



深圳市国显科技股份有限公司

Shenzhen K&D Technology Co. Ltd

- Preliminary Specification
- Approval Specification

SPECIFICATION  
FOR  
LCD MODULE

Customer : \_\_\_\_\_

Product Model:           KD122N4-30NH-B2          

Sample code: \_\_\_\_\_

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

**Final Approval by Customer**

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

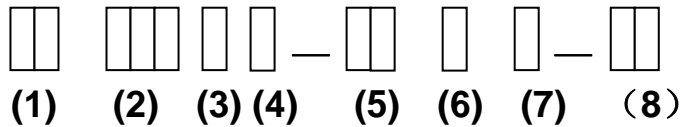
※ The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.



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### 1. Numbering System



| No  | Definition                               | Specifications   |
|-----|--|--|
| (1) | TFT LCM Productor No.                    | KD ---- Kingdisplay technology Co.,Ltd   |
| (2) | Display monitor opposite angle line size | Unit :mm (size <10 inch: takes two integers ; size >=10 inch: takes three integers )   |
| (3) | Productor Types                          | D ---- Digital photo frame / DVD<br>G ----GPS<br>M ----MP<br>P ----Mobile-Phone<br>N ----Notebook<br>... ..  |
| (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;<br>L----LG; W----Wintek; H----HSD; S----Century<br>T----Tianma ; Y----Hydis ; I----INNOLUX ;<br>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.》

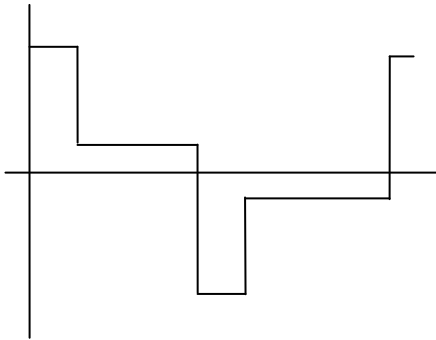
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

IEC61747-1 《SIXTH PARTGB2828`2829-87 《National Standard of PRC》

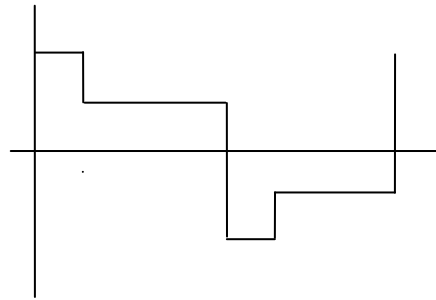
## 4. Definitions

### 4.1 Definitions of Vop

The definitions of threshold voltage Vth1, Vth2 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 Vth1: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform

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

② Vth2: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform

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

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

### 4.2 Definition of Response Time Tr, Td

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

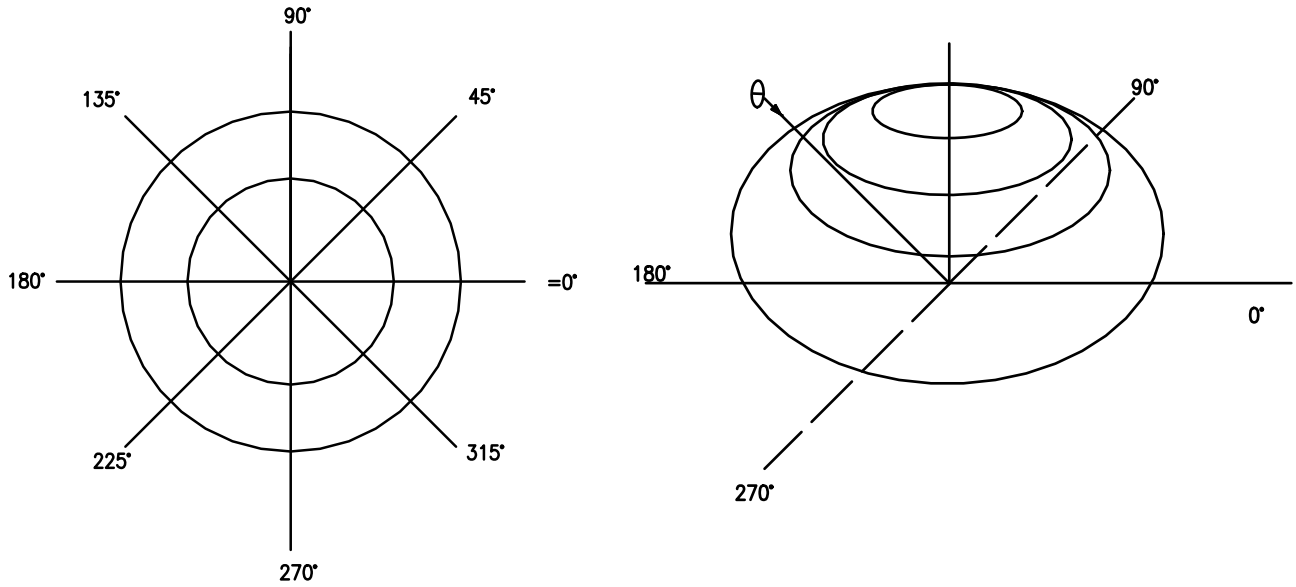
②Td: The time required which the brightness of segment becomes 90% from 10% when waveform is switched to selected one from selected one.  $(f_r=80\text{Hz}, \Phi=10^\circ\theta=270^\circ \text{ at } 25^\circ\text{C})$

### 4.3 Definition of Contrast Ratio Cr

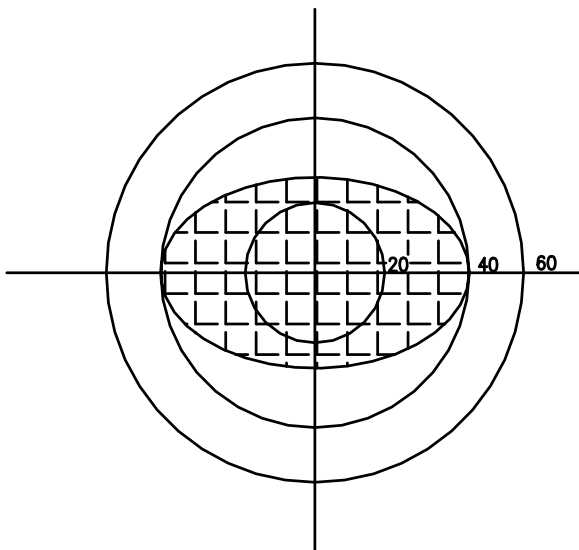
$$Cr=A/B$$

- 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

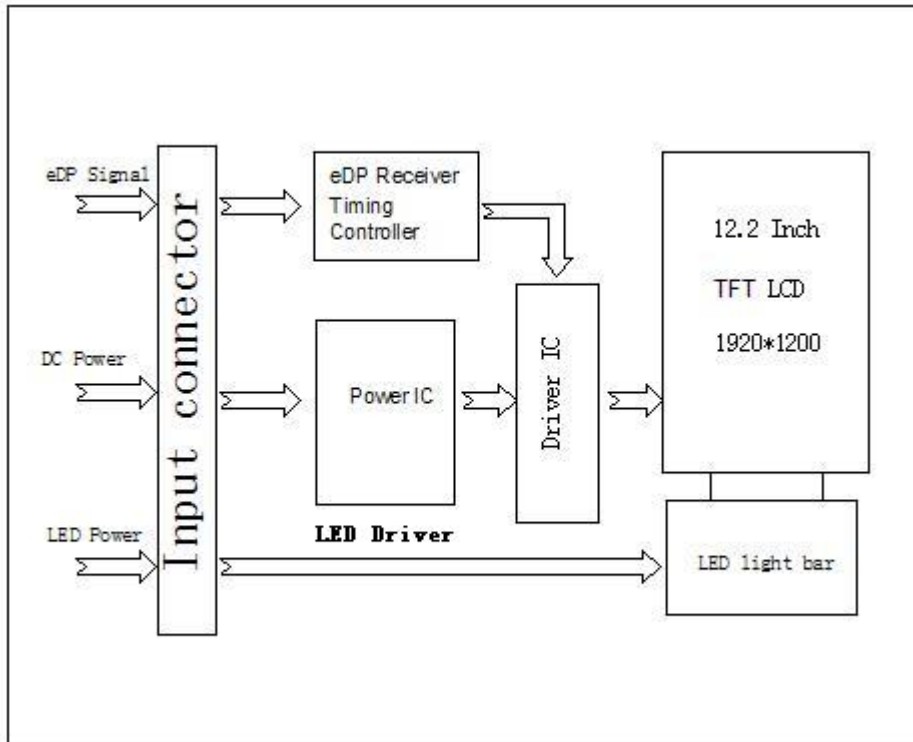


Angular Graph: Constrast Ratio



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 48-lamps white LED. Construction: 12.2" a-Si color TFT-LCD ,With HSD Cell, White LED backlight, FPC, 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                 | 262.771 (H)X164.23 (V) mm      |
| 6   | Module size                 | 273.30(H)X176.50(V)X2.75 (T)mm |
| 7   | Pixel arrangement           | RGB Vertical stripe            |
| 8   | Surface Treatment           | Haze                           |
| 9   | Interface                   | eDP                            |
| 10  | Backlight power consumption | 3.35W                          |
| 11  | Panel power consumption     | 1.03W                          |
| 12  | Weight                      | 225g (LCM)                     |

**6.3 LCM 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 (LCM)**

| 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>  | -10    | 50   | °C                |
| Storage Temperature       | T <sub>ST</sub>  | -20    | 60   | °C                |

**6.5 Typical Operation Conditions**

LCM:

| Item                | Symbol           | Values |      |      | Unit |
|---------------------|------------------|--------|------|------|------|
|                     |                  | Min.   | Typ. | Max. |      |
| Power Supply        | VCC              | 3.0    | 3.3  | 3.6  | V    |
|                     | VLED             | 5      | 12   | 20   | V    |
| Current Consumption | I <sub>LCD</sub> | -      | 313  | -    | mA   |
|                     | I <sub>LED</sub> | -      | 280  | -    | mA   |
| Power Consumption   | P <sub>LCD</sub> | -      | 1.03 | -    | W    |
|                     | P <sub>LED</sub> | -      | 3.35 | -    | W    |

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

## 6.6 Signal Electrical Characteristics

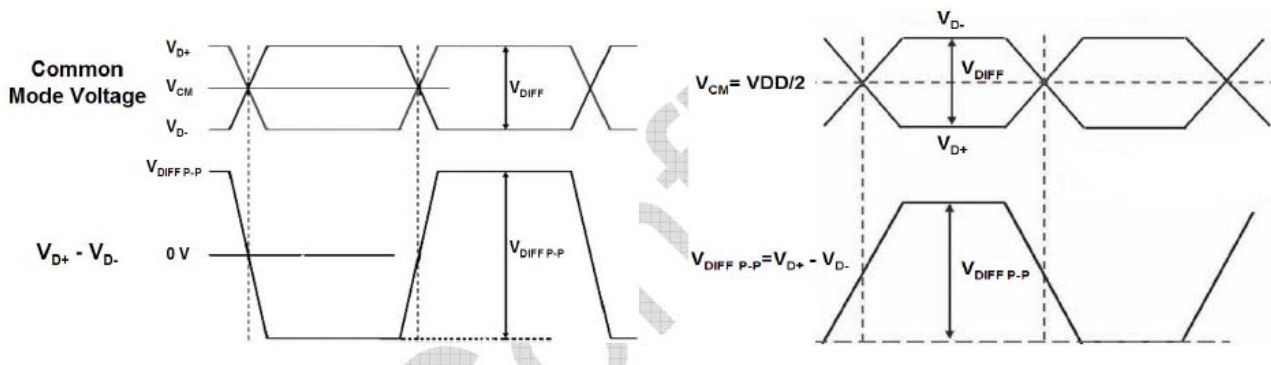
### Display Port Main Link

| Parameter              | Description                               | Min. | Typ. | Max. | Unit |
|------------------------|---|------|------|------|------|
| $V_{CM}$               | Differentia Common Mode Voltage           | 0    | -    | 2.0  | V    |
| $V_{DIFF P-P}$ Level 1 | Differential Peak to Peak Voltage Level 1 | 0.34 | 0.40 | 0.46 | V    |
| $V_{DIFF P-P}$ Level 2 | Differential Peak to Peak Voltage Level 2 | 0.51 | 0.60 | 0.68 | V    |
| $V_{DIFF P-P}$ Level 3 | Differential Peak to Peak Voltage Level 3 | 0.69 | 0.80 | 0.92 | V    |
| $V_{DIFF P-P}$ 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.



Display Port Main Link Signal

Display Port AUX\_CH Signal

| 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

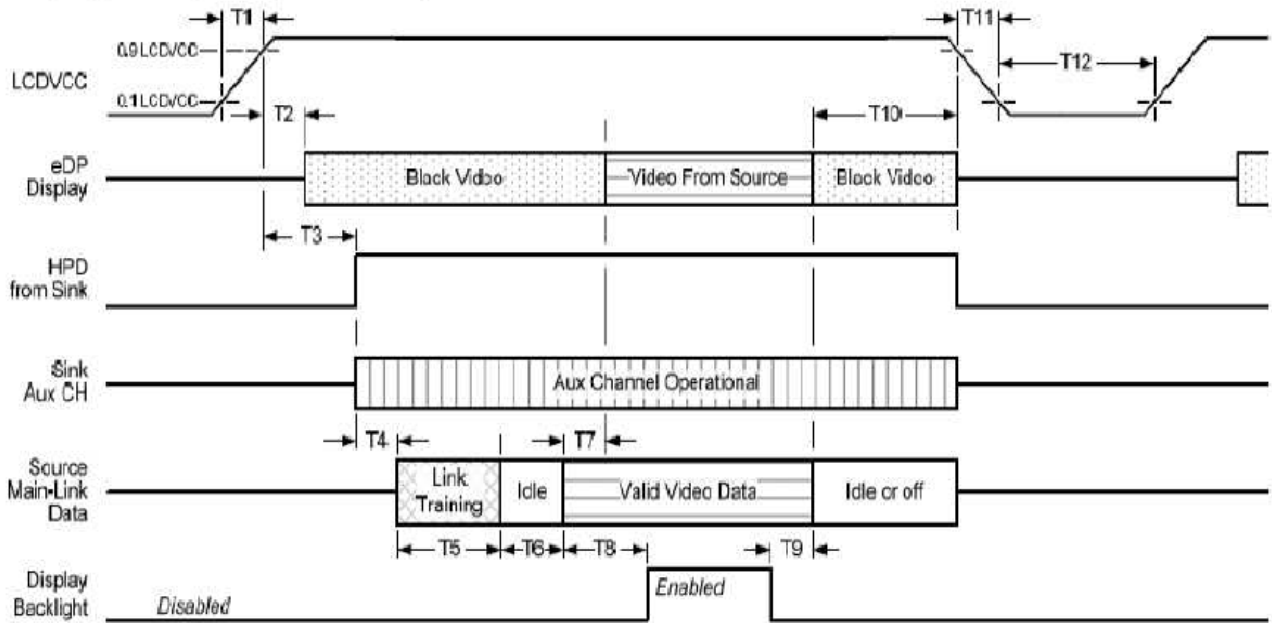
| Parameter | Description | Min. | Typ. | Max. | Unit |
|-----------|-------------|------|------|------|------|
| $V_{HPD}$ | HPD Voltage | 2.25 | -    | 3.60 | V    |

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

### Display Port $V_{HPD}$

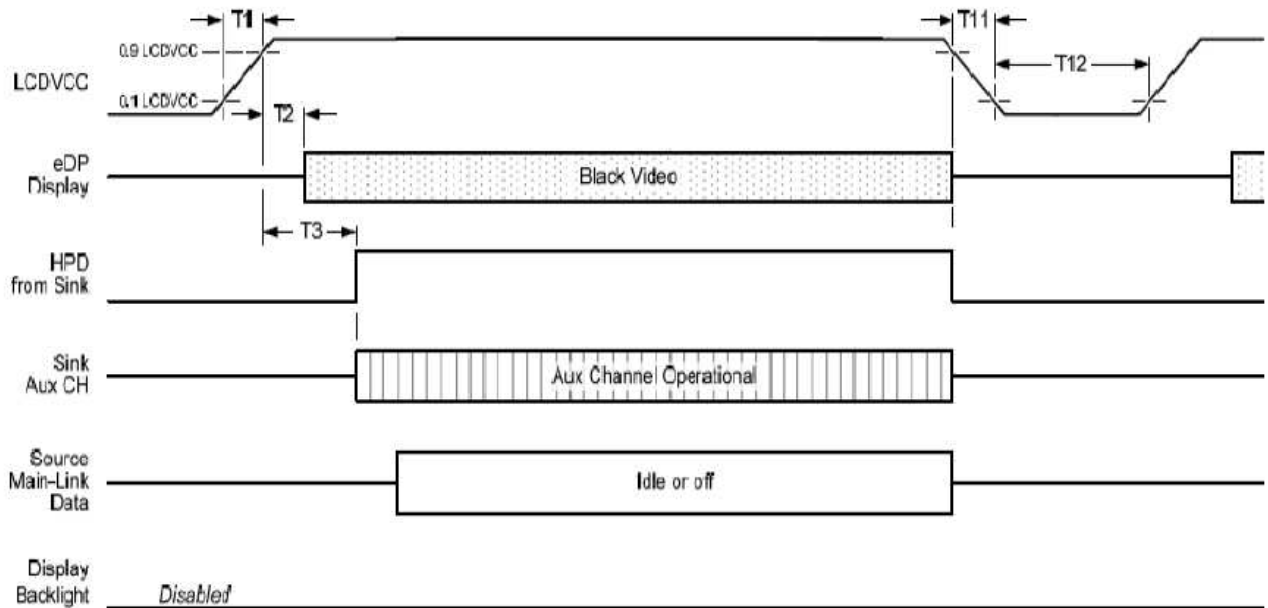
### 6.7 Power On/Off Sequence

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

|                      | 1920 Horizontal    | 16                 | 16                 | 32                |
|----------------------|--------------------|--------------------|--------------------|-------------------|
| <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>2</b>             | <b>Sync. Width</b> |                    |                    |                   |
| <b>18</b>            | <b>Back porch</b>  |                    |                    |                   |

### 6.9 Optical specifications

| Item                       | Symbol     | Condition                       | Values |       |       | Unit     | Remark                     |
|----------------------------|------------|---------------------------------|--------|-------|-------|----------|----------------------------|
|                            |            |                                 | Min.   | Typ.  | Max.  |          |                            |
| Viewing angle<br>(CR≥ 10)  | $\theta_L$ | $\Phi=180^\circ$<br>(9 o'clock) | -      | 80    | -     | degree   | Note 1                     |
|                            | $\theta_R$ | $\Phi=0^\circ$<br>(3 o'clock)   | -      | 80    | -     |          |                            |
|                            | $\theta_T$ | $\Phi=90^\circ$<br>(12 o'clock) | -      | 80    | -     |          |                            |
|                            | $\theta_B$ | $\Phi=270^\circ$<br>(6 o'clock) | -      | 80    | -     |          |                            |
| Response time<br>Rise+Fall | $T_{RT}$   | Normal<br>$\theta=\Phi=0^\circ$ | -      | 30    | 45    | msec     | Note 3                     |
| Contrast ratio             | CR         |                                 | 600    | 800   | -     | -        | Note 4                     |
| Color<br>chromaticity      | $W_X$      |                                 | 0.273  | 0.313 | 0.353 | -        | Note 2<br>Note 5<br>Note 6 |
|                            | $W_Y$      |                                 | 0.289  | 0.329 | 0.369 | -        |                            |
|                            | $R_X$      |                                 | 0.595  | 0.625 | 0.655 | -        |                            |
|                            | $R_Y$      |                                 | 0.334  | 0.364 | 0.394 | -        |                            |
|                            | $G_X$      |                                 | 0.285  | 0.315 | 0.345 | -        |                            |
|                            | $G_Y$      |                                 | 0.586  | 0.616 | 0.646 | -        |                            |
|                            | $B_X$      |                                 | 0.116  | 0.146 | 0.176 | -        |                            |
|                            | $B_Y$      |                                 | 0.032  | 0.062 | 0.092 | -        |                            |
| NTSC                       | Ratio      | -                               | 70     | -     | %     |          |                            |
| Luminance                  | L          | 250                             | 280    | -     | -     | Note 6   |                            |
| Luminance<br>uniformity    | $Y_U$      | 70                              | -      | -     | %     | Note 6,7 |                            |

Note 1: Definition of viewing angle range

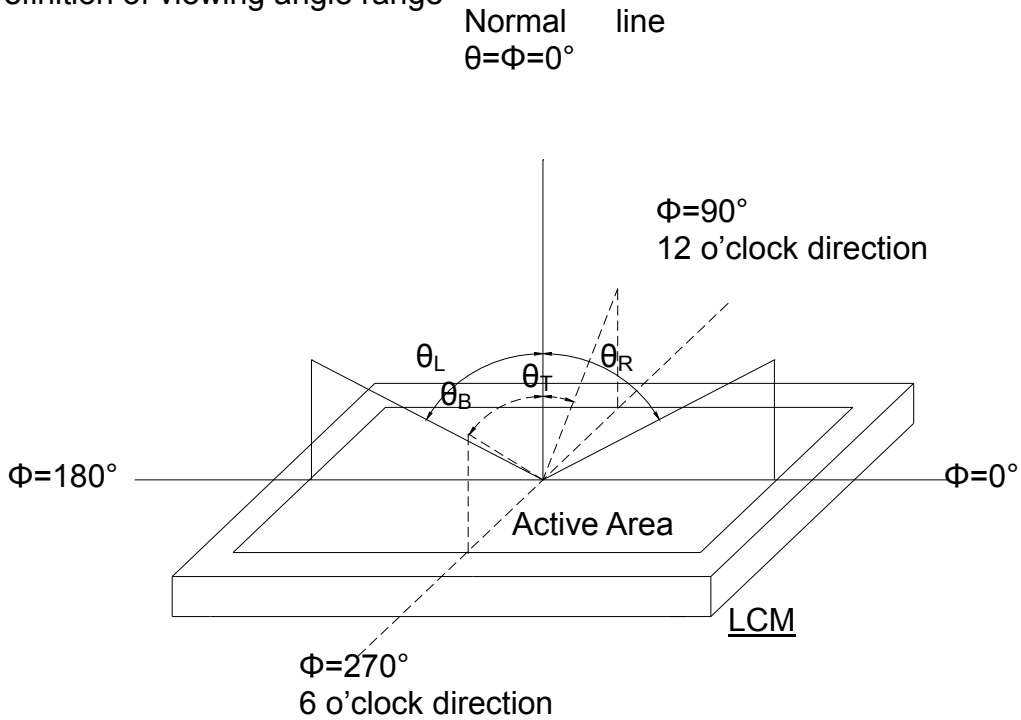


Fig. 4-1 Definition of viewing angle

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:  $1^\circ$  /Height: 500mm.)

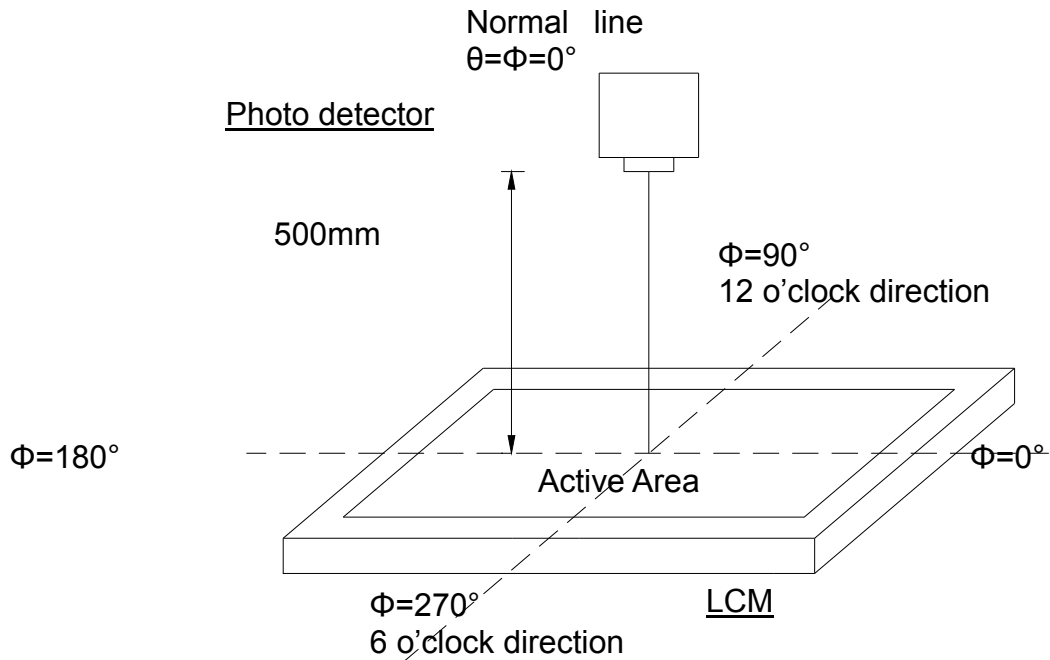


Fig. 4-2 Optical measurement system setup

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%.

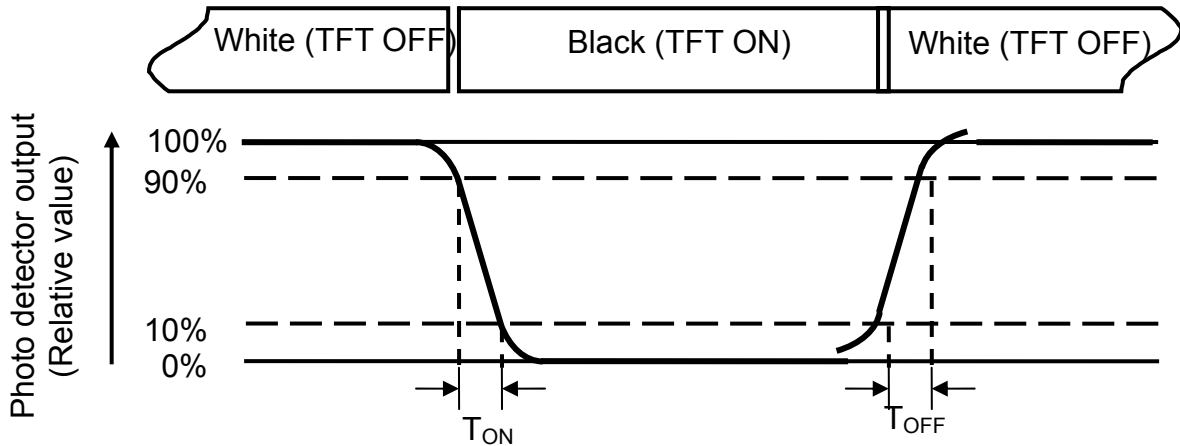


Fig. 4-3 Definition of response time

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  $V_{LED}=12V$ , PWM=100%

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

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

L-----Active area length      W----- Active area width

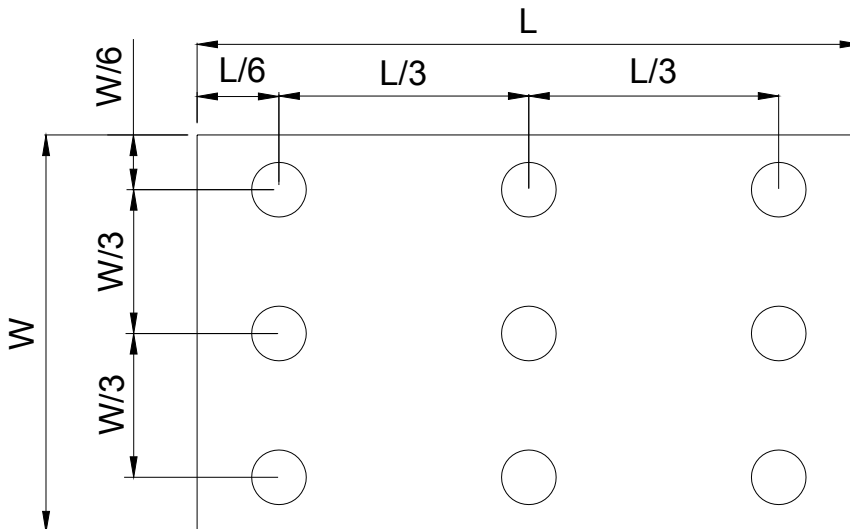


Fig. 4-4 Definition of measuring points

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

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

## 7. Reliability Test Conditions And Methods

| Item                                     | Test Conditions                            | Remark        |
|--|--|---------------|
| High Temperature Storage                 | Ta = 60°C 96 hrs                           |               |
| Low Temperature Storage                  | Ta = -20°C 96hrs                           |               |
| High Temperature Operation               | Ts = 50°C 96hrs                            |               |
| Low Temperature Operation                | Ta = -10°C 96hrs                           |               |
| Operate at High Temperature and Humidity | 40°C, 90%RH max. 96hrs                     | Operation     |
| Thermal Shock                            | -20°C~ +60°C 10 cycles 1Hrs/cycle          | Non-operation |
| Electrostatic Discharge                  | Contact=±4KV, class B<br>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

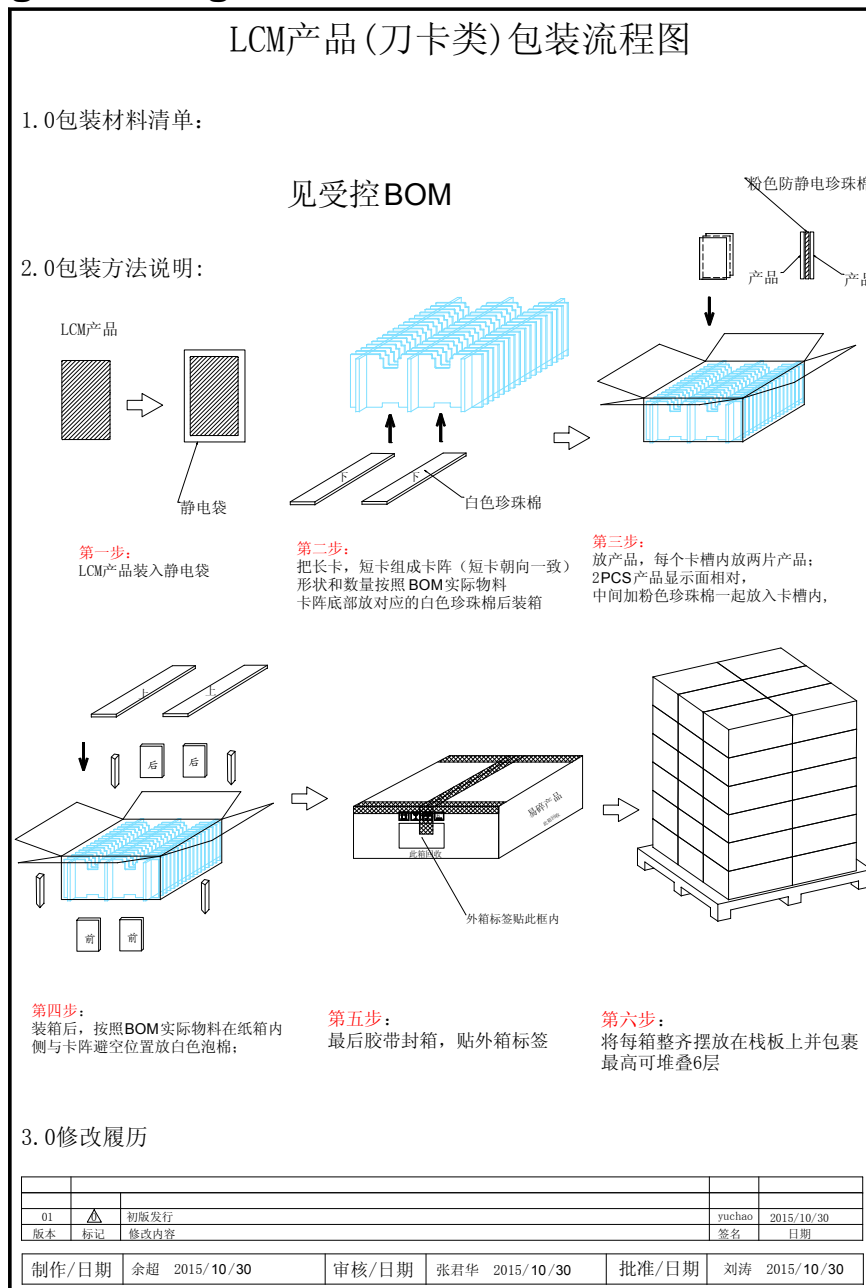
A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 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

