



Flexible, Printed And Thin Film Batteries 2015 - 2025

Thin, flexible and printed batteries have commercially existed for more than ten years. Traditionally, the micro-power thin and printed batteries were used in skin patches, RFID tags and smart cards. Today however the composition of the target market has drastically changed with greatest interest

from wearable devices, consumer electronics and Internet of Things.

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This change in focus has generated intense activity from big names such as Apple, LG, Samsung, Nokia, STMicroelectronics and others. At the same time, it has enticed many others to enter the foray despite many companies such as Infinite Power Solutions, Power Paper, KSW Microtec leaving the business due to lacklustre or sporadic success.

IDTechEx provides detailed technology assessments and benchmarking, ten-year market forecasts segmented by application and technology type, and detailed interview-based business intelligence and profiles on key players and large end users.

In this study IDTechEx has drawn upon at least 35 direct interviews and visits with key suppliers and large end users from a variety of sectors and years of accumulated experience and market knowledge for the end use applications such as active RFIDs, smart cards, skin patches, smart packaging and recently wearables. Our team working on this project has been highly technical, enabling it to fully understand the

merits and challenges of each technology in this complex landscape.

The market and technology landscape is complex. There are no black-and-white and clear technology winners and the definition of market requirements is in a constant state of flux.

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Indeed, on the technology side, there are many solutions that fall within the broad category of thin film, flexible or printed batteries. These include printed zinc-based batteries, thin

lithium batteries, thin film lithium polymer batteries, curved lithium ion batteries and also thin flexible supercapacitors. It is a confusing technology landscape which makes it challenging for developers to bet on the right technology and devise best product positions. It also creates uncertainty for the end users.

On the market side, many applications are still emerging and the requirements are fast evolving with time. The target markets are also very diverse, each with different requirements for power, lifetime, thinness, cost, charging cycles, reliability, flexibility, etc. This diversity of requirements means that no thin film battery solution offers a one-size-fits-all solution.

In general, wearable electronics is a major growth area for thin film and flexible batteries. This is because energy storage is a major technology challenge. Conventional secondary batteries may meet the energy requirements of wearable devices, but they struggle to achieve flexibility, thinness and light weight. These new market requirements open up the space for energy storage solutions with novel form factors. Indeed, the majority of thin film battery companies tell us that they have on-going projects in the wearable technology field.

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High-energy thin film batteries have the highest potential here followed by printed rechargeable zinc battery provided the latter can improve.

The healthcare sector is also a promising target market. Skin patches using printed batteries are already a commercial reality while IDTechEx anticipates that the market for disposable medical devices requiring micro-power batteries will also expand. Here, printed zinc batteries have the highest potential but price needs to continue falling before a higher market uptake takes place. Here too, new form factors will be the key differentiator compared to the high-volume incumbents such as coin cell batteries.

Medical diagnostic devices, medical sensors and memory backups are also promising markets. Here, LiPON-based thin lithium battery deliver most value as these applications require stable power sources with extreme safety, long life time and high capacity. The current thin battery technology is not mature enough yet to be applied straightaway. Wireless sensors/networks application is another important trend. Here, there is a trend to combine energy harvesting with thin batteries with superior form factors.

Active and battery-assisted passive RFID is also a potential target market although coin-cells are the main solutions unless there is a stringent requirement for laminar or flexible

design such as in car plates. It is also in these small niches that thin film batteries might find place.

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Smart cards also remain an attractive sector and several thin film battery technologies have been optimised to meet the lamination requirements for card manufacture. The price is however too steep and lifetime too low for primary batteries (and charging challenging for secondary ones) to enable widespread market penetration. The emerging of online and mobile banking carries a long-term threat of substitution.



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