ZKit-51 RTC Display Board

User Manual

1.0, June 2009

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Chapter 1. ZKit-51 RTC Display Board

1. Overview

The RTC Display Board provides a 6-digit, seven segment, LED display. The board can be used for real time clock and timer applications.

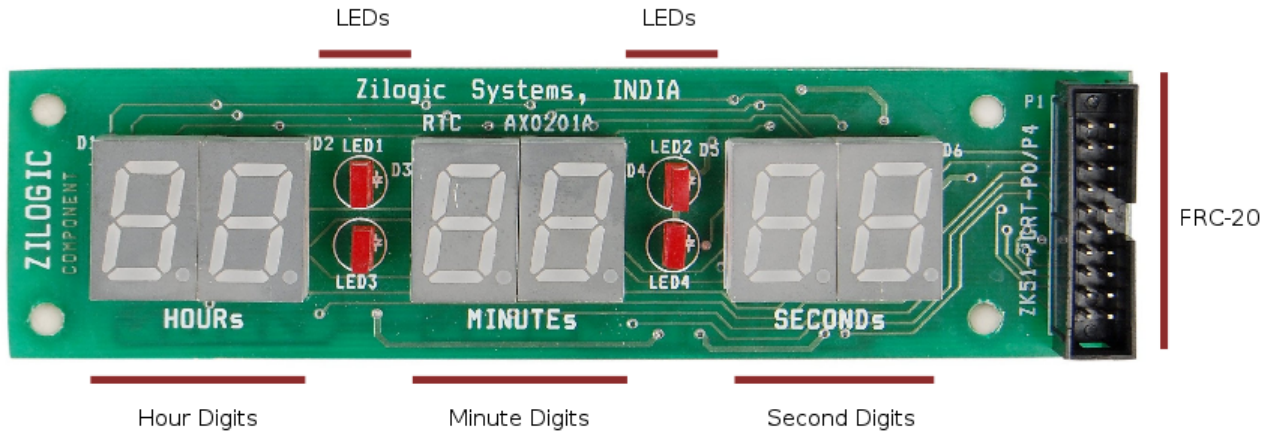
2. Features

- 6 seven segment displays with common anode configuration
- Segments are arranged in HH:MM:SS format
- Powered from motherboard
- Four LED's act as clock digits separator

3. Locating Components

The location of the components on the board is indicated in the following diagram.

Figure 1.1. Front View



4. Power Supply

The RTC Display Board is powered from the motherboard using FRC-20. In the FRC-20 connector, the 1st and 20th pins are used for `VCC` and `GND` respectively.

5. Connectivity

RTC Display Board can be interface to the `PORT-P0/P4` header of the motherboard using FRC-20 connector. The connection details are given below.

Figure 1.2. Signal connection diagram

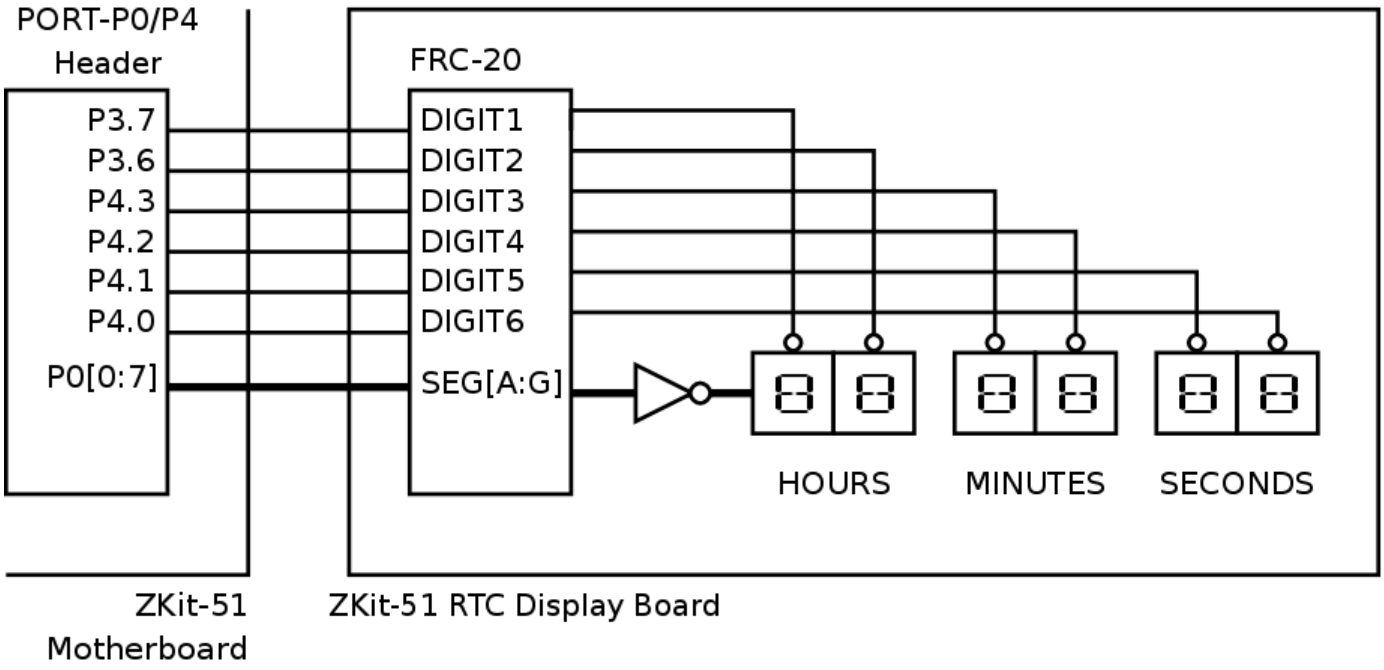


Table 1.1. Signal connection table

Pin#	Motherboard	RTC Display	Pin#	Motherboard	RTC Display
1	VCC	VCC	2	P0.0/AD0	SEGA
3	P0.1/AD1	SEGB	4	P0.2/AD2	SEGC
5	P0.3/AD3	SEGD	6	P0.4/AD4	SEGE
7	P0.5/AD5	SEGF	8	P0.6/AD6	SEGG
9	P0.7/AD7	-	10	P4.0/SCK/SCL	DIGIT6
11	P4.1/MISO/SDA	DIGIT5	12	P4.2/MOSI	DIGIT4
13	P4.3/SS	DIGIT3	14	SCL	-
15	SDA	-	16	WR/P3.6	DIGIT2
17	RD/P3.7	DIGIT1	18	ALE	-
19	INT1/P3.3	-	20	GND	GND

6. Algorithm

Since the signals that drive the segments are shared by the 6 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
>
> —

6.1. Single 7-Segment Display

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

1. Turn off all the 7-segment displays.

2. Turn on/off segments by driving the segment signals (SEGx). The segment signals to be driven for each hexadecimal digit is given in the following table.
3. Select the 7-segment display by driving one of DIGIT1, DIGIT2, … DIGIT6, to low.

Character	SEG[A:G]
0	0x3F
1	0x06
2	0x5B
3	0x4F
4	0x66
5	0x6D
6	0x7D
7	0x07
8	0x7F
9	0x67

6.2. Multiplexed 7-Segment Display

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

a. Initialise `digit_counter` to `0`.
b. Turn off all 7-segment displays.
c. Drive the segment signals corresponding to the digit to be displayed.
d. Select the 7-segment display indicated by `digit_counter`, by driving the corresponding `DIGITx` signal to low.
e. Generate a 1.5ms using a timer.
f. Increment `digit_counter`.
g. `digit_counter` = `digit_counter` % `6`
h. Goto step b.