

LQ104V1DG21

TFT-LCD Module

(Model No.: LQ104V1DG21)

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Spec No.: LD-14901A
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SPECIFICATION

REVISION : May. 6. 2003

DEVICE SPECIFICATION FOR
TFT-LCD Module
 MODEL No.
LQ104V1DG21

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

BY *Makoto Takeda*

M. TAKEDA
 Department General Manager
 Development Engineering Department II
 AVC LIQUID CRYSTAL DISPLAY Division
 AVC LIQUID CRYSTAL DISPLAY GROUP
 SHARP CORPORATION

1. Application

This specification applies to color TFT-LCD module, LQ104V1DG21

(This specification is only applied for the module which has letter "A" at the end of the lot number of the module.)

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

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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 .

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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 and power supply circuit and a backlight unit. Graphics and texts can be displayed on a 640 × 3 × 480 dots panel with 262,144 colors by supplying 18 bit data signal (6bit/color), four timing signals,+3.3V/ +5V DC supply voltage for TFT-LCD panel driving and supply voltage for backlight.

The TFT-LCD panel used for this module is a low-reflection and higher-color-saturation type. Therefore, this module is also suitable for the multimedia use.

Optimum viewing direction is 6 o'clock.

Backlight-driving DC/AC inverter is not built in this module.

3. Mechanical Specifications

| Parameter | Specifications | Unit |
|----------------------------|----------------------------------|-------|
| Display size | 26 (10.4") Diagonal | cm |
| Active area | 211.2(H) × 158.4(V) | mm |
| Pixel format | 640(H) × 480(V) | pixel |
| | (1 pixel = R + G + B dots) | |
| Pixel pitch | 0.330(H) × 0.330(V) | mm |
| Pixel configuration | R,G,B vertical stripe | |
| Display mode | Normally white | |
| Unit outline dimensions *1 | 265.0(W) × 195.0(H) × 11.5max(D) | mm |
| Mass | 700(max) | g |
| Surface treatment | Anti-glare and hard-coating 3H | |

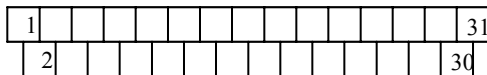
*1.Note: excluding backlight cables.

Outline dimensions is shown in Fig.1

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 Used connector:DF9MA-31P-1V (Hirose Electric Co., Ltd.)

CN1 pin arrangement from module surface
(Transparent view)

Corresponding connector : DF9-31S-1V (")

DF9A-31S-1V(")

DF9B-31S-1V(")

DF9M-31S-1V(")

| Pin No. | Symbol | Function | Remark |
|---------|--------|--|---------|
| 1 | GND | | |
| 2 | CK | Clock signal for sampling each data signal | |
| 3 | Hsync | Horizontal synchronous signal | 【Note1】 |
| 4 | Vsync | Vertical synchronous signal | 【Note1】 |
| 5 | GND | | |
| 6 | R0 | R E D data signal(LSB) | |
| 7 | R1 | R E D data signal | |
| 8 | R2 | R E D data signal | |
| 9 | R3 | R E D data signal | |
| 10 | R4 | R E D data signal | |
| 11 | R5 | R E D data signal(MSB) | |
| 12 | GND | | |
| 13 | G0 | G R E E N data signal(LSB) | |
| 14 | G1 | G R E E N data signal | |
| 15 | G2 | G R E E N data signal | |
| 16 | G3 | G R E E N data signal | |
| 17 | G4 | G R E E N data signal | |
| 18 | G5 | G R E E N data signal(MSB) | |
| 19 | GND | | |
| 20 | B0 | B L U E data signal(LSB) | |
| 21 | B1 | B L U E data signal | |
| 22 | B2 | B L U E data signal | |
| 23 | B3 | B L U E data signal | |
| 24 | B4 | B L U E data signal | |
| 25 | B5 | B L U E data signal(MSB) | |
| 26 | GND | | |
| 27 | ENAB | Signal to settle the horizontal display position | 【Note2】 |
| 28 | Vcc | + 3.3/5.0V power supply | |
| 29 | Vcc | + 3.3/5.0V power supply | |
| 30 | R/L | Horizontal display mode select signal | 【Note3】 |
| 31 | U/D | Vertical display mode select signal | 【Note4】 |

The shielding case is connected with GND.

【Note1】 480 line, 400 line or 350 line mode

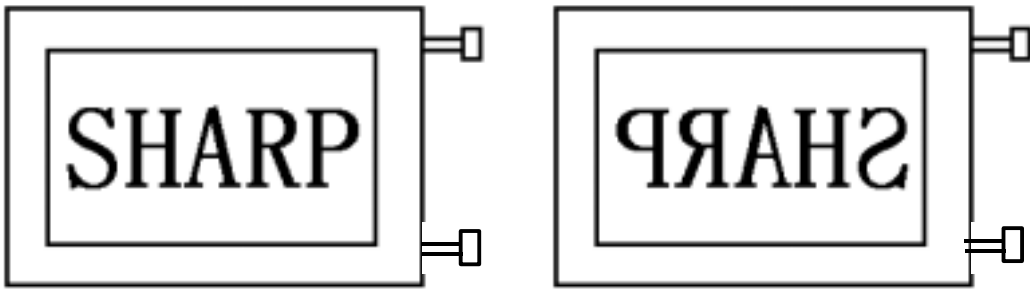
is selected by the polarity combination
of the both synchronous signals.

| Mode | 480 lines | 400 lines | 350 lines |
|-------|-----------|-----------|-----------|
| Hsync | Negative | Negative | Positive |
| Vsync | Negative | Positive | Negative |

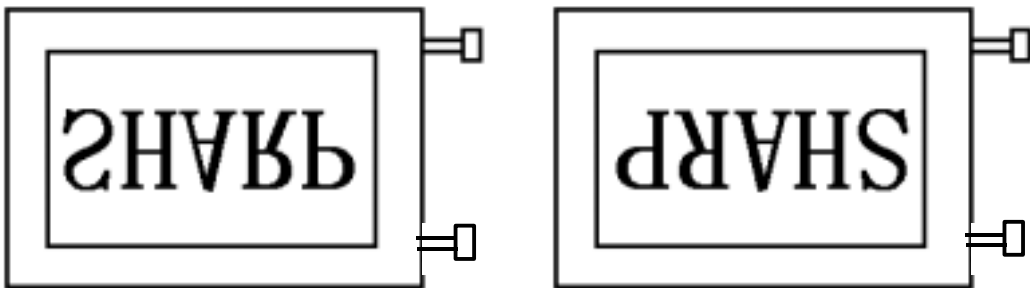
【Note2】 The horizontal display start timing is settled in

accordance with a rising timing of ENAB signal. In case ENAB is fixed "Low", the horizontal start timing is determined as described in 7-2. Don't keep ENAB "High" during operation.

【Note3】 【Note4】



R / L = High、U / D = Low R / L = Low、U / D = Low



R / L = High、U / D = High R / L = Low、U / D = High

4-2. Backlight driving

Used connector : BHR-03VS-1(JST)

CN2、CN3

Corresponding connector :SM02(8.0)B-BHS(JST)

| Pin no. | Symbol | Function |
|---------|-------------------|--|
| 1 | V _{HIGH} | Power supply for lamp (High voltage side) |
| 2 | NC | This is electrically opened. |
| 3 | V _{LOW} | Power supply for lamp (Low voltage side) |

5. Absolute Maximum Ratings

| Parameter | Symbol | Condition | Ratings | Unit | Remark |
|---------------------------------|------------------|-----------|-------------------------------|------|---------|
| Input voltage | V _I | Ta=25 | - 0.3 ~ V _{CC} + 0.3 | V | 【Note1】 |
| +5V supply voltage | V _{CC} | Ta=25 | 0 ~ + 6 | V | |
| Storage temperature | T _{stg} | - | - 30 ~ + 70 | | 【Note2】 |
| Operating temperature (Ambient) | T _{opa} | - | - 10 ~ + 65 | | |

【Note1】 CK,R0 ~ R5,G0 ~ G5,B0 ~ B5,Hsync,Vsync,ENAB, R/L, U/L

【Note2】 Humidity : 95%RH Max. at Ta 40 .

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

No condensation.

6. Electrical Characteristics

6-1. TFT-LCD panel driving

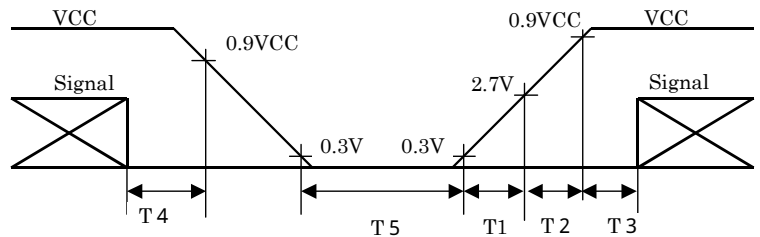
Ta = 25

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---------------------------------|---------------------|------------------|--------------------|-------------|--------------------|------------------|---|
| Power Supply | Supply voltage | Vcc | +3.0 | +3.3 +5.0 | +5.5 | V | 【Note1】 |
| | Current dissipation | Icc | - | 180 | 270 | mA | Vcc=3.3V 【Note2】 |
| Icc | | - | 150 | 230 | mA | Vcc=5.0V 【Note2】 | |
| Permissive input ripple voltage | | V _{RF} | - | - | 100 | mVp-p | |
| Input voltage (Low) | | V _{IL} | - | - | 0.3V _{cc} | V | 【Note3】 |
| Input voltage (High) | | V _{IH} | 0.7V _{cc} | - | - | V | |
| Input current (low) | | I _{OL1} | - | - | 1.0 | μA | V _I =0V 【Note4】 |
| | | I _{OL2} | - | - | 10 | μA | V _I =0V 【Note5】 |
| | | I _{OL3} | - | - | 800 | μA | V _I =0V 【Note6】 |
| Input current (High) | | I _{OH1} | - | - | 1.0 | μA | V _I =V _{cc} 【Note7】 |
| | | I _{OH2} | - | - | 300 | μA | V _I =V _{cc} 【Note8】 |
| | | I _{OH3} | - | - | 800 | μA | V _I =V _{cc} 【Note9】 |

【 NOTE 1 】

Vcc-turn-on conditions

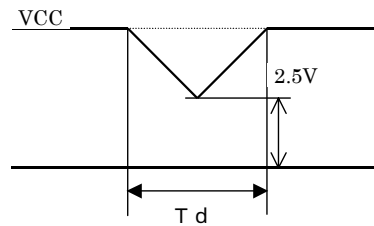
- 0 < T1 15 ms
- 0 < T2 10 ms
- 0 < T3 100 ms
- 0 < T4 1 s
- T5 > 200 ms



Vcc-dip conditions

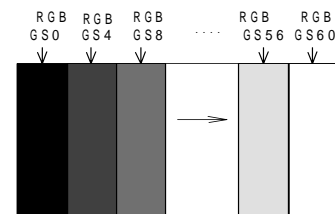
- 1) 2.5V < V_{cc}
- T_d 10 ms
- 2) V_{cc} < 2.5V

Vcc-dip condition should also follow
The Vcc-turn-on conditions



【Note2】 Typical current situation : 16-gray-bar pattern.

480 line mode/Vcc=+3.3V/ + 5.0V



【Note3】 CK,R0~R5,G0~G5,B0~B5,Hsync,Vsync,ENAB,
R/L,U/D

【Note4】 CK,R0~R5,G0~G5,B0~B5,Hsync,Vsync,

【Note5】 U/D,ENAB

【Note6】 R/L

【Note7】 CK,R0~R5,G0~G5,B0~B5,Hsync,Vsync,R/L

【Note8】 ENAB

【Note9】 U/D

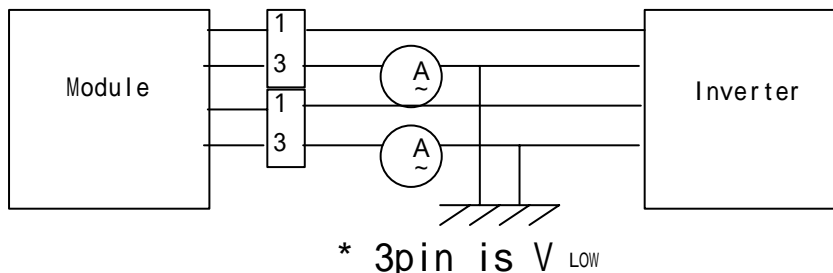
6-2. Backlight driving

The backlight system is an edge-lighting type with double CCFT (Cold Cathode Fluorescent Tube). The characteristics of single lamp are shown in the following table.

Ta=25

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|------------------------|----------------|-------|------|------|-------|-----------------|
| Lamp current | I _L | 2.0 | 6.0 | 6.5 | mArms | 【Note1】 |
| Lamp power consumption | P _L | - | 2.8 | - | W | 【Note2】 |
| Lamp frequency | F _L | 20 | 35 | 60 | KHz | 【Note3】 |
| Kick-off voltage | V _s | - | - | 950 | Vrms | Ta=25 【Note4】 |
| | | - | - | 1250 | Vrms | Ta =0 【Note4】 |
| | | - | - | 1500 | Vrms | Ta =-10 【Note4】 |
| Lamp life time | L _L | 50000 | - | - | hour | 【Note5】 |

【Note1】 Lamp current is measured with current meter for high frequency as shown below.



【Note2】 At the condition of I_L=6.0mArms

【Note3】 Lamp frequency may produce interference with horizontal synchronous frequency, and this may cause beat on the display. Therefore lamp frequency shall be detached as much as possible from the horizontal synchronous frequency and from the harmonics of horizontal synchronous to avoid interference.

【Note4】 The open output voltage of the inverter shall be maintained for more than 1sec; otherwise the lamp may not be turned on.

【Note5】 Since lamp is consumables, the life time written above is referencial value and it is not guaranteed in this specification sheet by SHARP.

Lamp life time is defined that it applied either or under this condition

(Continuous turning on at Ta=25 , I_L=6.0mArms)

Brightness becomes 50% of the original value under standard condition.

Kick-off voltage at Ta= -10 exceeds maximum value, 1500Vrms.

www.sharp.com In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower.

(Continuous operating under for around 1 month under lower temp condition may reduce the brightness to half of the original brightness.)

In case of such usage under lower temp environment, periodical lamp exchange is recommended.

【Note6】 The performance of the backlight, for example life time or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occur. when you confirm it, the module should be operated in the same condition as it is installed in your instrument.

【Note7】 It is required to have the inverter designed so that to allow the impedance deviation of the two CCFT lamps and the capacity deviation of barast capacitor.

7. Timing Characteristics of input signals

Timing diagrams of input signal are shown in Fig.2 - ~ .

7-1. Timing characteristics

| Parameter | | Symbol | Mode | Min. | Typ. | Max. | Unit | Remark |
|------------------------------|-------------|--------|------|-------|-------|--------|-------|--------|
| Clock | Frequency | 1/Tc | all | - | 25.18 | 28.33 | MHz | |
| | High time | Tch | " | 5 | - | - | ns | |
| | Low time | Tcl | " | 10 | - | - | ns | |
| Data | Setup time | Tds | " | 5 | - | - | ns | |
| | Hold time | Tdh | " | 10 | - | - | ns | |
| Horizontal sync. signal | Cycle | TH | " | 30.00 | 31.78 | - | μs | |
| | | | " | 750 | 800 | 900 | clock | |
| | Pulse width | THp | " | 2 | 96 | 200 | clock | |
| Vertical sync. signal | Cycle | TV | 480 | 515 | 525 | 560 | line | |
| | | | 400 | 446 | 449 | 480 | line | |
| | | | 350 | 447 | 449 | 510 | line | |
| | Pulsewidth | TVp | all | 1 | - | 34 | line | |
| Horizontal display period | | THd | " | 640 | 640 | 640 | clock | |
| Hsync-Clock phase difference | | THc | " | 10 | - | Tc-10 | ns | |
| Hsync-Vsync phase difference | | TVh | " | 0 | - | TH-THp | clock | |

Note) In case of lower frequency, the deterioration of display quality, flicker etc., may be occurred.

7-2. Horizontal display position

The horizontal display position is determined by ENAB signal and the input data corresponding to the rising edge of ENAB signal is displayed at the left end of the active area.

| Parameter | | symbol | Min. | Typ. | Max. | Unit | Remark |
|--------------------------------------|-------------|--------|------|------|--------|-------|--------|
| Enable signal | Setup time | Tes | 5 | - | Tc-10 | ns | |
| | Pulse width | Tep | 2 | 640 | 640 | clock | |
| Hsync-Enable signal phase difference | | THE | 44 | - | TH-664 | clock | |

Note) When ENAB is fixed "Low", the display starts from the data of C104(clock) as shown

in Fig.2- ~ . Be careful that the module does not work when ENAB is fixed "High".

When the phase difference is below 104 clock, keep the "High level of ENAB is signal longer Than 104-The. If it will not be kept, the display starts from the data of C104(clock).

7-3. Vertical display position

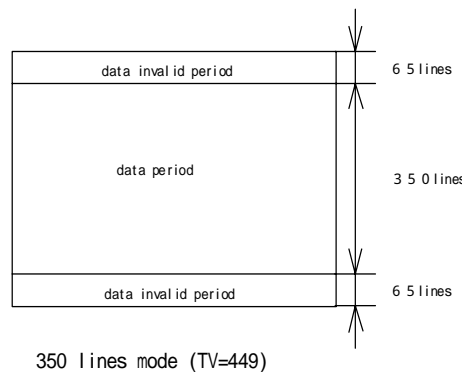
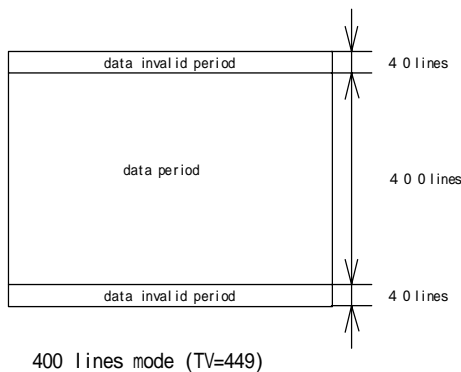
The vertical display position is automatically centered in the active area at each mode of VGA ,480-,400-,and 350-line mode . Each mode is selected depending on the polarity of the synchronous signals described in 4-1(Note1).

In each mode ,the data of TVn is displayed at the top line of the active area. And the display position will be centered on the screen like the following figure when the period of vertical synchronous signal,TV,is typical value.

In 400-,and 350-line mode,the data in the vertical data invalid period is also displayed, So ,inputting all data "0" is recommended during vertical data invalid period.

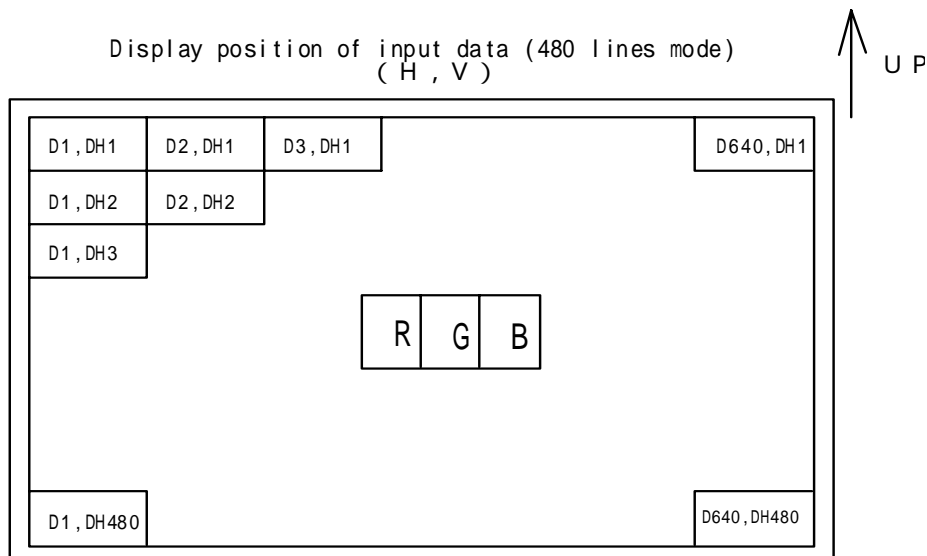
ENAB signal has no relation to the vertical display position.

| Mode | V-data start(TVs) | V-data period(TVd) | V-display start(TVn) | V-display period | Unit | Remark |
|------|-------------------|--------------------|----------------------|------------------|------|--------|
| 480 | 34 | 480 | 34 | 480 | line | |
| 400 | 34 | 400 | 443-TV | 480 | line | |
| 350 | 61 | 350 | 445-TV | 480 | line | |



7-4. Input Data Signals and Display Position on the screen

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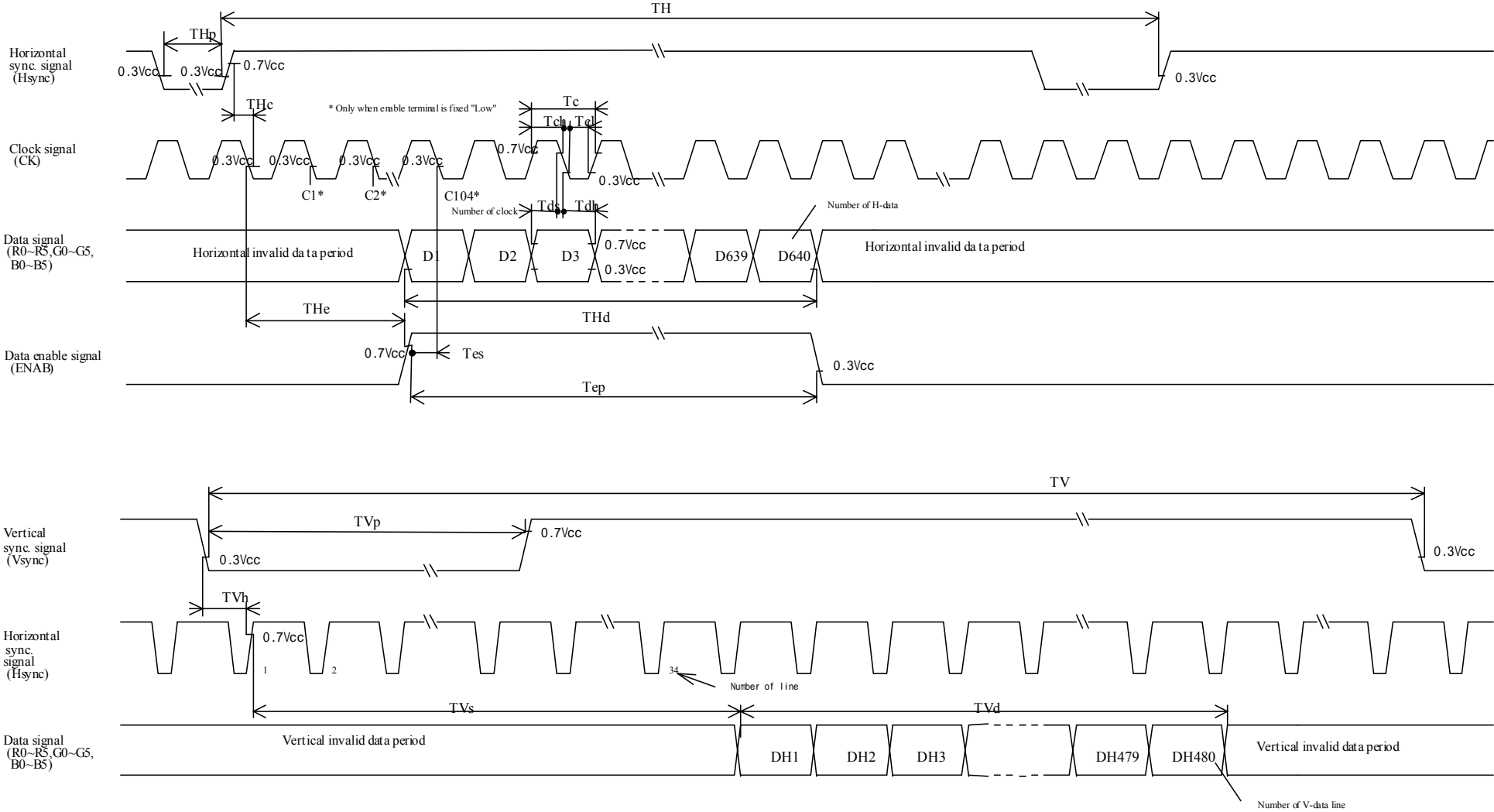


Fig 2-1 Input signal waveforms (480 line mode)

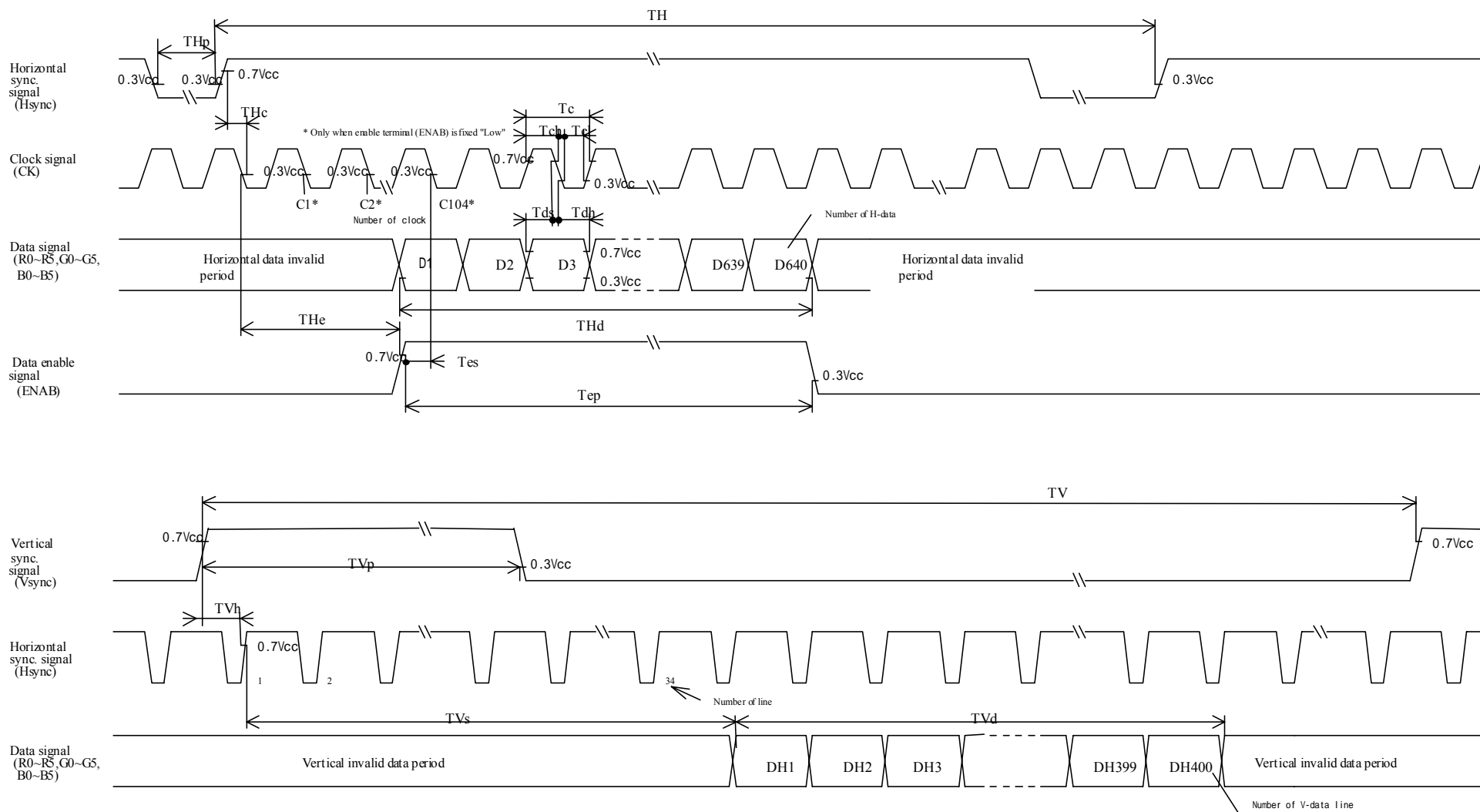


Fig.2-2 Input signal waveforms (400 line mode)

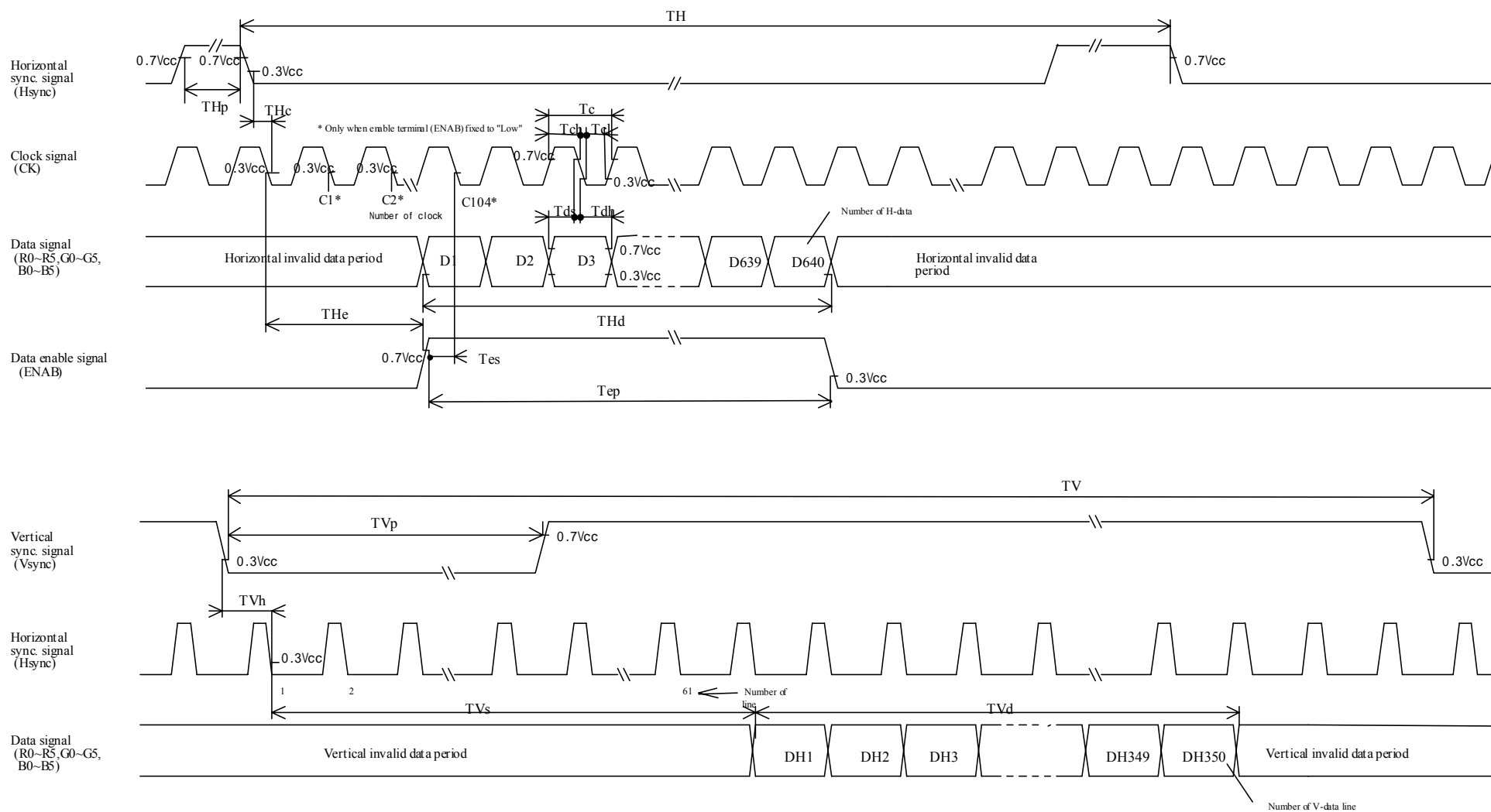


Fig.2-3 Input signal waveforms (350 line mode)

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

| | Colors & Gray scale | Data signal | | | | | | | | | | | | | | | | | | |
|---------------------|------------------------|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | 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 , Vcc=+5V

| Parameter | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|--|------------|----------------|-------------------------------|-----|-------|------|-------------------|-------------------------------------|
| Viewing Angle Range | Horizontal | 21, 22 | C R > 1 0 | 60 | 70 | - | Deg. | 【Note1,4】 |
| | Vertical | 11 | | 35 | 40 | - | Deg. | |
| | | 12 | | 55 | 70 | - | Deg. | |
| Contrast ratio | | C R | = 0 ° | 150 | - | - | - | 【Note2,4】 |
| | | | Optimum Viewing Angle | - | 300 | - | - | |
| Response Time | Rise | r | = 0 ° | - | 20 | - | ms | 【Note3,4】 |
| | Decay | d | | - | 40 | - | ms | |
| Chromaticity of White | | x | | - | 0.313 | - | | 【Note4】 I _L =6.0mArms |
| | | y | | - | 0.329 | - | | |
| Luminance of white | | Y _L | | 280 | 350 | - | cd/m ² | f=35kHz |
| White Uniformity | | w | | - | - | 1.45 | - | 【Note5】 |
| Viewing Angle range as a Brightness Definition | Horizontal | 21, 22 | 50% of the maximum brightness | - | 50 | - | Deg. | 【Note1】 |
| | Vertical | 11 | | - | 40 | - | Deg. | |
| | | 12 | | - | 35 | - | Deg. | |

The measurement shall be executed 30 minutes after lighting at rating. (condition:I_L=6.0mArms)

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.3 below.

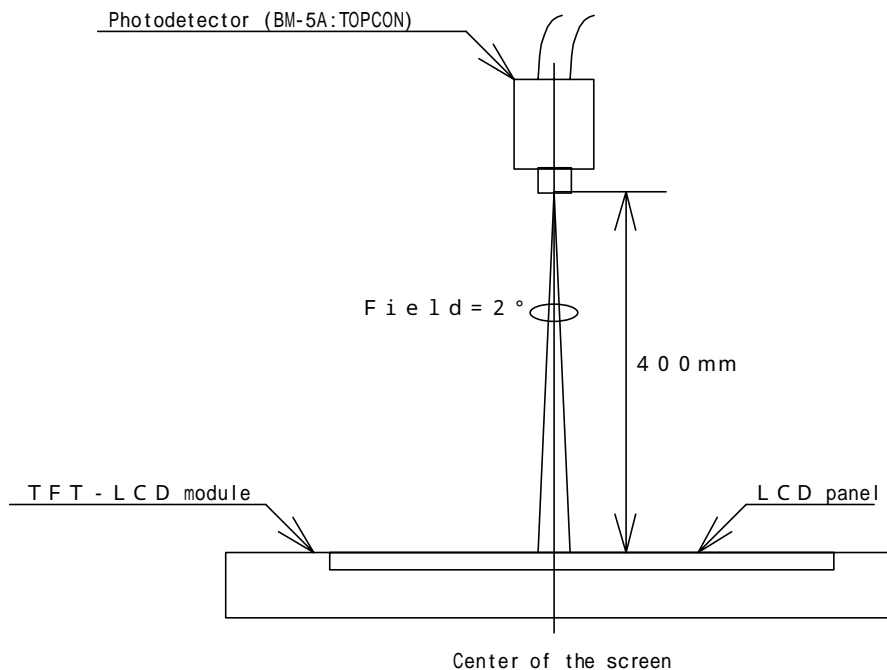
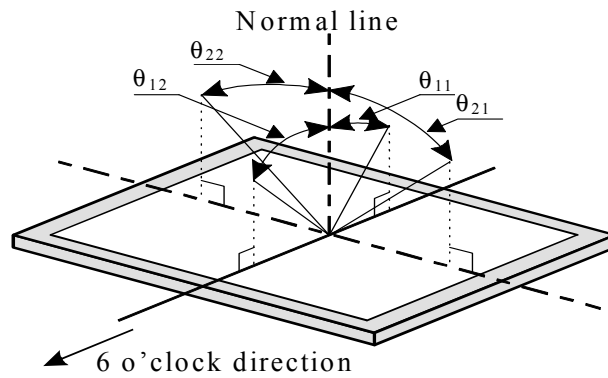


Fig.3 Optical characteristics measurement method

【Note1】 Definitions of viewing angle range:



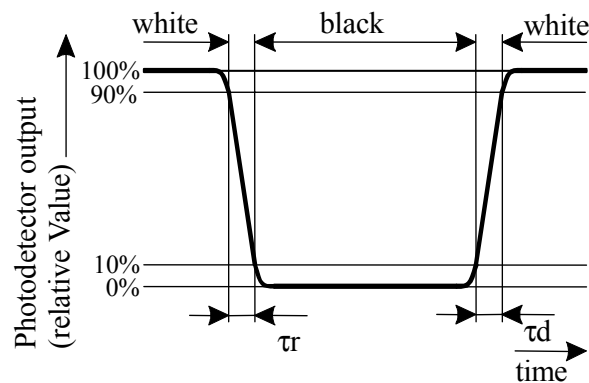
【Note2】 Definition of contrast ratio:

The contrast ratio is defined as the following.

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

【Note3】 Definition of response time:

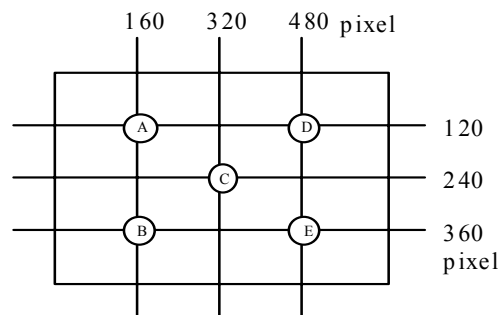
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white" .



【Note4】 This shall be measured at center of the screen.

【Note5】 Definition of white uniformity:

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



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

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.
- 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.
- h) 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.
- i) 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.
- j)Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.
- k) Connect GND to 4 place of mounting holes to stabilize against EMI and external noise.
- l) There are high voltage portions on the backlight and very dangerous. Careless touch may lead to electrical shock. When exchange lamps or service,turn off the power without fail.
- m) 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.
- n)Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal.

12.Packing form

| Product Country | JAPAN | TAIWAN |
|---|-----------------------|--------|
| Piling number of cartons | 7 (Max) | |
| Packing quantity in one carton | 20 | |
| Carton size [mm] | 525 (W)×309(D)×377(H) | |
| Total mass of one carton filled with full modules | 17.5kg | |
| Packing form is shown | Fig.4 | |

13 . Reliability test items

| No. | Test item | Conditions |
|-----|---|---|
| 1 | High temperature storage test | Ta=70 240h |
| 2 | Low temperature storage test | Ta= -30 240h |
| 3 | High temperature & high humidity operation test | Ta=40 ; 95%RH 240h (No condensation) |
| 4 | High temperature operation test | Ta=65 240h |
| 5 | Low temperature operation test | Ta= -10 240h |
| 6 | Vibration test (non- operating) | Frequency: 10 ~ 57Hz/Vibration width (one side):0.075mm : 58 ~ 500Hz/Gravity:9.8m/s ² Sweep time : 11 minutes Test period : 3 hours (1 hour for each direction of X,Y,Z) |
| 7 | Shock test (non- operating) | Max. gravity : 490m/s ² Pulse width : 11ms, half sine wave Direction : ± X, ± Y, ± Z once for each direction. |

【Result Evaluation Criteria】

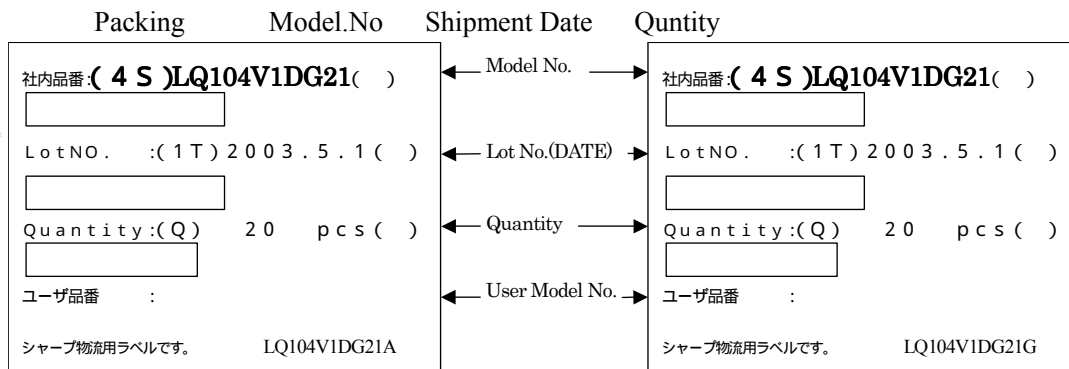
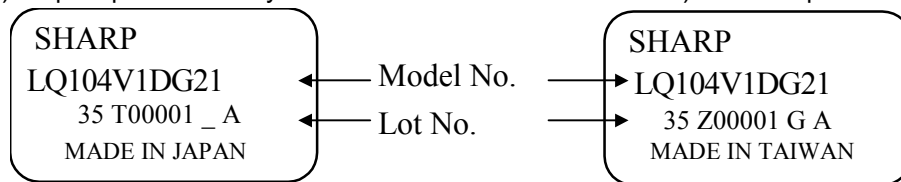
Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function.

14 . Others

1) Label: Module

Case 1) Japan product only

Case 2) Taiwan product only



Sharp internal Model No. for LCD modules in the carton will be shown here.

- 2) 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.
- 3) Disassembling the module can cause permanent damage and should be strictly avoided.
- 4) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.
- 5) If any problem occurs in relation to the description of this specification , it shall be resolved through discussion with spirit of cooperation.

15. Procedure to backlight replacement

Lamp which is used in the LCD module is consumable goods. When the lamp replacement is needed due to the expiry of lamp-operating life, make sure that the power supply is turned off before the lamp replacement. Since there is high-voltage current in the backlight area, an electric shock is likely to happen if the lamp is replaced without turning off the power supply. The lamp replacement can be conducted by either horizontal slide method or backside exchange.

(1) By horizontal slide (See figure #5 & figure #6)

- 1) Pull-out the lamp unit to the direction which arrow "F" indicates by pressing the white latch of the plastic lamp unit by using small flat-blade screwdriver to the either direction of "A" or "B" as shown in the figure #5.
- 2) Out of the 2 pcs of lamp units (2pcs/set), insert the replacement lamp which has triangle mark on the side of the lamp unit into the slot of the metal area of LCD module which also has triangle mark. And then, insert the remaining lamp unit which does not have triangle mark into the slot of the metal area of LCD module which also does not have triangle mark. During the insertion, lamp unit can be inserted smoothly by pressing the transparent resin (light guide sheet) inside the LCD module by using the end of the lamp unit to the direction which arrow "C" or arrow "D" indicate shown in the figure #6, then insert the lamp unit to the direction which arrow "E" indicates in the figure #6.
- 3) Insert the lamp unit slowly and in a straight line during the lamp replacement in order not to break the lamp. Be careful for any dust goes in. And make sure that lamp unit is completely inserted into the LCD module. You can hear clicking noise when the lamp unit is completely inserted .
- 4) Replace the both of the lamp units in same time.

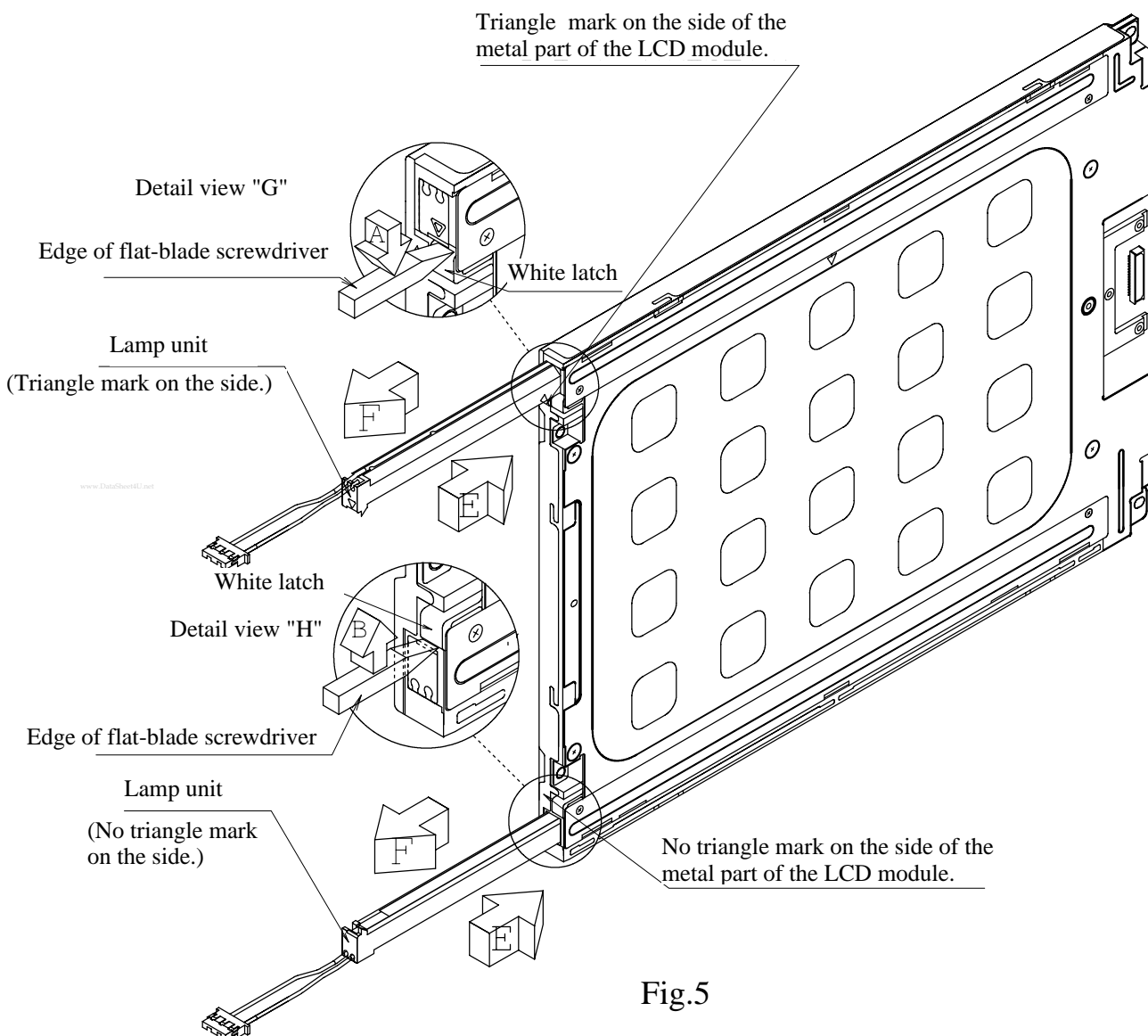


Fig.5

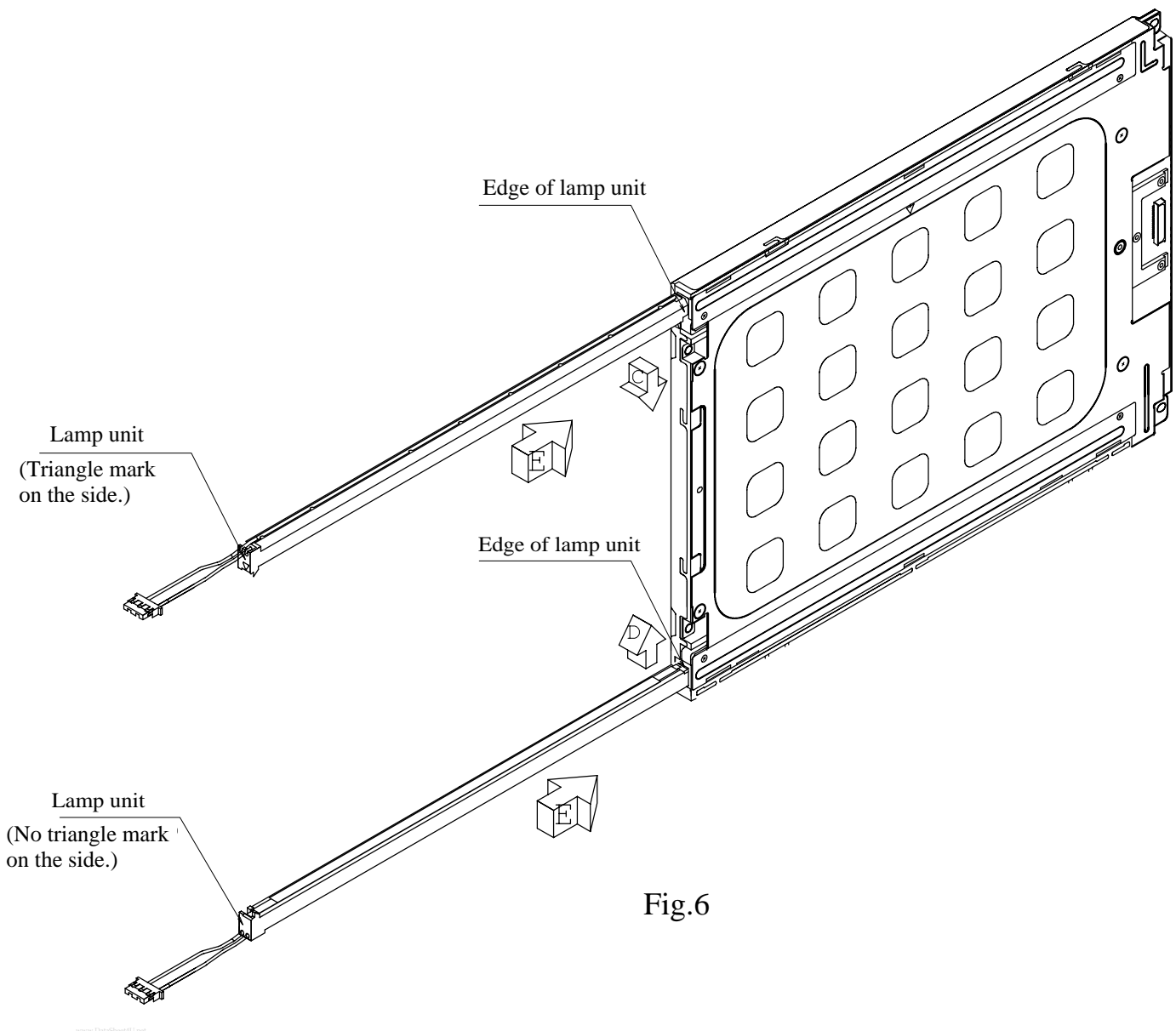


Fig.6

(2) How to replace from backside (See figure #7 & #8)

- 1) Remove 4 screws which hold the holder cover (sheet metal). (Please refer figure #7)
- 2) Slide the holder cover (sheet metal) to the direction which arrow "J" indicates. After checking that the nail is removed from the hub "L", remove 2pcs holder cover (sheet metal).
- 3) Remove the lamp units.
- 4) Out of the 2 pcs of lamp units (2pcs/set), set the replacement lamp which has triangle mark on the side of the lamp unit into the area of the LCD module which also has triangle mark on the rear side of the metal area. And then, set the remaining lamp unit which does not have triangle mark into the area of the LCD module which does not have triangle mark on the side of the metal area (Please refer figure #8).
- 5) Insert the nail of holder cover (sheet metal) into the hub "L" of the LCD module by sliding the 2 pcs of holder cover (sheet metal) slightly to the direction which arrow "K" indicates in the figure #7.
- 6) Tighten 4 screws which hold 2 pcs holder cover (sheet metal) along the thread groove of the prepared hole. Tightening torque is 1.6kgf.cm. If more torque is applied, the thread may be damaged.
- 7) Insert the lamp unit slowly and in a straight line during the lamp replacement in order not to break the lamp. Be careful that dirt or dust does not break into the module. And make sure that lamp unit is completely inserted.
- 8) Replace both of the lamp units in the same time.

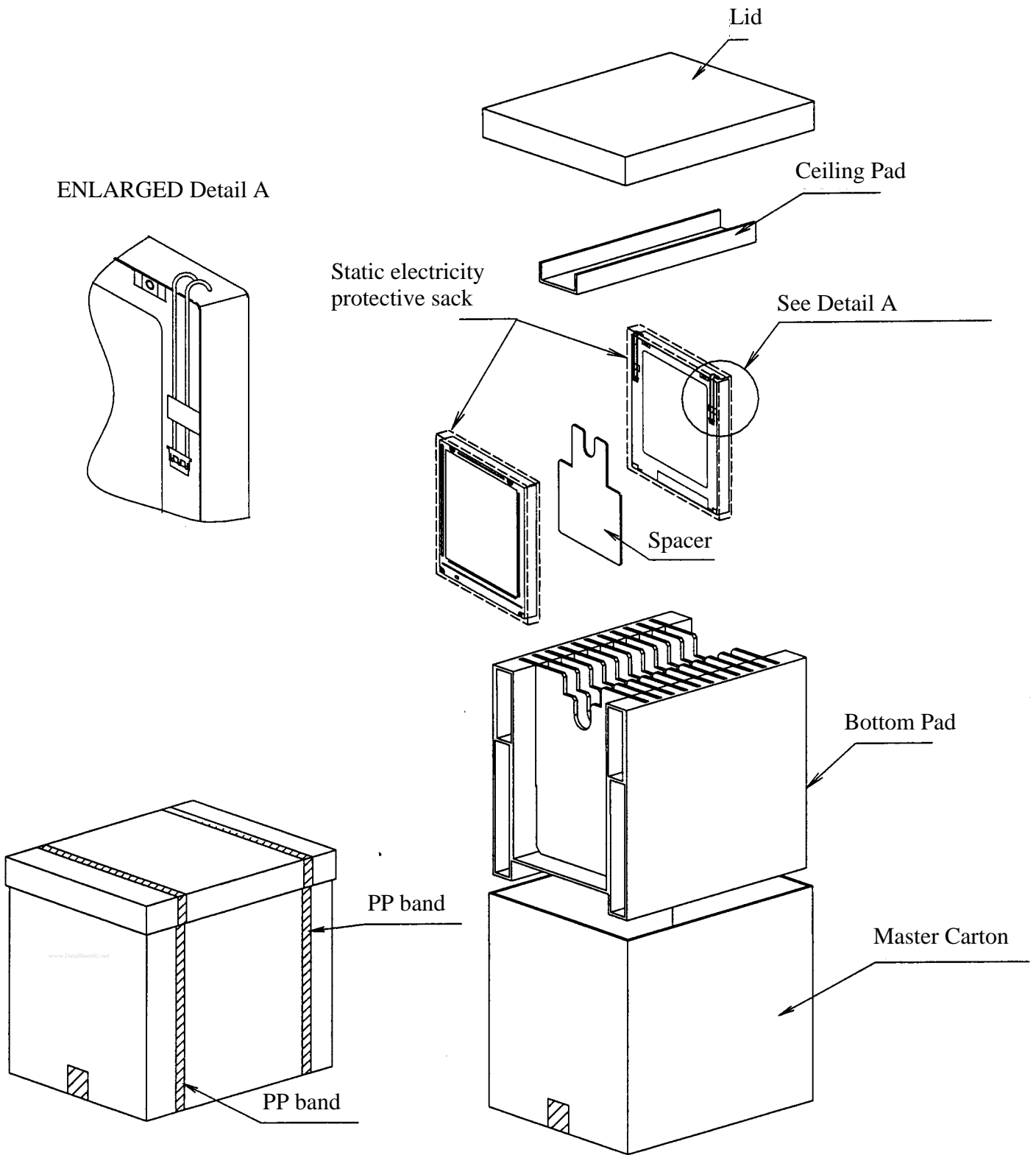


Fig.4 Packing Form

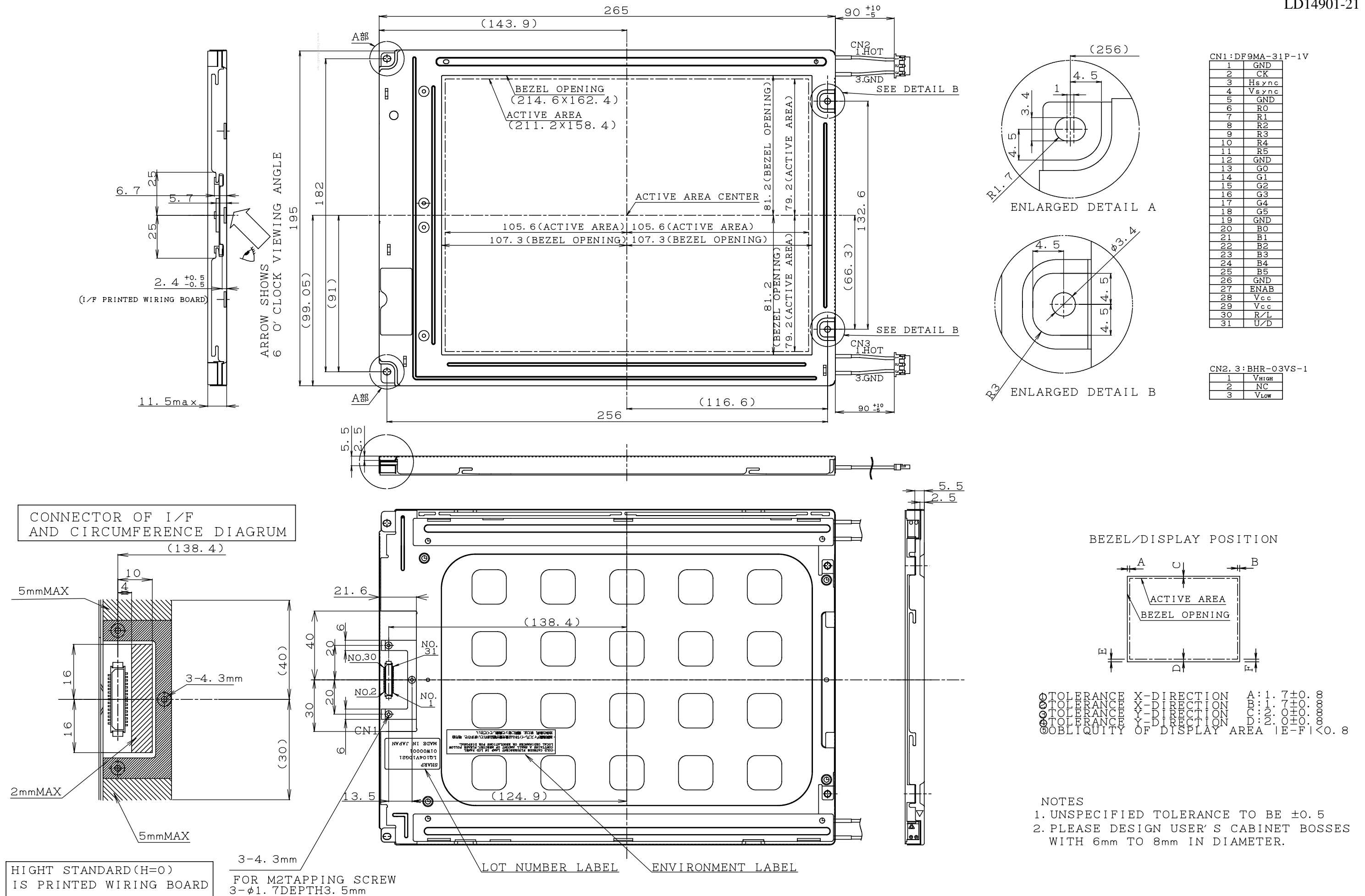


Fig.1 LQ104V1DG21 Outline Dimensions

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SHARP®

NORTH AMERICA

SHARP Microelectronics of the Americas
5700 NW Pacific Rim Blvd.
Camas, WA 98607, U.S.A.
Phone: (1) 360-834-2500
Fax: (1) 360-834-8903
Fast Info: (1) 800-833-9437
www.sharpsma.com

EUROPE

SHARP Microelectronics Europe
Division of Sharp Electronics (Europe) GmbH
Sonninstrasse 3
20097 Hamburg, Germany
Phone: (49) 40-2376-2286
Fax: (49) 40-2376-2232
www.sharpsme.com

JAPAN

SHARP Corporation
Electronic Components & Devices
22-22 Nagaike-cho, Abeno-Ku
Osaka 545-8522, Japan
Phone: (81) 6-6621-1221
Fax: (81) 6117-725300/6117-725301
www.sharp-world.com

TAIWAN

SHARP Electronic Components
(Taiwan) Corporation
8F-A, No. 16, Sec. 4, Nanking E. Rd.
Taipei, Taiwan, Republic of China
Phone: (886) 2-2577-7341
Fax: (886) 2-2577-7326/2-2577-7328

SINGAPORE

SHARP Electronics (Singapore) PTE., Ltd.
438A, Alexandra Road, #05-01/02
Alexandra Technopark,
Singapore 119967
Phone: (65) 271-3566
Fax: (65) 271-3855

KOREA

SHARP Electronic Components
(Korea) Corporation
RM 501 Geosung B/D, 541
Dohwa-dong, Mapo-ku
Seoul 121-701, Korea
Phone: (82) 2-711-5813 ~ 8
Fax: (82) 2-711-5819

CHINA

SHARP Microelectronics of China
(Shanghai) Co., Ltd.
28 Xin Jin Qiao Road King Tower 16F
Pudong Shanghai, 201206 P.R. China
Phone: (86) 21-5854-7710/21-5834-6056
Fax: (86) 21-5854-4340/21-5834-6057

Head Office:

No. 360, Bashen Road,
Xin Development Bldg. 22
Waigaoqiao Free Trade Zone Shanghai
200131 P.R. China
Email: smc@china.global.sharp.co.jp

HONG KONG

SHARP-ROXY (Hong Kong) Ltd.
3rd Business Division,
17/F, Admiralty Centre, Tower 1
18 Harcourt Road, Hong Kong
Phone: (852) 28229311
Fax: (852) 28660779
www.sharp.com.hk

Shenzhen Representative Office:

Room 13B1, Tower C,
Electronics Science & Technology Building
Shen Nan Zhong Road
Shenzhen, P.R. China
Phone: (86) 755-3273731
Fax: (86) 755-3273735