

Optical Sensors – Halios/ToF

elmos[®]



EXPERTS FOR AUTOMOTIVE ICs

We have a broad expertise in analog mixed-signal integrated circuit design.

We deeply understand our customers application needs to create real system innovation.

We are a global player for automotive ASSPs and ASICs. We offer worldwide sales and application support.



elmos[®]

CORPORATE KEY FACTS



7 Elmos ICs

on average in every new car

6 product segments

Motor Control, Lighting, Safety/Power/Custom ICs, Ranging, Optical, Sensor ICs

16 locations worldwide

incl. 7 R&D centers, HQ located in Dortmund, Germany

35+ years of experience

in analog mixed signal IC solutions

~1,150 employees

thereof 350+ product developers & engineers

WE ARE LOCATED ALL OVER THE WORLD

Berlin

Detroit

Dortmund

Shanghai

Dresden

Düsseldorf

Singapore

Seoul

St. Petersburg

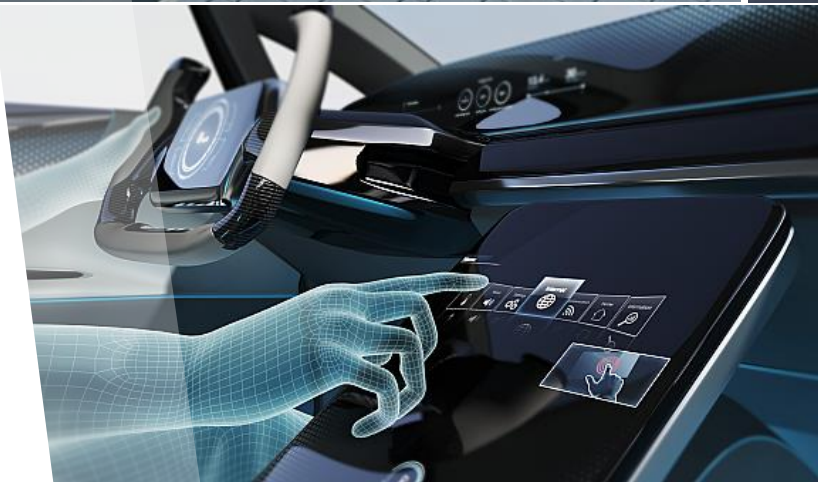
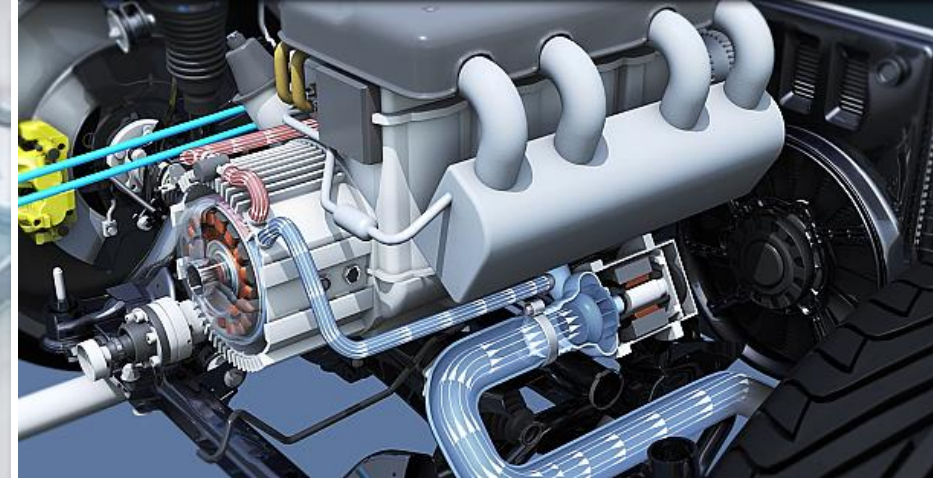
Tokyo

Frankfurt Oder

Bruchsal

PRODUCT SEGMENTS

- RANGING
- OPTICAL
- SENSOR ICs
- MOTOR CONTROL
- LIGHTING
- SAFETY, POWER & CUSTOM ICs





TRANSFORMING USER EXPERIENCE

- Intuitive and robust: Pioneering in automotive gesture control with >50 million ICs in the field
 - Proximity and swipes
 - Object detection
 - Touchless door / trunk access
- Reliable and eco-friendly
 - Presence and motion detection
 - Rain and light sensing
 - Smoke detection
- Development of LiDAR key components
 - Highly efficient iToF and dToF imagers
 - LiDAR read-out ICs
 - Best in class laser diode driver



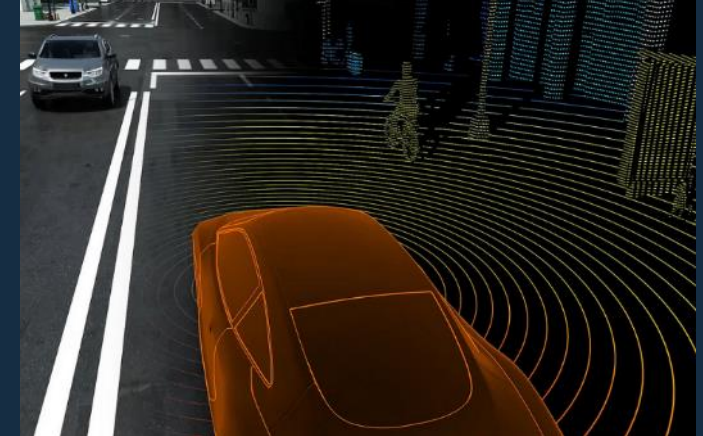
HALIOS® CONTROLLER
FOR PROXIMITY & GESTURE

- Super dynamic gestures and proximity
- Gesture control up to 30 cm, low resolution
- High ambient light immunity
- Cost efficient



TOF IMAGER
FOR 3D OBJECT RECOGNITION

- Static and dynamic gestures and object recognition
- Gesture control up to 200 cm, higher resolution
- Low power consumption
- Cost efficient



SPAD IMAGER
FOR SHORT/MID RANGE OBJECT
AND GESTURE RECOGNITION

- 3D environmental mapping
- High resolution
- High ambient light immunity
- Cost efficient

HALIOS® E909.21/.22/.23

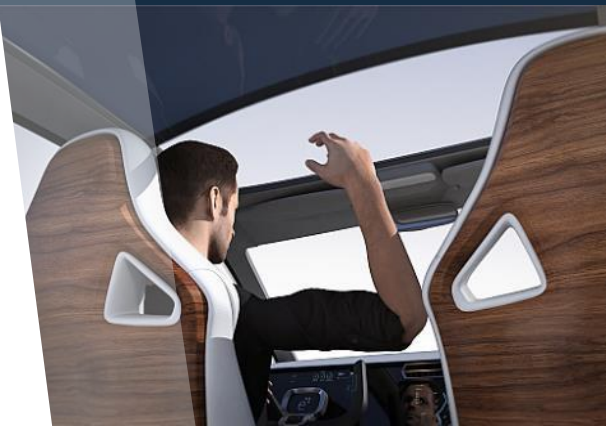
Optical sensor interface ICs with signal pre-processing

Key features

- HALIOS® technologies inside (immunity against high ambient, temperature and aging)
- Build-In compensation of ambient light for >200klx
- Low power consumption auto-mode
- Integrated PD and LED drivers (up to 200 mA)
- Very fast measuring frequency (up to 1MHz)
- Interface for multiple ICs chain
- I2C and SPI interface
- Automotive qualified (AEC-Q100)



EXTERIOR APPLICATIONS



INTERIOR APPLICATIONS

HALIOS® 909.23

for standalone situations and flexible integration

Use cases

- Small size display control
- Switch panel
- Door opener

Control features

- **Awareness** could activate the control illumination
- **Proximity** for dynamic features (light, zooming in)
- **Swipes** left/right and up/down to scroll



GESTURE CONTROL

- 1 X E909.23
- 4 X LEDS
- 1 X PHOTODIODE

TOF IMAGER 527.31

Simple IC design - highly versatile

Key features

- **3D object recognition** for simplified and intuitive operation of interior and exterior applications
- Allows to generate a **3D map** of the environment
- Reliable **detection of objects**, such as hand and foot
- Distinction between persons and objects possible
- **32 x 32 pixel** for good cost/performance ratio
- **High sensitivity**
- **Low power** consumption
- **850nm to 940nm** wavelength possible for LEDs, VCSEL and EEL



EXTERIOR APPLICATION



INTERIOR APPLICATIONS

TOF IMAGER 527.31

For hands-free handling

Use cases

- Automatic trunk opener

USPs of ToF Imager for object recognition

- Easy hands-free opening of the trunk using a **guided foot gesture** (no kick)
- **Easy handling** due to personalized light emblem
- **Easy installation** in all car models
- **Robust** against malfunctions
- **Very low power** consumption



HALIOS® AND TOF COMBINATION

for infotainment

Advanced touchless gesture control

- **Modular** system of **HALIOS®** and **ToF Imager**
- HALIOS® sensor bar below ABT and ToF Imager in mirror or roof position
- Coverage of the **entire display** →
Detection of...
 - **Static gestures** (single finger poses)
 - **Finger pointing** (direction)
 - **Proximity** (movement)
 - **Dynamic gestures** (e.g. swipes)



FUSION DEMONSTRATOR

- 1 X HALIOS®
BOTTOM SENSOR
(12 INCH)
- 1 X TOF IMAGER
WITH 850 NM LEDS

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Innovation Matters

DISCLAIMER

This presentation contains forward-looking statements based on beliefs of Elmos' management. Such statements reflect the company's current views with respect to future events and are subject to risks and uncertainties. Many factors could cause the actual results to be materially different, including, among others, changes in general economic and business conditions, changes in currency exchange rates and interest rates, introduction of competing products, lack of acceptance of new products or services and changes in business strategy. Actual results may vary materially from those projected here. Elmos does not intend or assume any obligation to update these forward-looking statements.



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