ZL70251 WSN Evaluation Kit
User's Guide

Microsemi

Table of Contents

1 Introduction 4

2 Installation and Setup 5
2.1 Hardware List 5
2.2 System Hardware Components 5
2.3 Switch Configuration 7
2.4 Hardware and Software Installation 8

3 Operation 9
3.1 Startup 9
3.2 *Node Configuration and Status* Section 10
3.3 *Hub Status and Control* Section 11
3.4 Registers Main Form 14
3.4.1 Register Tabs 14
3.4.2 *Register Controls* Section 16
3.4.3 Register Description Window 17

A Performing Firmware and EEPROM Updates 18
A.1 Programming Firmware Using Atmel Studio 18
A.2 Changing EEPROM Settings Using Atmel Studio 19

B References 21

C Glossary 22
C.1 Definitions 22
C.2 Abbreviations 22

D List of Changes 23

E Product Support 24
E.1 Customer Service 24
E.2 Website 24

List of Figures

Figure 1 – ZL70251 WSN Evaluation Kit 5
Figure 2 – Hub Mated with Hub Extender (HUBEXTNDR100) 6
Figure 3 – Accelerometer Node Mated with Node Extender (NODEXTNDR100) 6
Figure 4 – ZL70251 WSN Evaluation Kit Main Form 9
Figure 5 – ZL70251 WSN Evaluation Kit Main Form Displaying Data and Status from Three Accelerometer Nodes 10
Figure 6 – Node Accelerometer Strip Chart Data 11
Figure 7 – *RSSI* Window 12
Figure 8 – Registers Main Form 14
Figure 9 – Sample Register Access Subsection 15
Figure 10 – Register Settings Saved to Text File 16
Figure 11 – Sample *Register Description* Window (MAC_CTL1 register) 17
Figure 12 – EEPROM Utility 19

List of Tables

Table 1 – Switch Configuration 7

1 Introduction

The ZL70251 Wireless Sensor Network (WSN) Evaluation Kit is intended to support customer design and evaluation activities related to developing products that are based on Microsemi's ZL70251 Ultra-Low-Power RF Transceiver. The evaluation kit is supplied with antennas that work in both the US ISM and European SRD bands, and the China band can be used with user-supplied antennas. The band is selected via switch settings (see section "2.3 Switch Configuration" on page 7). The kit provides customers with an example accelerometer application, including a hub and an accelerometer node. In addition to being a working application to evaluate performance of the ZL70251 device, the kit provides hardware and software design examples to aid in the development and characterization of user applications for purposes of proof of concept.

This document applies to ZL70251 WSN Evaluation Kit version 1.0.X, where X is the patch number.

2 Installation and Setup

2.1 Hardware List

The ZL70251 WSN Evaluation Kit includes the following hardware:

1. Hub (HUB100) — Qty 1
2. Accelerometer node (NODE100 mated with ACCEL100) — Qty 1
3. Antennas (dual band) — Qty 2:

   US ISM and European SRD bands:
   Pulse Electronics Monopole Antenna, P/N W1900
4. Node programming/test adapter (NODEXTNDR100) — Qty 1
5. Hub programming/test adapter (HUBEXTNDR100) — Qty 1
6. CR1632 coin-cell battery — Qty 1
7. Getting Started guide with download and installation instructions — Qty 1

2.2 System Hardware Components

ZL70251 WSN Evaluation Kit: Figure 1 shows the hub and accelerometer node that are included in the ZL70251 WSN Evaluation Kit.

- **Hub:** The hub is a HUB100 board. For use with the hub, the kit includes a monopole antenna for operation in the US ISM band and the European SRD band.
- **Accelerometer Node**: The accelerometer node includes a NODE100 board mated with an ACCEL100 board. For use with the node, the kit includes a monopole antenna for operation in the US ISM band and the European SRD band.

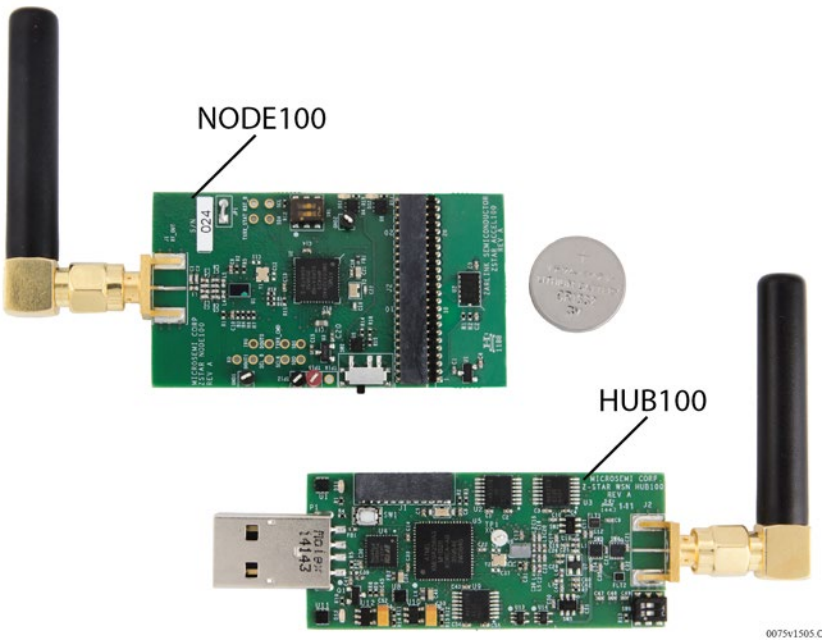

Figure 1 – ZL70251 WSN Evaluation Kit

Hub Extender: The hub extender (HUBEXTNDR100) connects between the Atmel ATXMEGA256A3 microcontroller on the HUB100 and the optional Atmel JTAGICE3 on-chip debug system programmer (JTAGICE3 - refer to "A – Performing Firmware and EEPROM Updates" on page 18 for ordering information). The HUBEXTNDR100, shown in Figure 2, allows users to download code and run the debugger to implement and test new features on the HUB100.

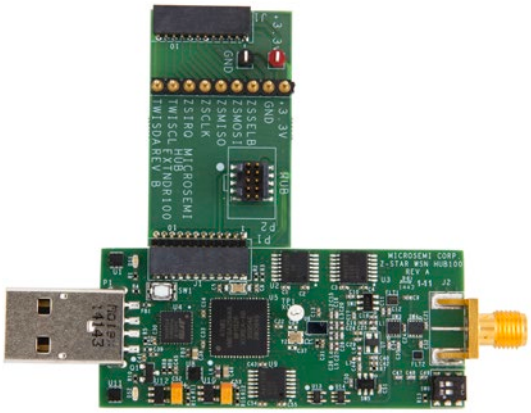

Figure 2 – Hub Mated with Hub Extender (HUBEXTNDR100)

Node Extender: The node extender (NODEXTNDR100) connects between the Atmel ATXMEGA32A4 microcontroller on the NODE100 and the optional Atmel JTAGICE3 on-chip debug system programmer (JTAGICE3 - refer to "A – Performing Firmware and EEPROM Updates" on page 18 for ordering information). The NODEXTNDR100, shown in Figure 3, allows users to download code and run the debugger to implement and test new features on the NODE100.

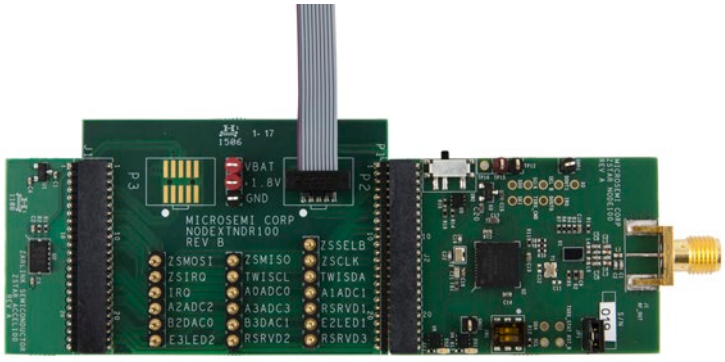

Figure 3 – Accelerometer Node Mated with Node Extender (NODEXTNDR100)

2.3 Switch Configuration

Table 1 provides a description and the default setting (if applicable) for each switch on each board.

Table 1 – Switch Configuration

	Switch Description	Default Setting
NODE100		
SW1	Dip switch. Selects operating frequency for the ZL70251 transceiver. **The operating frequency is configured only on power up. If a different operating frequency is switched in, the board must be turned off and then back on for the new switch settings to take effect.** There is a dot that annotates pin 1 on this switch. The switch configuration relative to the position of this dot selects operating frequency: • 00 (both switches away from the dot): The ZL70251 transceiver operates in the US ISM band at 915.9 MHz. • 01 (switch closest to the dot is switched toward the dot and the switch farthest from the dot is switched away from the dot): The ZL70251 transceiver operates in the European SRD band at 864.7 MHz. • 10 (switch farthest from the dot is switched toward the dot and the switch nearest the dot is switched away from the dot): The ZL70251 transceiver operates in the China band at 781.8 MHz. • 11 (both switches toward the dot): The ZL70251 transceiver operates in the US band and outputs a carrier wave at 915.9 MHz.	00
SW2	Slide switch. Provides 3V battery power to the NODE100 and the ACCEL100. To apply power, slide the switch up (away from the ACCEL100 board).	Down (Note 1)
HUB100		
SW1	Push-button switch. When pressed, resets the processor (that is, the ATXMEGA256A3 microcontroller) on the HUB100.	N/A
SW6	Dip switch. Selects operating frequency for the ZL70251 transceiver. **The operating frequency is configured only on power up. If a different operating frequency is switched in, the board must be turned off and then back on for the new switch settings to take effect.** There is a dot that annotates pin 1 on this switch. The switch configuration relative to the position of this dot selects operating frequency: • 00 (both switches away from the dot): The ZL70251 transceiver operates in the US ISM band at 915.9 MHz. • 01 (switch closest to the dot is switched toward the dot and the switch farthest from the dot is switched away from the dot): The ZL70251 transceiver operates in the European SRD band at 864.7 MHz. • 10 (switch farthest from the dot is switched toward the dot and the switch nearest the dot is switched away from the dot): The ZL70251 transceiver operates in the China band at 781.8 MHz. • 11 (both switches toward the dot): The ZL70251 transceiver operates in the US band and outputs a carrier wave at 915.9 MHz.	00

Note:

1. *Direction is given assuming the user is reading the board name upright.*

2.4 Hardware and Software Installation

Note: The ZL70251 WSN Evaluation Kit is supported under Windows XP and Windows 7. Only the hub directly interfaces to the PC.

The following steps are required before operation of the ZL70251 WSN Evaluation Kit can begin.

1. Screw the two dual-band monopole antennas onto the SMA connectors located on the edges of both the HUB100 and the NODE100.
2. Install the CR1632 battery on the bottom of the NODE100.
3. Download the ZL70251 WSN Evaluation Kit software.
   - Download the ZIP file for release *1.0.X* , where X is the latest patch number. Use the QR code on the box or visit: http://www.microsemi.com/products/ultra-low-power-wireless/sub-ghz-radio-transceivers/zl70251#docs-amp-specs
   - Extract the files from the ZIP file onto your PC.
4. Run *setup.exe* (extracted from the ZIP file) and follow the on-screen instructions.

   Note that multiple versions of the ZL70251 WSN Evaluation Kit software can be installed on a PC without conflict, so there is no need to remove previous versions (although you may if you no longer need them).

   Also note that, in order for some of the features to work, the user must have permission to create files in the *Program* subfolder under the ZL70251 WSN installation folder. For example, this is required for the *Save Registers to File* checkbox in the registers main form.
5. Connect the HUB100 to the PC via a USB port.
6. The PC then detects a new USB device and prompts to search for the device driver. If you are not prompted for the driver and it starts searching automatically, cancel the search so you can install the driver manually. Next, take the steps necessary to install the driver located in the following folder (in this path, replace the *X* in *1.0.X* with the patch number for the release):

   C:\Program Files (x86)\Microsemi\ZL70251 WSN Evaluation Kit 1.0.X\Hub USB Driver

   If you need guidance, the driver folder contains files with installation instructions, for example FTDI USB drivers (*FTDI Drivers Installation Guide for Windows XP.pdf* and *FTDI Drivers Installation Guide for Windows 7.pdf*). In the example installation instructions, substitute the driver folder above for the driver folder in the example, and substitute *ZL7025X Hub* for the device named in the example. Also, ignore instructions pertaining to the COM port driver because the hub driver does not use that.
7. Power to the hub is supplied once plugged into a USB port on the PC.

3 Operation

This chapter describes in detail the operation of the main components of the ZL70251 WSN Evaluation Kit for both the hub and the node.

3.1 Startup

To start up the kit:

- Launch the software by double-clicking the *ZL70251 WSN Evaluation Kit 1.0.X* icon on the desktop. As shown in Figure 4, the ZL70251 WSN Evaluation Kit main form appears, the software connects to the hub, and then the WSN main form changes the operational state to *Listening for Data*.

  The *Node Configuration and Status* section remains empty until a sensor node is discovered.

- Power on the accelerometer node by sliding the power switch up.

  Note: To activate the accelerometer for the first time after a battery is installed, you must tilt the NODE100 to a vertical position (90 degrees) and then lay it flat for at least 2 seconds. After it has been activated, whenever the NODE100 is rotated or shaken, the accelerometer immediately wakes up and starts sending data. When the NODE100 is laid flat (battery against a horizontal surface) for more than 2 seconds, the accelerometer goes to sleep and no data is transmitted until it wakes up again. This is done for power saving purposes and enables a long battery life.

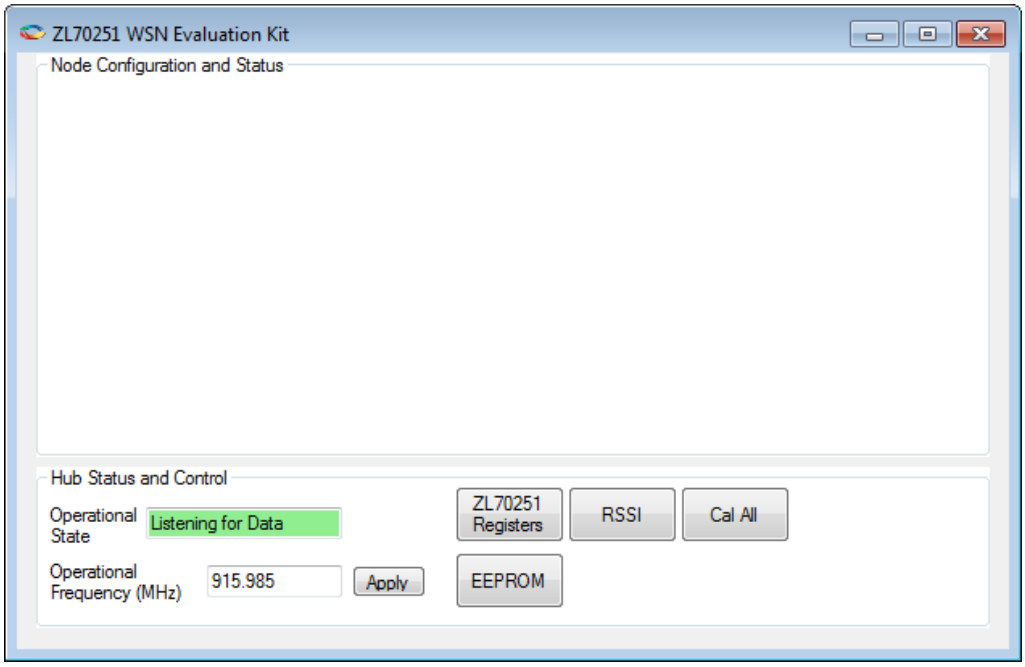

Figure 4 – ZL70251 WSN Evaluation Kit Main Form

3.2 *Node Configuration and Status* Section

The *Node Configuration and Status* section of the WSN main form shows the sensor nodes as they are discovered by the hub. When a hub discovers a new sensor node, it populates the *Node Configuration and Status* section with the sensor's name and its parameters. (One accelerometer node is shipped with the ZL70251 WSN Evaluation Kit. If needed, additional accelerometer nodes may be purchased separately; contact Microsemi for details.)

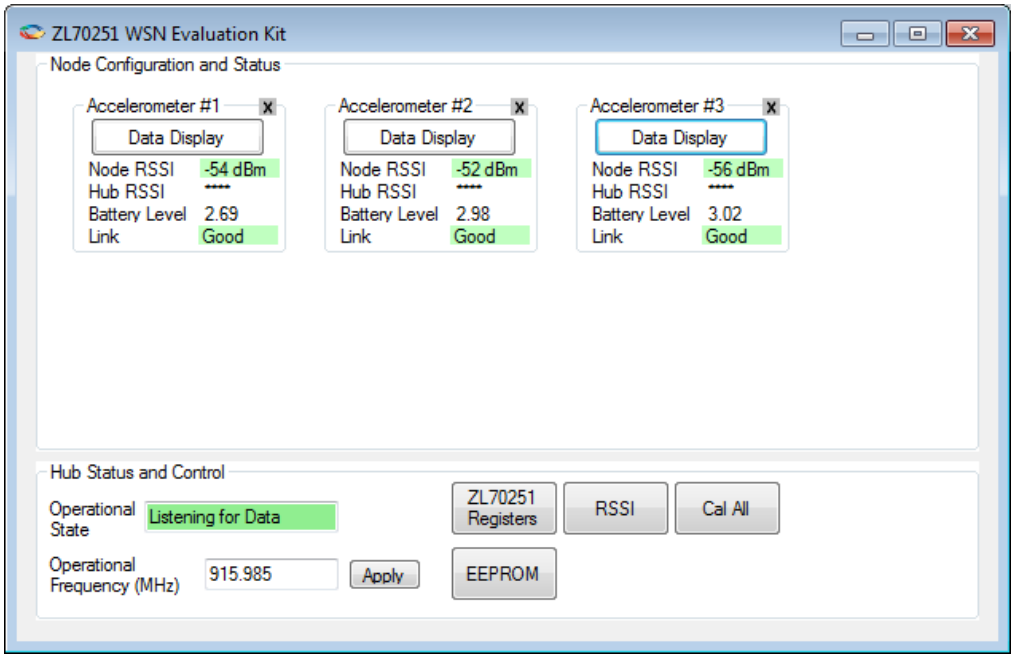

Figure 5 – ZL70251 WSN Evaluation Kit Main Form Displaying Status from Three Accelerometer Nodes

As can be seen in Figure 5, the status section shows the *Node RSSI* (Received Signal Strength Indicator), *Battery Level*, and the quality of the *Link*.

- ***Node RSSI***: This field represents the last known received signal strength measurement taken from the NODE100 during a packet reception from the HUB100. The color changes from green for a stronger signal to yellow for a weaker signal. If the hub loses communication with the node, this field is populated with asterisks (****).
- ***Hub RSSI***: Not supported at this time.
- ***Battery Level***: This displays the NODE100 battery level. The NODE100 uses a 3-volt CR1632 coin-cell battery. If the hub loses communication with the node, this field is populated with asterisks (****).
- ***Link***: If the link quality field displays *Good* and the display is green, this means that no packets are being dropped. If the link quality field displays *Fair* and the display is yellow, this means a packet was dropped unexpectedly. If the hub loses communication with the node, this field is populated with asterisks (****).
- ***Data Display***: Click this button to bring up a strip chart that shows streaming data for the accelerometer, an example of which is shown in Figure 6 on page 11.

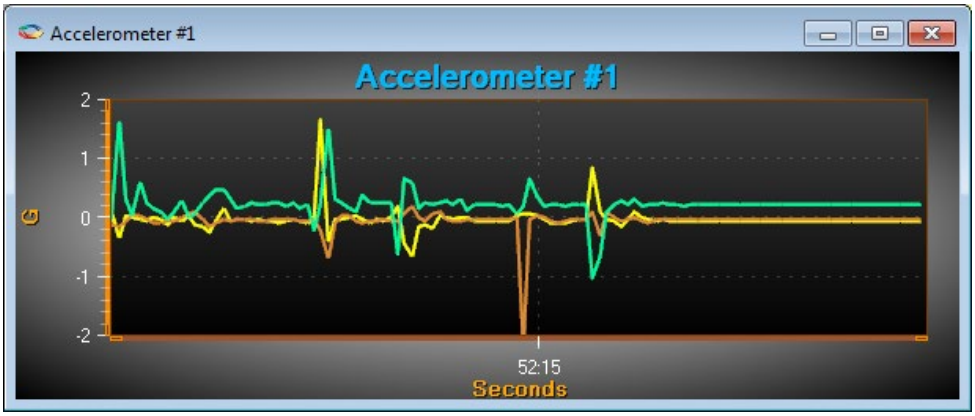

Figure 6 – Node Accelerometer Strip Chart Data

3.3 *Hub Status and Control* Section

The *Hub Status and Control* section of the ZL70251 WSN Evaluation Kit main form (refer to Figure 5 on page 10) provides for control of the main functions of the system and displays status information for the key operational state and settings of the link:

- ***Operational State***: This field displays the current operational status of the hub as follows:
  - *Searching for Hub*: The software is searching for the hub.
  - *Initializing*: The software is initializing after a change (for example, found hub or adding node).
  - *Listening for Data*: The software is polling the hub for packets received from the nodes.
  - *RSSI*: The *RSSI* window is open. The software does not listen for data while the *RSSI* window is open.
- ***Operational Frequency (MHz)***: This field shows the operating frequency for the ZL70251 transceiver on the hub. The user has the ability to change the operating frequency of the transceiver. The user can simply enter the desired frequency in megahertz (which doesn't need to be exact) and press the *Apply* button. The software then takes the entered frequency, calculates the exact operating frequency, updates the *Operational Frequency* text box, and then configures the radio for the new desired frequency. The intended use of this field is for developers who want to create custom nodes that operate at a different frequency than the nodes provided with the kit. This allows users to develop PC-based applications without having to modify the API and embedded software for the hub application.
- ***ZL70251 Registers***: This button brings up a separate window for accessing the registers of the hub (refer to "3.4 Registers Main Form" on page 14). The software continues to listen for data while the *Registers Main Form* is open.
- ***RSSI***: This button brings up a separate window for reading the RSSI on a number of contiguous channels. This dialog box is useful when the user wants to see RF power on a range of channels. It could help determine if an interfering signal is operating on the same channel that the evaluation kit is using. When this button is pressed and the *RSSI* window launches, the *Operational State* changes to *RSSI*. The software

does not listen for data as long as the *RSSI* window is open. As shown in Figure 7, the fields in the *RSSI* window are:

- ***Start Frequency (MHz)***: In this text box the user enters the starting frequency (value does not have to be exact) on which the RSSI measurement is to be performed.

  Note: User must press enter for the text change to take effect.

- ***Stop Frequency (MHz)***: In this text box the user enters the ending frequency (value does not have to be exact) on which the RSSI measurement is to be performed.

  Note: User must press enter for the text change to take effect.

- ***Continuous***: If this box is checked, the RSSI measurements are repeated for the desired channels until manually stopped.
- ***Sniff Period***: The user can define the amount of sniff time for each channel by selecting the time in this drop down box.
- ***Start***: Press the start button to begin taking RSSI measurements. The correct channel frequency is calculated and displayed on the x-axis. The resulting RSSI value for each channel is displayed in the form of a bar chart. Moving the cursor over the bar (the data measurement) for any channel causes the statistics for that channel to be displayed at the top of the bar chart.

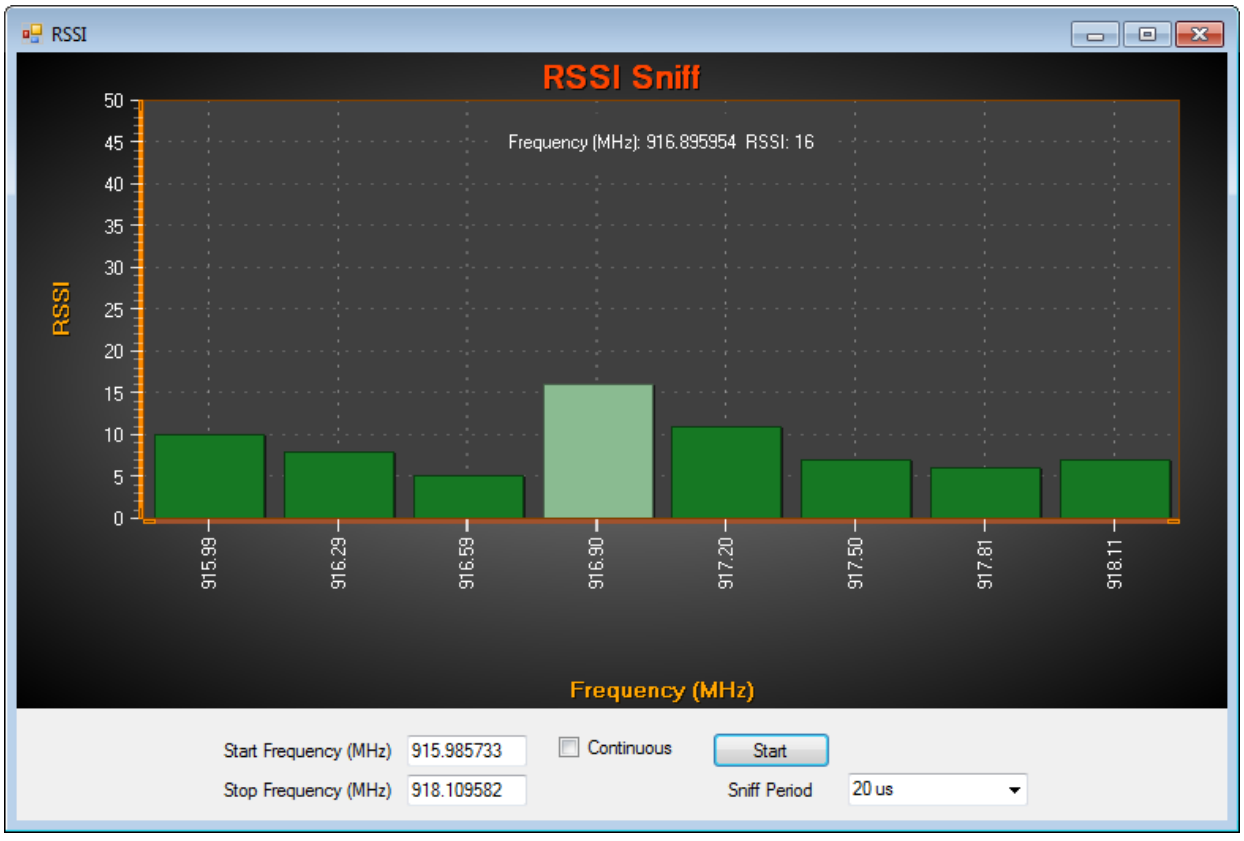

Figure 7 – *RSSI* Window

- ***Cal All***: When this button is pressed, the ZL70251 transceiver is recalibrated. The user can then use the ZL70251 registers page to see the resulting trim values. When pressing the *Cal All* button, the following trims are performed:
  - VFT TXPAOFF (trim results can be seen at addresses 113 and 114)
  - VCO amplitude (trim result can be seen at address 37)
  - VFT TXPAON (trim results can be seen at addresses 115 and 116)
  - VFT RX (trim results can be seen at addresses 111 and 112)
  - Peak detector (trim result can be seen at address 39)
  - Antenna (trim result can be seen at address 38)
  - LNA (trim result can be seen at address 40)
- ***EEPROM***: When this button is pressed, the EEPROM utility is launched. The EEPROM utility allows the user to perform a read-modify-write operation on existing EEPROM files or to create new EEPROM files. Refer to section “A.2 Changing EEPROM Settings Using Atmel Studio” on page 19 for more details.

3.4 Registers Main Form

The registers main form for the ZL70251 WSN Evaluation Kit provides access to all ZL70251 registers, and is organized into tabs to access various groups of ZL70251 registers.

The registers main form is divided into two major sections. The display for the hub is shown in Figure 8. The upper section of the form contains tabs that allow access to different groups of ZL70251 registers. The lower section is a static display that allows for basic register controls. Paragraphs 3.4.1 through 3.4.2 provide detailed descriptions of the various controls for the registers main form.

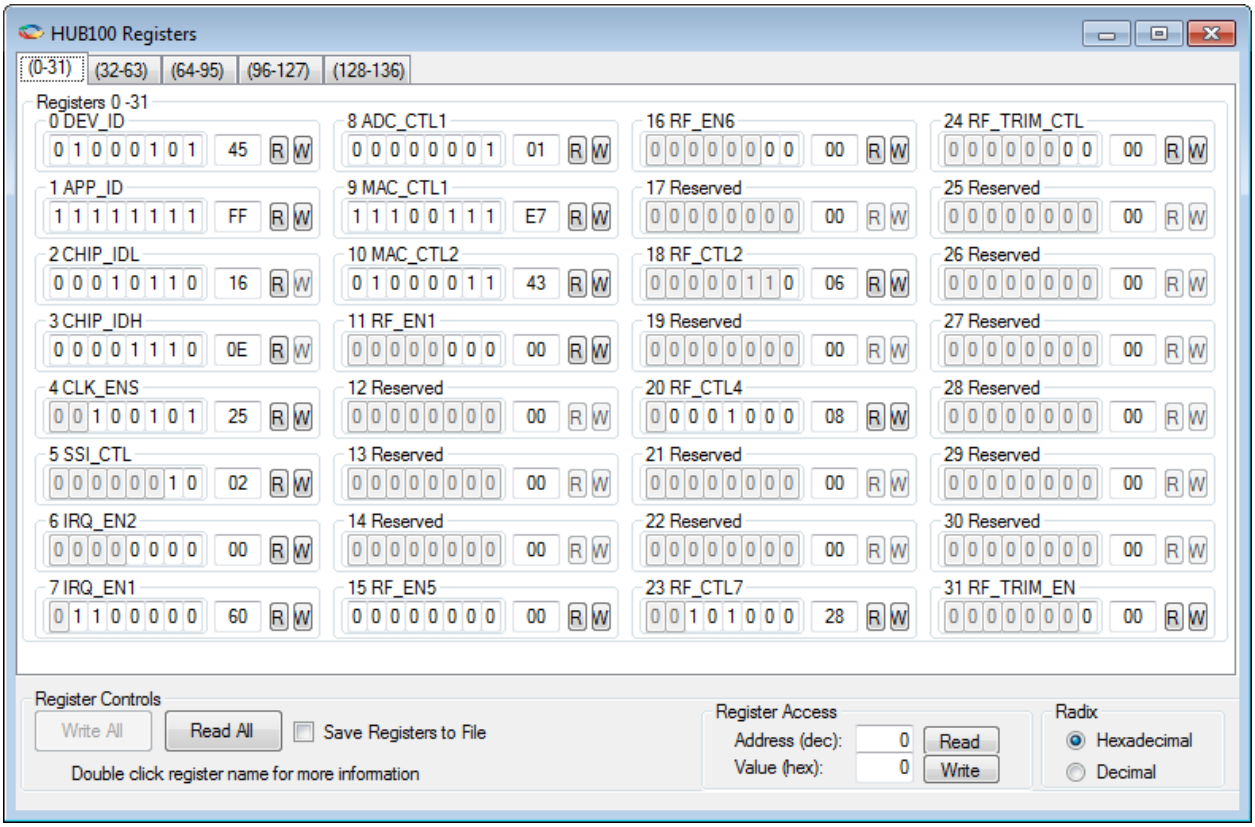

Figure 8 – Registers Main Form

Note: Manually changing register values using the registers main form has the potential to adversely affect the link. If manual changes to the registers cause problems such as loss of connectivity, it is recommended that the user reset the registers to their default values. This can be accomplished by unplugging the hub from the USB port and restarting the software for the ZL70251 WSN Evaluation Kit.

3.4.1 Register Tabs

The upper section of the registers main form contains tabs that allow the user to access all registers of the ZL70251. Each tab is labeled with the decimal addresses of the registers that are found on that tab; for example, the first tab *(0-31)* enables access to the first 32 registers. Since all tabs in the registers main form (Figure 8) have the same register access subsections, only one register function is detailed in Figure 9 on page 15 and described below.

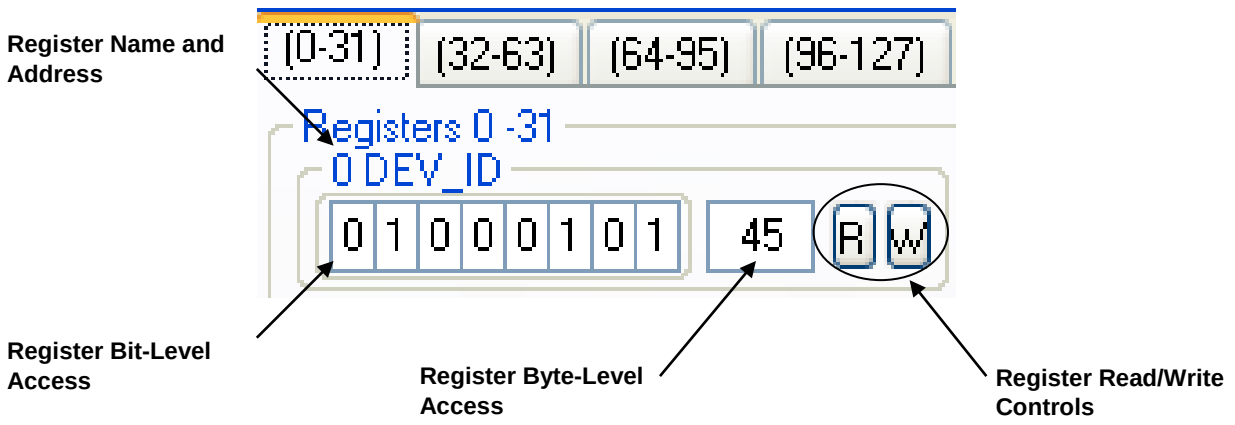

Figure 9 – Sample Register Access Subsection

The sample register access subsection in Figure 9 above includes:

- **Register name and address**: The register name and decimal address are the same as those given in the *ZL70251 Programmer User's Guide* (refer to Chapter 11). By double-clicking on the register name (near the register address), more information about the register is displayed in a pop-up window (refer to "3.4.3 Register Description Window" on page 17).
- **Register bit-level access**: This field allows for bit-level access to the register value. Bits that are not valid (don't cares) for a register are grayed out and cannot be modified. When clicking on a bit, the value toggles and turns red, indicating a change from the current value. After all desired bit changes are made, pressing the *W* (write) button causes the new bit values to turn back to black and the new register value is written to the ZL70251. (Refer to Note below.)
- **Register byte-level access**: This field allows for byte-level access to the register value in hexadecimal format. When clicking in this field, the current value disappears and a new value may be written in its place. The new value turns red, indicating a change from the current value. After the new value is entered, pressing the *W* (write) button causes the new value to turn black and the new value is written to the ZL70251. (Refer to Note below.) The radix used to display and enter the value is controlled by the *Radix* radio buttons in the *Register Controls* section (located below the tabs; refer to "3.4.2 Register Controls Section" on page 16).
- **Register read/write controls**: The *R* and *W* buttons control the read and write functions, respectively, from and to the registers. If an *R* or *W* control is grayed out, it is an indication that its operation is not allowed for that register.
  - *R*: Pressing the *R* button causes a read from the register of the ZL70251 at the address displayed in the register name, and displays the register's value in both the byte- and bit-level access fields. All values are displayed in black.
  - *W*: If the register value is changed by the user (and is therefore red in the display), pressing the *W* button writes the new value to the register of the ZL70251 at the address displayed in the register name, and changes the color of the new value to black. (Refer to Note below.)

Note: If the user wants to simultaneously change multiple registers, refer to "3.4.2 Register Controls Section" on page 16 for a description of the *Write All* button.

3.4.2 *Register Controls* Section

The lower section of the registers main form, called *Register Controls*, provides for control over global functions of all register tabs (for example the ability to write to and read from all registers). The buttons and fields in this section are:

- ***Write All***: When this button is pressed, all outstanding register changes (shown in red on the register tabs) are written to the ZL70251. This operation takes a few seconds to complete.
- ***Read All***: When this button is pressed, all register settings are read from the ZL70251. This operation takes a few seconds to complete.
- ***Save Registers to File***: When this checkbox is checked and *Read All* is pressed, all registers settings are saved to a text file. The file is stored under *C:\Program Files (x86)\Microsemi\ZL70251 WSN Evaluation Kit 1.0.X\Program*. Figure 10 is an example of the file format viewed in Notepad.

  Figure 10 shows that the address is displayed in decimal and the data is displayed in hexadecimal. This is compatible with the default format shown in the registers main form as well as the *ZL70251 Programmer User's Guide*.
- ***Register Access***: The fields in this group allow users to enter any register address for *Read* or *Write* access. The address is in decimal and the data value is in hexadecimal (in the *Address (dec)* and *Value (hex)* fields, respectively). The *Radix* radio buttons (refer to next bullet) do not apply to this function.
- ***Radix***: These radio buttons select the radix used for register values in the register byte-level access field for each register in the register tabs.

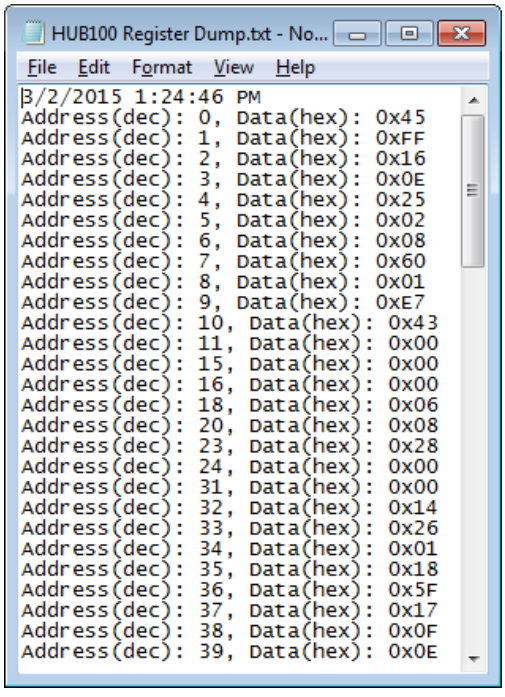

Figure 10 – Register Settings Saved to Text File

3.4.3 *Register Description* Window

The *Register Description* window is displayed when a user double-clicks on a register name (near the address) in the register tabs of the registers main form. Figure 11 shows an example of the *Register Description* window for the MAC_CTL1 register.

The *Register Description* window is an informational dialog and therefore all fields are read-only. The fields are:

- ***Address***: The address of the register is displayed in decimal and in hexadecimal.
- ***Name***: This field gives the name of the register. This name is consistent with the name in the *ZL70251 Programmer User's Guide*.
- ***Type***: This field indicates which type of access is permissible. The options are:
  - R: Read only. A write operation is ignored.
  - W: Write only. A read value is meaningless.
  - R/W: Read or write.
- ***Bits***: This field indicates how many bits in the register are relevant. The relevant bits are right justified.
- ***Category***: This field indicates the register grouping as defined in the *ZL70251 Programmer User's Guide* in chapter "9 – System Memory Map".
- ***Reset***: This field indicates the default value, in hexadecimal format, for the register at power-on reset.
- ***Description***: This field gives a bit definition (bit word name) and a description for each bit in the register.

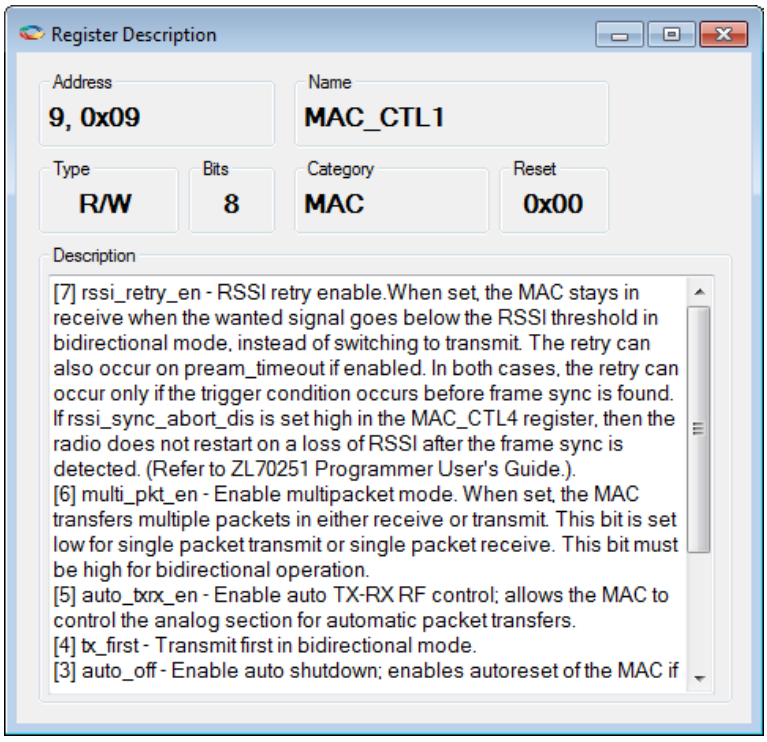

Figure 11 – Sample *Register Description* Window (MAC_CTL1 register)

A Performing Firmware and EEPROM Updates

This appendix describes how to program the firmware on the boards included with the ZL70251 WSN Evaluation Kit. The kit is shipped with the latest firmware installed. If customers want to modify the software for their own needs or update their software to a current release, the procedure outlined in this appendix should be followed.

A.1 Programming Firmware Using Atmel Studio

The ZL70251 WSN Evaluation Kit includes a hex format file (.hex) for each board's firmware. These files can be used with Atmel Studio to program the firmware on the boards. Atmel Studio can be downloaded at www.Atmel.com. This procedure also requires an Atmel JTAGICE3 programmer, which may be purchased separately from distributors such as Digikey and Mouser.

If the kit software is installed on your PC, the firmware files can be found under *C:\Program Files (x86)\Microsemi\ZL70251 WSN Evaluation Kit 1.0.X\Firmware*. If the kit software was installed in a different location, adjust the path accordingly. If the kit software has not been installed, the firmware files can be found under the *Firmware* directory in the ZIP file for the ZL70251 WSN Evaluation Kit (see section "2.4 Hardware and Software Installation" on page 8).

To use Atmel Studio to program a HUB100 or NODE100 board:

1. Connect the JTAGICE3 to the PC via USB.
2. Connect either the HUBEXTNDR100 to the HUB100 board or NODEXTNDR100 to the NODE100 board.
3. Connect the JTAGICE3 to the PDI port on the HUBEXTNDR100 (HUB100) or NODEXTNDR100 (NODE100) target board.
4. Turn on the power to the board to be programmed.
5. Launch the Atmel Studio software.
6. Click *Tools > Device Programming*
7. Select *JTAGICE3* under *Tools*. Under *Device,* select either *ATXMEGA256A3* for the HUB100 or *ATXMEGA32A4* for the NODE100*.* Select *PDI* under *Interface.* Then click *Apply*. If the JTAGICE3 is connected properly and the board is powered up, a new set of options appears on the left panel.
8. Select *Memories*.
9. In the *Flash* section, click the box labeled with an ellipsis (that is, …) and navigate to the appropriate firmware file for the target board. The firmware files can be found under *C:\Program Files (x86)\Microsemi\ZL70251 WSN Evaluation Kit 1.0.X\Firmware* or under the *Firmware* directory in the evaluation kit release (ZIP file). Click the *Program* button.
10. When Atmel Studio finishes programming the firmware, you may disconnect the extender board.
11. To run the new firmware, toggle the power on the appropriate board.

A.2 Changing EEPROM Settings Using Atmel Studio

The ZL70251 WSN Evaluation Kit includes an EEPROM utility that allows the user to perform a read-modify-write operation on existing EEPROM files or to create a new EEPROM file to program into the hub or node. To open the EEPROM utility, click the *EEPROM* button in the *Hub Status and Control* section of the WSN main form. The EEPROM utility is shown in Figure 12 with the default settings for the node and hub.

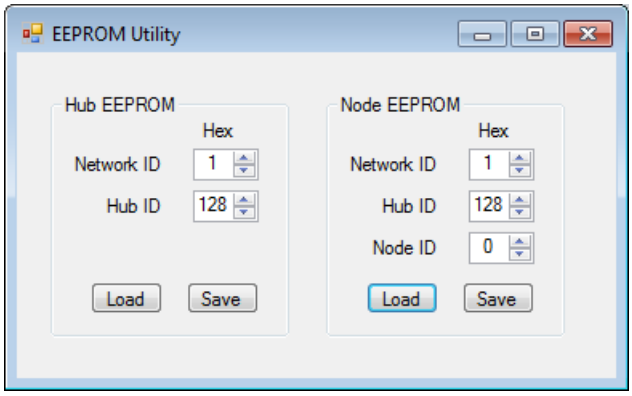

Figure 12 – EEPROM Utility

- ***Network ID*** and ***Hub ID***: These values must be programmed the same on the hub and node for them to be able to communicate.
- ***Node ID***: This can be changed if the user wants to add new sensors to the ZL70251 WSN Evaluation Kit. The kit supports and displays data for up to three accelerometers using node IDs 0, 1, and 2. If the user programs a node's EEPROM with a node ID that is greater than 2, the kit does not display data for that node.
- ***Load***: Press one of these buttons to open an existing EEPROM file (.eep) for either the hub or the node. This populates the appropriate fields in the EEPROM utility according to the file's contents. **Note that this does not read the microcontroller's current EEPROM contents; rather, it only opens the contents of the selected EEPROM file.** To open the microcontroller's current EEPROM contents in the EEPROM utility, first use Atmel Studio to create an EEPROM file that contains the microcontroller's current EEPROM contents (refer to instructions later in this section), and then use the appropriate *Load* button to load that file into the EEPROM utility. After a file is opened, the user can modify the fields as desired, and then *Save* the changes as described below.
- ***Save***: Press the corresponding *Save* button to save the field settings that are currently displayed for either the hub or the node to an EEPROM (.eep) file. Pressing one of the *Save* buttons brings up a dialog box where the user can either select an existing EEPROM file to overwrite or create a new EEPROM file containing the changes. **Note that this does not program the EEPROM contents of the microcontroller; rather, it only saves the field settings that are currently displayed to the selected EEPROM file.** To program the contents of the resulting EEPROM file into the microcontroller's EEPROM, use Atmel Studio (refer to instructions later in this section).

To create an EEPROM file that contains the microcontroller's current EEPROM contents, perform the following steps:

1. Repeat steps 1 through 8 in "A.1 Programming Firmware Using Atmel Studio" on page 18.
2. In the *EEPROM* section, click the *Read* button and specify the desired EEPROM file.

To program a microcontroller's EEPROM with the contents of an existing EEPROM file, perform the following steps:

1. Repeat steps 1 through 8 in "A.1 Programming Firmware Using Atmel Studio" on page 18.
2. In the *EEPROM* section, click the box labeled with an ellipsis (that is, …) and select the desired EEPROM file.
3. When Atmel Studio finishes programming the EEPROM, you may disconnect the extender board.
4. To run the new firmware, toggle the power on the appropriate board.

B References

Document	Document Title
146499	ZL70251 Programmer User's Guide
146670	ZL70251 Data Sheet
151662	ZL70251 WSN Evaluation Kit Release Notes
N/A	ZL70251 WSN Evaluation Kit Source Code Overview

C Glossary

Paragraphs "C.1 Definitions" and "C.2 Abbreviations" below contain lists of definitions and abbreviations that are used throughout the User Guide.

C.1 Definitions

Term	Definition
HUB100	Hub board. This is the functional level of hardware and software for the application.
NODE100	Node device application board. This is the functional level of hardware and software for the application.

C.2 Abbreviations

Term	Definition
FTDI	Future Technology Devices International
GUI	Graphical user interface
ISM	Industrial Scientific Medical (various unlicensed frequency bands throughout the RF spectrum for the purposes of industrial, scientific, and medical applications)
JTAG	Joint Test Action Group (standard to test integrated circuit connections)
LNA	Low-noise amplifier
P/N	Part number
PA	Power amplifier
PC	Personal computer
PDI	Program and debug interface
Qty	Quantity
RF	Radio frequency
RSSI	Received strength signal indicator
RX	Receive *or* receiver
SMA	Subminiature A
SRD	Short-range device
TX	Transmit *or* transmitter
US	United States
USB	Universal serial bus
VCO	Voltage-controlled oscillator
VFT	VCO frequency trim
WSN	Wireless sensor network
ZIP	Zone information protocol (a protocol that allows compression of files) *or* the three-character file extension on such a compressed file

D List of Changes

The following table lists substantive changes that were made in the ZL70251 WSN Evaluation Kit User's Guide.

Revision	Change	Page
Revision 1 (May 2015)	Initial release for ZL70251 WSN Evaluation Kit version 1.0.0.	–

E Product Support

Microsemi CMPG backs its products with various support services, including customer service, a website, electronic mail, and worldwide sales offices. This appendix contains information about contacting Microsemi CMPG and using these support services.

E.1 Customer Service

Contact Customer Service for nontechnical product support, such as product pricing, product upgrades, update information, order status, and authorization.

From North America, call 800.432.4009
From the rest of the world, call 512.228.5400

Via e-mail, write to sales.support@microsemi.com

E.2 Website

For more information, please visit www.microsemi.com, where you can browse a variety of technical and nontechnical information. Many answers available on the searchable web resource include diagrams, illustrations, and links to other resources on the website.

Microsemi Corporate Headquarters
One Enterprise
Aliso Viejo, CA 92656 USA

Within the USA: +1 (800) 713-4113
Outside the USA: +1 (949) 380-6100
Sales: +1 (949) 380-6136
Fax: +1 (949) 215-4996

E-mail: sales.support@microsemi.com
Web: www.microsemi.com

© 2015 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense & security, aerospace and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; security technologies and scalable anti-tamper products; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, Calif., and has approximately 3,400 employees globally. Learn more at **www.microsemi.com**.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.