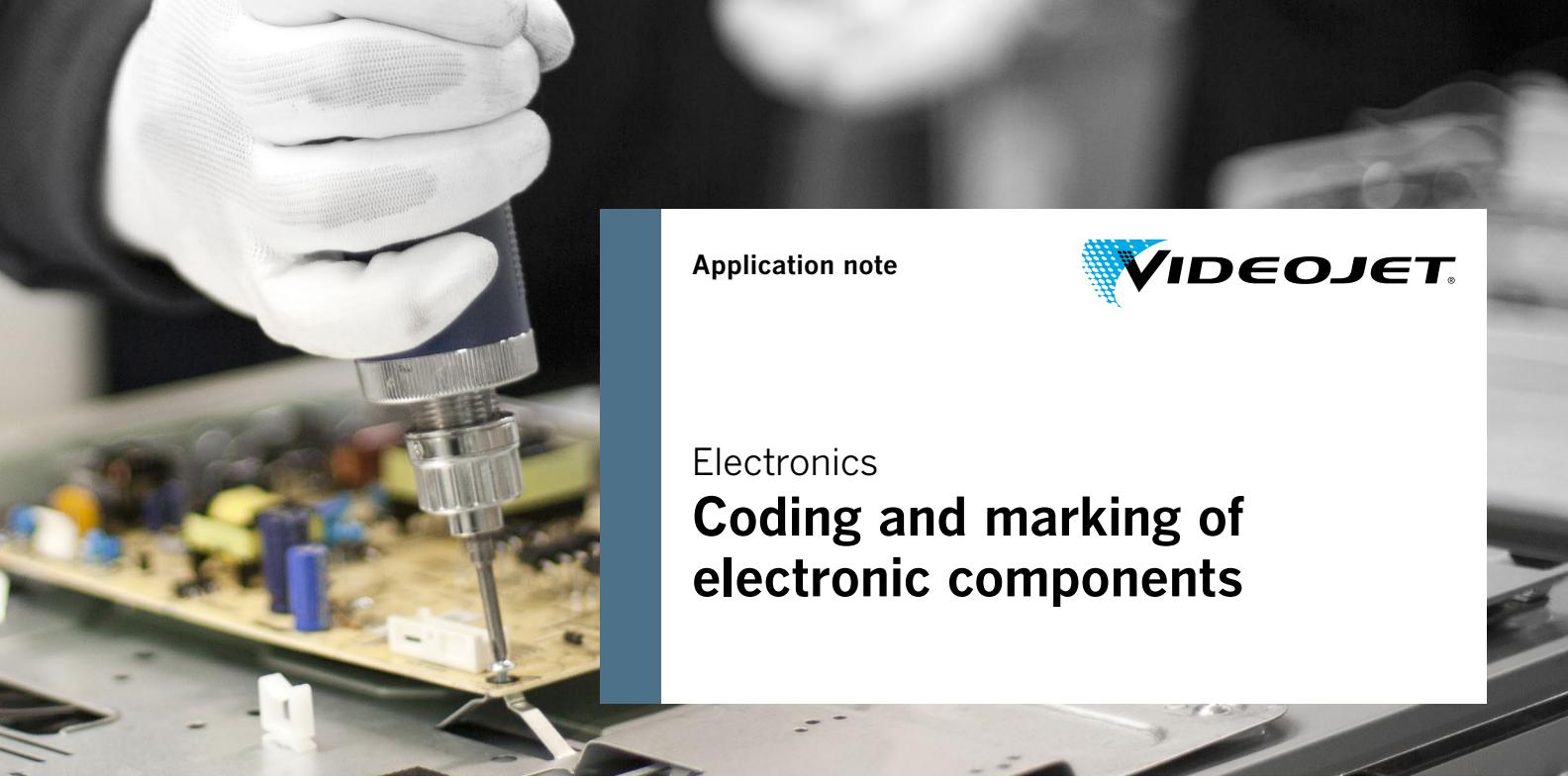
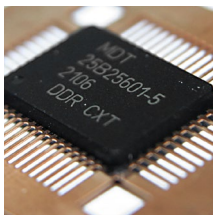


Application note

Electronics

Coding and marking of electronic components



The electronics industry is experiencing vigorous growth in micro-electronic components. With the development of these smaller components comes the need for micro-sized, highly durable codes. These identifiers are used for product serialization, supporting anti-piracy and counterfeiting initiatives in the electronics market.

The challenge:

Electronic components frequently require codes that fit in small, constrained spaces. Aside from size limitations, coding equipment for electronic components must provide clean, complex and high resolution codes that are durable for production processes, including alcohol cleaning. Coders must also have the ability to produce readable DataMatrix codes or unique identifiers for traceability and tracking purposes. Manufacturers must also be mindful of regulatory requirements and be prepared to meet customer-specific needs such as using inks that are halogen-free.

Videojet advantage:

Based on print size, resolution requirements, and code content, two technology options that are well-suited for electronic products marking are continuous inkjet (CIJ) and laser.

Videojet CIJ printers are engineered to provide high resolution, durable codes on a variety of materials, even at micro sizes often required for electronic components and products. Videojet high-resolution (HR) models are specifically designed to print more content in less space. These printing solutions also offer advanced functionality for increased productivity and uptime, along with ink formulations to meet customer-specific needs.

Videojet laser marking systems deliver indelible marks on a variety of substrates at high production line speeds. These products offer a number of advantages including high quality marks, permanence and fewer consumables. The Videojet line of laser solutions includes CO_2 and Fiber laser sources in different power outputs that address a wide range of marking and application requirements.

The benefits of coding

Why coding matters

Component identification

Many electronic components look exactly the same. In many cases, the outer look is the same, and only the internal circuitry changes. Coding allows differentiation between components and manufacturers.

Brand identification and recognition

Most electronic components are sold in bulk directly to manufacturers. Only a small fraction is sold with individual packaging. In many cases, coding is the only opportunity the electronic component manufacturer has to identify its product and to represent its brand to its users.

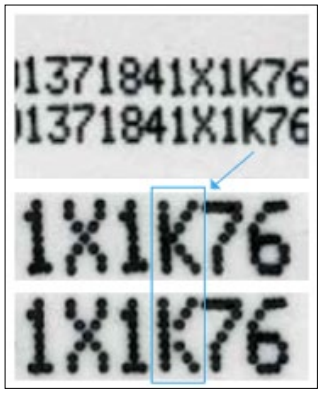
Traceability and counterfeiting

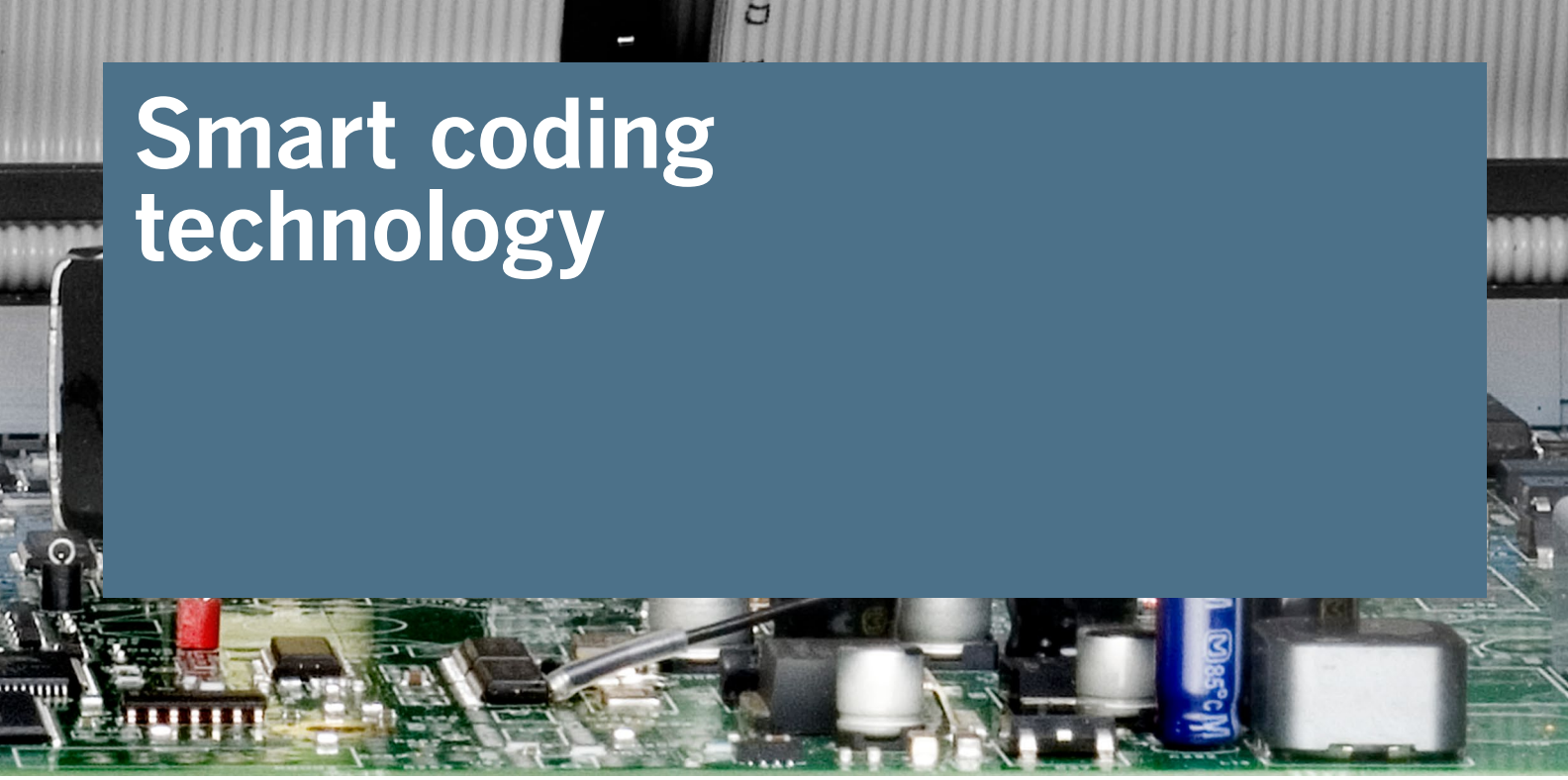
Aside from providing track and trace visibility of product throughout the distribution chain, codes can also be an integral means of fighting counterfeit products. A common challenge for manufacturers is the illegal copying and sale of electronic components that look like very similar to the original device. Products manufactured with counterfeit components can introduce serious risk to the reliability and warranty of the device. Moreover, such components can even get the product manufacturer in trouble with regulators, as the counterfeit component has not been certified for use in the final product. With smart coding technology, manufacturers can add unique product identifiers which help to make counterfeiting more difficult.

Smart coding for anti-counterfeiting

Coding and marking technology can provide a whole new level of visibility and tracking to the distribution channel. Utilizing smart coding solutions can help manufacturers build a stronger foundation in support of existing distribution tracking initiatives and anti-diversion efforts. They can also help provide increased visibility towards protecting product brands and profitability.

Smart coding techniques include enhancing basic lot/batch codes by altering and verifying specific characters in your codes. Algorithmic software technology helps manufacturers make their codes more difficult for unauthorized parties to replicate. It is also possible to generate unique single item product codes for individual products on the line.

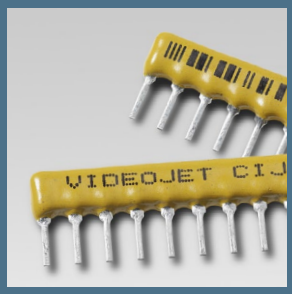




Smart coding technology

Smart Coding Technique	What it is	How it works
Self-verifying codes	These codes follow a pre-determined rule or pattern such as the digits adding up to a specific number or certain digits that are multiples of one another.	A basic way to provide your supply chain partners with a visual check to confirm that products are genuine.
Interleaved marking	Two or more programmatically selected characters within an alphanumeric code partially overlap.	Only accomplished with custom software on both the printer and controller, interleaved marking provides additional code protection because it is easily viewed but is difficult to replicate.
Dynamically altered font	Software generated codes with small segments of a different letter or number missing to create unique codes on each product.	Subtle and therefore difficult to recognize by an untrained eye, dynamically altered fonts can still be visually inspected by supply chain partners to prove authenticity of a product.
Verifiable code	Codes created by unique software-driven algorithms that can be scanned and tracked with vision systems throughout the supply chain.	Impossible to replicate without knowledge of the algorithm and keys, verifiable codes add a unique fingerprint to each item.

Coding challenges



Considerations for successful coding

Complex codes, small spaces

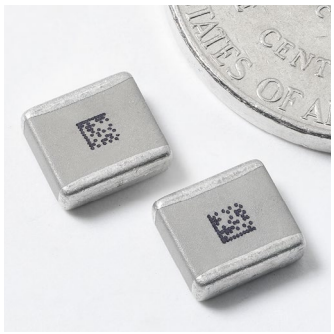
With computer circuitry being incorporated in everyday devices like light bulbs, watches, shoes, etc., the space required to print long, complex codes is shrinking. This is especially true in the electronics industry where DataMatrix codes are so widely used to track products throughout the distribution chain.

Durability for production processes

A key step in electronic components manufacturing is the cleaning of the PCB and/or product with organic solvents to remove, among other things, solder residue. Codes need to be able to survive this cleaning process, while not affecting the electronic component.

Legislative compliance

To stay competitive and be compliant in the global marketplace, electronic component manufacturers must meet current and evolving legislation requirements. ROhS legislation, for example, started in the EU, but has influenced the establishment of similar regulations around the globe. These regulations ban the use of certain hazardous substances like lead, mercury, cadmium, hexavalent chromium, and polybrominated flame retardants in products



Solutions for electronics marking

Based on print size and resolution requirements, two technology options well-suited for electronics marking are laser and continuous inkjet.

Laser

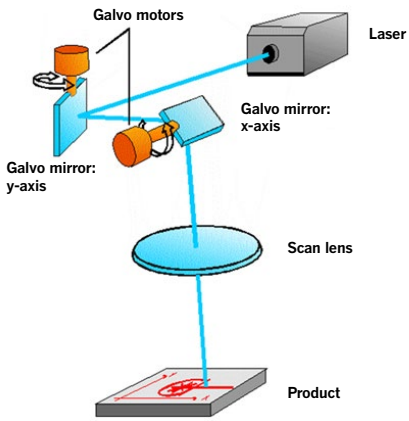
Lasers are known for producing clean, consistent, high quality codes – from simple lot and batch detail to more complex graphics, including DataMatrix codes. Low maintenance and versatile in high speed and high automation environments, lasers are also ideal for generating permanent, traceable codes on electronic components.

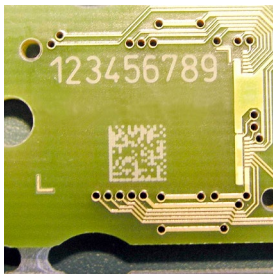
As part of the marking process, a laser beam changes or ablates the surface properties of the component being marked, creating a high resolution, high contrast code. Since laser marking is not ink-based, codes are not affected by organic solvent cleaners.

There are several methods that lasers utilize to make a mark. The ideal method for each application will depend on the sensitivity of the material being marked. Advanced lasers can offer larger marking fields that can mark multiple parts without reorienting the laser or the tray of components. By optimizing marking fields and laser power settings, manufacturers can improve output and minimize energy use.

Not all laser marking systems are equal, and expertise can go a long way in helping specify an ideal laser for each application. It is recommended that manufacturers work with a coding partner that offers a large selection of laser configurations. This helps enable manufacturers to more easily identify and integrate an optimal solution for their needs, and not over-purchase more than is required for the application.

Permanent laser lot/batch codes can help to protect product integrity throughout the supply chain. Smart coding technology can help manufacturers move beyond basic lot/batch code data by making it possible to alter and verify specific characters in a code. This process makes it more difficult for unauthorized parties to duplicate and pirate products.





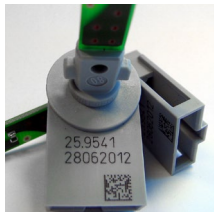
Continuous inkjet (CIJ)

A good choice for electronic components coding, CIJ printers can produce high quality codes, including DataMatrix codes, as small as 0.6mm. Videojet has high-resolution (HR) models specifically engineered for micro print applications. They provide a viable option for low-to-medium or medium-to-high volume producers and offer ease of integration into existing production equipment.

Fast-drying, CIJ inks can accommodate a range of production speeds and application requirements. This printing technology is non-contact and will not damage or compromise the surface of the part and is ideal for very thin components (e.g. LCD screens, battery packs) that could be adversely affected by a laser marking solution. And for manufacturing processes requiring them, durable, alcohol-resistant or halogen-free inks are available. With low maintenance requirements, manufacturers can help maximize the uptime of their production lines with a CIJ coding solution.

Conclusion

Coding technology can provide many benefits for electronic components manufacturers, including product identification, branding and traceability. The latest laser and CIJ printer offerings can provide outstanding resolution, print durability and the ability to generate complex codes, even in small spaces. Videojet offers a wide range of solutions to meet your varied production needs, including specialty inks and printers that meet RoHs compliance requirements. As an industry leader, we strive to understand the needs of your business as well as your manufacturing processes. This expertise helps us to partner with you to identify your ideal coding solution and then assist with seamless integration into your line.



The bottom line

With a variety of code considerations to keep in mind and coding technologies to choose from, achieving high quality coding on your electronic components requires thoughtful planning. Videojet offers proven coding solutions for electronics that address your unique needs. We are ready to help you think through the ideal solution for your production process.

Ask your Videojet representative for more guidance, a production line audit, or sample testing on your substrate.

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