National Semiconductor

LM95071EVAL NOPB Evaluation Board User's Guide

LM95071EVAL NOPB Evaluation Board User's Guide
Table of Contents

LM95071EVAL NOPB Evaluation Board User's Guide

References

1. LM95071 SPI/MICROWIRE 13-Bit Plus Sign Temperature Sensor datasheet.

The latest copy of the LM95071 datasheet can be obtained by going to the National Semiconductor website www.national.com, by searching on "LM95071", and then downloading the LM95071.pdf file.

2. SensorEval Version 1.1.0q or later Evaluation Board CD containing:
    a. The SensorEval.exe executable program used to run the LM95071EVAL NOPB 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 LM95071EVAL NOPB 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 LM95071 EVAL NOPB Evaluation Board is provide by the +5VDC line of the USB connection. No external power supply or signal sources are required for operation of the LM95071 evaluation board.

Before connecting the LM95071EVAL NOPB evaluation board to the PC 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.

After the SensorEval software is running, the user can connect the USB cable first to the computer and then to the LM95071EVAL NOPB Evaluation Board.

The PC should be able to recognize the board and the user simply selects the LM95071EVAL NOPB Eval Board radio button. By selecting the "Read Cont" (Read Continuously) box the temperature

reading will update the temperature readings continuously. The user may also select the plot program and the temperature will be plotted for each reading made by the LM95071 temperature sensor. See Section 4.0 for more details.

The block diagram below describes the LM95071 EVAL NOPB 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 ICs. 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 LM95071 Evaluation Board.

The microcontroller on the board provides the chip select (CS), the serial clock (SC), and the serial I/O (SI/O) signals and relays the information from the LM95071to the PC via the USB bus.

The block in the lower right of the Block Diagram shows the signals that are available to probe by the user.

1.1 Block Diagram
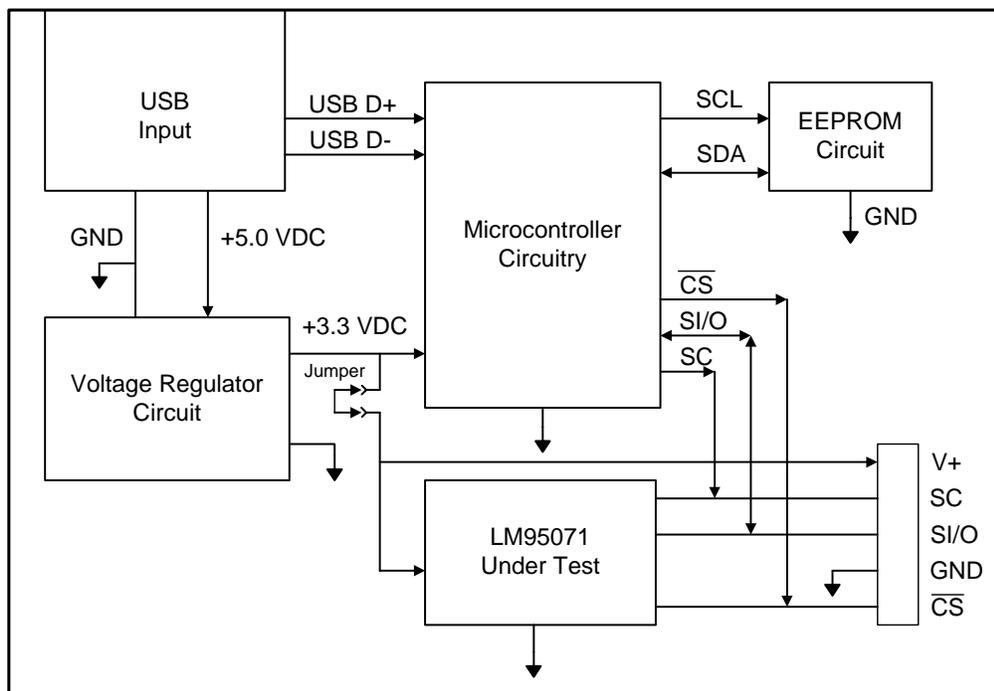
2.0 Quick Start

1. Install the CD into the CD drive of the computer and install the SensorEval software (see Section 4.0).
2. Make sure that the jumper is installed on the LM95071EVAL NOPB Evaluation Board as shown in the Quick Start Diagram below.
3. Hookup the USB cable between the PC or notebook computer as shown in Quick Start Diagram below.

Quick Start Diagram

Important! *NO EXTERNAL POWER SUPPLY OR SIGNAL INPUTS ARE REQUIRED!*
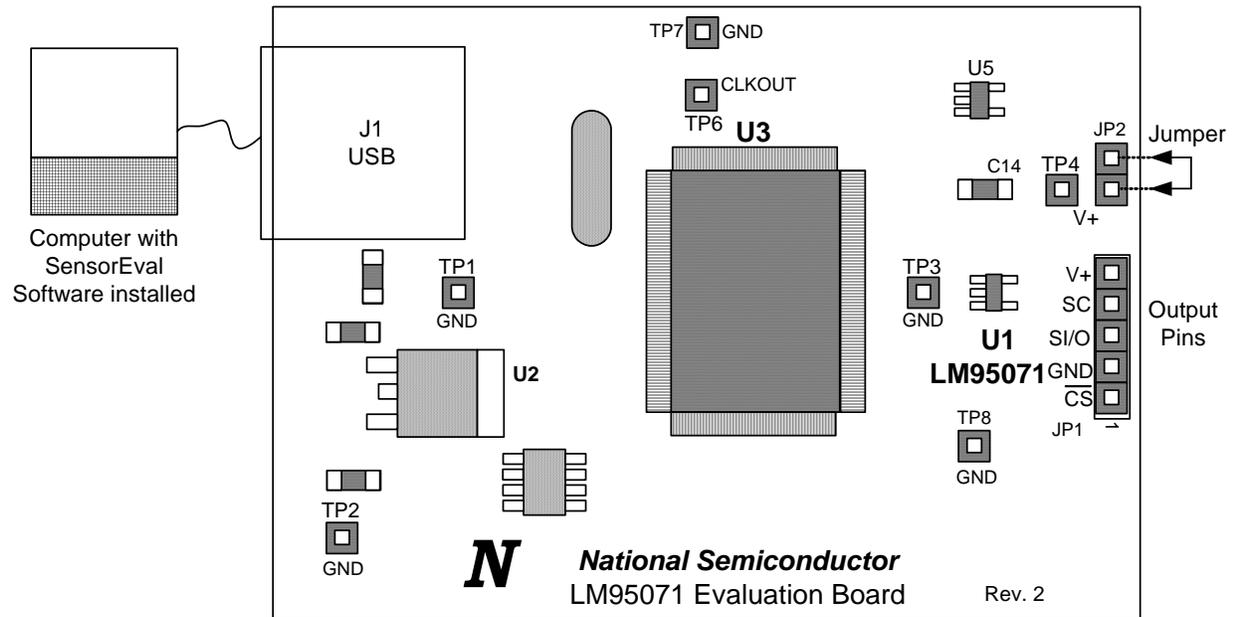
2.0 Quick Start (Continued)

4. Run the SensorEval software clicking the icon on the desktop. The first screen will look like this:

    Select the LM95071/NOPB Evaluation Board. Click OK.

5. The next screen will look like this:
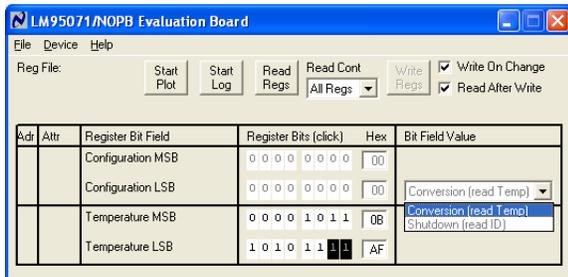
6. If the user clicks on the Read Cont box the temperature will read continuously.

7. If the user clicks on the Start Plot button a graph box will appear and will graph the temperature. An example is shown below.
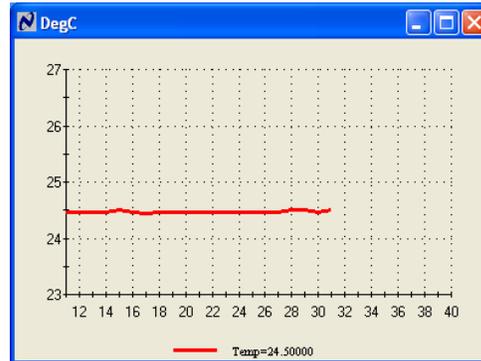
8. If the user clicks on the on the Start Log button a window, as shown below, will appear.
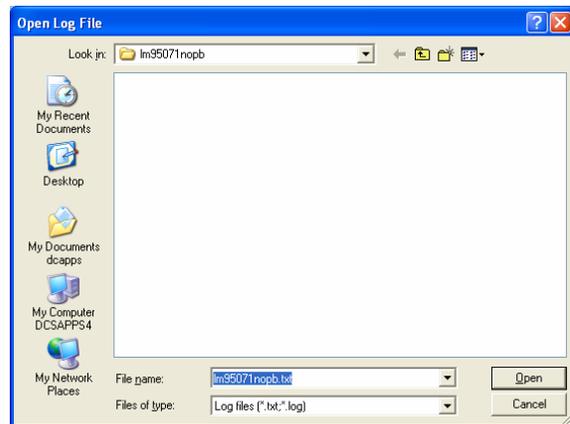
3.0 Functional Description

The LM95071 EVAL NOPB Evaluation Board, along with the SensorEval Software, provides the system designer with a convenient way to learn about the operation of the LM95071 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 LM95071EVAL NOPB 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 LM95071, the on-board microcontroller, and the EEPROM chip, which stores the board ID information.

The microcontroller provides the active low Chip Select (CS) signal and the Serial Clock (SC) signal to the LM95071 chip. The Serial Input/Output (SI/O) communications between the LM95071 and the PC USB data lines is controlled by the microcontroller. For all of the details of this communication protocol see the latest LM95071 datasheet, available at www.national.com.

3.1 LM95071EVAL NOPB 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.
JP1 Output header provides user with signals for test purposes only. *Do not apply any external power or signals to any of the pins on this header!*	1	Chip Select. Signal from microcontroller to the LM95071 chip select input.
	2	Ground
	3	SI/O. Serial I/O signal from the microcontroller to the LM95071 SI/O pin.
	4	SC. Serial Clock signal from the microcontroller to the LM95071 SC input.
	5	V+. The +3.3 VDC voltage supplied by the on-board voltage regulator to the LM95071 V_{DD} input pin.
JP2	1-2	Jumper the two pins on the header for regular operation. A milliammeter may be connected here to measure the input current to the LM95071.
TPx	N/A	These test points (1x1 headers) are provided for convenient Ground or Power access to the board.

 www.national.com

Software Installation and Operation

Installation

The CD provided in the LM95071EVAL NOPB Evaluation Board Kit contains the SensorEval software used to make the LM95071EVAL NOPB 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 operation system.

The software is installed as follows:

1. Insert the LM95071EVAL NOPB 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. 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 LM95071 EVAL NOPB 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 LM95071EVAL NOPB Evaluation Board. The first screen will look like this:

If the computer cannot find the eval board run the "Add Hardware" wizard in the Control Panel.

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

Refer to the schematic, layout and connector diagrams for the connections to remote diodes for the temperature readings.

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
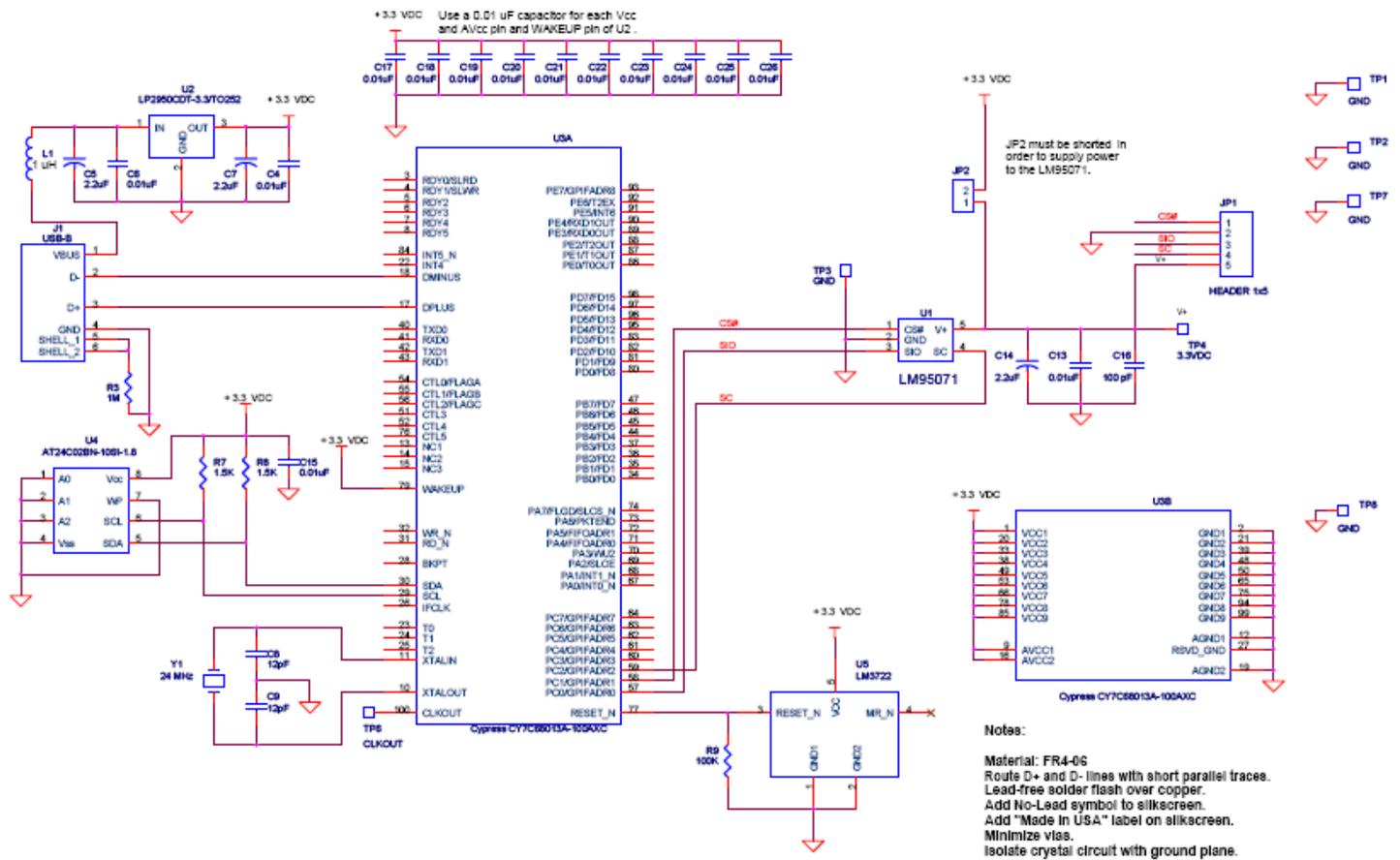
Figure 5.2 Schematic Diagram of the LM95071 Evaluation Board

5.3 Evaluation Board Layout
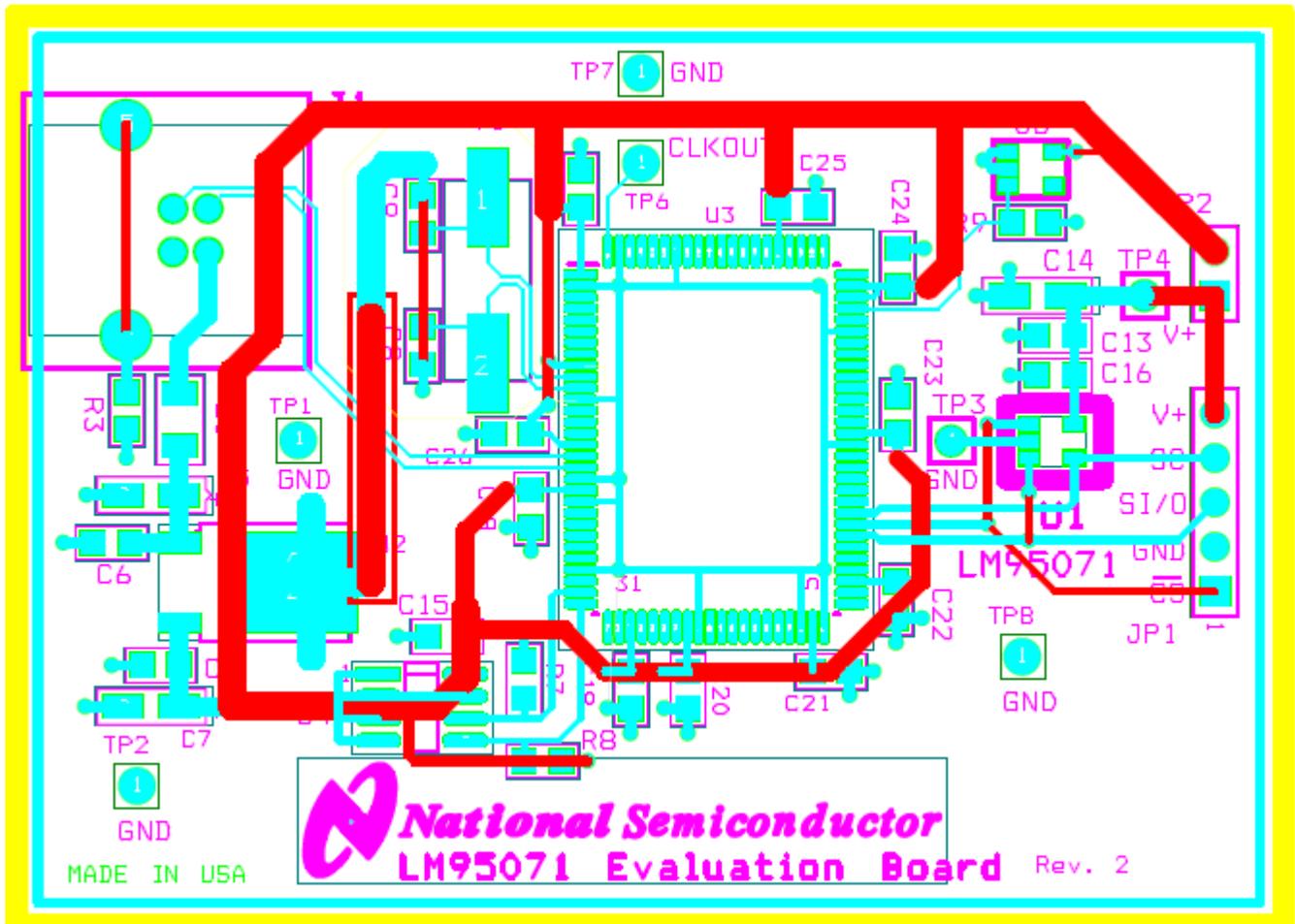
Figure 5.3 Layout diagram of the LM95071EVAL NOPB Evaluation Board

5.4 Bill of Materials for LM95071 Evaluation Board

Item	Quantity	Reference	Part
1	14	C4, C6, C13, C15, C17, C18, C19, C20, C21, C22, C23, C24, C25, C27	Capacitor, Ceramic, 10nF
2	2	C8, C9	Capacitor, ceramic, 12pF
3	3	C5, C7, C14	Capacitor, ceramic, 2.2uF
4	1	C16	Capacitor, ceramic, 100pF
5	1	JP1	Header, 1X5, 0.1 in centers
6	1	JP2	Header, 1X2, 0.1 in centers
7	1	J1	Connector, USB-B
8	1	L1	Filter, 1uH, Stewart MI1206K900R-00
9	1	R3	Resistor, SMT, 1M, 0805
10	2	R7, R8	Resistor, SMT, 1.5k, 0805
11	1	R9	Resistor, SMT, 100k, 0805
12	7	TP1-TP4, TP6-TP8	Test Points (1X1 Headers)
13	1	U1	LM95071CIMF Device Under Test (DUT)
14	1	U2	IC, Voltage Regulator, National LP2950CDT-3.3
15	1	U3	IC, Microcontroller, Cypress CY7C68013A-100AXC
16	1	U4	IC, EEPROM, Atmel AT24C02BN-10SU-1.8
17	1	U5	IC, Reset, National LM3722EM5-3.08
18	1	Y1	Crystal, 24 MHz, ECS-240-12-5PX-TR
19	1	--	Circuit Board, Fabricated, LM95071 Evaluation Board, Rev. 2

5.5 Mechanical Specifications

5.5.1 Operating Mechanical and Environmental Specifications

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

5.5.2 Evaluation Board Basic Dimensions
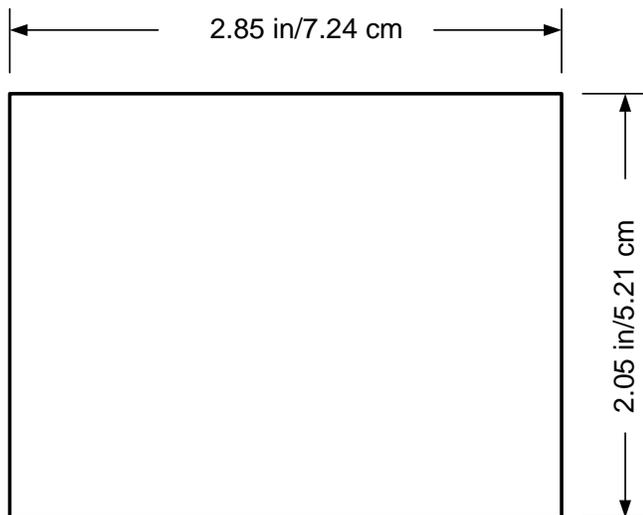
5.5.3 Electrostatic Discharge (ESD) Precautions

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

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

BANNED SUBSTANCE COMPLIANCE

National Semiconductor certifies that the products and packing materials meet the provisions of the Customer Products Stewardship Specification (CSP-9-111C2) and the Banned Substances and Materials of Interest Specification (CSP-9-111S2) and contain no "Banned Substances" as defined in CSP-9-111S2.

National does not assume any responsibility for any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.