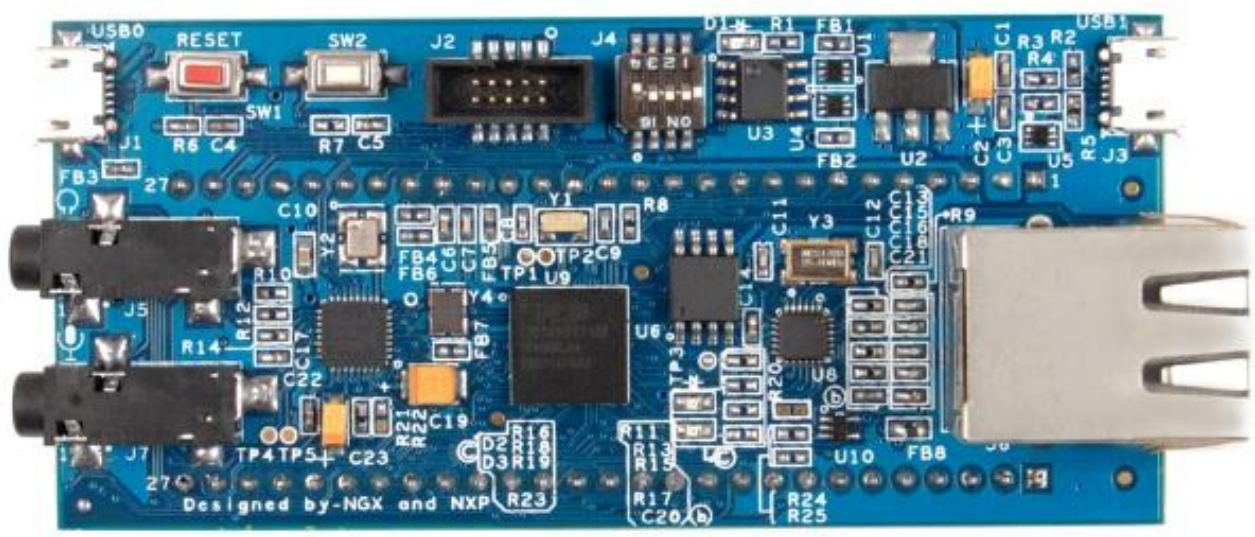
LPC4330-Xplorer



User Manuals for Xplorer:

For KEIL MDK-ARM with ULINK2/ME: Click here
For LPC-Xpresso with NXP-LPCLink: Click here

Sample projects for Xplorer:

For KEIL MDK-ARM: Click here
For LPC-Xpresso: Click here

Schematic for Xplorer Board:
Click here to download Schematic.

USB Virtual Com INF file:
Click here to download USB Virtual Com INF file.

About NGX Technologies

NGX Technologies is a premier supplier of development tools for the ARM7, ARM Cortex M0, M3 and M4 series of microcontrollers. NGX provides innovative and cost effective design solutions for embedded systems. We specialize in ARM MCU portfolio, which includes ARM7, Cortex-M0, M3 & M4 microcontrollers. Our experience with developing evaluation platforms for NXP controller enables us to provide solutions with shortened development time thereby ensuring reduced time to market and lower development costs for our customers. Our cost effective and feature rich development tool offering, serves as a testimony for our expertise, cost effectiveness and quality.

Contact Information:

NGX Technologies Pvt. Ltd.
No.216, 5th main Road, R.P.C. Layout,
Vijayanagar 2nd Stage,
Bangalore – 560 104
Phone : +91-80-40925507
email:sales@ngxtechnologies.com

CE certification:

NGX Technologies LPC4330-Xplorer board has been tested for radiated emission as per EN55022 class a standard. The device is under the limits of the standard EN55022 class A and hence CE marked. No other test have been conducted other than the radiated emission (EN55022 class A standard). The device was tested with the ports like USB, Serial, and Power excluding the GPIO ports. Any external connection made to the GPIO ports may alter the EMC behavior. Usage of this device under domestic environment may cause unwanted interference with other electronic equipment's. User is expected to take adequate measures. The device is not intended to be used in and end product or any subsystem unless the user re-evaluates applicable directive/conformance.

Table of Contents

1.0 INTRODUCTION

This document is a 'Quick Start Guide' for LPC4330-Xplorer; a cost effective evaluation platform for NXP's LPC43xx (dual core Cortex M4 and M0) MCUs. This document focuses on the kit contents, board verification, possible debuggers and IDEs that can be used.

1.1 LPC4330 Xplorer Ordering Options

Option A: With ULINK-ME debugger

This option is recommended for customers that do not already have a suitable debug probe.

The Xplorer is packaged as shown in the image below.

TBD

Fig. 1

After unboxing the package you should find Xplorer Board, ULINK-ME, 2 ‘USB AM to Micro B’ cables and ‘USB AF to Micro B’ cable as shown in the following image.

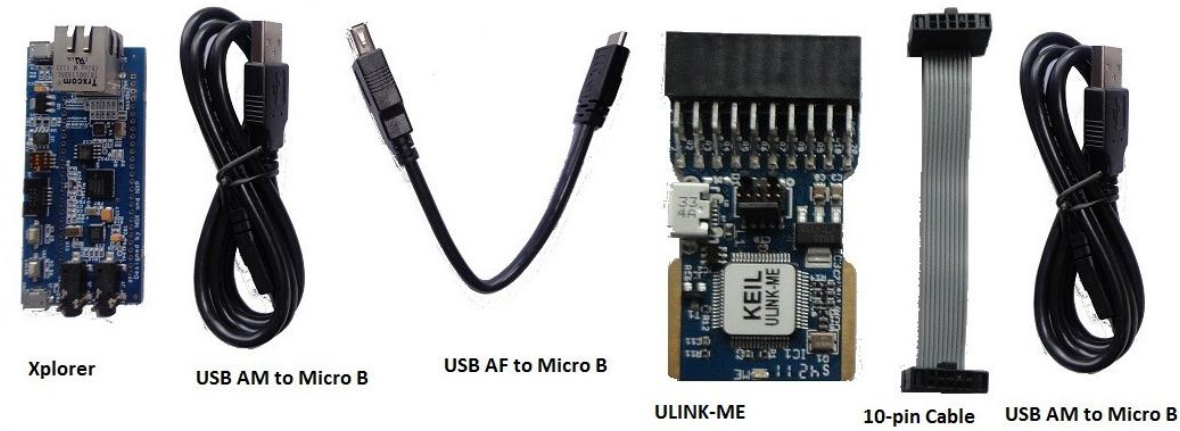


Fig. 2

Option B: Without the debugger

This option is recommended for customers who already own and wish to use a debugger such as.

- **ULINK2 with KEIL uVision**
- **NXP LPCLink with LPCXpresso**
- **Red Probe+ with Red Suite from Code Red**
- **I-jet with IAR Embedded Workbench**
- **Segger JLink with IAR Embedded Workbench or KEIL uVision**

The Xplorer is packaged as shown in the following image.

Fig. 3

After unboxing the package you should find Xplorer Board, ‘USB AM to Micro B’ cable and ‘USB AF to Micro B’ cable as shown in the following image.

Fig. 4

1.2 ARM JTAG (20-pin) to Cortex JTAG (10-pin) Adaptor

Please note that your existing debugger might be supporting only the ‘20-pin ARM JTAG connector’. In such scenarios one would require a ‘20-pin to 10-pin adaptor’ and the necessary cables. The Xplorer has on board ‘Cortex SWD/JTAG 10-pin male connector’, the ‘20-pin to 10-pin adaptor’ is not a part of the Xplorer package, and user needs to buy them separately.

If the debugger supports the ‘10-pin Cortex header’ one needs to have the 10-pin ribbon cable and can directly connect to the Xplorer. Please note even the 10-pin ribbon cable is not a part of standard delivery and needs to be procured separately.

The picture below shows 20-pin ribbon cable, 10-pin cable and ‘20-pin to 10-pin adaptor’.

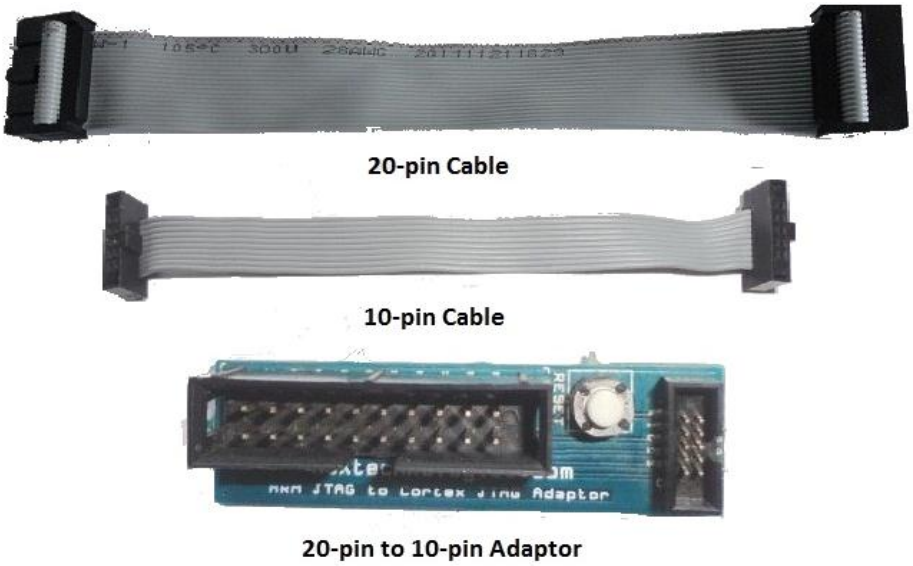


Fig. 5

1.3 ULINK-ME and KEIL

Connect one end of the 10-pin cable to 'ULINK-ME 10-pin box header' and other end to Xplorer debug header as shown in the following image. The hardware setup is now ready for programing an Xplorer board with ULINK-ME and KEIL IDE. Please refer keil knowledgebase article for connecting ULINK-ME 10-pin ribbon cable to NGX Xplorer.

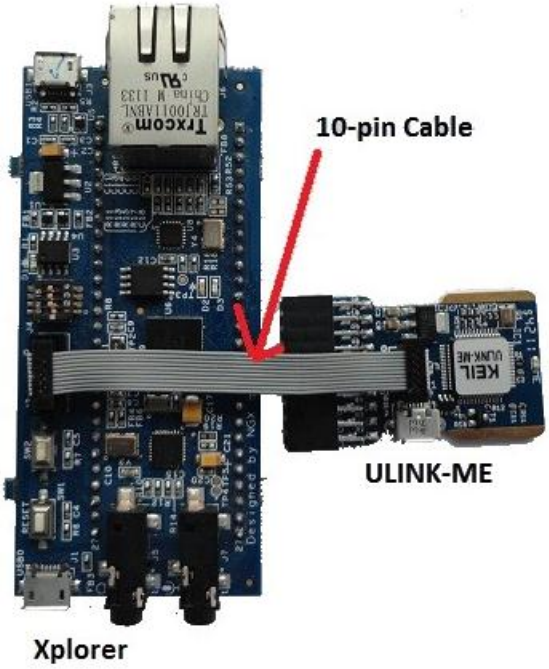


Fig. 6

1.4 ULINK2 and KEIL

Connect the 'ULINK2 20-pin cable' to '20-pin to 10-pin adaptor' and connect one end of 10-pin cable to '20-pin to 10-pin adaptor' and other end to Xplorer as shown in the following image. The hardware setup is now ready for programing with ULINK2 and KEIL IDE. Please refer to keil knowledgebase article for connecting 10-pin ribbon cable to NGX Xplorer.

Fig. 7

1.5 NXP-LPCLink and LPCXpresso

Separate the LPCXpresso controller part and use only the NXP LPCLink as shown in the below image.

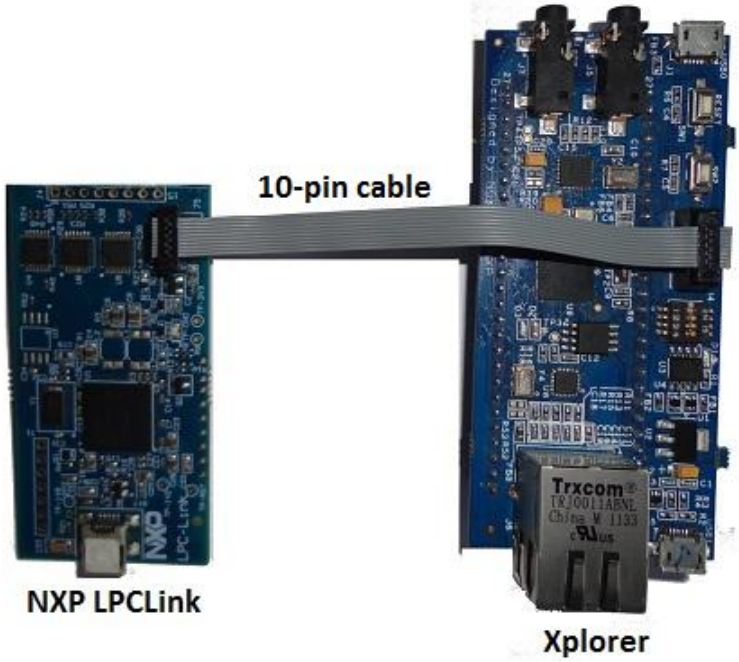


Fig. 8

The Xplorer board has on board ‘Cortex SWD/JTAG 10-pin box header’; connect one end of the 10-pin ribbon cable to NXP LPCLink and the other end to Xplorer. Make sure the 10-pin cable notch on the connector is facing towards the arrow mark on the NXP LPCLink. The hardware setup is now ready for programing with **NXP LPCLink** and **LPCXpresso**.

2.0 LPC4330-Xplorer Overview

2.1 Introduction

The NGX LPC4330-Xplorer is a compact and versatile evaluation platform for the NXP's Cortex-M4 based MCUS. NGX's evaluation platforms are generally not tied up to any particular debugger or compiler/IDE. However it is not practical to test and ensure that the solution would work out of box with all the available debuggers and compilers/IDE. As long as the compiler supports the particular MCU and the debugger supports the standard debug interfaces like the SWD/JTAG you can use this platform with any tool. The board is supported by extensive sample examples allowing you to focus on the application development.

2.2 Board Features

Following are the salient features of the board

- Dimensions: 86mm X 40mm
- Controller: LPC4330, 100 pin BGA
- PCB: 4-layer (RoHS complaint)
- Two LEDs
- One user switch and one reset switch
- Boot select switch
- 32Mb Quad flash
- On board crystals for controller, RTC and audio codec
- On board Ethernet PHY, 50 MHz Oscillator and RJ45 connector with magnetics
- On board audio codec and audio jacks
- On board USB host power switch
- Two USB ports, one HS (High speed) port and one FS (Full Speed) port
- 10-pin cortex debug header
- The board is shipped with two USB cables, one USB device cable and one USB host adapter cable
- Unused I/O's brought to a header (pin compatible with Xpresso pinning*)

**The I/0s brought out to the header are not 100% pin compatible with Xpresso Pinning, unlike the Xpresso boards, this evaluation platform has lot of connectors on board and also the controller has some other special features like the SGPIO, which have been brought out to the header. We have put in our best efforts to have maximum number of pins to be Xpresso pin compatible.*

2.3 BLOCK DIAGRAM

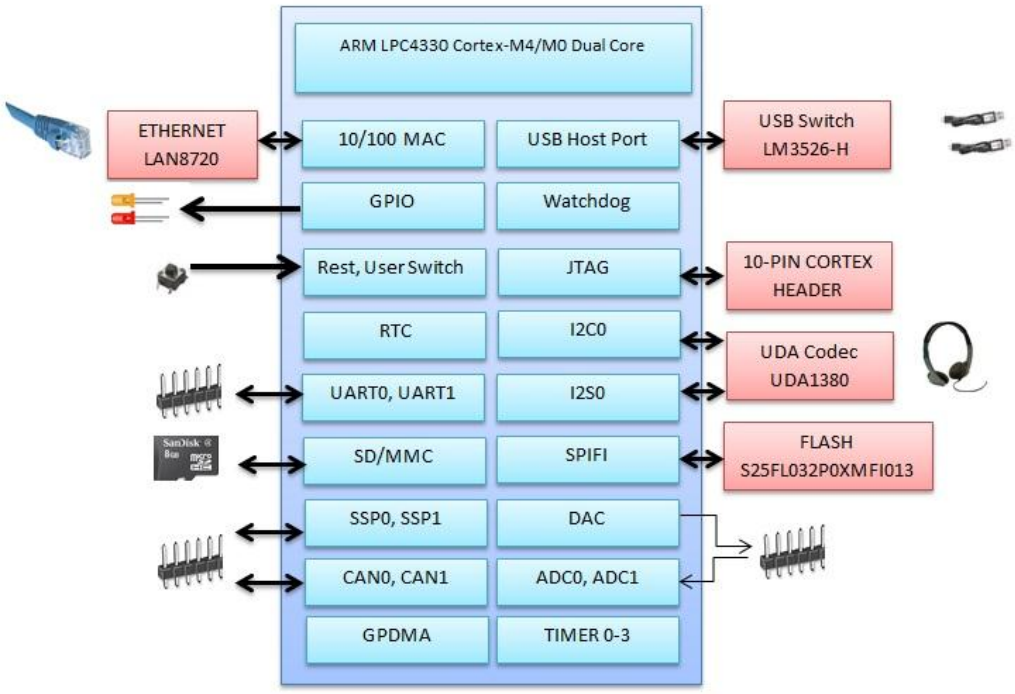


Fig. 9

2.4 LPC4330-Xplorer pin out

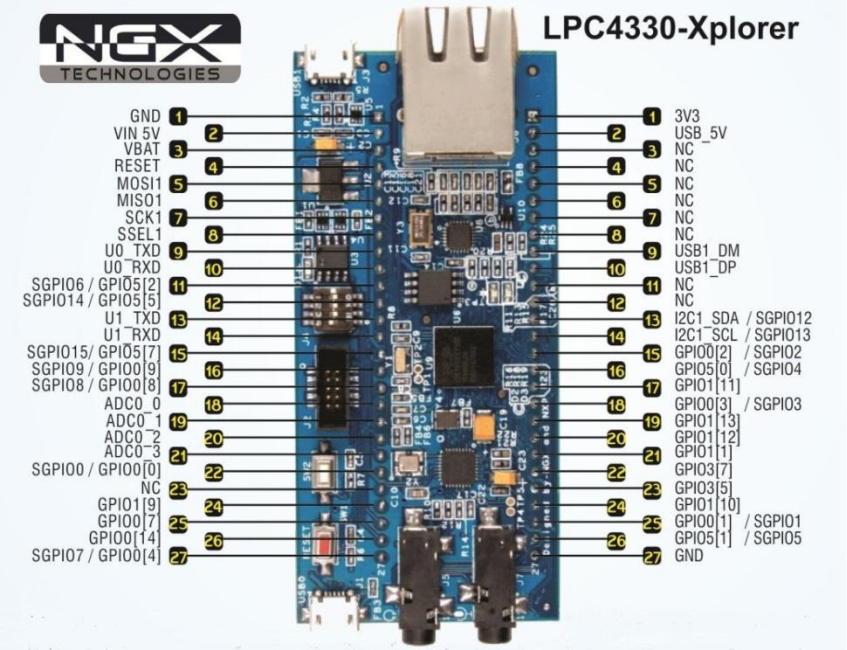


Fig.10

2.5 LPC4330 description

The LPC4330 is an ARM Cortex-M4 based digital signal controller with an ARM Cortex-M0 coprocessor designed for embedded applications requiring signal processing. The ARM Cortex-M4 core offers single-cycle Multiply-Accumulate and SIMD instructions and a hardware floating-point unit to support signal processing while the M0 coprocessor handles I/O and digital control processing. The LPC4330 includes 264 KB of data memory, two High Speed USB 2.0 Host/OTG/Devices, advanced configurable peripherals such as the State Configurable Timer (SCT), Serial General Purpose I/O (SGPIO), and SPI Flash Interface (SPIFI) as well as Ethernet, an external memory controller and multiple digital and analog peripherals.

Features

- ARM Cortex-M4 processor, running at frequencies of up to 204 MHz
- ARM Cortex-M4 built-in Memory Protection Unit (MPU) supporting eight regions
- ARM Cortex-M4 built-in Nested Vectored Interrupt Controller (NVIC)
- Hardware floating-point unit
- Non-maskable Interrupt (NMI) input
- JTAG and Serial Wire Debug (SWD)
- System tick timer
- ARM Cortex-M0 co-processor running at frequencies of up to 204 MHz
- 264 kB SRAM for code and data use

- Two 32 kB SRAM blocks with separate bus access
- 32 kB ROM containing boot code and on-chip software drivers
- 32 bit One-Time Programmable (OTP) memory for customer use
- Serial GPIO (SGPIO) interface
- State Configurable Timer (SCT) subsystem on AHB
- Quad SPI Flash Interface (SPIFI) with four lanes and up to 40 MB per second
- 10/100T Ethernet MAC with RMII and MII interfaces and DMA support
- One High-speed USB 2.0 Host/Device/OTG interface with DMA support
- One High-speed USB 2.0 Host/Device interface with DMA support
- One 550 UART with DMA support and full modem interface
- Three 550 USARTs with DMA and synchronous mode support
- One C_CAN 2.0B controller with one channel
- Two SSP controllers with FIFO and multi-protocol support
- One SPI controller
- One Fast-mode Plus I2C-bus interface with rates of up to 1 Mbit/s
- One Fast-mode I2C-bus interface
- Two I2S interfaces
- External Memory Controller (EMC) supporting external SRAM, ROM, flash, SDRAM
- Secure Digital Input Output (SDIO) card interface
- Eight-channel General-Purpose DMA (GPDMA) controller
- Up to 49 General-Purpose Input/Output (GPIO) pins
- Four general-purpose timer/counters with capture and match capabilities
- One motor control Pulse Width Modulator (PWM) for three-phase motor control
- One Quadrature Encoder Interface (QEI)
- Repetitive Interrupt timer (RI timer)
- Windowed watchdog timer (WWDT)
- Ultra-low power Real-Time Clock (RTC) on separate power domain
- Alarm timer; can be battery powered
- One 10-bit DAC with DMA support and a data conversion rate of 400 kSamples/s
- Two 10-bit ADCs with DMA support and a data conversion rate of 400 kSamples/s
- Two 128-bit secure OTP memories for AES key storage and customer use
- Crystal oscillator with an operating range of 1 MHz to 25 MHz
- 12 MHz Internal RC (IRC) oscillator trimmed to 1 % accuracy
- Ultra-low power Real-Time Clock (RTC) crystal oscillator
- Three PLLs allow CPU operation up to the maximum CPU rate
- Clock output
- Single 3.3 V (2.2 V to 3.6 V) power supply with on-chip DC-to-DC converter
- RTC power domain can be powered separately by a 3 V battery supply
- Four reduced power modes
- Processor wake-up from Sleep mode via wake-up interrupts
- Brownout detect with four separate thresholds for interrupt and forced reset
- Power-On Reset (POR)

For the most updated information on the MCU please refer to NXP's website.

3.0 LPC4330-Xplorer verification

NGX's evaluation platforms ship with a factory-programmed test firmware that verifies all the on-board peripherals. It is highly recommended that you verify the board, before you start programming. Also this exercise helps you get acclimatized with the board quickly.

To run the tests you will need the following:

- LPC4330-Xplorer
- Power: USB cable (you can power it through either port, we recommend to use USB1 for the verification) or external power supply (Alternatively the Xplorer has a 5V in pin available for powering through external power source)
- PC: With Windows7 or XP (32-bit)
- One USB AM to Micro B cable in addition to the one provided with the KIT
- Micro SD card
- 2-GB USB pen drive
- Audio-in (Auxiliary) cable (3.5mm diameter connector)

3.1 Board Image with pointers to the peripherals

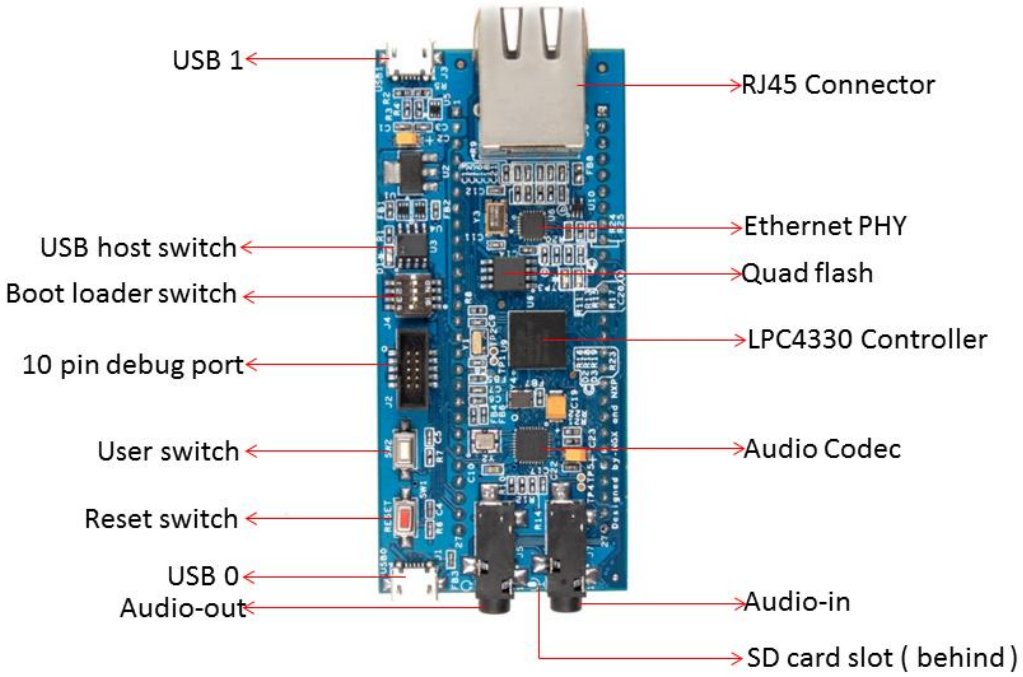


Fig.11

3.2 Powering the Board

The LPC4330-Xplorer can be powered through USB; we can either power it from USB0 port or USB1 port. It is highly recommended that the user tests all the peripherals as soon as the board is received. A regulated supply can be supplied to the 5V pin on the Xplorer-LPC4330 header.

Note: The USB power can source only up to 500 mA of current. For applications having higher current requirements we recommend to use an external power supply. Please note that the external power supply is not a part of standard delivery.

3.3 Verifying all the peripherals on LPC4330-Xplorer

The following section focuses on the verification of all the peripherals supported on the LPC4330-Xplorer. The order of the tests is mentioned in the same manner as the flow of the test firmware. We highly recommend that you follow the order of the test. The test firmware is designed in a manner that the user needs to spend as minimum time as possible to verify all the on-board peripherals. The test firmware executable resides on the external Quad Flash. The default boot select switch is configured to execute from the Quad Flash interface.

Note: The test firmware "Debug Messages" or flow might be changed in due course. Generally these are only cosmetic changes so that the usage is easier. If you observe a different message than the one mentioned in the Manual, do not worry and please proceed with the test.

***Important Note:* The user needs to press the RESET switch twice to be able to reset the controller. This is due to the issue with the silicon. However for the power up reset (USB power cycle) the controller boots up fine.**

Power up the board over USB1 port and we are all set to verify the LPC4330-Xplorer peripherals. Before we get to the verification we need to install the Virtual COM port drivers needed for the LPC4330-Xplorer (USB1 port) to appear as a Virtual COM port (Used for viewing the debug messages on serial emulation tool). Fortunately, this is a one-time setup and fairly simple. On a Windows machine the user needs to point to the location of the INF file. To download INF file Click here.

Steps to install the VCOM drivers on windows 7 machine:

Step 1: Connect USB1 to the computer. Open device manager, you can find “NXP LPC43xx VCOM” new device listed under ‘Other devices’.

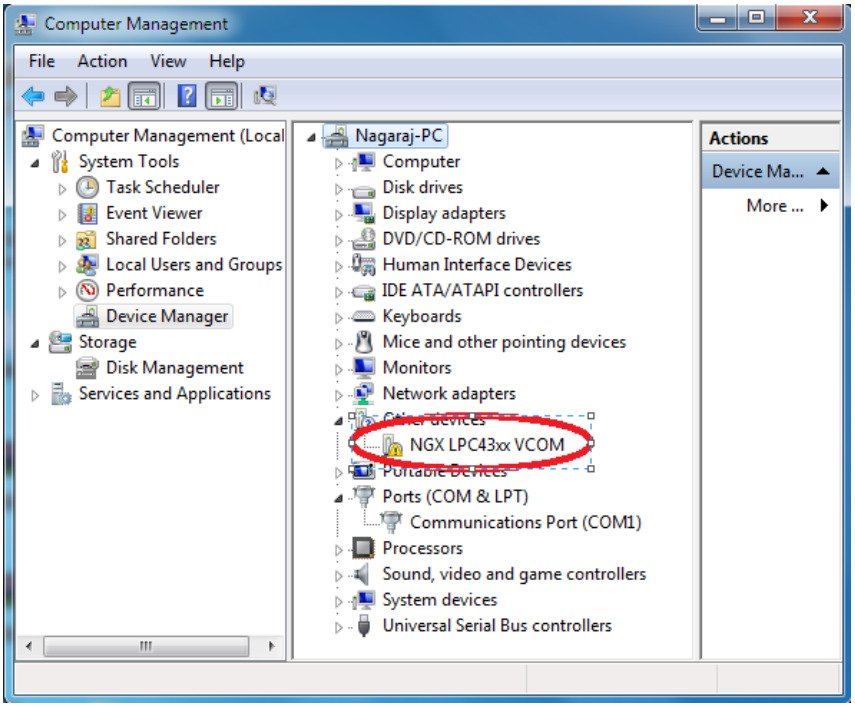


Fig.12

Step 2: Right click on “NXP LPC43xx VCOM” and then click on ‘Update Driver Software’.

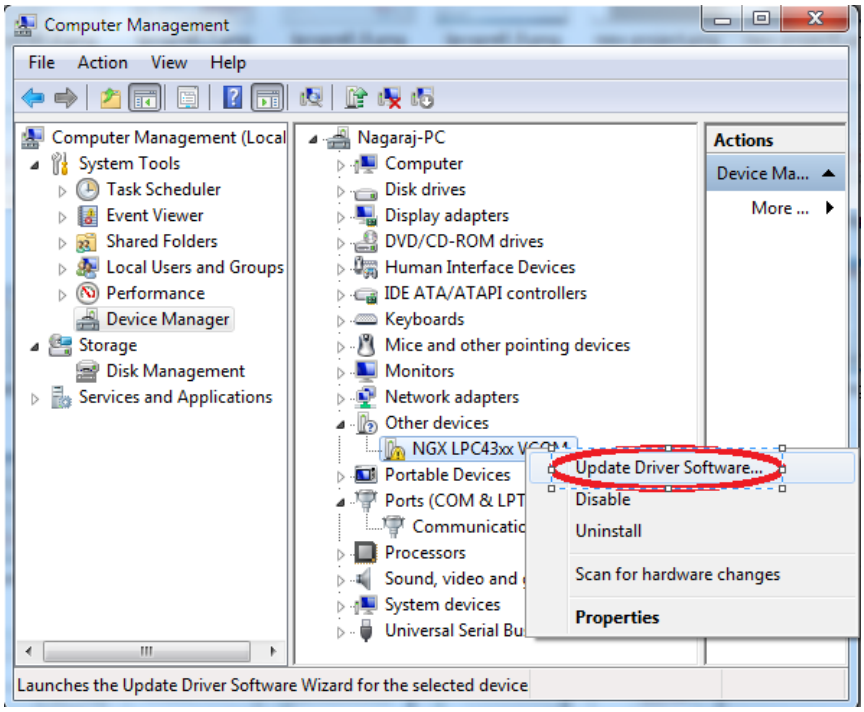


Fig.13

Step 3: Click on browse my computer for driver software.

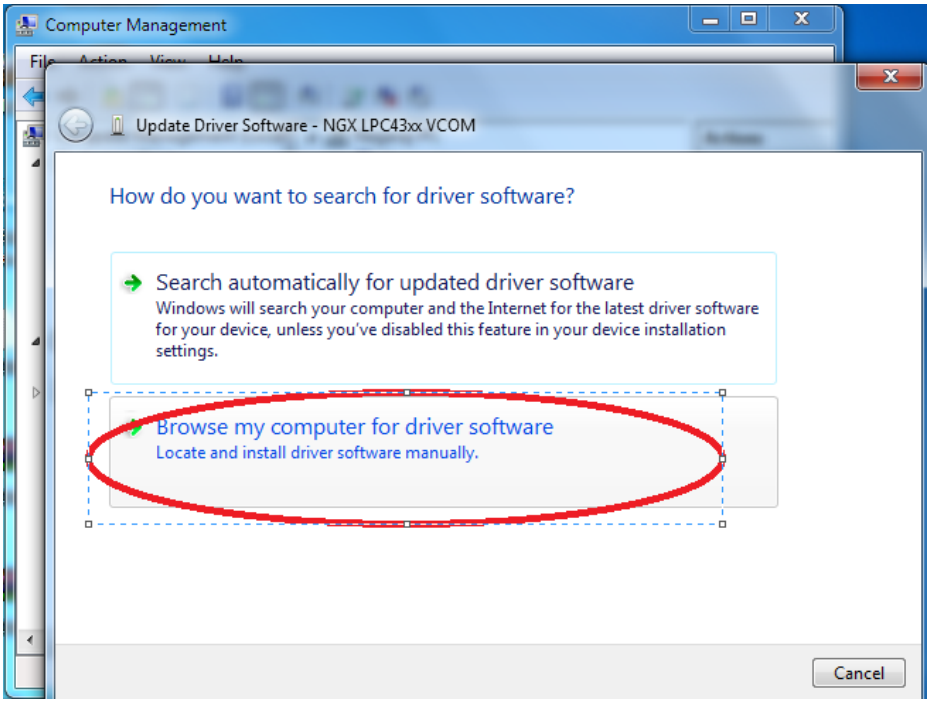


Fig.14

Step 4: Click Browse, select downloaded LPC4330_Xplorer_VCOM_inf unzipped driver folder and then click on OK.

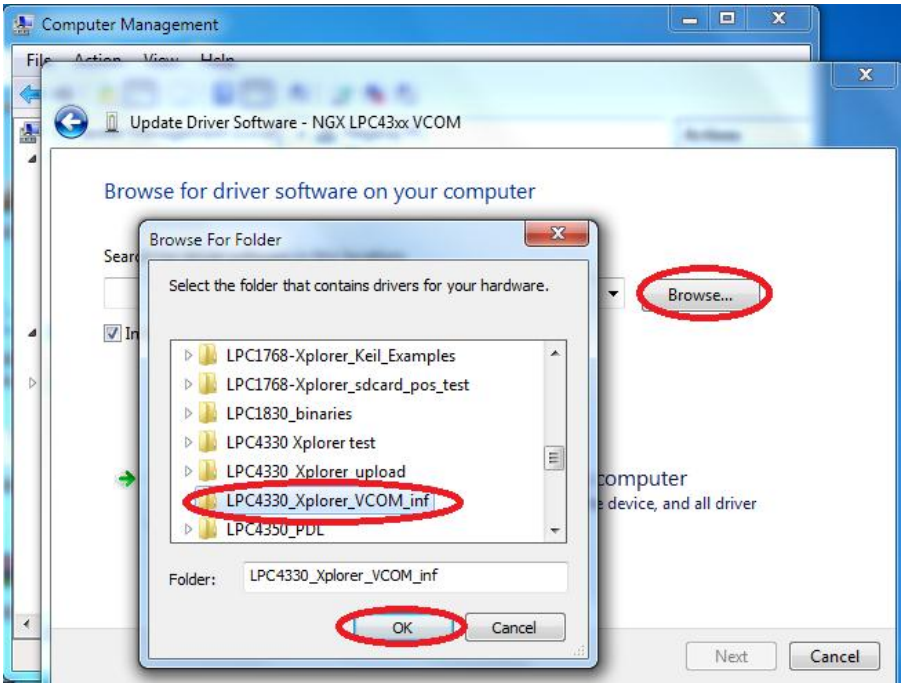


Fig.15

Step 5: Click on Next to continue driver installation.

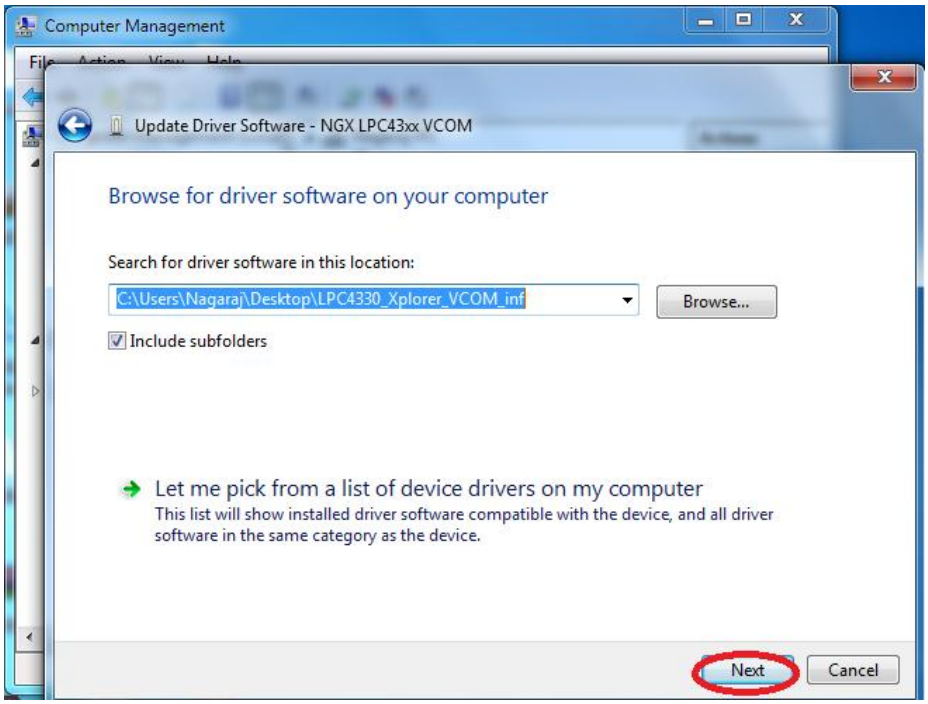


Fig.16

Step 6: Click on 'Install this driver software anyway'.

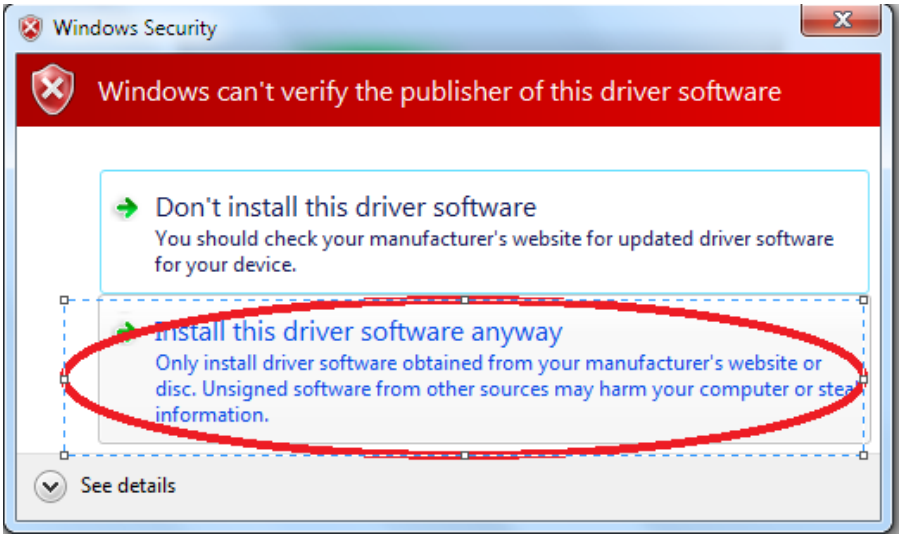


Fig.17

Step 7: The “LPC43xx USB VCom” driver is successfully installed, click on close.

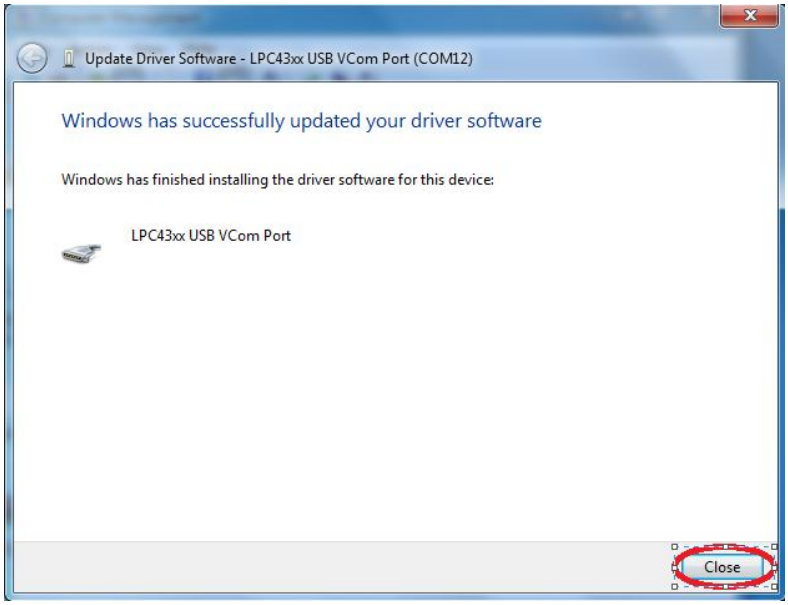


Fig.18

Step 8: Now “LPC43xx USB VCom Port” (COM12) is ready to use.

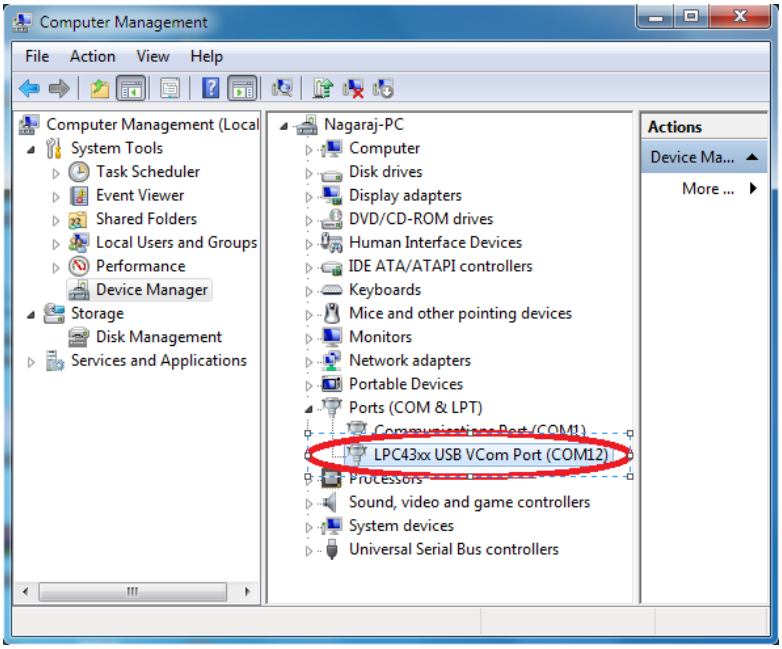
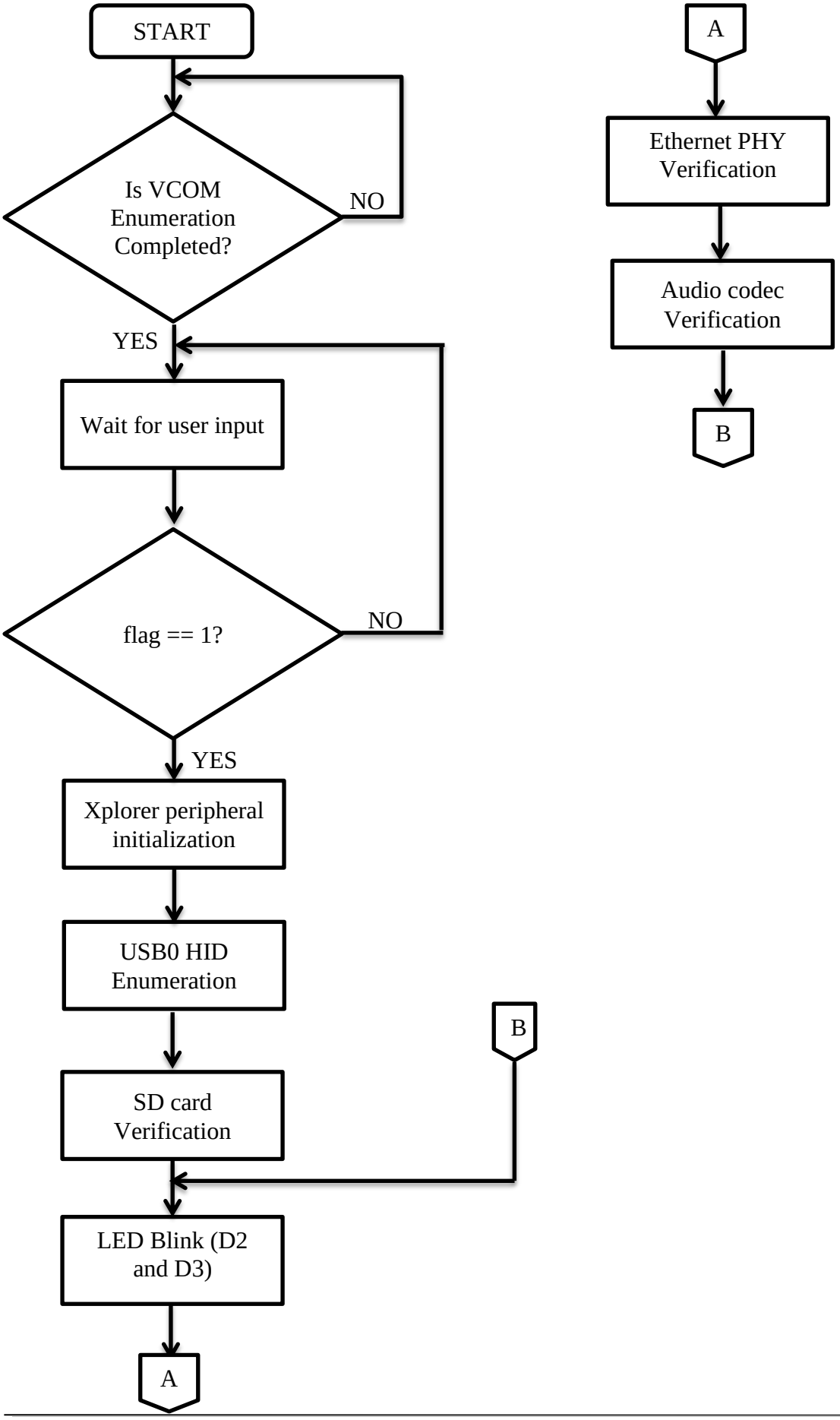


Fig.19

Note: The Virtual COM is listed under the device manager. Please note that the COM port list under the Device Manager is automatically updated with the COM port number for the Virtual COM. On our test machine we see two COM ports listed COM1 and COM12. COM1 is the actual COM port and COM12 is the virtual COM port. The COM12 will appear only if the Xplorer board is connected (USB1) to the PC. ***Every time the Xplorer is reset the user needs to close the Hyper Terminal application and restart it again.***

The orders in which the on-board peripherals are verified by the firmware are as follows:
Test Firmware Flowchart:



3.3.1 LEDs

Test setup and verification:
As soon as the Xplorer is turned ON or reset; the test LEDs go ON & OFF for a couple of times, this simple test validates the LEDs. The Xplorer has one Green LED and one Blue LED. These LEDs are also connected to the outputs of the SCT lines. Please refer to the schematics for more details.

3.3.2 USB1 (Virtual COM port)

Test setup and verification:
For the very first time the windows machine will ask for the appropriate virtual COM drivers to be installed.

Steps to select 'USB1 VCOM port' on HyperTerminal in windows 7 machine:

Step 1: Open a HyperTerminal, type the name and click on OK.

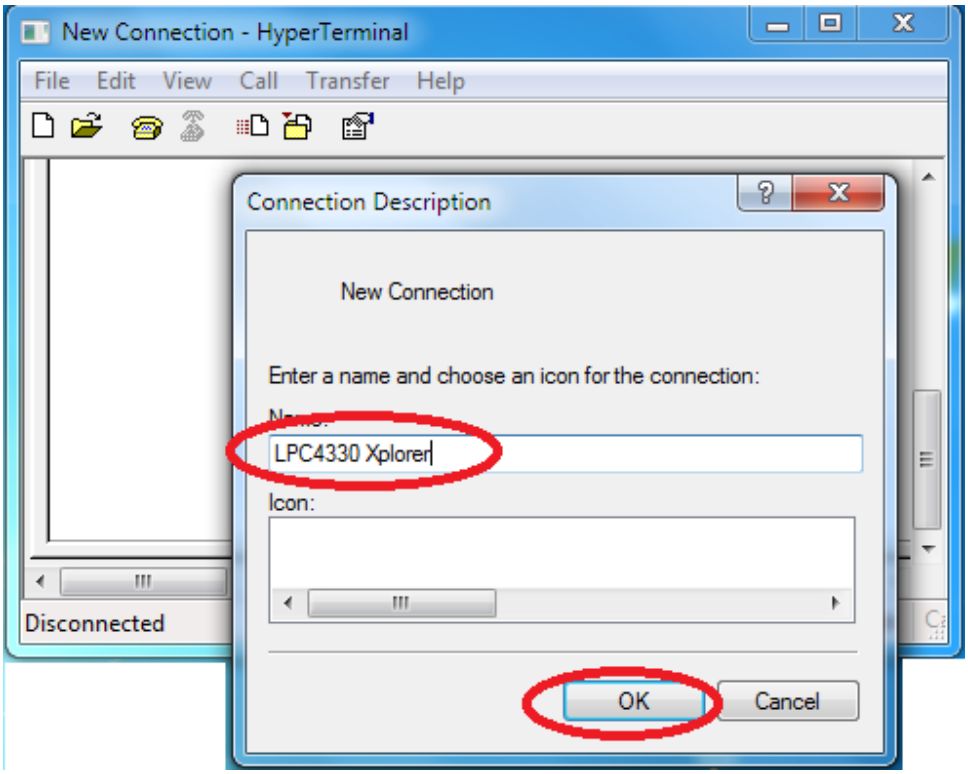


Fig.20

Step 2: Select “USB1 Vcom Port” (COM12) and click on OK.

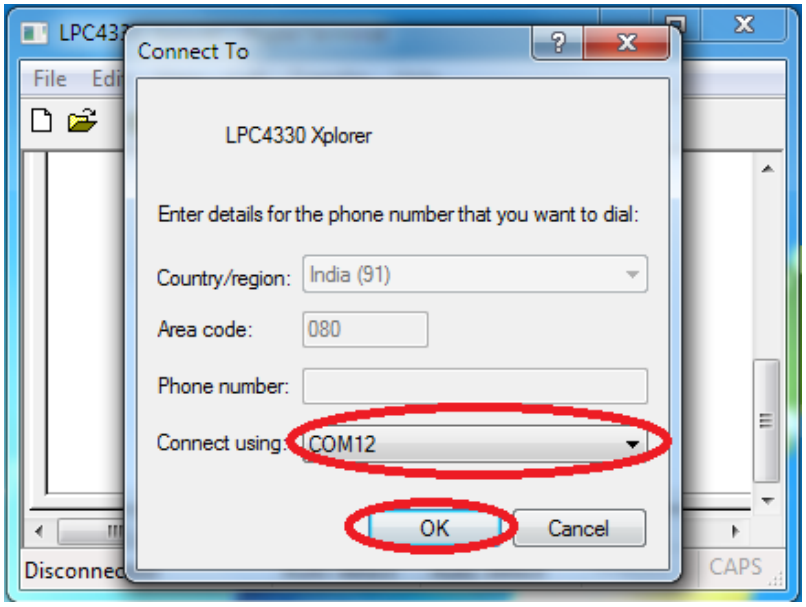


Fig.21

Step 3: Click on ‘Restore Defaults’ and click on OK.

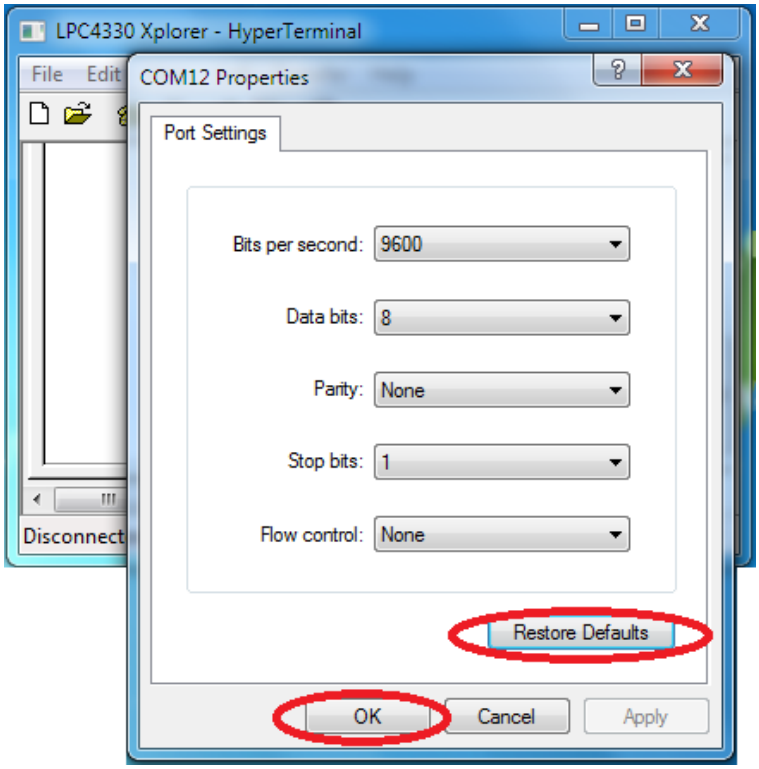


Fig.22

Step 4: Now the ‘USB1 VCom’ is ready to use.

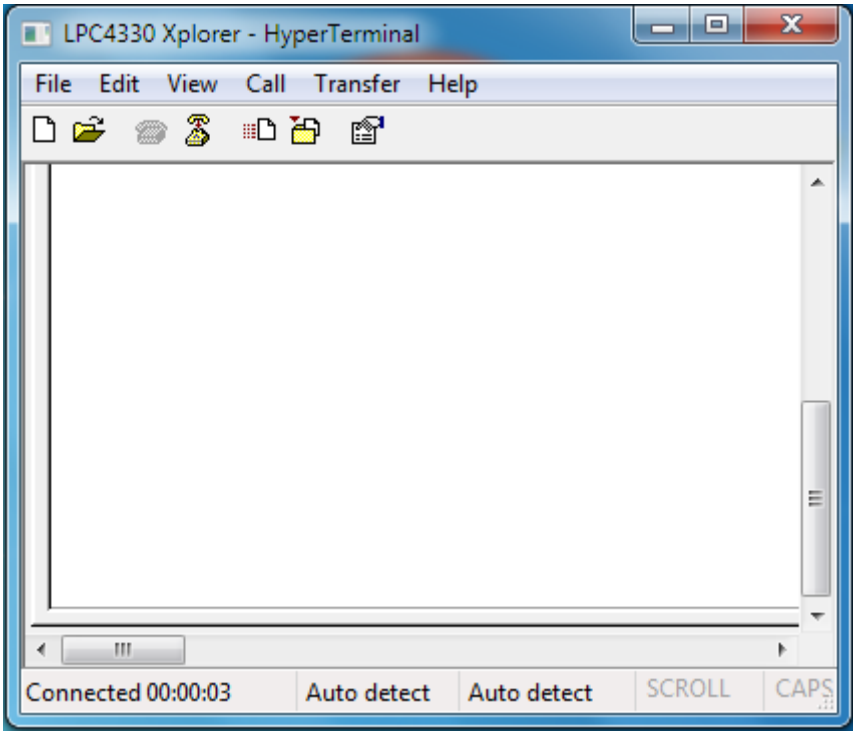


Fig.23

Note: You would not be able to proceed with the verification unless the Virtual COM drivers are installed. The firmware waits for the USB1 to enumerate as VCOM port.

3.3.3 User Input Switch

Test setup and verification:

Once the VCOM drivers are installed the Xplorer waits for the User Input Switch to be pressed. Only after detecting a user button (SW2) press the test firmware proceeds with validating other peripherals. This synchronization is necessary to ensure that the debug messages on the VCOM port can be viewed from the start of the test. Without this synchronization the test firmware would proceed with the debug messages being displayed, while the user is still configuring the Hyper-Terminal or other serial emulation tool.

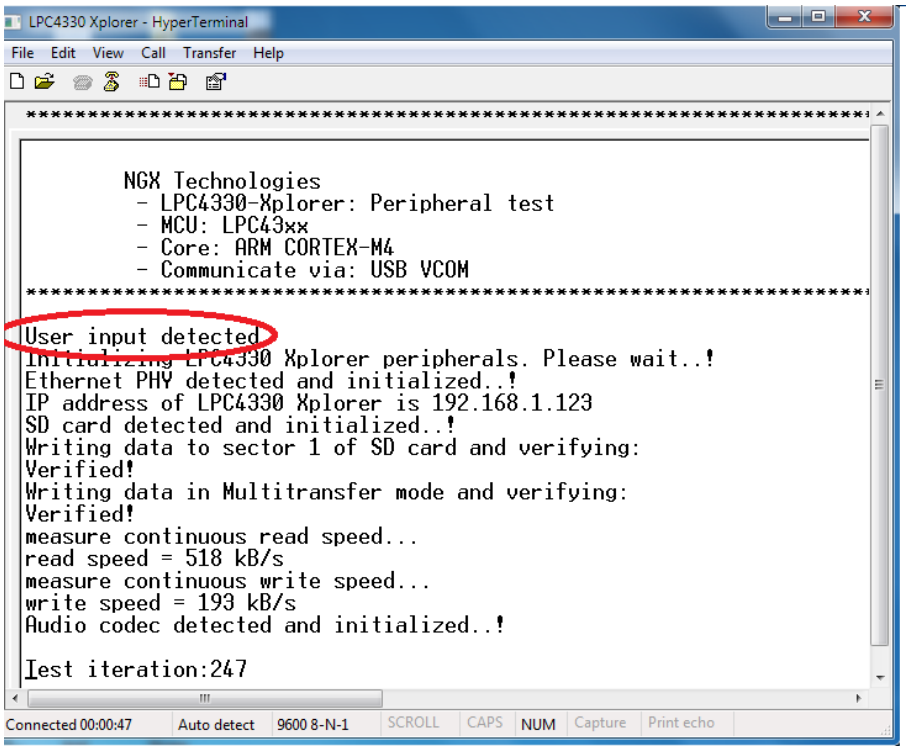


Fig.24

3.3.4 USB0 (HID device)

Test setup and verification:
Connect the USB cable to USB0 connector. The USB enumeration can be checked in device manager. The Xplorer enumerates as a Human Interface Device (HID). On a Windows machine this can be confirmed by looking in to the ‘Device Manager’ under ‘Human Interface Devices’.

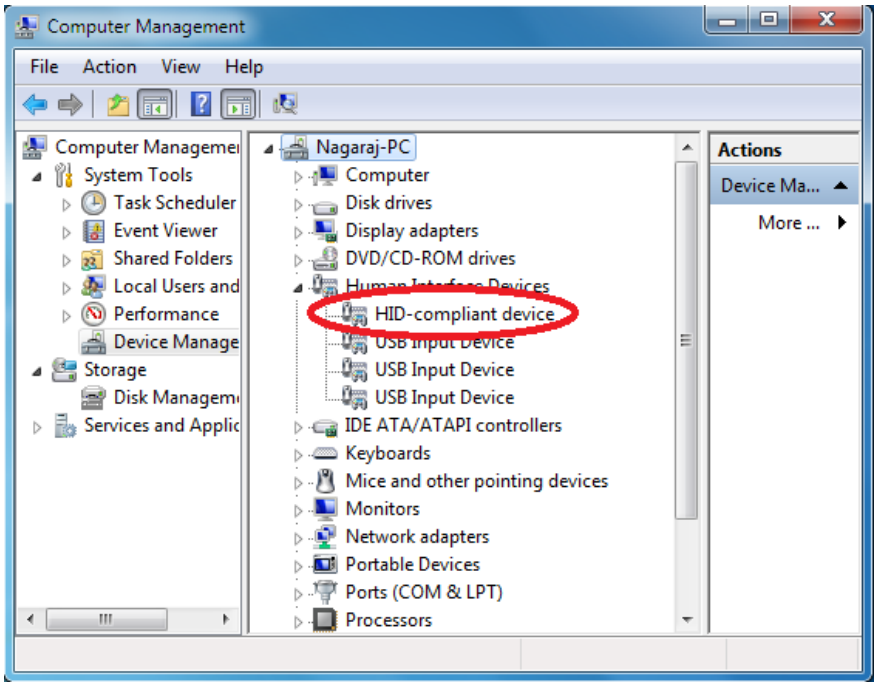


Fig.25

Note: The Xplorer is shipped with only one 'USB AM to micro B'; to test the USB1 interface you would require another similar cable. In the subsequent firmware releases the firmware would configure the USB0 port as USB host.

3.3.5 Ethernet

Test setup and verification:
The test firmware configures the Xplorer board as a Webserver.

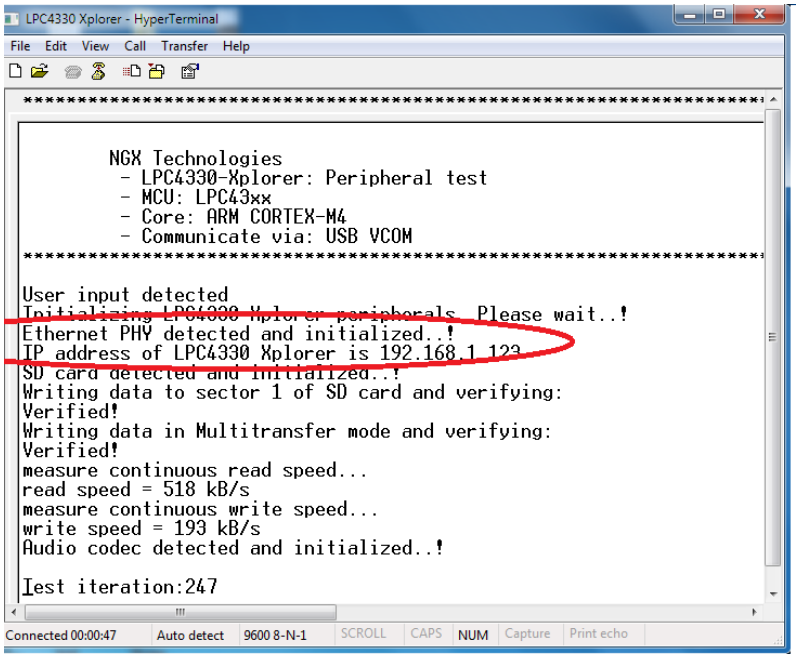


Fig.26

The ethernet interface can be verified by either using a PING command in the windows command prompt.

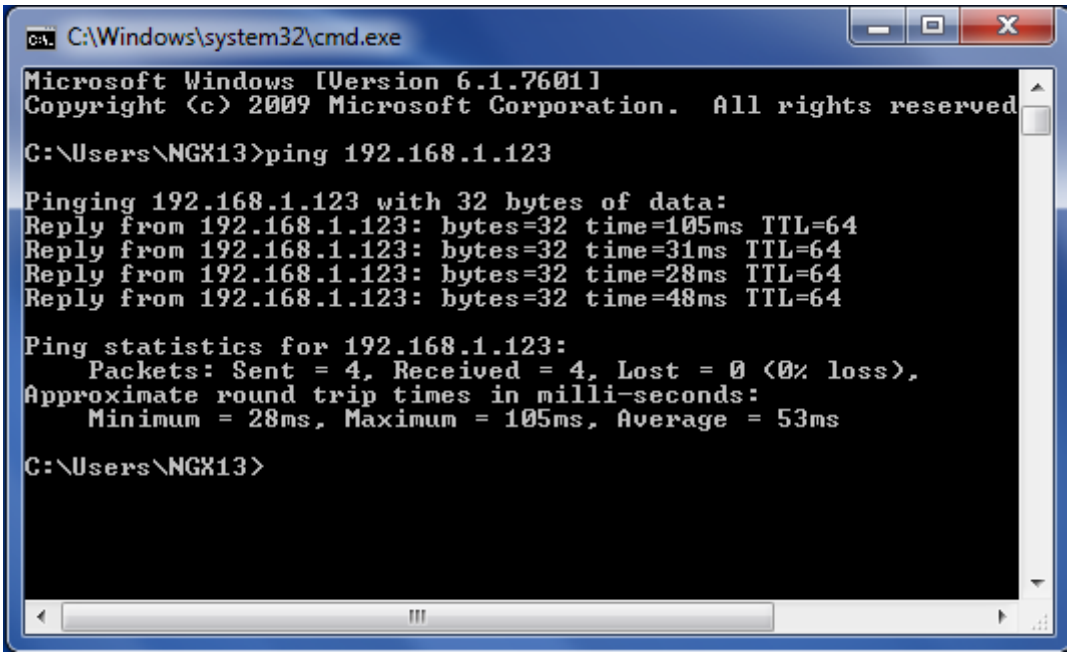


Fig.27

The IP address of the Xplorer board is configured as 192.168.1.123. Type the same IP address in the browser. Clicking the ON button will TURN-ON LED D3 and clicking OFF button will TURN-OFF LED D3.

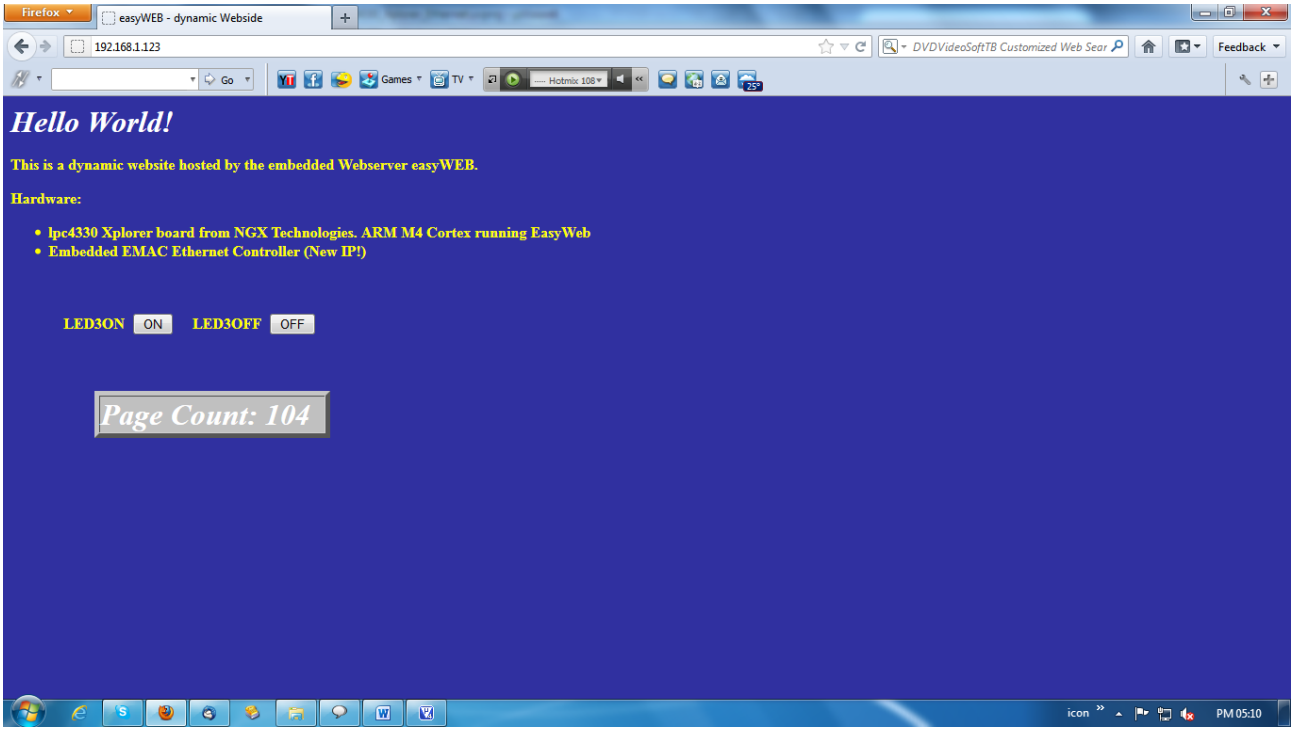


Fig.28

3.3.6 Micro SD connector

Test setup and verification:
The firmware validates the micro SD card interface by writing and reading a sector of the SD card connected. Please note that we need to use a micro SD card with FAT file system. The result of this test is displayed over the VCOM port.

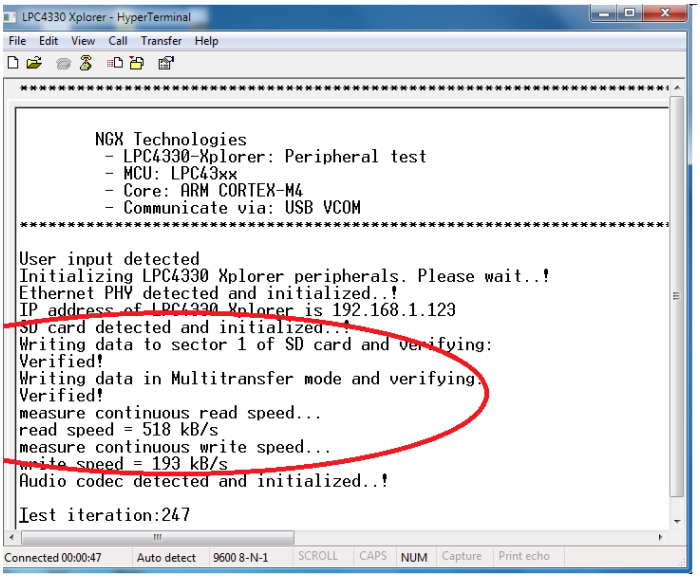


Fig.29

3.3.7 Audio Interface

Test setup and verification:
For the audio interface the LPC4330 Xplorer incorporates external audio codec from NXP. The codec is interfaced to the MCU over I2S0 for data and over I2C0 for command interface. The test firmware verifies both the audio-in and audio-out path. To verify the audio interface the user needs to feed some audio data through the audio-in (LINE-IN) interface and then connect a headphone at the audio-out jack. If one is able to hear the same audio data that is being fed over audio-in interface, we have verified the audio interface.

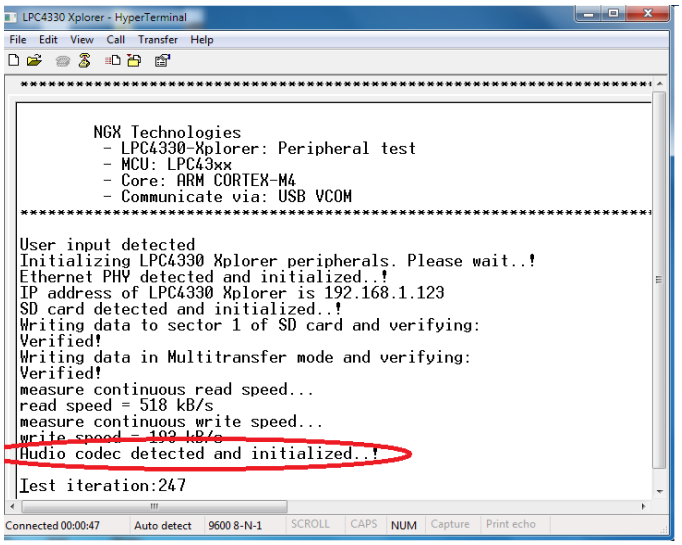


Fig.30

About this document:

Revision History

Version: V1 author: Nagaraj Baddi

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