| PREPARED BY : DATE | SHARP | SPEC No. LD-22Z03A |
|---|---|---|
| APPROVED BY : DATE | | FILE No. LD-22Z03A |
| | LIQUID CRYSTAL DISPLAY GROUP<br>SHARP CORPORATION | ISSUE : 16-Dec-11 |
| | | PAGE : 25pages |
| | SPECIFICATION | APPLICABLE GROUP<br>DISPLY DEVICE BUSINESS GROUP |

REVISION : 16-Dec-11

DEVICE SPECIFICATION FOR

# TFT-LCD Module

MODEL No.

# LQ190E1LW52

These parts have corresponded with the RoHS

☐ CUSTOMER'S APPROVAL

BY

BY J. Kawanishi

J.Kawanishi
GENERAL MANAGER
ENGINEERING DEPARTMENT I
DISPLY DEVICE DIVISION II
DISPLY DEVICE BUSINESS GROUP
SHARP CORPORATION

# RECORDS OF REVISION

## LQ190E1LW52

| SPEC No. | DATE | REVISED No | PAGE | SUMMARY | NOTE |
|---|---|---|---|---|---|
| LD-22Z03A | 2011/12/16 | | | - | |
| | | | | | |

– Contents –

# 1. Application

This specification  applies to the color TFT-LCD module LQ190E1LW52.



The device listed in this specification  was designed and manufactured for use in general electronic equipment.

In case of using the device for applications such as control and safety equipment for transportation (controls of aircraft, trains, automobiles, etc.), rescue and security equipment and various safety related equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.

Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment (trunk lines), nuclear power control equipment and medical or other equipment for life support.

SHARP assumes no responsibility for any damage resulting from the use of the device which does not comply with the instructions and the precautions specified in this specification .

Contact and consult with a SHARP sales representative for any questions about this device.

## 2. Overview

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, power supply circuit and a White-LED Backlight unit. Graphics and texts can be displayed on a 1280×RGB×1024dots panel with about 16 million colors by using LVDS (Low Voltage Differential Signaling) and supplying +5.0V DC supply voltages for TFT-LCD panel driving and supply voltage for backlight.

It is a wide viewing-angle-module.

LED-Backlight driver is not built in this module.

## 3. Mechanical technical literatures

| Parameter | technical literatures | Unit |
|---|---|---|
| Display size | 48(19inch)Diagonal | cm |
| Active area | 376.32(H)×301.056(V) | mm |
| Pixel format | 1280(H)×1024(V)<br>(1pixel=R+G+B dot) | pixel |
| Aspect ratio | 5:4 | |
| Pixel pitch | 0.294(H)×0.294(V) | mm |
| Pixel configuration | R,G,B vertical stripe | |
| Display mode | Normally black | |
| Unit outline dimensions 【*1】 | 326.5(W)×253.5(H)×9.6(D) | mm |
| Mass | 950 (Max.) | g |
| Surface treatment (Haze value) | Anti-glare and hard-coating 2H(40%) | |

【*1】 Excluding the protrusion of the connector cover from thickness.

Outline dimensions are shown in Fig.1.

# 4. Input Terminals

## 4-1. TFT-LCD panel driving

CN1 (Interface signals and +5V power supply)

Using connectors : FI-X30SSL-HF (Japan Aviation Electronics Industry, Limited)

Corresponding connectors : FI-X30M (FPC type) (Japan Aviation Electronics Industry, Limited)

: FI-X30H (Wire type), FI-X30HL(Wire type with lock)

: FI-X30C (Coaxial cable type), FI-X30C2L(Coaxial cable type with luck)

Using LVDS receiver : Building into cotrol IC (THC63LVDF84B (Thine electronics) or Compatible product)

Corresponding LVDS transmitter : THC63LVDM83D (Thine electronics) or Compatible product

CN1

| Pin | Symbol | Function | Remark |
|---|---|---|---|
| 1 | RxO0- | Receiver signal of LVDS (O0-) | LVDS |
| 2 | RxO0+ | Receiver signal of LVDS (O0+) | LVDS |
| 3 | RxO1- | Receiver signal of LVDS (O1-) | LVDS |
| 4 | RxO1+ | Receiver signal of LVDS (O1+) | LVDS |
| 5 | RxO2- | Receiver signal of LVDS (O2-) | LVDS |
| 6 | RxO2+ | Receiver signal of LVDS (O2+) | LVDS |
| 7 | GND | GND | |
| 8 | RxOC- | Receiver signal of LVDS (OC-) | LVDS |
| 9 | RxOC+ | Receiver signal of LVDS (OC+) | LVDS |
| 10 | RxO3- | Receiver signal of LVDS (O3-) | LVDS |
| 11 | RxO3+ | Receiver signal of LVDS (O3+) | LVDS |
| 12 | RxE0- | Receiver signal of LVDS (E0-) | LVDS |
| 13 | RxE0+ | Receiver signal of LVDS (E0+) | LVDS |
| 14 | GND | GND | |
| 15 | RxE1- | Receiver signal of LVDS (E1-) | LVDS |
| 16 | RxE1+ | Receiver signal of LVDS (E1+) | LVDS |
| 17 | GND | GND | |
| 18 | RxE2- | Receiver signal of LVDS (E2-) | LVDS |
| 19 | RxE2+ | Receiver signal of LVDS (E2+) | LVDS |
| 20 | RxEC- | Receiver signal of LVDS (EC-) | LVDS |
| 21 | RxEC+ | Receiver signal of LVDS (EC+) | LVDS |
| 22 | RxE3- | Receiver signal of LVDS (E3-) | LVDS |
| 23 | RxE3+ | Receiver signal of LVDS (E3+) | LVDS |
| 24 | GND | GND | |
| 25 | SELLVDS | Selection of LVDS mapping | 【*1】 |
| 26 | N.C. | | |
| 27 | N.C. | | |
| 28 | VCC | +5V power supply | |
| 29 | VCC | +5V power supply | |
| 30 | VCC | +5V power supply | |

【*1】 SELLVDS is shown in 4-2.

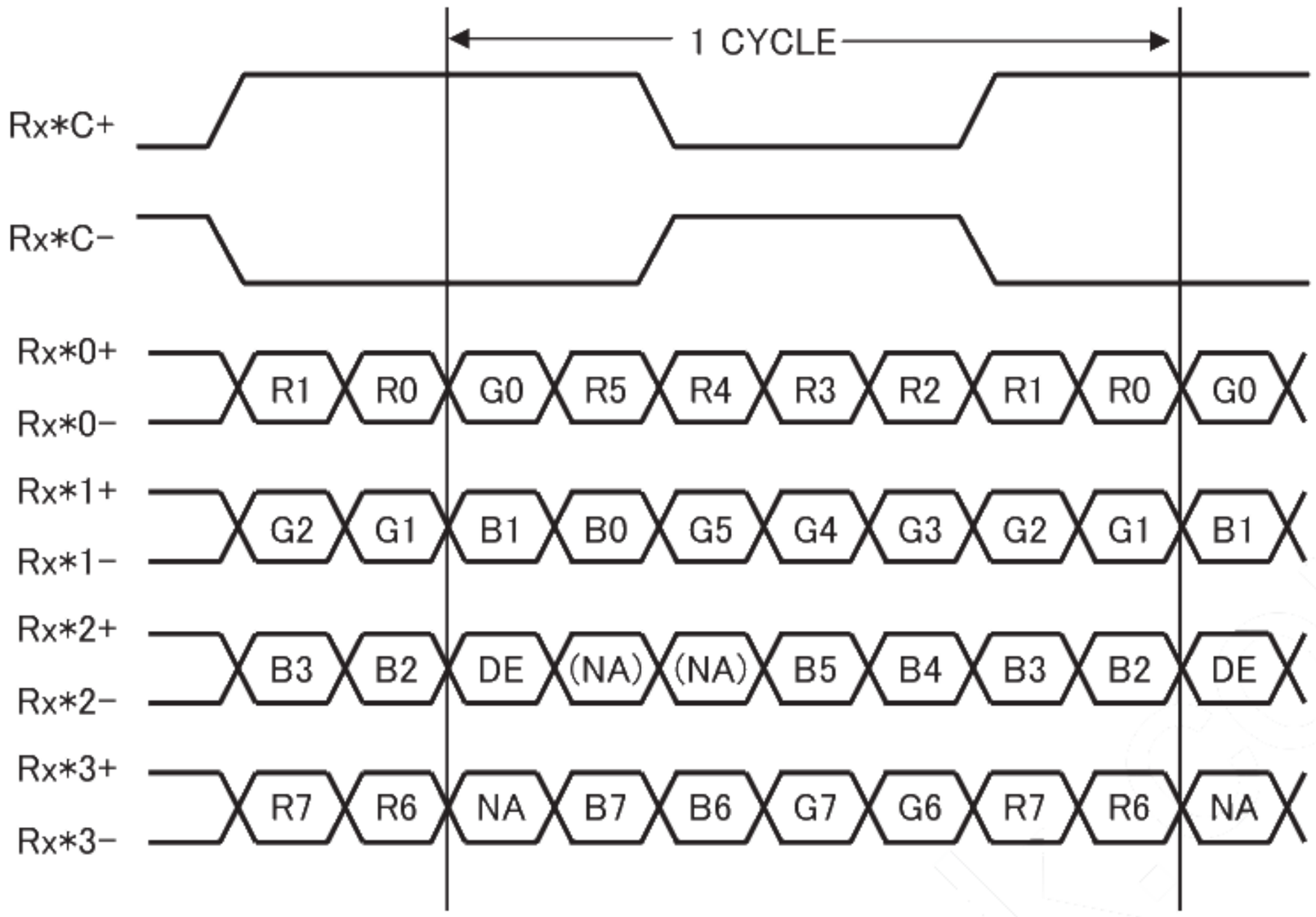
## 4-2. Data Mapping

1) 8 bit input

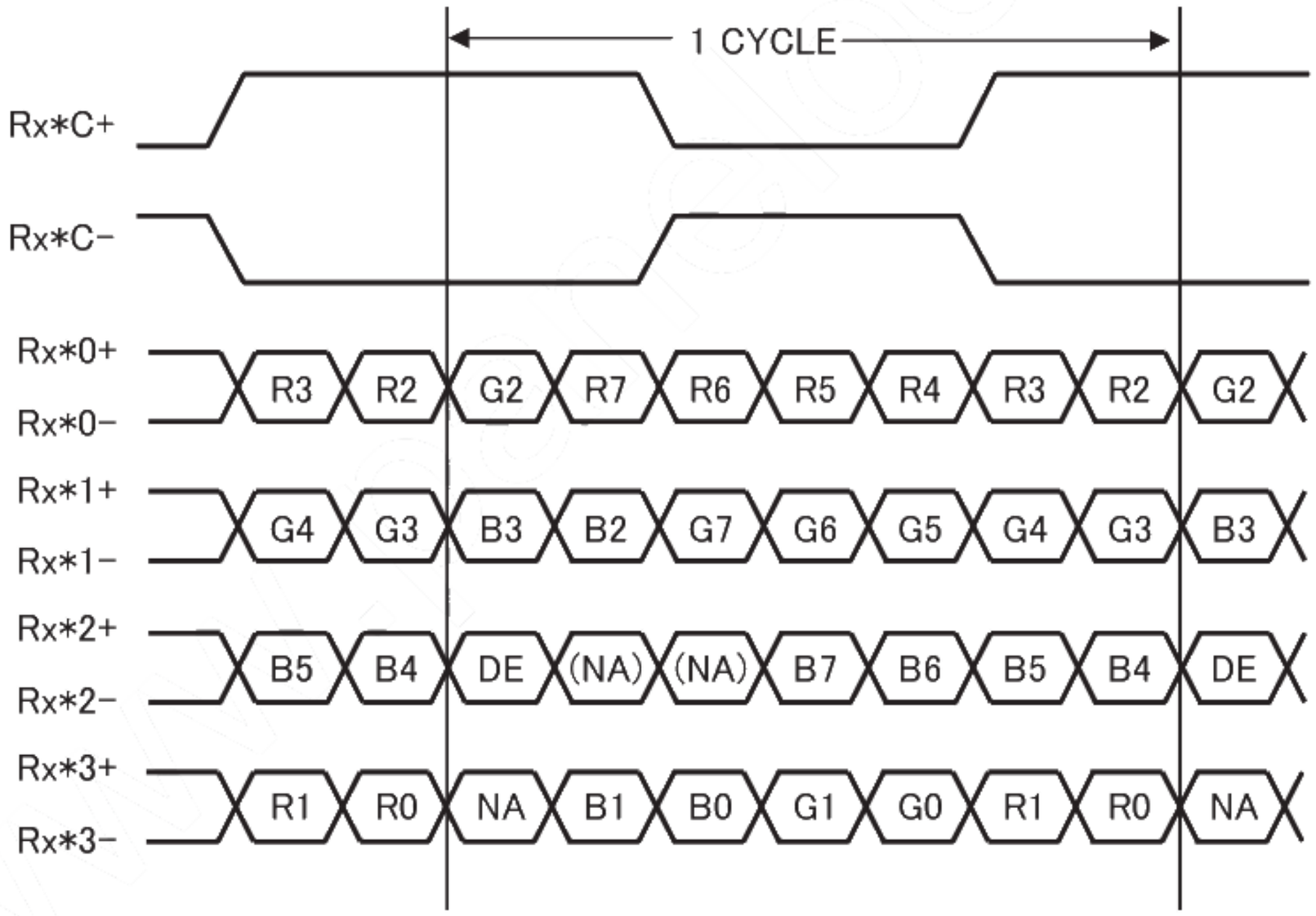
pin assignment with SELLVDS pin (THC63LVDM83D(Thine electronics) or Compatible product)

| Transmitter | | 25Pin SELLVDS | |
|---|---|---|---|
| Pin No | Data | = H(3.3V) | = L(GND) or Open |
| 51 | TA0 | R0 (LSB) | R2 |
| 52 | TA1 | R1 | R3 |
| 54 | TA2 | R2 | R4 |
| 55 | TA3 | R3 | R5 |
| 56 | TA4 | R4 | R6 |
| 3 | TA5 | R5 | R7 (MSB) |
| 4 | TA6 | G0 (LSB) | G2 |
| 6 | TB0 | G1 | G3 |
| 7 | TB1 | G2 | G4 |
| 11 | TB2 | G3 | G5 |
| 12 | TB3 | G4 | G6 |
| 14 | TB4 | G5 | G7 (MSB) |
| 15 | TB5 | B0 (LSB) | B2 |
| 19 | TB6 | B1 | B3 |
| 20 | TC0 | B2 | B4 |
| 22 | TC1 | B3 | B5 |
| 23 | TC2 | B4 | B6 |
| 24 | TC3 | B5 | B7 (MSB) |
| 27 | TC4 | (NA) | (NA) |
| 28 | TC5 | (NA) | (NA) |
| 30 | TC6 | DE | DE |
| 50 | TD0 | R6 | R0 (LSB) |
| 2 | TD1 | R7 (MSB) | R1 |
| 8 | TD2 | G6 | G0 (LSB) |
| 10 | TD3 | G7 (MSB) | G1 |
| 16 | TD4 | B6 | B0 (LSB) |
| 18 | TD5 | B7 (MSB) | B1 |
| 25 | TD6 | (NA) | (NA) |

< SELLVDS = H(3.3V) >




< SELLVDS = L(GND) or Open >




*: O or E

DE: DATA ENABLE

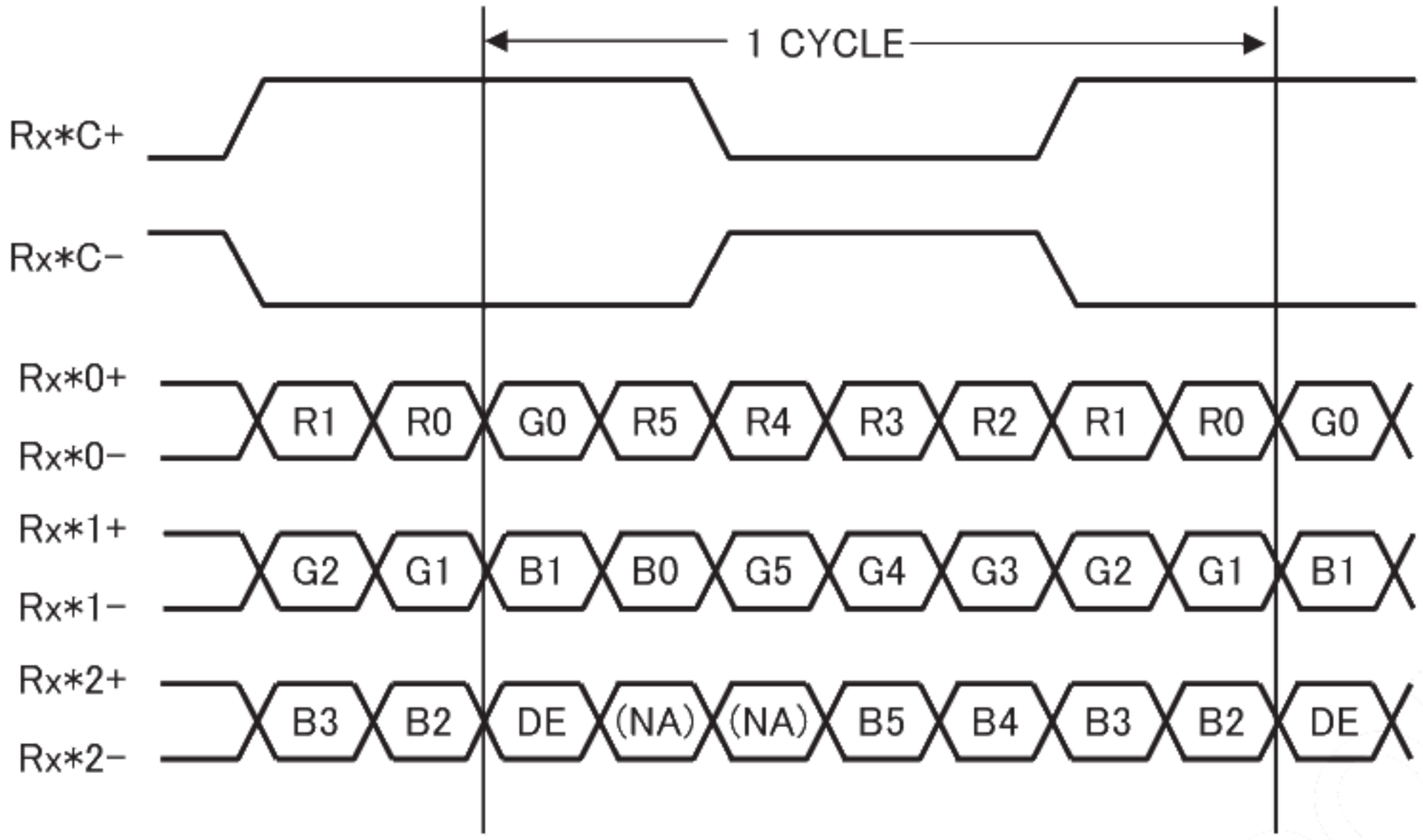
NA: Non Available

1) 6bit input

pin assignment with SELLVDS （THC63LVDM83D（Thine electronics） or Compatible product）

| Transmitter | | 25Pin SELLVDS | |
|---|---|---|---|
| Pin No | Data | = H(3.3V) | = L(GND) or Open |
| 51 | TA0 | − | R0 (LSB) |
| 52 | TA1 | − | R1 |
| 54 | TA2 | − | R2 |
| 55 | TA3 | − | R3 |
| 56 | TA4 | − | R4 |
| 3 | TA5 | − | R5 (MSB) |
| 4 | TA6 | − | G0 (LSB) |
| 6 | TB0 | − | G1 |
| 7 | TB1 | − | G2 |
| 11 | TB2 | − | G3 |
| 12 | TB3 | − | G4 |
| 14 | TB4 | − | G5 (MSB) |
| 15 | TB5 | − | B0 (LSB) |
| 19 | TB6 | − | B1 |
| 20 | TC0 | − | B2 |
| 22 | TC1 | − | B3 |
| 23 | TC2 | − | B4 |
| 24 | TC3 | − | B5 (MSB) |
| 27 | TC4 | − | (NA) |
| 28 | TC5 | − | (NA) |
| 30 | TC6 | − | DE |
| 50 | TD0 | − | GND |
| 2 | TD1 | − | GND |
| 8 | TD2 | − | GND |
| 10 | TD3 | − | GND |
| 16 | TD4 | − | GND |
| 18 | TD5 | − | GND |
| 25 | TD6 | − | (NA) |

< SELLVDS = L(GND) or Open >

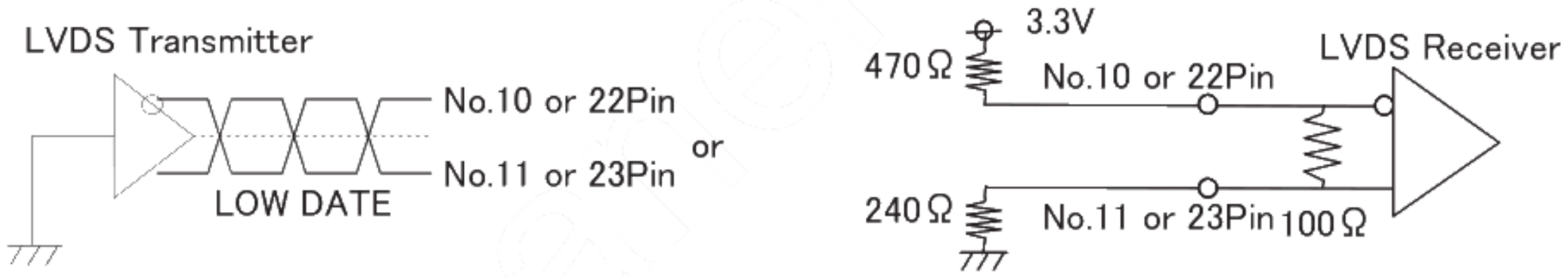



*:O or E

DE:DATA ENABLE

NA:Non Available

Recommended input （at 6bit ）




## 4-3. LED backlight

LED backlight connector

CN2,3 Used connector : 5015680607 ( MOLEX )

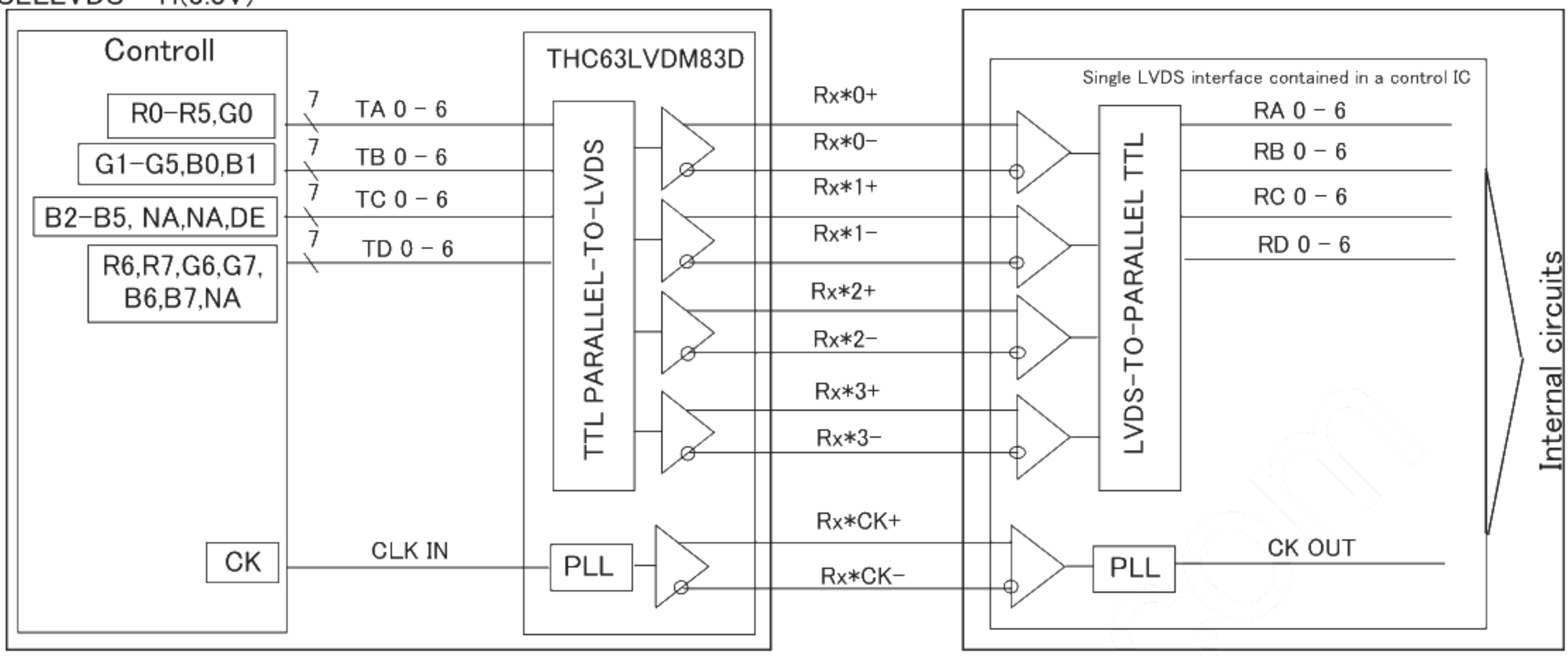
Corresponding connector : 5013300600 ( MOLEX )

| Connector No. | Pin No. | symbol | function |
|---|---|---|---|
| CN2,3 | 1 | VLED | LED power supply |
| | 2 | ILED1 | LED current sense for string 1 |
| | 3 | ILED2 | LED current sense for string 2 |
| | 4 | ILED3 | LED current sense for string 3 |
| | 5 | ILED4 | LED current sense for string 4 |
| | 6 | ILED5 | LED current sense for string 5 |

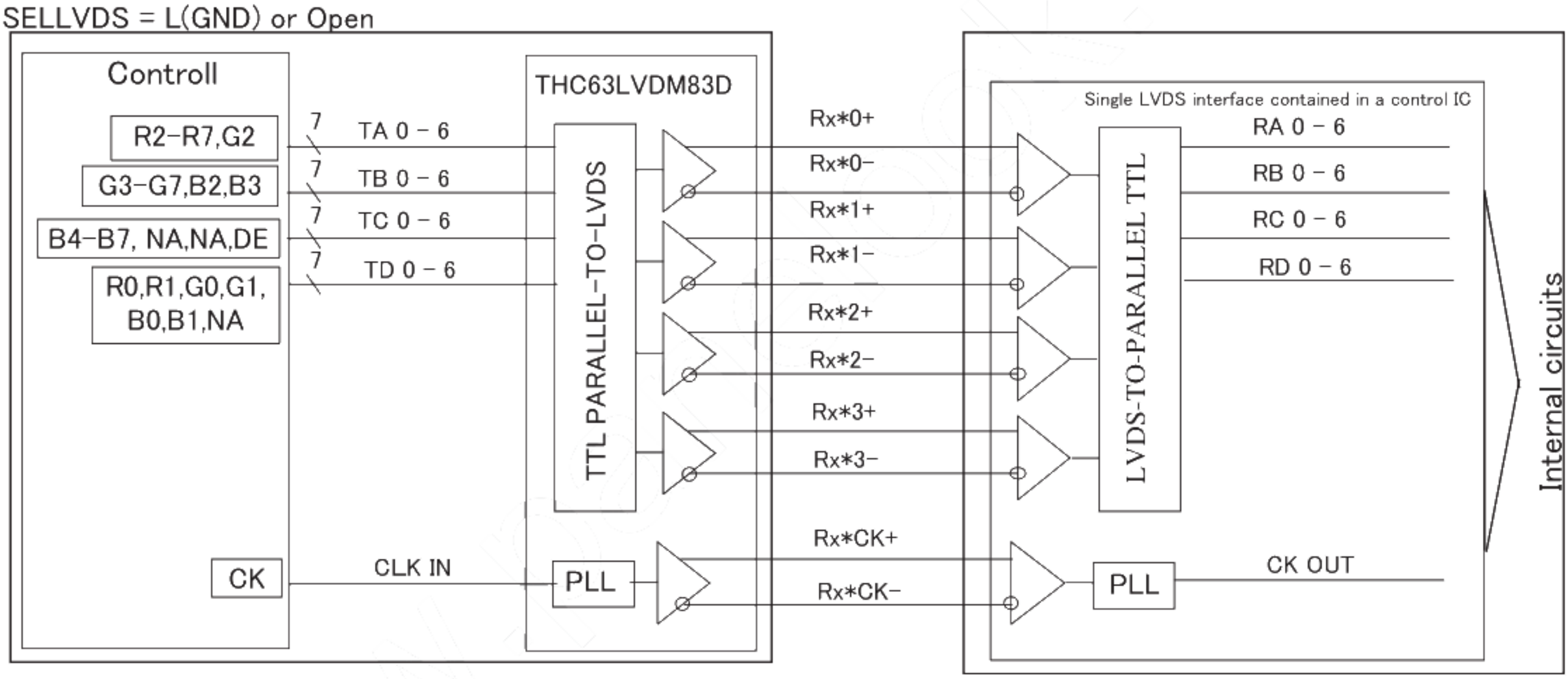
## 4-4. Interface block diagram

(Computer Side) (TFT-LCD side)

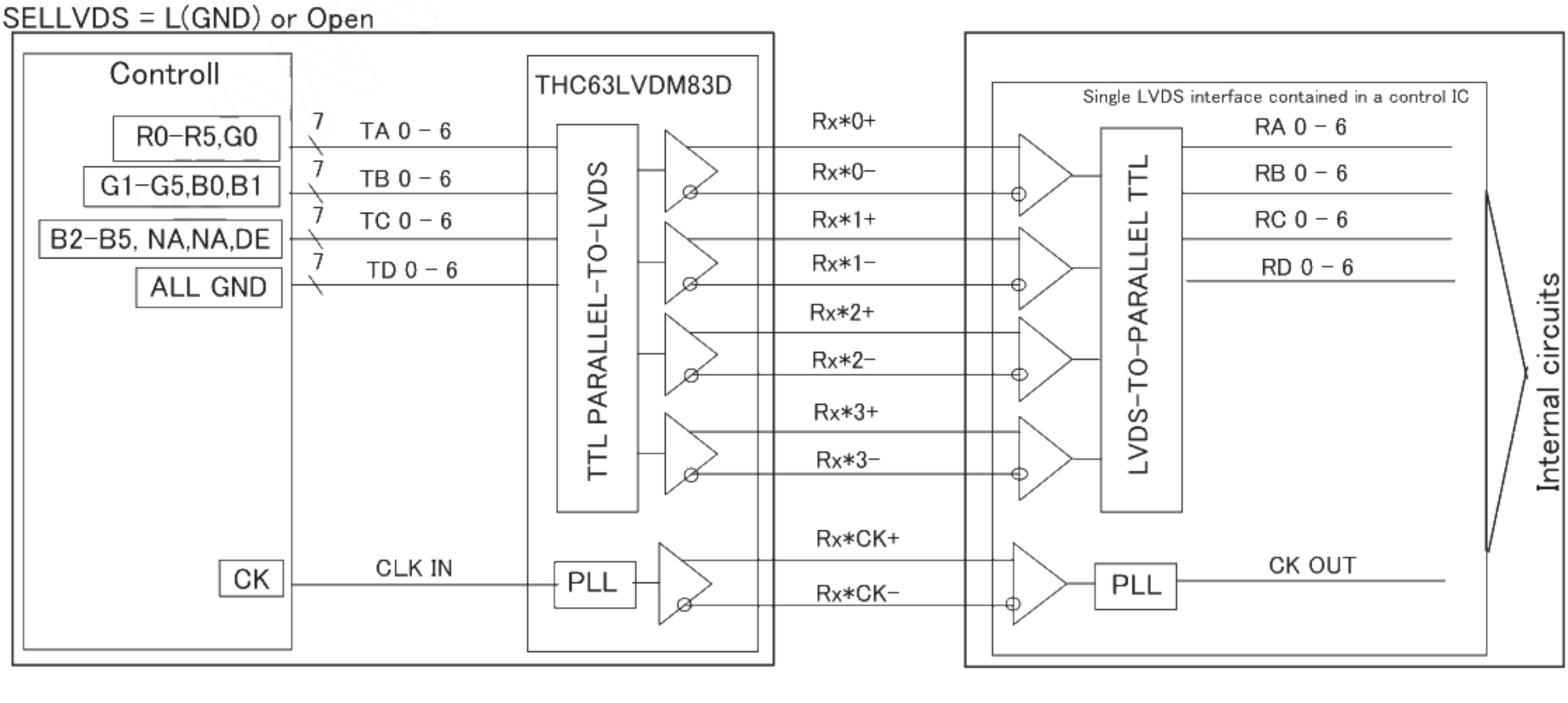
①8 bit input
SELLVDS = H(3.3V)




②8 bit input
SELLVDS = L(GND) or Open




③6 bit input
SELLVDS = L(GND) or Open



## 5. Absolute Maximum Ratings

| Parameter | Symbol | Condition | Pin | Ratings | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply voltage | Vcc | Ta=25℃ | VCC | −0.3 ～ +6.0 | V | 【∗1,2】 |
| | $V_{DD}$ | Ta=25℃ | VDD | −0.3 ～ +15.0 | V | 【∗1,2】 |
| Input voltage | $V_{I1}$ | Ta=25℃ | Rx∗i −/+<br>Rx∗CK −/+ | −0.3～Vcc+0.3 | V | i=0,1,2,3 |
| | $V_{I2}$ | Ta=25℃ | SELLVDS | −0.3～Vcc+0.3 | V | |
| | $V_{I4}$ | Ta=25℃ | ILEDn | −0.3～$V_{DD}$ | V | |
| Storage temperature | $T_{STG}$ | — | - | −25 ～ +60 | ℃ | 【∗1】 |
| Operating temperature | $T_{OPA}$ | — | - | 0 ～ +60 | ℃ | 【∗1,3,4】 |

【∗1】 Humidity：95%RH Max.( Ta≦40℃ ) Note static electricity.

Maximum wet-bulb temperature at 39℃ or less. (Ta>40℃) No condensation.

【∗2】 The Vcc power supply capacity must use the one of 3A or more.

【∗3】 There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness when using it around 60℃.

【∗4】 In the operating temperature item, the low temperature side is the ambient temperature regulations.

The high temperature side is the panel surface temperature regulations.

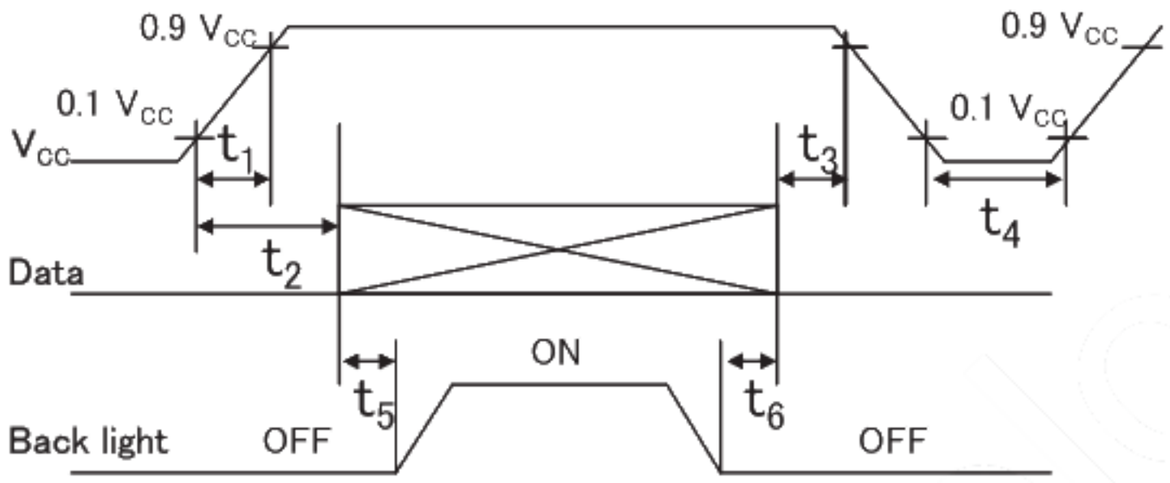
# 6. Electrical Characteristics

## 6-1. TFT-LCD panel driving

$T_a$＝+25°C

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Supply voltage | | $V_{CC}$ | | 4.75 | 5.0 | 5.25 | V | 【*1】 |
| Current dissipation | | $I_{CC}$ | Vcc=5V | - | 750 | 1400 | mA | 【*2】 |
| Input voltage width for LVDS receiver | | $V_L$ | | 0 | — | 2.4 | V | |
| Permissive input ripple voltage | | $V_{RP}$ | | — | — | 200 | $mV_{P-P}$ | Vcc = 5V |
| Differential input Threshold voltage | High | $V_{TH}$ | | — | — | $V_{CM}$ +100 | mV | $V_{CM}$ =+1.2V 【*3】 |
| | Low | $V_{TL}$ | | $V_{CM}$ -100 | — | — | mV | |
| Input voltage | | $V_{IH}$ | | 2.2 | - | 3.3 | V | 【*4】 |
| | | $V_{IL}$ | | 0.0 | - | 0.8 | V | |
| Input reak current | | $I_{OH}$ | | — | — | 400 | μA | $V_{I2}$ = +5V【*4】 |
| | | $I_{OL}$ | | -10 | — | +10 | μA | $V_{I2}$ =0V 【*4】 |
| Terminal resistor | | $R_T$ | | — | 100 | — | Ω | Differential input |

【*1】 On-off conditions for supply voltage




$20\mu s < t_1 \leqq 20ms$

$0 < t_2 \leqq 40ms$

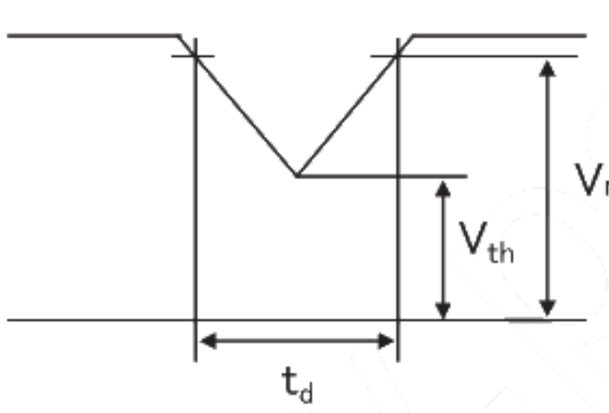
$0 < t_3 \leqq 40ms$

$0.5s \leqq t_4$

$300ms \leqq t_5$

$200ms \leqq t_6$

Vcc-dip conditions




$V_{th} = 4.5V$

$V_{min} = 4.75V$

- $V_{th} < V_{CC} \leqq V_{min}$

  $t_d \leqq 20ms$

- $V_{CC} < V_{th}$

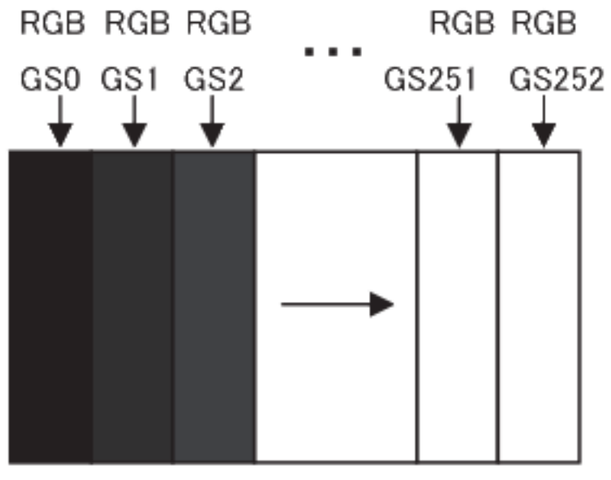
Vcc-dip conditions should also follow the On-off conditions for supply voltage

- Hsync/Vsync need not be input so that this model may drive only by the ENAB signal.
- The relation between the data input and the backlight lighting will recommend the above-mentioned input sequence. When the backlight is turned on before the panel operates, there is a possibility of abnormally displaying. The liquid crystal module is not damaged.

【*2】 Current dissipation

Typical current situation : 253-gray-bar pattern

（ Vcc=+5V、fck = 54MHz、Ta=25°C）




【*3】 $V_{CM}$ : LVDS common mode voltage

【*4】 SELLVDS

## 6-2. LED backlight

Ta＝+25℃

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply voltage | $V_{LED}$ | – | 21.0 | 23.8 | V | 【*1】 |
| Current dissipation | $I_{LED1}$ | – | 550 | – | mA | 【*2】 |
| | | – | 750 | – | μA | 【*3】 |
| Power Consumption | $P_{LED1}$ | – | 11.6 | – | W | 【*1,2,4】 |
| | | – | 15.8 | – | W | 【*1,3,4】 |
| Life time | L | – | (50,000) (Module) | – | h | 【参考値】 【*1,2,5】 |
| | | | (30,000) (Module) | – | h | 【参考値】 【*1,3,5】 |

【*1】 There are two Light Bars, and the specified current is input LED chip 100% duty current.

【*2】 The sensing current of each string is 55mA.

Each light bar have five current sensing strings, so that each light bar input current is 275mA.

【*3】 The sensing current of each string is 75mA.

Each light bar have five current sensing strings, so that each light bar input current is 375mA.

【*4】 PLED = ILED × VLED , LED matrix is (7 serial x 5 parallel) x 2 (Right-bar/Left-bar).

【*5】 The life time is determined as the time at which luminance of the LED becomes 50% of the initial brightness or not normal lighting at ILED =Typ. mA on condition of continuous operating at 25℃.

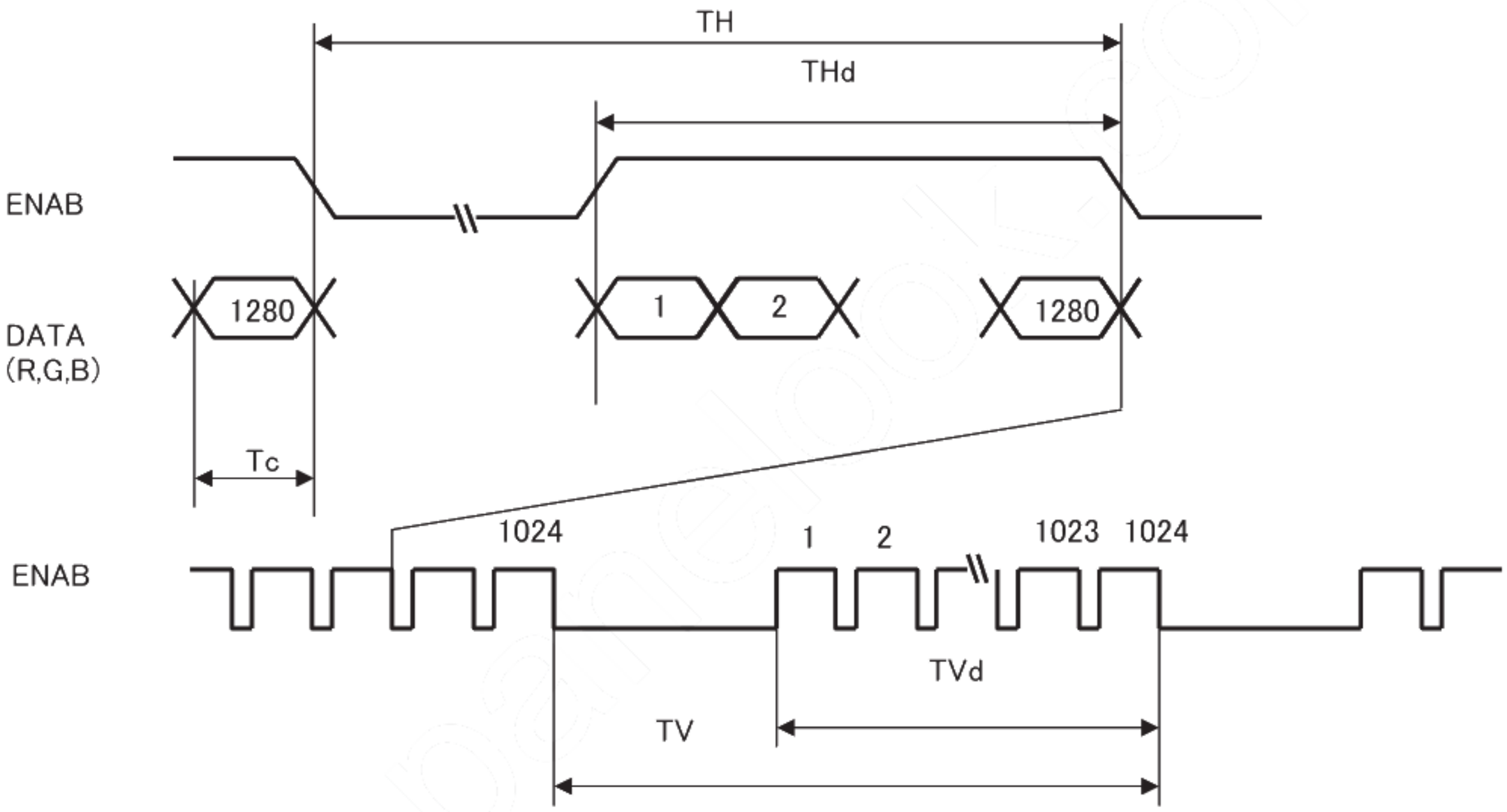
【*6】 In case of using PWM control for backlight driving, please keep frequency enough high in order to avoid the flicker or the deterioration of display quality.

# 7. Timing characteristics of input signals

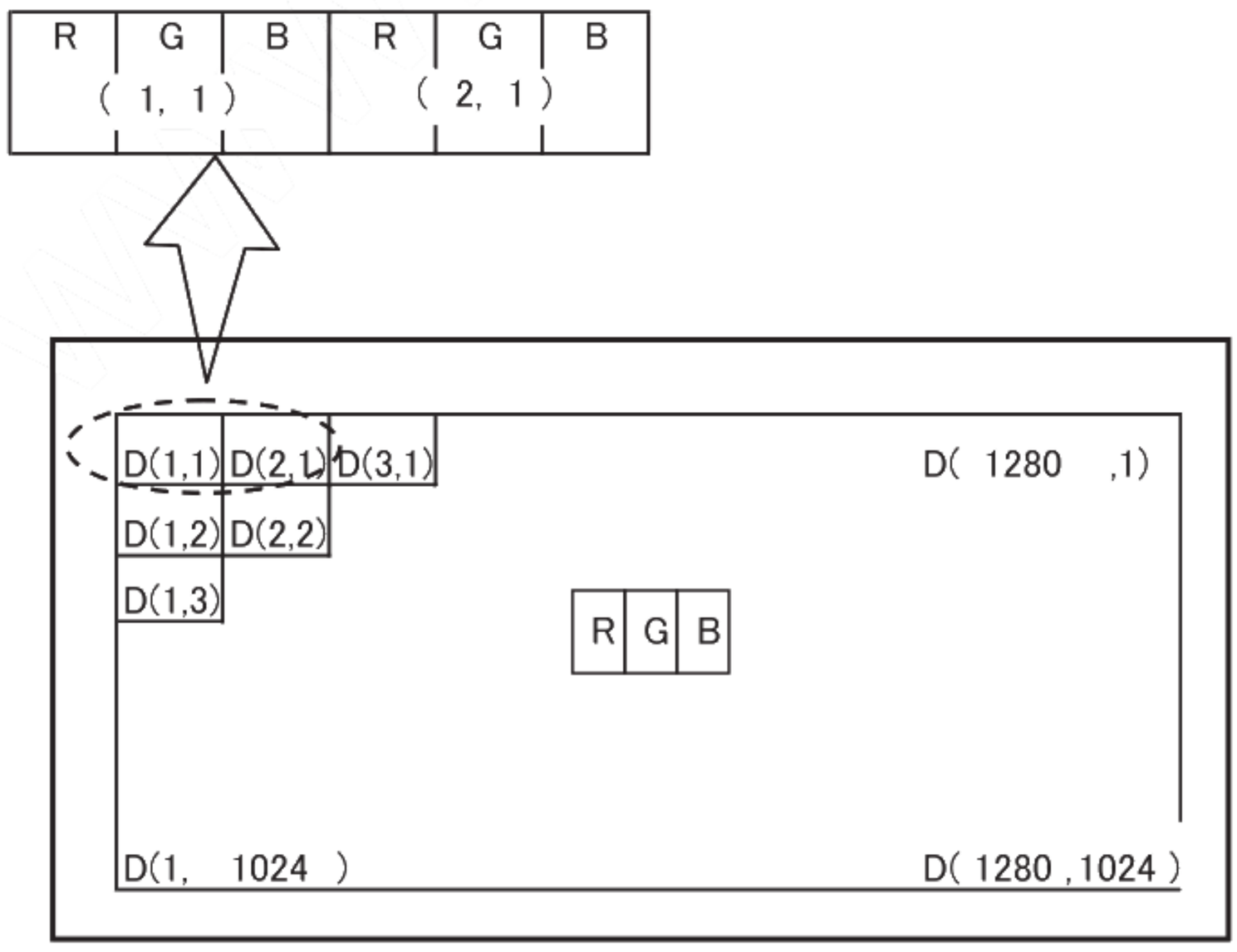
## 7-1. Timing characteristics

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Clock | Frequency | 1/Tc | 40 | 54 | 70 | MHz | |
| ENAB | Horizontal period | TH | 670 | 844 | 929 | clock | |
| | | | 12.3 | 15.6 | – | μs | |
| | Horizontal period (High) | THd | 1280 | 1280 | 1280 | clock | |
| | Vertical Frequency | TV | 1031 | 1066 | 2043 | line | 【*1】 |
| | | | 13.1 | 16.7 | – | ms | |
| | Vertical period (High) | TVd | 1024 | 1024 | 1024 | line | |

【*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



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

## 8-1. 8 bit input

| | Colors & Gray scale | Data signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gray Scale | R0 | R1 | R2 | R3 | R4 | R5 | R6 | R7 | G0 | G1 | G2 | G3 | G4 | G5 | G6 | G7 | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
| 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 |
| | Blue | — | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | — | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cyan | — | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 | 1 | 1 | 1 | 1 | 1 | X | X | 1 | 1 | 1 | 1 | 1 | 1 |
| | Red | — | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Magenta | — | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | — | X | X | 1 | 1 | 1 | 1 | 1 | 1 | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | — | X | X | 1 | 1 | 1 | 1 | 1 | 1 | X | X | 1 | 1 | 1 | 1 | 1 | 1 | X | X | 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 |
| | ↑ | 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 |
| | 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 |
| | ↑<br>↓ | ↑<br>↓ | | | | ↑<br>↓ | | | | | | | | ↑<br>↓ | | | | | | | | ↑<br>↓ | | | | |
| | Brighter | GS250 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ↓ | GS251 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | GS252 | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| | ↑ | 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 |
| | 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 |
| | ↑<br>↓ | ↑<br>↓ | | | | ↑<br>↓ | | | | | | | | ↑<br>↓ | | | | | | | | ↑<br>↓ | | | | |
| | Brighter | GS250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ↓ | GS251 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | GS252 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| | ↑ | 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 |
| | 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 |
| | ↑<br>↓ | ↑<br>↓ | | | | ↑<br>↓ | | | | | | | | ↑<br>↓ | | | | | | | | ↑<br>↓ | | | | |
| | Brighter | GS250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| | ↓ | GS251 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| | Blue | GS252 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | 1 | 1 | 1 | 1 | 1 | 1 |

0 :Low level voltage　1 :High level voltage　X :Don't care

Each basic color can be displayed in253 gray scales from 8 bit data signals. According to the combination of、total 24 bit data signals, the 16-million-color display can be achieved on the screen.

## 8-2. 6 bit input

| | Colors & Gray scale | Data signal | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | GrayScale | 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 |
| | ↑<br>↓ | ↓<br>↓ | | | | ↓<br>↓ | | | | | ↓<br>↓ | | | | | ↓<br>↓ | | | | |
| | 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 |
| | ↑<br>↓ | ↓<br>↓ | | | | ↓<br>↓ | | | | | ↓<br>↓ | | | | | ↓<br>↓ | | | | |
| | 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 |
| | ↑<br>↓ | ↓<br>↓ | | | | ↓<br>↓ | | | | | ↓<br>↓ | | | | | ↓<br>↓ | | | | |
| | 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 |

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=＋5V

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing angle range | Horizontal | θ 21, θ 22 | CR>10 | 85 | – | – | Deg. | 【*1,2,4】 |
| | Vertical | θ 11 | | 85 | – | – | Deg. | |
| | | θ 12 | | – | 80 | – | Deg. | |
| Contrast ratio | | CR | optimized angle | 400 | 1000 | – | | 【*2,4】 |
| Response Time | White Black | τ r + τ d | θ =0° | – | 12 | – | ms | 【*3,4】 |
| Chromaticity of White | | Wx | | 0.250 | 0.300 | 0.350 | | 【*4】 |
| | | Wy | | 0.270 | 0.320 | 0.370 | | |
| Chromaticity of Red | | Rx | | – | 0.640 | – | | |
| | | Ry | | – | 0.345 | – | | |
| Chromaticity of Green | | Gx | | – | 0.315 | – | | |
| | | Gy | | – | 0.630 | – | | |
| Chromaticity of Blue | | Bx | | – | 0.150 | – | | |
| | | By | | – | 0.080 | – | | |
| Luminance of white | | $Y_{L1}$ | | 210 | 300 | – | $cd/m^2$ | $I_{LED}$=550mA 【*4】 |
| | | | | 280 | 400 | – | $cd/m^2$ | $I_{LED}$=750mA 【*4】 |
| White Uniformity | | | | – | – | 1.43 | | 【*5】 |

※The measurement shall be executed 30 minutes after lighting at rating.

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.

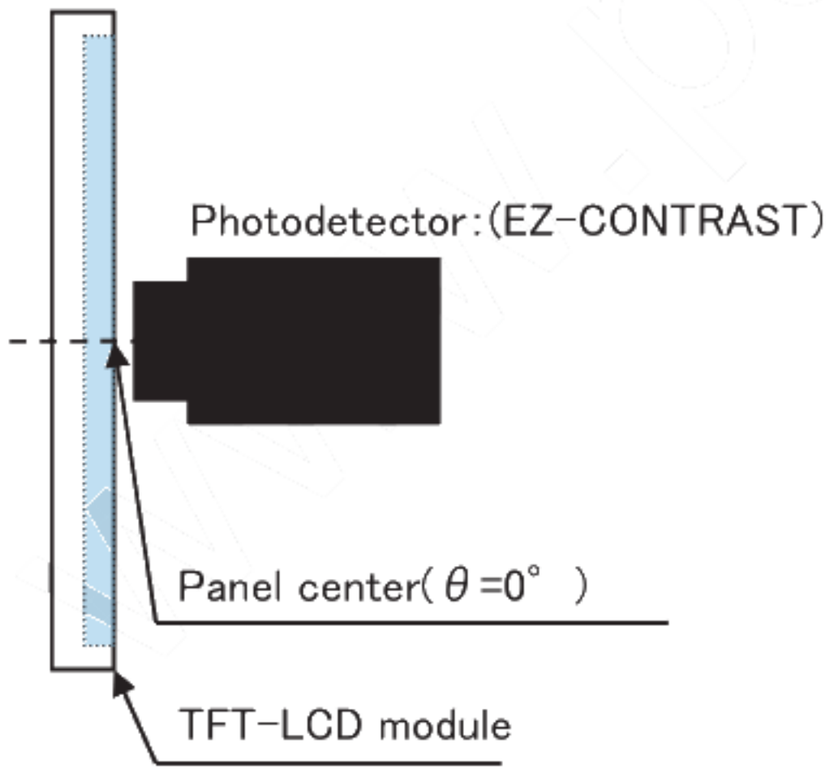



fig.2-1 Measuring method of Viewing angle range.

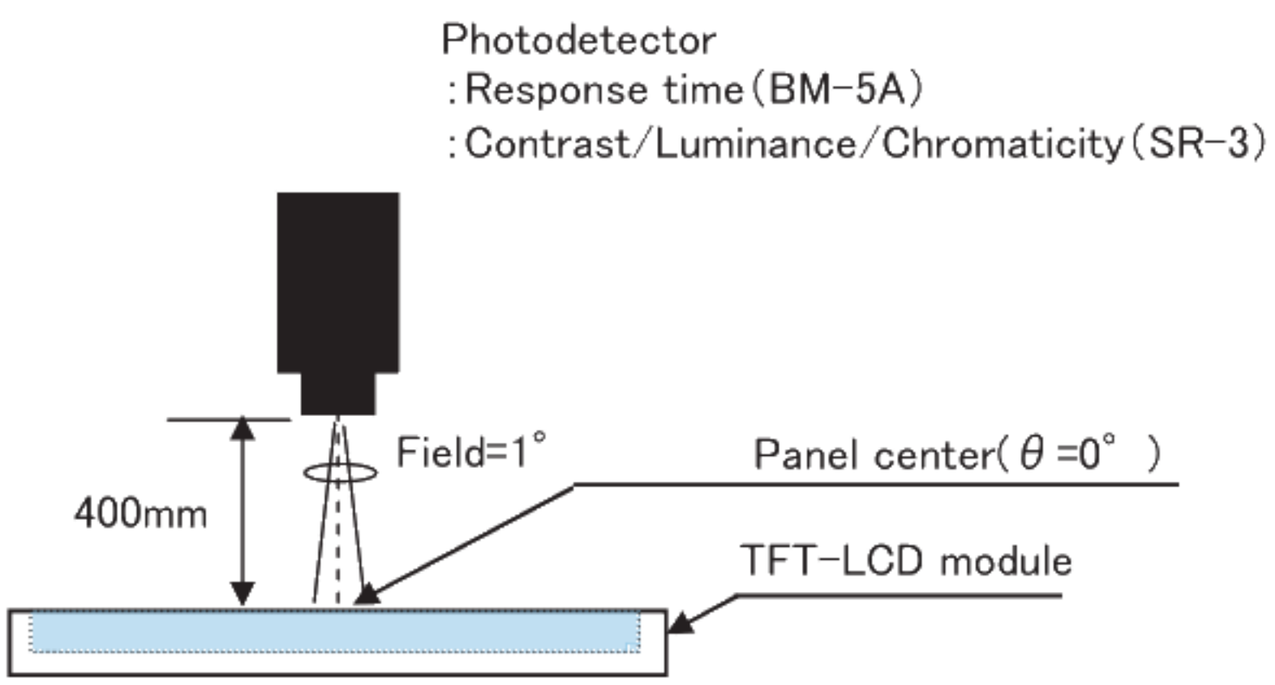
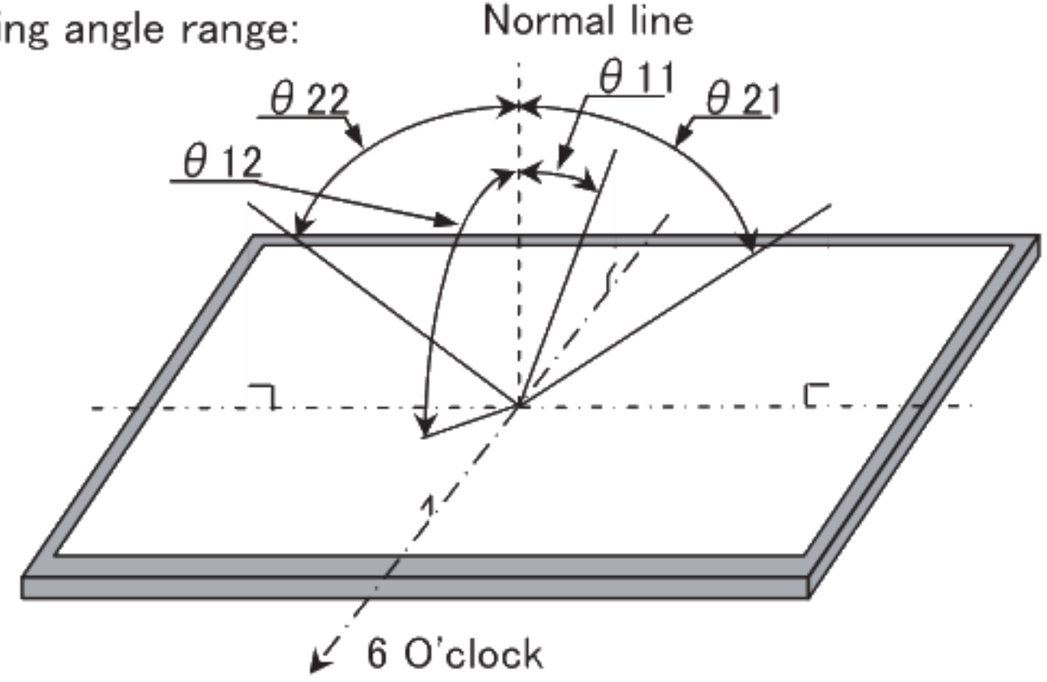



fig.2-2 Measuring method of contrast, luminance, response time, and Chromaticity.

Fig.2 Optical characteristics measurement method

【*1】Definitions of viewing angle range:

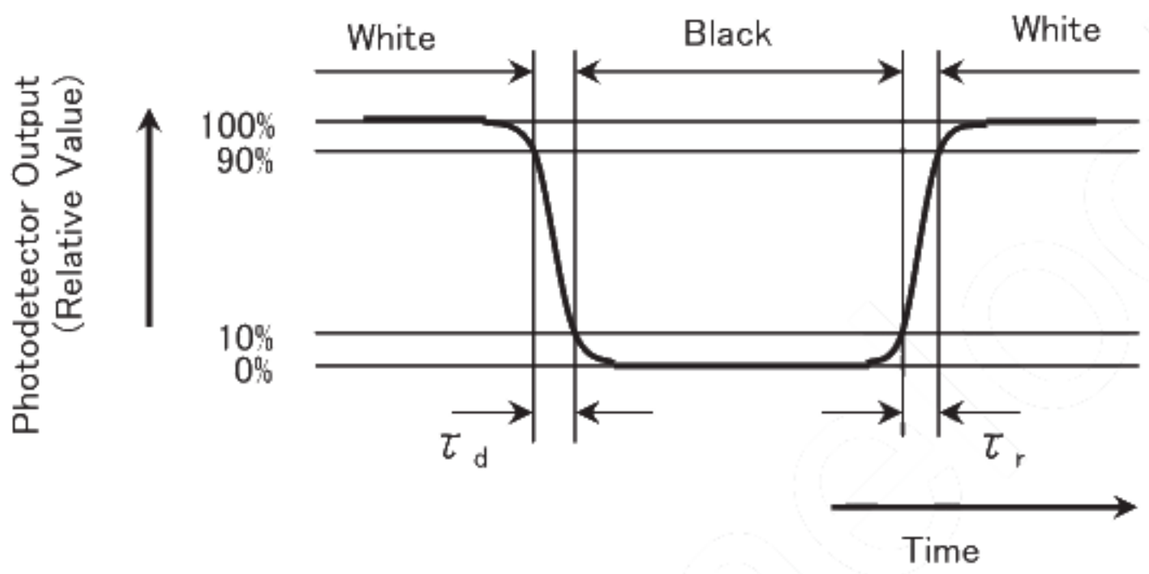



【*2】Definition of contrast ratio:

The contrast ratio is defined as the following. $\text{Contrast (CR)} = \dfrac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$

【*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".

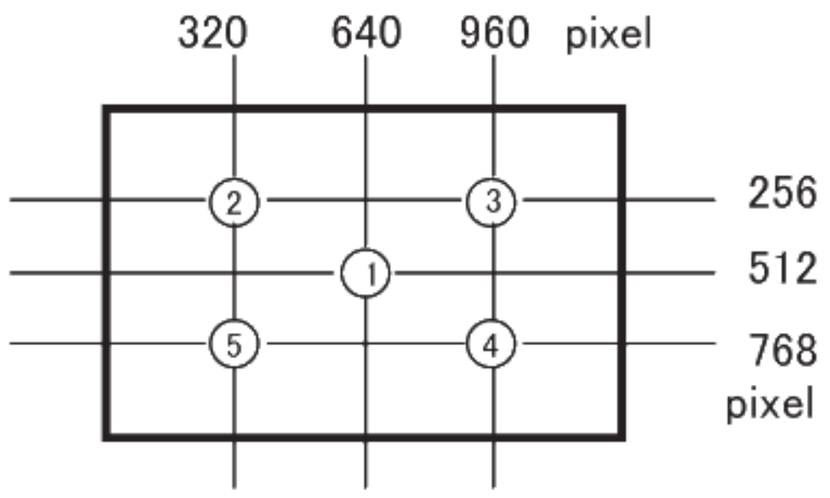



【*4】This shall be measured at center of the screen.

【*5】Definition of white uniformity:

White uniformity is defined as the following with five measurements. (①～⑤)

$$\delta_w = \frac{\text{Maximum luminance of 5 points(①～⑤).}}{\text{Minimum luminance of 5 points(①～⑤).}}$$



## 10. Handling Precautions

a ) Be sure to turn off the power supply when inserting or disconnecting the cable.

b ) Since the front polarizer is easily damaged, pay attention not to scratch it.

c ) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

d ) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

e ) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

f ) 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.

g ) 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.

h ) It causes an irregular display and the defective indication, etc., when always put constant pressure on the back of the module.
Please do not make the structure to press the back of the module.

i ) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.

j ) Connect GND to stabilize against EMI and external noise.

k ) 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.
Do not use the LCD module under such environment.

l ) 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.

m ) Be careful when using it for long time with fixed pattern display as it may cause accidential image.

n ) Adjusting volume have been set optimally before shipment, so do not change any adjusted value.
If adjusted value is changed, the specification may not be satisfied.

o ) 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.

p) The polarizer surface on the panel is treated with Anti-Glare for low reflection. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.

q ) Notice : Never take to pieces the module , because it will cause failure.
Please do not peel off the Black tape pasted to the product.

r) An abnormal display by changing in quality of the polarizing plate might occur regardless of contact or no contact to the polarizing plate, because of epoxy resin (amine system curing agent) that comes out from the material and the packaging material used for the set side, the silicon adhesive (dealcoholization system and oxime system), and the tray blowing agents (azo-compound), etc.
Please confirm adaptability with your employed material.

## 11. Packing form

a) Piling number of cartons　:　MAX. 5

b) Package quantity in one carton:　5pcs

c) Carton size(TYP):　493mm(W) × 417mm(D)×293mm(H)

d) Total mass of one carton filled with full modules(5pcs):　15kg

## 12. Reliability test items

| No. | Test item | Conditions | Remark |
|---|---|---|---|
| 1 | High temperature storage test | Ambient temperature 60℃ 240H | 【Note1】 |
| 2 | Low temperature strage test | Ambient temperature −25℃ 240H | 【Note1】 |
| 3 | High temperature & high humidity operation test | Ambient temperature 40℃、Humidity 95% RH 240H<br>(No condensation.) | 【Note1】 |
| 4 | High temperature operation test | Panel surface 60℃ 240H | 【Note1】 |
| 5 | Low temperature operation test | Ambient temperature 0℃ 240H | 【Note1】 |
| 6 | Vibration test (non-operating) | ＜Sin wave＞<br>Frequency :10～57Hz／Vibration width (one side) :0.076mm<br>:57～500Hz／Gravity:9.8m/s2<br>Sweep time:11minutes<br>Test period :3H(X, Y, Z direction 1H) | 【Note1】 |
| 7 | Shock test (non-operating) | Max. gravity:490m/s2 Pulse width:6ms<br>Direction:±X,±Y,±Z Test period :1time／1direction | 【Note1】 |
| 8 | Electrostatic discharge test (non-operating) | Contact discharge (150pF 330Ω):<br>non-operation=±10kV, operation=±8kV<br>Aerial discharge (150pF 330Ω):<br>non-operation=±20kV, operation=±15kV | 【Note1】 |

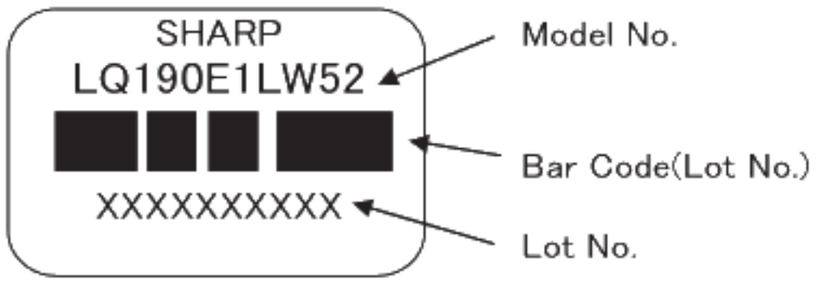
【Note1】 Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function. (normal operation state:Temperature:15～35℃, Humidity:45～75%, Atmospheric pressure:86～106kpa)

# 13. Others

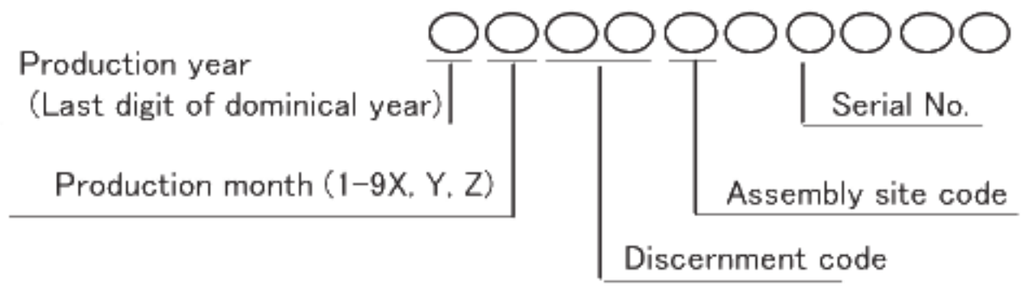
13-1. Lot No Label:

A) Module serial label

The label that displays SHARP・Model No.( LQ190E1LW52)・Lot No. is stuck on the back of the module.

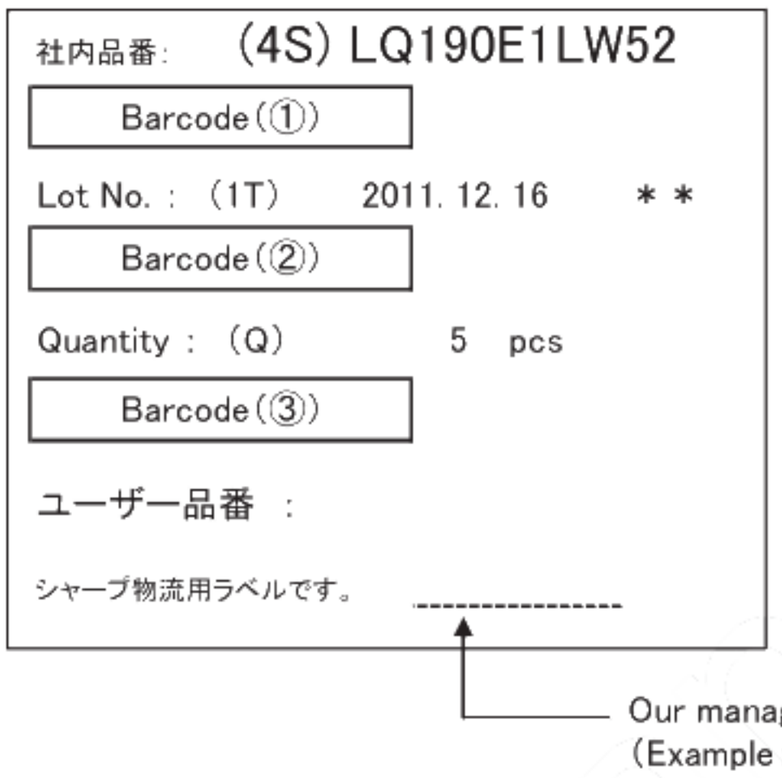



Lot No display method(Figure and alphabet)




13-2. Packing box Label:

The label that displays ①Model number( LQ190E1LW52) ②Lot number ③Quantity of module is stuck on the packing box. Moreover, the display of bar code also applies to this.




① Model number( LQ190E1LW52)

② Lot number (DATA)

③ Quantity of module

A right picture is written to the packing box of module for the RoHS restriction.

※ R.C.(RoHs Compliance) means these parts have corresponded with the RoHs directive.
This module corresponds from the first sample to RoHS Directive.

R.C.

13-3. The ozone-depleting substances is not used.

13-4. If any problem occurs in relation to the description of this specification , it shall be resolved through discussion with spirit of cooperation.

## 14. Storage conditions

Environmental condition range of storage temperature and humidity

Temperature 0 to 40 degrees Celsius

Relative humidity 95% and below

【Note】Please refer below as a mean value of the environmental conditions.

Summer time temperature 20 to 35 degrees Celsius humidity , 85% and below

Winter time temperature 5 to 15 degrees Celsius humidity , 85% and below

Please maintain within 240 hours of accumulated length of storage time, with conditions of 40 degrees Celsius and room humidity of 95%.

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

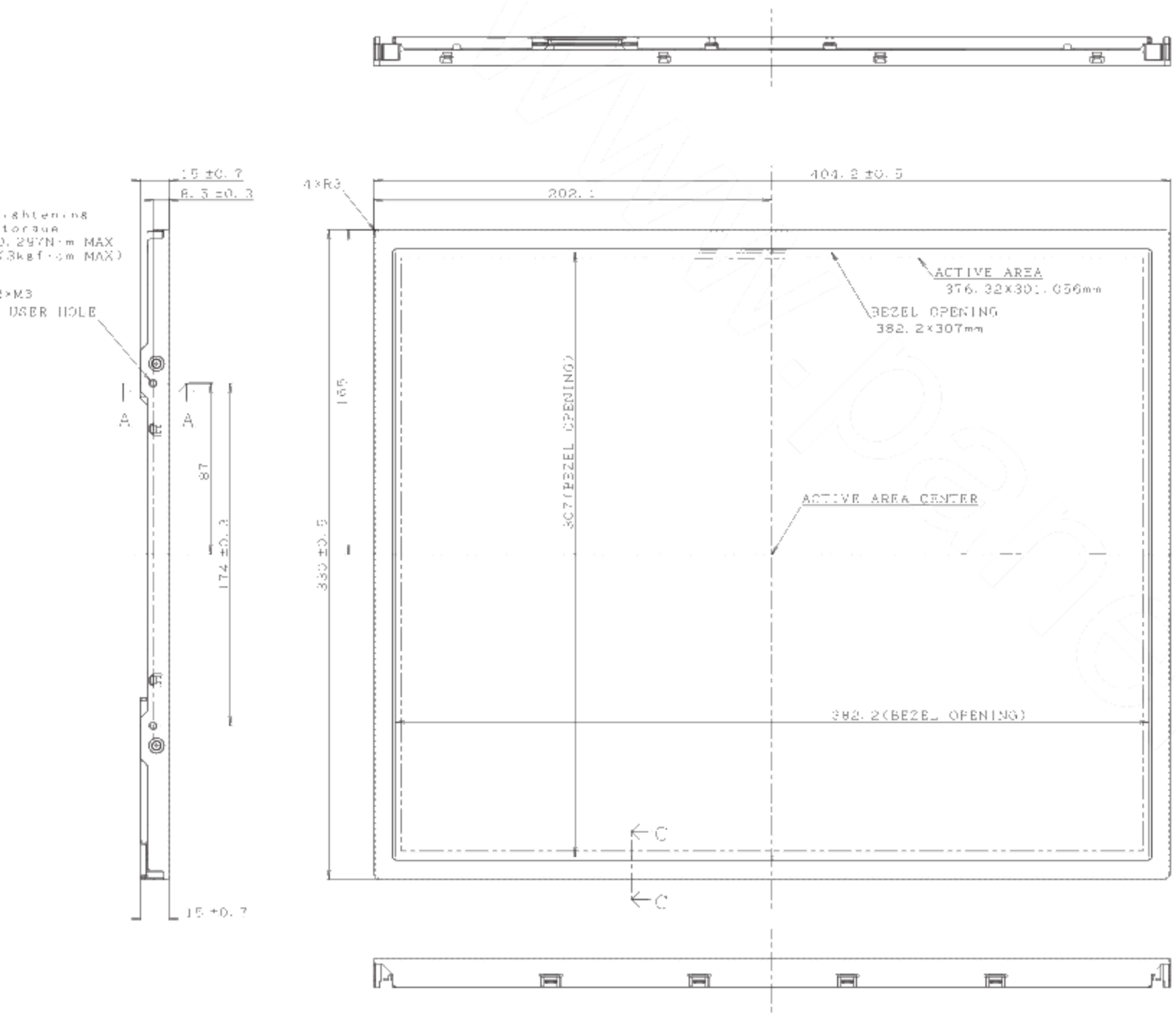
Please store the product carton either on a wooden pallet or a stand / rack to prevent dew.

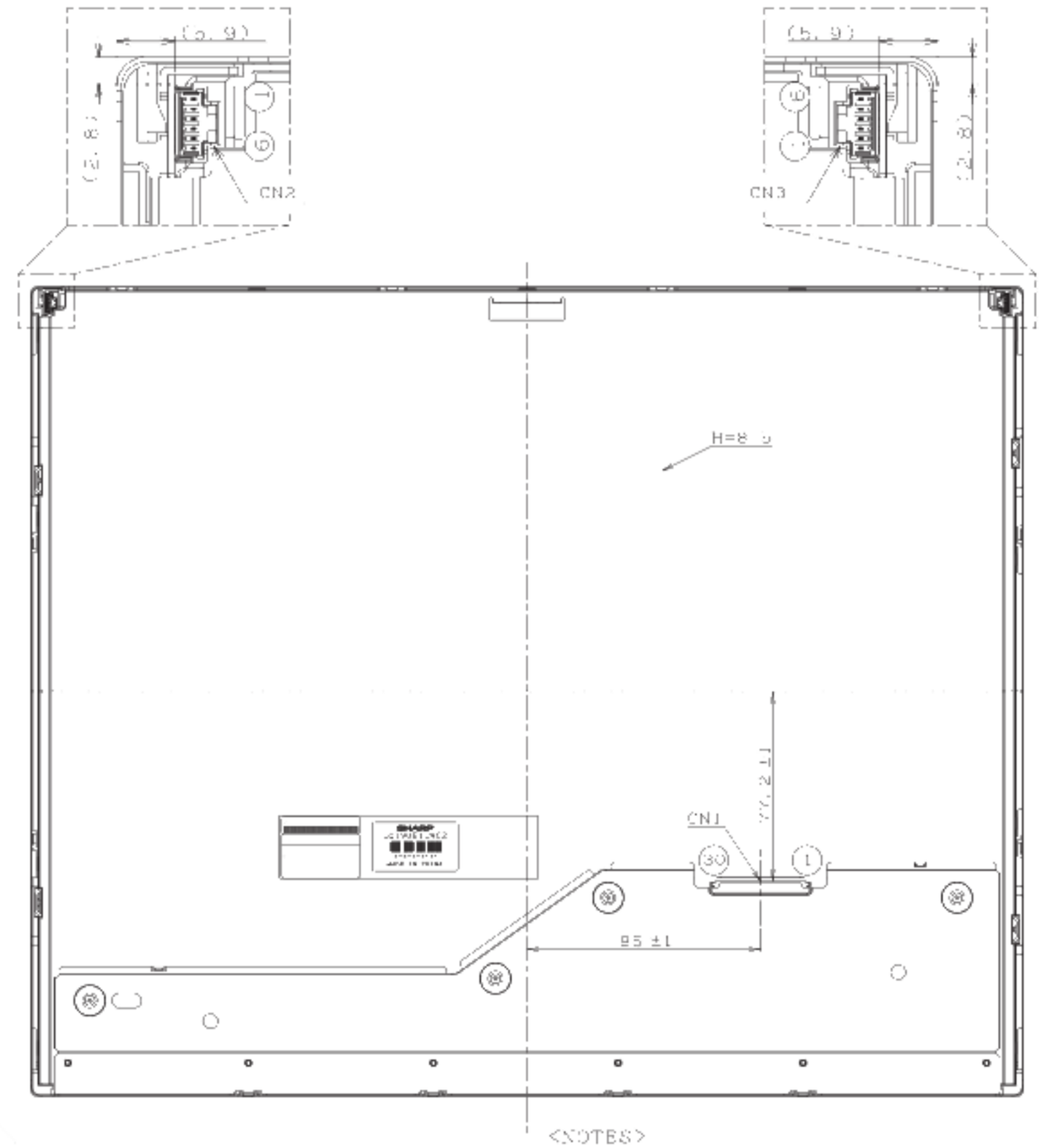
Do not place directly on the floor. In addition, to obtain moderate ventilation in between the pallet's top and bottom surfaces, pile the cartons up in a single direction and in order.

Please place the product cartons away from the storage wall.

Storage period

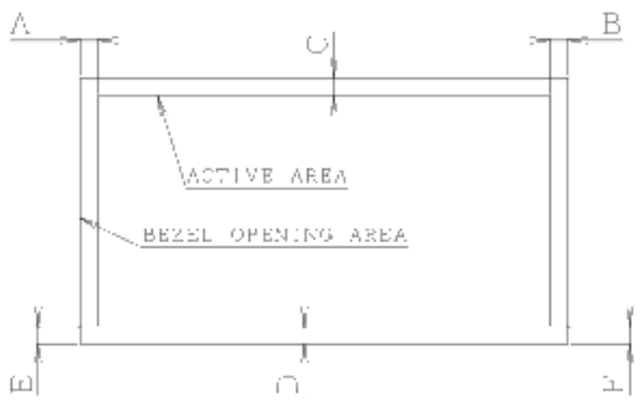
Within above mentioned conditions, maximum storage period should be one year.




<NOTES>
1. UNSPECIFIED TOLERANCE TO BE ±0.5
2. UNIT:mm

BEZEL/DISPLAY POSITION




| | | |
|---|---|---|
| 1) TOLERANCE X-DIRECTION | A:2.94 | ±0.8 |
| 2) TOLERANCE X-DIRECTION | B:2.94 | ±0.8 |
| 3) TOLERANCE Y-DIRECTION | C:2.972 | ±0.8 |
| 4) TOLERANCE Y-DIRECTION | D:2.972 | ±0.8 |
| 5) OBLIQUITY OF DISPLAY AREA | E F | <0.8 |

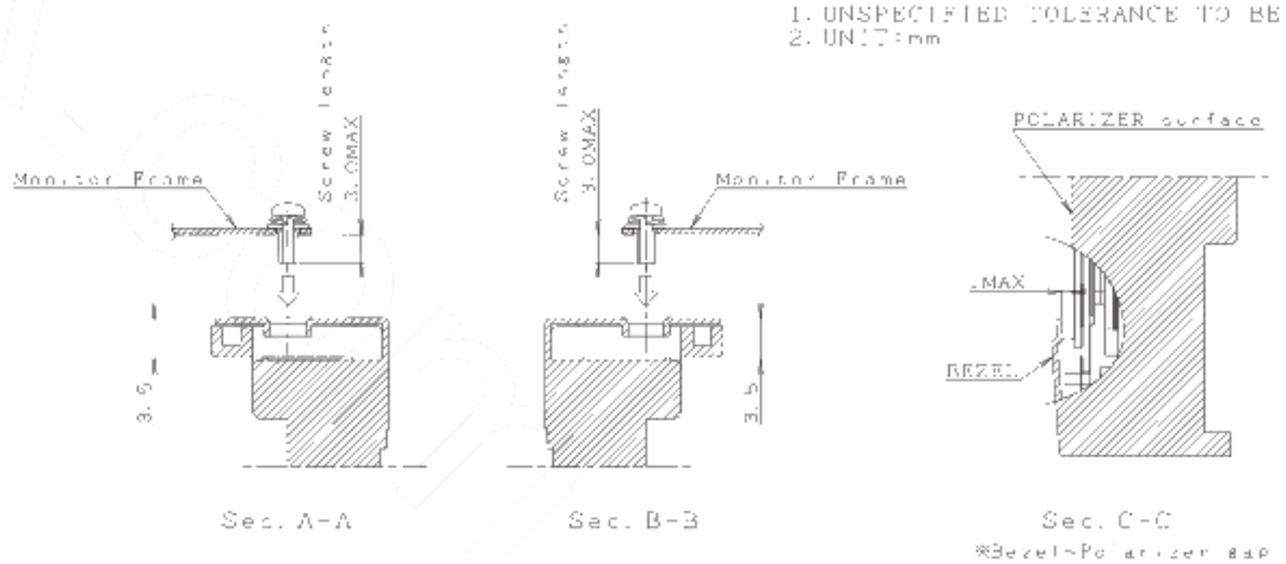



Fig. 1 Outline dimensions (LQ190E1LW52)

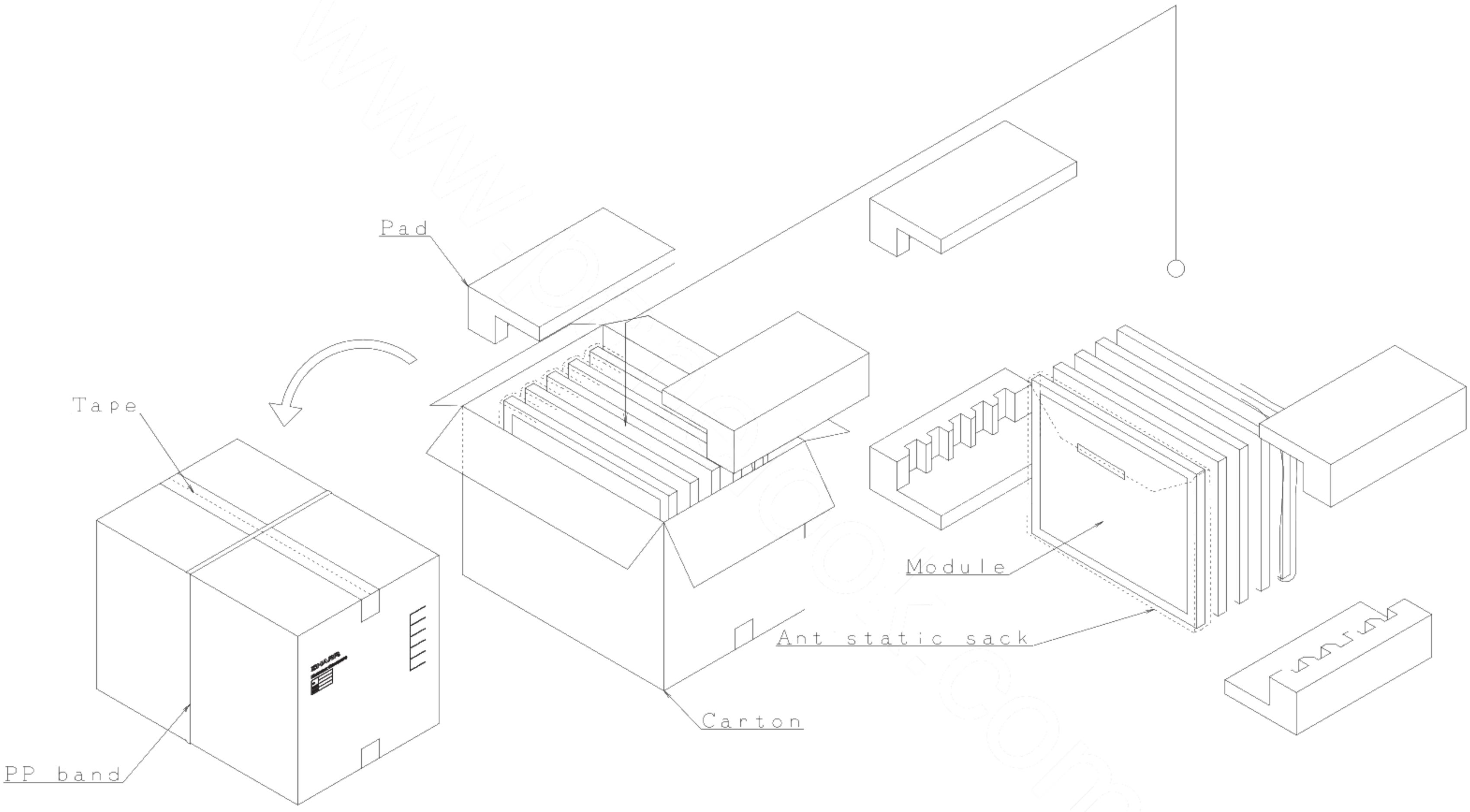



Fig3:Packing form