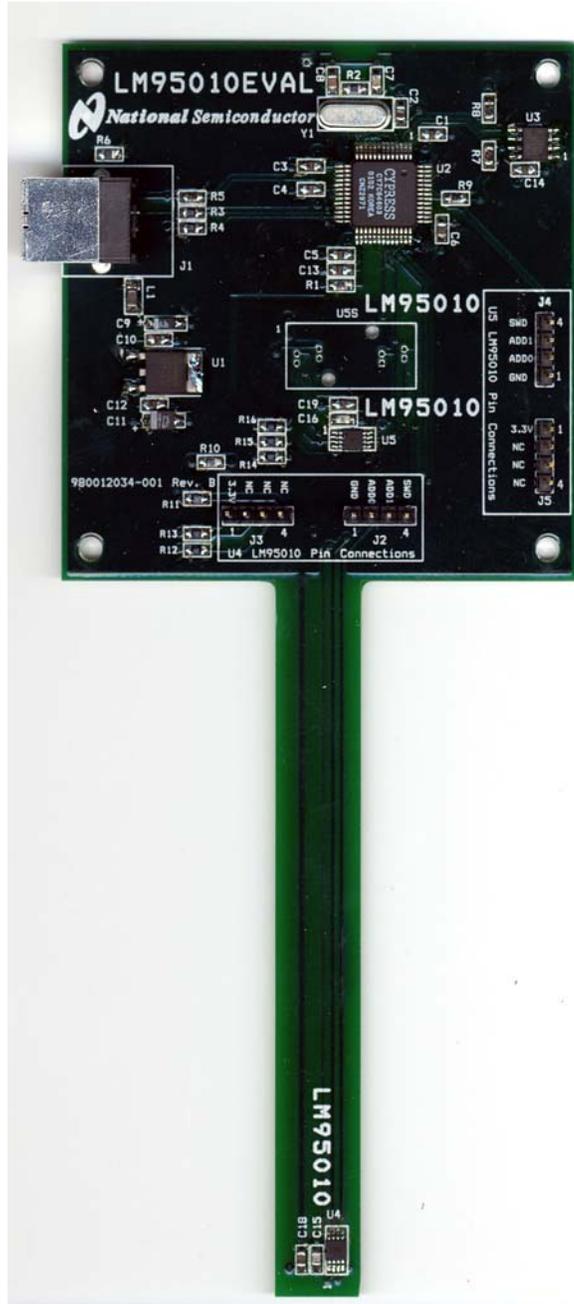


LM95010 Evaluation Board User's Guide



LM95010 Evaluation Board User's Guide
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LM95010 Evaluation Board User's Guide

References

1. "LM95010 Digital Temperature Sensor With the SensorPath Bus in MSOP-8" datasheet. The latest copy of the LM95010 datasheet can be obtained by going to the National Semiconductor website www.national.com, by searching on "LM95010", and then downloading the LM95010.pdf file.

2. SensorEval Version 1.04b or later, Evaluation Board CD containing:
 - a. The SensorEval.exe executable program used to run the LM95010 Evaluation Board.
 - b. A softcopy of this User's Guide
 - c. A readme.txt file with useful information about the program.
 - d. A softcopy of the SensorEval Software manual.

1.0 Introduction

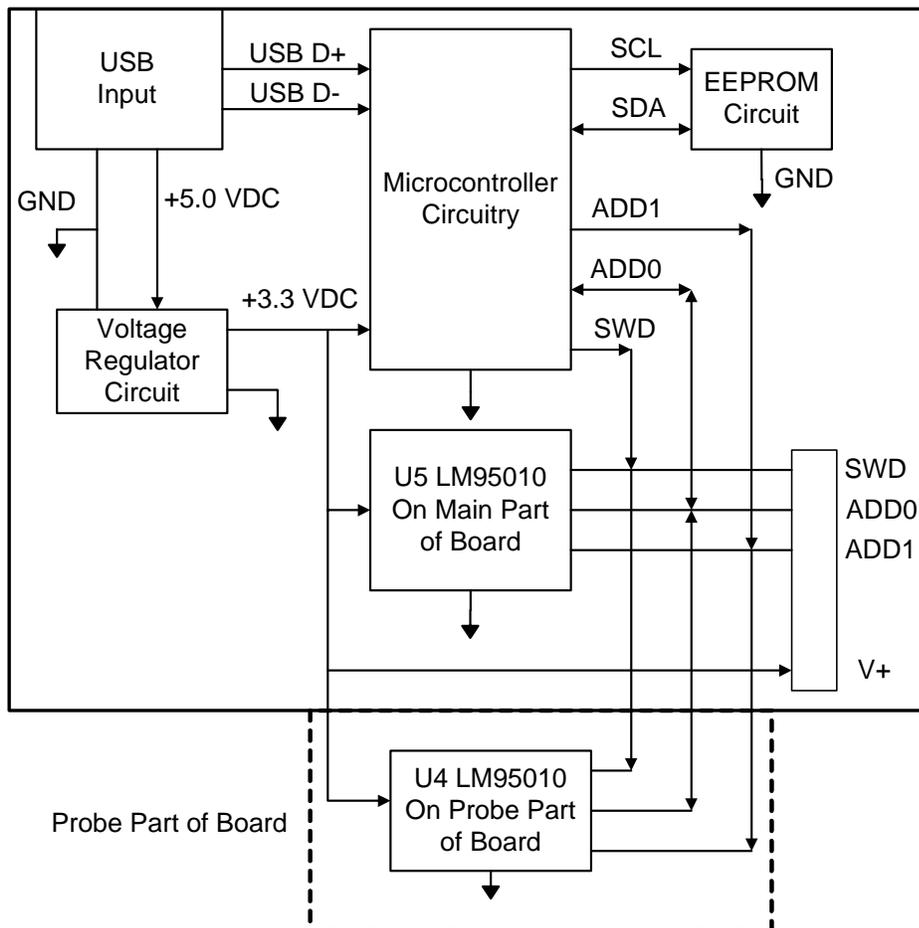
The LM95010 Evaluation Board is used together with the National Semiconductor SensorEval software (provided in the kit), and with a USB cable (not provided in the kit), and with an external personal computer (PC). Power to the LM95010 Evaluation Board is provided by the +5VDC line of the USB connection. No external power supply or signal sources are required for operation of the LM95010 evaluation board.

Before connecting the PC to the LM95010 evaluation board through the USB cable, the PC is first turned on and allowed to go through its boot-up procedure. The user installs and initiates the SensorEval software. See Section 4.0 for details.

After the SensorEval software is running, the user can connect the USB cable first to the computer and then to the LM95010 Evaluation Board.

The PC should be able to recognize the board and the user simply selects the LM95010 Eval Board radio button. The software allows the user to select which of the two LM95010 devices wanted.

1.1 Block Diagram



Registers 05 and 0A must be enabled in order to read the temperature.

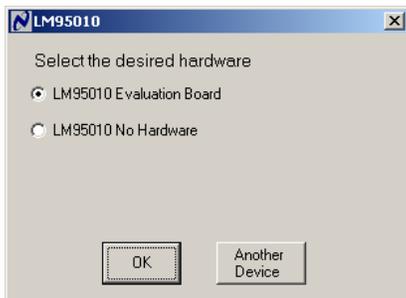
The block diagram below describes the LM95010 Evaluation Board itself. The USB input provides the +5.0 VDC power to the board, which is regulated down to 3.3 VDC to power the IC's. The EEPROM is programmed at the factory with a unique ID code for this particular board. When the USB cable is plugged in, the PC interrogates the USB devices and can identify this device as the LM95010 Evaluation Board.

The microcontroller on the board provides the serial clock (SC), provides the chip select (CS) signal, and relays the information from the LM95010 to the PC via the USB lines.

The block in the lower right of the Block Diagram shows the signals that are available to probe by the user for either of the LM95010 devices on the board.

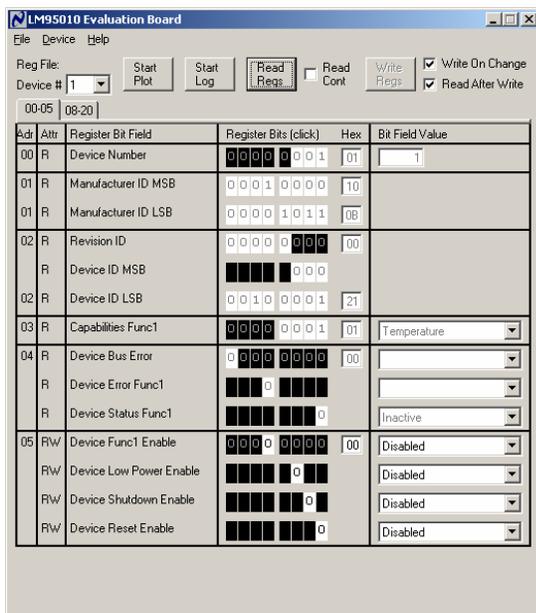
2.0 Quick Start

1. Install the CD into the CD drive of the computer and install the SensorEval software (see Section 4.0).
2. Hookup the USB cable between the PC or notebook computer as shown in Quick Start Diagram below.
3. Run the SensorEval software clicking the icon on the desktop. The first screen will look like this:



Select the LM95010 Evaluation Board.
Click OK.

4. The next screen will look like this:

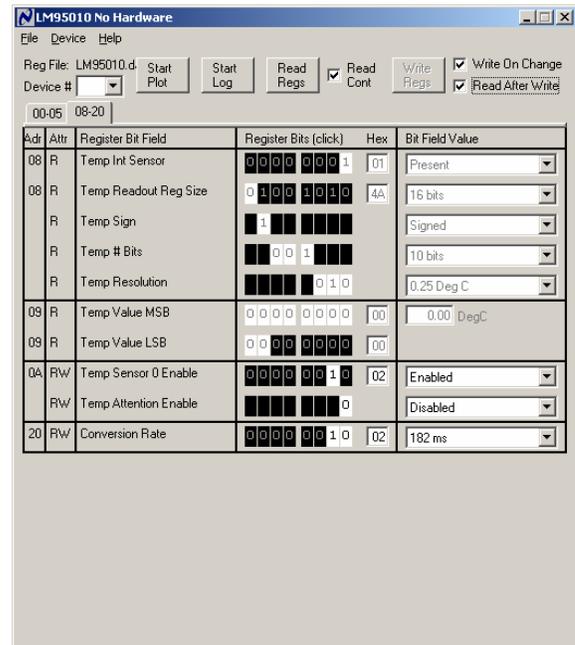


In the Device Box (upper left corner) select Device 1 (U5 on the main part of the board) or Device 2 (U4 on the “probe” end of the board).

Select “Read Cont” to read the temperature continuously.

For Register 05 Device Func1 Enable, select ENABLED.

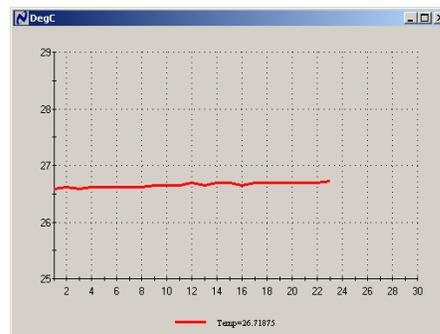
5. Click on the 08-20 Register Tab.
The Screen should look like this:



For Register 0A, Temp Sensor 0 Enable, select ENABLED.

The temperature should read the temperature continuously for whichever device was selected as long as the Register 05 and 0A settings are Enabled as previously explained..

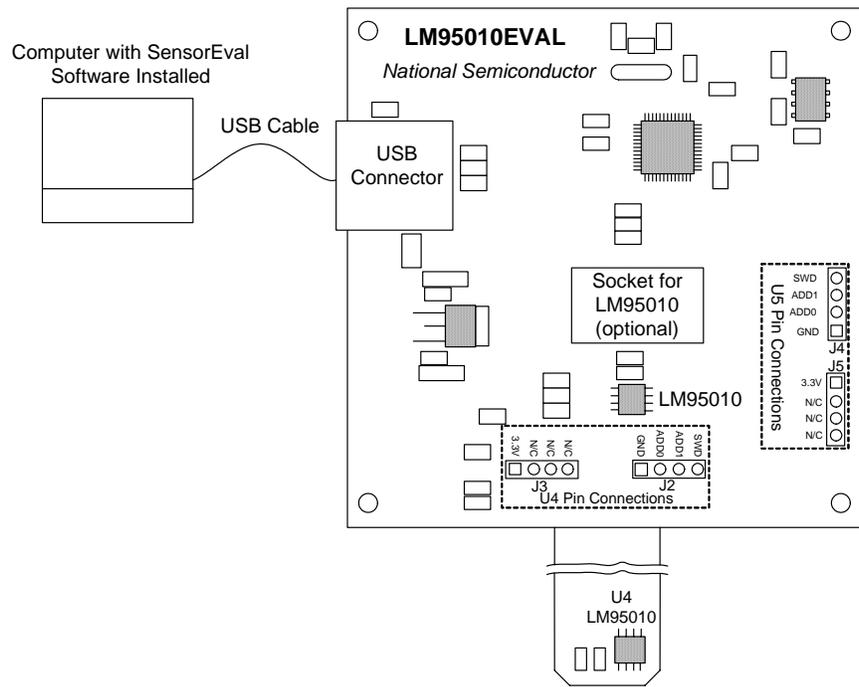
6. If the user clicks on the Start Plot button a graph box will appear and will graph the temperature. An example is shown below.



7. If the user clicks on the Start Log button a screen will appear that will allow the temperature data to be logged into the specified directory and filename.

2.1 Quick Start Diagram

Important! NO EXTERNAL POWER SUPPLY OR SIGNAL INPUTS ARE REQUIRED!



3.0 Functional Description

The LM95010 Evaluation Board, along with the SensorEval Software, provides the system designer with a convenient way to learn about the operation of the LM95010 Temperature Sensor chip. The user simply has to install the SensorEval software on his PC, run it, connect the USB cable from the PC to the Evaluation Board, and the user can read temperatures. It's that simple! The user doesn't have to provide any power or external signals to the evaluation board.

Power to the LM95010 Evaluation Board is taken from the USB 5-Volt line. This +5VDC is the input

to the on-board LM2950 low dropout voltage regulator, which regulates the output voltage to +3.3 VDC. This output voltage powers the LM95010, the on-board microcontroller, and the EEPROM chip where the board ID information is stored.

The microcontroller provides the active low Chip Select (CS) signal and the Serial Clock (SC) signal to the LM95010 chip. The Serial Input/Output (SI/O) communications between the LM95010 and the PC USB data lines is controlled by the microcontroller. For all of the details of this communication protocol see the latest LM95010 datasheet, available at www.national.com.

3.1 LM95010 Evaluation Board Connection Table

Connector Label	Pin Number	Description
J1	N/A	USB Cable Input. Connect the USB cable to this jack <i>after</i> the SensorEval software has been loaded on the PC.
J2, J4 Output header provides user with signals for test purposes only. <i>Do not apply any external power or signals to any of the pins on these headers!</i>	1	Ground
	2	ADD0. Address 0 LSB input to LM95010.
	3	ADD1. Address 1 MSB input to LM95010.
	4	SWD. Single-wire Data SensorPath serial bus device open-drain output from LM95010.
J3, J5 <i>Do not apply any external power or signals to any of the pins on these headers!</i>	1	V+. The +3.3 VDC voltage supplied by the on-board voltage regulator to the LM95010 V _{DD} input pin. Do not connect an external power supply to this pin!
	2	N/C
	3	N/C
	4	N/C

4.0 Software Installation and Operation

4.1 Installation

The CD provided in the LM95010 Evaluation Board Kit contains the SensorEval software used to make the LM95010 Evaluation Board operate with the user's PC. It is assumed that the user will be using a PC with a Pentium® III or higher processor and Microsoft Windows® XP/2000/98/ME operating system.

The software is installed as follows:

1. Insert the LM95010 Evaluation Board CD into the CD drive of the PC. See details in the readme.txt file.
2. The software manual, provided on the CD, may be useful to the user during this process.
3. Follow all of the Installation instructions in the windows as the SensorEval software is installing.
4. The installation process will put an icon on the PC desktop so that the SensorEval program will run when the icon is double-clicked.

4.2 Operation

Follow the following procedure for operation the LM95010 Evaluation Board using the SensorEval software:

1. Run the SensorEval program by either double-clicking on the icon on the desktop or by selecting Start, Run, and browse to find the SensorEval.exe file.
2. Plug in the USB cable on both the PC and the LM95010 Evaluation Board.

Follow the register setup steps given in section 2.0 Quick Start of this User's Guide. Make sure that you are following the given procedure for the specific evaluation board you are working with.

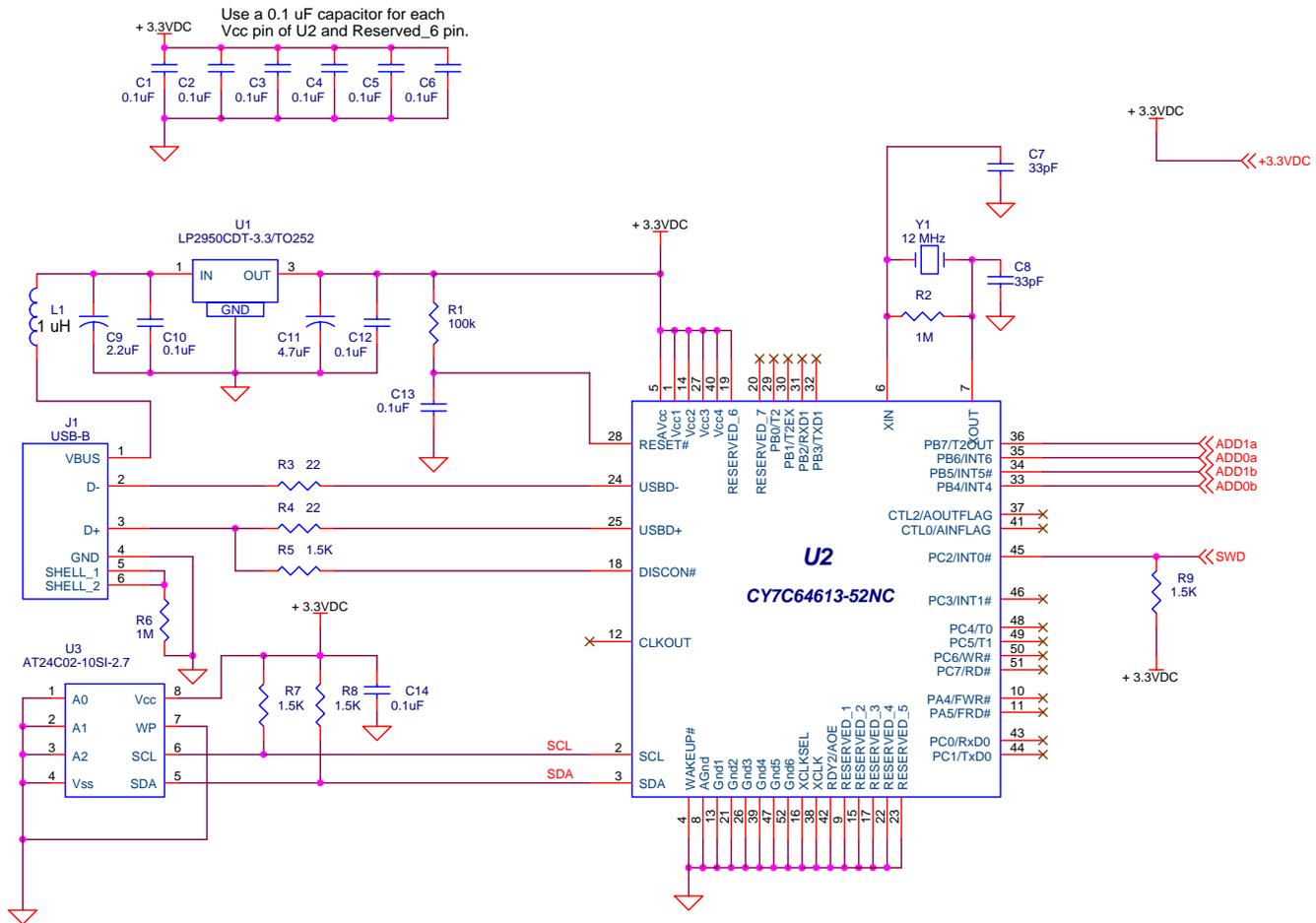
Refer to the electrical schematic, layout and connector diagrams for proper connections to external remote thermal diodes.

5.0 Electrical and Mechanical Specifications

5.1 Electrical Specifications

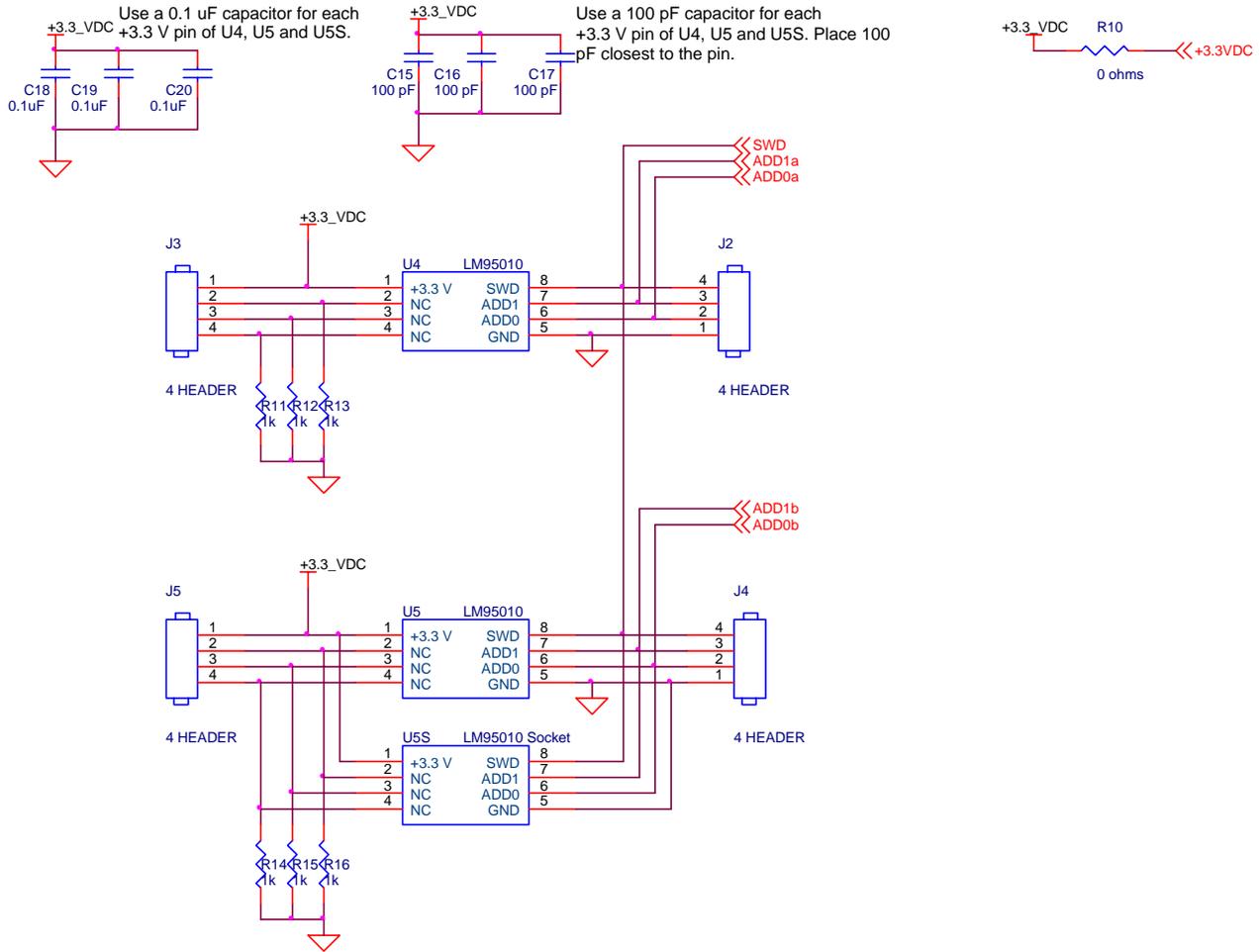
Power Requirements	
The Board uses the +5.0 VDC and GND lines from the USB connection. This +5.0 VDC voltage is regulated down to +3.3 VDC for board power. * NO EXTERNAL POWER SUPPLY INPUTS ARE REQUIRED *	+5.0 ± 0.1 V, 100 mA max.

5.2 Electrical Schematic



Page 1 of 2 Pages of the Schematic of the LM95010 Evaluation Board

5.2 Electrical Schematic (continued)



Page 2 of 2 Pages of the Schematic of the LM95010 Evaluation Board

5.3 Evaluation Board Layout

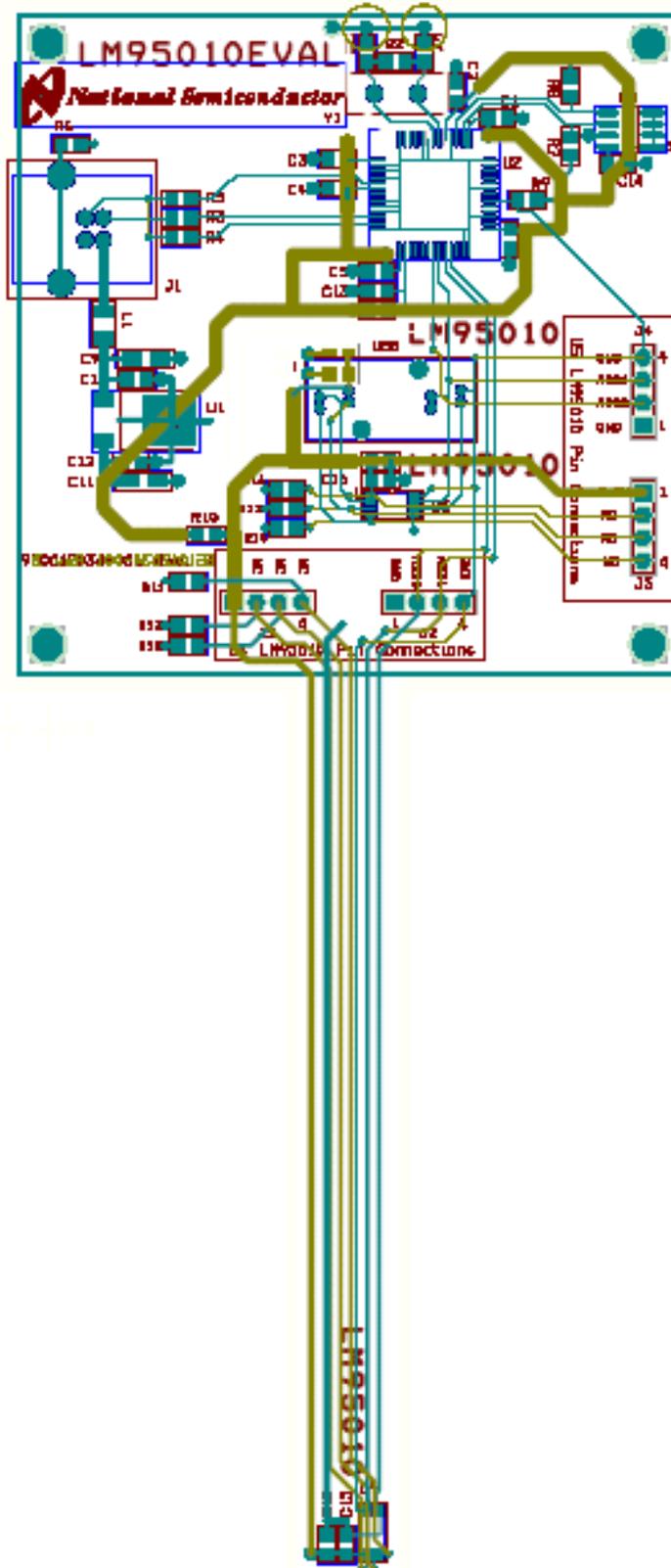


Figure 5.3 Layout diagram of the LM95010 Evaluation Board

5.4 Bill of Materials for LM95010 Evaluation Board

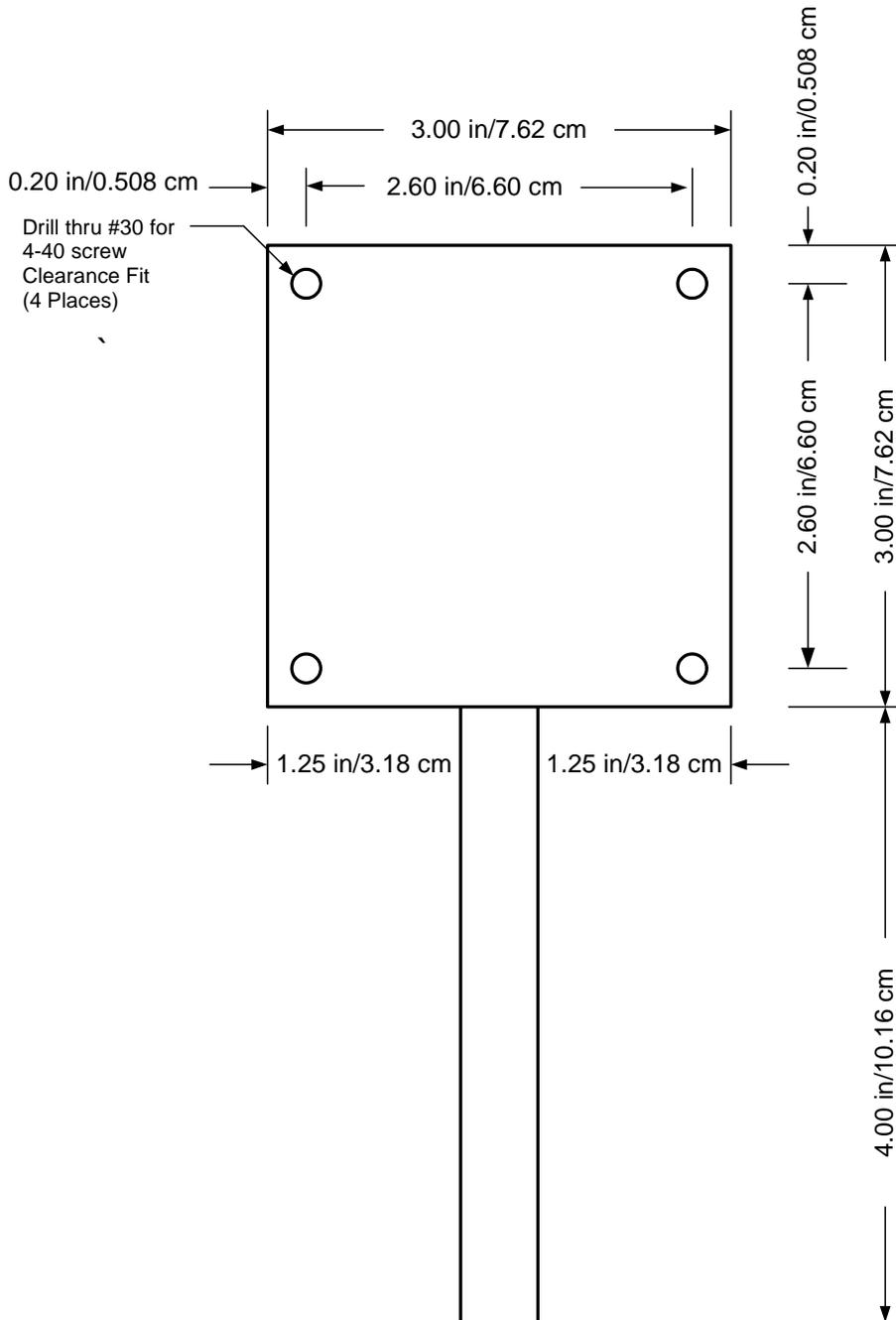
Item	Quantity	Reference	Part
1	13	C1, C2, C3, C4, C5, C6, C10, C12, C13, C14, C18, C19, C20	Capacitor, Ceramic, 0.1 uF
2	2	C7, C8	Capacitor, ceramic, 33 pF
3	4	C9	Capacitor, electrolytic, 2.2 uF
4	1	C11	Capacitor, electrolytic, 4.7 uF
5	3	C15, C16, C17	Capacitor, ceramic, 100 pF
6	1	J1	Connector, USB-B
4	4	J2, J3, J4, J5	Header, 1X4, 0.1 in centers
5	1	L1	Filter, 1uH, Stewart MI1206K900R-00
6	1	R1	Resistor, SMT, 100 k, 0805
7	2	R2, R6	Resistor, SMT, 1M, 0805
8	2	R3, R4	Resistor, SMT, 22 Ohm, 0805
9	4	R5, R7, R8, R9	Resistor, SMT, 1.5 k, 0805
10	1	R10	Resistor, SMT, 0 Ohm, 0805
11	6	R11, R12, R13, R14, R15, R16	Resistor, SMT, 1k, 0805
12	1	U5Socket	Socket, Loranger, 8-pin MSOP-8
13	2	U4, U5	LM95010CIMF Device Under Test (DUT)
14	1	U1	IC, Voltage Regulator, National LP2950CDT-3.3
15	1	U2	IC, Microcontroller, Cypress CY7C64603-52NC
16	1	U3	IC, EEPROM, Atmel AT24C02-10SI-2.7
17	1	Y1	Crystal, 12 MHz, Pletronics 2S1200G140
18	1	--	Circuit Board, Fabricated, LM95010 Evaluation Board, Rev. 1

5.4 Mechanical Specifications

5.4.1 Operating Mechanical and Environmental Specifications

	Minimum	Typical	Maximum
Temperature	0°C	25°C	70°C

5.4.2 Evaluation Board Basic Dimensions



5.4.3 Electrostatic Discharge (ESD) Precautions

The user shall use ESD precautions as specified in National Semiconductor ESD control document (SC)CSI-3-038 available through www.national.com.

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