Advanced Materials

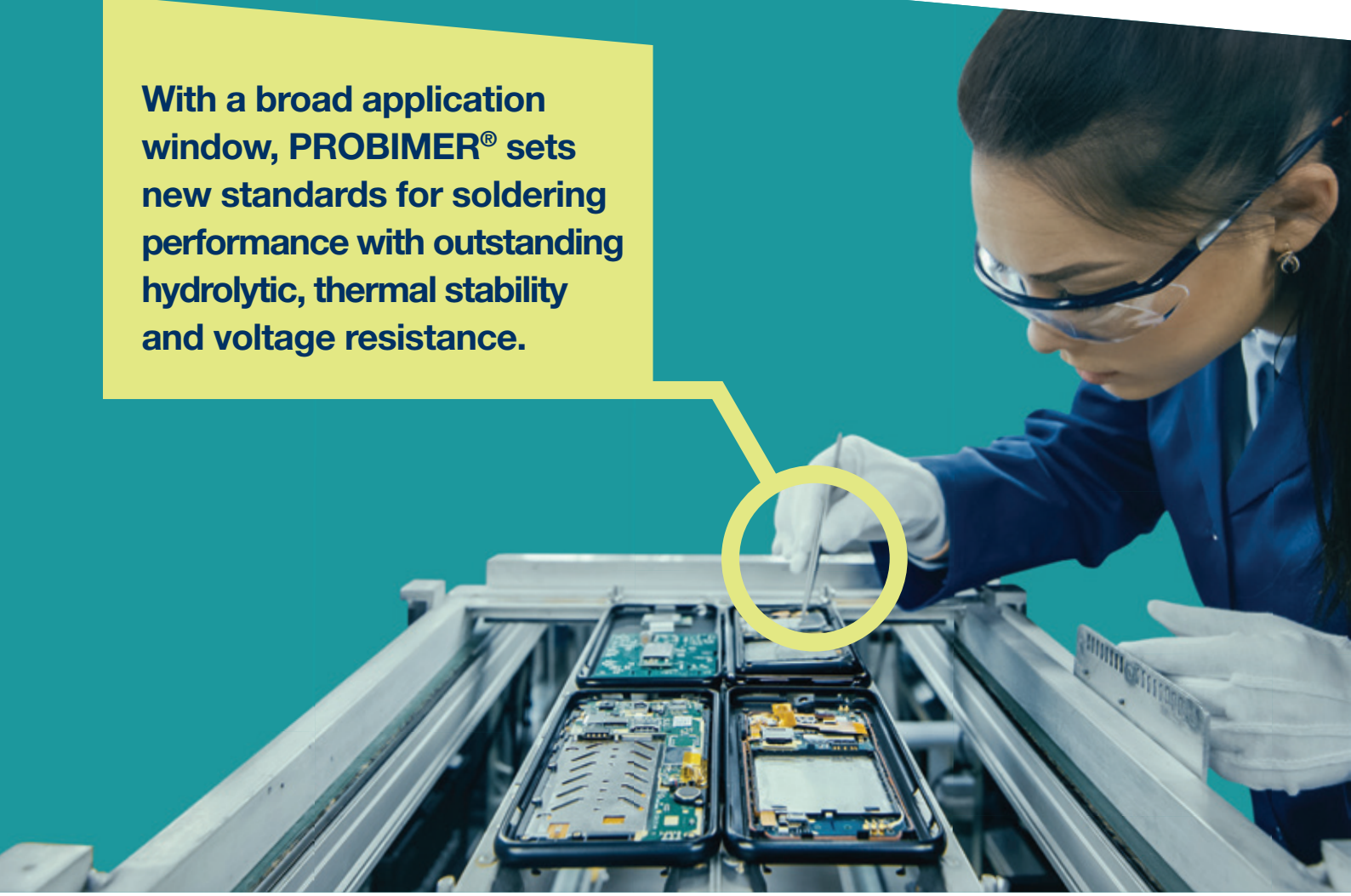
HUNTSMAN

Enriching lives through innovation

HIGH PERFORMANCE AND RELIABILITY FOR ALL YOUR PCB NEEDS

Product selector guide

With a broad application window, PROBIMER® sets new standards for soldering performance with outstanding hydrolytic, thermal stability and voltage resistance.



MADE POSSIBLE

SUSTAINABLE CLASS-LEADING SOLDER MASK SOLUTIONS FOR TOMORROW'S APPLICATIONS

At Huntsman Advanced Materials, we make things possible. That's why our PROBIMER® range of solder masks are approved by many of the world's leading OEMs to deliver the sustainable, reproducible, and cost-efficient performance needed to produce highly reliant PCBs for the automotive industry.

For over 40 years we have brought unrivalled expertise and formulation know-how to the printed circuit board (PCB) industry. This rich experience translates directly into sustainable, reliable innovations for resins at temperature > 160 °C and at comparative tracking index (CTI) > 600.

OUTSTANDING PERFORMANCE

PROBIMER® solder masks can help you to accelerate your product development ambitions through high resolution, extended formulations that open exciting new possibilities in design and innovation.

All our products are easy to handle with no micro bubbles or blistering and deliver excellent edge coverage, helping you to maximize productivity and process efficiency. Each offers exceptional thermal resistance and dielectric strength, enabling you to address key performance challenges and meet future market demands.

GLOBAL SUPPORT

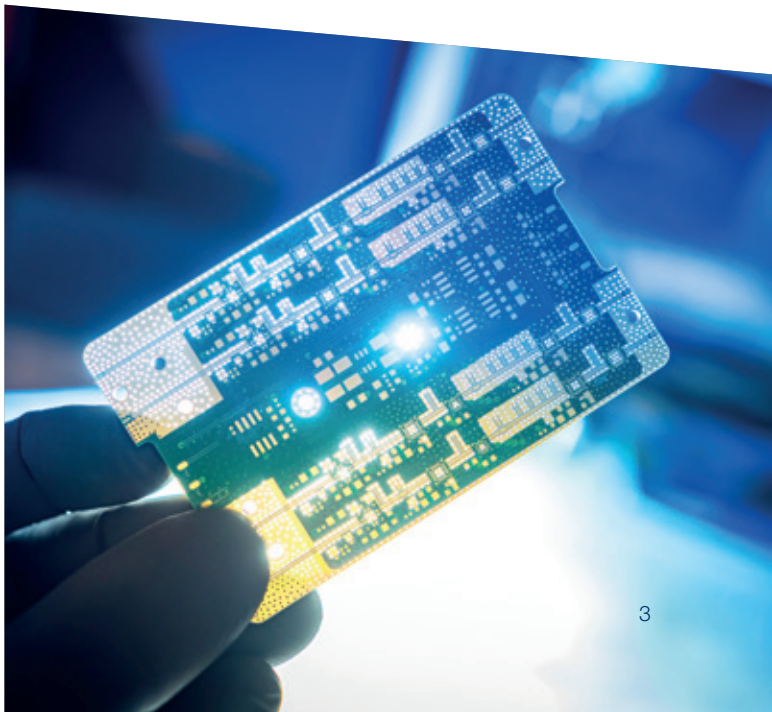
With a worldwide support network, our technical service teams offer unrivalled expertise in formulation, processing, and simulation technologies, backed by world-class manufacturing resources and globally dependable supply chains.

Not only does this help to streamline development cycles and safeguard your production process, but we can also help you to ensure that your products comply with international regulations, such as TSCA and REACH.

Temperature resistance
-40 °C/+160 °C

Low energy solutions
150 - 300 mJ/cm²

High voltage resistance
>1000 V



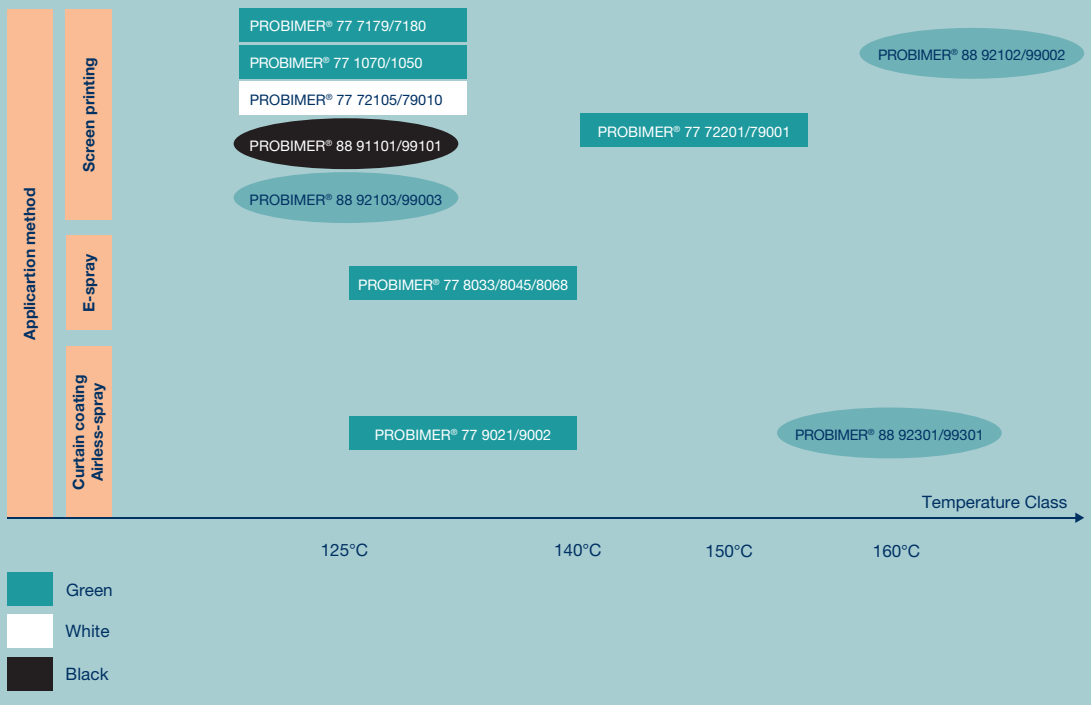
40+ YEARS IN THE SOLDER MASK BUSINESS FOR PRINTED CIRCUIT BOARDS

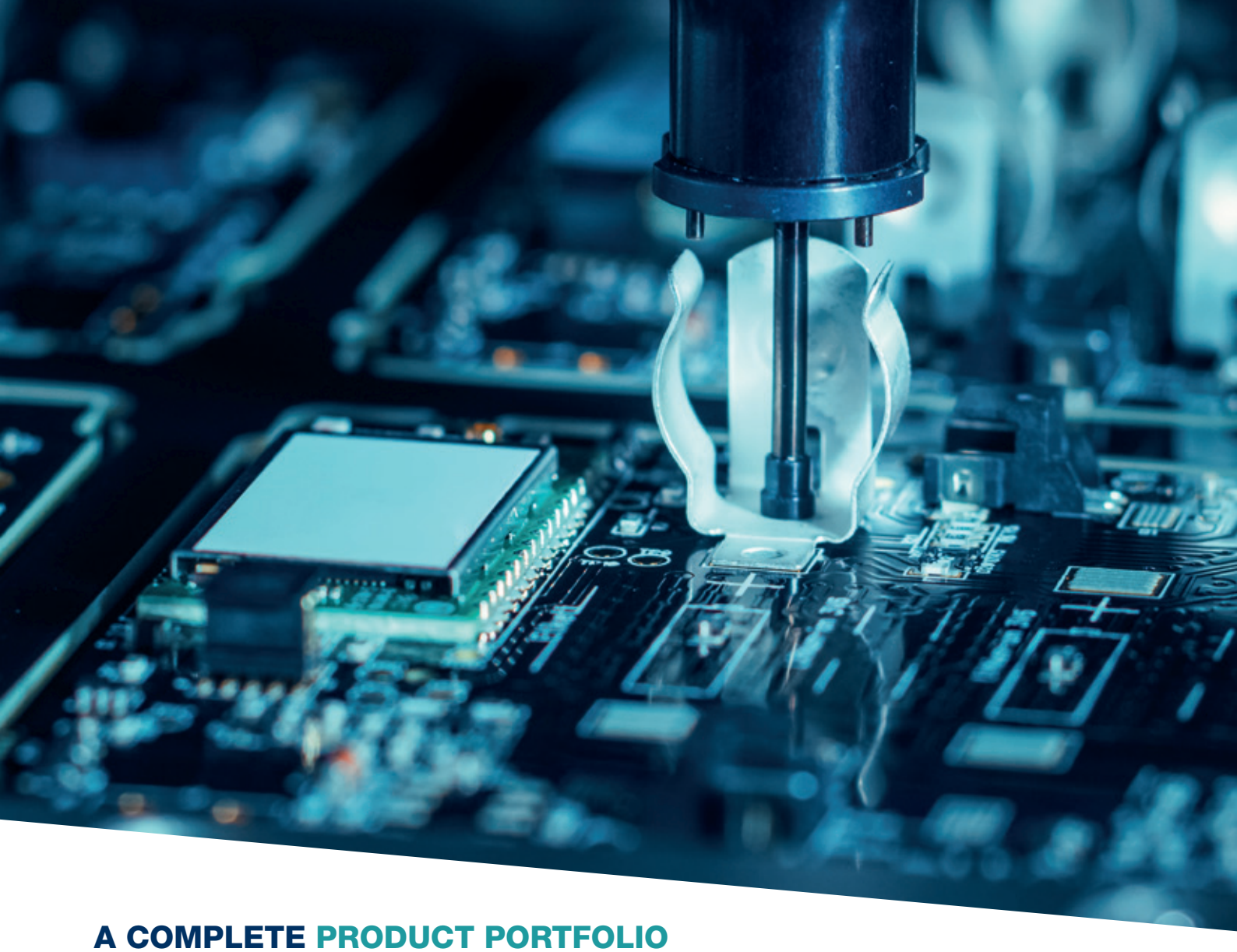
Our world-leading expertise and dependable solutions deliver high resolution, extended formulations that streamline your development process.

Each of our products are easy to handle and offer outstanding thermal resistance and dielectric strength, and are fully compliant with international regulations, such as TSCA and REACH.

MARKET-LEADING SOLDER MASKS FOR THE AUTOMOTIVE INDUSTRY

Continued innovation in thermal class





A COMPLETE PRODUCT PORTFOLIO

PROBIMER® range

Application	Gloss rate	Product designation	Performance highlights
CC	Glossy	**PROBIMER® 77 9020/9002**	Good chemical resistance
CC	Semi-matt	**PROBIMER® 77 9021/9002**	Good chemical resistance
CC/Spray	Semi-matt	**PROBIMER® 88 92301/99301**	TC 7/8 160 °C, high photospeed
E-Spray	Semi-matt	**PROBIMER® 77 8033/8045/8068**	Gloss 10 - 15%
FSP	Glossy	**PROBIMER® 77 9000/9002**	Good chemical resistance
FSP	Semi-matt	**PROBIMER® 77 7179/7180**	Well-proven for automotive, Gloss 30 - 40%
FSP	Semi-matt	**PROBIMER® 77 3rd Gen. 72101/79001**	Thermal Class D1000, -40 /+140 °C 1 000 h Continental approval
FSP	Semi-matt	**PROBIMER® 88 92102/99002**	Thermal Cycling Class TC 8/9 Plus 170 °C High Voltage Application > 1000 V High Dielectric Strength 150 - 170 V/µm High Surface Tension > 36 mN/m (2 x Reflow)
FSP	Semi-matt	**PROBIMER® 88 92103/99003**	TC 4 125 °C, low D_k/D_f and low latency
FSP	Matt	**PROBIMER® 77 1070/1050**	Gloss < 8% less solder balls
FSP black	Matt	**PROBIMER® 88 91101/99101**	TC 4 125 °C, low exposure energy
FSP white	Glossy	**PROBIMER® 77 3rd Gen. 73100/79002**	Excellent white colour stability High reflectivity
FSP white	Semi-matt	**PROBIMER® 77 3rd Gen. 72105/79010**	Thermal Class C, -40 /+125 °C 500 h

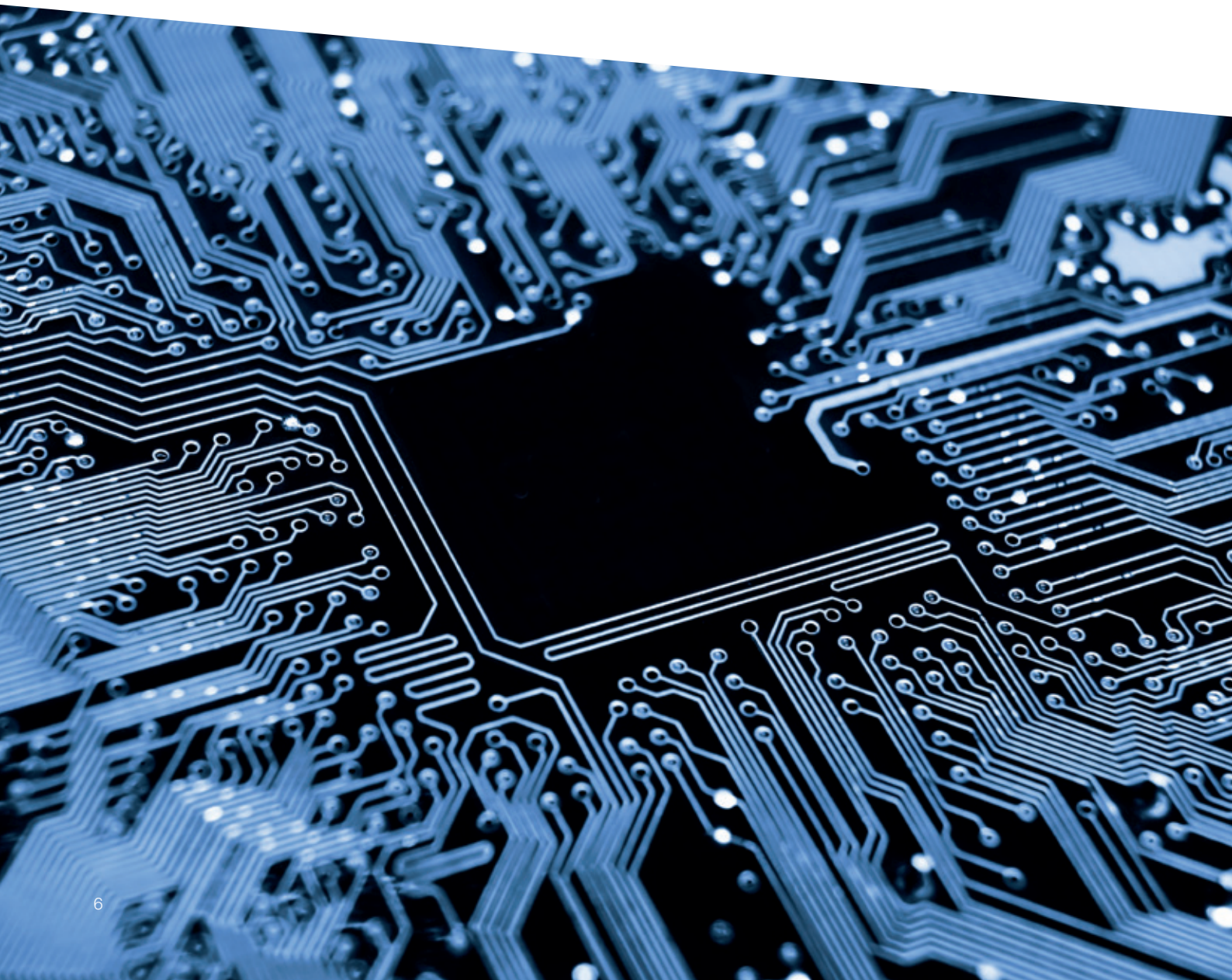
FSP: Flooded screen printing
CC: Curtain coating
D_k: Permittivity
D_f: Loss constant

PHOTOIMAGEABLE SOLDER MASK PROBIMER® 77

The PROBIMER® 77 series is a photoimageable solder mask. It is designed for high-end applications across Automotive, Telecom, and General Industry that require class-leading reliability.

KEY BENEFITS:

- **Wide process window**
- **Outstanding performance in post solder mask process**
- **High reliability**
- **Screen printing**
- **Electrostatic spray**
- **Curtain coating**



PROBIMER® 77 PROPERTIES

7179/7180 Wide curing window, and high resolution

Properties	High resolution
	Fulfills the requirements of IPC SM-840
	Wide drying window
	High comparative tracking index (CTI)
	High dielectric strength

Typical process condition

Process	Conditions	Process	Conditions
Ink viscosity	150 dPa·s (VT-04 F)	**Pre-drying**	80 - 85 °C for 40 - 60 min
Pretreatment	Pumice scrubbing or super etching	**UV exposure**	150 - 300 mJ/cm² (UV 351) SSG >10
Screenprint	45 - 50 µm wet thickness on copper	**Developing**	2 kg/cm² for 60 - 90 sec
Flash-off	30 min holding time	**Post-curing**	145 - 155 °C for 45 - 70 min
		UV bumping	1 000 - 2 000 mJ/cm²

Application performance

Items	Requirements	Performances
Gloss on copper at 60°	/	20 - 45
Film thickness on copper	Reference	25 µm
Soldering resistance: 288 °C for 10 sec	3 cycles pass	Pass
Acid resistance 10% HCl, 30 min	No peeling	Pass
ENIG (Au: 0.02 - 0.05 µm; Ni: 3 - 7 µm) / IMT (Tin: ~1 µm) / HASL (~270 °C / flux HAR-809K)	No peeling	Pass
Drying window 85 °C for 40 min / 85 °C for 60 min / 85 °C for 80 min	Reference	32 sec / 37 sec / 45 sec
Hole develop ability (based on developing parameter)	Blocked hole size	≤ 0.35 mm

PROBIMER® 77 CLASS-LEADING TECHNOLOGY

Lower energy demand, faster developing, and robust application window

Items	PR77 7179/7180	Competitor
Solid content	70 - 72%	75%
Per curing	80 °C for 60 min	80 °C for 60 min
Exposure	150 - 300 mJ/cm²	300 - 400 mJ/cm²
Developing	60 - 90 sec	60 - 100 sec
Post curing	150 °C for 60 min	150 °C for 60 min
UV bumping	1 000 - 2 000 mJ/cm²	500 - 1 000 mJ/cm²

PROBIMER® 77 IN FIELD PERFORMANCE DATA

Excellent processability

Items	Requirement	Result
Film thickness on copper	Reference	25 µm
Soldering resistance (flux HAR-809K): 288 °C for 10 sec	3 cycles pass	Pass
Acid resistance 10% HCl, 30 min	No peeling	Pass
ENIG (Au: 0.02 - 0.05 µm; Ni: 3 - 7 µm) / IMT (Tin: ~1 µm) / HASL (~270 °C / flux HAR-809K)	No peeling	Pass
Solder dam	/	51 µm

PHOTOIMAGEABLE SOLDER MASK PROBIMER® 77 WHITE

PROBIMER® 77 White is designed for high performance across multiple applications within the ALED BLU and LED lighting sectors.

KEY BENEFITS:

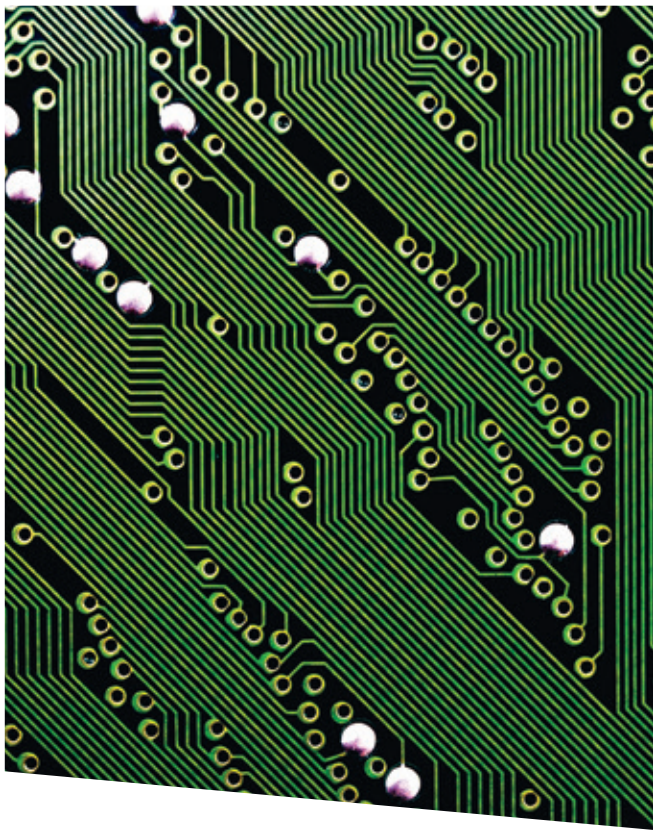
- **Excellent non-yellowing performance**
- **Good reflectance for lighting**
- **Outstanding performance in post solder mask process**

PROBIMER® 77 WHITE PROPERTIES

Application method: screen printing

Product designation	73100/79002	72103/79002	72105/79010
Color	White	White	White
Gloss	Glossy	Semi-matt	Semi-matt
N.V (wt.%)	70 - 74	70 - 74	70 - 74
Shelf life (months)	12	12	9
Pencil hardness	6H	6H	6H
Adhesion on copper (ISO2409, Cross Hatch)	GT 0 - 1	GT 0 - 1	GT 0 - 1
Resolution (solder dam after HAL - µm)	102	76	102
Soldering resistance (260 °C, 10 sec, 3 cycles)	Pass	Pass	Pass
Dielectric strength (V/µm)	120 - 130	120 - 130	120 - 130
Finish treatment	ENIG/HASL/IMT/OSP		
Halogen free (JPCA-ES-01)	Yes	Yes	Yes

PHOTOIMAGEABLE SOLDER MASK PROBIMER® 88



PROBIMER® 88 features a semi-matt surface and has exceptional temperature resistance. This makes it the perfect choice for automotive circuit boards with a thermal class of 140 °C and 160 °C requirements.

KEY BENEFITS:

- **Halogen-free, meets JPCA standards**
- **High resolution**
- **Wide process window**
- **Outstanding performance in post solder mask process**

PROBIMER® 88 RANGE

Thermal Class/Photospeed

Product designation	Aspect	Colour	Application	Photospeed standard
PROBIMER® 88 92102/99002	Semi-matt	Green	FSP	300 - 500 mJ
PROBIMER® 88 92301/99301	Semi-matt	Green	CC, Spray	200 - 400 mJ
PROBIMER® 88 92103/99003	Semi-matt	Green	FSP Low D_k/D_f - high CTI	100 - 300 mJ
PROBIMER® 88 91101/99101	Matt	Black	FSP	300 - 500 mJ

Product designation	Temperature class	Cycle/hour	Temperature
PROBIMER® 88 FSP	TC 8/9 Plus	2 000 cycles	-40 °C/+160 °C
		1 000 cycles	-40 °C/+170 °C
	TS 8/9 Plus	2 000 h	160 °C
		1 000 h	180 °C
PROBIMER® 88 CC	TC 7/8	1 000 cycles	-40 °C/+160 °C
	TS 7/8	1 000 h	160 °C
PROBIMER® 88 low D_k/D_f	TC 4	500 cycles	-40 °C/+125 °C
	TS 4	500 h	125 °C
PROBIMER® 88 black	TC 4	500 cycles	-40 °C/+125 °C
	TS 4	500 h	125 °C

Performance summary PROBIMER® 88 92102/99002 FSP with outstanding leakage performance

Test item	Properties
Dry film thickness on copper	30 - 32 µm
Copper thickness	50 µm
Photo speed / 400 mJ / cm^2 (Stouffer 21 step)	11
Adhesion	GT 0
Hardness, 750 g weight loading	≥ 6H
Acid resistance, 30 min	Pass
Solvent resistance, 30 min	Pass
Soldering resistance, HAR-809K, 288 °C for 10 sec, 3 times	Pass
Thermal shock 2 000 cycles (-40 °C/+160 °C)	Pass
Thermal storage 2 000 h 160 °C	GT 1
Dielectric strength	150 - 170 V/µm
MIR 500 V / 1 000 V high voltage test	Pass
Surface tension (2xPb-free Reflow)	> 36 mN/m
CTI	600

PROBIMER® 88 RANGE

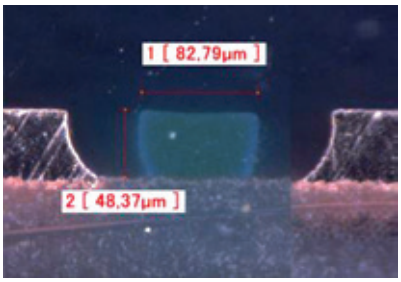
PROBIMER® 88 92102/99002 FSP: CTI higher than standard laminate values

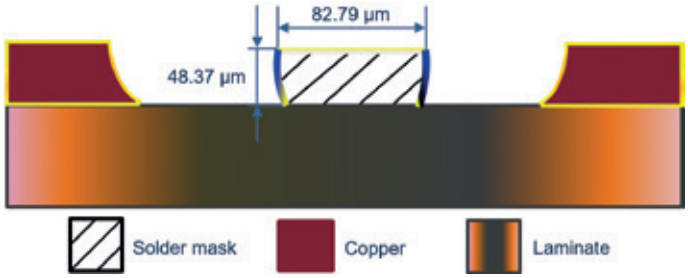
Laminate	CTI of laminate	Solder mask	CTI result
Standard Laminate A	175	PR 77 7179/7180	CTI 250
		PR 77 72101/79001	CTI 250
		PR 88 92102/99002	CTI 350
Standard Laminate B	175	PR 77 7179/7180	CTI 300
		PR 77 72101/79001	CTI 250
		PR 88 92102/99002	CTI 350
High CTI Laminate	600	PR 77 7179/7180	CTI 600*
		PR 77 72101/79001	CTI 600*
		PR 88 92102/99002	CTI 600*

*when CTI value matched 600, the external test party stopped the test

PROBIMER® 88 92301/99301 CC: Super fast in exposure

Exposure		Exposure energy	Cycle time	Panel size
UV Direct Imaging	Fe-doped lamp	60 mJ/cm²	24 s	610 x 535 mm
50 - 150 mJ/cm²	100 - 300 mJ/cm²			

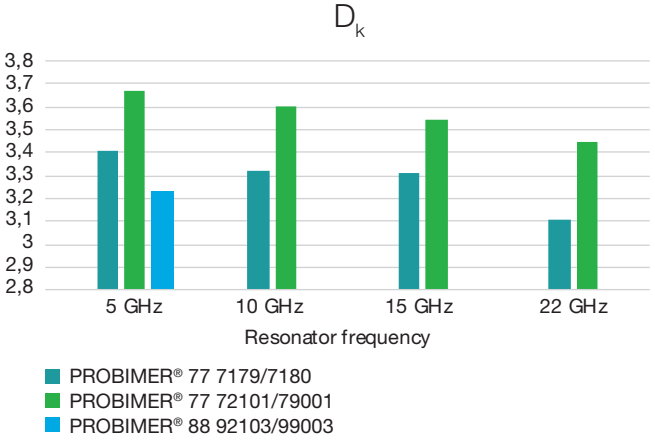


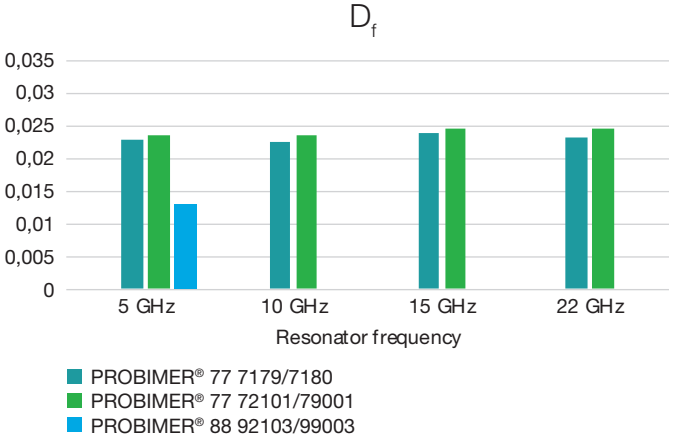


PROBIMER® 88 92103/99003: Low D_k/D_f and low latency

Test item		Test method	Low D_k/D_f formulation
D_k	5 GHz	Cavity resonator (SPDR)	3.23 ± 0.1
D_f	5 GHz	Cavity resonator (SPDR)	0.013 ± 0.1

SPDR: Split post dielectric resonators





MADE POSSIBLE

HUNTSMAN

Enriching lives through innovation

Huntsman Advanced Materials

At Huntsman Advanced Materials, we make things possible. Serving many of the world's leading businesses across virtually every industry, we enable greater innovation, performance and sustainability to address global engineering challenges and contribute towards a better quality of life.

Our capabilities in high-performance adhesives and composites, delivered by more than 1600 associates, support over 2000 global customers with innovative, tailor-made solutions and more than 1500 pioneering epoxy, acrylic, phenolic and polyurethane-based polymer products.

We operate synthesis, formulating and production facilities around the world

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Ref. No. AdMat PROBIMER® brochure 09.22_EN_EU

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OUR COMMITMENT TO SUSTAINABILITY

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