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<i>MS Huang</i>		VERSION : 4

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

13B30(REFLECTIVE TYPES)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

RECORDS OF REVISION

DATE	REVISED PAGE NO.	SUMMARY																																																										
OCT.21,1999	1~3 , 5	THE ENTIRE PAGES REVISED																																																										
OCT.26,2001	1	ADDED (9) VIEWING DIRECTION *																																																										
	3 , 5	ADDED 12 O'CLOCK																																																										
MAR.03,2003	3	<p>4. ELECTRICAL CHARACTERISTICS</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN .</th> <th>TYP .</th> <th>MAX .</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (2)</td> <td>IDD</td> <td>VDD - VSS = 5.0 V VDD - VO = 9.2 V</td> <td>—</td> <td>7.0</td> <td>—</td> <td>mA</td> </tr> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)</td> <td rowspan="3">VDD - VO ∅ = 10° θ = **</td> <td>Ta = -20 °C</td> <td>—</td> <td>9.2</td> <td>—</td> <td rowspan="3">V →</td> </tr> <tr> <td>Ta = 25 °C</td> <td>—</td> <td>9.2</td> <td>—</td> </tr> <tr> <td>Ta = 70 °C</td> <td>—</td> <td>8.4</td> <td>—</td> </tr> </tbody> </table> <p>NOTE (1) : APPLIED TO TERMINALS CS1, CS2, R/W, D/I, DB0-DB7, E, RST. NOTE (2) : THE DISPLAY PATTERN IS ALL "ON" / "OFF" . NOTE (3) : RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ±1.0V BY EACH MODULE .</p> <table border="1"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN .</th> <th>TYP .</th> <th>MAX .</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR LOGIC NOTE (2)</td> <td>IDD</td> <td>VDD - VSS = 5.0 V VDD - VO = 9.2 V</td> <td>—</td> <td>7.0</td> <td>10.0</td> <td>mA</td> </tr> <tr> <td rowspan="3">RECOMMENDED LCD DRIVING VOLTAGE</td> <td rowspan="3">VDD - VO ∅ = 10° θ = **</td> <td>Ta = -20 °C</td> <td>8.2</td> <td>9.2</td> <td>10.2</td> <td rowspan="3">V</td> </tr> <tr> <td>Ta = 25 °C</td> <td>8.2</td> <td>9.2</td> <td>10.2</td> </tr> <tr> <td>Ta = 70 °C</td> <td>7.4</td> <td>8.4</td> <td>9.4</td> </tr> </tbody> </table> <p>NOTE (1) : APPLIED TO TERMINALS CS1, CS2, R/W, D/I, DB0-DB7, E, RST. NOTE (2) : THE DISPLAY PATTERN IS ALL "ON" / "OFF" .</p>	PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VO = 9.2 V	—	7.0	—	mA	RECOMMENDED LCD DRIVING VOLTAGE NOTE (3)	VDD - VO ∅ = 10° θ = **	Ta = -20 °C	—	9.2	—	V →	Ta = 25 °C	—	9.2	—	Ta = 70 °C	—	8.4	—	PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT	POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VO = 9.2 V	—	7.0	10.0	mA	RECOMMENDED LCD DRIVING VOLTAGE	VDD - VO ∅ = 10° θ = **	Ta = -20 °C	8.2	9.2	10.2	V	Ta = 25 °C	8.2	9.2	10.2	Ta = 70 °C	7.4	8.4	9.4
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NUMBERING SYSTEM

Polarizer Mode	Backlight	Code value
Reflective	—	R

E W 1 3 B 3 0 G R U

Viewing direction
NIL : 6 o'clock
U : 12 o'clock

LCD type + color	Code Value
STN + Yellow-Green	Y
STN + Gray	G
FSTN + White	F

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1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU - 002 A

1.2 APPLICATION NOTES FOR CONTROLLER

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU - 100

1.3 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

2. MECHANICAL SPECIFICATIONS

- (1) NUMBER OF DOTS ----- 128W * 64H DOTS
- (2) MODULE SIZE ----- 93.0W * 70.0H * 9.5D(max) mm
- (3) EFFECTIVE AREA ----- 70.7W * 38.8H mm
- (4) ACTIVE AREA ----- 65.25W * 32.61H mm
- (5) DOT SIZE ----- 0.48W * 0.48H mm
- (6) DOT PITCH ----- 0.51W * 0.51H mm
- (7) LCD TYPE *
- (8) DRIVING METHOD ----- 1 / 64 DUTY MULTIPLEX DRIVE
- (9) VIEWING DIRECTION *

* PLEASE REFER TO NUMBERING SYSTEM .

3. ABSOLUTE MAXIMUM RATINGS

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS .

PARAMETER	SYMBOL	MIN .	MAX .	UNIT	REMARK
POWER SUPPLY FOR LOGIC	VDD - VSS	0	7.0	V	
INPUT VOLTAGE	VI	VSS	VDD	V	
STATIC ELECTRICITY	—	—	100	V	NOTE (1)

NOTE (1) : TEST METHOD AND CONDITIONS :
AFTER CHARGING UP 200 PF CAPACITOR BY STATED VOLTAGE ,
THE CAPACITOR IS CONNECTED WITH INTERFACE PINS OF THE
MODULE .

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS .

I T E M	OPERATING		STORAGE		REMARK
	MIN .	MAX .	MIN .	MAX .	
AMBIENT TEMPERATURE	-20 °C	70 °C	-30 °C	80 °C	NOTE (2), (3)
HUMIDITY	—	85 % RH	—	85 % RH	WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s ² (0.25 G)	—	11.76 m/s ² (1.2 G)	10 ~ 100 HZ XYZ DIRECTIONS 1 Hr . EACH
SHOCK	—	29.4 m/s ² (3 G)	—	490.0 m/s ² (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -30°C : 48HR MAX .
80°C : 168HR MAX .

NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT
TEMPERATURE THIS PHENOMENON IS REVERSIBLE .

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	4.75	5.0	5.25	V
INPUT VOLTAGE NOTE (1)	VIH	H LEVEL	0.7*VDD	—	VDD	V
	VIL	L LEVEL	GND	—	0.3*VDD	V
OUTPUT VOLTAGE NOTE (1)	VOH	H LEVEL	VDD - 0.4	—	—	V
	VOL	L LEVEL	—	—	0.4	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)	IDD	VDD - VSS = 5.0 V VDD - VO = 9.2 V	—	7.0	10.0	mA
RECOMMENDED LCD DRIVING VOLTAGE	VDD - VO ∅ = 10° θ = **	Ta = -20 °C	8.2	9.2	10.2	V
		Ta = 25 °C	8.2	9.2	10.2	
		Ta = 70 °C	7.4	8.4	9.4	

** θ = 0° WHEN VIEWING DIRECTION IS 6 O'CLOCK .

θ = 180° WHEN VIEWING DIRECTION IS 12 O'CLOCK .

NOTE (1) : APPLIED TO TERMINALS CS1, CS2, R/W, D/I, DB0~DB7, E, RST .

NOTE (2) : THE DISPLAY PATTERN IS ALL "ON" / "OFF" .

5. INTERFACE TIMING CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	FIG.
E cycle time	t _{CYC}	1000	—	—	nS	1,2
E high level	P _{WEH}	450	—	—	nS	1,2
E low level width	P _{WEL}	450	—	—	nS	1,2
E rise time	t _r	—	—	25	nS	1,2
E fall time	t _f	—	—	25	nS	1,2
Address setup time	t _{AS}	140	—	—	nS	1,2
Address hold time	t _{AH}	10	—	—	nS	1,2
Data setup time	t _{DSW}	200	—	—	nS	1
Data delay time	t _{DDR}	—	—	320	nS	2
Data hold time (Write)	t _{DHW}	10	—	—	nS	1
Data hold time (Read)	t _{DHR}	20	—	—	nS	2

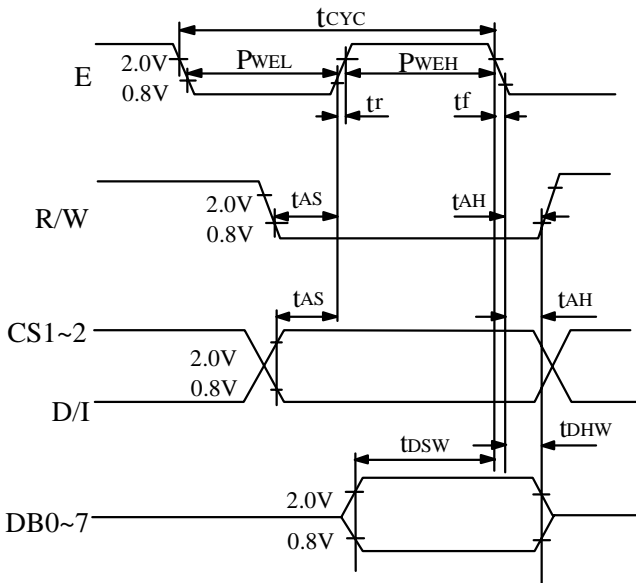


Fig . 1 CPU Write Timing

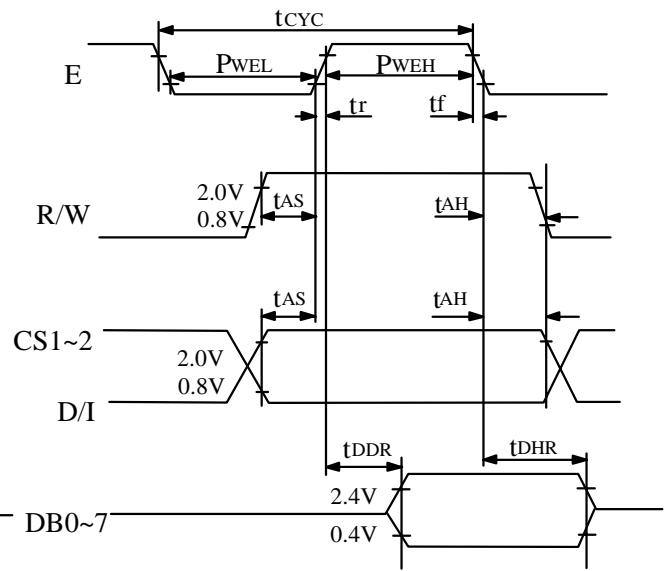


Fig . 1 CPU Read Timing

6. OPTICAL CHARACTERISTICS

Ta = 25 °C

VDD = 5.0 V

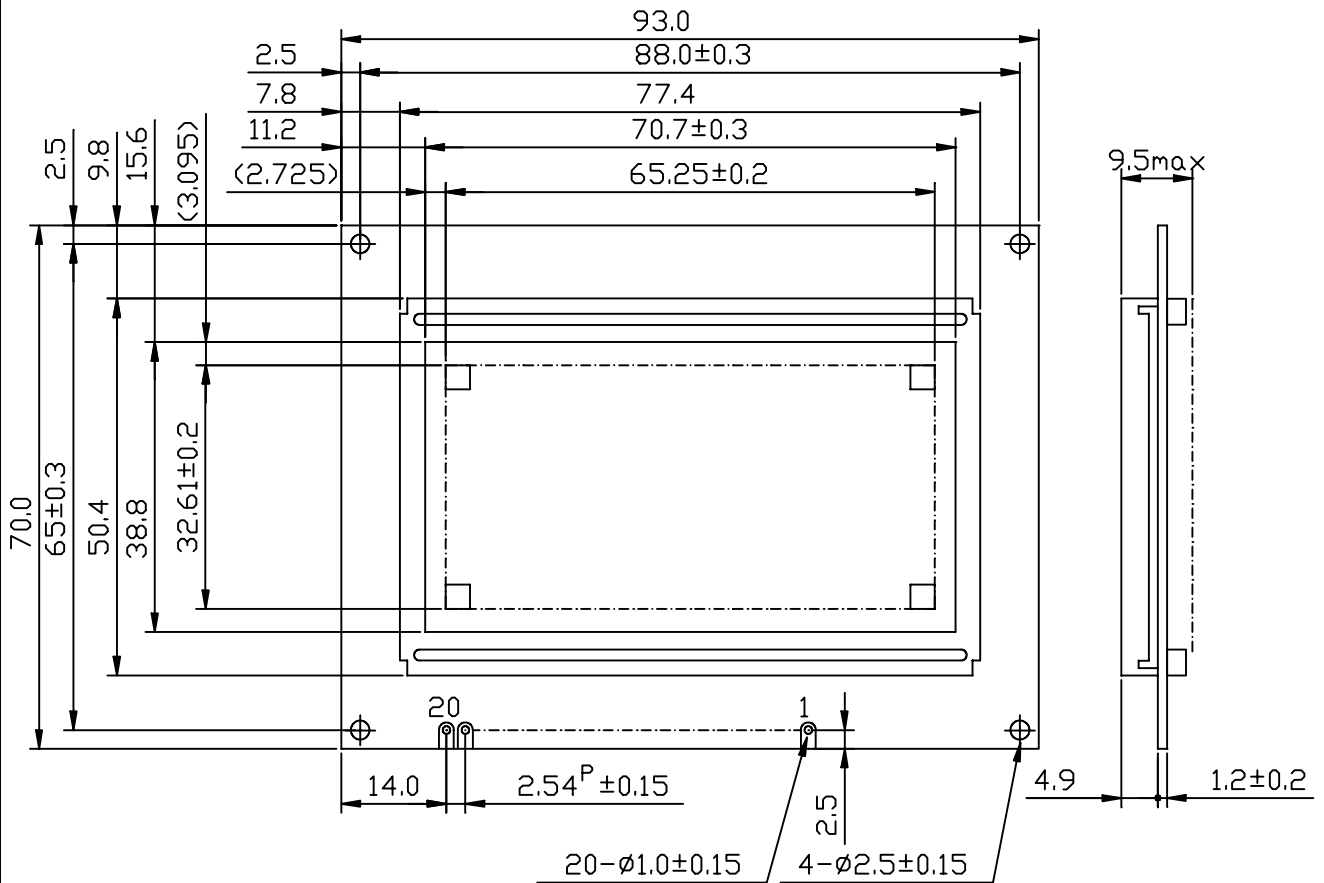
VDD - VO = 9.2 V

I T E M		SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE
VIEWING AREA	STN	∅ 2 - ∅1	K ≥ 1.4	30	—	—	deg.	1
	FSTN			40	—	—	deg.	1
CONTRAST RATIO	STN	K	∅ = 10° θ = **	—	5	—	—	1
	FSTN			—	8	—	—	1
RESPONSE TIME	tr (rise)	∅ = 10° θ = **	Ta = -20°C	—	5538	—	ms	1
			Ta = 25°C	—	228	—		
			Ta = 70°C	—	104	—		
	tf (fall)		Ta = -20°C	—	2316	—		
			Ta = 25°C	—	174	—		
			Ta = 70°C	—	85	—		

** θ = 0° WHEN VIEWING DIRECTION IS 6 O'CLOCK .
θ = 180° WHEN VIEWING DIRECTION IS 12 O'CLOCK .

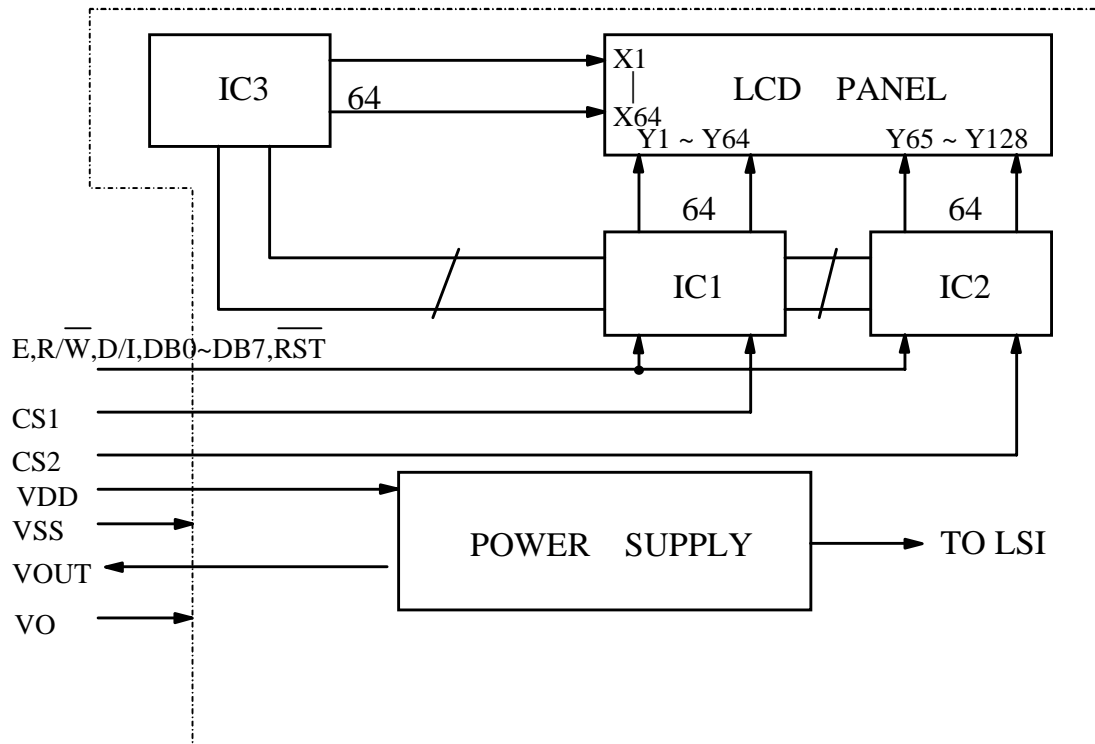
NOTE (1) : PLEASE REFER TO :
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS.
EU - 001A

7. OUTLINE DIMENSION

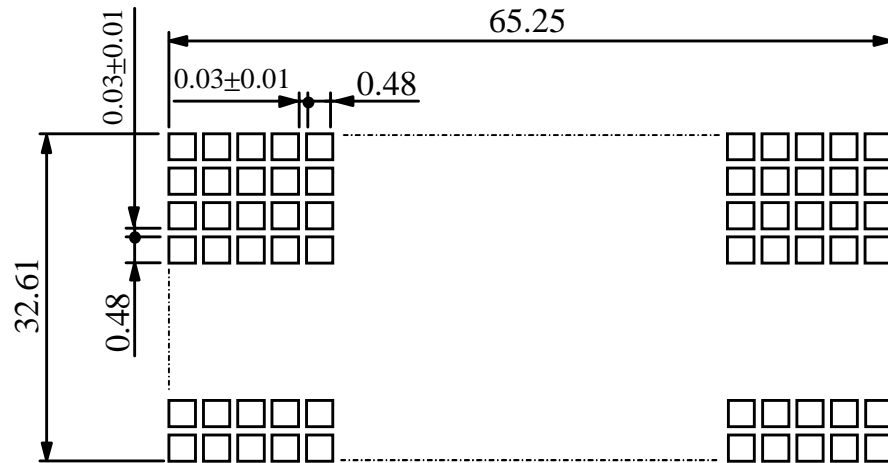


UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.5 mm

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



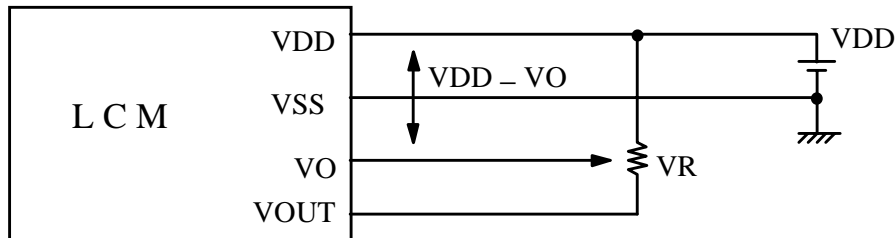
UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1

10. INTERFACE SIGNALS

PIN NO	SYMBOL	LEVEL	FUNCTION
1	VSS	—	GROUND
2	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
3	VO	—	OPERATING VOLTAGE FOR LCD DRIVING
4	D/I	H/L	H: DATA REGISTER L: INSTRUCTION REGISTER
5	R/ \overline{W}	H/L	H: DATA READ (LCD MODULE \rightarrow MPU) L : DATA WRITE (LCD MODULE \leftarrow MPU)
6	E	H,H \rightarrow L	ENABLE SIGNAL
7 14	DB0 DB7	H/L	DATA BUS LINE
15	CS1	H	CHIP SELECTION FOR IC1
16	CS2	H	CHIP SELECTION FOR IC2
17	\overline{RST}	L	RESET
18	VOUT	—	POWER SUPPLY FOR LCD DRIVING
19	N.C.	—	————
20	N.C.	—	————

11. POWER SUPPLY

11.1 POWER SUPPLY FOR LCM



VDD - VO : LCD DRIVING VOLTAGE
VR : 10K ~ 20KΩ

11.2 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

