ELPEPCB®
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PTR PRELIMINARY TECHNICAL REPORT

Solder resists of the series Elpemer® SD 2491 SG-TSW-R8

On account of their high resolution alongside excellent dielectric properties, the photoimageable solder resists of the series **Elpemer® SD 2491 SG-TSW-R8** are used as insulating coatings for pcbs in fine and superfine line technology, SMD technology as well as for multilayers.

On account of their pure white colour and their extraordinary yellowing resistance they are especially suitable for LED applications in automobile electronics.

- **white-opaque (SD 2491 SG-TSW-R8) or snow white-opaque (SD 2491 SG-TSW-R8-B)**
- application by means of screen printing
- aqueous-alkaline developable
- **excellent yellowing resistance even after lead-free reflow solder processes and high temperature loads**
- no influence on light colour when applied below white LEDs
- UL approval: best flame class V-0 according to UL 94, UL file no. E80315
- halogen-free acc. to JPCA-ES01-2003 / IEC 61249-2-21.
- very good reflectivity values
- broad processing window for predrying
- good scratch resistance
- no pink/purple discolouration after electroless Ni/Au (ENIG) and SMD soldering

Characteristics

The characteristics are indicated in the product-specific process data sheets. We will provide them with the first shipment of this product or send them to you upon request.

Indices: SD = screen printing, SG = silk-glossy, TSW = thermally stable white, R8 = revision 8

Optical properties

Property	Test method	Result
Reflectivity at 460 nm	40 µm coating thickness measured on copper with a spectral photometer (measuring geometry: 45/0, light source type: D 65, standard observer: 10°)	≥ 90 %

LP 182803 E-0 / 301326e_000

Physical and mechanical properties

Property	Test method	Result
Adhesion	IPC-SM-840E, 3.5.2.1	class H and T
Cross hatch	DIN EN ISO 2409 on copper on FR 4	 Gt 0 Gt 0
Pencil hardness	IPC-SM-840E, 3.5.1 acc. to Wolff-Wilborn	≈ 6 H ≈ 6 H
Resistance to solvents/ cleaning agents	IPC-SM-840E, 3.6.1 Isopropanol Isopropanol : water (75 : 25) D-Limonene deonized water	 passed passed passed passed
Solder bath resistance Solder flux = 2 % adipic acid	IPC-SM-840E, 3.7.2 IPC-TM-650, 2.6.8	20 s at 265 °C [509 °F] 20 s at 288 °C [550.4 °F]*
Simulation lead-free reflow soldering	IPC-SM-840E, 3.7.3.1 5 x 10 s at 260 °C [500 °F]	no cracking no delamination
Resistance against acid	10 % H_2SO_4, 30 min at 20 °C [68°F]	no change
Resistance against lye	10 % NaOH, 30 min at 20 °C [68 °F]	no change

* With a solder bath resistance of 20 s at 288 °C [550.4 °F] the solder resist **ELPEMER® SD 2491 SG-TSW-R8** fulfils the required temperature resistance for lead-free soldering.

Electrical properties

Property	Test method	Result
Dielectric strength	IPC-SM-840E, 3.8.1	passed
Surface resistance	VDE 0303, Teil 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	≈ 6 x 10^{13} Ohm
Volume resistivity	VDE 0303, Teil 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	≥ 10^{15} Ohm x cm
Moisture and insulation resistance	IPC-SM-840E, 3.9.1	class H and T
Comparative Tracking Index (CTI, Tracking resistance)	DIN EN 60 112 on FR 4 base material with CTI 225 with CTI 600	 ≥ CTI 450* ≥ CTI 600*

* The CTI value of the coating depends on the CTI value of the base material; this value is at least maintained.

Note: Optimum electrical insulation values are only achieved if all flux residues are removed thoroughly from the printed circuit boards.

Processing

	Please read this technical report and the publications listed below carefully before using the product. These sheets are enclosed with the first shipment of product or sample.
MSDS	The corresponding material safety data sheet contains detailed information and characteristics on safety precautions, environmental protection, transport, storage, handling and waste disposal.
PD	The process data sheet contains product-specific data such as characteristics and recommendations for processing parameters.
AI	Application information AI 2/1 “Processing instructions for photoimageable Elpemer® solder resists“ – here you find basic information on the processing of photoimageable systems.
TI	Technical information TI 15/3 “Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents“
TI	Technical information TI 15/13 “Precleaning in the pcb fabrication process

➔ When applying electroless/galvanic surface finish processes the resistance of **Elpemer®** SD **2491 SG-TSW-R8** has to be verified in pre-trials. In any case, a multiple chemical pre-treatment according to the principle of grain boundary etching (see TI 15/13 for detailed information) is recommended.

Protect from UV light

Since the many different permutations make it impossible to evaluate the whole spectrum (parameters, reactions with materials used, chemical processes and machines) of processes and subsequent processes in all their variations, the parameters we recommend are to be viewed as guidelines only that were determined in laboratory conditions. We advise you to determine the exact process limitations within your production environment, in particular as regards compatibility with your specific follow-up processes, in order to ensure a stable fabrication process and products of the highest possible quality.

The specified product data is based upon standard processing conditions/test conditions of the mentioned norms and must be verified if necessary while observing suitable test conditions on processed products.

Feel free to contact our application technology department (ATD) if you have any questions or for a consultation.

Safety recommendations

➔ When using chemicals, the common precautions should be carefully noted.

➔ Ensure that extractor units of workplace ventilation arrangements are positioned at solvent source level.

Auxiliary products recommended

- Screen opener HP 5200
  highly active spray for dissolving dried screen printing inks from the screen; silicone- and grease-free, thus no surface defect/dewettings or smearing effects to be expected
- Anti-static spray HP 5500
  prevents and eliminates electrostatic discharge occurring during screen printing; silicone- and grease-free

- Special stripper HP 5707
  for removing photoimageable solder resists (e.g. in case of incorrect exposure) and for cleaning ink developer and resist stripping units.
- Defoamant HP 5911
  for defoaming of aqueous-alkaline developer solutions, silicone-free, biologically degradable
- Cleaning agent R 5899
  for screen washing equipment, simply and safely to handle, no labelling in accordance with the German dangerous goods regulations required, extremely high flash point (> 100 °C [> 212 °F]), low vapour pressure < 0.1 hPa at 20 °C [68 °F], thus not affected by the EU-VOC regulation 1999/13/CE
- Cleaning agent R 5821
  for the cleaning of equipment and work tools, high flash point (+32 °C [89.6 °F])
- Cleaning agent R 5817
  for the manual cleaning of screens and tools

Drying/curing

Further information on drying/curing can be found in the corresponding process data sheets of each solder resist.

Packaging

The packing units available are indicated in our offer which we will send you upon request.

Shelf-life and storage conditions

The shelf life / minimum shelf life and storage conditions are indicated in the product-specific product data sheets (PD) and shown on the container labels.

Disclaimer

All descriptions and images of our goods and products contained in our technical literature, catalogues, flyers, circular letters, advertisements, price lists, websites, data sheets and brochures, and in particular the information given in this literature are non-binding unless expressly stated otherwise in the Agreement. This shall also include the property rights of third parties if applicable.

The products are exclusively intended for the applications indicated in the corresponding technical data sheets. The advisory service does not exempt you from performing your own assessments, in particular as regards their suitability for the applications intended. The application, use and processing of our products and of the products manufactured by you based on the advice given by our Application Technology Department are beyond our control and thus entirely your responsibility. The sale of our products is effected in accordance with our current terms of sale and delivery.

ATTENTION! For new products, according to preliminary technical reports, adequate practical results are not always available which would permit a comprehensive assessment of such a product. It is therefore imperative to exercise particular care in the testing of such products with regard to the application intended!

Any questions? We would be pleased to offer you advice and assistance in solving your problems. Samples and technical literature are available upon request.

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Coating Innovations for Electronics

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PTR PRELIMINARY TECHNICAL REPORT

Elpemer® solder resist SD 2491 SM-TSW-R6-B

On account of its high resolution alongside its excellent dielectric properties the photoimageable solder resist **Elpemer® SD 2491 SM-TSW-R6-B** is used as an insulating coating for pcbs in fine and superfine line technology, SMD technology as well as for multilayers.

On account of its pure white colour and its extraordinary yellowing resistance it is especially suitable for LED applications in automobile electronics.

- **white-opaque**
- for application by means of screen printing
- aqueous-alkaline developable
- **extraordinary yellowing resistance even after lead-free reflow solder processes and high temperature loads**
- no influence on light colour when applied below white LEDs
- good resistance in TCT (temperature cycling test): -40 to +125 °C [-40 to +257 °F], 500 cycles, no cracking of ink if appropriate FR4 base material is used
- UL approval: best flame class V-0 according to UL 94, UL file no. E80315
- halogen-free acc. to JPCA-ES01-2003 / IEC 61249-2-21.
- very good reflectivity values
- broad processing window for predrying
- good scratch resistance
- excellent adhesion of subsequent coatings (marking inks, conformal coatings and others.)
- no pink/purple discolouration after electroless Ni/Au (ENIG) and SMD soldering

Characteristics

The characteristics are indicated in the product-specific process data sheets. We will provide them with the first shipment of this product or send them to you upon request.

Indices: SD = screen printing, SM = silk-mat, TSW = thermally stable white R6 = reflectivity 6, B = snow white

LP 141109 E-0 / 0263800e.000

Optical properties

Property	Test method	Result
Reflectivity at 460 nm	40 µm coating thickness measured on copper with a spectral photometer (measuring geometry: 45/0, light source type: D 65, standard observer: 10°)	≈ 90 %
Yellowing resistance	1000 h, 125 °C [257 °F], comparison standard: PCB after 2 x reflow soldering (lead-free), CIE lab system	$\Delta b \approx 1.2$

Physical and mechanical properties

Property	Test method	Result
Adhesion	IPC-SM-840E, 3.5.2.1	class H and T
Cross hatch	DIN EN ISO 2409 on copper on FR 4	Gt 0 Gt 0
Pencil hardness	IPC-SM-840E, 3.5.1 acc. to Wolff-Wilborn	5 H 5 H
Resistance to solvents/ cleaning agents	IPC-SM-840E, 3.6.1 Isopropanol Isopropanol : water (75 : 25) D-Limonene deonized water	 passed passed passed passed
Solder bath resistance Solder flux = 2 % adipic acid	IPC-SM-840E, 3.7.2 IPC-TM-650, 2.6.8	20 s at 265 °C [509 °F] 20 s at 288 °C [550.4 °F]*
Simulation lead-free reflow soldering	IPC-SM-840E, 3.7.3.1 5 x 10 s at 260 °C [500 °F]	no cracking no delamination
Temperature shock	IPC-SM 840E, 3.9.3, -65 to +125 °C [-85 to 257 °F], 100 cycles	class H and T
Resistance against acid	10 % H_2SO_4, 30 min at 20 °C [68°F]	no change
Resistance against lye	10 % NaOH, 30 min at 20 °C [68 °F]	no change

* With a solder bath resistance of 20 s at 288 °C [550.4 °F] the solder resist **Elpemer®** **SD 2491 SM-TSW-R6-B** fulfils the required temperature resistance for lead-free soldering.

Electrical properties

Property	Test method	Result
Dielectric strength	VDE 0303, part 21 DIN EN 60243-1	105 kV/mm
	IPC-SM-840E, 3.8.1	passed
Surface resistance	VDE 0303, Teil 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	2 x 10^{14} Ohm
Volume resistivity	VDE 0303, Teil 30/DIN IEC 60093 IPC-TM-650, 2.5.17.1	10^{15} Ohm x cm
Moisture and insulation resistance	IPC-SM-840E, 3.9.1	class H and T
Comparative Tracking Index (CTI, Tracking resistance)	DIN EN 60 112 on FR 4 base material with CTI 175 with CTI 600	 CTI 450* CTI 600*

* The CTI value of the coating depends on the CTI value of the base material; this value is at least maintained.

Note: Optimum electrical insulation values are only achieved if all flux residues are removed thoroughly from the printed circuit boards.

Processing

	Please read this technical report and the publications listed below carefully before using the product. These sheets are enclosed with the first shipment of product or sample.
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➔ When appyling electroless/galvanic surface finish processes the resistance of **SD 2491 SM-TSW-R6-B** has to be verified in pre-trials. In any case, a multiple chemical pre-treatment according to the principle of grain boundary etching (see TI 15/13 for detailed information) is recommended.

Protect from UV light

Since the many different permutations make it impossible to evaluate the whole spectrum (parameters, reactions with materials used, chemical processes and machines) of processes and subsequent processes in all their variations, the parameters we recommend are to be viewed as guidelines only that were determined in laboratory conditions. We advise you to determine the exact process limitations within your production environment, in particular as regards compatibility with your specific follow-up processes, in order to ensure a stable fabrication process and products of the highest possible quality.

The specified product data is based upon standard processing conditions/test conditions of the mentioned norms and must be verified observing suitable test conditions on processed printed circuit boards.

Feel free to contact our application technology department (ATD) if you have any questions or for a consultation.

Safety recommendations

➔ When using chemicals, the common precautions should be carefully noted.

➔ Ensure that extractor units of workplace ventilation arrangements are positioned at solvent source level.

➔ Please also pay attention to national guidelines or directives concerning operating safety such as the German TRBS (technical rules for operating safety) and those concerning the handling of flammable liquids as for example the German TRbF (technical rules for flammable liquids) or European directives.

Auxiliary products recommended

- **Deoxidising agent HP 5625**
  Deoxidises Cu areas in continuous spray coating units as a pre-treatment of pcbs prior to ink/resist application
- **Screen opener HP 5200**
  highly active spray for dissolving dried screen printing inks from the screen; silicone- and grease-free, thus no surface defect/dewettings or smearing effects to be expected
- **Anti-static spray HP 5500**
  prevents and eliminates electrostatic discharge occurring during screen printing; silicone- and grease-free
- **Special stripper HP 5707**
  for removing photoimageable solder resists (e.g. in case of incorrect exposure) and for cleaning ink developer and resist stripping units
- **Defoamant HP 5911**
  for defoaming of aqueous-alkaline developer solutions, silicone-free, biologically degradable
- **Cleaning agent R 5899**
  for screen washing equipment, simply and safely to handle, no labelling in accordance with the German dangerous goods regulations required, extremely high flash point (> 100 °C [> 212 °F]), low vapour pressure < 0.1 hPa at 20 °C [68 °F], thus not affected by the EU-VOC regulation 1999/13/CE
- **Cleaning agent R 5821**
  for screen washing equipment and the cleaning of work tools, high flash point (+32 °C [89.6 °F])
- **Cleaning agent R 5817**
  for the manual cleaning of screens and tools

Drying/curing

Further information on drying/curing can be found in the corresponding process data sheets of each solder resist.

Standard packaging

	Component A	Componente B	Selling unit
SD 2491 SM-TSW-R6-B	10 tins à 0.96 kg	10 tins of 0.08 kg	10.4 kg
Thinner V 2467-SD	1 can of 15 kg	—	15 kg

Partial lots of the selling unit / smaller quantities available against surcharge.

Shelf-life and storage conditions

The shelf life / minimum shelf life and storage conditions are indicated in the product-specific product data sheets (PD) and shown on the container labels.

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