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MODEL NO. : TM070DDHG21**ISSUED DATE: 2017-12-21****VERSION : Ver 1.0**

- ☒ **Preliminary Specification**
☐ **Final Product Specification**

Customer : _____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Yongwei Long		

This technical specification is subjected to change without notice.
This technical specification is with IIS.

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Record of Revision

[illegible]

1 General Specifications

Feature		Spec
Display Spec.	Size	6.92 inch
	Resolution	1024(RGB) x 600
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.1521(H)x0.1357(V)
	Display Mode	TM with Normally White
	Surface Treatment	Anti Glare
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	167.00 x 93.70 x 5.40
	Active Area(mm)	155.75 x 81.42
	With /Without TSP	Without TSP
	Connection Type	FPC
	LED Numbers	18 LEDs
	Weight (g)	141.4
Electrical Characteristics	Interface	LVDS 45 Pin
	Color Depth	16.7M
	Driver IC	HX8282+HX8696

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: $\pm 5\%$

2 Input/Output Terminals

2.1 Pins definition of FPC

Matching Connector of FH28S-45S-0.5SH

No	Symbol	I/O	Description	Comment
1	UPDN	I	Gate Up or Down Scan Control	
2	SHLR	I	Source Right or Left Sequence Control	
3	RESET	I	Global Reset Pin	
4	GND	P	Ground	
5	STBYB	I	Standby Mode Select; H:normal operation, L:standby mode	
6	V14	I	Gamma Voltage 14	
7	V13	I	Gamma Voltage 13	
8	V12	I	Gamma Voltage 12	
9	V11	I	Gamma Voltage 11	
10	V10	I	Gamma Voltage 10	
11	V9	I	Gamma Voltage 9	
12	V8	I	Gamma Voltage 8	
13	GND	P	Ground	
14	CLKIN-	I	-LVDS differential clock input	
15	CLKIN+	I	+LVDS differential clock input	
16	GND	P	Ground	
17	RXIN0-	I	-LVDS differential data input	
18	RXIN0+	I	+LVDS differential data input	
19	GND	P	Ground	
20	RXIN1-	I	-LVDS differential data input	
21	RXIN1+	I	+LVDS differential data input	
22	GND	P	Ground	
23	RXIN2-	I	-LVDS differential data input	
24	RXIN2+	I	+LVDS differential data input	
25	GND	P	Ground	
26	RXIN3-	I	-LVDS differential data input	
27	RXIN3+	I	+LVDS differential data input	
28	GND	P	Ground	
29	SELB	I	6bit/8bi mode select	
30	V7	I	Gamma Voltage 7	
31	V6	I	Gamma Voltage 6	
32	V5	I	Gamma Voltage 5	
33	V4	I	Gamma Voltage 4	
34	V3	I	Gamma Voltage 3	
35	V2	I	Gamma Voltage 2	
36	V1	I	Gamma Voltage 1	
37	GND	P	Ground	
38	AVDD	P	Analog Power	
39	VGH	P	Positive Power for TFT	
40	NC	N	No Connection	
41	VGL	P	Negative Power for TFT	

42	GND	P	Ground	
43	VDD	P	Digital Power	
44	VCOM	I	Common Voltage Input	
45	NC	N	No Connection	

Note1: I/O definition: I-----Input O---Output P----Power/ Ground NC---Not Connected

2.2 CN2 of LED BLU Connector

Matching Connector of BHSR-02VS-1

No	Symbol	I/O	Description	Comment
1	LED+	P	LED Anode	Red Cable
2	LED-	P	LED Cathode	Black Cable

2.3 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
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

(AGND= GND=0V, Ta = 25℃)

Item	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VDD	-0.50	3.96	V	Base on IC Spec
	AVDD	-0.50	14.85	V	Base on IC Spec
	VGH	-0.3	42	V	Base on IC Spec
	VGL	VGH-42	0.3	V	Base on IC Spec
Operating Temperature	T _{OPR}	-30	85	℃	Base on RA
Storage Temperature	T _{STG}	-30	85	℃	Base on RA

Table 3.1 Absolute maximum rating

4 Electrical Characteristics

4.1 LCD module

(GND=AGND= 0V, TA= 25°C)

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Digital Supply Voltage	VDD	3.00	3.30	3.60	V	--
Analog Supply Voltage	AVDD	10.2	10.4	10.6	V	--
Gate On Voltage	VGH	21.7	22	22.3	V	--
Gate Off Voltage	VGL	-7.3	-7	-6.8	V	--
Common Electrode Driving Signal	VCOM	4.24	4.29	4.34	V	--

Table 4.1 LCD module electrical characteristics

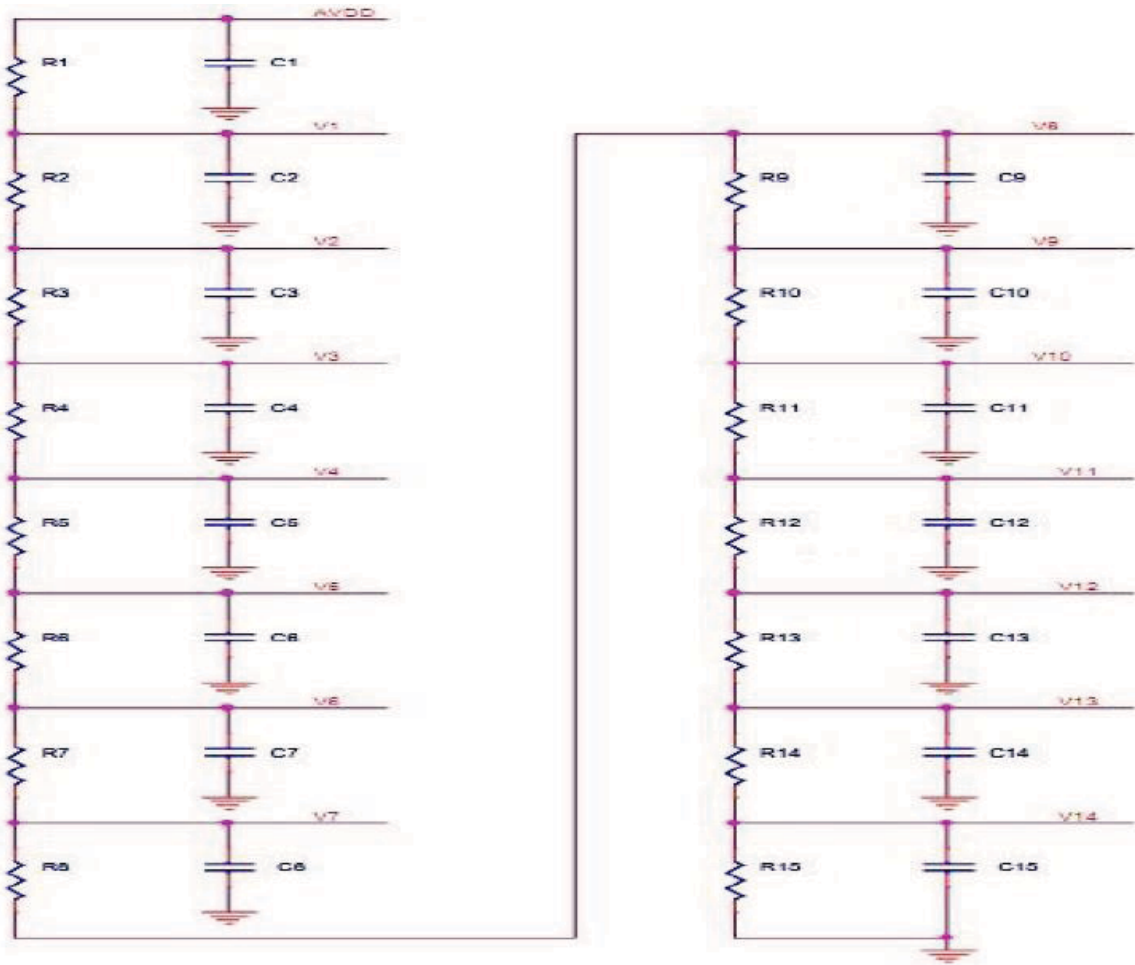
4.2 Gamma Correction Voltage Setting

4.2.1 Gamma Correction Reference Voltage Setting

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
Gamma correction reference voltage V1~V14	V1	-	10.10	AVDD-0.1	V	
	V2	-	9.98	-	V	
	V3	-	8.00	-	V	
	V4	-	7.48	-	V	
	V5	-	7.09	-	V	
	V6	-	6.38	-	V	
	V7	-	5.36	-	V	
	V8	-	5.10	-	V	
	V9	-	4.08	-	V	
	V10	-	3.37	-	V	
	V11	-	2.98	-	V	
	V12	-	2.46	-	V	
	V13	-	0.48	-	V	
	V14	GND+0.1	0.36	-	V	

Note: AVDD-0.1> V1 > V2> V3 > V4 > V5 > V6 > V7>V8 > V9 > V10 > V11> V12 >V 13 > V14 >GND+0.1V

4.2.2 Gamma Correction Reference Voltage Setting



4.2.3 Gamma Correction Resistance Value

Symbol	Unit	Resistance	Symbol	Unit	Resistance
R1	Ω	232	R2	Ω	93.1
R3	Ω	1540	R4	Ω	402
R5	Ω	300	R6	Ω	549
R7	Ω	787	R8	Ω	200
R9	Ω	787	R10	Ω	549
R11	Ω	300	R12	Ω	402
R13	Ω	1540	R14	Ω	93.1
R15	Ω	280	C1~C15	μF	0.1

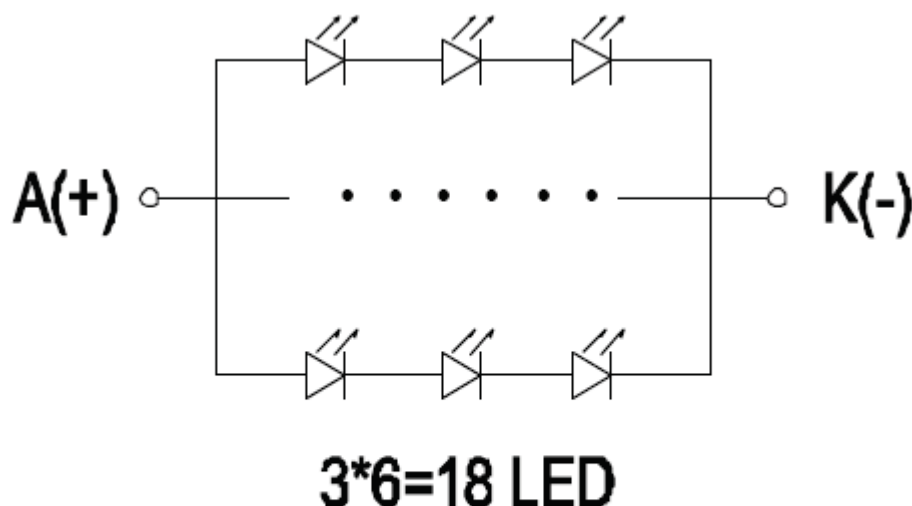
Note: Setting the resistance only when AVDD=9.840V, AGND=GND=0V;

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4.3 Backlight Unit
Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F		360		mA	18 LEDs (3 LED Serial, 6 LED parallel)
Forward Voltage	V_F	8	9.3	10.5	V	
Backlight Power Consumption	W_{BL}	-	3.348	5.04	W	
Operating Life Time	-	10,000	(20,000)	-	Hrs	

Note 1: Figure below shows the connection of backlight LED.



Backlight Circuit Diagram

Note 2: For each LED: $V_F = 3.1V$ $I_F = 60mA$

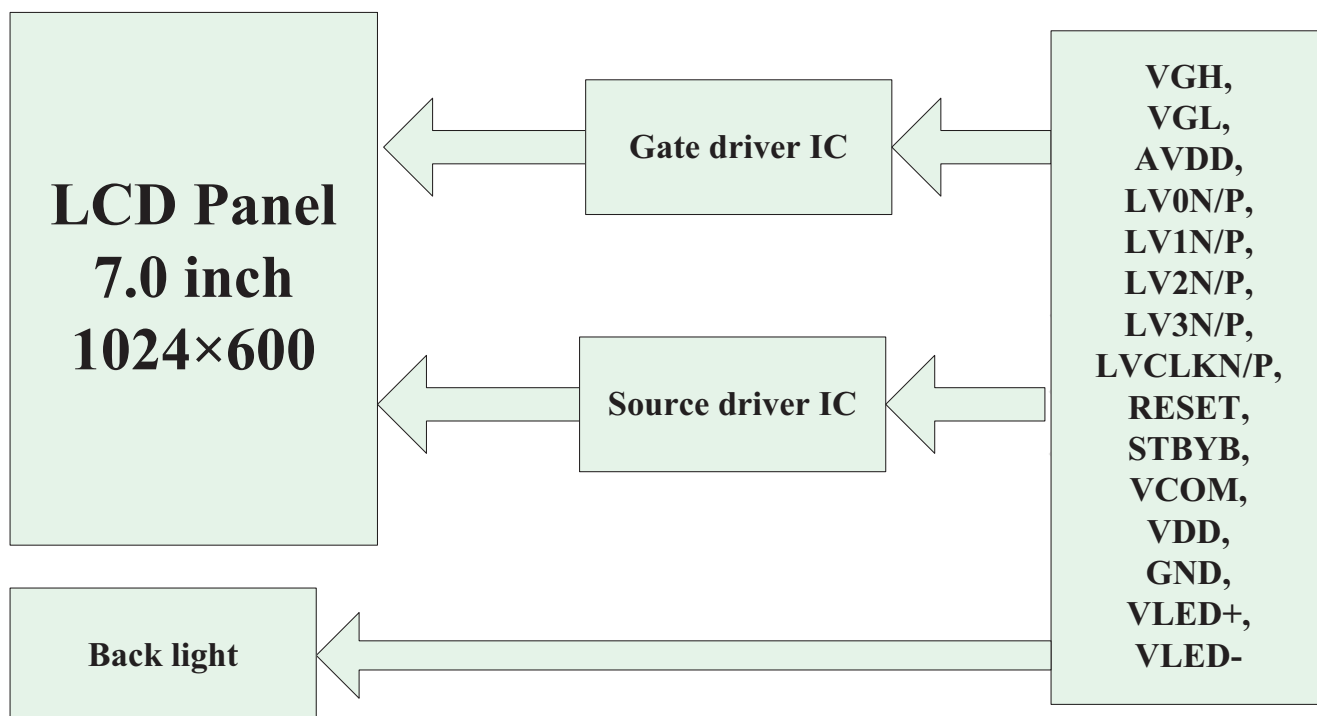
Note 3: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note 4: I_F is defined for one LED.

Optical performance should be evaluated at Ta=25°C 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% initial brightness. Typical operating life time is estimated data.

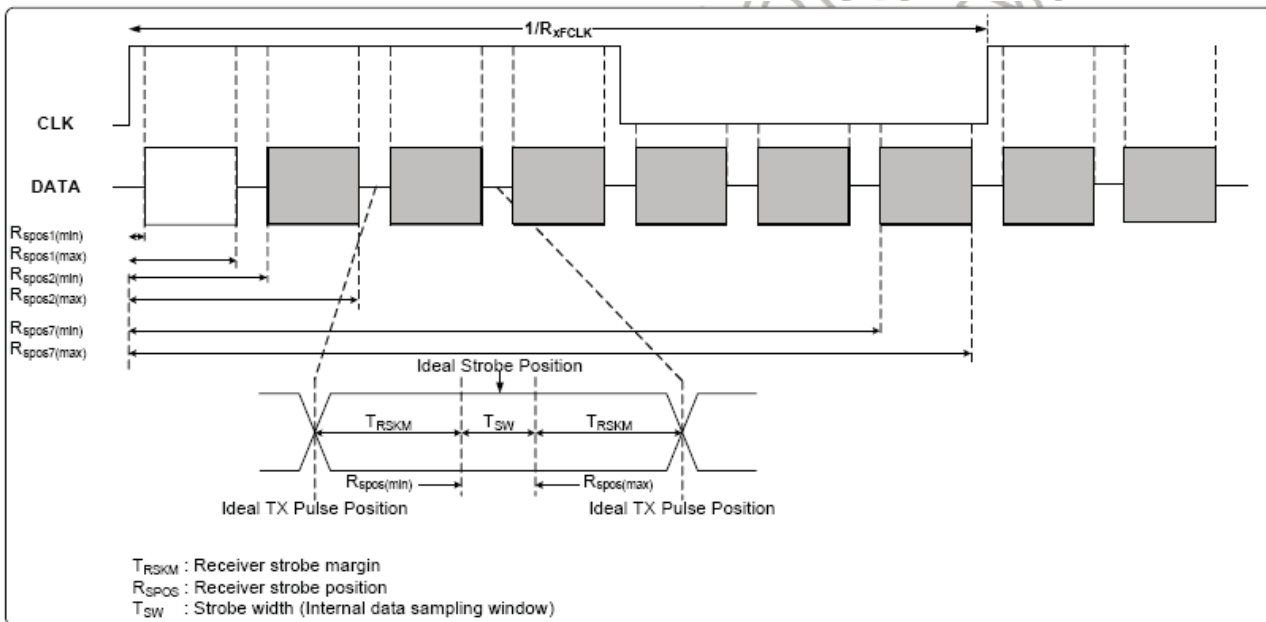
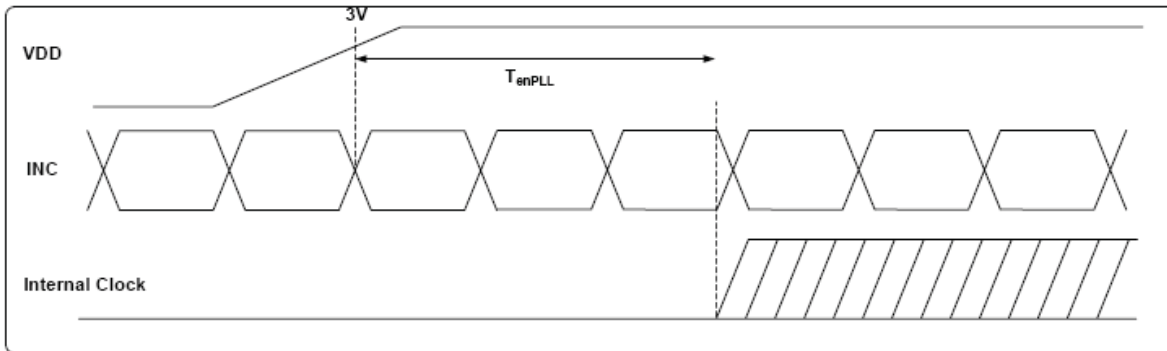
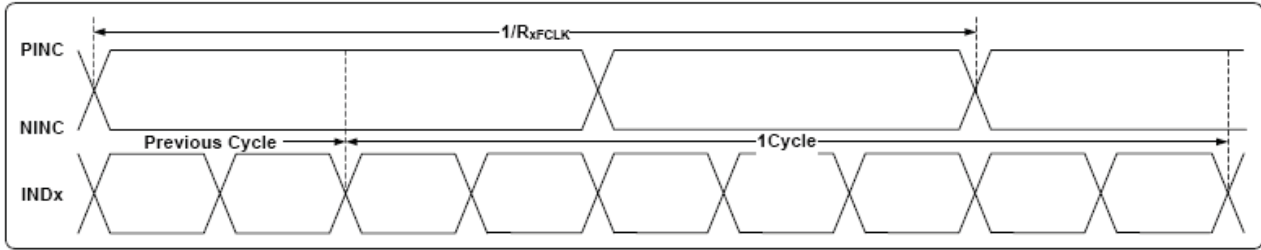
4.4 Block Diagram



5 Timing Chart

5.1 AC Electrical Characteristics

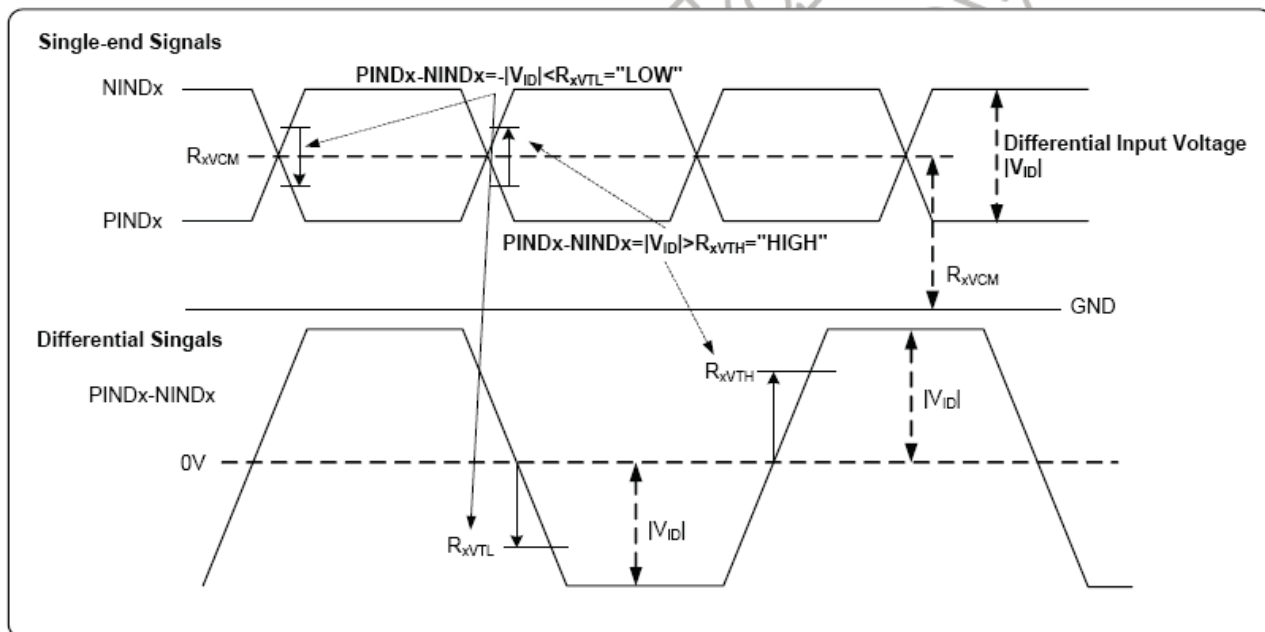
Parameter	Symbol	Min.	Spec. Typ.	Max.	Unit	Condition
Clock frequency	R_{XFCLK}	20	-	71	MHz	-
Input data skew margin	T_{RSKM}	500	-	-	pS	$ V_{ID} =400mV$ $R_{XVCM}=1.2V$ $R_{XFCLK}=71MHz$
Clock high time	T_{LVCH}	-	$4/(7 * R_{XFCLK})$	-	ns	-
Clock low time	T_{LVCL}	-	$3/(7 * R_{XFCLK})$	-	ns	-
PLL wake-up time	T_{enPLL}	-	-	150	μs	-



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5.2 DC Electrical Characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	$R_{xVCM}=1.2V$
Differential input low threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	$VDD-1.2+ V_{ID} /2$	V	-
Differential input common Mode voltage	R_{xVCM}	$ V_{ID} /2$	-	$VDD-1.2$	V	-
Differential input voltage	$ V_{ID} $	0.2	-	0.6	V	-
Differential input leakage Current	$R_{V_{XlIZ}}$	-10	-	+10	μA	-
LVDS Digital Operating Current	Iddlvds	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	-	10	50	μA	Clock & all Functions are stopped

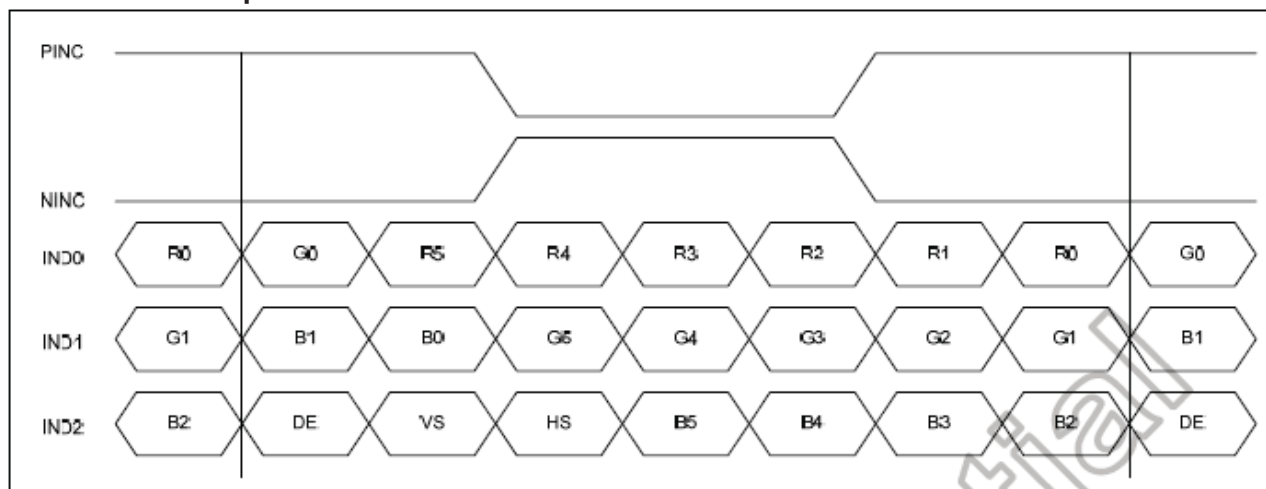


5.3 Timing

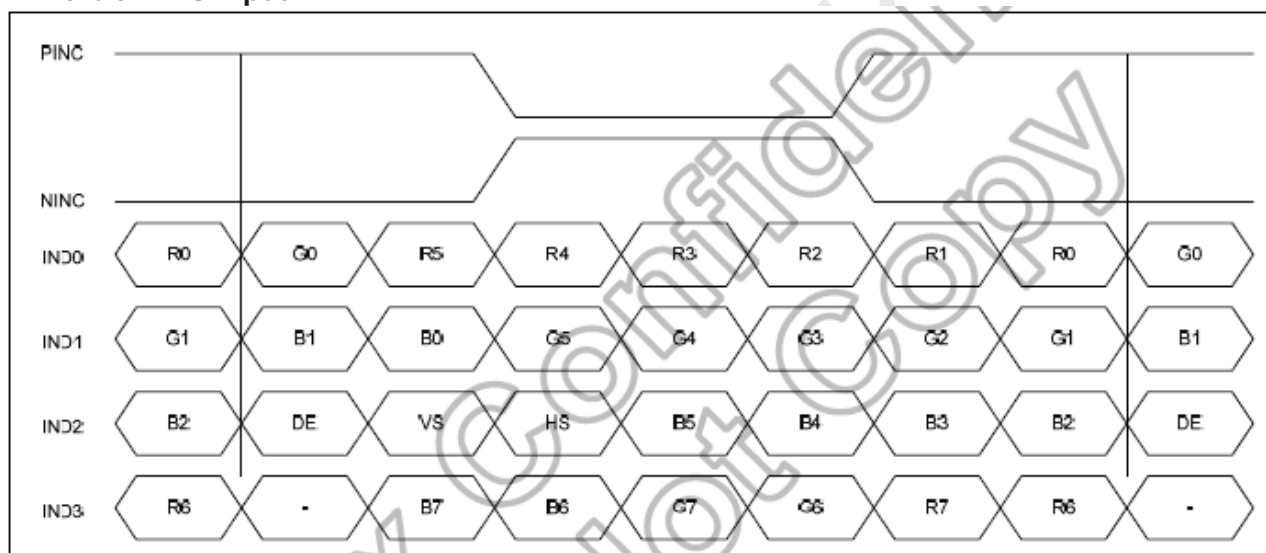
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	40.8	51.2	67.2	MHz
Horizontal Display Area	thd	1024			DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd	600			T_H
VSD Period	tv	610	635	800	T_H
VSD Blanking	tvbp+ tvfp	10	35	200	T_H

5.4 Date Input Format

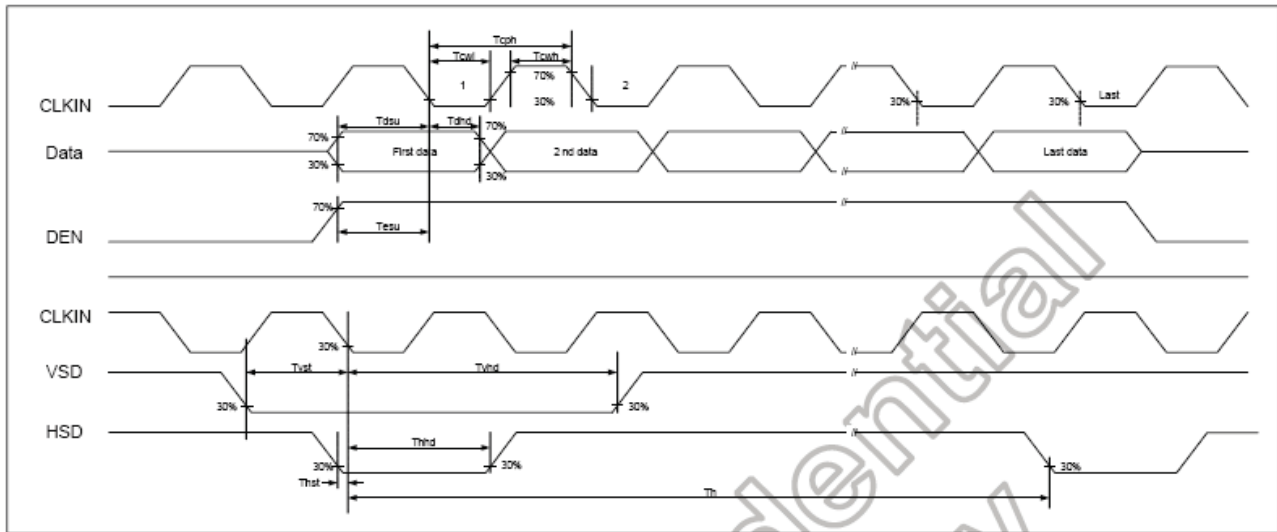
6-bit LVDS Input



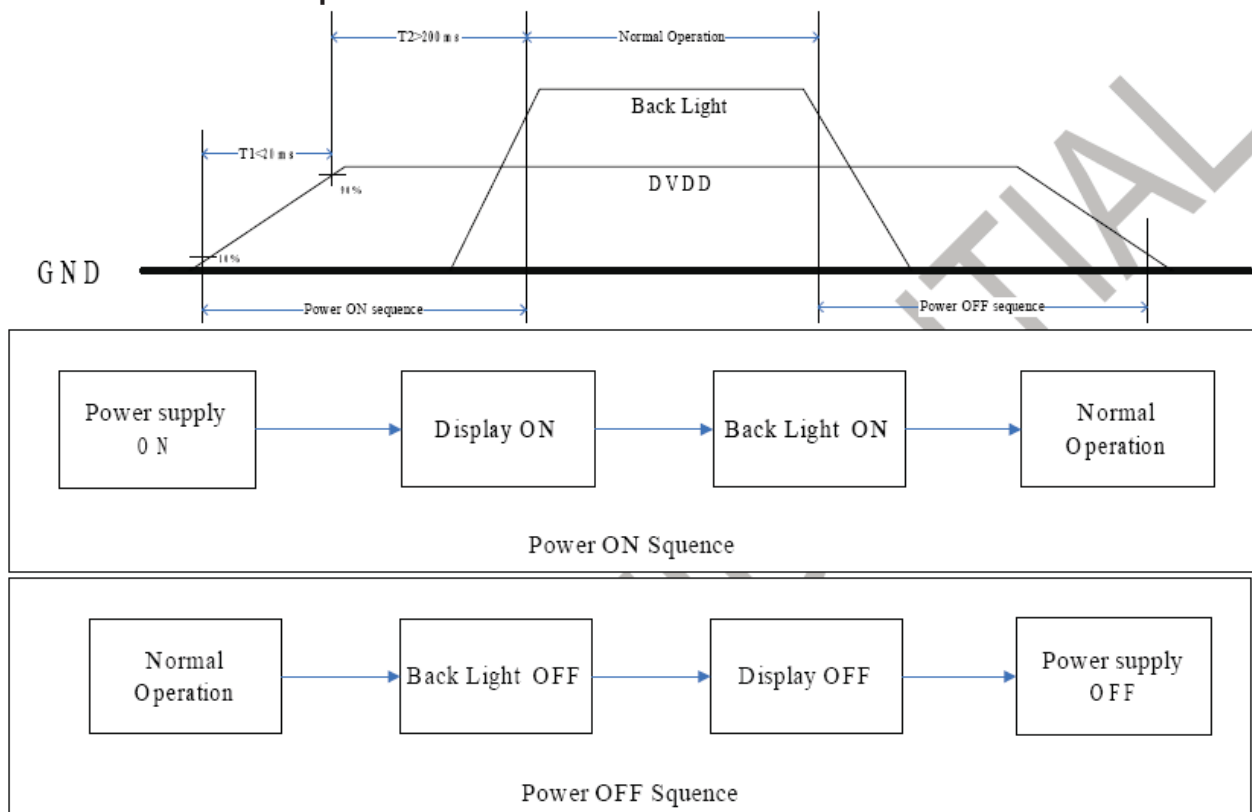
8-bit LVDS Input



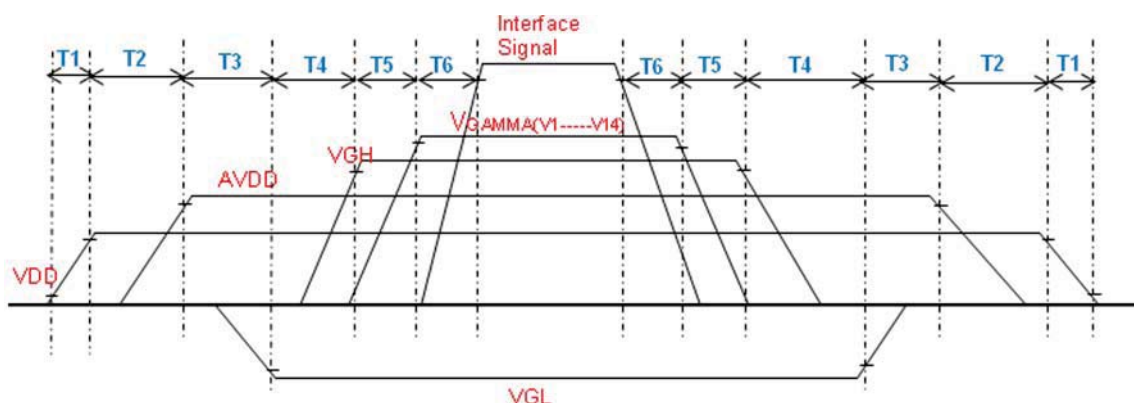
5.5 Input Clock and Data Timing Diagram



5.6 Power ON/OFF Sequence



5.7 System Power ON/OFF Sequence



	Min.	Typ.	Max.	Unit
T1	-	-	20	ms
T2	16	-	-	ms
T3	> 0			ms
T4	> 0			ms
T5	> 0			ms
T6	> 0			ms

6 Optical Characteristics

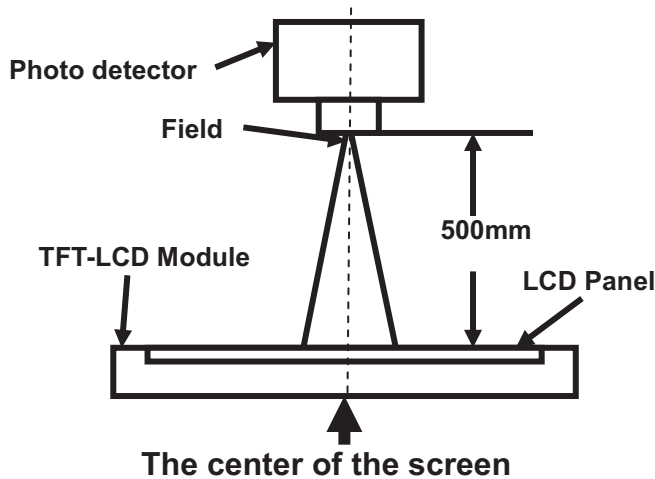
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	$CR \geq 10$	50	60		Degree	Note2,3
	θB		60	70			
	θL		60	70			
	θR		60	70			
Contrast Ratio	CR	$\theta=0^\circ$	350	400			Note 3
Response Time	T_{ON}	25℃		20	30	ms	Note 4
	T_{OFF}						
Chromaticity	White	x	0.264	0.314	0.364		Note 1,5
		y	0.292	0.342	0.392		
	Red	x	0.566	0.616	0.666		Note 1,5
		y	0.308	0.358	0.408		
	Green	x	0.287	0.337	0.387		Note 1,5
		y	0.525	0.575	0.625		
	Blue	x	0.106	0.156	0.206		Note 1,5
		y	0.046	0.096	0.146		
Uniformity	U		75	80		%	Note 6
NTSC				50		%	Note 5
Luminance	L		400	500		cd/m ²	Note 7

Test Conditions:

1. $I_F = 60$ mA/LED, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

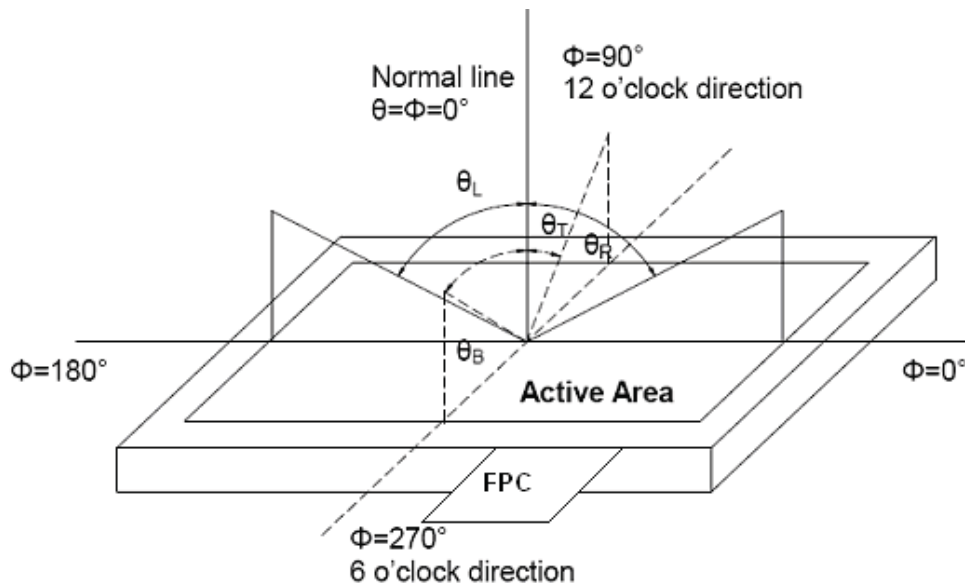
Note 1: Definition of optical measurement system.

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 V_{white} .

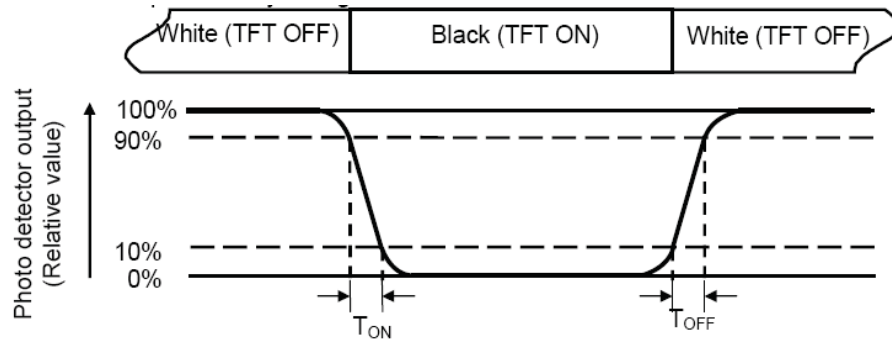
"Black state": The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

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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)

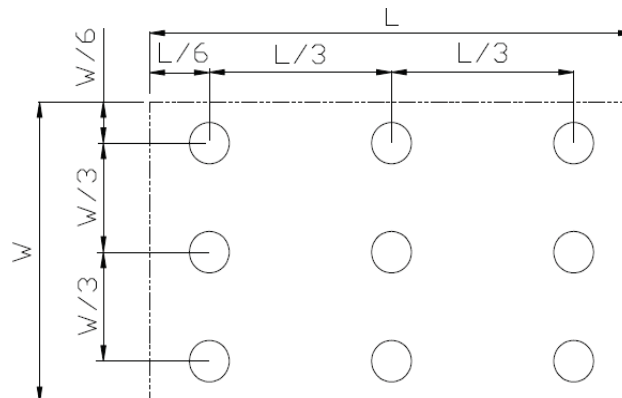
Color coordinates measured at center point of LCD.

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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



$L_{\max}$: The measured Maximum luminance of all measurement position.

$L_{\min}$: 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	Ts=+80℃, 240hrs	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	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	High Temperature and Humidity Operation	Ta=+60℃, 90% RH, 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+85℃ 30 min, Change time:5min, 50 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	Electro Static Discharge (operation)	C=150pF, R=330Ω, 5points/panel Air:± 8KV, 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, 2h for x,y,z (total 6h)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (non-operation)	Half-sine 60G 6ms, ± X,± Y,± Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

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

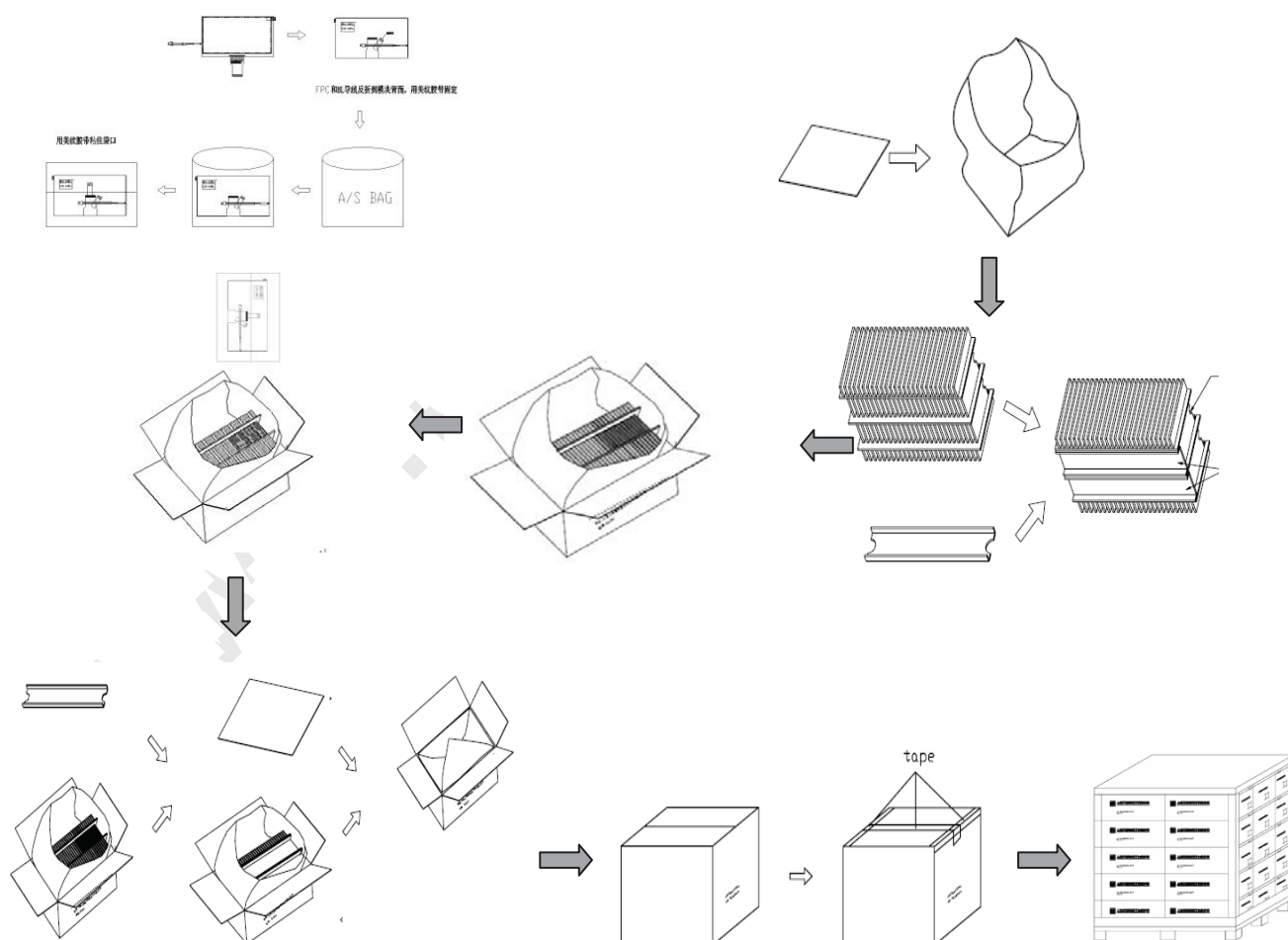
Note2: Ta is the ambient temperature of sample.

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.

9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM070DDHG20-00	167X93.7X5.4mm	0.1414	50	
2	Partition_1	Corrugated Paper	513*333*215	2.0	1	
3.	Anti-Static Bag	PE	200*185*0.05	0.01	50	Anti-static
4	Dust-Proof Bag	PE	700*545*0.05	0.0600	1	
5	Partition_2	Corrugated Paper	505*332	0.1	2	
6	Corrugated Bar	Corrugated Paper	513*148	0.06	4	
7	Crepe Paper Tape	Crepe Paper Tape	30*10	0.01	100	
8	Dessicant	Dessicant	45*35	0.002	8	
9	Carton	Corrugated Paper	530*350*250	1.1000	1	
10	Total weight	3.4834±5%				



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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.