Flexible Circuits and Interconnect Solutions

More than a manufacturer
• Currently 150 employees
• Focussed on Flex Technologies & Assembly
• Largest flex circuit manufacturer in the UK
• 3rd/4th largest flex manufacturer in Europe
• Supply all major UK Aerospace/Military primes
DIVERSITY OF TECHNOLOGIES

“All flexible and flex-rigid technologies from a single source”

• Single and double-sided flexible circuits
• Multilayer flexible circuits
• Flex-rigid multilayer circuits
• REGAL™ flex circuits
• Sculptured circuits
• Surface Mount Interconnects (SMI)
• Silver brazed pin and tubelet technology (Pinflex©)
• Hybrid constructions
• Reel to Reel manufacturing
• Component assembly
DESIGN SOLUTIONS
TECHNICAL RESOURCES

Applications & Design
- 2 Applications Engineers (+ Technical Sales)
- 2 CAD Engineers using SolidWorks (3D)

CAM
- 2 CAM Engineer/Technicians

Product Engineering
- 5 Product Engineers

Process Engineering
- 6 Process Engineers

Quality, Laboratory, Inspection & Test
- 7 Quality Engineers & Technicians
- 8 Inspectors & ET Technicians

500+ Years experience of flex circuit manufacture & quality
MARKETS

Aerospace (20%)  Medical (11%)  Communications (2%)

Defence (53%)  Industrial/Consumer (11%)  Automotive (3%)
QUALITY APPROVALS

Goal “Obtain and maintain all quality and systems approvals relevant to our international market focus”

- AS9100 – Design, Manufacture & Assembly
- ISO9001:2008
- IECQ-CECC BSEN123000 Printed wiring of assessed quality
- IECQ-CECC BSEN123400 Flexible wiring without through connections
- IECQ-CECC BSEN123500 Flexible wiring with through connections
- IECQ-CECC BSEN123600 Flex rigid multilayer
- IECQ-CECC BSEN123700 Flex rigid double-sided with through hole connections
- IECQ-CECC BSEN123800 Flexible M/L printed boards with through connections
- Release in accordance with IPC-6013 classes 1,2 or 3
- Release in accordance with IPC-A-610 classes 1, 2 or 3
- Conformal coating to customer specifications
- BS8555 (ISO14001) – target 2010
- ANSI-J-Std-001 & IPC-610 trained staff
- BAE BCP Level 4
- ESA approval in progress
- NADCAP – target 2011
FINANCIALS

![Financial Chart]

- Sales
- Trading Profits

2006/07  2007/08  2008/09  2009/10
SINGLE & DOUBLE SIDED FLEX

Flexible circuits

- Generally lowest cost option
- Replaces conventional point to point connections
- Suitable for Dynamic applications

Single Sided Construction

Double sided through hole plated
Flexible Multilayers

- 3 layers+ of flexible materials
- Above 5-6 layers ability to bend becomes impaired => Thin laminates
- Teknoflex can offer constructions to optimise reliability & performance

Multilayer Flexible Circuit
SCULPTURED FLEX CIRCUITS

Sculptured Circuits

• Single & multiple conductor layers
• Processing typically starts with 0.25mm (7.25 oz) thickness RA copper foil
• Irregular shaped component leads can be designed in etched features
• Suitable for mechanically robust applications where power is required
SCULPTURED FLEX CIRCUITS

Copper Thickness
"Sculptured" 0.1 ± 0.025mm
within circuit to;

0.140 to 0.250mm ±10%

Finger integral extension of conductor

Sculptured™ Circuits

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SCULPTURED FLEX CIRCUITS

Multilayer Sculptured Flex

- Power & signal layers together
- Screening – Polymeric or copper
- Integrated assembly
- Integration of connector features
- Hybrid options

Potential Advantages:

- Weight reduction
- Assembly ease
- Power management
- Signal management
Combining flexible & rigid materials into a single homogenous structure
- Typically from 3 to 30+ conductor layers with 1 or more flexible limbs
- Higher the layer count => Higher complexity & cost
- High reliability/performance in space constrained applications
- Adhesive, adhesiveless & REGALFlex constructions

Adhesive FRML => Adhesiveless FRML => REGALFlex FRML
PINFLEX©

Pinflex

- High reliability pin in flex technology
<table>
<thead>
<tr>
<th>Parameter</th>
<th>High Volume Production</th>
<th>Low-Medium Volume Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track &amp; Gap/microns</td>
<td>150um/150um</td>
<td>75um/100um</td>
</tr>
<tr>
<td>Minimum drilled hole dia/mm</td>
<td>0.20mm - Mechanical</td>
<td>0.15 to 0.2mm – Mechanical</td>
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<td></td>
<td></td>
<td>0.05 to 0.1mm - Laser</td>
</tr>
<tr>
<td>Minimum Sealed edge/mm</td>
<td>0.25mm – Soft tooling</td>
<td>&lt;0.025mm - Laser</td>
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<tr>
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<td>0.1mm – Hard tooling</td>
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<tr>
<td>No. of layers</td>
<td>Flex = 9</td>
<td>Flex = 10+</td>
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<tr>
<td></td>
<td>FRML = 27</td>
<td>FRML = 30+</td>
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<tr>
<td>Materials</td>
<td>Polyimide-Adhesiveless</td>
<td>Polyimide-Glass</td>
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<td>Polyimide-Adhesive</td>
<td>FEP</td>
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<td>PET</td>
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<td>FR4</td>
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<tr>
<td>Surface Finish</td>
<td>Tin/Lead</td>
<td>Speciality finishes</td>
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<tr>
<td></td>
<td>ENIG</td>
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<tr>
<td></td>
<td>Tin – Matt &amp; bright</td>
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<tr>
<td></td>
<td>Gold – Hard</td>
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<tr>
<td></td>
<td>Gold – Soft</td>
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<td>Imm. Silver</td>
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<td></td>
<td>OSP’s</td>
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<tr>
<td>Copper Thickness/microns</td>
<td>9 to 300 microns</td>
<td>5 to 500 microns</td>
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<tr>
<td>Copper Type</td>
<td>RA &amp; ED</td>
<td>RA &amp; ED</td>
</tr>
<tr>
<td>Material Format</td>
<td>Panels &amp; rolls</td>
<td>Panels &amp; rolls</td>
</tr>
<tr>
<td>Component Assembly</td>
<td>SMT - 0.042</td>
<td>SMT – BGA</td>
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<tr>
<td></td>
<td>Wave, Hand solder, back potting</td>
<td>Wave, Hand solder, back potting &amp; conformal coating</td>
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<tr>
<td></td>
<td>&amp; conformal coating</td>
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</tr>
<tr>
<td>Material Format</td>
<td>Circuits or Panels</td>
<td>Circuits or Panels</td>
</tr>
</tbody>
</table>
HYBRID CONSTRUCTIONS

Significant benefits for challenging interconnection solutions:

• FRML / Pinflex
• FRML / SFC
• SFC / Pinflex
• Multilayer SFC
• Multilayer flex / Pinflex
• FRML / SFC / Pinflex

• Ideal for high reliability applications where space & weight are critical
<table>
<thead>
<tr>
<th>Year</th>
<th>Technology Roadmap</th>
</tr>
</thead>
</table>
| 2010 | 0.3mm pitch SFC  
Microvia SFC  
Microvia FRML  
ESA Qual for SFC  
Full Genflex implementation  
HASL for space  
Fine pitch SMT solderpaste printing  
High power SFC’s  
<50um track & gap  
High conductivity inks  
High speed materials |
| 2011 | High temp ML flex to 250°C  
Additive fine line flex  
Microvia ML flex  
0.25mm pitch SFC  
Dynamic prediction model  
Higher layers count SFC’s  
Laser structuring for Sensor On Flex  
Water recycling  
0201 assembly  
Resistive foils for flex & SFC’s |
| 2012 | ML Flex space qual  
High temp ML flex to 350°C  
Optical flex  
Embedded devices in ML flex  
Fine pitch FRML or hybrid assemblies  
Module Flex  
<25um track & gap  
Improved thermal management  
Large format flex |
COLLABORATIVE ACTIVITY

• SC21 member & participant in improvement activities – QCD & DFM

• Working on a collaborative R&D project on high temperature flex materials

• Working with a university regarding research into super capacitive materials & functional films

• Working with customers, & customers customers, to develop new flex solutions;
  • For high dynamic cycle sensor products
  • DFM guidelines for flex technology
  • Simplified assembly & reduced interconnects
  • High speed & high frequency flex applications
  • Power management for battery technology
Thank You

Please contact us & visit our website

www.teknoflex.com