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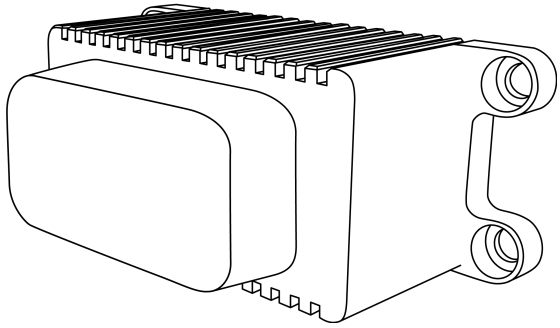
ES2
True Solid-State Long-Range Lidar



SUMMARY
The ES2 is the first high-performance true solid-state digital lidar sensor. The solid-state electronic scanning ES2 features 200+ meter range, 0.1° horizontal and vertical angular resolution, and will have ISO 26262, ASIL-B, SIL-2 and ASPICE certifications. The sensor is designed for high-volume automotive, robotics, and industrial applications.

HIGHLIGHTS

- True solid-state digital lidar design
- Industry-leading resolution, reliability, and range
- Fixed resolution per frame
- Camera-grade ambient and intensity data
- Multi-sensor crosstalk immunity

OPTICAL PERFORMANCE

Range (80% Lambertian, >90% detection probability, 100 klx)	450 m
Range 10% Lambertian, >90% detection probability, 100 klx)	200 m
Minimum Range	0.25 m
Range Accuracy	±5 cm for lambertian targets, ±5 cm for retroreflectors
Precision (10% Lambertian target; 1 standard deviation)	0.25 m - 10 m: ± 0.5 cm 10 m - 150 m: ± 1.5 cm 150+ m: ± 3.0 cm
Range Resolution	0.3 cm
Vertical Angular Resolution	0.1°
Horizontal Angular Resolution	0.1°
Field of View	Vertical: 13° Horizontal: 26°
False Positive Rate	1/10,000
Frame Rate	10 - 30 Hz (configurable)
# of Returns	3 (first, strongest, last)

LASER

Laser Product Class	Class 1 eye-safe per IEC/EN 60825-1: 2014
Laser Wavelength	880 nm
Beam Divergence	0.03° (FWHM)

LIDAR OUTPUT

Connection	100BASE-T1 Automotive ethernet
Points Per Second	819,200
Data Per Point	Range, signal, reflectivity, ambient sunlight, channel, azimuth angle, timestamp
Timestamp Resolution	< 1 µs
Data Latency	< 10 ms

CONTROL INTERFACE

Connection	TCP and HTTP APIs
Time Synchronization	Input sources: • IEEE1588 Precision Time Protocol (PTP) • 802.11AS gPTP • NMEA $GPRMC UART message support • External PPS • Internal 10 ppm drift clock Output sources: • Configurable 1 - 60 Hz output pulse

MECHANICAL/ELECTRICAL

Power Consumption	12 - 18 W
Operating Voltage	9 - 26 V, 24 V nominal
Connector	Customizable to OEM specifications
Dimensions	Length x Width x Height: • With mounting screw holes: 116 mm x 68 mm x 48 mm • Without mounting screw holes: 89 mm x 68 mm x 48 mm

OPERATIONAL

Operating Temperature	-40 °C to +85 °C
Storage Temperature	-40 °C to +120 °C
Ingress Protection	IP68 (1m submersion for 1 hour, with I/O cable attached) IP69K (with I/O cable attached)
Shock	IEC 60068-2-27 (Amplitude: 100 g, Shape: 11 ms half-sine, 3 shocks x 6 directions) IEC 60068-2-29 (Amplitude: 40 g, Shape: 6 ms half-sine, 1,500 shocks x 6 directions)
Vibration	IEC 60068-2-64 (Amplitude: 3 G-rms, Shape: 10 - 1000 Hz, Mounting: sprung masses, 3 axes w/ 8 hr duration each)

Compliance	**Laser Safety:** **• IEC/EN 60825-1:2014 Class 1 eye safe** **• US 21CFR1040: Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 56, dated May 8th, 2019** **Product Safety: IEC/EN 62368-1:2014** **Functional Safety: ASIL-B** **EMC:** **• FCC 47Cfr Part 15B, Class A** **• EN 55032: 2012/AC: 2013, Class A** **• IEC/EN 61000-4-3,4,5,6** **• IEC/EN 61000-6-2:2005 Class A** **• IEC/EN 61000-6-4: 2007**