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	SPECIFICATION	APPICABLE GROUP Mobile Liquid Crystal Display Group

DEVICE SPECIFICATION FOR

TFT-LCD module

MODEL No. LQ056A3AG01

☐ CUSTOMER'S APPROVAL

DATE _____

BY _____

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RECORDS OF REVISION

MODEL No : LQ056A3AG01

SPEC No : LCY-02118A

	NO.	PAGE	SUMMARY	NOTE
2002.12.18		-	-	1st Issue
2006.08.08		3	Addition:" This module is adapted to RoHS compliance.	2nd Issue
		10	Change : Mechanical characteristics 9-3)text	
		12	Change: 14-1)lot number label LQ056A3AG01 → LQ056A3AG01 R	
		15	Change : Used connector [CN1]006208500024000 → IMSA-9619S24B-GF	
			Addition: Mercury warning label	

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CONTENTS

(1) Introduction

Sharp Color TFT-LCD module is the 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 amorphois silicon TFT (Thin Film Transistor). The module accepts full color video signal conforming to the NTSC(M) and PAL(B･G) system standards.

When additionally provided with the circuit for producing standard analog R･G･B video signals from composite video signal, it is applicable to pocket TV and various display monitors.

(2) Features

- The module is a dual mode type that can be used with both NTSC (M) and PAL(B･G) systems.
- Using a 234 scanning line display panel, a PAL system with a 273 line display screen is effectively obtained. (MBK-PAL, or MaBiKi("thinning" in Japanese)-PAL)
- 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 and control circuit responsive to two sets of standard R･G･B analog video signals which can be superimposed.
- Built-in CCFT backlight(Edge type) and DC/AC inverter for backlight operation.
- The recycling structure for easy the backlight replacement, is adopted.
- By adopting a high aperture panel, high transmittance color filter and high transmittance polarizing plates, transmittance ratio is realized. (Optimal viewing angle: 6 o'clock)
- An inverted video display in the vertical as well as horizontal directions is possible.
- This module is adapted to RoHS compliance.

(3) Construction and Outline

The module is composed of the TFT-LCD panel, drivers, electronic parts and DC/AC inverter mounted on a control pwb, frame, backlight, sealed front case, and sealed back case.

* Illstration of a TFT-LCD panel : See Fig.1.
* Outline dimensions of TFT-LCD module : See Fig.2.
* Form of the module : See Fig.3.

(4) Mechanical specification

Table 1

Parameter	Specifications	Units	Remarks
Display format	74,880 960(W)×234(H)	pixels dots	
Active area	114.2(W)×83.5(H)	mm	
Screen size (diagonal)	14 [5.6"]	cm	
Dot pitch	0.119 (W) ×0.357 (H)	mm	
Dot configuration	R,G,B Stripe configuration	-	
Outline dimension	140.0(W)×102.7(H)×20.0(D)	mm	【Note4-1】
Mass	250±20	g	

【Note4-1】

Typical values are given. For detailed measurements and tolerances, please refer to Fig. 3.

(5)Input / Output symbol and description

5-1)Input / Output terminals

Table 2 (Hi=VSH, Lo=GND)

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	NTP	i	Selection for NTSC or PAL	【Note5-4】
5	HRV	i	Terminal for right/left reverse scanning	【Note5-5】
6	VRV	i	Terminal for up/down reverse scanning	【Note5-6】
7	VSW	i	Selection signal of two sets of video signals	【Note5-7】
8	CLKC	i	Selection for input/output direction of CLK,HSY,VSY	【Note5-8】
9	VCDC	i	DC bias voltage adjusting terminal of common electrode driving signal	【Note5-9】
10	VIN	i	Input terminal for LCD driving voltage	
11	VBS	i	Composite video signal for sync. separater	【Note5-10】
12	BRT	i	Brightness adjusting terminal	【Note5-11】
13	VR1	i	Color video signal (Red) 1	ON at VSW=Hi
14	VG1	i	Color video signal (Green) 1	ON at VSW=Hi
15	VB1	i	Color video signal (Blue) 1	ON at VSW=Hi
16	GND1	i	Ground (for LCD driving voltage)	【Note5-12】
17	VR2	i	Color video signal (Red) 2	ON at VSW=Low
18	VG2	i	Color video signal (Green) 2	ON at VSW=Low
19	VB2	i	Color video signal (Blue) 2	ON at VSW=Low
20	GND1	i	Ground (for LCD driving voltage)	【Note5-12】
21	VBL	i	Input terminal for backlight driving voltage	
22	VBL	i	Input terminal for backlight driving voltage	
23	GND2	i	Ground (for backlight driving voltage)	【Note5-12】
24	GND2	i	Ground (for backlight driving voltage)	【Note5-12】

("Hi" means high level of digital input voltage, "Lo" means low level of digital input voltage.)

【Note5-1】

When CLKC="Hi", the output is a horizontal synchronizing signal synchronized by the VBS signal. When CLKC="Lo", the module is synchronized via the horizontal synchronizing signal input at this terminal.

【Note5-2】

When CLKC="Hi", the output is a vertical synchronizing signal synchronized by the VBS signal. When CLKC="Lo", the module is synchronized via the vertical synchronizing signal input at this terminal.

【Note5-3】

When CLKC="Hi", the output level is low.

When CLKC="Lo", module operation is based on the input clock signal. This signal should correspond to sampling timing of the horizontal direction image. Terminal No.4 should be "Hi" when CLKC="Lo".

【Note5-4】

NTP="Hi": NTSC system

NTP="Lo": PAL system

【Note5-5】

HRV="Hi": Normal display

HRV="Lo": Right/Left reverse

【Note5-6】

HRV="Hi": Normal display

HRV="Lo": Up/Down reverse

【Note5-7】

VSW="Hi": VR1,VG1 and VB1="ON"

VSW="Lo": VR2,VG2 and VB2="ON"

【Note5-8】
CLKC="Hi": CLK,HSY and VSY="Output Mode"
CLKC="Lo": CLK,HSY and VSY="Input Mode"

【Note5-9】
This terminal is applicable to the DC bias voltage adusting terminal of common electrode driving signal. DC bias voltage is adjusted to the optimum value every module shipping.

【Note5-10】
Responsive to standard composite sync. signal with negative polarity of the same amplitude level as that of the composite video signal.

【Note5-11】
Brightness (black level of video signal) is adjusted by the DC voltage supplied to the pin.
Brightness is adjusted to the optimum value on shipping, but, it can be re-adjusted by external circuit shown in Fig.5.

【Note5-12】
GND1 and GND2 terminals are not connected in the module. Make sure to have them connected outside of the module.

5-2) Input/Output mode of synchronizing signal and clock signal

Table 3

	CLKC="Hi"	CLCK="Lo"
HSY	Output	Input
VSY	Output	Input
CLK	Output "Lo"	Pixel Clock Input

(6) Absolute maximum ratings

Table 4 GND=0V, Ta=25℃

Parameter	Symbol	MIN	MAX	Unit	Remarks
Supply voltage for LCD driving	V_{IN}	-0.3	+15	V	
Supply voltage for lamp driving	V_{BL}	-0.3	+15	V	
Analog input signals	V_i	-	2.0	Vp-p	【Note6-1】
Digital input signals	V_I	-0.3	5.5	V	【Note6-2】
DC bias voltage of common electrode driving signal	V_{CDC}	0	5.2	V	
Brightness adjusting terminal voltage	V_{BRT}	0	5.2	V	
Strorage temperature	Tstg	-25	70	℃	【Note6-3,4】
Operating temperature (panel)	Topp	0	65	℃	【Note6-3,4,5】
Operating temperature (ambient)	Topa	0	45	℃	【Note6-3,4,5】

【Note 6-1】 VBS, VR1, VG1, VB1, VR2, VG2, VB2 terminals (Video Signal)

【Note 6-2】 HSY, VSY, NTP, HRV, VRV, VSW, CLKC, CLK terminals

【Note 6-3】 Do not cover the radiation holes on the upper, bottom and back sides of the module. If the radiation of the heat is not sufficient, the temperature inside the sealed case will go up, while the temperature at the back side of the sealed case should be kept under 60 ℃.

【Note 6-4】 Maximum wet-bulb temperature must be less than 38℃. No dew condensation. Dew condensation may cause electrical current leaks and a degradation of specific performance finally.

【Note 6-5】 The operating temperature only guarantees operation of circuits. Otherwise, contrast, response time, and other factors related to display quality is determined by operating temperature using the formula Ta=+25℃

(7)Electrical characteristics

7-1)Recommended operating conditions

Table5

GND＝0, Ta=25℃

Parameter			Symbol	MIN	TYP	MAX	unit	Remarks	
Power supply voltage for LCD driving			V_{IN}	11.4	12.0	12.6	V		
Power supply voltage for BL driving			V_{BL}	11.4	12.0	12.6	V		
Analog input voltage	Amplitude		VBS	0.7	1.0	2.0	Vp-p		Input register is over 10kΩ
			Vi	-	0.7	-	Vp-p	【NOTE7-1】	
	DC		V_{IDC}	-1.0	0	+1.0	V	【NOTE7-2】	
Digital input voltage	High level		V_{IH}	3.5	-	5.25	V	Input register is over 60kΩ【NOTE 7-3】	
	Low level		V_{IL}	0	-	1.5	V		
Digital output voltage	High level		V_{OH}	4.0	-	5.5	V	Load register is over 60kΩ【NOTE 7-4】	
	Low level		V_{OL}	0	-	1.0	V		
Input horizontal sync. component	freq.	NTSC	$f_{H(N)}$	15.13	15.73	16.33	kHz	CLKC="Hi" 【NOTE7-5】 for VBS terminal	
		PAL	$f_{H(P)}$	15.03	15.63	16.23	kHz		
	pulse width	NTSC	$\tau_{HI(N)}$	4.2	4.7	5.2	μs		
		PAL	$\tau_{HI(P)}$	4.2	4.7	5.2	μs		
	rise time		τ_{rHI1}	-	-	0.5	μs		
	fall time		τ_{fHI1}	-	-	0.5	μs		
Input vertical sync. component	freq.	NTSC	$f_{V(N)}$	f_H/284	f_H/262	f_H/258	Hz	CLKC="Hi",H=1/f_H 【NOTE7-6】 for VBS terminal	
		PAL	$f_{V(P)}$	f_H/344	f_H/312	f_H/304	Hz		
	pulse width	NTSC	$\tau_{VI(N)}$	-	3H	-	μs		
		PAL	$\tau_{VI(P)}$	-	2.5H	-	μs		
	rise time		τ_{rVI1}	-	-	0.5	μs		
	fall time		τ_{fVI1}	-	-	0.5	μs		
Input clock	frequency		f_{CLI}	6.0	6.8	7.6	MHz	CLKC="Lo" 【NOTE7-7】 for CLK terminal	
	'Hi' width		τ_{WH}	20.0	-	-	ns		
	'Lo' width		τ_{WL}	20.0	-	-	ns		
	rise time		τ_{rCLI}	-	-	5.0	ns		
	fall time		τ_{fCLI}	-	-	5.0	ns		
Input HSY (Horizontal sync.)	frequency		f_{HI}	f_{CLI}/465	f_{CLI}/435	f_{CLI}/405	Hz	CLKC="Lo" 【NOTE7-8】 for HSY terminal	
	pulse width		τ_{HI}	1.0	4.7	8.4	μs		
	rise time		τ_{rHI2}	-	-	0.05	μs		
	fall time		τ_{fHI2}	-	-	0.05	μs		
Input VSY (Vertical sync.)	frequency		f_{VI}	50	f_{HI}/262	f_{HI}/258	Hz	CLKC=" Lo" 【NOTE7-9】 for VSY terminal	
	pulse width		$\tau_{VI(P)}$	1H	3H	5H	μs		
	rise time		τ_{rVI2}	-	-	0.5	μs		
	fall time		τ_{fVI2}	-	-	0.5	μs		
Data set up time			t_{SU1}	25	-	-	ns	【NOTE7-10】	CLKC=" Lo"
Data hold time			t_{HO1}	25	-	-	ns		
Data set up time			t_{SU2}	1.0	-	-	μs	【NOTE7-11】	
Data hold time			t_{HO2}	1.0	-	-	μs		
DC bias voltage for common electrode driving signal			V_{CDC}	+0.0	+1.5	+3.0	V	DC component 【NOTE7-12】	
Terminal voltage applicable to brightness			V_{BRT}	+1.9	+2.1	+2.3	V		

【Note7-1】 VR1,VG1,VB1,VR2,VG2,VB2 terminals (Video signal)
【Note7-2】 VBS,VR1,VG1,VB1,VR2,VG2,VB2 terminals
【Note7-3】 HSY,VSY,NTP,VSW,HRV,VRV,CLKC,CLK terminals
【Note7-4】 HSY,VSY,CLK terminals
【Note7-5】 VBS (horizontal sync. component)
【Note7-6】 VBS (vertical sync. components)
【Note7-7】 CLK terminals
【Note7-8】 HSY terminals
【Note7-9】 VSY terminals
【Note7-10】 In case of CLKC='Hi', it shows the phase difference from HSY to CLK.
In that case, HSY will be taken at the rise timing of CLK.
【Note7-11】 In case of CLKC='Hi', it shows the phase difference from VSY to CLK.
In that case, VSY will be taken at the rise timing of HSY.
【Note7-12】 V_{CDC} is adjusted to the optimum voltage every module so as to attain minimum flicker level.
In case of re-adjustment, you will be able to adjust it with the adjusting volume in the module or the external circuit shown in Fig.5. Refer to Appendix-1.

7-2)Power consumption

Table 6 Ta=25℃

Parameter	Symbol	Voltage	MIN	TYP	MAX	Unit	Remarks
Panel driving current	I_{IN}	Vin=+12.0V	—	98	130	mA	
Lamp current	I_{BL}	Vbl=+12.0V	—	380	470	mA	

7-3) Circuit Diagram
The circuit block diagram of TFT-LCD module is shown in Fig.4.
BRT, V_{CDC}, external adjusting recommended circuit is shown in Fig.5.

Caution : Be careful to supply all power voltage before inputting signals.

7-4) Input/Output signal waveforms
They are shown in Fig. 6-A,B,C.

Caution : For the VBS signal, input standard composite video (or sync.) signal applicable to the operating mode which have NTSC(M) or PAL(B･G) and is selected by the NTP signal.
A long time input of non-standard sync. signal may cause flicker or degradation of display quality.

Table 7 (CLKC='Hi', NTSC:f_H=15.7kHz,fv=60Hz / PAL:f_H=15.6kHz,fv=50Hz)

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Horizontal sync. output	pulse width	τ_{HS2}	2.9	3.9	4.9	μs	【Note7-13】
	phase difference	τ_{pd}	0.6	1.3	2.0	μs	【Note7-14】
	rise time	τ_{rHO}	-	-	0.5	μs	CL=10pF
	fall time	τ_{fHO}	-	-	0.5	μs	
Vertical sync. output	pulse width	τ_{VS}	-	4H	–	μs	1H=1/f_H
	phase difference	τ_{VHO}	-	11.0	28.0	μs	【Note7-15】
	rise time	τ_{rVO}	-	-	2.0	μs	CL=10pF
	fall time	τ_{fVO}	-	-	2.0	μs	
Vertical sync. phase difference	odd field	τ_{PV1}	-	1H	-	μs	【Note7-16】
	even field	τ_{PV2}	-	0.5H	-	μs	

(Supply voltage condition : V_{IN}=+12.0V)

【Note7-13】 Adjusted by variable resister (H-POS) in a module.
【Note7-14】 Variable range by variable resister (H-POS) in a module.
Adjustment : $\tau_{pd}=1.3\pm0.5\,\mu s$
【Note7-15】 Synchronized with HSY, based on falling timing of HSY.
【Note7-16】 VSY signal delays.

7-5) Display time range

(1) NTSC(M) mode (NTP='Hi', CLKC='Hi')

Displaying the following range within video signals.

(a) Horizontally : 12.3 ～ 62.9μs from the falling edge of HSY.

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

(2) PAL(B･G) mode (NTP='Lo', CLKC='Hi')

Displaying the following range within video signals.

(a) Horizontally : 13.1 ～ 63.7μs from the falling edge of HSY.

(b) Vertically : 26 ～ 298H from the falling edge of VSY.

However, the video signals of (14n+12)H, (14n+20)H/Even field.
(14n+17)H, (14n+23)H/Odd field (n=1,2･･･,20)

are not displayed on the module.

(3) External clock mode (NTP='Hi', CLKC='Lo')

Displaying the following range within video signals.

(a) Horizontally : 84 ～ 403 clk from the falling edge of HSY.
(clk means input external clock.)

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

(8)Optical characteristics

Measurement shall be executed with no diffuser.

Table 8 Ta=25℃

Parameter		Symbol	Conditions	MIN	TYP	MAX	Units	Remarks
Viewing angle range		△θ11	CR≧5	60	65	-	° (degree)	【Note 8-1,2】
		△θ12		35	40	-	° (degree)	
		△θ2		60	65	-	° (degree)	
Contrast ratio		CRmax	Optimal Viewing Angle	60	-	-	-	【Note 8-2,3】
Response time	Rise	τr	θ＝0°	-	15	30	ms	【Note 8-2,4】
	Decay	τd		-	20	40	ms	
Luminance		Y		190	250	-	cd/m²	【Note 8-5】
Chromaticity shift		X	-	0.263	0.313	0.363	-	【Note 8-5】
		Y	-	0.279	0.329	0.379	-	
Lamp lifetime		-	continuation	10,000	25,000	-	hour	【Note 8-6】

(Supply voltage condition : V_{IN}=+12.0V, V_{BL}=+12.0V)

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

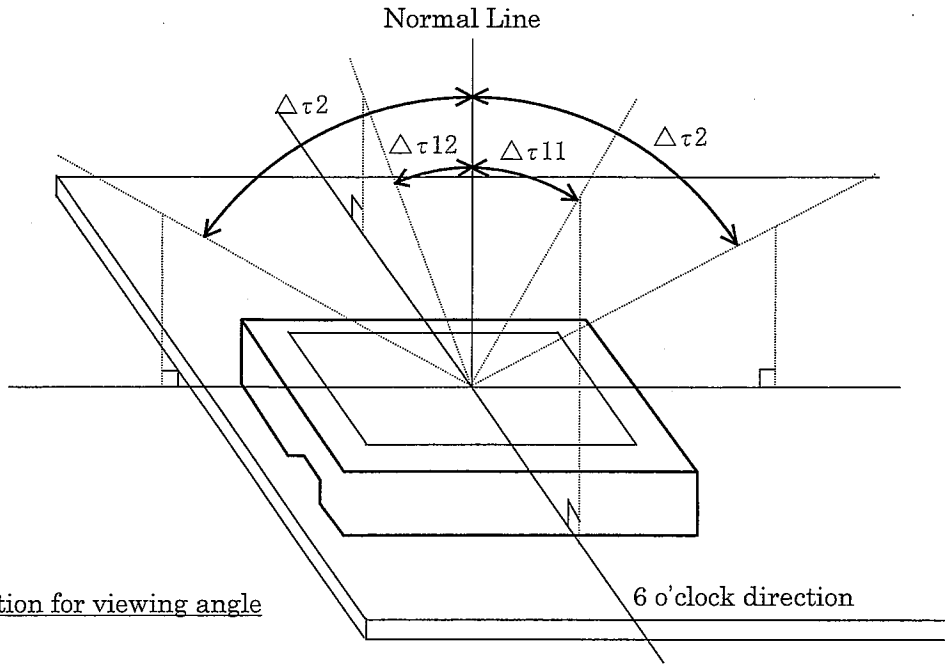


fig.(i) definition for viewing angle

【Note 8-2】 Applied voltage conditios:
①Terminal adjustable to brightness(BRT) is open.
②Input video signal of standard black level and 100% white level.

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

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

【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".

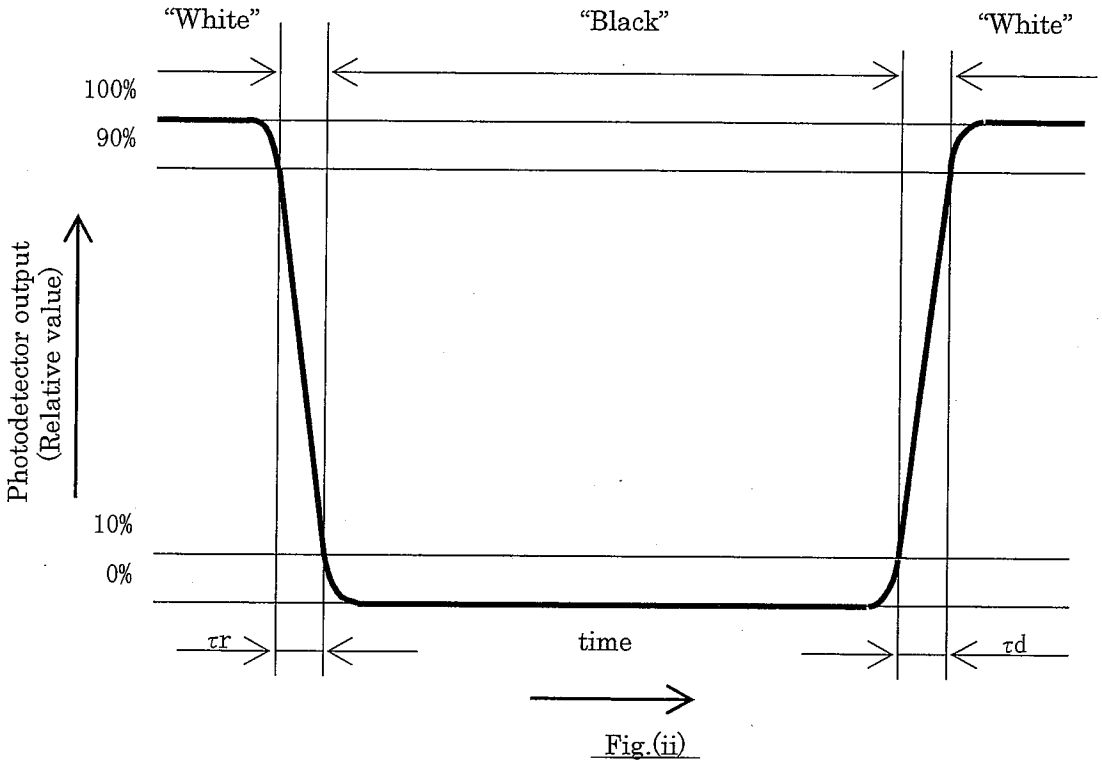


Fig.(ii)

【Note 8-5】 Measured on the center area of the panel at a viewing cone 1° by TOPCON luminance meter BM-7.(After 20 minutes operation)

【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.

(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) Liquid crystal panel drive input FFC/FPC specification

- Refer to the one that the size of FFC/FPC was recommended it of input connector.

  [IMSA-9619S24B-GF (IRISO ELECTRIC CO.,LTD.) , 24pin 1mm pitch)]

- The terminal of FFC/FPC of input connector recommend gold or gold plating specification.

  Because point of contact with its is gold plating specification.

(10) Handling of TFT-LCD module

10-1) Insertion and taking out of FPC

Be sure insert and take out of the FPC into the connector of the set after turning off the power supply on the set side.

10-2) Mounting of module

(1)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.

(2)To pushing module,(ex.touching switch,etc.)causes disordered image. so taking care not to conduct directly for LCD module.

11-3) Precautions in mounting

①Polarizer 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 optimal distance between module and discharging blower (See Fig. ⅳ-①.)

b) Attach adhensive tape to the laminator part near discharging blower so as to protect polarizer against flaw. (See Fig. (ⅳ-②).)

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.

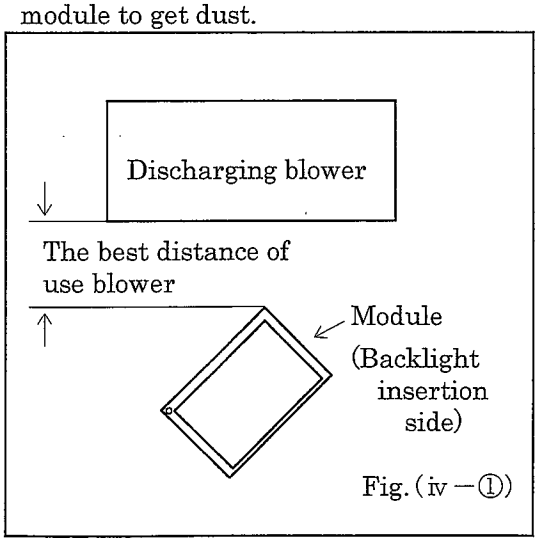


Fig. (ⅳ－①)

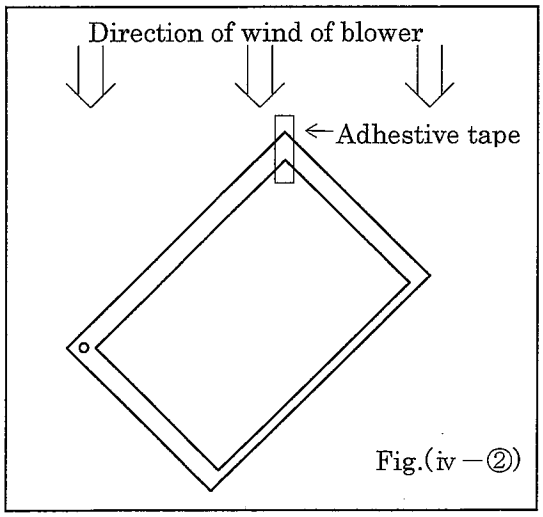


Fig.(ⅳ－②)

Fig. (ⅳ)

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.

10-4) Precautions in adjusting module

Do not change the adjusting volumes on the back side of the module. They are optimized when delivered and if changed, the module might not work properly. In case some adjustment is necessary, make sure to use an insulating driver.

10-5) Caution of product design

①The LCD module shall be protected against water salt-water by the waterproof cover.

②Please take measures to interferential radiation from module, to do not interfere surrounding appliances.

10-6) Others

① The liquid-crystal is deteriorated by ultraviolet rays. Do not leave it in direct sunlight and strong ultraviolet rays for many hours.

② If it is kept at a temperature below the rated storage temperature, it becomes coagulated and the panel may be broken. Also, if it is kept at a temperature above the rated storage temperature, it becomes isotropic liquid and does not return to its original state. Therefore, it is desirable to keep it at room temperature as much as possible.

③ When the LCD is broken, liquid-crystal may leak from the panel. Use care so that it does not enter the eyes and mouth. If it gets on hands, legs, and clothes, wash it away immediately, using soap.

④ Wipe off water drop on polarizer immediately.

⑤ Static image should not be displayed more then 5 minutes in order to prevent from occurrence of residual image.

⑥ Components with high voltage are used in this module. Do not have the module dismounted or remodeled for safety reasons.

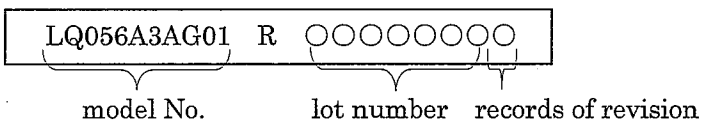
⑦ Observe all other precautionary requirements in handling general electric components.

(11) Reliability test items
Reliability test items for the TFT-LCD module are shown in Table 9.

(12) Forward form
12-1) Fig.8 shows packing form.
12-2) Conditions for storage.
① Pilling number of cartons : MAX 10
② Environment
Temperature : 0～40℃
Humidity : 60%RH or less (at 40℃)
No dew condensation at low temperature and high humidity.
Atmosphere : Harmful gas, such as acid or alkali which bites electric components and/or wires, must not be detected.
Period : about 3 months
Opening of the package : In order to prevent the LCD module from breakdown by electrostatic charges, please control the room humidity over 50%RH and open the package taking sufficient countermeasures against electrostatic charges, such as earth, etc.

(13) Display quality
The display quality of the color TFT-LCD module shall be in compliance with the Delivery Inspection Standard.

(14) Others
14-1) Indication of lot number label
① Attached location of the label : See fig.3
② Indicated contents of the label



14-2) If some problems arise about mentioned items in this document and other items, the user of the TFT-LCD module and SHARP will cooperate and make efforts to solve the problems with mutual respect and good will.

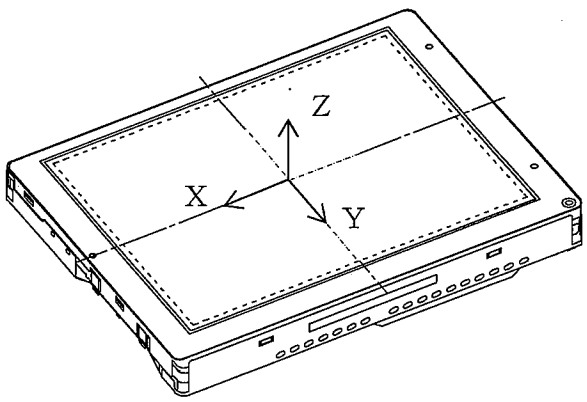
Reliability test

Table 9

No	Test items	Test conditions	
1	High temperature storage test	Ta=+70℃	240h
2	Low temperature storage test	Ta=−25℃	240h
3	High temperature and high humidity operating test	Tp=+40℃・90~95%RH	240h
4	High temperature operating test	Tp=+65℃ (Ta=+45℃)	240h
5	Low temperature operating test	Tp=0℃	240h
6	Electro static discharge test	±200V・200pF(Ω), 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 X,Y,Z 2 hours for each direction (total 6 hours) (JIS C0040, A-10 Condition A)	
9	Heat shock test	Ta = −25℃～+70℃ / 5 cycles (1h) (1h)	

【Note】 Ta = Ambient temperature Tp = Panal temperature

【Check items】 In the standard condition, there shall be no practical problem that may affect the display functions.



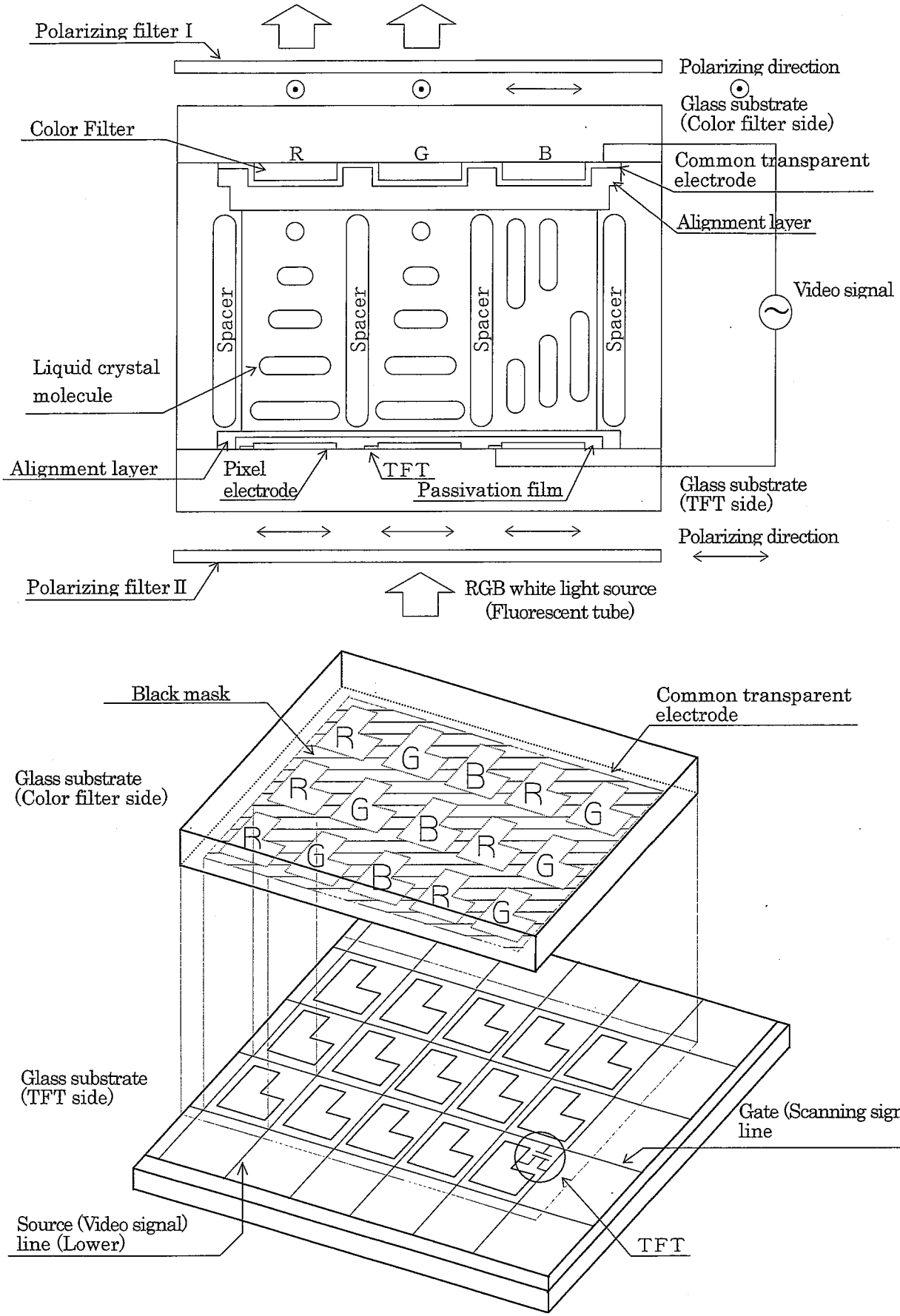
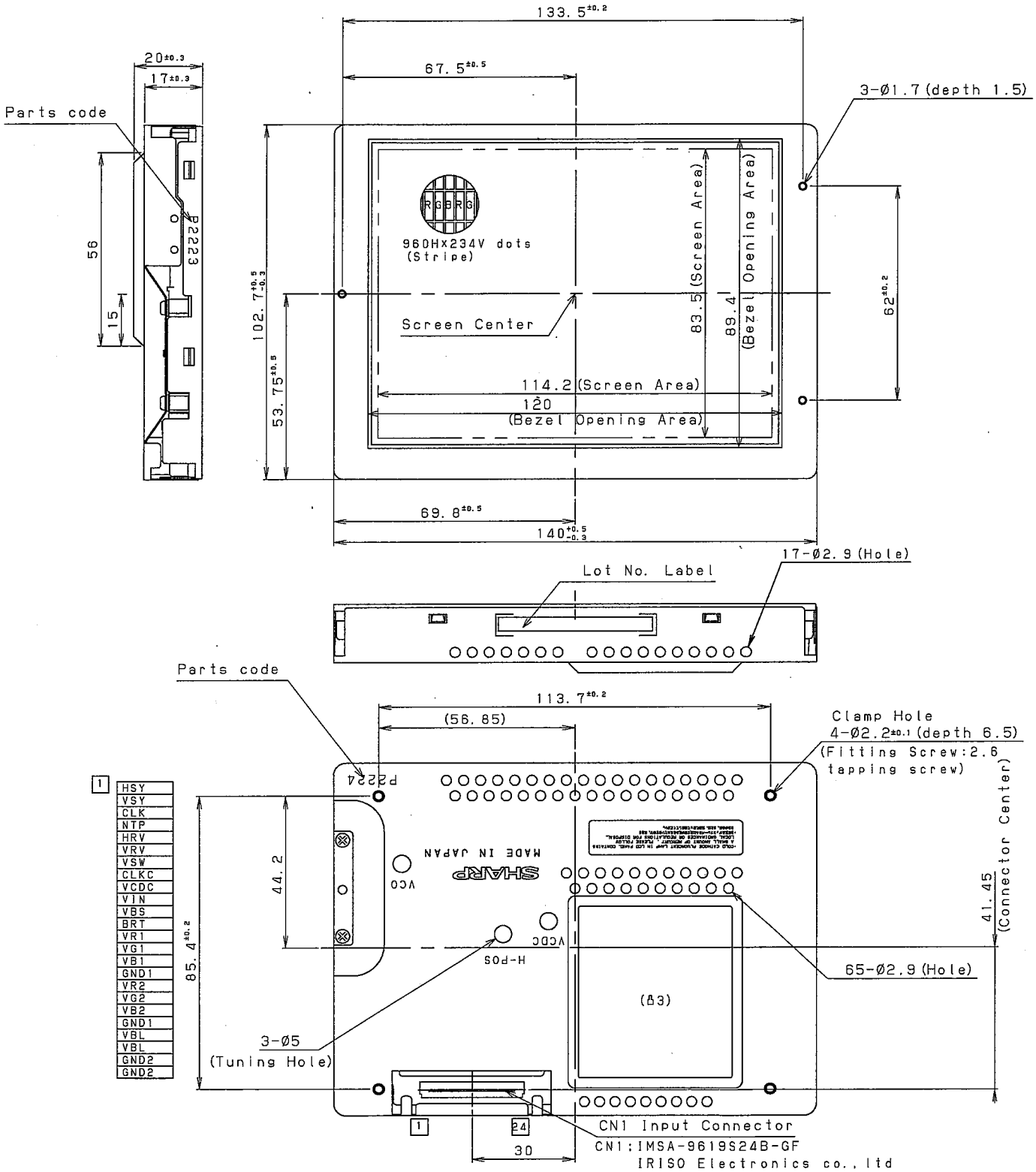


Fig.1. Illustration of TFT-LCD panel



note1) General tolerance is ±0.5

Parts	Parts Code
Case1	P2223
Case2	P2224

FIg3. OUTLINE DIMENSIONS

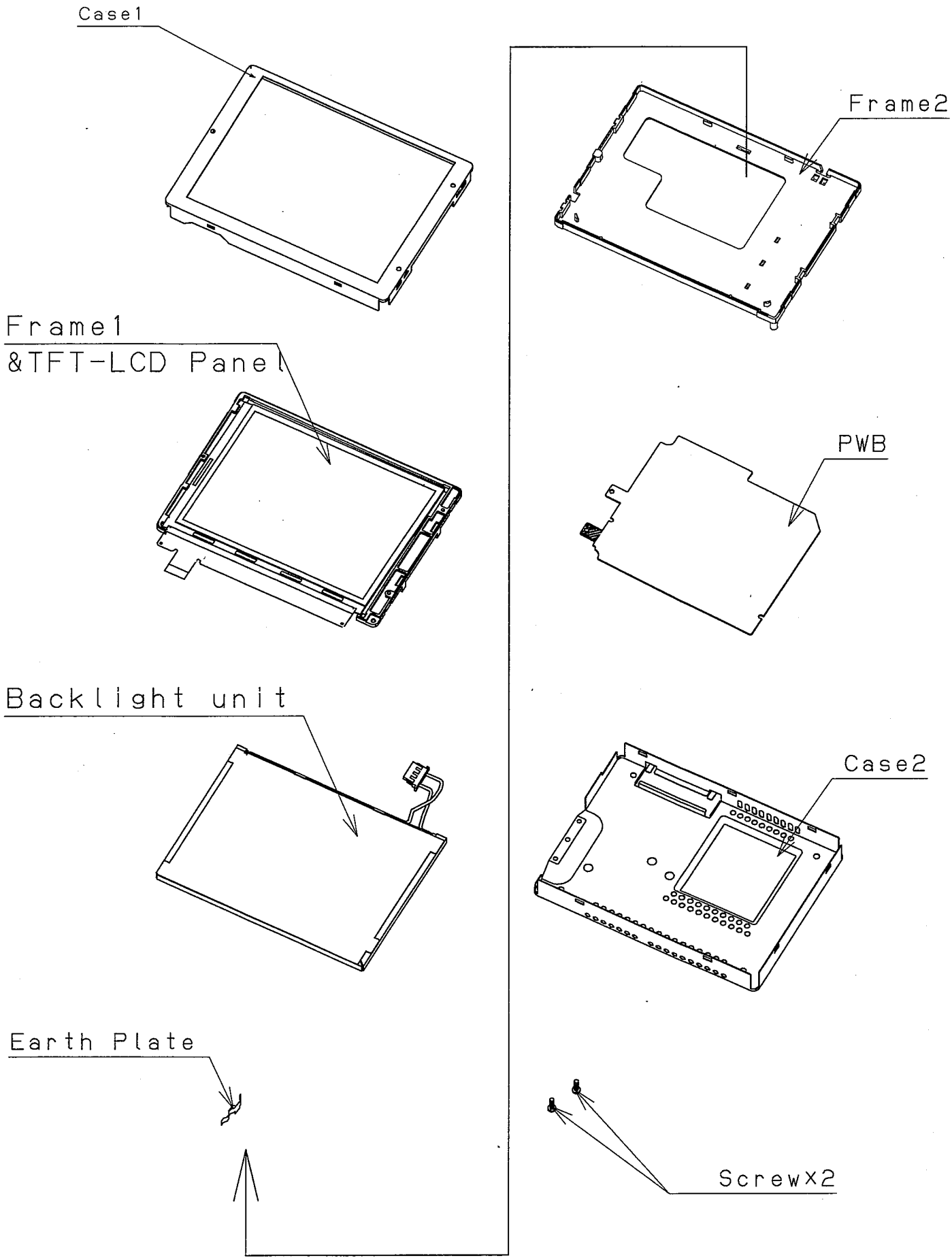


Fig.2.Construction of TFT-LCD module

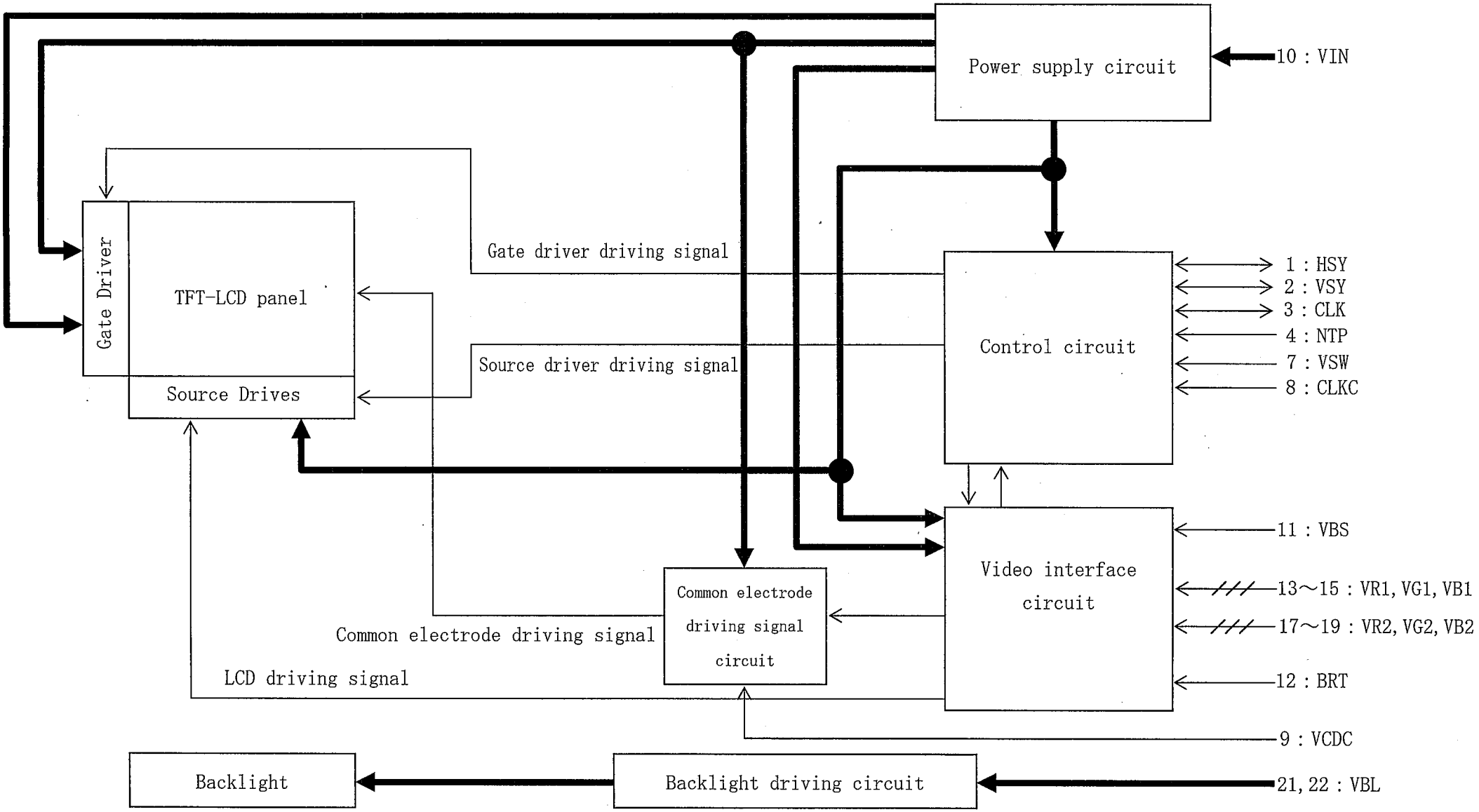


Fig.4　Circuit block diagram of the module

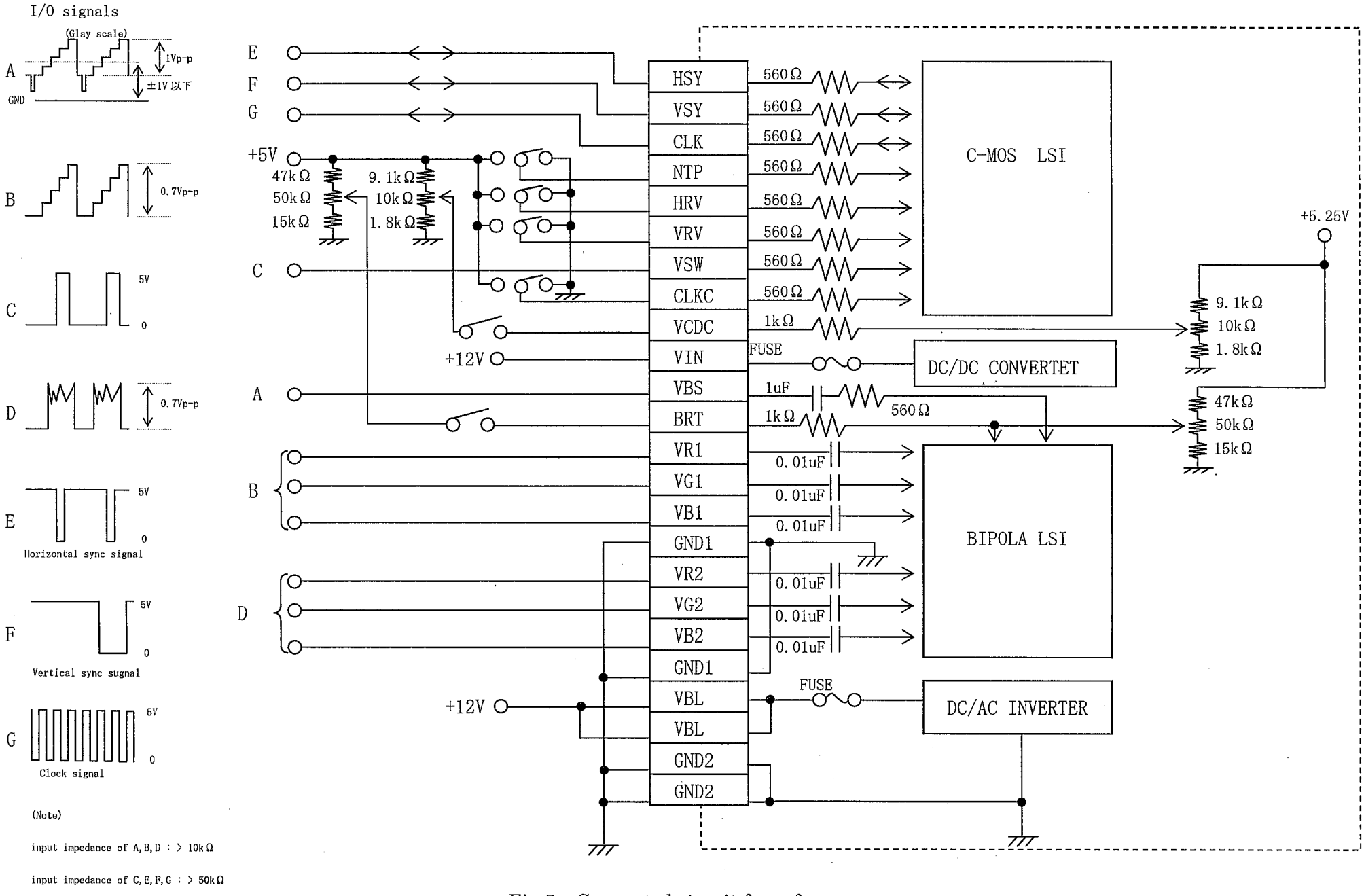


Fig.5 Connected circuit for refer

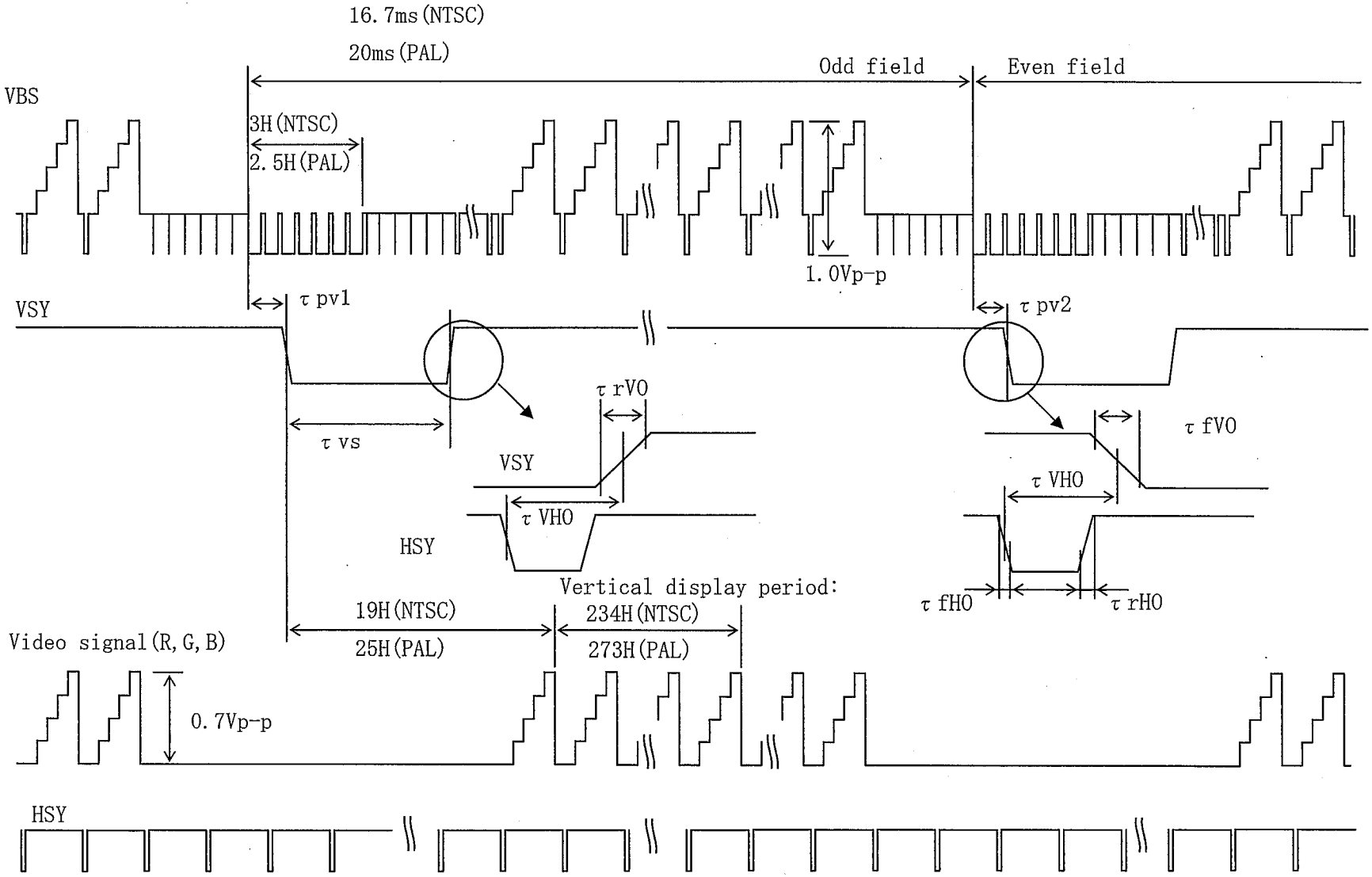


Fig.6-A　Input/Output signal waveforms (CLKC=" Hi")

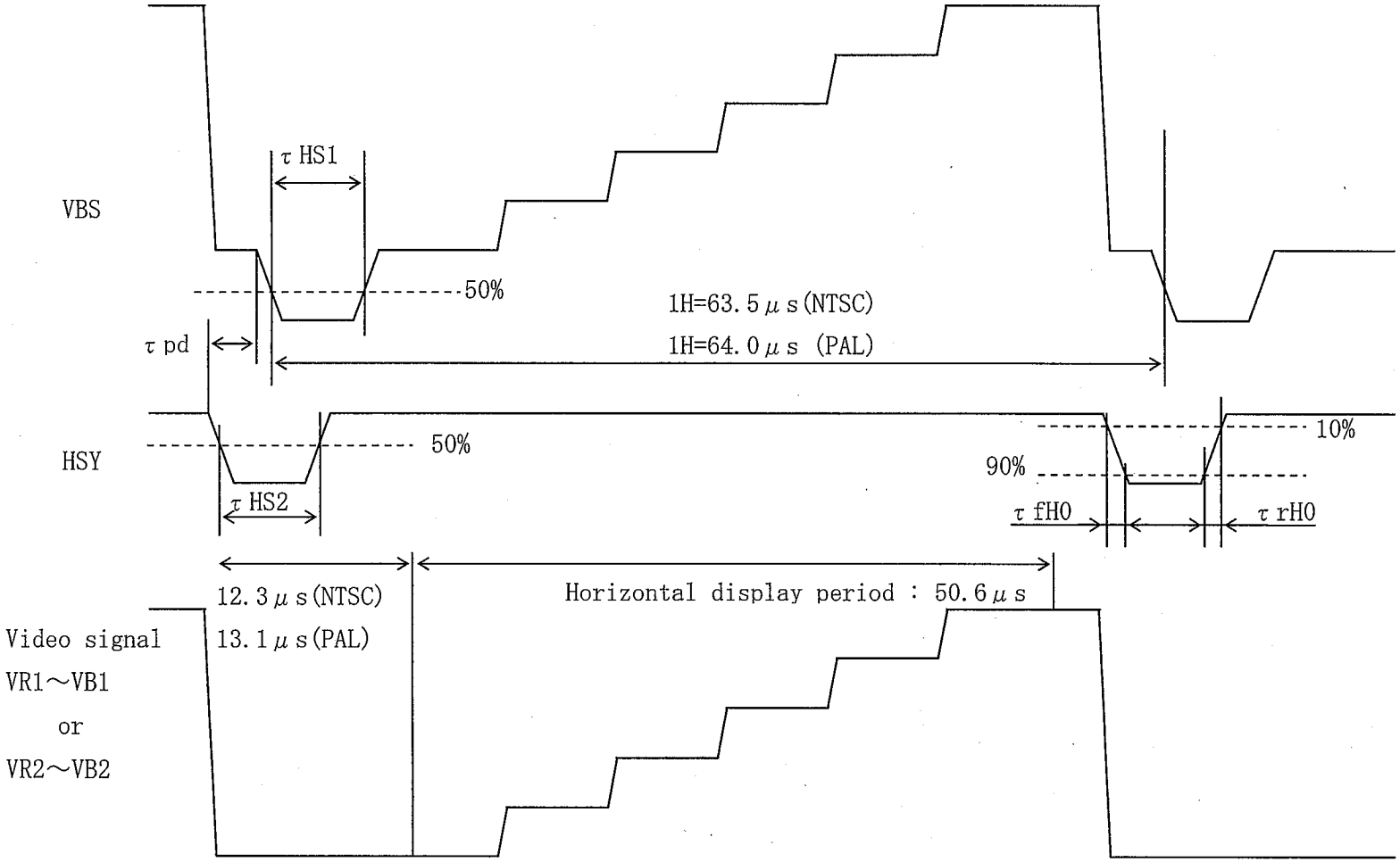


Fig.6-B　Input/Output signal waveforms (CLKC=" Hi")

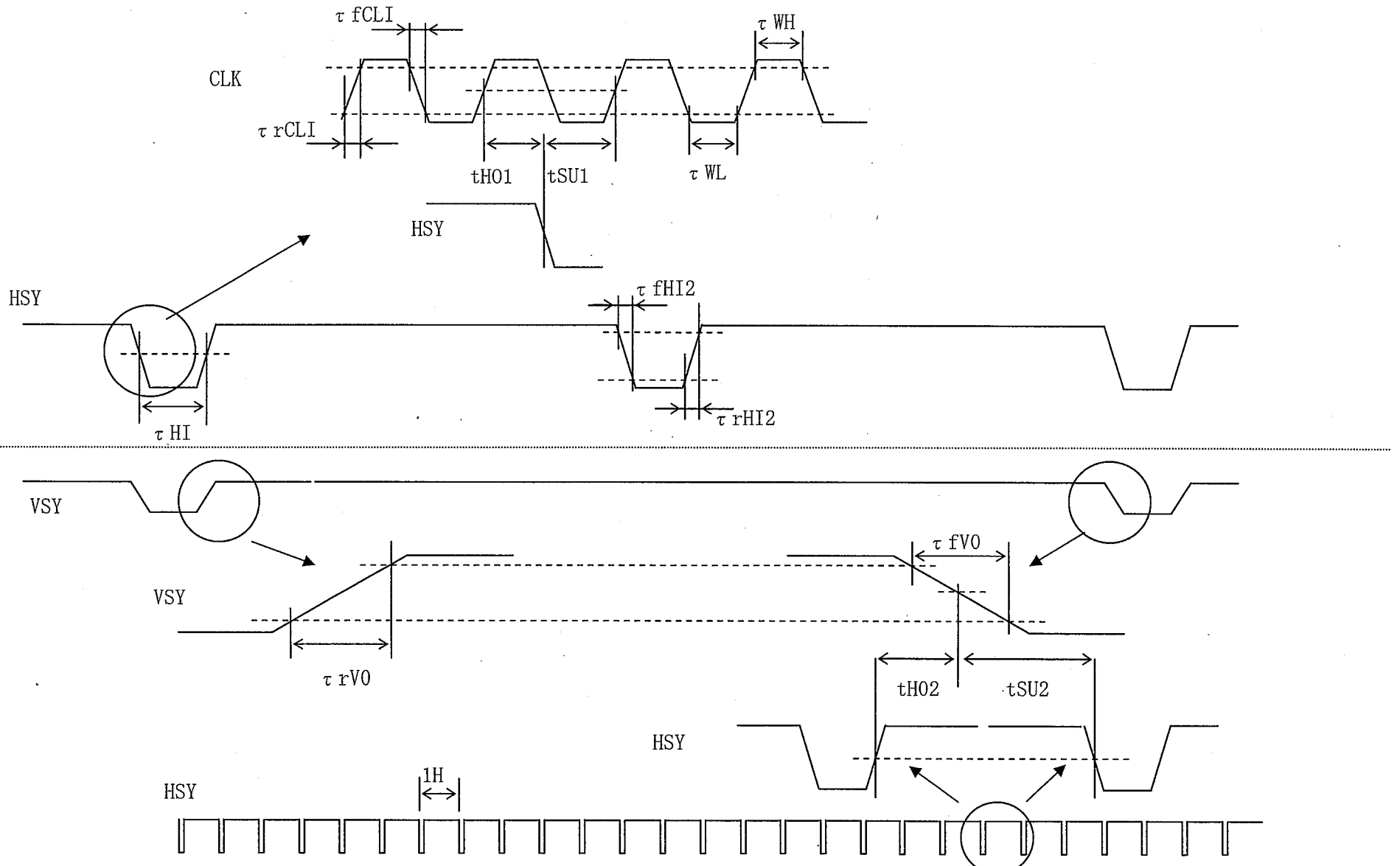


Fig.6-C Input/Output signal waveforms (external clock mode NTP=" Hi" ,CLKC=" Lo")

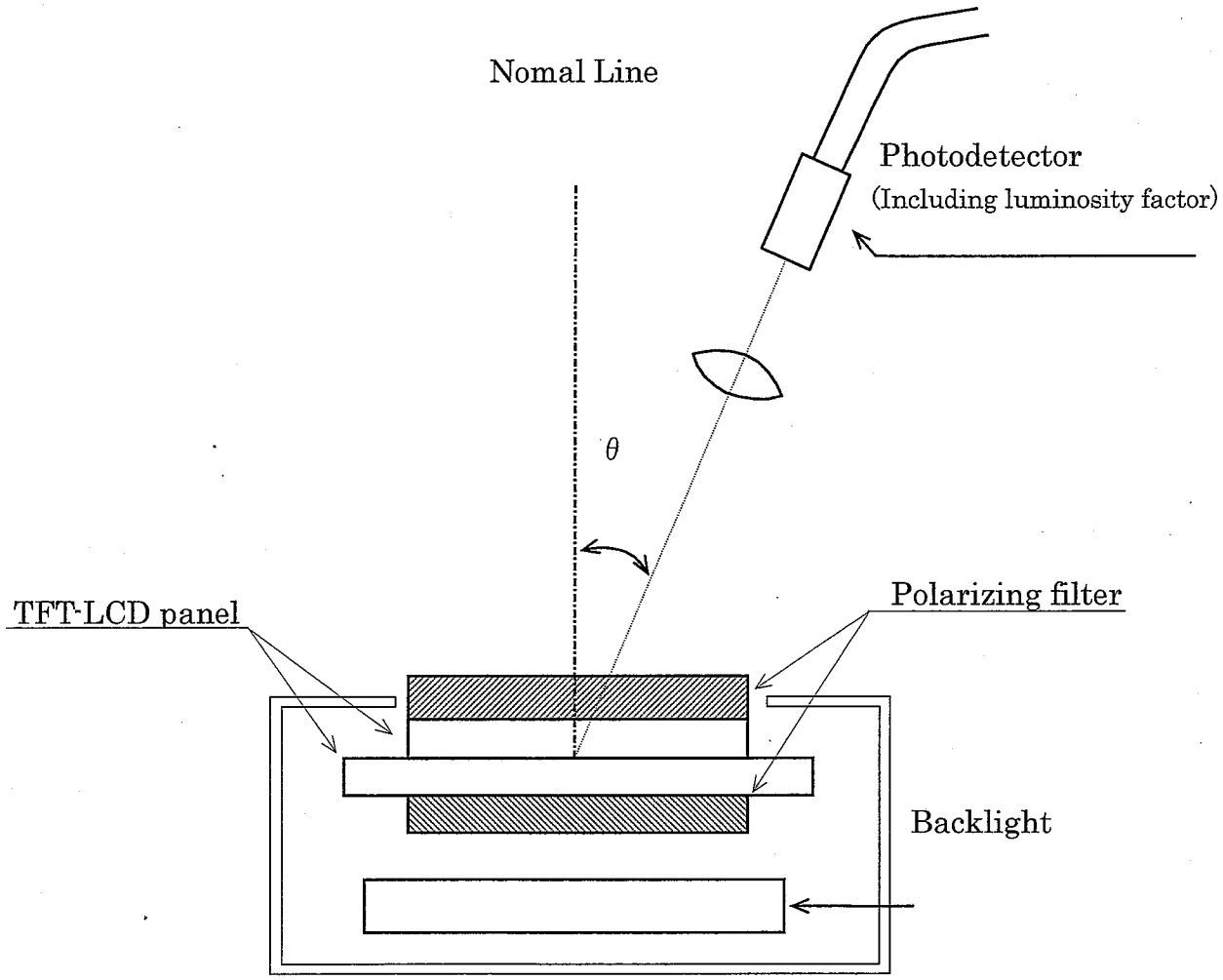
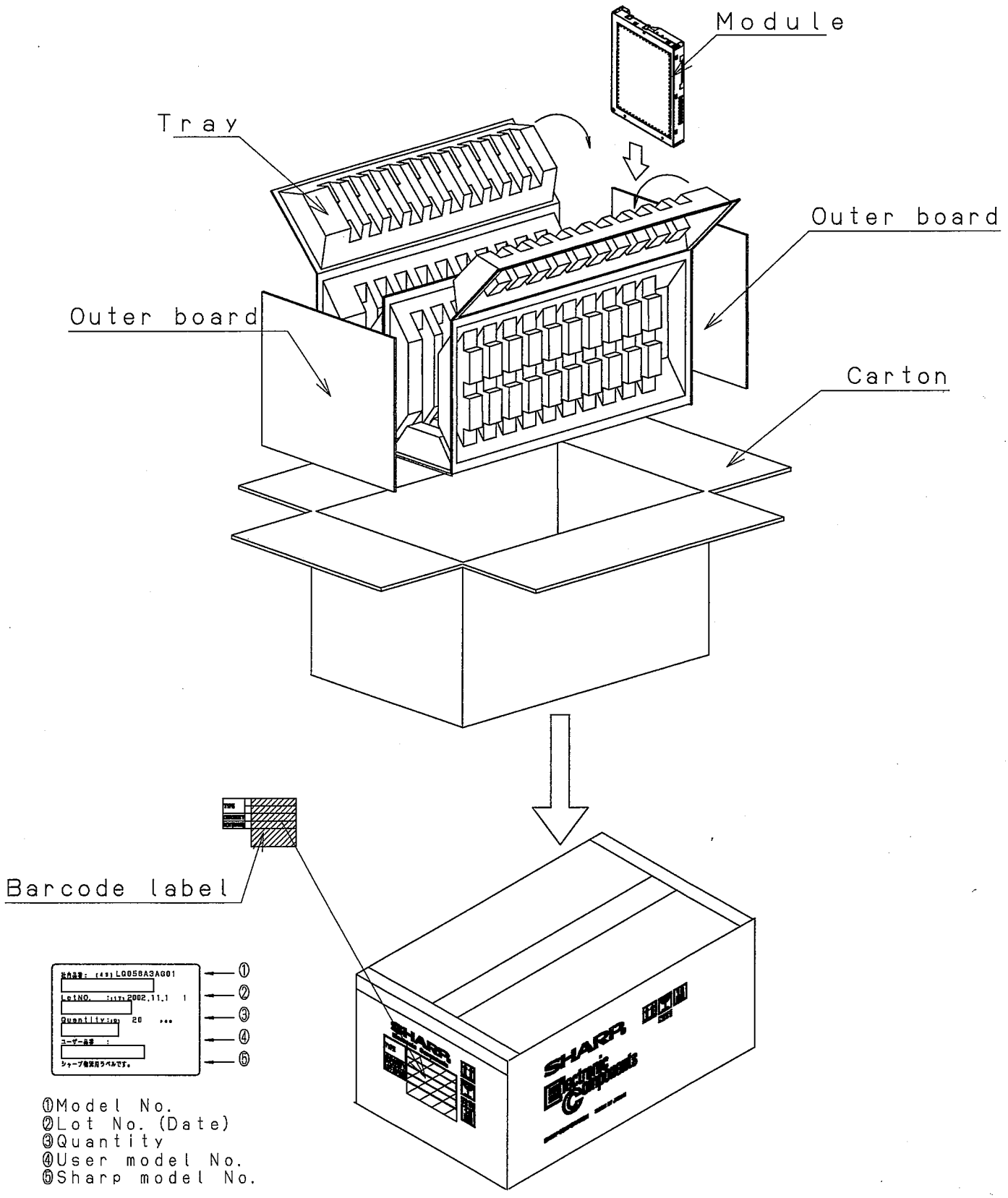


Fig.7　Optical characteristics measuring method



Maximum 20 units per 1 carton

Fig.8.Packing form

Appendix-1

Adjusting method of optimum common electrode DC bias voltage

To obtain optimum DC bias voltage of common electrode driving signal (V_{CDC}), 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 indivisuals.)

To gain optimum common electrode DC bias, there are two methods which use photo-electric devices. The value of optimum DC bias voltage is the same in both methods.

① Measurement of flicker

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

② Measurement of contrast

DC bias voltage is adjusted so as to minimize the photo-electric output voltage.

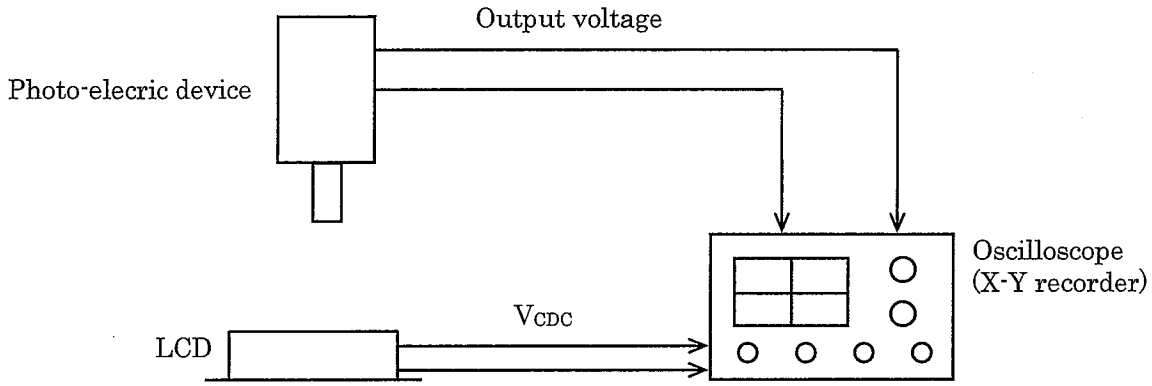
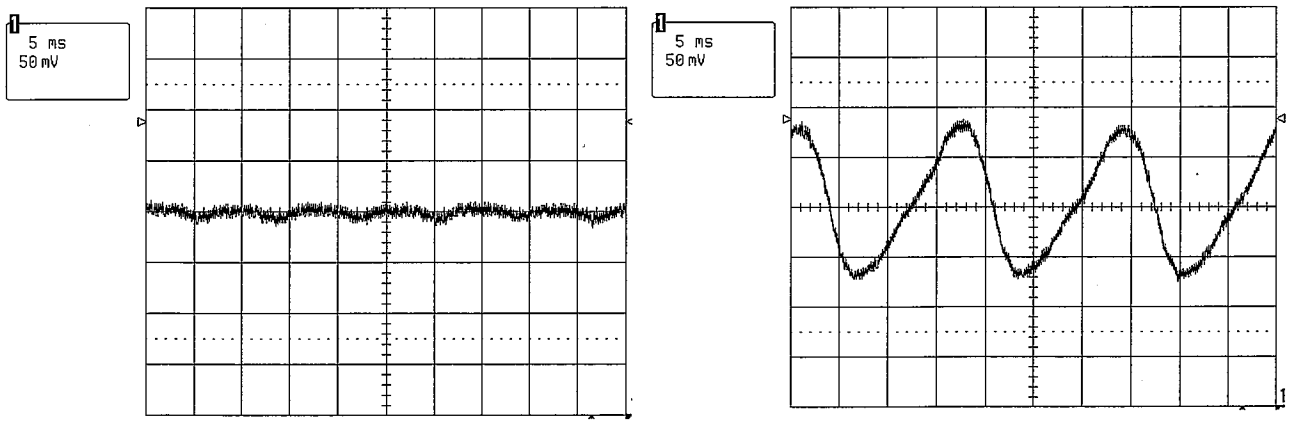


Fig.A Measurement system

[1] Measurement of flicker

Photo-electric output voltage is measured by an oscilloscope at a sytem shown in Fig.A.

DC bias voltage must be adjusted so as to minimize the NTSC:60Hz(30Hz)/PAL:50Hz(25Hz) flicker with DC bias voltage changing slowly. (Fig.B)

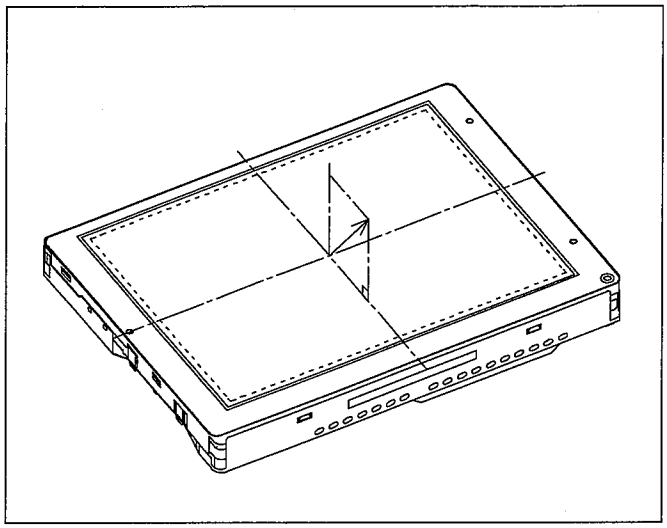


DC bias : Optimum

DC bias: Optimum + 1V

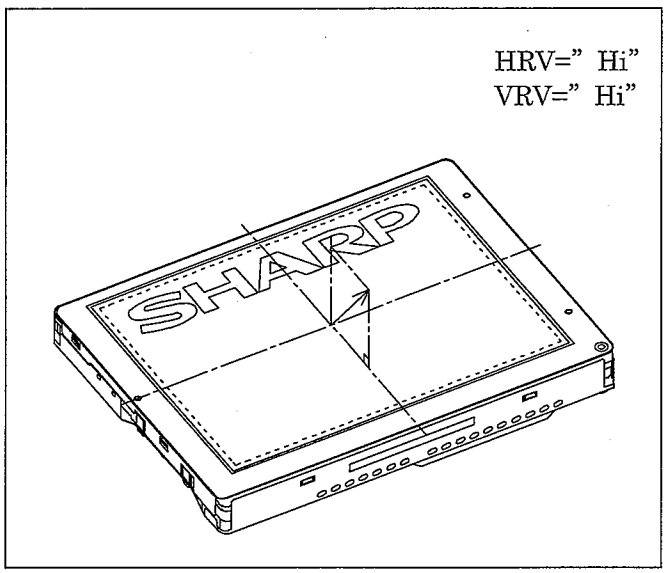
Fig.B Waveforms of flicker

(appendix-2) Electrical display rotating function
This module LQ056A3AG01 has a following optical characteristics.
And the optimum viewing angle is 6 o'clock direction.

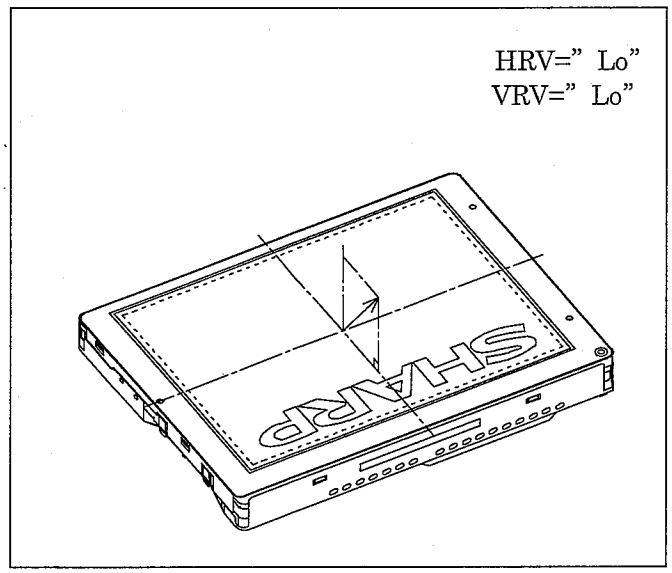


Direction of arrow : optimum viewing angle
Fig.C 6 o'clock viewing angle panel

Basically this TFT-LCD module LQ6AN102 has the 6 o'clock viewing angle panel as above.
However, it is also possible to use as 12 o'clock viewing angle type by using "Electrical display rotating function" as follows; (at this moment, it is necessary to rotate the module 180° mechanically.)



Direction of arrow : optimum viewing angle
Fig.D. 6 o'clock direction type



Direction of arrow : optimum viewing angle
Fig.E. 12 o'clock direction type

Appendix 3）

Method of replace the backlight.

1） A screw(two place) to be loosened and a case2 to be removed.

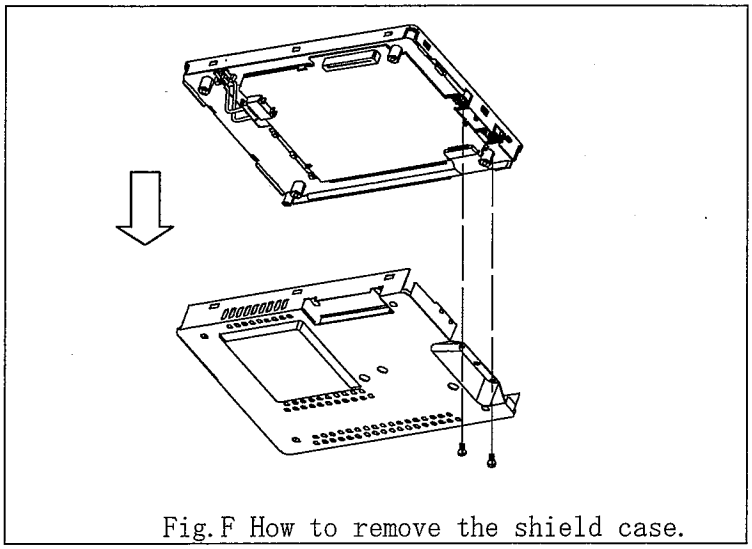


Fig. F How to remove the shield case.

2） Connected the FPC and the lamp connector to be removed from the main PWB's connector.

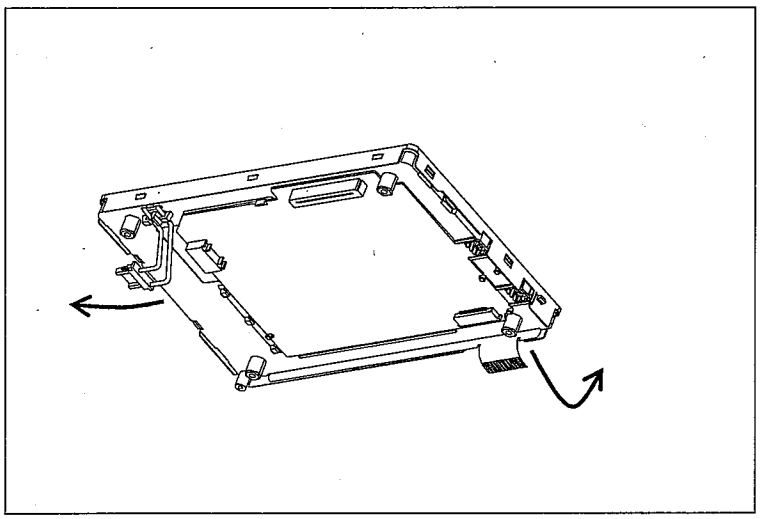


Fig. G How to remove a connector.

3） Hook A(two places) to be opened and remove the backlight case.

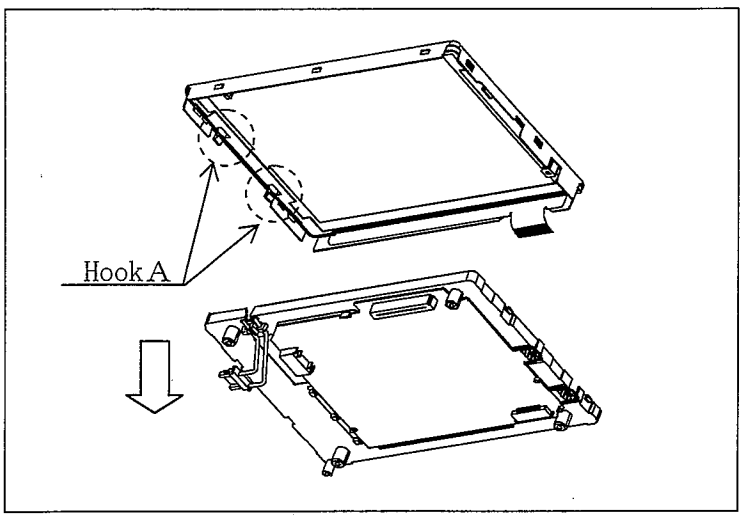


Fig. H How to remove the backlight case.

4) The backlight unit to be removed from the backlight case.

〈Caution〉 The hooks of the backlight case are hooked into the reflective case. When you removed it, please be careful not to creep the reflective case.

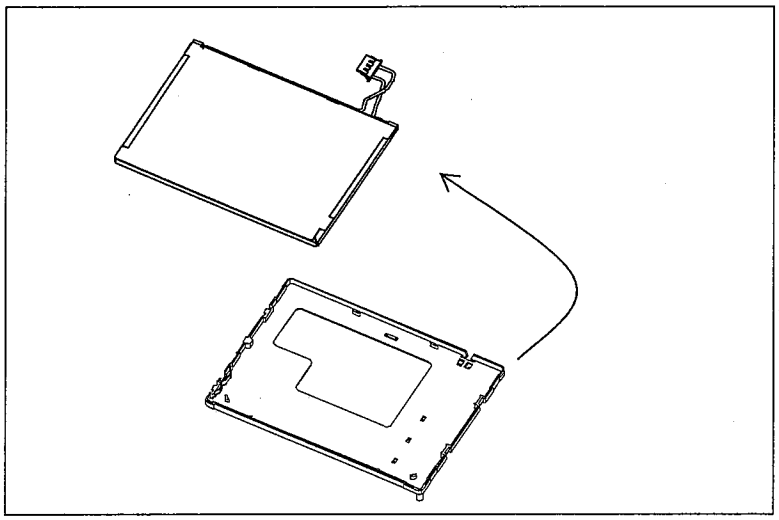


Fig. I How to remove the backlight unit.

5) After replacement, to re-assemble, please follow the reverse procedures.