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ZT 8904

Single Board 386 EX Computer

A cost-effective single board STD 32® computer for embedded applications, with extended temperature and multiprocessing capabilities.

The ZT 8904 is a highly integrated STD 32 computer based on the Intel386™ EX, a microprocessor optimized for embedded designs. The ZT 8904 cost-effectively incorporates the features of the 386 EX into the compact, rugged STD 32 format. It can be used in stand-alone applications, and in single or multiple processor STD 32 systems.

The ZT 8904 single board computer includes up to 5 Mbytes of Pseudo Static RAM, 4 Mbytes of flash memory, 128 Kbytes of RAM that can be battery backed for a RAM disk, 24 lines of digital I/O, four serial ports, a parallel port, and a watchdog timer. An optional local bus video module speeds video applications while maintaining the ZT 8904's single-slot format. Other options include an IDE subsystem for high-speed disk operation, and a math coprocessor for increased computational performance.

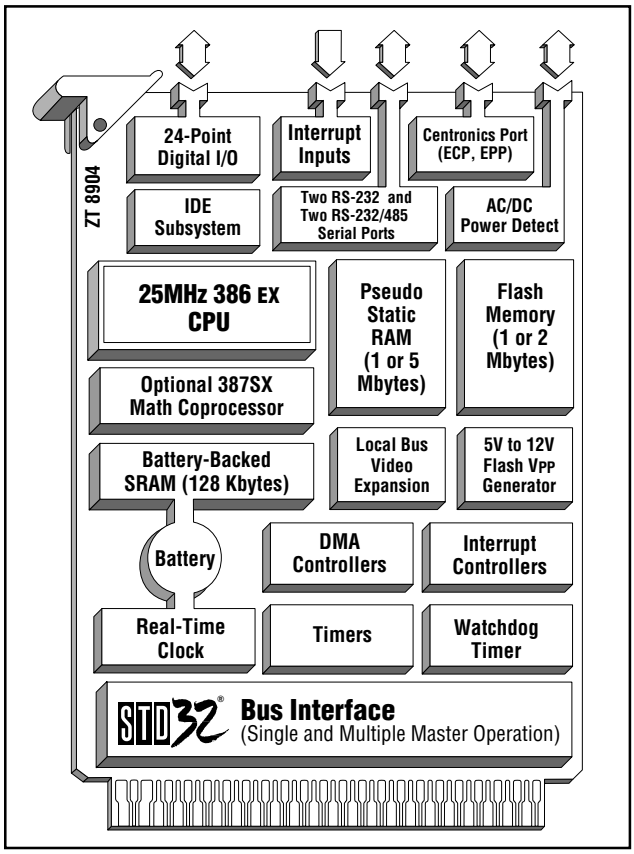
The ZT 89CT04 offers the same features as the ZT 8904, but adds extended temperature (-40° to +85°C) operation for harsh industrial environments.

- STD 32- and STD-compatible
- STD 32 multiprocessing option
- 25 MHz Intel386™ EX CPU
- Math coprocessor socket
- Optional local bus video support
- 128 Kbyte SRAM, battery backed
- 1, 2, or 4 Mbytes flash PROM
- 1 or 5 Mbytes of Pseudo Static RAM
- 64 Kbyte I/O address range
- Two interrupt controllers (8259)
- Two DMA channels
- Two RS-232/485 (J1708 capable) serial ports (16450), DMA capable
- Two RS-232 serial ports (16550), with FIFO
- +5V operation (±12V not required)
- Three 16-bit timers (8254)
- IEEE 1284 parallel port (Centronics, ECP, EPP)
- Integrated IDE Subsystem
- 24 bi-directional digital I/O lines with event sense and debounce
- Real-time clock, with battery backup
- AC/DC power-fail detection
- Two-stage watchdog timer
- Push-button reset
- Software-programmable LED
- Dynamic 8- and 16-bit bus sizing
- Extended temperature operation (-40° to +85°C) on the ZT 89CT04

Note: CT denotes CMOS, TTL backplane-compatible, and extended temperature operation of -40° to +85°C. (Users should make adjustments for temperature rise in enclosures.)

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ZT 8904 Functional Block Diagram

Functional Considerations

STD Bus Interface

The ZT 8904 supports both STD and STD 32 backplane architectures. In an STD backplane, all bus transfers are reduced to 8 bits. In an STD 32 backplane, dynamic bus sizing signals determine the data transfer width between the ZT 8904 and other cards in the backplane.

ASAP Program

The ZT 8904 is available for Ziatech's ASAP (Application Specific Automation Processor) Program. The ASAP Program allows features to be added to or deleted from the ZT 8904, creating a custom board for volume applications. Contact Ziatech for more information.

The 386 EX Processor

The Intel386 EX microprocessor is the first in a family of products based on the Intel386 architecture with enhanced functionality for the embedded processor market. Its 32-bit, static core design enables embedded applications to function in very low power environments, and it integrates many common peripherals that bring added functionality to embedded designs.

A socket for an optional 80387SX math coprocessor is included on the ZT 8904.

Power Saving Modes

The ZT 8904 supports two software programmable power conservation modes: idle and power-down. Idle mode freezes the CPU clocks, but leaves the peripheral clocks running. Power-down mode freezes both the CPU and peripheral clocks.

Memory and I/O Addressing

The ZT 8904 can address 16 Mbytes of memory. Local memory consists of backup memory, flash EPROM and program memory. Standard backup memory for the ZT 8904 consists of 128 Kbytes of static RAM with battery backup. Up to 4 Mbytes of flash memory is provided for DOS and BIOS space, as well as application program storage. Pseudo Static RAM is provided for local program memory, from 1 Mbyte minimum to 5 Mbytes maximum. Total addressable memory for the ZT 8904 is 16 Mbytes, including local memory, on-board video RAM, and backplane memory.

The STD I/O expansion signal (IOEXP) is driven low for backplane I/O operations in the address range from FC00 though FFFFh. This prevents redundant mapping of boards that decode IOEXP and fewer than 16 bits of address.

ZT 8904 data transfers are automatically adjusted to support 8- or 16-bit memory and I/O boards.

Video/Keyboard Support

Video and keyboard I/O is supported with a separate STD 32 video interface or with a small, local bus video adapter module that plugs directly onto the ZT 8904. Ziatech's STD 32 video interfaces include the ZT 8982 Super VGA/Flat Panel and Keyboard Interface and the ZT 8842 VGA/Flat Panel and Keyboard Interface.

Ziatech's zVID2 adds local bus Super VGA and flat panel video capability to the ZT 8904. The plug-on zVID2 adapter operates at the CPU speed and utilizes a full 16-bit data bus width. Local bus operation provides dramatically faster video performance than video boards operating at ISA bus speeds, such as PC 104 modules. The ZT 8904, with the zVID2 adapter installed, occupies a single STD 32 backplane slot.

Serial I/O

Four PC/AT-compatible serial ports (COM1 through COM4) are available. COM1 and 2 are 16450-compatible and software-configurable for RS-232 or RS-422/485 with or without DMA. COM3 and 4 are 16550-compatible featuring 16-byte FIFOs. All RS-232 serial ports include a complete set of handshaking and modem control signals, maskable interrupt generation, and data transfer rates up to 115.2K baud.

Digital I/O

The ZT 8904 includes 24 buffered parallel I/O lines which can be individually programmed for input or output with readback. The open collector outputs sink 12mA (suitable for driving LEDs, low-current lamps, etc.) and do not glitch during power-up or power-down. Event sense capability can generate an interrupt on a negative or positive edge when programmed as inputs. Software selectable debounce for groups of eight inputs can also be selected.

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The I/O lines and fused power are accessible through a 50-pin vertical non-latching header.

IEEE 1284 Parallel Port

The ZT 8904 includes an IEEE 1284-compliant parallel port. This is a Centronics-compatible printer port with Enhanced Parallel Port (EPP) and Extended Capabilities Port (ECP) enhancements. The enhancements and extensions allow the use of high-speed, non-printing devices on the parallel port with or without DMA. Bidirectional control is available via software.

Integrated IDE Subsystem

An integrated IDE hard disk option is available for stand-alone and local operation. When combined with the ZT 8904's I/O complement, the IDE option provides a completely integrated single board computer that does not require a backplane.

Local IDE operation provides efficient, high-speed disk operation for single processor or multiprocessing systems. In single processor systems, the on-board disk subsystem conserves slots while decreasing system costs. In multiprocessing systems, each processor can utilize its own IDE drive for use at system start-up, to log data, etc.

Interrupts

Two interrupt controllers provide a total of 15 interrupt inputs for the ZT 8904. The controllers support level- and edge-triggered sensing, fixed and rotating priorities, and the ability to mask individual inputs. Eight interrupts are software or jumper configurable for backplane and frontplane sources. The remaining sources are hard-wired and used internally.

Watchdog Timer

The two-stage watchdog timer can be configured to monitor system operation. When the watchdog timer is enabled, it must be strobed at a designated interval. Failure to strobe the watchdog timer generates a non-maskable interrupt which resets the system if recovery is not possible.

Timers

Three independent, 16-bit timers (8254 architecture) are available. An interrupt can be generated on the end-of-count. Timers 0 and 2 are reserved in DOS systems.

Battery-Backed Real-Time Clock

Time-keeping features are compatible with the Dallas Semiconductor 1287 real-time clock. These features include 12- or 24-hour operation, leap-year adjustment, rollover status, time comparison and periodic interrupts.

AC/DC Power-Fail Detect

With the addition of an AC transformer, the ZT 8904 can monitor AC power. When AC power falls below an acceptable operating range, a non-maskable interrupt can be generated to notify the CPU of impending failure. This allows the system software to take appropriate action before the CPU is reset.

Multiprocessing Operation

The ZT 8904 supports STD 32 multiprocessing operation, enabling it to share backplane I/O and memory resources with other processors in an STD 32 STAR SYSTEM™. The STD 32 multiprocessing architecture can accommodate one permanent master processor and up to six temporary master processors. The ZT 8904 can be configured as either a permanent or temporary master processor. (See the STD 32 STAR SYSTEM data sheet in the Multiprocessing section of Ziatech's Technical Data Book for detailed information.)

Extended Temperature Operation

The ZT 8904 is available in an extended temperature (-40° to +85°C) model. The ZT 89CT04 is part of Ziatech's growing family of "CT" and "LT" extended temperature products for harsh environments.

Software

Ziatech offers a variety of system software options and development environments. Separate data sheets are available from Ziatech for STD ROM, STD DOS, and STAR BIOS development environments.

STD ROM

STD ROM allows users to develop ROM-based (non-operating system) STD applications for the ZT 8904. STD ROM is a high-speed, low-cost solution for OEMs designing embedded systems in large quantities.

STD DOS

STD DOS provides the standard MS-DOS environment and services in flash memory on the ZT 8904. Applications for STD DOS can be developed for or ported from MS-DOS quickly for programmers already familiar with DOS. STD DOS provides standard support for common peripherals such as video and disks, and is supported by many third party development tools such as compilers, editors and debuggers.

STAR BIOS

STAR BIOS supports Ziatech's multiprocessing STD 32 STAR SYSTEM™. See the STD 32 STAR SYSTEM and the STAR QNX data sheets for details.

Specifications

- Compatible with the STD 32 and STD-80 Bus specifications

Electrical

Power Req.	*Min.*	*Typ.*	*Max.*
Supply Voltage, V_{CC}	4.75V	5.00V	5.25V
Supply Current, V_{CC}=5.0V	–	0.8A	1.2A

Mechanical

- Measures 4.5" (11.4cm) x 6.5" (16.5cm)
- Height (from top surface): 0.5" (1.27cm)
  (from bottom surface): 0.07" (0.18cm)
- Weight: 5.0 oz. (141.7g)

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- Connectors
  - P1: 136-pin STD 32 Bus card edge connector on 0.0625" (0.16cm) spacing
  - J1: 80-pin latching header with two RS-232, two RS-232/485, parallel port, external battery
  - J2: 10-pin latching frontplane interrupts
  - J3: 2-pin AC power-fail
  - J4: 50-pin header 24-bit digital I/O
  - J5: 50-pin RAM expansion connector
  - J6: 100-pin local bus interface
  - J7: 2-position power connector

STD 32 Compliance Levels

See the short-form STD 32 Specification in the appendix of the Technical Data Book for complete STD 32 Compliance Level descriptions:

- SA8, SA16, I, SDMA8, SDMA16, MB.

Environmental	
Operating Temperature **(ZT 8904)**	0° to 65° Celsius
Operating Temperature **(ZT 89CT04)**	-40° to +85° Celsius
Storage Temperature **(ZT 8904)**	-40° to +85° Celsius
Storage Temperature **(ZT 89CT04)**	-55° to +105° Celsius
Non-Condensing Relative Humidity	less than 95% at 40° Celsius

Reliability

- MTBF: 20 years
- MTTR: five minutes (based on board replacement)

Ordering Information

ZT 8904 Single Board 386 EX Computer
ZT 89CT04 Single Board 386 EX Computer, extended temperature

Must choose one option from each category:

CPU options

C1 25 MHz Intel386 EX

Drive options

D0 No drive installed
D1 350 Mbyte 2.5" drive integrated with board (occupies two slots total)

Flash options

P1 1 Mbyte flash PROM
P2 2 Mbytes flash PROM
P3 4 Mbytes flash PROM

RAM options

R1 1 Mbyte
R2 5 Mbytes

Software options

S0 VTI installed on board (STD ROM only)
S1 DOS 5.0 and Ziatech's industrial BIOS installed in flash memory
S2 DOS 5.0 and Ziatech's STAR BIOS (multiprocessing) installed in flash memory

Select from the following options as needed:

Video options

V2 zVID2 Local Bus Super VGA and Flat Panel Video Adapter, installed
L2 zVID2 Local Bus Super VGA and Flat Panel Video Adapter, low temperature, installed

Miscellaneous options

M 80387 Numeric coprocessor

Development environments (for first purchase):

STD DOS or STD ROM is required with an initial system purchase. Hardware manuals are included with the purchase of either development toolkit.

ZT 94033 STD DOS Development Toolkit
Includes host development disk containing VSC, PROMPREP, FLASH, and other utilities. STD Device Driver Package (STD DDP) with support for STD 32 I/O cards and peripherals, ZT 7502/00 BIOS diagnostic card, full Microsoft MS-DOS, and ZT 90200 cable.

ZT 94034 STD ROM Development Toolkit
STD ROM development system for PROM-based target systems, Includes Virtual Terminal Interface (VTI) installed in flash memory, Paradigm Locate and Startup modules, STD DDP, Paradigm's DEBUG/RT, and ZT 90200 cable.

ZT 94038 STD 32-QNX Development Toolkit
Tools for the development of ROM and STAR embedded QNX applications. Includes flash programming tools, STD DDP, BIOS diagnostic card, Boot Off-Board module, and complete hardware and software manuals. QNX and QNX licenses must be purchased from QNX Software Systems Ltd. Development hardware should include a CPU, video card and floppy disk. A hard disk is strongly recommended.

Note: See the STD 32 STAR SYSTEM data sheet for STAR development options.

Accessories

Cables *(see Data Book cable section for details):*

ZT 90072 10' (3m) 50-pin to 50-pin digital I/O cable for module racks
ZT 90100 Front plane interrupt cable
ZT 90200 10" (25.4cm), 80-pin to four 9-pin male D-shell, two 9-pin female D-shell cable, one 25-pin female D-shell cable
ZT 90166 10" (25.4cm) video/keyboard, zVID2 to panel mount connectors
ZT 90167 10" (25.4cm) video/keyboard, zVID2 to desktop-style connector
ZT 90168 10" (25.4cm) video/keyboard, connects seven zVID2 adapters to desktop-style connectors
ZT 95190 Boot recovery module. Used if BIOS and boot code in flash is corrupted.

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