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		APPLICABLE DIVISION ENGINEERING DEPARTMENT III MOBILE LCD DESIGN CENTER MOBILE LCD ENTERPRISE DEVELOPMENT CENTER MOBILE LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION
SPECIFICATION		

DEVICE SPECIFICATION for
Duty Color LCD Module
(128 × RGB × 160 dots)
with B/W SubLcd

Model No.
LM18WGSBZ05

CUSTOMER'S APPROVAL DATE

DATE _____

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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-oxy) emits gas to which polarizer reacts(color change). Check carefully that gas from materials used in system housing or packing 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 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: $1 \times 10^8 \Omega$) should be made.
- ④ Humidity
Proper humidity of working room may reduce the risk of electrostatic charge up and discharge. Humidity should be kept over 50% all the time.
- ⑤ Transportation/storage
Storage materials must be anti-static to prevent causing electrostatic discharge.
- ⑥ Others
Protective film is attached on the surface of LCD panel to prevent scratches or other damages When

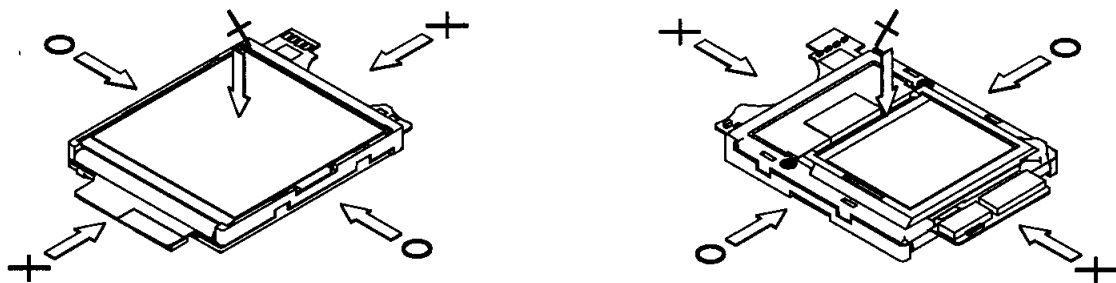
removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.

(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 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 are 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, TCP and other electric parts are not damaged.



(15) Do not touch the TCP's exposed base film and patterning area, slit part. 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 opto-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.

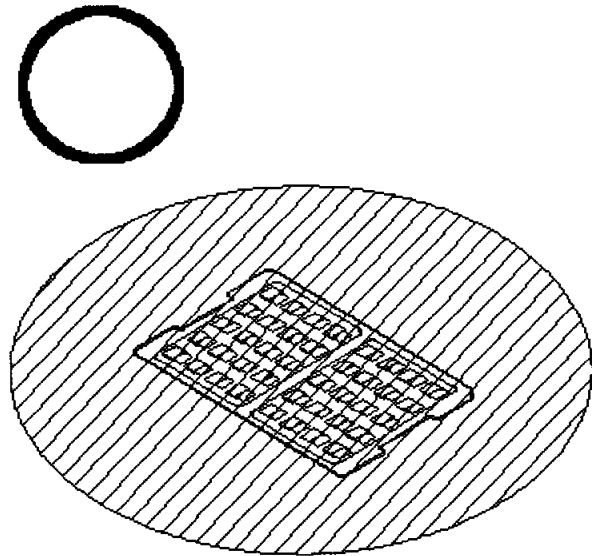
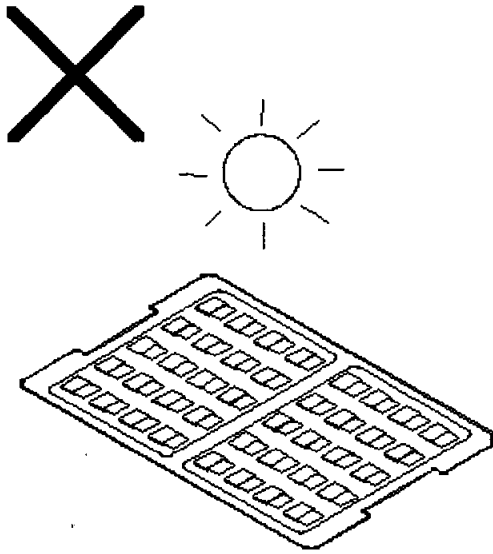
(2) The liquid crystal material will solidify if stored below the rated storage temperature and will become an isotropic liquid if stored above the rated storage temperature, and may not retain its original properties.

Only store the module at normal temperature and humidity ($25 \pm 5^{\circ}\text{C}$, $60 \pm 10\%$ RH) in order to avoid exposing the front polarizer to chronic humidity.

(3) Keeping Method

a. Don't keep under the direct sunlight.

b. Keeping in the tray under the dark place.



(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(VDD-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 PWB 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.

[Precautions for Discarding Liquid Crystal Modules]

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.

PWB :Dispose of as similar way to circuit board from electric device.

1. Application

This data sheet is to introduce the specification of S6B33A1(SAMSUNG), passive matrix type color LCD module.

B/W Sub LCD panel's driver IC is BU97565(ROHM).

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(COG) , FPC , PWB with electric components ,

3 White LED lump, prism sheet, diffuser, light guide and reflector, plastic frame to fix them mechanically.

Sub-LCD(COG) , FPC.

Outline : See page 31.

Connection : 40 pin ; 0.4mm pitch board to board type connector. (24-5602-040-000-829, ELCO)

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 (S·U·)

3. Mechanical Specification

Table 1

Parameter		Specifications	Unit
Outline dimensions *1		35.13±0.3 (W)×55.46±0.3 (H)×4.9Max(D)	mm
Main LCD Panel	Viewing area	28.99(W) × 37.46(H)	mm
	Active area	26.988(W) × 35.985(H)	mm
	Display format	120(W) × RGB × 160(H)	-
	Dot size	0.063(W) × 0.210(H)	mm
	Dot spacing	0.012(W) / 0.015(H)	mm
	Base color *2	Normally black *3	-
Sub LCD Panel	Viewing area	23.2(W) × 14.5(H)	mm
	Active area	20.14(W) × 11.5(H)	mm
	Display format	96(W) × 48(H)	-
	Dot size	0.19(W) × 0.22(H)	mm
	Dot spacing	0.02(W) / 0.02(H)	mm
	Base color *4	Normally white *5	-
Mass		Approx. 10	g

*1 See page 31.

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

*3 Negative-type display

Display data "H" : ON →White, Display data "L" : OFF →Black

*4 Due to the characteristics of the LC material, the contrast vary with environmental temperature.

*5 Positive-type display

Display data "H" : ON →Black, Display data "L" : OFF →White

4. Absolute Maximum Ratings

(4-1) Electrical absolute maximum ratings

Table 2

Parameter	Symbol	Min	Max	Unit	Remark
Supply voltage	VDD-VSS	-0.3	3.6	V	
Input Voltage	V _{IN}	-0.3	VDD+0.5	V	*1
LED forward current *2	I _{WLED}	0	30	mA	White LED

*1 Input terminal of logic system.

*2 per a piece of LED

Voltage value is based on VSS = 0V.

(4-2) Environment Conditions

Table 3

Item	Top		Tstg		Remark
	MIN.	MAX.	MIN.	MAX.	
Ambient temperature	-20 °C	+60°C	-30 °C	+75°C	Note 2)
Humidity	Note 1)		Note 1)		No condensation

Note 1) $T_a \leq 40 \text{ °C}$95 % RH Max.

$T_a > 40 \text{ °C}$Absolute humidity shall be less than $T_a=40 \text{ °C} / 95 \text{ % RH}$.

As opto-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.

Control an internal voltage generator and a temperature coefficient so that $|V_3-MV_3|$ of S6B33A1 may not exceed 20V. When $|V_3-MV_3|$ exceeds 20V, it sometimes reaches the permanent destruction of the IC.

5. Electrical Specifications

(5-1) Electrical characteristics

Table 4

(VSS=0V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable Pin
Supply voltage	VDD-VSS	Ta=-20~60 °C	2.75	2.85	2.95	V	VDD
	VBAT-VSS		1.8	-	6.0	V	VBAT
Under voltage lockout thresh hold	VUVLO	VI failling	-	1.5	1.7	V	VBAT
Electronic volume value range	EVOL	Ta=-20~60 °C	00	-	26	Hex	(note1)
Electronic volume adjust value (note1)		Ta=-20 °C(VDD=2.85V)	16	1C	22	Hex	(note1)
		Ta= 25 °C(VDD=2.85V)	15	1B	21	Hex	
		Ta= 60 °C(VDD=2.85V)	15	1B	21	Hex	
"H" level input voltage	VIH	Ta=-20~60 °C	0.8VDD	-	VDD	V	(note2)
"L" level input voltage	VIL		0.0	-	0.2VDD	V	
PWM "H" level input voltage	VIH		1.3	-	-	V	PWM
PWM "L" level input voltage	VIL		-	-	0.3	V	
"H" level output voltage	VOH	Ta=-20~60 °C	0.8VDD	-	VDD	V	(note3)
"L" level output voltage	VOL	IOH=-0.5mA, IOL=0.5mA	0.0	-	0.2VDD	V	
Input leakage current	IIL	Ta=-20~60 °C VIN= VSS or VDD	-1.0	-	1.0	μA	(note2)
Current consumption(1)	IVDD1	Ta=25 °C 4k color	-	1.33	2.00	mA	(note4)
Current consumption(2)	IVDD2	Ta=25 °C	-	220	350	μA	(note5)
Current consumption(3)	IBAT	Ta=25 °C VBAT=3.2V	-	65	100	mA	VBAT
Operating quiescent current into VIN	I(Q)	IO=0mA, not switching	-	38	65	μA	VBAT
Shutdown current	IO(SD)	PWM=GND		0.1	1.0	μA	VBAT

(5-2) LED back light

The back light use 3pcs Edge light type white LED.

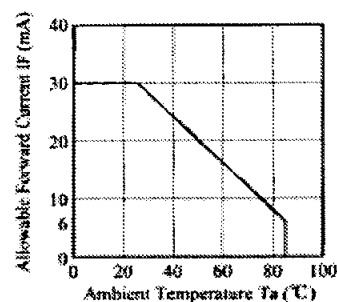
Table 5-1

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Remark
Forward current	I _{WLED}	T _a =25 °C	-	15.75	-	mA	Each white LED

LED lamp : NICHIA Corporation model NSCW215

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

■ Ambient Temperature vs. Allowable Forward Current



<LED driver : TPS61042(TEXAS INSTRUMENTS)>

Absolute Maximum Ratings

Table 5-2

Parameter	Symbol	Min	Max	Unit	Remark
Supply voltage	V _(VIN)	-0.3	7.0	V	V _{BAT} -V _{SS}
Input Voltage	V _(CTRL)	-0.3	V _(VIN) +0.3	V	PWM-V _{SS}

(5-3) Interface signals

Table 6

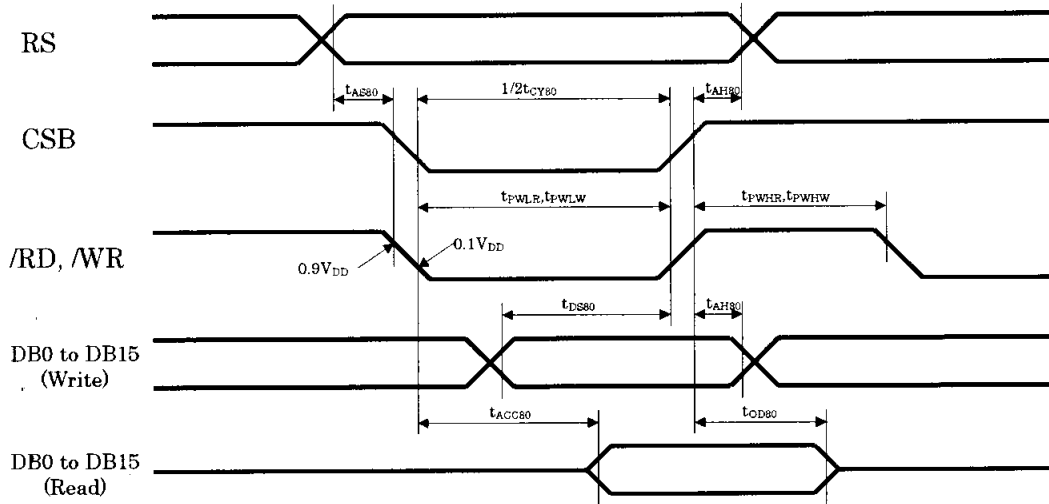
Pin No.	Symbol	Description	I/O	Remark
1	PWM	LED back light drive control	I	"H" active
2	VSS	Ground potential	-	-
3	RESET	Reset signal input pin	I	"L" active
4	VSS	Ground potential	-	-
5	RD	Main LCD's read control input pin	I	"L" active
6	VDD	VDD level pin	-	For LCD driving
7	S_RS	Sub LCD's register select input pin	I	-
8	M_RS	Main LCD's register select input pin	I	-
9	WR	Main LCD's write control input pin	I	"L" active
10	Main_CS	Main LCD's Chip select input pin	I	"L" active
11	SCLK	Sub LCD's serial clock input pin	I	-
12	Sub_CS	Sub LCD's Chip select input pin	I	"L" active
13	SDIN	Sub LCD's serial data input pin	I	"L" active
14	D15	Data Bus	I/O	-
15	D14	Data Bus	I/O	-
16	D13	Data Bus	I/O	-
17	D12	Data Bus	I/O	-
18	D11	Data Bus	I/O	-
19	D10	Data Bus	I/O	-
20	VIB	Through circuit for "MOTOR+"	-	-
21	VSS	Ground potential	-	-
22	D9	Data Bus	I/O	-
23	D8	Data Bus	I/O	-
24	D7	Data Bus	I/O	-
25	D6	Data Bus	I/O	-
26	D5	Data Bus	I/O	-
27	D4	Data Bus	I/O	-
28	D3	Data Bus	I/O	-
29	D2	Data Bus	I/O	-
30	D1	Data Bus	I/O	-
31	D0	Data Bus	I/O	-
32	VSS	Ground potential	-	-
33	RCV-	-	-	-
34	RCV+	-	-	-
35	SPK-	-	-	-
36	SPK+	-	-	-
37	VSS	Ground potential	-	-
38	VBAT	VBAT level pin	-	For LED driving
39	VBAT	VBAT level pin	-	For LED driving
40	VSS	Ground potential	-	-

Connector: 24-5602-040-000-829 (ELCO); 0.4mm pitch board to board type connector.

(Note) See the specification of LCD-driver(S6B33A1) and Sub LCD driver (BU97565) for the details of electrical functions.

(5-4) Host Interface Timing Diagrams (80-family MPU) for Main LCD panel

Read/Write timing



note) $t_{EWH(W)}$ and $t_{EWH(R)}$ is specified in the overlapped period when CSB is low and E is high.

Table 7

(VSS=0V, VDD=2.6 to 3.3V, Ta=-20 to 60°C)

Item	Signal	Symbol	Condition	Min	Max	Unit
Address setup time	RS	t_{AS80}		0	-	ns
Address hold time	R/W	t_{AH80}		10	-	ns
System cycle time		$t_{CY80(WR)}$		130	-	ns
		$t_{CY80(RD)}$		250	-	ns
Enable width high for write	/WR	t_{PWHW}		140	-	ns
Enable width low for write		t_{PWLW}		70	-	ns
Enable width high for read	/RD	t_{PWHR}		140	-	ns
Enable width low for read		t_{PWLR}		70	-	ns
Data setup time	DB0	t_{DS80}		10	-	ns
Data hold time		t_{DH80}		5	-	ns
Read access time	to DB15	t_{ACC80}	$C_L=100pF$	15	170	ns
Output disable time		t_{OD80}		5	60	

note)The input signal rise and fall time is specified at 10ns or less.

Reset timing

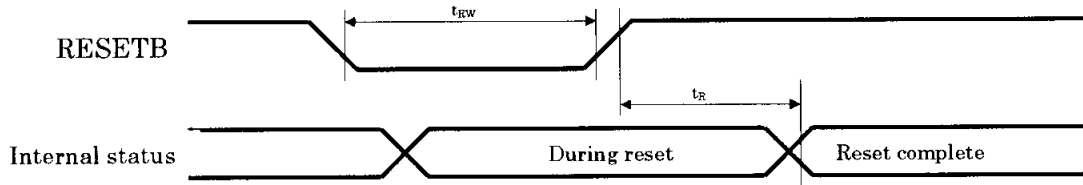


Table 8

(VSS=0V, VDD=2.6 to 3.3V, Ta=-20 to 60°C)

Item	Signal	Symbol	Condition	Min	Max	Unit
Reset low pulse width	RESETB	t_{rw}		1000	-	ns
Reset time	-	t_r		-	1000	ns

(5-5) Command table [Main LCD panel driver S6B33A1]

Table 9 instruction set

RS	R/W	D7	D6	D5	D4	D3	D2	D1	D0	Instruction
0	1									Status Read
0	0	0	0	1	0	0	1	0	1	NOP Instruction
0	0	1	0	1	0	1	1	1	1	Display ON
0	0	1	0	1	0	1	1	1	0	Display OFF
0	0	1	0	1	0	0	1	1	0	Normal Display
0	0	1	0	1	0	0	1	1	1	Inverse Display
0	0	1	0	1	1	1	0	1	1	COM Scan Direction
0	0	1	1	0	0	1	0	1	0	Display Control
0	0	1	0	0	1	0	1	0	1	Sleep IN
0	0	1	0	0	1	0	1	0	0	Sleep OUT
0	0	0	1	1	1	0	1	0	1	Page Address Set
0	0	0	0	0	1	0	1	0	1	Column Address Set
0	0	1	0	1	1	1	1	0	0	Data Scan Direction
0	0	1	1	0	0	1	1	1	0	256-color position set
0	0	1	0	1	0	1	0	0	0	Partial Display IN
0	0	1	0	1	0	1	0	0	1	Partial Display OUT
0	0	1	1	1	0	0	0	0	0	Read Modify Write IN
0	0	1	1	1	0	1	1	1	0	Read Modify Write OUT
0	0	1	0	1	0	1	0	1	0	Area Scroll Set
0	0	1	0	1	0	1	0	1	1	Scroll Start Set
0	0	1	1	0	1	0	0	0	1	Internal Oscillator ON
0	0	1	1	0	1	0	0	1	0	Internal Oscillator OFF
0	0	0	0	1	0	0	0	0	0	Power Control Set
0	0	1	0	0	0	0	0	0	1	Electronic Volume Control
0	0	1	0	0	0	0	0	1	0	Temperature Gradient Set
0	0	1	1	0	1	0	1	1	0	Increment Electronic Control by 1
0	0	1	1	0	1	0	1	1	1	Decrement Electronic Control by 1
0	0	0	1	0	1	1	1	0	0	Display Data Write
0	0	0	1	0	1	1	1	0	1	Display Data Read

(5-6) Schematics of LCD

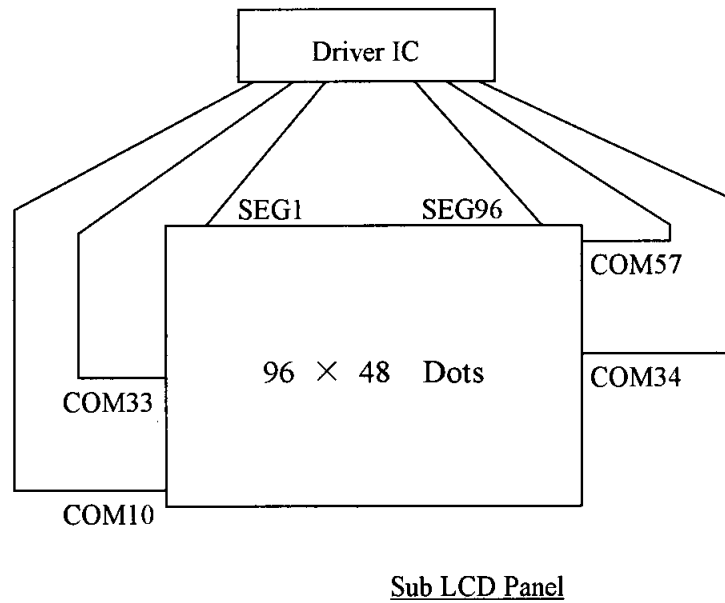
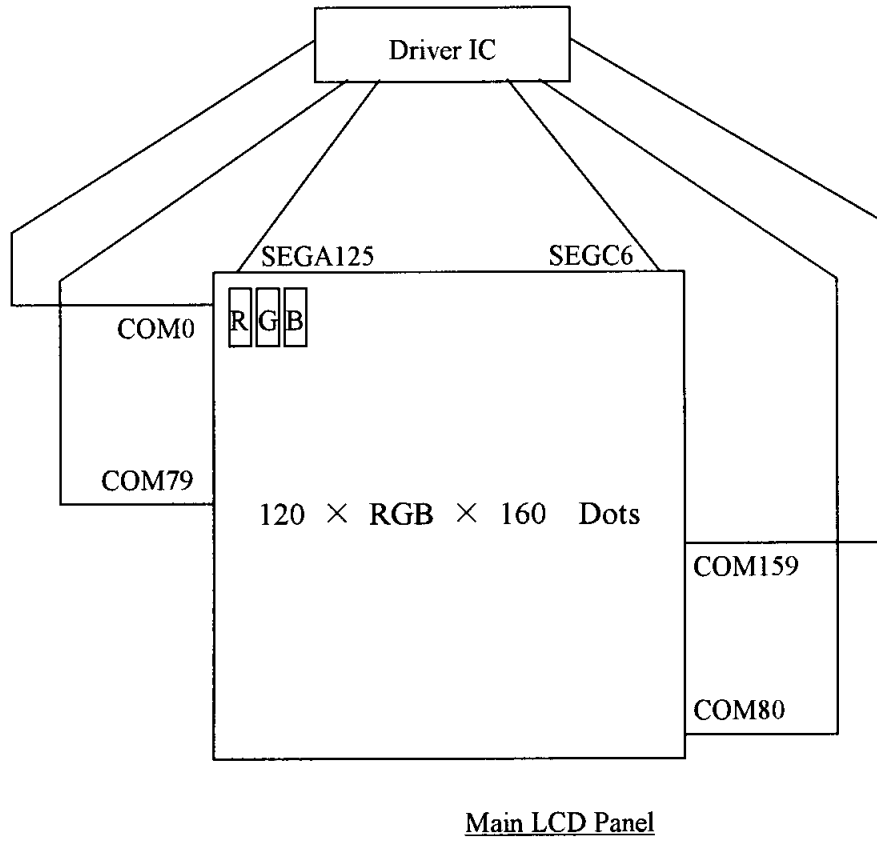


Fig.1 Schematic of LCD

6. Optical Characteristics

Table 10

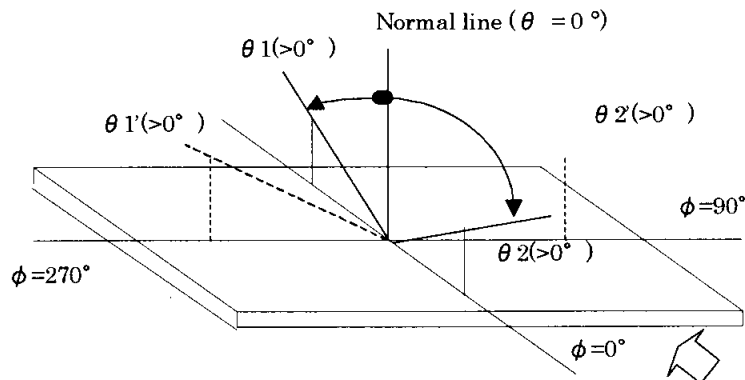
(Ta = 25 °C, VDD= 2.85V, 1/160Duty, 4-Line MLS, 1/6 Bias)

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remark
Contrast ratio	Transmissive mode	Co(t)	$\theta = 0^\circ, \phi = 0^\circ$ at Diffusion light	20	40	-		Note 1)
Viewing angle range (Co>2.0)		$\theta 1$	$\phi = 0^\circ \sim 180^\circ$ at Diffusion light	15	20	-	Deg.	Note 2)
				$\theta 2$	25	35	-	
		$\theta 1'$	$\phi = 90^\circ \sim 270^\circ$ at Diffusion light	25	40	-	Deg.	
				$\theta 2'$	25	40	-	
Response time	Rise	τr	$\theta = 0^\circ, \phi = 0^\circ$ at Diffusion light	Ta = -20 °C	2500	3500	ms	Note 3)
				Ta = 25 °C	170	340		
	Decay	τd	$\theta = 0^\circ, \phi = 0^\circ$ at Diffusion light	Ta = -20 °C	7500	10500	ms	
				Ta = 25 °C	100	200		
Module chromaticity (Transmissive mode)	White	x	$\theta = 0^\circ, \phi = 0^\circ$	-	0.27	-	Note 4)	
		y		-	0.32	-		
	Red	x		-	0.45	-		
		y		-	0.33	-		
	Green	x		-	0.27	-		
		y		-	0.44	-		
	Blue	x		-	0.16	-		
		y		-	0.18	-		
Brightness		B	ILED=15.75mA×3	40	70	-	cd/m ²	Note5)

Note 1) Contrast ratio is defined as follows:

$$C_o = \frac{\text{Luminance(brightness) all pixels "White" at } V_{\text{max}}}{\text{Luminance(brightness) all pixels "Dark" at } V_{\text{max}}}$$

Note 2) The viewing angle range is defined as shown Fig.2.


Fig. 2

Note 3) The response characteristics of photo-detector output are measured as shown in Fig 5, assuming that input signals are applied so as to select and deselect the dot to be measured, in the optical characteristics test method shown in Fig.3.

Note 4) The measuring method is shown in Fig. 4.

Note 5) 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.

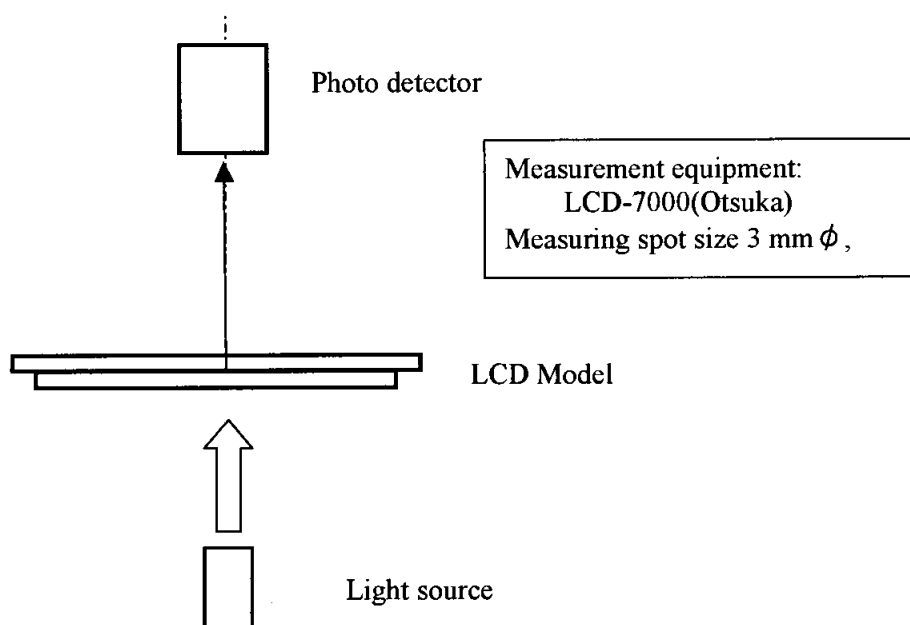


Fig. 3 Optical Characteristics Test Method I

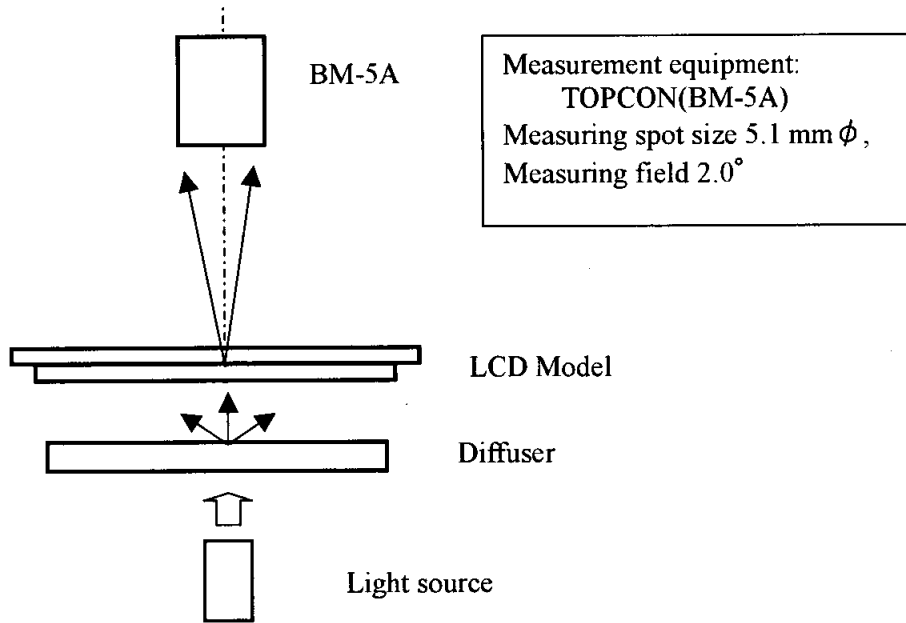


Fig. 4 Optical Characteristics Test Method II

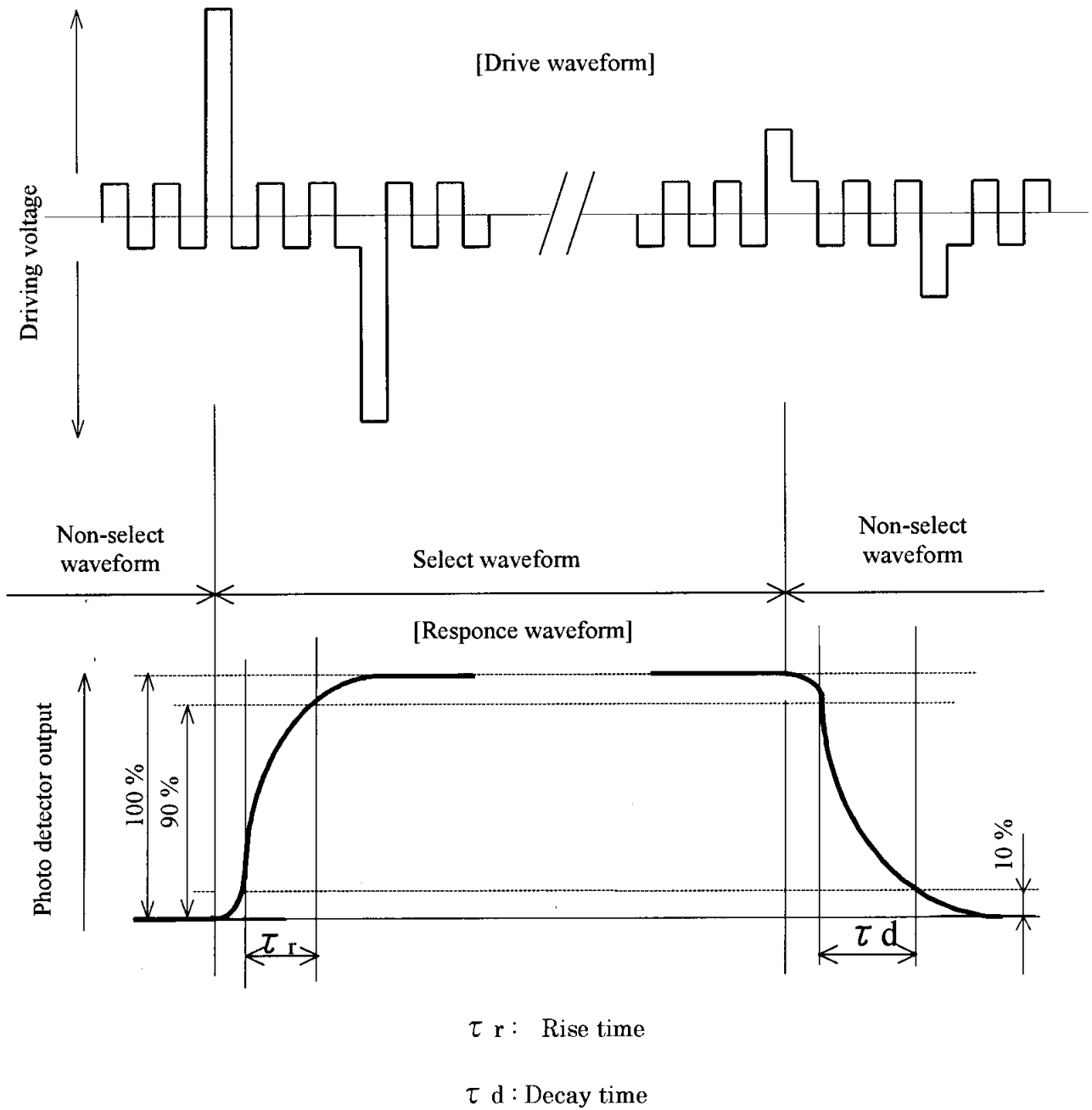


Fig. 5 Definition of Response time

7. Sub LCD

7-1 driver AC characteristics

Serial Interface Characteristic

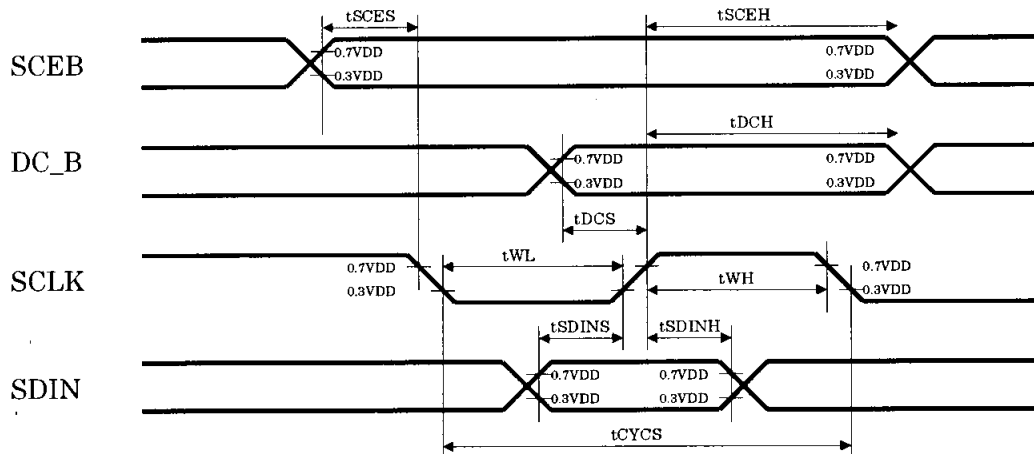
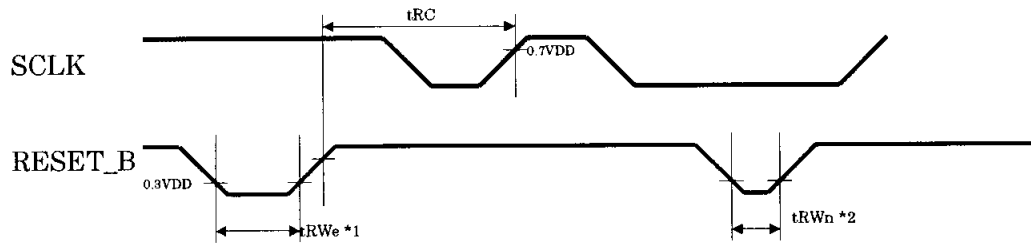


Table 11

(VSS=0V, VDD=2.5 to 3.6V)

Item	Symbol	Condition	Min	Typ	Max	Unit
Input rise time	tr		-	-	100	ns
Input fall time	tf		-	-	100	ns
SCLK cycle	fCYCLS		250	-	-	ns
"H" SCLK pulse width	fWH		100	-	-	ns
"L" SCLK pulse width	fWL		100	-	-	ns
DC_B set-up time	tDCS		100	-	-	ns
DC_B hold time	tDCH		100	-	-	ns
SDIN setup time	tSDINS		100	-	-	ns
SDIN hold time	tSDINH		100	-	-	ns
SCEB set-up time	tSCES		60	-	-	ns
SCEB hold time	tSCEH		100	-	-	ns

Reset Input Timing



*1:RESET_B pulse width of reset function.

*2:RESET_B pulse width of no reset function.

Table 12

(VSS=0V, VDD=2.5 to 3.6V)

Item	Symbol	Condition	Min	Typ	Max	Unit
RESET_B-Instruction time	t_{RC}		500	-	-	ns
RESET_B enable pulse width	t_{RWe}		500	-	-	ns
RESET_B disable pulse width	t_{RWn}		100	-	-	ns

7-2 driver Instructions

Table 13 instruction set

DC_B	D7	D6	D5	D4	D3	D2	D1	D0	Instruction(H=0 or 1)
0	0	0	0	0	0	0	0	0	NOP
0	0	0	1	0	0	PD	V	H	Function Set
1	D7	D6	D5	D4	D3	D2	D1	D0	Write Data

Basic instruction

DC_B	D7	D6	D5	D4	D3	D2	D1	D0	Instruction(H=0)
0	0	0	0	0	0	0	*	*	Reserved(Do not use)
0	0	0	0	0	1	D	0	E	Display control
0	0	0	0	1	0	0	0	*	NOP
0	0	1	0	0	Y3	Y2	Y1	Y0	Set Y address of DDRAM
0	1	X6	X5	X4	X3	X2	X1	X0	Set X address of DDRAM

Extend instruction

DC_B	D7	D6	D5	D4	D3	D2	D1	D0	Instruction(H=0)
0	0	0	0	0	0	0	0	1	Reserved(Do not use)
0	0	0	0	0	0	0	1	*	Reserved(Do not use)
0	0	0	0	0	0	1	*	*	NOP
0	0	0	0	0	1	0	*	*	NOP
0	0	0	0	1	0	BS2	BS1	BS0	Set bias
0	0	1	*	*	*	*	*	*	Reserved(Do not use)
0	1	X6	X5	X4	X3	X2	X1	X0	Set contrast

7-3 Electro optical Properties

Table 14

Item	Symbol	Temp. °C	Standard Values			Unit	Conditions
			Min	Typ	Max		
Electronic volume Value range (Reference data)		-20	2E	34	3A	HEX	Bias Set=14h (1/7Bias)
		+25	2F	35	3B		
		+60	30	36	3C		
Contrast ratio	Co(t)	+25	2.0	3.0	-		VDD=2.85V, Electric VR=35h
Response time	Tr	-20	-	3000	4500	ms	
		+25	-	130	260	ms	
	Td	-20	-	4600	6900	ms	
		+25	-	180	360	ms	
Brightness	B	+25	20	35	-	cd/m ²	ILED=15.75mA X 3

8. Packaging specifications

(8-1) Details of packaging

1) Packaging style : Fig

(8-2) 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)
	○	○	○		
	← 3 minutes →				

2) Drop test

Drop height: 750mm

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

(8-3) Packaging quantities

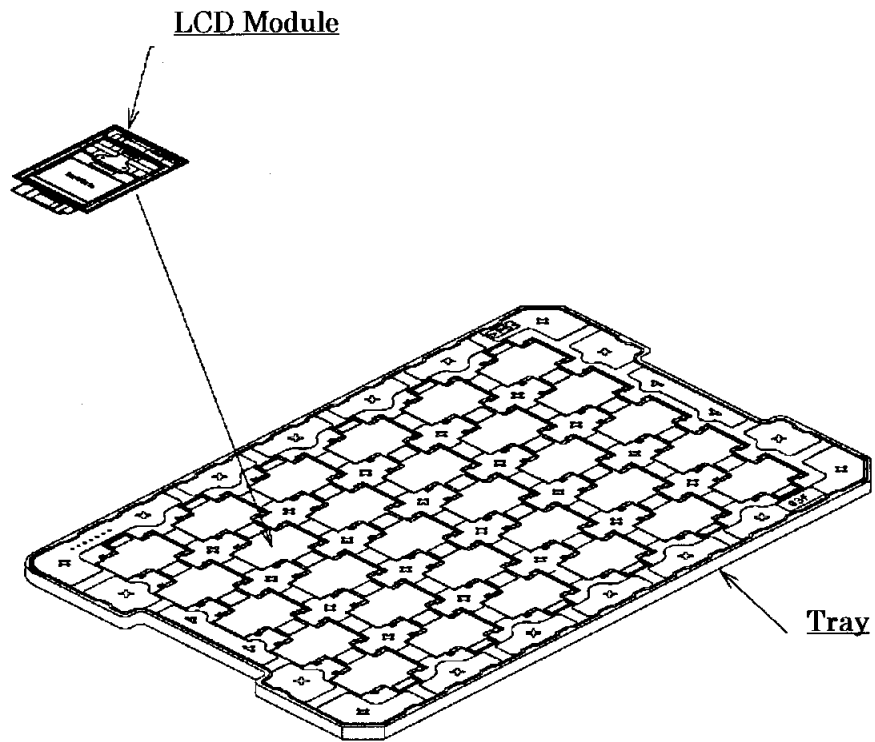
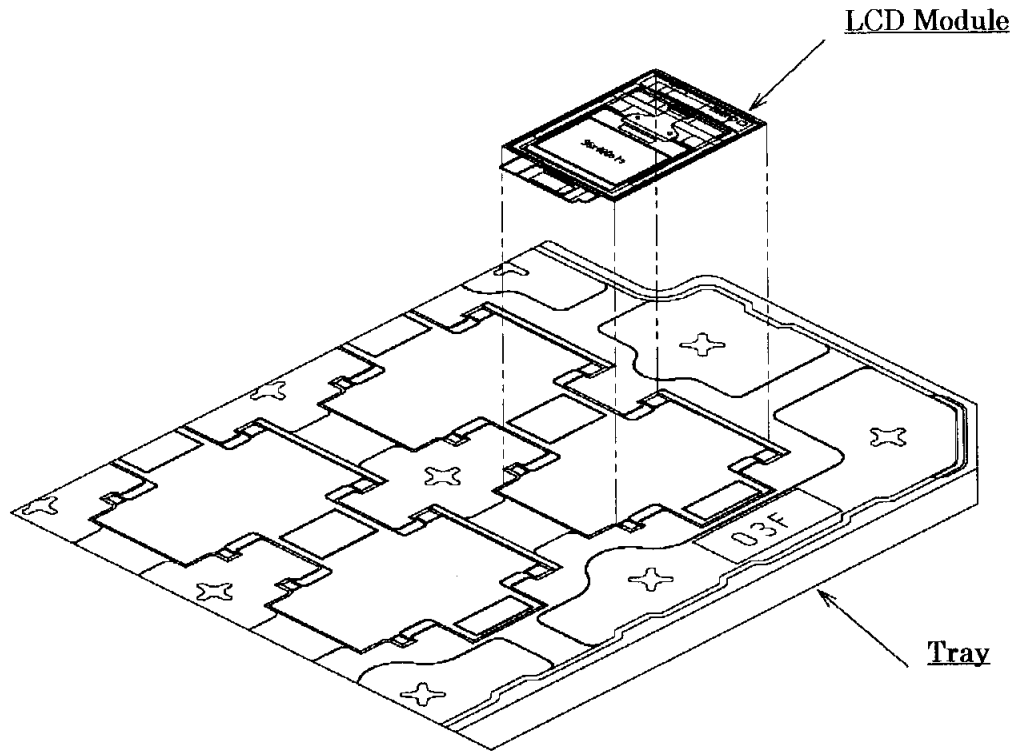
300 modules (max) per master carton

(8-4) Packaging weight

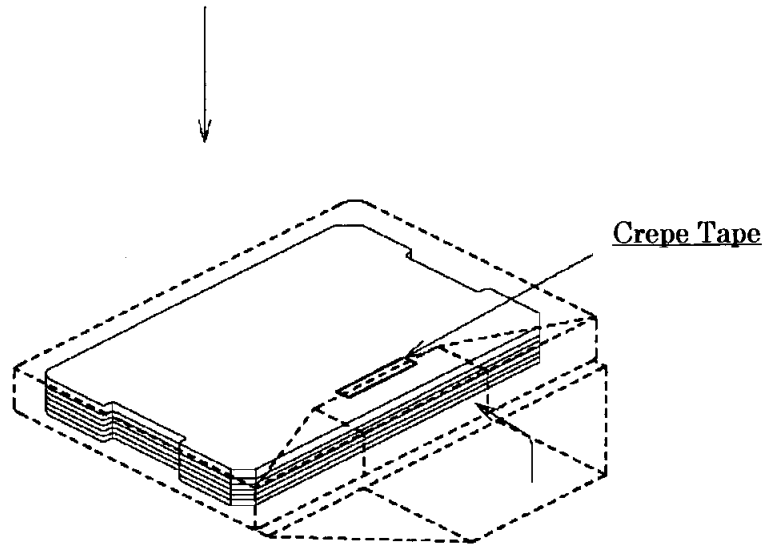
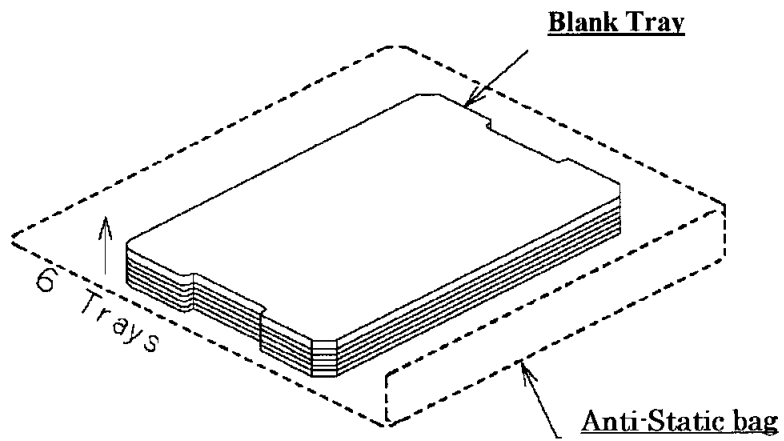
8.5 kg

(8-5) Packaging outline dimensions

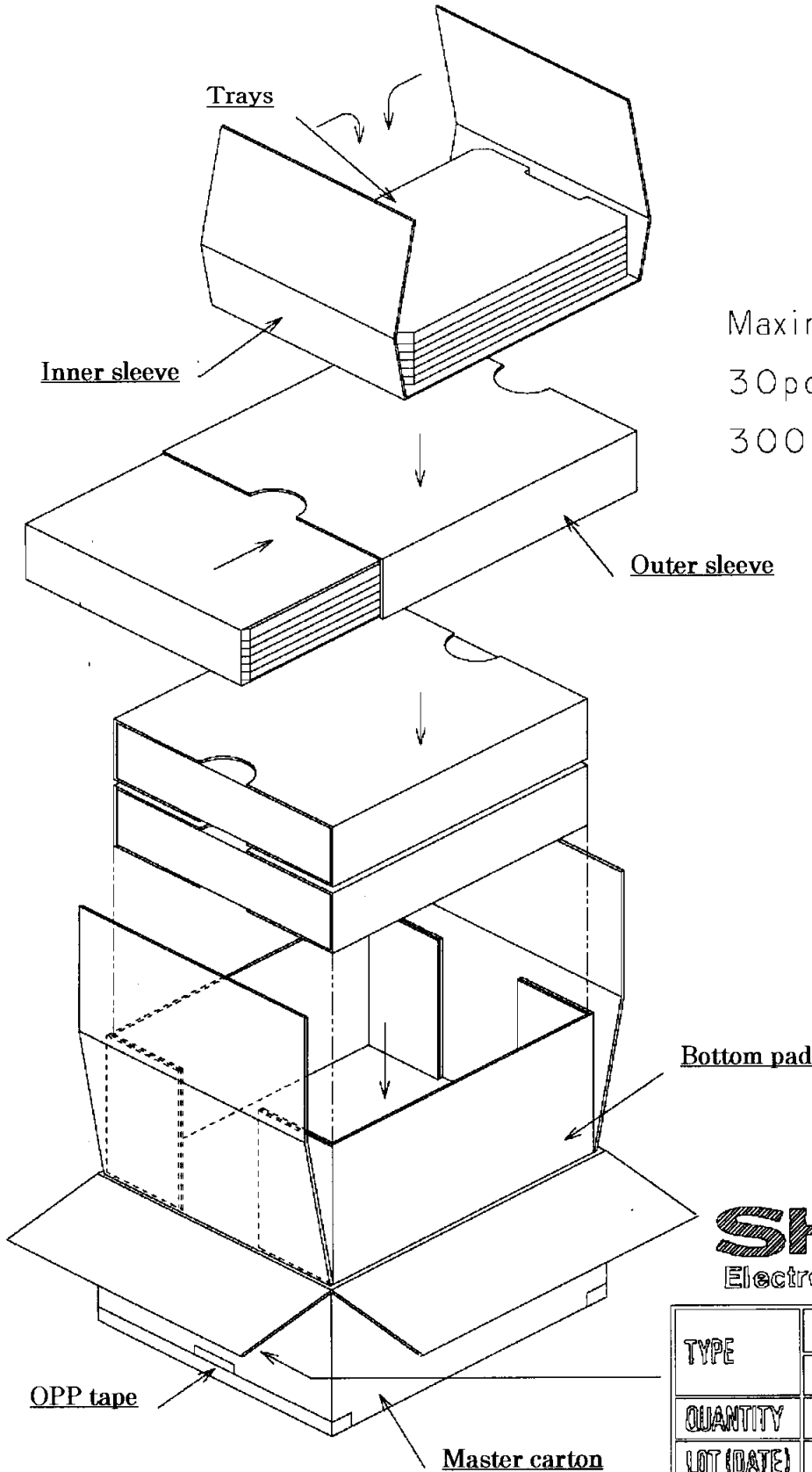
382 mm × 578 mm × 255 mm (H)



Packing Tray



Packing Anti-static bag



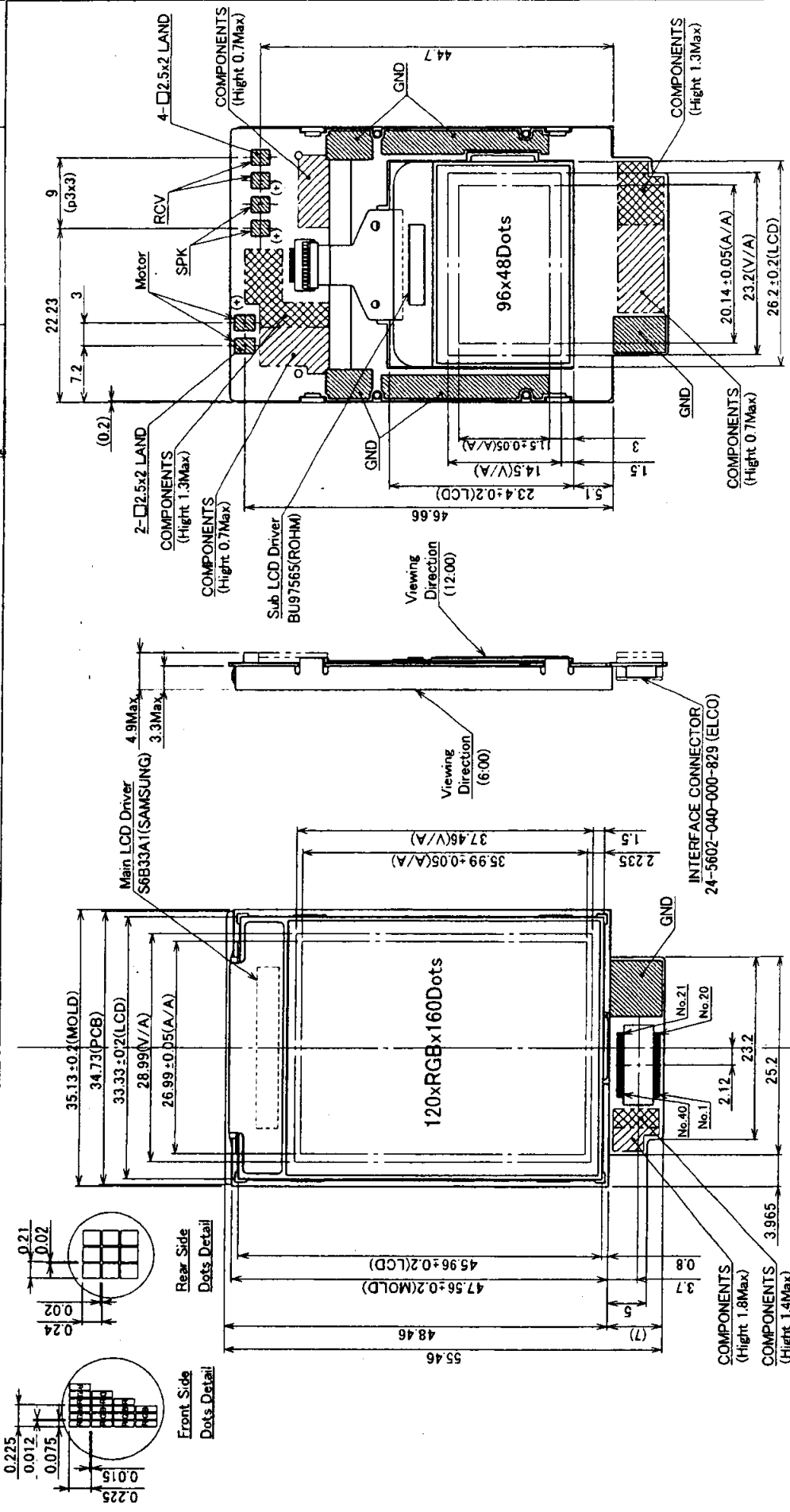
Maximum Quantity
30pcs/a tray
300pcs/a carton

Packing master carton

SHARP
Electronic Components

TYPE		SHARP (4S)LM18WGSBZ05
QUANTITY		LotNO. (IT)2003.08.28
LOT (DATE)		Quantity: (0)300 PCS
		3-7-AP
		SHARP ELECTRONIC COMPONENTS

Bar-code label



指示公差は±0.3
UNLESS OTHERWISE

年月日	作成者	承認者	品名	図番
			液晶パネル	LM18WGSBZ05
仕様書 No.	図番	品番	メーカー	社名
				シャープ株式会社
設計者	検査者	製造者	部品名	数量
			液晶パネル	1
製図	検査	製造	部品名	数量
			液晶パネル	1
製図	検査	製造	部品名	数量
			液晶パネル	1
製図	検査	製造	部品名	数量
			液晶パネル	1
製図	検査	製造	部品名	数量
			液晶パネル	1
製図	検査	製造	部品名	数量
			液晶パネル	1

INTERFACE CAN(CNI)

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Symbol	PWM	VSS	RESET	Vss	RD	VDD	S	RS	M	RS	WR	CS	SCLK	Sub	CS	SDIN	D15	D14	D13	D12	D11	D10	VIB
No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40			
Symbol	VSS	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	VSS	RCV+	RCV-	SPK+	SPK-	VSS	VBAT	VBAT	VSS			