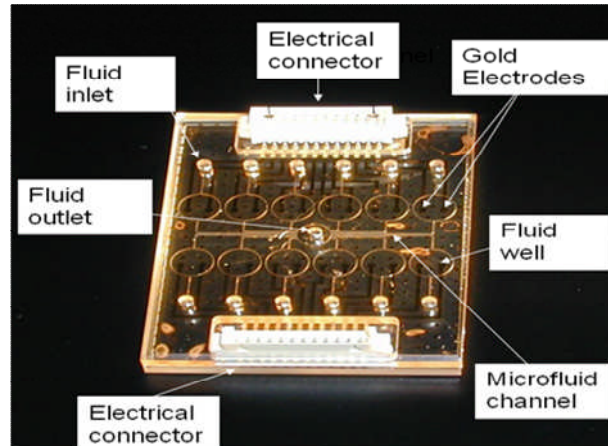
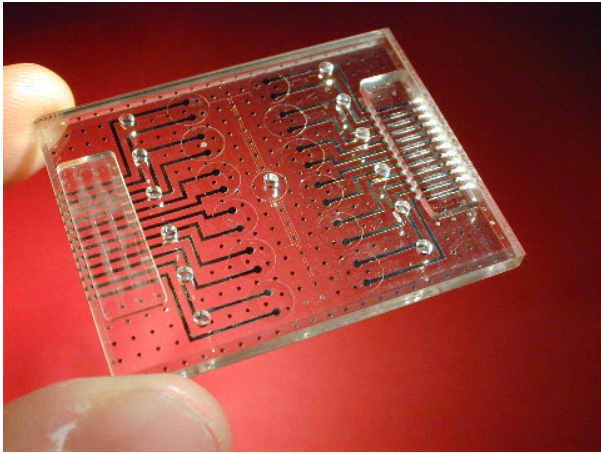


Electrical - Microfluidic Integration



- Adds active functionality to microfluidics
- Multi-layers (fluidic and electrical) available
- PCB-like construction, not thin metal films

Overview

Epigem offers to assist customers with design and manufacture of polymer microfluidic modules and systems. Increasingly, such devices require more than just a passive microfluidic function (such as flow splitting or passive mixing). Therefore we have developed the fabrication processes necessary for the integration of robust, PCB-like electrical circuit layers with the microfluidic devices. Unlike glass or silicon devices, where the metal tracks are made by patterning thin sputtered films on top of the microfluidic layer. Our technology uses an embedded construction for the circuit layers, allowing the metal tracks to be many microns thick, yet still have a planar surface. This means that the tracks have a much lower line resistance, are less prone to cracking and are suitable for wire bonding or soldering. The planar surface enables microfluidic layers to be patterned or bonded directly on top of each electrical layer without any leaks. Device manufacturing is carried out in a clean room environment and is ISO9001:2000 quality

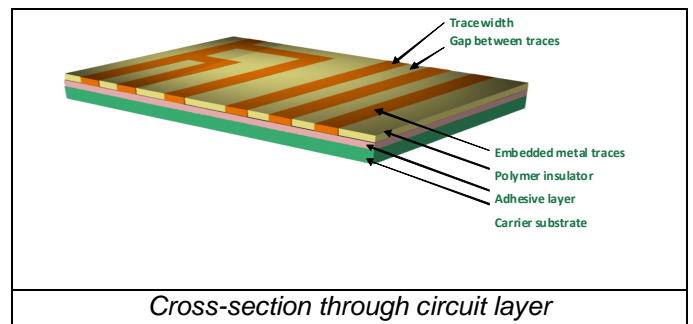
See over for detailed design guidelines

If your design does not fit with the design guidelines then please contact us to discuss it, as often modification can be made either to the design or the process that will enable your parts to be manufactured.

assured. High volume manufacturing is available to provide customers with a complete service from prototype through to manufacture.

Application examples

- Electrophoresis separation
- Dielectrophoresis
- Particle sorting and trapping
- Cell sorting
- Capacitance / impedance sensing
- Micro-valves
- Micro-heaters
- Micro-electro magnets



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Design guidelines for electrical layer

- Size Up to 200 x 200 mm
- Metal type Ni
- Trace thickness 3 to 6 μm
- Metal surface finish (optional) Au
- Finish thickness Gold thickness = 0.01 to 0.06 μm .
- Trace width 5 μm or larger so that aspect ratio ≤ 1 .
- Gap between traces Equal to or greater than trace width
- Pad sizes Must be smaller than 1 mm or made up of 1 mm or smaller sized features to prevent lifting during plating.
- Photomasks When feature size is less than 10 μm then a chrome on glass hard photomask is required. Above this size then a flexible photomask can be used.
- Yield and electrical testing The yield depends on the minimum feature size and the particular layout of the circuit pattern. Try to minimise the number and length of any very narrow tracks. Optical inspection of the board will be carried out to identify faults. Electrical test of the board is by agreement with Epigem (using Wentworth probe station) and if required the design should allow probing using either a custom wafer probe card (extra cost) or using 2 manual spring loaded probes.
- Background grid/waffle pattern A background cross-hatch grid or spacer dot pattern is recommended in areas not covered by the circuit pattern so as to ensure uniform thickness of metal during plating. Epigem can advise or add this to your design as required.
- Polymer insulator layer thickness Equal to metal thickness
- Surface flatness Peak to valley less than 0.2 μm typical.
- Adhesive layer thickness 15 to 20 μm
- Carrier substrate PMMA
- Placement Electrical layer can be placed above or below a fluid circuit layer
- Number of electrical layers 1 layer; or 2 layers separated by a microfluid layer.
- Electrical vias between layers Not available
- Overcoat layer Optional. Can be applied on top of electrical layer to isolate electrical layer from contact with fluids. Thickness between 0.5 μm and 100 μm .
- Solder mask layer Optional on top of outer electrical layer
- Solder mask dimensions
 - Photolithographic Thickness: 25 to 100 μm
Minimum feature size: 25 μm .
Material: transparent epoxy
 - Drilled/milled Thickness : 0.1 mm
Min feature size: 0.3 mm
Material: PEN/epoxy or PET/epoxy