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PART NO.: MC2004E-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

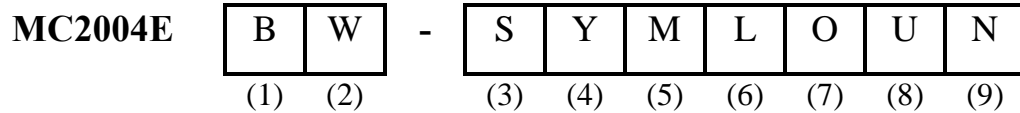
#### 3.1 General specifications

PLEASE REFER TO:

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

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

#### 3.3 NUMBERING SYSTEM



(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

“E” : EL BACKLIGHT

“R” : REFLECTIVE

(7).BACKLIGHT COLOR :

LED TYPE :

“nil” : YELLOW-GREEN      “A” : AMBER

“O” : ORANGE                      “R” : RED

EL TYPE :

“nil” : WHITE                      “B” : BLUE-GREEN

(8).VIEWING DIRECTION :

“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 CHARACTER-----20 CH \* 4 LINE
- (2) MODULE SIZE -----98.0 W \* 60.0 H \* “C” T (max) mm
- (3) EFFECTIVE AREA-----76.0 W \* 25.2 H mm
- (4) CHARACTER PATTERN -----5 \* 7 DOTS + CURSOR
- (5) CHARACTER SIZE -----2.95 W \* 4.15 H mm
- (6) CHARACTER PITCH-----3.55 mm
- (7) DOT SIZE-----0.55 W \* 0.55 H mm
- (8) DOT PITCH -----0.60 W \* 0.60 H mm

*NOTE : The dimension of "C" , please refer to Outline dimension on PAGE 8/10*

## 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 B.L	NOTE(2)	-----	NOTE(2)	NOTE(2)	NOTE(2)

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>B.L TYPE</i>	<i>SYMBOL</i>	<i>MAX.</i>	<i>UNIT</i>	<i>COMMENT</i>
ARRAY LED	V <sub>LED</sub>	5.0	V	YELLOW-GREEN,AMBER,ORANGE,RED
EDGE LED	V <sub>LED</sub>	6.0	V	BLUE,PURE GREEN,WHITE
EL	V <sub>EL</sub>	AC115V	V	f <sub>EL</sub> : 1.0KHz 60SEC.MAX
	f <sub>EL</sub>	2.0	KHz	AC115V <sub>rms</sub> 60SEC.MAX

### 5.2 Environmental absolute maximum ratings

<i>I T E M</i>	<i>CONDITION</i>	<i>OPERATION</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 NOTE (3)	-----	-----	0.5G	-----	2G	10~300Hz XYZ DIRECTIONS 1 Hr EACH
SHOCK NOTE (4)	-----	-----	3G	-----	50G	10 msec XYZ DIRECTIONS 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=9.8m/s<sup>2</sup>

**6. Electrical characteristics**

$T_a = 25$        $V_{DD} = 5.0$   $60.25$   $V$

<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 <sub>IH</sub>	-----	2.2	-----	-----	V	
	V <sub>IL</sub>	-----	-----	-----	0.6	V	
OUTPUT VOLTAGE	V <sub>OH</sub>	-I <sub>OH</sub> =0.2 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	-----	2.0	3.5	mA	
RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1)	V <sub>DD</sub> -V <sub>O</sub>	STN/ FSTN DUTY =1/16 =10° 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 DUTY =1/16 =25° 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 B.L	NOTE(3)	NOTE(3)	-----	NOTE(3)	NOTE(3)	NOTE(3)	

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 BACKLIGHT TYPE

<i>B.L TYPE</i>	<i>SYMBOL</i>	<i>CONDITION</i>	<i>MIN.</i>	<i>TYP.</i>	<i>MAX.</i>	<i>UNIT.</i>	<i>LED COLOR</i>
ARRAY LED	I <sub>LED</sub>	V <sub>LED</sub> =5.0V	-----	150	200	mA	YELLOW-GREEN, AMBER, ORANGE, RED
EDGE LED	I <sub>LED</sub>	V <sub>LED</sub> =4.0V	-----	60	80	mA	BLUE, WHITE, PURE GREEN
EL	I <sub>EL</sub>	V <sub>EL</sub> =AC115V f <sub>EL</sub> = 400Hz	-----	230	350	mA	-----

## 7. Optical characteristics

### TN TYPE LCD

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

<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 = 1.4 NOTE(1)	20	30	----	deg.	NOTE(2)
CONTRAST RATIO	K	= 25° NOTE(1)	2.0	3.0	----	----	NOTE(2)
RESPONSE TIME	tr (rise)	= 25° NOTE(1)	----	150	250	ms	NOTE(2)
	tf (fall)	= 25° NOTE(1)	----	150	250	ms	NOTE(2)

### STN TYPE LCD

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

<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 NOTE(1)	30	40	----	deg.	NOTE(2)
CONTRAST RATIO	K	= 10° NOTE(1)	3.0	4.0	----	----	NOTE(2)
RESPONSE TIME	tr (rise)	= 10° NOTE(1)	----	200	350	ms	NOTE(2)
	tf (fall)	= 10° NOTE(1)	----	300	400	ms	NOTE(2)

### FSTN TYPE LCD

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

<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 NOTE(1)	30	40	----	deg.	NOTE(2)
CONTRAST RATIO	K	= 10° NOTE(1)	4.0	5.0	----	----	NOTE(2)
RESPONSE TIME	tr (rise)	= 10° NOTE(1)	----	200	350	ms	NOTE(2)
	tf (fall)	= 10° NOTE(1)	----	300	400	ms	NOTE(2)

### Brightness for backlight

<i>SYMBOL</i>	<i>CONDITION</i>	<i>MIN.</i>	<i>TYP.</i>	<i>MAX.</i>	<i>UNIT</i>	<i>B.L TYPE</i>	<i>NOTE</i>
B	= 0°	4.0	----	----	cd/m <sup>2</sup>	EL	NOTE(2) NOTE(3)
	= 0°	5.0	----	----		LED	

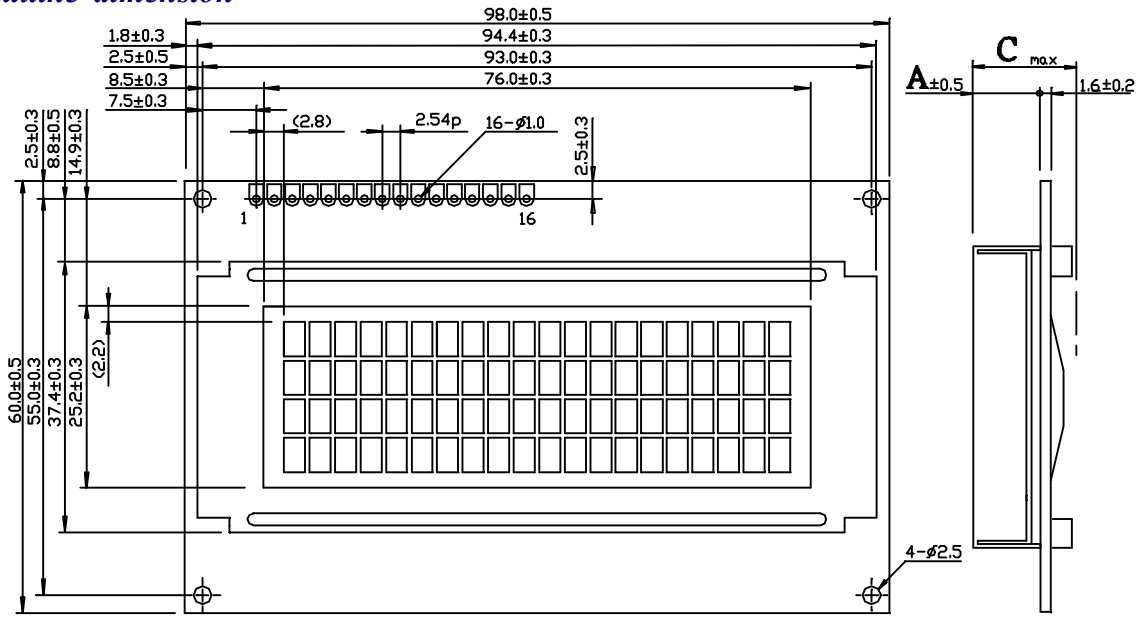
NOTE (1): = 0° : VIEWING DIRECTION AT 6 O' CLOCK

= 180° : VIEWING DIRECTION AT 12 O' CLOCK

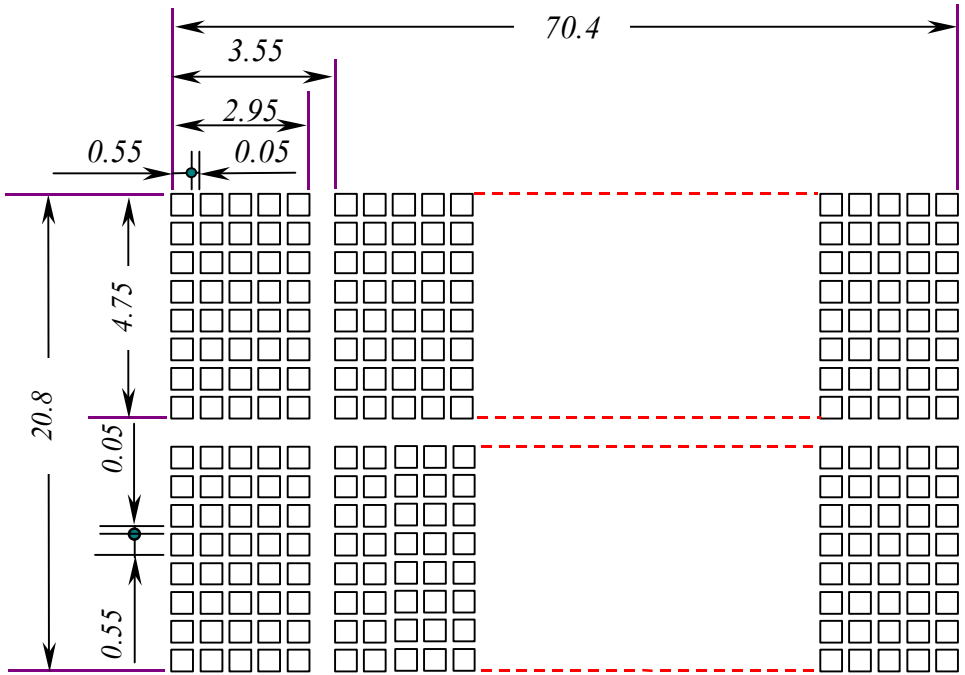
NOTE (2):SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR  
DEFINITION OF OPTICAL CHARACTERISTICS.

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

**8. Outline dimension**



TYPE	A	C
LED B.L	9.0	15.0
EL & NO B.L	5.1	10.0



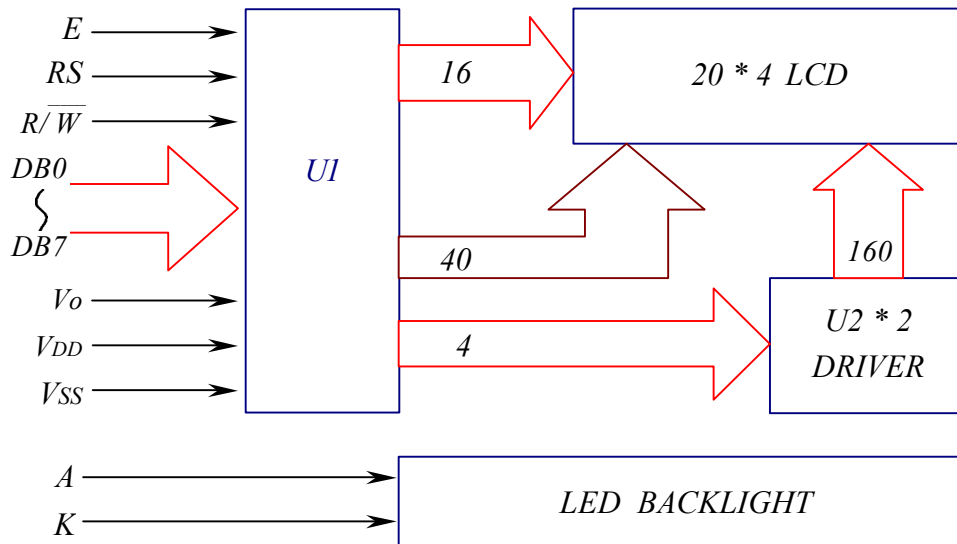
NOTE :  
 1.UNIT : mm  
 2.SCALE : NTS

**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(-)



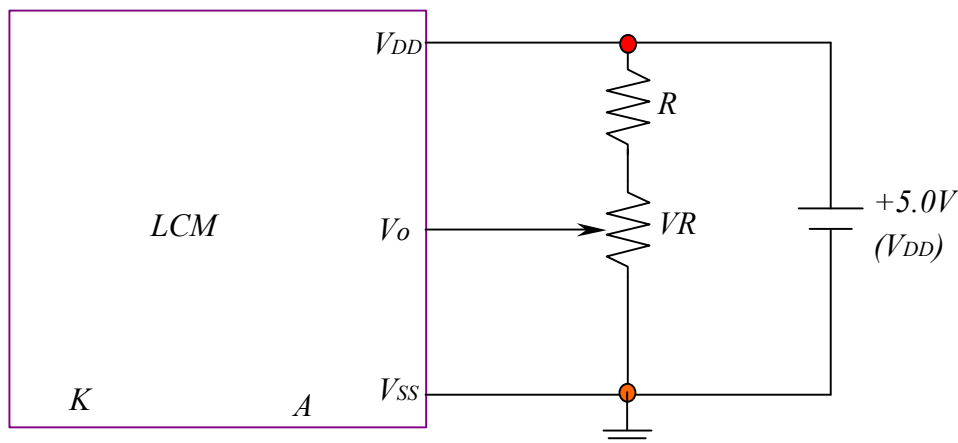
### 9. Block diagram



### Display data address charts

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	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
LINE 3	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27
LINE 4	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67

### 10. Power supply for LCM

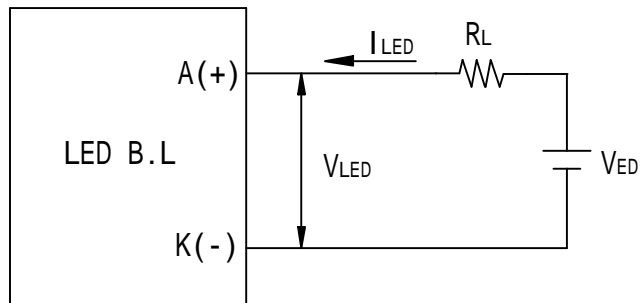
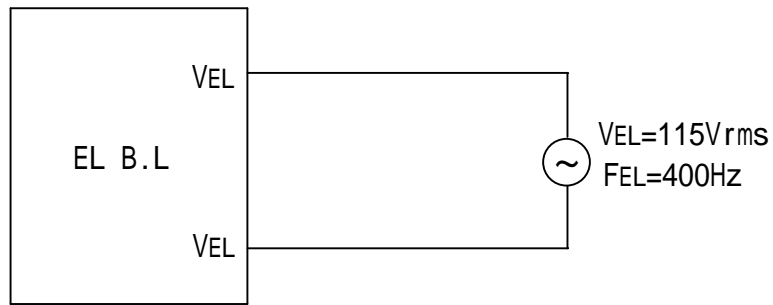


RECOMMENDED RESISTOR R:  $V_{DD}-V_0$  1.5V

$V_{DD}-V_0$ : LCD DRIVING VOLTAGE

VR: 10K ~20K

**10.1 Power supply for backlight**



<b><i>ITEM</i></b>	<b><i>LED TYPE</i></b>	<b><i>CONDITION</i></b>
Limit resister of LED (RL)	ARRAY LED	RL ((VED-5.0V) / ILED) , ILED 200mA
	EDGE LED	RL ((VED-4.0V) / ILED) , ILED 80mA

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