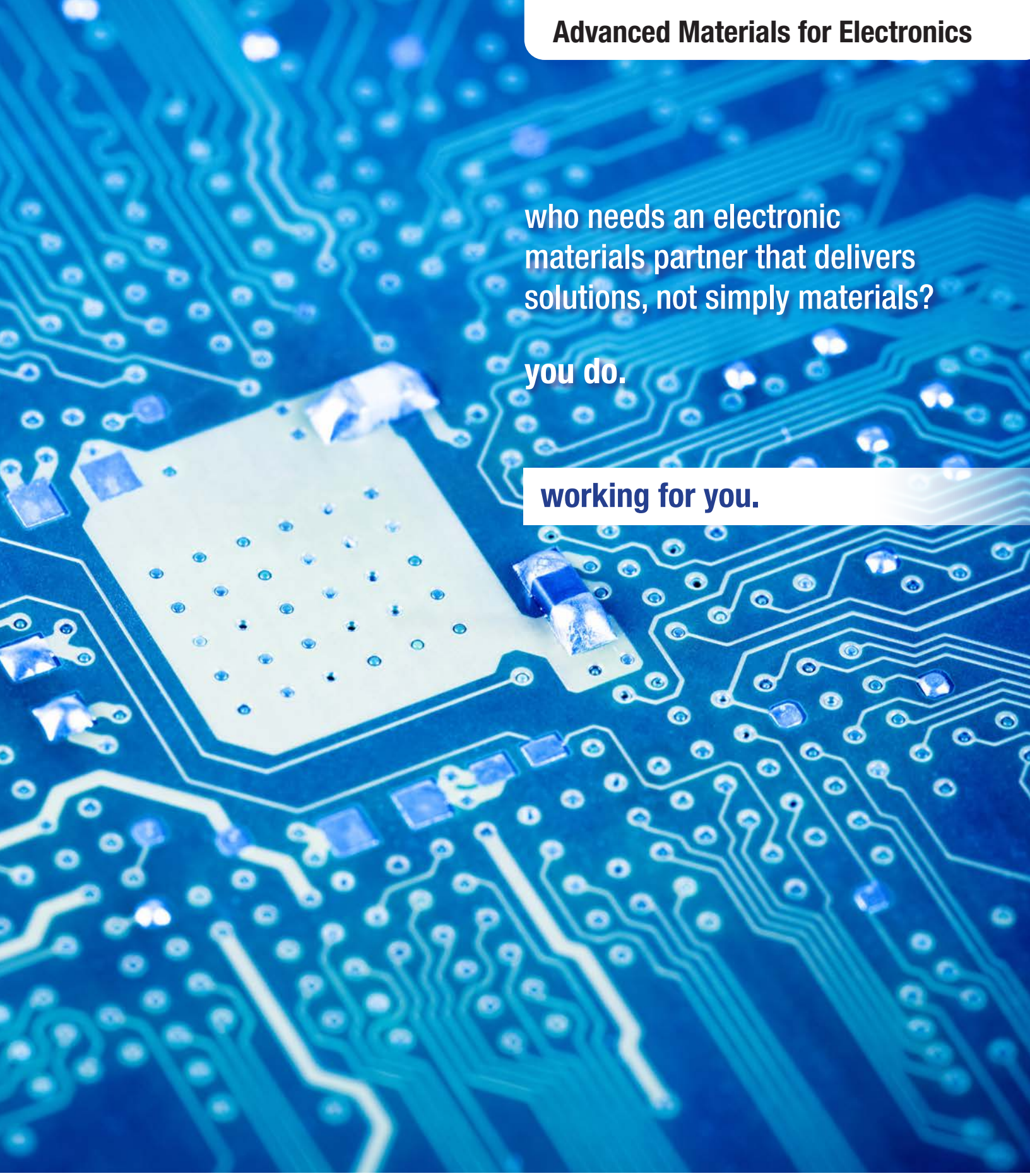


who needs an electronic materials partner that delivers solutions, not simply materials?

you do.

working for you.

SunChemical®

a member of the DIC group

Color & Comfort

Sun Chemical Advanced Materials:

Integrated solutions for electronics applications

Sun Chemical Advanced Materials is a trusted solutions provider for printed circuit boards, printed electronics, flexible hybrid electronics and advanced photovoltaics. By combining unmatched R&D capabilities and global technical service, our Advanced Materials team is the ideal partner from project conception to production.

Tailor-Made Solutions to Meet Your Needs.

The challenges to success in the electronics market have never been greater. Now more than ever, the path to continued success is through alliance and collaboration with committed, competent and innovative technology partners. Sun Chemical Advanced Materials delivers solutions for for printed circuit boards, printed electronics, flexible hybrid electronics and advanced photovotaics so your organization can meet today's challenges and opportunities with our Solutions Tailor-Made approach.

We have long been a global technology leader in printing inks and coatings formulations along with the color pigments, dispersion and specialty materials that are required to meet critical performance parameters.

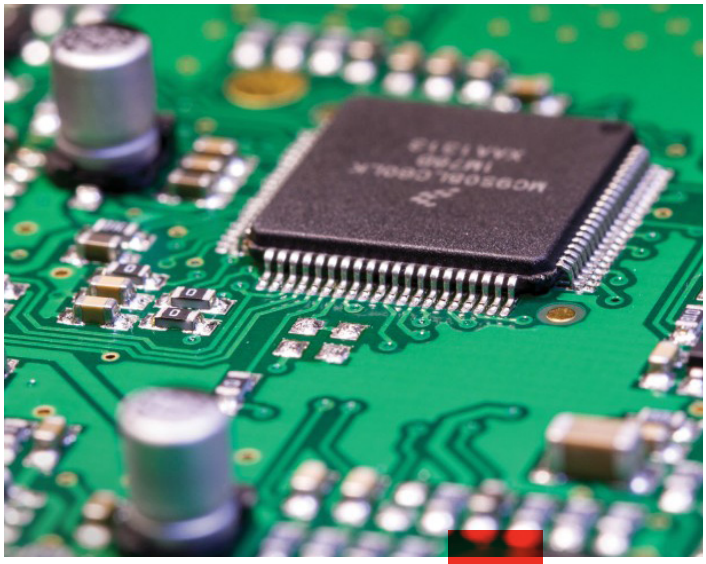
Our goal is to deliver solutions through close collaboration with like-minded companies seeking to develop new technologies and products. We are leveraging our worldwide network of technological and commercial support to advance applications in:

- Printed Circuit Boards
- Flexible Hybrid Electronics
- Printed Switches and Sensors
- Wearable and Stretchable Electronics
- Touch Panel Displays
- Lighting, Smart Windows
- Smart Labels and Packaging
- In-mold Electronics
- Biosensors and Enzymes
- Internet of Things and Connectivity
- Advanced Photovoltaics
- Electroluminescent Panels

who can benefit from a broad-range of solutions for printed circuit boards?

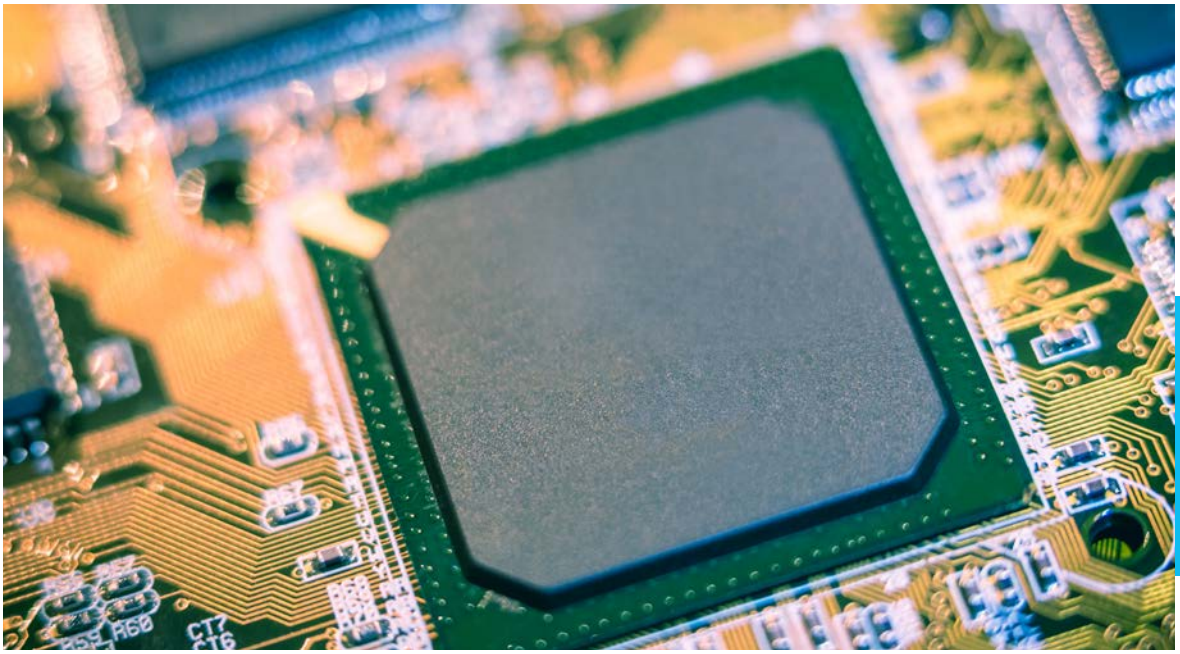
you can.

Broad Range of Reliable Materials for All Stages of PCB Fabrication



Sun Chemical Advanced Materials' range of technologies ensure the production of printed circuit boards (PCBs) with consistent, repeatable quality while exceeding industry standards for performance and reliability. Along with world-renowned soldermask, Sun Chemical delivers trusted solutions for all stages of PCB fabrication. Additionally, Sun Chemical's products for PCBs are environmentally-friendly and approved by many major global OEMs.

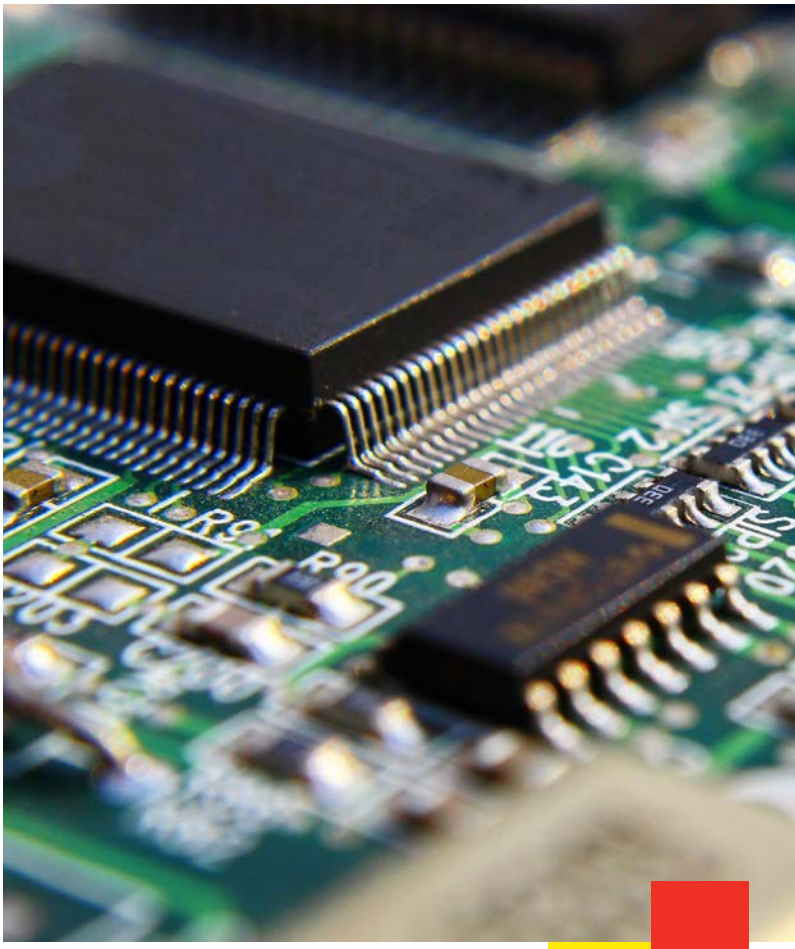
- Imagecure Soldermask
- Legend/Notation Inks
- EPR5000 Peelable Mask
- Etch & Plating Resists
- Inkjet Materials



Imagecure Soldermask (LPISM)

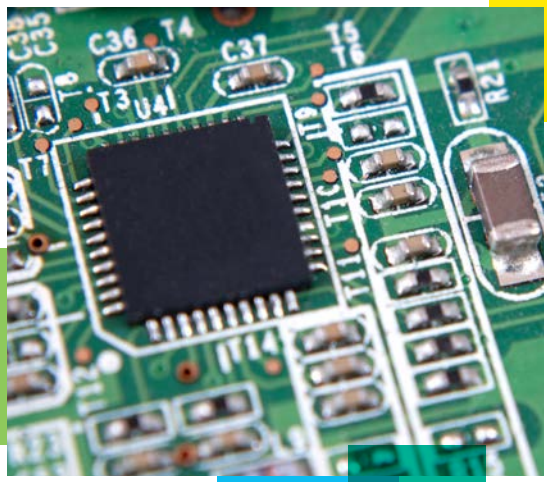
Soldermask for rigid printed circuits boards (PCBs) can be applied using screen print, curtain coat or spray methods and provide a wide process window.

- Available in a range of colors and halogen free versions
- Global approval by OEMs in automotive, medical, aerospace, telecom and other industries
- Fine solder dam capabilities
- Small hole clearance
- Wide process window
- Versions available for use with direct imaging (DI) equipment



Imagecure HT

- Exceeds industry standards for thermal cycling & thermal storage
- -40°C/+180°C for 1000 cycles
- -40°C/+170°C for 2000 cycles
- 180°C for 2000 hours storage
- Screen Print, Curtain Coat or Spray application
- Can be exposed using ‘conventional’ light source or direct image
- Low Ionics
- High surface tension



Imagecure DI

- Screen Print, Curtain Coat or Spray application
- Suitable for all direct image light sources
- Fine feature capability to <50µm
- Fast exposure

who can deliver the broadest portfolio and best support for printed circuit boards?

we can.

Inkjet Materials for Printed Circuit Boards

Sun Chemical are a leading Global supplier of inkjet technologies with over 25 years experience working with printer OEM's and print head manufacturers.
This enables us to offer unmatched expertise in the R&D and manufacturing of inkjet solutions.

Sun Chemical can provide both solder mask and notation inks for inkjet applications for the manufacture of printed circuit boards.

- Tailored solutions for individual printheads
- Fast UV & LED curing formulations
- In-house dispersion capability for strong greens and bright whites
- Excellent adhesion on Cu & substrate
- All products RoHS, REACH and WEEE compliant

EPR5000 Series Peelable Mask

A cost-effective and environmentally-friendly temporary peelable mask for high-temperature soldering and chemical plating.

- Improved peeling and removal
- Excellent adhesion
- Suitable for lead-free soldering processes
- Can be used as a temporary plating resist
- Green, red and blue colors available
- Stable viscosity at up to 40°C storage temperature
- 4.0mm hole tenting capabilities
- 100% solids

Legend/Notation Inks

A vast portfolio of legend inks which have excellent adhesion properties and are highly resistant to scuffing, heat and solvents when fully cured.

- Available in various colors
- Screen defined thermal & UV cure versions with exceptional on-screen stability
- Photo-image versions for screen or spray applications
- Compliant with RoHS and WEEE directives
- Excellent adhesion to all clean copper surfaces and various soldermasks and substrates
- Resistant to commonly used soldering processes and solvents
- Optimized for a wide range of process conditions

Etch and Plating Resists

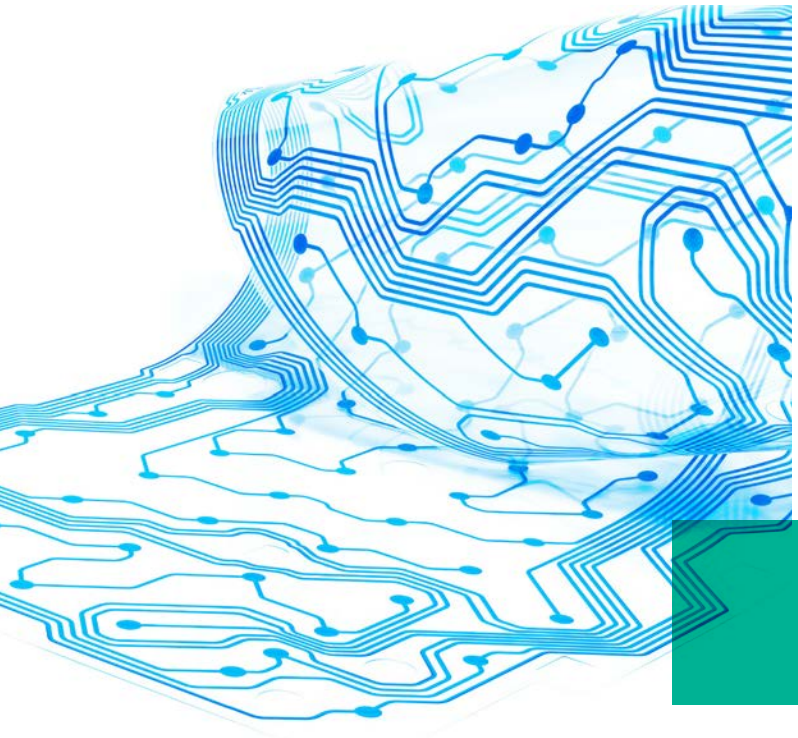
A range of etch and plating resists for printed circuit boards that can be used with either acid or alkaline etch chemistry.

- Resistant to most plating and etching chemistries
- Available in thermal and UV curable versions
- Liquid photoimageable (LPI) types can be applied by screen, roller coat, spray or curtain coating
- Strippable in alkaline or solvent
- Suitable for glass and metal etch processing

Trusted Solutions Provider

Sun Chemical Advanced Materials' printed electronics portfolio SunTronic contains a broad range of products to support applications like flexible circuits for membrane switches and capacitive switches, interconnects for lighting applications, stretchable electronics, bus bars for touch screens, printed antennae for SmartCards, UHF and NFC RFID tags and sensors, in-mold electronics, and others.

Printed electronics materials, together with Sun Chemical's Hy-Tech Graphics and DIC's pressure sensitive tapes and foams, offer a complete material solution for multiple markets, including consumer electronics, automotive, medical, industrial, aerospace and wearables. Sun Chemical's formulation and application development capabilities enable the products to meet and often exceed the ever-increasing requirements for performance and reliability of electronic materials and offer tailored-made solutions for any printed electronics application.



Inks for Flexible Circuits and Interconnects

Polymer thick film inks found commercial success in additive manufacturing of flexible circuits for keyboard, membrane switches and capacitive switches and various interconnects. The push for better cost effectiveness, higher density and complexity of flexible hybrid circuits and more environmental friendly inks and processes, give rise to innovative ink technologies hitting the market.

- Screen printable thermally cured conductive inks and UV or UV-LED curable dielectrics
- SunTronic silver conductive inks offer cost-performance balance to meet even the most cost sensitive projects
- Silver and carbon inks with a wide range of conductivities are available
- Robust Carbon/graphite conductive inks for flex tails for effective barrier to prevent silver migration
- Elastic silver, carbon and dielectric package for stretchable circuits and sensors
- Conductive inks capable to print high resolution complex circuitry
- Compatible with current surface mount technologies – electrically conductive adhesives as well as low temperature solder pastes
- Optically transparent clears for passivation and environmental protection of transparent switch and backlighting applications
- Inkjet printable conductive nanosilver ink and dielectrics inks for digital printing also available

who has high performance conductive inks and insulators for printed electronics?

we do.

Inks for Antenna Applications

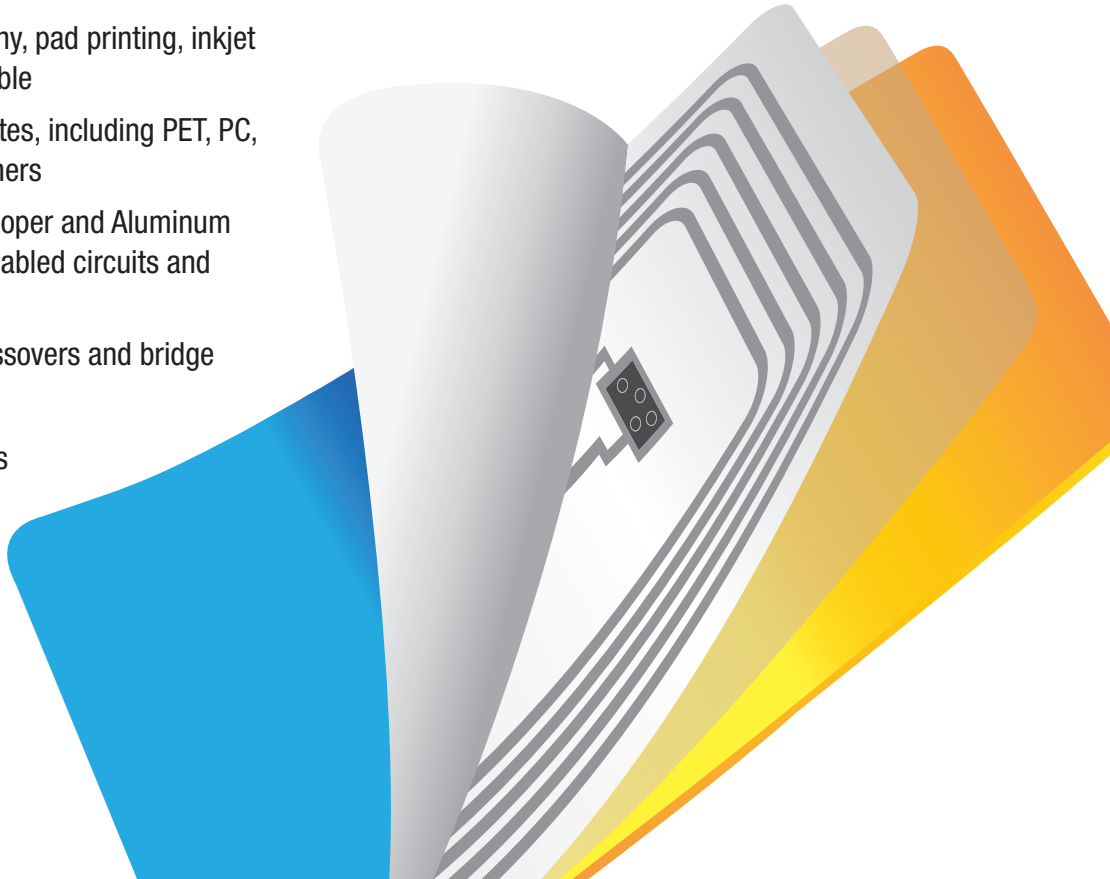
With the expanding wireless network system capabilities and the expectations of connectivity everywhere, antenna integration is on a rise. SunTronic products for antenna applications can conform to a wide range of processes, from etch and plating resists for subtractive process to fully additive processes including high speed roll to roll and inkjet printing. Printed RFID antenna is already used in many devices, including smart cards for payment, transportation or access control, smart supply chains and logistics. It can also be used as a part of various sensors systems for tracking the goods during the manufacture, transportation, storage and even the use. Printed antenna for mobile devices and interconnects on 3D surfaces is also finding its way to market and offers a lower cost alternative to laser direct structuring.

- High conductivity silver inks with sharp definition and low roughness
- Inks for screen printing, flexography, pad printing, inkjet printing and dispensing are available
- Compatibility with various substrates, including PET, PC, PVC, acrylics, label papers and others
- Inks with excellent adhesion to Cooper and Aluminum traces for hybrid tags and RFID enabled circuits and sensors
- UV and UV-LED dielectrics for crossovers and bridge insulation
- Release inks for tamper-proof tags

Inks for Smart and Interactive Packaging

Interactivity and ability to incorporate electronics functionality and connectivity within a package is an attractive proposition for consumer packaging companies to meet the demands and expectations of today's consumers. Flexographic conductive inks enable printing of circuits, interconnects and antennae directly on packaging materials.

- Water based silver and carbon conductive inks
- Fully compatible and miscible conductive inks for customized conductivity levels
- UV curable overprint varnish for circuit passivation and insulation



who can create revolutionary electronics designs with best in class IME materials?

you can.

In-Mold Electronics

In-Mold-Electronics (IME) is a revolutionary new way of integrating electronics into plastics. The new generation of Sun Chemical's IME inks enables integration of touch switches and lighting into IMD/FIM applications using the best-in-class electronic materials that can withstand even the harshest conditions of the 3D forming and injection molding processes.

- Screen printable conductive IME silver inks deliver best balance between electrical performance and 3D formability
- High conductivity silvers available for non-formed or slight-formed antenna and heater applications
- Excellent gate wash resistance of electronic inks
- Solvent based and UV curable cross-over insulators for multilayer printed circuits
- IME ink package suitable for first and/or second surface molding
- IME inks compatible with Sun Chemical's IMD/FIM inks, as well as other decorative inks on the market
- Adhesion promoters for variety of molding resins

Electronic Materials for Biosensors

Sun Chemical offers a portfolio of screen applied materials that are tailor-made for a range of biosensors, including diagnostic sensors, environmental sensors and agricultural sensors.

Reference/Working/Counter Electrode Materials

- Various functional carbon pastes with desired electrochemical and impedance properties

Reference/Counter Electrode Materials

- Low and high temperature metallic Reference/Counter electrode pastes with desired response and conductivity properties
- Pseudo carbon reference electrode materials and Silver underprint pastes are also available

Mediator Carbon Pastes

- Mediated carbons pastes for range of substrates
- Cobalt Phthalocyanine and Prussian Blue mediated carbons pastes are suitable for oxidases and dehydrogenases enzyme-based systems

Dielectric/Insulation Electrode Materials

- Various Dielectric/insulating pastes with good definition and printing properties

Photovoltaic Solutions

Sun Chemical's photovoltaic solutions have proven ability to deliver higher performance, excellent reliability, and higher cost-performance balance in manufacture of advanced solar cells. The broad product portfolio of etch and plating resists and dielectrics allows for high quality patterning of metallization layers for advanced solar cell technologies, including p-type and n-type crystalline silicone cells (i.e. advanced PERC, HJT, IBC, etc.) as well as thin film solar cells (CdTe, GaAs, CIGS, etc.).

Etch and Plating Resists

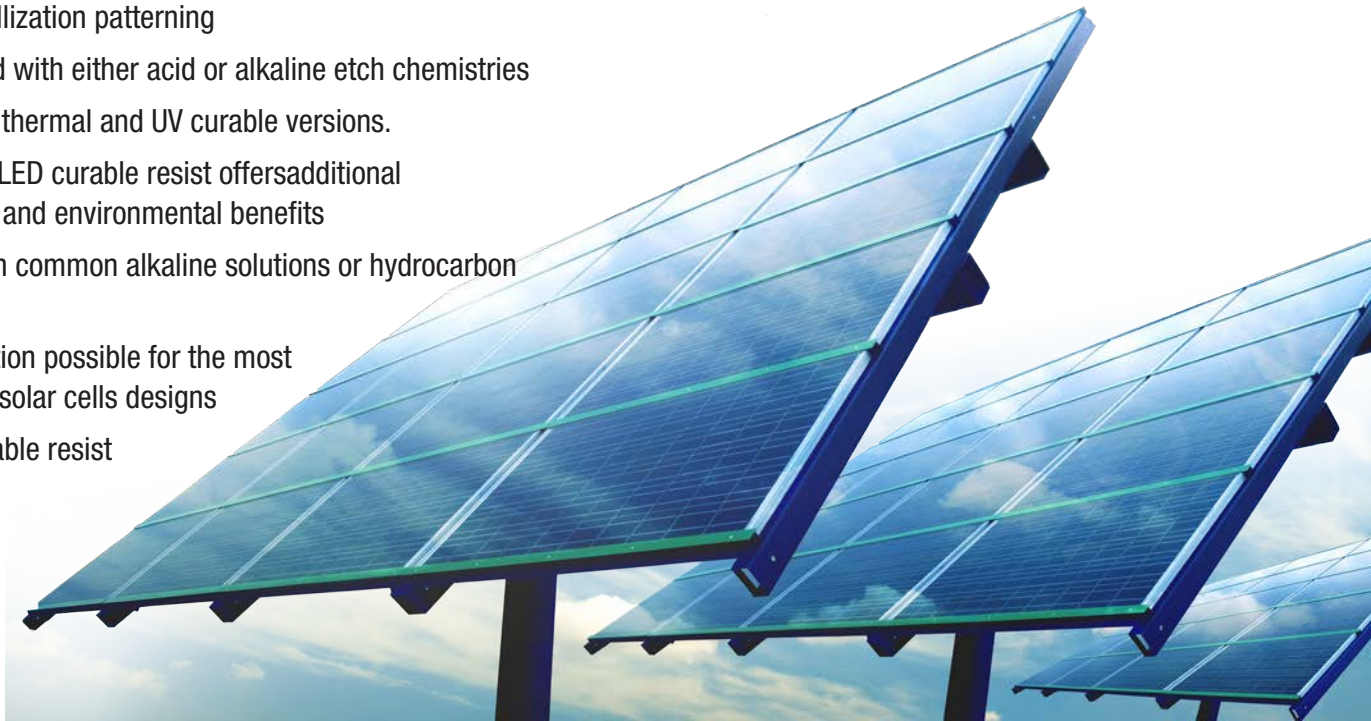
- Various wdeposition processes are possible, including screen printing, hot-melt ink-jet printing, roll coating, edge coating, and others
- Resistant to most plating and etching chemistries used for PV metallization patterning
- Can be used with either acid or alkaline etch chemistries
- Available in thermal and UV curable versions.
- Newest UV-LED curable resist offersadditional processing and environmental benefits
- Strippable in common alkaline solutions or hydrocarbon solvents
- High resolution possible for the most demanding solar cells designs
- Laser ablatable resist allows for

Hot Melt Etch and Plating Inks

- Excellent resistant to HF, for etching of glass, or silicon
- Environmentally friendly – Zero VOC's
- Available in a range of melting points for optimised resistant and stripping properties
- Print dimension tracks less than 50 microns, and gaps less than 25 microns
- Suitable for all commercially available hot melt printheads
- Clear options suitable for light induced plating
- Fluorescents under UV black light, for optical alignment, and inspection
- Alternative colours also available

Dielectric Inks

- Designed for screen printing or ink-jet deposition
- Thermally or UV curable
- Thermally curable dielectrics offer high temperature stability for reliable processing and operation life



Electroluminescent Materials

Sun Chemical offers a portfolio of materials for the manufacture of Electroluminescent (EL) panels.
The range also includes a number of products that can be molded or formed for the production of IME (In Mold Electronics)

Phosphor Inks

- We manufacture a range of various coloured Phosphor Pastes that are controlled to colours of CIE 1931 using x,y parameters
- Phosphour inks are available in thermoplastic or thermoset type depending on application requirements

Silver Inks

- Thermoplastic silver pastes
- Flexible and strong silver pastes to contact onto ITO coated polymer films, some of which can be moulded and formed for IME applications

Dielectric Inks

- Thermoplastic and thermoset Dielectric pastes exhibiting the best reflectance and high capacitance that is needed for EL panel production

Transparent Conductive Inks

- A transparent conductive ink for reverse-build EL panels
- Suitable for applications using opaque substrates for backlight applications

A partner who transforms with you.

Today's environment requires more than change. It demands transformation — and a partner who's willing to transform with you. Sun Chemical, a member of the DIC group, is a leading producer of packaging and graphic solutions, color and display technologies, functional products, electronic materials, and products for the automotive and healthcare industries. Together with DIC, Sun Chemical is continuously working to promote and develop sustainable solutions to exceed customer expectations and better the world around us. With combined annual sales of more than $8.5 billion and 22,000+ employees worldwide, the DIC Group companies support a diverse collection of global customers. As you move forward into a world of stiffer competition, faster turnarounds, more complex demands and sustainable products, count on Sun Chemical to be your partner.

working for you.

Sun Chemical
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