invention described in copending U.S. Ser. No. 09/148,026. The displaceable member moves over 100 micron.

For the lower-pressure valves, the room-temperature actuator resistance is 187 ohm. Applying a voltage of 20 volts heats the ribs to an average temperature of 100 K above room temperature, increasing the resistance to 292 ohm and yielding a heating power of about 1.4 watt. The microvalve or chip temperature, monitored with an on-chip reference resistor, rises about 45° K. in steady state operation.

Flow-rate data for nitrogen (measured at atmospheric pressure) as a function of power is provided in FIG. **7** for a normally open valve with both upper and lower orifices (as illustrated in FIG. **1**(*c*) and FIG. **3**) and in FIG. **8** for a normally closed valve with only an upper orifice (as also illustrated in FIG. **1**(*c*). Below 1 bar, there is negligible hysteresis or "stiction" as the normally-open valve is activated and deactivated. Hysteresis is observed for the normally closed valve due to its lack of z-axis pressure-force balancing. Both valves show leakage below 0.2 ml/min (the flowmeter resolution). FIG. **9** shows data for pressures up to 10 bar for the normally-open valve. Hysteresis and leakage can occur at higher pressures where no z-force balancing is present.

Where z-force balancing is present, a normally closed valve has been used to control liquid at a pressure of 13 bar and flow rates up to 300 ml/min.

The valves also have a short response time. The response time is less than 0.5 sec., measured by observing the flowmeter for step changes in input pressure.

What is claimed is:

1. A microvalve comprising a first layer, a second layer, and a third layer, said second layer being disposed between said first layer and said third layer;

said first layer having a first port therethrough, said third layer having a second port theretrough, and said second layer having a flow area defined therein and positioned so that a fluid flows through said first port, said flow area, and said second port in the absence of an obstruction to flow;

said second layer having a displaceable member and at least one actuator disposed relative to a first end portion of said member to displace said member in a plane parallel to said second layer, said member being displaceable to selectively and proportionally place a second end portion of said member at a position between an open and a closed position relative to at least one of said first and second ports;

said first layer having a first pressure-equalizing contour in fluid communication with a first face of said second end portion and in fluid communication with said first port;

said third layer having a second pressure-equalizing contour in fluid communication with a second face of said second end portion and in fluid communication with said first port;

and said first and second pressure-equalizing contours each having sufficient depth and length that a fluid filling said first and second pressure-equalizing contours during use provides a pressure force on said first face that counteracts a pressure force on said second face as said second end portion of said member is displaced.

2. The microvalve of claim **1** wherein said second end portion of said member includes a cavity through which fluid in said first pressure-equalizing contour is in pressure communication with fluid in said second pressure-equalizing contour.

3. The microvalve of claim **1** wherein a first tie-rod attaches to said actuator at a first end of said first tie-rod, wherein said first tie-rod attaches to a side of said member at a second end of said first tie-rod, and wherein a second tie-rod is attached at its first end to said member on said side of said member, and wherein said second tie-rod is attached at its second end to said second layer.

4. The microvalve of claim **1** wherein said actuator comprises a plurality of ribs attached at their first ends to the second layer and attached at their second ends to a shaft, and wherein the first and second ends of each of said ribs is narrower than a midpoint section of each of said ribs.

5. The microvalve of claim **3** wherein said actuator comprises a plurality of ribs attached at their first ends to the second layer and attached at their second ends to said first tie-rod, and wherein the first and second ends of each of said ribs are narrower than a midpoint section of each of said ribs.

6. The micirovalve of claim **1** wherein said second pressure-equalizing contour is positioned such that at least a portion of the fluid that flows between said first port and said second port flows into said second pressure-equalizing contour and past said second and portion of said deflectable member as said fluid flows between said first port and said second port.

7. The microvalve of claim **1** wherein said second pressure-equalizing contour is positioned such that said second pressure-equalizing contour is sufficiently obscured by said second end portion of said deflectable member that the fluid does not flow out of said second pressure-equalizing contour when the fluid flows between said first port and said second port.

8. The microvalve of claim **5** wherein said ribs, said first and second tie-rods, and said displaceable member are configured so that said displaceable member and said third layer form an orifice when said displaceable member is positioned to allow the fluid to flow through said microvalve so that said fluid is cooled as it passes through said microvalve.

9. The microvalve of claim **1** wherein said second layer comprises single crystal silicon.

10. The microvalve of claim **1** wherein said first, second, and third layers comprise single crystal silicon.

11. The microvalve of claim **2** wherein said first cavity comprises a portion of said first port.

12. A microvalve for controlling flow of a fluid, said microvalve comprising a body having an inlet, an outlet, a channel in the body in fluid communication between the inlet and outlet, and a flow controller at least partially positioned within the channel; wherein the flow controller comprises a slider having a first face that contacts fluid entering the channel from the inlet and a second face opposite of the first face; wherein the slider is moved to a position by an actuator; wherein the body of the microvalve further has a pressure-equalizing contour communicating with the second face of the slider, said pressure-equalizing contour being sufficiently deep that the slider does not contact the bottom of the pressure-equalizing contour as the slider is opened and shut while fluid flows through the microvalve, and wherein said pressure-equalizing contour is in fluid communication with the inlet of the microvalve regardless of the position of the slider.

13. The microvalve of claim **12** wherein the actuator comprises a plurality of ribs whose first ends are attached to the body of the microvalve and whose second ends are attached to one end of a shaft that is attached at its opposite end to the slider.

14. The microvalve of claim **13** wherein the inlet is positioned on a first face of the microvalve, the outlet is