

Getting Started Guide



Version 1.1

Xilinx[®] Spartan[®]-6 FPGA LX9 MicroBoard

Revision History

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2/28/2011	1.0	Initial release for ISE 12.4
4/4/2011	1.1	Update Next Steps

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ABOUT THIS GUIDE

This guide provides detailed information for getting started with the Xilinx® Spartan®-6 FPGA LX9 MicroBoard development kit. The Spartan-6 FPGA LX9 MicroBoard is delivered with a preprogrammed bitstream that demonstrates the functionality of this board. This guide will walk you through this demo. If you have already installed ISE WebPACK onto your computer and completed the steps in the “[Setting up the Spartan-6 FPGA LX9 MicroBoard](#)” section, then proceed to the “[Next Steps](#)” section of this document to learn more about additional tutorials available for this kit. Otherwise, follow the steps outlined below to install and enable the required software for this kit.

Additional Documentation

Available from Avnet:

www.em.avnet.com/s6microboard

- **Spartan-6 FPGA LX9 MicroBoard User Guide**
This specification provides a detailed description of the S6LX9 MicroBoard circuitry.
- **Spartan-6 FPGA LX9 MicroBoard Configuration Guide**
This guide provides instructions on how to configure the FPGA on the S6LX9 MicroBoard as well as program the on-board serial flash.
- **CP201x USB-to-UART Setup Guide**
This document provides step-by-step instructions for installing the Silicon Labs CP210x USB-to-UART drivers onto your PC.

Available from Xilinx:

www.xilinx.com/products/spartan6

- **Spartan-6 Family Overview**
This overview outlines the features and product selection of the Spartan-6 family
- **Spartan-6 FPGA Data Sheet: DC and Switching Characteristics**
This data sheet contains the DC and switching characteristic specifications for the Spartan-6/
- **Spartan-6 FPGA Packaging and Pinout Specifications**
This specification includes the tables for device/package combinations and maximum I/Os, pin definitions, pinout tables, pinout diagrams, mechanical drawings, and thermal specifications.
- **Spartan-6 FPGA Configuration User Guide**
This all-encompassing configuration guide includes chapters on configuration interfaces (serial and parallel), multi-bitstream management, bitstream encryption, boundary-scan and JTAG configuration, and reconfiguration techniques.
- **Spartan-6 FPGA SelectIO Resources User Guide**
This guide describes the SelectIO™ resources available in all Spartan-6 devices.
- **Spartan-6 FPGA Clocking Resources User Guide**
This guide describes the clocking resources available in all Spartan-6 devices, including the DCMs and PLLs.
- **Spartan-6 FPGA Block RAM Resources User Guide**
This guide describes the Spartan-6 device block RAM capabilities.
- **Spartan-6 FPGA DSP48A1 Slice User Guide**
This guide describes the architecture of the DSP48A1 slice in Spartan-6 FPGAs.
- **Spartan-6 FPGA PCB Designers Guide**
This guide provides information on the PCB design for Spartan-6 devices, with a focus on strategies for making design decisions at the PCB interface level.

INTRODUCTION

The Xilinx Spartan-6 FPGA LX9 MicroBoard provides a complete development platform for designing and verifying applications based on the Xilinx Spartan-6 LX FPGA family. Available with the Spartan-6 LX9, the kit enables designers to prototype versatile designs with ease.

The Spartan-6 FPGA LX9 MicroBoard is available with the XC6SLX9-2CSG324C FPGA. The board includes LPDDR SDRAM, Multi-I/O SPI Flash memory, a 10/100 Ethernet PHY, and a USB serial port. Other board features include a USB JTAG port, a programmable clock, user switches, and LEDs. The board also provides two 2x6 expansion headers for general purpose use or to add one of the many Pmod™ Peripheral Modules. Pmods are small I/O interface boards that offer an ideal way to extend the capabilities of the Spartan-6 FPGA LX9 MicroBoard. See a full list of Digilent Pmods here:

www.digilentinc.com/pmods

This Getting Started Guide will walk you through the steps to setup the Spartan-6 FPGA LX9 MicroBoard and run the out-of-box embedded demonstration, which is designed to illustrate the features of the Xilinx MicroBlaze 32-bit soft processor IP core. If you have not already installed the Xilinx ISE® software, you will be directed through the steps to install the software, get updates and generate a license.

Xilinx® Spartan-6 FPGA LX9 MicroBoard Kit contents:

- **Spartan-6 FPGA LX9 MicroBoard**
- USB A to micro-USB B cable
- USB extension cable (Type A Male to Type A Female)

- **Xilinx ISE® Design Suite (IDS) 12.4 DVD**
 - WebPACK Edition
 - ChipScope Pro (device-locked to XC6SLX9)
 - SDK (device-locked to XC6SLX9)
- **Documentation**
 - Welcome Letter
 - Abbreviated Getting Started Guide for the Spartan-6 LX9 MicroBoard
 - Xilinx software license voucher
- **Online Documentation (www.em.avnet.com/s6microboard)**
 - Board Errata
 - Schematics
 - BOM
 - Hardware User Guide
 - Targeted Reference Designs
 - MicroBlaze Hardware Platforms

INSTALLATION AND LICENSING OF ISE DESIGN SUITE

This Spartan-6 FPGA LX9 MicroBoard Development kit comes with the Xilinx ISE WebPACK Design Suite. Additionally, a device locked license voucher (XC6SLX9 only) for SDK and Chipscope is included with this kit. The voucher has a unique serial number that is used to generate the license at [Xilinx's Licensing Site](http://www.xilinx.com/support/download/index.htm). ISE WebPACK software can be installed from the DVD or downloaded via the Web installer at www.xilinx.com/support/download/index.htm. For detailed information on licensing & installation, please refer to the Xilinx Licensing FAQ webpage: www.xilinx.com/tools/faq.htm

GETTING STARTED WITH SPARTAN-6 LX9 MICROBOARD DEVELOPMENT KIT

This Spartan-6 FPGA LX9 MicroBoard is preprogrammed with an embedded demonstration project that tests the on-board circuitry. This embedded project utilizes a soft-core MicroBlaze processor. Using a terminal program and a web browser, you can interact with the demo to validate the functionality of the board.

This project is available as part of the downloadable documentation package. Users who wish to modify or investigate this design will need an EDK license (see Xilinx's Embedded website for licensing information, www.xilinx.com/technology/embedded.htm.) After installing the ISE® WebPACK and EDK, you can examine and edit the preloaded EDK project. However, this demo will run without an EDK license since the bitstream is already built and loaded into the FPGA.

The Embedded Reference Design Demonstration

The following figure shows a high-level block diagram of the reference design. The design consists of:

- MicroBlaze Processor
- 32 KB of BRAM
- 64 MB of LPDDR SDRAM
- 128 Mb of SPI Flash
- Timer
- Interrupt controller
- USB-UART with virtual COM port
- DIP and push switches
- User LEDs
- Microprocessor Debug Module (MDM) JTAG connection

\

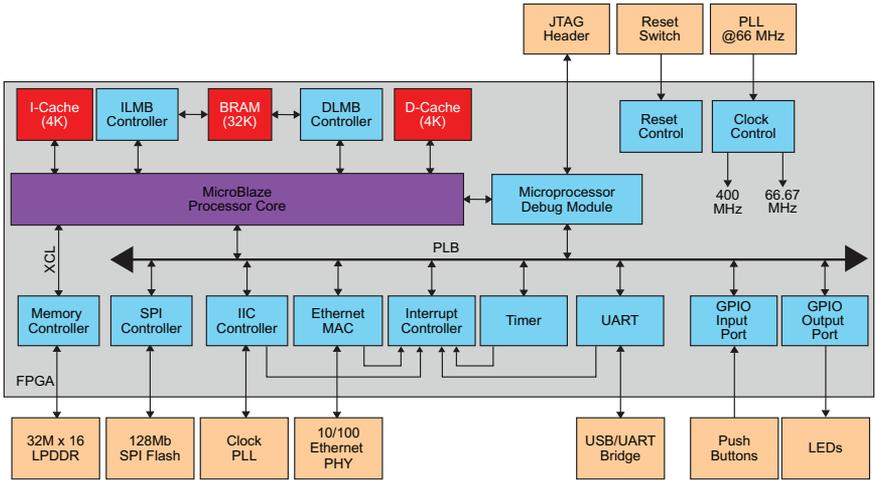


Figure 1 – Spartan-6 Embedded Reference Design

Embedded Demo Hardware Requirements

- Computer running Windows XP or later.
- Avnet Spartan-6 FPGA LX9 MicroBoard
- Micro-USB cable
- Ethernet cable (not included in kit)

Setting up the Xilinx Spartan-6 FPGA LX9 MicroBoard

1. Connect the Spartan-6 FPGA LX9 MicroBoard, J3, to the PC via the USB A to micro-USB B cable, as shown below:

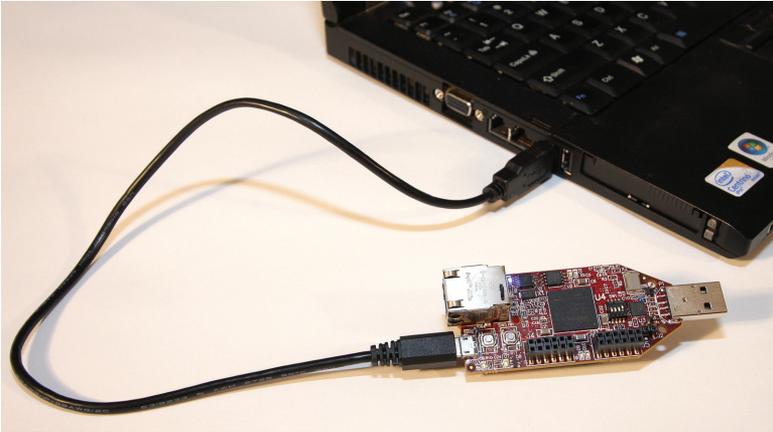


Figure 2 – Connecting MicroBoard to a PC

2. Once connected, green LED D7 should light. This is the Power Good LED for the MicroBoard.
3. LED D1 should also light. This blue LED is connected to the DONE pin of the FPGA. When lit, this indicates that the FPGA has successfully configured.
4. The PC may pop-up a dialog box asking for driver installation.

The Spartan-6 FPGA LX9 MicroBoard Development Board has a USB-UART based on the CP2102 chipset. Use of this feature requires that a USB driver be installed on your Host PC.

If Windows recognizes the USB-UART and loads the software driver, then amber LED D6 will light. Please skip ahead to the next section. However, if your PC does not recognize the USB-UART as a COM port please open a web browser and navigate to the S6LX9 MicroBoard's product page on the Avnet Design Resource Center (DRC). On this page, click on the Support Files & Downloads button.

www.em.avnet.com/s6microboard → **SUPPORT FILES & DOWNLOADS** ↓

On the S6LX9's "Support Files and Downloads" page, select the **CP210x_Setup_Guide.pdf** link for instructions on installing this driver. When driver installation is complete, continue to the next step.

5. On your PC, open a serial terminal program. For this demo, Windows XP was used which comes with HyperTerminal. HyperTerminal can be accessed from the start menu:

Select Start → Programs → Accessories → Communications → HyperTerminal



Figure 3 – HyperTerminal – Setup Screen 1 of 3

- Specify something like S6LX9, or the baud rate settings, for the name of your terminal session, and then click **OK**.

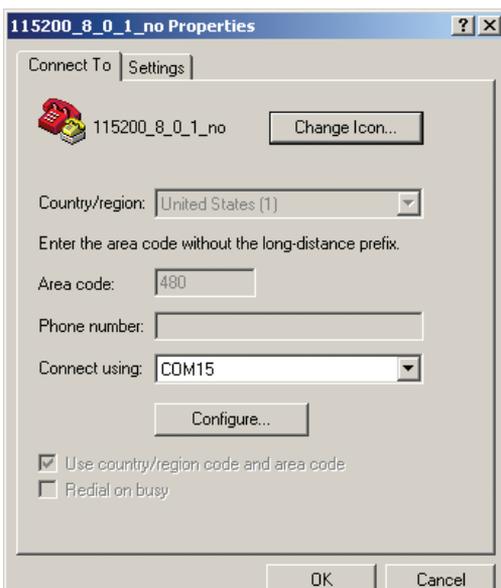


Figure 4 – HyperTerminal – Setup Screen 2 of 3

- Select the COM port corresponding to the previous installation step, then click **OK**. If unsure the aforementioned **CP201x Setup Guide** will illustrate how to identify the assigned COM port.

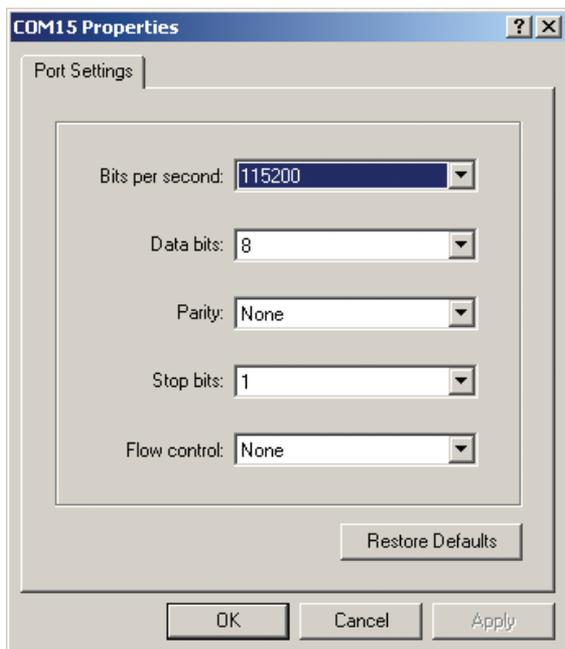


Figure 5 – HyperTerminal – Setup Screen 3 of 3

8. Specify the settings of the serial connection:

- Bits per second = 115200
- Data bits = 8
- Parity = None
- Stop bits = 1
- Flow control = None

Connecting to the Spartan-6 FPGA LX9 MicroBoard via HyperTerminal

1. Once the terminal is connected, press the PROG (SW4) button. This resets the MicroBlaze embedded processor test application that was previously configured in the FPGA on power-up. The operation of the processor is displayed in the terminal window.

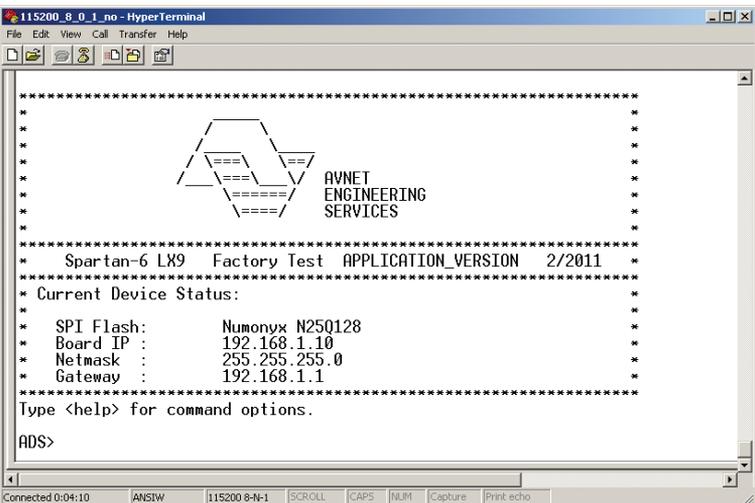


Figure 6 – HyperTerminal Connection Established

2. Type 'help' to see more functions.

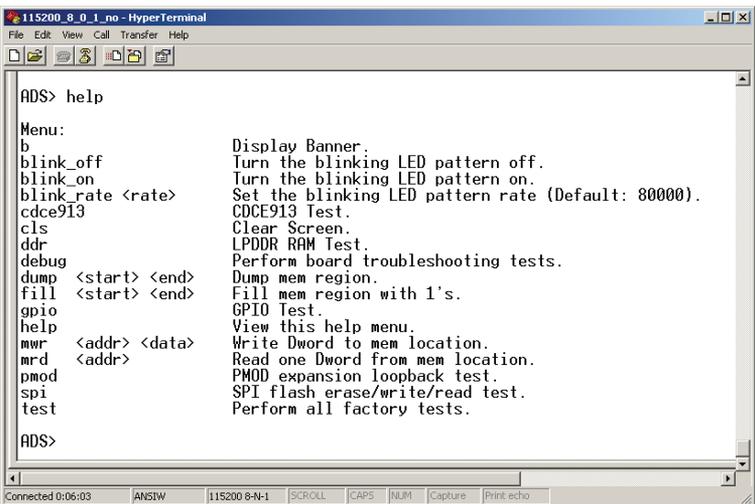


Figure 7 – S6LX9 MicroBoard Help Menu

3. The default factory test is command **test**. However, this is not an effective test for this demonstration since two Pmod loopback connectors are required to be attached to the expansion connectors. Command **test** is designed to abort after first error, so the experiment would end at the first loopback I/O failure. Instead, individual commands are demonstrated.
4. The **blink_** commands affect the four LEDs D2, D3, D9, and D10. Type '**blink_off**' to stop the LEDs from blinking. Type '**blink_on**' to turn the blinking back on. Type '**blink_rate 1000**' to accelerate the blinking.

```
ADS> blink_off
ADS> blink_on
ADS> blink_rate 1000
ADS>
```

5. Type '**ddr**' to test the LPDDR. After a short time, it should return as PASSED.

```
ADS> ddr
LPDDR RAM Test...PASSED
ADS>
```

6. Type '**gpio**' to test the DIP switches. When instructed set the DIP switches to the proper setting. Note, only one DIP switch should be active at a time for this test. A corresponding LED will light when DIP switches are enabled. When the **gpio** test is complete, all four FPGA user LEDs will resume blinking.

```
ADS> gpio
GPIO Switch LED Test...
  *Set DIP Switch 1 only.
  *Set DIP Switch 2 only.
  *Set DIP Switch 3 only.
  *Set DIP Switch 4 only.
PASSED
ADS>
```

7. Type '**spi**' to test the multi-I/O SPI Flash.

```
ADS> spi
SPI Flash Test...PASSED
ADS>
```

8. Type '**cdce913**' to test the Texas Instruments clock synthesizer.

```
ADS> cdce913
CDCE913 PASSED!
PASSED
ADS>
```

9. Type **'debug'** to test all the peripherals. It is expected to get failures for the Pmod loopback tests since the loopback connectors are not installed. If you are interested in designing your own loopback connectors, the diagrams are available on the DRC for the **Spartan-6 LX16 board**.

www.em.avnet.com/s6microboard

10. Close the terminal
11. This concludes the HyperTerminal Demo.

WebServer Demonstration

The default FPGA design also includes a WebServer application. To run this application, you may have to configure the network properties on your PC. The following steps will guide you through this process.

1. Attach an standard Ethernet Cable between the MicroBoard and the PC.
2. Open Network Connections.

Start → Control Panel

Select **Network Connections**

3. Once open, right-click on Local Area Connection and select Properties:

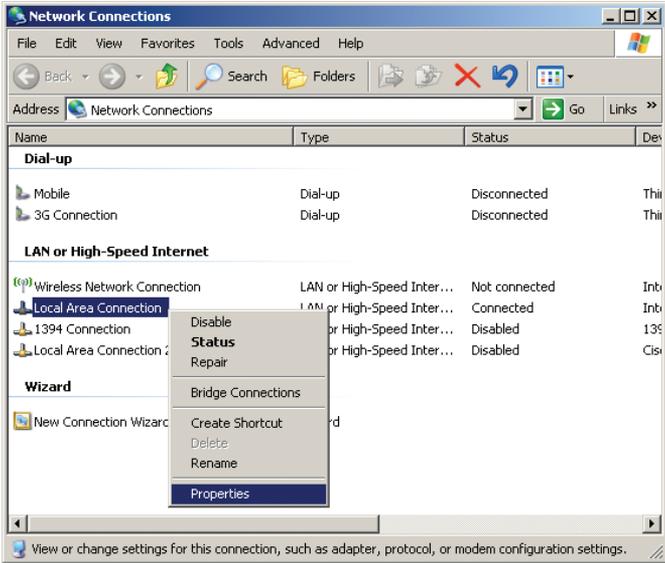


Figure 8 – Network Connections

4. In Local Area Network Properties, Select Internet Protocol (TCP/IP), then click Properties.

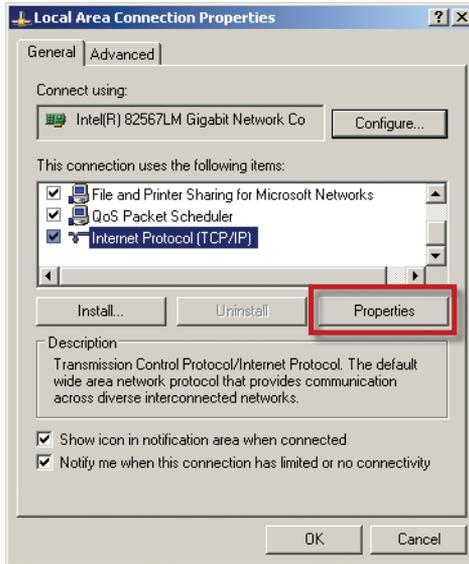


Figure 9 – Local Area Connection Properties

5. In the Properties Window, Select the Alternate Configuration tab. Click on 'User configured' and enter 192.168.1.50 for the IP address, 255.255.255.0 for the Subnet mask and 192.168.1.1 for the Default gateway

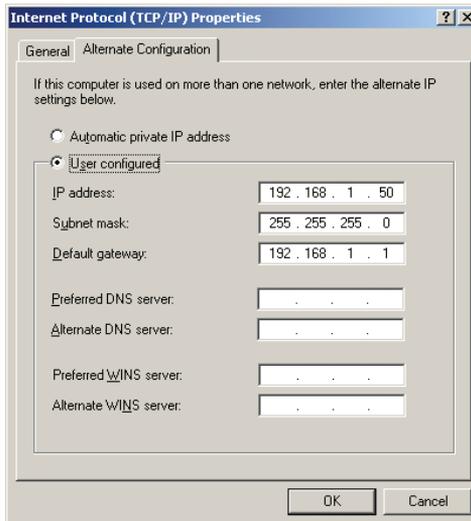


Figure 10 – IP Settings

6. Click OK.
7. Launch an internet browser.
8. Press SW4, PROG Button, on the MicroBoard.
9. Wait for the blue DONE LED to come on and the four user LEDs to start flashing.
10. In the browser, browse to <http://192.168.1.10/>. The following webpage will open in the browser:



Figure 11 – Webpage displayed on Browser

11. Click the button several times to see the LEDs turn on and off under the browser control.
12. Click the button several times while flipping one or more of the DIP Switches. The state of the switches is shown in the browser.

13. Two of the hyperlinks on the page link to an image of the Spartan-6 FPGA LX9 MicroBoard, http://192.168.1.10/images/Avnet_S6MB-LX9.jpg. The image originally stored in the Flash, then transferred to a file system in LPDDR. It displays the Spartan-6 FPGA LX9 MicroBoard with the LEDs and DIP switches highlighted.

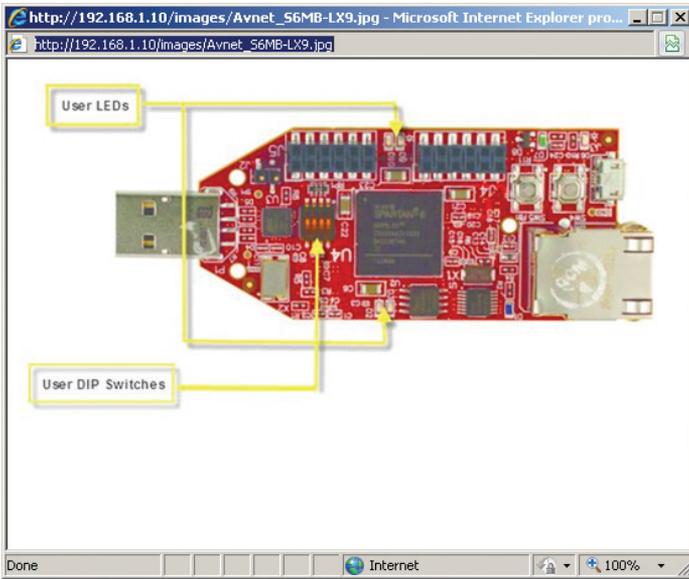


Figure 12 – MicroBoard Picture Stored in Flash Memory

14. This concludes the WebServer demonstration.

Next Steps

At the completion of this Getting Started Guide, you have installed the CP210x USB-to-UART driver, experimented with the embedded demo, and installed ISE WebPACK. You are now ready to create custom systems for the Spartan-6 LX9 FPGA. Various reference designs and documentation for this board can be downloaded from the Avnet web site at:

www.em.avnet.com/s6microboard → 

The driver for the on-board USB-JTAG circuit must be installed to configure the FPGA. Download and follow the instructions in the *Spartan-6 LX9 MicroBoard Configuration Guide*.

A description of all the hardware features is available to read in the *Xilinx Spartan-6 LX9 MicroBoard – Hardware User Guide*.

Based on your area of interest, please select one of the tutorials below to begin your design work:

- RTL Design Flow: Select the *Blinking LED Design using Command-line Tools* tutorial
- Embedded Hardware: Select the *EDK01 - Creating Embedded System* tutorial
- Embedded Software: Download the *AVS6LX9MBHP010 v12.4.01* Hardware Platform and follow the *Software 101 - Hello World* Tutorial
- Embedded: *PicoBlaze for the Xilinx Spartan-6 LX9 MicroBoard* tutorial
- Memory Interface: *MIG Traffic Generator Design* tutorial

Getting Help and Support

For technical support including the installation and use of your product license file you may contact Xilinx Online Technical Support at www.support.xilinx.com. On this site you will also find the following resources for assistance:

- Software, IP and documentation updates
- Access to technical support web tools
- Searchable answer database with over 4,000 solutions
- User forums
- Training - Select instructor-led classes and recorded e-learning options

Contact Avnet Support for any questions regarding the Spartan-6 FPGA LX9 MicroBoard reference designs or kit hardware:

www.em.avnet.com/s6microboard

Additionally, a web forum is available for this board at:

<http://community.em.avnet.com/t5/Spartan-6-LX9-MicroBoard/bd-p/Spartan-6LX9MicroBoard>



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