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APPROVED BY: DATE		APPLICABLE DIVISION ENGINEERING DEPT. I LCD DIVISION I MOBILE LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION
	SPECIFICATION	

DEVICE SPECIFICATION for

TFT Color LCD Module

(240 × RGB × 400 dots)

Model No.

LS030B3UW01

☐ CUSTOMER'S APPROVALDATE

DATE _____

BY _____

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	PAGE 28		FPC Address Number addition	

SHARP	SPEC No. LCY-1209X01C	MODEL No. LS030B3UW01	PAGE 1

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instructions and the precautions specified in these specification sheets.

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[For handling and system design]

(1) Do not scratch the surface of the polarizer film as it is easily damaged.

(2) If the cleaning of the surface of the LCD panel is necessary, wipe it swiftly with cotton or other soft cloth. Do not use organic solvent as it damages polarizer.

(3) Water droplets on polarizer must be wiped off immediately as they may cause color changes, or other defects if remained for a long time.

(4) Since this LCD panel is made of glass, dropping the module or banging it against hard objects may cause cracks or fragmentation.

(5) Certain materials such as epoxy resin (amine's hardener) or silicone adhesive agent (de-alcohol or de-oxym) emits gas to which polarizer reacts (color change). Check carefully that gas from materials used in system housing or packaging do not hart polarizer.

(6) Liquid crystal material will freeze below specified storage temperature range and it will not get back to normal quality even after temperature comes back within specified temperature range. Liquid crystal material will become isotropic above specified temperature range and may not get back to normal quality. Keep the LCD module always within specified temperature range.

(7) Do not expose LCD module to the direct sunlight or to strong ultraviolet light for long time.

(8) If the LCD driver IC (COG
) is exposed to light, normal operation may be impeded. It is necessary to design so that the light is shut off when the LCD module is mounted.

(9) Do not disassemble the LCD module as it may cause permanent damage.

(10) As this LCD module contains components sensitive to electrostatic discharge, be sure to follow the instructions in below.

① Operators
Operators must wear anti-static wears to prevent electrostatic charge up to and discharge from human body.

② Equipment and containers
Process equipment such as conveyer, soldering iron, working bench and containers may possibly generate electrostatic charge up and discharge. Equipment must be grounded through 100Mohms resistance. Use ion blower.

③ Floor
Floor is an important part to leak static electricity which is generated from human body or equipment.
There is a possibility that the static electricity is charged to them without leakage in case of insulating floor, so the
countermeasure(electrostatic earth:$1\times10^{8}\Omega$) should be made.

④Humidity
Proper humidity of working room may reduce the risk of electrostatic charge up and discharge. Humidity should be kept over 50% all the time.

⑤Transportation/storage
Storage materials must be anti-static to prevent causing electrostatic discharge.

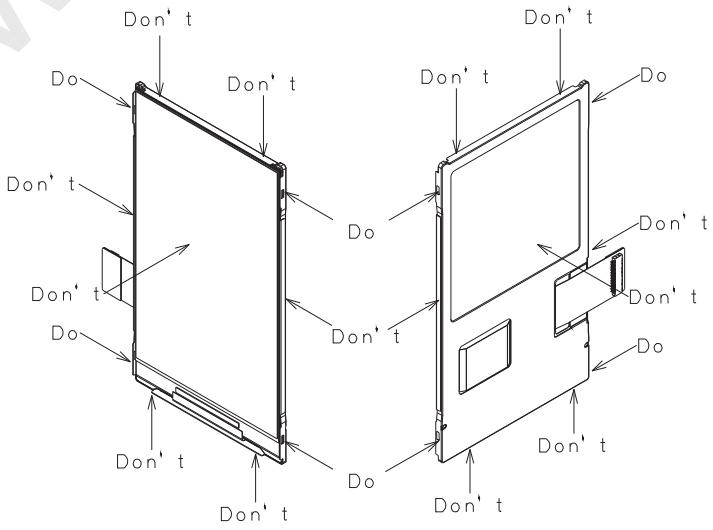
⑥Others
Protective film is attached on the surface of LCD panel to prevent scratches or other damages. When removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.

(11) Hold LCD very carefully when placing LCD module into the system housing. Do not apply excessive stress or pressure to LCD module. Do not to use chloroprene rubber as it may affect on the reliability of the electrical interconnection.

(12) Do not hold or touch LCD panel to flex interconnection area as it may be damaged.

(13) As the binding material between LCD panel and flex connector mentioned in 12) contains an organic material, any type of organic solvents are not allowed to be used. Direct contact by fingers is also prohibited.

(14) When carrying the LCD module, place it on the tray to protect from mechanical damage. It is recommended to use the conductive trays to protect the CMOS components from electrostatic discharge. When holding the module, hold the Plastic Frame of LCD module so that the panel, COG and other electric parts are not damaged.



(15) Do not touch the COG's patterning area. Otherwise the circuit may be damaged.

(16) Do not touch LSI chips as it may cause a trouble in the inner lead connection.

(17) Place a protective cover on the LCD module to protect the glass panel from mechanical damages.

(18) LCD panel is susceptible to mechanical stress and even the slightest stress will cause a color change in background. So make sure the LCD panel is placed on flat plane without any continuous twisting, bending or pushing stress.

(19) Protective film is placed onto the surface of LCD panel when it is shipped from factory. Make sure to peel it off before assembling the LCD module into the system. Be very careful not to damage LCD module by electrostatic discharge when peeling off this protective film. Ion blower and ground strap are recommended.

(20) Make sure the mechanical design of the system in which the LCD module will be assembled matches specified viewing angle of this LCD module.

(21) This LCD module does not contain nor use any ODS (1,1,1-Trichloroethane, CCL4) in all materials used, in all production processes.

[For operating LCD module]

(1) Do not operate or store the LCD module under outside of specified environmental conditions.
(2) At the shipment, adjust the contrast of each LCD module with electric volume. LCD contrast may vary from panel to panel depending on variation of LCD power voltage from system.
(3) As opt-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

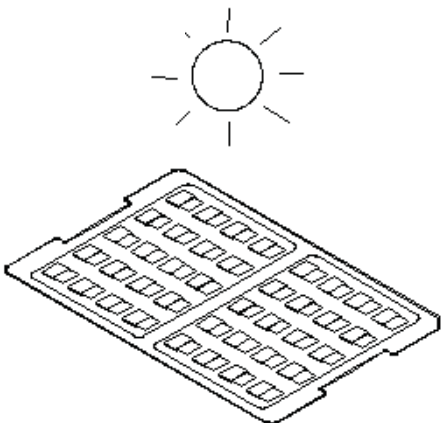
[Precautions for Storage]

(1) Do not expose the LCD module to direct sunlight or strong ultraviolet light for long periods. Store in a dark place.
(2) The liquid crystal material will solidify if stored below the rated storage temperature and will become an isotropic liquid if stored above the rated storage temperature, and may not retain its original properties. Only store the module at normal temperature and humidity (25±5°C,60±10%RH) in order to avoid exposing the front polarizer to chronic humidity.
(3) Keeping Method

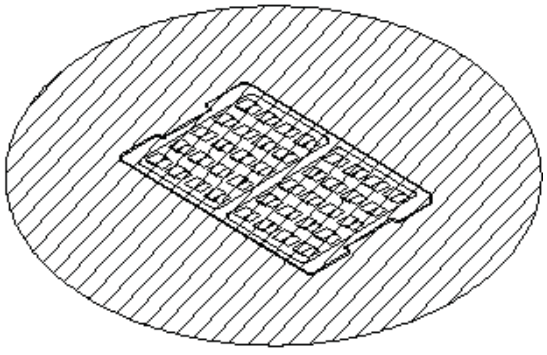
a. Don't keeping under the direct sunlight.

b. Keeping in the tray under the dark place.

DON'T



DO



(1) Do not operate or store the LCD module under outside of specified environmental conditions.
(2) Be sure to prevent light striking the chip surface.

[Other Notice]

(1) Do not operate or store the LCD module under outside of specified environmental conditions.

(2) As electrical impedance of power supply lines (VCC-GND) are low when LCD module is working, place the de-coupling capacitor near by LCD module as close as possible.

(3) Reset signal must be sent after power on to initialize LSI. LSI does not function properly until initialize it by reset signal.

(4) Generally, at power on, in order not to apply DC charge directly to LCD panel, supply logic voltage first and initialize LSI logic function including polarity alternation. Then supply voltage for LCD bias. At power off, in order not to apply DC charge directly to LCD panel, execute Power OFF sequence and Discharge command.

(5) Don't touch to FPC surface, exposed IC chip, electric parts and other parts, to any electric, metallic materials.

(6) No bromide specific fire-retardant material is used in this module.

(7) Do not display still picture on the display over 2 hours as this will damage the liquid crystal.

(8) The connector used in this LCD module is the one Sharp have not ever used.
Therefore, please note that the quality of this connector concerned is out of Sharp's guarantee.

[Precautions for Discarding Liquid Crystal Modules]

COG: After removing the LSI from the liquid crystal panel, dispose of it in a similar way to circuit boards from electronic devices.
LCD panel: Dispose of as glass waste. This LCD module contains no harmful substances. The liquid crystal panel contains no dangerous or harmful substances. The liquid crystal panel only contains an extremely small amount of liquid crystal (approx.100mg) and therefore it will not leak even if the panel should break.
-Its median lethal dose (LD50) is greater than 2,000 mg/kg and a mutagenetic (Aims test: negative) material is employed.
FPC: Dispose of as similar way to circuit board from electric device.

1. Application

This data sheet is to introduce the specification of LS030B3UW01 active matrix 262,144color LCD module.
Main color LCD module is controlled by Driver IC (Samsung S6D14E0).
If any problem occurs concerning the items not stated in this specification, it must be solved sincerely by both parties after deliberation.
As to basic specification of driver IC refer to the IC specification and handbook.

2. Construction and Outline

Construction: LCD panel, Driver (COG), FPC with electric components,
6 White LED lump, prism sheet, diffuser, light guide and reflector, plastic frame and metal frame to fix them mechanically.
Outline: See page 34
Connection: B to B connector (LSMtron: GB042-40P-H10-E3000)
There shall be no scratches, stains, chips, distortions and other external drawbacks that may affect the display function.

Rejection criteria shall be noted in Inspection Standard LDI-MPL11 (rev. b)

In order to realize thin module structure, double-sided adhesive tapes are used to fix LCD panels. As these tapes do
not guarantee to permanently fix the panels, LCD panel may rise from the module when shipped from factory. So please make sure to design the system to hold the edges of LCD panel by the soft material such as sponge when LCD module is assembled into the cabinet.

3. Mechanical Specification

Table 1

Parameter		Specifications	Unit
Outline dimensions (typ)		43.08 (W) × 75.4 (H) × 1.8 (D)	mm
Main LCD Panel	Active area	38.88 (W) × 64.8 (H)	mm
	Viewing area	39.88 (W) × 65.8 (H)	mm
	Display format	240×RGB(W)×400(H)	-
	Dot pitch	0.054 (W) ×0.162 (H)	mm
	Base color *1	Normally Black	-
Mass		Approx 11	g

*1 Due to the characteristics of the LC material, the colors vary with environmental temperature.

4. Absolute Maximum Ratings

(4-1) Electrical absolute maximum ratings

Table 2 Ta=25 ℃

Parameter	Symbol	Min	Max	Unit	Remark
Supply voltage	VDDIO-GND	-0.5	6.0	V	
	VCC-GND	-0.5	6.0	V	
Input Voltage	V_{IN}	-0.5	VDDIO+0.5	V	*1

*1: Input terminal of logic system.
Voltage value is based on GND = 0V.

(4-2) Environment Conditions

Table 3

Item	Top		Tstg		Remark
	MIN.	MAX.	MIN.	MAX.	
Ambient temperature	-20 °C	+70°C	-30 °C	+80°C	Note 2)
Humidity	Note 1)		Note 1)		No condensation

Note1) Ta ≤ 40 °C.....95 % RH Max
Note2) Ta > 40 °C.....Absolute humidity shall be less than Ta=40 °C /95 % RH.

As opt-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

Be sure not to exceed the rated voltage, otherwise a malfunction may occur.

5. Electrical Specifications

(5-1) Electrical characteristics

Table 4

Ta=25 ℃, GND=0V

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable Pin
Supply voltage	VDDIO-GND	Ta=-10～60 °C	1.70	1.80	2.90	V	(note 1)
Supply voltage	VCC-GND	Ta=-10～60 °C	2.70	2.80	2.90	V	(note 1)
"H" level input voltage	V_{IH}	Ta=-10～60 °C	0.8xVDDIO	-	-	V	(note 2)
"L" level input voltage	V_{IL}		-	-	0.2xVDDIO	V	(note 2)
Input leakage current	I_{LI}	Ta=-10～60 °C	-1	-	1	μA	(note 2)
Output leakage current	I_{LO}	V_{IN}= GND or VDDIO	-1	-	1	μA	(note 3)
"H" level output voltage	V_{OH}	Ta=-10～60 °C	0.8xVDDIO	-	-	V	(note 4)
"L" level output voltage	V_{OL}	I_{OH}=-0.1 mA , I_{OL} =0.1 mA	-	-	0.2xVDDIO	V	
Current consumption	I_{cc}	Ta=25 °C	-	4.0	5.2	mA	(note 5)

(note 1) The condition VDDIO ≤ VCC must be met.
(note 2) Input mode of D0～D15, RS, RDB, WRB, CSB, RESETB, IF_MODE0, IF_MODE1
(note 3) Output mode of D0～D15, VSYNC_O
(note 4) Output mode of D0～D15, VSYNC_O
(note 5) Following Conditions

Ta=25℃, Sequence : see page 22 (typical frame frequency = 65Hz) , MAKER_ID pin =Low.

Display Pattern: All ON (white) Pattern. No Host CPU access.

*All ON (white) Pattern

(5-2) LED back light

(1) At main panel the back light uses 6pcs edge light type white LED.

Table 5

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward current	Ta=25 °C	I_{LED}	-	20 *1	-	mA@1LED	LEDA - LED1 to 6

LED lamp: NSSW006T (NICHIA)

([Luminous Intensity rank]: A18 ~, [Color rank]: a52 / a62)

*1 per one piece of LED

*Please consider Allowable Forward Current on used temperature
(refer to Ambient Temperature vs. Allowable Forward Current curve)

Table 6

Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	IF	35	mA
Pulse Forward Current	IFP	100	mA
Reverse Voltage	VR	5	V
Power Dissipation	PD	123	mW
Operating Temperature	Topr	-30 ~ + 85	°C
Storage Temperature	Tstg	-40 ~ +100	°C
Soldering Temperature	Tsld	Reflow Soldering : 260°C for 10sec. Hand Soldering : 350°C for 3sec.	

IFP Conditions : Pulse Width ≦ 10msec. and Duty ≦ 1/10

■ Ambient Temperature vs. Allowable Forward Current

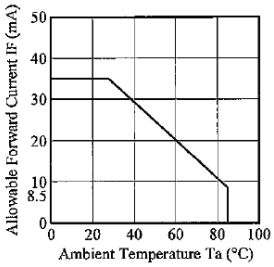


Table 7

Initial Electrical/Optical Characteristics (Ta=25°C)

Item		Symbol	Condition	Typ.	Max.	Unit
Forward Voltage		VF	IF=20[mA]	(3.2)	3.5	V
Reverse Current		IR	VR= 5[V]	-	50	μA
Luminous Intensity (Chromaticity Coordinate 1)		Iv	IF=20[mA]	(2.20)	-	cd
Chromaticity Coordinate*1	x	-	IF=20[mA]	0.310	-	-
	y	-	IF=20[mA]	0.320	-	-
Luminous Intensity (Chromaticity Coordinate 2)		Iv	IF=20[mA]	(2.05)	-	cd
Luminous Flux (Chromaticity Coordinate 2)		ϕv	IF=20[mA]	(5.5)	-	lm
Chromaticity Coordinate*2	x	-	IF=20[mA]	0.300	-	-
	y	-	IF=20[mA]	0.295	-	-

* Please refer to CIE 1931 chromaticity diagram.

Table 8

Ranking (Ta=25°C)

Item		Symbol	Condition	Min.	Max.	Unit
Luminous Intensity	Rank A22	Iv	IF=20[mA]	2.20	2.30	cd
	Rank A21	Iv	IF=20[mA]	2.10	2.20	cd
	Rank A20	Iv	IF=20[mA]	2.00	2.10	cd
	Rank A19	Iv	IF=20[mA]	1.90	2.00	cd
	Rank A18	Iv	IF=20[mA]	1.80	1.90	cd

* Luminous Intensity Measurement allowance is ± 7%.

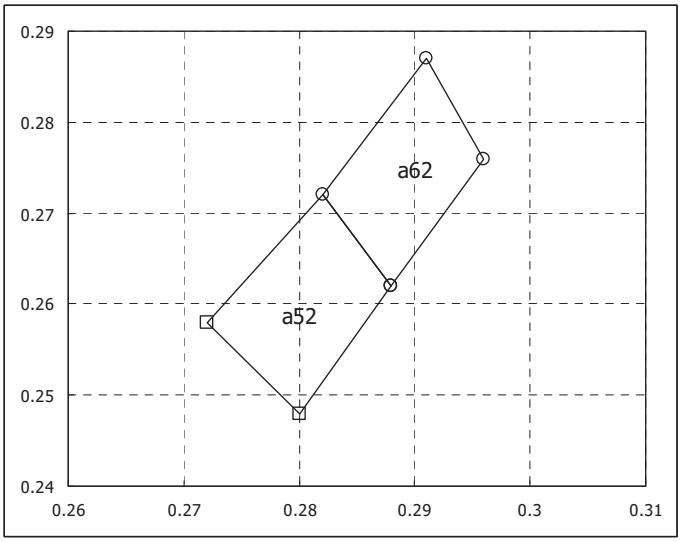
Table 9

Color Ranks (IF=20mA,Ta=25°C)

	Rank a52			
x	0.2800	0.2720	0.2820	0.2880
y	0.2480	0.2580	0.2720	0.2620

	Rank a62			
x	0.2880	0.2820	0.2910	0.2960
y	0.2620	0.2720	0.2870	0.2760

* Color Coordinates Measurement allowance is ± 0.005.



(5-3) Interface signals

Table 10

Pin No	Symbol	Description	I/O	Remarks
1	GND	GND level pin	-	
2	VDDIO	Power supply for I/O	-	
3	VCC	Power supply for analog	-	
4	D0	Data Bus	I/O	
5	D1	Data Bus	I/O	
6	D2	Data Bus	I/O	
7	D3	Data Bus	I/O	
8	D4	Data Bus	I/O	
9	D5	Data Bus	I/O	
10	D6	Data Bus	I/O	
11	D7	Data Bus	I/O	
12	D8	Data Bus	I/O	
13	D9	Data Bus	I/O	
14	D10	Data Bus	I/O	
15	D11	Data Bus	I/O	
16	D12	Data Bus	I/O	
17	D13	Data Bus	I/O	
18	D14	Data Bus	I/O	
19	D15	Data Bus	I/O	
20	GND	GND level pin	-	
21	GND	GND level pin	-	
22	IF_MODE 0	CPU Interface bus width select	I	
23	OPEN (OTP)	(OTP Program Pin)	I	Don't Care (open)
24	VSYNC_O	Tearing Effect Output	O	
25	WRB	Write enable	I	Low(GND) enable
26	RDB	Read enable	I	Low(GND) enable
27	RESETB	Reset enable	I	Low(GND) enable
28	CSB	Chip Select	I	Low(GND) enable
29	RS	Data / Command selectable	I	High(VDDIO) : Access to data Low(GND) : Access to Index
30	IF_MODE	CPU Interface bus width select	I	
31	LED6	LED6 Cathode	-	
32	LED5	LED5 Cathode	-	
33	LED4	LED4 Cathode	-	
34	LED3	LED3 Cathode	-	
35	LED2	LED2 Cathode	-	
36	LED1	LED1 Cathode	-	
37	LEDA	LED1~6 Anode Common	-	
38	MAKER_ID (L)	Maker ID pin	-	Connected to "GND" on FPC
39	LED_PWM	PWM signal for backlight control	O	
40	GND	GND level pin	-	

Corresponded connector : Board to Board connector (LSMtron : GB042-40P-H10-E3000)
Signals connect to LCD module. Symbols correspond able to Circuit diagram in Page 32.

(5-4) Host Interface Timing Diagrams

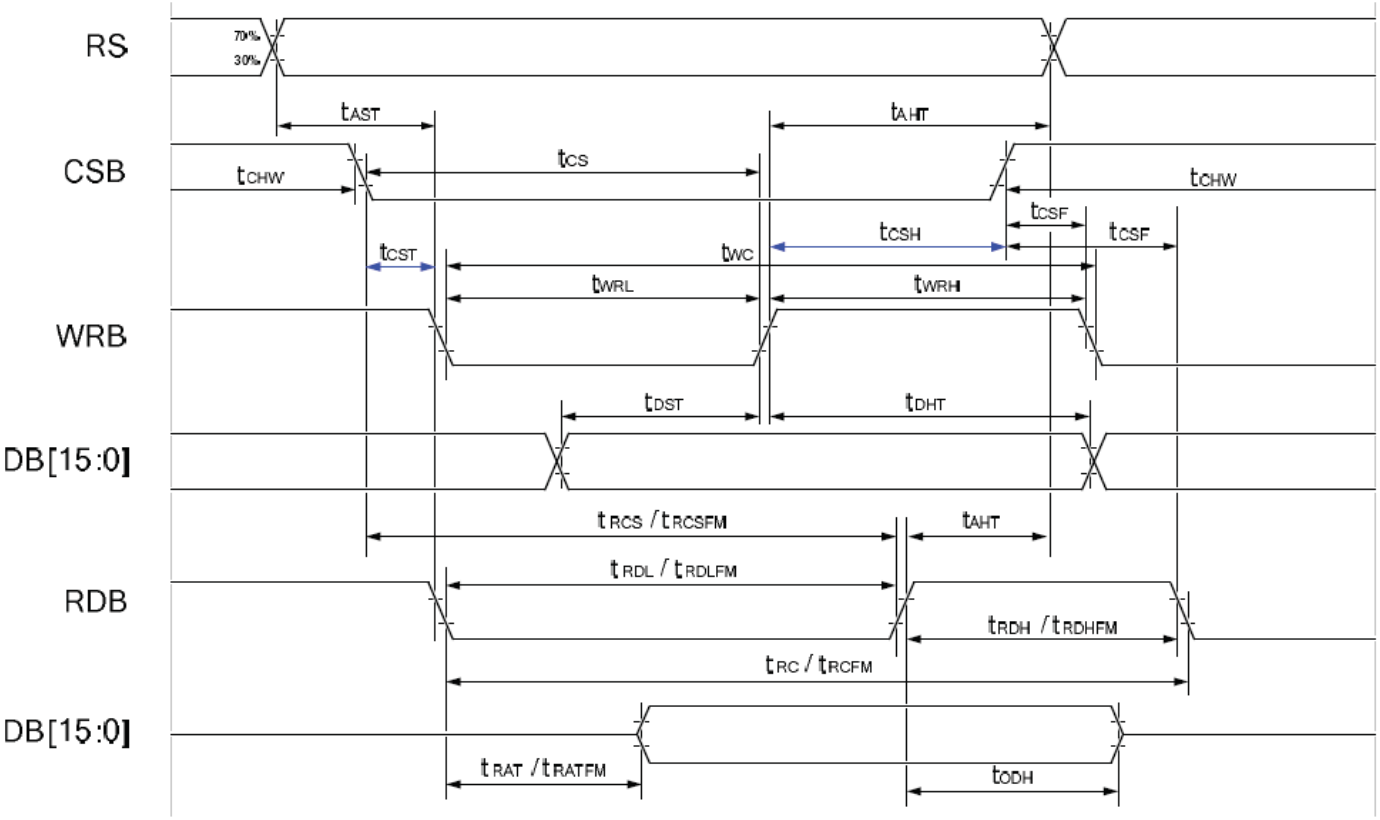


Fig.1 Timing diagram

Condition : VCC=2.7～2.9V, VDDIO=1.7～2.9V, Ta =25℃

Table

Signal	Symbol	Description / Condition	MIN	TYP	MAX	Unit	REMARK
RS	tAST	Address setup	10	-	-	ns	
	tAHT	Address hold time(write/read)	10	-	-	ns	
CSB	tCHW	CSB high pulse width (write)	0	-	-	ns	
	tCS	CSB setup time (write)	35	-	-	ns	
	tRCS	CSB setup time (register)	70	-	-	ns	
	tRCSFM	CSB setup time (memory)	355	-	-	ns	
	tCSF	CSB wait time (write/read)	10	-	-	ns	
	tCST	CSB enable setup time	0	-	-	ns	
	tCSH	CSB enable hold time	10	-	-	ns	
WRB	tWC	Write cycle	77	-	-	ns	
	tWRH	Control pulse H duration	35	-	-	ns	
	tWRL	Control pulse L duration	35	-	-	ns	
RDB	tRC	Read register cycle (register)	160	-	-	ns	
	tRDH	Control pulse H duration (register)	90	-	-	ns	
	tRDL	Control pulse L duration (register)	65	-	-	ns	
RDB	tRCFM	Read cycle (memory)	450	-	-	ns	
	tRDHFM	Control pulse H duration (memory)	90	-	-	ns	
	tRDLFM	Control pulse L duration (memory)	355	-	-	ns	
D[15:0]	tDST	Data setup time	10	-	-	ns	
	tDHT	Data hold time	10	-	-	ns	
	tRAT	Read access time (register)	-	40	-	ns	
	tRATFM	Read access time (memory)	-	340	-	ns	
	tODH	Output diable time	20	80	-	ns	

(5-5) Schematic of LCD module system

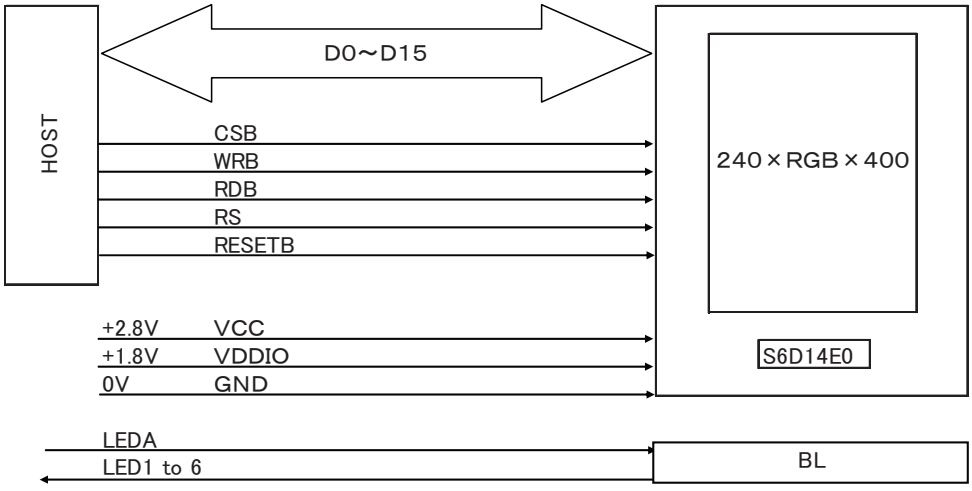


Fig.2 Schematic of LCD module system

6. Optical Characteristics

Table 12 VDDIO=1.8V, VCC=2.8V, ILED=20mA/pcs, Ta = 25℃

Initial Sequence of page 22

Optical Characteristics

Parameter		symbol	condition	MIN	TYP	MAX	unit	Remark
Brightness		Br	θ=0°	350	500	-	cd/㎡	Note1,2
Contrast		Co	θ=0°	1000	2000	-		Note1,3
Viewing Angle		θ11	Co > 5	70	80	-	deg	Note1
		θ12		70	80	-		
		θ21		70	80	-		
		θ22		70	80	-		
Response Time	Rise	τr1	θ=0°	-	11	22	ms	Note1,4
	Deca	τd1		-	24	48	ms	
White chromaticity		x	θ=0°	0.24	0.29	0.34		Note.1
		y		0.27	0.32	0.37		
Red chromaticity		x	θ=0°	0.59	0.64	0.69		
		y		0.28	0.33	0.38		
Green chromaticity		x	θ=0°	0.24	0.29	0.34		
		y		0.55	0.60	0.65		
Blue chromaticity		x	θ=0°	0.09	0.14	0.19		
		y		0.01	0.06	0.11		
Uniformity		-	θ=0°	80	-	-	%	Note.5
NTSC ratio		-	θ=0°	60	70	-	%	Note.1
Color Temperature		-	θ=0°	6000	-	10000	K	Note.1
Flicker ratio		-	θ=0°	-	-	7	%	Note.1 , *1

*1: Measuring condition

- ·Measuring systems: YOKOGAWA 3298_01 + 3298_11
- ·Temperature = 25℃(±3℃), LED back-light: ON, Environment brightness < 150 lx
- ·Measuring pattern : Horizontal stripe pattern <black (V0) / gray(V32) / black (V0) /gray (V32)…>
- ·Measured sample : New sample before a long term aging.
- ·Flicker ratio is very sensitive to measuring condition.

Note 1) Definition of range of visual angle

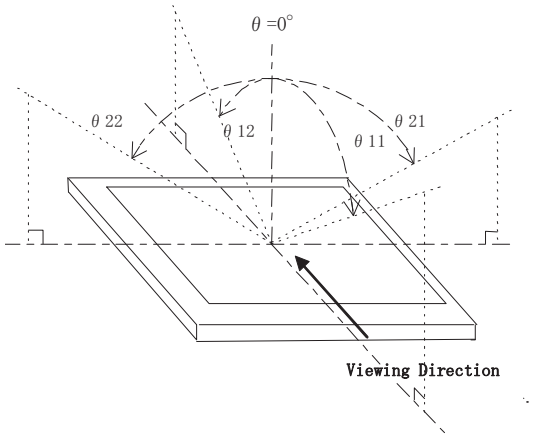


Fig .3 Definition of viewing angle

Note 2) Brightness is measured as shown in Fig.4, and is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

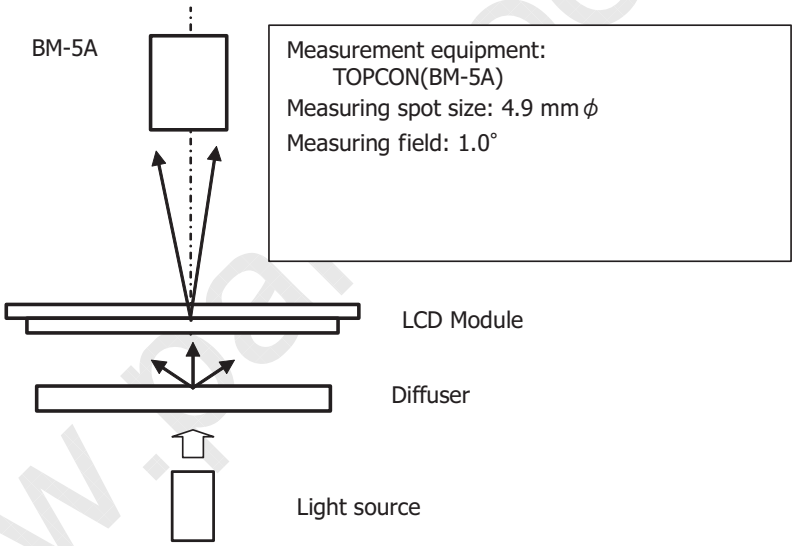


Fig. 4 Optical characteristics Test Method (Brightness)

*Back Light Control Mode ="OFF" (9Eh=00)

Note 3) Contrast ratio is defined as follows:

$$Co = \frac{\text{Luminance(brightness) all pixcels "White"}}{\text{Luminance(brightness) all pixcels "Black"}}$$

*Back Light Control Mode ="OFF" (9Eh=00)

Note 4) Response time is defined as follows:

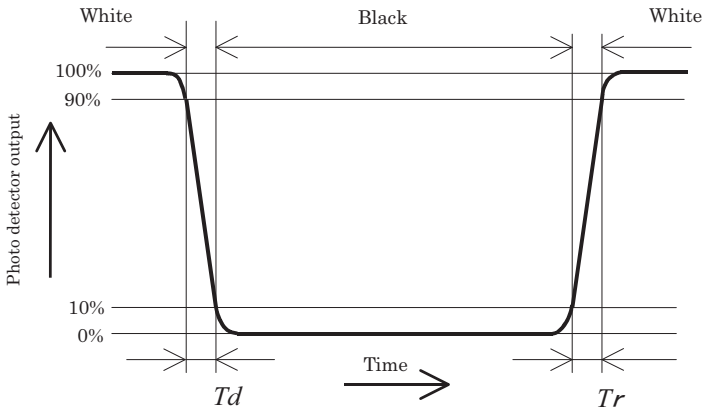


Fig. 5 Response time

*Back Light Control Mode ="OFF" (9Eh=00)

Note 5) Uniformity is defined as follows:

$$\text{Uniformity} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

*Back Light Control Mode ="OFF" (9Eh=00)

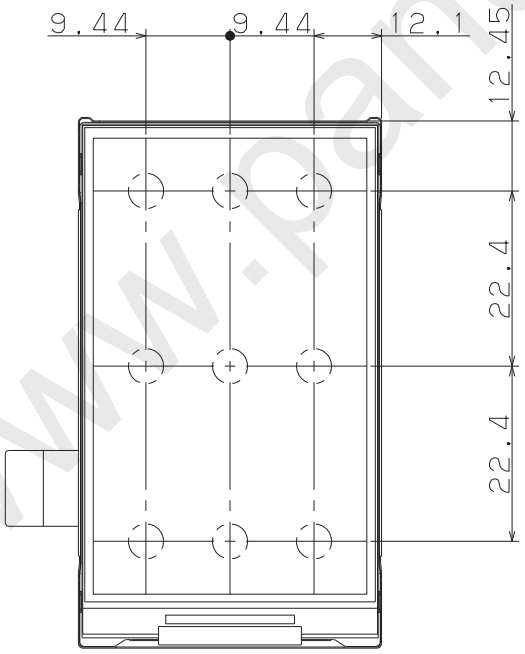


Fig. 6 Measuring Point

7. Reliability

Table. 13

No.	Test	Condition	Judgment criteria
1	Temperature Cycling	-30℃ → 80℃ → -30℃ ... 60min (3min) 60min (3min) 60min 10cycle	Per table in below
2	High Temp. Storage	Ta=80℃ 96h	Per table in below
3	Low Temp. Storage	Ta=-30℃ 96h	Per table in below
4	Humidity Operation	Ta=60℃ 90%RH 96h	Per table in below (polarizer discoloration is excluded)
5	High Temp. Operation	Ta=70℃ 96h	Per table in below
6	Low Temp. Operation	Ta=-20℃ 96h	Per table in below
7	ESD	Discharge resistance: 0 Ω Discharge capacitor: 200 pF Discharge voltage: ±200 V Max Discharge 1 time to each input line ※ "GND" of display module is connected GND of test system ground.	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

8. Mechanical strength (*1,*2,*3)

Table. 14

Mechanical strength	MIN	TYP	MAX	Unit	Remark
3 Point Bending	4.0	—	—	Kgf	Note.1)
COG Constant Pushing	1.9	—	—	Kgf	Note.2)

※Testing condition
- ·Testing systems:
- ·Temperature = 25℃(±3℃)
- ·Non operation
- ·Measured sample : New sample before a long term aging.

*1. Mechanical Strength specification shall be out of LG Electronics's incoming inspection standard and not applicable to AQL.

*2. Above specification are meaning of the typical lowest values gotten from actual measurement at sampling test.

*3. If there are a lot of samples which doesn't meet the specifications in the standard sampling test, Sharp & LG have discussions how to proceed in each case.

Note.1) 3 Point Bending Test is measured as follows
The strength of 3 Point Bending is defined as the load of Pushing Bar at when LCD glass is broken.

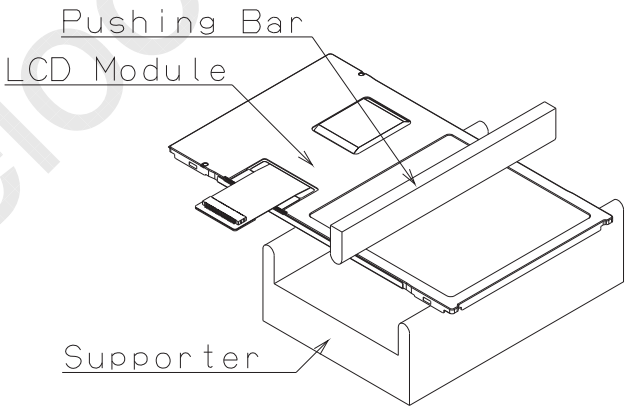


Fig. 7 3Point Bending Test

(Test condition)

Pushing Bar:
- Tip shape:Φ3mm(round shape)
- Sweep Speed:3mm/min
- Material:Aluminum or Steel
- Position: Fig. 8

Supporter
- Tip shape:Φ3mm(round shape)
- Pitch:36mm
- Material:Aluminum or Steel

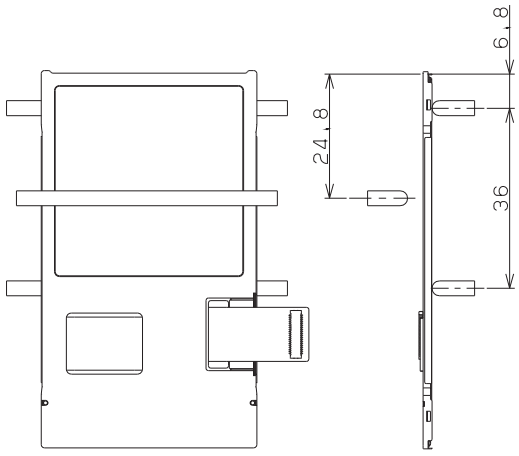


Fig. 8 Test Position

Note.2) COG Constant Pushing Test is measured as follows

The strength of COG Constant Pushing is defined as the load of Pushing Rod at when LCD glass or driver IC is broken.

(Test condition)

Pushing Rod:

Tip diameter: Φ5mm (flat shape)

Sweep Speed: 3mm/min

Material: Aluminum or Steel

Position: Fig. 10

Supporter

Tip shape: Flat shape

Pitch: 30mm

Material: Aluminum or Steel

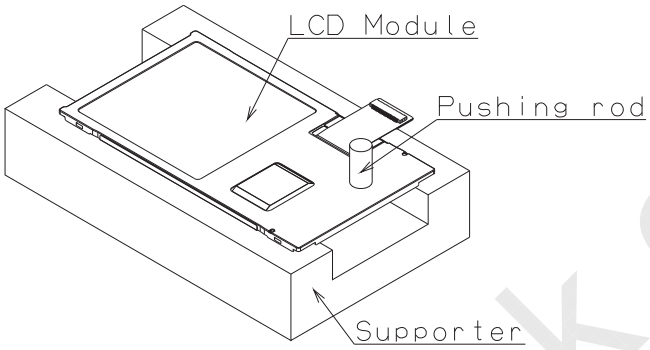


Fig. 9 COG Constant Pushing Test

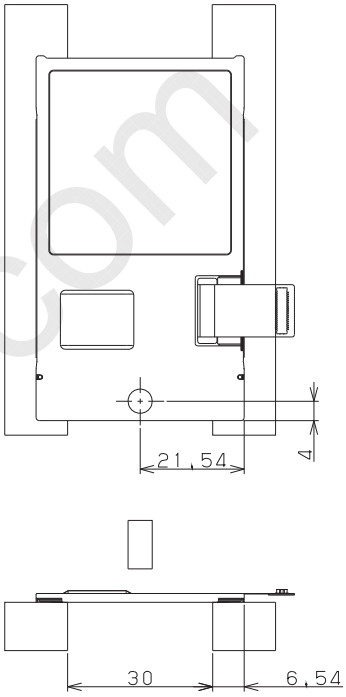


Fig.10 Test Position

9. Packaging specifications

(9-1) Details of packaging

1) Packaging materials: Table.16
2) Packaging style : Fig. 11, 12

(9-2) Reliability

1) Vibration test

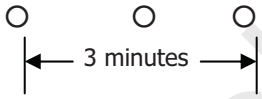
Table.15

Item	Test			
Frequency	5 Hz to 50 Hz (3 minutes cycle)			
Direction	Up-Down, Left-Right, Front-Back (3 directions)			
Period	Up-Down	Left-Right	Front-Back	Total
	60min	15min	15min	90min

The frequency should start at 5 Hz and vary continuously.

Total amplitude 20mm 0.2mm 20mm 0.2mm

Frequency 5 Hz 50 Hz 5 Hz 50 Hz (For 9.8m/s^2)



2) Drop test

Drop height: 750mm

Number of drop: 10 times (Drop sequence: 1 corner, 3 edges, 6 faces)

(9-3) Packaging quantities

400 modules per master carton

(9-4) Packaging weight

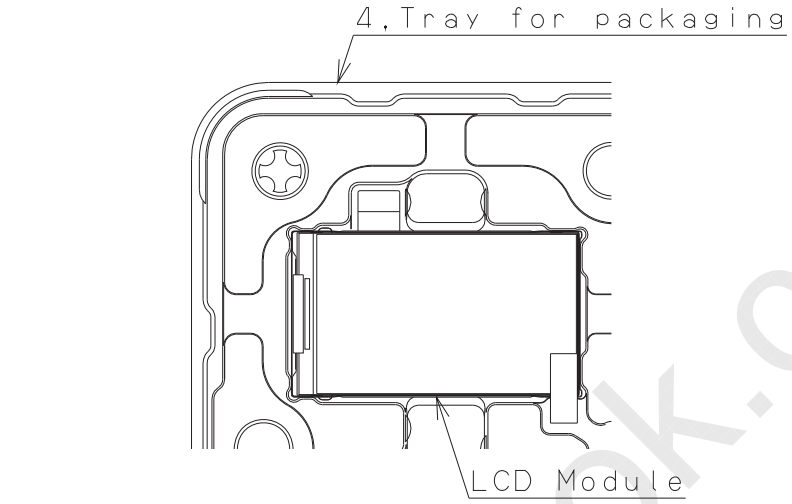
About 9 kg

(9-5) Packaging outline dimensions

365 mm×530 mm×235 mm (H)

(Packaging materials) Table.16

	Parts name	Materials
1	Master carton	Corrugate card board
2	Inside sleeve	Corrugate card board
3	Outside sleeve	Corrugate card board
4	Tray for packaging	Polystyrene with anti-static treatment + anti-static polystyrene
5	Protective bag	Polyethylene with anti-static treatment
6	OPP tape	Polypropylene
7	Bar code label	Anti-static polyethylene



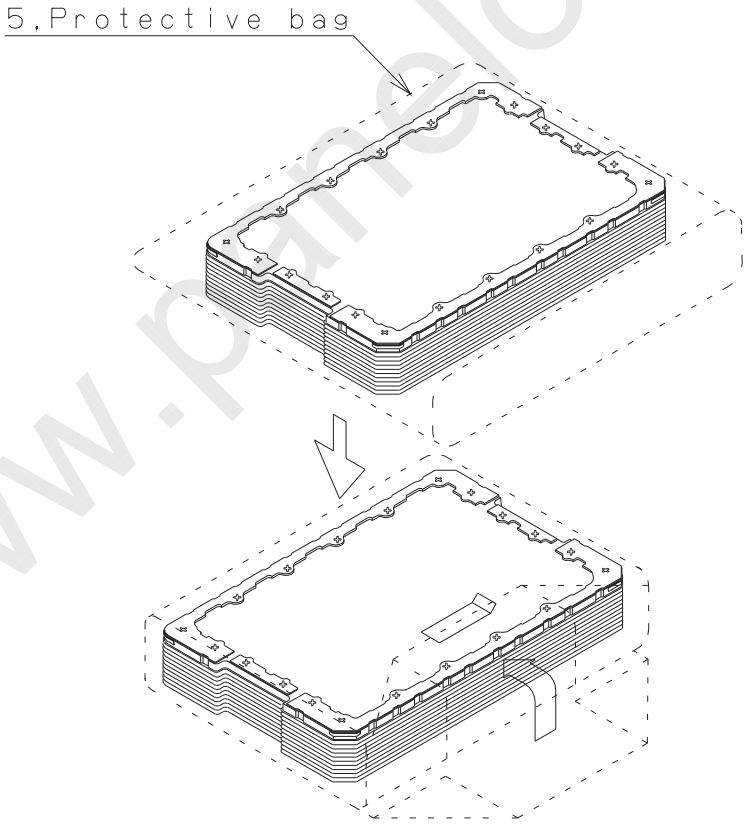


Fig.11 Packaging style (Tray for packaging)

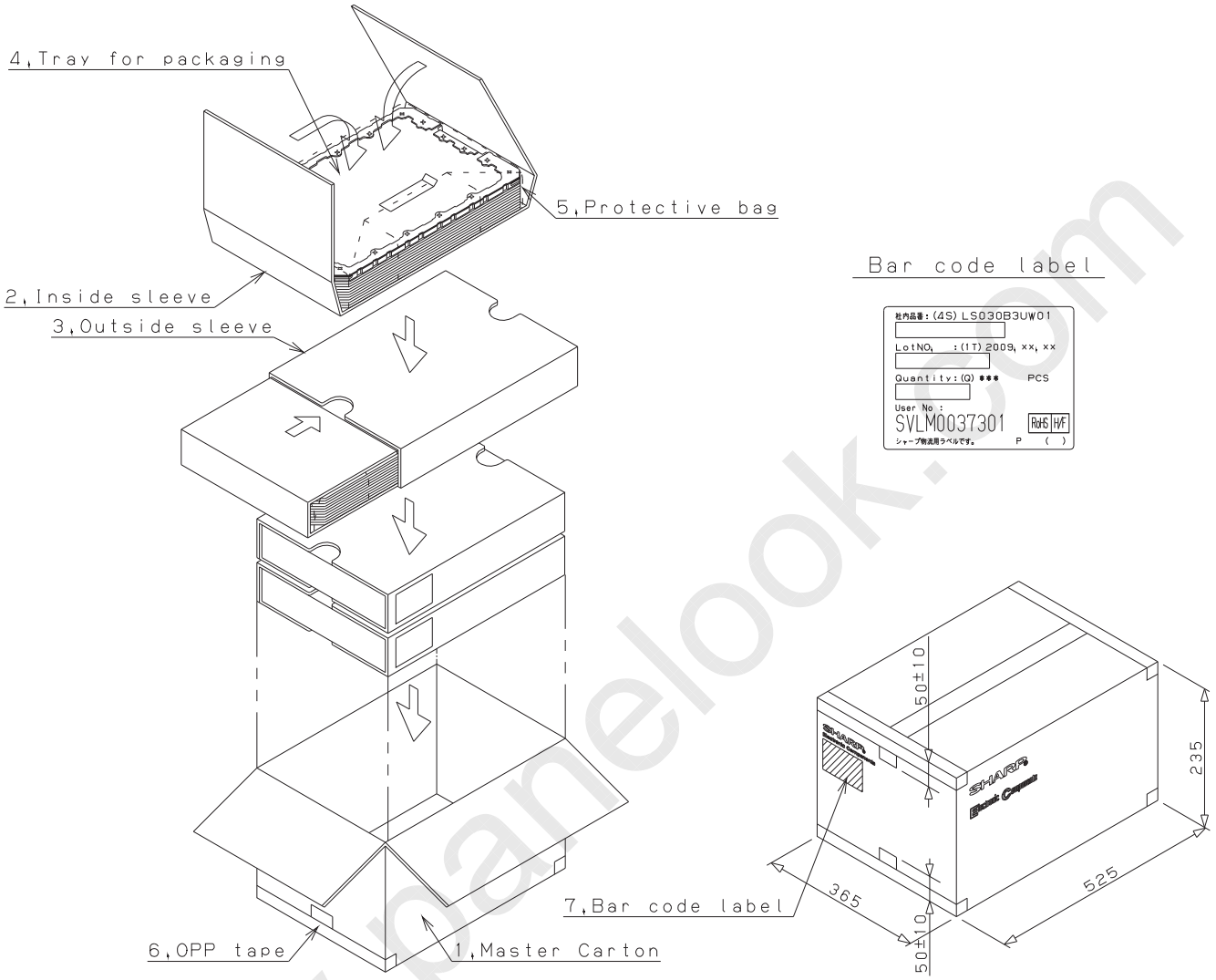
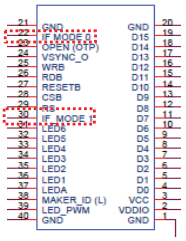


Fig. 12 Packaging style (Master carton for packaging)

10. Initial Sequence

[Power ON sequence]

In case of 16BUS / 16bits 1time transfer
01(h)Register=02(h)/IF_MODE0=GND/IF_MODE1=VDDIO
In case of 8BUS / (6+6+6)bits 3time transfer
01(h)Register=00(h)/IF_MODE0=IF_MODE1=VDDIO
Frame(osc)=65Hz
VCC=2.8V, VDDIO=1.8V



1) POWER ON Sequence

ITEM	Command or Parameter	HEX	REMARK
VDDIO ON			
VCC ON			
HW RESET			
WAIT 5ms			
TRFMODE	Command	01h	
	Parameter	**h	Data bus width / Picture Data transfer mode select
MEMCTL	Command	08h	
	Parameter	00h	
MPSX	Command	10h	
	Parameter	F0h	
MPSY1	Command	11h	
	Parameter	90h	
MPSY2	Command	12h	
	Parameter	01h	
WAS	Command	19h	
	Parameter	01h	
RAMCTL	Command	1Dh	
	Parameter	24h	
TVGLN	Command	1Eh	
	Parameter	50h	
DSPCTL2	Command	33h	
	Parameter	02h	
TVFPSIZE	Command	42h	
	Parameter	34h	
TVBPSIZE	Command	43h	
	Parameter	01h	
THCNT	Command	44h	
	Parameter	07h	
TGSPWD	Command	45h	
	Parameter	08h	
TGCKST	Command	46h	
	Parameter	04h	
TCOMST	Command	48h	
	Parameter	01h	
TSSWCLT1	Command	4Ah	
	Parameter	01h	
TSSWCTL2	Command	4Bh	
	Parameter	A8h	
TASWST	Command	4Ch	
	Parameter	05h	
TASW2	Command	62h	
	Parameter	29h	
TB1AS1	Command	65h	
	Parameter	02h	
VGAMH1	Command	66h	
	Parameter	03h	

COMMODE	Command	6Ah	
	Parameter	03h	
WINADDR0	Command	C9h	
	Parameter	01h	
WINADDR1	Command	CAh	
	Parameter	8Fh	
CABC4 :Write MIE mode	Command	9Eh	
	Parameter	**h	BLC ON 02 OFF 00
CABC8 :Write Backlight control mode	Command	A4h	
	Parameter	02h	
CABC3 :BCTRL, DD, BL	Command	9Dh	
	Parameter	21h	
CABC11	Command	C7h	
	Parameter	02h	

PWD0	Command	36h	
	Parameter	5Ah	
PWD1	Command	37h	
	Parameter	5Ah	
BCT00	Command	0Bh	
	Parameter	E5h	
BCT01	Command	0Ch	
	Parameter	5Ah	
BCT02	Command	0Dh	
	Parameter	28h	
BCT03	Command	0Eh	
	Parameter	73h	
BCT04	Command	0Fh	
	Parameter	1Ah	
BCT05	Command	10h	
	Parameter	5Ch	
BCT06	Command	11h	
	Parameter	19h	
BCT07	Command	12h	
	Parameter	69h	
BCT08	Command	13h	
	Parameter	37h	
BCT09	Command	14h	
	Parameter	80h	
BCT10	Command	15h	
	Parameter	48h	
BCT11	Command	16h	
	Parameter	6Bh	
BCT12	Command	17h	
	Parameter	00h	
TGT00	Command	18h	
	Parameter	37h	
TGT01	Command	19h	
	Parameter	18h	
TGT02	Command	1Ah	
	Parameter	10h	
TGT03	Command	1Bh	
	Parameter	1Dh	
TGT04	Command	1Ch	
	Parameter	07h	
TGT05	Command	1Dh	
	Parameter	10h	
TGT06	Command	1Eh	
	Parameter	08h	
TGT07	Command	1Fh	
	Parameter	1Fh	
TGT08	Command	20h	
	Parameter	14h	
TGT09	Command	21h	
	Parameter	28h	
TGT10	Command	22h	
	Parameter	37h	

TGT11	Command	23h	
	Parameter	17h	
TGT12	Command	24h	
	Parameter	08h	
PWD0	Command	36h	
	Parameter	A5h	
PWD1	Command	37h	
	Parameter	A5h	
WAIT 50ms			
GVCP0A	Command	D6h	
	Parameter	00h	
GVCP1A	Command	D7h	
	Parameter	38h	
GPRP0A	Command	D8h	
	Parameter	14h	
GPRP1A	Command	D9h	
	Parameter	14h	
GPKP01A	Command	DAh	
	Parameter	5Bh	
GPKP23A	Command	DBh	
	Parameter	A6h	
GPKP45A	Command	DCh	
	Parameter	38h	
GVCN0A	Command	DDh	
	Parameter	02h	
GVCN1A	Command	DEh	
	Parameter	3Dh	
GPRN0A	Command	DFh	
	Parameter	0Ah	
GPRN1A	Command	E0h	
	Parameter	0Bh	
GPKN01A	Command	E1h	
	Parameter	7Dh	
GPKN23A	Command	E2h	
	Parameter	95h	
GPKN45A	Command	E3h	
	Parameter	5Ah	
GVCP0B	Command	E4h	
	Parameter	00h	
GVCP1B	Command	E5h	
	Parameter	38h	
GPRP0B	Command	E6h	
	Parameter	14h	
GPRP1B	Command	E7h	
	Parameter	14h	
GPKP01B	Command	E8h	
	Parameter	5Bh	
GPKP23B	Command	E9h	
	Parameter	A6h	
GPKP45B	Command	EAh	
	Parameter	38h	
GVCN0B	Command	EBh	
	Parameter	02h	
GVCN1B	Command	ECh	
	Parameter	3Dh	
GPRN0B	Command	EDh	
	Parameter	0Ah	
GPRN1B	Command	EEh	
	Parameter	0Bh	
GPKN01B	Command	EFh	
	Parameter	7Dh	
GPKN23B	Command	F0h	
	Parameter	95h	
GPKN45B	Command	F1h	
	Parameter	5Ah	
GVCP0C	Command	F2h	
	Parameter	00h	
GVCP1C	Command	F3h	
	Parameter	38h	

GPRP0C	Command	F4h	
	Parameter	14h	
GPRP1C	Command	F5h	
	Parameter	14h	
GPKP01C	Command	F6h	
	Parameter	5Bh	
GPKP23C	Command	F7h	
	Parameter	A6h	
GPKP45C	Command	F8h	
	Parameter	38h	
GVCN0C	Command	F9h	
	Parameter	02h	
GVCN1C	Command	FAh	
	Parameter	3Dh	
GPRN0C	Command	FBh	
	Parameter	0Ah	
GPRN1C	Command	FCh	
	Parameter	0Bh	
GPKN01C	Command	FDh	
	Parameter	7Dh	
GPKN23C	Command	FEh	
	Parameter	95h	
GPKN45C	Command	FFh	
	Parameter	5Ah	
DCDCLK	Command	81h	
	Parameter	00h	
PNLCKC	Command	82h	
	Parameter	01h	
DC1CNT	Command	83h	
	Parameter	3Eh	
DC1SET	Command	84h	
	Parameter	07h	
DC0CNT	Command	85h	
	Parameter	3Eh	
DC0SET	Command	86h	
	Parameter	07h	
VPON1	Command	90h	
	Parameter	25h	
VPON2	Command	91h	
	Parameter	05h	
VPOFF1	Command	92h	
	Parameter	15h	
VALG0	Command	31h	
	Parameter	01h	
RAMDT	Command	03h	
picture (black)		**h	
SEQCTL	Command	3Eh	
	Parameter	01h	
WAIT 100ms			
DSPCTL1	Command	30h	
	Parameter	81h	
BACKLIGHT ON			
WXMIN	Command	13h	
	Parameter	00h	X Start address=0
WYMIN1	Command	14h	Y Start address=0
	Parameter	00h	
WYMIN2	Command	15h	
	Parameter	00h	
WXMAX	Command	16h	
	Parameter	EFh	X End address=239
WYMAX1	Command	17h	X End address=399
	Parameter	8Fh	
WYMAX2	Command	18h	
	Parameter	01h	
RAMDT	Command	03h	
picture (etc)		**h	

[Power OFF sequence]

ITEM	RS	Command or Parameter	HEX	REMARK
BACKLIGHT OFF				
Display Off	L	Command	30h	
	H	Parameter	80h	
WAIT 50ms				
Auto off	L	Command	3Eh	
	H	Parameter	02h	
WAIT 100ms				
HW RESET				
VCC OFF				
VDDIO OFF				

[Sleep IN sequence]

ITEM	RS	"I"NDEX or "D"ATA	HEX	REMARK
BACKLIGHT OFF				
Display Off	L	Command	30h	
	H	Parameter	80h	
WAIT 50ms				
Auto off	L	Command	3Eh	
	H	Parameter	02h	
WAIT 100ms				
SYSCTL	L	Command	07h	
	H	Parameter	00h	
POWCTL	L	Command	80h	
	H	Parameter	01h	

[Sleep OUT sequence]

ITEM	RS	"I"NDEX or "D"ATA	HEX	REMARK
POWCTL	L	Command	80h	
	H	Parameter	81h	
WAIT 10ms				
SYSCTL	L	Command	07h	
	H	Parameter	01h	
WAIT 10ms				
SEQCTL	L	Command	3Eh	
	H	Parameter	01h	
WAIT 130ms				
DSPCTL1	L	Command	30h	
	H	Parameter	81h	
BACKLIGHT ON				

11. Parts List

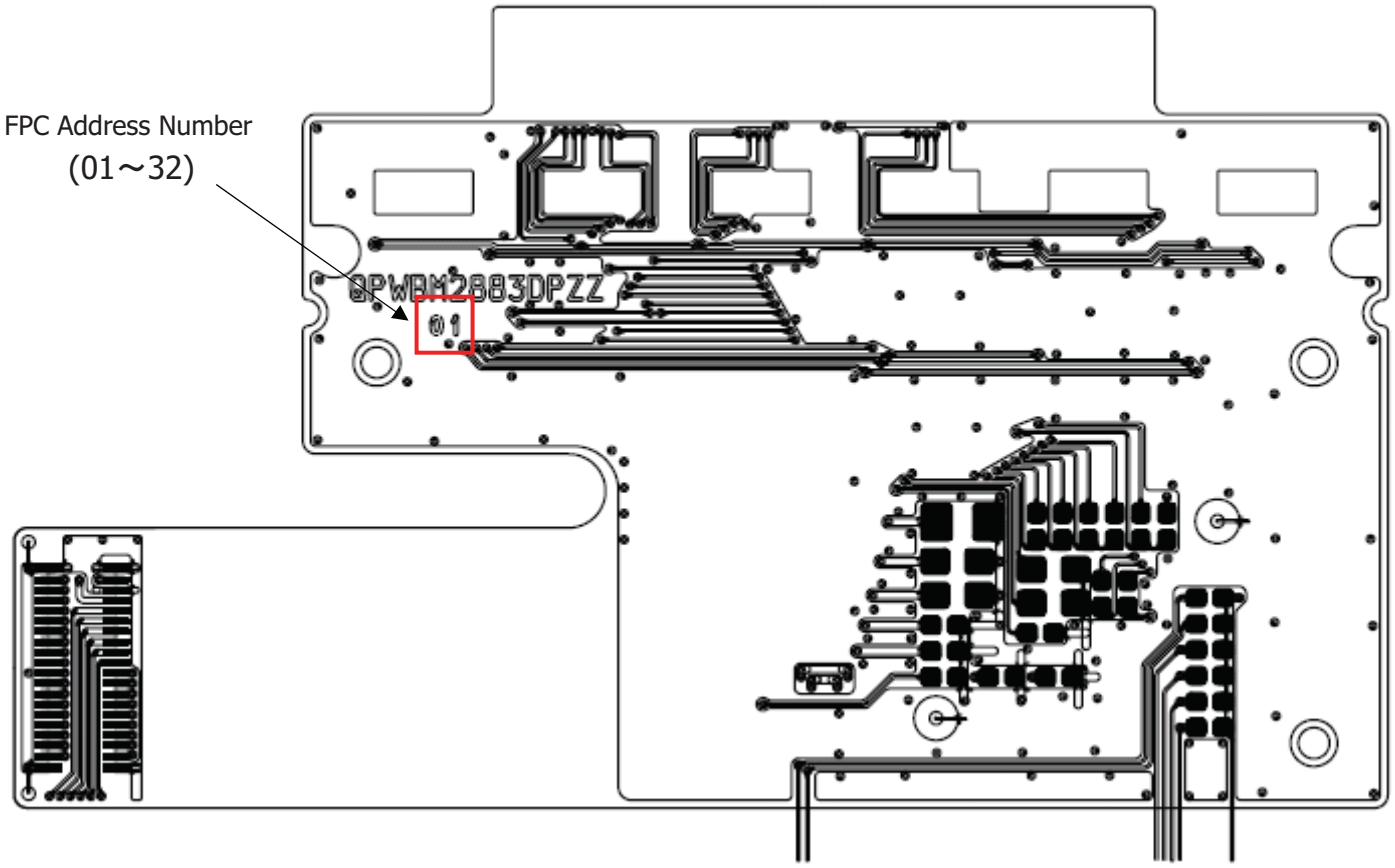
Table 17

PARTS CODE	SPECIFICATION	SIZE	VENDOR
LCD	240XRGBx400	29.8	SHARP
Polarizer	-	-	NITTO
Driver LSI	S6D14E0	-	SAMSUNG
Back Light	-	-	OMRON PRECISION
FPC	2layer	-	NIHON MEKTRON
D1~6	NSSW006T	-	NICHIA
C1	2.2uF/10V	1608	TAIYO/MURATA/KYOCERA
C2	2.2uF/16V	2125	TAIYO/MURATA/KYOCERA
C3	2.2uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C4	1uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C5	2.2uF/10V	1608	TAIYO/MURATA/KYOCERA
C6	1uF/10V	1005	TAIYO/MURATA/KYOCERA
C7	2.2uF/10V	1608	TAIYO/MURATA/KYOCERA
C8	0.47uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C9	0.47uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C10	2.2uF/10V	1608	TAIYO/MURATA/KYOCERA
C11	0.47uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C12	0.47uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C13	1uF/10V	1005	TAIYO/MURATA/KYOCERA
C14	1uF/10V	1005	TAIYO/MURATA/KYOCERA
C15	1uF/10V	1005	TAIYO/MURATA/KYOCERA
C16	1uF/10V	1005	TAIYO/MURATA/KYOCERA
C17	2.2uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C18	1uF/6.3V	1005	TAIYO/MURATA/KYOCERA
C19	0.1uF/10V	1005	TAIYO/MURATA/KYOCERA
C20	0.1uF/10V	1005	TAIYO/MURATA/KYOCERA
C21	0.1uF/10V	1005	TAIYO/MURATA/KYOCERA
C22	0.1uF/10V	1005	TAIYO/MURATA/KYOCERA
C23	0.1uF/10V	1005	TAIYO/MURATA/KYOCERA
C24	0.1uF/10V	1005	TAIYO/MURATA/KYOCERA

12. FPC art work

(12-1) Layer 1

△2



(12-2) Layer 2

△2

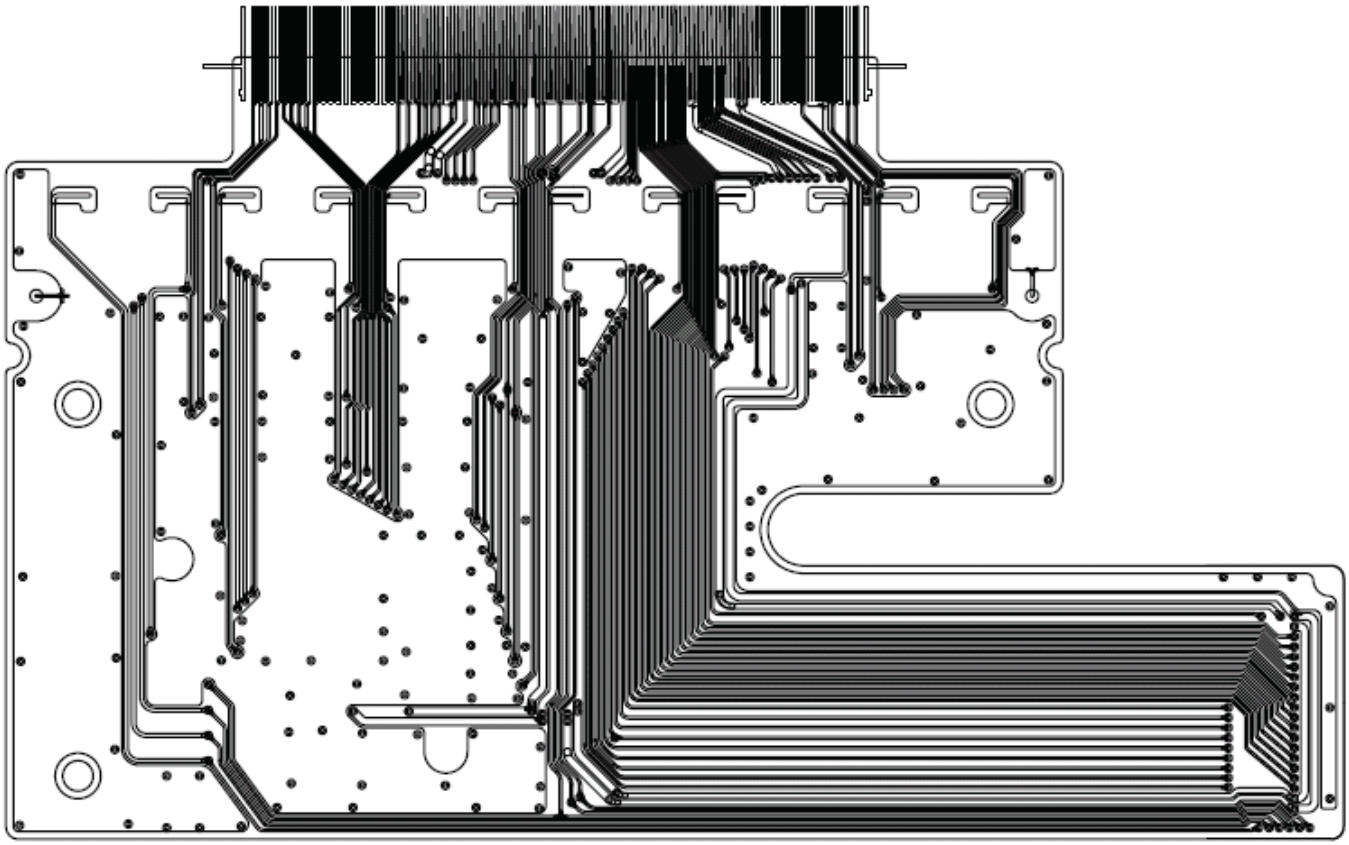


Fig. 14 Layer 2

(12-3) Part layout (Layer1)

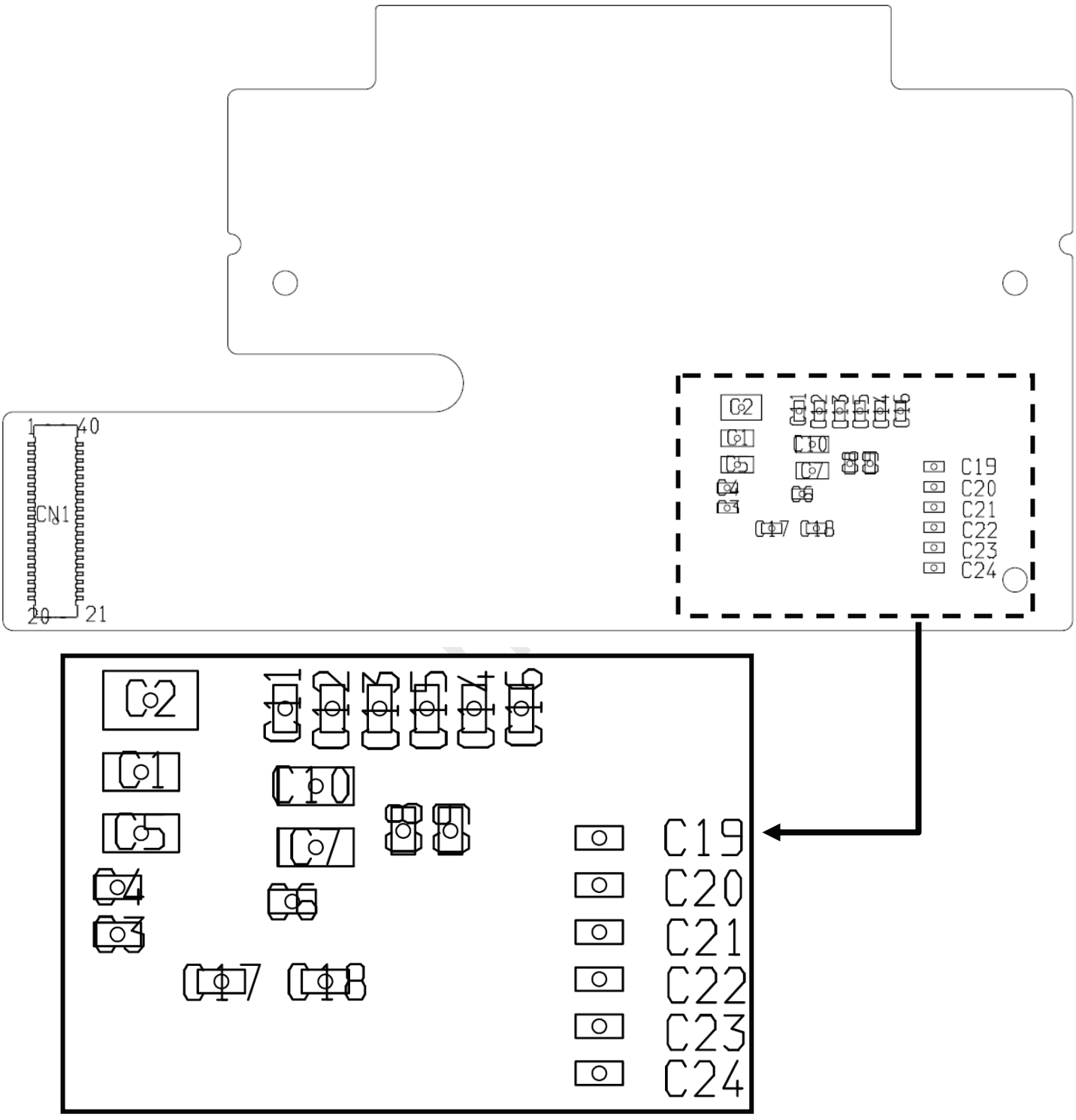


Fig. 15 Parts layout (Layer 1)

(12-4) Part layout (Layer2)

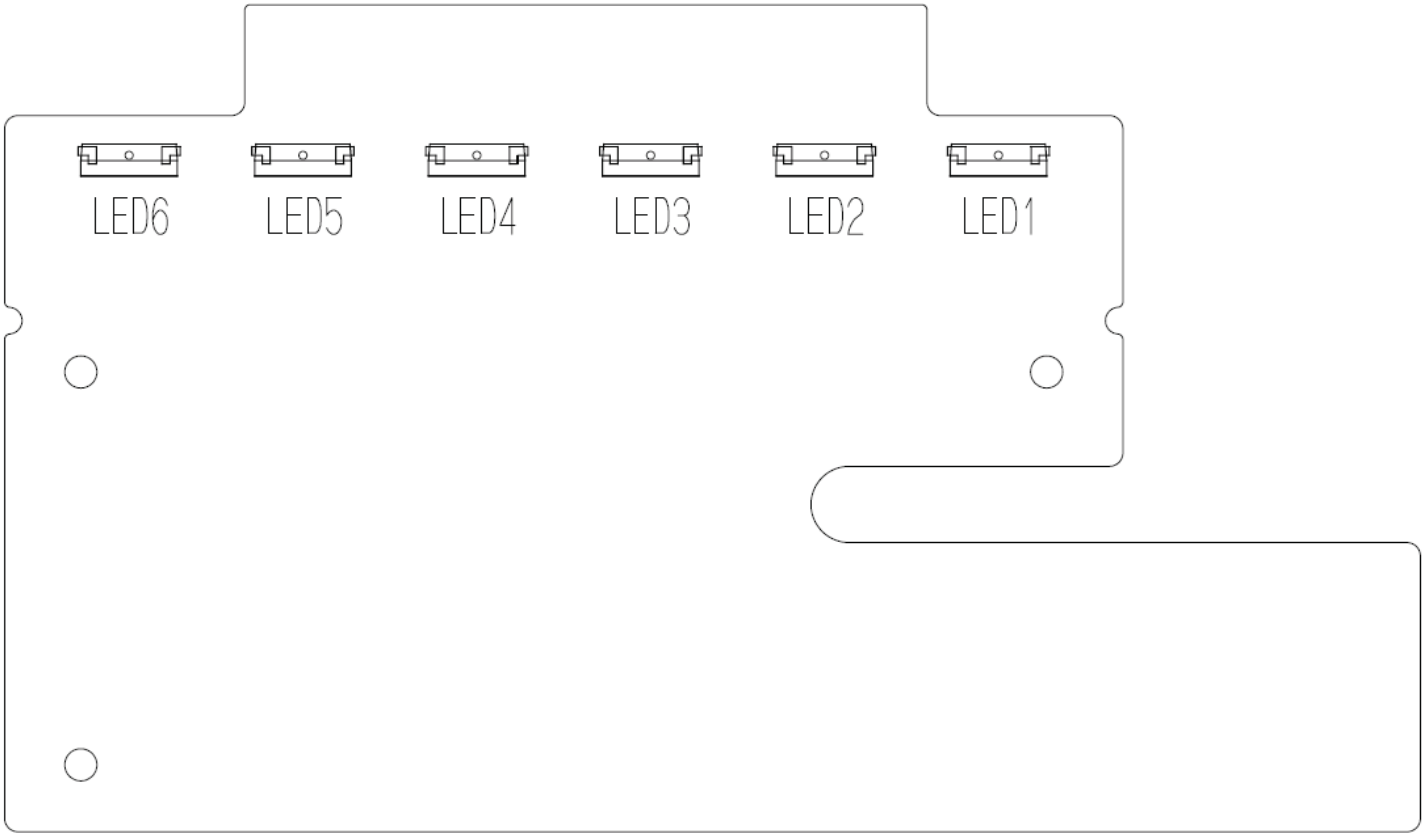


Fig. 16 Parts layout (Layer 2)

13. Circuit diagram

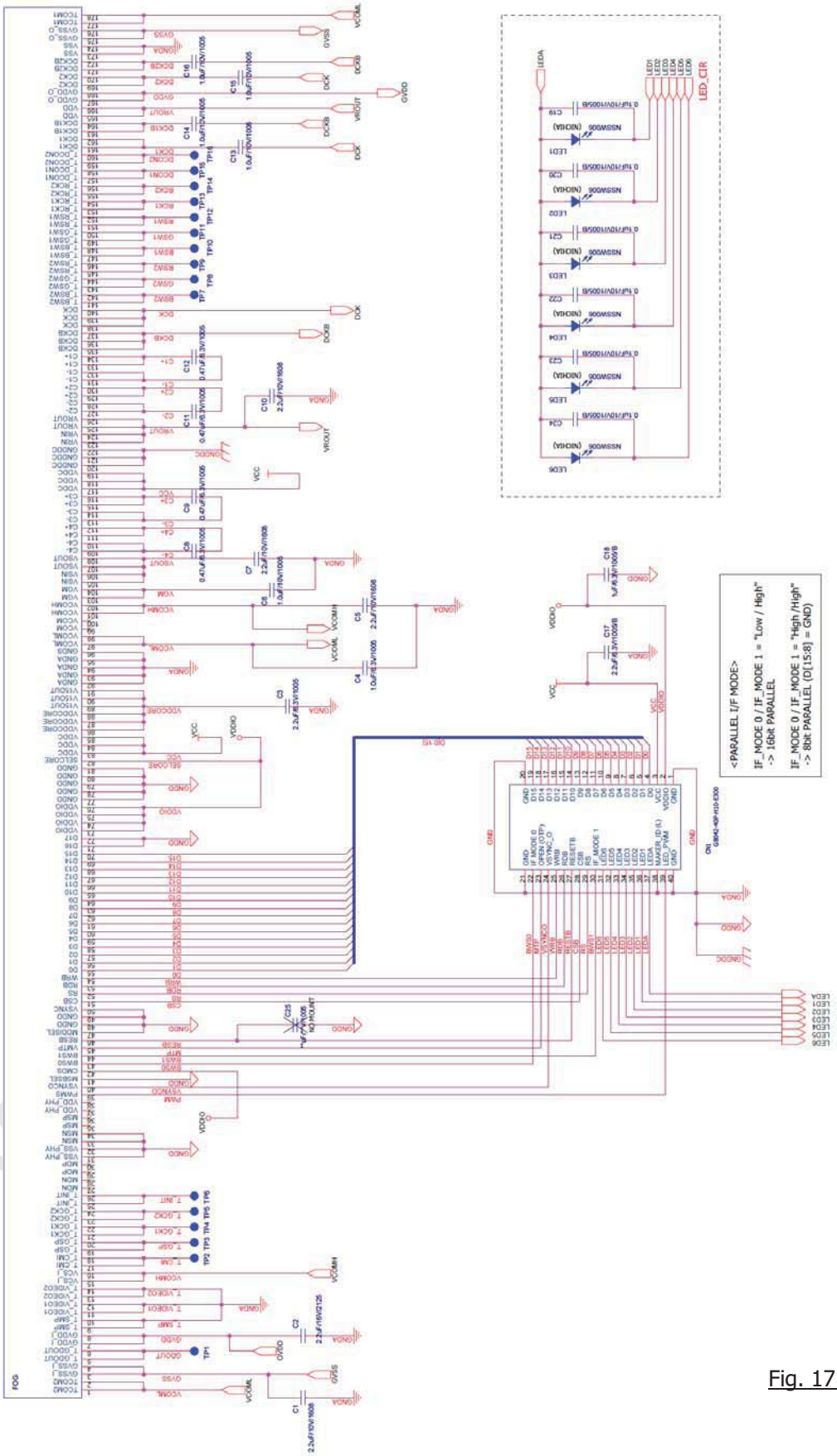


Fig. 17 Circuit diagram

14. Serial Number Label identification

Numbering is specified as follows.

9 01 Z 000001 A Q

① ② ③ ④ ⑤ ⑥

① product year (lower 1 digits)

9: 2009

0: 2010

② product week

01 ～ 52 or 53

③ Line number

A ～ Z, 0 ～ 9

④ serial number

000001 ～ 999999, A00001 ～ Z99999

⑤ Version number

⑥ factory code

16. LCD Module Code Rule

LS 030 B 3 U W 01

① ② ③ ④ ⑤ ⑥ ⑦

①Parts type

CGS LCD

②Active area size

2.98inch

③Dot format

WQVGA format

④LCD type

Transmissive

⑤Interface type

CPU interface

⑥Polarizer / LCD viewing type

anti glare type / Wide viewing angle

⑦Serial Code

15. Outline dimensions

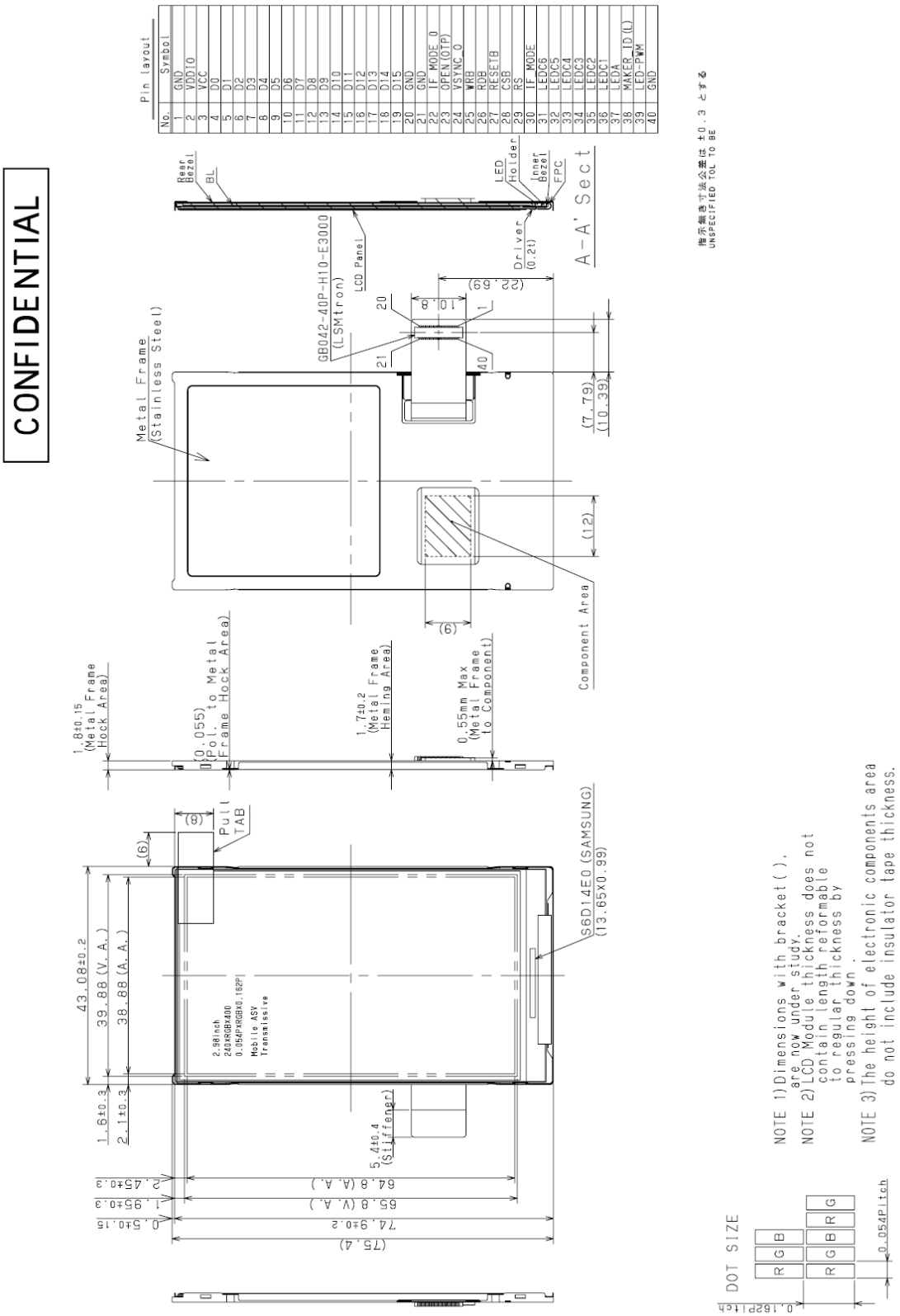


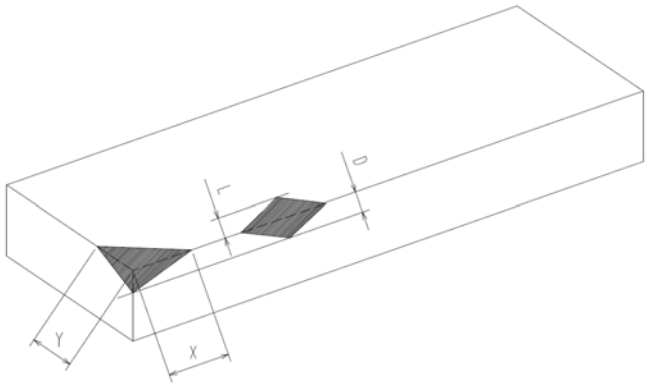
Fig. 18 Outline dimensions

APPENDIX

A1. LCD Driver Chip spec

*Specification of LCD driver

Item	Inspection criteria (Acceptable level)
Depth of chip	D<40um
Length of chip	X or Y <50um , L <40um



A2. LCD Driver Chip spec

Items	Inspection criteria (Acceptable level)	note
Chip on glass corner (Part A)	L <= 5mm , D <= 1mm L + D <= 5mm *BM (black mask) is not affected.	Fig.1-A fig.2
Chip on the terminal glass (Part B)	L <= 3mm , D <= 3mm *FPC and patterns are not affected	fig.1-B fig.2
Chip on glass edge	L <= 10mm , D <= 1mm *BM (black mask) is not affected	fig.3