

## TECH OFFER

### Reliable and Comfortable Stretchable Printed Circuit for Electronic Applications



#### KEY INFORMATION

TECHNOLOGY CATEGORY:

Electronics - Printed Electronics

Electronics - Sensors & Instrumentation

Healthcare - Medical Devices

TECHNOLOGY READINESS LEVEL (TRL): **TRL4**

COUNTRY: **JAPAN**

ID NUMBER: **TO175351**

#### OVERVIEW

With the integration of monitoring electronics into our everyday lifestyle, such as wearables, the utilisation of flexible electronics becomes more apparent as users demand them to not impede into their daily activities while being operational due to their ability to be deployed in areas with mechanical motion. Conventional flexible printed circuits (FPC), due to use of non-stretchable substrates, struggle under various constant deformation, resulting in poor adhesion, poor electrical contact and even pressure points which potentially limits normal operation. With discomfort and limitation on their motions, users are also less inclined to adopt these wearable solutions.

The technology owner has leveraged on their expertise in stretchable substrates and conductive ink to develop a stretchable printed circuit (SPC), which have the ability to maintain contact and performance comparable to a rigid printed circuit under repeated deformation, such as stretching and twisting. The developed SPC enables existing electrical and semiconductor components to be mounted, eliminating any need for proprietary electrical components, while fully operational under external

environmental conditions. The technology excels in larger surface application with semi-disposability in mind while having good adhesion and comfortable on skin.

The technology owner is currently seeking industrial collaborators looking to explore use-cases, such as medical equipment development and diagnostic devices, whereby electrical performance can be maintained while providing mechanical flexibility.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The technology solution leverages on the owner's technical knowhow by integrating stretchable substrate and conductive ink to develop a stretchable circuitry while designed to ensure customisation of wiring and components, much like a printed circuit board (PCB). This eliminates the shortfall of flexible printed circuits while maintaining electrical performance. The key features include:

- Thickness of each layer is about 100  $\mu\text{m}$
- Higher insulation and reliability due to suppression of ion migration occurrence
- Designed for disposability / semi-disposability
- Operating temperature and humidity of up to 40  $^{\circ}\text{C}$  and 95%RH respectively
- Mounting electrodes are designed to accept normal rigid semiconductor and electronic components
- Possible miniaturisation of existing devices due to higher density of component and wiring (compared to FPC)
- Coating and encapsulation enable possible laminating of shield layer to reduce signal noise, improving performance
- Compliance with ANSI / AAMI EC12 and ISO10993 based on in-house testing

## POTENTIAL APPLICATIONS

With the technology solution providing the electrical performance of rigid circuit while eliminating drawbacks of existing flexible printed circuits, there are potential applications that this stretchable printed circuit is able to be deployed, which include:

- Wearable Biometric Sensors: For continuous monitoring and tracking of vitals, especially for sensitive skins (e.g. young children)
- Skin Patches: For reliable controlled drug delivery and real-time diagnostics even in emergency situations
- Smart Wound and Post-Surgery Monitoring: Monitoring and optimisation of wound healing environment

## UNIQUE VALUE PROPOSITION

The developed stretchable printed circuit is designed to ensure rigid semiconductor and electronic components can be mounted for potential replacement of existing circuitry. In addition, due to its stretchability, it can maintain conductivity while under repeated deformation during operation, highlight its robustness and performance. With the inclusion of the coating layer, the circuitry encapsulated is able to operate in high humidity environment while maintaining insulation, showcasing its high reliability.