SPECIFICATION

[◉] Preliminary Specification
[ ] Final Specification

Description **10.1” 1280xRGBx800 TFT-LCD Module**

Part Number **P1010WXF1MA01**

Customer			Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date		Approved By	Date
			Reviewed By	
			Prepared By	
			Yao Zhang	2023-10-24
Comments:				

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

Rev	Date	Page	Revision Items	Editor
1.0	2023/10/24	-	Preliminary spec	Yao Zhang

CONTENTS

1. Summary

1.1 General Description

This is a 10.1 inch a-Si TFT-LCD module with Normal- Black technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle
- High luminance
- Wide temperature range
- Interface: LVDS
- LED driver integrated

- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: TBD)
- 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	10.1 inches	
	Resolution	1280(RGB)x800	
	Pixel Pitch	0.1695x0.1695	mm
	TFT Active Area	216.96x135.60	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	HC	
	Viewing Direction	All	
	Gray Scale Inversion Direction	NA	
Mechanical Characteristics	LCM (W x H x D)	229.8*149*6.2	mm
	Weight	TBD+/-5%	g
Optical Characteristics	Luminance	1000	cd/m^2
	Contrast Ratio	700:1	
	NTSC	50	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	LVDS, 6/8bit selectable	
	Color Depth	262 K/16.7 M	color
	Power Consumption	LCD:TBD; Backlight:TBD	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	HD1S040HA1 or equivalent
Matching connector	TBD

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	NC	-	No Connection	
2	VDD	P	Power Supply +3.3V	
3	VDD	P	Power Supply +3.3V	
4	VDD	P	Power Supply +3.3V	
5	NC	-	No Connection	
6	NC	-	No Connection	
7	NC	-	No Connection	
8	Rxin0-	I	-LVDS differential data input(R0~R5,G0)	
9	Rxin0+	I	+LVDS differential data input(R0~R5,G0)	
10	GND	P	Power ground	
11	Rxin1-	I	-LVDS differential data input(G1~G5,B0~B1)	
12	Rxin1+	I	+LVDS differential data input(G1~G5,B0~B1)	
13	GND	P	Power ground	
14	Rxin2-	I	-LVDS differential data input(B2~B5,HS,VS,DE)	
15	Rxin2+	I	+LVDS differential data input(B2~B5,HS,VS,DE)	
16	GND	P	Power ground	
17	RxCLK-	I	-LVDS differential data input	
18	RxCLK+	I	+LVDS differential data input	
19	GND	P	Power ground	
20	Rxin3-	I	-LVDS differential data input(R6~R7,G6~G7,B6~B7)	Connect to GND in 6 bit mode
21	Rxin3+	I	+LVDS differential data input(R6~R7,G6~G7,B6~B7)	
22	GND	P	Power ground	
23	NC	-	No Connection	
24	NC	-	No Connection	
25	GND	P	Power ground	
26	NC	-	No Connection	
27	SEL6/8	-	SEL6/8=”H”, 6bit; SEL6/8=”L” ,8bit	
28	GND	P	Power ground	
29	NC	-	No Connection	
30	NC	-	No Connection	
31	VLED_GND	P	VLED Ground	

32	VLED_GND	P	VLED Ground	
33	VLED_GND	P	VLED Ground	
34	NC	-	No Connection	
35	VLED_PWM	P	Backlight dimming control (NC: 100%duty cycle)	
36	VLED_EN	P	Backlight on/off control (1 or NC:ON , 0:OFF)	
37	NC	-	No Connection	
38	VLED	P	Backlight power supply	
39	VLED	P	Backlight power supply	
40	VLED	P	Backlight power supply	

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection
Note2: All of the GND pins should be connected to the system ground.
Note3: This LCD module supports DE mode. Please refer to the descriptions.

4. Absolute Maximum Ratings

4.1 Driving TFT LCD Panel

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Voltage Input	VDD	TBD	TBD	V	Note1
Operating Temperature	T_{op}	-30.0	80.0	℃	
Storage Temperature	T_{st}	-40.0	85.0	℃	
Relative Humidity (Note2)	RH				
Absolute Humidity	AH				

Table 4.1 absolute maximum rating

Note1: Input voltage include Rxin0-/+, Rxin1-/+, Rxin2-/+, Rxin3-/+, RxCLK-/+, SEL6/8, VDD.

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.

5. Electrical Characteristics

5.1 Driving TFT LCD Panel

VDD=3.3V,GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power supply Voltage		VDD	TBD	TBD	TBD	V	
Power supply ripple		Vp-p	-	-	TBD	mV	
Power supply current		I_{VDD}	-	TBD	-	mA	
Power consumption		P	-	TBD	-	mW	Note1
Differential input voltage		$\|V_{ID}\|$	TBD	-	TBD	mV	
Differential input common voltage		RxVCM	-	TBD	-	V	
Differential input threshold voltage	Low level	RxVTL	TBD	-	-	mV	
	High level	RxVTH	-	-	TBD	mV	
Inrush current		Irush	-	-	TBD	A	

Table 5.1 LCD module electrical characteristics

5.2 Driving Backlight

Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark	
Backlight power supply voltage		VLED	TBD	TBD	TBD	V		
Backlight power supply current		I_LED	-	TBD	-	mA		
Backlight power consumption		P_LED	-	TBD	-	mW		
Input voltage for VLED_PWM signal	High level	-	TBD	-	TBD	V		
	Low level	-	TBD	-	TBD	V		
Input voltage for VLED_EN	High level	-	TBD	-	TBD	V		
	Low level	-	TBD	-	TBD	V		
VLED_PWM frequency		Fpwm	TBD		TBD	HZ		
VLED_PWM duty		D	TBD		TBD	%	Note1	
Operating Life Time		--	--	50000	--	hrs	Note2	

Note 1: According to LED driver IC characteristics, the minimum value of VELD_PWM duty may vary with VLED_PWM frequency, higher the frequency, bigger the duty.

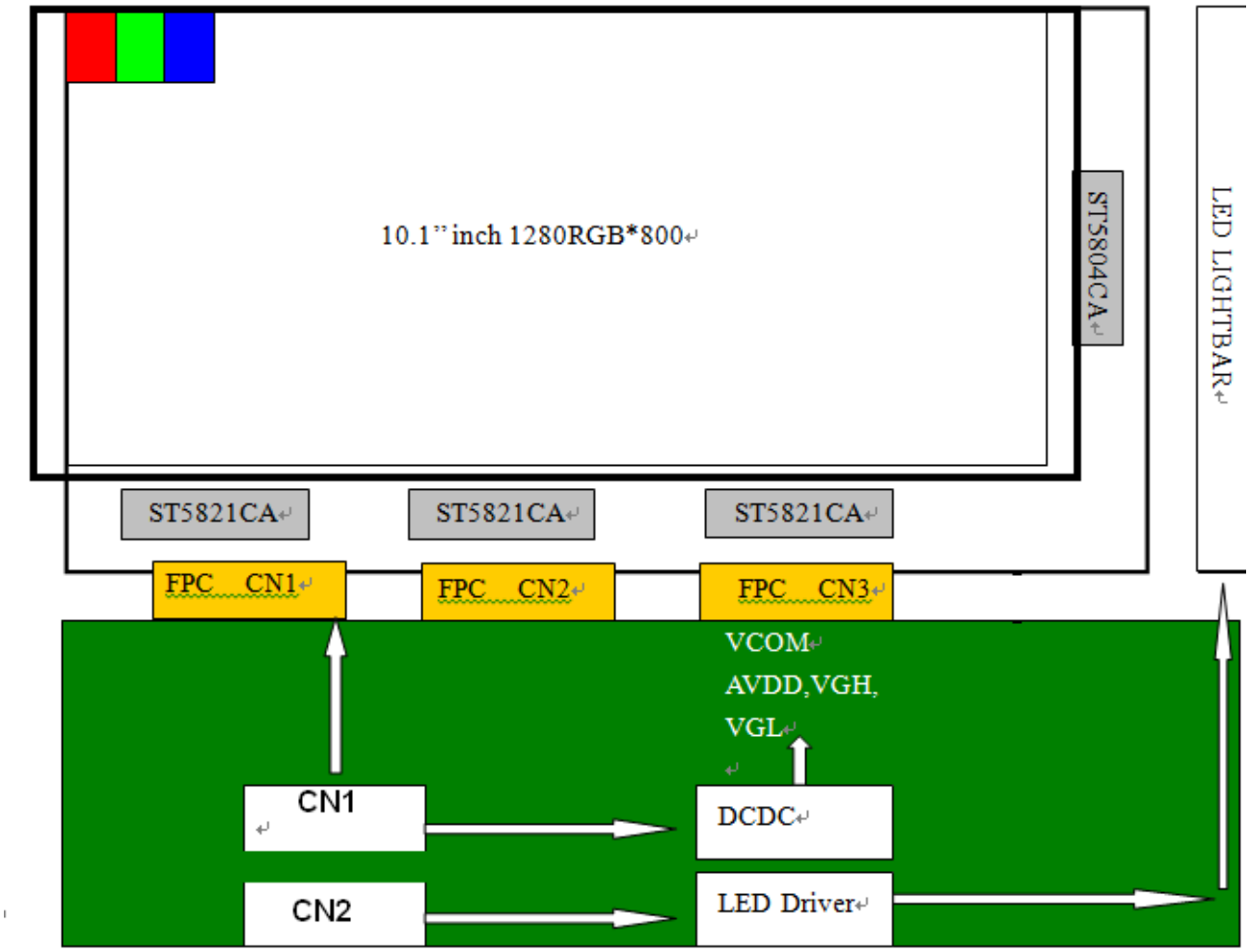
Note 2: Optical performance should be evaluated at Ta=25℃ only.

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% of initial brightness.

Typical operating life time is estimated data.

5.3 Block Diagram



6. Timing Chart

6.1 LVDS signal timing characteristics

VDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
CLK frequency	$1/t_{clk}$	TBD	TBD	TBD	MHz	
Horizontal blanking time	tHBT	TBD	TBD	TBD	tclk	thbp + tHFP
Horizontal back porch	tHBP	-	TBD	TBD	tclk	
Horizontal display area	tHD	-	TBD	-	tclk	
Horizontal front porch	tHFP	TBD	TBD	TBD	tclk	
Horizontal period	tH	TBD	TBD	TBD	tclk	
Horizontal pulse width	tHPW	-	TBD	TBD	tclk	
Vertical blanking time	tVBT	TBD	TBD	TBD	tH	tVBP + tVFP
Vertical back porch	tVBP	-	TBD	TBD	tH	
Vertical display area	tVD	-	TBD	-	tH	
Vertical front porch	tVFP	TBD	TBD	TBD	tH	
Vertical period	tV	TBD	TBD	TBD	tH	
Vertical pulse width	tVPW	-	TBD	TBD	tH	
Frame Rate	F	-	TBD	-	HZ	

Table 6.1 timing parameter

6.2 Input Clock and Data timing Diagram:

Tbd

6.3 LVDS data input format

TBD

6.4 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD on to VDD stable	Tp1	TBD	-	TBD	ms	
VDD stable to signal on	Tp2	TBD	-	TBD	ms	
Signal on to VLED_EN on	Tp3	TBD	-	-	ms	
PWM on to VLED_EN on	Tp4	TBD	-	TBD	ms	
VLED to PWM on	Tp5	TBD	-	-	ms	
VLED on to VELD stable	Tp6	TBD	-	TBD	ms	
VDD off time	Tp7	TBD	-	TBD	ms	
VDD off to next VDD on	Tp8	TBD	-	-	ms	
Signal off before VDD off	Tp9	TBD	-	TBD	ms	
VLED_EN off before signal off	Tp10	TBD	-	-	ms	
VLED_EN off before PWM off	Tp11	TBD	-	TBD	ms	
PWM off before VLED off	Tp12	TBD	-	-	ms	

Table 6.4 Power on/off sequence

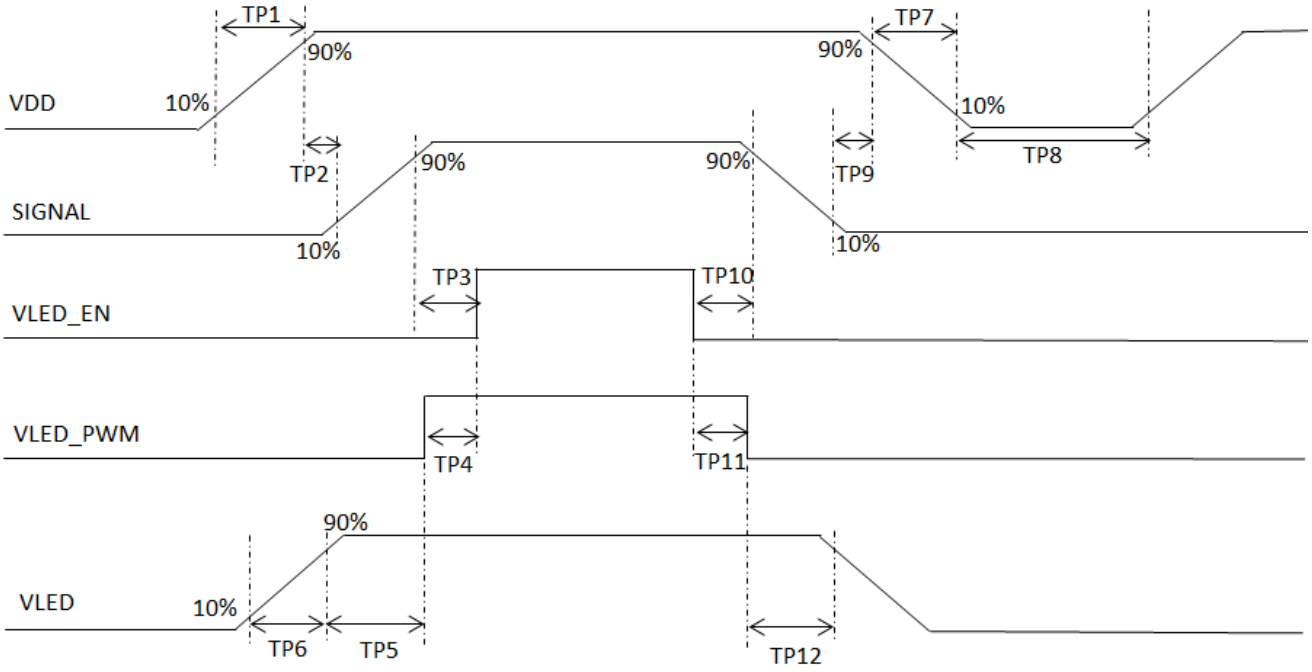


Figure 6.4 Interface power on/off sequence

7. Initial Code

TBD

8. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	75	88		degree	Note2,3
		θB		75	88			
		θL		75	88			
		θR		75	88			
Contrast Ratio		CR	θ=0°	500	700			Note 3
Response Time		T_{ON}	25℃	-	25	40	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
	Red	x		TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
	Green	x		TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
	Blue	x		TBD	TBD	TBD		Note 1,5
		y		TBD	TBD	TBD		
Uniformity		U		75	80		%	Note 6
NTSC		-		45	50		%	Note 5
Luminance		L		800	1000		cd/m^2	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. I_F= **XX** mA, and the ambient temperature is 25℃.
2. The test systems refer to Note1 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.

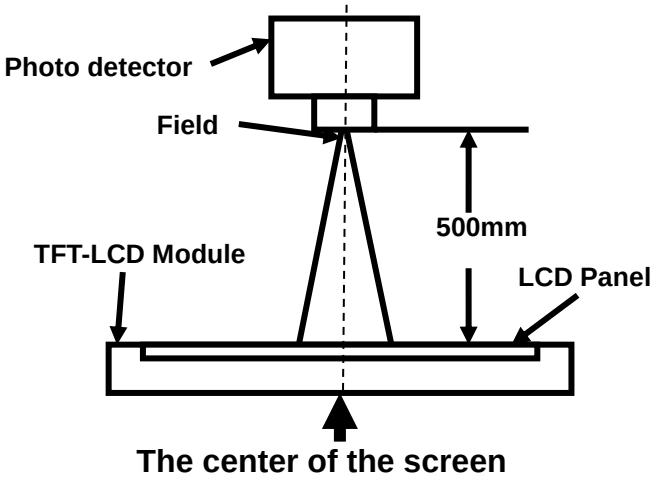


Fig1. Measurement Set Up

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

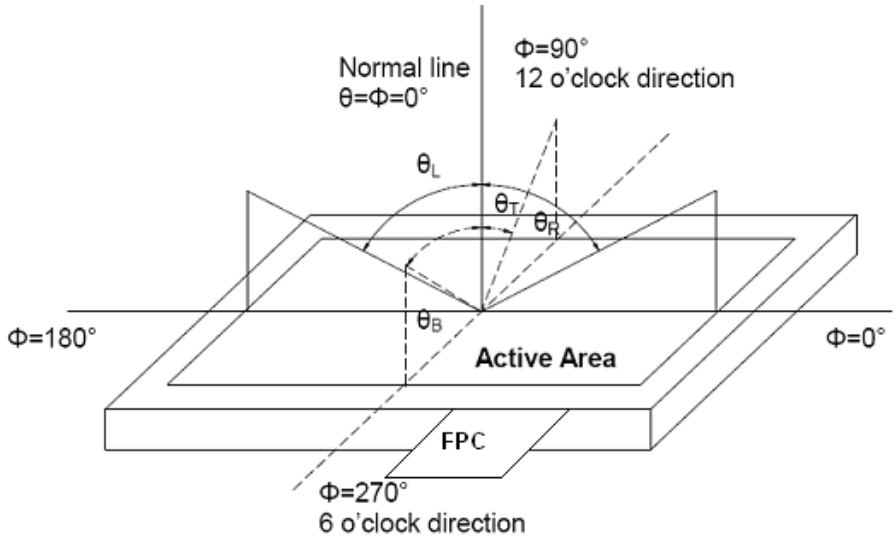


Fig2. Measurement viewing angle

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

For SFT LCM, 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%.

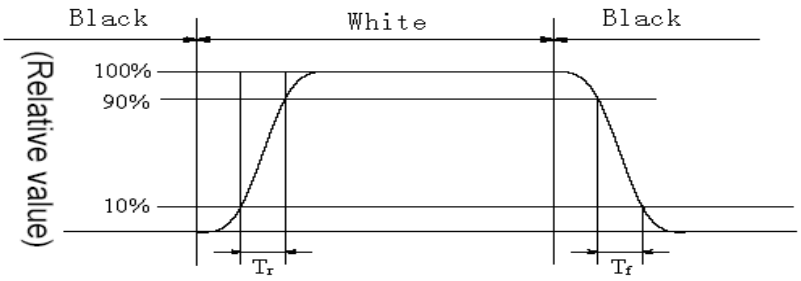


Fig4. Response Time Testing(SFT)

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.

Luminance Uniformity (U) = Lmin/ Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

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

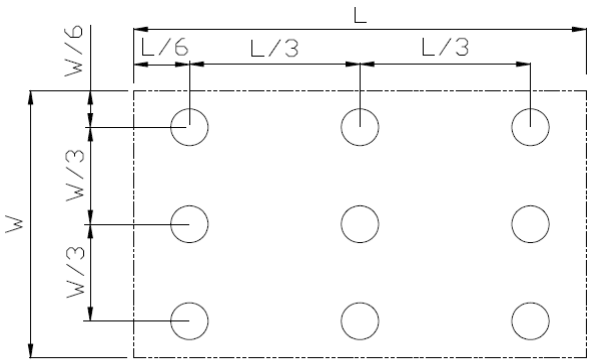


Fig5. Luminance Uniformity Measurement Locations(9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

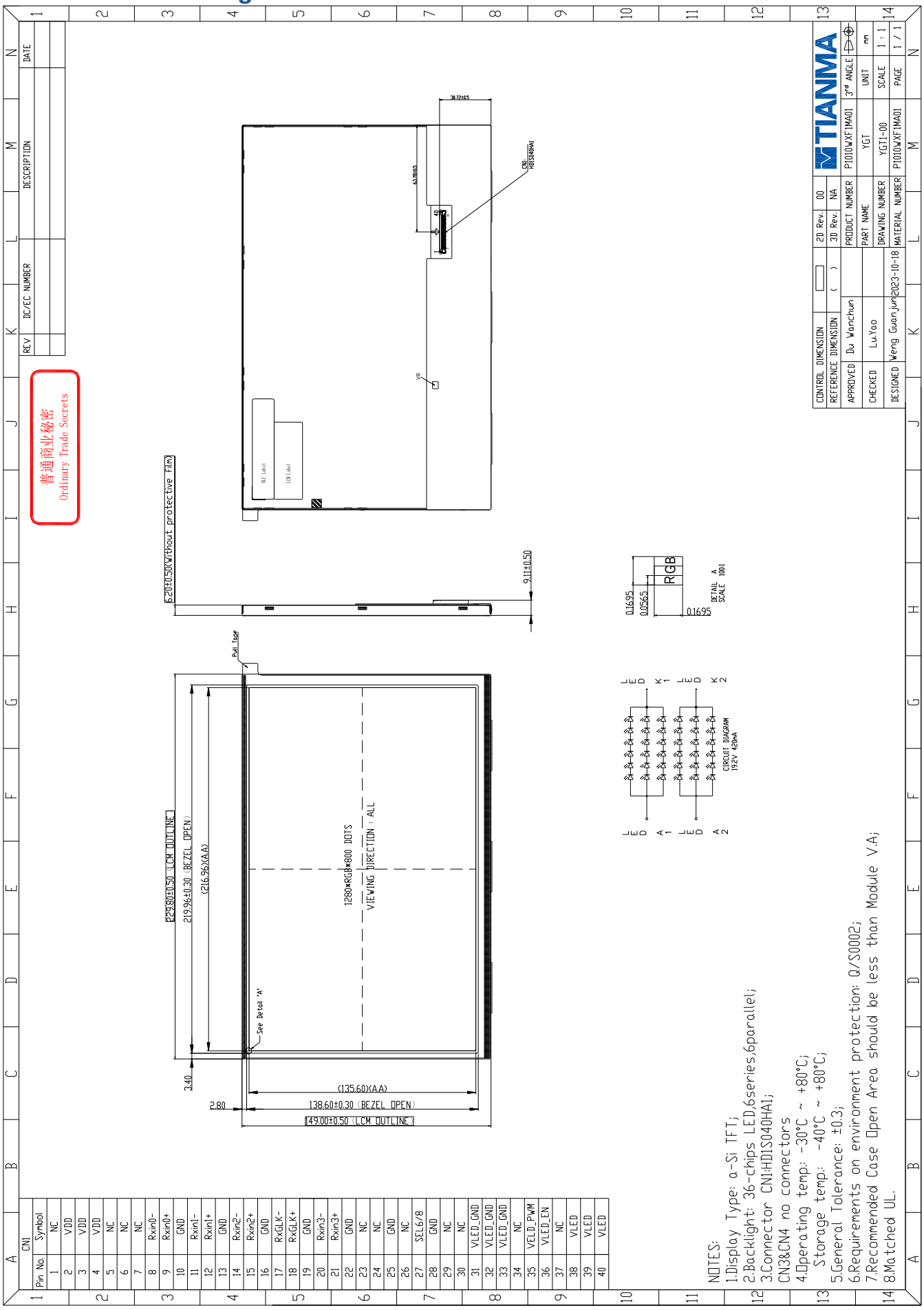
9. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta=+80℃, 240hrs	(Note1) IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	Ta=+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	Ta=-40℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Electro Static Discharge (operation)	C=150pF，R=330Ω，5point/panel Air：±8kv，5times； Contact：±4kv，5times； （Environment：15℃~35℃， 30%~60%，86Kpa~106Kpa）	IEC61000-4-2:2001 GB/T17626.2-2006
7	Package Vibration (non-operation)	Frequency range:：5-20-200HZ， PSD：0.01-0.01-0.001 Total:0.781g2/HZ, Times：x/y/z direction each 30min	IEC60068-2-6:1982 GB/T2423.10—1995
8	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min,100cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
9	Package Drop Test	Weight≤10Kg，Height:80cm; Weight＞10Kg,，Height:60cm; 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

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 2 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. Mechanical Drawing



11. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Q'ty	Remark
1	LCM module					
2	Tray					
3	Dust Proof Bag					
4	BOX					
5	Carton					
6	Total weight					

12. Precautions for Use of LCD Modules

12.1 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.

12.2 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.

12.3 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.

12.4 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

12.5 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.