INLAYS FOR ELECTRONIC PASSPORT

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Agenda

1. RFID Inlay Technology Highlights
2. Inlay for RFID Passport – Cross section
3. Inlay for RFID Passport - Features
4. Inlay for Dual Interface Card – Cross section
5. Comparison of different Antenna Technology
6. Inlay for RFID Passport, Production Layout
7. Inlay for RFID Passport Production Line, Features
8. Inlay for RFID Passport Production Line, Standards
RFID Inlay Technology Highlights

ANTENNA

MICROCHIP

CARD BODY
RFID Inlay Technology Highlights

- **ANTENNA**

  Embedding Technology – is the cutting edge process for high quality and reliable application: like biometric passports, payment transactions.

  Cross section of the embedded wire for 13,56 MHz.
MICROCHIP INTERCONNECTION

**TC** – Bonding (Thermo Compression Bonding) is the micro welding process. The most reliable method to interconnect insulated cooper wire with a chip module.

Substrate bumping with Au stud bumps on Au pads
CARD BODY - LAMINATION

- Key technology in RFID Inlay and Card production.
- Unique technology know-how.
- As a first mover developing the lamination process for high reliable transponder cards production.
Inlay for RFID Passports
Cross section

- Thickness of inlay depends on chip module
- 456μ
- 178μ
- 100μ
- 178μ

- Antenna
- Chipmodule
- Leadframe
- 8mm
- 40μ

- Top Sheet
- Inlay Sheet
- Bottom Sheet
Inlay for RFID Passports

Features

- Format: ID–1, diverse standard sheet available
- Construction: cover page, visa pages, holder page
- Chip module Philips:
  - MOB 2 = 390 µm
  - MOB 4 = 320 µm
- Material: PVC, PET, PC
- Lifespan: 10 years
- ISO Bending Cycle Test: > 50 000 bendings
- Operating Temperatures: -20°C - +100°C
- Climate Test: 80% humidity/ 1000 hour, 100% hermetically sealed
Inlay for Dual Interface Card, ID-Card Cross section

- Contact Chip
- Contact Chip Surface
- Contactless Chip
- Wire on Chip Direct Bonding
- Overlay 1
  - Printed Sheet 1
- Inlay Sheet 2
- Inlay Sheet 1
- Printed Sheet 2
- Overlay 2
## Comparison of different Antenna, Technology Highlights

<table>
<thead>
<tr>
<th></th>
<th>etched</th>
<th>Embedded</th>
<th>printed (conductive inks or silverfilled epoxies)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interconnection Technology</strong></td>
<td>Soldering or crimping</td>
<td>TC bonding</td>
<td>Soldering using conductive adhesive</td>
</tr>
<tr>
<td><strong>Quality of Interconnection</strong></td>
<td>fair</td>
<td>very good</td>
<td>poor</td>
</tr>
<tr>
<td><strong>Shear tests with Philips lead frame module</strong></td>
<td>using conductive adhesive (29-59cN)</td>
<td>&gt;200cN</td>
<td>no reliable data</td>
</tr>
<tr>
<td><strong>Adhesion of interconnection when applying temperature (especially during hot lamination)</strong></td>
<td>poor</td>
<td>very good</td>
<td>poor</td>
</tr>
<tr>
<td><strong>Insulation of antenna wires (in order to avoid short circuiting when crossing tracks)</strong></td>
<td>none</td>
<td>yes</td>
<td>none</td>
</tr>
<tr>
<td><strong>Ductility of the conductive tracks (during bending tests)</strong></td>
<td>good</td>
<td>very good</td>
<td>fair</td>
</tr>
<tr>
<td><strong>Elongation factor of conductive tracks before fracture</strong></td>
<td>~6%</td>
<td>&gt;20%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Inlay for RFID Passports Production Layout

- Inlay production (sheets)
- Cover sheet preparation
- Testing
- Lamination
Production Line for RFID Inlays for Passports, Features

- Semiautomatic production line for sheet format
- Easily adapted with additional process units
- Modular platform various process units available
- Minimum conversion time in format change
- Suitable for RFID Passports Inlays, Contactless Cards as well as Dual Interface Cards
- Appropriate for low and high quantities inlay production, up to 2000 Inlays/hour (one module)
Inlay for RFID Passports Standards

- Inlay with implemented Smart MX chip P5CD072 conform to:
  ISO 14443 type A, ISO 7816, ICAO 9303, ISO/IEC 7501, CC EAL 5+ (chip), ISO/IEC 15693 (not endorsed for use by ICAO 9303)
- Inlay body tests conform several sections of ISO/IEC 10373 for:
  - mechanical
  - visual
  - chemical
  - thermal
- Protection against flexing, stamping and heat treatment
Thank you!

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