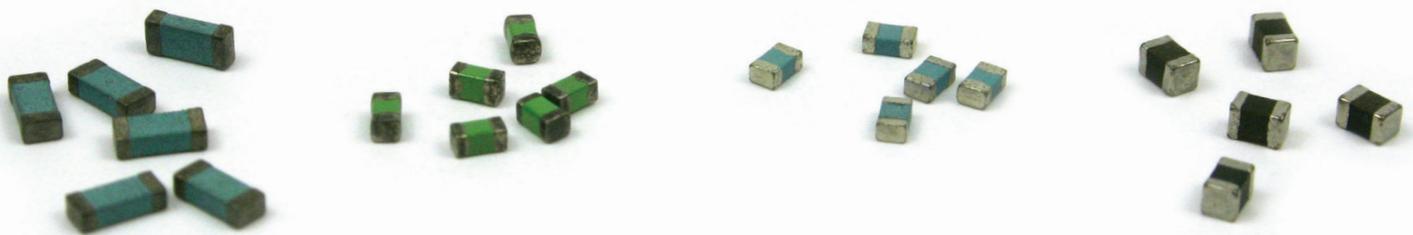


# HANDLING AND SOLDERING METHODS FOR QTI SMD THERMISTORS

QTI Sensing Solutions Engineering Department



# HANDLING

The electronic ceramics and dielectrics utilized in QTI SMDs make them inherently fragile. SMD thermistors should be handled with appropriate tools, especially designed for this purpose. When removing devices from waffle pack packaging, use non metallic tweezers and due care to avoid damage. Ensure automated equipment does not place stresses on the component. While robust, the termination finish consists of a soft solderable or gold outer layer. This may become marred or damaged by excessive force or handling.

# GENERAL

NTC (Negative Temperature Coefficient) thermistors, which are typically composed of metal oxides, are manufactured to take on the form of disks, rods, chips and other shapes. A more common shape, the SMD (surface mount device), is widely used in standard reflow soldering processes. The different values and tolerances offered by the industry allow many renditions of package sizes within the dimensional constraints of an EIA standard. Although the SMD EIA standard specifies a maximum component height, in most cases a minimum is not, allowing the manufacturer greater flexibility in offering different values within an NTC. This bulletin will focus on the methods and materials recommended for component attachment either through hand soldering for prototype construction or reflow/wave soldering operations for normal production.

# DESIGN/ PROTOTYPE CONSIDERATIONS

QTI SMD thermistors perform well in reflow soldering operations using standard low temp eutectic solders such as SN63 (see note). The gradual increase of temperature allows the component body temp to rise gradually resulting in proper solder junctions and reducing any stresses that may occur. Thermistors which contain a tin/lead plate on the terminations outperform those that do not in solderability requirements, however care must be taken to ensure proper solder paste dispensing, especially if a “low profile” component is used, to reduce any tensile stresses on the component.

# HAND SOLDERING

Due to the nature of their materials and construction, NTC thermistors can be very brittle, requiring delicate handling, especially during hand soldering operations. Their composition makes them very prone to tensile stress anomalies while remaining relatively strong in compression. During a reflow soldering operation, the component body temp is allowed to rise gradually prior to solder reflow, however in a hand solder operation, there is typically no preheat and the component is subjected to a thermal shock which may result in a fractured component. If hand soldering is necessary, a greater than 150°C temperature difference between the thermistor and the soldering iron is not recommended prior to solder iron contact. A pre-heat of the component should diminish any possibility of thermal shock occurring. If hand soldering for prototype purposes is required, ensure proper component preheat and low temp solder (max 230°C) is used.

# REFLOW SOLDERING

- QTI SMDs are not suitable for mounting on flexible substrates or in configurations that may place loads on the body. Improper CTE matches or board flexing will result in failure of the device.
- Exposure to soldering heat induces an irreversible shift in the device base resistance, therefore rework is not recommended. This magnitude of this shift is dependent on the device, contact QTI for more information.
- QTI PTC surface mount devices are not suitable for high temp (>230°C) soldering.

# CONCLUSIONS

QTI SMD thermistors are designed to accommodate most standard reflow soldering operations using standard low temp eutectic solders such as SN63. Care should be taken in selecting a thermistor that is right for the application. High temp solders are generally not recommended, especially for hand soldering operations. If the application requires the use of a high temp solder, a pre-heat of the component should be instituted to reduce any effects of thermal shock.

**NOTE:** Eutectic solder Sn63 has a melting point of approx. 183°C and typical reflow profiles will peak at 220°C-240°C for 40-75 seconds depending on the application.

# 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.