DECchip 21066/21068 Evaluation Board

Product Brief

September 1993

Description

The DECchip 21066/21068 Evaluation Board (EB66) is an evaluation and development module for computing systems based on the DECchip 21066 and DECchip 21068 microprocessors. The EB66 provides a single-board hardware and software PCI and ISA development platform for the design, integration, and analysis of supporting logic, subsystems, and software for 21066/21068 I/O devices. The EB66 is a fully populated "baby AT" size module which can act as a PC motherboard. It is one of many example designs offered by Digital for a microprocessor that implements the Alpha AXP architecture.

Features

- 21066 CPU runs at a frequency of either 150 MHz or 166 MHz; 21068 CPU runs at 66 MHz. A serial ROM boots the CPU at reset.
- DRAM Memory subsystem is 64-bit wide plus 8-bit ECC and includes 32 MB (256 MB maximum). The memory subsystem supports 8-, 16-, 32-, 64-, 128-, or 256-MB configurations.
- Backup cache (Bcache) subsystem uses a combination of 32K by 8 and 32K by 9 or 128K by 8 and 128K by 9 commodity SRAMs to support either a 256 KB or a 1 MB physical size.
- PCI local bus interface running at 25 to 33 MHz is brought out to one dedicated onboard PCI expansion slot for additional I/O devices. A second PCI slot is shared with the ISA bus. Connects to the following onboard PCI chips:
  - SCSI controller
  - Ethernet controller
  - PCI to ISA bridge
- ISA bus interface, utility bus, and control (8- and 16-bit DMA) from PCI to ISA bridge. The ISA bus is brought out to two dedicated onboard expansion slots for additional I/O devices. A third ISA slot is shared with the PCI bus. ISA bus and utility bus connect to the following onboard chips:
  - Slow-speed peripheral interface that includes a diskette controller, two UARTs for serial device applications, bidirectional parallel port, and an interrupt driven hardware timer.
  - Mouse/keyboard controller.
  - Two UVPROMs for debug. One is preprogrammed by Digital's applications support group; the other is user-programmable.
  - Time of year (TOY) clock.
  - NVRAM that provides an additional 8K bytes of nonvolatile RAM for operating system support.
- Frame buffer connectors (2) physically in line with one ISA expansion slot provides a basis for a high-speed video frame buffer design.
- Latches, buffers, glue logic, power regulators, oscillators, decoupling capacitors, and other necessary components, as needed to form a complete system
- Database and user documentation—The full database, including schematics and source files, are supplied with the EB66. User documentation is also included. The database allows designers with no previous Alpha AXP experience to successfully create a working Alpha AXP system with minimal help.

DECchip 21066/21068 Evaluation Board Microarchitecture

The DECchip 21066/21068 Evaluation Board (EB66) is implemented using industry-standard parts with PCI bus arbitration and system interrupt control implemented in programmable logic devices (PLDs). The following major functional components are included.

Central Processing Unit —EB66 employs the DECchip 21066 CPU running at 150 MHz or 166 MHz, or the DECchip 21068 CPU running at 66 MHz. Both CPUs include an integral bridge to the PCI bus, 8 KB instruction cache (Icache), 8 KB data cache (Dcache), DRAM controller with independent bank timing, floating-point processor, and embedded graphics support.

DRAM—Dynamic RAM (DRAM) memory is user-configurable in up to four commodity single in-line memory modules (SIMMs) from 8 to 256 MB in two banks.

Backup Cache—The external backup cache (Bcache) is a write-back, read-allocate cache built from off-the-shelf SRAMs. It is available in either a 256 KB or a 1 MB configuration. The cache interface is programmable to allow for cache speed selection.

Frame Buffer—Two 100-pin connectors are provided in line with one ISA slot for support of a high-speed video frame buffer. The DRAM bus connects to the frame buffer and uses video RAM signals from the CPU .

Peripheral Component Interconnect Bus—EB 66 provides an interface to industry standard PCI local bus with one dedicated expansion slot. A second slot is shared with the ISA bus.

SCSI Controller—An NCR 53C810 PCI to SCSI controller provides a standard SCSI-2 interface which is brought out to an onboard high-density connector with termination. Up to seven SCSI devices may be connected.

Ethernet Controller—A DECchip 21040 provides Ethernet LAN control and interface from the PCI bus. Both 10BASE-T (twisted-pair) and 10BASE2 (ThinWire) interfaces are provided by means of an external Halo Electronics adapter module.

PCI to ISA Bridge—An Intel 82378IB PCI to ISA bridge offers an interface to slower speed ISA devices. Independent PCI and ISA addressing affords concurrent operation of devices on each bus. ISA 8- or 16-bit DMA is provided.

Industry Standard Architecture Bus—EB66 provides an interface to industry standard IEEE-P996 ISA bus with two dedicated expansion slots. A third slot is shared with the PCI bus.

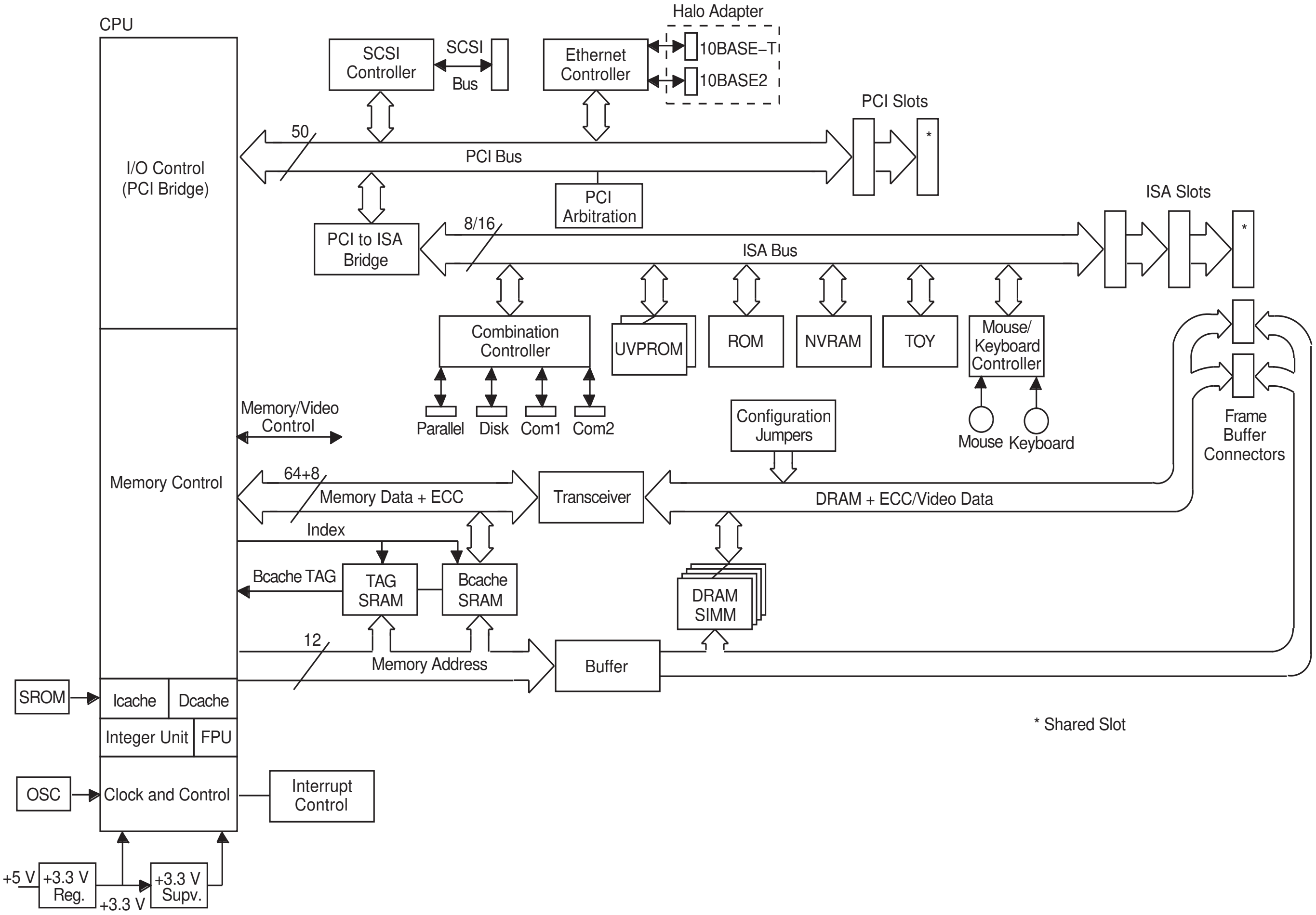
Combination Controller—A National PC87312 provides an interface to slow-speed peripherals including a diskette, one input or output parallel device, and two serial devices.

Mouse/Keyboard Controller—An Intel 8242 controls inputs from a standard mouse and keyboard.

Time of Year Clock—A DS1287A chip provides the time of year (TOY) function.

Debug Monitor ROM—Two 512 KB UVPROMs are provided for debug. One is preprogrammed by Digital's application support group; the other is user-programmable. A debug monitor allows the design engineer to develop code on a host system and load it into the EB66 through the Ethernet port using BootP protocol or through the serial port.

Figure 1 EB66 Microarchitecture Block Diagram



Add the EB66 to Your Design Strategy

Use the EB66 to begin your design work with the DECchip 21066 and 21068. The benefits of using the EB66 include:

Faster System Development —In its released configuration, the EB66 can be used as the basis of a full computing system. You need only design or integrate off-the-shelf PCI and ISA supporting modules. The EB66 works under worst-case voltage, temperature, and process conditions, and can serve as the core of a high-volume product without significant changes.

Easier Software Development —The EB66 has a software debug monitor for loading code into the system and performing other software debug functions such as memory read, memory write, and instruction breakpoint. When combined with the appropriate hardware interface, the debug monitor can be used to write and debug software (for example, device drivers) for workstation and personal computers. The EB66 is also suited for embedded control products such as laser printers, communication engines (such as servers, bridges and routers), and video products.

Flexible Memory and Bcache Subsystem Implementation — The EB66 is a high-speed design and includes a full 64-bit data path for the DRAM main memory and the Bcache. The CPU runs at speeds of 150 MHz or 166 MHz, with power regulation and cooling handled on the board. High performance of the EB66 Bcache SRAM subsystem takes into account signal integrity issues.

You can select Bcache size and DRAM access time. The Bcache SRAM supports both 256K byte and 1M byte cache. Both sizes support different speed SRAMs. Such flexibility allows you to change these characteristics and run performance benchmarks to determine the effect on actual programs. The available hardware configurations can also be combined and tested with different coding techniques to determine optimum system performance.

Supporting Documentation and Software Tools

Digital provides the following documentation and software tools with the EB66:

- User documentation
- Sources for SROM, debug ROM, and example privileged architecture library code (PALcode)
- Software development tools for Windows NT and OSF/1 host platforms
- Circuit schematics
- Board artwork
- Circuit design database compatible with Viewlogic Powerview 5.1
- Able and JEDEC files for PLDs
- Hardware design application notes

EB66 Characteristics

Power Supply	Industry-standard PC power supply
Operating Temperature Range	Operates at normal room temperatures
Storage Temperature Range	-55°C to 125°C
Size	33 cm (13.0 in) by 22.1 cm (8.7 in)

For More Information

To learn more about pricing and availability of the DECchip 21066 and 21068, as well as the EB66 Evaluation Board, contact your Digital sales representative, or, in the United States, call our DECchip Information Line:

1-800-DEC-2717
1-800-DEC-2515 (TTY)

Outside North America, call:

+1-508-568-6868

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