

TECH OFFER

Non-Invasive Wearable for Stress Tracking via Pulse Shape Variability



KEY INFORMATION

TECHNOLOGY CATEGORY:

Healthcare - Diagnostics

Infocomm - Wearable Technology

TECHNOLOGY READINESS LEVEL (TRL): **TRL7**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO175340**

OVERVIEW

This non-invasive wearable integrates advanced photoplethysmography (PPG) sensing with a **proprietary Pulse Shape Variability (PSV)** algorithm to deliver real-time insights into stress levels linked to blood pressure fluctuations. Unlike conventional wearables that rely solely on heart rate or HRV, this technology analyzes the full morphology of the pulse waveform, capturing dynamic changes in amplitude, rise time, and contour that reflect vascular tone modulation caused by psychological stress.

The result is a highly responsive and motion-tolerant stress detection platform that functions effectively in real-world conditions. By transforming microvascular signals into actionable insights, the solution enables proactive stress awareness, personalized wellness coaching, and context-aware emotional feedback, unlocking new opportunities in digital health, telemedicine, fitness, and mental wellness ecosystems.

The technology owner is primarily seeking industry adopters and solution partners including medical institutions, device manufacturers, software developers, and fitness centers, who can integrate the technology into real-world applications with

interest in deploying the system for use cases such as mental wellness, stress monitoring, fitness optimization, and remote healthcare. They also welcome collaboration with subject-matter experts to jointly enhance the algorithm and explore new features or application areas.

TECHNOLOGY FEATURES & SPECIFICATIONS

This wrist-worn wearable captures and processes high-resolution biometric signals using integrated optical and motion sensors, enabling detailed physiological monitoring through advanced signal analysis.

Signal Acquisition:

- Photoplethysmography (PPG) and Accelerometer (ACC) signals

Derived Metrics:

- Heart Rate (HR)
- Blood Oxygen Saturation (SpO₂)
- Pulse Shape Variability (PSV) – derived from pulse waveform morphology to assess stress-related vascular responses
- Sleep Parameters:
 - REM and NREM sleep stages
 - Total Sleep Time (TST)
 - Apnea-Hypopnea Index (AHI)
- Activity Data:
 - Step count and movement recognition

System Capabilities:

- Real-Time Stress Detection:
 - Continuous analysis of physiological stress signals with no need for user calibration
 - Operates effectively during both rest and typical daily movement
- Motion-Tolerant Signal Processing:
 - Proprietary algorithms reduce noise from physical activity, enabling reliable readings in dynamic conditions

POTENTIAL APPLICATIONS

This wearable stress and health monitoring technology has broad applications across healthcare, wellness, fitness, and cognitive performance domains. Its ability to deliver continuous, non-invasive physiological insights makes it suitable for a wide range of use cases:

- **Healthcare & Telehealth:** Continuous patient monitoring, early detection of stress-linked health risks, and remote management of chronic conditions, particularly for mental health, cardiovascular, and sleep-related concerns.
- **Medical Concierge & Premium Wellness Services:** Personalized health monitoring for high-net-worth individuals, offering tailored stress and wellness insights, real-time biometric updates, and proactive intervention strategies.

- **Mental Wellness & Stress Counselling:** Real-time monitoring of stress indicators to support therapists, coaches, or counselors in delivering timely, personalized stress management interventions.
- **Fitness & Recovery Optimization:** Accurate tracking of heart rate and stress levels during and post workouts, enabling intelligent recommendations for training intensity, rest periods, and recovery quality.
- **Workplace Well-being & Performance:** Monitor cognitive load and emotional strain in high-performance environments, enabling preventive strategies for burnout and stress-related fatigue.
- **Smart Devices & Platform Integration:** Embedding into smartwatches, fitness trackers, or medical-grade wearables, with seamless connectivity to digital health apps, dashboards, and remote care platforms.

UNIQUE VALUE PROPOSITION

This wrist-worn device offers a significant advancement over current health monitoring solutions by leveraging advanced photoplethysmography (PPG) technology combined with a proprietary Pulse Shape Variability (PSV) algorithm. It delivers highly accurate and continuous tracking of vital signs, including heart rate, SpO₂, and stress-related biomarkers—with minimal interference from physical movement, making it ideal for real-world, everyday use.

Unlike conventional wearables that rely on basic HR or HRV metrics, this solution analyzes the full morphology of the pulse waveform to detect subtle changes in vascular tone associated with psychological stress. This allows users to **correlate emotional states with verbal expressions and behavior, enabling more mindful, data-driven self-awareness and health management.**

The device's **motion-tolerant design, real-time data transmission,** and non-invasive operation ensure consistent performance even during physical activity. Its seamless integration with health platforms and apps further enhances usability, positioning it as a versatile tool for individuals, clinicians, and wellness providers.

Ultimately, this technology empowers users to make informed decisions about their stress levels, recovery, and overall well-being—bridging the gap between biometric sensing and emotional health insight in a user-friendly wearable format.