

SOL9651B



SOL9651B
> +0.1%
Eta gain

efficiency

Patent Pending

FRONT-SIDE PASTE



New Generation Front Side Silver Paste

- High Voc, extra protection on laser damaged Selective Emitter
- High FF, superior contact for further diffusion optimization
- Fine-line printing for better efficiency and mass production

Heraeus, the technology leader, closely following the industry trend, has developed the SOL9651B series based on the paste chemistry upgraded from last generation for ULDE (Ultra Lightly Doped Emitter) with Selective Emitter (SE), combined with the latest improvement in organic vehicle system for UFL (Ultra-Fine-Line) printing. As confirmed by customers, SOL9651B has efficiency gain >0.10% in mass production.

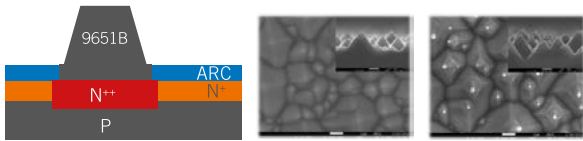
SOL9651B is an evolutionary product family designed for advanced PERC (Passivated Emitter Rear Contact) technology. Such paste chemistry provides a wide firing window toward lower temperature side, which makes this series well-performed on PERC. It is worth mentioning that the 9651B formulation also allows our local PML (Product Modification Labs) to do quick and efficient customization for versatile customer applications.

KEY BENEFITS

- High Voc, extra protection of laser damaged selective emitter area
- High FF, superior contact performance to provide more space of diffusion optimization
- Ultra-fine-line (UFL) screen printing for defect-free mass production
- Wide process window
- Great CTM (cell-to-module) performance
- Allows quick and efficient customization
- Double and Dual printing packages available
A+A' : SOL9652B1/SOL9652B2
A+B : SOL9651B/SOL9622B

UNIQUE PASTE CHEMISTRY DESIGNED FOR SELECTIVE EMITTER PERC CELL

Driven by ULDE in c-Si solar industry, the cell manufacturers are trying different technologies to boost cell efficiency; Selective Emitter by laser doping from phosphosilicate glass is a promising one. Continued innovation from last generation, SOL9651B features a unique patent pending glass frit and silver combination, enabling the tolerance of wide firing temperatures and emitter protection. SOL9651B successfully overcome the challenge of contacting ULDE ($\sim 10^{-19}$ dopant concentration) and also ensure the less damage under laser-processed SE area under metallization finger. Such features bring out the most benefits of ULDE, such as higher I_{sc} and V_{oc} , therefore boosts the cell efficiency.



FURTHER IMPROVED ULTRA-FINE-LINE PRINTABILITY

The SOL9651B is perfectly tailored for Ultra-fine-line printability for screen printing. It supports a finger geometry that can print defect-free through a less than $28\mu\text{m}$ screen opening in high throughput mass production.

Wafer	PERC Mono + Selective Emitter	
Screen	440 Mesh-28 μm Opening	
Paste	Name	9651B
Screen Printing	Deposit/Pcs	0
	Δ Fired L.W.	-4.4 μm
	Δ Fired L.H.	0
	Δ Fired A.R.	+4 %
	Δ Print speed [mm/s]	+50
Electrical Performance	Δ Eff [%]	+0.11 %
	Δ Voc [mV]	+1.6
	Δ Isc [mA]	+37
	Δ FF [%]	+0.1
	Δ Rs [m Ω]	-0.08
	Δ Rsh [Ω]	+873

TYPICAL PROPERTIES

Solids: $91.0 \pm 1\%$

Viscosity:

SOL9641B:

- CPE-51 spindle (Brookfield):
80–150kcps @ 1 RPM, 25°C

Fineness of Grind (FOG):

4th scratch: $\leq 10\mu\text{m}$

50%: $\leq 5\mu\text{m}$

Wafer Types:

- Monocrystalline with Selective Emitter on ULDE
- Multicrystalline by Diamond-Wire-Cut

Recommended finger opening:

Single Print : 25–40 μm

Double Print : can be optimized based on customer case

RECOMMENDED PROCESSING GUIDELINES

Printing: screen parameter recommended:

25–45 μm opening:

calendared 360 mesh, 16 μm or

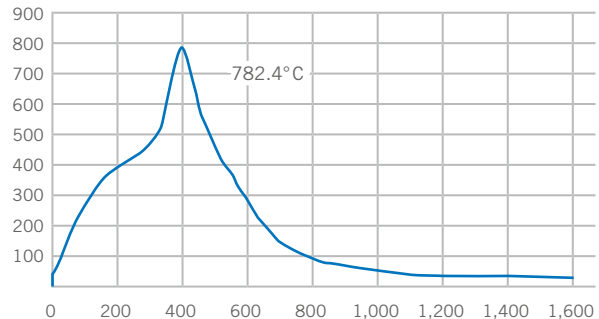
calendared 440 mesh, 13 μm or

calendared 325 mesh, 16 μm

- EOM thickness: 12–20 μm

Drying: typically dried in an IR dryer with set points of 250–300°C in less than 30 seconds or 150–200°C for 10 minutes in circulated air oven.

Firing:



A typical firing profile for Mono ULDE PERC cell

Storage:

Store in a dry location at 5°C–25°C.

EUROPE (GERMANY)

Heraeus Deutschland GmbH & Co. KG

63450 Hanau

Phone +49 6181 35 5051

pv.hde@heraeus.com

AMERICA (USA)

Heraeus Precious Metals North America Conshohocken LLC/Heraeus Incorporated

19428 W. Conshohocken

Phone +1 610 825-6050

pv.hpmmc@heraeus.com

ASIA (TAIWAN)

Heraeus Materials Technology Taiwan Ltd.

33855 Luzhu (Taoyuan)

Phone +886 3 321 9937

pv.hmmt@heraeus.com

ASIA (KOREA)

Heraeus Korea Corporation

16506 Suwon-si

(Gyeonggi-do)

Phone +82 31 270 9428

pv.hmk@heraeus.com

ASIA (CHINA)

Heraeus Materials Technology Shanghai Ltd.

201108 Shanghai

Phone + 86 21 3357 5688

pv.hmmts@heraeus.com

ASIA (JAPAN)

Heraeus K. K.

112-0012 Tokyo

Phone +81 3 6902 6564

pv.hkk@heraeus.com

ASIA (SINGAPORE)

Heraeus Materials Singapore Pte. Ltd.

639335 Singapore

Phone +65 6571 7888

pv.hmsl@heraeus.com

Visit us online:

www.heraeus-photovoltaics.com

www.heraeus-renewables.com

www.heraeus-photovoltaics.cn

www.heraeus-renewables.cn

Follow us on our Chinese WeChat!

