



SA-110 /21285

DIGITAL Semiconductor SA-110/21285 Evaluation Board Product Brief

DIGITAL Semiconductor's SA-110/21285 Evaluation Board (EBSA-285) provides a flexible hardware environment to help manufacturers incorporate the SA-110 microprocessor and 21285 core logic chip into their products quickly. This hardware expedites the development of applications that require an SDRAM memory subsystem, PCI I/O, and high integration in a low-cost design.

Applications

- Designing software and hardware prototypes
- Porting operating systems and applications
- Verifying hardware design
- Running ARM V4 architecture-compliant software test suites
- Running software benchmarks
- Building PCI-based systems that incorporate one or more SA-110 microprocessors

Benefits

- This hardware helps OEMs and third-party software application providers deliver leadership StrongARM based products easily and quickly.
- This hardware reduces time and effort by the developer to:
 - Generate and benchmark code
 - Simulate processors and memory
 - Download code to target hardware
 - Debug efficiently and rapidly
- The hardware developer's kit expedites the development of successful customer products by providing detailed, royalty-free application examples.
- The evaluation board enables software testing prior to hardware system availability.

Description

The EBSA-285 contains processor, system controller, memory, input/output devices, and a passive backplane (EBSA-BPL). There are a number of header blocks on the card that accept two-pin jumpers. This allows the card to be configured in one of two distinct ways so that all of the major features of the 21285 can be used. The mounting bracket of the EBSA-285 holds a female nine-way D-type connector, three LED indicators, and a rotary switch. The D-type connector provides an RS-232-C terminal connection to the host system. The LEDs provide status information. The rotary switch is used by onboard software to allow a particular image stored on the board to be executed automatically at power-up.

Features

Software Features

The EBSA-285 onboard software is programmed into the flash ROM.

SA-110/21285 Hardware Developer's Kit

The SA-110/21285 Hardware Developer's Kit describes and documents non-proprietary designs that can be used as the basis for products. The kit includes an *ARM Architecture Reference Manual*, *SA-110 Microprocessor Technical Reference Manual*, and the following EBSA-285 documentation and code (* indicates that it is supplied on a 3.5-inch FAT-format floppy disk):

- User's guide
- Circuit schematics*
- Design database*
- Bill-of-materials (BOM)*
- Onboard firmware source code and binaries*
- Onboard utilities source code and binaries*
- Host utilities source code and binaries*
- Printed circuit board plots*

SA-110/21285 Evaluation Board

The SA-110/21285 Evaluation Board is an example design that hardware designers can use to expedite product development, and software developers can use to test their applications before a complete hardware system is available. The SA-110/21285 Evaluation Board features the PCI add-in card form factor, which can be used in the following two distinct ways:

- As the central processor in an SA-110-based computer
 - The EBSA-285 acts as the central processor, main memory, and host bridge.
 - The EBSA-285 provides standard system capabilities, including interrupt controller, DMA controller, timers, and a UART.
 - The EBSA-285 can configure and control other devices on the PCI bus.
 - This mode requires a PCI backplane.
- As an add-in card in an existing PCI-based machine
 - The EBSA-285 acts as a coprocessor to the host system.

User-configurable jumpers on the EBSA-285 provide flexibility to select from several modes of operation supported by the SA-110 and 21285. The EBSA-285 *does not* support parity on its SDRAM memory subsystem.

SA-110/21285 Main Components

The main hardware components of the SA-110/21285 are:

- SA-110 microprocessor running at speeds of up to 233 MHz
- 21285 core logic chip with PCI Revision 2.1-compliant, 32-bit, 33-MHz PCI interface
- Universal (3.3 V or 5 V) PCI connector memory
 - 4MB flash ROM
 - 16MB SDRAM (socketed DIMM)
 - Second DIMM socket
 - 32-pin, 0.6-inch DIL socket for third-party 8-bit ROM emulator
- Nine-way D-type connector for connection to the 21285 internal UART
- Debug LEDs and image-selection switch decoded on the 21285 X-Bus
- Connectors for probing the board or attaching third-party X-Bus mezzanine cards

SA-110 Microprocessor

The EBSA-285 (see Figure 1) uses the SA-110 microprocessor as its CPU. It operates at speeds of up to 233 MHz.

21285 Core Logic Chip

The 21285 is a core logic controller for the SA-110 microprocessor. It performs all of the control functions on the EBSA-285.

Memory Subsystem

The EBSA-285 provides synchronous DRAM (SDRAM) for its main memory and flash ROM (with nonvolatile storage) for its boot path. The EBSA-285 supports two SDRAM DIMM sockets; one 16MB SDRAM DIMM is supplied. Nonvolatile storage is provided by four byte wide 1MB flash ROMs, arranged to provide a 32-bit ROM path. This provides a total of 4MB of ROM. An EPROM emulator is a debugging tool that connects to a target as though it were an EEPROM, but allows fast download and modifications of code.

I/O Subsystem

All local I/O within the EBSA-285 is performed as programmed I/O under the control of the SA-110. The I/O subsystem provides the following resources:

- An RS-232-C console port (data leads only) accessed via a nine-way D-type connector on the bulkhead. This is referred to as COM0.
- An 8-bit I/O port that is used to control LEDs, read the state of jumpers, and contains a switch.

Interrupts

When the EBSA-285 is used as a *host bridge* (21285 configured as central function), logic in the 21285 acts as an interrupt controller for interrupts generated locally (on the module and within the 21285) and for interrupts generated by other devices on the PCI. When the EBSA-285 is used as an *add-in*

card, logic in the 21285 acts as an interrupt controller for interrupts generated locally (on the module and within the 21285). In this mode, the SA-110 can generate an interrupt to the host bridge (across the PCI bus) under software control. The interrupt is routed out of the EBSA-285 as INTA#.

PCI Interface

The EBSA-285 has a 32-bit PCI interface that is compliant with Revision 2.1 of the PCI bus local specification. It supports both 3.3-V and 5-V signaling.

Clocks

The EBSA-285 uses these oscillators:

- The 3.6864-MHz oscillator has two purposes. It drives the SA-110 phase-locked loop (PLL) input, from which the SA-110 generates its core clock. It provides a fixed frequency input to one of the timers in the 21285.
- The 50-MHz oscillator provides the **osc** clock input for the 21285. The 21285 buffers and redrives this clock to generate the SA-110 bus clock, the SDRAM clocks, and the 21285 feedback clock (**fclk**). The local buses and the majority of the chip's internal logic run synchronously at this clock frequency.
- The PCI clock is supplied by the backplane.

JTAG

The SA-110 and the 21285 both contain JTAG ports that allow test access to the I/O pins of the device.

Expansion

The I/O capabilities of the EBSA-285 can be expanded by the PCI interface and by expansion headers of the buffered 21285 X-Bus.

Resets

The reset source at power-on is dependent on the configuration (host bridge or device) and is link configurable. There are three sources of resets on the EBSA-285:

- Power-on reset
- Reset from the PCI
- Reset from 21285 watchdog timer

Power Requirements

The EBSA-285 has the following power requirements:

- +5 V +/- 5%
- +12 V +/- 5%

Onboard Power Generation

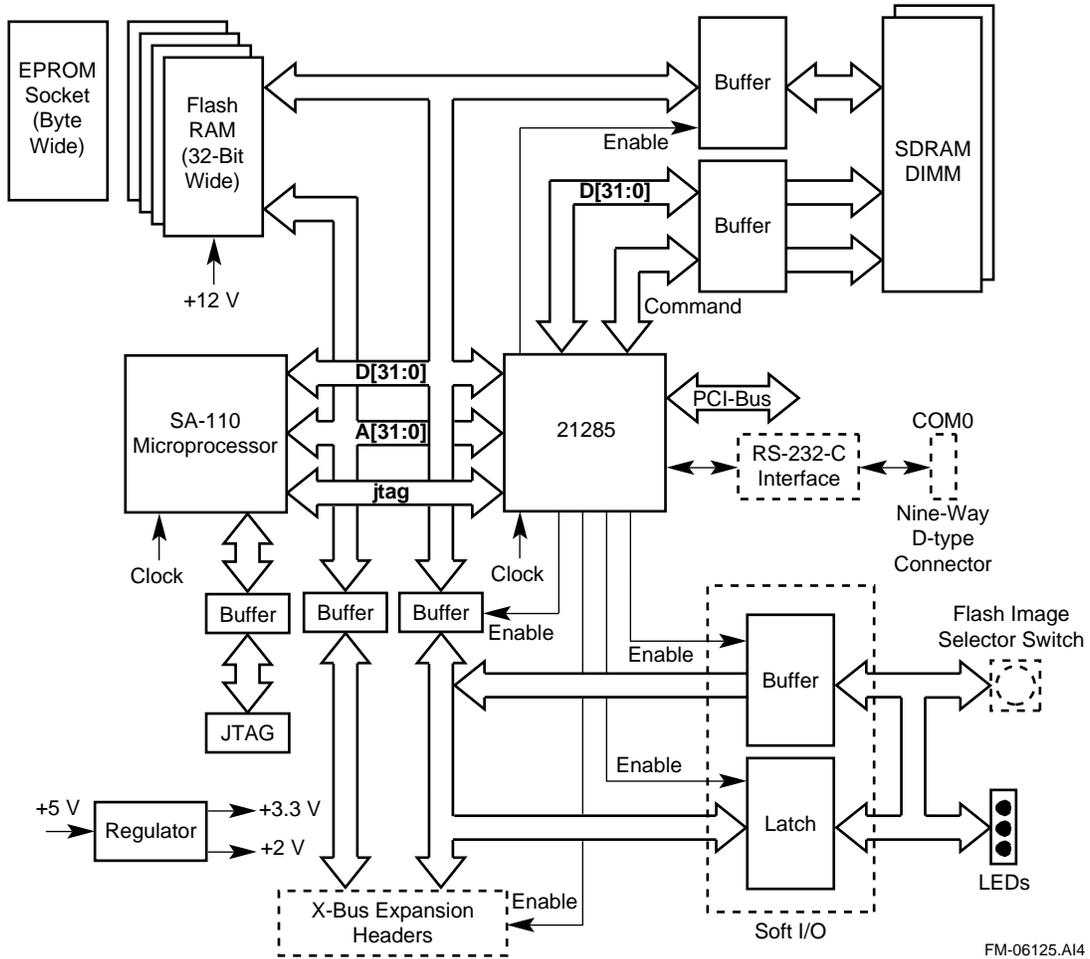
The EBSA-285 generates +3.3 V and +2 V using onboard circuitry.

Onboard Software

The EBSA-285 onboard software is programmed into the flash ROM. The flash ROM can contain a number of independent images. At a minimum, the flash ROM contains a program called the Primary Boot Loader (PBL). The PBL can load and start a specific image that is stored in flash ROM and is selected by using the rotary flash image selector switch on the bulkhead mounting bracket. By default, the PBL starts up the ARM remote debug agent.

An onboard diagnostic suite is also programmed into flash ROM and is always selected using IMAGE1 on the rotary switch.

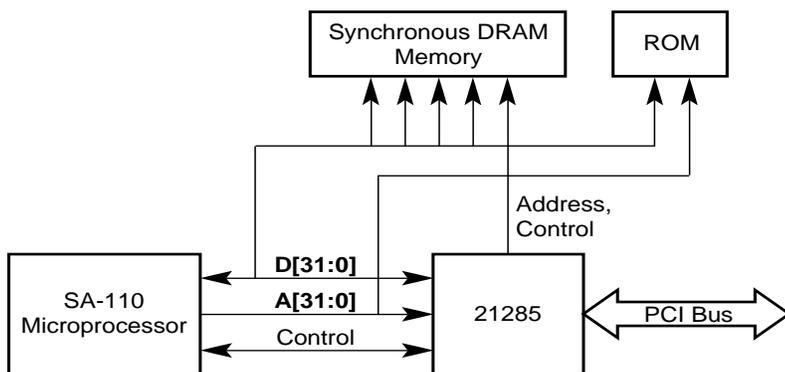
Figure 1 EBSA-285 Block Diagram



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The 21285 core logic controller is part of the DIGITAL Semiconductor provision of PCI I/O support for the StrongARM family. Specifically, it is a support chip for the SA-110 StrongARM microprocessor, integrating an SDRAM memory controller, PCI bus, UART (data leads only), timers, interrupt control, boot ROM/flash, and low-speed (X-Bus) I/O in a single device. The chip supports an optional system arbiter, which shares pins with the X-Bus control signals making it an either/or option. The LEDs and rotary switch (X-Bus peripherals) are not accessible if the arbiter is configured rather than the X-Bus. Figure 2 shows a diagram of the 21285 and SA-110 in a host bridge application.

Figure 2 21285 Host Bridge Application Diagram



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PCI Backplane Application

The EBSA-BPL PCI passive backplane (see Figure 3) complements the EBSA-285 offering. The backplane allows a wide variety of StrongARM (and mixed processor) configurations to be tested. Specifically, it allows verification and evaluation of the 21285 and future PCI-related StrongARM product line developments as system masters and intelligent devices in non-Intel/Alpha (or other desktop/server) environments. The backplane provides the following:

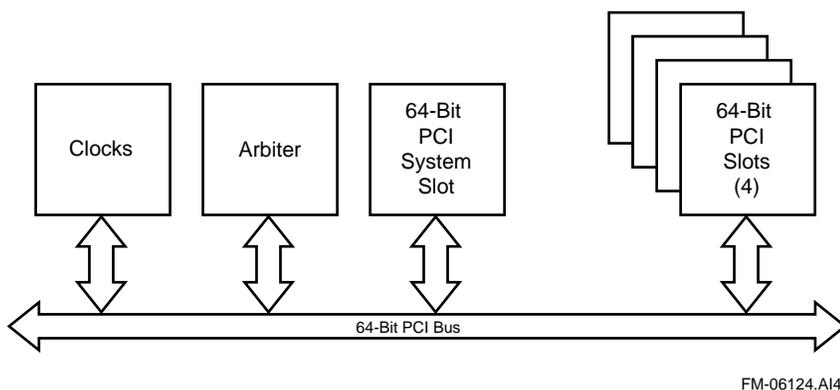
- Support for all features on the EBSA-285 module.
- An environment for verification, evaluation, and benchmarking of StrongARM PCI support with the widest range of peripherals. For this reason, the standard PCI I/O form factor adopted by the PCI industry is used.
- The ability to use industry-standard enclosures and power supply units (PSUs).
- An environment for testing all current and future DIGITAL Semiconductor (standard form factor assumed) PCI peripheral cards from the PCI-to-PCI bridge (PPB) group, multimedia, and communications business units of the StrongARM family. Of particular importance is interworking with the PCI bridge evaluation boards, which allows a wide variety of bridged bus configurations to be investigated and/or verified.
- 64-bit support (for future proofing of the design).
- Two variants: EBSA-BPL-5V complying with the 5-V PCI signaling environment, and EBSA-BPL-3V3 complying with the 3.3-V PCI signaling environment.
- Backplane provision for the PCI system clock and PCI arbitration from the EBSA-285 or other EBSA-BPL compatible module.
- Optional support for PCI Industrial Computer Manufacturers Group (see the www.picmg.com website for details) arbitration from the EBSA-285 module.

Main Components of PCI Backplane

The main components of the PCI backplane include the following:

- 5 each 64-bit PCI slots
 - System slot with PICMG arbiter support.
 - Four standard PCI slots for devices.
- Two backplane variants
 - 5-V signaling
 - 3.3-V signaling
- Two PCI arbitration options
 - Via system slot
 - Backplane arbiter
- Backplane clock (25, 27.5, 30, and 33.33 MHz)
- AT desktop chassis compatible
- PC-AT or VRM supply options

Figure 3 EBSA-BPL PCI Passive Backplane Block Diagram





EBSA-285 Characteristics

Electrical	
Power supply	5 V \pm 5% 12 V \pm 5%
Physical	
Package	Form factor PCI add-in card

For More Information

To learn more about the availability of the EBSA-285, contact your local semiconductor distributor. To learn more about DIGITAL Semiconductor's product portfolio, visit the DIGITAL Semiconductor World Wide Web Internet site:

<http://www.digital.com/semiconductor>

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