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BOOKBINDING AREA

DOC.

DATASHEET STATEMENT

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 4.1: providing quick reference when you are judging whether or not the product meets your requirements.
 4.2: listing out definitely the tolerance.

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- 5. The sequence of the icons is random and doesn't indicate the importance grade.
- 6. Icons explanation

Midas 2006 version logo.Midas is an integrated manufacturer of flat panel display (FPD). Midas supplies TN, HTN, STN, FSTN monochrome LCD panel; COB, COG, TAB LCD module; and all kinds of LED backlight.



FAST RESPONSE TIME

This icon on the cover indicates the product is with high response speed; Otherwise not.

C	

HIGH CONTRAST

This icon on the cover indicates the product is with high contrast; Otherwise not.



WIDE VIEWING SCOPE

This icon on the cover indicates the product is with wide viewing scope; Otherwise not.



RoHS COMPLIANCE

This icon on the cover indicates the product meets ROHS requirements; Otherwise not.



3TIMEs 100% QC EXAMINATION This icon on the cover indicates the product

has passed Midas thrice 100% QC. Otherwise not.



VIcm = 3.0V

This icon on the cover indicates the product can work at 3.0V exactly; otherwise not.



PROTECTION CIRCUIT

This icon on the cover indicates the product is with protection circuit; Otherwise not.



LONG LIFE VERSION

This icon on the cover indicates the product is long life version (over 9K hours guaranteed); Otherwise not.



Anti UV VERSION

This icon on the cover indicates the product is against UV line. Otherwise not.



OPERATION TEMPERATURE RANGE

This icon on the cover indicates the operating temperature range (X-Y).



TWICE SELECTION OF LED MATERIALS

This icon on the cover indicates the LED had passed Midas twice strict selection which promises the product's identical color and brightness; Otherwise not.



N SERIES TECHNOLOGY (2008 developed) New structure, new craft, new technology and new materials inside both LCD module and LCD panel to improve the "RainBow"

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1	2011.02	INITIAL ISSUED	ALL	ALL	Sty &
					<i>,</i>

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	MECHANICAL SPECIFICATIONS

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		MC44005A6W-BNMLW				

1. GENERAL SPECIFICATIONS

ITEM	NOMINAL DIMENSIONS / AVAILABLE OPTIONS
DISPLAY FORMAT	40 Characters by 4 Lines
LCD PANEL OPTIONS	STN (Blue color)
POLARIZER OPTIONS	Negative, Transmissive
BACKLIGHT OPTIONS	Edge type LED backlight (White color)
VIEWING ANGLE OPTIONS	6:00 (Bottom)
TEMPERATURE RANGE OPTIONS	Wide temperature range (-20°C ~ 70°C)
CONTROLLER IC	SUNPLUS
DISPLAY DUTY	1/16
DRIVING BIAS	1/5

2. MECHANICAL SPECIFICATIONS

OVERALL SIZE	LED backlight	LED backlight version : 190.0 x 54.0 x max 13.0					
VIEWING AREA	147.0W x 29.5H	mm	HOLE-HOLE	183.0W x 47.0H	mm		
CHARACTER SIZE	2.78W x 4.89H	mm	CHARACTER PITCH	0.75W x 1.20H	mm		
DOT SIZE	0.50W x 0.55H	mm	DOT PITCH	0.07W x 0.07H	mm		

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT
POWER SUPPL <mark>Y (</mark> LO <mark>GIC</mark>)	Vdd	25°C	-0.3	7.0	V
POWER SUPPLY (LCD)	V0	25°C	Vdd -13.5	Vdd +0.3	V
INPUT VOLTAGE	Vin	25°C	-0.3	Vdd +0.3	V
OPERATING TEMPERATURE	Vopr		-20	70	°C
STORAGE TEMPERATURE	Vstg		-30	80	°C

4. ELECTRONICAL CHARACTERISTIC*

ITEM	EVMDOL	CONDITION	S	TANDAI	RD	UNIT
ITEM	SYMBOL	CONDITION	MIN	ТҮР	MAX	UNIT
Input voltage	Vdd	+5V	4.7	5.0	5.5	V
Supply current	ldd	Vdd=5V		2.5		mA
		-20 [°] C	4.75		5.25	
Recommended LCD driving	Vdd - V0	0°C	4.55		5.05	
voltage for normal temp. Version module		25 [°] C	4.40	4.75	4.90	V
		50°C	4.30		4.80	
		70 [°] C	4.15		4.75	
LED forward voltage	Vf	25 [°] C	2.9		3.4	V
LED forward current	lf	25 [°] C		60	80	mA
LED reverse Current	Ir	25 [°] C		40		μA
LED color range	X coordinate	25 [°] C If = 60mA	0.25		0.28	
	Y coordinate	25 [°] C If = 60mA	0.26		0.29	
LED illuminance (Without LCD)	Lv	25 [°] C If = 60mA	280		380	cd/m ²
LED life time		25 [°] C If = 60mA	9K**			Hours

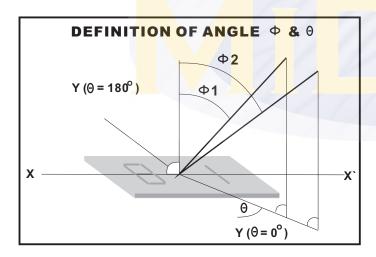
* The above data are for reference only. ** The warranty period of FORDATA LCD module is 1YEAR counted from the date shown on the label of products. ** If you wanted to drive the LED BKL uninterruptedly exceed 12hours/day, you are not suggested this version

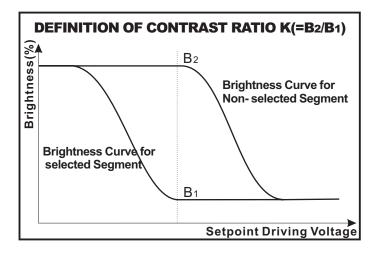
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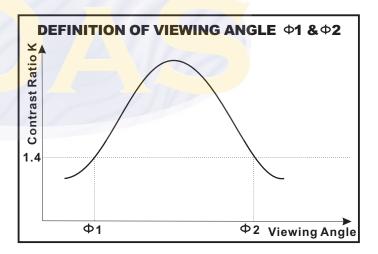
5. OPTICAL CHARACTERISTIC

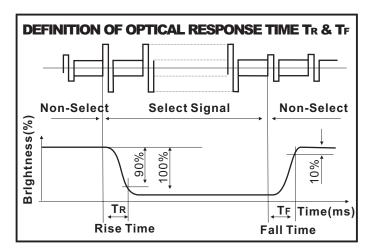
FOR TN TYPE LCD MODULE (TA=25°C, Vdd=5.0V ± 0.25V)									
ITEM	SYMBOL	CONDITION	MIN	ТҮР	MAX	UNIT			
	Φ2-Φ1	K=4		30			deg		
VIEWING ANGLE	Θ		25			ueg			
CONTRAST RATIO	К			2					
RESPONSE TIME(RISE)	TR			120	150	ms			
RESPONSE TIME(FALL)	TF			120	150	ms			

FOR STN TYPE LCD MODULE (TA=25 °C, Vdd=5.0V \pm 0.25V)										
ITEM	ТҮР	MAX	UNIT							
	Φ2-Φ1	K=4	40			deg				
VIEWING ANGLE	Θ	N=4	60			ueg				
CONTRAST RATIO	К			6						
RESPONSE TIME(RISE)	TR			150	250	ms				
RESPONSE TIME(FALL)	TF			150	250	ms				









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6. ELECTRICAL SPECIFICATIONS

6.1 DC CHARACTERISTICS (VDD = 4.5V to 5.5V, TA = 25 °C)

CHARACTERISTICS	SAMBOI		LIMIT		UNIT	TEST CONDITION
CHARACTERISTICS	STNIDUL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
INPUT HIGH VOLTAGE	Vih1	2.2		Vdd	V	Pins (E. RS. R/W. DB0 - DB7)
INPUT LOW VOLTAGE	VIL1	-0.3		0.6	V	$\left(\mathbb{L}, \mathbb{K}_{3}, \mathbb{K}_{3}, \mathbb{K}_{3}, \mathbb{L}_{3} \right)$
INPUT HIGH CURRENT	Іін	-2.0		2.0	μA	Pins (RS. R/W. DB0 - DB7)
INPUT LOW CURRENT	lı∟	-20	-50	-100	μΑ	Vdd = 5.0V
OUTPUT HIGH VOLTAGE (TTL)	Vон1	2.4		Vdd	V	Іон = - 0.1mA Pins: DB0 - DB7
OUTPUT LOW VOLTAGE (TTL)	Vol1			0.4	V	lo∟ = 0.1mA Pins: DB0 - DB7

6.2 AC CHARACTERISTICS (VDD = 4.5V to 5.5V, TA = 25° C)

Write mode

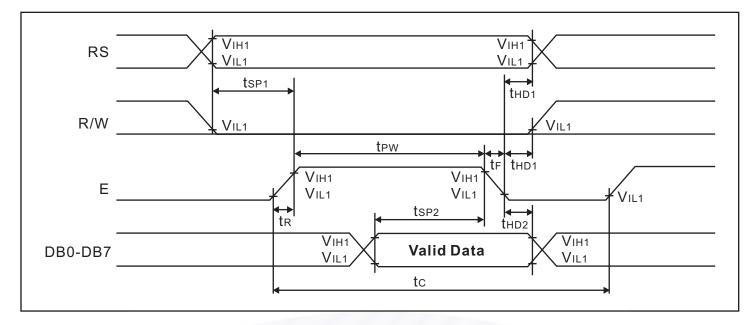
	SYMPOL		LIMIT		UNIT	TEST CONDITION
CHARACTERISTICS	STNIBUL	MIN.	MIN. TYP. MAX.		UNIT	TESTCONDITION
ENABLE CYCLE TIME	tc	<mark>500</mark>			ns	Pin E
ENABLE PULSE WIDTH	tpw	230			ns	Pin E
ENABLE RISE/ FALL TIME	tr, tr		/	20	ns	Pin E
ADDRESS SETUP TIME	tsp1	40			ns	Pins RS, R/W, E
ADDRESS HOLD TIME	thd1	10			ns	Pins RS, R/W, E
DATA SETUP TIME	tsp2	80			ns	Pins: DB0 - DB7
DATA HOLD TIME	thd2	10			ns	Pins: DB0 - DB7

Read mode

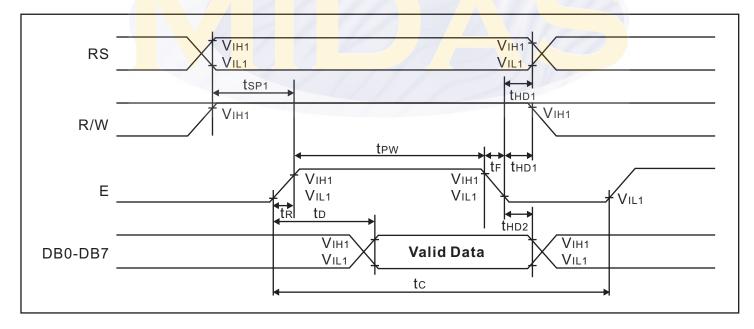
CHARACTERISTICS	SAMBOL		LIMIT		UNIT	TEST CONDITION
CHARACTERISTICS	STWDUL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
ENABLE CYCLE TIME	tc	500			ns	Pin E
ENABLE PULSE WIDTH	tpw	230			ns	Pin E
ENABLE RISE/ FALL TIME	tr, tr			20	ns	Pin E
ADDRESS SETUP TIME	tsp1	40			ns	Pins RS, R/W, E
ADDRESS HOLD TIME	thd1	10			ns	Pins RS, R/W, E
DATA OUTPUT DELAY TIME	to			120	ns	Pins: DB0 - DB7
DATA HOLD TIME	thd2	5			ns	Pins: DB0 - DB7

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6.3.1 WRITE MODE TIMING DIAGRAM

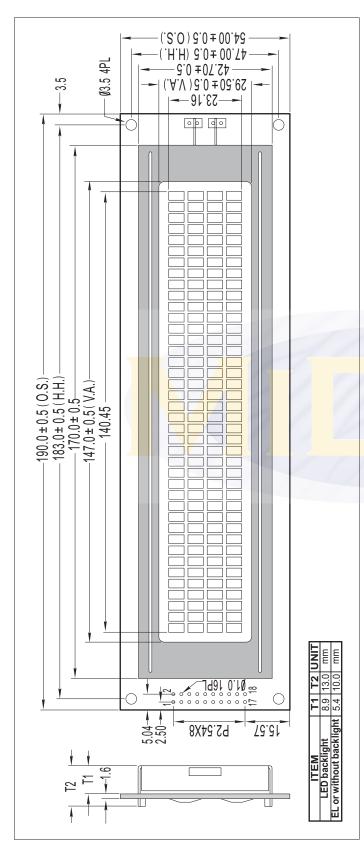


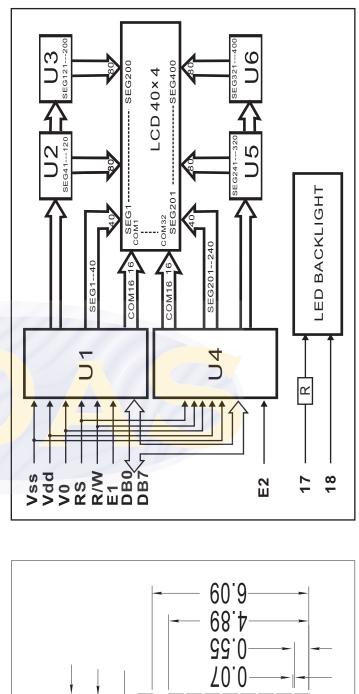
6.3.2 READ MODE TIMING DIAGRAM

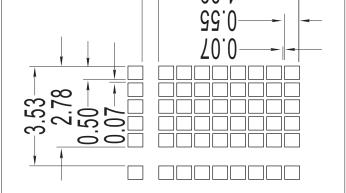


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7. EXTERNAL DIMENSIONS





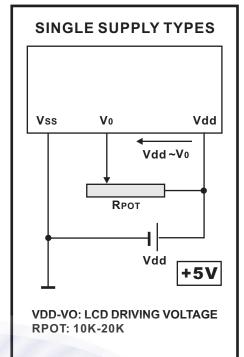


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8.PIN ASSIGNMENT

PIN	SYMBOL	FUNCTION
1-8	DB7 - DB0	Data bus line
9	E1	Enable Signal
10	R/W	Data Read / Write
11	RS	Register Select Signal
12	V0	Contrast Adjust
13	Vss	GND
14	Vdd	Power supply for LCM (+5.0V)
15	E2	Enable Signal
16	NC	No connection
17	LED+	Power supply for BKL (+5.0V)
18	LED-	Power supply for BKL (0V)

9.POWER SUPPLY



10. REFLECTOR OF SCREEN AND DDRAM ADDRESS

									_	_
Display p <mark>osi</mark> tion	1-1	1-2	1-3	1-4	<mark>1-</mark> 5	1-6	1-7	1-8	1-9	1-10
DDRAM address	00	01	02	03	04	05	06	07	08	09
Display position	1-11	1-12	1-13	1-14	1-15	1-16	1-17	1-18	1-19	1-20
DDRAM address	0A	0B	0C	0D	0E	0F	10	11	12	13
Display position	1-21	1-22	1-23	1-24	1-25	1-26	1-27	1-28	1-29	1-30
DDRAM address	14	15	16	17	18	19	1A	1B	1C	1D
Display position	1-31	1-32	1-33	1-34	1-35	1-36	1-37	1-38	1-39	1-40
DDRAM address	1E	1F	20	21	22	23	24	25	26	27
Display position	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10
DDRAM address	40	41	42	43	44	45	46	47	48	49
Display position	2-11	2-12	2-13	2-14	2-15	2-16	2-17	2-18	2-19	2-20
DDRAM address	4A	4B	4C	4D	4E	4F	50	51	52	53
Display position	2-21	2-22	2-23	2-24	2-25	2-26	2-27	2-28	2-29	2-30
DDRAM address	54	55	56	57	58	59	5A	5B	5C	5D
Display position	2-31	2-32	2-33	2-34	2-35	2-36	2-37	2-38	2-39	2-40
DDRAM address	5E	5F	60	61	62	63	64	65	66	67

1-1 means first character of line 1 on screen

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11. INSTRUCTION TABLE

				Inst	ructio	on Co	de				_	Execution
Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Time(fosc= 270kHz)
Clear Display	0	0	0	0	0	0	0	0	0	1	Write 20H to DDRAM set DDRAM address to 00H from AC	1.52ms
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.	1.52ms
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	38µs
Display ON/OFF Control	0	0	0	0	0	0	1	D	С	В	Set display(D) cursor(C) and blinking of cursor(B) on/off	38µs
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 DDRAM data	38µs
Function Set	0	0	0	0	1	DL	N	F	-		Set interface data length(DL:8bit/4bit), number of display line (N:2line/1line) and,display font type F:5X11dots / 5X8dots	38µs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	38µs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	38µs
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)	38µs
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	38µs

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12. INSTRUCTION DESCRIPTION

A. Clear Display

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

Clear all the display data by writing 20H (space code) to all DDRAM address, and set DDRAM address to 00H into AC (address counter).

Return cursor to the original status, namely, bring the cursor to the left edge on the first line of the display.

Make the entry mode increment (I/D = HIGH)

B. Return Home

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	1	

Set DDRAM address to 00H into the address counter.

Return cursor to its original site and return display to its original status, if shifted. Contents of DDRAM does not change.

C. Entry Mode Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	1	I/D	SH

Set the moving direction of cursor and display.

I/D:Increment /decrement of DDRAM address(cursor or blink)

I/D=High,cursor/blink moves to right and DDRAM address is increased by 1.

I/D=low,cursor/blink moves to left and DDRAM address is decreased by 1.

*CGRAM operates the same way as DDRAM, when reading from or writing to CGRAM. **SH:Shift of entire display**

When DDRAM read (CGRAM read/write) operation or SH=Low,shifting of entire display is not performed.if SH=High, and DDRAM write operation,shift of entire display is performed according to I/D value(I/D=High,shift left, I/D=Low, shift right).

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D. Display ON/OFF Control

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	С	В

D:Display ON/OFF control bit

When D=High, entire display is turned on.

When D=Low, display is turned off, but display data remains in DDRAM.

C:Cursor ON/OFF control bit

When C=High, cursor is turned on.

When C=Low, cursor is disappeared in current display ,but I/D register preserves its data.

B:Cursor Blink ON/OFF control bit

When B=High, cursor blink is on, which performs alternately between all the High data and display characters at the cursor position.

When B=Low ,blink is off.

E. Cursor or Display Shift

RS	<mark>R</mark> /W	DB7	DB6	D <mark>B5</mark>	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	1	S/C	R/L	-	-

Shifting of right/left cursor position or display without writing or reading of display data. This instruction is used to correct or search display data.

During 2-line mode display, cursor moves to the 2nd line after the 40th digit of the 1st line. Note that display shift is performed simultaneously in all the lines.

When displayed data is shifted repeatedly, each line is shifted individually.

When display shift is performed, the contents of the address counter are not changed.

S/C	R/L	Operation
0	0	Shift cursor to the left, AC is decreased by 1
0	1	Shift cursor to the right, AC is increased by 1
1	0	Shift all the display to the left,cursor moves according to the display
1	1	Shift all the display to the right,cursor moves according to the display

BOOKBINDING AREA

F. Function set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	DL	Ν	F	-	-

DL:Interface data length control bit

When DL=High, it means 8-bit bus mode with MPU.

When DL=Low, it means 4-bit bus mode with MPU.

When 4-bit bus mode, it needs to transfer 4-bit data twice.

N:Display line number control bit

When N=Low, 1-line display mode is set.

When N=High, 2-line display mode is set.

F:Display font type control bit

When F=Low, 5x8 dots format display mode is set. When F=High, 5x11 dots format display mode.

G. Set CGRAM Address

RS	R/W	DB7	DB6	D <mark>B5</mark>	DB4	DB3	DB2	DB1	DB0
0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0

Set CGRAM address to AC.

This instruction makes CGRAM data available from MPU.

H. Set DDRAM Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0

Set DDRAM address to AC.

This instruction makes DDRAM data available from MPU.

When 1-line display mode (N=Low), DDRAM address is from 00H to 4FH In 2-line display mode(N=High),DDRAM address in the 1st line is from 00H to 27H and DDRAM address in the 2nd line is from 40H to 67H

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I. Read Busy Flag & Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0

This instruction shows whether IC is in internal operation or not .

If BF is High, internal operation is in progress and shall wait until BF is to be Low, which by then the next instruction can be performed. In this instruction you and also read the value of the address counter.

J. Write data to RAM

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Write binary 8-bit data to DDRAM/CGRAM.

The selection of RAM from DDRAM, and CGRAM, is set by the previous address set instruction (DDRAM address set, CGRAM address set).

RAM set instruction can also determine the AC direction to RAM.

After write operation, the address is automatically increased /decreased by 1,according the entry mode.

K. Read data from RAM

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	1	D7	D6	D5	D4	D3	D2	D1	D0

Read binary 8-bit data from DDRAM/CGRAM.

The selection of RAM is set by the previous address set instruction. If the address set instruction of RAM is not performed before this instruction, the data that has been read first is invalid, as the direction of AC is not yet determined. If RAM data is read several times without RAM address instructions set before read operation, the correct RAM data can be obtained from the second. But the first data would be incorrect, as there is no time margin to transfer RAM data.

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In case of DDRAM read operation, cursor shift instruction plays the same role as DDRAM address set instruction, it also transfers RAM data to output data register.

After read operation, address counter is automatically increased/decreased by 1 according to the entry mode.

After CGRAM read operation, display shift may not be executed correctly.

Note:In case of RAM write operation,AC is increased/decreased by 1 as in read operation. At this time,AC indicates the next address position, but only the previous data can be read by the read instruction.

13. RELATIONSHIP BETWEEN CHARACTER CODE AND CGRAM

	С	har	act	ter	cod	le		C	GR	AM	Ade	dre	SS			CG	RA	MD	ata			Pattern
D7	D6	D5	D4	D3	D2	2 D1	D0	A5	A4	A3	A2	A1	A0	P7	P6	P5	P4	P3	P2	P1	P0	number
0	0	0	0	Х	0	0	0	0	0	0	0	0	0	Х	Х	Х	0	1	1	1	0	pattern 1
											0	0	1	х	Х	х	1	0	0	0	1	-
											0	1	0	х	Х	Х	1	0	0	0	1	
											0	1	1	х	х	х	1	1	1	1	1	
								7			1	0	0	х	х	х	1	0	0	0	1	
											1	0	1	х	х	х	1	0	0	0	1	
											1	1	0	х	Х	x	1	0	0	0	1	
											1	1	1	х	х	x	0	0	0	0	0	
			-										-	/		/				\wedge		
									4								1					
																	1					
0	0	0	0	х	1	1	1	0	0	0	0	0	0	x	х	х	1	0	0	0	1	pattern8
Ū	Ū	Ŭ	Ũ	~	•	•	•	Ŭ	Ŭ	Ũ	0	0	1	x	X	x	1	0	0	0	1	patterne
											0	1	0	x	X	x	1	Õ	Õ	0	1	
											0	1	1	x	X	x	1	1	1	1	1	
											1	0	0	x	x	x	1	0	0	0	1	
											1	0	1	x	x	x	1	0	0	0	1	
											1	1	0	x	x	x	1	0	0	0	1	
											1	1	1	x	x	X	0	0	0	0	0	
											1	I	1	^	^	^	0	0	0	0	U	

14. DISPLAY DATA RAM(DDRAM)

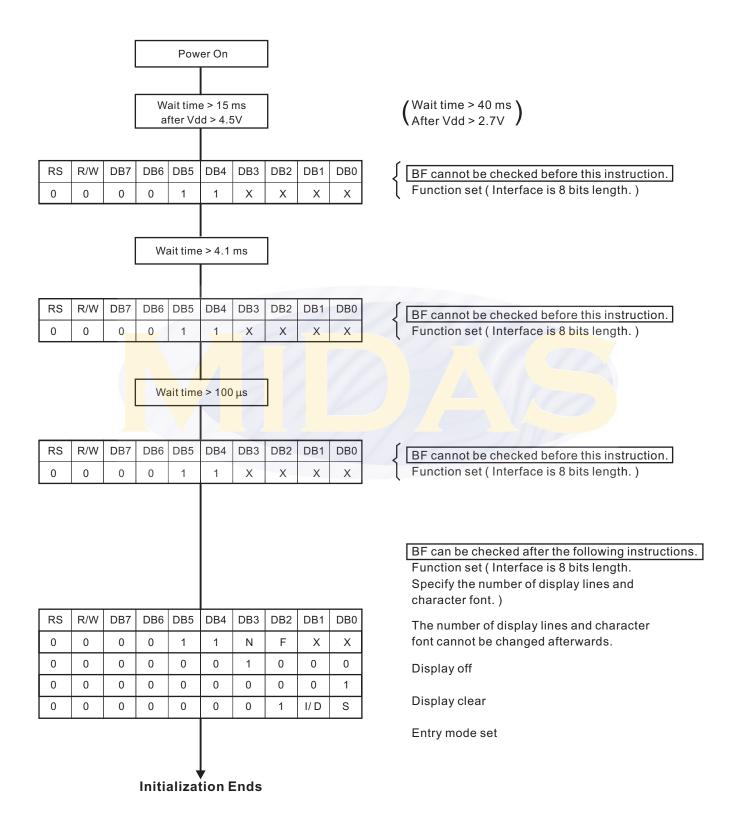
DDRAM stores display data of maximum 80x8 bits(80 characters). DDRAM address is set in the address counter(AC) as a hexadecimal number

MSB						LSB
AC6	AC5	AC4	AC3	AC2	AC1	AC0

BOOK	BINDING AREA			
	PRODUCT SPEC.	MODE NO. MC44005A6W-BNMLW	PAGE	15/19

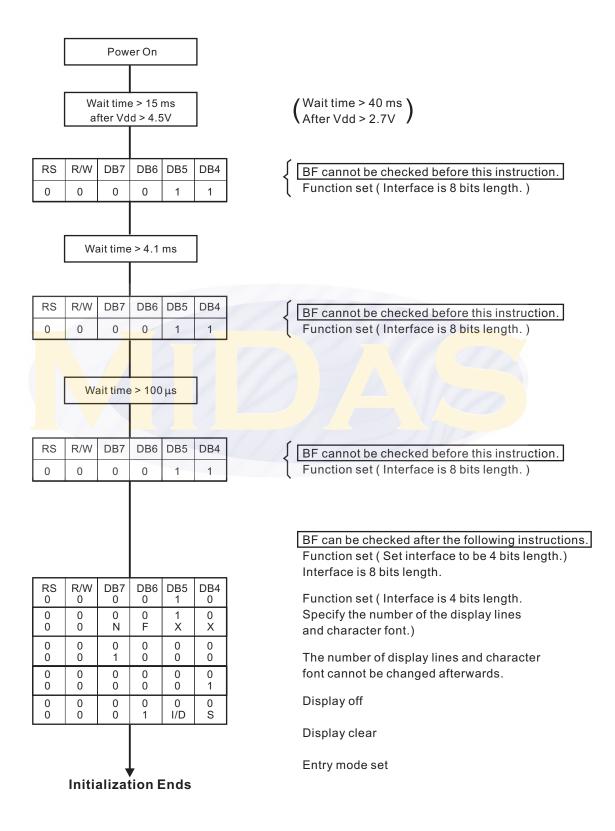
15. INITIALIZATION

15.1 8-bit interface mode (Condition: fosc = 270KHZ)



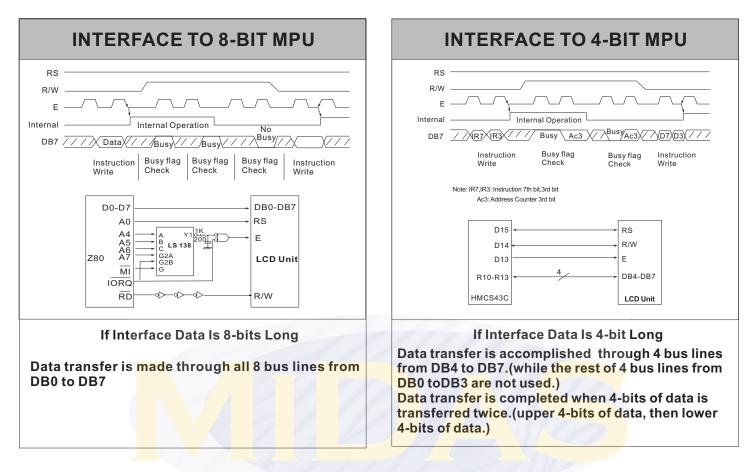
BOOKBIN	DING AREA			
	PRODUCT	MODE NO.	PAGE	16/10
	SPEC.	MC44005A6W-BNMLW	FAGE	10/19

15.2 4-bit interface mode (Condition: fosc = 270KHZ)



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	PRODUCT	MODE NO.	PAGE	17/10
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16.INTERFACE TO MPU



Features

- 1. Interface to an 8-bit or 4-bit MPU is available.
- 2. 192 types of alphanumeric, symbols and special characters can be displayed with the built in character generator (ROM).
- 3. Other preferred characters can be displayed by character generator (RAM).
- 4. Various instructions may be programmed.
 - Clear display
 - Cursor at home
 - On/Off cursor
 - Blink character
 - Shift display
 - Shift cursor
 - Read/Write display data .etc.
- 5. Compact and light weight design which can easily be integrated into end products.
- 6. Single power supply +5V drive (except for extended temperature type).
- 7. Low power consumption.

PRODUCT SPEC.MODE NO. MC44005A6W-BNMLWPAGE 18/19	BOOKBIN	DING AREA			
		PRODUCT	MODE NO.	DAGE	19/10
		SPEC.	MC44005A6W-BNMLW	FAGE	10/19

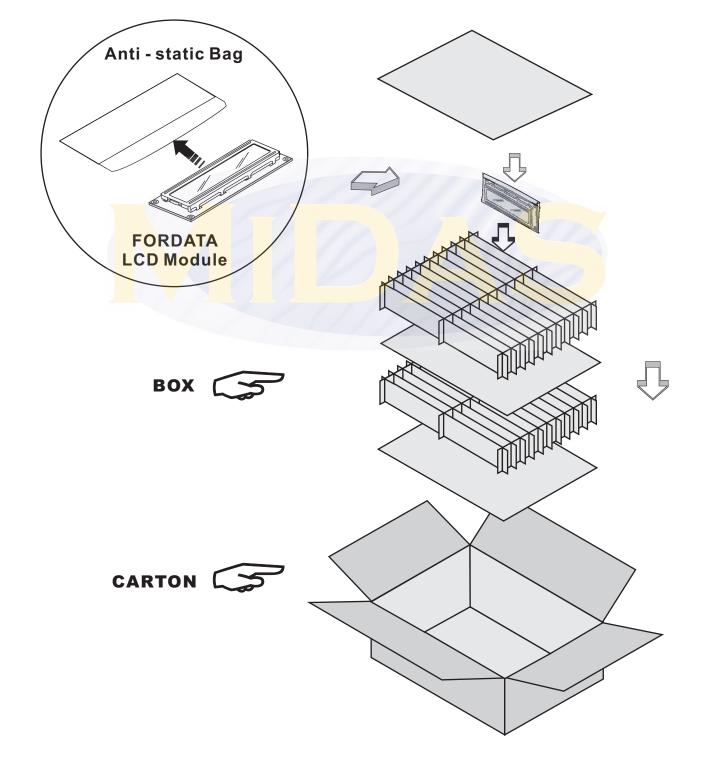
17. STANDARD FONT MAP

Upper 4bit Lower 4bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LННН	HLLL	HLLH	HLHL	нгнн	HHLL	ннгн	нннг	нннн
LLLL	CG RAM (1)															
LLLH	(2)															
LLHL	(3)															
LLHH	(4)															
LHLL	(5)															
LHLH	(6)															
LHHL	(7)															
LHHH	(8)															
HLLL	(1)															
HLLH	(2)															
HLHL	(3)															
HLHH	(4)															
HHLL	(5)															
HHLH	(6)															
HHHL	(7)															
нннн	(8)															

BOOKBIN	DING AREA			
	PRODUCT SPEC.	MODE NO. MC44005A6W-BNMLW	PAGE	19/19

18. PACKING DETAIL

WITH LED BKL	WITHOUT LED BKL	NOTE
45 PCS/BOX	45 PCS/BOX	1. The weight is estimated for reference only.
10 BOXES/CARTON	10 BOXES/CARTON	2. Packing detail may be changed without notice.
450 PCS/CARTON	450 PCS/CARTON	
20.00 KGS/CTN(G.W.)	18.00 KGS/CTN(G.W.)	
0.07 M ³ /CARTON	0.07 M ³ /CARTON	



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