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PART NO. : **MC2004F-SYL**

FOR MESSRS. :

CONTENTS

ACCEPTED BY: PROPOSED BY :

RECORD OF REVISION

DATE	PAGE	SUMMARY
1999/9/8	7	AMEND THE INTERFACE PIN CONNECTION PIN NO. SYMBOL → PIN NO. SYMBOL 2 V_{DD} → 2 V_{SS} 3 V_{SS} → 3 V_{DD}
	8	AMEND THE BLOCK DIAGRAM AMEND THE DISPLAY DATA ADDRESS CHARTS
	9	ADD THE INITIALIZATION BY INSTRUCTIONS

3. General specifications

3.1 General specifications

PLEASE REFER TO:

"CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (MS-10-2004F)".

3.2 This individual specification is prior to general specifications

4. Mechanical data

(1) NUMBER OF CHARACTERS----------20 CH * 4 LINE

(2) MODULE SIZE ----------59.0 W * 29.3H * 5.5 T (MAX) mm

(3) EFFECTIVE AREA ----------44.595 W * 11.595 H mm

(4) CHARACTER PATTERN----------5 * 7 DOTS

(5) CHARACTER SIZE----------1.845 W * 2.595 H mm

(6) CHARACTER PITCH----------2.25 mm

(7) DOT SIZE ----------0.345 W * 0.345 H mm

(8) DOT PITCH ----------0.375 W * 0.375 H mm

(9) VIEWING DIRECTION ----------6 O'CLOCK

(10) LCD TYPE----------STN.YELLOW-GREEN.TRANSFLECTIVE.

(11) LED COLOR----------YELLOW-GREEN

5. Absolute maximum ratings

5.1 Electrical absolute maximum ratings

I T E M	SYMBOL	MIN.	MAX.	UNIT	COMMENT
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_{DD}-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	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-20℃	70℃	-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℃: 85% RH MAX.

TA ＞ 50℃: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85% RH AT 50℃. (50% RH AT 60℃).

NOTE (3): 1G = 9.8 m/s^2

6. Electrical characteristics

ITEM	SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR CIRCUIT	VDD-VSS	-------		2.7	-------	5.5	V
INPUT VOLTAGE	VIH	-------		0.7VDD	-------	VDD	V
	VIL			-0.3	-------	0.6	V
OUTPUT VOLTAGE	VOH	IOH = -0.1 mA		0.75VDD	-------	-------	V
	VOL	IOL = 0.1 mA		-------	-------	0.2VDD	V
POWER SUPPLY CURRENT	IDD	VDD = 5.0V		-------	0.35	0.6	mA
CLOCK OSCILLATION FREQUENCY	FOSC	FOR LCD MODULE (VDD = +5.0V)		190	270	350	KHz
RECOMMENDED LCD DRIVING VOLTAGE, NOTE (1)	VDD-VO DUTY= 1/32	VDD =5.0V	TA=-20℃	-------	4.0	-------	V
			TA=25℃	-------	4.1	-------	V
			TA=70℃	-------	4.3	-------	V
		VDD =3.0V	TA=-20℃	-------	1.0	-------	V
			TA=25℃	-------	1.1	-------	V
			TA=70℃	-------	1.3	-------	V
POWER SUPPLY CURRENT FOR LED	ILED	VDD-VLED(-) =5.0V		-------	40	50	mA

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

7. Optical characteristics

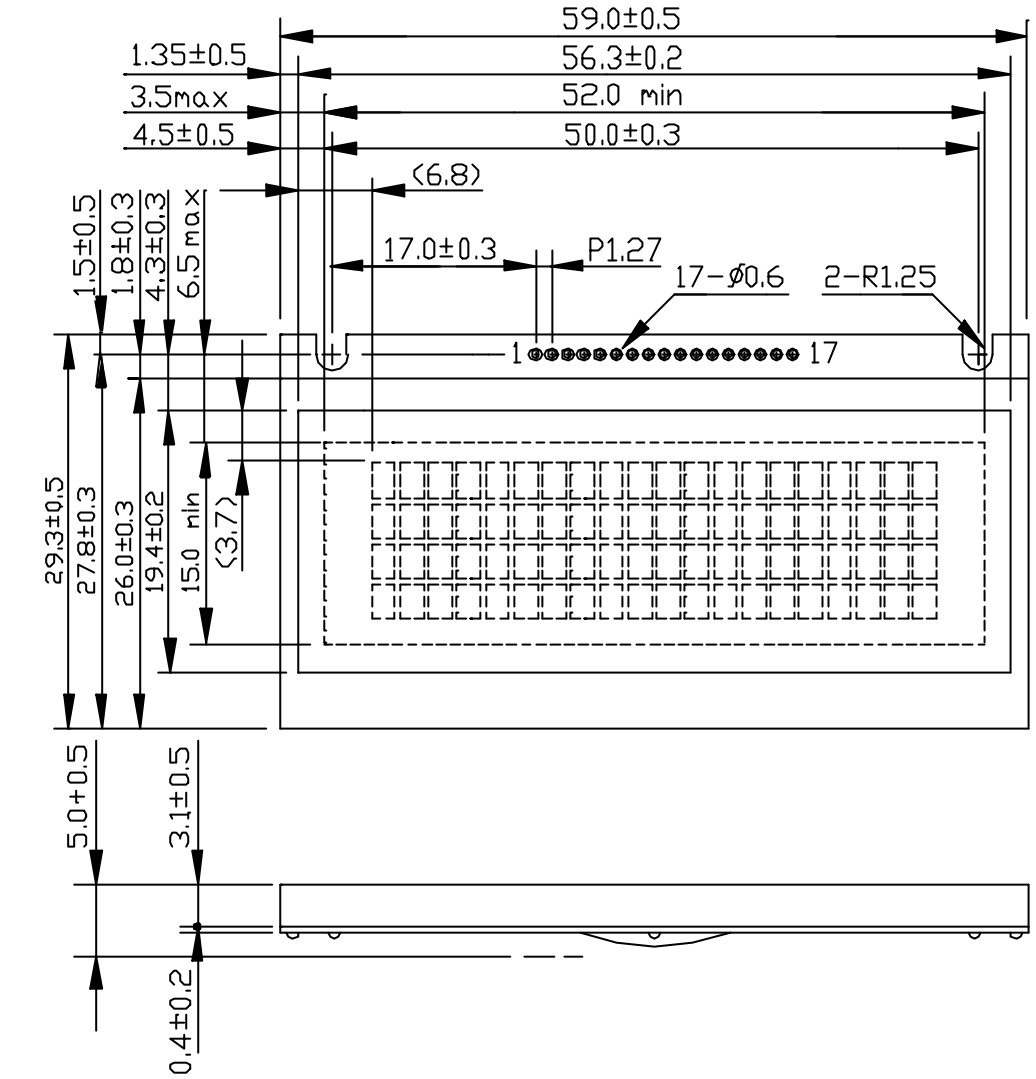
TA = 25℃ VDD = 5.0V

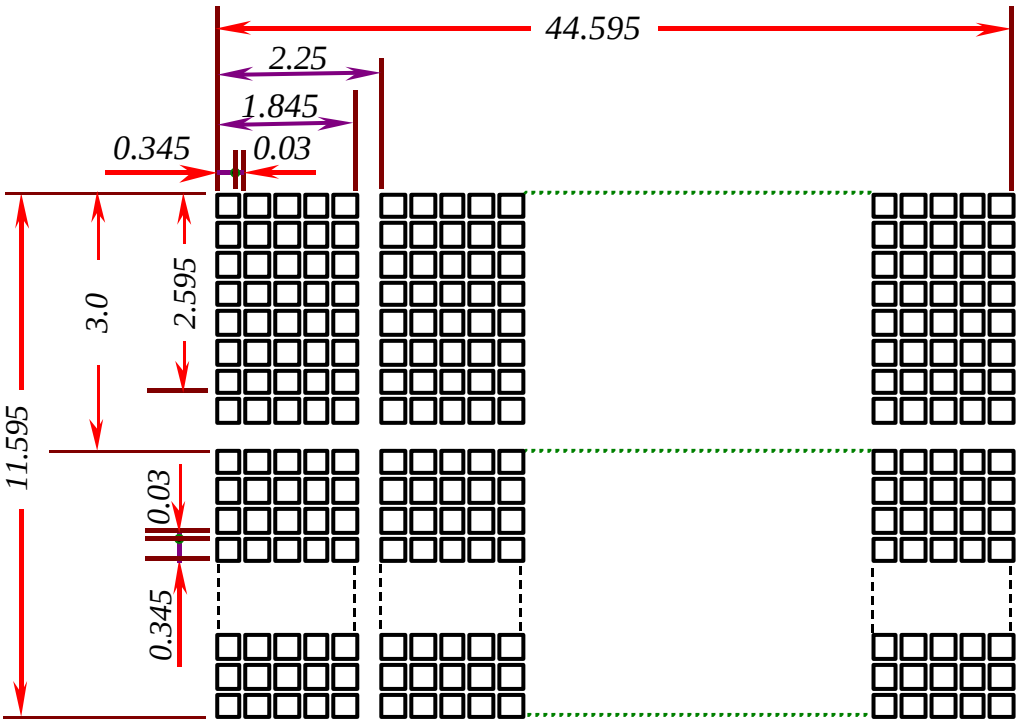
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING ANGLE	Φ2-Φ1	K = 2.0	30	40	-------	deg.	2
CONTRAST RATIO	K	Φ = 10 ° Θ = 0 °	3.0	4.0	-------	-------	2
RESPONSE TIME	TR (RISE)	Φ = 10 ° Θ = 0 °	-------	200	350	ms	2
	TF (FALL)	Φ = 10 ° Θ = 0 °	-------	300	400	ms	2
BRIGHTNESS FOR LED BACKLIGHT	B	Φ = 0 ° θ = 0 °	4.0	-------	-------	cd/m^2	3

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

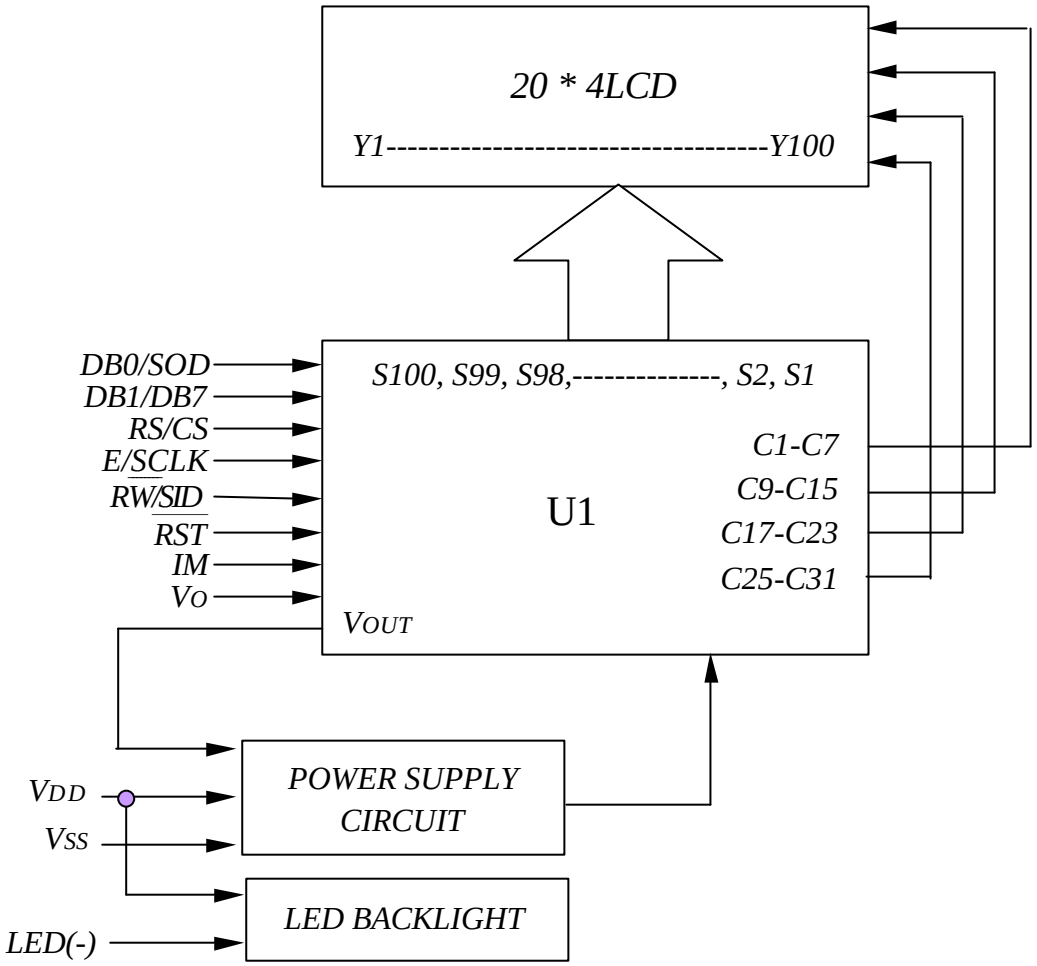




Interface pin connection

PIN NO.	*SYMBOL*	*LEVEL*	*FUNCTION*
1	LED(-)	L	POWER SUPPLY FOR LED BACKLIGHT
2	VSS	——	GROUND
3	VDD	5.0V	POWER SUPPLY FOR LOGIC
4	VO	——	INPUT VOLTAGE TO THE VOLTAGE CONVERTER TO GENERATE LCD DRIVE VOLTAGE
5	RS/CS	H/L	(1) IN BUS MODE H: DATA REGISTER IS SELECTED L: INSTRUCTION REGISTER IS SELECTED (2) IN SERIAL MODE H: CHIP IS NO SELECTED L: CHIP IS SELECTED (ACCESS ENABLE)
6	$\overline{RW}$/SID	H/L	(1) IN BUS MODE H: READ OPERATION L: WRITE OPERATION (2) IN SERIAL MODE USED FOR DATA INPUT PIN
7	E/SCLK	H/L	(1) IN BUS MODE USED AS READ/WRITE ENABLE SIGNAL (2) IN SERIAL MODE USED AS SERIAL CLOCK INPUT PIN
8	DB0/SOD	——	(1) IN BUS MODE DATA INPUT/OUTPUT (LSB) (2) IN SERIAL MODE USED AS SERIAL DATA OUTPUT PIN
9	DB1	——	DATA INPUT/OUTPUT
10	DB2	——	DATA INPUT/OUTPUT
11	DB3	——	DATA INPUT/OUTPUT
12	DB4	——	DATA INPUT/OUTPUT
13	DB5	——	DATA INPUT/OUTPUT
14	DB6	——	DATA INPUT/OUTPUT
15	DB7	——	DATA INPUT/OUTPUT (MSB)
16	$\overline{RST}$	L	L : RESET
17	IM	H/L	H: 4-BIT/8-BIT BUS MODE L: SERIAL MODE

9. Block diagram



Display data address charts

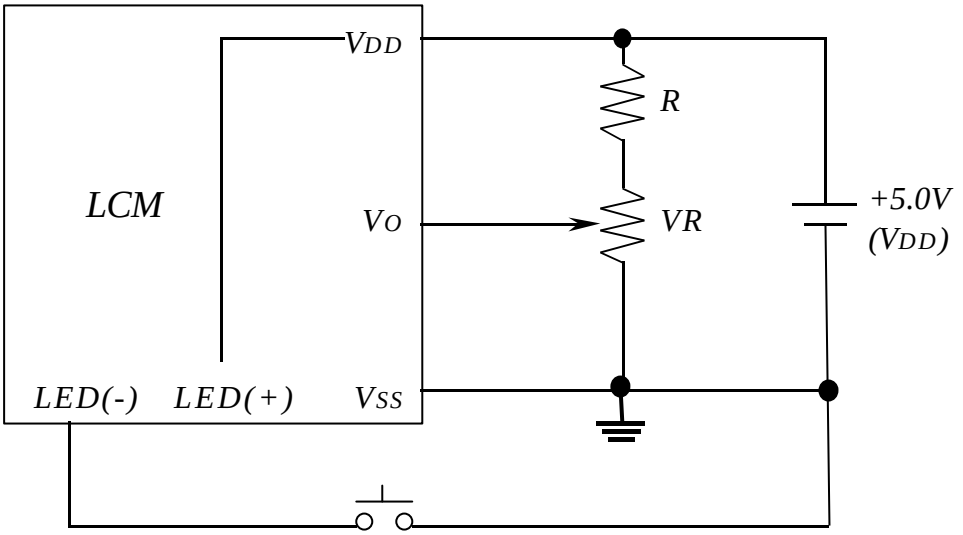
Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LINE 1	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
LINE 2	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33
LINE 3	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53
LINE 4	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	70	71	72	73

10. Initialization by instructions

	RS	R/W	D7	D6	D5	D4	D3	D2	D1	D0	
POWER ON											
FUNCTION SET	0	0	0	0	1	1	1	1	0	0	3C
EXTENDED FUNCTION SET	0	0	0	0	0	0	1	0	0	1	09
ENTRY MODE SET	0	0	0	0	0	0	0	1	1	1	07
FUNCTION SET	0	0	0	0	1	1	1	0	0	0	38
DISPLAY ON/OFF CONTROL	0	0	0	0	0	0	1	1	0	0	0C
CLEAR DISPLAY	0	0	0	0	0	0	0	0	0	1	01
SET DDRAM ADDRESS	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	
WRITE DATA TO DDRAM	1	0	DISPLAY DATA								
WRITE DATA TO DDRAM	1	0	DISPLAY DATA								

11. Power supply for LCM

(A) V_{DD} = 5.0V



RECOMMEND RESISTOR R: V_O -V_{SS} ≦ 4.5V

(B) V_{DD} = 3.0V