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Device Specification for

**TFT-LCD module**

MODEL No. **LQ133T1JW19**

☐ CUSTOMER'S APPROVAL

DATA \_\_\_\_\_

BY \_\_\_\_\_

<PART OF TECHNICAL> (Page 1 to 25)

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## RECORDS OF REVISION

MODEL NO : LQ133T1JW19

SPEC NO: LD-D21-13802A

[illegible]



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## 1. Application

This specification applies to a color TFT-LCD module, LQ133T1JW19.

## 2. Overview

This module is a color active matrix LCD module incorporating Oxide TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, a control circuit and power supply circuit, and a backlight unit. Graphics and texts can be displayed on a 2560×3×1440 dots panel with (16,777,216) colors by using eDP (Embedded Display Port) Ver1.3 to interface and supplying +3.3V DC supply voltage for TFT-LCD panel driving and applying DC supply voltage for LED backlight-driving DC/DC converter.

In this TFT-LCD panel, color filters for excellent color performance and backlights for high brightness are incorporated to realize brighter and clearer pictures, making this model optimum for use in multi-media applications.

Optimum viewings are in all directions.

Backlight-driving LED controller is built in this module.

eDP Transfer rate Specification : 2.7Gbps / 4 lane

## 3. Mechanical Specifications

| Parameter           | Specifications                         | Unit  |
|---------------------|----------------------------------------|-------|
| Display size        | 33.78 (13.3") Diagonal                 | cm    |
| Active area         | 293.76 (H)×165.24 (V)                  | mm    |
| Pixel format        | 2560 (H)×1440 (V)                      | pixel |
|                     | (1 pixel = R+G+B dots)                 |       |
| Pixel pitch         | 0.11475 (H)×0.11475 (V)                | mm    |
| Pixel configuration | R,G,B vertical stripe                  |       |
| Display mode        | Normally black                         |       |
| Surface treatment   | Anti-glare coating<br>(Haze value 42%) |       |

### Outline dimensions

| Parameter                             |        | Min.   | Typ.   | Max.   | Unit | Remark           |
|---------------------------------------|--------|--------|--------|--------|------|------------------|
| Unit outline dimensions<br>[Note 3-1] | Width  | 304.48 | 304.98 | 305.48 | mm   |                  |
|                                       | Height | 177.7  | 178.2  | 178.7  | mm   | W/o PCB          |
|                                       |        | 187.4  | 187.9  | 188.4  | mm   | W/ PCB           |
|                                       | Depth  | 2.15   | 2.35   | 2.55   | mm   | W/o shading tape |
|                                       |        | 2.20   | 2.40   | 2.60   | mm   | W/ shading tape  |
| Mass                                  |        | -      | (178)  | -      | g    |                  |

[Note 3-1] Outline dimensions is shown in Fig.2



## 4. Input Terminals

## 4 - 1. Symbol

CN1 (eDP signals, +3.3V DC power supply, and B/L power supply)

| Pin No. | Symbol     | I/O | Function                            | Remark      |
|---------|------------|-----|-------------------------------------|-------------|
| 1       | NC         | -   | Reserved for LCD manufacturer's use | [Note4-1-1] |
| 2       | H_GND      | P   | High Speed Ground                   |             |
| 3       | Lane3_N    | I   | Complement Signal Link Lane 3       |             |
| 4       | Lane3_P    | I   | True Signal Link Lane 3             |             |
| 5       | H_GND      | P   | High Speed Ground                   |             |
| 6       | Lane2_N    | I   | Complement Signal Link Lane 2       |             |
| 7       | Lane2_P    | I   | True Signal Link Lane 2             |             |
| 8       | H_GND      | P   | High Speed Ground                   |             |
| 9       | Lane1_N    | I   | Complement Signal Link Lane 1       |             |
| 10      | Lane1_P    | I   | True Signal Link Lane 1             |             |
| 11      | H_GND      | P   | High Speed Ground                   |             |
| 12      | Lane0_N    | I   | Complement Signal Link Lane 0       |             |
| 13      | Lane0_P    | I   | True Signal Link Lane 0             |             |
| 14      | H_GND      | P   | High Speed Ground                   |             |
| 15      | AUX_CH_P   | I   | True Signal Auxiliary Channel       |             |
| 16      | AUX_CH_N   | I   | Complement Signal Auxiliary Channel |             |
| 17      | H_GND      | P   | High Speed Ground                   |             |
| 18      | VDD        | P   | LCD logic and driver power(3.3V)    |             |
| 19      | VDD        | P   | LCD logic and driver power(3.3V)    |             |
| 20      | VDD        | P   | LCD logic and driver power(3.3V)    |             |
| 21      | VDD        | P   | LCD logic and driver power(3.3V)    |             |
| 22      | NC         | -   | Reserved for LCD manufacturer's use | [Note4-1-1] |
| 23      | LCD_GND    | P   | LCD logic and driver ground         |             |
| 24      | LCD_GND    | P   | LCD logic and driver ground         |             |
| 25      | LCD_GND    | P   | LCD logic and driver ground         |             |
| 26      | LCD_GND    | P   | LCD logic and driver ground         |             |
| 27      | HPD        | O   | HPD signal pin                      |             |
| 28      | BL_GND     | P   | Backlight ground                    |             |
| 29      | BL_GND     | P   | Backlight ground                    |             |
| 30      | BL_GND     | P   | Backlight ground                    |             |
| 31      | BL_GND     | P   | Backlight ground                    |             |
| 32      | BL_ENABLE  | I   | Backlight On/Off                    |             |
| 33      | BL_PWM_DIM | I   | System PWM                          |             |
| 34      | NC         | -   | Reserved for LCD manufacturer's use | [Note4-1-1] |
| 35      | NC         | -   | Reserved for LCD manufacturer's use | [Note4-1-1] |
| 36      | VBL        | P   | Backlight power                     |             |
| 37      | VBL        | P   | Backlight power                     |             |
| 38      | VBL        | P   | Backlight power                     |             |
| 39      | VBL        | P   | Backlight power                     |             |
| 40      | NC         | -   | Reserved for LCD manufacturer's     | [Note4-1-1] |

※ I : Input , O : Output , P : Power:



[Note 4-1-1] Don't input any signals or any powers into a NC pin. Keep the NC pin open.

[Note 4-1-2] The shielding case is connected with signal GND.

- Connector used : 20455-040E-02 (I-PEX)
- Corresponding connector : HD1P040MA1 (JAE) or 20454-040T (I-PEX)

(Sharp is not responsible to its product quality, if the user applies a connector not corresponding to the above model.)

#### 4 - 2. eDP interface

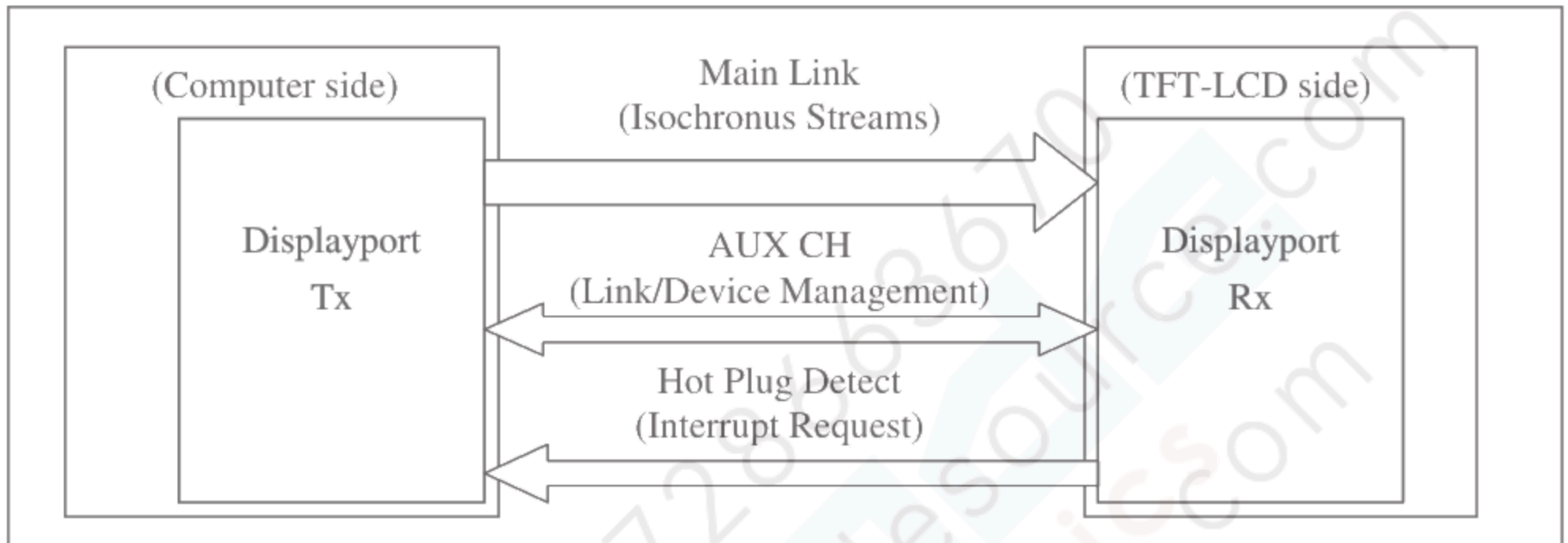


Fig.4-2-1 DP architecture.

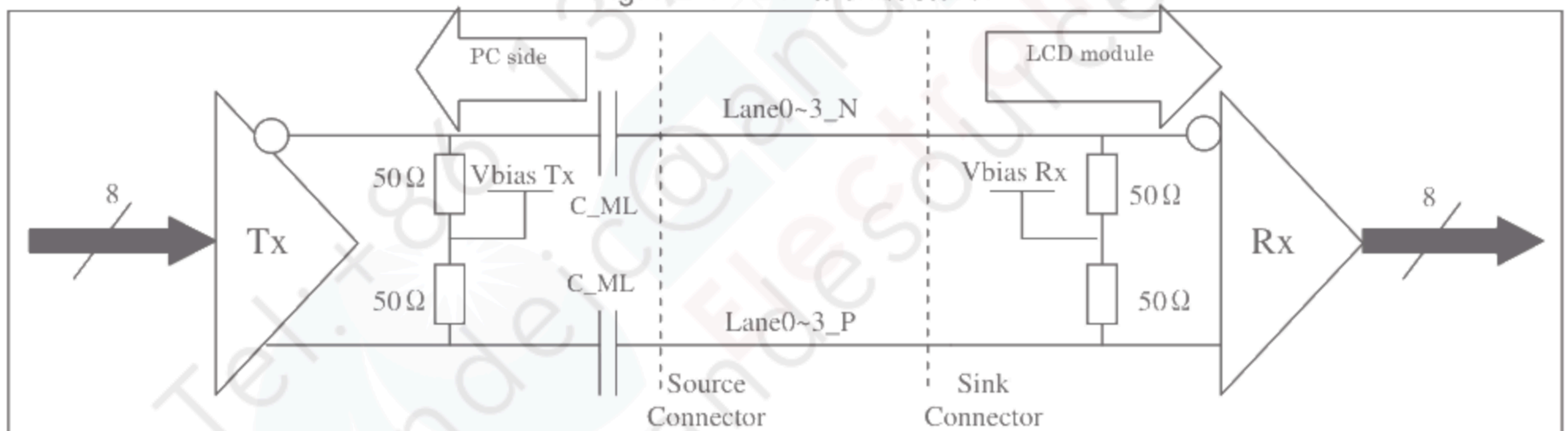


Fig.4-2-2 Main Link differential pair.

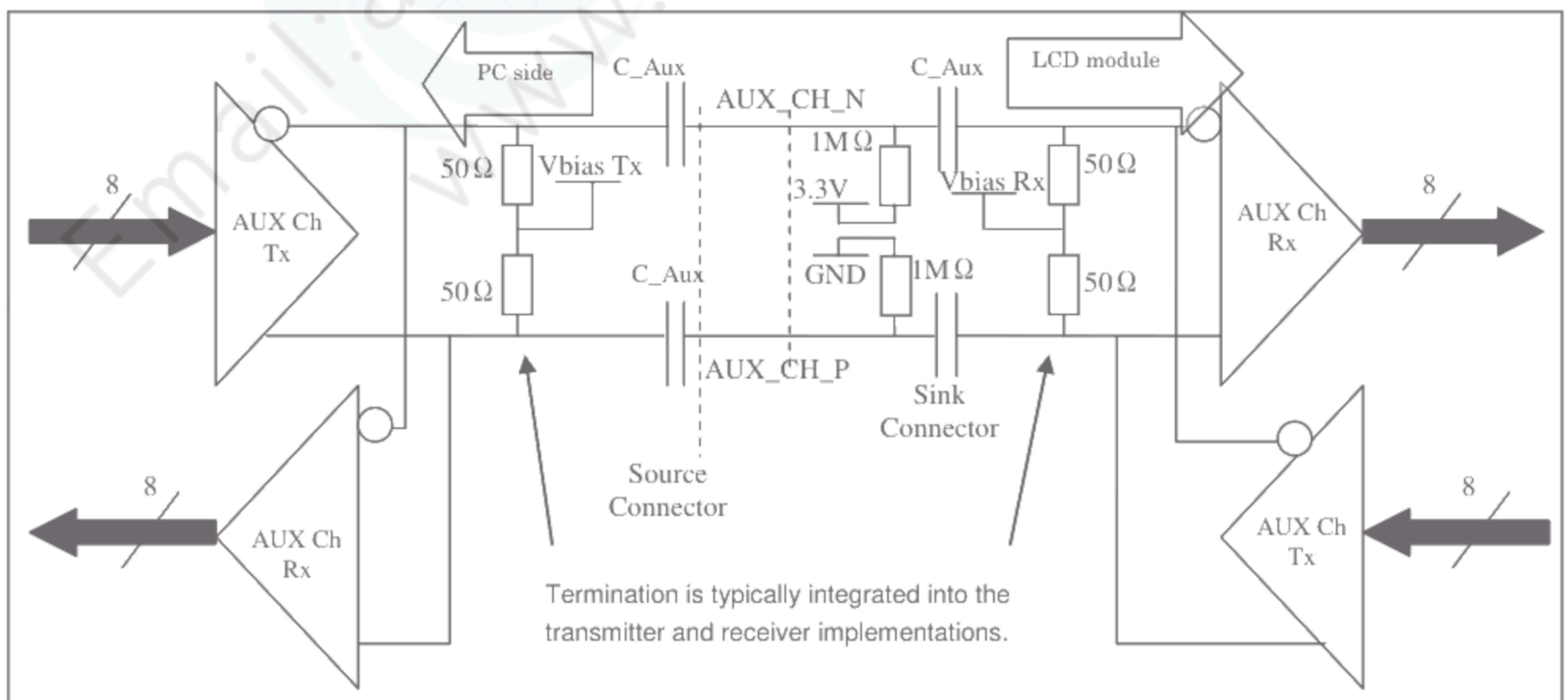


Fig.4-2-3 AUX Link differential pair.



| Lane0  | Lane1  | Lane2   | Lane3   |
|--------|--------|---------|---------|
| R0-7:0 | R1-7:0 | R2-7:0  | R3-7:0  |
| G0-7:0 | G1-7:0 | G2-7:0  | G3-7:0  |
| B0-7:0 | B1-7:0 | B2-7:0  | B3-7:0  |
| R4-7:0 | R5-7:0 | R6-7:0  | R7-7:0  |
| G4-7:0 | G5-7:0 | G6-7:0  | G7-7:0  |
| B4-7:0 | B5-7:0 | B6-7:0  | B7-7:0  |
| R8-7:0 | R9-7:0 | R10-7:0 | R11-7:0 |
| G8-7:0 | G9-7:0 | G10-7:0 | G11-7:0 |
| B8-7:0 | B9-7:0 | B10-7:0 | B11-7:0 |

Fig.4-2-4 eDP 4 lane 8 bit input data mapping.



## 5. Absolute Maximum Ratings

| Parameter                      | Symbol | Condition | Ratings |         | Unit | Remark     |
|--------------------------------|--------|-----------|---------|---------|------|------------|
|                                |        |           | Min.    | Max.    |      |            |
| +3.3V supply voltage           | VDD    | Ta=25°C   | -0.3    | +4.0    | V    |            |
| Back Light supply voltage      | VBL    | Ta=25°C   | -0.3    | +26.5   | V    |            |
| Input voltage(eDP)             | VI     | Ta=25°C   | -0.3    | 1.8     | V    | [Note 5-1] |
| Input voltage(BL)              | VBL_I  | Ta=25°C   | -0.3    | VDD+0.3 | V    | [Note 5-2] |
| Storage temperature (ambient)  | Tstg   | —         | -20     | +60     | °C   | [Note 5-3] |
| Operating temperature(ambient) | Topa   | —         | 0       | +50     | °C   |            |

[Note 5-1] eDP signals

[Note 5-2] Back light control signals (BL\_ENABLE, BL\_PWM\_DIM)

[Note 5-3] Humidity : 90%RH Max. at Ta≤+40°C.

Maximum wet-bulb temperature at +39°C or less at Ta>+40°C.

No condensation.



## 6. Electrical Characteristics

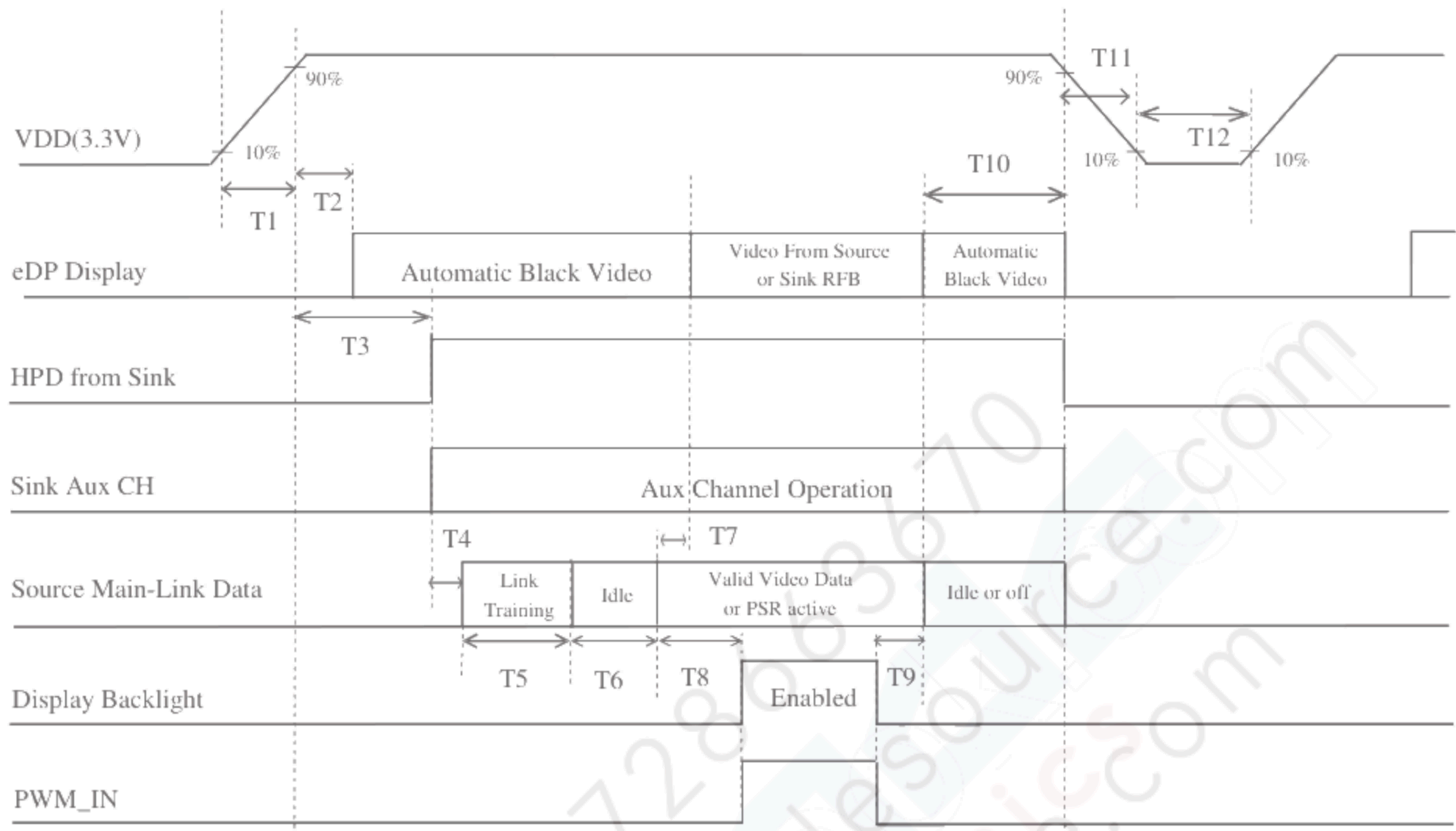
## 6 - 1. TFT-LCD panel driving

Ta=+25°C

| DC Electrical Characteristics                              |                                               |      |      |      |                   |              |
|------------------------------------------------------------|-----------------------------------------------|------|------|------|-------------------|--------------|
| Parameter                                                  | Symbol                                        | Min. | Typ. | Max. | Unit              | Remark       |
| Supply voltage                                             | VDD                                           | +3.0 | +3.3 | +3.6 | V                 | [Note 6-1-1] |
| Current dissipation                                        | IDD                                           | —    | 424  | 760  | mA                | [Note 6-1-2] |
| Power consumption                                          | P <sub>VDD</sub>                              | —    | 1.4  | 2.74 | W                 |              |
| Permissive input ripple voltage                            | V <sub>RP</sub>                               | —    | —    | 100  | mV <sub>P-P</sub> | VDD = +3.3V  |
| eDP AUX Channel Characteristics                            |                                               |      |      |      |                   |              |
| Parameter                                                  | Symbol                                        | Min. | Typ. | Max. | Unit              | Remark       |
| Unit Interval for AUX channel                              | UI <sub>AUX</sub>                             | 0.4  | 0.5  | 0.6  | μs                |              |
| peak-to-peak voltage at TP1                                | V <sub>AUX-DIFF-p</sub>                       | 0.32 | -    | 1.36 | V                 |              |
| AUX DC Common Mode Voltage                                 | V <sub>AUX-DC-CM</sub>                        | -    | 0.9  | -    | V                 |              |
| AUX Short Circuit Current Limit                            | I <sub>AUX_SHORT</sub>                        | -    | -    | 90   | mA                |              |
| AUX CH termination DC resistance                           | R <sub>AUX-TERM</sub>                         | -    | 100  | -    | Ω                 |              |
| AUX AC Coupling Capacitor                                  | C <sub>AUX</sub>                              | 75   | -    | 200  | nF                |              |
| Number of pre-charge pulses                                | Pre-charge pulses                             | 10   | -    | 16   | -                 |              |
| eDP Main Link Receiver Characteristics                     |                                               |      |      |      |                   |              |
| Parameter                                                  | Symbol                                        | Min. | Typ. | Max. | Unit              | Remark       |
| Link clock down spreading                                  | Down_Spread_Amplitude                         | 0    | -    | 0.5  | %                 |              |
| Differential Peak-to-peak Input Voltage at RX package pins | V <sub>RX-DIFFp-p</sub>                       | 90   | -    | 1380 | mV                |              |
| Differential Return Loss at 1.35 GHz at RX package pins    | RL <sub>RX-DIFF</sub>                         | 9    | -    | -    | dB                |              |
| Differential termination resistance                        | V <sub>RX-TERM</sub>                          | -    | 100  | -    | Ω                 |              |
| RX Short Circuit Current Limit                             | I <sub>RX-SHORT</sub>                         | -    | -    | 50   | mA                |              |
| Lane Intra-pair Skew at RX package pins                    | L <sub>RX-SKEW-INTRA-PAIR-High-Bit-Rate</sub> | -    | -    | 60   | ps                |              |



[Note 6-1-1] ON-OFF conditions for supply voltage



[Note6-1-2] Do not keep the interface signal high-impedance or unusual signal when power is on.

| Symbol | Min | Max | Unit | Note         |
|--------|-----|-----|------|--------------|
| T1     | 0.5 | 10  | ms   |              |
| T2     | 0   | 200 | ms   |              |
| T3     | 0   | 100 | ms   |              |
| T4     | —   | —   | ms   |              |
| T5     | —   | —   | ms   |              |
| T6     | —   | —   | ms   |              |
| T7     | 0   | 50  | ms   |              |
| T8     | —   | —   | ms   |              |
| T9     | —   | —   | ms   |              |
| T10    | 0   | 500 | ms   |              |
| T11    | 1   | 50  | ms   | [Note 6-1-3] |
| T12    | 500 | —   | ms   |              |

[Note 6-1-3] As for the power off sequence for VDD (T11), Be sure to keep above mentioned timing.

If the VDD power off sequence timing is other than shown above, LCD may cause permanent damage.

\*1 : As for the power sequence for backlight, it is recommended to apply above mentioned input timing.

If the backlight is light on and off at a timing other than shown above, displaying image may get disturbed.

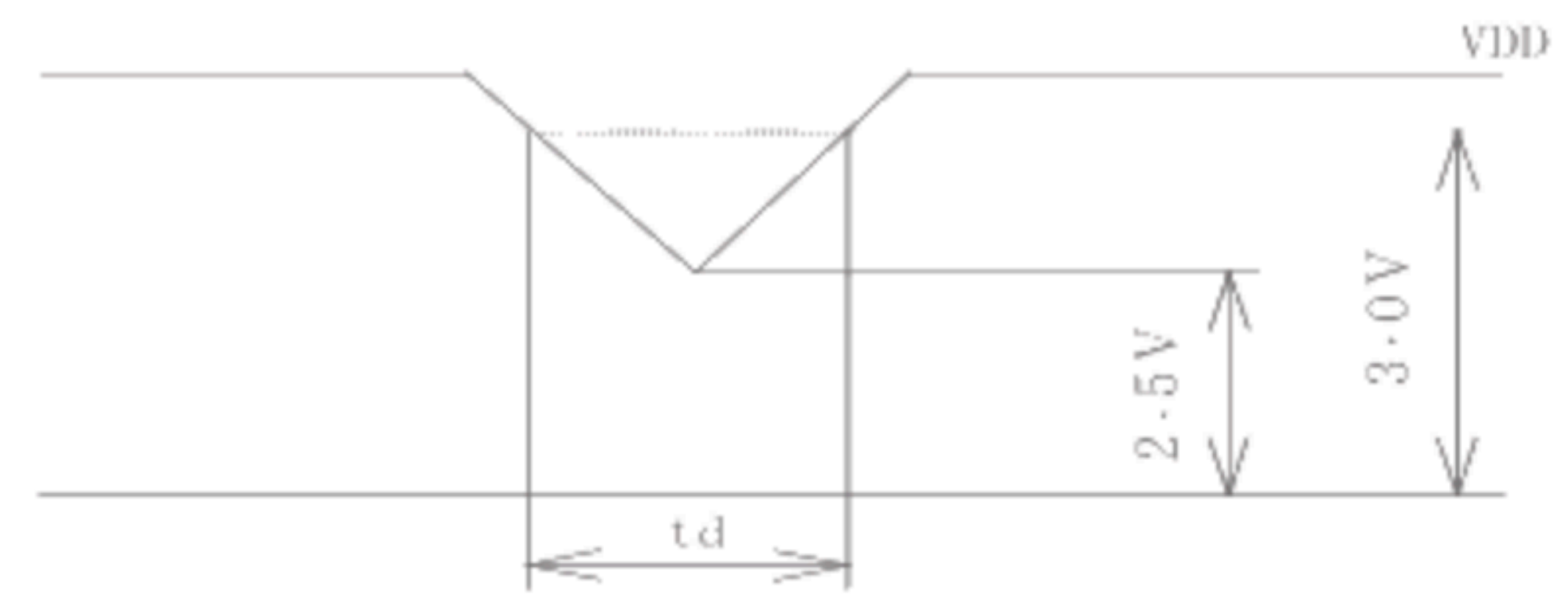


## VDD-dip conditions

- 1)  $2.5\text{ V} \leq \text{VDD} < 3.0\text{ V}$

$$t_d \leq 10\text{ ms}$$

Under above condition, the display image should return to an appropriate figure after VDD voltage recovers.

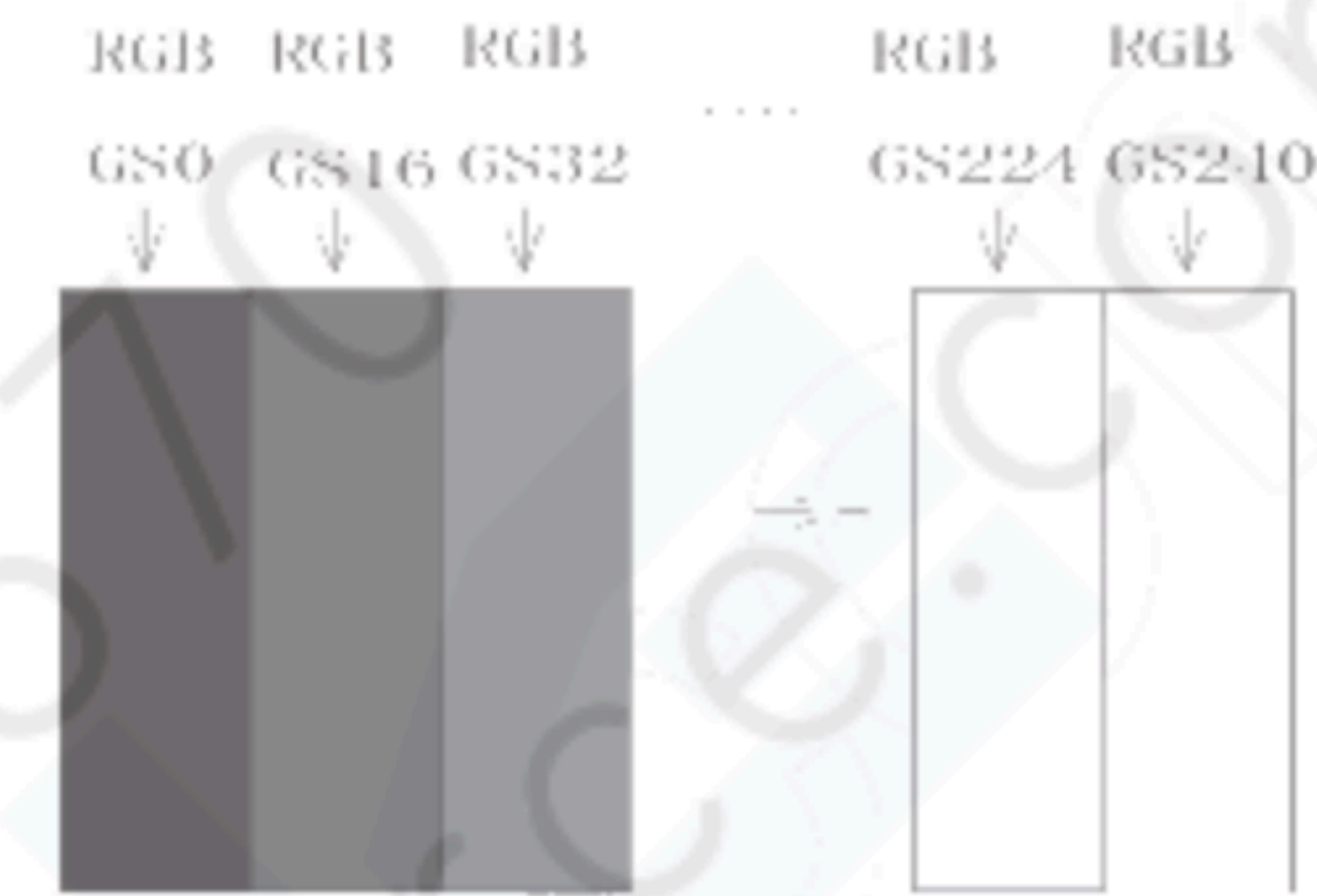


- 2)  $\text{VDD} < 2.5\text{ V}$

VDD-dip conditions should also follow the ON-OFF conditions for supply voltage

[Note 6-1-2] Typical current condition: 16-gray-bar pattern

$$\text{VDD} = +3.3\text{V}$$



Maximum current condition: Dot checker pattern

$$\text{VDD} = +3.3\text{V}$$





## 6 - 2. Backlight driving

The backlight system is an edge-lighting type with white-LED.

(It is usually required to measure under the following condition. :  $T_a=25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ )

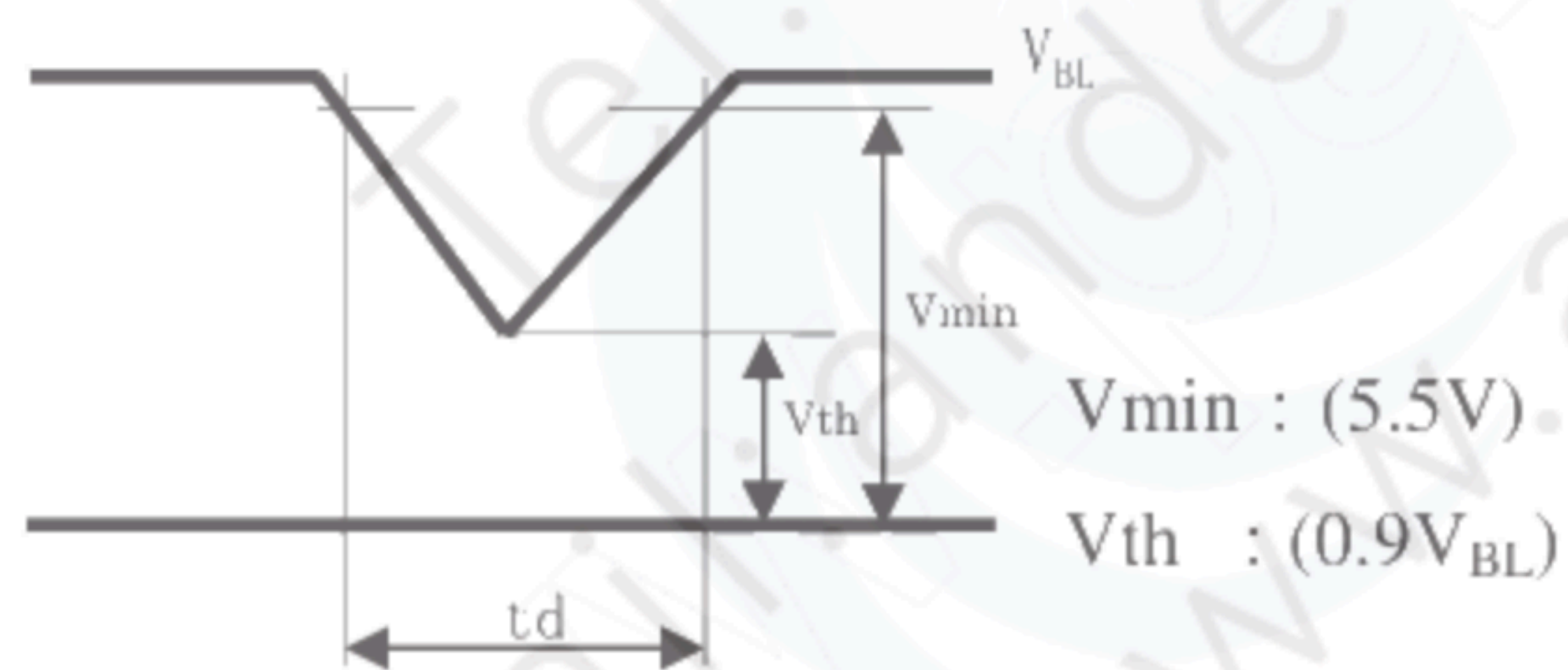
| Parameter                      | Symbol     | Min. | Typ.   | Max   | Unit          | Remark                                                                     |
|--------------------------------|------------|------|--------|-------|---------------|----------------------------------------------------------------------------|
| Supply voltage                 | $V_{BL}$   | 5.5  | 12.0   | 21.0  | V             |                                                                            |
| Current dissipation            | $I_{BL}$   | —    | (345)  | (820) | mA            | $V_{BL}=12.0\text{V(TYP)}$<br>$V_{BL}=5.5\text{V(MAX)}$<br>Duty Ratio=100% |
| Modulated light signal voltage | $V_{PWMH}$ | 2.0  | —      | VDD   | V             |                                                                            |
|                                | $V_{PWL}$  | 0    | —      | 0.8   | V             |                                                                            |
| Brightness Control Duty Ratio  | Duty       | 2    | —      | 100   | %             | 【Note6-2-1】                                                                |
| Brightness Control pulse width | $T_{PWM}$  | 10   | —      | —     | us            | 【Note6-2-2】                                                                |
| Brightness Control frequency   | $f_{PWM}$  | 200  | 200    | 2,000 | Hz            |                                                                            |
| LED-BL ON/OFF High voltage     | $V_{CNTH}$ | 2.0  | —      | VDD   | V             | 【Note6-2-3】                                                                |
| LED-BL ON/OFF Low voltage      | $V_{CNTL}$ | 0    | —      | 0.8   | V             |                                                                            |
| Input signal pin current       | $I_{IN}$   | —    | —      | 1.0   | $\mu\text{A}$ | $V_{CNT}$ , $V_{PWM}$ pin                                                  |
| LED lifetime                   | -          | —    | 10,000 | —     | h             | LED                                                                        |

【Note6-2-1】  $V_{PWM}$  Input : 100%= Max luminance    2%= Min luminance

【Note6-2-2】 The minimum value of the dimming signal pulse width is assumed regulations of the width of high and the width of low.

【Note6-2-3】  $V_{CNT}$  Input : High or OPEN = BL turn on, Low =BL turn off

$V_{BL}$ -dip conditions



$$1) V_{th} \leq V_{BL} < V_{min} : t_d \leq 20\text{ms}$$

2)  $V_{BL} < V_{th}$  : The condition of instantaneous voltage drop is apply to input voltage sequences



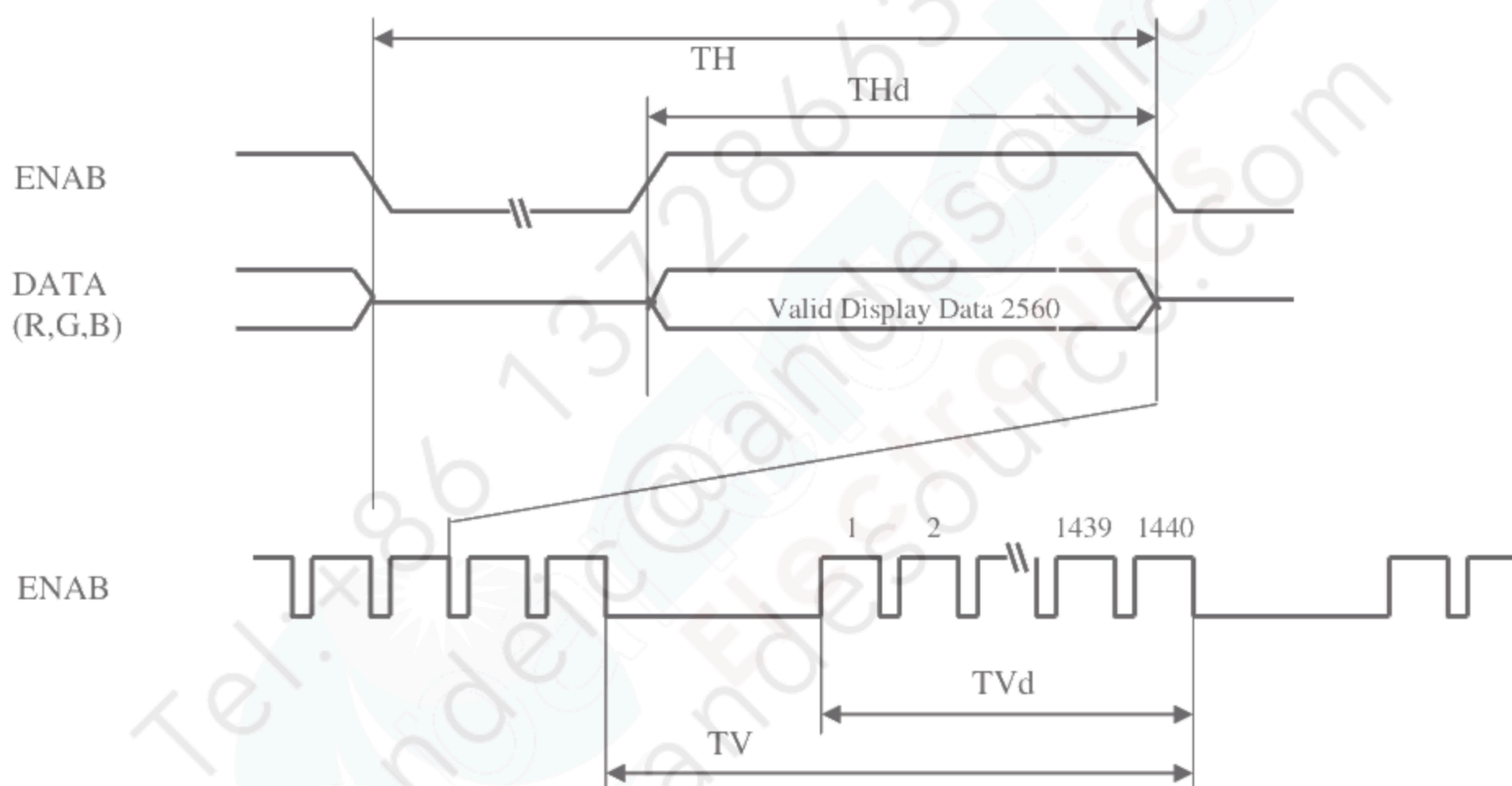
## 7. Timing Characteristics of Input Signals

## 7 - 1. Timing characteristics

VDD=+3.0V~+3.6V, Ta=0°C~+50°C

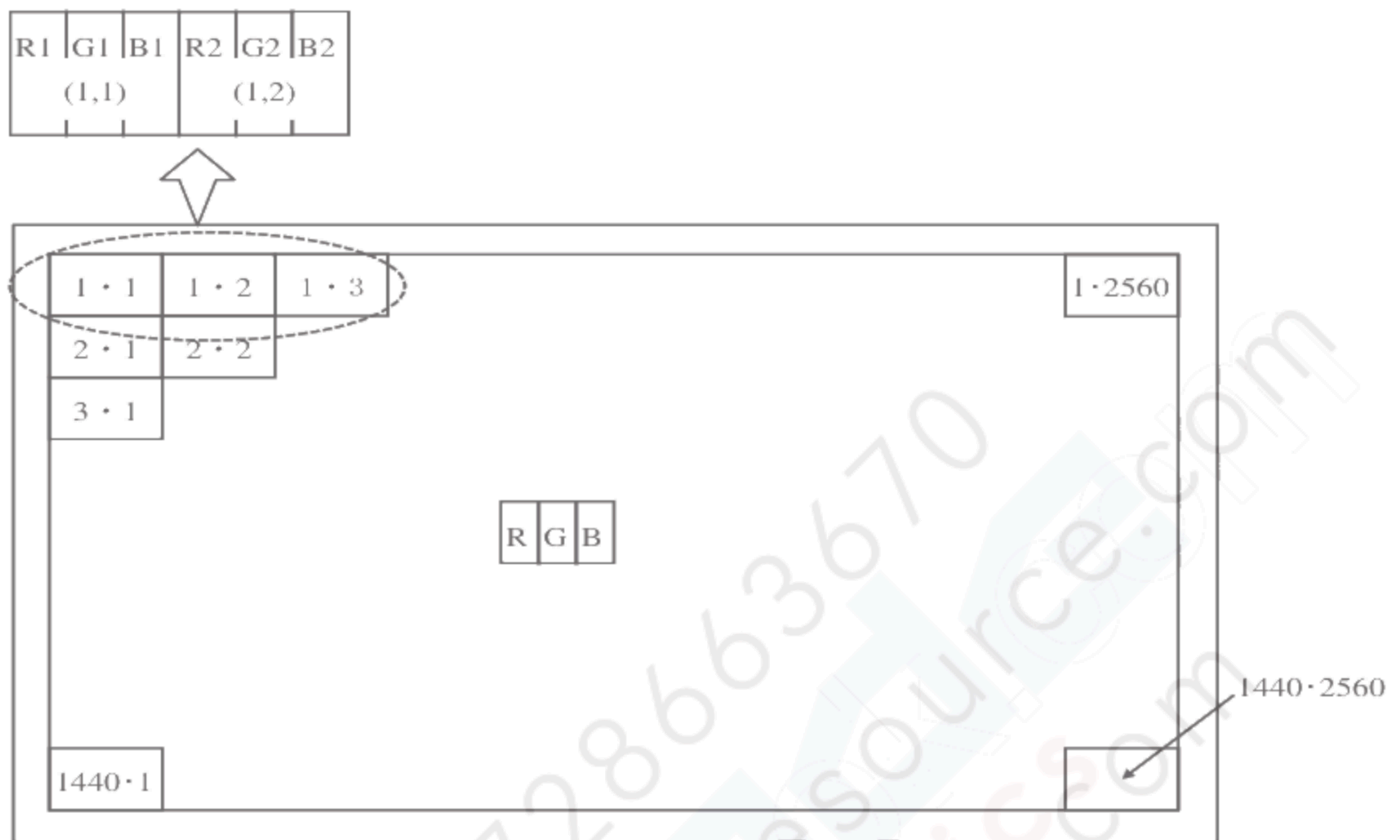
| Parameter             |                          | Symbol | Min. | Typ.   | Max. | Unit    | Remark       |
|-----------------------|--------------------------|--------|------|--------|------|---------|--------------|
| Clock                 | Frequency                | 1/Tc   | —    | 244.35 | —    | MHz     | [Note 7-1-1] |
| Data enable<br>Signal | Horizontal period        | TH     | —    | 2720   | —    | clock   |              |
|                       |                          |        |      | 11.13  |      | $\mu s$ |              |
|                       | Horizontal period (High) | THd    | —    | 2560   | —    | clock   |              |
|                       | Vertical period          | TV     | —    | 1498   | —    | Line    |              |
|                       |                          |        | —    | 16.68  | —    | ms      |              |
|                       | Vertical period (High)   | TVd    | —    | 1440   | —    | line    |              |

[Note 7-1-1] In case of using the long vertical period, the deterioration of display quality, flicker, etc, may occur.





## 7 - 2. Input data signals and display position on the screen



Display position of input data(V · H)



## 8. Input Signals, Basic Display Colors and Gray Scale of Each Color

|                     | Colors & |       | Date signal |    |    |    |    |    |    |     |    |    |    |    |    |    |     |    |    |    |    |    |    |     |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|---------------------|----------|-------|-------------|----|----|----|----|----|----|-----|----|----|----|----|----|----|-----|----|----|----|----|----|----|-----|----|----|---|---|--|--|-----|--|--|--|--|--|--|-----|--|--|--|--|--|
|                     | Gray     | Gray  | R0          | R1 | R2 | R3 | R4 | R5 | R6 | R7  | G0 | G1 | G2 | G3 | G4 | G5 | G6  | G7 | B0 | B1 | B2 | B3 | B4 | B5  | B6 | B7 |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Scale    | Scale | LSB         |    |    |    |    |    |    | MSB |    |    |    |    |    |    | LSB |    |    |    |    |    |    | MSB |    |    |   |   |  |  | LSB |  |  |  |  |  |  | MSB |  |  |  |  |  |
| Basic Color         | Black    | —     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Blue     | —     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1 | 1 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Green    | —     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Cyan     | —     | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Red      | —     | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Magenta  | —     | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Yellow   | —     | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | White    | —     | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
| Gray Scale of Red   | Black    | GS0   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↑        | GS1   | 1           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Darker   | GS2   | 0           | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↑        | ↓     | ↓           |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↓        | ↓     | ↓           |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Brighter | GS253 | 1           | 0  | 1  | 1  | 1  | 1  | 1  | 1   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↓        | GS254 | 0           | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Red      | GS255 | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
| Gray Scale of Green | Black    | GS0   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↑        | GS1   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Darker   | GS2   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↑        | ↓     | ↓           |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↓        | ↓     | ↓           |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Brighter | GS253 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1  | 0  | 1  | 1  | 1  | 1  | 1   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↓        | GS254 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Green    | GS255 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 | 0 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
| Gray Scale of Blue  | Black    | GS0   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↑        | GS1   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Darker   | GS2   | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 0  | 0  | 0  | 0   | 0  | 0  | 0 |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↑        | ↓     | ↓           |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↓        | ↓     | ↓           |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |    |    |    |    | ↓   |    |    |   |   |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Brighter | GS253 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 1  | 0  | 1  | 1  | 1  | 1   | 1  | 1  | 1 | 1 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | ↓        | GS254 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1 | 1 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |
|                     | Blue     | GS255 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 0  | 0  | 0   | 0  | 1  | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1 | 1 |  |  |     |  |  |  |  |  |  |     |  |  |  |  |  |

0 : Low level voltage, 1 : High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals.

According to the combination of 24 bit data signals, the 16.7M color display can be achieved on the screen.



## 9. EDID Specifications

## 9 - 1. EDID data structure

This is the EDID(Extended Display Identification Data) data formats to support displays as defined in the VESA Plug & Display

| Byte<br>(decimal) | Byte<br>(hex) | Field Name and Comments                               | Value<br>(hex) | Value<br>(binary) |
|-------------------|---------------|-------------------------------------------------------|----------------|-------------------|
| 0                 | 00            | Header                                                | 00             | 00000000          |
| 1                 | 01            | Header                                                | FF             | 11111111          |
| 2                 | 02            | Header                                                | FF             | 11111111          |
| 3                 | 03            | Header                                                | FF             | 11111111          |
| 4                 | 04            | Header                                                | FF             | 11111111          |
| 5                 | 05            | Header                                                | FF             | 11111111          |
| 6                 | 06            | Header                                                | FF             | 11111111          |
| 7                 | 07            | Header                                                | 00             | 00000000          |
| 8                 | 08            | EISA manufacture code = SHP                           | 4D             | 01001101          |
| 9                 | 09            | EISA manufacture code (Compressed ASCII)              | 10             | 00010000          |
| 10                | 0A            | Product code (LQ133T1JW19 : 5138)                     | 12             | 00010010          |
| 11                | 0B            | Product code (hex,LSB first)                          | 14             | 00010100          |
| 12                | 0C            | LCD module Serial No (fixed "0")                      | 00             | 00000000          |
| 13                | 0D            | LCD module Serial No (fixed "0")                      | 00             | 00000000          |
| 14                | 0E            | LCD module Serial No (fixed "0")                      | 00             | 00000000          |
| 15                | 0F            | LCD module Serial No (fixed "0")                      | 00             | 00000000          |
| 16                | 10            | Week of manufacture                                   | 24             | 00100100          |
| 17                | 11            | Year of manufacture - 1990 (ex 2000 - 1990 = 10)      | 17             | 00010111          |
| 18                | 12            | EDID structure version # = 1                          | 01             | 00000001          |
| 19                | 13            | EDID revision # = 4                                   | 04             | 00000100          |
| 20                | 14            | Video i/p definition = Digital 8bit DP support        | A5             | 10100101          |
| 21                | 15            | Max H image size(cm) = 29cm                           | 1D             | 00011101          |
| 22                | 16            | Max V image size(cm) = 17cm                           | 11             | 00010001          |
| 23                | 17            | Display gamma (2.2×100) - 100 = 120                   | 78             | 01111000          |
| 24                | 18            | Feature support(stanby,suspend,RGB color/Prefer Time) | 06             | 00000110          |
| 25                | 19            | Red/Green Low bit(RxRy/GxGy)                          | 88             | 10001000          |
| 26                | 1A            | Blue/White Low bit(BxBY/WxWy)                         | 00             | 00000000          |
| 27                | 1B            | Red X(Rx) (written value 0.643 )                      | A4             | 10100100          |
| 28                | 1C            | Red Y(Ry) (written value 0.336 )                      | 56             | 01010110          |
| 29                | 1D            | Green X(Gx) (written value 0.303 )                    | 4D             | 01001101          |
| 30                | 1E            | Green Y(Gy) (written value 0.602 )                    | 9A             | 10011010          |
| 31                | 1F            | Blue X(Bx) (written value 0.149 )                     | 26             | 00100110          |
| 32                | 20            | Blue Y(By) (written value 0.051 )                     | 0D             | 00001101          |
| 33                | 21            | White X(Wx) (written value 0.313 )                    | 50             | 01010000          |
| 34                | 22            | White Y(Wy) (written value 0.329 )                    | 54             | 01010100          |
| 35                | 23            | Established timings 1                                 | 00             | 00000000          |
| 36                | 24            | Established timings 2                                 | 00             | 00000000          |
| 37                | 25            | Established timings 3(Manufacture's reserved timing)  | 00             | 00000000          |
| 38                | 26            | Standard timing ID1                                   | 01             | 00000001          |
| 39                | 27            | Standard timing ID1                                   | 01             | 00000001          |



|    |    |                                                                                                |    |          |
|----|----|------------------------------------------------------------------------------------------------|----|----------|
| 40 | 28 | Standard timing ID2                                                                            | 01 | 00000001 |
| 41 | 29 | Standard timing ID2                                                                            | 01 | 00000001 |
| 42 | 2A | Standard timing ID3                                                                            | 01 | 00000001 |
| 43 | 2B | Standard timing ID3                                                                            | 01 | 00000001 |
| 44 | 2C | Standard timing ID4                                                                            | 01 | 00000001 |
| 45 | 2D | Standard timing ID4                                                                            | 01 | 00000001 |
| 46 | 2E | Standard timing ID5                                                                            | 01 | 00000001 |
| 47 | 2F | Standard timing ID5                                                                            | 01 | 00000001 |
| 48 | 30 | Standard timing ID6                                                                            | 01 | 00000001 |
| 49 | 31 | Standard timing ID6                                                                            | 01 | 00000001 |
| 50 | 32 | Standard timing ID7                                                                            | 01 | 00000001 |
| 51 | 33 | Standard timing ID7                                                                            | 01 | 00000001 |
| 52 | 34 | Standard timing ID8                                                                            | 01 | 00000001 |
| 53 | 35 | Standard timing ID8                                                                            | 01 | 00000001 |
| 54 | 36 | Detailed timing descriptor#1 fck/10000 (=244.35MHz/10000=24435=5F73h)                          | 73 | 01110011 |
| 55 | 37 | #1 fck                                                                                         | 5F | 01011111 |
| 56 | 38 | #1 Horizontal active 2560=A00h 00h                                                             | 00 | 00000000 |
| 57 | 39 | #1 Horizontal blanking 160=0A0h A0h                                                            | A0 | 10100000 |
| 58 | 3A | #1 Horizontal active/Horizontal blanking A0h                                                   | A0 | 10100000 |
| 59 | 3B | #1 Vertical active 1440=5A0h A0h                                                               | A0 | 10100000 |
| 60 | 3C | #1 Vertical blanking 58=03Ah 3Ah                                                               | 3A | 00111010 |
| 61 | 3D | #1 Vertical active/Vertical blanking 50h                                                       | 50 | 01010000 |
| 62 | 3E | #1 Horizontal sync , offset(Thfp) 48=030h 30h                                                  | 30 | 00110000 |
| 63 | 3F | #1 Horizontal sync , width 32=020h 20h                                                         | 20 | 00100000 |
| 64 | 40 | #1 Vertical sync,offset / Vertical sync,width (offset=Eh/width=5h)                             | E5 | 11100101 |
| 65 | 41 | #1 Horizontal sync offset/width/Vertical sync offset/width                                     | 00 | 00000000 |
| 66 | 42 | #1 Horizontal image size 293.76mm=126h 26h                                                     | 26 | 00100110 |
| 67 | 43 | #1 Vertical image size 165mm=0A5h A5h                                                          | A5 | 10100101 |
| 68 | 44 | #1 Horizontal image size / Vertical image size 10h                                             | 10 | 00010000 |
| 69 | 45 | Horizontal boader                                                                              | 00 | 00000000 |
| 70 | 46 | Vertical boader                                                                                | 00 | 00000000 |
| 71 | 47 | Flags(Non-interlaced=0/non 3D=00/Degital separate=11/Horizontal polarity/Vertical polarity=00) | 18 | 00011000 |
| 72 | 48 | Detailed timing descriptor#2 fck/10000 (=195.2529152MHz/10000=19525=4C45h)                     | 45 | 01000101 |
| 73 | 49 | #2 fck                                                                                         | 4C | 01001100 |
| 74 | 4A | #2 Horizontal active 2560=A00h 00h                                                             | 00 | 00000000 |
| 75 | 4B | #2 Horizontal blanking 160=0A0h A0h                                                            | A0 | 10100000 |
| 76 | 4C | #2 Horizontal active/Horizontal blanking A0h                                                   | A0 | 10100000 |
| 77 | 4D | #2 Vertical active 1440=5A0h A0h                                                               | A0 | 10100000 |
| 78 | 4E | #2 Vertical blanking 58=03Ah 3Ah                                                               | 3A | 00111010 |
| 79 | 4F | #2 Vertical active/Vertical blanking 50h                                                       | 50 | 01010000 |
| 80 | 50 | #2 Horizontal sync , offset(Thfp) 48=030h 30h                                                  | 30 | 00110000 |
| 81 | 51 | #2 Horizontal sync , width 32=020h 20h                                                         | 20 | 00100000 |
| 82 | 52 | #2 Vertical sync,offset / Vertical sync,width (offset=Eh/width=5h)                             | E5 | 11100101 |
| 83 | 53 | #2 Horizontal sync offset/width/Vertical sync offset/width                                     | 00 | 00000000 |
| 84 | 54 | #2 Horizontal image size 293.76mm=126h 26h                                                     | 26 | 00100110 |
| 85 | 55 | #2 Vertical image size 165mm=0A5h A5h                                                          | A5 | 10100101 |
| 86 | 56 | #2 Horizontal image size / Vertical image size 10h                                             | 10 | 00010000 |



|     |    |                                                                                                |    |          |
|-----|----|------------------------------------------------------------------------------------------------|----|----------|
| 87  | 57 | Horizontal boader                                                                              | 00 | 00000000 |
| 88  | 58 | Vertical boader                                                                                | 00 | 00000000 |
| 89  | 59 | Flags(Non-interlaced=0/non 3D=00/Degital separate=11/Horizontal polarity/Vertical polarity=00) | 18 | 00011000 |
| 90  | 5A | Detailed timing descriptor#2 fck/10000 (=162.9824MHz/10000=16298=3FAAh)                        | AA | 10101010 |
| 91  | 5B | #3 fck                                                                                         | 3F | 00111111 |
| 92  | 5C | #3 Horizontal active 2560=A00h 00h                                                             | 00 | 00000000 |
| 93  | 5D | #3 Horizontal blanking 160=0A0h A0h                                                            | A0 | 10100000 |
| 94  | 5E | #3 Horizontal active/Horizontal blanking A0h                                                   | A0 | 10100000 |
| 95  | 5F | #3 Vertical active 1440=5A0h A0h                                                               | A0 | 10100000 |
| 96  | 60 | #3 Vertical blanking 58=03Ah 3Ah                                                               | 3A | 00111010 |
| 97  | 61 | #3 Vertical active/Vertical blanking 50h                                                       | 50 | 01010000 |
| 98  | 62 | #3 Horizontal sync , offset(Thfp) 48=030h 30h                                                  | 30 | 00110000 |
| 99  | 63 | #3 Horizontal sync , width 32=020h 20h                                                         | 20 | 00100000 |
| 100 | 64 | #3 Vertical sync,offset / Vertical sync,width (offset=Eh/width=5h)                             | E5 | 11100101 |
| 101 | 65 | #3 Horizontal sync offset/width/Vertical sync offset/width                                     | 00 | 00000000 |
| 102 | 66 | #3 Horizontal image size 293.76mm=126h 26h                                                     | 26 | 00100110 |
| 103 | 67 | #3 Vertical image size 165mm=0A5h A5h                                                          | A5 | 10100101 |
| 104 | 68 | #3 Horizontal image size / Vertical image size 10h                                             | 10 | 00010000 |
| 105 | 69 | Horizontal boader                                                                              | 00 | 00000000 |
| 106 | 6A | Vertical boader                                                                                | 00 | 00000000 |
| 107 | 6B | Flags(Non-interlaced=0/non 3D=00/Degital separate=11/Horizontal polarity/Vertical polarity=00) | 18 | 00011000 |
| 108 | 6C | Detailed timing descriptor #4                                                                  | 00 | 00000000 |
| 109 | 6D | Flag                                                                                           | 00 | 00000000 |
| 110 | 6E | Reserved                                                                                       | 00 | 00000000 |
| 111 | 6F | Display Product name                                                                           | FC | 11111100 |
| 112 | 70 | Flag                                                                                           | 00 | 00000000 |
| 113 | 71 | Supplier P/N#1 (L)                                                                             | 4C | 01001100 |
| 114 | 72 | Supplier P/N#2 (Q)                                                                             | 51 | 01010001 |
| 115 | 73 | Supplier P/N#3 (1)                                                                             | 31 | 00110001 |
| 116 | 74 | Supplier P/N#4 (3)                                                                             | 33 | 00110011 |
| 117 | 75 | Supplier P/N#5 (3)                                                                             | 33 | 00110011 |
| 118 | 76 | Supplier P/N#6 (T)                                                                             | 54 | 01010100 |
| 119 | 77 | Supplier P/N#7 (1)                                                                             | 31 | 00110001 |
| 120 | 78 | Supplier P/N#8 (J)                                                                             | 4A | 01001010 |
| 121 | 79 | Supplier P/N#9 (W)                                                                             | 57 | 01010111 |
| 122 | 7A | Supplier P/N#10 (1)                                                                            | 31 | 00110001 |
| 123 | 7B | Supplier P/N#11 (9)                                                                            | 39 | 00111001 |
| 124 | 7C | Supplier P/N#12 ("Space")                                                                      | 0A | 00001010 |
| 125 | 7D | (If<13 char,then terminate with ASCII code 0Ah,set remaining char 20h)                         | 20 | 00100000 |
| 126 | 7E | Extension flag                                                                                 | 00 | 00000000 |
| 127 | 7F | Checksum                                                                                       | B6 | 10110110 |



## Optical Characteristics

Ta=+25°C, VDD=+3.3V

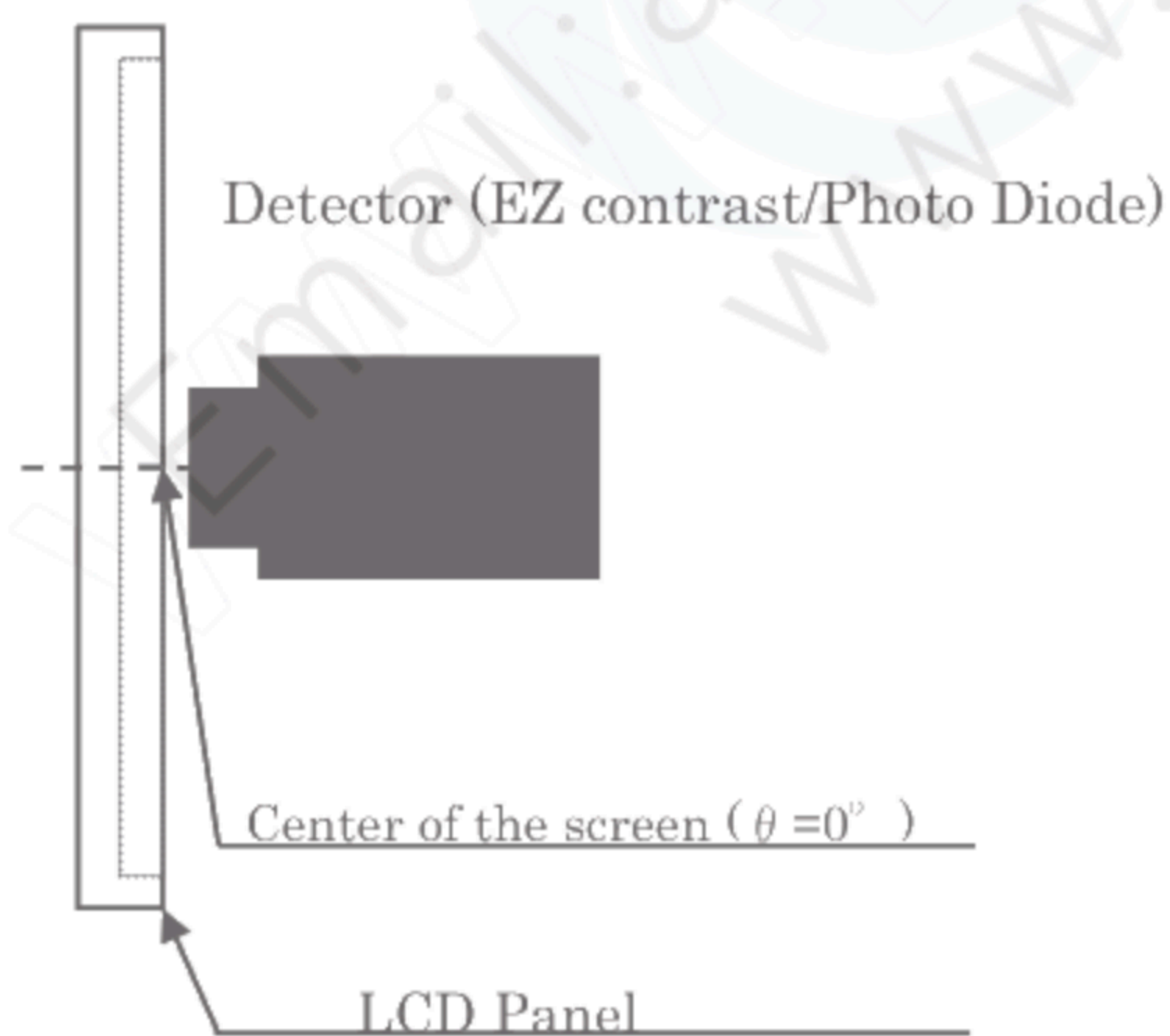
| Parameter             |            | Symbol                   | Condition           | Min.  | Typ.  | Max.  | Unit              | Remark                                                   |
|-----------------------|------------|--------------------------|---------------------|-------|-------|-------|-------------------|----------------------------------------------------------|
| Viewing angle range   | Horizontal | $\theta\ 21, \theta\ 22$ | CR>10               | 70    | 80    | —     | deg.              | [Note 10-1, 10-3, 10-4, 10-6]                            |
|                       | Vertical   | $\theta\ 11$             |                     | 70    | 80    | —     | deg.              |                                                          |
|                       |            | $\theta\ 12$             |                     | 70    | 80    | —     | deg               |                                                          |
| Contrast ratio        |            | CR                       | $\theta =0^{\circ}$ | 700   | 1000  | —     |                   | [Note 10-2, 10-4, 10-6]                                  |
| Response time         |            | $\tau\ r+ \tau\ d$       | $\theta =0^{\circ}$ | —     | 25    | —     | ms                | [Note 10-2, 10-5, 10-6]                                  |
| Chromaticity of white |            | x                        |                     | 0.283 | 0.313 | 0.343 |                   | [Note 10-2, 10-6]<br>Normal operation<br>(PWM Duty=100%) |
|                       |            | y                        |                     | 0.299 | 0.329 | 0.359 |                   |                                                          |
| Chromaticity of red   |            | x                        |                     | —     | 0.643 | —     |                   |                                                          |
|                       |            | y                        |                     | —     | 0.336 | —     |                   |                                                          |
| Chromaticity of green |            | x                        |                     | —     | 0.303 | —     |                   |                                                          |
|                       |            | y                        |                     | —     | 0.602 | —     |                   |                                                          |
| Chromaticity of blue  |            | x                        |                     | —     | 0.149 | —     |                   |                                                          |
|                       |            | Y                        |                     | —     | 0.051 | —     |                   |                                                          |
| NTSC ratio            |            |                          |                     | —     | 72    | —     |                   |                                                          |
| Luminance of white    |            | $Y_{Li}$                 |                     | 280   | 350   | —     | cd/m <sup>2</sup> |                                                          |
| White Uniformity      |            | $\delta\ w$              | $\theta =0^{\circ}$ | —     | 1.25  | 1.40  |                   |                                                          |

※ The measurement shall be taken 30 minutes after lighting the module at the following rating:

Condition: PWM Duty = 100%

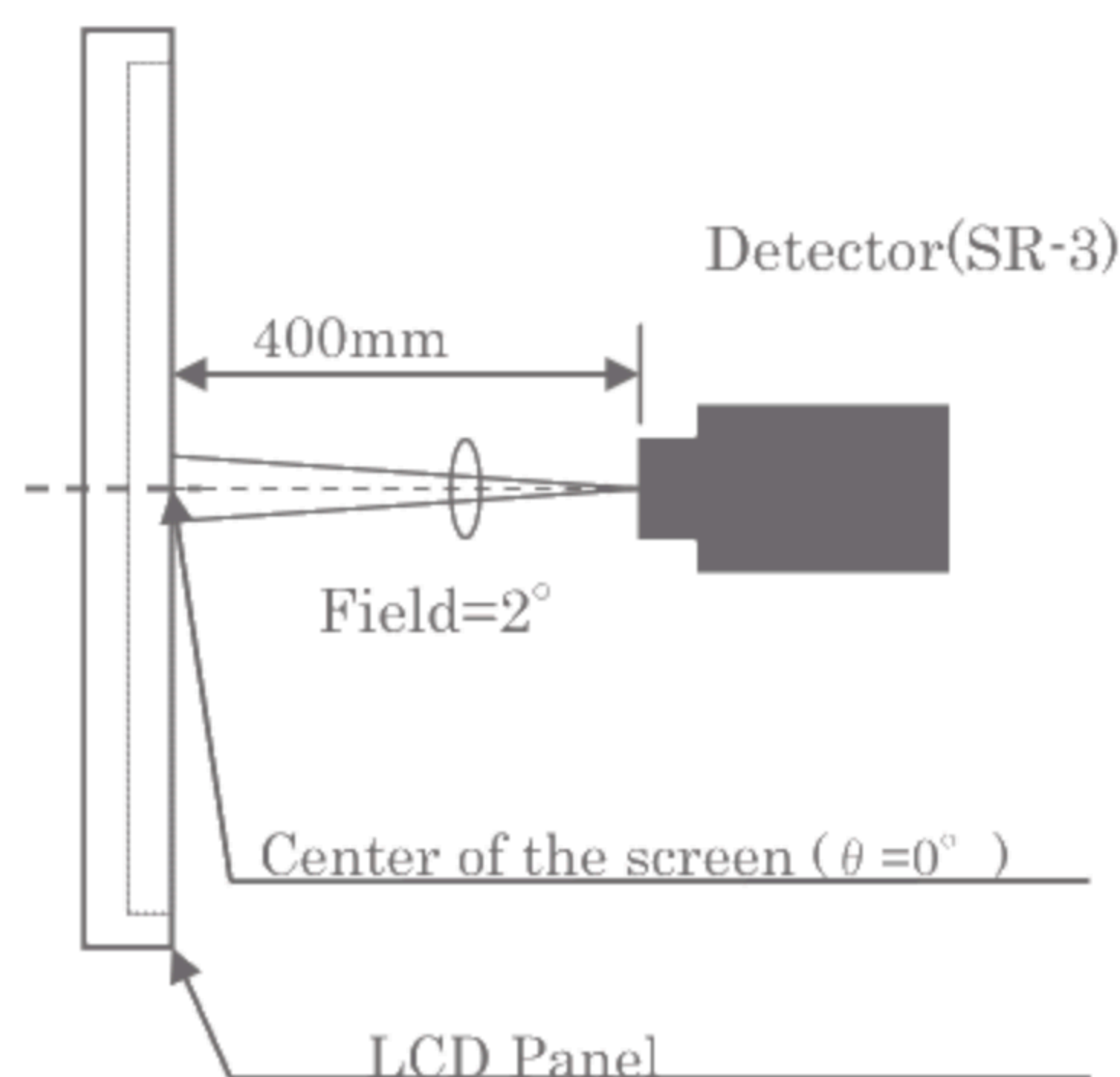
The optical characteristics shall be measured in a dark room or equivalent.

[Note 10-1] Measurement of viewing angle range and Response time.



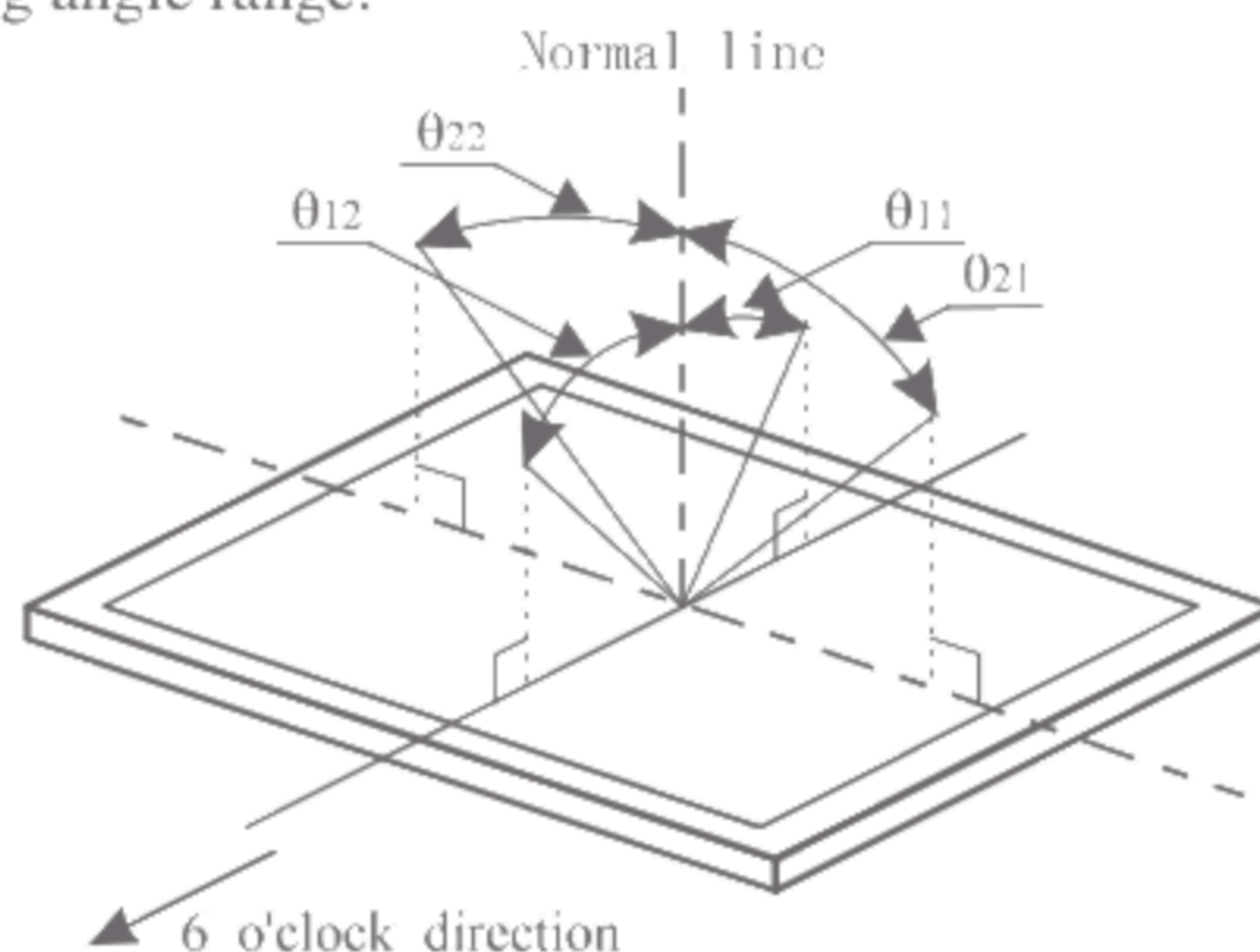
Viewing angle range: EZ-CONTRAST  
/Response time: Photo diode)

[Note 10-2] Measurement of luminance and Chromaticity and Contrast.





[Note 10-3] Definitions of viewing angle range:



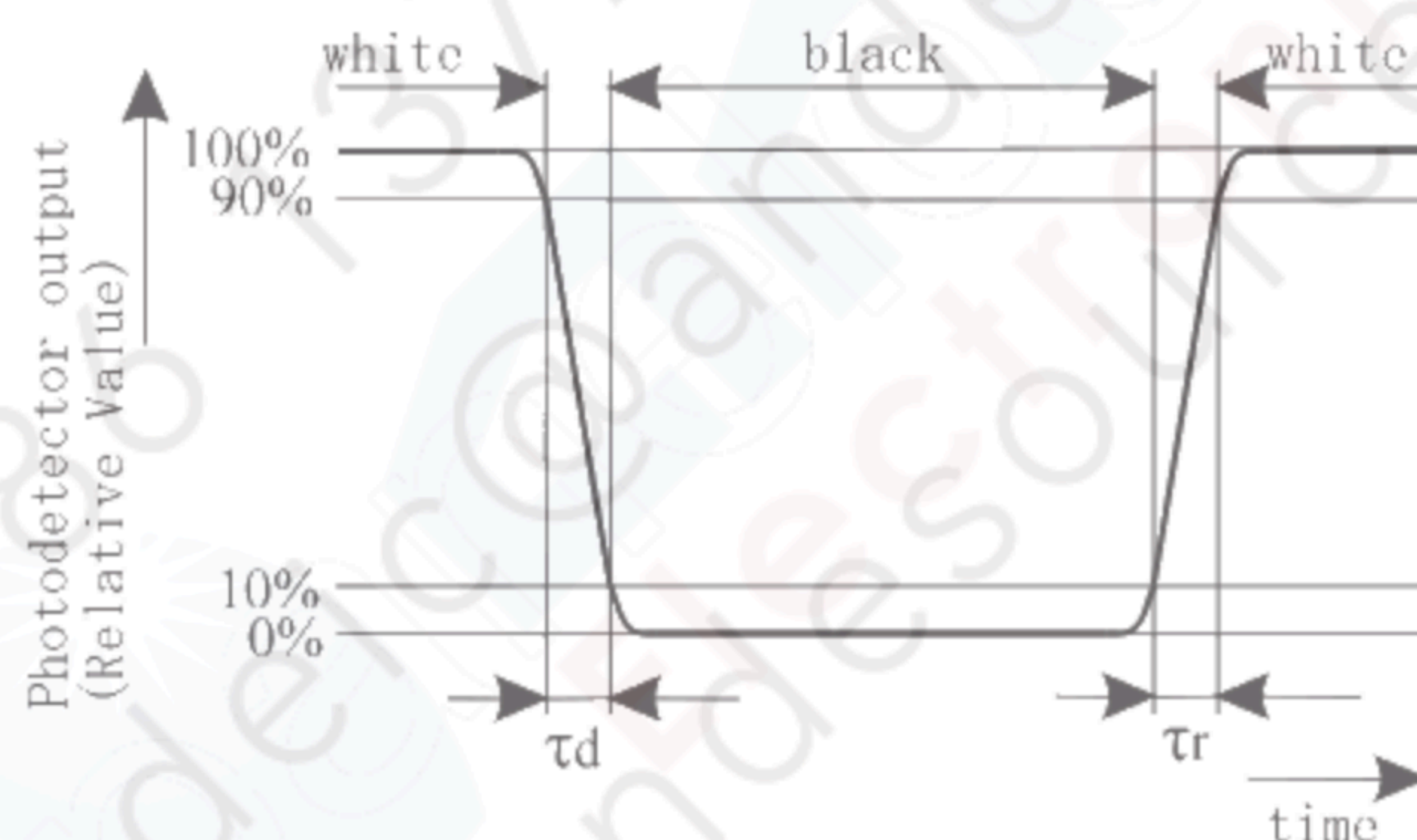
[Note 10-4] Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

[Note 10-5] Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

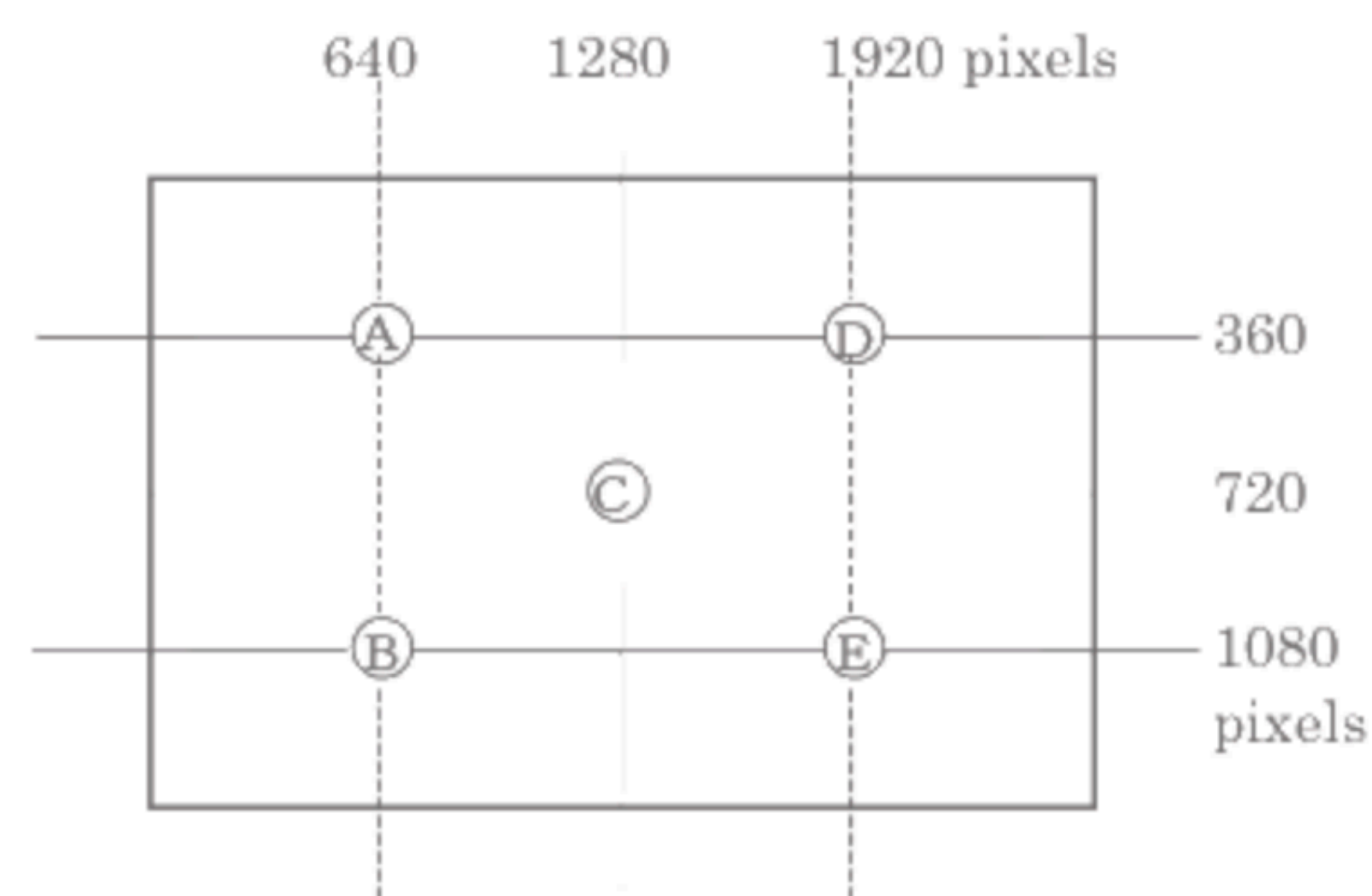


[Note 10-6] This shall be measured at center of the screen.

[Note 10-7] Definition of white uniformity:

White uniformity is defined as the following with five measurements (A~E).

$$\delta_w = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$



## 10. Display Quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standard.



## 11. Handling Precautions

- a) Be sure to turn off the power supply when inserting or disconnecting the cable.  
Please insert for too much stress not to join a connector in the case of insertion of a connector.
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
- c) Since the front polarizer is easily damaged, pay attention not to scratch it.
- d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
- g) Since CMOS LSI is used in this module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.
- h) This module has its circuitry PCBs on the side and should be handled carefully in order not to be stressed.
- i) Protect sheet(Laminate film) is attached to the module surface to prevent it from being scratched. Peel the sheet off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc. Working under the following environments is desirable.
  - All workers wear conductive shoes, conductive clothes, conductive fingerstalls and grounding belts without fail.
  - Use Ionized blower for electrostatic removal, and peel of the protect sheet with a constant speed. (Peeling of it at over 2 seconds)
- j) The polarizer surface on the panel is treated with Anti Glare . In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.
- k) Do not expose the LCD module to a direct sunlight, for a long period of time to protect the module from the ultra violet ray.
- l) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.
- m) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.
- n) Disassembling the module can cause permanent damage and should be strictly avoided.  
Please don't remove the fixed tape, insulating tape etc that was pasted on the original module.  
(Except for protection film of the panel.)
- o) Be careful when using it for long time with fixed pattern display as it may cause afterimage.  
(Please use a screen saver etc., in order to avoid an afterimage.)
- p) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.
- q) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series),  
tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film.  
Be sure to confirm the component of them.
- r) Do not use polychloroprene. If you use it, there is some possibility of generating  $\text{Cl}_2$  gas that influences the reliability of the connection between LCD panel and driver IC.



- t) Do not put a laminate film on LCD module, after peeling of the original one. If you put on it, it may cause discoloration or spots because of the occurrence of air gaps between the polarizer and the film.
- u) Ground module bezel to stabilize against EMI and external noise.

## 12. Packing Condition

|                                                   |                    |
|---------------------------------------------------|--------------------|
| Piling number of cartons                          | 6                  |
| Package quantity in one carton                    | 20 pcs             |
| Carton size                                       | 550 x 450 x 233 mm |
| Total mass of one carton filled with full modules | 9.6kg              |
| Packing form                                      | Fig.1              |



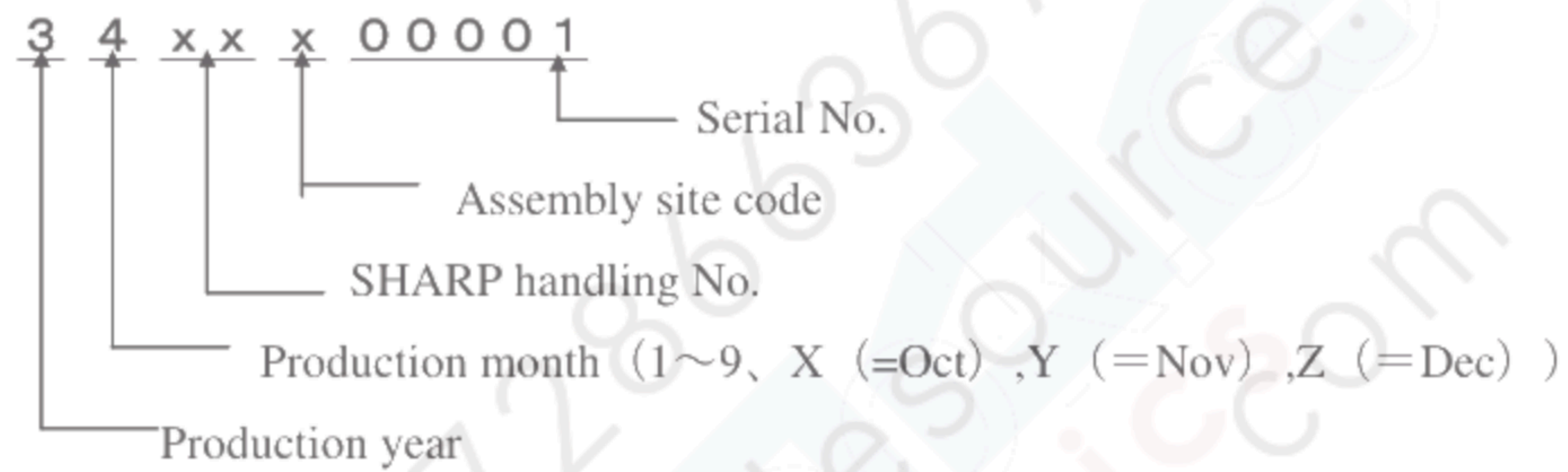
## 13. Label

## 1) Module Bar code label:

①Model.No. ②Barcode( Model No.) ③Serial No. ④User Model.No. ⑤User Version No.



## Serial No.



## 2) Packing Bar code label:

Notation/ Bar code: ①Model No. ②Date ③Quantity (20pcs / Carton )



## 14. RoHS Directive

This LCD module is compliant with RoHS Directive.



## 15. Reliability Test Items

| No. | Test item                                          | Conditions                                                                                                                                                                     |
|-----|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | High temperature storage test                      | Ta = 60°C      240h                                                                                                                                                            |
| 2   | Low temperature storage test                       | Ta = -20°C      240h                                                                                                                                                           |
| 3   | High temperature<br>& high humidity operation test | Ta = 40°C ; 90%RH    240h<br>(No condensation)                                                                                                                                 |
| 4   | High temperature operation test                    | Ta = 50°C      240h                                                                                                                                                            |
| 5   | Low temperature operation test                     | Ta = 0°C      240h                                                                                                                                                             |
| 6   | Vibration test<br>(non- operating)                 | Frequency:10~57Hz/Vibration width (one side):0.076mm<br>:57~500Hz/Acceleration:9.8m/s <sup>2</sup><br>Sweep time: 11minutes<br>Test period: 1 hour for each direction of X,Y,Z |
| 7   | Shock test<br>(non- operating)                     | Max. gravity : 490 m/s <sup>2</sup><br>Pulse width : 11 ms, half sine wave<br>Direction : ±X,±Y,±Z<br>once for each direction.                                                 |
| 8   | ESD                                                | ±200V, 200pF(0Ω) 1time/each terminal                                                                                                                                           |

[Result Evaluation Criteria] Under the display quality test conditions with normal operation state.

Do not change these conditions as such changes may affect practical display function.

[Normal operation state] Temperature : +15~+35°C, Humidity : 45~75%, Atmospheric pressure : 86~106kPa





Fig. 1 Packing Condition





Fig. 2 Outline Dimensions