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| EXAMINED BY: <i>Jony Chen</i> | mitsutech INTERNATIONAL CORPORATION | FILE NO . CAS-10090 |
| APPROVED BY: <i>David Chang</i> | | ISSUE : OCT.21,1999 |
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| | | VERSION : 2 |

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|----------|------------|----------------|
| CUSTOMER | ACCEPTANCE | SPECIFICATIONS |
|----------|------------|----------------|

MODEL NO. :

13B30(REFLECTIVE TYPES)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

| Polarizer Mode | Backlight | Code value |
|----------------|-----------|------------|
| Reflective | — | R |

E W 13 B 30 G R

| 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 :

E U - 0 0 2 A

1.2 APPLICATION NOTES FOR CONTROLLER

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

E U - 1 0 0

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

* 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 | — | mA |
| RECOMMENDED LCD DRIVING VOLTAGE NOTE (3) | VDD - V0 ∅ = 10° θ = 0° | Ta = -20 °C | — | 9.2 | — | V |
| | | Ta = 25 °C | — | 9.2 | — | |
| | | Ta = 70 °C | — | 8.4 | — | |

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 .

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 |

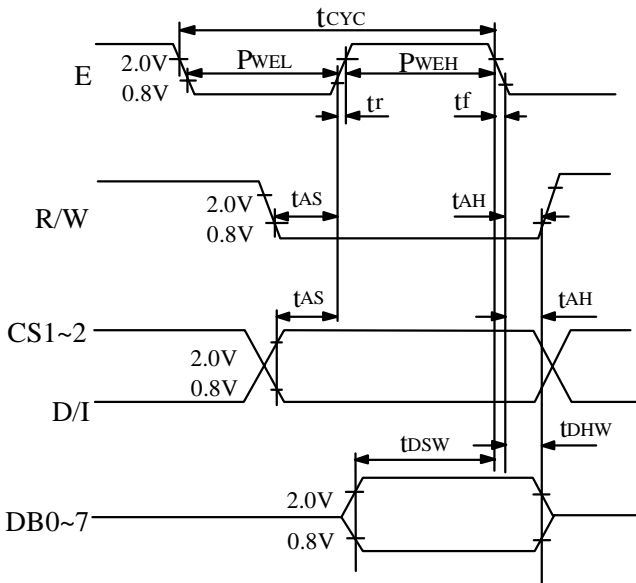


Fig . 1 CPU Write Timing

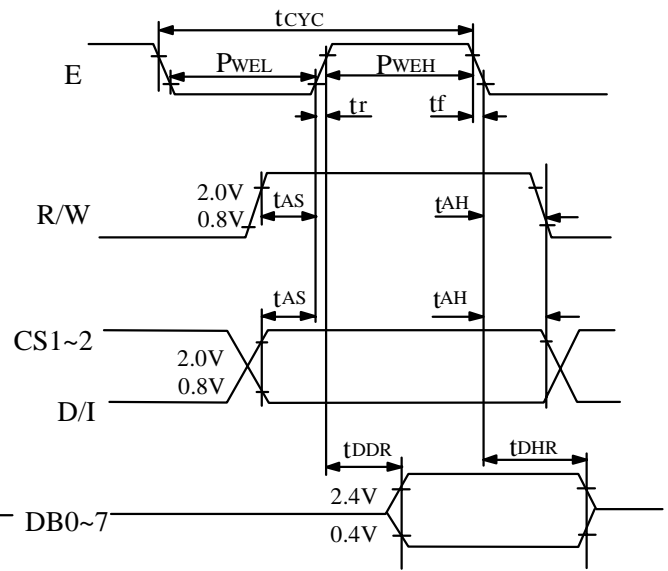


Fig . 1 CPU Read Timing

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 = 0° | — | 5 | — | — | 1 |
| | FSTN | | | — | 8 | — | — | 1 |
| RESPONSE TIME | tr (rise) | ∅ = 10° θ = 0° | 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 | — | | |

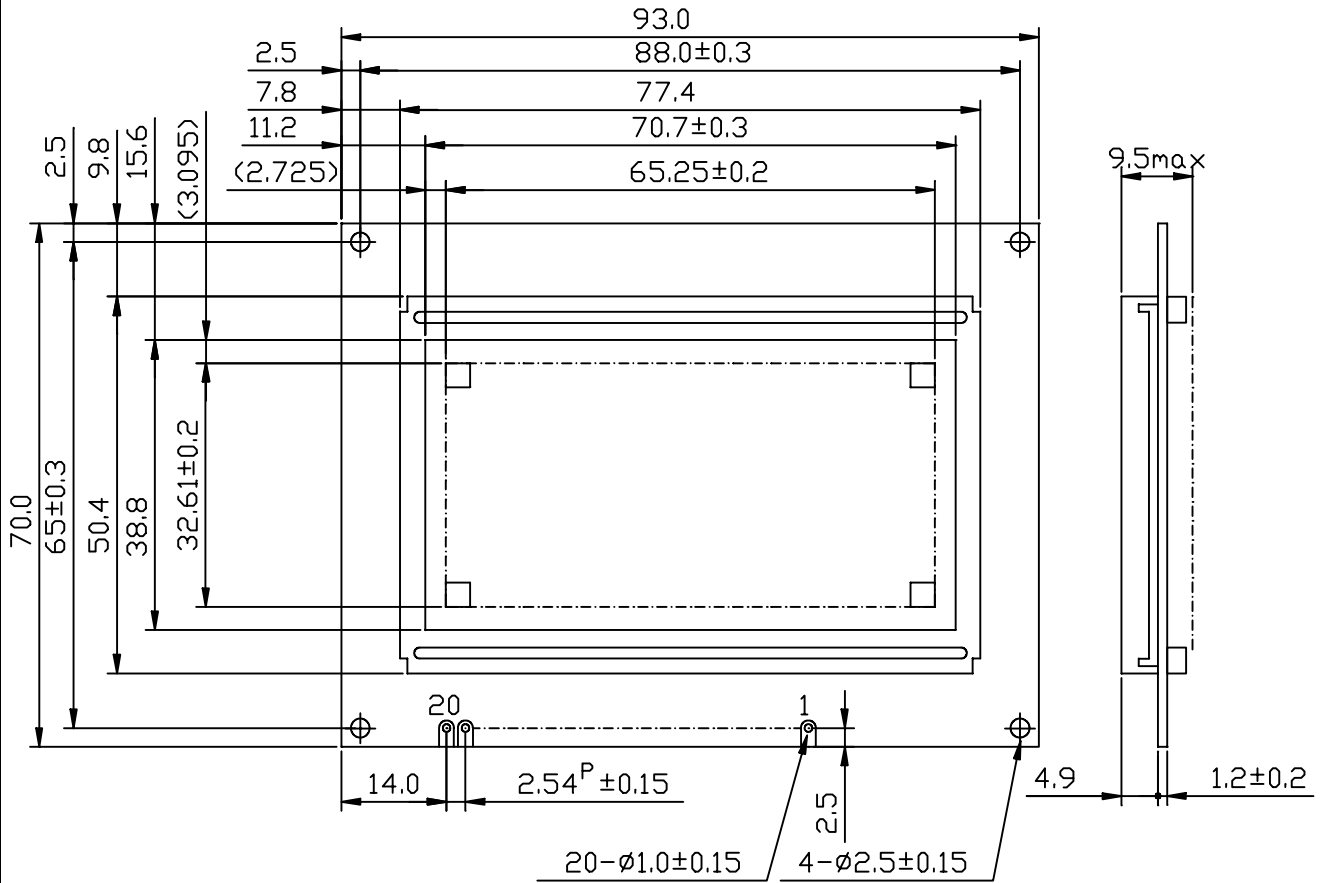
NOTE (1) : PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS.

EU-001A

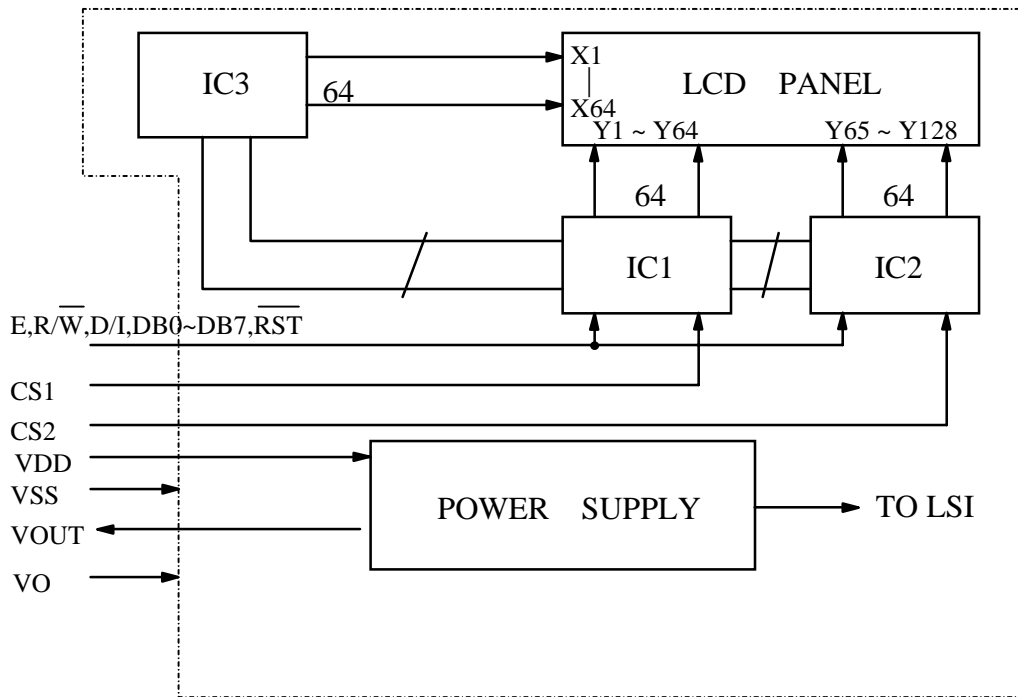
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7. OUTLINE DIMENSION

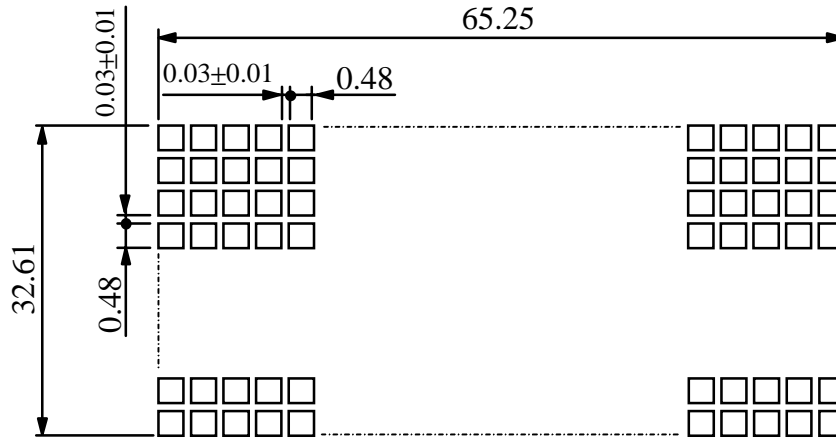


UNIT : mm
 SCALE : NTS
 NOT SPECIFIED TOLERANCE IS ±0.5mm

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



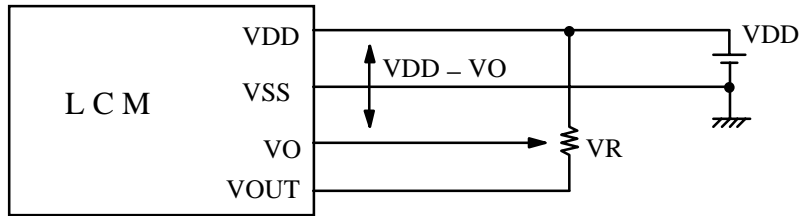
UNIT : mm
 SCALE : NTS
 NOT SPECIFIED TOLERANCE IS ± 0.1

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/W | H/L | H: DATA READ (LCD MODULE → MPU) L : DATA WRITE (LCD MODULE ← MPU) |
| 6 | E | H,H→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 | RST | L | RESET |
| 18 | VOUT | — | POWER SUPPLY FOR LCD DRIVING |
| 19 | N.C. | — | ———— |
| 20 | N.C. | — | ———— |

1 1 . POWER SUPPLY

1 1 . 1 POWER SUPPLY FOR LCM



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

1 1 . 2 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

