

# CTS SENSING SOLUTIONS GUIDE





# CTS TEMPERATURE SOLUTIONS

## WHY CTS? WE...

### ARE THE EXPERTS IN THERMISTOR MANUFACTURING

CTS Temperature Solutions designs and manufactures the thermistors used in our probes, so we are assured that customers receive the most stable, accurate and reliable sensors available.

### TEST 100% FOR ACCURACY

All of the temperature probes manufactured by QTI are 100% inspected for accuracy in temperature-controlled baths to ensure proper electrical and curve-fit tolerances. Calibration data is available as an option on all of the probes we manufacture.

### CARE ABOUT THE DETAILS

Our proprietary manufacturing processes and the materials used in manufacturing ensure proper sensor placement to optimize thermal time response and minimize thermal load on the sensing element.

### PROVIDE DESIGN ASSISTANCE

While we trust that the information provided within this catalog will assist you, there is no substitute for candid one-to-one dialog. We encourage you to contact CTS Temperature Solutions to discuss specific design, sales or customer support needs.

## WHY USE A THERMISTOR?

### ECONOMICAL COST

Thermistors are the economical choice in temperature sensing. Not only are they less expensive to purchase, but there are no calibration costs during installation or during the service life of the sensor. In addition, interchangeable thermistors can be swapped out without calibration.

### QUICK TEMPERATURE RESPONSE

Due to their small size, thermistors can respond very quickly to slight changes in temperature.

### NO CALIBRATION REQUIRED

Properly manufactured thermistors are aged to reduce drift before leaving the factory. Therefore, thermistors can provide a stable resistance output over long periods of time.

### GREATER ACCURACY AND RESOLUTION

Thermistors are available with base resistances (at 25°C) ranging from tens to millions of ohms. This high resistance reduces the effect of resistance in the lead wires, which can cause significant errors with low resistance devices such as RTDs.

# Experts in Temperature Sensing



## HVAC & Refrigeration

- Heating systems, Central air systems
- Thermostats, Control/automation systems
- Remote temp sensing, Heat pumps
- Dehumidifiers and humidifiers
- Duct temp sensors



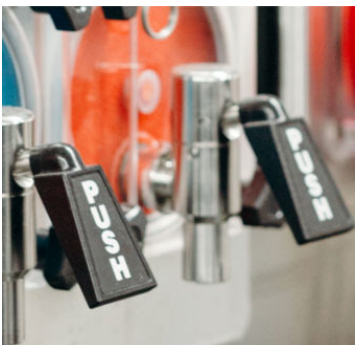
## Aerospace & Defense

- NASA Space vehicles
- Land systems
- Defense electronics
- Satellite communication
- Sensor assemblies



## Medical & Precision Instrumentation

- Cardiac Ablation Catheter
- Respiratory therapy
- Infant incubators
- Blood dialysis equipment
- Patient Temperature Control
- Disposable Skin Temperature Probe



## Food Service

- Industrial refrigerator
- Industrial freezers
- Ice machines
- Milk coolers
- Fryers, Ovens



## Pool & Spa

- High-limit temperature sensors
- Pool and spa water temp probes
- Solar collector temperature sensors
- Ambient air (freeze protection sensors)



## Boilers & Water Heating

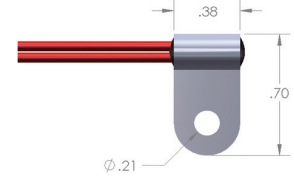
- Conventional/ Storage Tank Water Heater
- Direct, Indirect Water Heater
- Condensing Water Heater
- Electric, Gas, Solar-Powered Water Heater

# SURFACE PROBES

## FLAG RING LUG (QT06025 SERIES)



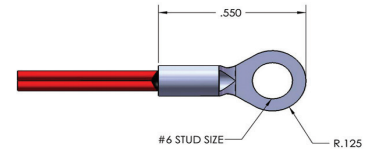
- Available in a variety of sizes with or without insulation
- Standard lug sizes: #4 to #12 with additional styles available
- Typical wire sizes: #24-28 AWG
- Material: tinned copper or nickel-plated steel



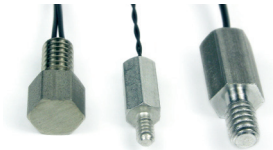
## RING LUG (QT06009 SERIES)



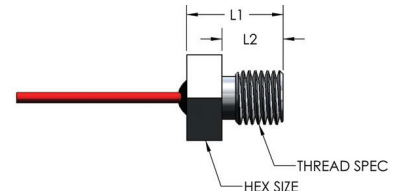
- Available in a variety of sizes with or without insulation
- Standard lug sizes: #4 to #12 with additional styles available
- Typical wire sizes: #24-28 AWG
- Material: tinned copper or nickel-plated steel



## HEX NUT PROBE (QT06007 SERIES)



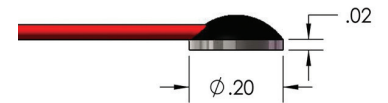
- General purpose, rugged design
- Typical wire sizes: #26-28 AWG
- Material: stainless steel, brass, titanium, aluminum
- Available with or without O-rings
- Available in metric and reverse threads



## FLAT DISC PROBE (QT06022 SERIES)



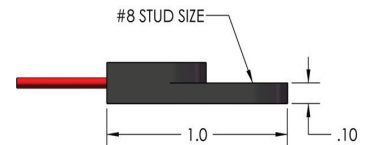
- Versatile, multi-purpose surface sensor
- Standard sizes: 0.33" and 0.21"
- Typical wire sizes: #24-28 AWG
- Can be overmolded
- Material: stainless steel, copper, aluminum



## MOLDED RING LUG PROBE (QT06024A SERIES)



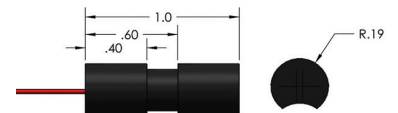
- Ideal for high humidity environments
- Operating temp range: -40°C to 80°C
- Typical wire size: #22 AWG
- Material: molded plastic



## PIPE MOUNT PROBE (QT06024B SERIES)



- Ideal for high humidity environments
- Operating temp range: -40°C to 80°C
- Typical wire size: #22 AWG
- Material: molded plastic

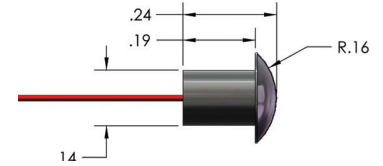


# GENERAL PURPOSE PROBES

## RIVET STYLE PROBES (QT06027 SERIES)



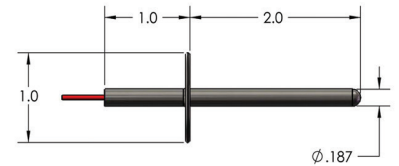
- Available in a variety of sizes
- Designed for harsh environments
- Ideal for overmolding
- Material: stainless steel, anodized aluminum



## FLANGED, OPEN OR CLOSED TIP (QT06004 SERIES)



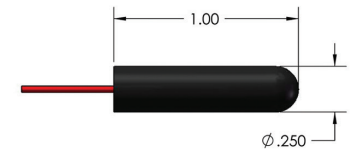
- Available in a variety of sizes with or without brazed flange
- Flange can be screwed or riveted in place
- Typical wire sizes: #22-28 AWG
- Material: stainless steel



## MOLDED TUBE PROBES (QT06024C SERIES)



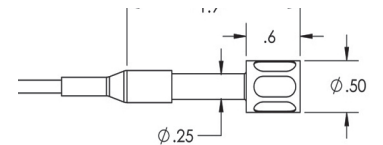
- Ideal for high humidity environments
- Operating temperature range:  $-40^{\circ}\text{C}$  to  $80^{\circ}\text{C}$
- Typical wire size: #22 AWG
- Material: molded plastic



## BIRDCAGE PROBES (QT06035 SERIES)



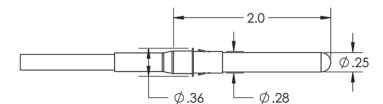
- Typical wire: #22-26 AWG
- Material: stainless steel
- Typically used for air temperature measurement where time response is critical
- Also available for use with a micro thermistor for even faster response times



## CLIP-IN AIR SENSOR (QT06037 SERIES)



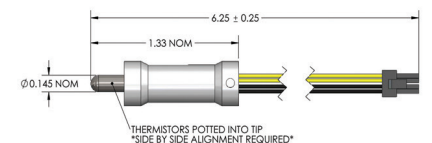
- Typical wire: #22-26 AWG
- Material: stainless steel or nickel plated brass
- Incorporated press-in clip
- Ideal for air temperature sensing in HVAC applications (install in plenums or blower housings)



## LUER-LOCK PROBES (QT06040 SERIES)



- Typical wire size: #24-30 AWG
- Compatible with standard luer fittings
- Available with two thermistors for redundancy
- Used in a wide variety of medical applications from organ transport to blood oxygenators

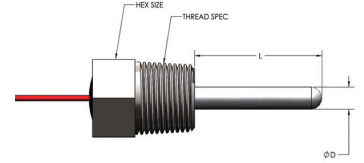


# LIQUID PROBES

## PIPE AND SAE THREADED FITTING WITH TUBE (QT06001 SERIES)



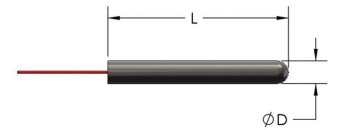
- General purpose, rugged high-pressure design
- Typical wire sizes: #22-28 AWG
- Material: stainless steel, brass, titanium
- Straight thread option with or without O-rings



## CLOSED-END TUBE (QT06005 SERIES)



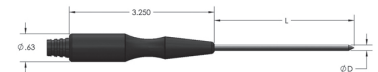
- Versatile, multi-purpose sensor
- Standard sizes: 0.040" to 0.250" in diameter
- Typical wire sizes: #22-32 AWG
- Material: stainless steel, brass, titanium, Inconel, Hastelloy



## INSPECTION PROBE (QT06028 SERIES)



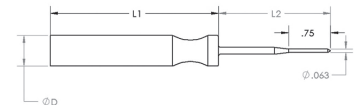
- Ideal for spot inspection
- Typical wire/cable sizes: #22-28 AWG
- Material: stainless steel with plastic or metal handle
- Available with straight or T handle



## FAST RESPONSE-STEPPED HOUSING (QT06028 SS SERIES)



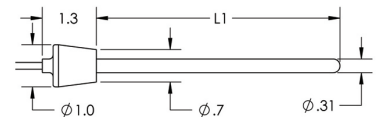
- Typical wire sizes: #22-28 AWG
- Material: stainless steel
- Available with stepped housings for fast response
- Food grade stainless steel



## BOTTLE PROBES (QT06038 SERIES)



- Typical wire size: #24-28 AWG, coil cord
- Material: stainless steel
- Integral rubber stopper for inserting into wine bottles or equivalent
- Ideal for temperature monitoring in wine cabinets, cellars, etc.

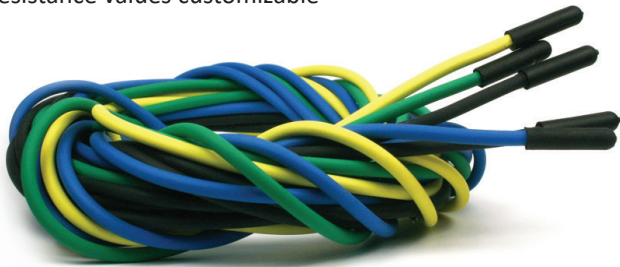


# WATERPROOF SENSORS

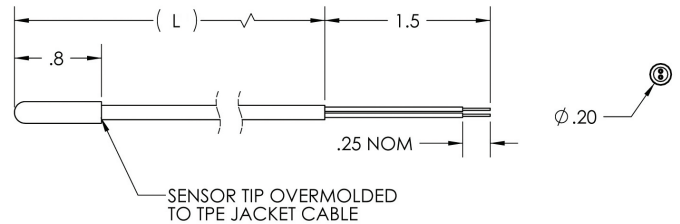
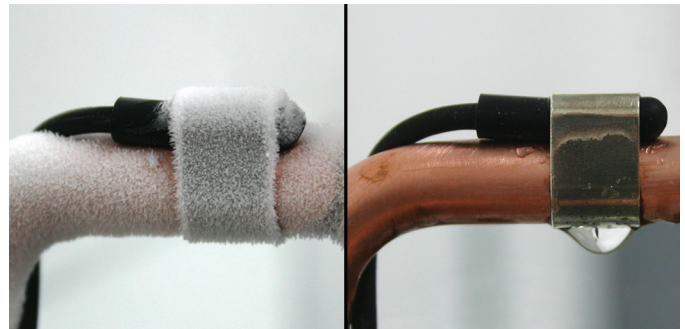
## QTIP68 SENSOR

Waterproof to IP68 rating, this sensor is designed to weather the harsh freeze/thaw cycles found in HVAC and Refrigeration environments.

- Made from double insulated thermoplastic rubber
- Ruggedized housing and corrosion resistant cable
- Waterproof rating to IP68
- Based on the most common NTC thermistor curves in the industry
- Ideal for harsh freeze/thaw cycles
- Possible applications: refrigeration and air conditioning equipment and high humidity environments
- Optional clip mount for easy installation on copper tubing
- Resistance values customizable



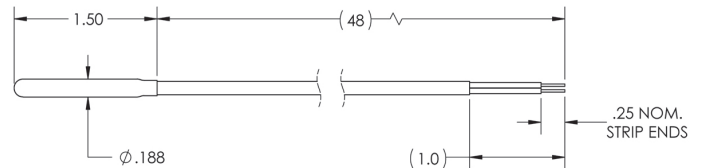
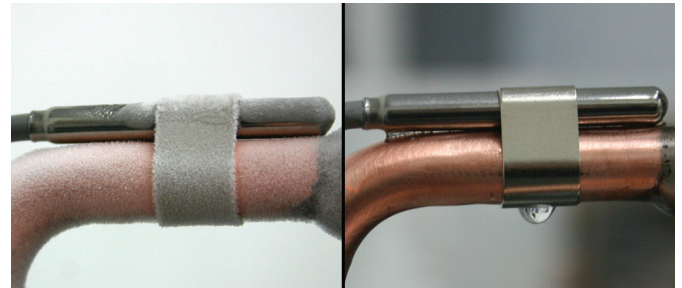
- Several cable colors available



## QTSSP SWAGE SENSOR

The waterproof QTSSP sensor excels in severe environments where response time is critical.

- Made from double insulated thermoplastic rubber
- Waterproof rating to IP68
- Robust sensor for a broad range of sensing applications
- Operating temperature range: -40°C to 105°C
- Ideal for industrial applications where response time is critical
- Swaged end provides cable strain relief and improves moisture resistance
- CTS Temperature Solutions-manufactured thermistor provides unrivaled accuracy, stability and reliability
- Optional clip mount for easy installation on copper tubing



## OPTIONAL CLIP MOUNT

Save installation time and improve the performance of the QTIP68 and QTSSP sensors by clipping them to copper tubing. Our standard clip made from stainless steel is compatible with copper tubing. A variety of clip sizes are available to suit most refrigeration applications.

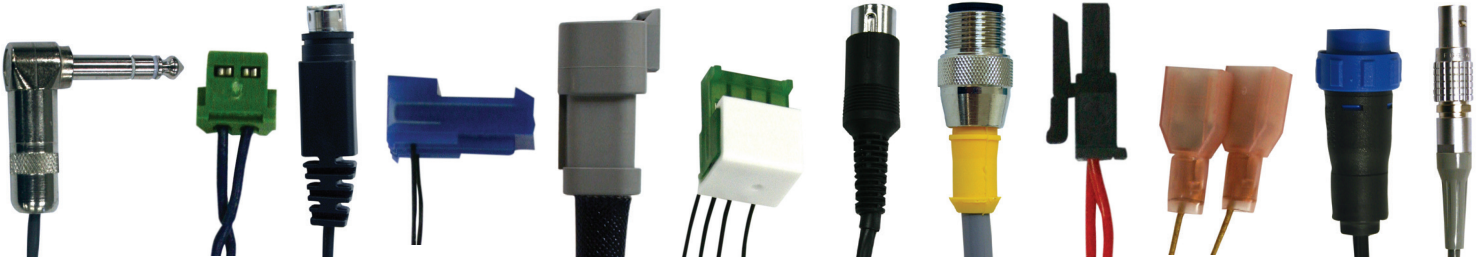
Clip sizes available: 1/4", 3/8", 1/2", 5/8", 7/8" and 1 1/8".  
1/4" and 3/8" clips are 0.38" wide. All other clips are 0.625" wide.



# VALUE ADDED CAPABILITIES

## CONNECTORS

Let CTS Temperature Solutions add a connector to your temperature probe to save you time and money. Connectors protect against displacement and increase resistance to vibration, water, oils and pressure. We offer connectors from AMP (TE), Molex, JST, Switchcraft, Deutsch, TURCK, ITT Cannon, Delphi and others.



## HOOK UP CABLES AND CABLE ASSEMBLIES

CTS' cable and cable assemblies incorporate the latest materials science to meet rigorous electrical, mechanical and environmental requirements. Our cables are engineered for the most demanding applications to offer the highest-in-class performance. They are valued in multiple industries for delivering signal integrity, and mechanical robustness in the harshest environments.



## CUSTOM AND STANDARD MOLDED STRAIN RELIEFS AND HANDLES

CTS can offer custom designed over molded wire strain reliefs and handles for applications where "end user" construction or human interface will be required. Contact us for a complete list of capabilities in this area.



## VALUE ADDED PROBE PACKAGING AND LABELING

CTS Temperature Solutions can add special labeling to any of our probe assemblies. Probe marking, lead tags, heat shrink labels, colored cables and others are our specialty. We can also single package and coil package with your label if you desire. Please contact us for a complete list of options available.





# DIRECTEMP™ USB THERMOMETERS



- Custom probe and cable configuration
- NIST-traceable certification available
- Data logging and alert notification software included
- Able to run multiple sensors

Available tolerances*	+/- 0.5°C (0°C to 70°C) +/- 0.1°C (0°C to 100°C) +/- 0.05°C (0°C to 70°C)
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Resolution 0 .01°C

RoHS compliant Yes

Current draw <100mA



- Multiple probe styles are available. Pictured below are DTU6022 (flat disc), DTU6009 (ring lug), DTU6035 (air), DTU6024C (IP68 waterproof), DTU6005 (closed-end tube), DTU6028S (fast response probe), DTU6028P (plastic-handled probe) and DTU6005-008 (immersion probe.)

Please contact CTS Temperature Solutions for additional probe styles.

## AVAILABLE INTERFACE OPTIONS

### HID configuration

(Plug and play, DirectTemp software included)

- Automatic driver installation in Microsoft Windows
- DirectTemp data logging software included for Windows
- Stream data to a plot and record to file for future analysis
- Compatible with Windows (XP, Vista, 7 and 8)

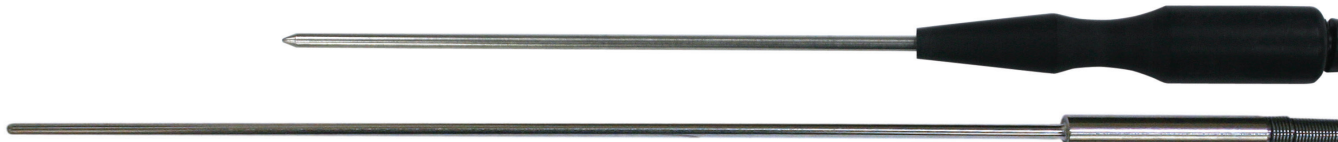
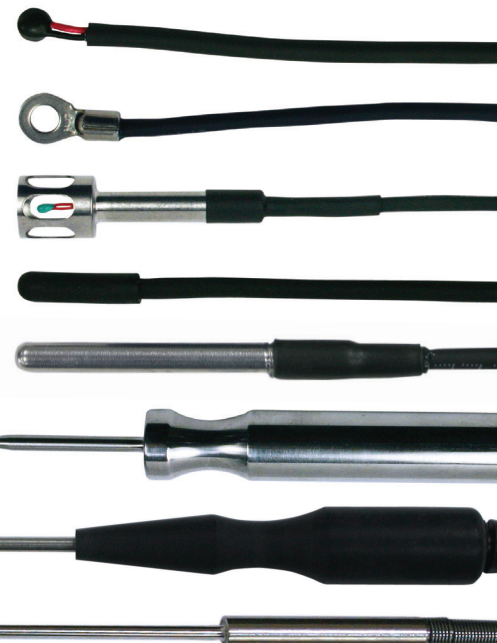
### USB-SERIAL CONFIGURATION

(Virtual Com Port, for OEM and proprietary software applications)

- Virtual serial device
- Designed for integration with custom third party software applications
- Free demo software and LabVIEW VI included
- Communication protocol information available upon request
- Compatible with Linux and Windows systems
- Additional programming language examples available

\* User specified single point temperatures and tolerances available

Warning: Do not use in human life support applications. This device is not designed nor intended to operate in situations where human injury will result in the event of a failure.

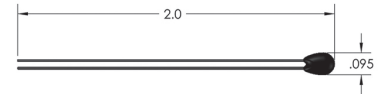


# NTC THERMISTOR ELEMENTS

## POINT MATCHED THERMISTORS (QTMC SERIES)



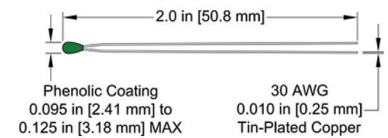
- Available in a variety of wire types and lengths
- Typical wire sizes: #26-30 AWG
- Leads: Kynar, PVC, Teflon, tin-plated copper
- Resistance values from 100 ohms to 9.8 M ohms
- Temperature range: -55°C to 155°C
- RoHS compliant parts available



## INTERCHANGEABLE THERMISTORS (E100, T100 SERIES)



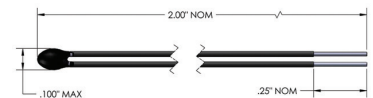
- Available in a variety of sizes with or without insulation
- Standard lug sizes: #4 to #12 with additional styles available
- Typical wire sizes: #24-28 AWG
- Material: tinned copper or nickel-plated steel



## POINT MATCHED THERMISTORS WITH INSULATED LEADS (QTMCA, QTMCB, QTMCC SERIES)



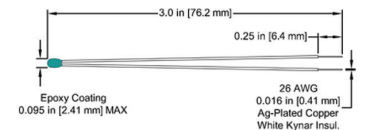
- General purpose, rugged design
- Typical wire sizes: #26-28 AWG
- Material: stainless steel, brass, titanium, aluminum
- Available with or without O-rings
- Available in metric and reverse threads



## INTERCHANGEABLE THERMISTORS WITH INSULATED LEADS (E200, T200 SERIES)



- Versatile, multi-purpose surface sensor
- Standard sizes: 0.33" and 0.21"
- Typical wire sizes: #24-28 AWG
- Can be overmolded
- Material: stainless steel, copper, aluminum

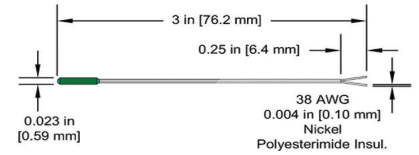


# MINI/MICRO NTC THERMISTORS

## MICRO THERMISTORS (E320 SERIES)



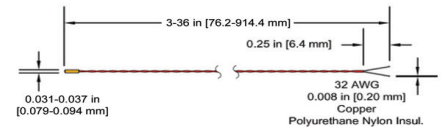
- Typical diameter: 0.023"
- Operating temperature range: 0°C to 70°C
- Typical wire size: #38 AWG
- Leads: solid nickel, Polyesterimide insulation
- Material: epoxy, polyimide
- Typical Dissipation Constant = 0.2mW/°C in still air
- Typical Time Constant in still air = 3 seconds
- RoHS compliant
- Available in point matched and interchangeable tolerances



## MINIATURE THERMISTORS (E330 SERIES)



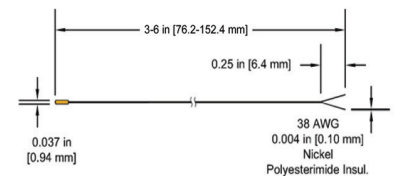
- Typical diameter: 0.0031" to 0.037"
- Operating temperature range: 0°C to 70°C
- Typical wire sizes: #32 AWG
- Leads: solid copper, polyurethane insulation
- Material: epoxy, polyimide
- Typical Dissipation Constant = 1mW/°C in still air
- Typical Time Constant in still air = 4 seconds
- RoHS compliant
- Available in point matched and interchangeable tolerances



## MINIATURE THERMISTORS (E340 SERIES)



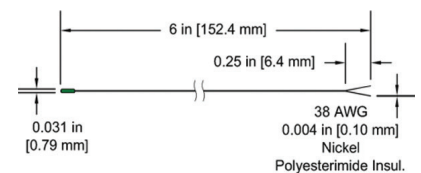
- Typical diameter: 0.037"
- Operating temperature range: 0°C to 70°C
- Typical wire size: #38 AWG
- Leads: solid nickel, Polyesterimide insulation
- Material: epoxy, polyimide
- Typical Dissipation Constant = 1mW/°C in still air
- Typical Time Constant in still air = 4 seconds
- RoHS compliant
- Available in point matched and interchangeable tolerances



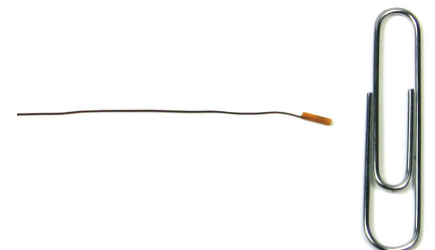
## MINIATURE THERMISTORS (E350 SERIES)



- Typical diameter: 0.031"
- Operating temperature range: 0°C to 70°C
- Typical wire size: #38 AWG
- Leads: solid nickel, Polyesterimide insulation
- Material: epoxy, polyimide
- Typical Dissipation Constant = 0.5mW/°C in still air
- Typical Time Constant in still air = 4 seconds
- RoHS compliant
- Available in point matched and interchangeable tolerances



- Scale of E340 Series miniature thermistor probes

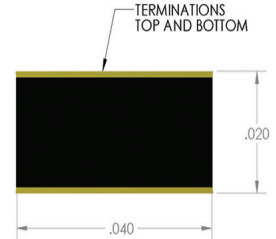


# NTC/SMD THERMISTOR CHIPS

## GOLD THICK-FILM TERMINATED DIE (T021 SERIES)



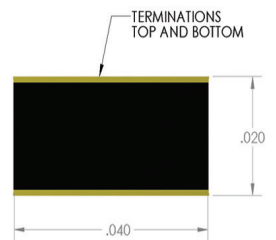
- Part sizes: 0.040" square to 0.011" square
- Resistance values from 100 ohms to 20 M ohms
- Available with gold or silver terminations
- Hybrid attachment (wire bond/epoxy)
- RoHS compliant
- Typical Dissipation Constant = 0.0625W, derate to 0 at 125°C
- Typical Time Constant in still air = 10 seconds
- Tolerances: 1%, 2%, 5%, 10%



## GOLD THIN-FILM TERMINATED DIE (T041 SERIES)



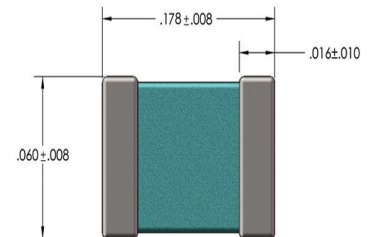
- Part sizes: 0.040" square to 0.011" square
- Resistance values from 100 ohms to 20 M ohms
- Available with gold or silver terminations
- Hybrid attachment (wire bond/solder)
- RoHS compliant
- Typical Dissipation Constant = 0.0625W, derate to 0 at 125°C
- Typical Time Constant in still air = 10 seconds
- Tolerances: 1%, 2%, 5%, 10%
- Ideal for reflow soldering die to board and wire-bonding die top side
- Available with pre-deposited solder



## QT0805 NTC SERIES THERMISTORS (E340 SERIES)



- Standard EIA 0805 package size
- Resistance values from 50 ohms to 10 M ohms
- Available with gold, pure tin or tin/lead terminations
- Typical Dissipation Constant = 2 mW/°C in still air
- Typical Time Constant in still air = 8 seconds max
- Tolerances: 1%, 2%, 5%, 10%
- Operating range: -65°C to 150°C
- Power rating: 0.125 Watts max
- Available waffle packed or tape and reel
- Available in Z/D, S/F, T, Y, X, P and V curves



- Scale of T041 thermistor chips

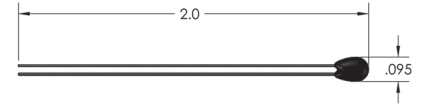


# DEFENSE-QUALIFIED THERMISTORS

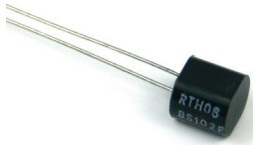
## RTH44 MIL-PRF-23648/20



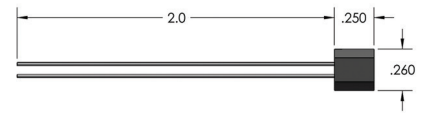
- Resistance values from 300 ohms to 500k ohms
- Operating temp range -55°C to 125°C
- Meets or exceeds MIL-PRF 23648
- Typical Dissipation Constant = 2mW/°C in still air
- Tolerance: 1%, 2%, 5%, 10%
- Power rating: 0.2 Watts at 25°C max



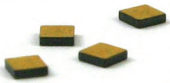
## RTH06 MIL-PRF-23648/1



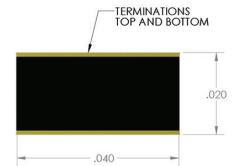
- Resistance values from 68 ohms to 75k ohms
- Typical Dissipation Constant = 5mW/°C in still air
- Thermal Time Constant in still air = 80 seconds max
- Temp Range: -55°C to 125°C
- Meets or exceeds MIL-PRF 23648
- Power rating: 0.5 Watts at 25°C max



## M32192/3 NTC THERMISTOR DIE



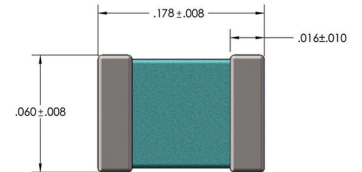
- Resistance values from 15 ohms to 20 M ohms
- Typical Dissipation Constant = 0.625mW/°C in still air
- Thermal Time Constant in still air = 10 seconds max
- Power rating: 0.0625W, derate to 0 at 125 °C
- Available with a variety of termination finishes



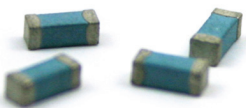
## M32192/4 NTC EIA 0805 PACKAGE



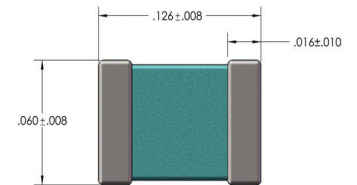
- Typical Dissipation Constant = 2mW/°C in still air
- Thermal Time Constant in still air = 8 seconds max
- Power rating: 0.125 Watts at 25°C max
- Available with a variety of termination finishes



## M32192/5 NTC EIA 1206 PACKAGE



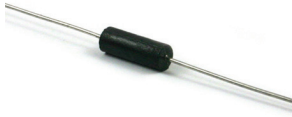
- Thermal Time Constant: 8 seconds max in still air
- Dissipation Constant: 2 mW/°C min in still air
- Power rating: 0.25 W at 25°C, derate to 0 W at 125°C
- Resistance at 25°C: 470 ohms to 10 M ohms
- Operating temperature range: -55°C to 125°C
- Storage temperature range: -65°C to 150°C



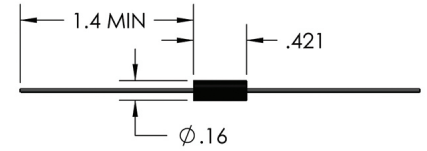
\*Thermal time constant and dissipation constant may vary depending on mounting

# DEFENSE-QUALIFIED PTC THERMISTORS

## RTH44 MIL-PRF-23648/9



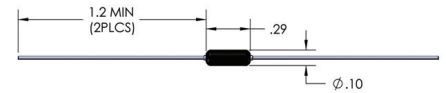
- Positive temperature coefficient: 0.7%/°C
- Resistance values from 10 ohms to 10k ohms
- Operating temperature range -55°C to 125°C
- Meets or exceeds MIL-PRF 23648
- Tolerance: 5%, 10%
- Power rating: 0.5 Watts at 25°C
- Thermal Time Constant in still air = 60 seconds max



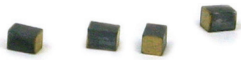
## RTH42 MIL-PRF-23648/19



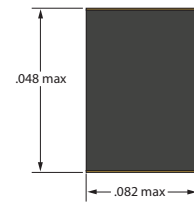
- Positive temperature coefficient: 0.7%/°C
- Resistance values from 10 ohms to 10k ohms
- Operating temp range -55°C to 125°C
- Meets or exceeds MIL-PRF 23648
- Tolerance: 5%, 10%
- Power rating: 0.250 Watts at 25°C
- Thermal Time Constant in still air = 60 seconds max



## M32192/1 PTC THERMISTOR DIE



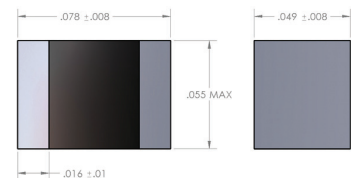
- Positive temperature coefficient: 0.7%/°C
- Resistance values from 10 ohms to 10k ohms
- Typical Dissipation Constant = 1.25mW/°C in still air
- Thermal Time Constant in still air = 30 seconds max
- Power rating: 0.125W, derate to 0 at 125°C



## M32192/2 PTC EIA 0805 PACKAGE



- Positive temperature coefficient: 0.7%/°C
- Typical Dissipation Constant = 2.5mW/°C in still air
- Thermal Time Constant in still air = 30 seconds max
- Power rating: 0.250 Watts at 25°C max
- Available with a variety of termination finishes

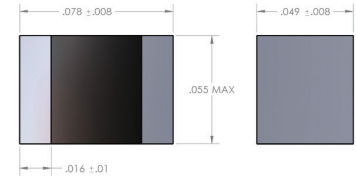


# DEFENSE-QUALIFIED THERMISTORS

## SPACE LEVEL NASA GSFC S-311-P-827/31, 32



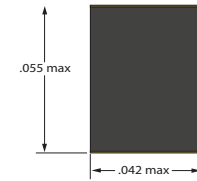
- Resistance values from 150 ohms to 2k ohms
- Acceptable for use in NASA space programs specifying quality level (Grade) 1 parts
- Available with Sn/Pb or gold termination
- Meets Level 1 classification per EEE-INST-002
- Single lot traceability



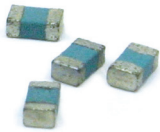
## SPACE LEVEL NASA GSFC S-311-P-827/33, 34



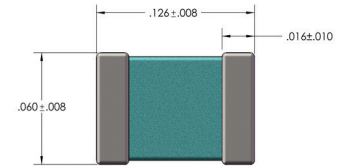
- Resistance values from 75 ohms to 1.5k ohms
- Acceptable for use in NASA space programs specifying quality level (Grade) 1 parts
- Meets Level 1 classification per EEE-INST-002



## SPACE LEVEL NASA GSFC S-311-P-827/01, 02, 03, 04



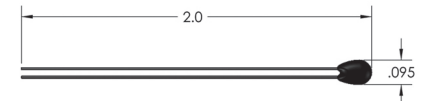
- Available in 50k or 100k ohms
- Interchangeable tolerances to +/- 0.5°C (0°C to 70°C)
- Acceptable for use in NASA space programs specifying quality level (Grade) 1 parts
- Available with Sn/Pb or gold termination
- Meets Level 1 classification per EEE-INST-002
- Single lot traceability



## SPACE LEVEL NASA GSFC S-311-P-18



- Resistance values from 2.252k to 30k ohms
- Interchangeable tolerances to +/- 0.1°C (0°C to 70°C)
- Acceptable for use in NASA space programs specifying quality level (Grade) 1 parts
- Single lot traceability



## QTI TEST LAB

CTS maintains an extensive test laboratory, designed with defense and aerospace customers in mind. This test lab is ISO 9001:2008 and AS9100 Revision B certified. We are qualified to perform all tests dictated by the Department of Defense, Defense Logistics Agency MIL-PRF-23648, and MIL-PRF-32192 specifications. In addition we have the facilities to perform many of the tests specified in MIL-STD-202, MIL-STD-883, NASA Goddard S-311-P-18 and S-311-P-827, EEE-INST-002, TOR-2006, ESA 4006, and MIL-PRF-38534 Class K and H Element Evaluation tests.

### Testing services provided upon customer request: Testing capabilities:

- Power burn-in
- Temperature cycling
- Moisture testing
- Shock and vibration testing
- Temperature characterization
- Space-level screening
- QCI military testing
- Cryo-chamber conditioning
- Wafer evaluation
- Die shear
- Wire bonding/evaluation
- Bake out
- Environmental: 150m Torr to 150 PSI
- -196°C to 1400°C
- Up to 100% relative humidity
- DC power: 0 to 6000 volts
- 0 to 100 amps
- Inspection: 0x to 100x optical
- Digital image capture
- Shock/vibration: 30g to 1500g, 75Hz to 2000Hz
- Wire bond pull: 0 to 1000 grams
- Die shear: 0g to 10 Kg
- Solderability: per all military specs
- Density: 0.001 to 61 g/cm3

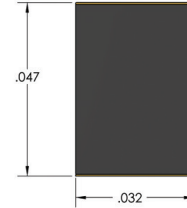


# DEFENSE-QUALIFIED PTC THERMISTORS

## PTC THERMISTOR DIE (QTC11)



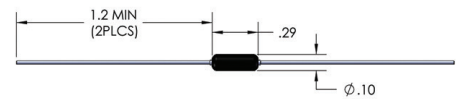
- Part size: 0.032" x 0.032" square
- Part thickness: 0.028", 0.050" or 0.072"
- Resistance values from 10 ohms to 10k ohms
- Gold terminations
- Board attachment by either wire bonding or conductive epoxy
- RoHS compliant
- Typical Dissipation Constant = 2mW/°C in still air
- Typical Time Constant in still air = 8 seconds
- Tolerances: 1%, 2%, 5%, 10%
- Operating range: -55°C to 125°C
- Positive temperature coefficient: 0.7%/°C



## GLASS AXIAL PTC THERMISTORS (QTG12)



- Standard DO35 package size
- Resistance values from: 10 ohms to 10k ohms
- Typical Time Constant in still air = 55 seconds max
- Tolerances: 1%, 2%, 5%, 10%
- Operating range: -65°C to 125°C
- Power rating: 0.125 Watts at 100°C
- Available loose or tape and reel
- RoHS compliant available
- Commercial version of RTH42 (MIL-PRF 23648)
- Positive temperature coefficient: 0.7%/°C







# RESISTANCE/TEMPERATURE CHART

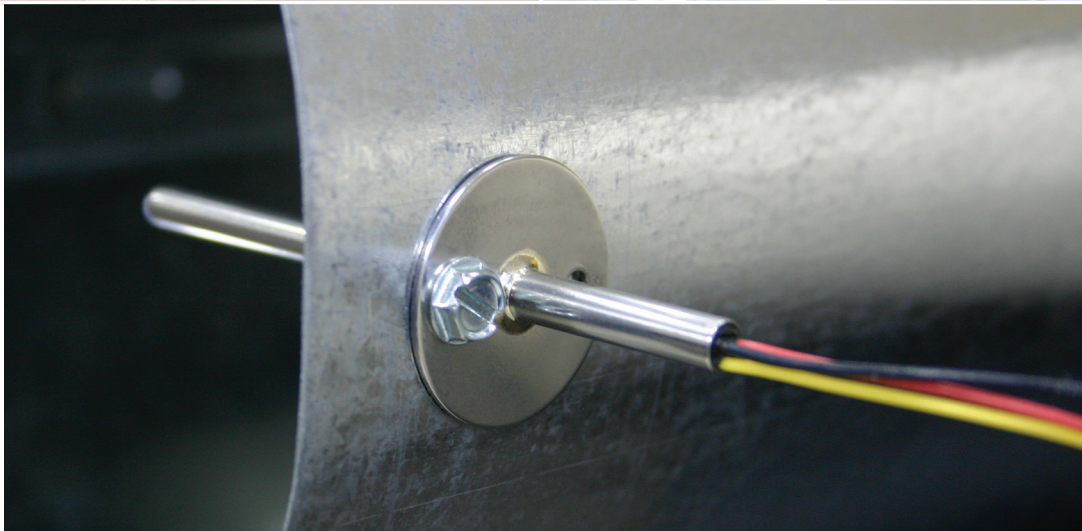
Reference R/T Characteristics for MIL-PRF-23648, MIL-PRF-32192 and S-311-P-827 NTC Thermistors. To determine the resistance at particular temperature, multiply the 25°C base resistance value by the multiplier in the table below. For example, a 10,000 ohm at 25°C, MIL Ratio B part would measure 36,430 ohm at 0°C (10,000 x 3.643 = 36,430).

Temp (°C)	Ratio A	Ratio B	Ratio C	Ratio D	Ratio H	Ratio L	Ratio M	Ratio N	Ratio R	Ratio X
Ratio 25/125	19.8	29.4	48.7	7.1	13	16.1	23.3	38.5	62.5	142.9
-55	54.78000	96.40000	130.60000	11.51000	31.90000	36.60000	60.78000	117.50000	159.00000	479.00000
-50	40.06000	67.06000	90.06000	9.55000	24.30000	27.50000	44.13000	81.32000	110.10000	307.00000
-45	29.53146	47.08421	62.48620	7.97020	18.60800	20.90389	32.31143	56.69045	77.39160	196.70410
-40	22.05000	33.66000	44.03000	6.69000	14.40000	16.10000	23.98000	40.16000	55.50000	128.00000
-35	16.59240	24.28525	31.23700	5.63700	11.27500	12.46138	17.93125	28.66344	39.76690	83.16060
-30	12.58000	17.70000	22.35000	4.77000	8.93000	9.70000	13.52000	20.64000	28.40000	54.00000
-25	9.61546	13.03128	16.14070	4.05690	7.11500	7.61934	10.27869	14.99955	20.34710	35.20120
-20	7.42200	9.71200	1.80000	3.47000	5.69000	6.05000	7.89100	11.03000	14.65000	23.38000
-15	5.77700	7.29800	8.69100	2.98000	4.56000	0.84000	6.10200	8.17500	10.51000	15.84000
-10	4.52700	5.53400	6.45300	2.56000	3.68000	3.89000	4.75400	6.11900	7.60900	10.85000
-5	3.58000	4.23400	4.83000	2.22000	2.99000	3.15000	3.73100	4.61500	5.55800	7.50800
0	2.84800	3.26600	3.64300	1.93000	2.45000	2.57000	2.94900	3.51000	4.09400	5.24600
5	0.28200	2.54000	2.77400	1.67800	2.02000	2.10000	2.34600	2.69000	3.04100	3.70000
10	1.83800	1.99000	2.12800	1.47000	1.68000	1.73000	1.87900	2.07800	2.27700	2.63300
15	1.49200	1.57100	1.64400	1.29000	1.42000	1.43000	1.51300	1.61700	1.71800	1.89100
20	1.21800	1.24900	1.27800	1.13000	1.18000	1.19000	1.22600	1.26700	1.30600	1.36900
25	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
30	0.82610	0.80580	0.78700	0.88450	0.85400	0.84100	0.81940	0.79420	0.77090	0.73580
35	0.68620	0.65320	0.62340	0.78470	0.73200	0.71100	0.67520	0.63480	0.59830	0.54550
40	0.57270	0.53260	0.49680	0.69830	0.62800	0.60400	0.55920	0.51050	0.46740	0.40730
45	0.48040	0.43680	0.39830	0.62320	0.53700	0.51500	0.46550	0.41290	0.36470	0.30650
50	0.40450	0.36020	0.32100	0.55780	0.46400	0.44200	0.38930	0.33590	0.29050	0.23170
55	0.34270	0.29860	0.26020	0.50000	0.40300	0.38000	0.32700	0.27480	0.23110	0.17640
60	0.29140	0.24880	0.21200	0.45050	0.35000	0.32800	0.27600	0.22950	0.18480	0.13580
65	0.24900	0.20820	0.17340	0.40640	0.30500	0.28500	0.23390	0.18670	0.14870	0.10490
70	0.21370	0.17510	0.14260	0.36750	0.26700	0.24800	0.19900	0.15500	0.12020	0.08130
75	0.18410	0.14800	0.11790	0.33320	0.23600	0.21600	0.17000	0.12930	0.09770	0.06350
80	0.15920	0.12560	0.09780	0.30270	0.20800	0.18900	0.14580	0.10840	0.07980	0.04980
85	0.13820	0.10710	0.08140	0.27570	0.18300	0.16700	0.12550	0.09120	0.06550	0.03930
90	0.12040	0.09164	0.06810	0.25160	0.16300	0.14700	0.10840	0.07710	0.05400	0.03130
95	0.10530	0.07874	0.05720	0.23010	0.14500	0.13000	0.09393	0.06540	0.04470	0.02500
100	0.09230	0.06792	0.04820	0.21090	0.13000	0.11500	0.08168	0.05570	0.03720	0.02000
105	0.08130	0.05880	0.04080		0.11700	0.10173	0.07126	0.04760	0.03120	0.01610
110	0.07180	0.05108	0.03470		0.10500	0.08996	0.06235	0.04080	0.02620	0.01300
115	0.06360	0.04452	0.02960		0.09400	0.07949	0.05473	0.03510	0.02200	0.01060
120	0.05650	0.03894	0.02530		0.08500	0.07076	0.04818	0.03030	0.01860	0.00870
125	0.05040	0.03416	0.02170		0.07700	0.06183	0.04253	0.02630	0.01580	0.00710

## R/T CHARACTERISTICS FOR MIL-PRF-23648, MIL-PRF-32192 and S-311-P-827 PTC THERMISTORS

Temp °C	10-75 ohms	82 -160 ohms	180-510 ohms	560-1,800 ohms	1,800-6,200 ohms	6,800-10,000 ohms
25/125 ratio	0.53 - 0.55	0.53-0.55	0.53-0.55	0.53-.055	0.53-0.55	0.53-0.55
-55	0.615	0.582	0.56	0.55	0.515	0.51
-15	0.079	0.77	0.74	0.74	0.73	0.73
0	0.863	0.847	0.835	0.835	0.825	0.825
25	1	1	1	1	1	1
50	1.16	1.17	1.2	1.2	1.23	1.19
75	1.35	1.37	1.42	1.42	1.45	1.4
100	1.545	1.584	1.656	1.656	1.67	1.61
125	1.75	1.8	1.92	1.92	1.96	1.83

Numbers above are for reference only. Consult the specific performance specification for actual R/T multipliers by part style; MIL-PRF-23648/9, MIL-PRF-32192/1 and /2, and S-311-P-827-31, -32, -33, and -34.



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