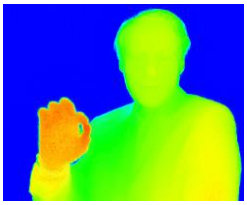
Application Brief

In-cabin sensing supporting ADAS

Using the 3D Time-of-Flight imager REAL3™

On the way to highly automated driving it is important to know what is happening inside the car. How distracted is the driver? Is the driver able to respond appropriately to a request by the automated driving system to intervene?
The solution is a Time-of-Flight (ToF) camera providing the most robust 3D data of the environment and additionally a sunlight independent amplitude picture.



Depth data

Amplitude data

Driver Monitoring

A direct facing ToF camera system positioned in the instrument cluster provides exact information to observe the state of the driver and to adapt driver assistance systems when necessary.

- Distraction detection by head pose analysis
- Drowsiness detection by statistical analysis of eye lid blink frequency and speed
- Micro sleep event detection
- Face and emotion recognition
- Optimization of head-up displays and 3D-displays to the drivers head position

Occupant Monitoring and Gesture Recognition

A ToF camera system positioned in the roof module or infotainment cluster enables convenient applications as well as personalized safety features.

- Passenger classification: Autonomous setting of pre-defined preferences (e.g. seat and mirror position, music favorites)
- Intention detection: move in-cabin search lights depending on head, arm and body movement
- Gesture control of infotainment, navigation, climate, and other systems
- Personalized safety: adjust airbag pressure depending on the passenger; switch off in case of child's safety seat

Key features

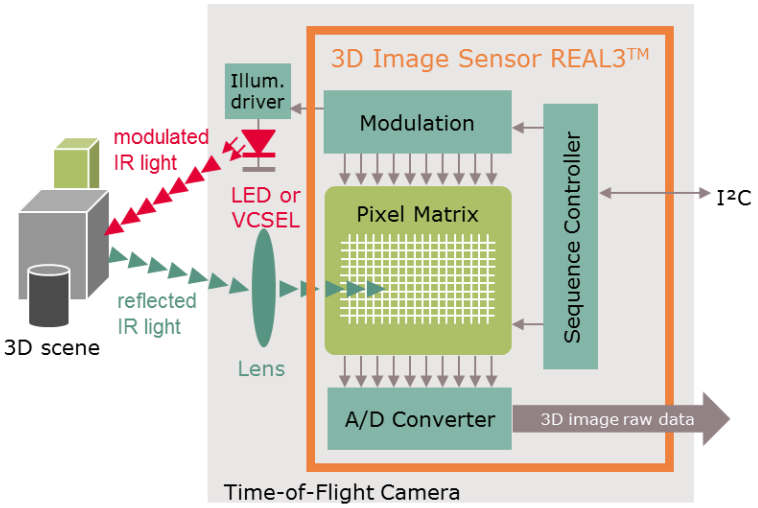
Compared to other depth sensing technologies like 2D stereo or structured light, ToF has many strong benefits:

- Unbeatable independence from changing ambient light conditions
  - Modulated infrared light
  - Suppression of Background Illumination (SBI) circuitry
  - independent data streams for brightness and distance
- Monocular system architecture
  - No mechanical baseline: no special requirements on mechanical stability, no mechanical alignment or angle correction required
  - No recalibration necessary
  - No risk of de-calibration due to vibrations or thermal bending
- Easy once-in-a-lifetime calibration
  - Very fast mass production calibration time
- Small form factor
- Lean computational load

In-cabin sensing supporting ADAS

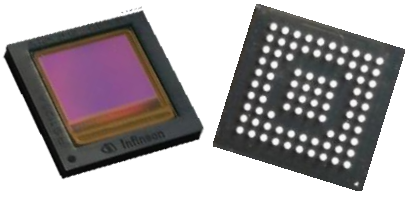
Using the 3D Time-of-Flight imager REAL3™

The REAL3 imager is a highly integrated Time-of-Flight single-chip already available in the market as bare die for consumer applications.
IRS1125A, the automotive qualified variant in an optical BGA package, is in development for mass production starting in 2019.



Key Features

- Time-of-Flight single-chip including illumination control and digital data output
- Dedicated ToF CMOS technology with micro-lenses
- Best infra-red sensitivity supporting wavelength up to 940nm
- High lateral resolution offering up to 100k pixels with configurable region of interest
- Patented Suppression of Background Illumination circuitry in every pixel for best sunlight robustness
- Highly configurable during operation to optimize performance and power consumption
  - Frame rate adaptation
  - Configurable exposure time
  - Number of phase measurements
- Up to 100MHz modulation frequency
- Optical PG-LFBGA-84 package, 10mm x 10mm
- AEC-Q100 grade 2 qualification
- T_amb = -40°C to 105°C



IRS1125A – automotive REAL3 imager in optical BGA package

Product variants

Product type	Pixel resolution	Description	Package
IRS1125A	352 x 288 pixel (~100k pixel)	Single-chip ToF sensor with micro-lenses, automotive qualified	PG-LFBGA-84

Dedicated bare die imager variants available for consumer electronic applications.

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