Enhanced Universal Platform System-on-Chip Processor

EDB9302A

Engineering Development Board

Technical Reference Manual

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1. EDB9302A Kit Contents

Each EDB9302A kit comes with the following:

- EDB9302A Development Board
- Null Modem Serial Cable
- Power Supply: +12V, 5A, 110V/220V with AC Power Cord
- Quick Start Guide
- Registration Card
- DC10-to-DB9 Cable
- IAR™ Evaluation CD
- Quick Start Guide
- Board Registration Card
- Trial Software Download Information Card

All documentation, schematics, software, utilities, and related information is available from the download section of the Cirrus Logic ARM Developer's web site, http://arm.cirrus.com.

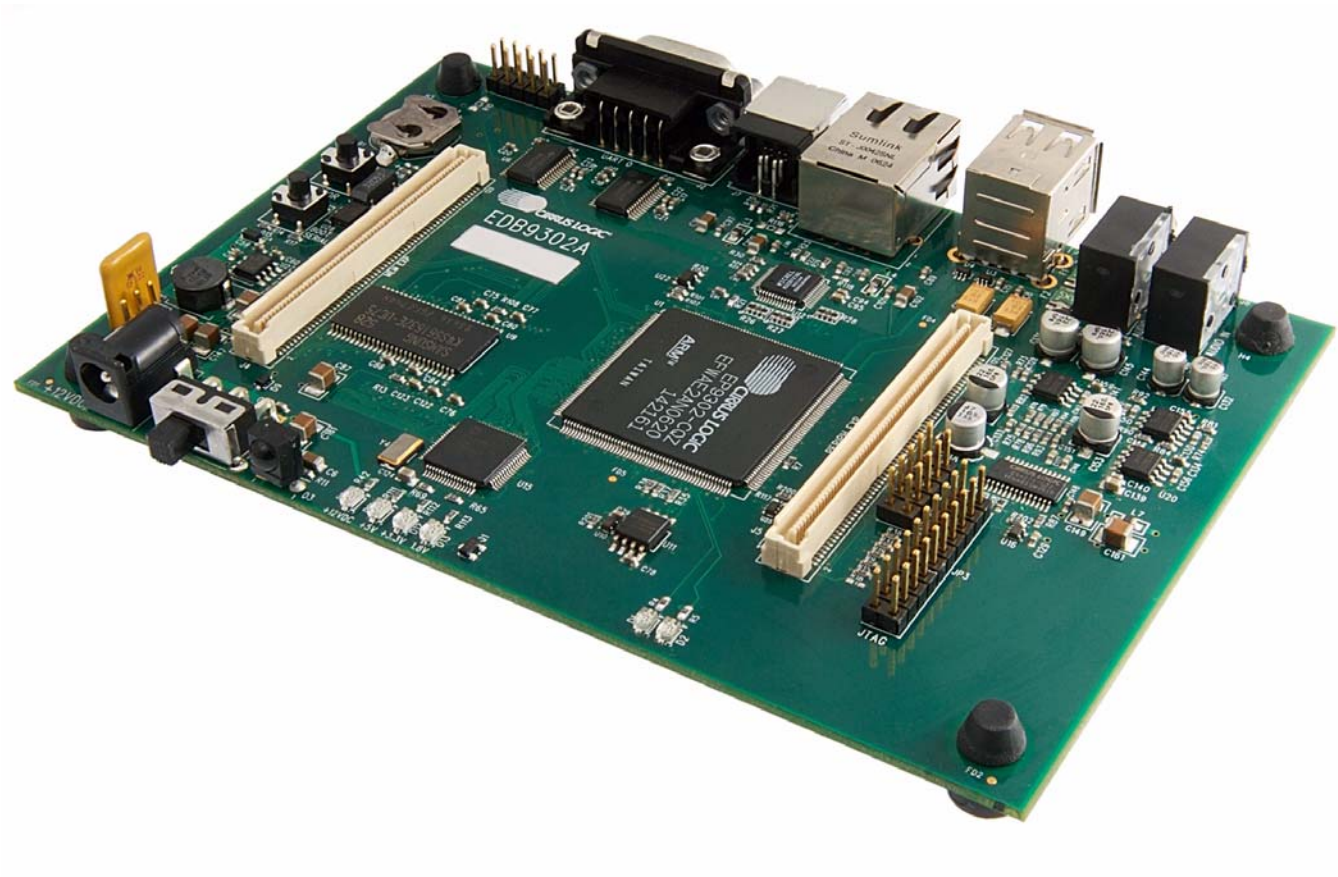

Figure 1. EDB9302A Board

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2. Introducing the EDB9302A Engineering Development Board

This document will describe the features and basic operation of the EDB9302A board developed by Cirrus Logic. Detailed information regarding the operation and programming of the EP9302 device are covered by the EP9302 datasheet and User's Guide on the Cirrus Logic web site.

The EDB9302A is a convenient and easy-to-operate evaluation platform. It has been designed to provide the majority of the EP9302 functions on a small 6" x 4" base board. These features include:

- EP9302 Processor Running at 200MHz
- 64MByte SDRAM
- 16MByte NOR Flash Memory
- Two USB 2.0 Full-speed Host Ports
- USB 2.0 High-speed Device Interface
- Audio Out
- Audio In
- Two UARTs
- 10/100 Ethernet Interface
- JTAG
- Consumer IR (CIR)
- Expansion Connectors
- 5-channel ADC

Two high-density connectors have been provided to allow for daughter card expansion. The full memory bus is connected to one of the connectors and any peripherals not on the development board are attached to the other connector. In addition, some features such as Ethernet MII interface have been brought out to the peripheral connector as well.

2.1 Identifying What's on the Board

Figure 2 shows the top side of the EDB9302A. The accompanying legend identifies the main components of the board.

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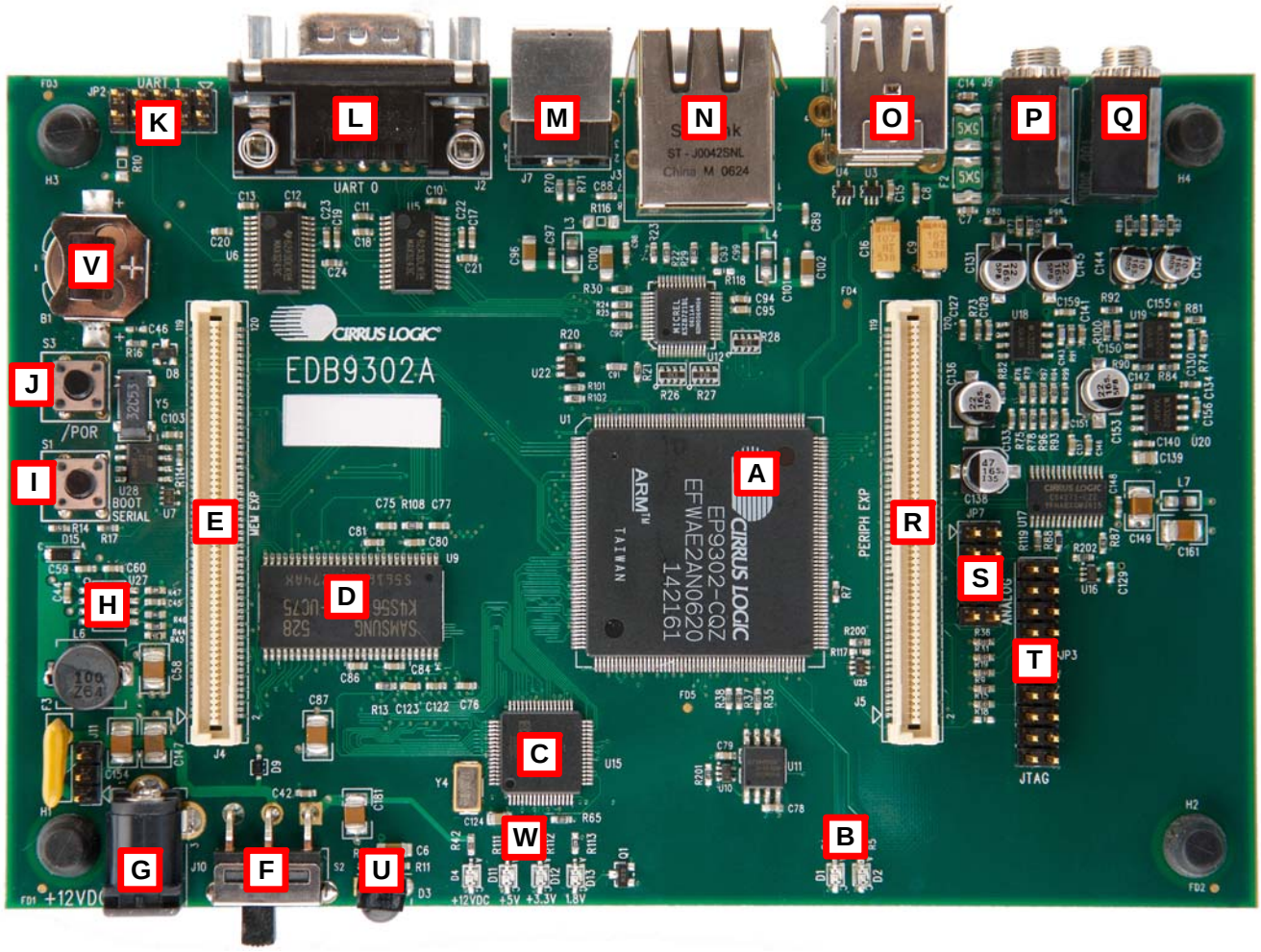

Figure 2. EDB9302A Top View

A. EP9302 Processor
B. Processor Status LEDs - one Red and one Green
C. USB 2.0 High-speed Device IC (ISP1581)
D. SDRAM - 16-bit device
E. Memory Bus Expansion Connector
F. Main Power Switch, S2
G. 12V Power Connector
H. 3.3V Voltage Regulator - switching, 3A
I. Serial Boot Pushbutton - labeled "SERIAL BOOT"
J. Reset Pushbutton - labeled "/POR"
K. UART1 Header - 5x2
L. UART0, DB9 Male
M. USB Device Connector
N. Ethernet Connector
O. Dual, Stacked USB Host Connector
P. Audio Out Connector
Q. Audio In Connector
R. Peripheral Bus Expansion Connector
S. ADC Connector
T. JTAG Connector
U. Commercial IR
V. RTC and Battery Backup
W. Power Status LEDs

One item not listed above is the Flash device. It is located on the bottom side of the board, under item C. There are no jumpers on the board. The only "jumper" is the serial boot pushbutton. This button is used when the developer wants to use the Cirrus Logic download utility to put new code into Flash memory.

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3. Getting Started

3.1 Before you Begin...

The developer will find it useful to have some additional hardware not provided in the EDB9302A kit. Items such as a USB keyboard and a set of powered speakers can make using the EDB9302A and the software installed on the board more enjoyable.

Caution: Make sure you are in a static-free environment and are following proper procedures for handling ESD-sensitive electronic equipment.

3.2 Attaching Cables

Before attaching cables to the board make sure you know where pin 1 for each of the connectors is located. Most connectors are keyed. However, some connectors use 2 x n headers, allowing the cable to be plugged in backwards. Prime examples of this are the ADC and JTAG connectors.

There is silkscreen on the PCB identifying each connector and its pin 1 location. Make sure to pay attention to the markings on the PCB for the pin 1 location. The pin 1 identifier is marked by either a number or a triangle.

3.3 Before Applying Power...

In order to use the EDB9302A the user must first connect the peripherals to the EDB9302A as described in the following procedure.

1. Place the EDB9302A on a static-free surface.
2. Make sure power switch S2 is in the OFF position.
3. Connect the 12V power supply provided to the board at J10.
4. Connect null modem serial cable provided in the kit from DB9 connector J2 to a serial port on a PC or notebook (if so equipped).
5. Launch a terminal program, such as minicom or HyperTerminal. Configure the PC com port for: 38400 baud, 8 data bits, no parity, 1 stop bit, no flow control for WinCE and 57600 baud for Linux.
6. Connect the board to a network that has a DHCP server or to a router with DHCP capabilty enabled.
7. Connect a USB keyboard.
8. Turn power switch S2 to the ON position and the board will boot and start to display information in the HyperTerminal window.

NOTE: The WinCE 5.0 binary is not provided on the support web site. If you erase the image on the board, you will have to download the BSP provided by Cirrus Logic and compile it using Platform Builder.
Due to changes in distribution policy, the Microsoft trial CD/DVD that was formerly included in the kit is no longer available. Please refer to the card in the kit that describes how to download the Microsoft trial software from the Microsoft web site.

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4. EDB9302A Circuit Description

This chapter makes reference to the schematics in Appendix A and discusses the main circuit functionality of each schematic page. A detailed block diagram of the EDB9302A Engineering Development Board is shown below.

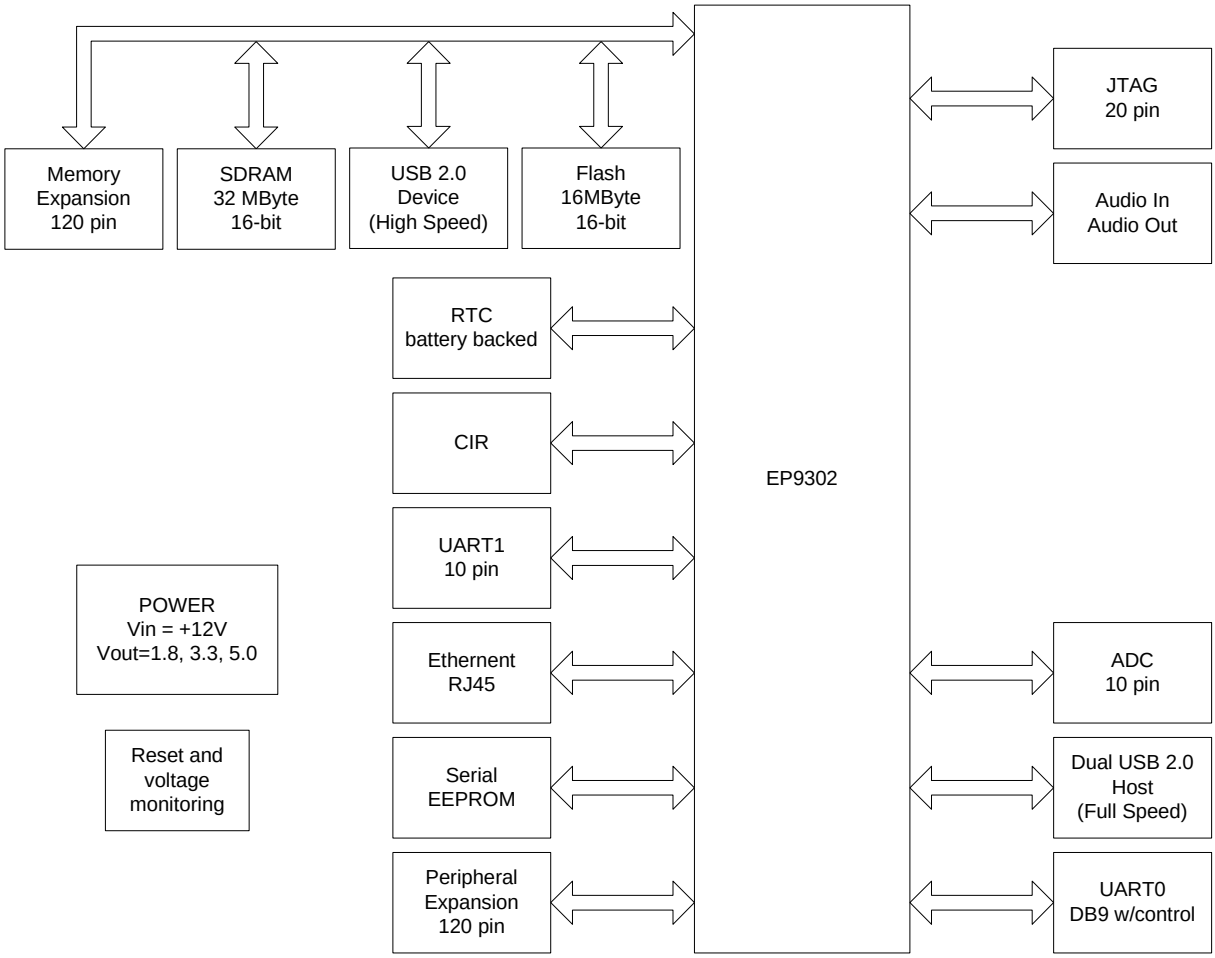

Figure 3. Block Diagram

Detailed information regarding the EP9302 processor and interfaces can be found at www.cirrus.com. The details of this device will not be discussed in this document. Refer to the EP9302 datasheet, User's Guide, and other information on the web site for more information.

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4.1 Circuit Operation

The major circuit operation for each page of the schematic will be discussed.

Note: Refer to http://arm.cirrus.com for the latest board schematics. Look under the download link at the top of the page.

Page 1

Block diagram and revision history.

Page 2

There are two main clock inputs to the EP9302 device. One is the 14.7456 MHz crystal oscillator and the other is the 32.768 kHz real time clock (RTC).

The 14.7456 MHz clock can be generated from a crystal circuit as shown in the schematics, or optionally from a 14.7456 MHz oscillator. If a 14.7456 MHz oscillator is used, then only the XTALI pin is driven and the drive level of the clock must be 3.3 V.

The RTC clock may be generated by the circuit shown in the schematics, or optionally an RTC oscillator. Due to the cost of RTC oscillators, the circuit shown in the schematics is used. An external oscillator is made by using an unbuffered '04 inverter. It is very important to use an unbuffered inverter in this application. Using a buffered inverter may make the circuit oscillate in the ~MHz range or not start at all. Refer to application note AN265.

The two LEDs connected to the EP9302 device are used to indicate processor health during boot and general status of the board.

The reset output, RSTON (active-low signal) is buffered by U25. There is a resistor option for the RSTON signal to be either driven by this buffer or bypassed. If the reset signal is not going to be buffered, U25 must be removed and R117 installed. By default, RSTON is buffered.

Page 3

This block shows the peripheral connections from the EP9302 processor. This page also shows the ADC connector, JP7.

Page 4

Main items on this page are the USB 2.0 Full-speed Host, USB power, UART, and Commercial IR (CIR) circuits.

The USB Host circuits are connected directly from the EP9302 to U3 and U4 and then on to the stacked USB connector, J1. U3 and U4 provide termination for the USB signals and ESD protection. Power for the USB Host ports comes from the +5V switching regulator and is protected with poly fuses rated for 0.5 A each.

The board has both UARTs brought out. The main UART interface, UART0, is connected to a standard male DB9 connector and provides for full modem control. The other UART interface is connected to a 5x2 header. There is an option for installing a zero-ohm resistor if the developer needs to provide +5V power to an external device. The pinout of the headers matches common IDC10-to-DB9 cables. One such cable is included with the kit. All UART signals are level shifted from TTL to RS-232.

The CIR uses an enhanced GPIO (EGPIO) line to communicate to the EP9302 device.

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Page 5

This is the power section for the EP9302 device. The ADC and PLL supplies are filtered. There is no reason to filter the 3.3 and the 1.8V power rails.

Page 6

The SDRAM interface is comprised of one 16-bit SDRAM device to form a 16-bit SDRAM bus. The SDRAM is connected to /SDCS0 and is located at physical memory address 0xC000_0000.

The Flash interface is made from a single 16-bit device. It uses a "multi-cell" Flash device. The Flash device is connected to /CS6 and is located at physical memory address 0x6000_0000. The reference design uses only one Flash device. The Flash device installed is a 128 Mbit, 16 Mbyte, device.

The serial EEPROM is a 4 Mbit device and may be used for serial "SPI Boot" or for storing the Ethernet MAC address. SPI Boot is not used as the default boot method but may be used by the developer if it fits his/her application. Details about SPI Boot are in the EP9302 User's Guide. The serial EEPROM is accessed only if the EGPIO7 line is configured to the proper level. The SPI™ frame signal and the EGPIO7 "enable" signal are OR'ed to create the enable for the serial EEPROM device. EGPIO7 must be low in order to communicate to the serial EEPROM. Other devices on the SPI bus must be enabled in a similar manner but not enabled simultaneously.

Page 7

The JTAG interface is connected to a 2x10 header, JP3. This connector is wired for the Multi-ICE debugger.

There are 10 signals that determine how the EP9302 will boot and operate. They are all shown on this page except for BOOT1. BOOT1 is connected to GND. BOOT1 is used for factory testing only. The other nine signals are either pulled up or down external to the EP9302 device. The boot configuration shown sets the EP9302 device to perform an Internal Async boot from a 16-bit-wide memory.

The “Serial Boot” pushbutton, S1, is used to configure the board to perform a serial boot. A serial boot is used to program the Flash device with the Cirrus Logic download utility. Instead of using jumpers, a pushbutton is used. Simply hold the pushbutton down while pressing and releasing the reset pushbutton, S3. Continue to hold S1 until the red LED turns off. Once the red LED is off, release S1.

The ISL1208 is connected to the EP9302 to provided an external, battery backed RTC clock. This device has 2 bytes of battery backed SRAM. The battery is a common lithium coin cell and easily removable if desired.

Page 8

The Micrel KS8721Bl PHY is used to provide the 10/100 Mbit Ethernet interface. The PHY is attached to the EP9302 device MII interface. The PHY also connects to RJ45 connector, J3. The Ethernet connector has integrated magnetics and status LEDs. The Micrel PHY requires external power filtering of the 2.5V supply it produces.

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Page 9

The two connectors provide a daughter card interface for making custom circuits. J4 is the Memory Expansion connector and J5 is the Peripheral Expansion connector.

The entire memory bus is connected to J5. It is recommended that the bus signals be buffered if adding additional memory. However if a CPLD or FPGA is attached there is no reason to buffer. Use proper engineering practices when using the high-speed memory bus with daughter cards.

The Peripheral Expansion bus has the signals for features not implemented on the EDB9302A board and for commonly used signals.

Page 10

An external USB 2.0 High-speed Peripheral device is provided. The USB device allows a Host to see the board as a Mass Storage device. The USB interface chip is connected to the lower 16-bits of the memory bus.

Page 11

Audio is supported by a Cirrus Logic CS4271 device. Two-channel audio out and line-level audio in is supported. The audio device communicates to the EP9302 through the I^2S interface and audio clocks are generated by the EP9302. The audio in is line level, it is not a microphone-level input. Like the serial EEPROM, the CS4271 is controlled by the SPI frame signal and EGPIO6. EGPIO6 must be low in order to communicate to the CS4271 device. As mentioned before, only one SPI™ device can be enabled at a time.

Page 12

Power and reset circuits are shown on this page. Most of the changes made to this revision of the EDB9302A board were made in this section. The most important change made is that the board is now powered from a +12V power supply.

The board has two connectors for input power. J10 is the standard power connector and is where the power supply provided in the kit attaches. However, a 3x1 header, J11 is also available to supply power to the board.

The 3.3V power rail is generated from a 3A, adjustable, switching regulator, U27. The 5V power rail is generated from an identical 3A switching regulator, U28. The 5V supply requires a diode, D7. The 3.3V supply does not require this diode.

The 1.8V power rail is generated from an 800mA linear regulator. Both the 3.3V and 1.8V power rails are are monitored by U22 and it will issue a reset if either supply falls below the threshold voltage.

The reset pushbutton can connect directly to the voltage monitor reset input or to a supplementary reset-detect circuit. Refer to AN258 for more information. This circuit is implemented by U24 and some passive devices. In general, this circuit is not required with EP9302 Rev E2 devices and may be removed if desired. It is installed by default. If removed, R109 needs to be installed if the use of the reset pushbutton is desired.

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5. Software

5.1 Overview

The software programmed into the Flash on the EDB9302A development board is WinCE® 5.0. Linux® 2.6.8.1, from Cirrus Logic, is also available for the EDB9302A board

The WinCE 5.0 image programmed into Flash by the factory is not available from Cirrus Logic directly. This image can not be provided to users due to distribution and royalty reasons. If the developer decides to overwrite the factory WinCE 5.0 Flash image with Linux or some other software, and then later desires to put the WinCE 5.0 image back into Flash, they must obtain the WinCE 5.0 BSP from their Cirrus Logic FAE and build the image themselves using the trial version of Platform Builder™ or with a version of Platform Builder they have purchased. Only WinCE 5.0 supports the EDB9302A board. Cirrus Logic technical support for WinCE 4.2 is not available.

Cirrus Logic provides complete source for its Linux 2.6 offering. The Cirrus Logic release images for the EDB9302A are also provided for those who do not want to build the toolchain and environment or want a quick way to load Linux onto the board. If, however, you wish to implement functionality other than that provided in the release package images, you must download the gcc toolchain from the Cirrus Logic User's Development Forum, under the download link at the top of the page http://arm.cirrus.com/files/tools . The other method is to download the buildroot package from the same location and let it download and build all the appropriate packages and toolchain.

Note: Linux development should be done on a Linux PC, not under Windows. Cirrus Logic uses Debian as the default build environment. Red Hat® and other versions of Linux may be used as well, but Cirrus Logic Linux 2.6. development is done under Debian.

5.2 Download Utility

The download utility provides the user with a tool for programming the flash memory on the EDB9302A Development Board with a binary image. Two versions of the download executable are provided: one supporting a PC running Windows/DOS, and one supporting a PC running Linux. The following procedure will allow in-circuit programming of the flash memory via the EP9302 processor:

1. Connect null-modem serial cable to the DB9 connector on the board and to the PC.
2. Run the download utility; make sure all terminal windows are "Disconnected" Assuming the download utility is located in same directory as the binary image…
    a. For Windows: download binary_image_filename.bin
    b. For Linux: download binary_image_filename.bin
3. "Waiting for board to wake up…" message is displayed on the PC.
4. Press and hold down pushbutton S1 "SERIAL BOOT"
5. Press and then release pushbutton S3 "/POR"
6. Wait for the red LED to go off then release pushbutton S1.
7. Messages will be displayed regarding erasing, then programming the flash.
8. "Successfully programmed binary_image_filename.bin" message displayed upon programming completion.
9. Press pushbutton S3 to reboot the board with the new code image.

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6. Developer’s User Forum

Many references have been made to the Cirrus Logic Developers User's Forum in this document.

The Cirrus Logic Developers User's Forum is a company-sponsored site and moderated by Cirrus Logic employees. However, it is not the technical help line for the Cirrus Logic ARM® product line. It is intended to be a place where developers can share ideas and ask questions from others.

Developers should become familiar with the Developer's User Forum and the files provided under the download link. Both software and hardware files are provided for Cirrus Logic offerings. Refer to Chapter 7 for useful information related to the Cirrus Logic ARM products.

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7. Other Useful Information

Web Sites

- Cirrus Logic main web site: www.cirrus.com
- Developer's Web Site: arm.cirrus.com
- Registration Web Site: www.cirrus.com/boardreg

Processor Information

The following information is located on the www.cirrus.com web site.

- EP9302 Datasheet
- EP9302 User's Guide
- EP9302 Errata

Application Notes

The following information is located on the www.cirrus.com web site.

- AN273, *"EP93xx Silicon Rev E Design Guidelines"*
- AN265, *"EP93xx RTC Oscillator Circuit"*
- AN258, *"EP93xx Power-up and Reset Lockup Workaround"*

Board Information

The following information is located on the arm.cirrus.com web site.

- EDB9302A Technical Reference Manual
- Schematics
- BOM
- Artwork and PCB stackup

Code Information

The following information is located on the arm.cirrus.com web site.

- Linux 2.6
- Board utilities
- Tools

Contact a Cirrus Logic FAE for information regarding the following.

- WinCE 5.0 BSP

The documents listed above are updated periodically and may be more up to date than the information in this document. Check with the web sites for the latest updates.

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Appendix A. Schematics

The schematics for the EDB9302A Development Board are located on the Cirrus Logic Developer's Forum website (arm.cirrus.com). The schematics are provided in Adobe's portable document format (PDF) and PADS™ format. OrCAD™ versions of the schematics are not available.

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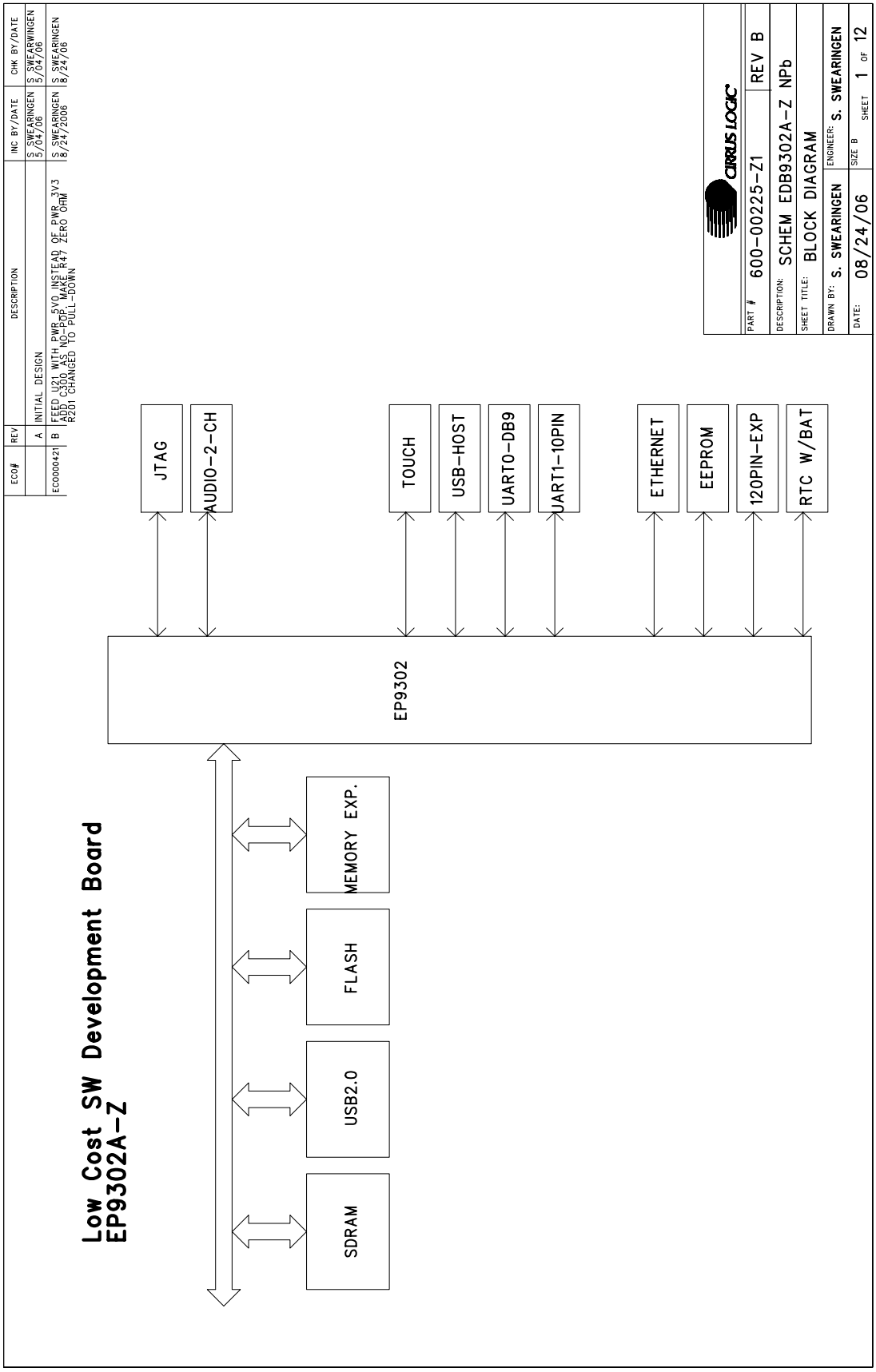

Figure 4. Schematic Page 1 - Block Diagram

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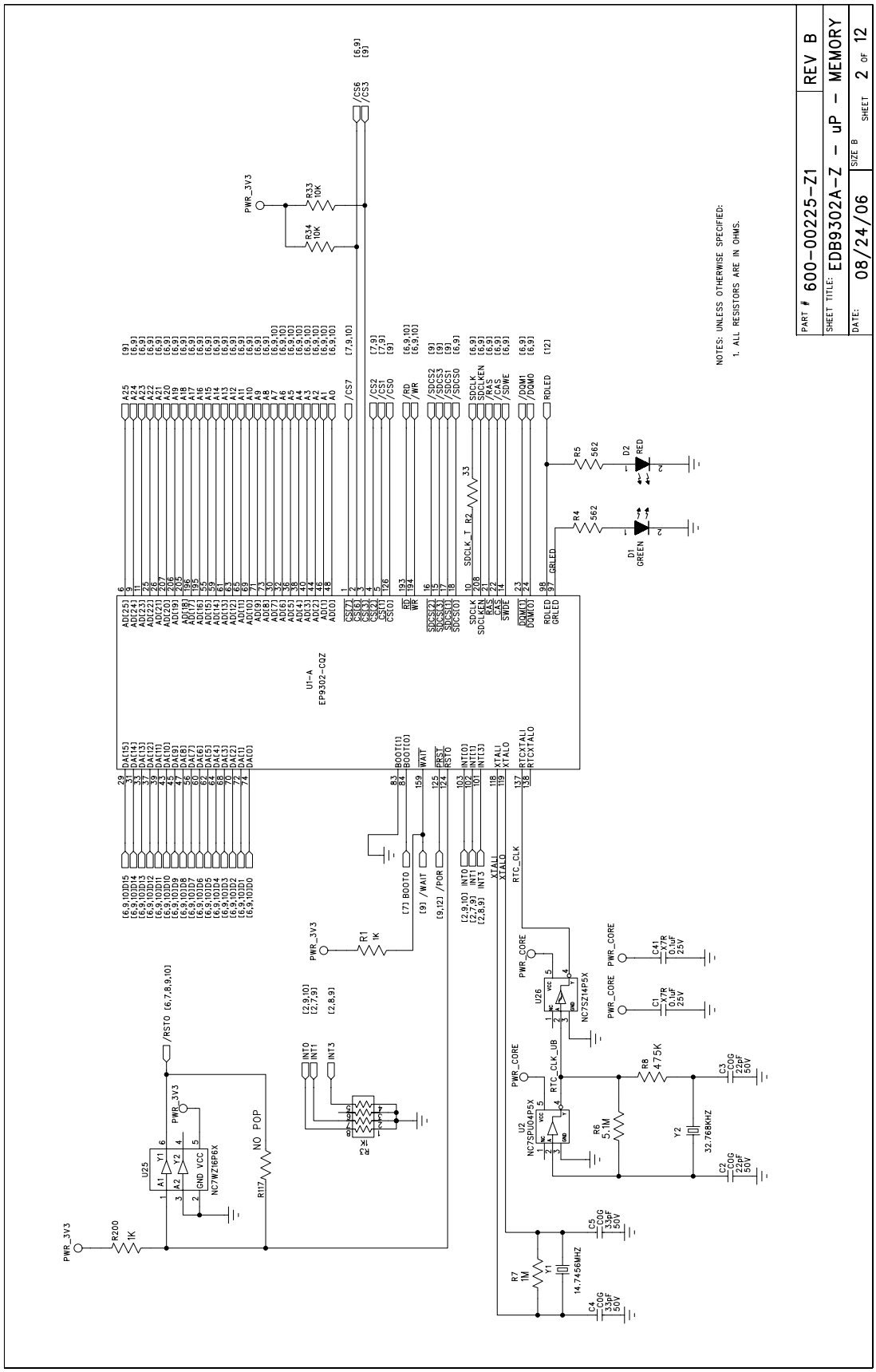

Figure 5. Schematic Page 2 - Processor & Memory

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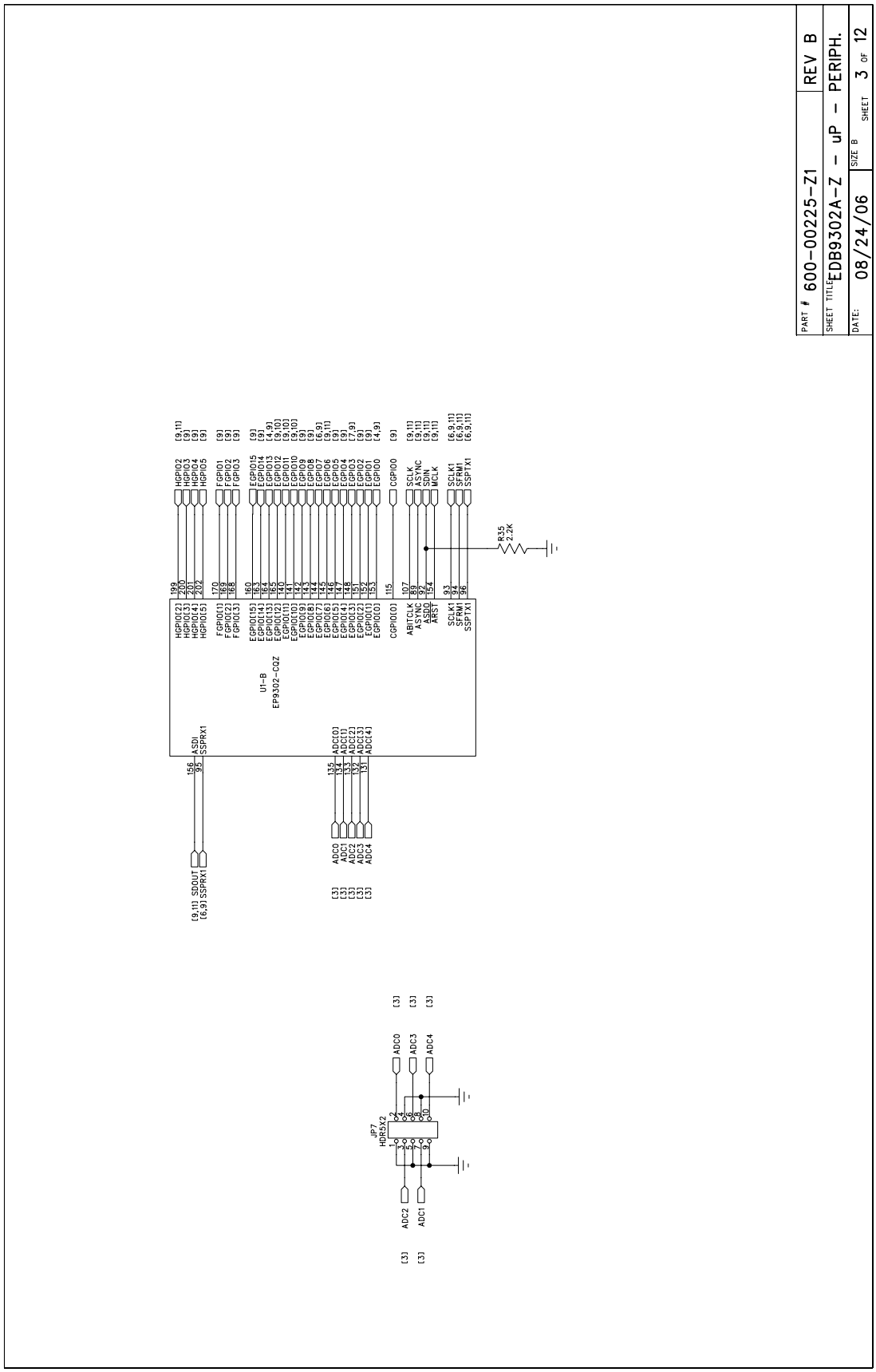

Figure 6. Schematic Page 3 - Peripherals

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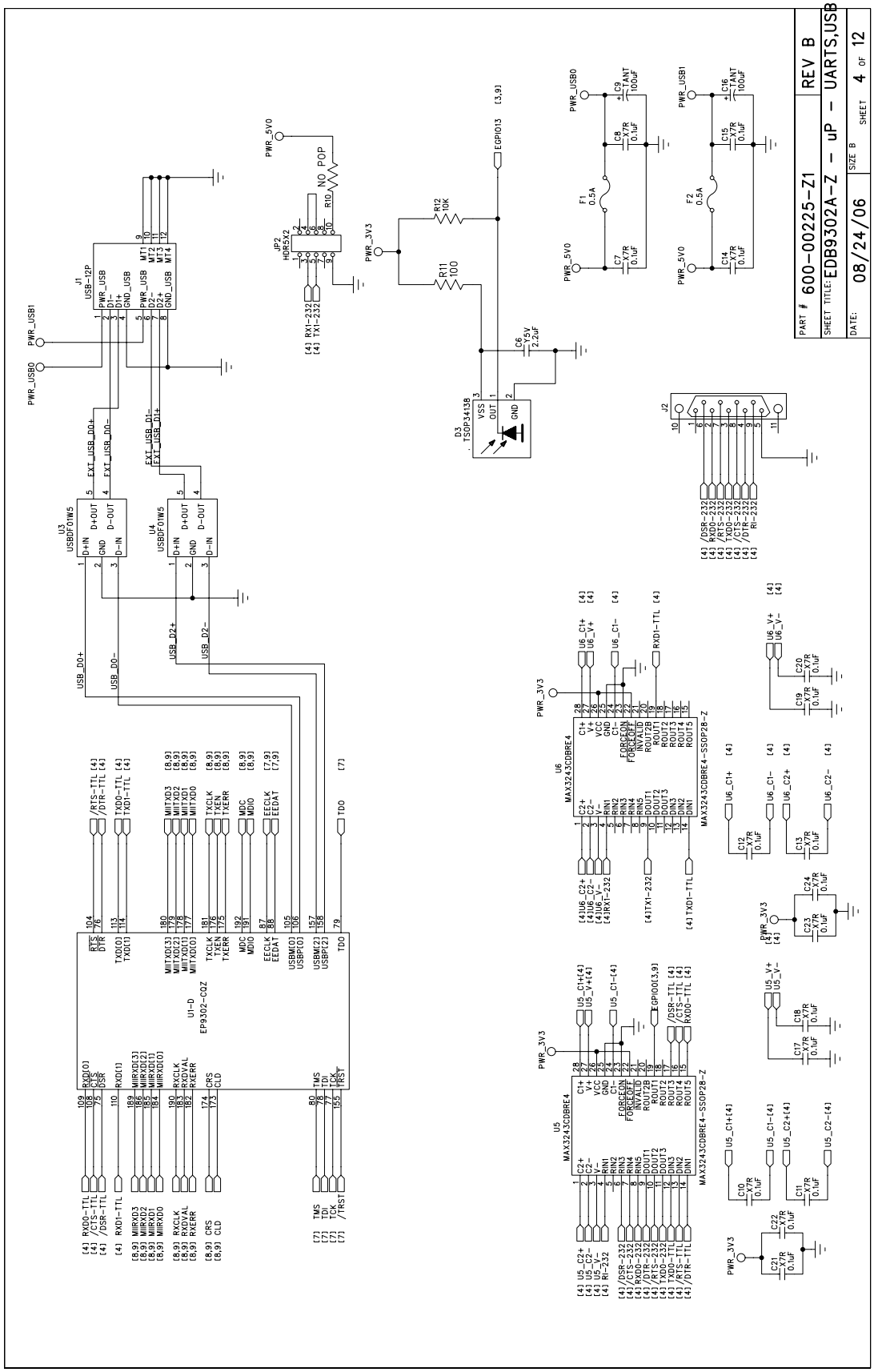

Figure 7. Schematic Page 4 - UARTs & USB

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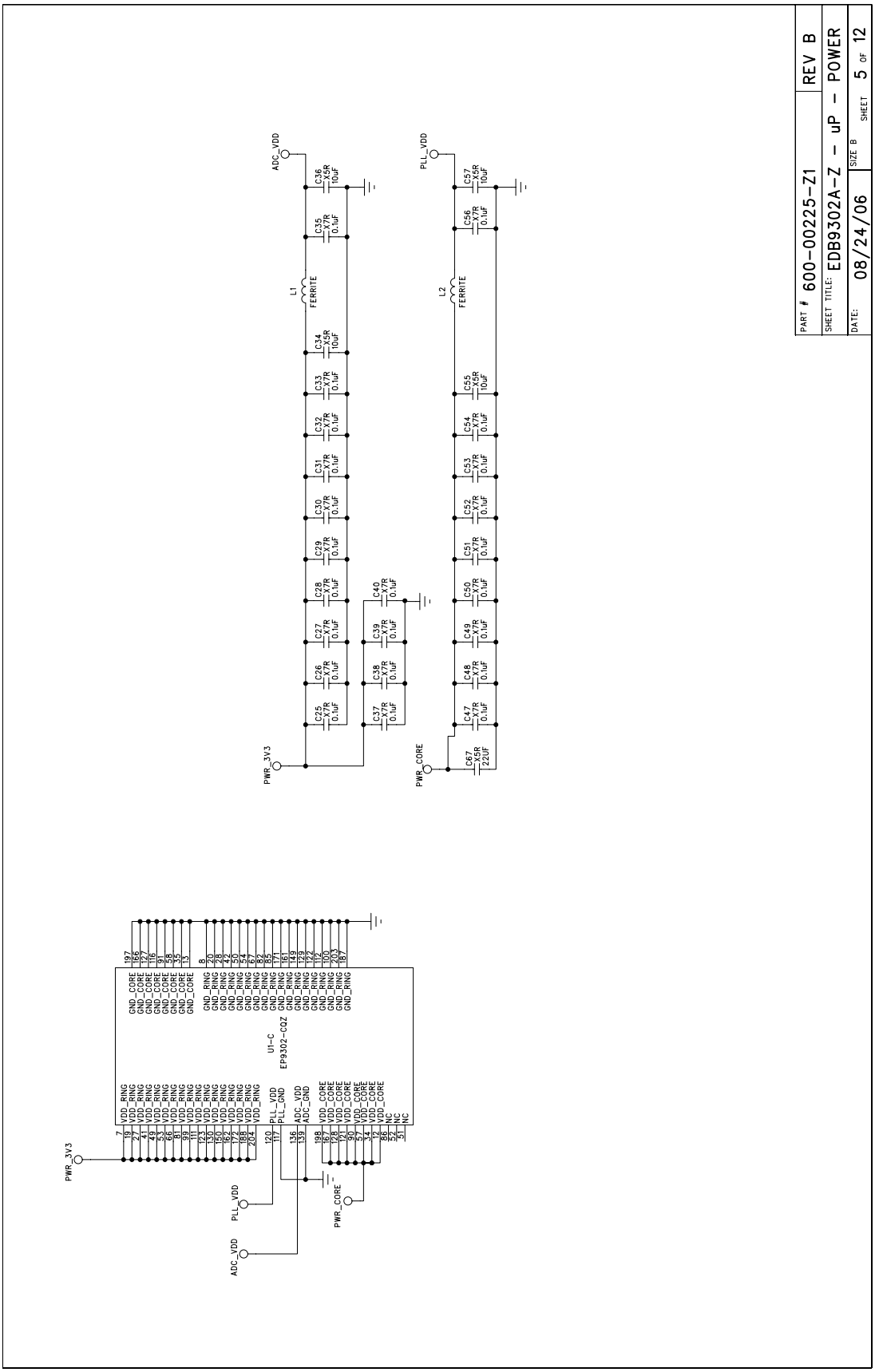

Figure 8. Schematic Page 5 - µP Power

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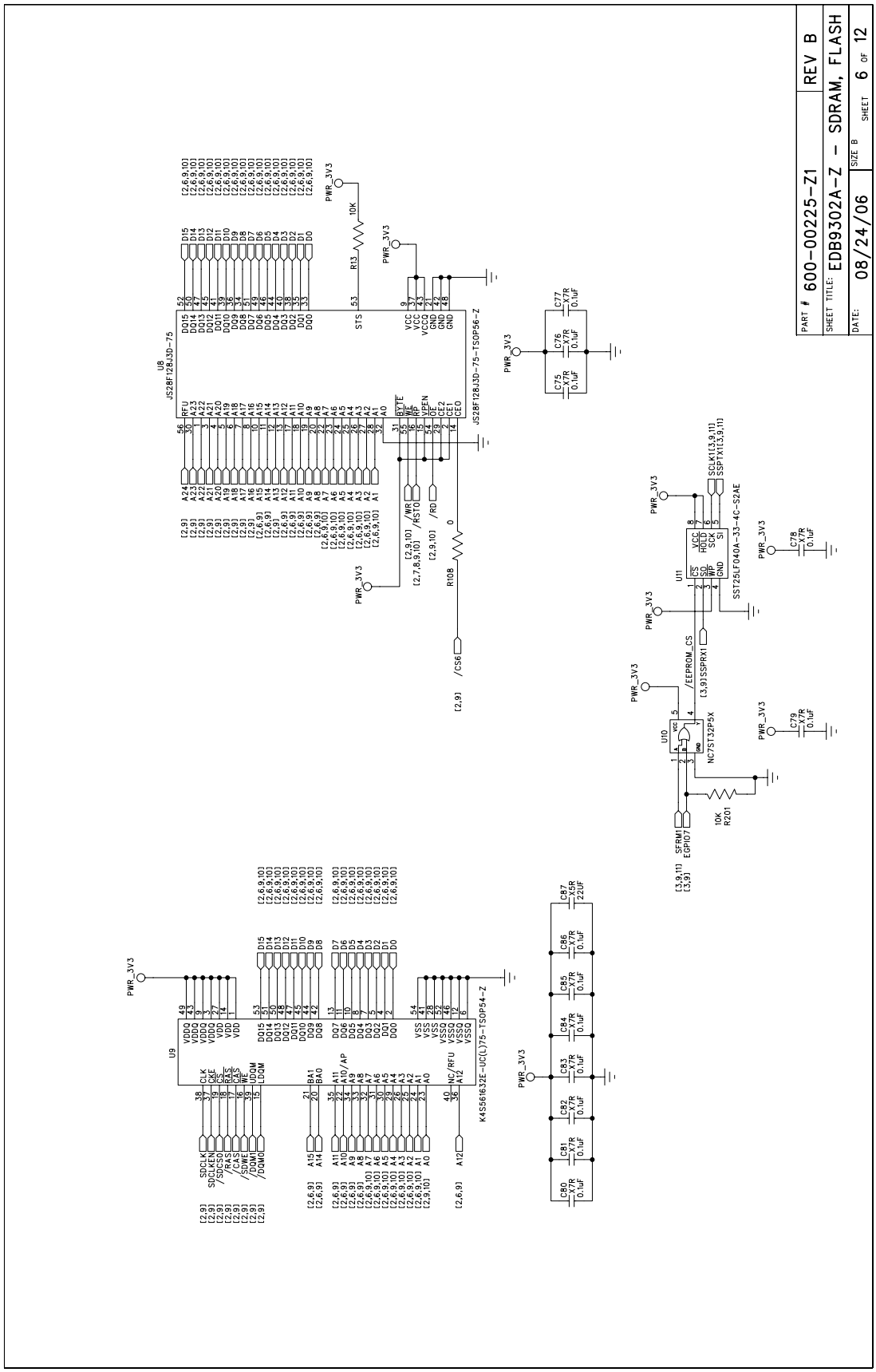

Figure 9. Schematic Page 6 - SDRAM & Flash

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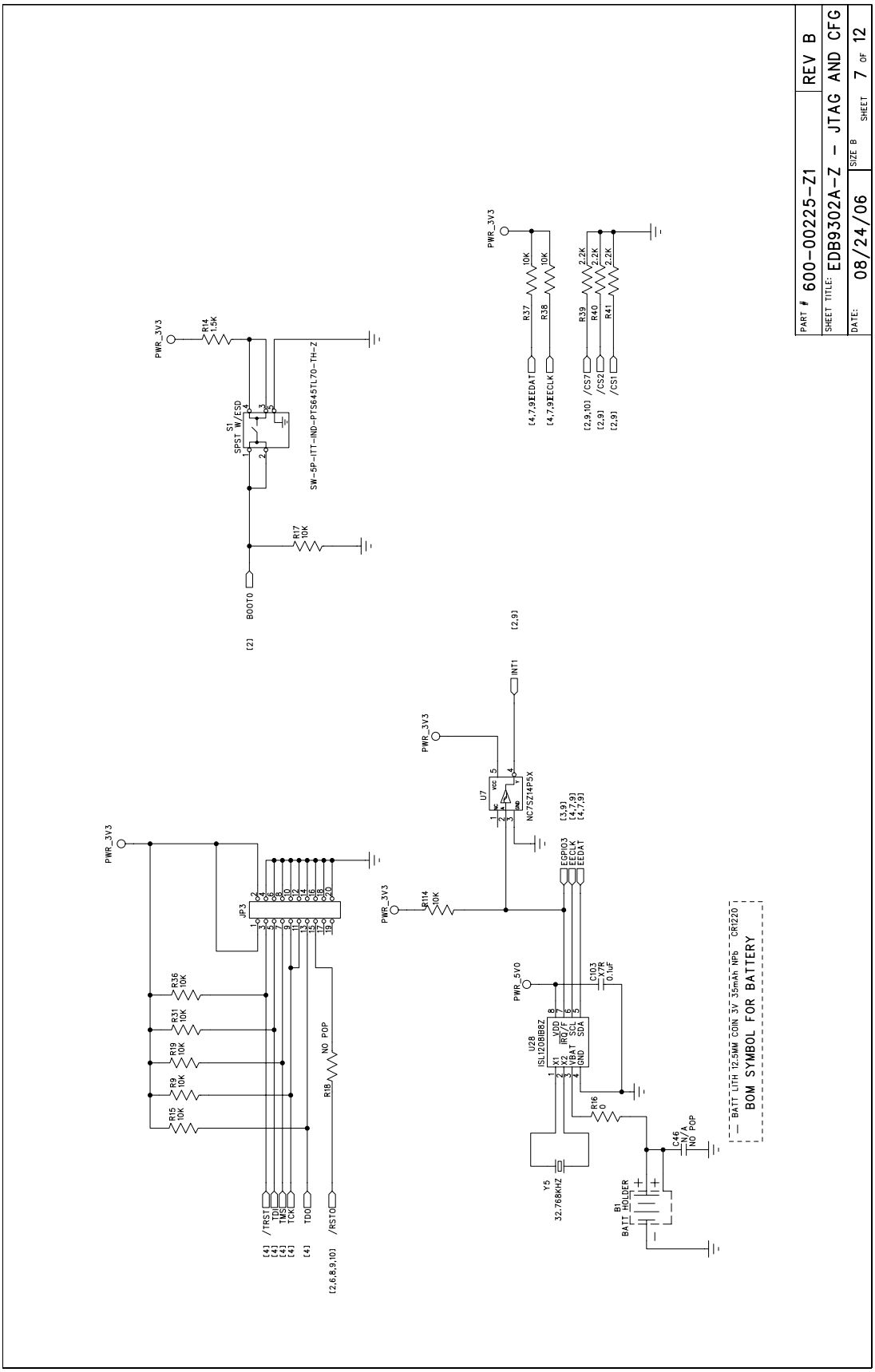

Figure 10. Schematic Page 7 - JTAG & CFG

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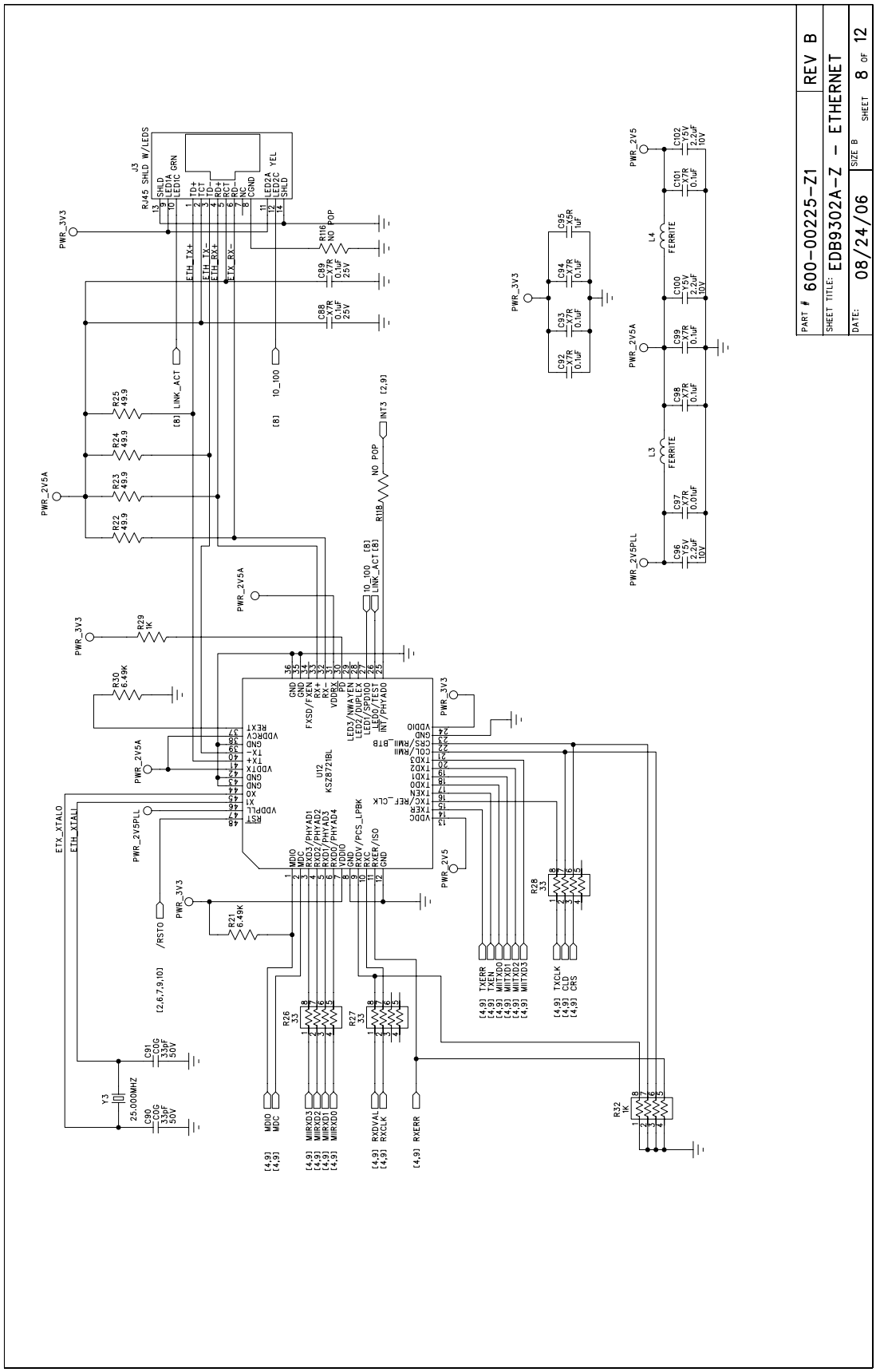

Figure 11. Schematic Page 8 - Ethernet

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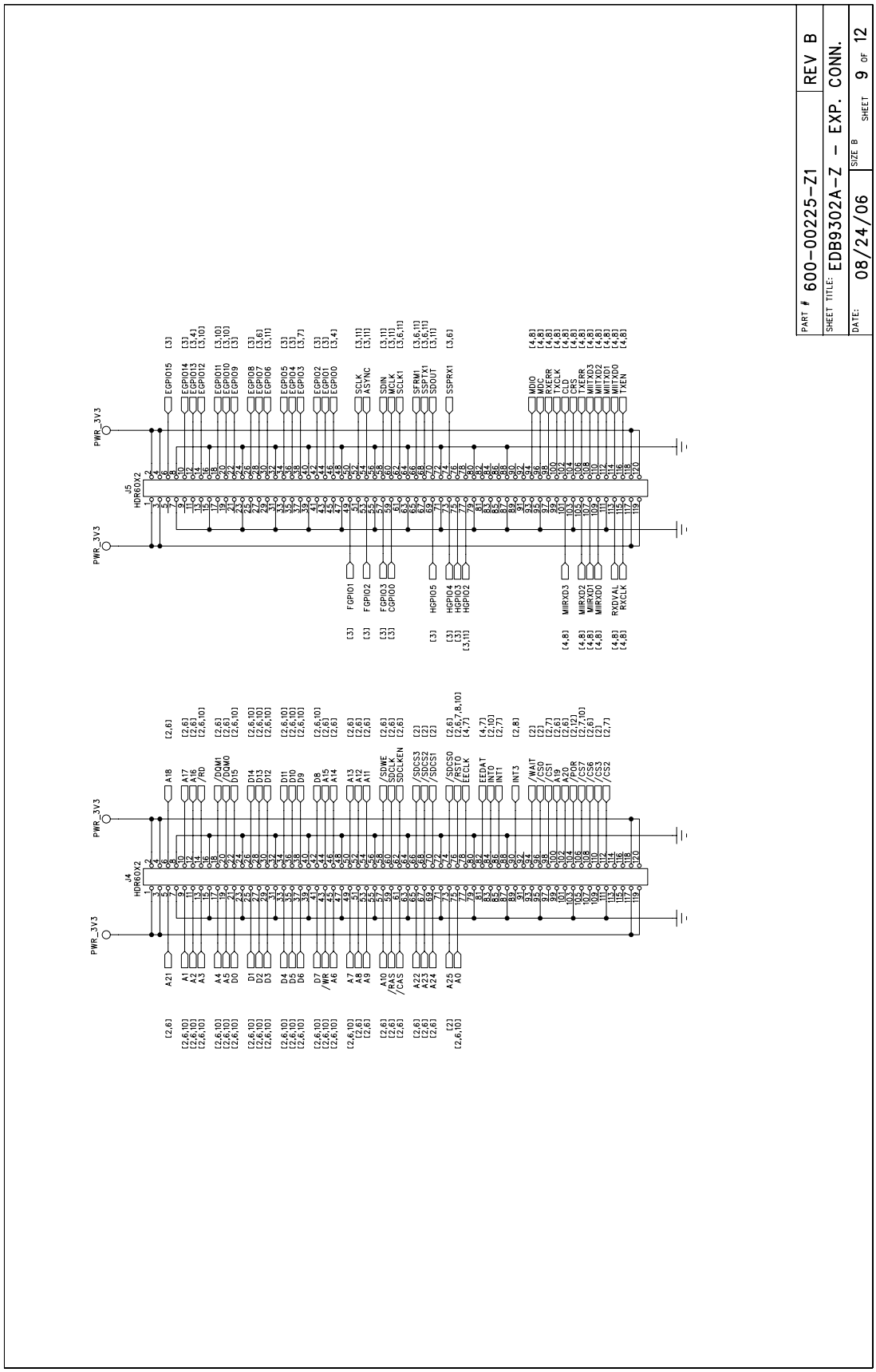

Figure 12. Schematic Page 9 - Expansion Connector

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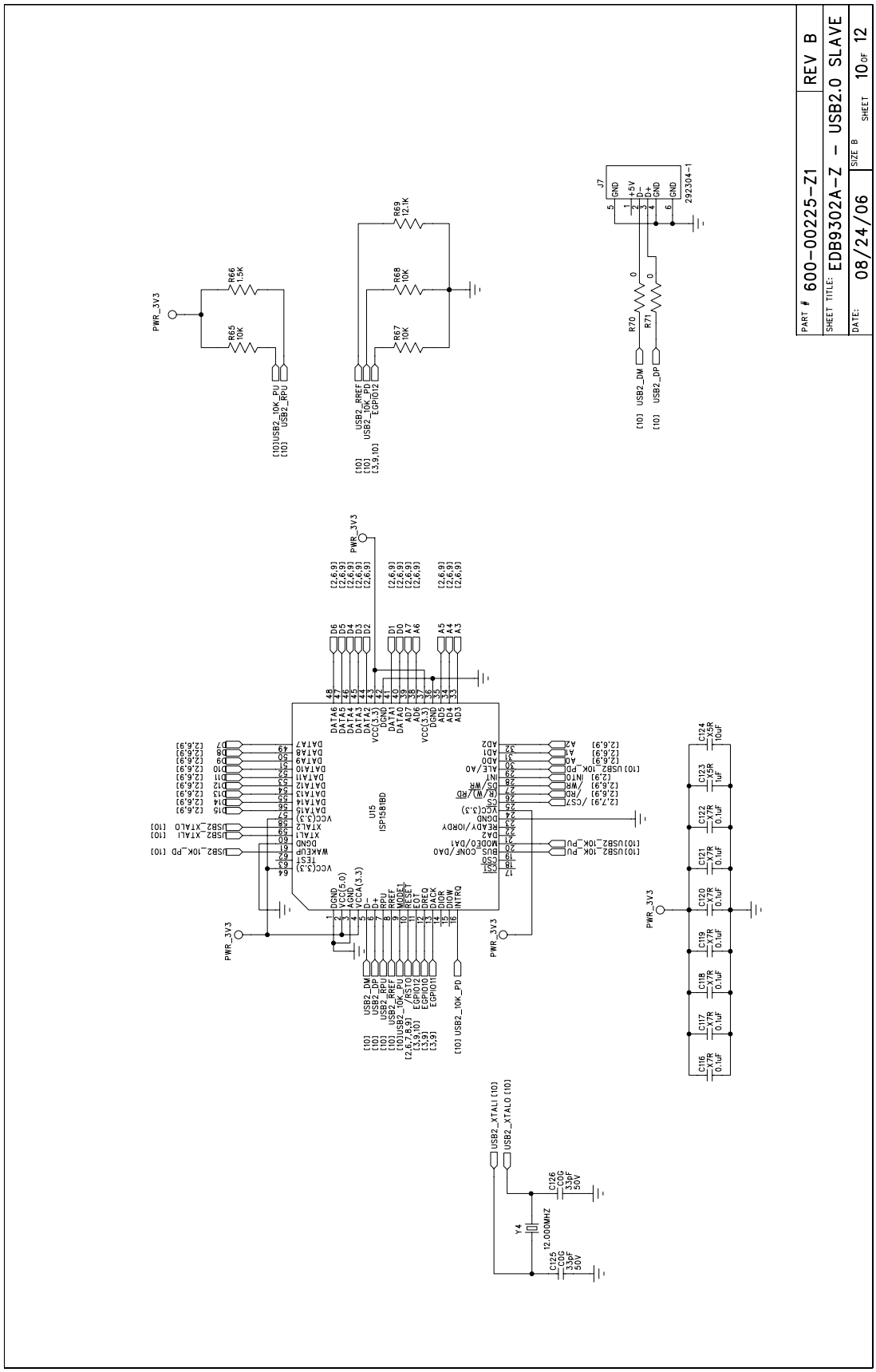

Figure 13. Schematic Page 10 - USB2.0 Slave

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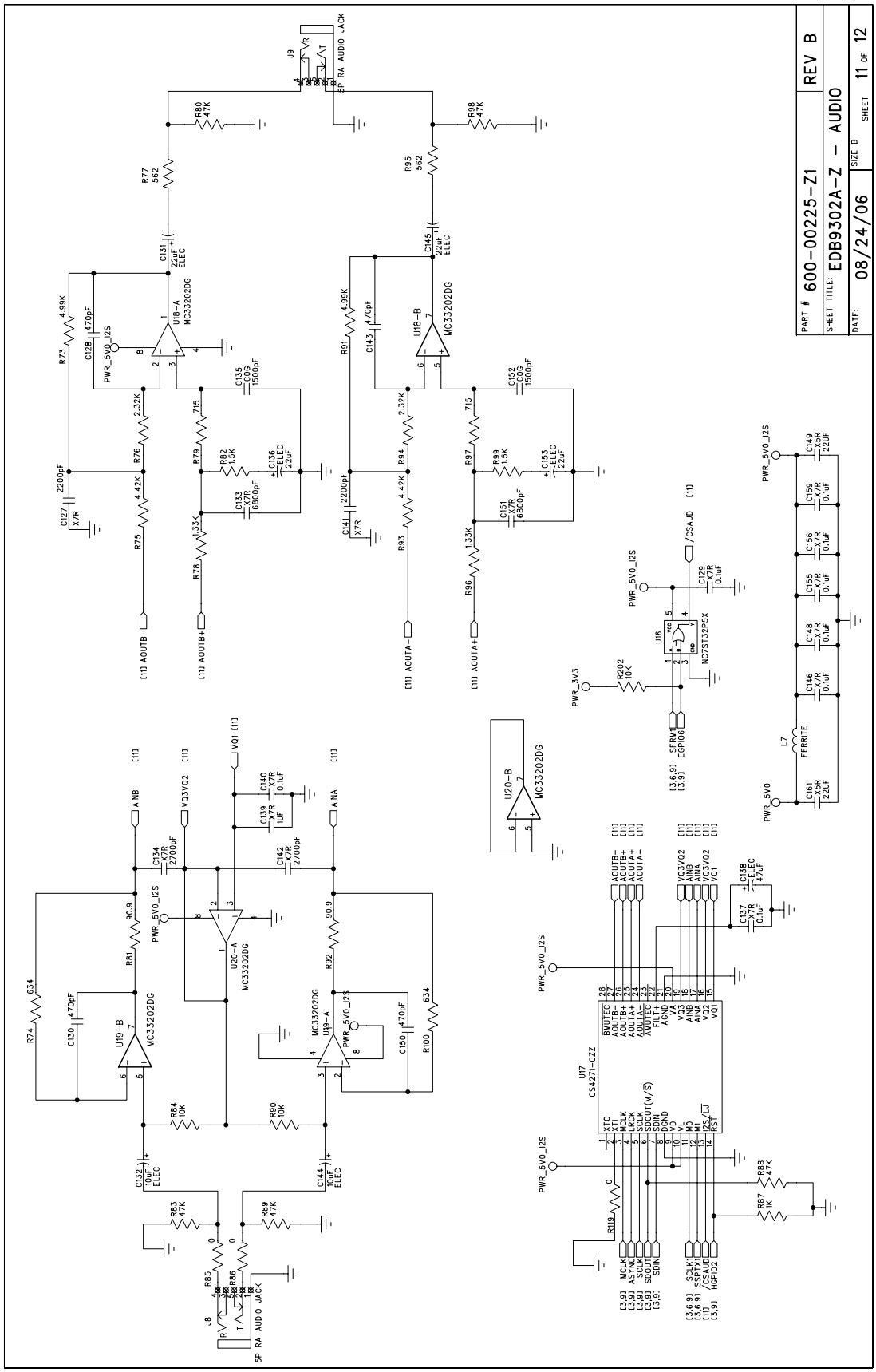

Figure 14. Schematic Page 11 - Audio

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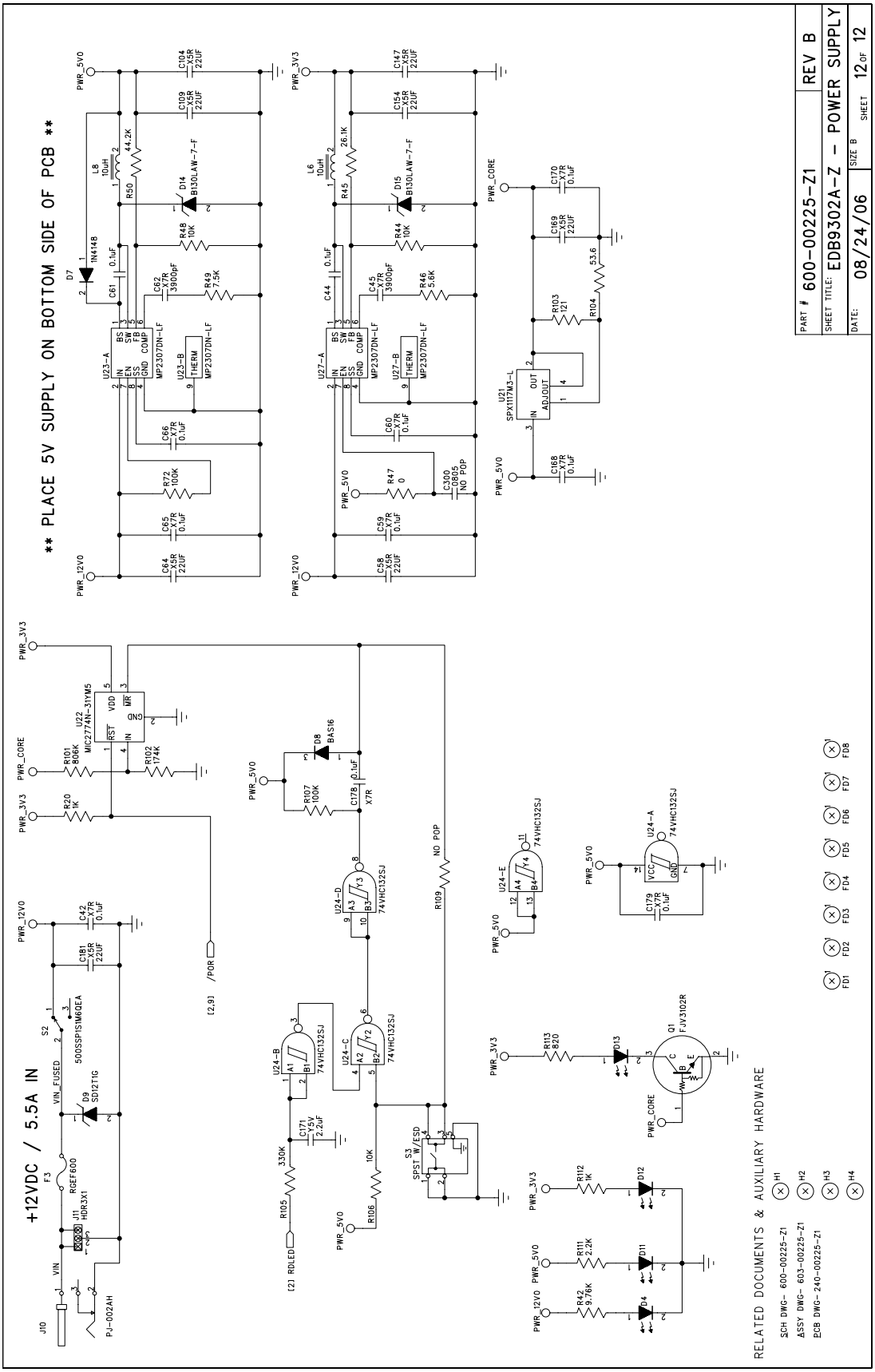

Figure 15. Schematic Page 12 - Power Supply

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Appendix B. Programming Linux Images into Flash from a Windows® PC

For those people who want to program Linux images onto the board but do not have a Linux PC.

Materials and Equipment Needed

A. +12V, 5 amp power supply, provided with kit

B. Computer

- Must be running Windows® 2000 or Windows® XP with SP2 installed on a Pentium® III or better with at least 256M RAM.
- Must have at least one (1) serial port with DB9 connector.
- Must have at least one (1) Ethernet 10/100 port with RJ45 connector.
- Must have HyperTerminal software (comes with Windows 2000/XP).
- Must be able to connect to the Internet and download files from web site.
- Monitor, keyboard and mouse.

C. Cables

- One DB9 Null Model cable with female to female connectors, provided with kit
- One Ethernet cross-over cable, not provided with kit

D. Software

Linux images are provided by Cirrus Logic. The Linux files are on the http://arm.cirrus.com website. Click on the download link at the top of the page.

The files are in various directories and depend on the kernel version, build revision and board type you need.

http://arm.cirrus.com/files/linux/releases/linux-2.6 has the image files:

redboot.bin, *zImage* and *ramdisk.gz*

Look for the version you are interested in and download the pre-built images.

Go to http://arm.cirrus.com/files/tools to get the Windows download utility called, *download.zip*.

E. PC Software

- TFTP software

Note: The instructions and screen shots in this Appendix make reference to the SolarWinds 6.0 TFTP server program. This program is not provided by Cirrus Logic. Other TFTP server programs may work equally well but will need to be verified by the developer.

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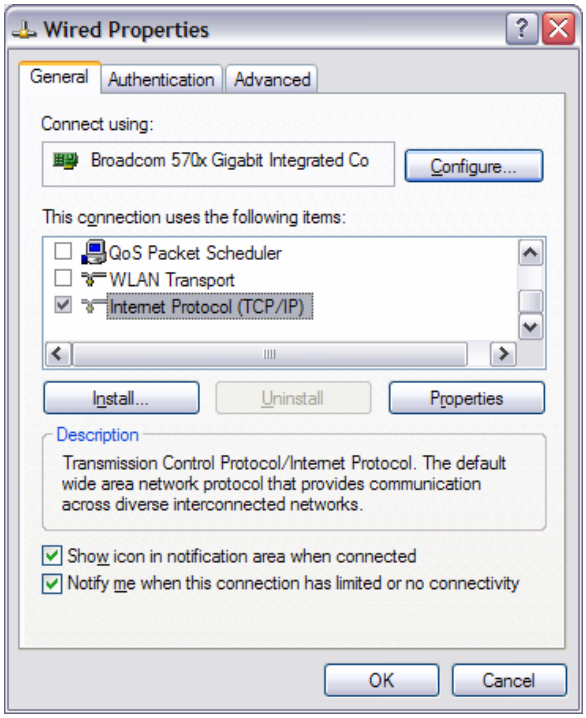
Downloading Files

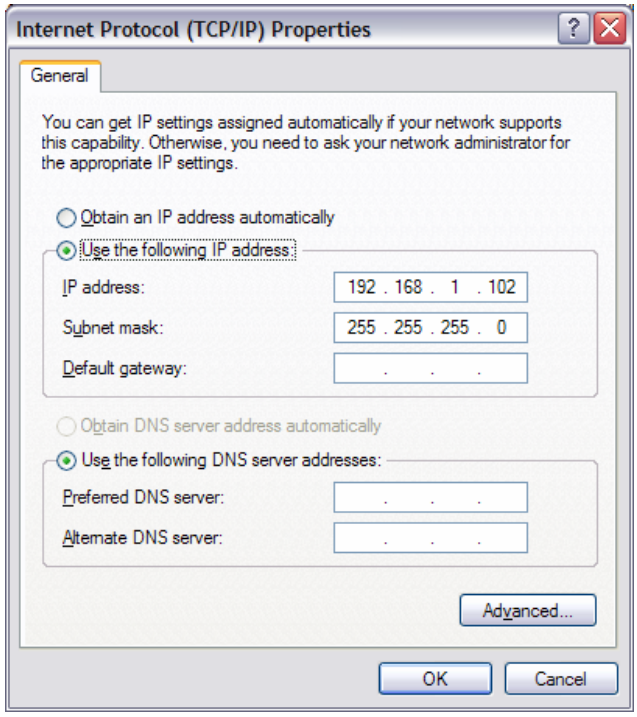
1. Make a directory called "TFTPROOT" on C:\
2. Use a computer that has an Internet connection and download the files specified in "D. Software" to the directory made in step 1.
3. Disconnect the Ethernet cable if using Wired Ethernet. Plug in the Ethernet cross-over cable into the computer's Ethernet port.

Windows PC Ethernet Setup

1. Go to *Control Panel*, click on *Network Connections*. Click on the Ethernet port icon representing the RJ45 port on the computer. In the scroll box, go to the end and double click on the item called *Internet Protocol (TCP/IP)*.
2. Under the *General* tab, enable *Use the following IP address* and configure per the picture below. When done, click on *OK* and then *OK* again for changes to take effect.

Note: The IP address can be any address you chose, just make sure it matches the IP address you use in the fconfig step below.





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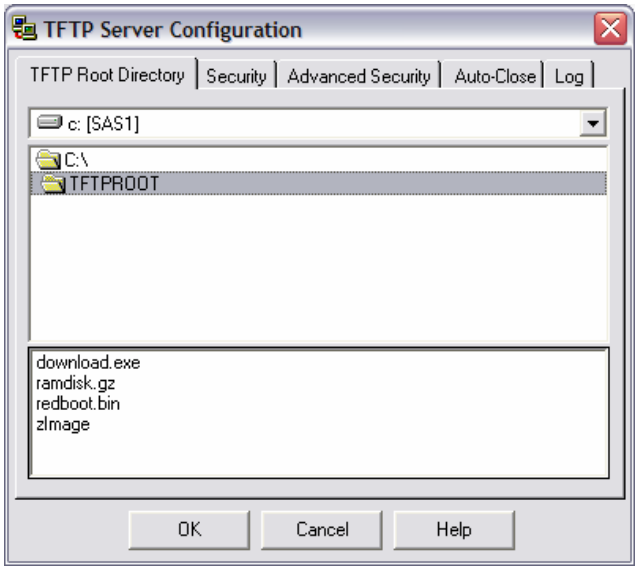
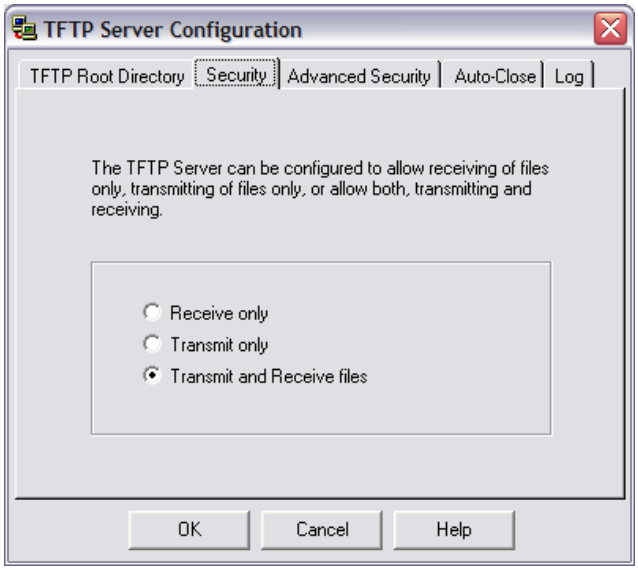
TFTP Server Setup (Setup may vary depending on TFTP server used)

1. Install the TFTP Server program on the Windows PC and select the default configuration.
2. You may have to disable the firewall if using Windows XP.

3. Once the program is installed, run the TFTP Server program.
4. Configure the TFTP Root directory to point to *C:\TFTPROOT*.
5. Select the Security Tab and make sure the Client access is *Transmit and Receive files*. See the pictures below.





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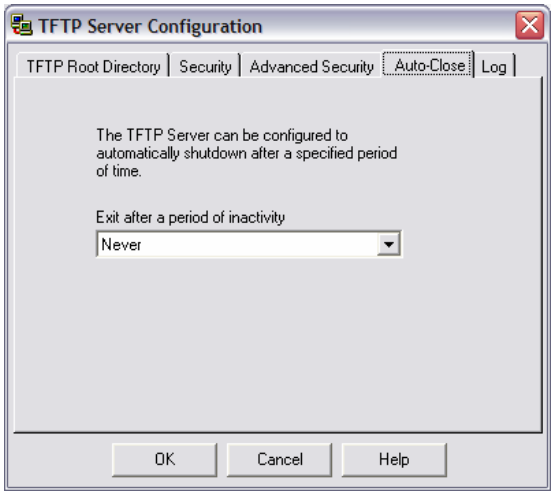
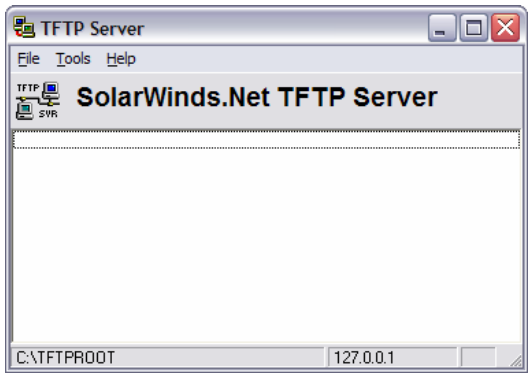
6. Verify that the Auto-Close setting is set to "Never".



7. When complete, click the OK button. You should see a screen like the picture below. Note that the directory is located in the status bar at the bottom left. Additionally, the IP address the TFTP Server is "listening" to is located in the lower right.



Note: Note: You may get an IP address of 127.0.0.1 because the EDB9302A board does not have the boot loader code programmed yet. This is ok. Simply quit the TFTP server program. Instructions on when to start the program will be given during the board programming section. If an IP address other then the one above appears, the Ethernet port is connected to something and should be removed.

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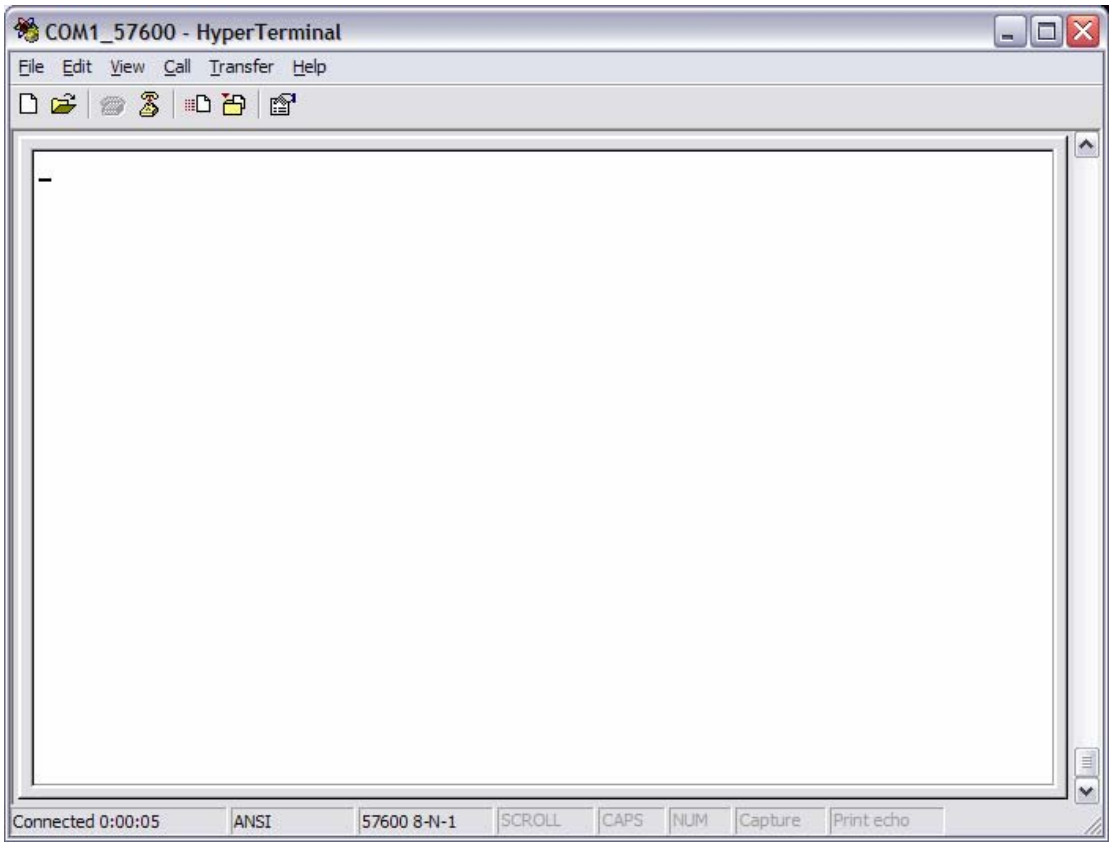
HyperTerminal Setup

Run the HyperTerminal program and configure to use COM1 and to run at 57600 baud, 8 data bits, no parity, one (1) stop bit (8-N-1) and NO hardware control flow. It should look like the picture below when complete. Note you have to "Disconnect" in order to make configuration changes. Click "Call" once the configuration is complete.



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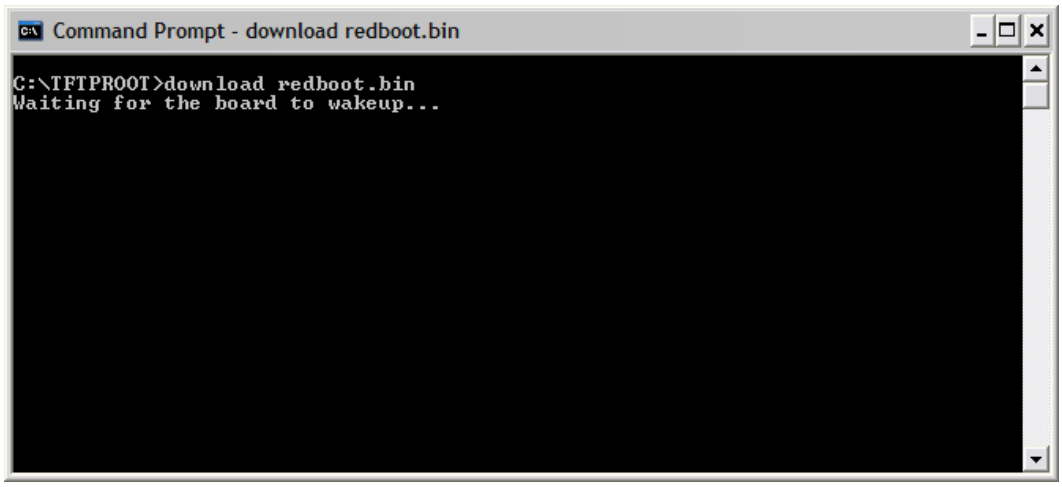
Board Programming Setup

1. At this point, the RJ45 Ethernet port on the Windows PC is configured, HyperTerminal is running, the TFTP server is running, the Cirrus Logic software has been downloaded to the C:\TFTPROOT directory and the board is powered up.
2. Connect one end of the Null Modem cable to J2.
3. Connect the other end of the Null Modem cable to the COM1 port on the Windows 2000/XP computer.
4. Connect the other end of the Ethernet cross-over cable to J3. A green LED in the J3 Ethernet connector should light up.
5. Open a "Command Prompt" window so DOS commands can be issued.
6. Go to the C:\TFTPROOT directory by typing "cd\tftproot"
7. Click the "Disconnect" button in HyperTerminal to disable serial communication. HyperTerminal has to be disconnected whenever the download.exe program is executed.

Programming Software into the Board

1. From the Command Prompt, type the following command: *download redboot.bin*.



2. At this point, the download program is waiting for the user to press AND hold down pushbutton S1 *SERIAL BOOT*. While holding down S1, press and release pushbutton S3 */POR*. Keep holding down S1 until red LED, D2 (next to the flashing green LED) is no longer illuminated. Afterwards, release S1. You should then see the following in the Command Prompt window.

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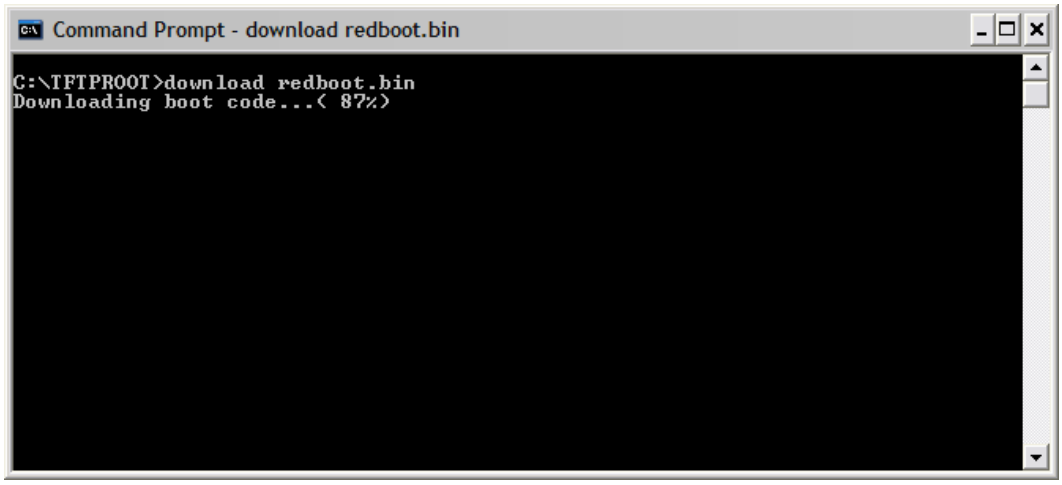
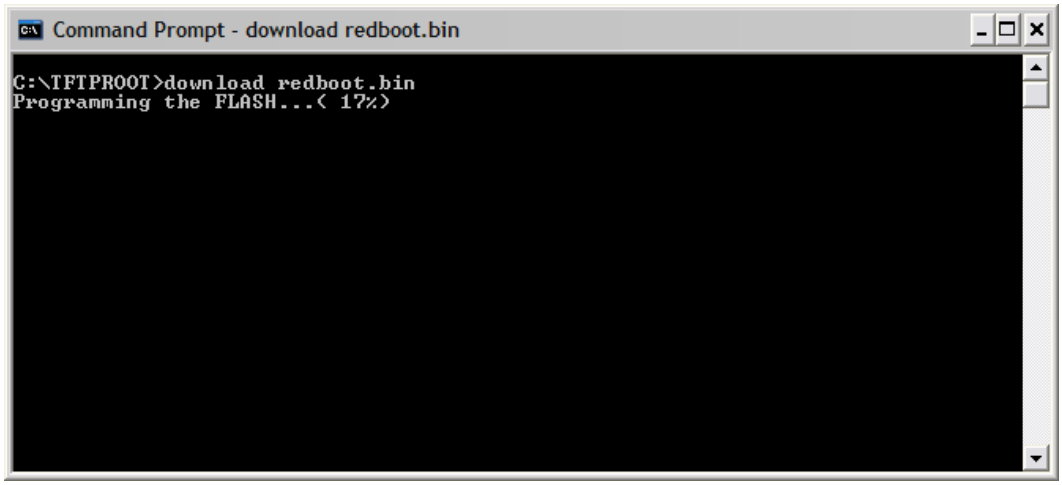
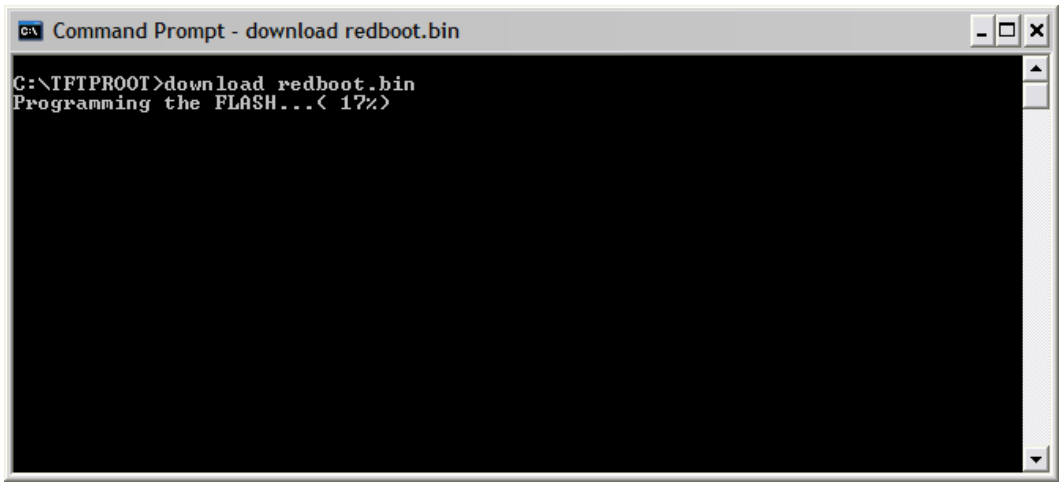


***download.exe* Downloading the Code**



***download.exe* Erasing then Programming the Flash Memory**



download.exe* Successfully Programming *redboot.bin

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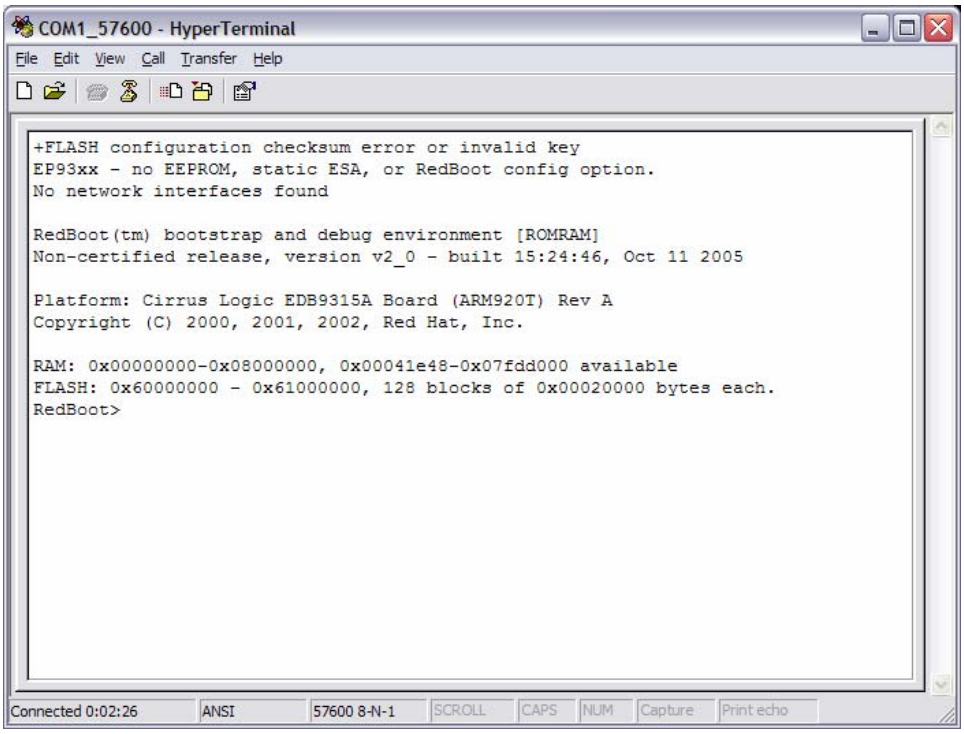
3. Redboot.bin has been programmed into Flash memory. Go to HyperTerminal and re-establish serial communication to the board by pressing the *Call* button.
4. Press and release pushbutton S3, */POR*. The board will reboot and eventually display information in the HyperTerminal window.



Note: The initial error about configuration checksum error is expected for a brand new board or a board where the Flash device has been completely erased. This happens because the Flash memory has not been initialized for redboot yet.

Note: Linux is case sensitive, pay close attention to the commands that follow.

Note: Steps 5-9 are for new boards only or when putting Linux on the board for the first time or for boards where the Flash device has been completely erased. If you have already configured the board, proceed to step 10.

5. Initialize Flash memory by typing "fis init -f" at the RedBoot> prompt.
6. The next step is to configure the board so it can communicate via Ethernet. Type "fconfig" in the HyperTerminal window and set all parameters like the picture below.

Note: You may have to hit the Backspace key to change some parameters and then type in the new parameter.

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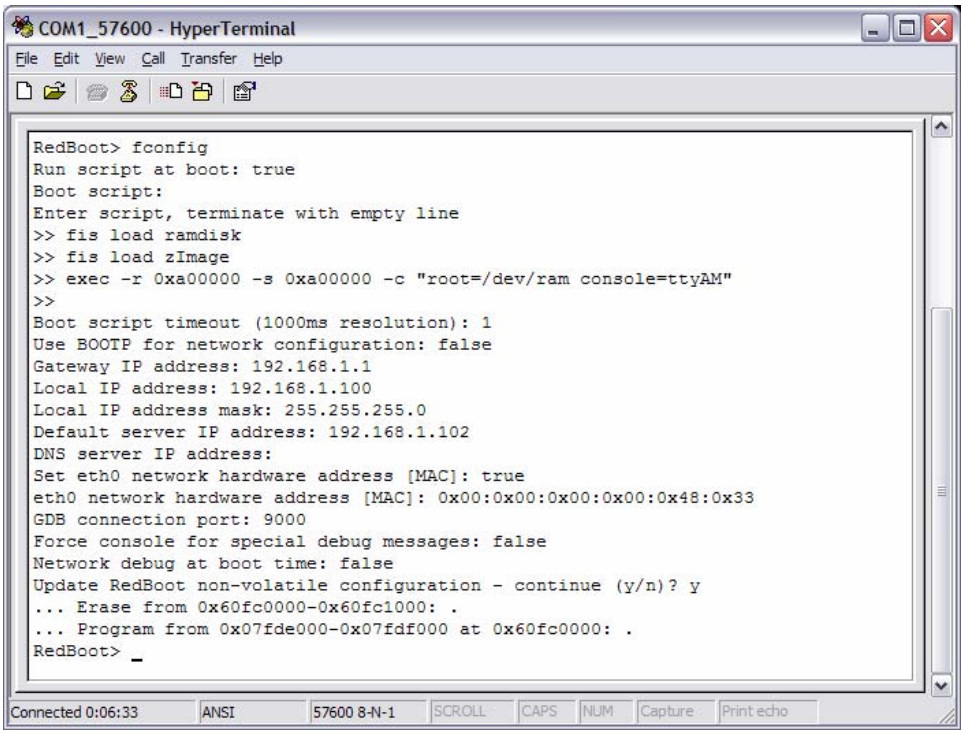
7. The MAC address label on the top of the board has a hexadecimal number on it. It has the following format: AB1234567890. When programming the MAC address, use the following format: 0xAB:0x12:0x34:0x56:0x78:0x90. This is an example MAC address.



8. Remember, assign a unique MAC address to each board.
9. Press and release pushbutton S3 "/POR" for the changes to take effect. You should see the following.

Note: It will say "No image 'image_name' found". That is ok for now. We have not downloaded and programmed those images into Flash yet

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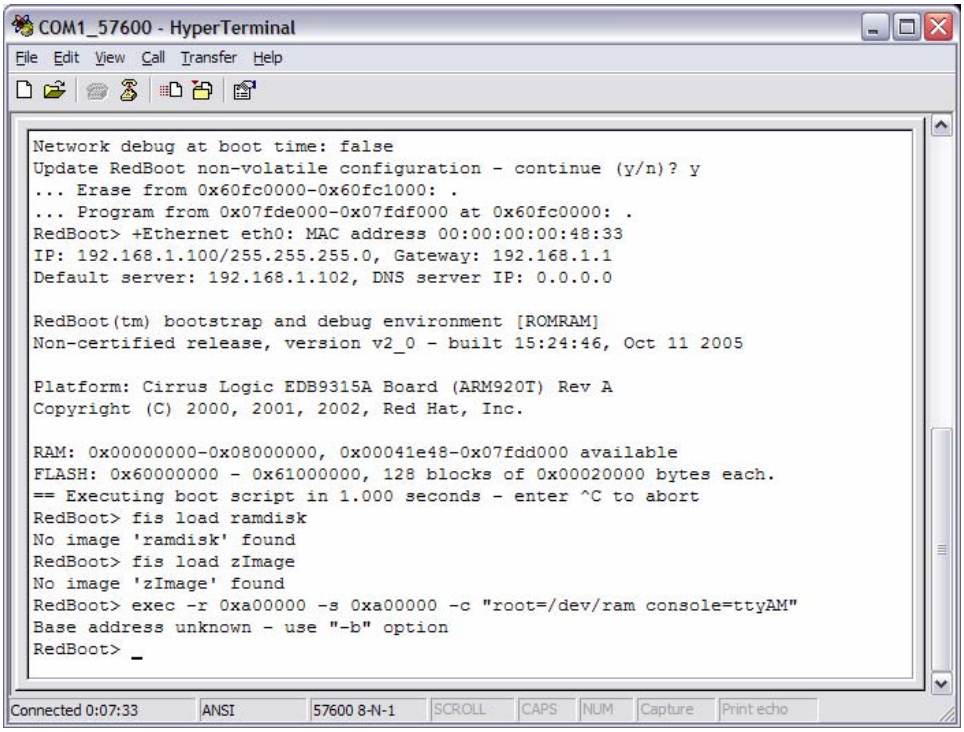

10. Execute the following command: *load -v -r -b 0xa00000 ramdisk.gz*
11. You will see a spinning character in the bottom left hand side of the window. Wait until the *RedBoot>* prompt returns.
12. Next type: *fis create -b 0xa00000 -l 0xa00000 ramdisk*
13. This command will program the *ramdisk.gz* file into a Flash partition called *ramdisk*. Wait until the *RedBoot>* prompt returns.
14. Execute the following command: *load -v -r -b 0x80000 zImage*
15. You will see a spinning character in the bottom left hand side of the window. Wait until the *RedBoot>* prompt returns.
16. Next type: *fis create -b 0x80000 -l 0x140000 zImage*
17. This command will program the *zImage* file into a Flash partition called *zImage*. Wait until the *RedBoot>* prompt returns.
18. The software has now been programmed into Flash.

Note: The image sizes may increase as new features are added. In that case, some of the values in the load and fis create commands may change. The size can be determined from the reported status after the load. Simply subtract the end address from the start address. It is acceptable to make the partition larger than the exact image file size.

Once the board has been programmed, reset the board and wait for it to boot up. You will see boot information in the HyperTerminal window.

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Revision History

Revision	Date	Changes
DB1	OCT 2006	First release.

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For all product questions and inquiries contact a Cirrus Logic Sales Representative.
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