



Biocompatible Flexible Substrates for **Directly Implantable Applications**

HIGHLIGHTS

- For short term and long term implants
- Thin film noble metal traces
- Biocompatible dielectrics, such as LCP or PI
- Highest resolutions for miniaturized interconnects
- Large manufacturing panels
- Combining biocompatible structures and conventional PCB technology



Biocompatible Flexible Substrates for Directly Implantable Applications



Biocompatible dielectrics with embedded noble metal conductors provide a fully biocompatible platform for applications such as diagnostics, neurostimulation, implantable electrodes, catheters, sensors and actors.

Short Term Implants (<30 Days)

Catheters, blood glucose se	ensors, etc.
Hybrid buildup	
Standard Copper based PCE	technology for electronics
Biocompatible materials and	d conductors for implanted part
Thick CU	Thin metal high resolution
Via	Flexible thin base material

Biocompatible Base Materials

LCP (Liquid Crystal Polymer), PI (Polyimide), Glass	
The properties of LCP are especially capable for direct implantables:	
Very flexible thermoplast; can be transfer molded to various shapes	
Fully biocompatible according to ISO 10993-5 (in vitro cytotoxicity)	
Near-hermetic due to very low water absorption (< 0.04%)	
Temperature stable up to 190°C; density: 1.4 g/cm³	
Production panel size of 18" x 12" enables large substrates	

Electrode Surfaces

Electrode surface coatings: Pt, PtIr, IrO₂ or Ti Surface coatings are electroplated or sputtered



Based in Switzerland, DYCONEX has been in the PCB business for more than 50 years and delivers leading edge interconnect solutions in flex, rigid-flex and rigid technology. DYCONEX core competence lies in the production of highly complex HDI, high-frequency and highreliability circuit boards for medical, defense, aerospace, industrial and semiconductor applications. DYCONEX is an MST company.



Long Term Implants (>30 Days)

Leads and electrodes for neurostimulation or cochlear implants, etc.		
Fully biocompatible flexible structure		
Gold traces embedded within LCP		
Electrodes connected with vias to inner traces		
Various surface coatings available (Pt, PtIr, IrO ₂ or Ti)		
Gold traces Gold electrodes		

Nobel Metal Traces

Conductor material consists of pure gold	
Minimum line width: 15 µm	
Minimum spacing between traces: 10 µm	
Conductor thickness: 0.3 to 10 µm	
Line resistance: 0.1 to 1 Ω/cm	
Resistance shows linear temperature coefficient and can be used to measure temperature in-vivo	

Other Substrate Characteristics

Conductors are fully embedded in biocompatible dielectrics
Electrodes can be recessed or raised to the polymer surface
Minimum substrate thickness: 50 µm
Glue-free buildup with LCP base material
Tape test in accordance with IPC-TM-650 2.4.1 and bending test to verify thin film adhesion
Final cleaning operations to ensure biocompatibility



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DYCONEX AG Grindelstrasse 40 CH-8303 Bassersdorf, Switzerland Phone +41 (43) 266 11 00 Fax +41 (43) 266 11 01 mail.dyconex@mst.com www.mst.com



Micro Systems Technologies engineering for life

Micro Systems Technologies Management GmbH Sieversufer 7-9 DE-12359 Berlin, Germany Phone +49 (30) 68905-4001 info@mst.com www.mst.com