Conductor Tracks on 3D Metallic Bodies

LPKF LDS PowderCoating
Conductor Tracks on Metal?

Laser Direct Structuring (LDS) developed by LPKF is the market leader for conductive traces on three-dimensional plastic parts. The range is further extended with LDS PowderCoating, now enabling metallic base bodies to carry electric circuits.

Conductors in the Third Dimension
The standard method for Laser Direct Structuring is for a laser beam to apply structures to a three-dimensional plastic part. The laser beam activates an additive in the plastic, thereby enabling it to be metallized later. The desired conductor tracks are built up at the processed areas in a currentless metallization bath.

LPKF has taken this active principle and transferred it to other media. First, to the liquid LPKF ProtoPaint LDS for spray painting of LDS prototypes, and now also to a powder for electrostatic coating of metal parts. The range of use is thus expanded to applications that rely on the physical properties of metal: a high level of mechanical stability and good thermal conductivity.

The LPKF powder coatings are based on thermosetting plastics, which melt with heat, merge and cross-link. The effect: the coated parts tolerate heat far beyond the original melting temperature.

Electrostatic Coating
LPKF LDS PowderCoating can be reliably processed electrostatically. When the coating is applied, the powder is electrically charged and homogeneously distributed on the grounded part through corona or tribo charging.

Powder coatings achieve homogeneous layers with exactly definable thickness and any excess powder coating material can be collected and reused.
• Two variants with special properties
• For LED lighting and power electronics
• Metallic cooling elements
• Solderable in the reflow process

Conductor Tracks on Metallic Parts
LED technology was the inspiration for the development of the LDS PowderCoating: innovative lighting concepts require a 3D arrangement of the LEDs and reliable heat dissipation. This can be ensured with metallic carriers, but how do the conductor traces get onto the metallic bodies?

LDS PowderCoating ensures both a high level of electrical insulation and good heat management of the entire system. The coating remains stable at temperatures of more than 240 °C – important for industrial soldering processes. Layer thicknesses between 60 – 80 µm are required.

Two Variants
LPFK PowderCoating is available in the PES 200 and PU 100 variants. While the silk-matt PES-based surface is optimized for a high level of mechanical stability, the glossy PU 100 offers more rugged chemical and thermal properties.

Both powder coatings are available in volumes of 2 kg (test sample) and 20 kg (serial production). LDS PowderCoating is neither a hazardous material nor a dangerous substance: instead, it is environmentally friendly and free of solvents.

Heat distribution after eight hours of continuous LED operation:
Above, a conventional plastic component with temperature peaks; below, a metallic body coated with LDS PowderCoating
**Technical Data:**

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<thead>
<tr>
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<th>PowderCoating PU 100</th>
<th>PowderCoating PES 200</th>
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<tbody>
<tr>
<td><strong>Base material</strong></td>
<td>Polyurethane</td>
<td>Polyester resin</td>
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<tr>
<td><strong>Color</strong></td>
<td>Glossy white</td>
<td>White, matt – silk-matt</td>
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<tr>
<td><strong>Max. temperature for reflow soldering</strong></td>
<td>270 °C (518 °F), 5 s</td>
<td>240 °C (464 °F), 5 s</td>
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<tr>
<td><strong>Dielectric strength</strong></td>
<td>77.7 kV/mm</td>
<td>63.7 kV/mm</td>
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<tr>
<td><strong>Recommended layer thickness</strong></td>
<td>60 – 80 µm (2.4 – 3.2 Mil)</td>
<td>80 – 100 µm (3.2 – 4 Mil)</td>
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<tr>
<td><strong>Hardening</strong></td>
<td>20 – 35 min at 190 °C (374 °F)</td>
<td>15 – 35 min at 170 °C (338 °F)</td>
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<tr>
<td><strong>Flammability according to UL 94</strong></td>
<td>V-0</td>
<td>V-0</td>
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**Worldwide Support for Laser Direct Structuring**

Wherever they are in the world, users of LPKF systems can be supported from our application centers in Germany, the USA, Japan, Korea and China. At these centers, users have access to LPKF’s extensive experience in laser material processing and the laser direct structuring process. User training for technical employees and special consulting services complete the offer from the world market leader in laser systems for structuring three-dimensional molded interconnect devices. LPKF will gladly provide application reports and further information on request.