MODEL NO : TM070RDSG12

MODEL VERSION: 00

SPEC VERSION : 1.7

ISSUED DATE: 2019-06-05

■Preliminary Specification
□Final Product Specification

Customer :

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by

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	2019-01-31	Update input/output terminal function description	Xiaohui.zhou
1.7	2019-06-05	Add LED driver power supply current	Xiaohui.zhou

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	24
	Weight (g)	TBD
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

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 Low：Up→Down High：Down→Up	
4	LR	I	Source IC scanning direction control Low：Right→Left High：Left→Right	
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)	Connect GND for 6bits
19	RXIN3+	I	Positive LVDS Differential data input(3)	Connect GND for 6bits
20	GND	P	Power Ground	
21	SEL68	I	High level：8bit Low level：6bit	Data mode select
22	BL_ON/OFF	I	Backlight on/off control High level：On Low level：Off	
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

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.5	5.0	V	Note1
Input voltage	V_{IN}	-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 CSB, SCL, SDA, RESET, STBYB, PWM, EN, R/L, U/D.

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 Driving TFT LCD Panel

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	V_{OH}	VDD-0.4V	-	VDD	V	
	Low Level	V_{OL}	0	-	0.4V	V	

Table 4.1 LCD module electrical characteristics

4.2 TFT Driving Backlight

Item		Symbol	Min	Typ	Max	Unit	Remark
Power Supply Voltage		VLED	11.5	12	12.5	V	
Power Supply Current		I_LED	-	230	280	mA	
Input Signal Voltage	Low Level	VIL	-0.3	-	0.3xVDD	V	
	High Level	VIH	0.7xVDD	-	VDD	V	
Output Signal Voltage	High Level	V_{OH}	0.8*VDD	-	VDD	V	
	Low Level	V_{OL}	0	-	0.2*VDD	V	
VLED_PWM frequency		Fpwm	100	-	100K	Hz	
VLED_PWM duty		D	1	-	-	%	Note1
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.

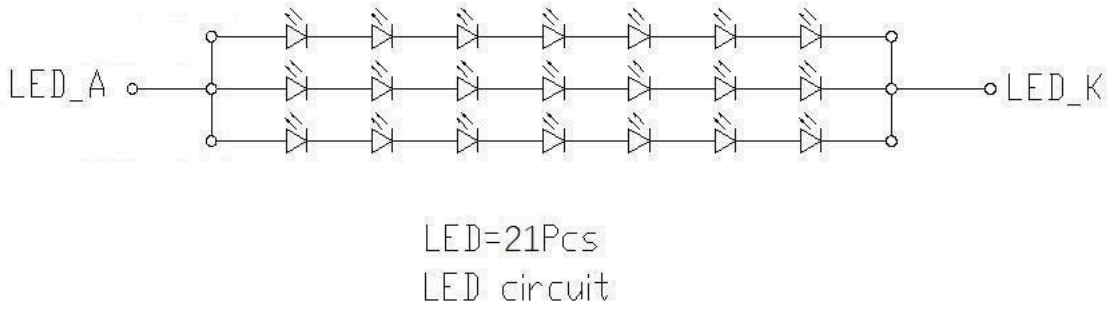
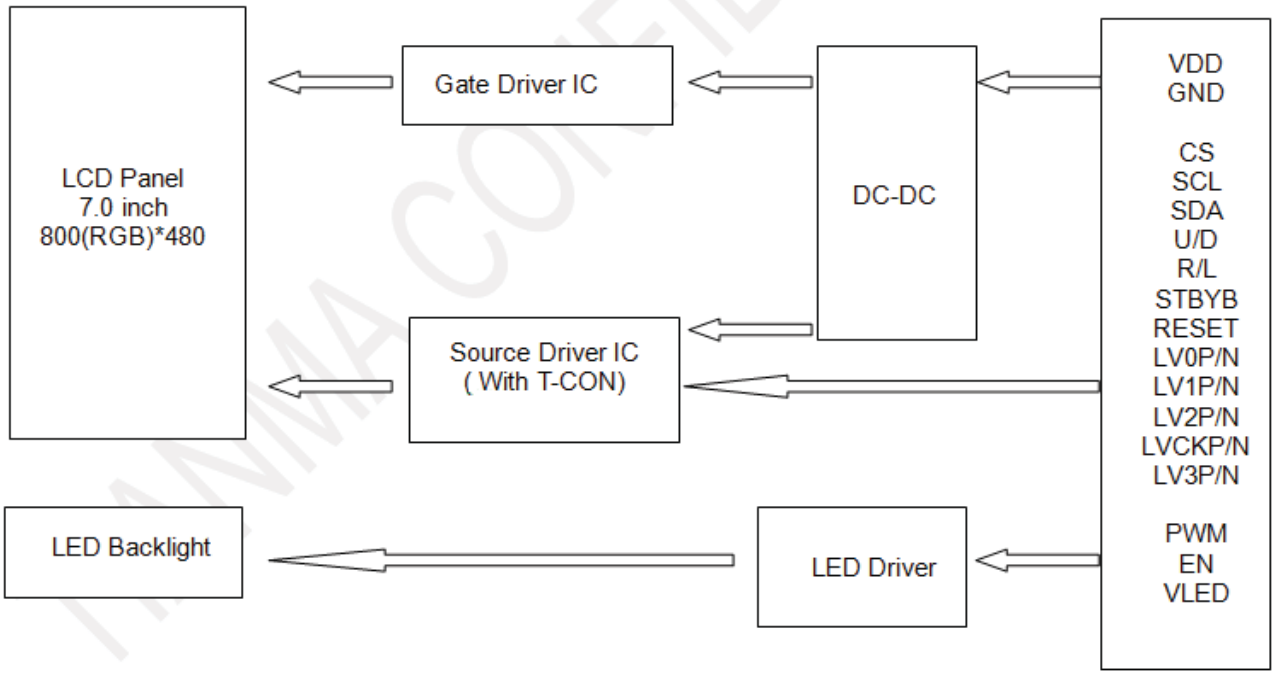


Figure 4.2 LED connection of backlight

4.3 TFT Block Diagram



5 Timing Chart

5.1 LVDS signal timing characteristics

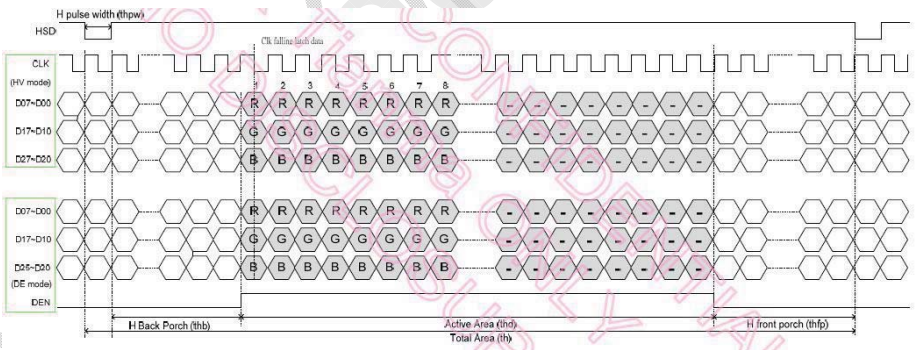
VCC=3.3V, GND=0V, Ta=25℃

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	
HSD pulse width	thpw	1	48	87	DCLK	thb+thpw=88 DCLK
HSD Back Porch is fixed. (Blanking)	thb	87	40	1	DCLK	HSD Back Porch is fixed.
HSD Front Porch	thfp	20	40	200	DCLK	
Vertical display area	tvd		480		H	
VSD period time	Tv	517	525	712	H	
VSD pulse width	tvpw	1	1	3	H	Tvpw+tvb=32 H
VSD Back Porch is fixed (Blanking)	tvb	31	31	29	H	VSD Back Porch is fixed
VSD Front Porch	tvfp	5	13	200	H	

Table 5.1 timing parameter

5.2 Input Clock and Data timing Diagram:

Horizontal input timing



Vertical input timing

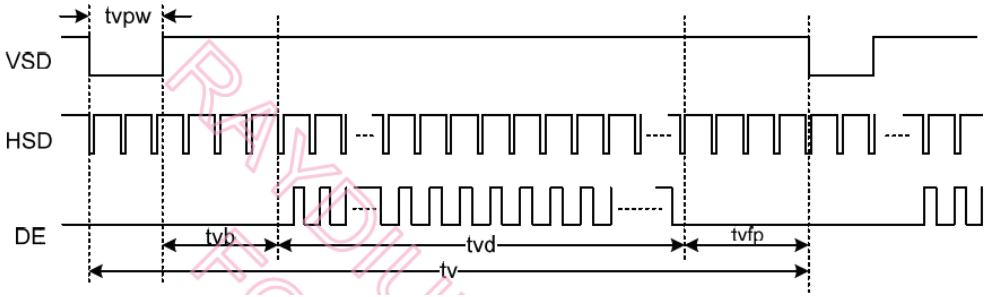
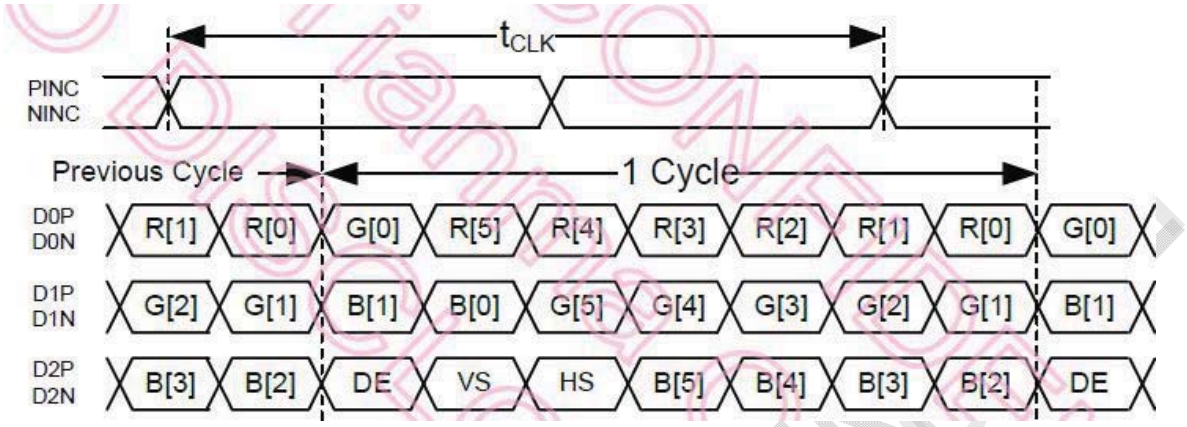


Figure 5.2 TTL Input signal data timing

5.3 LVDS data input format

6-bit LVDS input interface



8-bit LVDS input interface

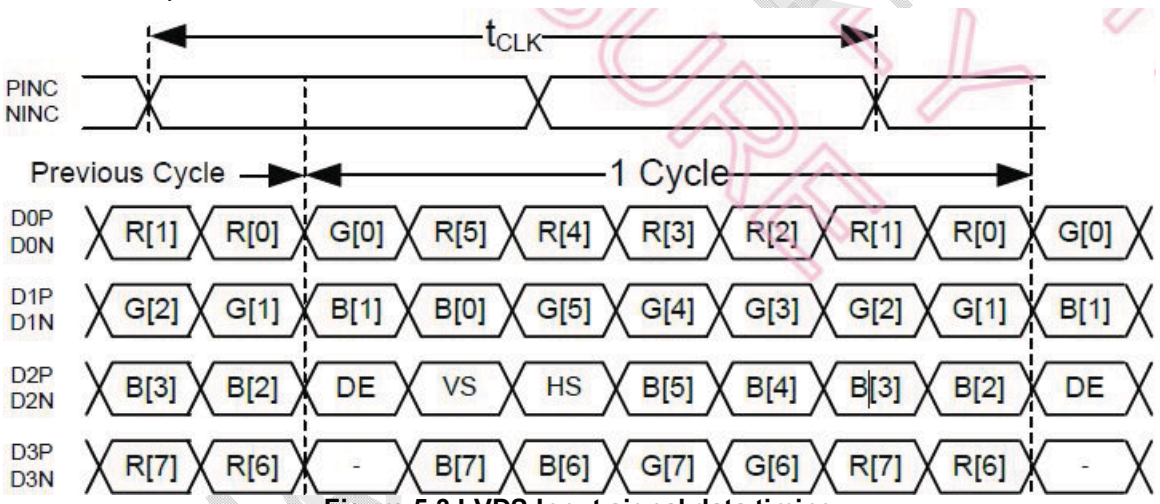


Figure 5.3 LVDS Input signal data timing

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 on to VLED_EN on	Tp3	200	-	-	ms	
PWM on to VLED_EN on	Tp4	0	-	200	ms	
VLED to PWM on	Tp5	10	-	-	ms	
VLED on to VELD stable	Tp6	0.5	-	10	ms	
VDD off time	Tp7	0	-	10	ms	
VDD off to next VDD on	Tp8	500	-	-	ms	
Signal off before VDD off	Tp9	0	-	500	ms	
VLED_EN off before signal off	Tp10	200	-	-	ms	
VLED_EN off before PWM off	Tp11	0	-	200	ms	
PWM off before VLED off	Tp12	10	-	-	ms	

Table 5.4 Power on/off sequence

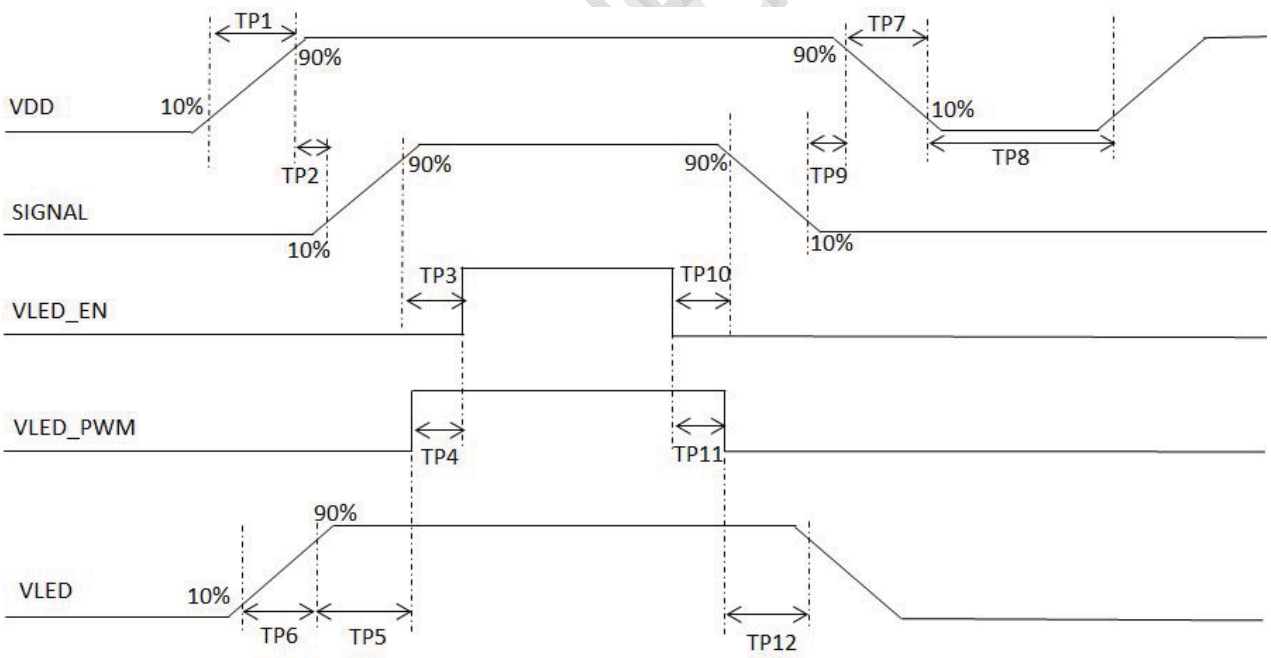


Figure 5.4 Interface power on/off sequence

6 Optical Characteristics

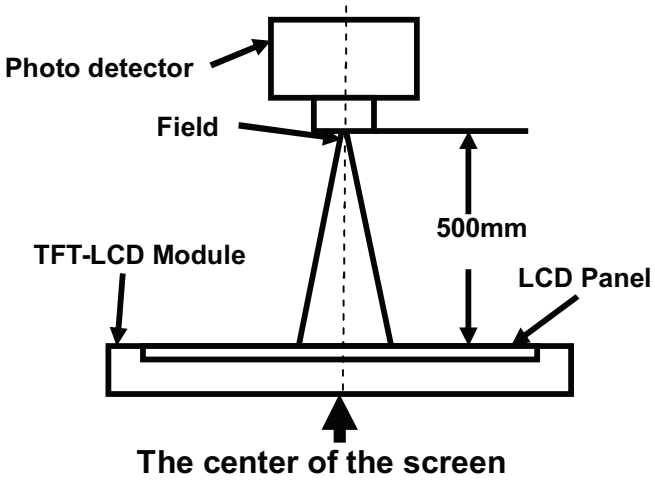
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	80	85	-	Degree	Note2,3
		θB		80	85	-		
		θL		80	85	-		
		θR		80	85	-		
Contrast Ratio		CR	θ=0°	800	1000	-		Note 3
Response Time		T_{ON}	25℃		20	30	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.291	0.321	0.351		Note 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℃.

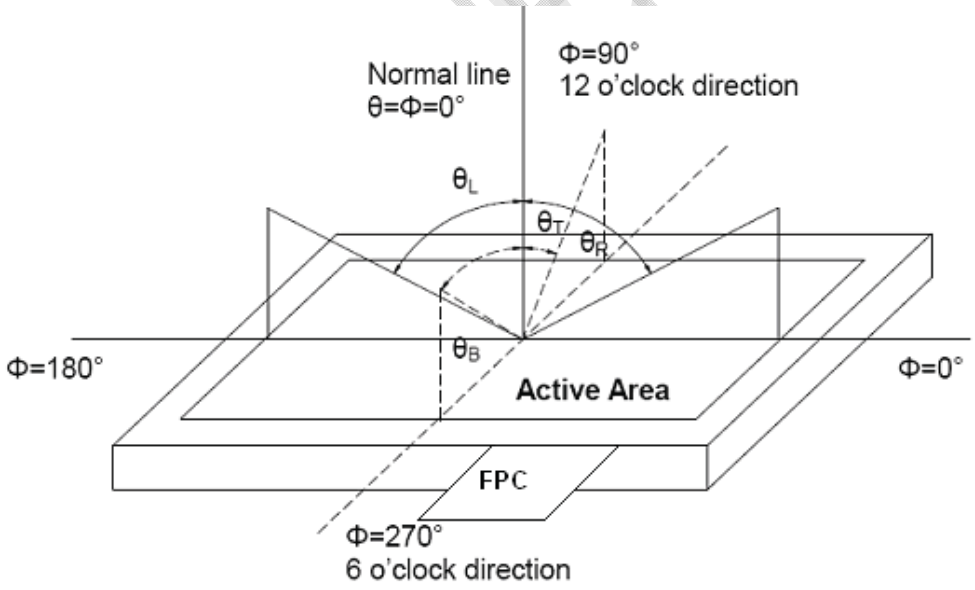
Note 1: Definition of optical measurement system.

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

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

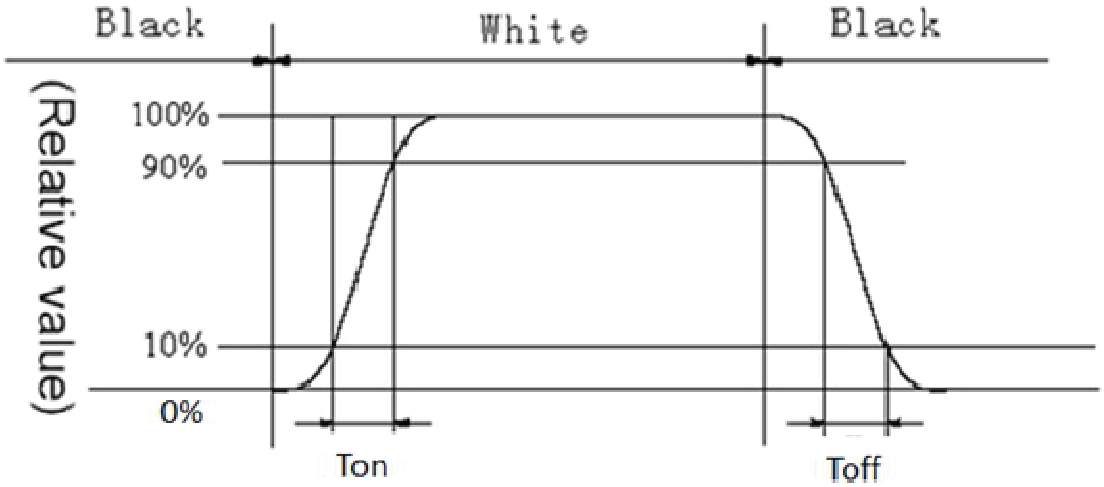
"White state ": The state is that the LCD should drive by Vwhite.

"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)

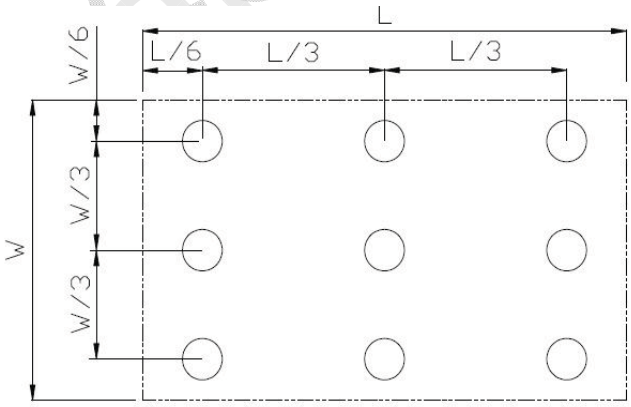
Color coordinates measured at center point of LCD.

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℃, 500hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃, 500hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃, 500hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃, 500hours	IEC60068-2-1:2007 GB2423.1-2008
5	Operation at High Temperature and Humidity	60±2℃, RH= 90% 500hours 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

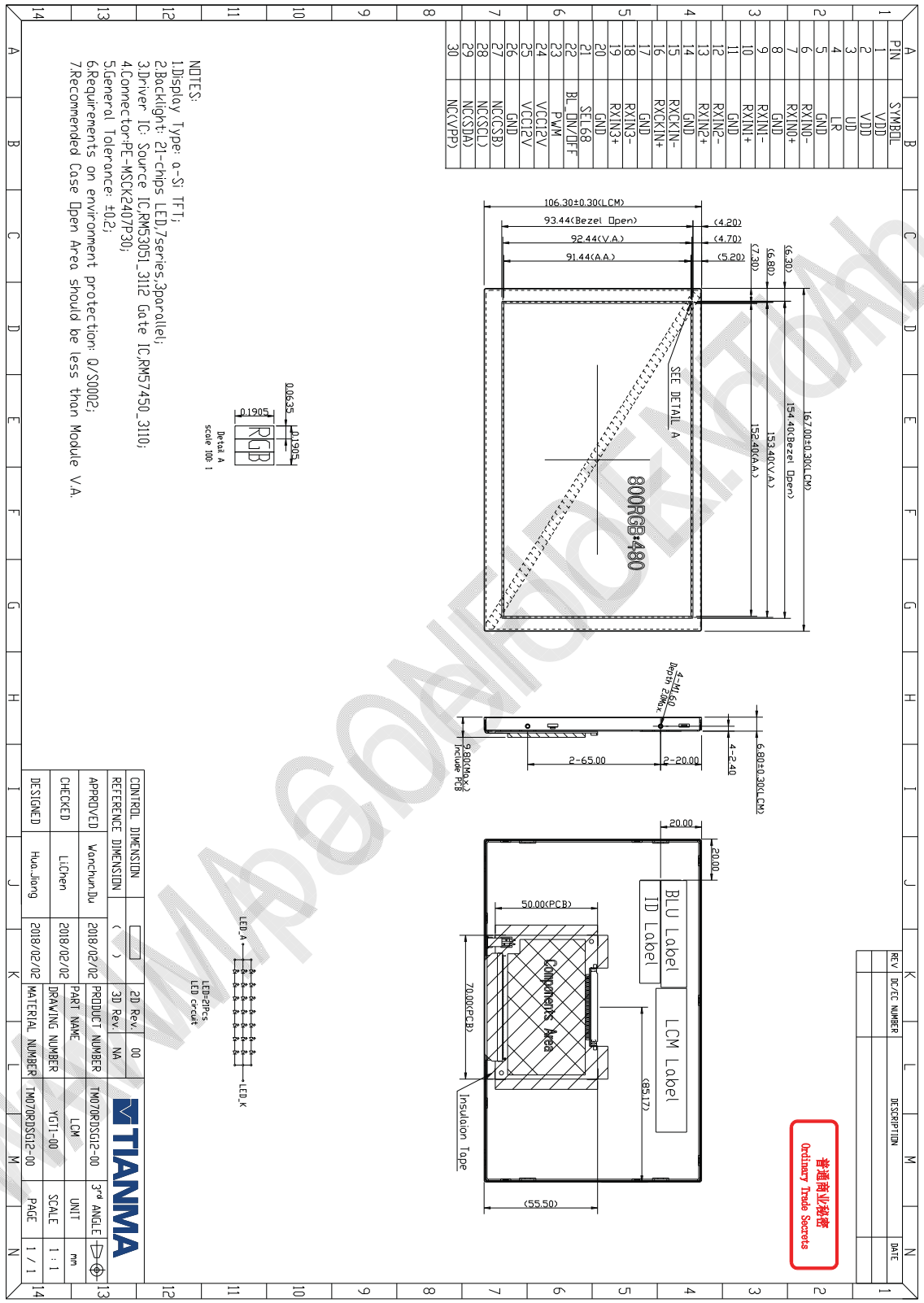
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: 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.

8 Mechanical Drawing

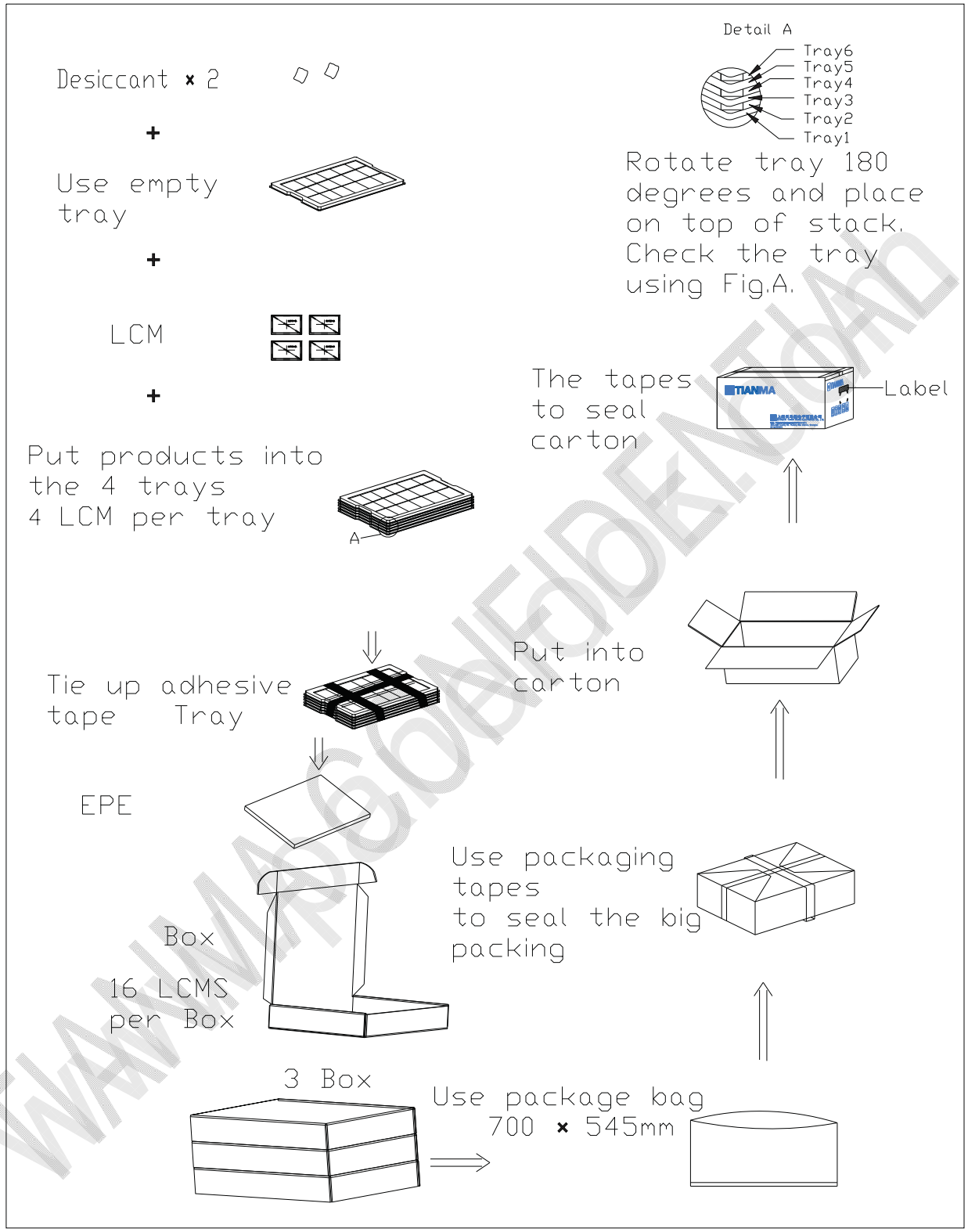


9 Packing Drawing

(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	TBD	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	TBD				



10 Precautions for Use of LCD Modules

10.1 Handling Precautions

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

10.1.2 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.

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

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

10.1.5 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

10.1.6 Do not attempt to disassemble the LCD Module.

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

10.1.8 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.

10.2 Storage precautions

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

10.2.2 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%

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

10.3 Transportation Precautions

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