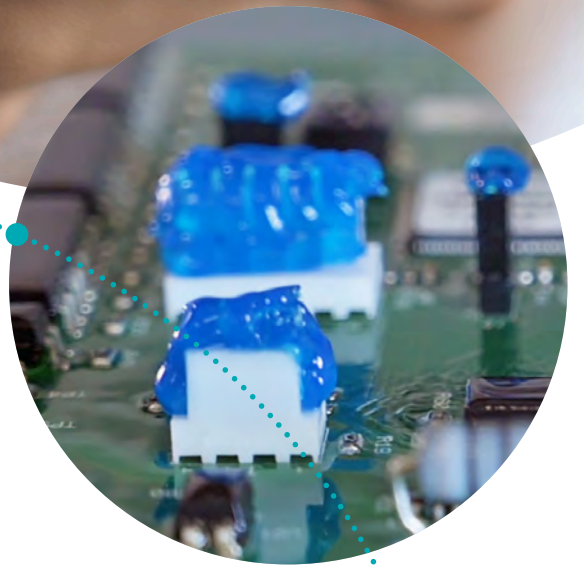


Smart Connected Device Assembly

7 Ways Light-Curable Maskants Can Provide Protection

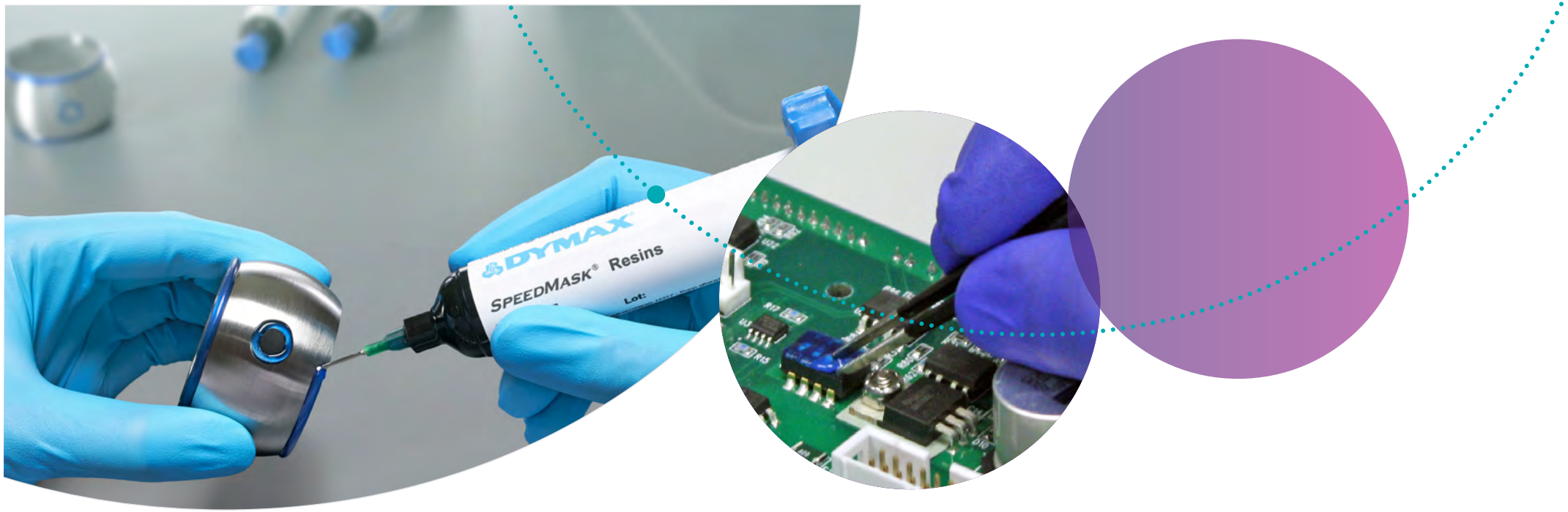
Contents

Introduction

The world is becoming smaller due to advances in technology, especially when it comes to smart-connected devices and IoT. Companies continue to increase their reliance on these products to communicate with employees and global locations through video conferencing, smartphones, and tablets. Healthcare providers are prescribing the use of advanced monitoring devices for diabetes, lab-on-chip diagnostics, cardiac sensors, and tele-medicine initiatives to improve the health of patients. People in their every-day lives are relying on wearable devices to improve physical fitness, cameras to secure their homes, and smart appliances that can automate routine tasks and increase efficiency, all while being operated remotely through software applications and programs.

What are smart devices? Simply stated, they are electronic devices that connect to other devices or networks and function through wireless protocols like Bluetooth. They are typically comprised of three distinct technology layers: hardware, network, and application. When we talk about hardware, we're usually referring to the components that are used to house the device and the circuitry located within. In order to assemble these devices, electronics manufacturers rely on a variety of technologies such as conformal coatings for circuit board protection, adhesives for display laminating and assembly, and maskants to shield parts from surface finishing processes.

As a result of this increased demand, electronic OEMs are looking for ways to assemble these devices quickly and safely. Some of the key factors affecting their decision on what type of technology to utilize in their process are the effect on the environment, speed of assembly, elimination of hazardous waste associated with solvent disposal, decreased operating costs, and increased throughout. Additionally, the engineering community is starting to search outside traditional masking processes for alternatives, and light-cure technology is an ideal solution.



What are light-curable maskants (LCMs)?

Light-curable masking resins are temporary, removable, protective barriers used to protect component surfaces and cavities and shield designated areas on parts from wave solder and reflow, grit blasting, shot peening, harsh chemicals, and many other finishing processes.

The maskants are typically comprised of five basic elements: the photoinitiator, additive, modifier, monomer, and oligomer. The ultraviolet (UV) light-curing process begins when the photoinitiator in the LCM is exposed to a light-energy source of the proper spectral output. The molecules of the LCM split into free radicals (initiation), which then commence to form polymer chains with the monomers, oligomers, and other ingredients (propagation), until all ingredients have formed a solid polymer (termination). Upon sufficient exposure to light, the liquid LCM is polymerized, or cured.

Some specific benefits of light-curable maskants are ease of use, cost effectiveness, and reductions in process time and parts handling. In addition, they offer more reliable surface protection than traditional, inefficient, time-consuming masking methods, such as lacquer, wax, tape, and boots. They are easily and precisely dispensed through spraying and cure in seconds so parts can quickly be moved onto the next manufacturing step.

Benefits of Light-Curable Maskants

Time and Money Savings

The easy application of the materials reduces processing time compared to labor-intensive manual taping or lacquer and wax application. In addition, since performance is not consistent with these traditional masks, significant losses resulting from rework and scrap often occur. Light-curable maskants are easily and quickly removed by peeling or incineration, leaving residue-free surfaces. Easy, clean removal results in time and labor savings.

Easy Instant Application

No heating or mask preparation is needed; LCMs can be precision dispensed, sprayed, dipped, or brushed. With a single coat they provide reliable protection of metal, glass, or plastic substrates. Other maskants have higher chances of application errors, which result in edge lift and leaking.

On-Demand Curing

Light-curable masking resins cure in seconds upon exposure to LED/UV/Visible light energy and are easy to incorporate into automated systems. On-demand curing leads to a long pot life, and less waste. Parts are also immediately available for production.

Conformation to Complex Shapes

The more complex and intricate a component, the longer it takes to apply and remove traditional masks. Light-curable maskants are suitable for very complex and intricate configurations-both large and small and are an ideal solution for reliably covering hard-to-mask parts. They also eliminate labor-intensive application.

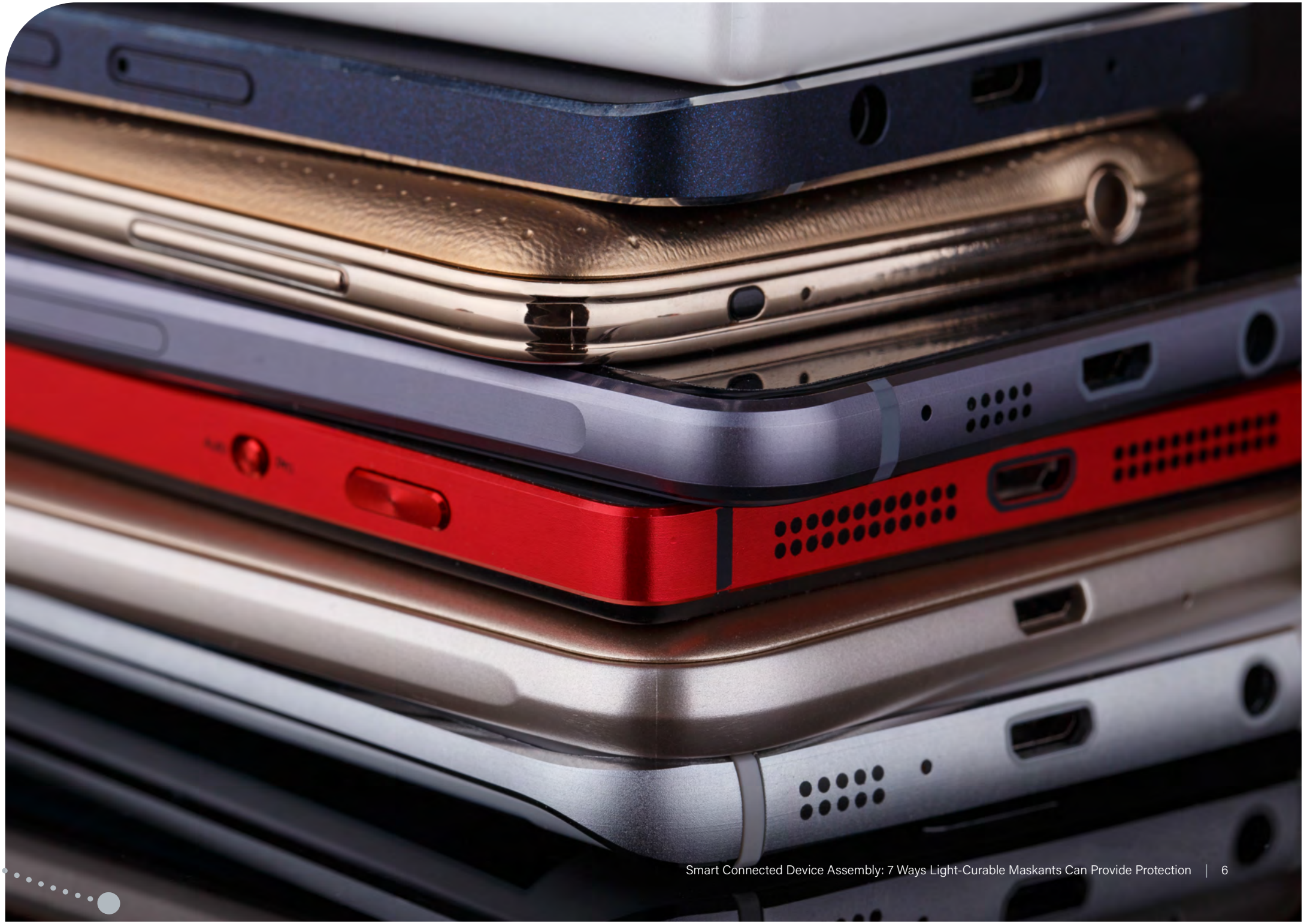
Greener Process

These masking resins are solvent free allowing your manufacturing process to go green with the elimination of solvent lacquers. Cured maskants are 100% solids and RoHS compliant making them easier to dispose of compared to traditional masking tapes, waxes, and lacquers.

Protecting Parts During Anodizing

Over the past few years, phones and other smart connected devices have transitioned from mainly plastic substrates to being available in a variety of colors and more high-end finishes, like metal, glass, and even leather. For those high-end devices that are comprised of metal, anodized metal is a popular choice. During the anodizing process, the surface of aluminum and other metal types is oxidized, creating a decorative, durable, protective layer that is resistant to corrosion. That layer can then be dyed to provide coloration for additional style options.

In some cases, components of the part must be protected from the strong acids used during anodizing. Light-curable maskants are available in formulations that can tolerate chromic acid, sulfuric acid, or hard-coat processing. They protect the substrate's surface while the oxide layer of the coating is applied.

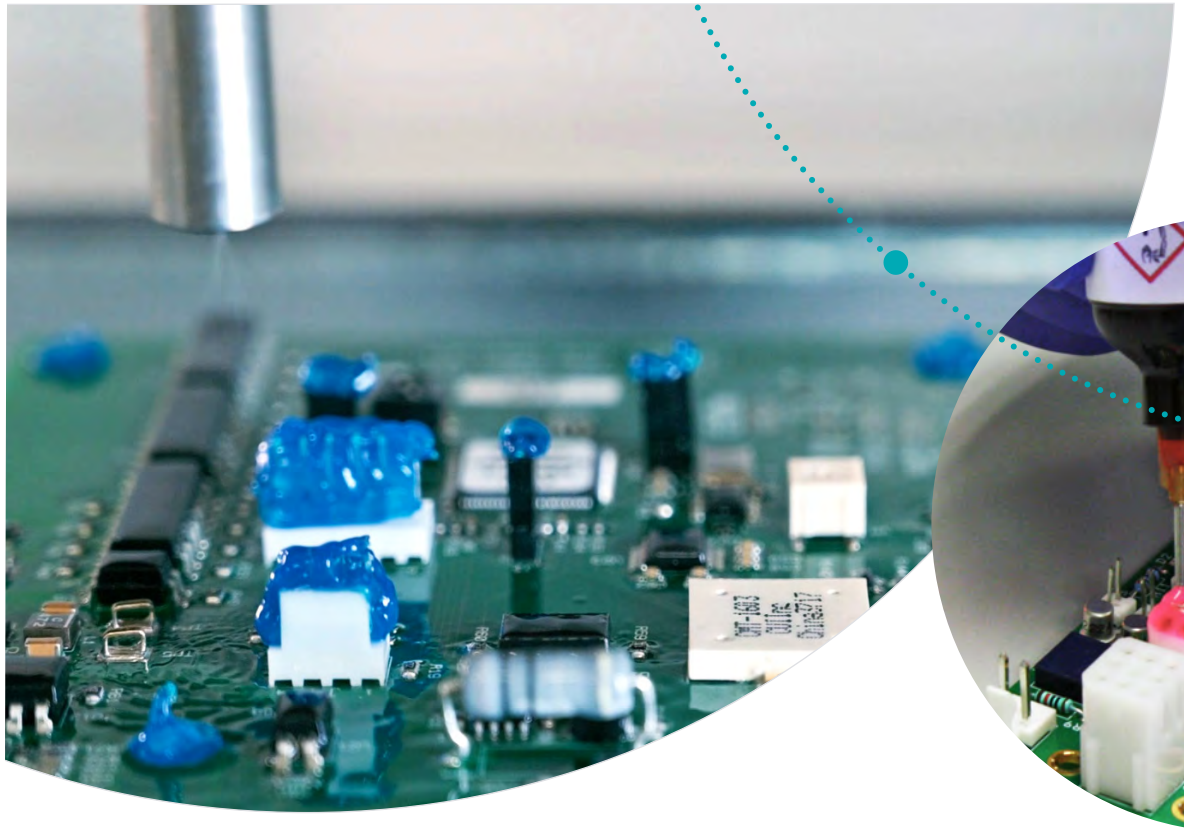


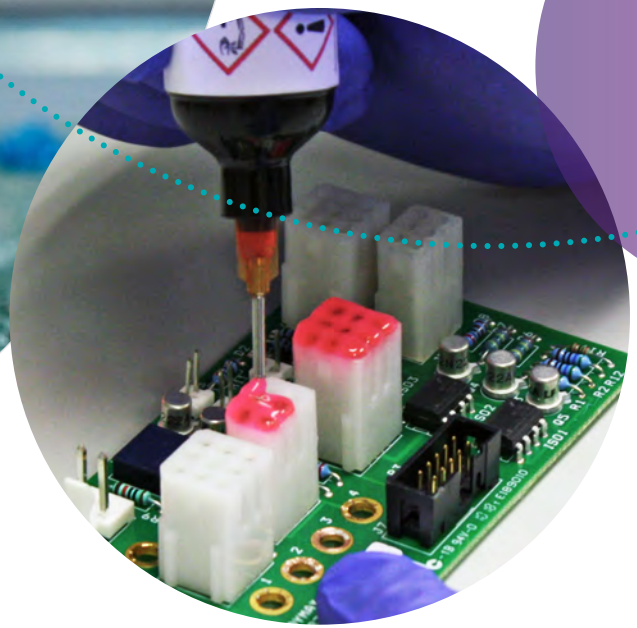
Protecting Surfaces During Engraving and Machining

One of the strengths of light-curable maskants is their durability. Cured maskants are resilient enough that they can be machined through, without the remaining mask lifting and compromising protection. They can also withstand various water-soluble and oil-based coolants used in machining. This creates clean, crisp edges and can be beneficial when engraving logos, safety warning, or other items on parts or when machining out areas for buttons, speaker areas, and other jacks.

Protecting Delicate Parts from Damage During Handling

Smart connected devices have surfaces that require protection during handling and shipping. Peelable maskants can be applied in thin layers to glass and metal surfaces to keep them from getting scratched or damaged during transport. When exposed to the proper amount of UV curing energy, the maskants peel cleaning from substrates and leave no ionic contamination behind. Since the materials are solvent-free and one-component, cured masks can be disposed of more easily than solvent-based products.





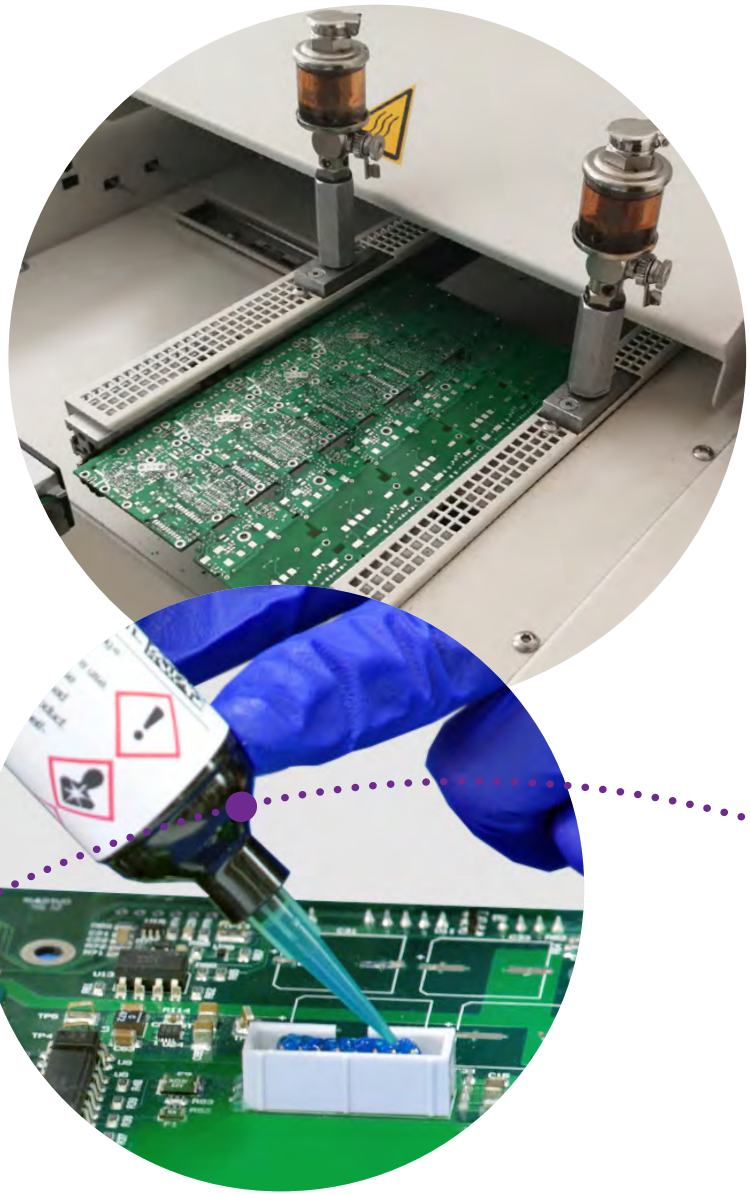
Masking Off Areas During Conformal Coating

Conformal coatings are used to protect the sensors, diodes, resistors, and other circuitry on PCBs from a variety of service environments. They are designed to "wick" under and between these components for complete coating coverage. However, the operation of the circuitry can be compromised if coating wicks into "keep-out" areas such as through holes or connector pins. Light-curable maskants can be precisely dispensed and cured in these areas to protect components during the conformal coating process.

Spot Masking During Wave Solder or Reflow Processes

Many times, printed circuit boards (PCB) require protection of selected board areas during the surface finish or assembly process to keep solder from flowing onto contacts, terminals, and plated through-holes (PTH). Peelable, light-curable masks provide such protection in soldering processes like wave or reflow soldering. Reliable, time saving, and cost-saving in their application, they have long surpassed manual masking with heat-resistant tapes.

After this process, a spot mask is applied to protect contact surfaces where additional components will be added after circuit board assembly. These are usually components with odd geometry, or those that cannot withstand the heat of in-line processing. After the spot mask has cured, the board then moves through the wave soldering process.



Protecting Parts During Polishing

Before they make it to market, many smart connected devices undergo a final buffing or polishing. Light-curable maskants can be used to mask off areas that need to be protected from the abrasive nature of this process.

Masking Before Painting or Coating

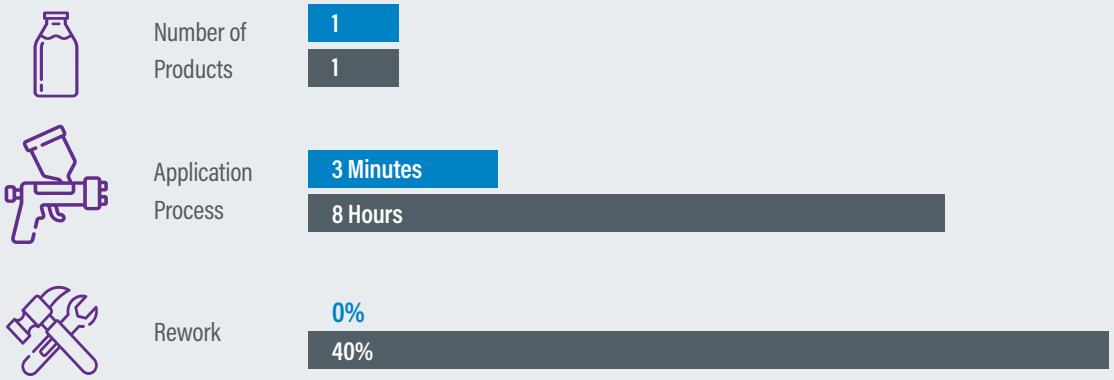
With the wide popularity of color and soft touch coatings, laptops, tablets, and cell phones are being coated and painted more than ever. Maskants can be used to seal off areas of the housing that are not intended to be painted or to protect other areas that might be damaged if exposed to a coating or paint.

Light-curable maskants are used in a wide range of applications and offer manufacturers of smart connected devices cost-effective alternative to traditional masking methods, enabling faster production, decreased costs, enhanced reliability, and improvement in the overall assembly process.

Application Case History

A large global industrial electronics company who manufactured PCB assemblies for an array of industries needed to increase process throughput and improve quality to counter increased production demands and raised costs from rework. Their goal was to find an alternative to their latex-based masking process that would allow them to support a 30% increase in demand while reducing overall operating costs.

Process Comparison



- Process Using Dymax Light-Curable Maskant
- Process Using Latex-Based Maskant

Summary:

- Reduced application/drying time drastically, freeing up labor to expand business
- Increased mask reliability and reduced keep-out violations to zero
- Created a more efficient process that met the planned 30% increase without increasing floor space

Production Increase of

30%

Want to Learn More?

Visit the dymax.com resource center for more information on light-curable maskants.

A wide variety of educational materials are available, including:

- Comprehensive guides
- Infographics
- White papers
- Webinars
- Articles
- Application case histories
- Videos
- And more!

If you have questions or would like to discuss an application, our Application Engineering team can help. Contact them today.

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EB004EU 10/19/2020