ADVANCE INFORMATION

Basic PC Compatible **ADM1024 LifeGuard™ SYSTEM MONITOR**

The ADM1024 combines CPU thermal monitoring and all motherboard temperature, fan control and power supply instrumentation detailed in the Desktop Management Interface v2.0 specification for desktop PC health monitoring and/or remote network diagnostics. The single-chip monitoring device includes remote CPU and motherboard temperature sensing, supply voltage monitoring and fan speed monitoring circuitry plus analog/digital conversion for digitization and reporting over the Systems Management Bus (SMBus™) to the DMI Service Provider and/or SMBIOS.

SUPPORTS BASIC PC DESIGNS

Integrated CPU thermal diode and DMI hardware monitoring solution combines two previously discrete devices

50% reduction in BOM cost and board space supports sub-$1000 PC cost structures and MicroATX form factors

IMPROVED SYSTEM RELIABILITY

Robust noise immunity avoids inadvertent alarms and system shutdown due to noisy CPU and motherboard environments

PENTIUM II® AND CELERON™ COMPATIBLE

Two-channel digital thermometer with programmable comparator and over/under alarm

Measures temperature using diode-connected PNP transistor found on Intel™ Deschutes, Mendocino, Katmai, Dixon, Coppermine and subsequent processor generations

SUPPORTS INTEL WfM v2.0

Lead Heceta III ASIC for Intel's *Wired for Management* initiative

Compatible with the DMI v2.0 Service Provider

Supports LANDesk® Client Manager and similar applications

TEMPERATURE MONITORING

Thermal diode remotely monitors internal temperature of Pentium II

For dual Pentium systems, a second thermal diode monitor (TDM) is optional

On-chip bandgap temperature sensor

A/D conversion with 1.0°C resolution and 2.0°C total accuracy for on-chip sensor

Programmable comparator with hot trigger point and hysteresis

One-time interrupt and comparator modes

Fully supports the ACPI Model for thermal interrupt generation

FAN SPEED MONITORING AND CONTROL

Two programmable fan speed monitoring channels

Nominal speeds of 8800, 4400, 2200, 1100 RPM

D/A conversion for 0.4% resolution, linear fan control

Fault tolerant fan speed control

POWER SUPPLY MONITORING

Seven programmable voltage measurement channels

On-chip resistive attenuators for direct voltage input

12 V, 5 V, 3.3 V, 2.5 V plus two core CPU voltages

Core V_{CCP} voltages from 0 V to 3.6 V with 14 mV resolution

Five voltage identification (VID) digital inputs

LEGACY SOFTWARE COMPATIBILITY

Register-compatible with LM78/79 and ADM9240 (Heceta I and II)

I²C™-compatible, SMBus serial interface

Fully compatible with Intel's DMI v2.0 Service Provider

COMPANION DESIGN GUIDE

Comprehensive reference design schematics

Demonstration board and application notes available

ANALOG DEVICES

PRODUCT SPECIFICATIONS

General

Fully compliant with DMI v2.0

Operation from single 2.85 to 5.75 V supply

24-pin (7.8 x 6.5 mm) TSSOP package

On-chip and remote temperature sensing

No calibration necessary

Programmable over/under temperature limits

Programmable conversion rate

Temperature Monitoring

On-chip bandgap temperature sensor via diode-connected PNP transitor, a microprocessor or low cost transistor

2.0°C accuracy for on-chip sensor

3.0°C accuracy for remote sensor

−40 to +125°C operation

8-bit A/D conversion

1.0°C measurement resolution

8-bit digital comparator with hysteresis

Programmable hot trigger point

One-time interrupt and comparator modes

Fan Speed Monitoring And Control

Two programmable fan speed channels

22.5 kHz clock gated for 1 cycle

Nominal speeds of 8800, 4400, 2200, 1100 RPM

8-bit D/A converter for linear fan control

Supply Voltage Monitoring

Eight voltage measurement channels

On-chip resistive attenuators for direct voltage input

+12 V, +5 V, +3.3 V, +2.5 V plus two V_{CCP} CPU voltages

V_{CCP}[1] and V_{CCP}[2] voltages from 0 to 3.6 V

Core voltage measurement with 14 mV resolution

Five voltage identification (VID) digital inputs

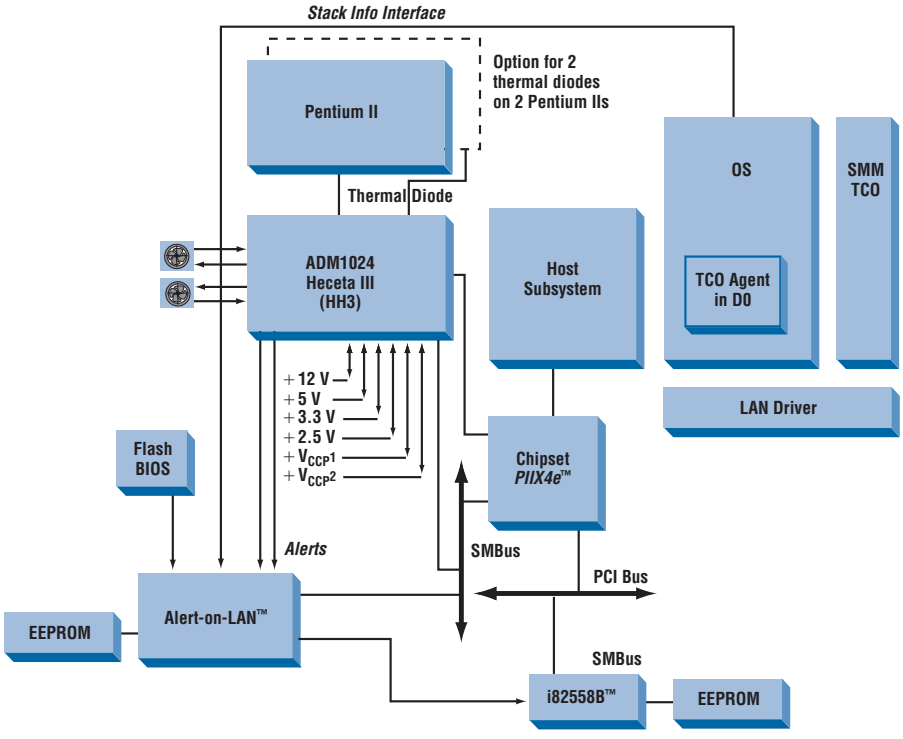
Output

2-wire SMBus serial interface

Power Requirements

1.4 mA operating current

3 µA standby current



Hardware Management System Block Diagram

TECHNOLOGY

Voltage Monitoring

Typical system supplies include a combination of some or all of the following: +15 V, +12 V, +5 V, +3.3 V, +2.7 V and +2.5 V. With so many (and different) supplies being monitored, an ADC-based multiplexed measurement system provides the greatest flexibility. An ADC-based solution has the added advantage in being compatible with software control and limit setting. Since the supplies being measured are usually generated using noisy switched-mode techniques, they can be difficult to accurately monitor. Switching glitches or load-dependent voltage excursions can also cause spurious alarms. It is therefore important that the monitoring circuitry rejects supply glitches and excursions, but is still fast enough to detect when the supply is really out of tolerance. When the supply is out of tolerance, it is important to deal with the situation as quickly as possible before damage occurs. The input filtering circuitry on the ADM1024 serves a dual role of:
(a) Filtering the input signals and
(b) Attenuating the input levels to more appropriate input levels for the on-board ADC.

Having the attenuation network integrated on-chip has a further important advantage: Any errors it introduces due to inaccurate resistors or mismatch are already included in the specifications for the channel so the user does not need to be concerned about them. With external attenuation networks, the additional errors need to be added to the error budget.

Temperature Monitoring

The ADM1024 exploits the negative temperature coefficient of a diode (or the base-emitter voltage of a transistor) operated at constant current by using the following formula:

$$V_{be} = KT/q \ln(N)$$

where:

V_{be} is the voltage measured across the base-emitter junction
K is Boltzmann's constant
q is the charge on the carrier
T is the absolute temperature in Kelvins
N is the ratio of the two currents

By running two different currents through the diode or transistor and measuring the change in voltage, the ADM1024 can calculate the temperature, which is reported over a two-wire serial interface compatible with SMBus standards. Under- and over-temperature limits can be programmed into the devices over the serial bus, and an ALERT output signals when the on-chip or remote temperature is out of range. This signal can be used as an interrupt or as an SMBus alert.

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ANALOG DEVICES

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