

AMCC PowerPC 460EX 开发方案

关键词: PowerPC, 嵌入式系统, Linux, DDR2, PCI-Express, GbE, 千兆以太网,

摘要: AMCC 公司的低成本 PowerPC 460EX 评估套件适用于高性能的 PowerPC 460EX 和 460GT 处理器,它采用 Linux 操作系统,为用户评估处理器和软件开发提供了容易使用的平台. 本文介绍了 PowerPC 460EX 的主要特性和方框图,以及 PowerPC 460EX 评估套件的主要特性和亮点,方框图以及详细的电路图.

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AMCC Introduces Low-Cost Evaluation Kits for High-Performance PowerPC 460EX and 460GT Processors

The PowerPC 440 Core

To enhance overall throughput, the PowerPC 440 superscalar core incorporates a 7-stage pipeline and executes up to two instructions per cycle. Its large 32-KB data cache and 32-KB instruction cache are 64-way setassociative. Versatile configurations enhance performance tuning while optional parity protection preserves data integrity. For additional system performance, the PowerPC 440 core includes dynamic branch prediction and 24 multiply accumulate instructions (MAC) that can be used for signal processing or other numerical tasks, as well as non-blocking caches that can be managed in either writethrough or write-back mode.

High Performance FPU

In addition to its powerful 440 core, the PowerPC 460EX includes a high-performance FPU. This superscalar FPU supports both single and double precision operations, and offers single cycle throughput on most instructions. The result is exceptional performance in imaging and other calculation intensive applications.

Turbo Security (Optional)

The PPC460EX delivers advanced security capabilities with the optional Turbo Security Engine. This security engine attaches directly to the PLB4 bus for the fastest possible throughput between the PPC460 processor, memory, and the security engine itself. The Turbo Security engines supports DES, 3DES, AES, ARC-4 encryption, MD-5, SHA-1 and SHA-256 hashing. The security engine includes a pseudo random number generator as well as header and trailer protocol processor. The header/trailer protocol processor eliminate any need for security processing by the PPC460 processor, freeing it to handle applicationbased operations, while improving overall security performance. The engine incorporates an on-chip true random number generator and a public key accelerator. The algorithms are compliant with FIPS-140-2 and ANSI X9.17 Annex C.

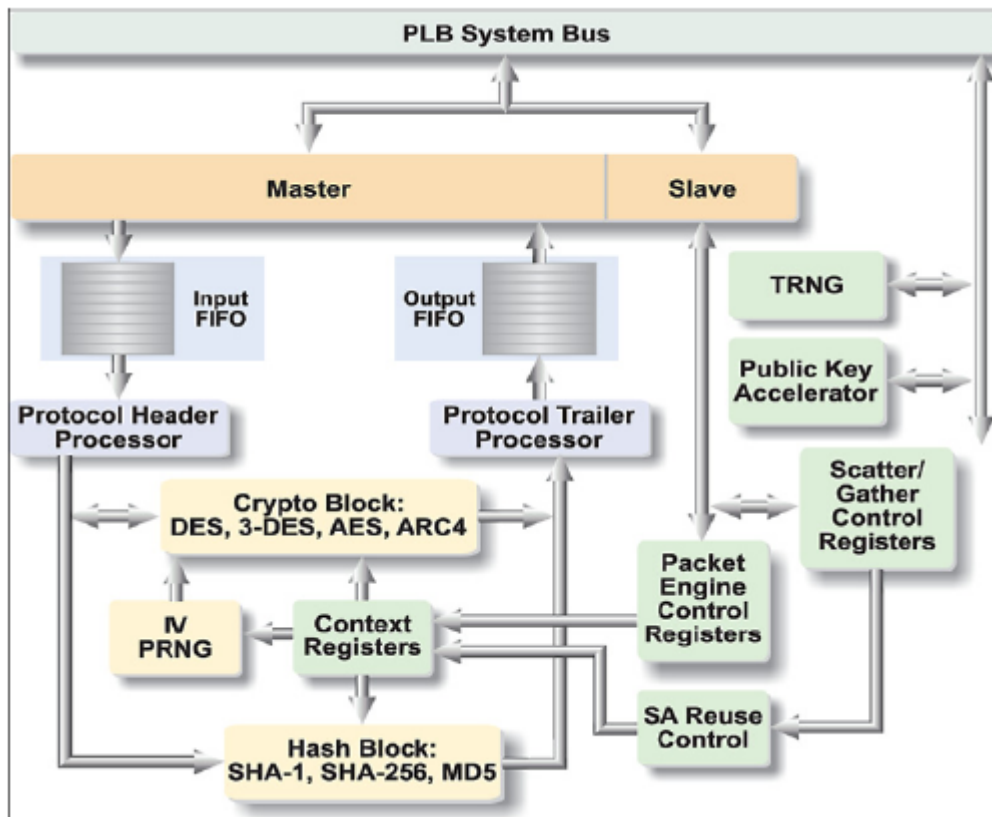


图1.Turbo安全引擎方框图

High-Bandwidth Bus Architecture

The PowerPC 460EX 128-bit processor local bus (PLB) provides a two-way crossbar, with a separate 128-bit read and 128-bit write data bus for each way. The four 128-bit data buses may operate concurrently, providing up to 12.8 GBs/s of peak on-chip bandwidth at 200 MHz. The SDRAM controller attaches to both PLB slave segments to provide optimal access to memory from any other peripheral/core.

Lower bandwidth I/O devices are supported by the onchip peripheral bus (OPB).

Extensive Memory Support

An on-chip double data rate 1/2 (DDR1/2) SDRAM controller provides a 32/64-bit memory interface with optional error checking and correcting (ECC). It supports four memory banks of up to 4 GBs each, for a maximum capacity of 16 GBs. An integrated NAND Flash controller allows up to four banks of Flash memory devices to be connected to the processor's external peripheral bus. The Flash controller supports device densities up to 256 Mbytes. It can also interface to an optional SmartMedia card interface. These devices can be accessed much like diskette drives, with available boot capability.

On-Chip Memory

The PowerPC 460EX offers 64 KB of on-chip memory.

PCI Express and PCI Interfaces

The 460EX offers two independent PCI-Express interfaces compliant with PCI-Express base specification 1.1. One interface has four lanes and supports x4 or x1 configurations. The other interface has one lane. Both interfaces can be configured as root or end point ports. In addition, the 460EX offers a 32-bit PCI V2.2 interface and supports frequencies

of up to 66 MHz. Multiple read prefetch and write post buffers enhance throughput, while the ability to boot the processor from PCI bus memory increases functionality.

SATA

The 440EX offers an on-chip one port SATA controller. Fully compliant with Serial ATA II specifications, the SATA controller supports both 1.5Gb/s and 3.0 Gb/s.

Dual Ethernets with QoS and TCP/IP Acceleration Hardware For extensive connectivity options, the 460EX offers two integrated 10/100/1000 Ethernet ports with TCP/IP Acceleration Hardware, QoS and Jumbo Frame support.

Supports GMII/MII, TBI, RTBI, RGMII, SGMII and SMII interfaces.

USB Interface

The 460EX includes USB 2.0 host and OTG controllers able to operate at 1.5, 12 and 480Mbps.

External Bus Interface

To accommodate connectivity with other devices, the PowerPC 460EX offers a 32-bit bus supporting up to six ROM, RAM or slave peripheral I/O devices and speeds up to 100 MHz. The 4-Channel DMA is also supported.

The PowerPC 460EX offers support for up to 64 general-purpose I/O (GPIO) and two IIC controllers. A serial peripheral interface (SPI), also referred to as a serial communications port (SCP), allows full-duplex, synchronous data exchanges with other serial devices. The 460EX also supports up to four UARTs in a variety of configurations. A JTAG interface is provided for debugging purposes.

PowerPC Partners Ecosystem

AMCC's embedded PowerPC processors are supported by an extensive ecosystem of products and services from a wide range of leading suppliers.

AMCC's PowerPC Partners program includes industry standard providers of:

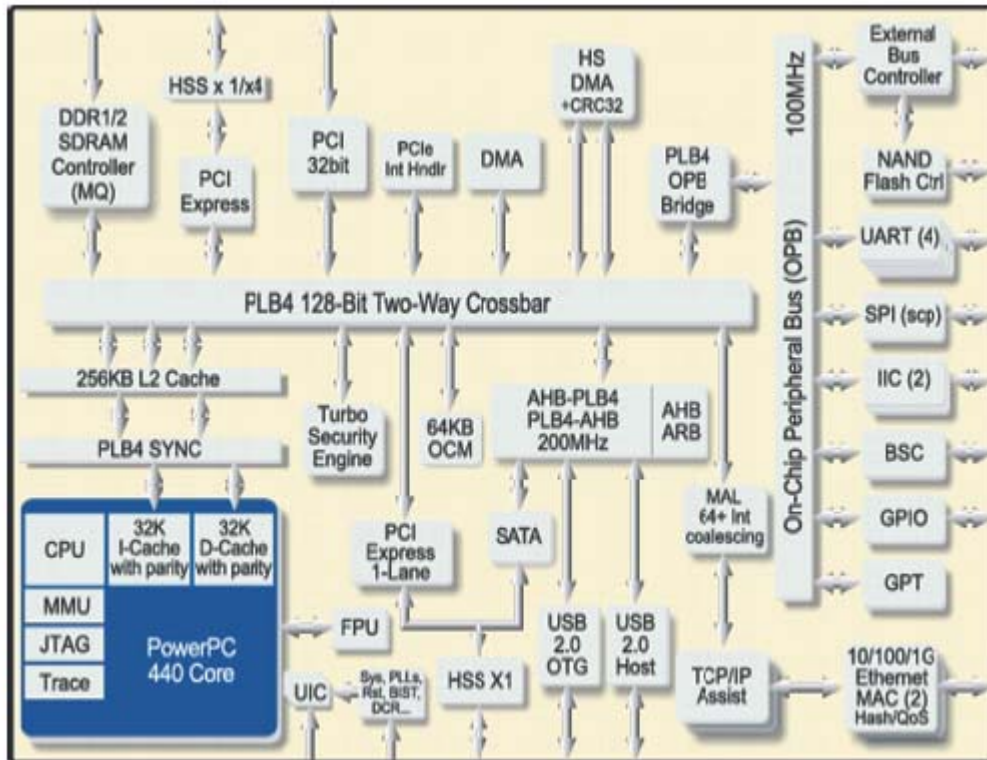
- Embedded operating systems
- Hardware and software development tools
- Embedded software products and services
- Board-level products
- System design services
- Technical training.

AMCC also provides an evaluation kit for this PowerPC processor, including an optimized evaluation board as well as sample applications and other software.

PowerPC 460EX 主要特性:

- CPU Speed (frequency): 600 MHz to 1.2GHz
- Performance: 2.0 DMIPS/MHz (2,400 DMIPS @ 1.2 GHz peak)
- 32-KB-I/32-KB-D L1 caches, and 256-KB L2/SRAM with parity protection
- 64KB On Chip Memory
- On-chip double data rate 1/2 (DDR1/2) SDRAM controller with 32/64-bit interface
 - Support for four banks of DDR SDRAM memory of up to 4 GB each, maximum capacity of 16 GBs with CAS latencies of 2, 3, 4, 5, 6, and 7
- Two PCI-Express interfaces, one with four lanes and one with one lane; 2.5-Gbit/s full duplex per lane; compliant with PCI-Express base specification 1.1; configurable as root or end point

- 32-bit PCI V2.2, 3.3-V interface supporting frequencies of up to 66 MHz
- One port SATA controller operating at up to 3.0Gb/s. Compliant with Serial ATA II specifications
- 5-stage FPU with 2.0 MFLOPS/MHz (SP/DP); hardware support for IEEE 754; single-precision and double-precision operation with thirty-two 64-bit floating-point registers
- On-chip IPsec/SSL acceleration (optional)
- NAND Flash controller. Supports one to four banks of NAND Flash memory devices; direct interfacing to discrete NAND Flash devices (up to four devices) and Smart-Media Card socket (22-pins); 4-Mbyte - 256-Mbyte devices sizes supported; 512-byte +16-byte or 2-KB +64-byte device page sizes supported; DMA support allows direct, no processor-intervention block copy from NAND Flash out to SDRAM; boot-from-NAND supported
- 4-channel DMA - available for internal and external use
 - Support for memory-to-memory, peripheral-to-memory, and memory-to-peripheral transfers
 - Scatter/gather capability
- 1-channel high performance DMA for internal use
- USB 2.0 OTG controller and USB 2.0 Host controller operating at 1.5Mbps, 12 Mbps and 480Mbps
- (2) Ethernet 10/100/1000-Mbit/s, full-duplex MACs with TCP/IP Acceleration Hardware, QoS, and Jumbo Frame support, supporting GMII/MII, TBI, RTBI, RGMII, SGMII, SMII interfaces. Memory access layer (MAL) provides DMA capability to both Ethernet channels
- Up to 100 MHz, 27-bit address bus, 32-bit data bus external bus control (EBC) interface
 - Support for up to 6 ROM, RAM, or slave peripheral I/O devices
- Up to four UARTs (1x 8-pin, or 2x 4-pin, or 4x 2-pin, or 1x4-pin and 2x 2-pin)
- Two IIC (with one integrated boot strap controller)
- One SPI serial interface
- Programmable interrupt controller with 16 external inputs, 48 internal inputs
- Programmable timers
- General-purpose I/O (64)
- Support for JTAG board testing, JTAG debuggers, and 4xx instruction trace interface
- RoHS compliant (lead-free) version available



详情请见:

https://www.amcc.com/MyAMCC/retrieveDocument/PowerPC/460EX/PPC460EX_PB2027.pdf

PowerPC 460EX 评估套件

The AMCC Canyonlands evaluation kit provides users with a comprehensive set of resources to evaluate the 460EX processor as well as to start system development.

The Canyonlands evaluation board, incorporating the industrystandard Linux operating system and U-Boot firmware, is an optimized, low-cost platform designed specifically for evaluation purposes.

Schematics and layout files for the board are provided so that customers can start their designs from a proven baseline. Likewise, the Linux code and U-Boot firmware source are available to accelerate customers' software development.

The kit includes advanced software development tools from multiple suppliers, to assist customers in selecting the most appropriate development and run-time environments.

Canyonlands Board

The Canyonlands board, with an approximately 7" x 7" form factor, is a custom-designed platform developed by Embedded Planet for evaluating the 460EX processor:

- 1.0 GHz AMCC 460EX processor
- 256 MB DDR2 SDRAM
- 64 MB NOR Flash
- 32 MB NAND Flash
- Two 10/100/1G Ethernet ports
- One USB 2.0 host port
- One USB 2.0 OTG port
- Two PCI Express connectors

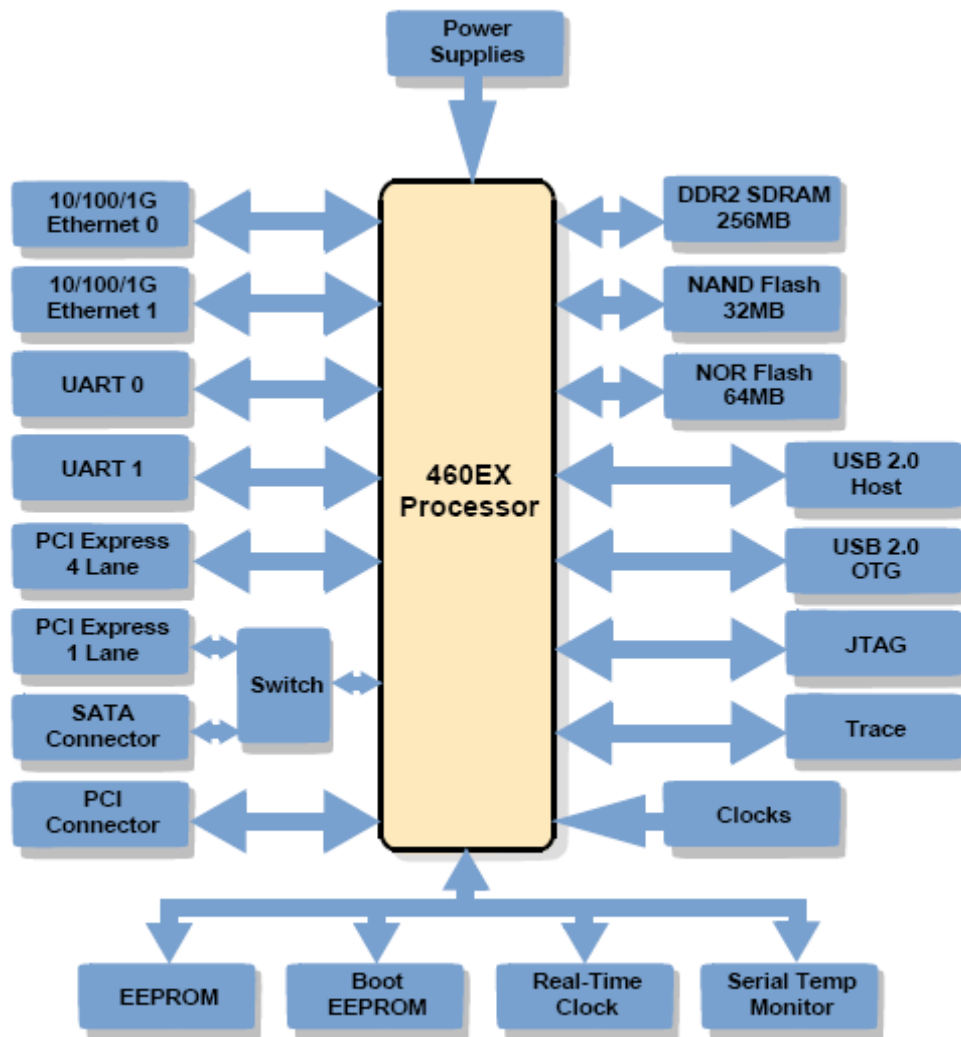
- One PCI host connector
- One SATA connector
- Two serial ports
- JTAG and trace connectors
- SPI connector
- Real-time clock
- Linux (2.6 kernel) and file system in Flash
- U-Boot boot firmware in Flash.

PowerPC 460EX 评估套件主要亮点:

- Comprehensive, easy-to-use evaluation kit designed for customer setup in 15 minutes or less
- Resource CD with system-level benchmarks and sample applications
- Industry-standard U-Boot firmware, Linux operating system and Linux software development tools
- Board schematics, layout files, U-Boot source and Linux source available from AMCC Web site
- Software development tools CDs from multiple industry-leading suppliers
- Serial cable provides direct connection to the host system for initial configuration
- Ethernet crossover cable provides direct connection to the host system for downloading and running applications
- Remote connection via a router or the Internet is also supported
- On-board JTAG connector enables connection of any compatible external JTAG probe for run-control debugging
- Universal 120-240 V power adapter supports operation worldwide
- Comprehensive processor, board and software documentation on the Resource CD.



图 2. PowerPC 460EX 评估套件外形图



Canyonlands Block Diagram

图 3. PowerPC 460EX 评估板方框图

Sample Applications and Utilities

The Resource CD provides a wide range of sample applications as a starting point for software development, and utilities to assist in system configuration:

- Web server on evaluation board
- Telnet server on evaluation board
- FTP server on evaluation board
- Web slots game on evaluation board
- Processor / board configuration report
- Ethernet utility to configure IP address, MAC address, and modify EMAC registers
- Example flash file system for persistent storage Script-based Linux root file system build environment.

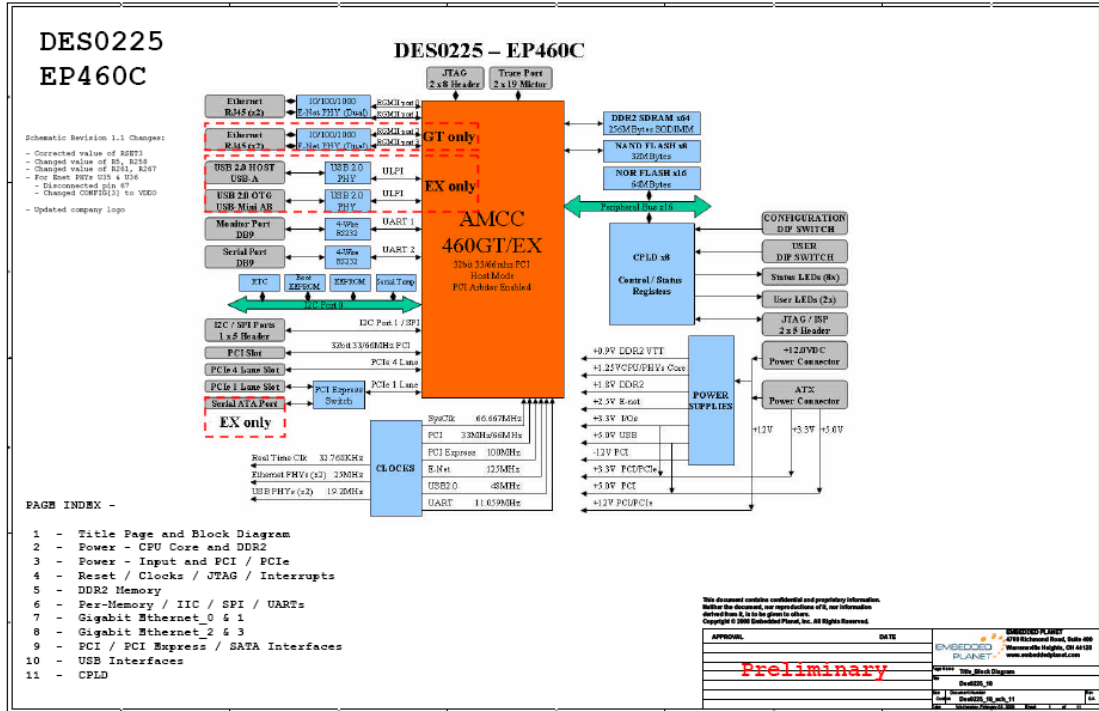


图 4. PowerPC 460EX 评估板电路图(1)

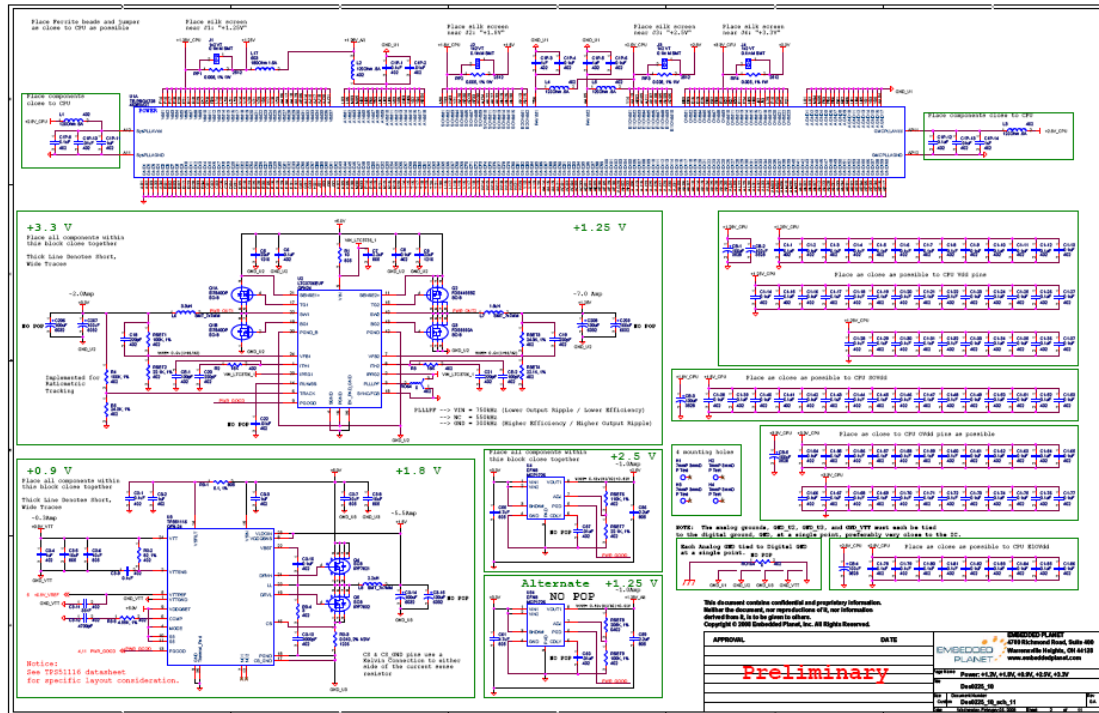


图 5. PowerPC 460EX 评估板电路图(2)

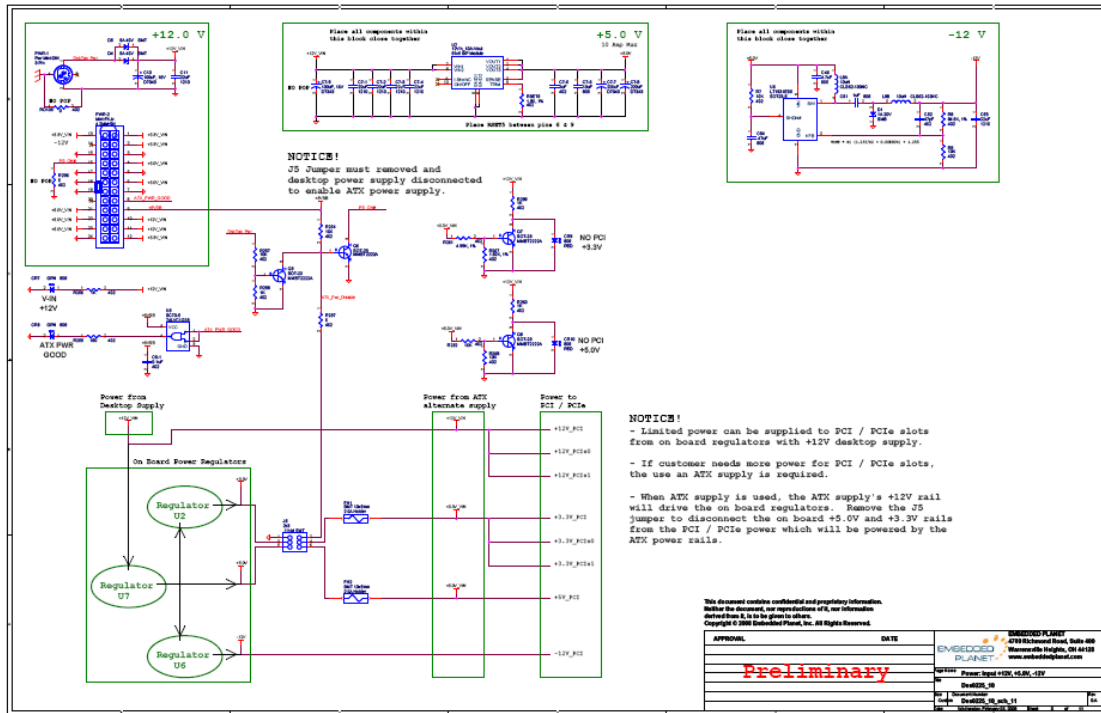


图 6. PowerPC 460EX 评估板电路图(3)

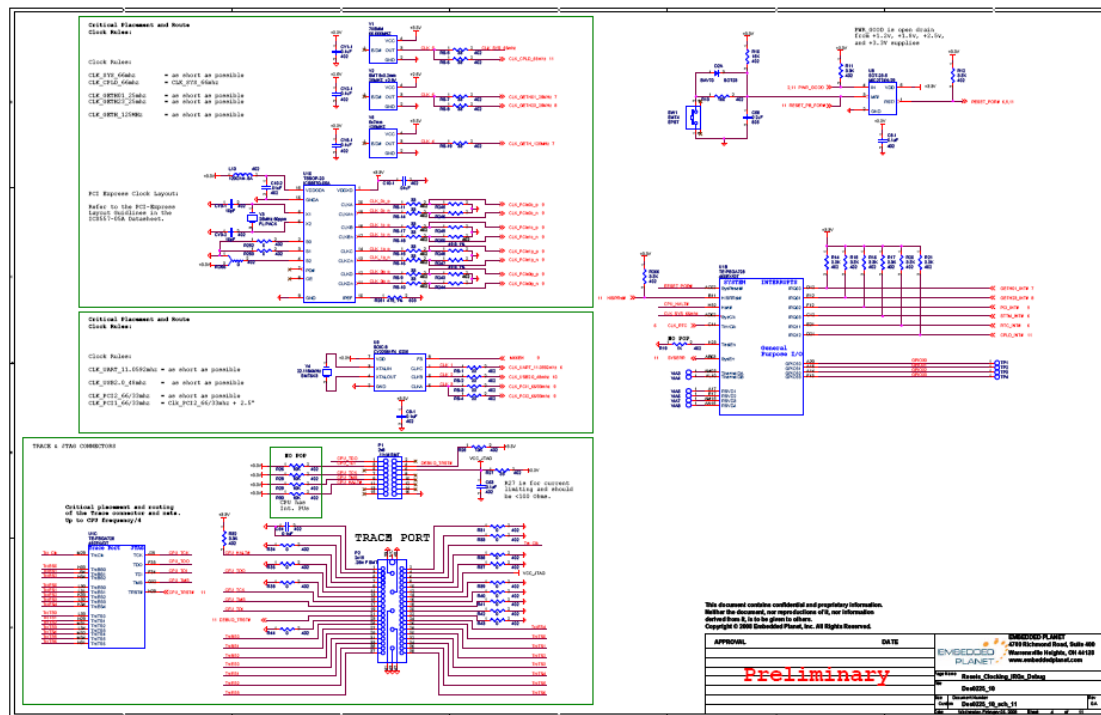


图 7. PowerPC 460EX 评估板电路图(4)

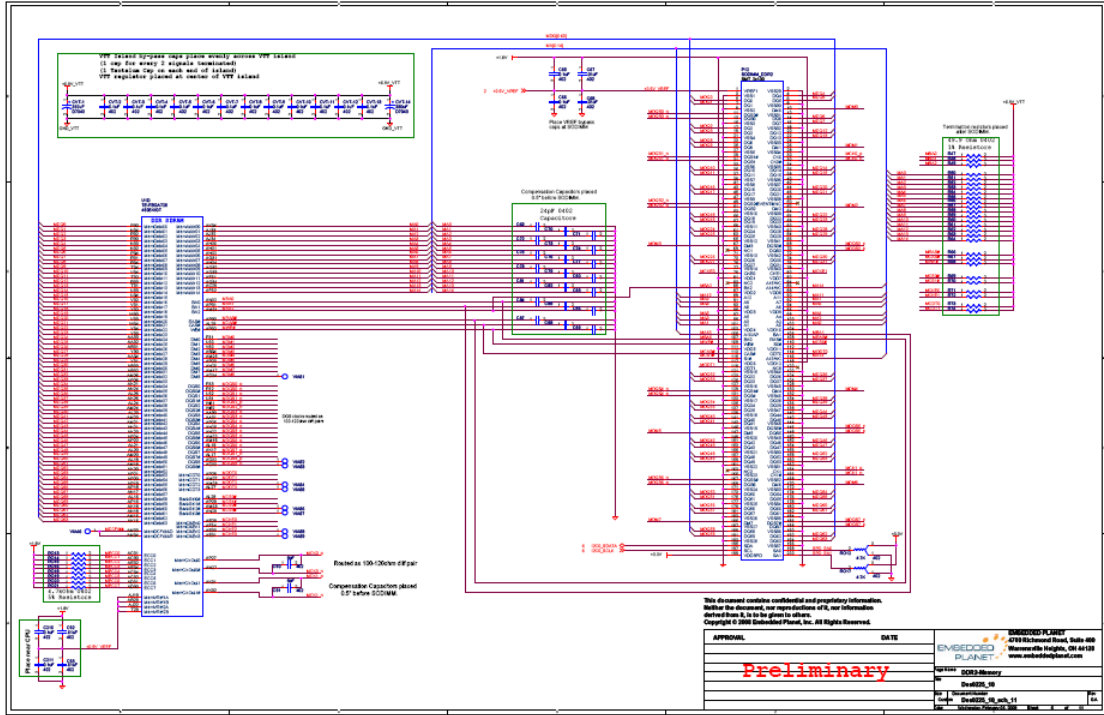


图 8. PowerPC 460EX 评估板电路图(5)

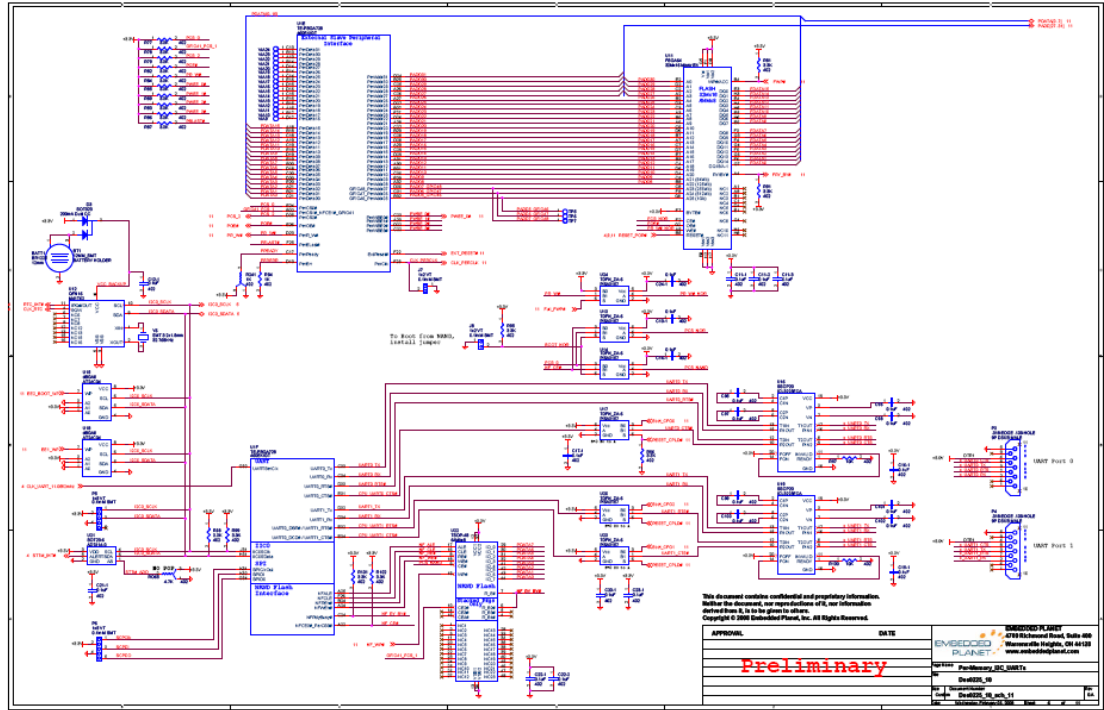


图 9. PowerPC 460EX 评估板电路图(6)

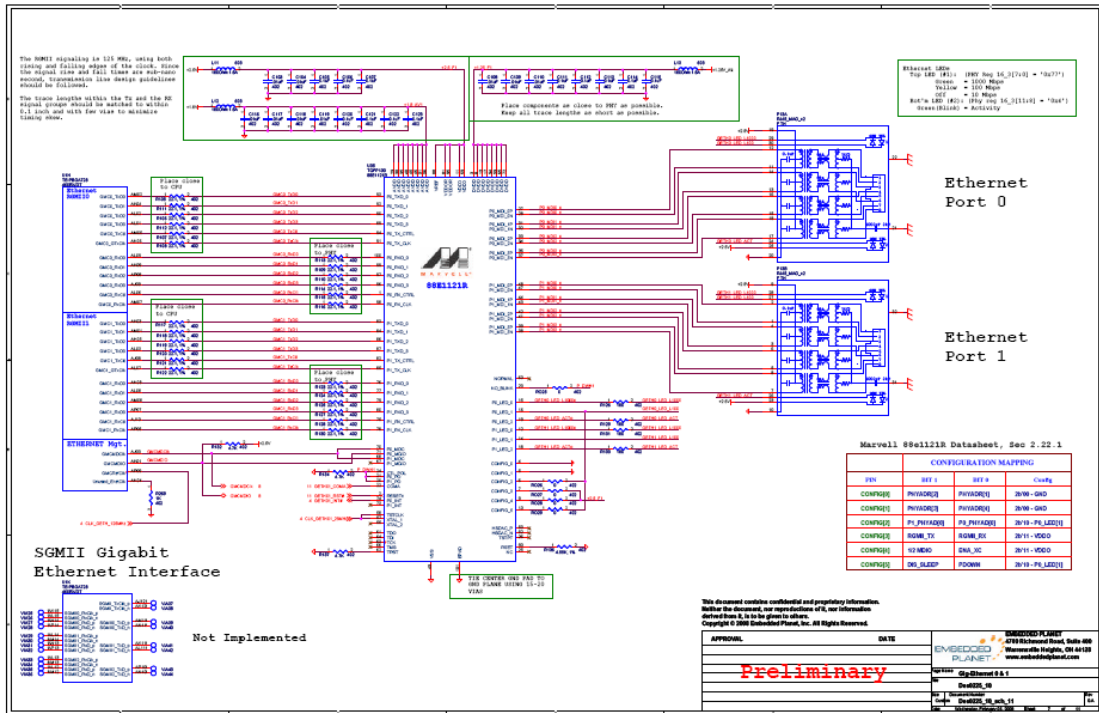


图 10. PowerPC 460EX 评估板电路图(7)

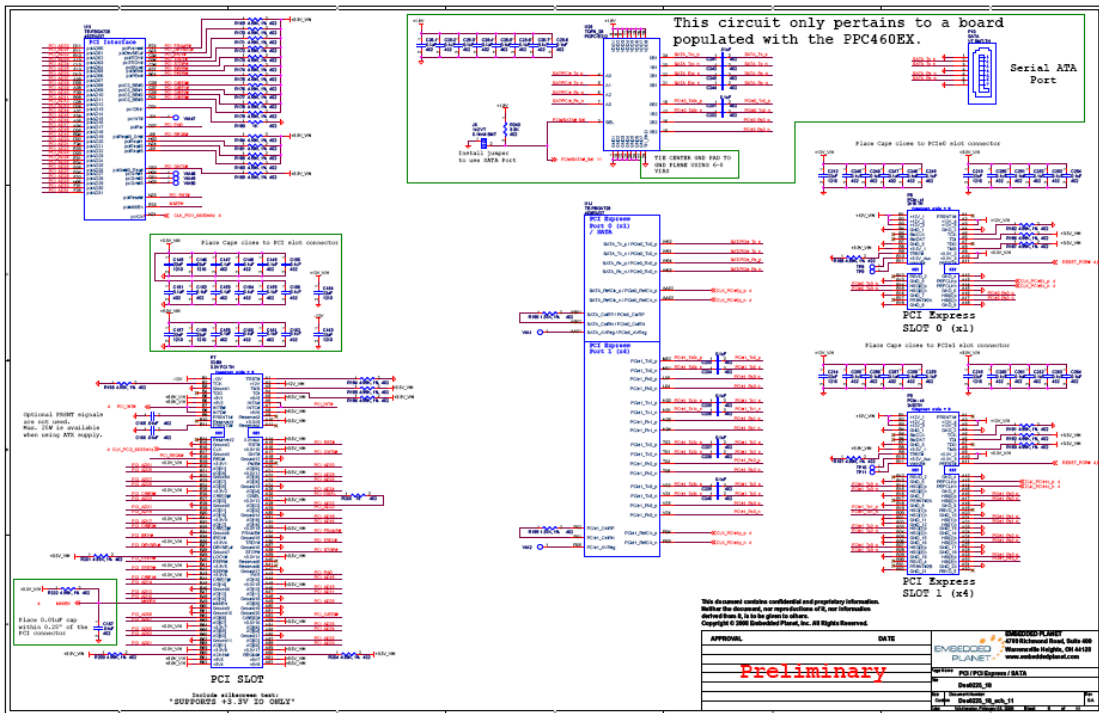


图 11. PowerPC 460EX 评估板电路图(8)

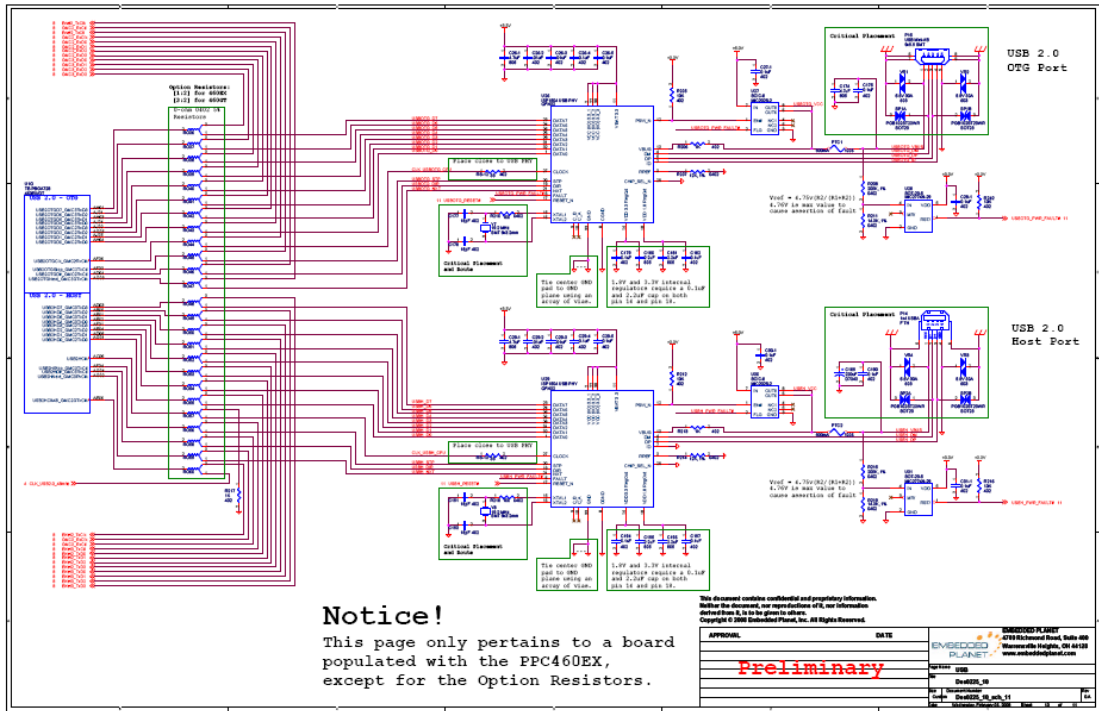


图 12. PowerPC 460EX 评估板电路图(9)

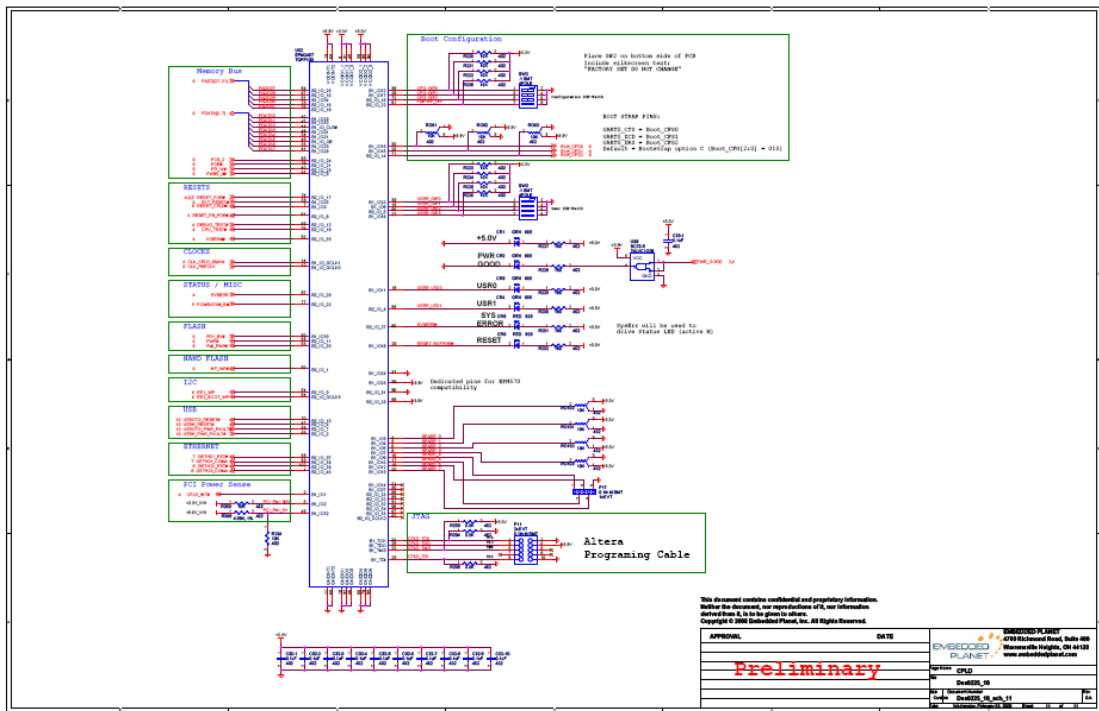


图 13. PowerPC 460EX 评估板电路图(10)