NMV2D

Temperature Sensor – Wafer Temperature Calibration Details

1. Introduction

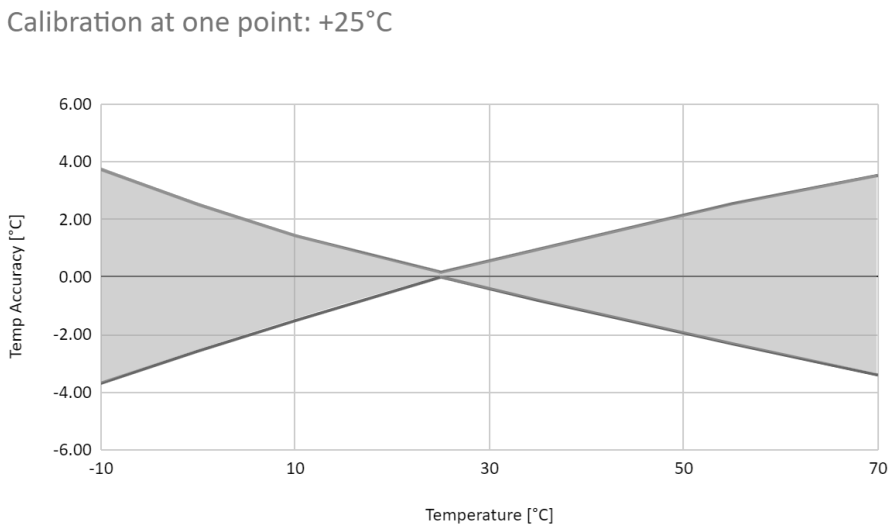
For the NMV2D RFID chip, the temperature calibration at wafer level is basically to perform some conducted RFID reads and writes of data based on the result of a comparison to a reference temperature source. So, at the next temperature measure operation using the calibrated chip, mounted on a transponder label, the written data is used to calculate the current temperature.

In this document, details of the wafer temperature calibration results are shown.

2. Temperature Accuracy

NMV2D temperature sensor calibration done at wafer level uses one temperature point. This is set at wafer prober equipment and the calibration controller executes the process for all the dies. Normally it is executed at room temperature, around 25ºC.

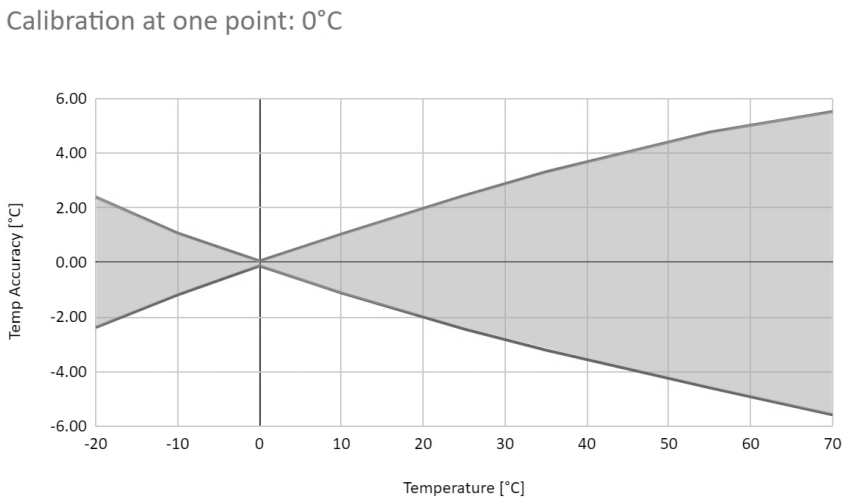
Temperature accuracy is extracted based on exhaustive tests at bench. Its behavior can be described using the graph below:



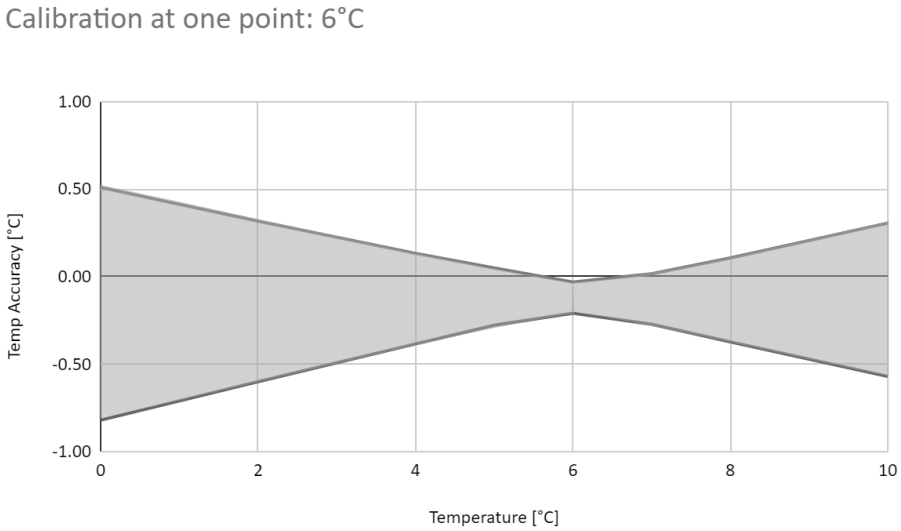
At temperatures near the calibration temperature, the accuracy is around ±0.1ºC. As the temperature moves away from the calibration point, the variation in accuracy tends to increase, which is a normal behavior for systems of this type.

So, calibration temperature can be adjusted for better accuracy depending on the final application environment.

For instance, if we define the calibration temperature for 0ºC the expected accuracy behavior is:



Considering an application that will work on the temperature range of 2ºC and 8ºC, we can define the calibration temperature to be 6ºC, as shown below:

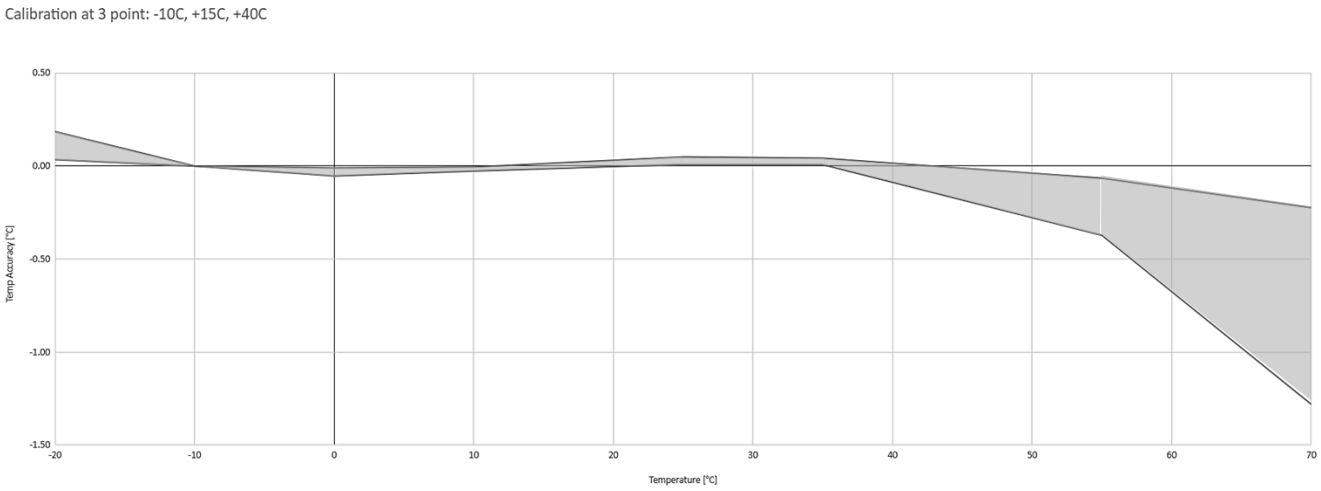


The average accuracy for the application's temperature range will be ±0,27ºC.

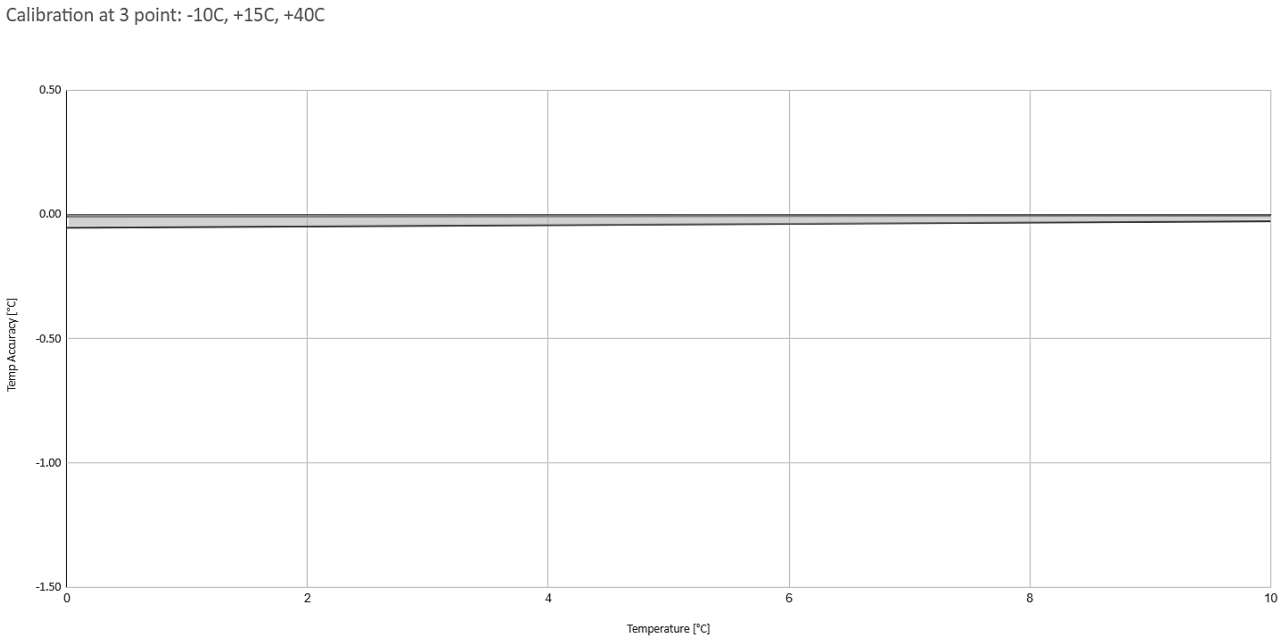
Using a single point for calibration of the temperature sensor is a common and most used technique that generates good results at short execution time.

Instead, when we consider 3 points for calibration of the temperature sensor, its accuracy is limited to the sensor temperature project resolution ±0,1ºC, that is, ±0,2ºC.

For instance, using the temperatures of -10ºC, +15ºC and +40ºC for temperature sensor calibration, the sensor accuracy is as follows:

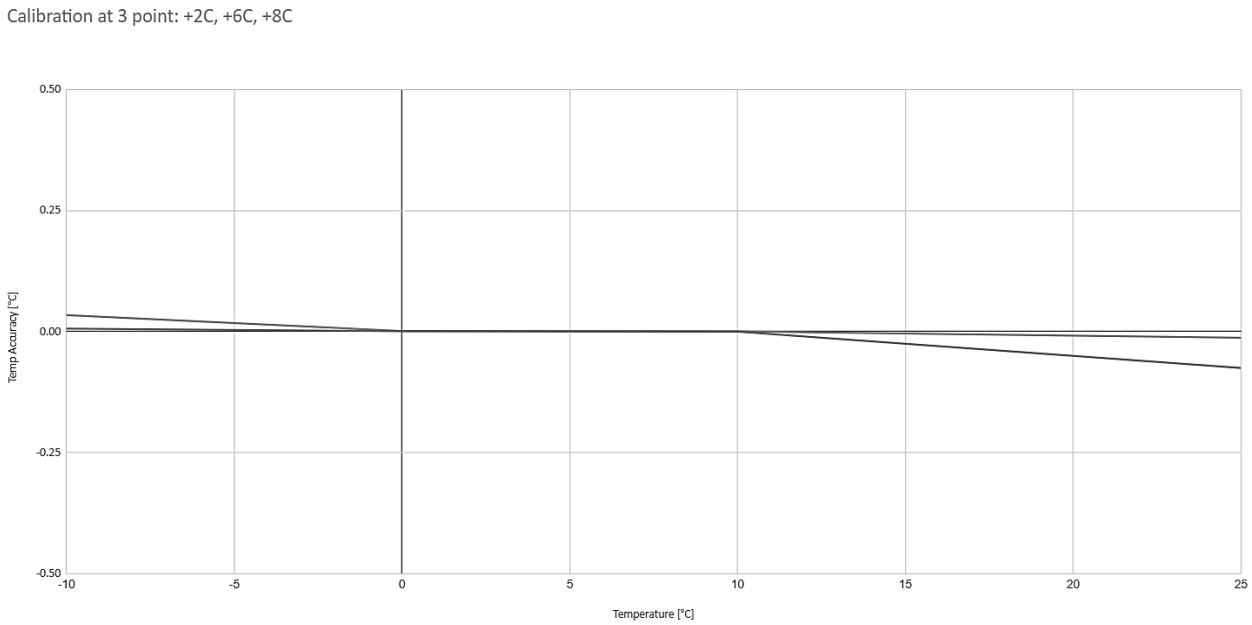


Zooming to the interest application temperature range, we verify that it's quite constant:



Temperature sensor can be calibrated using one of the showed methods (single or multiple points) and at any desired temperature(s) for better adjustment to the application requirements.

For instance, if we use the temperatures of +2ºC, +6ºC and +8ºC for the calibration procedure at a 3 points method, the expected temperature sensor behavior is:



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