PRODUCT SPECIFICATIONS

SHARP

Mobile Liquid Crystal Displays Group

# LQ121S1LW01

## TFT-LCD Module

Spec. Issue Date: Feb. 16, 2006

No: LD-18225A

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DEVICE SPECIFICATION FOR

# TFT-LCD Module

MODEL No.

# LQ121S1LW01

**These parts have corresponded with the RoHS directive.**

☐ CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

BY

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# RECORDS OF REVISION

LQ121S1LW01

| SPEC No. | DATE | REVISED No. | PAGE | SUMMARY | NOTE |
|---|---|---|---|---|---|
| LD-18225A | Feb.16.2006 | - | - | - | 1 st Issue |

1. Application

This technical literature applies to color TFT-LCD module, LQ121S1LW01



The device listed in these technical literature sheets 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 (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 these technical literature sheets.

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 backlight unit. Graphics and texts can be displayed on a 800 X 3 X 600 dots panel with 262,144 colors by using LVDS (Low Voltage Differential Signaling) system for interface and supplying +3.3Vor+5.0V DC supply voltage for TFT-LCD panel driving.

It is a wide viewing-angle-module for ASV technology (Viewing angle:170 ° at CR≧10).

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

3. Outline Specifications

| Parameter | Specifications | Unit |
|---|---|---|
| Display size | 31 (12.1") Diagonal | cm |
| Active area | 246.0 (H ) X 184.5 (V) | mm |
| Pixel format | 800 (H ) X 600 (V) | pixel |
| | (1 pixel=R+G+B dots) | |
| Number of colors (Number of gray scale level) | 262, 144 colors (64 gray scales per color) | |
| Pixel pitch | 0.3075 (H) X 0.3075 (V) | mm |
| Pixel configuration | R,G,B vertical stripe | |
| Display mode | Normally black | |
| Unit outline dimensions *1 | 276.0(W)×209.0(H)×Max.11.0 (D)<br>*Outline dimensions is shown in Fig.1 | mm |
| Mass | Max. 800 | g |
| Surface treatment | Anti-glare and hard-coating 2H | |

[Note] excluding backlight cables.

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (LVDS signals , +3.3V / +5.0V DC power supply and Contorol signal)

Corresponding connector:FI-SE20ME (JAE) or FI-S20S (JAE)

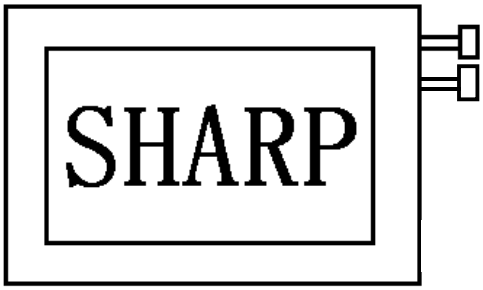
| Pin No. | Symbol | Function | Remark |
|---|---|---|---|
| 1 | $V_{CC}$ | +3.3V / +5.0V power supply | |
| 2 | $V_{CC}$ | +3.3V / +5.0V power supply | |
| 3 | GND | | |
| 4 | GND | | |
| 5 | RXIN0- | Differential data input, CH0 (negative) | LVDS signal |
| 6 | RXIN0+ | Differential data input, CH0 (positive) | LVDS signal |
| 7 | GND | | |
| 8 | RXIN1- | Differential data input, CH1 (negative) | LVDS signal |
| 9 | RXIN1+ | Differential data input, CH1 (positive) | LVDS signal |
| 10 | GND | | |
| 11 | RXIN2- | Differential data input, CH2 (negative) | LVDS signal |
| 12 | RXIN2+ | Differential data input, CH2 (positive) | LVDS signal |
| 13 | GND | | |
| 14 | RXCLK IN- | Differential clock input (negative) | LVDS signal |
| 15 | RXCLK IN+ | Differential clock input (positive) | LVDS signal |
| 16 | GND | | |
| 17 | R/L | Horizontal display mode select signal | [Note1] |
| 18 | U/D | Vertical display mode select signal | [Note2] |
| 19 | GND | | |
| 20 | GND | | |

[Note ] To obtain the proper relation between LVDS signals and actual digital data signals, the digital signals should be inputted into the transmitter as described in the nextsection, 4-2.

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

[Note 1],[Note 2]

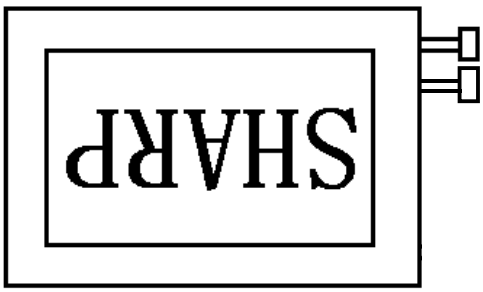
R/L = High, U/D = Low




R/L = Low, U/D = Low


R/L = High, U/D = High


R/L = Low, U/D = High

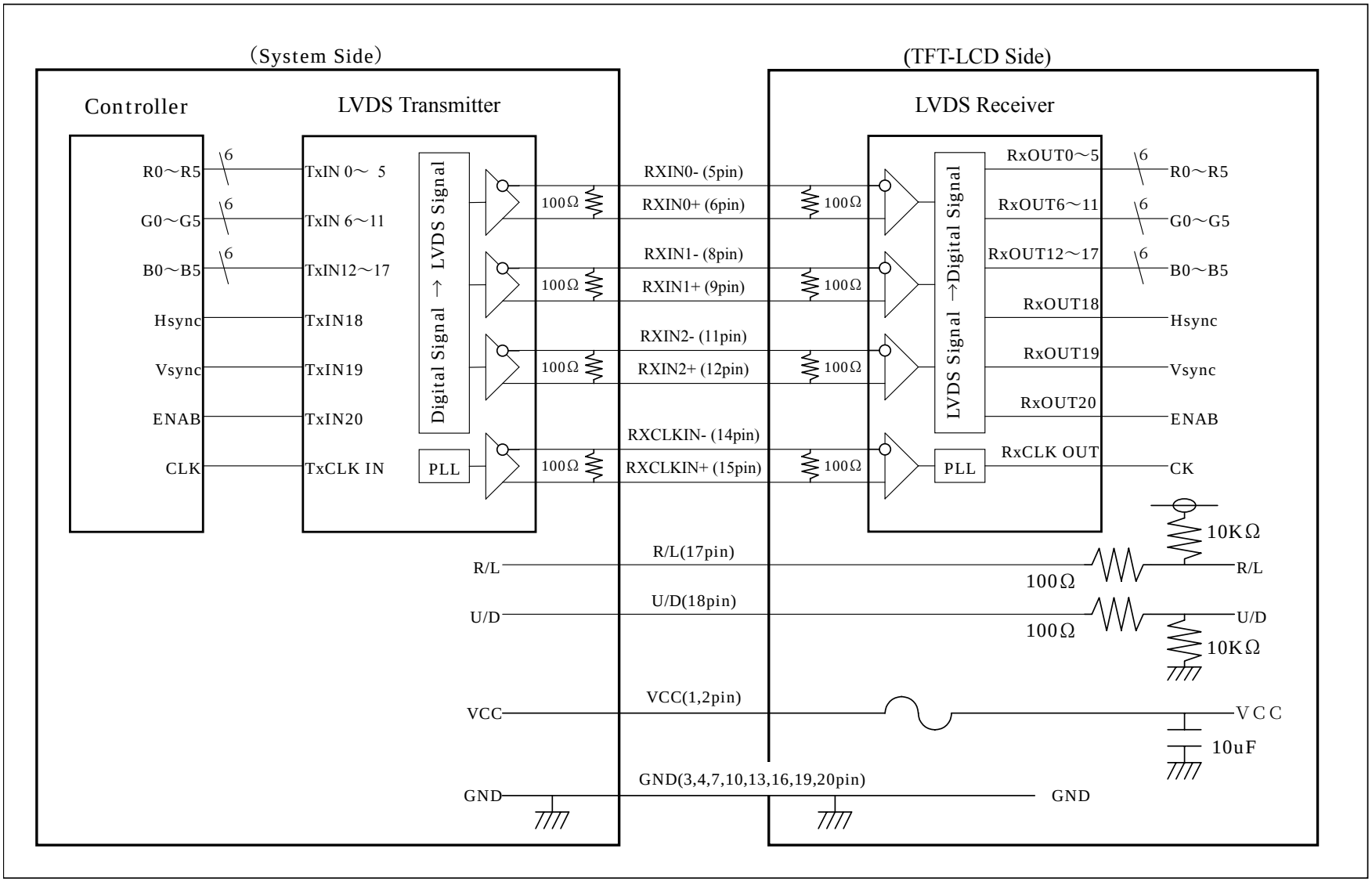


## 4-2 LVDS Interface block diagram

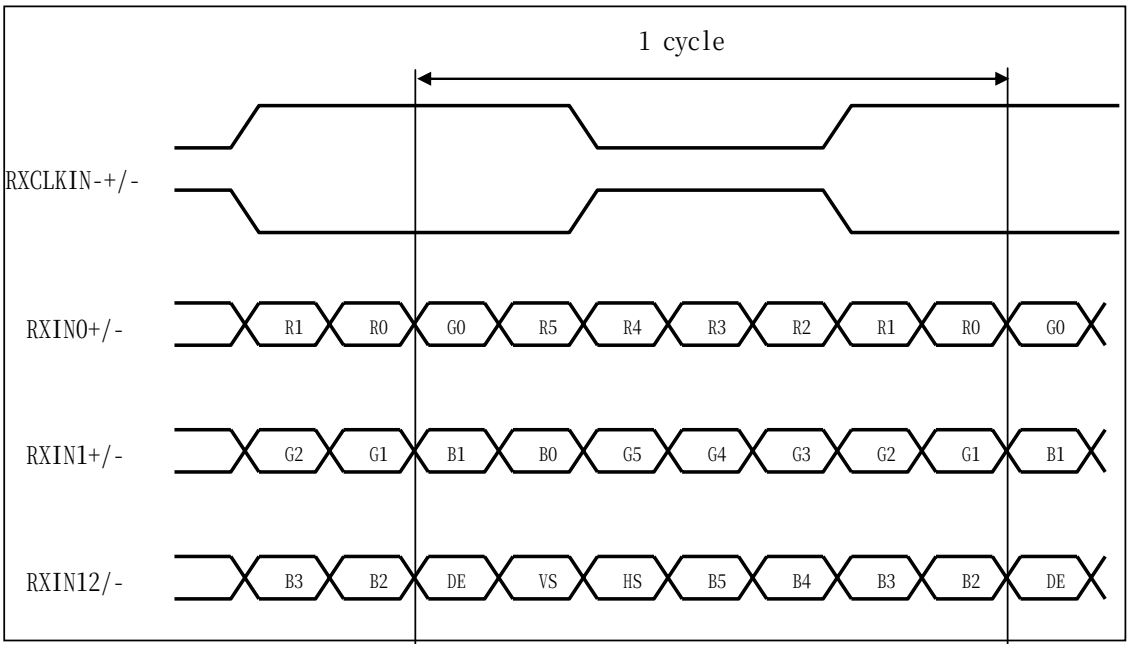
Using receiver：Single LVDS interface, which equals THC63LVDF64A(THine),contained in a control IC

Corresponding Transmitter：DS90C363, DS90C363A, DS90C383, DS90C383A(National semiconductor)，

THC63LVDF63A,THC63LVDM63A(THine), SN75LVDS84(Ti)



[Note ] Data Mapping




4-3. Backlight driving

CN2 ,CN3

Used connector : BHR-02(8.0)VS-1N (JST)

Corresponding connector : SM02(8.0)B-BHS-1-TB(LF)(SN) or -1N-TB(LF)(SN) (JST)

| Pin no. | symbol | function | Color of FL cable | |
|---|---|---|---|---|
| | | | CN2 | CN3 |
| 1 | VHIGH | Power supply for lamp (High voltage side) | Orange | Blue |
| 2 | VLOW | Power supply for lamp (Low voltage side) | White | Gray |

5. Absolute Maximum Ratings

| Parameter | Symbol | Condition | Pin name | Ratings | Unit | Remark |
|---|---|---|---|---|---|---|
| +3.3V / +5.0V supply voltage | Vcc | Ta=25 ºC | Vcc | 0 to + 6.0 | V | |
| Input voltage | VI1 | Ta=25ºC | RXINi-/+(i= 0,1,2) | -0.3 to Vcc+0.3 | V | Vcc<3.0V |
| | | | RXCLK IN-/+ | -0.3 to 3.3V | V | 3.0V≦Vcc |
| | VI2 | Ta=25ºC | R/L , U/D | -0.3 to Vcc+0.3 | V | |
| Lamp input voltage | VHIGH | - | - | 1800 | Vrms | |
| Storage temperature | Tstg | - | - | -25 to +60 | ºC | [Note1] |
| Operating temperature | Topa | - | - | 0 to +50 | ºC | |

[Note1] Humidity: 95%RH Max. at Ta=<40ºC.

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

No condensation.

6.Recommended operation condition

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply voltage | Vcc | ＋3.0 | +3.3/+5.0 | ＋5.5 | V | [Note1] |
| LVDS Signals | $V_L$ | 0 | | 2.4 | V | [Note2] |
| Input voltage | VI | 0 | | Vcc | V | [Note3] |
| Ambient temperature | Topa | 0 | | +50 | ℃ | [Note4], [Note5] |

[Note1]On-off conditions for supply voltage

0<t1≦15ms

0<t2≦10ms

0<t3≦100ms

0<t4≦1s

200ms<t5

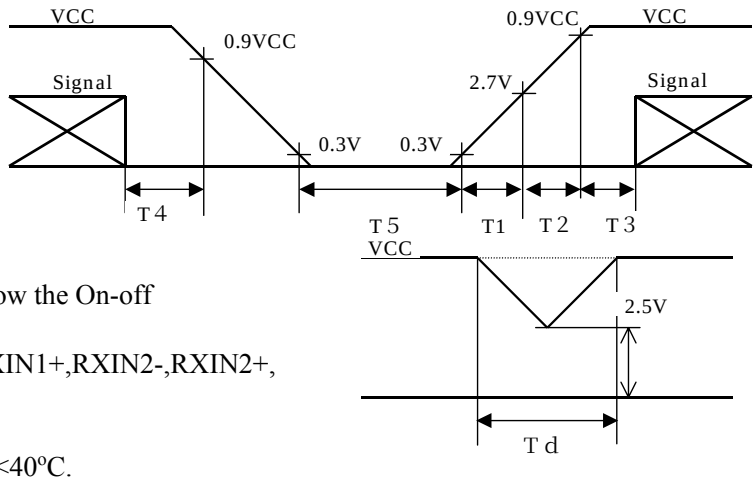
Vcc-dip conditions

1) 2.5V≦Vcc

td≦10ms

2) Vcc<2.5V

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




[Note2] RXIN0-, RXIN0+,RXIN1-,RXIN1+,RXIN2-,RXIN2+, RXCLK IN-,RXCLK IN+

[Note3] R/L, U/D

[Note4] Humidity: 95%RH Max. at Ta=<40ºC.
Maximum wet-bulb temperature at 39ºC or less at Ta>40ºC.
No condensation.

[Note5] Maximum value : Panel surface temperature

7. Electrical Characteristics

7-1.TFT-LCD panel driving Ta=25ºC

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Current dissipation | Vcc=+3.3V | Icc | - | 440 | 580 | mA | [Note1] |
| | Vcc=+5.0V | Icc | - | 290 | 380 | mA | |
| Permissive input ripple voltage | | VRP | - | - | 100 | mVp-p | |
| Input voltage range | LVDS signal | VL | 0 | - | 2.4 | V | [Note2] |
| Differential input threshold voltage | High | VTH | - | - | VCM+ 100 | mV | $V_{CM}$=1.2V [Note3] |
| | Low | VTL | VCM– 100 | - | - | mV | |
| Input impedance (Differential input) | | RT | - | 100 | - | Ω | [Note2] |
| Input voltage | Low | VIL | - | - | 0.8 | V | [Note4] |
| | High | VIH | 2.1 | - | - | | [Note5] |
| Input current1 | Low(VI=0V) | IOL1 | -800 | - | - | | [Note4] |
| | High(VI=Vcc) | IOH1 | -10.0 | - | 10.0 | | |
| Input current2 | Low(VI=0V) | IOL2 | -10.0 | - | 10.0 | uA | [Note5] |
| | High(VI=Vcc) | IOH2 | - | - | 800 | uA | |

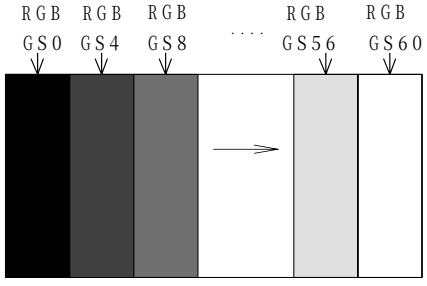
[Note1] Typical current situation : 16-gray-bar pattern.
Vcc=+3.3V / +5.0V

[Note2] LVDS signals

[Note3] $V_{CM}$ : Common mode voltage of LVDS driver.

[Note4] R/L

[Note5] U/D

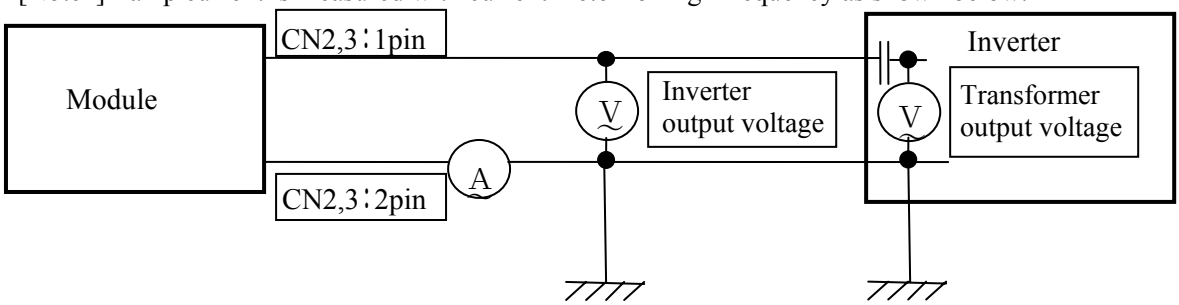


7-2. Backlight driving

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

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Lamp current range | IL | 3.0 | 6.0 | 6.5 | mArms | [Note1] |
| Lamp power consumption | PL | - | 3.5 | - | W | [Note2] |
| Lamp frequency | FL | 35 | 60 | 70 | kHz | [Note3] |
| Kick-off voltage | Vs | - | - | 1400 | Vrms | Inverter output [Note4] |
| | | - | - | (2000) | Vrms | Transformer output at barast capacitor =12pF Ta= 0 °C |
| Lamp life time | LL | 50000 | - | - | hour | IL=6.0 mArms [Note5] |
| | | 60000 | - | - | hour | IL=5.0 mArms [Note5] |

[Note1] Lamp current is measured with current meter for high frequency as shown below.




[Note2] Referential data per one CCFT by calculation. (I L × VL)
The data don't include loss at inverter. ( IL=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 voltage above this value should be applied to the lamp for more than 1 second to start-up. 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 technical literature sheet by SHARP.
Above value is applicable when lamp (the long side of LCD module) is placed horizontally. (Landscape position)
Lamp life time is defined that it applied either ① or ② under this condition
(Continuous turning on at Ta=25 °C, IL=6.0mArms)
① Brightness becomes 50% of the original value under standard condition.
② Kick-off voltage at Ta=0 °C exceeds maximum value,1400Vrms.
(Lamp lifetime may vary if lamp is in portrait position due to the change of mercury density inside the lamp.)
In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower. (Continuous operating 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.
Be sure to use a back light power supply with the safety protection circuit such as the detection circuit for the excess voltage, excess current and or electric discharge waveform.
Be sure to use the detect circuit by which one side of the CCFT lamps can be controlled independently. Otherwise, when one side of the CCFT is open, the excess current may possibly be applied to the other side of the lamp. Recommended inverter is CXA-P1212B-WJL(TDK).
(CXA-454:TDK(wide temperature model) can also be used)

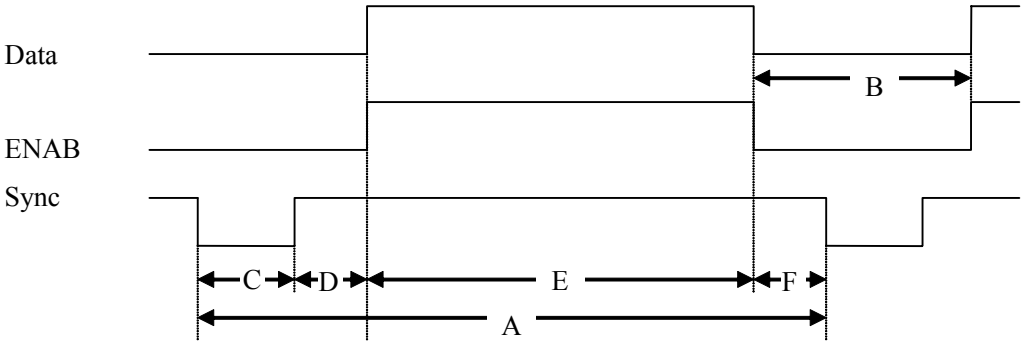
[Note7] It is required to have the inverter designed so that to allow the impedance deviation of the two CCFT lamps and the capacity deviation of barast capacitor.

[Note8] Under the environment of 10lx or less, miss-lighting or lighting delay may occur.

8. Timing characteristics of input signals

8-1. Timing characteristics

(These are specified at the digital inputs/outputs of LVDS transmitter/receiver.)




(Vertical timing)

| Item(symbol) | Min. | Typ. | Max. | Unit | 備考 |
|---|---|---|---|---|---|
| Vsync cycle ($T_{VA}$) | - | 17.6 | - | ms | Negative |
| | 628 | 666 | 798 | line | |
| Blanking period($T_{VB}$) | 28 | 66 | - | line | |
| Vsync pulse width ($T_{VC}$) | 2 | 4 | 6 | line | |
| Back porch ($T_{VD}$) | 23 | 23 | 23 | line | |
| Vsync pulse width+Back porch ($T_{VC}$+$T_{VD}$) | 25 | 27 | 29 | line | |
| Active display area ($T_{VE}$) | 600 | 600 | 600 | line | |
| Front porch ($T_{VF}$) | 3 | 39 | - | line | |

(Horizontal timing)

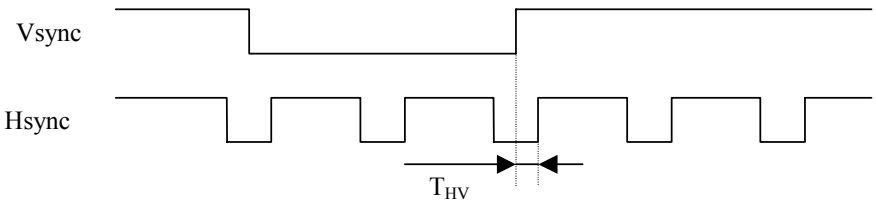
| Item(symbol) | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| Hsync cycle ($T_{HA}$) | 20.8 | 26.4 | 39.9 | us | Negative |
| | 832 | 1056 | 1395 | clock | |
| Blanking period ($T_{HB}$) | 40 | 256 | - | clock | |
| Hsync pulse width ($T_{HC}$) | 2 | 128 | 200 | clock | |
| Back porch ($T_{HD}$) | 928-$T_{HA}$ | 88 | $T_{HA}$-752 | clock | |
| Active display area ($T_{HE}$) | 800 | 800 | 800 | clock | |
| Front porch ($T_{HF}$) | 0 | 40 | - | clock | |

(Clock signal)

| Item | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| Frequency | 35 | 40 | 42 | MHz | [Note1] |

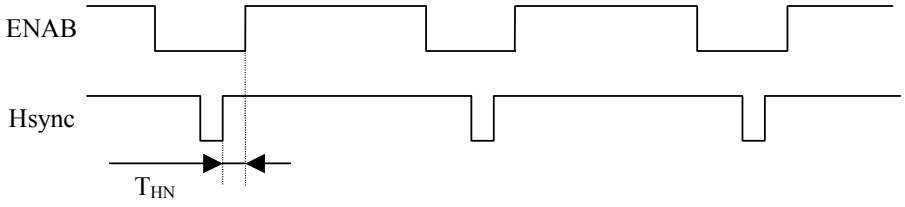
[Note1] In case of lower frequency, the deterioration of display quality, flicker etc., may be occurred.

(Hsync-Vsync Phase difference)




| Item(symbol) | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| Hsync-Vsync Phase difference ($T_{HV}$) | 1 | - | $T_{HA}$-$T_{HC}$ | clock | |

(Hsync-ENAB Phase difference)




| Item | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| Hsync-ENAB Phase difference ($T_{HN}$) | 0 | - | $T_{HA}$-$T_{HC}$ -800 | clock | |

8-2 Display position

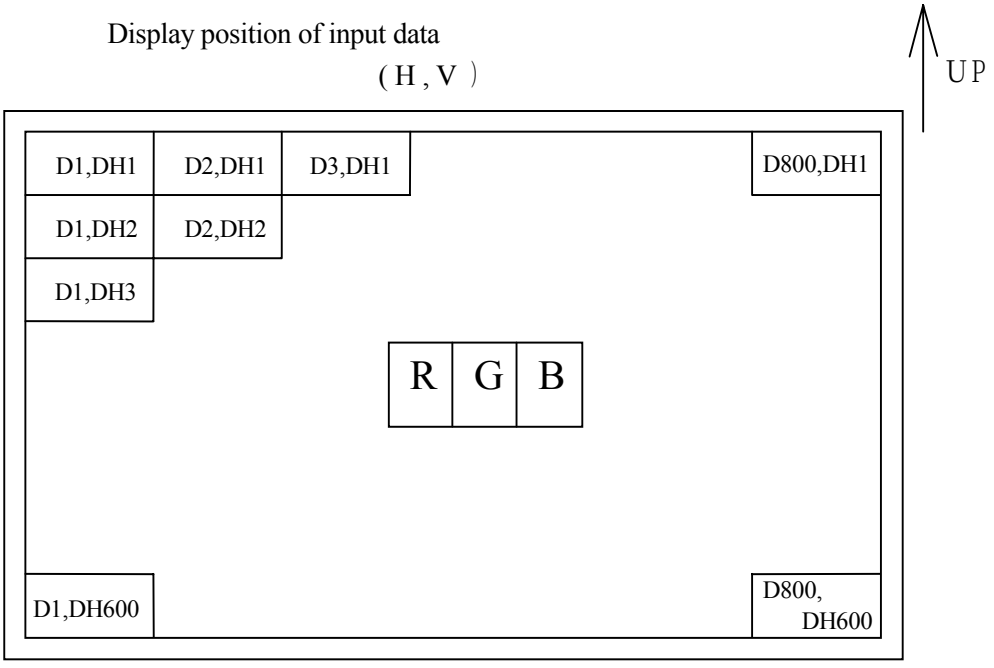
| Item | Standards | Beginning | Ending | Unit | Remark |
|---|---|---|---|---|---|
| Horizontal | rising edge of ENAB | 0 | 800 | clock | |
| | rising edge of Hsync | 88 | 888 | clock | [Note1] |
| Vertical | rising edge of Vsync | 23 | 623 | line | |

[Note1] In case that ENAB signal is fixed to low level. Do not keep ENAB signal high during operation.

8-3. Input Data Signals and Display Position on the screen

Display position of input data

( H , V )



9. 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.

10. Optical Characteristics

Ta=25°C, Vcc=+3.3V / +5.0V

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing angle range | Horizontal | θ 21, θ 22 | CR>10 | 70 | 85 | - | Deg. | [Note1] |
| | Vertical | θ 11 | | 70 | 85 | - | Deg. | [Note4] |
| | | θ 12 | | 70 | 85 | - | Deg. | |
| Contrast ratio | | CRn | θ =0° | 550 | 800 | - | - | [Note2] [Note4] |
| Response time | Rise | τ r | θ =0° | - | 13 | - | ms | [Note3] |
| | Decay | τ d | | - | 16 | - | ms | [Note4] |
| Chromaticity of white | | x | | 0.263 | 0.313 | 0.363 | - | [Note4] |
| | | y | | 0.279 | 0.329 | 0.379 | - | |
| Chromaticity of red | | x | | 0.546 | 0.596 | 0.646 | - | |
| | | y | | 0.279 | 0.329 | 0.379 | - | |
| Chromaticity of green | | x | | 0.260 | 0.310 | 0.360 | - | |
| | | y | | 0.502 | 0.552 | 0.602 | - | |
| Chromaticity of blue | | x | | 0.098 | 0.148 | 0.198 | - | |
| | | y | | 0.090 | 0.140 | 0.190 | - | |
| Luminance of white | | $Y_{L1}$ | | 200 | 250 | - | cd/m$^2$ | IL=6.0mArms fL=60kHz |
| White Uniformity | | δW | | - | - | 1.35 | - | [Note5] |

[Note]

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.3 below.

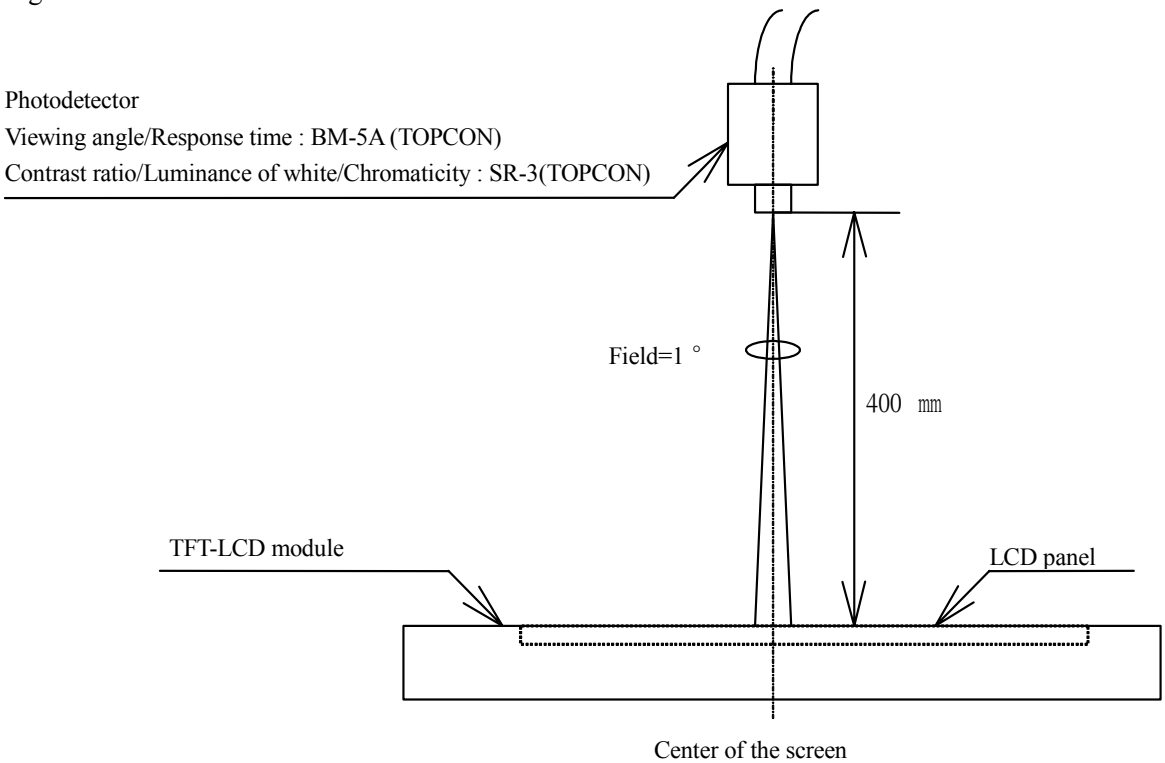
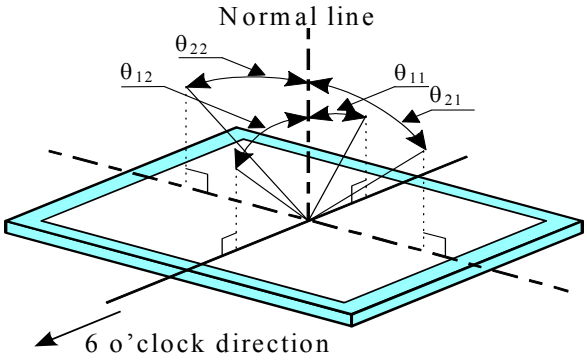



Fig.3 Optical characteristics measurement method

[Note1]Definitions of viewing angle range:



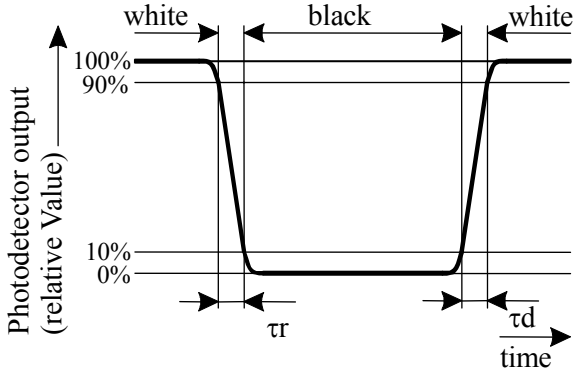

[Note2]Definition of contrast ratio:

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:

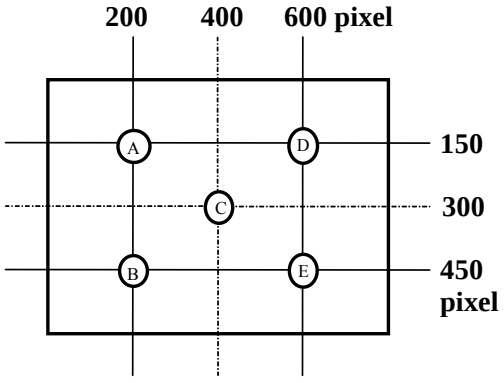
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white" .




[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).




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

11. Display Quality

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

12.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) Since there is a circuit board in the module back, stress is not added at the time of a design assembly. Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.
i) Protection film is attached to the module surface to prevent it from being scratched . Peel the film off slowly , just before the use, with strict attention to electrostatic charges. Blow off 'dust' on the polarizer by using an ionized nitrogen.
j) 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 panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.
l) Connect GND to 4 place of mounting holes to stabilize against EMI and external noise.
m) 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 tail.
n) 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.
o) Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal.
p) Be careful of a back light lead not to pull by force at the time of the wiring to an inverter, or line processing.
q) When install LCD modules in the cabinet, please tighten with “torque=0.294±0.02N·m(3.0±0.2kgf·cm)”.
r) 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.
s) Notice:Never dismantle the module , because it will cause failure.
t) Be careful when using it for long time with fixed pattern display as it may cause afterimage.
u) 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.
v) 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.

13. Packing form

| Product countries / Areas | JAPAN | TAIWAN | CHINA |
|---|---|---|---|
| Piling number of cartons | 6 | | |
| Package quantity in one carton | 10pcs | | |
| Carton size | 388(L) x 334(W) x 263(H) | | |
| Total mass of one carton filled with full modules | 10,000g | | |
| Packing form is shown | Fig4 | | |

14.Reliability test items

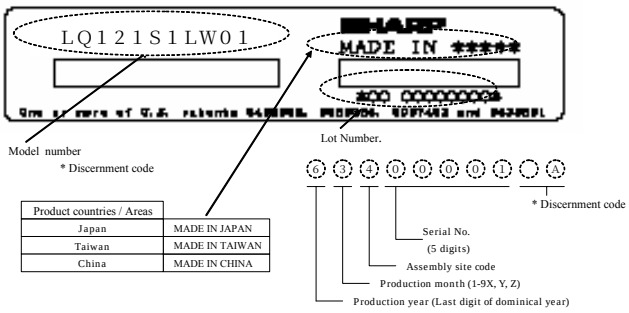
| No. | Test item | Conditions | Remark |
|---|---|---|---|
| 1 | High temperature storage test | Ta=60℃ 240h | ce |
| 2 | Low temperature storage test | Ta= -25℃ 240h | |
| 3 | High temperature<br>& high humidity operation test | Ta=40℃ ; 95%RH 240h<br>(No condensation) | |
| 4 | High temperature operation test | Ta= 50℃ 240h | |
| 5 | Low temperature operation test | Ta= 0℃ 240h | |
| 6 | Vibration test<br>(non- operating) | Frequency: 10～57Hz/Vibration width (one side):0.075mm<br>: 57～500Hz/Gravity: 9.8 m/s$^2$<br>Sweep time : 11 minutes<br>Test period : 3 hours<br>(1 hour for each direction of X,Y,Z) | |
| 7 | Shock test<br>(non- operating) | Max. gravity : 490m/s$^2$<br>Pulse width : 11ms, half sine wave<br>Direction : ±X,±Y,±Z once for each direction. | |
| 8 | ESD test | Human Body Model(IEC-6100-4-2)<br>・Contact discharge (150pF 330Ω)<br>non-operating = ±10kV, operating = ±8kV<br>・Atmospheric discharge (150pF 330Ω)<br>non-operating = ±20kV, operating = ±15kV | |
| 9 | EMI | Measurement in 10m site | |

[Result Evaluation Criteria]

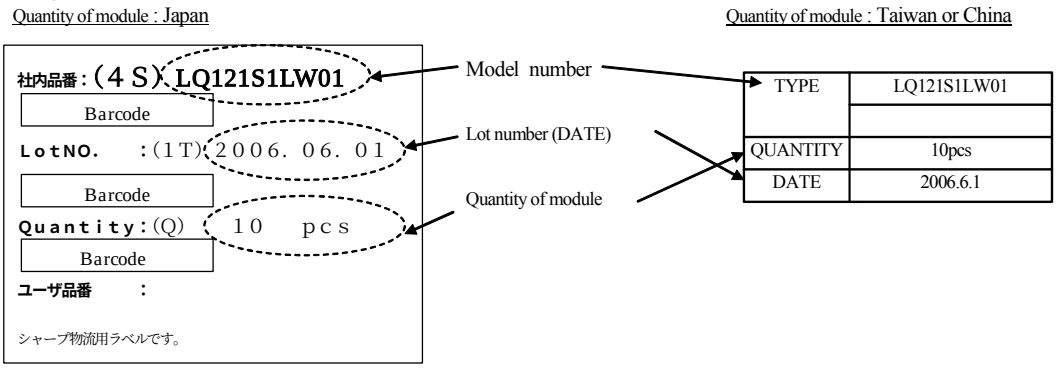
Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function. (normal operation state：Temperature:15～35℃, Humidity:45～75%, Atmospheric pressure:86～106kpa)

15.Others

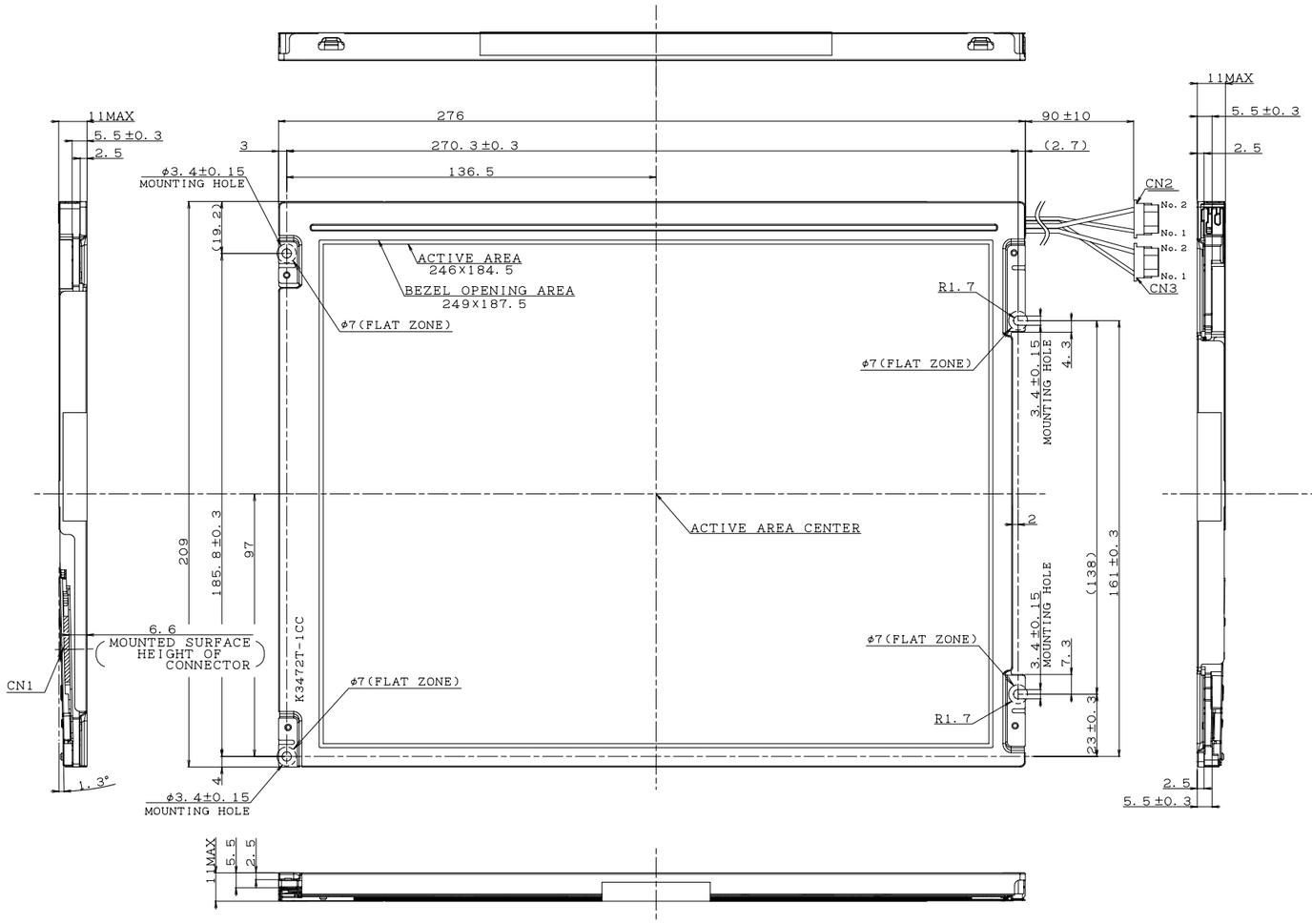
15-1 Lot number Label:

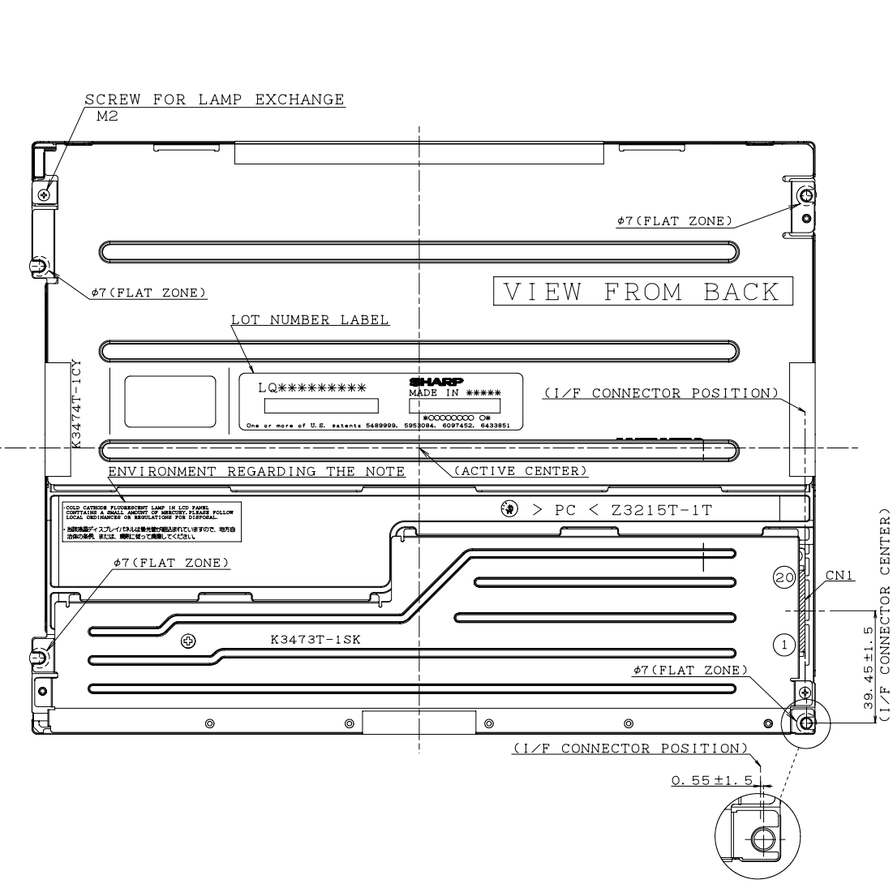


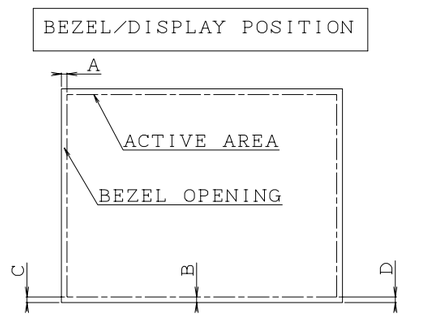

15-2 Packing box Label:




15-3 If any problem occurs in relation to the description of this specification , it shall be resolved through discussion with spirit of cooperation.




1)TOLERANCE X-DIRECTION A:1.5±0.8
2)TOLERANCE Y-DIRECTION B:1.5±0.8
3)OBLIQUITY OF DISPLAY AREA |C-D|<0.8

## INTERFACE CONNECTOR

PIN LAYOUT

| pin | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | VCC | VCC | GND | GND | RXIN0- | RXIN0+ |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| GND | RXIN1- | RXIN1+ | GND | RXIN2- | RXIN2+ | GND |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| RCLKIN- | RCLKIN+ | GND | R/L | U/D | GND | GND |

CORRESPONDING CONNECTOR:FI-SE20M, FI-S20S

## CCFT CONNECTOR

CN2, CN3:BHR-02(8.0)VS-1N(JST)

PIN LAYOUT

| | |
|---|---|
| 1 | High |
| 2 | GND |

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.
3. RECOMMENDED TIGHTEN TORQUE FOR MOUNTING 0.294±0.02N·m(3.0±0.2kgf·cm)

# Fig1. OUTLINE DIMENSIONS (LQ121S1LW01)

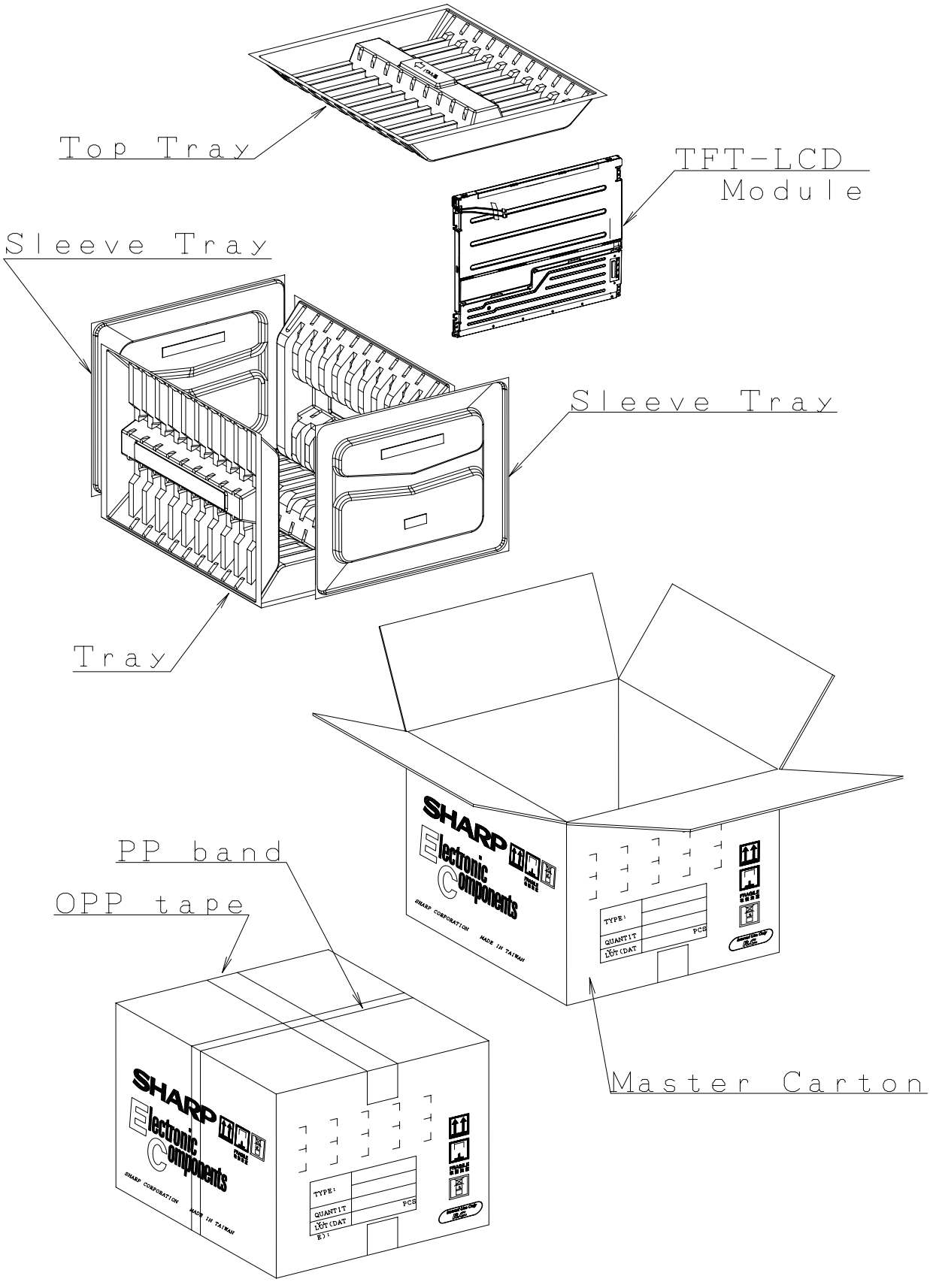



Fig4. Packing Form

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