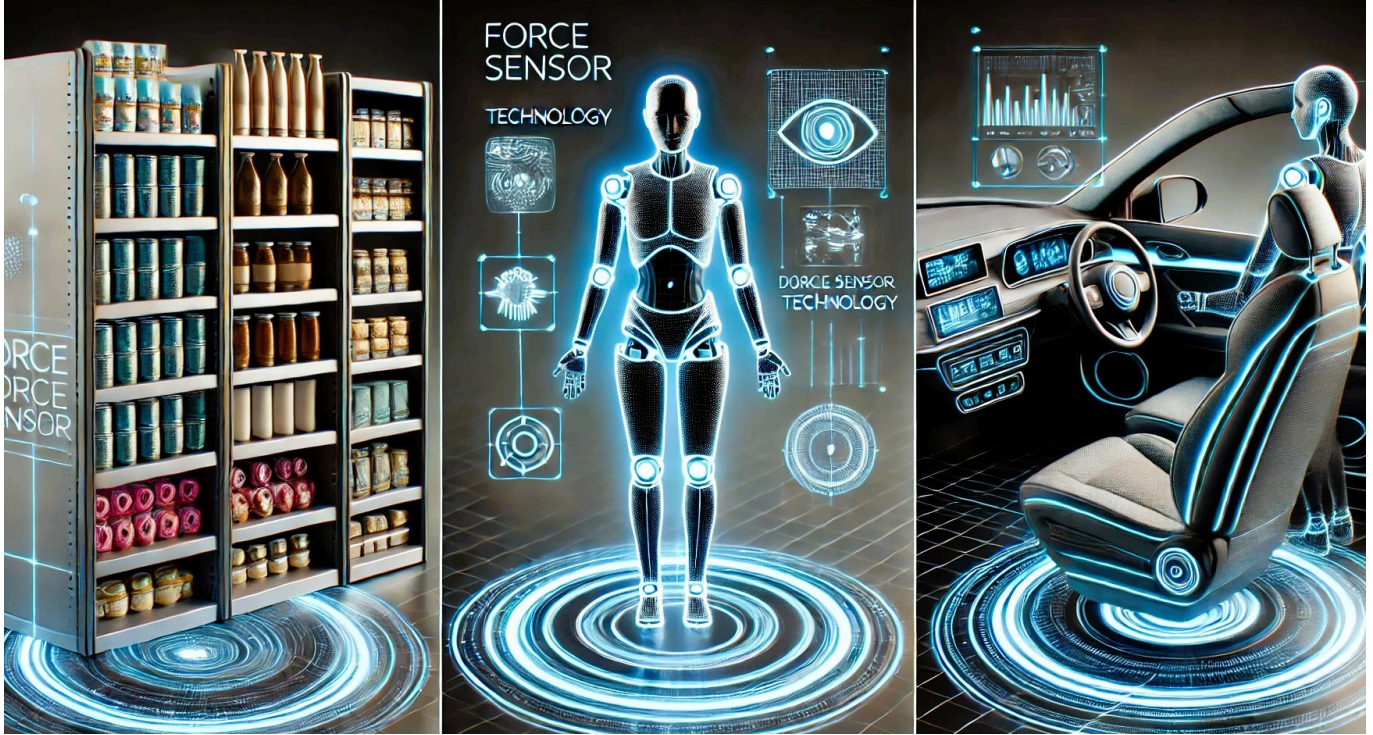


TECH OFFER

Unique Large-Area Capacitive Force Sensor with Wide Dynamic Range



KEY INFORMATION

TECHNOLOGY CATEGORY:

- Electronics - Sensors & Instrumentation
- Infocomm - Human-Computer Interaction
- Infocomm - Robotics & Automation
- Infocomm - Internet of Things

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

COUNTRY: **SINGAPORE**

ID NUMBER: **TO175197**

OVERVIEW

A variety of force sensors have been adopted for different applications. Among them, sheet-type sensors, designed to be installed on curved surfaces, are typically categorized into two types: resistive type sensors that rely on the deformation of conductive materials, and capacitive type sensors that utilise the deformation of elastic materials. However, both types face limitations due to the restricted amount of deformation of the materials used. Consequently, these sensors often have a narrow force detection range (dynamic range), making it challenge to measure both low and high forces with a single device.

To address this, the technology owner has developed an innovative, large-area force sensing device leveraging a unique built-in wire structure. This device is capable of detecting surface pressure distribution in a matrix with high linearity across a broad range of loads, from low to high. The detection level of capacitance exhibits excellent linearity against applied loads. By integrating conductive wires into a large elastic sheet, the device is scalable, making it suitable for large-area applications. This

technology offers versatile applications across various sectors. In smart retail shelves, it can monitor product status and inventory levels over the entire surface. In robotics, it enables full-body tactile sensing for the entire surface of a humanoid. In automotive applications, it can detect and monitor the status of drivers and passengers.

The technology owner is seeking R&D collaboration and licensing opportunities with industrial partners, particularly in robotics, automotive, retail and logistics sectors, to explore potential applications.

TECHNOLOGY FEATURES & SPECIFICATIONS

Multiple wires covered with a dielectric material are arranged across the entire rubber surface, with conductive rubber placed to intersect the wires. This unique structure allows the capacitance value to change based on the contact area between the conductive rubber and the wires, depending on the applied load. This innovative force sensor has the following features:

- High linearity in capacitance detection with respect to force, enabling highly accurate force sensing
- Able to detect a wide range of forces, from low to high
- Able to detect surface force distribution in a matrix over a large area
- Designed as a stretchable and flexible sheet-type sensor

POTENTIAL APPLICATIONS

As a sensing device for interactive systems including actuators, its potential applications include, but are not limited to:

- Smart Shelf: retail, logistic, factory automation (FA), etc.
- Robotics: palm, foot, etc.
- Automotive: driver monitoring systems (DMS), occupant detection, etc.

UNIQUE VALUE PROPOSITION

This large-area sheet-type sensor has stretchability and flexibility to be installed on curved surfaces to achieve highly accurate output linearity over a wide range of loads. It delivers the following customer value in each application:

- **For Smart Shelf:** enables monitoring of product status and inventory levels across the entire shelf with light to heavy items
- **For Robotics:** realise tactile functionality for the entire body surface of a humanoid robot
- **For Automotive:** detects the status of both the driver and passengers