

## PulseOn Optical Heart Rate Module

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**Based on >11y of development and optimized through thousands of recordings**

**Patented optical HR solution & activity tracking: low-power fully integrated module + algorithms for several use cases**

- Sports – accurate up to MaxHR and full running speeds
- Rest – beat-to-beat accurate (HRV) enabling analysis of stress and recovery with extremely low power (90% reduction in LED currents during no movement)
- 24/7 – reliable HR tracking combined with activity tracking (activity, steps, calories)

**Multiwavelength (green & IR) measurement with optimally matched asymmetric geometry and optomechanical design (pat. pending) provides large dynamic measurement range and low power consumption**

- Adaptation to skin color variations & anatomic differences
- Adaptation to perfusion variations
- Efficient ambient light cancellation even in extreme conditions
- Optimized power consumption – extremely low power in rest while still accurate during movement and high ambient light conditions

**The most accurate and reliable detection of heart rate for sports, rest and daily HR Efficient movement cancellation even when heart and movement frequencies overlap**

- Efficient ambient light cancellation even in rapidly changing conditions
- Compensation of poor quality or missing PPG with accelerometer
- Beat-to-beat detection comparable to ECG => HRV
- Algorithmic power consumption optimization (LED power control, channel selection)
- Reliability >94%, accuracy >96% during sports in reference design (PulseOn wrist HR device)
- Optimized for running (up to maxHR), walking and cycling, works during any sports and also during rest
- Integrated activity tracking (steps, calories, activitydetection, inertia-based distance and speed)

## P-OHRIF in nutshell

### P-OHRIF

#### Product offering

- Turnkey optical HR measurement and analytics
- HW module for all-in-one optical HR measurements
- Integrated algorithms and analytics
- NRE project for algorithm tailoring to target use cases, and product validation

#### Main benefits

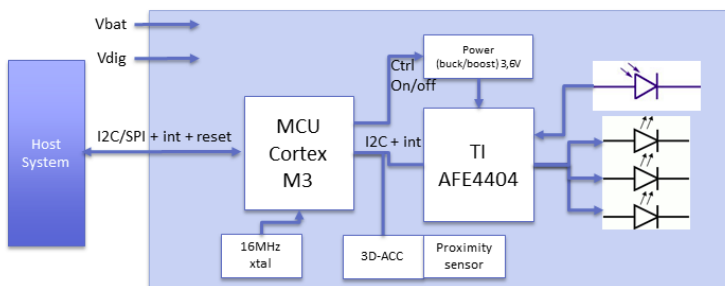
- Turnkey solution for world's best optical HR measurement with fast integration and delivery

#### Host system requirements

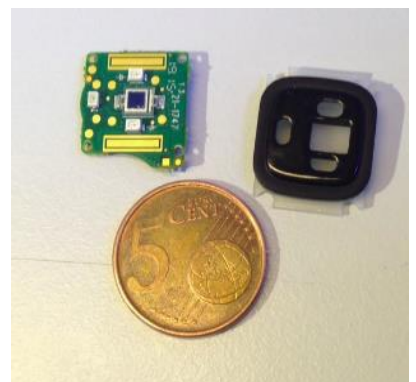
- SPI interface with IRQ
- 5mW average power
- 1.7V - 2.0V (Vdig) and 2.5-5.5V (Vbat) power sources

#### Target projects

- Fast implementation for any host platform




Block diagram of the PulseOn OHRM module



Module in real size

## Technical specifications

<b>Key features</b>	<p>PulseOn patented and proprietary optical sensor design (optomechanical design, optics, ambient light protection, optical shielding)</p> <p>Market's most accurate and reliable continuous optical heart rate, up to beat-to-beat accuracy comparable to ECG based heart rate variability</p> <p>Embedded algorithms for heart rate and heart rate variability, ambient light, movement cancellation, movement classification (steps, activity class), steps and inertia-based speed and distance</p> <p>Integrated heart rate analytics (optional, powered by Firstbeat)</p> <p>Several operating modes (off, activity monitoring, sampled HR, sports, sleep, etc) controllable by host system</p>
<b>Dimensions</b>	<p>Sensor dimensions optimized for accurate HR.</p> <p>3,95mm thick and 16.4mm x 20.2 mm wide. Also direct integration on device B cover possible.</p> 
<b>Sensors</b>	<p>Optical HR (green + IR), plastic optical lenses</p> <p>3D accelerometer</p> <p>Proximity sensor (off hand detection)</p>
<b>Power consumption</b>	<p>Disabled: Less than 1uW</p> <p>Activity monitoring (no HR): &lt;3mW</p> <p>HR monitoring: 4-17mW, depending on operating mode and conditions</p>
<b>Power</b>	<p>Vbat (2.5V to 6V)</p>
<b>Interface</b>	<p>SPI</p> <p>Heart rate, beat-to-beat heart rate</p> <p>Activity class, steps (running, walking, cycling, sleep)</p> <p>Sleep analytics (Deep sleep, light sleep, wake-up times)</p> <p>Speed and distance (inertia-based)</p> <p>Energy expenditure (kCal), training intensity (%VO2Max)*, training effect (EPOC)*, fitness level (VO2Max)*</p> <p style="text-align: right;">* optional by integrated Firstbeat analytics</p>
<b>Mechanical design</b>	<p>Plastic housing</p> <p>Waterproof integration e.g. by ultrasonic welding.</p>