



# Wincom Tech CO., LTD.

**The LCD(M) Specialist**

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PART NO. : WC1602K

FOR MESSRS. : \_\_\_\_\_

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ACCEPTED BY: .....

PROPOSED BY: .....



### **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: 16 characters x 2 lines
- Microprocessor interface: 8 Bits Parallel
- LCD type: STN positive Yellow-Green
- Viewing angle: 6 o'clock
- LCD controller: S6A0069
- Module size: 53x 20 mm
- View area: 36x10 mm
- Dot size: 0.33x 0.35 mm
- Dot pitch: 0.38 x 0.4mm
- Driving method: 1/16 duty, 1/5 bias
- Backlight color : Yellow-Green LED
- RoHS regulation: To our best knowledge, this product satisfies material requirement of RoHS regulation. Our company is doing the best efforts to Obtain the equivalent certificate from our suppliers.

## 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 <sub>DD</sub> -V <sub>SS</sub>	-0.3	7	V	-----
INPUT VOLTAGE	V <sub>I</sub>	-0.3	V <sub>DD</sub>	V	-----
POWER SUPPLY FOR BACKLIGHT	V <sub>S</sub>	-0.3	4.3	V <sub>rms</sub>	-----
	f <sub>FL</sub>	-----	-----	KHz	-----
STARTING VOLTAGE FOR BACKLIGHT	-----	-----	-----	V <sub>rms</sub>	Ta = 25°C
	-----	-----	-----	V <sub>rms</sub>	Ta = 25°C
POWER SUPPLY FOR LCD	V <sub>DD</sub> -V <sub>0</sub>	-----	5.5	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	-----	5G	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/s<sup>2</sup>

## 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	-----	4.75	5.0	5.25	V
Power supply voltage for LCD drive	VDD-VSS	-----	-----	4.8	-----	V
LCD display duty ratio	DUTY	-----	-----	1/16	-----	-----
LED BACKLIGHT	Ifp	I mse0 plus 10% Dutg cyele		--		mA
		Operating voltage	-----	4.1	-----	V
		Forward current		18		mA
LED Lifetime	-----	VFL=4.1Vrms fFL= KHZ	-----	100,000	-----	Hr
Power supply LCD current	IEE	VDD-VO= 4.8 V	-----	----	-----	mA

**LED backlight:** Due to the LED backlight working current is XXX Max, and LED chips Vop may be different, Wincom will adjust the backlight resistor according to the LED chips Vop, to meet the brightness maximum.

## 7. Optical characteristics

Ta = 25°C VDD-VO = 4.8V

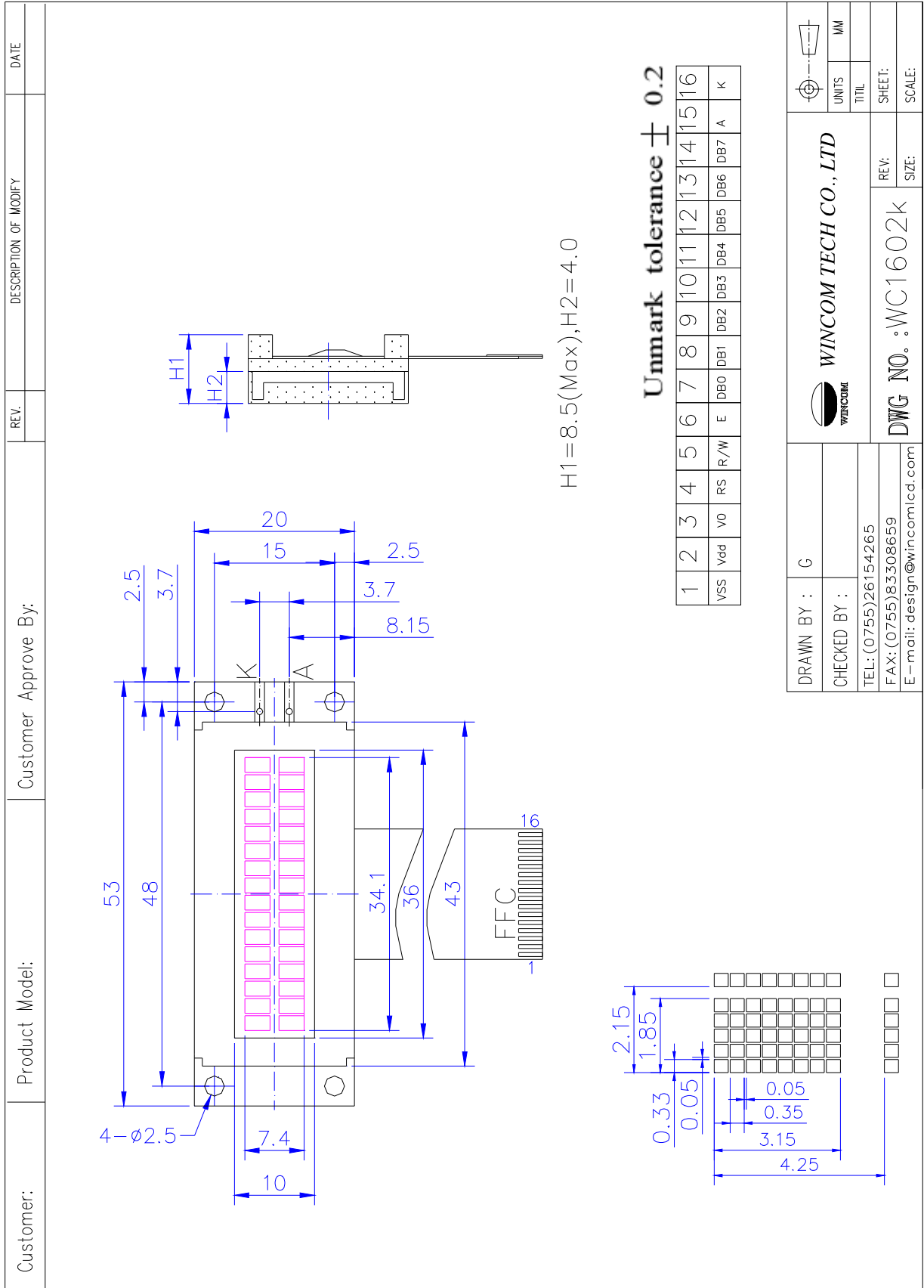
<i>I T E M</i>	<i>SYMBOL</i>	<i>CONDITION</i>	<i>MIN.</i>	<i>TYP.</i>	<i>MAX.</i>	<i>UNIT</i>	<i>NOTE</i>
Viewing angle	Φ2-Φ1	K ≥ 2.0	-35	-----	20	deg.	1
Contrast ratio	K	Φ = 10° θ = 0°	4.0	-----	-----	-----	1
Response time (at 25°C)	tr (rise)	Φ = 10° θ = 0°	-----	-----	150	ms	1
	tf (fall)	Φ = 10° θ = 0°	-----	-----	150	ms	1
The brightness of backlighting source	B	VFL=4.1Vrms fFL= KHZ	-----	--	-----	cd/m <sup>2</sup>	2

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

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

S

# 8. Outline dimension

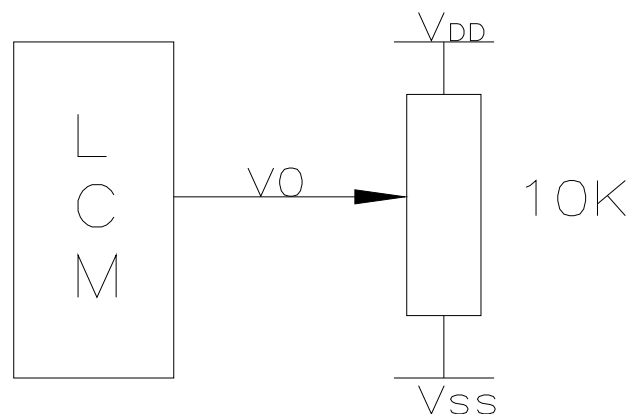
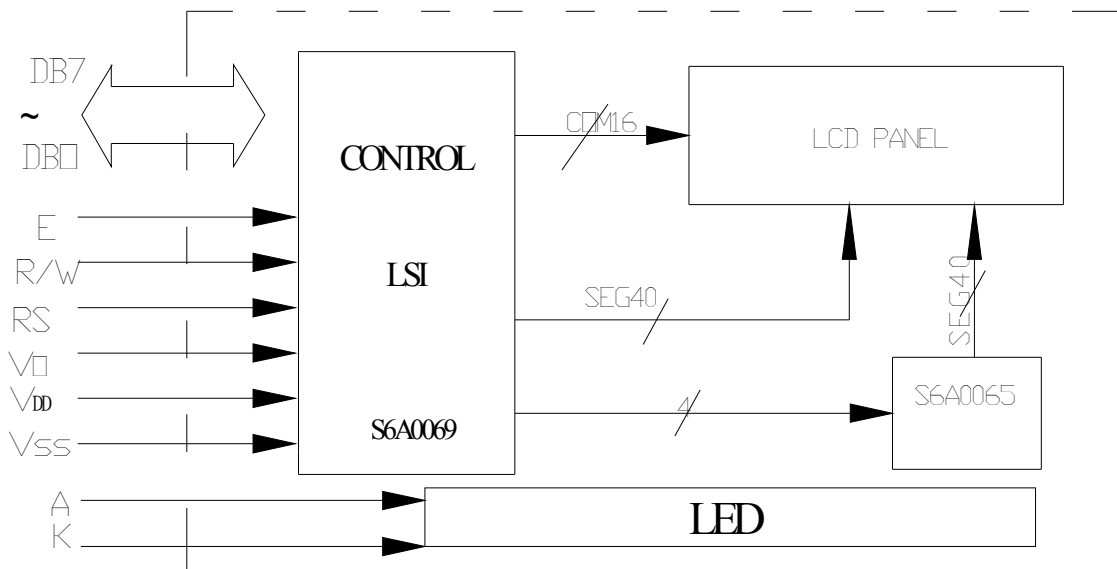


## 8.1 Interface

### Pin Assignment

PIN NO.	Symbol	Level	Function
1	V <sub>SS</sub>	0V	Ground
2	V <sub>DD</sub>	5.0V	Power supply voltage for LCM(+)
3	V <sub>0</sub>	--	Contrast Adjust
4	RS	H/L	Register select signal
5	R/W	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	(+5.0V)	Power supply for LED BL(+)
16	K	(-)	Power supply for LED BL(-)

## 9. Block diagram



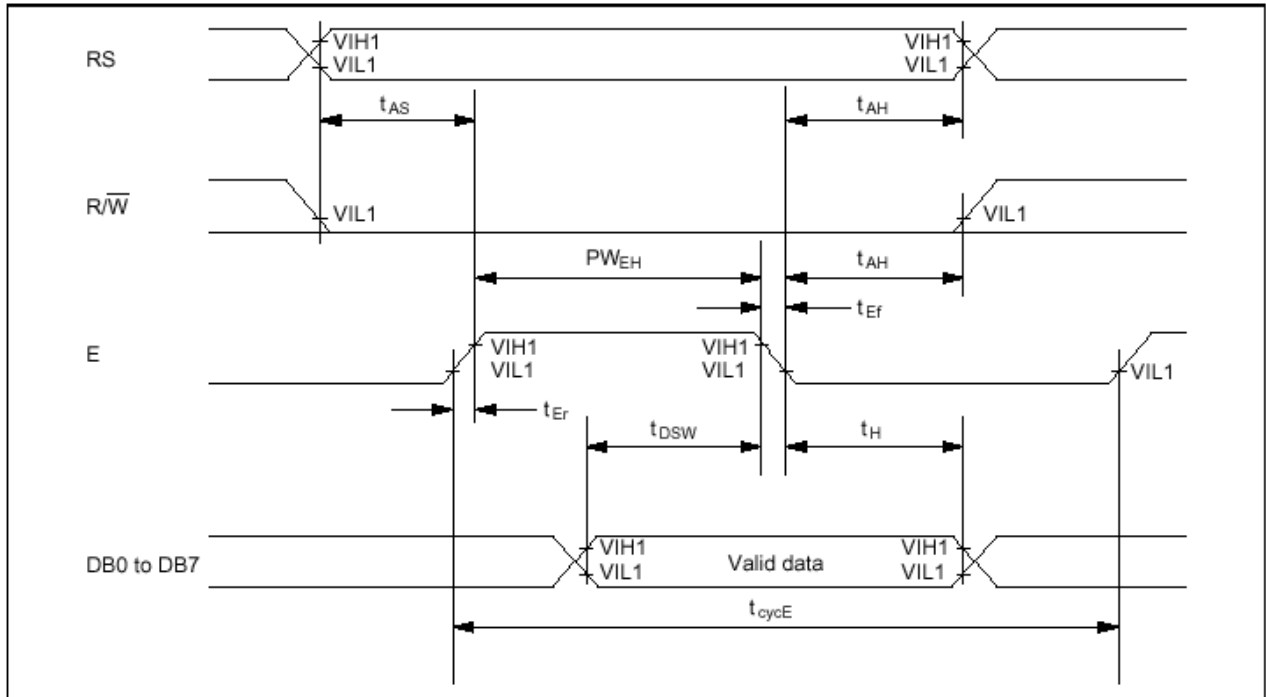
## 10. Interface Timing Chart

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

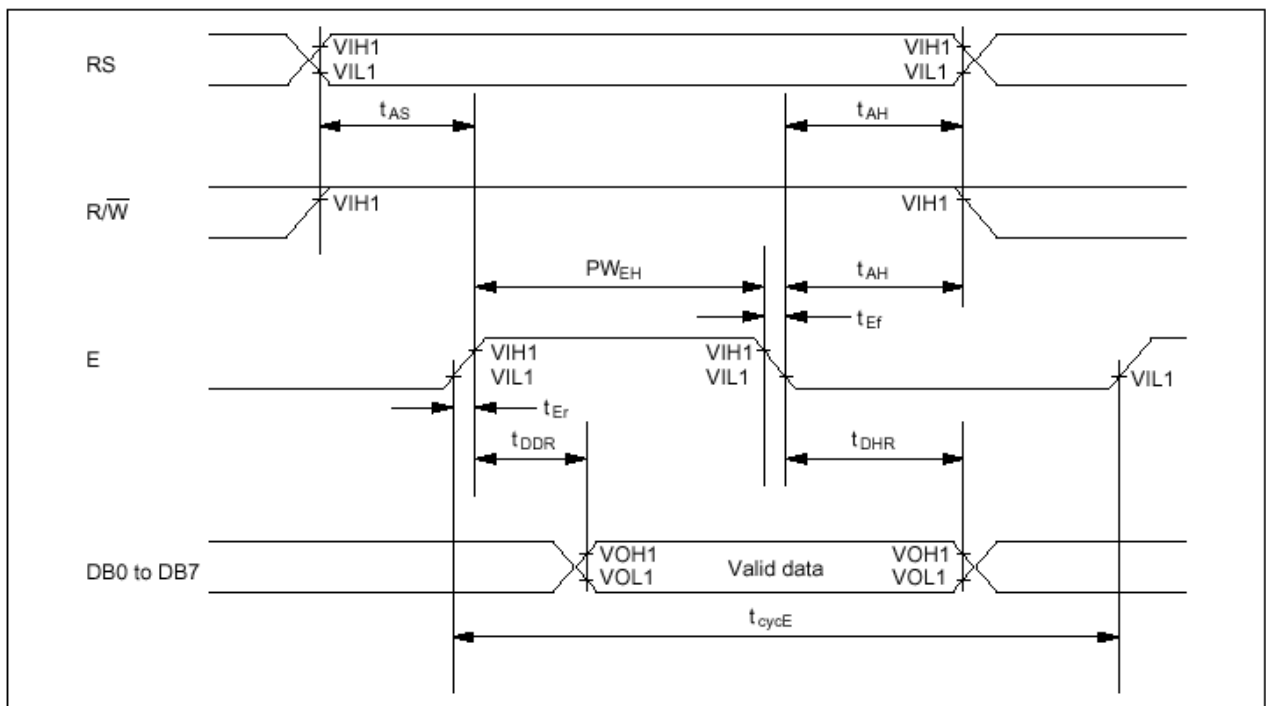
Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode (Refer to Fig-6)	E Cycle Time	$t_c$	500	-	-	ns
	E Rise / Fall Time	$t_R, t_F$	-	-	20	
	E Pulse Width (High, Low)	$t_w$	230	-	-	
	R/W and RS Setup Time	$t_{su1}$	40	-	-	
	R/W and RS Hold Time	$t_{H1}$	10	-	-	
	Data Setup Time	$t_{su2}$	80	-	-	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

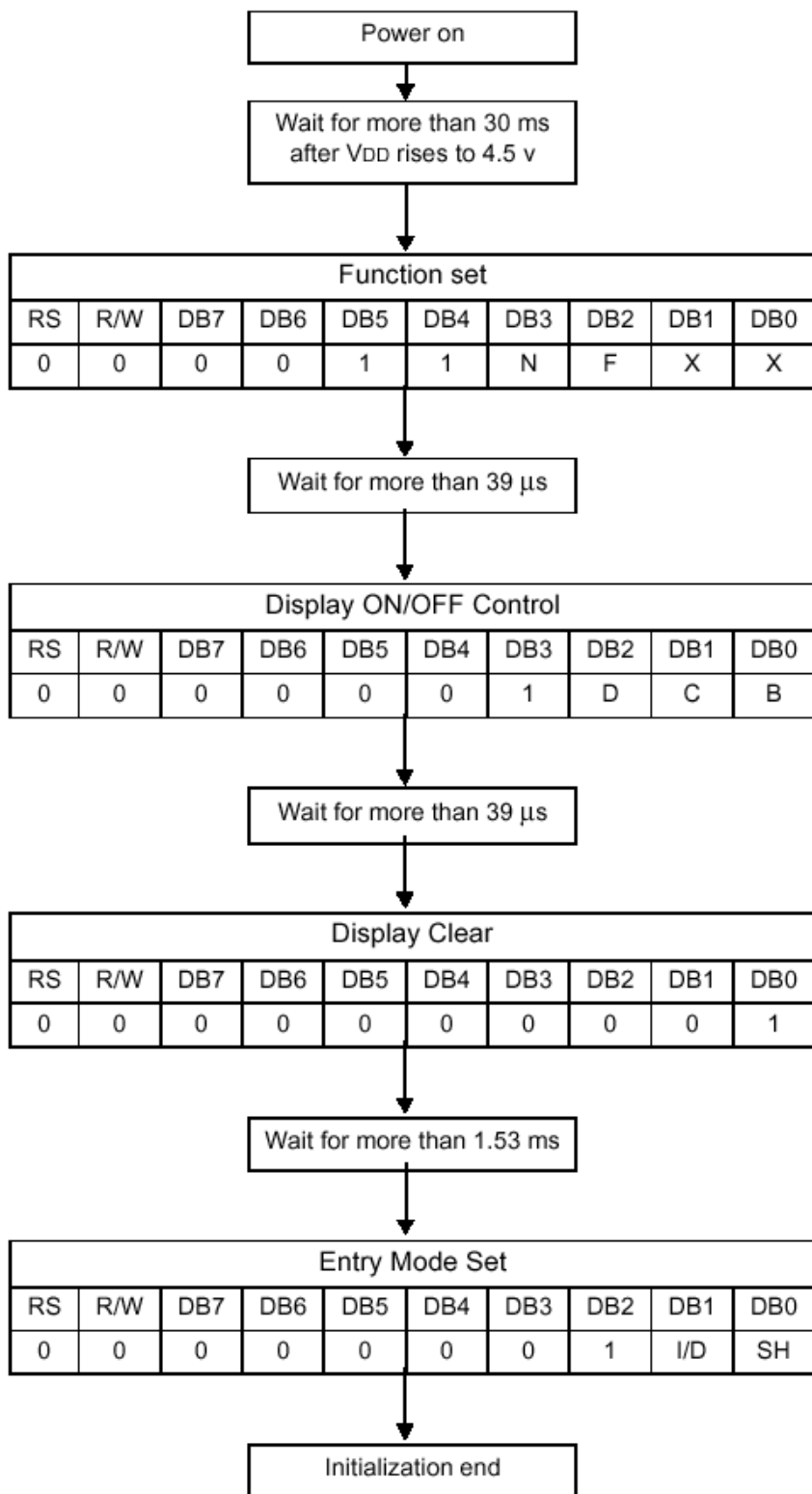
Instruction Table

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	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	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display.	39 μs
Display ON/OFF Control	0	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 μs
Cursor or Display Shift	0	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 μs
Function Set	0	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:5×11dots/5×8 dots)	39 μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0		Set CGRAM address in address counter.	39 μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0		Set DDRAM address in address counter.	39 μs
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 μs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0		Write data into internal RAM (DDRAM/CGRAM).	43 μs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0		Read data from internal RAM (DDRAM/CGRAM).	43 μs

\* "-": 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".

8-bit interface mode (Condition: fosc = 270KHZ)



N	0	1-line mode
	1	2-line mode

F	0	display off
	1	display on

D	0	display off
	1	display on

C	0	cursor off
	1	cursor on

B	0	blink off
	1	blink on

I/D	0	decrement mode
	1	increment mode

SH	0	entire shift off
	1	entire shift on

## 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)		0	1	P	`	P		-	9	3	Q	P
xxxx0001	(2)	!	1	A	Q	a	9	o	7	チ	4	ä	g
xxxx0010	(3)	"	2	B	R	b	r	「	イ	ツ	×	ß	ø
xxxx0011	(4)	#	3	C	S	c	s	」	ウ	テ	モ	ε	ø
xxxx0100	(5)	\$	4	D	T	d	t	、	イ	ト	ト	μ	Ω
xxxx0101	(6)	%	5	E	U	e	u	・	オ	ナ	1	3	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		'	μ
xxxx1010	(3)	*	:	J	Z	j	z	エ	コ	ン	レ	j	〒
xxxx1011	(4)	+	;	K	L	k	l	オ	サ	ヒ	ロ	*	斤
xxxx1100	(5)	,	<	L	¥	1	1	カ	シ	フ	ワ	φ	円
xxxx1101	(6)	-	=	M	J	m	j	ユ	ス	ン	シ	も	÷
xxxx1110	(7)	.	>	N	^	n	キ	ヨ	セ	ホ	シ	ん	
xxxx1111	(8)	/	?	O	_	o	+	ツ	ソ	マ	°	ö	■