B3 QV070WSM-N60 Product Specification Rev.P0

BUYER	FINETEK
SUPPLIER	HEFEI BOE Optoelectronics Technology CO., LTD
FG-Code	QV070WSM-N60-39P0

ITEM	BUYER SIGNATURE	DATE

ITEM	SUPPLIER SIGNATURE	DATE
Prepared		
Reviewed		
Approved		

HEFEI BOE OPTOELECTRONICS TECHNOLOGY

REVISION HISTORY

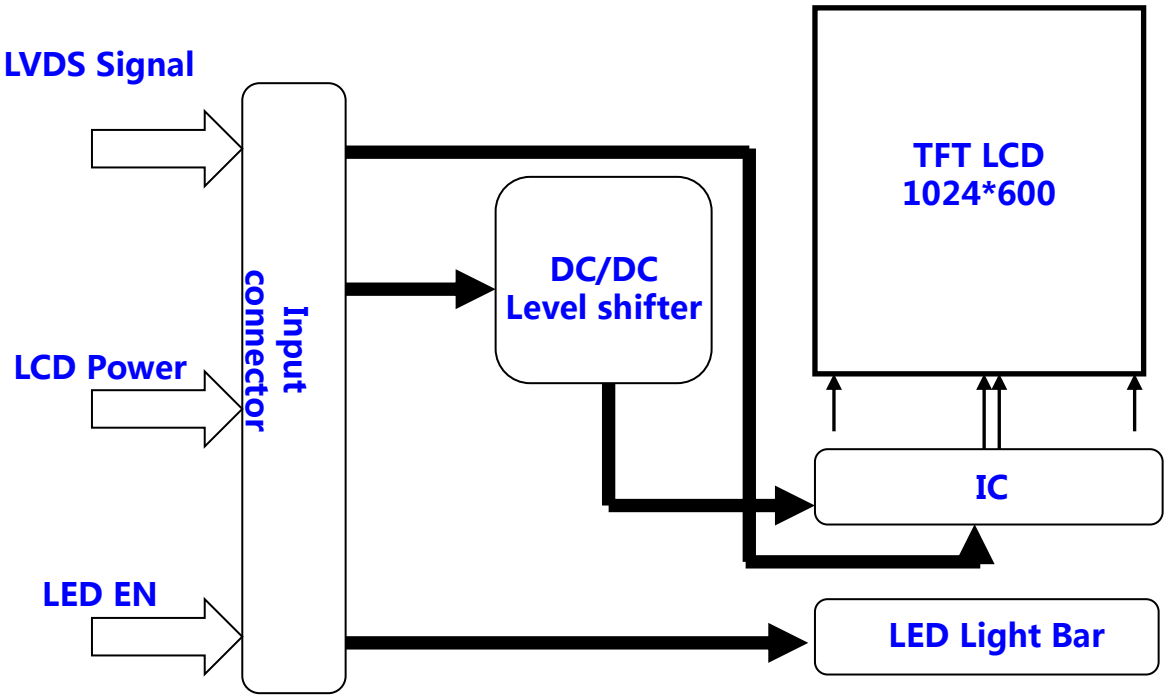
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0		Initial Release	2018-5-28	Li Xi

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

QV070WSM-N60 is a color active matrix TFT LCD module using amorphous silicon TFT 's (Thin Film Transistors) as an active switching devices. This module has a 7.0 inch diagonally measured active area with WSVGA resolutions (1024 horizontal by 600 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors.



1.2 Features

- LVDS Interface;
- 8-bit color depth, display 16.7M colors
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS compliant

1.3 Application

- Oven

1.4 General Specification

The followings are general specifications at the ** ********

<Table 1. LCD Module Specifications>

Parameter	Specification	Unit	Remarks
Active Area	153.6(H)*90(V)	mm	
Number Of Pixels	1024(H) ×600(V)	pixels	
Pixel Pitch	150(H)×RGB×150(V)	μm	
Pixel Arrangement	Pixels RGB stripe arrangement		
Display Mode	Normally Black		
Display Colors	16.7M(8bits)	colors	
Surface Treatment	3H HC + LR		
Contrast Ratio	900:1(typ.)		
Viewing Angle(CR>10)	80/80/80/80(typ.)	deg.	
Response Time	30(typ.)	ms	
Color Gamut	51.7%		
Brightness	340(min)/400(typ)	cd/m2	
Brightness Uniformity	80%(min)/90%(typ)		
Power Consumption	2.2W(Max.)	watt	
Outline Dimension	164.05(H)*100.86(V)*2.35(typ)(LCM)	mm	
Weight	90(Max.)	gram	

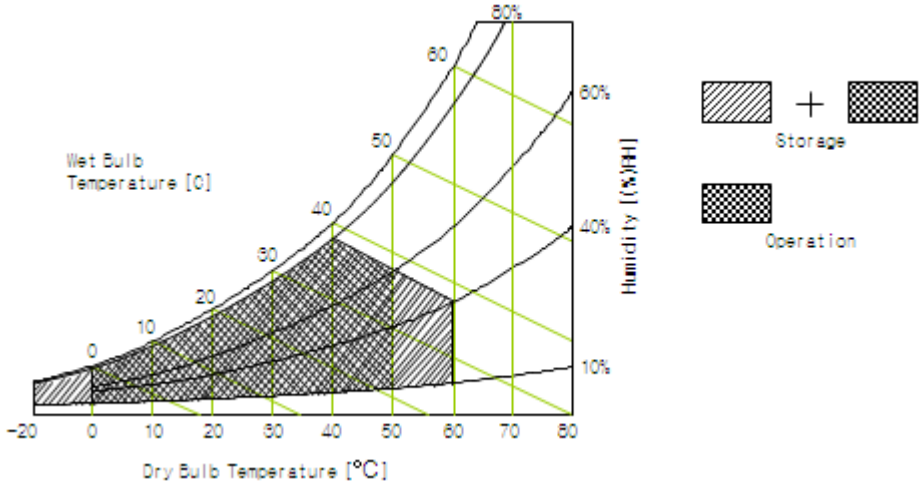
2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

Parameter		Symbol	Min.	Max.	Unit	Remarks
Power Supply	LCD Module	VDDIN	VSS-0.3	4.2	V	Ta = 25 ℃ LED(5S4P)
	BLU	VLED(total)	13	15	V	
		ILED(total)	-	80	mA	
Operating Temperature		T_{OP}	-20	+60	℃	Note 1
Operating Ambient Humidity		Hop	-	90	%RH	
Storage Humidity		Hst	-	90	%RH	

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



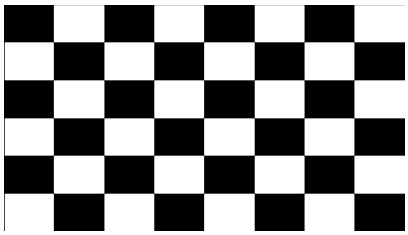
3.0 ELECTRICAL SPECIFICATIONS

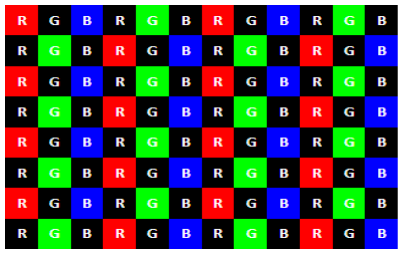
3.1 TFT LCD Module

< Table 3. LCD Module Electrical specifications > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	VDDIN	3.2	3.7	4.2	V	
Power Supply Current	IVDDIN	-	514	595	mA	Note 1
Power Consumption	PLCD	-	1.9	2.2	W	
Rush current	IRUSH	-	-	1.0	A	Note 2
Positive-going Input Threshold Voltage	VIT+	-	-	+100	mV	Vcom = 1.2 V
Negative-going Input typ. Threshold Voltage	VIT-	-100	-	-	mV	Negative-going Input typ.
Differential input common mode voltage	Vcom	-	1.2	-	V	VIH=100mV, VIL=-100mV

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDDIN=3.7V, Frame rate f_V=60Hz and Clock frequency = 51.2MHz. Test Pattern of power supply current
a) Typ : Mosaic 8 x 6 Pattern(L0/L255) b) Max : skip 1H1V dot(L0/L255)





2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

3.2 Back-Light Unit

Table 4. LED Driver Electrical Specifications > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max.		
LED Supply Voltage	VDDIN	3.2	3.7	4.2	V	
BLU on/off Level	BLU on	2		VDDIN	V	
	BLU off	0		0.4	V	
LED Quantity	QLED	-	20	-	EA	
LED Life Time	TLED	15000	-	-	Hrs	Note 1

Notes: 1. The life time of LED, 15,000Hrs, is determined as the time at which luminance of the LED is 50% compared to that of initial value at the typical LED current on condition of continuous operating at 25 ± 2°C.

3.4 INPUT TERMINAL PIN ASSIGNMENT

This LCD employs one interface connections, a 31 pin ZIF connector is used for the LCD module electronics interface.

3.4.1 Pin assignment for LCD module

Connector : PF030-O31B-C09-HE (UJU)

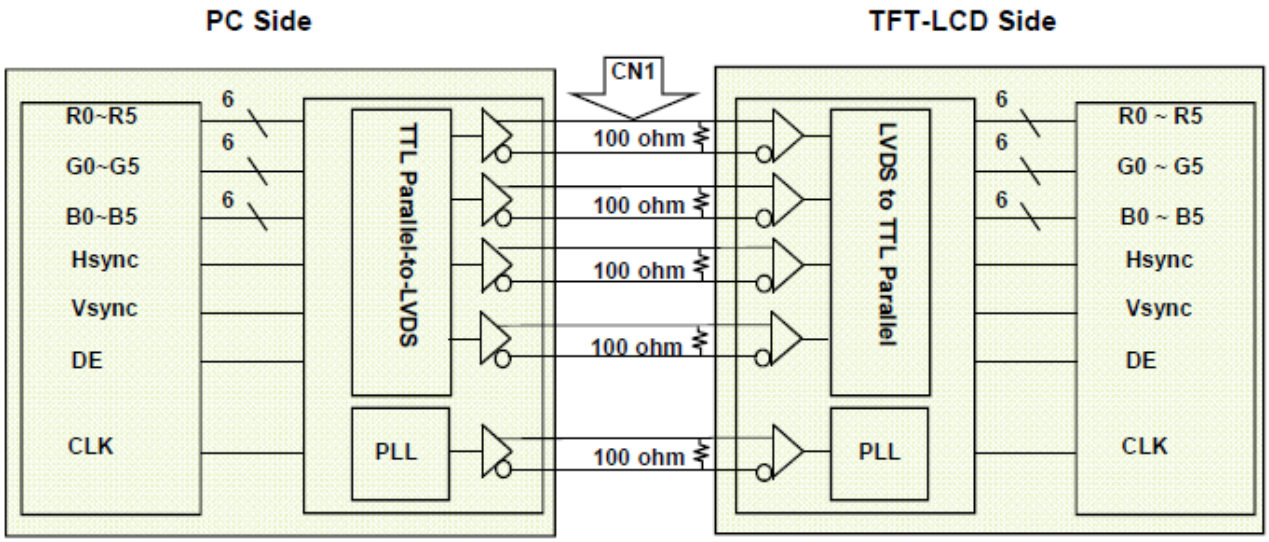
< Table5. Pin Assignment for LCD Module Connector >

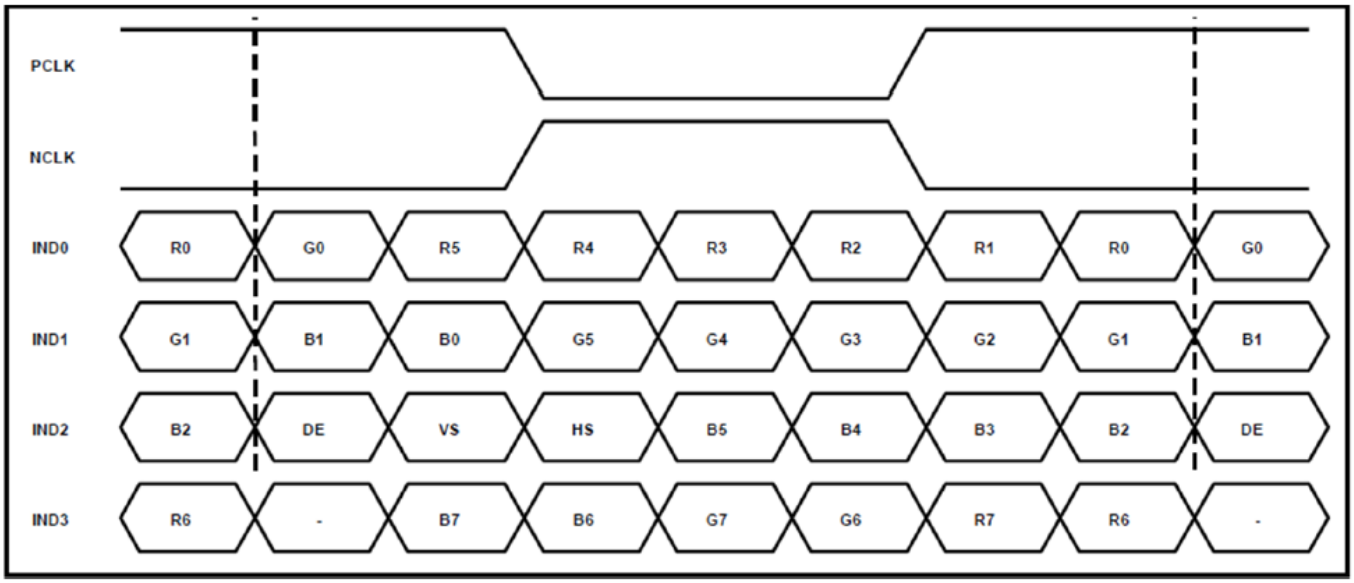
Pin No.	Symbol	Description	I/O
1	VDDIN	Power Supply 3.2-4.2V	P
2	VDDIN	Power Supply 3.2-4.2V	P
3	VDDIN	Power Supply 3.2-4.2V	P
4	VDDIN	Power Supply 3.2-4.2V	P
5	VDDIN	Power Supply 3.2-4.2V	P
6	VDDIN	Power Supply 3.2-4.2V	P
7	VDDIN	Power Supply 3.2-4.2V	P
8	NC	Not Connection	-
9	NC	Not Connection	-
10	NC	Not Connection	-
11	GND	Ground	P
12	GND	Ground	P
13	R0-	LVDS Negative data signal 0 (-)	I
14	R0+	LVDS Positive data signal 0 (+)	I
15	GND	Ground	P
16	R1-	LVDS Negative data signal 1 (-)	I
17	R1+	LVDS Positive data signal 1 (+)	I
18	GND	Ground	P
19	R2-	LVDS Negative data signal 2 (-)	I
20	R2+	LVDS Positive data signal 2 (+)	I
21	GND	Ground	P
22	RC-	LVDS Negative data signal C (-)	I
23	RC+	LVDS Positive data signal C (+)	I
24	GND	Ground	P
25	R3-	LVDS Negative data signal 3 (-)	I

Pin No.	Symbol	Description	I/O
26	R3+	LVDS Positive data signal 3 (+)	I
27	GND	Ground	P
28	LED_EN	LED enable	I
29	GND	Ground	P
30	DVDDT	SEC test	O
31	GND	Ground	P

3.5 LVDS Interface Characteristic

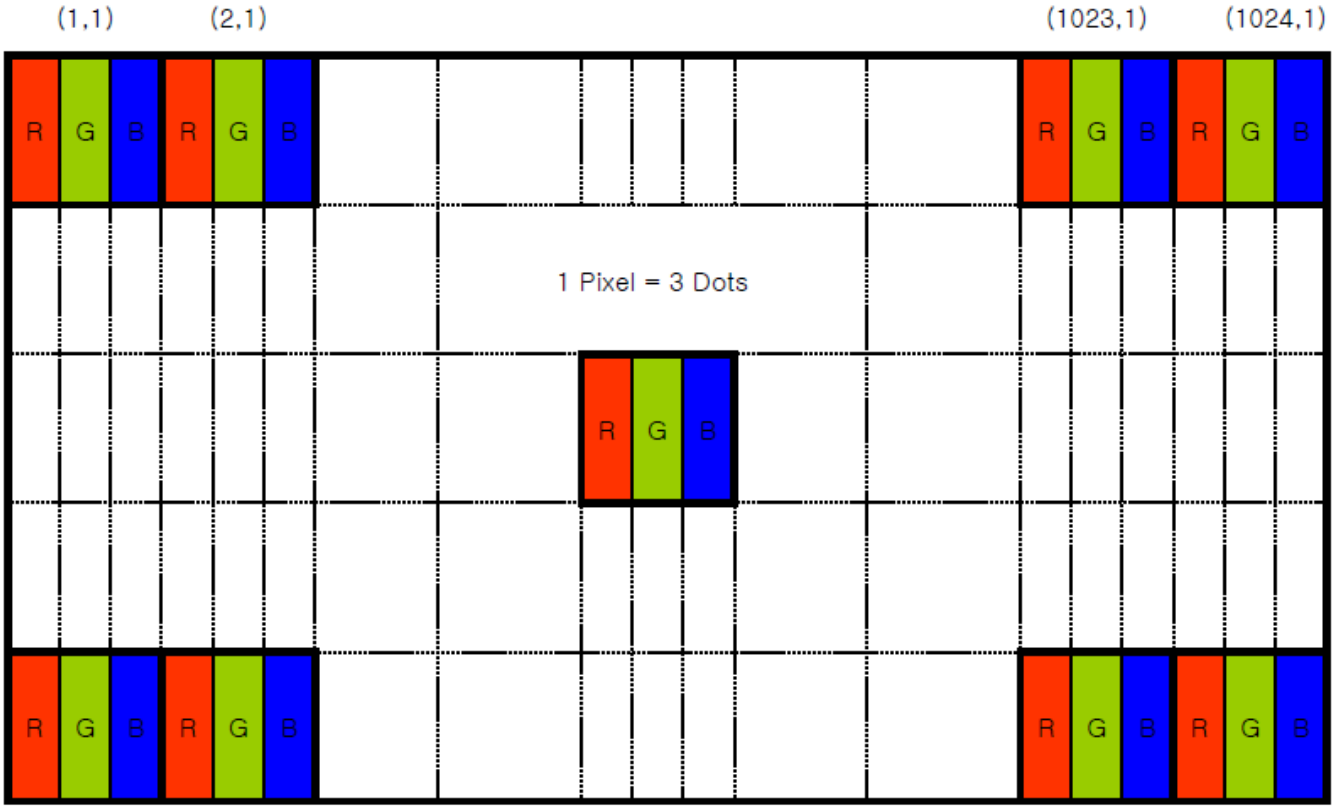
3.5.1 Data Format





3.5 LVDS Interface Characteristic

3.5.1 Data Format



Display Position of Input Data (V-H)

3.5.2 Timing Specification

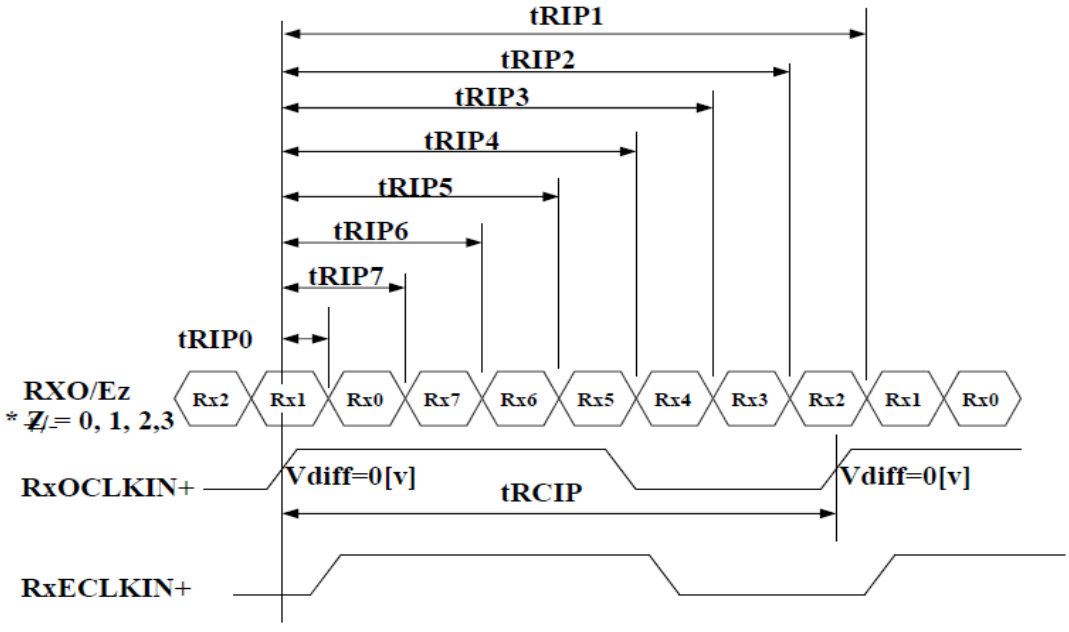
< Table6. Timing Specification >

ITEM	Symbol		Min	Typ	Max	Unit	Note
CLK	Frequency	1/Tc	41.2	51.2	67.2	MHz	
Hsync	Period	Th	1114	1344	1400	clocks	Note 1
Vsync	Period	Tv	616	635	800	lines	
	Frequency	f_V	-	60	-	Hz	
Horizontal Active Display Term	Valid	Thd	-	1024	-	clocks	
	Total	Th	1114	1344	1400	clocks	
Vertical Active Display Term	Valid	Tvd	-	600	-	lines	
	Total	Tv	616	635	800	lines	

Note 1: This product is DE only mode.

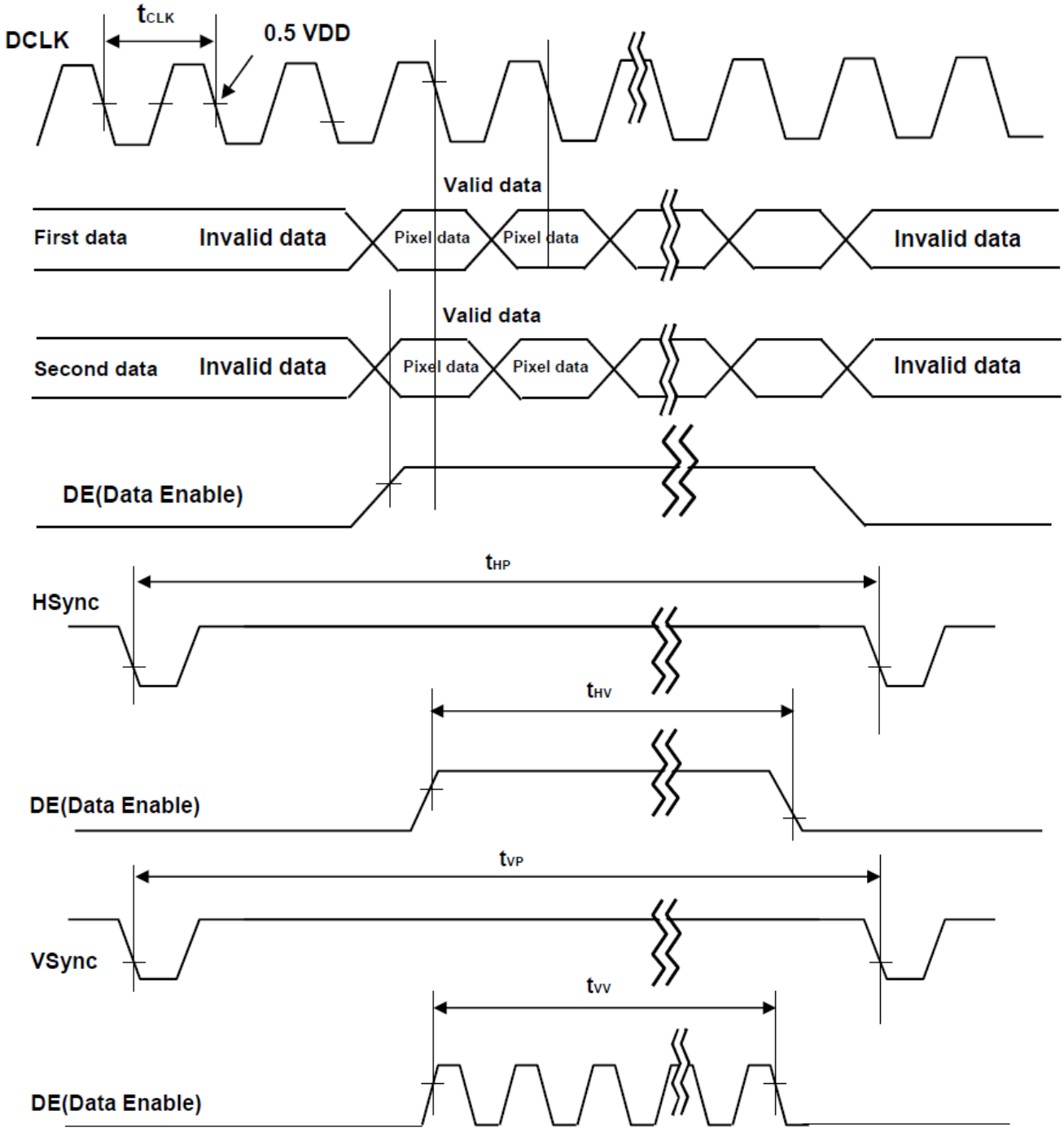
3.5.3 Signal Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	14.88	19.53	24.27	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRICP/7-0.4	tRICP/7	tRICP/7+0.4	nsec	
Input Data 2	tRIP7	2 ×tRICP/7-0.4	2 ×tRICP/7	2 ×tRICP/7+0.4	nsec	
Input Data 3	tRIP6	3 ×tRICP/7-0.4	3 ×tRICP/7	3 ×tRICP/7+0.4	nsec	
Input Data 4	tRIP5	4 ×tRICP/7-0.4	4 ×tRICP/7	4 ×tRICP/7+0.4	nsec	
Input Data 5	tRIP4	5 ×tRICP/7-0.4	5 ×tRICP/7	5 ×tRICP/7+0.4	nsec	
Input Data 6	tRIP3	6 ×tRICP/7-0.4	6 ×tRICP/7	6 ×tRICP/7+0.4	nsec	
Input Data 7	tRIP2	7 ×tRICP/7-0.4	7 ×tRICP/7	7 ×tRICP/7+0.4	nsec	



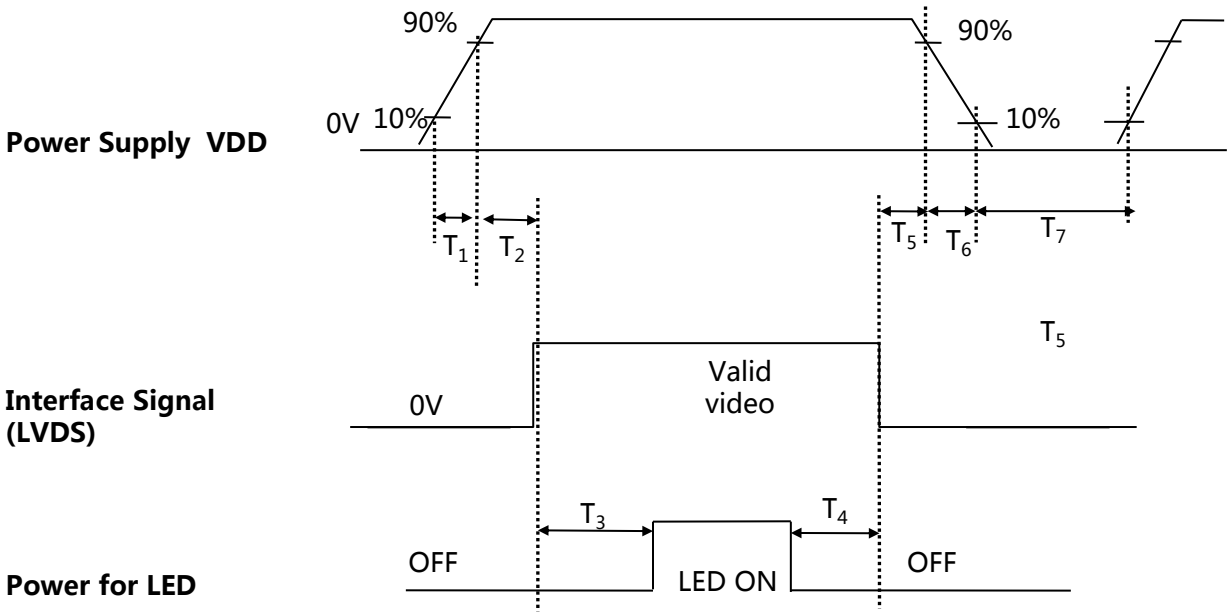
* Vdiff = (RXO/Ez+)-(RXO/Ez-),…. ,(RXO/ECLK+)-(RXO/ECLK-)

3.5.4 Signal Timing wave forms



3.6 Power Sequence

[Ta =25±2 ℃]



< Table7. Sequence Table >

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.1	-	10	(ms)
T2	0	-	50	(ms)
T3	200	-	-	(ms)
T4	200	-	-	(ms)
T5	0.5	-	50	(ms)
T6	0	-	10	(ms)
T7	500	-	-	(ms)

4.0 OPTICAL SPECIFICATIONS

4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Gonio meter system and TOPCON BM-5) 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°. We refer to θØ =0 (=θ3) as the 3 o' clock direction (the "right"), θØ=90 (= θ12) as the 12 O' clock direction ("upward"), θØ=180 (= θ9) as the 9 O' clock direction ("left") and θØ=270(= θ6) as the 6 O' clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed.

4.2 Optical Specifications

< Table8. Optical Table >

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
luminance	Bp	θ=0°	340	400	--	cd/m2	Note 1
Brightness Uniformity	△Bp		80	90	--	%	Note 2
Viewing Angle	θL	Cr≥10	--	80	--	deg	Note 3
	θ_R		--	80	--		
	ψ_T		--	80	--		
	ψ_B		--	80	--		
Contrast Ratio	Cr	θ=0°	700	900	--	-	Note 4
Response Time (Rising+Falling)	Tr+Tf	θ=0° Ta=25°	--	30	--	ms	Note 5
Color Coordinate of CIE1931	**Rx**	θ=0°	0.570	0.600	0.630	-	Note 6
	Ry		0.310	0.340	0.370		
	Gx		0.315	0.345	0.375		
	Gy		0.535	0.565	0.595		
	Bx		0.115	0.145	0.175		
	By		0.095	0.125	0.155		
	Wx		0.273	0.303	0.333		
	Wy		0.303	0.333	0.363		
NTSC Ratio	NTSC	CIE1931	46.7	51.7	--	%	Note 7
Color Temperature	CT		6000	7000	8000		
Gamma	-		2.0	2.2	2.4		Note 8

Note1:Luminance measurement

The test condition is at ILED=20mA and measured on the surface of LCD module at 25℃.

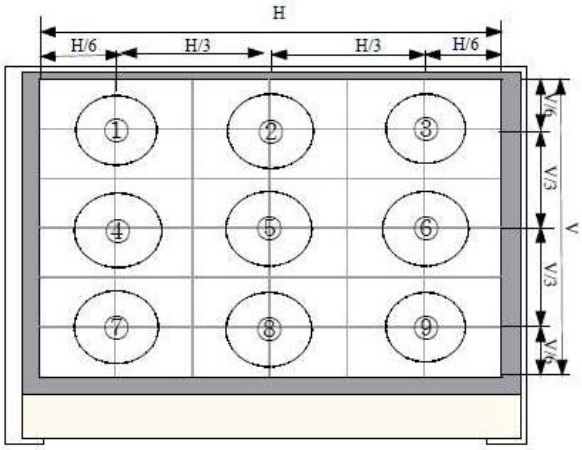
●The data are measured after LEDs are lighted on for more than 5 minutes and LCM displays are fully white. The brightness is the average value of 9 measured spots. Measurement equipment CS2000 or si milar equipments(Field of view:1deg,Distance:50cm)

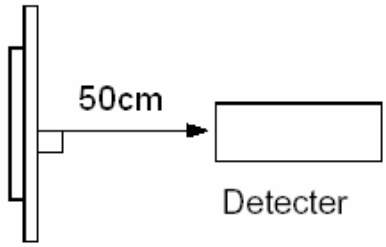
●Measuring surroundings: Dark room.

●Measuring temperature: Ta=25℃.

●Adjust operating voltage to get optimum contrast at the center of the display.

●Measured value at the center point of LCD panel must be after more than 5 minutes while backlight





Note2:Uniformity

●The test condition is at ILED=20mA and measured on the surface of LCD module at 25℃.

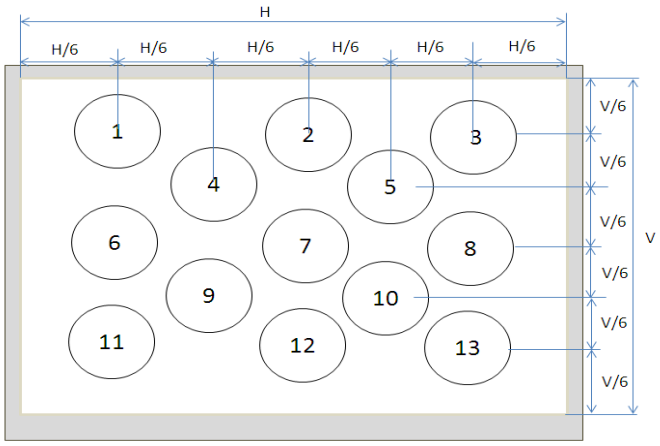
●Measurement equipment:CS2000 or similar equipments

●The luminance uniformity is calculated by using following formula:

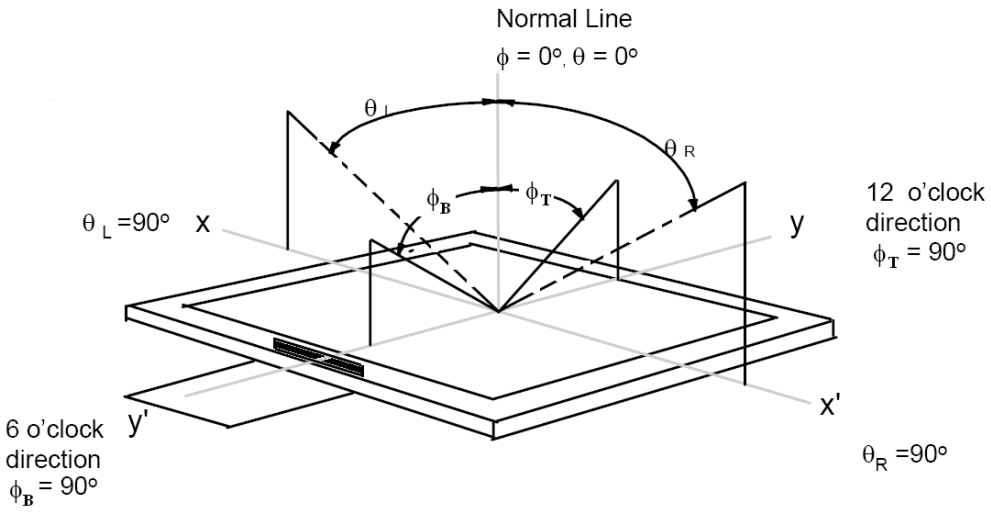
●▵Bp = Bp (Min.) / Bp (Max.)×100 (%)

●Bp (Max.) = Maximum brightness in 13 measured spots

●Bp (Min.) = Minimum brightness in 13 measured spots.



Note 3:**The definition of Viewing Angle**
Refer to the graph below marked by θ and Φ.

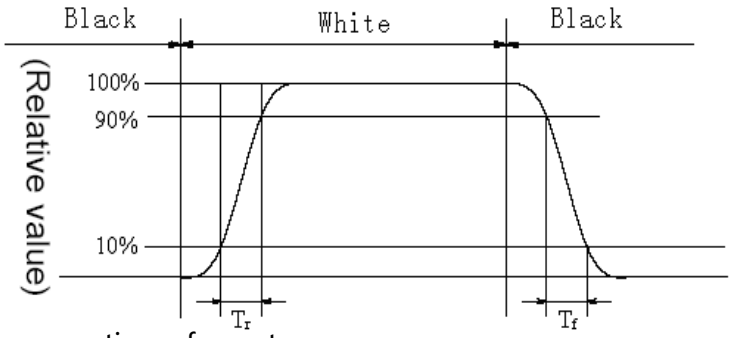


Note4:**ThedefinitionofContrastRatio** (Test LCM using CS2000 or similar equipments):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

Note5:**DefinitionofResponse time.**(Test LCD using DMS501 or similar equipments):
The output sign also photo detector are measured when the input sign also are changed from "black " to "white" (Voltage falling time)and from "white" to "black" (Voltage rising time), respectively . The response time is defined as the time interval between the 10% and 90% of amplitudes . Refer to fi gures below.



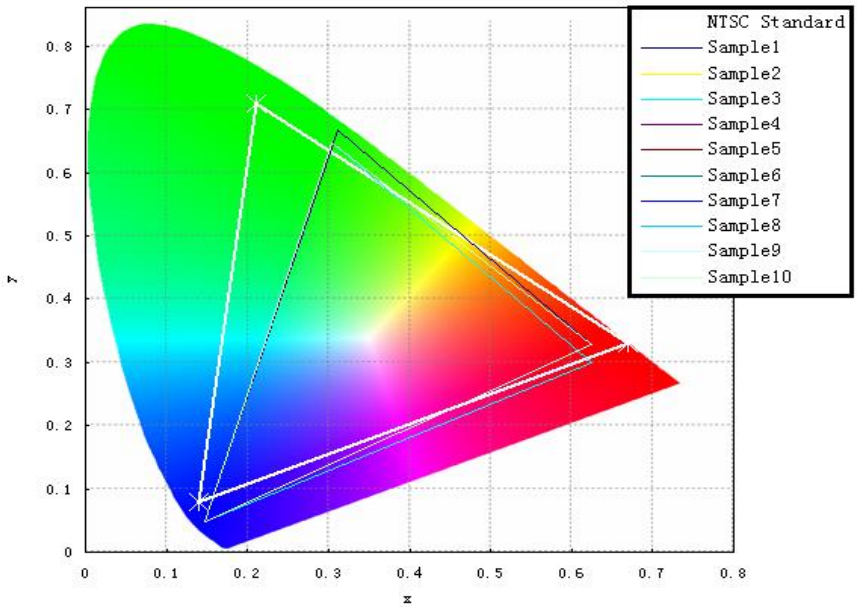
	L0	L1	L2	L3	L4	L5	L6	L7
L0	■							
L1		■						
L2			■					
L3				■				
L4					■			
L5						■		
L6							■	
L7								■

Response time of gray to gray:
Measurement equipment: DMS501 or similar equipments.
Test method: we define 8 grays L0-L7,the grays of L0-L7 were defined as:0,36,73, 109, 146, 182, 219, 25 5. Theoutputsignalsofphotodetectoraremeasuredwhentheinputsignalsarechanged from "Lx" to "Ly" , x, y= [0, 7]. The response time is defined as the time interval between the 10% and 90% of amplitudes. The result of the test can be noted as below:

Note 6: Color Coordinates of CIE 1931
The test condition is at ILED=20mA and measured on the surface of LCD module at 25℃.
Measurement equipment:CS2000 or similar equipments
The Color Coordinate (CIE 1931) is the measurement of the center of the display shown in below figure.

Note 7: Definition of Color of CIE Coordinate and NTSC Ratio.

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$



Note 8: gamma curve control
●For gamma curve control, HUAWEI’ s request as below:
●1,the whole curve’ s tolerance must control within +/-0.3, HUAWEI will test the gray scale below:
0, 8, 16, 25, 33, 41, 49, 58, 66, 74, 82, 90, 99, 107, 115, 123, 132, 140, 148, 156, 165, 173, 181, 189, 19
7,206, 214, 222, 230, 239, 247, 255

Note 9: Color uniformity

●Measurement Conditions

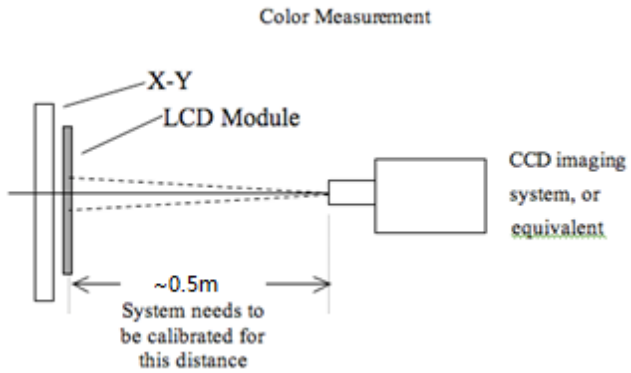
Recommended measuring equipment for color is ICPMI16 Colorimeter or similar CCD type equipment. The optical characteristics are determined after the unit has been 'ON' and stable at the following con ditions:

Maximum brightness

Dark environment

Ambient temperature at 25°C ± 2°C

●Optical measurement system

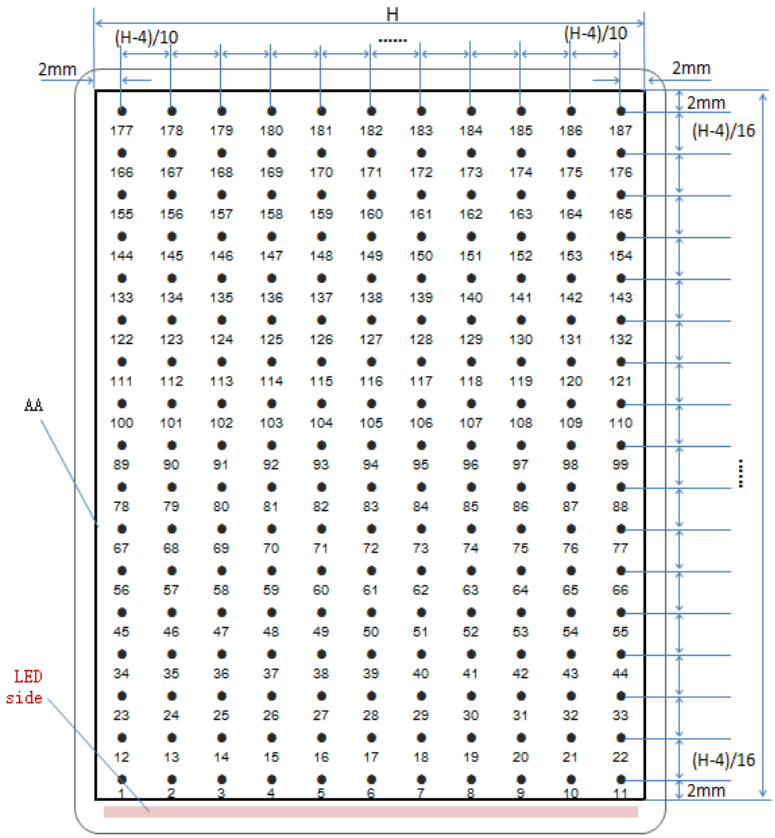


●Total 187 measure points should set as shown in the following figures. The CIE 1976 Standards shall be used.

●The color difference is calculated by using following formula:

Max (▵u′ v′ -A) (the max ▵u′ v′ value between two random point of 187 point)

Max (▵u′ v′ -B) (the max ▵u′ v′ value between two adjacent point in column and row of 187point)



5.0 RELIABLITY TEST

The Reliability test items and its conditions are shown in below.

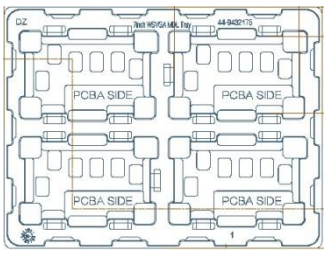
<Table 9. Reliability Test Parameters >

No.	Test Items	Conditions
1	HTO（高温运行）	60℃, 0%，24h operation
2	LTO（低温运行）	-20℃, 0%RH，24h operation
3	THO（高温高湿运行）	60℃, 90% ，96h operation
4	8585（8585存储）	85℃, 85%, 120h storage
5	ALT（温湿度循环）	-10℃~65℃, 93%, 10cycle，240h operation
6	TST（高低温冲击）	-40℃(30mins) ~+85℃(30mins)，96h，storage 96cycles
7	ESD	Air: IC处点±2kV，其他点位±5kV
8	Packing VIB	1-200Hz, 1.47G, Random, +X+Y±Z, 30min/方向
9	Packing Drop	1Angle,3Edge,6Face H=60cm 1次/方向

6.0 PACKING INFORMATION(产品形态：)

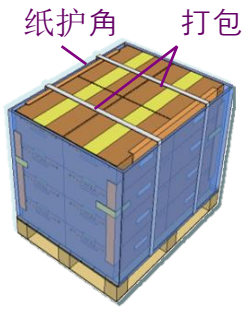
Packing procedure:

-. 将 4pcs MDL 平放入Tray,
CF 侧向上放置;

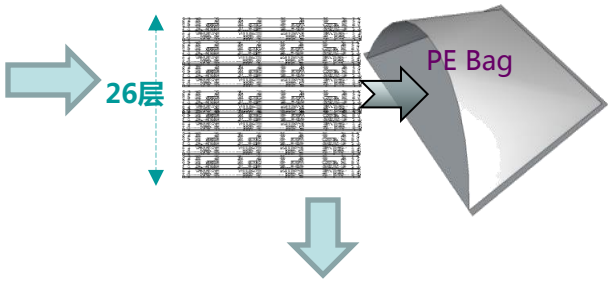


Tray

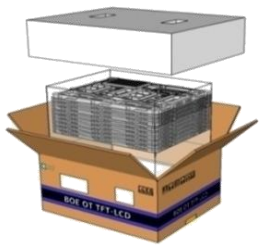
-. 每个Pallet上放3层Box
1层4箱,共计12ea Box
-. Pallet外进行缠膜包装
-. 1200pcs Panel / Pallet



-. 将26pcs PET Tray 平放入PE Bag
顶部1pcs 空Tray
-. Tray 不旋转码放



- .将PET Tray堆码后平放入Inner Box
上下放置EPE Board
-. 100pcs/Box



6.1 Packing Note(产品形态：LCM)

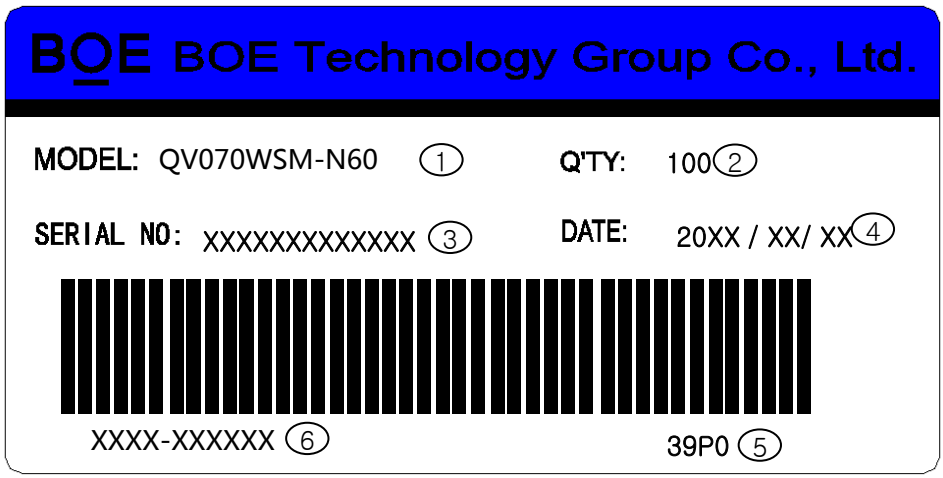
- Box Dimension: 496mm(W) x 396mm(D) x 290mm(H)
- Package Quantity in one Box: 100pcs

6.2 Box label (产品形态： LCM)

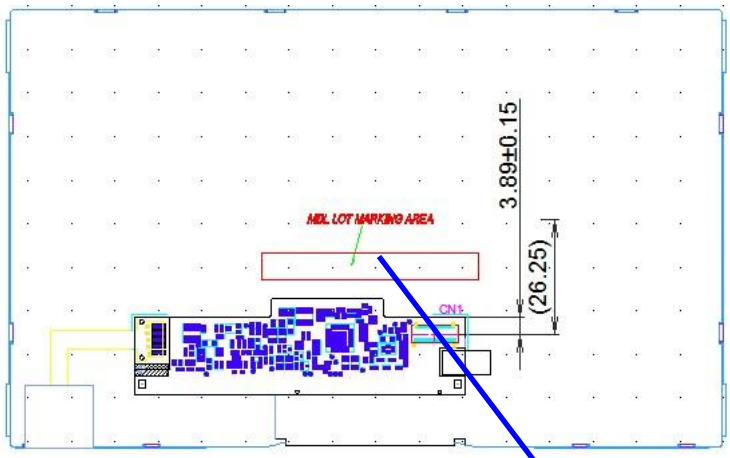
- 说明如下:

  Label Size: 110mm*55mm

  1. **FG-CODE**
  2. **Box 产品数量**
  3. **Box ID, 编码规则如下**
  4. **Box Packing 日期**
  5. **FG-CODE 后四位**
  6. 客户料号： XXXX-XXXXXX



7.0 Product Label



喷码规则：

1. FG-CODE: QV070WSM-N60-39P0
2. MDL ID
3. MDL ID对应条形码

① QV070WSM-N60-39P0 XXXXXXXXXXXXXXXX ②

③

序列号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
代码	X	X	X	3	X	X	X	3	9	P	0	X	X	X	X	X	X
描述	GBN 代码		等级	B 3	年	月	日	FG Code后四位				序列号					

8.0 Handling & Cautions

8.1 Mounting Method

- The panel of the LCD consists of two thin glasses with polarizers which easily get damaged. So extreme care should be taken when handling the LCD.
- Excessive stress or pressure on the glass of the LCD should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD 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 LCD module with the specified mounting parts.

8.2 Caution of LCD Handling and Cleaning

- Since the LCD 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 may be broken.
- The polarizers on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizers or it leads the polarizers to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent (recommended below) to clean the LCD ‘s surface with wipe lightly.
  -IPA(Isopropyl Alcohol), Ethyl Alcohol, Trichlorotriflorothane
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizers and others. Do not use the following solvent.
  -Water, Ketone, Aromatics
- It is recommended that the LCD be handled with soft gloves during assembly, etc. The polarizers on the LCD's surface are vulnerable to scratch and thus to be damaged by sharp particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD 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 the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

8.3 Caution Against Static Charge

- The LCD modules 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 LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

8.4 Caution For operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher Voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD 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 LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

8.5 Packaging

- Modules use LCD 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.

8.6 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 LCD’ s surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizers.
- Do not store the LCD near organic solvents or corrosive gasses.
- Keep the LCD safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCD is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD.
- 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 LCD in the packaging situation LCD when it was delivered.

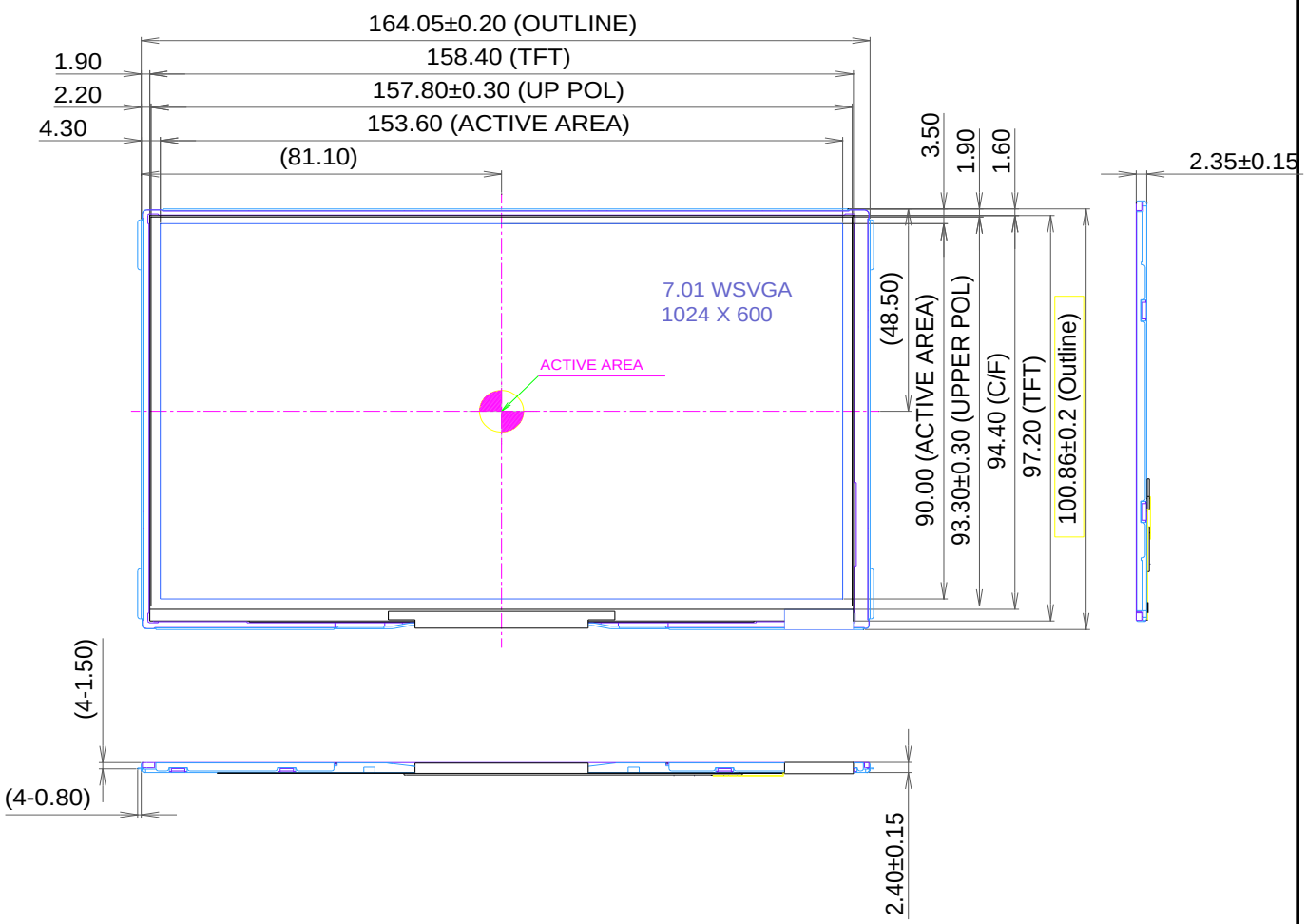
8.7 Safety

- For the crash damaged or unnecessary LCD, 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 the LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water an 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 should 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.

9.0 APPENDIX

Mechanical Drawing

Drawing Attachment: Front



Mechanical Drawing

Drawing Attachment: Back