

LQ070Y3LG4A LCD Module

Product Specification

July 2009

WVGA module with LVDS interface, 350 nits brightness and 400:1 contrast; LED backlight.

Full Specifications Listing

| | | |
|--------------------------|--|-------------------------------------|
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| | | MOBILE LIQUID CRYSTAL DISPLAY GROUP |

DEVICE SPECIFICATION FOR
TFT-LCD Module
 MODEL No.
LQ070Y3LG4A

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

BY *T. Naka*

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1. Application

This specification applies to a color TFT-LCD module, LQ070Y3LG4A.

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, power supply circuit, and a backlight unit. Graphics and texts can be displayed on a 800×3×480 dots panel with 16,194,277 colors by using LVDS (Low Voltage Differential Signaling) interface and supplying +3.3V DC supply voltage for TFT-LCD panel driving and supply voltage for backlight.

In this TFT-LCD panel, low reflection / color filters of excellent color performance and 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.

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

3. Mechanical Specifications

| Parameter | Specifications | Unit |
|---------------------|--------------------------------|-------|
| Display size | 17.8 (7.0") Diagonal | cm |
| Active area | 152.4(H)×91.4 (V) | mm |
| Pixel format | 800 (H)×480 (V) | pixel |
| | (1 pixel = R+G+B dots) | |
| Aspect ratio | 15 : 9 | |
| Pixel pitch | 0.1905 (H)×0.1905 (V) | mm |
| Pixel configuration | R,G,B Horizontal stripe | |
| Display mode | Normally white | |
| Surface treatment | Anti-Glare and hard-coating 2H | |

| Parameter | | Min. | Typ. | Max. | Unit | Remark |
|-------------------------------------|--------|-------|-------|-------|------|----------|
| Unit outline dimensions [Note 1] | Width | 162.9 | 163.2 | 163.5 | mm | [Note 1] |
| | Height | 103.7 | 104.0 | 104.3 | mm | |
| | Depth | — | 3.9 | 4.2 | mm | |
| | | — | — | 6.25 | mm | [Note 2] |
| Mass | | — | 135 | 150 | g | |

[Note 1] Excluding the FPC and parts mounting area.

Outline dimensions is shown in Fig.2

[Note 2] Including the FPC and parts mounting area.

4. Input Terminals

4-1. TFT-LCD panel driving and LED Backlight driving
CN1 (LVDS signals, +3.3V DC power supply and LED power supply)

| Pin No. | Symbol | Function | Remark |
|---------|--------|---------------------------------|----------|
| 1 | GND | | [Note 2] |
| 2 | Vcc | +3.3V power supply | |
| 3 | Vcc | +3.3V power supply | |
| 4 | NC | | [Note 3] |
| 5 | NC | | [Note 3] |
| 6 | NC | | [Note 3] |
| 7 | NC | | [Note 3] |
| 8 | RxIN0- | Receiver signal of LVDS CH0 (-) | [Note 1] |
| 9 | RxIN0+ | Receiver signal of LVDS CH0 (+) | [Note 1] |
| 10 | GND | | [Note 2] |
| 11 | RxIN1- | Receiver signal of LVDS CH1 (-) | [Note 1] |
| 12 | RxIN1+ | Receiver signal of LVDS CH1 (+) | [Note 1] |
| 13 | GND | | [Note 2] |
| 14 | RxIN2- | Receiver signal of LVDS CH2 (-) | [Note 1] |
| 15 | RxIN2+ | Receiver signal of LVDS CH2 (+) | [Note 1] |
| 16 | GND | | [Note 2] |
| 17 | CK IN- | Receiver signal of LVDS CLK (-) | [Note 1] |
| 18 | CK IN+ | Receiver signal of LVDS CLK (+) | [Note 1] |
| 19 | GND | | [Note 2] |
| 20 | RxIN3- | Receiver signal of LVDS CH3 (-) | [Note 1] |
| 21 | RxIN3+ | Receiver signal of LVDS CH3 (+) | [Note 1] |
| 22 | GND | | [Note 2] |
| 23 | NC | | [Note 3] |
| 24 | LED A | Power Supply for LED (Anode) | [Note 4] |
| 25 | LED A | Power Supply for LED (Anode) | [Note 4] |
| 26 | LED A | Power Supply for LED (Anode) | [Note 4] |
| 27 | LED K1 | Power Supply for LED (Cathode) | |
| 28 | NC | | [Note 3] |
| 29 | LED K2 | Power Supply for LED (Cathode) | |
| 30 | LED K3 | Power Supply for LED (Cathode) | |

[Note 1] Relation between RxIN_i(i=0,1,2,3) and actual data is shown in following section (4-2)(7-2).

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

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

[Note 4] "LED A"(Pin No.24-26) are tied together on LCD PCB.

Using connector : FI-XB30SRL-HF11 (JAE) or MDF76LBRW-30S-1H(Hirose)

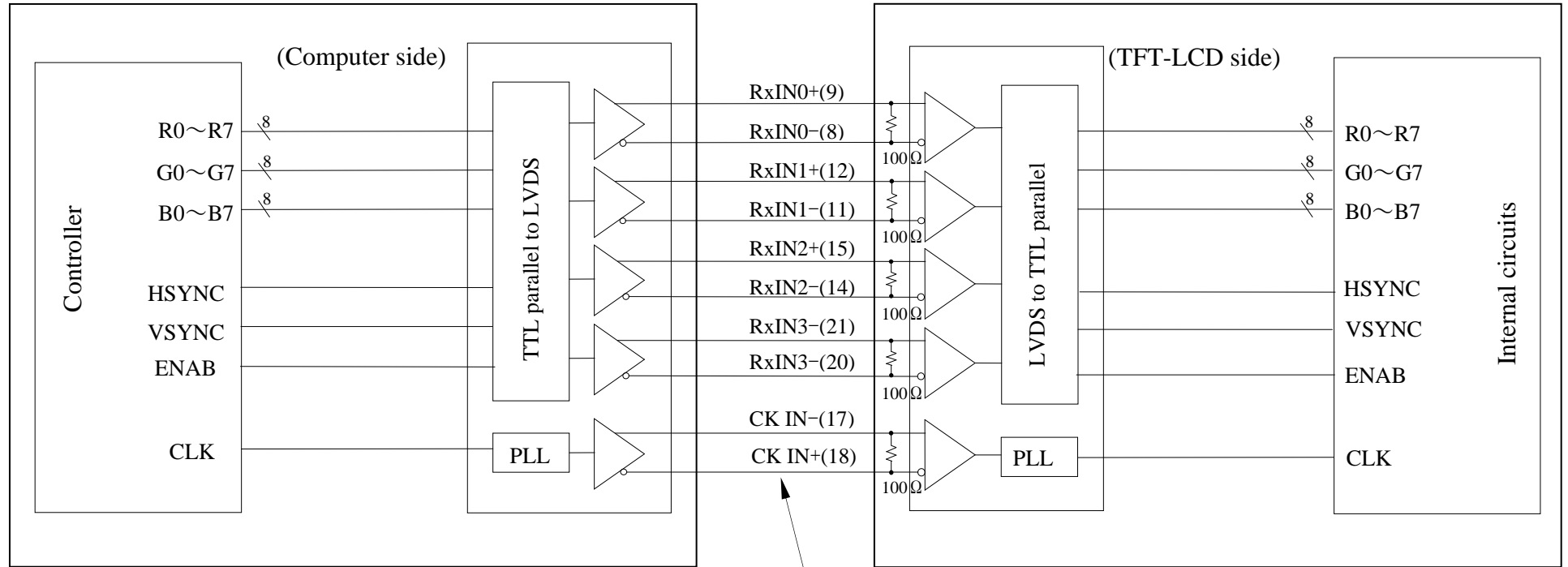
Corresponding connector : FI-X30H,FI-X30HL or FI-X30M (JAE)

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

[Note]Connector metallic shell is not connected with signal GND.

4-2 LVDS interface block diagram

Using receiver : Single LVDS interface contained in a control IC



[Note] Refer “6.3.2.LVDS data” for LVDS data mapping

Symbol of CN1 (Pin No.)

5. Absolute Maximum Ratings

| Parameter | Symbol | Condition | Ratings | | Unit | Remark |
|-----------------------|--------------|------------------------|---------|--------------|------------------|----------|
| | | | Min. | Max. | | |
| Input voltage | V_I | $T_a=25^\circ\text{C}$ | -0.3 | $V_{CC}+0.3$ | V | [Note 1] |
| +3.3V supply voltage | VCC | $T_a=25^\circ\text{C}$ | 0 | +4.0 | V | |
| LED forward current | I_{LED} | $T_a=25^\circ\text{C}$ | 0 | 30 | mA | [Note 2] |
| LED reverse voltage | V_{LED_R} | $T_a=25^\circ\text{C}$ | — | 5 | V | |
| Storage temperature | Tstg | — | -30 | +70 | $^\circ\text{C}$ | [Note 3] |
| Operating temperature | Topa | — | -20 | +60 | $^\circ\text{C}$ | |

[Note 1] LVDS signals

[Note 2] LED_A to LED_Kn (n=1,2,3)

[Note 3] Humidity : 95%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.

6. Electrical Characteristics

6-1.TFT-LCD panel driving

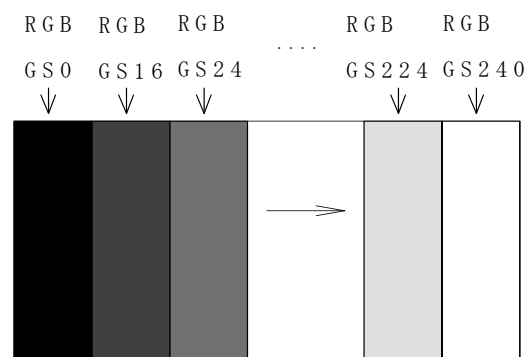
$T_a = +25^\circ\text{C}$

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|--------------------------------------|----------|----------|------|----------|-------------------|--|
| Supply voltage | VCC | +3.0 | +3.3 | +3.6 | V | |
| Current dissipation | I_{CC} | — | 160 | 200 | mA | [Note 1] |
| Permissible input ripple voltage | V_{RP} | — | — | 100 | mV_{P-P} | $V_{CC} = +3.3\text{V}$ |
| Input voltage range | V_I | 0 | — | 2.4 | V | LVDS signals |
| Differential input threshold voltage | High | V_{TH} | — | +100 | mV | $V_{CM} = +1.2\text{V}$ [Note 2] |
| | Low | V_{TL} | -100 | — | mV | |
| Input current (High) | I_{OH} | — | — | ± 10 | μA | $V_I = +2.4\text{V}$ $V_{CC} = +3.6\text{V}$ |
| Input current (Low) | I_{OL} | — | — | ± 10 | μA | $V_I = 0\text{V}$ $V_{CC} = 3.6\text{V}$ |
| Terminal resistor | R_T | — | 100 | — | Ω | Differential input |

[Note 1] Typical current situation :

16-gray-bar pattern.

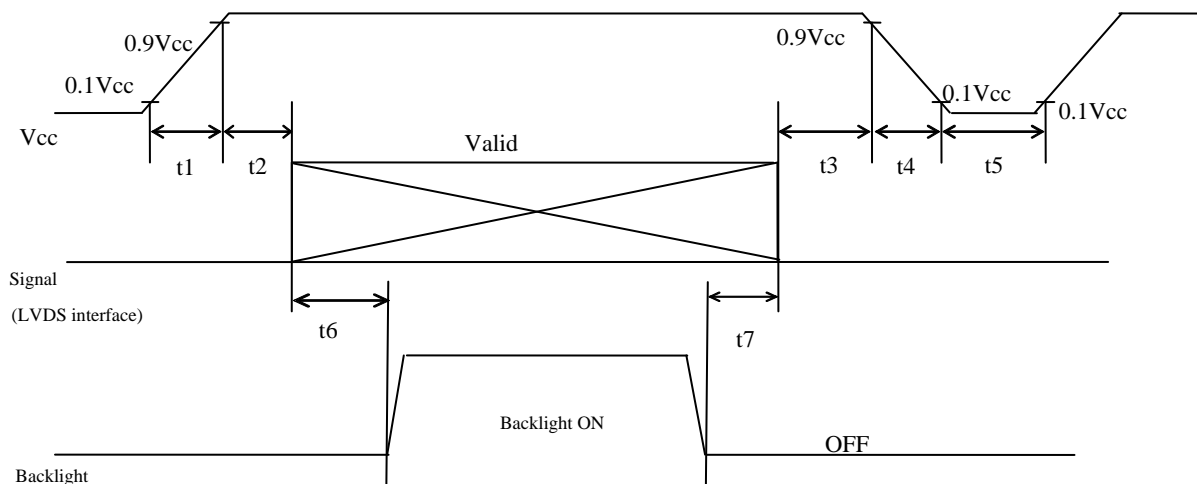
$V_{CC} = +3.3\text{V}$



[Note 2] V_{CM} : Common mode voltage of LVDS driver.

[Note 3]

On-off conditions for supply voltage



| Symbol | Min. | Max. | Unit | Remark |
|--------|------|------|------|--------|
| t1 | 0 | 10 | ms | |
| t2 | 0 | 1 | ms | |
| t3 | 0 | 1 | ms | |
| t4 | 0 | 400 | ms | |
| t5 | 1 | — | s | |
| 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.

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

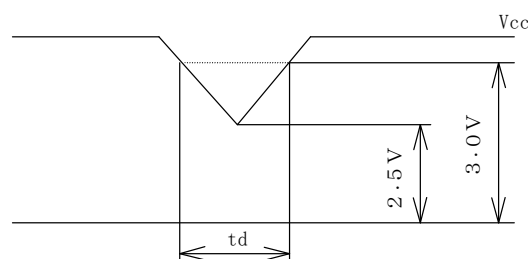
Vcc-dip conditions

1) $2.5\text{ V} \leq V_{cc} < 3.0\text{ V}$ $t_d \leq 10\text{ ms}$

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

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

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



6-2. Backlight driving

The backlight system is edge-lighting type with 24 White-LED(White Light Emitting Diode).

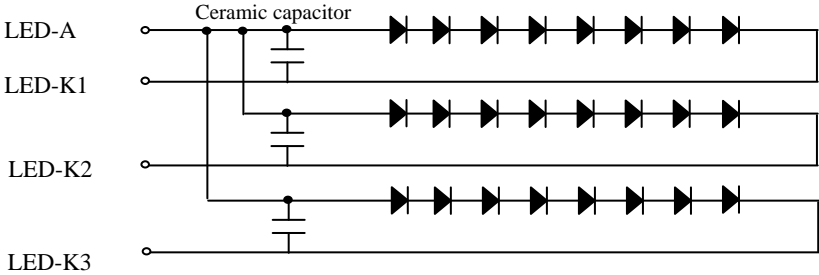
The characteristics of White-LED are shown in the following table. (Ta=25 °C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---------------------------|--------|-------|------|------|------|------------|
| LED voltage | V_L | — | 25.6 | 28 | V | $I_L=20mA$ |
| LED current range | I_L | 15 | 20 | 25 | mA | |
| Number of circuit strings | | — | 3 | — | | [Note 1] |
| LED power consumption | W_L | — | 1.54 | — | W | [Note 2] |
| LED life time | L_L | 10000 | — | — | Hour | [Note 3] |

[Note 1] The LED backlight is composed by 3 strings from which 8 LED is connected with the series.

The figure below shows the circuit chart.

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



[Note 2] Calculated value for reference ($I_L \times V_L$)

[Note 3] LED life time is defined as the time when Brightness becomes 50 % of the original value. under the condition of Ta = 25°C and IL = 20 mA,and continuous lighting.

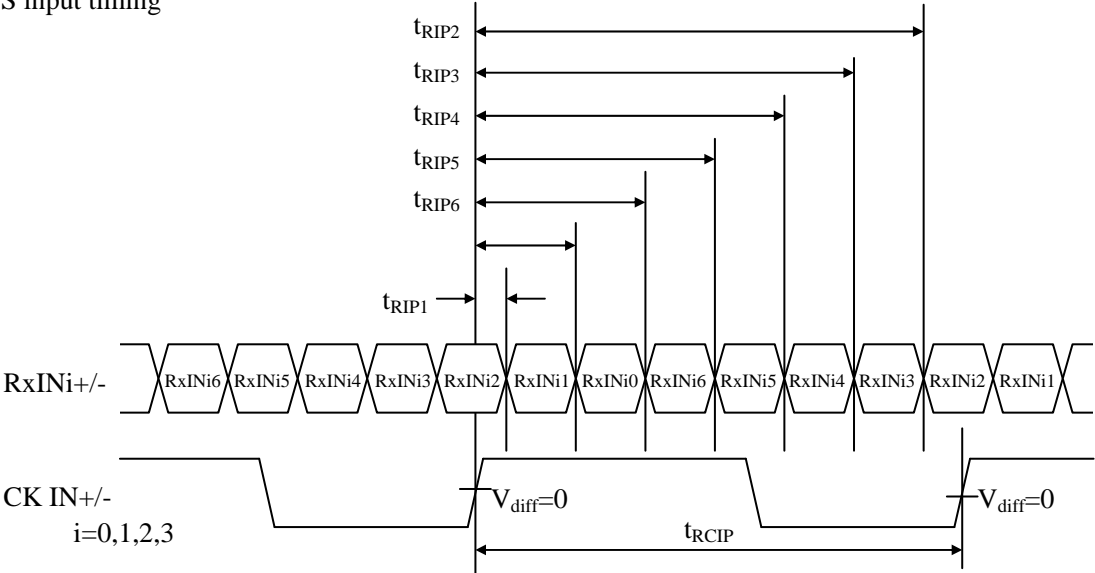
6-3. LVDS input specification

6.3.1. AC characteristics

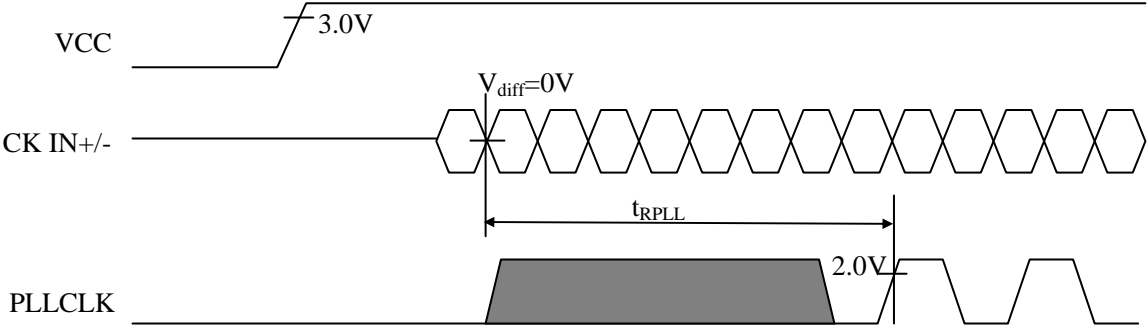
$V_{CC}=+3.0V \sim +3.6V, T_a=0^{\circ}C \sim +60^{\circ}C$

| Parameter | Symbol | Min | Typ. | Max. | Unit |
|---|------------|---------------------|----------------|---------------------|------|
| Input Data Position 0 ($t_{RCIP}=30.1ns$) | t_{RIP1} | -0.25 | 0.0 | +0.25 | ns |
| Input Data Position 1 ($t_{RCIP}=30.1ns$) | t_{RIP0} | $t_{RCIP}/7-0.25$ | $t_{RCIP}/7$ | $t_{RCIP}/7+0.25$ | ns |
| Input Data Position 2 ($t_{RCIP}=30.1ns$) | t_{RIP6} | $2 t_{RCIP}/7-0.25$ | $2 t_{RCIP}/7$ | $2 t_{RCIP}/7+0.25$ | ns |
| Input Data Position 3 ($t_{RCIP}=30.1ns$) | t_{RIP5} | $3 t_{RCIP}/7-0.25$ | $3 t_{RCIP}/7$ | $3 t_{RCIP}/7+0.25$ | ns |
| Input Data Position 4 ($t_{RCIP}=30.1ns$) | t_{RIP4} | $4 t_{RCIP}/7-0.25$ | $4 t_{RCIP}/7$ | $4 t_{RCIP}/7+0.25$ | ns |
| Input Data Position 5 ($t_{RCIP}=30.1ns$) | t_{RIP3} | $5 t_{RCIP}/7-0.25$ | $5 t_{RCIP}/7$ | $5 t_{RCIP}/7+0.25$ | ns |
| Input Data Position 6 ($t_{RCIP}=30.1ns$) | 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} | 28.9 | 30.1 | 31.3 | ns |

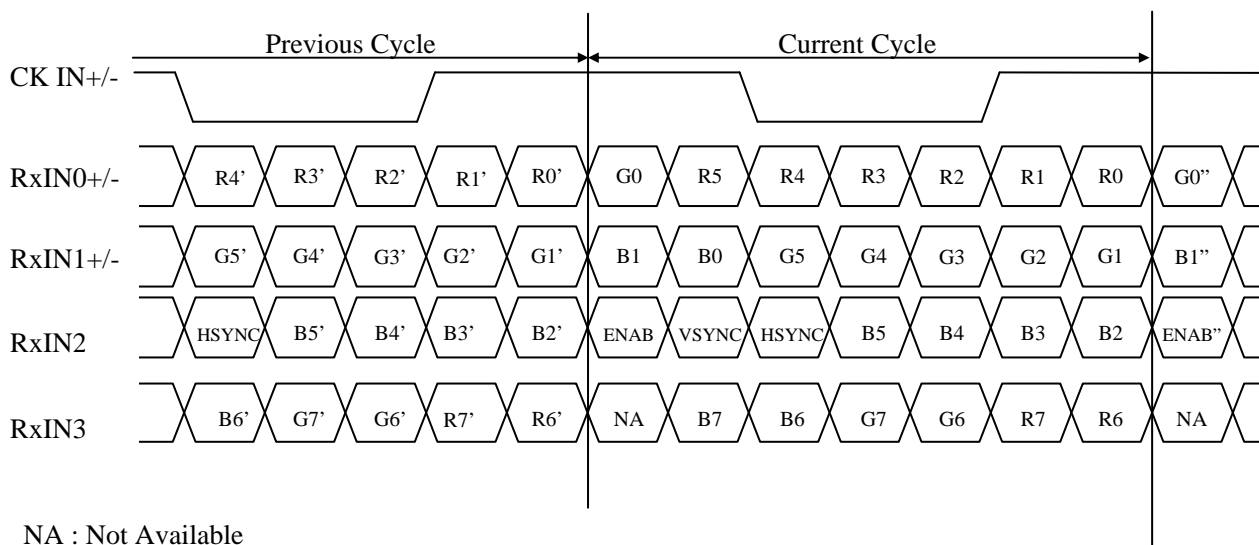
LVDS input timing



LVDS phase lock loop set

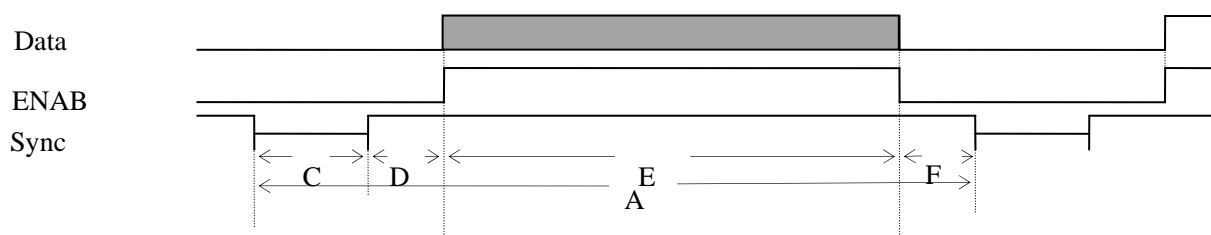


6.3.2.LVDS data



7. Timing Characteristics of Input Signals

7-1. Timing characteristics



(Vertical)

| Item (symbol) | Min. | Typ. | Max. | Unit | Remark |
|----------------------------------|------|-----------|--------|------|--------|
| Vsync cycle (T_{VA}) | 520 | 525 | 530 | line | |
| Sync pulse width (T_{VC}) | 2 | | TV-515 | line | |
| Back porch($T_{VC}+T_{VD}$) | - | 35(Fixed) | - | line | |
| Active display area (T_{VE}) | 480 | 480 | 480 | line | |
| Front porch (T_{VF}) | 3 | - | - | line | |

(Horizontal)

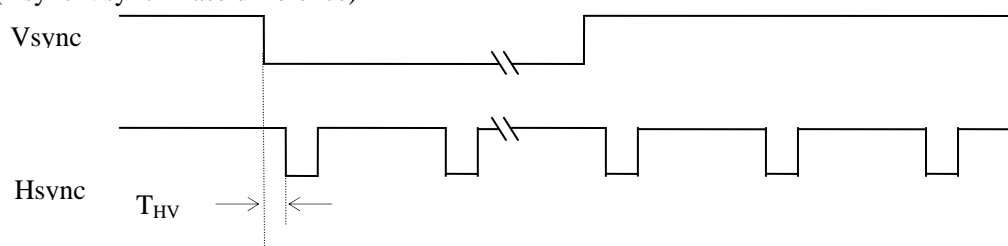
| Item (symbol) | Min. | Typ. | Max. | Unit | Remark |
|----------------------------------|-------|-------|------|-------|----------|
| Hsync cycle (T_{HA}) | 31.45 | 31.75 | - | us | Positive |
| | 1024 | 1056 | 1088 | clock | |
| Sync pulse width (T_{HC}) | 5 | 128 | 186 | clock | |
| Active display area (T_{HE}) | 800 | 800 | 800 | clock | |

(Clock)

| Item (symbol) | Min. | Typ. | Max. | Unit | Remark |
|---------------|-------|-------|------|------|---------|
| Frequency | 31.95 | 33.26 | 34.6 | MHz | [Note1] |

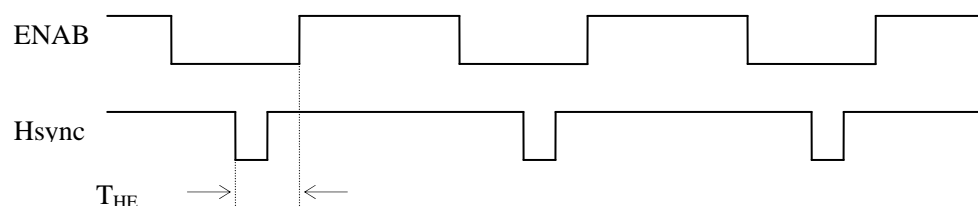
[Note1] In case of lower frequency, the deterioration of display quality, flicker etc., may be occurred.

(Hsync-Vsync Phase difference)



| Item (symbol) | Min. | Typ. | Max. | Unit | Remark |
|---|------|------|--------|-------|--------|
| Hsync-Vsync Phase difference (T_{HV}) | 8 | - | TH-THp | clock | |

(Hsync-ENAB Phase difference)



| Item | Min. | Typ. | Max. | Unit | Remark |
|--|------|------|------|-------|--------|
| Hsync-ENAB Phase difference (T_{HN}) | 88 | - | 216 | clock | |

7-2. Display position

| Item | Standards | Beginning | Ending | Unit | Remark |
|------------|-----------------------|-----------|--------|-------|----------|
| Horizontal | rising edge of ENAB | 0 | 800 | clock | |
| | falling edge of Hsync | 216 | 1016 | clock | [Note 1] |
| Vertical | falling edge of Vsync | 36 | 516 | clock | |

[Note 1] ENAB signal must be fixed to low.

[Note]

(Horizontal display direction)

When ENAB is fixed low, 216 clocks are counted from Hsync negative edge and data from after are available. If you need other timing, please use ENAB signal.

(Vertical display direction)

36 lines are counted from Vsync negative edge and data from next line are available.

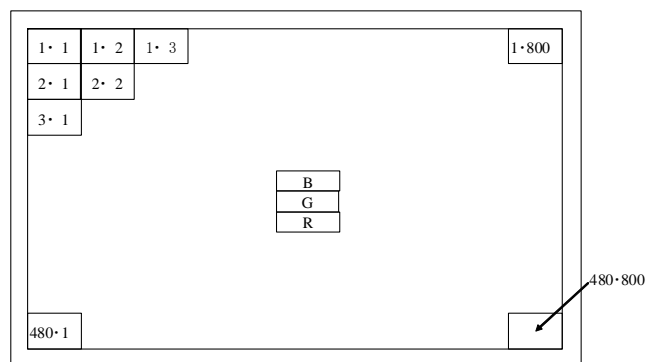
(ENAB signal)

ENAB could not be used for the purpose of the vertical display start timing.

Caution

Image will not be displayed on the right position otherwise.

7-3. Input data signals and display position on the screen



Display position of input data(V· H)

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

| | Colors & Gray scale | Data signal | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|---------------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | Grav 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 |
| | ↑ | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | | 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 |
| | Brighter | 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 |
| | | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | Red | GS255 | 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 |
| | ↑ | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | | 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 |
| | Brighter | 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 |
| | | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | Green | Gs255 | 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 |
| | ↑ | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | | 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 |
| | Brighter | 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 |
| | | ↓ | | | | | ↓ | | | | | | | ↓ | | | | | | | | ↓ | | | | |
| | Blue | GS255 | 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(GS252~GS255 are same grayscale)

Each basic color can be displayed in 253 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.

9. Optical Characteristics

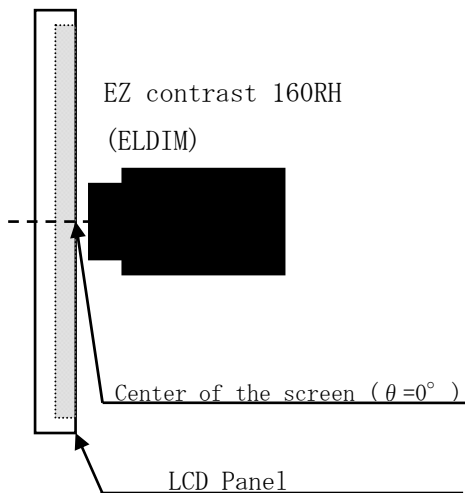
Ta=+25°C, Vcc=+3.3V

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|-----------------------|------------|------------------------|--------------------|-------|-------|-------|-------------------|---------------------------------|
| Viewing angle range | Horizontal | $\theta 21, \theta 22$ | CR>10 | 55 | 65 | — | Deg. | [Note 1,3,6] |
| | Vertical | $\theta 11$ | | 40 | 50 | — | Deg. | |
| | | $\theta 12$ | | 50 | 60 | — | Deg. | |
| Contrast ratio | | CRn | $\theta = 0^\circ$ | 300 | 400 | — | | [Note 2,4,6] |
| Response time | | $\tau r + \tau d$ | $\theta = 0^\circ$ | — | 35 | 50 | ms | [Note 2,5,6] |
| Chromaticity of white | | x | | 0.252 | 0.302 | 0.352 | | [Note 2,6] |
| | | y | | 0.279 | 0.329 | 0.379 | | |
| Chromaticity of red | | x | | 0.533 | 0.583 | 0.633 | | |
| | | y | | 0.272 | 0.322 | 0.372 | | |
| Chromaticity of green | | x | | 0.274 | 0.324 | 0.374 | | |
| | | y | | 0.496 | 0.546 | 0.596 | | |
| Chromaticity of blue | | x | | 0.103 | 0.153 | 0.203 | | |
| | | y | 0.048 | 0.098 | 0.148 | | | |
| Luminance of white | | Y_{LI} | | 280 | 350 | — | cd/m ² | I _f =20mA [Note 2,6] |

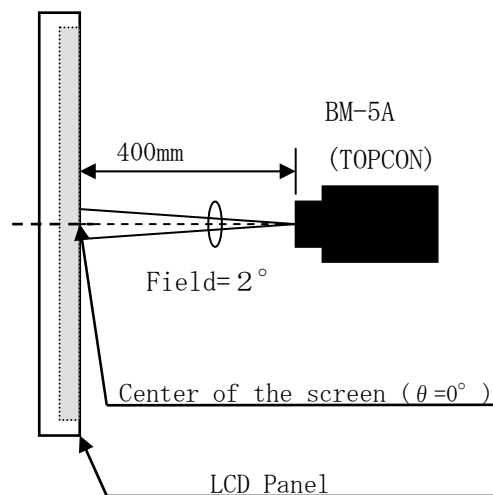
※ The measurement shall be executed 30 minutes after lighting at rating. Condition : (I_f=20mA)

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

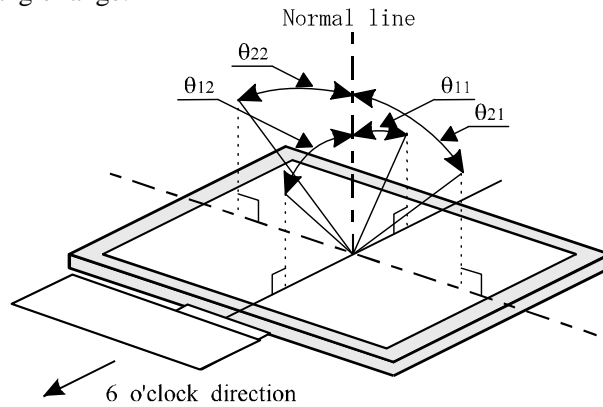
[Note 1] Measuring Viewing Angle Range



[Note 2] Other Measurements



[Note 3] Definitions of viewing angle range:



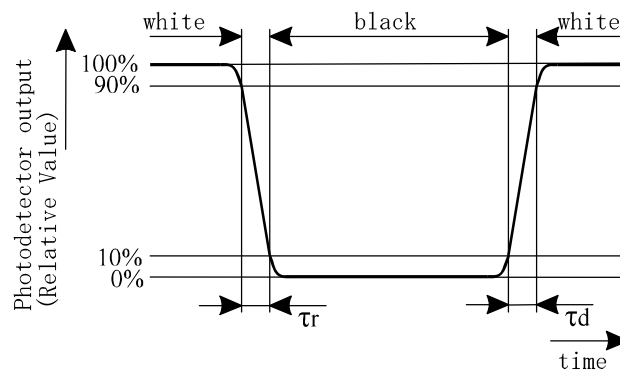
[Note 4] Definition of contrast ratio:

The contrast ratio is defined as the following.

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

[Note 5] Definition of response time:

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



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

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.
Observe all other precautionary requirements in handling components.
- h) This module has its circuitry PCBs on the rear side and should be handled carefully in order not to be stressed.
- i) Protect sheet is attached to the module surface to prevent it from being scratched. Peel the sheet off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc..
- j) 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.
- k) Do not expose the LCD module to a direct sunlight, for a long period of time to protect the module from the ultra violet ray.
- l) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.
- m) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.
- n) Disassembling the module can cause permanent damage and should be strictly avoided.
Please don't remove the fixed tape, insulating tape etc that was pasted on the original module.
(Except for protection film of the panel and the crepe tape (yellow tape) of fixing lamp cable 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 have been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.
- q) 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.
- r) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film.

Be sure to confirm the component of them.

- s) Do not use polychloroprene. If you use it, there is some possibility of generating Cl₂ gas that influences the reliability of the connection between LCD panel and driver IC.
- t) Do not put a laminate film on LCD module, after peeling of the original one. If you put on it, because of the occurrence of air gaps between the polarizer and the film, It may cause discoloration or spots.

12. Packing form

| | |
|---|--------------------------|
| Piling number of cartons | Max.8 |
| Package quantity in one carton | 40pcs |
| Carton size | 380 (W)×575(D)×225(H) mm |
| Total mass of one carton filled with full modules | 10 kg |
| Packing form | Fig.1 |

13. Reliability Test Items

| No. | Test item | Conditions |
|-----|---|--|
| 1 | High temperature operation test | Ta = +60°C 240h |
| 2 | Low temperature operation test | Ta = -20°C 240h |
| 3 | High temperature storage test | Ta = +70°C 240h |
| 4 | Low temperature storage test | Ta = -30°C 240h |
| 5 | High temperature & high humidity operation test | Ta = +40°C ; 95 %RH 240h (No condensation) |
| 6 | Shock test (non- operating) | Max. gravity : 490 m/s ² (50G) Pulse width : 11 ms, half sine wave Direction : ±X, ±Y, ±Z once for each direction. |
| 7 | Vibration test (non- operating) | Frequency : 10~57Hz: half amplitude 0.075mm 57~500Hz: Gravity 9.8m/s ² Sweep time: 11minutes Test time: 3h (X,Y,Z 1h for each direction) |

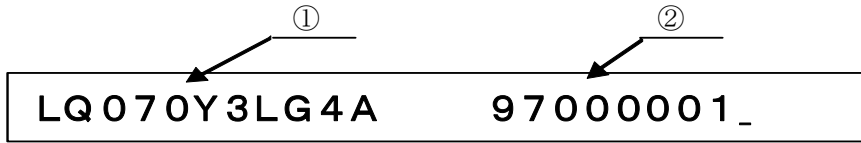
[Result Evaluation Criteria]

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

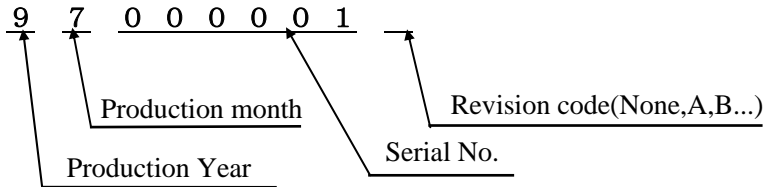
14.Label

1) Module label:

Notation: ①Model No. ②Serial No.



Serial No.

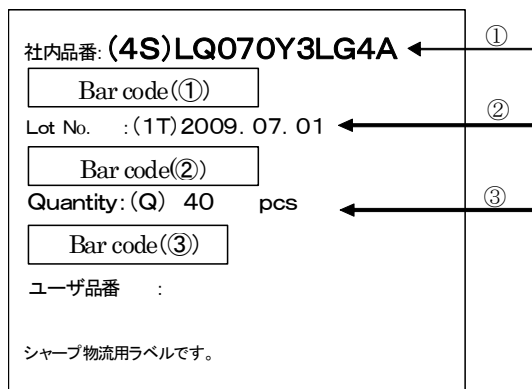


(Production months)

1-9(Jan.-Sep.),X(Oct.),Y(Nov.),Z(Dec)

2) Packing bar code label

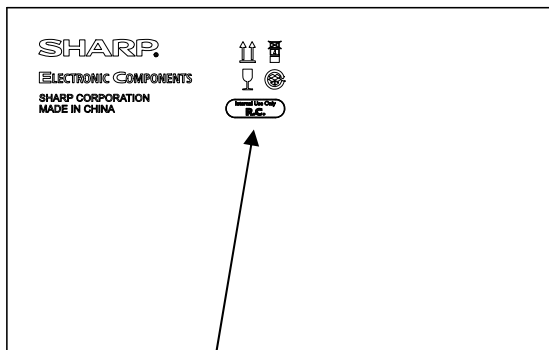
Notation/ Bar code: ①Model No. ②Date ③Quantity



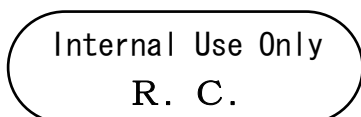
15. RoHS Regulations

This LCD module is compliant with RoHS Directive.

Carton mark



Carton mark (This side)



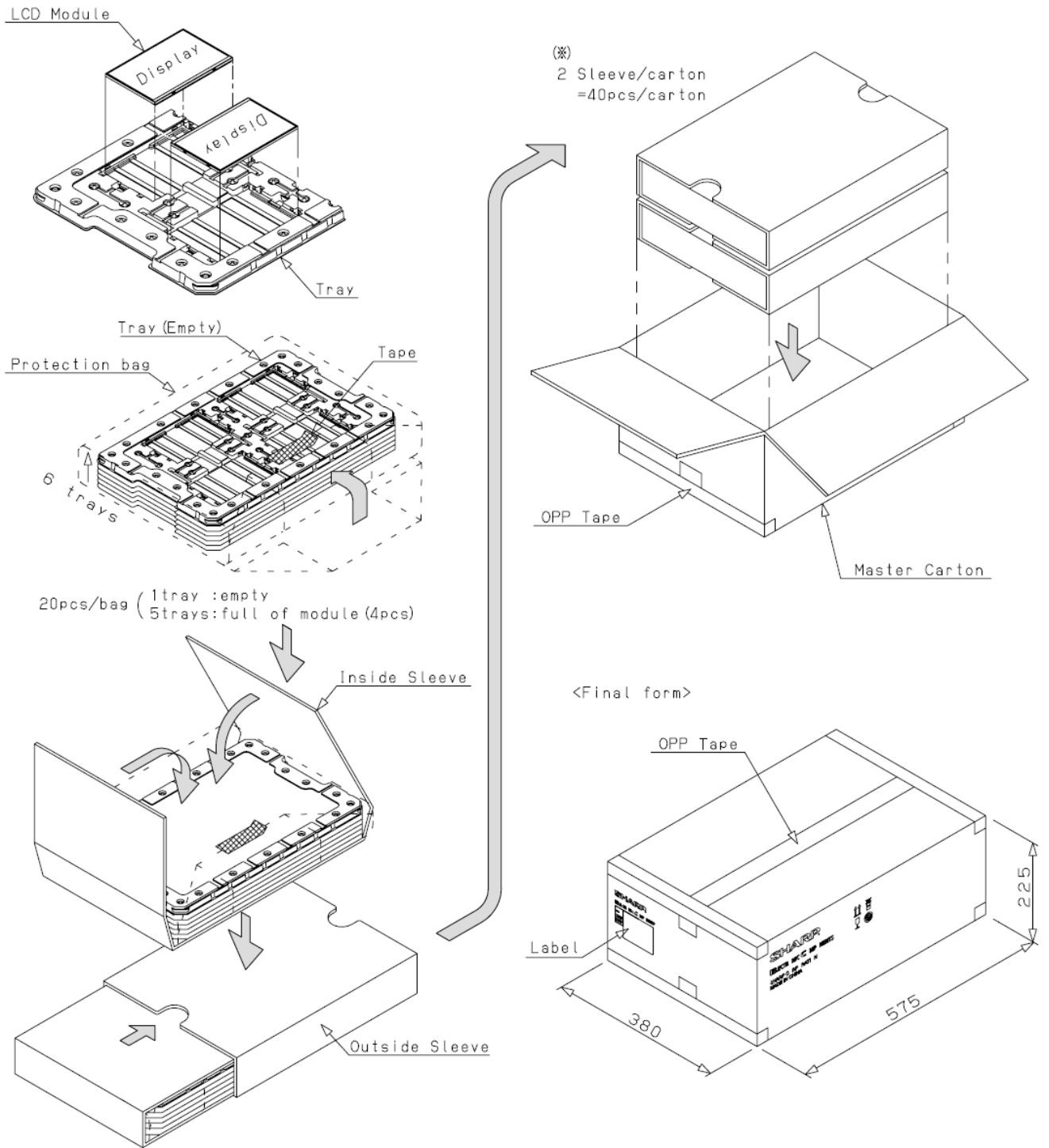
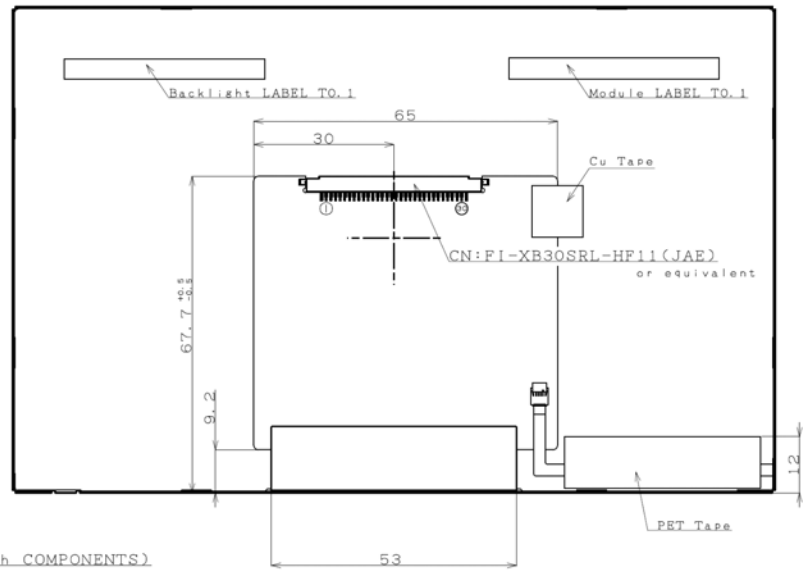
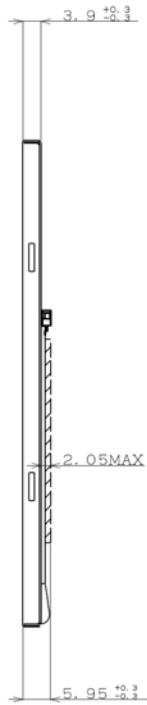
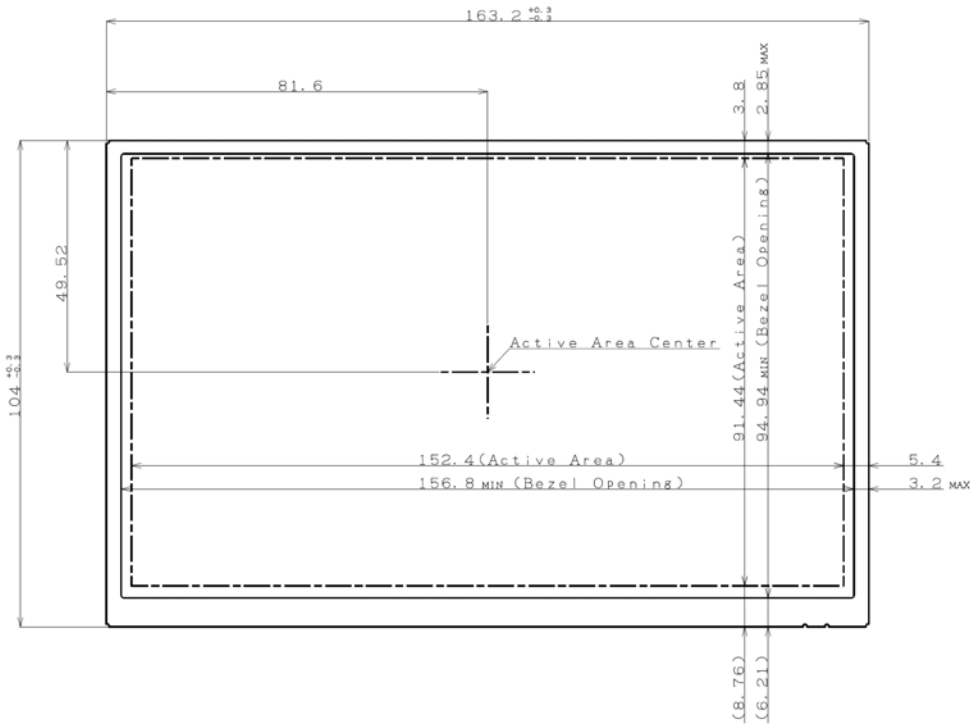


Fig1. Packing Form



NOTES
 1. UNSPECIFIED TOLERANCE TO BE ±0.5
 2. WARP AND FLATING FOR PCB AND CHASSIS ARE EXCLUDED FROM THICKNESS AND DIMENSION OF THE UNIT.

Fig2 Outline Dimensions

LCD Specification

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