LM64032 Additional Info

The Datasheet only gives pinout information for a 10 Pin
connector which is in the centre of the LCD   Pcb.
My LCD actually has a 2nd connector which is a 14
Pin this is how the two connectors relate.

14 Pin Conn	10 Pin Conn
1	N/C
2	1
3	2
4,7,14	4
5	3
6,8	5
9	6
10	7
11	8
12	9
13	10

Simon Hampton (23-06-99)

www.DataSheet.in

PREPARED BY:	DATE			

SHARP

ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPEC No.	LC 62921 A
FILE No.	
ISSUE	Sep. 5. 1987
PAGE	Pages

REPRESENTATIVE DIVISION

☐ SEMICONDUCTOR APPLICATION DIV.
☒ LCD DIV.
☐ ELECTRONIC COMPONENTS DIV.
☐

APPROVED BY: DATE

SPECIFICATION

DEVICE SPECIFICATION FOR

640 X 200 Dot
    Graphic LCD Unit

MODEL No.

LM64032B

www.DataSheet.in

☐ CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED
BY *H. Nakajima*

H. Nakajima
Department General Manager
Engineering Department 1
LCD Division
ELECOM Group
SHARP CORPORATION

| MODEL No.	PAGE
LM 64032 B	1

SHARP

1. Application

This data sheet is to introduce the specification of the Dot-Matrix LCD Unit
LM 64032B

2. Construction and Outline

Construction : 640 X 200 full dot graphic display unit consisting of an
LCD panel ,PWB(printed wiring board) with electric components
mounted onto,TAB(tape automated bonding) to connect
the LCD panel and PWB electrically, and plastic
chassis and bezel to fix them mechanically.
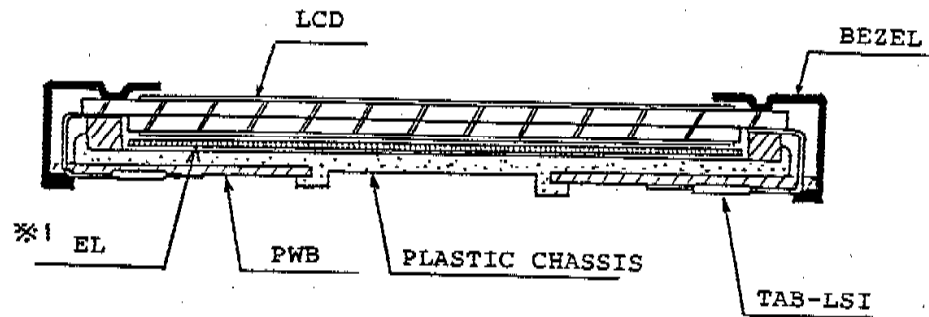
Outline: See Fig. 8
Connection: See Fig. 8 and Table 6
There shall be no scratches,chips,stains,distortions and other external
drawbacks that may affect the display function.
Rejection criteria shall be noted in Inspection Standard S-U-006 .
(*1)Three types of EL backlight are available as optional;

    LFOB   (White)
    LFOB   . (Blue-green)
    LFOB   (Green)

    For each model,refer to the separate specification please.

MODEL No.	PAGE
LM64032B	2

SHARP

3. Mechanical Specifications

<u>Table 1</u>

Parameter	Specifications	Unit
Outline dimensions * 1	256(W) x 128(H) x 12(D Max)	mm
Effective viewing area	223.97(W) x97.97(H)	mm
Display format	640 (W) x200(H) full dots	—
Dot size	0.32(W) x0.46(H)	mm
Dot spacing	0.03	mm
Dot color * 2	WHITE	—
Background color * 2	DARK BLUE	—
Weight	Approx. 320	g

* 1 Excluded the mounting tab. (See Fig.8)

* 2 Due to the characteristics of the L C Material,the colors vary with environmental temperature.

4. Absolute Maximum Ratings

4-1. Electrical Absolute Maximum Ratings

<u>Table 2</u>

Parameter	Symbol	Min.	Max.	Unit	Remark
Supply voltage (Logic)	$V_{DD}-V_{SS}$	0	6.0	V	Ta = 25°C
Supply voltage (LCD drive)	$V_{DD}-V_{EE}$	0	31.5	V	Ta = 25°C
Input voltage	V_{IN}	0	V_{DD}	V	Ta = 25°C

MODEL No.	PAGE
LM64032B	3

SHARP

4-2.   Environmental Conditions   Table 3

Item	Tstg		Topr		Remark
	MIN.	MAX.	MIN.	MAX.	
Ambient temperature	−25°C	+60°C	0°	+45°C	Note 4
Humidity	Note 1		Note 1		No condensation
Vibration	Note 2		Note 2		3 directions (X/Y/Z)
Shock	Note 3		Note 3		6 directions (±X/±Y/±Z)

Note 1)   Ta ≦ 40°C ..... 95% RH Max
          Ta > 40°C ..... Absolute humidity shall be less than Ta = 40°C/
                          95% RH.

Note 2)   Frequency: 10 ∿ 55Hz
          Vibration width: 1.5mm
          Interval: 10Hz ∿ 55Hz ∿ 10Hz
                          (1 min)
                  2 hours for each direction of X/Y/X (6 hours as total)

Note 3)   Accerelation: 50G
          Pulse width: 11ms
          3 times for each direction of ±X/±Y/±Z.

Note 4)   Care shoud be taken so that the LCD Unit
          may not be exposed the temperature ranges out of
          this specifications.

MODEL №	PAGE
LM 64032 B	4

SHARP

5. Electrical Specifications

5-1. Electrical characteristics

Table 4

Ta = 25°C. V_{DD} – 5V ± 5%

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Supply voltage (Logic)	$V_{DD}-V_{SS}$			4.75	5.0	5.25	V
Supply voltage (LCD drive)	$V_{EE}-V_{SS}$	Note		-26.2	-21.1	-14.6	V
Input signal voltage	V_{IN}	"H" level		$0.8V_{DD}$		V_{DD}	V
		"L" level		0		$0.2V_{DD}$	V
Input leakage current	I_{IL}	"H" level				20	μA
		"L" level		-20			μA
Supply current (Logic)	I_{DD}	V_{EE} = -21.1V			26.5	33	mA
Supply current (LCD drive)	I_{EE}	V_{DD} = 5V, Frame frequency =60Hz display high frequency pattern			19	23.5	mA
Power consumption	P_d				534	661	mW

Note) The viewing angle θ where obtains the maximum contrast can
be set by adjusting above $V_{EE} - V_{SS}$. Refer to Fig. for
the difinition of θ.
Max.   and   Min.   values are specified as the Max.
and Min. voltage within the condition of operational
temperature range(0℃～45℃).
Typ. values are specified as the typical voltage at
25℃.

5-2. Input capacitance

Table 5

Signal	Input capacitance
S	40 pF TYP
CP_1	110 pF TYP
CP_2	90 pF TYP
$D_0 \sim D_3$	90 pF TYP
	pF TYP
	pF TYP

MODEL №	PAGE
LM64032B	5

SHARP

5-3. Interface signals

Table 6

Pin No.	Symbol	Description	Level
1	S	Scan start-up signal	"H"
2	CP_1	Input data latch signal	H → L
3	CP_2	Data input clock signal	H → L
4	V_{DD}	Power supply for logic and LCD (+)	-
5	V_{SS}	Ground potential	-
6	V_{EE}	Power supply for LCD (-)	-
7	D_0		
8	D_1	Display data signal	H(ON), L(OFF)
9	D_2		
10	D_3		

Used connector: FFC (P 1.25)

MODEL No.	PAGE
LM64032B	6

SHARP

Fig1 Dot Chart of Display Area
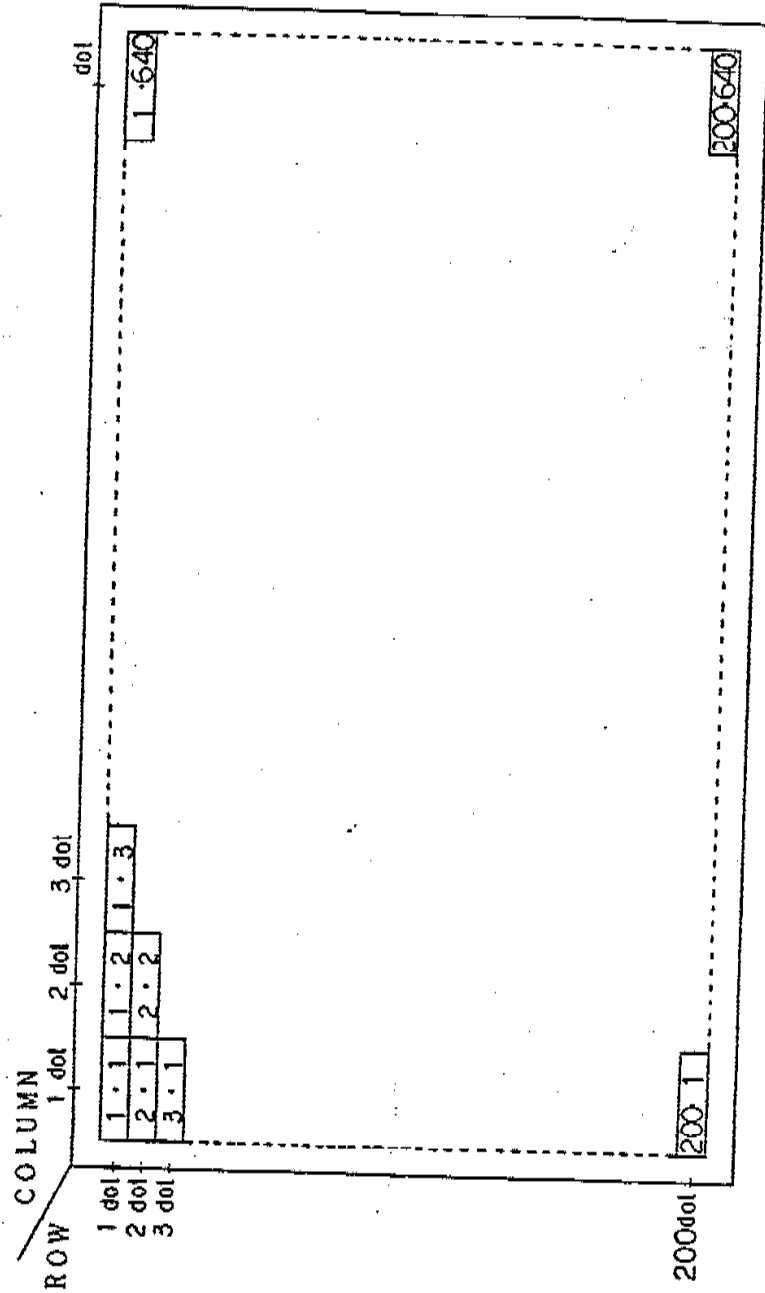
Note: 1 · 2 means 1st row 2nd column dot.

MODEL № LM 64032 B   PAGE 7

Fig.2 Data Input Timing

MODEL №	PAGE
LM64032B	8

Fig.3   Interface Timing Chart

$V_{IH} = 0.8V_{DD}$

$V_{IL} = 0.2V_{DD}$
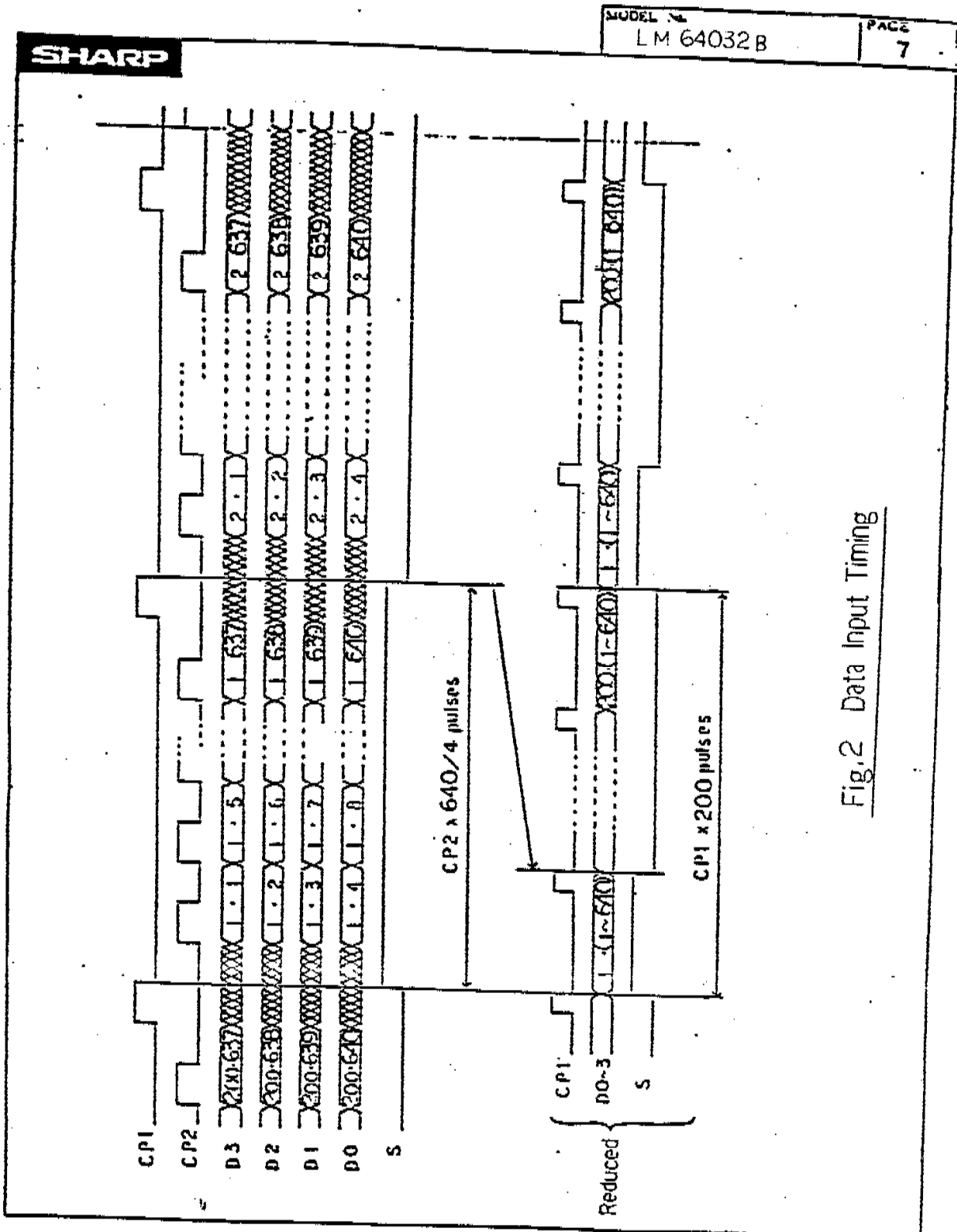
MODEL №	PAGE
LM64032 B	9

Table 7 Interface timing ratings

Item	Symbol	Rating MIN.	Rating TYP.	Rating MAX.	Unit
Frame cycle	TFRM	13.69		20.40	ms
CP₂ clock cycle	TCP2	400			ns
"H" level clock width	tCWH	145			ns
"L" level clock width	tCWL	145			ns
"H" level latch clock width	tLWH	130			ns
Date set up time	tSU	70			ns
Date hold time	tH	50			ns
CP₂↑ clock allowance time from CP1↓	tS12	0			ns
CP₁↑ clock allowance time from CP2↓	tS21	0			ns
Clock rise/fall time	tr,tf			50	ns

MODEL No.	PAGE
LM64032B	10 -

SHARP

6. Unit Driving Method

6.1 Circuit Configuration

Fig. 7 shows the block diagram of the Unit's circuitry.

6.2 Display Face Configuration

The display face electrically consists of two (upper and lower) display segments so that the unit may offer higher contrast by reducing drive duty ratio. Each display segment (640 x 200 dots) is driven at 1/200 duty ratio.

6.3 Input Data and Control Signal

The LCD driver is 80 bits LSI, consisting of shift registers, latch circuits and LCD driver circuits.

Display data which are externally divided into data for each row (640 dots) will be sequentially transferred in the form of 4-bit parallel data through shift registers by Clock Signal CP_2 from the left top of the display face.

When data of one row (640 dots) have been inputted, then latched in the form of parallel data for 640 lines of signal electrodes by Latch Signal CP_1. Then the corresponding drive signal will be transmitted to the 640 lines of column electrodes of the LCD panel by the LCD drive circuits.

At this time, scan start-up signal S has been transferred from the scan signal driver to the 1st row of scan electrodes, and the contents of the data signals are displayed on the 1st rows of upper and lower half of the display face according to the combinations of voltages applied to the scan and signal electrodes of the LCD. While the 1st rows of data are being displayed, the 2nd rows of data are entered. When 640 dots of data have been transferred then latched on the falling edge of CP_1 clock, the display face proceeds to the 2nd rows of display.

Such data input will be repeated up to the 200th row of each display segment, from upper to lower rows, to complete one frame of display by time sharing method. Then data input proceeds to the next display face.

Scan start-up Signal S generates scan signal to drive horizontal electrodes.

The unit shall be driven at the speed of 50 -60Hz/frame to avoid flickering.

Since DC voltage, if applied to LCD panel, causes chemical reaction which will deteriorate LCD panel, drive waveform shall be inverted at every display frame to prevent the generation of such DC voltage. Control Signal M plays such role.

MODEL No.	PAGE
LM64032B	11

SHARP

Because of the characteristics of the CMOS driver LSI, the power
consumption of the unit goes up as the operating frequency CP_2
increases. Thus the driver LSI applies the system of transfer-
ring 4-bit parallel data through the 4 lines of shift registers
to reduce the data transfer speed CP_2. Thanks to the LSI, the
power consumption of the unit will be minimized.

In this circuit configuration, 4-bit display data shall be
therefore inputted to data input pins of D_{0-3}.

Furthermore the LCD unit adopts bus line system for data input to
minimize the power consumption. In this system data input terminal
of each driver LSI is activated only when relevant data input is
fed.

Data input for column electrodes of both the upper and the lower
display segment and chip select of driver LSI are made as follows:

The driver LSI at the left end of the display face is first selec-
ted, and the adjacent driver LSI of the right side is selected when
80 dots data($20CP_2$) is fed. This process is sequentially continued
until data is fed to the driver LSI at the right end of the display
face.

This process is simultaneously followed at the column driver LSI's
of both the upper and the lower display segments. Thus data input
for both the upper and the lower display segments must be fed
through 4-bit bus line sequentially from the left end of the dis-
play face.

Since this graphic display unit contains no reflesh RAM, it re-
quires data and timing pulse inputs even for static display.

The timing chart of input signals are shown in Fig. 3.

MODEL №	PAGE
LM64032B	12

SHARP

7. Optical Characteristics

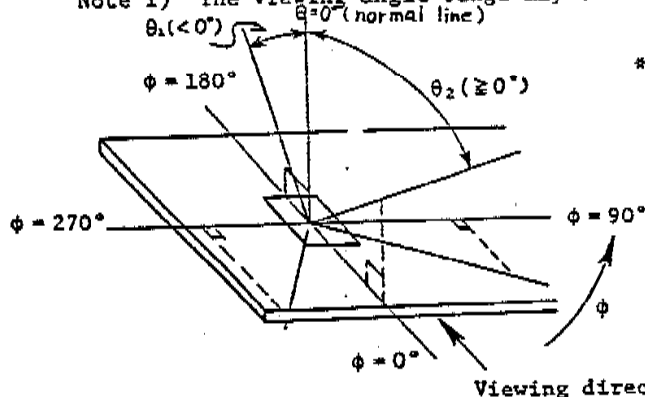Table 8 $(T_a = 25\,°C)$ $V_{DD} = 5V$
                                                     $V_{EE} = -21.1\ V_{TYP}$

Following spec. are based upon the electrical measuring condition, $(V_{EE} = -18.7\ V_{min} \sim -24.0\ V_{max})$
on which the contrast of perpendicular direction($\theta = 0°$) will be MAX.

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit	Remark
Viewing angle range	$\theta_2 - \theta_1$	$\phi = 0°$ $\theta_1 < \theta_2$	$C_0 \geq 2.0$	55	–	–	dgr.	Note 1
	θ_1		$C_0 = 2.0$	–	–	-25	dgr.	Note 1
	θ_2			25	–	–	dgr.	Note 1
	$\theta_2 - \theta_1$	$\phi = 45°$ $\phi = 315°$ $\theta_1 < \theta_2$	$C_0 \geq 2.0$	55	–	–	dgr.	Note 1
	θ_1		$C_0 = 2.0$	–	–	-25	dgr.	Note 1
	θ_2			25	–	–	dgr.	Note 1
Contrast ratio	C_0	$\theta = 0°, \phi = 0°$		3.5	5.0	–		Note 2
Response speed	Rise T_r	$\theta = 0°, \phi = 0°$		–	100	200	ms	Note 3
	Decay T_d	$\theta = 0°, \phi = 0°$		–	200	300	ms	Note 3

Note 1) The viewing angle range may be defined as shown below.

$\theta_1 (< 0°)$ $\theta = 0°$(normal line)

$\phi = 180°$ $\theta_2 (\geq 0°)$

$\phi = 270°$ $\phi = 90°$

ϕ

$\phi = 0°$

Viewing direction

* Angles θ_1, θ_2 and ϕ shall fall
  within the range over which
  the displayed character can
  be read.

Fig. 4 Definition of Viewing Angle

Note 2) Contrast ratio may be defined as follows:

Contrast ratio is calculated by using the following formula
when the waveform voltage (Fig. 6) is applied in the optical
characteristics test method (Fig. 5).

$$\text{Contrast ratio} = \frac{\text{Photo-detector output voltage with select waveform being applied}}{\text{Photo-detector output voltage with non select waveform being applied}}$$

* Measuring wavelength $\lambda = 540\ nm.$

MODEL №	PAGE
LM64032B	13

SHARP

Note 3) The response characteristics of photo-detector output
are measured as shown in Fig. 6, assuming that input
signals are applied so as to select and deselect the
dots to be measured, in the optical characteristics
test method shown in Fig. 5.

616
KETHLEY
DIGITAL
ELECTRO
METER

| Contrast Detector |

| Response time Detector |
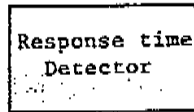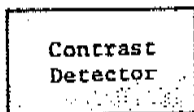
TEKTRONIX
TYPE549
STORAGE
OSCILLOSCOPE

Note 4) Table 8 shows the optical
characteristics detected when the
LCD applied voltage waveforms
are in the highest frequency*.

* The most critical condition
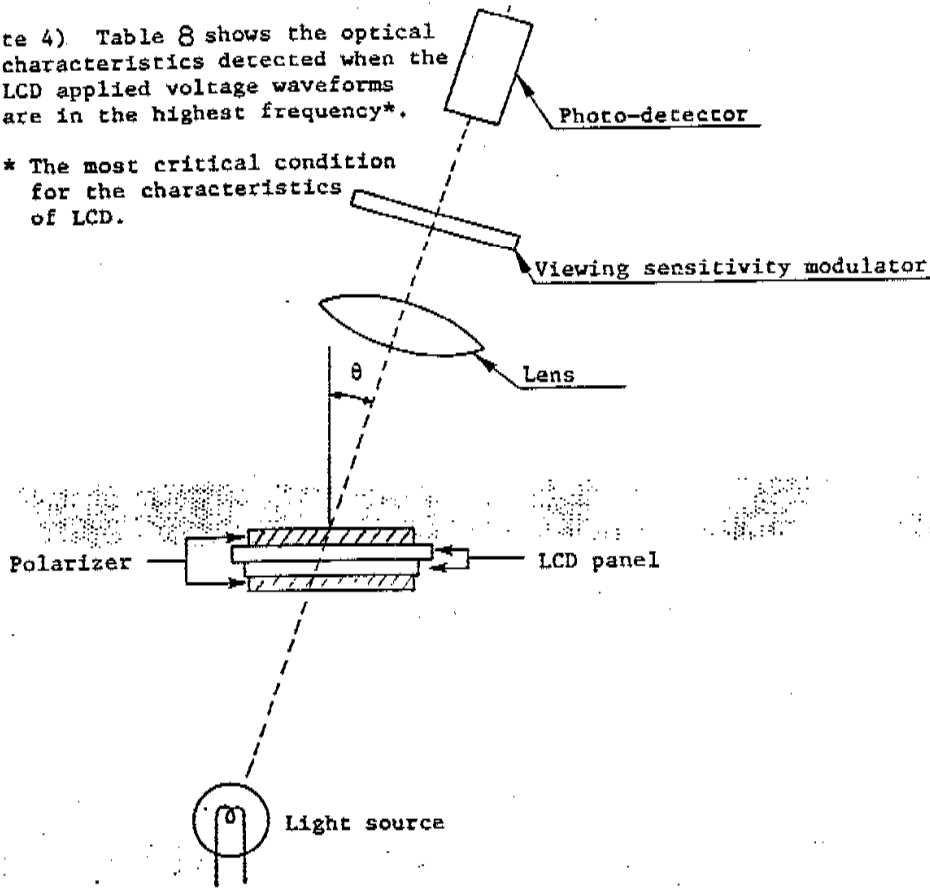for the characteristics
of LCD.

Photo-detector

Viewing sensitivity modulator

θ

Lens

Polarizer

LCD panel

Light source

Fig. 5 Optical Characteristics Test Method

MODEL No.	PAGE
LM64032B	14

SHARP

[Drive waveform]

1/200Duty

Non-select
waveform   Select waveform   Non-select
                                                               waveform

Response
waveform

Photo-
detector
output

100% 90%

10%

Tr   Td

Tr : Rise time
Td : Decay time
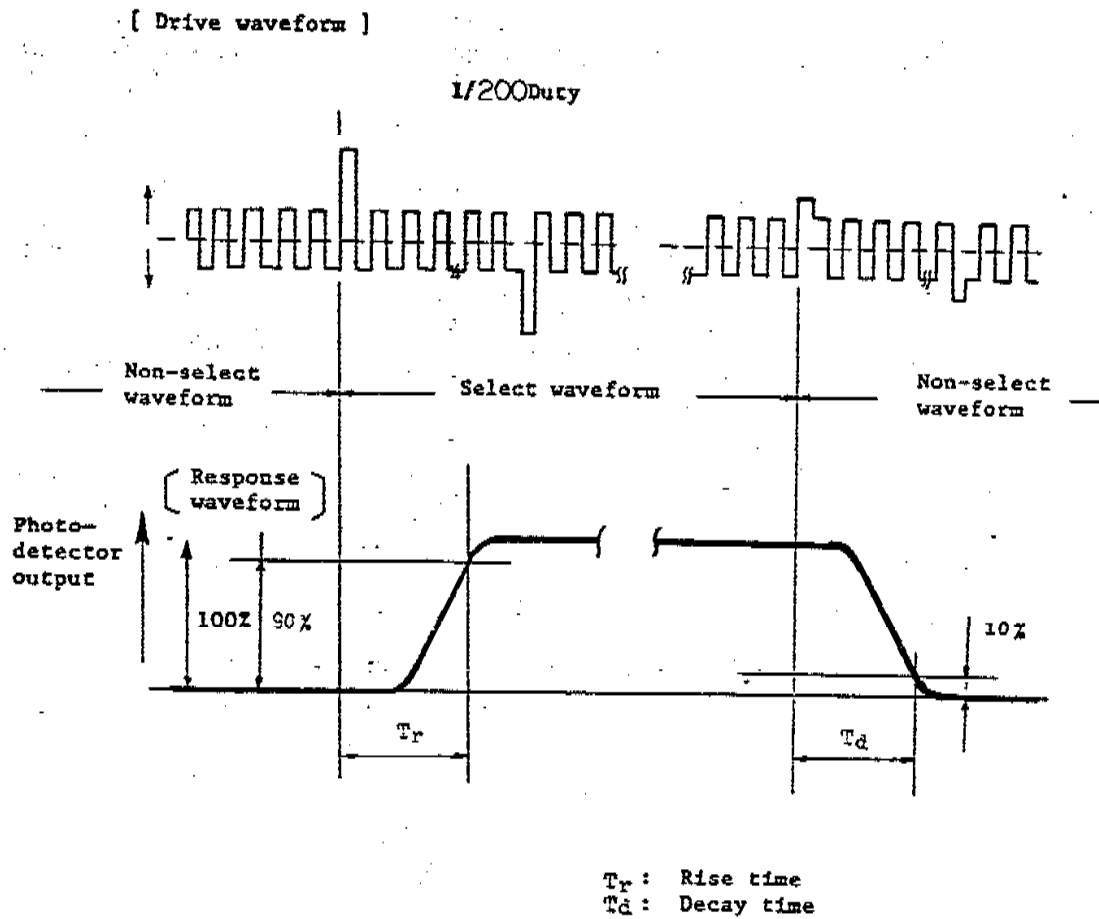
Fig. 6   Definition of Response Time

MODEL №	PAGE
LM 64032 B	15

SHARP

Fig.7 Circuit brock diagram
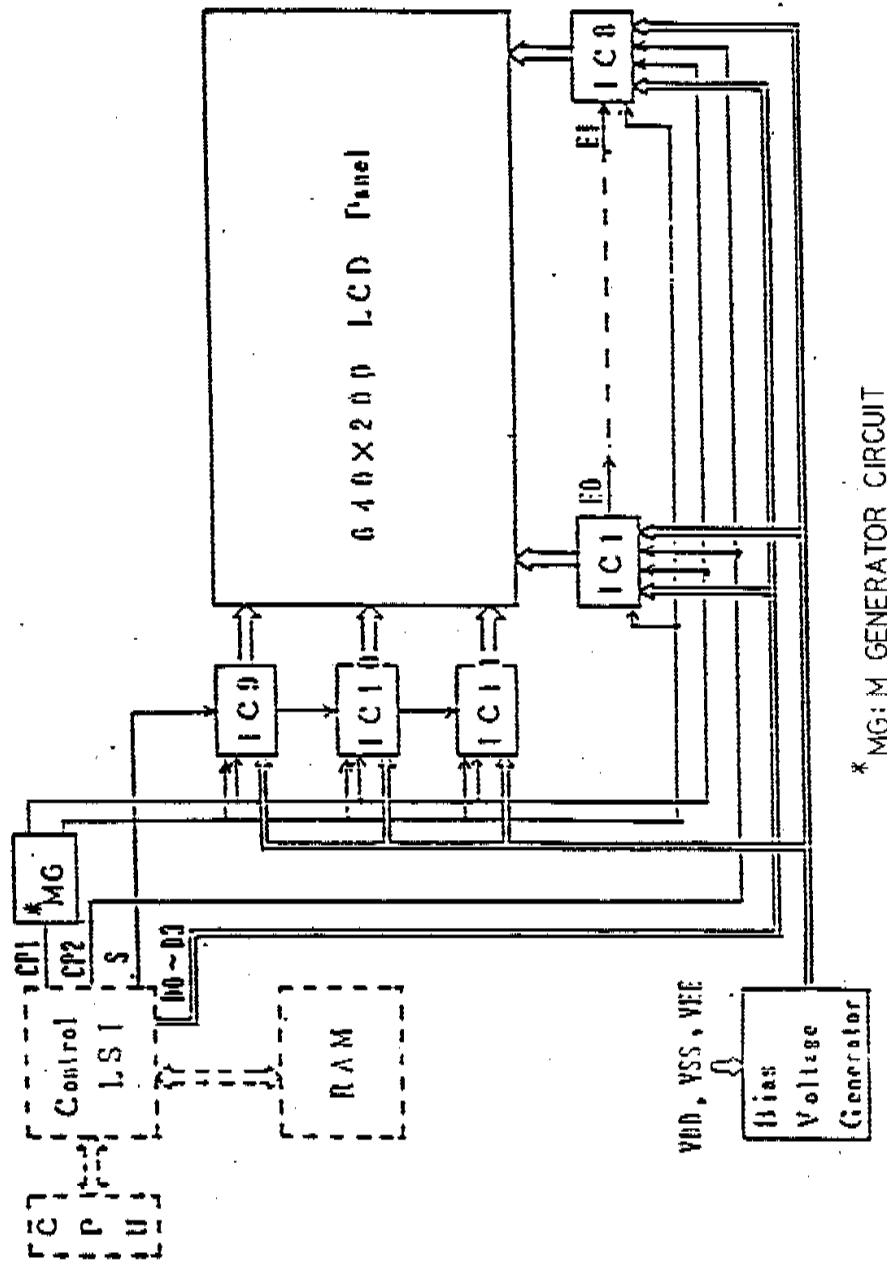
*MG: M GENERATOR CIRCUIT
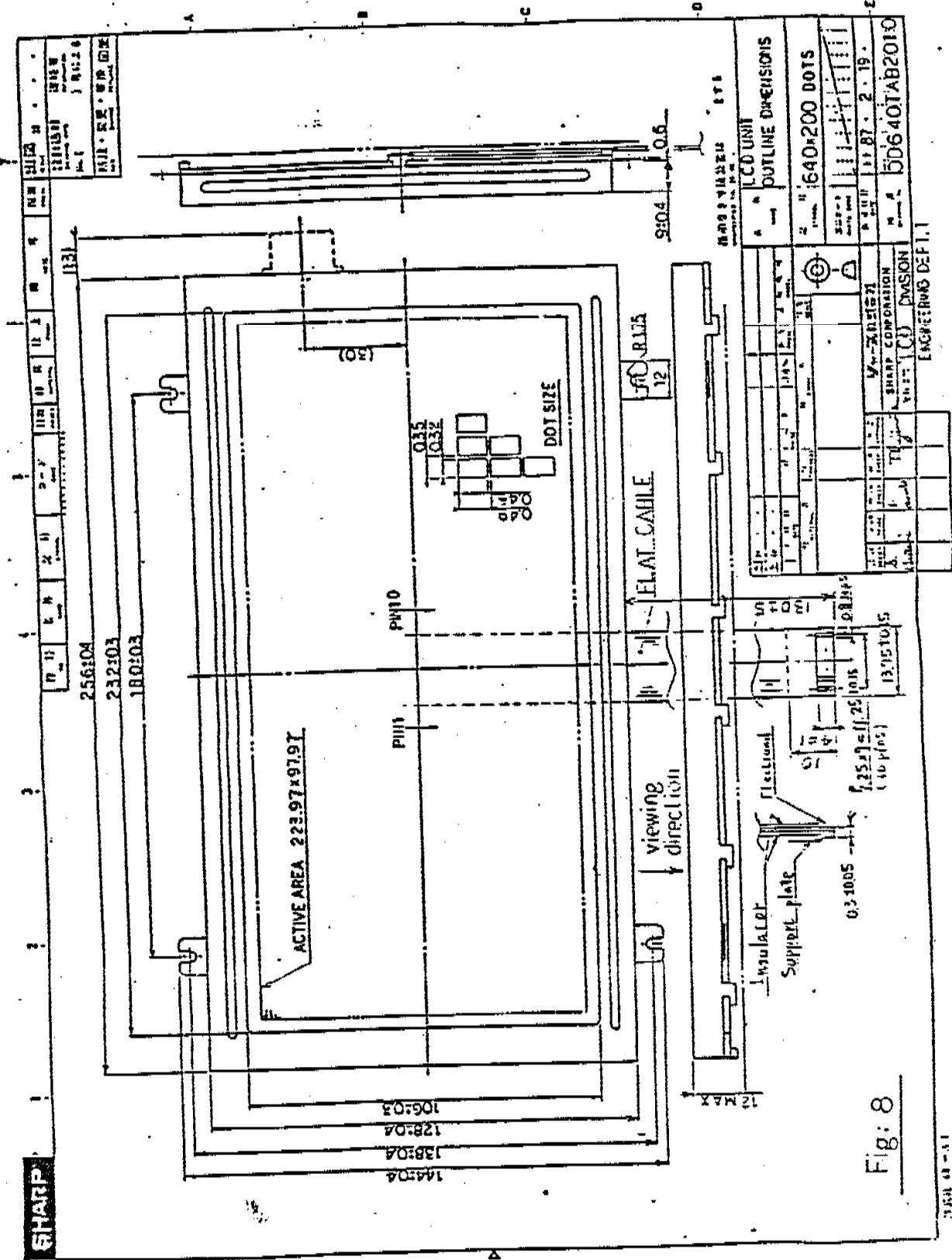
16

Fig. 8

MODEL No.	PAGE
LM64032B	17

SHARP

8. Precautions

8.1 Angle when installing the unit

This unit's viewing angle is illustrated in Fig.9 .

$\theta_1 <$ viewing range $< \theta_2$ ($\theta_1 < 0°$, $\theta_2 \geqq 0°$)

(For the specific values of θ_1, θ_2, refer to the Table 8.)

Please consider the optimum viewing conditions according to the purpose when installing the unit.
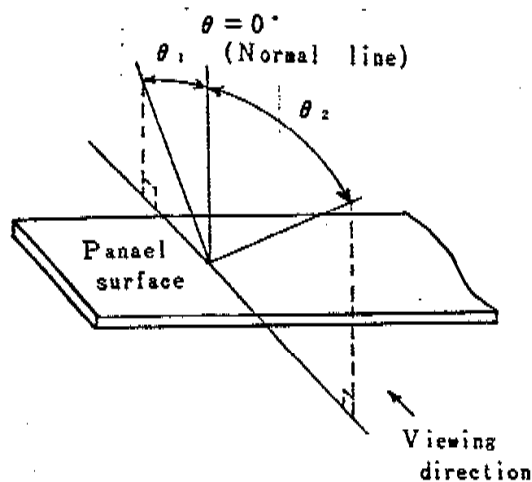

Fig.9   Dot matrix LCD viewing angle

8.2 Handling cautions

This unit is installed using mounting tabs at the four corners of PCB or bezel.
When installing the unit, pay attention and handle carefully not to allow any undue stress such as twist or bend.
A transparent acrylic resin board or other type of protective panel should be attached to the front of the unit to protect the polarizer, LCD cells, etc.

MODEL No.	PAGE
LM64032B	18

SHARP

8.3 Notes on attachment

(1) Since the front polarizer is easily damaged, please pay attention not to scratch on its face.

(2) If the surface of the LCD cells needs to be cleaned, wipe it swiftly with cotton or other soft cloth. If still not completely clear, blow on it and wipe.

(3) Water droplets, etc. must be wiped off immediately since they may cause color changes, staining, etc. if remained for a long time.

(4) Since LCD is made of glass plates, dropping the unit or banging it against hard objects may cause cracking or fragmentation.

(5) CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro static charge, by earthing human body, etc. Take the following measures, to protect the unit from the electric discharge via mounting tabs from the main system electrified with static electricity.
  (1) Earth the metallic case of the main system (contact of the unit and main system).
  (2) Insulate the unit and main system by attaching insulating washers made of bakelite or nylon, etc.

8.4 Notes on operation

(1) The unit should be driven according to the specified ratings to avoid malfunction of permanent damage. DC voltage drive leads to rapid deterioration of LC, so ensure that the drive is alternating waveform by continuous application of the signal M.

8.5 Others

(1) Avoid to expose the unit to the direct sun-light, strong ultra-violet light, etc. for a long time.

(2) If stored at temperatures below specified storage temperature, the LC may freeze and be deteriorated. If storage temperature exceed the specified rating, the molecular orientation of the LC may change to that of a liquid, and they may not revert to their original state. As far as possible always store at normal room temperature.

(3) If the LCD panel is removed from the LCD unit, it may cause the poor contact on reinsertion. So please avoid to dismantle the unit.