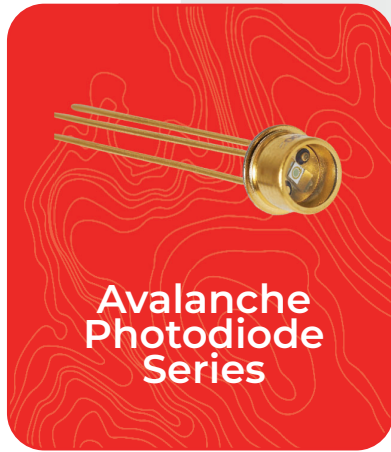


Spotlight on LiDAR Applications: Avalanche Photodiodes Driving Advanced Ranging Systems



KEY FEATURES

- High responsivity
- High gain (100×) with low excess noise
- Low dark current (~0.4 nA typ.)
- Low capacitance (~1.2 pF)
- Hermetically sealed TO-46 package
- Rugged reliability

APPLICATIONS

- Automotive LiDAR
- ADAS obstacle detection
- Industrial safety scanners
- Time-of-Flight (ToF)
- 3D mapping and surveying systems
- Drone and UAV-based LiDAR
- Autonomous logistics

Driving Precision in Next-Generation LiDAR and Autonomous Systems

LiDAR (Light Detection and Ranging) technology is transforming automotive, industrial, and mapping applications by providing high-resolution distance and imaging data. As new systems push for greater range and reliability under challenging environmental conditions, detector performance becomes critical. Opto Diode's ODD-APD-002 Silicon Avalanche Photodiode, optimized for 905 nm, delivers the sensitivity, speed, and stability required for advanced LiDAR and time-of-flight (ToF) systems. With decades of photonics expertise, Opto Diode offers a dependable solution for designers seeking enhanced accuracy, range, and detection confidence.

Technology Advantages

Avalanche photodiodes (APDs) amplify faint optical signals internally, enabling the detection of weak reflections from distant or low-reflectivity objects. Operating under high reverse bias, the ODD-APD-002 provides gain up to ~100× while maintaining low noise and excellent linearity. With a 500 μm active area and responsivity of ~0.55 A/W at 905 nm, it ensures strong signal conversion and rapid response, even in bright ambient light. The device's low capacitance (~1.2 pF) supports sub-nanosecond rise times, critical for accurate time-of-flight ranging.

LiDAR and Ranging Applications

The 905 nm wavelength is widely adopted for automotive and industrial LiDAR because of its balance performance, cost and eye safety. The ODD-APD-002 is ideal for:

- Autonomous vehicles obstacle detection and ADAS sensors
- Industrial safety scanners and robotics navigation
- Compact ToF modules and range finding instruments
- Free space optical communication and optical speed measurement

For extended range or specialty platforms, Opto Diode Corporation also offers the ODD-APD-003 (Si, 1064nm) and ODD-APD-001 (InGaAs) for atmospheric or eye safe LiDAR designs, ensuring full spectral coverage of key LiDAR wavelengths.



Integration and Design Support

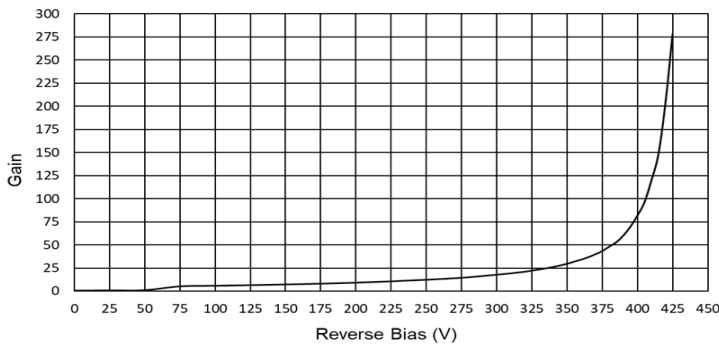
Each APD is available in a hermetic TO-46 package, tested over -45 °C to +85 °C, and can be customized with optical filters or pre-amplified assemblies to reduce ambient interference. Vertically integrated manufacturing guarantees consistent gain characteristics and long-term reliability under demanding environmental conditions.

Featured Products

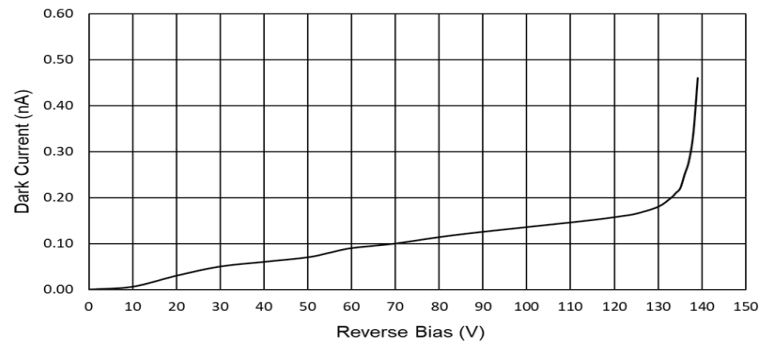
Avalanche Photodiode

Model Number	Active Area (mm ²)	V _{OP} (Min) (Gain = M)	Responsivity (Gain = 1)	Dark Current (Typ.)	Rise Time (R _L =50Ω)	Breakdown Voltage
ODD-APD-001	0.031	34V, M=30	1.0 A/W @ 1550nm	8.0nA, M=30	0.3ns @ 1550nm	50V
ODD-APD-002	0.2	95V, M=100	0.55 A/W @ 905nm	0.4nA, M=100	0.5ns @ 905nm	220V
ODD-APD-003	0.2	332V, M=100	0.36 A/W @ 1064nm	5.0nA, M=100	2.0ns @ 1064nm	460V

Reverse Bias Curve (APD-002)



Typical Dark Current (APD-002)



Performance Highlights and Market Insights

Beyond 905 nm LiDAR systems, Opto Diode's ODD-APD-003 and ODD-APD-001 expand detection capability for advanced, long-range, and eye-safe applications. These high-sensitivity APDs are engineered to meet the demanding needs of aerial mapping, defense, and autonomous navigation, where accurate ranging and consistent performance are essential.

The ODD-APD-003, optimized for 1064 nm, delivers reliable performance in airborne and spaceborne LiDAR, target designators, and industrial

laser instrumentation. Its 500 μm active area, low dark current, and fast 2 ns response enable precise distance measurement over extended ranges. High breakdown stability and low capacitance ensure clean, high-speed signal capture even in harsh or variable environments, making it ideal for surveying and remote-sensing platforms that require accuracy over long distances.

For applications demanding eyesafe operation and maximum range, the ODD-APD-001 provides exceptional sensitivity at 1550 nm. Featuring InGaAs technology and a 200 μm active area, it achieves high quantum efficiency (~1.0 A/W) and low excess noise for automotive, topographic and atmospheric LiDAR systems using high-power fiber lasers. Its extended spectral response from 900–1700 nm and GHz-class bandwidth allow for both long-range detection and fine resolution 3D mapping in sunlight or adverse weather conditions.

ODD-APD-002

