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	SPECIFICATION	APPLICABLE GROUP Liquid Crystal Display Group

DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ10PX2I

❑ CUSTOMER' S APROVAL

DATE

BY

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SHARP CORPORATION

RECORDS OF REVISION

LQ1OPX21

SPEC No.	DATE	REVISED No.	PAGE	S W Y	NOTE
LD-8204	1996. 2. 17				1 st Issue
LD-8204A	1996. 2. 29	A1	1	Correction: 2,621,144 → 262,144	2nd Issue
		A2	2	Revise	
		A3	3	Correct ion: 73 ENAB TEST → 73 ENAB	

1. Application

These specifications apply to color TFT-LCD module, LQ1OPX21.

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. Graphics and texts can be displayed on a 1024X768 pixel panel in 262,144 colors by supplying 18(6 ×RGB)×2 bit parallel data signals, four kinds of timing signals, and +5V DC supply voltage for TFT-LCD panel driving.

The backlight system is not installed in this module and the TFT-LCD panel used for this model is a high-transmissim and higher-color-saturation type. Therefore, this module is suitable for the projection-me multimedia applications.

Moreover, it has the capability for horizontal reverse scanning which fits the display for projecting.

[Features]

◎ Low power consumption

◎ Light weight

◎ High transmissivity

◎ Wide color reproduction range

◎ Mechanical compatibility with the VGA models:LQ10P341

3. Mechanical Specifications

Parameter	Specifications	unit
Display size	25 (Diagonal)	cm
	10.0 (Diagonal)	inch
Active area	202.8 (H) × 152.1(V)	mm
Pixel format	1024(H)x 768(V)	pixel
	(1 pixel=R+G+B dots)	
Pixel pitch	0.198(H) X 0.198(v)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally white	
Unit outline dimensions *1 (Typical)	265.0(W)×195.0(H)×8.0(D)	mm
Mass	430±20	g
Surface treatment	Hard-courting 2H (Clear)	

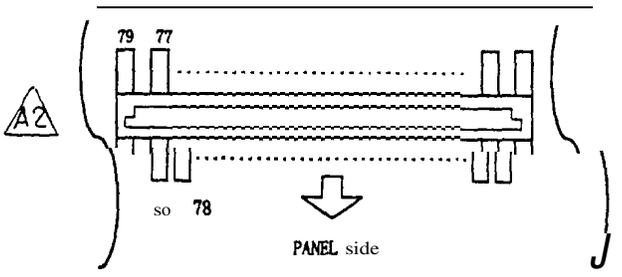
*1. Outline dimensions is shown in Fig. 1

4. Input Terminal and function

CN1

Using connector: KX14-80K2D(JAE)

Corresponding connector KX15-80K2D(JAE)



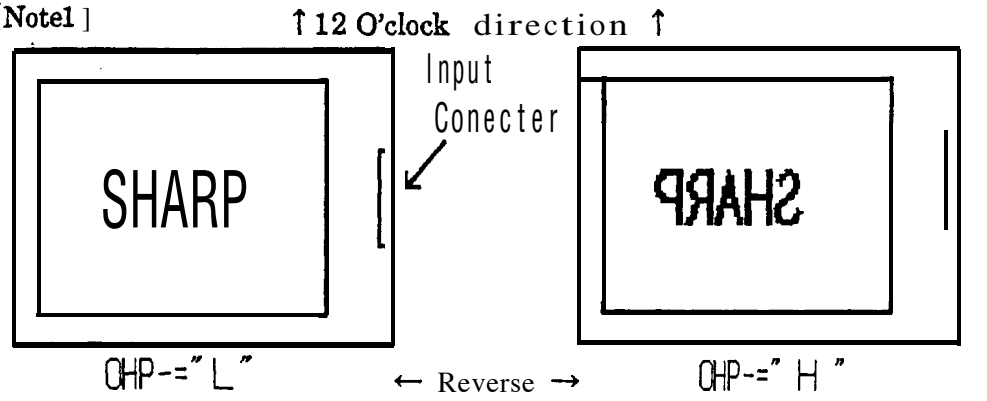
Pin No.	Symbol	Function	Remark
1	GND		
2	GND		
3	VCC	+5V power supply	
4	Vcc	+5V power supply	
5	CK	Clock signal for sampling each data signal	
6	GND		
7	Hsync	Horizontal sync. signal (negative)	
8	GND		
9	Vsync	Vertical sync. signal (negative)	
10	GND		
11	NC	NC	
12	NC	NC	
13	RAo	Red data signal of A pixels (LSB)	
14	RA1	Red data signal of A pixels	
15	GND		
16	RA2	Red data signal of A pixels	
17	RA3	Red data signal of A pixels	
18	RA4	Red data signal of A pixels	
19	RA5	Red data signal of A pixels (MSB)	
20	GND		
21	NC	NC	
22	NC	NC	
23	RBO	Red data signal of B pixels (LSB)	
24	RB1	Red data signal of B pixels	
25	GND		
26	RB2	Red data signal of B pixels	
27	RB3	Red data signal of B pixels	
28	RB4	Red data signal of B pixels	
29	RB5	Red data signal of B pixels (MSB)	
30	GND		
31	NC	NC	
32	NC	NC	
33	GAO	Green data signal of A pixels (LSB)	
34	GA1	Green data signal of A pixels	

LD

Pint No.	Symbol	Function	Remark
35	GND		
36	GA2	Green data signal of A pixels	
37	GA3	Green data signal of A pixels	
38	GA4	Green data signal of A pixels	
39	GA5	Green data signal of A pixels (MSB)	
40	GND		
41	NC	NC	
42	NC	NC	
43	GBO	Green data signal of B pixels (LSB)	
44	GB1	Green data signal of B pixels	
45	GND		
46	GB2	Green data signal of B pixels	
47	GB3	Green data signal of B pixels	
48	GB4	Green data signal of B pixels	
49	GB5	Green data signal of B pixels (MSB)	
50	GND		
51	NC	NC	
52	NC	NC	
53	BAO	Blue data signal of A pixels (LSB)	
54	BA1	Blue data signal of A pixels	
55	GND		
56	BA2	Blue data signal of A pixels	
57	BA3	Blue data signal of A pixels	
58	BA4	Blue data signal of A pixels	
59	BA5	Blue data signal of A pixels (MSB)	
60	GND		
61	NC	NC	
62	NC	NC	
“63	BBO	Blue data signal of B pixels (LSB)	
64	BB1	Blue data signal of B pixels	
65	GND		
66	BB2	Blue data signal of B pixels	
67	BB3	Blue data signal of B pixels	
68	BB4	Blue data signal of B pixels	
69	BB5	Blue data signal of B pixels (MSB)	
70	GND		
71	OHP-	Terminal for horizontal direction reverse scanning	【note1】
72	GND		
73	ENAB	Display Data Enable Signal	【note2】
-74	GND		
75	VCC	+5V power supply	
76	Vcc	+5V power supply	
77	Vcc	+5V power supply	
78	Vcc	+5V power supply	
79	GND		
80	GND		

*The shielding case is connected with the signal GND.

【Note1】



【Note2】

The horizontal display start timing is settled in accordance with a rising edge of ENAB signal. In case ENAB is fixed "LOW", the horizontal display start timing is determined as described in 6-2. Don't keep ENAB "High" during operation.

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	unit	Remark
Input voltage	V_I	Ta=25℃	−0.5～+6.5	V	【Note1 1
+5V supply voltage	Vcc	Ta=25℃	0 ～ + 6.0	V	
Storage temperature	Tstg	-	'25 ～+60	℃	【Note2】
Operating temperature (Ambient)	Topa	–	O ～+50	℃	
Temperature on panel	Tp	-	0 ～ +60	'c	
Light wavelength	λ_I	-	≧ 400	nm	
Light source illumination intensity	I_I	"	≦ 300,000	lx	【Note3,4】

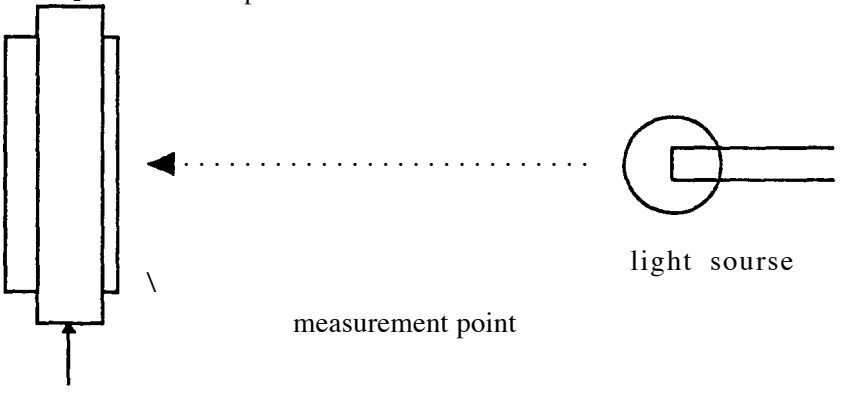
【Note1】 CK,Hsync,Vsync,R00～R05,R10～R15,G10～G15,B00～B05,B10～B15,ENAB

【Note2】 Relative humidity 95%rh Max. (at Ta≦40℃)

Maximum wet-bulb temperature at 39°C or less. (at Ta>40℃)

No condensation.

【Note3】 Measured on panel.



【Note4】 Light source must be over the top of module. (See Fig.1)

6. Electrical Characteristics

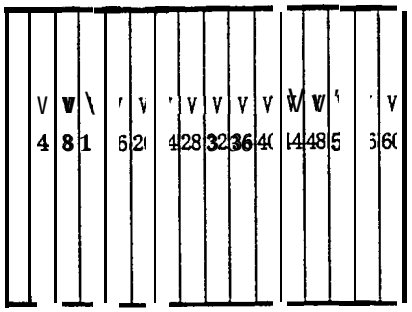
6-1. TFT-LCD panel driving

Ta=25℃

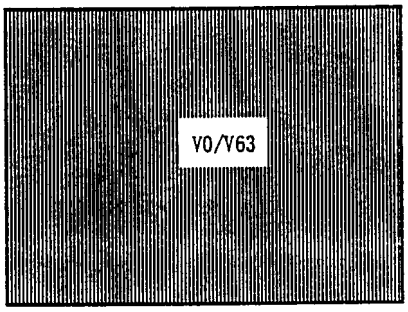
Parameter		symbol	Min.	Typ.	Max.	Unit	Remark
+5V	Supply voltage	Vcc	+4.5	+5.0	+5.5	V	
	Current dissipation	Icc	-	300	500	mA	【Note1】
Input voltage (Low)		V_{IL}	–	–	0.6	V	
Input voltage (High)		V_{IH}	+2.6	-	-	V	
Permissive input ripple voltage		V_{RP}	–	–	100	mVp-p	Vcc=+5V
Input low current (V_I=0V)		I_{OL1}	-200	—	—	μA	【Note2】
		I_{OL2}	-1	-	-	μA	【Note3】
Input High current (V= Vcc)		I_{OH}	-	-	+1	μA	

【Note1】 Current dissipation are measured as follows.

Typical pattern : 16 gray scale



Max pattern : Strip (2dot)



【Note2】 OHP- Signal

[Note3] Except for OHP- Signal

6-2. Timing Characteristics of input signals

Parameter		symbol	Min.	Typ.	Max.	unit	Remark
Clock	Frequency	1/Tc	25	32.5	37.5	MHz	【Note1】
	High time	Tch	12	–	–	us	
	Low time	Tcl	13	–	-	ns	
Data	Setup time	Tds	10	–	–	ns	
	Hold time	Tdh	10	–	–	us	
Horizontal sync. signal	Cycle	TH	19.0	20.7	–	u s	
			520	672	–	clock	
	Pulse width	THp	4	68	–	clock	
Horizontal display start		THds	148	148	148	clock	【Note2】
Hsync-Clock phase ifference		THc	5	—	—	ns	
Hsync-ENAB phase difference		THN	0	–	186	ns	
Vertical sync. signal	Cycle	TV	–	16.7	–	ms	
			774	806	–	line	
	Pulse width	TVp	4	6	–	line	
Vertical display start		TVds	35	35	35	line	
Hsync-Vsync phase difference		TVh	I	–	TH-THp	clock	

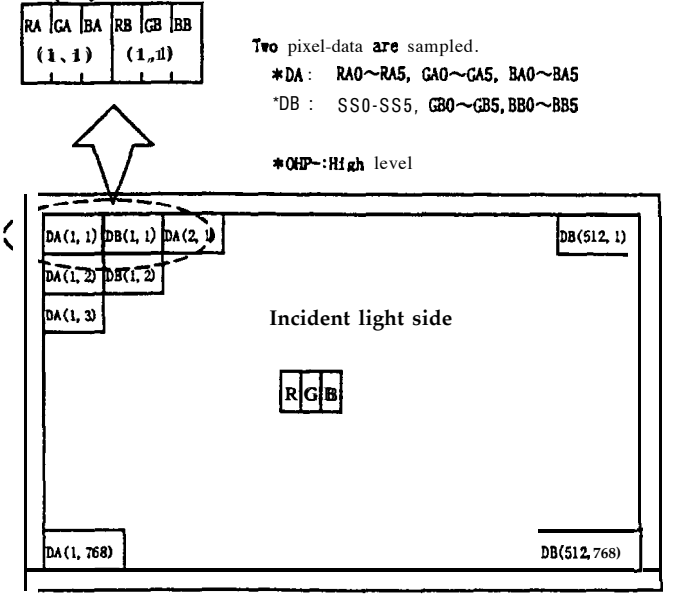
【Note1] Two pixel-data are sampled.

[Note2] In case ENAB is fixed “Low”

Note 1.Make sure that of the signals are above data to ensure right display position and display quality.

2.If the frequency is lower, deterioration of display quality, such as flickering may occur.

6-3 Input signals and Display on the screen



Display position of input data (H, V)

8. Input signals, Basic display colors and Gray scale of each color

gray scale		Data signal																	
and	DA	RA0	RA1	RA2	RA3	RA4	RA5	GA0	GA1	GA2	GA3	GA4	GA5	BA0	BA1	BA2	BA3	BA4	BA5
color	DB	RB0	RB1	RB2	RB3	RB4	RB5	GB0	GB1	GB2	GB3	GB4	GB5	BB0	BB1	BB2	BB3	BB4	BB5
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Basic	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
color	Blue	0	0	0	0	0	0	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
	Purple	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray	↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dark	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
scale	↑				↑			0	0	0	0	0	0	0	0	0	0	0	0
	↓				↓			0	0	0	0	0	0	0	0	0	0	0	0
of	Bright	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	↓	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Red	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray	↑	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Dark	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
scale	↑	0	0	0	0	0	0				↑			0	0	0	0	0	0
	↓	0	0	0	0	0	0				↓			0	0	0	0	0	0
of	Bright	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	⇓	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
Green	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray	↑	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
scale	↑	0	0	0	0	0	0	0	0	0	0	0	0				↑		
	⇓	0	0	0	0	0	0	0	0	0	0	0	0				↓		
of	Bright	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	⇓	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Blue	Blue	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 color is displayed in 64 gray scales from 6 bit data signal input According to the combination of total 18 bit data , 262,144 colors are displayed.

9. optical Characteristics

Ta=25℃, Vcc=+5V

Parameter		symbol	Condition	Min.	Typ.	Max.	unit	Remark
Viewing angle range	Horizontal	θ 21, θ 22	CR>10	35	–	–	Deg.	【Note1】
	Vertical	e 11		30	–	–	Deg.	
		θ 12		10	-	–	Deg.	
Contrast ratio		C R	θ =0°	100	–	–		【Note2】
Response time	Rise	τ r		–	30	-	m s	【Note3】
	Decay	τ d		–	50	–	m s	
Transmissivity		t r		–	5.6	–	%	【Note4】
Chromaticity of white		x			0.313	–		
		Y		–	0.329	-		

※The measurement shall be executed 15～20 minutes after lighting at rating.

Measured by standard backlight with (x=0.299, y=0.298) and standard inverter for B/L,

The optical characteristics are measured in a darkroom or equivalent condition with the method shown in Fig.3.

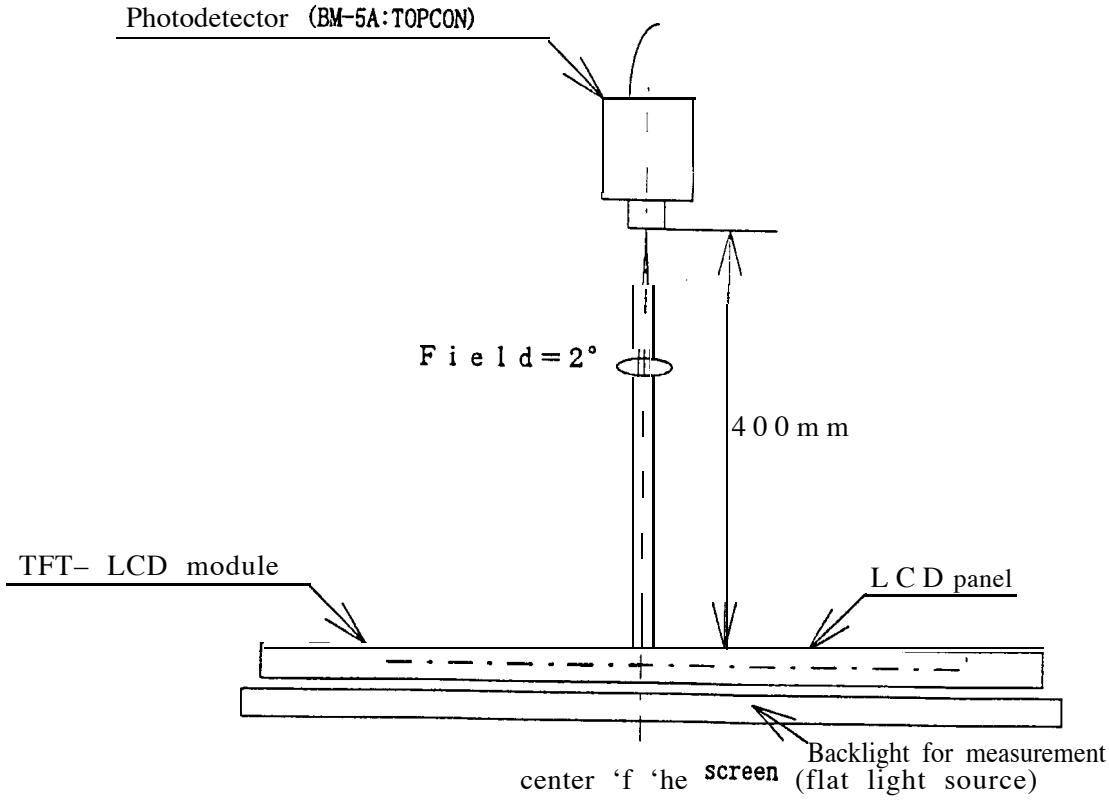
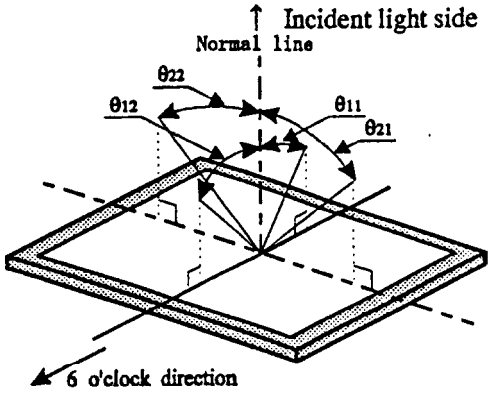


Fig. 3 Optical characteristics measurement method

【Note1】 Definitions of viewing angle range:



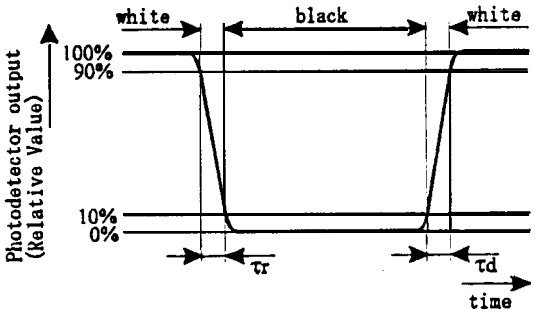
【Note2】 Definition of contrast ratio:

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】 Def init ions of Transmissivity:

$$\text{Transmissivity} = \frac{\text{1 ight detected level of the transmission through the LCD panel}}{\text{light detected level of the original light source}}$$

10. Display quality

The display quality of this module shall be in compliance with the Delivery Inspection Standard.

11. Handling Precautions

11-1) when insert or pull off the comector for module, please turn off the power supply on the system side.

11-2) Precautions in mounting.

A) When installing the module, be sure to fix the same plane, not to warp or twist the ❑ odule.

B) Since the polarizer is made of soft material, please take care not to scratch the surface.

C) On shipping, laminating film is attached on the panel surface to protect from scratches or dirts. It is recommended to peel off the laminated film just before the use with strict attention to electrostatic charges.

11-3) Precautions when peeling off laminated film:

A) Work in environment

When the laminated film is peeled off, there may be cases that some particles like dust are stuck on the panel by electrostatic charges or TFT panel is damaged by electrostatic discharge, so the following working environment is recommended.

(a) Anti-electrostatic treatment more than 1MΩ on the floor.

(b) working the clean room.

(c) Humidity: 50% to 70%, Temperature: 15°C to 27°C.

(d) Worker needs to wear the anti-electrostatic shoes, anti-electrostatic worker, anti-electrostatic globe and earth band.

B) How to work

(a) Sufficient ionized air blow is needed to avoid electrostatic charge caused by peeling the laminated film. Please keep the distance between the module and the heated ionized air blower within 20 cm. (Fig. ①)

(b) Attach an adhesive tape on the laminated film at the corner near the blower to make peeling easier. (Fig. ②)

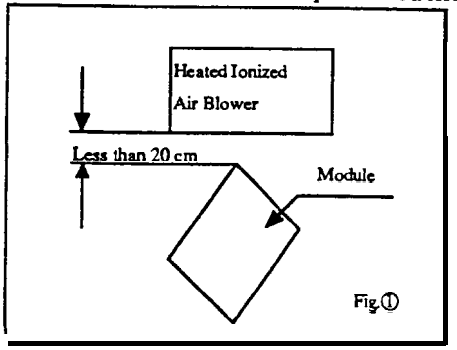
(c) Pull the adhesive tape to your side with the film. Please peel it off slowly and carefully using more than 5 seconds.

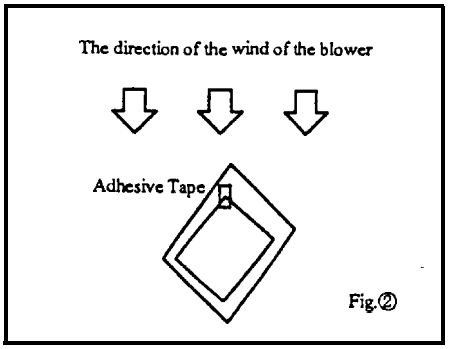
(d) The module after peeling the laminated film must be moved to next work immediately without getting dust.

(e) The way to remove 'dust' from the surface of the polarizer.

● Blow it off by nitrogen blow that is taken ❑easures against electrostatic charges.

(f) When the polarizer is stained, wipe it gently using a soft cloth like a lens wiper breathing n it.





12. Packing form

a) Piling number of cartons: MAX. 7

b) Package quantity in one carton: 10pcs

c) Carton size: 464(W) × 379(H) × 309(D)mm

d) Total mass of 1 carton filled with fill modules: 8,500g

Packing form is shown in Fig.4

13. Reliability test items

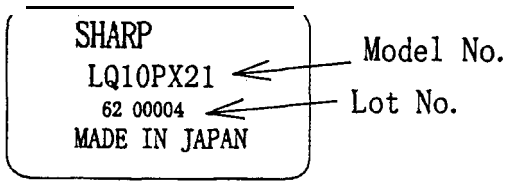
No.	Test item	Conditions
1	High temperature storage test	Ta=60℃ 240h
2	Low temperature storage test	Ta=-25℃ 240h
3	High temperature & high humidity operation test	Ta=40℃ ; 95%RH 240h (No condensation)
4	High temperature operation test	Ta=50℃ 240h
5	Low temperature operation test	Ta=0℃ 240h
6	Vibration 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 :1 lms, 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) Lot No. Label:



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

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

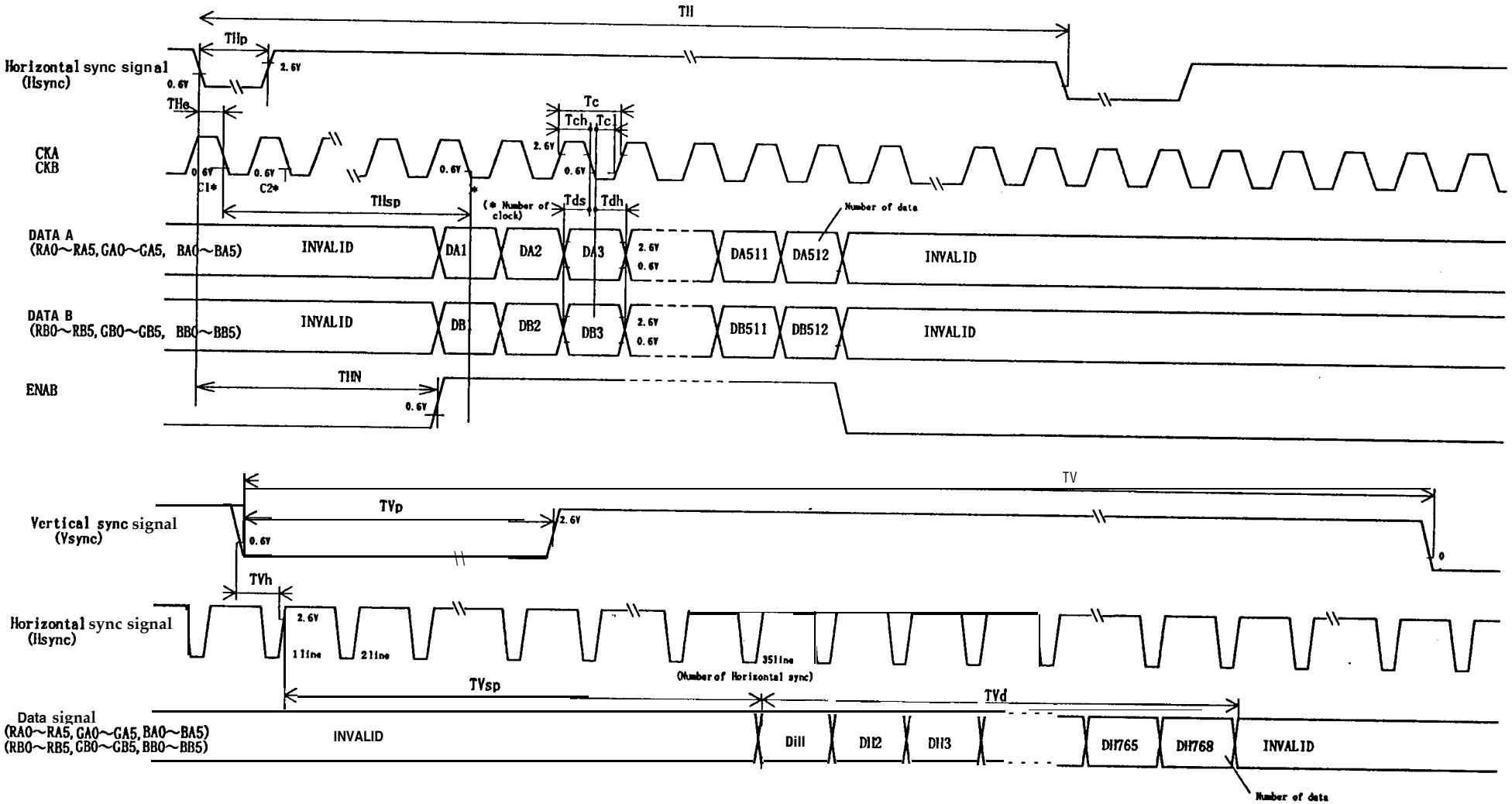
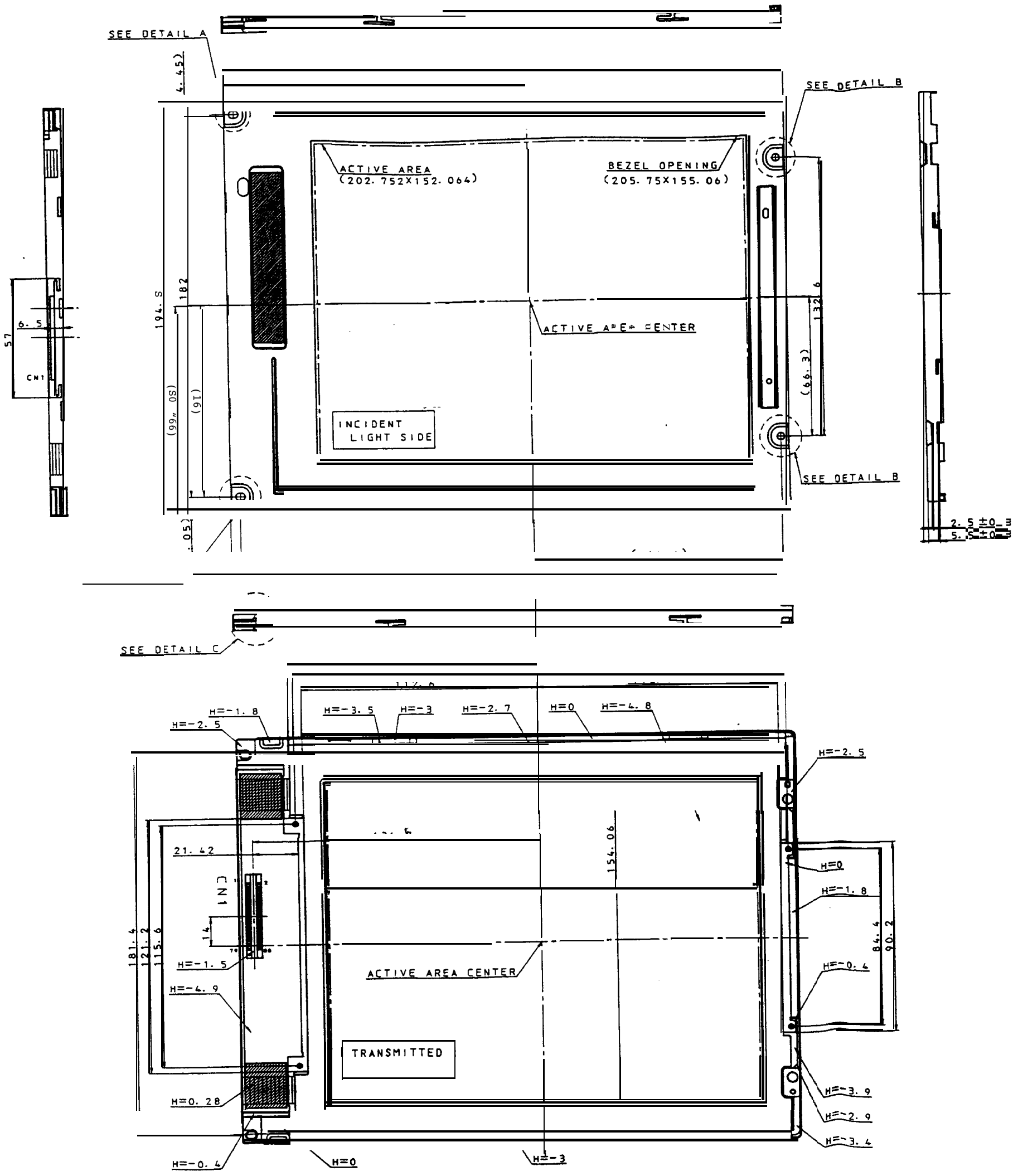
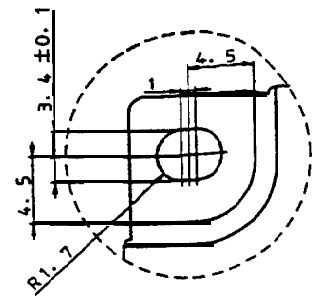
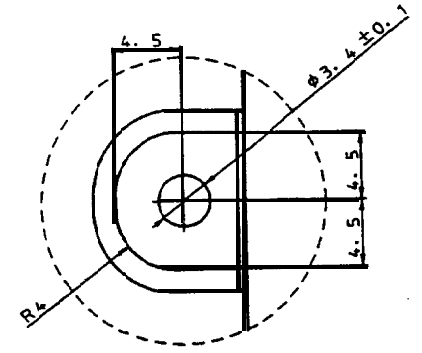


Fig2 Input Signal Waveforms

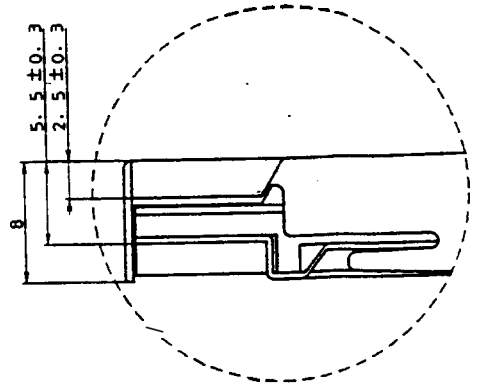




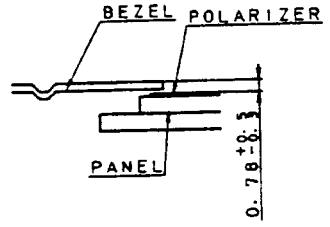
ENLARGED DETAIL A(S=4/1)



ENLARGED DETAIL B(S=4/1)

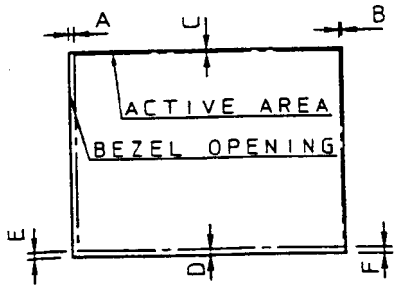


ENLARGED DETAIL C(S=4/1)



BEZEL/PANEL POSITION

BEZEL/DISPLAY POSTION



① TOLERANCE X-DIRECTION A: 1.5±0.8
② TOLERANCE X-DIRECTION B: 1.5±0.8
③ TOLERANCE Y-DIRECTION C: 1.5±0.8
④ TOLERANCE Y-DIRECTION D: 1.5±0.8
⑤ OBLIQUITY OF DISPLAY AREA |E-F|<0.8

NOTES
※UNSPECIFIED TOLERANCE TO BE ±0.5

LQ10PX21

OUTLINE DIMENSIONS