MODEL NO. : TL055VVXH04-00

ISSUED DATE: 2015-04-30

VERSION : V1.0

■**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

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2015-04-30	Preliminary Specification Release	

1 Features

The TL055VVXH04-00 is a 5.46 inch LTPS-TFT-LCD module. This module is composed of a 5.46 inch TFT-LCD panel with INCELL touch panel, driver circuits, FPC and a backlight unit.

This module is display terminals for cellular phone.

2 General Specifications

Feature		Spec
Display Spec.	Size	5.46
	Resolution	1080RGB*1920
	Technology Type	LTPS SFT
	Pixel Configuration	R,G,B Vertical strip
	Pixel pitch(mm)	0.063*0.063
	Display Mode	NB
	Surface Treatment(Up polarizer)	Hard coat treating(2H)
	Viewing Direction	All
	Color Depth	16.7M
Mechanical Characteristics	LCM (W x H x D) (mm)(with lens)	70.44*128.11*1.397
	Active Area(mm)	68.04*120.96
	LED Numbers	12
	Weight (g)	TBD
Electronic	Interface	MIPI
	Driver IC	OTM1906C
Touch Spec.	TP Type	Two layer INCELL TP
	TP IC	Synaptics s3320
	Substrate Thickness(mm)	0.55
	Lens V.A(mm)	121.76×68.84

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%

3 Input/Output Terminals

3.1 TFT LCD Panel pin assignment

Pin	Symbol	Conclusion	Pin	Symbol	Conclusion
1	GND_1		40	GND_14	
2	D3N	MIPI Signal	39	VEE_TP	TP Power
3	D3P	MIPI Signal	38	TP_ATIN	TP ATTN
4	GND_2		37	TP_SDA	TP IIC
5	D0N	MIPI Signal	36	TP_SCL	TP IIC
6	D0P	MIPI Signal	35	TP_RST	TP Reset
7	GND_3		34	GND_13	
8	CLKN	MIPI Signal	33	TE	TE Signal
9	CLKP	MIPI Signal	32	GND_12	
10	GND_4		31	AVEE	For Driver
11	D1N	MIPI Signal	30	GND_11	
12	D1P	MIPI Signal	29	AVDD	For Driver
13	GND_5		28	GND_10	
14	D2N	MIPI Signal	27	VDDIO	For Driver
15	D2P	MIPI Signal	26	RESX	IC RESET
16	GND_6		25	GND_9	
17	GND_7		24	LED1-	LED Postive
18	LEDPWM	PWM Out	23	LED2-	LED Postive
19	GND_8		22	LED+_2	LED Negative
20	LCD_ID	LCD ID	21	LED+_1	LED Negative

4 Absolute Maximum Ratings

4.1 Driving TFT LCD Panel

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	AVDD	4.5	6.0	V	
	AVEE	-6.0	-4.5	V	
	VDDIO	1.65	3.3	V	
Input signal Voltage	Vin	GND	3.3	V	Note2
Operating Temperature	TOPR	-30	70	℃	
Storage Temperature	TSTG	-40	80	℃	
Note2	Signals include D1±, D2±, D3±, D0±, CLK±, RST				

Table 4.1 absolute maximum rating

4.2 Driving TP Panel

Item	Symbol	Min	Max	Unit	Remark
Analog Supply Voltage	VDDH	-0.3	4.0	V	
Digital Supply Voltage	VDDL	-0.3	2.0	V	
GPIO pins supply Voltage	VBUS	-0.3	4.0	V	
Operating Temperature	T_{OPR}	-30	70	℃	
Storage Temperature	T_{STG}	-40	80	℃	

Table 4.2 absolute maximum rating

5 Electrical Characteristics

5.1. Interface ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
LCD Input Analog Voltage	VSP-Vss	5.3	5.4	5.5	V	
	VSN-Vss	-5.5	-5.4	-5.3	V	
LCD Logic I/O Voltage	IOVCC-Vss	1.7	1.8	1.9	V	
TP INPUT Analog Voltage	VDDH-VSS	2.7	2.8	3.3	V	
"H" Level Input Voltage	V_{IH}	0.7xIOVCC	-	IOVCC	V	Applicable Pin： REST
"L" Level Input Voltage	V_{IL}	0.0	-	0.3xIOVCC	V	Applicable Pin： REST
"H" Level Output Voltage	V_{OH}	0.8xIOVCC	-	IOVCC	V	Applicable Pin： BC I OUT = -1mA
"L" Level Output Voltage	V_{OL}	0.0	-	0.2xIOVCC	V	Applicable Pin： BC I OUT = +1mA
Input high level leakage current	I_{IH}	-	-	1	μA	Applicable Pin： REST H ：IOVCC L ：Vss
Input low level leakage current	I_{IL}	-1	-	-	μA	

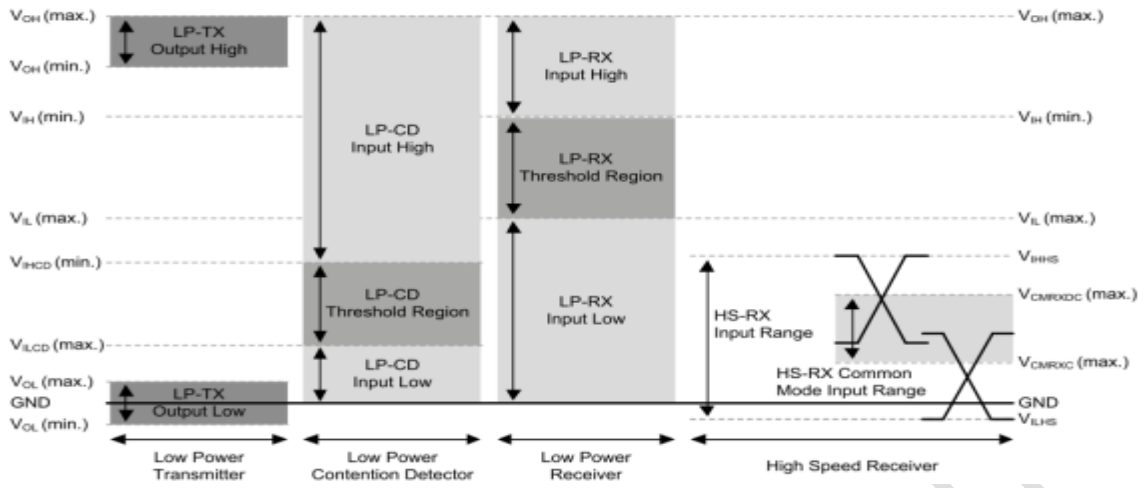
5.2 . Logic Power Consumption

Parameter	Symbol	Values		Units	Notes
		Typ	Max		
Normal Mode	I_{IOVCC}	TBD	TBD	mA	White Pattern with TP function
	I_{Vsp}	TBD	TBD	mA	
	I_{Vsn}	TBD	TBD	mA	
	total	225	230	mW	
Sleep Mode	I_{IOVCC}	350	400	uA	
	I_{Vsp}	5.5	6	uA	
	I_{Vsn}	7	8	uA	
	total	0.711	0.792	mW	

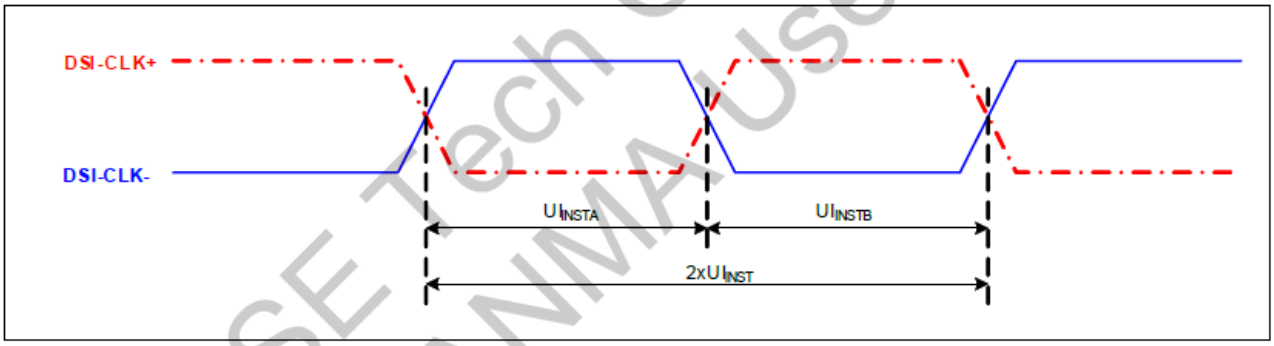
5.3MIPI Interface Characteristics

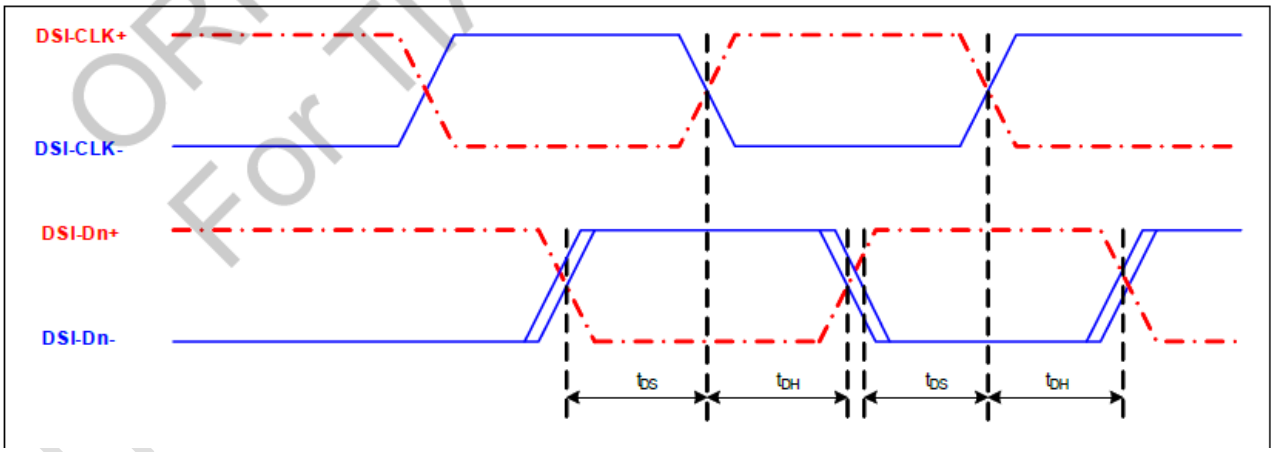
(a) MIPI interface DC characteristic：

Item		Parameter	Min.	Typ.	Max.	Unit
LP_TW	Thevenin output high level	VOH	1.1	1.2	1.3	V
	Thevenin output low level	VOL	-50		50	mV
	Output impedance of LP transmitter	ZOLP	110	—	—	Ω
HS_RX	Common-mode voltage HS receive mode	VCMRX(DC)	70	—	330	mV
	Differential input high threshold	VIDTH	—	—	70	mV
	Differential input low threshold	VIDTL	-70	—	—	mV
	Single-ended input high voltage	VIHHS	—	—	460	mV
	Single-ended input low voltage	VILHS	-40	—	—	mV
	Single-ended threshold for HS termination enable	VTERM-EN	—	—	450	mV
	Differential input impedance	ZID	80	100	125	Ω
LP_RX	Logic 1 input voltage	VIH	880	—	—	mV
	Logic 0 input voltage. not in ULPState	VIL	—	—	550	mV
	Input hysteresis	VHYST	25	—	—	mV
LP_CD	Logic 1 contention threshold	VIHCD	450	—	—	mV
	Logic 1 contention threshold	VILCD	—	—	200	mV

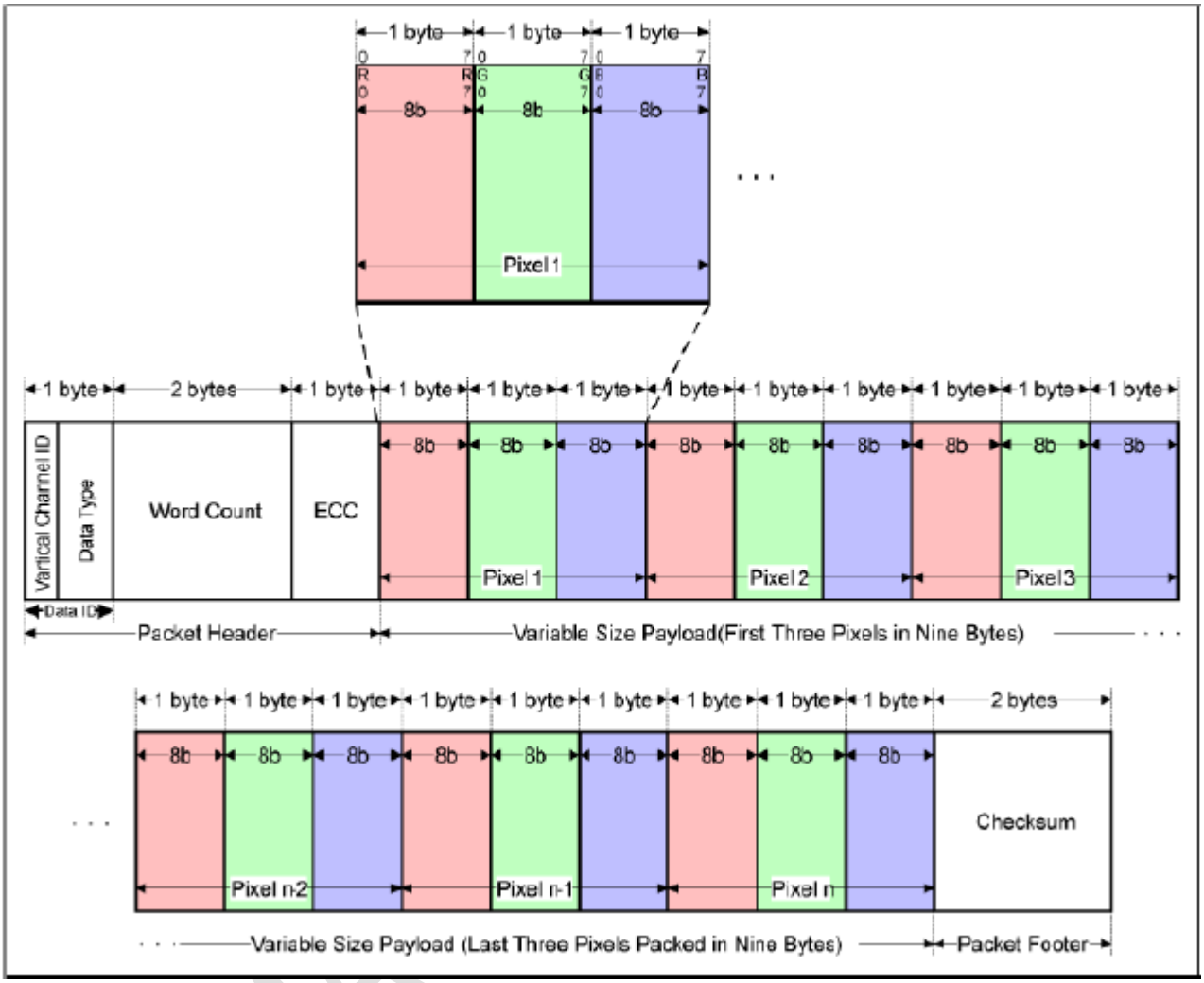


Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Mode						
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	2	-	25	ns
DSI-CLK+/-	UI_{INSTA} , UI_{INSTB}	UI instantaneous Halfs	1	-	12.5	ns
DSI-Dn+/-	t_{DS}	Data to clock setup time	0.15	-	-	UI
DSI-Dn+/-	t_{DH}	Data to clock hold time	0.15	-	-	UI
DSI-CLK+/-	t_{DRTCLK}	Differential rise time for clock	150	-	0.3UI	ps
DSI-Dn+/-	$t_{DRTDATA}$	Differential rise time for data	150	-	0.3UI	ps
DSI-CLK+/-	t_{DFTCLK}	Differential fall time for clock	150	-	0.3UI	ps
DSI-Dn+/-	$t_{DFTDATA}$	Differential fall time for data	150	-	0.3UI	ps

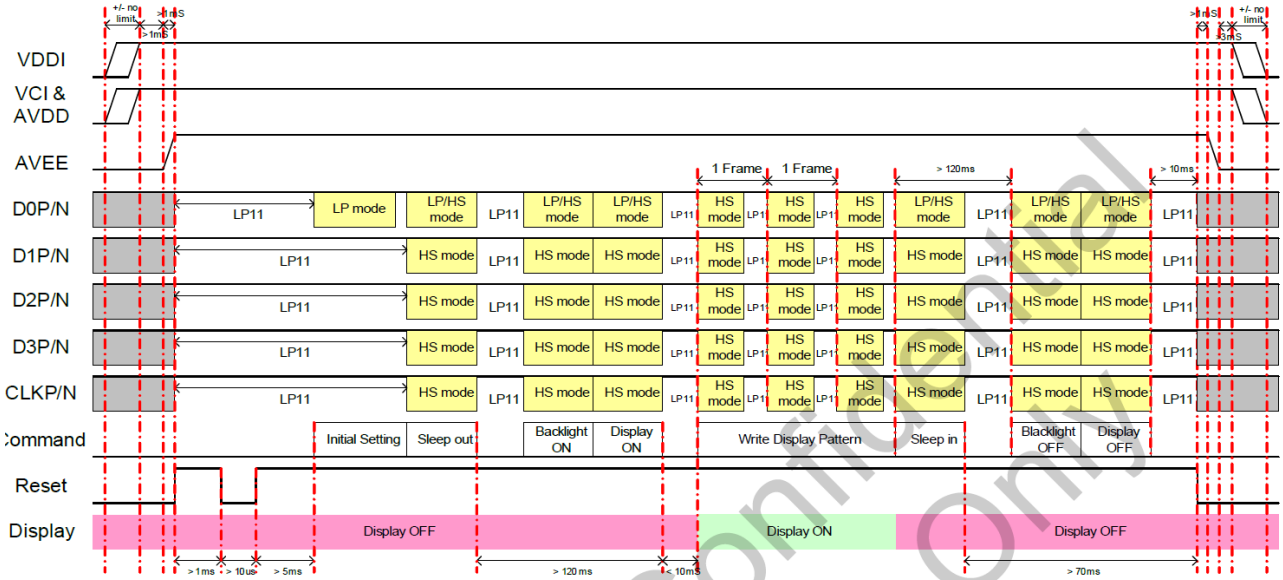




5.4 MIPI 24 bits RGB Data Format

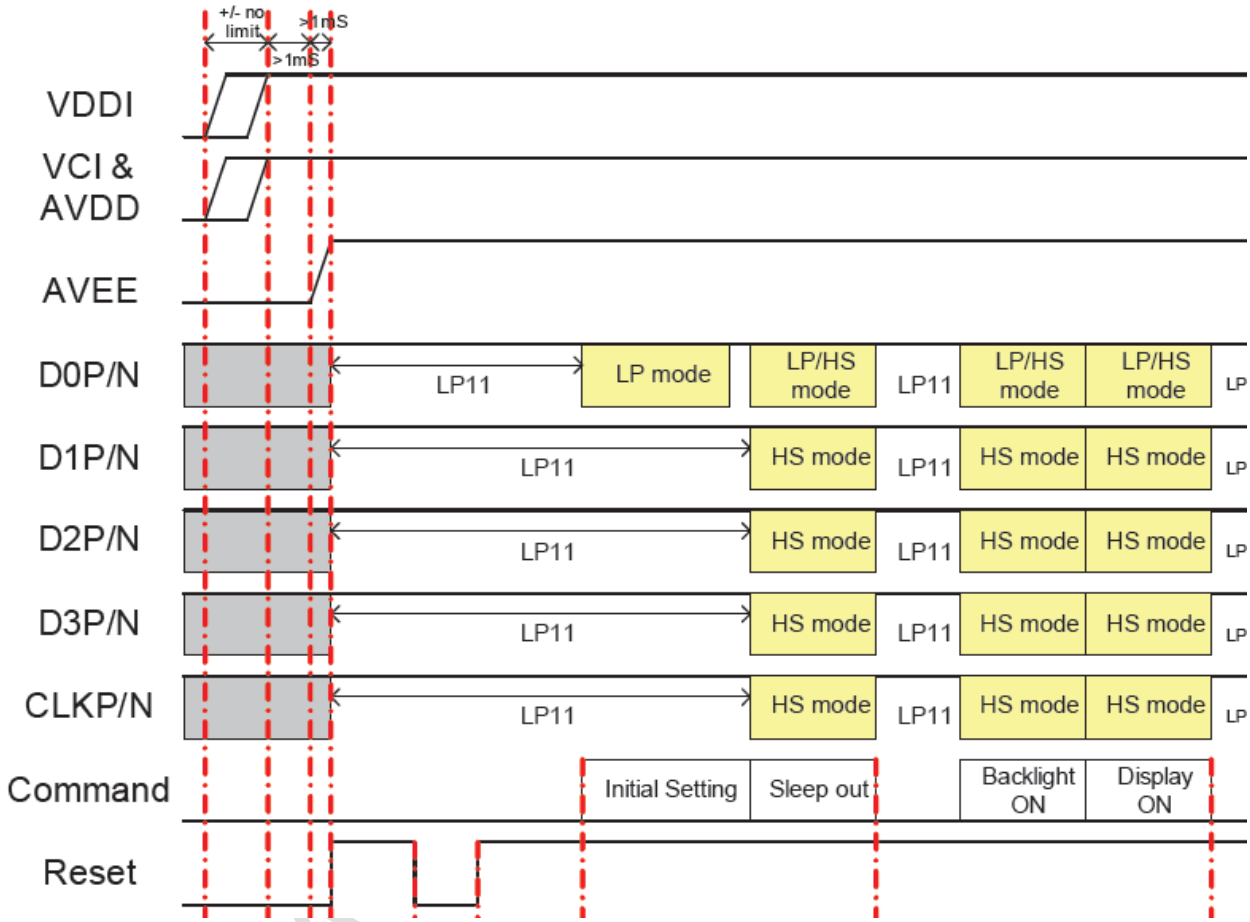


5.5 Power on/off sequence

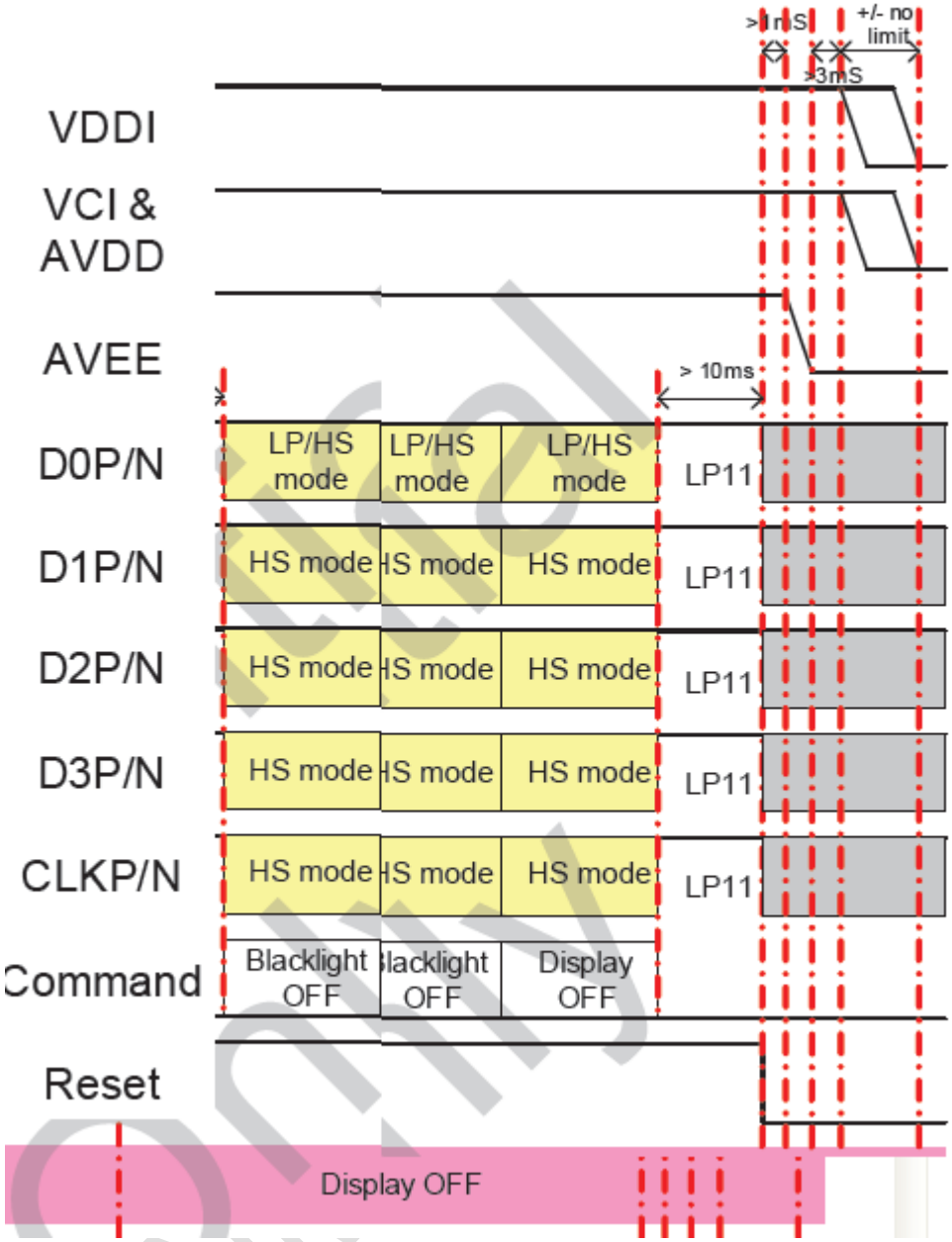


Note : We proposed using non-continue CLK with Burst mode

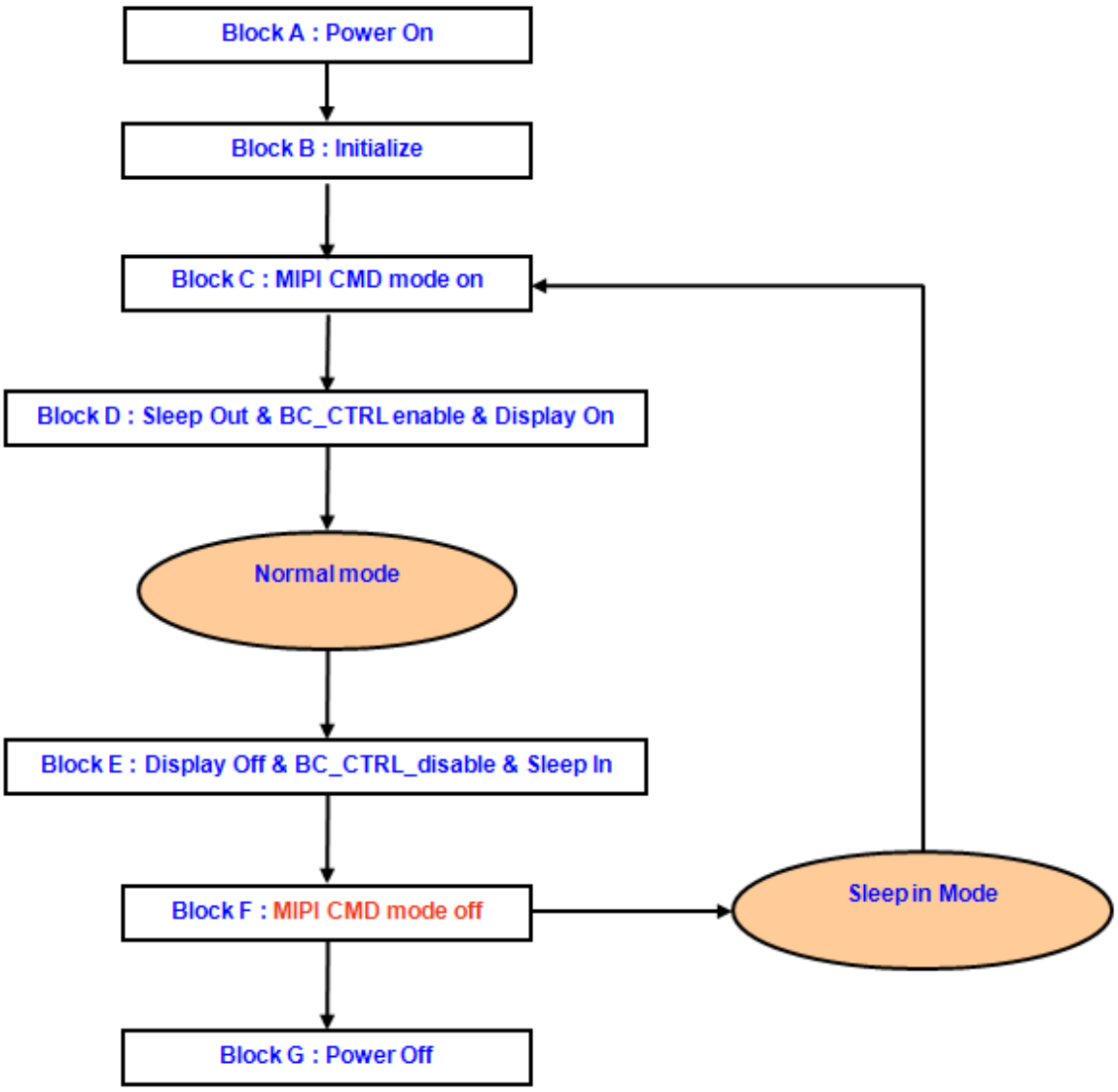
5.5.1Power on



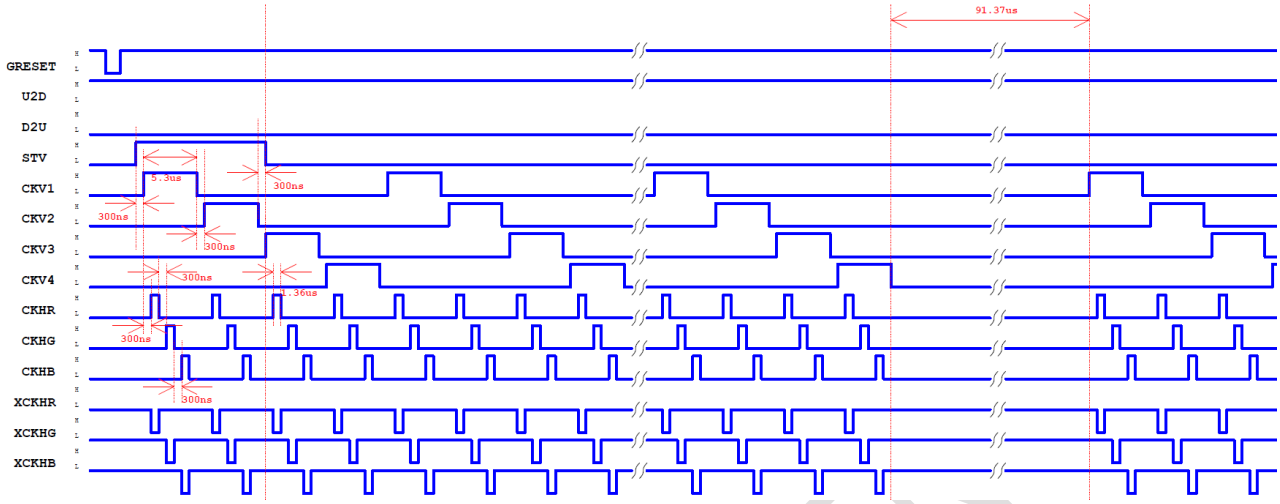
5.5.2 Power off



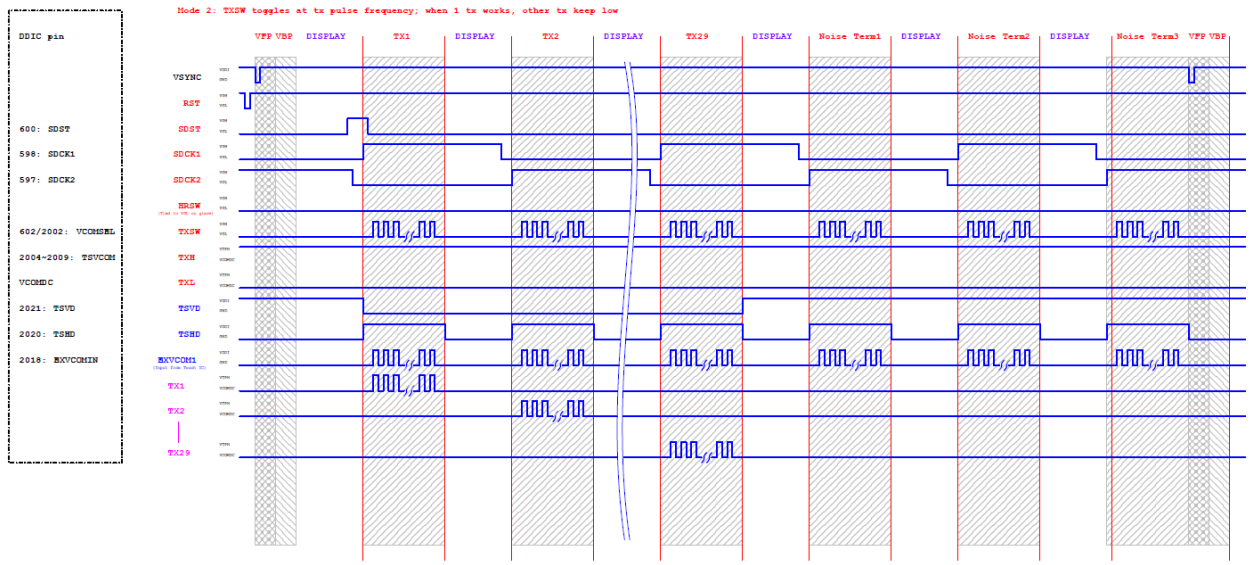
5.5.3 Software flow



6 Timing Chart



7 TP Timing



8 Optical Characteristics

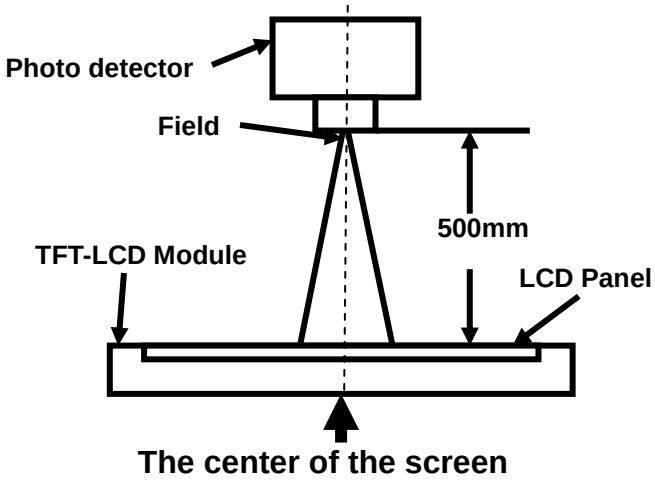
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	80	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ=0°	700	1000	-		Note 3
Response Time		TON	25℃	-	25	30	ms	Note 4
		TOFF						
Chromaticity	**White**	x	Backlight Is on	0.270	0.300	0.330		Note 1,5
		y		0.290	0.320	0.350		
	Red	x		0.610	0.640	0.670		Note 1,5
		y		0.300	0.330	0.360		
	Green	x		0.270	0.300	0.330		Note 1,5
		y		0.570	0.600	0.630		
	Blue	x		0.120	0.150	0.180		Note 1,5
		y		0.030	0.060	0.090		
Uniformity		U		75	80	-	%	Note 6
NTSC				65	70	-	%	Note 5
Luminance		L		330	410		cd/m2	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.

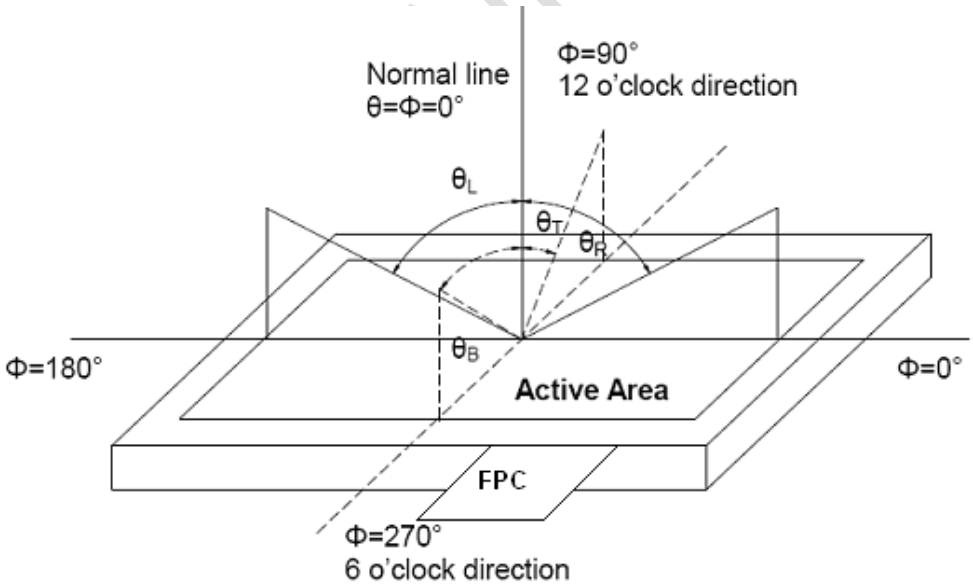
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	CS2000	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	GLRT	2°

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

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

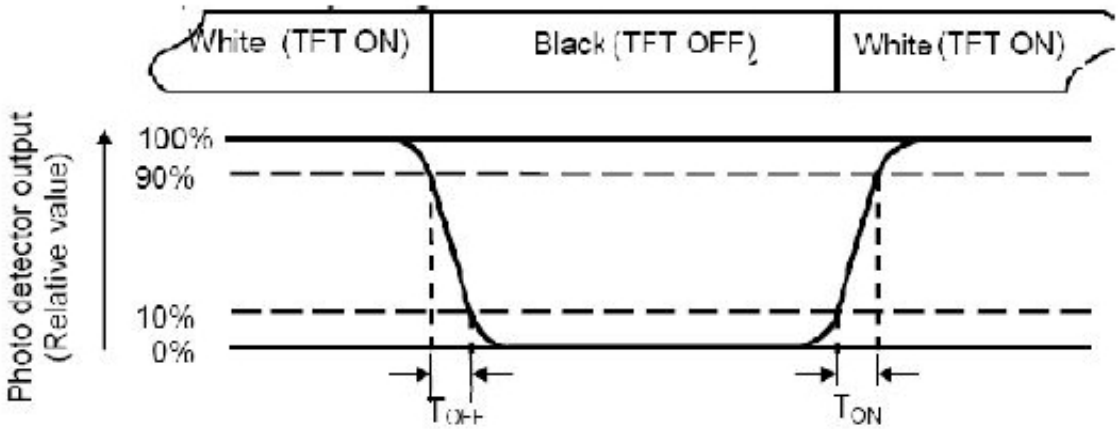
"White state ": The state is that the LCD should drive by Vwhite.

"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 10% to 90%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 90% to 10%.



Note 5: Definition of color chromaticity (CIE1931)

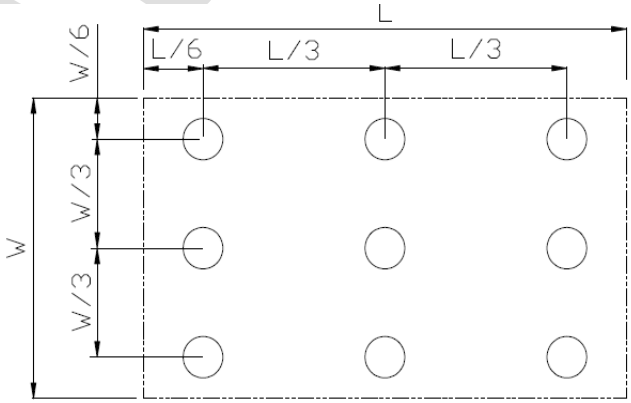
Color coordinates measured at center point of LCD.

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.

9 Touch performance

Section	Description	SPEC
1	Accuracy test	Border:＜1.5mm Center:＜1.0mm
2	Precision test	Border:＜0.5mm Center:＜0.5mm
3	Linearity test	Border:＜1.5mm Center:＜1.0mm
4	Sensitivity test	Φ4mm ok
5	Jitter test	Border:＜0.5mm Center:＜0.5mm
6	Finger Separation test	9 mm fingers Center to center ≤11mm
7	Palm & Face test	Φ30mm ok
8	Report Rate test	120Hz Typ (60Hz in Noisy conditions)
9	SNR Test	≥35dB
10	Common-mode interference test	≥3vPP
11	Power Consumption test	Active mode≤40mw
12	Response Time test	≤30ms
13	Anti Water test	TBD, Please provide detailed requiremetns
14	Stylus test	Φ2.5mm ok
15	Glove test	3mm ok

10 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	70℃，240h	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃，240h	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	80℃，240h	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃，240h	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	60℃，90%RH，240h	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃,30min~80℃,30minChange time:5min,20cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF ， R=330Ω ， 8point/panelAir ：±8kv，10times；Contact：±4kv，10times；（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 OP)	60G，6ms，±X，Y，Z 3times，For each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height：80cm1corner，3edges，6faces	IEC60068-2-32:1990 GB/T2423.8—1995

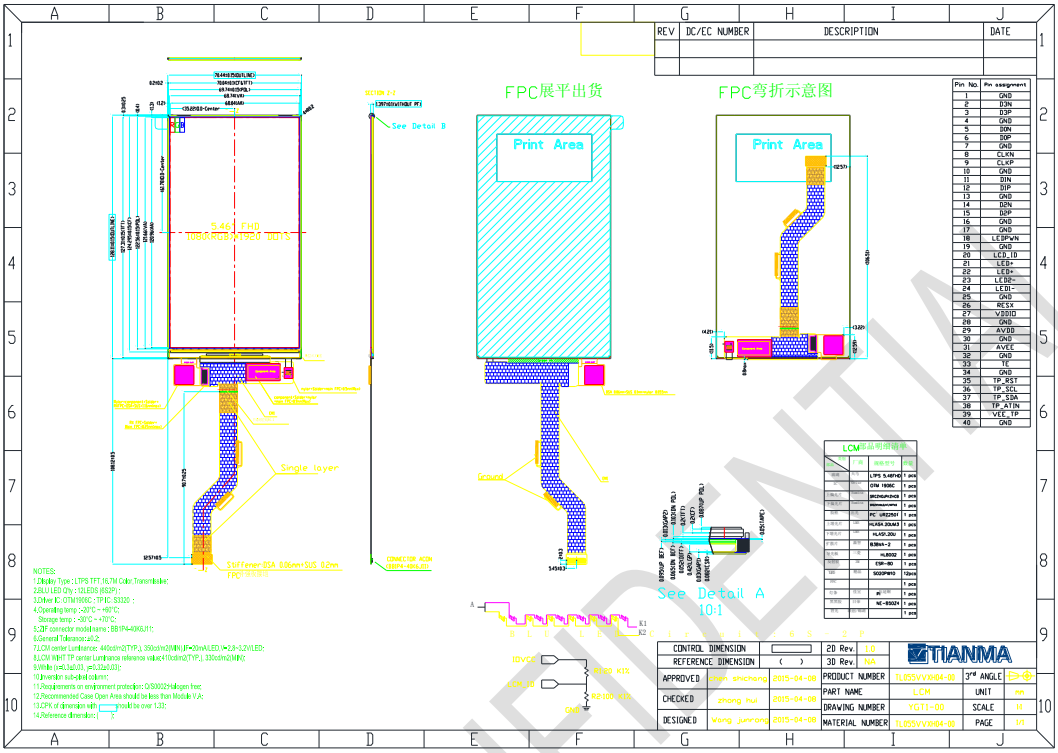
Note1: Ts is the temperature of panel's surface.

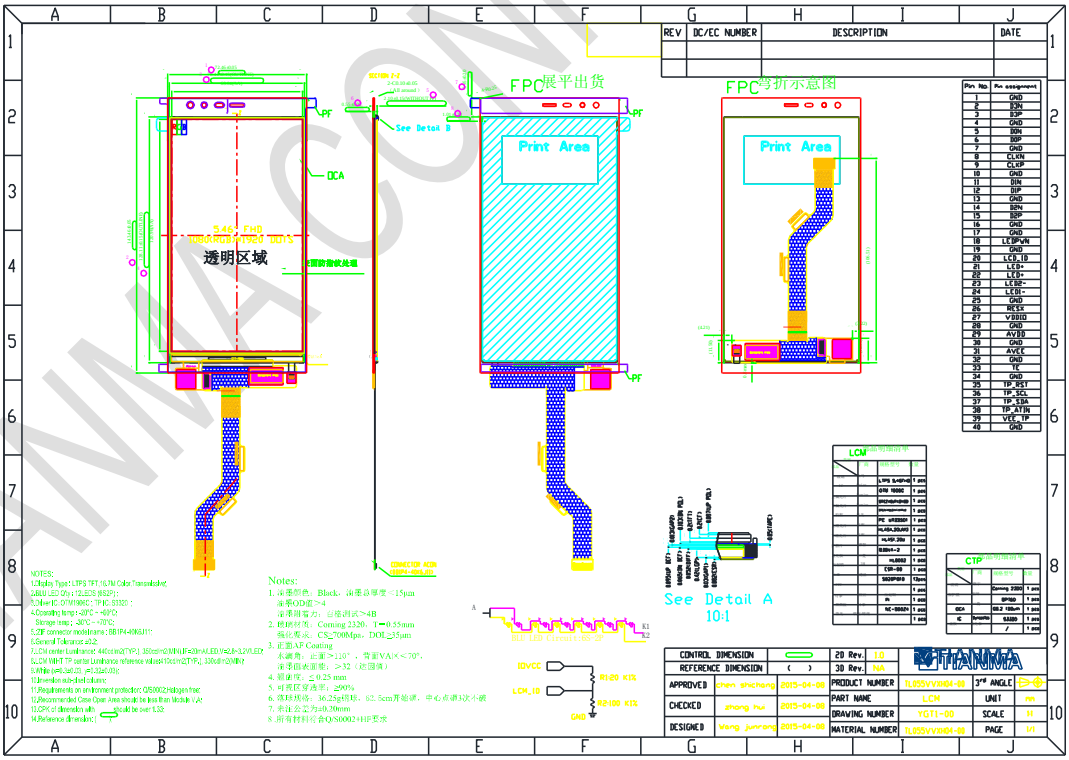
Note2: Ta is the ambient temperature of sample.

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.

11 Mechanical Drawing





12 Packing Drawing

(如果客户对标签或 Label 有特殊要求，请注明)

1. 将 4 片 LCM 放置于 tray 内，显示面朝上的方式放置（如图 1）；

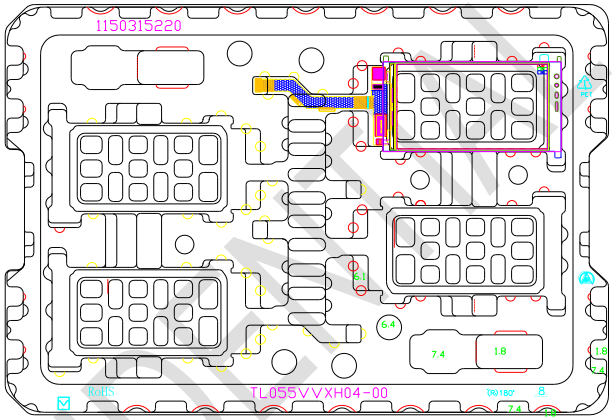


图 1

2. 放满一盘后盖上一张 EPE，（如图 2）；

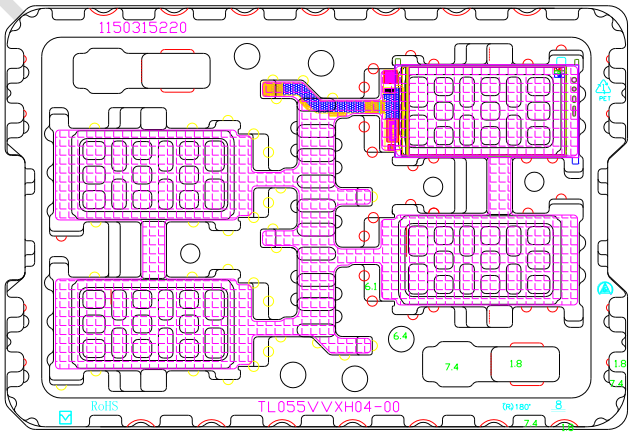
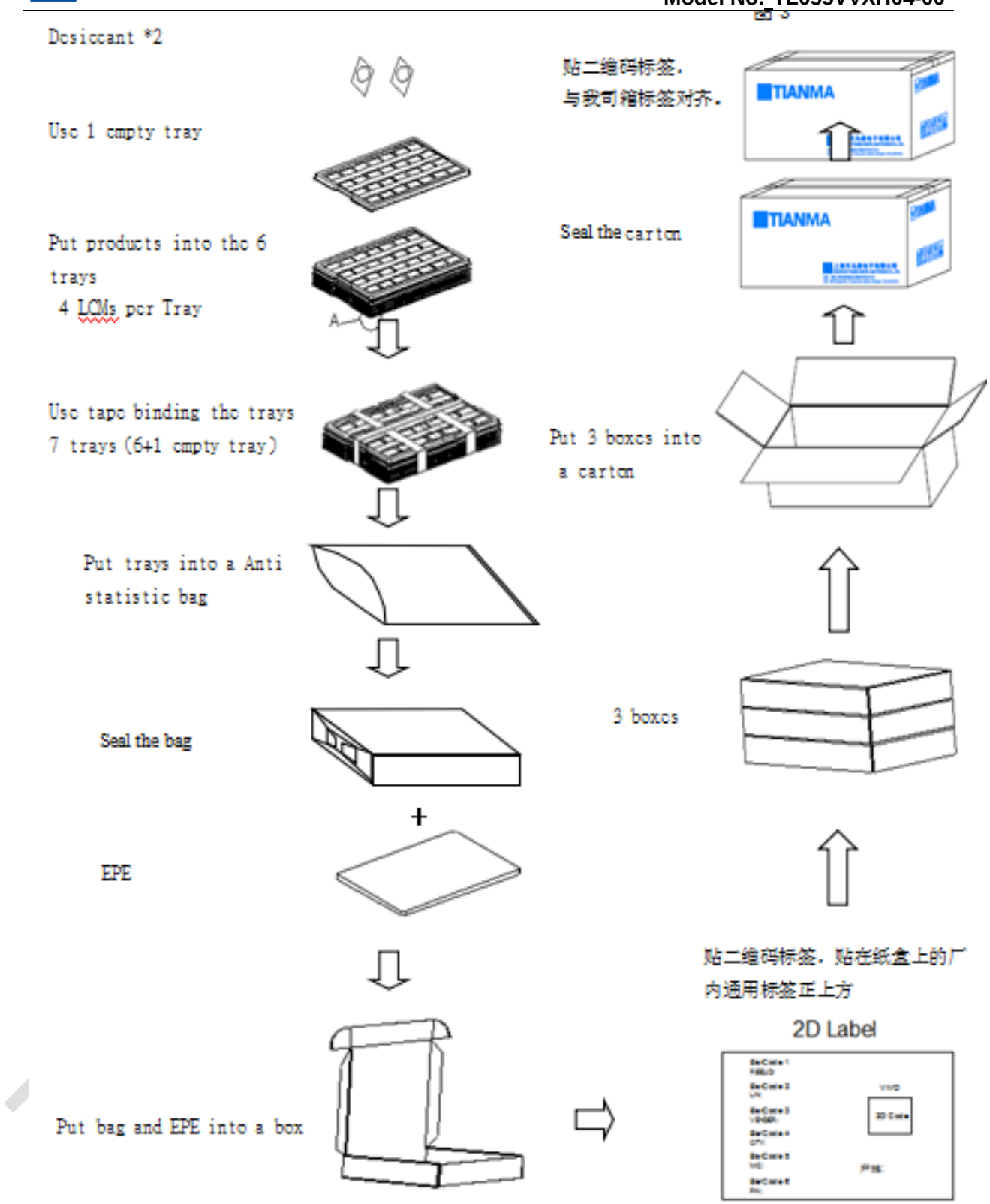


图 2



13 Precautions for Use of LCD Modules

13.1 Handling Precautions

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

13.1.2 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.

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

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

13.1.5 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

13.1.6 Do not attempt to disassemble the LCD Module.

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

13.1.8 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.

13.2 Storage precautions

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

13.2.2 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%

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

13.3 Transportation Precautions

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