PRODUCT SPECIFICATIONS

SHARP

AVC Liquid Crystal Displays Group

LQ170WX02L

TFT-LCD Module

Spec. Issue Date: MAY15,2008

NO.-LD20309A

RECORDS OF REVISION

LQ170WX02L

SPEC No.	DATE	REVISED No.	PAGE	SUMMARY	NOTE
LD-20309A	May.15.2008	-	-	-	1st Issue

These specification sheets are the proprietary product of SHARP CORPORATION (”SHARP) and include materials protected under copyright of SHARP. Do not reproduce or cause any third party to reproduce them in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP.

The device listed in these specification 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 specification sheets.

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

1. Application

This specification applies to color TFT-LCD module, LQ170WX02L

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 1280×3×768 dots panel with about 16 million colors by using LVDS (Low Voltage Differential Signaling) system for interface and supplying +5.0V DC supply voltage for TFT-LCD panel driving and supply voltage for backlight.

LED backlight rail is appliced in this module.

3. Outline Specifications

Parameter	Specifications	Unit
Display size	43 (17.0") Diagonal	cm
Active area	369.6 (H)×221.76 (V)	mm
Pixel format	1280 (H)×768 (V)	pixel
	(1 pixel=R+G+B dots)	
Pixel pitch	0.28875 (H)×0.28875 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally black	
Unit outline dimensions *1	413.8(W)×259.0(H)×15.0(D) *Outline dimensions is shown in Fig.1	mm
Mass	MAX. 1750	g
Surface treatment	Anti-glare and hard-coating 3H	

*1 excluding backlight cables.
Outline dimensions is shown in Fig.1

4.Input Terminals

4-1. TFT-LCD panel driving

CN1 (LVDS signals and +5.0V DC power supply)

Used connector: DF14H-20P-1.25H (56) [HIROSE ELECTRIC Co.,Ltd]

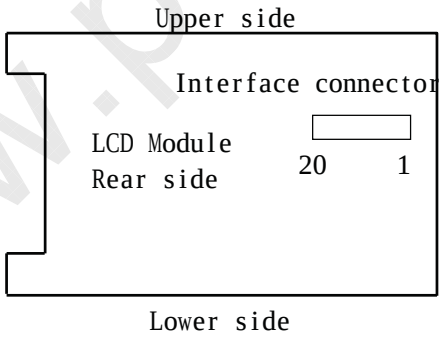
Corresponding connector: DF14-20S-1.25C (connector) [HIROSE ELECTRIC Co.,Ltd]
DF14-2628SCFA(terminal) [HIROSE ELECTRIC Co.,Ltd]

Used LVDS receiver: Type with built-in control IC (THC63LVDF84A[Thine] equivalent device)

Corresponding LVDS transmitter: THC63LVDM83R[Thine] or equivalent device

Pin No.	Symbol	Function	Remark
1	V_{CC}	+5.0V power supply	
2	V_{CC}	+5.0V power supply	
3	GND	GND	
4	GND	GND	
5	RXIN0-	Receiver signal, CH0 (-)	LVDS
6	RXIN0+	Receiver signal, CH0 (+)	LVDS
7	GND	GND	
8	RXIN1-	Receiver signal, CH1 (-)	LVDS
9	RXIN1+	Receiver signal, CH1 (+)	LVDS
10	GND	GND	
11	RXIN2-	Receiver signal, CH2 (-)	LVDS
12	RXIN2+	Receiver signal, CH2 (+)	LVDS
13	GND	GND	
14	RXCKIN-	Receiver signal, CK (-)	LVDS
15	RXCKIN+	Receiver signal, CK (+)	LVDS
16	GND	GND	
17	RXIN3-	Receiver signal, CH3 (-)	LVDS
18	RXIN3+	Receiver signal, CH3 (+)	LVDS
19	GND	GND	
20	LVDS_SET	LVVDS_SET	[Note1]

[Note1] Relation between LVDS signals and actual data shows below section (4-2)

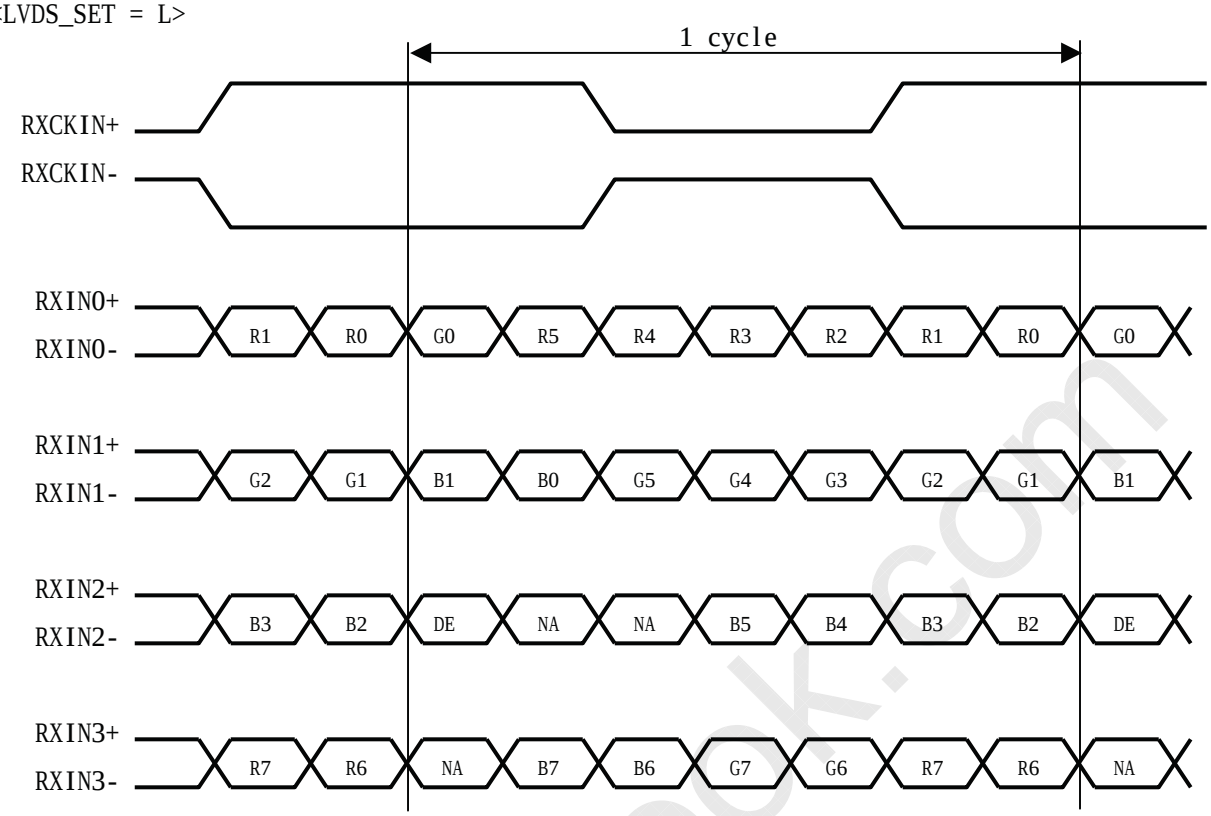


4-2. Data Mapping

[Note] pin assignment with LVDS_SET pin (Thine:THC63LVDM83R)

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

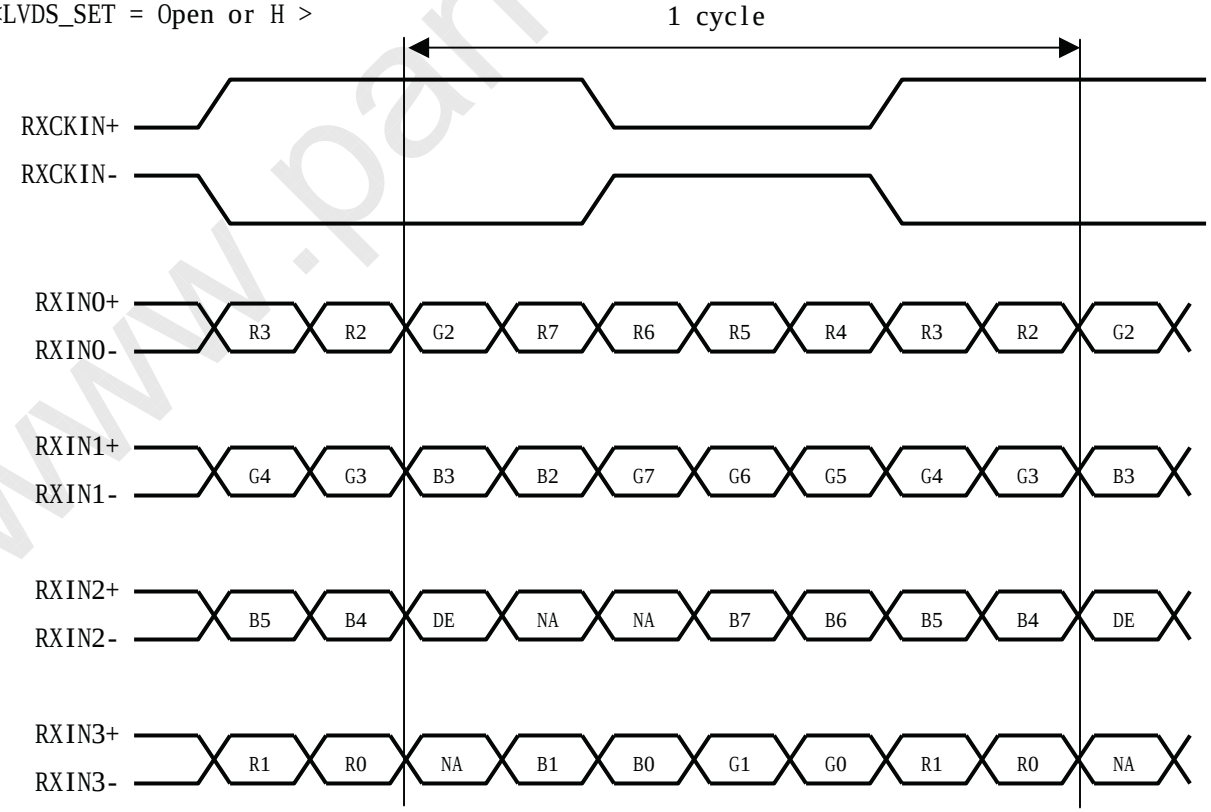
<LVDS_SET = L>



DE: Display Enable

NA: Not Available

<LVDS_SET = Open or H >



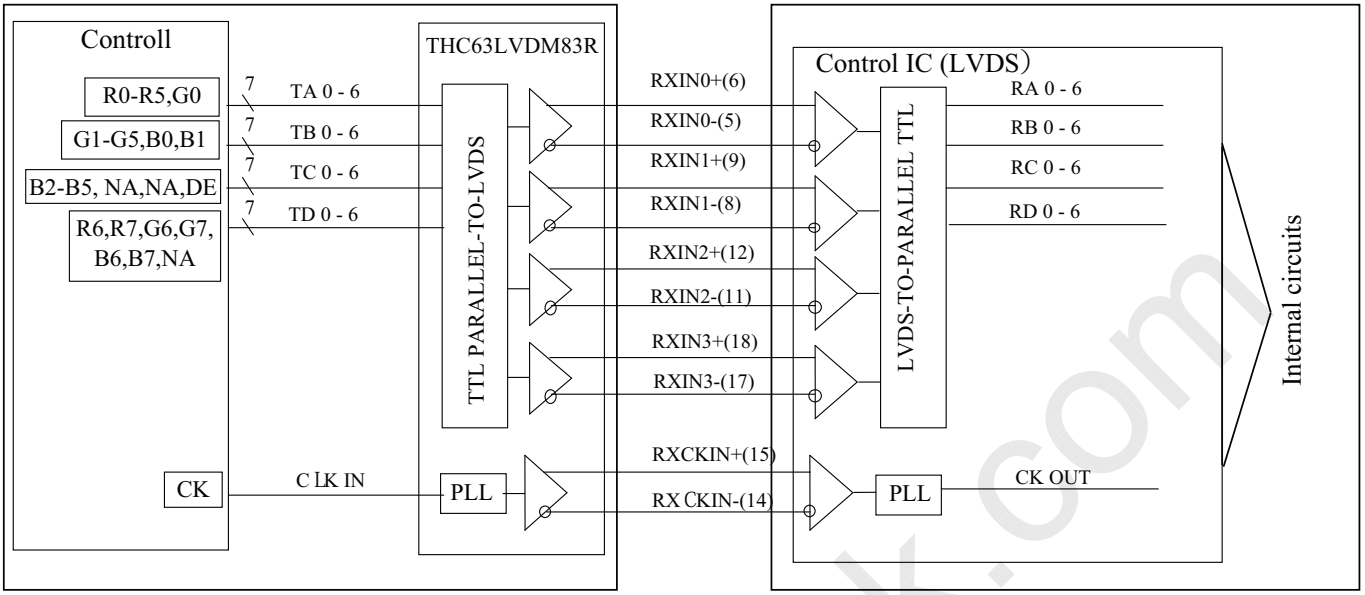
DE: Display Enable

NA: Not Available

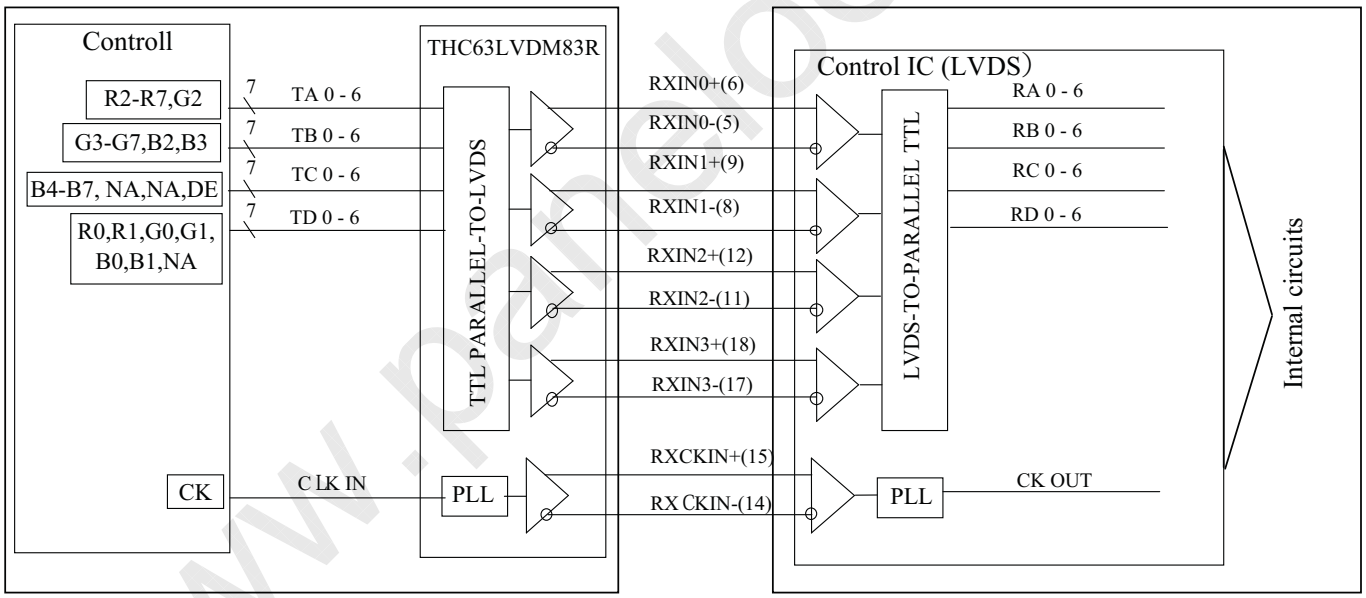
4-3 LVDS interface block diagram

(Computer Side) (TFT-LCD side)

◎ LVDS_SET=L (20 pin=GND)



◎ LVDS_SET=H (20 pin=Open or high3.3[V])



5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Supply voltage	V_{CC}	Ta=25℃	-0.3 ～ + 6.0	V	【Note1】
Input voltage	V_{IN}	Ta=25℃	-0.3 ～ Vcc+0.3	V	
Lamp Voltage	V_{HIGH}	—	0 ~ +2000	Vrms	
Storage temperature	T_{STG}	—	-20 ～ + 70	℃	【Note1】
Operating temperature	T_{opa}	Panel surface	0 ～ +70	℃	【Note2,3】

[Note1] Humidity: 85%RH Max. at Ta=<40ºC.
Maximum wet-bulb temperature at 29ºC or less at Ta>40ºC. No condensation.

[Note2] When used on condition of Operating temperature [57~70℃], degradation of display grace, such as screen stain etc, may be caused.

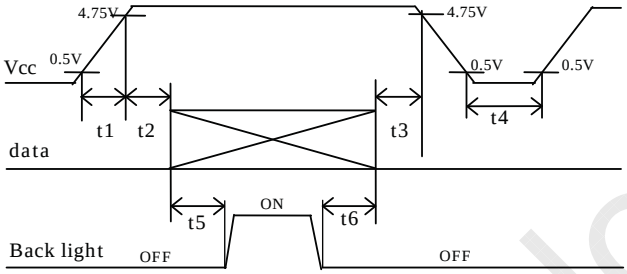
[Note3] This liquid crystal becomes Ni point at 70℃. The liquid crystal metastasizes and a part of the screen darkens when using it at about 70℃. This phenomenon returns to a normal display when it lowers the temperature.

6. Recommended operation condition

6-1. TFT-LCD panel driving Ta=25℃

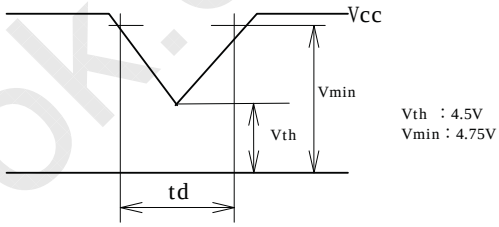
Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage		V_{CC}	4.75	5.0	5.25	V	[Note1]
Current dissipation		I_{CC}	-	485	750	mA	[Note2]
LVDS_SET	(High)	V_{IH}	3.0	3.3	3.6	V	
LVDS_SET	(Low)	V_{IL}	GND		0.9	V	
Permissive input ripple voltage		V_{RF}	-	-	100	mV_{p-p}	Vcc=+5.0V
Differential input Threshold voltage	(High)	V_{TH}	-	-	100	mV	V_{CM}=+1.2V [Note3]
	(Low)	V_{TL}	-100	-	-	mV	
Input current	(High)	I_{OH}	-	-	±10	uA	V_I=3.0V,V_{CC}=5.25V [Note4]
Input current	(Low)	I_{OL}	-	-	±10	uA	V_I=0V,V_{CC}=5.25V [Note4]

[Note1]On-off conditions for supply voltage



0＜t1≦20ms
0≦t2≦40ms
0≦t3≦40ms
1s≦t4
200ms≦t5
200ms≦t6

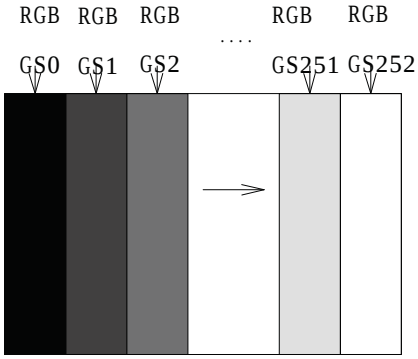
Vcc-dip conditions



1) Vth ≦ Vcc ＜ Vmin
td ≦ 10ms
2) Vcc＜Vth
Vcc-dip conditions should also follow the On-off conditions for supply voltage

It is recommended to consider some timing difference between LVDS input and Backlight input as shown above.If the Backlight lights on before LCD starting, or if the Backlight is kept on after LCD stopping, the screen may look white for a moment or abnormal image may be displayed. This is caused by variation in output signal from timing generator at LVDS input on or off. It does not cause the damage to the LCD module

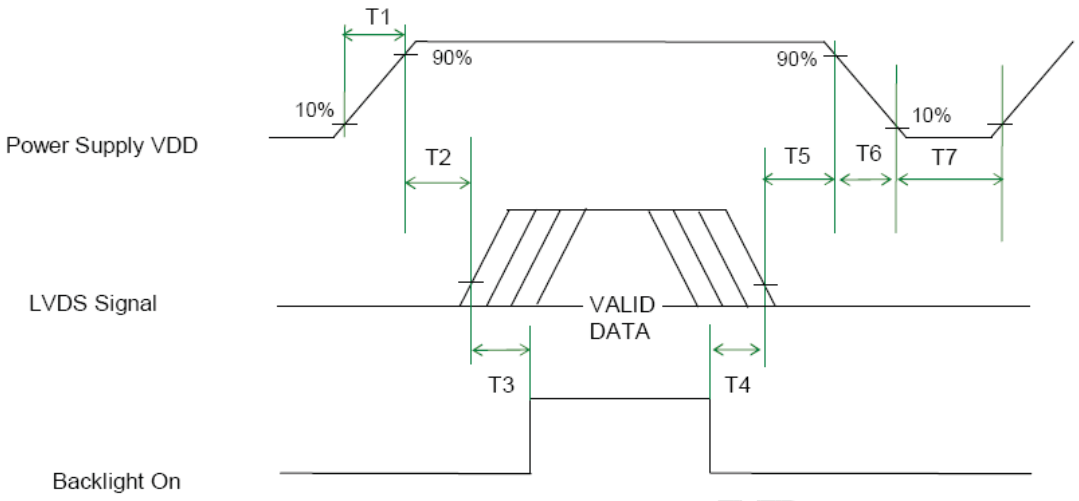
[Note2] Typical current situation : 253-gray-bar pattern.
(Vcc=+5.0V,fck=65MHz,Ta=25℃)
The explanation of each gray scaleis described below section 8



[Note3] V_{CM} : Common mode voltage of LVDS driver
[Notel4] VI : LVDS_SET

Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



6-2. LED Backlight driving

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

Connector Name / Designation	Lamp Connector / Backlight lamp
Manufacturer	JST
Type Part Number	EHR-2 or Compatible
Mating Type Part Number	S2B-EH or Compatible

Signal for LED Backlight connector

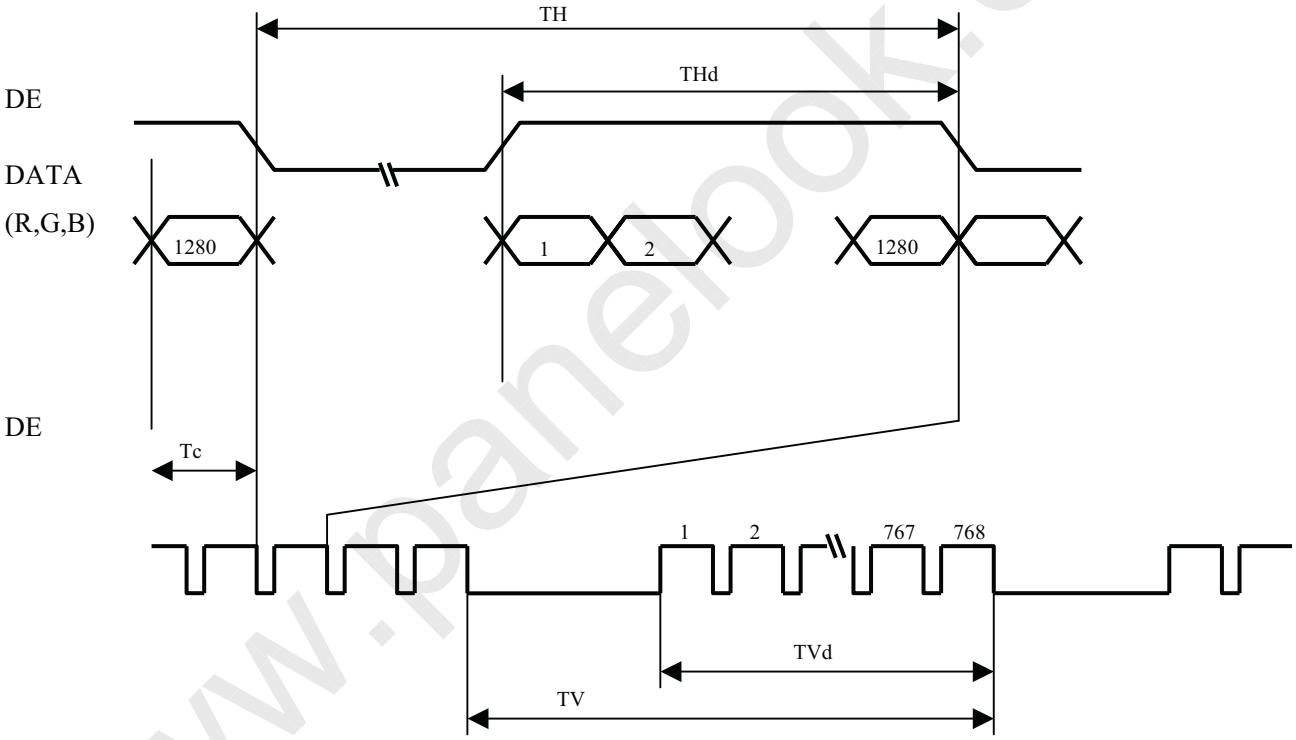
Connector No.	Pin No.	Input	Color	Function
CN1	1	Vcc	RED	Positive pole
	2	Gnd	Black	Negative pole
CN2	1	Vcc	RED	Positive pole
	2	Gnd	Black	Negative pole

7. Timing characteristics of input signals

7-1. Timing characteristics

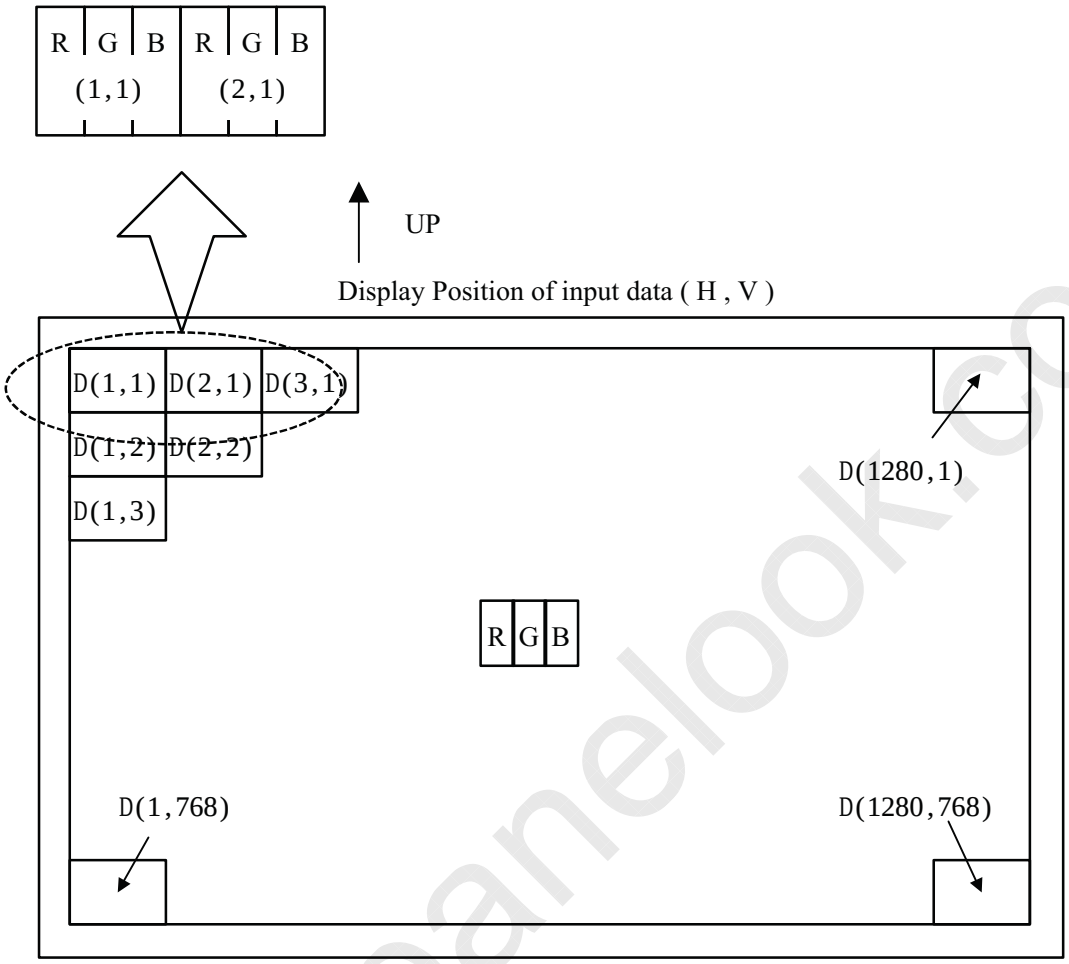
Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock signal	Frequency	1/Tc	50.0	65.0	82.0	MHz
ENAB signal	Horizontal period	TH	1310	1344	1688	clock
			-	20.67	-	µs
	Horizontal Frequency	1/TH	35.0	48.3	75.0	KHz
	Horizontal period (High)	THd	1280	1280	1280	clock
	Vertical period	TV	776	806	806	Line
			-	16.7	-	ms
	Vertical Frequency	1/TV	50	60	75	Hz
	Vertical period (High)	TVd	768	768	768	line

【Note】In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.



7-2. Input Data Signals and Display Position on the screen

Graphics and texts can be displayed on a 1280 × RGB × 768 dots panel with 16-million-color by supplying 24 bit data signal (8bit/color [253 gray scales] × 3).



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

	Colors & Gray scale	Gray Scale	Data signal																							
			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
	⇧	↓				↓								↓								↓				
	⇩	↓				↓								↓								↓				
	Brighter	GS250	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS251	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS252	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓								↓								↓				
	⇩	↓				↓								↓								↓				
	Brighter	GS250	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS251	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS252	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓				↓								↓								↓				
	⇩	↓				↓								↓								↓				
	Brighter	GS250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1
	⇩	GS251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
	Blue	GS252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1

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

Each basic color can be displayed 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=+5.0V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ21, θ22	CR≧10	70	85	-	Deg.	
	Vertical	θ11		70	85	-	Deg.	
		θ12		70	85	-	Deg.	
Contrast ratio		CR	θ=0°	350	600	-	-	[Note2,4]
Response time		τd+τr	θ=0°	-	20	35	ms	[Note3,4]
Chromaticity of white		Wx	θ=0°	0.283	0.313	0.343	-	IL=6.0mArms fL=60kHz [Note4]
		Wy		0.299	0.329	0.359	-	
Chromaticity of red		Rx		0.610	0.640	0.670	-	
		Ry		0.320	0.350	0.380	-	
Chromaticity of green		Gx		0.257	0.287	0.317	-	
		Gy		0.566	0.596	0.626	-	
Chromaticity of blue		Bx		0.113	0.143	0.173	-	
		By		0.050	0.080	0.110	-	
Luminance of white		Y_L		240	350	-	cd/m²	
White Uniformity		δW		-	-	1.4	-	[Note5]

※The measurement shall be executed 30 minutes after lighting at rating.
The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.

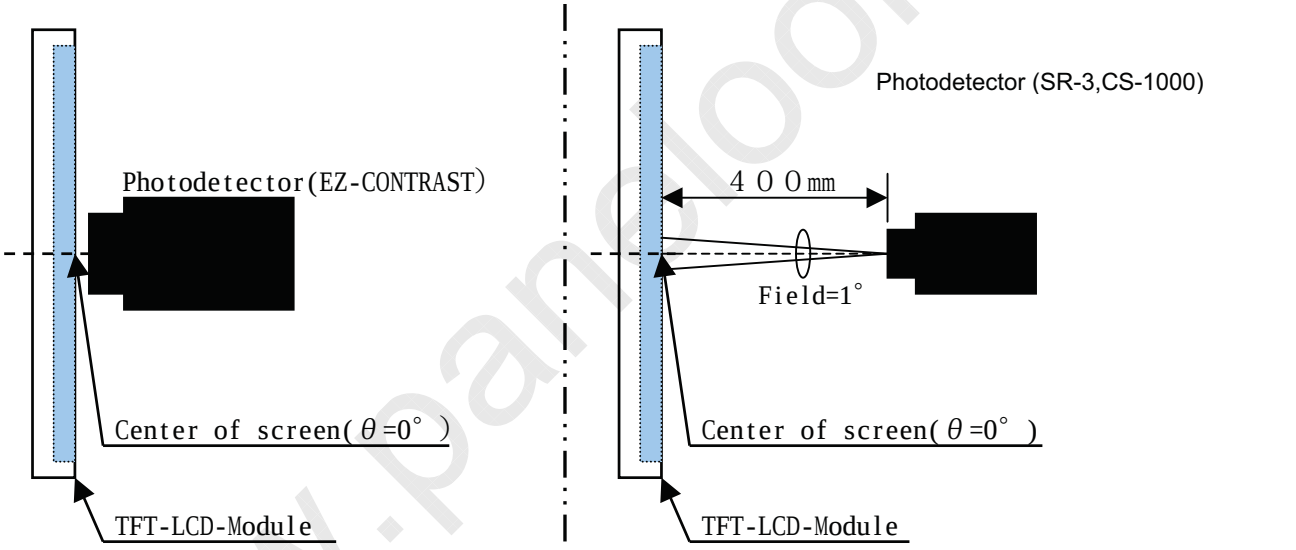
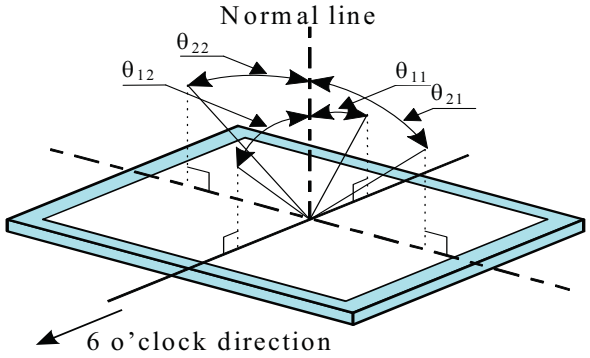


Fig2-1 Viewing angle measurement method

Fig2-2 Luminance/Contrast ratio/Response time/Chromaticity measurement method

Fig2 Optical characteristics measurement method

[Note1] Definitions of viewing angle range:



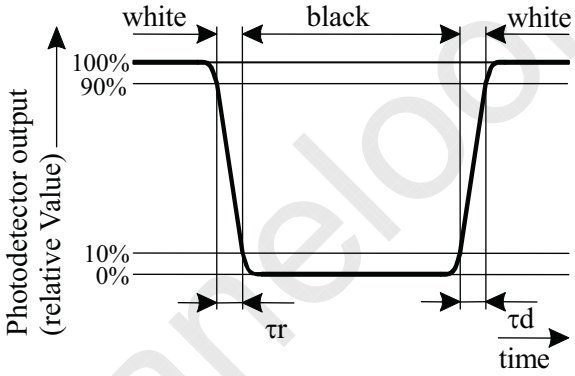
[Note2] Definition of contrast ratio:

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:

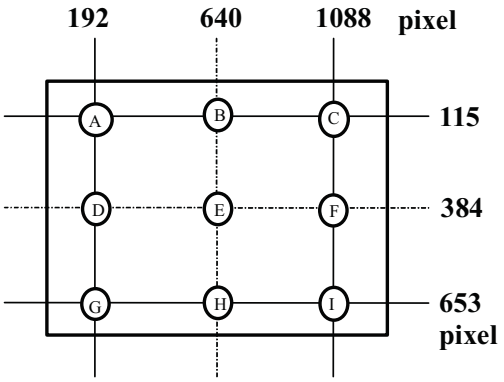
The response time is defined as the following figure and shall be measured byswitching the input signal for "black" and "white" .



[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~I).



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

10. 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) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.
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) Make sure the four mounting holes of the module are grounded sufficiently. Take electro-magnetic interference (EMI) into consideration.
i) The module has some printed circuit boards (PCBs) on the back side. Take care to keep them form any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.
j) Observe all other precautionary requirements in handling components.
k) It is necessary to remove the screw on the back of the module to exchange lamps.
Please consider it when you design the cabinet.
l) When some pressure is added onto the module from rear side constantly, it causes display non-uniformity issue, functional defect, etc. So, please avoid such design.
m) When handling LCD modules and assembling them into cabinets, please avoid that long-term storage inthe 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.

11. Packing form

11-1. Packing

a) Piling number of cartons: maximum 5 cartons

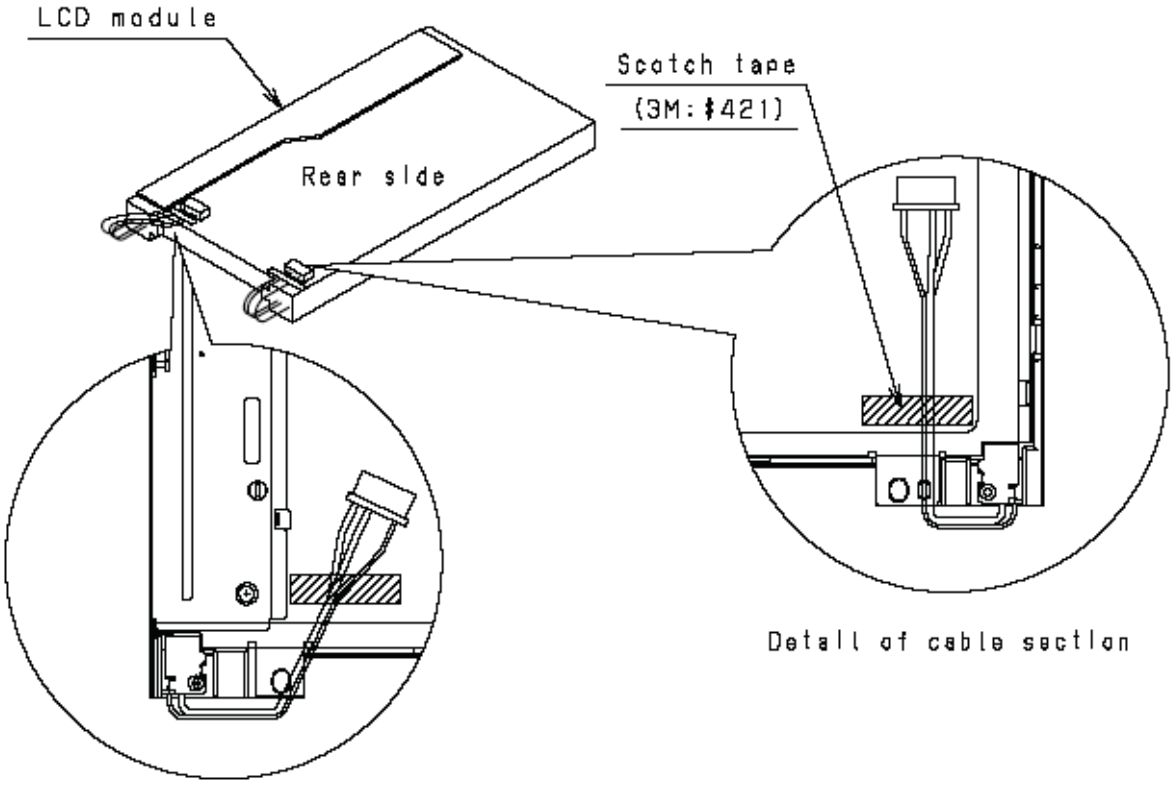
b) Packing quantity in one carton: 5 modules

c) Carton size : 509(W) × 250(H) × 398(D)

d) Total mass of one carton filled with full modules: 13kg

11-2. Packing method

Fig.11-2 (a),(b),(c),(d),(e),(f) show the packing method.



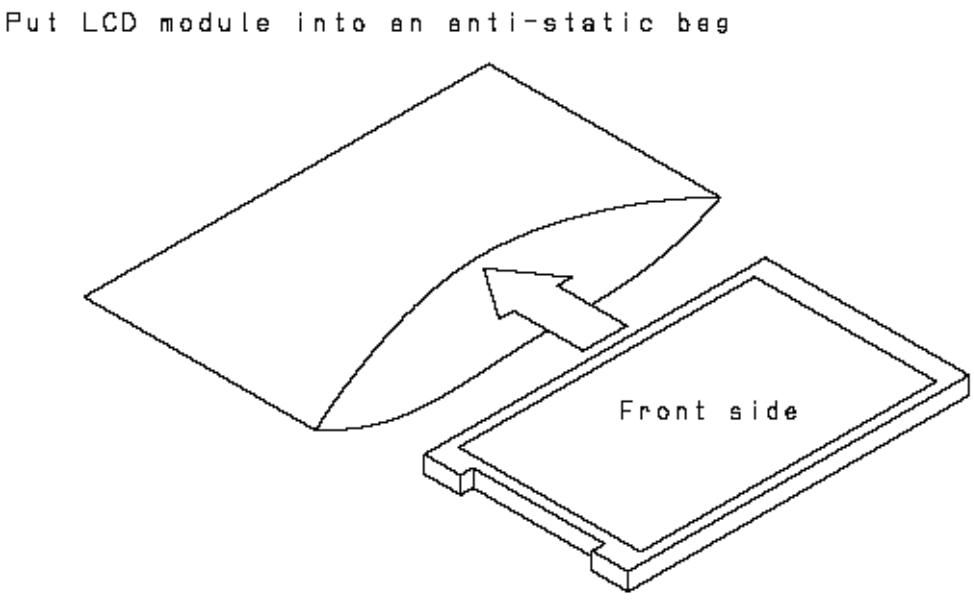
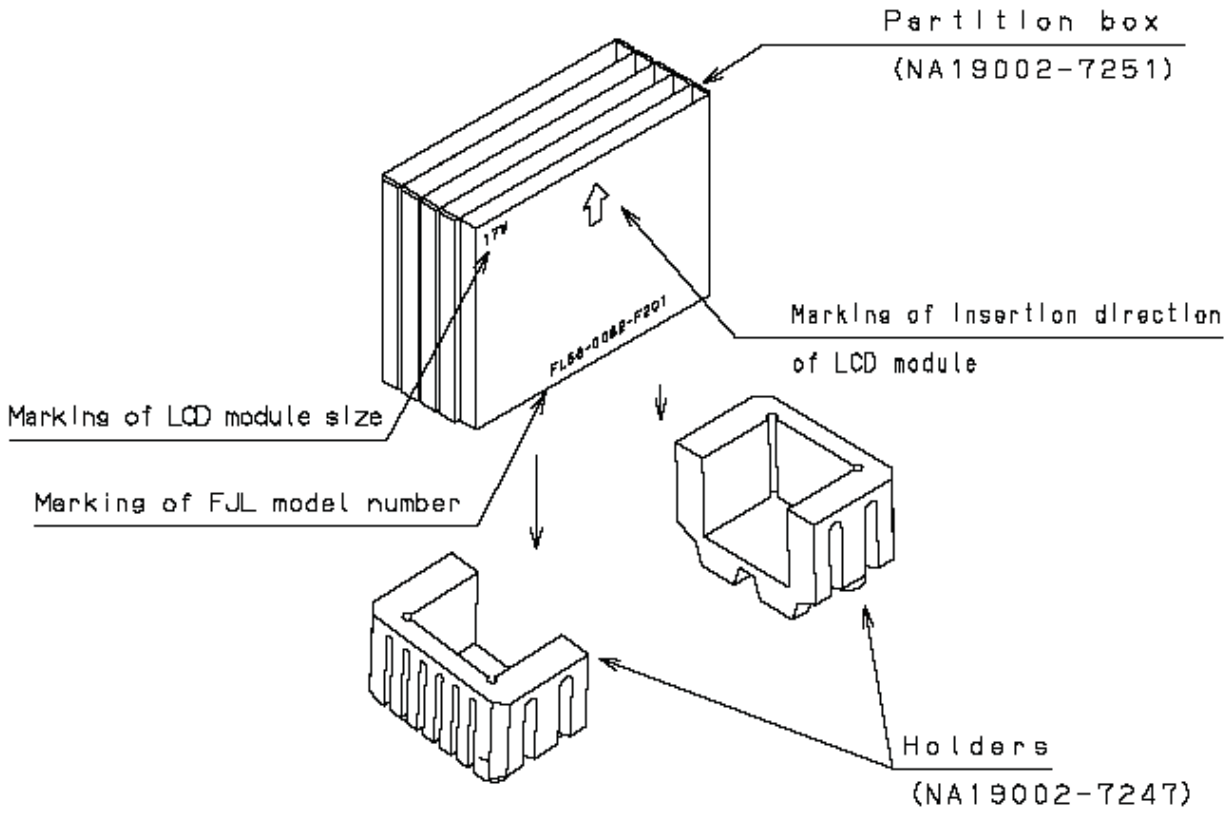


Fig.11-2 (a) Packaging method

Packing

Set a corrugated carton onto bottom holders(2 pieces)



Set the holders so that the insertion side of partition box faces up.

Fig.11-2 (b) Packaging method

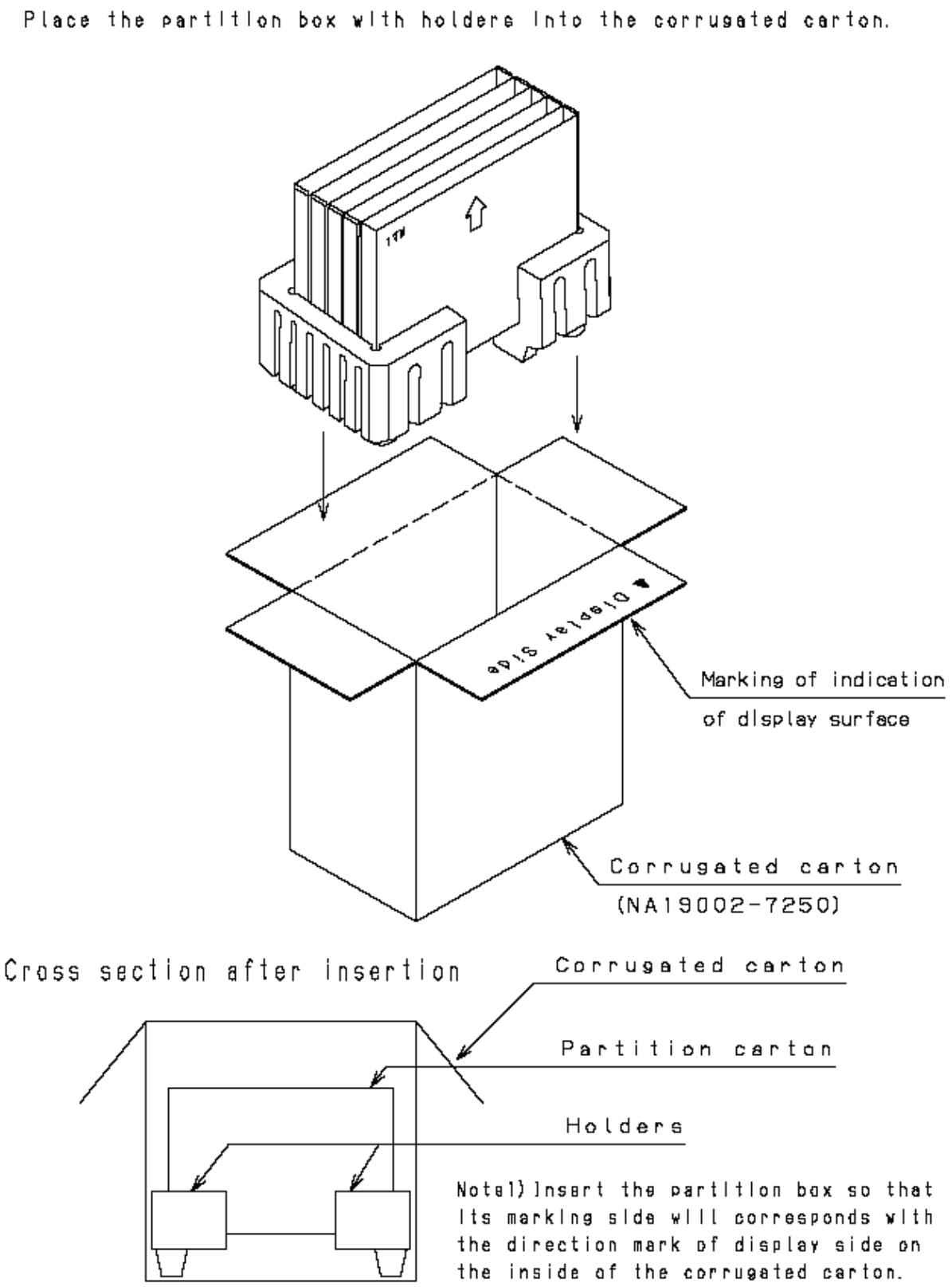
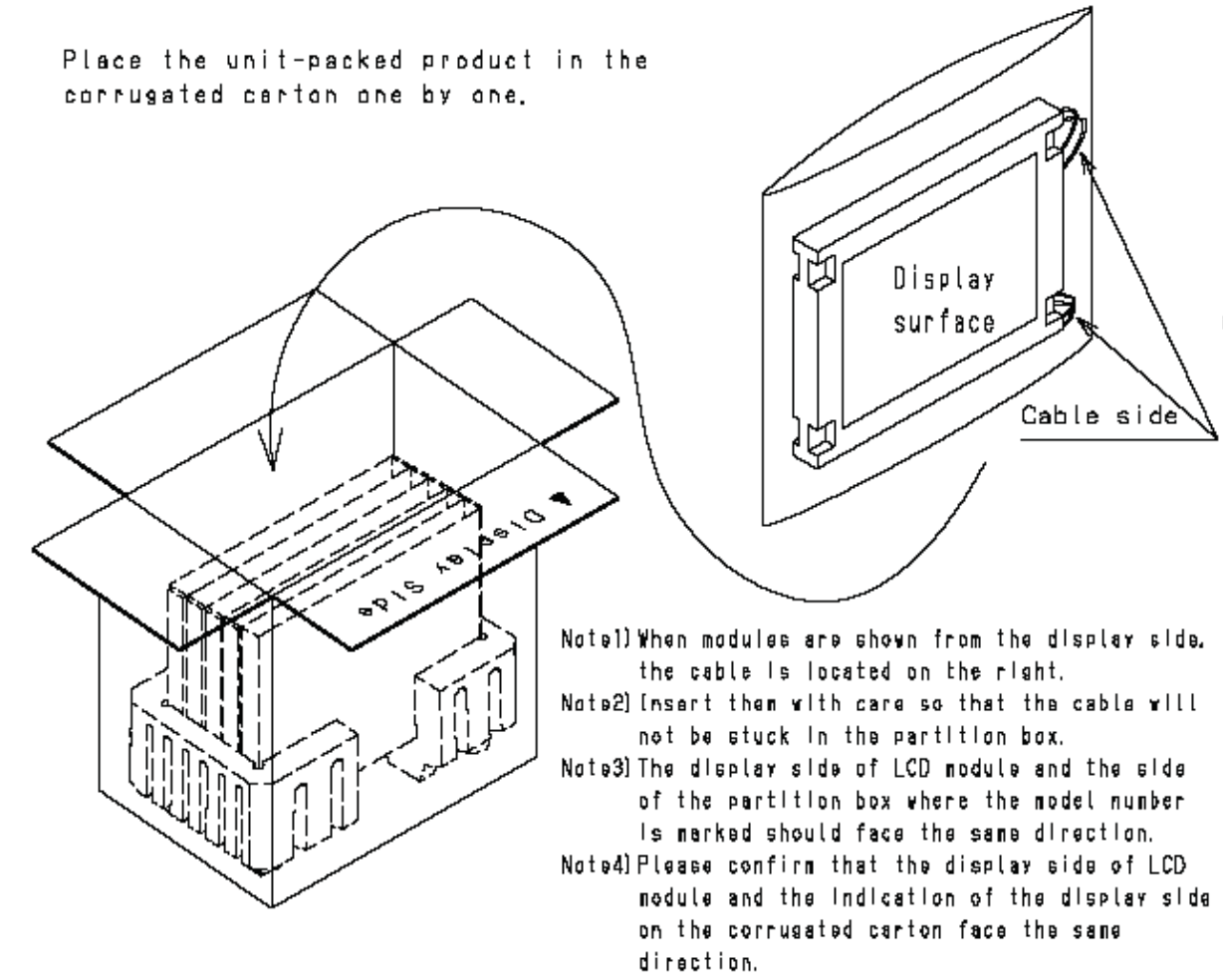


Fig.11-2 (c) Packaging method



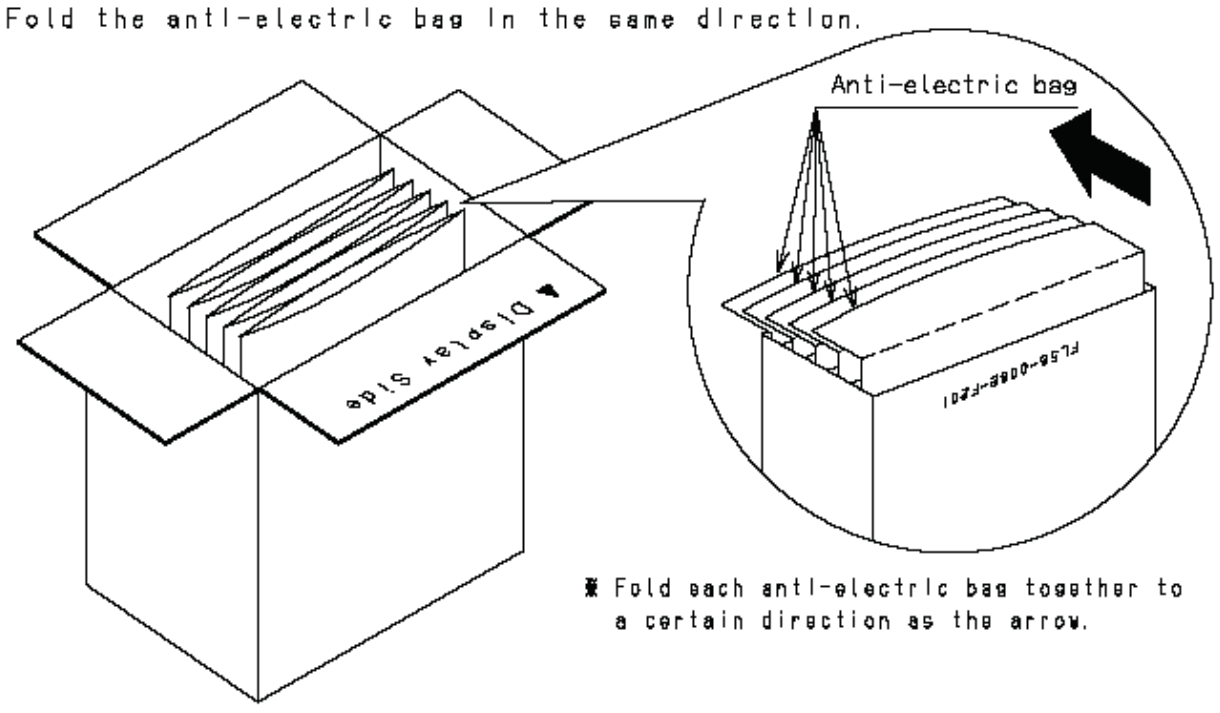


Fig.11-2 (d) Packaging method

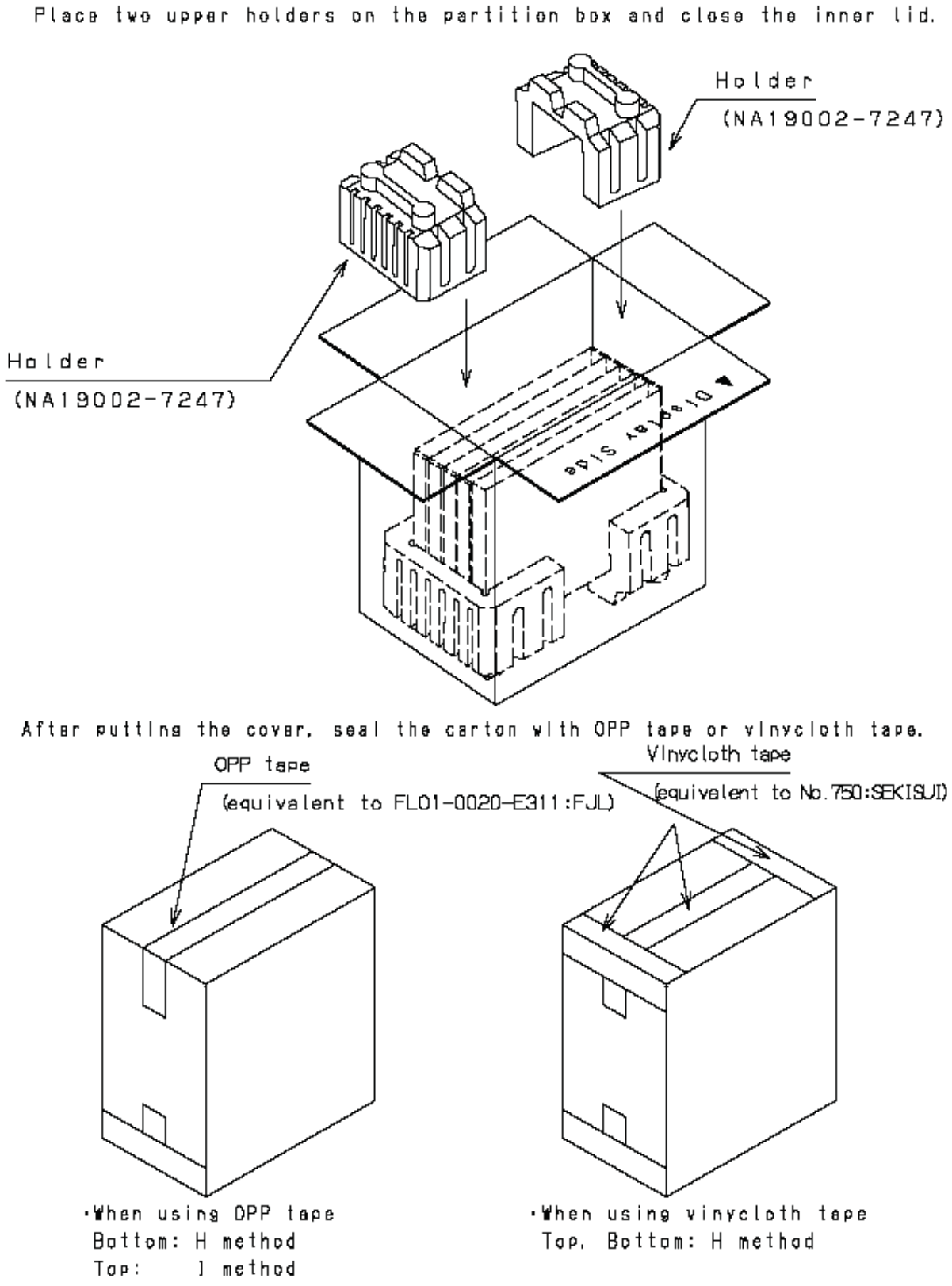


Fig.11-2 (e) Packaging method

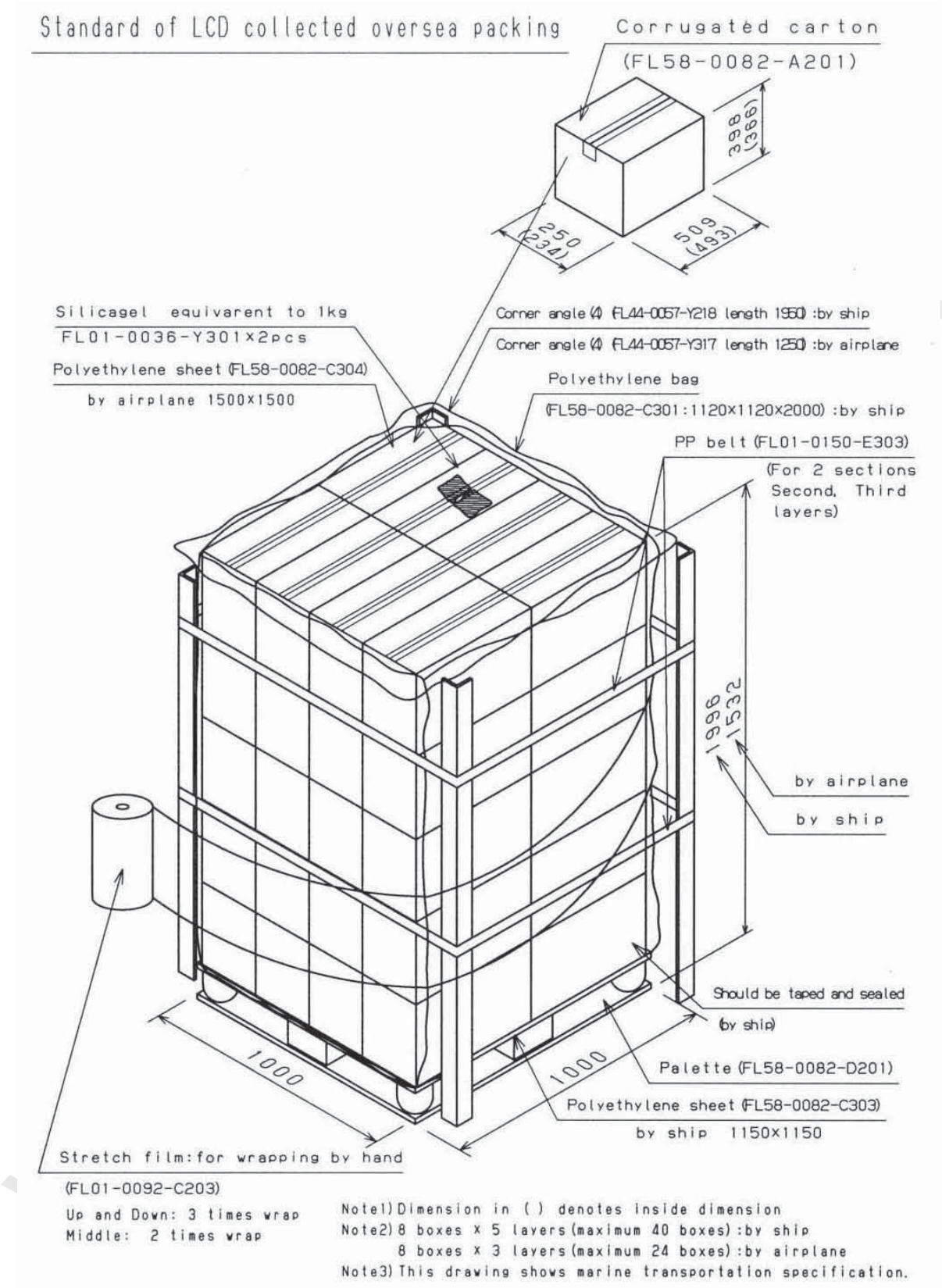


Fig.11-2 (f) Packaging method

12. Reliability test items

No.	Test item	Conditions	Remark
1	High temperature storage test	Ta = 70℃ 240h (Panel Surface)	
2	Low temperature storage test	Ta = -20℃ 240h	
3	High temperature & high humidity operation test	Ta = 40℃ ; 85%RH 240h (No condensation)	
4	High temperature operation test	Ta = 70℃ 240h (Panel Surface)	
5	Low temperature operation test	Ta= 0℃ 240h	
6	Vibration test (non- operating)	Waveform: Sine wave Frequency: 10～500Hz, 19.6m/ s^2, max=1.5mm. Sweep time: 20 minutes Test period: 3 hours (1 hour for each direction of X,Y,Z)	[Note]
7	Shock test (non- operating)	Max. gravity: 294m/s^2 Pulse width: 6ms, sine wave Direction : ±X,±Y,±Z once for each direction.	[Note]
8	Thermal shock test (Storage)	Ta=-25℃～70℃ ; 5 cycles Test period: 10 hours (1 hour for each temperature)	
9	Altitude	Ta=50℃,70kPa,3,048m(10,000ft), t=24h (Operating) Ta=70℃,12kPa,15,240m(50,000ft), t=24h (Storage)	

[Note]A gap of panel shall not occur by vibration or the shock.

[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)

13. Others

1) Lot number Label:

(1) Product name: LCD unit

(2) SHARP Model number: LQ170WX02L

(3) Model number: FLC43XWC8V-06A

(4) Manufacturing number: 5 7 0 0 0 0 1

Serial number
(To be reset every month on 1st.)

Manufacturing month
(Oct. = X, Nov. =Y, Dec. =Z)

Last digit of manufacturing year.

(5) Version number: 01A (Example)
-1st 2 digits "01" means operational version.
-3rd alphabet means functional version.

(6) Country of origin: MADE IN TAIWAN

(7) Company name: SHARP CORPORATION

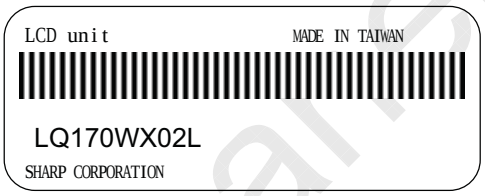


Fig.13-1 Product label (example)

2). Shipping Label

State the following items on shipping label.
Stick the label according to the locating mark on
a side face of corrugated carton.

(1) Item to state
- Model No. section : Indicate the product model number
- Drawing No. section : Indicate the product drawing number
- Quantity section : indicate the quantity of packing
- Revision No. section : indicate the product revision number
- Serial No. of the same packing unit

(2) Position of sticking shipping label

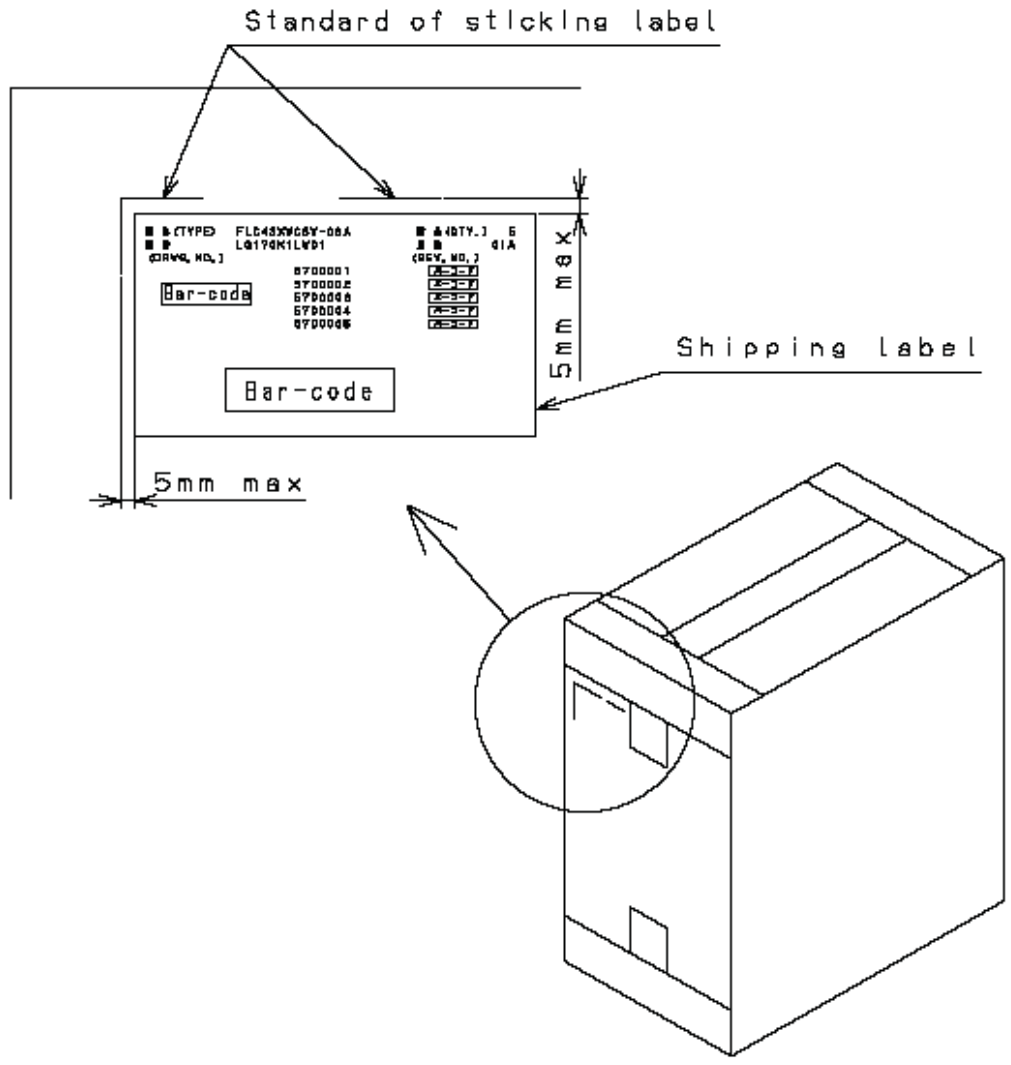


Fig13-2. Packaging method

3) 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.

4) Disassembling the module can cause permanent damage and should be strictly avoided.

5) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

6) The chemical compound which causes the destruction of ozone layer is not being used.

7) Cold cathode fluorescent lamp in LCD PANEL contains a small amount of mercury, Please follow local ordinances or regulations for disposal. (put on the back of the module.)

8) When any question or issue occurs, it shall be solved by mutual discussion.

14. Carton storage condition

Temperature	0℃ to 40℃
Humidity	95%RH or less
Reference condition :	20℃ to 35℃ , 85%RH or less (summer) 5℃ to 15℃ , 85%RH or less (winter) the total storage time (40℃,95%RH) : 240H or less
Sunlight	Be sure to shelter a product from the direct sunlight.
Atmosphere	Harmful gas, such as acid and alkali which bites electronic components and/or wires must not be detected.
Notes	Be sure to put cartons on palette or base, don't put it on floor, and store them with removing from wall Please take care of ventilation in storehouse and around cartons, and control changing temperature is within limits of natural environment

Storage period 1 year or less

LD-20309A-26