ELPEPCB®
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TR TECHNICAL REPORT

Solder resist SD 2496 TSW

The solder resist **SD 2496 TSW** enables so-called complete soldering with simultaneous selective soldering.

- High definition in screen printing
- excellent adhesion
- suitable for “static-flex” circuits
- excellent yellowing resistance even after lead-free reflow soldering and tempering processes
- low ΔE values
- high remission
- improves the light emission of LEDs through very high reflectivity
- very good resistance to weathering (QUV accelerated weathering test)
- halogen-free in accordance with JPCA-ES01-2003/IEC 61249-2-21
- basically compatible with lead-free soldering processes
- UL Recognised Component: best flame class V-0 acc. to UL 94 (UL File No. E80315)
- no brittleness with multiple hardening, e.g. subsequent prints

Characteristics

Colour/appearance	white
Solids content of mixture DIN EN ISO 3251 (1 h, 125 °C [257 °F], 1 g weighed quantity)	70 ± 2 by weight
Viscosity* of mixture at 20 °C [68 °F], DIN EN ISO 3219	31 500 ± 4 500 mPas
Density at 20 °C [68 °F], ISO 2811-1 Comp. A Comp. B Mixture	 1.43 ± 0.05 g/cm³ 1.05 ± 0.05 g/cm³ 1.41 ± 0.05 g/cm³
Pot life of mixture (at 18 – 23 °C) [64.4 - 68 °F], set-up quantity 500 g	approx. 8 hours

* measured with Haake RS 600, C 20/1°, D = 100 s^{-1},
viscosity measuring unit supplied by Thermo Fisher Scientific, www.thermofisher.com

Indices: SD = screen printing, TSW = thermally stable white

LP 251806 E-3 / 300448e_000

Optical properties

Property	Test method	Result
Remission at 460 nm	light sourceLichtart D65, 45°/0°, 10° standard observer, 40 µm layer thickness	91 %
Brightness (L index)		95
ΔE after thermal stress (1000 h at 125 °C [257 °F])	ISO 7724-3	< 1*
ΔL after thermal stress (1000 h at 125 °C [257 °F])		< 1*
ΔE after UV stress (1000 h xenon arc radiation, 550 W/cm²)		< 1*

* The highest quality (least yellowing) corresponds to a colour change of ΔE < 1. The grades in descending order to the lowest quality correspond to colour changes in ΔE as follows:
ΔE = 0–1: normally not visible
ΔE = 1–2: slight yellowing, only visible to the trained eye
ΔE = 2–3,5: medium change, visible to the untrained eye
ΔE = 3,5–5: marked change
(applies in the same manner to ΔL for changes in brightness)

Physical and mechanical properties

Property	Test method	Result
Adhesion	IPC-SM-840E, 3.5.2.1	class H and T
	IPC-SM-840E, 3.6.2.6 (ink on ink)	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	≈ 4 H
Flexibility	Mandrel bending acc. to DIN 53152, polyimide film, thickness: 50 µm	1,5 mm mandrel
Resistance to solvents	IPC-SM-840E, 3.6.1.1 Isopropanol Isopropanol : deionised water (75 : 25) D-Limonene 10% alkaline cleaning agents Monoethanolamine Deionised water	 passed passed passed passed passed passed
Solder bath resistance	IPC-SM-840E, Pkt. 3.7.2 IPC-TM-650, 2.6.8 UL 94	passed: 20 s at 265 °C [509 °F] passed: 10 s at 288 °C [550.4 °F] passed: 20 s at 288 °C [550.4 °F]*

* With a solder bath resistance of 20 s at 288 °C [550.4 °F], the solder resist fulfils the required temperature resistance for lead-free soldering.

Electrical properties

Property	Test method	Result
Dielectric strength	IPC-TM-650, 2.5.6.1	96 kV/mm
Surface resistance	DIN EN 62631-3-2	≥ 2 x 10^{14} Ohm
Volume resistivity	DIN EN 62631-3-1	≥ 5 x 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 IEC 60 112, on FR 4 base material with CTI 250	CTI ≥ 600

Optimum electrical insulation values can only be achieved when 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.
TI	Technical information TI 15/3 “Protective measures when using chemicals including lacquers, casting compounds, thinners, cleaning agents”
TI	Technical information TI 15/10 “Processing of 2-pack systems“
TI	Technical information TI 15/13 “Precleaning in the pcb fabrication process“

→ Due to the large number of fluxes available on the market, check their compatibility, especially with low-solid fluxes.

→ When using chemical finishing processes, check the resistance of the solder resist in preliminary tests. Dry film thicknesses > 20 µm are recommended.

→ Please note that the solder resist is not resistant to aggressive cleaning agents and solvents. However, the solvent resistance according to IPC-SM-840E, 3.6.1.1, is fulfilled.

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.

Mixing

Component A : Hardener (Component B) = 100 : 2 (parts by weight)

On the labels of our containers, you will find the volume [L] and weight [kg]. The mixing ratio refers to the weight.

Adjustment of viscosity

The solder resist **SD 2496 TSW** is adjusted in such a manner that it can normally be processed in the condition supplied. To reduce its viscosity for processing purposes

DIL dilute with universal thinner **UV 5000** or universal retarder **UZ 5100**

When using the retarder, the screen open time is extended at the same time.

Auxiliary products recommended

- ELPESPEC® 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
- ELPESPEC® anti-static spray HP 5500
  prevents and eliminates electrostatic discharge occurring during screen printing; silicone- and grease-free
- ELPESPEC® 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
- ELPESPEC® cleaning agent R 5821
  for the cleaning of equipment and work tools, high flash point (+32 °C [89.6 °F])
- ELPESPEC® cleaning agent R 5817
  for the manual cleaning of screens and tools

Screen printing

➔ Ensure that the surface to be coated is clean, dry and grease/oxide-free and that copper surfaces preferably have an average surface roughness of 2 µm.

Recommended screen printing parameters

Screen fabric	Polyester 43-80 to 77-48 (acc. to old nomenclature polyester 43-77 T [lines/cm]) or corresponding steel fabric
Screen tension	at least 25 N/cm or according to the instructions of the screen mesh manufacturer
Squeegee	75-80 Shore-A hardness
Squeegee profile	right angled
Squeegee angle	approx. 75 °C

Drying/curing

➔ Cure the solder resist **SD 2496 TSW** in a convection dryer under the following conditions: **30 min* at 150 °C [302 °F] or 60 min* at 130 °C [266 °F]**.

* Object holding time: The curing time starts when the panels reach the curing temperature.

SD 2496 TSW is also suitable for curing in conveyorised IR lines.

➔ Determine the optimum temperature profile of the system in preliminary tests.

Packaging

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

Shelf life and storage conditions

Shelf life: In sealed original containers at least 4 months

Storage conditions: +5 °C to +25 °C [+41 °F to +77 °F]

For warehousing reasons, isolated cases may occur where the shelf life upon shipment is less than the shelf life indicated in this technical report. However, it is ensured that our products have **at least** two-thirds of their shelf life remaining when they leave our company. Labels on containers show shelf life and storage conditions.

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.

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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PTR PRELIMINARY TECHNICAL REPORT

Solder resist SD 2446

The solder resist **SD 2446** enables so-called complete soldering with simultaneous selective soldering.

- High definition printing
- excellent adhesion
- suitable for “static-flex” circuits
- excellent color stability even after lead-free reflow soldering and tempering processes
- very good resistance to weathering and chalking (QUV accelerated weathering test)
- halogen-free in accordance with JPCA-ES01-2003/IEC 61249-2-21
- basically compatible with lead-free soldering processes
- no brittleness with multiple hardening, e.g. subsequent prints

Characteristics

Colour/appearance	black opaque
Solids content of mixture DIN EN ISO 3251 (1 h, 125 °C [257 °F], 1 g weighed quantity)	70 ± 2 % by weight
Viscosity* of mixture at 20 °C [68 °F], DIN EN ISO 3219	22 000 ± 3 000 mPas
Density at 20 °C [68 °F], ISO 2811-1 Comp. A Comp. B Mixture	 1.35 ± 0.05 g/cm³ 1.05 ± 0.05 g/cm³ 1.35 ± 0.05 g/cm³
Pot life of mixture (at 18 – 23 °C) [64.4 - 68 °F], set-up quantity 500 g	approx. 8 hours

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viscosity measuring unit supplied by Thermo Fisher Scientific, www.thermofisher.com

Index: SD = screen printing

LP 251605 E-3 / 301666e_000

Physical and mechanical properties

Property	Test method	Result
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* With a solder bath resistance of 10 s at 288 °C [550.4 °F], the solder resist **SD 2446** fulfils the required temperature resistance for lead-free soldering.

Electrical properties

Property	Test method	Result
Dielectric strength	DIN EN 60243-2	64 kV/mm
Surface resistance	DIN EN 62631-3-2	≥ 2 x 10^{14} Ohm
Volume resistivity	DIN EN 62631-3-1	≥ 3.7 x 10^{16} Ohm x cm
Comparative Tracking Index (CTI, Tracking resistance)	DIN EN IEC 60 112, on FR 4 base material with CTI 400	CTI 400

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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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