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ALHAMMADI FOR ELECTRONICS

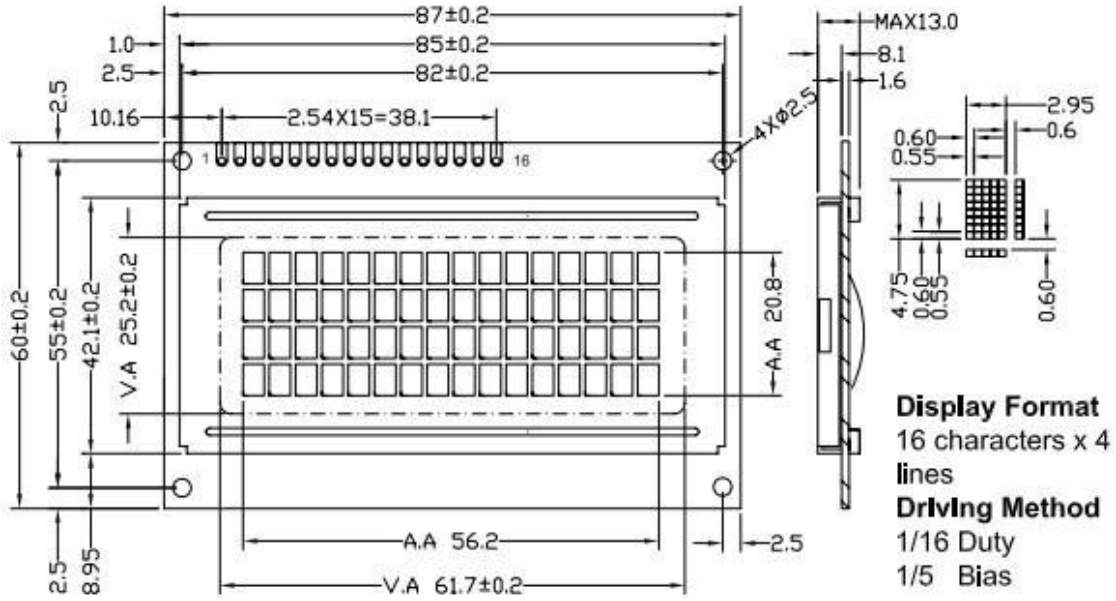
1604A LCD Instruction Manual

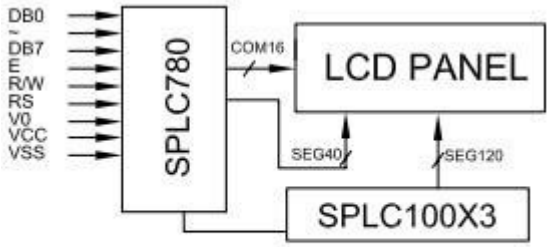
LCD Monitor Instruction Manual

directory

overview

1604A It is an industrial character type liquid crystal, which can display 16x04 or 64 characters at the same time. (16 columns and 4 rows) Second, the size of the module (as shown in the figure).





三、Pin Interface Description Table

numbering	symbol	Pin Description	numbering	symbol	Pin Description
1	**VSS**	Power Ground	**9**	**D2**	data
2	**VDD**	Power supply positive	**10**	**D3**	data
3	**VL**	Liquid crystal bias display	**11**	**D4**	data
4	**RS**	data/Command selection	**12**	**D5**	data
5	**R/W**	read/Write Select	**13**	**D6**	data

6	**E**	Enable the signal	**14**	**D7**	data
7	**D0**	data	**15**	**BLA**	Backlight positive
8	**D1**	data	**16**	**BLK**	Backlight anode

Pin **1**: **VSS** is the ground power.

Pin 2: **VDD** connected to **5V** positive power supply.

Pin **3**: **VL** is the contrast adjustment end of the LCD monitor, the contrast is the weakest when the power supply is connected, the contrast is the highest when grounded, and the "ghost" will be produced when the contrast is too high, and it can pass a **10K when used** The potentiometer adjusts the contrast.

Pin **4**: **RS** is the register selection, the data register is selected when the high level is high, and the instruction register is selected when the low level is selected.

Pin **5**: **R/W** is the read and write signal line, read at high level, write at low level. When **RS** and **R/W** are both low, you can write instructions or display addresses, **when RS** is low **and R/W** is high, you can read busy signals, and when **RS** is high Data can be written when R/W is low.

Pin **6**: The **E** terminal is the enable terminal, and when **the E** terminal jumps from high to low, the LCD module executes the command.

Pin **7~14**: **D0~D7** is **an 8-bit** bidirectional

data line. Foot **15**: Backlight positive.

Foot **16** : Backlight anode. **ⅣInstructions for the 1604LCD** and the timing **The controller inside the 1604** LCD module has a total of **11** control instructions, as shown in the table serial number	directives	**RS**	**R/W**	**D7**	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**
1	Clear display	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
2	Cursor returns	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	*****
3	set the input mode	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**I/D**	**S**
4	Show on/off control	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**D**	**C**	**B**
5	Cursor or character shift bit	**0**	**0**	**0**	**0**	**0**	**1**	**S/C**	**R/L**	*****	*****
6	set function	**0**	**0**	**0**	**0**	**1**	**DL**	**N**	**F**	*****	*****
7	Set the address of the memory where the character occurs	**0**	**0**	**0**	**1**	字符发生存贮器地址					
8	Set the address of the data storage	**0**	**0**	**1**	显示数据存贮器地址						
9	Read the busy sign or address	**0**	**1**	**BF**	Counter address						
10	Write counts **CGRAM** or **DDRAM**）	**1**	**0**	The content of the data to be written							

11	from **CGRAM** or **DDRAM** reading	**1**	**1**	The content of the data read out

14: Control Command Table

The read and write operations of the 1602 LCD module, as well as the operation of the screen and cursor, are all realized by instruction programming. (Note: **1** is high, **0** is low) Instruction **1**: Clear display, command code **01H,** cursor reset to address **00H** position. Instruction **2**: The cursor resets, and the cursor returns to address **00H**.

Instruction **3**: Cursor and Display Mode Settings **I/D**: Cursor move direction, high level to right, low level to move left **S:** Whether all text on the screen is moved left or right. A high level is valid, a low level is invalid.

Instruction **4**: Display switch control. **D**: Control the overall display on and off, high level means on display, low level means off display **C**: Control cursor on and off, high level means there is cursor, low level means no cursor **B**: Control whether the cursor flashes, high level flashes, low level does not flash.

Instruction **5**: Cursor or Display Shift **S/C**: Move the displayed text when high and move the cursor when low.

Instruction **6**: Function Setting Command **DL:** 4-bit bus at high and **8-bit** bus **at low N**: Single-line display at low **and F: F:** at high level A dot matrix character of 5x7 **is displayed at low** levels and a dot matrix character of 5x10 **is displayed at high levels**. Instruction **7**: Character generator **RAM** address setting.

Instruction **8**: **DDRAM** address setting.

Instruction **9**: Read the busy signal and cursor address **BF**: is the busy flag bit, the high level indicates busy, at this time the module cannot receive commands or data, if it is low, it means not busy.

Instruction **10**: Write data.

Instruction 11: Read data.

Five. Basic Operation Timing

Diagram: Read operation sequence

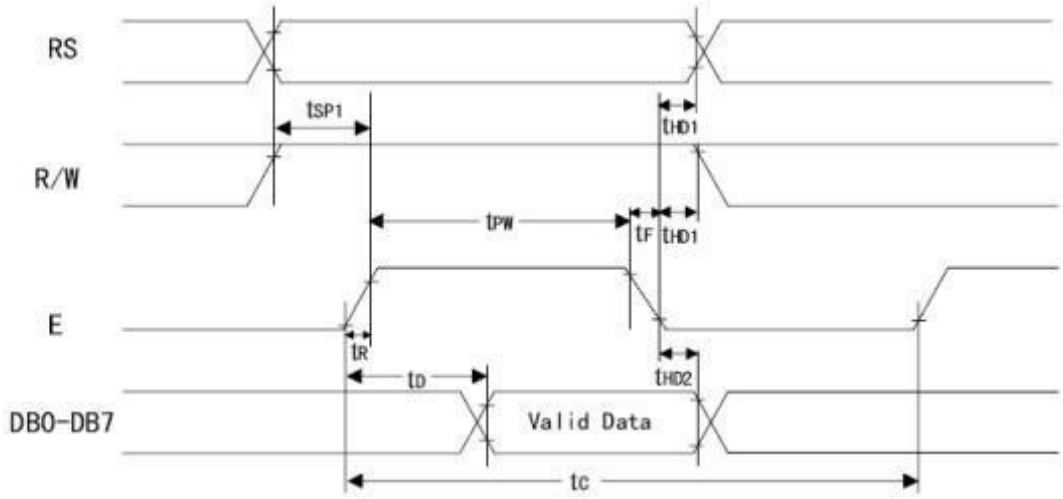
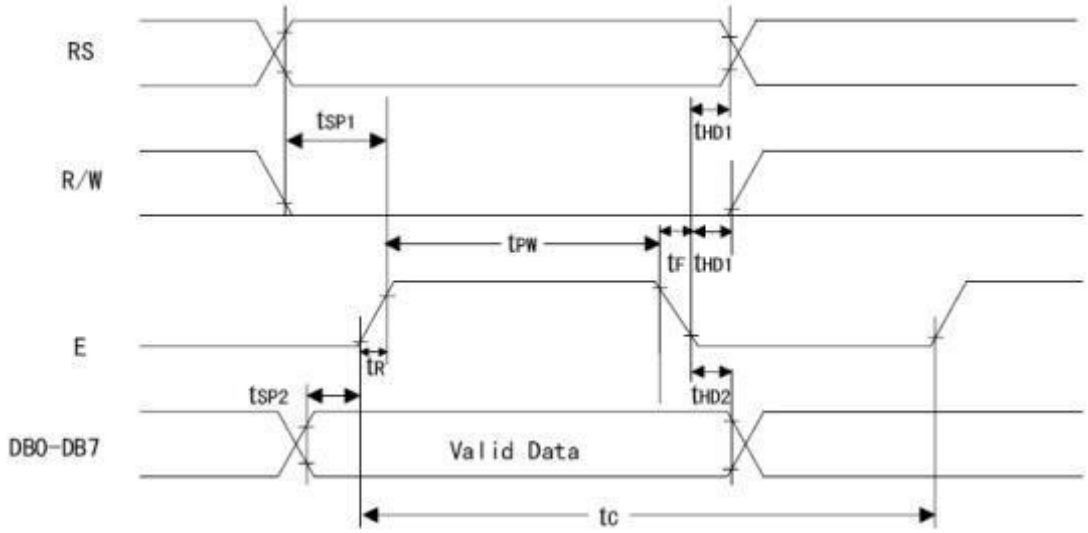


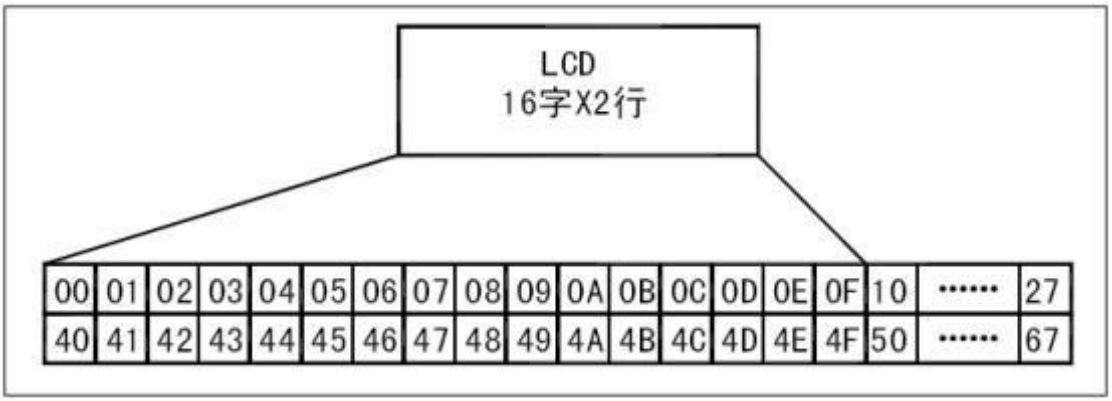
图: 写操作时序



The 1604LCD RAM address mapping and standard font table LCD module is a slow display device, so be sure to confirm that the module's busy sign is low before executing each instruction

Ping, which means that it is not busy, otherwise this command will be invalid. To display a character, you first enter the display character address, which tells the module where to display the character.

Six . 1602 inside division display show earth location (as fig)



For example, if the address of the first character of the second line is **40H**, then whether you write **40H directly** can position the cursor on the second line

What about the position of a character? This is not possible, because the highest bit **D7 is** required to be constant high level **1 when writing to the display address,** so the actual written data should be **01000000B(40H)+10000000B(80H)=11000000B(C0H)** 。

In the initialization of the LCD module, the display mode should be set first, and the cursor will automatically move right when the LCD module displays characters

without human intervention. Before entering the command every time, it is necessary to judge whether the LCD module is busy. **The 1602** LCD module's internal character generation memory **(CGROM)** already stores **160** different dot matrix character graphics, as **shown in Figure 10-58**, these characters are: Arabic numerals, upper and lower case of English letters, commonly used symbols, and Japanese kana. Each character has a fixed code, for example, the code of the uppercase English letter **"A"** is **01000001B(41H)**, and when it is displayed, the module displays the **dot matrix character graphics in the address 41H**, and we can see the letters **"A"**

表 13-4 CGROM 和 CGRAM 中字符代码与字符图形对应关系

高位 / 低位	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
××××0000	CGRAM (1)		0	@	P	\	p		ー	タ	三	α	P
××××0001	(2)	!	1	A	Q	a	q	口	ア	チ	ム	ä	q
××××0010	(3)	"	2	B	R	b	r	r	イ	川	メ	β	θ
××××0011	(4)	#	3	C	S	c	s	」	ウ	ラ	モ	ε	∞
××××0100	(5)	$	4	D	T	d	t	、	エ	ト	セ	μ	Ω
××××0101	(6)	%	5	E	U	e	u	ロ	オ	ナ	ユ	B	O
××××0110	(7)	&	6	F	V	f	v	テ	カ	ニ	ヨ	P	Σ
××××0111	(8)	>	7	G	W	g	w	ア	キ	ヌ	ラ	g	π
××××1000	(1)	(	8	H	X	h	x	イ	ク	ネ	リ	∫	X
××××1001	(2)	)	9	I	Y	i	y	ウ	ケ	」	ル	-1	y
××××1010	(3)	*	:	J	Z	j	z	エ	コ	リ	レ	j	千
××××1011	(4)	+	;	K	[	k	{	オ	サ	ヒ	ロ	x	万
××××1100	(5)	フ	<	L	¥	l	|	セ	シ	フ	ワ	¢	円
××××1101	(6)	-	=	M	]	m	}	ユ	ス	ヘ	ソ	ŧ	÷
××××1110	(7)	.	>	N	^	n	→	ヨ	セ	ホ	ハ	n̄	
××××1111	(8)	/	?	O	-	o	←	ツ	ソ	マ	ロ	Ö	

The 1604LCD has a 15mS delay in the typical initialization (reset) process

Write instruction **38H** (does not detect busy signal) with a delay **of 5mS**

In the future, every time you write a command or

read/write data, you need to detect the busy signal

write command **38H**: Display mode setting write

command **08H**: Display off write command **01H**:

Display clear screen

Write Command 06H: Display Cursor Movement Setting Write Command

0CH: Show On and Cursor Setting