

# LONGTECH

## OPTICS

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## SPECIFICATIONS OF LCD MODULE

MODULE NO : LCDRS2 Driver

REVISION: 00

	SIGNATURE	DATE
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### 1. Features

- +5V power supply
- Communicate over RS232 interface
- Assembled with 1602A, 1602B, 1602K or 1602S character displays, with or without back lighting
- LCD Backlighting controlled via software.
- Up to 8 custom characters can be defined
- Low current consumption - without LCD backlight is about 4mA

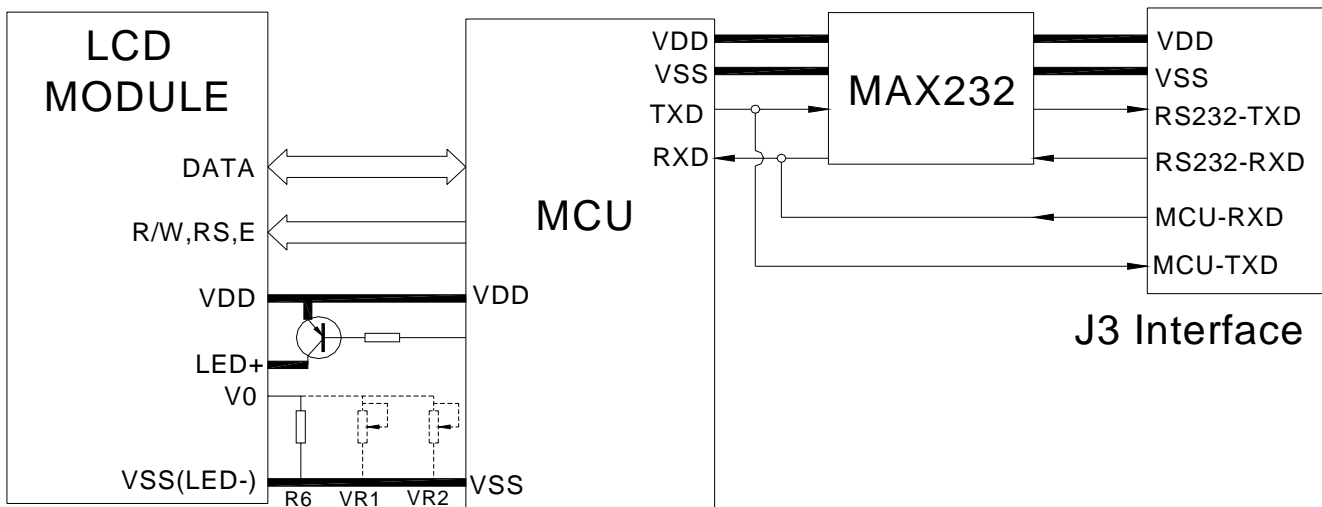
### 2. Mechanical Specifications

Module size	58 mm(L)* 30 mm(W)* Max 8 (H)mm
Viewing area	
Character size	
Character pitch	
Weight	Approx.

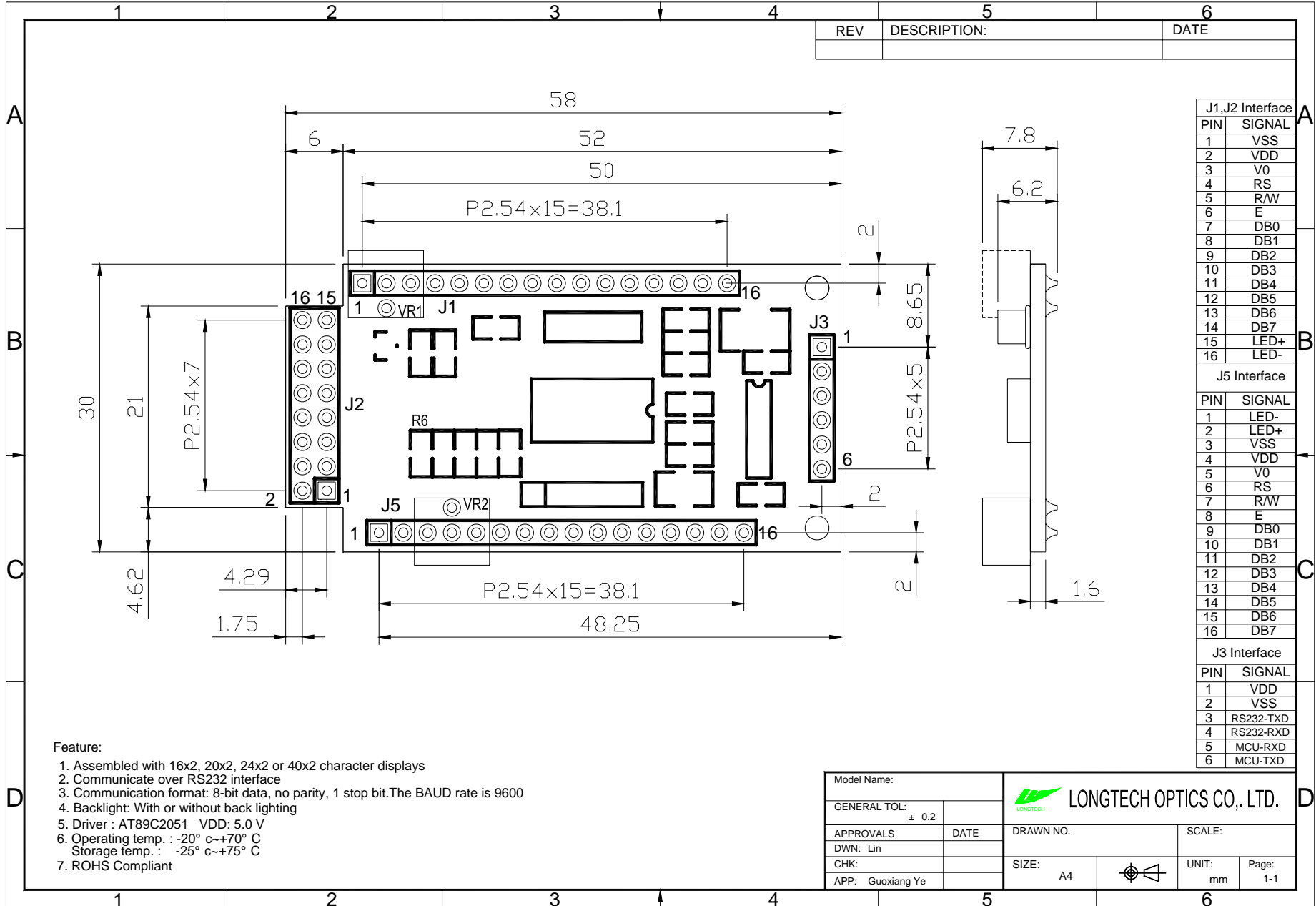
### 3. Absolute maximum ratings

Item	Symbol	Standard			Unit
Power voltage	$V_{DD}-V_{SS}$	0	-	5.5	V
Input voltage	$V_{IN}$	VSS	-	VDD	
Operating temperature range	$V_{OP}$	-20	-	+70	°C
Storage temperature range	$V_{ST}$	-30	-	+80	

### 4. Block diagram



# 5.Outline dimension



## 6.Interface PIN Description

### PIN Description (J1,J2)

Pin no.	Symbol	External connection	Function
1	VSS	Power supply	Signal ground for LCM (GND)
2	VDD		Power supply for logic (+5V) for LCM
3	V0	LCD Module	Contrast adjust
4	RS		Register select signal
5	R/W		Read/write select signal
6	E		Operation (data read/write) enable signal
7~10			NC
11~14	DB4~DB7		Four high order bi-directional three-state data bus lines.Used for data transfer between the MPU
15	LED+	LED BKL power supply	Power supply for BKL
16	LED-		Power supply for BKL(VSS)

### PIN Description (J5)

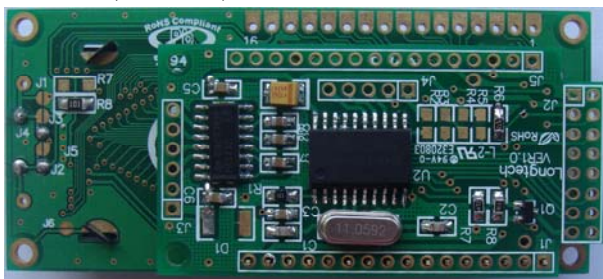
Pin no.	Symbol	External connection	Function
1	LED-	LED BKL power supply	Power supply for BKL(VSS)
2	LED+		Power supply for BKL
3	VSS	Power supply	Signal ground for LCM (VSS)
4	VDD		Power supply for logic (+5V) for LCM
5	V0	LCD Module	Contrast adjust
6	RS		Register select signal
7	R/W		Read/write select signal
8	E		Operation (data read/write) enable signal
9~12			NC
13~16	DB4~DB7		Four high order bi-directional three-state data bus lines.Used for data transfer between the MPU

### PIN Description (J3)

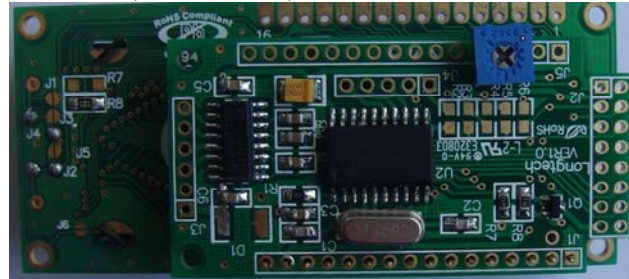
Pin no.	Symbol	External connection	Function
1	VDD	Power supply	Power supply for logic (+5V) for module
2	VSS	Power supply	Signal ground for module (GND)
3	RS232-TXD	PC	Data from LCD
4	RS-232-RXD	PC	Data to LCD
5	MCU-RXD	MCU	NC
6	MCU-TXD	MCU	NC

## 7.Contrast adjust

Used R6 (All LCM)



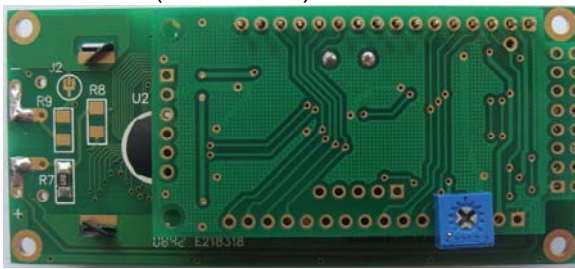
Used VR1(LCM1602K1)



Used VR2(LCM1602B,LCM1602S)



Used VR2(LCM1602K)



### 8. Electrical characteristics

#### DC characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage for LCD	$V_{LCD}$	$T_a = 25^{\circ}C$	-		5.0	V
Input voltage	$V_{DD}$		4.8	5.0	5.3	
Supply current	$I_{DD}$	$T_a = 25^{\circ}C, V_{DD} = 5.0V$	-	4	8	mA
“H” level input voltage	$V_{IH}$		2.2	-	$V_{DD}$	V
“L” level input voltage	$V_{IL}$	Twice initial value or less	0	-	0.6	
“H” level output voltage	$V_{OH}$	LOH=-0.25mA	2.4	-	-	
“L” level output voltage	$V_{OL}$	LOH=1.6mA	-	-	0.4	
Backlight supply voltage	$V_{LED}$		-	4.8		
Backlight supply current	$I_{LED}$	$V_{LED} = 5.0V$				mA

### 9. FUNCTION DESCRIPTION

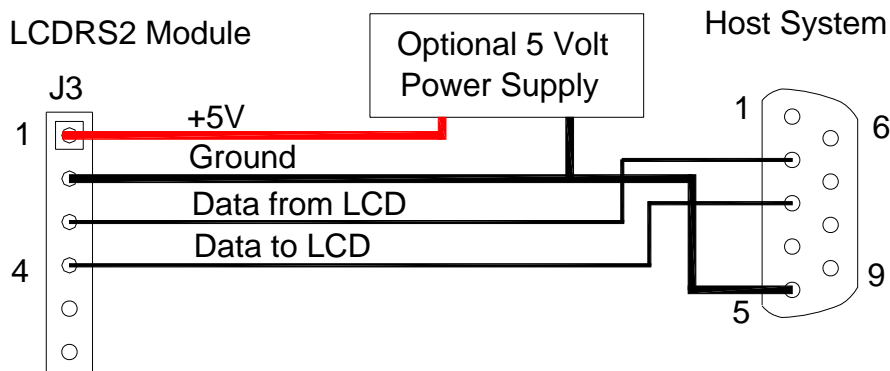
#### ➤ RS-232 Communications

The RS-232 connector on the PC cable is wired so that a standard “straight through” 9 pin D-sub cable may be used to connect the module to a standard serial port such as COM ports on PCs. Note that this device complies with the EIA232 standard in that it uses signal levels from  $\pm 12V$  to  $\pm 12V$  and can be converted to TTL levels as well. The LCDRS2 is set at **9600** bps default speed. Other settings are:

**8 bits, no parity, 1 stop bit.**

#### ➤ DB9 Connection

A standard DB-9F is provided for RS-232 communications. Power may also be supplied via this connector if desired.



#### ➤ Basic Operation

Once the LCDRS2 is properly connected and configured it is simple to talk to it serially, data sent to it will appear on the display. For example, if you send “Hello” then “Hello” appears on the display. The cursor (printing position) automatically moves from left to right. You can also send commands to the LCDRS2. LCDRS2 supports one type of simple command protocols, described below. Which allow you to connect the LCDRS2 to serial port and start using it. All the commands have prefix of ASCII 254 (0xFE, 11111110 binary). The interface treats the Byte immediately after the prefix as a command depending on the command

**10. Advanced operation Commands:**

➤ **Turn On Display**

Syntax            hexadecimal 0xFE    0x41

Parameter	Parameter	Length	Description
	None	None	Turn on LCD screen

Description    This command turn on the LCD display screen, the display text is not altered.  
 Default        LCD screen is on

➤ **Turn Off Display**

Syntax            hexadecimal 0xFE    0x42

Parameter	Parameter	Length	Description
	None	None	Turn off LCD screen

Description    This command turn off the LCD display screen, the display text is not altered.  
 Default        LCD screen is on

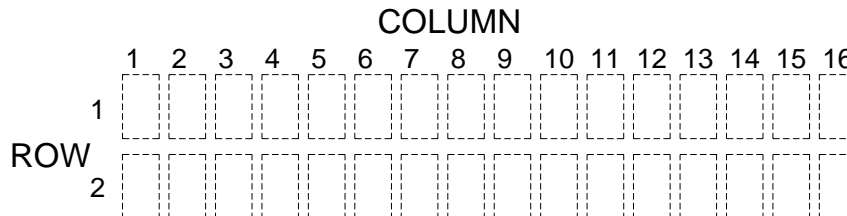
➤ **Set Cursor Position**

Syntax            hexadecimal 0xFE    0x45 [column] [row]

Parameter	Parameter	Length	Description
	[column]	1 byte	Columns have values from 1 to 16 (0x01 to 0x10)
	[row]	1 byte	Rows have values of 1 to 2 (0x01 to 0x02).

Description    Set the cursor position (text insertion point) to the [column] and [row] specified. A typical cursor position for a 2-line display is show below; a cursor position outside these ranges will not be viewable.

Default        After a reset, the cursor is on position column=1, row=1.



➤ **Home Cursor**

Syntax            hexadecimal 0xFE    0x46

Parameter	Parameter	Length	Description
	None	None	Position cursor at column 1, row 1

Description    This command move the cursor to row 1, column 1 of the LCD screen, the display text is not altered.

Default        None

➤ **Turn On Underline Cursor**

Syntax            hexadecimal 0xFE    0x47

Parameter	Parameter	Length	Description
	None	None	Turn on underline cursor

Description This command turn on the underline cursor, the cursor position is where the next character will appear.  
 Default The underline cursor is on.

➤ **Turn Off Cursor**

Syntax hexadecimal 0xFE 0x48

Parameter	Parameter	Length	Description
	None	None	Turn off underline cursor

Description This command turn off the cursor.  
 Default The underline cursor is on.

➤ **Move Cursor Left One Space**

Syntax hexadecimal 0xFE 0x49

Parameter	Parameter	Length	Description
	None	None	Move cursor left 1 space

Description This command move the cursor position left 1 space, regardless the cursor is displayed or not, and the displayed character is not altered  
 Default None

➤ **Move Cursor Right One Space**

Syntax hexadecimal 0xFE 0x4A

Parameter	Parameter	Length	Description
	None	None	Move cursor right 1 space

Description This command move the cursor position right 1 space, regardless the cursor is displayed or not, and the displayed character is not altered  
 Default None

➤ **Turn On Blinking Cursor**

Syntax hexadecimal 0xFE 0x4B

Parameter	Parameter	Length	Description
	None	None	Turn on the blinking cursor

Description This command turn on the blinking cursor, both the cursor and the character on the cursor will blink.  
 Default The blinking cursor is off.

➤ **Back Space**

Syntax hexadecimal 0xFE 0x4E

Parameter	Parameter	Length	Description
	None	None	Move cursor back one space and delete the character on the cursor.

Description This command is destructive backspace, the cursor is moved back one space and the character on the cursor is deleted.  
 Default None.



➤ **Clear Screen**

Syntax hexadecimal 0xFE 0x51

Parameter	Parameter	Length	Description
	None	None	Clear LCD and move cursor to column 1 row 1.

Description This command clears the entire display and place the cursor at column 1 row 1.  
Default None.

➤ **Set Backlight on**

Syntax hexadecimal 0xFE 0x52

Parameter	Parameter	Length	Description
	None	None	Set the backlight on

Description This command set the backlight on.  
Default Default backlight off.

➤ **Set Backlight off**

Syntax hexadecimal 0xFE 0x53

Parameter	Parameter	Length	Description
	None	None	Set the backlight off

Description This command set the LCD display backlight off.  
Default Default backlight off.

➤ **Load Custom Characters**

Syntax hexadecimal 0xFE 0x54 [position] [D0 ...D7]

Parameter	Parameter	Length	Description
	[position]	1 byte	Custom character address, 0 – 7
	[D0..D7]	8 bytes	Custom character pattern bit map

Description There are space for eight user defined custom characters, this command load the custom character into one of the eight locations. The custom character pattern is bit mapped into 8 data bytes, the bit map for Spanish character '¿' is shown in table below, to display the custom character, user simply enter the address of the character (0 to 7).

Default None.

Bit	7	6	5	4	3	2	1	0	Hex
Byte 1	0	0	0	0	0	1	0	0	0x04
Byte 2	0	0	0	0	0	0	0	0	0x00
Byte 3	0	0	0	0	0	1	0	0	0x04
Byte 4	0	0	0	0	1	0	0	0	0x08
Byte 5	0	0	0	1	0	0	0	0	0x10
Byte 6	0	0	0	1	0	0	0	1	0x11
Byte 7	0	0	0	0	1	1	1	0	0x0E
Byte 8	0	0	0	0	0	0	0	0	0x00

➤ **Shift Display to the Left**

Syntax hexadecimal 0xFE 0x55 [row]

Parameter	Parameter	Length	Description
	[row]	1 byte	[row]=0: Shift the LCD screen to the left one Place. [row]=1: Shift the display of line 1 to the left one Place. [row]=2: Shift the display of line 2 to the left one Place.

Description This command shift the display one place to the left, the cursor position also moves with the display, and the display data is not altered.

Default None

➤ **Shift Display to the Right**

Syntax hexadecimal 0xFE 0x56

Parameter	Parameter	Length	Description
	[row]	1 byte	[row]=0: Shift the LCD screen to the right one Place. [row]=1: Shift the display of line 1 to the right one Place. [row]=2: Shift the display of line 2 to the right one Place.

Description This command shift the display one place to the right, the cursor position also moves with the display, and the display data is not altered.

Default None

➤ **Display Firmware Version Number & RS232 Baud Rate**

Syntax hexadecimal 0xFE 0x57

Parameter	Parameter	Length	Description
	None	None	Display the firmware version number.

Description This command display the micro-controller firmware version number. and display the current RS232 BAUD rate.

Default None.

➤ **Direct HD44780 Command**

Syntax hexadecimal 0xFE 0x58 [cmd]

Parameter	Parameter	Length	Description
	[cmd]	1 byte	Direct interface to the LCD controller, HD44780.

Description This command is for advanced programmer, it allows LCD instruction to send directly to the HD44780 controller.

Default None.

➤ **ASCII TEXT**

To display normal text, just enter its ASCII number, a number from 0x00 to 0x07 displays the user defined custom character, 0x20 to 0x7F displays the stand set of characters. And numbers from 0xA0 to 0xFD display characters and symbols that are factory-masked on the HD44780 controller and 0xFE is reserved for function command.

## 11. Command Summary

Prefix	CMD	Param	Description
0xFE	0x41	None	Turn On Display 显示开
0xFE	0x42	None	Turn Off Display 显示关
0xFE	0x45	2 Byte	Set Cursor Position 设置光标位置
0xFE	0x46	None	Home Cursor 光标归位
0xFE	0x47	None	Underline cursor on 光标开
0xFE	0x48	None	cursor off 光标关
0xFE	0x49	None	Move cursor left one place 光标左移一位
0xFE	0x4A	None	Move cursor right one place 光标右移一位
0xFE	0x4B	None	Blinking cursor on 光标闪烁开
0xFE	0x4E	None	Backspace 退格
0xFE	0x51	None	Clear screen 清屏
0xFE	0x52	None	Set backlight on 设置背光亮
0xFE	0x53	None	Set backlight off 设置背光关
0xFE	0x54	9 Byte	Load custom character 载入定制字符
0xFE	0x55	1 Byte	Move display one place to the left 显示左移一位
0xFE	0x56	1 Byte	Move display one place to the right 显示右移一位
0xFE	0x57	None	Display firmware version number 显示版本, Display RS232 BAUD rate 显示 232 波特率 显示行列数量
0xFE	0x58	1 Byte	Send control byte to LCD 发送字节数据