



# ***PALM TECHNOLOGY CO., LTD.***

***The LCD(M) Specialist***

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PART NO. : PMC24021AA-SERIES

FOR MESSRS. : \_\_\_\_\_

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ACCEPTED BY : ..... PROPOSED BY : .....

## RECORD OF REVISION

| DATE | PAGE | SUMMARY |
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|      |      |         |

### 3. General specifications

#### 3.1 General specifications

PLEASE REFER TO:

“CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-12780)”.

#### 3.2 This individual specification is prior to general specifications

#### 3.3 NUMBERING SYSTEM

|           |     |     |    |     |     |     |     |     |     |
|-----------|-----|-----|----|-----|-----|-----|-----|-----|-----|
| PMC24021A | B   | W   | A- | S   | Y   | M   | L   | W   | U   |
|           | (1) | (2) |    | (3) | (4) | (5) | (6) | (7) | (8) |

##### (1).CHARACTER FONTS :

PLEASE REFER TO

“CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-0069)”

##### (2).LCM TEMPERATURE :

“nil” : NORMAL TEMP

“W” : WIDE TEMP

##### (3).LCD TYPE :

“T” : TN TYPE

“S” : STN TYPE

“H” : HTN TYPE

“F” : FSTN TYPE

##### (4).LCD COLOR :

“Y” : YELLOW-GREEN “B” : BLUE(STN/NEGATIVE)/BLACK(FSTN/NEGATIVE)

“G” : GRAY “W” : WHITE(FSTN/POSITIVE)

##### (5).LCD POLARIZE TYPE

“nil” : TRANSFLECTIVE

“M” : TRANSMISSIVE

##### (6).BACKLIGHT TYPE :

“L” : LED BACKLIGHT

##### (7).BACKLIGHT COLOR :

LED TYPE :

“nil” : YELLOW-GREEN

“A” : AMBER

“B” : BLUE

“G” : PURE-GREEN

“O” : ORANGE

“R” : RED

“W” : WHITE

##### (8).VIEWING DIRECTION :

“nil” : 6 O’CLOCK

“3” : 3 O’CLOCK

“U” : 12 O’CLOCK

“9” : 9 O’CLOCK

#### 4. *Mechanical data*

- (1) NUMBER OF CHARACTERS-----24 CH \* 2 LINE
- (2) MODULE SIZE -----118.0 W \* 36.0 H \* 10.0 T (Max) mm
- (3) EFFECTIVE AREA -----96.0 W \* 18.8 H mm
- (4) CHARACTER PATTERN -----5 \* 7 DOTS + CURSOR
- (5) CHARACTER SIZE-----3.20 W \* 4.85 H mm
- (6) CHARACTER PITCH-----3.70 mm
- (7) DOT SIZE-----0.60 W \* 0.65 H mm
- (8) DOT PITCH -----0.70 W \* 0.65 H mm

## 5. Absolute maximum ratings

### 5.1 Electrical absolute maximum ratings

| I T E M                | SYMBOL                           | MIN.            | MAX.            | UNIT | COMMENT  |
|------------------------|----------------------------------|-----------------|-----------------|------|----------|
| POWER SUPPLY FOR LOGIC | V <sub>DD</sub> -V <sub>SS</sub> | 0               | 6.0             | V    | -----    |
| INPUT VOLTAGE          | V <sub>I</sub>                   | V <sub>SS</sub> | V <sub>DD</sub> | V    | -----    |
| STATIC ELECTRICITY     | -----                            | -----           | 100             | V    | NOTE (1) |

NOTE (1): ELECTRO-STATIC DISCHARGE RESISTANCE IS TESTED BY CHARGING A 200PF CAPACITOR AND DISCHARGING IT BY CONTACT WITH A INTERFACE CONNECTOR PIN.

### 5.2 Environmental absolute maximum ratings

| I T E M               | CONDITION | OPERATING      |      | STORAGE        |      | COMMENT                                     |
|-----------------------|-----------|----------------|------|----------------|------|---------------------------------------------|
|                       |           | MIN.           | MAX. | MIN.           | MAX. |                                             |
| AMBIENT TEMPERATURE   | NORMAL    | 0              | 50   | -20            | 70   | -----                                       |
|                       | WIDE      | -20            | 70   |                |      |                                             |
| HUMIDITY              | -----     | NOTE (2)       |      | NOTE (2)       |      | NO CONDENSATION                             |
| VIBRATION<br>NOTE (3) | -----     | -----          | 0.5G | -----          | 2G   | 10~300Hz<br>XYZ<br>DIRECTIONS<br>1 Hr EACH  |
| SHOCK<br>NOTE (3)     | -----     | -----          | 3G   | -----          | 50G  | 10 msec<br>XYZ<br>DIRECTIONS<br>1 TIME EACH |
| CORROSIVE GAS         | -----     | NOT ACCEPTABLE |      | NOT ACCEPTABLE |      | -----                                       |

NOTE (2): Ta 50 : 90% RH MAX.

Ta > 50 : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90% RH AT 50 . (80%RH AT 60 )

NOTE (3): 1G = 9.8 m/s<sup>2</sup>

**6. Electrical characteristics** $T_a = 25$  $V_{DD} = 5.0 \pm 0.25 \text{ V}$ 

| <i>I T E M</i>                           | <i>SYMBOL</i>  | <i>CONDITION</i>                                              |                            | <i>MIN.</i> | <i>TYP.</i> | <i>MAX.</i> | <i>UNIT</i> |
|------------------------------------------|----------------|---------------------------------------------------------------|----------------------------|-------------|-------------|-------------|-------------|
| INPUT VOLTAGE                            | $V_{IH}$       | -----                                                         |                            | 2.2         | -----       | -----       | V           |
|                                          | $V_{IL}$       |                                                               |                            | -----       | -----       | 0.6         | V           |
| OUTPUT VOLTAGE                           | $V_{OH}$       | $-I_{OH} = 0.2 \text{ mA}$                                    |                            | 2.4         | -----       | -----       | V           |
|                                          | $V_{OL}$       | $I_{OL} = 1.2 \text{ mA}$                                     |                            | -----       | -----       | 0.4         | V           |
| POWER SUPPLY CURRENT                     | $I_{DD}$       | $V_{DD} = 5.0 \text{ V}$                                      |                            | -----       | 1.5         | 3.0         | mA          |
| RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1) | $V_{DD} - V_O$ | STN/<br>FSTN<br>DUTY<br>=1/16<br>$\Phi = 10^\circ$<br>NOTE(2) | $T_a = -20^\circ \text{C}$ | -----       | 4.8         | -----       | V           |
|                                          |                |                                                               | $T_a = 0^\circ \text{C}$   | -----       | 4.7         | -----       | V           |
|                                          |                |                                                               | $T_a = 25^\circ \text{C}$  | -----       | 4.5         | -----       | V           |
|                                          |                |                                                               | $T_a = 50^\circ \text{C}$  | -----       | 4.3         | -----       | V           |
|                                          |                |                                                               | $T_a = 70^\circ \text{C}$  | -----       | 4.2         | -----       | V           |
|                                          |                | TN<br>DUTY<br>=1/16<br>$\Phi = 25^\circ$<br>NOTE(2)           | $T_a = -20^\circ \text{C}$ | -----       | 4.5         | -----       | V           |
|                                          |                |                                                               | $T_a = 0^\circ \text{C}$   | -----       | 4.4         | -----       | V           |
|                                          |                |                                                               | $T_a = 25^\circ \text{C}$  | -----       | 4.2         | -----       | V           |
|                                          |                |                                                               | $T_a = 50^\circ \text{C}$  | -----       | 4.0         | -----       | V           |
|                                          |                |                                                               | $T_a = 70^\circ \text{C}$  | -----       | 3.9         | -----       | V           |
| POWER SUPPLY CURRENT FOR LED             | $I_{LED}$      | $V_{DD} = 5.0 \text{ V}$                                      |                            | -----       | 30          | 40          | mA          |

NOTE (1): RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT  $\pm 0.5 \text{ V}$  BY EACH MODULE.

(2):  $\theta = 0^\circ$  : VIEWING DIRECTION AT 6 O'CLOCK  
 $\theta = 180^\circ$  : VIEWING DIRECTION AT 12 O'CLOCK

## 7. Optical characteristics

### TN TYPE LCD

 $T_a = 25$        $V_{DD}-V_O = 4.2V$ 

| I T E M        | SYMBOL          | CONDITION                    | MIN. | TYP. | MAX. | UNIT | NOTE    |
|----------------|-----------------|------------------------------|------|------|------|------|---------|
| VIEWING ANGLE  | $\Phi 2-\Phi 1$ | K = 1.4<br>NOTE(1)           | 20   | 30   | ---- | deg. | NOTE(2) |
| CONTRAST RATIO | K               | $\Phi = 25^\circ$<br>NOTE(1) | 2.0  | 3.0  | ---- | ---- | NOTE(2) |
| RESPONSE TIME  | tr (rise)       | $\Phi = 25^\circ$<br>NOTE(1) | ---- | 150  | 250  | ms   | NOTE(2) |
|                | tf (fall)       | $\Phi = 25^\circ$<br>NOTE(1) | ---- | 150  | 250  | ms   | NOTE(2) |

### STN TYPE LCD

 $T_a = 25$        $V_{DD}-V_O = 4.5V$ 

| I T E M        | SYMBOL          | CONDITION                    | MIN. | TYP. | MAX. | UNIT | NOTE    |
|----------------|-----------------|------------------------------|------|------|------|------|---------|
| VIEWING ANGLE  | $\Phi 2-\Phi 1$ | K = 2.0<br>NOTE(1)           | 30   | 40   | ---- | deg. | NOTE(2) |
| CONTRAST RATIO | K               | $\Phi = 10^\circ$<br>NOTE(1) | 3.0  | 4.0  | ---- | ---- | NOTE(2) |
| RESPONSE TIME  | tr (rise)       | $\Phi = 10^\circ$<br>NOTE(1) | ---- | 200  | 350  | ms   | NOTE(2) |
|                | tf (fall)       | $\Phi = 10^\circ$<br>NOTE(1) | ---- | 300  | 400  | ms   | NOTE(2) |

### FSTN、STN BLUE TYPE LCD

 $T_a = 25$        $V_{DD}-V_O = 4.5V$ 

| I T E M        | SYMBOL          | CONDITION                    | MIN. | TYP. | MAX. | UNIT | NOTE    |
|----------------|-----------------|------------------------------|------|------|------|------|---------|
| VIEWING ANGLE  | $\Phi 2-\Phi 1$ | K = 2.0<br>NOTE(1)           | 30   | 40   | ---- | deg. | NOTE(2) |
| CONTRAST RATIO | K               | $\Phi = 10^\circ$<br>NOTE(1) | 4.0  | 5.0  | ---- | ---- | NOTE(2) |
| RESPONSE TIME  | tr (rise)       | $\Phi = 10^\circ$<br>NOTE(1) | ---- | 200  | 350  | ms   | NOTE(2) |
|                | tf (fall)       | $\Phi = 10^\circ$<br>NOTE(1) | ---- | 300  | 400  | ms   | NOTE(2) |

### Brightness for LED backlight

| SYMBOL | CONDITION          | MIN. | TYP. | MAX. | UNIT              | LED TYPE                           | NOTE    |
|--------|--------------------|------|------|------|-------------------|------------------------------------|---------|
| B      | $\Phi = 0^\circ$   | 5.0  | ---- | ---- | cd/m <sup>2</sup> | YELLOW-GREEN, RED<br>AMBER, ORANGE | NOTE(2) |
|        | $\theta = 0^\circ$ | 6.0  | ---- | ---- |                   | BLUE, WHITE,<br>PURE-GREEN         | NOTE(3) |

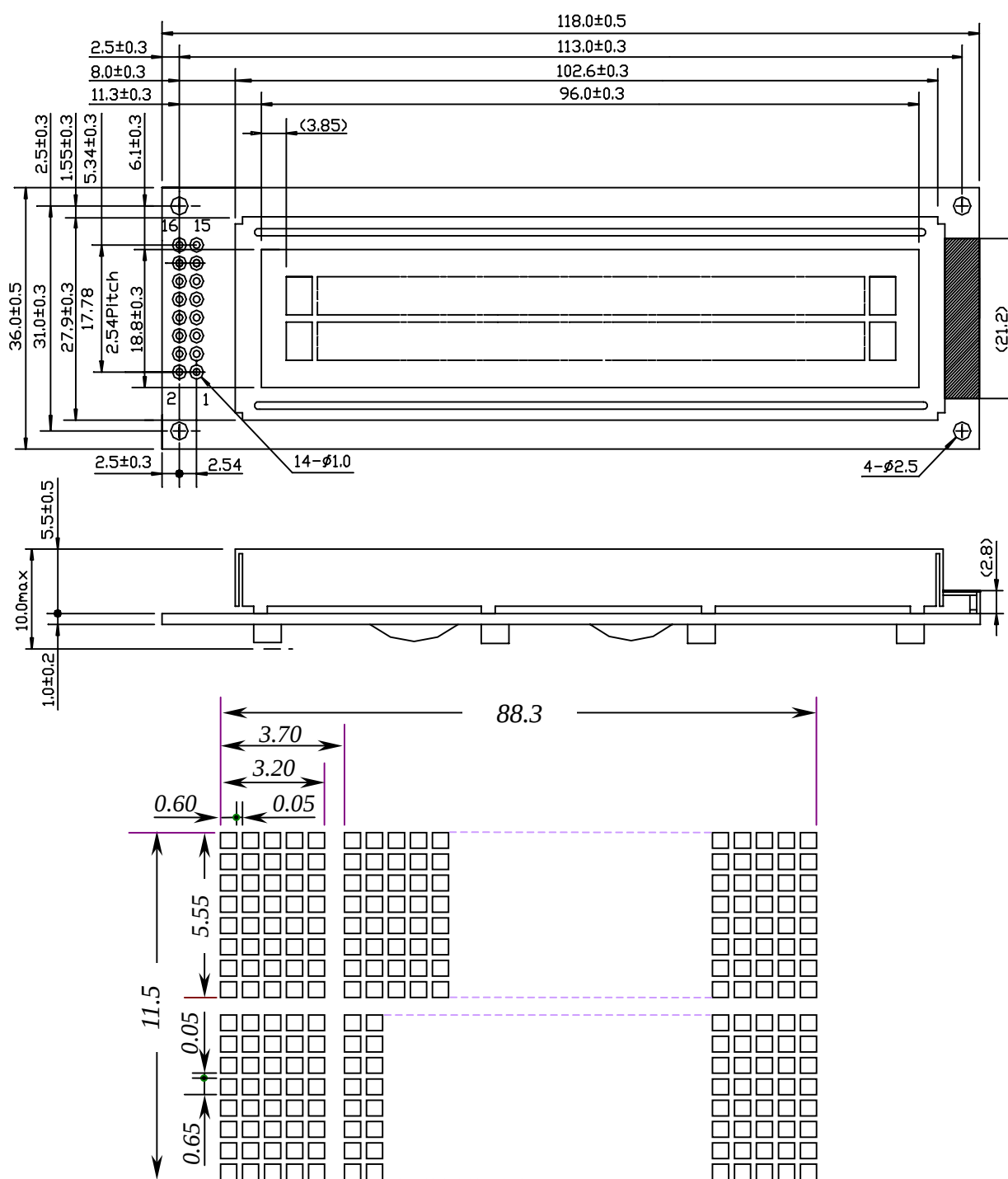
NOTE (1):  $\theta = 0^\circ$  : VIEWING DIRECTION AT 6 O'CLOCK

$\theta = 180^\circ$  : VIEWING DIRECTION AT 12 O'CLOCK

NOTE (2): SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR  
DEFINITION OF OPTICAL CHARACTERISTICS.

NOTE (3): UNDER NORMAL TEMPERATURE AND HUMIDITY IN A DARK ROOM.

## 8. Outline dimension



NOTE :

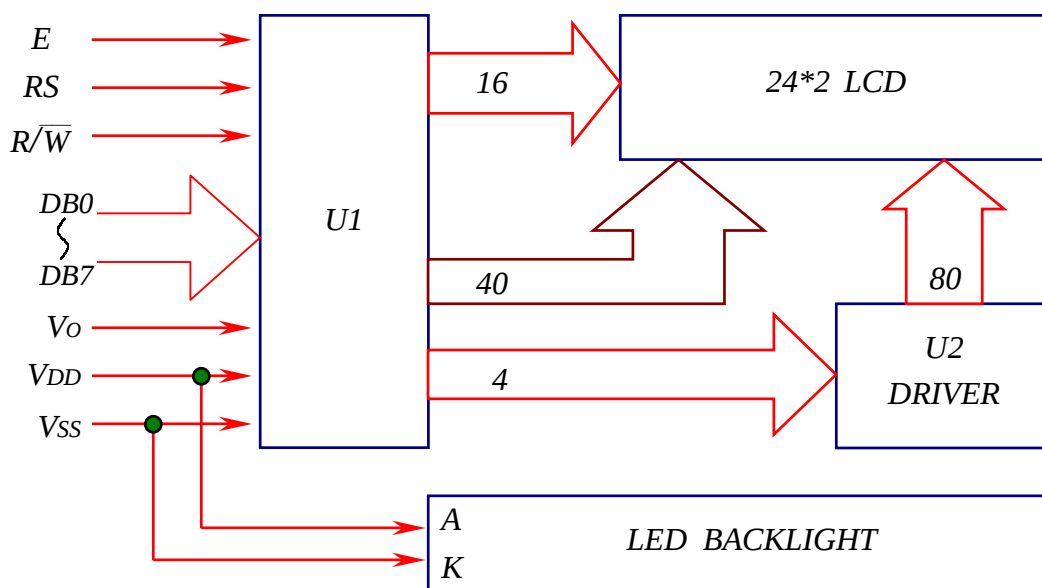
1.UNIT : mm

2.SCALE : NTS

### Interface pin connection

| PIN NO. | 1               | 2               | 3              | 4   | 5   | 6   | 7   | 8   |
|---------|-----------------|-----------------|----------------|-----|-----|-----|-----|-----|
| SYMBOL  | V <sub>SS</sub> | V <sub>DD</sub> | V <sub>O</sub> | RS  | R/W | E   | DB0 | DB1 |
| PIN NO. | 9               | 10              | 11             | 12  | 13  | 14  | 15  | 16  |
| SYMBOL  | DB2             | DB3             | DB4            | DB5 | DB6 | DB7 | NC  | NC  |

## 9. Block diagram



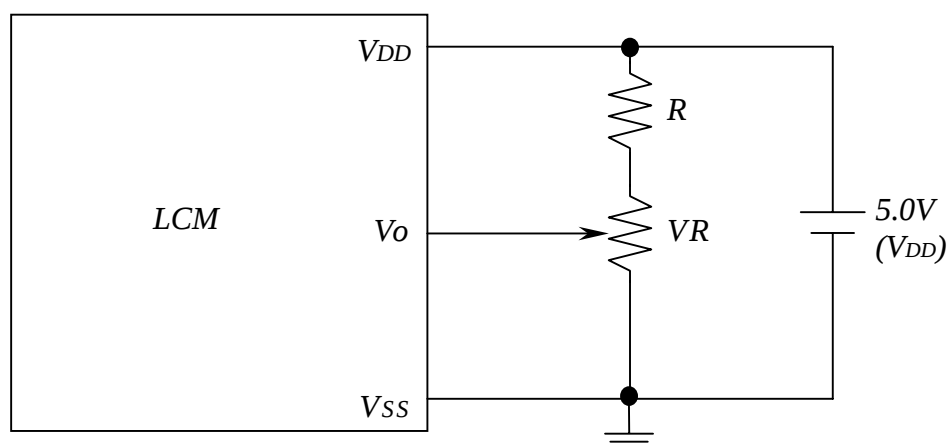
### Display data address charts

| Character | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| LINE 1    | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F | 10 | 11 | 12 | 13 |
| LINE 2    | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F | 50 | 51 | 52 | 53 |

|        | 21 | 22 | 23 | 24 |
|--------|----|----|----|----|
| LINE 1 | 14 | 15 | 16 | 17 |
| LINE 2 | 54 | 55 | 56 | 57 |

## 10. Power supply for LCM



RECOMMENDED RESISTOR R:  $V_{DD} - V_O$  1.5V

$V_{DD} - V_O$ : LCD DRIVING VOLTAGE

VR: 10K $\Omega$ ~20K $\Omega$