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For Messrs.

Date. Jan.21.'91

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

LMG6381QHGE

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Accepted by; _____

Proposed by; W. J. HWANG

RECORD OF REVISION

D a t e	Sheet No.	S u m m a r y
Oct.15'90	3284PS 2503- LMG6381QHGE-1 PAGE 3-1/1	CHANGE: (2)MODULE SIZE 160.0W×68.0H ×9.0D (MAX) mm. ⇒ 160.0W×68.0H ×9.5D (MAX) mm. ADD: (9) EL PART No.
	3284PS 2504- LMG6381QHGE-1 PAGE 4-1/1	CHANGE: f EL=50HZ(TYP.) ⇒ 50HZ(MIN.)
	3284PS 2505- LMG6381QHGE-1 PAGE 5-1/1	CHANGE: RECOMMENDED LC DRIVING VOLTAGE. VDD-V0 { Ta= 0℃ (17.1) 16.2 Ta=25℃ (16.0) ⇒ 15.3 Ta=40℃ (15.4) 14.7 ADD: NOTE(4) RECOMMEND ED EL INVERTER
	3284PS 2506- LMG6381QHGE-1 PAGE 6-1/3	CHANGE: DIMENSIONAL OUTLINE. MODULE HEIGHT:9.0 MAX ⇒ 9.5 MAX
Jan.21.'91	3284PS 2506- LMG6381QHGE-2 PAGE 6-1/3 PAGE 6-2/3	ADD: INTERFACE NO. E1,E2 FOR EL DRIVING

3. GENERAL SPECIFICATIONS.

3.1 STANDARD SPECIFICATIONS

3284PS 2501 - 401 - 1

THIS INDIVIDUAL SPECIFICATIONS IS PRIOR TO GENERAL SPECIFICATION.

4. MECHANICAL DATA

(1) NUMBER OF DOTS	256W × 64H DOTS
(2) MODULE SIZE	160.0W × 68.0H × 9.5D (MAX.) mm
(3) EFFECTIVE DISPLAY AREA	126.3W × 37.0H mm
(4) DOT SIZE	0.44W × 0.44H mm
(5) DOT PITCH	0.47W × 0.47H mm
(7) VIEWING DIRECTION	6 O'CLOCK
(8) LCD	NEW GRAY MODE WITH EL BACKLIGHT
(9) EL	LIGHTING COLOR WHITE
	No. NEL-5LL-715-W
	MAKER: NEC

5. ABSOLUTE MAXIMUM RATINGS

5.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

I T E M	SYMBOL	MIN.	TYP.	MAX.	UNIT	COMMENT
POWER SUPPLY FOR LOGIC	VDD-VSS	0	-	7.0	V	
POWER SUPPLY FOR DRIVE	VDD-VEE	0	-	22.0	V	
INPUT VOLTAGE	VI	VSS	-	VDD	V	
STATIC ELECTRICITY	-	-	-	100	V	
EL POWER SUPPLY	VEL	-	-	AC150	Vrms	
	fEL	50	-	1000	HZ	AC100Vrms

5.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

I T E M	OPERATING		STORAGE		C O M M E N T
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0℃	40℃	-20℃	60℃	NOTE(2,3)
HUMIDITY	NOTE(1)		NOTE(1)		WITHOUT CONDENSATION
VIBRATION	—	4.9m/s ² (0.5G)	—	19.6m/s ² (2G)	
SHOCK	—	29.4m/s ² (3G)	—	490.0m/s ² (50G)	XYZ DIRECTION
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE(1) Ta ≤ 40℃ : 85%RH max.

Ta > 40℃ : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY
OF 85%RH AT 40℃

NOTE(2) Ta AT -20℃ < 48hr.

NOTE(3) BACKGROUND COLOR OF LCD CHANGES DEPENDING ON TEMPERATURE

0℃ : PURPLISH-GRAY



25℃ : GREENISH-GRAY



40℃ : GREEN-GRAY

40℃ ~ 50℃ : NO PERMANENT DAMAGE

6 ELECTRICAL CHARACTERISTICS

I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
LOGIC CURCUIT POWER SUPPLY VOLTAGE		VDD-VSS	————	4.75	5.0	5.25	V
LC DRIVER CIRCUIT POWER SUPPLY VOLTAGE		VEE-VSS	————	-12.5	-13.0	-13.5	V
INPUT VOLTAGE NOTE(1)	H	V _{IH}	————	0.3XVDD	-	VDD	V
	L	V _{IL}	————	0	-	0.2XVDD	V
INPUT LEAK CURRENT		I _{in}		-5.0	-	5.0	μA
OUTPUT LEAK CURRENT		I _{out}		-10.0	-	10.0	
CLOCK FREQUENCY NOTE(2)		f _{CL2}		-	-	1.2	MHz
POWER CONSUMPTION		PW	VDD=5.0V Ta=25°C	-	-	250	mW
RECOMMENDED LC DRIVING VOLTAGE NOTE(3)	VDD-V0		Ta= 0°C	-	16.2	-	V
	θ=0°		Ta=25°C	-	15.3	-	
	φ=10°		Ta=40°C	-	14.7	-	
EL POWER SUPPLY NOTE(4)	V _{EL}		f _{EL} =400HZ	-	100	-	V _{rms}
	I _{EL}		V _{EL} =100V _{rms} f _{EL} =400HZ	-	-	100	mA _{rms}

NOTE(1)APPLIED TO DB0~DB7,CS,E,R/W,RS.

NOTE(2)INTERNAL CLOCK

NOTE(3)RECOMMENDED LC DRIVING VOLTAGE MAY FLUCTUATE ABOUT ±0.5V BY EACH MODULE.

NOTE(4)RECOMMENDED EL INVERTER:NEL-D32-48.MAKER:NEC

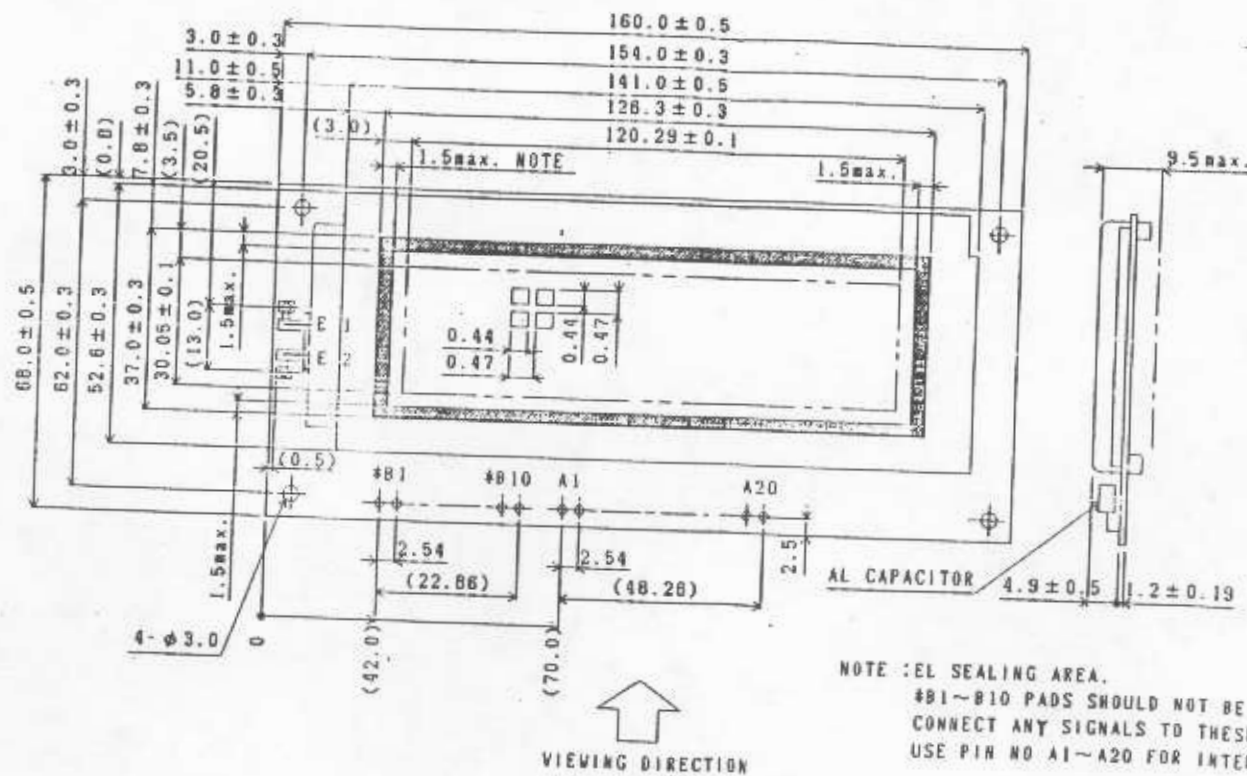
7. OPTICAL DATA

Ta=25°C VDD=5.0V VEE=-13.0V VDD-V0=15.3V

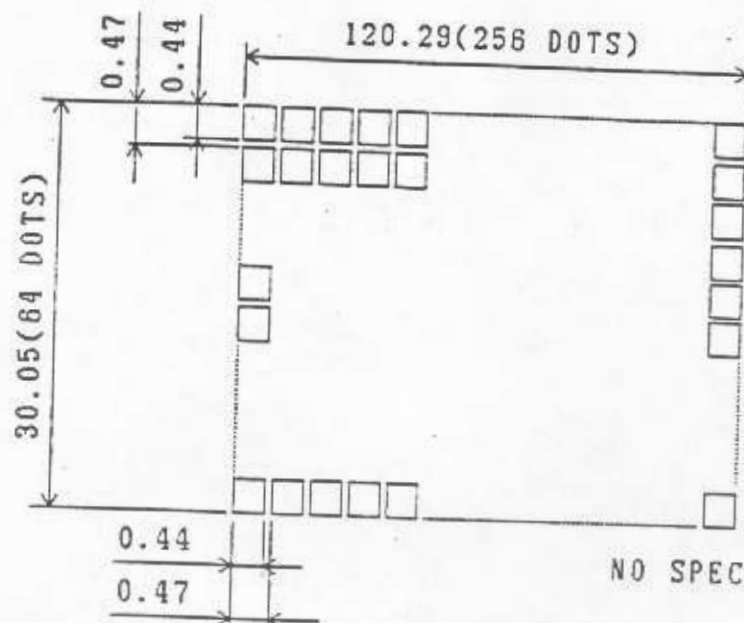
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	φ2-φ1	K=1.4	-	40	-	deg.	1
CONTRAST RATIO	K	φ=10° θ=0°		3.0	-	-	1
RESPONSE TIME	t _r (rise)	φ=10° θ=0°	-	250	400	ms	1
	t _f (fall)	φ=10° θ=0°	-	300	450	ms	1
EL BRIGHTNESS	B _{EL}	φ=10° θ=0°	-	10.0	-	cd/m ²	1

NOTE(1)SEE GENERAL SPECIFICATIONS FOR DEFINITION OF OPTICAL CHARACTERISTICS.

B. DIMENSIONAL OUTLINE



NOTE(1)DETAIL DRAWING OF MATRIX PATTERN



UNIT:mm

Scale:NTS.

NO SPECIFIED TOLERANCE ± 0.1

NOTE(2)INTERNAL PIN CONNECTION

PIN NO.	SYMBOL	FUNCTION
A1	VSS	GROUND
A2	VDD	POWER SUPPLY FOR LOGIC
A3	V0	POWER SUPPLY FOR LCD DRIVE
A4	RS	REGISTER SELECT
A5	R/W	READ/WRITE
A6	E	ENABLE
A7~14	DB0~DB7	DATA BUS
A15	CS	CHIP SELECT
A16	RES	RESET
A17	VEE	POWER SUPPLY FOR LCD
A18~20	N.C	NO CONNECTION
E1	VEL	EL DRIVING VOLTAGE
E2	VEL	EL DRIVING VOLTAGE

9. BLOCK DIAGRAM

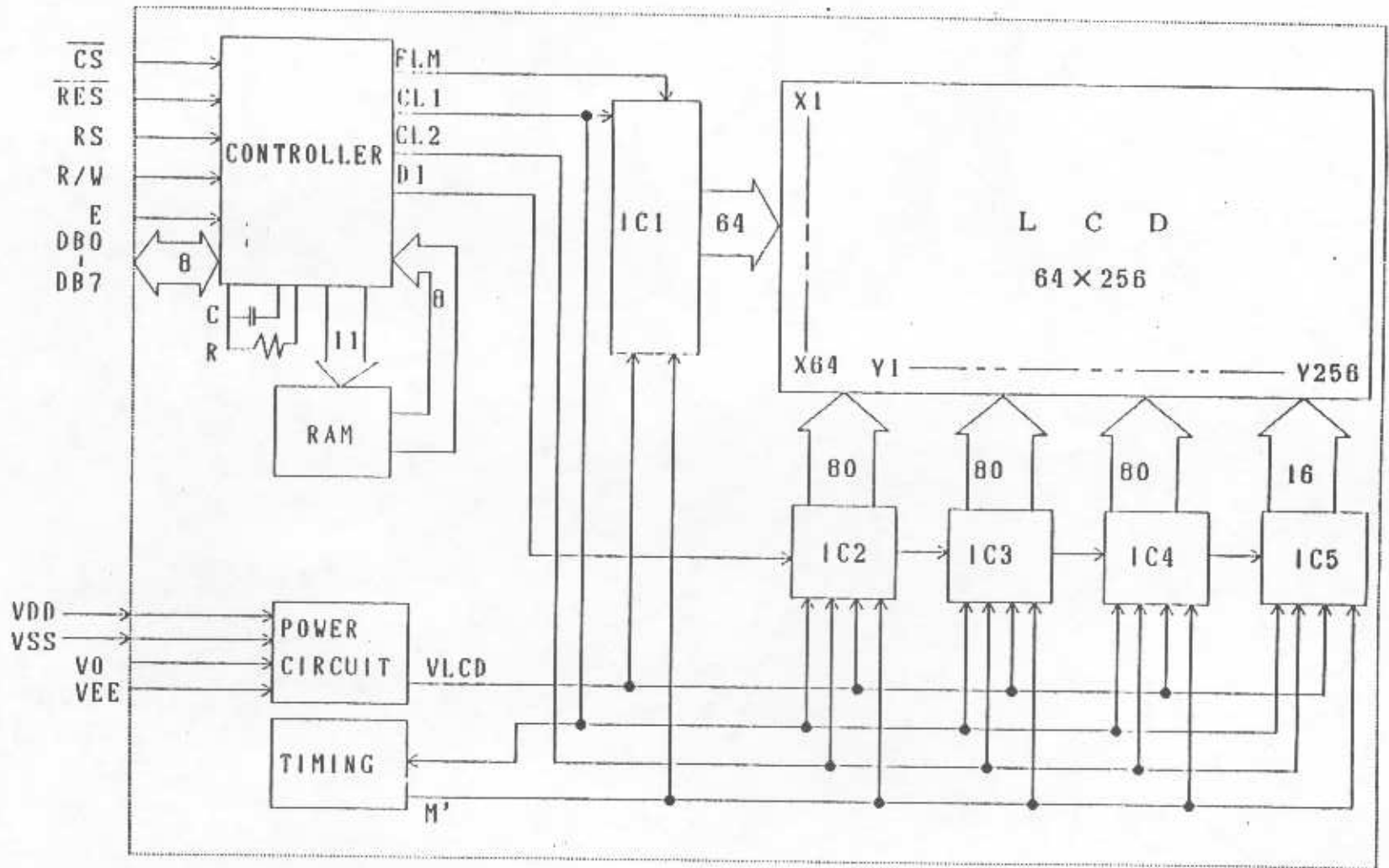
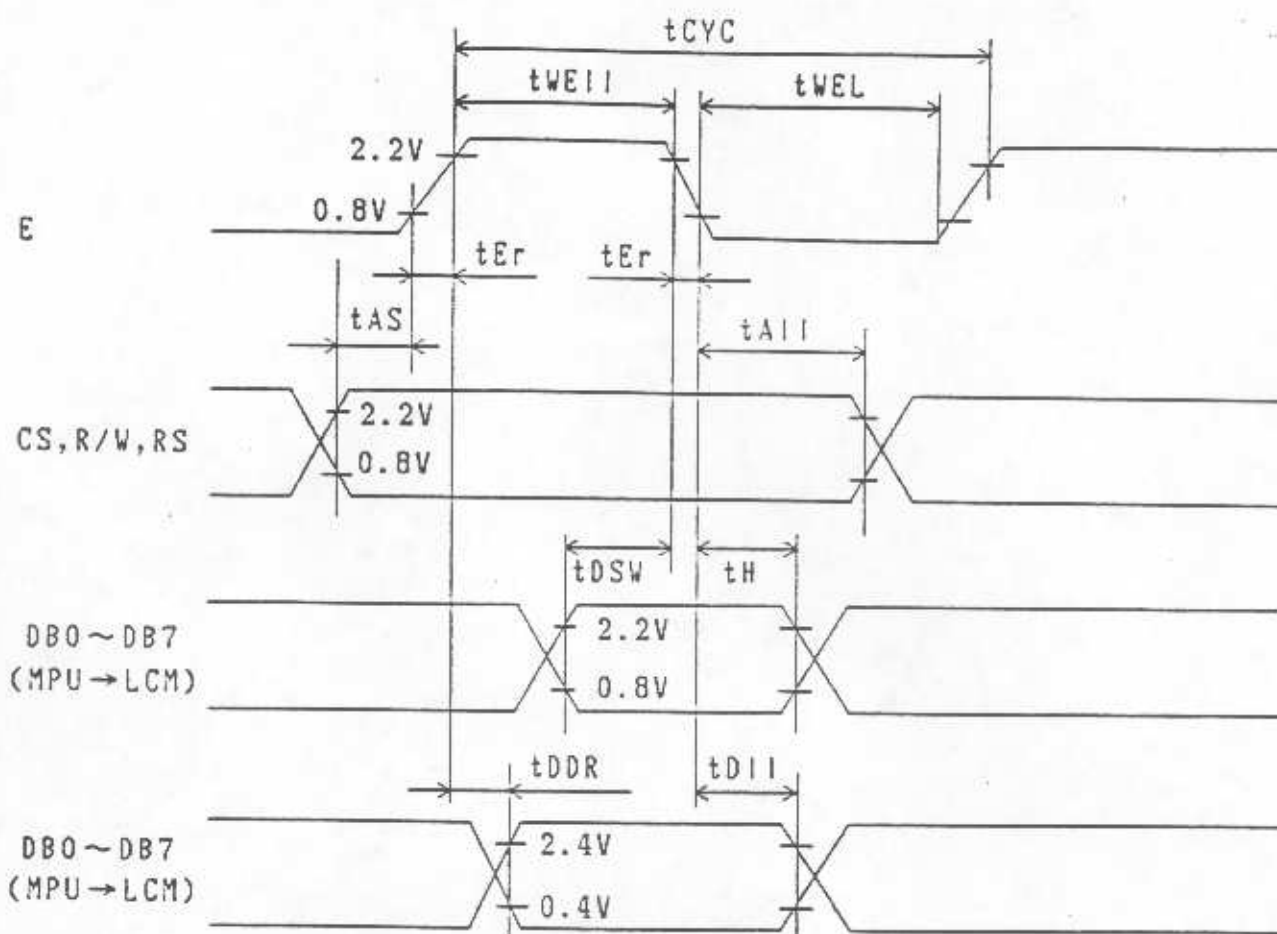


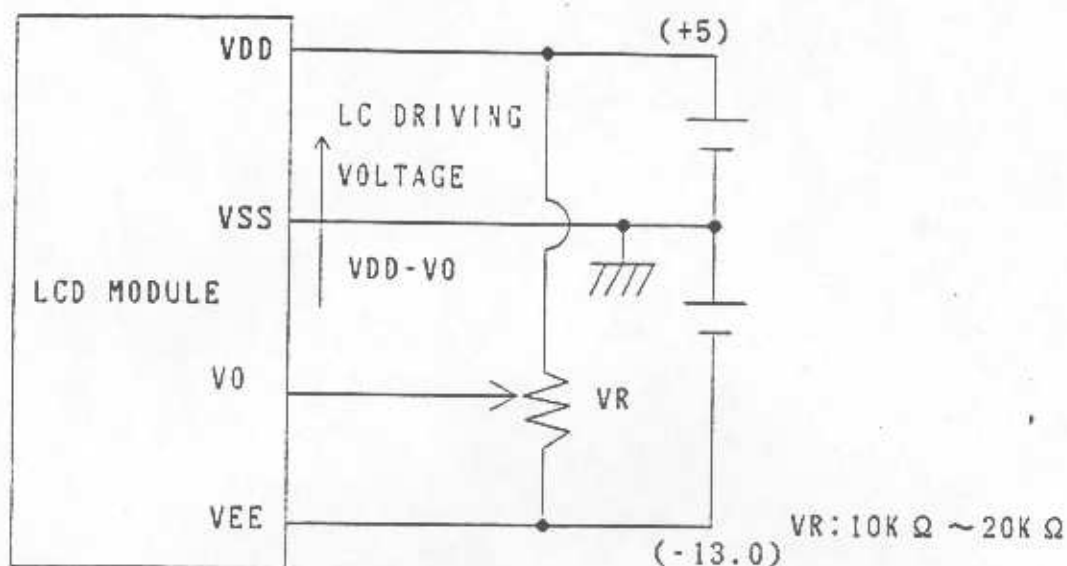
FIG.1-1 BLOCK DIAGRAM

10. TIMING CHARACTERISTICS

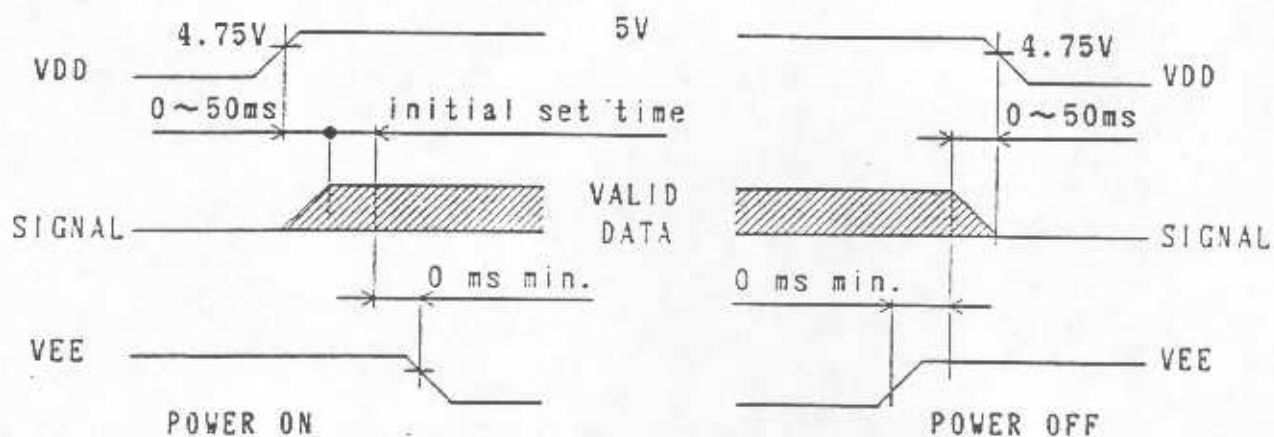


ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
ENABLE CYCLE TIME	t_{CYC}	1.0	-	-	us
ENABLE PULSE WIDTH	"HIGH" LEVEL	t_{WEH}	0.45	-	us
	"LOW" LEVEL	t_{WEL}	0.45	-	us
ENABLE RISE TIME	t_{Er}	-	-	25	ns
ENABLE FALL TIME	t_{Ef}	-	-	25	ns
SETUP TIME	t_{AS}	140	-	-	ns
DATA SETUP TIME	t_{DSW}	225	-	-	ns
DATA DELAY TIME	t_{DDR}	-	-	225	ns
DATA HOLD TIME	t_{DH}	10	-	-	ns
ADDRESS HOLD TIME	t_{AH}	10	-	-	ns
DATA HOLD TIME	t_{DII}	20	-	-	ns

11 POWER SUPPLY FOR LCD MODULE



12. POWER AND INTERFACE TIMING SEQUENCE



NOTE: INITIAL SET TIME - THE TIME IS INITIAL INSTRUCTIONS SET TIME OF CONTROLLER HD61830.

- (INITIAL INSTRUCTIONS: ① MODE CONTROL
 ② SET CHARACTER PITCH.
 ③ SET NUMBER OF CHARACTERS.
 ④ SET NUMBER OF TIME DIVISION.)

HITACHI

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For Messrs.

DATE : JUL.22. '99

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

LM016L-S

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9	REFERENCE MATERIALS	7B64PS 2707 - LM016L - S - 2	7 - 1/1

Accepted by : _____

Proposed by : Y. J. Wang

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RECORD OF REVISION

Date	Sheet No.	Summary
JUL.22.'99	7B64PS 2705- LM044L-S-2 PAGE 5-1/1	7.OPTICAL CHARACTERISTICS CONTRAST RATIO CHENGED: TYP : 2 → 3

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3. GENERAL SPECIFICATIONS

3.1 GENERAL SPECIFICATIONS WITH HD44780
3284PS 2501 - 233 - 2

3.2 STANDARD SPECIFICATIONS
3284PS 2501 - 234 - 1

THIS INDIVIDUAL SPECIFICATIONS IS PRIOR TO GENERAL SPECIFICATION.

4. MECHANICAL DATA

(1) NUMBER OF DISPLAY CHARACTER	16 CHARACTER * 2 LINES
(2) MODULE SIZE	84.0W * 44.0H * 10.50 D MAX mm
(3) EFFECTIVE DISPLAY AREA	61.0 W * 15.8H mm
(4) DISPLAY PATTERN CHARACTER	5 * 7 DOTS
CURSOR	5 * 1 DOTS
(5) CHARACTER SIZE	2.96W * 4.86H mm (5*7 dots)
(6) CHARACTER PITCH	3.55mm
(7) DOT SIZE	0.56W * 0.66H mm
(8) DOT PITCH	0.6 * 0.7 mm
(9) VIEWING DIRECTION	6:00

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5. ABSOLUTE MAXIMUM RATINGS.

5.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
POWER SUPPLY FOR LOGIC	VDD-VSS	0	6.5	V	
POWER SUPPLY FOR LCD DRIVE	VDD-VO	0	6.5	V	
INPUT VOLTAGE	VI	VSS	VDD	V	
STATIC ELECTRICITY	—	—	100	V	NOTE(1)

5.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0°C	50°C	-20°C	70°C	50HR MAX. (AT Ta = 70°C)
HUMIDITY	NOTE (2)		NOTE (2)		WITHOUT CONDENSATION
VIBRATION	—	4.9m/s ²	—	19.6m/s ²	
SHOCK	—	29.4m/s ²	—	490.0m/s ²	XYZ DIRECTIONS
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) : Test method and conditions

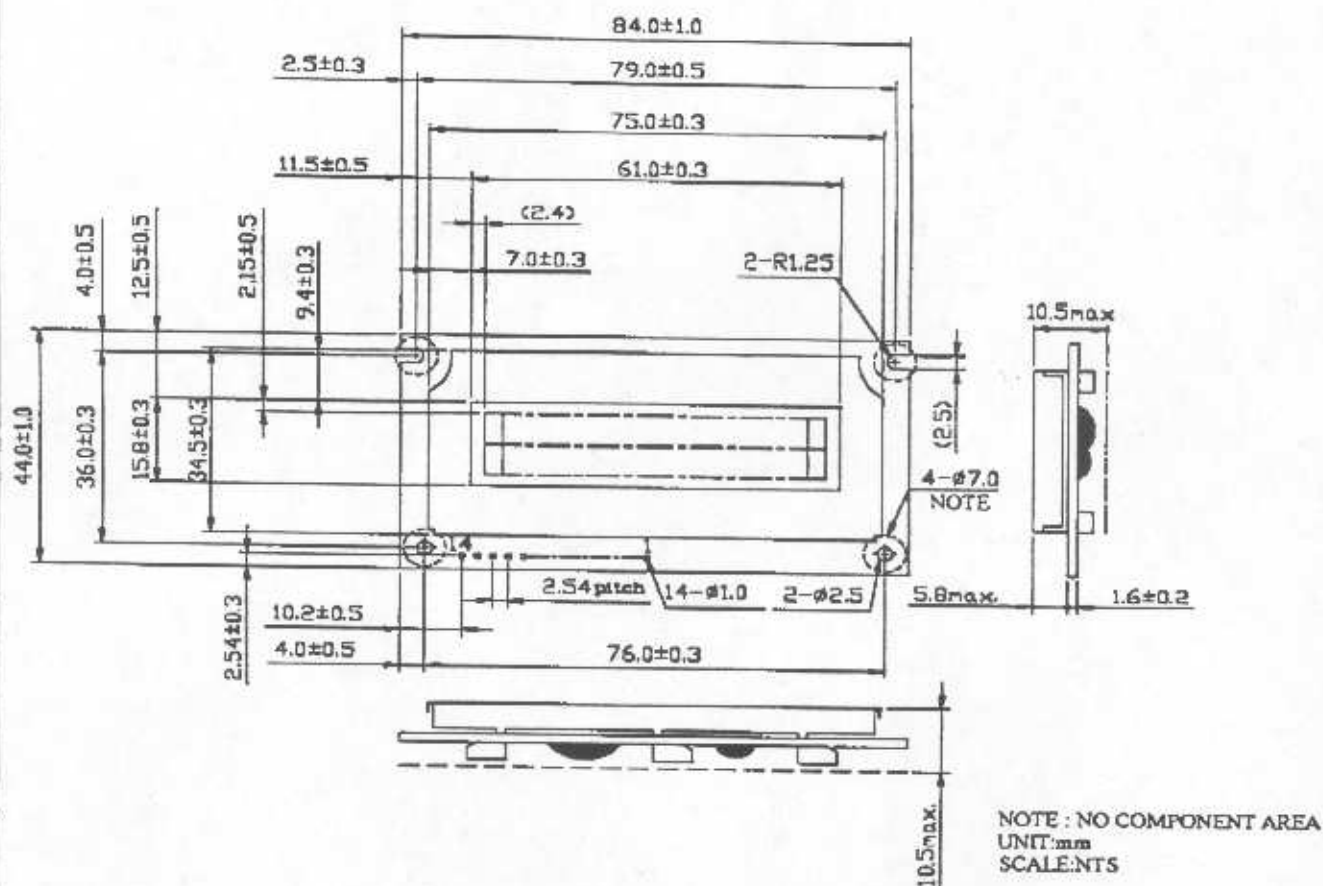
After charging up 200 PF capacitor by stated voltage, the capacitor is connected with the interface pins of the modules.

NOTE (2) : Ta ≤ 40°C : 95% RH MAX.

Ta > 40°C : Absolute humidity must be lower than the humidity of 95% RH at 40°C

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8. DIMENSION OUTLINE

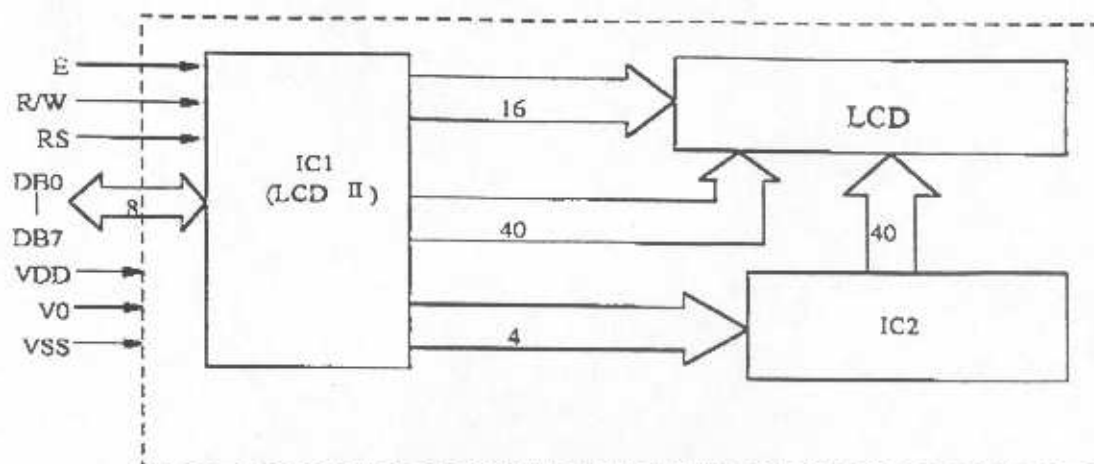


INTERFACE PIN CONNECTION

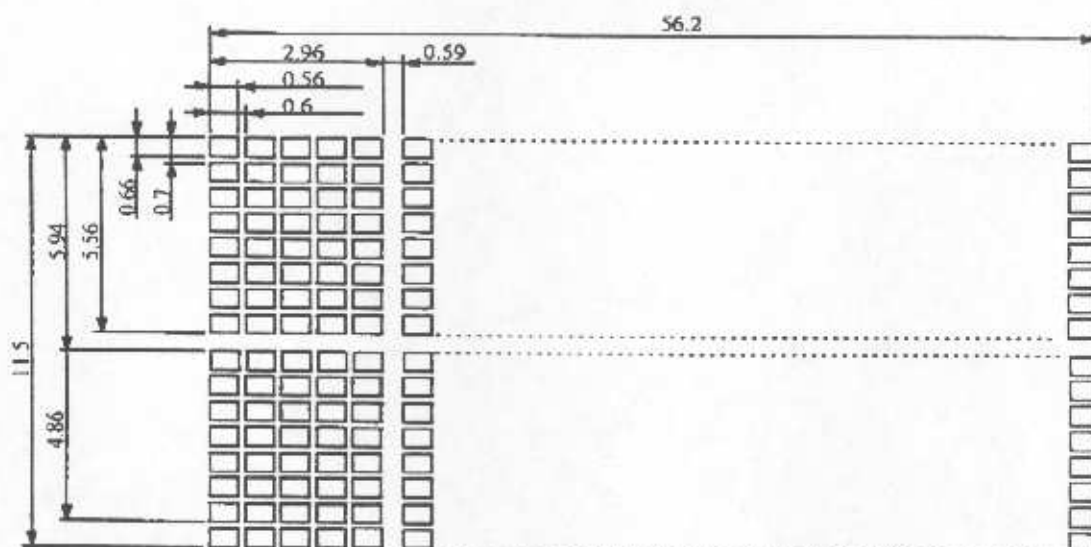
PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SYMBOL	VSS	VDD	VO	RS	R/W	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7

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NOTE 1. BLOCK DIAGRAM



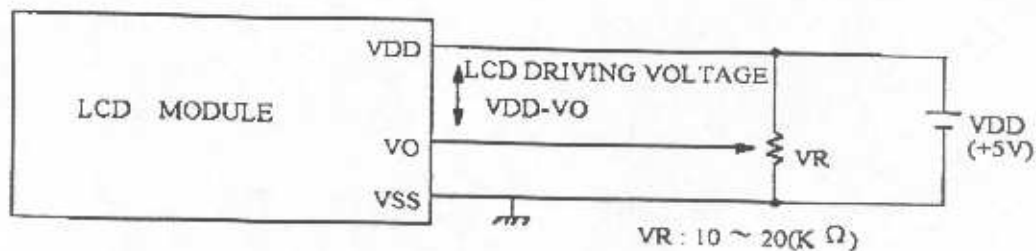
NOTE2. DETAIL DRAWING OF MATRIX PATTERN



UNIT : mm
SCALE : NTS

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NOTE 3. POWER SUPPLY FOR LCD MODULE



9. REFERENCE MATERIALS

HD44780 MANUAL : HITACHI DOT MATRIX LIQUID CRYSTAL DISPLAY
CONTROLLER/DRIVER LCD- II (HD44780) USER'S MANUAL.

Kaohsiung Hitachi Electronics Co.,Ltd.	Date	JUL.22. '99	Sh. No.	7B64PS 2707 - LM016L - S - 2	Page	7 - 1/1
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