ACTE Components

SPEC CODE : SC-010013701-A

SPECIFICATION
EG7504C-RS

SEIKO EPSON CORPORATION
LCD DIVISION

LD DESIGN DEP.		
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1. BASIC SPECIFICATIONS

1.1 Display Specifications

1) LCD Mode ; FTN ; Positive ; Transflective
2) Display Color *1
   - Display Color ; Display Data "1" ; Black
   - Background Color ; Display Data "0" ; White
3) Viewing Angle ; 6 0'clock direction
4) Driving Duty ; 1/200 Duty
5) Backlight ; LED Backlight (Yellow Green)
6) LCD Surface ; Glare
7) Gray Scale ; Non - correspondence

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

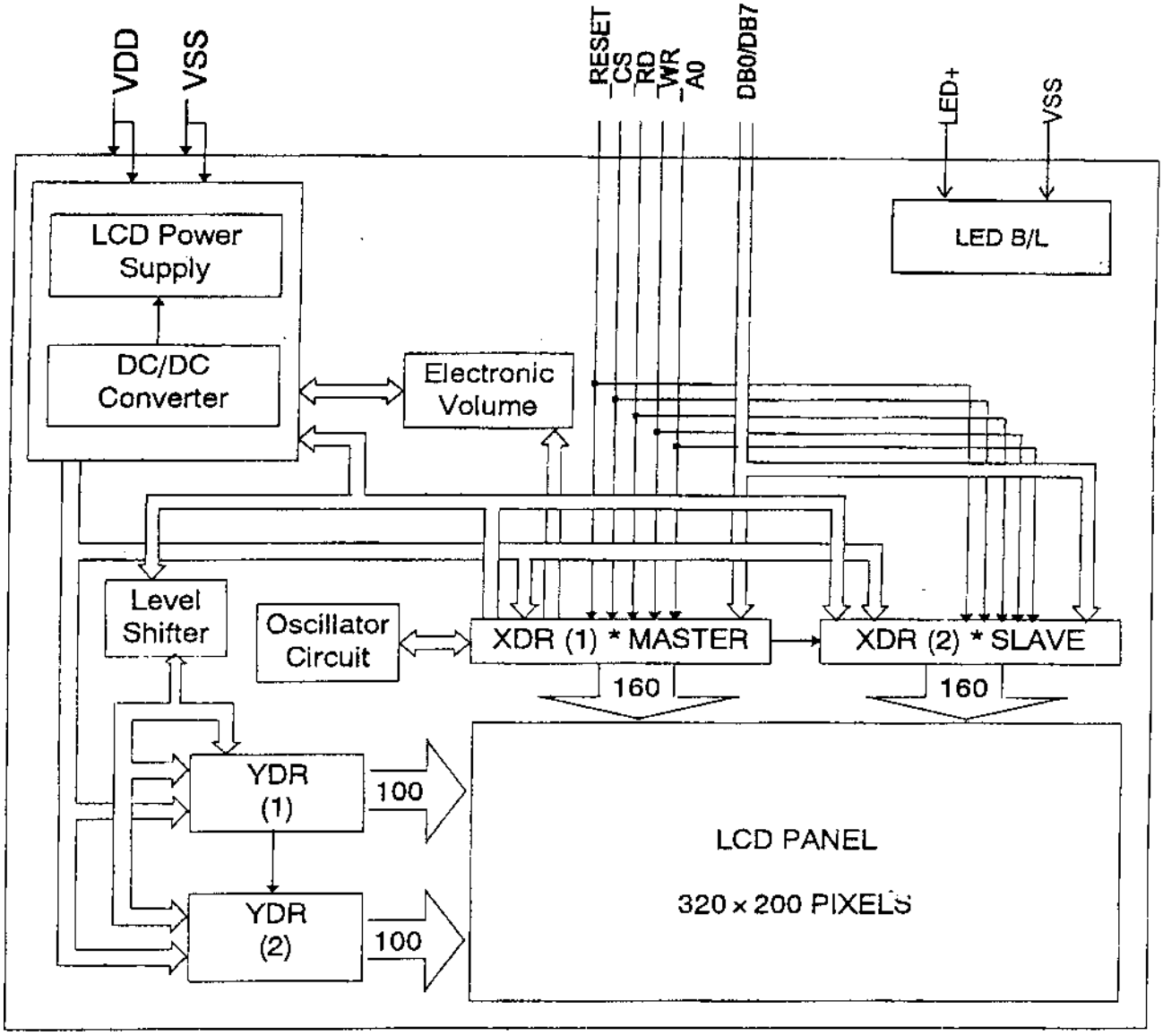
1.2 Mechanical Specifications

1) Outline Dimension ; Refer to attached outline dimensions figure SD-020275
2) Pixel Format ; 320 x 200 (Pixels)
3) Pixel Size ; 0.165 x 0.165 (mm)
4) Pixel Pitch ; 0.18 x 0.18 (mm)
5) Weight ; Approx. 24 (g)

1.3 Terminal Functions

Pin No.	Symbol	I/O	Function
1	V_{DD}	I	Power Supply for Logic
2	LED+	I	LED anode
3,4	V_{SS}	I	Ground
5	RESET	I	Reset ("L" = Initialization)
6	CS	I	Chip Select
7	RD	I	Read Enable Input
8	WR	I	Write Enable Input
9	A0	I	Register Select
10	V_{SS}	I	Ground
11~18	DB0~DB7	I	Data Bus

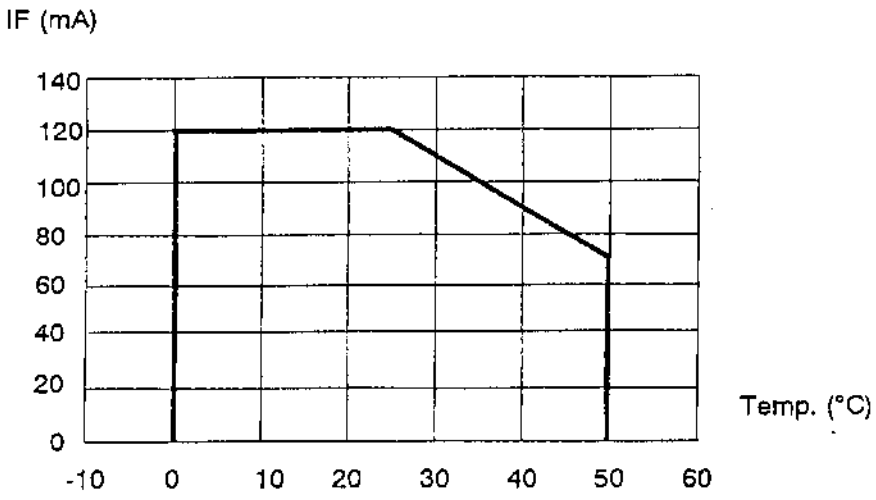
1.4 Block Diagram



2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Standard Value		Unit	Condition
		Min.*	Max.		
Power Supply Voltage	V_{DD}-V_{SS}	-0.3	3.7	V	
Input Voltage	V_{IN}	-0.3	V_{DD}+0.3	V	
LED Backlight Forward Current *1	IF	-	120	mA	Ta = 25 °C
LED Backlight Reverse Voltage	VR	-	5.0	V	Ta = 25 °C
LED Backlight Power Dissipation	PD	-	300	mW	Ta = 25 °C
Operation Temperature	T_{OP}	0	50	°C	no condensation
Storage Temperature	T_{ST}	-20	70	°C	

*1 ; Current derating is as follows.



3. ELECTRICAL CHARACTERISTICS

3.1 DC Characteristics

Ta = 0-50°C, VDD = 3.3±0.3V

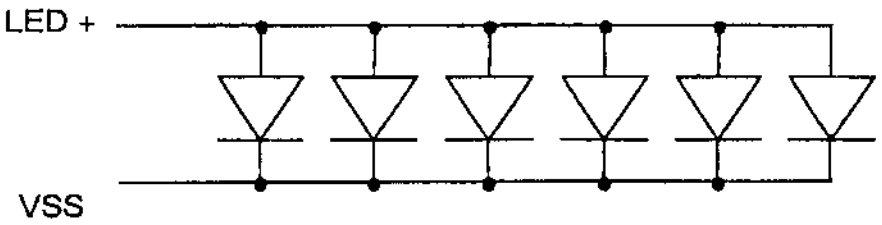
Item	Symbol	Standard			Unit	Applicable Terminal	Condition
		Min.	Typ.	Max.			
Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	V_{DD}	
"0" Input Voltage	V_{IL}	0	-	$0.2V_{DD}$	V	_RESET,_CS	
"1" Input Voltage	V_{IH}	$0.8V_{DD}$	-	V_{DD}	V	_RD,_WR,A0	
Input Leak Current	|IL|	-	-	50	μA	DB0~DB7	
Power Supply Current	I_{DD}	-	0.9	3.0	mA	V_{DD}	*1
		-	0.5	-			*1 DISPLAY OFF
		-	0.1	-			*1, sleep mode

*1 Measuring Conditions
Typ Value: Ta = 25°C, V_{DD} = 3.3V, V_{OP} = Getting Maximum contrast
Max Value: Ta = 25°C, V_{DD} = 3.6V, V_{OP} = Maximum Voltage (Electronic Volume Setting Value = 31)
* Power Supply Current (IDD) shows the value when the module is not accessed by MPU

3.2 Backlight DC Characteristics

Ta = 25°C

Item	Symbol	Standard Value			Unit	Applicable Terminal	Condition
		Min.	Typ.	Max.			
Forward Voltage	VF	-	2.0	2.2	V	-	IF=60 mA
Forward Current	IF	-	60	-	mA	-	
Reverse Current	IR	-	-	600	μA	-	VR=5.0V

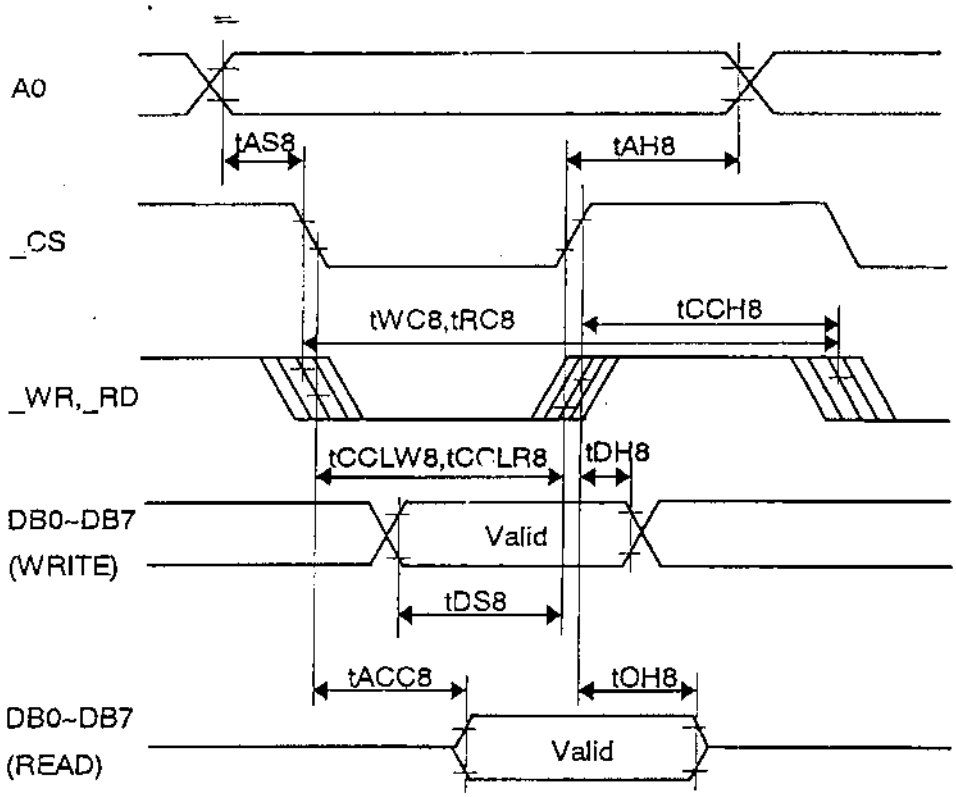


3.3 AC Characteristics

Ta = 0-50°C, VDD = 3.3±0.3V

Item	Symbol	Standard Value		Units	Condition
		Min.	Max.		
CS Setup Time	t_{AS8}	5	-	ns	
CS Hold Time	t_{AH8}	5	-	ns	
Write Cycle Time	t_{WC8}	1300	-	ns	Write
Read Cycle Time	t_{RC8}	300	-	ns	Status Read
Control Pulse Width	t_{cch8}	600		ns	Write
Control Pulse Width	t_{CCLW8} t_{CCLR8}	50 140	-	ns	Write Status Read
Data Setup Time	t_{DS8}	35	-	ns	
Data Hold Time	t_{DH8}	5	-	ns	
RD Access Time	t_{ACC8}	-	140	ns	
Output Disable Time	t_{OH8}	30	90	ns	

3.4 Timing Chart



- Rise time tr and Fall time tf of input wave form is the time within 15ns.
- All timing is determined on the basis of 20% or 80% of VDD-VSS.
- tCCLW8, tCCLR8 is the time overlapped by low level of _CS and low level of _WR, _RD.

4. FUNCTION SPECIFICATIONS

4.1 List of Commands

Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks	Data
Display ON/OFF	0	1	0	1	0	1	0	1	1	1	1	Display On	-
Control	0	1	0	1	0	1	0	1	1	1	0	Display Off	-
Sleep ON/OFF	0	1	0	1	0	0	1	0	1	0	1	Sleep On	-
Control	0	1	0	1	0	0	1	0	1	0	0	Sleep Off	-
Page Address Set	0	1	0	0	1	1	1	0	1	0	1		1 byte
Page Address	0	1	0	0	1	1	0	1	0	1	0	Normal	-
Direction Control	0	1	0	0	1	1	0	1	0	1	1	Reversed	-
Column Address Set	0	1	0	0	0	0	1	0	1	0	1		2 byte
Column Address	0	1	0	0	1	0	1	1	0	1	0	Increment	-
Direction Control	0	1	0	0	1	0	1	1	0	1	1	Decrement	-
Scan Direction	0	1	0	0	1	0	0	1	0	1	0	Page Direction	-
Control	0	1	0	0	1	0	0	1	0	1	1	Column Direction	-
Display Normal/	0	1	0	1	0	1	0	0	1	1	0	Display Normal	-
Invert Control	0	1	0	1	0	1	0	0	1	1	1	Display Inverted	-
Duty Register Set	0	1	0	1	0	1	0	1	0	0	0	—	-
n-Line Invert Set	0	1	0	1	1	0	0	1	0	1	0		1 byte
Pattern Register Set	0	1	0	1	1	0	0	1	1	0	0		1 byte
Individual Display OFF	0	1	0	1	0	1	1	0	1	0	0		1 byte
Clock Divide Register Set	0	1	0	1	0	1	1	1	1	1	1		1 byte
Volume Control	0	1	0	1	1	0	0	0	1	1	0		1 byte
Volume Register Read	0	1	0	1	0	1	1	0	1	1	0		1 byte
Initialize	0	1	0	0	1	0	1	0	1	1	0	Counter Clear	-
	0	1	0	0	0	0	0	1	0	1	0	Page Clear	-
	0	1	0	0	0	0	0	0	1	0	1	Column Clear	-
Return	0	1	0	1	0	1	1	1	1	1	0		-
Display Data Write	0	1	0	0	1	0	1	1	1	0	0		Data
Status Read	0	0	1	O7	O6	O5	O4	O3	O2	O1	O0		-
NOP	0	1	0	0	0	1	0	0	1	0	1		-
	0	1	0	0	1	0	0	0	1	0	0		-

4.2 Details of Commands

This module recognizes data bus signals according to the AO, _RD and _WR combination. Command interpretation and execution is done according to the internal timing only, not according to an external clock, so normally processing is at high speed without a busy check being necessary.

4.2.1 *Display ON/OFF Control* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
DON	0	1	0	1	0	1	0	1	1	1	1	Display On
DOFF	0	1	0	1	0	1	0	1	1	1	0	Display OFF

Forced control of full display ON/OFF is carried out by this command.
When the display is OFF, all driver outputs are fixed at VC (= V_{SS}).

4.2.2 *Sleep ON/OFF Control* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
SLPON	0	1	0	1	0	0	1	0	1	0	1	Sleep On
SLPOFF	0	1	0	1	0	0	1	0	1	0	0	Sleep OFF

The sleep status of the LCD module is controlled by this command.
Always input a display OFF command before starting this command, and execute it with the display turned off.
Also, always have the logic power supply hold 40 ms after sleep OFF in order to discharge the power supply IC's load.

4.2.3 *Page Address Set* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
PASET	0	1	0	0	1	1	1	0	1	0	1	
DATA	1	1	0				PA4	PA3	PA2	PA1	PA0	

This command and the data which follow it can be used to specify a page address corresponding to the row address when accessing display data RAM from the MPU. The desired bit in the display data RAM can be accessed by specifying the page address and column address. The page address has 5 bits and corresponds to 30 pages (pages 0-29). Even if the page address is changed, there is no change in the display status.

4.2.4 *Page Address Direction Control* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
PDNOR	0	1	0	0	1	1	0	1	0	1	0	Page Direction Normal
PDINV	0	1	0	0	1	1	0	1	0	1	1	Page Direction Reverse

This command can be used to reverse the page 0 position of a page address in the display data RAM.

Accordingly, if the MPU is handling display data in the page direction, the page address scan direction can be reversed.

The relationship between the internal RAM physical position and the page address changes.

4.2.5 *Column Address Set* (Command: 1 Data: 2)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
CASET	0	1	0	0	0	0	1	0	1	0	1	
DATA1	1	1	0				CA4	CA3	CA2	CA1	CA0	Lower Order 5 bits
DATA2	1	1	0				CA9	CA8	CA7	CA6	CA5	Higher Order 5 bits

This command and the data which follow it can be used to specify the column address when the display data RAM is accessed from the MPU. The desired bit in the display data RAM can be accessed by specifying the page address and column address. The column address has 10 bits and corresponds to up to 640 dots, but since this module has 320 dots (columns 0-319) in the horizontal direction, set CA9=0. Even if the column address is changed, there is no change in the display status.

The address value (CA0-CA9) is input in the order of lower order (higher order). If only the lower order data are input, and another command is input, the lower order data only are input to the register, but they are not loaded in the counter. Data are loaded in the counter when all the lower order and higher order data are present and the input contents are stored in the register.

4.2.6 *Column Address Direction Control* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
CAINC	0	1	0	0	1	0	1	1	0	1	0	Increment
CADEC	0	1	0	0	1	0	1	1	0	1	1	Decrement

This command can be used to specify operation (increment/decrement) of the column address counter.

Each time the display data RAM is accessed by the MPU, this address is incremented/decremented. In the case of the increment mode, the count operation is stopped by 27'9H (639) and in the decrement mode, it is stopped by 000H (0).

4.2.7 *Scan Direction Control* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
PDIR	0	1	0	0	1	0	0	1	0	1	0	Page Direction Scan
CDIR	0	1	0	0	1	0	0	1	0	1	1	Column Direction Scan

This command determines whether access of display data RAM by the MPU is done in the page direction or the column direction in the case of continuous access.

4.2.8 *Display Normal / Invert* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
DISNOR	0	1	0	1	0	1	0	0	1	1	0	Display Normal
DISINV	0	1	0	1	0	1	0	0	1	1	1	Display Invert

This command can be used to invert the display ON/OFF status without rewriting the contents of display data RAM. Since the entire screen is either normal or inverted, partial inversion cannot be done.

4.2.9 *Duty Register Set* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
DTYSET	0	1	0	1	0	1	0	1	0	0	0	
DATA	1	1	0			DT5	DT4	DT3	DT2	DT1	DT0	(The number of Display Line)/4-1
Ex. 1/200	1	1	0	0	0	1	1	0	0	0	1	

This command and the data which follow it set the display duty.
Data are expressed in 5 bits and the duty can be set in multiples of 4 within a range of 1/4 ~1/256 DUTY.
Data = (The number of Display Line)/ 4-1.

4.2.10 *n-Line Invert Set* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
LINSET	0	1	0	1	1	0	0	1	0	1	0	
DATA	1	1	0					LN3	LN2	LN1	LN0	

This command and the data which follow it set the number of lines inverted in the LCD module.
Normally, inversion of 11 lines is set. (LN3, LN2, LN1, LN0) = (1,0,1,0)

4.2.11 Pattern Register Set *(Command: 1 Data: 1)*

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
PATSET	0	1	0	1	1	0	0	1	1	0	0	
DATA	1	1	0							PT1	PT0	

This command and the data which follow it set the LCD module's pattern switching interval.
Normally, this is set at 01H. (PT1, PT0) = (0,1)

Correspondence between input data and the switching interval is as shown in the table below.

	8H	4H	16H	Field
PT0	0	1	0	1
PT1	0	0	1	1

Perception of jitter or flicker is changed by changing this setting.

4.2.12 *Individual DOFF Set* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
DVDSET	0	1	0	1	0	1	1	0	1	0	0	
DATA	1	1	0					DV3	DV2	DV1	DV0	

This command and the data which follow it can be used to control the LCD module's display ON/OFF for each driver.

DV1=1: Display left half display ON DV1=0: Display left half display OFF
DV0=1: Display right half display ON DV0=0: Display right half display OFF
DV3 and DV2 are disregarded in this module.

4.2.13 *Clock Divide Register Set* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
CKSET	0	1	0	1	0	1	1	1	1	1	1	
DATA	1	1	0							CK1	CK0	

This command and the data which follow it set the clock divide ratio which is the basis for timing signals for LCD module display.

By setting this module's divide ratio=2 (CK1, CK0) = (0, 0), the frame frequency becomes approximately 60Hz.

Correspondence between the input data and the divide ratio is shown in the following table.

	2	1	4	8
CK0	0	1	0	1
CK1	0	0	1	1

4.2.14 *Volume Control* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
VOLCTL	0	1	0	1	1	0	0	0	1	1	0	
DATA	1	1	0				VC4	VC3	VC2	VC1	VC0	

This command and the data which follow it set the 5-bit data which adjust the LCD module's contrast.

At (VC4, VC3, VC2, VC1, VC0) = (0, 0, 0, 0, 0), the voltage for LCD becomes Min.

At (VC4, VC3, VC2, VC1, VC0) = (1, 1, 1, 1, 1), the voltage for LCD becomes Max.

32 levels of adjustment are possible.

4.2.15 *Volume Register Read* (Command: 1 Data: 1)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
VOLRD	0	1	0	1	0	1	1	0	1	1	0	
DATA	1	0	1				VC4	VC3	VC2	VC1	VC0	

This command causes the volume set bit to be read out to the data bus.

Execute the read operation after inputting the command.

4.2.16 *Initialize* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
CNTCLR	0	1	0	0	1	0	1	0	1	1	0	Counter Clear
PCCLR	0	1	0	0	0	0	0	1	0	1	0	Page Counter Clear
CCCLR	0	1	0	0	0	0	0	0	1	0	1	Column Counter Clear

This command is used to clear the contents of the page counter, page register, column counter and column register and set them at 0.

CNTCLR: Resets the page counter, page register, column counter and column register all to 0.

PCCLR: Loads the register value into the page counter.

CCCLR: Loads the register value into the column counter.

4.2.17 *Return* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
RETURN	0	1	0	1	0	1	1	1	1	1	0	

This command is used to set the counter in the increment direction to the set value and increment the counter in the fixed direction (+1).

4.2.18 *Display Data Write* (Command: 1 Data: Write Data Count)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
MWRITE	0	1	0	0	1	0	1	1	1	0	0	
DATA	1	1	0	D7	D6	D5	D4	D3	D2	D1	D0	

This command changes the status to the data entry status when the MPU is writing data to the display memory.

By writing data after this command, the contents of display data RAM can be rewritten. Data write is canceled automatically when another command is input.

4.2.19 *Status Read* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
STREAD	0	0	1	ST7	ST6	ST5	ST4	ST3	ST2	ST1	ST0	

The LCD driver's internal operating state can be monitored by this read operation.

In the RAM busy state (1), no signals other than status read will be received. In the normal use state, it is not necessary to see the RAM busy state if the cycle time is kept.

ST7:	BUSY	RAM	Busy: 0	Ready: 1
ST6:	PADIR	Page Address Direction	Normal: 1	Inverted: 0
ST5:	CADIR	Column Address Direction	Normal: 1	Inverted: 0
ST4:	INC_DIR	Increment Direction	Column: 1	Page: 0
ST3:	ON/OFF	Display Status	OFF: 1	ON: 0
ST2:	SLEEP	Sleep Status	Sleep: 1	Sleep OFF: 0
ST1:	INVERT	Display Status	Normal: 1	Inverted: 0
ST0:	High	Reserved Terminal		

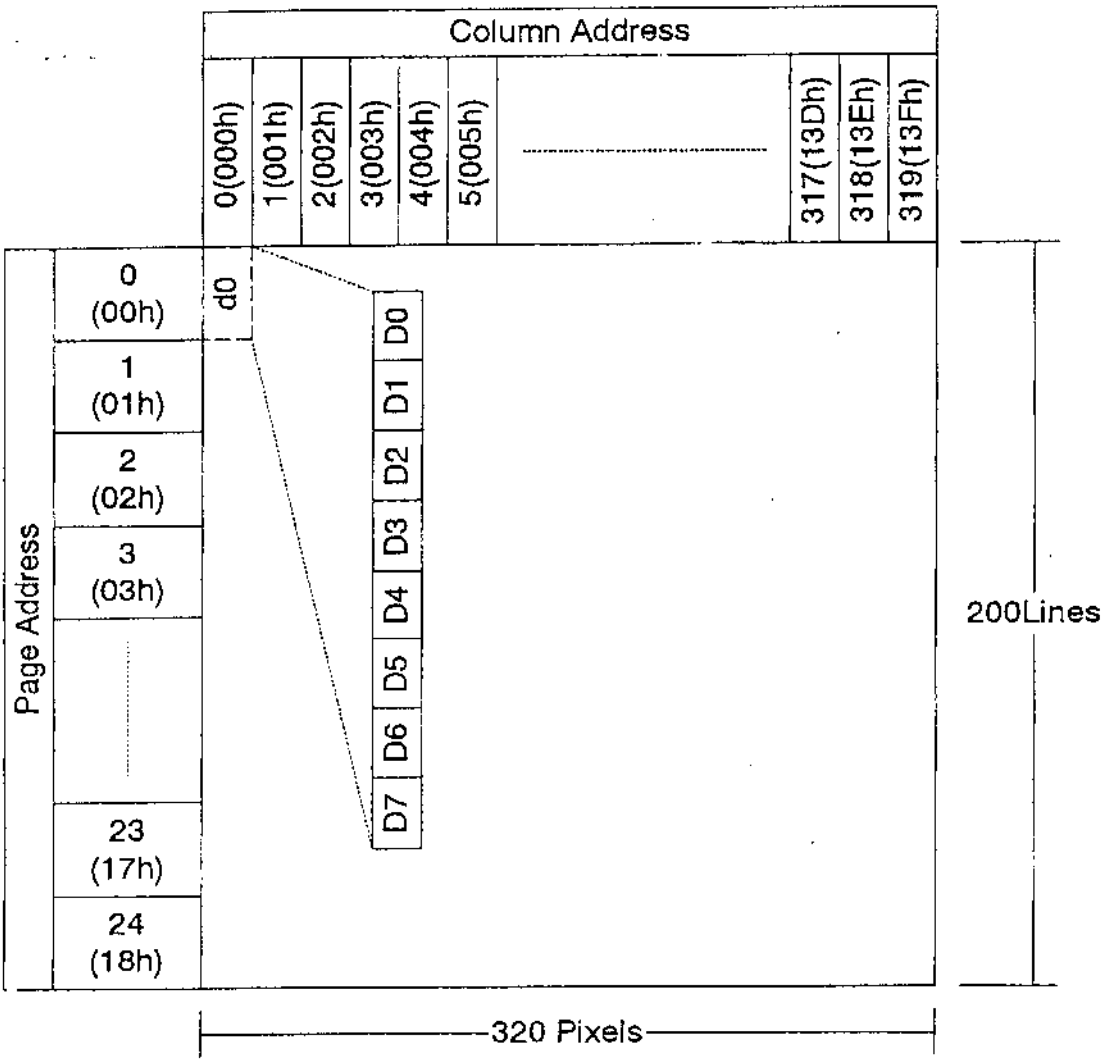
4.2.20 *NOP (Non-operation)* (Command: 1 Data: 0)

	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
NOP1	0	1	0	0	0	1	0	0	1	0	1	
NOP2	0	1	0	0	1	0	0	0	1	0	0	

This command has no effect on operation.

4.3 Relationship between Data and the Screen

Page address : normal direction



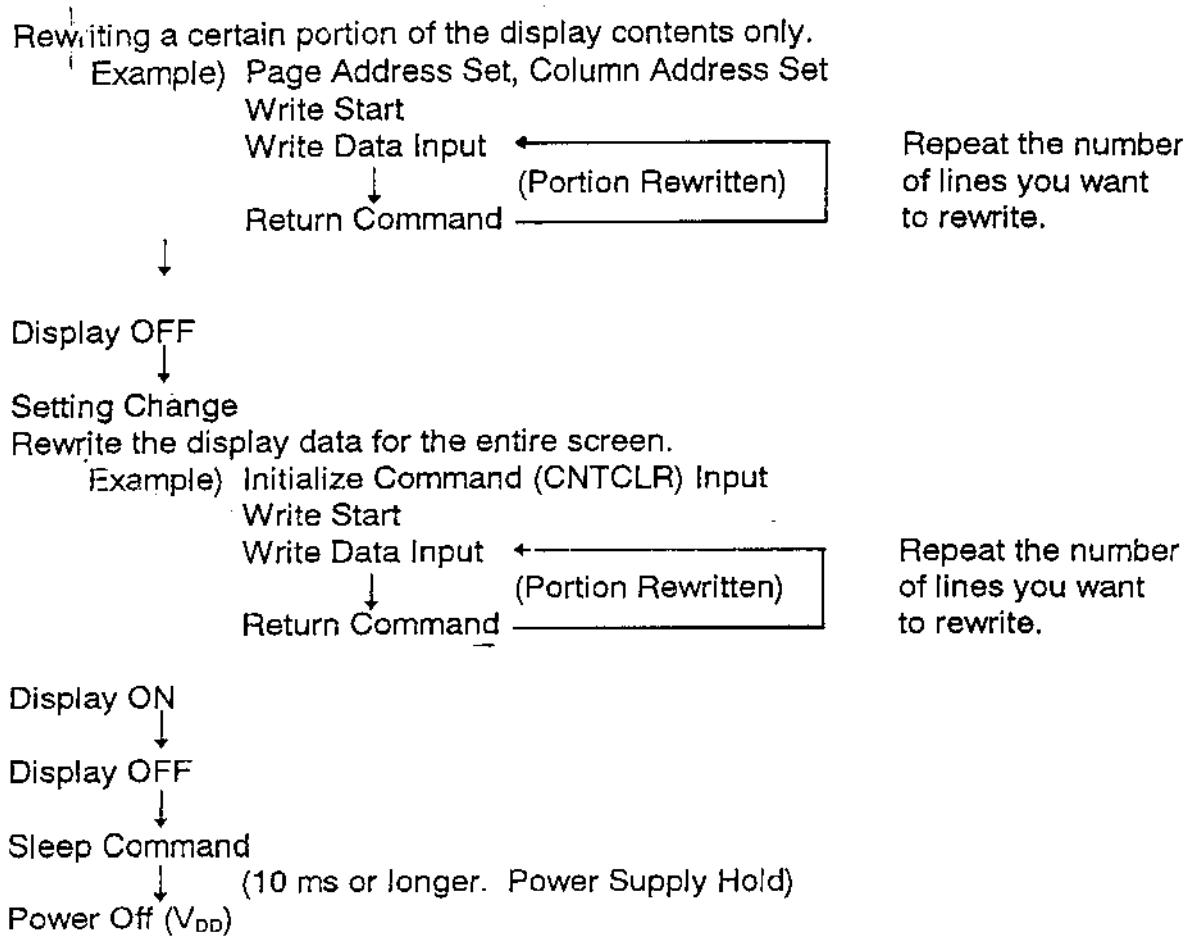
4.4 Example of Actual Use

The method of using commands is explained using an example of actual use.

During Power ON
VDD Power Supply Input
↓
Be sure to execute power on reset. The default settings during reset are as shown below.

Sleep ON/OFF Status	Sleep ON
Display ON/OFF Status	Display OFF (Individual DOFF is not set.)
Display Normal/Invert	Normal
Drive Duty	1/240 Duty
n-Line Invert	11 Line Invert
Page Address Register	00h
Column Address Register	000h
Page Address Direction	Normal
Column Address Direction	Increment
Scan Direction	Column Direction
Pattern	8 Selection Intervals
Volume Control Bit	00h
Clock Divide Ratio	2

↓
Input the command that you want to change the setting for.
Example) Drive Duty: 1/200 Duty
Page Address Direction: Reversed
Increment Direction: Page Direction
↓
Cancel sleep.
↓
Input display data.
Example) Write Start
Write Data Input ← (Write one line of data continuously.)
↓
Return Command
Repeat the number of lines you want to display.
↓
Display ON (after canceling sleep, hold 40 ms or longer in the display OFF state.)
↓



4.4.1 Cautions

1) It is recommended that the display be turned OFF when rewriting full screen data.
2) If rewriting data to portions only, do not rewrite the data for the same address to one frame repeatedly (approx. 60 Hz).
3) Obey the proper sequence for sleep and display ON/OFF.
4) The following 3 commands only may effect the display due to noise:
   - Display ON/OFF
   - Display Normal/Inverted
   - Sleep ON/OFF

   If noise occurs in any case, input the above 3 commands periodically. Also, when inputting data, input the data after setting the address without using the Return command.

5. OPTICAL CHARACTERISTICS

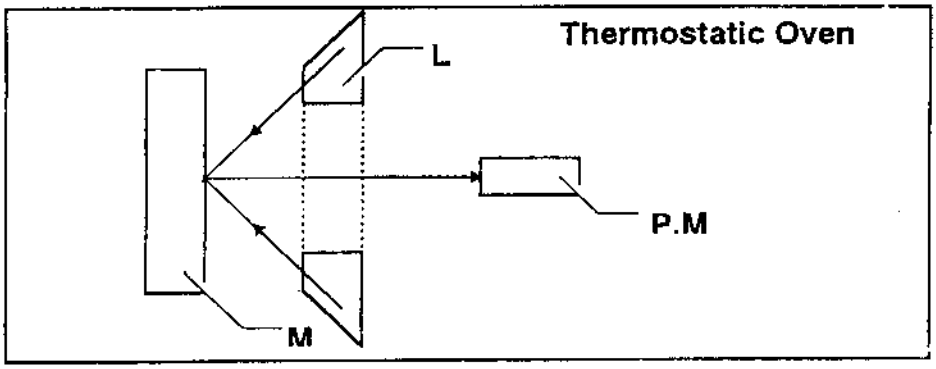
5.1 Optical Characteristics[Δ1]

Item	Symbol	Temp (°C)	Standard Value			Unit	Remarks
			Min.	Typ.	Max.		
Contrast Control Voltage	-	25	08h	-	16h		VDD=3.3V
Response Speed	t_r	0	-	400	600	ms	
		25	-	150	230		
	t_f	0	-	1000	1500		
		25	-	350	530		
Contrast Ratio	K	25	4.0	7.0	-		reflective

Due to manufacturing variations, LCD module have its own unique value which is within the specified range. Contrast Control Voltage should be adjusted by each LCD Module.
The contrast ratio will vary when changing the VDD value because of characteristics of this LCD module.

5.2 Definition of Optical Characteristics

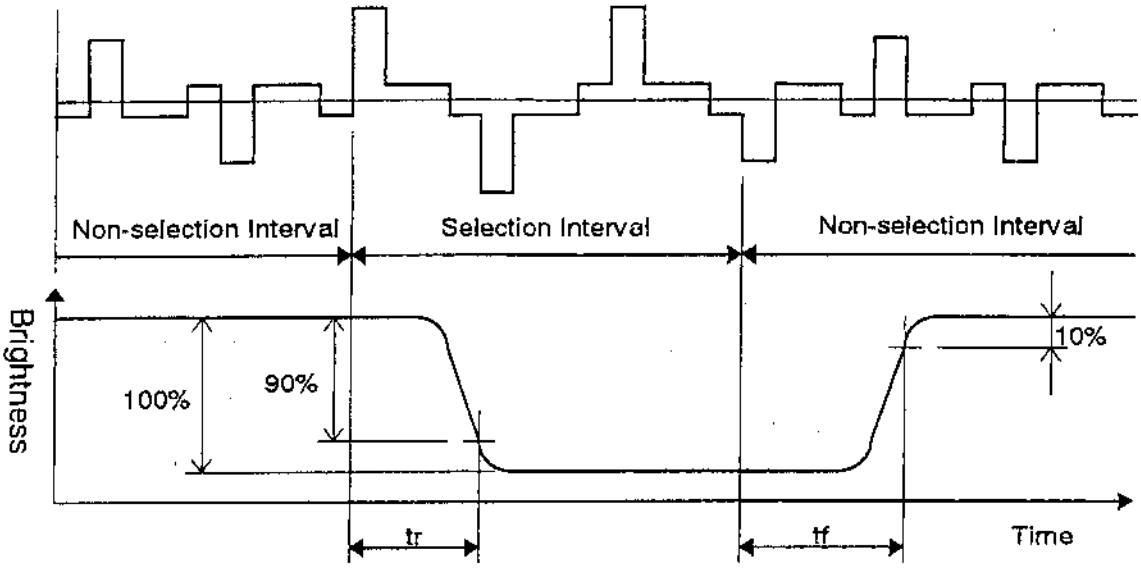
5.2.1



L : Light Source (Circular Halogen lamp)
P.M : Light Meter Sensor
M : Module

[Device Standard and Measuring Conditions]
- Light Meter : Canon LC-3S
  Brightness Measuring Spot Diameter: ϕ2mm

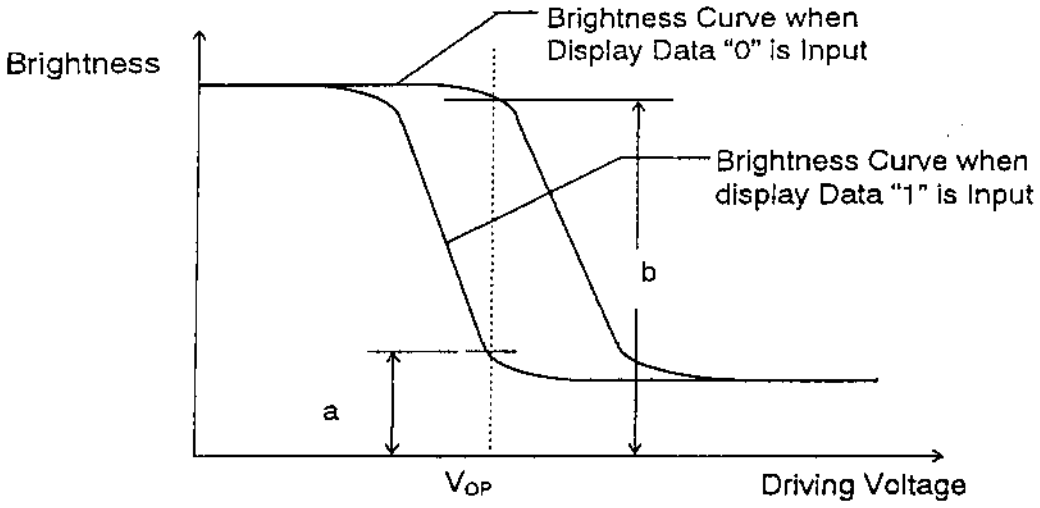
5.2.2 Definition of Response Time



[Measuring Conditions]

- V_{OP} = Proper Voltage at Each Operating Temperature
- θX = θY = 0°

5.2.3 Definition of Contrast Ratio



[Measuring Condition]

$$\text{Contrast Ratio} = \frac{\text{Brightness Curve when Display Data "0" is Input} \quad b}{\text{Brightness Curve when Display Data "1" is Input} \quad a}$$

- V_{OP} = Proper Voltage at Each Operation Temperature
- θX = θY = 0°

6. RELIABILITY

6.1 Contents of Reliability Test

No	Test Item	Test Content	Conditions
		Environment Test	
1	High Temperature Storage	Judges the endurance to heat when stored for long periods at high temperatures.	70°C 200 H
2	High temperature Operation	Judges the endurance to electrical stress (voltage, current) and thermal stress applied to the element for long periods.	50°C 200 H
3	High Temperature and Humidity Storage	Judges resistance in the case of storage for long periods at high temperatures and high humidity.	50°C 90 %RH 200 H
4	High Temperature and High Humidity Operation	Judges resistance to electrical stress (voltage, current) and thermal and humidity stress applied to the element for long periods.	40°C 90 %RH 200 H
5	Thermal Shock	Judges resistance in the case of exposure to low and high temperatures. -20°C → 25°C → 70°C → 25°C (30min) (within 10sec) (30min) (within 10sec)	-20°C / 70°C 10 cycles
		Mechanical Test	
6	Packing Vibration	Judges the resistance of the product to vibrations received when the package is shipped in the packaged condition.	10-500 Hz 2.0mm p-p max. 3.0Gmax 0.5H for X, Y directions. 1.0 H for Z direction.
7	Package Dropping	Judges the endurance of the product to impacts received when the package is shipped in the packaged condition.	Drop the box from 55cm height. 1 corner, 3 ridges, 6 surfaces. 1 time per each direction.

*1) There should be no condensation occur during the test.
*2) Operating condition for operating test:
Power supply voltage for logic system(VDD)=3.3V(typical value)

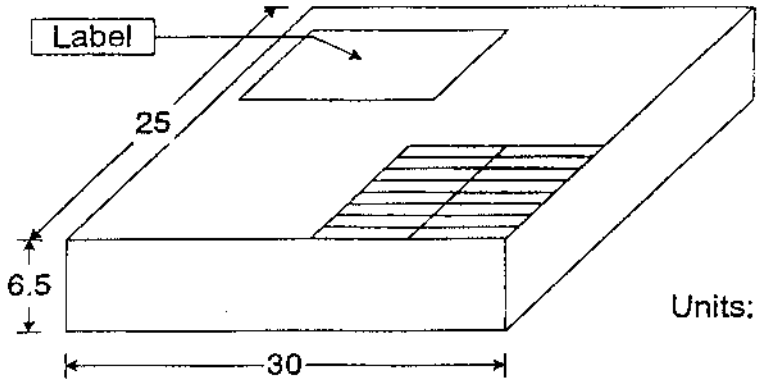
6.2 Failure Judgment Criterion

After the above-mentioned test
1) There should not exist conspicuous failure of display quality and appearance. Contrast ratio should be 50% of the initial contrast ratio.
2) There should not have any abnormality of functions.

7. PACKAGE SPECIFICATIONS

7.1 Inner Carton Box

The LCD module is packed singly in an anti-static bag, then 45 units are packed in a small packing case.



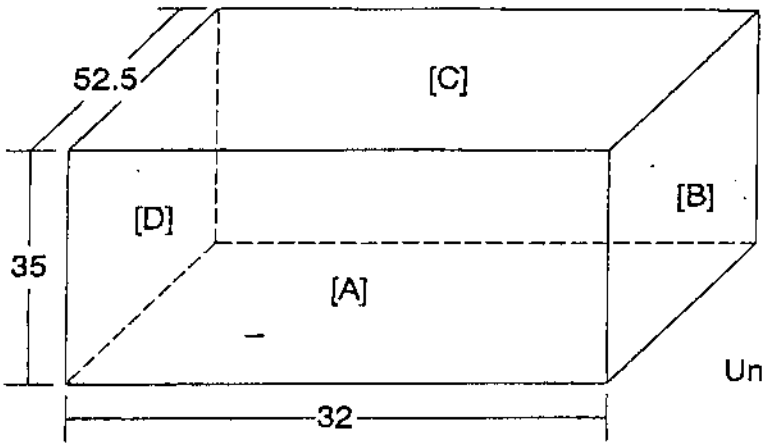
Units: cm

Model	EG7504C-RS
Q'ty	45 pcs
Lot	Lot No.
EPSON SEIKO EPSON CORP. LIQUID CRYSTAL DISPLAY DIVISION	

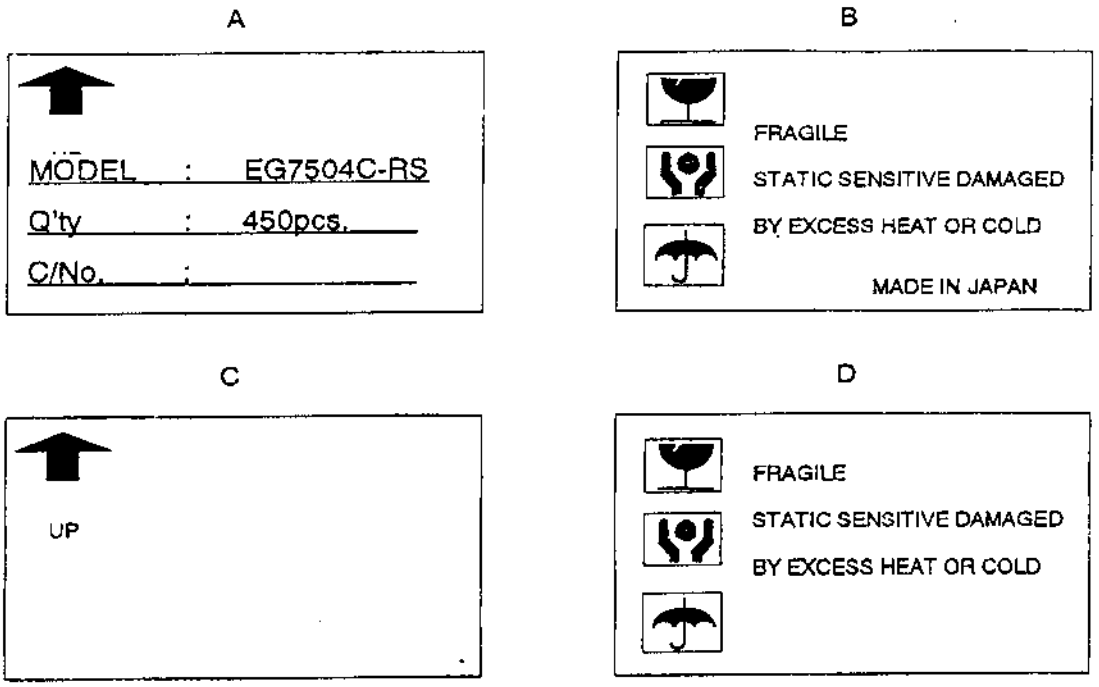
Label Display Contents

7.2 Master Carton Box

A master carton box is a case for containing the shipping units to the customer.
10 small cases (packed in 5 layers of 2 cases each) make a large case.
Labels are affixed on Sides A, B, C and D which display the respective contents.



Master Carton Box Dimensions



Display Contents on Each Side

8. PRECAUTIONS FOR USE OF LCD MODULE

8.1 Handling Precautions

1) The display panel is made of glass, so do not subject it to strong mechanical impacts such as dropping from a high place.
2) In the event that a display panel is damaged and the liquid crystal inside leaks out, do not attempt to suction it up or blot it up. If the liquid crystal material gets on your skin or clothing, wash it immediately with soap and water, then rinse thoroughly.
3) If pressure is applied to the LCD module's display surface or around the edges, it will cause discoloration, so be careful not to apply any undue force to it.
4) Since the polarizing plate covering the LCD module's display surface is soft and extremely easy to scratch, use caution in handling at all times.
5) If the LCD module's surface becomes dirty, breathe on it, then wipe lightly with a soft, dry cloth. If the dirt is hard to remove, wipe lightly with a soft cloth dipped in one of the following solvents.
   - Isopropyl alcohol
   - Ethyl alcohol

   Any solvent other than the above may possibly penetrate the polarizing plate. In particular, do not use the following solvents.
   - Water
   - Ketone
   - Aromatic Solvents
6) When packaging the LCD module, be sure to do so in such a way that no strain such as twisting or bending is applied to the LCD module. Strain has an effect on the screen display. Also be sure that the case has sufficient rigidity.
7) When packaging the LCD module, do not pull or bend the I/O cables unduly.
8) If the LCD module's TAB is touched, there is a possibility that display abnormalities could develop and the module may not recover. Do not touch the TAB.
9) Do not disassemble or machine the LCD module.
10) Do not make any connections to the NC terminal.
11) Do not apply an input signal when no logic circuit power supply is connected.
12) To prevent destruction of the element from static electric discharge, take adequate precautions in the working environment.
    - Be sure to use a human body ground when handling the LCD module.
    - Be sure to ground soldering irons and other tools needed for assembly.
    - In order to reduce the generation of static electricity, avoid working in a dry environment.
    - A protective film has been affixed to the LCD module to protect the surface (depending on the model, there are some modules to which this protective film is not affixed). When peeling off the protective film, static electricity will be generated, so exercise caution.
13) Some models of LCD module which can be touched have a protective film affixed to the front and back surface of the display panel. Be sure to peel these films off before assembly.

14) If the power is turned on when there is condensation or when the humidity is high, electrodes will become corroded, so exercise caution.
15) Be careful when treating the glass because it has very sharpened edge.

8.2 Storage Precautions

1) When storing the LCD module, avoid exposure to light such as direct sunlight and fluorescent lights, and avoid storage in environments with high temperatures and humidity or low temperatures (0°C or lower). Also, store it in the anti-static bag (it is recommended that it be stored in the packaging originally used by this company). During storage, be careful that there are no water drops or condensation forming on the modules' packaging.
2) If the power is turned on when there are drops of water present, water vapor condensing or the humidity is high, electrodes will become corroded, so exercise caution.

8.3 Design Precautions

1) The absolute maximum ratings are rating values which must not be exceeded in the LCD module. If these values are exceeded, the module's characteristics may not be recovered.
2) To avoid malfunction due to noise, the V_{IL} and V_{IH} specification values should be satisfied. Also give consideration to shortening the signal line cables, etc.
3) A liquid crystal elements is dependent on temperature. Recognition of the display's contents becomes difficult when used at temperatures outside the operating temperature range, so be sure to use it at temperatures within the operating temperature range. Also, the voltage required for display changes with the temperature, so exercise caution.
4) If the ON/OFF sequence is not adhered to, the resulting electrochemical reaction inside the liquid crystal panel will cause the display quality to deteriorate rapidly. Always be sure to follow the ON/OFF sequence faithfully.
5) It is recommended that an over-current prevention device (current fuse, etc.) be provided in the power supply line. (Recommended Value: 0.5A)
6) Exercise adequate precautions against mutual noise interference with peripheral devices.
7) Concerning EMI, please basically, countermeasures should be taken at the set (output side).
8) When fastening the LCD module,
   - For modules with installation holes, use the installation holes provided.
   - For models enclosed in a plastic case, fasten the module at the surrounding plastic case.

8.4 Others

1) At low temperatures (below the storage temperature range), liquid crystal may congeal and faulty orientation or air bubbles (black or white in color) may develop. Air bubbles may also occur if a strong impact is applied to the module under low temperature conditions.

2) If an LCD module is operated for long periods of time, particularly in cases where it is operated for long periods with the same screen display, the display pattern may remain as an after-image, or a slight contrast non-uniformity may develop, but if operation is stopped and it is permitted to discharge, it will return to its original state. There is also no problem with reliability.

3) In order to protect the LCD module from performance drops due to static electric discharge, etc., be careful not to tough the following parts as much as possible during handling:
   - Terminal electrode.
   - Parts where patterns are printed, such as the PCB.

4) Generally the characteristics of semiconductor device will be changed by irradiating the light. This may cause uncertain operation for IC.
   - Please ensure that there is enough shading for the light before designing or assembling the product.
   - Please ensure that there is also enough shading for light in the inspection process.

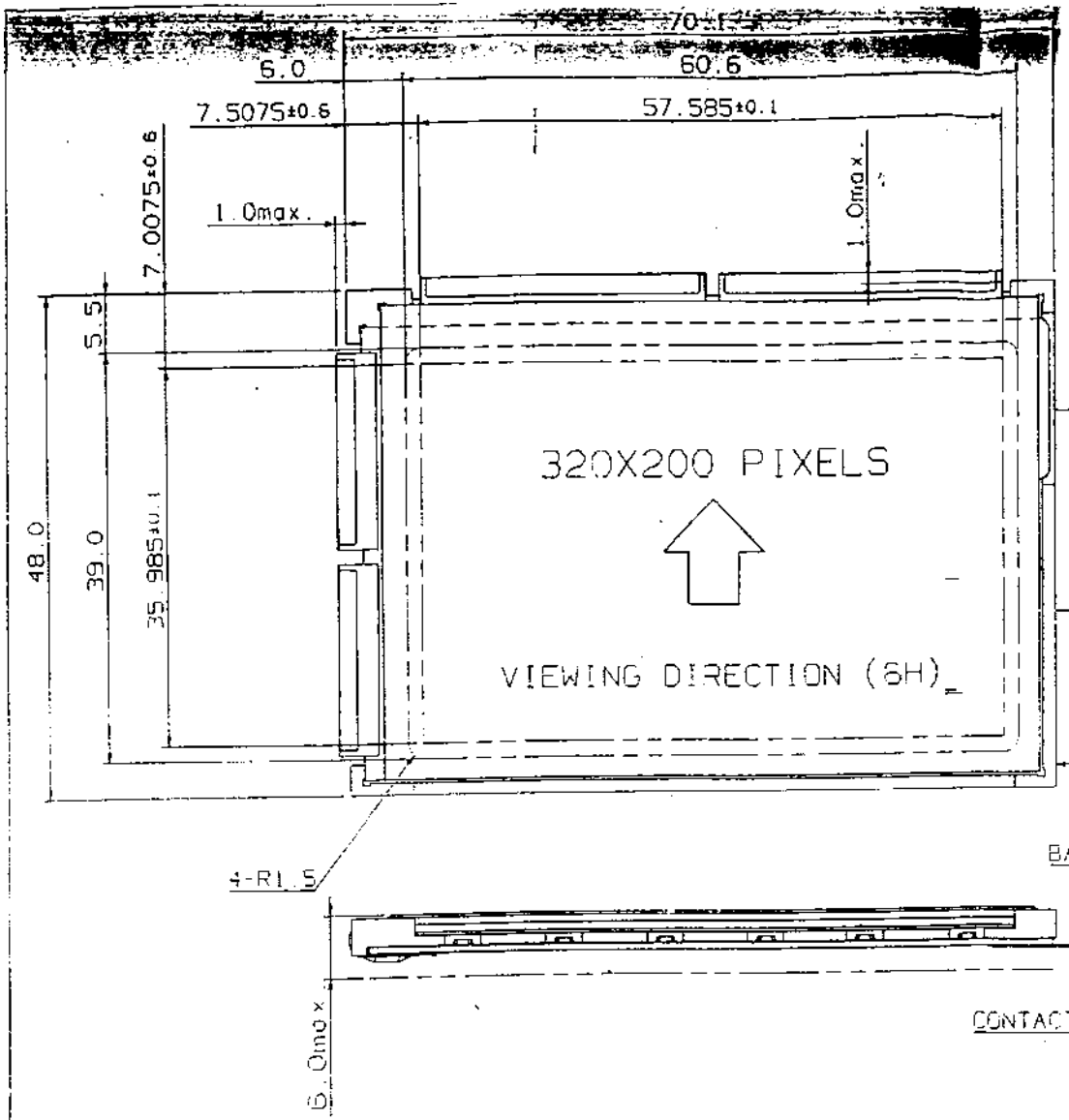
5) In state of self-refresh mode the display data is kept, however that data will be easily changed by external noise. Please reduce the noise level of the product or system so that influence to the module is kept at minimum.

6) To cope with unexpected noise, periodic refresh operation such as setting the command and sending the display data is recommend.

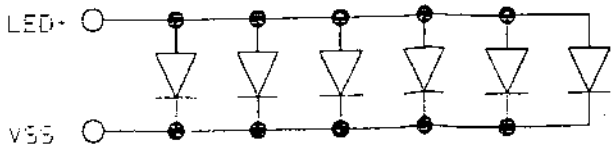
7) Please design the product so that dust or particle can not easily get into the LCD Module because there is a gap between LCD panel and LED B/L due to the structure of LCD Module.

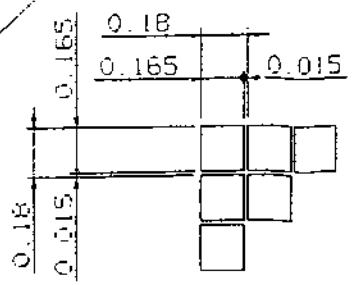
8) Optimum voltage to obtain best contrast value depending on products. Therefore voltage adjustment with electric volume is required in each display.

9) When disposal of LCD module, ask specialization company of industrial waste which is permitted by the government. When burn up LCD module, obey the law of environmental hygienics.



I/F CONNECTOR	
1	VDD
2	LED+
3	VSS
4	VSS
5	_RESET
6	_CS
7	_RD
8	_WR
9	A0
10	VSS
11	DB0
12	DB1
13	DB2
14	DB3
15	DB4
16	DB5
17	DB6
18	DB7





PIXELS DETAIL
(SCALE=50:1)

NOTES

1. A : P1.0x(18-1)=17.0±0.1
2. MODULE HEIGHT : 6.0mm MAX.
3. LED : Vf=2.0V, If=60mA
4. Cross point and cosmetic imperfection will be allowed outside the V.A(Viewing Area)

E			
D			
C			
B			
A			

MODEL: EG7504C-R6

TITLE: OUTWARD DWG.

DWG NO: SD-020275

SCALE	UNIT	TOL.	DATE
2/1	mm	±0.5	1999/08/03

VCR	CHIEF	CHECK	DRAWN
Ueda	Yoshida		M. MOMOSE