

## WHAT ARE SOLID-STATE TEMPERATURE SENSORS?

### Monitor Your Product or Process Reliably

**Temperature** measurements are among the most common data logging applications found across a broad variety of industries including cold chain integrity, medical monitoring, machine/equipment monitoring, environmental monitoring, and in practically every other field. Since temperature monitoring devices are designed for such a wide variety of needs, it's important that you decide on the type of sensors or inputs you'll use. However it can seem like a lengthy decision to find the right type.

Solid-state devices include **LCDs, LEDs, integrated circuits** and more. These low-cost sensors are ideal for many temperature monitoring applications, especially for medical temperature monitoring in hospitals and clinics. In our latest White Paper, [CAS DataLoggers](#) covers the basics of solid-state temperature sensors and how they might benefit your application.

### What are Solid-State Sensors?

Like other types of sensors such as thermocouples and RTDs, **solid-state temperature sensors** measure a physical value and then record or otherwise react to it. The sensor (as part of a probe) measures its surrounding temperature. This is done by means of a diode or voltage reference that has a well-established voltage vs temperature characteristic, along with signal- processing electronics to generate a voltage or current output that is proportional to temperature. For example, the [Analog Devices AD592 transducer](#) provides an output current of  $1\mu\text{A/K}$  with an output of  $248\mu\text{A}$  at  $-25^{\circ}\text{C}$ .



These devices only require a simple voltage or current measurement and linear calculation to scale the signal to temperature. Consider using semiconductors when price is a factor and you have a very specific temperature range in mind.

Taking their name from the solid material of their construction, solid-state sensors have no moving components (unlike transducers, switches etc.) and are controlled by a signal processing unit. In computer hardware, this same design is seen in solid-state hard drives. The sensor's solid material (typically a crystalline semiconductor) prevents electrical dispersion, making them popular for accurate data collection in critical applications such as healthcare and science. As a good alternative to thermocouples, solid-state temperature sensors are also an effective way to log the temperature data of a specific product or to continually monitor an industrial process (for alarm purposes, etc.).

## How Do Users Store Data?

**Temperature data loggers** are able to store temperature data by connecting to external probes including **semiconductor sensors** incorporating a solid-state device. When selecting a data logger for use with solid-state sensors, make sure to select one that is designed to connect with external temperature probes and your specific sensor type. The three other temperature sensor types are thermocouples, thermistors and RTDs.



Whether you want a simple single-channel temperature monitor or a multi-channel system to log several temperature inputs and other parameters at the same time, there are many models of temperature data loggers available to meet your needs.

## Why Use Solid-State Temperature Sensors?

The conductive nature of silicon and other inexpensive materials makes them a common component in temperature sensors. This makes solid-state sensors relatively inexpensive given their high degree of accuracy.

Solid-state sensors are also ideal for less tech-savvy users, being straightforward in operation. They're easy to connect to a data logger, noise-resistant, and usually don't require additional signal conditioning in the form of expensive add-on devices. This sensor type is also easy to use with an ADC (Analog-to-Digital Converter) in case your application requires you to convert an analog input voltage to a digital number prior to processing. In other words, it converts a smoothly-varying signal to a quantized digital value. Important characteristics of an ADC are its linearity, resolution, noise rejection and speed.

Naturally there are a few considerations to keep in mind when using these devices (i.e. potential drawbacks). Like thermistors, solid-state sensors lack the wide measurement range of many thermocouples, so you may need to use the latter if your environment or process heavily fluctuates in temperature. Additionally, since the other types of temperature sensors are more common, there are more models available which may be better suited to your particular project.



## The Data Logging Experts:

As one of the largest data logger distributors in North America, **CAS DataLoggers** has sold automated monitoring solutions and real-time systems to customers since 2001 and has been in business for over 20 years. Customers can select from hundreds of different models from over 16 trusted manufacturers to tackle all manner of data recording applications.

Users can select from many models of temperature data loggers which can read the signals from thermocouple sensors including wired and wireless models, lightweight and compact units, power over Ethernet loggers, etc.

For more information on [Temperature Data Loggers](#), or to find the ideal solution for your application-specific needs, contact a **CAS Data Logger Applications Specialist** at **(800) 956-4437** or visit our website at [www.DataLoggerInc.com](http://www.DataLoggerInc.com).