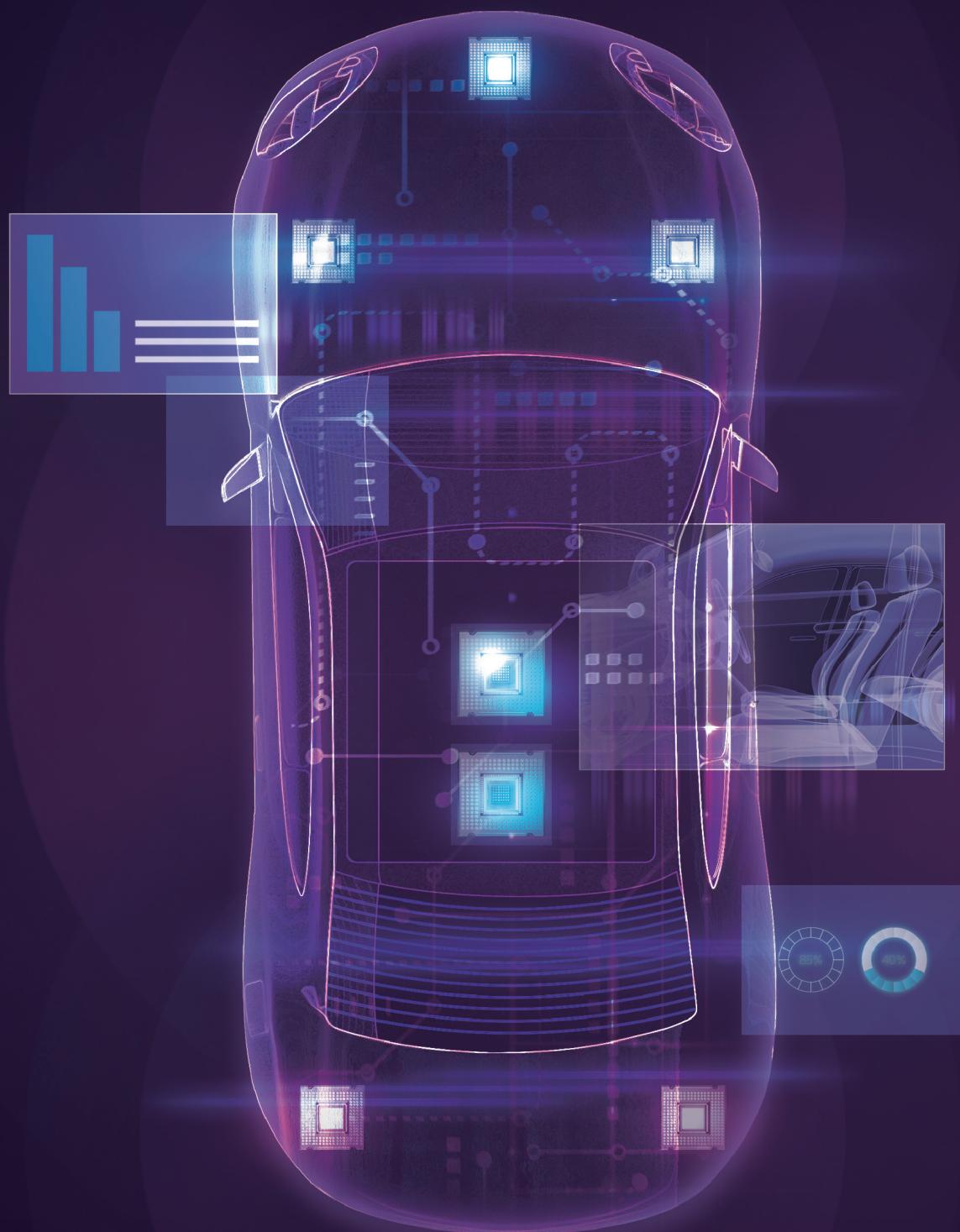


SMART RADAR SYSTEM

Leading
Software Defined
Imaging Radar



Our mission, values and vision-beyond

We are committed to making the world safer and transparent with the leading Software Defined Imaging Radar technology that is next generation

* Low-SWaP optimized AI 4D imaging radar.

* Low Size, Weight, and Power

Automotive

- ① Autonomous Driving
- ② In-Cabin
- ③ AGV
- ④ UAM
- ⑤ Last Mile Delivery

Industrial

- ⑥ Construction Vehicle
- ⑦ Factory Robotics
- ⑧ Level-meter
- ⑨ Defense Drone

Healthcare

- ⑩ Home
- ⑪ Hospital / Nursing Home
- ⑫ Public Bathroom

Smart Places

- ⑬ Elevator
- ⑭ Retailer
- ⑮ Office
- ⑯ Smart Pole PINN
- ⑰ Security



Smart Radar System's Technology Roadmap

Seed stage

4D Imaging Radar prototype awarded <Radio Pulse Tech Award> by Korea Prime Minister



Start-up stage

Applications expanded by use-cases



RETINA-4FN launched :
Mobility (for AD,
ADAS and
Construction)



Co-development project with global OEM :
Next Gen Imaging Radar (mass production in 4Q2024)



Growth stage

Co-development project with
Tier-1 funded by government :
Ultra High Resolution Imaging Radar
(9M\$ till 2025)



Drone detection Imaging Radar
exports to US



Agriculture machine : US and EU



mass production
for global OEM :
Front Long Range Radar

Expansion stage

Long Range Radar development project



CES 2023
Innovation Award Honoree
Smart Guard: IRIS



IRIS solutions : Special vehicle and Heavy
construction machine



full-scale exports and commercialization



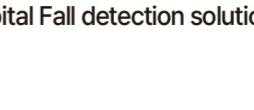
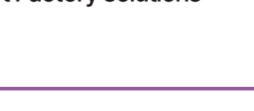
Smart Factory solutions



Hospital Fall detection solution



Public Toilets monitoring solutions

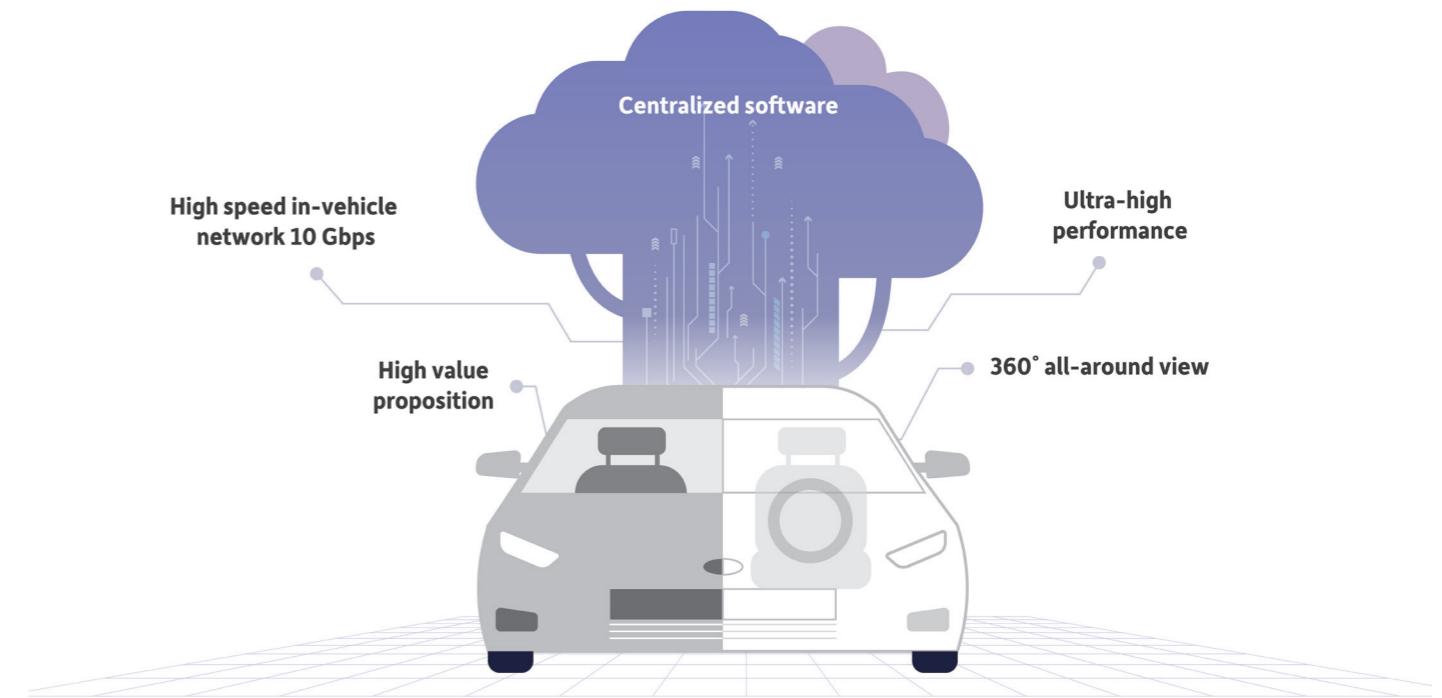


Mobility

Non-Mobility

RETINA 2.0

Leading Software Defined
Imaging Radar



4D Imaging Radar for Autonomous Driving

Present safer autonomous driving with long range & highly accurate imaging radar



Built-in
AI Engine



Weather
Almighty



Long-Range



Speed
Detection



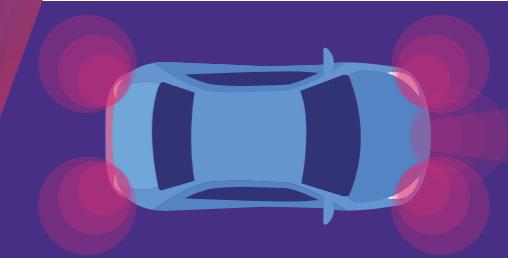
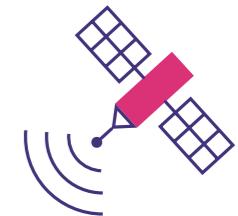
✓ Customer needs

- Long range radar with higher resolution
- Powerful detection capability for the safety
- Robust radar in challenging environments



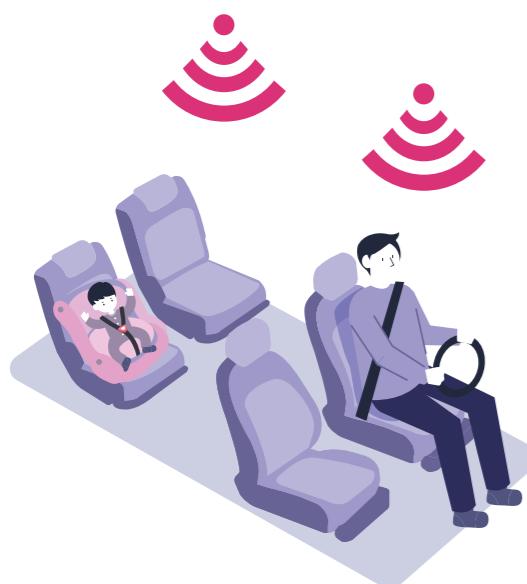
⊕ What we offer

- Provide 3 types of range mode to cover all usage in autonomous driving
- Less power and higher accuracy
- Rich point cloud with faster output rate
- AI engine embeded for object classification



Introducing In-Cabin Radar: To see the unseen all-around the vehicle and even inside

Smart Radar System's effective and market-leading in-cabin sensing mmWave radar to ensure EuroNCAP standards that will put on a bar in new coming vehicle era



| | Front (room-mirror / dashboard) | Ceiling |
|---------------------------------|------------------------------------|---------|
| Driver Presence Detection | ● | ● |
| Driver Vital Sign (conditional) | ● | |
| Child Presence Detection | | ● |
| Low Power Consumption | ● | ● |
| Intruder Alert | ● | ● |
| Seat Belt Reminder | ● | ● |
| Optimized Airbag Deployment | ● | |

4D Imaging Radar for Hospital / Elderly House

Reducing the risk and improving quality of care with AI embed 4D imaging radar



✓ Customer needs

- Immediate fall detection
- Accurate fall precaution
- Cover wide range
- Privacy protection
- No need to wear

⊕ What we offer

- 7m x 7m coverage
- 24/7 operation in all environment
- AI for object & posture classification
- Monitoring behind curtain

mmWave Radar for the Elderly & the Handicapped

Quick but hidden assistant to detect bed-fall and slight movement



✓ Customer needs

- Bed Fall detection
- Person presence detection
- Micro movement & vital sign (HR/BR) detection

+ What we offer

- 24/7 monitoring
- Hidden but immediate reaction
- Harmless to human body

Keep life safe at the public space with single radar

Optimal occupancy & abnormal situation detect solution for public safety



Privacy
Protected



Waterproof



No Light



Presence
Detection



✓ Customer needs

- Detect occupancy in the public restroom cells
- Must Not miss long time occupancy
- Requirement for sitting or lying on the floor in each restroom cell
- No camera, not even camera-like
- Should work without light
- Control multi radars through single gateway



⊕ What we offer

- Accurate detect of occupancy and exit
- Perfect occupancy detect regardless of light or temperature
- Not miss long time occupancy using vital sign
- Continuous occupancy of users is well divided into individual use, by distinguishing large action
- Detect sitting or lying on the floor in the cell, even wide cell such as toilets for the disabled
- Maximum 32 radars connect to one gateway
- CAN Comm. interface

360°, Zero Blind Spot Safety Smart Guard : IRIS

Ensuring safety in various industrial sectors to prioritize human safety with all-around detection capability with mmWave radar



Weather Almighty



Waterproof



Presence Detection



Surveillance



✓ Customer needs

- Replace legacy radar (*FoV 120°) with Better *Field of View
- Reduced blindspot at desired detecting area
- At least 15m of detection all-around
- Cost-effective, durable solution that can work in harsh environments (dusty, rainy, muddy environment)



+ What we offer

- Cover upto 360° and max 50 feet range
- Real-time detection of any danger in safety critical environments
- All-around detection with no blind spot
- Provide IP69 rating endurance to be used under harsh outdoor environments
- Compatible to technical standards and stand alone operation
- Easy installation and operation



Wide Angle and Long Range Multi-Purpose Detector

Enhancing safety and providing instant alert of any danger in harsh environment



Long-Range



Presence Detection



Weather Almighty



No Light



✓ Customer needs

- Affordable-price sensor for commercial and specialist vehicles
- Reduced blindspot at desired detecting area
- Plug and play solution for various vehicle types/shapes

⊕ What we offer

- Wide angle and long range detection
- Object detection in harsh environment, dark, rain and dusty environments
- Easy connection to any types of vehicle
- Field proven accurate detection, less false detection
- Save management & operation cost of special vehicles

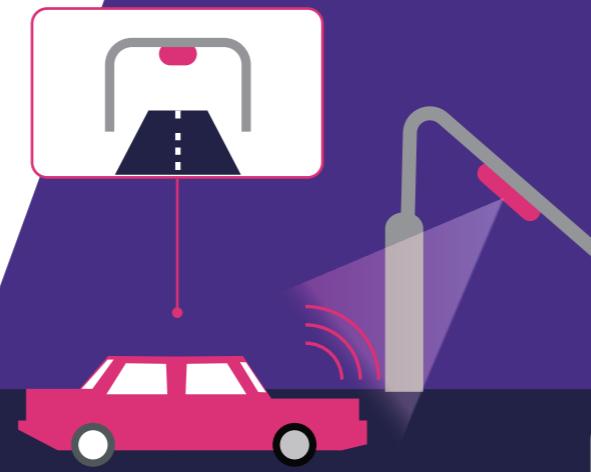
Optimized radar for road traffic detection

Improving safety and mobility by preventing traffic accidents & paradigm shift from road management to user safety



Customer needs

- Solution for short lifespan and increasingly high total operating costs when installing loop sensors
- The 24GHz radar is still the mainstream, but it will gradually fade out
- Multi-lane detection and high measurement accuracy
- Necessity of sensor integrated unmanned control equipment



What we offer

- Replacement effect of existing loop sensors, low initial cost and low operating cost
- Released 60GHz radar for the first time in the Korean market as a government-designated excellent procurement product
- Detection rate corresponding to existing roof sensors
- Detection distance of 20 to 80 meters with $\pm 5\%$ of speed measurement accuracy
- Simultaneous target detections up to 18

Smart Home for Smart Life using mmWave Radar

Smarter, safer, easier and more convinience in smart home lifestyle using mmWave



No Contact



Privacy
Protected



Waterproof



No Light



✓ Customer needs

- People counting and detecting
- More capability beyond for future
- Optimal for Smart home environment
- Need to ensure privacy protection



⊕ What we offer

- Provides basic level of people counting, detecting and vital sign counting for healthier and smarter life
- Enables AI engine for future to also stretch into posture detection and expandability in future project
- Provides features with optimal power consumption suitable for indoor detection
- Non-vision sensor capable of securing privacy for smart home life

Improves elevator boarding convenience

Ensuring elevator-related safety and promoting user convenience



No Contact



Cost Saving



No Light



Presence Detection



✓ Customer needs

- Detect getting in & out of passengers, ignore non-passengers by bypassing
- Integratable radar into the current HPI (hall position indicator) system
- Privacy protection compared to IP cameras
- Passenger detection in various shapes of boarding spaces
- Easy setting of detection range, depending on type of installations



⊕ What we offer

- Wide horizontal FOV upto 150 degrees by minimizing blind spots(door walls)
- Zero tilt angle contributes to design freedom by keeping HPI designs
- Radar protocols enable the auto-setting on system level
- Formfactors for radar-fusion sensors
- Market lead & mass production on 2023

Product Lineup



| | RETINA-4FN | RETINA-4SN | IRIS-t-03A |
|------------------------------|---|-------------------|-------------------|
| Type | 4D Imaging Radar | 4D Imaging Radar | Single chip Radar |
| Frequency | 77 ~ 81 GHz | 77 ~ 81 GHz | 77 ~ 81 GHz |
| Detection range | *LR/SR/USR 250m(vehicle)/ 100m(vehicle) / 15m(pedestrian) | 7m | 20m |
| Azimuth Angle FoV | LR/SR/USR 30°(±15°) / 100°(±50°) / 100°(±50°) / | 90°(±45°) | 180°(±90°) |
| Elevation Angle FoV | 24°(±12°) | 90°(±45°) | 30°(±15°) |
| Update Rate | 50ms | 50ms | 100ms |
| Comm. Interface | CAN FD x1 Ethernet x1 | Wi-Fi | CAN FD x1 |
| Main Power supply | Typ. 12V | Typ. 12V | Typ. 12V/24V |
| Operating Temperature | -40 °C ~ +85 °C | -30 °C ~ +65 °C | -40 °C ~ +85 °C |
| IP Rating | IP67 | IP43 | IP69K |
| Dimension (mm) | 147.3 x 121.5 x 37.0 | 130 x 130 x 33.8 | 90 x 117 x 59.35 |
| Weight (g) | 529 | 580 | 375 |

*Long-Range/Short-Range/Ultra-Short-Range

| IRISc-03A | SE68-51 | SE68-03W |
|------------------------------|---|-------------------------------|
| Single chip Radar | Single chip Radar | Single chip Radar |
| 77 ~ 81 GHz | 60 ~ 64 GHz | 60 ~ 64 GHz |
| 45m(vehicle)/22m(pedestrian) | 3m | 60m(vehicle)/40m(pedestrian) |
| 100°(±50°) | 120°(±60°) | Front 90°(10m) / Side 45°(5m) |
| 30°(±15°) | 120°(±60°) | 45°(±22.5°) |
| 100ms | 100ms | 100ms |
| CAN FD x1 | CAN | Wi-Fi/ BLE |
| Typ. 12V/24V | Typ. 24V | Typ. 5V |
| -40 °C ~ +85 °C | -40 °C ~ +85 °C | -40 °C ~ +85 °C |
| IP69K | IP43 (ceiling installation based) | IP43 |
| 90 x 117 x 38.50 | 119.5 x 82 x 35 (Radar PCB 1.6t/ Power PCB 1.6t) | 76 x 76 x 22 (PCB 1.6t) |
| 275 | 135 | 72 |

BEYOND THE VISION





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