DEVICE SPECIFICATION FOR

TFT - LCD module

MODEL No. LQ042T3GG01

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

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RECORDS OF REVISION

MODEL No : LQ042T3GG01

SPEC No.	Date	NO.	PAGE	SUMMARY	NOTE
LCY-03046	2003.4.1		-	-	1st Issue

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(1) Summary
This module utilizes amorphous silicon thin film transistors and a 16:9 aspect ratio. A 4.2 active matrix liquid crystal display allows full color to be displayed.
An outline of the module is given in Table 1.

(2) Features
·Utilizes a panel with a 16:9 aspect ratio, which makes the module suitable for use in wide-screen systems.
·The 4.2 screen produces a high resolution image that is composed of 74,880 pixel elements in a stripe arrangement.
·Wide viewing field angle technology is employed. (The most suitable viewing angle is in the 6 o'clock direction.)
·By adopting an active matrix drive, a picture with high contrast is realized.
·Reflection due to external light is minimized through the use of a low reflection, black matrix and an antiglare (AG) plate.
·A thin, light and compact module is accomplished through the use of COG mounting technology.
·By adopting a high aperture panel, high transmittance color filter and high transmittance polarizing plates, transmittance ratio is realized.

(3) Structure and External Shape
External measurements for the module are given in Fig. 1, and the structure of the module is shown in Fig. 2.
The module is composed of the TFT-LCD panel, drivers, frame, backlight, sealed front case, and sealed back case.

(4)Mechanical specifications
table 1

Parameter	Specifications	Units	Remarks
Display format	224,640	pixels	
	960(W)×234(H)	dots	
Active area	93.1 (W) ×52.4 (H)	mm	
Screen size (Diagonal)	10.7 [4.2"]	cm	
Dot pitch	0.097 (W) ×0.224 (H)	mm	
Pixel configuration	R,G,B Stripe configuration		
Outline dimension	111.2(W)×70.1(H)×7.3(D)	mm	[Note1-1]
Mass	85 (max)	g	

[Note1-1]　Typical values are given. For detailed measurements and tolerances, please refer to Fig. 1.

(5)Input / Output terminal
5-1)TFT-LCD panel driving part
table 2

(H i ＝VSH、 L o ＝GND)

Pin No.	Symbol	i/o	Description	Remarks
1	VGH	i	Power supply for gate driver(High level).	
2	VCC	i	Power supply for logic circuit in gate driver.	
3	MO 1	i	Control signal for gate driver.	【Note 2-1】
4	VRV	i	Switching signal of scanning direction for gate driver.	【Note 2-2】
5	SPS	i	Start signal for gate driver.	
6	CLS	i	Clock signal for gate driver.	
7	VSS	i	Power supply for logic circuit in gate driver(Low level).	
8	VGL	i	Power supply for gate driver(Low level).	
9	COM	i	Common electrode driving signal	
10	CLD	i	Clock signal for source driver.	
11	SPIO	i	Start signal for source driver.	
12	CTR	i	Control signal for source driver.	【Note2-3】
13	OPEN	—	Open	
14	OPEN	—	Open	
15	HRV	i	Switching signal of scanning direction for source driver.	【Note2-2】
16	OPEN	—	Open	
17	CS	i	Capacity supplement driving signal	
18	MO 2	i	Control signal for gate driver.	【Note2-1】
19	VG	i	Color video signal (Green)	
20	VR	i	Color video signal (Red)	
21	VB	i	Color video signal (Blue)	
22	VSH	i	Power supply for source driver(High level).	
23	GND	i	Ground	
24	OPEN	—	Open	
25	OPEN	—	Open	
26	OPEN	—	Open	
27	OPEN	—	Open	
28	GND	i	Ground	
29	SPOI	i	Start signal for source driver.	
30	OPEN	—	Open	
31	OPEN	—	Open	
32	OPEN	—	Open	

【Note 2-1】　　　Refer to 7-7)
【Note 2-2】　　　Refer to 7-4)
【Note 2-3】　　　Refer to 7-5)

5-2) Backlight fluorescent tube driving part

terminal	No.	Symbol	i/o	Function	Remarks
CN1	1	VL1	i	Input terminal　(high voltage side)	
	2	NC	—	Non connection	
	3	VL2	i	Input terminal　(low voltage side)	【Note3-1】

【Note3-1】　　　Connect the low voltage side of the DC/AC inverter used to drive the
fluorescent tube to GND of the inverter circuit.

(6)Absolute maximum ratings
table 3　　　　　　　　　　　　　　　　　　　　　　　　　　GND＝0 V

Parameter			Symbol	MIN	MAX	Unit	Note
Positive power supply voltage			VSH	-0.3	+6.0	V	Ta＝25℃
Power supply for gate driver	TFT driving circuit	High level	VGH	-0.3	+33.0	V	〃
		Low level	VGL	VGH-33.0	VGH+0.3	V	〃
	Logic circuit	High level	VCC	VSS-0.3	VSS+0.7	V	〃
		Low level	VSS	VGH-33.0	VGH+0.3	V	〃
Analog input signals　[terminal 4-1]			VIA	-0.3	VSH+0.3	V	〃
Digital input signals　[terminal 4-2]			VID	-0.3	VSH+0.3	V	〃
Common electrode driving signal			VCDC	-4	+6	V	〃
Storage temperature			Tstg.	-25	70	℃	【Note 4-1,2】
Operating temperature　(panel surface)			Topr1	0	70	℃	【Note 4-1,2,3】
Operating temperature (Ambient temperature)			Topr2	0	50	℃	【Note 4-4】

[terminal 4-1]VR，VG，VB
[terminal 4-2]CLD，SPIO，SPOI，CTR，HRV，VRV，MO2，MO1，SPS，CLS
[terminal 4-3]HSY，FRPT，FRPV，VCS，VSY，CLK，PWM，TST

【Note 4-1】　　This rating applies to all parts of the module and should not be exceeded.
【Note 4-2】　　Maximum wet-bulb temperature is 58℃.　Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

【Note 4-3】　　The operating temperature only guarantees operation of the circuit. For contrast, speed response, and other factors related to display quality, determine operating temperature using the formula Ta=＋25℃
【Note 4-4】　　Ambient temperature when the backlight is lit (reference value).

(7)Electrical characteristics
　7-1)Recommended operating conditions
　　A)TFT-LCD panel driving section
　　table 4　　　　　　　　　　　　　　　　　GND＝0 V，Ta＝25℃

Parameter			Symbol	MIN	TYP	MAX	Unit	Remarks
Power supply for source driver			VSH	+5.0	+5.3	+5.5	V	【Note5-1】
Power supply for gate driver	TFT driving circuit	High level	VGH	+12.5	+13.0	+13.5	V	
		Low level AC	VGLAC	±0.5	±3.9	±5.0	Vp-p	
		DC	VGLDC	-9.5	-10.0	-10.5	V	
	Logic circuit	High level	VCC	-10.4	-10.9	-11.4	V	
		Low level	VSS	-15.5	-16.0	-16.5	V	
Analog input signal [Terminal 2－1]	AC component		VIAC	∓2.0	-	±2.0	V	【Note5-2】
	DC component		VIDC	VSM-0.1	VSM	VSM+0.1	V	【Note5-3】
Digital input signal [Terminal 2－2]	High level		VIDSH	VSH-1.0	-	VSH	V	
	Low level		VIDSL	0	-	1.0	V	
Digital input current [Terminal 2－2]	High level		IIDSH	-	-	1.0	μA	VIDSH=VSH
	Low level		IIDSL	-	-	1.0	μA	VIDSL=0V
Digital input voltage [Terminal 2－3]	High level		VIDGH	VSH-1.0	-	VSH	V	
	Low level		VIDGL	0	-	1.0	V	
Digital input current [Terminal 2－2]	High level		IIDGH	-	-	1.0	μA	VIDGH=VSH
	Low level		IIDGL	-	-	1.0	μA	VIDGL=0V
Common electrode driving signal	AC component		VCAC	±0.5	±3.9	±5.0	Vp-p	【Note 5-1,5-4】
	DC component		VCSDC	+0.5	+2.0	+3.5	V	
Capacity supplement driving signal	AC component		VCSAC	±0.5	±3.9	±5.0	Vp-p	
	DC component		VCSDC	-4.4	-4.9	-5.4	V	

Cautionary Matter: When applying or disconnecting power, please be sure that such action is simultaneously carried out for all power supplies. In addition, apply input signals only after power has been turned on.

ON ⋯ VSH→VSS→VCC→VGL→VGH   OFF ⋯ VGH→VGL→VCC→VSS→VSH

[terminal 2-1]VR, VG, VB

[terminal 2-2]CLD, SPIO, SPOI, CTR, HRV

[terminal 2-3]MO2, MO1, VRV, SPS, CLS

【Note5-1】 Any change in voltage after adjusting VCDC should be less than 0.1 V.

【Note5-2】 Positive and negative amplitudes should be equal. When the AC input voltage is −／＋, FRPV and T are in phase. When the AC input voltage is ＋／−, FRPV and T are 180° out of phase. The MIN value produces a white display, and the MAX value produces a black display.

【Note5-3】 VSM=VSH/2.
Any change in voltage after adjusting VCDC should be less than 0.1 V.

【Note5-4】 To obtain the maximum value of contrast, each module must be adjusted to an optimum voltage.

B)Backlight driving section

table 5

Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
Lamp voltage	VL	540	600	660	Vrms	IL=4.0mArms
Lamp current	IL	3.5	4.0	4.5	mArms	Normal Condition
Lamp frequency	FL	40	-	80	kHz	Normal Condition
Kick-off voltage	VS	-	-	1170	Vrms	25℃,22pF,50kHz
		-	-	1270	Vrms	-10℃,22pF,50kHz
Life time		10000	-	-	Hour	IL=4.0mArms Ta=25℃,constant

(Inverter : HIU−288 Harison Electric co. Ltd.)

7-2)Electrical characteristics

table 6 V_{SH}=5.3V,V_{GH}=13.0V,V_{CC}=-10.9V,V_{SS}=-16.0V,V_{GLDC}=-10.0V,V_{GLAC}=±3.9V,GND=0V,Ta=25℃

	Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
S O U R C E	Operating Clock frequency	f_{CLD}	-	-	5.0	MHz	CLD
	High level clock width	t_{WHC}	80.0	-	-	ns	
	Low level clock width	t_{WLC}	80.0	-	-	ns	
	Clock rise time	t_{rD}	-	-	20.0	ns	
	Clock fall time	t_{fD}	-	-	20.0	ns	
	Data set up time	t_{SUD}	30.0	-	-	ns	SPIO,SPOI
	Data hold time	t_{HD}	30.0	-	-	ns	
	High level pulse width	t_{WHD1}	0.4			μs	
	Pulse rise time	t_{rP}			30	ns	
	Pulse fall time	t_{fP}			30	ns	
G A T E	Operating Clock frequency	f_{CLS}	-	-	80.0	kHz	CLS
	Minimum clock pulse with	t_{WHS}	0.5	-	-	μs	
	Clock rise time	t_{rCL}	-	-	100.0	ns	
	Clock fall time	t_{fCL}	-	-	100.0	ns	
	Data set up time	t_{SUS}	100.0	-	-	ns	CLS
	Data hold time	t_{HS}	300.0	-	-	ns	SPS
	Mode set up time	t_{SUM}	300.0	-	-	ns	CLS、MO2
	Pulse rise time	t_{rs}	-	-	100	ns	SPS
	Pulse fall time	t_{fs}	-	-	100	Ns	

7-3)Input signal timing chart
　　　Refer FIG.4

7-4)Signal for reverse scanning
　　　table 7

Mode	HRV	VRV
Normal mode	Hi	Hi
Right/Left reverse mode	Lo	Hi
Up/Down reverse mode	Hi	Lo
Right/Left & Up/Down reverse mode	Lo	Lo

　　　caution)　　Lo=GND　,　Hi=VSH

7-5)CRT terminal
This is control signal of switching sample holder circuit. Please set the high or low level synchronizing with SPD signal during the period each horizontal line.
※　　　High level = VSH, Low level = GND

7-6) Current dissipations
　　　table8　　　　　　　　　　　　　　　　　　　　　Ta＝25℃

Parameter		Symbol	Conditions	MIN	TYP	MAX	Unit
Current for source driver	Hi	I_{SH}	$V_{SH}=+5.3V$	-	24	40	mA
Current for gate driver	Hi	I_{GH}	$V_{GH}=+13.0V$	-	0.1	1.0	mA
	Lo	I_{GL}	$V_{GLDC}=-10.0V$	-	0.1	1.0	mA
	Logic	I_{CC}	$V_{CC}=-10.9V$	-	0.1	1.0	mA
		I_{SS}	$V_{SS}=-16.0V$	-	0.1	1.0	mA
Lamp power consumption		WL	Normal driving	-	3.6	-	W

　　Condition : CLS=15.73kHz, the SPS=60Hz, the SPD=15.73kHz and the CLD=3.99MHz

　　　　　　In case of using exclusive control-IC (LZ9GHXX) and inputting standard NTSC

　　　　　　signal.

7-7)Signal for control of gate driver ［MO 1、MO 2］
　　　　　　table 9

MO 1	MO 2	Outputting mode
H i	H i	Normal mode （1 line writing）
L o	H i	Out of use
H i	L o	2 line same time writing mode
L o	L o	No outputting

　　Coition)　Lo=GND　,　Hi=VSH

(8)Optical characteristics

Table 12   Ta=25℃

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing angle range		$\triangle\theta11$	CR≧5	60	65	-	° (degree)	【Note 6-1,2,3】
		$\triangle\theta12$		35	40	-	° (degree)	
		$\triangle\theta2$		60	65	-	° (degree)	
Contrast ratio		CRmax	Optimal	60	-	-		【Note 6-2,3】
Response time	Rise	τr	$\theta=0°$	-	30	60	ms	【Note 6-2,4】
	Fall	τd		-	50	100	ms	
Luminance		Y	IL=4.0mArms	240	350	-	cd/m²	【Note 6-5】
White chromaticity		x	IL=4.0mArms	0.263	0.313	0.363		【Note 6-5】
		y	IL=4.0mArms	0.279	0.329	0.379		
lamp life time	+25℃	-	continuation	10,000	-	-	hour	【Note 6-6】
	-30℃	-	intermission	2,000	-	-	time	【Note 6-7】

DC/AC inverter for external connection shown in following.
　　　Harison Co.: HIU-288
※measuring after 30minutes

Photodetector(including luminosity facter)

TFT-LCD Module

LCD panel

Center　　DC/AC inverter driving frequency : 49kHz
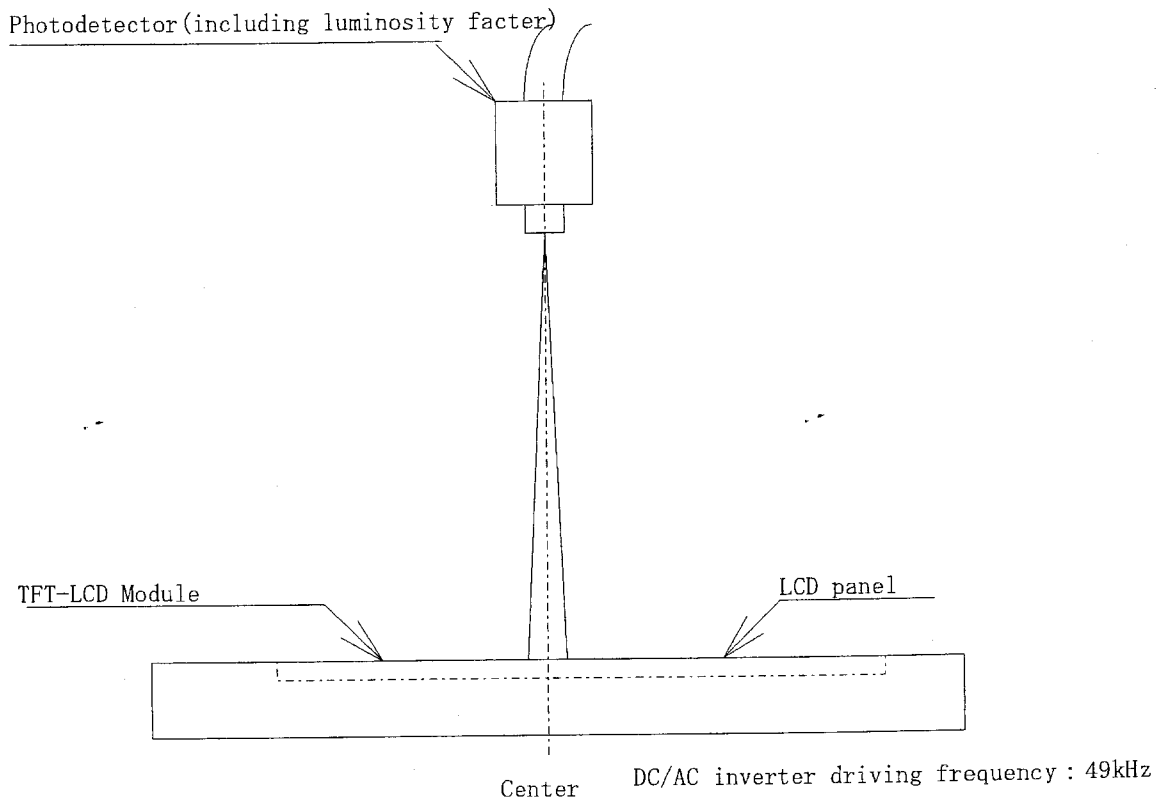
mesuring method for optical characteristics

【Note 6-1】 Viewing angle range is defined as follows.

definition for viewing angle
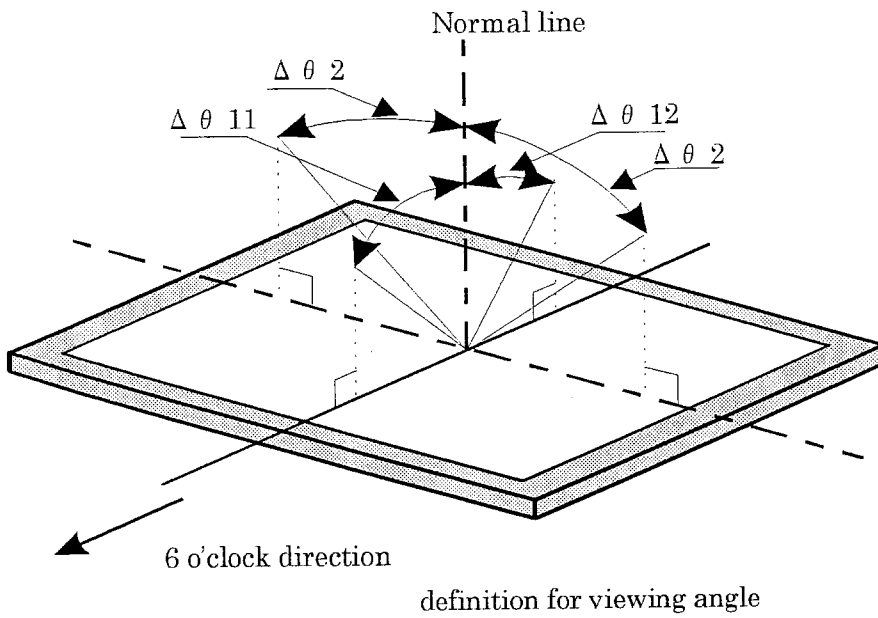
【Note 6-2】 Applied voltage condition:
  (1) VCDC is adjusted so as to attain maximum contrast ratio.
) Input ±1.90V at VIAC.
      When VI50= transmission is 50% at Voltage-Transmission curve,
      Black level : Vi50=±2.5V, White level :Vi50 = ∓ 1.5V

【Note 6-3】 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 6-4】 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".
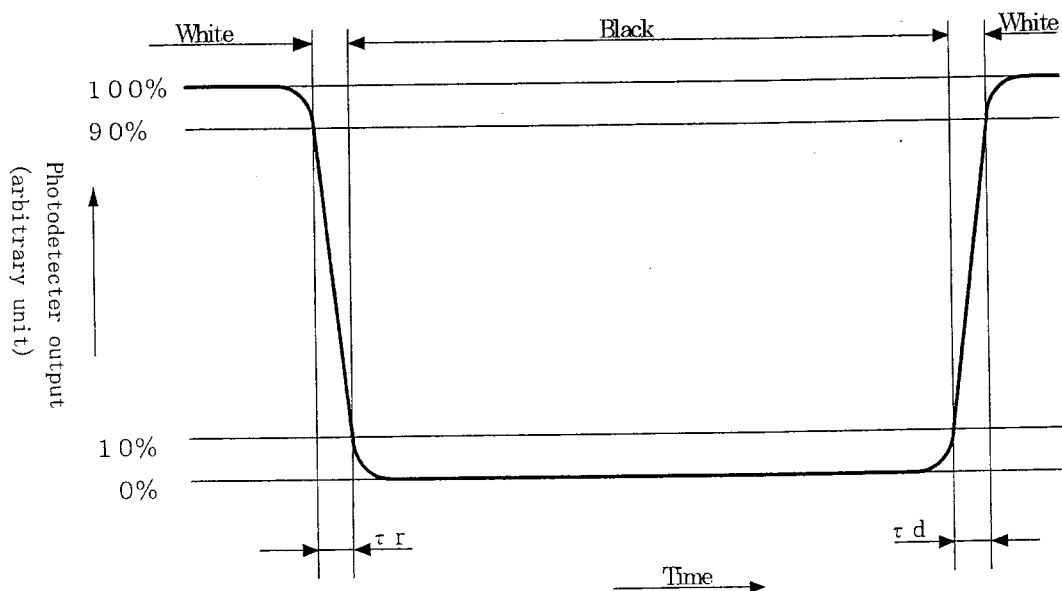
【Note 6-5】 Measured on the center area of the panel at a viewing cone 1° by
TOPCON luminance meter BM-7.(After 10 minutes operation)
DC/AC inverter driving frequency:49kHz

【Note 6-6】 Lamp life time is defined as the time when either or occurs in the
continuous operation under the condition of lamp current IL=3~7mArms
and PWM dimming 100%~5% (Ta=25℃)
Brightness not to become under 50% of the original value.

【Note 6-7】 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.

Ambient temperature:-30℃

HIGH(9mArms)

OFF

5min 5min 5min 5min
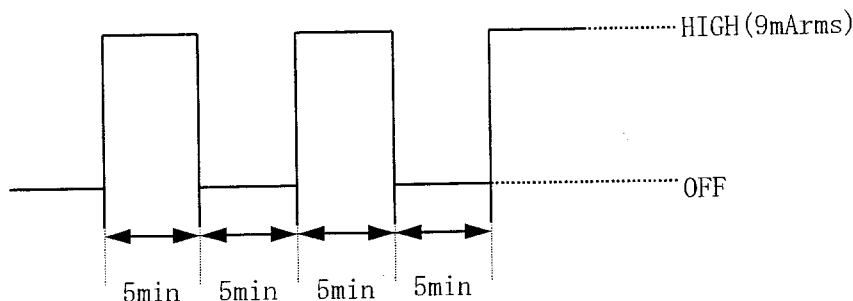
(9)Mechanical characteristics
9-1) External appearance
Do not exist extreme defects. (See Fig. 1)

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) I/O connector performance
A)Input/output connectors for the operation of LCD module
1)Applicable FPC   : FCI:SFR32R-1ST
2)FPC flexibility : I. Slit on the film cover lay
If it had been tested bending under radius 0.6 mmR and bending angle 90
degrees condition, the FPC should not be cut at 30 times in or less.
II. Slit on the film cover lay coat part of one side printing
If it had been tested bending under radius nothingness and bending angle
180degrees, the FPC should not be cut.
(It should be bend by hand and only at once).

B)I/O connector of backlight driving circuit 【JST】

Symbol	Used Connector	Corresponding connector
CN1	BHR-03VS-1	SM02(8.0)B-BHS-TB (assembled on PWB)
		BHMR-03V (interconnecter)

(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 be sure to fix the module on the same plane, taking care not to wrap
or twist the module.
Don't reach the pressure of touch-switches of the set side to a module directly, because images
may be disturbed.
Please power off the module when you connect the input/output connector.
Please connect the metallic shielding cases of the module and the ground pattern of the
inverter circuit surely. If that connection is not perfect, there may be a possibility
that the following problems happen.
a). The noise from the backlight unit will increase.
b). The output from inverter circuit will be unstable.   Then, there may be a possibility
that some problems happen.
c). In some cases, a part of module will heat.

11-2) Precautions in mounting
Polarizer which is made of soft material and susceptible to flaw must be handled
arefully. Protective film (Laminator) is applied on the surface to protect It against scratches
and dirts. It is recommended to peel off the laminator immediatery before the use,
taking care of static electricity.
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 form 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.
b) Attach adhensive tape to the laminator part near discharging blower
so as to protect polarizer against flaw.
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.
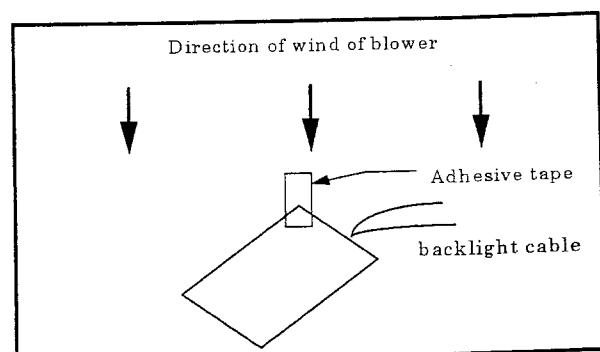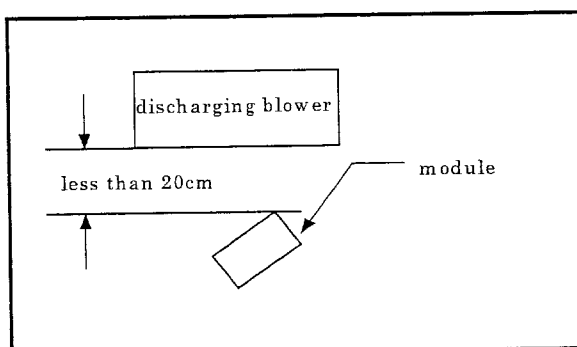
e) Method of removing dust from polarizer

· Blow off dust with N2 blower for which static electricity preventive measure has been taken.
Ionized air gun (Hugle Electronics Co.) is recommended.
· 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.
When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth. For stubborn dirts, wipe the part, breathing on it.
Wipe off water drops or finger grease immediately. Long contact with water may cause discoloration or spots.
TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Handle with care.
Since CMOS LSI is used in this module, take care of static electricity and earth your body when handling.

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
① Do not expose the module to direct sunlight or intensive ultraviolet rays for many hours;
liquid crystal is deteriorated by ultraviolet rays.
② Store 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.
③ The 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.
④ 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.
⑤ Observe all other precautionary requirements in handling general electronic components.
⑥ Please adjust the voltage of common electrode as material of attachment by 1 module.

(12) Shipping form
12- 1)Packing form (Refer Fig.5)

12- 2) Carton keeping conditions
· ①The cartons can be piled up maximum 12 layers.
②Environments

Temperature	:	0 ~ 4 0 ℃
Humidity	:	6 0 ％R H or less (at 4 0 ℃)
		No dew condensation at low temperature and high humidity.
Atmosphere	:	Harmful gas such as acid or alkaline that bites electronic components and/or wires, must not be detected.
Periods	:	About 3 months
Opening of the package		: In order to prevent the LCD module from breakdown by

electrostatic charges, please control the humidity over 50%RH

and open the package taking sufficient countermeasures against

electrostatic charges, such as earth, etc..

(13) Reliability test

table 13

Remark) Temperature condition is based on operating temperature conditions No. (6) − table5-1.

| No.	Test items	Test condition
1	High temperature strong test	Ta = +70℃ 240h
2	Low temperature strong test	Ta = -25℃ 240h
3	High temperature and high humidity operation test	Ta = +40℃, 90～95%RH 240h
4	Hi temperature operating test	Tp = +70℃ 240h
5	Low temperature operating test	Ta = 0℃ 240h
6	Electro static discharge test	±200V・200pF (0Ω) 1 time for each terminals
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 :8～33.3Hz Stroke : 1.3mm Sweep : 33.3Hz～400Hz Acceleration : 28.4m/s² Cycle : 15 minutes X, Z 2 hours for each directions, 4 hours for Y direction (total 8 hours) 【caution】 (JIS D1601)
9	Heat shook test	-25℃ ～ +70℃ / 5 cycles (1 h) (1 h)

【Note】 Ta = Ambient temperature, Tp = Panel temperature

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

【It is the goal specification with a mass production article, and there also is an item which you are not satisfied of this condition in a prototype level.】

【caution】 X, Y, Z direction are shown as follow
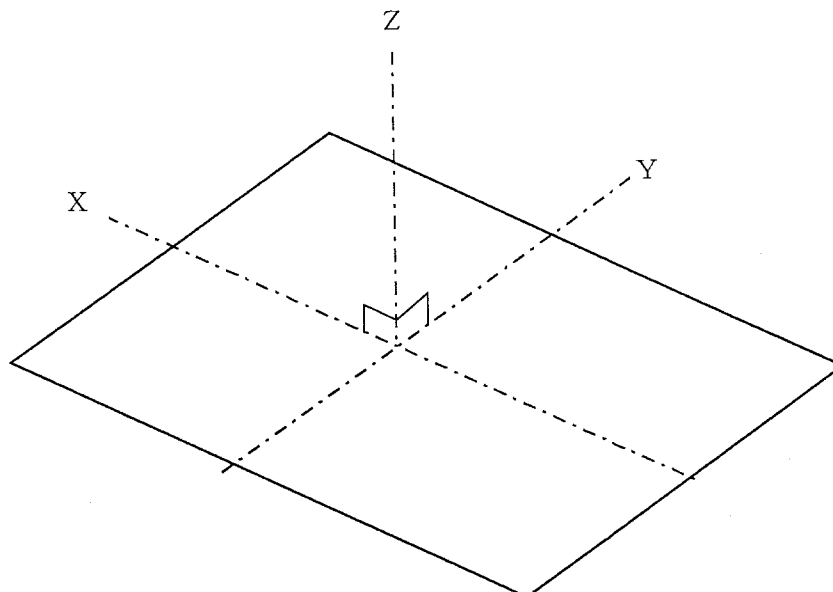
(14) Indication of lot number label

    ①Attached location of the label   : See Fig. 1

    ②Indicated contents of the label

$$\boxed{\text{L Q 0 4 2 T 3 G G 0 1} \quad \text{○○○○○○○○}}$$

            Model number   Lot number

Contents of lot number   : 1st   ·· Production year 1999⇒9

                             : 2nd   ·· Production month 1, 2, 3, ···9, X, Y, Z

                             : 3rd～7th ··Serial numbers 00001～
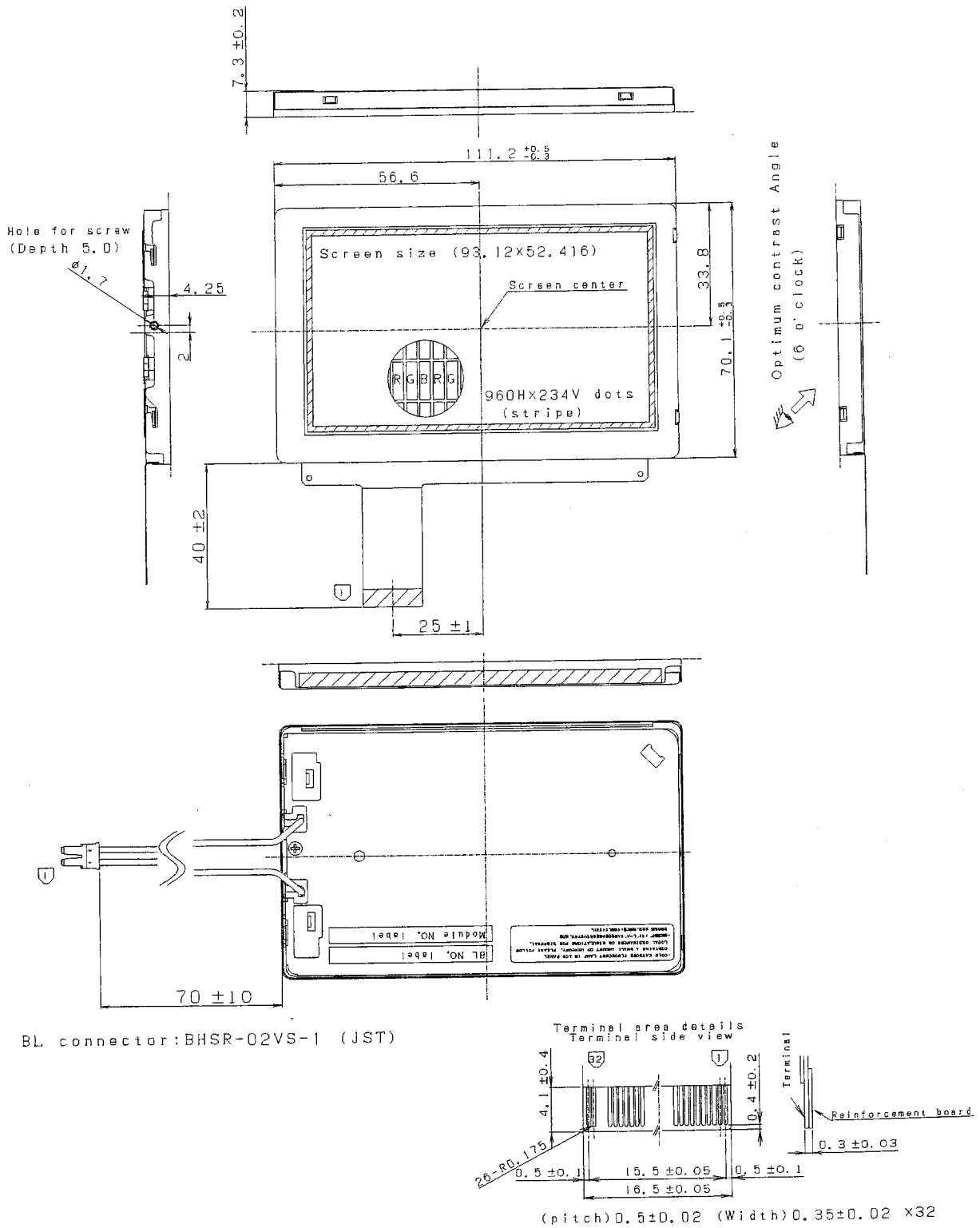
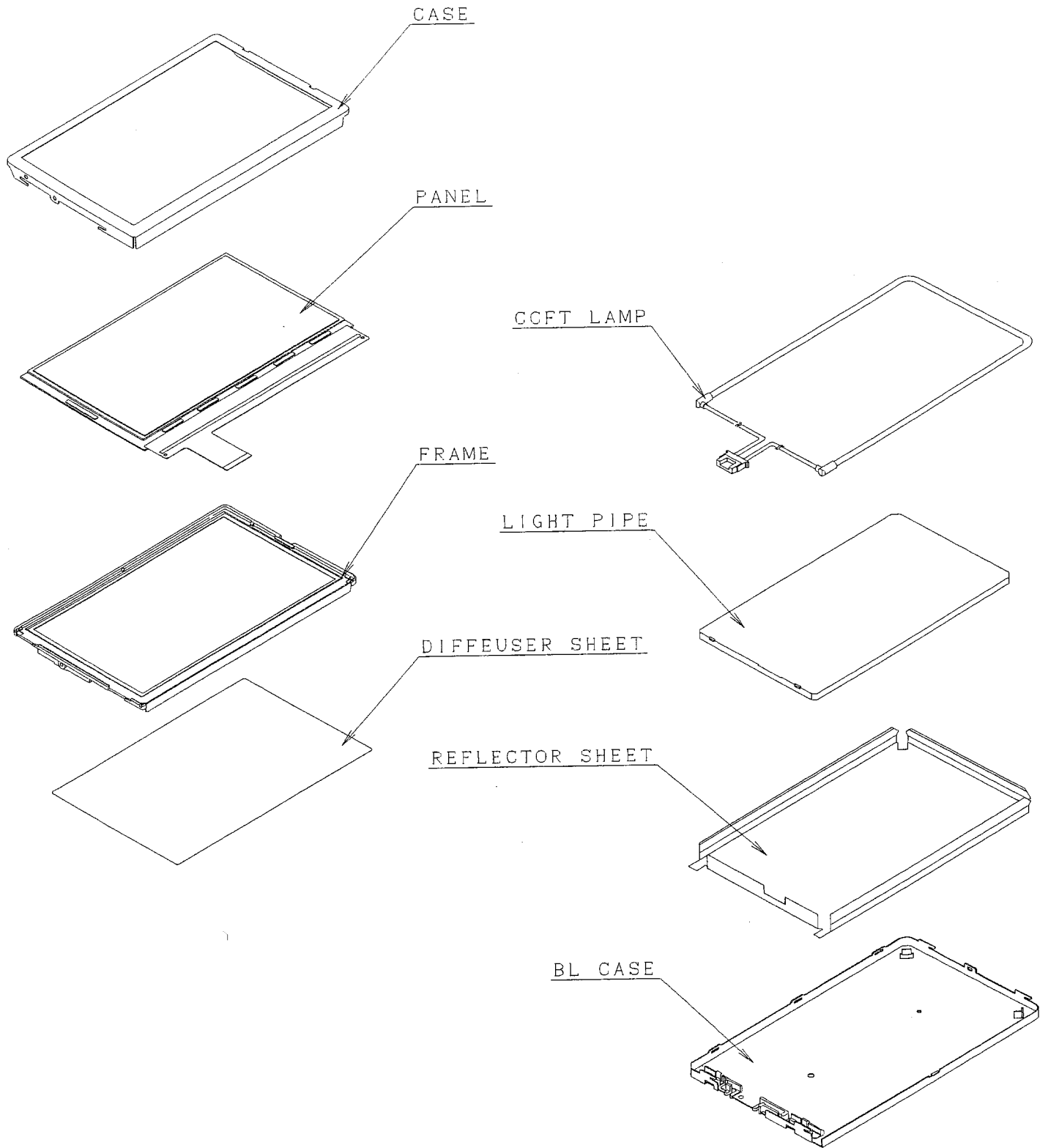   : 8th   ·· Revision symbols A, B, C···

Hole for screw
(Depth 5.0)

ø1.7

4.25

2

7.3 ±0.2

111.2 +0.5 -0.3

56.6

Screen size (93.12×52.416)

Screen center

R G B R G

960H×234V dots
(stripe)

33.8

70.1 +0.5 -0.3

Optimum contrast Angle
(6 o'clock)

40 ±2

25 ±1

Module NO. label

BL NO. label

COLD CATHODE FLUORESCENT LAMP IN LCD PANEL.
CONTAINS A SMALL AMOUNT OF MERCURY. PLEASE FOLLOW
LOCAL ORDINANCES OR REGULATIONS FOR DISPOSAL.

70 ±10

BL connector:BHSR-02VS-1 (JST)

Terminal area details
Terminal side view

32

1

4.1 ±0.4

0.4 ±0.2

Terminal

Reinforcement board

0.3 ±0.03

26-R0.175

0.5 ±0.1

15.5 ±0.05

0.5 ±0.1

16.5 ±0.05

(pitch)0.5±0.02 (Width)0.35±0.02 ×32

Take care in set design to hide
the scratches and bubbles appeared on
the polarizer or other frame area
which is located outside of active area.

Fig.1   Outline Dimension

CASE

PANEL

CCFT LAMP

FRAME

LIGHT PIPE

DIFFEUSER SHEET

REFLECTOR SHEET

BL CASE

Fig. 2 Structure of the TFT-LCD module

Fig. 3 Reference drive circuit chart

Fig. 4 Input signal timing chart

Top tray
SPAKG2595TP23

Side tray
SPAKG2595TP22

SPAKG2595TP22

Tray
SPAKG2595TP20

Tray
SPAKG2595TP20

Side tray
SPAKG2595TP22

SPAKG2595TP10

Master carton

SHARP.
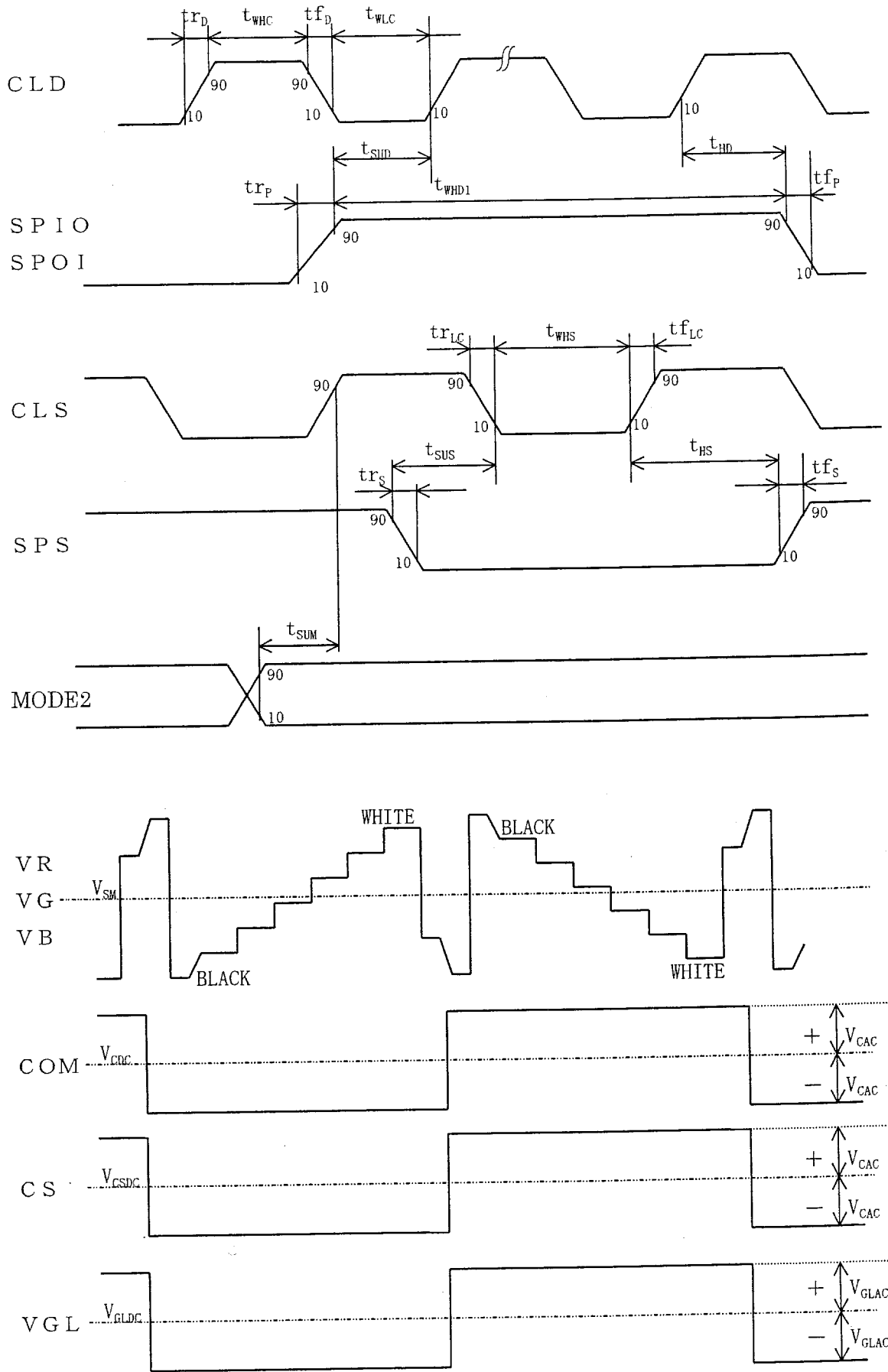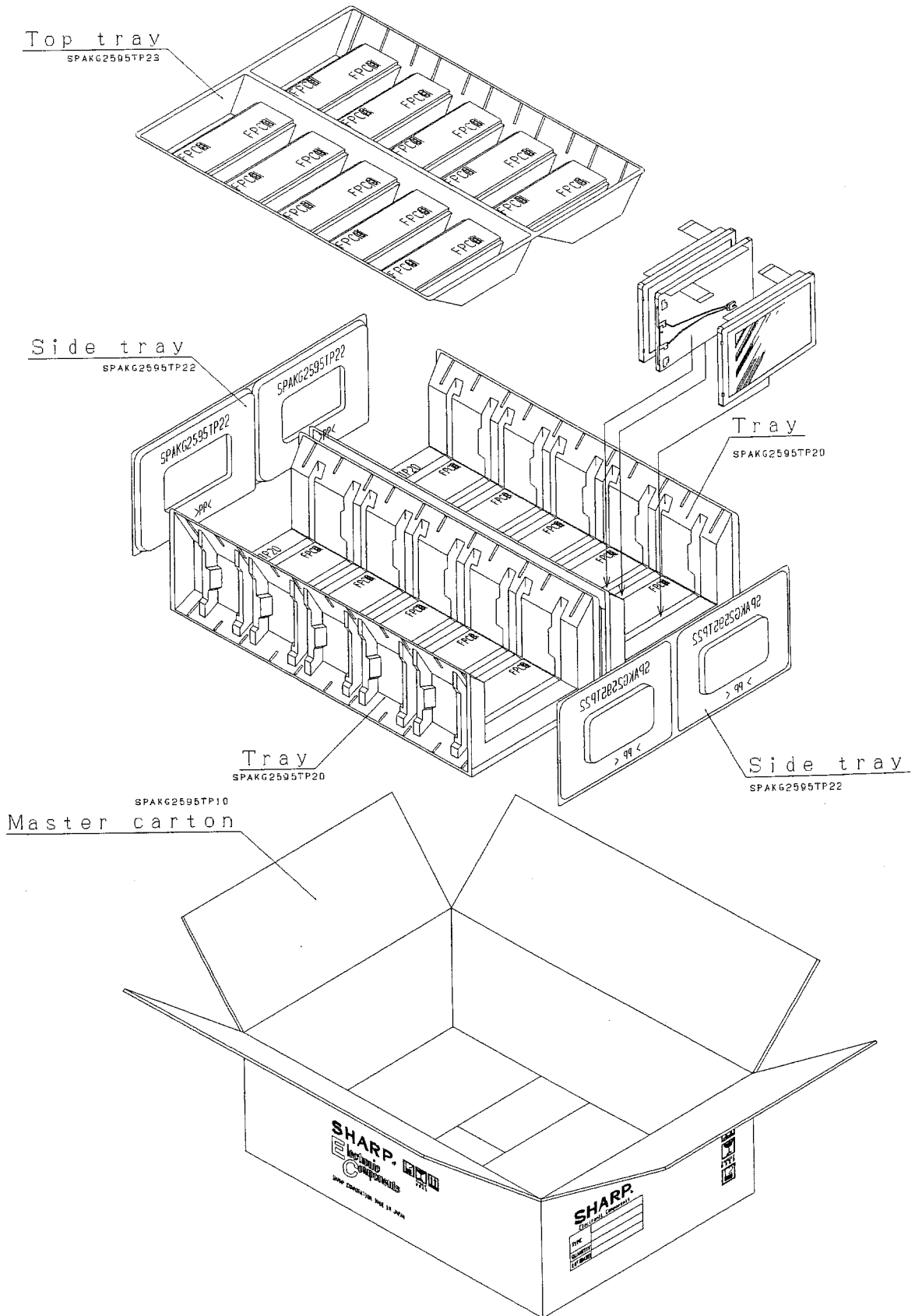
Fig.5·1 Package form

(Appendix)

Adjusting method of optimum common electrode DC bias voltage

To obtain optimum DC bias voltage of common electrode driving signal (VCDC), photoelectric devices are very effective, and the accuracy is with 0.1V. (In visual examination method, the accuracy is about 0.5V because of the difference among individuals.)

To gain optimum common electrode DC bias, there is the method that uses photoelectric devices.

Measurement of flicker

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

Photo-electric device

Output voltage

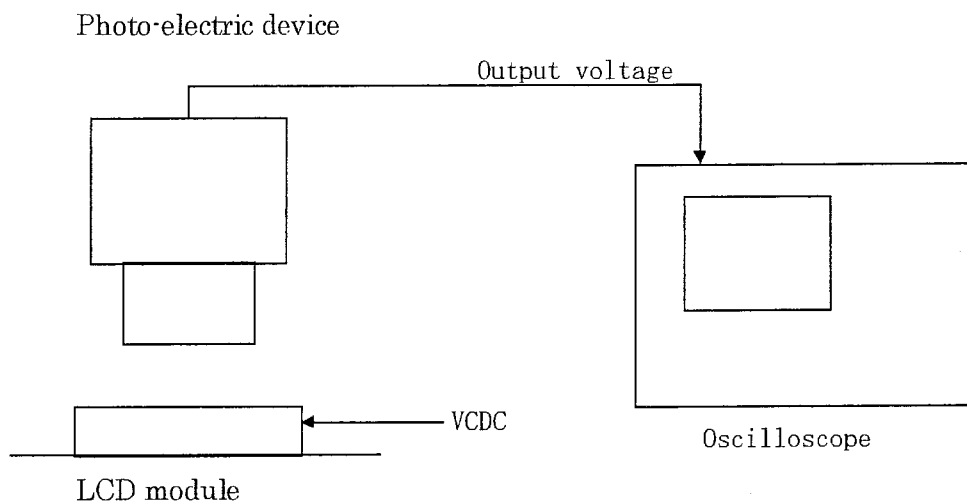VCDC

LCD module

Oscilloscope

Fig. A   Measurement system

《Measurement of flicker》

Photoelectric output voltage is measured by an oscilloscope at a system show 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)
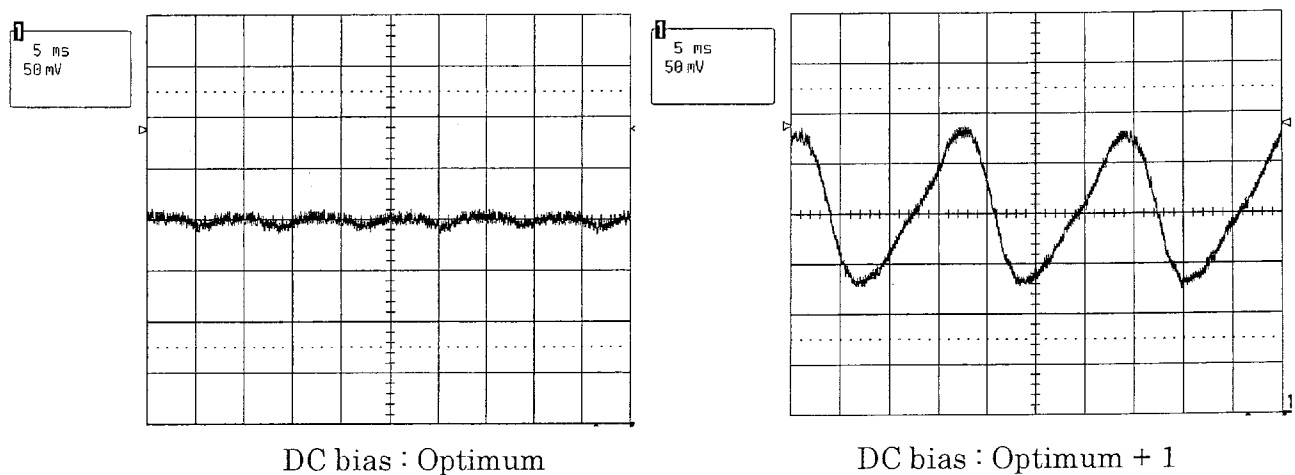
5 ms
50 mV

5 ms
50 mV

DC bias : Optimum   DC bias : Optimum + 1

Fig. B   Waveforms of flicker