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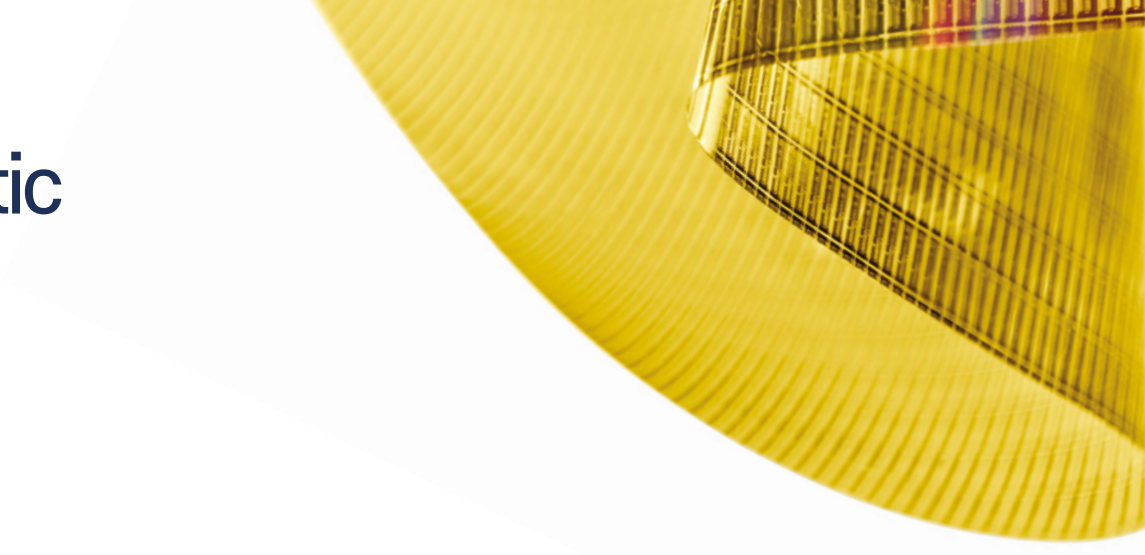

APPLICATION SPOTLIGHT

Ultra-low-cost intelligence for reusable packaging

Accelerate development of circular packaging models with Pragmatic FlexICs

As concern mounts around the environmental impact of plastic packaging, the pressure is on for manufacturers to move to reusable models. But due to cost, smart reusable packaging has typically been reserved for high-value items.

Pragmatic is revolutionising semiconductor fabrication 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 packaging solutions to provide granular, item-level data – and a compelling opportunity to make reusable packaging at scale a reality.

How big are FlexICs?

FlexICs themselves are just 30 microns thick – thinner than a human hair – so sit comfortably within any standard RFID inlay and label.

How do they attach to the packaging?

They can be applied as a durable label or embedded within the product. Their physical flexibility and ultra-thin form means you can add intelligence almost anywhere – even on curved or domed surfaces – without impacting product aesthetics.

How durable are they?

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

Key challenges

- **Cost of implementation**
  Adding intelligence to packaging at scale has, until now, proved prohibitive for all but high-value items, 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

Benefits of FlexICs

- **Ultra-low-cost intelligence**
  FlexICs cost just a fraction of traditional smart chips, so they can keep a wider range of materials in use for longer
- **Physical flexibility**
  Thanks to their physical flexibility, FlexICs can be applied almost anywhere, opening up new possibilities for smart packaging
- **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

Aren't microchips bad for the environment?

FlexIC production uses just a fraction of the power and water of traditional microchips, and significantly fewer chemicals and gases. In the case of a standard, 500ml PET bottle, a FlexIC would increase the total environmental footprint by less than 0.4%[1].

[1]Life Cycle Analysis of FlexICs, Pragmatic, 2023

Why are they so good for returnable packaging?

FlexICs are significantly more cost-effective than traditional RFID solutions, allowing you to bring intelligence to a wider range of packaging. And FlexIC-enabled tags can be read quickly and easily – in any orientation or without a clear line of sight – enabling high levels of automation and system scalability.

What data can be obtained?

Through unique item-level identity, FlexICs support traceability and provide important insights such as number of successful reuse cycles, adherence to washing protocols and return rates. Item-level intelligence also enables prediction of supply deficits and bottlenecks, as well as accurate management of stock levels across the supply chain.

Could data be skewed by multiple scanning?

No. Information stored on the RFID cannot be readily replicated. Each unique asset identity ensures each item can only be scanned once before being returned.

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.

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. It can even remove consumer uncertainty around returns by facilitating quick, accurate segregation at mixed-item collection points.

What else can they do?

FlexIC-enabled tags also create an opportunity for customer engagement beyond the point of sale, giving quick and easy access to product or packaging information, special offers or details of the nearest return point. Customers can even be rewarded for consistent or repeated packaging reuse by a simple credit mechanism, linked to their mobile device.

FlexICs make it cost-effective to add intelligence to a wide range of packaging

Their physical flexibility makes them extremely versatile

They enable item-level traceability, helping to predict supply issues...

...make consumer returns quick and easy...

...and streamline reverse logistics

Find out more: www.pragmaticsemi.com/traceable-reusable-packaging

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