

A piezoresistive sensor for pressure monitoring at inkjet nozzle

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Abstract: This paper presents a MEMS piezoresistive sensor for monitoring the fluidic pressure at the nozzle of an inkjet during droplet generation. The device consists of a sensing membrane (150 μm wide and 1 μm thick) with a nozzle orifice (20 μm in diameter), and piezo-resistors placed around. The pressure information is useful in detecting missing droplets and estimating the size of the generated droplets. The device is fabricated on SOI wafers with an IC-compatible process. A resistance variation of 8.7% is measured with a 1×10^5 Pa applied pressure. The sensitivity is $3.9 \times 10^{-7} \text{V/Pa}$ in a Wheatstone bridge configuration with 1 V supply voltage. The detected pressure signal can be used to implement a close-loop control to replace the open-loop control in most current commercial inkjet printheads, for better volume precision and system reliability. ©2010 IEEE.

Index Keywords: Applied pressure; Close-loop control; Compatible process; Droplet generation; Fluidic pressure; Inkjet printheads; Nozzle orifice; Open loop control; Piezo-resistors; Piezoresistive sensors; Pressure monitoring; Pressure signal; Resistance variations; Sensing membranes; SOI wafers; Supply voltages; System reliability; Wheatstone bridges; Bridge circuits; Drop formation; Spray nozzles; Sensors

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