深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

TFT-LCD Module Specification

Module NO.: TST215FHBL-PA4

Version: V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer's Acceptance:	
Approved by	**Comment**

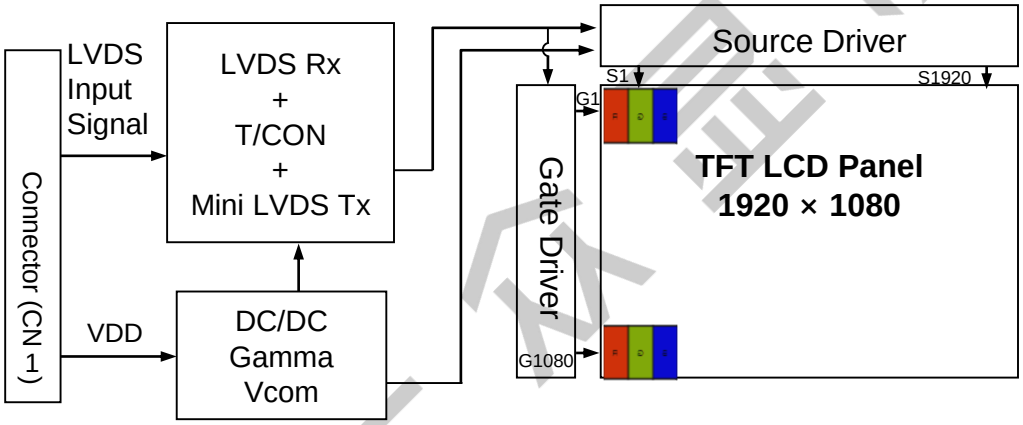
Team Source Display:		
Presented by	**Reviewed by**	**Organized by**

Version No.	Date	Content	Remark
V1.0	2026-05-05	First Released	

1.0 GENERAL DESCRIPTION

1.0.1 Introduction

TST215FHBL-PA4 is a color active matrix TFT LCD Open Cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This open cell has a 21.5 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this open cell can display 16.7M colors.



1.0.2 Features

- LVDS Interface with 2 pixel / clock
- High-speed response
- 0.5t Glass
- 6-bit (Hi-FRC) color depth, display 16. 7M colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- DE (Data Enable) only
- RoHS/Halogen Free
- Gamma Correction
- Landscape and Portrait Enabled

1.0.3 Application

- Desktop Type of PC & Workstation Use
- Slim-Size Display for Stand-alone Monitor
- Display Terminals for Control System
- Monitors for Process Controller
- Digital Signage for Class Information
- Storage Cabinet for Outdoor

1.0.4 General Specification

<Table 1. General Specifications>

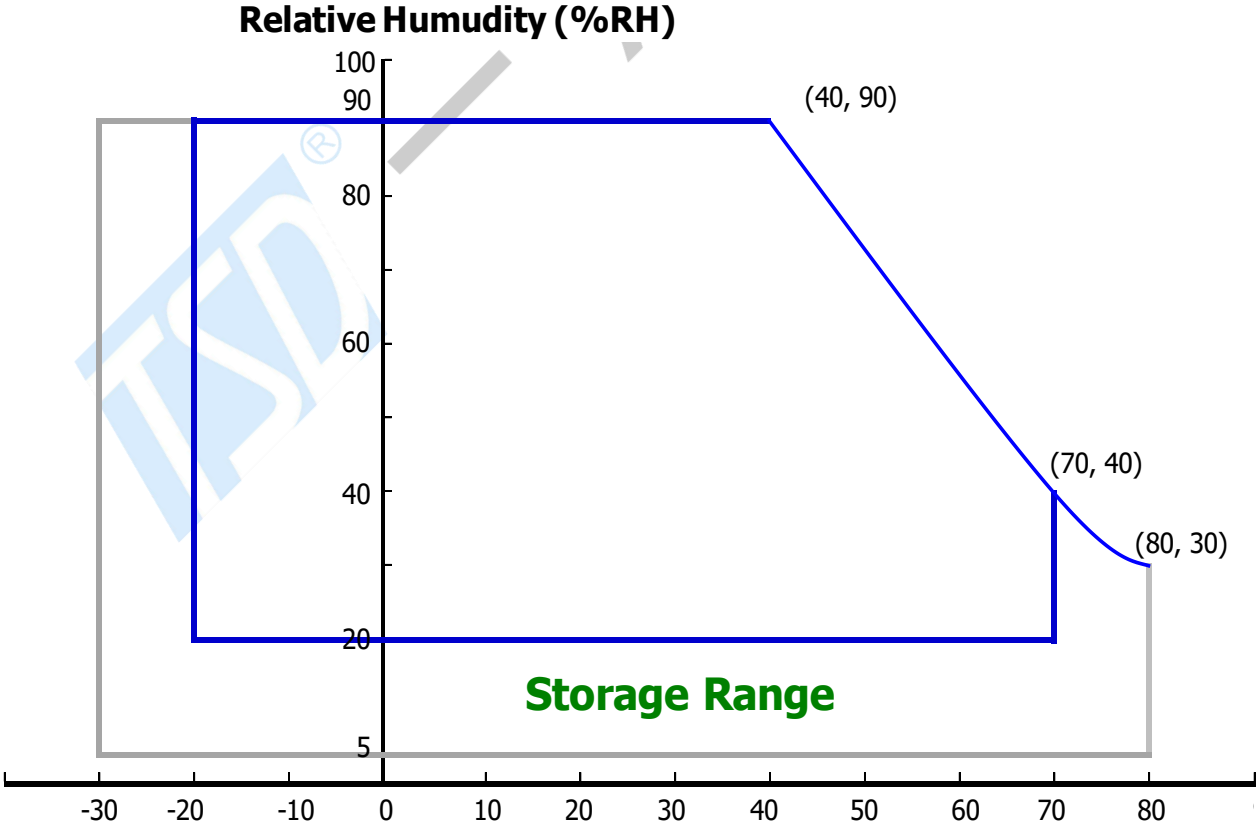
Parameter	Specification	Unit	Remarks
Active area	476.64(H) × 268.11(V)	mm	
Number of pixels	1920(H) ×1080(V)	pixels	
Pixel pitch	0.24825(H) x 0.24825(V)	mm	
Pixel arrangement	RGB Vertical stripe	-	
Display colors	16.7M	colors	
Display mode	Normally Black	-	
Possible Display Type	Landscape and Portrait Enabled	-	
Open Cell Transmittance	3.55	%	
Weight	392	g	
Surface Treatment	Haze 25%, 3H	-	

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> [VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.3	5.5	V	Ta = 25 ℃
Logic Supply Voltage	V_{IN}	VSS-0.3	V_{DD}+0.3	V	
Operating Temperature	T_{OP}	-20	+70	℃	
Storage Temperature	T_{ST}	-30	+80	℃	
Liquid crystal clear point	T_{Lc}	104.9		℃	Typ.



3.0 ELECTRICAL SPECIFICATIONS

3.0.1 Electrical Specifications

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

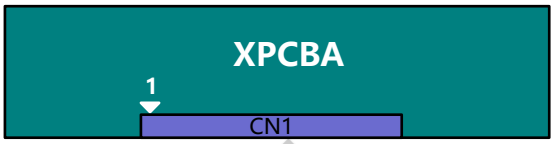
Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	4.5	5.0	5.5	V	**Note1**
Power Supply Current	I_{DD}	-	700	1200	mA	
In-Rush Current	I_{RUSH}	-	-	3	A	**Note 2**
Permissible Input Ripple Voltage	V_{RF}	-	-	300	mV	**V_{DD} = 5.0V**
High Level Differential Input Threshold Voltage	V_{IH}	-	-	+100	mV	
Low Level Differential Input Threshold Voltage	V_{IL}	-100	-	-	mV	
Differential input voltage	$\|V_{ID}\|$	200	-	600	mV	
Differential input common mode voltage	Vcm	1.0	1.2	1.5		V_{IH}=100mV, V_{IL}=-100mV
Power Consumption	P_D	-	3.5	5.4	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of open cell.
The current draw and power consumption specified is for VDD=5.0V, Frame rate=60Hz. Test Pattern of power supply current

a) Typ : Color Bar pattern
b) Max : Gray Level 255 Pattern

2. Duration of rush current is about 2 ms and rising time of VDD is 520 μs ± 20 %

4.0 INTERFACE CONNECTION.



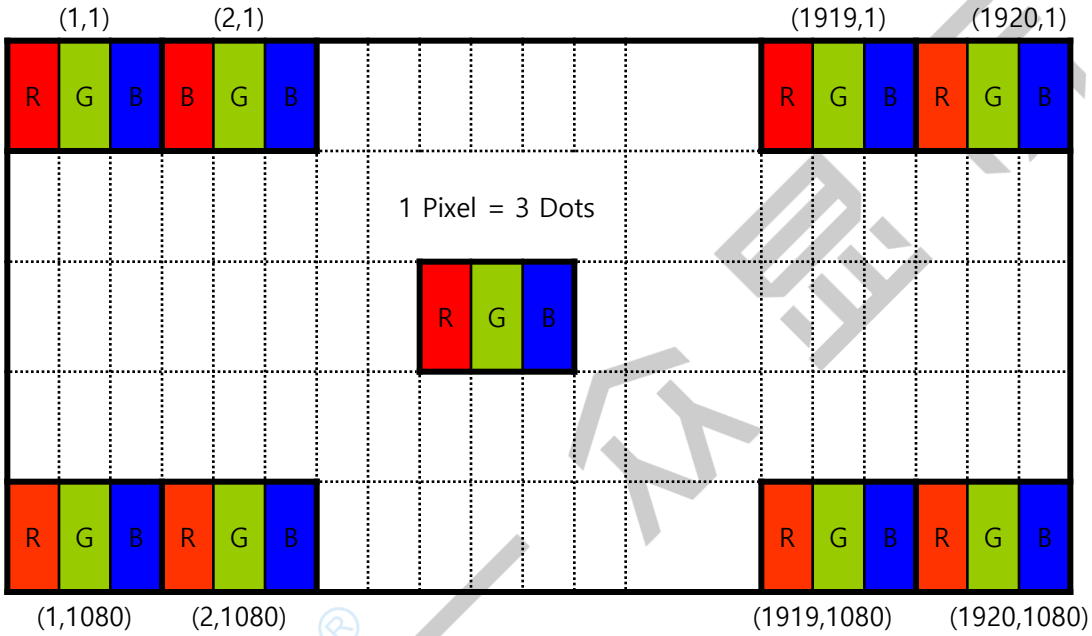
4.0.1 Electrical Interface Connection

- CN1 Module Side Connector : UJU IS100-L30O-C23 or MSBKT2407P30
  User Side Connector : JAE FI-X30H

Pin No	Symbol	Function	Remark
1	RXO0-	Negative Transmission data of Pixel 0 (ODD)	
2	RXO0+	Positive Transmission data of Pixel 0 (ODD)	
3	RXO1-	Negative Transmission data of Pixel 1 (ODD)	
4	RXO1+	Positive Transmission data of Pixel 1 (ODD)	
5	RXO2-	Negative Transmission data of Pixel 2 (ODD)	
6	RXO2+	Positive Transmission data of Pixel 2 (ODD)	
7	GND	Power Ground	
8	RXOC-	Negative Transmission Clock (ODD)	
9	RXOC+	Positive Transmission Clock (ODD)	
10	RXO3-	Negative Transmission data of Pixel 3 (ODD)	
11	RXO3+	Positive Transmission data of Pixel 3 (ODD)	
12	RXE0-	Negative Transmission data of Pixel 0 (EVEN)	
13	RXE0+	Positive Transmission data of Pixel 0 (EVEN)	
14	GND	Power Ground	
15	RXE1-	Negative Transmission data of Pixel 1 (EVEN)	
16	RXE1+	Positive Transmission data of Pixel 1 (EVEN)	
17	GND	Power Ground	
18	RXE2-	Negative Transmission data of Pixel 2 (EVEN)	
19	RXE2+	Positive Transmission data of Pixel 2 (EVEN)	
20	RXEC-	Negative Transmission Clock (EVEN)	
21	RXEC+	Positive Transmission Clock (EVEN)	
22	RXE3-	Negative Transmission data of Pixel 3 (EVEN)	
23	RXE3+	Positive Transmission data of Pixel 3 (EVEN)	
24	GND	Power Ground	Note 1
25	NC	Not connection, this pin should be open	
26	NC	Not connection, this pin should be open	
27	NC	Not connection	
28	VDD	Power Supply: +5V	
29	VDD		
30	VDD		

Note 1 : This pin should be connected with GND.

4.0.2 Data Input Format



Display Position of Input Data (V-H)

5.0 SIGNAL TIMING SPECIFICATION

5.0.1 The GV215FHM-N10 is operated by the DE only.

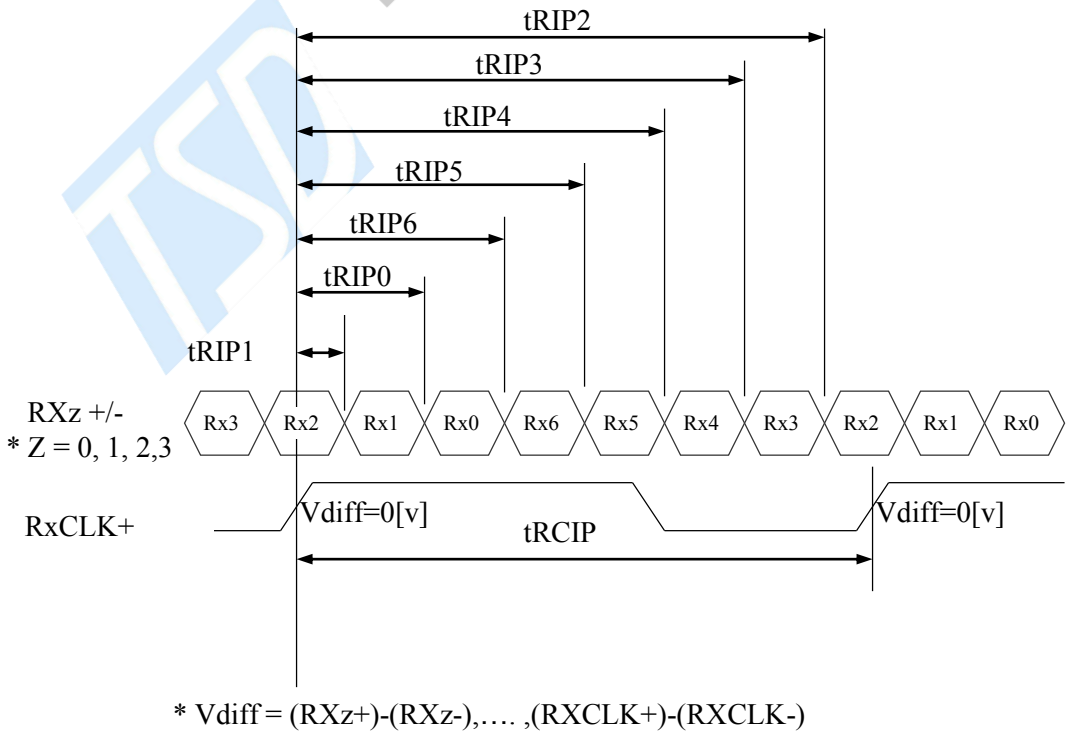
Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	63	74.25	88	MHz
	High Time	-	-	4/7Tc	-	
	Low Time	-	-	3/7Tc	-	
Frame Period		Tv	1100	1125	1200	line
			55	60	65	Hz
			15.38	16.67	18.18	ms
Vertical Display Period		Tvd	-	1080	-	line
One line Scanning Period		Th	1050	1100	1120	clocks
Horizontal Display Period		Thd	-	960	-	clocks

5.0.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.

<Table 4. LVDS Rx Interface Timing Specification>

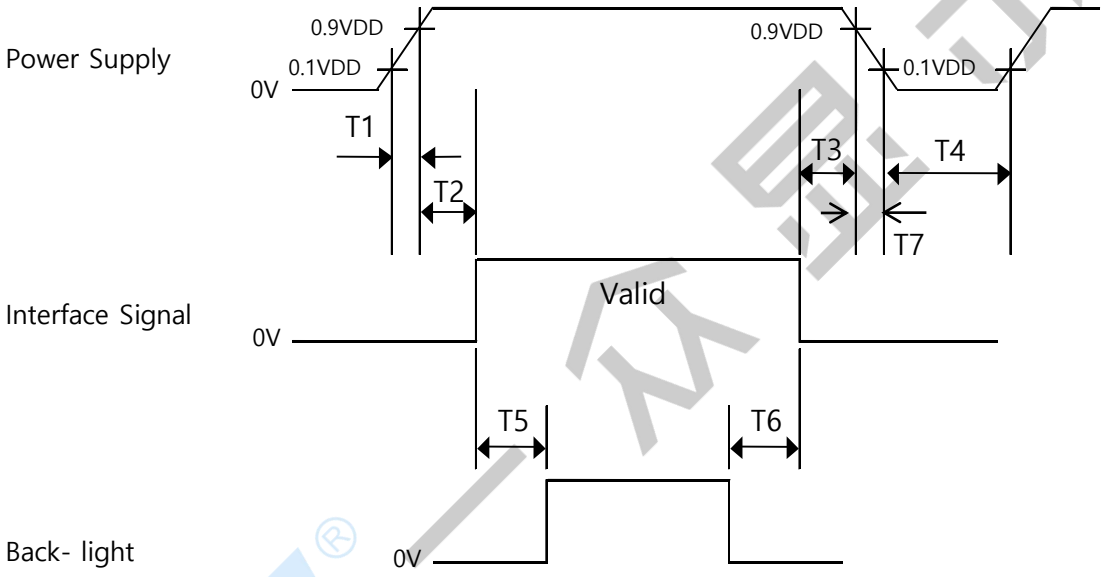
Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	10.76	13.46	16.15	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 ×tRCIP/7-0.4	2 ×tRCIP/7	2 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 ×tRCIP/7-0.4	3 ×tRCIP/7	3 ×tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRCIP/7-0.4	4 ×tRCIP/7	4 ×tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 ×tRCIP/7-0.4	5 ×tRCIP/7	5 ×tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 ×tRCIP/7-0.4	6 ×tRCIP/7	6 ×tRCIP/7+0.4	nsec	



* Vdiff = (RXz+)-(RXz-),…. ,(RXCLK+)-(RXCLK-)

6.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



- 0.5 ms ≤ T1 ≤ 10 ms
- 0 ≤ T2 ≤ 50 ms
- 0 ≤ T3 ≤ 50 ms
- 1 sec ≤ T4
- 200 ms ≤ T5
- 200 ms ≤ T6

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.
4. T7 decreases smoothly, there is none re-bouncing voltage.
5. During changing the resolution or mode changing, the logic power/ back-light/interface signal should be turned off as shown above; after the changing, power on as shown above.

7.0 OPTICAL SPECIFICATION

7.0.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2°C) with the equipment of Luminance meter system (Goniometer system and TOPCONE PR730) 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 $\theta_{Ø=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ_6) 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. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 5.0V +/-10% at 25°C. Optimum viewing angle direction is 6 'clock.

7.0.2 Optical Specifications

[VDD = 5.0V, Frame rate = 60Hz, Clock = 74.25MHz, Ta =25±2 °C]

< Table 5. Open Cell Optical >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	85	89	-	Deg.	Note 2
		Θ_9		85	89	-	Deg.	
	Vertical	Θ_{12}		85	89	-	Deg.	
		Θ_6		85	89	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0° (Center) Normal Viewing Angle	700	1000			Note 3
Surface Luminance (White)		YL		1000	1500		cd/m²	CA-210
White luminance uniformity		ΔY		75	80	-	%	Note 5
Reproduction of color	White	W_x		0.283	0.313	0.343	-	Note 6 (Cell maker's BL)
		W_y		0.299	0.329	0.359	-	
	Red	R_x		0.607	0.637	0.667	-	
		R_y		0.320	0.350	0.380	-	
	Green	G_x		0.266	0.296	0.326	-	
		G_y		0.590	0.620	0.650	-	
	Blue	B_x		0.120	0.150	0.180	-	
		B_y		0.02	0.05	0.08	-	
Response Time	GTG	T_g			14	25	ms	Note 7
Cross Talk		CT		-	-	2.0	%	Note 8

Note :

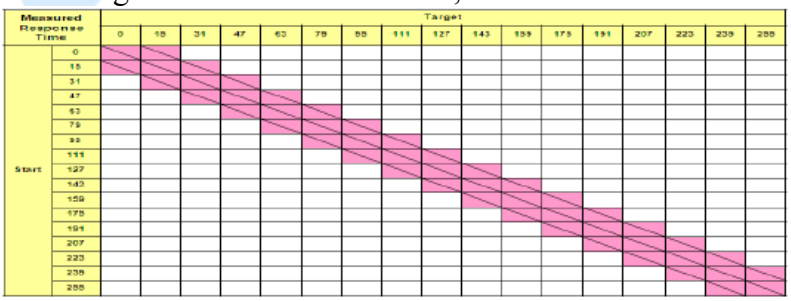
1. The value in upper table are based on BLU provided by Cell maker.
2. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
3. 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 FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

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

4. Luminance of LCD module shall be made without signal input. Cell transmittance is defined mathematically, BLU provided by Cell maker.

$$\text{Transmittance} = \frac{\text{Luminance of LCD Module}}{\text{Luminance of BLU}}$$

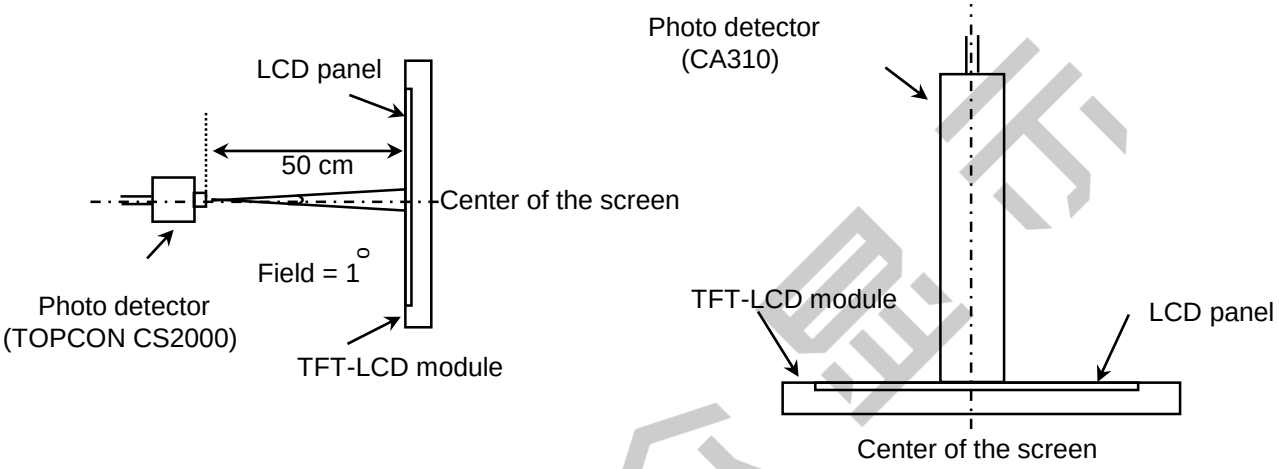
5. The White luminance uniformity on LCD surface is then expressed as :
   ΔY = (Minimum Luminance of 9points / Maximum Luminance of 9points) * 100
   (See FIGURE 2 shown in Appendix).
6. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
7. The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td, and 90% to 10% is Tr.



8. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4 shown in Appendix).

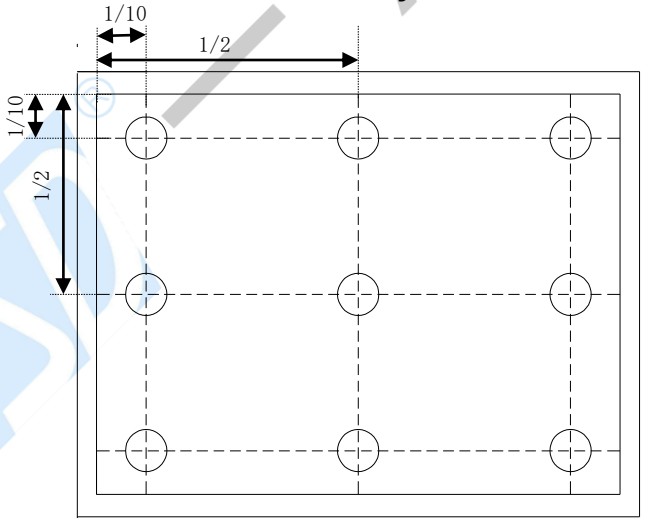
7.0.3 Optical measurements

Figure 1. Measurement Set Up



View angel range, uniformity, etc. measurement setup Flicker, measurement setup

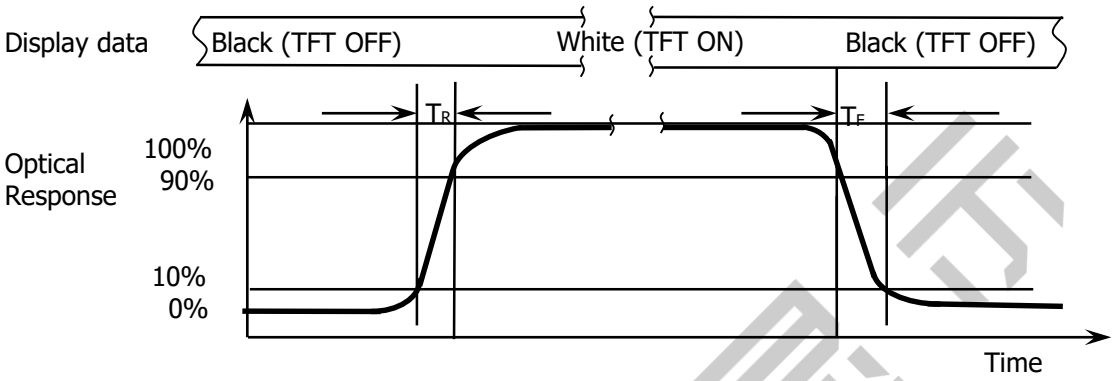
Figure 2. White Luminance and Uniformity Measurement Locations (9 points)



Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

The White luminance uniformity on LCD surface is then expressed as : ΔY9 = Minimum Luminance of 9 points / Maximum Luminance of 9points (see FIGURE 2).

Figure 3. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Td.

8.0 MECHANICAL CHARACTERISTICS

8.0.1 Dimensional Requirements

<Table 6. Dimensional Parameters>

Parameter	Specification	Unit	Remarks
Active area	476.64(H) × 268.11(V)	mm	
Number of pixels	1920(H) ×1080(V)	pixels	
Pixel pitch	0.24825(H) x 0.24825(V)	mm	
Pixel arrangement	RGB Vertical stripe	-	
Display colors	16.7M	colors	
Display mode	Normally Black	-	
Possible Display Type	Landscape and Portrait Enabled	-	
Open Cell Transmittance	3.55	%	
Weight	392	g	
Surface Treatment	Haze 25%, 3H	-	

8.2 RELIABLITY TEST

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

<Table 7 Reliability Test Parameters >

No	Test Items	Conditions		Remark
1	High temperature storage test	Ta = 85 ℃, 240 hrs		After test ,The Module can normal operation and have no function problem
2	Low temperature storage test	Ta = -30 ℃, 240 hrs		
3	High temperature & high humidity operation test	Ta = 50 ℃, 80%RH, 240hrs		
4	High temperature & high humidity storage test	Ta = 60 ℃, 90%RH, 240hrs		
5	High temperature operation test	Ta = 80 ℃, 240hrs		
6	Low temperature operation test	Ta = -20℃, 240hrs		
7	Thermal shock	Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle		
8	Packing Vibration Test (non-operating)	Frequency Gravity / AMP Period	Random,10 ~ 300 Hz, 30 min/Axis 1.05 Grms X, Y, Z 30 min	
9	Shock test (non-operating)	Gravity	50G	
		Pulse width	11msec, sine wave	
		Direction	±X, ±Y, ±Z Once for each	
10	Electro-static discharge test	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV		
11	Altitude test	Non Operating: 40000 ft, -10℃ / 24 Hr,25 ℃ / 24 Hr,-10℃ / 24 Hr		
		Operating: 15000 ft, 0℃ / 24 Hr,25℃ / 24 Hr,50℃ / 24 Hr		

9.注意事项 General Precautions

9.1.1 储存 Storage

1.模级需储存在暗室，并要求室温在 25±10℃，湿度在 65±10%RH，不能暴露在阳光下

Stor the module ina dark room where must keep at 25±10℃, 65±10%RH, the module shall be exposed under strong light such as direct sunlight.

2.请不要将产品放置在有机溶剂中或是有腐蚀性气体的场合

Do not store the produce in surroundings containing organic solvent or corrosive gas

1. 应当把产品储存在防静电容器中或是防静电膜中

Store the module in an anti-electrostatic container or film .

10.1.2 操作 Handing

1. 请不要施加机械振动或是过大外力在模组上

Do not subject the module to mechanical shock or to excessive force On its surface

2. 禁止放置污染物在模组表面，不可使用裸露的手碰触产品。

To avoid contamination on the display surface, do not touch the module Surface with bare hands

3. Must be the correct way to connec the power cable, otherwise it will Cause damage

10.1.3 运输 transportation

1. 运输过程中严禁超高堆放挤压，倒放，整车装卸.

In transporting, Goods are strictly prohibited during the ultra-high stacking Extrusion, upside down, entire vehicle liading and unloading.

2. 防静电措施 Static Electricity

人体在接触产品时，应当以适当的方式接地

Persons who handle the module should be grounded through adequate methods.

9.2 其它 Other

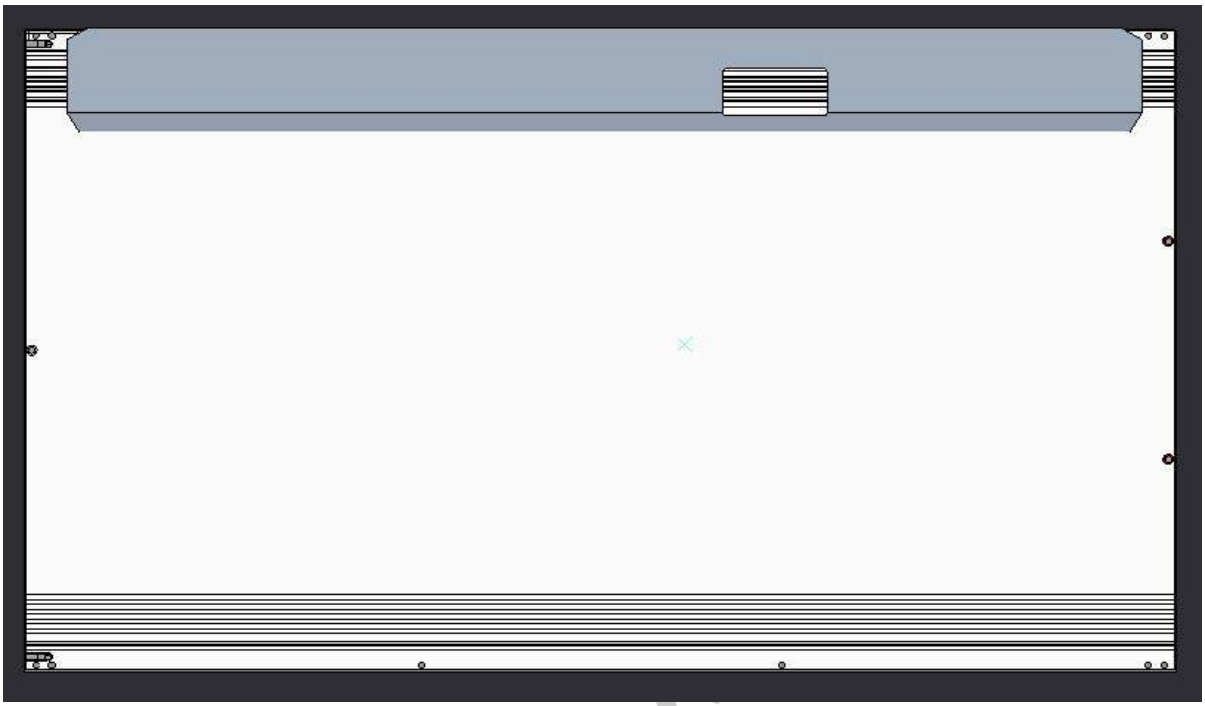
1. 对本规格书，如有任何议疑，经双方协议后处理.

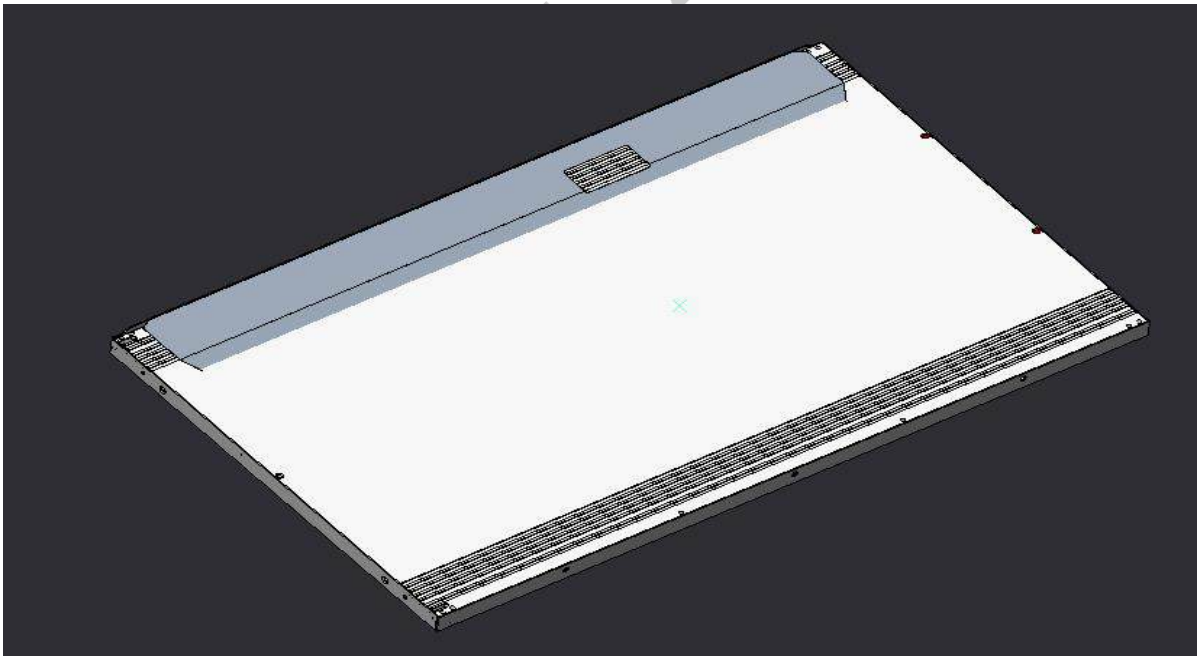
About this specification, if any question, go through both sides agreement Post-processing.

2. 任何变更都必须经过联络，并取得双方同意后主可变更，并针对变更内容记录管理.

Any changes must get into contant with each other, get tht agreement then To change , and update the contents to record.

10.背光模组背板图(Moudle Darwing)

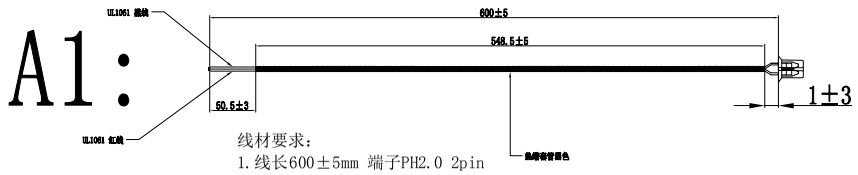




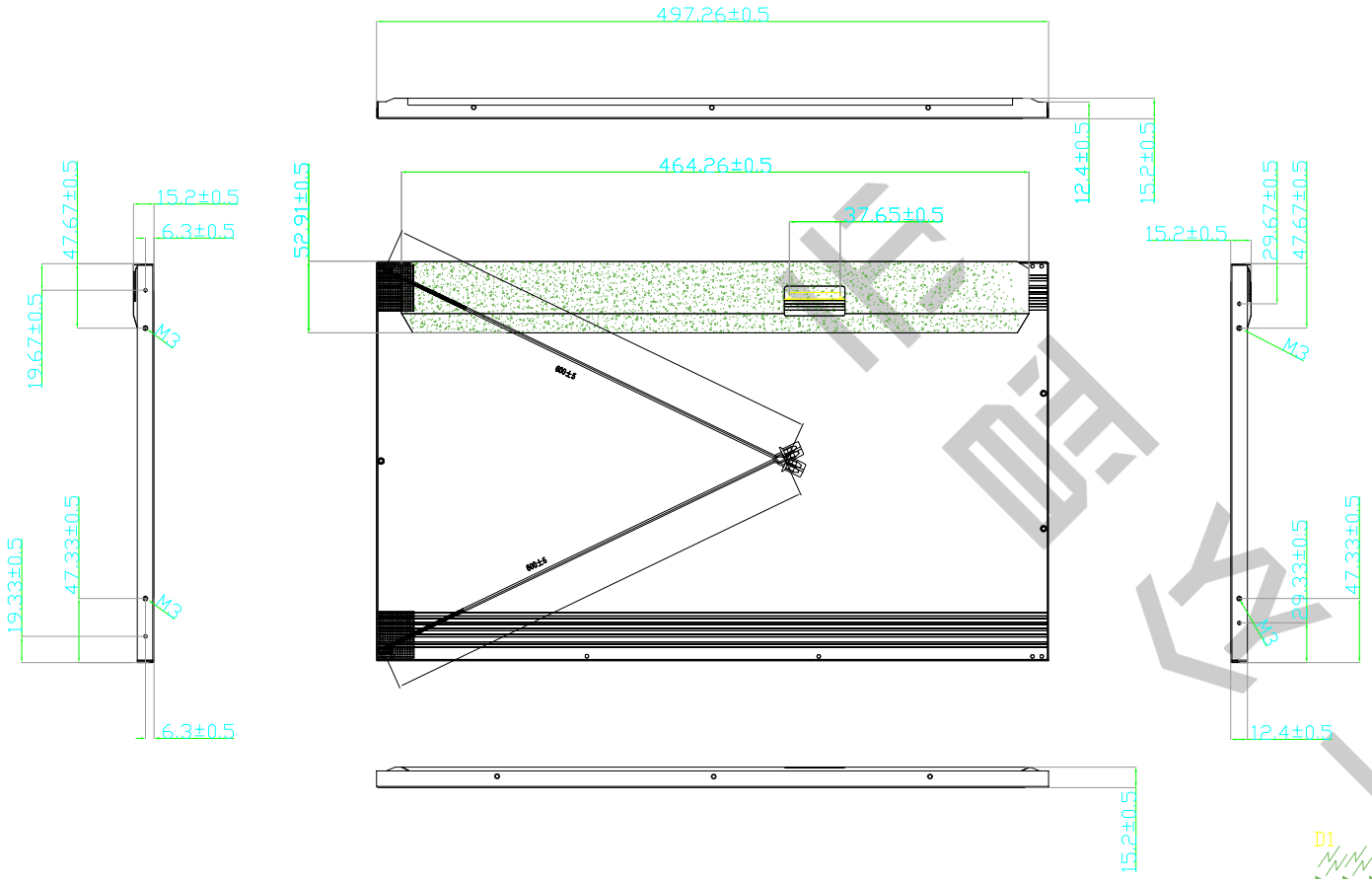
CLASS / LIMITS	f	m	c	v
0.5~3	±0.05	±0.1	±0.2	---
>4~6	±0.05	±0.1	±0.3	±0.5
>6~30	±0.1	±0.2	±0.5	±1
>30~120	±0.15	±0.3	±0.8	±1.5
>120~400	±0.2	±0.5	±1.2	±2.5
>400~1000	±0.3	±0.8	±2	±4
>1000~2000	±0.5	±1.2	±3	±6
>2000~4000	---	±2	±4	±8

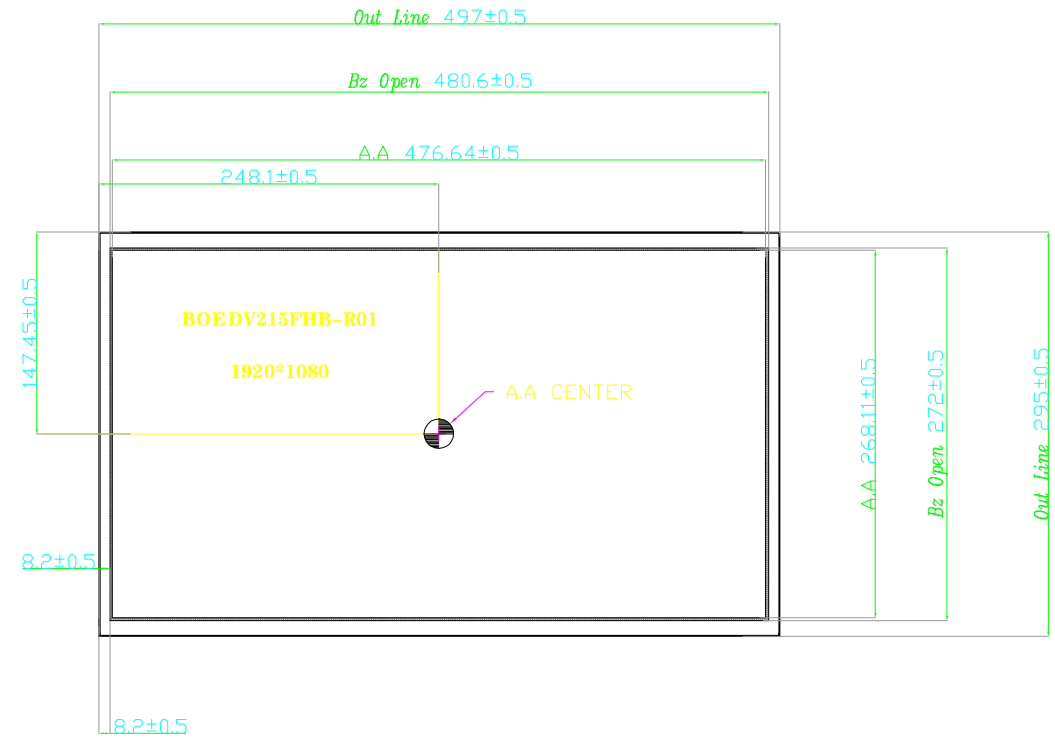
RoHS

型号：PH2.0 2Y 28AWG UL1061/600mm红黑并线



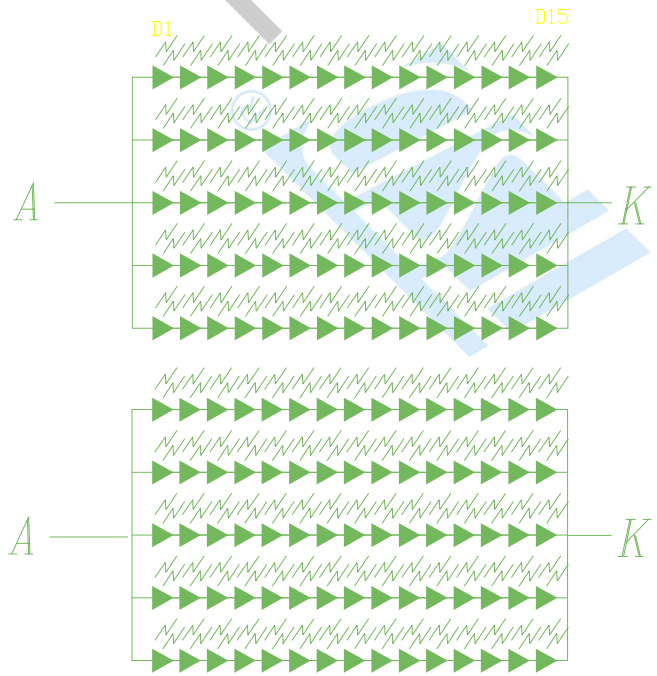
线材要求：
1. 线长600±5mm 端子PH2.0 2pin
2. 线材端子另一端剥皮侵锡，侵锡头尺寸1.2±0.3mm
3. 线材红黑并线

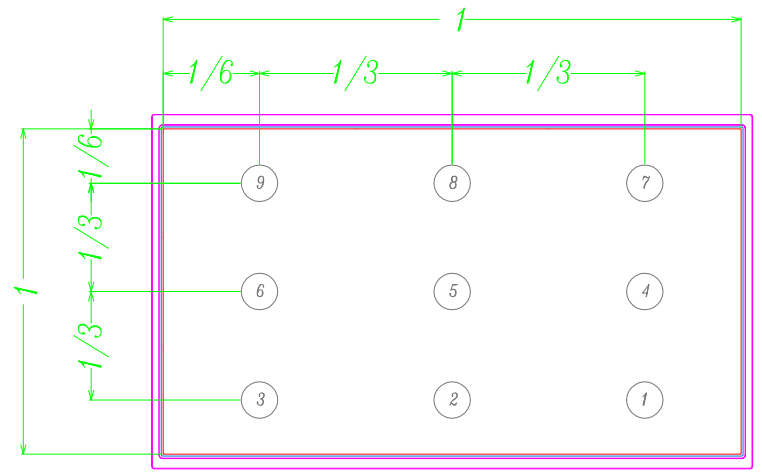




CURRENT IF=600mA*2
15c*5b=72LED

CA-210





9点测试示意图

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Luminous (Without PET)	IV	1000	1500		cd/m²
Chromaticity Coordinatses Without PET	X	(0.285)	(0.305)	(0.335)	
	Y	(0.298)	(0.318)	(0.348)	
Uniformity		72	75		%
Backlight voltage	VF	42	45	49.5	V
Backlight current	IF		★600*2		mA

REV 修改	DATE 日期	DESCRIPTION 修改内容	REVISER 修改者

TYPE 类型	模组成品图	MATERIAL 材料		PAGE 页次	1/1
MODEL NO. 模组号		EDITION 版本号	01	第三视角	
PART NO. 料号		DATE 日期			

APPROVED 承认	
CHECK 核对	
DESIGNED 设计者	