SPECIFICATION

FOR

TOSHIBA MATSUSHITA DISPLAY TECHNOLOGY

TFT-LCD MODULE

LTA070B340A

SPECIFICATION No. : **G040037-S831**
LTA070B340A-12

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Revision History

Date	Rev.	Sheet (New)	Item	Old	New	Reason

Caution and Handling Precaution

For your end user's safety, it is strongly advised that the items with "*" should be included in the instruction manual of the system which may be issued by your organization.
Toshiba Matsushita Display Technology always endeavor to maintain sufficient quality of the LCD panel in process of designing and manufacturing, however, to avoid causing extended damages such as accidents resulting in injury or death, fire accidents, or social damages if the LCD panel fails, please adopt safe design as a whole set, by adopting redundant design , taking measure in set design to prevent fire-spreading, over-current, or incorrect operation, etc.

For Safety

! Warning

1) SPECIAL PURPOSES

a) Toshiba Matsushita Display Technology's Standard LCD modules have not been customized for operation in extreme environments or for use in applications where performance failures could be life-threatening or otherwise catastrophic.

b) Since they have not been designed for operation in extreme environments, they must never be used in devices that will be exposed to temperatures above 50 degrees Celsius or below 0 degrees Celsius, to X-ray or Gamma-ray radiation, or to abnormally high levels of vibration or shock which exceed Toshiba Matsushita Display Technology's specification limits.

c) In addition, since Toshiba Matsushita Display Technology's Standard LCD modules have not been designed for use in applications where performance failures could be life-threatening of catastrophic, they must never be installed in aircraft navigation control systems (such as, but not limited to Traffic Collision Avoidance System and Air Traffic Indicator), in military defense or weapons systems, in critical industrial process-control systems (e.g., those involved in the production of nuclear energy), or in critical medical device or patient life-support systems.

2) ELECTRIC SHOCK

DISCONNECT POWER SUPPLY before handling LCD modules. In order to prevent electric shock, DO NOT TOUCH the electrode part, cables, connectors, and the fluorescent lamp's (hereinafter called "FL") circuit part of a module in which FL tubes are built in as a light source of a backlight or a front light. High voltage is supplied to these parts while power supply is turned on.

3) FL CABLE CONNECTION

Make sure to insert the module FL connector to the inverter connector in correct position and correct polarity. If incorrect, this may cause smoke or burn of electrical parts by high voltage of FL circuit. If there is a possibility that the connector has been inserted incorrectly, re-insert the connector only after you confirm the module and FL power is completely off. When disconnecting the connector, do not pull on the cable.

DO NOT USE the mating FL connector which Toshiba Matsushita Display Technology does not specify. Otherwise, Toshiba Matsushita Display Technology shall not be liable for any damages caused by the connector.

! Caution

1) * DISASSEMBLING OR MODIFICATION

DO NOT DISASSEMBLE OR MODIFY the modules.

Sensitive parts inside LCD module may be damaged, and dusts or scratches may mar the displays. Toshiba Matsushita Display Technology does not warrant the modules, if customer disassembled or modified them.

2) * BREAKAGE OF LCD PANEL

DO NOT INGEST liquid crystal material, DO NOT INHALE this material, and DO NOT PERMIT this material to contact the skin, if glass of LCD panel is broken.

If liquid crystal material contacts the skin, mouth or clothing, take the following actions immediately.

In case contact to the eye or mouth, rinse with large amount of running water for more than 15 minutes. In case contact to the skin or clothing, wipe it off immediately and wash with soap and large amount of running water for more than 15 minutes. The skin or closing may be damaged if liquid crystal material is left adhered.

In case ingestion, rinse out the mouth well with water. After spewing up by drinking large amount of water, get medical treatment.

3) * GLASS OF LCD PANEL

BE CAREFUL WITH CHIPS OF GRASS that may cause injuring fingers or skin, when the glass is broken.

Since FL is also made of glass, when FL is built in, handle it with due caution as well.

4) ABSOLUTE MAXIMUM RATINGS

DO NOT EXCEED the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.

5) POWER PROTECTION CIRCUIT

Employ protection circuit for power supply, whenever the specification specifies it.

A suitable protection circuit should be applied, based on each system design.

6) DISPOSAL

Always comply all applicable environmental regulations, when disposing of LCD module.

7) EDGES OF PARTS

Be careful with handling the metal flame (bezel) of a module. Even though burr disposal treatment is performed, it may cause injuring. Be careful with edges of glass parts and touch panel identically. For designing the system, give special consideration that the wiring and parts do not touch those edges.

8) * LUMINANCE DECREASE OF FL

When FL becomes extremely dark and its color changes from white to pink, stop the use of the module immediately. FL, at the end of its life with its discharge color turns into pink as the characteristics of FL, may adversely affect the module at the end part of FL due to temperature raising caused by depletion of the mercury which is contained in FL tube, or may have a possibility of breakage.

9) RECOMMENDED OPERATING CONDITIONS

Don't exceed "the recommended operation conditions" in this specification. (The LCD module should be used within "the recommended operation conditions".)

The performance and quality of the LCD module are warranted only when the LCD module is used within "the recommended operation conditions". Toshiba Matsushita Display Technology never warrants the performance and quality of the LCD module when you use the LCD module over "the recommended operation conditions", although within "the absolute maximum rating".

To use the LCD module over "the recommended operation conditions" may have bad influence on the characteristics and reliability of the LCD module and may shorten the life of the LCD module.

Therefore, when designing the whole set, not to be over "the recommended operation conditions", you should fully take care of supply voltage change, characteristic of connection parts, serge of input-and-output line, and surrounding temperature.

For Designing the System

2-1 DESIGNING ENCLOSURE

1) MECHANICAL DIMENSIONS

Refer to the individual specification for LCD module's mechanical dimensions.

2) MOUNTING HOLES

LCD module should be assembled to the system by using all mounting holes specified in the individual specification with the specified screws.

In addition, some modules may not be necessary to use all the mounting holes. Make comprehensive judgments on the entire system.

3) * BENDING / TWISTING

Make sure to design the enclosure that bending/twisting forces are not applied to LCD module during and after the installation into the system.

4) GASES FROM SETTING MATERIAL

Some plastic materials and shock absorbing materials (rubber) used in the system may generate gases that may cause the deterioration of the polarizer laminated on LCD's panel or internal parts of the module. Prior confirmation is required.

5) GASES FROM PACKAGING MATERIAL

Some materials used for packaging (for which sulfuric acid is used in the recycling process) generate gases that may cause the deterioration of the polarizer laminated on LCD's panel or internal parts of the module. Prior confirmation is required.

2-2 DESIGNING POWER SUPPLIES AND INPUT SIGNALS TO LCD MODULE

1) CAPACITY OF POWER SUPPLY

Refer to individual specification for details for capacity of power supply, and apply some protection circuit including fuses for power supply lines.

2) SEQUENCE OF POWER SUPPLIES AND INPUT SIGNALS

Power supply lines should be designed as follows.

Power supplies should always be turned on before the input signals are applied to LCD module, and the input signals should be disconnected before power supplies are turned off.

The detailed sequence of power supplies and signals are described in the individual specification.

In addition, refer to individual specifications for unused terminals.

3) FL CABLE CONNECTION

Make sure to connect correctly high-voltage wire and low-voltage wire between FL tube and inverter unit.

If high-voltage wire and low-voltage wire are connected incorrectly, it may cause insufficient brightness or unstable operation of FL, and smoke or burn of the parts.

4) PREVENTION OF IMAGE STICKING

Design the system not to display same pattern for a long time in order to prevent image sticking on the panel. Note that incorrect sequence of power supplies and input signals may cause the sticking on the panel, too.

5) GROUNDING OF METAL FRAME

Grounding of metal frame of LCD module is generally effective to prevent radiation interference from the system design.

However, the necessity of grounding, or effective grounding method should be dependent on each system design.

2-3 DESIGNING FOR BETTER VISIBILITY

1) PANEL ANGLE

Visibility of LCD module deeply depends on the viewing directions. The position and the angle of LCD module in the system should be designed so that the best visibility can be obtained at the actual usage

2) WINDOW OPENING

Dimensions of window opening of the system's enclosure should be designed as smaller than "Viewing Area" and larger than "Active Area" specified in individual specification in order to obtain better appearance.

3) PROTECTIVE COVER

In case of severe environmental condition like outdoor usage, a proper transparent protective cover(lens) over LCD module is recommended to apply in order to prevent scratches, and invasion of dust, water, etc., from the system's window onto LCD module.

Ultra-violet ray cut filter is recommended to apply onto LCD module for outdoor operation. Strong ultra-violet ray may cause damage the panel. However, in that case, transmittance-luminance will decrease. Careful selection of material is required.

2-4 DESIGNING FL POWER SUPPLY CIRCUIT

Input FL starting voltage(VSFL) should be longer than two seconds. If it were not, it may cause unstable operation of FL.

Inverter should be design to stop output when the inverter is no-load to FL tubes (due to breakage of FL, etc.) to prevent high-voltage generation.

When high voltage is applied to FL continuously without normal operation of FL (due to output leakage within FL wiring circuit, etc.) it may cause smoke or burn. To prevent excess current, design the inverter with a protection circuit such as a current limiter (excess current detection) to stop inverter output.

For Installation in Assembly

3-1 ESD (ELECTRO-STATIC DISCHARGE) PREVENTION

The C-MOS LSIs used in LCD module is very sensitive to ESD. The following caution should be taken when installing LCD module to an enclosure of the system in order to prevent damage of C-MOS LSIs used in LCD module.

1) HUMIDITY

Ambient humidity of working area is recommended to be higher than 50%RH in order to avoid ESD.

2) GROUNDING

2-1) Grounded electro-conductive mats are recommended to be covered on the floor of working area and surface of working benches.

2-2) The grounding should be done through a resister of 0.5-1M ohms in order to prevent spark of ESD.

2-3) Person handling LCD modules should be grounded with wrist band.

2-4) Tools like soldering iron and screw drivers and working benches should be grounded.

3) IONIZER

Using ionizer (an antistatic blower) is recommended at working area in order to reduce electro-static voltage.

4) REMOVING PROTECTION FILM

When removing protection film from LCD panel, peel off the film slowly (more than three seconds) from the edge of the panel with round-ended tweezers or adhesive tape while blowing with ionizer toward the peeling face to minimize ESD which may damage electrical circuit.

5) **Be careful with touching metal portion of testing instruments in order to prevent unnecessary ESD.**

6) **Do not touch the electrode area of PCB and electrical parts like LSI, capacitor, connector pin, etc.**

3-2 DUST AND STAIN PREVENTION

1) WORKING AREA

Reduce dust level in working area. Especially the level of metal particle should be decreased, otherwise electrical circuit in LCD module may be damaged due to short circuit by metal particles.

2) PROTECTION FILM

LCD module may be shipped with "protection film" on LCD panel in order to prevent from scratches and dust.

It is recommended to remove the film at later process of assembling.

3) FINGER PRINT

Use finger stalls or soft and dust-free gloves in order to keep clean appearance of LCD module when handled for incoming inspection and assembly.

4) * WIPING OFF DUST ON THE PANEL

When LCD panel becomes dirty, wipe the panel surface off softly with absorbent cotton or another soft cloth.

If necessary, breathe upon the panel surface and then wipe off immediately and softly again.

If the dirt can not be wiped off, follow the instructions described in individual specification.

Be careful not to spill organic solvents into the inside of LCD module. The solvents may damage driver IC and PCB area used inside module.

The polarizer laminated to LCD panel and adhesives may be damaged by the solvents, so do not use any organic solvents for wiping off LCD panel.

5) ADHESIVE ON LCD PANEL

Be careful not to attach adhesive, grease, etc., on LCD panel, because it is difficult to remove them without any damages on LCD panel.

6) * WATER SPOTS ON THE PANEL

Avoid the dewing or water condensation.

Wipe off a spot or spots of water or mist on LCD panel softly with absorbent cotton or another cloth as soon as possible if happened, otherwise discoloration or stain may be caused.

3-3 BENDING / TWISTING OF LCD MODULE DURING ASSEMBLY

1) INSTALLING LCD MODULE TO THE ENCLOSURE

Do not bend or twist LCD module even momentary when LCD module is installed into an enclosure of the system.

2) FASTENING SCREWS

Fasten screws for mounting holes uniformly, otherwise bending / twisting force may be applied to LCD module.

3) INTERFACE / FL CABLES

Do not fasten screws, with catching interface cables or FL cables between LCD module and the enclosure.

This may cause bending of LCD module, or become the cause of a failure by damaging cables.

3-4 MECHANICAL FORCES

1) * STRONG MECHANICAL SHOCK

Refrain from strong mechanical shock like dropping from the working bench or knocking against hard object.

These may cause panel crack, damage of FL or other mis-operation.

2) * EXCESSIVE FORCE

Refrain from excessive force like pushing the surface of LCD panel. This may cause scratches or breakage of the panel, or a failure of the module.

3) * SCRATCHES ON THE PANEL

Do not put heavy object such as tools, books, etc., and do not pile up LCD modules.

Be careful not to touch surface of the polarizer laminated to the panel with any hard and sharp object. The polarizer is so soft that it can be easily scratched, even the protect film covers it.

4) CONNECTORS

When inserting or disconnecting the connectors to LCD module, be sure not to apply force against PCB nor connecting cables, otherwise internal connection of PCB and TAB drivers may be damaged.

5) FL CABLES

Be careful not to pull the FL cables in order to avoid mechanical damage in FL lamp and soldering area.

While mounting, do not bind or twist the FL cables, or the Lamp current may not be applied as designed.

3-5 OPERATION

Be sure that the following caution should be taken under assembly and inspection of the system.

1) POWER SUPPLY

Power supplies should always be turned off in connecting process.

Do not connect or disconnect the power cables and connectors with power applied to LCD module.

2) INPUT SIGNAL

The signal should be applied after power supplies are turned on.

The signal should be removed before power supplies are turned off.

The detailed sequence of power supplies and signals are described in individual specifications.

For Transportation and Storage

1) TEMPERATURE

Do not store LCD modules in high temperature, especially in high humidity for a long time (approximately more than one month).

It is strongly recommended to store LCD modules where the temperature is in the range of 0 to 35 degrees Celsius and the humidity is lower than 70%.

2) LOW TEMPERATURE

Liquid crystal material may be coagulated and LCD panel may be damaged at the lower temperature than storage temperature range described in individual specification.

3) ULTRA VIOLET RAY

Store LCD module without exposure to direct sunlight or fluorescent lamps in order to prevent the module from strong ultra violet ray.

4) CLEANLINESS

Keep the module in clean place, because any dust, hard particle may damage the polarizer, or dust invades the inside of the module.

5) * CONDENSATION OF WATER

Avoid condensation of water on LCD module, otherwise it may cause mis-operation or defects. Keep away LCD module from such ambient.

6) PACKAGING

In case of transportation or storage after opening the original packaging, LCD modules are recommended to be repacked into the original packaging with the same method, especially with same kind of desiccant.

CONTENT

1. Application

This specification is applied to the 18cm(7 inch) wide , full colors and 480×RGB×234 dots color TFT Liquid Crystal Display Module manufactured by Toshiba Matsushita Display Technology Co.,Ltd.

Controller circuit, inverter for lamp are not included in this module.

Production Code (Part No) : LTA070B340A

2. General Specification

CHARACTERISTIC ITEM	SPECIFICATION
1.Display technology	a-Si TFT active-matrix
2.Display mode	NW (normally white)
3.Module outer dimension (note2-1)	166.0(W) × 100.0(H) × 7.0(D)
4.Effective display area	154.08 × 86.58mm
5.Number of dots	480(W) × 3(RGB) × 234(H)
6.Color-filter-array	RGB vertical stripes
7.Weight	175 g ±10g
8.Backlight	CCFL with 3 wave-length spectrum ..... L Type Combined use for CCFL, Harison and Stanley lamp.
9.Front surface treatment	AG coat (with WV film)
10.Polarizer protective sheet	None
11.Appearance	There are not remarkable defects.
12.Metal frame condition	Not be connected to inner circuit

note 2-1...Detailed dimensions are shown as per "11.Device outside view".

3. Absolute Maximum Ratings

CHARACTERISTICS	SYMBOL	CONDITION	MIN.	MAX.	UNIT	REMARKS
Logic voltage	VDD	Ta=25°C	-0.3	6.5	V	
Source driver voltage	VEE	Ta=25°C	-0.3	6.5	V	
Logic signal voltage	VIN	Ta=25°C	-0.3	VDD+0.3	V	
Analog input voltage	VANA	Ta=25°C	-0.3	VEE+0.3	V	note3-1
Gate driver positive voltage	VGON	Ta=25°C	-0.3	45.0	V	VSS=0
Gate driver negative voltage	VSS	Ta=25°C	VGON-45.0	VGON+0.3	V	
Back light input voltage	VBL	Ta=25°C	-	3000	ACVrms	
Panel surface temp			-30	80	°C	
Panel surface humidity	-	-	10	90	%	

note 3-1...Analog input voltages mean seven kinds of voltage such as VB, RED, GREEN, BLUE .

Attention)

Absolute maximum ratings are the limited value which must not be applied to the product even a second, and the product may have a permanent damage when it is exceeded.

Accordingly, please pay attention to the surge of input voltage, fluctuation and/or ripple of supply voltage, ambient temperature and so on.

4. Environmental Conditions

ITEM	SPECIFICATION	REMARKS
Operating Temperature (Panel surface temp.)	-20 - 70°C	note4-1, note4-3
Storage Temperature (Panel surface temp.)	-30 - 80°C	note4-2, note4-3

note 4-1...This value guarantees only operation, but doesn't guarantee all the contents of Electro-optical specification.

Electro-optical specification can be guaranteed at the condition that ambient temperature is 25°C

note 4-2...Please refer to section " For Transportation and Storage " of Sheet 10.

5.Electro-optical Specification

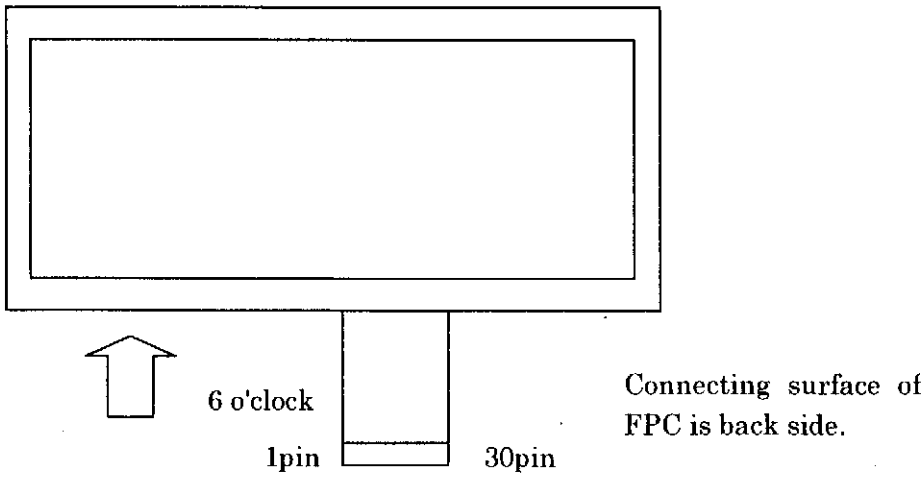
CHARACTERISTICS	SYMBOL	CONDITION			STANDARD VALUE			UNIT	measuring method
		θ	ϕ	C.	MIN.	TYP.	MAX.		
1.Brightness *note	B	0°	0°		300	400	-	cd/m²	5-1
2.Contrast Ratio	Cmax	best angle			100	300	-	-	5-2
3.White color chromaticity	X	0°	0°		0.275	0.315	0.355	-	5-1
	Y	0°	0°		0.300	0.340	0.380	-	
4.Brightness uniformity	-	0°	0°		0.7	-	-	-	5-1
5.Vertical viewing Angle	θu	-	0°	≥10	20	30	-	°	5-3
	θD	-	0°	≥10	40	60	-	°	
6.Horizontal Viewing Angle	ϕL	0°	-	≥10	45	60	-	°	
	ϕR	0°	-	≥10	45	60	-	°	
7.Response Time	τr	0°	0°		-	11	22	ms	5-4
	τd	0°	0°		-	22	44	ms	

* note : Fluorescent lamp current is 6.5mA.

Measuring condition:

: Measuring surroundings : Dark room or its coordinate
: Measuring temperature : 25±5°C (others)
: Measuring humidity : 40 - 70%RH
: Adjust operating voltage to get optimum contrast at the center of the display.
(more than 30 minutes after turning on back light)
: Use inverter :HIU-742A; 16.5pF

Main viewing angle direction (Contrast ratio becomes max.)



5-1. Measuring method for brightness

(1)Measuring instrument

TOPCON BM-5A(measuring field = 1°)

(2)Measuring point

center of the display area($\theta = 0°$, $\phi = 0°$)

θ : viewing angle against vertical axis

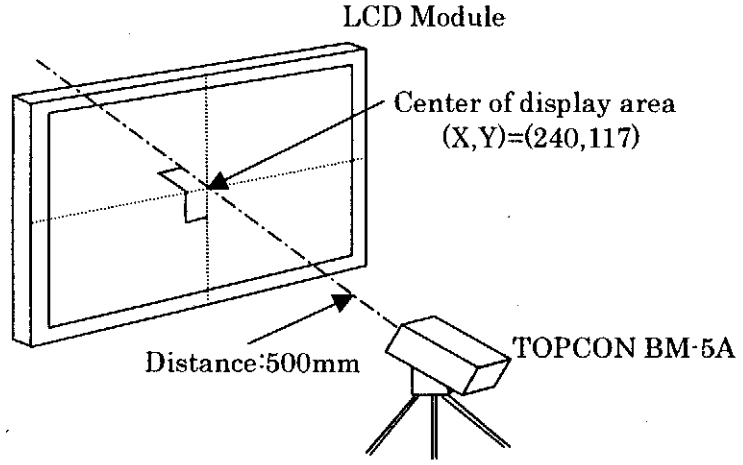
ϕ : viewing angle against horizontal axis

(3)Measuring method

Measure the brightness B(cd/m²) and white color chromaticity X,Y supplying signal voltage to get maximum brightness at the display pattern to be all white.

The distance from screen to "BM-5A" is 500mm.

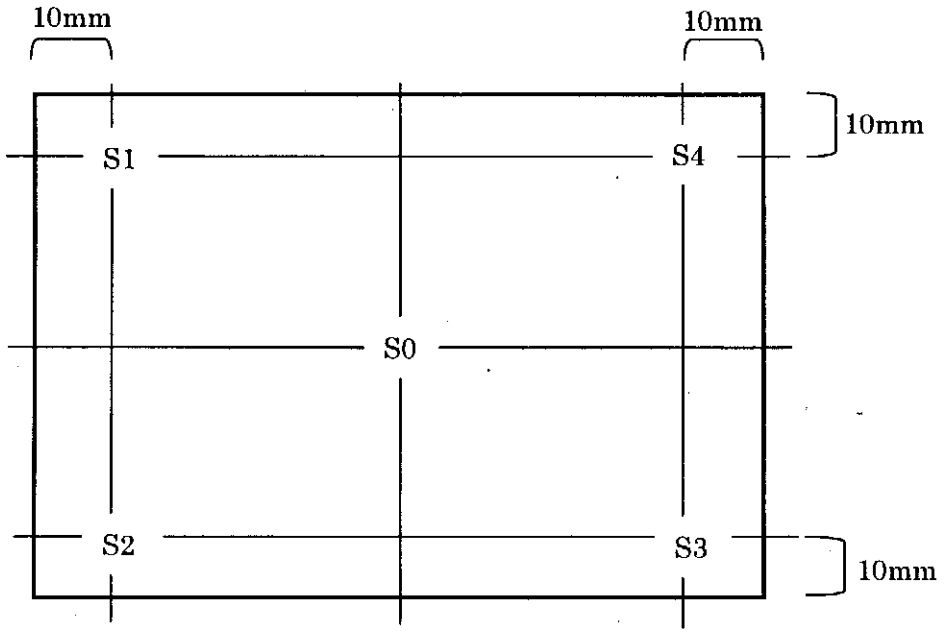
Measure it after a lapse of at least 30 min. since a back light is turned on.



Definition of the brightness uniformity

Measure 5 points (S0 - S4) and define the brightness uniformity using the following formula.

Brightness uniformity = (The minimum brightness among S1 - S4)/S0



5-2.Measuring method for contrast

(1)Measuring instrument
TOPCON BM-5A (measuring field=1°.)

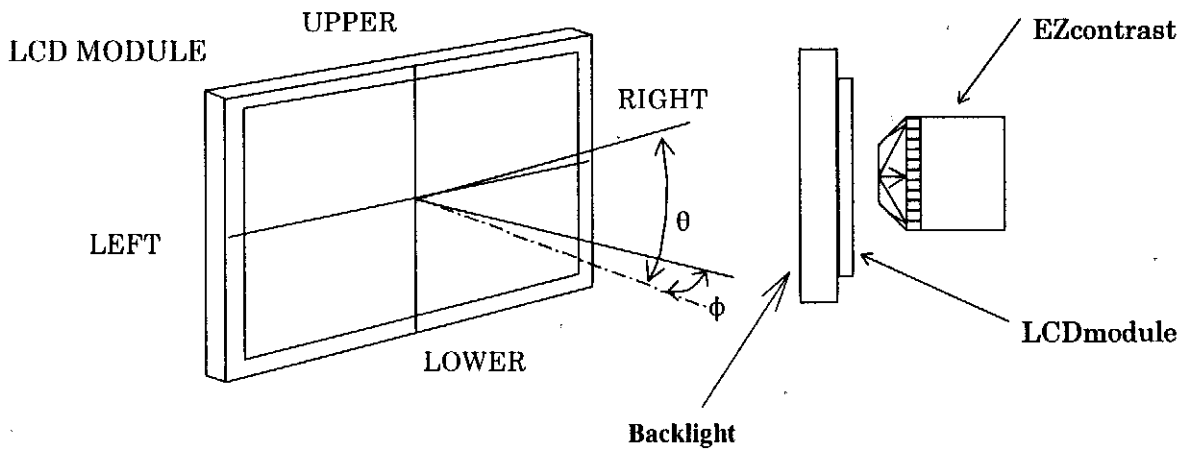
(2)Measuring point
Center of the display area : Exactly same point as that of measuring brightness

(3)Measuring method
Set the LCD module at $\theta = \theta 0$, $\phi = \phi 0$
θ : viewing angle in vertical axis
ϕ : viewing angle in horizontal axis
$\theta 0$, $\phi 0$ are the best angle to get the maximum contrast.
Measure maximum brightness "Y1"(Vlc=0v) and minimum brightness"Y2"(Vlc=5v).
The contrast ratio C is Y1/Y2.
Where, Vlc means the effective voltage applied to liquid crystal in LCD panel.

5-3. Measuring method for viewing angle

(1)Measuring instrument
ELDIM : EZ contrast

(2)Measuring point
center of the display area



θU : Upper side viewing angle
θL : Lower side viewing angle
ϕL : Left side viewing angle
ϕR: Right side viewing angle

Record upper, lower, right, left angles of contrast 10 from circular chart data of EZ contrast.

5-4.Measuring method for response time

(1)Measuring instrument

Ohtsuka Electric. LCD evaluation equipment LCD-7000

Measuring spot size(aperture size)is ϕ12mm.

(2)Measuring point

center of the display area

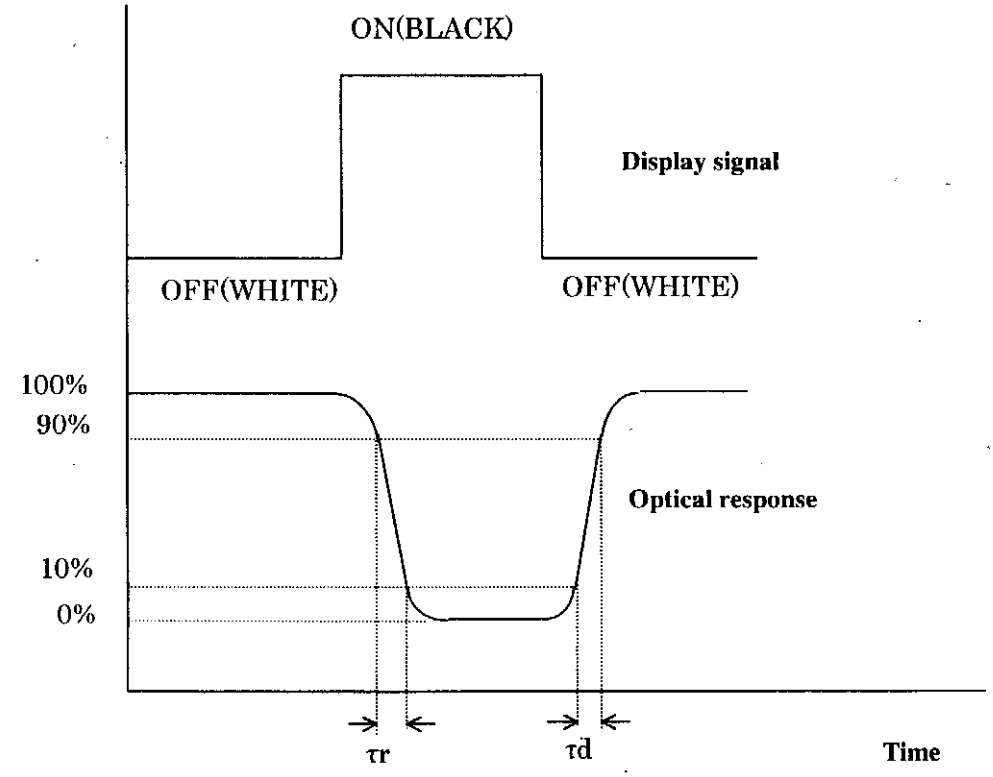
(3)Measuring method

Set LCD module at $\phi = 0°$ and $\theta = 0°$

Apply the signal voltage at maximum contrast ratio and switch LCD-cell off/on/off.

(make screen white, then black and white)

When normalizing each brightness level corresponding to the display signal "OFF" and "ON" as shown in the figure below, the rise time τ_r is defined as the time until the brightness level goes down to 10% from 90% after display signal changed from OFF to ON and also fall-time τ_d is defined as the time until the brightness level goes up to 90% from 10% after display signal changes from "ON" to "OFF".

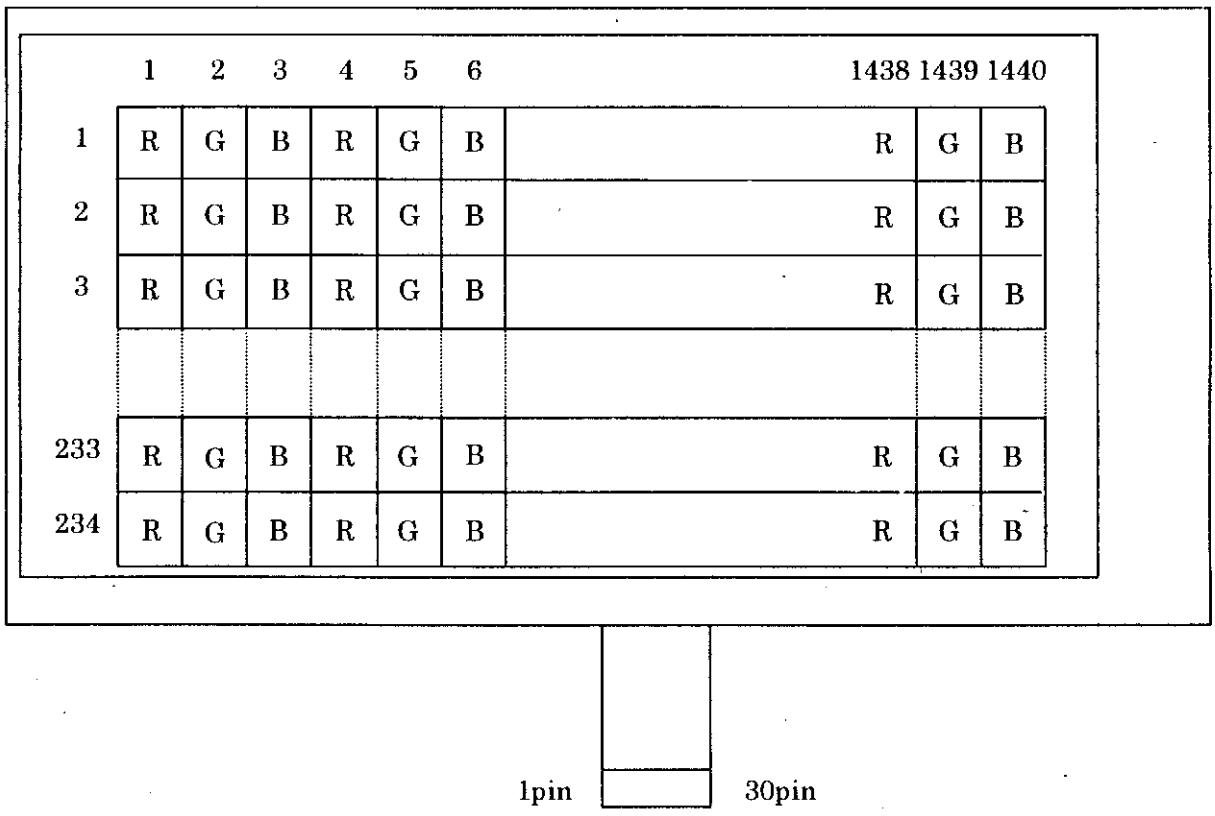


6. Electrical Specification

(1)Contents

Item	Contents	Remark
Screen size	18cm (7 inch) wide	
Display mode	TN type full color (Transmitting type)	Normally white
Driving method	a-Si TFT active-matrix line-at-a-time scan	
Pixel arrangement	RGB stripe arrangement	
Input video signal	RGB line-inverted	(Fig 6-1) Sheet 23
Control voltage	CMOS level	(Fig 6-2) Sheet 24
Backlight	Light-guiding plate with straight type lamp	Sheet 26,27

(2)Pixel arrangement and I/O interface pin assignment



Connecting surface of FPC is back side.
Surface treatment is gilding.

(3)Interface

Pin NO	SYMBOL	Function
1	VCOM	Voltage applied to color filter substrate
2	STH1	Source scanning start signal 1
3	VB	Source output current adjustment
4	RED	Red video signal
5	GREEN	Green video signal
6	BLUE	Blue video signal
7	OEH	Source driver output enable
8	VDD	Power line for logic
9	MOD	Sampling mode change (H: Simultaneous, L: Sequential)
10	CLK1	Source driver clock input 1
11	CLK2	Source driver clock input 2 (Set "H" at Simultaneous Mode)
12	CLK3	Source driver clock input 3 (Set "H" at Simultaneous Mode)
13	RL	Right / Left scanning change
14	STH2	Source scanning start Signal 2
15	VEE	Power line for source driver IC
16	GND	Ground
17	VCOM	Voltage applied to color filter substrate
18	STV2	Gate scanning start signal 2
19	OEV3	Gate driver output enable 3
20	OEV2	Gate driver output enable 2
21	OEV1	Gate driver output enable 1
22	CPV	Gate driver scanning clock pulse
23	U/D	Up/Down scanning change
24	STV1	Gate scanning start signal 1
25	NC	Non connect
26	VSS	Gate driver negative voltage
27	GND	Ground
28	VDD	Power line for logic
29	NC	Non connect
30	VGON	Gate driver positive voltage

Connector: IL - FPR Series (0.5mm pitch 30p) (JAE) gilded type

(3)Interface

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12	CLK3	Source driver clock input 3 (Set "H" at Simultaneous Mode)
13	RL	Right / Left scanning change
14	STH2	Source scanning start Signal 2
15	VEE	Power line for source driver IC
16	GND	Ground
17	VCOM	Voltage applied to color filter substrate
18	STV2	Gate scanning start signal 2
19	OEV3	Gate driver output enable 3
20	OEV2	Gate driver output enable 2
21	OEV1	Gate driver output enable 1
22	CPV	Gate driver scanning clock pulse
23	U/D	Up/Down scanning change
24	STV1	Gate scanning start signal 1
25	NC	Non connect
26	VSS	Gate driver negative voltage
27	GND	Ground
28	VDD	Power line for logic
29	NC	Non connect
30	VGON	Gate driver positive voltage

Connector: IL - FPR Series (0.5mm pitch 30p) (JAE) gilded type

(4) Recommended operating conditions

Under TFT LCD Module operating condition

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
IC logic voltage	VDD	2.70	3.00 - 3.30	3.60	V	
Source driver IC voltage	VEE	4.50	5.00	5.50	V	
Logic signal input voltage	VIL	0	-	0.20*VDD	V	
	VIH	0.80*VDD	-	VDD	V	
Black input voltage(+)	VSB+	(0.20)	0.75	(VSW+)	V	R,G,B, VEE=5V
White input voltage(+)	VSW+	(VSB+)	4.25	(4.80)	V	R,G,B, VEE=5V
Black input voltage(-)	VSB-	(VSW-)	4.25	(4.80)	V	R,G,B, VEE=5V
White input voltage(-)	VSW-	(0.20)	0.75	(VSB-)	V	R,G,B, VEE=5V
Source signal width	VSPP	-	3.50	VEE-0.4	V	R,G,B, note 6-4
Source driver center voltage	VSC	2.30	VEE/2	2.70	V	R,G,B
Source output current adjustment	VB	2.10	2.30	2.50	V V V	VEE=5.0V VSPP=3.5V VCPP=7.0V
Gate driver positive voltage	VGON	16.00	17.00	18.00	V	
Gate driver negative voltage	VSS	-14.00	-13.00	-12.00	V	
V center applied to color filter sub.	VCOM	-0.50	0.50	1.50	V	note 6-2
V amplitude applied to color filter sub.	VCPP	3.00	7.00	9.00	Vpp	note 6-1, 6-4
Logic supply current	IDD	-	1.79	3.60	mA	VDD=3.3V, note 6-3
Source driver IC supply current	IEE	-	19.60	39.20	mA	VEE=5.0V, VB=2.5V, note 6-3
Gate driver IC positive supply current	IGH	-	0.12	1.00	mA	VGON=17.0V, note 6-3
Gate driver IC negative supply current	ISS	-	-0.30	-1.00	mA	VSS=-13.0V, note 6-3

note 6-1...Brightness level is adjusted by varying this amplitude.

note 6-2...Please adjust VCOM voltage between -1.5V and +2.5V to make the flicker level be minimum.

note 6-3...Current value is an average level , not a peak level.

note 6-4...VSPP / 2 + VCPP / 2 < 5.5(V) Please keep this condition for picture quality.

Attention) Electrical specification guarantees the normal operation of the product. In case of using the product over electrical specification, the normal operation is not guaranteed even within absolute maximum ratings.

The function of STV1 and STV2 is changed as follows by the U/D terminal (up/down scanning)

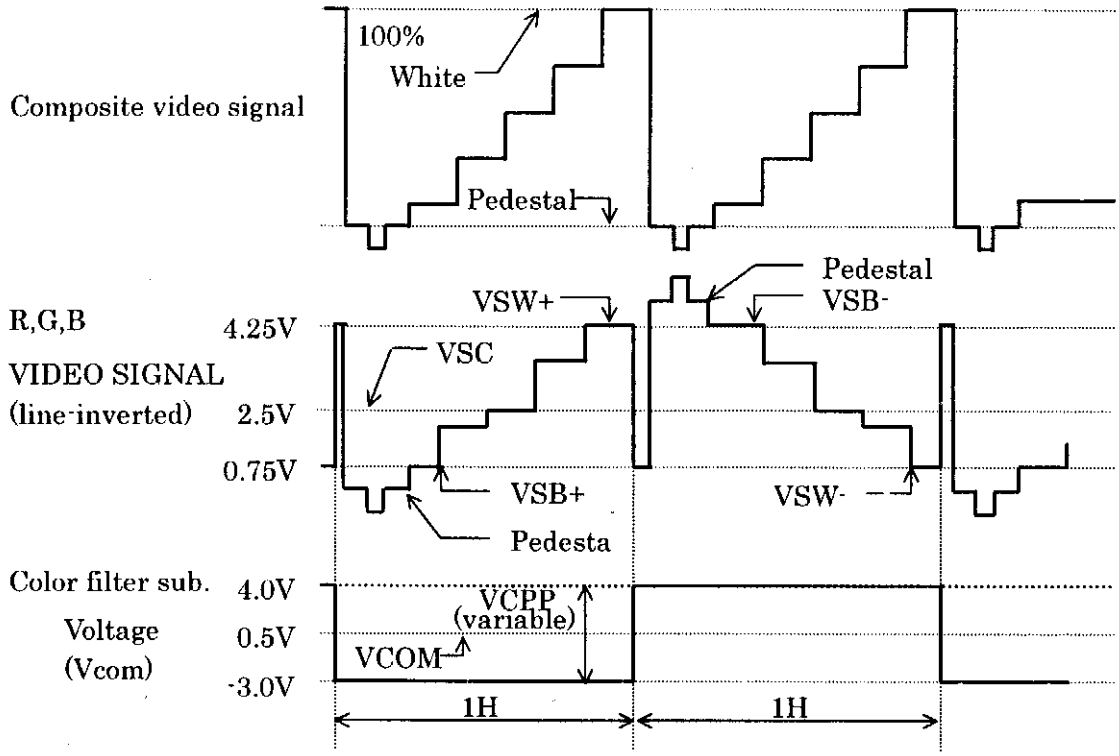
UD	STV1	STV2
H (VDD)	Signal Input	Signal Output
L(0V)	Signal Output	Signal Input

The function of STH1 and STH2 is changed as follows by the RL terminal (Right/Left scanning)

RL	STH1	STH2
H (VDD)	Signal Input	Signal Output
L(0V)	Signal Output	Signal Input

(5)Signal polarity and phase

It is needed to modulate RGB Video signal (inverted polarity line by line) and the voltage applied to color filter substrate (Vcom) synchronizing inversion timing.



note···Please drive that Vcom (1, 17pin) is equal to or more than 4μ, less than or equal to 7μs as voltage change time, and is less than or equal to 50Ω as output impedance, in order to control non uniformity and cross talk.

Please adjust the brightness level by varying the amplitude of Vcpp.

Relation of Black / White display and signal Voltages

video signal	Vcom	
	H level	L level
higher voltage	Black	White
lower voltage	White	Black

(6) Timing characteristics of input signals

CHARACTERISTICS	SYMBOL	MIN	TYP	MAX	UNIT	REMARKS
1 Field scanning period	t1V	-	262.5	-	H	
1 Line scanning period	tylH	-	63.5	-	μs	
Source driver operating frequency	fhc	1.00	9.56	10.00	MHz	CLK full scan mode
	fhc			(14.4)	MHz	side panel area
Signal sampling pulse width	tchw	100.0	104.6	1000.0	ns	
Signal sampling pulse delay	tchd	31.4	34.9	38.4	ns	
Signal sampling pulse width(H)	tchwh	47.1	52.3	57.5	ns	tchd 12,23
Signal sampling pulse width(L)	tchwl	47.1	52.3	57.5	ns	
Source start signal pulse width	tshw	30.0	104.6	208.0*	ns	*tshset=tshhld
Source start signal setup time	tshset	10.0	52.3	-	ns	
Source start signal hold time	tshhld	20.0	52.3	-	ns	
Source output enable pulse width	tohw	7.5	8.0	8.5	μs	
Source start signal rising time	tss	1.45	9.85	10.96	μs	
Video input signal start point	tvs	1.59	10.00	11.11	μs	
Phase difference between OEH & CPV	toc	1.5	2.3	-	μs	
Phase difference of the standup of CPV, and standup of OEV	tsovc	1.0	1.5	2.0	μs	
Phase difference of the standup of CPV, and falling of OEV	thovc	2.0	3.0	4.0	CLK	
Gate clock period	tcvw	10.0	63.5	-	μs	
Gate clock pulse width (H)	tcvwh	5.0	10.3	58.5	μs	
Gate clock pulse width (L)	tcvwl	5.0	53.2	58.5	μs	
Gate start signal pulse width	tsvw	5.0	63.5	126.0**	μs	**tsvset=tsvhld
Gate start signal setup time	tsvset	2.00	31.75	-	μs	
Gate start signal hold time	tsvhld	2.00	31.75	-	μs	
Phase difference between OEH & STH	tosp	0.0	0.5	-	μs	
Phase difference between SYNC & OEH	tohs	-	1.4	1.9	μs	

note)

Rise time (tr) and fall time (tf) of source driver logic signal are less than 6ns.

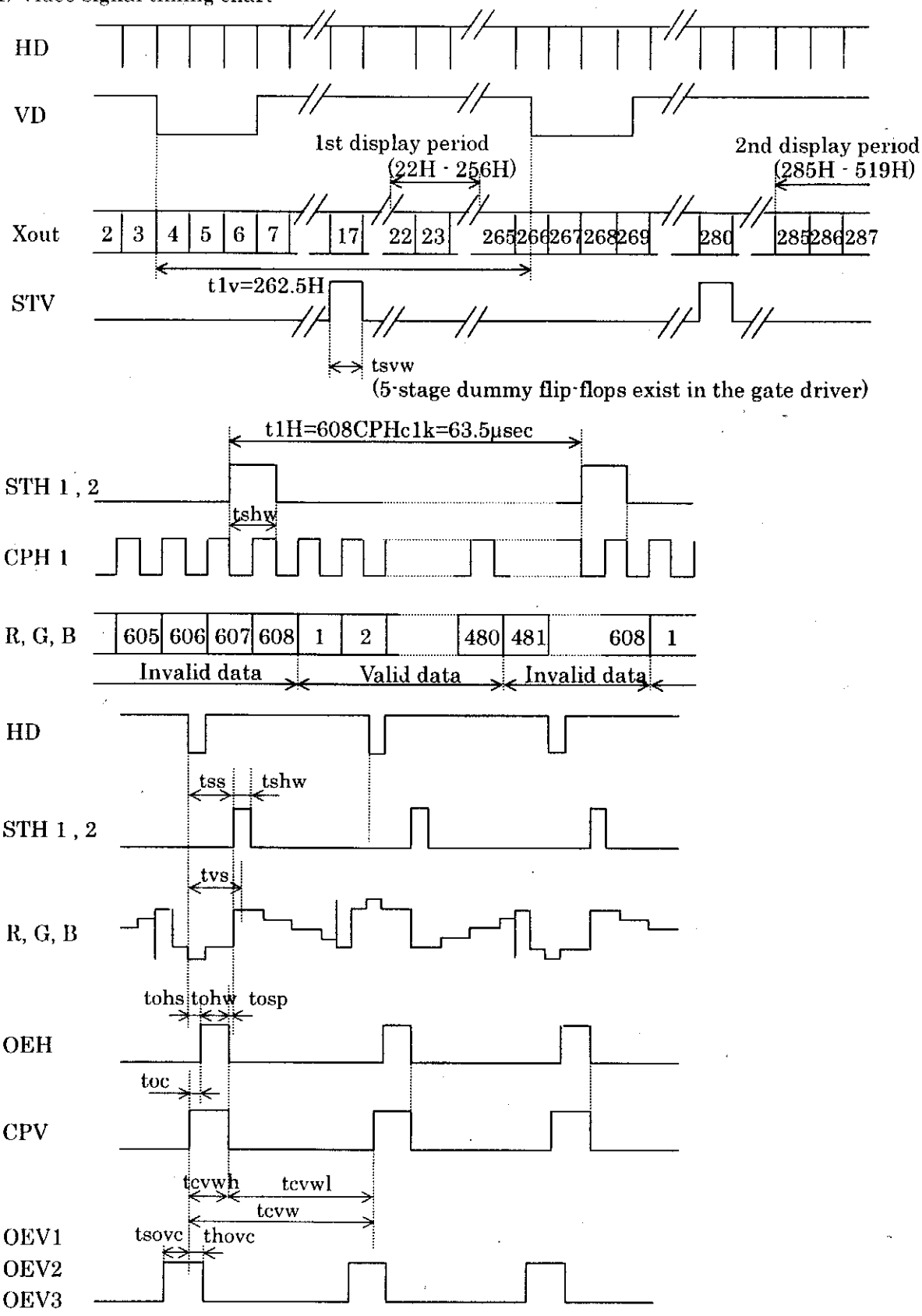
Rise time (tr) and fall time (tf) of gate driver logic signal are less than 50ns.

Rise time (tr) and fall time (tf) of OEH are less than 200ns.

Rise time (tr) and fall time (tf) of OEV are less than 200ns.

Rise time (tr) and fall time (tf) is defined as the time from 0% to 63.2%.

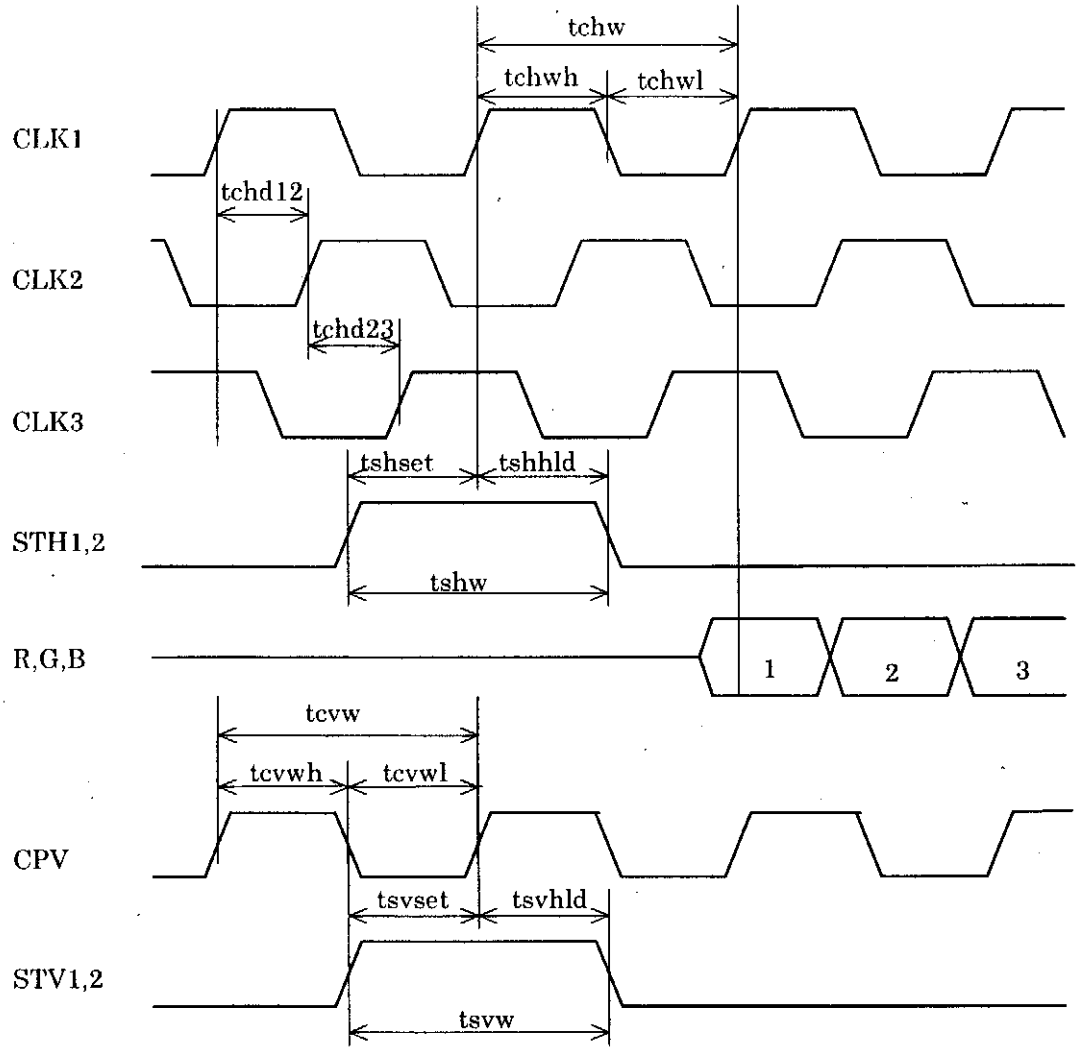
(Fig.6-1) Video signal timing chart



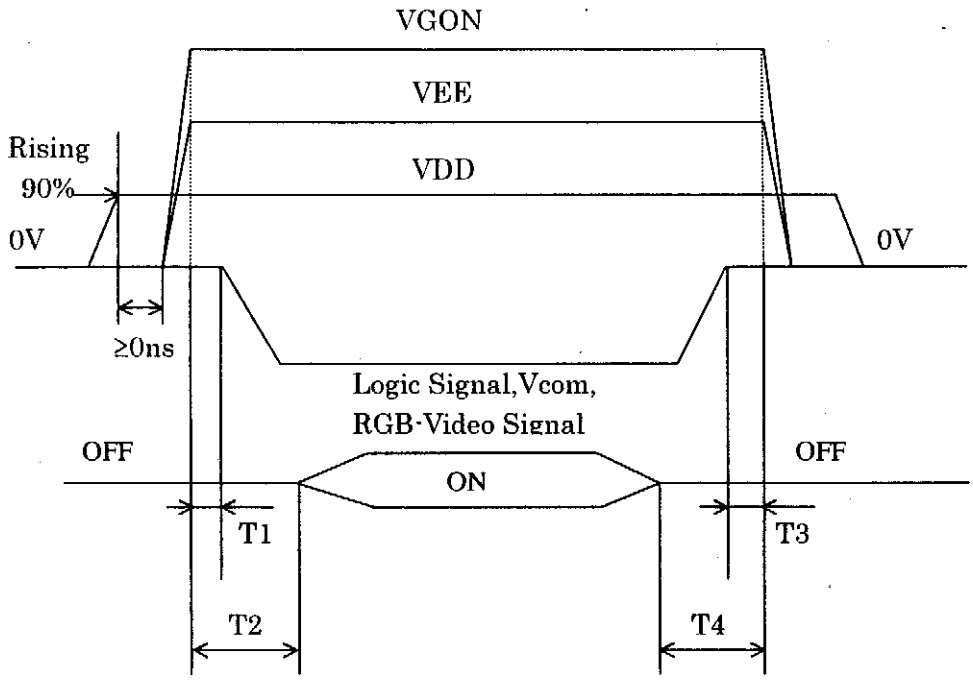
*At the full scan mode

note...After STV and CPV are outputted at the time of a power supply injection, more than one Field scanning period should hold OEV on Hi voltage (3.3V).

(Fig. 6-2)Control signal timing diagram

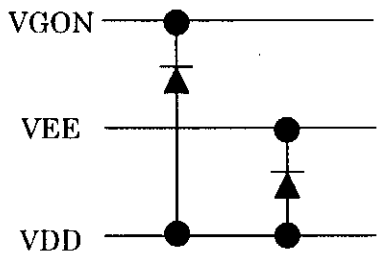


(7)Sequence for power-on /off and signal on / off



1)10ms ≤ T1 < T2 , 0 < T3 < T4 ≤ 10ms

2)Please use the schottky Barrier Diode among VDD ,VEE and VGON, shown as follows.



(8) Backlight

CHARACTERISTICS	SYMBOL	MIN	TYP	MAX	UNIT	REMARKS
Lamp current	IL	3.0	6.5	7.0	mArms	
Lamp voltage	VL	-	600	-	Vrms	
Lamp power consumption	PL	-	3.9	-	Wrms	
Possible lighting frequency	FL	-	30 - 70	-	kHz	
Starting voltage	VS	-	-	1900	Vrms	Ta=-20°C
Life time	-	10000	-	-	Hour	

Attention)

*1 Panel surface temperature should be kept less than contents of "3. Absolute Maximum Ratings".

*2 Inverter should be designed to be subject to the conditions below:
(1) Both the area and the peak under the positive and negative cycles of the waveform of the lamp current and lamp voltage should be symmetric.
(The symmetric ratio should be larger than 90%)
(2) There should not be any spikes in the waveform.
(3) The waveform should be close to a sine wave whenever possible.
(4) Lamp current should not exceed the "MAX" value under the "Operating Temperature" (It is prohibited to exceed the "MAX" value even if it is operated in the non-guaranteed temperature). When lamp current exceed the maximum value for a long time, it may cause a smoking and ignition. Therefore, it is recommended that the inverter have the current limited circuit that is used as a protection circuit and/or the lamp current-controlled inverter.
(5) Please check the lamp current not to exceed the "MAX" value in the inverter open/short test.
(6) The "MIN" of "Lamp current " is the necessary value which must not be applied to the product for an stable working condition.
Please pay attention to keep the "MIN" of "Lamp current" for a light dimmer.

*3 The lamp frequency should be selected as different as possible from display horizontal synchronous signal (Including harmonic frequency of this scanning frequency) to avoid "Beat "interference which may be observed on the screen as horizontal stripes like moving wave.
This phenomenon is caused by interference between lamp (CCFL) lighting frequency and LCD horizontal synchronous signal.

*4 "Life time" is defined as a lamp maker's warranty value which applied to CCFL only.
"Life time" is defined as the lamp brightness decrease to 50% original brightness at IL=MAX; continuous lighting, Ta=25°C.

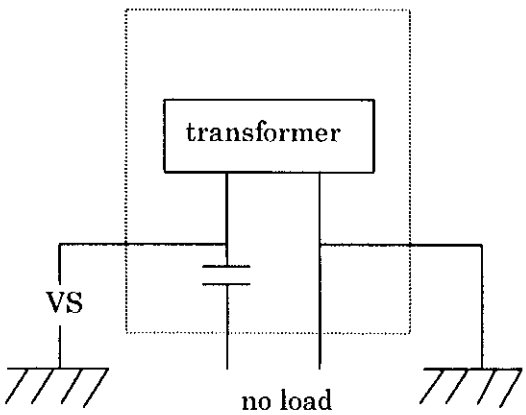
*5 Values of "Lamp Voltage", "Lamp power consumption" and "Starting voltage" are defined on condition of the LCD module derived by Toshiba Matsushita Display Technology Co.,Ltd. standard inverter (Harison HIU-742A; 16.5pF).
The "MAX" of "Starting voltage "means the minimum voltage to light normally in the LCD module. However this isn't the values that we can assure stability of starting lamp on condition that the module is installed in your set.
It is careful that "Starting voltage" is changed by an increase of stray capacitance in your set, inverter method, value of ballast capacitor in your inverter and so on.
Especially, the value of "Starting voltage" is higher in low temperature condition than in normal temperature condition, because impedance of CCFL is increased.
So, please check your set in low temperature condition.

*6 Please do not bring the high voltage wire into contact with metallic frame and the GND lead wire, so as to ensure the safety and decrease the difference of brightness.

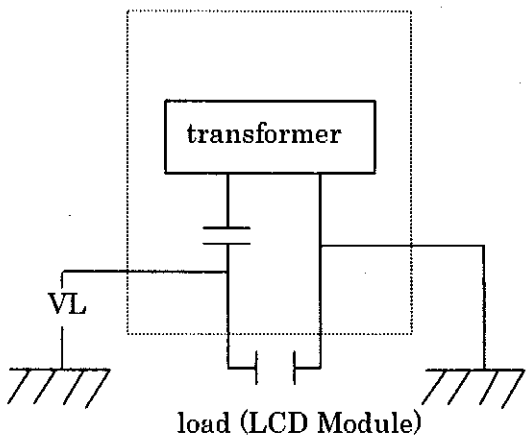
*8 Inverter output voltage should be stopped automatically and simultaneously when open-circuit or short-circuit happened between the inverter output and CCFL. (Please design the inverter which has shutdown function in case of no load for inverter output.) Continuous voltage output from the inverter under the open or short circuit may cause excessive leak current and overheat.
<u>However inverter output voltage is required to remain for on-condition at least 3 seconds, because CCFL needs 1 or 2 seconds as start-up time.</u>

*7 "Starting Voltage" and "Lamp voltage" are defined as follows.

(1)Starting voltage
*Use inverter : HIU-742A; 16.5pF



(2)Lamp voltage
*Use inverter : HIU-742A; 16.5pF



Lamp Connector Use Connector : BHSR-02VS-1 (JST)

Pin No.	SYMBOL	FUNCTION	REMARKS
1	L	CCFL power supply (Ground)	cable color : White
2	H	CCFL Power supply (High Voltage)	cable color : Red

7. Product specification

(1)Test Condition

Environment ...Room ambience (100 - 300lx, Temperature :25±5°C, Humidity :40 - 70%RH)
Supply voltage...Standard Value
Input signal ... Standard Value
Back light...Lamp current is 6.5mA (The brightness is 400±100cd/m².)
Inspection area...Active area
Inspection distance...30cm
Inspection angle...The direction of the front ($\theta = 0°$, $\phi = 0°$)
Display pattern...The raster display of White, Black, Red, Green, Blue
Standard eyesight...1.0
Inspection method...The active area is observed visually.

(2)Line Defect Nothing

(3)Point Defect

ITEM		SPECIFICATION			UNIT	REMARK
(1)Brighten Spot *7-1	R	1)	2		dot	P means pixel.
	G	2)	2			
(2)Black Spot *7-2		3)	10			
(3)Foreign object			P ≤ 3	20	*7-3	unit
		4)	3 < P ≤ 7	4		
			7 < P	None		
Acceptable defect numbers		Total count of No. 1),2),3),4),and blue brighten spot should be ≤ 10				

Relative position
Distance between two countable level brighten spots should be over 5mm.
Acceptable number of adjacent brighten spots should be less than 2.
Acceptable number of adjacent black spots should be less than or equal to 2.
In the case of (3) even within acceptable numbers, the distance between two countable defects should be over 5mm.

Note)

- Brighten spot is defined as the spot which is constantly lighted on when black image is displayed in the LCD panel screen.
- Black spot is defined as the spot which is constantly lighted off when white image is displayed in the LCD panel screen.

*7-1 Countable level as brighten spot or black spot is over 50% of each dot.
As for adjacent brighten spot, less than two dots are counted as one.
As for adjacent black spot, less than or equal to two dots are counted as one.

*7-2 This includes the defect in the LCD panel cell being able to recognize when LCD panel is operated.

*7-3 This is not recognizable level ,so if necessary, discussion will be held when appropriate limiting sample is found.

(4)Bubble between polarizer and LCD glass, Dent (Apply to both side of AR and CF)

Size	Zone		Unit
D:average diameter (mm)	Effective display area	BM area	
D < 0.3	≤ 5	Ignore	pcs
0.3 ≤ D	0		

note)

1. Above criteria assumes inconspicuous of defect.
2. Limiting sample will be established if necessary.

(5)Polarizer scratch (Apply to both side of AR and CF)

Size	Zone		Unit
W:wide(mm), L:length(mm)	Effective display area	BM area	
W ≤ 0.02, L ≤ 5	≤ 3	Ignore	pcs
W > 0.02, L > 5	0		

note)

1. Above the judgement criteria is applied to the scratch of glass beneath the polarizer.
2. Above criteria shall be applicable to inconspicuous defects.
3. Limit samples shall be established if necessary.

(6) Peeling of polarizer

Zone		Unit
Effective display area	BM area	
0	Ignore	pcs

Note)

1. Above criteria shall be applicable to inconspicuous defects.
2. Limit samples shall be established if necessary.

(7) Foreign dust inside panel / inside polarizer, Dust in back light

Zone		Unit
Effective display area	BM area	
Refer to Dot Defect Standard.	Ignore	pcs

Note)

1. Above criteria shall be applicable to inconspicuous defects.
2. Limit samples shall be established if necessary.

(8)Display nonuniformity

1. Display nonuniformity shall not be observed through 2.5% ND filter at white raster, black, gray pattern.
2. Limit samples shall be established if necessary.

8.Reliability specification

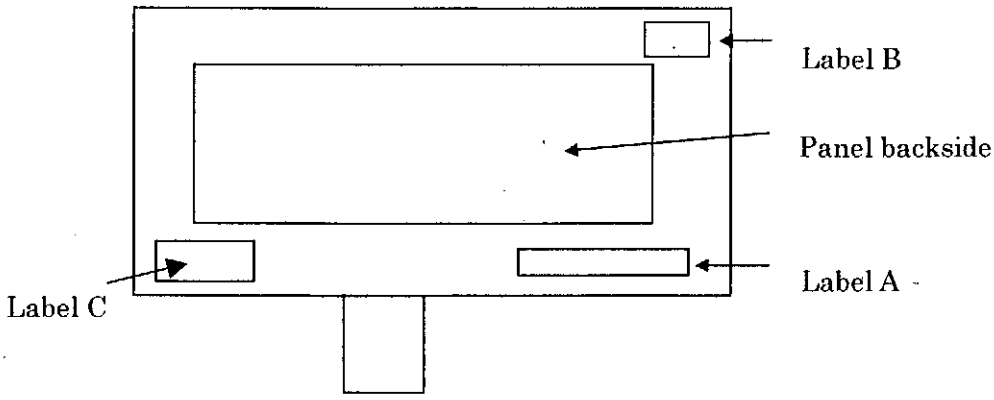
TEST ITEM	TEST CONDITION	JUDGMENT
(1)Operation at high temperature	70 °C 192h (LCD panel surface temperature)	After test, display should maintain the contents (2) - (8) of "7. Product specification".
(2)Operation at low temperature	-20°C 192h (ambient temperature)	
(3)Operation at high temperature and high humidity	55°C 90% 192h (ambient temperature)	
(4)High temperature exposure	80°C 192h	
(5)Low temperature exposure	-30°C 192h	
(6)Heat shock	-20°C / 70°C (0.5h/0.5h)50 cycles	
(7)Electrostatic withstanding voltage	Panel surface :150pF ± 15 kV 150Ω (direct discharge ,five times) FPC input terminal : 100pF ± 200V 0Ω	Operate normally after test
(8)Product drop test	490m/s², 11msec half-sine pulse Once for each direction of X, Y and Z.	
(9)Product vibration test	10 - 57 Hz : width 0.075mm 58 - 500 Hz: 9.8m/s² peak 11 minutes / cycle 3 hours (one hour each for X,Y and Z.)	
(10)Packaged drop test	Bottom surface : 40cm Others : 25cm Once for four surfaces, two sides, one Corner	Operate normally after test. There are not remarkable defects.
(11)Packaged vibration test	5 - 50 Hz Z direction 9.8m/s²/54 minutes X,Y direction 4.9m/s²/27 minutes	

note) The test (1) is performed at the backlight on condition. Lamp current is 6.5mA.
The test (2) - (11)is performed at the backlight off condition.
The test (3) is performed at non dew condensed condition.
Judgment is performed after one hour exposure at room temperature after test.

9 .Serial number label

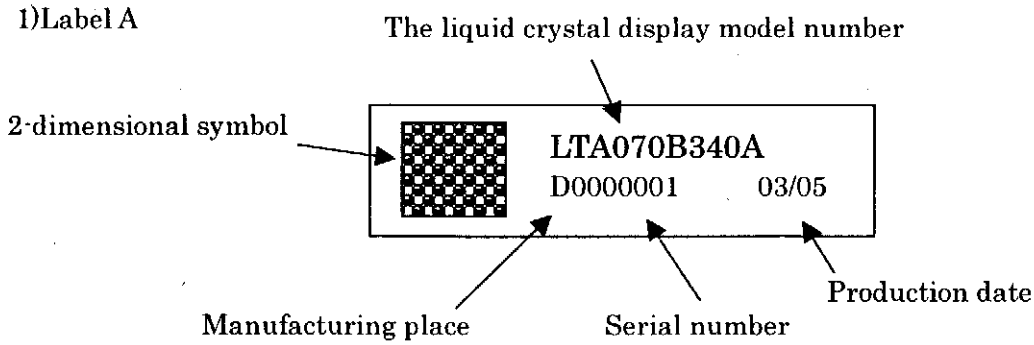
(1) Position and sticking

Label is stuck to the place displayed as below.



(2)Display contents

1)Label A



1. Serial number.....This is described by a number of seven figures beginning with 1

(ex) 1st 0000001

158th 0000158

The delivered device doesn't always have a successive serial number.

The display of manufacturing place is as follows according to the mark before serial number.

a) A : Aichi

b) D : Utsunomiya

2. Product year and month.....This means the year and month of the LCD module production.

(ex) 2003 April → 03/04

2) Label B

3) Label C : Backlight lot label

"LLY0019"mean/Radiant made

"LLY0033"mean/Stanley made

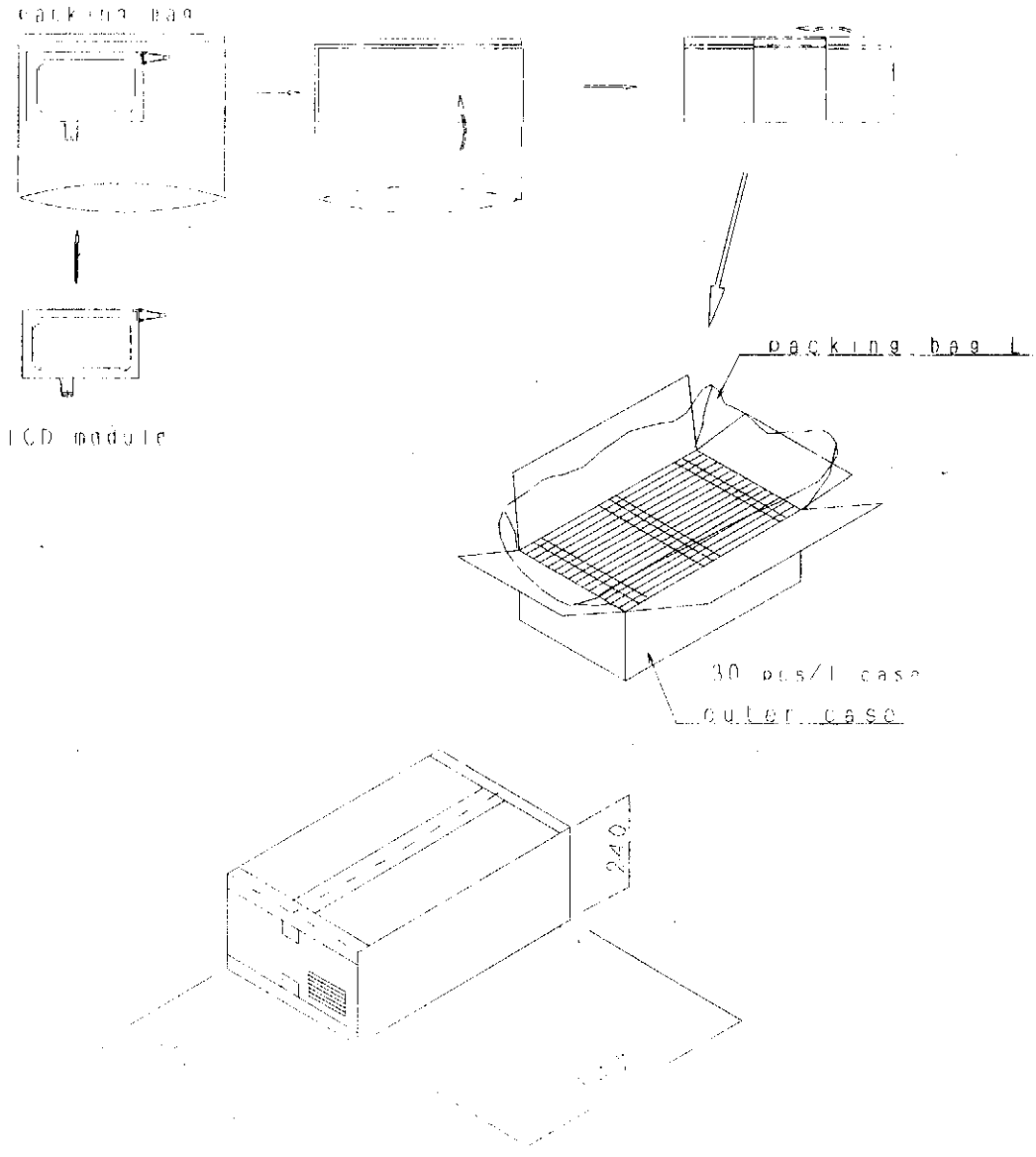
10. The Package Specification

(1) The LCD module is put into the packing bag with anti - electrostatics treatment, and then it is put into the outer case at the condition that the maximum quantity is 30.

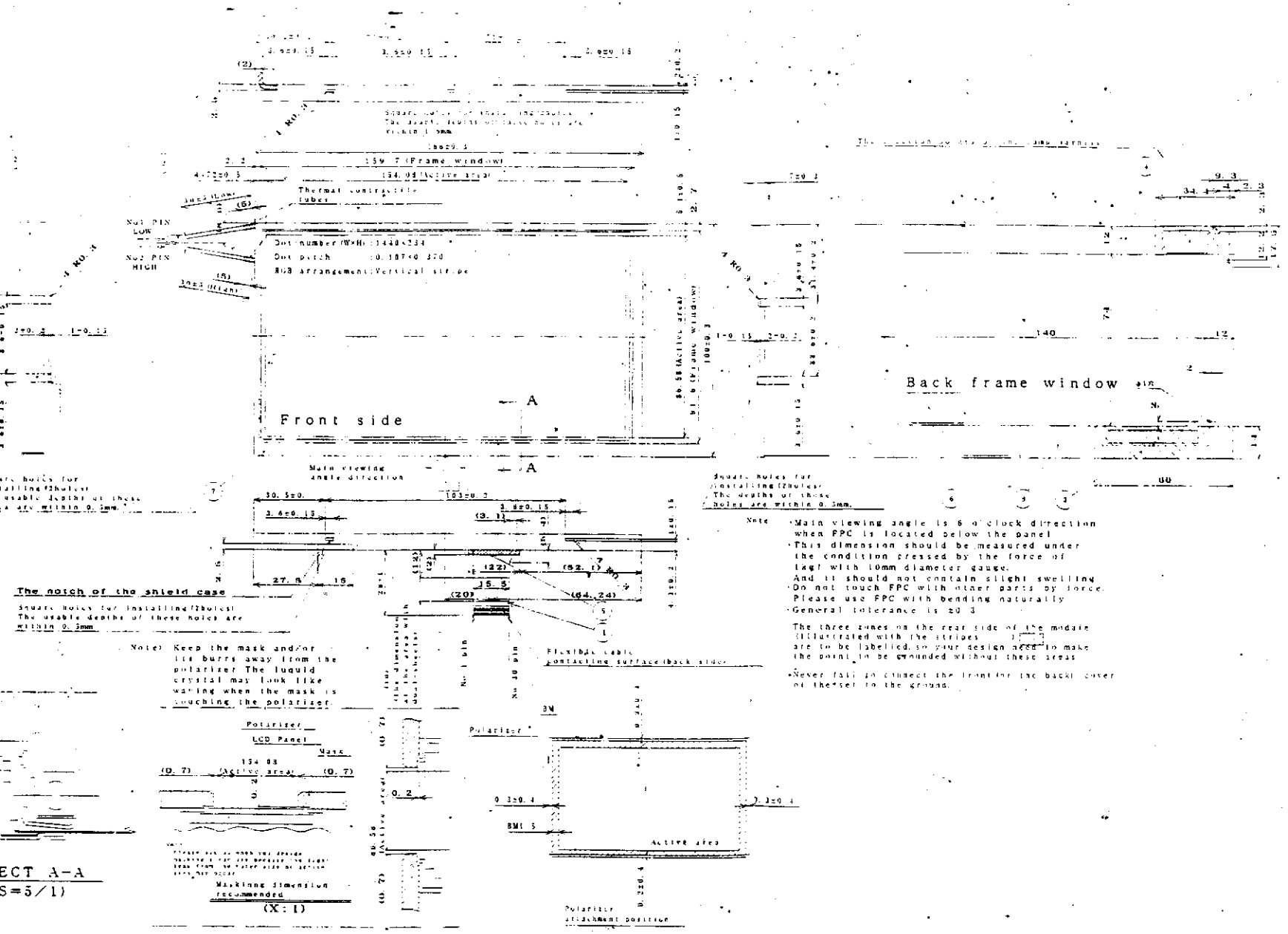
(2) Below mentioned contents are directly printed on the outer case, or the label which describes below mentioned contents is stuck to the outer case.

Customer	
Cust. Part. No.	
Part. No.	LTA070B340A
Quantity	(EX) 30
Lot No.	(EX) 03.05.22

(3)The drawing for packaging



.Device outside view



ECT A-A
S=5/1)