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PART NO. : MC2002D-SERIES

FOR MESSRS. : _____

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ACCEPTED BY : _____ PROPOSED BY : _____

RECORD OF REVISION

DATE	PAGE	SUMMARY
2004/6/25	3/9	ADD the "R" REFLECTIVE of (6).BACKLIGHT TYPE
	8/9	ADD the table to distribute LCM type LED B.L and NO B.L
	8/9	ADD the 15th and 16th pins of Interface pin connection.

3. General specifications

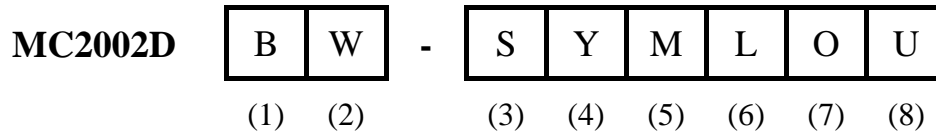
3.1 General specifications

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

“R” : REFLECTIVE

(7).BACKLIGHT COLOR :

LED TYPE :

“nil” : YELLOW-GREEN “A” : AMBER “O” : ORANGE

“R” : RED

(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 ----- 20 CH * 2 LINE
- (2) MODULE SIZE ----- 116.0 W * 37.0 H * 14.0 T (Max) mm
- (3) EFFECTIVE AREA ----- 82.2 W * 18.6 H mm
- (4) CHARACTER PATTERN ----- 5 * 7 DOTS + CURSOR
- (5) CHARACTER SIZE ----- 3.2 W * 4.85H mm
- (6) CHARACTER PITCH ----- 3.7 mm
- (7) DOT SIZE ----- 0.60 W * 0.65 H mm
- (8) DOT PITCH ----- 0.65 W * 0.70 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 _{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 LED	V _{LED}	-----	6.0	V	-----

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>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 (2)		NOTE (2)		NO CONDENSATION
VIBRATION NOTE (3)	-----	-----	0.5G	-----	2G	10~300Hz XYZ DIRECTIONS 1 Hr EACH
SHOCK NOTE (3)	-----	-----	3G	-----	50G	10 msec XYZ DIRECTIONS 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/s²

6. Electrical characteristics

$T_a = 25$

$V_{DD} = 5.0 V \pm 0.25 V$

<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_{IH}	-----	2.0	-----	-----	V	
	V_{IL}		-----	-----	0.8	V	
OUTPUT VOLTAGE	V_{OH}	$-I_{OH} = 0.2 \text{ mA}$	2.4	-----	-----	V	
	V_{OL}	$I_{OL} = 1.6 \text{ mA}$	-----	-----	0.4	V	
POWER SUPPLY CURRENT	I_{DD}	$V_{DD} = 5.0V$	-----	2.0	3.5	mA	
RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1), NOTE(3)-A	$V_{DD} - V_O$	DUTY = 1/16 = 10° 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
RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1), NOTE(3)-B	$V_{DD} - V_O$	DUTY = 1/16 = 10° 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
RECOMMENDED LCD DRIVING VOLTAGE NOTE(1)	$V_{DD} - V_O$	TN DUTY = 1/16 = 25° 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}	5.0V	-----	120	250	mA	

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

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

NOTE(3): RECOMMENDED LCD DRIVING VOLTAGE FOR DIFFERENT LCD TYPE

	<i>LCD TYPE</i>	<i>LCD COLOR</i>	<i>LCD POLARIZE TYPE</i>
A	STN	GRAY/ BLUE(NEGATIVE)	TRANSFLECTIVE TRANSMISSIVE
	FSTN	BLACK(NEGATIVE) WHITE(POSITIVE)	
B	STN	YELLOW-GREEN	TRANSFLECTIVE TRANSMISSIVE

7. Optical characteristics

TN TYPE LCD

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

<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

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

<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 = 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、STN BLUE TYPE LCD

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

<i>I T E M</i>	<i>SYMBOL</i>	<i>CONDITIO N</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 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° = 0°	5.0	----	----	cd/m ²	YELLOW-GREEN, RED AMBER, ORANGE	NOTE(2) NOTE(3)

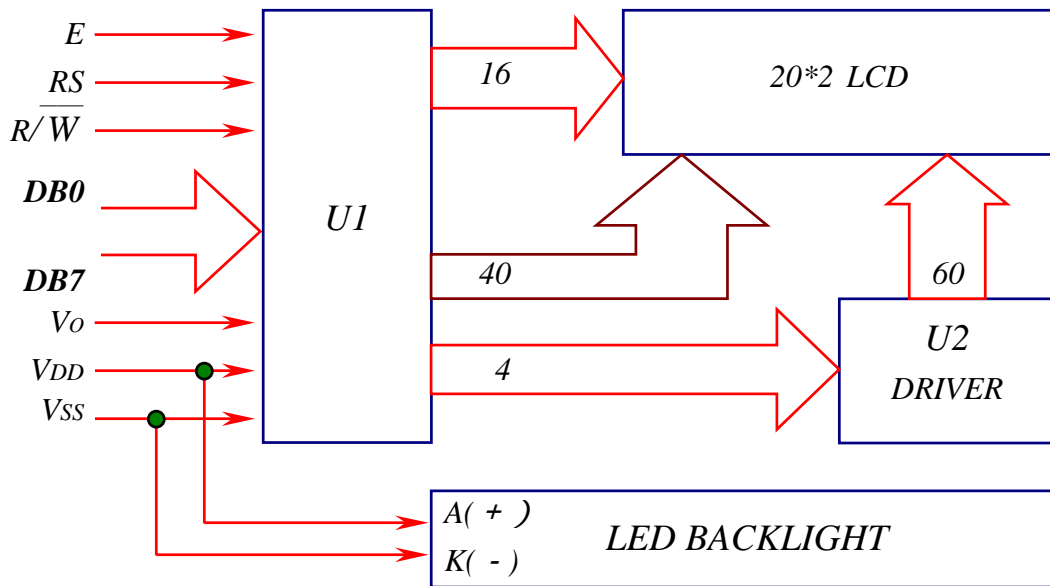
NOTE (1): = 0° : VIEWING DIRECTION AT 6 O'CLOCK

= 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.

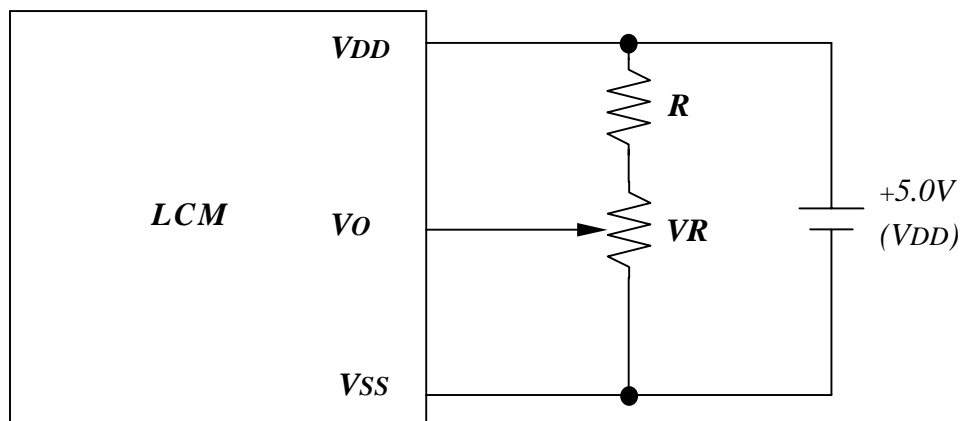
9. Block diagram



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
LINE1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
LINE2	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53

10. Power supply for LCM



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

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

VR: 10K ~ 20K