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DEVICE SPECIFICATION FOR

TFT-LCD module

MODEL No. LQ056A3CH01

☐ CUSTOMER'S APPROVAL

DATE

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MODEL No. : LQ056A3CH01

RECORDS OF REVISION

SPEC No.	DATE	REVISE	PAGE	SUMMARY	NOTE
LCY-98102	Sep. 3.'98		—	—	1st Issue
LCY-98102A	Nov. 9.'99	A	8	(8)Optical characteristics Lamp Life Time 10000 hour→25000 hour (Ta=25℃) [Lamp lead wire color RED→ORANGE(high voltage side)]	2nd Issue
LCY-98102B	July.16.'00	B	—	Change the glass thickness of the panel. (1.1 ㎜ → 0.7 ㎜)	3rd Issue
			2	Change the mass by the above change. (260±10g → MAX 220g)	
LCY-98102C	Jun.17.'04	C	13	Revision mark of the label is "T".	4th Issue

C O N T E N T S

(1)Introduction

The SHARP Color TFT-LCD module is an active matrix LCD (Liquid Crystal Display) produced by making the most of Sharp's expertise in liquid-crystal and semiconductor technologies.

The active device is amorphous silicon TFT (Thin Film Transistor). The module accepts full color video signal conforming to the NTSC(M) system standards.

Module geometry(Mechanical specification): Table 1

(2)Features

- By adopting an active matrix drive, a picture with high contrast is realized.
- Through the use of TN-normally white mode, an image with highly natural color reproduction is realized.
- The 5.6” screen produces a high resolution image that is composed of 74,880 pixel elements in a stripe arrangement.
- Built-in video interface circuit (including chroma demodulator, picture tone, video AGC circuit) and control circuit responsive to composite video signal.
- Also responsive to standard analog RGB video signals.
- An anti-glare (AG) surface polarization plate is used.
- Viewing angle: 6 o'clock
- An inverted video display in the vertical as well as horizontal directions is possible.
- An external clock mode is available.

(3)Construction and Outline

- The construction form figure :See Fig.2
- Outline dimensions of TFT-LCD module : See Fig. 3
- The module consists of a TFT-LCD panel, drivers, control PWB mounted with electronic circuits, backlight, frame, front and rear shielding cases.

(4)Module geometry(Mechanical specification)

Table 1

Parameter	Specification	Unit	Remarks
Display format	**７４,８８０**	Pixels	
	960(H) × 234(V)	dots	
Active area	114.2(H)×83.5 (V)	mm	
Screen-size (Diagonal)	14 [5.6"]	cm	
Dot pitch	0.119(H)×0.357(V)	mm	
Dot configuration	R•G•B Stripe configuration		
Outline dimension	140.0(W)×102.7(H)×17.0(D)	mm	【Note 4-1】
Mass	MAX 220	g	

【Note 4－1】This measurement is typical, and see Fig.3 for the details .

(5)Input / Output terminal

5-1)TFT-LCD panel driving section

Table 2

Pin No.	Symbol	i/o	Description	Remarks
1	HSY	i/o	Input/output horizontal sync. signal (low active)	【Note5-1】
2	VSY	i/o	Input/output vertical sync. signal (low active)	【Note5-2】
3	CLK	i/o	Input/output clock signal	【Note5-3】
4	GND	－	Ground	
5	HVRV	i	Turning the direction of horizontal and vertical scanning	【Note5-4】
6	GAM	i	γ adjusting terminal	【Note5-5】
7	VSW	i	Selection signal of two sets of video signals	【Note5-6】
8	CLKC	i	Selection for input/output direction of HSY,VSY,CLK	【Note5-7】
9	Vcdc	i	DC bias voltage adjusting terminal of common electrode driving signal	【Note5-8】
10	VSH	i	Positive power supply voltage	
11	VBS	i	Composite video signal	【Note5-9】
12	BRT	i	Brightness adjusting terminal	【Note5-10】
13	CNT	i	Contrast adjusting terminal	【Note5-10】
14	COL	i	Color gain adjusting terminal	【Note5-10】
15	TIN	i	Tint adjusting terminal	【Note5-10】
16	VSL	i	Negative power supply voltage	
17	VR	i	Color video signal (Red)	
18	VG	i	Color video signal (Green)	
19	VB	i	Color video signal (Blue)	
20	GND	i	Ground	
21	SAM	i	Terminal for sampling mode change	【Note5-11】
22	TEST	－	This shall be electrically opened during operation	
23	TEST	－	This shall be electrically opened during operation	
24	TEST	－	This shall be electrically opened during operation	

'High' and 'Low' refer to table 5 [digital input voltage].

【Note5-1】When CLKC='High', this terminal outputs horizontal sync. signal in phase with VBS. When CLKC='Low', this terminal will be external horizontal sync. input terminal.

【Note5-2】When CLKC='High', this terminal outputs vertical sync. signal in phase with VBS. When CLKC='Low', this terminal will be external vertical sync. input terminal.

【Note5-3】When CLKC='High', this terminal outputs 'Low' voltage level. When CLKC='Low', this terminal will be external clock input terminal.

【Note5-4】When this terminal is 'High', it will be normal and when it is 'Low', it will display reversely on horizontal and vertical direction.

【Note5-5】γ characteristic adjusted by the DC voltage supplied to the pin.
It is adjusted to the optimum value on shipping, but, they can be re-adjusted by external circuit.

【Note5-6】When this terminal is 'High', composite video signal (pin No.11) is selected and when it is 'Low', RGB signal set (pin No.17 through 19) is selected.

【Note5-7】When this terminal is 'High', HSY,VSY,CLK terminals are output mode. When this terminal is 'Low', HSY,VSY,CLK terminals are input mode.

【Note5-8】This terminal is applicable to the DC bias voltage adjusting terminal of common electrode driving signal. If power supply voltage is typical, it is not necessary to re-adjust it, so use it in the open condition. However, in the case that power supply voltage is changed, or power supply voltage is reduced, please adjust it externally to get the best contrast with a resistor you add to this terminal, or semifixed resistor, VCDC, in module.

【Note5-9】Similarly in case of RGB input, apply composite video signal for sync. separator.

【Note5-10】Brightness, Contrast, Color, Tint, are adjusted by the DC voltage supplied to each pin.

(contrast, color gain, and tint are not available for RGB signal input)
They are adjusted to the optimum value on shipping, but, they can be re-adjusted by external circuit.
【Note5-11】This terminal is to switch sampling mode. It is the independent data-sampling timing at RGB dots when SAM is 'High' and it is the simultaneous data-sampling timing at RGB dots when SAM is 'Low'.

5-2) Functional maching and Input/Output mode

Table 3

	CLKC ="Hi"		CLKC ="Lo"	
Terminal	SAM="Hi"	SAM="Lo"	SAM="Hi"	SAM="Lo"
HSY	Output	Output	Input	Input
VSY	Output	Output	Input	Input
CLK	Output "Lo"	Output"Pixelclock"	Input "Dot clock"	Input"Pixel clock"

5-3) Backlight driving section

Table 4

Terminals	NO.	symbol	i/o	function	note
CN1	1	VL1	i	Input terminal(hi voltage side)	
	2	VL2	i	Input terminal(low voltage side)	【NOTE 5-12】

【Note 5-12】Low Voltage side of DC/AC inverter for backlight driving connects with ground of inverter circuit.

(6) Absolute maximum ratings

Table 5 GND=0V、Ta=25℃

Parameter		Symbol	MIN	MAX	Unit	Remarks
Positive power supply voltage		VSH	－0.3	＋9.0	V	
Negative power supply voltage		VSL	－6.0	＋0.3	V	
Analog input signals		Vi	－	2.0	V p-p	【Note 6-1】
Digital input signals		VI	－0.3	＋5.4	V	【Note 6-2】
Digital output signals		VO	－0.3	＋5.4	V	【Note 6-3】
DC bias voltage of common electrode driving signal		VCDC	0	＋5.4	V	
Adjusting terminal voltage		Vadj	－0.3	＋5.1	V	【Note 6-4】
Storage temperature		Tstg	－30	＋80	℃	【Note 6-5】
Operating temperature	Surface of panel	Top1	－10	＋80	℃	【Note 6-5,6,7】
	Environment	Top2	－10	＋70	℃	【Note 6-7,8】

【Note 6-1】VBS, VR, VG, VB terminals(Video signal)
【Note 6-2】HSY, VSY, CLK, CLKC, HVRV, VSW, SAM, terminals
【Note 6-3】HSY, VSY, CLK, terminals
【Note 6-4】GAM0, BRT, CNT, COL, TIN terminals
【Note 6-5】The temperature of panel surface must not exceed this rating to the heat of backlight system.
【Note 6-6】Maximum wet-bulb temperature must be less than 58℃. No dew condensation.
【Note 6-7】The operating temperature assure only driving. Contrast, response time, the other display quality is judgment at 25℃.
【Note 6-8】The temperature around considering that the backlight lighting-up generates heat. (The reference value)

(7)Electrical characteristics

7-1)Recommended operating conditions

A)TFT-LCD panel driving section

Table 6 GND=0V, Ta=25℃

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Positive power supply voltage		Vsh	+7.8	+8.0	+8.2	V	
Negative power supply voltage		Vsl	－5.2	－5.0	－4.8	V	
Analog input voltage	Amplitude	VBS	0.7	1.0	2.0	Vp-p	【Note7-1】
		Vi	-	0.7	-	Vp-p	【Note7-2】
	DC component	Vidc	-0.1	0	+1.0	V	【Note7-3】
Digital input voltage	Hi	Vih	+3.5	-	+5.0	V	【Note7-4】
	Lo	Vil	0	-	+1.5	V	
Digital output voltage	Hi	Voh	+3.5	-	+5.2	V	【Note7-5】
	Lo	Vol	0	-	+1.5	V	
Input Horizontal sync. component	frequency	fH(N)	15.13	15.73	16.33	kHz	CLKC=High for VBS terminal 【Note7-6】
	pulse width	τ HI(N)	4.2	4.7	5.2	μs	
	rising time	τ rHI1	-	-	0.5	μs	
	falling time	τ fHI1	-	-	0.5	μs	
Input vertical sync. component	frequency	fV(N)	fH/284	fH/262	fH/258	Hz	CLKC=High for VBS terminal 【Note7-7】
	pulse width	τ VI(N)	-	3H	-	μs	
	rising time	τ rVI	-	-	0.5	μs	
	falling time	τ fVI	-	-	0.5	μs	
Input clock	frequency	fCLI	18.2	18.9	19.6	MHz	SAM='High'
		fCLI	6.0	6.8	7.6	MHz	SAM='Low'
	Hi pulse width	τ WH	20.0	-	-	ns	CLKC=Lo 【Note7-8】
	Lo pulse width	τ WL	20.0	-	-	ns	
	rising time	τ rCLI	-	-	5.0	ns	
	falling time	τ fCLI	-	-	5.0	ns	
Input HSY (Horizontal sync.)	frequency	fHI	fCLI/1230	fCLI/1200	fCLI/1170	Hz	SAM='High'
		fHI	fCLI/465	fCLI/435	fCLI/405	Hz	SAM='Low'
	pulse width	τ HI	1.0	4.7	8.4	μs	CLKC=Lo 【Note7-9】
	rising time	τ rHI2	-	-	0.05	μs	
	falling time	τ fHI2	-	-	0.05	μs	
Input VSY (vertical sync.)	frequency	fVI	50	fHI/262	fHI/258	Hz	CLKC=Lo 【Note7-10】
	pulse width	τ VI	1H	3H	5H	μs	
	rising time	τ rVI2	-	-	0.05	μs	
	falling time	τ fVI2	-	-	0.05	μs	
Data setup time		tSU1	25	-	-	ns	CLKC=Lo 【Note7-11】
Data hold time		tHO1	25	-	-	ns	
Data setup time		tSU2	1.0	-	-	μs	CLKC=Lo 【Note7-12】
Data hold time		tHO2	1.0	-	-	μs	
DC bias voltage of common electrode driving signal		Vcdc	+0.0	+1.5	+3.0	V	DC component 【Note7-13】
Terminal voltage applicable to brightness		Vbrt	+2.0	+2.2	+2.3	V	

【Note7-1】VBS terminal（composite video signal） Input impedance : 75Ω
【Note7-2】VR,VG,VB terminals（RGB signals for analog display） Input impedance : >10kΩ
【Note7-3】VBS,VR,VG,VB terminals
【Note7-4】VSW,HVRV,SAM terminals Input impedance : >10kΩ
【Note7-5】HSY、VSY terminals Load resistance : >60kΩ
【Note7-6】VBS (horizontal sync. component)
【Note7-7】VBS (vertical sync. component)
【Note7-8】CLK (input mode)
【Note7-9】HSY (input mode)
【Note7-10】VSY (input mode)
【Note7-11】In case of CLKC='Low', it shows the phase difference from HSY to CLK. In case, HSY will be taken at the rise timing of CLk.
【Note7-12】 In case of CLKC='Low', it shows the phase difference from VSY to HSY. In case, VSY will be taken at the rise timing of HSY.

B) Backlight driving section

Table 7 Ta=25℃

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Lamp voltage	VL7	560	620	680	Vrms	IL=6.5mArms
Lamp current	IL	3.0	6.5	7.0	mArms	normal operation
Lamp frequency	FL	30	—	60	kHz	
Kick-off voltage	Vs	—	—	1300	Vrms	25℃
Kick-off voltage	Vs	—	—	1380	Vrms	-10℃

(Inverter : HIU-288 Harison Electric co. ltd.)

The attention item
As for the inverter, use the one of the sine wave without the occurrence of the spike wave in both positive negative wave objects.

7-2)Power consumption

Table 8 Ta=25℃

Parameter	Symbol	Voltage	MIN.	TYP.	MAX.	Unit	Remarks
Positive supply current	Ish	Vsh=+8.0V	—	150	200	mA	
Negative supply current	Isl	Vsl=—5.0V	—	-50	-75	mA	
	Ws		—	1.45	1.98	W	【Note7-15】
Lamp current	Wl	normal driving	—	4.03	4.76	W	【Note7-16】

【Note7-15】Excluding backlight section.
【Note7-16】Reference data by calculation. (IL×VL)

7-3)Input/Output signal timing chart

Table 9

VSH=+5.3V,GND=0V CLKC='High', NTSC:fH=15.73kHz,fv=60Hz

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Horizontal sync. output [HSY]	pulse width	τ HS2	3.3	4.3	3.2	μs	f=fH【Note7-17】
	phase difference	τ pd	0.5	1.45	2.4	μs	【Note7-18】
	rising time	τ rHO	-	-	0.5	μs	CL=10pF
	falling time	τ fHO	-	-	0.5	μs	
Vertical sync. output [VSY]	pulse width	τ VS	-	4H	-	μs	1H=1/fH
	phase difference	τ VHO	-	11.0	28.0	μs	【Note7-19】
	rising time	τ rVO	-	-	2.0	μs	CL=10pF
	falling time	τ fVO	-	-	2.0	μs	
Vertical sync. phase difference	odd field	τ PV1	-	1H	-	μs	【Note7-20】
	even field	τ PV2	-	0.5H	-	μs	

【Note7-17】Variable by variable resister (H-POS) in a module.

【Note7-18】variable range by variable resister (H-POS) in a module.

Adjustment : τ pd＝1.4±0.5μs

【Note7-19】Synchronized with HSY, based on falling timing of HSY.

【Note7-20】VSY signal delays.

7-6) Display time range

(1) Internal clock mode (CLKC='High')

Displaying the following range within video signals.

(a) Horizontally : 12.2 ～ 63 μs from the falling edge of HSY. (SAM='High')

: 12.3 ～ 62.9 μs from the falling edge of HSY. (SAM='Low')

(b) Vertically : 20 ～ 253 H from the falling edge of VSY.

(2) External clock mode (CLKC='Low')

Displaying the following range within video signals.

(a) Horizontally : 205 ～ 1164 clk from the falling edge of HSY. (SAM='High')

: 84 ～ 403 clk from the falling edge of HSY. (SAM='Low')

(clk means input external clock.)

(b) Vertically : 20 ～ 253 H from the falling edge of VSY.

(8)Optical characteristics

Table 11 Ta=25℃

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing angle range		△θ11	CR≧10	30	-	-	° (degree)	【Note 8-1,2,3】
		△θ12		10	-	-	° (degree)	
		△θ2		45	-	-	° (degree)	
Contrast ratio		CRmax	Optimal	100	-	-		【Note 8-2,3】
Response time	Rise	τr	θ＝0 °	-	30	60	ms	【Note 8-2,4】
	Fall	τd		-	50	100	ms	
Luminance		Y	IL=6.5mArms	225	300	-	cd/m²	【Note 8-5】
White chromaticity		x	IL=6.5mArms	0.263	0.313	0.363		【Note 8-5】
		y	IL=6.5mArms	0.279	0.329	0.379		
Lamp life time	+25℃	-	continuation	25,000	-	-	hour	【Note 8-6】
	-10℃	-	intermission	2,000	-	-	time	【Note 8-7】

DC/AC inverter for external connection shown in following.
Harison Co.: HIU-288

【Note 8-1】 Viewing angle range is defined as follows.

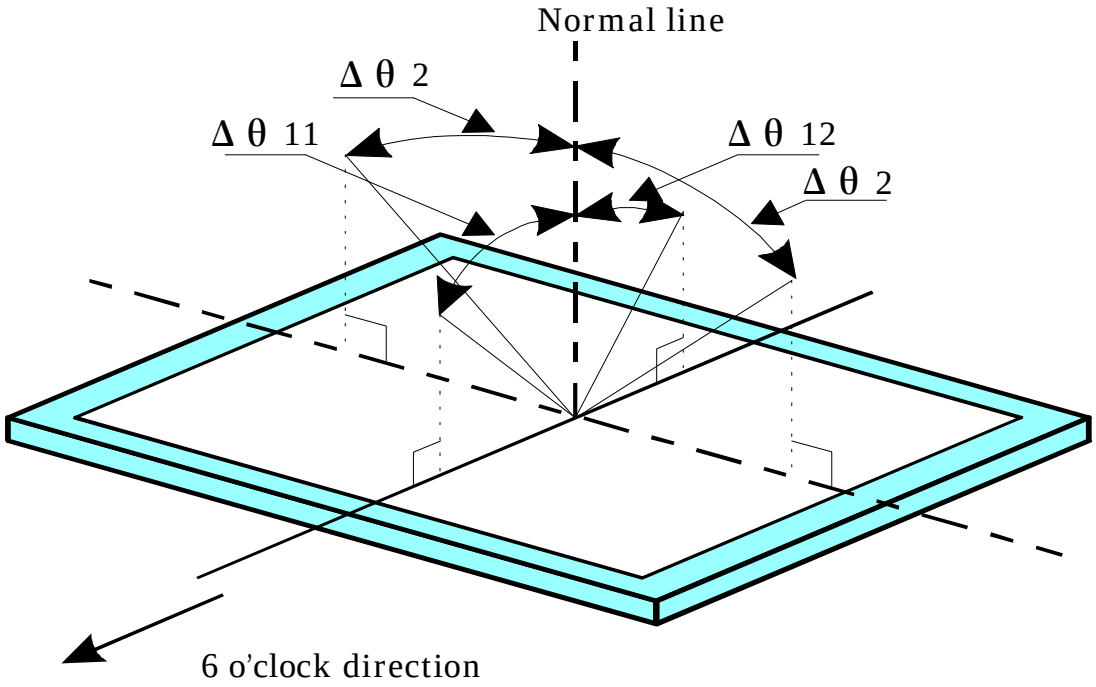


Fig.(i) definition for viewing angle

【Note 8-2】Applied voltage condition:
(1) VCDC is adjusted so as to attain maximum contrast ratio.
(2) Brightness adjusting voltage (BRT) is open.
(3) Input video signal of standard black level and 100% white level.

【Note 8-3】Contrast ratio is defined as follows:

$$\text{Contrast ratio(CR)} = \frac{\text{Photodetector output with LCD being "white"}}{\text{Photodetechor output with LCD being "black"}}$$

【Note 8-4】Response time is obtained by measuring the transition time of photodetector output, when input signals are applied so as to make the area "black" to and from "white".

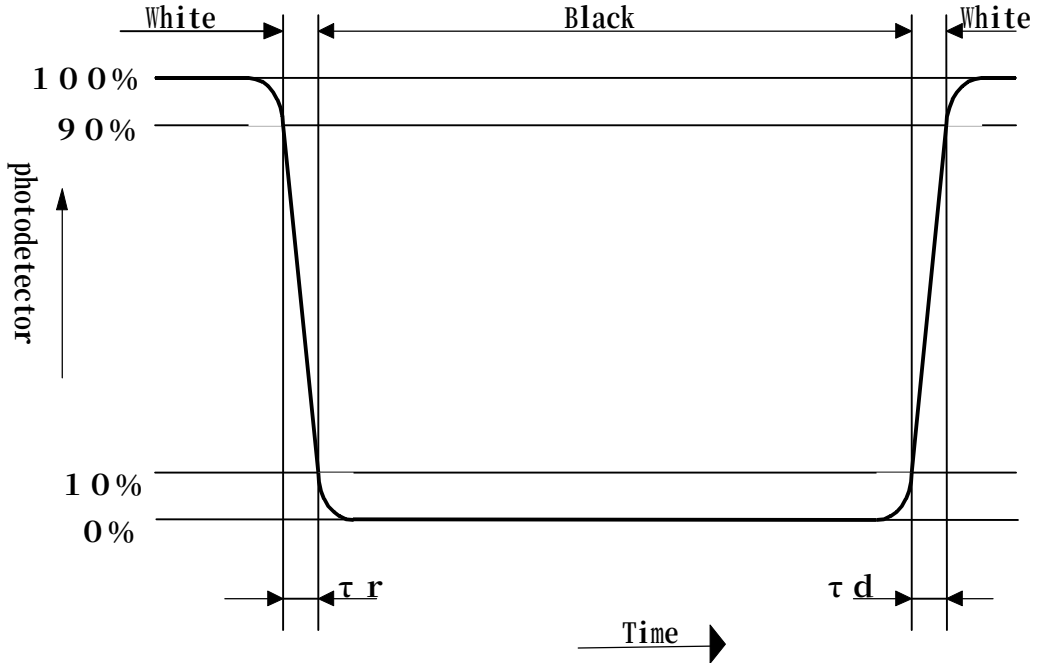
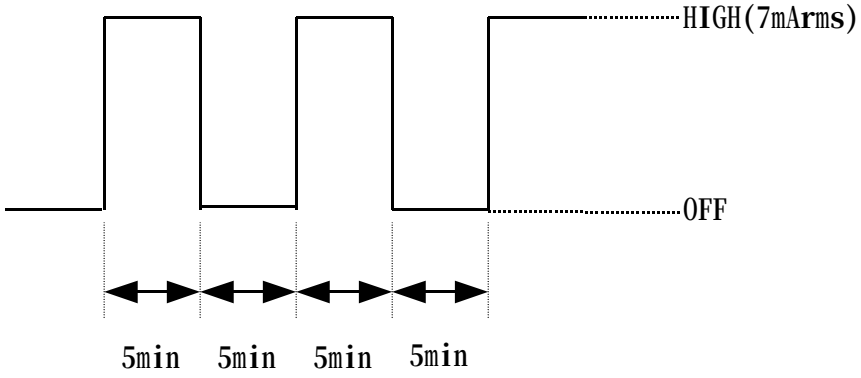


Fig.(ii)

【Note 8-5】Measured on the center area of the panel at a viewing cone 1° by TOPCON luminance meter BM-7.(After 30 minutes operation)
DC/AC inverter driving frequency:49kHz

【Note 8-6】Lamp life time is defined as the time when the brightness of the panel not to become less than 50% of the original value.
(operation conditions)
Current dimming: lamp current IL=3.0～6.5mArms
PWM dimming 100%~5%

【Note 8-7】The intermittent cycles is defined as a time when brightness not to become under 50% of the original value under the condition of following cycle.
(condition) Ambient temperature:-10℃



(9)Mechanical characteristics

9-1) External appearance

Do not exist extreme defects. (See Fig. 3)

9-2) Panel toughness

The panel shall not be broken, when 19N is pressed on the center of the panel by a smooth sphere having 15 mm diameter.

Caution: In spite of very soft toughness, if, in the long-term, add pressure on the active area, it is possible to occur the functional damage.

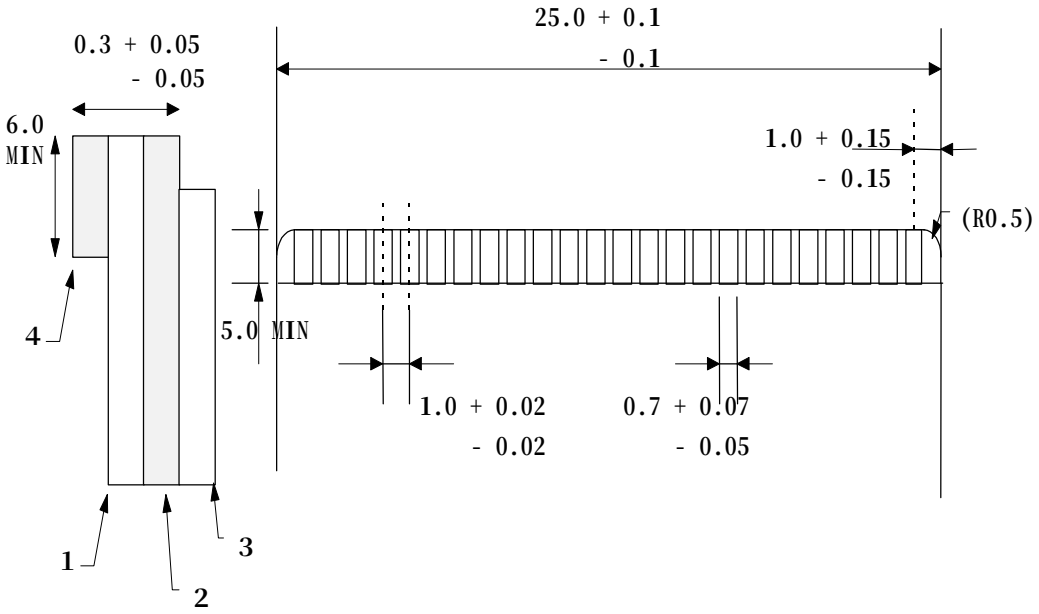
9-3) Input/output connector performance

A)Input/output connectors for the operation of LCD module (24 pin)

1)Applicable FPC refer the below Fig.(**iii**).

2)Terminal holding force : More than 0.9N/pin
(Each terminal is pulled out at a rate of 25 ±3mm/min.)

3)Insertion/pulling : contact resistance is not twice larger than the durability initial value after applicable FPC is inserted and pulled out 20 times.



No.	Name	Materials
1	Base material	Polyimide or equivalent material(25μm thick)
2	Copper foil	Copper foil(35μm thick) Solder plated over 2μm
3	Cover lay	Polyimide or equivalent material
4	Reinforcing plate	Polyester polyimide or equivalent material(188μm thick)

Fig.(**iii**) FPC applied to input/output connector (1.0mm pitch)

B) I/O connector of backlight driving circuit

Symbol	Used Connector	Corresponding connector	Manufacture
CN1	BHR-02(8.0)VS-1N	SM02(8.0)B-BHS-TB (wire on board)	JST
		SM02(8.0)B-BHS-1N (wire on board)	JST
		BHMR-03V (wire to wire)	JST

(10) Display quality

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

(11) Handling instructions

11-1) Mounting of module

The TFT-LCD module is designed to be mounted on equipment using the mounting tabs in the four corners of the module at the rear side.
On mounting the module, as the M2.6 tapping screw (fastening torque is 0.3 through 0.5N•m) is recommended, be sure to fix the module on the same plane, taking care not to wrap or twist the module.
To pushing module,(ex.touching switch etc.)causes disordered image.
so taking care not to conduct directly for LCD module.
Please power off the module when you connect the input/output connector.

11-2) Precautions in mounting

① Polarizer which is made of soft material and susceptible to flaw must be handled carefully.
Protective film (Laminator) is applied on the surface to protect it against scratches and dirts.
It is recommended to peel off the laminator immediately before the use, taking care of static electricity.

② Precautions in peeling off the laminator

A) Working environment

When the laminator is peeled off, static electricity may cause dust to stick to the polarizer surface. To avoid this, the following working environment is desirable.

a) Floor: Conductive treatment of 1MΩ or more on the tile
(conductive mat or conductive paint on the tile)
b) Clean room free from dust and with an adhensive mat on the doorway
c) Advisable humidity:50%～70% Advisable temperature:15℃～27℃
d) Workers shall wear conductive shoes, conductive work clothes, conductive gloves and an earth band.

B) Working procedures

a) Direct the wind of discharging blower somewhat downward to ensure that module is blown sufficiently. Keep the distance between module and discharging blower within 20 cm. (See Fig. (iv.)
b) Attach adhensive tape to the laminator part near discharging blower so as to protect polarizer against flaw. (See Fig. (iv).)
c) Peel off laminator, pulling adhesive tape slowly to your side taking 5 or more second.
d) On peeling off the laminator, pass the module to the next work process to prevent the module to get dust.
e) Method of removing dust from polarizer
- Blow off dust with N2 blower for which static electricity preventive measure has been taken.
- Since polarizer is vulnerable, wiping should be avoided.
But when the panel has stain or grease, we recommend to use adhesive tape to softly remove them from the panel.

③When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it

with soft dry cloth. For stubborn dirties, wipe the part, breathing on it.

④Wipe off water drop or finger grease immediately. Long contact with water may cause discoloration or spots.

⑤TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Handle with care.

⑥Since CMOS LSI is used in this module, take care of static electricity and earth your body when handling.

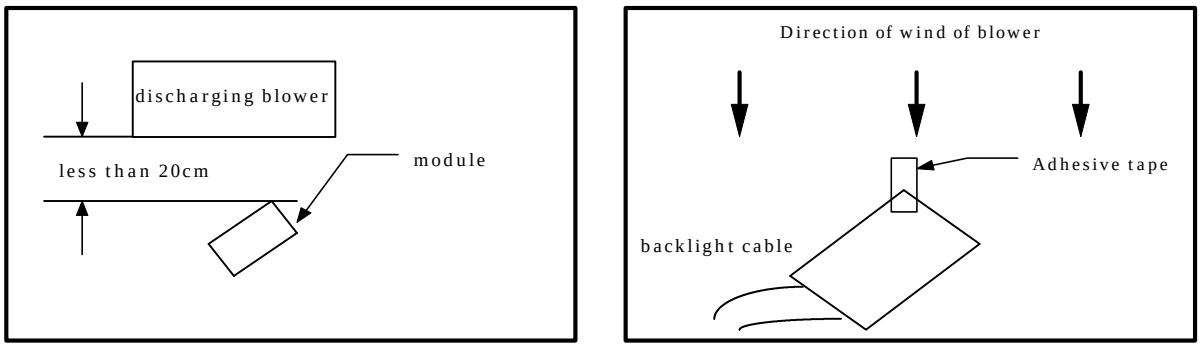


Fig .(iv)

11-3) Precautions in adjusting module

Adjusting volumes on the rear face of the module have been set optimally before shipment. Therefore, do not change any adjusted values.

If adjusted values are changed, the specifications described here may not be satisfied.

11-4) Caution of product design

The LCD module shall be protected against water salt-water by the waterproof cover.

Please take measures to interferential radiation from module, to do not interfere surrounding appliances.

11-5) Others

①Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours; liquid crystal is deteriorated by ultraviolet rays.

②Store the module at a temperature near the room temperature. At lower than the rated storage temperature, liquid crystal solidifies, causing the panel to be damaged. At higher than the rated storage temperature, liquid crystal turns into isotropic liquid and may not recover.

③The voltage of beginning electric discharge may over the normal voltage because of leakage current from approach conductor by to draw lump read lead line around. If LCD panel breaks, there may be a possibility that the liquid crystal escapes from the panel. Since the liquid crystal is injurious, do not put it into the eyes or mouth. When liquid crystal sticks to hands, feet or clothes, wash it out immediately with soap.

④Observe all other precautionary requirements in handling general electronic components.

(12)Shipping requirements

12-1) Packing form is shown in Fig.7.

12-2) Carton storage condition

① Number of layers of cartons in pile : 10 layers max.

② Environmental condition :

・Temperature	0℃ to 40℃
・Humidity	60 %PH or less (at 40℃) No dew condition even at a low temperature and high humidity
・Atmosphere	Harmful gases such as acid and alkali which corrode electronic components and wires must not be detected.
・Storage period	About 3 months
・ Opening of package	To prevent TFT-LCD module from being damaged by static electricity ,adjust the room humidity to 50 %PH or higher and provide an appropriate measure for electrostatic earthing before opening the package.

(13) Reliability test conditions

Reliability test conditions for the TFT-LCD module are shown in Table 9.

(14) Others

14-1)Indication of lot number

The lot number is shown on a label. Attached location is shown in Fig.3 (Outline Dimensions).

Indicated contents of the label

Module name ○○○○○○○○○
model No. lot No.

contents of lot No. the 1st figure ‥ production year (ex. 1998 : 8)

the 2nd figure ‥ production month 1,2,3,‥‥‥,9,X,Y,Z

the 3rd～8th figure ‥ serial No. 000001～

the 9th figure ‥ revision marks A,B,C,•••,T,•••,Z

Reliability Test Conditions for TFT-LCD module

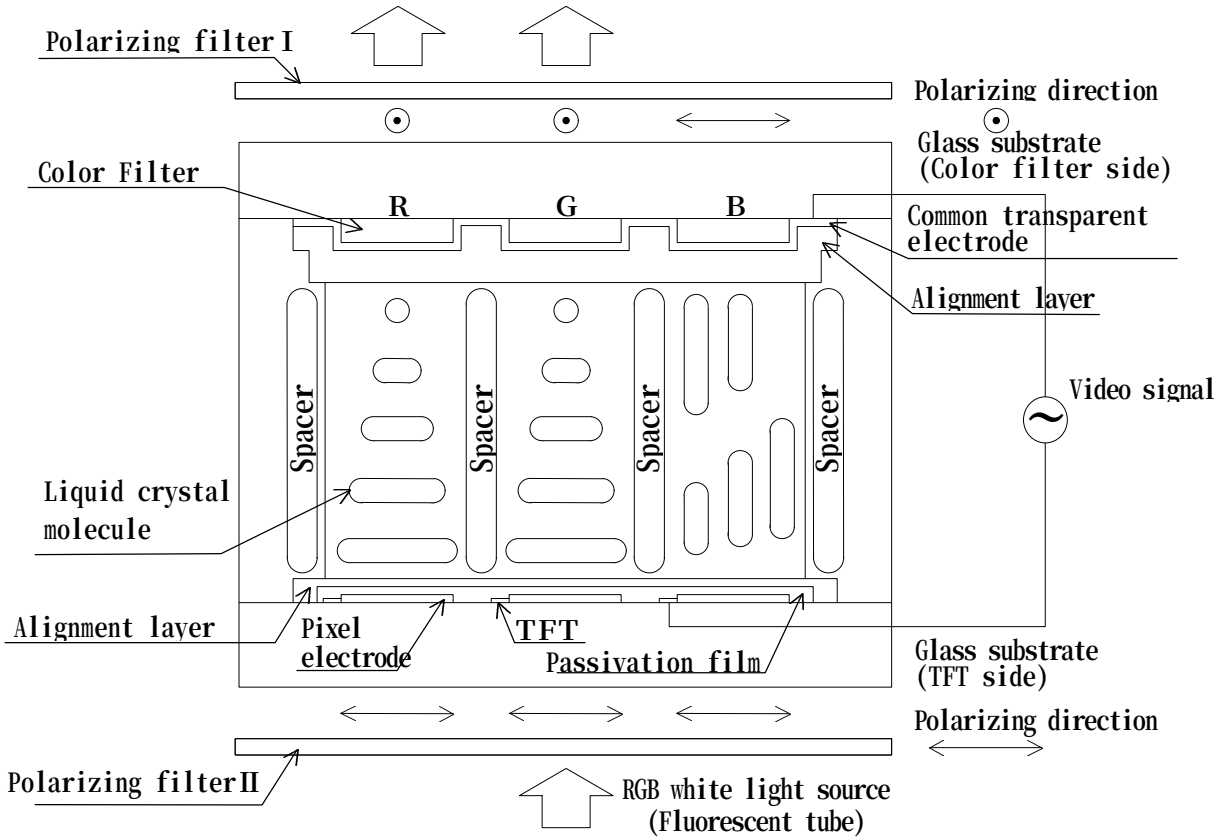
Table 9

No	Test items	Test condition
1	High temperature storage test	Ta=+80℃ 240h
2	Low temperature Storage test	Ta=－30℃ 240h
3	High temperature And high humidity Operating test	Tp=+40℃ (90～95%RH) 240h
4	High temperature Operating test	Tp=+80℃ 240h
5	Low temperature Operating test	Ta=－10℃ 240h
6	Electrostatic Discharge test	±200V•200pF(0Ω), Once for each terminal
7	Shock test	980m/s²•6ms,±X、±Y、±Z 3 times for each direction (JIS C0041, A-7 Condition C)
8	Vibration test	Frequency range : 10～55Hz Stroke : 1.5mm. Sweep : 10Hz～55Hz～10Hz 2 hours for each direction of X, Y, Z (6 hours in total) (JIS C7021, A-10 Condition A)
9	Heat shock test	-30℃～+80℃,200cycles (1h) (1h)

Ta = Ambient temperature
Tp = Panel temperature

【Evaluation result criteria】

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



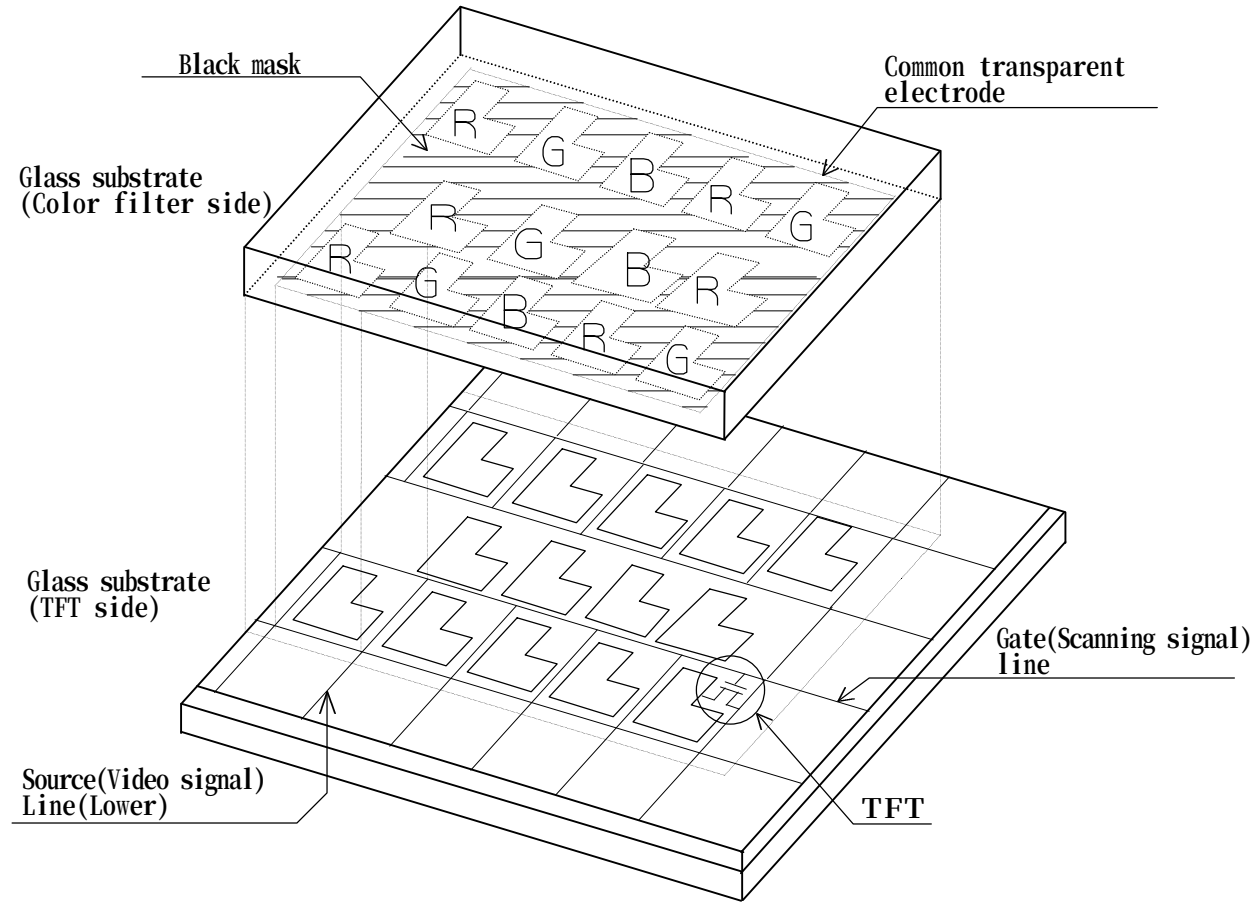


Fig.1. Illustration of TFT-LCD panel

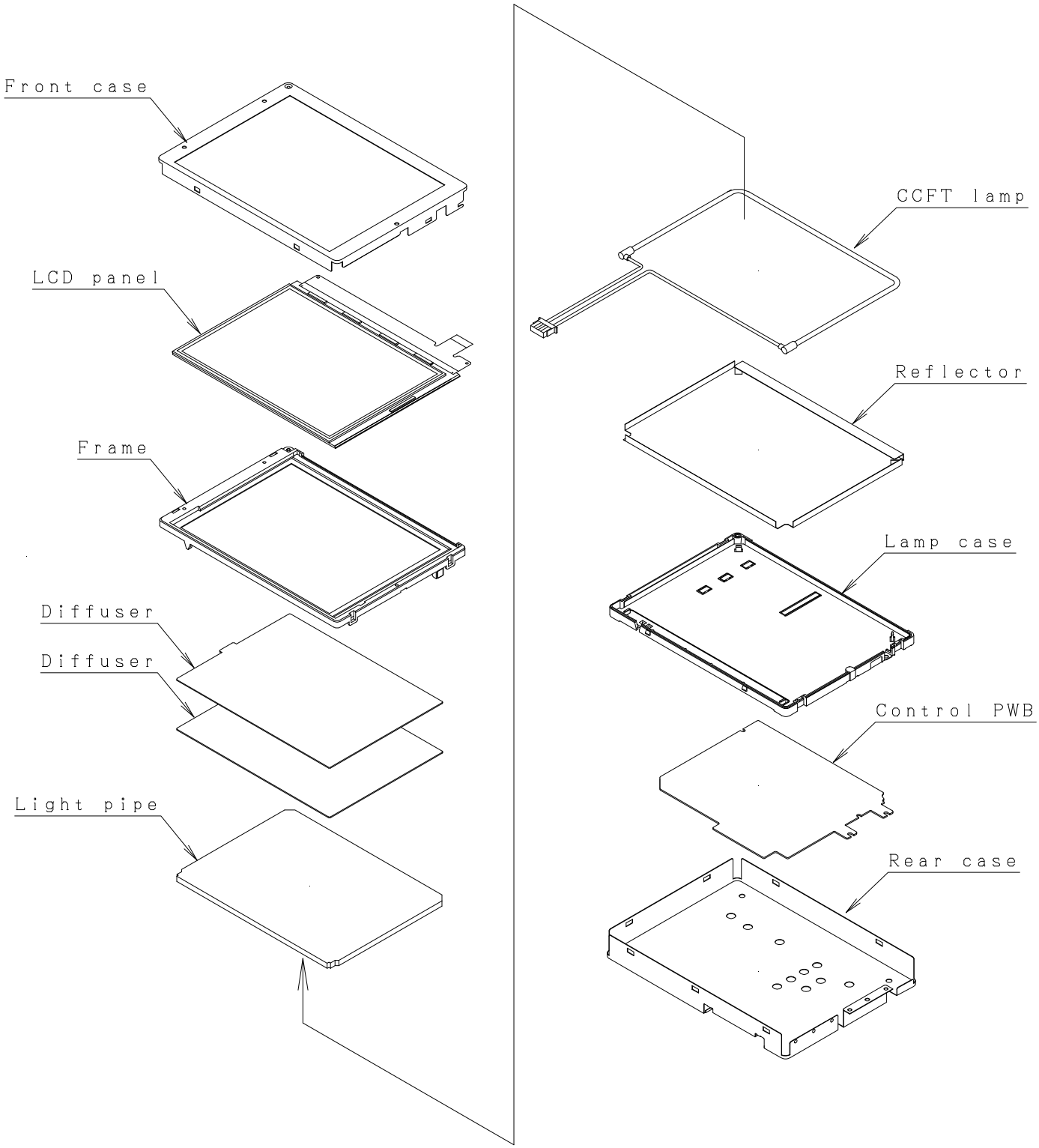
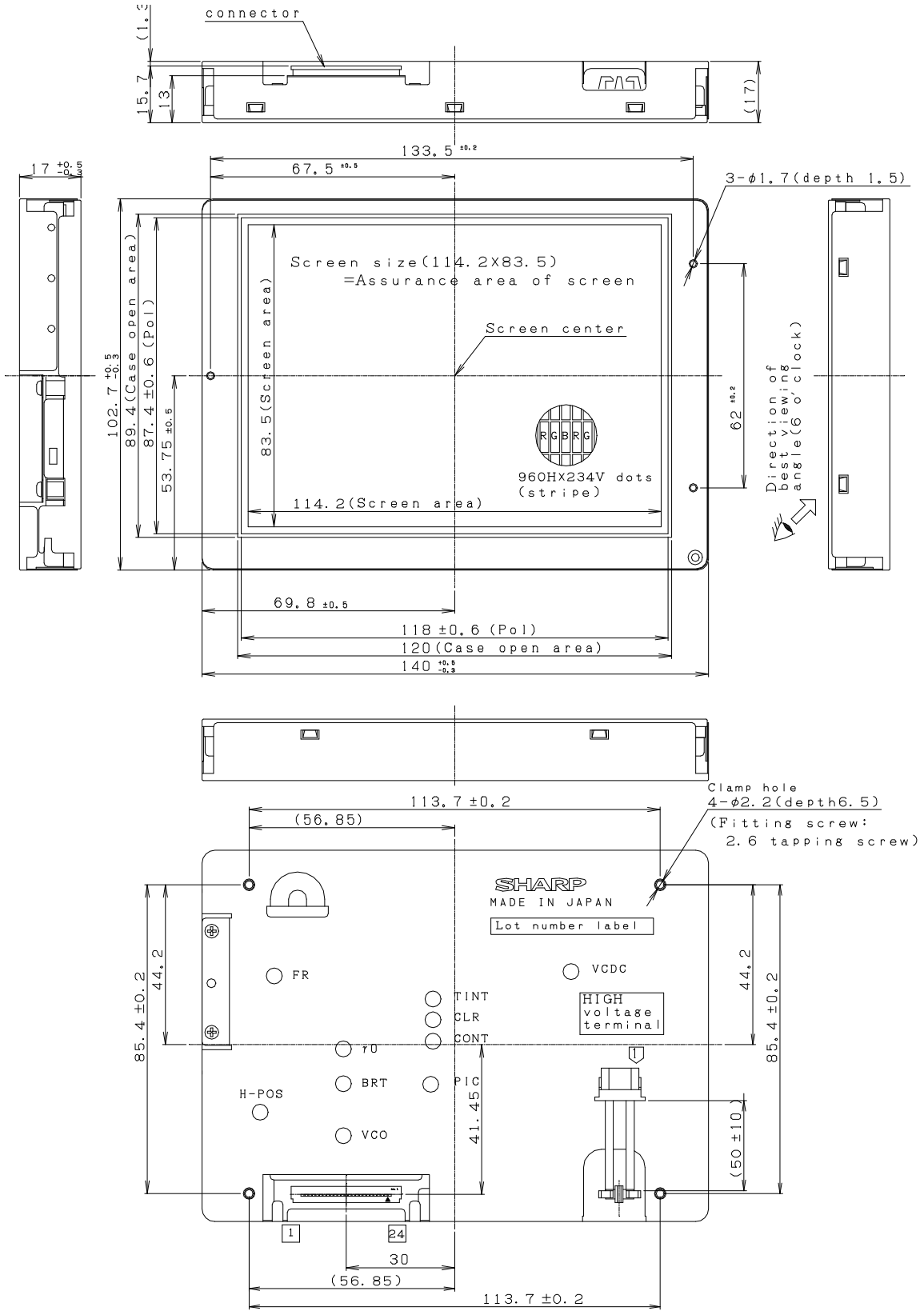


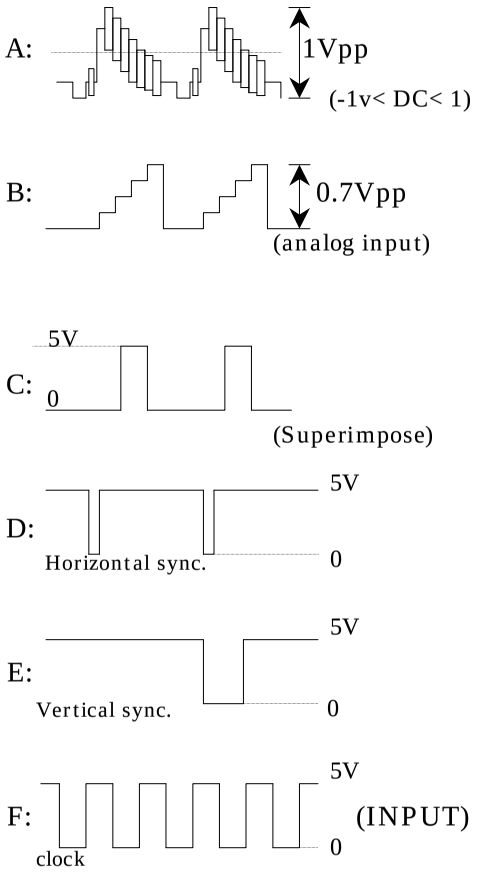
Fig.2. Construction of TFT-LCD module



General tolerance is ±0.5.

Fig.3. Outline dimensions of TFT-LCD module

I/O SIGNALS



(NOTE)

input impedance of A , B : > 10kΩ

input impedance of C : > 50kΩ

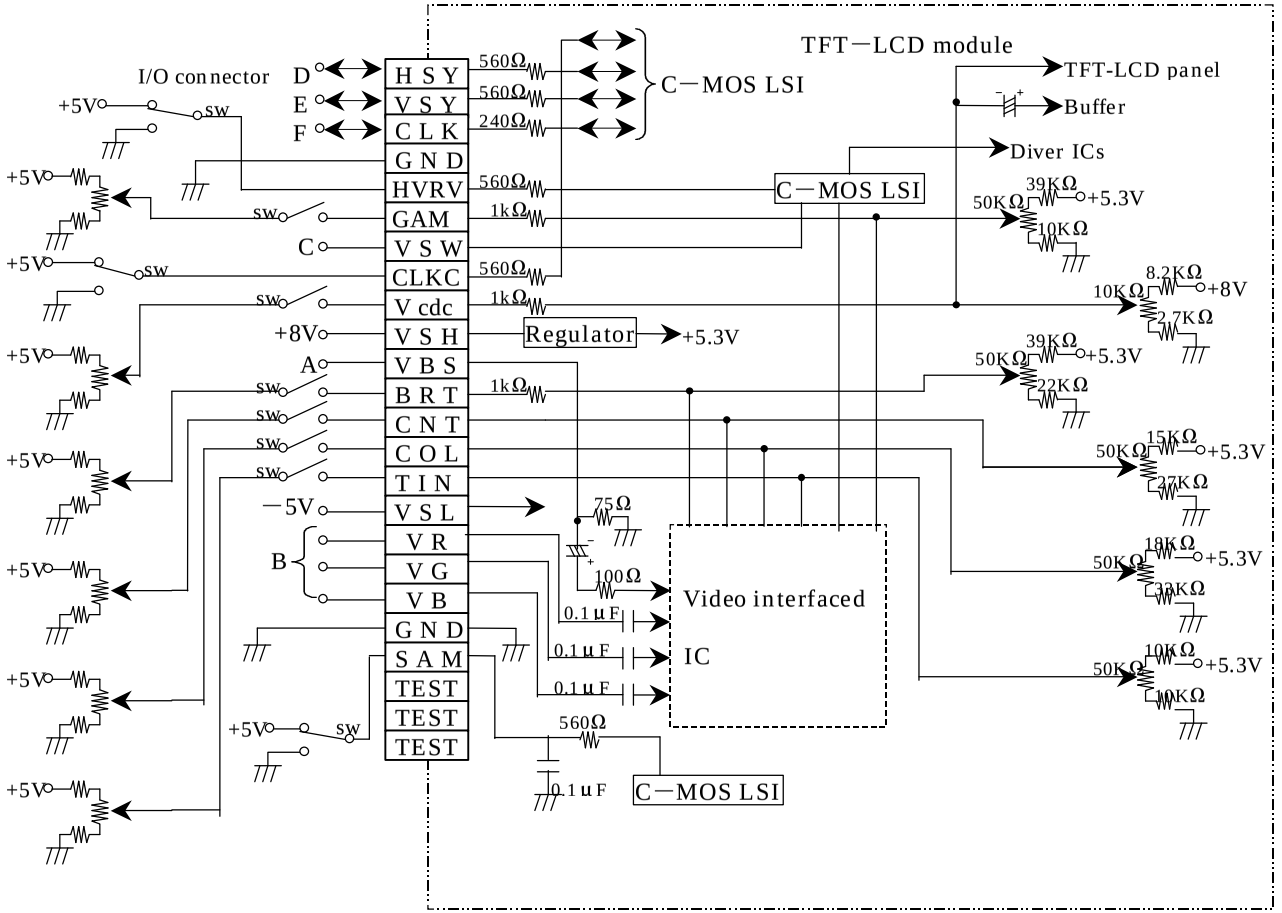


Fig.4 Recommended circuit of TFT-LCD module

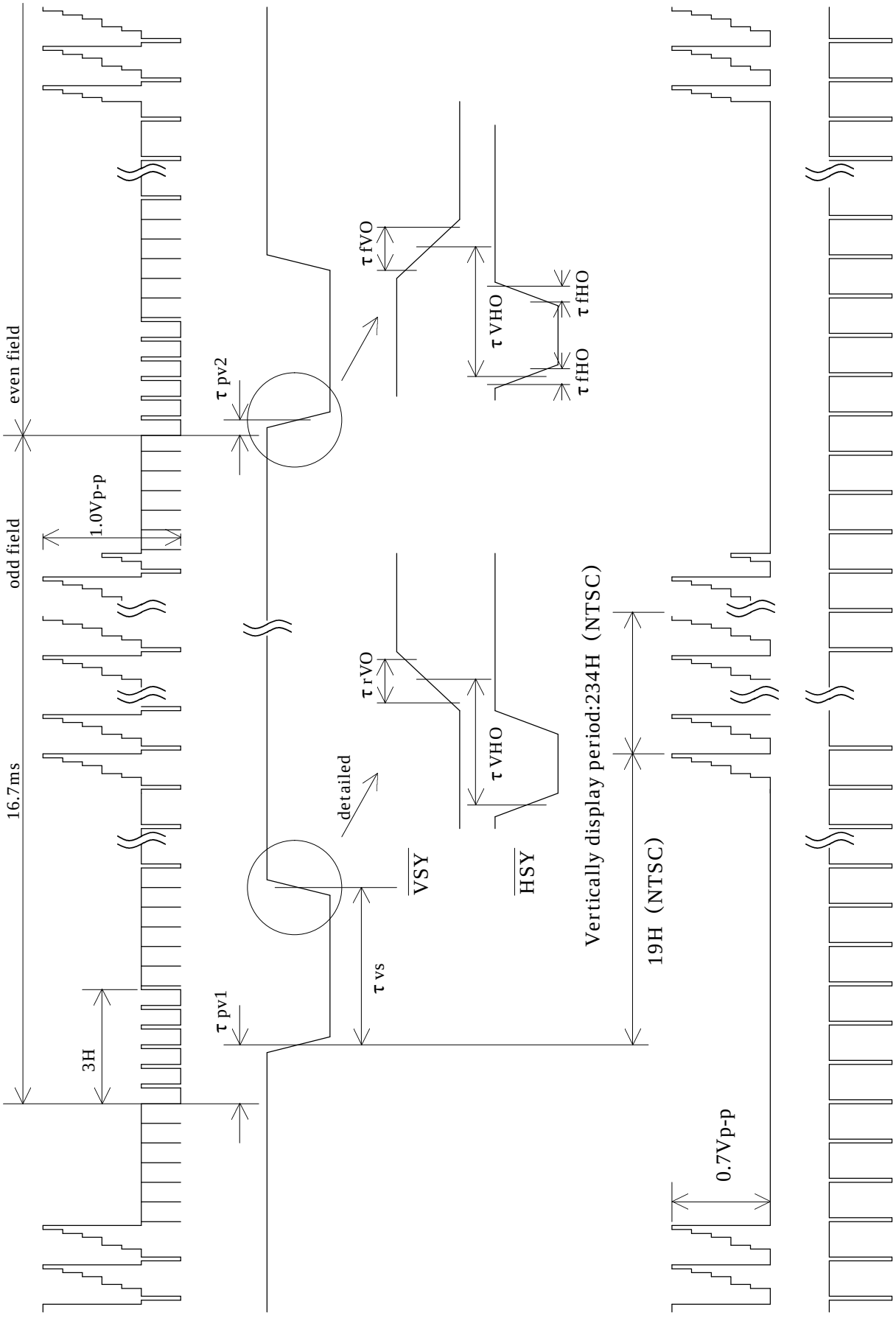


Fig.5-A Input / Output signal waveforms (CLKC='Hi')

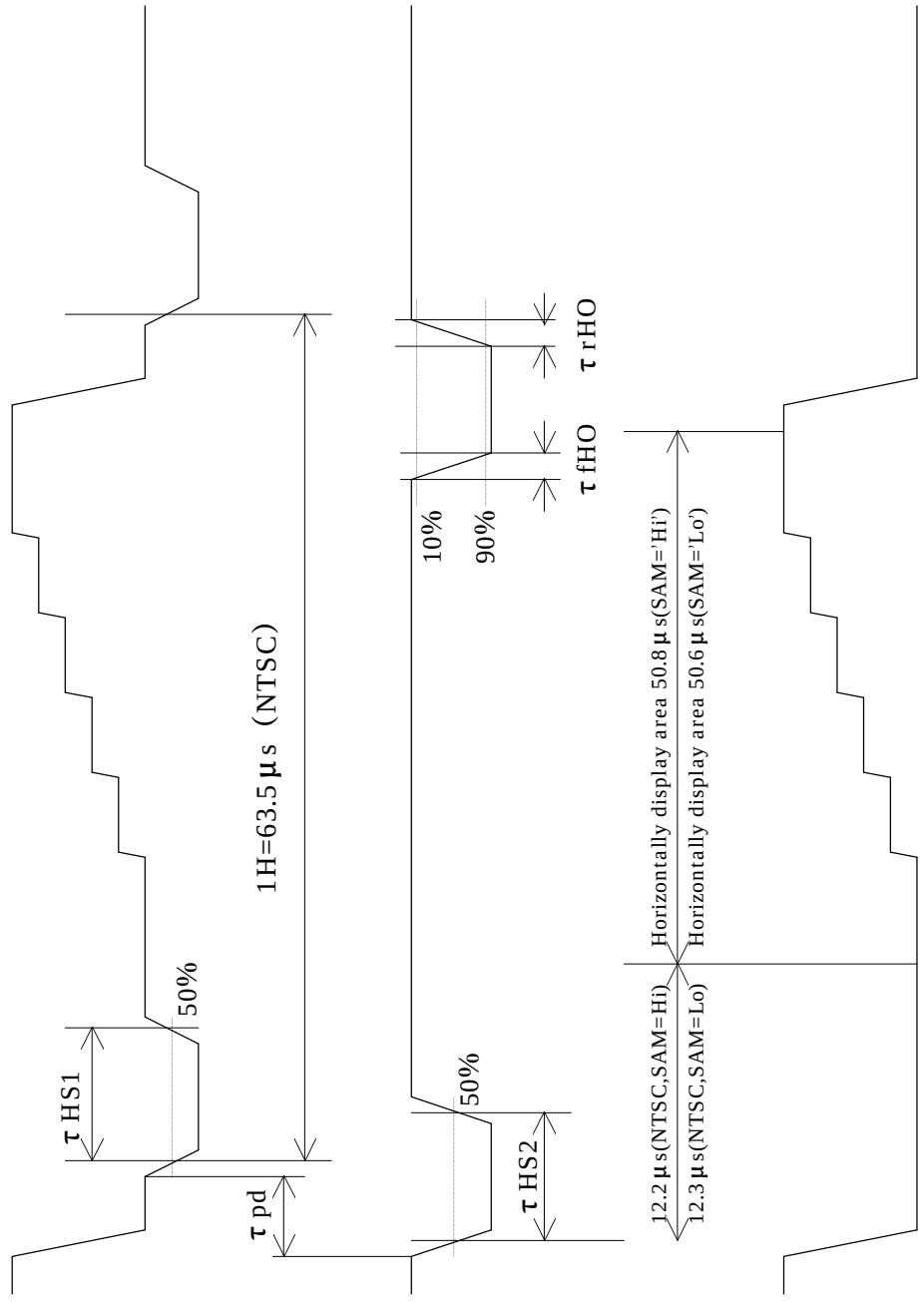


Fig.5-B Input / Output signal waveforms (CLKC='Hi')

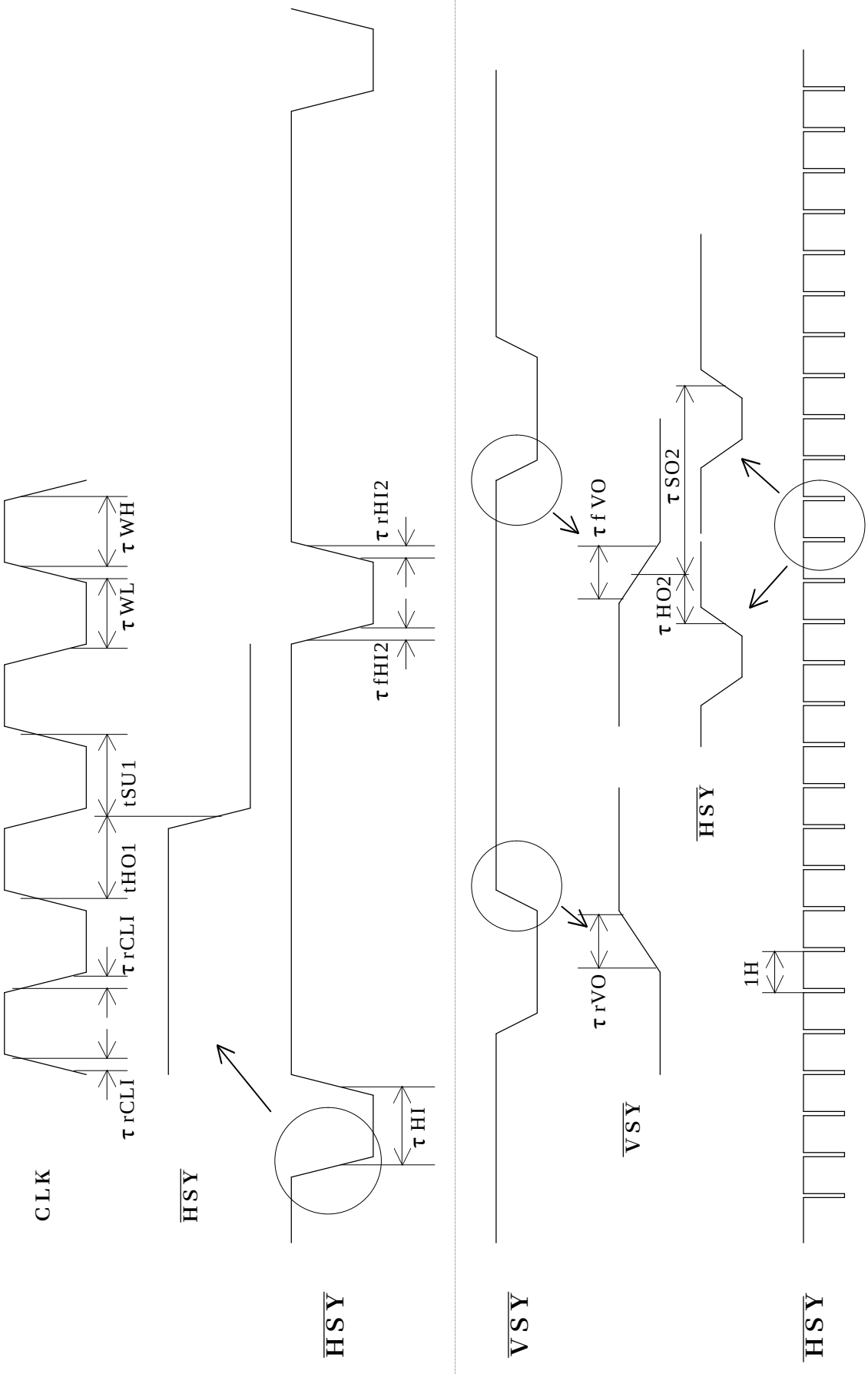
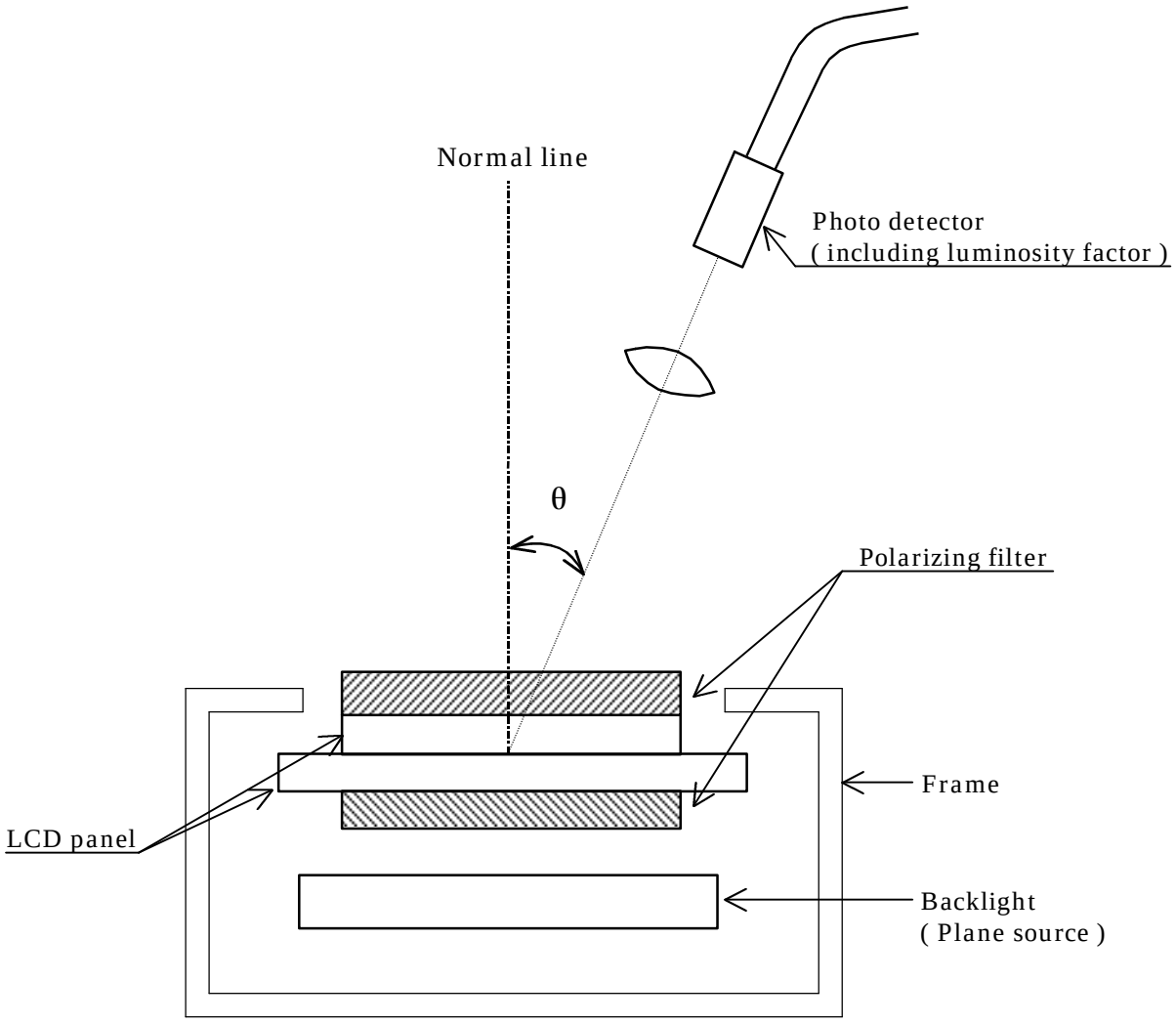


Fig.5-C Input / Output signal waveforms (external clock mode CLKC='Lo')



Brightness : Less then 5000cd/m²
Wave length : To be cut less than 400nm

Fig.6. Optical characteristics

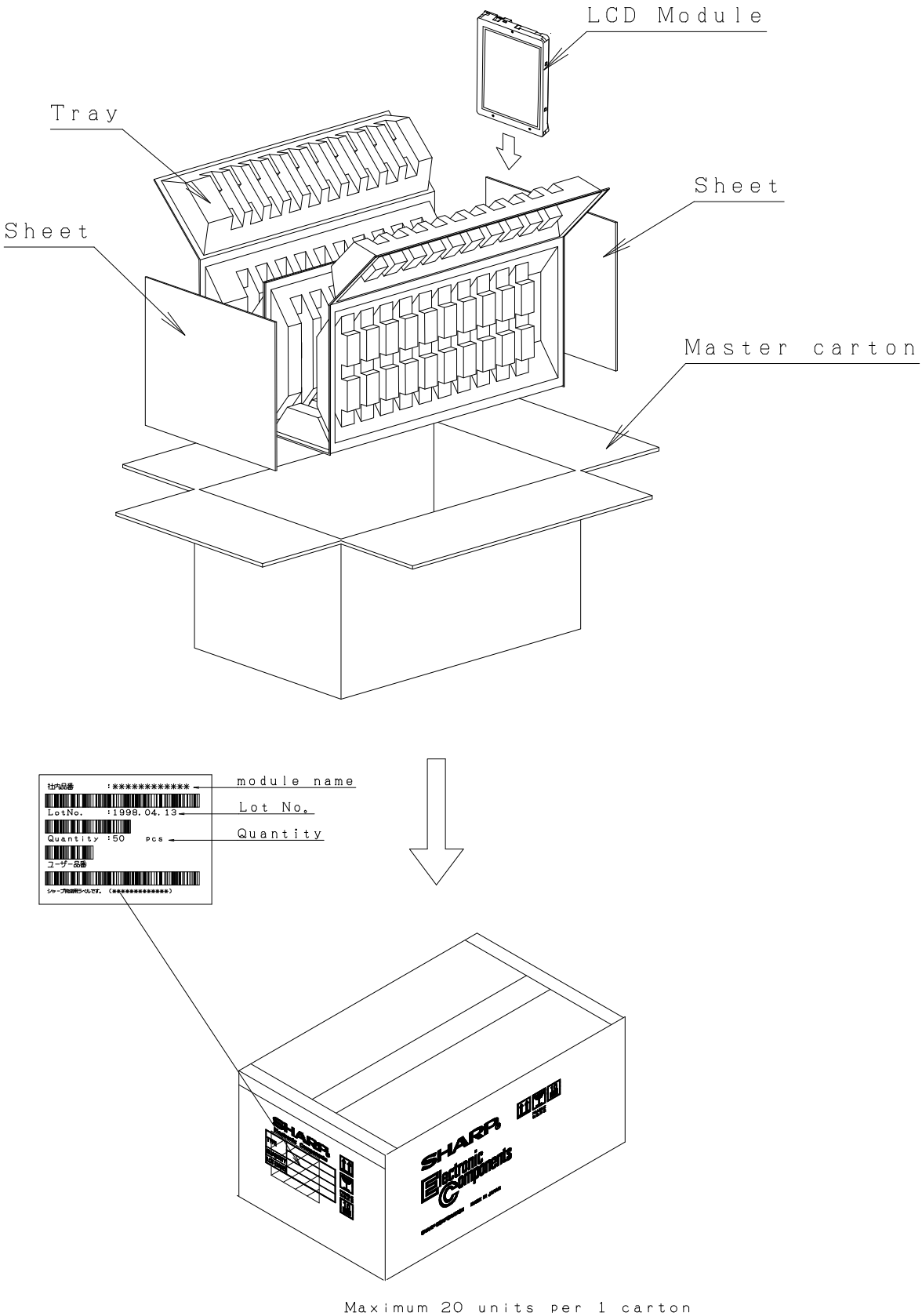


Fig.7. Packing form

(Appendix)

Adjusting Method of Optimum Common electrode DC Bias Voltage

To obtain optimum DC bias Voltage of common electrode driving signal, photo-electric devices are very effective, and the accuracy is within 0.1V.
(in visual examination method, the accuracy is about 0.5V because of the difference among individuals.)
To obtain optimum common electrode DC bias voltage, there is a measurement method as follows:

Measurement of flicker method

DC bias voltage is adjusted so as to minimize NTSC:60Hz(30Hz)/PAL:50Hz(25Hz)flicker.

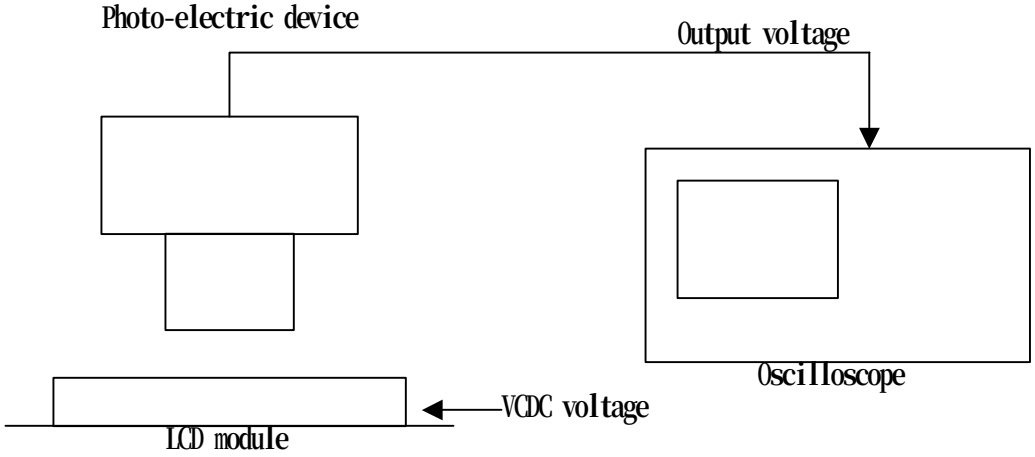
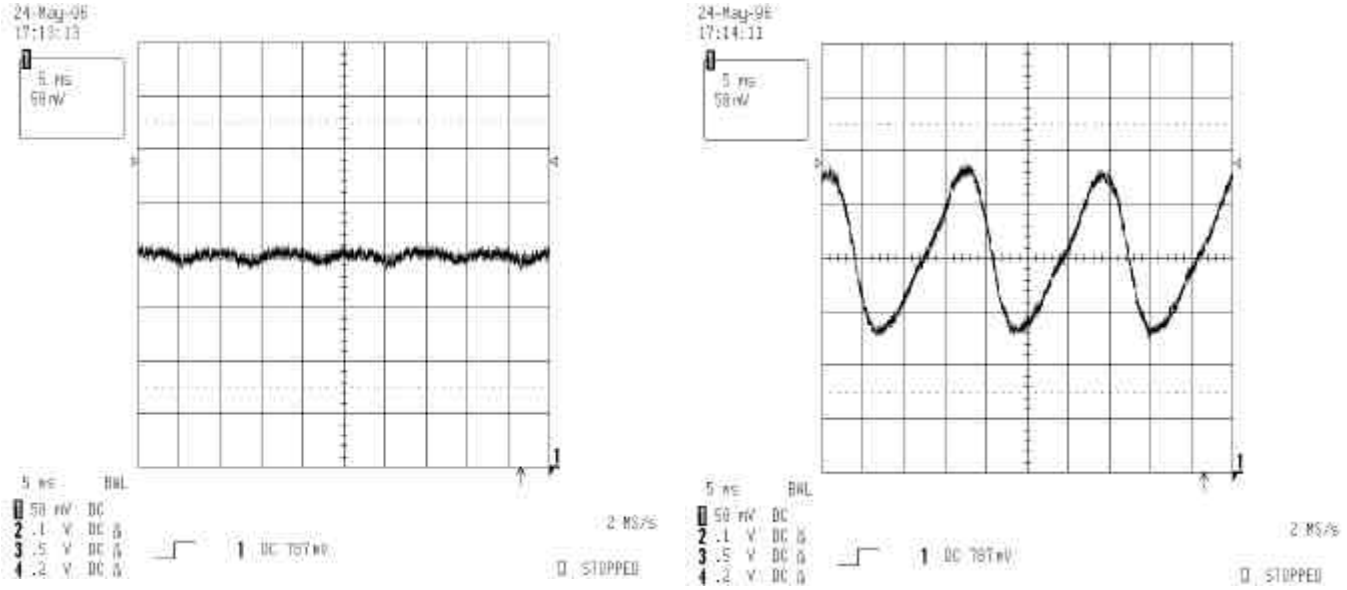


Fig.A. Measurement system

《Measurement of flicker》

Photo-electric output voltage is measured by an oscilloscope at a system shown in Fig.A
DC bias voltage must be adjusted so as to minimize the 60Hz(30Hz)[NTSC]/50Hz(25Hz)[PAL] flicker with DC bias voltage changing slowly.(Fig.B)



DC bias : Optimum　　DC bias : Optimum +1V

Fig.B. Waveforms of flickers