

# embedded adventures

Device: DSP-7S04H

This document Version: 1

Date: 23 March 2015

Description: 2.3" 4x 7 segment display module with decimals

Matches module hardware version: [28 Jan 2015 v2]



## Table of Contents

Introduction.....	3
Features.....	3
Connections.....	3
Power .....	4
Commands .....	4
Print .....	4
Dot.....	4
Clear.....	5
Level.....	5
Raw.....	5
Bitrate.....	6
Test.....	6
Schematic.....	7
PCB.....	9
Firmware update.....	9
Versions .....	9

## Introduction

---

The DSP-7S04H is a 2.3" height 4 digit seven segment display module with decimals.

## Features

---

The DSP-7S04H has a TTL (asynchronous) serial interface and I2C connection allowing easy control from your microcontroller.

## Connections

---

The DSP-7S04H has four connection ports.

### LED Power

GND	Ground connection
VLED	8.4V – 12V

### I2C Port

VCC	Positive supply (3V – 5V)
SDA	I2C data
SCL	I2C clock
GND	Ground connection

### TTL Serial Port

TxO	TTL serial transmit (out)
RxI	TTL serial receive (in)
GND	Ground connection
VCC	Positive supply (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 complete reprogramming of the on-board microcontroller – however this is not usually necessary. We may find a use for these pins in the future.

## Power

---

The DSP-7504H requires two power supplies. The LEDs themselves are 2.1V red LEDs and have up to 4 in series. As such VLED requires at least 8.4V. A 9V regulated power supply will suit this application well.

Each LED segment uses approximately 20mA, so lighting all segments on all digits requires approximately 180mA. This can be reduced further by decreasing the brightness level of the display.

The logic part of the board can be powered from anything from 3V to 5V. Make sure that the TTL serial or I2C voltages match VCC, not VLED.

## Commands

---

Serial commands are terminated by carriage return (character 13). The initial bit rate of the serial port is 115,200 bps.

I2C commands begin with a command identifier, followed by the data appropriate for the command.

### Print

Serial Format: print "abcd"

Serial Example: print "1934"

I2C Format: 0x01 d0 d1 d2 d3

I2C Example: 0x01 0x31 0x39 0x33 0x34

Display the ASCII text on the display. The firmware will do its best to represent the characters given. Numbers are of course no problem and many characters are possible too.

### Dot

Serial Format: dot d [on|off]

Serial Example: dot 0 on

I2C Format: 0x03 d [0x00|0x01]

I2C Example: 0x03 0x00 0x01

Turn decimal point on or off, where d = 0 to 3.

### Clear

Serial Format: clear

Serial Example: clear

I2C Format: 0x05

I2C Example: 0x05

Clear the display (blank all digits)

### Level

Serial Format: level n

Serial Example: level 128

I2C Format: 0x06 n

I2C Example: 0x06 0x80

Set the brightness level of the display. 0 is as dim as it gets, 255 is as bright as it gets.

### Raw

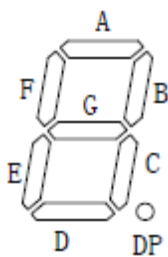
Serial Format: raw aaaa,bbb,cccc,dddd

Serial Example: raw ff00,ff00,ff00,ff01

I2C Format: 0x02 msb lsb msb lsb msb lsb msb lsb

Set the individual segments directly. Each 16 bit hexadecimal number is stored and shifted into the TLC5926 in turn.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Segment	DP	G	F	E	D	C	B	A	-	-	-	-	-	-	-	CO



The CO colon digit is only valid in digit 3 (right most digit).

## Bitrate

Format: bitrate n

Example: bitrate 115200

Changes the serial bit rate to the specified rate. Options are 2400, 4800, 9600, 19200, 38400, 57600 or 115200. The new bitrate is stored and will apply even if power is lost. There is no i2c equivalent command.

## Test

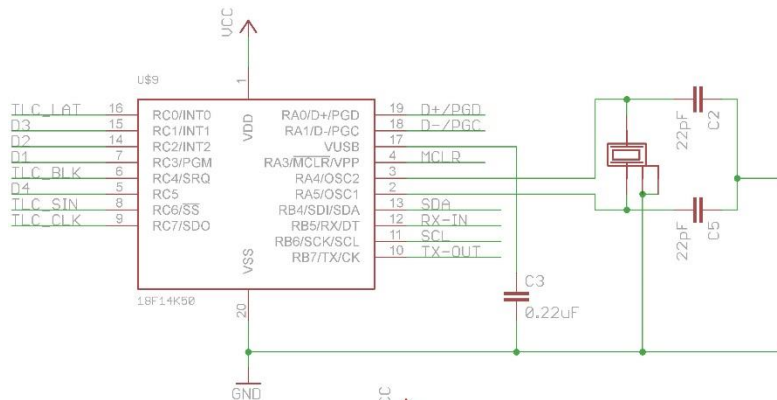
Format: test

Example: test

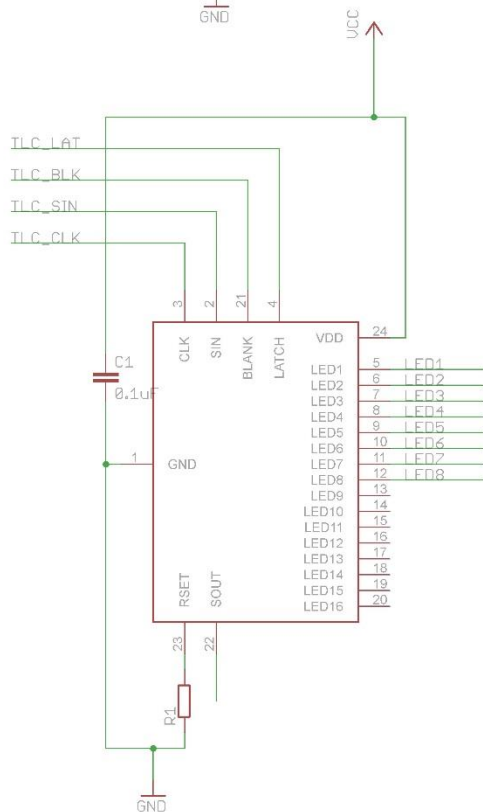
I2C Format: 0x00 [0x00|0x01]

Toggle test mode on or off.

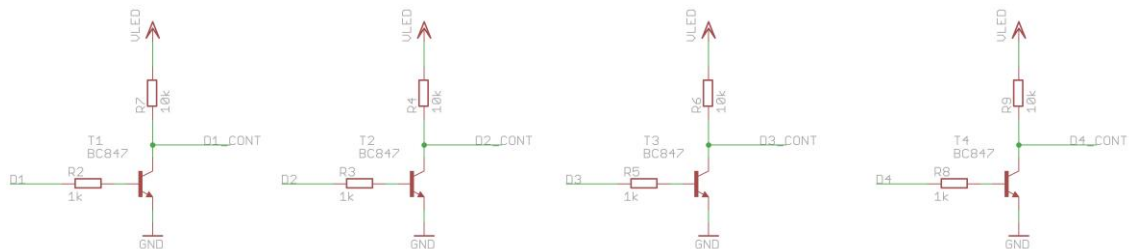
## Schematic



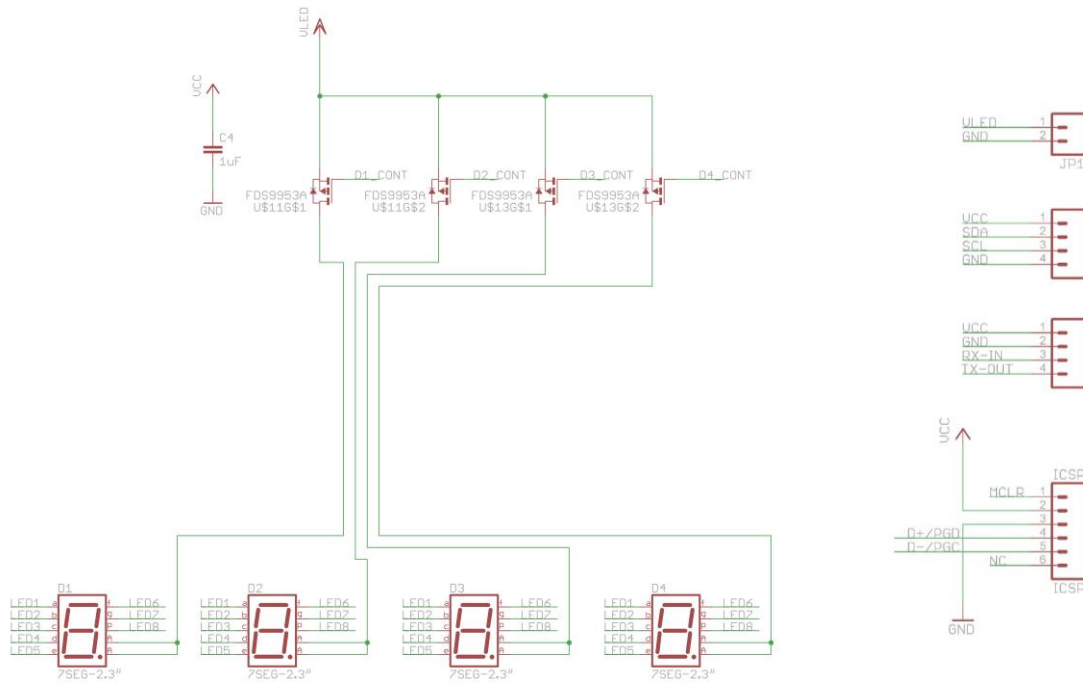
The DSP-7504B uses a constant current LED driver IC. The current setting resistor is chosen to supply approximately 20mA to each segment.



The PIC18F14K50 handles the interfaces with the outside world. It loads the TLC5926 for each digit and switches the digit using 9953 MOSFETs. Only one digit is actually active at any one time.



BC847 transistors are used to drive the MOSFETS.



And finally we have the interfaces to the outside world.



## PCB



## Firmware update

It is possible to update the firmware in the on-board microcontroller, using the Screamer program. Updates to the firmware will be made when we add new features or find bugs, so please let us know if you have any problems or indeed ideas to improve the way the board works.

Contact us at support [at] embeddedadventures dot com

Check the Embedded Adventures website product page for the DSP-7S04H for any updates.

## Versions

Version	Date	Comments
Version 1	23 Mar 2015	Initial Version for board HW v2