MODEL NO. : TM090JDH01

ISSUED DATE: 2012-7-18

VERSION : Ver. 2.0

□Preliminary Specification
■Final Product Specification

Customer :_____

Approved by	Notes

SHANGHAI AVIC Confirmed :

Prepared by	Checked by	Approved by
Ye Chen 2012/7/18	-	Hyman Chen 2012/7/18

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2012-6-28	Final Specification Release	Ye Chen
2.0	2012-7-18	Delete the VCOM and Modify power on/off timing	Ye Chen

1 General Specifications

Feature		Spec
Display Spec	Size	9.0 inch
	Resolution	1280 (RGB) x 800
	Interface	LVDS 8-BIT
	Color Depth	16.7M
	Technology Type	a-Si TN
	Pixel Pitch (mm)	0.1515 (H) x 0.1515 (V)
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Clear
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	206.76(W)×135.06(H)×3.60(D)
	Active Area(mm)	193.92 (W) x 121.20 (H)
	With /Without TSP	Without TSP
	Weight (g)	175g
	LED Numbers	36 LEDs

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: RoHS

Note 3: LCM weight tolerance: +/- 5%

2 Input/Output Terminals

2.1 CN1 of FPC

No	Symbol	I/O	Description	Comment
1	VDD	P	Power supply input for C-TP	Notes1
2	GND	P	Ground for C-TP	
3	Reset	I	Reset C-TP	
4	SCL	I	Clock pin for I2C communication	
5	SDA	I/O	Data pin for I2C communication	
6	INT	O	Interrupt pin	
7	NC		--	
8	NC		--	
9	GND	P	Ground	
10	GND	P	Ground	
11	GND	P	Ground	
12	NC		--	
13	VDD	P	Power Voltage for digital circuit	
14	VDD	P	Power Voltage for digital circuit	
15	NC		--	
16	Reset	I	Global reset pin	
17	STBYB	I	Standby mode, Normally pulled high STBYB = “1”, normal operation STBYB = “0”, timing controller, sourcedriver will turn off, all output are High-Z	
18	GND	P	Ground	
19	RXIN0-	I	- LVDS differential data input	
20	RXIN0+	I	+ LVDS differential data input	
21	GND	P	Ground	
22	RXIN1-	I	- LVDS differential data input	
23	RXIN1+	I	+ LVDS differential data input	
24	GND	P	Ground	
25	RXIN2-	I	- LVDS differential data input	
26	RXIN2+	I	+ LVDS differential data input	
27	GND	P	Ground	
28	RXCLKIN-	I	- LVDS differential clock input	
29	RXCLKIN+	I	+ LVDS differential clock input	
30	GND	P	Ground	
31	RXIN3-	I	- LVDS differential data input	
32	RXIN3+	I	+ LVDS differential data input	
33	GND	P	Ground	
34	NC		--	
35	NC		--	
36	GND	P	Ground	
37	NC		--	
38	DIMO	O	Backlight CABC controller signal output	
39	SELB	I	6bit/8bit mode select	Notes 2
40	AVDD	P	Power for Analog Circuit	

41	GND	P	Ground	
42	LED-	P	LED Cathode	
43	LED-	P	LED Cathode	
44	L/R	I	Horizontal inversion	
45	U/D	I	Vertical inversion	
46	VGL	P	Gate OFF Voltage	
47	CABCEN1	I	CABC H/W enable	Notes 3
48	CABCEN0	I	CABC H/W enable	Notes 3
49	VGH	P	Gate ON Voltage	
50	LED+	P	LED Anode	
51	LED+	P	LED Anode	

Note1: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No Connection

Notes 2: If LVDS input data is 6 bits ,SELB must be set to High;
If LVDS input data is 8 bits ,SELB must be set to Low.

Notes 3: When CABC_EN=”00”, CABC OFF.
When CABC_EN=”01”, user interface image.
When CABC_EN=”10”, still picture.
When CABC_EN=”11”, moving image.
When CABC off, don’t connect DIMO, else connect it to backlight.

2.2 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	DVDD	Up to Down, Left to Right
DVDD	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
DVDD	DVDD	Down to Up, Left to Right

2.3 CN2 of FPC

No	Symbol	I/O	Description	Comment
1	VDD	P	Power supply input for C-TP	
2	GND	P	Ground for C-TP	
3	Reset	I	Reset C-TP	
4	SCL	I	Clock pin for I2C communication	
5	SDA	I/O	Data pin for I2C communication	
6	INT	O	Interrupt pin	
7	NC		--	
8	NC		--	

3 Absolute Maximum Ratings

Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCC	-0.3	5.0	V	
	AVDD	-0.5	15	V	
	VGH	-0.3	+42	V	
	VGL	-20	+0.3	V	
Operating Temperature	T_{OPR}	-20	50	℃	
Storage Temperature	T_{STG}	-30	60	℃	

4 Electrical Characteristics

4.1 Recommended Operating Condition

Ta = 25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Digital Supply Voltage	VCC	2.8	3.3	3.6	V	
Analog Supply Voltage	AVDD	10.7	11	11.3	V	
Gate On Voltage	VGH	19.5	20	20.5	V	
Gate Off Voltage	VGL	-7.3	-6.8	-6.3	V	

Note: The value is for design stage only.

4.2 Recommended Driving Condition for Backlight

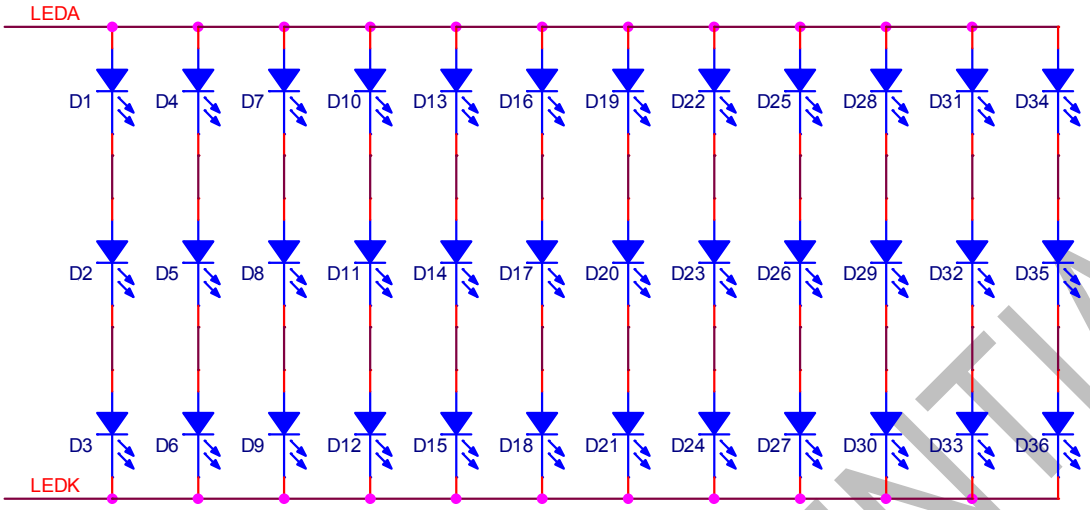
Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	240	-	mA	36 LEDs (3 LED Serial, 12 LED Parallel)
Forward Voltage	V_F	-	9.6	-	V	
Operating Life Time	-	20000		-	Hrs	

Note1: For each LED: I_F (1/12) =20mA, V_F (1/3) =3.2V.

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED. Optical performance should be evaluated at Ta=25℃ 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.



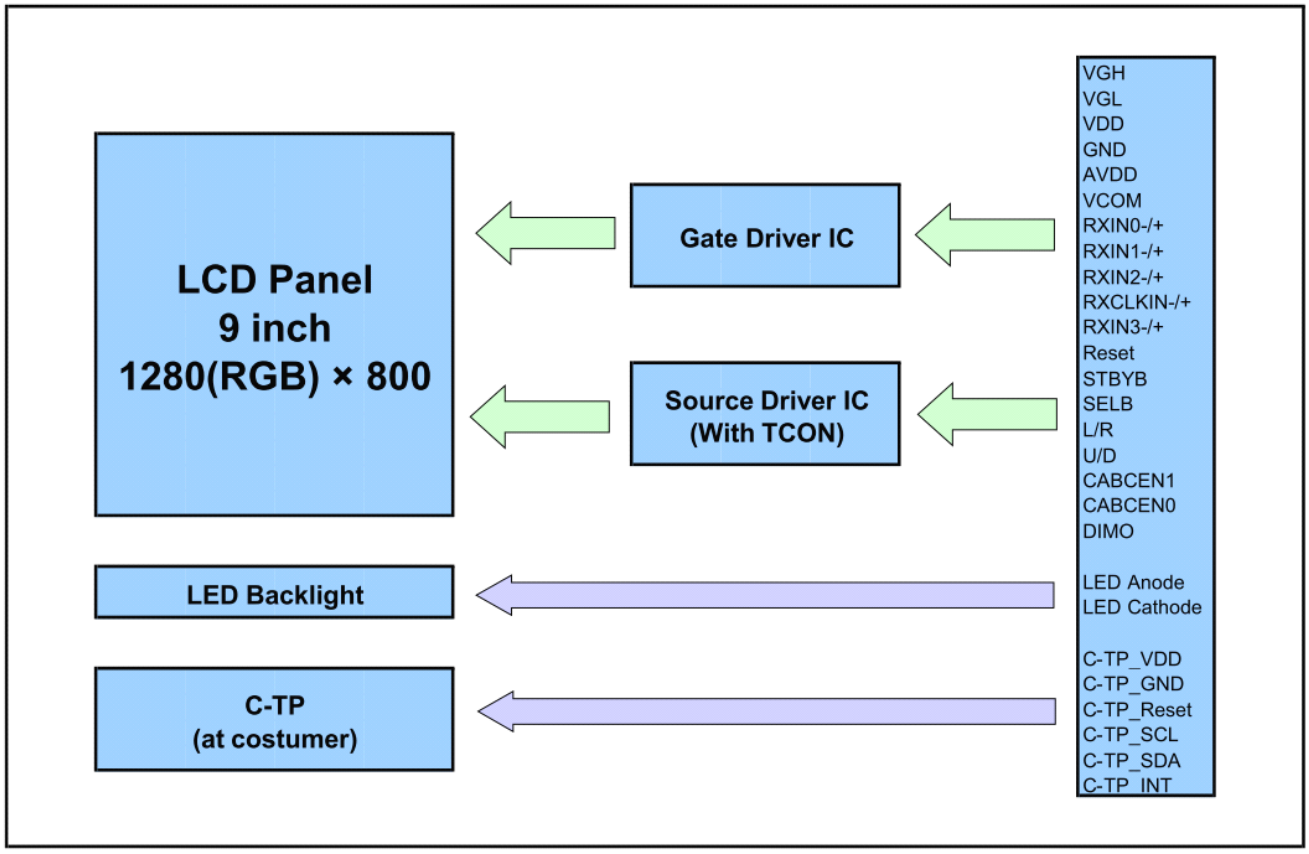
Note4: The LED driving condition is defined for each LED module.

4.3 Power Consumption

Ta = 25℃

Item	Symbol	Condition	Min	Typ (Black Patten)	Max	Unit	Remark
Digital Supply Current	I_{VCC}	VCC=3.3V	55.730	56.100	56.180	mA	
Analog Supply Current	I_{AVDD}	AVDD=11V	42.296	42.411	43.258	mA	
Gate On Current	I_{VGH}	VGH=20V	0.734	0.765	0.767	mA	
Gate Off Current	I_{VGL}	VGL=-6.8V	0.739	0.750	0.760	mA	
Power Consumption	Panel&Gamma	-	600	675	750	mW	
	Backlight	-	-	2.304	2.880	W	
	Total	-	-	2.979	3.630	W	

4.4 Block Diagram



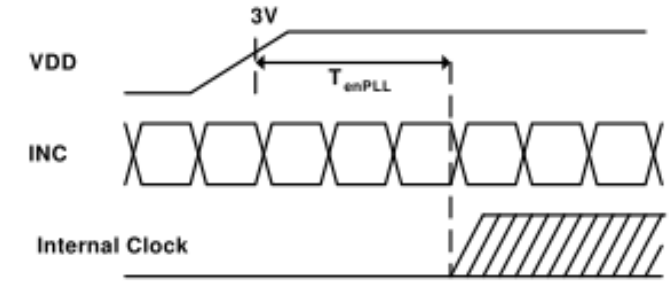
5 Timing Chart

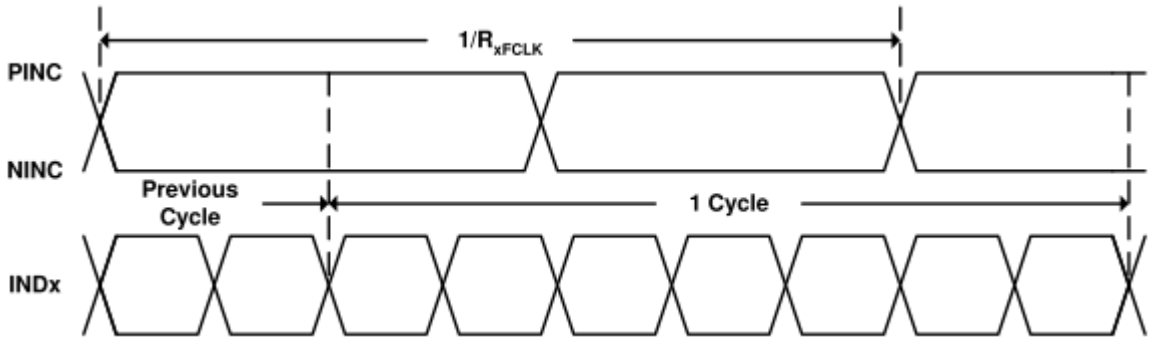
5.1 Input Clock and Data Timing

(VDD= 2.3 to 3.6V, AVDD= 8 to 13.5V, GND=AGND= 0V, TA= -20 to +85℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	R_{xFCLK}	20		81	MHz	
Input data skew margin	T_{RSKM}	500			pS	$\lvert V_{ID}\rvert$ = 400mV R_{xVCM} = 1.2V R_{xFCLK} = 81 MHz
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	uS	

Input Timing diagram:



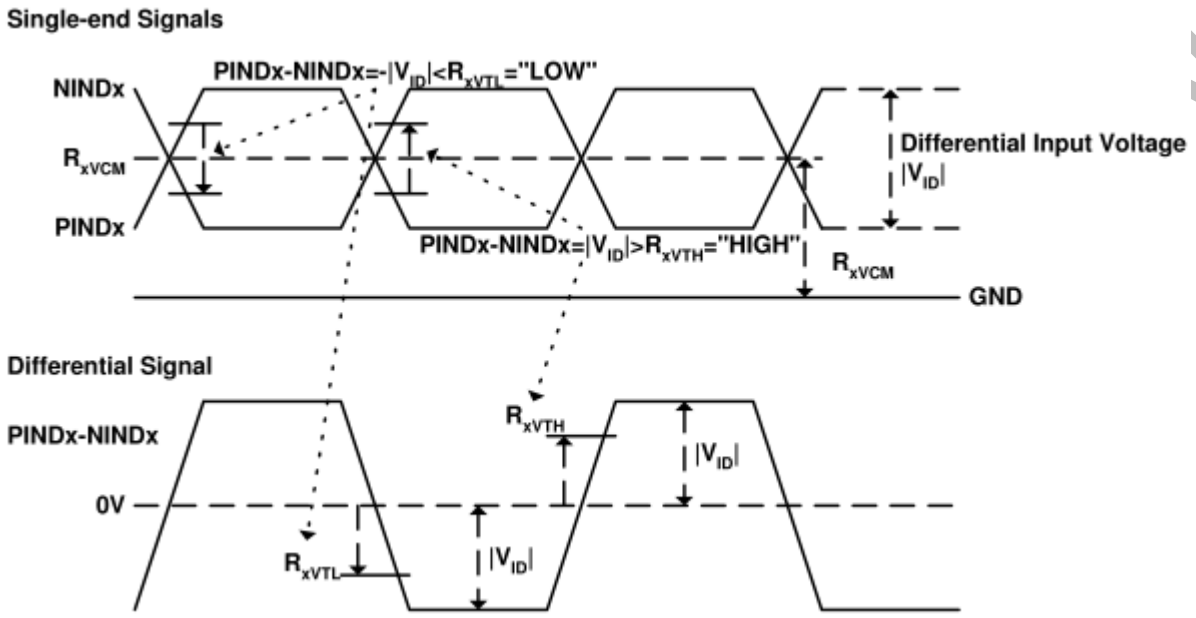


5.2 Recommended Timing Setting Of TCON

(VDD= 2.3 to 3.6V, AVDD= 8 to 13.5V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
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		2.4	V	
Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$		2.4-$\|V_{ID}\|/2$	V	
Differential input voltage	$\|V_{ID}\|$	0.2		0.6	V	
Differential input leakage current	RV_{xliz}	-10		+10	uA	
LVDS Digital Operating current	I_{ddlvds}	-	TBD		mA	Fclk=65 MHz, VDD=3.3V
LVDS Digital Stand-by Current	I_{stlvds}	-	TBD		uA	Clock & all Functions are stopped

LVDS Timing Parameters

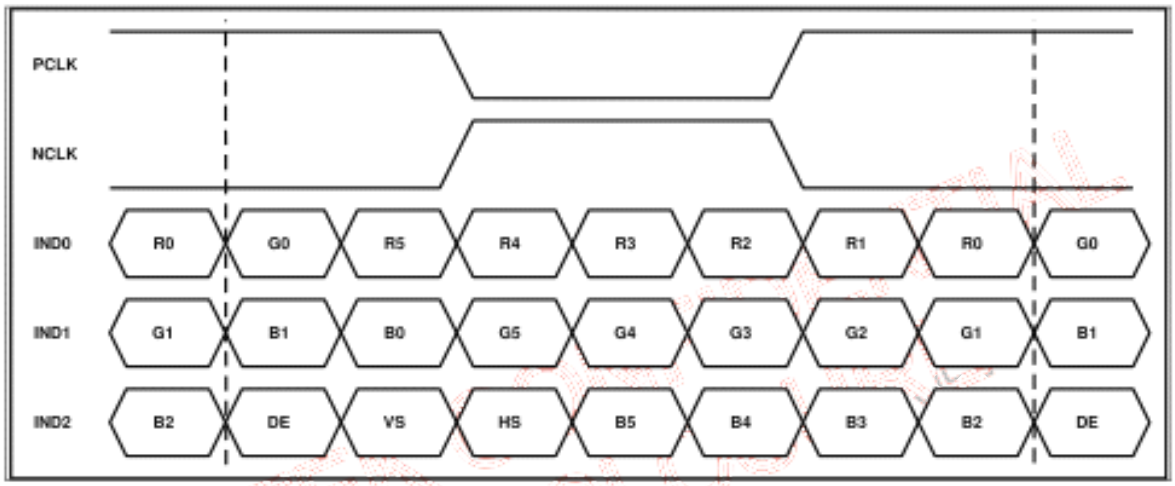


For 1280x800 panel

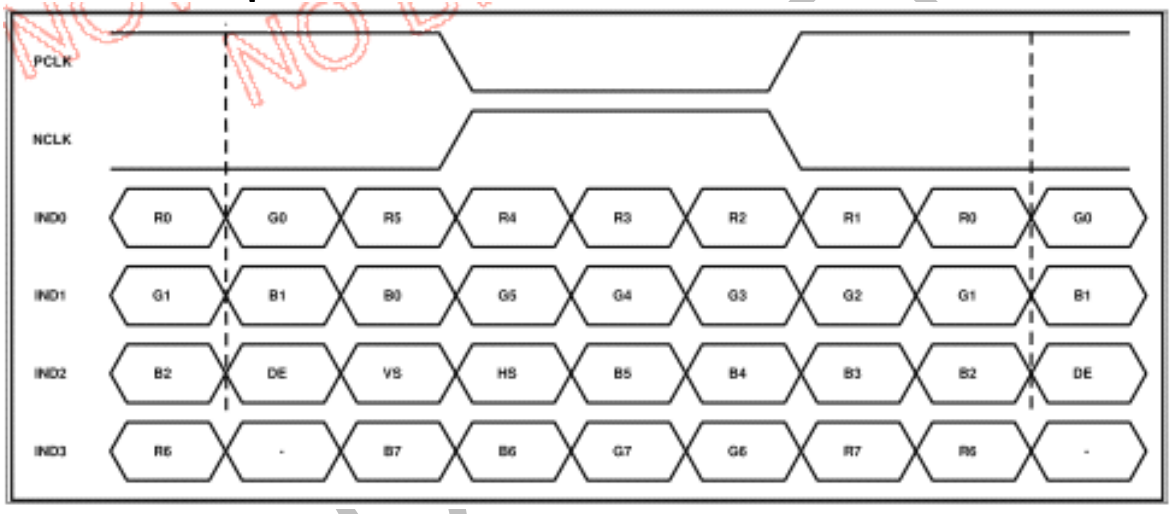
DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @ Frame rate = 60Hz	fclk	66.6	72.4	78.9	MHz
Horizontal display area	thd		1280		DCLK
HSD period time	th	1370	1440	1500	DCLK
HSD blanking	thb+thfp	90	160	220	DCLK
Vertical display area	tvd		800		H
VSD period time	tv	810	838	877	H
VSD blanking	tvb+tvfp	10	38	77	H

6-bit LVDS input

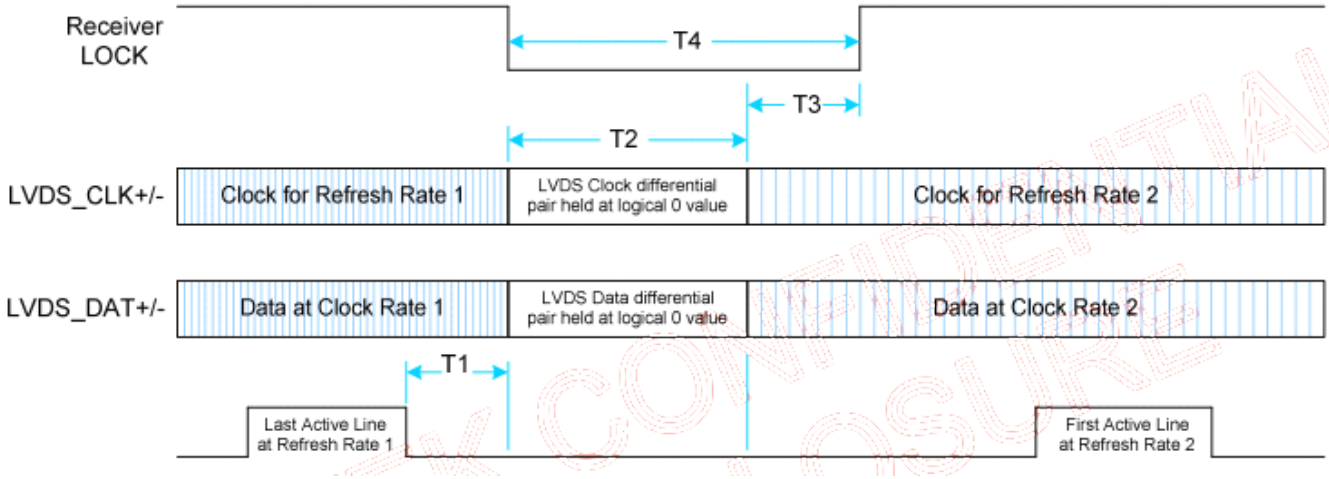


8-bit LVDS input



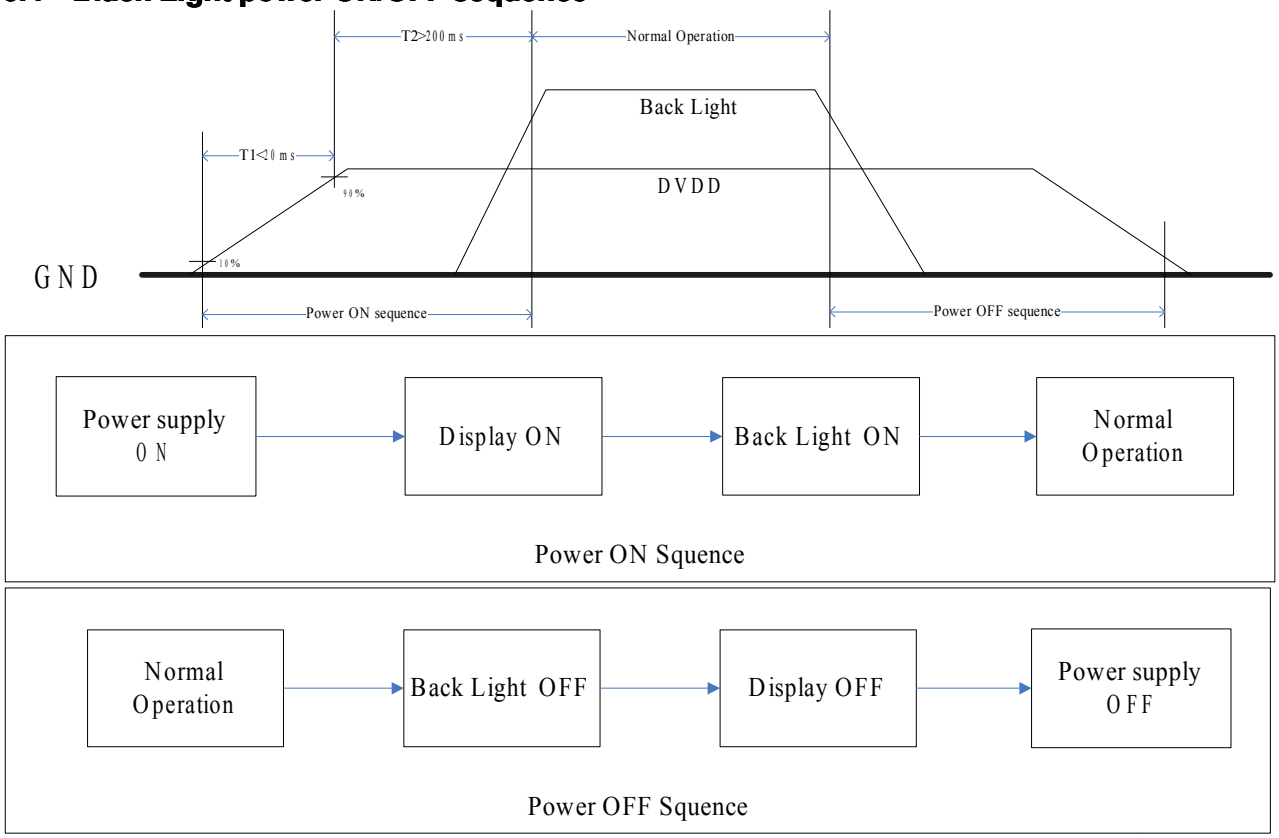
5.3 SDRRS Timing

SDRRS(aeamless display refresh rate switching)
When showing the still picture, it is accept to reduce the refresh rate from 60Hz to low refresh rate (for example 40Hz). The purpose is mainly for power saving. INTEL defined a timing chart switch between different refresh rate. Following this timing chart, the switch between different refresh rates is seamless for end user.



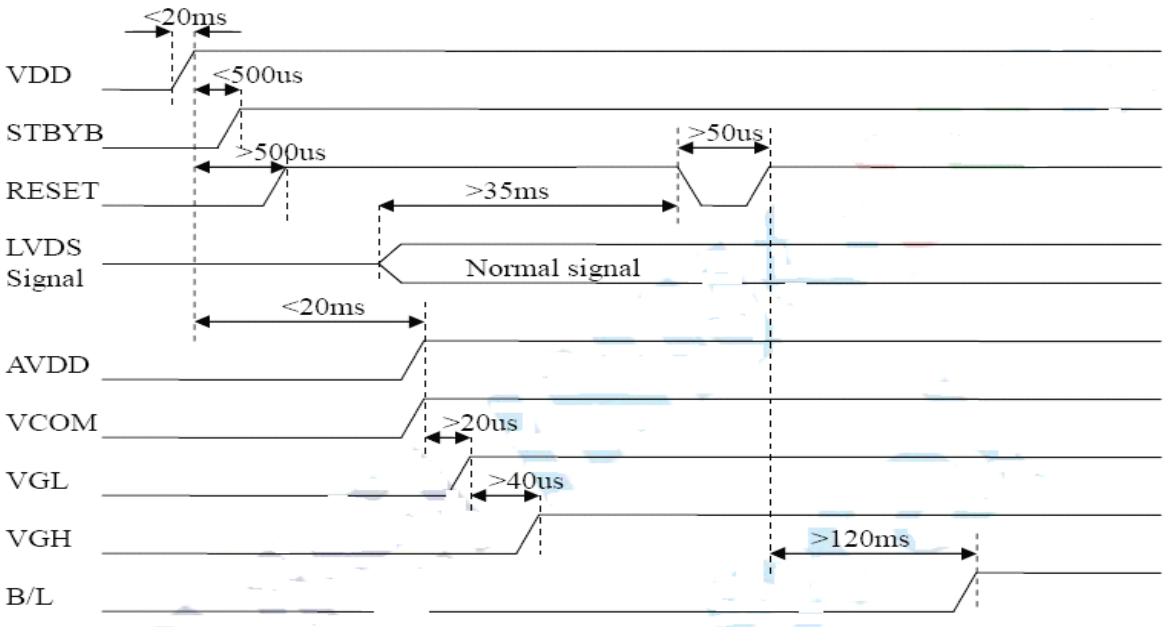
T1 - Min delay from start of vert blank to start of timing change: 2 lines(HSYNC periods)
T2 - Max delay for clock to transition to new frequency: 100us
T3 - Max receiver lock delay from stable clock: Display specific(TBD)
T4 - Max period during which panel maintains display(T2 + T3): Display specific(TBD)

5.4 Black Light power ON/OFF sequence



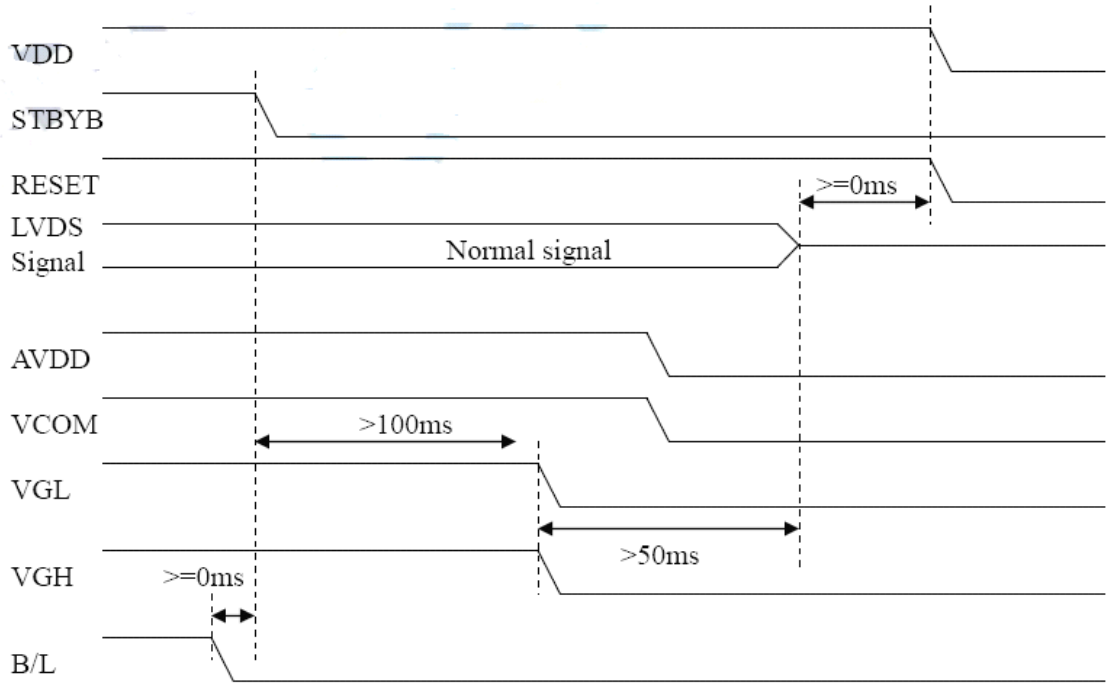
5.5 System power ON/OFF sequence

a. Power on:



5.6 Enter and exit standby mode sequence

b. Power off:



6 Optical Characteristics

Ta=25℃

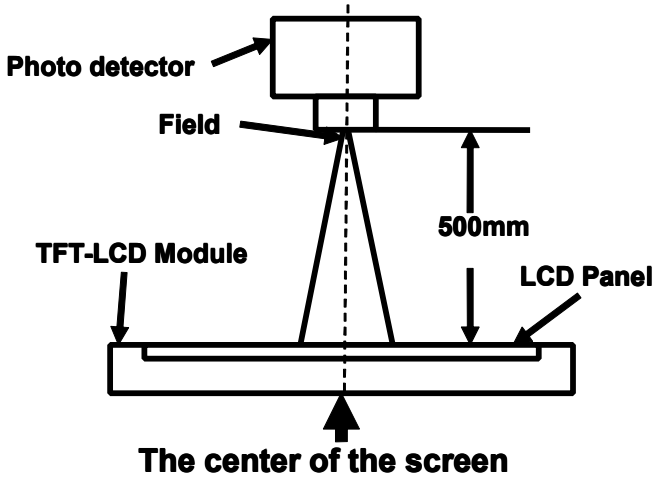
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note 2
		θB		40	50	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	500	700	-		Note1 Note3
Response Time		T_{ON}	25℃	-	25	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.259	0.309	0.359		Note1 Note5
		y		0.279	0.329	0.379		
	Red	x			0.644			
		y			0.354			
	Green	x			0.333			
		y			0.604			
	Blue	x			0.145			
		y			0.059			
Uniformity		U		70	75	--	%	Note1 Note6
NTSC				65	70	-	%	Note 5
Luminance		L		200	250	-	cd/m^2	Note1 Note7

Test Conditions:

1. I_F= 120 mA, V_F=19.2 V and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

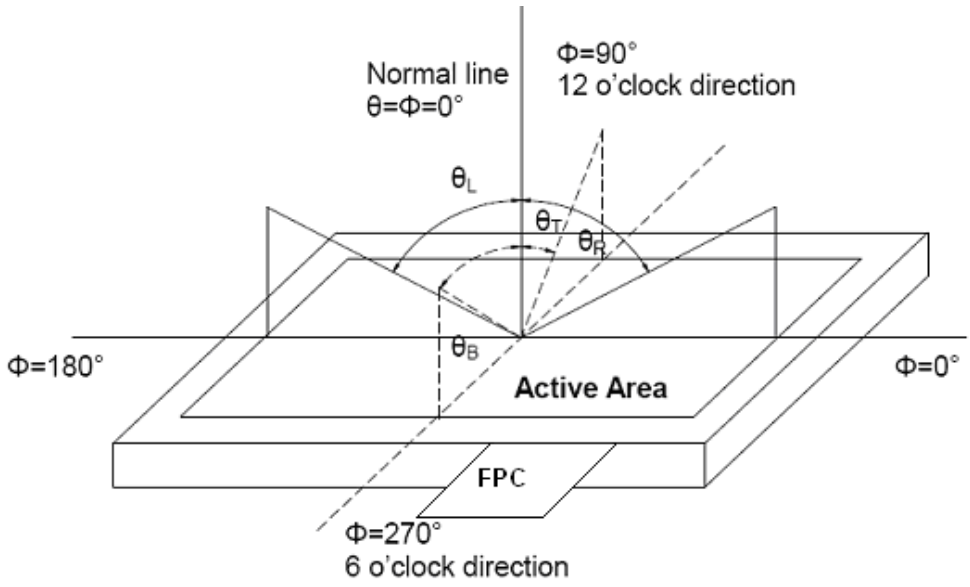
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	
Response Time	TRD100	-

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

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

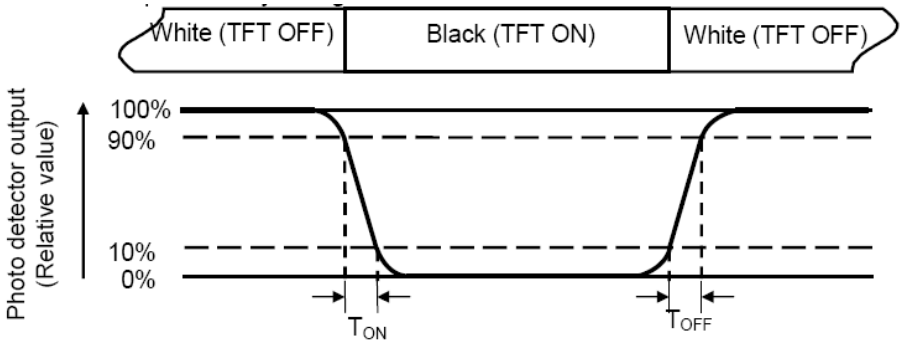
"White state ": The state is that the LCD should drive by Vwhite.

"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)

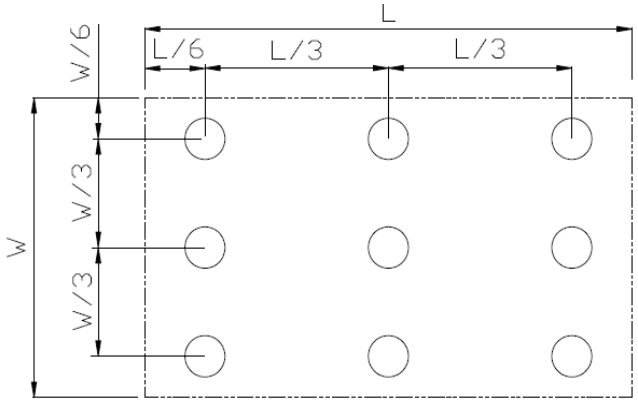
Color coordinates measured at center point of LCD.

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

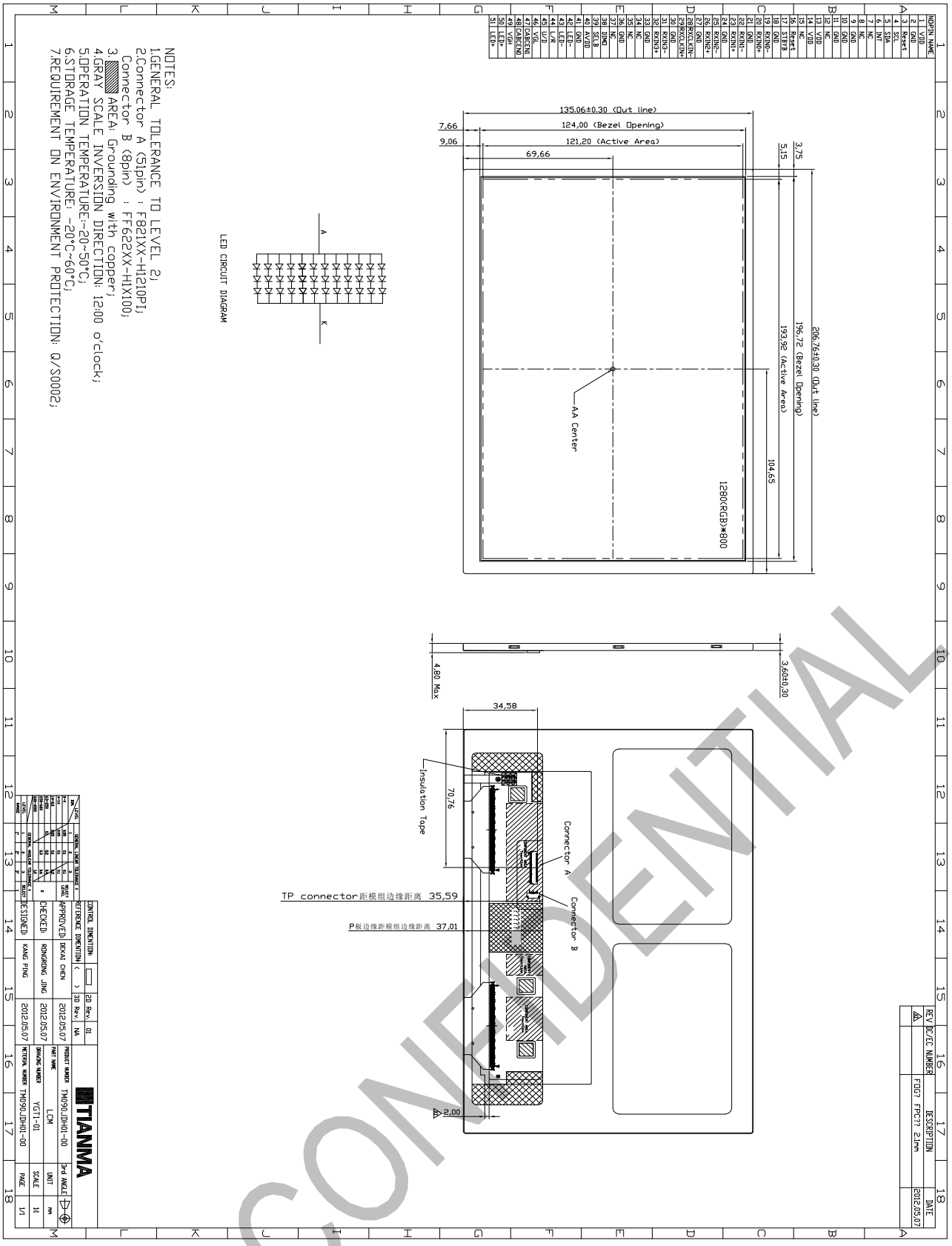
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +50℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +60℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +40℃, 90% RH max,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ 30 min~+60℃ 30 min, Change time:3min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
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
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:60cm, 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 samples.

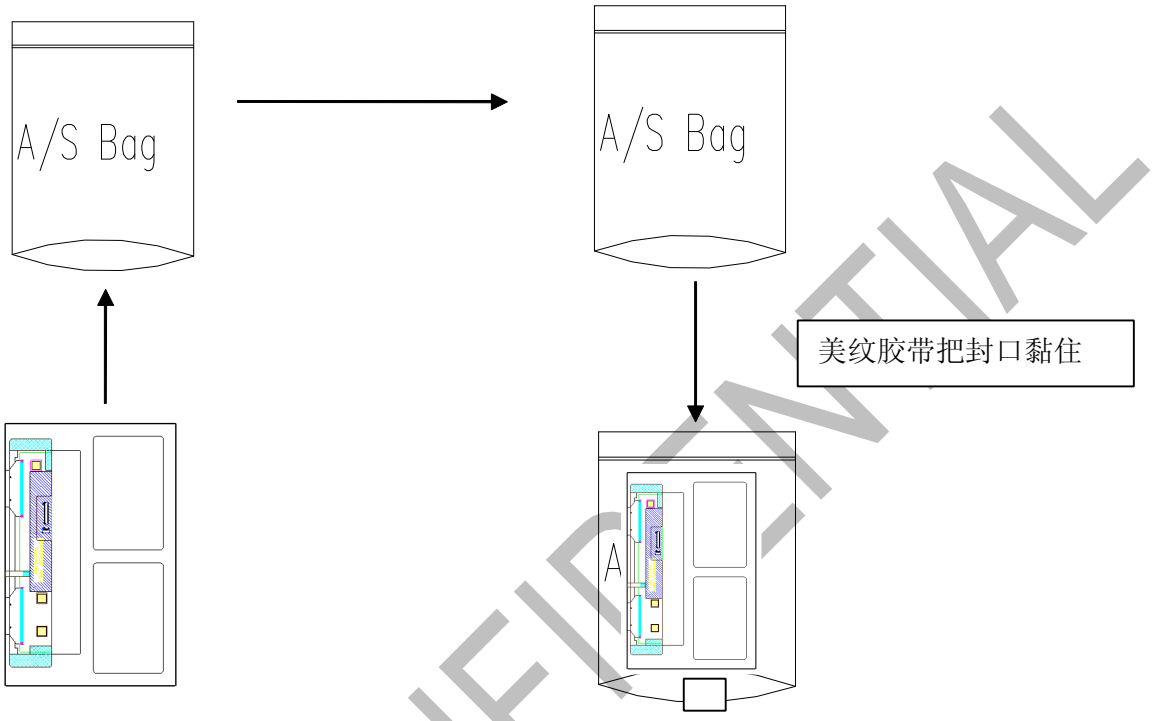
Note3: In the standard condition,there is not display function NG issue occurred.All the cosmetic specification is judged before the reliability stress.

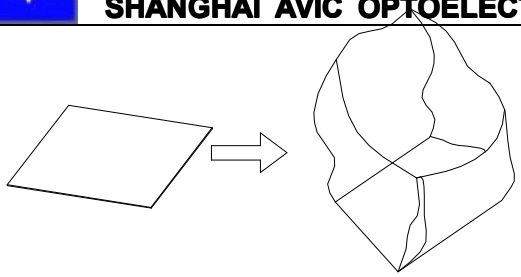
8 Mechanical Drawing

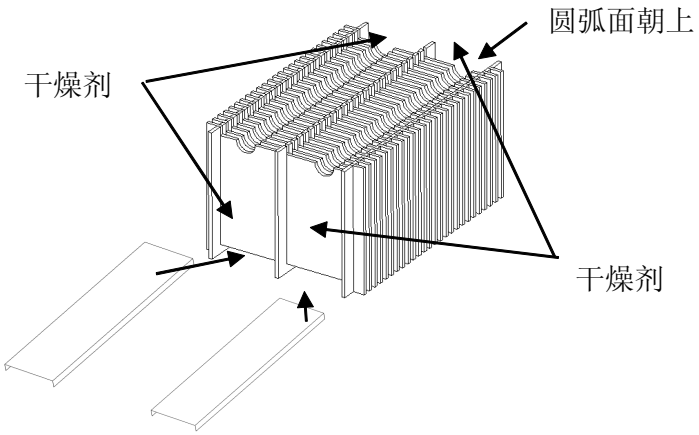


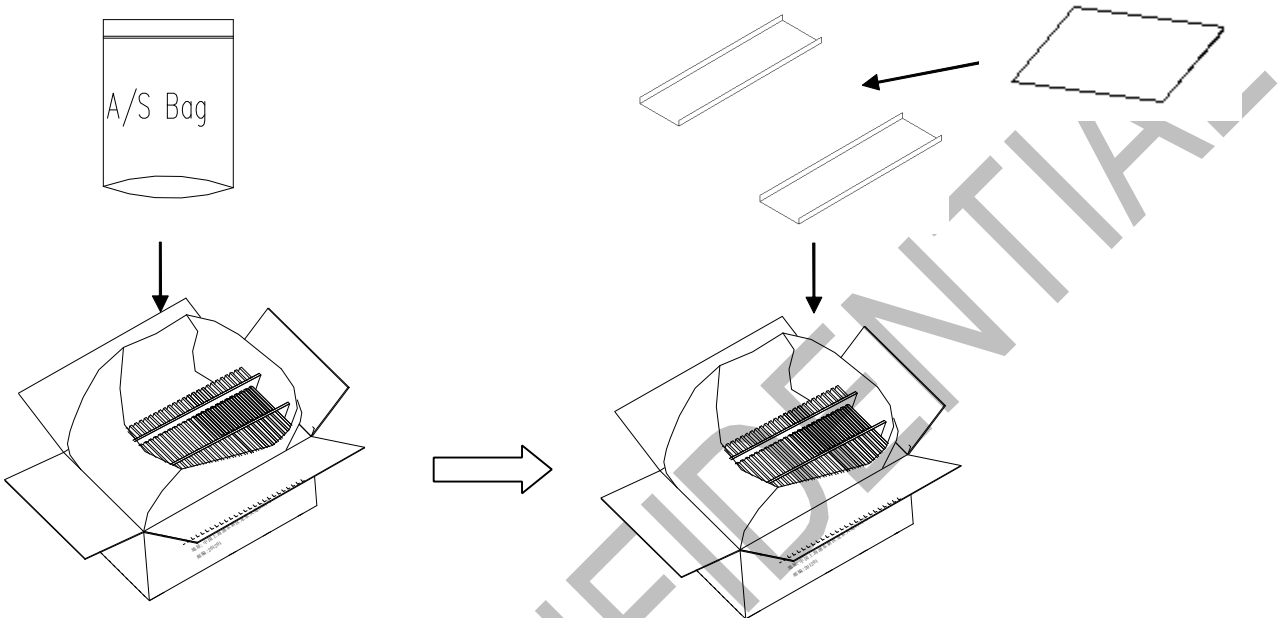
9 Packing drawing

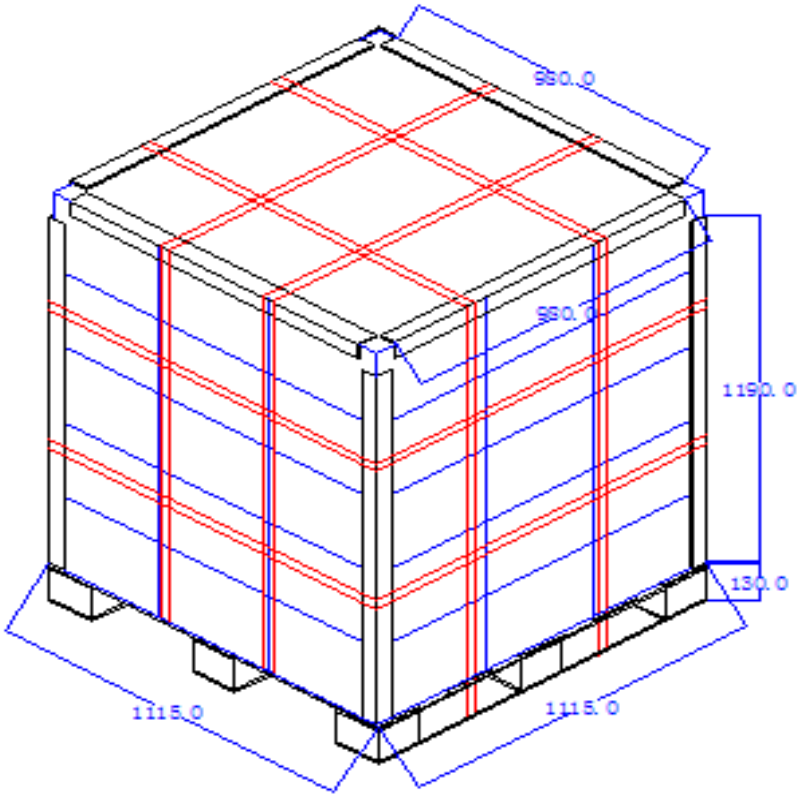
No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM-MODULE	TM090JDH01-00	206.76*135.06*5	0.175	50	
2	Anti-static Bag	PE	253*161*0.05	0.001	50	1680006450
3	Partition-1	Corrugated Paper	513*333*251	1.178	1	1680015020
4	Corrugated Bar	Corrugated Paper	513*173*3	0.041	4	1680015030
5	Partition-2	Corrugated Paper	505*332*4	0.098	2	1680009720
6	Desiccant	--	45*35	0.01	12	1680003280
7	Dust-proof Bag	PE	700*545	0.06	1	1680000520
8	Carton	Corrugated Paper	530*350*288	1.12	1	1680007642
9	Total weight	(evaluate)11.6±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.