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PART NO.: MC24021A-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

MC24021A	B	W	-	S	Y	M	L	O	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

“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 CHARACTERS-----24 CH * 2 LINE
- (2) MODULE SIZE -----118.0 W * 36.0 H * "C" T (Max) mm
- (3) EFFECTIVE AREA -----96.0 W * 18.8 H mm
- (4) CHARACTER PATTERN -----5 * 7 DOTS + CURSOR
- (5) CHARACTER SIZE-----3.20 W * 4.85 H mm
- (6) CHARACTER PITCH -----3.70 mm
- (7) DOT SIZE-----0.60 W * 0.65 H mm
- (8) DOT PITCH -----0.65 W * 0.70 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	VDD-VSS	0	6.0	V	
INPUT VOLTAGE	V _I	VSS	VDD	V	
STATIC ELECTRICITY	-----	-----	100	V	NOTE (1)
POWER SUPPLY FOR EL BLACKLIGHT	V _{EL}	-----	AC200	V _{rms}	Fel=1.0KHz 60 SEC.MAX
	f _{EL}	-----	2.0	KHz	ACC115 V _{rms} 60 SEC. MAX
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 T E M	CONDITION	OPERATION		STORAGE		COMMENT
		MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	NORMAL	0°C	50°C	-20°C	70°C	-----
	WIDE	-20°C	70°C			
HUMIDITY	-----	NOTE (2)		NOTE (2)		NO CONDENSATION
VIBRATION NOTE (2)	-----	-----	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°C: 90% RH MAX.

Ta > 50°C: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90% RH AT 50°C. (80%RH AT 60°C)

NOTE (3): 1G=9.8m/s²

6. Electrical characteristics

$T_a = 25^{\circ}\text{C}$

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

<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 mA		2.4	-----	-----	V
	V _{OL}	I _{OL} = 1.2 mA		-----	-----	0.4	V
POWER SUPPLY CURRENT	I _{DD}	V _{DD} = 5.0V		-----	1.8	3.0	mA
RECOMMENDED LCD DRIVING VOLTAGE, NOTE(1)	V _{DD} -V _O	STN/ FSTN DUTY =1/16 Φ=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 Φ=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 $\pm 0.5\text{V}$ 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

B.L TYPE	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT.	LED COLOR
ARRAY LED	I_{LED}	$V_{LED} = 5.0\text{V}$	-----	140	180	mA	YELLOW-GREEN, AMBER, ORANGE, RED
EL	I_{EL}	$V_{EL} = 115\text{V}_{rms}$ $f_{EL} = 400\text{Hz}$	-----	3.0	-----	mArms	-----

7. Optical characteristics

TN TYPE LCD

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

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
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 T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
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、STN BLUE TYPE LCD

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

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
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 LCM

SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	B.L TYPE	NOTE
B	$\Phi = 0^{\circ}$	4.0	----	----	cd/m ²	EL	NOTE(2)
	$\theta = 0^{\circ}$	6.0	----	----		ARRAY LED	NOTE(3)

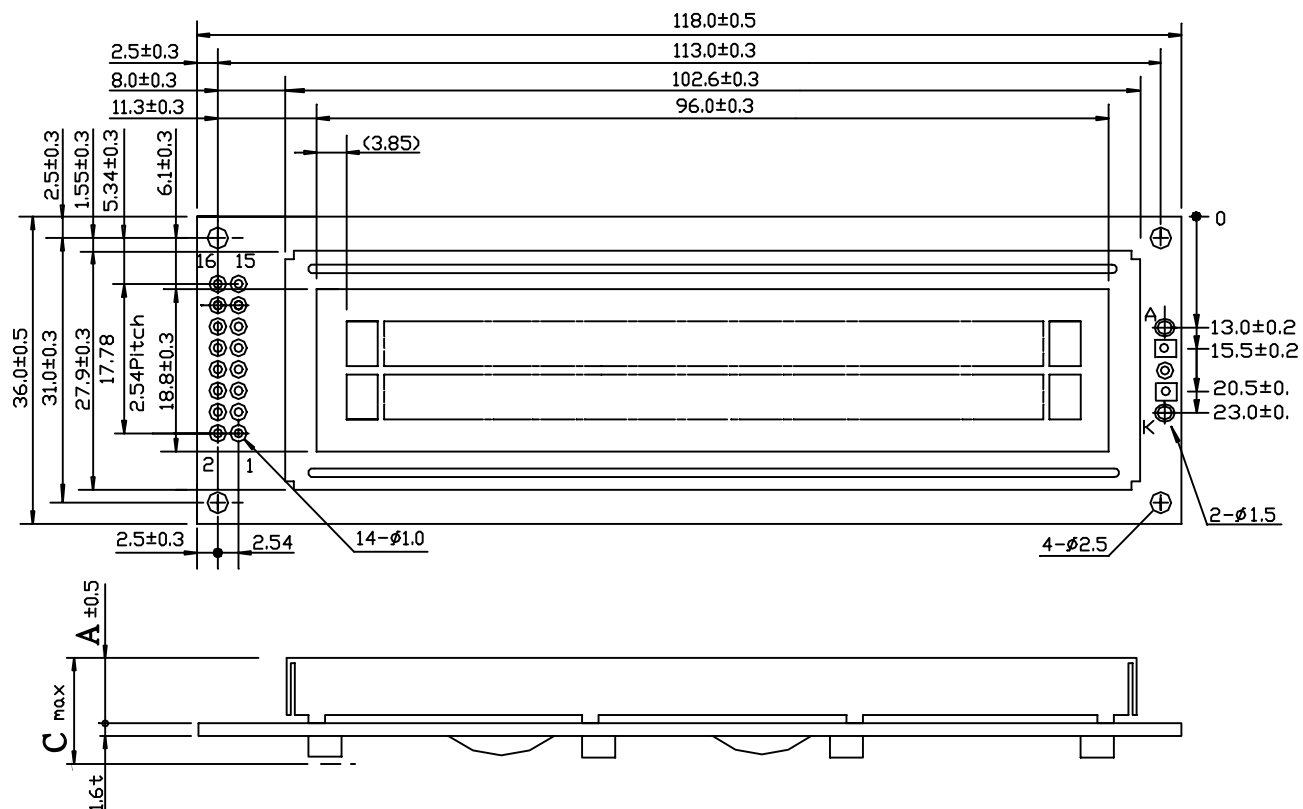
NOTE (1): $\theta = 0^{\circ}$: VIEWING DIRECTION AT 6 O'CLOCK

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

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

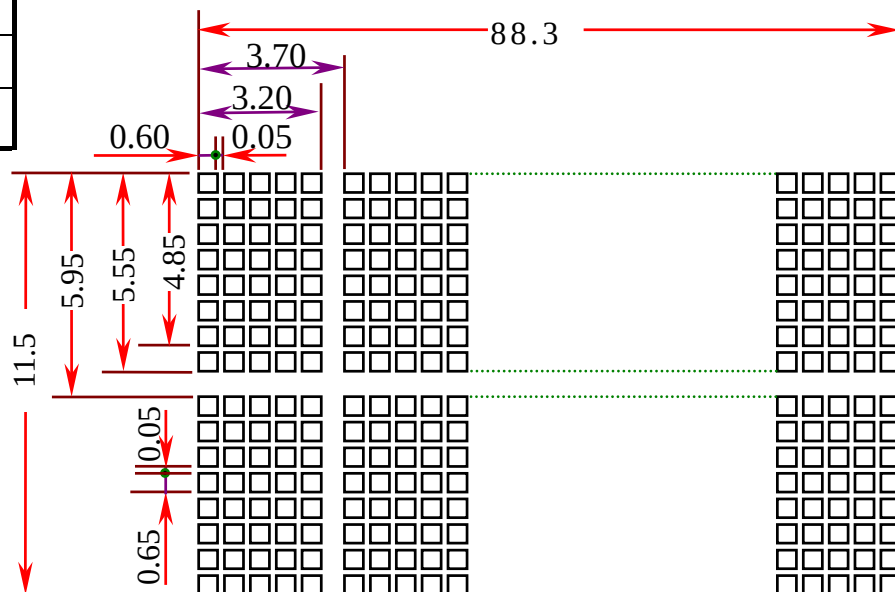
NOTE (3):UNDER NORMAL TEMPERATURE AND HUMIDITY IN A DARK ROOM.

8. Outline dimension



TYPE	A	C
LED B.L	9.5	15
EL& NO B.L	4.9	10

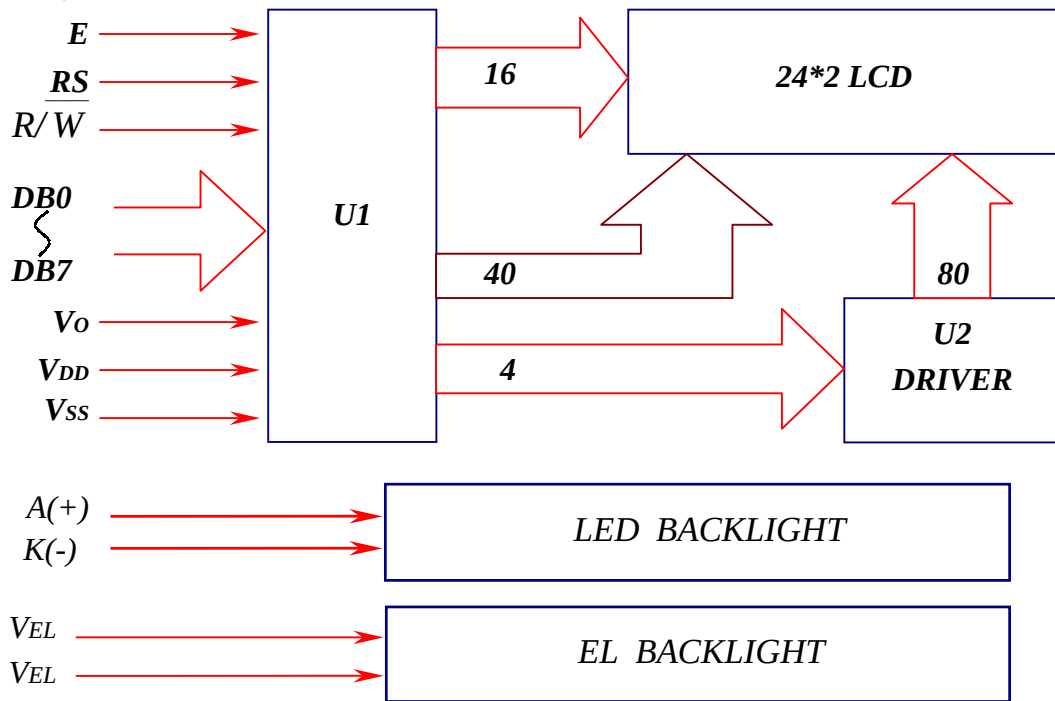
UNIT : mm
SCALE : NTS



Interface pin connection

PIN NO.	1	2	3	4	5	6	7	8	9
SYMBOL	VSS	VDD	VO	RS	R/W	E	DB0	DB1	DB2
PIN NO.	10	11	12	13	14	15	16	A	K
SYMBOL	DB3	DB4	DB5	DB6	DB7	A(+)	K(-)	VEL	VEL

9. Block diagram

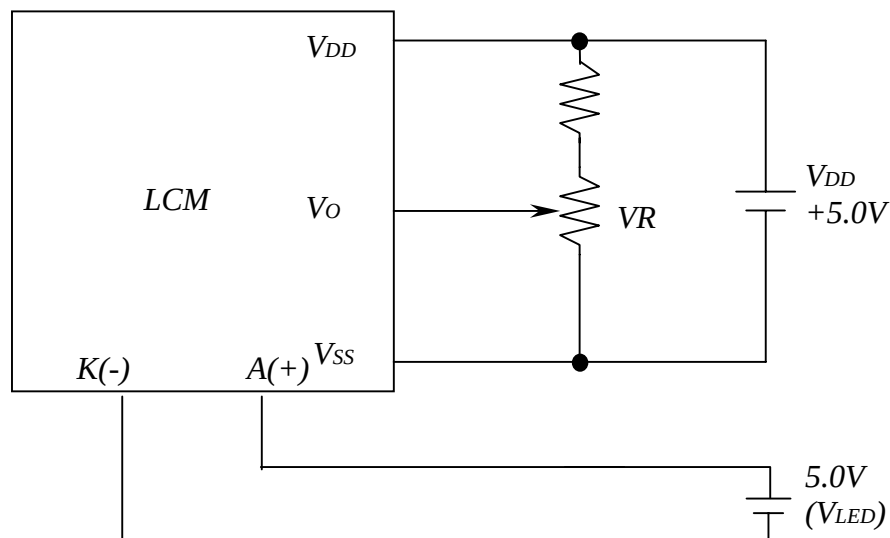


Display data address charts

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

	21	22	23	24
LINE 1	14	15	16	17
LINE 2	54	55	56	57

10. Power supply for LCM



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

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

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

10.1 Power supply for backlight

