

承認書

APPROVAL SHEET



客戶 CUSTOMER	BECK	DATE OF APPROVAL
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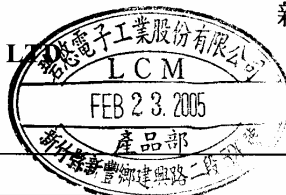
產品型號 TYPE NO.	電 路 功 能 DESCRIPTION OF MODULE
PVG121202BWE06	1. 128 X 128 Dots Matrix LCD Module. 2. LCD Type : FSTN LCD Transflective / Positive. 3. Dot color / Background color : BLACK / WHITE 4. EL Color : Cool white

REMARKS:

ORIGINAL: 	CONCURRED: 	APPROVED: 	Q. C.:
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FINAL APPROVAL BY CUSTOMER:	
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新竹縣新豐鄉建興路二段526號
 NO. 526, SEC. 2, CHIEN-HSING RD
 HSING-FUNG, HSIN-CHU
 TAIWAN R. O. C.

THIS APPROVAL SHEET INCLUDES PRODUCT SPECIFICATIONS FOR
P/N PVG121202BWE06 , VERSION NEW

GRAPHIC TYPE LCD MODULE

PVG121202BWE06

PRODUCT SPECIFICATIONS

★ CAUTION ★

The product described by these specifications is designed to be used with ordinary electronic equipment or devices, such as audio/video equipment, office-automation equipment, communication devices, and other. Should you intend to use this product with equipment or devices that could endanger or affect human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers, and all other safety devices and equipment), please be sure to consult our sales representatives in advance.

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TABLE OF CONTENTS

1.0 COMPOSITION	3
2.0 MECHANICAL SPECIFICATIONS	3
3.0 DIMENSIONAL DIAGRAM.....	4
4.0 OPTICAL CHARACTERISTICS	5
4.1 θ AND ϕ	5
4.2 CONTRAST RATIO CR	5
4.2 CONTRAST RATIO CR	6
4.3 RESPONSE TIMES T_R AND T_F	6
4.4 OPTICAL MEASUREMENT SYSTEM	6
4.4 OPTICAL MEASUREMENT SYSTEM	7
5.0 ELECTRICAL SPECIFICATIONS	8
6.0 INTERFACE PIN DESCRIPTION	8
7.0 BLOCK DIAGRAM	9
8.0 POWER SUPPLY CIRCUIT DIAGRAM.....	10
9.0 INTERFACE TIMING CHART :.....	11
9.1 TIMING CHART :.....	11
9.2 TIMING CHARACTERISTICS	11
10.0 APPLICATION OF LCD MODULE :	12
10.1 INTERFACE BETWEEN LCM AND MPU	12
10.2 CONTROL INSTRUCTIONS	15
11.0 EL LAMP DATA	33
12.0 MAXIMUM ABSOLUTE VALUES	33
13.0 RELIABILITY.....	34
14.0 COSMETIC CRITERIA	35
15.0 PRECAUTIONS	36
15.1 HANDLING OF LCD	36
15.2 USER NOTES FOR PIN-TYPE LCD.....	36
15.3 HANDLING OF LCM	37
15.4 MUST BE WITH HUMAN BODY EARTH WHEN TOUCHING	37
15.5 BE USING NO AC CURRENT LEAKAGE WELDING HAND.	38
15.6 MUST BE WITH EARTH FOR ELECTRIC DRIVER	38
15.7 KEEP THE HUMIDITY OF OPERATION ROOM ABOVE 45%	38
15.8 BE ATTENTION TO THE USE OF CLEANING MACHINE	38
APPENDIX—	39

1.0 COMPOSITION

Display type: [128 ×128 Dots Matrix LCD Module]

Driving method: [1/128 Duty, 1/13 Bias]

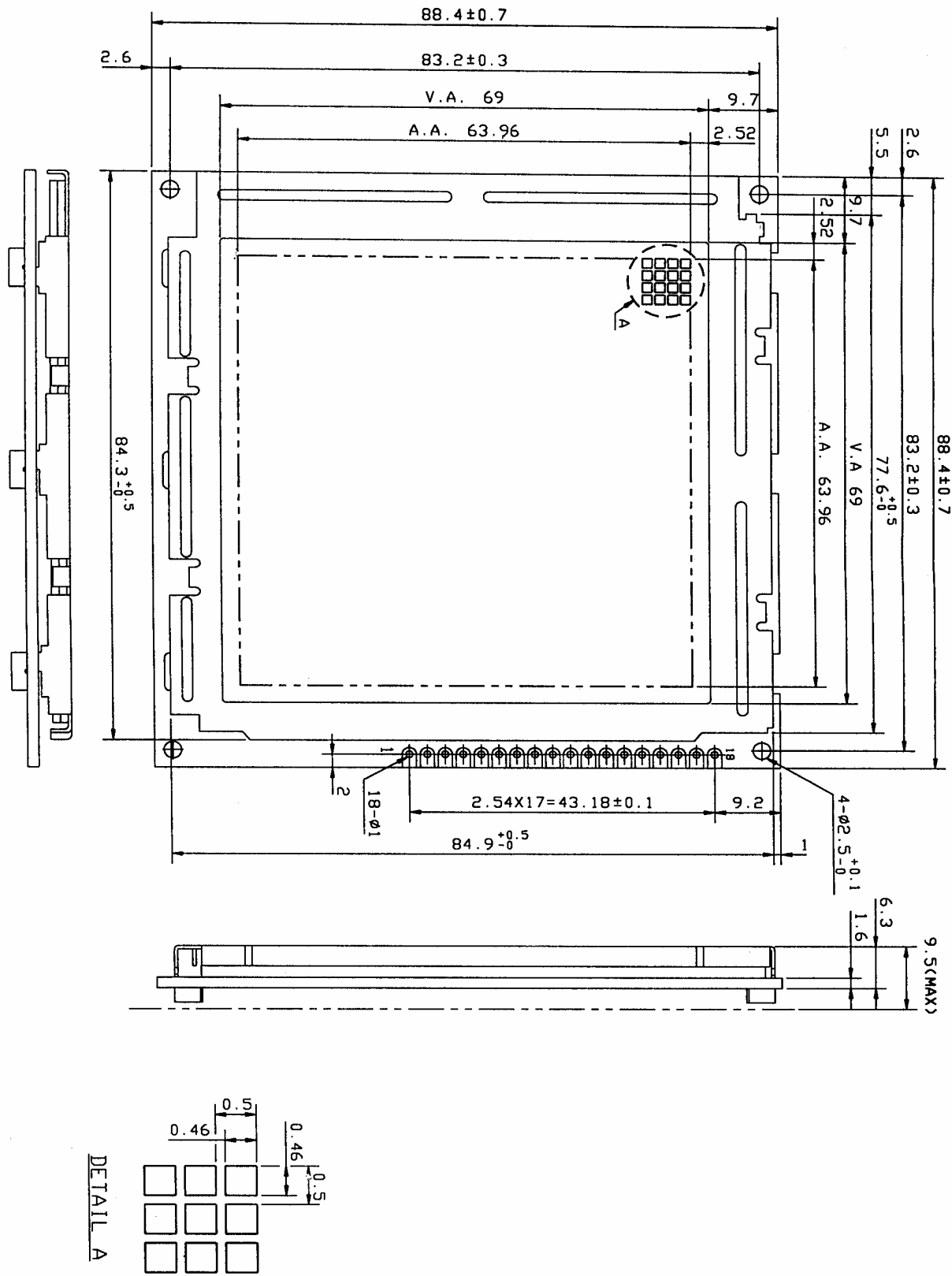
View Direction: [6 O'clock]

Backlight: EL (Cool white)

2.0 MECHANICAL SPECIFICATIONS

ITEM	STANDARD VALUES	UNITS
LCD type	FSTN Transflective / Positive	
Dot arrangement	128×128	dots
Module size	88.4 (W) ×88.4 (H) ×9.5 (D)	mm
View area	69 (W) ×69 (H)	mm
Active area	63.96 (W) ×63.96 (H)	mm
Dot size	0.50 (W) × 0.50 (H)	mm
Dot pitch	0.46 (W) × 0.46 (H)	mm
Viewing direction	6 O'clock	
Weight		g

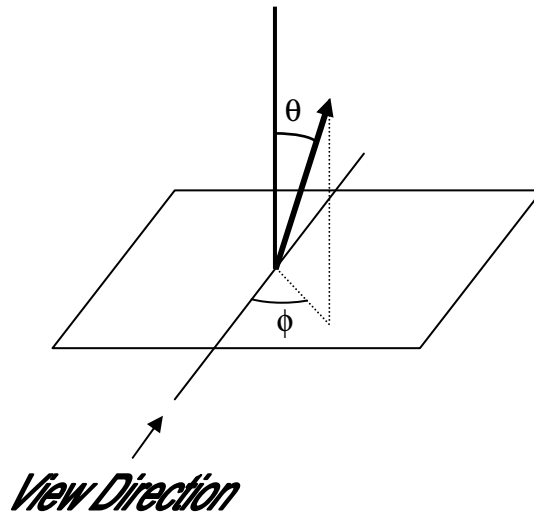
3.0 DIMENSIONAL DIAGRAM



4.0 OPTICAL CHARACTERISTICS

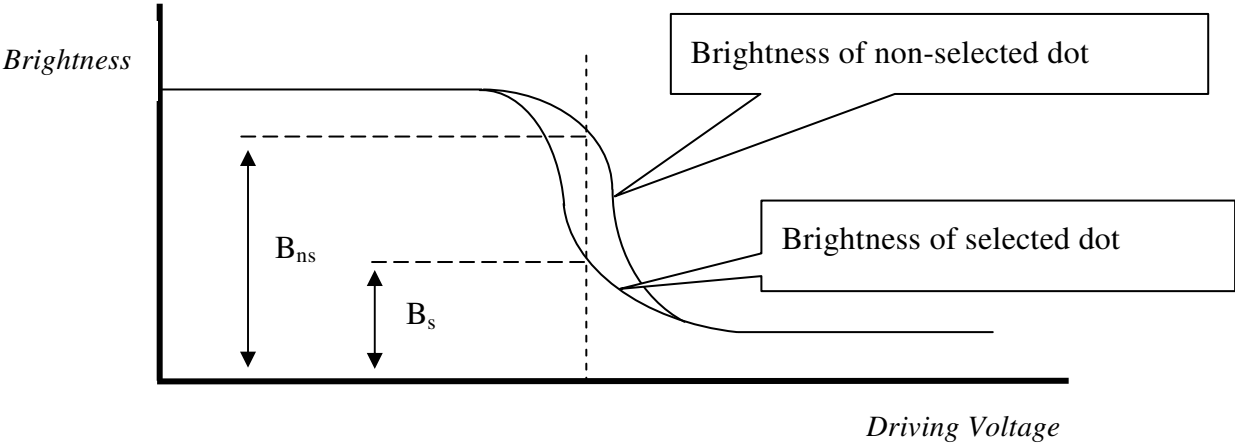
ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Viewing angle	θ	$\phi = 0^\circ$	—	25	—	Deg
		$\phi = 180^\circ$	—	30	—	
		$\phi = 90^\circ$	—	30	—	
		$\phi = 270^\circ$	—	30	—	
Contrast Ratio	C_r (MAX)	$\theta = 0$ and $T_a = 25^\circ\text{C}$	6.0			
Response time	T_R	$\theta = 0$ and $T_a = 25^\circ\text{C}$	—	180	280	ms
	T_F		—	230	330	

4.1 θ and ϕ



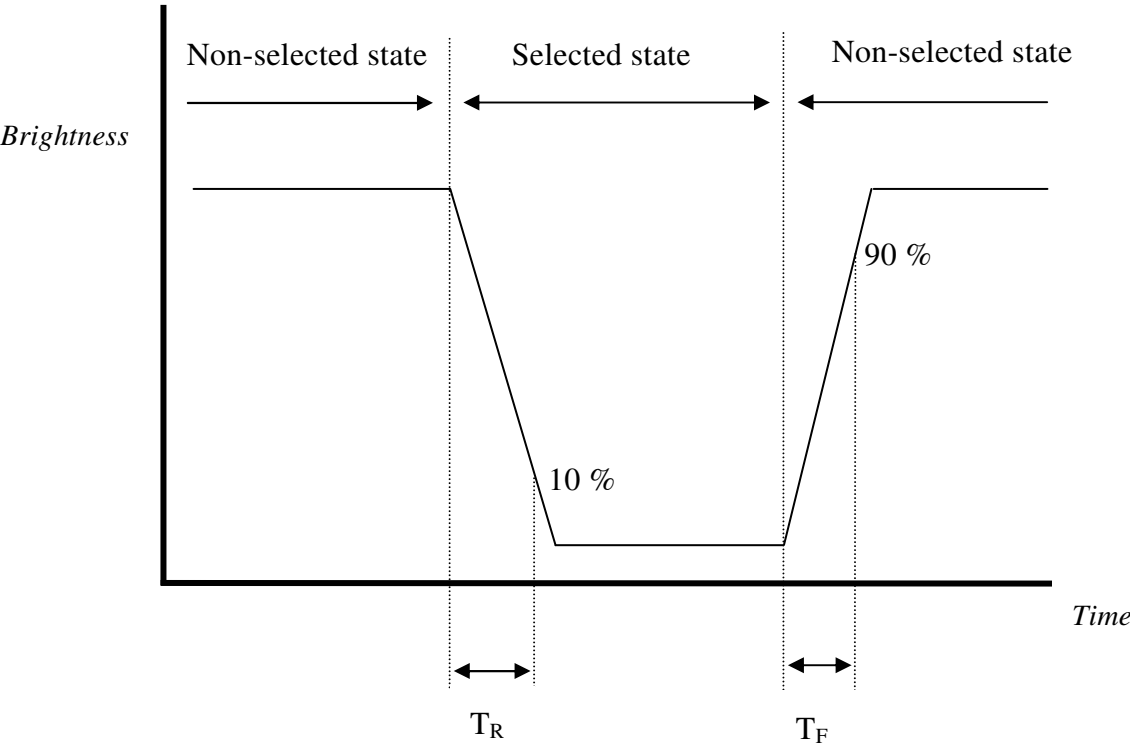
- The contrast of the display is optimal when viewed in the “View Direction” ($\phi = 0^\circ$).
- $0^\circ \leq \theta < 90^\circ$; $0^\circ \leq \phi < 360^\circ$

4.2 Contrast ratio Cr

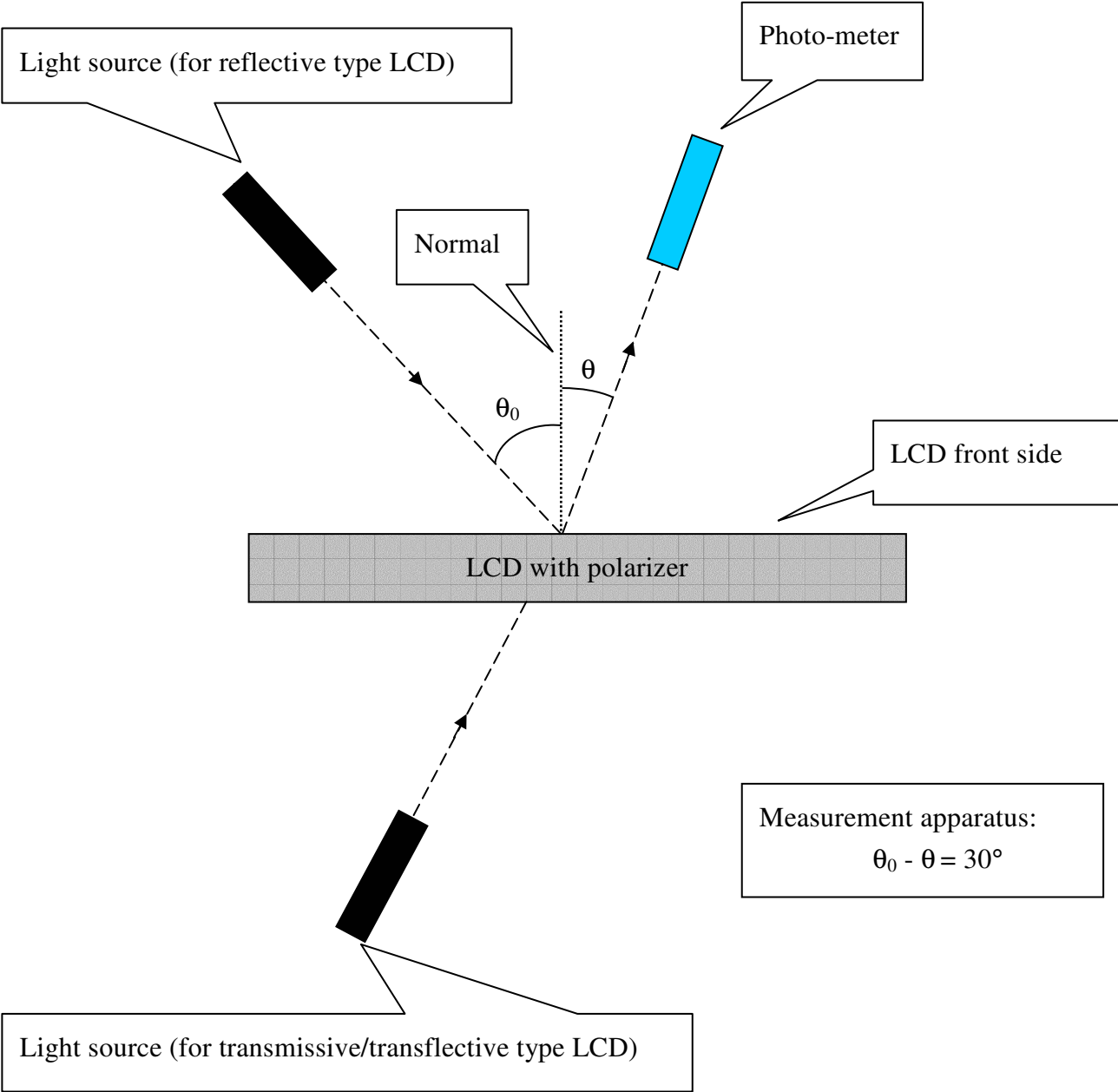


Contrast Ratio: $C_r = B_{ns} / B_s$

4.3 Response times T_R and T_F



4.4 Optical measurement system



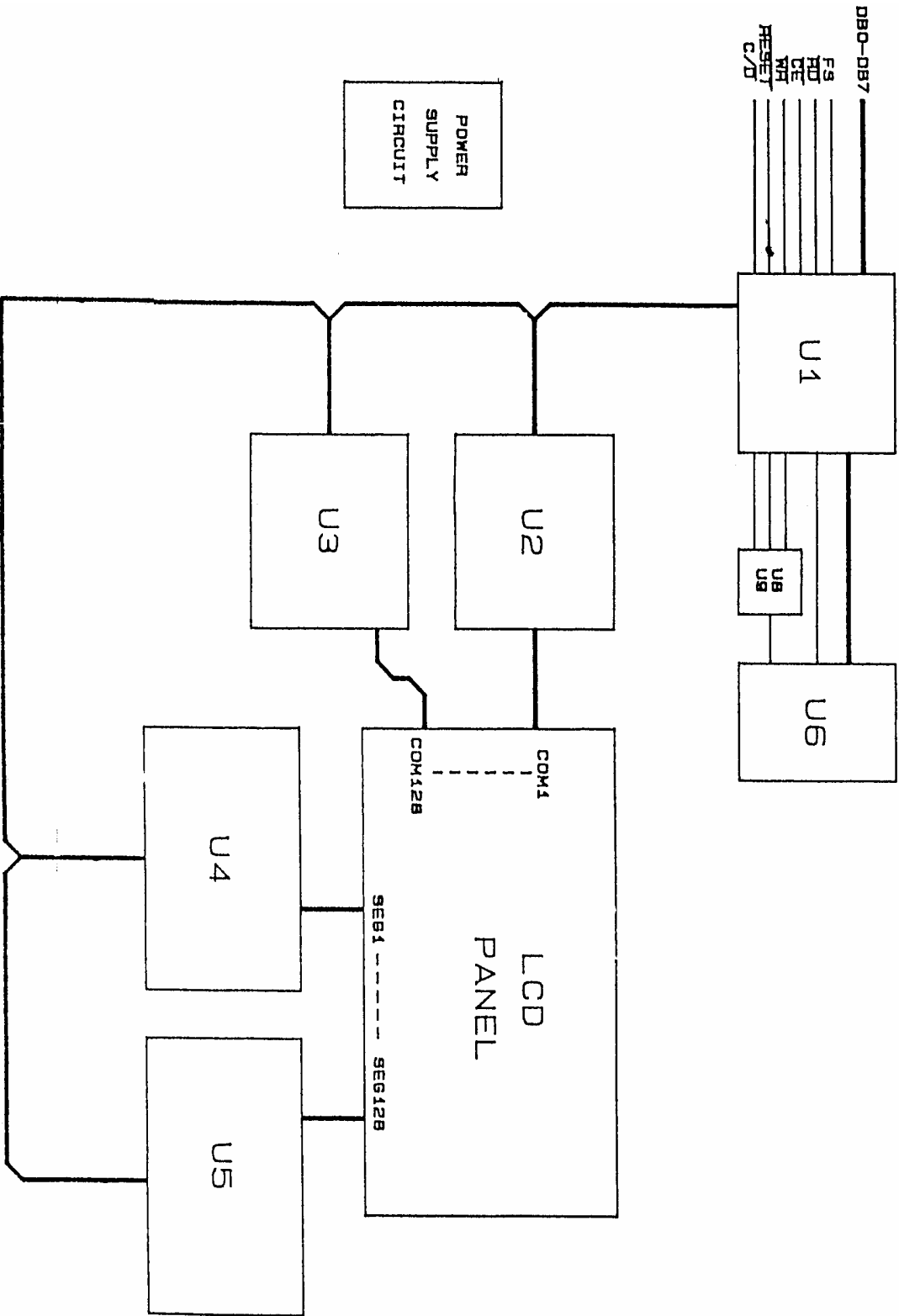
5.0 ELECTRICAL SPECIFICATIONS

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply voltage for logic	VCC-GND	—	4.75	5.0	5.25	V
Supply voltage for LCD Driver	VEE-GND	—	—	-12.5	-15.0	V
Input voltage	VI	H LEVEL	0.8 VDD	—	VDD	V
		L LEVEL	0	—	0.2 VDD	V
Power supply for logic current	ICC	VCC = 5V VEE = -12.5V	—	6.0	—	mA
Power supply for LCD Driving	IEE	fFLM = 75Hz	—	2.0	—	mA
Frame frequency	FR	—	—	75	85	Hz

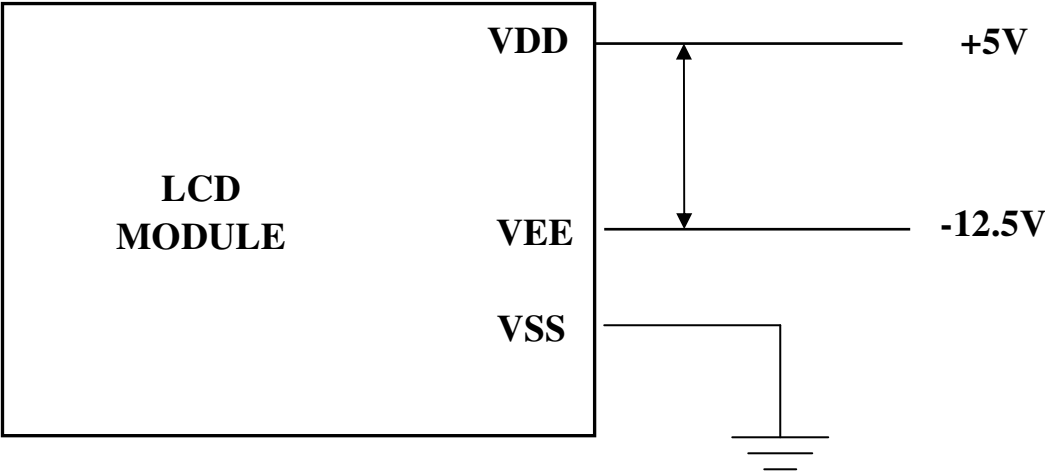
6.0 INTERFACE PIN DESCRIPTION

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	FGND	—	FRAME GROUND (CONNECTED TO BEZEL)
2	VSS	—	GROUND
3	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
4	VEE	—	POWER SUPPLU FOR LCD
5	/ WR	I	DATA WRITE
6	/ RD	I	DATE READ
7	/ CE	I	CHIP ENABLE
8	C/D	I	CODE / DATA
9	/ RESET	I	CONTROLLER RESET
10-17	D0-D7	I/O	DATA BUS (D0:LSB ; D7 :MSB)
18	FS	I	FONT SELECT FS="H" :6*8 CHARACTER FONT FS ="L" 8*8 CHARACTER FONT

7.0 BLOCK DIAGRAM

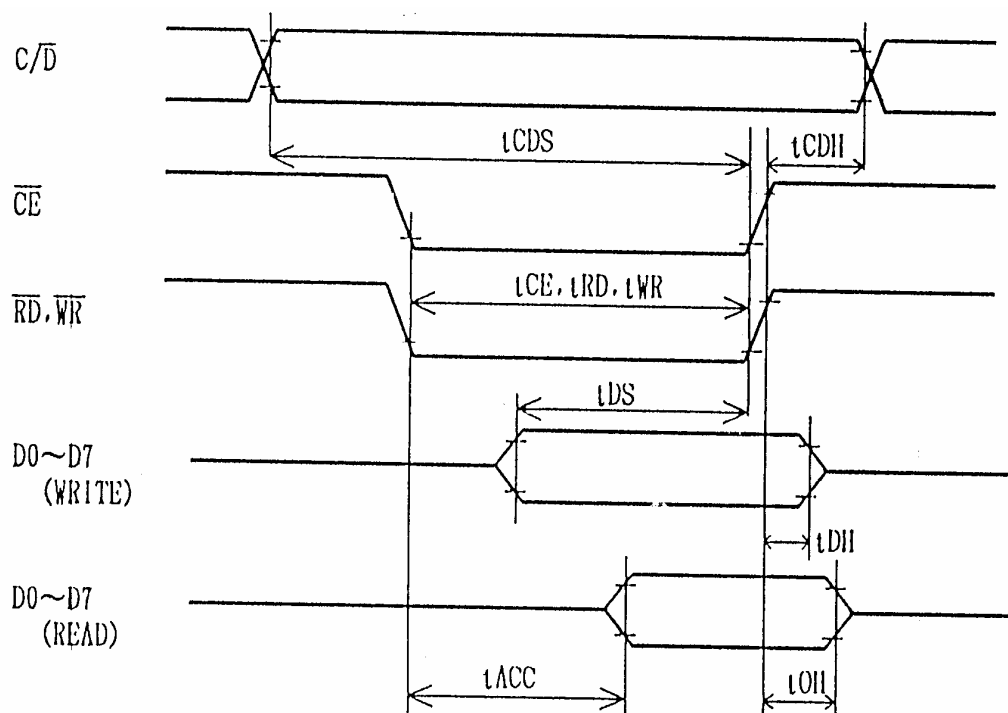


8.0 POWER SUPPLY CIRCUIT DIAGRAM



9.0 INTERFACE TIMING CHART :

9.1 Timing Chart :



9.2 Timing Characteristics

P A R A M E T E R	SYMBOL	MIN.	MAX.	UNIT
C/D set up time	t_{CDS}	100	—	ns
C/D hold time	t_{CDH}	10	—	ns
CE, RD, WR pulse width	t_{CE}, t_{RD}, t_{WR}	80	—	ns
Data set up time	t_{DS}	80	—	ns
Data hold time	t_{DH}	40	—	ns
Access time	t_{ACC}	—	150	ns
Output hold time	t_{OH}	10	50	ns

10.0 Application of LCD module :

10.1 Interface between LCM and MPU

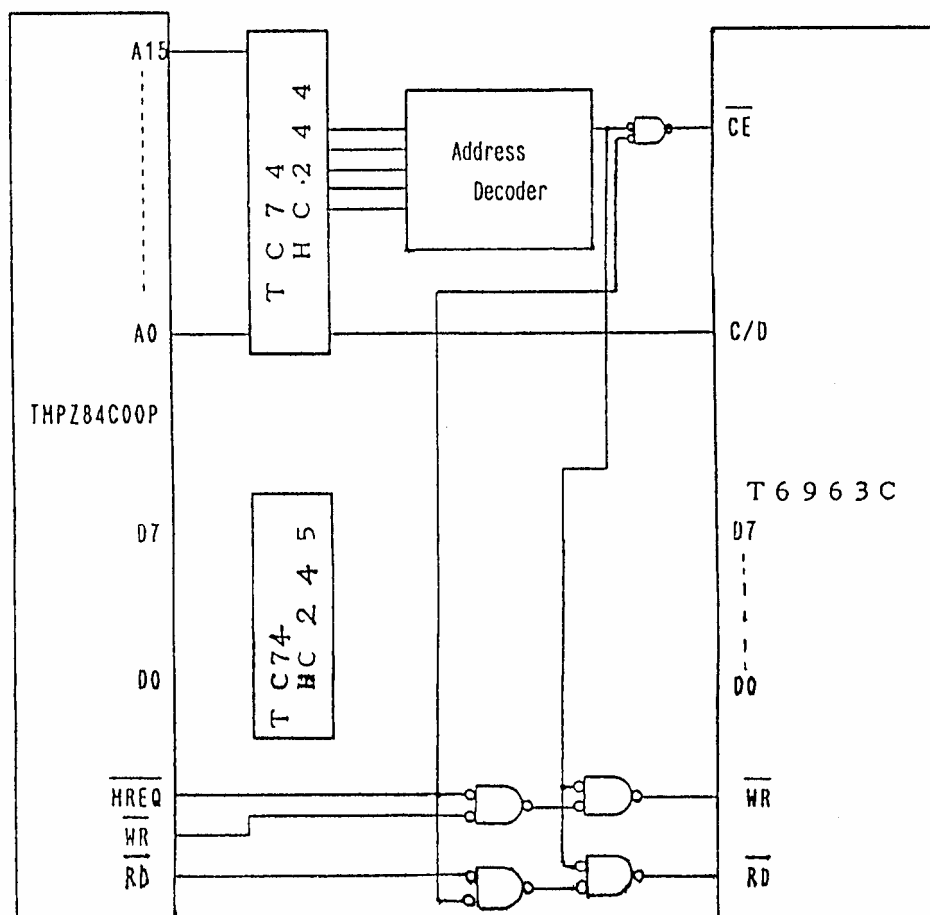
EXAMPLE OF APPLICATION CIRCUITS

T6963C is directly connected TMPZ84C00A (Z80 NOTE1 CMOS). T6963C Application circuit can be used with TMPZ84C00A in the following case.

[1] The setting of MPU's address (MAPPED I/O)

T6963C is addressed in a MPU's address by the address decode circuit.

	address
DATA (I/O)	XXXXH
Command/Status	XXXX+1H

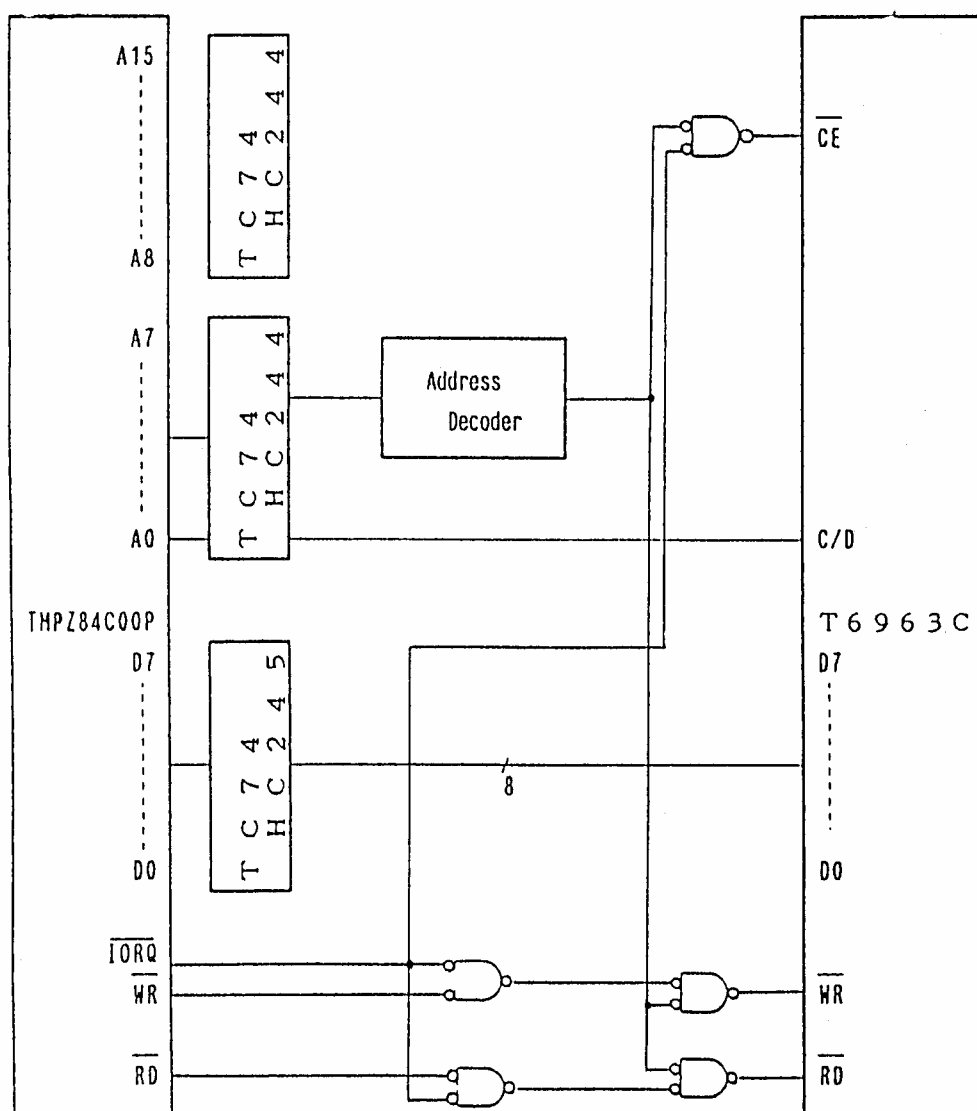


note1: Z80 is a trademark of Zilog Inc.

[2] The setting of MPU I/O address

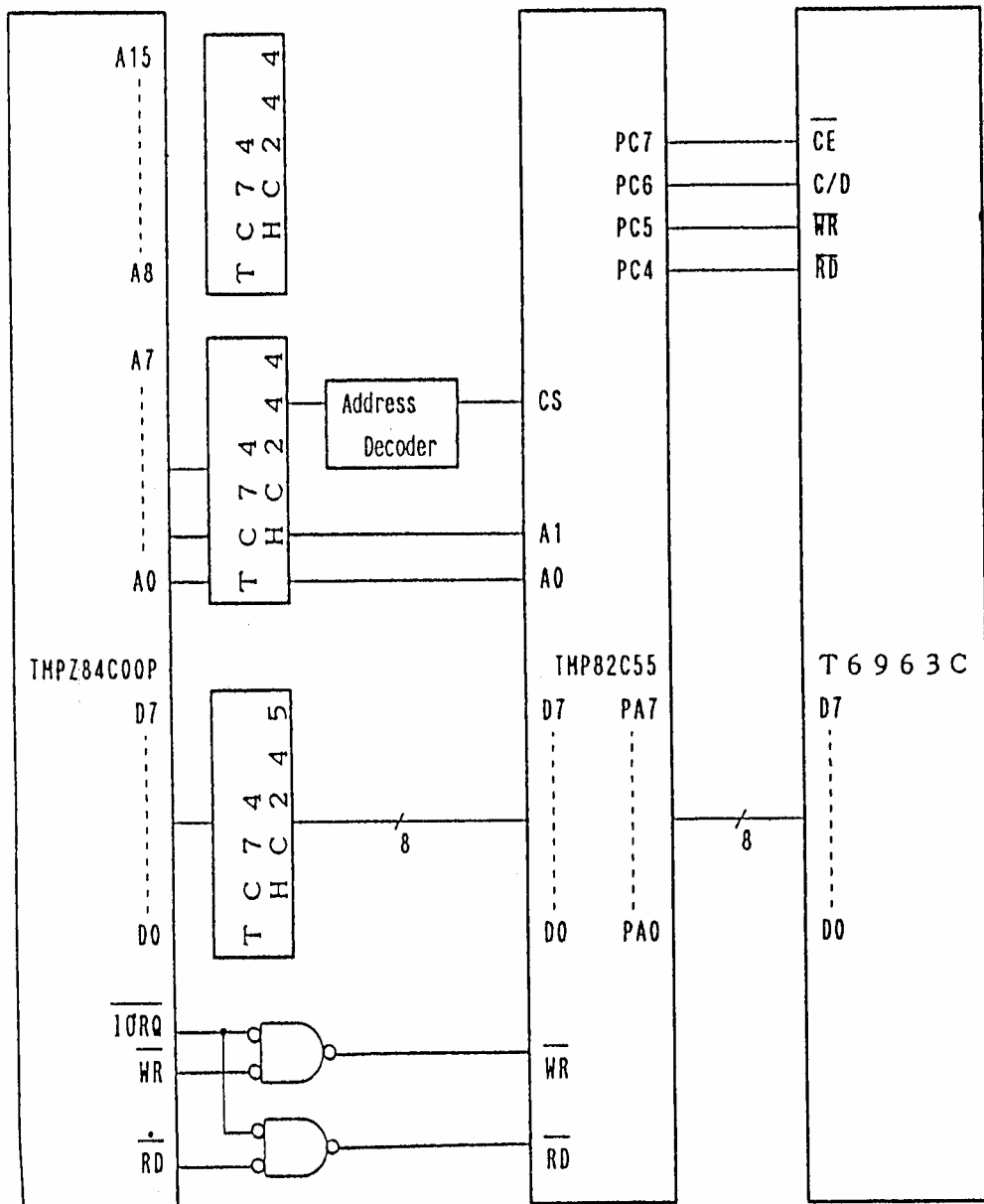
T6963C is addressed in an I/O address by the I/O address decoder

	I/O address
DATA	XXH
Command/Status	XX+1H



[3] The case of using PPI LSI (TMP82C55)

T6963C can be connected with PPI LSI.
 The portA connects data bus
 The portC connects control bus.
 (C/D, CE, WR, RD)



10.2 Control Instructions

FLOWCHART OF COMMUNICATIONS WITH MPU

- 1) Status read
Before sending data(read/write), command it is necessary to check the status.

Status check

Status of T6963C can be read from data lines.

$\overline{RD}$	L
$\overline{WR}$	H
$\overline{CE}$	L
C/D	H
D0-D7	Status word

T6963C Status word format is following.

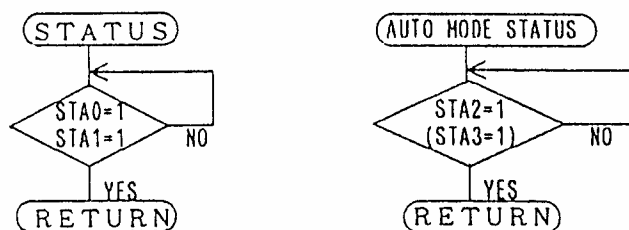
MSB				LSB			
STA7	STA6	STA5	STA4	STA3	STA2	STA1	STA0
D7	D6	D5	D4	D3	D2	D1	D0

STA0	check capability of command execution	0:disable 1:enable
STA1	check capability of data read/write	0:disable 1:enable
STA2	check capability of auto mode data read	0:disable 1:enable
STA3	check capability of auto mode data write	0:disable 1:enable
STA4	not use	
STA5	check capability of controller operation	0:disable 1:enable
STA6	error flag. using screen peek/copy command	0:no error 1:error
STA7	Check the condition blink	0:display off 1:normal display

Note)

1. It is necessary to check STA0 and STA1 at the same time. The error is happened by sending data, at executing command.
2. The status check will be enough to check STA0/STA1.
3. The STA2/STA3 are valid in auto mode STA0/STA1 are invalid.

Status checking flow



4. It is impossible to save status check in the case of command that is MSB 0. To have the delay time cannot be save status check.

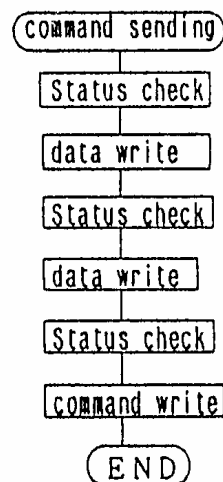
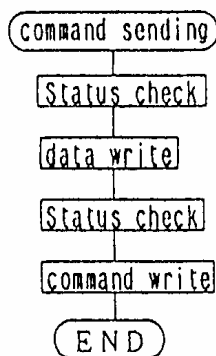
The interrupt of hardware is happened at the end of lines. If command of MSB0 is send in this period, the command executing is waited. The state of waiting doesn't be known without to check status. The sending next command or data is disregarded or rewrites data of waiting command.

2] Data set

In T6963C, the data have been set and command executes.

The order of procedure of command sending

- ① the case of 1data ② the case of 2data



Note: In case of over 2data sending, the last data (or last 2data) is valid.

COMMAND	CODE	D1	D2	FUNCTION
REGISTER SET	00100001	X adrs	Y adrs	CURSOR POINTER SET
	00100010	data	00H	OFFSET REGISTER SET
	00100100	Low adrs	High adrs	ADDRESS POINTER SET
CONTROL WORD SET	01000000	Low adrs	High adrs	TEXT HOME ADDRESS SET
	01000001	Columns	00H	TEXT AREA SET
	01000010	Low adrs	High adrs	GRAPHIC HOME ADDRESS SET
	01000011	Columns	00H	GRAPHIC AREA SET
MODE SET	1000X000	—	—	"OR" mode
	1000X001	—	—	"EXOR" mode
	1000X011	—	—	"AND" mode
	1000X100	—	—	"TEXT ATTRIBUTE" mode
	10000XXX	—	—	INTERNAL CG ROM mode
	10001XXX	—	—	EXTERNAL CG RAM mode
DISPLAY MODE	10010000	—	—	DISPLAY OFF
	1001XX10	—	—	CURSOR ON ,BLINK OFF
	1001XX11	—	—	CURSOR ON ,BLINK ON
	100101XX	—	—	TEXT ON , GRAPHIC OFF
	100110XX	—	—	TEXT OFF, GRAPHIC ON
	100111XX	—	—	TEXT ON , GRAPHIC ON
CURSOR PATTERN SELECT	10100000	—	—	1 LINE CURSOR
	10100001	—	—	2 LINES CURSOR
	10100010	—	—	3 LINES CURSOR
	10100011	—	—	4 LINES CURSOR
	10100100	—	—	5 LINES CURSOR
	10100101	—	—	6 LINES CURSOR
	10100110	—	—	7 LINES CURSOR
	10100111	—	—	8 LINES CURSOR
DATA AUTO. READ/WRITE	10110000	—	—	DATA AUTO WRITE SET
	10110001	—	—	DATA AUTO READ SET
	10110010	—	—	AUTO RESET

COMMAND	CODE	D1	D2	FUNCTION
DATA READ WRITE	11000000	data	—	DATA WRITE AND ADP INCREMENT
	11000001	—	—	DATA READ AND ADP INCREMENT
	11000010	data	—	DATA WRITE AND ADP DECREMENT
	11000011	—	—	DATA READ AND ADP DECREMENT
	11000100	data	—	DATA WRITE AND ADP NONVARIABLE
	11000101	—	—	DATA READ AND ADP NONVARIABLE
SCREEN PEEK	11100000	—	—	SCREEN PEEK
SCREEN COPY	11101000			SCREEN COPY
BIT SET/ RESET	11110XXX	—	—	BIT RESET
	11111XXX	—	—	BIT SET
	1111X000	—	—	BIT0 (LSB)
	1111X001	—	—	BIT1
	1111X010	—	—	BIT2
	1111X011	—	—	BIT3
	1111X100	—	—	BIT4
	1111X101	—	—	BIT5
	1111X110	—	—	BIT6
	1111X111	—	—	BIT7 (MSB)

Description of command

1) Register set

CODE	FUNCTION	D 1	D 2
00100001	21H CURSOR POINTER SET	XADRS	YADRS
00100010	22H OFFSET REGISTER SET	data	00H
00100100	24H ADDRESS POINTER SET	LOW ADRS	HIGH ADRS

① CURSOR POINTER SET

The position of cursor is specified by XADRS, YADRS. The cursor position is moved only by this command. The cursor pointer doesn't have the function of increment and decrement. The shift of cursor are set by this command.

XADDRS YADDRS are specified following

XADRS 00H~4FH (lower 7bits are valid)

YADRS 00H~1FH (lower 5bits are valid)

A) 1 screen drive
XADRS 00~4FH

B) 2 screen drive
XADRS 00~4FH

YADRS 00H~0FH

YADRS 00H~0FH

UPPER SCREEN

YADRS 10H~1FH

LOWER SCREEN

②OFFSET REGISTER SET

OFFSET REGISTER SET
The offset register is used to determine external character generator RAM area.
T6963C has 16bit address lines as follow

MSB
LSB
 ad15 ad14 ad13 ad12 ad11 ad10 ad 9 ad 8 ad 7 ad 6 ad 5 ad 4 ad 3 ad 2 ad 1 ad 0

The upper 5bit (ad15~ad11) are determined by offset register.

The middle 8 bit (ad10~ad3) are determined by character code.

The lower 3bit (ad2 ~ad0) are determined by vertical counter.

The lower 5bit of D1 (data) are valid.

The data format of external character generator RAM

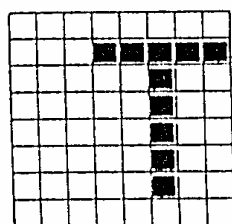
1) The relationship of display RAM address and offset register

data of offset register	CG RAM HEX.address(start-end)
00000	0000-07FFH
00001	0800-0FFFH
00010	1000-17FFH
11100	E000-E7FFH
11101	E800-EFFFH
11110	F000-F7FFH
11111	F800-FFFFH

ex1) offset register 02H
character code 80H

character generator RAM start address

0001 0100 0000 0000 H
1 4 0 0



address	data
1400H	00H
1401H	1FH
1402H	04H
1403H	04H
1404H	04H
1405H	04H
1406H	04H
1407H	00H

ex2) The relationship of display RAM data and display character

A B γ D E ζ G H I J K L M
.
.
.

display character

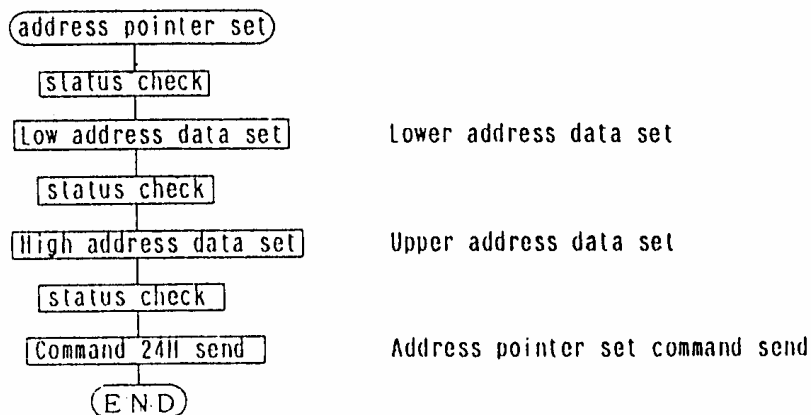
RAM DATA	character
21H	A
22H	B
83H	γ
24H	D
25H	E
86H	ζ

γ and ζ are displayed by character generator RAM.

③ Address pointer set

The address pointer set command is used to indicate the start address for writing (or reading) to external RAM.

The flow chart of address pointer set command



2] Control word set

CODE	FUNCTION	D1	D2
01000000	40H TEXT HOME ADDRESS SET	Low adrs	High adrs
01000001	41H TEXT AREA SET	Columns	00H
01000010	42H GRAPHIC HOME ADDRESS SET	Low adrs	High adrs
01000011	43H GRAPHIC AREA SET	Columns	00H

The home address and column size are defined by this command.

① Text home address set

The starting address of external display RAM for Text display is defined by this command. The text home address shows the left end and most upper position.

The relationship of external display RAM address and display position

TH		TH+CL
TH+TA		TH+TA+CL
(TH+TA)+TA		TH+2TA+CL
(TH+2TA)+TA		TH+3TA+CL
TH+(n-1)TA		TH+(n-1)TA+CL

TH:Text Home address
TA:Text area number(columns)
CL:Columns are fixed by hardware, pin-programmable

ex) Text home address 0C00H
Text area 0020H
HD2=H, HD3=H :32columns
DUAL=H, HDS=L, HD0=L, HD1=H :4lines

0000H	0001H		001EH	001FH
0020H	0021H		003EH	003FH
0040H	0041H		005EH	005FH
0060H	0061H		007EH	007FH

② Graphic home address set

The starting address of external display RAM for Graphic display is defined by this command. The graphic home address shows the left end and most upper line.

The relationship of external display RAM address and display position

GH		GH+CL
GH+GA		GH+GA+CL
(GH+GA)+GA		GH+2GA+CL
(GH+2GA)+GA		GH+3GA+CL
GH+(n-1)GA		GH+(n-1)GA+CL

GH:Graphic Home address

GA:Graphic area number(columns)

CL:Columns are fixed by hardware.(pin-programmable)

ex) Graphic home address 0000H
 Graphic area 0020H
 MD2=H, MD3=H :32columns
 DUAL=H, MDS=L, MD0=H, MD1=H :21lines

0000H	0001H		001EH	001FH
0020H	0021H		003EH	003FH
0040H	0041H		005EH	005FH
0060H	0061H		007EH	007FH
0080H	0081H		009EH	009FH
00A0H	00A1H		00BEH	00BFH
00C0H	00C1H		00DEH	00DFH
00E0H	00E1H		00FEH	00FFH
0100H	0101H		011EH	011FH
0120H	0121H		013EH	013FH
0140H	0141H		015EH	015FH
0160H	0161H		017EH	017FH
0180H	0181H		019EH	019FH
01A0H	01A1H		01BEH	01BFH
01C0H	01C1H		01DEH	01DFH
01E0H	01E1H		01FEH	01FFH

③ Text area set

The columns of display are defined by the hardware setting. This command can be used to adjust columns of display.

ex) LCD size:20columns,4lines
 Text home address :0000H
 Text Area:0014H
 MD2=H, MD3=H :32columns
 DUAL=H, MDS=L, MD0=L, MD1=H:4lines

0000	0001		0013	0014		001F
0014	0015		0027	0028		0033
0028	0029		003B	003C		0047
003C	003D		004F	0050		005B

→LCD←

④ Graphic area set

The columns of display are defined by the hardware setting. This command can be used to adjust columns of graphic display.

ex) LCD size: 20 columns, 21 lines

Text home address : 0000H

Text Area: 0014H

MD2=H, MD3=H : 32 columns

DUAL=H, MDS=L, MD0=H, MD1=H : 21 lines

0000	0001	...	0013	0014	...	001F
0014	0015	...	0027	0028	...	0033
0028	0029	...	003B	003C	...	0047
003C	003D	...	004F	0050	...	005B
0050	0051	...	0063	0064	...	006F
0064	0065	...	0077	0078	...	0083
0078	0079	...	008B	008C	...	0097
008C	008D	...	009F	00A0	...	00AB
00A0	00A1	...	00B3	00B4	...	00BF
00B4	00B5	...	00C7	00C8	...	00D3
00C8	00C9	...	00DB	00DC	...	00E7
00DC	00DD	...	00EF	00F0	...	00FD
00F0	00F1	...	0103	0104	...	011F
0104	0105	...	0127	0128	...	0123
0128	0129	...	013B	013C	...	0147
013C	013D	...	014F	0150	...	015B

→ LCD ←

The address in graphic area can be continuous and RAM area can be used without uneffective area, if graphic area is defined the same number as the actual column number of LCD display.

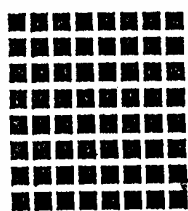
3) Mode set

CODE	FUNCTION	OPERAND
1000X000	"OR" mode	-
1000X001	"EXOR" mode	-
1000X011	"AND" mode	-
1000X100	"TEXT ATTRIBUTE" mode	-
10000XXX	INTERNAL CHARACTER GENERATOR MODE	-
10001XXX	EXTERNAL CHARACTER GENERATOR MODE	-

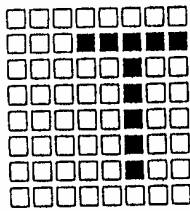
The display mode is defined by this command. The display mode don't have changed until to send next this command. Logically "OR", "EXOR", "AND" of text and graphic display can be displayed.

When internal character generator mode is selected, character code 00H~7FH are selected from built-in character generator ROM. The character code 80H~FFH are automatically selected from external character generator RAM.

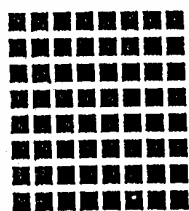
ex)



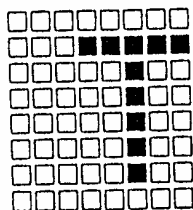
Graphic



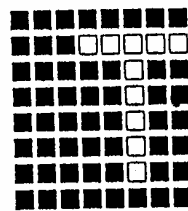
Text



"OR"



"AND"



"EXOR"

Note: Only text display is attributed, because attribute data is located in graphic RAM area.

Attribute function

"Reverse display", "Character blink" and "Inhibit" are called "Attribute".

The attribute data is written in the graphic area defined by Control word set command. The mode set command selects text display only and graphic display cannot be displayed.

The attribute data of the 1st character in text area is written at the 1st byte in graphic area, and attribute data of n-th character is written at the n-th byte in graphic area. Attribute function is defined as follow.

Attribute RAM 1byte

X	X	X	X	d3	d2	d1	d0
---	---	---	---	----	----	----	----

d3	d2	d1	d0	FUNCTION
0	0	0	0	normal display
0	1	0	1	reverse display
0	0	1	1	inhibit display
1	0	0	0	blink of normal display
1	1	0	1	blink of reverse display
1	0	1	1	blink of inhibit display

X: don't care

4) Display mode

CODE	FUNCTION	OPERAND
10010000	display off	-
1001XX10	cursor on, blink off	-
1001XX11	cursor on, blink on	-
100101XX	text on, graphic off	-
100110XX	text off, graphic on	-
100111XX	text on, graphic on	-

100111XX

cursor blink	on:1, off:0
cursor display	on:1, off:0
text display	on:1, off:0
graphic display	on:1, off:0

Note: It is necessary to turn on "text display" and "graphic display" in following case.

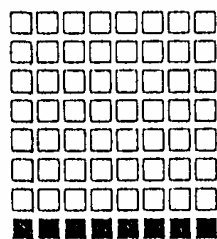
1) Combination of text/graphic display

2) Attribute function

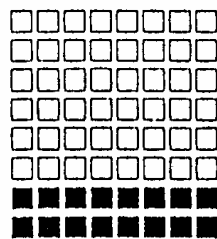
5) Cursor pattern select

CODE	FUNCTION	OPERAND
10100000	1 line cursor	-
10100001	2 lines cursor	-
10100010	3 lines cursor	-
10100011	4 lines cursor	-
10100100	5 lines cursor	-
10100101	6 lines cursor	-
10100110	7 lines cursor	-
10100111	8 lines cursor	-

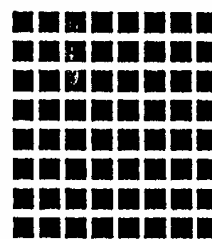
When cursor display is ON, this command selects the cursor pattern from 1 line to 8 lines. The cursor address is defined by cursor pointer set command.



1 line
cursor



2 lines
cursor



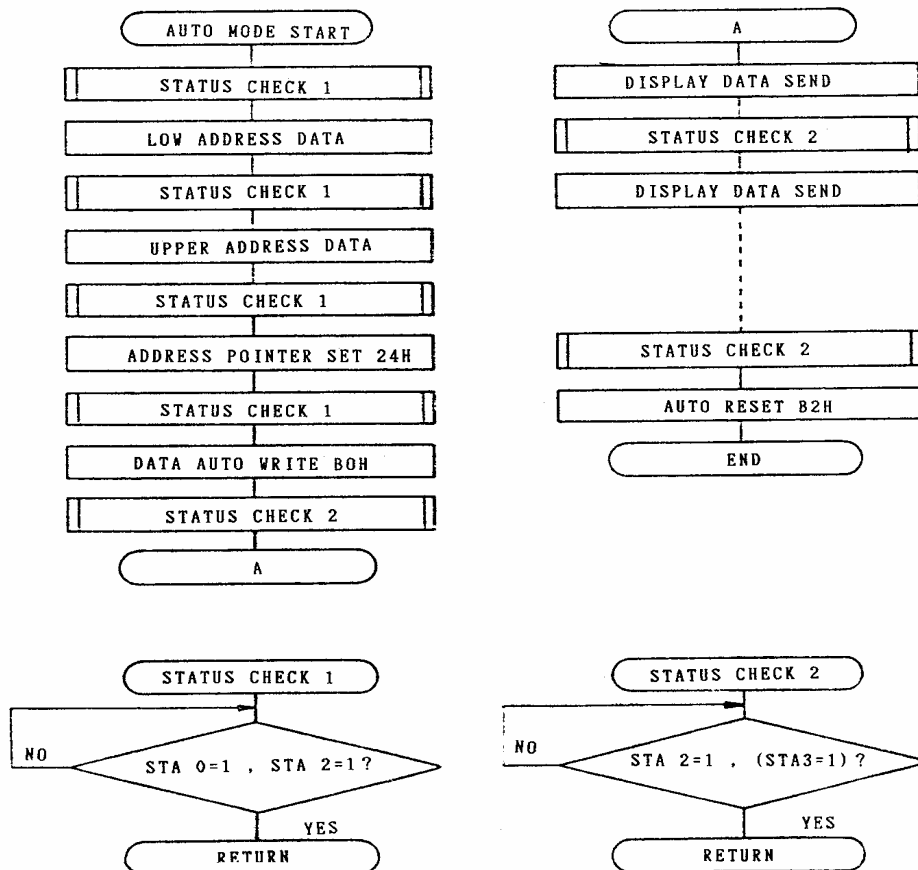
8 lines
cursor

6) Data auto read/write

CODE	FUNCTION	OPERAND
10110000	B0H data auto write set	-
10110001	B1H data auto read set	-
10110010	B2H auto reset	-

This command is convenient to send full screen data from external display RAM. After setting auto mode, "data write (or read)" command is not necessary between each data. "Data auto write (or read)" command should follow the "Address pointer set" and address pointer is automatically increment by +1 after each data. After sending (or receiving) all data "auto reset" is necessary to return normal operation because all data is regarded "display data" and no command can be accepted in the auto mode.

Note: Status check for auto mode (STA2, STA3 should be checked between each data. Auto reset should be performed after checking STA3=1 (STA2=1). Refer following flow chart.



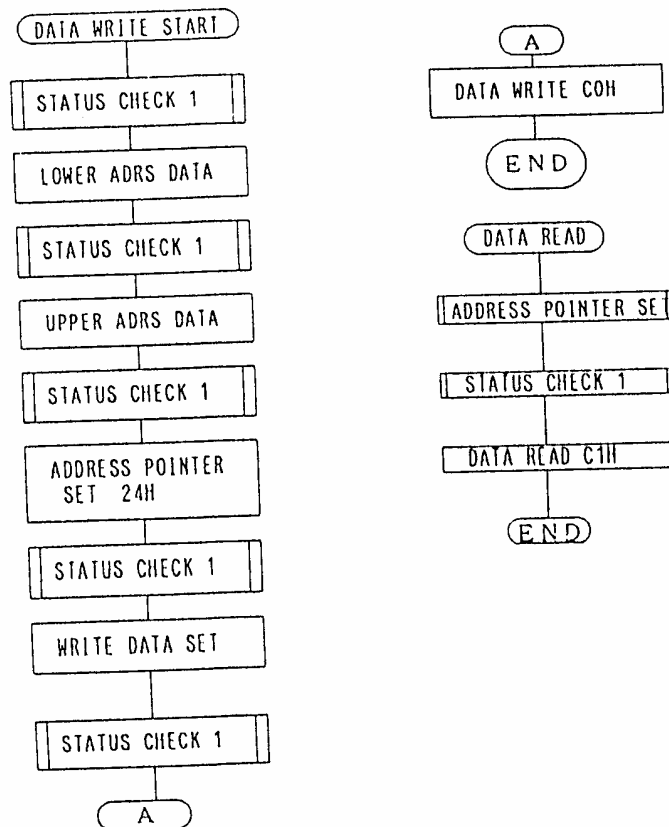
7) Data read write

CODE	FUNCTION	OPERAND
11000000	C0H DATA WRITE AND ADP INCREMENT	data
11000001	C1H DATA READ AND ADP INCREMENT	-
11000010	C2H DATA WRITE AND ADP DECREMENT	data
11000011	C3H DATA READ AND ADP DECREMENT	-
11000100	C4H DATA WRITE AND ADP NONVARIABLE	data
11000101	C5H DATA READ AND ADP NONVARIABLE	-

This command is used for data write from MPU to external display RAM, and data read from external display RAM to MPU. Data write/data read should be executed after setting address by address pointer set command. Address pointer can be automatically increment or decrement by setting this command.

Note: This command is necessary for each 1byte data.

Refer following flow chart.



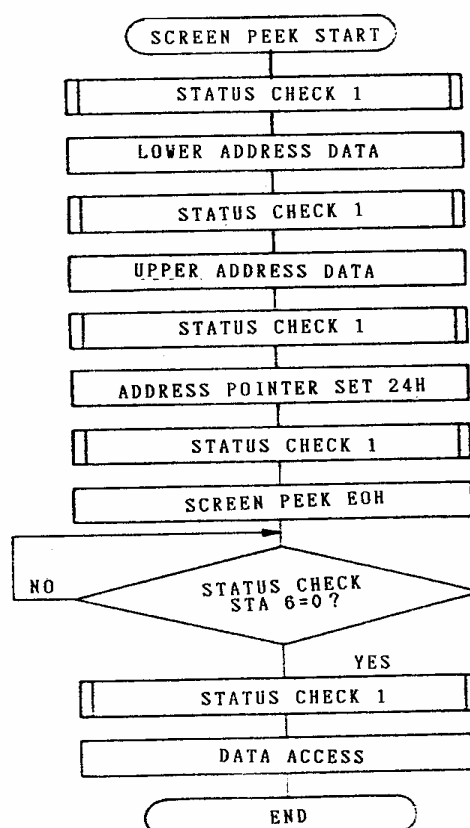
8) Screen peek

CODE	FUNCTION	OPERAND
11100000 E0H	screen peek	-

This command is used to transfer displayed 1byte data to data stack, and this 1byte data can be read from MPU by data access. The logical combination data of text and graphic display on LCD screen can be read by this command.

The status (STA6) should be checked just after "screen peek" command. If the address determined by "address pointer set" command is not in graphic area, this command ignored and status flag (STA6) is set.

Refer following flow chart.



9) Screen copy

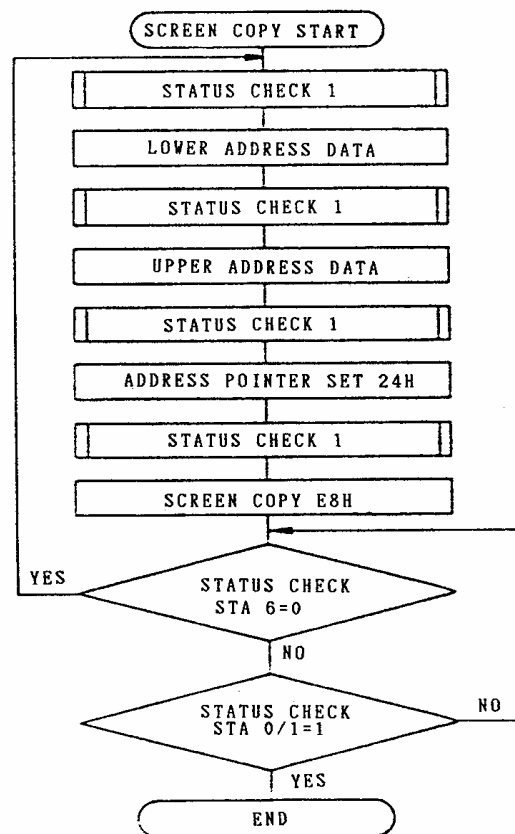
CODE	FUNCTION	OPERAND
11101000 E8H	screen copy	-

This command is used to copy displayed 1line data to graphic area. The start point of 1line data in the screen is determined by the address pointer.

Note: ①When the attribute of text is used this command cannot be used.
(because attribute data is in the graphic area.)

②In case of 2screen drive, this command cannot be used.
(because T6963C cannot separate upper screen data and lower screen data.)

Refer following flow chart.

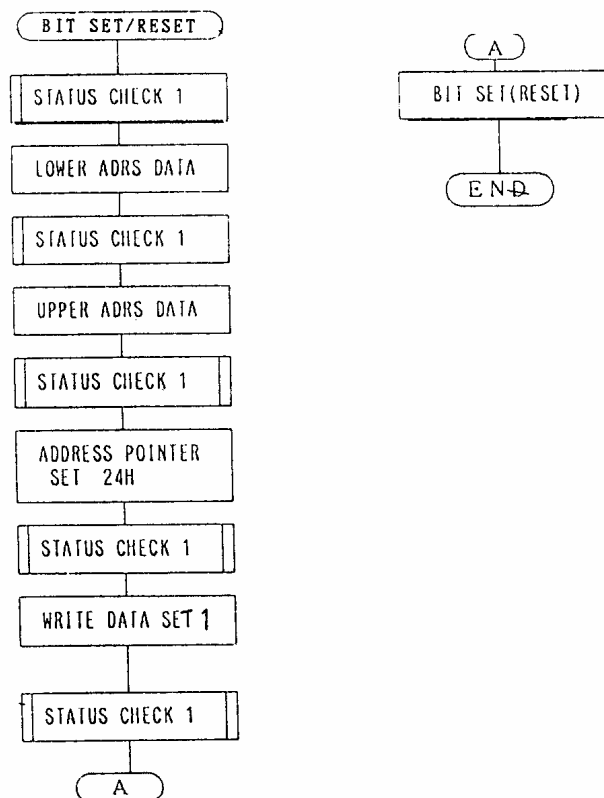


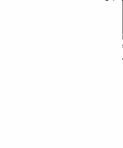
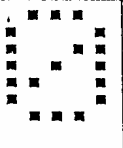
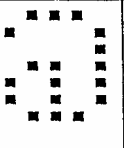
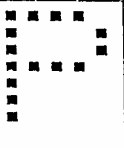
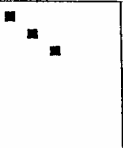
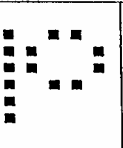
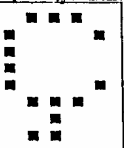
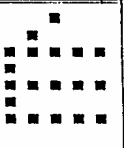
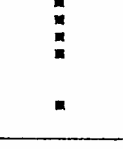
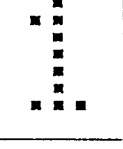
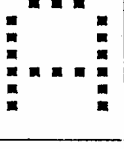
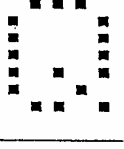
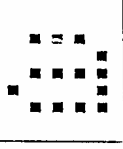
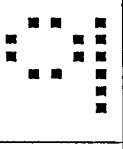
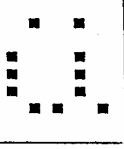
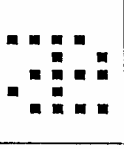
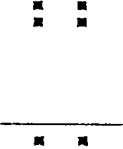
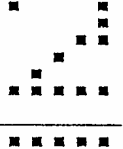
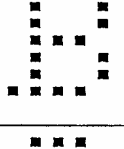
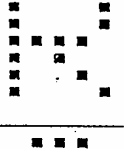
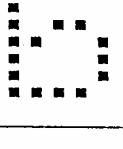
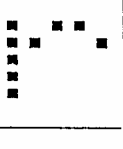
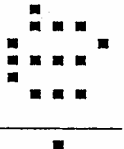
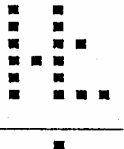
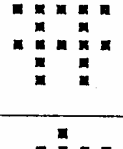
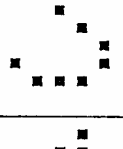
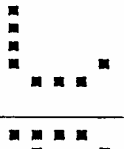
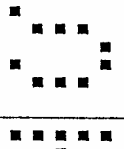
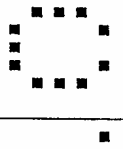
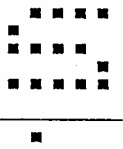
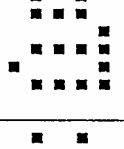
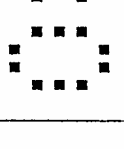
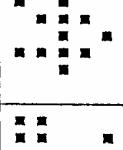
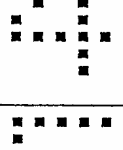
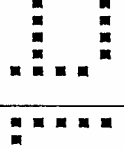
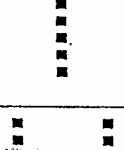
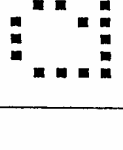
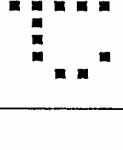
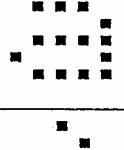
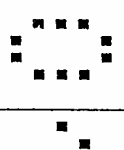
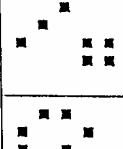
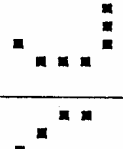
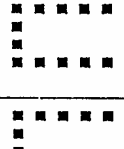
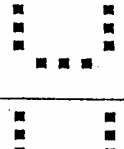
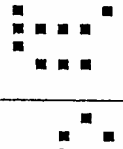
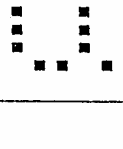
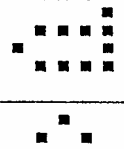
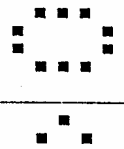
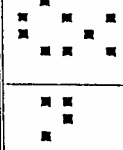
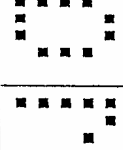
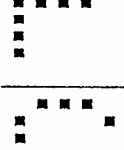
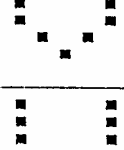
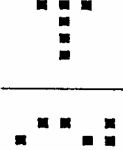
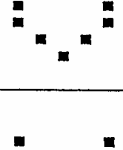
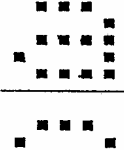
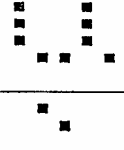
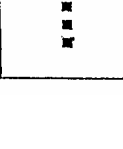
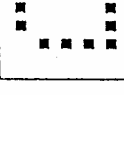
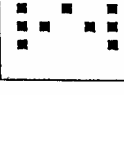
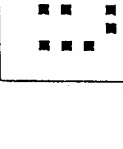
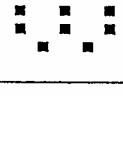
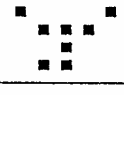
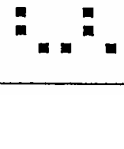
10) Bit set/reset

CODE	FUNCTION	OPERAND
11110XXX	bit reset	-
11111XXX	bit set	-
1111X000	bit 0 (LSB)	-
1111X001	bit 1	-
1111X010	bit 2	-
1111X011	bit 3	-
1111X100	bit 4	-
1111X101	bit 5	-
1111X110	bit 6	-
1111X111	bit 7 (MSB)	-

This command is used to set or reset a bit of 1byte is specified by address pointer. Plural bits in the 1byte data cannot be set/reset at a time.

Refer following flow chart.



	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

	0	1	2	3	4	5	6	7
8								
9								
A								
B								
C								
D								
E								
F								

11.0 EL Lamp Data

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Voltage	V	—	100	—	Volt rms A.C.	Without Inverter
Operating Frequency	F _{op}	—	400	—	Hz	Without Inverter
Average Luminous Intensity	I _v	65	75	—	1cd/m ²	F _{op} =100Hz V = 100 V
Current Density	I _d	—	0.12	0.17	mA/cm ²	F _{op} =100Hz V = 100 V Without Inverter
Color	COOL WHITE					

12.0 MAXIMUM ABSOLUTE VALUES

ITEM	SYMBOL	MIN	MAX	UNITS
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C
Supply voltage for logic	V _{DD} —V _{SS}	—	+6.5	V
Supply voltage for LCD driving	V _{DD} —V _O	—	+22.0	V
Logic input voltage	V _I	V _{SS}	V _{DD}	V

13.0 RELIABILITY

ITEM	CONDITIONS	CRITERIA
High temperature operation	70 °C for 200 hours	◆ No defect in cosmetic and operational functions. ◆ Total current consumption below double of initial value.
Low temperature operation	-20 °C for 200 hours	
High humidity	40 °C, 90 % RH for 240 hours	
High temperature	80 °C for 200 hours	
Low temperature	-30 °C for 200 hours	
Temperature cycling	-30 °C (30 min) ↓↑ 25 °C (5 min) ↓↑ 80 °C (30 min) CYCLES: 10	
Vibration	Random Wave: 40~500 Hz Acceleration: 2g Time: 2 Hrs Direction: x, y, z	

14.0 COSMETIC CRITERIA

DEFECT	JUDGMENT CRITERION		
Spots	Size d (mm)		Acceptable quantity in active area
	d ≤ 0.1		Disregard
	0.1 < d ≤ 0.2		6
	0.2 < d ≤ 0.3		2
	d > 0.3		0
Note: d = (Length + Width)/2			
Polarizer Bubbles	Size d (mm)		Acceptable quantity in active area
	d ≤ 0.3		Disregard
	0.3 < d ≤ 1.0		3
	1.0 < d ≤ 1.5		1
	d > 1.5		0
Note: d = (Length + Width)/2			
Lines	Width W (mm)		Acceptable quantity in active area
	Length L (mm)		
	W ≤ 0.02		Disregard
	0.02 < W ≤ 0.05	L ≤ 5.0	6
		L > 5.0	0
	0.05 < W ≤ 0.1	L ≤ 2.0	6
		L > 2.0	0
W > 0.1		See criteria for Spots	
Testing conditions: 20W fluorescent lamp at 30 cm distance at normal viewing angle			

15.0 PRECAUTIONS

15.1 HANDLING OF LCD

1. The surface is easy to get scratched ! !
The surface of LCD glass is covered with polarizer (organic film).
This surface is quite soft and so should avoid rubbing with hard material for keeping it not get scratched.
2. Away from water ! !
LCD must not be used with dro of water adhered on it in order to keep electrodes from corrosion, Wipe the droplets off and use it dry.
3. Keep off dirty ! !
Saliva, fingerprint, starch or oily materials are easy to adhere on LCD Surface. On case this happened, wipe it off using soft cloth slightly wetted with normal hexane. Better keep LCD away from other organic solvents.
4. High temperature and high humidity will cause LCD'S easy deterioration ! !
LCD dislike high temperature and high humidity. Store and use them under the condition where the temperature and humidity are kept in specified range.

15.2 User notes for pin-type LCD

1. Keep off high temperature and high stress ! !
High stress or high temperature will cause poor pin connection.
Install LCD 2mm or more apart from PCB. Making the pin at both ends both sides dummy will help stress release.
The connector pin installation area must be designed to the temperature not to exceed 80°C when using.
2. Do not clean whole LCD part after PCB soldering ! !
This will cause washing solution (fleon, or trichloroethane) to penetrate into resin of pin, decomposes resin under sunlight producing chlorine and combines with water to produce hydrochloric acid. This acid will then desolve the electrodes, causing wire breaks.

15.3 Handling of LCM

1. Keep away from processing or modifying of metal frame fingers ! !
This will often affect the consistency of C-MOS LSI signal output resulting in unusual display.
2. Take good care on CFL handling ! !
When installing CFL to the unit, care must be taken not to be grasped by hand or hit by hard material to avoid damages.
3. Do not hardy press metal frame or PCB ! !
When pressure is applied to metal frame or PCB, will often give rise to distortion of conducting rubber, breakage of LCD or backlighting lamp, resulting in display failure, Therefore on installation of LCM, please use holes for fixing to keep LCM or lamp free from stress.
4. Though-hole-pad should not be peeled off ! !
When repairing or soldering the connector, care must be taken not to peel off through-hole-pad. Watch closely the soldering iron temperature and soldering time duration.
5. Watch for an after image ! !
When there is an object existing under the direct sunlight or fluorescent lamp above LCM unit, will often transfer the image to the LCM acting as an after image. Not put an object above LCM to abstract the display.
6. Watch for low temperature bubbles ! !
Prolonged storing under the temperature even lower than specified temperature range or strong impact applied on the unit, will often give rise to black or white bubbles appeared in the display.

15.4 Must be with human body earth when touching

Please, must be well with human body earth at time of LCM handling. Because it would become reasons why C-MDS, LSI being demolished if touch LCM without earth. It is advisable to wear conductive shoes, and operate under conductive sheet for safety.

15.5 Be using no AC current leakage welding hand.

Be sure there will have no AC current leakage for welding hand when is making use, It would probably destroyed by involuntarily voltage Applying to LCM .

15.6 Must be with earth for electric driver

Please, must be well with earth when using electric driver for LCM installation, It had been reconized that LCM might be broken due to static electricity occurred by electric driver.

15.7 Keep the humidity of operation room above 45%

Please keep the room humidity above 45%.

Because the dryer the air, the easier static electricity will occur.

Further, please also hold attention to operation desks, chairs, shelves push care be well with earth, Special attention have to be extended to the movement as taking LCM out or transferring from packing box.

15.8 Be attention to the use of cleaning machine

Do not get the mouth of cleaning machine near to the LCM when is cleaning the operation room by cleaning machine. It had been found sometime the LCM were demolished by static electricity.

APPENDIX—

REVISION RECORD

REV	REVISION ITEM	DATE
NEW		2005/02/22
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		
M		
N		