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Specification

MC42005A6W-BNMLWS

DOCUMENT REVISION HISTORY:

DATE	PAGE	DESCRIPTION
2013.2	-	First release

MIDAS DISPLAYS

Contents

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Midas LCD Part Number System

MC	COG	132033	A	*	6	W	*	*	-	S	N	T	L	W	*	*
1	2	3	4	5	6	7	8	9	-	10	11	12	13	14	15	16

1 = **MC:** Midas Components

2 = **Blank:** COB (chip on board) **COG**: chip on glass

3 = **No of dots** (e.g. 240064 = 240 x 64 dots) (e.g. 21605 = 2 x 16 5mm C.H.)

4 = **Series**

5 = **Series Variant:** A to Z – see addendum

6 = **3:** 3 o'clock **6:** 6 o'clock **9**: 9 o'clock **12**: 12 o'clock

7 = **S**: Normal (0 to + 50 deg C) **W:** Wide temp. (-20 to + 70 deg C) **X:** Extended temp (-30 + 80 Deg C)

8 = **Character Set**

Blank: Standard (English/Japanese)
C: Chinese Simplified (Graphic Displays only)
CB: Chinese Big 5 (Graphic Displays only)
H: Hebrew
K: European (std) (English/German/French/Greek)
L: English/Japanese (special)
M: European (English/Scandinavian)
R: Cyrillic
W: European (English/Greek)
U: European (English/Scandinavian/Icelandic)

9 = **Bezel Height** (where applicable / available)

	Top of Bezel to Top of PCB	Common (via pins 1 and 2)	Array or Edge Lit
Blank	9.5mm / not applicable	Common	Array
2	8.9 mm	Common	Array
3	7.8 mm	Separate	Array
4	7.8 mm	Common	Array
5	9.5 mm	Separate	Array
6	7 mm	Common	Array
7	7 mm	Separate	Array
8	6.4 mm	Common	Edge
9	6.4 mm	Separate	Edge
A	5.5 mm	Common	Edge
B	5.5 mm	Separate	Edge
D	6.0mm	Separate	Edge
E	5.0mm	Separate	Edge
F	4.7mm	Common	Edge
G	3.7mm	Separate	EL

10 = **T:** TN **S**: STN **B:** STN Blue **G:** STN Grey **F:** FSTN **F2:** FFSTN

11 = **P:** Positive **N**: Negative

12 = **R:** Reflective **M**: Transmissive **T:** Transflective

13 = **Backlight: Blank:** Reflective **L:** LED

14 = **Backlight Colour: Y:** Yellow-Green **W:** White **B:** Blue **R:** Red **A:** Amber **O:** Orange **G:** Green **RGB:** R.G.B.

15 = **Driver Chip: Blank:** Standard **I:** I²C **T:** Toshiba T6963C **A:** Avant SAP1024B **R:** Raio RA8835

16 = **Voltage Variant**: e.g. **3** = 3v

2. Precautions in use of LCD Modules

(1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
(2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
(3) Don't disassemble the LCM.
(4) Don't operate it above the absolute maximum rating.
(5) Don't drop, bend or twist LCM.
(6) Soldering: only to the I/O terminals.
(7) Storage: please storage in anti-static electricity container and clean environment.

3. General Specification

Item	Dimension	Unit
Number of Characters	20characters x 4 Lines	—
Module dimension (With LED Backlight)	98.0 x 60.0 x 13.5 (MAX)	mm
View area	76.0 x 25.2	mm
Active area	70.40 x 20.80	mm
Dot size	0.55 x 0.55	mm
Dot pitch	0.60 x 0.60	mm
Character size	2.95 x 4.75	mm
Character pitch	3.55 x 5.35	mm
LCD type	STN, Blue, Negative, Transmissive	
Duty	1/16	
View direction	6 o'clock	
Backlight Type	White LED backlight	

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4. Absolute Maximum Ratings

Item		Symbol	Min	Max	Unit
Input Voltage		V_I	-0.3	VDD+0.3	V
Supply Voltage For Logic		VDD-V_{SS}	-0.3	5.5	V
Supply Voltage For LCD		V_{DD}-V_0	Vdd-7.0	Vdd+0.3	V
Wide Temperature LCM	Operating Temp.	Top	-20	70	°C
	Storage Temp.	Tstr	-30	80	°C

5. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	4.5	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_0	Ta=25°C	4.2	4.5	4.8	V
Input High Volt.	V_{IH}	—	0.7 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	V_{SS}	—	0.3 V_{DD}	V
Supply Current	I_{DD}	V_{DD}=5V	0.8	1.2	2.0	mA
Supply Voltage of White backlight	V_{LED}	Forward current =30 mA Number of LED die 1x2=2	3.8	4.0	4.2	V

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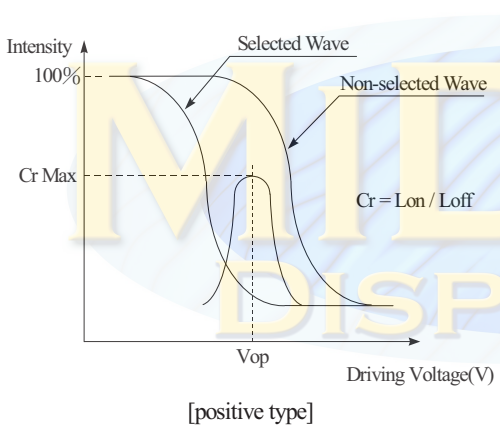
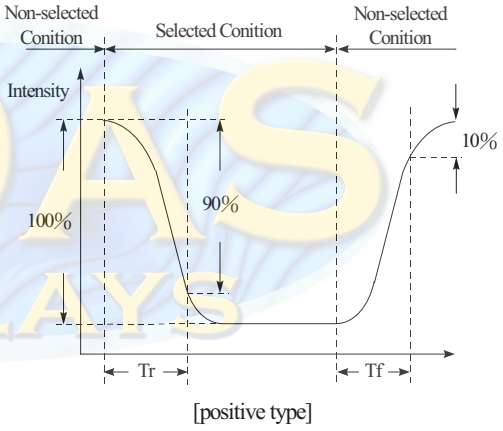
6. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	CR≧2	-20	—	35	deg
	(H)φ	CR≧2	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	—	250	ms
	T fall	—	—	—	250	ms

Definition of Operation Voltage (Vop)



Definition of Response Time (Tr, Tf)

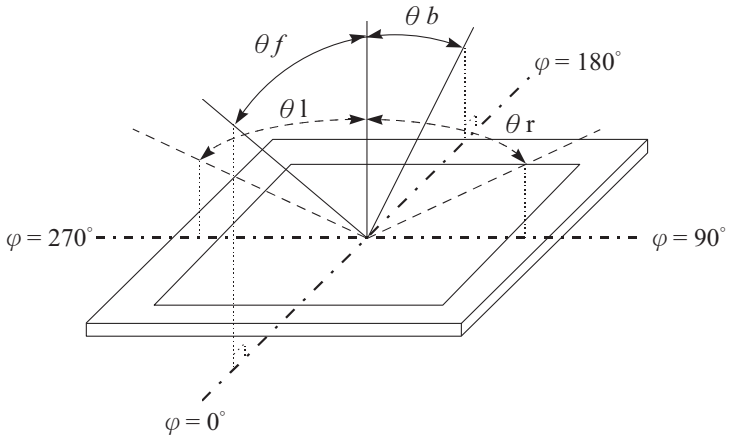


Conditions:

Operating Voltage: Vop　　Viewing Angle (θ，φ): 0°， 0°

Frame Frequency: 64 HZ　　Driving Waveform: 1/N duty, 1/a bias

Definition of viewing angle (CR≧2)



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7. Interface Pin Function

Pin No.	Symbol	Level	Description
1	LED(+)		Anode of LED Backlight
2	LED(-)		Cathode of LED Backlight
3	V_{SS}	0V	Ground
4	V_{DD}	5.0V	Supply Voltage for logic
5	SCLK	H/L	Serial Clock
6	SID	H/L	Serial Data
7	V0	(Variable)	Operating voltage for LCD
8	/CSB	H/L	Chip Select
9	RS	H/L	Register Select
10	NC		No Connection

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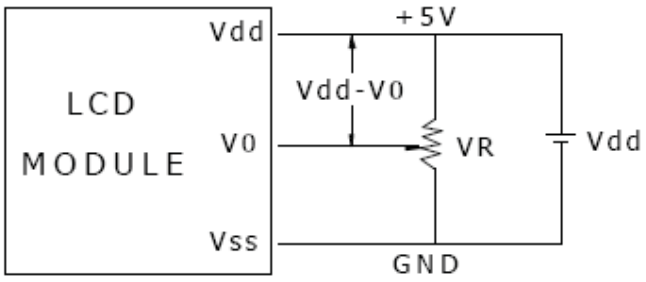
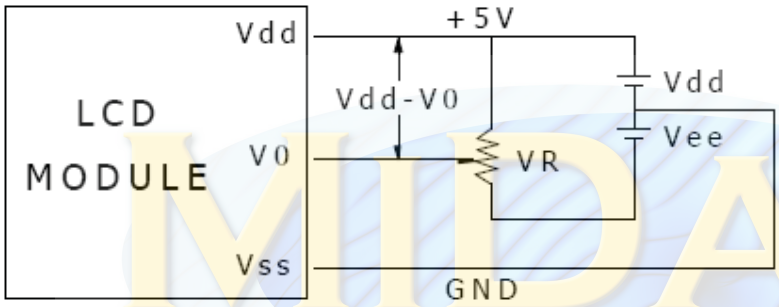
8. Power Supply

SINGLE SUPPLY VOLTAGE TYPE



Vdd-V0: LCD Driving Voltage
VR: 10K - 20K

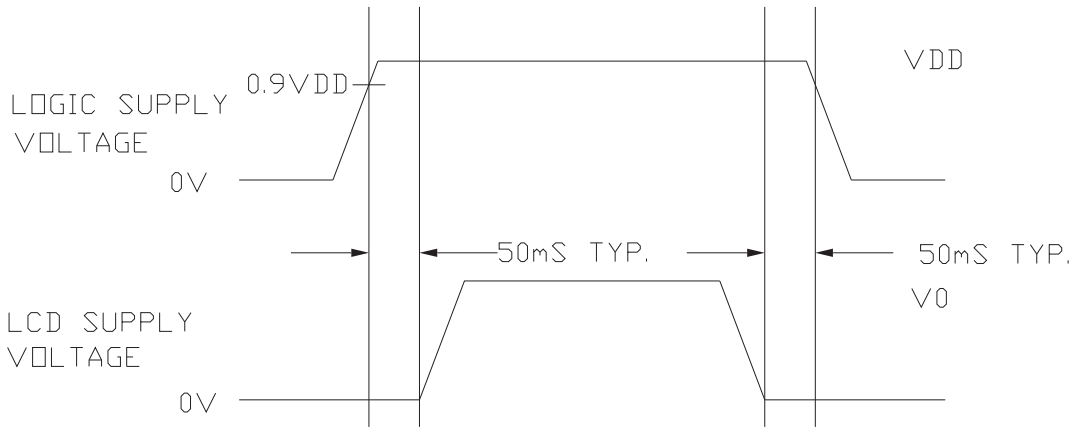
DUAL SUPPLY VOLTAGE TYPE



Vdd-V0: LCD Driving Voltage
VR: 10K - 20K

Timing Diagram of VDD Against V0.

Power on sequence shall meet the requirement of Figure 4, the timing diagram of VDD against V0.



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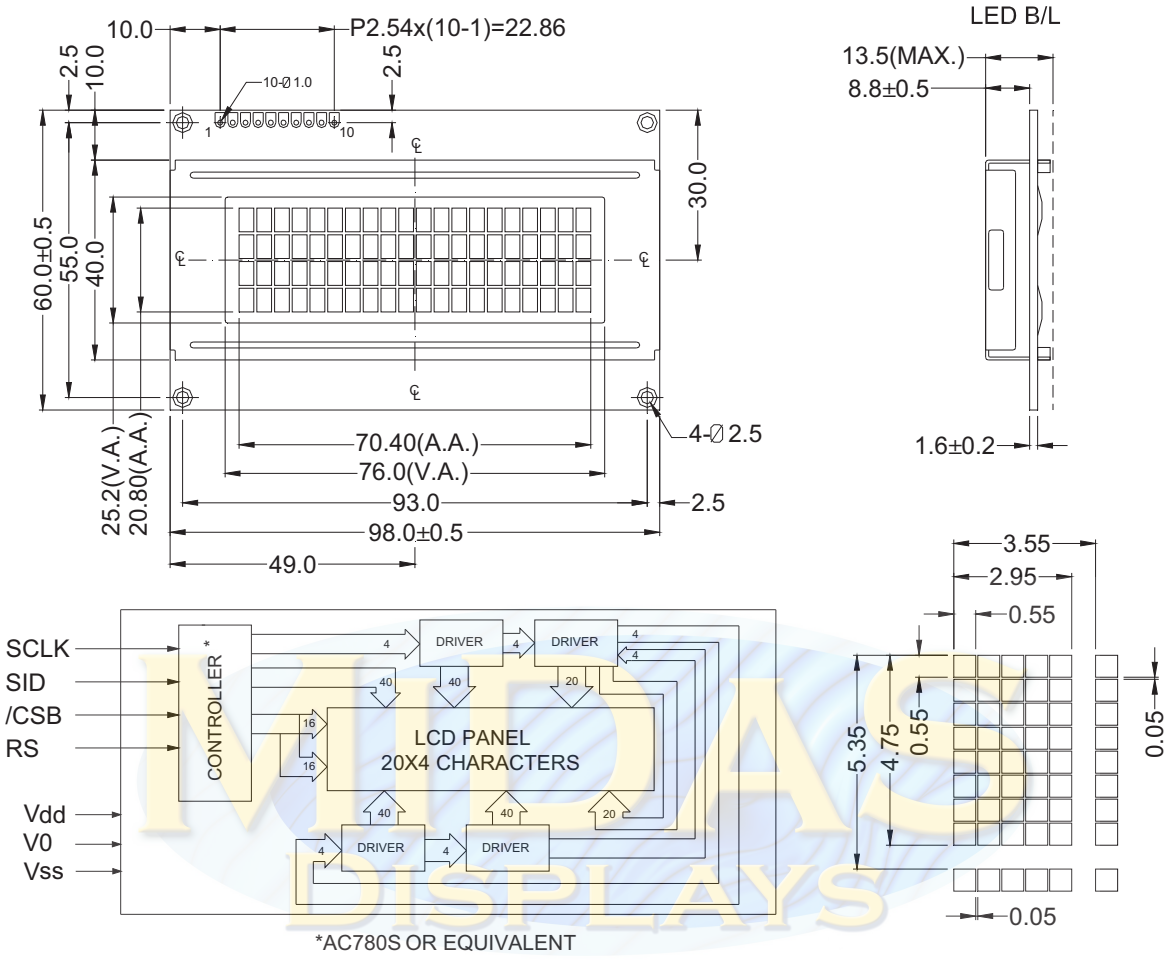
9. Contour Drawing & Block Diagram



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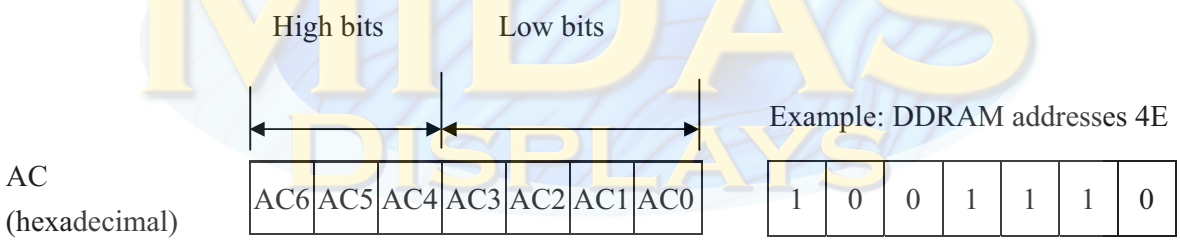
10. Function Description

The LCD display Module is built in a LSI controller, the controller has two 8-bit registers, an instruction register (IR) and a data register (DR).
The IR stores instruction codes, such as display clear and cursor shift, and address information for display data RAM (DDRAM) and character generator (CGRAM). The IR can only be written from the MPU. The DR temporarily stores data to be written or read from DDRAM or CGRAM. When address information is written into the IR, then data is stored into the DR from DDRAM or CGRAM.

Address Counter (AC)
The address counter (AC) assigns addresses to both DDRAM and CGRAM

Display Data RAM (DDRAM)
This DDRAM is used to store the display data represented in 8-bit character codes. Its extended capacity is 80×8 bits or 80 characters. Below figure is the relationships between DDRAM addresses and positions on the liquid crystal display.



Display position DDRAM address

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53
14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27
54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67

4-Line by 20-Character Display

Character Generator ROM (CGROM)
The CGROM generate 5×8 dot or 5×10 dot character patterns from 8-bit character codes. See Table 2.

Character Generator RAM (CGRAM)
In CGRAM, the user can rewrite character by program. For 5×8 dots, eight character patterns

can be written, and for 5×10 dots, four character patterns can be written.

Write into DDRAM the character code at the addresses shown as the left column of table 1. To show the character patterns stored in CGRAM.

Relationship between CGRAM Addresses, Character Codes (DDRAM) and Character patterns

Table 1

For 5 * 8 dot character patterns

Character Codes (DDRAM data)	CGRAM Address	Character Patterns (CGRAM data)	
7 6 5 4 3 2 1 0	5 4 3 2 1 0	7 6 5 4 3 2 1 0	
High Low	High Low	High Low	
0 0 0 0 * 0 0 0	0 0 0 0 0 0	* * * ■ ■ ■ ■ 0	Character pattern(1)
	0 0 1	* * * ■ 0 0 0 ■	
	0 1 0	* * * ■ 0 0 0 ■	
	0 1 1	* * * ■ ■ ■ ■ 0	
	1 0 0	* * * ■ 0 ■ 0 0	
	1 0 1	* * * ■ 0 0 ■ 0	
	1 1 0	* * * ■ 0 0 0 ■	
	1 1 1	* * * 0 0 0 0 0	Cursor pattern
0 0 0 0 * 0 0 1	0 0 1 0 0 0	* * * ■ 0 0 0 ■	Character pattern(2)
	0 0 1	* * * 0 ■ 0 ■ 0	
	0 1 0	* * * ■ ■ ■ ■ ■	
	0 1 1	* * * 0 0 ■ 0 0	
	1 0 0	* * * ■ ■ ■ ■ ■	
	1 0 1	* * * 0 0 ■ 0 0	
	1 1 0	* * * 0 0 ■ 0 0	
	1 1 1	* * * 0 0 0 0 0	Cursor pattern
	0 0 0	* * *	
	0 0 1		
0 0 0 0 * 1 1 1	1 1 1 1 0 0		
	1 0 1		
	1 1 0		
	1 1 1	* * *	

For 5 * 10 dot character patterns

Character Codes (DDRAM data)	CGRAM Address	Character Patterns (CGRAM data)	
7 6 5 4 3 2 1 0	5 4 3 2 1 0	7 6 5 4 3 2 1 0	
High Low	High Low	High Low	
0 0 0 0 * 0 0 0	0 0 0 0 0 0 0 0	* * * 0 0 0 0 0 0	Character pattern
	0 0 0 1	* * * 0 0 0 0 0 0	
	0 0 1 0	* * * ■ 0 ■ ■ ■ 0	
	0 0 1 1	* * * ■ ■ 0 0 ■	
	0 1 0 0	* * * ■ 0 0 0 ■	
	0 1 0 1	* * * ■ 0 0 0 ■	
	0 1 1 0	* * * ■ ■ ■ ■ ■ 0	
	0 1 1 1	* * * ■ 0 0 0 0 0	
	1 0 0 0	* * * ■ 0 0 0 0 0	
	1 0 0 1	* * * ■ 0 0 0 0 0	
	1 0 1 0	* * * 0 0 0 0 0 0	Cursor pattern
	1 1 1 1	* * * * * * * * *	

■ : " High "

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11. Character Generator ROM Pattern

12. Instruction Table

Instruction	Instruction Code										Description	Execution time (fosc=210Khz)
	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	1.98ms
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.	1.98ms
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.	48μs
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	Set display (D), cursor (C), and blinking of cursor (B) on/off control bit.	48μs
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.	48μs
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:5×11 dots/5×8 dots)	48μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	48μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	48μs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	48μs

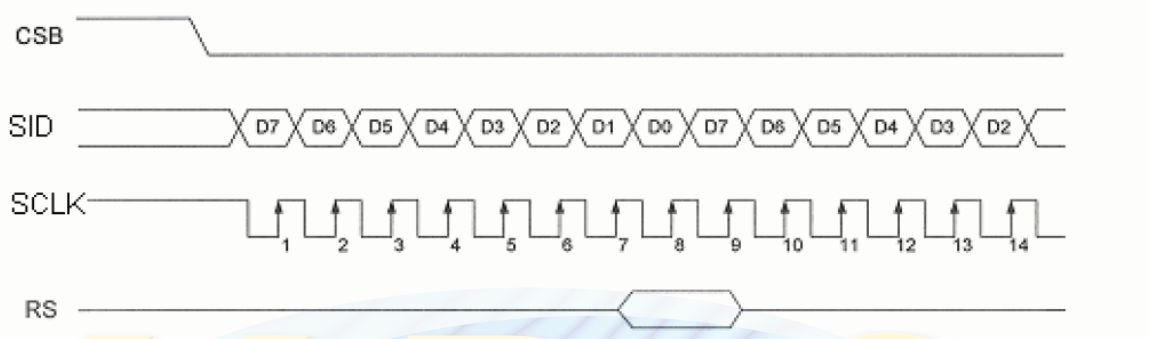
＊ ”—”：N/A

13. Interface with MPU

- **For serial interface data, bus lines (DB5 to DB7) are used. 4-Line SPI**

If 4-Pin SPI mode is used, CSB (DB5), SID (DB7), SCLK (DB6), and RS are used. They are chip selection; serial input data, serial clock input, and data/instruction section, relatively. The example of timing sequence is shown below.

➢ **Example of timing sequence**



Note: Following is the master SPI clock mode of MPU.
Idle state for clock is a high level，data transmitted on rising edge of SCLK, and data is hold during low level.

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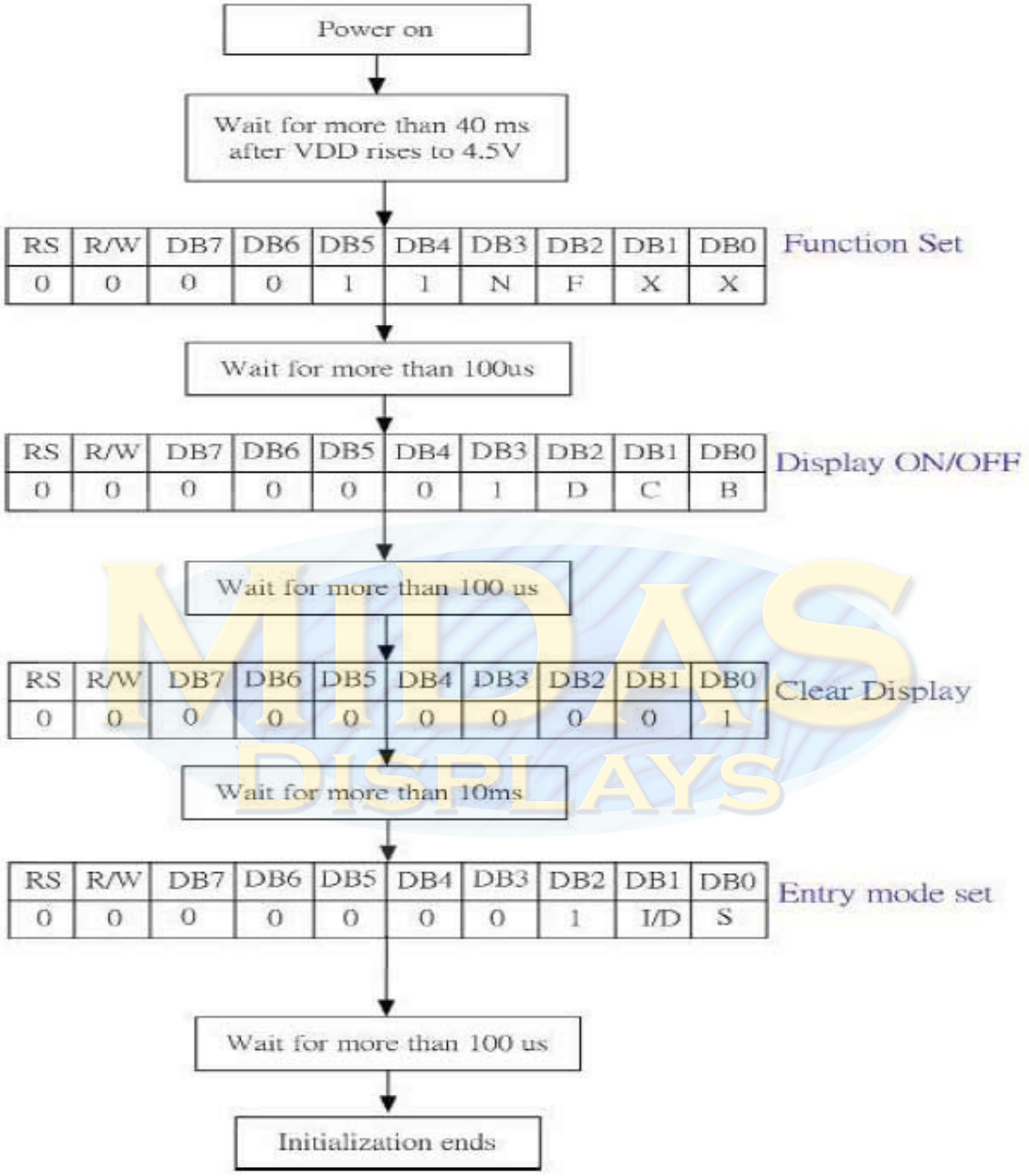
14. Initializing of LCM



Initial Code:

```
void InitRW1063(void)
{
    WriteInst (0x38);    //DL=1: 8 bits; N=1: 2 line; F=0: 5 x 8dots
    WriteInst (0x0c);    // D=1, display on; C=B=0; cursor off; blinking off;
    WriteInst (0x06);    // I/D=1: Increment by 1; S=0: No shift
}
```

15. Quality Assurance

Screen Cosmetic Criteria

Item	Defect	Judgment Criterion	Partition
1	Spots	A)Clear Size: d mm — Acceptable Qty in active area d ≦0.1 — Disregard 0.1<d≦0.2 — 6 0.2<d≦0.3 — 2 0.3<d — 0 Note: Including pin holes and defective dots which must be within one pixel size. B)Unclear Size: d mm — Acceptable Qty in active area d ≦0.2 — Disregard 0.2<d≦0.5 — 6 0.5<d≦0.7 — 2 0.7<d — 0	Minor
2	Bubbles in Polarizer	Size: d mm — Acceptable Qty in active area d≦0.3 — Disregard 0.3<d≦1.0 — 3 1.0<d≦1.5 — 1 1.5<d — 0	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor

16. Reliability

Content of Reliability Test

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Applicable Standard**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 96hrs	——
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°C 96hrs	——
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 96hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 96hrs	——
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	80°C, 90%RH 96hrs	——
High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	70°C, 90%RH 96hrs	——
Temperature Cycle	Endurance test applying the low and high temperature cycle. -30°C 25°C 80°C  30min 5min 30min 1 cycle	-30→80°C 10 cycles	——
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	——
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msedc 3 times of each direction	——

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25°C