

DFL-D44780 Serial LCD Interface IC

(Pb free)

Features:

- RS232 and TTL-Level Compatible
- Compatible with HD44780 LCD
- Full support text with 4x20 characters or 2x20 characters or 1x20 characters
- Partly support text with 1*40 characters or 2*40 characters
- 4800 Serial Baud rates
- Not need RS232 Voltage converter, not need polarity selection
- Available in 18 pin DIP (300mils) or SOIC Packages
- Cost effective for OEM applications

The DFL-D44780 Serial LCD Interface IC is designed to interface a HD44780 LCD to a microcontroller. HD44780 is widely used in industry for text display. It allows nearly any text-based LCD module to be controlled via a simple one-wire data link, freeing an additional 6 to 11 I/O lines on your microcontroller system, which frequently allows a smaller, less costly

Microcontroller to be utilized in your design. We advise the customers **read HD44780 LCD datasheet firstly** before reading this datasheet.

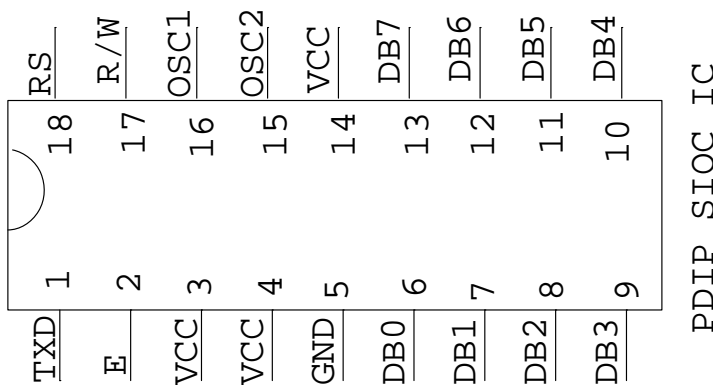


Table 1 PDIP SOIC footprint:

Pin 1	Rxd	Pin 10	DB4
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Pin 2	E	Pin 11	DB5
Pin 3	VCC	Pin 12	DB6
Pin 4	VCC	Pin 13	DB7
Pin 5	Gnd	Pin 14	VCC
Pin 6	DB0	Pin 15	OSC2
Pin 7	DB1	Pin 16	OSC1
Pin 8	DB2	Pin 17	R/W
Pin 9	DB3	Pin 18	RS

Rxd: Input pin. Serial Data in (8-N-1), 4800 Baudrate. You connect it directly to uart if you use TTL/CMOS voltage for serial communication. You must use a 33K ohm of serious resistor to connect to RS232 if you use RS232 voltage level

RS: Output pin. LCD Register selection line

RW: Output pin. LCD Read/Write selection line

E: Output pin. LCD Enable signal line

DB0: bidirectional port pin. LCD data 0 (LSB)

DB1: bidirectional port pin. LCD data 1

DB2: bidirectional port pin. LCD data 2

DB3: bidirectional port pin. LCD data 3

DB4: bidirectional port pin. LCD data 4

DB5: bidirectional port pin. LCD data 5

DB6: bidirectional port pin. LCD data 6

DB7: bidirectional port pin. LCD data 7 (MSB)

OSC1: input pin. It's one pin of 4MHz Parallel-cut crystal or resonator, or a direct clock input

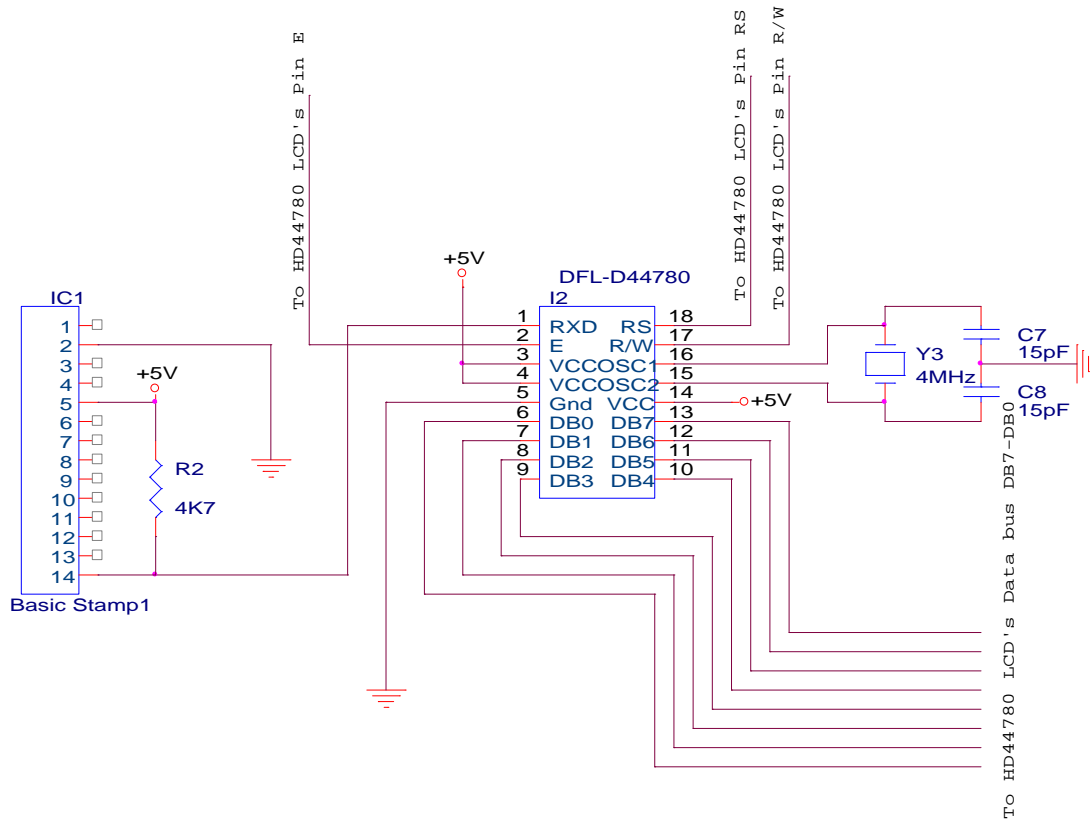
OSC2: Output pin. It's other pin of 4MHz Parallel-cut crystal or resonator, or leave it unconnected if OSC1 driven with a clock input

VCC: Power pin. Connect to the positive side of DC power supply which is 3.3VDC or 5 VDC according to LCD voltage supply

Gnd: Power pin. Connect to the negative side of DC power supply

PC CONNECTION

Fig.2 Connection to BASIC STAMP1 host MCU



USING THE DFL-D44780 SERIAL LCD CONTROLLER

There are 2 working modes in DFL-D44780. One is terminal display mode; the other is direct control mode. In terminal display mode, the DFL-D44780 can be written to in much the same way as a terminal display device. It receives standard ASCII characters and writes them to the display screen. And, the DFL-D44780 will interpret several ASCII control commands and perform specific functions as directed by them. This section explains the use of the various commands available on the DFL-D44780. Upon power up, your host controller should be programmed to wait approximately 30 ms for the LCD to initialize. After this, the DFL-D44780 enters the terminal display mode automatically. The display is ready to receive data for display. The first character written to the DFL-D44780 will be displayed in the upper-left hand corner of display. Subsequent character writes to the DFL-D44780 will cause the cursor location to increment by one for each character written. Most ASCII characters can be displayed on the LCD. However, the DFL-D44780 will intercept some ASCII control characters and not display them on the screen, instead performing a specific command upon the LCD module. The table 2 shows the ASCII codes that will be intercepted by the DFL-D44780

Table 2 The command table of ASCII code in terminal display mode

Binary value	command	description
0000 1101	Carriage Return	Invisible cursor moved to next line, column unchanged
0000 1010	Line Feed	Invisible cursor moved to column 0 and next line
0000 1100	Form Feed	Clear screen and cursor moved to line 0 column 0.
0000 1000	Backspace	Cursor position decreased by 1, character was replace with space
1111 1110	HD44780 Direct control	Enter HD44780 direct control mode

The DFL-D44780 will enter direct control mode when it receives "1111 1110"

The table 3 shows the command in direct control mode. It is almost compatible to HD44780 command

Table 3 The commands in direct control mode

Binary value	Command
0 0 0 0 0 0 1	Clear display and return cursor to home position.
0 0 0 0 0 1 X	Home Cursor
0 0 0 0 1 I/D S	Sets cursor move direction & shifting. I/D=1 for increment, S=1 for shift.
0 0 0 0 1 D C B	Sets display on (D), cursor on (C), blink on (B). 1=on, 0=off.
0 0 0 1 S/C R/L X X	Moves cursor and shifts display without affecting DDRAM. S/L=1: display shift; 0=cursor movement. R/L=1, shift right; 0=left.
0 0 1 DL N F X X	Sets data length (DL), number of lines (N), and character font (F). DL=1:8 bit; 0=4 bit. N=1:2 lines; 0=1 line. F=1:5x10;0=5x7 dots
0 1 X X X X X X	Set CGRAM Address. Character data is sent after receiving this setting
1 X X X X X X X	Set DDRAM Address. Data display address is set using this command.
1 1 1 1 1 1 1	Return terminal display mode

The host microcontroller's basic program should be the following

- Step 1: Initiate the UART port as "4800 8N1"
 Step 2: Delay about 30ms to wait DFL-D44780 initialization
 Step 3: Send the string of display, such as "Hello! HD44780 LCD!\n"

You can enter HD44780 direct control mode if you want to control cursor's position and you want to display cursor or blink cursor. You cannot output display ASCII code in direct control mode. You have to return to terminal display mode and then output display ASCII code. In the HD44780 direct control mode, after you send "0 1 X X X X X X" (Set CGRAM Address), you have to send self-definition character dot-matrix data. At last you send "1111 1110" to end the character dot-matrix data.

- **IMPORTANT NOTE:** You'd better turn off cursor display before you send "0 1 X X X X X X" (Set CGRAM Address) to modify self-definition character dot-matrix data. After you finish sending dot-matrix data, you may turn on cursor display.

For 1*40 or 2*40 LCD, You can use DFL-D44780 if you don't use direct control mode to modify DDRAM address.

- **IMPORTANT NOTE:** The DFL-D44780 does not support hot-plug. You have to connect UART firstly, and then turn on power. Otherwise, some logic error will occur.
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Electrical Specification

Absolute Maximum ratings

Oscillator Frequency.....	4MHz
VCC.....	6.5V
Ambient Temperature under bias.....	-40 to +125
Max output current sunk by any I/O Pin.....	25 mA
Max output current sourced by any I/O Pin.....	25 mA

DC Characteristics:

Standard operating Temperature: -40 to 85

Average current draw: less than 350uA when Vcc=2.0, less than 1mA when Vcc=3.3V

VCC: min:2VDC Max:5.5VDC

VIL for Osc1----- Input low voltage: max=0.3Vcc

VIH for Osc1----- Input high voltage: min=0.7Vcc
VOH-----Output high voltage(Pin Osc2): min=VCC-0.7
VOL-----Output low voltage(Pin Osc2): max=0.6

Packaging Information

DFL-D44780/P is PDIP (300mils) packaging

DFL-D44780/S is SIOC packaging

18-Lead Plastic Dual In-Line (P)-300 mil Body [PDIP]

18-Lead Plastic Small Outline (SO)-Wide, 7.5 mm Body [SOIC]

IMPORTANT NOTICE

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