics

Note 1: The figure below shows the connection of backlight LED.



Backlight Circuit Diagram

Note 2: I_F / V_F is defined for one string LED.

Note 3: Optical performance should be evaluated at Ta=25°C only.

If LED is driven by high current, high ambient temperature & humidity condition, the life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

5.3 Recommended Power ON/OFF Sequence

VDD must be on 1 to 2 ms before LVDS signal is rising

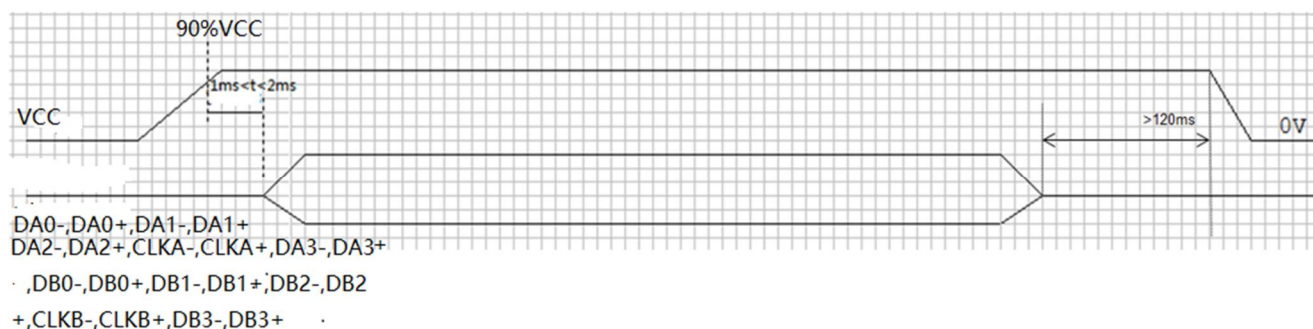


Figure 5.3 Power on/OFF sequence

5.4 LCD Module Block Diagram

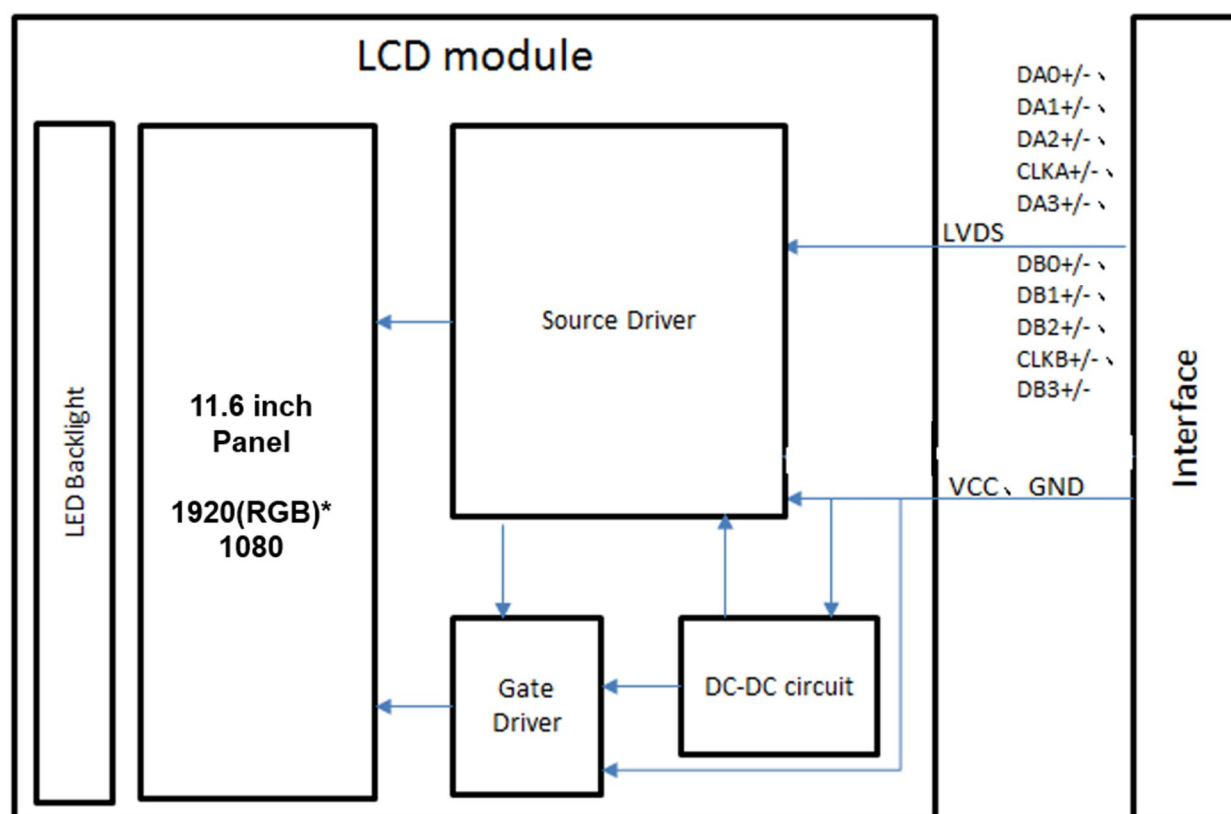
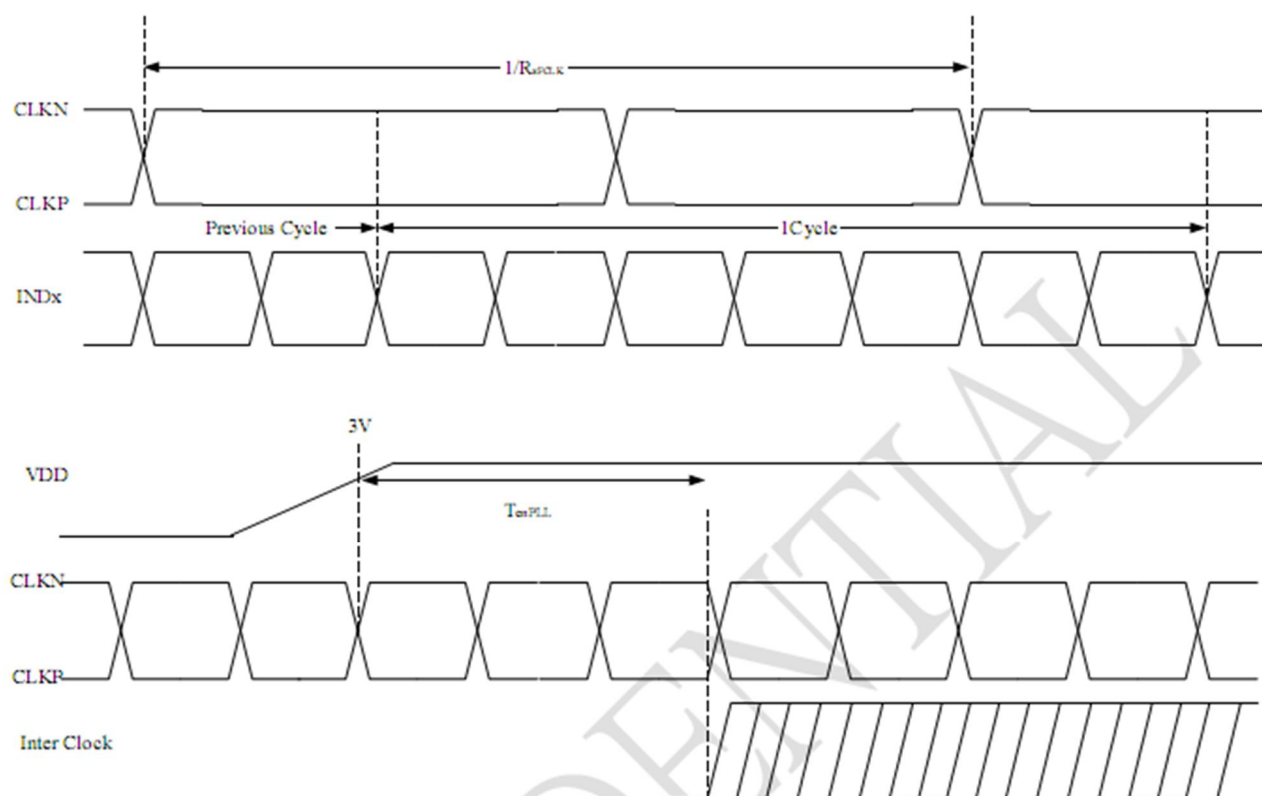


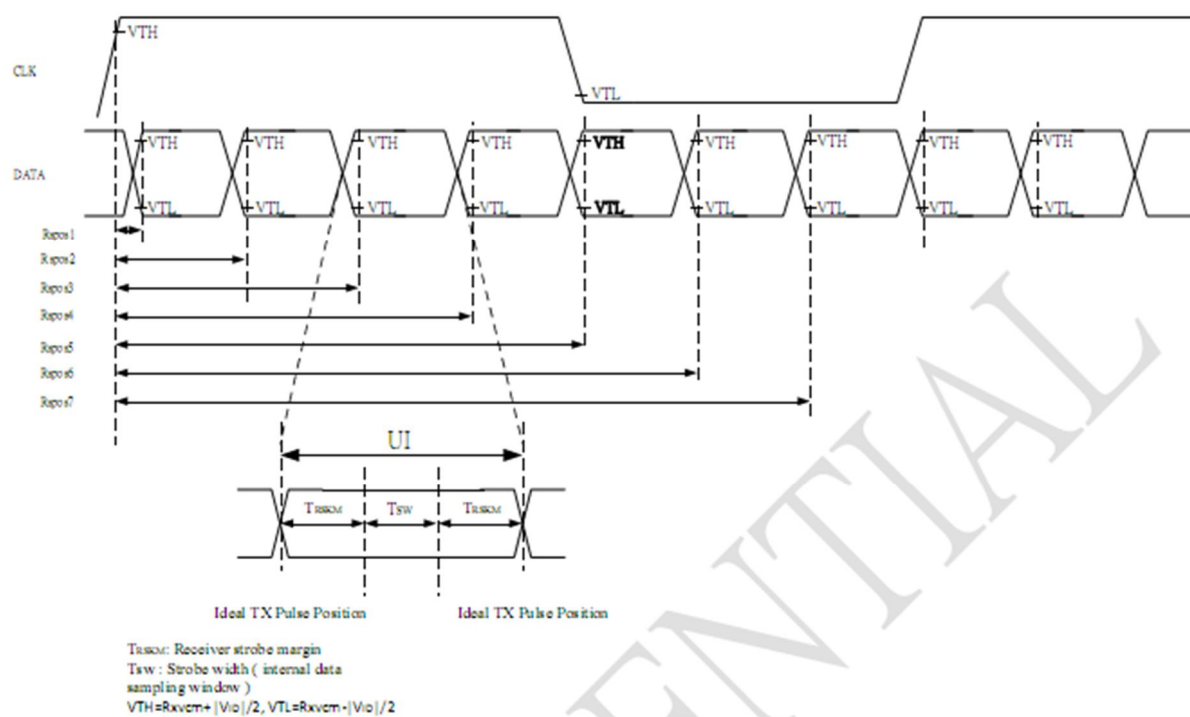
Figure 5.4 LCD Module Block Diagram

6. Timing Characteristics

6.1 AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	RXFCLK	10	-	110	MHz	
1 data bit time	UI		1/7		1/RXFCLK	
Position 1	Rspos1	-0.2	0	0.2	UI	
Position 2	Rspos2	0.8	1	1.2	UI	
Position 3	Rspos3	1.8	2	2.2	UI	
Position 4	Rspos4	2.8	3	3.2	UI	
Position 5	Rspos5	3.8	4	4.2	UI	
Position 6	Rspos6	4.8	5	5.2	UI	
Position 7	Rspos7	5.8	6	6.2	UI	
Input data skew margin	T_{RSKM}	-	-	0.2	UI	$ VID =100mV$ RXVCM=1.2V RXFCLK=75MHz
Clock high time	T_{LVCH}	-	$4/(7 \cdot \text{RXFCLK})$	-	ns	
Clock low time	T_{LVCL}	-	$3/(7 \cdot \text{RXFCLK})$	-	ns	
PLL wake-up time	T_{enPLL}	-	-	150	us	

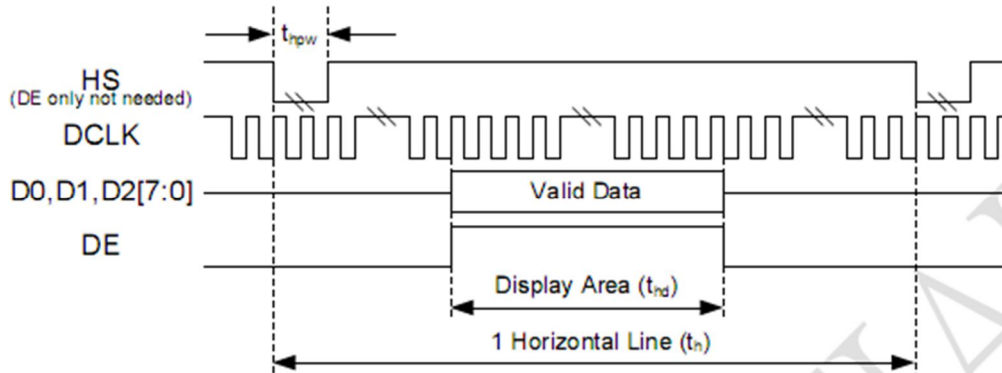




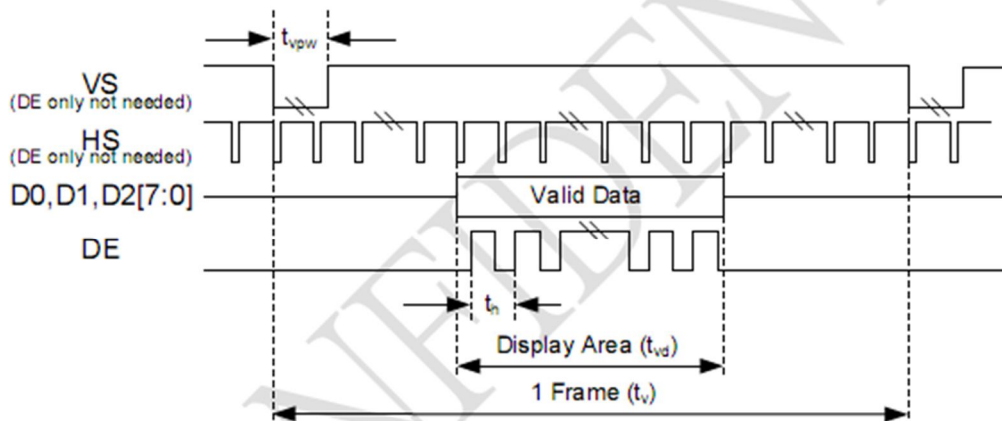
6.2 Timing input format

DE Mode Data Input Format for IC as source driver with timing controller

Horizontal

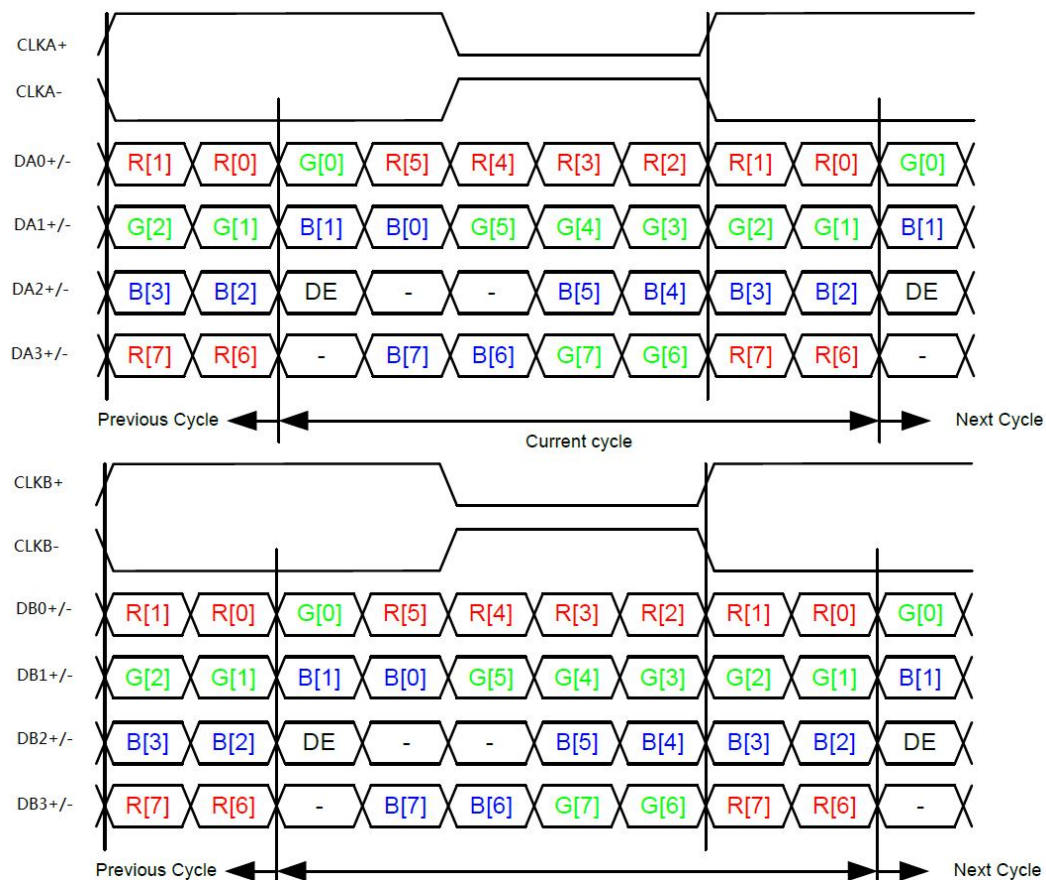


Vertical



Parameter	Symbol	1920RGBx1080 (Two Port)			Unit	Note
		Min.	Typ.	Max.		
DCLK Frequency	F _{DCLK}	66.46	66.85	83.42	MHz	
Horizontal valid data	t _{hd}	960			DCLK	
1 Horizontal Line	t _h	1020	1024	1150	DCLK	
Vertical valid data	t _{vd}	1080			H	
1 Vertical field	t _v	1086	1088	1209	H	if thermal enable, V-blank > 5line+315us
Frame rate	FR	60			Hz	

6.3 Data input format



2-port LVDS signals, VESA format

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	88	-	degree	Note2,3
		θB		70	88	-		
		θL		70	88	-		
		θR		70	88	-		
Contrast Ratio		CR	θ=0°	700	900			Note 3
Response Time		T _{ON}	25℃	-	25	35	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.254	0.304	0.354		Note 1,5
		y		0.273	0.323	0.373		
	Red	x		0.581	0.631	0.681		Note 1,5
		y		0.286	0.336	0.386		
	Green	x		0.262	0.312	0.362		Note 1,5
		y		0.562	0.612	0.662		
	Blue	x		0.099	0.149	0.199		Note 1,5
		y		0.003	0.053	0.103		
Uniformity		U		70	80	-	%	Note 6
NTSC		-		65	70	-	%	Note 5
Luminance		L		1280	1600	-	cd/m ²	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. $I_F=40mA$ (LED current), the ambient temperature is 25°C.

2. The test systems refer to Note 1 and Note2.

.

Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

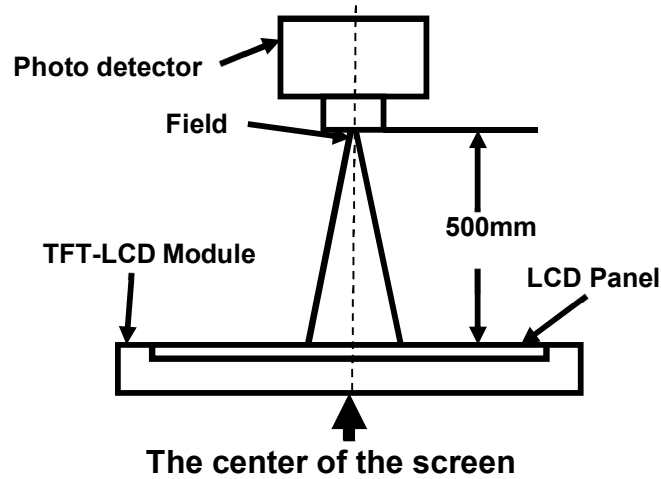


Fig1. Measurement Set Up

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD .

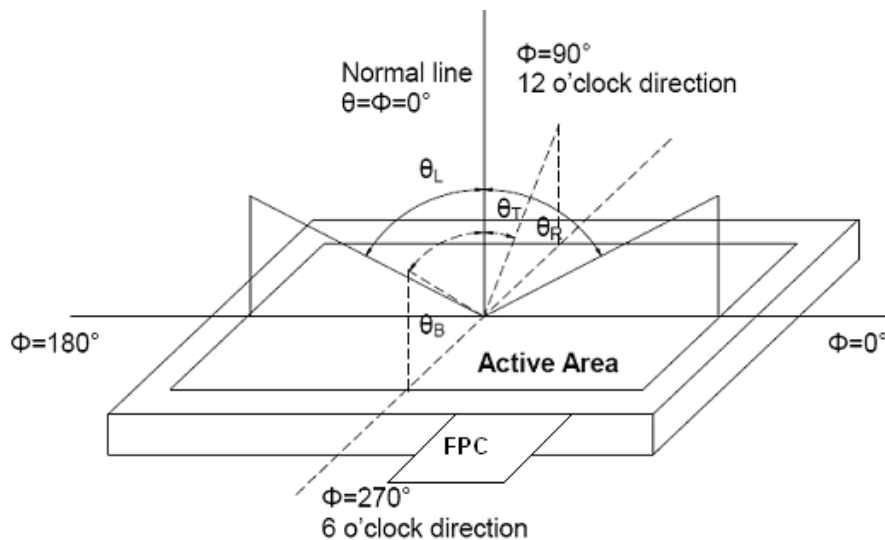


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note4: Definition of Response time

the response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_r) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.

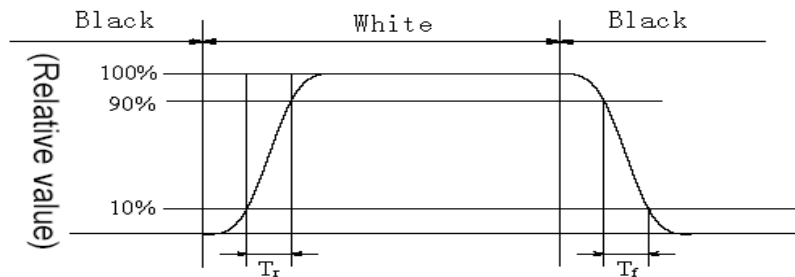


Fig4. Response Time Testing(SFT)

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

$L_{\max}$: The measured Maximum luminance of all measurement position.

$L_{\min}$: The measured Minimum luminance of all measurement position.

L-----Active area

length;W----- Active area width

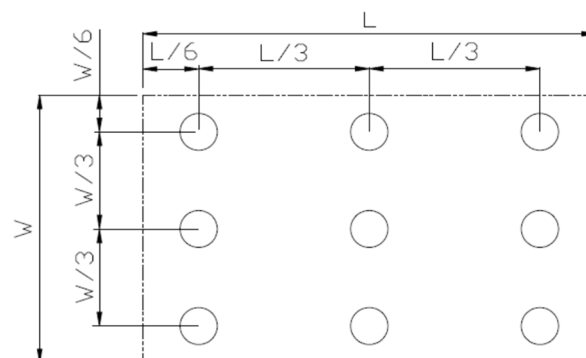


Fig5. Luminance Uniformity Measurement Locations (9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	+80℃,240H	IEC60068-2-1:2007 GB/T 2423.2-2008
2	Low Temperature Operation	-20℃,240H	IEC60068-2-1:2007 GB/T 2423.1-2008
3	High Temperature Storage	+85℃,240H	IEC60068-2-1:2007 GB/T 2423.2-2008
4	Low Temperature Storage	-30℃,240H	IEC60068-2-1:2007 GB/T 2423.1-2008
5	Temperature & Humidity Operation	60℃,90%RH,240 hours	IEC60068-2-78 :2001 GB/T 2423.3-2016
6	Thermal Shock (non-operation)	-30℃,30min~80℃,30min, change time:5min,100cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984, GB/T 2423.22-2012-Na
7	ESD	C=150pF, R=330Ω,5point/panel Air: ±8kv,5times; Contact: ±4kv,5times; (Environment:15℃~35℃, 30%~60%,86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T 17626.2-2018
8	Vibration (non-operation)	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2h for x, y, z(total 6h)	IEC60068-2-6:1982 GB/T 2423.10-2019
9	Shock (non-operation)	Half Sine Wave 60G ,6ms, ±X, ±Y, ±Z 3times for each direction	IEC60068-2-27:1987 GB/T 2423.5-2019
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	GB/T 4857.5-1992

Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample

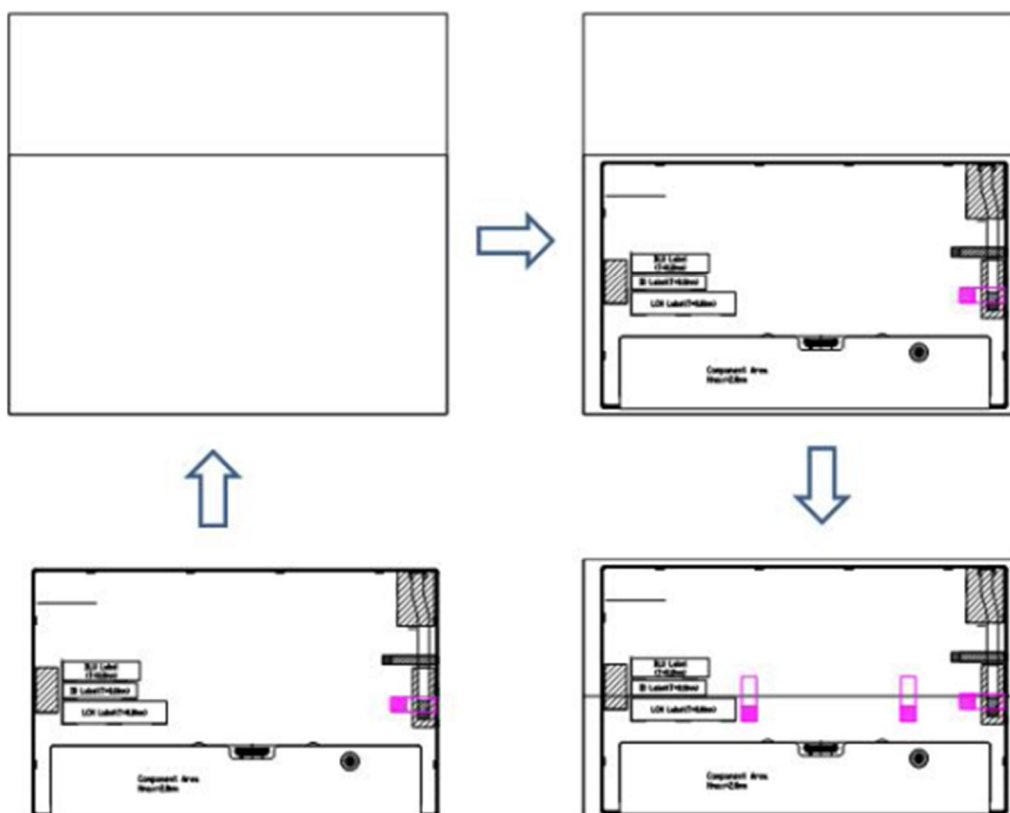
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

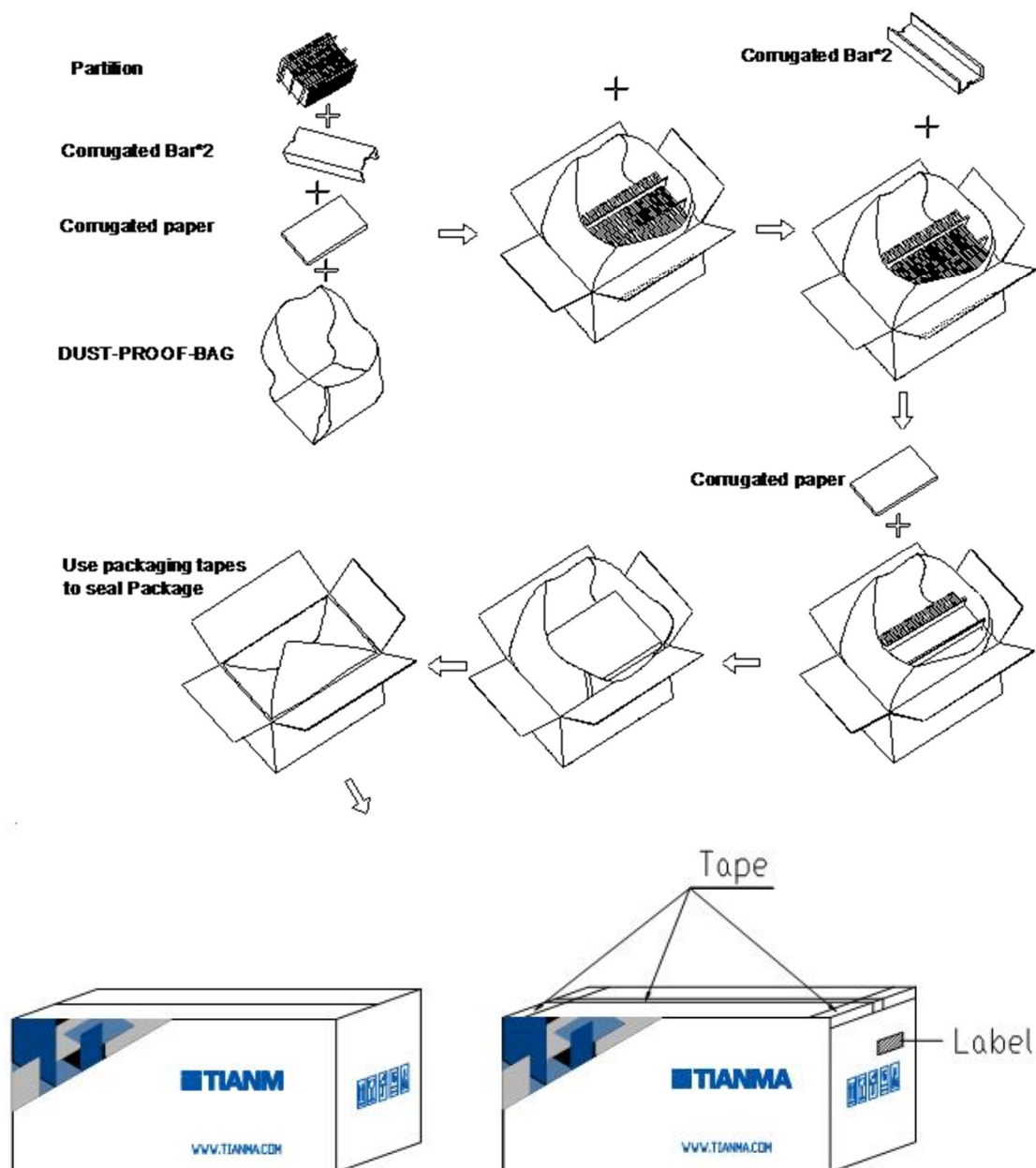
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

10. Packing Instruction

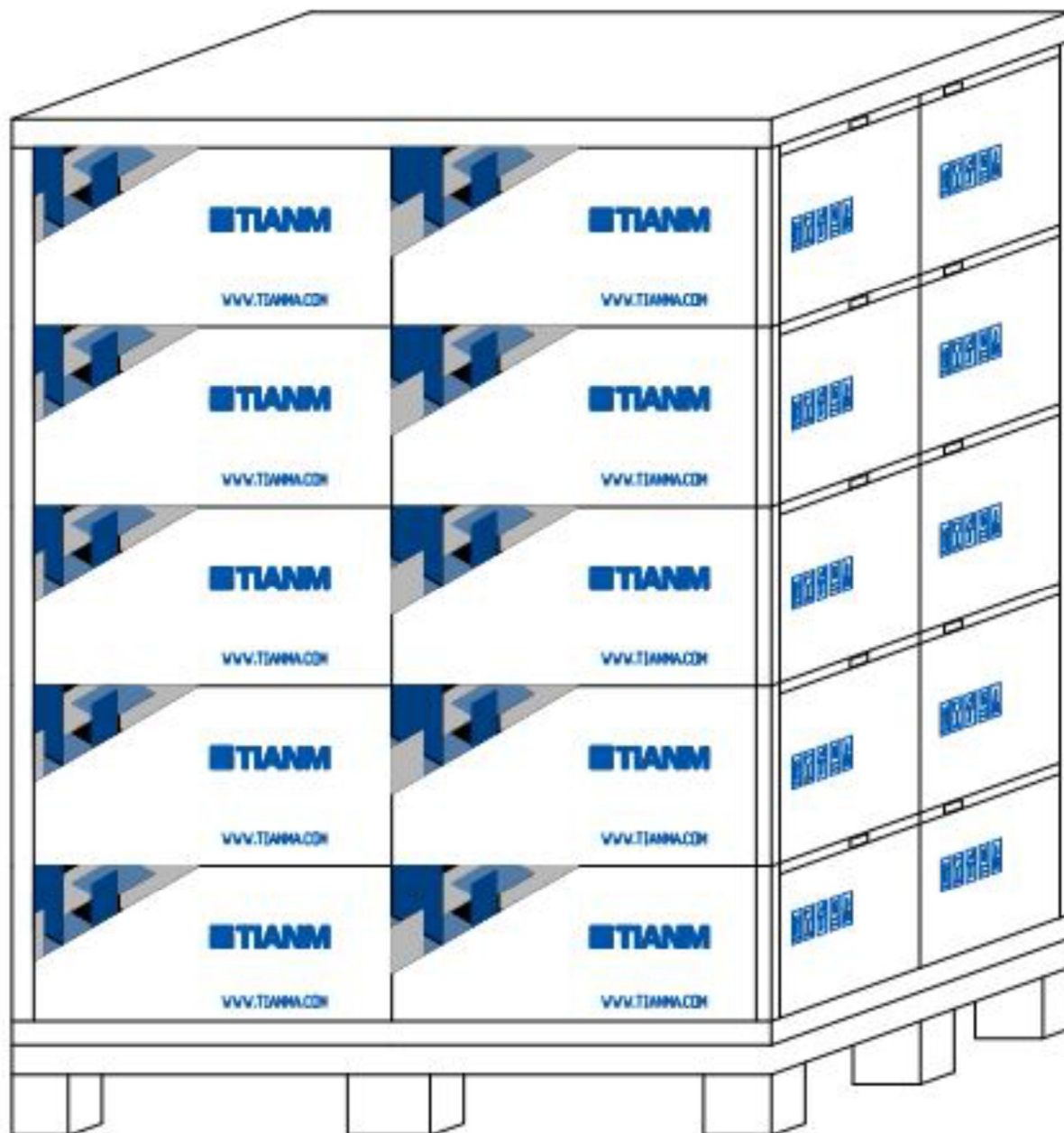
No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Q'ty	Remark
1	LCM module	P1160FHF1MA01	273.50*166.50*7.80	0.525	14	
2	Partition_1	Corrugated Paper	513.00*413.00*240	1.42	1	
3	Anti-static Bubble Bag	PE	270*295	0.01	14	Anti-static
4	Dust-Proof Bag	PE	700*545	0.06	1	
5	Partition_2	Corrugated Paper	513*413	0.1	1	
6	Corrugated Bar	Corrugated Paper	367*305*48	0.08	1	
7	Beauty-grain	Tape	30*10	0.00003	42	
8	Carton	Corrugated Paper	530*430*274	0.76	1	
9	Label	Label	100*52	0.000345	1	
10	Total weight	9.93±5%Kg				

Total LCM quantity in Carton: 14





Stock method (2*2*5 layer)



11. Precautions for Use of LCD Modules

11.1 Handling Precautions

- (1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
- (2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcohol
 Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- (6) Do not disassemble the LCD Module.
- (7) If powered off, do not apply the input signals.
- (8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
- (9) Be sure to ground your body when handling the LCD Modules.
- (10) Tools used for assembly, must be properly grounded.
- (11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
- (12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

11.2 Storage precautions

- (1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 °C at normal humidity.
- (3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

11.5 Safety Precautions

- (1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
- (2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- (3) LED driver should be designed to limit or stop its function when over current is detected on the LED.