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PART NO. : MG1603GC9-SERIES

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

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|            |                            |             |



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

**RECORD OF REVISION**

| <b>DATE</b> | <b>PAGE</b> | <b>SUMMARY</b> |
|-------------|-------------|----------------|
|             |             |                |

### 3. General specifications

#### 3.1 General specifications

PLEASE REFER TO :

- a. "CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-10000)"
- b. "CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (IC-ST7920)"

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

#### 3.3 NUMBERING SYSTEM

**MG1603G**

|   |   |
|---|---|
| C | W |
|---|---|

**9-**

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

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

(1).CHARACTER FONTS :

PLEASE REFER TO :

| Symbol | Product      | Font type                            |
|--------|--------------|--------------------------------------|
| B      | IC-ST7920-0B | GB code simplified character set     |
| C      | IC-ST7920-0C | GB code,BIG-5 code and Japanese code |

(2).LCM TEMPERATURE :

"nil" : NORMAL TEMP

"W" : WIDE TEMP

(3).LCD TYPE :

"S" : STN 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

(9).BACKLIGHT TYPE :

"nil" : A(+),K(-)---NORMAL

"N" : A(+),K(-)---CHANGE

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

- (1) NUMBER OF DOT -----160 W \* 32 H DOTS
- (2) MODULE SIZE -----80.0 W \* 36.0 H \* 10.0 T (Max) mm
- (3) EFFECTIVE AREA -----64.5 W \* 16.0 H mm
- (4) ACTIVE AREA -----59.17 W \* 11.81 H mm
- (5) DOT SIZE-----0.34 W \* 0.34 H mm
- (6) DOT PITCH -----0.37 W \* 0.37 H 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> | -0.3        | 5.5                  | V           | -----          |
| POWER SUPPLY FOR LCD   | V <sub>O</sub>                   | -0.3        | 3.5                  | V           | -----          |
| INPUT VOLTAGE          | V <sub>I</sub>                   | -0.3        | V <sub>DD</sub> +0.3 | V           | -----          |
| STATIC ELECTRICITY     | -----                            | -----       | 100                  | V           | NOTE(1)        |
| POWER SUPPLY FOR LED   | NOTE(2)                          | -----       | 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> | 5.5V                        | YELLOW-GREEN,AMBER,ORANGE,RED |
|                  | 5.0V                        | BLUE,PURE GREEN,WHITE         |

### 5.2 Environmental absolute maximum ratings

| <i>I T E M</i>        | <i>CONDITION</i> | <i>OPERATING</i> |             | <i>STORAGE</i> |             | <i>COMMENT</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):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 (4):1G = 9.8 m/s<sup>2</sup>

## 6. Electrical characteristics

Ta = 25

| <i>I T E M</i>                           | <i>SYMBOL</i>                     | <i>CONDITION</i>                                 | <i>MIN.</i>         | <i>TYP.</i> | <i>MAX.</i>     | <i>UNIT</i> |   |
|--|-----------------------------------|--|---------------------|-------------|-----------------|-------------|---|
| POWER SUPPLY VOLTAGE FOR CIRCUIT         | V <sub>DD</sub> - V <sub>SS</sub> | -----  | 2.7                 | -----       | 5.5             | V           |   |
| INPUT VOLTAGE                            | V <sub>IH</sub>                   | -----  | 0.7 V <sub>DD</sub> | -----       | V <sub>DD</sub> | V           |   |
|  | V <sub>IL</sub>                   | -----  | -0.3                | -----       | 0.6             | V           |   |
| OUTPUT VOLTAGE                           | V <sub>OH</sub>                   | I <sub>OH</sub> = -0.1 mA                        | 0.8V <sub>DD</sub>  | -----       | V <sub>DD</sub> | V           |   |
|  | V <sub>OL</sub>                   | I <sub>OL</sub> = 0.1 mA                         | -----               | -----       | 0.1             | V           |   |
| POWER SUPPLY CURRENT                     | I <sub>DD</sub>                   | V <sub>DD</sub> - V <sub>SS</sub>                | -----               | 0.5         | 1.0             | mA          |   |
| RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1) | V <sub>O</sub> -V <sub>SS</sub>   | STN/<br>FSTN<br>DUTY<br>=1/32<br>=10°<br>NOTE(2) | Ta=-20°C            | -----       | -----           | -----       | V |
|  |                                   |  | Ta= 0°C             | -----       | -----           | -----       | V |
|  |                                   |  | Ta= 25°C            | -----       | 2.9             | -----       | V |
|  |                                   |  | Ta= 50°C            | -----       | -----           | -----       | V |
|  |                                   |  | Ta= 70°C            | -----       | -----           | -----       | V |
| POWER SUPPLY CURRENT FOR NOTE(3)         | I <sub>LED</sub>                  | V <sub>LED</sub> =NOTE(3)                        | -----               | NOTE(3)     | NOTE(3)         | mA          |   |

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

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

(3): LED CURRENT OF DIFFERENT LED TYPE

| <i>LED B.L TYPE</i> | <i>V<sub>LED</sub></i> | <i>I<sub>LED</sub></i> |             |             |              | <i>LED COLOR</i>                 |
|---------------------|------------------------|------------------------|-------------|-------------|--------------|----------------------------------|
|                     |                        | <i>MIN.</i>            | <i>TYP.</i> | <i>MAX.</i> | <i>UNIT.</i> |                                  |
| A                   | 4.8V                   | -----                  | 30          | 40          | mA           | YELLOW-GREEN, AMBER, ORANGE, RED |
| B                   | 4.0V                   | -----                  | 30          | 40          | mA           | BLUE, WHITE, PURE GREEN          |

## 7. Optical characteristics

### STN TYPE LCD

Ta = 25

| <i>I T E M</i> | <i>SYMBOL</i> | <i>CONDITION</i>   | <i>MIN.</i> | <i>TYP.</i> | <i>MAX.</i> | <i>UNIT</i> | <i>NOTE</i> |
|----------------|---------------|--------------------|-------------|-------------|-------------|-------------|-------------|
| 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 /STN BLUE TYPE LCD

Ta = 25

| <i>I T E M</i> | <i>SYMBOL</i> | <i>CONDITION</i>   | <i>MIN.</i> | <i>TYP.</i> | <i>MAX.</i> | <i>UNIT</i> | <i>NOTE</i> |
|----------------|---------------|--------------------|-------------|-------------|-------------|-------------|-------------|
| 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 LCM backlight

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

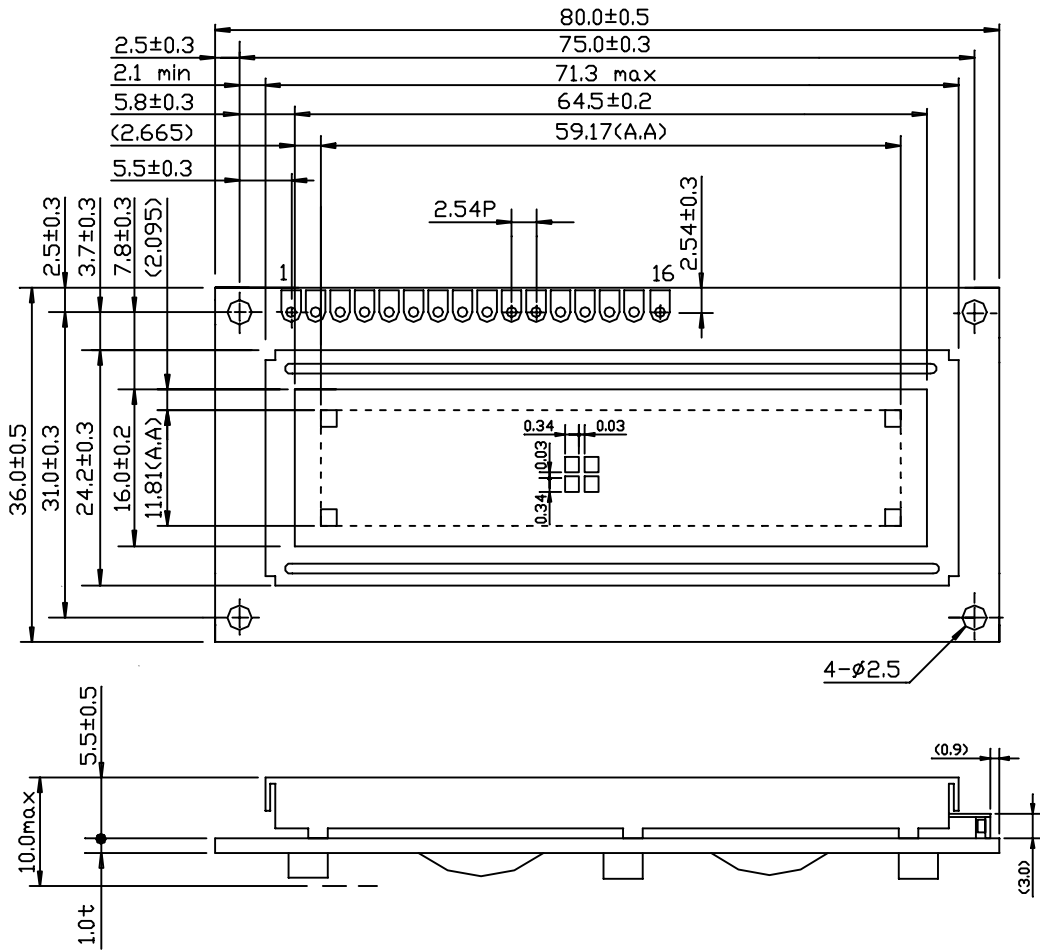
NOTE (1): = 0° WHEN VIEWING DIRECTION AT 6 O'CLOCK

= 180° WHEN VIEWING DIRECTION 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



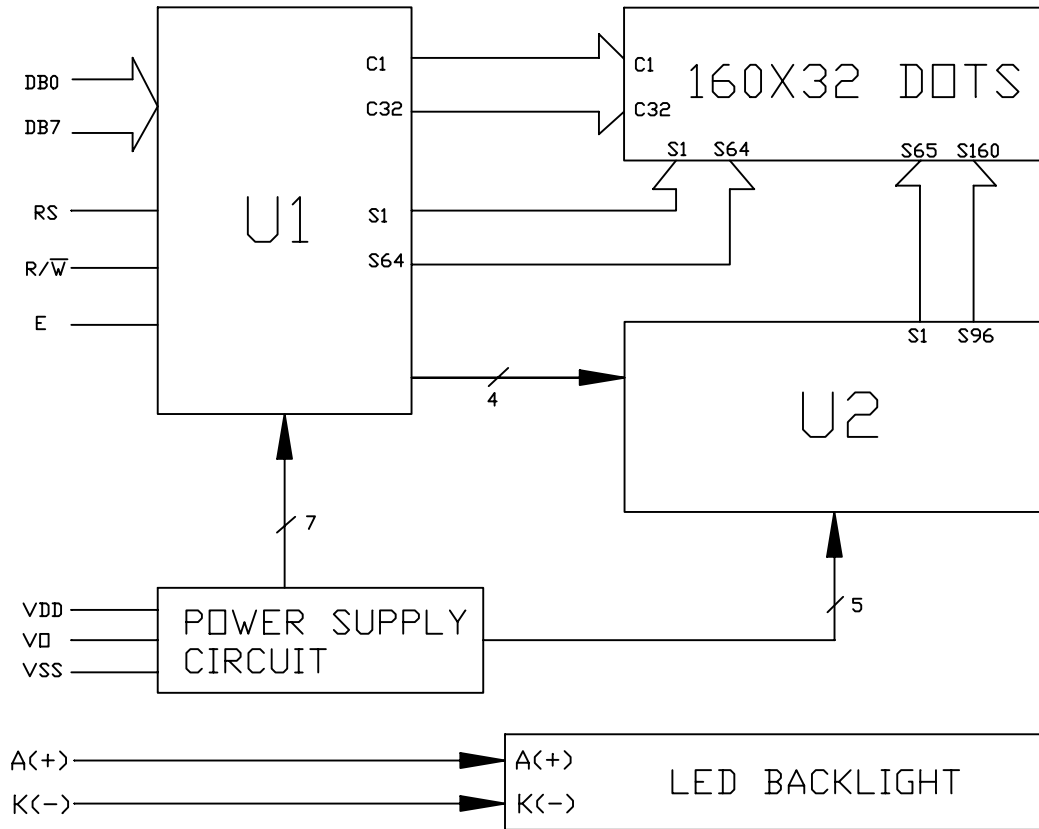
NOTE :  
 1.UNIT : mm  
 2.SCALE : NTS



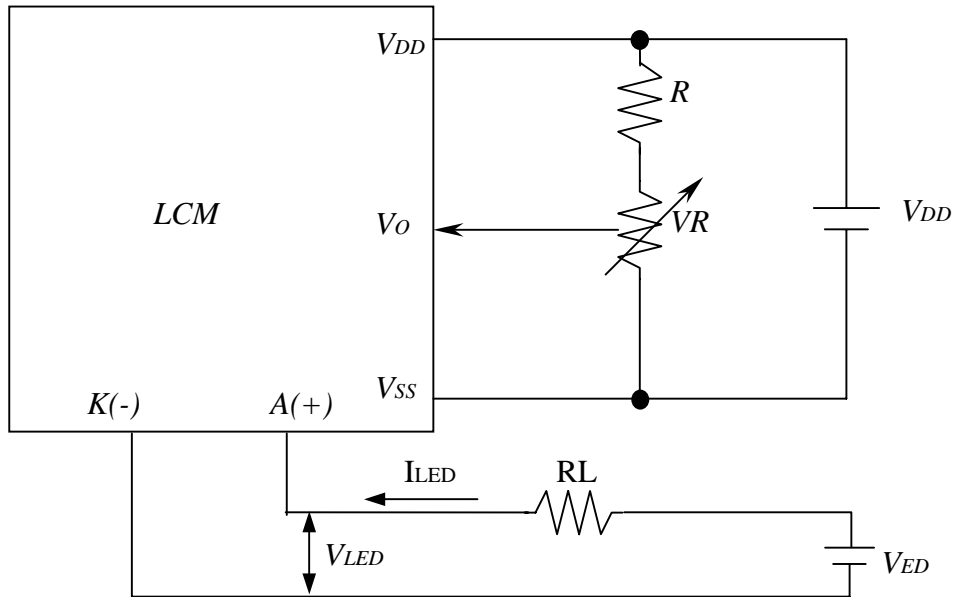
### 8.1 Interface pin connection

| <i>PIN NO.</i> | <i>SYMBOL</i>   | <i>FUNCTION</i>  |
|----------------|-----------------|--|
| 1              | V <sub>SS</sub> | POWER SUPPLY ( GND )   |
| 2              | V <sub>DD</sub> | POWER SUPPLY ( +5V )   |
| 3              | V <sub>o</sub>  | POWER SUPPLY FOR LCD   |
| 4              | RS              | RS = "H" DB0~DB7 FOR DISPLAY DATA<br>RS = "L" DB0~DB7 FOR CONTROL DATA |
| 5              | R/ $\bar{W}$    | H: DATA READ ( LCD MODULE MPU )<br>L: DATA WRITE ( LCD MODULE MPU )    |
| 6              | E               | ENABLE SIGNAL  |
| 7              | DB0             | DATA INPUT/OUTPUT (LSB)  |
| 8              | DB1             | DATA INPUT/OUTPUT  |
| 9              | DB2             | DATA INPUT/OUTPUT  |
| 10             | DB3             | DATA INPUT/OUTPUT  |
| 11             | DB4             | DATA INPUT/OUTPUT  |
| 12             | DB5             | DATA INPUT/OUTPUT  |
| 13             | DB6             | DATA INPUT/OUTPUT  |
| 14             | DB7             | DATA INPUT/OUTPUT (MSB)  |
| 15             | A(+)            | POWER SUPPLY FOR LED (+)   |
| 16             | K(-)            | POWER SUPPLY FOR LED (-)   |

**9. Block diagram**



### 10. Power supply for LCM



$V_o - V_{SS}$ : LCD DRIVING VOLTAGE  
 $V_R$ : 10K $\Omega$ ~20K $\Omega$

| <i>ITEM</i>                | <i>LED B.L TYPE</i> | <i>CONDITION</i>                                |
|----------------------------|---------------------|---|
| Limit resistor of LED (RL) | <b>A</b>            | RL $((V_{ED}-4.8V) / I_{LED})$ , $I_{LED}$ 40mA |
|                            | <b>B</b>            | RL $((V_{ED}-4.0V) / I_{LED})$ , $I_{LED}$ 40mA |