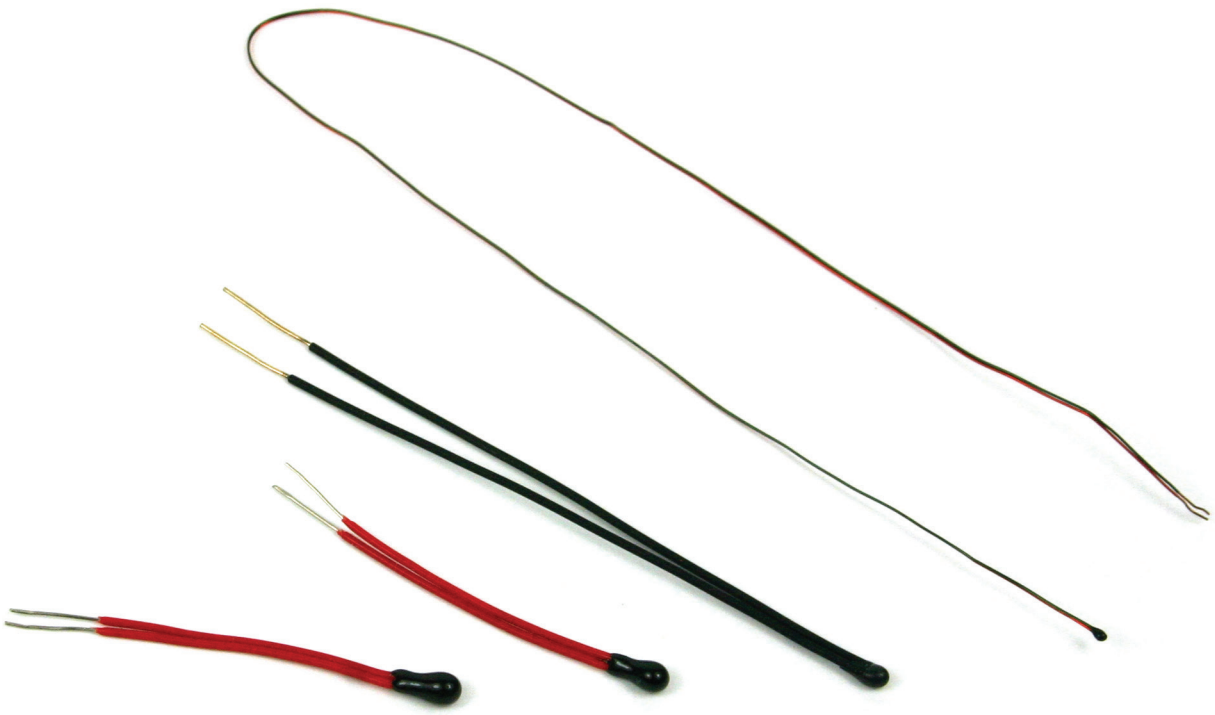
Qti
Sensing Solutions

APPLICATION NOTE

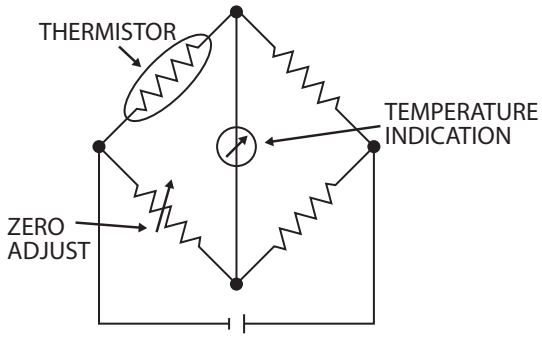
TEMPERATURE MEASUREMENT AND COMPENSATION USING THERMISTORS

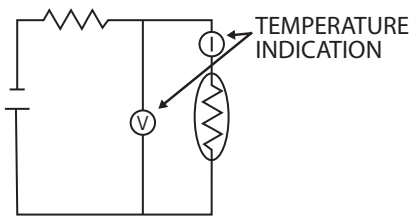
QTI Engineering Department



BASIC TEMPERATURE MEASUREMENT USING THERMISTORS

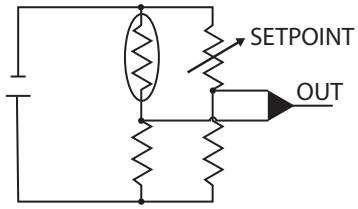
Temperature measurement can be accomplished with a simple Wheatstone bridge as illustrated, or in any configuration where the voltage across or current through the thermistor can be measured.





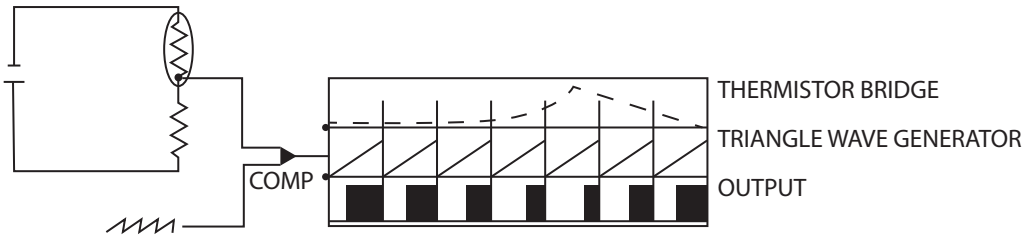
BASIC TEMPERATURE CONTROL

By using a thermistor in a voltage comparator circuit basic on-off temperature control as well as over-temperature protection can be incorporated.



PWM PRECISION TEMPERATURE CONTROL

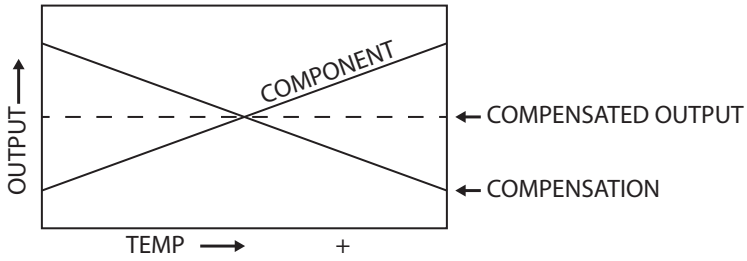
The following circuit uses a thermistor as a sensor for precision temperature control.



TEMPERATURE COMPENSATION USING THERMISTORS

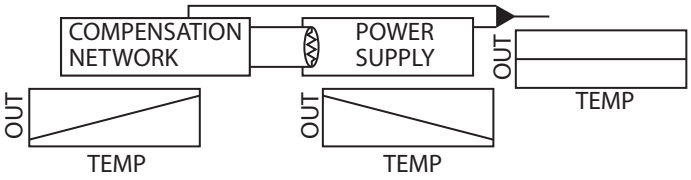
Most electronic components and assemblies are temperature sensitive to some extent, and circuit precision often necessitates some sort of temperature compensation. Oscillators, coils, and amplifiers are examples of circuits that are commonly in need of temperature compensation. Thermistors are easily utilized for general temperature compensation. Circuits and components can use either active or passive compensation. Active compensation utilizes the thermistor as a sensing element which drives an active compensation circuit, whereas passive compensation uses a thermistor in a configuration to offset an element's characteristic R-T response. Active compensation is more suitable to applications where the temperature of an entire assembly is in question, where passive compensation focuses on a critical component. The first step in electronic temperature compensation is to determine the R-T characteristic of the circuit or component which is to be compensated. The appropriate thermistor compensation network is then determined to inversely match this response as closely as possible.

ACTIVE COMPENSATION

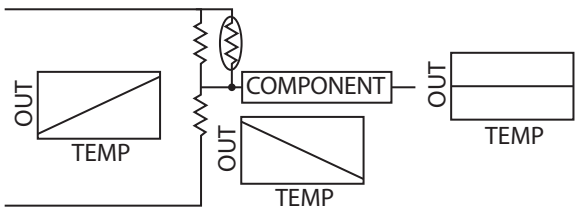


The following circuit is an example of a thermistor used to compensate a power supply. Assume that as temperature of the power supply board increases, the output voltage of the supply drifts in a negative direction. The thermistor is placed on the power supply in a location where the thermistor resistance accurately reflects the temperature of the supply circuit. As the supply heats up, the compensation amplifier voltage increases. The output of the power supply and the compensation amplifier are then fed through a summing amplifier, stabilizing the final output.

PASSIVE COMPENSATION



Assume the following component has the given R-T transfer characteristics. By incorporating the thermistor into the component biasing circuit, the effects of component temperature rise can be negated.



ABOUT QTI SENSING SOLUTIONS

QTI Sensing Solutions was founded in 1977 to meet the increasing demand for high quality electronic components for the aerospace industry. Since then, QTI has exceeded the requirements of some of the most stringent high cost of failure applications, changing the landscape of the supply chain for the entire industry.

Today, QTI continues to maintain its leadership position for mission-critical applications as well as for medical and industrial applications by supplying the world's top companies with innovative products and services. In fact, QTI developed the highest standard for surface mount thermistors with the introduction of qualified surface mount parts to MIL-PRF-32192; supplying design engineers with fully qualified Defense Logistics Agency options for two PTC and three NTC surface mount package styles. Additionally, QTI has partnered with the NASA Goddard Space Flight Center for surface mount thermistors qualified to S311-P827, an industry first!

In addition to QTI's accomplishments, our ISO:09001:2000 and AS9100 certified manufacturing and testing facilities in Idaho enhances our ability to meet the needs of today's challenging temperature measurement and control applications.

LEARN MORE

If you would like to learn more about how QTI can help you, please contact us today. We would be happy to discuss your project with you and help with the product selection process. Additionally, if you are unable to find the item you need, our engineers may be able to produce a custom component for your individual application.

Qti
Sensing Solutions

2108 Century Way Boise, Idaho 83709 USA
T: (208) 377-3373, 800-554-4784 | F: (208) 376-4754
qtisales@thermistor.com | www.thermistor.com