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PART NO.: MC2004E-SERIES

FOR MESSRS.: _____

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ACCEPTED BY: _____

PROPOSED BY : _____

RECORD OF REVISION

DATE	PAGE	SUMMARY

3. General specifications

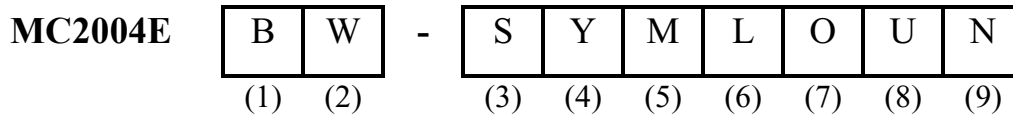
3.1 General specifications

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 _{DD} -V _{SS}	0	6.0	V	-----
INPUT VOLTAGE	V _I	V _{SS}	V _{DD}	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 _{LED}	5.0	V	YELLOW-GREEN,AMBER,ORANGE,RED
EDGE LED	V _{LED}	6.0	V	BLUE,PURE GREEN,WHITE
EL	V _{EL}	AC115V	V	f _{EL} : 1.0KHz 60SEC.MAX
	f _{EL}	2.0	KHz	AC115V _{rms} 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/s²

6. Electrical characteristics

$T_a = 25\text{ }^\circ\text{C}$ $V_{DD} = 5.060.25\text{ V}$

<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}	$V_{DD} = 5.0\text{V}$	-----	2.0	3.5	mA	
RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1)	$V_{DD} - V_O$	STN/ FSTN DUTY =1/16 $\Phi=10^\circ$ 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 DUTY =1/16 $\Phi=25^\circ$ 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 B.L	NOTE(3)	NOTE(3)	-----	NOTE(3)	NOTE(3)	NOTE(3)	

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

(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_{LED}	$V_{LED} = 5.0\text{V}$	-----	150	200	mA	YELLOW-GREEN、 AMBER、ORANGE、RED
EDGE LED	I_{LED}	$V_{LED} = 4.0\text{V}$	-----	60	80	mA	BLUE、WHITE、 PURE GREEN
EL	I_{EL}	$V_{EL} = \text{AC}115\text{V}$ $f_{EL} = 400\text{Hz}$	-----	230	350	mA	-----

7. Optical characteristics

TN TYPE LCD

$$T_a = 25\text{ }^{\circ}\text{C} \quad V_{DD}-V_O = 4.2\text{V}$$

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

STN TYPE LCD

$$T_a = 25\text{ }^{\circ}\text{C} \quad V_{DD}-V_O = 4.5\text{V}$$

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

FSTN TYPE LCD

$$T_a = 25\text{ }^{\circ}\text{C} \quad V_{DD}-V_O = 4.5\text{V}$$

<i>I T E M</i>	<i>SYMBOL</i>	<i>CONDITION</i>	<i>MIN.</i>	<i>TYP.</i>	<i>MAX.</i>	<i>UNIT</i>	<i>NOTE</i>
VIEWING ANGLE	$\Phi 2-\Phi 1$	K = 2.0 NOTE(1)	30	40	----	deg.	NOTE(2)
CONTRAST RATIO	K	$\Phi = 10^{\circ}$ NOTE(1)	4.0	5.0	----	----	NOTE(2)
RESPONSE TIME	tr (rise)	$\Phi = 10^{\circ}$ NOTE(1)	----	200	350	ms	NOTE(2)
	tf (fall)	$\Phi = 10^{\circ}$ 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	$\Phi = 0^{\circ}$	4.0	----	----	cd/m ²	EL	NOTE(2) NOTE(3)
	$\theta = 0^{\circ}$	5.0	----	----		LED	

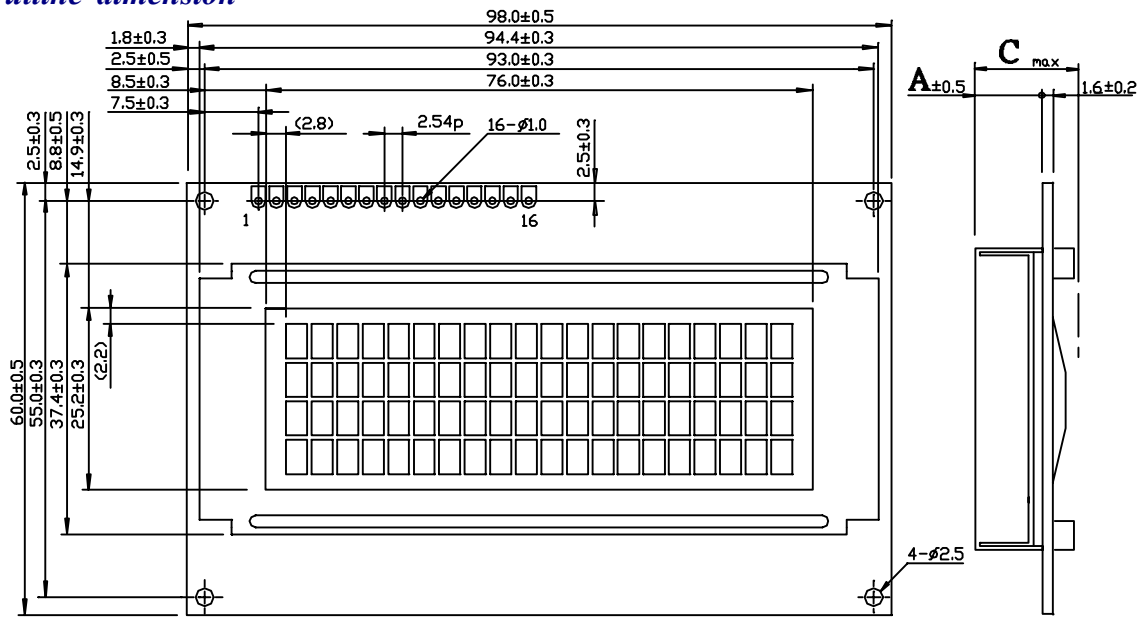
NOTE (1): $\theta = 0^{\circ}$: VIEWING DIRECTION AT 6 O' CLOCK

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

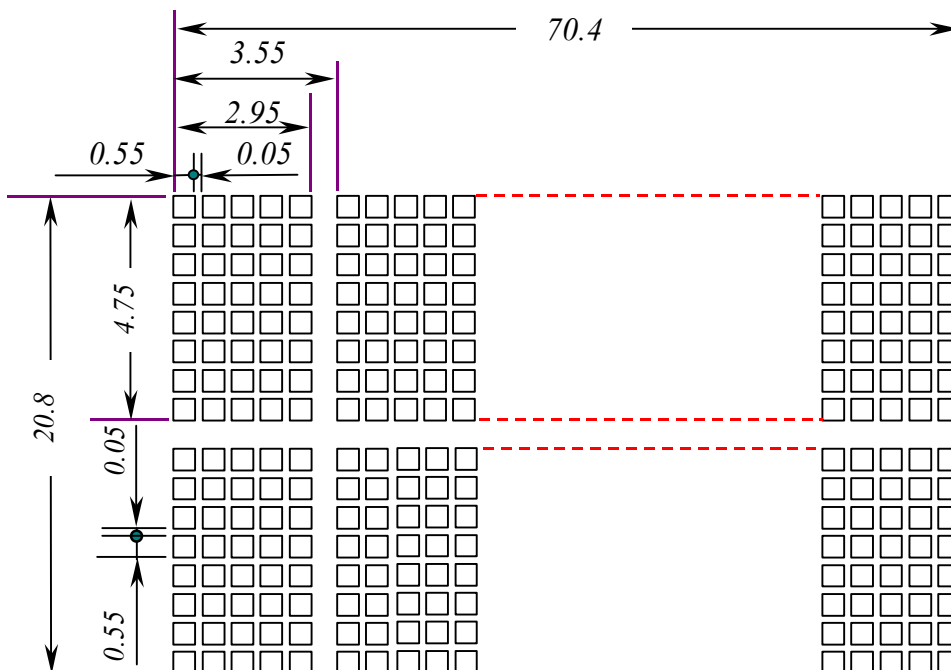
NOTE (2):SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR DEFINITION OF OPTICAL CHARACTERISTICS.

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

8. Outline dimension



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

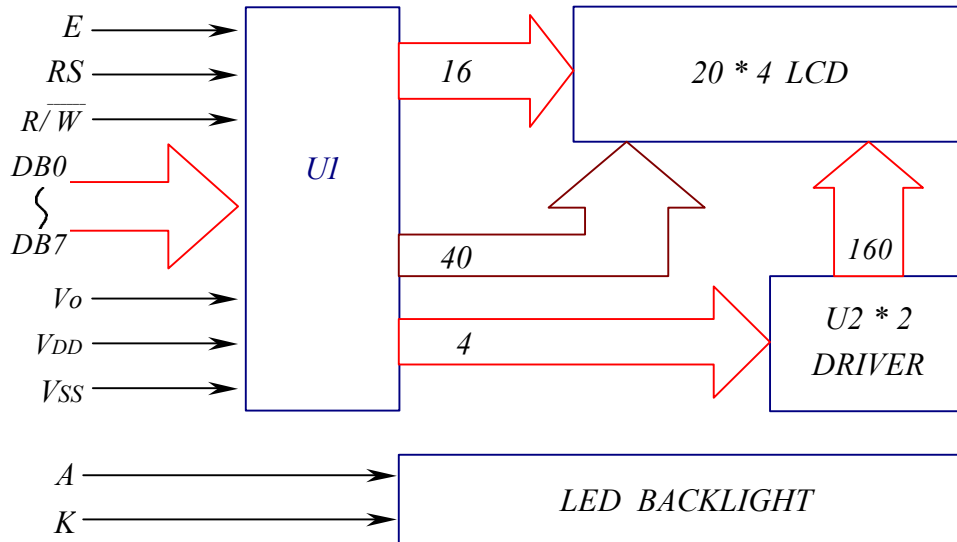


NOTE :
 1.UNIT : mm
 2.SCALE : NTS

Interface pin connection

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

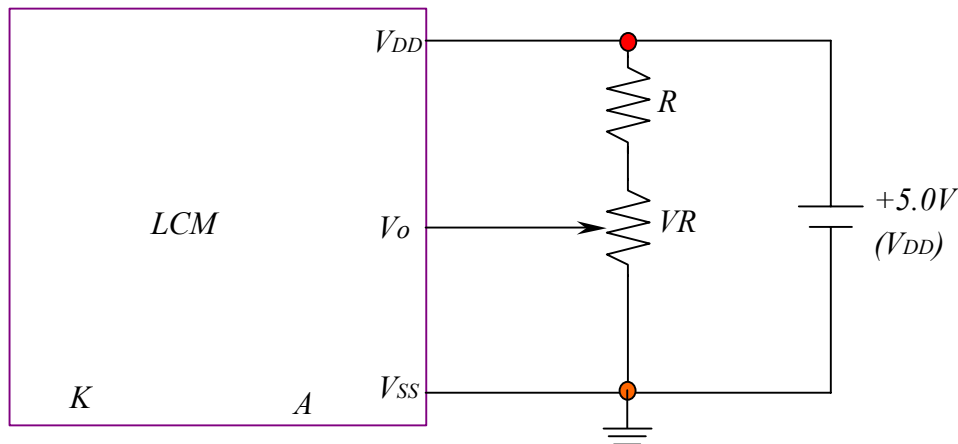
9. Block diagram



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

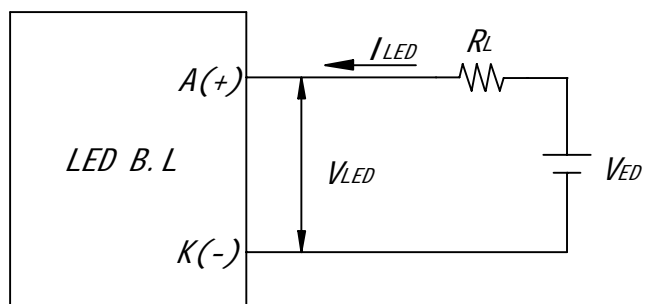
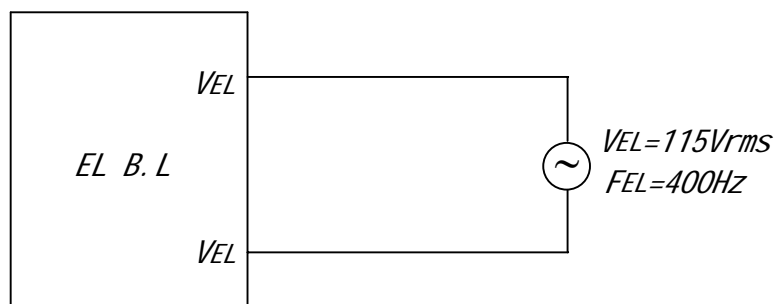


RECOMMENDED RESISTOR R: $V_{DD}-V_0 \geq 1.5V$

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

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

10.1 Power supply for backlight



ITEM	LED TYPE	CONDITION
Limit resister of LED (RL)	ARRAY LED	$R_L \geq ((V_{ED}-5.0V) / I_{LED})$, $I_{LED} \leq 200mA$
	EDGE LED	$R_L \geq ((V_{ED}-4.0V) / I_{LED})$, $I_{LED} \leq 80mA$