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The LCD(M) Specialist

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RoHS

PART NO. : WC0802D
-STBLWNC06

FOR MESSRS. : _____

CONTENTS

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: 8 characters x 2 line
- LCD type: STN Negative, Blue, Transmissive
- Backlight color: LED, White
- Viewing angle: 6 : 00
- Data transfer: 8Bit Parallel
- LCD controller: S6A0069
- Module size: 40 x 35.4 mm
- View area: 30.4x13.9 mm
- Dot size: 0.60 x 0.60 mm
- Driving method: 1/16 duty, 1/5 bias

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}	-0.3	6	V	---------
STATIC ELECTRICITY	---------	------	-----	V	--
POWER SUPPLY FOR BACKLIGHT	V_S	0	4.3	V_{rms}	---------
	f_{FL}	------	------	KHz	---------
STARTING VOLTAGE FOR BACKLIGHT	------	------	------	V_{rms}	Ta = 25℃
	------	------	------	V_{rms}	Ta = 25℃

5.2 Environmental absolute maximum ratings

I T E M	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-0℃	50℃	-10℃	60℃	------
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/s^2

6. Electrical characteristics

Ta = 25℃ V_{DD} = 5.0 V

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power supply voltage for circuit	V_{DD}-V_{SS}	------	4.75	5.0	5.25	V
Power supply voltage for LCD drive	V_{DD}-V_0	------	-----	4.8	------	V
Data input voltage	V_{IH}	H LEVEL	2.4	------	V_{DD+}0.3	V
	V_{IL}	L LEVEL	-0.3	------	0.2V_{DD}	V
LCD display duty ratio	DUTY	------	------	1/16	------	------
LED BACKLIGHT	Ifp	I mseo plus 10% Dutg cyele		---		mA
		Operating voltage	-----	4.1	----	V
		Forward current		50		mA
LED Lifetime	------	V_{FL}=4.1Vrms f_{FL}= KHz	------	100,000	------	Hr

7. Optical characteristics

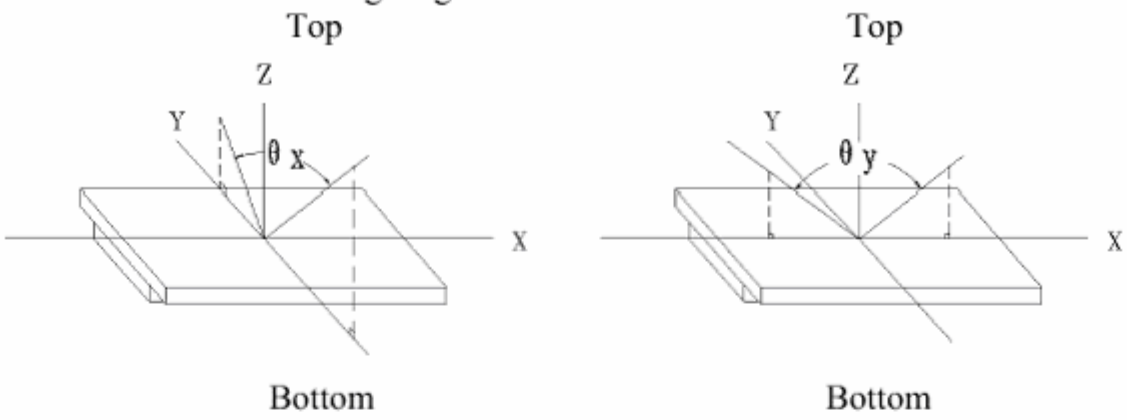
Ta = 25℃ V_{DD}-V_O = 4.8V

I T E M	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
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℃)	tr (rise)	Φ = 10° θ = 0°	------	-----	250	ms	1
	tf (fall)	Φ = 10° θ = 0°	------	-----	250	ms	1
The brightness of backlighting source	B	VFL=4.1Vrms fFL= KHZ	------	150	------	cd/m^2	2

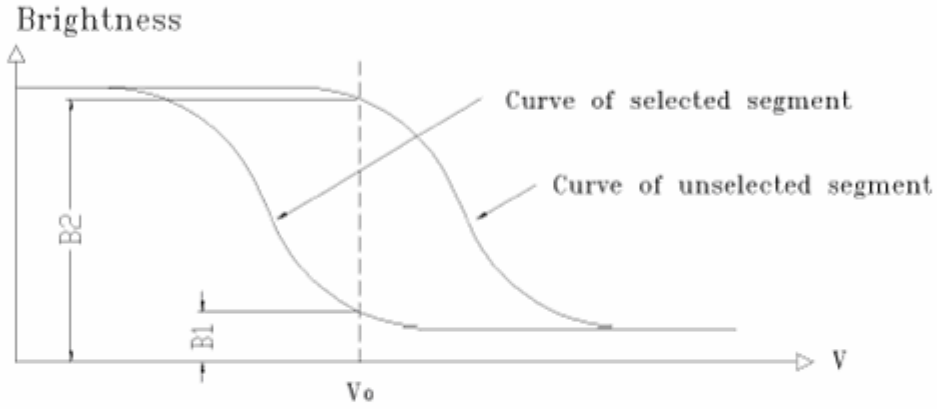
NOTE (1): SEE CUSTOMER ACCEPTANCE STANDARD SPECIFICATION FOR DEFINITION OF OPTICAL CHARACTERISTICS

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

7.2.1 Definition of Viewing Angle



7.2.2 Definition of Contrast Ratio

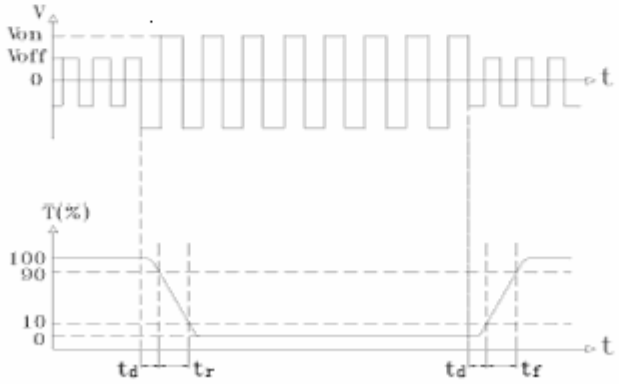


$$\text{Contrast Ratio} = B2/B1 = \frac{\text{unselected state brightness}}{\text{selected state brightness}}$$

Measuring Conditions:

1) Ambient Temperature: 25℃ ; 2) Frame frequency: 64Hz

7.2.3 Definition of Response time

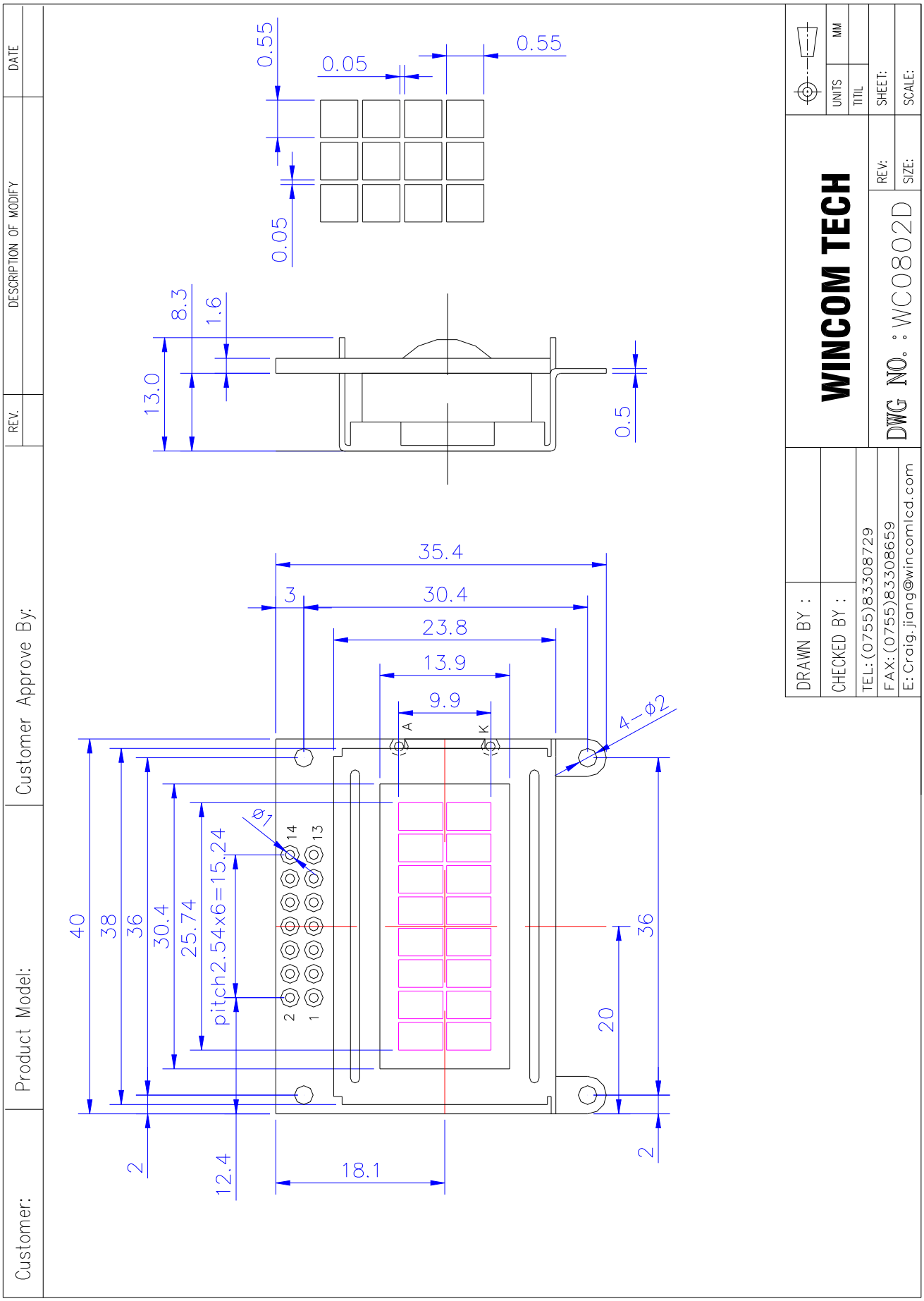


Turn on time: $t_{on} = t_d + t_r$ Turn off time: $t_{off} = t_d + t_f$

Measuring Condition:

1) Operating Voltage: 5.0V 2) Frame frequency: 64Hz

8. Outline dimension

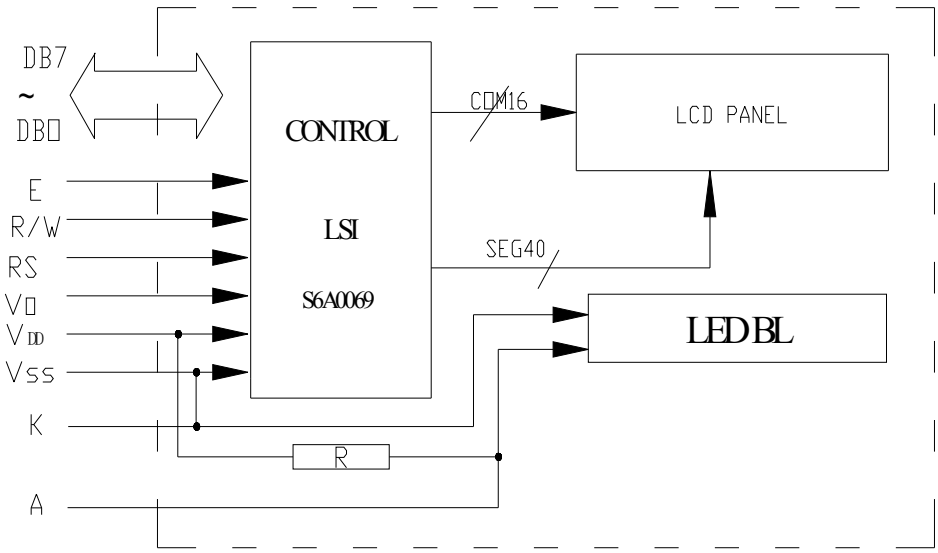


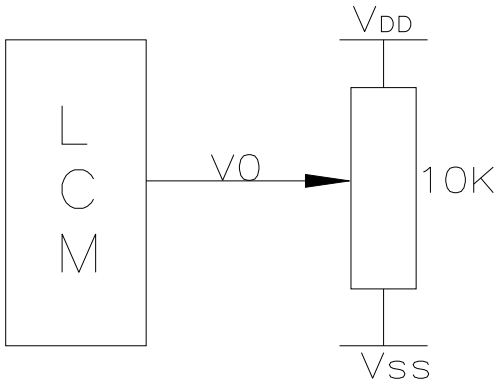
8.1 Interface

Pin Assignment

PIN NO.	Symbol	Leve	Function
1	Vss	0V	Ground
2	Vdd	5.0V	Power Supply for LCD and LED Backlight(+)
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
A	+	4.1V/50mA	Power Supply for LED Backlight(+)
K	-	0V	Power Supply for LED Backlight(-)

9. Block diagram



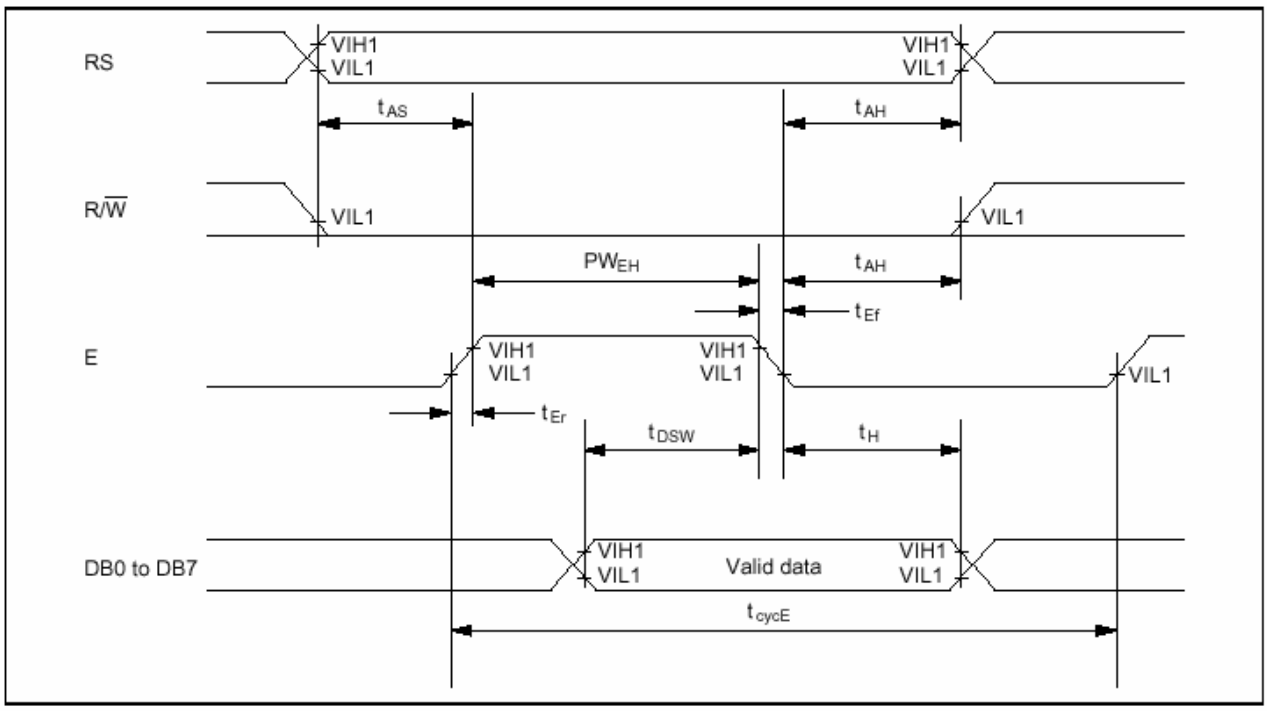


10.Interface Timing Chart

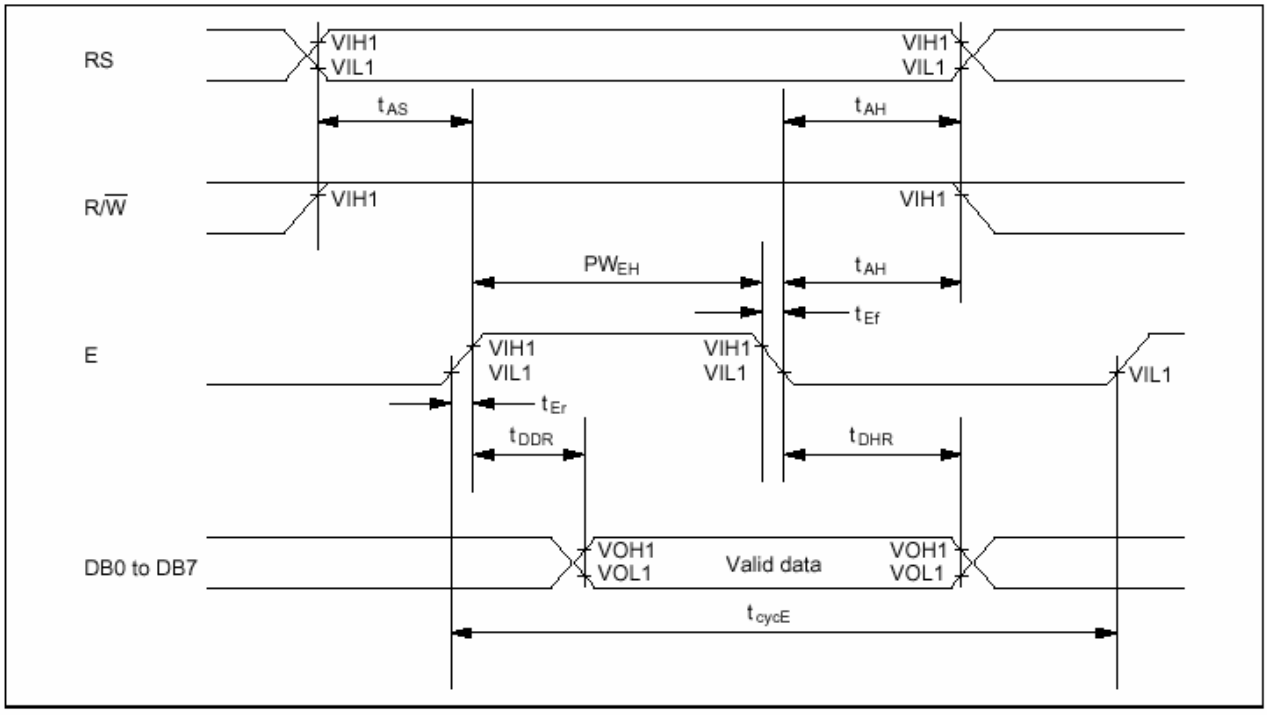
AC Characteristics(V_{DD}=4.5V~5.5V,Ta=-30~+85℃)

Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode (Refer to Fig-6)	E Cycle Time	tc	500	-	-	ns
	E Rise / Fall Time	t_R,t_F	-	-	20	
	E Pulse Width (High, Low)	tw	230	-	-	
	R/W and RS Setup Time	tsu1	40	-	-	
	R/W and RS Hold Time	t_{H1}	10	-	-	
	Data Setup Time	tsu2	80	-	-	
	Data Hold Time	t_{H2}	10	-	-	
Read Mode (Refer to Fig-7)	E Cycle Time	tc	500	-	-	ns
	E Rise / Fall Time	t_R,t_F	-	-	20	
	E Pulse Width (High, Low)	tw	230	-	-	
	R/W and RS Setup Time	tsu	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

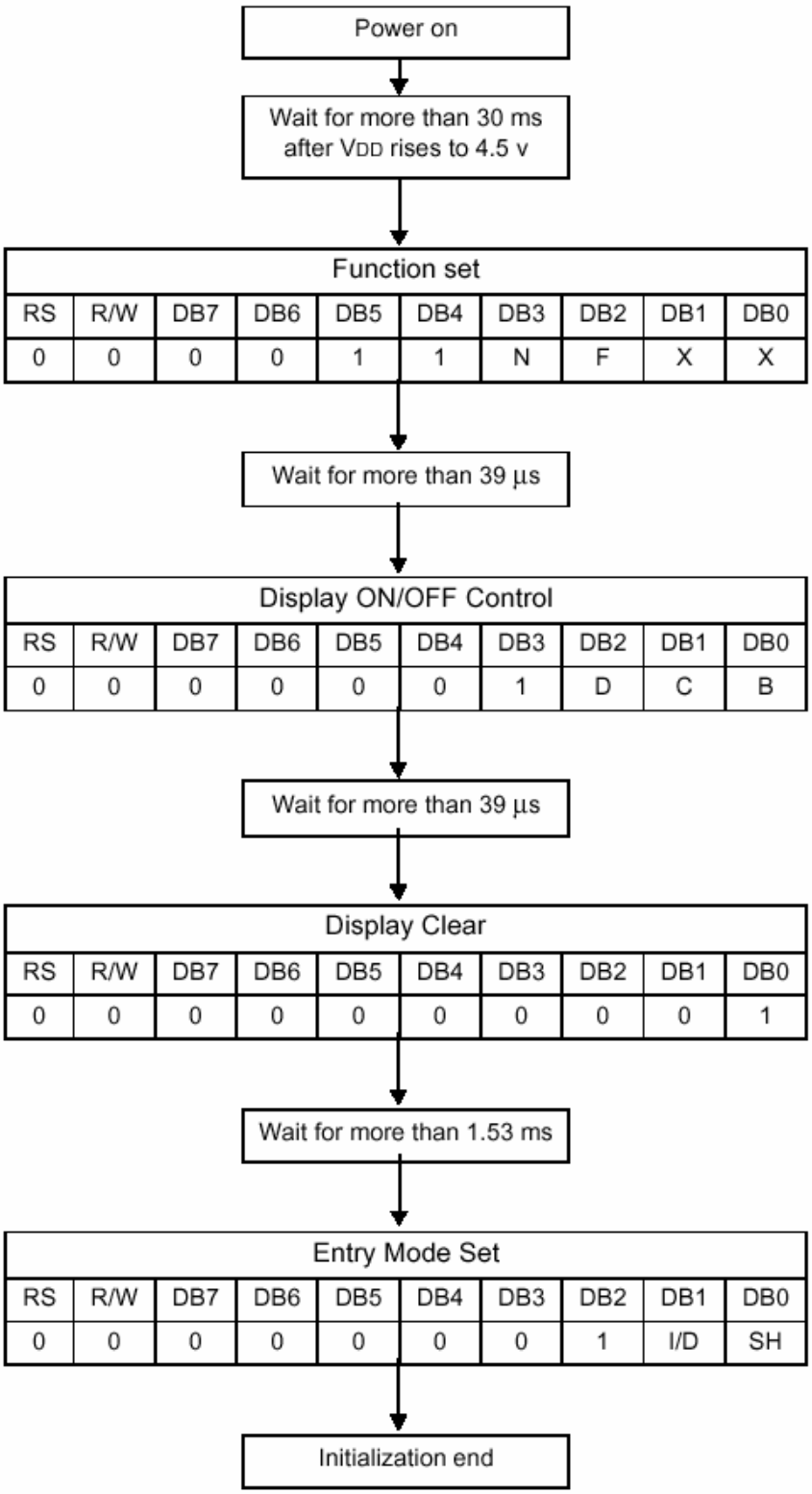
Instruction Table

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 μs
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 μs
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 μs
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:5×11dots/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