Device: DSP-16S16M

Document Version: 1.0

Matches module version: [2 June 2017 v2]

Date: 18 September 2017

Description: 16-digit 16 segment micro display

Contents

Introduction

The DSP-16S16M is a 16-digit sixteen segment LED display based off Hewlett-Packard's HPDL-1414 4-digit smart LED modules.

Features

The DSP-16S16M has a UART serial interface and I2C connection, allowing easy control from your microcontroller.

Construction

It's all pre-built! Just add female or male header pins, or solder directly to the board, and away you go.

Connections

The DSP-16S16M has 4 connection ports.

LED Display Power Port

VLED	Positive supply (5V)
GND	Ground connection

I2C Port

VCC	Positive supply (3.3V - 5V)
SDA	I2C data
SCL	I2C clock
GND	Ground connection

TTL Serial Port

TX	UART serial transmit (out)
RX	UART serial receive (in)
GND	Ground connection
VCC	Positive supply (3.3V – 5V)

ICSP Port

MCLR	Reset
VCC	Positive supply
GND	Ground connection
PGD	Data
PGC	Clock
NC	No connection

The ICSP port can be used for firmware updates of the on-board microcontroller, or to completely reprogram it. Generally you shouldn't need to use it.

Power

The DSP-16S16M has two separate power pins. The on-board microcontroller can be powered from 3.3V to 5V, but the LED display requires its own power due to a higher current consumption.

If you have a 3.3V microcontroller you're interfacing the display with, you can provide the 3.3V on the I2C or Serial port.

If you have a 5V microcontroller, then you can solder the "VCC – 5V" pads together to save having to power the on-board microcontroller.

Commands

I2C commands begin with a command identifier, followed by the data appropriate for the command. The device I2C address is 0x1C, or 28 decimal.

Serial commands are terminated by carriage return (character 13). The initial bit rate of the serial port is 9600 bps.

I2C Command	Serial Command	Parameters (bytes)	Details
0x00	test	N/A	Cycles through and displays all characters
0x01	clear	N/A	Empties the display buffers
0x02	paint	N/A	Displays data in display buffer
0x03	put_char	<char><position>	Place *char* at *position* to be displayed at next call
0x04	put_str	<data> String data	Place string *data* into display buffer to be displayed at next call
0x05	scroll	<data> data - 0-100	Place string *data* into scroll buffer to be played at next call
0x06	speed	<speed>	Change delay time between scroll frame change (in milliseconds)
0x07	play	N/A	Starts the scrolling of data in scroll buffer
0x08	query	N/A	Asks MCU if scrolling is finished. 0xFF if it's still scrolling

Command Examples

Action: print "x" on position 3 (3rd position from the right)
Serial: put_char "x" 2<enter>
Serial: paint<enter>
I2C: 0x03 0x58 0x03 [put_char command]
I2C: 0x02 [paint command]

Action: print "hello"
Serial: put_str "hello"
Serial: paint
I2C: 0x04 0x48 0x45 0x4C 0x4C 0x4F [put_str command]
I2C: 0x02 [paint command]

NOTE: strings are right-justified

Action: scroll the words "I am scrolling"
Serial: scroll "I am scrolling"
Serial: play
I2C: 0x05 0x49 0x20 0x41 0x4D 0x20 0x53 0x43 0x52 0x4F 0x4C 0x4C 0x49 0x4E 0x47 [scroll command]
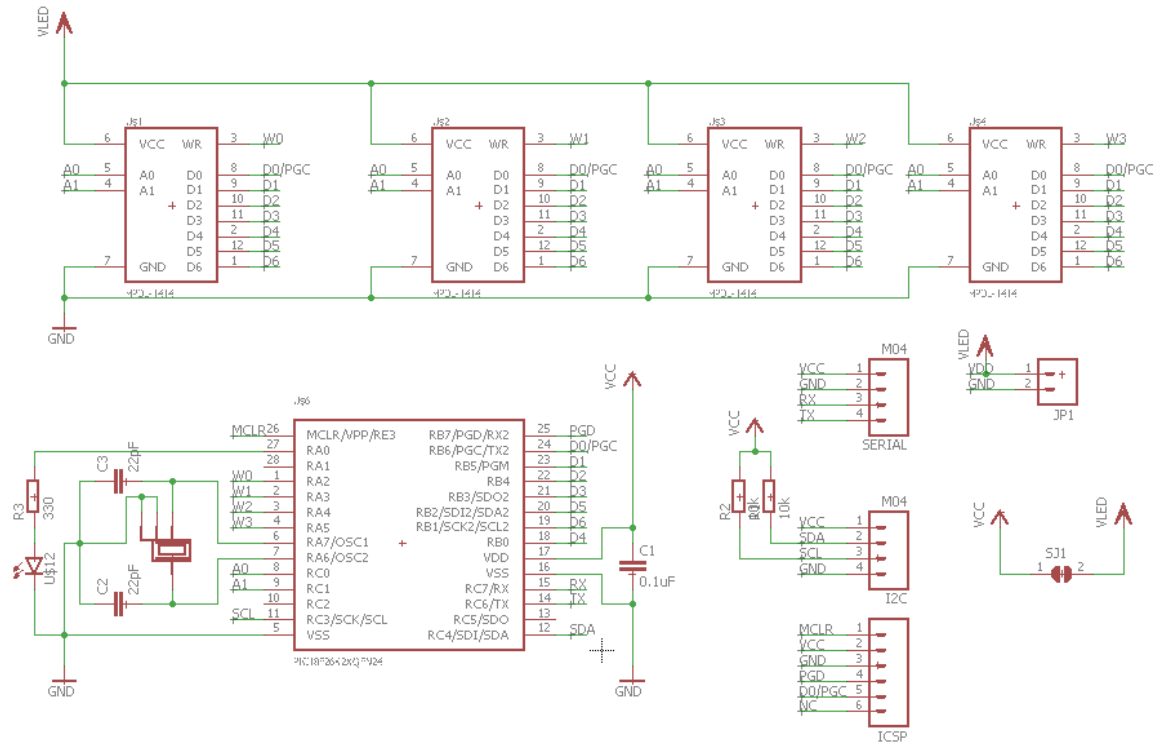I2C: 0x07 [play command]

REMEMBER:

1. all serial commands must be terminated with a carriage return, "\r"
2. All letters will be displayed as upper-case letters, even if lower-case letters are sent

Character Bank

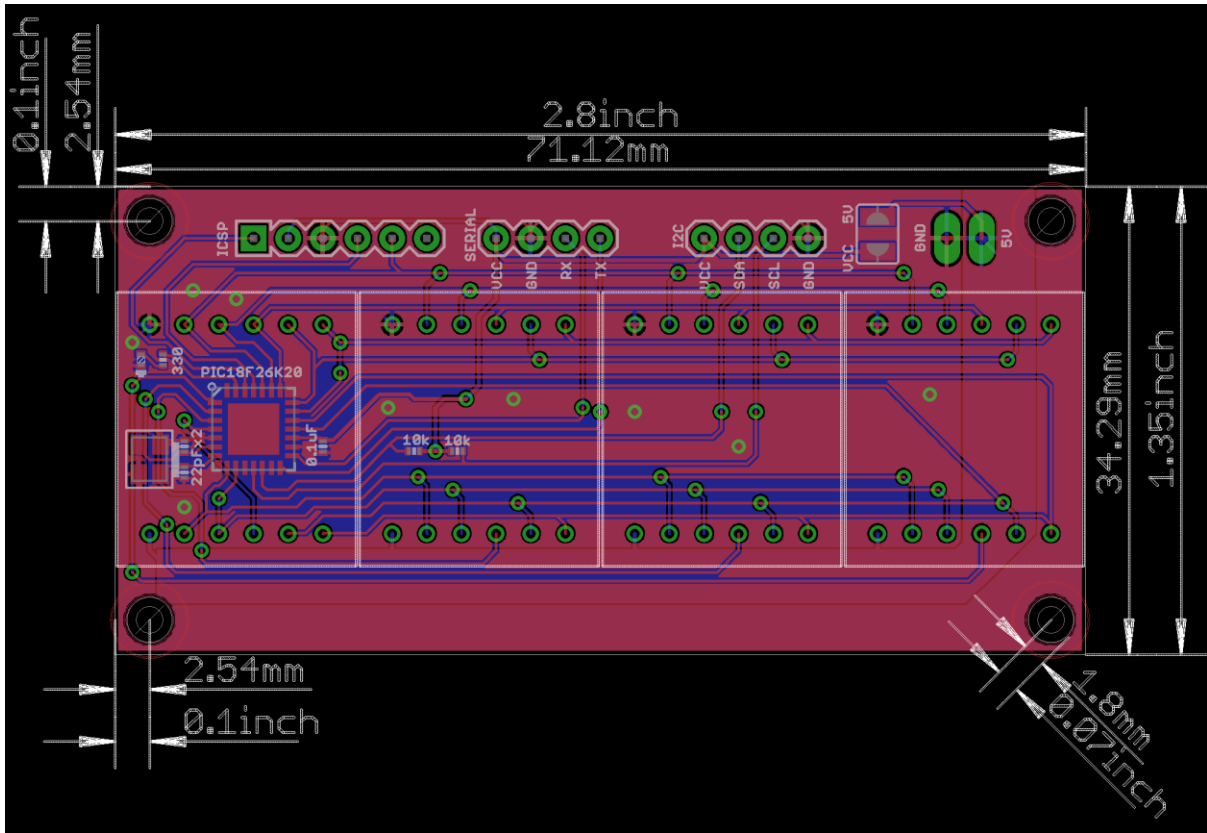| 0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
(space)	!	''	#	$	%	&	/	〈	〉	✳	+	,	—	.	/
0	1	2	3	4	5	6	7	8	9	⸬	7	∠	=	〉	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_

Figure 1: HPDL-1414 datasheet

Schematic

The on-board microcontroller, the PIC18F26K22, drives all the LED modules through the ADDR bus, the DATA bus, and WR pins.

PCB

Versions

Doc Version	Date	Comments
1	18 Sep 2017	Initial Version for board v2 [2 June 2017 v2]