

## Modular architecture of a non-contact pinch actuation micropump

### Abstract:

This paper demonstrates a modular architecture of a non-contact actuation micropump setup. Rapid hot embossing prototyping was employed in micropump fabrication by using printed circuit board (PCB) as a mold material in polymer casting. Actuator-membrane gap separation was studied, with experimental investigation of three separation distances: 2.0 mm, 2.5 mm and 3.5 mm. To enhance the micropump performance, interaction surface area between plunger and membrane was modeled via finite element analysis (FEA). The micropump was evaluated against two frequency ranges, which comprised a low driving frequency range (0-5 Hz, with 0.5 Hz step increments) and a nominal frequency range (0-80 Hz, with 10 Hz per step increments). The low range frequency features a linear relationship of flow rate with the operating frequency function, while two magnitude peaks were captured in the flow rate and back pressure characteristic in the nominal frequency range. Repeatability and reliability tests conducted suggest the pump performed at a maximum flow rate of 5.78 mL/min at 65 Hz and a backpressure of 1.35 kPa at 60 Hz. © 2012 by the authors; licensee MDPI, Basel, Switzerland.