PREPARED BY : DATE	SHARP	SPEC No. LD17421
		FILE No.
APPROVED BY : DATE		ISSUE : Apr.20.2005
		PAGE : 35 pages
	Mobile Liquid Crystal Display GROUP SHARP CORPORATION	APPLICABLE GROUP Mobile Liquid Crystal Display Group
	SPECIFICATION	

DEVICE SPECIFICATION

TFT-LCD Module

MODEL No.

LQ150X1DWF1

(FLC38XGC6V-06P)

CUSTOMER : _____

☐ CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

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REVISION HISTORY

Revision	Date	Prepared	Checked		Approved	Summary
01A	Jun.21,2004	M.Nishido	Y.Furukoshi		F.Yamada	1st issue
02A	Apr.20,2005	M.Nishido	T. Ito		F. Yamada	Change manufacture to SHARP.

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						LQ150X1DWF1 (FLC38XGC6V-06P)
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02	20050420	Nishido		T. Ito	Add 02A, Revise P3,6,18,22,23,24,31	
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DESIG.	20040621	M.Nishido	CHECK	Y.Furukoshi	APPR.	F.Yamada

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1. APPLICATIONS

This specification is applied to the 15.0 in. XGA supported TFT-LCD module.

2. PRODUCT NAME AND MODEL NUMBER

2-1. Product Name : LCD Module

02 2-2. SHARP Model Name : LQ150X1DWF1

2-3. Model Name : FLC38XGC6V-06P

3. OVERVIEW

This LCD module has a TFT active matrix type liquid crystal panel 1024×768 pixels, and diagonal size of 38cm (15.0-inch). This module supports 1024×768 XGA mode (Non-interlace). This LCD has a digital RGB interface and can display 262,144 colors.
Timing control signal is "Data enable signal : ENAB" only. (Data enable mode)
Even and odd data are transmitted at the same timing in the interface, so data lines are 36. (R, G, B each 6 bit ×2) The signal level of this interface is +3.3V CMOS level or 5V TTL level.
The power supply of this LCD module is +5v DC single.

4. CONFIGURATION

This LCD module consists of a LCD panel, LCD driving circuit, control circuit, interface circuit and backlight unit.
The LCD panel is active matrix TFT type. The LCD driving circuit is integrated in IC chips, which are bonded on plastic wiring film (hereinafter TAB driver-IC), and the output terminals of the IC chips are connected to the LCD panel. The control circuit and the interface circuit are mounted on three kinds of printed circuit board (hereinafter PCB) and the input of the TAB driver-ICs are connected to the PCBs.
With such circuit construction, the image data received by the interface circuit is forwarded to the control circuit and the control circuit modulates the image data to LCD driving signals. The TAB driver ICs buffer the LCD driving signals and output driving voltages to the LCD panel.
These LCD parts such as the LCD panel, the TAB-ICs and the PCBs are assembled together with the backlight module in a plastic case and a metal frame.
Fig.4-1 shows a block diagram of this LCD module.

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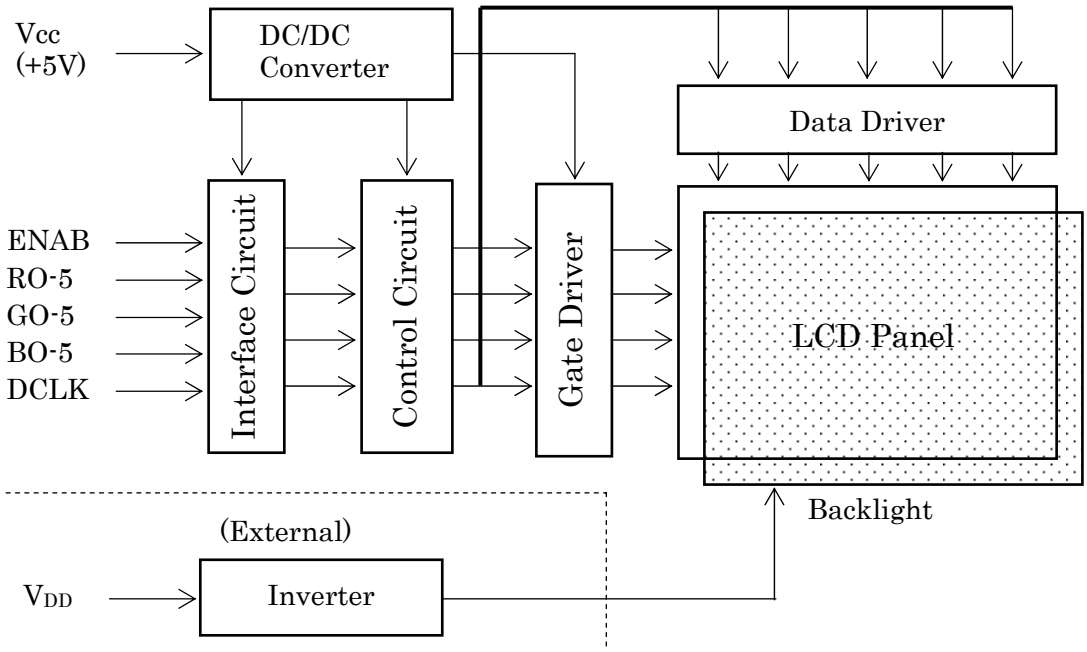

Fig.4-1.Block Diagram

5. MECHANICAL SPECIFICATIONS

Table 5-1 shows the mechanical specifications of this LCD module.

Table 5-1. Mechanical Specifications

Item	Specifications	Unit	Remark
Dimensions	347.3×263.5×15.8(TYP.) (Excluding I/F Connector and fixing parts)	mm	Edge type backlight is used. (ϕ2.6 CCFL×4) Outward Appearance is shown at page 34 and 35.
Display Resolution	(1024×3) ×768	—	
Display Dot Area	304.1×228.1	mm	
Dot Pitch	(0.099×3) ×0.297	mm	
Aspect Ratio	1 : 1	—	
Weight	1,600max	g	
FG-SG	Short circuit	—	

6. ABSOLUTE MAXIMUM RATINGS

Table 6-1 shows the absolute maximum rating of this LCD module.

Table 6-1. Absolute Maximum Ratings

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	Ta=25ºC	-0.3	—	6.0	V
Input Voltage	V_{IN}	Ta=25ºC	-0.3	—	Vcc+0.3	V

7. RECOMMENDED OPERATING CONDITIONS

Table 7-1 shows the recommended operating conditions of this LCD module.

Table 7-1. Recommended Operating Conditions

Item		Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage (Logic)		V_{CC}	4.75	5.0	5.25	V
Ripple Voltage	V_{CC}	V_{RP}	—	—	100	mV

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8. ELECTRICAL SPECIFICATIONS

Table 8-1 shows the electrical specifications of this LCD module.

Table 8-1. Electrical Specifications

Item		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remark
Supply Current		I_{CC}	V_{CC}=+5.0±0.25V Vss=0V DCLK=32.505MHz	—	380	800	mA	*1
"H" Level Logic Input Voltage		V_{IH}		2.3	—	V_{CC}	V	
"L" Level Logic Input Voltage		V_{IL}		V_{SS}	—	0.9	V	
Leak Current (Logic Input)		I_{IL}		-5	—	+5	μA	
Supply Rush Current		I_{SCC}		—	—	5.5	A	*2
Supply Rush Current Duration (1A excess)		T_{SCC}		—	—	0.4	ms	
BACK LIGHT	CCFL Turn on Voltage	V_S	f_L=50kHz, Ta=25ºC	—	1324	1500	Vrms	
			f_L=50kHz, Ta=0ºC	—	—	1500		
	Lighting Voltage	V_L	f_L=50kHz I_L=7mA	550	580	610	Vrms	
	Lighting Frequency	f_L	V_L=580Vrms	40	50	60	kHz	
*4	Tube Current	I_L	f_L=50kHz V_L=580Vrms	6	7	8	mA	*4

(*1) Typical current value is measured when color bar pattern is displayed at Vcc=5.0V.
Maximum current value is measured when 55/63 and 63/63 gray scale pattern every 2 pixel is displayed at Vcc=4.75V.
Without rush current.

(*2) These items prescribe the rush current for starting internal DC/DC.
Charging current to capacitors of Vcc is not prescribed.

(*3) Backlight specifications are valid when using a suitable inverter such as the "LQ0DDJ5004 (FLCV-07) " of Sharp .
△02

(*4) Tube current (I_L) shows the value of the current that is consumed at one lamp.
This LCD module has 4 lamps. Each 2 lamps are placed at upper and lower side of the display.
2 lamps are connected in parallel. Each low voltage terminals are bound into 1 line cable, which connected to the backlight connector.

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Note 1) Measurement Circuit

Based on Fig.8-1.

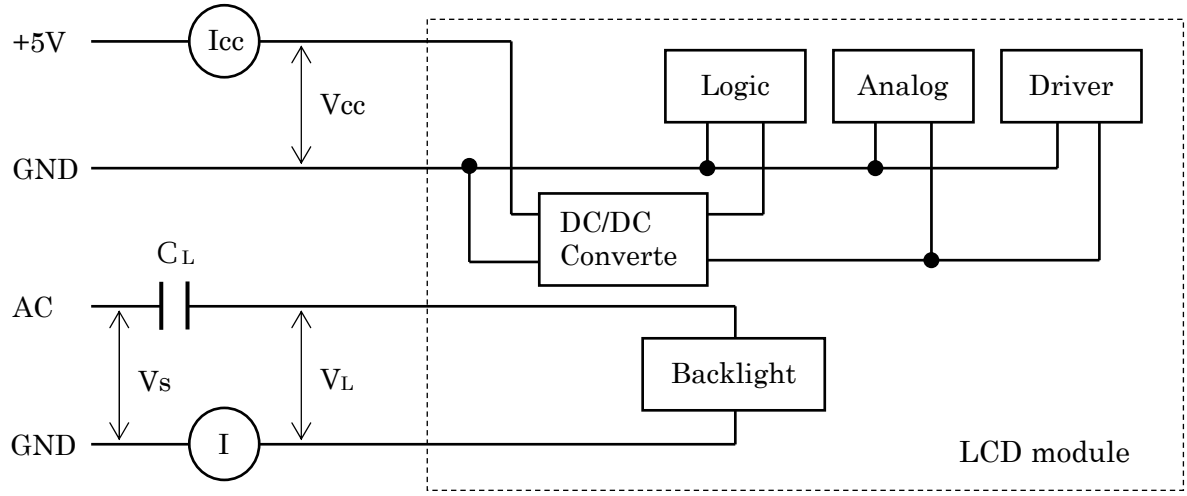
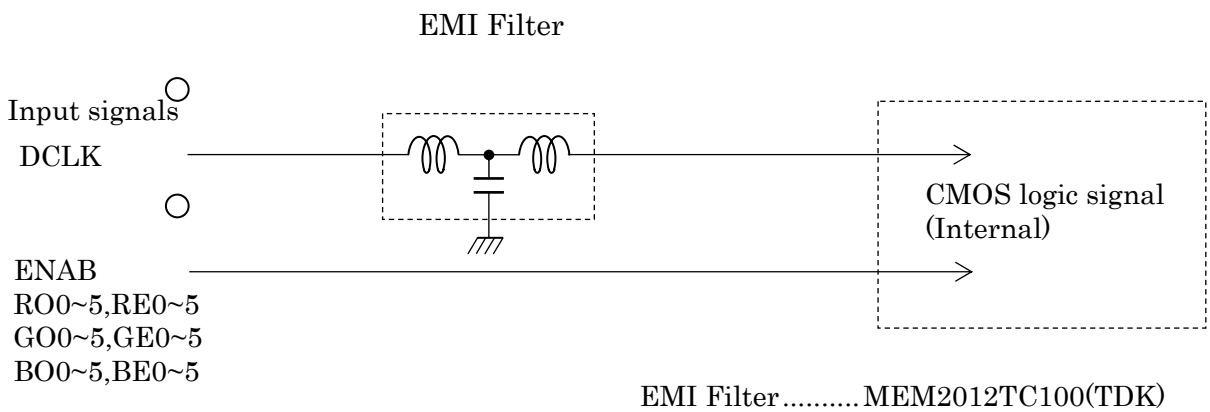


Fig.8-1. Measurement Circuit

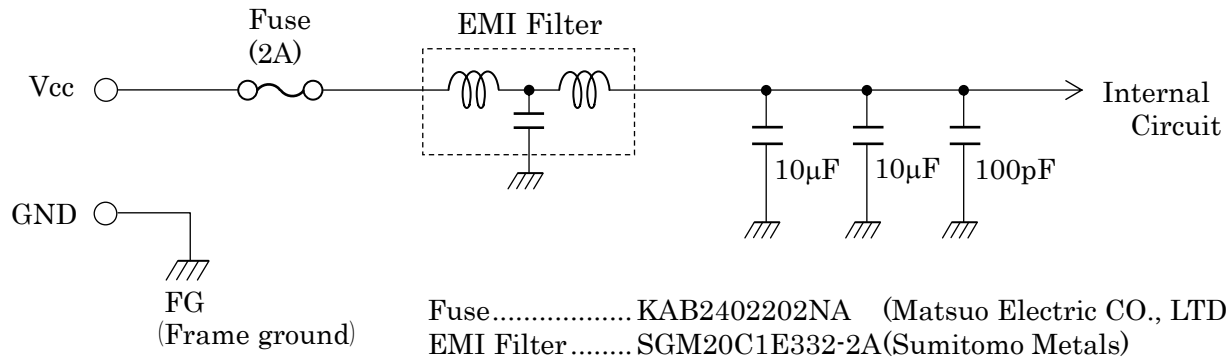
Note 2) Equivalent Circuit

Based on Fig.8-2 (a), (b).



EMI Filter.....MEM2012TC100(TDK)

Fig.8-2 (a) Equivalent Circuit of Logic Signal Input



Fuse.....KAB2402202NA (Matsuo Electric CO., LTD.)
EMI Filter.....SGM20C1E332-2A(Sumitomo Metals)

Fig.8-2 (b) Equivalent Circuit of Power Supply

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9. OPTICAL SPECIFICATIONS

Table 9-1 shows the optical specifications of this LCD module.

Table 9-1. Optical Specifications — Ta=25˚C,Signal timing=Typ.

Item		Symbol	Condition		Specifications MIN.	Specifications TYP.	Specifications MAX.	Unit	Remark	Remark Note
Visual Angle	Horizontal	$\theta_{L,R}$	CR≥10	$\theta_{U,D}$=0°	80	—	—	deg		(1)(2)(3)(5)(6)
	Vertical	$\theta_{U,D}$		$\theta_{L,R}$=0°	80	—	—	deg		
Contrast Ratio		CR	$\theta_{L,R,U,D}$=0°		210	400	—	—	White/Black	(1)(2)(3)(5)
Response Time(ON) (Black→White)		t_{on}	$\theta_{L,R,U,D}$=0°	Ta=25°C	—	15	30	ms		(1)(4)(5)
				Ta=0°C	—	50	100	ms		
Response Time(OFF) (White→Black)		t_{off}	$\theta_{L,R,U,D}$=0°	Ta=25°C	—	10	25	ms		
				Ta=0°C	—	50	100	ms		
Brightness		I	$\theta_{L,R,U,D}$=0° V_{CC}=5V, I_L=7mA fL=50kHz R*,G*,B*Signal =All"H"		200	250	—	cd/m²	White *1	(1)(5)
Brightness Uniformity		ΔI			80	—	—	%		(1)(5)(7)
Chromaticity	W	x			0.283	0.313	0.343	—		(1)(5)
		y			0.299	0.329	0.359	—		
	R	x				(0.637)				
		y				(0.352)				
	G	x				(0.281)				
		y				(0.604)				
	B	x				(0.145)				
		y				(0.126)				
LCD Panel Type					TFT Color					
Display Mode					Normally Black VA					
Wide Viewing Angle Technology					MVA					
Optimum Viewing Angle					— (symmetry)					(6)
Display Color					262,144 (6-bit color)					
Color of non-display area					Black					
Surface Treatment					Anti-glare(Haze value：25%,2H)					

(*1) Value at 15~20 minutes after lighting on.

(Note) ・CS-1000 (MINOLTA Co., Ltd.) Field=1°, L=500mm

・Back-light current = 7mA, Dark room condition(1 lux or less)

Be carefull that the luminance meter, which you use, may not be able to get correct brightenss if it's no set correctly.

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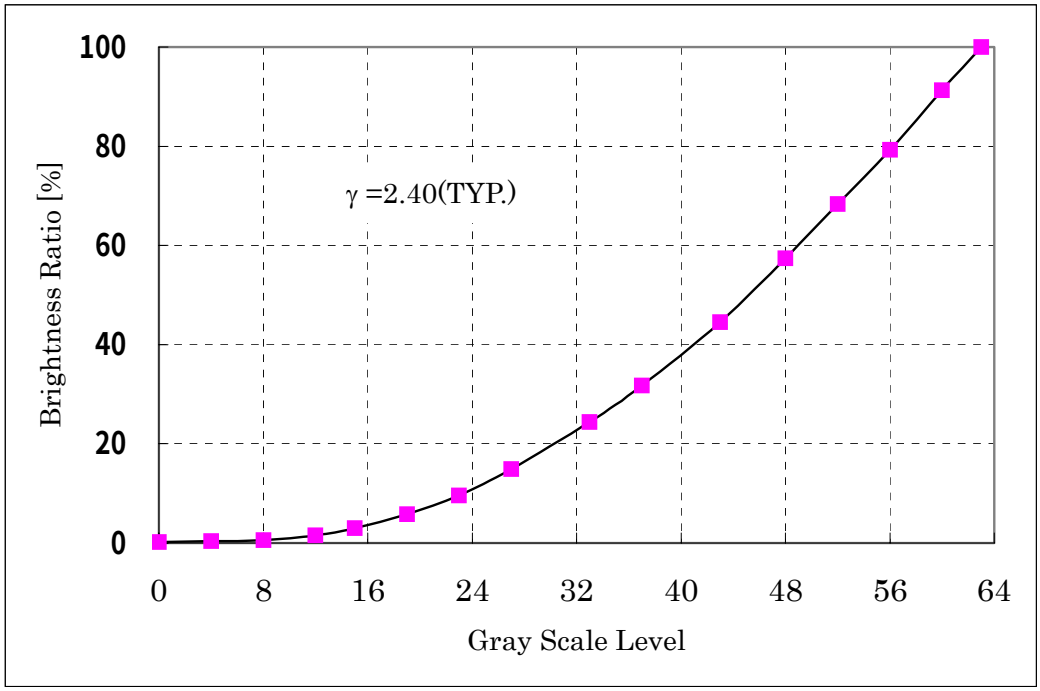

Fig.9-1. γ -Curve (Reference Value)

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Note 1) Definition of Viewing Angle (1)

Based on Fig.9-2.

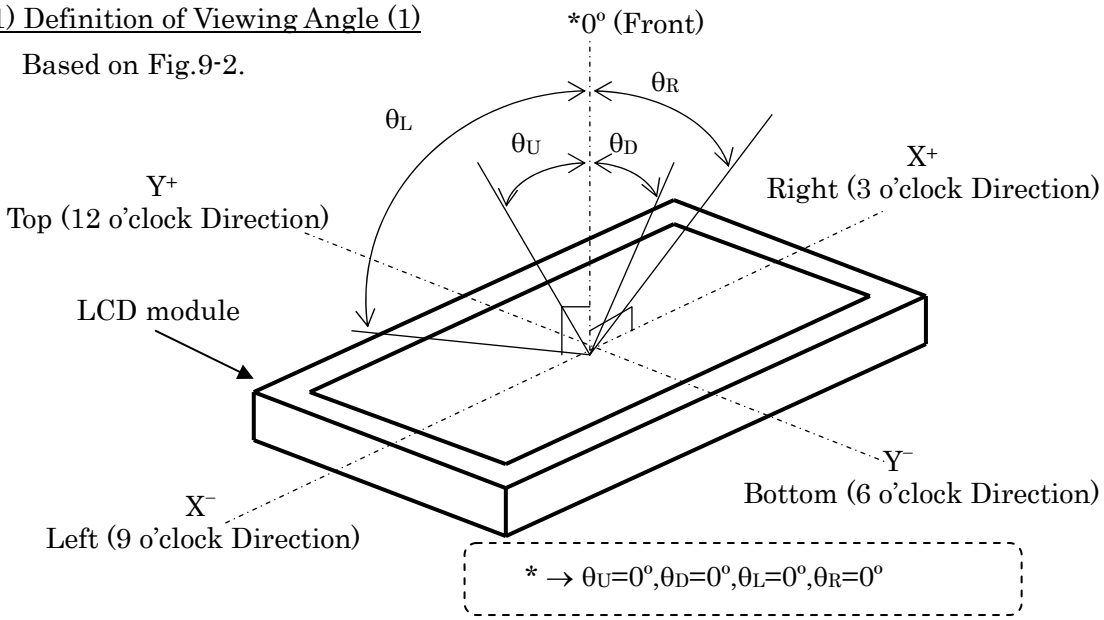

Fig.9-2. Definition of Viewing Angle (1)

Note 2) Definition of Viewing Angle (2)

Based on Fig.9-3.

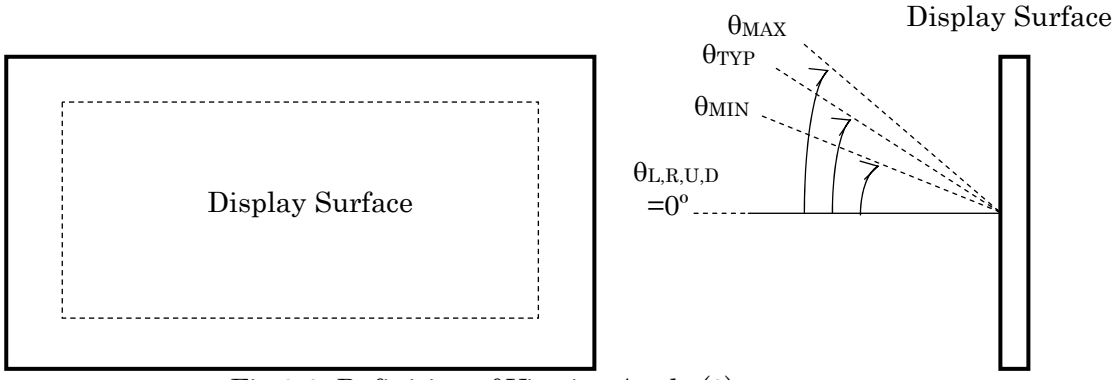

Fig.9-3. Definition of Viewing Angle (2)

Note 3) Definition of Contrast Ratio (CR)

Determined by Formula (1) based on Fig.9-4.Voltage-Brightness Characteristics.

$$= \frac{L_W \text{ (Brightness at white)}}{L_B \text{ (Brightness at black)}} \quad \text{-------- (1)}$$

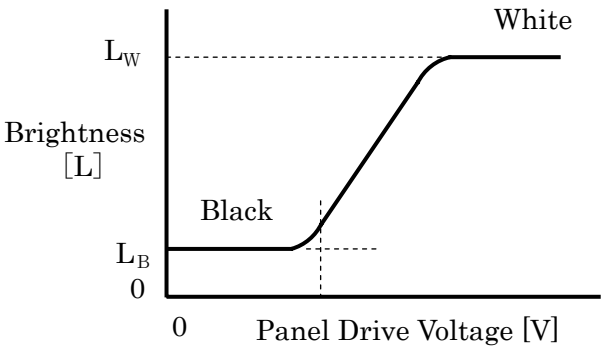

Fig.9-4. Voltage-Brightness Characteristics

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Note 4) Definition of Response Time

Based on Fig.9-5.

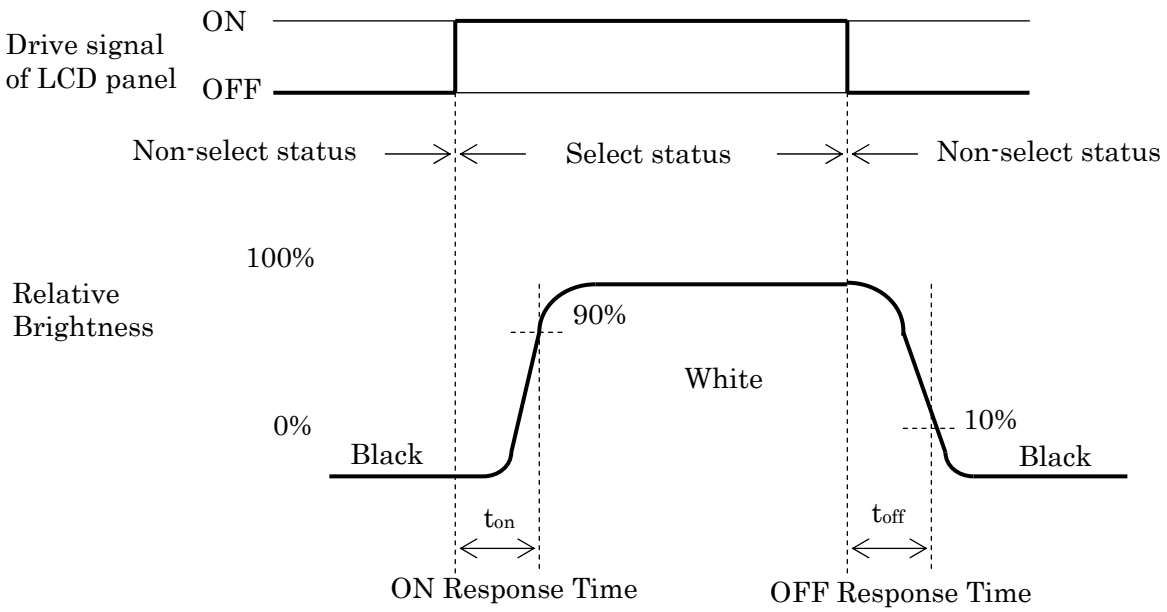

Fig.9-5. Definition of Response Time

Note 5) Contrast Ratio and Response Measurement System

Based on Fig.9-6.

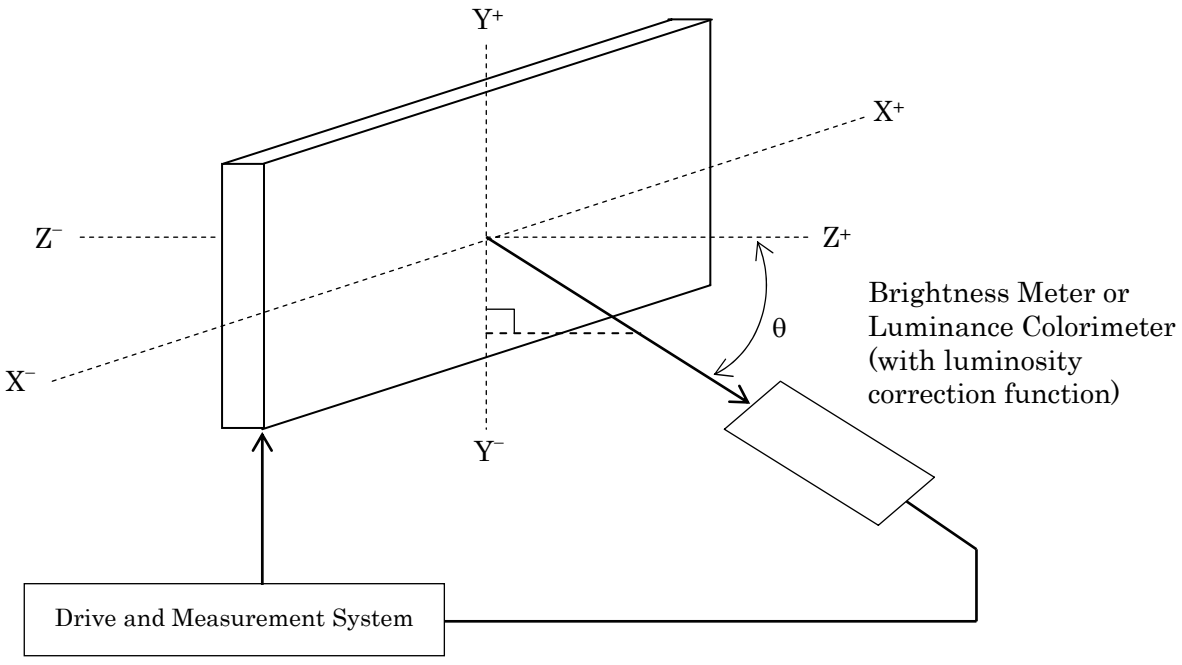

Fig.9-6. Contrast Ratio and Response Time Measurement System

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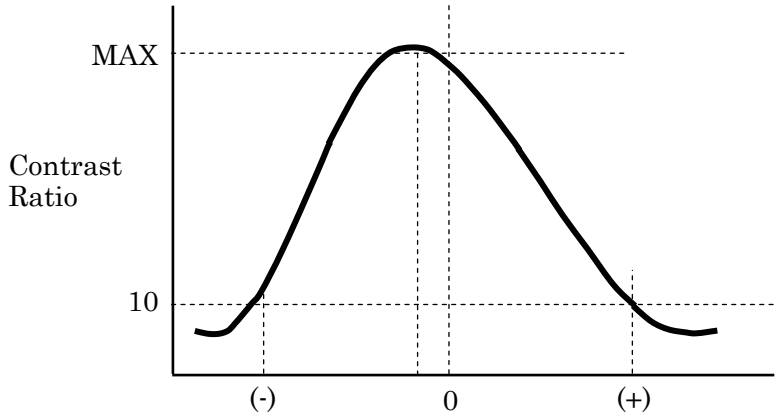
Note 6) Definition of Optimum Viewing Angle

Based on Fig.9-7.



6 o'clock ← Viewing Angle θ → 12 o'clock

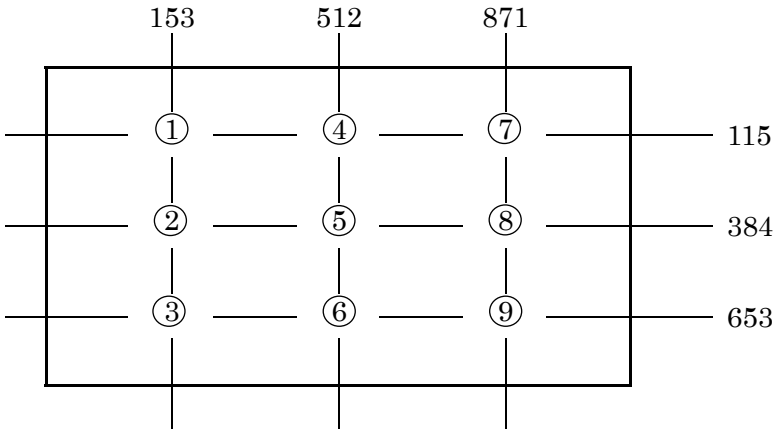
Fig.9-7. Definition of Viewing Angle

Note 7) Definition of Brightness Uniformity

Brightness uniformity is defined by the following formula.

Brightness (I1~I9) art measured at the following 9 points (① ~ ⑨) on the display area shown in Fig.9-8.

$$\text{Brightness Uniformity } (\Delta L) = \frac{|\text{Min. In}|}{|\text{Max. In}|} \times 100\ (\%),\ n=1 \text{ to } 9$$



Note) Each measurement point (① ~ ⑨) defines the center spot of Brightness Meter view.
The tolerance of measurement position is ±5mm.

Fig.9-8. Measurement Points

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10. INTERFACE SPECIFICATIONS

10-1. Signal descriptions

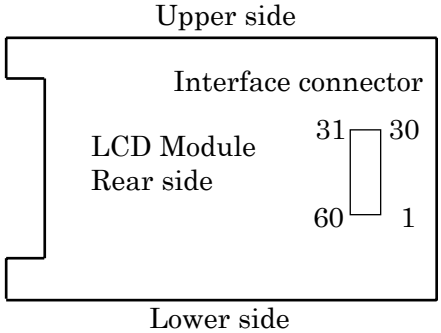
Table 10-1 shows the description and configuration of Interface signals (CN1).

Table 10-1. Interface signals (CN1)

Pin №	Symbol	I/O	Function	Pin №	Symbol	I/O	Function
1	GND	—	Ground	31	GO1	I	Green odd data 1
2	RE0	I	Red even data 0	32	GO2	I	Green odd data 2
3	RE1	I	Red even data 1	33	GO3	I	Green odd data 3
4	RE2	I	Red even data 2	34	GO4	I	Green odd data 4
5	RE3	I	Red even data 3	35	GO5	I	Green odd data 5
6	RE4	I	Red even data 4	36	GND	—	Ground
7	RE5	I	Red even data 5	37	BO0	I	Blue odd data 0
8	GND	—	Ground	38	BO1	I	Blue odd data 1
9	GE0	I	Green even data 0	39	BO2	I	Blue odd data 2
10	GE1	I	Green even data 1	40	BO3	I	Blue odd data 3
11	GE2	I	Green even data 2	41	BO4	I	Blue odd data 4
12	GE3	I	Green even data 3	42	BO5	I	Blue odd data 5
13	GE4	I	Green even data 4	43	GND	—	Ground
14	GE5	I	Green even data 5	44	PULL	I	(*2)
15	GND	—	Ground	45	PULL	I	(*2)
16	BE0	I	Blue even data 0	46	ENAB	I	Data enable signal
17	BE1	I	Blue even data 1	47	GND	—	Ground
18	BE2	I	Blue even data 2	48	GND	—	Ground
19	BE3	I	Blue even data 3	49	DCLK	I	Dot clock signal
20	BE4	I	Blue even data 4	50	GND	—	Ground
21	BE5	I	Blue even data 5	51	GND	—	Ground
22	GND	—	Ground	52	SS	—	SS function ON/OFF (*1)
23	RO0	I	Red odd data 0	53	N.C.	—	—
24	RO1	I	Red odd data 1	54	GND	—	Ground
25	RO2	I	Red odd data 2	55	GND	—	Ground
26	RO3	I	Red odd data 3	56	GND	—	Ground
27	RO4	I	Red odd data 4	57	VDD	—	+5V Power supply
28	RO5	I	Red odd data 5	58	VDD	—	+5V Power supply
29	GND	—	Ground	59	VDD	—	+5V Power supply
30	GO0	I	Green odd data 0	60	VDD	—	+5V Power supply

(*1) SS (Spread Spectrum):SS function is ON when signal level is high or N.C..(generally set up N.C.)
SS function is OFF when signal level is low.

(*2).Connect it to GND for the protection of internal circuit.



Connector : 52760-0600 (Molex)
User's connector : 53475-0600 (Molex)

(*3)When using a connector other than the recommended one , a defect in the initial stage or a problem concerning long term reliability may occur.

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10-2. Color Data Assignment

Table 10-2 shows the color data assignment.

Table 10-2. Color Data Assignment

Color			R Input data						G Input data						B Input data					
	Odd / Even		R05 / RE5	R04 / RE4	R03 / RE3	R02 / RE2	R01 / RE1	R00 / RE0	G05 / GE5	G04 / GE4	G03 / GE3	G02 / GE2	G01 / GE1	G00 / GE0	B05 / BE5	B04 / BE4	B03 / BE3	B02 / BE2	B01 / BE1	B00 / BE0
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	1	1	1	1	1	1
	White		1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	⇧																			
	⇩																			
	Brighter	61	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	62	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧																			
	⇩																			
	Brighter	61	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	⇩	62	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green	63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	⇧																			
	⇩																			
	Brighter	61	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	⇩	62	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue	63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note.1) Definition of gray scale : Color (n) ---"n" indicates gray scale level.
The gray scale is brighter as the number is larger.

Note.2) Data; 1: High, 0: Low

Note.3) Color data consist of 36 bits, namely, 6-bit odd and even data for each red, green and blue.
Optional data can be set to red, green and blue independently.
Therefore, the module is able to display 262,144 colors.

DOCUMENT CONTROL SECTION

DATE

EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION
DESIG.			CHECK		APPR.

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10-3. Input Signal Timing

Table 10-3 and Fig.10-3 shows the input signal timing.

Table 10-3. Timing Characteristics (T=0~50ºC, Vcc=5±0.25V)

Item			Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK signal (Clock)		Period	Tc	25.000	30.764	40.000	ns	
		Frequency	fc	25.000	32.505	40.000	MHz	fc=1/Tc
		Duty	Tch/Tc	45	50	55	%	*1
		High time	TclkH	5.0	—	—	ns	
		Low time	TclkL	5.0	—	—	ns	
		Rise time	Tclkr	—	—	5.0	ns	
		Fall time	Tclkf	—	—	5.0	ns	
DCLK-Data Timing		Setup time	Tset	4.5	—	—	ns	40MHz
		Hold time	Thold	6.5	—	—	ns	40MHz
Data-ENAB timing	Horizontal	Period	Th	565	672	1566	DCLK	fh=1/Th
		Frequency	fh	38.6	48	60	kHz	
		Display period	Thd	—	512	—	DCLK	*2,3
	Vertical	Period	Tv	772	806	868	Th	16.67ms
		Frequency	fv	50	60	75	Hz	
		Display period	Tvd	—	768	—	Th	*2,3
	Data-ENAB timing		—	—	0	—	DCLK	*4

*1) DCLK signal input must be valid while power supply is applied.

*2) Display position is specified by the ENAB signal.
- Horizontal display position is specified by the rise of ENAB signal. The data of a horizontal line, which is latched by the falling edge of 1st DCLK right after the rise of ENAB, is displayed on the left edge of the screen.
- Vertical display position is specified by the rise of ENAB after a "Low" level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise of ENAB is displayed at the top line of screen.

*3) If a period of ENAB "High" is less than 512 DCLK or less than 768 lines, the rest of the screen displays black.

*4) The display position does not fit to the screen if the ENAB period and the effective data period do not synchronize with each other.

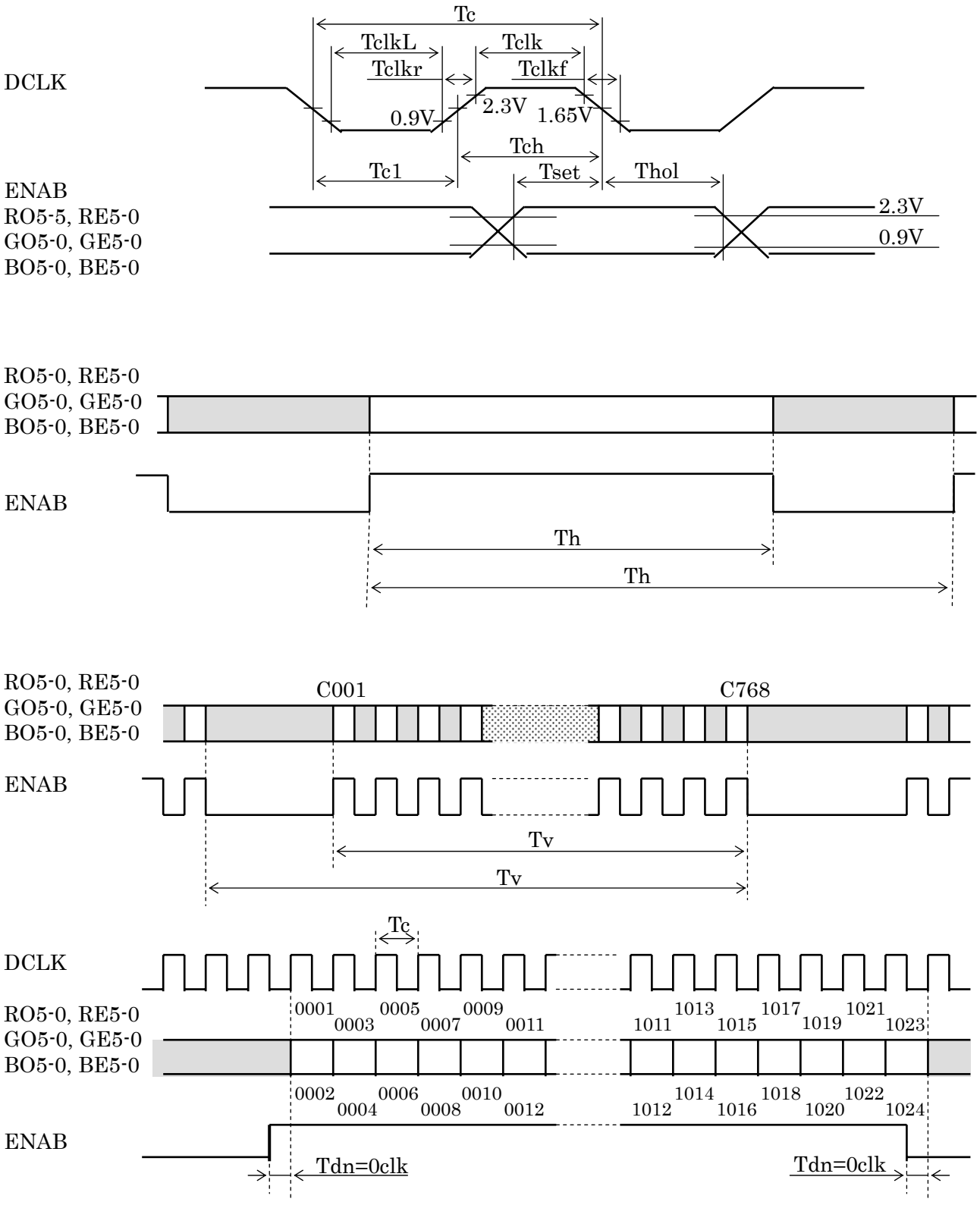

Fig.10-3.Input Signal Timing Chart

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10-4. Correspondence between Data and Display Position

Fig.10-3 shows the Correspondence between Data and Display Position.

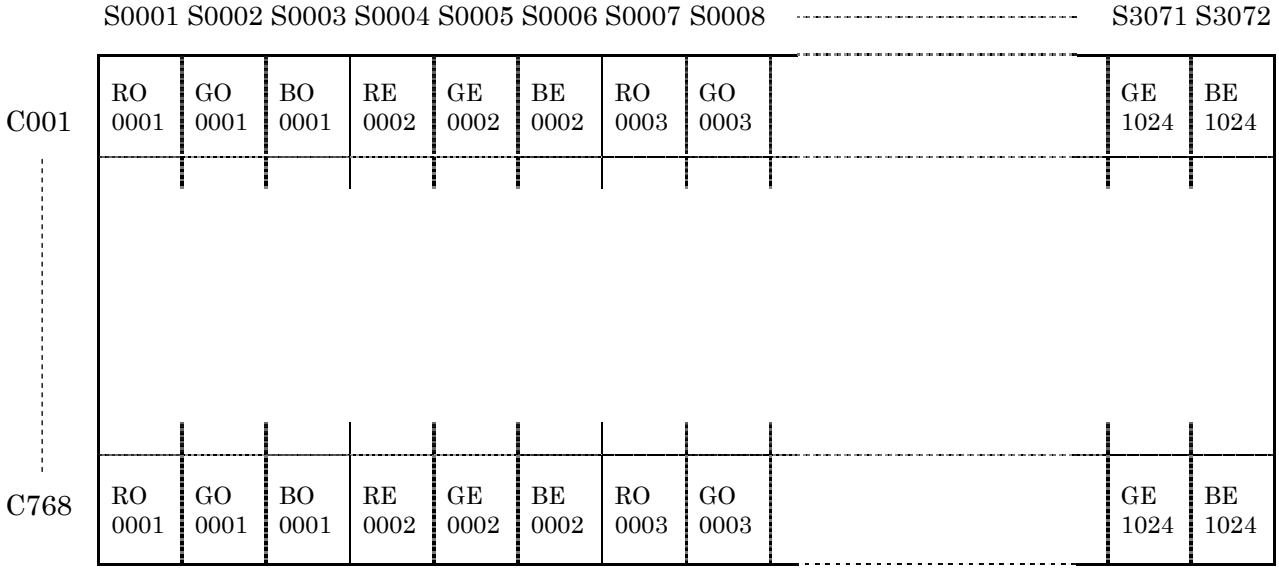

Fig.10-4.Correspondence Data and Display Position

10-5. Power Supply Sequence

The sequence of input signals and On/Off of the power supply of this LCD module should be in the specification shown in Fig.10-4 to prevent latch-up of the driver ICs and DC driving of the LCD panel.

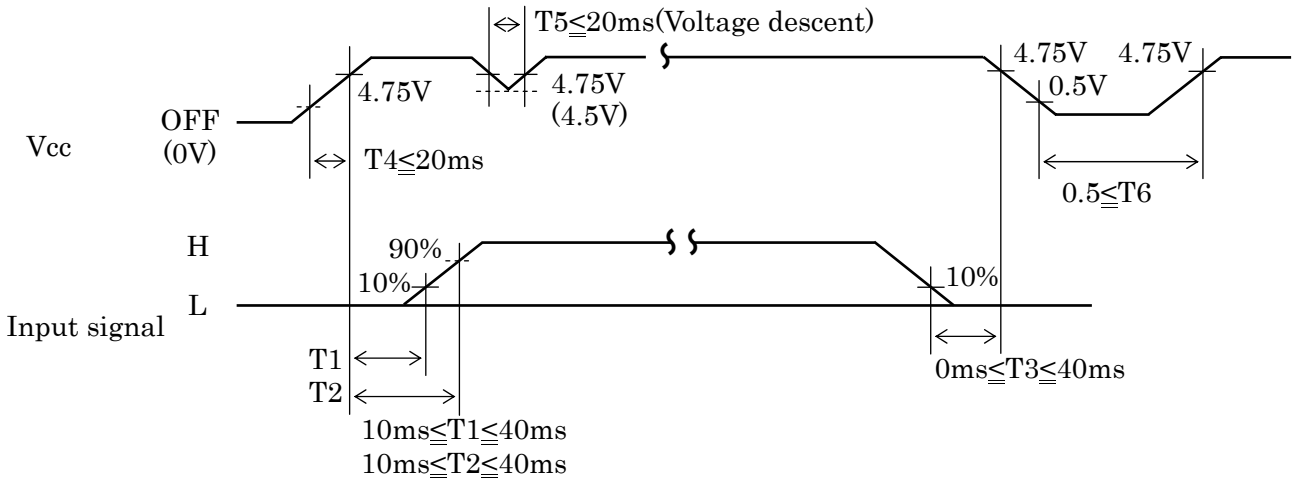

Fig.10-5. Power Supply Sequence

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DESIG.			CHECK		APPR.

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11. BACKLIGHT SPECIFICATIONS

11-1. Pin Configuration for Backlight

Table 11-1(a) and 11-1(b) shows the description and pin assignment of the connectors (CN-A and B) for the Backlight of this LCD module.

Table 11-1(a) Pin Assignment of CN-A

Pin №	Signal	Function
1	V_L1	Power supply for CCFL 1
2	V_L2	Power supply for CCFL 2
3	NC	——
4	GND	Ground (for V_L1, 2)

Table11-1(b) Pin Assignment of CN-B

Pin №	Signal	Function
1	V_L3	Power supply for CCFL 3
2	V_L4	Power supply for CCFL 4
3	NC	——
4	GND	Ground (for V_L3, 4)

Cable color (CN-A and B) : White at GND, Pink at V_L1,2,3 and 4

Connector : Housing : BHR-04VS-1
: Contact : SBH-001T-P0.5
User's Connector : Post with base : SM04(4.0)B-BHS-1-TB
Supplier : Japan Solderless Terminal Trading Company LTD. (J.S.T.)

11-2. CCFL

Supplier : SANKEN ELECTRIC CO., LTD Part No. KFN8319F315296Z

11-3. Life

The life of the backlight is a minimum of 50,000 hours at the following conditions.

(1) Working conditions
① Ambient temperature : 25±5ºC
② Tube current(I_L) : (7mA or less)

(2) Definition of life
① Brightness becomes 50% or below 50% of the minimum brightness value shown in Table 9-1.
② The lamp cannot be lit by the breakdown voltage of 1500Vvms.
③ Lamp is flashing.

11-4. Lamp Assembly set (for replacement)

Lamp Assembly set (with charge) is prepared for maintenance.
This set consists of an upper lamp assembly and a lower lamp assembly.

△02 Type number : LQ0DDB5462 (FLCL-16S) for upper and lower

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EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION
02	20050420				Change Lamp Assembly set No

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12. APPEARANCE SPECIFICATIONS

12-1. Zone

- Inside display dot area (304.1× 228.1mm)
- Display dot area means active area.
- One pixel consists of 3 dots (red, green and blue).
- Foreign particle and scratch unharmful to display image, such as the foreign particle under polarizer film but outside of the display area and scratch or stain on metal bezel, backlight module, aluminum chassis or polarizer film out of the display area, etc., are not counted.

12-2. Bright spots

(1) Bright spots by the defect of TFT.

- Visible under bias of 2% ND filter ..... High bright spot R・G
- Visible under 5% but invisible under 2% ND filter ..... Low bright spot R・G・B
- Invisible under bias of 5% ND filter ..... Not counted

(2) Bright spots by the light passing through tears, breaks, etc in color filter.

- Exceed size of a half dot ..... High bright spot
- A half dot or less ..... Not counted

(3) Bright spots by the light passing through tears, breaks, etc in chromium mask.

- Exceed 50μm ..... High bright spot
- 50μm or less ..... Not counted

12-3. Test condition

- Inspector must observe the LCD screen from the normal direction under the illumination by a single 20W fluorescent lamp. The distance between the LCD screen and the inspector should be a height of 50cm above the worktable.
  The vertical illuminance is 300 to 600lux (reference value).
- Bright spot should be counted under entire black screen.
- Dark spot should be counted under entire white screen.
- Frame frequency should be 60Hz.

12-4. Specifications

Table 12-4 shows the appearance standard.

(Note1) Please do not mistake a single bright spot for a bright spot connection due to Cs(supplemental capacitance) line at the center of each dot.

(Note2) If a pixel is dark partially, it connects into the number of dark spots in accordance with following rule.

(a) S<1/3 : Not count. Only one of 4 dark connection is allowed.

(b) 1/3≦S<2/3 : Considered as 0.5 dot.

(C) 2/3≦S : Considered as 1 dot.

(S=Dark spot size/dot size)

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Table 12-4. Appearance specifications

No.	Item		Judgment method and standard		
1	Bright spot (high and Low)		≦3 dots (Note 1)		
2	Bright spot connection (high and low)		≦1 pair (Note 1) (2 dot connection in horizontal only)		
3	Total of bright spot		≦3 dots		
4	Dark spot		≦6 dots (Note 2)		
5	Dark spot connection		≦3 pairs (Note 2) (2 dot connection in horizontal only)		
6	Total of dark spot		≦6 dots (Note 2)		
7	Total of dot defect (bright and dark)		≦ 6 dots		
8	Distance of bright spot	high-hgh	≧15mm		
		others	≧ 5mm		
9	Distance of dark spot		≧ 5mm		
10	Scratch on polarizer, line shape		W≦0.03	————	Ignore
			0.03<W≦0.05	L≦6	Ignore
				6<L≦12	≦3
				12<L	0
			0.05<W≦0.15	L≦0.6	Ignore
				0.6<L≦5	≦2
				5<L	0
			0.15<W≦0.3	W×L≦0.4	≦1
				0.4<W×L	0
			0.3<W	————	0
11	Dent on polarizer, dot shape		D≦0.2		Ignore
			0.2<D≦0.4		≦4
			0.4<D		0
12	Bubble in polarizer		D≦0.4		≦4
			0.4<D		0
13	Black white spot (Foreign circular matter)		D≦0.5		≦4
			0.5<D		0
14	Light leakage by foreign articles		S<1/3	1dot	Ignore
				Consecutive 2~3 dots	≦3
				Consecutive 4~5 dots	≦2
				Consecutive 6 dots	0
			1/3≦S<2/3		Dot defect +0.5
			2/3≦S		Dot defect +1
15	Lints, black/white line		W≦0.03	————	Ignore
			0.03<W≦0.05	L≦6	Ignore
				6<L≦12	≦3
				12<L	0
			0.05<W≦0.1	L≦0.6	Ignore
				0.6<L≦5	≦2
				5<L	0
			0.1<W	(W+L)/2=D	Conform to No.13

D:Average diameter [mm], W:Width [mm], L:Length [mm], S=(bright spot size)/(dot size)

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13. ENVIRONMENTAL SPECIFICATIONS

Table 13-1 shows the environmental specifications.

Table 13-1. Environmental Specifications

Item	Condition		Remark
Temperature	Operation	0~50ºC	Temperature on surface of LCD panel (display area.)
	Storage	-20~60ºC	
Humidity	Operation	20~85%RH	Maximum wet-bulb temperature should not exceed 29ºC. No condensation.
	Storage	5~85%RH	
Vibration	Non-operation	10~500Hz, 1 cycle/20minute, 2G, 1.5mm max, 2hour each X, Y and Z directions	For single module without package.
Shock	Non-operation	50G, 6ms, 1time each ±X, ±Y and ±Z directions.	

NOTE: Table 13-2 and Fig. 13-1 show the shock resistance standard when module is packaged.

Table 13-2. Shock Resistance Standard when Module is Packaged

Dropping location	Dropping height	Count
A ~ J	60cm	1 time

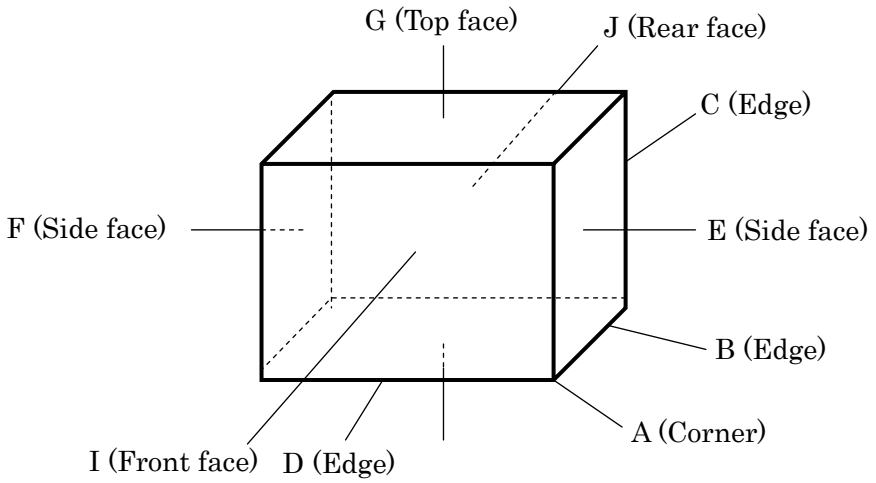

Fig.13-1. Direction to apply shock to package

14. INDICATIONS

This module has the following indications.

Product label

(1) SHARP Model number : LQ150X1DWF1

(2) Model number : FLC38XGC6V-06P

(3) Version number : 02A (Example)
-1st 2 digits "01" means operational version.
-3rd alphabet means functional version.

(4) Company name : SHARP

(5) Manufacturing number : 4 6 XXX 0 0 0 0 1

- Serial number (To be reset every month on 1st.)
- Manufacturing code (For internal use)
- Manufacturing month (Oct. = X, Nov. =Y, Dec. =Z)
- Last digit of manufacturing year.

(6) Country of origin : MADE IN JAPAN

(7) Disposal method of cold-cathode tubes. (See Fig.14-1)

(8) Caution when changing cold-cathode tubes. (See Fig. 14-2)

・FLUOREACENT LAMPS IN THIS PRODUCT CONTAIN MERCURY AND MUST BE DISPOSED OF ACCOREDING TO LOCAL ORDINANCE,STATE OR FEDERAL LAWS.,
・この製品の内部の蛍光管には水銀が含まれていますので、地方自治体の条例、州法または連邦法に従って廃棄してください。

Fig.14-1

・WHEN CHANGING COLD CATHODE FLUORESCENT LAMPS, FOLLOW OPERATING SPECIFICATIONS. ESPECIALLY BE CAREFUL BOUT THE LAMPS SIDE-EDGE.
・蛍光管の交換は作業仕様書に従って行って下さい。特に蛍光管ホルダ側面のエッジに気をつけて下さい。

Fig.14-2

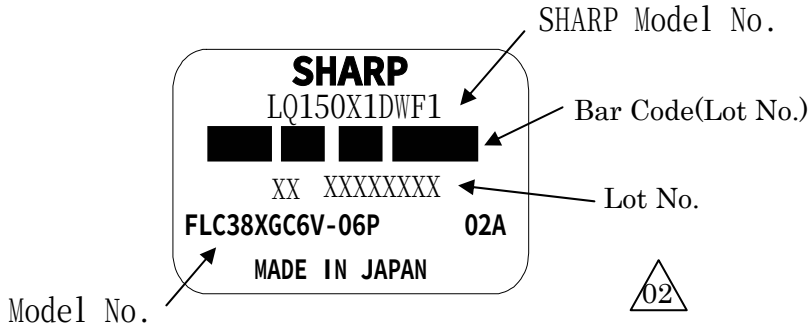

Fig.14-3 Product label (example)

EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION
02	20050420				Change product label

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15. PACKAGING

Separately specified in packaging specifications.

15-1. Packaging specifications

(1) 5 LCD modules / 1 package.

(2) Weight: approximately 10kg / 1 package.

(3) Outline dimensions : 353mm (W)×268mm (D) ×462mm (H)

15-2. Packaging method

Fig.15-2 (a),(b),(c),(d) show the packing method.

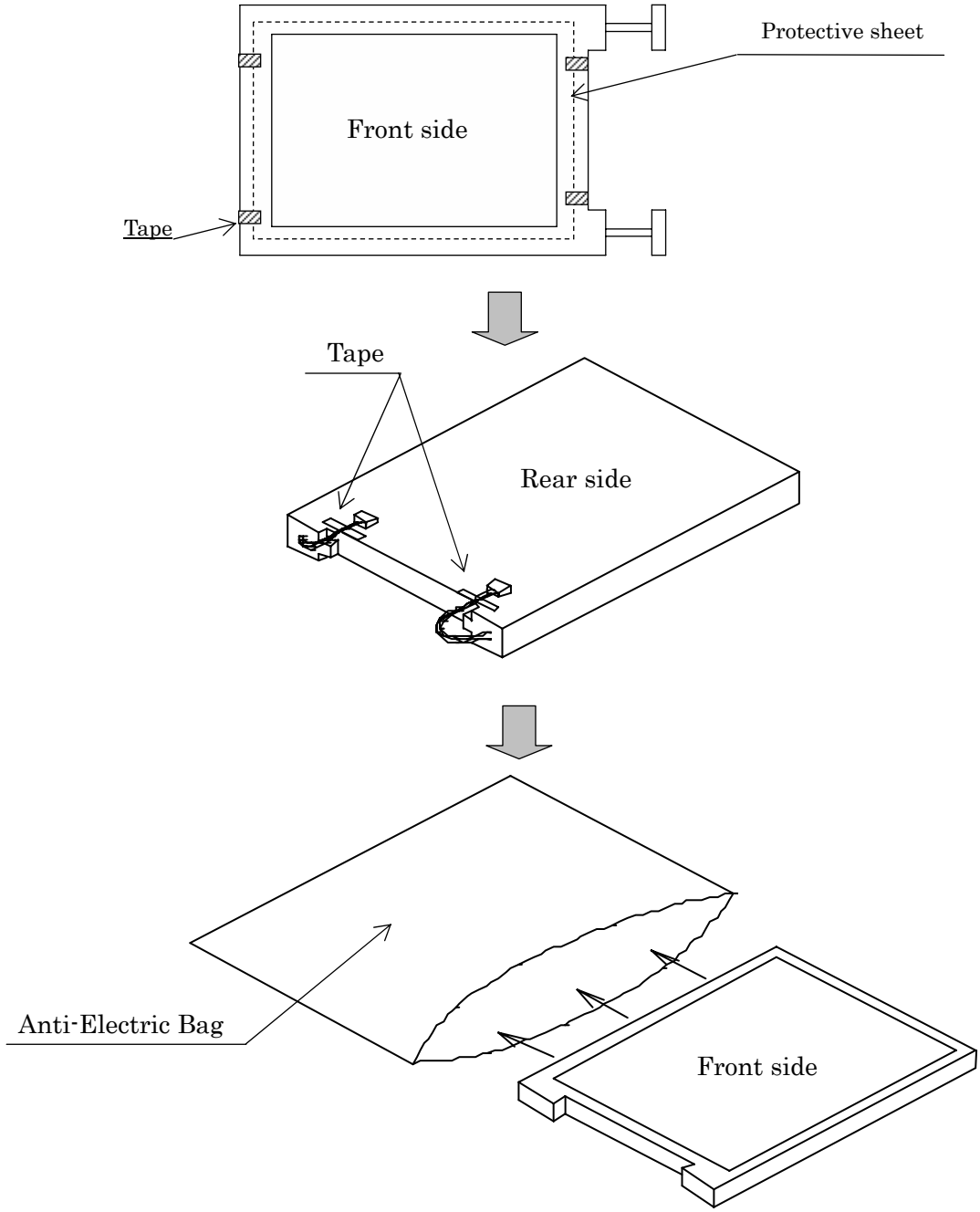

Fig.15-2(a) Packaging Method

						LQ150X1DWF1 (FLC38XGC6V-06P)	
						LD17421	CUST.
02	20050420				Add tape.		
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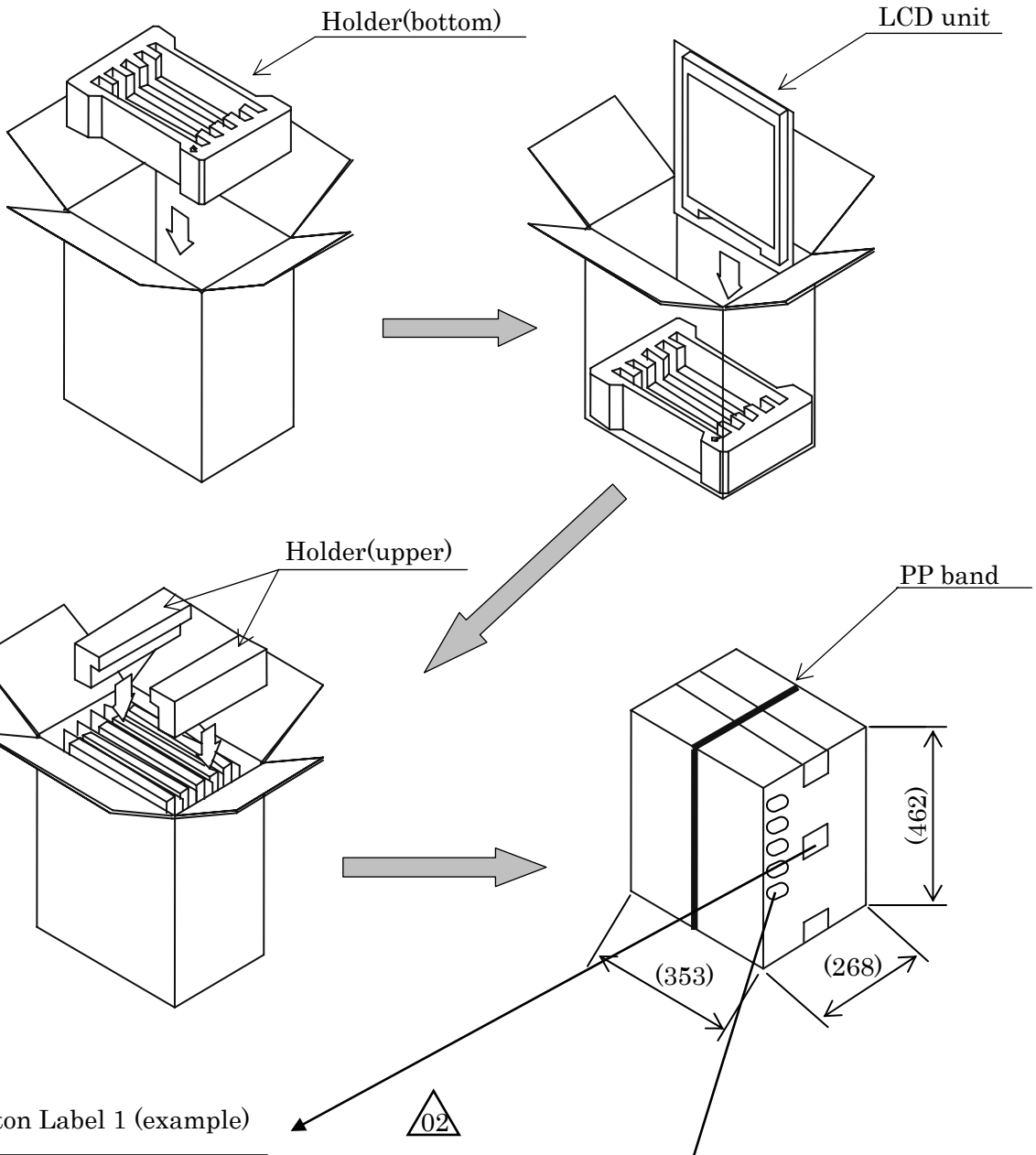

Carton Label 1 (example)

社内品番：(4S) LQ150X1DWF1
Bar code (①)
LotNO. :(1T) 2005. X. XX
Bar code (②)
Quantity:(Q) 5 pcs
Bar code (③)
ユーザ品番 :
シャープ物流用ラベルです。 ④

02

Carton Label 2 (example) : 5 pcs

SHARP
LQ150X1DWF1
[redacted]
XX XXXXXXXX
FLC38XGC6V-06P 02A
MADE IN JAPAN

Label format is same as product label .
The number of label attachment depends on module quantity.

Fig.15-2(b) Packaging Method

EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION
04	20050420				Change carton label format.

DESIG. CHECK APPR.

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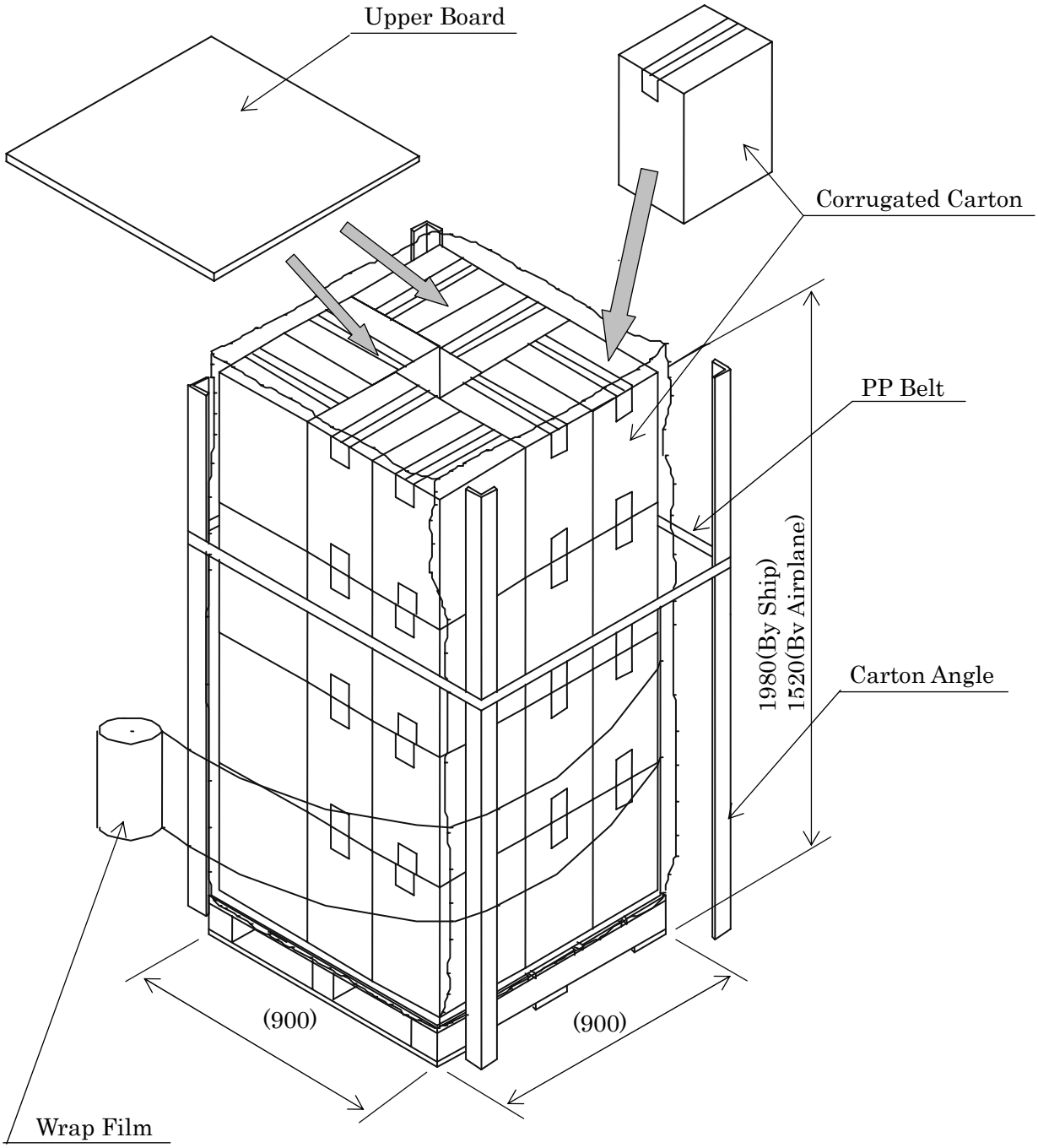

Note:1) 8 boxes×4 layers (maximum 32 boxes) : by ship
8 boxes×3 layers (maximum 24 boxes) : by airplane
Note:2) This drawing shows marine transportation specification.

Fig.15-2(c) Packaging Method

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EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION
DESIG.			CHECK		APPR.

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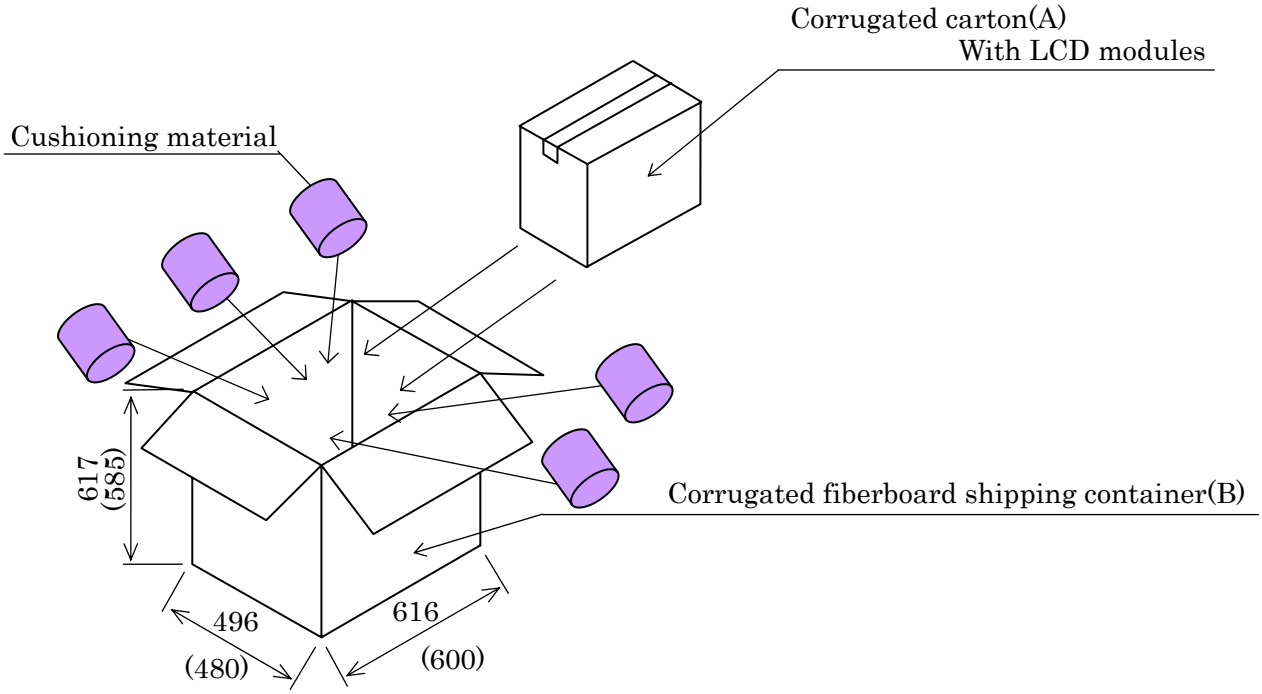

Note 1) The carton (A) should be placed in the middle of the container(B) with enough cushioning materials.

Note 2) The figures in ( ) show inside measurements of the container(B).

Figure.15-2(d) Packaging Method

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16. WARRANTY

The warranty period is one year after manufacturing. Products which fail during this period are repaired or replaced without charge, unless the failure is caused by user.

17. PRECAUTIONS

Adhere to the following precautions to properly use this LCD module.

(1) Fail safe design

LCD module has an inherent chance of failure. Customers must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

(2) Handling of LCD panel

①Do not apply any strong mechanical shock to the LCD panel.

Since the LCD panel is made of glass, excessive shock may damage the panel or cause a malfunction.

② Do not press hard on the LCD panel surface.

In the LCD panel, the gap between two glass plates is kept perfectly even to maintain display properties and reliability. The hard pressure on the LCD panel may cause the following problems. If the pressure is over 2kg/cm2, the problem don't return to normal Condition.

① Ununiformity of color
② Disorder of orientation of liquid crystal

Problem ① returns to normal condition after a while. Problem ② returns to normal condition by turning the power off and turning on again.
However these operations should be avoided to insure reliability.

③Do not scratch the polarizer film on the LCD panel surface.

- Do not press or rub the display surface with a hard tool, pincet, etc.
- For handling, use cotton or conductive gloves so that the display surface is not stained.
- For If the display surface is stained by dust or dirt, clean it as follows with a soft cloth (deer skin, etc.)

[Dust] Wipe off with a soft cloth. (do not rub.)
[Dirt] Wipe off lightly with a soft cloth after soaking in the clear water and squeezing hard out of water drops. Only if the dirt is hardly wiped off, use isopropyl alcohol or ethanol.
Be careful not to splash the water or the solvent and water penetrated between the polarizer and the LCD panel.
Do not use solvents such as ketone (acetone, etc.) and aromatics (xylene, toluene, etc.)

- If saliva or water drops are left for long time, it may deform partial deformation or discolored. Wipe off immediately in the same way as for dirt.
- Do not allow oil to adhere to the module, since the cleaning of oil is difficult.

④ Do not place or contact objects on the display surface for a long period of time.

That's because this may make some parts of the LCD module distorted and the display quality may decline.

(3) Handling of LCD module

①Do not pull the cold-cathode tube cable strongly.
If the cable is pulled with the loaf of 2kg or more, the cable may be damaged or reliability may decrease.

②Assemble the module into user's system in a dust free environment.
If conductive foreign matter adheres to the module, failures may occur.

③Take anti-static measures for assembling the module.
Since the LCD module contains CMOS-ICs, the following considerations are necessary.

- For assembling the module, operator should be grounded and wear cotton or conductive gloves.
- Floor of work area and work table to assemble the LCD module should be covered with electrostatic shielding in order to discharge static electricity via an earth wire.
- If necessary, ground operation tools (soldering iron, radio pliers, pincet, etc.).
- Do not take the module out of the conductive bag until the time when the module is assembled.
- Assemble the module under low humidity (50%RH or less).

④Do not pull the connecting cable on the rear face of the LCD module strongly.

⑤Do not disassemble or remodel the LCD module.
If this LCD module is disassembled or remodeled, it may have some trouble, or the display quality and reliability may not be assured.

(4) Precautions for operating the LCD module

① Adhere to the specified power supply sequence.
If not followed, the CMOS-IC may cause a latch-up, or the DC voltage may be applied the liquid crystal, and a failure or serious deterioration in display quality may occur.

② Do not operate the LCD module when condensation is present.
If the LCD module is operated when condensation is on the terminals of the LCD panel, the terminals cause electrochemical reaction, and may reach disconnection. Condensation easily occurs especially when the module is moved from a cold environment to a warm environment.

③ Trouble that occurs when the LCD module is used at not recommended temperature.

- Operation at high temperature(>50ºC) :Display colors shift to blue.
- Storage at high temperature (>60ºC) :The polarizer film deteriorates and contras decreases.
- Operation at low temperature(<0ºC) :The response speed decreases considerably.
- Storage at low temperature (<-20ºC) :The liquid crystal may solidify and become damaged.

④ Always input the control signals at the correct timing.
If control signals (DCLK, or ENAB) are not input, or if the timing is out of the specified timing, DC voltage may be applied to the liquid crystal and, as a result, cause image sticking or deterioration of contrast.

(5) Precautions on designing module mounting

①Do not press the display surface and bottom face of the LCD module.

Display quality or reliability may be deteriorated if the installation of the LCD module is inappropriate and, as a result, excessive pressure is applied to the surface of LCD screen.

Brightness uniformity or the reliability of CCFL may decrease if the pressure is applied to the backlight module.

②Consider the module mounting design, so that twisting and bending do not occur to the LCD module.

Excessive twisting and bending may damage display quality and reliability.

③The power cable length between the LCD module and inverter should not be extended.

Otherwise the backlight may not light or flickering may occur.

④Do not make the power cable of the backlight clung to a metal plate, etc.

Backlight frequency current for backlight driving may leak to the metal and desired brightness may not be assured.

⑤When Mounting LCD module with M4 screw (x4) should be screw up under 5.75kgf torque.

(6) Storage method

①Do not store the LCD module in an atmosphere of organic solvent or corrosive gas.

In an organic solvent atmosphere, the polarizer film discolors and display quality deteriorates.

In a corrosive gas environment, various problems may occur.

②Store the LCD module in a SHARP package.

At storing, SHARP packages can be stacked up to 4 boxes.

The LCD module is in an anti-static bag. Keep the module in that status.

③It is recommended that the storage environment should be humidity controlled, cool and dark.

Recommended storage environment

- Place :Dark (avoid direct sunlight)
- Temperature : 10~35°C
- Humidity : 50~60%RH

Note) If the module is left in an environment of 60°C or more for a long period of time, optical characteristics may deteriorate.

(7) Disposal Method

① LCD module

The components of this LCD module can be grouped into metal, resin, glass and so on. As the backlight contains CCFL which includes mercury, it must be disposed according to the local ordinance or regulations.

② Package

All the packages are made of recyclable papers except the anti-ESD bag.

(8) CAUTION IN DESIGNING INVERTER

Fluorescent lamps driven by high voltage are included in this LCD module. Please stand to the instructions below when designing inverter that lights the fluorescent lamps. Otherwise it may lead to FATAL FAILURE, such as SMOKING or FIRING.

① **APPLY PROTECTIVE CIRCUIT** in preparation for lamp breaking, wire breaking and short circuit. The protective circuit should also detect half open circuit and wire breaking in narrow gap etc.. Otherwise it may lead to fatal failure.

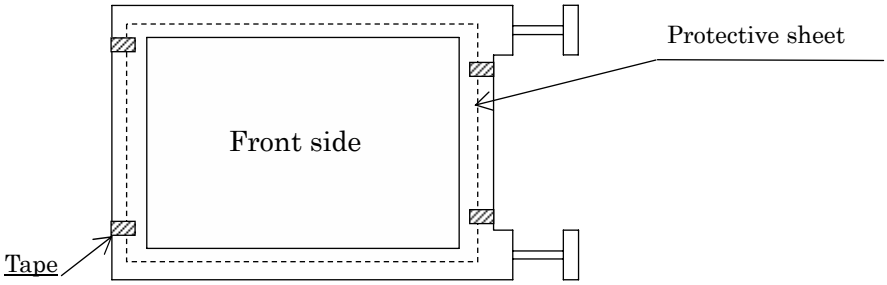
② **KEEP ENOUGH CURRENT CAPACITY** of inverter output for leakage current, which leaks from lamps and wire to surrounding metal material. Usually output current of about 1.5 times as same as the lamp current is necessary. But it sometimes varies due to characteristics of the inverter itself. So before determining design, please check characteristics of the inverter by connecting it to the LCD module.

③ **KEEP ENOUGH TEMPERATURE MARGIN** for each parts mounted on inverter. Temperature of the parts becomes higher when they are mounted in the final products due to heating inside. The temperature of each parts MUST NOT increase over the guaranteed temperature.

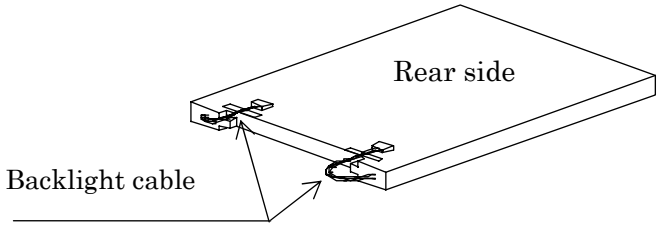
(9) Return method of the LCD module requested for repair or analysis of the problem

・When returning the LCD modules, adhere to the following procedures not to damage the LCD panel or the backlight cables. (Fig. 17-1(a)~(b))
When the LCD module is returned without following the specified packaging procedures, SHARP will not take responsibility for the damages caused by the failure of the packaging method.

① Attach protective sheet.



② Hook the backlight cables.



* If the cables are not fixed, the connectors may scratch the LCD panel surface or the cables may be damaged.

③ Put the LCD module into the anti-electrostatic bag
(Please do not use torn anti-electrostatic bags)

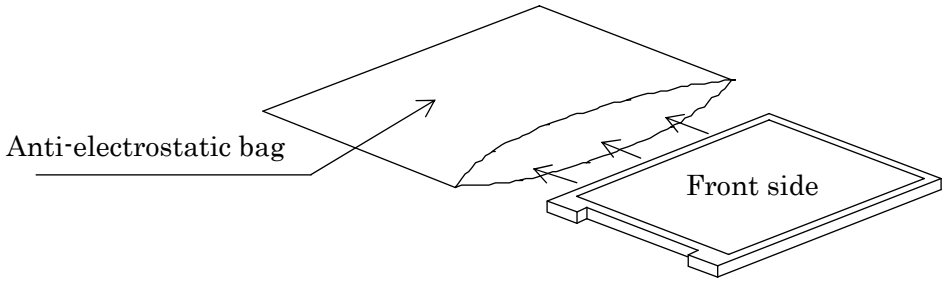


Fig. 17-1(a) Packaging method

EDIT	DATE	DESIG.	CHECK	APPR.	DESCRIPTION
02	20050420				Add tape.

DESIG. CHECK APPR.

LQ150X1DWF1
(FLC38XGC6V-06P)

LD17421 CUST.

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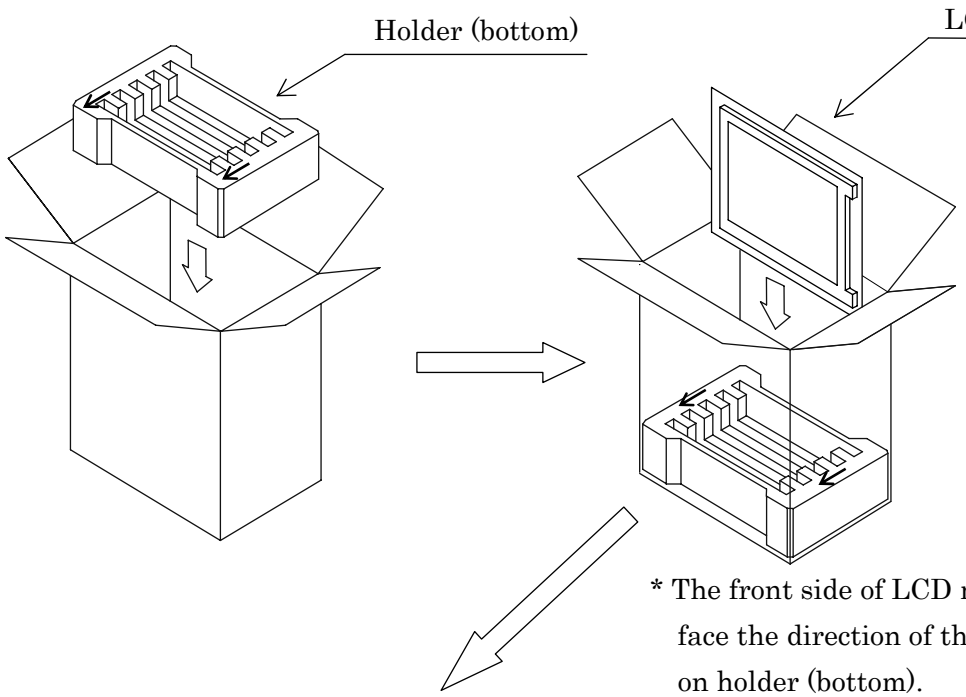
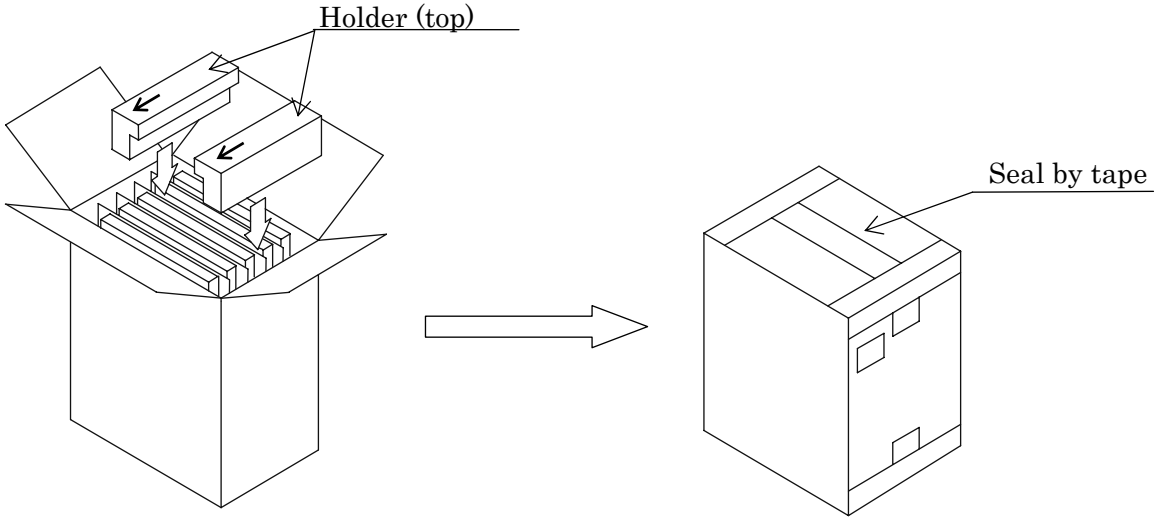
④ Storage into the carton box

・When using the carton box manufactured by SHARP

(Please use carton boxes and arrowheads that are not collapsed)



* The front side of LCD modules should face the direction of the arrowhead on holder (bottom).



* The direction of the arrowhead on holder (top) should face the front side of the LCD modules.

The arrowheads are shown on the holders.

Fig. 17-1(b) Packaging method

・When not using the carton box manufactured by SHARP

Please pack the LCD modules one by one and make sure not to damage the LCD modules when transporting.

(10) Others

① **If the LCD panel is damaged, do not inhale and do not swallow the liquid crystal.**
If the liquid crystal adhere to the body or cloths, wash it off with soap immediately.
Follow regular precautions for electronic components.

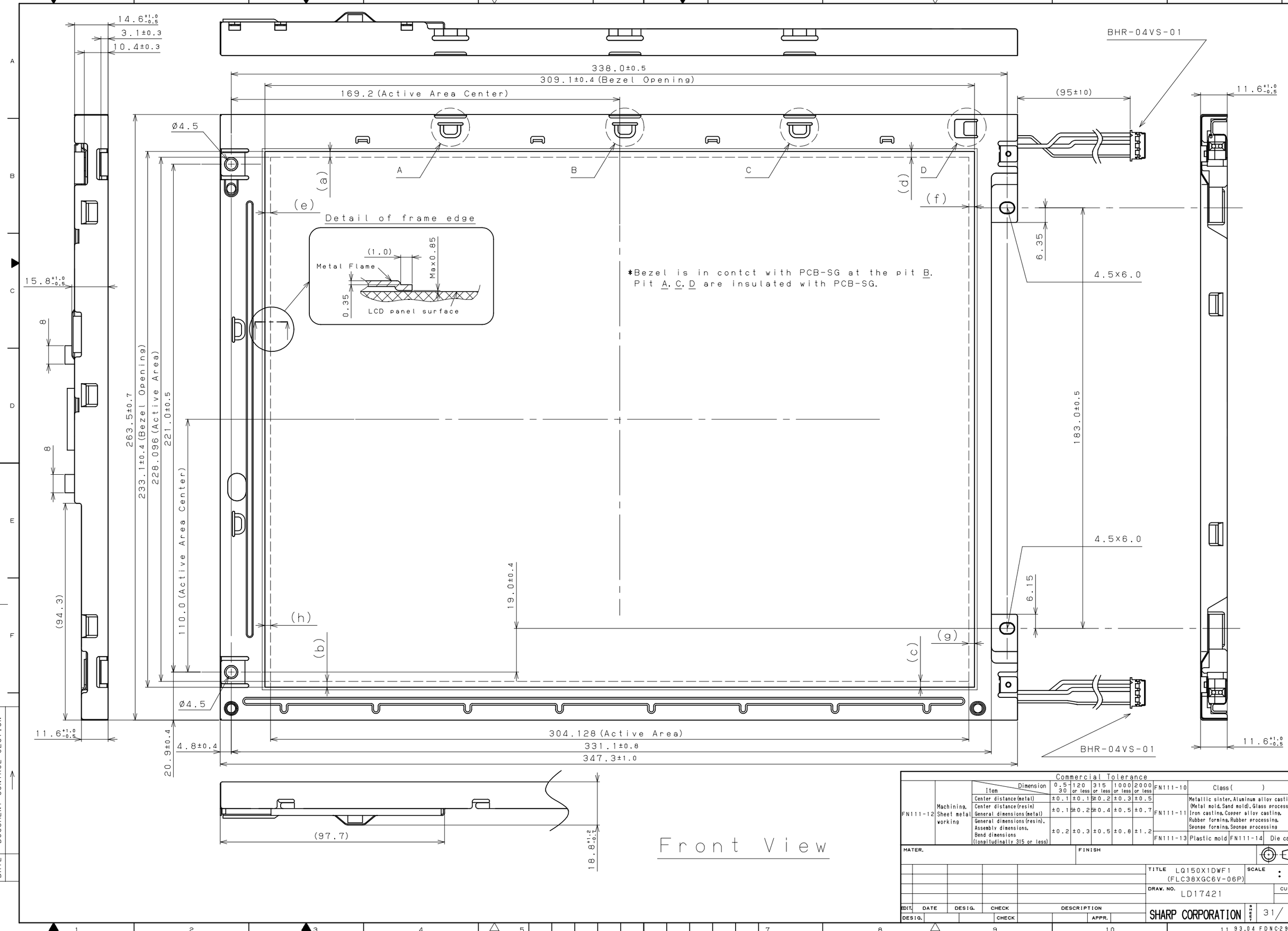
② **Flux residue on the printed circuit board is harmless to the quality and reliability of LCD module.**
SHARP has adopted non-wash technology on module assembly process.

18. PRECAUTIONS FOR USE

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter "High Safety Required Use"), including without limitation, nuclear reaction control in nuclear facility,
aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer's product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, SHARP shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

19. MISCELLANEOUS

Specifications of the TFT-LCD panel and other components used in the LCD module are subject to change. Both parties shall discuss together before change.
If any doubt is raised in the content of the specifications, both parties shall discuss and make best effort for the agreement.



Front View

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DATE

Commercial Tolerance

FN111-12	Machining, Sheet metal working	Item \ Dimension	0.5-30	120 or less	315 or less	1000 or less	2000 or less
		Center distance (metal)	±0.1	±0.15	±0.2	±0.3	±0.5
		Center distance (resin) General dimensions (metal)	±0.1	±0.25	±0.4	±0.5	±0.7
		General dimensions (resin), Assembly dimensions, Bend dimensions (longitudinally 315 or less)	±0.2	±0.3	±0.5	±0.8	±1.2

FN111-10	Class ( )
FN111-11	Metallic sinter, Aluminum alloy casting (Metal mold, Sand mold), Glass processing, Iron casting, Copper alloy casting, Rubber forming, Rubber processing, Sponge forming, Sponge processing
FN111-13	Plastic mold
FN111-14	Die cast

MATER. FINISH

TITLE LQ150X1DWF1 (FLC38XGC6V-06P) SCALE :

DRAW. NO. LD17421 CUST.

EDIT. DATE DESIG. CHECK DESCRIPTION

DESIG. CHECK APPR.

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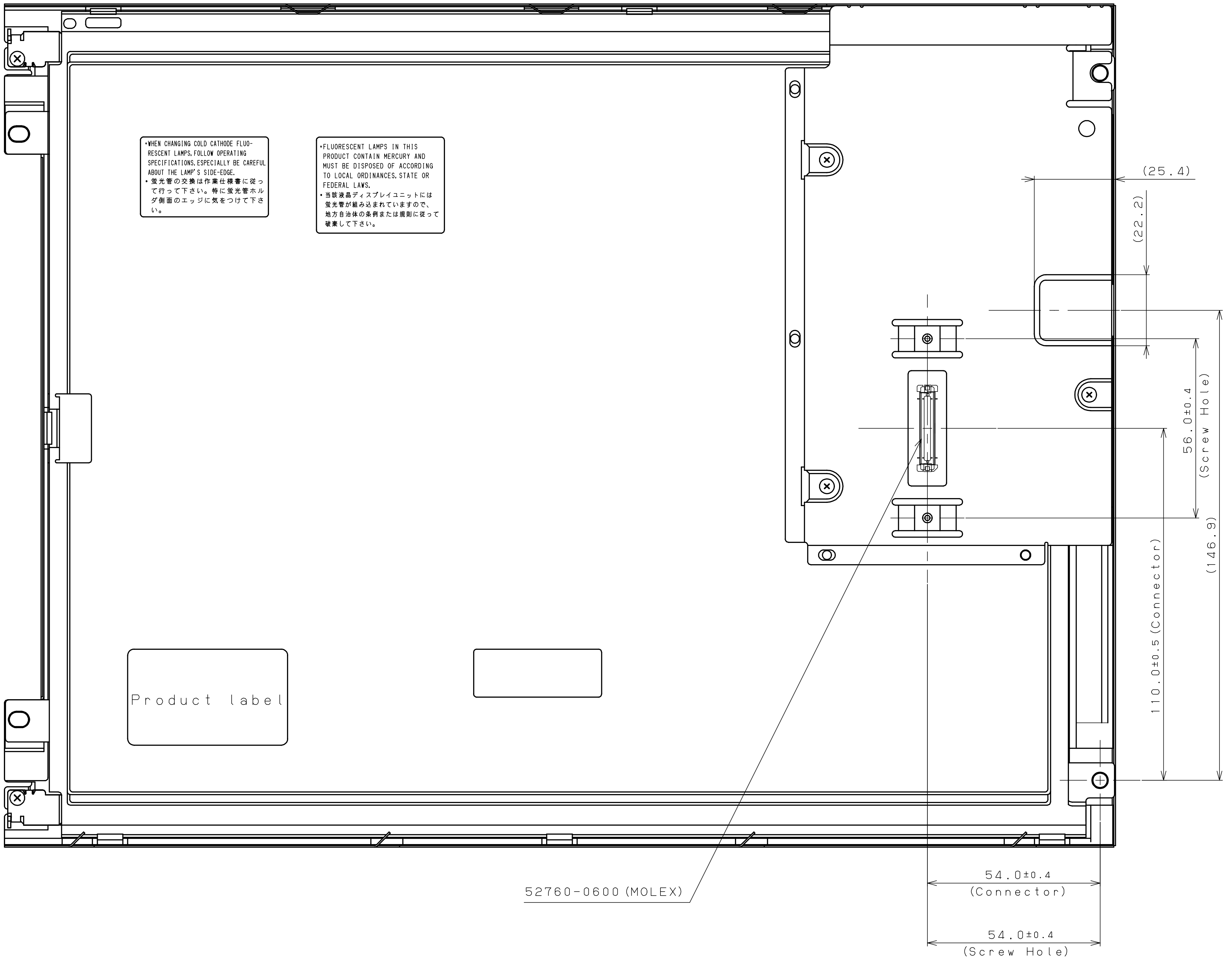
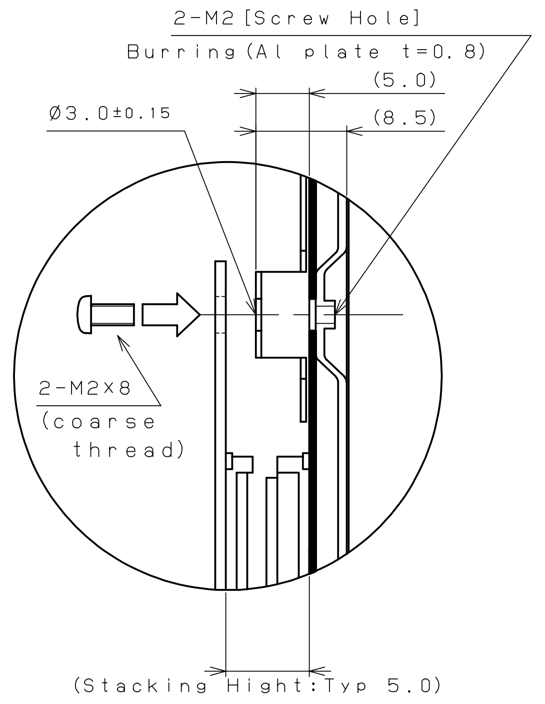
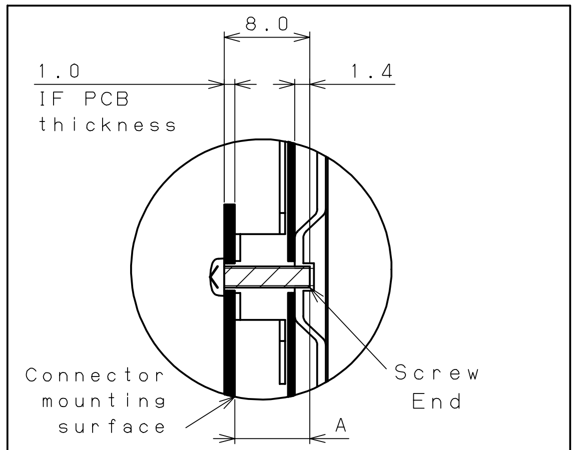
93.04 FDNC-2905-3



Rear View



IF Detail



If the thickness of IF PCB is 1.0mm, the length of engagement is 1.4mm with a screw which thread length is 8mm.

※Please adjust thread length or washer thickness so that dimension "A" will be 7~7.8mm.

Commercial Tolerance

		Item \ Dimension	0.5-30	120 or less	315 or less	1000 or less	2000 or less	FN111-10	Class ( )		
FN111-12	Machining, Sheet metal working	Center distance (metal)	±0.1	±0.15	±0.2	±0.3	±0.5	FN111-11	Metallic sinter, Aluminum alloy casting (Metal mold, Sand mold), Glass processing, Iron casting, Copper alloy casting, Rubber forming, Rubber processing, Sponge forming, Sponge processing		
		Center distance (resin) General dimensions (metal)	±0.15	±0.25	±0.4	±0.5	±0.7				
		General dimensions (resin), Assembly dimensions, Bend dimensions (longitudinally 315 or less)	±0.2	±0.3	±0.5	±0.8	±1.2	FN111-13	Plastic mold	FN111-14	Die cast

MATER.
FINISH

EDIT.	DATE	DESIG.	CHECK	DESCRIPTION
DESIG.		CHECK		APPR.

TITLE LQ150X1DWF1 (FLC38XGC6V-06P)
SCALE :
DRAW. NO. LD17421
CUST.
SHARP CORPORATION
SHEET 35/35

DOCUMENT CONTROL SECTION
DATE