



Industry Support Using the Atmel AT30TS750 Family of Digital Temperature Sensors

Atmel White Paper

Author:

Christopher Gorog, PMP , Atmel Corp. Applications Manager

Abstract

This document discusses common industry needs for precision temperature control. It identifies several related industry problems in industrial controls, computers, communications, and consumer systems, where similar environment factors and needs for temperature monitoring make precision digital temperature sensors ideal. Features offered by the Atmel® AT30TS750 family of precision temperature sensors along with the Atmel Microprocessors provide an ideal solution to both measure temperature and control functionality of systems which are temperature sensitive. This document provides solutions to these common industry problems using the AT30TS750 family of products, and outlines the advantages to utilize the Atmel products over similar market available components. Though many uses are outlined here, this document should not be considered to encompass all the possible markets or uses for this highly functional device.

Table of Contents

Introduction	2
Features of the Atmel AT30TS750 family of digital temperature sensors.....	2
Industrial uses for digital temperature sensors	2
Supporting Communications markets.....	3
Digital temperature sensors in PC products.....	3
Temperature monitoring in consumer products.....	4
Conclusion.....	4
References.....	4
Editor's notes about Atmel Corporation.....	4

Introduction

The Atmel AT30TS750 family of digital temperature sensors combines the features of industry standard LM75-type devices with a non volatile registers and serial EEPROM memory producing a versatile multi functional solution. This device provides solutions that can benefit multiple applications across many industries with the exceptional features offered by this device.

Features of the Atmel AT30TS750 family of digital temperature sensors

The AT30TS750 family of digital temperature sensors provides exceptional feature sets to support the needs for temperature monitoring across many industries. The AT30TS750 family of products offers many features that set it apart from competing products on the market. It expands on competitor's offerings by adding the ability to configure non-volatile registers that store the devices power-up defaults. The addition of a one-shot mode allows for temperature reads in shutdown low power states.

These features eliminate the need for configuring the device on power up, thus eliminating noise on buses that could potentially cause configuration problems. The configurations can also be locked so that they can not be altered or tampered with in deployed products. Temperature limits can be set in the factory and locked so end users or system operations cannot change them. The AT30TS750 offers the ability to set and lock temperature set points. You can then be assured that the design settings have not been altered by users to allow the system to operate outside the designed temperature ranges. By ensuring temperature operating ranges, designers can achieve the best performance thus reducing product failures and warrantee support cost.

The low power shutdown and one-shot modes are extremely valuable for systems that have low operating power constraints. This is especially important for battery power control circuits and battery powered handheld devices. The AT30TS750 family of devices can be placed into low power shutdown mode when not in use and only placed in active mode for advanced operations. The one-shot mode was designed especially for power constrained applications as it allows a single temperature read to be performed while the AT30TS750 devices are in shutdown low power mode. Battery control circuits can continuously monitor cell temperature during charge/discharge cycles without concerns of adding large current draws on the batteries.

Industrial uses for digital temperature sensors

Industrial applications have traditionally used thermistors, thermocouples, visual indicators, and resistance temperature detectors (RTDs) for temperature monitoring solutions because of their durability and resistance to extreme industrial conditions. However, with industrial control systems migrating to more capable microcontroller based platforms, the need for more accurate environment controls are becoming a requirement. The systems that house and support the microcontroller operations have a higher sensitivity to environment temperature and need to be monitored and controlled. The AT30TS750 is ideal for these needs

as it provides a companion solution to any microcontroller based system. This cost effective device can provide a replacement for legacy thermistor, thermocouples, visual indicators, and RTDs.

Systems that implement process control can do so with much greater accuracy when using digital temperature sensors. Digital temperature sensors are perfect for systems that implement sensitive processes that need highly controlled climates or perform precise temperature chemical mixing. Test and measuring equipment with high accuracy requirements also require the temperatures and volumes to be exactly measured. Digital temperature sensors are a perfect complement to the growing precision needs of modern Industrial control systems.

Medical processes are one of the most highly regulated of all manufacturing environments. For the highly controlled manufacturing, handling, and storing of drugs and medical equipment temperature controls are essential. The AT30TS750 can meet the needs for temperature monitoring and control for this highly regulated industry.

Supporting communications markets

The AT30TS750 can also support many applications in the communications market. With the large growth in handheld communication devices over the last few years, competition between mobile phone makers has heated up. As such, the need for distinguishing devices has prompted designs that have more features better performance and increased battery life. Digital temperature sensors provide a way to support performance and reduced power consumption by monitoring component temperatures. The AT30TS750 is also designed for low power consumption as its operating current is 45 μ A and its shutdown current is 0.1 μ A. The AT30TS750 is also ideal for many other communications application where temperature monitoring is required, such as wireless routers, Bluetooth devices, Ethernet switches, DSL/cable modems, VOIP equipment, and enterprise communication equipment such as SONET, MPLS, or ATM.

Every electronic system requires a power supply to convert industrial AC sources to the required control or operating voltages for the specific equipment. The ambient heat created by these supplies requires cooling sources, fans, and/or other control circuitry to maintain proper operating temperature. Digital temperature sensors such as the AT30TS750 family are ideally suited for this purpose. The built in set points for low, high, and critical can be used directly by the control circuits to enable cooling to turn on and off fans or shutdown the entire supply when critical temperatures are reached. The built in set point features allows the AT30TS750 family of devices to be used in the most simple control circuitry.

Digital temperature sensors in PC products

Personal Computing (PC) markets are currently one of the largest users of digital temperature sensor. As many of these operations require both monitoring temperature and storing of configuration data, the AT30TS750 family of products is by far the best solution for these functions. With options for 2-, 4-, and 8-Kbits of storage in the AT30TSE752, AT30TSE754, and AT30TSE758 devices respectively, they can replace the functionalities performed in most systems by two separate devices with a single device. They can be used as drop in replacements for configuration serial devices on many PC components, maintaining all the legacy operation but adding the capability to monitor temperature as well. They provide great solutions for desktops, notebooks, netbooks, tablets, servers, and individual components such as hard disk drives, DVD/CD drive, power supplies, NIC cards, and graphics cards.

Accessories to computers such as printers, scanners, copiers, and POS terminals also utilize digital temperature monitoring devices. Many opportunities exist for utilizing digital temperature sensors in these systems as increased performance, reduced components size, and lower power circuits become the key focus of design improvements. Monitoring temperature for precise operations and process control will be greatly improved with the high accuracy of the AT30TS750.

Temperature monitoring in consumer products

Many consumer products also can take advantage of benefits of digital temperature monitors. Audio/Video and other equipment that has analog operations often have degraded performance when operated outside of optimum temperature ranges. Controlling power and or cooling to equipment based on the optimum temperature to these applications will not only provide better performance and sound or operating quality, but will also reduce equipment failures and warrantee support cost.

Entertainment systems such as flat panel TVs, Blue Ray/DVD players, camcorder, and gaming consoles all provide high performance and high precision operations. Monitoring and controlling temperature in these items is essential for maintaining precision operations and reducing premature component failure. As printed circuit boards (PCB) become smaller and parts compressed together, the heat dissipation of overall PCBs becomes harder to manage. In white goods such as multimedia players, GPS devices, personal gaming consoles, etc., the circuitry has become so compressed that it has reached critical mass. This produces more heat due to the small size while at the same time does not leave much room for added components. The AT30TS750 family of temperature sensors is offered in a small size UDFN package which measures 2x3x0.6mm, making it feasible to fit into even the smallest board designs.

Conclusion

This document explored the numerous uses of digital temperature monitoring devices across many markets and industries. The strong set of functionality offered by the AT30TS750 family of digital temperature sensors provides an exceptional cost effective solution that beats the competition. The AT30TS750 can be used to upgrade capability from competition devices or to replace legacy technology such as thermistor, thermocouples, visual indicators, and RTDs. They provide exceptional solutions for use in industrial, PC, communications, and consumer products. With the addition of non-volatile memory, they are able to replace serial memory and legacy digital temperature sensors with a single device. To determine which AT30TS750 device fits your specific needs contact your local Atmel sales representative.

References

1. 2009 Temperature Sensors, November 2009, Publication Number: 09OSDM-TempSensors
2. JEDEC Standard, Draft February 2011, JEDEC Solid State Technology Association.
3. AT30TS75 Datasheet, October 2010, Atmel Corporation.

Editor's notes about Atmel Corporation

Atmel is a leader in microcontroller and touch solutions. Headquartered in San Jose, CA, Atmel (NASDAQ: ATML) has 40 local sales offices worldwide. Atmel is a worldwide leader in the design and manufacture of microcontrollers, capacitive touch solutions, advanced logic, mixed-signal, nonvolatile memory and radio frequency components. With wafer fabrication locations in Colorado Springs, CO, and third party foundries, Atmel is able to provide the electronics industry with complete system solutions focused on consumer, industrial, security, communications, computing and automotive markets. In addition, the company has test and assembly facilities in the Philippines and subcontractors, employing approximately 5,100 employees worldwide.

Further information can be obtained from the Atmel website at www.atmel.com.

Contact: Christopher Gorog, PMP, Applications Manager, Colorado Springs, Colorado, USA
Tel: (+1) (719) 540-1451, email: Christopher.Gorog@atmel.com



**Atmel Corporation**

2325 Orchard Parkway
San Jose, CA 95131
USA

Tel: (+1)(408) 441-0311

Fax: (+1)(408) 487-2600

www.atmel.com

Atmel Asia Limited

Unit 01-5 & 16, 19F
BEA Tower, Millennium City 5
418 Kwun Tong Road
Kwun Tong, Kowloon

HONG KONG

Tel: (+852) 2245-6100

Fax: (+852) 2722-1369

Atmel Munich GmbH

Business Campus
Parkring 4
D-85748 Garching b. Munich
GERMANY

Tel: (+49) 89-31970-0

Fax: (+49) 89-3194621

Atmel Japan

9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
JAPAN

Tel: (+81)(3) 3523-3551

Fax: (+81)(3) 3523-7581

© 2011 Atmel Corporation. All rights reserved. / Rev.: 8736A-DTS-3/11

Atmel®, logo and combinations thereof, and others are registered trademarks or trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. EXCEPT AS SET FORTH IN THE ATMEL TERMS AND CONDITIONS OF SALES LOCATED ON THE ATMEL WEBSITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS AND PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and products descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.