Device geometry: Width (w) = 100 μm, Height (h) = 50 μm, Length (L) = 28.1 mm,

Max flow rate (Q) = 250 nL/min = 4.17×10^{-12} m^3/s

Poiseuille's law: P = QR

$$R = \frac{8\mu L(w+h)^2}{w^3h^3} = \frac{8\left(1.0\times10^{-3}\left(Pa\cdot s\right)\right)\left(28.1\times10^{-3}\left(m\right)\right)\left(100\times10^{-6}\left(m\right)+50\times10^{-6}\left(m\right)\right)^2}{\left(100\times10^{-6}\left(m\right)\right)^3\left(50\times10^{-6}\left(m\right)\right)^3} =$$

$$R = 40.46\times10^{-12}\left(\frac{Pa\cdot s}{m^3}\right)$$

$$P = QR = 4.17\times10^{-12}\left(\frac{m^3}{s}\right)\times 40.46\times10^{-12}\left(\frac{Pa\cdot s}{m^3}\right) = 168.7\,Pa$$

Supplementary Material (ESI) for Lab on a Chip

Caption for Supplemental Movie:

LCAT Pump. Movie of LCAT pumping device with cavities angled at 15° to the main channel. The device is being operated with a square-wave signal at 45 kHz at $30V_{PP}$. The PZT is cycled on and off to demonstrate the active and inactive states of the LCAT cavities. As the PZT is turned on, the beads move forward while turning off the PZT stops the beads from moving. The video is played back at 30fps however it is taken at 60fps using the Photron FASTCAM.