

SPECIFICATION

For

EG7500B-LS

This specification consists of two documents as follows.

- | | |
|---------------------|--------------|
| 1.LCD Specification | SC-010009000 |
| 2.LCD QA Standard | M4-00100 |

Customer's Approval	
Date _____ By _____	Date <u>Feb. 16 '93</u> Presented by <i>Y. Katayama</i> <i>y. Takai</i> <i>h. Nakamura</i> Y.Katayama GM QA dep. SEIKO EPSON CORP. LCD DIV. Quality assurance Dep.

Spec Code

S C - 010009000

S P E C I F I C A T I O N S

E G 7 5 0 0 B - L S

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S E I K O E P S O N C O R P O R A T I O N
L C D D I V I S I O N

LD DESIGN Dep.

K. Uchiyoshi
Kense

K. Uchiyoshi
M. Yoshida

1. Basic Specifications

1-1 Display Specifications

(1) STN Mode Negative Display type ~~type~~ Transmissive Model

(2) Display Color

Display Color : Display Data "1" : White
Background Color : Display Data "0" : Blue

(3) Viewing Angle : 6 O'clock direction

(4) Driving Duty : 1/200 Duty

(5) Backlight : CCFT Backlight

*1) Color tone is slightly changed by temperature and driving voltage.

1-2 Mechanical Specifications

(1) Outline Dimensions : Refer to attached Outline Dimensions figure S D - 0 1 0 2 9 1 - B

(2) Dot Matrix : 3 2 0 dots × 2 0 0 dots

(3) Dot Size : 0. 3 4 (W) × 0. 4 8 (H) (mm)

(4) Dot Pitch : 0. 3 8 (W) × 0. 5 2 (H) (mm)

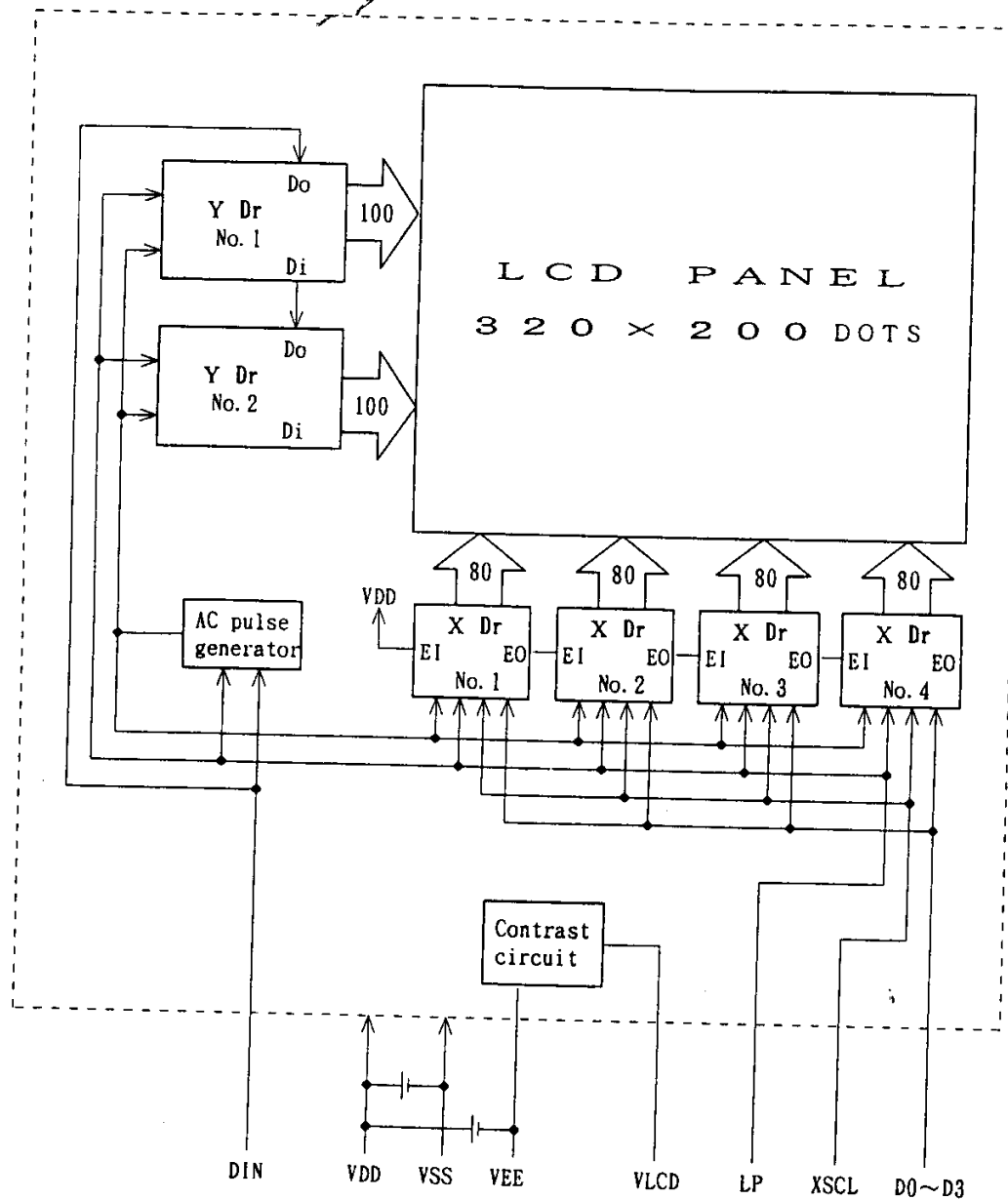
(5) Weight : 4 6 0 g (Approx.)

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1-3 Block Diagram



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1-4 Terminal Functions

(1) LCD

Pin No.	Symbol	F u n c t i o n
1	VDD	Power Supply for Logic
2	VSS	Ground
3	VEE	Power Supply for LCD
4	VLCD	Power Supply for LCD
5	N C	No Connection
6	L P	Latch Pulse Signal Input
7	N C	No Connection
8	N C	No Connection
9	D I N	Scan Start Pulse Input
10	X S C L	Display Data Shift Clock Input
11	D 0	Display Data Input
12	D 1	
13	D 2	
14	D 3	

(2) INVERTER

Model : IL-S-2S-S2C2-S (JAE)

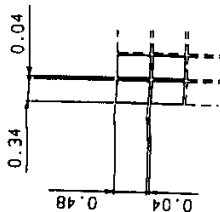
Applicable Connector : IL-S-2P-S2*2-EF (*=T or L) (JAE)

Pin No.	Symbol	F u n c t i o n
1	V INV	Power Supply for INVERTER
2	G INV	Ground for INVERTER

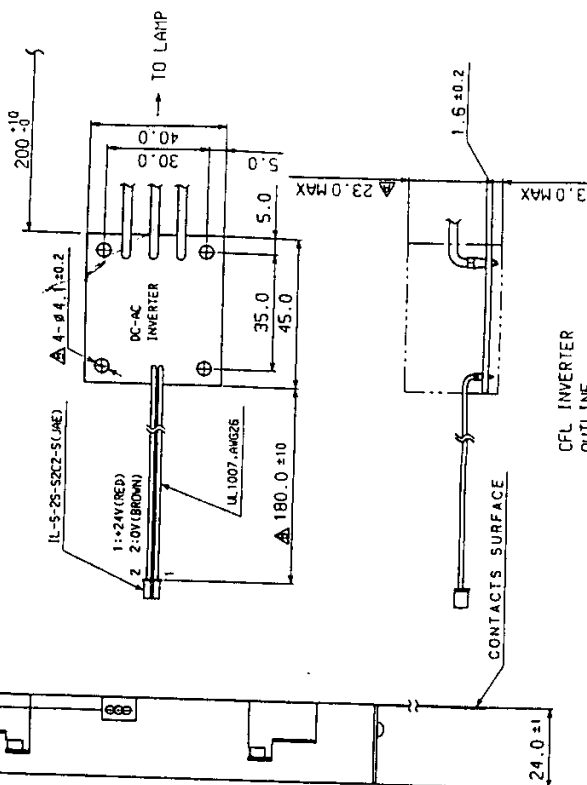
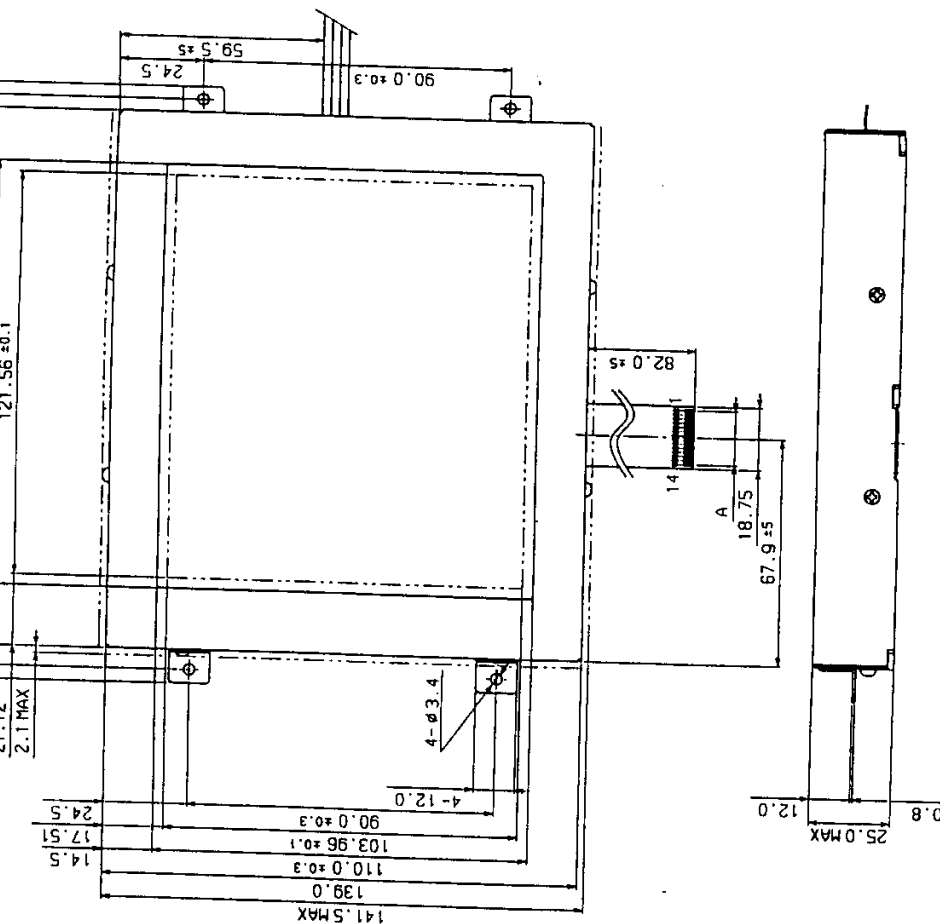
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DOT DETALE: 20/1



CFL INVERTER OUTLINE

NOTES

1. DO NOT SCALE THIS DWG.
2. LCO: 320x200 DOTS.
3. A: PITCH: 250.1x(14-1) = 16.25±0.2.
4. CONNECTOR: SMD-14186-ESX
- 10-P1. 25-S6±2.5-N(SUMITOMO)
or Equivalent

E	*	*
D	*	*
C	*	*
B	*	*
A	JUN/11/81	PLA
1	ALCAN. INV. MGMT	3062737-90
MODEL		
EG7500*-#5		
TYPE		
OUTWARD DWG.		
DWG NO		
50-010291-B		
CALCUL	TOL	DATE
1/1	0.0	10/1/88

2. Absolute Maximum Ratings

Item	Symbol	Standard Value	Unit	Condition
Power Supply Voltage	$V_{DD} - V_{SS}$	0 ~ +7.0	V	
	$V_{DD} - V_{EE}$	0 ~ +28.0		
LCD Driving Voltage	V_{LCD}	$V_{EE} \leq V_{LCD} \leq V_{DD}$		
Input Voltage	V_{IN}	$V_{SS} \leq V_{IN} \leq V_{DD}$		
Power Supply Voltage for INVERTER	V_{INV}	0 ~ +30.0		
Operating Temperature Range	T_{OP}	0 ~ +40	°C	No Condensation
Storage Temperature Range	T_{ST}	-20 ~ +60		

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21-C0000018

3. Electrical Characteristics

3-1 DC Characteristics

(1) Module DC Characteristics

$T_a = 0 \sim 40^\circ\text{C}$, $V_{DD} = 5\text{V} \pm 5\%$

I t e m	Symbol	Standard Value			Unit	Applicable Terminal	Condition
		M I N	T Y P	M A X			
Power Supply Voltage	VDD	4.75	5.0	5.25	V	VDD	
	VDD-VLCD	Depending on Optical Characteristics				VLCD	
"0" Input Voltage	VIL	0	—	0.2VDD	V	LP DIN XSCL D0~D3	
"1" Input Voltage	VIH	0.8VDD	—	VDD			
I/O Leak Current	| I L |	—	—	20	μ A		
Power Supply Current	I DD	—	5.3	13.5	m A	VDD	*1
	I EE	—	3.0	8.0		VEE	

*1) VLCD=-17V, Frame Frequency=75Hz

(2) Backlight Electric Characteristics

$T_a = 0 \sim 40^\circ\text{C}$

I t e m	Symbol	Standard Value			Unit	Condition
		M I N	T Y P	M A X		
Input Voltage for Inverter	VINV	21.6	24	26.4	V	
Input Current for Inverter	IINV	—	—	0.22	A	VINV=24V
Tube Current	IT	—	4	—	mA	
Tube Voltage	VT	—	320	—	Vrms	

*1) The life of half brightness is 10,000 hours with continuous lighting of tube current 4.0mA.

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3-2 AC Characteristics

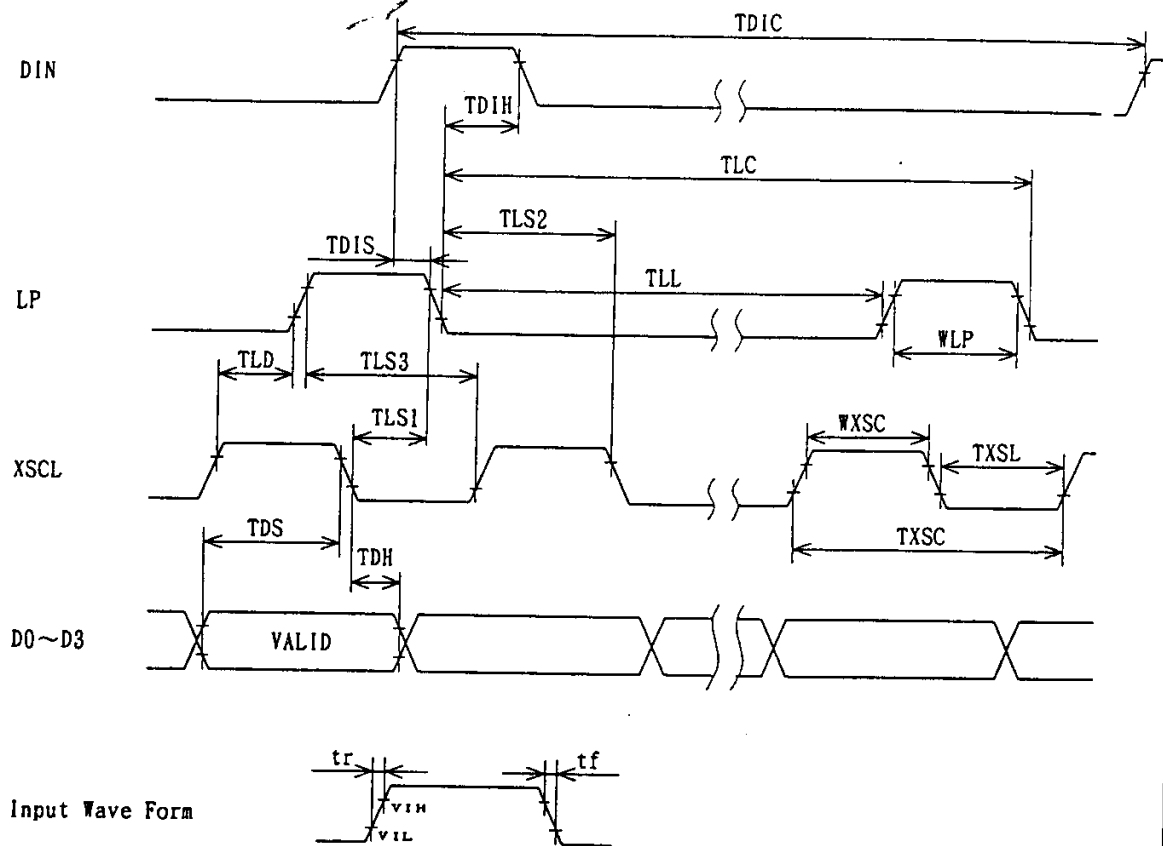
VDD = 5 V ± 5 %

Item	Symbol	Standard Value			Unit	Condition
		MIN	TYP	MAX		
DIN Cycle	TDIC	12	13.0	15.0	msec	
LP Cycle	TLC	500			nsec	
XSCL Cycle	TXSC	166	—	—	nsec	
LP "L" Time	TLL	330	—	—	nsec	
LP Pulse Width	WLP	70	—	—	nsec	
XSCL "L" Time	TXSL	70	—	—	nsec	
XSCL Pulse Width	WXSC	70	—	—	nsec	
Latch Timing	TLS1	70	—	—	nsec	
	TLS2	70	—	—		
	TLS3	70	—	—		
	TLD	0	—	—		
Data Setup Time	TDS	60	—	—	nsec	
Data Hold Time	TDH	40	—	—	nsec	
DIN Setup Time	TDIS	100	—	—	nsec	
DIN Hold Time	TDIH	10	—	—	nsec	
Input Wave Form Rise Time	t _r	—	—	※1	nsec	
Input Wave Form Fall Time	t _f	—	—	※1	nsec	

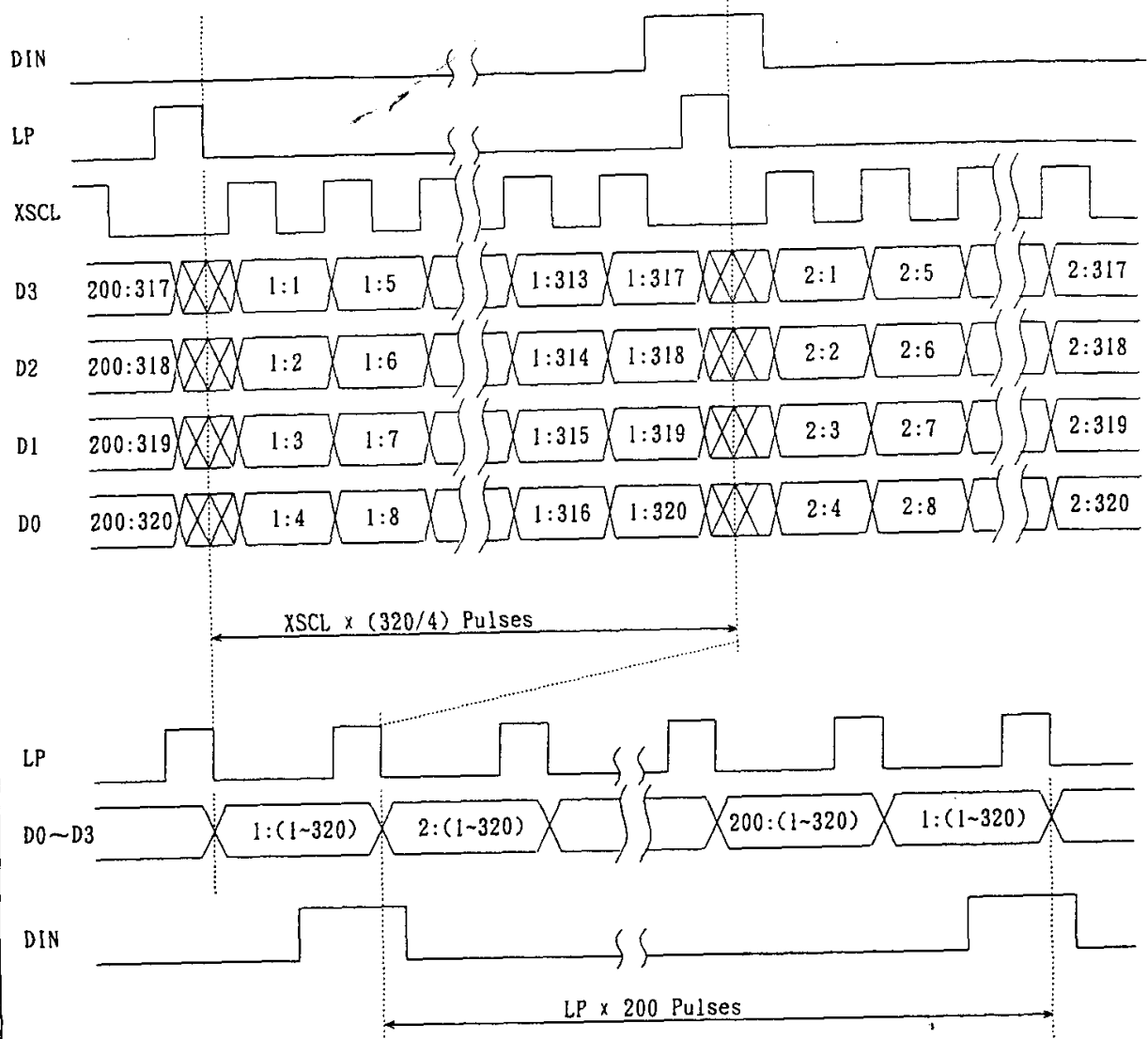
*1) $\frac{TXSC - TXSL - WXSC}{2}$

with 50 nsec MAX

3-3 Timing Chart 1



3-4 Timing Chart 2



3-5 Relation between Data and Display

1: 1	1: 2	1: 3	1: 4		1:317	1:318	1:319	1:320
2: 1	2: 2	2: 3	.		.	2:318	2:319	2:320
3: 1	3: 2	.	.		.	.	3:319	3:320
4: 1	.	.	.		.	.	.	4:320
197: 1	.	.	.		.	.	.	197:320
198: 1	198: 2	.	.		.	.	198:319	198:320
199: 1	199: 2	199: 3	.		.	199:318	199:319	199:320
200: 1	200: 2	200: 3	200: 4		200:317	200:318	200:319	200:320

4. Optical Characteristics

4-1 Optical Characteristics

f FR = 7.5 Hz

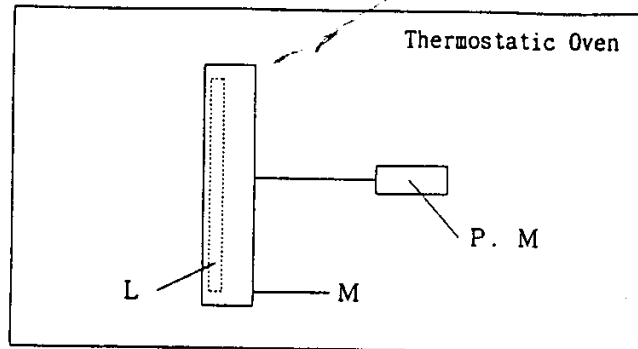
I t e m	Symbol	Temp (°C)	Standard Value			Unit	Condition
			M I N	T Y P	M A X		
Driving Voltage	VOP *1	0	—	23.6	24.3	V	
		25	—	21.8	—		
		40	19.3	19.9	—		
Response Time	Tr	0	—	350	530	ms	
		25	—	200	350		
	Tf	0	—	950	1400		
		25	—	350	530		
Recommended Viewing Area	$\theta Y1$	25	20	—	—	Deg	$K \geq 2$
	$\theta Y2$		20	—	—		
	$\theta X1$		30	—	—		
	$\theta X2$		30	—	—		
Contrast Ratio	K	25	—	4	—		
Brightness *2	B	25	400	600	—	cd/m ²	IT = 4.0mA

*1) Vop=LCD Driving Voltage getting maximum contrast
=VDD-VLCD

*2) Initial values on the Center of the Backlight Diffuser

4-2 Definition of Optical Characteristics

(1) Optical Measuring Equipment



L : Built-in Backlight
P. M : Lighting Sensor
M : Module

[Specification of Equipments and Measuring Condition]

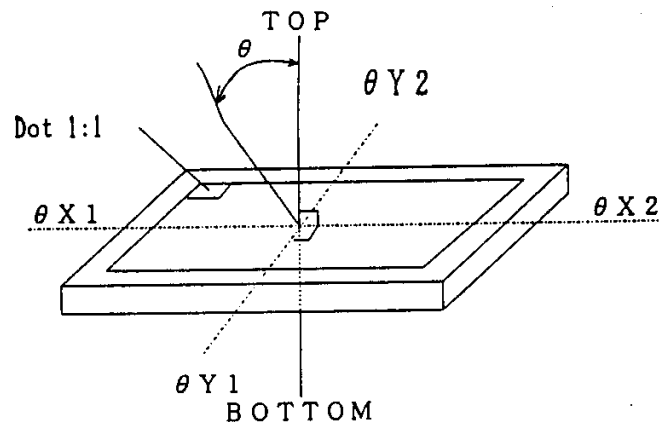
Luxmeter : Canon LC-3S

Brightness Measurement Spot Diameter $\phi 2\text{mm}$

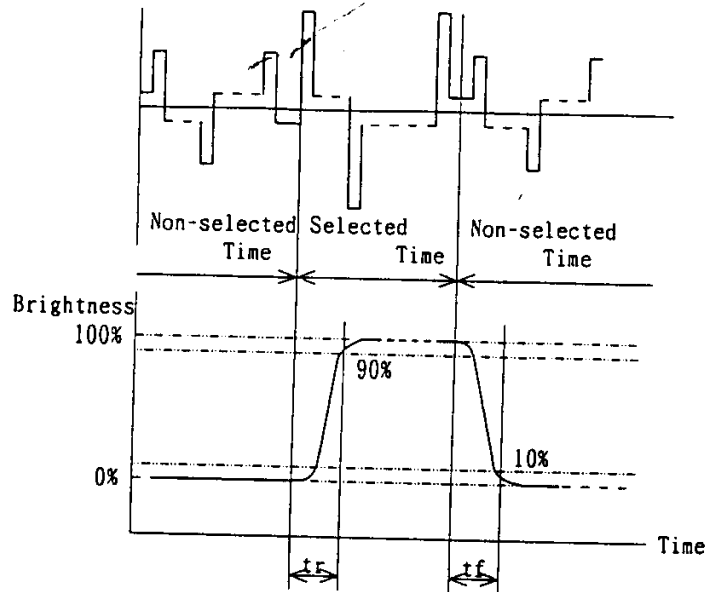
Lighting Source : Built-in Backlight

Tube Current : The Typical Value specified
at "3-1 DC Characteristics".

(2) Definition of Viewing Angle



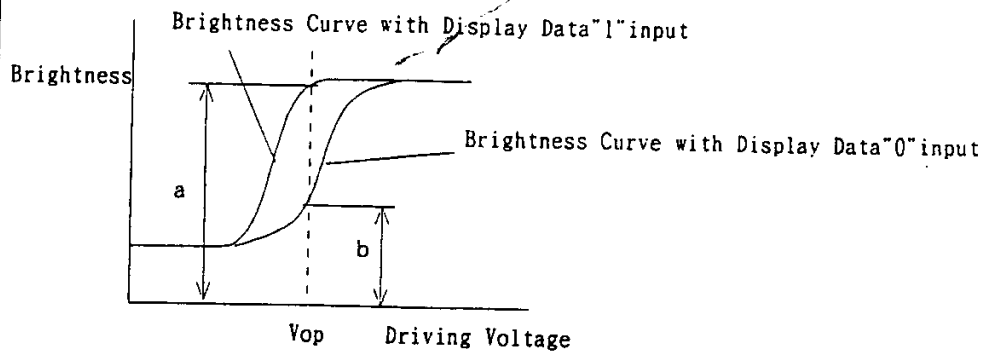
(3) Definition of Response Time



[Measuring Condition]

V_{op} = TYP. value at Operating Temperature
 $\theta X = \theta Y = 0^\circ$

(4) Definition of Contrast Ratio



$$\text{Contrast Ratio} = \frac{\text{Brightness Curve with Display Data "1" input } a}{\text{Brightness Curve with Display Data "0" input } b}$$

[Measuring Condition]

V_{op} = TYP. value at Operating Temperature

$\theta X = \theta Y = 0^\circ$

5. Reliability

5-1 Content of Reliability Test

Environmental Test				
No	Test Item	Content of Test	Test Condition	Applicable standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	60 °C 200 H	—
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-20 °C 200 H	—
3	High temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	40 °C 200 H	—
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	0 °C 200 H	—
5	High temperature/humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	60 °C 90 %RH 96 H	MIL-202E-103B JIS-C5023
6	High temperature/humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature/humidity stress to the element for a long time.	40 °C 90 %RH 96 H	MIL-202E-103B JIS-C5023
7	Temperature cycle	Endurance test applying the low and high temperature cycle. -20°C ↔ 25°C ↔ 60°C ↔ 25°C 30min. 5min. 30min. 5min. ← 1 cycle →	-20°C/60°C 10 cycle	—
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mm-p 22~500Hz →1.5G Total 0.5H	MIL-202E-201A JIS-C5025 JIS-C7022-A-10
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11msec 3 times of each direction	MIL-202E-213B
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115 mbar 40 H	MIL-202E-105C
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS = 800 v RS = 1.5 kΩ CS = 100 PF 1 time	MIL-883B-3015.1

*1) Driving condition for operation test
 Power supply voltage for Logic system = 5V
 Power supply voltage for LCD system = Rating voltage at 25°C

5-2 Failure Judgement Criterion

Criterriion Item	Test Item No.											Failure Judgment Criterion
	1	2	3	4	5	6	7	8	9	10	11	
Basic Specification	○	○	○	○	○	○	○	○	○	○	○	Out of the Basic Specification
Electrical characteristic	○		○	○	○	○					○	Out of the DC and AC Characteristic
Mechanical characteristic						○	○	○	○			Out of the Mechanical Specification Color change : Out of Limit Apperance Specification
Optical characteristic	○	○	○	○	○	○	○			○	○	Out of the Apperance Standard

6. Package Specifications

6-1 Inner Carton Box

Each LCD module is wrapped with a antistatic pouch, and put into the inner carton box for containing 10 pcs of LCD module.

The following contents should be indicated on the carton box.

TYPE : EG7500B-LS
Q' TY : 10 pcs
Lot : Lot No.
EPSON : SEIKO EPSON CORP
DISPLAY DIVISION

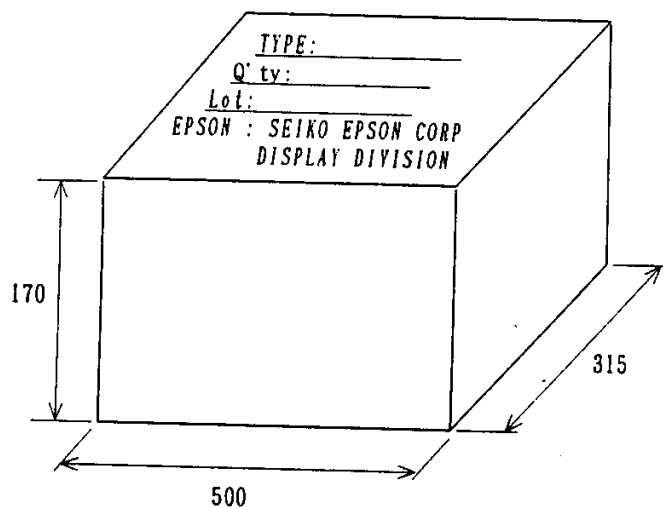


Fig.1 Outline Dimensions of Inner Carton BOX

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6-2 Master Carton Box

The master carton box is for sending to each user.
The master carton box contains 2 pcs of inner carton box.
The indications are applied to four faces A, B, C and D of the master carton as shown Fig. 1 below.

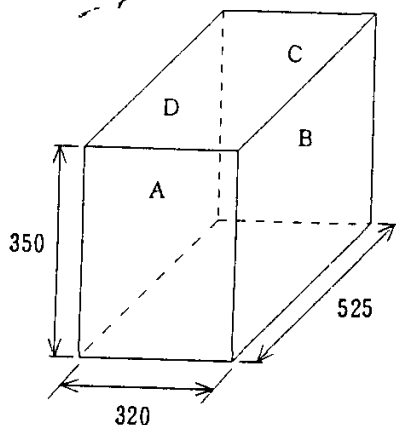


Fig. 1 Outline dimensions of Master Carton Box

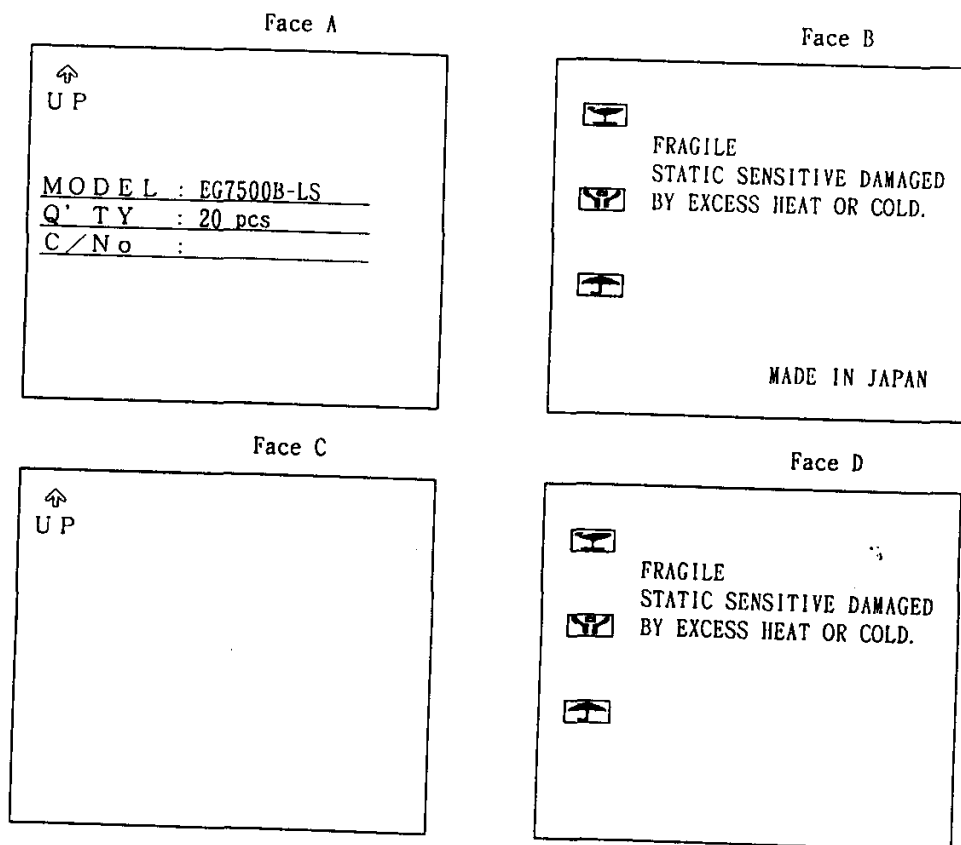


Fig. 2 Contents of Indication for Master Carton Box

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Precautions for use of LCD Modules

<Handling Precautions>

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
 - If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth. If the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
 - Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
 - The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
 - If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents.
 - Isopropyl alcohol
 - Ethyl alcohol
- Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following.
- Water
 - Ketone
 - Aromatic solvents
- Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- Install the LCD Module by using the mounting holes. When mounting the LCD Module make sure that it is free of twisting, warping, and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- Do not attempt to disassemble or process the LCD Module.
- NC terminal should be open. Do not connect anything.
- If the logic circuit power is off, do not apply the input signals.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD Modules.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Do not apply pressure to CCFT section at the rear of the module. Excessive pressure may damage CCFT.

<Storage Precautions>

- When storing the LCD Modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature/normal humidity conditions (avoid high temperature/high humidity and low temperatures below 0 °C). Whenever possible, the LCD Modules should be stored in the same conditions in which they were shipped from our company.

<Design Precautions>

- The absolute maximum ratings represents the rated value beyond which LCD Modules cannot exceed. When the LCD Modules are used in excess of this rated value, their operating characteristics may be adversely affected.
- To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy VII, VIII, and the other specification values, including taking the precaution of using signal cables that are short.
- The liquid crystal display exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also, keep in mind that the voltage levels necessary for clear displays (VLCD or VDDH) will vary according to temperature.
- If DC is impressed on the liquid crystal display panel, display definition is rapidly deteriorated by the electrochemical reaction that occurs inside the liquid crystal panel. To eliminate the opportunity of DC impressing, be sure to maintain the AC characteristics of the input signals sent to the LCD Module (especially, LP, DIN, and FR).

- When turning the power supply ON/OFF, strictly follow the sequence shown in Fig.1 so that latch-up and DC driving of the LCD Module can be prevented.

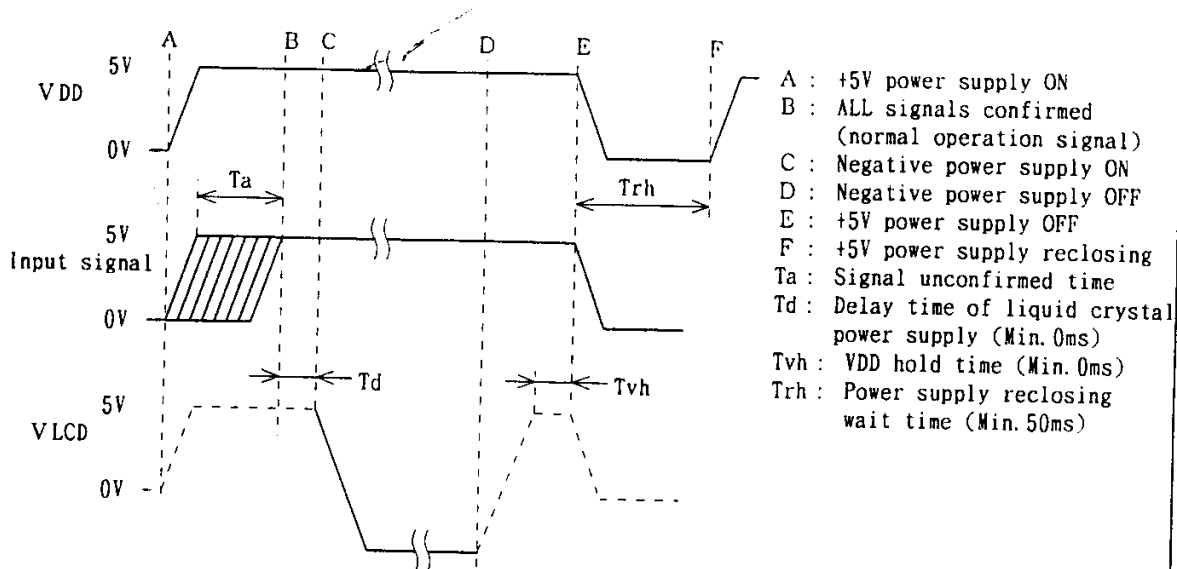


Fig.1 Power supply ON/OFF sequence

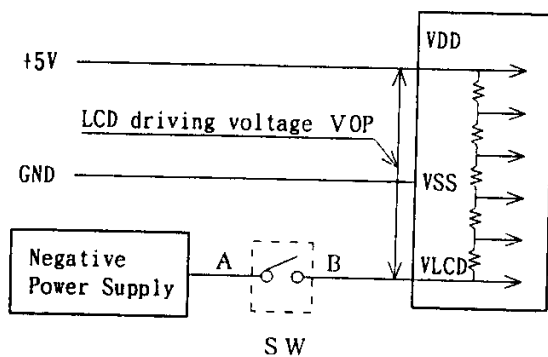


Fig.2 Example of power supply connection

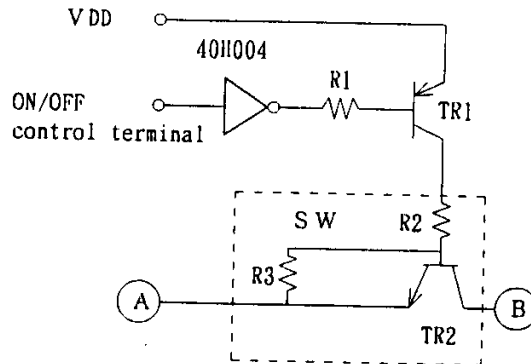


Fig.3 Example of SW section circuit

- Fig.1 shows the voltage levels at the module terminal section when the module is connected to a power supply and signal lines.
- Regarding VLCD in Fig.1, the dashed line shows the OFF status of SW in Fig.2, while the solid line indicates the ON status.
- Prepare the negative power supply shown in Fig.2 with a capacity that is at least sufficient to handle the current of the liquid crystal power supply in DC characteristics.
- Fig.3 provides an example of the circuit for SW section in Fig.2.

<Others>

- Liquid crystals solidify under low temperatures (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD Modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time.
It should be noted that this phenomenon does not adversely affect performance reliability.
- Cold cathode fluorescent tube (CCFT) is used in this LCD Module. Since a small amount of mercury gas is contained by this CCFT, observe applicable regulations when disposing of the CCFT.
- Customers are requested to understand that our company will not be held responsible for any discrepancies that occur in connection with work performed by customers to replace CCFT.
If you intend to use the LCD Modules in a way requiring the replacement of the CCFT, please consult our company in advance.
- To minimize the performance degradation of the LCD Modules resulting from destruction caused by static electricity, etc., exercise care to avoid holding the following sections when handling the modules.
 - Terminal electrode sections

Revision Record

REV.	Revision Items	Date
	New	1993. 02. 02
A		
B		
C		
D		
E		
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