ADPD4200 Technical Promotion

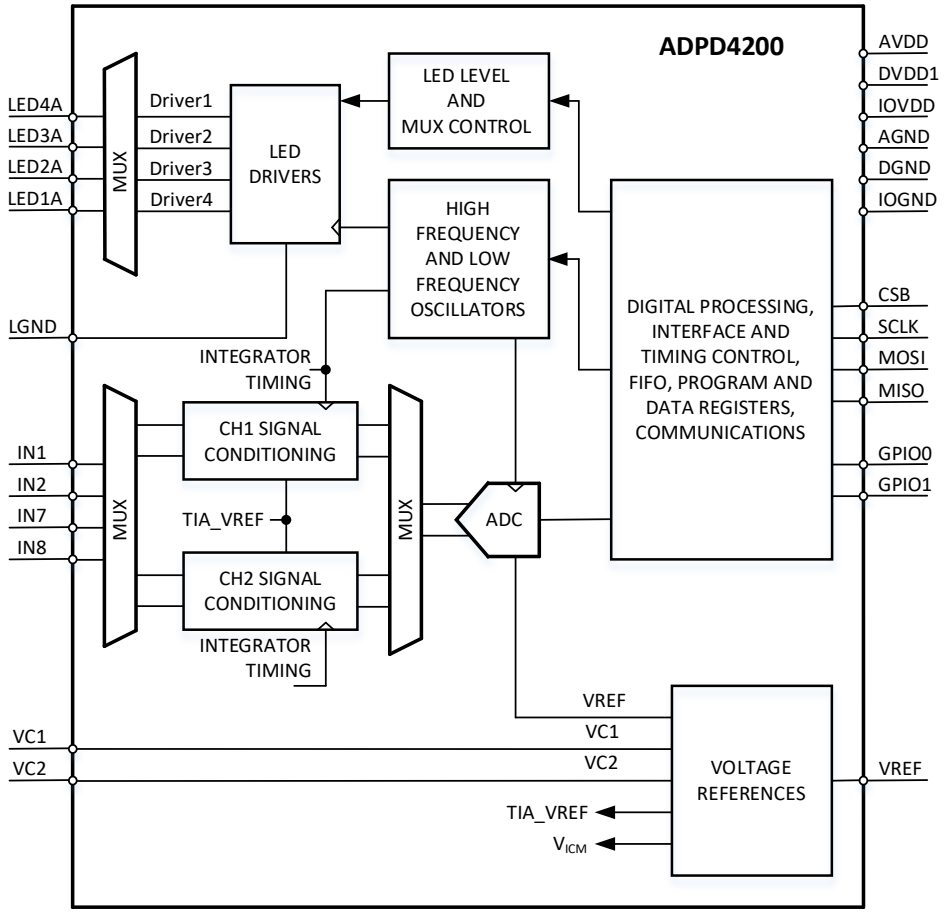
China BU

AHEAD OF WHAT'S POSSIBLE™

Agenda

- ADPD4200 Brief Introduction
- PPG Application
- Eval_ADPD4200Z_Hardware & Software
- Q&A

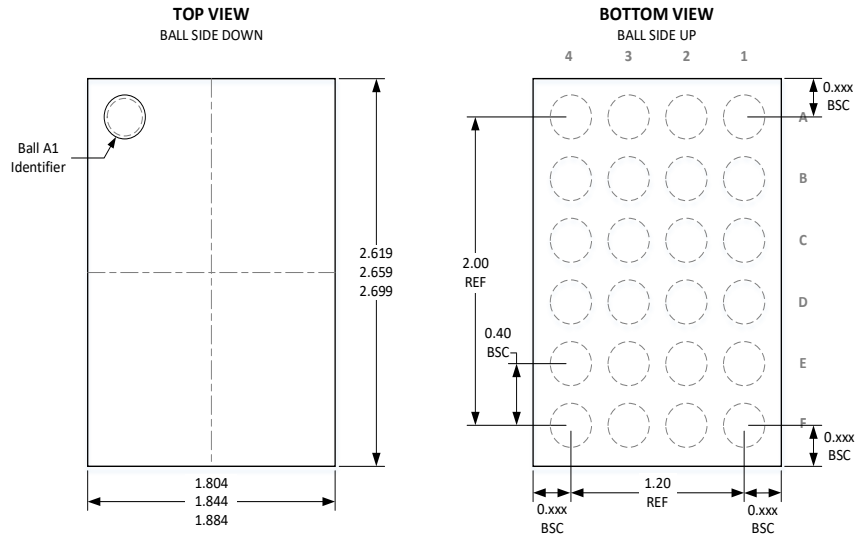
ADPD4200 Series Brief Structure

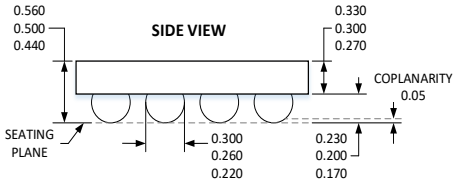


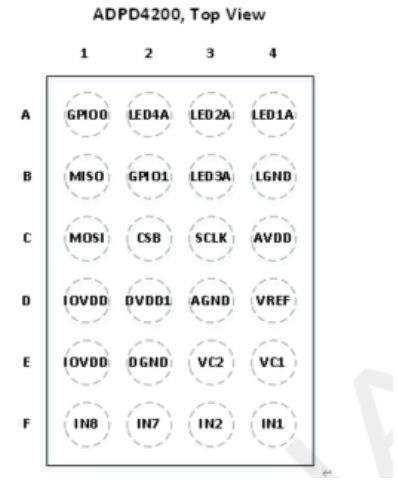
NOTES:
1. TIA_VREF IS THE INTERNAL VOLTAGE REFERENCE SIGNAL FOR THE TRANSIMPEDANCE AMPLIFIER.
2. CSB,SCLK, MOSI AND MISO ARE SPI INTERFACE PINS.

- **Multimodal analog front end**
  - 4 input channels with multiple operation modes to accommodate the following measurements: PPG, ECG, EDA, impedance, and temperature
  - Dual channel processing with simultaneous sampling
  - 12 programmable time slots for synchronized sensor measurements
  - Flexible input multiplexing to support differential and single-ended sensor measurements
- **Flexible sampling rate from 0.004 Hz to 9 kHz using internal oscillators**
- **On-chip digital filtering**
- **SNR of transmit and receive signal chain: 105 dB with digital integration mode**
- **Total system power dissipation: 30 µW (combined LED and AFE power), continuous PPG measurement at 75 dB SNR, 25 Hz ODR, 100 nA/mA CTR**
- **SPI communications supported**
- **512-byte FIFO**

ADPD4200 Series Package





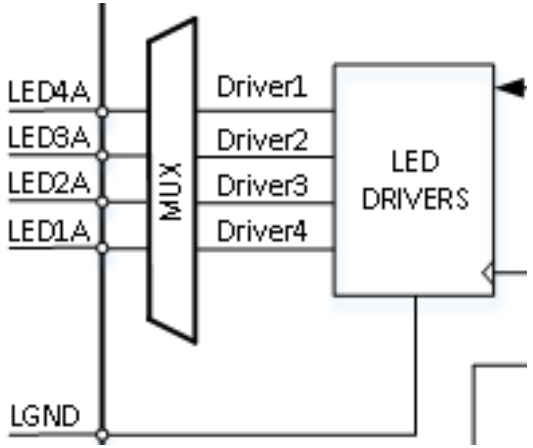


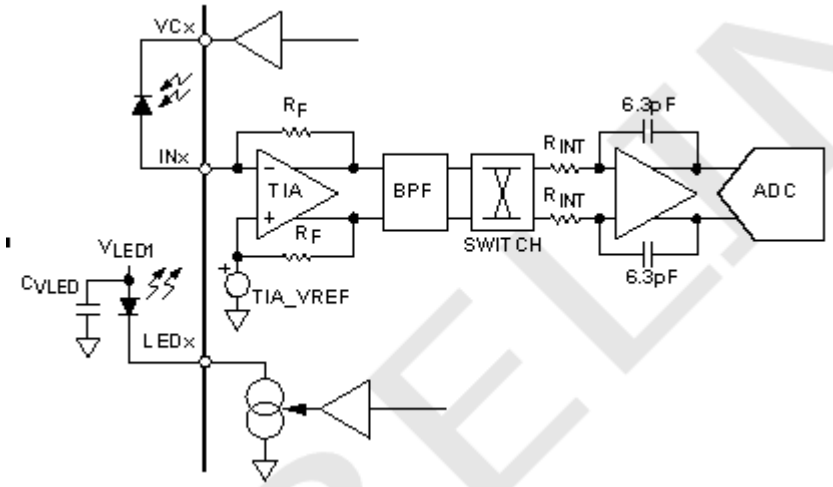
Series are all pin-pin compatible, flexible design

- **PPG Only**
  - Just optical path for HRM/SPO2 etc
- **PPG+ECG Measurement**
  - With superior ECG besides PPG path.
- **Package Description**
  - 24-Ball Wafer Level Chip Scale Package [WLCSP]

PPG Application

PPG - Key Features





- 4 LED drivers, which can be driven simultaneously
- 12 programmable time slots for synchronized sensor measurements
- 2 Channels signal path
- Ambient light rejection: 60 dB up to 1 kHz
- 400 mA total LED drive current
- Optical design/layout simulation guidance

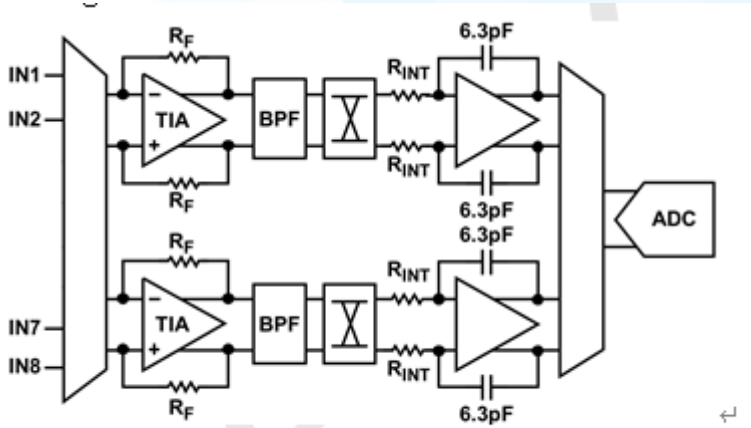
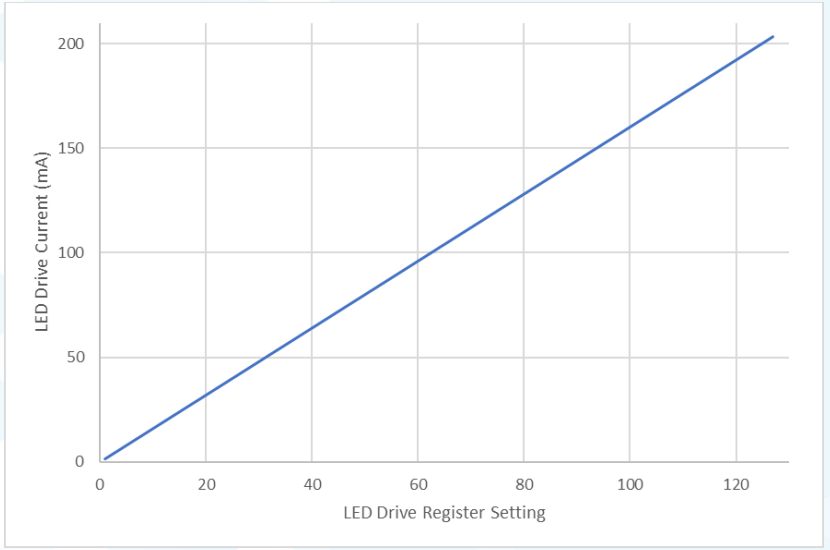


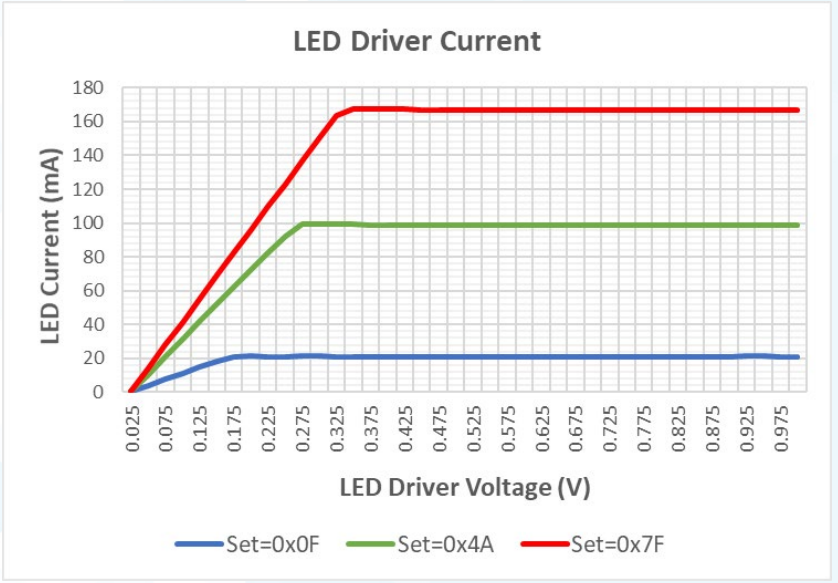
Figure 14. Analog Signal Path Block Diagram

Typical Performance Characteristics

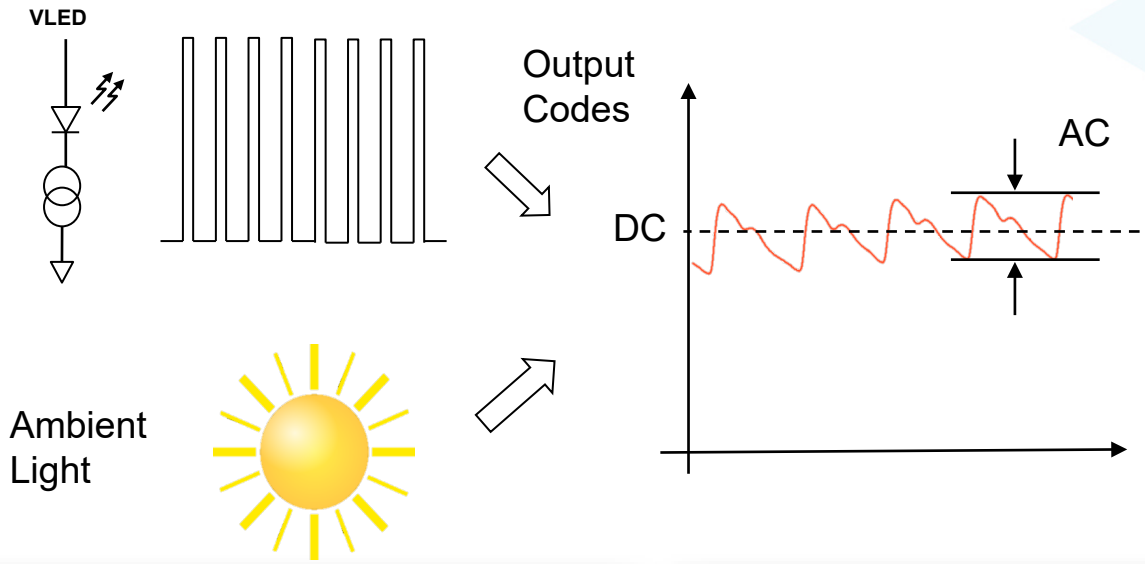
- Minimum RTI noise: only 0.97 nArms
- Maximum SNR: 100 dB with 100 kΩ Tia Gain
- 60 dB AC ambient light rejection
- 50 dB PSRR
- Max to 200 mA independent LED driver current

Referred to Input Noise	Single integration mode; single pulse; single channel; 90% full-scale input signal, no ambient light, TIA_VREF = 1.265 V, VCx = TIA_VREF+250mV, 2 µs LED pulse, photodiode capacitance (C_{PD}) = 70 pF, input resistor = 500 Ω				
	12.5 kΩ TIA gain		10.3		nA rms
	25 kΩ TIA gain		5.3		nA rms
	50 kΩ TIA gain		2.7		nA rms
	100 kΩ TIA gain		1.5		nA rms
	200 kΩ TIA gain		0.97		nA rms
SNR	12.5 kΩ TIA gain, single pulse		76		dB
	25 kΩ TIA gain, single pulse		76		dB
	50 kΩ TIA gain, single pulse		75		dB
	100 kΩ TIA gain, single pulse		74		dB
	200 kΩ TIA gain, single pulse		72		dB
	100 kΩ TIA gain, 100 Hz output data rate, 80 pulses, C_{PD} = 70 pF, 0.5 Hz to 20 Hz bandwidth		100		dB
AC Ambient Light Rejection	DC to 1 kHz, linear range of TIA		60		dB
DC Power Supply Rejection Ratio (DC PSRR)	At 75% full scale input		50		dB

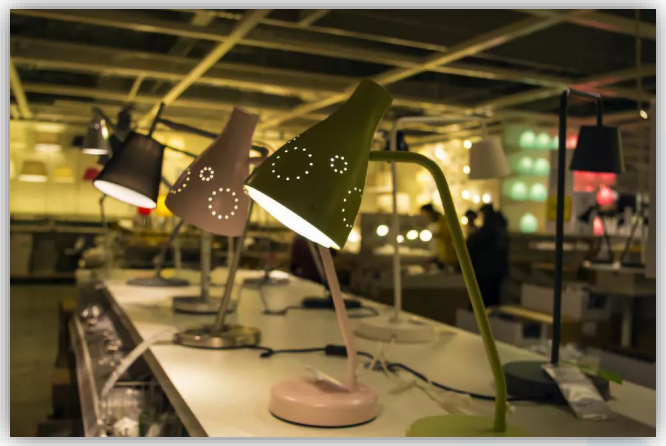




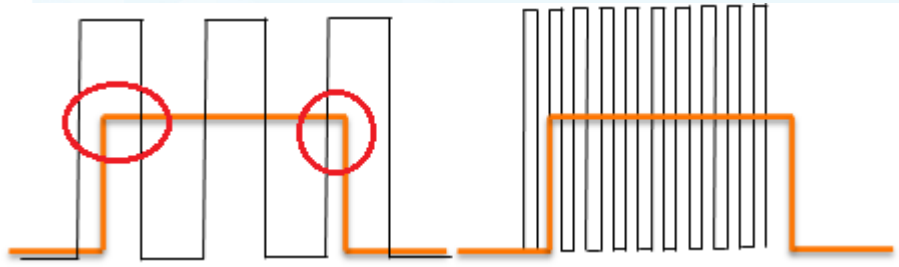
PPG - Flexible Pulse Width Setting



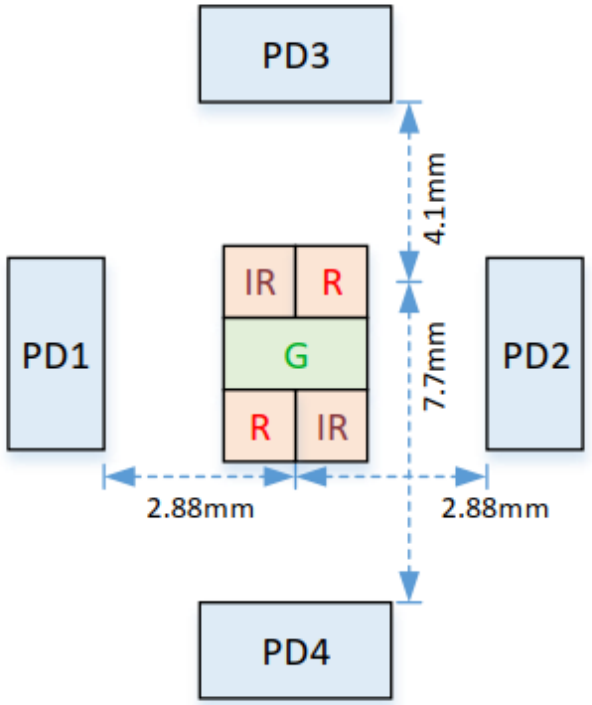
- Flexible pulse setting Flexible combination to cover different cases.
- Immune to dynamic light interference.
- 12 available time slots, enabling 12 separate optical measurements per sampling period.
- Convenient for relevant algorithm if needed.



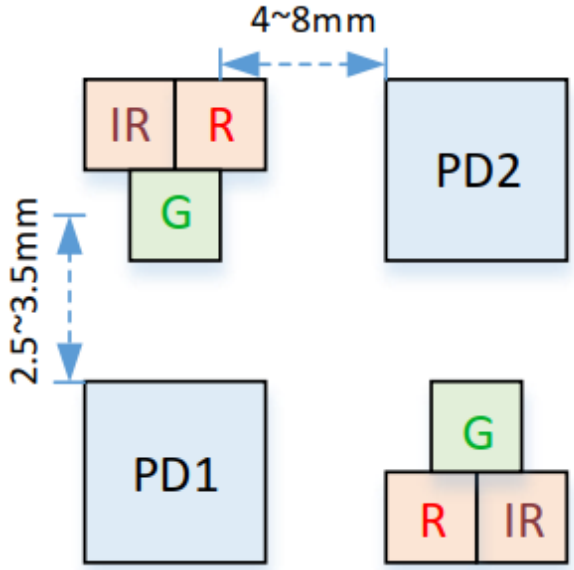
Low Eye Risk: >1250Hz（800us）， No Eye Risk: >3125Hz (320us)



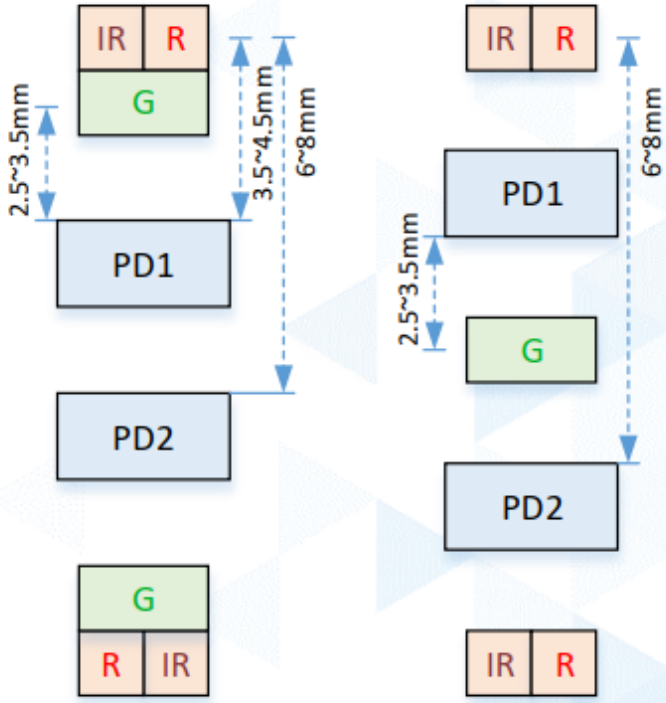
Example: Optical Placement Guidance



Option1 for Watch
- 4 PD
- Support SPO2 and CNIBP



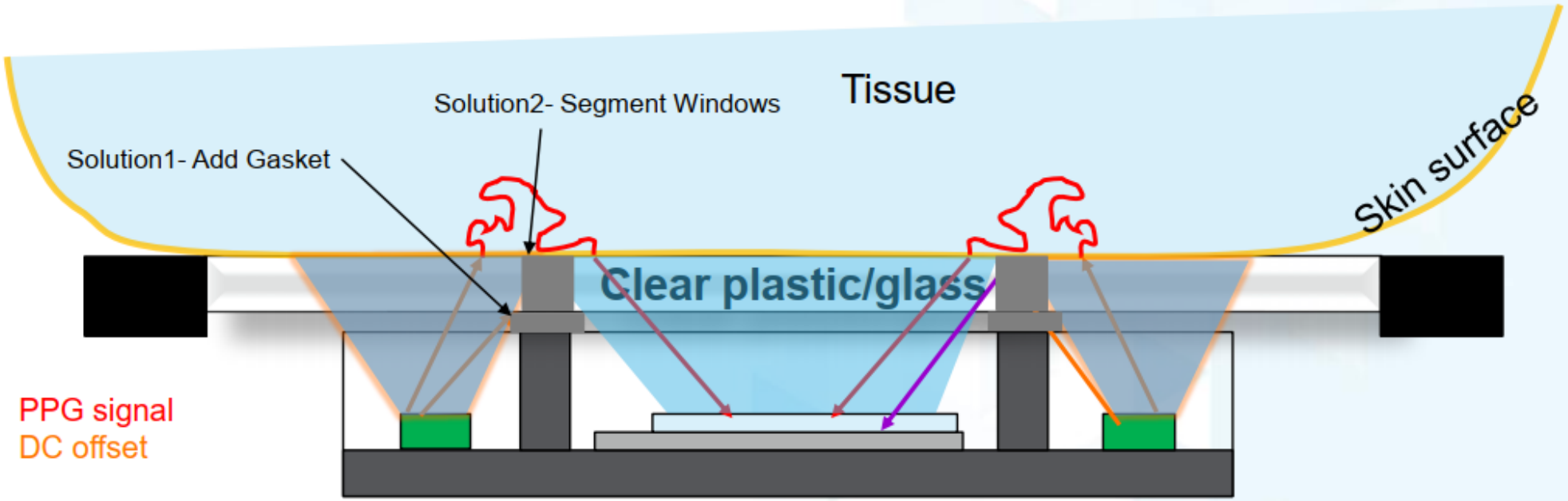
Option2 for Watch
- 2 PD
- Support SPO2 and CNIBP



Option3 for Wristband
- 2 PD
- Support SPO2 and CNIBP
- 2 placement options

Example: Solutions for ILP

Gasket is used to eliminate the air gap and prevent all ILP from first lens surface and some ILP from second surface(tissue side)

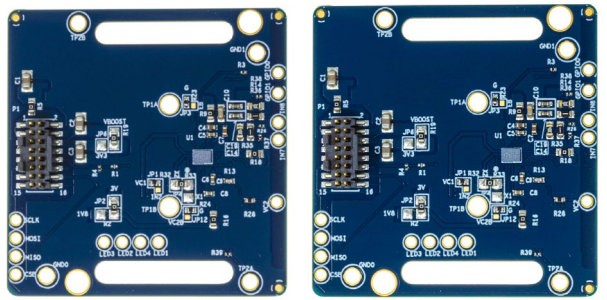


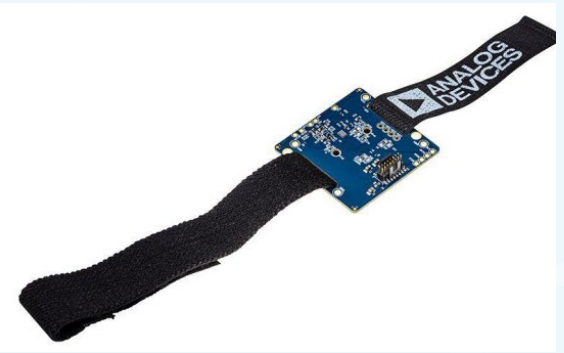
The segmented window blocks reflections off the glass from reaching the PD and increases the effective separation.

Eval-ADPD4200Z Hardware & Software

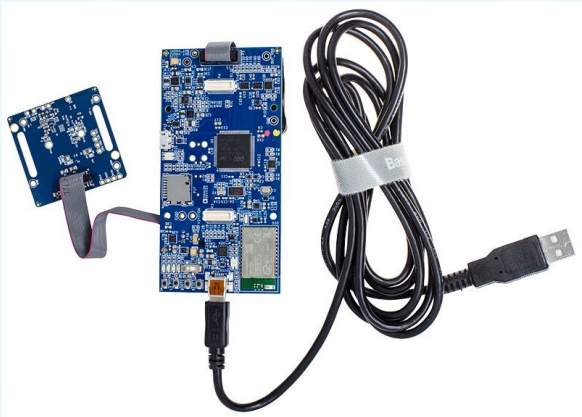
Current System Solutions & demo

- EVAL-ADPD4200Z-PPG
- Convenient PPG evaluation

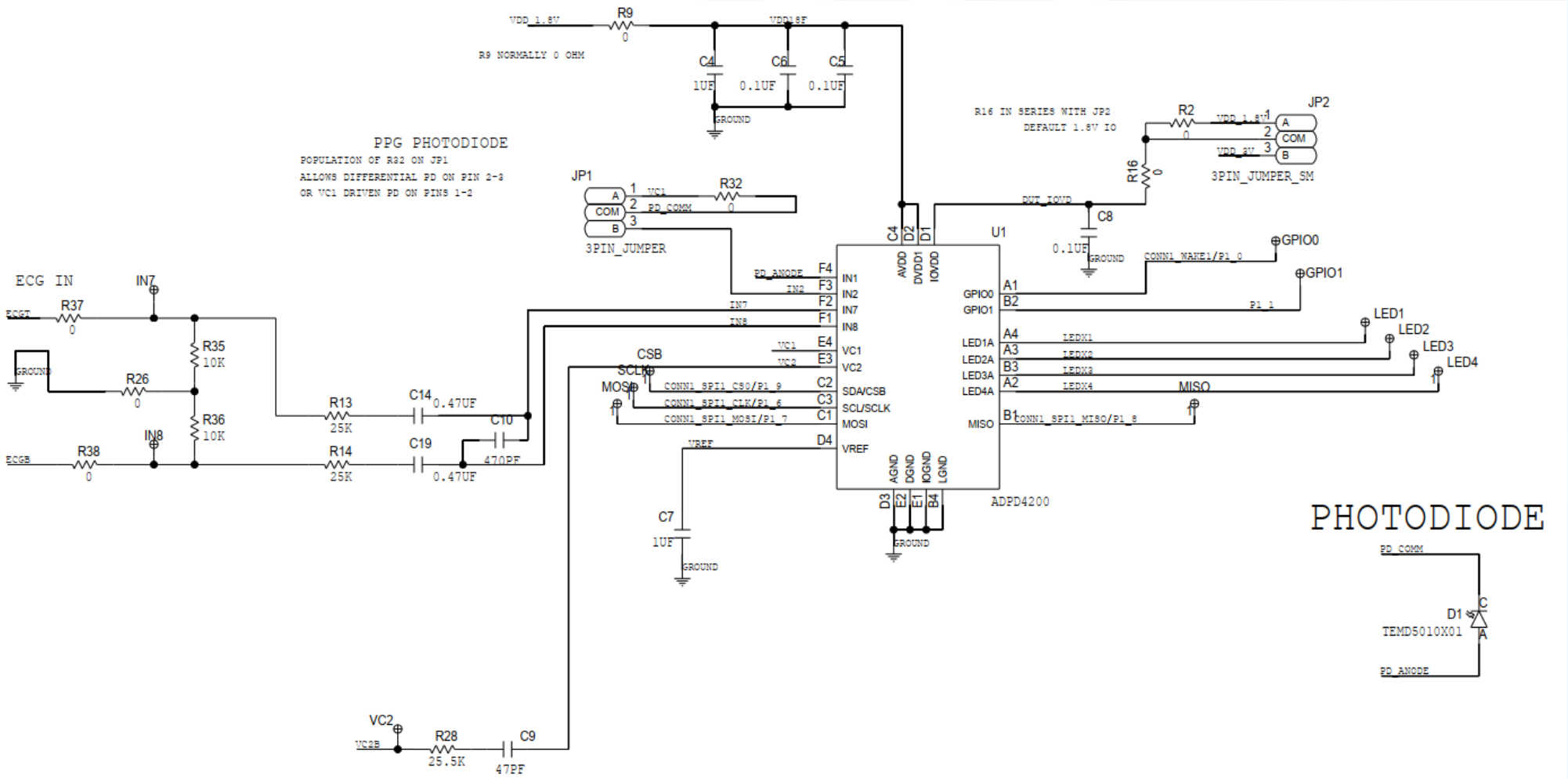




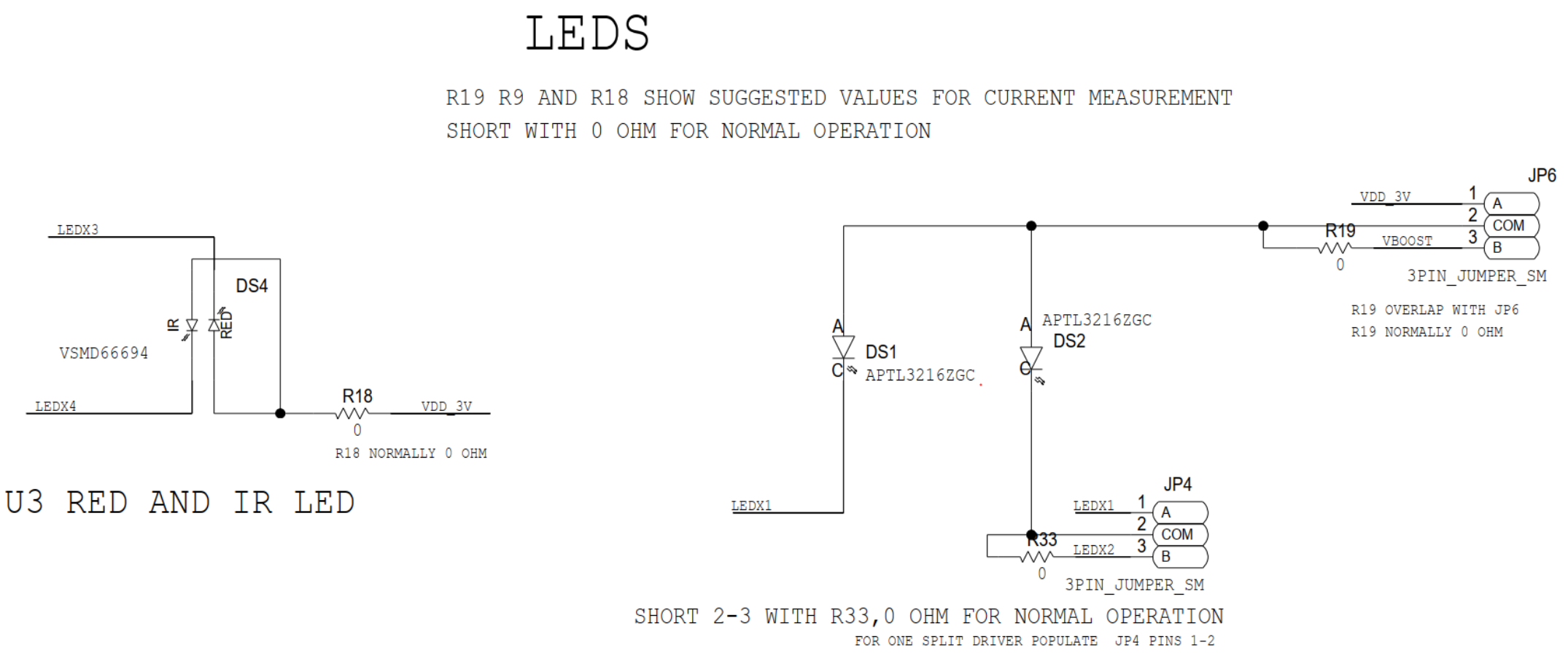
- ADPD-M4-UC-Z
- Controller Board



Example: Application Circuit (Part 1)

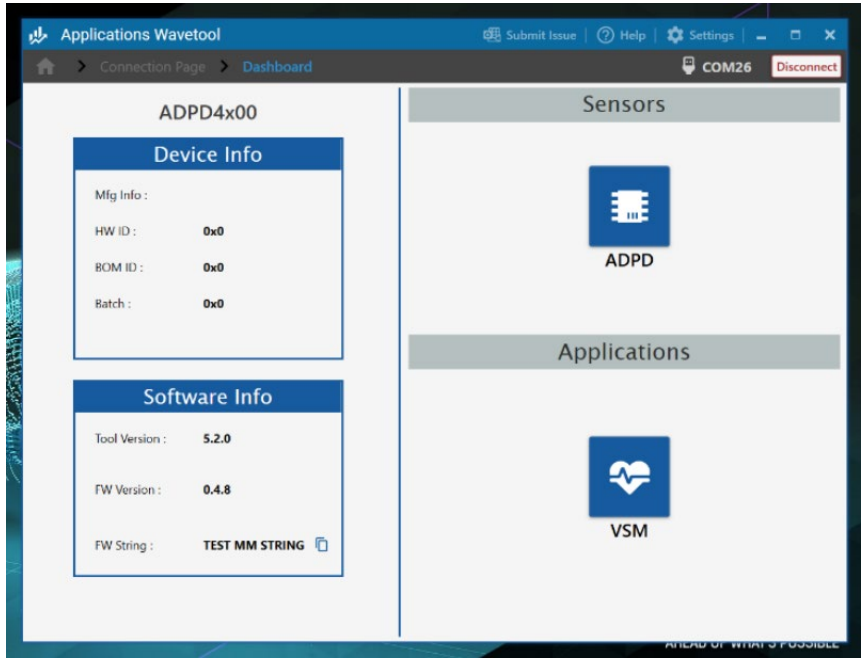


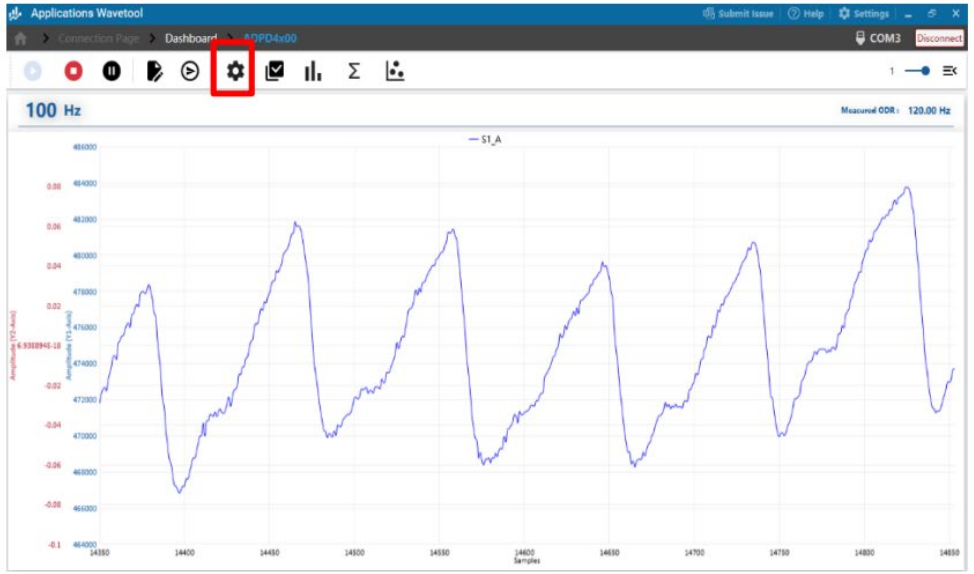
Example: Application Circuit (Part 2)

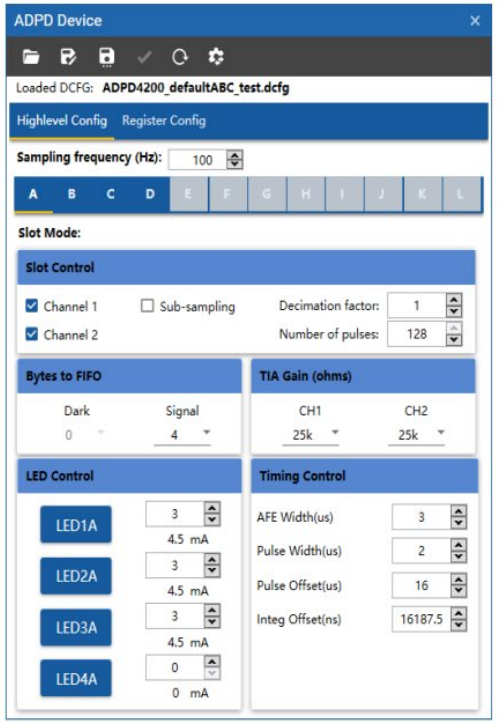


Application Wavetool

- Recommend to download the Wavetool from the website: https://www.analog.com/media/en/evaluation-boards-kits/evaluation-software/adi_applicationswavetool-rel5-6-0.exe
- Debugging with running ADPD4200
- Real-time PPG waveform
- Data-recording for further analysis







Q & A