APPLICATION NOTE:

Handling and Soldering Methods for QTI SMD Thermistors

HANDLING

The electronic ceramics and dielectrics utilized in QTI SMD's 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. PTC (Positive Temperature Coefficient) devices, typically consisting of an encapsulated silicon sensing element, have specialized construction methods and materials which requires consideration during circuit design and assembly stage. 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.

REFLOW SOLDERING

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 150C 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. Although typically more mechanically robust, the internal construction methods utilized in PTC devices makes them unsuitable for hand soldering. If hand soldering for prototype purposes is required, ensure proper component preheat and low temp solder (max 230 C) is used.

DESIGN/PROTOTYPE CONSIDERATIONS

- QTI SMD's 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 sales 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. 183C and typical reflow profiles will peak at 220C-240C for 40-75 seconds depending on the application.*

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