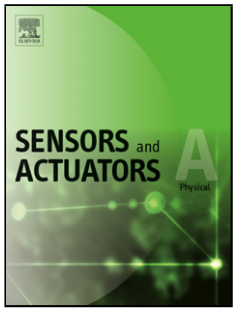

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Silicon micro thermal sensor platform at high accuracy with back side contacts

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Abstract

A temperature sensor platform of high accuracy and spatial resolution on a silicon substrate is presented. Spatial positioning and high precision are crucial for the thermal measurement of microdevices, where often only small temperature differences occur. This was addressed and solved by a new reusable and easy to mount temperature sensor chip. The sensor array consisted of 64 platinum thermistors arranged in a matrix of 16 rows and 4 columns. The sensors were contacted from the back side. This was realized by new techniques using KOH-etched cavities and metal membranes. Each sensor was realized with a size of 52 µm x 52 µm, while the minimum required space per sensor in terms of integration density was 784 µm x 784 µm. A thorough calibration and error assessment procedure resulted in a measurement accuracy of 78 mK. The chip may be used for detecting spatial temperature distributions on microchips. Applications are presented for measuring water temperatures directly inside silicon microchannels and for tracking the surface temperature of a chip containing a microchannel.

1. Introduction

Measuring the spatial temperature distribution on a microdevice is a challenge, as it often combines the need for high accuracy, due to small temperature variations, with the necessity of having small and well positioned sensors. One specific application, where a large variety of temperature measurement