APPLICATION NOTE

# WIRE BONDING TO NTC GOLD-TERMINATED THERMISTORS

QTI Sensing Solutions Engineering Department

QTI Sensing Solutions manufactures gold thick-film terminated NTC thermistors designed to meet the needs of today's hybrid circuit designers. These thermistors are designed for conductive epoxy mounting the bottom termination and wire bonding the top termination to a landing pad on a substrate. While reflow soldering the bottom termination to a substrate is possible, we recommend contacting QTI Engineering to discuss your application.

QTI's gold terminated thermistors are conducive to both gold ball bonding and wedge bonding. QTI performs all in-house qualifications using a K&S Model 1484LXQ ball bonder. The settings typically used for ball bonding on this machine are listed in Table I below. All wedge bond evaluations are sent to an independent lab for evaluation.

## TABLE 1. K&S BONDER SPECIFICATIONS

| Parameter | Setting | Units |
|---|---|---|
| Bond Velocity | 5-6 | mils/msec |
| Bond Time | 14-15 | msec |
| Bond Power | 90-100 | mWatts |
| Bond Force | 70-80 | grams |
| Ball Size Ratio | 2.0x | wire diameter |
| Heat | 145 | ˚C |
| Wire Diameter | 0.8-1.2 | mil |

Each Military and Aerospace lot of gold terminated NTC thermistors that QTI manufactures per MIL-PRF-32192 is evaluated for wire bond integrity. QTI uses a DAGE MT-22 bond puller to perform this test. A random sample of 12 pieces is mounted to a gold thick-film pad on an alumina substrate using conductive epoxy. The parts are then gold ball bonded and subjected to a wire bond pull test per paragraph 4.8.10.3. M32192 specifies a minimum bond pull of 4.0 grams for 30 seconds, when pulled normal to the face of the die.

In addition to the M32192 wire bond evaluations, QTI frequently performs bond strength testing per MIL-STD-883, Method 2011. Customer Source Control Drawings often specify this test specification by referencing MIL-PRF-38534 Appendix C, Table C-III Class H/K Element Evaluation. Per Method 2011 of MIL-STD-883, the minimum bond pull strength is 4.0 grams for 1.2mil Au wire.

QTI also performs occasional destructive bond pulls to determine the force required for failure and to evaluate the failure method. Using 1.2mil gold wire the typical force to fail is 8-12 grams and the failure occurs at the neck of the ball bond or at the heel of the second bond.

QTI's gold terminated NTC thermistors are engineered to meet the processing requirements of today's automated equipment without sacrificing reliability, accuracy or stability. Should you have any questions regarding the ball or wedge bonding of these thermistors, please contact QTI Engineering.

# 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.