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The LCD(M) Specialist

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PART NO. : WG24064A

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: 240 x 64 DOTS
- LCD type: STN Negative Blue
- Backlight color : White
- Viewing angle : 6:00
- Data transfer: 8Bit Parallel
- LCD controller: T6963+NT7086
- Module size: 180 x 65 mm
- View area : 131.5 x 39 mm
- Dot size : 0.48 x 0.48 mm
- Dot pitch : 0.53 x 0.53mm
- Driving method : 1/64duty, 1/8 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	2.9	3.3	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}	11.8	12.6	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 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	VDD -VEE	-----	-----	12.2	-----	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	-----	-----	1/64	-----	-----
LED BACKLIGHT	I _{fp}	I mse0 plus 10% Dutg cycle		--		mA
		Operating voltage	2.9	3.1	3.2	V
		Forward current		80		mA
LED Lifetime	-----	V _F L= 3.1V _{rms} f _F L= --KHz	-----	100,000	-----	Hr

7. Optical characteristics

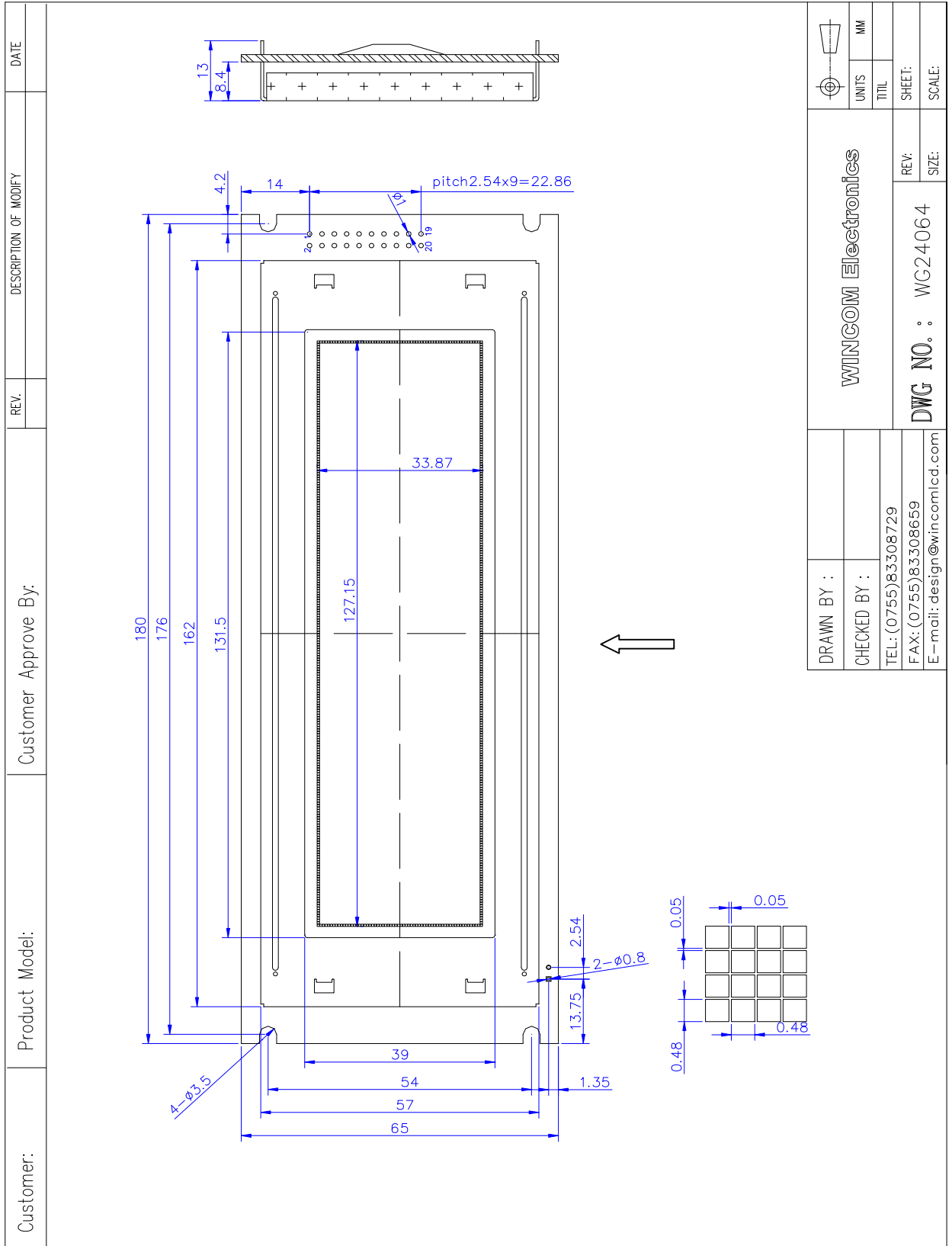
Ta = 25°C VDD-V_{EE} = 12.2V

<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	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 V _F L= V _{rms} f _F L= KHz	-----	-----	-----	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



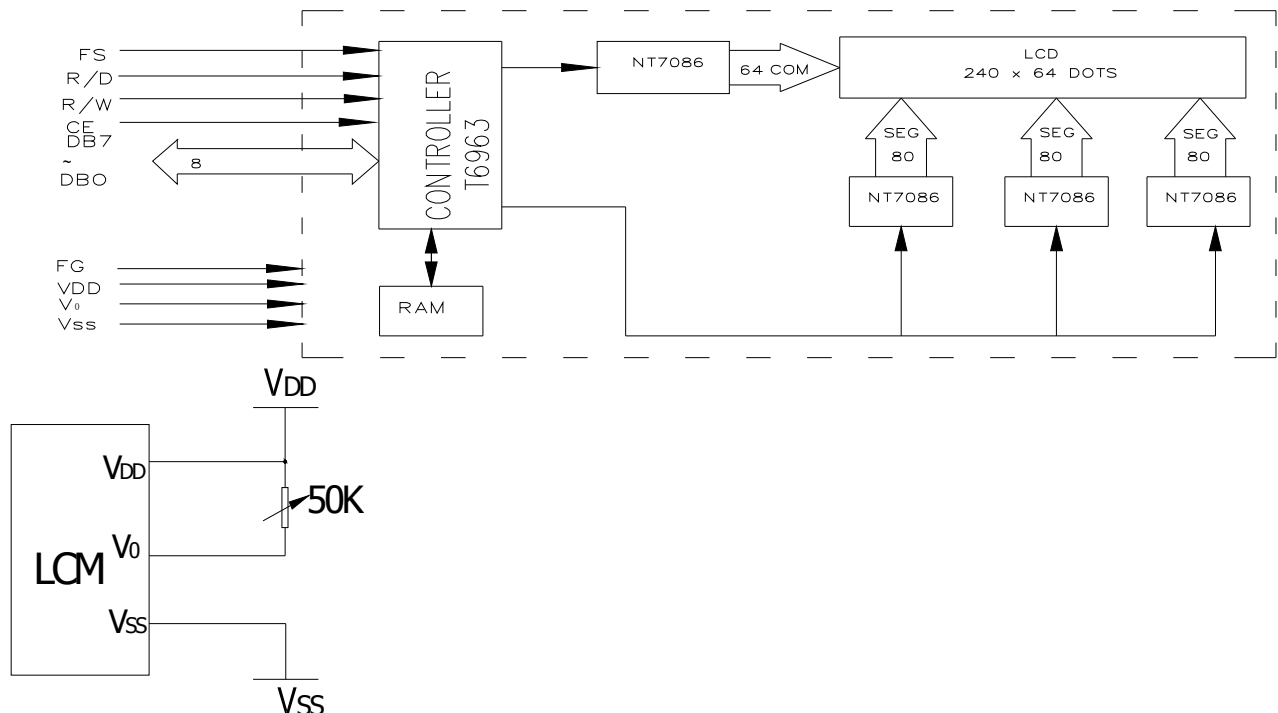
UNIT:mm

8.1 Interface

Pin Assignment

PIN NO.	Symbol	Level	Function
1	FG	0V	Frame Ground
2	Vss	0V	Ground
3	VDD	5.0V	Power supply voltage for LCM(+)
4	V0	--	Operating Voltage for LCD(variable)
5	R/W	L	Write Enable Signal
6	RD	L	Read Enable Signal
7	CE	L	Chip Enable Signal
8	CD	H/L	H: Instruction; L: Data
9	NC	---	No Signal
10	RST	L	Reset Signal
11	DB0	H/L	Data bit0
12	DB1	H/L	Data bit1
13	DB2	H/L	Data bit2
14	DB3	H/L	Data bit3
15	DB4	H/L	Data bit4
16	DB5	H/L	Data bit5
17	DB6	H/L	Data bit6
18	DB7	H/L	Data bit7
19	FS	H/L	Font Selection
20	NC	---	No Signal
BL+	LED(+)	(+)	Power supply for LED +
BL-	LED(-)	(-)	Power supply for LED -

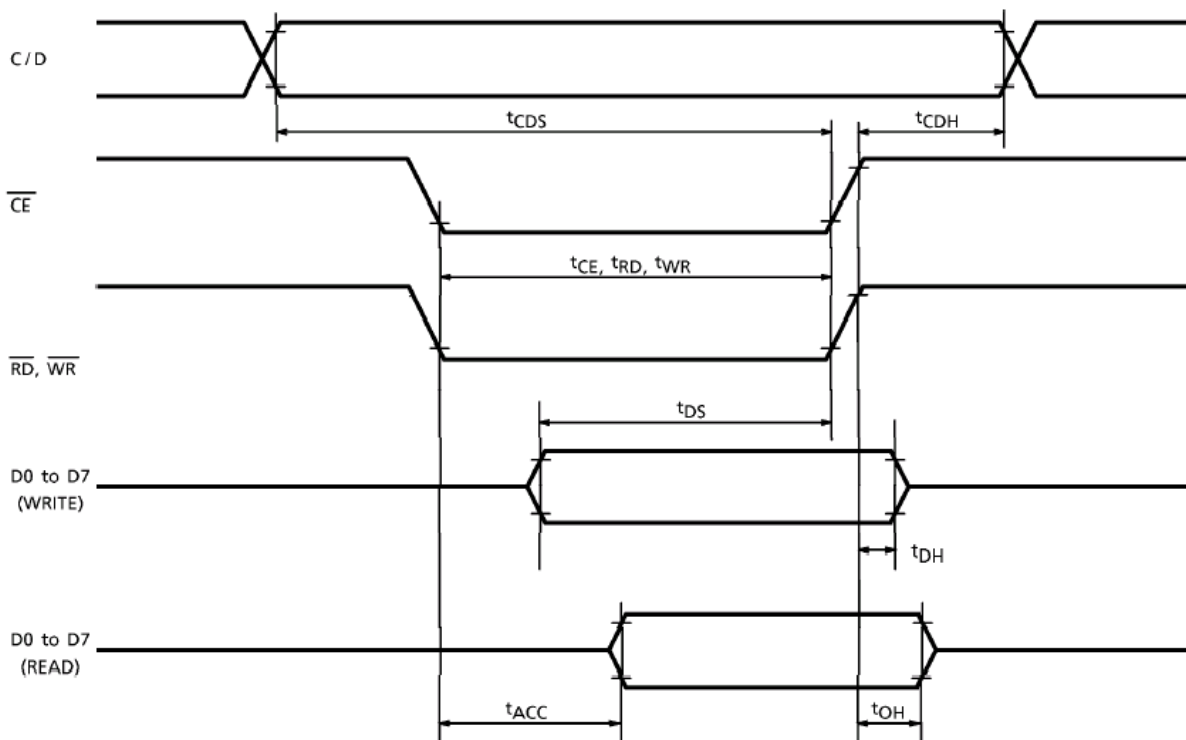
9. Block diagram



10. Interface Timing Chart

10.1 Switching Characteristics

Bus Timing



TEST CONDITIONS (Unless otherwise noted, $V_{DD} = 5.0V \pm 10\%$, $V_{SS} = 0V$, $T_a = -20$ to $75^\circ C$)

ITEM	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
C/D Set-up Time	t_{CDS}	—	100	—	ns
C/D Hold Time	t_{CDH}	—	10	—	ns
CE, RD, WR Pulse Width	t_{CE}, t_{RD}, t_{WR}	—	80	—	ns
Data Set-up Time	t_{DS}	—	80	—	ns
Data Hold Time	t_{DH}	—	40	—	ns
Access Time	t_{ACC}	—	—	150	ns
Output Hold Time	t_{OH}	—	10	50	ns

11. Instruction Code

COMMAND	CODE	D1	D2	FUNCTION
REGISTERS SETTING	00100001	X address	Y address	Set Cursor Pointer
	00100010	Data	00H	Set Offset Register
	00100100	Low address	High address	Set Address Pointer
SET CONTROL WORD	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00H	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00H	Set Graphic Area
MODE SET	1000X000	—	—	OR mode
	1000X001	—	—	EXOR mode
	1000X011	—	—	AND mode
	1000X100	—	—	Text Attribute mode
	1000XXX	—	—	Internal CG ROM mode
	10001XXX	—	—	External CG RAM mode
DISPLAY MODE	10010000	—	—	Display off
	1001XX10	—	—	Cursor on, blink off
	1001XX11	—	—	Cursor on, blink on
	100101XX	—	—	Text on, graphic off
	100110XX	—	—	Text off, graphic on
	100111XX	—	—	Text on, graphic on
CURSOR PATTERN SELECT	10100000	—	—	1-line cursor
	10100001	—	—	2-line cursor
	10100010	—	—	3-line cursor
	10100011	—	—	4-line cursor
	10100100	—	—	5-line cursor
	10100101	—	—	6-line cursor
	10100110	—	—	7-line cursor
	10100111	—	—	8-line cursor
DATA AUTO READ / WRITE	10110000	—	—	Set Data Auto Write
	10110001	—	—	Set Data Auto Read
	10110010	—	—	Auto Reset
DATA READ / WRITE	11000000	Data	—	Data Write and Increment ADP
	11000001	—	—	Data Read and Increment ADP
	11000010	Data	—	Data Write and Decrement ADP
	11000011	—	—	Data Read and Decrement ADP
	11000100	Data	—	Data Write and Nonvariable ADP
	11000101	—	—	Data Read and Nonvariable ADP
SCREEN PEEK	11100000	—	—	Screen Peek
SCREEN COPY	11101000	—	—	Screen Copy

COMMAND	CODE	D1	D2	FUNCTION
BIT SET / RESET	11110XXX	—	—	Bit Reset
	11111XXX	—	—	Bit Set
	1111X000	—	—	Bit 0 (LSB)
	1111X001	—	—	Bit 1
	1111X010	—	—	Bit 2
	1111X011	—	—	Bit 3
	1111X100	—	—	Bit 4
	1111X101	—	—	Bit 5
	1111X110	—	—	Bit 6
	1111X111	—	—	Bit 7 (MSB)

X : invalid

12.Character generator ROM

Lower 4 Bits \ Upper 4 Bits	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)		Ø	à	P	`	P		-	9	≡	α	ρ
xxxx0001	(2)	!	1	A	Q	a	9	。	ア	チ	△	ä	q
xxxx0010	(3)	"	2	B	R	b	r	「	イ	ツ	×	ß	θ
xxxx0011	(4)	#	3	C	S	c	s	」	ウ	テ	ε	ε	ω
xxxx0100	(5)	\$	4	D	T	d	t	、	エ	ト	ト	μ	Ω
xxxx0101	(6)	%	5	E	U	e	u	・	オ	ナ	1	ε	Ü
xxxx0110	(7)	&	6	F	V	f	v	ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(8)	'	7	G	W	g	w	ア	キ	ヌ	ラ	g	π
xxxx1000	(1)	(8	H	X	h	x	イ	ク	ネ	リ	γ	×
xxxx1001	(2))	9	I	Y	i	y	ウ	ケ	ル		'	γ
xxxx1010	(3)	*	:	J	Z	j	z	エ	コ	ン	レ	j	〒
xxxx1011	(4)	+	;	K	L	k	l	オ	サ	ヒ	ロ	*	〒
xxxx1100	(5)	,	<	L	¥	1	1	ヤ	シ	フ	ワ	φ	円
xxxx1101	(6)	-	=	M	J	m	j	ユ	ズ	ン	シ	モ	÷
xxxx1110	(7)	.	>	N	^	n	→	ヨ	セ	ホ	°	ñ	
xxxx1111	(8)	/	?	O	_	o	+	ッ	ッ	マ	°	ö	■