FAQ on Temperature Sensing and NTC Thermistors

WHY SHOULD I USE AN NTC THERMISTOR AS A TEMPERATURE SENSOR INSTEAD OF ANY OTHER TYPE OF CONTACT TEMPERATURE SENSOR?

- NTC thermistors provide the highest available degree of sensitivity to temperature changes. NTC thermistors have a temperature coefficient of - 3 %/°C to - 5 %/°C, compared to just 1 %/°C for a silicon-based sensor, 0.39 %/°C for a platinum-based sensor, and 0.3 %/°C to 0.55 %/°C for a nickel-based sensor.
- NTC resistance values can be high to very high, which means that low-current, two-point measurements can be done with a high level of precision.
- NTC thermistors offer the best performance/price ratio of the available temperature sensors.
- NTC thermistors can be supplied in a variety of different packages. Options include surface-mount (SMD) and through-hole (leaded) versions and assembly probes for fluid, gas, or contact surface temperature measurement.

IS THE NON LINEARITY OF AN NTC THERMISTOR A PROBLEM FOR PROPER USE?

- For the temperature detection of one or several threshold values, the non linearity does not play a role in the accurate measurement.
- For proper temperature evaluation based on a measured resistance value, the resistance versus temperature relation can be stored in the form of a look-up table with easy interpolation, or as an algorithm which can be programmed to give an exact matching temperature based on a resistance value.
- All the R-T curves of the Vishay BCcomponents NTC thermistors are available on the Vishay web site as downloadable files, for easy calculation of values, limits, and accuracies. (Thermistors - Vishay - Curve Computation)

I NEED AN NTC THERMISTOR MATCHING SEVERAL TEMPERATURE/RESISTANCE POINTS, WITH VALUES AND TOLERANCES GIVEN. HOW DO I OBTAIN SUCH A DEVICE?

- Point-matched or curve-tracked interchangeable NTC thermistors are usually installed in automotive applications.
- Please send your requirements directly to your Vishay office. A proposal will be made based on types that optimally match your request.
- Please provide as much detail as possible about the application, including temperature range, type of medium, accuracy needed, reaction time, mounting considerations, etc.

CAN I USE A STANDARD THERMISTOR FROM THE AVAILABLE RANGES, OR DO I NEED SPECIAL DEVICE TYPE?

- Our series types withstand standard conditions of use (95 % relative humidity at 40 °C) and are not insulated. If there is any possibility of the components coming in contact with conductive surfaces having different potentials, leakage currents can result, deteriorating the measured resistance value. If the component must be insulated, please contact your Vishay representative or use insulated parts from the 2381 640 20, 645 10, or 645 20 series.

WHERE CAN I FIND AN OVERVIEW OF THE R-T TABLES OF THE VISHAY NTC THERMISTORS?

- Look on the Vishay website under R/T computation files at (Thermistors - Vishay - Curve Computation)

I NEED TO MATCH A THERMISTOR CURVE DEFINED BY A R 25 °C OR R AT ANOTHER TEMPERATURE AND A B VALUE, BUT THE B VALUES I HAVE ARE DEFINED BETWEEN TEMPERATURES OTHER THAN 25 °C AND 85 °C. HOW CAN I GET THE CORRELATION WITH THE VISHAY-SPECIFIED B25/85?

- Some suppliers have B values specified between other temperatures. The correlation between these B values and Vishay values depends on the form of the curve and can change from one type of product to another. Please contact your Vishay representative or submit your question online here: nlr@vishay.com.

DOES VISHAY HAVE COMPONENTS WITH A TEMPERATURE RANGE UP TO 300 °C

- Yes, devices in the 2381 633 7 series of glass encapsulated leaded components are specified up to 300 °C.

ARE VISHAY THERMISTORS ROHS-COMPLIANT?

- Yes. RoHS compliance is indicated by the first 4 digits "2381" in the type number code and by the codes E2, E3 and E4 in the clear code SAP part numbers.

HOW CAN I TELL WHAT TYPE OF TERMINATION COATING THE DEVICE HAS BY LOOKING AT THE PART NUMBER?

- In the ordering part number, E2 means Sn alloys; E3 means pure tin (Sn); and E4 means noble metal is used as the termination finish.

WHAT DO I DO IF I NEED A COMPONENT WITH MAXIMUM PRECISION AT SOME TEMPERATURE VALUE OTHER THAN THE 25 °C INDICATED IN THE PRODUCT DATASHEET?

- Consult the R/T computation programs: a central reference temperature other than 25 °C can be chosen along with a tolerance. (Thermistors - Vishay - Curve Computation)

WHAT IF I WANT MY TEMPERATURE DATA EXPRESSED IN DEGREES FAHRENHEIT INSTEAD OF CELSIUS?

- Look in the R/T computation programs: download the files where R/T tables are expressed in °F. (Thermistors - Vishay - Curve Computation)

IN MY APPLICATION, THE COMPONENTS ARE POTTED INTO THERMO-CONDUCTIVE EPOXY. WHICH COMPONENTS ARE BEST COMPATIBLE WITH THIS PROCESS?

- Select the 2381-640-20, 2381-645-10 or 2381-645-20 series with a flexible top-coating.

I NEED A SENSOR FOR SURFACE TEMPERATURE MEASUREMENT... WHERE CAN I FIND THIS?

- Select the ring tongue sensors or LUG type 2381-645-90xxx or NTC A LUG…103 series.

ARE THERE SURFACE-MOUNT EQUIVALENTS FOR ALL THROUGH-HOLE THERMISTORS?

- Not for all the R25 values. Vishay offers equivalents for standard R25 values (10K, 100K with B25/85 = 3435K and 3977K). Consult the R/T computation programs for the SMD series and choose the low, medium, or high B values. The program will give you the appropriate part number.

DOES VISHAY TRIM ITS NTC THERMISTORS FOR HIGHER-PRECISION PERFORMANCE?

- In most cases no. The stability and homogeneity of the NTC material, together with the precise dimensioning of the NTC chip, allow us to achieve low tolerance parts without trimming. We use a trimming process only for some very tight tolerances in point-matched or curve-tracked interchangeable parts. In such cases, we only trim off a tiny percentage of the chip area to achieve the desired high accuracy.

WHY DO THE VISHAY THERMISTORS HAVE TWO PART NUMBERS?

- The 12 digit (12NC) codification comes originally from Philips components era.
- The SAP clear code was added when the logistic systems switched to SAP.
- Both codifications will coexist for some time.

CAN I DEDUCE PRODUCT INFORMATION FROM YOUR SAP PART NUMBER?

- Yes look in part number order information, and choose your execution (leaded, SMD or assemblies).

I NEED THE UTMOST STABILITY AND PRECISION FOR MY APPLICATION. WHICH COMPONENT SHOULD I CHOOSE?

- It all depends on the type of mechanical executions that you want to use.
- If SMD is needed, then use NTCS0805E3104*MT.
- If a leaded component is required, then we suggest 2381 640 55103.

WHICH DEVICE SHOULD I CHOOSE IF LOW PRICE IS MORE IMPORTANT THAN STABILITY OR PRECISION?

- In this case choose a ± 5 % tolerance part with copper leads like the 2381 640 63103. It's a low priced component with fair precision and good stability.
- For an SMD implementation, a part like the 2381 615 53103 (a 10 kΩ ± 5 % device in the 0805 package) will do the job perfectly.