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The LCD(M) Specialist

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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-10-10000)”.

3.2 Quality Assurance and Warranty

PLEASE REFER TO:

“QUALITY ASSURANCE MANUL (MS-10-10001)”.

3.3 This individual specification is prior to general specifications

4. Mechanical data

- Display format: 122 x 32DOTS
- LCD type: STN Positive Yellow-Green
- Backlight color : Yellow-Green
- Viewing angle : 6:00
- Data transfer: 8Bit Parallel
- LCD controller: SED1520x2
- Module size: 84 x 44 mm
- View area : 60.5 x 18 mm
- Dot size : 0.41 x 0.36 mm
- Dot pitch : 0.4 x 0.45mm
- Driving method : 1/32duty, 1/6 bias

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}	-0.3	5.5	V	-----
INPUT VOLTAGE	V _I	V _{SS}	V _{DD}	V	-----
STATIC ELECTRICITY	-----	-----	-----	V	-----
POWER SUPPLY FOR BACKLIGHT	V _S	4	4.2	V _{rms}	-----
	f _{FL}	-----	-----	KHz	-----
STARTING VOLTAGE FOR BACKLIGHT	-----	-----	-----	V _{rms}	Ta = 25°C
	-----	-----	-----	V _{rms}	Ta = 25°C
POWER SUPPLY FOR LCD	V _{DD} -V _{EE}	-----	5	V	-----

5.2 Environmental absolute maximum ratings

<i>I T E M</i>	<i>OPERATING</i>		<i>STORAGE</i>		<i>COMMENT</i>
	<i>MIN.</i>	<i>MAX.</i>	<i>MIN.</i>	<i>MAX.</i>	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	-----
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 ≦ 70°C: 75% RH MAX.

Ta > 70°C: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 75% RH AT 70°C.

NOTE (3): 1G = 9.8 m/s²

6. Electrical characteristics

Ta = 25°C VDD = 5.0 ± 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>
Power supply voltage for circuit	VDD-VSS	-----	4.5	5.0	5.5	V
Power supply voltage for LCD drive	VEE-VSS	-----	-----	4.7	-----	V
Data input voltage	V _{IH}	H LEVEL	2.4	-----	V _{DD}	V
	V _{IL}	L LEVEL	-0.3	-----	0.4	V
LCD display duty ratio	DUTY	-----	-----	1/32	-----	-----
LED BACKLIGHT	I _{fp}	I mse0 plus 10% Dutg cycle		--		mA
		Operating voltage	4	4.1	4.2	V
		Forward current		150		mA
LED Lifetime	-----	V _{FL} = --Vrms f _{FL} = --KHz	-----	100,000	-----	Hr

7. Optical characteristics

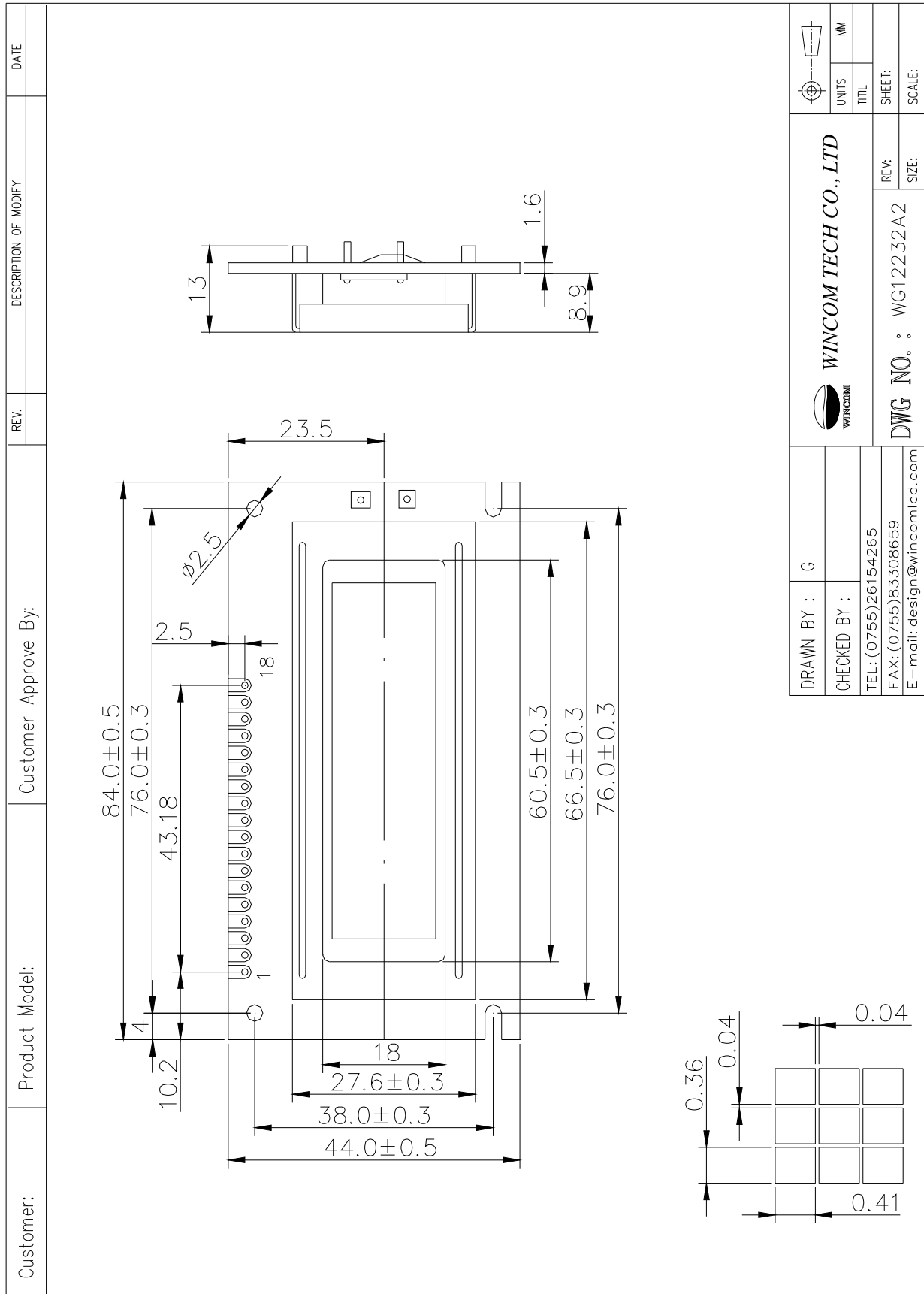
Ta = 25°C VDD-V_O = 4.6V

<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	Φ2-Φ1	K ≥ 2.0	-35	-----	20	deg.	1
Contrast ratio	K	Φ = 10° θ = 0°	4.0	-----	-----	-----	1
Response time (at 25°C)	tr (rise)	Φ = 10° θ = 0°	-----	-----	250	ms	1
	tf (fall)	Φ = 10° θ = 0°	-----	-----	250	ms	1
The brightness of backlighting source	B	DOTS ALL ON VFL= 4.1Vrms fFL= KHz	-----	220	-----	cd/m ²	2

NOTE (1): SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR DEFINITION OF OPTICAL CHARACTERISTICS

NOTE (2): UNDER NORMAL TEMPERATURE AND HUMIDITY IN A DARK ROOM

8. Outline dimension



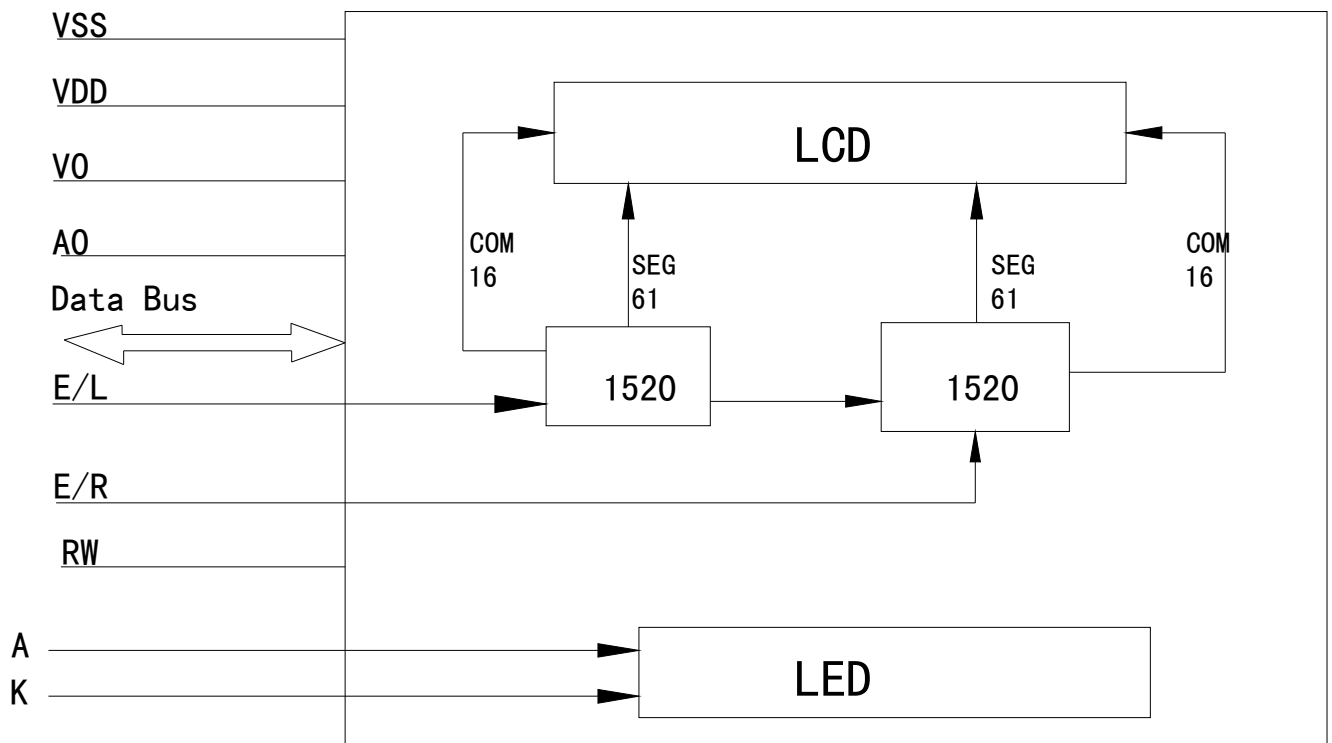
UNIT:mm

8.1 Interface

Pin Assignment

PIN NO.	Symbol	Level	Function
1	Vss	0V	Ground
2	VDD	5V	LCM supply voltage
3	V0	--V	LCD Driving Voltage
4	A0	H/L	H : Data Input L : Instruction Input
5	E/L	H/L	Left Enable signal
6	E/R	H/L	Right Enable signal
7	R/W	H/L	Read/Write Select signal
8	DB0	H/L	Data bit0
9	DB1	H/L	Data bit1
10	DB2	H/L	Data bit2
11	DB3	H/L	Data bit3
12	DB4	H/L	Data bit4
13	DB5	H/L	Data bit5
14	DB6	H/L	Data bit6
15	DB7	H/L	Data bit7
16	RST	H/L	Reset Signal
17	A	(+)	Power supply for BL LED(+)
18	K	(-)	Power supply for BL LED(-)

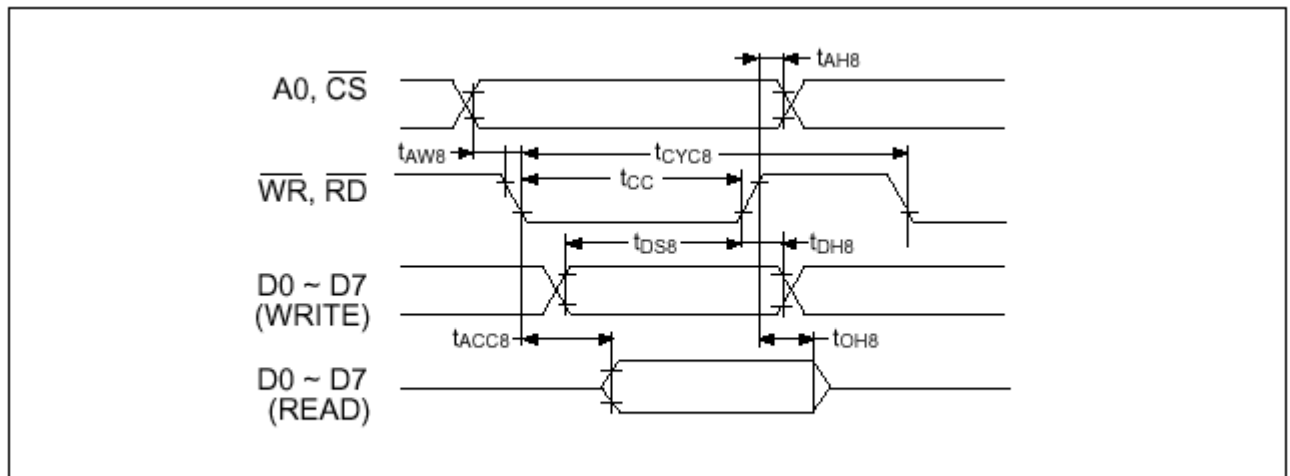
9. Block diagram



10. Interface Timing Chart

10.1 Switching Characteristics

System Bus Read/Write I (80 Family MPU)



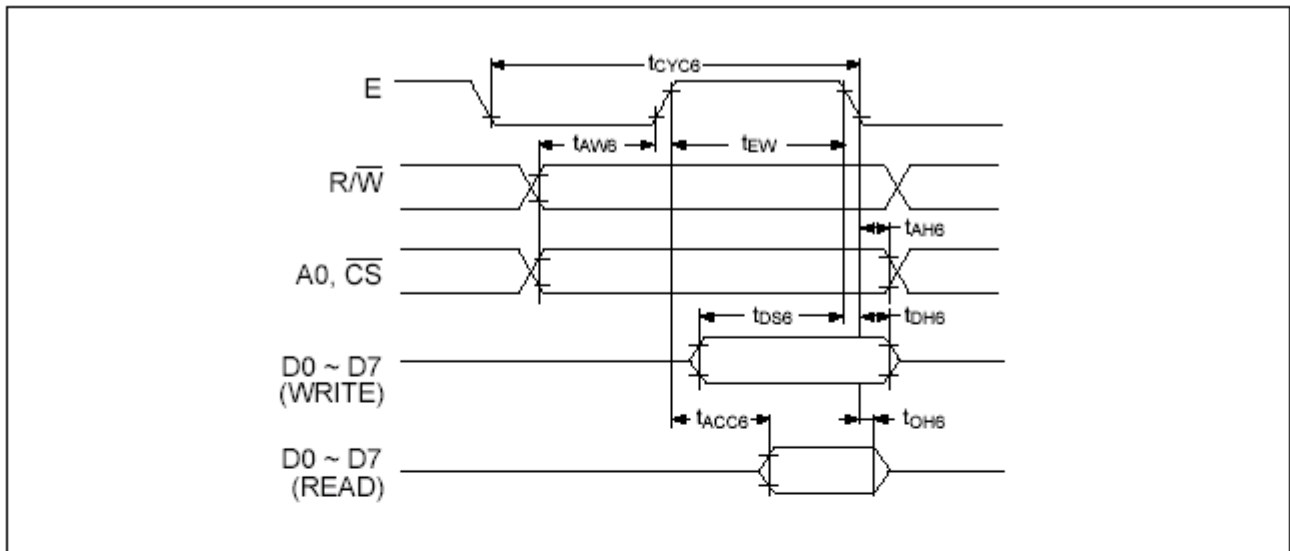
$T_a = -20$ to 75°C , $V_{SS} = -5.0\text{V} \pm 10\%$, Unit: ns

Signal	Symbol	Parameter	Min.	Max.	Condition
A0, $\overline{\text{CS}}$	t_{AH8}	Address hold time	10		
	t_{AW8}	Address setup time	20		
$\overline{\text{WR}}, \overline{\text{RD}}$	t_{CYC8}	System cycle time	1000		
	t_{CC}	Control pulse width	200		
D0-D7	t_{DS8}	Data setup time	80		
	t_{DH8}	Data hold time	10		
	t_{ACC8}	$\overline{\text{RD}}$ access time		90	
	t_{OH8}	Output disable time	10	60	
					CL = 100pF

*1. Each of the values where $V_{SS} = -3.0\text{V}$ is about 200% of that where $V_{SS} = -5.0\text{V}$ (i.e., the listed value).

*2. The rise or fall time of input signals should be less than 15 ns.

System Bus Read/Write II (68 Family MPU)



Ta = -20 to 75°C, Vss = -5.0V ± 10%, Unit: ns

Signal	Symbol	Parameter	Min.	Max.	Condition
A0, \overline{CS} R/ \overline{W}	t_{CYC6}^{*1}	System cycle time	1000		
	t_{AWS}	Address setup time	20		
	t_{AH6}	Address hold time	10		
D0-D7	t_{DS6}	Data setup time	80		CL = 100pF
	t_{DH6}	Data hold time	10		
	t_{OH6}	Output disable time	10	60	
	t_{ACC6}	Access time		90	
E	t_{EW}	Enable pulse width	Read	100	
		Write	80		

- *1. t_{CYC6} indicates the cycle time during which $CS \cdot E = "H"$. It does not mean the cycle time of signal E.
- *2. Each of the values where $V_{SS} = -3.0V$ is about 200% of that where $V_{SS} = -5.0V$ (i.e., the listed value).
- *3. The rise or fall time of input signals should be less than 15 ns.

11. Instruction Code

	Command	Code											Function	
		A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0		
(1)	Display ON/OFF	0	1	0	1	0	1	0	1	1	1	1	0/1	Turns all display on or off, independently of display RAM data or internal status. 1: ON 0: OFF (Power-saving mode with static drive on)*
(2)	Display start line	0	1	0	1	1	0	Display Start Address (0-31)					0/1	Specifies RAM line corresponding to uppermost line (COM0) of display.
(3)	Set page address	0	1	0	1	0	1	1	1	0	Page (0-3)		0/1	Sets display RAM page in page address register.
(4)	Set column (segment) address	0	1	0	0	Column Address (0-79)							0/1	Sets display RAM column address in column address register.
(5)	Read status	0	0	1	Busy	ADC	ON/OFF	RESET	0	0	0	0	0	Reads the following status: BUSY 1: Internal operation, 0: Ready ADC 1: CW output (forward), 0: CCW output (reverse) ON/OFF 1: Display off, 0: Display on RESET 1: Being reset, 0: Normal
(6)	Write display data	1	1	0	Write Data							0/1	Writes data from data bus into display RAM.	Display RAM location whose address has been preset is accessed. After access, the column address is incremented by 1.
(7)	Read display data	1	0	1	Read Data							0/1	Reads data from display RAM onto data bus.	
(8)	Select ADC	0	1	0	1	0	1	0	0	0	0	0	0/1	Used to invert relationship of assignment between display RAM column addresses and segment driver outputs. 0: CW output (forward) 1: CCW output (reverse)
(9)	Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0	0/1	Selects normal display or static driving operation. 1: Static drive (power-saving mode) 0: Normal driving
(10)	Select duty	0	1	0	1	0	1	0	1	0	0	0	0/1	Selects LCD cell driving duty. 1: 1/32 0: 1/16
(11)	Read modify write	0	1	0	1	1	1	0	0	0	0	0	0	Increments column address counter by 1 when display data is written. (This is not done when data is read.)
(12)	End	0	1	0	1	1	1	0	1	1	1	0	0	Clears read modify write mode.
(13)	Reset	0	1	0	1	1	1	0	0	0	1	0	0	Sets display start line register on the first line. Also sets column address counter and page address counter to 0.

* With display off (command (1)), static drive going on (9) invokes power-saving mode.