Seven Segment Board

User Manual

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Chapter 1. Seven Segment Board

1. Overview

Seven Segment Board has 8 seven segment LED displays. The board can be used as a display device for displaying decimal numerals as an alternative to more complex dot-matrix displays.

This multiplexed display board has a built-in decoder that needs only 3 control lines to select the required digit and 8 data lines shared to all seven segments. All segments including decimal points are available for control, so that customized readout is made possible. The TTL compatible inputs allows this board work with most micro-controllers and control systems.

2. Features

- Standard 0.56" 7-Segment LED Display
- 8 Digits for counter/timer applications
- Supports decimal point
- Powered from motherboard via FRC header
- TTL compatible inputs
- Standard 0.1" FRC header for connection to control logic/MCU
- Ready to go with Zilogic motherboards.

3. Applications

- Digital clocks and calendars.
- Electronic meters
- Weighing machines
- Currency displays
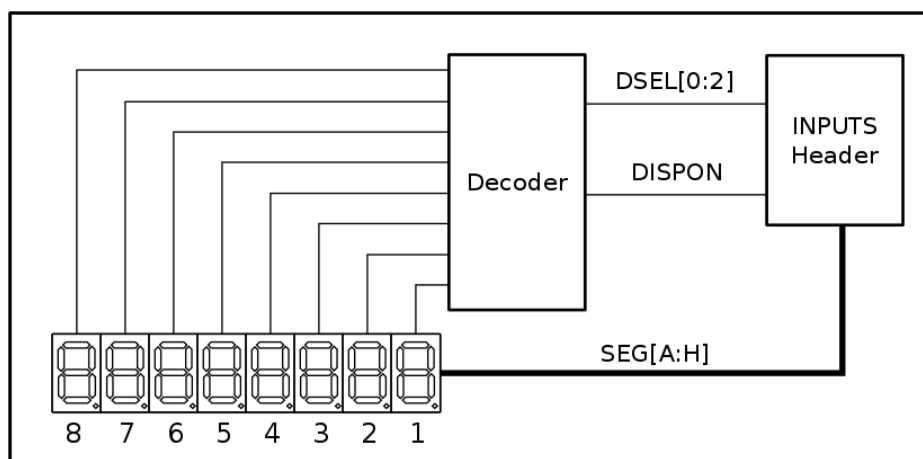- and other numerical digital read-outs.

4. Locating components

Below diagram explains the location of components on the board

Figure 1.1. Front View

5. Block Diagram

The devices available on the board, is shown in the following block diagram. Each device is described in detail in the following sections.

Figure 1.2. Block Diagram

6. Power Supply

The Seven Segment Board is powered from the motherboard using a FRC-14 connector. The 1st and 14th pin is connected to `VCC` and `GND` respectively. Detailed power supply specifications are available in section Specifications.

7. Control Inputs

The Seven Segment Board can be interfaced to the motherboard using the `INPUTS` header. The `SEG` signals in the header are used to drive the value to be displayed on a 7-segment. The `DSEL` signals are used to select the digit position on which the value has to be displayed. The `DISPON#` signal is used to entire display ON or OFF.

8. Connectors and Headers

8.1. `INPUTS` Header

The control inputs for the Seven Segment Board is provided through the `INPUTS` FRC header. The connector details are given below.

Table 1.1. `INPUTS` Header

Pin#	Display	Signal Type
1	`VCC`	Supply from motherboard
2	`SEG A`	TTL In
3	`SEG B`	TTL In
4	`SEG C`	TTL In
5	`SEG D`	TTL In
6	`SEG E`	TTL In
7	`SEG F`	TTL In
8	`SEG G`	TTL In
9	`SEG H`	TTL In
10	`DSEL 0`	TTL In

Pin#	Display	Signal Type
11	`DSEL 1`	TTL In
12	`DSEL 2`	TTL In
13	`DISPON#`	TTL In
14	`GND`	Ground

9. Specifications

Parameter	Value	Condition
VCC		
Voltage	5V	
Max. Current	100mA	
Digital Inputs		
Input Low Voltage	0.0 - 0.8V	
Input High Voltage	2.0 - 5.0V	

Chapter 2. Board Usage

1. Selecting a Digit

A digit of the Seven Segment Board can be selected by using three control lines `DSEL0` , `DSEL1` and `DSEL2` . The following table shows the `DSELx` pin states, the corresponding digit selected.

Table 2.1. Digit Selection

DSEL0	DSEL1	DSEL2	DIGIT Selected
0	0	0	`DIGI1`
0	0	1	`DIGI2`
0	1	0	`DIGI3`
0	1	1	`DIGI4`
1	0	0	`DIGI5`
1	0	1	`DIGI6`
1	1	0	`DIGI7`
1	1	1	`DIGI8`

2. Displaying a Single Digit

The algorithm for displaying a 7-segment digit is given below.

1. Drive the `DISPON#` high to turn off the display.
2. Turn on/off segments by driving the segment signals `SEG[A:H]` . The segment signals to be driven for each decimal digit is given in the following table.
3. Select the 7-segment display by driving `DSEL[0:2]`
4. Drive the `DISPON#` high to turn on the display.

Figure 2.1. Segment Naming
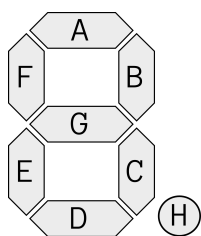
Table 2.2. Character to `SEG[A:H]` Map

Character	SEG[A:H] in Binary	SEG[A:H] in Hex
0	`0b1111_1100`	`0xFC`
1	`0b0110_0000`	`0x60`
2	`0b1101_1010`	`0xDA`
3	`0b1111_0010`	`0xF2`
4	`0b1010_1010`	`0xAA`
5	`0b1011_1010`	`0xBA`

Character	SEG[A:H] in Binary	SEG[A:H] in Hex
6	`0b0111_1101`	`0x7D`
6	`0b1011_1110`	`0xBE`
7	`0b1110_0000`	`0xE0`
8	`0b1111_1110`	`0xFE`
9	`0b0110_0111`	`0x67`
9	`0b1110_0110`	`0xE6`

The MSB of segment signals (7th bit) is used to switch on the dot separator.

3. Multiplexed 7-Segment Display

Since the signals that drive the segments are shared by the 8 displays, the segments of only one display can be driven at a time. Each display is turned on successively for a small period of time (1.5ms, to avoid flicker), and by persistence of vision all of them appear to be on simultaneously.

> Persistence of vision is the phenomenon of the eye by which even nanoseconds of exposure to an image result in milliseconds of sight. — Wikipedia.org

The algorithm for displaying multiple 7-segment digits simultaneously is given below.

a. Turn off the display.

b. Select the next 7-segment digit.

c. Drive the segment data pins corresponding to the value to be displayed.

d. Turn on the display.

e. Generate a 1.5ms delay using a timer.

f. Goto step a.

Appendix A. Legal Information

1. Copying

2. Limited Hardware Warranty

The warranties provided by Zilogic Systems in this Limited Hardware Warranty apply only to Hardware Products you purchase for your use, and not for resale. The term "Hardware Product" means a computing device with a specific function and limited configuration ability.

2.1. LIMITED HARDWARE WARRANTY

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The foregoing warranties and remedies shall be void as to any Hardware Products damaged or rendered unserviceable by one or more of the following: (1) improper or inadequate maintenance by anyone other than Zilogic Systems or Zilogic Systems' authorized engineers, (2) interfacing supplied by anyone other than Zilogic Systems, (3) modifications, alterations or additions to the Hardware Products by personnel not certified by Zilogic Systems or Zilogic Systems' authorized engineers to perform such acts, or other unauthorized repair, installation or other causes beyond Zilogic Systems' control, (4) unreasonable refusal to agree with engineering change notice programs, (5) negligence by any person other than Zilogic Systems or Zilogic Systems' authorized engineers, (6) misuse, abuse, accident, electrical irregularity, theft, vandalism, fire, water or other peril, (7) damage caused by containment and/or operation outside the environmental specifications for the Hardware Products, (8) alteration or connection of the Hardware Products to other systems, equipment or devices (other than those specifically approved by Zilogic Systems) not in accordance to the board and on-board device specifications (9) any use that is inconsistent with the user manual supplied with the Hardware Product. The warranty period is not extended if Zilogic Systems repairs or replaces a warranted product or any parts. Zilogic Systems may change the availability of limited hardware warranties, at its discretion, but any changes will not be retroactive.

2.3. HARDWARE RETURN PROCEDURES

If a Hardware Product or one of its component parts does not function as warranted during the warranty period, and such nonconformance can be verified by Zilogic Systems, Zilogic Systems, at

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Transportation costs, if any, incurred in connection with the return of a defective item to Zilogic Systems shall be borne by You. Any transportation costs incurred in connection with the redelivery of a repaired or replacement item to You by Zilogic Systems shall be borne by Zilogic Systems; provided, however, that if Zilogic Systems determines, in its sole discretion, that the allegedly defective item is not covered by the terms and conditions of the warranty or that a warranty claim is made after the warranty period, the cost of the repair by Zilogic Systems, including all shipping expenses, shall be reimbursed by You.

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For Warranty Replacement service, it is required that you deliver the faulty unit to a location Zilogic Systems designates, and provide courier name and tracking number to Zilogic Systems. After the Faulty unit is returned to Zilogic Systems, Zilogic Systems will use commercially reasonable efforts to ship the replacement hardware within fourteen (14) business days. Actual delivery times may vary depending on availability of the spares and customer's location.

2.5. ADDITIONAL RESPONSIBILITIES

You agree:

- To provide Zilogic Systems or its partner with sufficient and safe access to your facilities to permit Zilogic Systems to fulfill its obligations.
- To ship back the faulty Hardware Product (or replaceable unit) suitably packaged, quoting the RMA number, to the Zilogic Systems designated location.
- You shall ship the faulty Hardware Product once Zilogic Systems approves the RMA and provide the courier name and tracking number.
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