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MODEL NO : TM101DDHG06**MODEL VERSION: 01****SPEC VERSION : 2.1****ISSUED DATE: 2020-03-26**

- ☐ Preliminary Specification
☒ Final Product Specification

Customer : _____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Panpan Cao	Longping Deng	KimMinHong

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2019-01-04	Preliminary Specification Release.	Panpan Cao
2.0	2019-6-18	Final Specification Release.	Panpan Cao
2.1	2020-3-26	Update View Angles in page 13.	Panpan Cao

1 General Specifications

Feature		Spec
Display Spec.	Size	10.1 inch
	Resolution	1024(RGB) × 600
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.2175x0.2088
	Display Mode	Transmissive, Normally White
	Surface Treatment	AG
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	235.00 x 143.00 x 5.0
	Active Area(mm)	222.72 x 125.28
	With /Without TSP	Without TSP
	Matching Connection Type	Starconn:089H50-000100-G2-R
	LED Numbers	24 LED
	Weight (g)	272.3
Electrical Characteristics	Interface	24 bit RGB
	Color Depth	16.7M
	Driver IC	HX8282-A02*1+HX8677-G*2

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

Recommended connector: STARCONN 089H50-000100-G2-R

Pin	Symbol	I/O	Description	Remark
1	NC	-	No connection	
2	NC	-	No connection	
3	NC	-	No connection	
4	NC	-	No connection	
5	GND	P	Power GND	
6	NC	-	No connection	
7	VDD	P	Digital Power	
8	MODE	I	DE/SYNC mode select ("1":DE "0":SYNC)	Note1
9	DE	I	Data input enable	
10	VS	I	Vertical sync input	
11	HS	I	Horizontal sync input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data(LSB)	
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	
27	G0	I	Green data(LSB)	
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data(LSB)	
36	GND	P	Power GND	
37	DCLK	I	Clock for input data Latch at falling	

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			edge	
38	GND	P	Power GND	
39	SHLR	I	Left or right display control	Note2
40	UPDN	I	UP/down display control	Note3
41	VGH	P	Positive power for TFT	
42	VGL	P	Negative power for TFT	
43	AVDD	P	Analog power	
44	RESET	I	Global reset pin	
45	NC	-	No connection	
46	NC	-	No connection	
47	DITHB	I	Dithering function	Note4
48	GND	P	Power GND	
49	NC	-	No connection	
50	NC	-	No connection	

BackLight Connector

Connector: JST BHSR-02VS-1

No	Symbol	I/O	Description	Wire Color
1	LEDA	P	LED driving anode (high voltage)	Red
2	LEDK	P	LED driving cathode (low voltage)	White

*Shrouded header: SM02B-BHSS-1-TB

Note1: DE/SYNC mode select. Normally pull high.

When MODE=H: DE mode.

When MODE=L : SYNC mode.

Note2: Source Driver internal shift register is controlled by this pin as shown below:

Normally pull high.

SHLR=H:SO1 SO2 SO3...SO1024.(Default)

SHLR=L: SO1024 SO1023 SO1022...SO1.

Note3: Gate Driver Up/down scan setting. Normally pull low.

When UPDN=H: Reverse scan. G600 G599 G598...G1.

When UPDN=L, normal scan. (Default)G1 G2 G3...G600.

Note4: Dithering function enable control. Normally pull low.

When DITHB=H: Enable internal dithering function.

When DITHB=VFL: Disable internal dithering function.

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	3.9	V	
Positive power for TFT	VGH	-0.3	+42.0	V	
Negative power for TFT	VGL	VGH-42	+0.3	V	
Analog power	AVDD	-0.5	14.85	V	
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-30	80	°C	
Relative Humidity Note1	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta ≤ 50°C
		--	≤55	%	50°C < Ta ≤ 60°C
		--	≤36	%	60°C < Ta ≤ 70°C
		--	≤24	%	70°C < Ta ≤ 80°C
Absolute Humidity	AH	--	≤70	g/m ³	Ta > 70°C

Note1: 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

GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Power Supply Voltage		VDD	3.0	3.3	3.6	V	
Positive power for TFT		VGH	21	22	23	V	
Negative power for TFT		VGL	-6.5	-7	-7.5	V	
Analog power		AVDD	10.8	11	11.2	V	
Input Signal Voltage	Low Level	V _{IL}	GND	-	0.3VCC	V	
	High Level	V _{IH}	0.7VCC	-	VCC	V	

4.2 Recommended Driving Condition for Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I _F	-	224	240	mA	24LEDs (3 LED Serial, 8 LED Parallel, 28mA for each)
Forward Voltage	V _F	8.7	9.6	10.5	V	
Backlight Power Consumption	W _{BL}	-	2.418	2.520	W	
Operating Life Time	-	-	30000	-	Hrs	I _F =224mA

4.3 Power Consumption

AGND=GND=0V, Ta = 25℃

Item	Symbol	Condition	Min	Typ.	Max	Unit	Remark
Digital Supply Current	I _{VCC}	VDD=3.3V	3	5	8	mA	Note1
Analog Supply Current	I _{AVDD}	AVDD=11V	10	40	60	mA	Note1
Gate On Current	I _{VGH}	VGH=22V	0.3	0.50	1	mA	Note1
Gate Off Current	I _{VGL}	VGL=-7.0V	0.3	0.50	1	mA	Note1
Power Consumption	Pane I& Gamma		360	450	540	mW	Note1
	Backlight		1760	2200	2650	mW	-
	Total		2120	2650	3190	mW	Note1

Note1: Tested at black pattern @60Hz.

5 Timing Chart

5.1 Power sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.3V rising time	T1	0	-	20	ms	
VCC to AVDD on time	T2	16.7	-	-	ms	
AVDD to VGL on time	T3	>0	-	-	ms	
VGL to VGH on time	T4	>0	-	-	ms	
VGH to DATA on time	T5	>0	-	-	ms	
DATA to BL on time	T6	>0	-	-	ms	

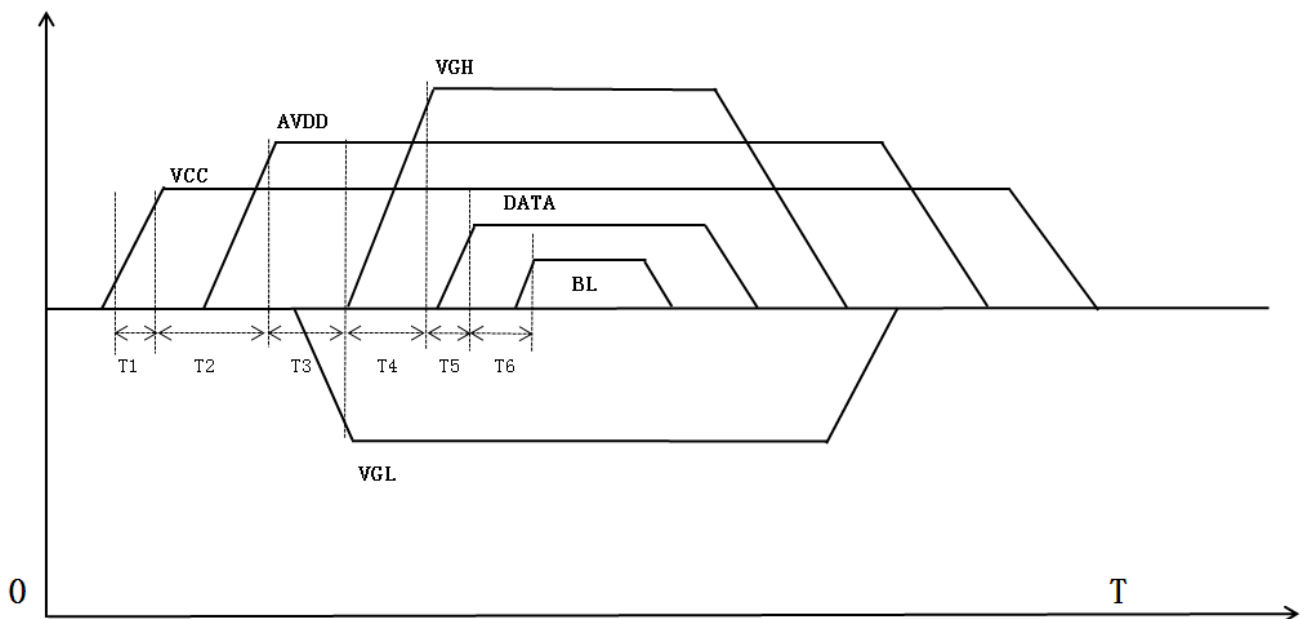


Figure 5.1.1 Power on/off sequence

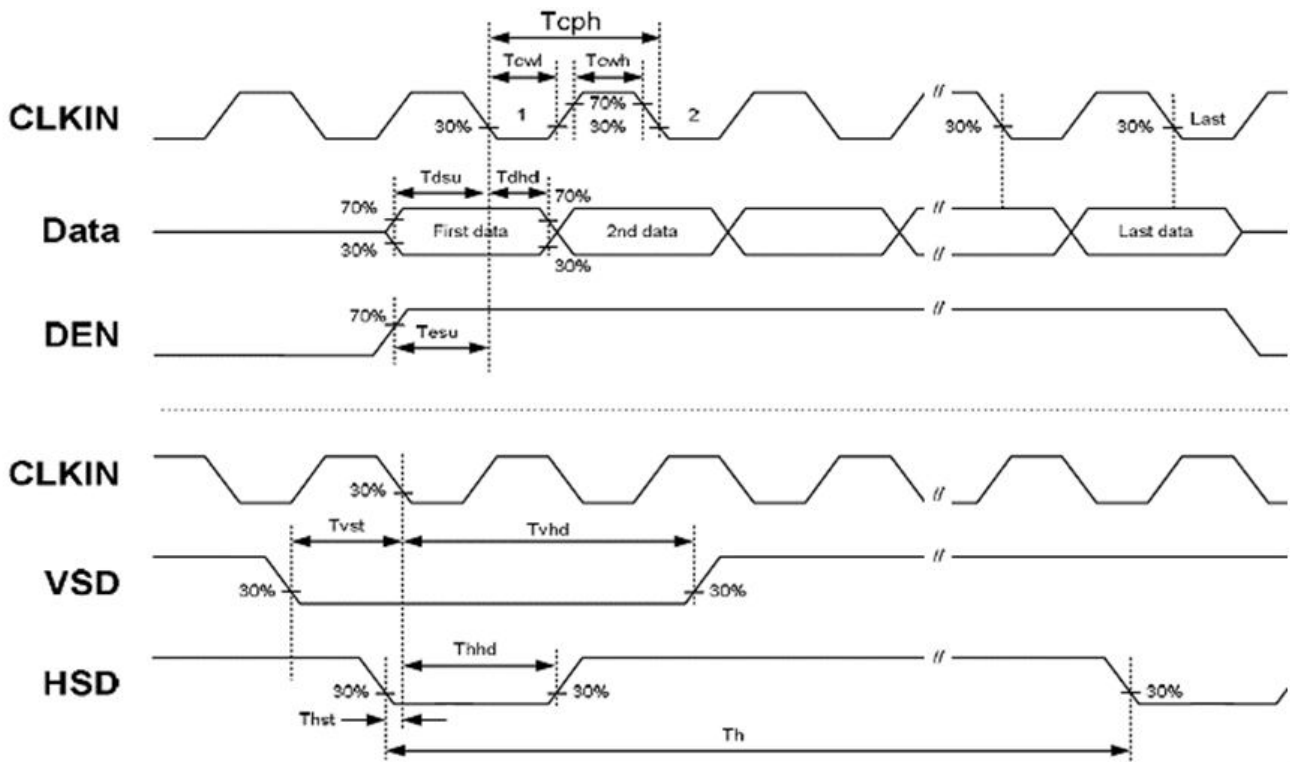
- Note:1. Power on sequence: VDD→AVDD→VGL→VGH→DATA ON→BACKLIGHT ON
2. Power off sequence: BACKLIGHT OFF→DATA OFF→VGH→VGL→AVDD→VDD
3. When VCC turned on, the rising time T1 should less than 20ms.
4. AVDD stable to VCC stable time T2 should better longer than 1 frame time.
5. The power off sequence can be set according to power on settings.

5.2.1 TTL mode AC electrical characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
VDD Power on slew rate	Tpor	-	-	20	ms	From 0V to 90%
Reset pulse width	Tgrb	50	-	-	us	DCLK=65MHz
DCLK Cycle Time	Tcph	14	-	-	ns	
DCLK Pulse Width	Tcw	40%	50%	60%	-	
VSD Setup Time	Tvst	5	-	-	ns	

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VSD Hold Time	Tvhd	5	-	-	ns	
HSD Setup Time	Thst	5	-	-	ns	
HSD Hold Time	Thhd	5	-	-	ns	
Data Setup Time	Tdsu	5	-	-	ns	Data to DCLK
Data Hold Time	Tdhd	5	-	-	ns	Data to DCLK
DE Setup Time	Tesu	5	-	-	ns	
DE Hold Time	Tehd	5	-	-	ns	

Table 5.2.1 Parallel 24-bit RGB mode

Figure 5.2.1 Input clock and data timing diagram

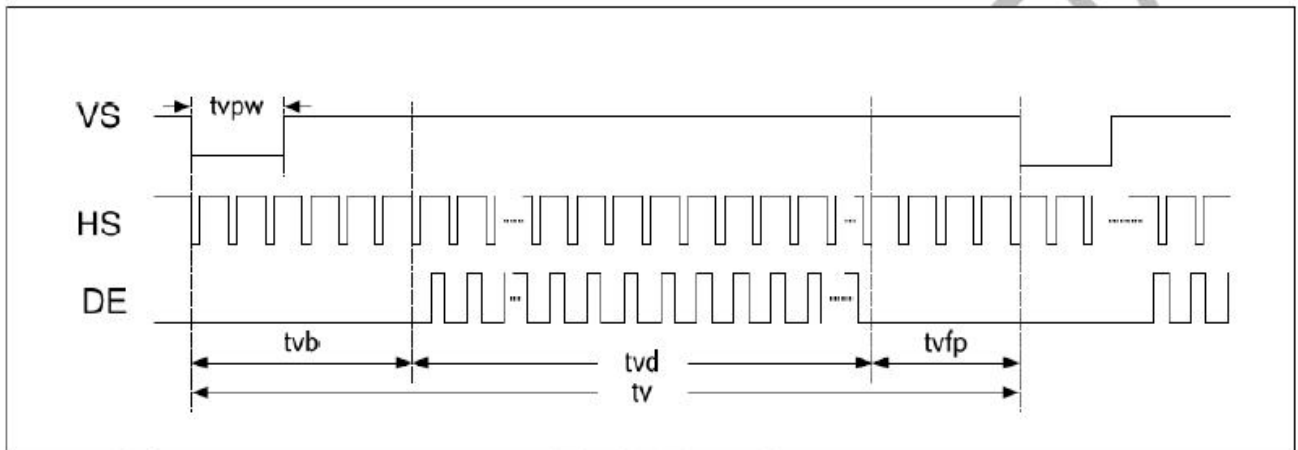


Figure 5.2.2 Vertical input timing

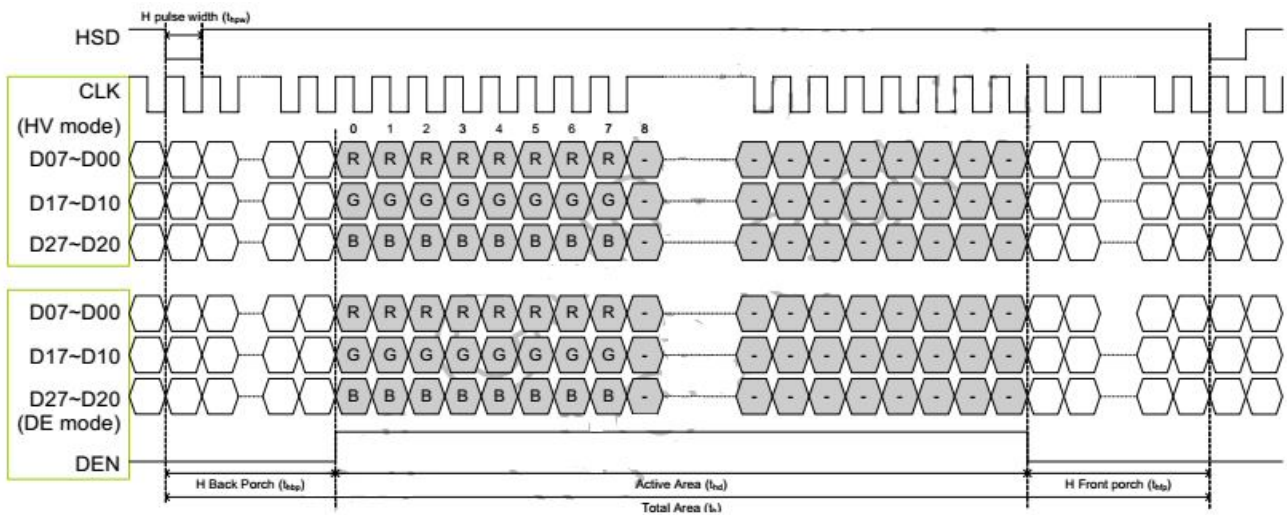


Figure 5.2.3 Horizontal input timing Diagram

5.5 Timing characteristics

- **DE mode**

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

Table 10.4: DE mode (1024x600)

- **HV mode**

Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	44.9	51.2	63	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1200	1344	1400	DCLK
HSD pulse Width	thpw	1	-	140	DCLK
HSD back porch	thbp	160			DCLK
HSD front porch	thfp	16	160	216	DCLK

Table 10.5: HV mode horizontal timing (1024x600)

Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			T _H
VSD period	tv	624	635	750	T _H
VSD pulse width	tpw	1	-	20	T _H
VSD back porch	tvbp	23			T _H
VSD front porch	tvfp	1	12	127	T _H

Table 10.6: HV mode vertical timing (1024x600)

6 Optical Characteristics

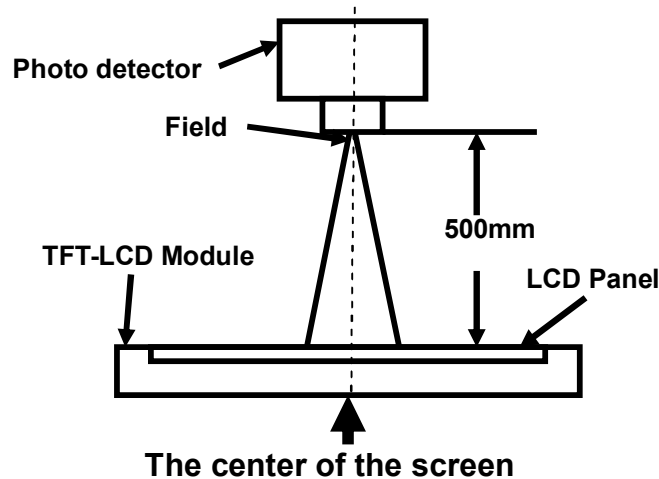
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≥ 10	60	75	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ=0°	400	500			Note 3
Response Time		T _{ON}	25℃	-	7	10	ms	Note 4
		T _{OFF}		-	9	18		
Chromaticity	White	x	Backlight is on	0.263	0.313	0.363		Note 1,5
		y		0.279	0.329	0.379		
	Red	x		0.524	0.574	0.624		Note 1,5
		y		0.285	0.335	0.385		
	Green	x		0.280	0.330	0.380		Note 1,5
		y		0.525	0.575	0.625		
	Blue	x		0.108	0.158	0.208		Note 1,5
		y		0.090	0.140	0.190		
Uniformity		U		70	80	-	%	Note 6
NTSC				42	47	-	%	Note 5
Luminance		L		280	350	-	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.

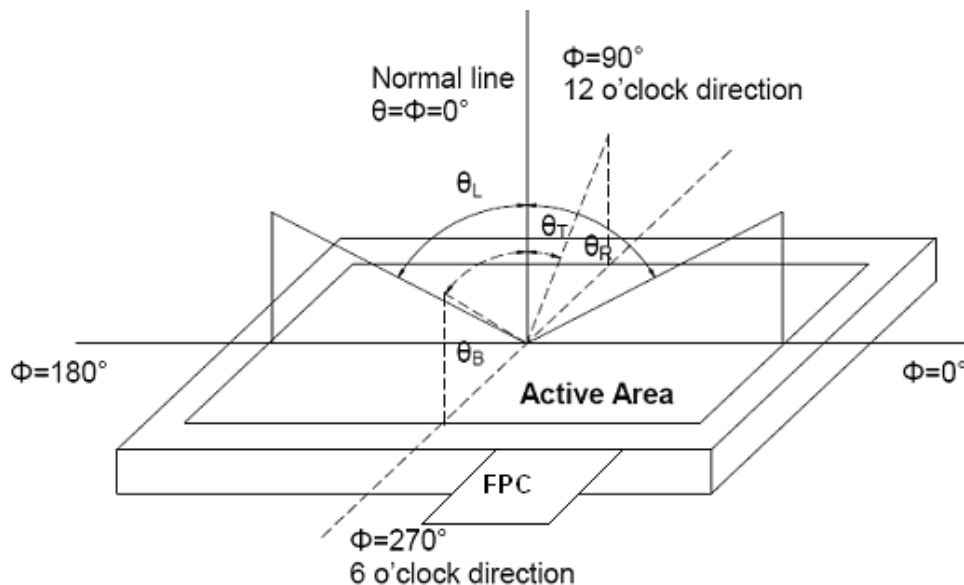
Note 1: Definition of optical measurement system.

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 by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

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

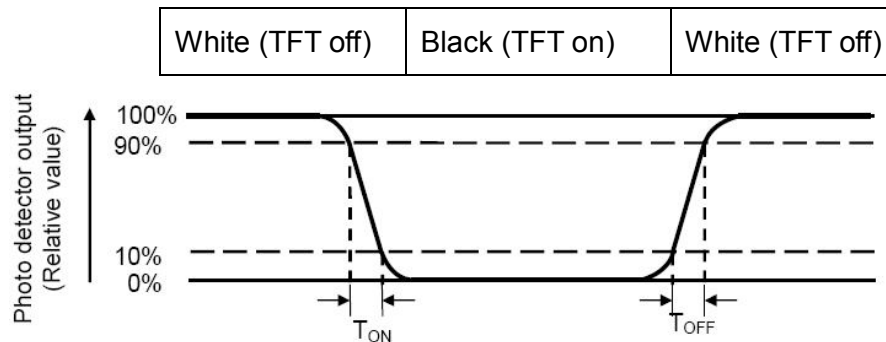
“White state “: The state is that the LCD should drive by V_{white} .

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

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

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)

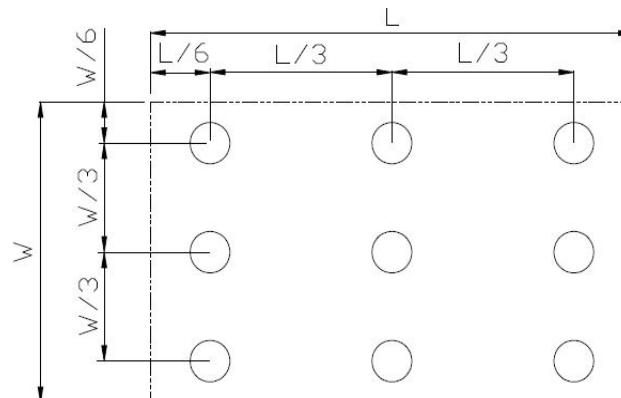
Color coordinates measured at center point of LCD.

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

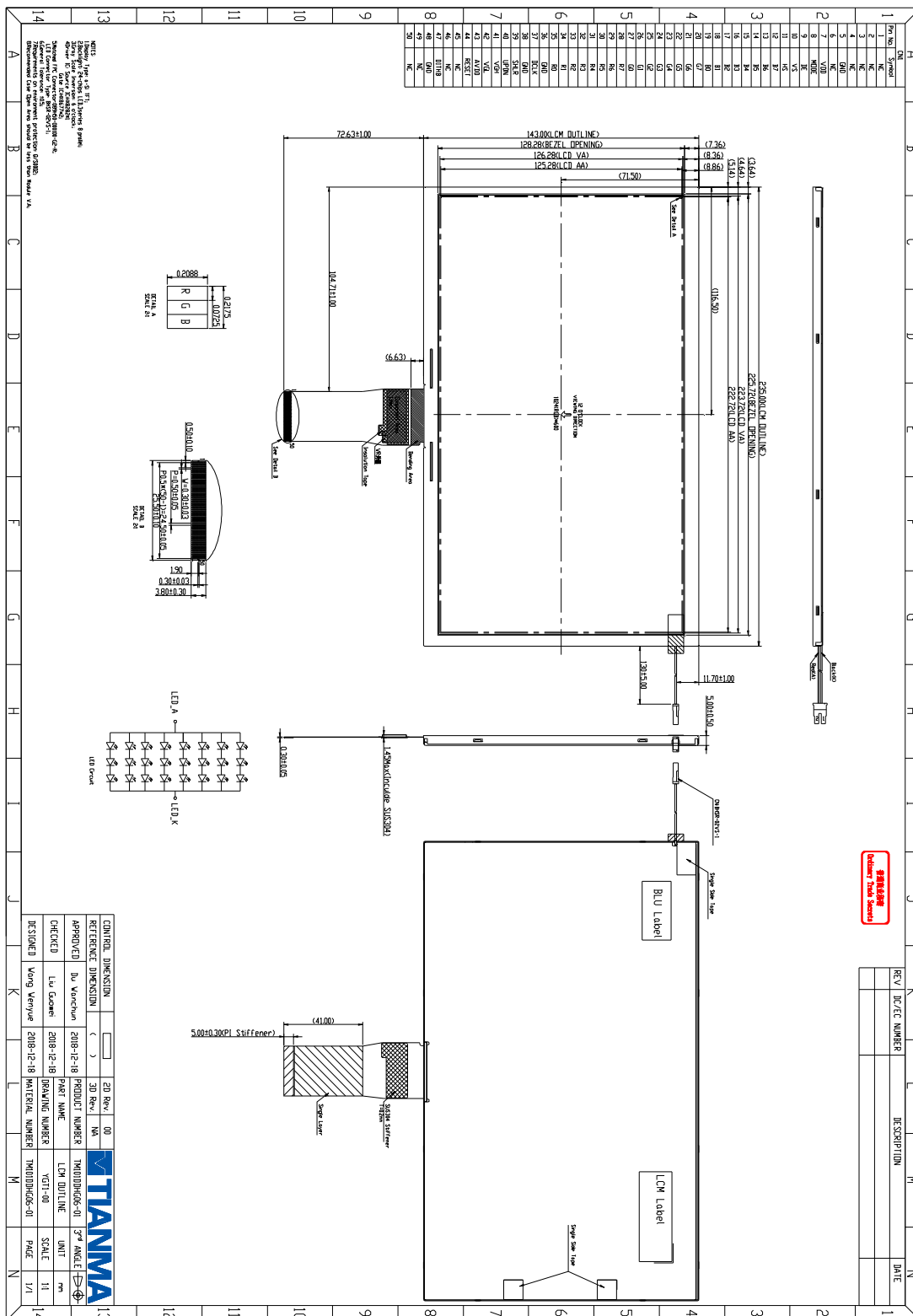
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta= +70℃,240hrs	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta= -20℃,240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃,240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃,240 hrs	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)	-30℃ 30 min~+80℃ 30 min, Change time:5min,20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	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

Note1: Ta is the ambient temperature of sample.

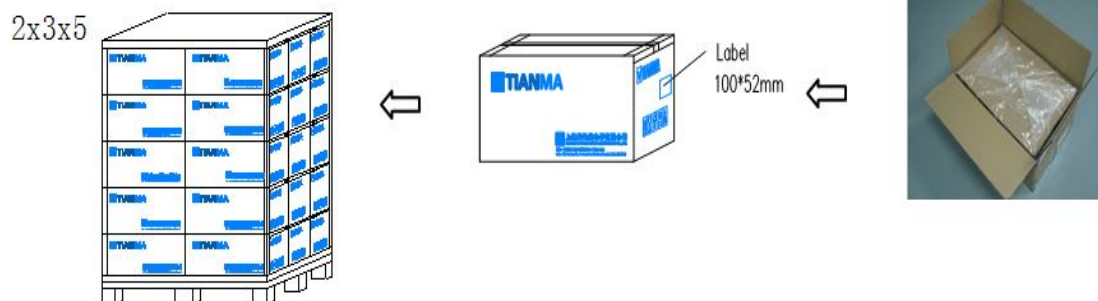
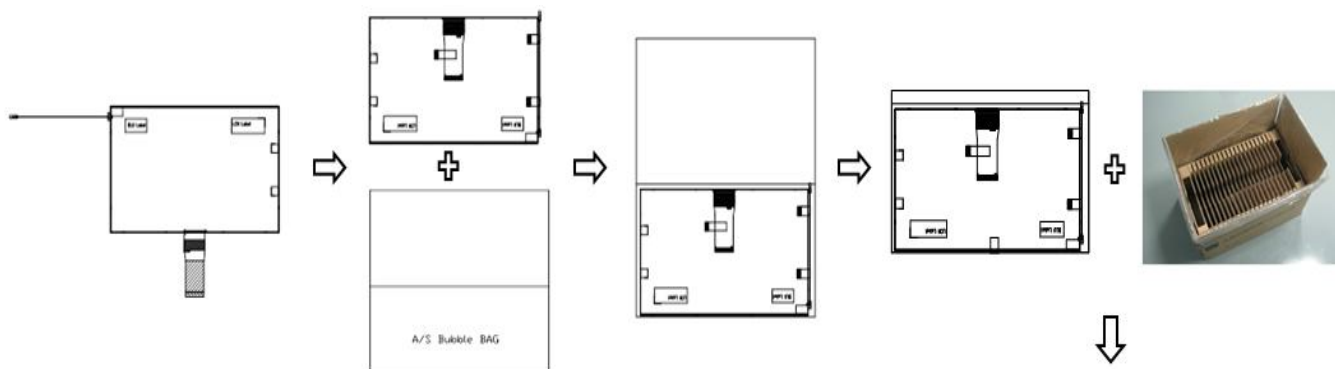
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8 Mechanical Drawing



No	Item	Model(Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM101DDHG06	235.0×143.0×5.0	0.2723	20	
2	Partition_1	Corrugated Paper	409×253×37	1.382	1	
3	Dust-Proof Bag	PE	700×545	0.046	1	
4	Partition_2	Corrugated Paper	505*332	0.1	1	
5	Crepe Paper Tape	PE	30*10	0.002	80	
6	Carton	Corrugated Paper	513×333×217	0.76	1	
7	Anti-Static Bubble Bag	PE	315×250×4	0.011	20	
8	Label	Label	100*52	0.002	1	
9	Total weight	8.116±5%kg				



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.