SPECIFICATION

[　] Preliminary Specification

[◉] Final Specification

Description **12.8" 1920xRGBx1080 TFT-LCD Module**

Part Number **P1280FHF1MAAA**

Customer	
Signatures	Date

Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Approved By	Date
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Comments:

* This cover page is for your Comments and Signatures back to TIANMA.

REVISION HISTORY

Rev	Date	Page	Revision Items	Editor
1.0	2021-8-5	First release	Preliminary spec	Yang Yang
1.1	2022-1-4	8	Update Lifetime of LED	Yang Yang
2.0	2022-5-7	all	Update Final Spec new Version	Yang Yang

CONTENTS

1. Summary

1.1 General Description

This is an 12.8 inch amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) Normally Black technology module, which is composed of a TFT-LCD panel, LCD Driver IC with T-con integrated, FPC and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle Super Fine TFT (SFT)
- High resolution 10801920xRGBx1920
- Interface: LVDS
- Surface treatment HC

- 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	12.8 inches	
	Resolution	1920 (RGB)x1080	
	Pixel Pitch	0.1476x0.1476	mm
	TFT Active Area	283.392×159.408	mm
	Technology Type	A-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	HC	
Mechanical Characteristics	LCM (W x H x D)	292.69*171.21*7.45	mm
	Weight	446.92	g
Optical Characteristics	Luminance	800typ	cd/m^2
	Contrast Ratio	1400:1typ	
	NTSC	74typ	%
	Viewing Angle	88/88/88/88 typ	degree
Electrical Characteristics	Interface	LVDS	
	Color Depth	16.7 Million	color
	Power Consumption	578	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

| Connector Information	
Matching connector	FH28K-60S-0.5SH or equivalent

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Remark
1	A4	P	LED Anode 4	
2	A3	P	LED Anode 3	
3	A2	P	LED Anode 2	
4	A1	P	LED Anode 1	
5	NC	/	Not connected	
6	NTC1	O	Thermistor +	
7	NTC2	O	Thermistor -	
8	NC	/	Not connected	
9	K4	P	LED Cathode 4	
10	K3	P	LED Cathode 3	
11	K2	P	LED Cathode 2	
12	K1	P	LED Cathode 1	
13	NC	/	Not connected	
14	NC	/	TIANMA test pin. This pin must float;	Note1
15	GND	P	Ground	
16	ELV3P	I	Even LVDS signal 3p	
17	ELV3N	I	Even LVDS signal 3n	
18	GND	P	Ground	
19	ELVCKP	I	Even LVDS clockp	
20	ELVCKN	I	Even LVDS clockn	
21	GND	P	Ground	
22	ELV2P	I	Even LVDS signal 2p	
23	ELV2N	I	Even LVDS signal 2n	
24	GND	P	Ground	
25	ELV1P	I	Even LVDS signal 1p	
26	ELV1N	I	Even LVDS signal 1n	
27	GND	P	Ground	
28	ELV0P	I	Even LVDS signal 0p	

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29	ELV0N	I	Even LVDS signal 0n	
30	GND	P	Ground	
31	OLV3P	I	Odd LVDS signal 3p	
32	OLV3N	I	Odd LVDS signal 3n	
33	GND	P	Ground	
34	OLVCKP	I	Odd LVDS clockp	
35	OLVCKN	I	Odd LVDS clockn	
36	GND	P	Ground	
37	OLV2P	I	Odd LVDS signal 2p	
38	OLV2N	I	Odd LVDS signal 2n	
39	GND	P	Ground	
40	OLV1P	I	Odd LVDS signal 1p	
41	OLV1N	I	Odd LVDS signal 1n	
42	GND	P	Ground	
43	OLV0P	I	Odd LVDS signal 0p	
44	OLV0N	I	Odd LVDS signal 0n	
45	GND	P	Ground	
46	NC	/	Not connected	
47	AVDD	P	Power supply for AVDD	
48	AVDD	P	Power supply for AVDD	
49	NC	/	Not connected	
50	SC	I	Scanning direction control PIN	Note2
51	NC	/	Not connected	
52	VGL	P	Power supply for VGL	
53	NC	/	Not connected	
54	VGH	P	Power supply for VGH	
55	NC	N	TIANMA test pin. This pin must float;	Note1
56	VCC	P	Power supply for LCD	
57	VCC	P	Power supply for LCD	
58	NC	N	TIANMA test pin. This pin must float;	Note1
59	NC	N	TIANMA test pin. This pin must float;	Note1
60	GND	P	Ground	

I/O definition: I--Input   O--Output   I/O--Input/Output   P--Power/Ground   N—No Connect

Note 1: TIANMA test pin. This pin must float;
Note 2: Description of scan direction: SC=H, case1 ; SC=L ,case2

Source Scan Direction

Gate Scan Direction

Case 1

Source Scan Direction

Gate Scan Direction
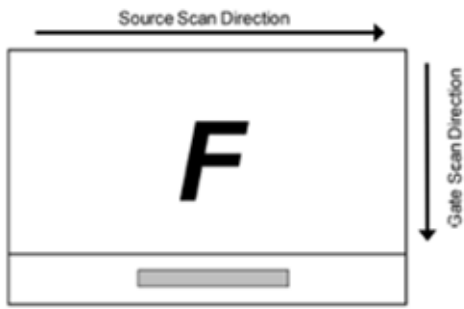
Case 2

4. Absolute Maximum Ratings

GND=0V

Item	Symbol	Min	Max	Unit	Remark
Logic supply voltage for LCD	VCC	-0.3	5	V	
Logic supply voltage for IO	IOVCC	-0.3	5	V	Note3
Driver output voltage	VLVDS	-0.5	2	V	Note4
Driver output volatge	AVDD	-0.5	15	V	
Supply voltage, VGG	VGH	-0.3	VGL+42V	V	
Supply voltage, VEE	VGL	VGH-42V	0.3	V	
Operating Temperature	Top	-30	85	°C	Note1/2
Storage Temperature	Tst	-40	90	°C	Note1

Table 4.1.1 Absolute Maximum Rating

Note1: The temperature is the ambient temperature (Ta = 25°C) of module.
Note2: No Electro-optical specifications are guaranteed below -30°C.
Note3: IOVCC includes SC PIN.
Note4: VLVDS includes dual link LVDS signal.

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

GND=0V.Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Logic supply voltage	VCC	3.2	3.3	3.4	V	
VCC Current			86	129	mA	NOTE1
Power for analog circuit	AVDD	12.8	13	13.2	V	
AVDD Current			19	28.5	mA	NOTE1
Positive power supply for gate	VGH	22	23	24	V	
VGH Current			1	1.5	mA	NOTE1
Negative power supply for gate	VGL	-7.5	-8	-8.5	V	
VGL Current			3	4.5	mA	NOTE1
Input High Voltage	V_{IH}	0.7*VCC	-	VCC	V	
Input Low Voltage	V_{IL}	0	-	0.3*VCC	V	
Output High Voltage	V_{OH}	VCC-0.4	-	VCC	V	
Output Low Voltage	V_{OL}	0	-	0.4	V	
Power Consumption	P(mW)	-	578	889		NOTE1

Table 5.1.1 Operating Voltages for Panel
Note1：Power consumption test and current test are under White pattern criteria.

5.2 AC Characteristics

Differential Input common Mode voltage	R_{XVCM}	1	1.2	1.4	V	
Differential Input voltage	$|V_{ID}|$	0.1	-	$(1.5-R_{XVCM})*2$		

Table 5.2 AC Characteristics for LVDS
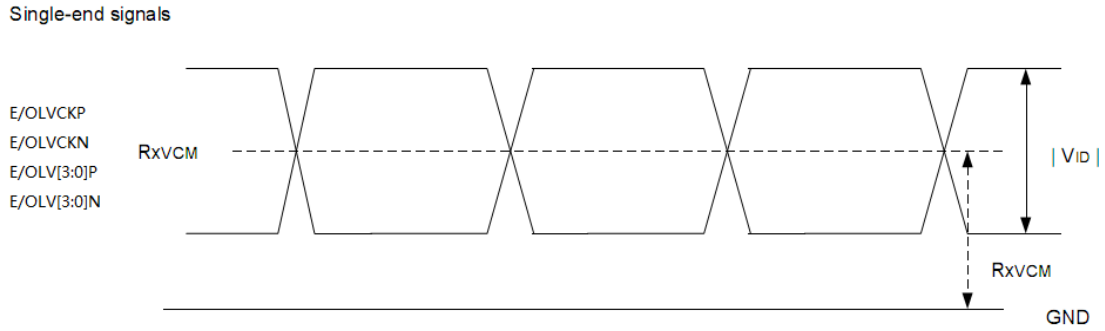
Figure 5.2 AC Characteristics for LVDS

5.3 DC Characteristics for Backlight Driving

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward current	I_F	--	105	120	mA	Note1
Forward voltage	V_{BL}	25.2	27.45	30.6	V	Note2
Backlight Power Consumption	P_{BL}	10.584	11.529	12.852	W	Note2
Lifetime	--	--	50000	--	Hrs	Note2,3

Table 5.2.1 LED backlight characteristics
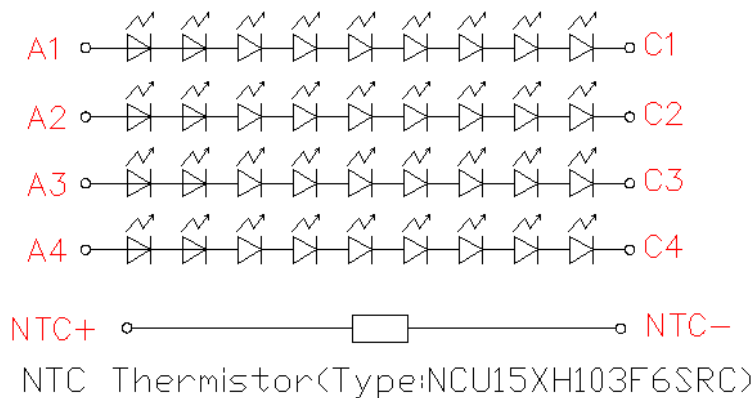
Figure 5.2.2 LED connection of backlight.

Item	Value	Remarks
Type	NCU15XH103F6SRC	Murata
Resistance / Tolerance	10kΩ±1%	Ta=25°C
Permissive Operating Current	0.31mA	Ta=25°C

Table 5.2.3 Thermistor description

Note1: IF is defined for one channel LEDs. There are total four LED channels in backlight unit. While the LCM is operating a stable forward current should be input.
Note2: IF =105mA per channel.
Note3: Optical performance should be evaluated at Ta=25°C only. If the LEDs are driven at high current or at high ambient temperature & humidity condition, the lifetime of the LEDs will be reduced. Operating lifetime means the brightness decrease to 50% of the original brightness.
Note4: NTC thermistor is included in the LED circuit and the part number is NCU15XH103F6SRC. It is used for measuring LED temperature and is located in the LED circuit on the backlight FPC.
Note5: To reduce the influence of NTC self-heating and improve the measurement accuracy, suggest the operating current of NTC is 0.031mA.
Note6: When operating at high temperature, NTC resistance should not be below 1.096Ω
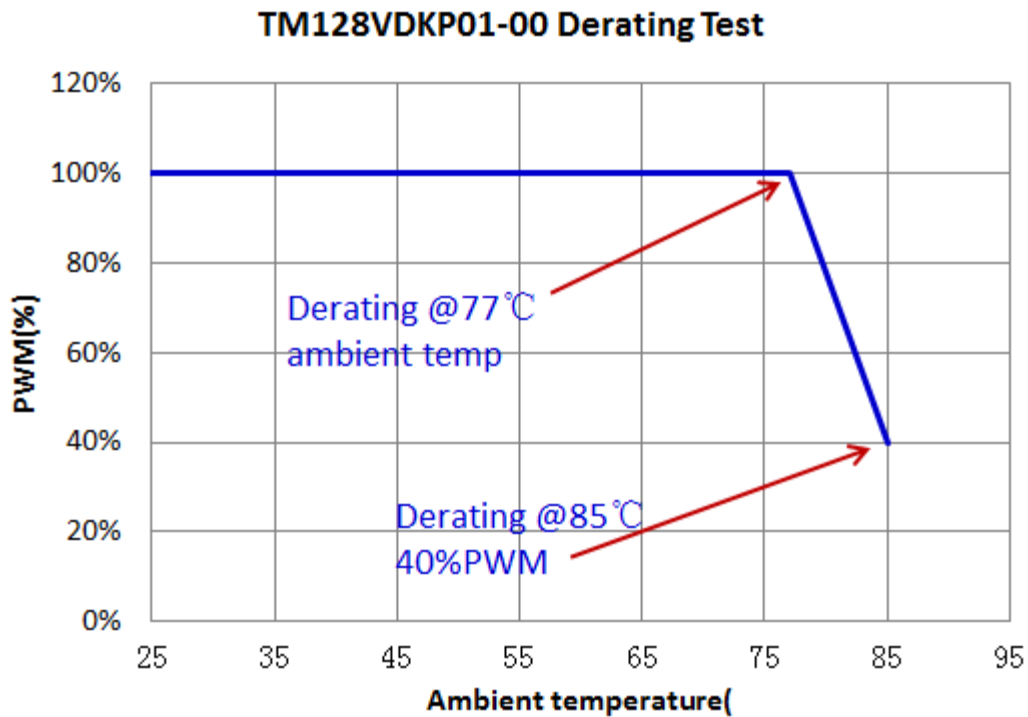

Figure 5.2.4 PWM vs. Ambient Temperature
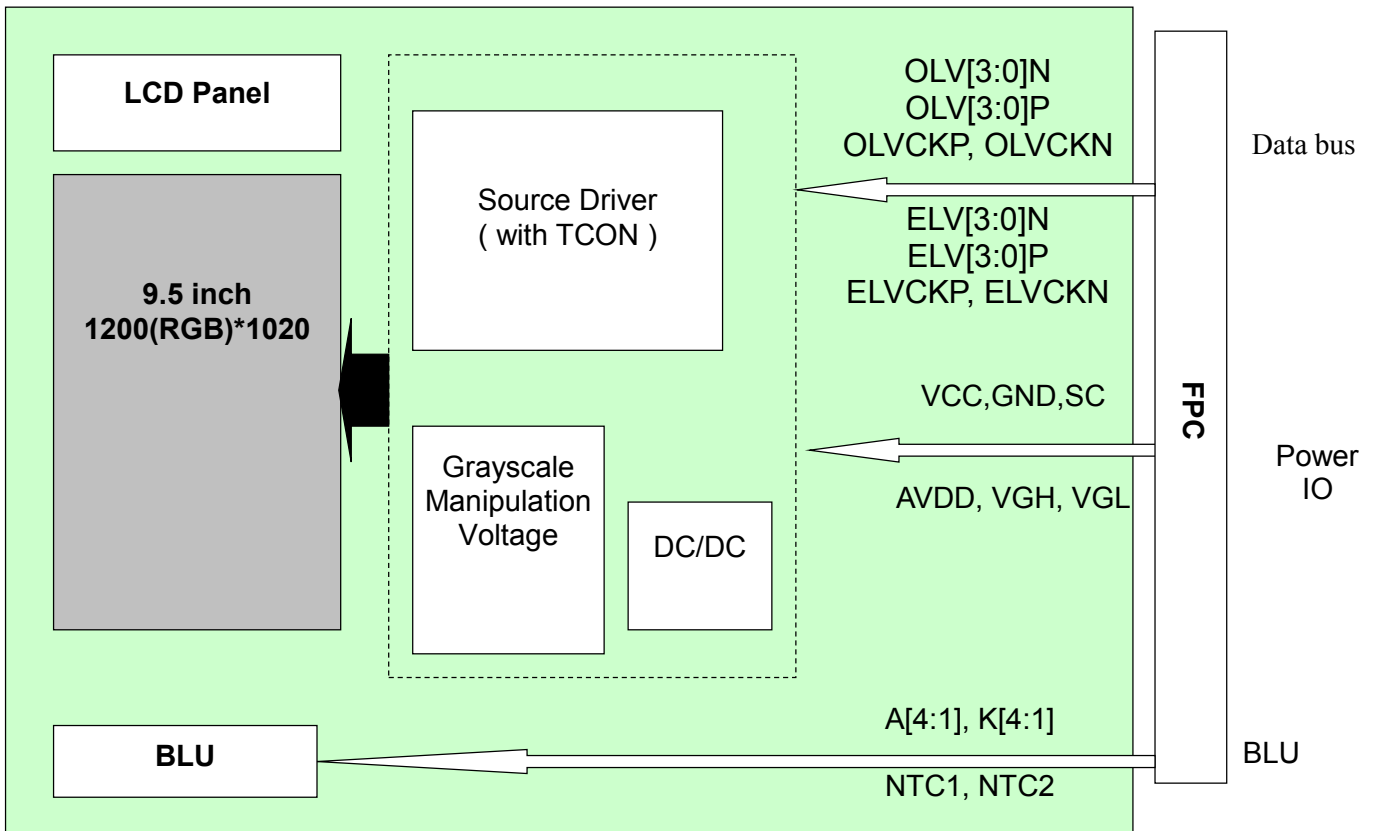
5.4 LCD Module Block Diagram

Figure 5.4.1 Block diagram

6. Timing Characteristics

6.1 LVDS 2 ports input timing

（GND=0V）

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	

Table 6.1.1 LVDS input timing
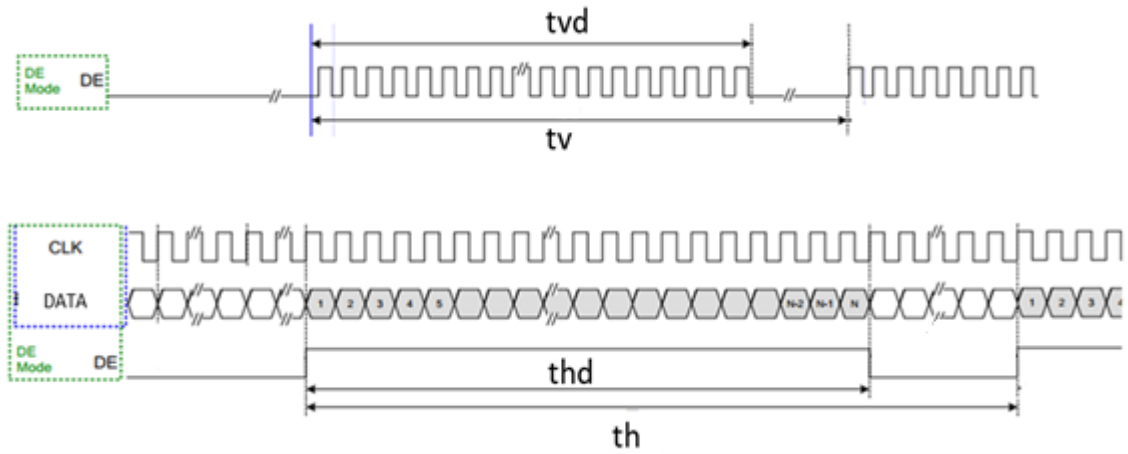
Figure 6.1.2　Dual-link LVDS Input Timing Format

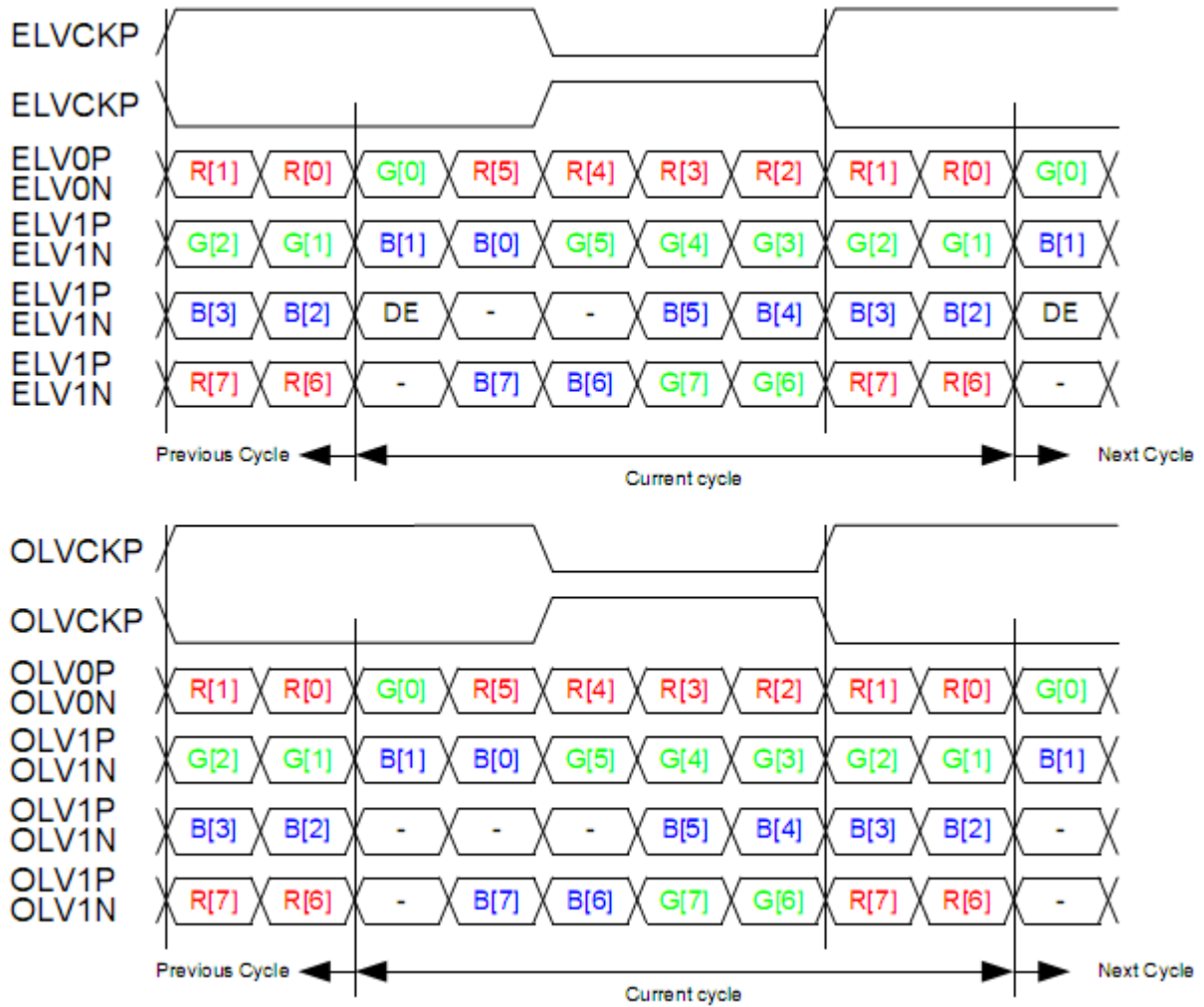## 6.2 RGB Timing at DE mode

6.2.1 LVDS data mapping

Figure 6.2.1   2ports LVDS 8-bit data VESA mapping
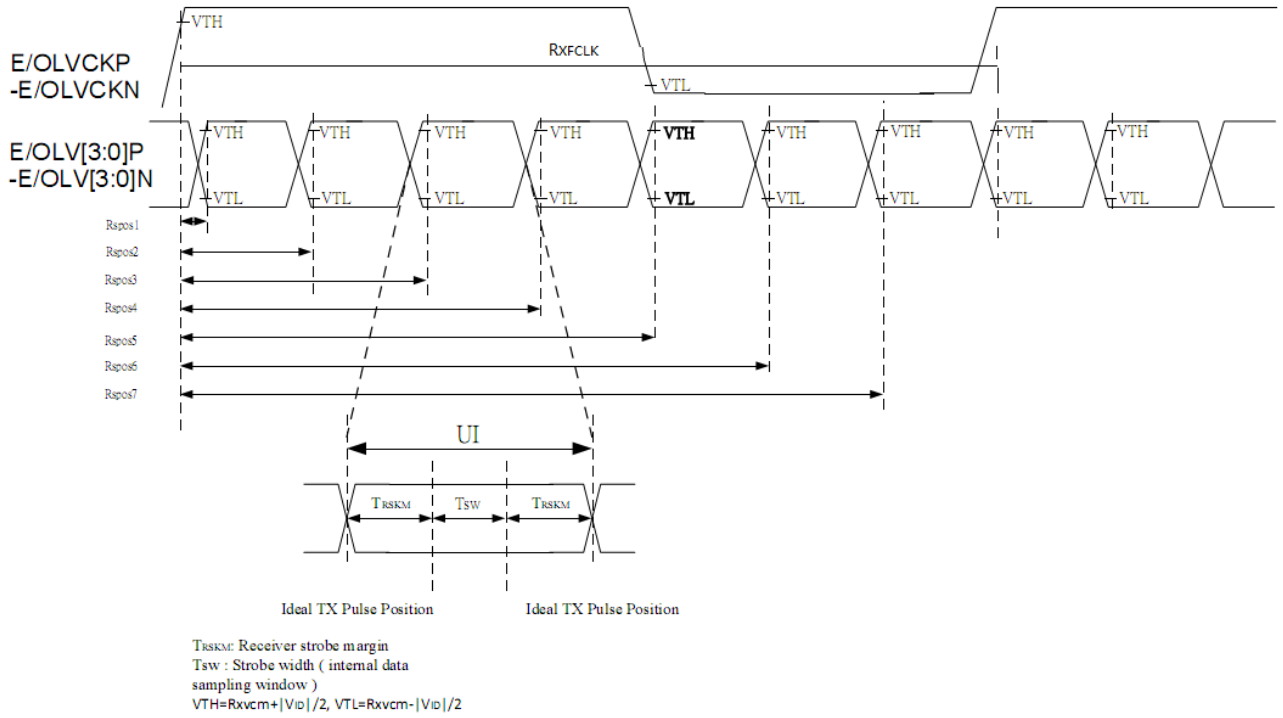
6.2.2 LVDS data mapping

T_{RSKM}: Receiver strobe margin
T_{SW} : Strobe width (internal data sampling window)
VTH=Rxvcm+|V_{ID}|/2, VTL=Rxvcm-|V_{ID}|/2

Figure 6.2.2 LVDS Input Timing

VCC=3.3V ;GND=0V

Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock Frequency	R_{XFCLK}	10	-	110	MHz
1 data bit time	UI	-	1/7	-	1/ R_{XFCLK}
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
Clock high time	T_{LVCH}	-	4/(7* R_{XFCLK})	-	ns
Clock low time	T_{LVCL}	-	3/(7* R_{XFCLK})	-	ns

Table 6.2.2 LVDS Input Timing Parameters

6.3 Recommended Power ON/OFF Sequence

6.3.1 Power on sequence
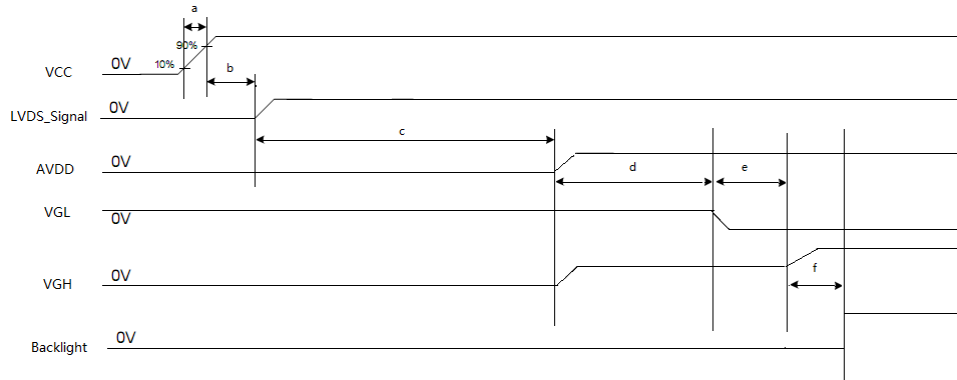
Parameter	Min	Typ	Max	Unit
Ta	>1	-	<20	ms
Tb	>1	-	-	ms
Tc	>47ms	-	<63	ms
Td	-	34ms	-	ms
Te	-	16.7ms	-	ms
Tf	>100ms	-	-	ms

Table 6.3 Power ON Sequence
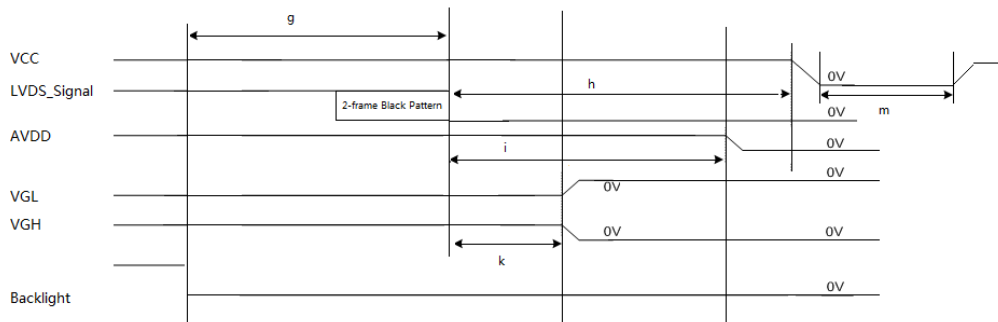
6.3.2 Power off sequence

Parameter	Min	Typ	Max	Unit
Tg	84	-	-	ms
Th	84	-	-	ms
Ti	67	-	-	ms
Tk	16.7	-	-	ms
Tm	1	-	-	s

Table 6.4 Power Off Sequence

7. Optical Characteristics

| Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle		θU	CR≧10	80	88	--		Note1
		θD		80	88	--		
		θL		80	88	--		
		θR		80	88	--		
Contrast		Perpendicular	25°C	1100	1400	--	--	Note2 Note3
Response Time		Ton+off	25°C	--	--	30	ms	Note4
		Ton+off	-20°C	--	--	250		
		Ton+off	-30°C	--	--	500		
Chromaticity	White	x	CIE1931-XYZ Backlight is on (25°C) perpendicular	0.252	0.292	0.332	--	Note5 Note2 Note10
		y		0.279	0.319	0.359	--	
	Red	x		(0.606)	(0.636)	(0.666)	--	Note5 Note2
		y		(0.295)	(0.325)	(0.355)	--	
	Green	x		(0.278)	(0.308)	(0.338)	--	
		y		(0.591)	(0.621)	(0.651)	--	
	Blue	x		(0.122)	(0.152)	(0.182)	--	
		y		(0.029)	(0.059)	(0.089)	--	
Luminance homogeneity white		U	9 points, 25°C	80%	85%			
Luminance homogeneity black		U	9 points, 25°C	60%	65%			
Luminance		Perpendicular	25°C	600	800			
NTSC		--	CIE1931-XYZ	70	74	--	%	Note5
Reflectivity		Module	SCI	--	--	6	%	Note8
Gamma		VESA γ	25°C	2.0	2.2	2.4		
Flicker		Half-grey pattern	db	--	--	-28		Note9

Test Conditions:
1. I$_F$= 105 mA (one channel), the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

3. Warm-Up Time before measurement: 5 min Ambient Temp. (if not specified): +25°C.   Backlight (if not specified):100% PWM. All values will be measured perpendicular if there is no viewing angle.
4. All test conditions are ambient temperature except for response time. For response time is panel surface temperature, center of display.

Note1: Definition of viewing angle range and measurement system

　　　Viewing angle is measured at the center point of the LCD by DMS-803/ EZ CONTRAST
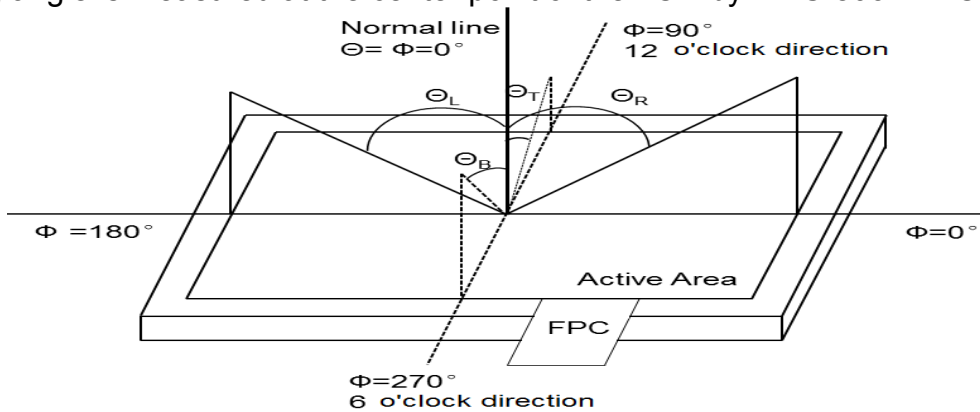
Note2: Definition of optical measurement system

　　Measured at the center of the panel by optical measurement system, refer to Table Optical Measurement System..

　　Measuring condition:
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=+25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.
- Measured value at the center point of LCD panel after 30 minutes while backlight is turned on.
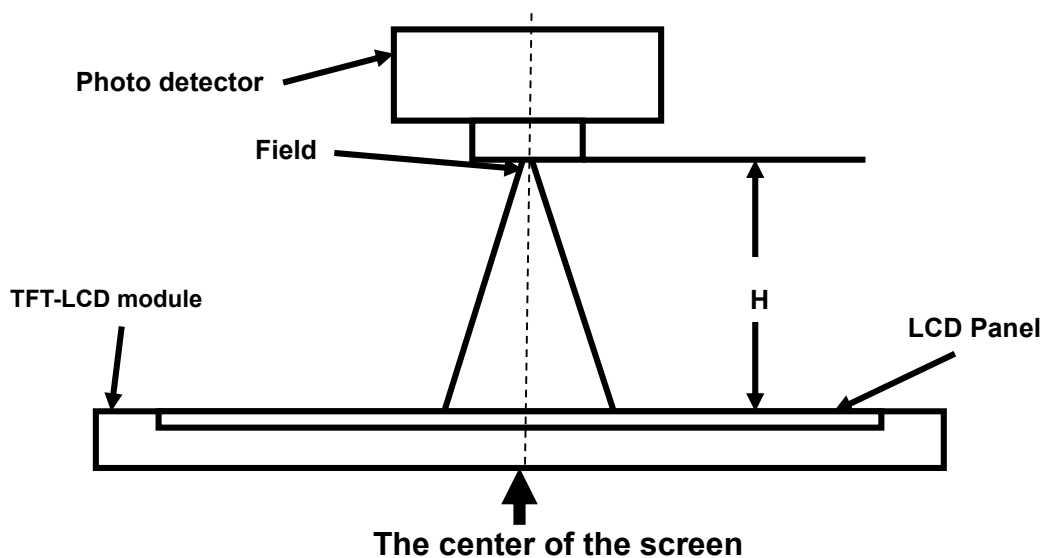

The center of the screen

Table: Optical Measurement System

Item	Photo detector	Field	Equipment Suppliers
Contrast Ratio	EZ-Contrast	6mm/3mm	SR-3 & SR-UL1R:TOPCON
Luminance	SR-3A	1°	SR-3 & SR-UL1R:TOPCON
Chromaticity	SR-3A	1°	SR-3 & SR-UL1R:TOPCON
Lum Uniformity	LMK 5-5COLOR/LMK98-4	\	Technoteam
Contrast Plot/	EZ-Contrast	6mm/3mm	EZ CONTRAST XL88RC:ELDIM
Viewing angel	EZ-Contrast		EZ CONTRAST XL88RC:ELDIM
Response Time	DMS803	3mm	DMS803 :Instrument Systems
Reflectivity	CM3600A	8mm/25.4mm	Konica
Flicker	CA310	\	Konica

Note3: Definition of contrast ratio:

$$\text{Contrast Ratio(CR)}= \frac{\textbf{Luminance When LCD is White}}{\textbf{Luminance When LCD is Black}}$$

Contrast Ratio is measured in optimum common electrode voltage

Note4: The response time has to be reached in stable temperature situation (30 min after start-up).

Definition of pixel response times:

Ton=Tblack→white

Toff=Twhite→black

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of the LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas. Every measuring pointed is placed at the center of each measuring area.

Luminance Uniformity(U)=Lmin/Lmax

L----Active area length W---- Active area width

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.
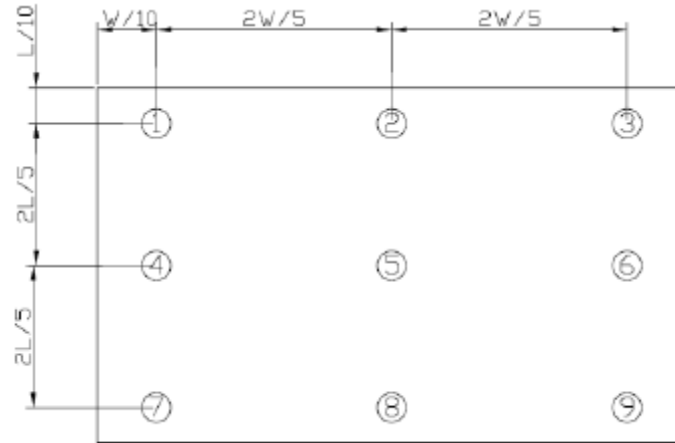
Note7: Definition of Luminance
  Measure the luminance of white state.
  Luminance is measured in optimum common electrode voltage
  White state ": The state is that the LCD should drive when 255 grey scale..
  The luminance test should follow the De-rating curve.
Note8: SCI&SCE reflective ratio measure method.
   Measurement system: CM 3600A fully integral sphere
   Light source: D65
   d/8°(ASTM E 1164-09)
   Observer angle: 10°
   State: LCD power-off
   Standard d/8° Integration Sphere Spectroscopic – Reflectometer
Note9: Definition of flicker
   Half-grey pattern

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8. Reliability Test

No	Test Item	Test condition	Criterion
1	High Temperature Storage	Ta=95℃±2℃ 500hrs	IEC60068-2-1:2007 GB/T 2423.2-2008
2	Low Temperature Storage	Ta=-40℃±3℃ 500hrs,	IEC60068-2-1:2007 GB/T 2423.1-2008
3	High Temperature Operation	Ta=85℃±2℃ 500hrs	IEC60068-2-1:2007 GB/T 2423.1-2008
4	Low Temperature Operation	Ta=-30℃±3℃ 500H	IEC60068-2-1:2007 GB/T 2423.1-2008
5	Operation at High Temperature and Humidity	Ta=60℃±2℃, 90±2%RH 500H	IEC60068-2-78 :2012 GB/T2423.3—2016
6	Thermal Shock (non-operational)	-40°C→ change→+85°C 30min 30s 30min 100cycle non-operation	Start with cold temperature, End with high temperature, IEC60068-2-14:2009, GB/T 2423.22-2012
7	Vibration Test (non-operational)	Frequency: 8 - 33.3 Hz, Total amplitude: 1.3mm Frequency: 33.3 - 400 Hz, Acceleration: 29.4 m/s² sweep time: 15 minutes 2 hours each for X and Z directions, 4 hours for Y direction (total 8 hours) non-operation	IEC60068-2-6:1995 GB/T2423.10—2008
8	Shock Test (non-operational)	100 x 9.8m/s2, t=6ms, XYZ directions, Half sin curve, [non-operating],each directions 2 times	IEC60068-2-27:1987 GB/T2423.5—1995
9	ESD	Air discharge: C=150pF±10%, R=330Ω±10%, 5 point/panel Air: +/-15KV, 5times Class C Single module Contact discharge: C=150pF±10%,R=330Ω±10%, 5 point/panel Contact: +/-8KV,5times Class C Single module	IEC61000-4-2:2001 GB/T17626.2-2006
10	Mechanical Shock (Non OP)	Half Sine Wave 60G ,6ms,±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
11	Package Drop Test	Height: X cm,1 corner, 3edges, 6 surfaces Note: X is according to the weight of the whole box, 60cm for ≥10Kg; < 10 kg, 80 cm	ISO 2248:1985 GB/T 4857.5-1992

Note1: Ta 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.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.
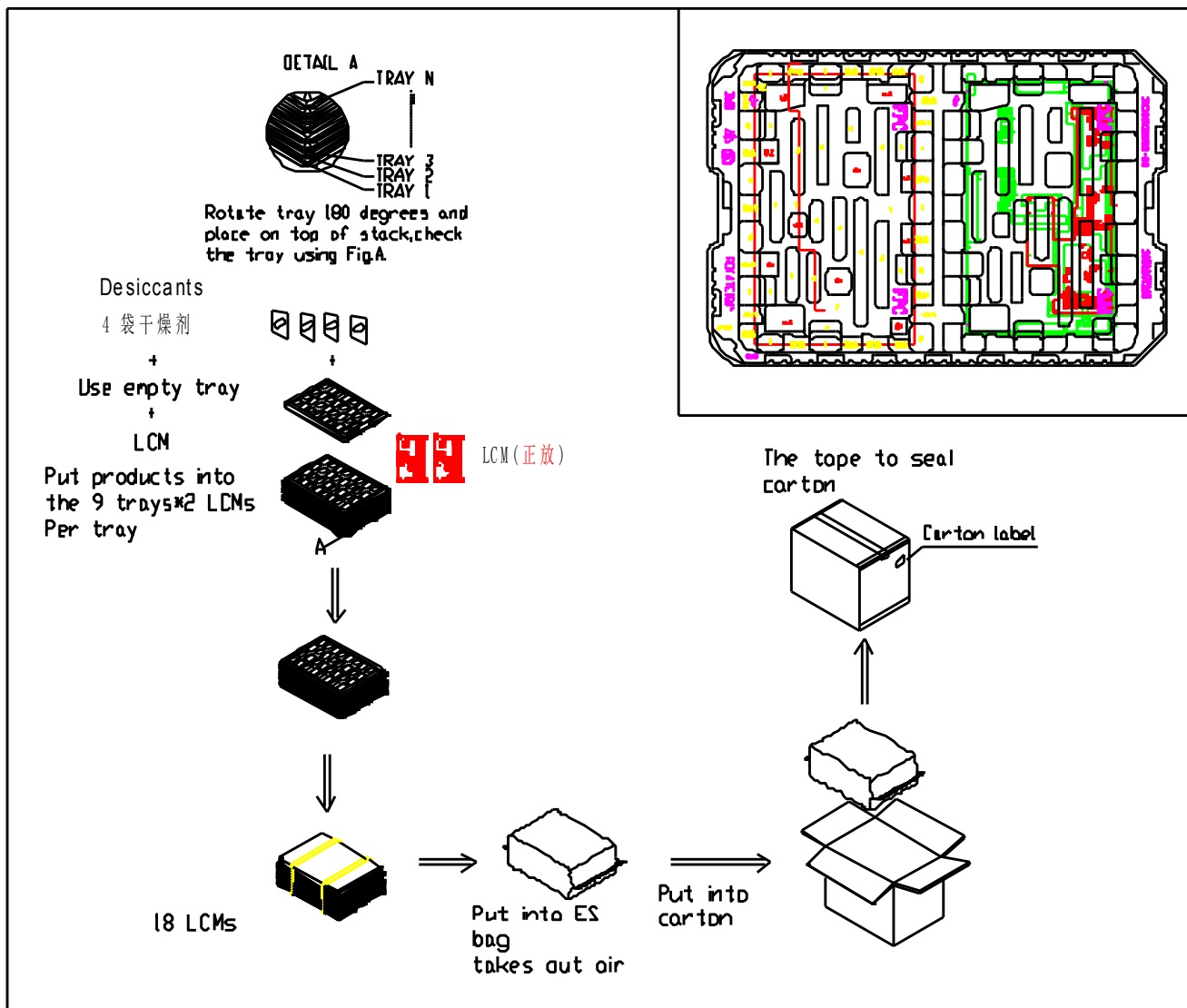
9. Mechanical Drawing
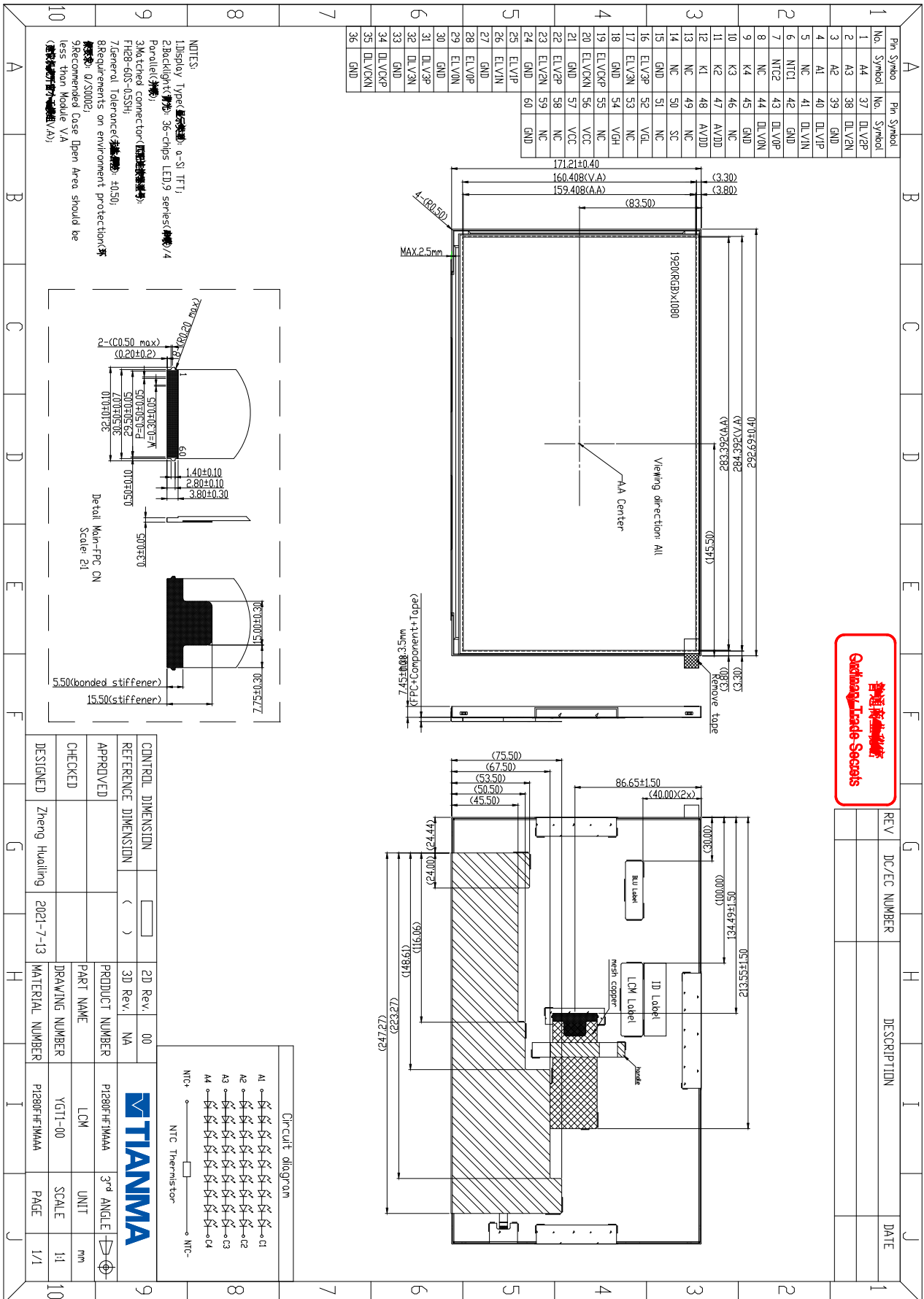
10. Packing Instruction

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	Module	TM128VDGP01-00	292.69×171.21×7.45	0.46	18	-
2	Tray	PP	533×368×26.05	0.254	10	-
3	Desiccant	Desiccant	45×48	0.003	4	
4	Anti-Static Bag	PE	700×550×(200×2)	0.063	1	-
5	Carton	Corrugated Pape	550×385×225	1.06	1	-
	Total weight		11.943±5% Kg			

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 ℃ 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.