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DEVICE SPECIFICATION FOR  
**TFT-LCD Module**  
 MODEL No.  
**LQ121X3LG02**

☐ CUSTOMER'S APPROVAL

DATE \_\_\_\_\_

BY \_\_\_\_\_

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### RECORDS OF REVISION

LQ121X3LG02

[illegible]



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## 1. Applicable Scope

This specification applies to a color TFT-LCD Module "LQ121X3LG02".

## 2. General Description

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit and power supply circuit and a back light unit.

Graphics and texts can be displayed on a 1024 x 3 x 768 dots panel with 262,144 colors by using LVDS (Low Voltage Differential Signaling) to interface and supplying +3.3V DC supply voltage for TFT-LCD panel driving and supply voltage for back light.

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

Optimum viewing direction is 6 o'clock.

LED Backlight-driving DC/DC converter is not built in this module.

## 3. Mechanical (Physical) Specifications

| Item                | Specifications                | Unit  |
|---------------------|-------------------------------|-------|
| Display size        | 30.7 (12.1" ) diagonal        | cm    |
| Active area         | 254.8 (H) × 184.3(V)          | mm    |
| Pixel format        | 1024 (H) x 768 (V)            | pixel |
|                     | (1Pixel = R+G+B dots)         | -     |
| Aspect ratio        | 4 : 3                         |       |
| Pixel pitch         | 0.240 (H) x 0.240 (V)         | mm    |
| Pixel configuration | R,G,B vertical stripes        | -     |
| Display mode        | Normally White                | -     |
| Surface treatment   | Antiglare and hard-coating 2H | -     |

| Parameter               |        | Min.  | Typ.  | Max.  | Unit |
|-------------------------|--------|-------|-------|-------|------|
| Unit outline dimensions | Width  | 258.5 | 259.0 | 259.5 | mm   |
|                         | Height | 204.5 | 205.0 | 205.5 | mm   |
|                         | Depth  | —     | 7.5   | 8.0   | mm   |
| Mass [Note 3-1]         |        | —     | 530   | 550   | g    |

Outline dimensions is shown in Fig.2

[Note 3-1] excluding LED backlight FPC and the mounting tab.

## 4. Input Terminals

## 4-1. TFT-LCD panel driving

CN1 (LVDS signals and +3.3V DC power supply))

| Pin No. | Symbol | Function                        | Remark     |
|---------|--------|---------------------------------|------------|
| 1       | Vcc    | +3.3V power supply              |            |
| 2       | Vcc    | +3.3V power supply              |            |
| 3       | GND    |                                 |            |
| 4       | GND    |                                 |            |
| 5       | RxIN0- | Receiver signal of LVDS CH0 (-) | [Note 4-1] |
| 6       | RxIN0+ | Receiver signal of LVDS CH0 (+) | [Note 4-1] |
| 7       | GND    |                                 |            |
| 8       | RxIN1- | Receiver signal of LVDS CH1 (-) | [Note 4-1] |
| 9       | RxIN1+ | Receiver signal of LVDS CH1 (+) | [Note 4-1] |
| 10      | GND    |                                 |            |
| 11      | RxIN2- | Receiver signal of LVDS CH2 (-) | [Note 4-1] |
| 12      | RxIN2+ | Receiver signal of LVDS CH2 (+) | [Note 4-1] |
| 13      | GND    |                                 |            |
| 14      | CK IN- | Receiver signal of LVDS CLK (-) | [Note 4-1] |
| 15      | CK IN+ | Receiver signal of LVDS CLK (+) | [Note 4-1] |
| 16      | GND    |                                 |            |
| 17      | NC     |                                 | [Note 4-2] |
| 18      | NC     |                                 | [Note 4-2] |
| 19      | GND    |                                 |            |
| 20      | GND    |                                 |            |

[Note 4-1] Relation between RxINi(i=0,1,2) and actual data is shown in following section (4-2)(7-2).

[Note 4-2] Please use NC by OPEN or GND. NC terminal is not connected with the internal circuit.

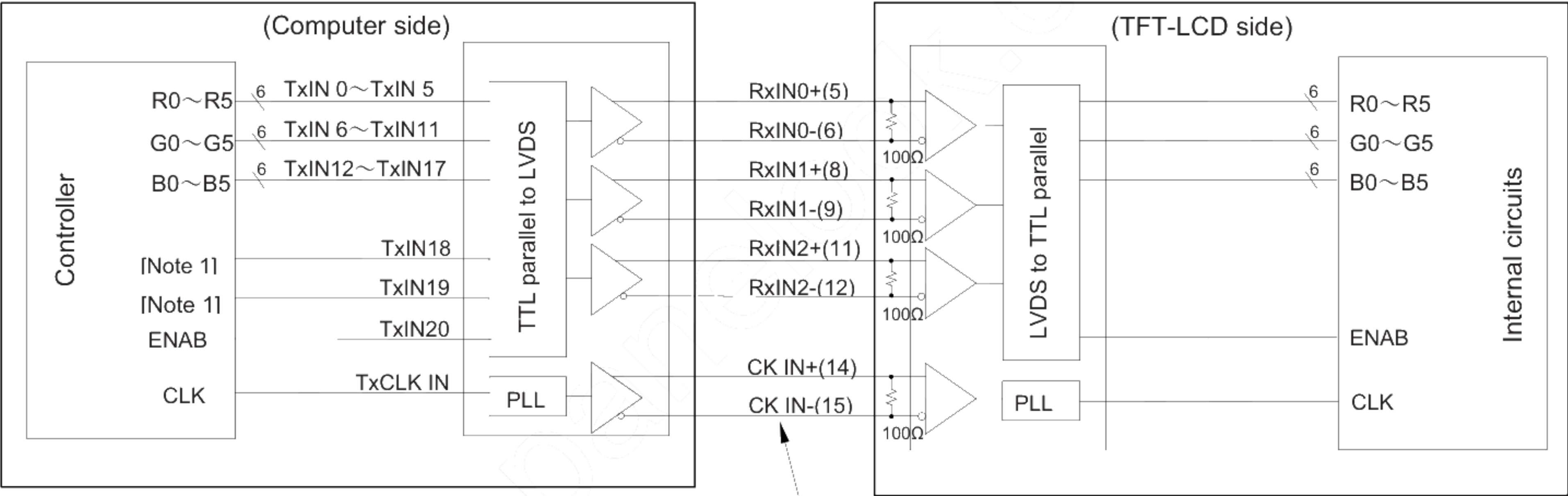
Using connector : DF19L-20P-1H (HIROSE) or equivalent.

Corresponding connector : DF19G-20S-1C(HIROSE)

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

4-2. LVDS interface block diagram

Using receiver : Single LVDS interface contained in a control IC  
Corresponding Transmitter : THC63LVDM63A (THINE) or equivalent



[Note] Do not use at high-impedance TxIN 18 - 19.

Symbol of CN1 (Pin No.)



## 4-3. Backlight driving

## LED-Back Light FPC

| Pin No. | Symbol | Function         | Remark     |
|---------|--------|------------------|------------|
| 1       | LED_C1 | LED-B/L Cathode1 |            |
| 2       | LED_C2 | LED-B/L Cathode2 |            |
| 3       | LED_C3 | LED-B/L Cathode3 |            |
| 4       | LED_C4 | LED-B/L Cathode4 |            |
| 5       | LED_C5 | LED-B/L Cathode5 |            |
| 6       | NC     |                  | [Note 4-3] |
| 7       | LED_A  | LED-B/L Anode    |            |
| 8       | LED_A  | LED-B/L Anode    |            |
| 9       | LED_A  | LED-B/L Anode    |            |
| 10      | LED_A  | LED-B/L Anode    |            |

[Note 4-3] Please use NC by OPEN. NC terminal is not connected with the internal circuit.

Corresponding connector : 52746-1071(MOLEX)

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

## 5. Absolute Maximum Ratings

| Item                            | Symbol       | Conditions               | Rated value |              | Unit             | Remarks        |
|---------------------------------|--------------|--------------------------|-------------|--------------|------------------|----------------|
|                                 |              |                          | Min.        | Max.         |                  |                |
| Input voltage                   | $V_I$        | $T_a = 25^\circ\text{C}$ | -0.3        | $V_{CC}+0.3$ | V                | [Note 5-1]     |
| +3.3V supply voltage            | $V_{CC}$     | $T_a = 25^\circ\text{C}$ | 0           | +4.0         | V                |                |
| LED forward current             | $I_{LED\_F}$ | $T_a = 25^\circ\text{C}$ | 0           | 280          | mA               | [Note 5-2]     |
| LED reverse current             | $I_{LED\_R}$ | $T_a = 25^\circ\text{C}$ | —           | 85           | mA               |                |
| Storage Temperature             | $T_{stg}$    | -                        | -35         | +75          | $^\circ\text{C}$ | [Note 5-3]     |
| Operating Temperature (Ambient) | $T_{opr}$    | $T_a = 25^\circ\text{C}$ | -20         | +50          | $^\circ\text{C}$ | [Note 5-3,5-4] |

[Note 5-1] LVDS signals

[Note 5-2] Value for one LED string

[Note 5-3] Humidity : 90%RH Max. at  $T_a \leq +40^\circ\text{C}$ .

Maximum wet-bulb temperature at  $+39^\circ\text{C}$  or less at  $T_a > +40^\circ\text{C}$ .

No condensation.

[Note 5-4] Temperature of Panel surface is  $60^\circ\text{C}$  Max.



## 6. Electrical Characteristics

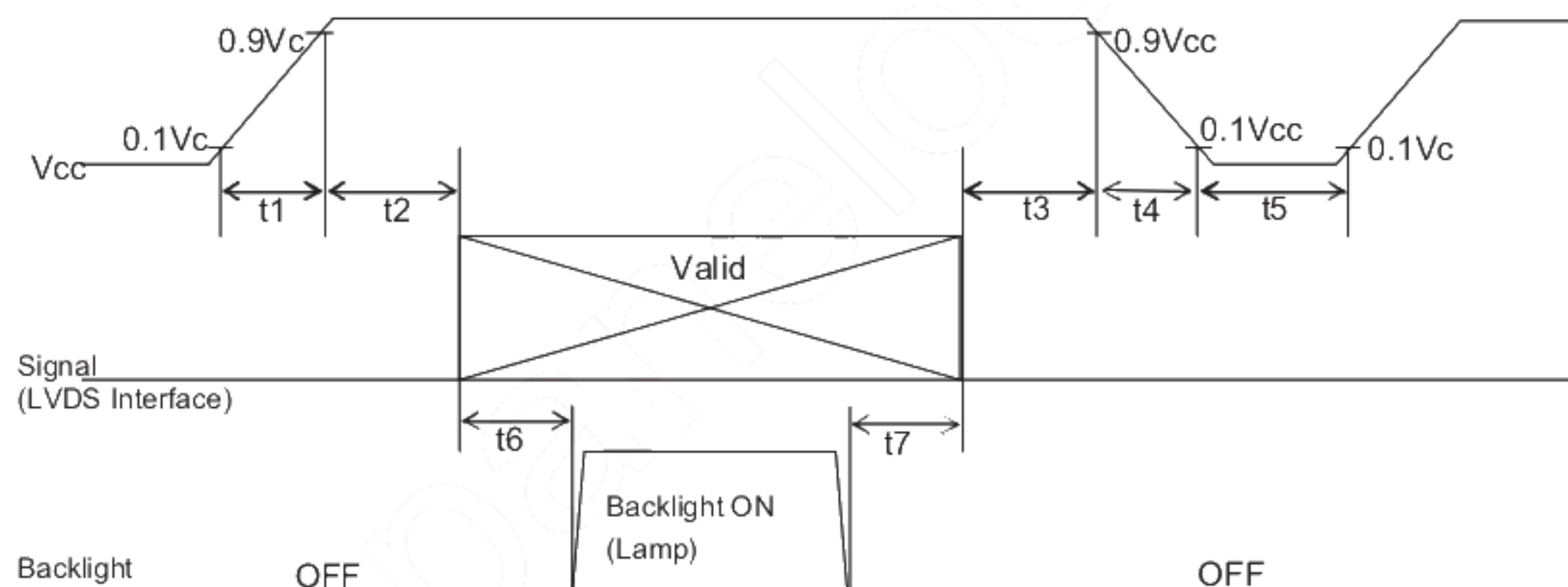
## 6-1. TFT LCD Panel Driving

Ta = 25°C

| Parameter                            | Symbol   | Min.     | Typ. | Max. | Unit              | Remark                         |
|--------------------------------------|----------|----------|------|------|-------------------|--------------------------------|
| Supply voltage                       | $V_{CC}$ | +3.0     | +3.3 | +3.6 | V                 | [Note 6-2]                     |
| Current dissipation                  | $I_{CC}$ | —        | 380  | 600  | mA                | [Note 6-3]                     |
| Permissive input ripple voltage      | $V_{RP}$ | —        | —    | 100  | mV <sub>P-P</sub> | $V_{CC} = +3.3V$               |
| Input voltage range                  | $V_I$    | 0        | —    | 2.4  | V                 | LVDS signals                   |
| Differential input threshold voltage | High     | $V_{TH}$ | —    | +100 | mV                | $V_{CM} = +1.2V$<br>[Note 6-1] |
|                                      | Low      | $V_{TL}$ | -100 | —    | mV                |                                |
| Input current (High)                 | $I_{OH}$ | —        | —    | ±10  | μA                | $V_I = +2.4V$ $V_{CC} = +3.6V$ |
| Input current (Low)                  | $I_{OL}$ | —        | —    | ±10  | μA                | $V_I = 0V$ $V_{CC} = 3.6V$     |
| Terminal resistor                    | $R_T$    | —        | 100  | —    | Ω                 | Differential input             |

[Note 6-1]  $V_{CM}$  : Common mode voltage of LVDS driver.

[Note 6-2] On-off conditions for supply voltage



| Symbol | Min. | Max. | Unit | Remark |
|--------|------|------|------|--------|
| t1     | 0    | 10   | ms   |        |
| t2     | 0    | 1    | s    |        |
| t3     | 0    | 1    | s    |        |
| t4     | 0    | 400  | ms   |        |
| t5     | 200  | —    | ms   |        |
| t6     | 180  | —    | ms   | *1     |
| t7     | 5    | —    | ms   | *1     |

\*1 : As for the power sequence for backlight, it is recommended to apply above mentioned input timing. If the backlight is lit on and off at a timing other than shown above, displaying image may get disturbed. This is due to variation of output signal from timing generator when LVDS signal is changed from on to off or vice versa, but has no harm to the module itself.

【Note】 Do not keep the interface signal high-impedance or unusual signal when power is on.

## Vcc-dip conditions

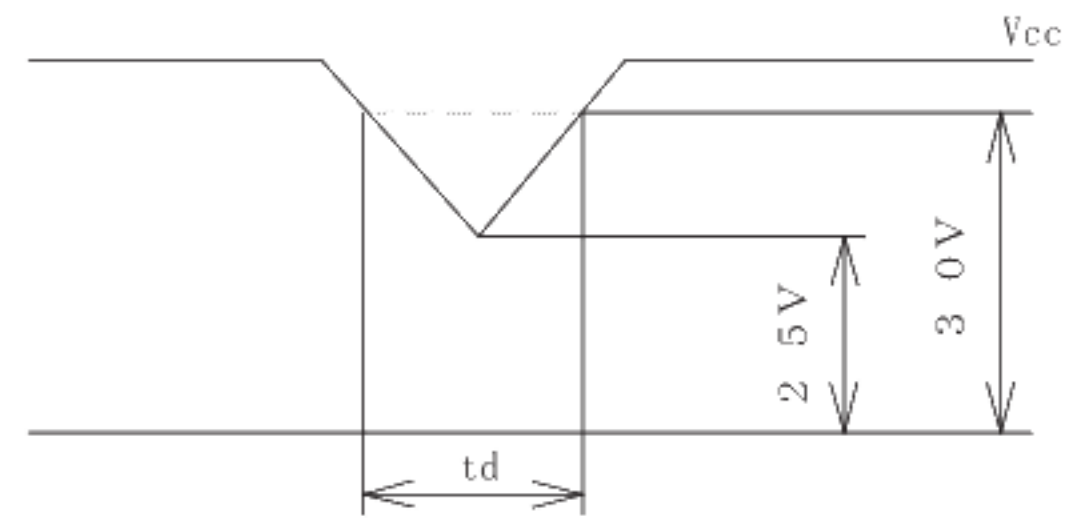
$$1) \quad 2.5 \text{ V} \leq V_{cc} < 3.0 \text{ V}$$

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

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

$$2) \quad V_{cc} < 2.5 \text{ V}$$

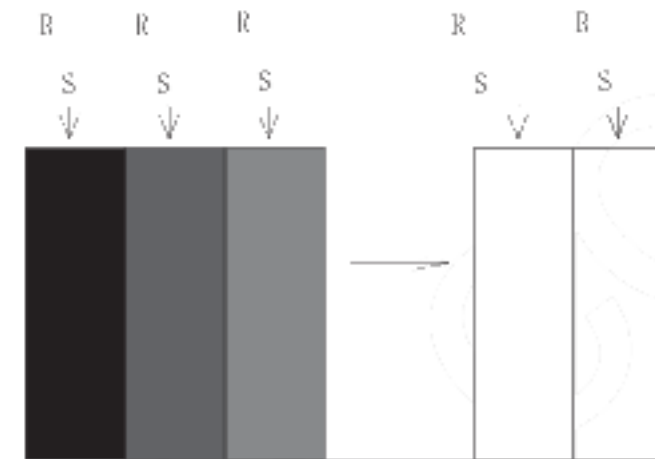
Vcc-dip conditions should also follow the On-off conditions for supply voltage



[Note 6-3] Typical current situation : 16-gray-bar pattern.

$$V_{cc} = +3.3 \text{ V}$$

Maximum current situation :  $V_{cc} = +3.0 \text{ V}$



## 6-2. Back light driving

The backlight system is edge-lighting type with 40 White-LED(White Light Emitting Diode).

The characteristics of White-LED are shown in the following table.

(Ta=25 °C)

| Parameter                     | Symbol       | Min.  | Typ. | Max. | Unit | Remark               |
|-------------------------------|--------------|-------|------|------|------|----------------------|
| LED forward voltage           | $V_{LED\_F}$ | —     | 24.0 | 27.2 | V    | [Note 6-4]           |
| LED forward voltage variation | $V_{LED\_F}$ | —     | —    | 3.2  | V    | [Note 6-4, 6-5]      |
| LED forward current range     | $I_{LED\_F}$ | —     | 70   | 70   | mA   | Value for one string |
| Number of circuit strings     |              | —     | 5    | —    |      | [Note 6-6]           |
| LED power consumption         | $W_{LED}$    | —     | 8.4  | 9.5  | W    | [Note 6-4, 6-7]      |
| LED life time                 | $L_{LED}$    | 50000 | —    | —    | Hour | [Note 6-8]           |

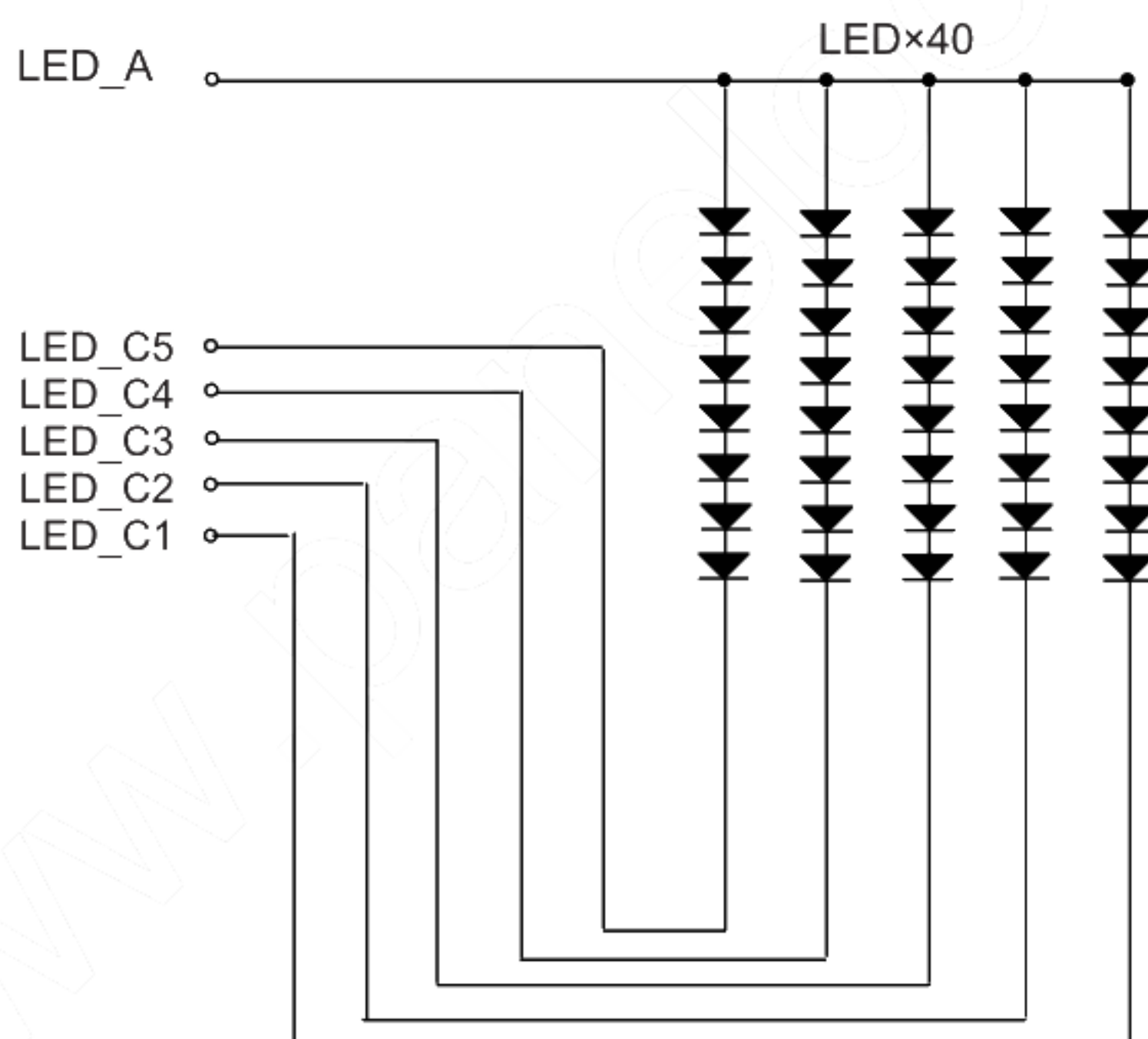
[Note 6-4]  $I_{LED\_F} = 70\text{mA}$

[Note 6-5] Variation of  $V_{LED\_F}$  between each string in one LCD module.

[Note 6-6] The LED backlight is composed by 5 strings from which 8 LED is connected with the series.

The figure below shows the circuit chart of each string.

In each circuit, there is a ceramic capacitor for the electrostatic protection.



[Note 6-7] Calculated value for reference (  $I_{LED\_F} \times V_{LED\_F}$  )

[Note 6-8] LED life time is defined as the time when Brightness becomes 50 % of the original value.  
under the condition of Ta = 25 °C and  $I_{LED\_F} = 70\text{mA}$ , and continuous lighting.



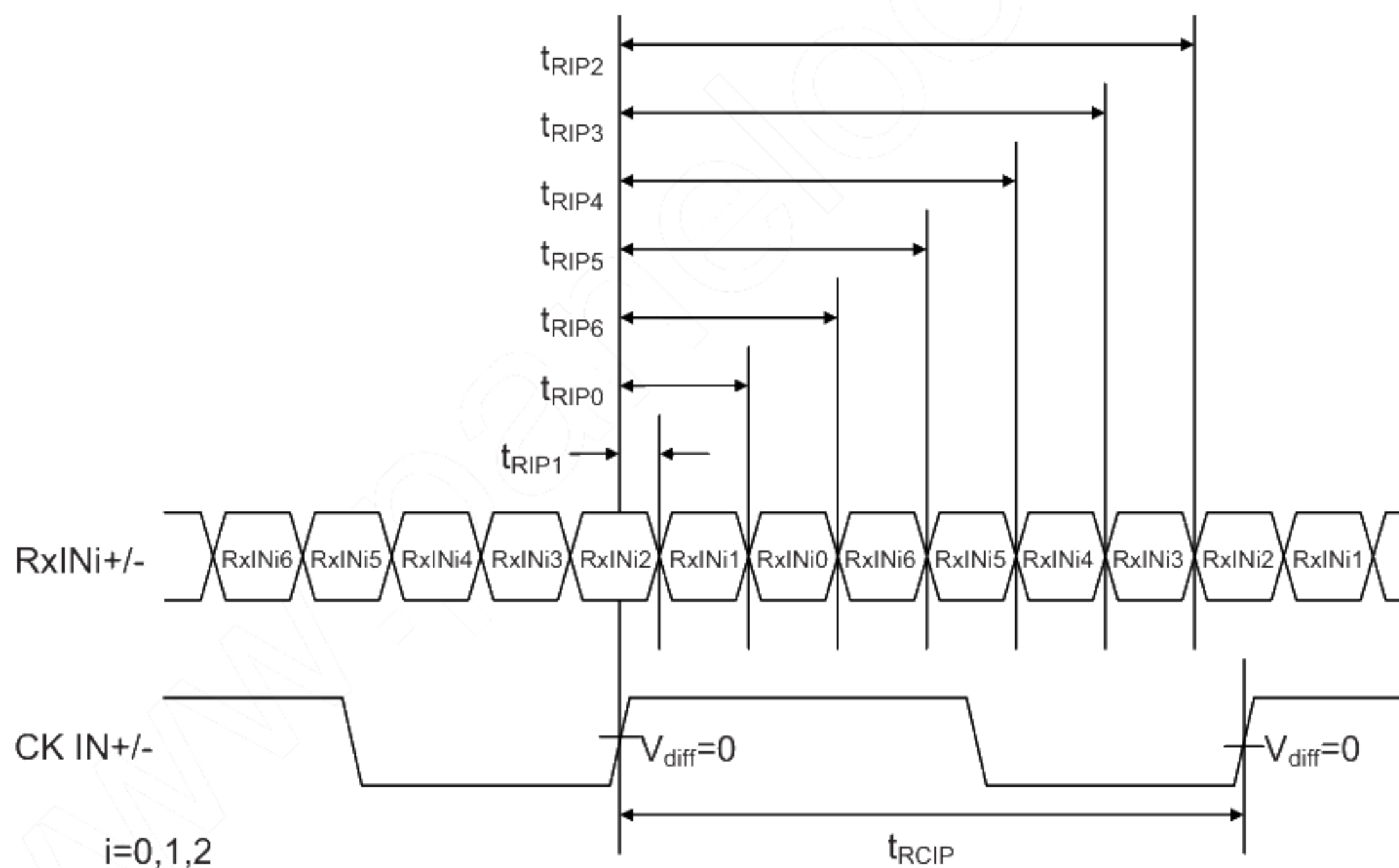
## 6-3. LVDS input specification

## 6-3-1. AC characteristics

 $V_{CC}=+3.0V \sim +3.6V$   $T_a$   $-20^{\circ}C \sim +60^{\circ}C$ 

| Parameter                                    | Symbol     | Min                 | Typ.           | Max.                | Unit |
|--|------------|---------------------|----------------|---------------------|------|
| Input Data Position 0 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP1}$ | -0.25               | 0.0            | +0.25               | ns   |
| Input Data Position 1 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP0}$ | $t_{RCIP}/7-0.25$   | $t_{RCIP}/7$   | $t_{RCIP}/7+0.25$   | ns   |
| Input Data Position 2 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP6}$ | $2 t_{RCIP}/7-0.25$ | $2 t_{RCIP}/7$ | $2 t_{RCIP}/7+0.25$ | ns   |
| Input Data Position 3 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP5}$ | $3 t_{RCIP}/7-0.25$ | $3 t_{RCIP}/7$ | $3 t_{RCIP}/7+0.25$ | ns   |
| Input Data Position 4 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP4}$ | $4 t_{RCIP}/7-0.25$ | $4 t_{RCIP}/7$ | $4 t_{RCIP}/7+0.25$ | ns   |
| Input Data Position 5 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP3}$ | $5 t_{RCIP}/7-0.25$ | $5 t_{RCIP}/7$ | $5 t_{RCIP}/7+0.25$ | ns   |
| Input Data Position 6 ( $t_{RCIP}=15.38ns$ ) | $t_{RIP2}$ | $6 t_{RCIP}/7-0.25$ | $6 t_{RCIP}/7$ | $6 t_{RCIP}/7+0.25$ | ns   |
| Phase Lock Loop Set                          | $t_{RPLL}$ | —                   | —              | 10                  | ms   |
| Input Clock Period                           | $t_{RCIP}$ | 14.9                | 15.4           | 20                  | ns   |

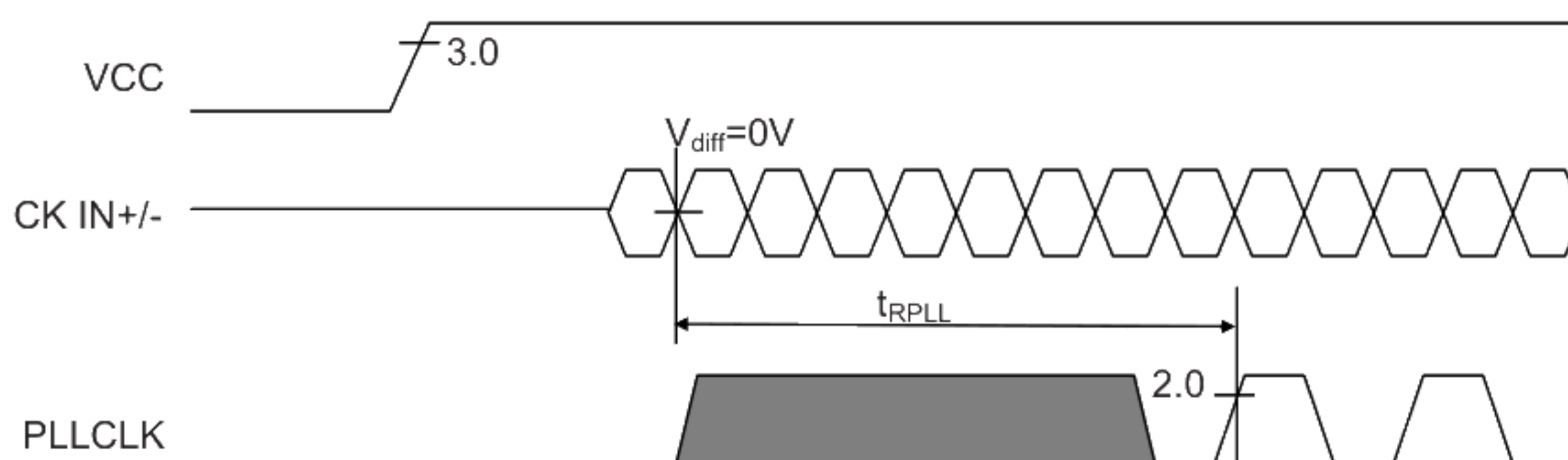
## LVDS input timing



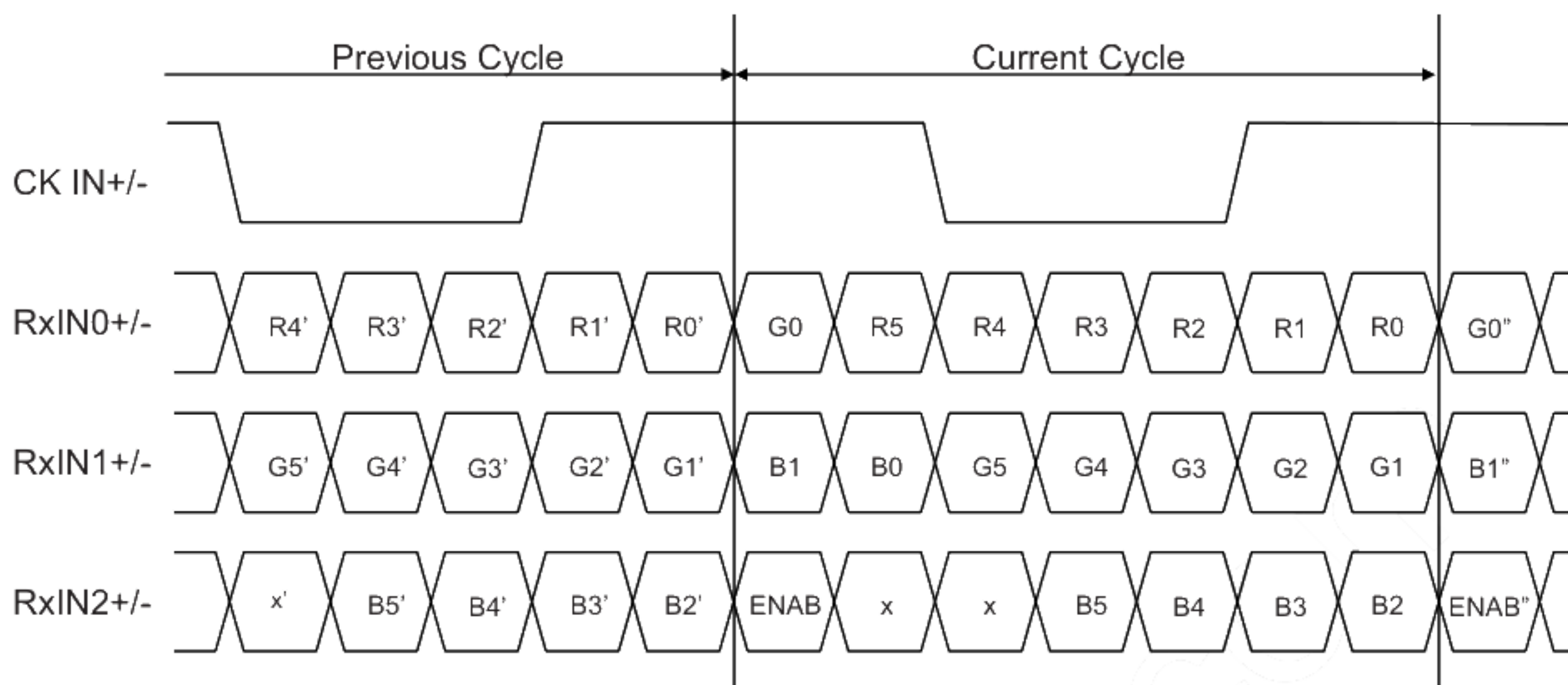
Note

$$V_{diff} = (RxINi+) - (RxINi-) \quad (CK IN+) - (CK IN-)$$

## LVDS phase lock loop set



## 6-3-2. LVDS data



## 7. Timing Characteristics of Input Signals

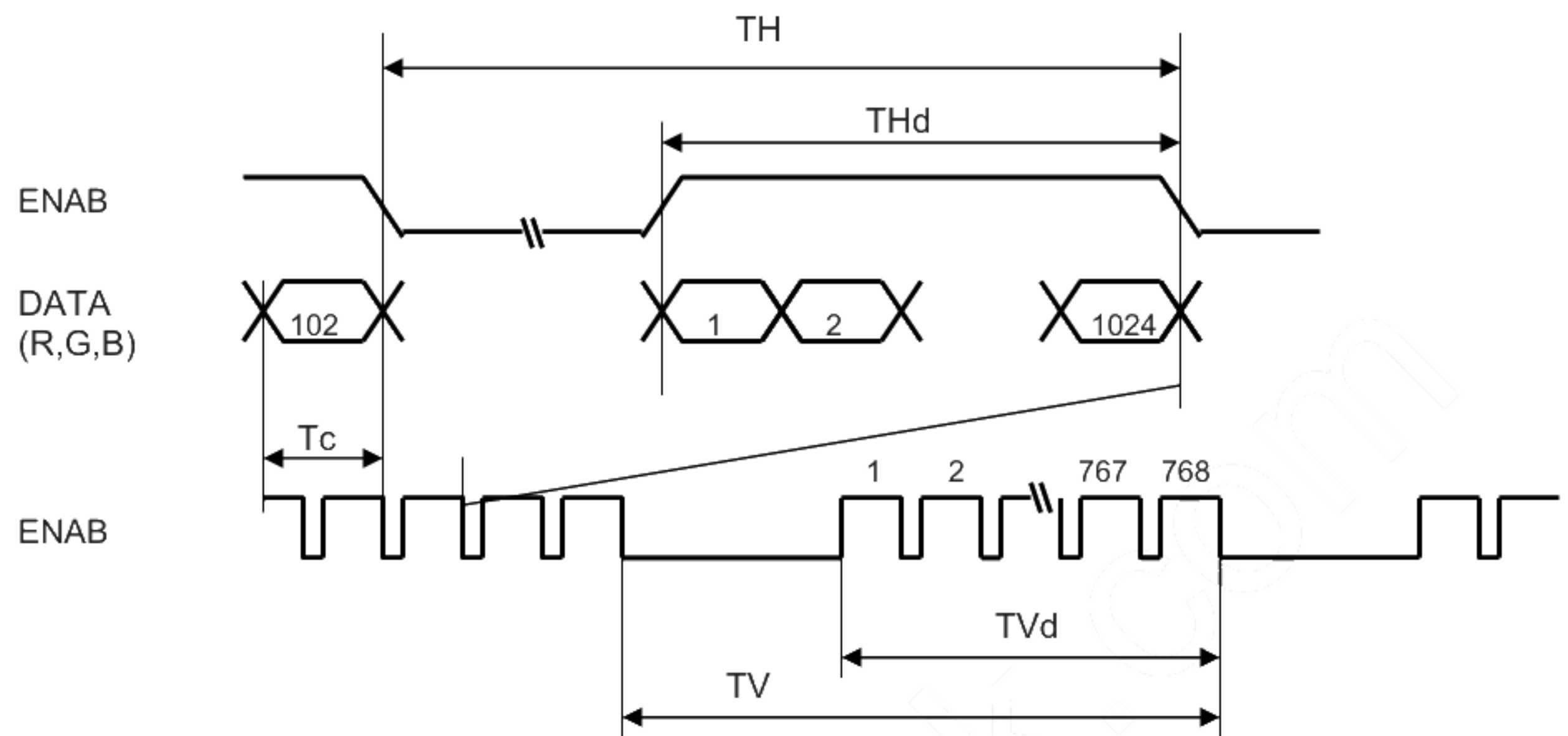
## 7-1. Timing Characteristics

(It provides by outputting the digital signal of LVDS-IC)

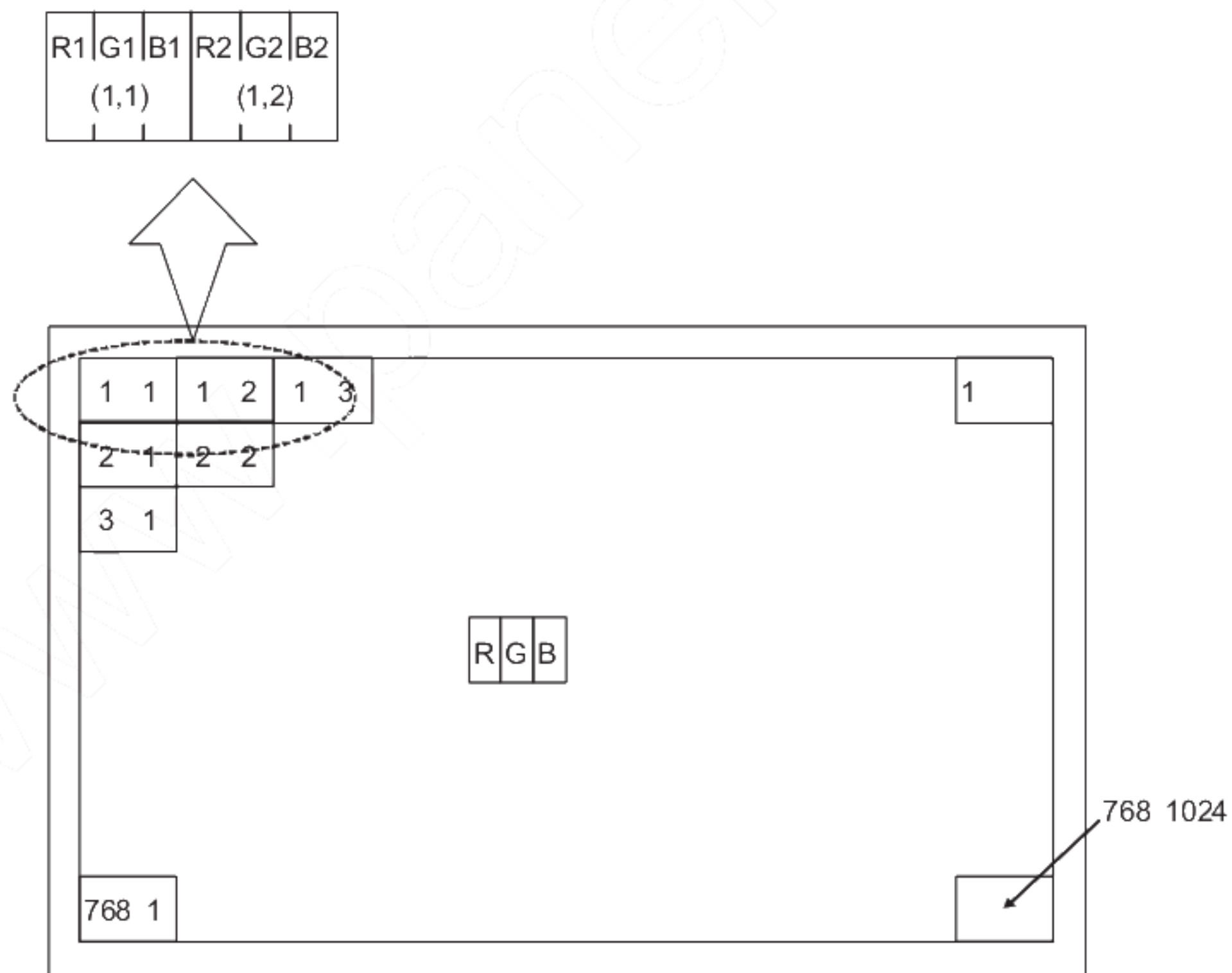
 $V_{CC}=+3.0V \sim +3.6V$   $T_a$   $-20^{\circ}C \sim +60^{\circ}C$ 

| Parameter          |                          | Symbol | Min.  | Typ.  | Max. | Unit  | Remark     |
|--------------------|--------------------------|--------|-------|-------|------|-------|------------|
| Clock              | Frequency                | 1/Tc   | 50    | 65    | 67   | MHz   | [Note 7-1] |
| Data enable Signal | Horizontal period        | TH     | 1260  | 1344  | 1408 | clock |            |
|                    |                          |        | 19.38 | 20.68 | —    | μs    |            |
|                    | Horizontal period (High) | THd    | 1024  | 1024  | 1024 | clock |            |
|                    | Vertical period          | TV     | 803   | 806   | 900  | Line  |            |
|                    |                          |        | 15.56 | 16.67 | —    | ms    |            |
|                    | Vertical period (High)   | TVd    | 768   | 768   | 768  | line  |            |

[Note 7-1] 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 Colors and Gray Scale of Each Color

|                     | Colors &   | Data signal |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------|------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|                     | Gray scale | Gray Scale  | R0 | R1 | R2 | R3 | R4 | R5 | G0 | G1 | G2 | G3 | G4 | G5 | B0 | B1 | B2 | B3 | B4 | B5 |
| Basic Color         | Black      | —           | 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  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Green      | —           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Cyan       | —           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Red        | —           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Magenta    | —           | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |
|                     | Yellow     | —           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 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  |
| Gray Scale of Red   | Black      | GS0         | 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  |
|                     | Darker     | GS2         | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑          | ↓           | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    |
|                     | ↓          | ↓           | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    |
|                     | Brighter   | GS61        | 1  | 0  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↓          | GS62        | 0  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Red        | GS63        | 1  | 1  | 1  | 1  | 1  | 1  | 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  |
|                     | ↑          | GS1         | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker     | GS2         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↑          | ↓           | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    |
|                     | ↓          | ↓           | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    |
|                     | Brighter   | GS61        | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | ↓          | GS62        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|                     | Green      | GS63        | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 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  |
|                     | ↑          | GS1         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
|                     | Darker     | GS2         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |
|                     | ↑          | ↓           | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    |
|                     | ↓          | ↓           | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    | ↓  |    |    |    |    |    |
|                     | Brighter   | GS61        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1  |
|                     | ↓          | GS62        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  |
|                     | Blue       | GS63        | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |

0 : Low level voltage, 1 : High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

## 9. Optical Characteristics

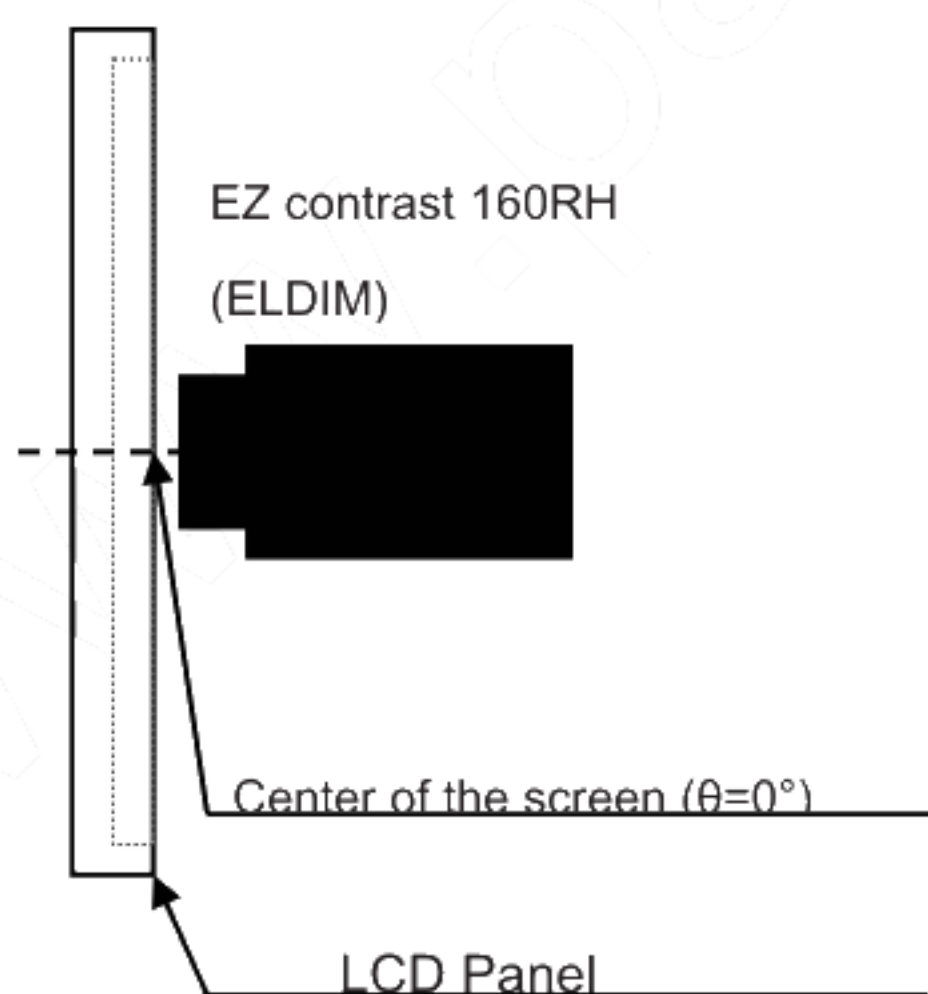
Ta = 25°C, Vcc=+3.3V

| Parameter             |              | Symbol        | Condition             | Min.  | Typ.  | Max.  | Unit              | Remark                         |
|-----------------------|--------------|---------------|-----------------------|-------|-------|-------|-------------------|--------------------------------|
| Viewing Angle range   | Horizontal   | $\theta_{21}$ | CR 10                 | 60    | 70    | -     | deg.              | [Note9-1,9-4]                  |
|                       |              | $\theta_{22}$ |                       | 60    | 70    | -     | deg.              |                                |
|                       | Vertical     | $\theta_{11}$ |                       | 40    | 50    | -     | deg.              |                                |
|                       |              | $\theta_{12}$ |                       | 50    | 60    | -     | deg.              |                                |
| Contrast ratio        |              | CRn           | $\theta=0^{\circ}$    | 600   | —     | —     |                   | [Note9-2,9-4]                  |
|                       |              | CRo           | Optimum viewing angle | 600   | 1000  | —     |                   |                                |
| Response Time         | Rise + Decay | $t_r+t_d$     | $\theta=0^{\circ}$    | -     | 30    | 40    | ms                | [Note9-3,9-4]                  |
| Chromaticity of White |              | x             |                       | 0.263 | 0.313 | 0.363 | -                 | [Note9-4]                      |
|                       |              | y             |                       | 0.279 | 0.329 | 0.379 | -                 |                                |
| NTSC ratio            |              |               |                       | -     | 40    | -     | %                 | [Note9-4]                      |
| Luminance of white    |              | $Y_{L1}$      |                       | 950   | 1200  | -     | cd/m <sup>2</sup> | $I_{LED\_F}=70mA$<br>[Note9-4] |
| White Uniformity      |              | $\delta_w$    |                       | -     | 1.20  | 1.45  | -                 | [Note9-5]                      |

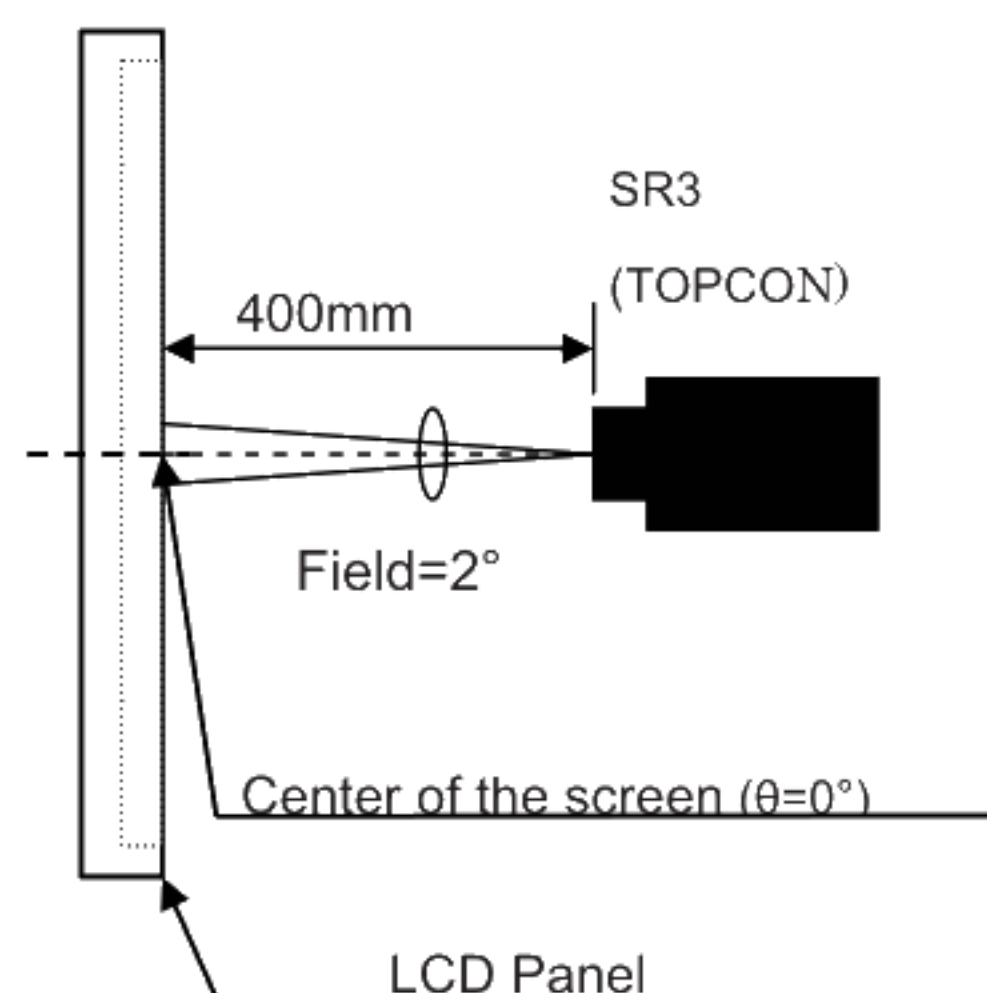
The measurement shall be executed 30 minutes after lighting at rating. Condition :  $I_{LED\_F}=70mA$

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

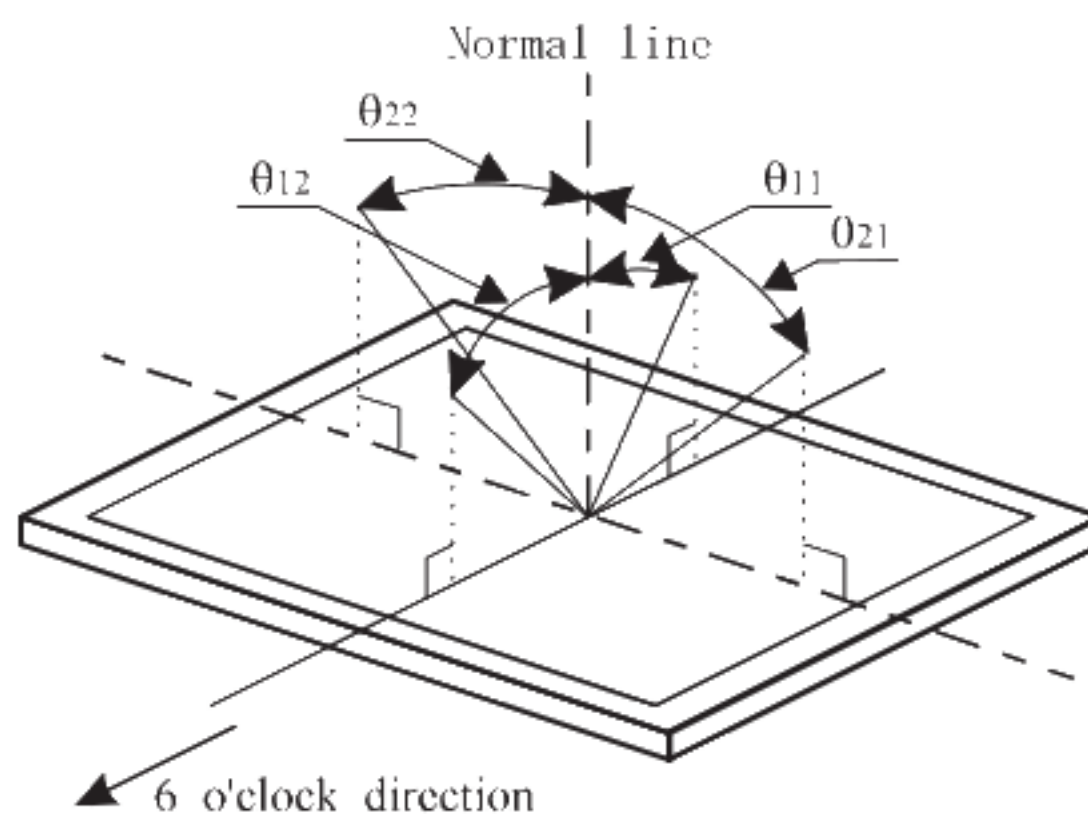
Measuring Viewing Angle Range



Other Measurements



## [Note9-1] Definitions of viewing angle range



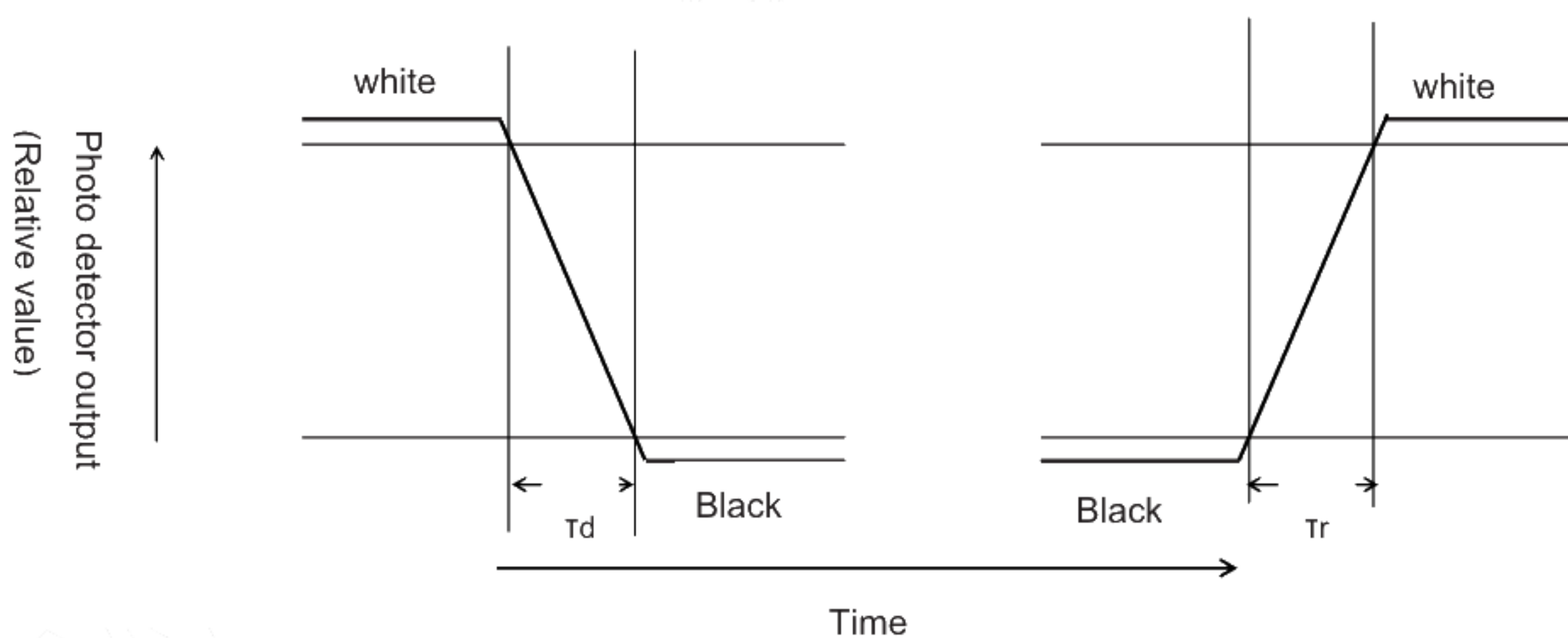
## [Note9-2] Definition of contrast ratio

The contrast ratio is defined as the following

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

## [Note9-3] 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"



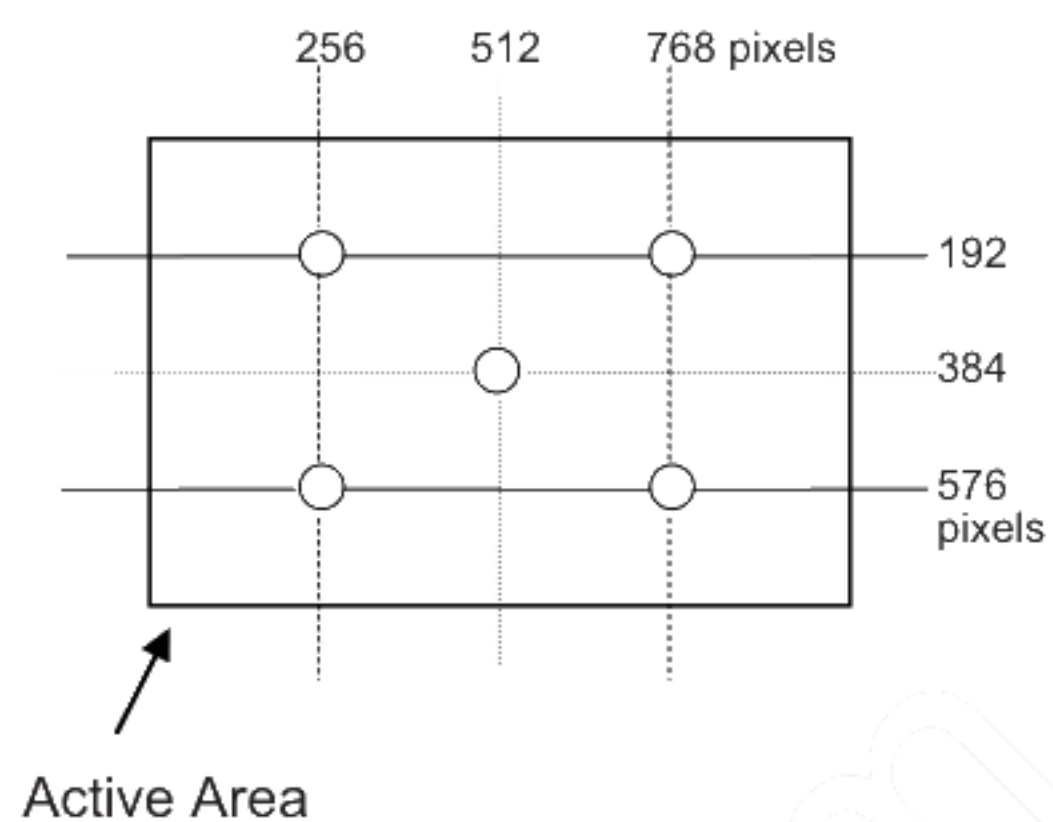
## [Note9-4] This shall be measured at center of the screen.



[Note9-5] Definition of Uniformity

$$Uniformity = \frac{\text{Maximum Brightness}}{\text{Minimum Brightness}} \times 100 (\%)$$

The brightness should be measured on the 5-point as shown in the right figure.



#### 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.
- 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.  
 Blow away dust on the polarizer with antistatic N<sub>2</sub> blow. It is undesirable to wipe off because a polarizer is sensitive.  
 It is recommended to peel off softly using the adhesive tape when soil or finger oil is stuck to the polarizer.  
 When unavoidable, wipe off carefully with a cloth for wiping lenses.
- 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) Since there is a circuit board in the module back, stress is not added at the time of a design assembly.  
 Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.
- i) Protection film is attached to the module surface to prevent it from being scratched .  
 Peel the film off slowly , just before the use, with strict attention to electrostatic charges.  
 Blow off 'dust' on the polarizer by using an ionized nitrogen.
- j) 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.
- k) Connect GND of mounting holes to stabilize against EMI and external noise.
- l) When handling LCD modules and assembling them into cabinets, please avoid that long-terms 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 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) Notice : Never dismantle the module , because it will cause failure.  
 Please don't remove the fixed tape, insulating tape etc that was pasted on the original module.  
 (Except for protection film of the panel and the crepe tape (yellow tape) of fixing LED FPC temporarily.)
- 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) Adjusting volume has been set optimally before shipment, so do not change any adjusted value.  
 If adjusted value is changed, the specification may not be satisfied.
- q) Please note that it is likely to damage your eyes when keeping seeing for a long time for a high luminance specification.



## 12. Packing form

This packing form and the specification are tentative.

This packing form and specification might be changed because they are designing now.

|   |                        |
|---|------------------------|
| Piling number of cartons                          | Max 6                  |
| Package quantity in one carton                    | 10 pcs                 |
| Carton size                                       | 474(W)×335(D)×296(H)mm |
| Total mass of one carton filled with full modules | 7500g                  |
| Packing form                                      | Fig.1                  |

## 13. Reliability Test Items

| No. | Test item  | Conditions   |
|-----|--|--|
| 1   | High temperature storage test                    | Ta = 75°C 96h  |
| 2   | Low temperature storage test                     | Ta = -35°C 96h   |
| 3   | High temperature & high humidity operation test  | (Ta = 40°C ; 90%RH 120h)<br>(No condensation)  |
| 4   | High temperature operation test                  | Ta = 50°C 24h<br>(Temperature of Panel surface is 60°C Max)  |
| 5   | Low temperature operation test                   | Ta = -20°C 24h   |
| 6   | Thermal Shock Test<br>(non- operating)           | +75°C(0.5hours) -35 °C(0.5hours)<br>Tested for 100 cycles  |
| 7   | Vibration test<br>(non- operating)               | Frequency range: 10 to 57Hz Sweep: 0.076mm<br>57 to 500Hz Acceleration:9.8m/s <sup>2</sup><br>Sweep time: 11minute<br>Test period: 3 hours (1 hours for each direction of X,Y,Z) |
| 8   | Shock test<br>(non- operating)                   | Direction: ±X, ±Y, ±Z, Time: 1 times for each direction.<br>Impact value: 490m/s <sup>2</sup> , Action time 11ms   |
| 9   | Electro static discharge test<br>(non-operating) | Bezel/Panel :IEC61000-4-2<br>Contact ±10kV<br>Air ±20kV<br>(LCD module is placed on an insulated board and examined.)  |
| 10  | Electro static discharge test<br>(operating)     | Bezel/Panel :IEC61000-4-2<br>Contact ±8kV<br>Air ±15kV<br>(LCD module is placed on an insulated board and examined.)   |

## [Result Evaluation Criteria]

Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function.

normal operation state : Temperature:15~35°C, Humidity:45~75%, Atmospheric pressure:86~106kpa  
(based on JIS Z 8703)

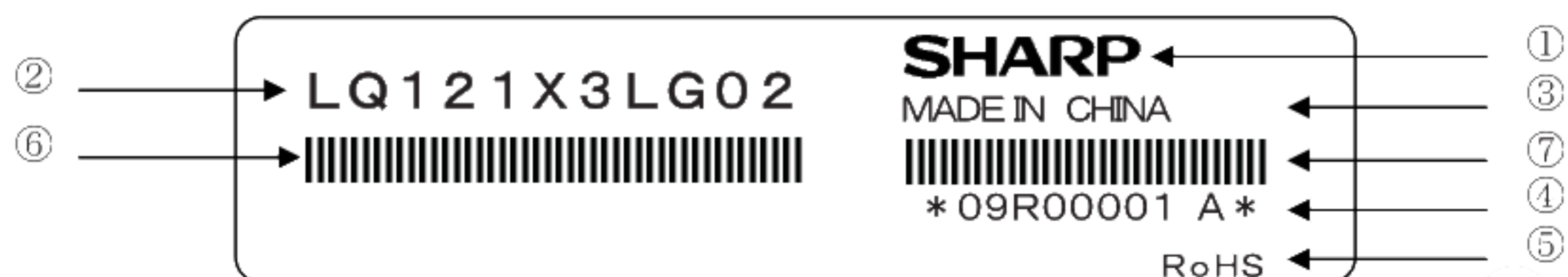


## 14. Lot No. marking

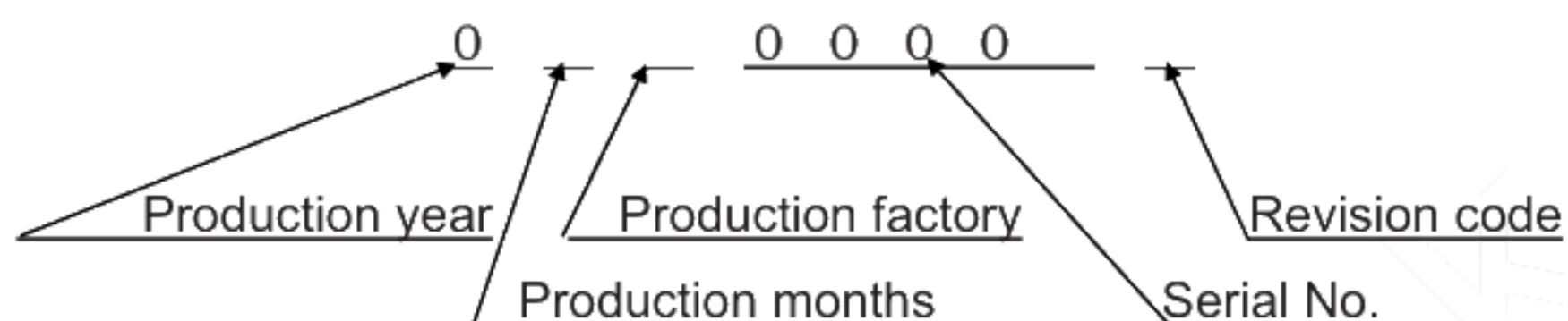
## 14-1. Module Bar code label

Notation: SHARP Logo Model No. Manufacture country Serial No. RoHS mark

Bar code: Model No. Serial No.

Details of Serial No.

(Example)



[Note] Production year : 0(2010) 1(2011) 2(2012)

Production month : 1(Jan) 2(Feb) 9(Sep) X(Oct) Y(Nov) Z(Dec)

Manufacture country : China

Production factory : WUXI SHARP ELECTRONIC COMPONENTS CO., LTD.

(Production factory code at Serial No : R )

## 14-2. Packing bar code label

Notion / Bar code: Model No. Date Quantity

|                         |     |
|-------------------------|-----|
| 社内品番: (4S)LQ121X3LG02   | ← ① |
| バーコード(①)                |     |
| LotNO. (1T)2010. 09. 01 | ← ② |
| バーコード(②)                |     |
| Quantity: (Q) 10 p      | ← ③ |
| バーコード(③)                |     |
| ユーザ品番 :                 |     |
| バーコード(④)                |     |
| シャープ物流用ラベルです。           |     |

#### 15. RoHS.Regulations

This LCD module is compliant with RoHS Directive.

#### 16. About PFOS

This module doesn't do intentional use about PFOS (perfluorooctanesulfonic acid) and the salt.

#### 17. Storage conditions

<Environmental condition range of storage temperature and humidity>

Temperature            0 to 40 degrees Celsius

Relative humidity    90% and below

Direct sun light

Please keep the product in a dark room or cover the product to protect from direct sun light.

Atmospheric condition

Please refrain from keeping the product with possible corrosive gas or volatile flux.

Prevention of dew

\* Please store the product carton either on a wooden pallet or a stand / rak to prevent dew.

Do not place directly on the floor. In addition, to obtain moderate ventilation in between the pallet's top and bottom surfaces, pile the cartons up in a single direction and in order.

\* Please place the product cartons away from the storage wall.

\* Please maintain the storage area with an appropriate ventilation. It is recommendable to furnish the storage area with equipments such as ventilation systems.

\* Please maintain the ambient temperature within the range of natural environmental fluctuation.

Storage period

Within above mentioned conditions, maximum storage period should be one year.

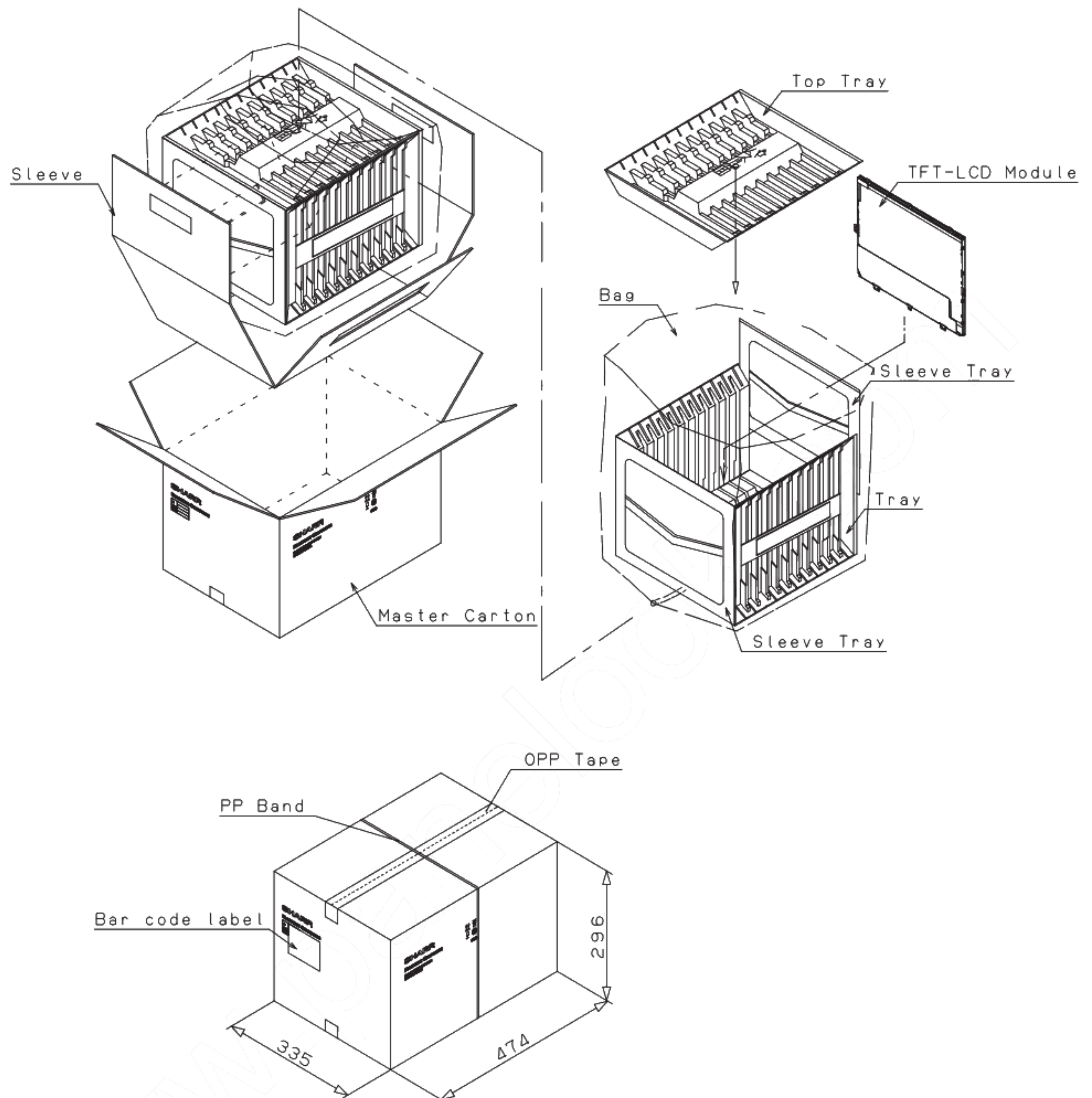


Fig1. LCD module packing carton



