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## Getting Started with EZ-USB® GX3™

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**Associated Project: No**

**Associated Part Family: CYUSB3610**

**Software Version: N/A**

**Related Application Notes: [AN97119](#)**

Cypress's EZ-USB® GX3™ SuperSpeed USB to Gigabit Ethernet Bridge Controller (CYUSB3610) brings plug-and-play USB 3.0 connectivity to the Ethernet network. This application note highlights key GX3 features and applications and provides references to design resources that help with GX3 development. It also walks you through the steps to get started with GX3 development using free Cypress tools.

### 1 Introduction

Cypress's EZ-USB GX3 is a SuperSpeed USB to Gigabit Ethernet Bridge Controller that provides Ethernet connectivity over USB. GX3 is a low-cost, high-performance, plug-and-play solution that is easy to design. It enumerates as a standard network adapter on the PC, enabling existing software applications to be reused, and accelerates time to market.

### 2 Target Applications

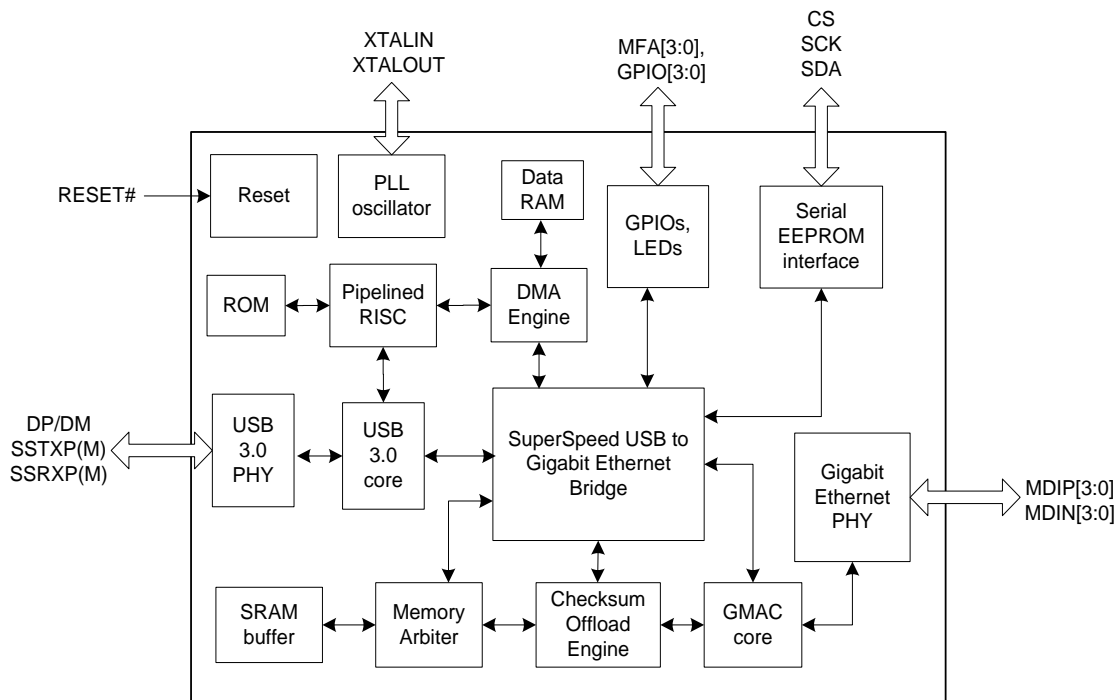
The GX3 device can be used in the following applications:

- Docking station
- USB dongle
- Embedded systems
- Set-top box, TV
- Gaming console

### 3 Overview

GX3 is a single-chip bridge controller with an integrated USB 3.0 device controller, Energy Efficient Ethernet (EEE) physical layer (PHY) working at 10/100/1000 Mbps, and internal one-time programmable memory for configuration in a 68-pin QFN package. It supports dynamic power management to reduce power consumption during idle or low Ethernet traffic and enable USB disconnect when the Ethernet cable is unplugged. GX3 also supports a serial EEPROM interface to store USB descriptors, MAC ID, and so on in the external serial EEPROM. The GX3 EEPROM Programming Guide provides detailed instructions on EEPROM programming. [Figure 1](#) shows the GX3 block diagram.

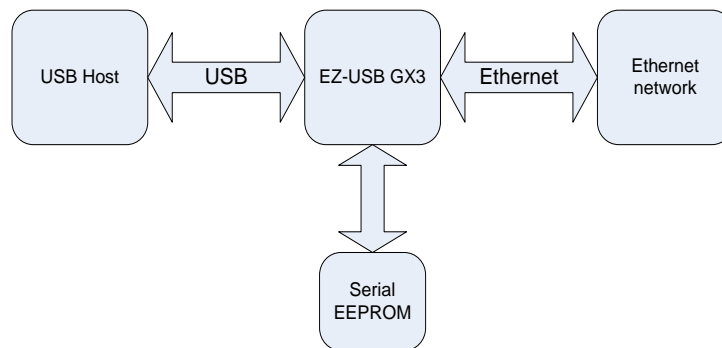
Figure 1. GX3 Block Diagram



GX3 supports EEE that provides an energy efficient mechanism to coordinate transitions to and from a lower power consumption. It integrates a Gigabit Ethernet PHY, providing the physical layer functions to transfer Ethernet packets. A checksum offload engine and the media access control (MAC) core are responsible for CRC checking and generation, collision detection and handling in half-duplex mode. A memory arbiter is used as a memory buffer, which stores the received MAC frames and passes them to the USB Host. The USB-to-Ethernet Bridge converts the Ethernet MAC frames into USB packets and vice versa. It also implements a burst transfer mechanism to enhance the data throughput.

Figure 2 shows a system block diagram of typical GX3 use.

Figure 2. USB-to-Ethernet Based System



## 4 GX3 Reference Design Kit

Information on the CY4701 GX3 Reference Design Kit (RDK) is available at [www.cypress.com/gx3](http://www.cypress.com/gx3), which includes the schematics and the RDK Gerber files. The driver package provides drivers for various operating systems (Windows, Linux, Mac OS, Chrome OS, and so forth). [Figure 3](#) shows a snapshot of the GX3 RDK with a Type-A USB 3.0 to Gigabit Ethernet dongle reference design, and [Figure 4](#) shows a snapshot of the GX3 RDK with a Type-C USB 3.1 (Gen 1, 5.0 Gbps) to Gigabit Ethernet dongle reference design. For information on USB 3.1 specification, see [www.usb.org](http://www.usb.org).

Figure 3. GX3 Type-A USB 3.0 Reference Design Kit (CY4701)

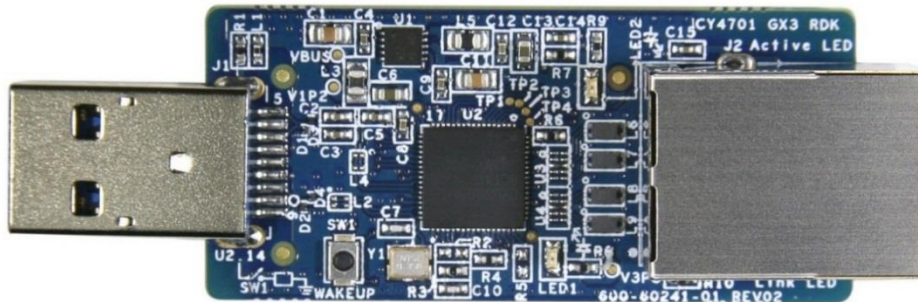
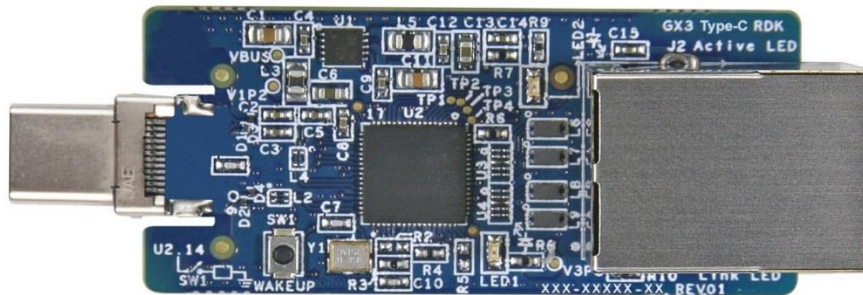


Figure 4. GX3 Type-C USB 3.1 Reference Design Kit (CY4702)

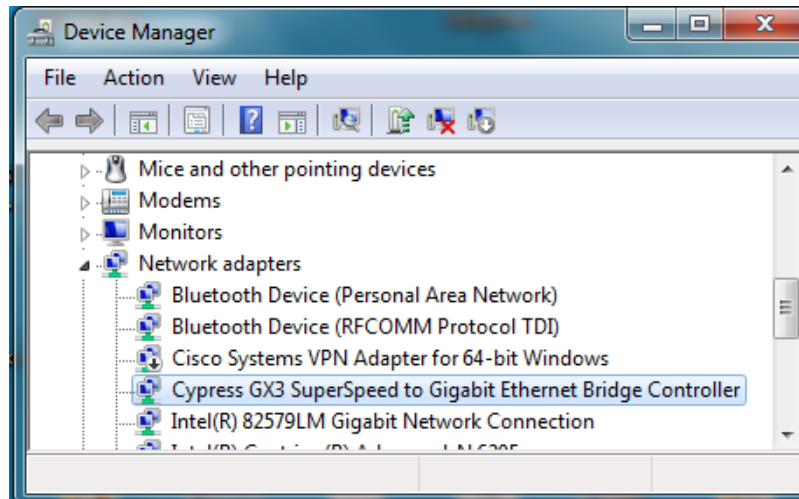


## 5 Testing GX3 Functionality in Windows

Follow these steps to test the basic functionality of the GX3 RDK in Windows.

1. Plug the GX3 RDK into a PC USB port. If the GX3 RDK is plugged into the PC for the first time, you should see a pop-up message to install the driver. The Microsoft Windows driver for GX3 will be installed automatically from the Windows website when the GX3 RDK is plugged into the USB Host controller because Cypress provides Microsoft certified drivers. The driver gets downloaded automatically only for Windows. For other operating systems and systems with no Internet connection, the driver should be predownloaded onto the PC. To install the drivers manually, refer to the [Troubleshooting](#) section.
2. Check whether the driver is successfully installed on the system by viewing the **Device Manager** (or a Device Manager equivalent for other operating systems), as shown in [Figure 5](#).

Figure 5. GX3 RDK Driver in Device Manager



3. Connect the Ethernet network cable to the RJ45 connector on the GX3 RDK.
4. Open a web browser application (such as Internet Explorer or Firefox) and type [www.cypress.com](http://www.cypress.com) in the address bar. When you make a successful connection, you will see the Cypress home page on your web browser.
5. To measure throughput, you can use a standard [iPerf test tool](#). This tool can be downloaded from the web for the Windows, Mac OS and Linux operating systems.

## 6 Software Support

Cypress provides GX3 USB to Gigabit Ethernet driver support for the following operating systems:

- Windows 10, 8.1, 8, 7; Windows Vista; Windows XP
- Windows CE
- Mac OS
- Linux
- Android
- Chrome OS
- Legacy PXE and UEFI PXE

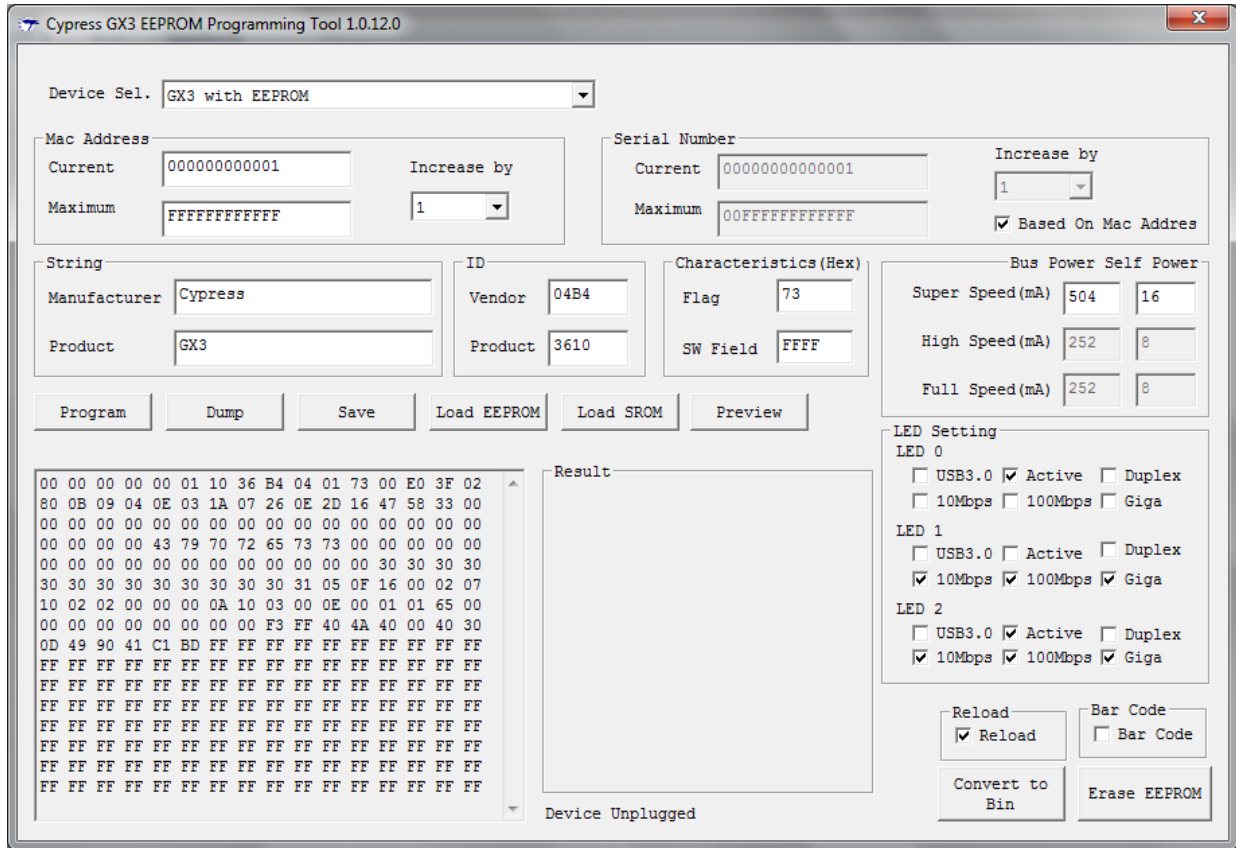
## 7 Mass Production Tools

To support mass production using GX3, Cypress provides the GX3 EEPROM Programming tool and GX3 Production Test tool solutions. The GX3 EEPROM Programming tool is used to configure different GX3 parameters and program them in serial EEPROM. The GX3 Production Test tool is used to do basic tests during mass production. The following sections give a brief overview of the tools. For more details, refer to the GX3 EEPROM Programming Guide. Please contact [Cypress Technical Support](#) to get the tool and the Programming Guide.

### 7.1 GX3 EEPROM Programming Tool

The GX3 EEPROM Programming tool ([Figure 6](#)) enables you to easily program the GX3 serial EEPROM on a typical Windows PC. You can also customize the MAC address, Vendor ID, Product ID, Serial Number, and so on for GX3 based applications in mass production.

Figure 6. GX3 EEPROM Programming Tool

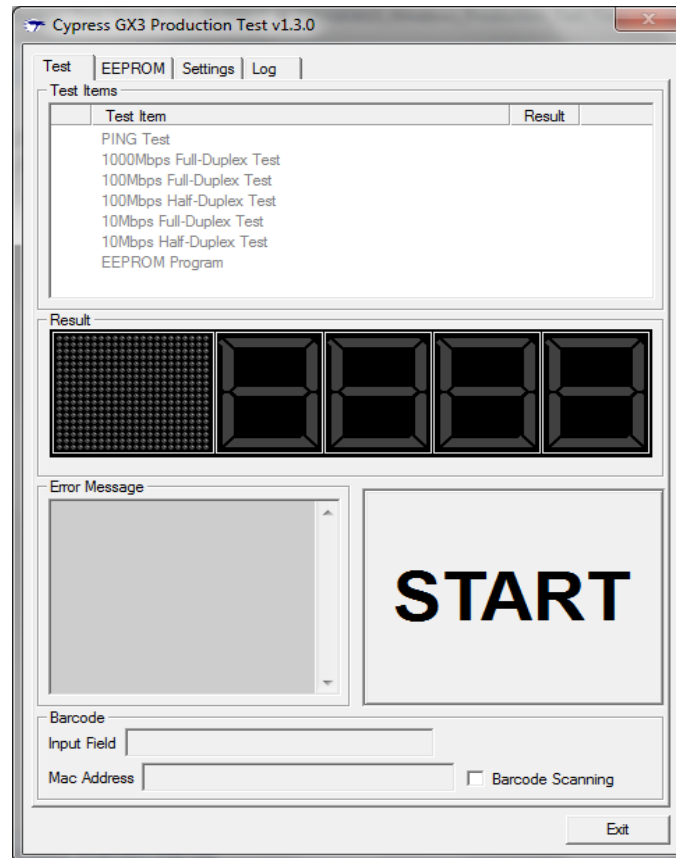


## 7.2 GX3 Production Test Tool

Cypress provides the GX3 Production Test tool (Figure 7) to allow you to run some basic network function tests and program the EEPROM during production.

The Production Test tool sends and receives packets in different Ethernet speed modes and programs the EEPROM. This tool can be run on a Windows system, which installs a special GX3 Windows test driver so the tool can function. The tool also requires a separate server PC to run the test server tool, which is provided by Cypress. The server can be a normal PC with the GX3 test server tool running on it. The test server tool can receive packets from the device under test (DUT) and then reply. For more information, refer to the GX3 EEPROM Programming Guide. Please contact [Cypress Technical Support](#) to get the tool and the Programming Guide.

Figure 7. GX3 Production Test Tool



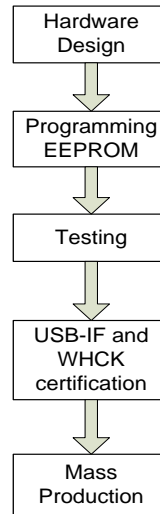
## 8 Key Features Compared to Competitors

- Driver support for Windows CE 7.0/6.0/5.0
- More throughput than that of competitors
- Lower operating temperature (57 °C) than that of competitors (72 °C)
- Low CPU utilization (25 percent max.)
- Easy driver installation on Mac OS

## 9 GX3 Design Flow

Figure 8 shows the GX3 design flow chart. The hardware design step involves the hardware board schematics and PCB layout design based on GX3. After the PCB is assembled, program the EEPROM with user parameters such as USB VID, PID, USB Manufacturer strings, Ethernet MAC address, and so on. After programming the desired parameters into the EEPROM, test the basic functionality of the GX3 board. If the basic functionality tests are successful, you can proceed with the USB-IF hardware certification, IEEE certification, and driver certification if any changes in the drivers are made. The last step involves mass production, in which you can program the EEPROM quickly in one step and also perform basic tests on the board.

Figure 8. GX3 Design Flow Chart



## 10 Related Resources

- GX3 datasheet
- GX3 Hardware Design Guidelines application note
- GX3 EEPROM Programming Guide (Contact [Cypress Technical Support](#))
- GX3 RDK User Guide
- GX3 RDK Hardware Design files
- GX3 drivers
- GX3 EEPROM Programming tool (Contact [Cypress Technical Support](#))
- GX3 Production Test tool (Contact [Cypress Technical Support](#))

All these resources are available at [www.cypress.com/gx3](http://www.cypress.com/gx3).

## 11 Troubleshooting

If the drivers are not automatically binding, follow these steps to install the driver manually:

1. Connect the GX3 RDK to the USB port and open **Device Manager**.
2. Right-click on the icon “GX3” and select **Update Driver Software**.
3. Select **Browse my computer for driver software**.
4. Browse to the desired path where the driver files are located and click **OK**.

## Document History

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Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	4786556	MDDD	08/05/2015	New application note
*A	5711818	AESATMP9	04/25/2017	Updated logo and copyright.
*B	5815035	MDDD	07/13/2017	Updated the links for software tools.



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