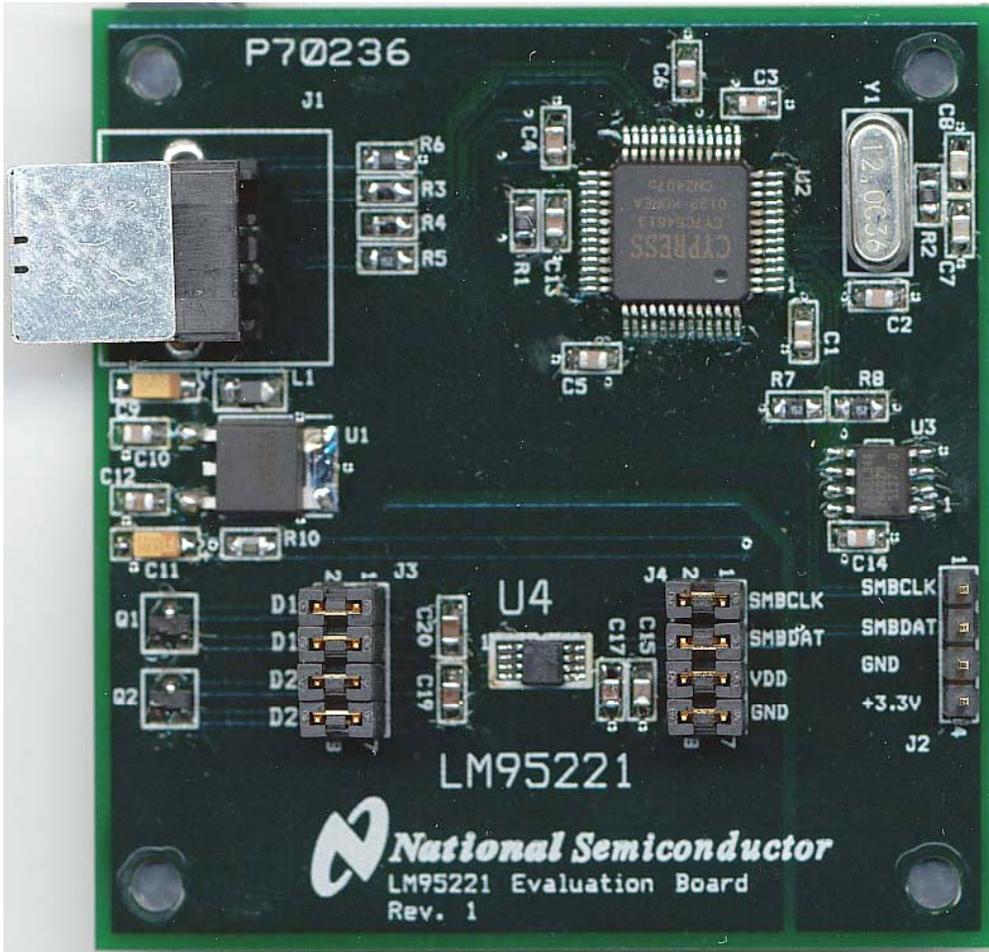


LM95221 Evaluation Board User's Guide



LM95221 Evaluation Board User's Guide

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LM95221 Evaluation Board User's Guide

References

1. "LM95221 Dual Remote Diode Digital Temperature Sensor with SMB Interface" datasheet.

The latest copy of the LM95221 datasheet can be obtained by going to the National Semiconductor website www.national.com, by searching on "LM95221", and then downloading the LM95221.pdf file.

2. SensorEval, Version 1.04b or later, Evaluation Board CD containing:
 - a. The SensorEval.exe executable program used to run the LM95221 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 LM95221 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 LM95221 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 LM95221 evaluation board.

Before connecting the PC to the LM95221 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 LM95221 Evaluation Board.

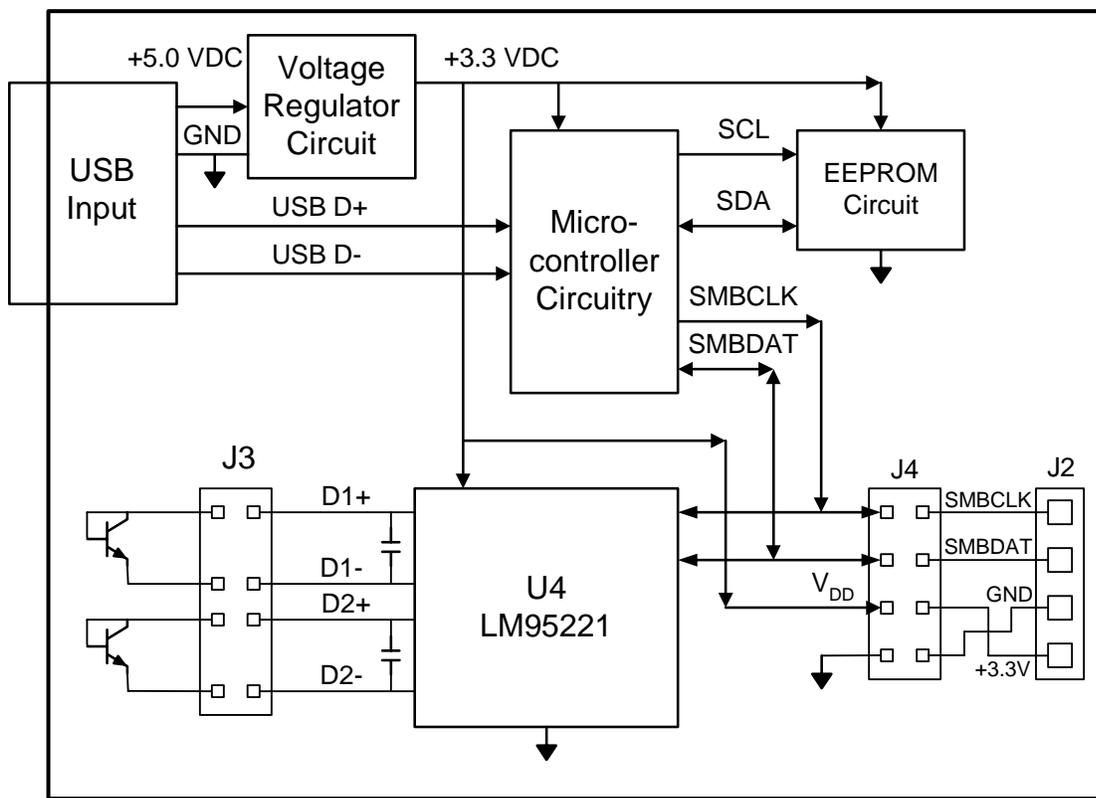
The PC should be able to recognize the board and the user simply selects the LM95221 Eval Board radio button.

The block diagram below describes the LM95221 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 LM95221 Evaluation Board.

The microcontroller on the board provides the SMBDAT and SMBCLK signals and relays the information from the LM95221 to the PC via the USB lines.

The J2 header in the lower right of the Block Diagram shows the signals that are available to probe by the user for either of the LM95221 devices on the board.

1.1 Block Diagram



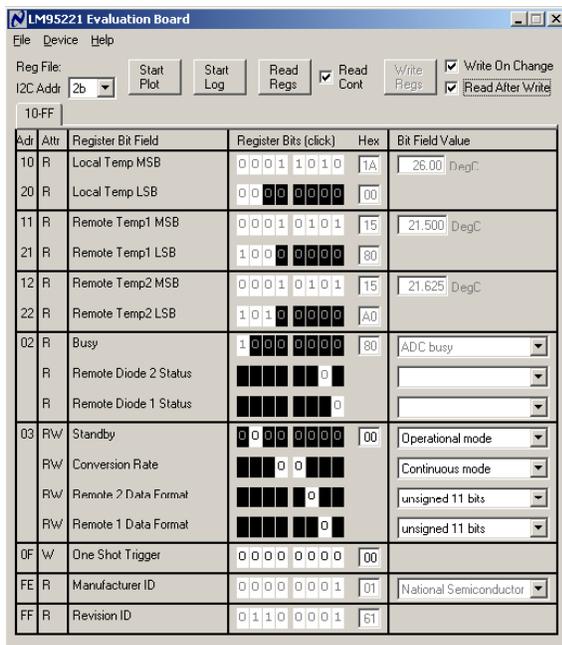
2.0 Quick Start

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:



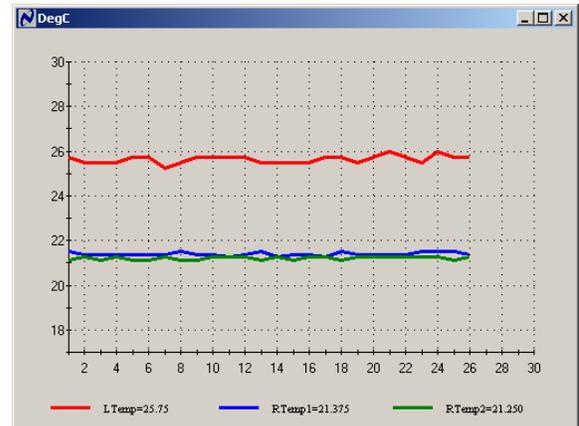
Select the LM95221 Evaluation Board.
Click OK.

4. The next screen will look like this:



Select "Read Cont" to read the temperature continuously.

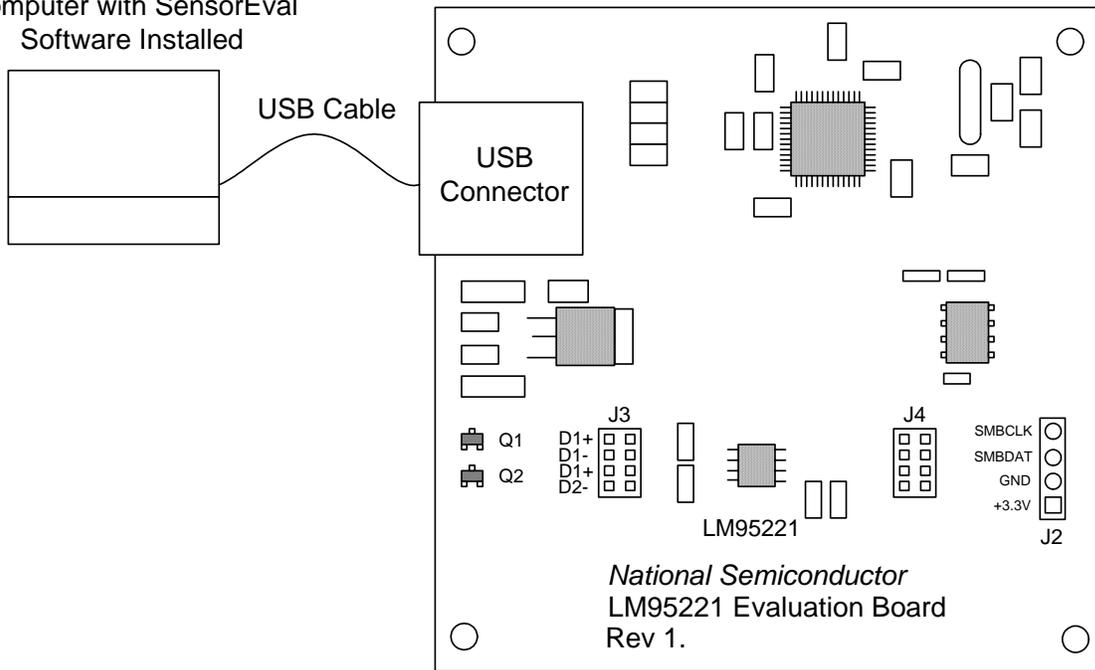
5. If the user clicks on the Start Plot button a graph box will appear and will graph the local and remote temperatures. An example is shown below.



2.1 Quick Start Diagram

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

Computer with SensorEval
Software Installed



3.0 Functional Description

The LM95221 Evaluation Board, along with the SensorEval Software, provides the system designer with a convenient way to learn about the operation of the LM95221 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 LM95221 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 LM95221, the on-board microcontroller, and the EEPROM chip where the board ID information is stored.

The microcontroller provides the SMBDAT and SMBCLK signals to the LM95221 chip and relays the communications between the LM95221 and the PC USB data lines via the microcontroller. For all of the details of this communication protocol see the latest LM95221 datasheet, available at www.national.com.

3.1 LM95221 Evaluation Board Connection Table

Connector Label	Pin Number	Description
J1	N/A	USB Cable Input. Connect the USB cable to this jack after the SensorEval software has been loaded on the PC.
J2 Output header provides user with signals for test purposes only. Do not apply any external power or signals to any of the pins on these headers!	1	+3.3V. The +3.3 VDC voltage is supplied by the on-board voltage regulator to the LM95221 VDD input pin. Do not connect an external power supply to this pin!
	2	GND. This is the signal and power return line.
	3	SMBDAT. This is the SMBus Data line.
	4	SMBCLK. This is the SMBus Clock line.
J3 Do not apply any external power or signals to any of the pins on these headers!	1,2	Jumper these pins to connect the LM95221 with the base-collector of Q1.
	3,4	Jumper these pins to connect the LM95221 with the emitter of Q1.
	5,6	Jumper these pins to connect the LM95221 with the base-collector of Q2.
	7,8	Jumper these pins to connect the LM95221 with the emitter of Q2.
J4 Do not apply any external power or signals to any of the pins on these headers!	1,2	Jumper these pins to connect the LM95221 with SMBCLK.
	3,4	Jumper these pins to connect the LM95221 with SMBDAT.
	5,6	Jumper these pins to connect the LM95221 with VDD.
	7,8	Jumper these pins to connect the LM95221 with Ground.

4.0 Software Installation and Operation

4.1 Installation

The CD provided in the LM95221 Evaluation Board Kit contains the SensorEval software used to make the LM95221 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 LM95221 Evaluation Board CD into the CD drive of the PC. See 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.

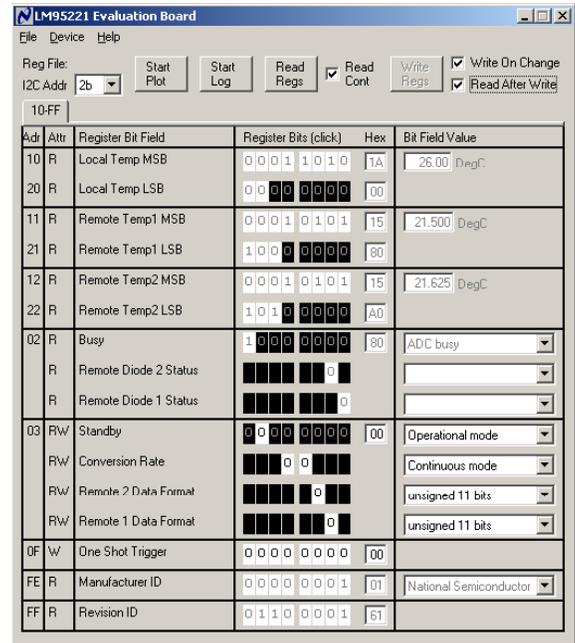
4.2 Operation

1. Hookup the USB cable between the PC or notebook computer as shown in Quick Start Diagram below.
2. Run the SensorEval software clicking the icon on the desktop. The first screen will look like this:



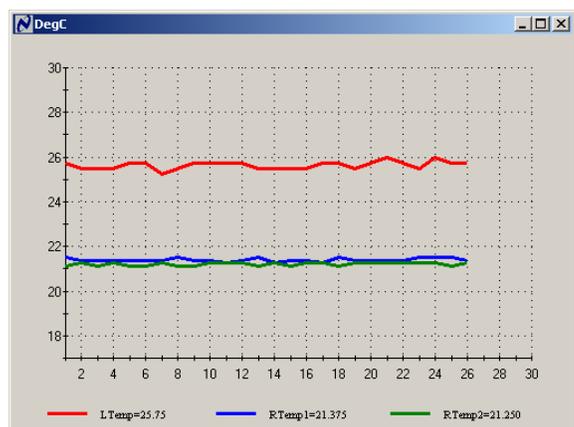
Select the LM95221 Evaluation Board. Click OK.

3. The next screen will look like this:



Select "Read Cont" to read the local and 2 remote temperatures continuously. Select "Start Log" to start logging the data into a file.

4. If the user clicks on the Start Plot button a graph box will appear and will graph the local and remote temperatures. An example is shown below.



4.2 Operation (continued)

6. The user may wish to create a log file so that the temperatures are stored for later analysis. This is done by clicking on the Start Log button. The screen will appear as follows:



The user may now create a filename and select a directory where the log file is to be stored.

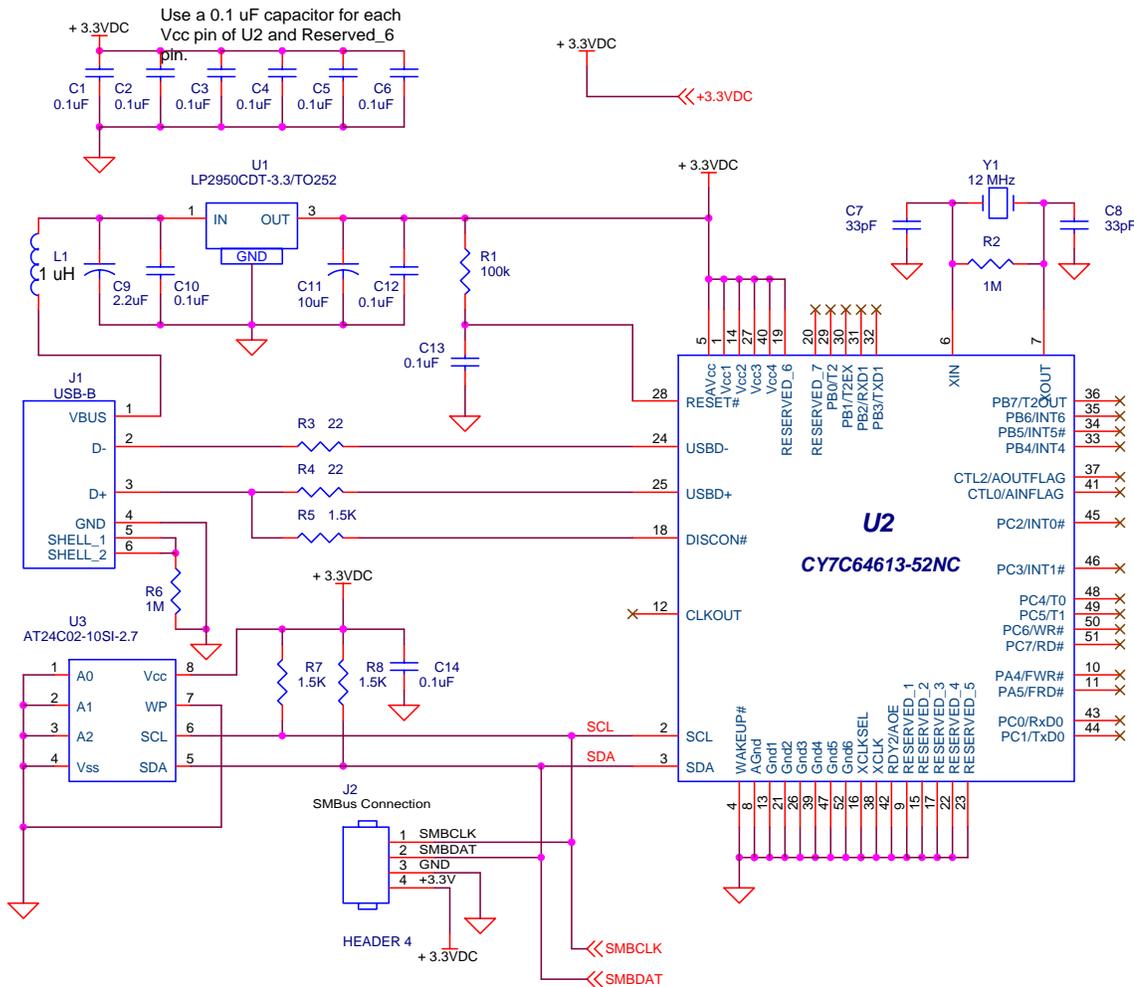
8. If the Set Read Time is selected then the user can input another read time (the default interval is 0.1 seconds).

5.0 Electrical and Mechanical Specifications

5.1 Electrical Specifications

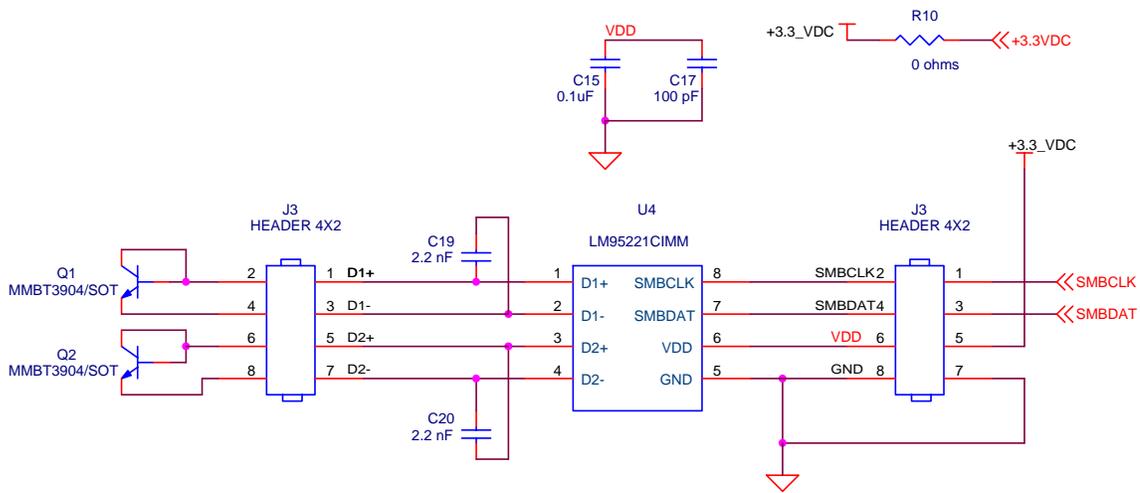
Power Requirements	
The Board uses the +5.0 VDC and GND lines from the USB connection. This +5.0 VDC voltage is regulated down to +3.3 VDC for board power. * NO EXTERNAL POWER SUPPLY INPUTS ARE REQUIRED *	+5.0 ± 0.1 V, 100 mA max.

5.2 Electrical Schematic



Page 1 of 2 Pages of the Schematic of the LM95221 Evaluation Board

5.2 Electrical Schematic (continued)



Page 2 of 2 Pages of the Schematic of the LM95221 Evaluation Board

5.3 Evaluation Board Layout

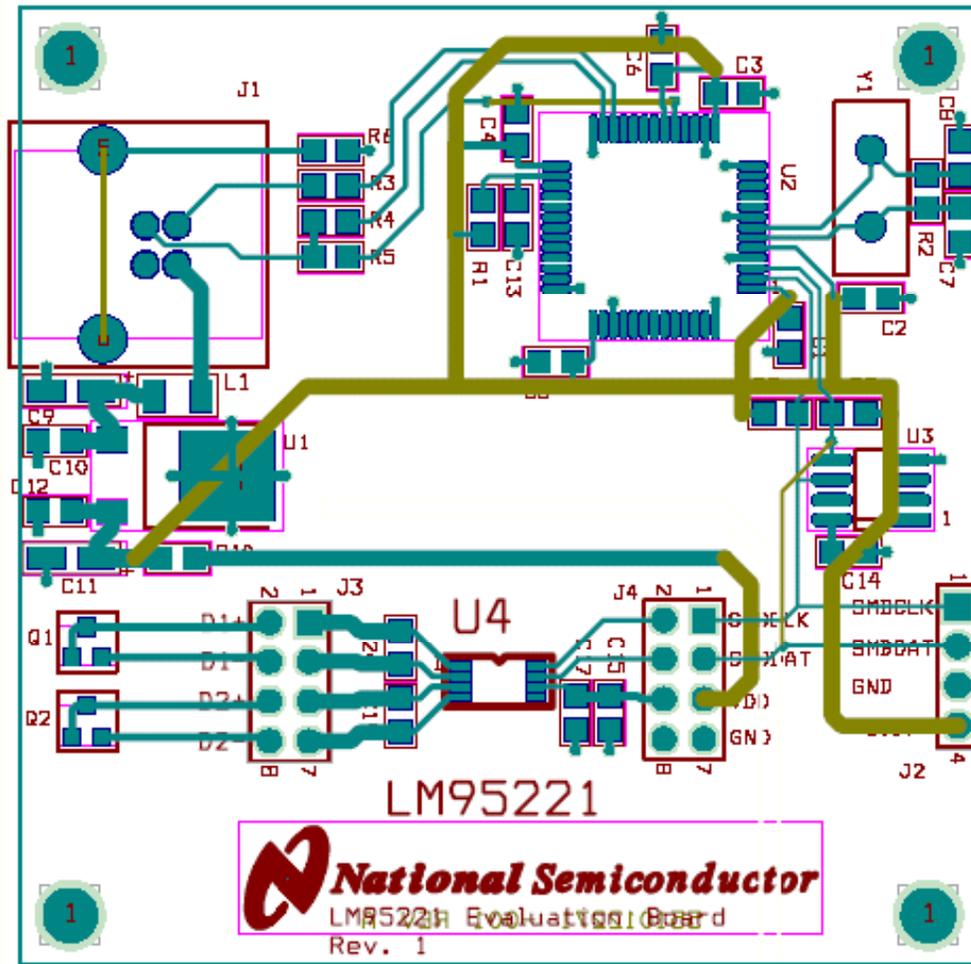


Figure 5.3 Layout diagram of the LM95221 Evaluation Board

5.4 Bill of Materials for LM95221 Evaluation Board

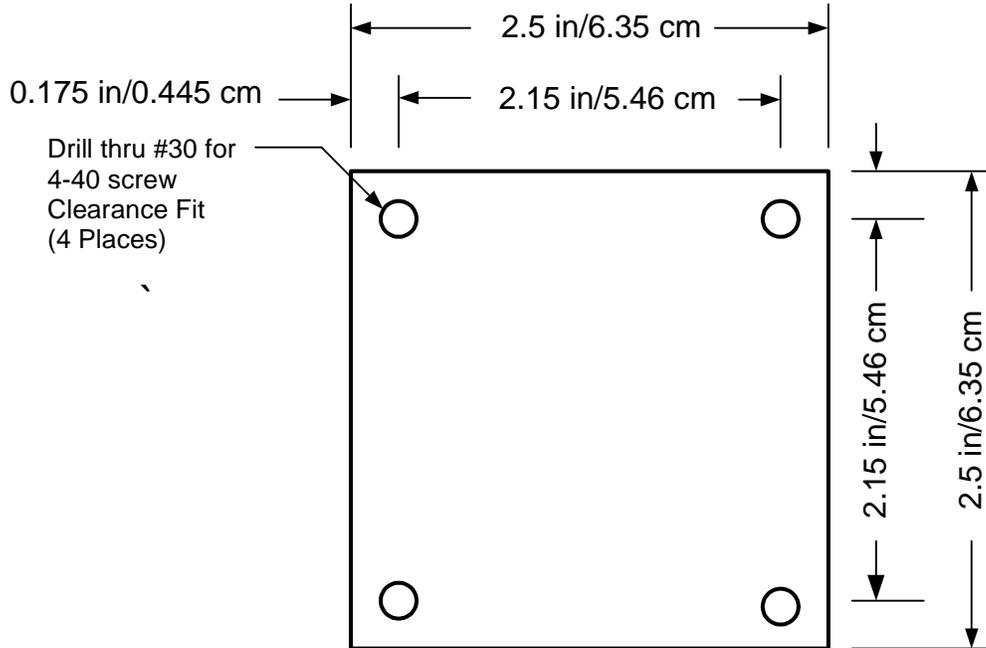
Item	Quantity	Reference	Part
1	1	C1, C2, C3, C4, C5, C6, C10, C12, C13, C14, C15	Capacitor, Ceramic, 0.1 uF
2	2	C7, C8	Capacitor, ceramic, 33 pF
3	1	C9	Capacitor, electrolytic, 10 uF
4	1	C17	Capacitor, electrolytic, 100 pF
5	2	C19, C20	Capacitor, ceramic, 2.2 uF
6	1	J1	Connector, USB-B
7	1	J2	Header, 1X4, 0.1 in centers
8	2	J3, J4	Header, 2X4, 0.1 in centers
9	1	L1	Filter, 1uH, Stewart MI1206K900R-00
10		Q1, Q2	Transistor, NPN, MMBT3904, SOT
11	1	R1	Resistor, SMT, 100 k, 0805
12	2	R2, R6	Resistor, SMT, 1M, 0805
13	2	R3, R4	Resistor, SMT, 22 Ohm, 0805
14	3	R5, R7, R8	Resistor, SMT, 1.5 k, 0805
16	1	R10	Resistor, SMT, 0 Ohm, 0805
17	1	U1	IC, Voltage Regulator, National LP2950CDT-3.3
18	1	U2	IC, Microcontroller, Cypress CY7C64603-52NC
19	1	U3	IC, EEPROM, Atmel AT24C02-10SI-2.7
20	1	U4	LM95221CIMF Device Under Test (DUT)
21	1	Y1	Crystal, 12 MHz, Pletronics 2S1200G140
22	1	--	Circuit Board, Fabricated, LM95221 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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