

- Preliminary Specification  
 Approval Specification

**SPECIFICATION  
FOR  
LCD MODULE**

Customer : \_\_\_\_\_  
 Product Model:           KD122N5-30NH-A6            
 Sample code: \_\_\_\_\_

Designed by	Checked by	Approved by
Zihong Huang	Zhijie Chen	Junhua Zhang

**Final Approval by Customer**

<input type="checkbox"/> LCM Machinery OK  Checked By _____  <input type="checkbox"/> LCM Display OK  Checked By _____	<input type="checkbox"/> LCM OK  <input type="checkbox"/> NG, Problem survey:  Approved By _____
--	--

※ The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

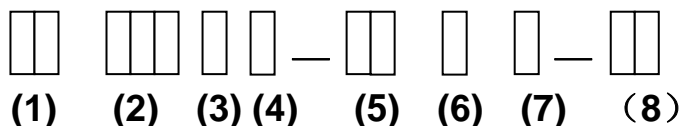
Revision History

Version	Contents	Date	Note
A	Original	2015.12.18	
A1	Modify the number of backlight for 56.	2015.12.29	
A2	Update Outline Dimension; Add power consumption.	2016.03.26	
A3	Update Outline Dimension & Reliability Test.	2016.04.08	
A4	Add luminance definition.	2016.04.12	
A5	Add LCM weight	2016.04.28	
A6	Update Outline Dimension tolerance	2016.09.23	P19

Contents

No.	Item	Page
1	<b>Numbering System</b>	4
2	<b>Scope</b>	5
3	<b>Normative Reference</b>	5
4	<b>Definitions</b>	5
5	<b>Block Diagram</b>	7
6	<b>Technology Specifications</b>	7
7	<b>Reliability Test</b>	16
8	<b>Handling Precautions</b>	16
9	<b>Precaution for use</b>	18
10	<b>Package Drawing</b>	18
11	<b>Outline Dimension</b>	19

### 1. Numbering System



No	Definition	Specifications
(1)	TFT LCM Productor No.	KD ---- Kingdisplay technology Co.,Ltd
(2)	Display monitor opposite angle line size	Unit :inch
(3)	Productor Types	D ---- Digital photo frame / DVD G ----GPS M ----MP P ----Mobile-Phone N ----Notebook ... ..
(4)	Productor Development Series No.	By two figures characters expression from 1 to 99
(5)	Interface PIN Number	By two figures characters expression from 1 to 99
(6)	With Touch Panel Or Not	T----With T/P ; N----Without T/P
(7)	LCD Type	A----AUO ; M----CMI ; C----CPT; B----BOE; L----LG; W----Wintek; H----HSD; S----Century T----Tianma ; Y----Hydis ; I----INNOLUX ; U---Samsung; V---- IVO
(8)	Productor Development edition No.	By The English letters : A1~ Z999

## 2. Scope

This specification applies to the TFT LCD module which is designed and manufactured by LCM Factory of Shenzhen K&D Technology Co. Ltd.

## 3. Normative Reference

GB/T4619-1996 《Liquid Crystal Display Test Method》

GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》

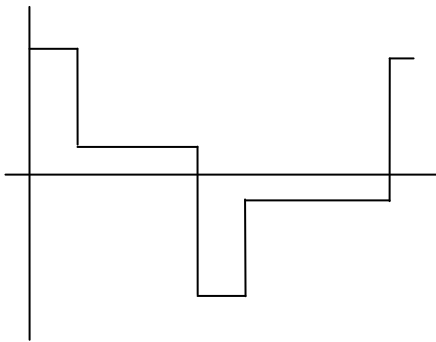
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

IEC61747-1 《SIXTH PART GB2828`2829-87 《National Standard of PRC》

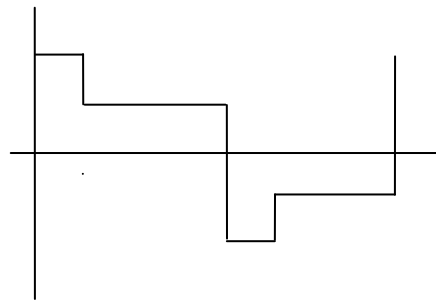
## 4. Definitions

### 4.1 Definitions of Vop

The definitions of threshold voltage  $V_{th1}$ ,  $V_{th2}$  the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias.



【 selected waveform 】



【 non-selected waveform 】

①  $V_{th1}$ : The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform

( $f_r=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

②  $V_{th2}$ : The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform

( $f_r=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

③  $V_{op}$ :  $(V_{th1}(50\%)+V_{th2}(50\%))/2$  ( $f_r=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

### 4.2 Definition of Response Time $T_r$ , $T_d$

①  $T_r$ : The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. ( $f_r=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

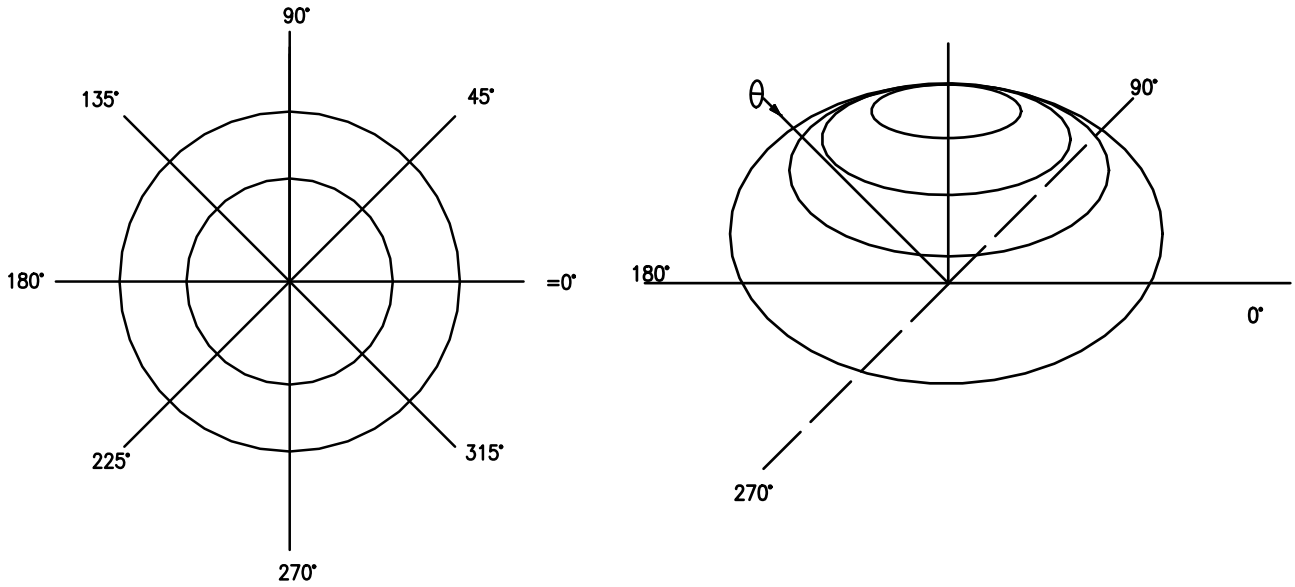
②  $T_d$ : The time required which the brightness of segment becomes 90% from 10% when waveform is switched to selected one from selected one. ( $f_r=80\text{Hz}$ ,  $\Phi=10^\circ$   $\theta=270^\circ$  at  $25^\circ\text{C}$ )

**4.3 Definition of Contrast Ratio Cr**

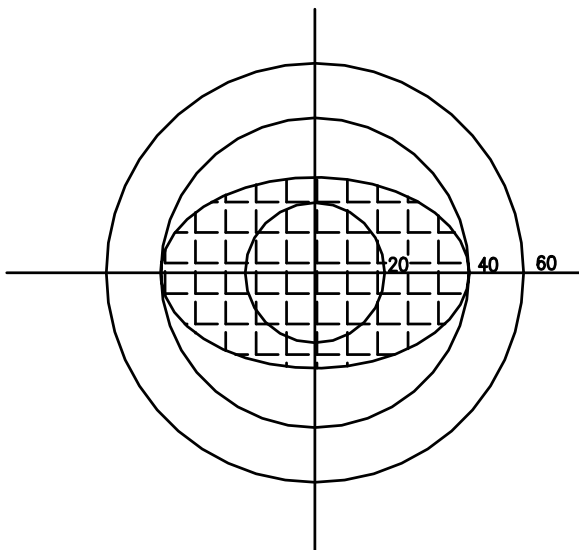
$Cr=A/B$

- ① A: Segments brightness in case of non-selected waveform
- ② B: Segments brightness in case of selected waveform

**4.4 Definition of Angle and Viewing Range**

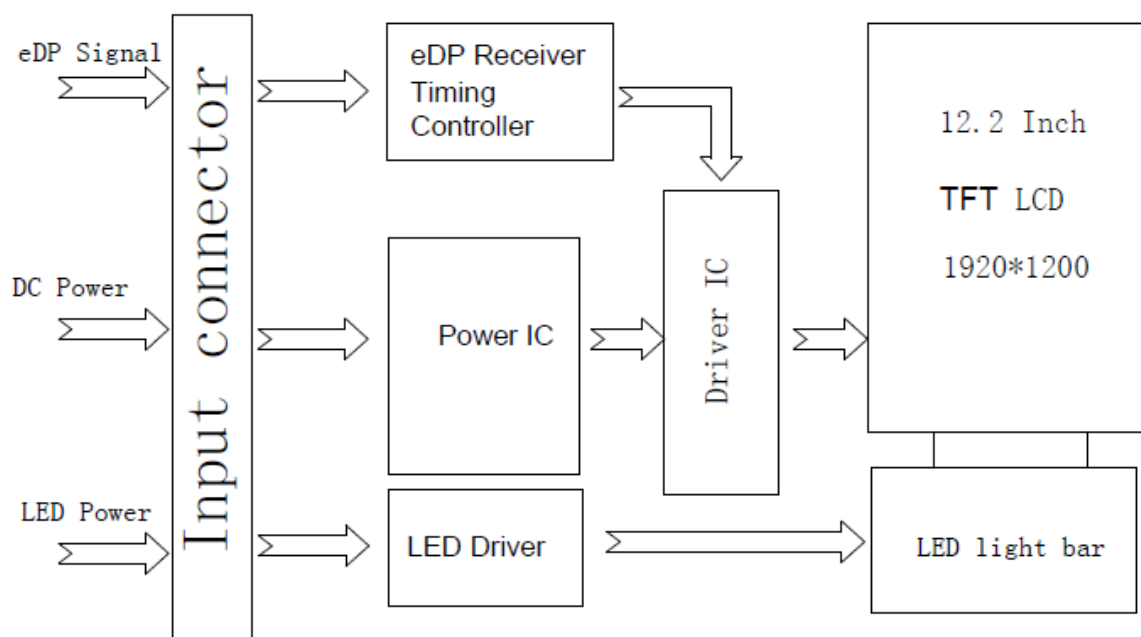


Angular Graph: Constrast Ratio



Such as:  
Viewing Angle Range:  
80(Cr>2) Horizontal  
70(Cr>2) Vertical

## 5. Block Diagram



## 6. Technology Specifications

### 6.1 Features

This single-display module is suitable for use in Notebook products. The LCD adopts one backlight with High brightness 56-lamps white LED. Construction: 12.2" a-Si color TFT-LCD ,With HSD Cell, White LED backlight、FPC and TCON .

### 6.2 General Specifications

No.	Item	Specification
1	LCD size	12.2 inch
2	Resolution	1920(RGB)X1200
3	Display mode	IPS ,Normally Black
4	Pixel pitch	0.13686(H)X 0.13686 (V) mm
5	Active area	262.7712 (H)X164.232 (V) mm
6	Module size	273.30(H)X176.50 (V)X2.65 (T)mm
7	Pixel arrangement	RGB Vertical stripe
8	Surface Treatment	Glare
9	Interface	eDP
10	Backlight power consumption	4.16W
11	Panel power consumption	1.03W
12	Weight	194g

## 6.3 Interface Pin Connection

Pin No.	Symbol	Function
1	LCD_GND	Ground
2	HPD	HPD signal pin
3	LCD_VCC	Power Supply,3.3V(typ.)
4	LCD_VCC	Power Supply,3.3V(typ.)
5	AUX_CH_P	True Signal Auxiliary Ch
6	AUX_CH_N	Complement Signal Auxiliary Ch
7	H_GND	Ground
8	LAN0_N	Complement Signal Link Lane 0
9	LAN0_P	True Signal Link Lane 0
10	H_GND	Ground
11	LAN1_N	Complement Signal Link Lane 1
12	LAN1_P	True Signal Link Lane 1
13	H_GND	Ground
14	DCR	NO connection
15	H_GND	Ground
16	H_GND	Ground
17	NC	NO connection
18	NC	NO connection
19	BL_PWR	LED Power Supply
20	BL_PWR	LED Power Supply
21	BL_PWR	LED Power Supply
22	BL_PWR	LED Power Supply
23	NC	NO connection
24	BL_GND	Ground
25	BL_GND	Ground
26	BL_GND	Ground
27	BL_GND	Ground
28	BL_PWM_DIM	LED PWM signal input. H=3.3V
29	BL_ENABLE	LED enable input. H=3.3V
30	NC	NO connection



### 6.4 Absolute Max. Rating

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	VCC	-0.3	4.0	V
Input Signal Voltage	V <sub>I</sub>	-0.3	2.4	V
Backlight forward current	I <sub>LED</sub>	0	25	mA (For each LED)
Operation Temperature	T <sub>OP</sub>	0	50	°C
Storage Temperature	T <sub>ST</sub>	-20	60	°C

### 6.5 Typical Operation Conditions

Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power Supply	VCC	3.0	3.3	3.6	V
	VLED	5	8	20	V
Current Consumption	I <sub>LCD</sub>	-	313	-	mA
	I <sub>LED</sub>	-	520	-	mA
Power Consumption	P <sub>LCD</sub>	-	1.03	-	W
	P <sub>LED</sub>	-	4.16	-	W

Note: Frame Rate=60Hz, VCC=3.3V, DC Current; Operating at 25°C at white pattern

### 6.6 Signal Electrical Characteristics

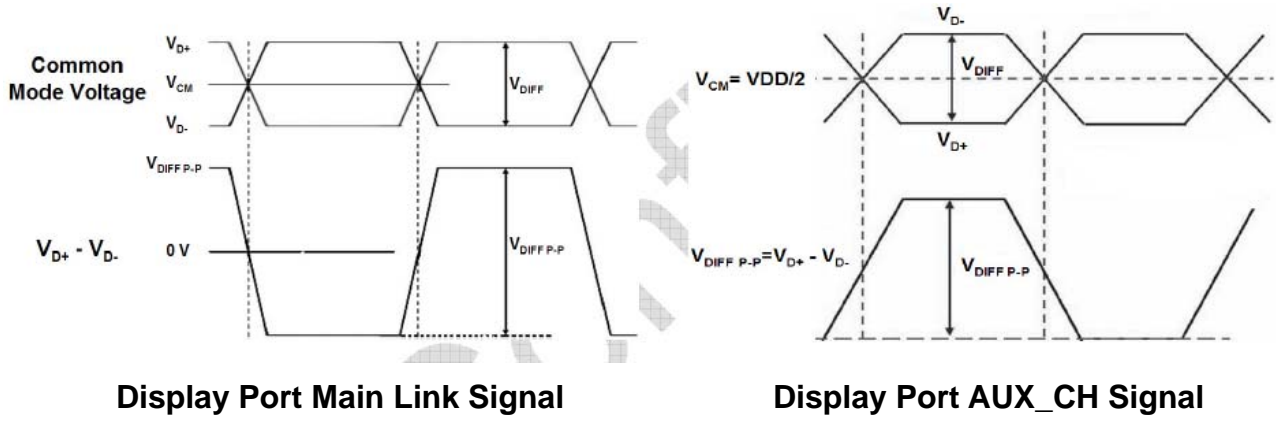
#### Display Port Main Link

Parameter	Description	Min.	Typ.	Max.	Unit
V <sub>CM</sub>	Differentia Common Mode Voltage	0	-	2.0	V
V <sub>Diff P-P</sub> Level 1	Differential Peak to Peak Voltage Level 1	0.34	0.40	0.46	V
V <sub>Diff P-P</sub> Level 2	Differential Peak to Peak Voltage Level 2	0.51	0.60	0.68	V
V <sub>Diff P-P</sub> Level 3	Differential Peak to Peak Voltage Level 3	0.69	0.80	0.92	V
V <sub>Diff P-P</sub> Level 4	Differential Peak to Peak Voltage Level 4	1.02	1.20	1.38	V

Note: (1) Input signals shall be low or Hi- resistance state when VDD is off.

(2) It is recommended to refer the specifications of VESA Display Port Standard V1.2 in detail.

(3) Follow as VESA display port standard V1.2 at both 1.62 and 2.7 Gbps link rates.



Parameter	Description	Min.	Typ.	Max.	Unit
$V_{CM}$	Differentia Common Mode Voltage	0	VDD/2	2	V
$V_{DIFF P-P}$	Differential Peak to Peak Voltage	0.39	-	1.38	V

Note: Follow as VESA display port standard V1.2.

### Display Port AUX\_CH

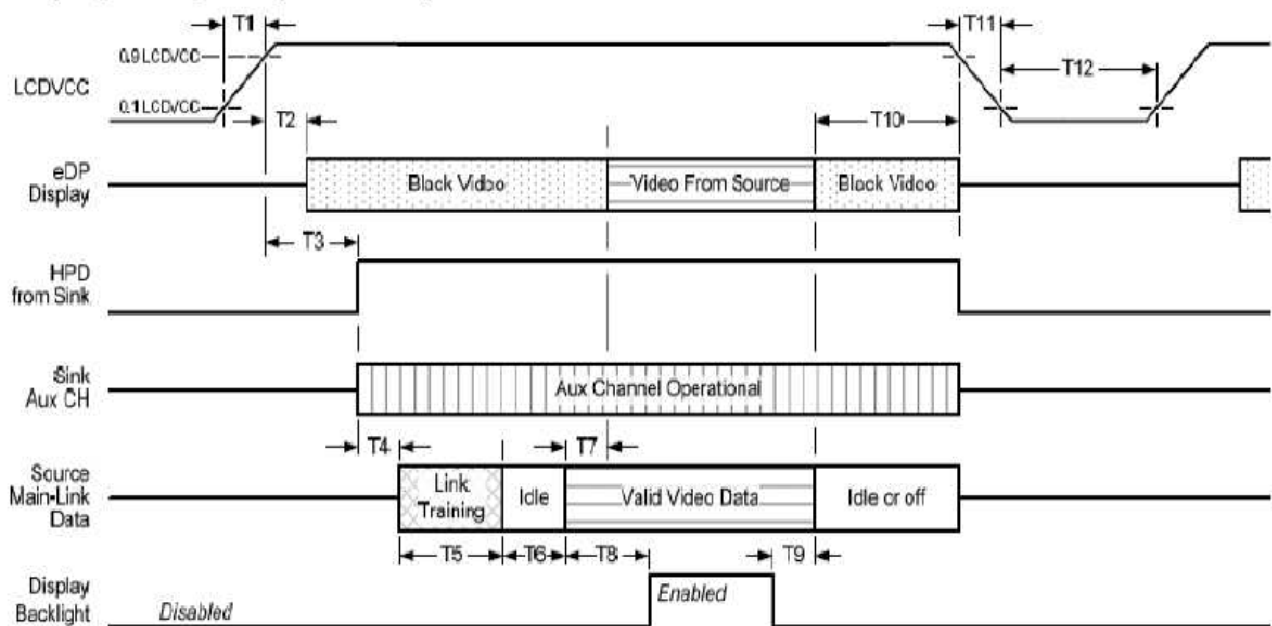
Parameter	Description	Min.	Typ.	Max.	Unit
$V_{HPD}$	HPD Voltage	2.25	-	3.60	V

Note: Follow as VESA display port standard V1.2.

### Display Port $V_{HPD}$

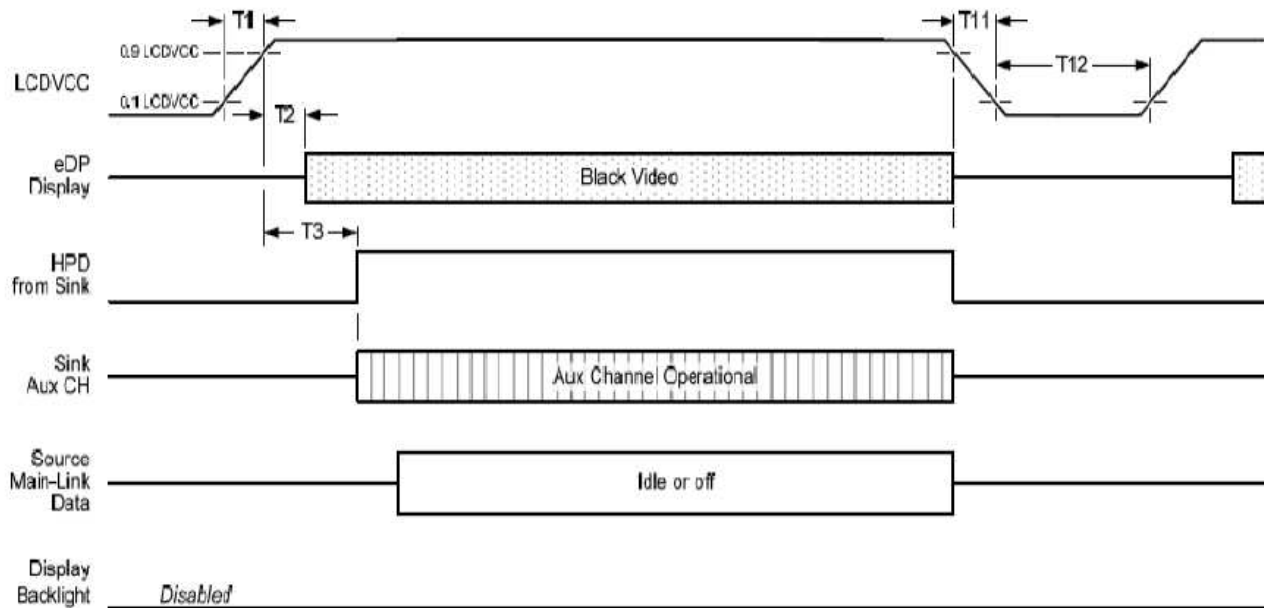
## 6.7 Power On/Off Sequence

Display Port panel power sequence:



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

Display Port AUX\_CH transaction only:



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

eDP Panel Power Sequence Timing Parameters

Timing Parameter	Description	Reqd. By	Limits		Notes
			Min	Max	
T1	Power rail rise time, 10% to 90%	Source	0.5ms	10ms	
T2	Delay from LCDVCC to black video generation	Sink	0ms	200ms	Prevents display noise until valid video data is received from the Source (see note 1 below)
T3	Delay from LCDVCC to HPD high	Sink	0ms	200ms	Sink Aux Channel 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 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 (see note 1 below)
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 (within 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 50ms (max) 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 Notes 1, above, for system development and debugging purposes.

**Note 3:** The Sink must support Aux Channel 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 to respond to an Aux Channel transaction with the time specified within T3 max.

### 6.8 Timing setting

Pixel Clock 147MHz

	<b>1920 Horizontal</b>	<b>16</b>	<b>16</b>	<b>32</b>
<b>1200 Vertical</b>	<b>Display</b>	<b>Front porch</b>	<b>Sync. Width</b>	<b>Back porch</b>
<b>15</b>	<b>Front porch</b>	<b>/</b>		
<b>2</b>	<b>Sync. Width</b>			
<b>18</b>	<b>Back porch</b>			

6.8 Optical specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	$\theta_L$	$\Phi=180^\circ$ (9 o'clock)	-	80	-	degree	Note 1
	$\theta_R$	$\Phi=0^\circ$ (3 o'clock)	-	80	-		
	$\theta_T$	$\Phi=90^\circ$ (12 o'clock)	-	80	-		
	$\theta_B$	$\Phi=270^\circ$ (6 o'clock)	-	80	-		
Response time Rise+Fall	$T_{RT}$	Normal $\theta=\Phi=0^\circ$	-	30	45	msec	Note 3
Contrast ratio	CR		600	800	-	-	Note 4
Color chromaticity	$W_X$		0.283	0.313	0.343	-	Note 2
	$W_Y$		0.299	0.329	0.359	-	Note 5
NTSC	Ratio		-	70	-	%	Note 6
Luminance	L		270	320	-	-	Note 6,8
Luminance uniformity	$Y_U$		65	-	-	%	Note 6,7

Note 1: Definition of viewing angle range

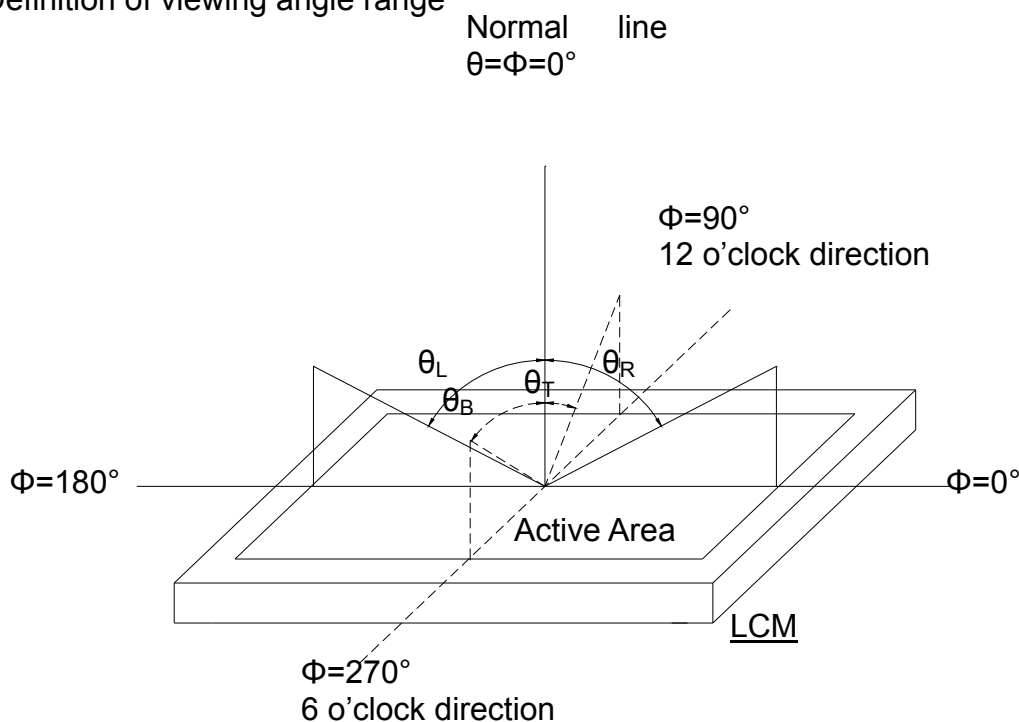


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm ,Response time is measured by Photo detector TOPCON BM-5A, other items are measured by BM-7A/Field of view: 1° /Height: 500mm.)

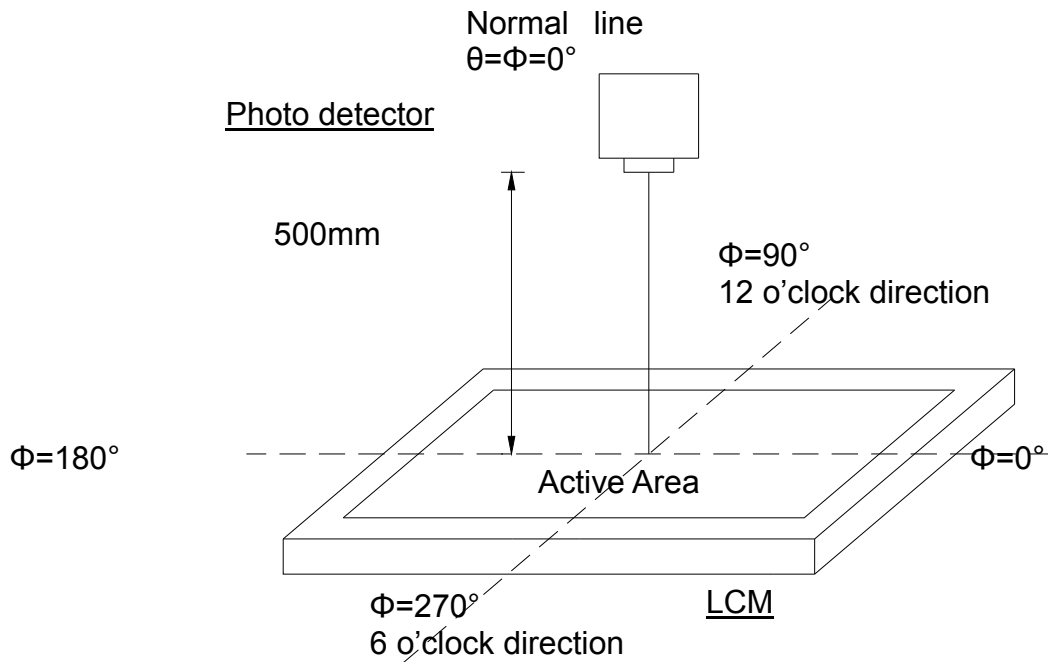


Fig. 4-2 Optical measurement system setup

Note 3: 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%.

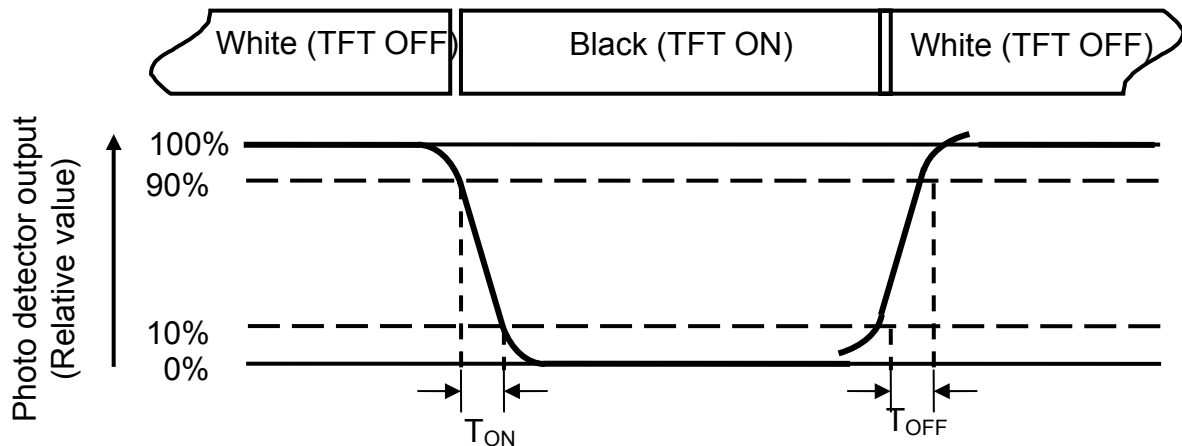


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is  $V_{LED} = 8V, PWM = 100\%$

Note 7: Definition of Luminance Uniformity

Active area is divided into 13 measuring areas (Refer to Fig. 4-4 ). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

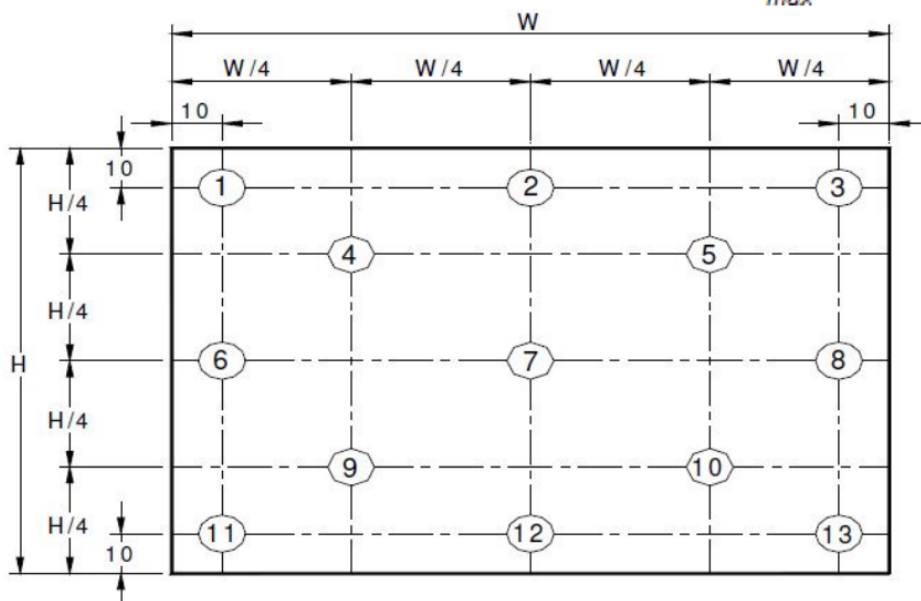


Fig. 4-4 Definition of measuring points

$B_{max}$ : The measured maximum luminance of all measurement position.

$B_{min}$ : The measured minimum luminance of all measurement position.

Note 8: Definition of Luminance White

Measure the luminance of white level 255 at center point.

$$\text{Luminance} = (L1+L2+L3+L4+L5) / 5$$

H—Active area length, V—Active area width, L—Luminance

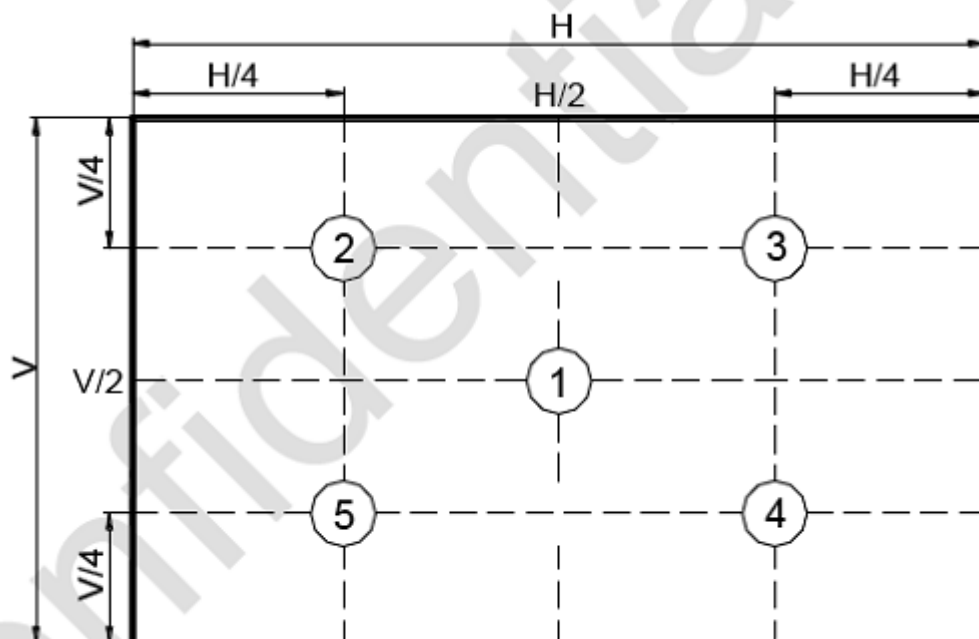


Fig. 4-5 Definition of measuring points

## 7. Reliability Test Conditions And Methods

Item	Test Conditions	Remark
High Temperature Storage	Ta = 60°C 240 hrs	
Low Temperature Storage	Ta = -20°C 240hrs	
High Temperature Operation	Ts = 50°C 240hrs	
Low Temperature Operation	Ta = 0°C 240hrs	
Operate at High Temperature and Humidity	50°C, 80%RH max. 240hrs	Operation
Thermal Shock	-20°C~ +60°C 100cycles 0.5Hrs/cycle	Non-operation
Vibration test	1.5G,10-500MHz, half sine X,Y,Z/sweep rate:1 hour	Non-operation
Shock test	220G, half sine wave 2mesc ±X, ±Y, ±Z, once for each direction	Non-operation
Electrostatic Discharge	Contact=±6KV, class B Air=±8KV, class B	

## 8. Handling Precautions

### 8.1 Mounting method

The LCD panel of K&D LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

### 8.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Salfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Salfur (S) from customer, Responsibility is on customer.



### 8.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

### 8.4 packing

- Module employ LCD elements 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 direct to sunshine or high temperature/humidity

### 8.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

### 8.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

### 8.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

## 9. Precaution for use

### 9.1

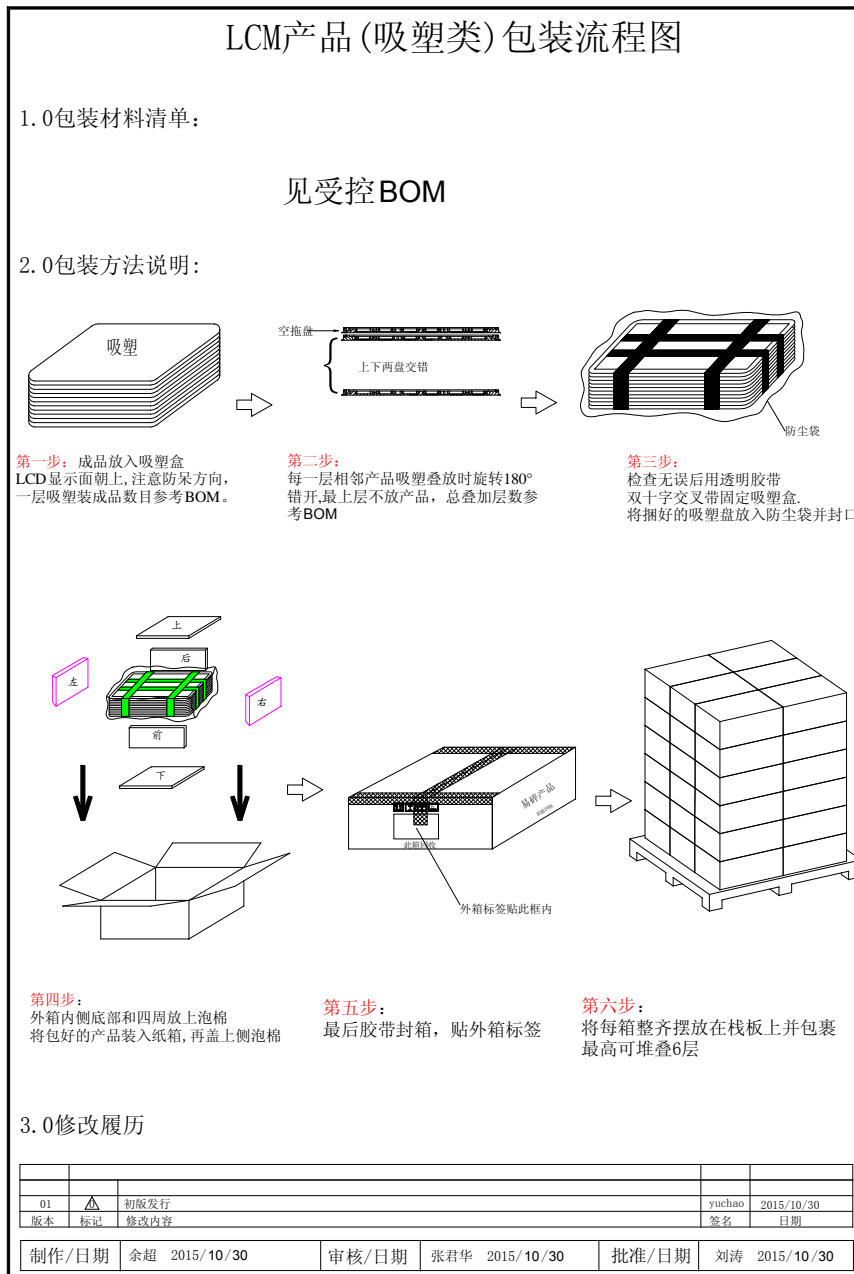
A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 9.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to K&D , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

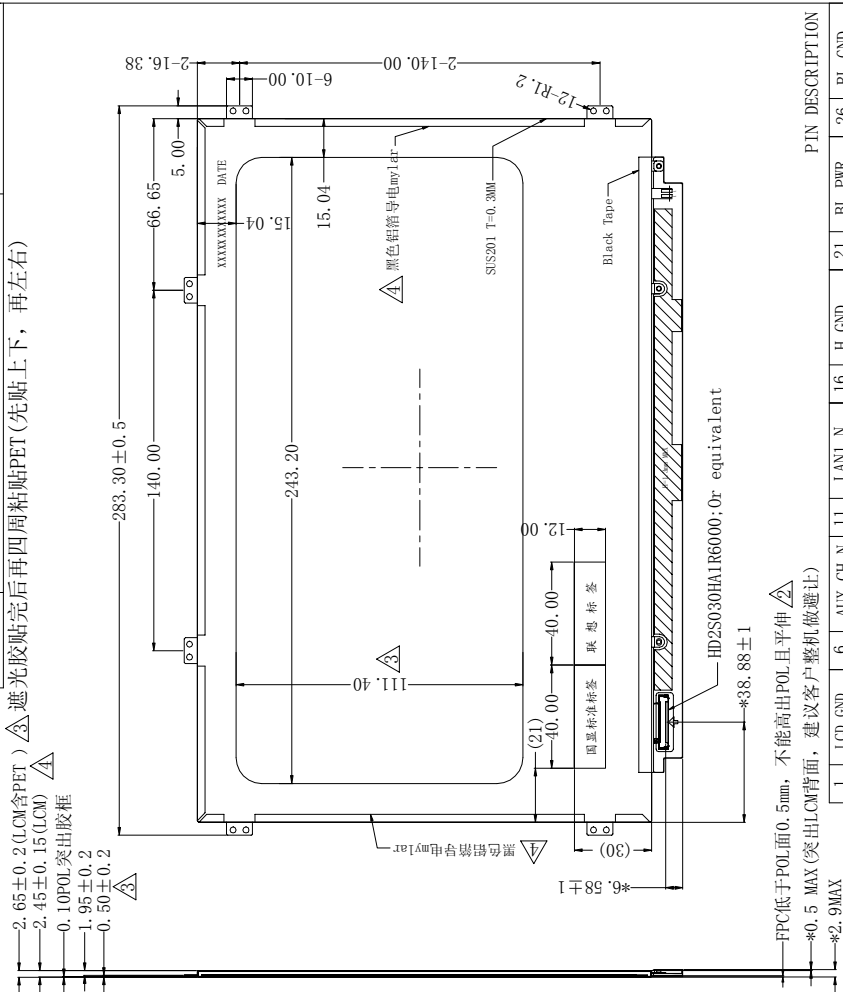
## 10. Package Drawing



# 11. Outline Dimension

注意: F05请靠右上角组装, 注意硬质PET材质不能压到IC; 不能超出玻璃边和LCM外形

REV	版本	DESCRIPTION	描述	DATE	日期
A00	First issue			2015-12-24	
A01	增加联想标签			2016-02-23	
A02	增加标注以及更新最新标准图框, 其他不变			2016-03-09	
A03	耳朵修改上升0.2mm, 0.7mm改为0.5mm; 以及玻璃和四周增加PET			2016-03-26	
A04	四周遮光绝缘mylar改为黑色铝箔导电mylar; 公差调整			2016-04-08	
A05	增加调整AA-孔中心的公差 (7.2和14.62的尺寸公差为±0.35)			2016-09-23	



SCALE: FIT  
 SHEET: 1 OF 1  
 UNIT: MM  
 DATE: 2016-09-23  
 MODEL NO: KD122N5-30NH-A6  
 PART NO:  
 TITLE: LCM

国显科技 Shenzhen K&D Technology Co., Ltd  
 深圳市国显科技有限公司 K&D Technology

1. DISPLAY TYPE: 12.2", TFT LCD  
 2. DISPLAY MODE: Normally black mode  
 3. VIEWING DIRECTION: ALL 85(TYP)  
 4. DRIVER IC:HX8299-A + HX8677-G  
 5. LCM+FP (White 13 AVG) :  
 Brightness: 270cd/m<sup>2</sup> (MIN), 320cd/m<sup>2</sup> (TYP)  
 Chromaticity: 0.313+/-0.03; 0.329+/-0.03.  
 Uniformity: 65%(MIN)  
 6. BACK LIGHT: 56 CHIP WHITE LED (20mA/LED), Vf=22.4V~24.8V  
 7. OPERATING TEMP: -0°C TO 50°C, STORAGE TEMP: -20°C TO 60°C  
 8. KEY DIMENSION: \*.reference dimension; ( ) Unspecified Tolerances: ±0.50mm  
 Modification mark: △  
 9. SUGGESTION: TP window size unilateral increase 0.3`0.5mm than LCM A.A  
 10. REQUIREMENTS ENVIRONMENTAL PROTECTION: RoHS

BackLight 56pcs LED Circuit  
 (IF=140mA, 22.4V~24.8V)

