Spec Code	S C – 010011500

SPECIFICATIONS

EG9013F–NZ

Item No	Item	Sheet Code
1	Basic Specification Outline Dimensions	1 1 – 00000018-B 1 2 – 00000015 1 3 – 00000014 SD–010543
2	Absolute Maximum RatingS	2 1 – 00000011-A
3	Electrical Characteristics	3 1 – 00000013-A 3 2 – 00000010 3 3 – 00000010 3 4 – 00000007 3 5 – 00000008
4	Optical Characteristics	4 1 – FE6037L02-A 4 2 – 00000007 4 3 – 00000001 4 4 – 00000001
5	Reliability	5 1 – 00000008-A 5 2 – 00000001
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SEIKO EPSON CORPORATION
LCD DIVISION

LD DESIGN Dep.		
F. Ushiboshi		
	N. Ito	

1. Basic Specifications

1-1 Display Specifications

(1) FTN Mode Negative Display type Transmissive Model

(2) Display Color

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

(3) Viewing Angle : 12 O'clock direction

(4) Driving Duty : 1/480 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 SD－010543

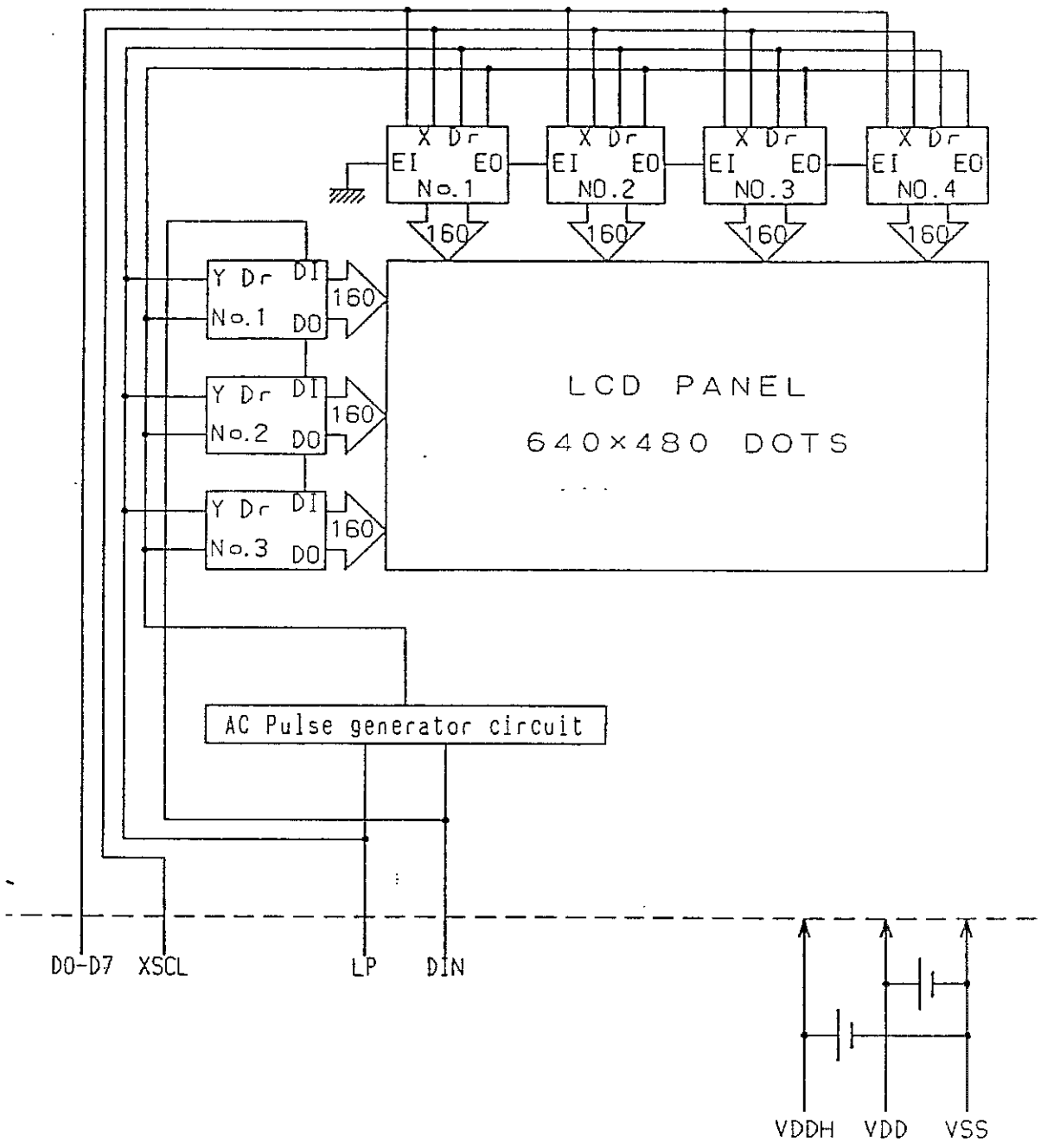
(2) Dot Matrix : 640 dots × 480 dots

(3) Dot Size : 0.17 (W) × 0.17 (H) (mm)

(4) Dot Pitch : 0.20 (W) × 0.20 (H) (mm)

(5) Weight : 250g (Typ.)

1-3 Block Diagram



1-4 Terminal Functions

(1) LCD

Model : 53261-1510 (Molex CO.,LTD.)
Applicable Connector : 51021-1500 (Molex CO.,LTD.)

Pin No.	Symbol	Function
1	DIN	Scan Start-up Signal
2	LP	Input Data Latch Signal
3	XSCL	Data Input Clock Signal
4	VDD	Power Supply for Logic and LCD (+5V)
5	VSS	Ground
6	VDDH	Power Supply for LCD (+)
7	VSS	Ground
8 ~ 15	D0 ~ D7	Display Data Signal

(2) CCFT

Model : M63M83-04 (MITSUMI ELECTRIC CO.,LTD.)
Applicable Connector : M60-04-30-1**P (MITSUMI ELECTRIC CO.,LTD.)

Pin No.	Symbol	Function
1	CCFT COLD	———
2	N C	No Connection
3	N C	No Connection
4	CCFT HOT	———

2.Absolute Maximum Ratings

Item	Symbol	Standard Value	Unit	Condition
Power supply Voltage	VDD -VSS	0 ~ +7.0	V	
LCD Driving Voltage	VDDH-VEE	0 ~+40.0		
Input Voltage	VIN	VSS≦ VIN ≦VDD		
Operating Temperature Range	TOP	+5 ~ +40 41°F 104°F	℃	Not to be dewy
Strage Temperature Range	TST	−20 ~ +60		

3.Electrical Characteristics

3-1 DC Characteristics

(1) Module DC Characteristics

Ta=5～40℃, VDD=5V±5%

Item	Symbol	Standard Value			Unit	Applicable Terminal	Condition
		MIN	TYP	MAX			
Power Supply Voltage	VDD	4.75 (3.0) ※2	5.0 (−)	5.25 (5.5) ※2	V	VDD	
	VDDH	Depending on Optical Characteristics				VDDH	
"0" Input Voltage	VIL	0	−	0.2VDD	V	DIN LP XSCL DO～D7	
"1" Input Voltage	VIH	0.8VDD	−	VDD			
I/O Leak Current	|IL|	−	−	50	μA		
Power Supply Current	IDD	−	1.0	2.0	mA	VDD	※1
LCD Power Supply Current	IDDH	−	12.0	30.0	mA	VDDH	

*1) Measuring Condition

Standard Value TYP.
Ta =25℃
VDD −VSS =5.0V
VDDH−VSS =VOP at Optimum Contrast
fFR =75Hz
1/480Duty
Display Pattern is shown as a text patern.

Standard Value TYP.
Ta =25℃
VDD −VSS =5.25V
VDDH−VSS =39.9V
fFR =85Hz
1/480Duty
Display Pattern is shown as a Checkered pattern.

*2) The samples which can operate by 3.0 to 5.5V Logic voltage will be available around the end of 1992.

(2) Backlight DC Characterisitics

Ta=5～40℃

Item	Symbol	Standard Value			Unit	Applicable Terminal	Condition
		MIN	TYP	MAX			
Tube Current	IT	3.0	3.5	4.0	mA		
Tube Voltage	VT	−	270	−	Vrms		
Discharge Start Voltage	VS	−	−	1100	Vrms		
Driving Frequency	ft	20	30	40	KHz		

*1)The life of half brightness is 10000hours with continuous lighting of tube corrent 3.5mA.

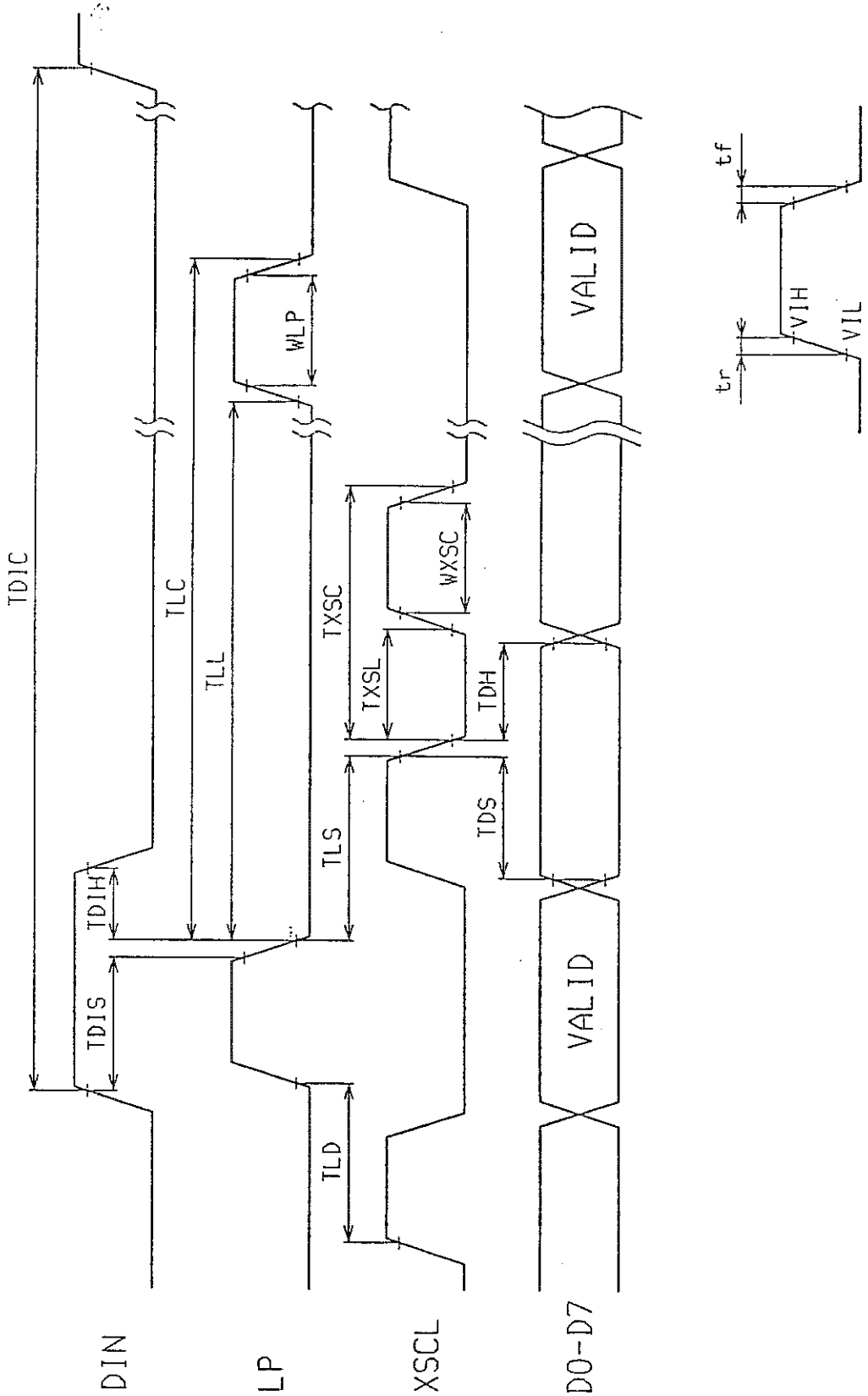
3-2 AC Characteristics

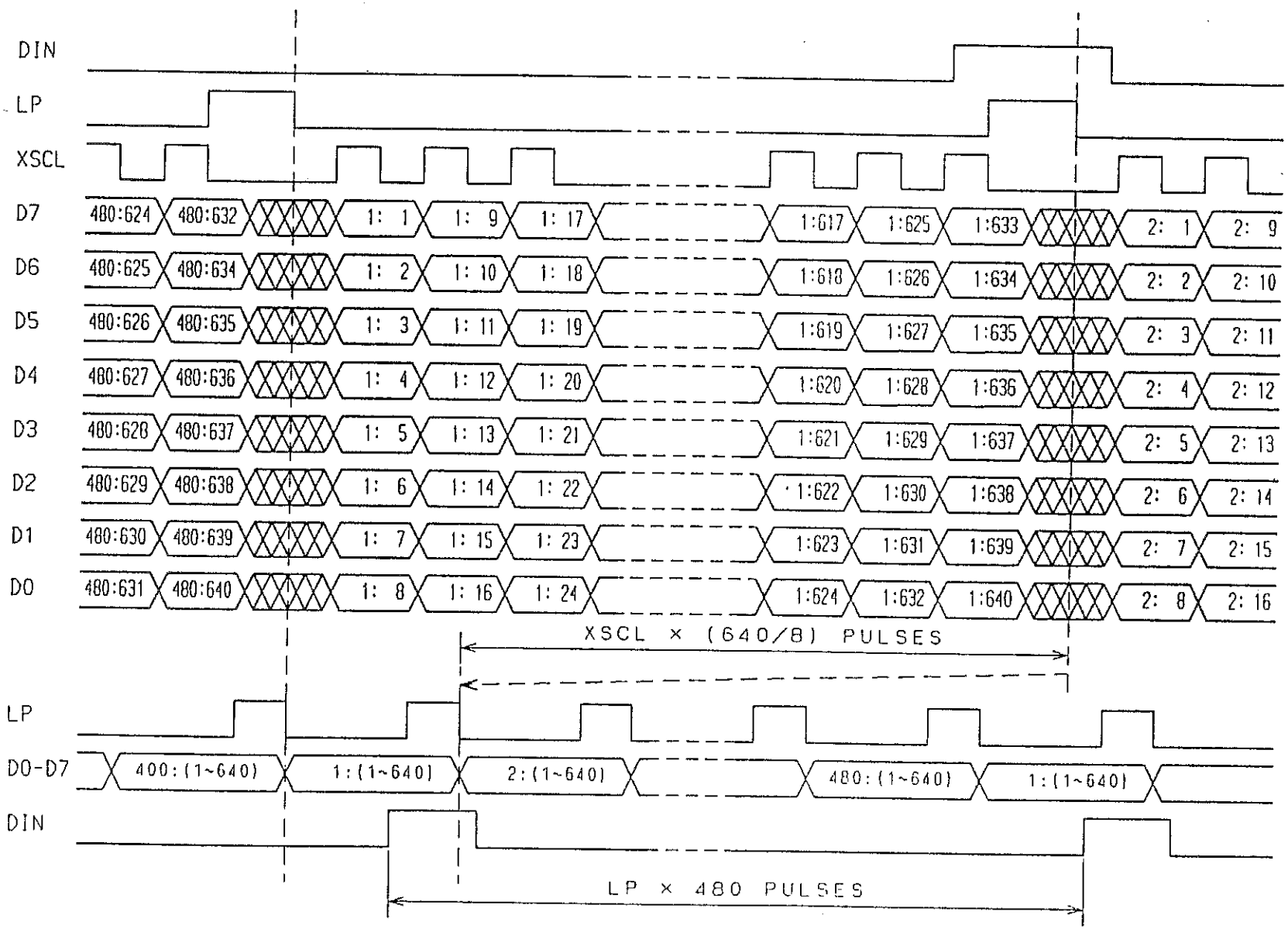
Ta=5～40℃, VDD=5.0V±5%

Item	Symbol	Standard Value			Unit	Condition
		MIN	TYP	MAX		
DIN Cycle	TDIC	12.0	13.3	15.0	msec	VDD=5V±5%
LP Cycle	TLC	400	–	–	nsec	
LP "L" Time	TLL	330	–	–	nsec	
LP "H" Time ※1	WLP	70	—	—	nsec	
XSCL Cycle	TXSC	83	—	—	nsec	
XSCL "L" Time	TXSL	30	—	—	nsec	
XSCL "H" Time	WXSC	30	—	—	nsec	
Latch Timing	TLS	60	—	—	nsec	
	TLD	-5	—	—		
Data Setup Time	TDS	30	—	—	nsec	
Data Hold Time	TDH	20	—	—	nsec	
DIN Setup Time	TDIS	100	—	—	nsec	
DIN Hold Time	TDIH	40	—	—	nsec	
Input Wave Form Rise Time e	tr	—	—	50	nsec	
Input Wave Form Fall Time	tf	—	—	50	nsec	

※1)WLP is specified LP pulse with when XSCL is "L".
※2)(TXSC-TXSL-WXSC)/2 with 50nsec max.
※3)At the LP input timing, it should cancel the 1 clock XSCL pulse.

3-3 Timing Chart 1




DIN
LP
XSCL
D7
D6
D5
D4
D3
D2
D1
D0
480:624 480:632 1: 1 1: 9 1: 17 1:617 1:625 1:633 2: 1 2: 9
480:625 480:634 1: 2 1: 10 1: 18 1:618 1:626 1:634 2: 2 2: 10
480:626 480:635 1: 3 1: 11 1: 19 1:619 1:627 1:635 2: 3 2: 11
480:627 480:636 1: 4 1: 12 1: 20 1:620 1:628 1:636 2: 4 2: 12
480:628 480:637 1: 5 1: 13 1: 21 1:621 1:629 1:637 2: 5 2: 13
480:629 480:638 1: 6 1: 14 1: 22 1:622 1:630 1:638 2: 6 2: 14
480:630 480:639 1: 7 1: 15 1: 23 1:623 1:631 1:639 2: 7 2: 15
480:631 480:640 1: 8 1: 16 1: 24 1:624 1:632 1:640 2: 8 2: 16
XSCL × (640/8) PULSES
LP
D0-D7
400:(1~640) 1:(1~640) 2:(1~640) 480:(1~640) 1:(1~640)
DIN
LP × 480 PULSES

3-5 Relation between Data and Display

1: 1	1: 2	1: 3	1: 4	1: 5		1:636	1:637	1:638	1:639	1:640
2: 1	2: 2	2: 3	2: 4	•		•	2:637	2:638	2:639	2:640
3: 1	3: 2	3: 3	•	•		•	•	3:638	3:639	3:640
4: 1	4: 2	•	•	•		•	•	•	4:639	4:640
5: 1	•	•	•	•		•	•	•	•	5:640
476: 1	•	•	•	•		•	•	•	•	476:640
477: 1	477: 2	•	•	•		•	•	•	477:639	477:640
478: 1	478: 2	478: 3	•	•		•	•	478:638	478:639	478:640
479: 1	479: 2	479: 3	479: 4	•		•	479:637	479:638	479:639	479:640
480: 1	480: 2	480: 3	480: 4	480: 5		480:636	480:637	480:638	480:639	480:640

4.Optical Characteristics

4-1 Optical Characteristics

fFR=75Hz

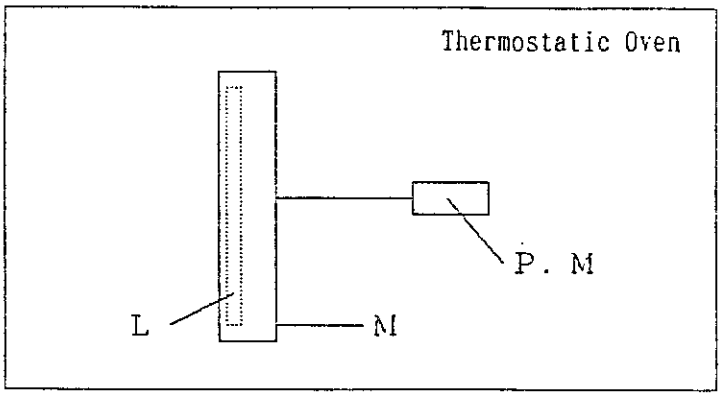
Parameter		Symbol	Temp (℃)	Standard Value MIN	TYP	MAX	Unit	Condition
Driving Voltage		VOP	5	–	35.7	36.7	V	
			25	–	33.5	–		
			50	30.7	31.7	–		
Response Time		Tr	5	–	850	1275	ms	
			25	–	250	375		
		Tf	5	–	760	1140		
			25	–	200	300		
Contrast Ratio	θX1	θY1,2	25					
	0	0		4.0	6.0	–		
	10	0		–	6.2	–		
	20	0		–	5.0	–		
	30	0		–	3.0	–		
	θX2	θY1,2						
	10	0		–	4.6	–		
	20	0		–	3.4	–		
	30	0		–	2.4	–		
	θX1,2	θY1						
	0	10		–	6.4	–		
	0	20		–	5.0	–		
	0	30		–	2.0	–		
	θX1,2	θY2						
	0	10		–	5.6	–		
	0	20		–	5.2	–		
	0	30		–	4.0	–		
Initial Brightness			25	30	50	–	cd/m²	*1

*1) Module Driving Condition : Ta=25℃
VOP at Optimum Contrast
Display pattern :All displayed Data "1"

CCFT Backlighte Driving Condition : 30minutes after power ON

4-2 Definition of Optical Characterisitics

(1) Optical Measuring Equipment

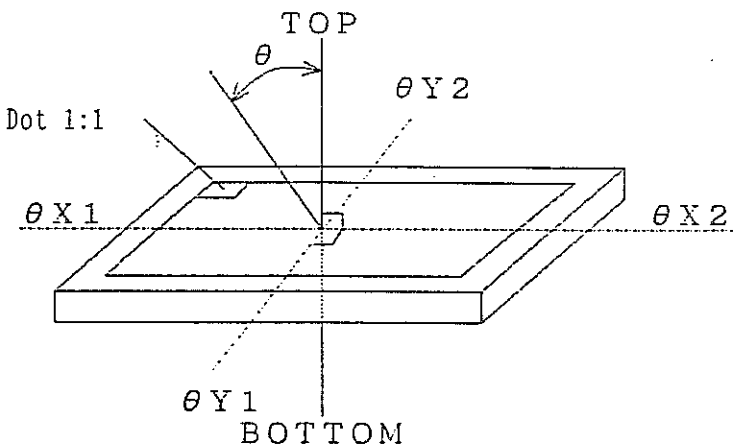


L : Built-in Backlight
P. M : Lighting Sensor
M : Module

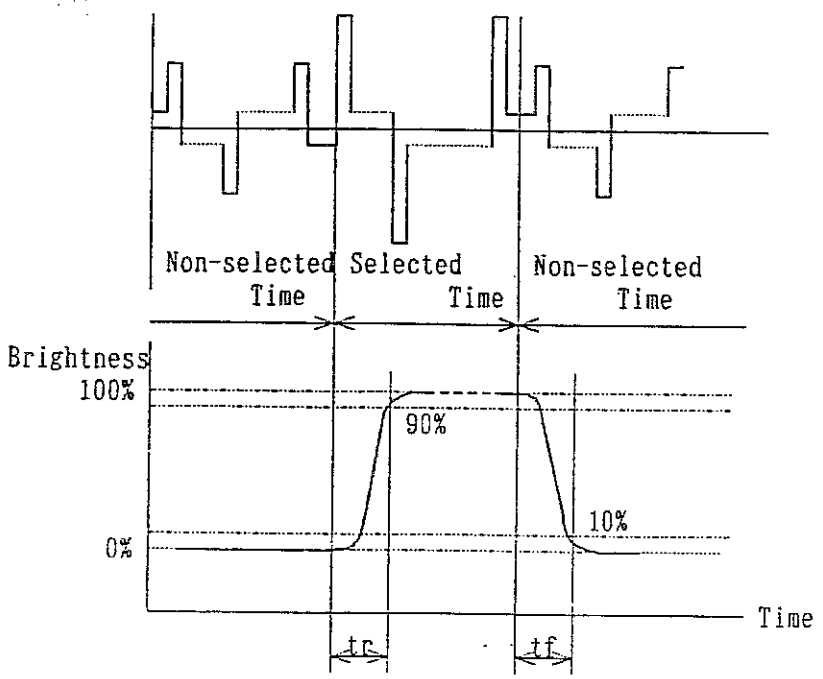
[Specification of Equipments and Measuring Condition]
Luxmeter : Canon LC-3S
Brightness Measurement Spot Diameter ø2mm

Lighting Source : Built-in Backlight
Tube Current : The Typical value specified at "3-1 DC Characteristics".

(2) Definition of Viewing Angle

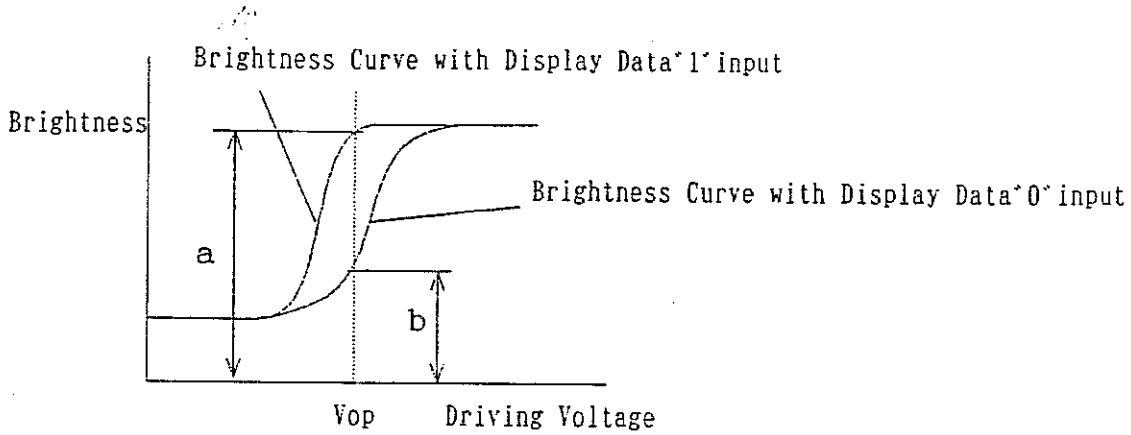


(3)Definition of Response Time



[Measuring Condition]
Top=25℃
Vop=TYP.value at 25℃
θX=θY=0°

(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]

Top=25℃

Vop=TYP.value at 25℃

$\theta X = \theta Y = 0°$

5.Reliability

5-1 Content of Reliability Test

No	Test Item	Content of Test	Test Condition	Applicable standard
		Environmental Test		
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	60 ℃ 200 H	———
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-20 ℃ 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 ℃ 200 H	———
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	5 ℃ 200 H	———
5	High temperature/ humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	60 ℃ 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 ℃ 90 %RH 96 H	MIL-202E-103B JIS-C5023
7	Temperature cycle	Endurance test applying the low and high temperature cycle. -20℃ ⇔ 25℃ ⇔ 60℃ ⇔ 25℃ 30min. 5min. 30min. 5min. ⇔ 1 cycle ⇔	-20℃/60℃ 10 cycle	———
		Mechanical Test		
8	Vibration test	Endurance test applying the vibration during transportation and using.	10～22Hz→1.5mmp-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 air1.	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 voltege for LCD system = Rating voltage at 25℃

5-2 Failure Judgement Criterion

Criterrion 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 : EG9013F-NZ
Q' TY : 10pcs
Lot : Lot No.
EPSON: SEIKO EPSON CORP
DISPLAY DIVISION

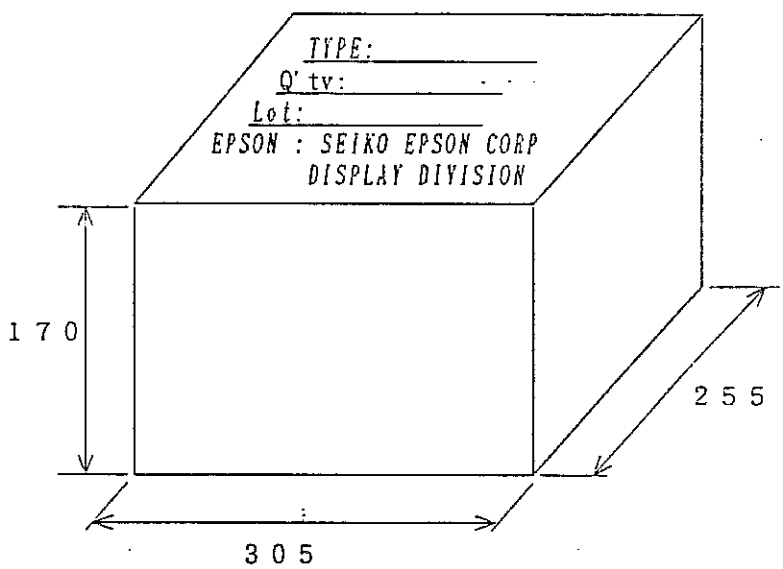


Fig. 1 Outline Dimensions of Inner Carton BOX

6-2 Master Carton Box

The master carton box is for sending to each user.
The master carton box contains 4 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.

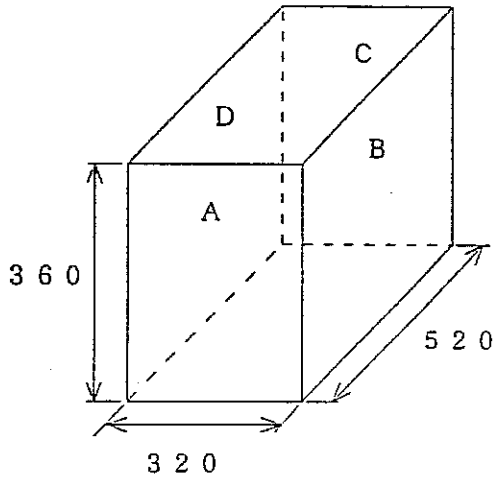
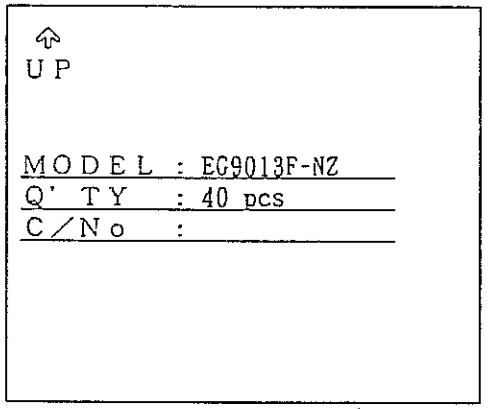
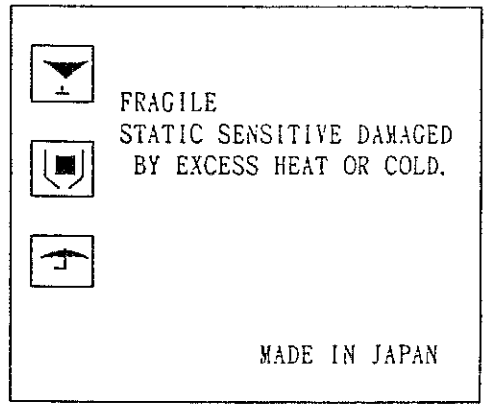


Fig. 1 Outline dimensions of Master Carton Box

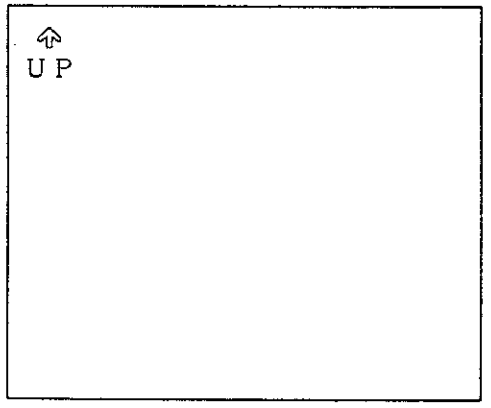
Face A



Face B



Face C



Face D

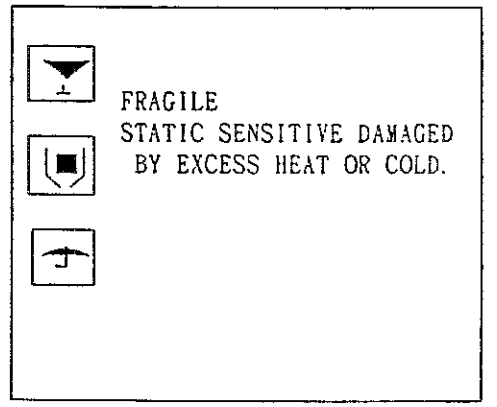


Fig. 2 Contents of Indication for Master Carton Box

Precautions for use of LCD Modules

(Handling Precautions)

- The display panel is made of glass. Care must be exercised to avoid dropping it or subjecting it to strong mechanical shocks.

- Should the display panel be damaged and its LC leak out, do not inhale or ingest the LC. If you come into contact with LC, immediately wash with soap and water.

- Applying pressure to the display surface or its periphery will cause it to change its color tone. Care must be exercised to keep the area free of unreasonable pressure.

- The polarizer covering the display surface of a LCD module is soft and easily damaged. Handle the polarizer with the greatest care.

- To clean the display surface, breathe on the dirty spot, and then lightly wipe it off with a soft cloth after it dries. If the stain remains, dip soft cloth in either of the following slovents, and lightly wipe the surface.

  - Isopropyl alcohol
  - Ethyl alcohol

  Solvents other than those listed may adversely affect the polarizer. Never use the following solvents to clean the display surface.

  - Water
  - Ketones solvents
  - Aromatic solvents

- Water droplets, condensation of water vapor, applying electricity in a high humidity environment may corrode the electrodes.

- Install the module in the mounting hole. During the installation, be careful to avoid twisting, bending, or distorting the LCD module. In particular, do not forcibly pull or bend the I/O cable or the back light cable .

- Do not dismantle of reassemble the module in a different way.

- NC terminal should be open. Do not connect anything.

- If the logic circuit power is not on, do not apply input signals.

- Pay attention to the working environment, as the element may be destroyed by static electricity.

  - Ground yourself before handling the LCD module.

  - Ground the soldering iron or other tools used during assembly.

- Avoid working in a dry environment to minimize the generation of static electricity.

- A protective film has been affixed to the LCD module to protect its display surface. Static electricity may be generated when this protective film is peeled off.

- Do not apply pressure to CCFT on the back of the LCD module. CCFT may be damaged.

〈Storage Precautions〉

Store away from direct sunlight and fluorescent light, and in a relatively low temperature area (avoid places of high temperature and high humidity or any place where the temperature is expected to drop below 0℃) after placing the LCD module in an electrostatic protection bag. Ideally, the module should be stored in the package provided by the supplier.

〈Design Precaustions〉

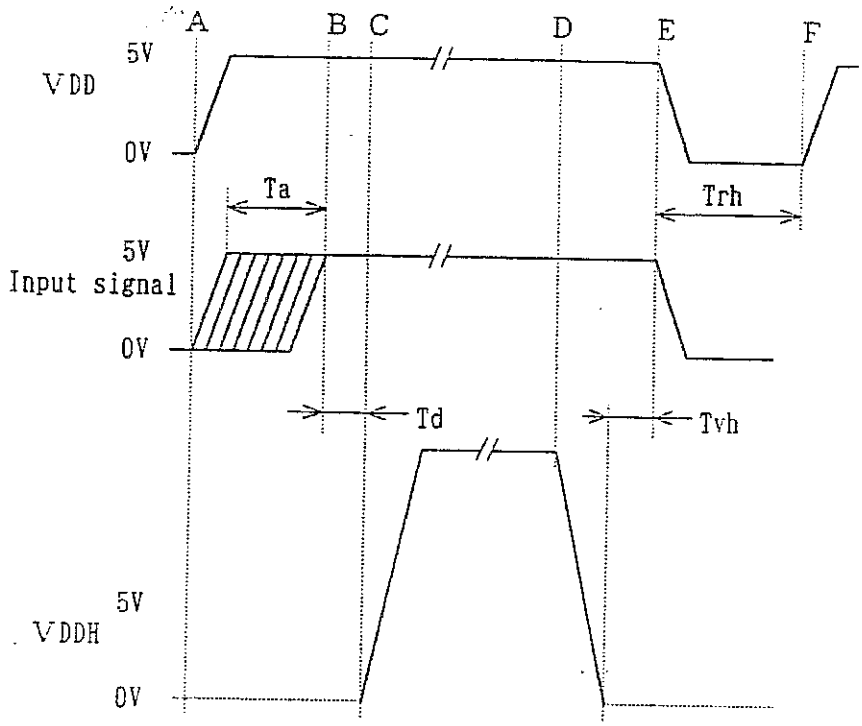
- The absolute maximum ratings represent the ratings that the LCD module should not exceed. Operating the module in excess of the absolute maximum ratings may cause a change in the characteristics of the LCD module.

- To prevent noise malfunctions, shorten the signal conductor cable or take measures to satisfy the specification values of VIL or VIH.

- The liquid crystal display element is temperature dependent. Use the device within the proper operating temperature range. Display recognition becomes difficult outside the operating temperature range. Moreover, pay attention to the fact that the voltage required for the display (VDDH) changes according to the temperature.

- Applying a direct current to the liquid crystal panel causes an electrochemical reaction inside the liquid crystal panel, rapidly deteriorating the display quality. To prevent direct energization, always apply AC to the input signals(specifically, CP1,S) of the LCD module.

- Strictly follow the sequence shown in Fig.1 to turn the power on/off, and prevent latch-up and the use of DC drive for the liquid crystal display module.



A : +5V power on
B : ALL signals determined (normal operation signal)
C : Plus power on
D : Plus power off
E : +5V power off
F : +5V power on again
Ta : Signal in determinate time
Td : Liquid crystal power leak time (Min.0ms)
Tvh : VDD hold time (Min.0ms)
Trh : Power-on waiting time

Fig.1 Power on/off sequence

- Fig.1 shows the voltage levels at the module terminal when the module is connected to the power and signal line.

〈Others〉

- The crystalline liquid coagulates at low temperatures (lower than 0℃), causing deficiences in orientation or producing bubbles (black or white). Bubbling can also occur when a large shock is applied at low temperatures

- If the LCD module is operated for a long time, especially if it is operated with the same display, the display pattern may remain as an after-image, or slight irregularities in contrast may occur. Suspending the operation and waiting a while will return the module to its normal condition. After-images or contrast irregularities do not in any way affect reliability.

- Cold cathode fluorescent lamp contains a small amount of Mercury. Please follow local ordin ances or regulations for disposal.