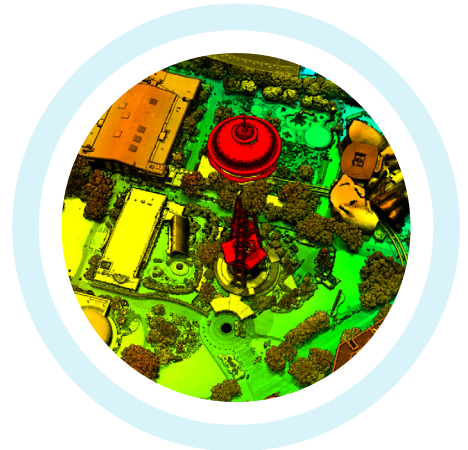
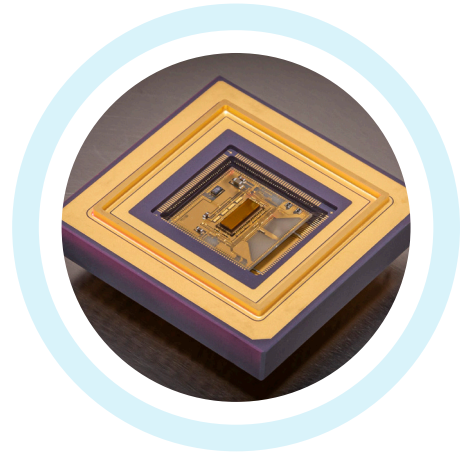


GEIGER-MODE LIDAR CAMERA



Ball Aerospace's Geiger-mode avalanche photodiode (GmAPD) cameras provide Light Detection and Ranging (LIDAR) systems with unparalleled performance, supporting non-conventional imaging; intelligence, surveillance and reconnaissance (ISR); and commercial mission needs. Our multi-pixel format arrays are capable of precise single-photon time-of-flight detection and provide orders of magnitude improvement in resolution and data collection speeds, enabling the warfighter to "see through" obstacles and identify threats at long distances. Whether your needs are for government, military/defense, space or commercial use, these unique Geiger-mode cameras get the job done.

*Images (Right Top to Bottom):
Synchronous 128x32 sensor;
Credit: L3Harris; Credit: U.S. Army.*



GO BEYOND WITH BALL.®

Overview

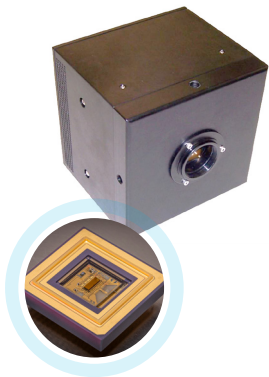
Trusted as a leading provider of advanced space-based, airborne tactical-grade and commercial electro-optic sensing systems for over four decades, Ball expands its LIDAR capabilities through research, development and production of shortwave infrared (SWIR) GmAPD sensors and cameras. Our sensors provide unmatched aerial coverage and point collection rates; precise time-of-flight detection; and single photon sensitivity for systems and payloads limited by size, weight and power (SWaP).

Ball manufactures standard commercial off-the-shelf (COTS) cameras and develops custom, advanced multi-pixel photon sensitive, Geiger-mode LIDAR sensors and systems.

Applications

- Target detection, acquisition, tracking and pointing
- 3D mapping and ISR tactical imaging at high altitudes and extended stand-off ranges
- Direct, coherent and passive detection sensing capabilities
- Free-space, low probability of intercept, low probability of detection, optical and quantum communications

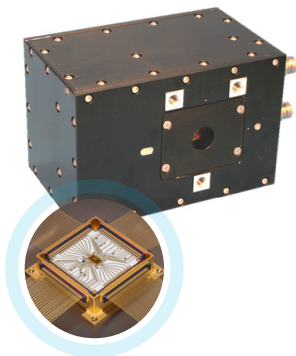
SYNCHRONOUS



FORMAT:	32×32	128×32
Pixel Pitch	100 μm	50 μm
Frame Rate (max)	186 kHz	90 kHz*
Range Depth (max)	1.5 km	6 km
Range Resolution	3.75 cm (250 ps)	7.5 cm (500 ps)**
Volume	900 cm ³	900 cm ³
Weight	1.3 kg	1.3 kg
Power	16 W	18 W

*Up to 115 kHz with reduced range depth
**250 ps in the future product offering

ASYNCHRONOUS



FORMAT:	32×32
Pixel Pitch	65.8 μm hexagonal
Frame Rate (max)	Continuous or Framed
Range Resolution	4.8 cm (320 ps)
Pixel Reset	~0.5 to 5 μs
Volume	<1000 cm ³
Weight	<1.5 kg
Power (at saturation)	<50 W

Performance

- Synchronous 32×32 and 128×32 pixel camera formats for 3D point cloud imaging
- Asynchronous 32×32 pixel camera requiring continuous and fast reset applications
- Broadband 1.0 μm to 1.6 μm as well as narrowband 1 μm or 1.5 μm wavelength sensor options
- Thermoelectric cooler (TEC) temperature controlled with air or liquid cooling
- CameraLink, CoaXPress® or custom electrical and data interface options
- Custom sensor and camera development for rugged, tactical or space environments

Advantages

Unlike a conventional linear-mode LIDAR receiver that requires approximately tens to thousands of photons returned per pixel, Ball Geiger-mode sensors offer superior sensitivity and unique advantages for active and passive sensor systems.

The camera detects single photons and measures a fraction of transmitted pulses that register a photon return. This innovative method allows a GmAPD-based LIDAR system to be implemented with significantly lower energy-per-pulse transmitters. Camera sensitivity combined with precise time-of-flight detection enables significant performance gains with increased range, faster acquisition rates and lower system SWaP and cost. Our camera technology allows the creation of an accurate 3D representation of wide-area terrain and offers the ability to “see through” dense foliage and other obscurants at significantly longer distances.

The Ball Geiger-mode camera can be used with various complex military systems on a variety of platforms, including crewed aircraft, autonomous aerial vehicles and systems, terrestrial fighter vehicles and more. For platforms that already have a camera installed, Ball offers reliable and cost-effective system upgrades, repairs and replacements.



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