



# PALM TECHNOLOGY CO., LTD.

## The LCD(M) Specialist

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PART NO. : PMC16021E8-SERIES

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

### CONTENTS

| NO. | ITEM                       | PAGE |
|-----|----------------------------|------|
| 1.  | COVER                      | 1    |
| 2.  | RECORD OF REVERSION        | 2    |
| 3.  | GENERAL SPECIFICATION      | 3    |
| 4.  | MECHANICAL DATA            | 4    |
| 5.  | ABSOLUTE MAXIMUM RATINGS   | 5    |
| 6.  | ELECTRICAL CHARACTERISTICS | 6    |
| 7.  | OPTICAL CHARACTERISTICS    | 7    |
| 8.  | OUTLINE DIMENSION          | 8    |
| 9.  | BLOCK DIAGRAM              | 9    |
| 10. | POWER SUPPLY FOR LCM       | 10   |
|     |                            |      |
|     |                            |      |
|     |                            |      |

ACCEPTED BY: \_\_\_\_\_

PROPOSED BY : \_\_\_\_\_



## RECORD OF REVISION

| DATE     | PAGE | SUMMARY  |
|----------|------|--|
| 92/04/10 | 6    | NOTE(3): I <sub>LED</sub> B:60mA/80mA→30mA/40mA                                      |
| 92/04/10 | 10   | Power supply for LCM : CONDITION<br>B: I <sub>LED</sub> 80mA → I <sub>LED</sub> 40mA |
| 92/04/21 | 8    | Outline dimension of LCD dot:LC→0.04   |
| 92/04/21 | 8    | Outline dimension of LCM:Add size (2.9) and size(3.0)                                |
|          |      |  |

### 3. General specifications

#### 3.1 General specifications

PLEASE REFER TO:

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

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

#### 3.3 NUMBERING SYSTEM

PMC16021E    

|   |   |
|---|---|
| B | W |
|---|---|

 8-    

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| S | Y | M | L | W | U | N |
|---|---|---|---|---|---|---|

(1)    (2)                      (3)    (4)    (5)    (6)    (7)    (8)    (9)

(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” : GREEN

“O” : ORANGE

“R” : RED

“W” : WHITE

(8).VIEWING ANGLE :

“nil” : 6 O’CLOCK

“3” : 3 O’CLOCK

“U” : 12 O’CLOCK

“9” : 9 O’CLOCK

(9).BACKLIGHT TYPE :

“nil” : LED(+),LED(-)---NORMAL

“N” : LED(+),LED(-)---CHANGE

#### **4. Mechanical data**

- (1) NUMBER OF DOT-----16 CH \* 2 LINE
- (2) MODULE SIZE -----84.0 W \* 44.0 H \* 10.0T(max) mm
- (3) EFFECTIVE AREA -----64.5 W \* 16.0 H mm
- (4) CHARACTER PATTERN -----5 \* 7 DOTS + CURSOR
- (5) CHARACTER SIZE-----2.96W \* 4.86 H mm
- (6) CHARACTER PITCH -----3.55 mm
- (7) DOT SIZE-----0.56 W \* 0.66 H mm
- (8) DOT PITCH -----0.60 W \* 0.70H mm

## 5. Absolute maximum ratings

### 5.1 Electrical absolute maximum ratings

| <i>I T E M</i>         | <i>SYMBOL</i>                    | <i>MIN.</i>     | <i>MAX.</i>     | <i>UNIT</i> | <i>COMMENT</i> |
|------------------------|----------------------------------|-----------------|-----------------|-------------|----------------|
| 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)       |
| POWER SUPPLY FOR LED   | V <sub>LED</sub>                 | -----           | NOTE(2)         | V           | -----          |

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

NOTE (2):

| <i>SYMBOL</i>    | <i>V<sub>LED</sub> MAX.</i> | <i>LED TYPE</i>               |
|------------------|-----------------------------|-------------------------------|
| V <sub>LED</sub> | 6.0V                        | YELLOW-GREEN,AMBER,ORANGE,RED |
|                  | 5.0V                        | BLUE,GREEN,WHITE              |

### 5.2 Environmental absolute maximum ratings

| <i>I T E M</i>        | <i>OPERATING</i> |             |                | <i>STORAGE</i> |                 | <i>COMMENT</i>                              |
|-----------------------|------------------|-------------|----------------|----------------|-----------------|---|
|                       | <i>CONDITION</i> | <i>MIN.</i> | <i>MAX.</i>    | <i>MIN.</i>    | <i>MAX.</i>     |   |
| AMBIENT TEMPERATURE   | NORMAL           | 0           | 50             | -20            | 70              | -----                                       |
|                       | WIDE             | -20         | 70             |                |                 |   |
| HUMIDITY              | NOTE (3)         |             | NOTE (3)       |                | NO CONDENSATION |   |
| VIBRATION<br>NOTE (4) | -----            | 0.5G        | -----          | 2G             |                 | 10~300Hz<br>XYZ<br>DIRECTIONS<br>1 Hr EACH  |
| SHOCK<br>NOTE (4)     | -----            | 3G          | -----          | 50G            |                 | 10 msec<br>XYZ<br>DIRECTIONS<br>1 TIME EACH |
| CORROSIVE GAS         | NOT ACCEPTABLE   |             | NOT ACCEPTABLE |                | -----           |   |

NOTE (3): T<sub>a</sub> 50 : 90% RH MAX.

T<sub>a</sub> > 50 : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90% RH AT 50 . (80%RH AT 60 )

NOTE (4): 1G = 9.8 m/s<sup>2</sup>

6. Electrical characteristics

Ta = 25

VDD = 5.0 ± 0.25 V

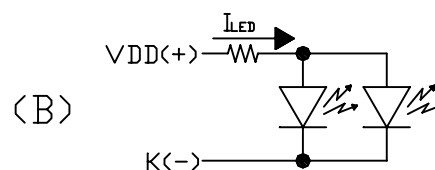
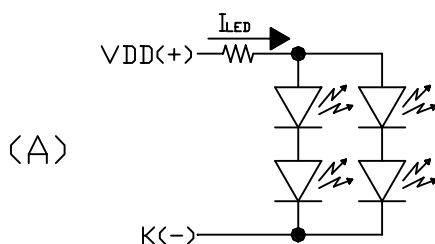
| ITEM                                     | SYMBOL                          | CONDITION  | MIN.     | TYP.    | MAX.    | UNIT  |   |
|--|---------------------------------|--|----------|---------|---------|-------|---|
| INPUT VOLTAGE                            | V <sub>IH</sub>                 | -----  | 2.2      | -----   | -----   | V     |   |
|  | V <sub>IL</sub>                 | -----  | -----    | -----   | 0.6     | V     |   |
| OUTPUT VOLTAGE                           | V <sub>OH</sub>                 | -I <sub>OH</sub> = 0.205 mA                      | 2.4      | -----   | -----   | V     |   |
|  | V <sub>OL</sub>                 | I <sub>OL</sub> = 1.2 mA                         | -----    | -----   | 0.4     | V     |   |
| POWER SUPPLY CURRENT                     | I <sub>DD</sub>                 | V <sub>DD</sub> = 5.0V                           | -----    | 1.0     | 1.5     | mA    |   |
| RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1) | V <sub>DD</sub> -V <sub>O</sub> | STN/<br>FSTN<br>DUTY<br>=1/16<br>=10°<br>NOTE(2) | Ta=-20°C | -----   | 4.8     | ----- | V |
|  |                                 |  | Ta= 0°C  | -----   | 4.7     | ----- | V |
|  |                                 |  | Ta= 25°C | -----   | 4.5     | ----- | V |
|  |                                 |  | Ta= 50°C | -----   | 4.3     | ----- | V |
|  |                                 |  | Ta= 70°C | -----   | 4.2     | ----- | V |
|  |                                 | TN<br>DUTY<br>=1/16<br>=25°<br>NOTE(2)           | Ta=-20°C | -----   | 4.5     | ----- | V |
|  |                                 |  | Ta= 0°C  | -----   | 4.4     | ----- | V |
|  |                                 |  | Ta= 25°C | -----   | 4.2     | ----- | V |
|  |                                 |  | Ta= 50°C | -----   | 4.0     | ----- | V |
|  |                                 |  | Ta= 70°C | -----   | 3.9     | ----- | V |
| POWER SUPPLY CURRENT FOR LED             | I <sub>LED</sub>                | V <sub>LED</sub>                                 | -----    | NOTE(3) | NOTE(3) | mA    |   |

NOTE (1): RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ±0.5V BY EACH MODULE.

(2): = 0° : VIEWING ANGLE AT 6 O’CLOCK  
 = 180° : VIEWING ANGLE AT 12 O’CLOCK

⚠ (3): LED CURRENT OF DEFFERENT LED TYPE

| TYPE | I <sub>LED</sub> TYP. / MAX. | LED TYPE                         |
|------|------------------------------|----------------------------------|
| A    | 30mA / 40mA                  | YELLOW-GREEN, AMBER, ORANGE, RED |
| B    | 30mA / 40mA                  | BLUE, GREEN, WHITE               |



## 7. Optical characteristics

### TN TYPE LCD

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

| ITEM           | SYMBOL    | CONDITION          | MIN. | TYP. | MAX. | UNIT | NOTE    |
|----------------|-----------|--------------------|------|------|------|------|---------|
| VIEWING ANGLE  | 2- 1      | K = 1.4<br>NOTE(1) | 20   | 30   | ---- | deg. | NOTE(2) |
| CONTRAST RATIO | K         | = 25°<br>NOTE(1)   | 2.0  | 3.0  | ---- | ---- | NOTE(2) |
| RESPONSE TIME  | tr (rise) | = 25°<br>NOTE(1)   | ---- | 150  | 250  | ms   | NOTE(2) |
|                | tf (fall) | = 25°<br>NOTE(1)   | ---- | 150  | 250  | ms   | NOTE(2) |

### STN TYPE LCD

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

| ITEM           | SYMBOL    | CONDITION          | MIN. | TYP. | MAX. | UNIT | NOTE    |
|----------------|-----------|--------------------|------|------|------|------|---------|
| VIEWING ANGLE  | 2- 1      | K = 2.0<br>NOTE(1) | 30   | 40   | ---- | deg. | NOTE(2) |
| CONTRAST RATIO | K         | = 10°<br>NOTE(1)   | 3.0  | 4.0  | ---- | ---- | NOTE(2) |
| RESPONSE TIME  | tr (rise) | = 10°<br>NOTE(1)   | ---- | 200  | 350  | ms   | NOTE(2) |
|                | tf (fall) | = 10°<br>NOTE(1)   | ---- | 300  | 400  | ms   | NOTE(2) |

### FSTN TYPE LCD

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

| ITEM           | SYMBOL    | CONDITION          | MIN. | TYP. | MAX. | UNIT | NOTE    |
|----------------|-----------|--------------------|------|------|------|------|---------|
| VIEWING ANGLE  | 2- 1      | K = 2.0<br>NOTE(1) | 30   | 40   | ---- | deg. | NOTE(2) |
| CONTRAST RATIO | K         | = 10°<br>NOTE(1)   | 4.0  | 5.0  | ---- | ---- | NOTE(2) |
| RESPONSE TIME  | tr (rise) | = 10°<br>NOTE(1)   | ---- | 200  | 350  | ms   | NOTE(2) |
|                | tf (fall) | = 10°<br>NOTE(1)   | ---- | 300  | 400  | ms   | NOTE(2) |

### Brightness for LED backlight

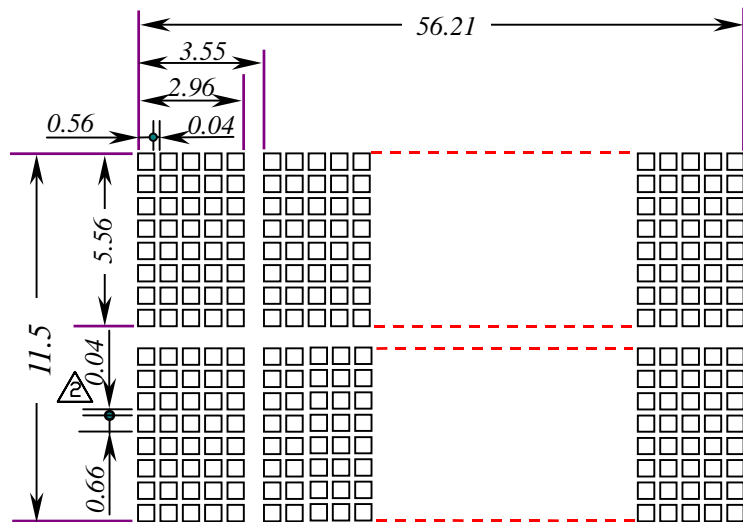
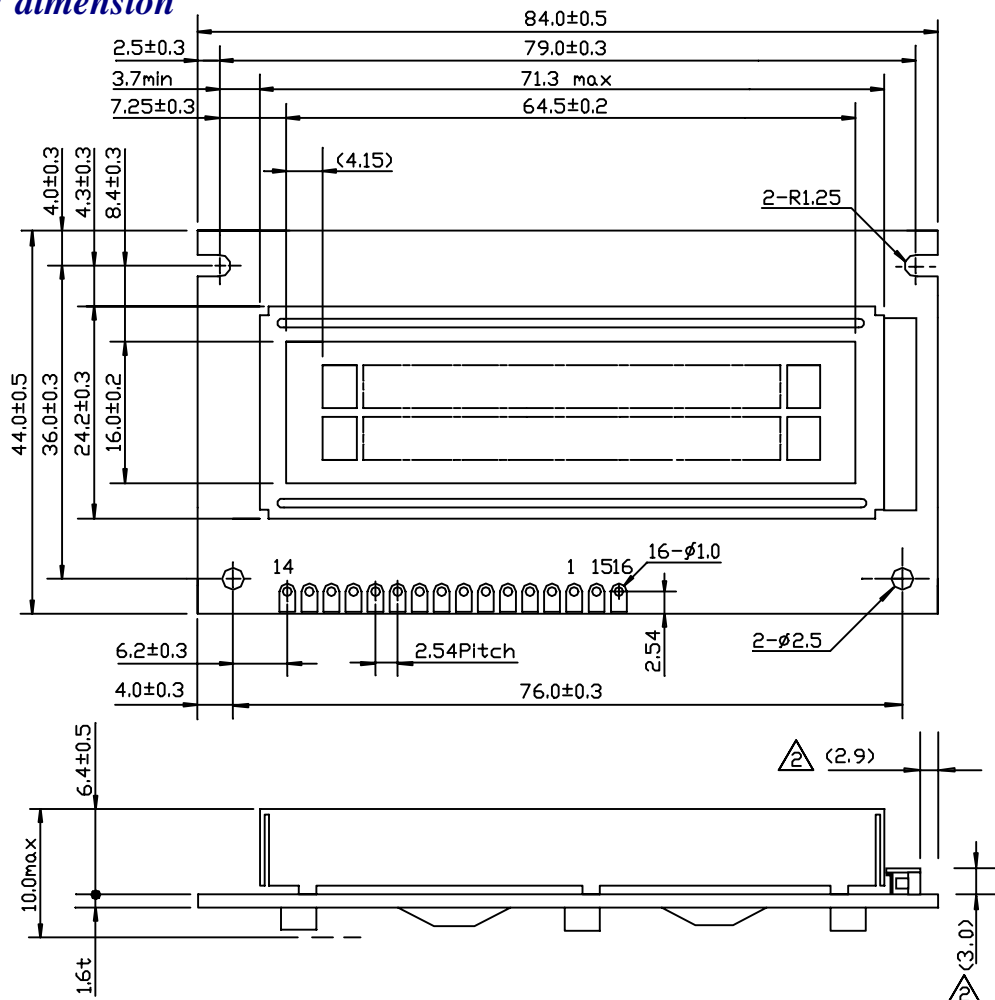
| SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT              | LED TYPE                            | NOTE    |
|--------|-----------|------|------|------|-------------------|-------------------------------------|---------|
| B      | = 0°      | 4.0  | ---- | ---- | cd/m <sup>2</sup> | YELLOW-GREEN, RED,<br>AMBER, ORANGE | NOTE(2) |
|        | = 0°      | 6.0  | ---- | ---- |                   | BLUE, GREEN, WHITE                  | NOTE(3) |

NOTE (1): = 0° WHEN VIEWING ANGLE AT 6 O'CLOCK  
= 180° WHEN VIEWING ANGLE AT 12 O'CLOCK

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

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

## 8. Outline dimension



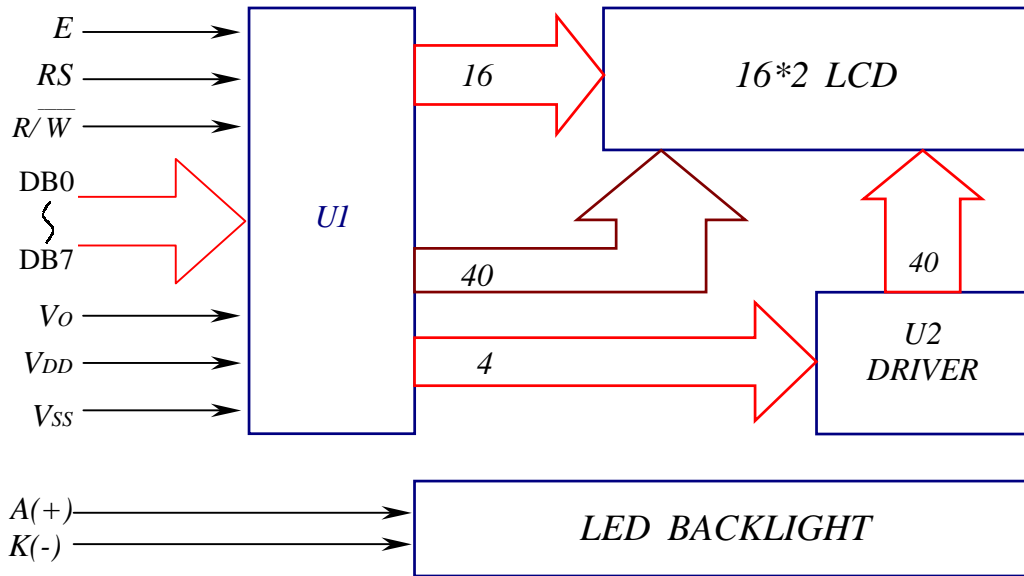
NOTE :  
 1.UNIT : mm  
 2.SCALE : NTS

### Interface pin connection

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



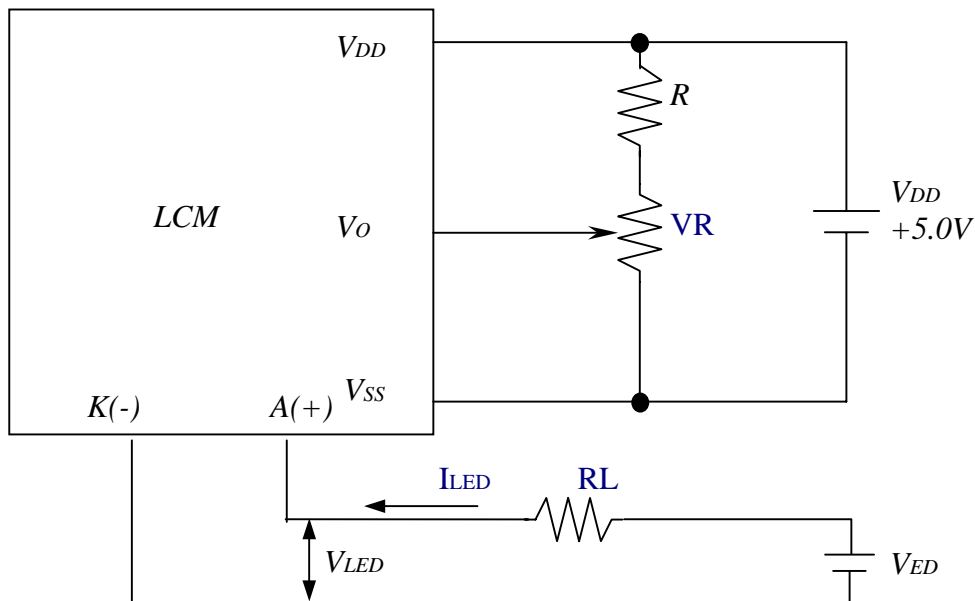
## 9. Block diagram



### Display data address charts

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

### 10. Power supply for LCM



RECOMMENDED RESISTOR R :  $V_{DD}-V_o \quad 1.5V$   
 $V_{DD}-V_o$ : LCD DRIVING VOLTAGE  
 VR: 10K ~20K

| ITEM                       | LED TYPE      | CONDITION  |
|----------------------------|---------------|--|
| Limit resister of LED (RL) | A             | $RL = ((V_{ED}-5.0V) / I_{LED}) , I_{LED} \leq 40mA$ |
|                            | $\triangle$ B | $RL = ((V_{ED}-4.0V) / I_{LED}) , I_{LED} \leq 40mA$ |