FlightSense™ Time-of-Flight sensors

Introduction

ToF principle & main functions

FlightSense™ use-cases

Product portfolio and roadmap
ST pioneer and leader in Time-of-Flight (ToF)

ST is #1 Worldwide ToF sensor supplier

4 Generations
of all-in-one ToF solution deployed since 5 years

>155 phones with FlightSense™
Above 15 smartphone OEMs

Hundreds other customers
Hundreds non wireless end-products in the market

>40,000
Evaluation kits deployed

>1Bu
ToF units shipped. Mastering end-to-end supply chain
FlightSense™
… making light work

ST proprietary FlightSense™ technology

True distance measurement
Independent of target size, color & reflectance

Fast and low power

Truly invisible 940 nm illumination

Time-of-Flight Principle

Measured distance = Photon travel time / 2 x Speed of light

1cm round-trip takes 67ps
All-in-One (illumination & sensor) Time of Flight system → Optimized size / performance / cost mix

- Advanced optics with integrated IR filter
- State-of-art assembly & testing manufacturing ST line in SHZ
- Monolithic ToF SoC, SPAD Array, RAM/ROM & powerful Class1 VCSEL driver
- High power VCSEL Full Class 1 safety
FlightSense™ sensors main functions

Enabling endless Use-Cases

- Ceiling detection
- Content analysis
- Cliff detection
- Gesture control
- Hands-free operation
- Light control
- Load management
- Object detection
- Obstacle avoidance
- Occupancy detection
- Parking occupancy
- People counting
- Power saving
- SLAM
- Touch-less operation
- User detection
- Volume control
- Wall tracking
Market & applications

- Drones
- White Goods
- Medical
- Wearable & IoT
- Dispensers
- Service Robots
- Vacuum cleaners
- Smart home
- ATM
- Medical
- Industrial
- Toons
- Warehouse
- Vending machines
- Trucks
- Public Parking
- Lighting
- Printers
- Projectors
- Tanks
- Logistic
- AR/VR
- Lockers
**FlightSense™ robotics applications**

### Typical use-cases

- **Cliff detection**
  - Avoid robot falling

- **Wall tracking**

- **Obstacle detection**
  - Avoid collision with user or breakable object

### Benefits

- Depth map (multi sensor design)
  - Avoid collision with human or object
  - Low power

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**Cleaning robots**

**Home assistant**

**Air purifier**

**Service robots**

**Pet robots**

**Toy robots**
FlightSense™ smart building applications

**Benefits**
- Small footprint for easy integration
- Works with many cover Glass materials
- Immune to color, texture, and material
- Battery-operated, high-performance applications
  - Down to 175 µW at 1 Hz

**Typical use-cases**
- Gesture control
  - Robust gesture recognition for IoT
- Light control
  - Energy management
- User detection
  - Energy saving
- Parking occupancy
  - Security, parking management

**Benefits**
- Small footprint for easy integration
- Works with many cover Glass materials
- Immune to color, texture, and material
- Battery-operated, high-performance applications
  - Down to 175 µW at 1 Hz
**FlightSense™ laptops / tablets / conference calls applications**

**Typical use-cases**

- **Security**
  Immediate log-off or lock, log-in assist

- **Power saving**
  Immediate screen on/off, low power mode

- **Eye protection**
  Warning when user is too close from screen

- **Audio/User interface enhanced control**
  Adjust mic/speaker mode based on distance

- **Simple and robust gesture**
  Tap & Swipe

**Benefits**

- Immediate Presence Detection
- Accurate distance measurement
- Small footprint for easy integration
- Autonomous low power mode

**Tablet proximity measurement**

**PC presence detection**

**Conference call system presence detection**
FlightSense™ industrial applications

**Typical use-cases**

- Liquid level control
  - Water / Oil tank level management
- User detection
  - People counting
- Load management
  - Filling monitoring
- Object detection
  - Smart lockers, smart shelves
- Security
  - Security barriers to protect

**Benefits**

- High accuracy
- Configurable FoV
- Fast ranging mode (100 Hz)
- Long distance ranging
FlightSense™ applications

### Medical
- Basic gesture recognition
- “zero-touch” control of devices

### Projectors
- Auto-Focus adjust
- Distance measurement
- Adaptive configuration & set-up
- Presence detection
- User eye safety protection

### Drones
- Flying assist
- Collision avoidance
- Obstacle, ceiling and floor detection
FlightSense™ mass-market roadmap

- XX° FoV
- Programmable FoV
- XX° Max
- Up to 4 zones sequentially
- Histogram
- MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance
- Linearity

**Overall performance**

- VL6180V1 (Gen1)
  - New In MP

- VL53L0CX (Gen2)
  - Already In MP

- VL53L3CX (Gen2)
  - New In MP

- VL53L1CB (Gen2)
  - New In MP
  - Already In MP

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**Max. Distance measurement in cm (in the dark)**

- 100cm
- 200cm
- 300cm
- 400cm

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Life augmented