



深圳市希恩凯电子有限公司

SHENZHEN CNK ELECTRONIC CO.,LTD.

### Product Specification For LCD Module

Model NO. : CNKT1560-21011A1

CUSTOMER ITEM NO. :

REVISION : A

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

CUSTOMER :

APPROVED BY :

#### CNK LCM R&D CENTER

APPROVED BY

CHECKED BY

PREPARED BY

DIRECTOR

MANAGER

ENGINEER

深圳市希恩凯电子有限公司

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-CONTENTS-

内容

	Page
1. <b>Product ID</b> -----	3
2. <b>General Description</b> -----	3
3. <b>General Features</b> -----	3
4. <b>Pin Description</b> -----	4
5. <b>Absolute Maximum Ratings</b> -----	5
6. <b>Electrical Specification</b> -----	5
7. <b>Optical Specification</b> -----	8
8. <b>Reliability and inspection standard</b> -----	10
9. <b>Prior consult matter</b> -----	11
10. <b>Outline dimension</b> -----	11
11. <b>Packing</b> -----	11



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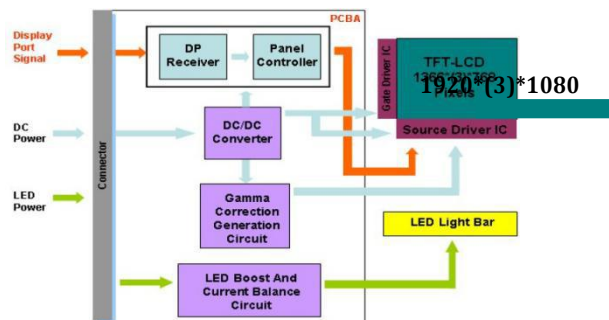
### 1. Product ID

HR-FHM-156-02

### 2. General Description

The model is a color TFT LCM without touch panel. This module has a 15.6 inch diagonally measured active area with 1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED、GREEN、BLUE dots which are arranged in vertical stripe and this module can display 262144 colors.

Functional Block Diagram



### 3. General Feature

Item	General feature	Remark
Display Mode	Normally black	
Viewing direction	All view	
Driving method	a color TFT active matrix	
Input signals	2 lane eDP	
Outside dimensions	359.5mm (W) × 224.37mm (H) × 3.3mm (D)	
Active area	344.16(H) × 193.59(V)	
Number of Pixels	1920(H) × 1080(V) (1pixels=R+G+B dot)	
Pixel Pitch	0.17925(H) x 0.17925 (V)	
Pixel Arrangement	R, G, B vertical stripes	
Response time	25ms (TYP)	
LCM Luminance	200 (MIN) 220 (TYP)	
LCM uniformity	75% (MIN)	
Surface Treatment	Anti-Glare coating: (3H)	
Weight	TBD	



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#### 4. Pin Description 引脚描述

Pin NO.	Symbol	I/O	Description
1	NC	-	Reserved for LCD
2	H_GND	P	High Speed Ground
3	Lane1_N	I	Complement Signal Link Lane 1
4	Lane1_P	I	True Signal Line 1
5	H_GND	P	High Speed Ground
6	Lane0_N	I	Complement Signal Link Lane 0
7	Lane0_P	I	True Signal Link Lane 0
8	H_GND	P	High Speed Ground
9	AUX_CH_P	I	True Signal Auxiliary Channel
10	AUX_CH_N	I	Complement Signal Auxiliary Channel
11	H_GND	P	High Speed Ground
12	LCD_VCC	P	LCD logic and driver power (3.3V)
13	LCD_VCC	P	LCD logic and driver power (3.3V)
14	NC	I	Reserved for LCD manufacturer's use
15	LCD_GND	P	LCD logic and driver ground
16	LCD_GND	P	LCD logic and driver ground
17	HPD	O	HPD signal pin
18	BL_GND	P	Backlight groud
19	BL_GND	P	Backlight groud
20	BL_GND	P	Backlight groud
21	BL_GND	P	Backlight groud
22	BL_ENABLE	I	Backlight ON/OFF
23	BL_PWM_DIM	I	System PWM Signal Input for Diming
24	NC	-	Reserved for LCD manufacturer's use
25	NC	-	Reserved for LCD manufacturer's use
26	BL_PWR	P	Backlight Power
27	BL_PWR	P	Backlight Power
28	BL_PWR	P	Backlight Power
29	BL_PWR	P	Backlight Power
30	NC	-	Reserved for LCD manufacturer's use



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### 5. Absolute Maximum Ratings

The absolute maximum ratings are list on Table . 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.

Item	Symbol	Ratings		Unit	Condition
+3.3V supply voltage	VDD	-0.3	4.0	V	
Operating temperature	T <sub>OPR</sub>	0	50	°C	No condensation
Storage temperature	T <sub>STR</sub>	-20	60		

### 6. Electrical Specification

#### 6.1 DC characteristics

[GND =0V, V<sub>ddin</sub>=3.3±0.05V, T<sub>OPR</sub>=-0~50°C]

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply power	V <sub>ddin</sub>		3.0	3.3	3.6	V
BL circuit Supply power	V <sub>BL</sub>		7.0	12.0	21	
Input high voltage	V <sub>IH</sub>		0.7* LCD_VCC	-	LCD_VCC	
Input low voltage	V <sub>IL</sub>		0	-	0.3* LCD_VCC	
Output high voltage	V <sub>OH</sub>		0.8* LCD_VCC	-	-	
Output low voltage	V <sub>OL</sub>		-	-	0.2*LCD_VCC	

#### 6.2 Back light circuit characteristics (LED Bar:10S4P)

Item	Symbol	Min	Typ.	Max.	Unit	Condition
Forward Voltage	V <sub>F</sub>	28	-	33	V	I <sub>F</sub> =80 mA
Forward Current	I <sub>F</sub>	-	80	-	mA	-
Back light uniformity (display white)	BU	75	80	-	%	I <sub>F</sub> =80mA, 10S4P

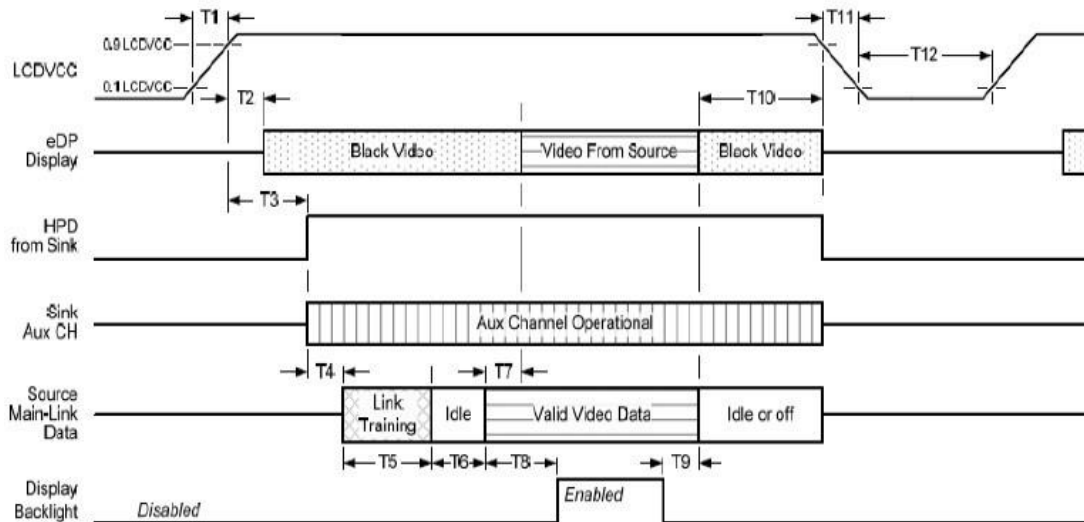


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### Power ON/OFF Sequence

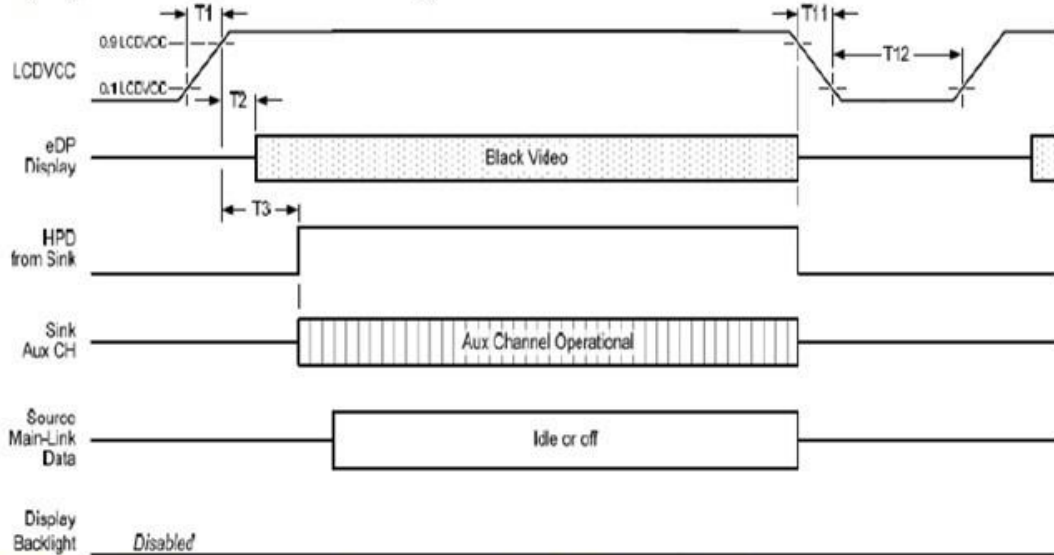
Interface signals are also shown in the chart. Signals from any system shall be Hi- resistance state or low level when VDD voltage is off.



Display port interface power up/down sequence, normal system operation

Display Port AUX\_CH transaction only:

### Display Port AUX\_CH transaction only:



Display port interface power up/down sequence, AUX\_CH transaction only

Display Port panel power sequence timing parameter:



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Timing parameter	Description	Reqd. by	Limits			Notes
			Min.	Typ.	Max.	
T1	power rail rise time, 10% to 90%	source	0.5ms		10ms	
T2	delay from LCDVDD to black video generation	sink	0ms		200ms	prevents display noise until valid video data is received from the source
T3	delay from LCDVDD to HPD high	sink	0ms		200ms	sink AUX_CH must be operational upon HPD high.
T4	delay from HPD high to link training initialization	source				allows for source to read link capability and initialize.
T5	link training duration	source				dependant on source link to read training protocol.
T6	link idle	source				Min accounts for required BS-Idle pattern. Max allows for source frame synchronization.
T7	delay from valid video data from source to video on display	sink	0ms		50ms	max allows sink validate video data and timing.
T8	delay from valid video data from source to backlight enable	source				source must assure display video is stable.
T9	delay from backlight disable to end of valid video data	source				source must assure backlight is no longer illuminated.
T10	delay from end of valid video data from source to power off	source	0ms		500ms	
T11	power rail fall time, 90% to 10%	source			10ms	
T12	power off time	source	500ms			

Note 1: The sink must include the ability to generate black video autonomously. The sink must automatically enable black video under the following conditions:

- upon LCDVCC power on (with in T2 max)-when the "Novideostream\_Flag" (VB-ID Bit 3) is received from the source (at the end of T9).

- when no main link data, or invalid video data, is received from the source. Black video must be displayed within 64ms (typ) from the start of either condition. Video data can be deemed invalid based on MSA and timing information, for example.

Note 2: The sink may implement the ability to disable the black video function, as described in Note 1, above, for system development and debugging purpose.

Note 3: The sink must support AUX\_CH polling by the source immediately following LCDVCC power on without causing damage to the sink device (the source can re-try if the sink is not ready). The sink must be able respond to an AUX\_CH transaction with the time specified within T3 max.



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### 7. Optical Specification

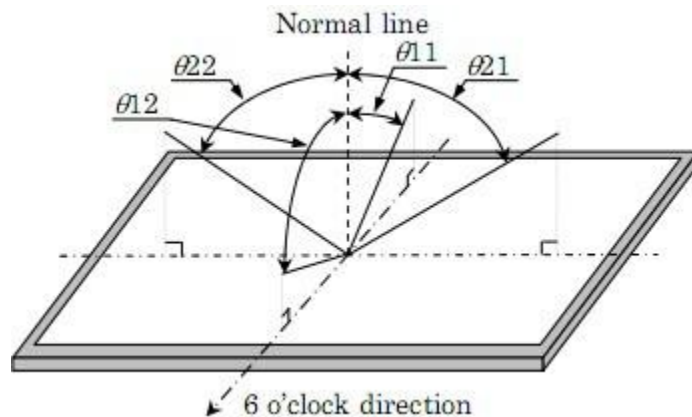
#### 7.1 LCD optical characteristics

Ta=25°C

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Viewing Angle	Horizontal	θ21	CR > 10	80	85	-	deg
		θ22		80	85	-	
	Vertical	θ11		80	85	-	
		θ12		80	85	-	
Response time		$\tau_{r+} \tau_d$		-	25	35	ms
Contrast ratio		CR	θ=0	700	1000		-
Color Coordinate	red	X	θ=0	Typ. -0.03	(0.592)	Tymsp. +0.03	
		Y	θ=0		(0.360)		
	green	X	θ=0		(0.342)		
		Y	θ=0		(0.557)		
	blue	X	θ=0		(0.158)		
		Y	θ=0		(0.109)		
	white	X	θ=0		(0.313)		
		Y	θ=0		(0.329)		

#### 7.2 Measurement system 测量系统

##### (1) LCD Viewing Angle



Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the



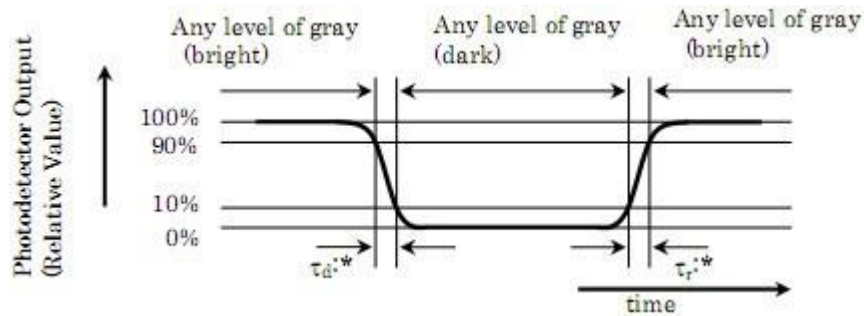


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horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.

### (2) Response time



Response time is the time required for the display to transition from white to black (Rising time, Tr) and from black to white (Falling time, Tf).for additional information.

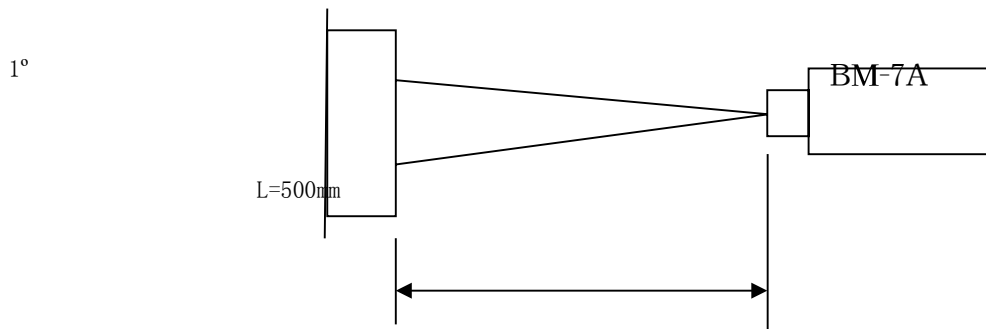
### (3) Contrast Ratio(CR)

Contrast Ratio(CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

Surface luminance is the center point across the lcd surface 500mm from the surface with all pixels Displaying white.

Measure condition:25°C±2°C, 60±10%RH, under 10Lux in the dark room. BM-7A(TOPCON), viewing Angle1°. Measurement after lighting on 10mins



Definition of Luminance Uniformity(Variation)

Measure the luminance at 1-9 points

$$\Delta L = [L(\text{MIN})/L(\text{MAX})] \times 100\%$$



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### 8. Reliability and inspection standard

#### 8.1 Environment test (reliability test)

Samples OK before testing

1	High Temperature Storage	60°C 96H Restore 2H at 25°C Power off	
2	Low Temperature Storage	-20°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	50°C 96H Restore 2H at 25°C Power on	
4	Low Temperature Operation	0°C 96H Restore 2H at 25°C Power on	
5	High Temperature & Humidity Operation	40°C 90%RH 96H Power on	
6	Temperature Cycle	-20°C ↔ 60°C 30min 5min 30min After 10 cycle , Restore 2H at 25°C Power off	After testing , cosmetic and electrical defects should not happen
7	Vibration test(non-operation)	1.5G, 10-500MHZ, half sine X, y, z/sweep rate:1 hour	
8	Shock test (non-operation)	220G, half Sine Wave 2msec ±X, ±Y, ±Z, Once for each direction	
7	Electro Static Discharge Test (non-operation)	Contact ±6KV. Air ±8KV Can't contact IC parts	

After completing the reliability test, leave the samples under the room temperature and for the following inspection items:

- a) No clearly visible defects or deterioration of display quality allowed.
- b) No function-related abnormalities.
- c) Connected parts still connecting tightly.
- d) Display characteristics fulfill initial value, contrast ratio should be an least 30% of initial value.



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**9. Prior consult matter**

9.1 For standard products, we keep the right to change material, process for improving the product Property without prior notice to our customer.

9.2 For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.

9.3 If you have special requirement about reliability condition, please let us know before you start the test on our samples.

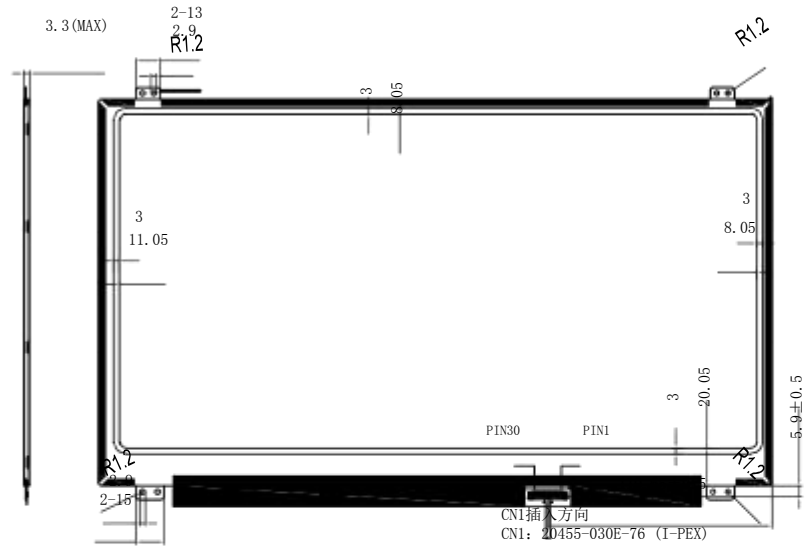
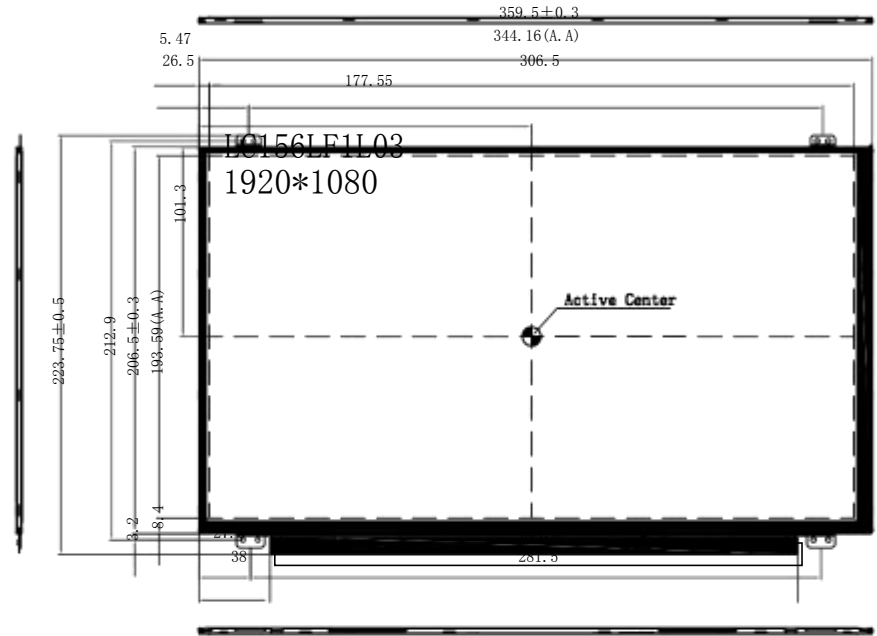
**10. Outline Dimension**

LCM

正视图

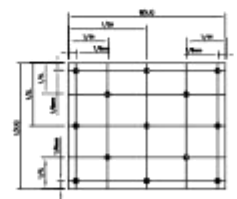
MARK	VER	DESCRIPTION	REV/SER	DATE
1				
2				
3				

背视图

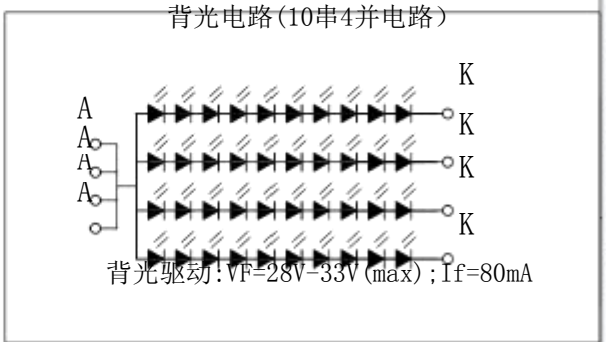


PIN	SYMBOL
01	NC
02	H GND
03	lane1 N
04	lane1 P
05	H GND
06	LANBO N
07	LANBO P
08	H GND
09	AUX CH P
10	AUX CH N
11	H GND
12	LCD VCC
13	LCD VCC
14	NC
15	LCD GND
16	LCD GND
17	HPD
18	BL GND
19	BL GND
20	BL GND
21	BL GND
22	LED ENABLE
23	LED PWM DIM
24	NC
25	NC
26	BL PWR
27	BL PWR
28	BL PWR
29	BL PWR
30	NC

- NOTES:
1. Display Type: 15.6" TFT IPS;
  2. Resolution: 1920RGB\*1080
  3. Driver IC: XXXX;
  4. Viewing Angle: ALL;
  5. Interface Types: EDP;
  6. Connector: **20455-030E-76(IPEX)**;
  7. 模组亮度 200cd/m<sup>2</sup> MIN ,220cd/m<sup>2</sup> TYP;
  8. Chromaticity White(X,Y): x=0.25-0.32; y=0.25-0.32;
  9. Uniformity: 75% MIN;(9点测试)\67%MIN(13点测试)
  10. Backlight: 40-chips LED,10 Strings of 4;
  11. Operating Temperature: 0°C-50°C;
  12. Storage Temperature: -20°C-60°C;
  13. General Tolerance: ±0.2mm;
  15. Warpage: ≤0.5
  16. All materials comply with ROHS standard.



亮度测试点



	NAME	DATE	UNIT'S:	mm	COLSTOMER NO.:
DRAW:			SCALE:	1:1	MODEL NO.:
CHKD:			SHEET:	1/1	PART NO.:
APPD:					
PRO:	THIRD ANGLE				