

## APPLICATION SPOTLIGHT

# Ultra-low-cost intelligence for track and trace

Increase item-level visibility and transparency across distribution networks with Pragmatic FlexICs

As distribution operations become increasingly complex, real-time, item-level visibility becomes ever more important. From picking and packing to transport and delivery, the ability to monitor the location, status and temperature of goods is essential for transparency and efficiency. But due to cost, track and trace has typically been reserved for high-value items.

Pragmatic is revolutionising track and trace with ultra-low-cost, flexible integrated circuits (FlexICs) that make it quick and easy to embed intelligence almost anywhere.

Durable and shock resistant, with a lower environmental footprint than traditional chips, FlexICs underpin RFID-based smart solutions to provide granular, item-level data – and a compelling opportunity to make low-cost smart distribution a reality.

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### How do FlexICs work?

FlexICs are just 30 microns thick – thinner than a human hair – so sit comfortably within standard RFID inlays and labels.

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### How are they applied?

They can be applied as a durable label or embedded within a product. Their physical flexibility and ultra-thin form means you can add intelligence almost anywhere – even on curved or domed surfaces.

### Key challenges

- **Cost of implementation**  
Adding intelligence at scale has, until now, proved prohibitive due to high unit cost
- **Limited options for application**  
Traditional solutions can struggle to cope with thin or curved surfaces, limiting their application
- **Environmental impact**  
Amid increasing scrutiny, adding intelligence 'everywhere' must be balanced against its environmental cost

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### Benefits of FlexICs

- **Ultra-low-cost intelligence**  
FlexICs cost just a fraction of traditional smart chips, making deployment at scale attainable
- **Physical flexibility**  
Thanks to their physical flexibility, FlexICs can be applied almost anywhere, opening up new possibilities for smart logistics
- **Lower environmental footprint**  
FlexIC production uses just a fraction of the power and water of traditional microchips, and significantly fewer chemicals and gases, reducing environmental impact

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## How durable are they?

As part of reusable packaging, FlexIC-enabled RFID inlays have been tested against typical industrial wash protocols, withstanding myriad wash cycles without losing adhesion or functionality.

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## Why are they so suited to distribution?

Because they enable item-level visibility from the factory door to the end customer. This helps to improve accuracy of shipments and deliveries, reducing shrinkage and improving customer satisfaction.

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## Do they support cold chain monitoring?

Yes. Used with condition sensors, they can safeguard the integrity of temperature-sensitive goods, such as perishable foodstuffs and medicines, ensuring that thermal standards are maintained during transportation. They can also be used to detect levels of humidity, or odours that indicate deterioration, enabling proactive management to prevent wastage.

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## Can FlexICs help with auditing?

They can. By enabling documentation of the complete product history, from manufacture and storage to transportation – and even end-of-life disposal – FlexICs help ensure robust compliance with regulatory requirements. And, in the case of damaged or contaminated goods, accurate location information lets you swiftly retrieve the affected items, without needing to recall an entire shipment.

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## What about return logistics?

The unique item-level traceability provided by FlexICs is indispensable for streamlined return logistics, underpinning efficient scheduling of collections, product categorization and location management.

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## What else can they do?

By providing insights into the condition and location of goods in transit, FlexICs allow prediction of supply deficits and operational bottlenecks, enabling accurate management of stock levels across the distribution chain. And they can even help to prevent tampering, diversion, and counterfeiting, by allowing readers to 'talk' to goods, verifying their origin, and their integrity.

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## Do I need new infrastructure to use them?

Typically, no. FlexIC-enabled RFID tags can be read by most commercial readers, as well as the vast majority of Android smartphones.

Find out more: [www.pragmaticsemi.com/track-and-trace](http://www.pragmaticsemi.com/track-and-trace)



FlexICs make it cost-effective to add intelligence wherever it's needed



Their physical flexibility makes them extremely versatile



They enable item-level traceability, improving accuracy of shipments and deliveries...



... reducing shrinkage...



... and improving customer satisfaction