Specification
For
Approval

□ Preliminary specification
■ Final specification

Title	12.1SVGA TN TFT-LCD (Module)

Buyer	
Model	

Supplier	Cheng Du BOE Optoelectronics Technology CO., LTD
Model	TT121S0M-NW0/BA121S01-100

TITLE/SIGNATURE	DATE
_____	_____
_____	_____
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_____	_____

Please return one copy confirmation with signature and your comments

ITEM	SIGNATURE/DATE
Approved	_____
Reviewed	_____
Reviewed	_____
Prepared	_____

BOE CHENG DU
Optoelectronics Technology CO., LTD

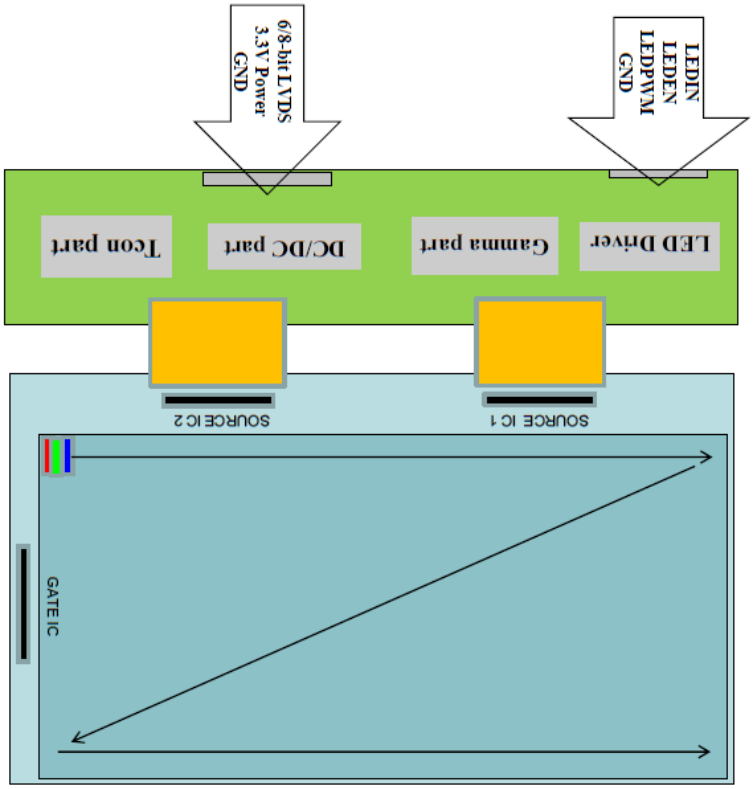
CONTENT LIST

Record of Revisions				
Revision	Date	Page	Description	Released by
Rev.0	2015.01.04		Initial Released	Huangli
Rev.1	2015.01.25	P7~P11 &P13	Add LED power supply & EN,PWM input voltage Add 2.4 Typical Operating Characteristics Add SYNC mode	Huangli

1.0 GENERAL DESCRIPTION

1.1 Introduction

TT121S0M-NW0 is a color active matrix TFT-LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This model is composed of a TFT-LCD Panel, a driving circuit and a back light system. It is a transmissive type display operating in the normal white. This TFT-LCD has a 12.1 inch diagonally measured active area with SVGA resolutions (800 horizontal by 600 vertical pixel array). Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripe and this panel can display 16.7M colors.



1.2 Features

- 0.5t Glass (Single)
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- Module Design
- RoHS Compliant

1.3 Application

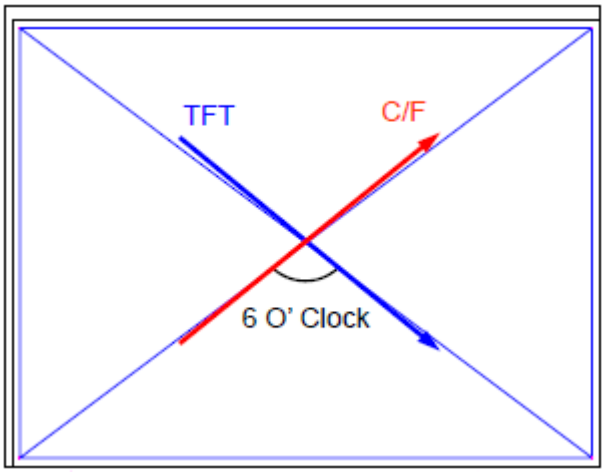
- Application

1.4 General Specifications (H: horizontal length, V: vertical length**)**

Parameter	Specification	Unit	Remark
Active Area	246.0(H) × 184.5(V)	mm	
Number of Pixels	800(H) RGB × 600(V)	pixels	
Pixel Pitch	0.3075(H) × 0.3075(V)	mm	
Pixel Arrangement	RGB Vertical stripe		
Display Colors	16.7 M	colors	
Color Gamut	55%(typ.)		
Display Mode	Normally White, Transmissive mode		
Dimensional Outline	279±0.5(H) × 209±0.5(V) × 9±0.3(D)	mm	Module
Viewing Direction (Human Eye)	12 O'clock		Note 1,2
D-IC	Source: HX8245-C01 / Gate: HX8677-G T-con: HX8841		
Weight	500(max)	gram	
Life Time	50,000(Min)	hours	

Note:

1. The biggest CR is 6 O'clock; the worst gray inversion is 6 O'clock;
2. The TFT and CF Rubbing Direction;



2.0 ELECTRICAL SPECIFICATION

2.1 Absolute Maximum Ratings

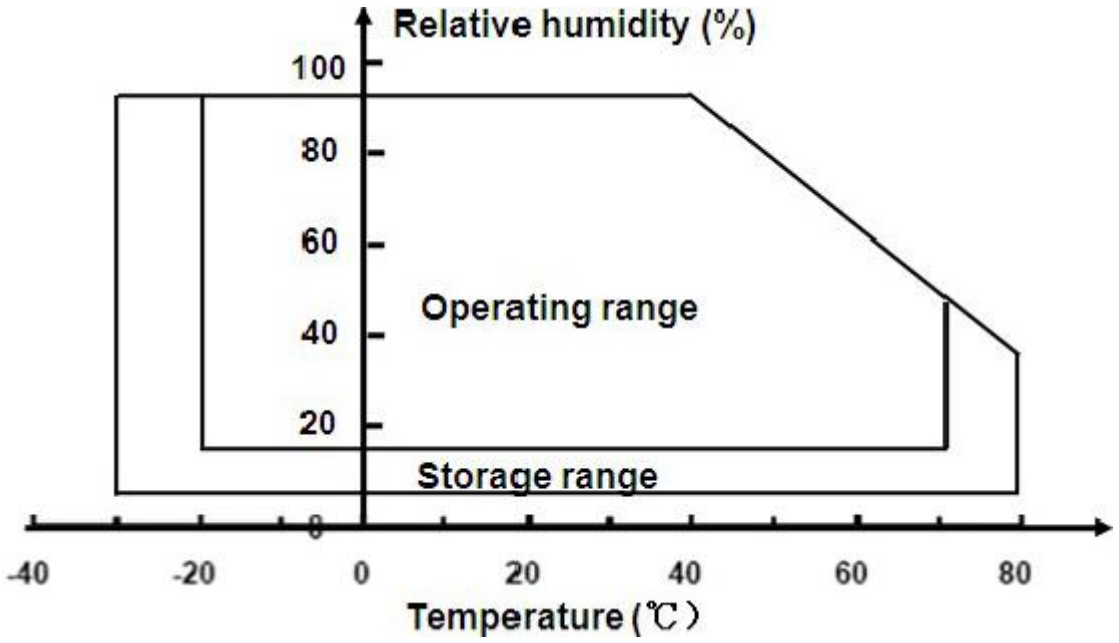
The absolute maximum ratings are list on table as follows. When used out of the absolute maximum ratings, the LSI may be permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LSI will malfunction and cause poor reliability.

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage (LCD Module)	V_{DD}	3.0	3.6	V	-
Backlight Power Supply Voltage	HV_{DD}	25.2	31.5	V	-
Operating Temperature	T_{OP}	-20	+70	℃	-
Storage Temperature	T_{ST}	-30	+80	℃	Note

Note:

Temperature and relative humidity range are shown in the Figure below.

Wet bulb temperature should be 39℃ max. and no condensation of water.



2.2 Electrical specification

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Supply Input Voltage	V_{DD}	3.0	3.3	3.6	V	
Power Supply Current	I_{DD}		380		mA	
Positive-going Input Threshold Voltage	V_{IT+}			+100	mV	
Negative-going Input Threshold Voltage	V_{IT-}	-100			mV	
Differential input common mode voltage	Vcom		4.6		V	V_{IH}=100mV V_{IL}=-100mV
LED Power Supply Input Voltage	V_{LED}	4.2	12	24	V	
LED EN,PWM Input Voltage	V_{IH}	2	-	-	V	
	V_{IL}	-	-	0.8		

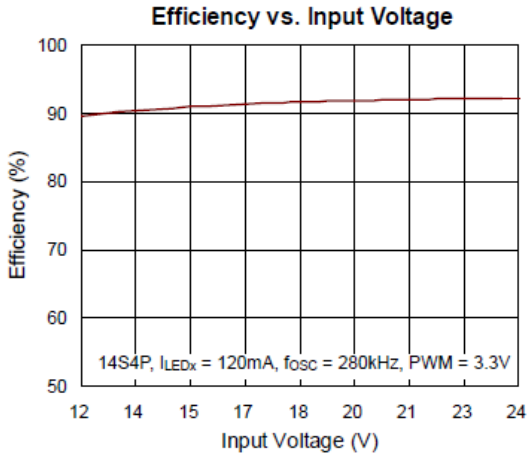
2.3 Backlight Driving Conditions

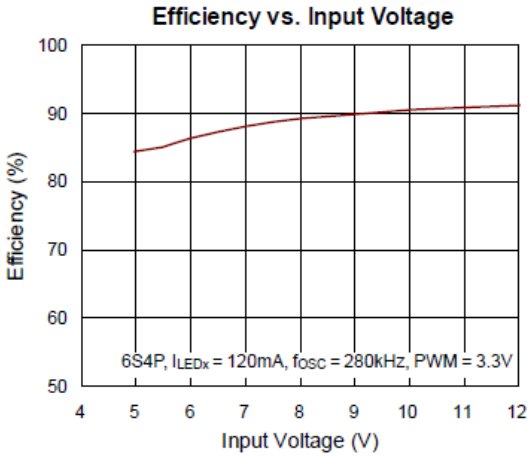
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Forward Voltage	V_F	25.2	27.9	31.5	V	-
Forward Current	I_F		160		mA	Note 1
Power Consumption	P_{BL}	4.03	4.47	5.04	W	Note 2
	P_D		1.3		W	
	P_{Total}		5.77		W	
Life Time	N/A	50,000			Hrs	I_F = 80mA Note 3

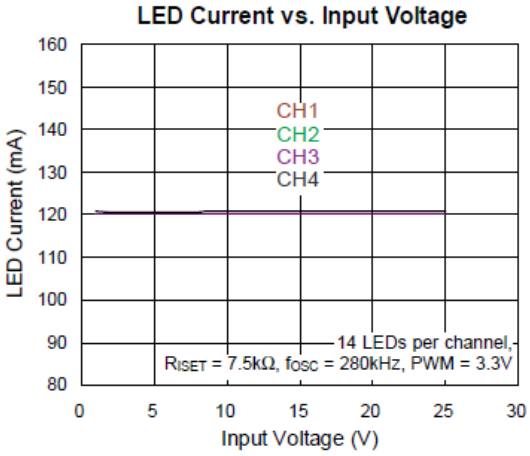
Notes:

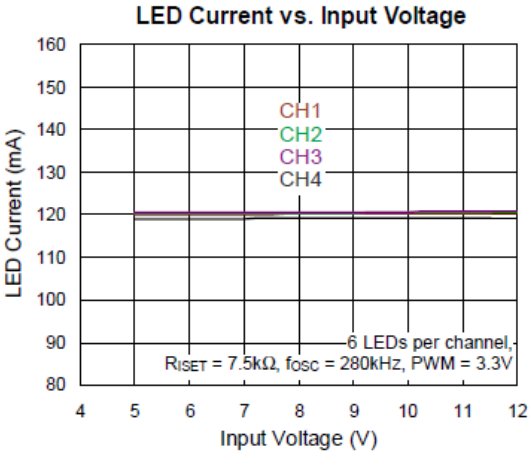
1. LED I_F=80mA, 2 Parallel * 9 String
2. Calculator Value for reference $I_F \times V_F$ = PLED.
3. The LED Life-time defined as the estimated time to 50% degradation of initial luminous.

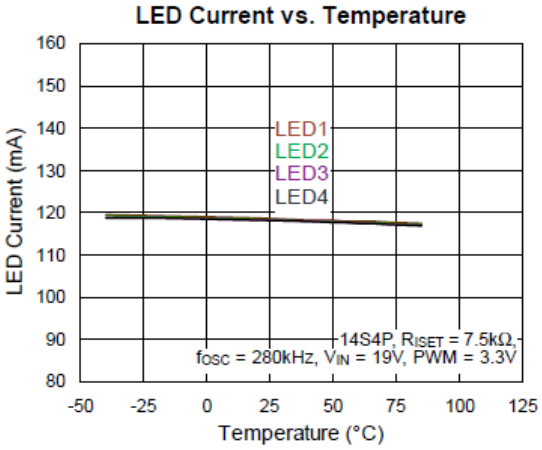
2.4 Typical Operating Characteristics

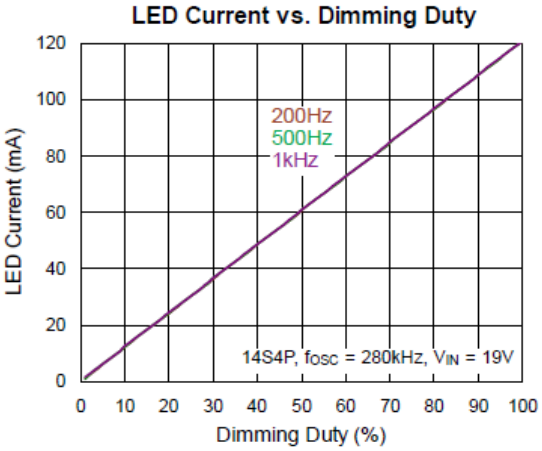




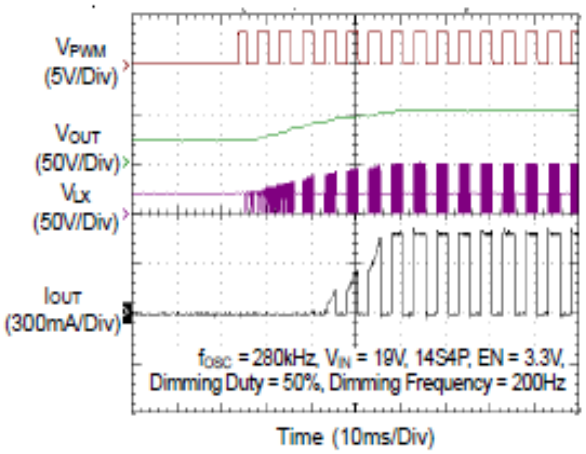




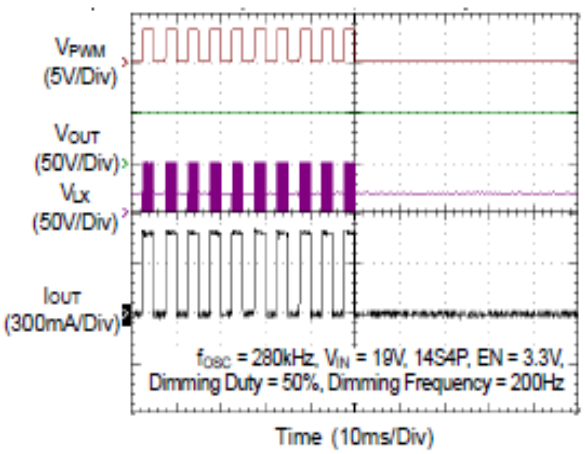




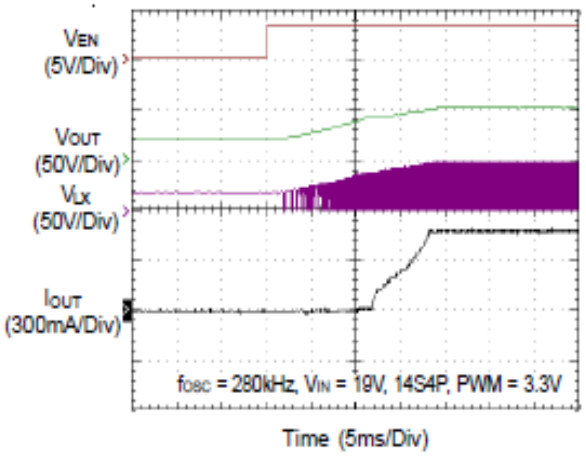
Power On from PWM



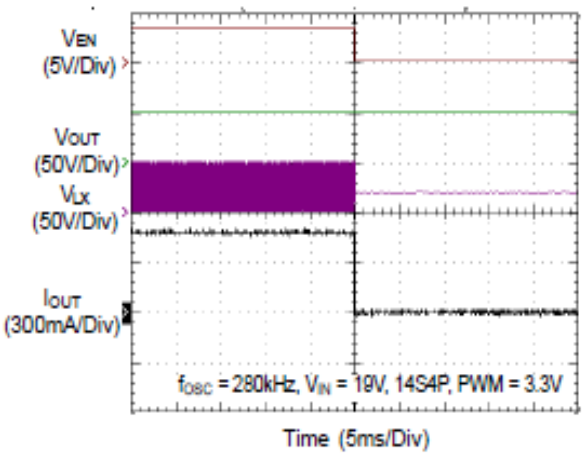
Power Off from PWM



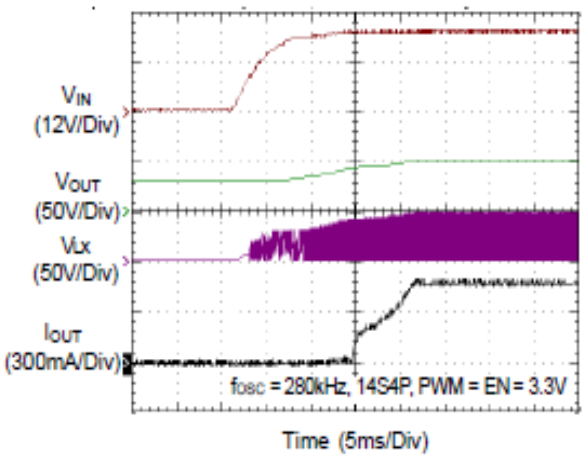
Power On from EN



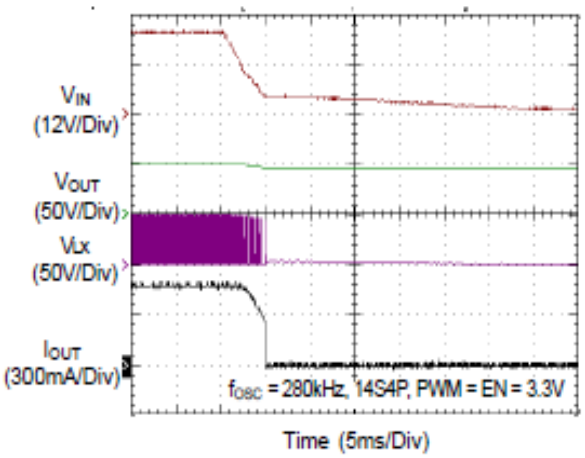
Power Off from EN



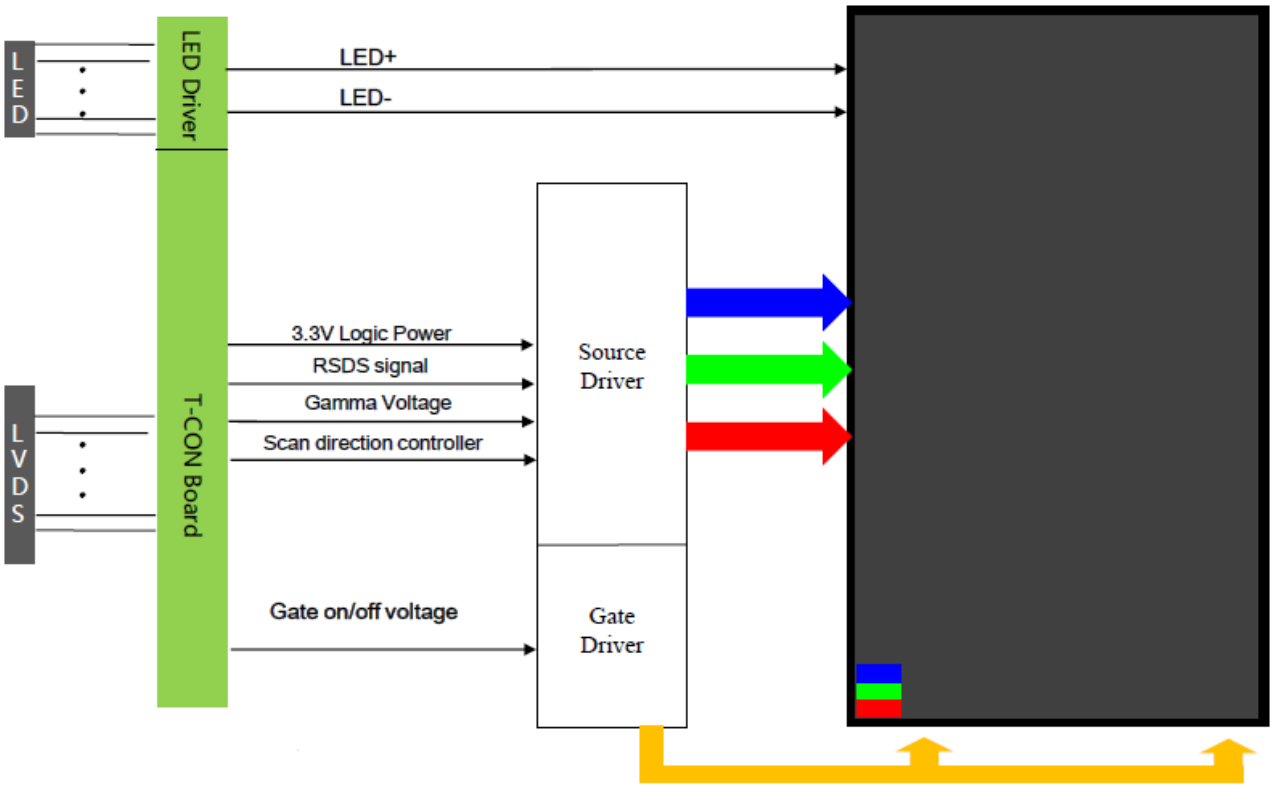
Power On from VIN



Power Off from VIN

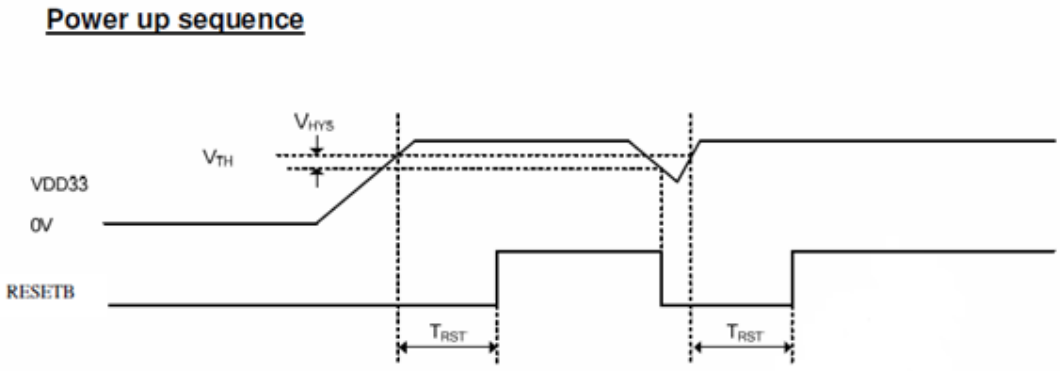


2.5 Block Diagram

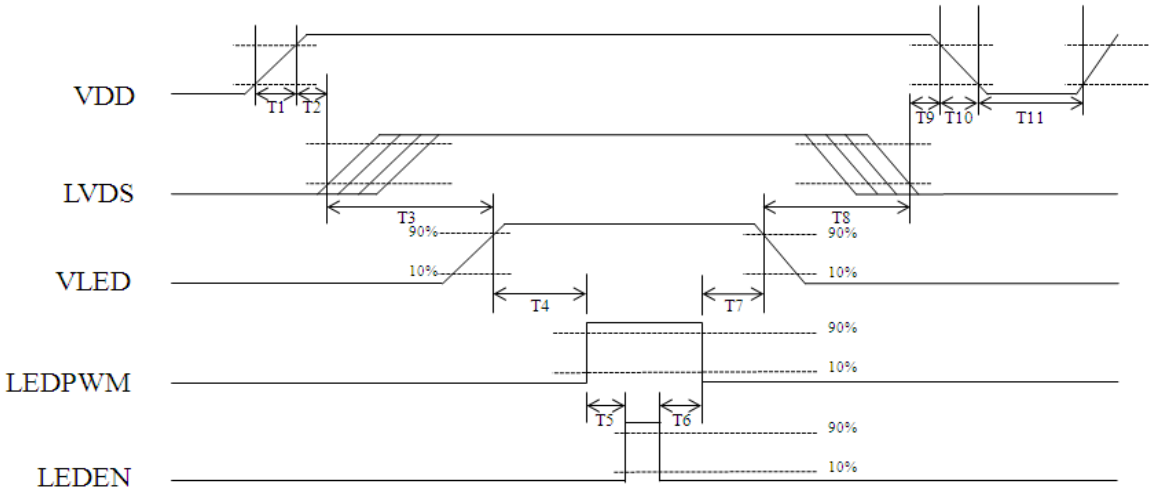


2.6 Power ON/OFF Sequence

Power on Sequence



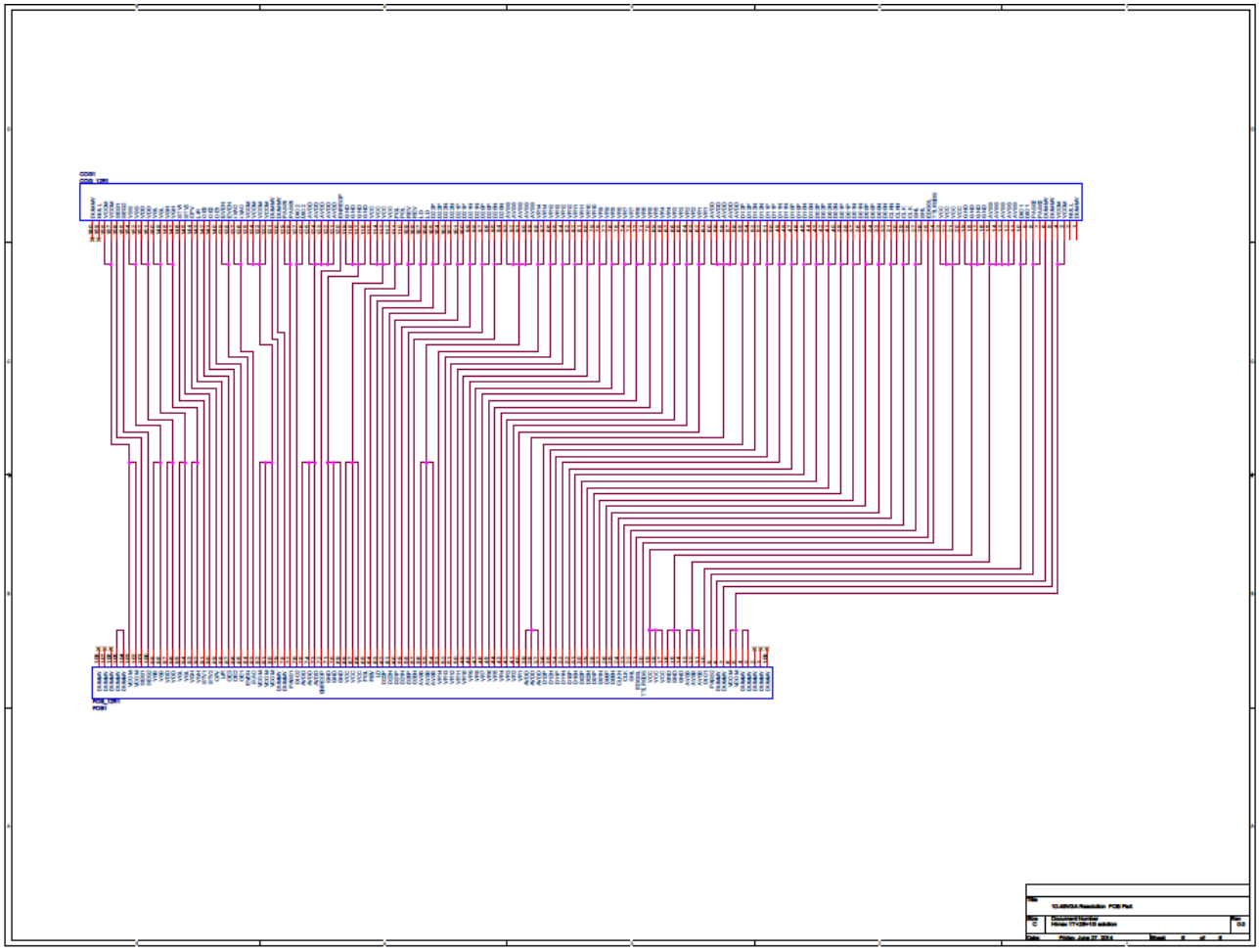
Symbol	Parameter	Condition	Spec.			Unit
			Min.	Typ.	Max.	
VTH	Reset threshold voltage	-	2	2.1	2.2	V
VHYS	Hysteresis voltage	-	-	200	-	mV
TRST	Reset duration @R=10KΩ, C=1μF	-	10	-	-	Ms



Power ON/OFF sequence timing

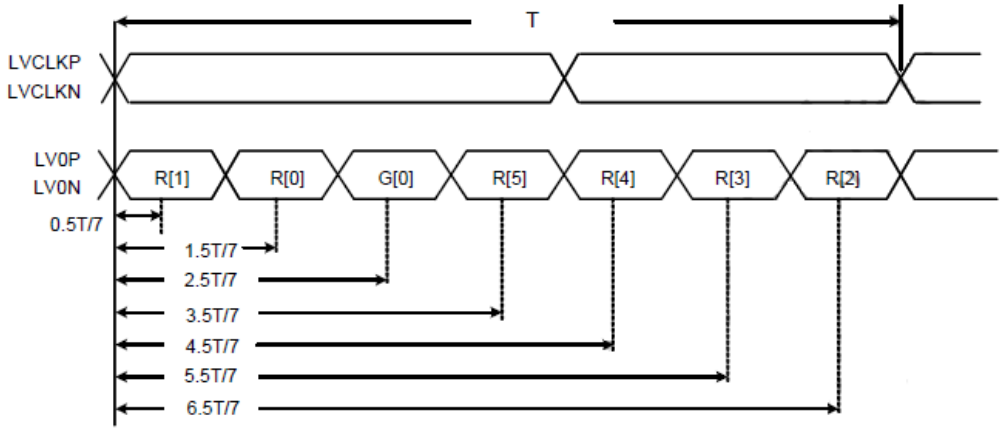
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	
T3	200	-	-	
T4	10	-	-	
T5	10	-	-	
T6	0	-	-	
T7	10	-	-	
T8	100	-	-	
T9	0	16	50	
T10	-	-	10	
T11	1000	-	-	

2.7 FPC Schematic



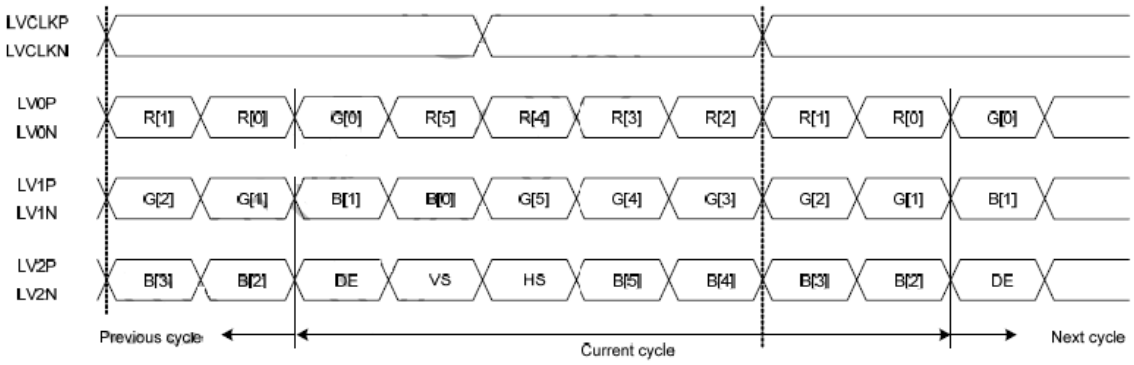
3.0 SIGNAL TIMING SPECIFICATION

Ideal strobe position for LVDS input

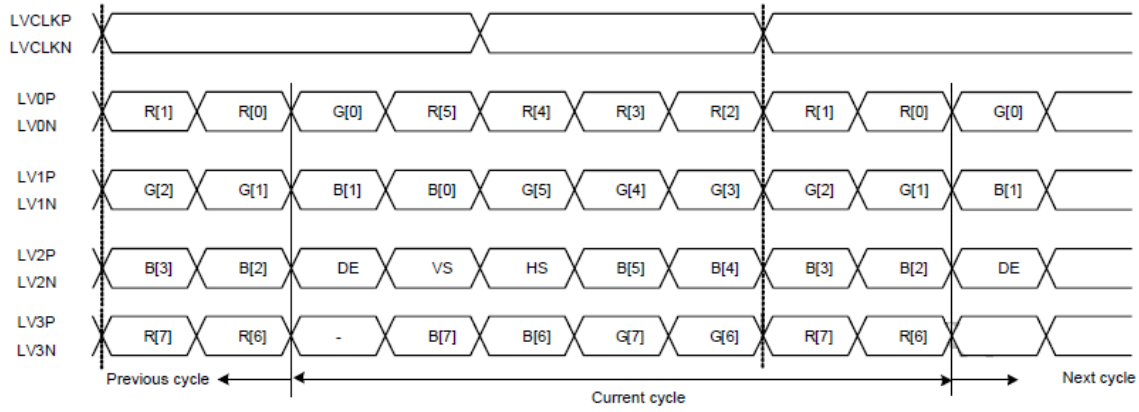


LVDS input data ideal strobe position

LVDS input data mapping



6-bit LVDS input data mapping



8-bit LVDS input data mapping

Input Timing

DE mode

Parameter	Symbol	Condition	SVGA 800X600	Unit
DCLK Frequency	FDCLK	TYP.	40	MHz
Horizontal total timing	TH	Min.	900	TDCLK
		TYP.	1056	TDCLK
		Max.	2047	TDCLK
Horizontal active timing	THA	TYP.	800	TDCLK
Vertical total timing	TV	Min.	604	TH
		TYP.	630	TH
		Max.	1023	TH
Vertical active timing	TVA	TYP.	600	TH

SYNC mode

Parameter	Symbol	SVGA 800X600	Unit
DCLK Frequency	FDCLK	40	MHz
Horizontal total timing	TH	1056	TDCLK
HD pulse width	TWHL	3	TDCLK
HD back porch	THBP	216	TDCLK
HD front porch	THFP	37	TDCLK
Horizontal active timing	THA	800	TDCLK
Vertical total timing	TV	630	TH
VD pulse width	TWVL	1	TH
VD back porch	TVBP	27	TH
VD front porch	TVFP	2	TH
Vertical active timing	TVA	600	TH

4.0 INTERFACE CONNECTION

20Pin data connector

Connector Name / Designation	Signal Connector
Manufacturer	STM or compatible
Connector Model Number	MSB240420-HEor compatible
Adaptable Plug	P240420 or compatible

Pin No.	Symbol	Description
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	GND	Ground
4	SEL68	6/ 8bits LVDS data input selection [H: 8bits L/NC: 6bit]
5	RIN0-	LVDS receiver signal channel 0
6	RIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RIN1-	LVDS receiver signal channel 1
9	RIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RIN2-	LVDS receiver signal channel 2
12	RIN2+	LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)
13	GND	Ground
14	CLKIN-	LVDS receiver signal clock
15	CLKIN+	
16	GND	Ground
17	RIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input
18	RIN3+	LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV)
19	RSV	Reverse Scan Function [H: Enable; L/NC: Disable]
20	GND	Ground

5Pin B/L power connector

Connector Name / Designation	Lamp Connector
Manufacturer	ACES or compatible
Connector Model Number	50277-00501-001 or compatible
Mating Model Number	H208K–P05N-02Bor compatible

Pin No.	Symbol	Description
1	VCC	Power Supply, 12V (typical)
2	GND	Ground
3	On/OFF	5V-ON,0V-OFF
4	Dimming	PWM（High effective）
5	NC	

Remark: PWM frequency 120~1Khz

5.0 OPTICAL SPECIFICATIONS

5.1 Overview

The test of Optical specifications shall be measured in a dark room(ambient luminance≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Topcon SR-UL1R and Westar TRD-100A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°.The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

5.2 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold Voltage		Vsat		2.0	2.2	2.4	V	Fig.1
		Vth		1.1	1.3	1.5	V	
Viewing Angle	Horizontal	Θ3	CR>10	70	80		°	Note 1
		Θ9		70	80		°	
	Vertical	Θ12		55	65		°	
		Θ6		65	75		°	
Contrast Ratio		CR	Θ= 0°	600	800			Note 2
Luminance		cd/m2	Θ= 0°	330	450		nit	Note 3
Uniformity		%	Θ= 0°	75	80			Note 4
NTSC		%	Θ= 0°		55%			
Reproduction Of color	Red	Rx	Θ= 0°	0.577	0.627	0.677		Note 5 * Module
		Ry		0.283	0.333	0.383		
	Green	Gx		0.285	0.335	0.385		
		Gy		0.519	0.569	0.619		
	Blue	Bx		0.101	0.151	0.201		
		By		0.043	0.093	0.143		
White		Wx	Θ= 0°	0.263	0.313	0.363		
		Wy		0.279	0.329	0.379		
Response Time		Tr+Tf	Θ= 0°		30		ms	Note 6

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIG.2).
2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIG. 2) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Surface luminance is the center point across the LCD surface 50cm from the surface with all pixels displaying white. This measurement shall be taken at the locations shown in FIG. 2.

4. Uniformity measurement shall be taken at the locations shown in FIG. 2&3, for a total of the measurements per display, measure surface luminance of these nine points across the LCD surface 50cm from the surface with all pixels displaying white.

$$\text{Uniformity} = \frac{\text{Min Luminance of 9 points}}{\text{Max Luminance of 9 points}} \times 100\%$$

5. The color chromaticity coordinates specified in Table1 shall be calculated from The spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the Module.

6. The electro-optical response time measurements shall be made as FIG.4 by switching the "data" input signal ON and OFF.

The times needed for the luminance to change from 10% to 90% is Tf and 90% to 10% is Tr.

Figure 1. The definition of Vth & Vsat

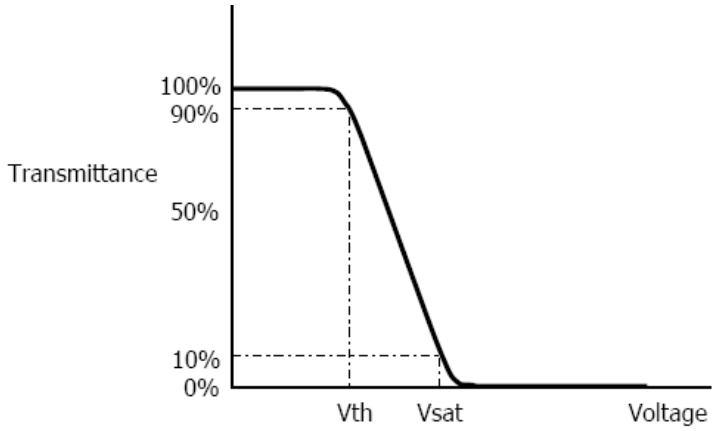


Figure 2. Measurement Set Up

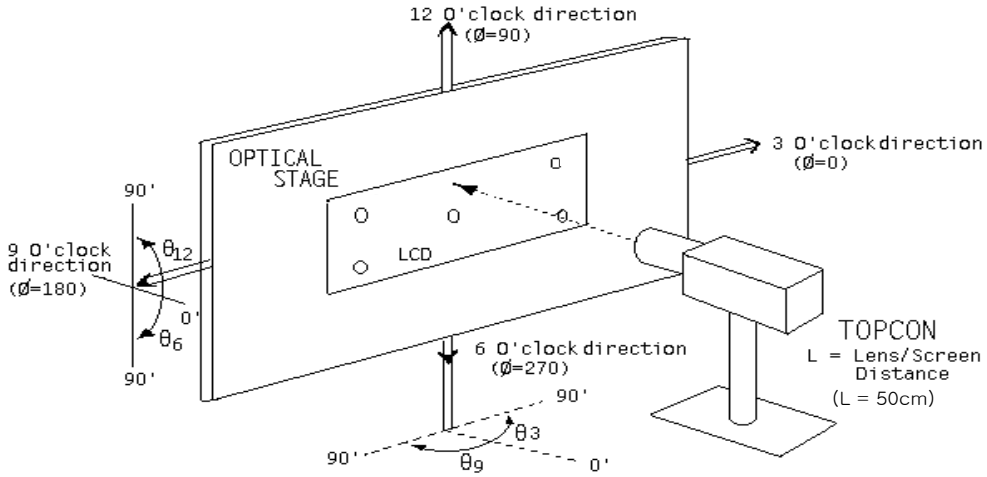


Figure 3. Uniformity Measurement Locations

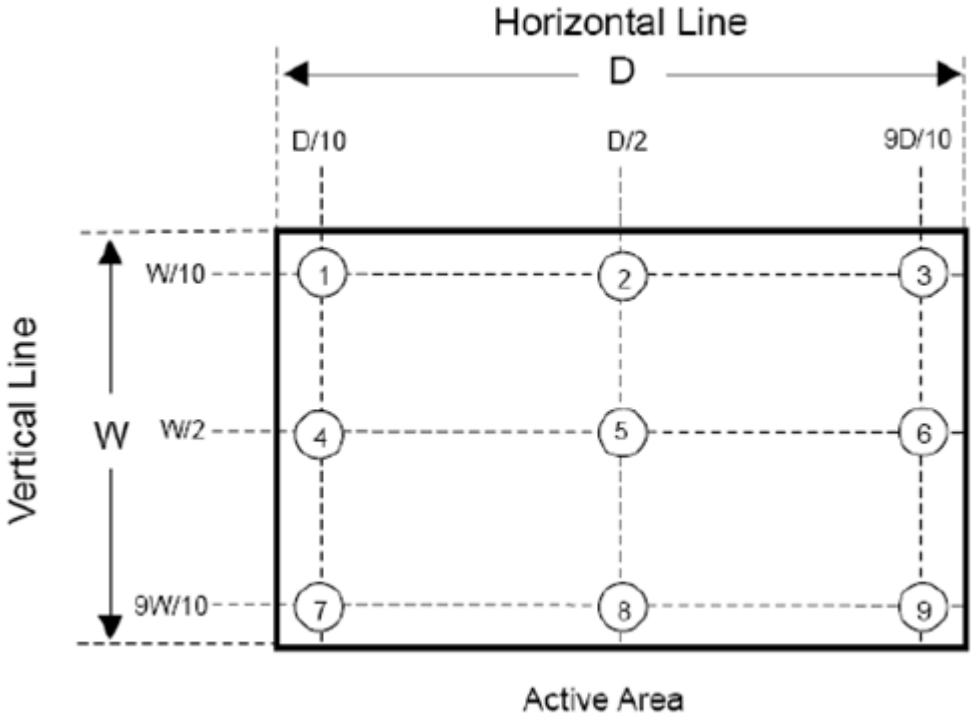
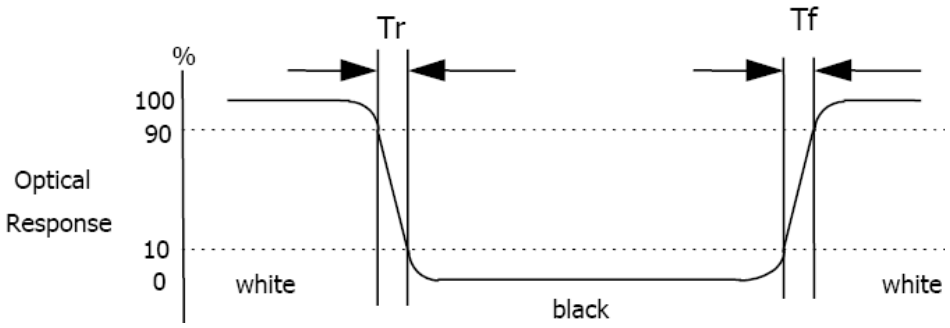
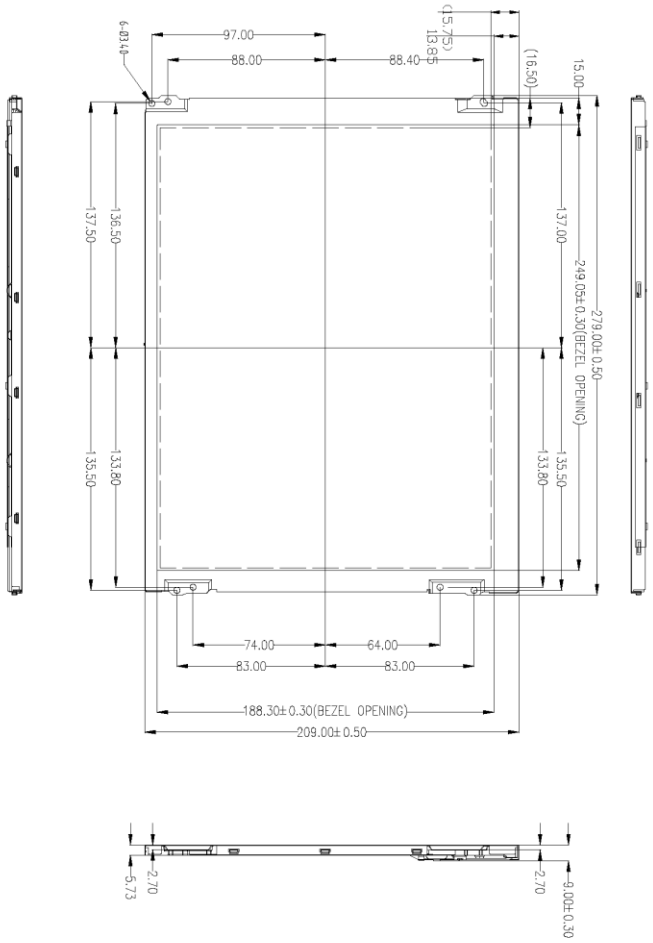
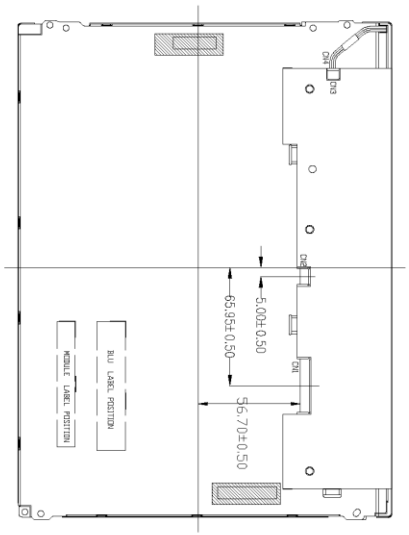


Figure 4. Response Time Testing



6.0 MECHANICAL CHARACTERISTICS



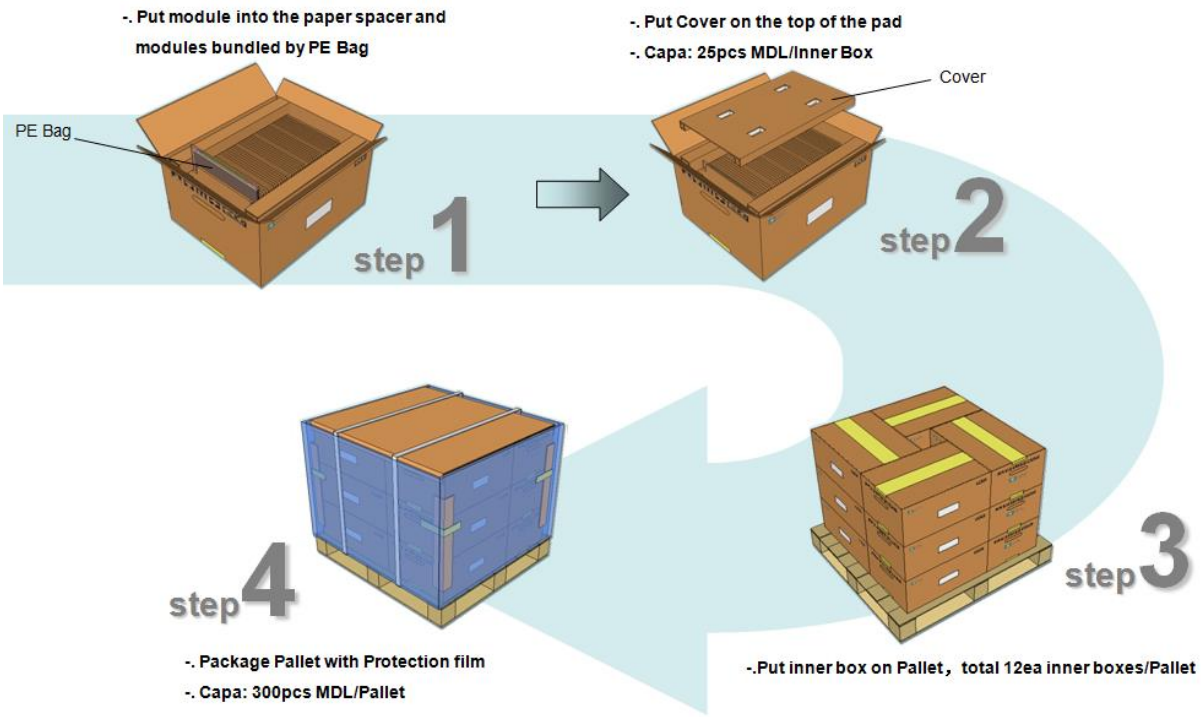


7.0 RELIABILITY TEST

NO.	Test Item	Test Condition	Duration
1	High temperature, high humidity operation test(THO)	60℃, 90%RH	240hrs
2	Low temperature operation test(LTO)	-20 ℃	240hrs
3	High temperature operation test(HTO)	70 ℃	240hrs
4	High temperature storage test(HTS)	80℃	240hrs
5	Low temperature storage test(LTS)	-30℃	240hrs
6	Thermal shock test (TST)	-30 ℃ →80 ℃ (Per 30min)	100hrs
7	Altitude test(ALT)	25℃,40000ft	12hrs
8	On/Off	On 30s / Off 30s	3000times
9	PCT	121 ℃,2ATM ,100%RH	12hr
10	ESD	150pF 330Ω ±8KV(Air) / ±6KV(Contact)	20points
11	Vibration	1.5G ,10/500/10,Sine,X/Y/ Z Direction	Total:30min

8.0 PACKING METHOD

Item		Specification	Q'ty/MDL	Remark
MDL	Model	TT121S0M-NW0	1	
PE Bag	Material	Thickness : 0.07mm	1	
Inner Box	Material	Corrugated Paper(BC)	0.04	
	Outline	580mm×400mm×285mm		
Pallet	Outline	1080mm×1080mm×130 mm	0.0034	
Protection film	Material	OPP	0.0034	



9.0 PRODUCT ID RULE

T T 121 S0 M – N W 0

1 2 3 4 5 6 7 8

1 <Company>

Code	Description
T	Tablet PC
N	Notebook
S	Special display

2 <Mode>

Code	Description
T	TN-a Si
V	ADS-a Si
S	ADS-LTPS

3 <Size>

Code	Description
121	12.1”
055	5.5”
060	6.0”

4 <Resolution>

Code	Description
S0	SVGA
FH	FHD
WH	WQHD

5 <Production type>

Code	Description
M	Module
Q	Q-Panel
S	Q-Panel SLM

6 <Product state>

Code	Description
N	Normal
E	In Cell Touch
A	Add On Touch

7 <Customer>

Code	Description
W	华南

8 <Product Rev>

Code	Description
0	First Mode
1	Second Mode
2	Third Mode

10.0 HANDDLING & CAUTIONS

10.1 Mounting Method

● The panel of the LCM consists of two thin glasses with polarizer which easily get damaged. So extreme care should be taken when handling the LCM.

● Excessive stress or pressure on the glass of the LCM should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCM unit when it is mounted.

● If the customer's set presses the main parts of the LCM, the LCM may show the abnormal display. But this phenomenon does not mean the malfunction of the LCM and should be pressed by the way of mutual agreement.

● To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.

● Mount a LCM with the specified mounting parts.

10.2 Caution of LCM Handling and Cleaning

● Since the LCM is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass maybe broken.

● The polarizer on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizer or it leads the polarizer to be deteriorated.

● If the use of a chemical is unavoidable, use soft cloth with solvent recommended below to clean the LCM's surface with wipe lightly.

-IPA (Isopropyl Alcohol), Ethyl Alcohol, Tri-chloro, tri-florothane.

● Do not wipe the LCM's surface with dry or hard materials that will damage the polarizer and others. Do not use the following solvent—Water, acetone, Aromatics.

● It is recommended that the LCM be handled with soft gloves during assembly, etc.

The polarizer on the LCM's surface are vulnerable to scratch and thus to be damaged by shape particles.

● Do not drop water or any chemicals onto the LCM's surface.

● A protective film is supplied on the LCM and should be left in place until the LCM is required for operation.

● The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent from the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

● Please handle FPC with care.

10.3 Caution Against Static Charge

- The LCM use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCM, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.4 Caution For Operation

- It is indispensable to drive the LCM within the specified voltage limit since the higher voltage than the limit causes LCM's life shorter. An electro-chemical reaction due to DC causes undesirable deterioration of the LCM so that the use of DC drive should avoid.
- Do not connect or disconnect the LCM to or from the system when power is on.
- Never use the LCM under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature(hot to cold or cold to hot), the LCM may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCM's surface which may affect the operation of the polarizer on the LCM.
- Response time will be extremely delay at lower temperature than the operating temperature range and on the other hand LCM may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCM. The LCM will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCM structure. If the screen is displayed with fixed pattern, use a screen saver.
- Do not disassemble and/or re-assemble LCM module

10.5 Packaging

- Modules use LCM element, and must be treated as such.

-Avoid intense shock and falls from a height.

-To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

10.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
- Original protective film should be used on LCM's surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizer.
- Do not store the LCM near organic solvents or corrosive gasses.
- Keep the LCM safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCM is stored for long time in the lower temperature or mechanical shocks are applied onto the LCM.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.

-Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
-Store in a dark place where neither exposure to direct sunlight nor light is.
-Keep temperature in the specified storage temperature range.
-Store with no touch on polarizer surface by the anything else. If possible, store the LCM in the packaging situation when it was delivered.

10.7 Safety

- For the crash damaged or unnecessary LCM, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol an should be burned up later.
- In the case of LCM is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.

11.0 Applicable Scope

- This product specification only applies to the products manufactured and sold by our company.
- Any specification, quality etc. about other parts mentioned in this product spec are no concern of our company.