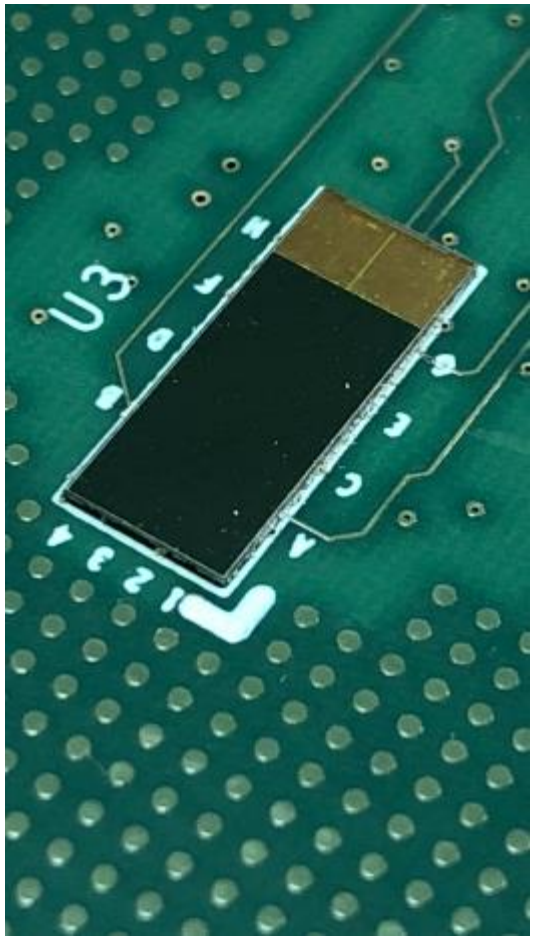
UltraPrint™ Ultrasonic Technology

Attracting Tomorrow TDK

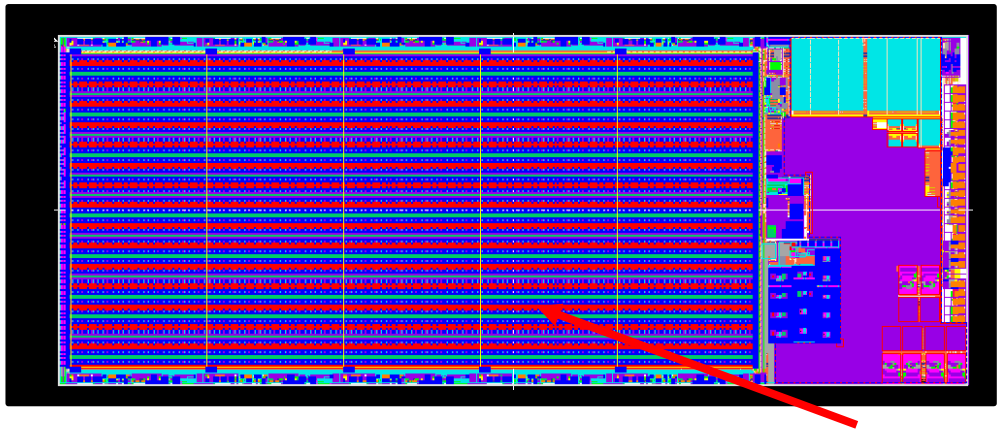
Under development

- UltraPrint™ sensors image a fingerprint using Ultrasonic pulses through a cover material like glass, plastic or aluminum
- UltraPrint™ sensors are comprised of a MEMS wafer bonded to CMOS, a mature TDK-Invensense fabrication process
- Each has an array of Piezoelectric Micromachined Ultrasonic Transducers or PMUTS, individually addressable, also have an onboard MCU and memory

TCFS-2000 SMT Package



TCFS-2000 Silicon Top View



Over 8000 PMUTs in a 9.4 x 4.2mm sensing area

Fingerprint - Executive Summary

Attracting Tomorrow

TDK

Under development

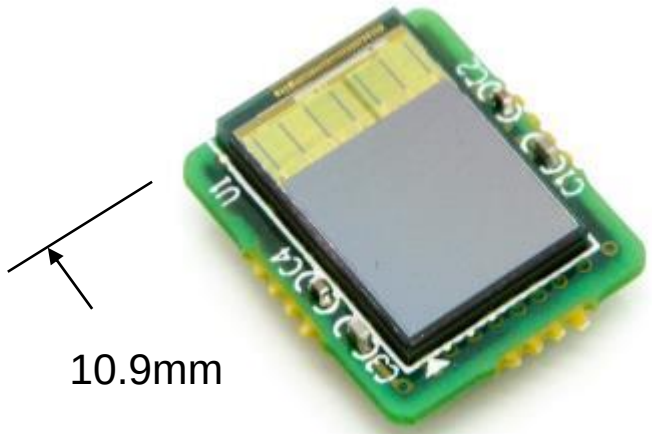
TCFS-3000 Module

Value Proposition

- Enable ID Design Flexibility:
  - Sense under covers: Thick Glass/Tint, Glass/Deco-film, Aluminum, Magnesium and PC-ABS, ABS and Acrylic
  - Can sense under a **3D curved surface** (concave or convex)
  - Superior performance over temp
  - Support volume manufacturing covers thickness variations
- Wake on Finger power consumption (competitive with Capacitive)
- Superior Immunity to contamination (**Wet**, **Sweaty** or **Oily fingers**)
- Ability to image at power up without requiring finger off sensor first, desirable for battery-powered applications seeking lowest power
- Supporting **Embedded MCU Authentication** (Cortex-M4 class)
- Low Module **BOM** (few components on Flex)
- Low integration Cost

Technology/IP Highlights

- First pMUT based FP sensing (patented)
- Patented CMOS MEMS integration
- Fully addressable pixels for 2D **beamforming**



Back