MODEL NO : TM070RDSG12

MODEL VERSION: 00

SPEC VERSION : 2.3

ISSUED DATE: 2022-9-13

□**Preliminary Specification**

■**Final Product Specification**

Customer :

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Zhao Zhang 2022/09/13	Zhu Guanchen 2022/09/21	Zhu Guanchen 2022/09/21

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2017-10-30	Preliminary release.	Xin Yin
1.1	2018-01-19	Update LCD design.	Xin Yin
1.2	2018-02-27	Update LCD design,add LED Life Time and Packing Drawing.	Xin Yin
1.3	2018-03-21	Update LCD design.	Xin Yin
1.4	2019-01-03	Update Optical Characteristics.	Xin Yin
1.5	2019-01-25	Change Figure 4.2 LED connection of backlight.	Xin Yin
1.6	2019-03-15	Update 2.2 UD / RL Function Description	Xin Yin
2.0	2020-01-13	Final version release. Page 4: Update LCM weight of chapter 1. Page 5: Add the connector of chapter 2.1. Page 6: Update the table of chapter 2.2. Page 6: Update the Power Voltage from VCC to VDD of the chapter 3, change the Note 1. Page 7: Add the Power Consumption of chapter 4.1. Page 7: Update the table of chapter 4.2. Page 15: Update the Reliability Test and note of chapter 7. Page 16: Update the drawing chapter 8. Page 17: Update the LCM weight and the total weight of package in chapter 9.	Louis Young
2.1	2020-03-25	Page 5: Update the title to Pin out for LCD PCB of chapter 2.1, add the matching connector type. Page 6: Update Note 1 of chapter 3. Page 7: Update the tables in chapter 4.1 and chapter 4.2. Page 9: Update the table of chapter 5.1. Page 9~Page 11: Update the timing diagrams of chapter 5.2 and chapter 5.3. Page 12: Update the table of chapter 5.4	Louis Young
2.2	2020-08-21	Page 4: Correct LED number; Update LCM weight. Page 18: Update the package weight.	Louis Young
2.3	2022-9-13	Change LED Driver IC, the related content change as below: Page7： Change LED Power Supply Consumption to 2.4typ,3.0max Change PWM duty	Zhao Zhang

1 General Specifications

Feature	Spec

Display Spec.	Size	7inch
	Resolution	800*480
	Technology Type	a-Si TFT
	Pixel Configuration	RGB stripe
	Pixel pitch(mm)	0.1905 x 0.1905
	Display Mode	Normal black(SFT)
	Surface Treatment	AG
	Viewing Direction	all direction
	Gray Scale Inversion Direction	NA (SFT mode)
Mechanical Characteristics	LCM (W x H x D) (mm)	167*106. 3*6.8
	Active Area(mm)	152.4×91.44
	With /Without TSP	Without TSP
	Matching Connection Type	ZIF
	LED Numbers	21pcs
	Weight (g)	175
Electrical Characteristics	Interface	LVDS / 1ch
	Color Depth	262K/16.7M
	Driver IC	RM53051+RM57450

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

2.1 Pin out for LCD PCB

Connector: MSCK2407P30

Pin No.	Symbol	I/O	Function	Remark
1	VDD	P	Power Supply 3.3V	
2	VDD	P	Power Supply 3.3V	
3	UD	I	Gate Driver Up/down scan setting	
4	LR	I	Source Right or Left sequence control.	
5	GND	P	Power Ground	
6	RXIN0-	I	Negative LVDS Differential data input(0)	
7	RXIN0+	I	Positive LVDS Differential data input(0)	
8	GND	P	Power Ground	
9	RXIN1-	I	Negative LVDS Differential data input(1)	
10	RXIN1+	I	Positive LVDS Differential data input(1)	
11	GND	P	Power Ground	
12	RXIN2-	I	Negative LVDS Differential data input(2)	
13	RXIN2+	I	Positive LVDS Differential data input(2)	
14	GND	P	Power Ground	
15	RXCKIN-	I	Negative LVDS Differential clock input	
16	RXCKIN+	I	Positive LVDS Differential clock input	
17	GND	P	Power Ground	
18	RXIN3-	I	Negative LVDS Differential data input(3)	
19	RXIN3+	I	Positive LVDS Differential data input(3)	
20	GND	P	Power Ground	
21	SEL68	I	6/8bit data select SEL68=H, 8bit input, SEL68=L, 6bit input	
22	BL_ON/OFF	I	Backlight on/off control	
23	PWM	I	Backlight dimming control	
24	VCC12V	P	Backlight power supply 12V	
25	VCC12V	P	Backlight power supply 12V	
26	GND	P	Power Ground	
27	NC(CSB)	-	No Connection (Serial communication chip select.)	
28	NC(SCL)	-	No Connection (Serial communication clock input)	

29	NC(SDA)	-	No Connection (Serial communication data input)	
30	NC(VPP)	-	No Connection (Power for OTP write used)	

Note1: I/O definition: I-----Input O-----output P----Power/Ground

2.2 UD / RL Function Description

Scan control input		Scanning direction
UD	LR	
GND	VDD	Up to down, left to right
VDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
VDD	VDD	Down to up, left to right

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VDD	-0.5	5.0	V	Note1
Input voltage	VIN	-0.5	5.0	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 3 Absolute Maximum Ratings

Note1: Input voltage include SEL68, BL_ON/OFF, PWM, UD, LR.
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.

4 Electrical Characteristics

4.1 TFT LCD Panel Driving

Item		Symbol	Min	Typ	Max	Unit	Remark
Power Supply Voltage		VDD	3.2	3.3	3.4	V	
Input Signal Voltage	Low Level	VIL	0	-	0.3xVDD	V	
	High Level	VIH	0.7xVDD	-	VDD	V	
Output Signal Voltage	High Level	VOH	VDD-0.4V	-	VDD	V	
	Low Level	VOL	0	-	0.4V	V	
(Panel+ LSI) Power Consumption		White Mode	-	510	765	mW	VDD=3.3V

Table 4.1 LCD module electrical characteristics

4.2 Backlight Driving

Item		Symbol	Min	Typ	Max	Unit	Remark
LED Power Supply Voltage		VCC12V	11.5	12	12.5	V	
LED Power Supply Consumption		P_ VCC12V	-	2.4	3.0	W	VLED=12V
Input Signal Voltage 1	Low Level	VIL1	-	-	0.4	V	BL_ON/OFF
	High Level	VIH1	1.65	-	-	V	
Input Signal Voltage 2	Low Level	VIL2	-	-	0.4	V	PWM
	High Level	VIH2	1.65	-	-	V	
PWM frequency		F_{PWM}	100	-	20K	Hz	
PWM duty		D	1	-	100	%	100Hz ≤F_{PWM} <1 KHz
			3	-	100		1KHz ≤F_{PWM} <20KHz
LED Life Time		-	40000	50000	-	Hrs	Note2

Table 4.2 LED backlight characteristics

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.

Note 3: 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.

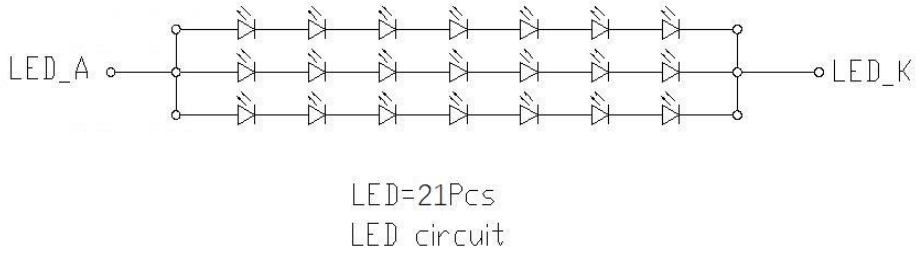
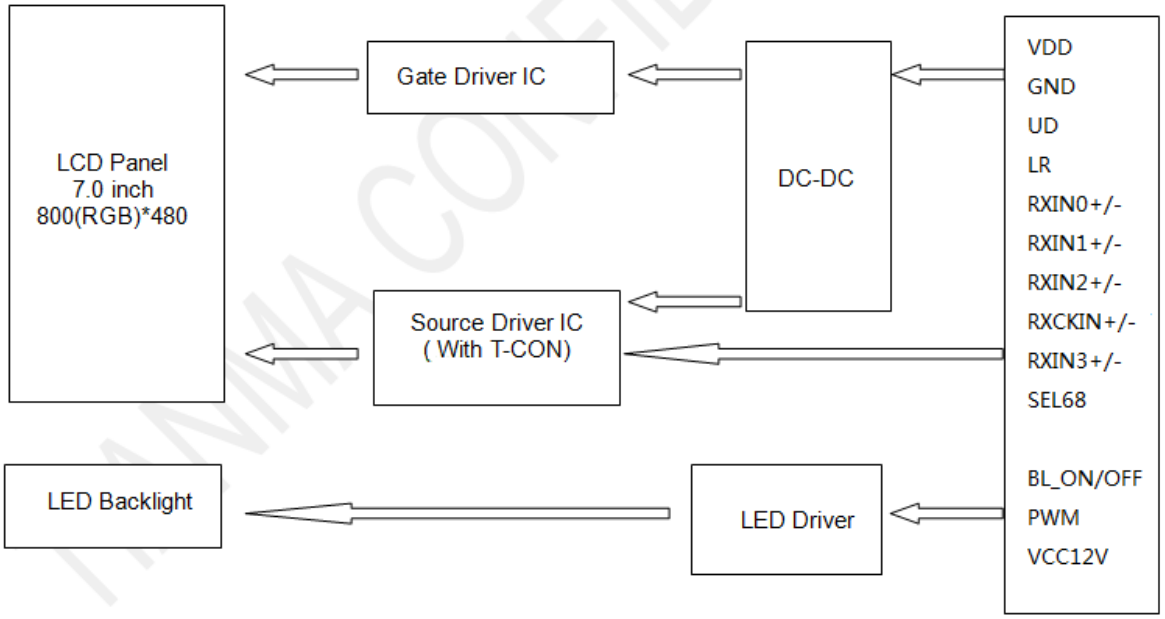


Figure 4.2 LED connection of backlight

4.3 TFT Block Diagram



5.Timing Chart

5.1 LVDS signal timing characteristics

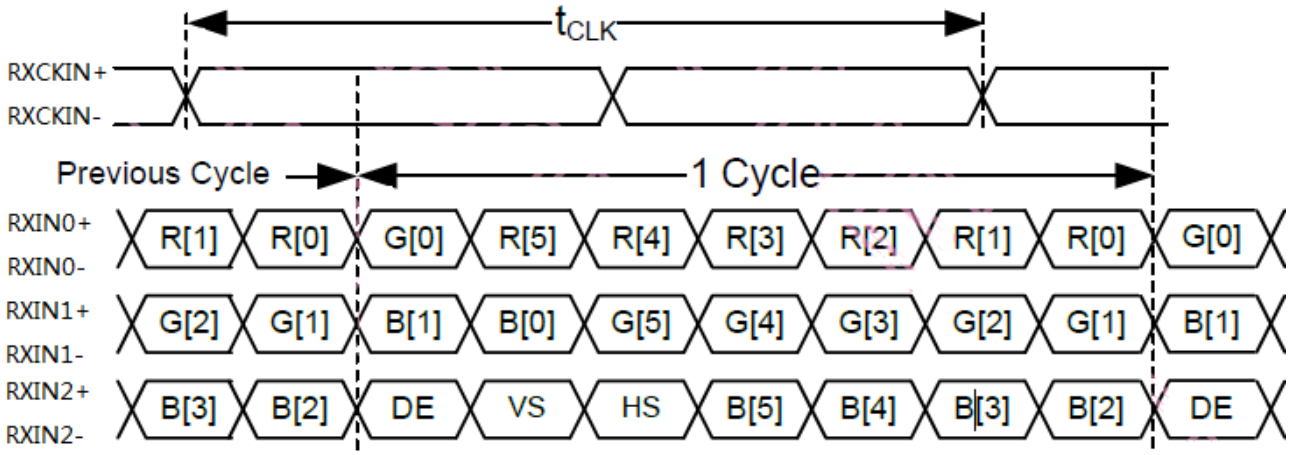
VDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	MIN	Typ	MAX	Unit	Remark
DCLK frequency	fclk	20	33.3	50	MHz	
Horizontal display area	thd		800		DCLK	
1 Horizontal Line	th	908	928	1088	DCLK	
Vertical display area	tvd		480		H	
VSD period time	Tv	501	525	712	H	

Table 5.1 timing parameter

5.2 LVDS data input format

6-bit LVDS input interface



8-bit LVDS input interface

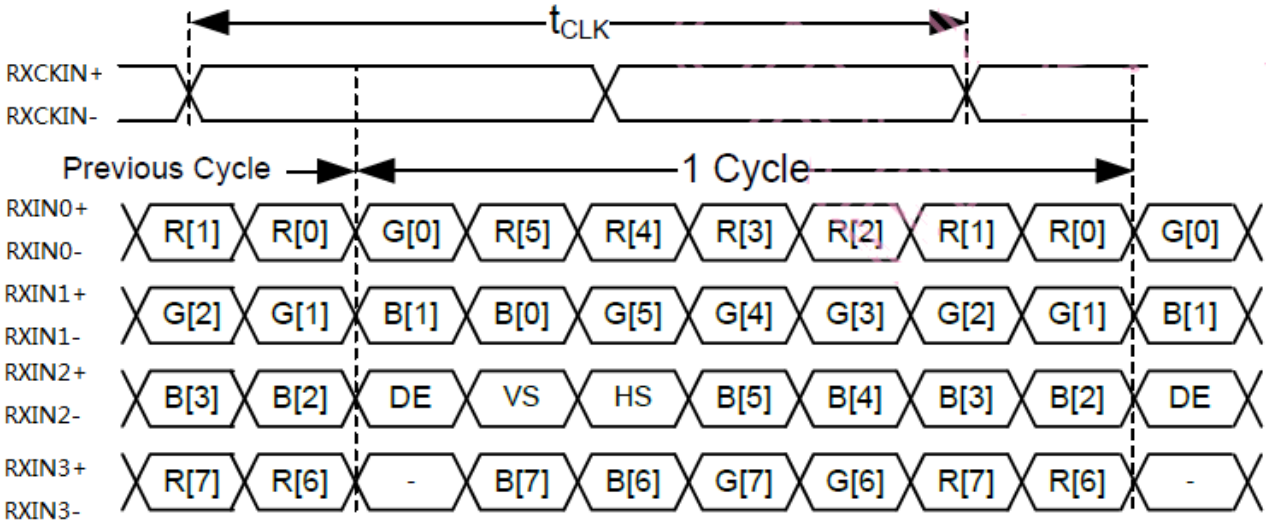
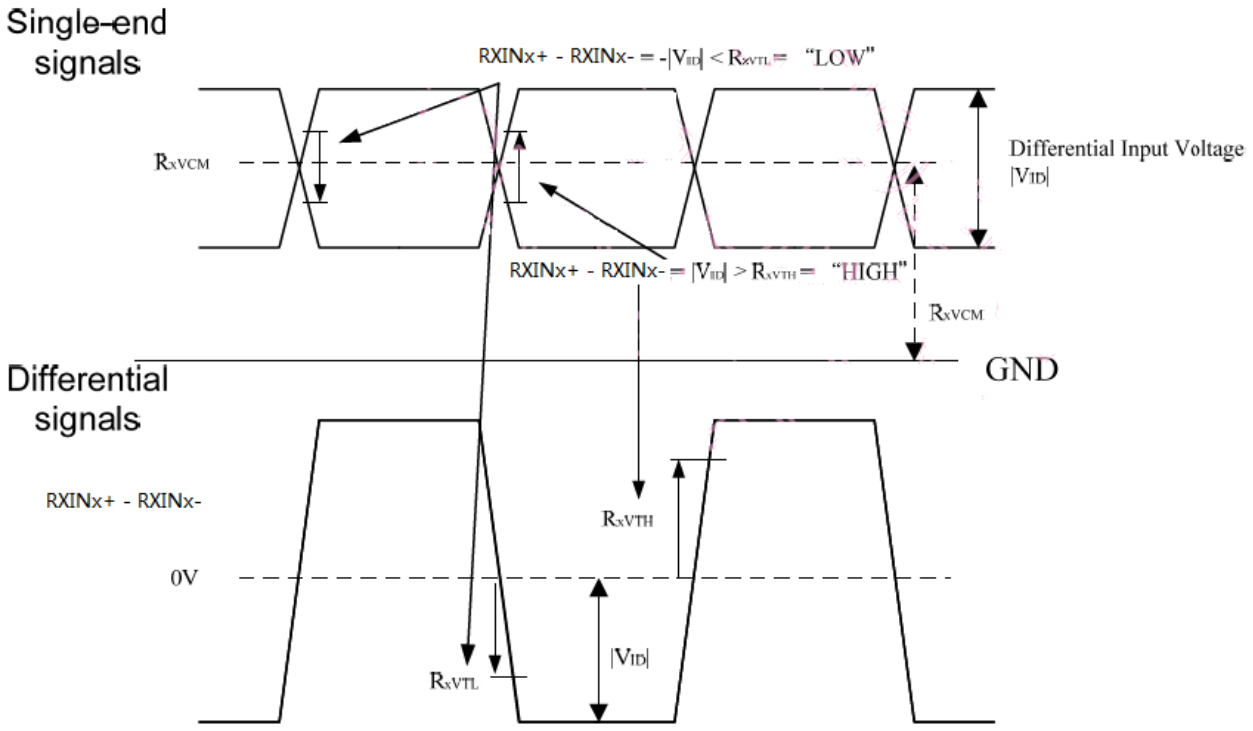


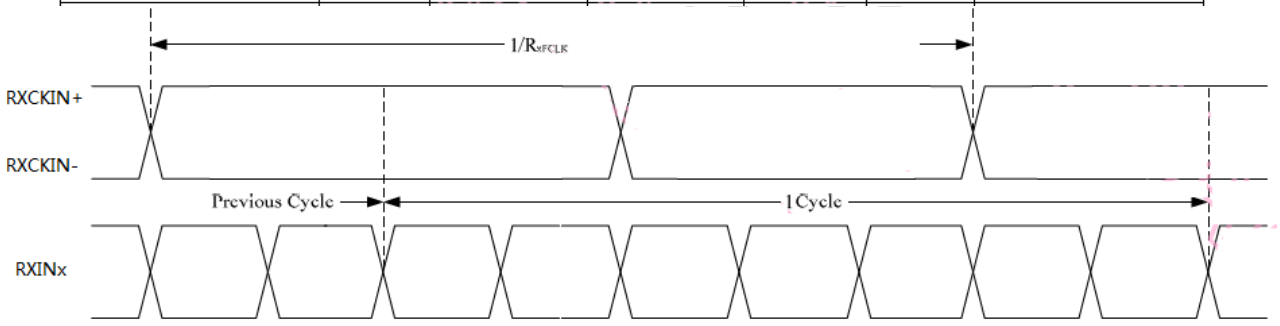
Figure 5.1 LVDS Input signal data timing

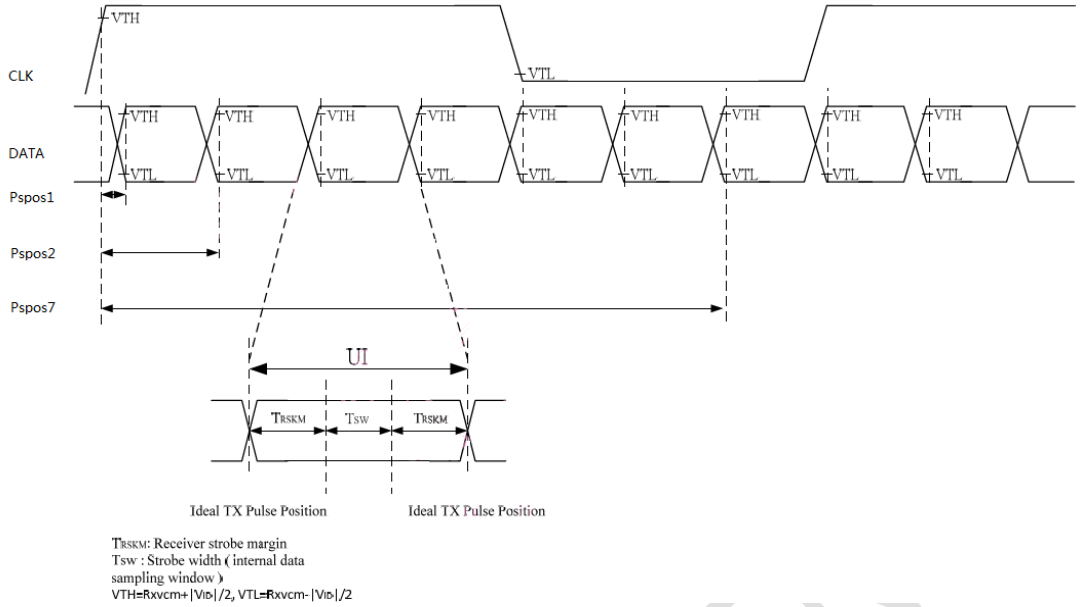
5.3 DC Electrical Characteristics format

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential Input high Threshold voltage	R_{XVTH}	-	-	+0.2	V	R_{XVCM}=1.2V
Differential Input Low Threshold voltage	R_{XVTL}	-0.2	-	-	V	
Input voltage range (signaled-end)	R_{XVIN}	0	-	VDD-1.2	V	-
Differential Input common Mode voltage	R_{XVCM}	$\|V_{ID}\|/2$	-	VDD-1.2-$\|V_{ID}\|/2$	V	-
Differential Input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	-



Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	RXFCLK	20	-	75	MHz	Htotal * Vtotal > 330000
Clock frequency	RXFCLK	2	-	30	MHz	500000>Htotal * Vtotal > 34000
1 data bit time	UI		1/7		1/ RXFCLK	
Position 1	Rspos1	-0.21	0	0.21	UI	
Position 2	Rspos2	0.79	1	1.21	UI	
Position 3	Rspos3	1.79	2	2.21	UI	
Position 4	Rspos4	2.79	3	3.21	UI	
Position 5	Rspos5	3.79	4	4.21	UI	
Position 6	Rspos6	4.79	5	5.21	UI	
Position 7	Rspos7	5.79	6	6.21	UI	
Input data skew margin	TRSKM	-	-	0.21	UI	|VID|=400mV RXVCM=1.2V RXFCLK=75MHz
Clock high time	TLVCH	-	4/(7*RXFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7*RXFCLK)	-	ns	





TRSKM: Receiver strobe margin
Tsw : Strobe width (internal data sampling window)
VTH=Rxvcm+|VID|/2, VTL=Rxvcm-|VID|/2

5.4 Power On/Off Sequence

Item	Symbol	MIN	Typ	MAX	Unit	Remark
VDD on to VDD stable	Tp1	0.5	-	10	ms	
VDD stable to signal on	Tp2	0	-	50	ms	
Signal stable to BL_ON/OFF on	Tp3	200	-	-	ms	
PWM on to BL_ON/OFF on	Tp4	0	-	200	ms	
VCC12V to PWM on	Tp5	10	-	-	ms	
VCC12V on to VCC12V stable	Tp6	0.5	-	10	ms	
VDD off time	Tp7	0.5	-	10	ms	
VDD off to next VDD on	Tp8	500	-	-	ms	
Signal off before VDD off	Tp9	0	-	500	ms	
BL_ON/OFF off before signal off	Tp10	200	-	-	ms	
BL_ON/OFF off before PWM off	Tp11	0	-	200	ms	
PWM off before VCC12V off	Tp12	10	-	-	ms	

Table 5.2 Power on/off sequence

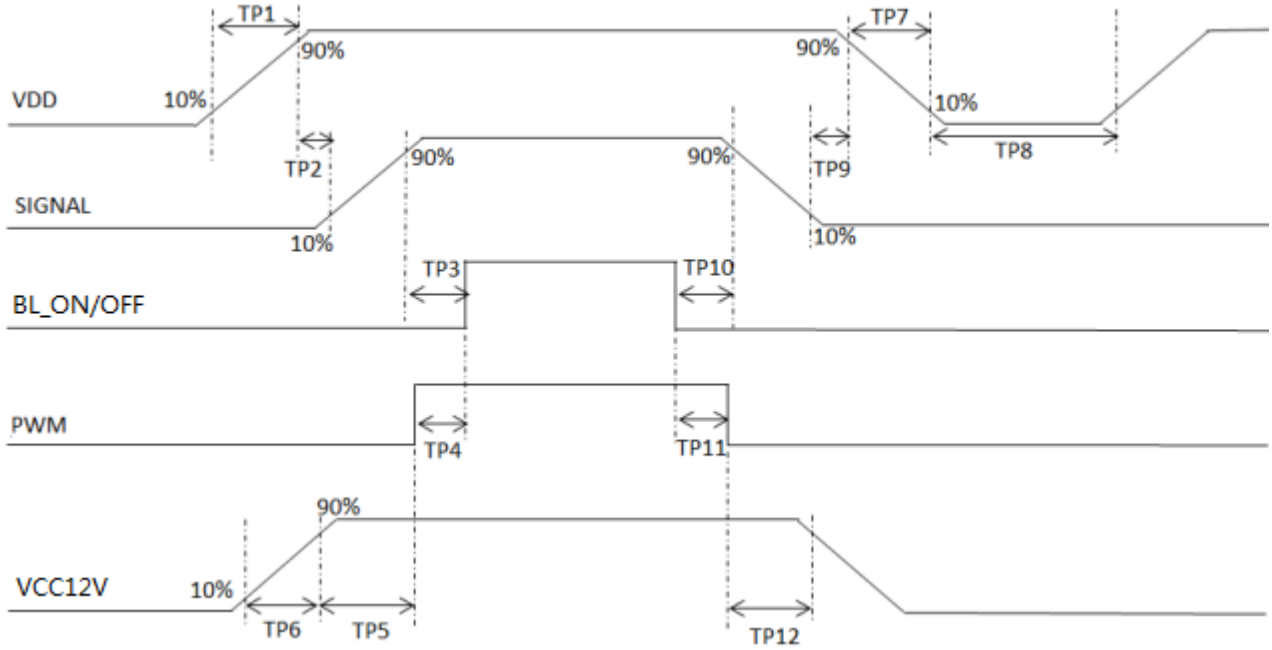


Figure 5.2 Interface power on/off sequence

5 Optical Characteristics

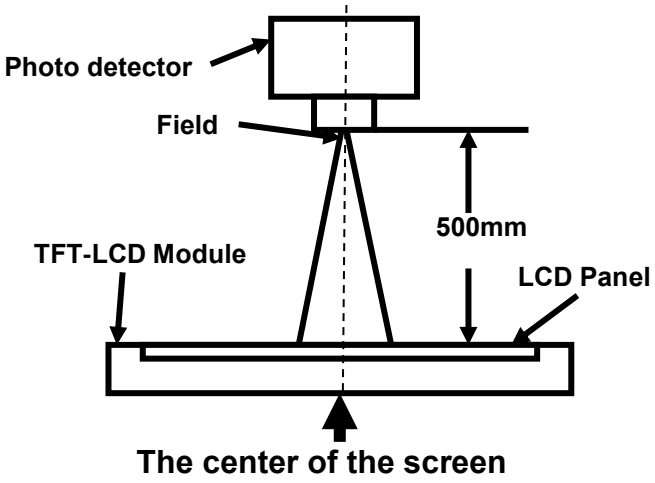
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	80	85	-	Degree	Note2,3
		θB		80	85	-		
		θL		80	85	-		
		θR		80	85	-		
Contrast Ratio		CR	θ=0°	800	1000	-		Note 3
Response Time		T_{ON}	25℃		20	30	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.291	0.321	0.351		Note 1,5
		y		0.313	0.343	0.373		
	Red	x		0.599	0.629	0.659		Note 1,5
		y		0.306	0.336	0.366		
	Green	x		0.286	0.316	0.346		Note 1,5
		y		0.597	0.627	0.657		
	Blue	x		0.122	0.152	0.182		Note 1,5
		y		0.042	0.072	0.102		
Uniformity		U		75	80	-	%	Note 6
NTSC		-		65	70	-	%	Note 5
Luminance		L		300	400	-	cd/m2	Note 7

Test Conditions:

1 I_F= 90 mA, and the ambient temperature is 25℃.

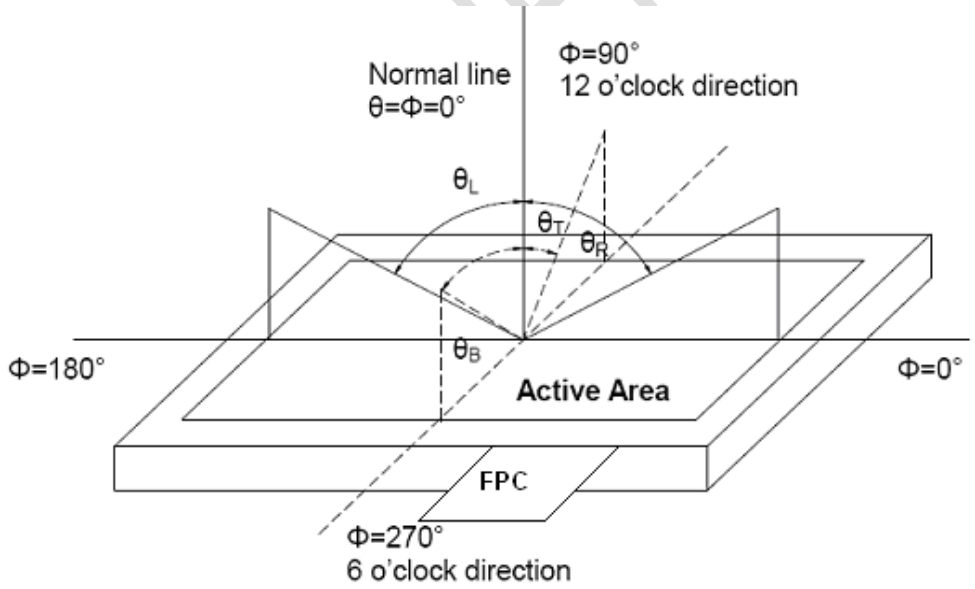
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD 。



Note 3: Definition of contrast ratio

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

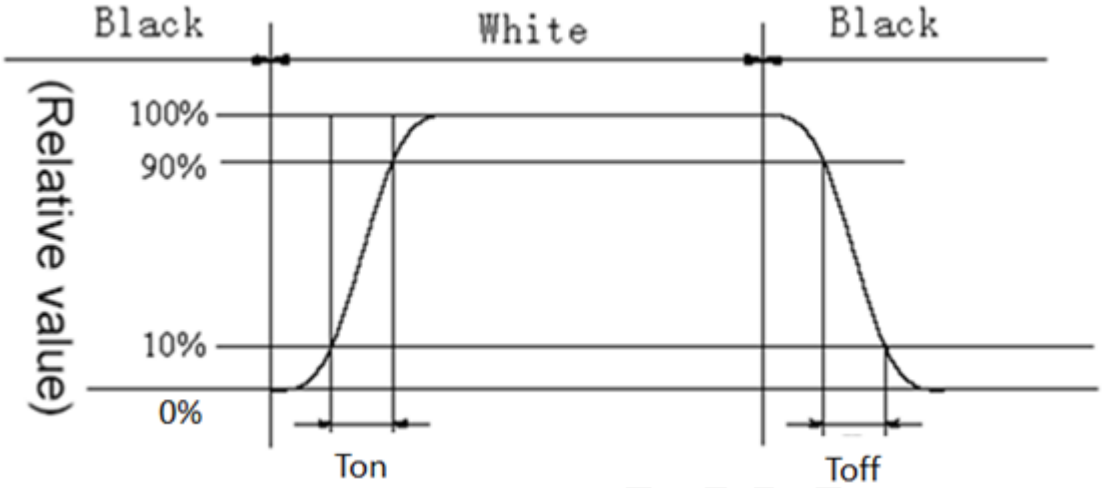
"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: 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_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

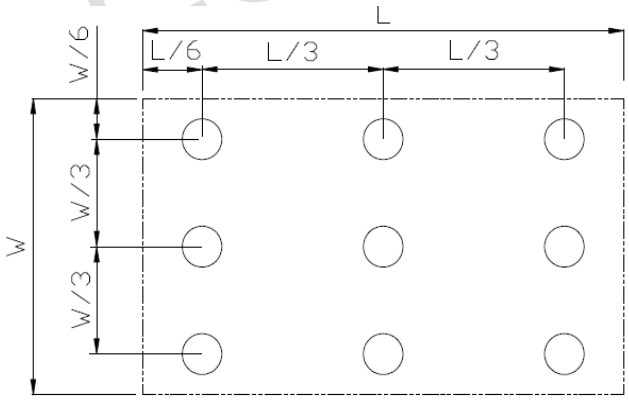
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point 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.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

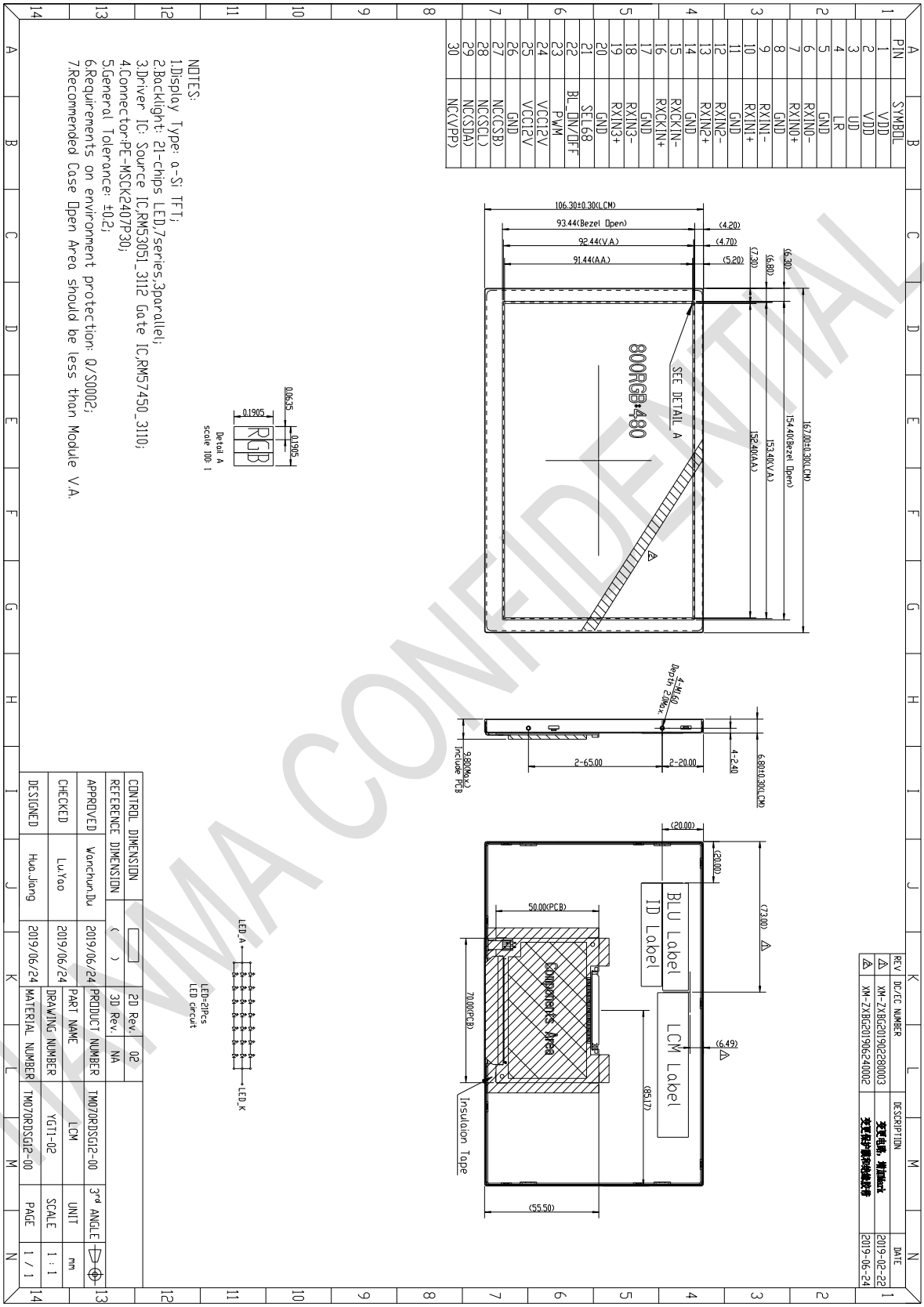
No	Test Item	Condition	Remarks
1	High Temperature Operation	+70℃, 240hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃, 240hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃, 240hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃, 240hours	IEC60068-2-1:2007 GB2423.1-2008
5	Operation at High Temperature and Humidity	60±2℃, RH= 90% 240hours Operation	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20±2℃ ；+60±3℃, 100cycles, 1hour/cycle Temperature transition time is within 5 minutes.	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	during the test, the system is tested with 5 fingers (drawing) , randomly in the active area of the touch/LCD. - Contact discharge ± 6 kV, Air discharge ± 8kV	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range: 10~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	Half Sine Wave 60G 6ms, ±X, ±Y, ±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height: 80cm, 1corner, 3edges, 6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Note 1: Ta is the ambient temperature of sample.

Note 2: 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

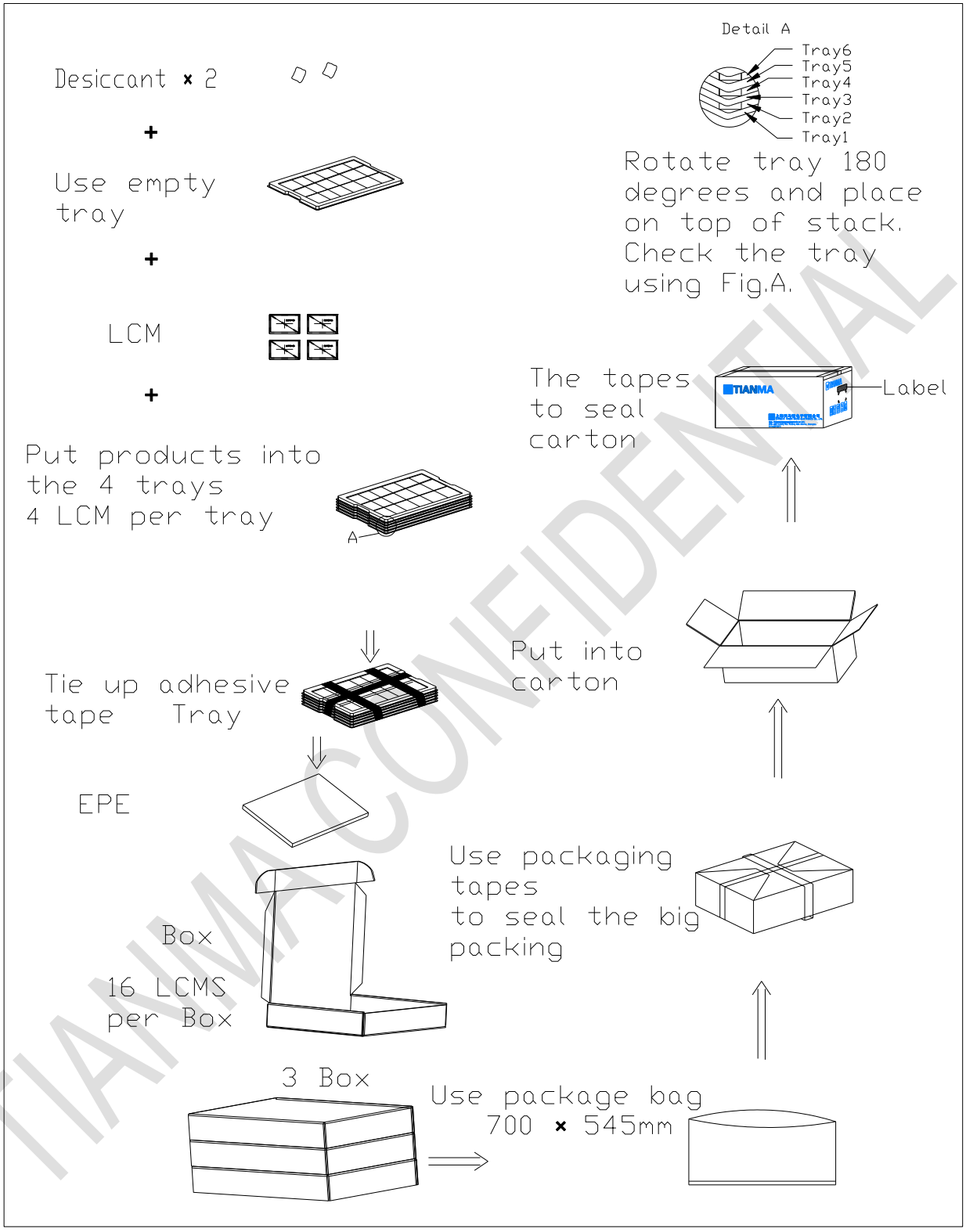


10 Packing Drawing

(Packaging Material)

Per Carton

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM070RDSG12-00	167×106.3×6.8mm	0.175	48	
2	Tray	PET(Transmit)	485×330×17	0.202	15	
3	Dust-proof bag	PE	700×545	0.046	1	
4	EPE	EPE	485×330×5	0.08	3	
5	BOX	CORRUGATED PAPER	520×345×74	0.40	3	
6	Desiccant	DESICCANT	45×35	0.002	6	
7	Carton	CORRUGATED PAPER	544×365×250	1.01	1	
8	Label	PP	100×52	0.001	1	
9	Total weight	13.939Kg				



11 Precautions for Use of LCD Modules

11.1 Handling Precautions

11.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5 If the display surface is contaMinated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

11.1.6 Do not attempt to disassemble the LCD Module.

11.1.7 If the logic circuit power is off, do not apply the input signals.

11.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

9.1.8.1 Be sure to ground the body when handling the LCD Modules.

9.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

9.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

9.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage precautions

11.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0□ ～ 40℃ Relatively humidity: ≤80%

11.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

11.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.