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## MAX86174A/MAX86174B

## Best-in-Class Optical Pulse Oximeter and Heart-Rate Sensor AFE for Wearable Health

### General Description

The MAX86174A/MAX86174B are ultra-low-power optical data acquisition systems with both transmit and receive channels. On the transmitter side, the MAX86174A/MAX86174B have four LED driver output pins. Each pin is programmable from two, high-current, 8-bit LED drivers. On the receiver side, the MAX86174A consists of two optical readout channels that can operate simultaneously while the MAX86174B has a single optical readout channel. The devices have low-noise, charge-integrating analog front-end, 20-bit ADC, and best-in-class ambient-light cancellation (ALC) circuits.

Due to the low power consumption, compact size, ease and flexibility of use, the MAX86174A/MAX86174B are ideal for a wide variety of optical sensing applications such as pulse oximetry and heart-rate detection.

The MAX86174A/MAX86174B operate on a 1.8V main supply voltage and a 2.7V to 5.5V LED driver supply voltage. The devices support both I<sup>2</sup>C- and SPI-compatible interfaces in a fully autonomous way. The devices have a large 256-word built-in FIFO. The MAX86174A/MAX86174B are available in a compact 16-WLP package.

### Applications

- Wearable Devices for Fitness, Wellness and Medical Applications
- Clinical Accuracy
- Suitable for Wrist, Finger, Ear, and Other Locations
- Optimized Performance to Detect
  - Optical Heart Rate
  - Heart-Rate Variability
  - Oxygen Saturation (SpO<sub>2</sub>)
  - Body Hydration
  - Muscle and Tissue Oxygen Saturation (SmO<sub>2</sub> and StO<sub>2</sub>)
  - Maximum Oxygen Consumption (VO<sub>2</sub> Max)

### Benefits and Features

- Complete Optical Data Acquisition System
- Ultra-Low-Power Operation for Body Wearable Devices
  - Low-Power-Operation, Optical Readout Channel < 11μA (typ) at 25fps
  - Exposure Integration Period Ranging from 14.6μs to 117.1μs
  - Low Shutdown Current < 1μA (typ)
- Excellent Top-End Dynamic Range > 93dB in White Card Loop-Back Test (Nyquist Sample-to-Sample Variance)
- Extended Dynamic Range up to 111dB (Averaging and Off-Chip Filtering) to Enable SpO<sub>2</sub> on Wrist/Chest for Low Perfusion Cases
- Support Frame Rates from 1fps to 2048fps
- High-Resolution 20-Bit Charge-Integrating ADCs
- Support Both Burst Averaging and Decimation Averaging Modes
- On-Chip 12Hz Low-Pass Filter for Improved SNR and Reduced Power for Continuous Heart-Rate Measurement
- Supports Two PD Inputs for Multi-Parameter Measurements
- Supports Four LED Driver Output Pins Generated from Two 8-Bit LED Current Drivers
- Low Dark-Current Noise of < 50pA<sub>RMS</sub> (Sample-to-Sample Variance in 117.1μs Integration Time)
- Excellent Ambient Range and Rejection Capability
  - 200μA Ambient Photodiode Current
  - > 70dB Ambient Rejection at 120Hz (Burst Average > 2)
- Miniature 1.67mm x 1.78mm, 0.4mm Ball Pitch, 4 x 4 WLP Package
- -40°C to +85°C Operating Temperature Range

[Ordering Information](#) appears at end of datasheet.

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# ABRIDGED DATA SHEET

MAX86174A/MAX86174B

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Heart-Rate Sensor AFE for Wearable Health

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/21	Release for Market Intro	—
1	2/22	Updated <i>General Description, Benefits and Features, Absolute Maximum Ratings, and Electrical Characteristics</i> table	1, 7, 9, 38, 39, 40
2	7/23	Updated <i>Detailed Description</i> , Register Map, and Figure 21	17, 23, 33, 61, 80, 40