



Wincom Tech CO., LTD.

The LCD(M) Specialist

CONTACT ADDRESS : 6F, Block 105, Jing Di Industrial Park,
Fu Qiang Rd. Fu Tian, Shenzhen City, China.

Tel: 0086-755-83308729

Fax: 0086-755-83308659

E-mail: craig.jiang@wincomlcd.com

RoHS

PART NO. : WC2002A-SFYLYHTC06

FOR MESSRS. : _____

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ACCEPTED BY: _____

PROPOSED BY: _____

RECORD OF REVISION

DATE	PAGE	SUMMARY
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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: 20 characters x 2 lines
- LCD type: STN Positive Yellow-Green
- Backlight color: Yellow-Green
- Viewing angle: 6:00
- Data transfer: 8Bit Parallel
- LCD controller: S6A0069
- Module size: 116 x 37 x 14mm
- View area: 83 x 18.6 mm
- Dot size: 0.6 x 0.65 mm
- Dot pitch: 0.65 x 0.7 mm
- Driving method: 1/16 Duty, 1/4 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>
INPUT VOLTAGE	V _I	V _{SS}	V _{DD}	V	-----
STATIC ELECTRICITY	-----	-----	-----	V	
POWER SUPPLY FOR BACKLIGHT	V _S	4.0	4.2	V _{rms}	-----
	f _{FL}	-----	-----	KHz	-----
STARTING VOLTAGE FOR BACKLIGHT	-----	-----	-----	V _{rms}	Ta = 25℃
	-----	-----	-----	V _{rms}	Ta = 25℃

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℃	70℃	-30℃	80℃	-----
HUMIDITY	NOTE (2)		NOTE (2)		NO CONDENSATION
VIBRATION NOTE (3)	-----	0.5G	-----	2G	10~300Hz XYZ DIRECTIONS 1 Hr EACH
SHOCK NOTE (3)	-----	3G	-----	5G	10 msec XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		-----

NOTE (2): Ta ≦ 70℃: 75% RH MAX.

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

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	-----	4.25	5.0	5.25	V
Power supply voltage for LCD drive	VDD-V0	-----	-----	4.7	-----	V
Data input voltage	VIH	H LEVEL	0.7VDD	-----	VDD+0.3	V
	VIL	L LEVEL	-0.3	-----	0.2VDD	V
LCD display duty ratio	DUTY	-----	-----	1/16	-----	-----
LED BACKLIGHT	Ifp	I meson plus 10% Duty cycle		----		mA
		Operating voltage	-----	4.1	-----	V
		Forward current		140	160	mA
LED Lifetime	-----	VFL=4.1Vrms fFL= KHz	-----	100,000	-----	Hr

7. Optical characteristics

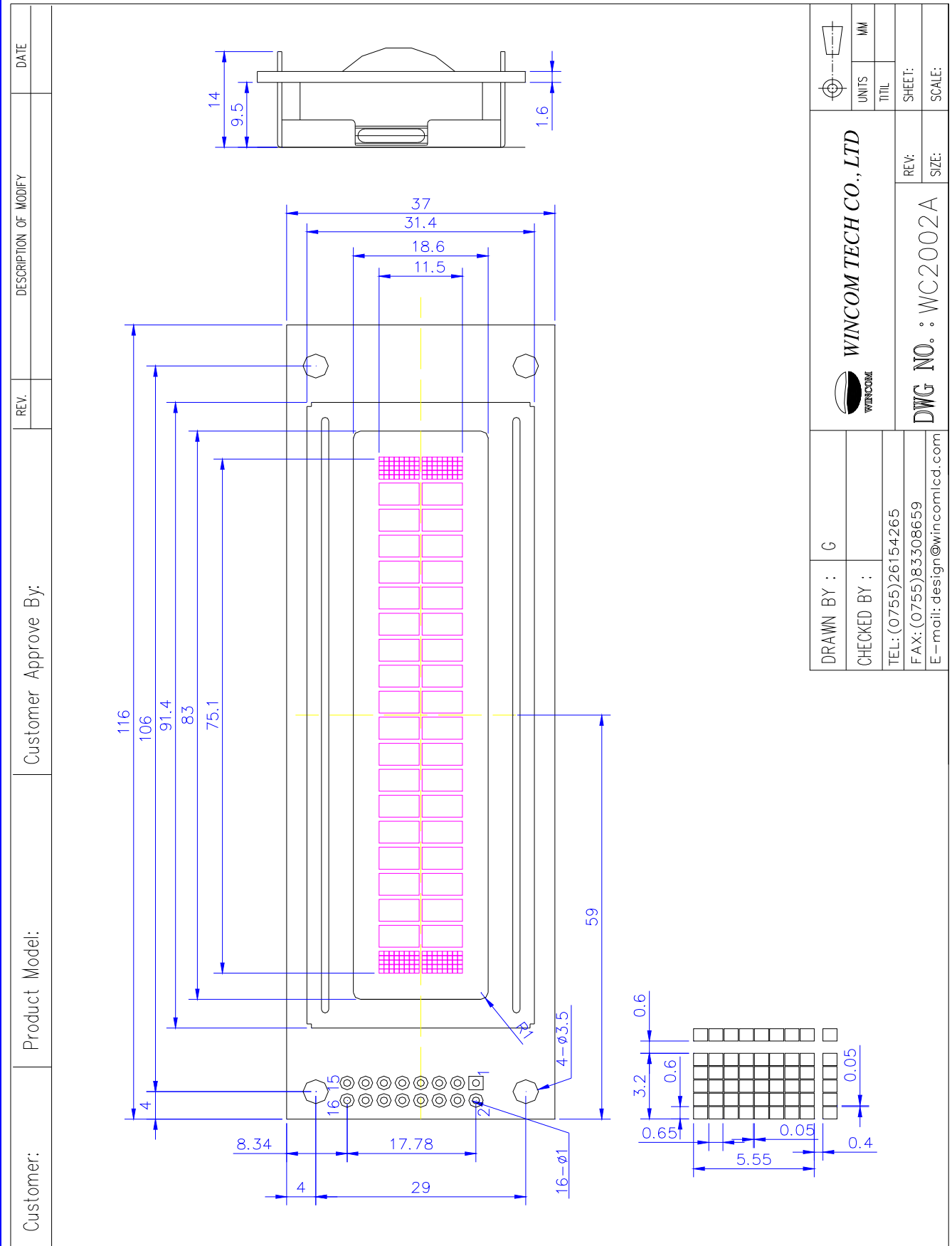
Ta = 25°C VDD-V0 = 4.7V

<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	Φ 2-Φ 1	K ≥ 2.0	-35	----	20	Deg.	1
Contrast ratio	K	Φ = 10 ⁰ θ = 0 ⁰	4.0	----	-----	-----	1
Response time (at 25°C)	tr (rise)	Φ = 10 ⁰ θ = 0 ⁰	-----	----	250	ms	1
	tf (fall)	Φ = 10 ⁰ θ = 0 ⁰	-----	----	250	ms	1
The brightness of backlighting source	B	VFL= 4.1 Vrms fFL= KHZ	-----	280	-----	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



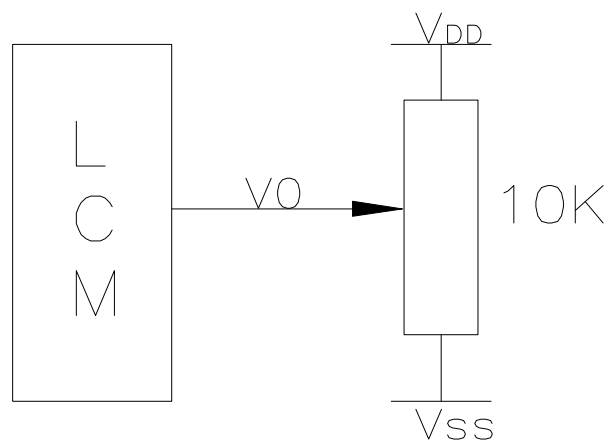
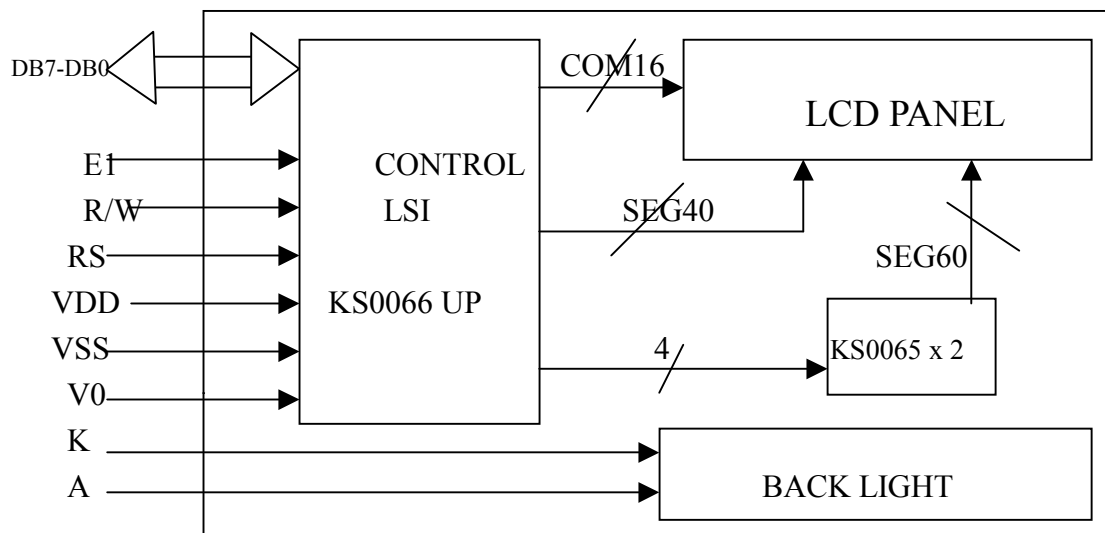
DRAWN BY : G		WINCOM TECH CO., LTD		SHEET: 6/12	
CHECKED BY :		WINCOM		SCALE:	
TEL: (0755)26154265		REV:		SIZE:	
FAX: (0755)83308659		DWG NO. : WC2002A			
E-mail: design@wincomlcd.com					

8.1 Interface

Pin Assignment

PIN NO.	Symbol	Level	Function
1	Vss	0V	ground
2	Vdd	5.0V	Power Supply for LCM(+)
3	V0	----	Contrast Adjust
4	RS	H/L	Register select signal
5	RW	H/L	Data read / write
6	E	H/L	Enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
15	A	(+)	Power supply for LED BL (+5V/140mA)
16	K	(-)	Power supply for LED BL (-)

9. Block diagram

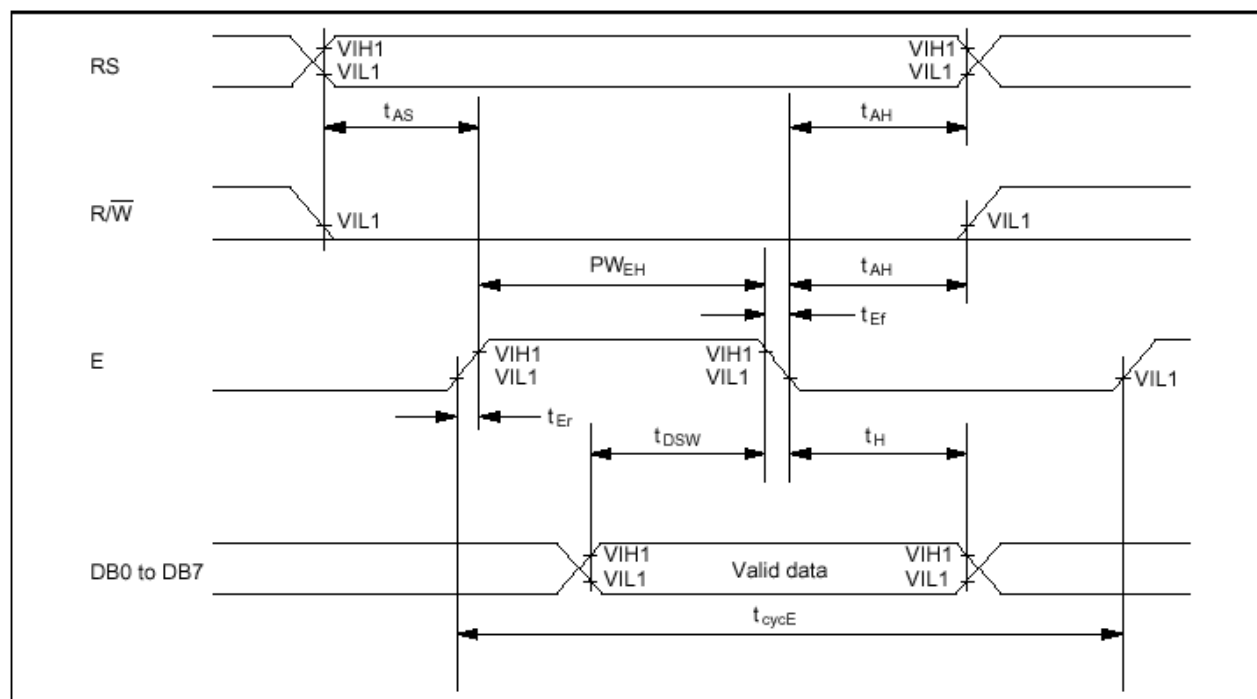


10.Interface Timing Chart

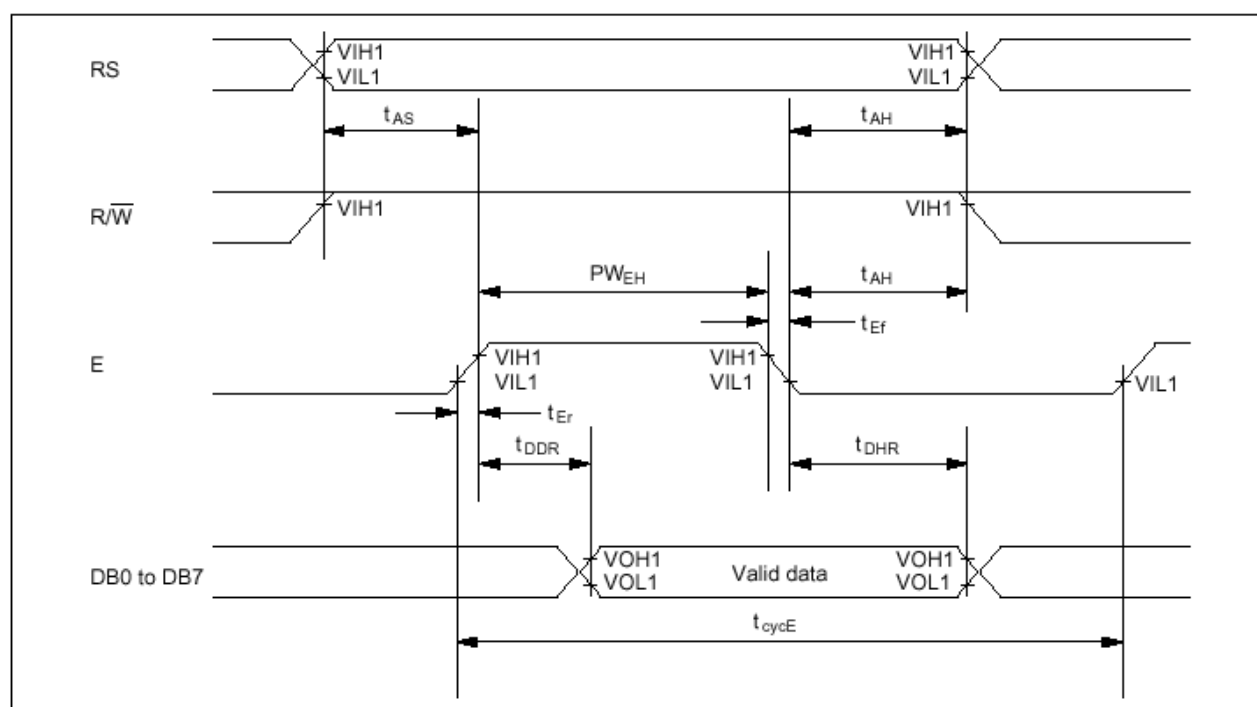
AC Characteristics($V_{DD}=4.5V\sim 5.5V$, $T_a=-30\sim +85^{\circ}C$)

Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode (Refer to Fig-6)	E Cycle Time	t_c	500	-	-	ns
	E Rise / Fall Time	t_R, t_F	-	-	20	
	E Pulse Width (High, Low)	t_w	230	-	-	
	R/W and RS Setup Time	t_{su1}	40	-	-	
	R/W and RS Hold Time	t_{H1}	10	-	-	
	Data Setup Time	t_{su2}	80	-	-	
	Data Hold Time	t_{H2}	10	-	-	
Read Mode (Refer to Fig-7)	E Cycle Time	t_c	500	-	-	ns
	E Rise / Fall Time	t_R, t_F	-	-	20	
	E Pulse Width (High, Low)	t_w	230	-	-	
	R/W and RS Setup Time	t_{su}	40	-	-	
	R/W and RS Hold Time	t_H	10	-	-	
	Data Output Delay Time	t_D	-	-	120	
	Data Hold Time	t_{DH}	5	-	-	

Timing Characteristics



Write Operation



Read Operation

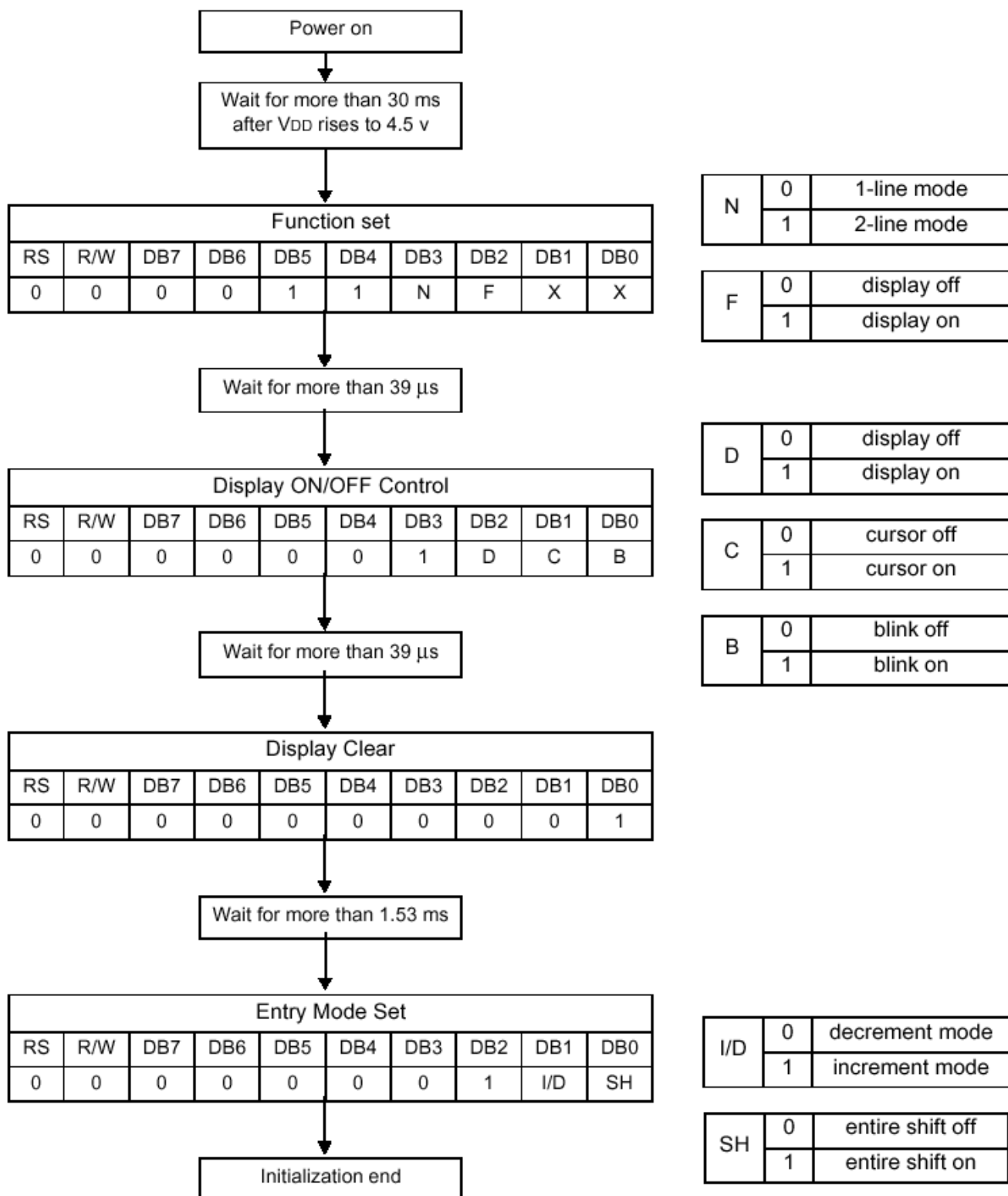
11. Instruction Code

Instruction Table

Instruction	Instruction Code										Description	Execution time (fosc= 270 kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM and set DDRAM address to "00H" from AC	1.53 ms
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.53 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39 μ s
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.	39 μ s
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	39 μ s
Function Set	0	0	0	0	1	DL	N	F	-	-	Set interface data length (DL: 8-bit/4-bit), numbers of display line (N: 2-line/1-line) and, display font type (F:5 $\times$ 11dots/5 $\times$ 8 dots)	39 μ s
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	39 μ s
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	39 μ s
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 μ s
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	43 μ s
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	43 μ s

* "-": don't care

NOTE: When an MPU program with checking the Busy Flag(DB7) is made, it must be necessary 1/2Fosc is necessary for executing the next instruction by the falling edge of the 'E' signal after the Busy Flag (DB7) goes to "Low".



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	Q	P	`	P		—	タ	ミ	α	ρ
xxxx0001	(2)	!	1	A	Q	a	q	。	ア	チ	△	ä	q
xxxx0010	(3)	"	2	B	R	b	r	「	イ	ツ	×	β	θ
xxxx0011	(4)	#	3	C	S	c	s	」	ウ	テ	モ	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	ル	´	Y
xxxx1010	(3)	*	:	J	Z	j	z	エ	コ	ン	レ	j	¥
xxxx1011	(4)	+	;	K	C	k	c	オ	サ	ヒ	ロ	*	万
xxxx1100	(5)	,	<	L	¥	1	1	ヤ	シ	フ	ワ	Φ	円
xxxx1101	(6)	—	=	M	]	m	]	ユ	ズ	へ	ン	も	÷
xxxx1110	(7)	.	>	N	^	n	→	ヨ	セ	ホ	°	ñ	
xxxx1111	(8)	/	?	O	_	o	←	ッ	ソ	マ	°	ö	■