MODEL NO : TM030LDHT15

MODEL VERSION: 00

SPEC VERSION : Ver 0.1

ISSUED DATE: 2020-8-6

■**Preliminary Specification**
□**Final Product Specification**

Customer :

Appoved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Lynn Li		

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
0.1	2020-8-6	First release	Lynn Li
		1.	

1 General Specifications

Feature		Spec
Display Spec.	Size	3,0”
	Resolution	240(RGB)x400
	Technology Type	a-si TFT
	Pixel Configuration	RGB Vertical Stripe
	Pixel pitch(mm)	0.162x0.162
	Display Mode	ECB Mode，Transflective
	Surface Treatment	Top POL: HC Type(¼ λ haze63%) Bottom POL: clear
	Viewing Direction	5 o’clock
	Gray Scale Inversion Direction	11 o’clock
Mechanical Characteristics	LCM (W x H x D) (mm)	76.65x46.48x2.97
	Active Area(mm)	38.88x64.8
	With /Without TSP	Without TP
	Matching Connection Type	Molex 55909-0574
	LED Numbers	6LEDs
	Weight (g)	21.2g
Electrical Characteristics	Interface	CPU 16 bits
	Color Depth	65K
	Driver IC	ILI9327

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

Matched connector: Molex 55909-0574

Pin No.	Symbol	I/O	Function	Remark
1	ID2	O	Identification(pull VDD 1.8V internally)	
2	GND	P	Ground	
3	GND	P	Ground	
4	RESB	I	System reset	
5	NC	-	Not connect	
6	DB15	I	Data signal	
7	DB14	I	Data signal	
8	DB13	I	Data signal	
9	DB12	I	Data signal	
10	DB11	I	Data signal	
11	DB10	I	Data signal	
12	DB9	I	Data signal	
13	DB8	I	Data signal	
14	NC	-	Not connect	
15	DB7	I	Data signal	
16	DB6	I	Data signal	
17	DB5	I	Data signal	
18	DB4	I	Data signal	
19	DB3	I	Data signal	
20	DB2	I	Data signal	
21	DB1	I	Data signal	
22	DB0	I	Data signal	
23	NC	-	Not connect	
24	LED-K	P	Power supply for LED(Cathode)	
25	NC	-	Not connect	
26	LED-A	P	Power supply for LED of full(Anode)	
27	GND	P	Ground(pull low internally)	
28	GND	P	Ground	
29	ID1	O	Identification(pull VDD 1.8V internally)	

30	TE	O	Tearing effect output	
31	GND	P	Ground	
32	GND	P	Ground	
33	GND	P	Ground	
34	GND	P	Ground	
35	GND	P	Ground	
36	GND	P	Ground	
37	NC	-	Not connect	
38	VDD	P	Voltage input pin for logic I/O	
39	VCI	P	Booster input voltage pin	
40	IM0	I	Interface mode select pin	Note2
41	IM1	I	Interface mode select pin	Note2
42	IM2	I	Interface mode select pin	Note2
43	GND	P	Ground	
44	GND	P	Ground	
45	GND	P	Ground	
46	NC	-	Not connect	
47	RD	I	Read control input pin	
48	WR	I	Write control input pin	
49	RS	I	Resister select input pin	
50	CS	I	Chip select pin of serial interface	
51	NC	-	Not connect	

Note1：Please add the FPC connector type and matched one if necessary .
Note2：IM2：IM1：IM0=010　CPU 16bits
　　IM2：IM1：IM0=011　CPU 8bits

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	4.6	V	Note1
Input voltage	V_{IN}	-0.3	4.6	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	85	℃	
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/m^3	Ta＞70℃

Table 3 Absolute Maximum Ratings

Note1: Input voltage include R0~R5, G0~G5, B0~B5, Dotclk, Hsync, Vsync, Enable, 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 LCD Module

GND=0V,Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	1.8	3.3	V	
Analog Supply Voltage		VCC	2.5	3.0	3.3	V	
Input Signal Voltage	High Level	VIH	0.7 IOVCC	-	IOVCC	V	
	Low Level	VIL	-	-	0.3 IOVCC	V	
Output Signal Voltage	High Level	VOH	0.8 IOVCC	-	-	V	
	Low Level	VOL	-	-	0.2 IOVCC	V	

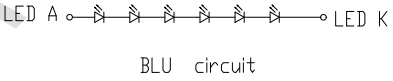
Table 4.1 LCD module electrical characteristics

4.2 Backlight Unit

Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20	-	mA	One LED
Forward Voltage	V_F	2.6	2.9	3.2	V	One LED
Backlight Power Consumption	W_{BL}	-	348	-	mW	6LEDs
Lifetime	T	-	20000	-	Hr	One LED

Table 4.2.1 backlight unit electrical characteristics



BLU circuit

Figure 4.2.1 LED backlight circuit

4.3 Block Diagram

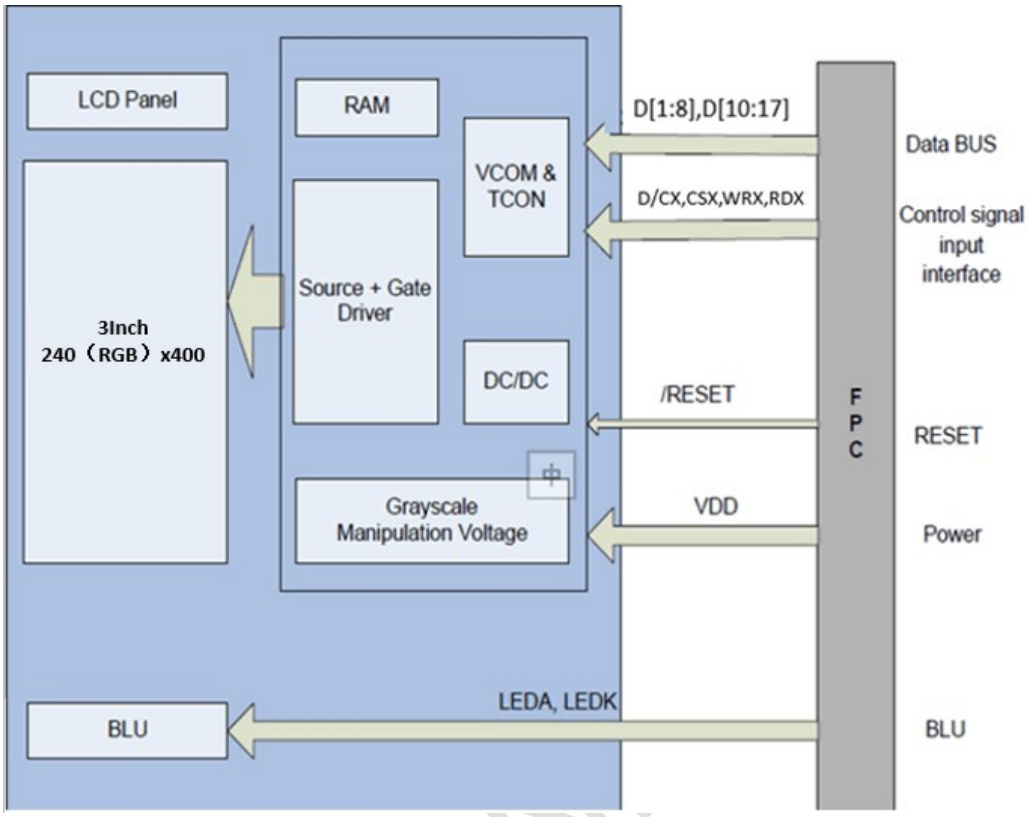


Figure 4.3 LCD module diagram

5 Timing Chart----TBD

5.1 AC Characteristics

Table 5.1 AC Characteristics

5.2 CPU Interface Input Timing parameters

Table 5.2 CPU Input Timing Parameters

5.3 CPU Interface Register write/read timing

Figure 5.3 CPU Interface Register write/read timing

5.4 Reset timing Characteristics

Figure 5.4 Reset Input Timing

5.5 POWER ON/OFF SEQUENCE

5.5.1 Power on Sequence

5.5.2 Power off Sequence

6 Optical Characteristics

6.1 Driving the backlight condition(Transmissive mode)

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥10	35	45	-	Degree	Note2,3
		θB		30	40	-		
		θL		35	45	-		
		θR		30	40	-		
Contrast Ratio		CR	θ=0°	60	80	120		Note 3
Response Time		T_{ON}	25℃	20	30	50	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.280	0.310	0.340		Note 1,5
		y		0.301	0.331	0.361		
	Red	x		0.473	0.503	0.533		Note 1,5
		y		0.315	0.345	0.375		
	Green	x		0.280	0.310	0.340		Note 1,5
		y		0.501	0.531	0.561		
	Blue	x		0.132	0.162	0.192		Note 1,5
		y		0.107	0.137	0.167		
Uniformity		U		70%	80%		%	Note 6
NTSC				28	33	38	%	Note 5
Luminance		L		130	150		cd/m^2	Note 7

Test Conditions:

1. I_F= **20**mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

6.2 Not Driving the backlight condition(Reflective mode)

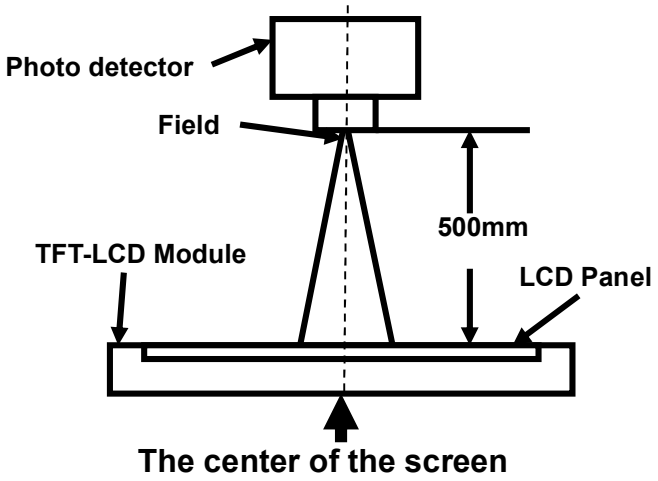
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥5	25	35	-	Degree	Note2,3
		θB		25	35	-		
		θL		20	30	-		
		θR		20	30	-		
Contrast Ratio		CR	θ=0°	8	10	-		Note 3
Response Time		T_{ON}	25℃	10	20	40	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is off	0.301	0.331	0.361		Note 1,5
		y		0.33	0.360	0.39		
	Red	x		0.388	0.418	0.448		Note 1,5
		y		0.327	0.357	0.387		
	Green	x		0.3	0.330	0.36		Note 1,5
		y		0.388	0.418	0.448		
	Blue	x		0.18	0.210	0.24		Note 1,5
		y		0.213	0.243	0.273		
Reflection ratio		U		6.55	7.27	7.63	%	
NTSC				6.2	7.35	8.5	%	

Test Conditions:

1. I_F= **20** mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

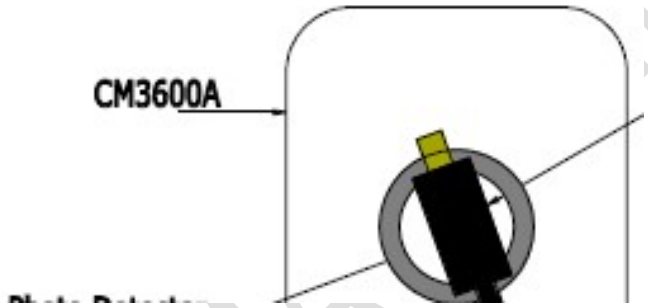
Note 1: Definition of optical measurement system.

1.Transsitive mode：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.

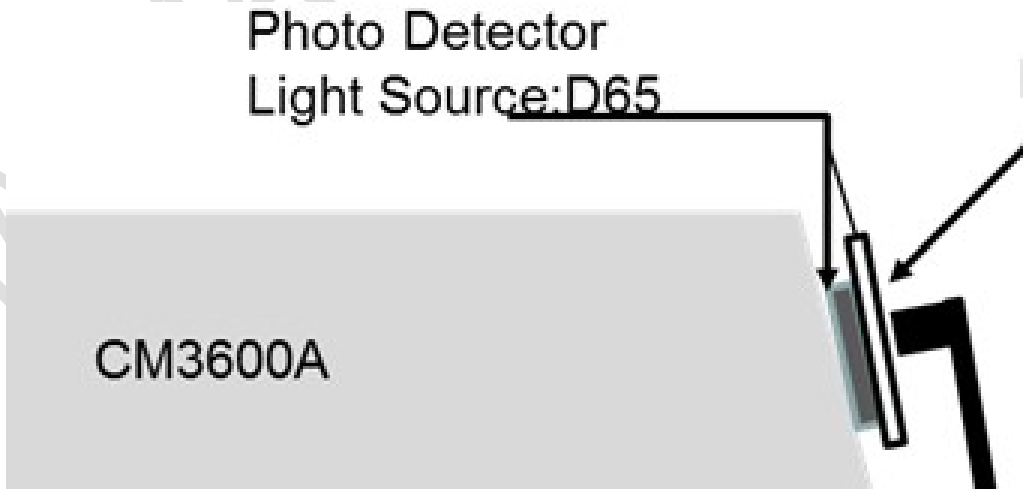


Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	LCD-5200	/
Flicker	CA-310	/

2.Reflective mode

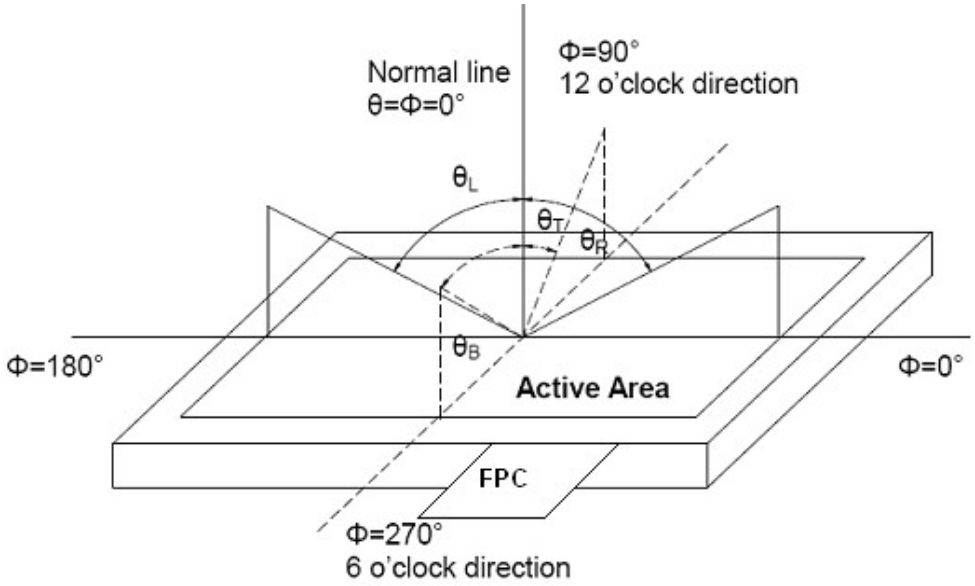


Item	Photo detector	Field
Chromaticity	CM-3600A	
Reflective Ratio		
Contrast Ratio		
Viewing angle	LCD-5200	
Flicker		



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

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



Note 3: Definition of contrast ratio

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

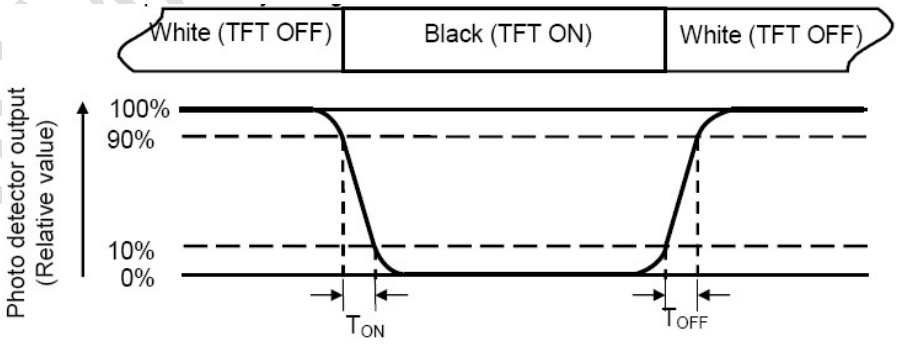
“White state “: The state is that the LCD should drive by Vwhite.

“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)

(1) Color coordinates measured at center point of LCD.

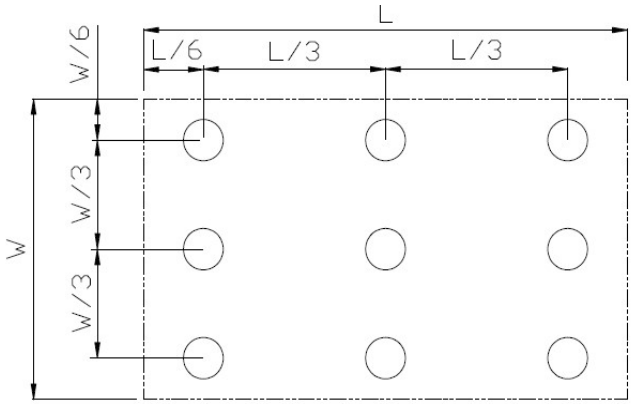
(2) For reflective mode color chromaticity we need to test at least 3 different batches to make sure the stability of panel and it accepts reasonable change after we get the stability data.

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

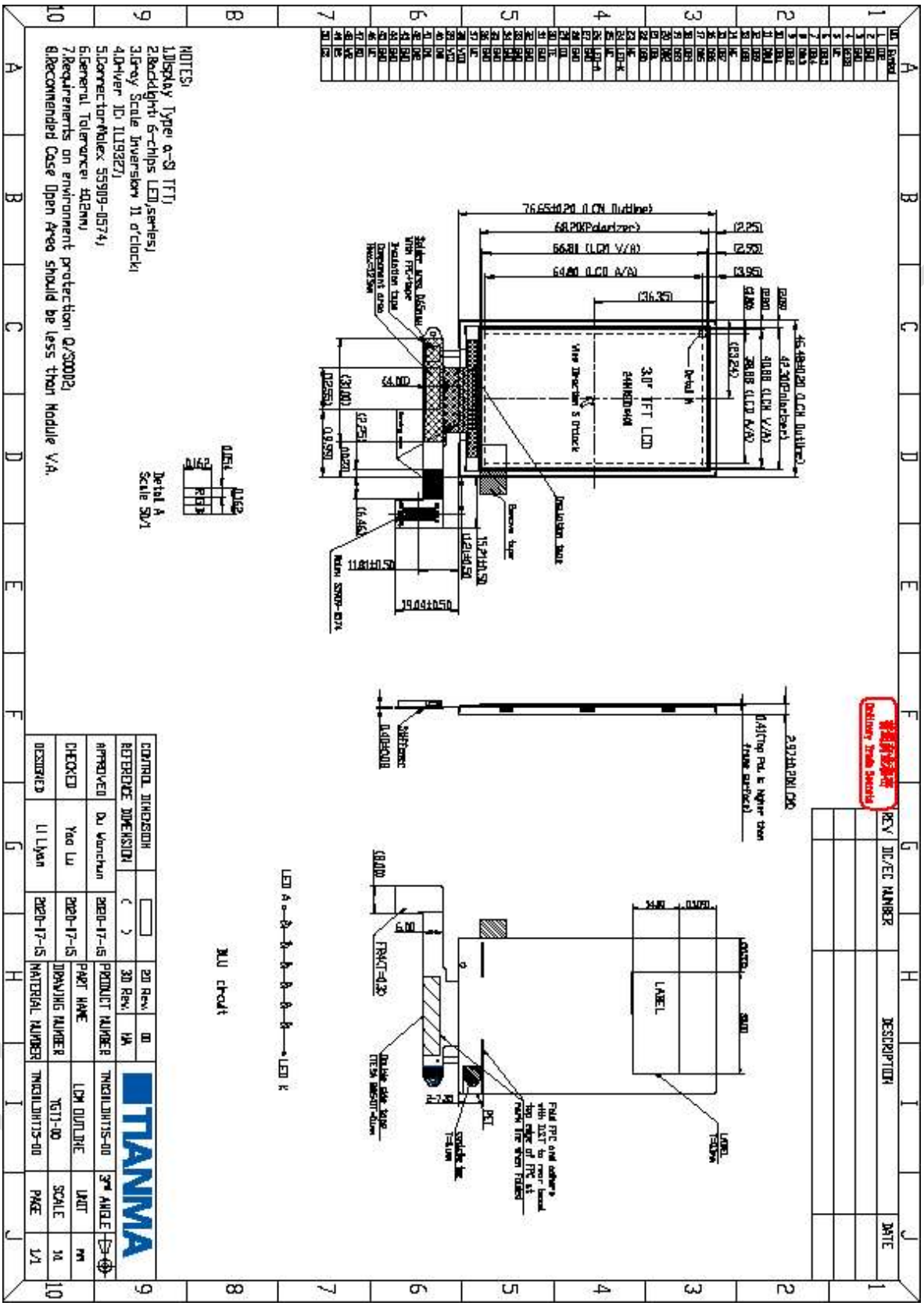
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta=+70℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=+85℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta=+60℃, 90% RH 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-40℃ 60 min~+85℃ 60 min, Change time:5min, 50 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF, R=330Ω, 5points/panel Air:±6KV, 5times; Contact:±4KV, 5 times; (Environment: 15℃～35℃, 30%～60%, 86Kpa～106Kpa)	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. (for total)(Package condition)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Drop onto the field floor from 76 cm heights, 6 faces, 3 edges and one of 8 corners. Total is 10 times	IEC60068-2-32:1990 GB/T2423.8—1995

Note1: Ta 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.

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.

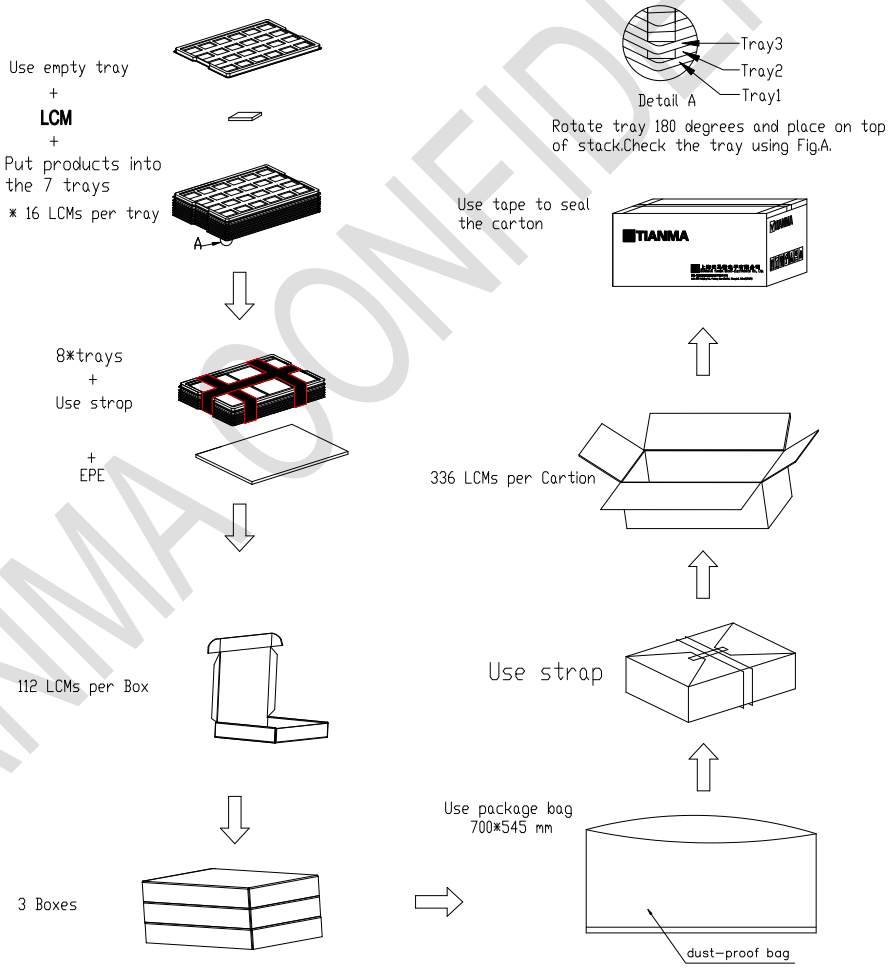
8 Mechanical Drawing



9 Packing Drawing

9.1 Packaging flow

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM030LDHT13-00	76.65*46.48*2.97	0.0212	336	
2	Carton	Corrugated paper	544×365×250	1.01	1	
3	Dust-Proof Bag	PE	700×545×0.05	0.046	1	
4	EPE	EPE	485×330x5	0.08	3	
5	Tray	PET(Transmit)	485×330×13.8	0.156	24	
6	BOX	Corrugated paper	520×345×74	0.44	3	
7	Total weight	13.48±10%				



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.

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

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

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

10.1.8.4 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:

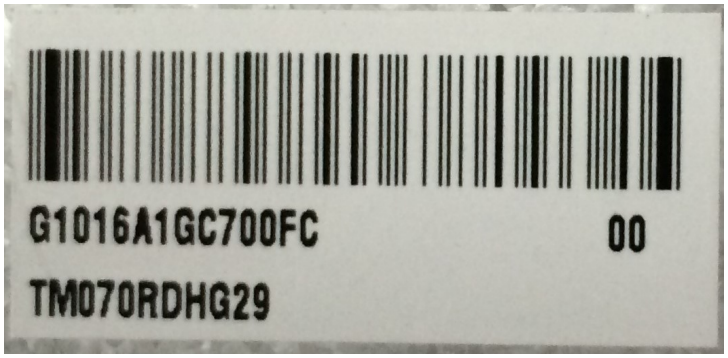
Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

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.

10.4 Bar Code definition on module



Note: Bar Code definition

Definition label is Panel ID, and it is unique and includes manufacture relevant information, for instance TM070RDHG29. G1016A1GC700FC Label definition as below:

G1016: Produce No.

A1: Produce line

G: 2014 year (A: 2008, B: 2009, C: 2010…);

C: December (1-9:Jan-Sep, A-C: Oct- Dec.)

7: Date 7 (date1-31,from 1-9,A-X,not including I,O)

00FC: Serial No(start from 0001).