

**PragmatIC**

™

# Reinventing electronics for a flexible world

[www.pragmatic.tech](http://www.pragmatic.tech)

10 October 2018

# Company overview



- ✦ Founded in 2010, now over 60 staff
- ✦ Based in Cambridge and Sedgefield, UK
- ✦ Strategic shareholders include:

The ARM logo consists of the lowercase letters 'arm' in a bold, blue, sans-serif font.

- ✦ World's leading semiconductor IP company
- ✦ More than 100 billion ARM-based ICs
- ✦ Powers 90% of mobile devices



- ✦ Fortune 500 company
- ✦ World's largest RFID inlay manufacturer
- ✦ Leader in labelling & packaging materials

# The evolution of electronics

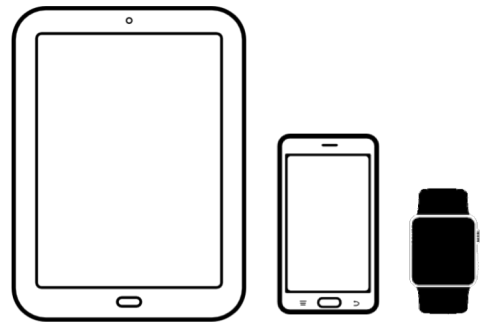


## VOLUME

300 million p.a. → 50 billion p.a. → >1 trillion p.a.



Computers



Smart devices



## COST

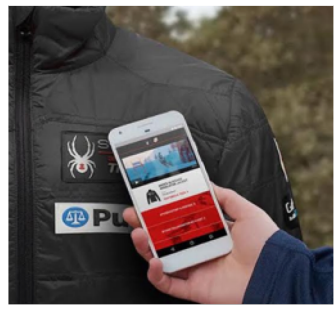
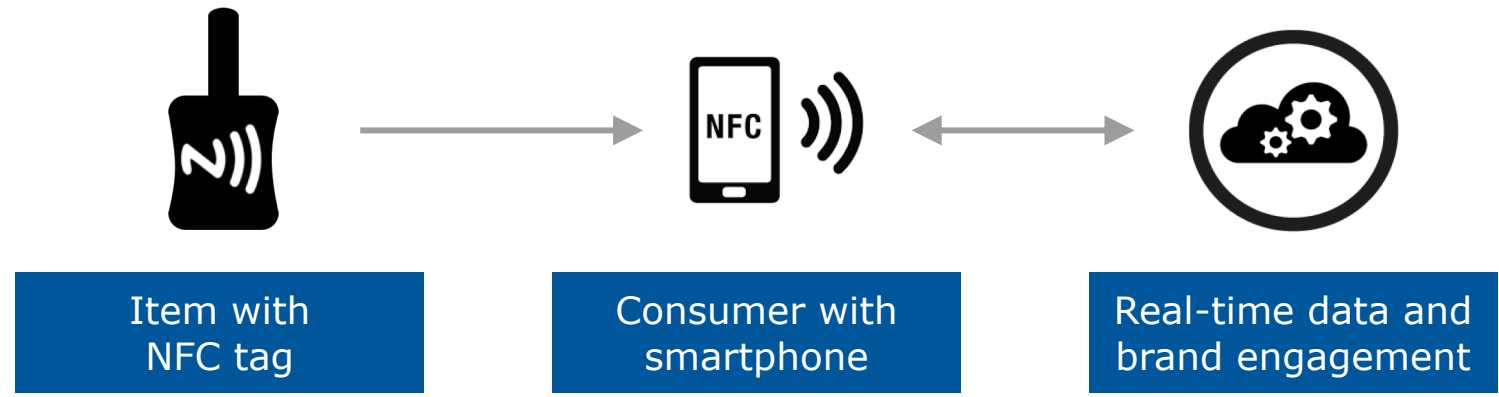
\$100 per IC → \$1-10 per IC → <1¢ per IC

# NFC merges digital & physical



NFC connects your brand's message directly from your product package to the consumer, via their smartphone

3.5 billion  
NFC handsets globally  
by 2019



# Benefits to brand owners



## Package becomes the most important marketing asset



- ✦ Expand the package: communicate additional product info or brand messages
- ✦ Let consumers use smartphones to unlock extra digital value from their products
- ✦ Build brand loyalty and drive repeat purchase or up-sell/cross-sell
- ✦ Influence purchase behaviour at the retail shelf



- ✦ Build a digital marketing database and capture valuable consumer insights
- ✦ Easily create, test and manage marketing campaigns to optimise spend
- ✦ Win the battle at retail for mindshare of the consumer
- ✦ Continue to communicate with the consumer, even after purchase

# Benefits to consumers



PragmatIC™



## IN STORE

### Product information

- ✦ Authentication
- ✦ Ratings/reviews/testimonials
- ✦ Product contents
- ✦ Product story (source-to-shelf)
- ✦ Multiple languages
- ✦ Complementary products
- ✦ Brand story

### Product engagement

- ✦ Discount coupons
- ✦ Loyalty points



## AT HOME

### Product information

- ✦ Product tutorials (how to use)
- ✦ Extended product information
- ✦ User manual
- ✦ FAQs
- ✦ Assembly instructions

### Product engagement

- ✦ Product registration
- ✦ Direct feedback to brand
- ✦ Connect with other product users (social media)



## END OF LIFE

### Product information

- ✦ Add ratings/reviews
- ✦ Product recommendations

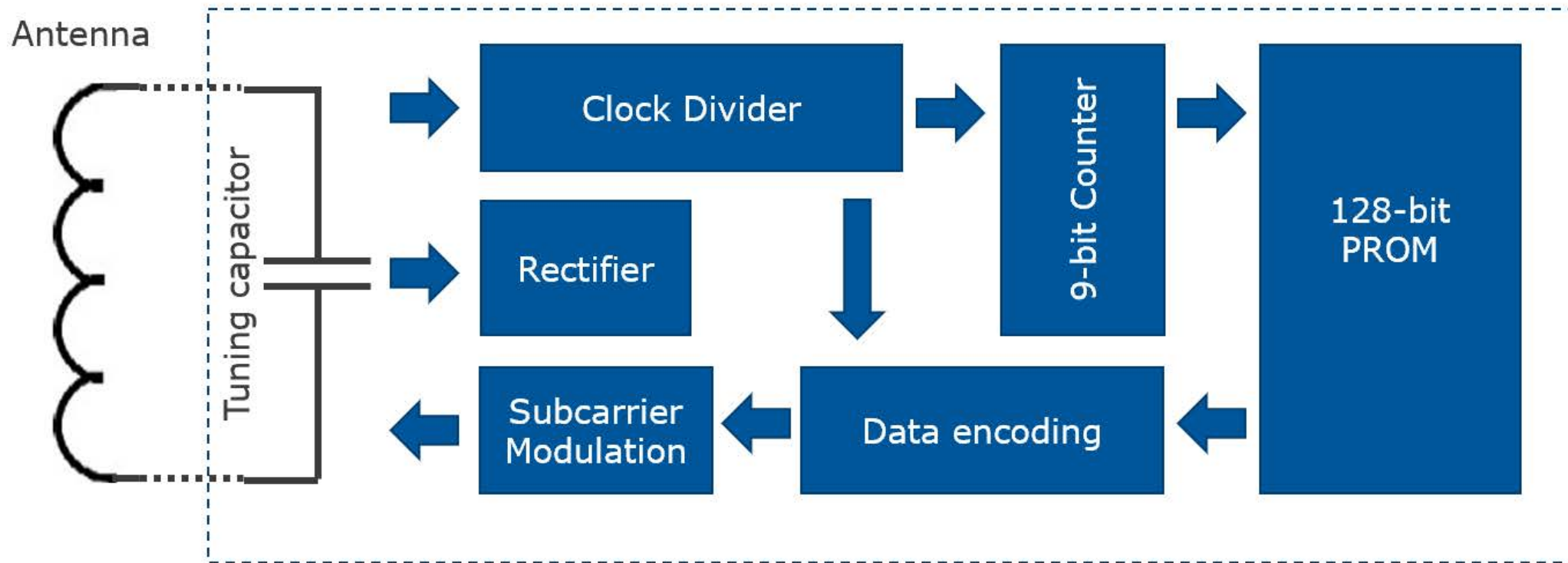
### Re-order

- ✦ Online
- ✦ Where to buy
- ✦ Automatic stock check

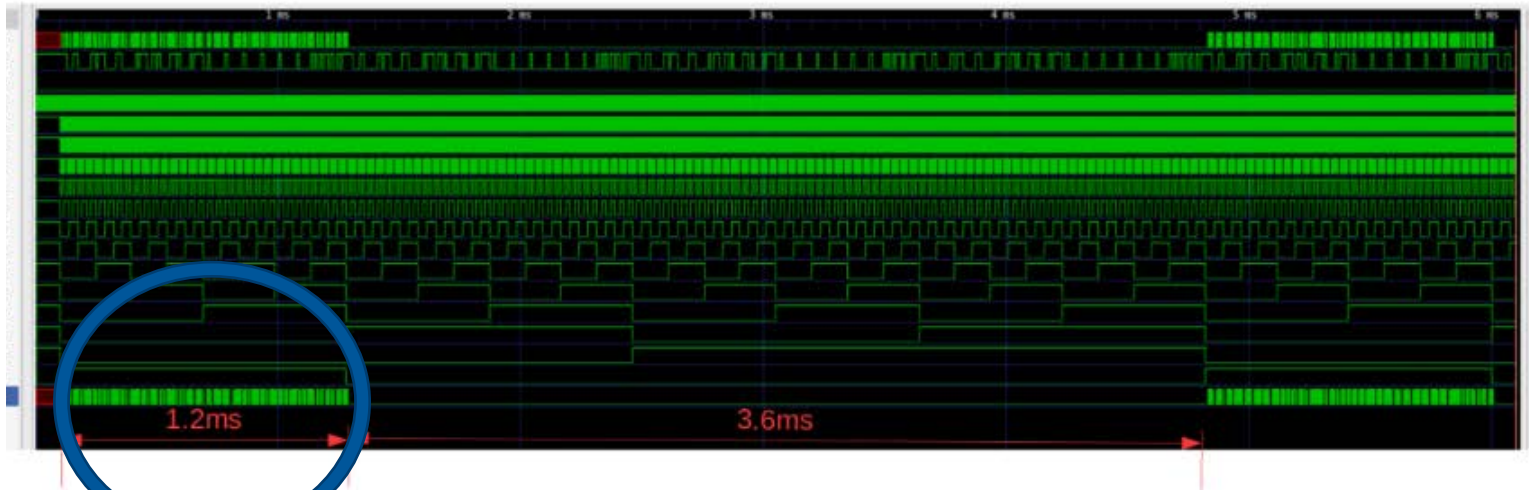
### Disposal

- ✦ Recycling information
- ✦ Automated waste sorting

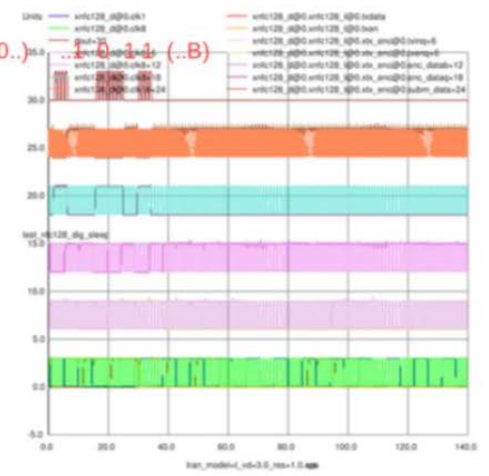
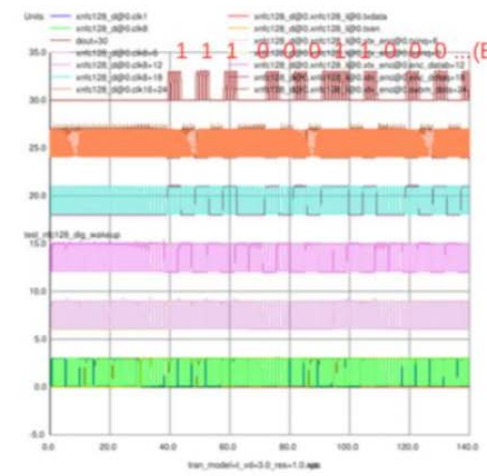
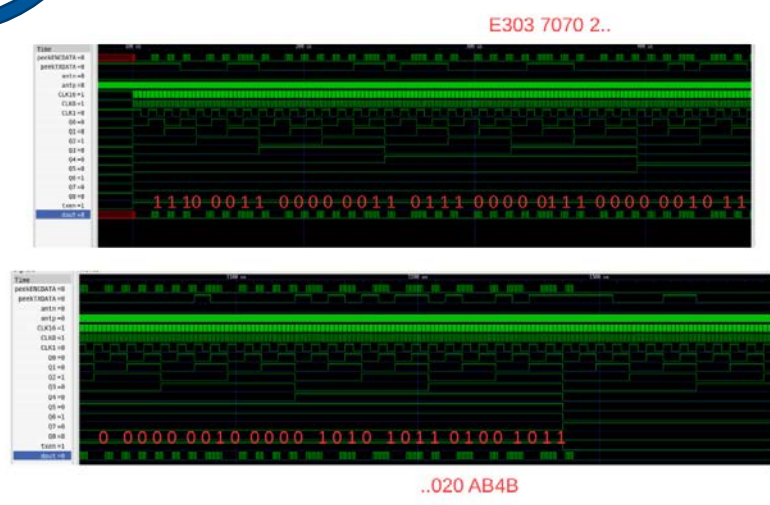
# NFC Functionality



# PragmatIC's approach



Verilog simulation at chip level showing matching NFC128 specifications



Analogue simulation

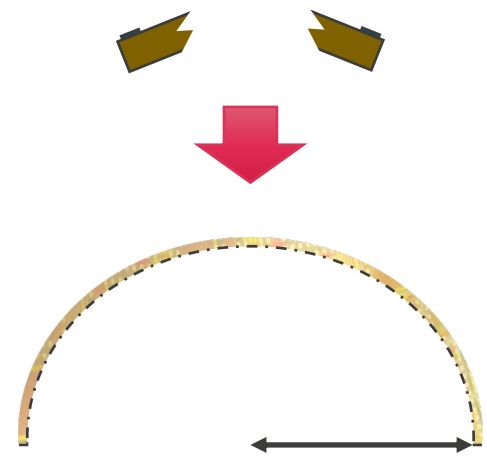


# PragmatIC's approach



## Inherently flexible

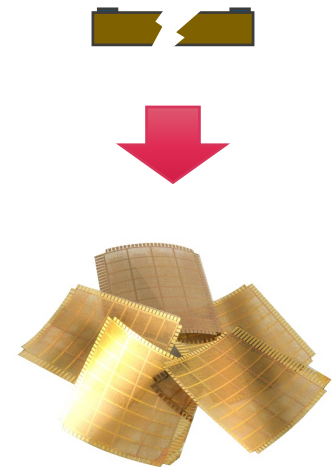
Silicon IC – doesn't bend...



FlexIC – bend radius up to 5mm

## Robust & shock resistant

Silicon IC – fragile...



FlexIC – plastic construction

# PragmatIC's approach

## Fully integrated FlexIC production line

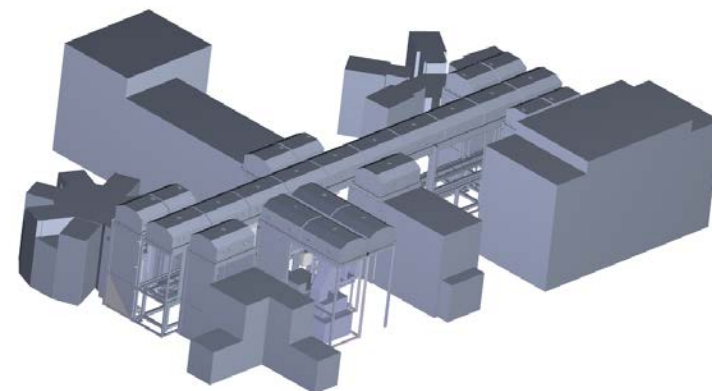
- ✦ Automated materials handling and process control
- ✦ Self-contained clean environment

## Enables rapid expansion of FlexIC manufacturing

- ✦ Capacity for billions of FlexICs per annum
- ✦ Modular scalability

## Compelling economics

- ✦ Capex 100-1000x lower than Silicon IC fab
- ✦ Pricing <1¢ per FlexIC in volume



**FlexLogIC™ fab-in-a-box**



**NETPark Explorer**

High quality combined  
office and laboratory space

# Pragmatix # Network Group # Map

**Pragmatix**

Network Group

Map

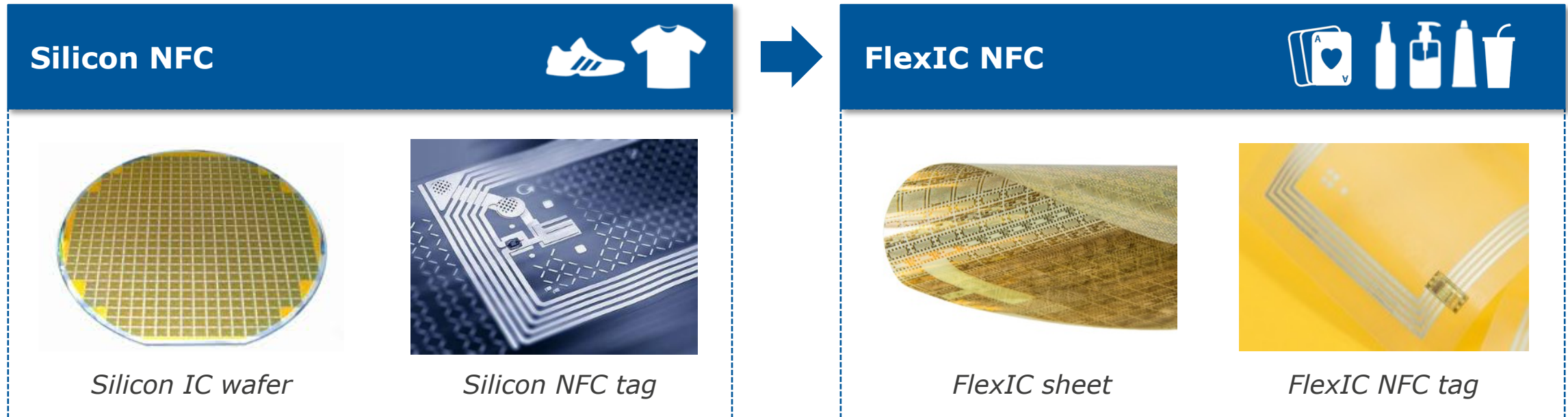


# Reinventing NFC for everyday products

**PragmatIC**<sup>TM</sup>

FlexICs reduce tag cost by up to 80%

*FlexIC = Flexible Integrated Circuit*

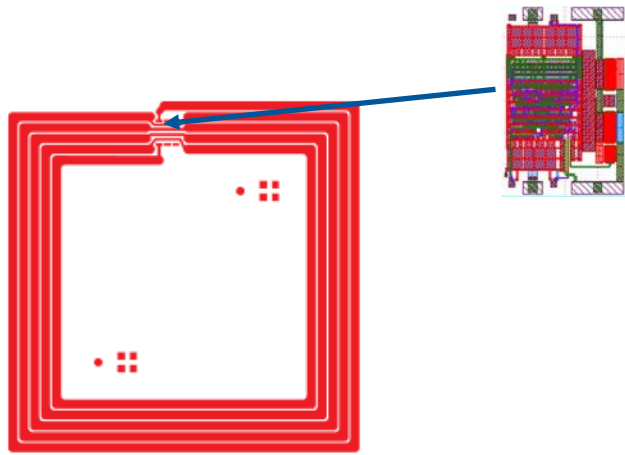


FlexICs also enable extreme thinness, flexibility & durability

# PragmatIC's approach



**PragmatIC**<sup>TM</sup>



Early 2019



Prototyping  
2mm x 3mm  
6mm<sup>2</sup>



Typical FlexIC size  
0.8mm x 2.5mm  
2mm<sup>2</sup>

Materials selection lowers intrinsic FlexIC cost.


Circuit used to bridge the antenna, simplifying assembly and lowering the final tag cost.

120 μm



**Typical Silicon IC**

<10 μm



**Typical FlexIC**

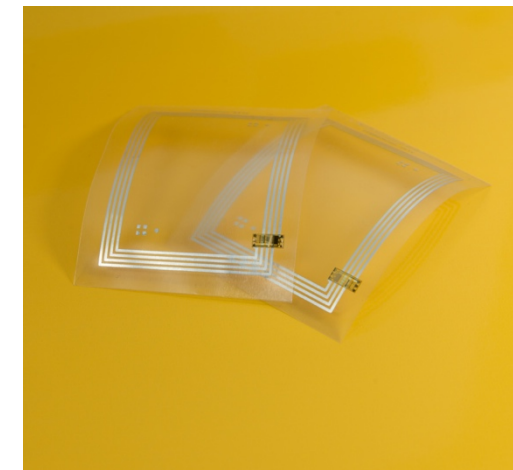
# NECOMADA project



**PragmatIC**

Customised conductive inks and flexible adhesives supporting high speed integration of electronics

B/S/H/



See more at <http://necomada.eu/>  
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 720897

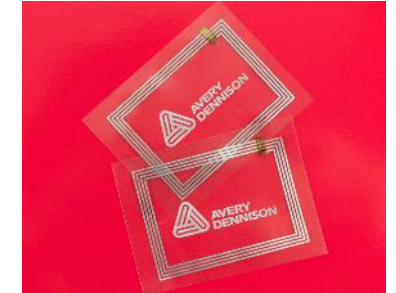
# Global RFID tag partners

PragmatIC<sup>TM</sup>



"With PragmatIC's technology, there is the potential to extend the use of unique item-level digital identities to improve consumer experiences in a number of new segments, such as fast-moving consumer goods."

– *Francisco Melo, VP and GM Global RFID, Avery Dennison*

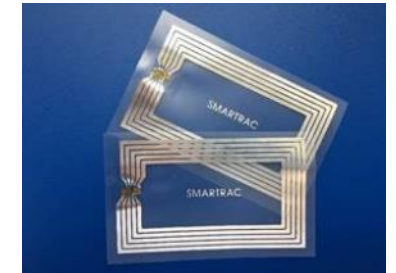


"complete supply chain to embed thin film based RFID technology in printed objects and printable substrates..."

"extremely thin, flexible and durable electronics..."

"manufacturing at the lowest cost and highest volumes."

– *PING project (Printed Intelligent NFC Game cards & packaging)*



"PragmatIC are the first company to bring flexible electronics to market at the price level previously unavailable for smart packaging technologies and thanks to that TALKIN' THINGS will be able to drive interactivity into a broader range of high volume consumer goods than ever before."

– *Marcin Pilarz, CEO, TALKIN' THINGS*



# PlasticArmPit project



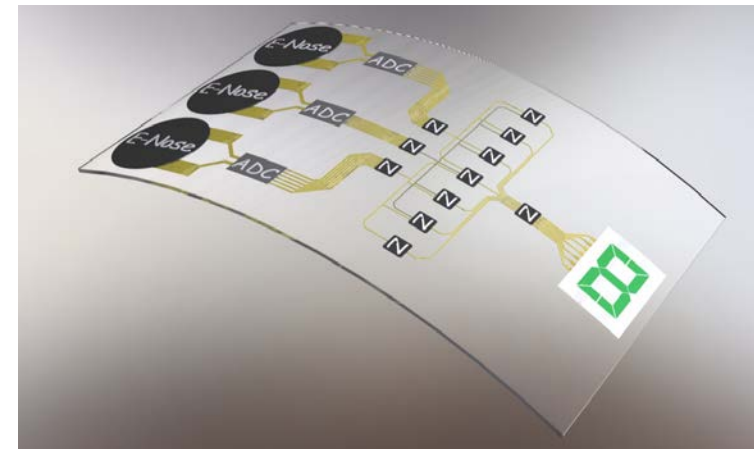
## Flexible Neural Network

- ✦ Natural conceptual-physical mapping of neurons
- ✦ Highly customised to the application
- ✦ Highly parallelised execution at low clock frequency
- ✦ Fault tolerant
- ✦ Low cost



## Flexible e-nose proof-of-concept

- ✦ For armpit malodour recognition





A detailed, high-magnification photograph of a microchip, showing a complex grid of gold-colored circuitry and various colored components. The chip is curved, and the lighting creates a gradient from bright white at the top to dark brown at the bottom.

**PragmatIC**

**Thank you**  
[www.pragmatic.tech](http://www.pragmatic.tech)