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APPROVED BY: <i>R. Yamuchi</i>		FILE No.
		ISSUED: May.29th.2007
		PAGE : 19pages
		APPLICABLE GROUP MOBILE LIQUID CRYSTAL DISPLAY GROUP

DEVICE SPECIFICATION FOR

TFT-LCD module

MODEL No. LQ057V3DG01

These parts have corresponded with the RoHS directive.

CUSTOMER'S APPROVAL

DATE _____

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RECORDS OF REVISION

MODEL No : LQ057V3DG01

SPEC No : LA1-07014

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1 Applicable TFT-LCD module

This specification applies to the color TFT-LCD module, LQ057V3DG01.

2 Overview

This module is a color active matrix transmissive LCD module incorporating amorphous silicon TFT (Thin Film Transistor).

It is composed of a color TFT-LCD panel, driver ICs, control circuits and power supply circuitry and a backlight unit. Graphics and texts can be displayed on a 640 x RGB x 480 dots panel with 262,144 colors by feeding 18 bit data signal (6bit/each of R,G,B), 4(four) timing signals, +3.3V DC power supply for TFT-LCD and AC power supply for backlight.

(Note: Backlight-driving DC/AC inverter is not built in this module.)

- Fine images with stripe aligned 307,200 pixels on 5.7 inch diagonal screen
- Color display capability of 262,144 colors with 18 bit data signal(6 bits for each RGB)
- Adapting a wide viewing angle technology [best viewing angle: 12 o'clock direction]
- High contrast, thanks to active matrix drive system
- AG(Anti Glare) polarizing filter
- Light and slim compact module achieved by COG assemble technology(6 o'clock direction is also available by the function to flip the screen horizontally or vertically)
- Natural coloring reproducibility by employing normally-white-mode, which has good nature in coloring
- Image inversion both horizontally and vertically

3 Mechanical Specifications

items	specifications	unit
Display size (Diagonal)	14.4 (5.7")	cm
Active display area	115.2 (H) x 86.4 (V)	mm
Pixel format	640(H) x RGB x 480(V)	dot
	(1 pixel=R+G+B dots)	-
Pixel pitch	0.18[H] x 0.18[V]	mm
Pixel configuration	R,G,B vertical stripe	-
LCD mode	Normally white	-
Dimension *	144 (W) x 104.6 (H) x 12.3(D)	mm
Mass	250(max)	g

*. Protrusion such as backlight harness and positioning boss are not included.

Fig.1 shows dimensions of the module.

4 Input Signal Assignment

4.1 TFT-LCD Panel driving section

Employed connector: IMSA-9637S-33Y902 (IRISO ELECTRONICS CO.,LTD.)

Pin No.	Symbol	Function	Polarity
1	GND	Ground	
2	CK	Clock signal for sampling each data signal	
3	Hsync	Horizontal synchronous signal	
4	Vsync	Vertical synchronous signal	
5	GND	Ground	
6	R0	RED data signal(LSB)	
7	R1	RED data signal	
8	R2	RED data signal	
9	R3	RED data signal	
10	R4	RED data signal	
11	R5	RED data signal(MSB)	
12	GND	Ground	
13	G0	GREEN data signal(LSB)	
14	G1	GREEN data signal	
15	G2	GREEN data signal	
16	G3	GREEN data signal	
17	G4	GREEN data signal	
18	G5	GREEN data signal(MSB)	
19	GND	Ground	
20	B0	BLUE data signal(LSB)	
21	B1	BLUE data signal	
22	B2	BLUE data signal	
23	B3	BLUE data signal	
24	B4	BLUE data signal	
25	B5	BLUE data signal(MSB)	
26	TEST1	TEST1(Please be sure to connect 26pin with ground)	
27	ENAB	Data enable signal (signal to settle the horizontal display position)	【Note 1】
28	Vcc	+3.3V power supply	
29	Vcc	(Supply same voltage to 28 and 29 pin)	
30	R/L	Selection signal for horizontal scanning direction ("L" : Normally , "H" : Right-and-Left reversal)	【Note 2】
31	U/D	Selection signal for vertical scanning direction ("H" : Normally , "L" : Up-and-Down reversal)	【Note 2】
32	TEST2	TEST2(to be fixed to "High")	
33	TEST3	TEST3(Please be sure to connect 33pin with ground)	

The back shield case is internally grounded to GND of the module.

The front shield case is not certainly grounded to GND of the module.

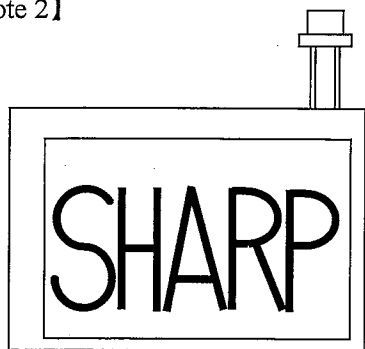
【Note 1】

The horizontal display location is designated and controlled by rising timing of ENAB signal.

However if ENAB signal is fixed to "Low", display location is designated by the default setting in the module.

(Don't use the module by fixing ENAB to "High")See: Chapter 7-2

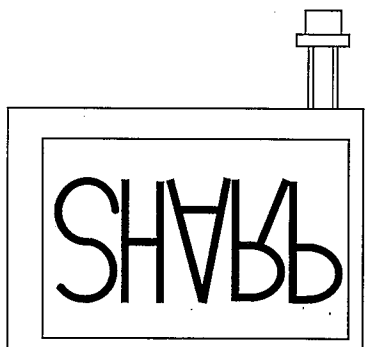
【Note 2】



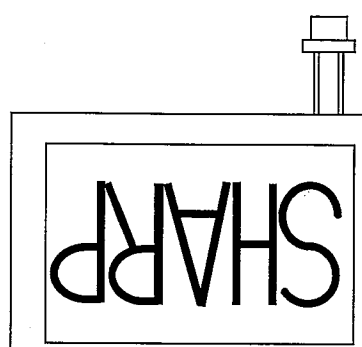
R/L = L, U/D = H



R/L = H, U/D = H



R/L = L, U/D = L



R/L = H, U/D = L

4.2 Backlight section

Employed connector: BHR-02(8.0)VS-1N (JST)

Adapted connector: SM02(8.0)B-BHS-1N-TB (JST)

CN2

Pin no.	Symbol	Function
1	V _{LOW}	input terminal (Low Voltage Side)
2	NC	Non connection
3	V _{HIGH}	input terminal (Hi Voltage Side)

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage	V _I	Ta=25°C	-0.3 ~ + V _{CC} +0.3	V	[Note 1]
Supply voltage	V _{CC}	Ta=25°C	0 ~ +4.6	V	-
Storage temperature	T _{stg}	-	-30 ~ +80	°C	[Note 2]
Operating temperature (Panel surface)	T _{opp}	-	-30 ~ +80	°C	

[Note 1] CK, R0 ~ R5, G0 ~ G5, B0 ~ B5, Hsync, Vsync, ENAB, R/L, U/D

[Note 2] Humidity: Less than 95%RH at Ta ≤ 40°C and

Maximum wet-bulb temperature must not exceed 39°C at Ta > 40°C,
with no condensation.

6. Electrical characteristics

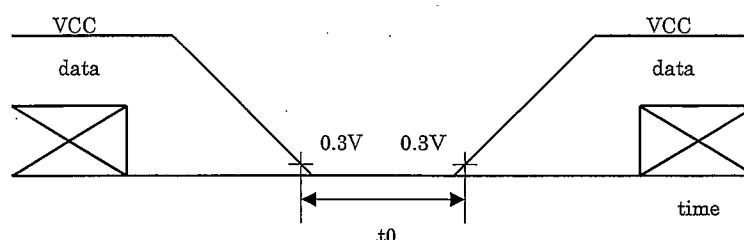
6.1 TFT-LCD Panel driving section

Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Supply voltage	V _{CC}	+3.0	+3.3	+3.6	V	[Note1]
Current dissipation	I _{CC}	-	220	-	mA	[Note2] V _{CC} =3.3V
Allowed input ripple voltage	V _{RF}	-	-	100	mV p-p	V _{CC} =3.3V
Input voltage ("Low" state)	V _{IL}	0	-	0.3*V _{CC}	V	[Note3]
Input voltage ("High" state)	V _{IH}	0.7V _{CC}	-	V _{CC}	V	
Input leakage current (low)	I _{OL1}	-	-	4	μA	V _I =0V [Note4]
	I _{OL2}	-	-	4	μA	V _I =0V [Note5]
Input leakage current (High)	I _{OH1}	-	-	4	μA	V _I =3.3V [Note4]
	I _{OH2}	-	-	4	μA	V _I =3.3V [Note5]

[Note1] V_{CC} turn-on/off conditions

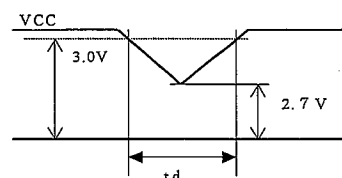
$$1s < t_0$$

V_{CC}-dip conditions1) At $2.7V \leq V_{CC} < 3.0V$

$$t_d \leq 10ms$$

2) At $V_{CC} < 2.7V$

V_{CC} dip conditions should also follow
the V_{CC} turn-on/off conditions

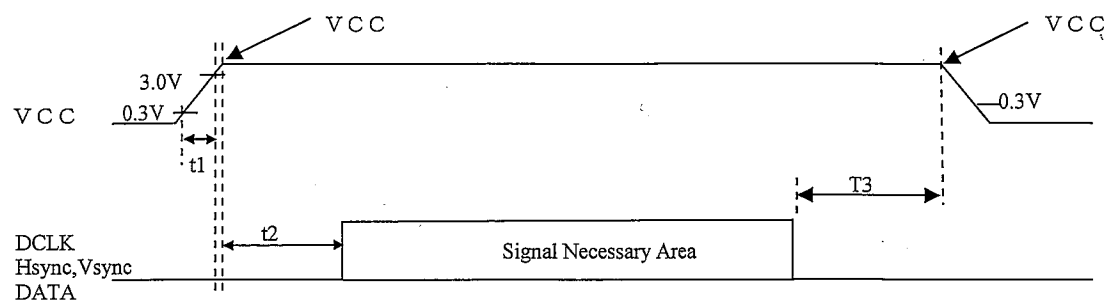


[Note2] Current dissipation (Typ.): When Black pattern is displayed.

[Note3] CK, R0~R5, G0~G5, B0~B5, Hsync, Vsync, ENAB, R/L, U/D

[Note4] R0~R5, G0~G5, B0~B5, Hsync, and Vsync

[Note5] ENAB

6-2 V_{CC} turn-on/off conditions

	Min.	Typ.	Max.	unit
t_1	0	-	10	ms
t_2	0	-	50	ms
t_3	0	-	100	ms

6.3 Backlight driving Section

Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Lamp voltage	VL	610	-	750	V rms	IL=5mA rms
Lamp current	IL	4.5	5.0	5.5	mA rms	[Note6-1]
Lamp frequency	fL	30	-	60	KHz	
Kick off voltage	VS	-	-	1080	Vrms	Ta=25°C
		-	-	1490		Ta=-30°C
Lamp life time	LL	-	50,000	-	hour	[Note6-2]

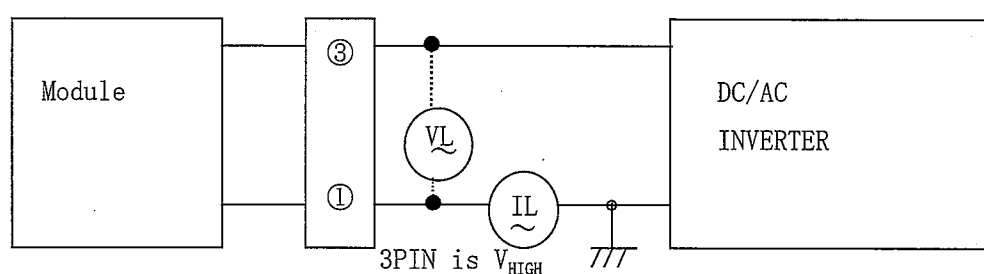
(Inverter: HARISON TOSHIBA LIGHTING CORPORATION Type HIU-288(22pF) is used)

Caution: Use Inverter providing symmetrical sine-wave in positive/negative polarity with no spike.

[Note6-1] Connect Module's metal shield case to GND of inverter circuit.

A piece of lamp current is 5mA rms.

Lamp current is measured with current meter for high frequency as shown below.



[Note6-2] The data for lamp is for your reference, because lamp is consumable component.

- a) Lamp life time is defined by either 1 or 2 below. (Continuous turning on at Ta=25°C, IL=5mA rms)
 - ① When a brightness of lamp surface became 50% of the initial value under the standard condition.
 - ② When a kick-off voltage in Ta= -30°C exceeded maximum value (1490 Vrms) at the output of inverter circuitry
- b) In case of operating under lower temp. environment, the lamp exhaustion is accelerated and the brightness becomes lower.
 (Continuous operating for around 1 month under lower temp. condition may reduce the brightness to half of the original brightness.)
 In case of such usage under lower temp. environment, periodical lampexchange is recommended

7 Timing Characteristics of Input Signals

Timing diagrams of input signal are shown in Fig.2.

7.1 Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	1/Tc	24.3	25.2	26.1	MHz
	“High” time	Tch	10	—	—	ns
	“Low” time	Tcl	10	—	—	ns
Data	Setup time	Tds	5	—	—	ns
	Hold time	Tdh	5	—	—	ns
Hsync	Period	TH	—	31.75	—	μs
			780	800	820	clock
	Pulse width	THp	2	—	TH-10	clock
Vsync	Period	TV	520	525	530	line
	Pulse width	TVp	2	—	519	line
Horizontal display period		THd	—	640	—	clock
Phase difference between Hsync and clock		THc	5	—	Tc-10	ns
Phase difference between Hsync and Vsync		TVh	0	—	50	clock
Vertical back porch		TVs	—	34(fixed)	—	—
Vertical front porch		TVf	6	—	16	—
Vertical display period		TVd	—	480	—	line

Note) In case of lower frequency, the deterioration of display quality, flicker etc., may occur.

7.2 Display Position in horizontal direction

Display position in horizontal direction is designated by rising timing of ENAB signal.

Parameter	Symbol	MIN	TYP	MAX	Unit	Note
ENAB signal	Setup time	Tes	5	—	Tc-10	ns
	Pulse width	Tep	—	640	—	clock
Phase difference between Hsync and ENAB signal		THe	44	—	104	clock

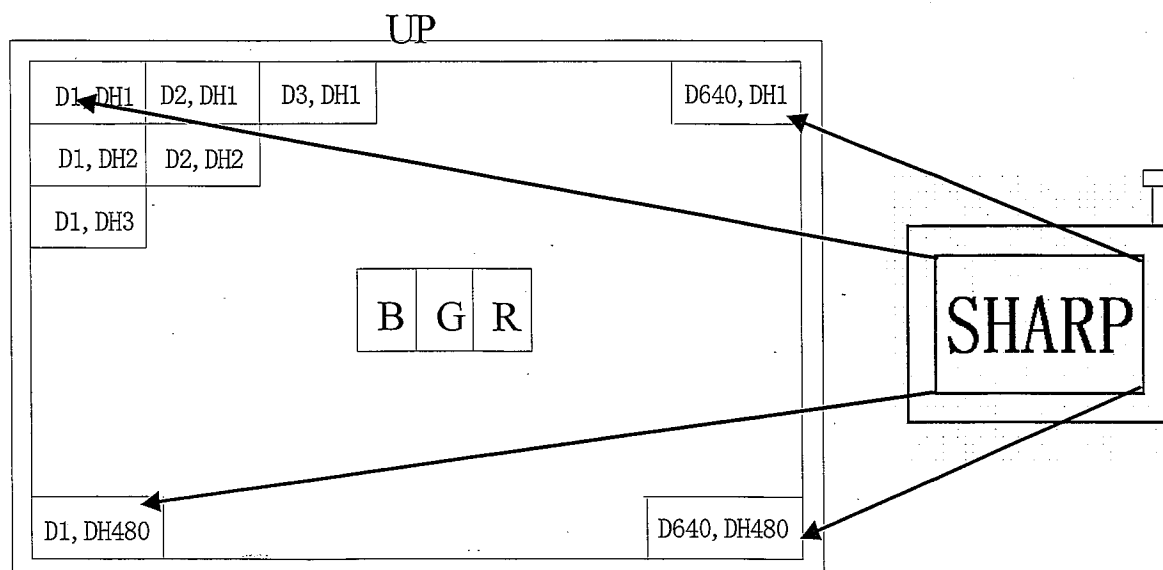
When ENAB is fixed to “Low”, the horizontal display will start from the clock C104 (clock) as shown in Fig.2.

7.3 Display position in vertical direction

Display start position in vertical direction TVs is fixed to the 34th line.

8 Input Signals, Basic Display Colors and Gray Scale of Each Color

Display position of input data



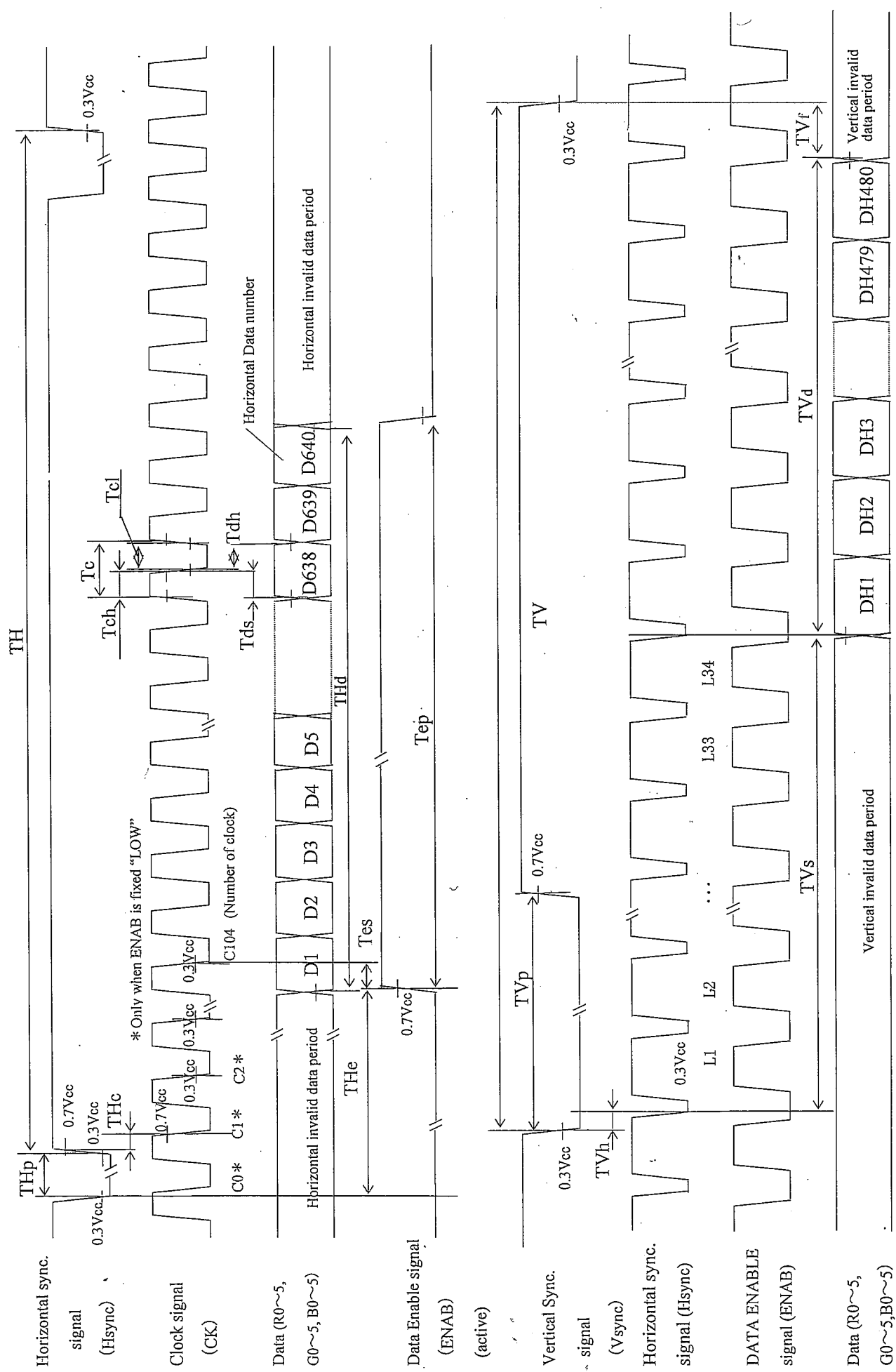


Fig 2. Input signal waveforms

	Colors & Gray scale	Data signal																		
		Gray Scale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Color	Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	-	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	-	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	-	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	-	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	-	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	↓	↓					↓					↓							
	↓	↓	↓					↓					↓							
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	↓	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	↑	↓	↓					↓					↓							
	↓	↓	↓					↓					↓							
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	↓	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	↑	↓	↓					↓					↓							
	↓	↓	↓					↓					↓							
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	↓	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Blue	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0: Low level voltage, 1: High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

9 Optical Specification

Ta=25°C, Vcc=+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle Range	Horizontal	$\theta 21, \theta 22$	CR≥5	-	80	-	° (Deg.)	[Note9-1,4]
	Vertical	$\theta 11$		-	80	-	° (Deg.)	
		$\theta 12$		-	70	-	° (Deg.)	
Contrast ratio		CR max	Best viewing angle	200	600	-	-	[Note9-2]
Response time	Rise	Tr	$\theta = 0^{\circ}$	-	8	20	ms	[Note9-3]
	Fall	Td		-	21	40	ms	
Chromaticity of white		x	IL=5mA _{rms}	0.263	0.313	0.363	-	[Note9-4]
		y		0.279	0.329	0.379	-	
Luminance		Y			-	400	-	

Lamp test in the module is made with the inverter type HIU-288(22pF) at 50kHz

The optical specifications are measured 30 minute after turning lamp on and in a dark room or equivalent condition, according to the method shown in Fig.9-1, 2 below.

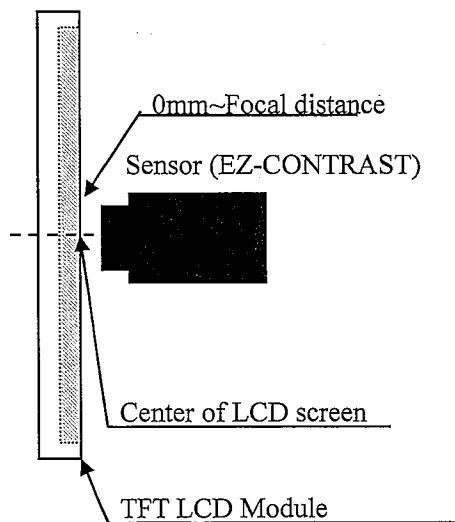


Fig.9-1 Measuring setup for
Viewing angle and Contrast
(BM-5A is used for contrast.)

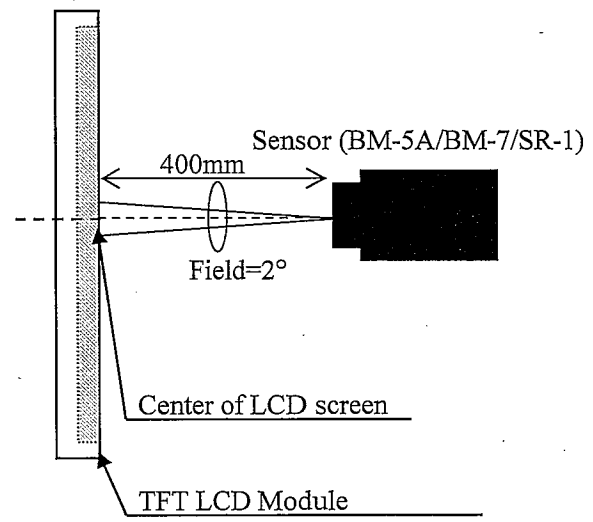
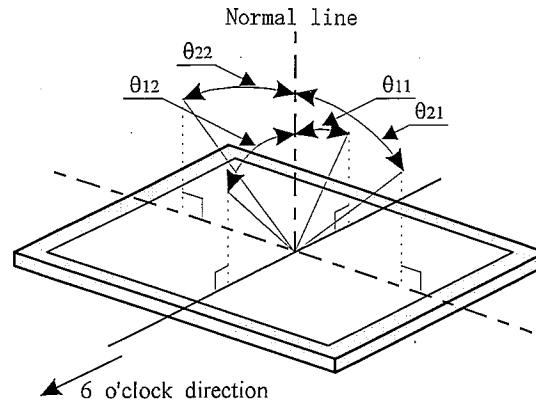


Fig.9-2 Measuring setup for
Luminance, Chromaticity
and Response time
(BM-7 is used for Luminance, SR-1 is for response)

[Note9-1] Definitions of viewing angle range:



The best viewing angle of this module is slightly leaned to 12 o'clock from normal line.

Where $\theta_{11} > \theta_{\max}$, gray scale is reversed partially.

Where $\theta_{11} < \theta_{\max}$, or in θ_{12} direction, gray scale isn't reversed.

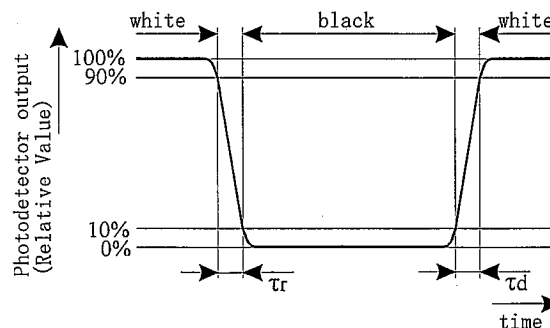
[Note9-2] Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

[Note9-3] Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal between "black" and "white" alternatively.



[Note9-4] This parameter should be measured at the center of the screen and 30 minutes after turn-on.

Inverter frequency: 50 kHz

The characteristics are measured when the driver circuit is not powered.

10 Display Qualities

Please refer to the Outgoing Inspection Standard.

11 Handling Instruction

11.1 Assembling the 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 nominal diameter 3.0mm tapping screw (fastening torque is 0.25 through 0.30 N·m) is recommended, be sure to fix the module on the same plane, taking care not to wrap or twist the module. The depth of tapping screw embedded into LCD module must be less than 5mm.

The pressing module, (ex. touching switch etc.) causes disordered image. So taking care for pressure not to conduct directly to LCD module.

- 2) Please power off the module before you connect or disconnect input connector..
- 3) Make sure to connect module's metal shield case to GND of inverter circuit.
If its connection is not made perfectly, some of the following problems may occur.
 - a) The noise from the backlight unit will increase.
 - b) The output from inverter circuit will be unstable.
 - c) In some cases, a part of module will heat up.

11.2 Precautions in mounting

- 1) Polarizer which is made of soft material and susceptible to flaw must be handled carefully.
- 2) Method of removing dust from polarizer.
 - Blow off dust with N2 blower for which static electricity preventive measure has been taken.
 - Since the polarizer is easily damaged, wiping should be avoided. If the panel has stain or finger grease, we recommend to use adhesive tape to softly remove them from the panel.
Inevitable, wipe off by cleaning cloth for a lens with carefully, breathing on it.
- 3) When 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.
- 4) Wipe off water drop or finger grease immediately. Long contact with water may cause discoloration or spots.
- 5) TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface handle with care.
- 6) Since CMOS LSIs are incorporated in this module, take care of electrostatic and earth human body while handling.

11.3 Caution in product design

The notes and cautions below should be followed when product is designed with this module.

The module should be protected with cover to prevent salt content and/or water droplet.

Take enough shielding countermeasure not to interfere to peripheral electronic device.

11.4 Others

The LCD has the nature that its performance is degradation by ultra-violet light. Don't leave the LCD module in direct sunlight or strong ultra violet ray.

If stored at the temperatures lower than the rated storage temperature, the LC may freeze and it may cause LCD panel damage. If storage temperature exceeds the specified rating, the molecular orientation of the LC may change to that of a liquid, and they may not revert to their original state. Store the module in normal room temperature.

The inductive loss caused by routing of lamp lead wire, which is closed to conductive section, may require the kick-off voltage greater than specified kick-off voltage.

The liquid crystal may leak out when the LCD is broken. If the liquid crystal drip into the eyes or mouth washes it out immediately.

The caution to other ordinal electronic component should be followed also.

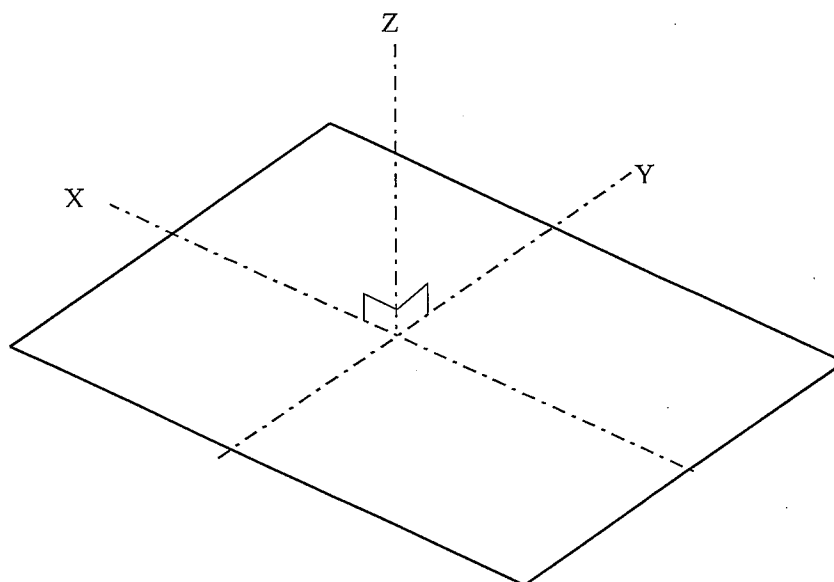
12 Reliability Test Items

No.	Test parameter	Conditions
1	High temperature storage test	Leaves the module at Ta=80°C for 240h
2	Low temperature storage test	Leaves the module at Ta=-30°C for 240h
3	High temperature & high humidity operation test	Operates the module at Ta=40°C; 90~95%RH for 240h (No condensation)
4	High temperature operation test	Operates the module with +80°C at panel surface for 240h
5	Low temperature operation test	Operates the module at Ta=-30°C for 240h
6	Strength against ESD	$\pm 200\text{V} \cdot 200\text{pF}$ [0 Ω] one time for each terminal
7	Shock test (non- operating)	Max. acceleration : 980m/s ² Pulse width : 6ms, half sine wave Direction : $\pm X, \pm Y, \pm Z$ once for each direction.
8	Vibration test (non- operating)	Frequency : 10~57Hz/Vibration width (one side):0.15mm : 58~500Hz/ acceleration:19.6m/s ² Sweep time : 6 minutes Test period : 3 hours (1 hour for each direction of X,Y,Z)
9	Thermal shock test	-30°C ~ +80°C /50 cycle [0.5h] [0.5h]

[Result Evaluation Criteria]

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

[Note] The directions of X, Y, Z are defined as below:



13 Packing Form

13.1 Fig.3 shows packaging form.

13.2 Carton stock conditions

- a) Maximum number of Carton being stuck: Max. 12 cartons
- b) Maximum number of product contained: 20 Unit
- c) Carton size: 442mm(W)×390mm(H)×170mm(D)
- d) Total mass (for 20Unit): Approximately 5.9kg
- e) Carton stock environment:
 - 1) Temperature: 0 ~ 40°C
 - 2) Humidity: Up to 60%RH
 - 3) Ambiance: No gases bite into electronic components and wiring materials
 - 4) Period: Approximately 3month
 - 5) Unpacking: To prevent LCD module from damaging by ESD,
unpack the module with effective measure after controlling
humidity 50%RH or more.

14 Marking of product name

1. Serial No. indication

Serial No. is indicated by labeling. The location is given in Fig.1 Outline dimension.

Indicated contents:

LQ057V3DG01	XXXXXXXXXX
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Model name

Serial No.

Serial No. contents	1st digit:	last digit of produced year (ex. 2004 → "4")
	2nd digit:	Produced month 1, 2, 3 ~ 9, X, Y, Z
	3rd ~ 8th digit:	Sequential number 000001 ~
	9th digit:	Interoffice control code

- 2. Don't disassemble this module, it may cause malfunction.
- 3. Image retention may occur when the fixed image is display for long time.
- 4. 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-9637S-33Y902(IRISO ELECTRONICS CO.,LTD.), 33pin 0.5mm 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.

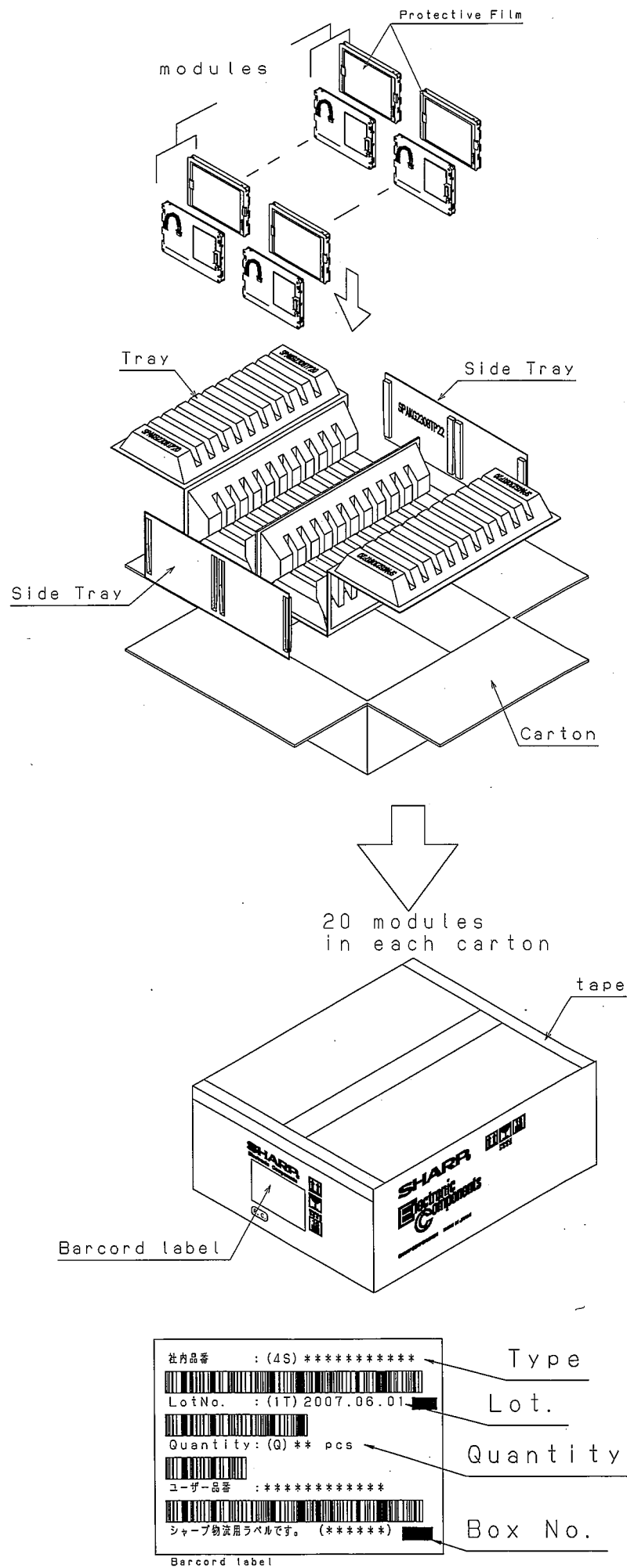
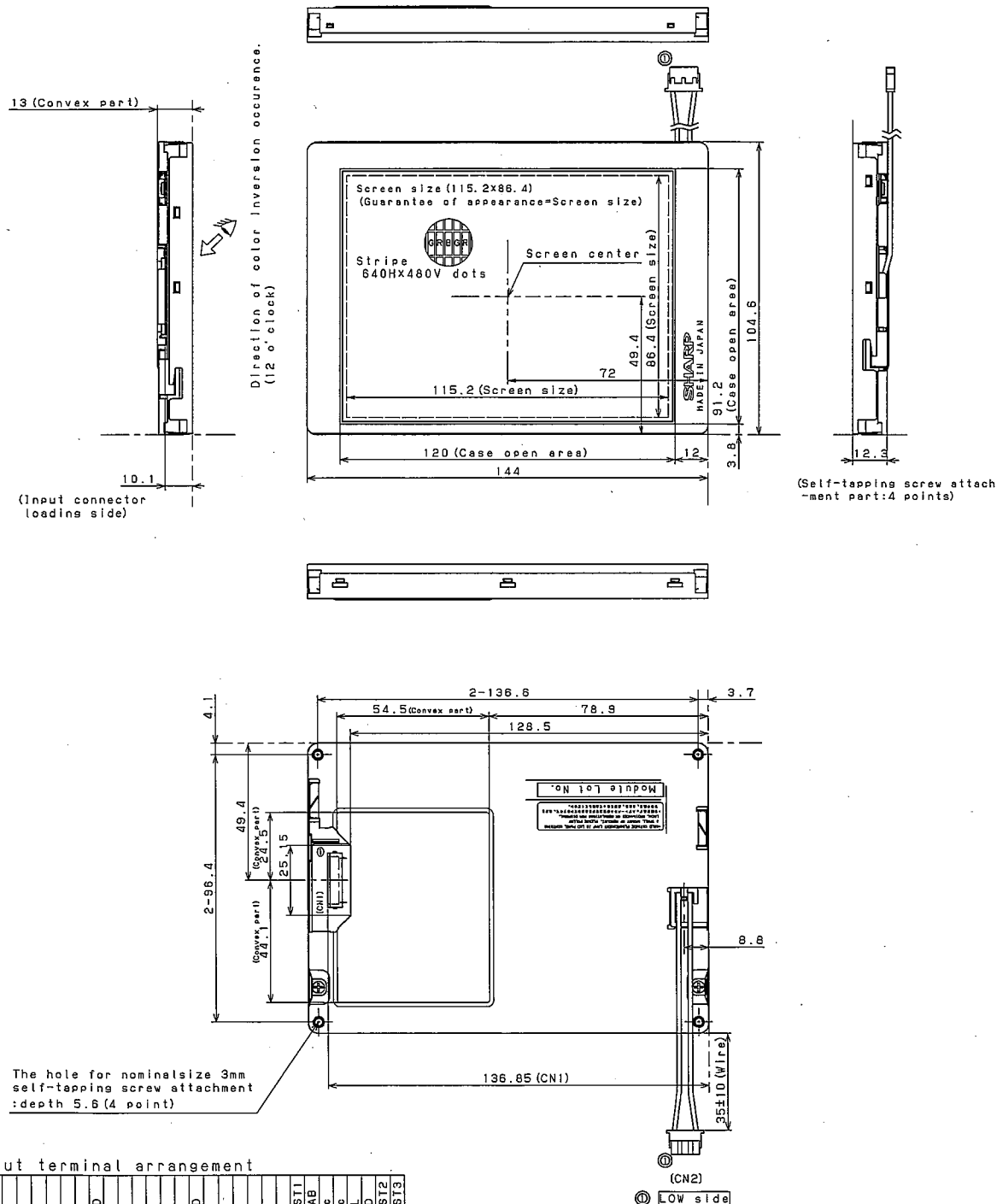


Fig.3 PACKING FORM

SHARP



① Input terminal arrangement

GND	CK	Haync	Vaync	GND	R0	R1	R2	R3	R4	R5	GND	G0	G1	G2	G3	G4	G5	GND	B0	B1	B2	B3	B4	B5	TEST1	ENAB	Vcc	R/L	U/D	TEST2	TEST3
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- 1) Take care in set design to hide the scratches and bubbles appeared on the polarizer or other flame area which is located outside of active area.
- 2) CN1: I/O connector is IMSA-9637S-33Y902 (IRISO ELECTRICS CO., LTD)
CN2: CCFT connector is BHR-03VS-1 (JST)
- 3) The whole curvature is not included thickness direction.
- 4) Recommendation screw is normal size 3mm tapping amount of invasion 5mm.
- 5) General tolerance is $\pm 0.5\text{mm}$.

unit:mm	Please do not copy this material and do not disclose this to third party.			
DATE	2007. 05. 21			
MODEL	L:Q:0:5:7:V:3:D:G:0:	free		
DRAWING NO	L:CM:1:1:-0:7:1:6:A	size A2		
SHARP CO. LTD			DATE	REVISION
ENGINEERING DEPARTMENT 1 MOBILE LIQUID CRYSTAL DIVISION 3 MOBILE LIQUID CRYSTAL GROUP			Sign.	