

周辺監視デバイス
Peripheral Monitoring Device

ミリ波レーダ

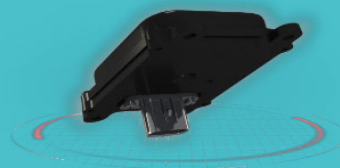
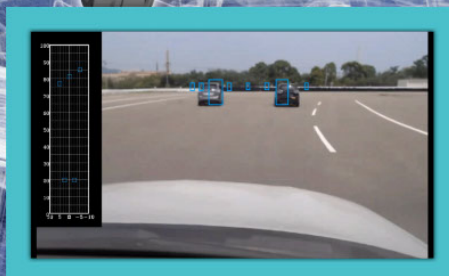
Millimeter-wave Radar

車両前方に搭載する自動運転を見据えたミリ波レーダ
悪天候にも強い電波を用いて、歩行者を含む障害物までの距離・相対速度・角度等を測定

次世代は、一般道での自動運転レベル3以上に対応可能なミリ波レーダとして、水平・垂直の両方向の分解能を高めた前方レーダと覆域角度範囲の広い側方レーダから構成される全周囲ミリ波レーダシステムを開発中

This millimeter-wave radar installed in the vehicle front is developed for autonomous driving.

Using a radio wave resistant to bad weather, this radar measures the distance, relative speed, angle, etc. to obstacles including pedestrians. This radar of next generation is currently being developed as the entire circumference radar system that consists of a front radar having higher resolution in both the horizontal direction and the vertical direction and a side radar having a wide coverage angle range, and can comply with the autonomous driving level 3 or higher on general roads.



< 現行開発品の特長 >

- ・高分離性能（水平方向）
- ・静止した歩行者も識別する物体識別機能
- ・小型化

< 次世代品の特長 >

- ・超高分解能（水平・垂直方向）前方監視による高精度フリースペース認識
- ・前方レーダと側方レーダの統合処理による車両・歩行者の移動方向の瞬時計測

<Features of currently developed radar>

- High separation performance (in the horizontal direction)
- Object identification function that can identify even still pedestrians
- Downsizing

<Features of next generation radar>

- Extremely high resolution (in the horizontal and vertical directions)
- High-precision free space recognition based on forward monitoring
- Instantaneous measurement of vehicle / pedestrian moving direction by integral processing of front radar and side radar

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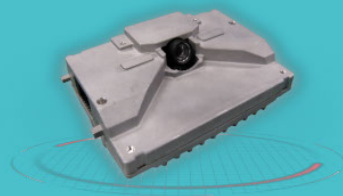
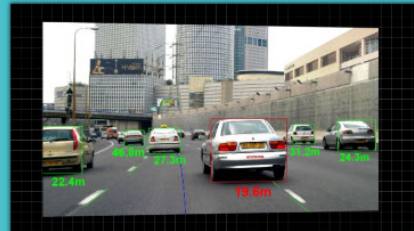
**前方監視
カメラシステム**

Forward-monitoring
camera system

予防安全／自動運転用の認識機能付き
前方監視カメラ
各アプリケーション（レーンキープ制御、
アダプティブクルーズコントロール、
被害軽減ブレーキ等）の機能要件に対応

This forward-monitoring camera system has the visual recognition function for preventive safety and autonomous driving.

This system meets function requirements of many applications such as lane keep control, adaptive cruise control and autonomous emergency braking.



- ・ 水平方向に100°の視野角を備え、
2020年Euro NCAP試験シナリオに対応
- ・ 夜間歩行者／二輪車の検知に対応

- This system offers a viewing angle of 100° in the horizontal direction, and complies with the 2020 Euro NCAP test scenario.
- This system can detect pedestrians and two-wheeled vehicles at night.

周辺監視デバイス
Peripheral Monitoring Device

ソナーシステム

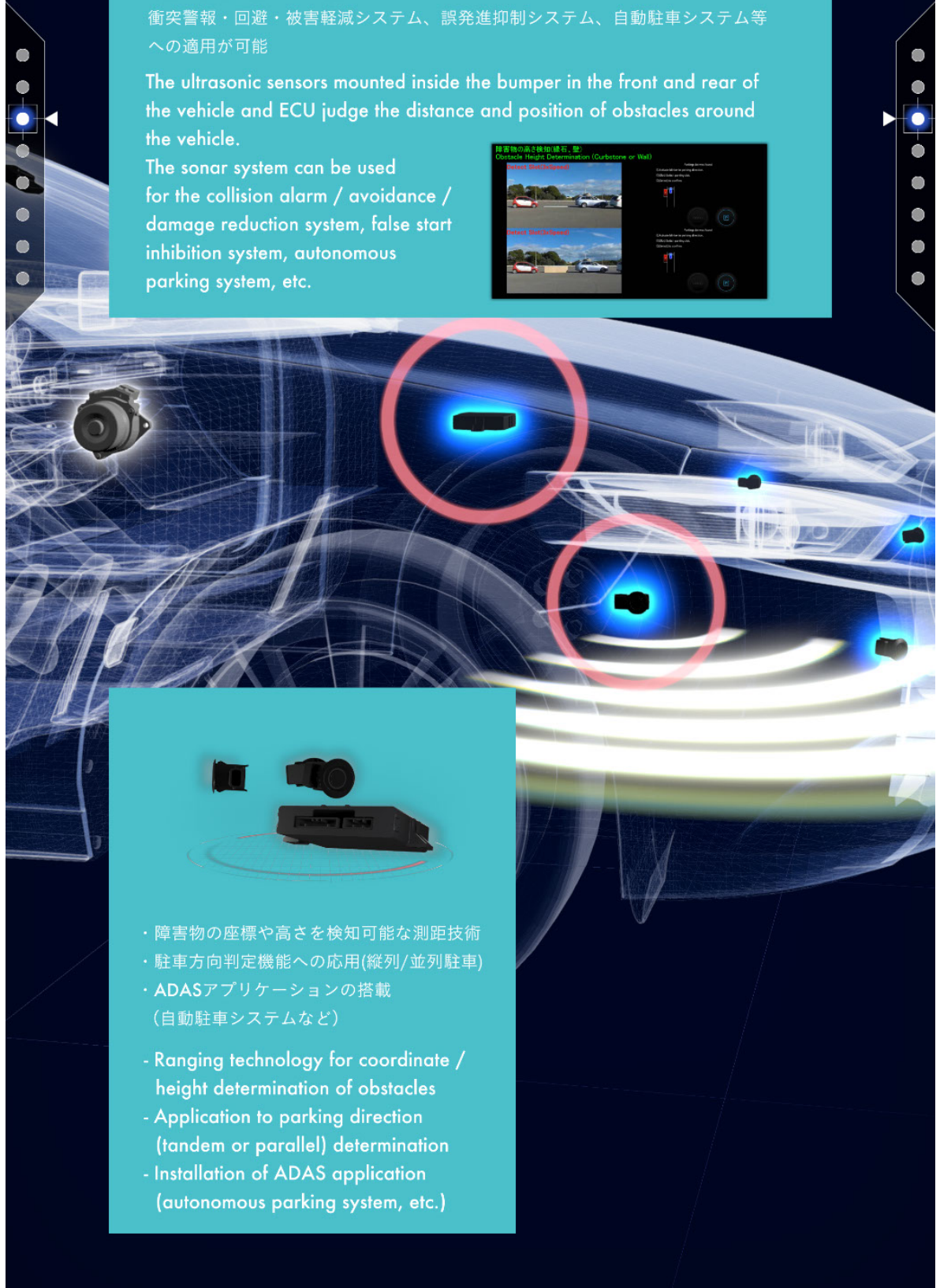
Sonar Sensor (Covers the entire car / 12 pieces installed)

車両前後のバンパーに取り付けられた超音波センサとECU、車両周辺の障害物の距離や位置情報の判定を行う

衝突警報・回避・被害軽減システム、誤発進抑制システム、自動駐車システム等への適用が可能

The ultrasonic sensors mounted inside the bumper in the front and rear of the vehicle and ECU judge the distance and position of obstacles around the vehicle.

The sonar system can be used for the collision alarm / avoidance / damage reduction system, false start inhibition system, autonomous parking system, etc.



- ・ 障害物の座標や高さを検知可能な測距技術
- ・ 駐車方向判定機能への応用(縦列/並列駐車)
- ・ ADASアプリケーションの搭載
(自動駐車システムなど)
- Ranging technology for coordinate / height determination of obstacles
- Application to parking direction (tandem or parallel) determination
- Installation of ADAS application (autonomous parking system, etc.)

周辺監視デバイス Peripheral Monitoring Device

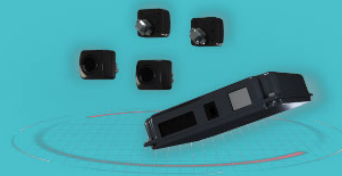
周辺監視カメラシステム Surround-view Camera System

車両周辺に搭載したカメラを用いて俯瞰映像を作成し、駐車時及び後退出庫時の安全確認をサポート

自動駐車制御や自動走行制御への適用が可能

This surround-view camera system creates top view images using cameras installed around the vehicle, and supports safety visual confirmation during parking operation and backward departure.

This system can be used for autonomous parking control and autonomous traveling control.



- ・自動駐車制御のための駐車枠を走行しながら高精度に検出
- ・後退出庫時の左右からの接近車検知と警報
- ・前方カメラとの連携により高精度な車線検知を行い、自動運転の横方向制御に適用
- This system offers highly precise detection during traveling in parking frames provided for autonomous parking control.
- This system detects vehicles approaching from the right and left during backward departure, and issues alarms.
- This system detects lanes with high precision in cooperation with the forward-monitoring camera, and can be used for lateral control in autonomous driving.

HMIデバイス Human Machine Interface Device

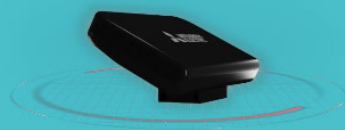


ドライバモニタ Driver Monitoring System

運転手や助手席乗員の状態をモニタリングし、不注意状態、異常状態を検出。乗員の認証や表情の認識を実現し、HMI、予防安全／自動運転の共通要素となるセンサ。

This driver monitor monitors the state of driver and passenger occupant, and detects inattentive state and abnormal state.

This unit authenticates occupants, recognizes expression, and works as a common element for HMI (human machine interface), preventive safety and autonomous driving.



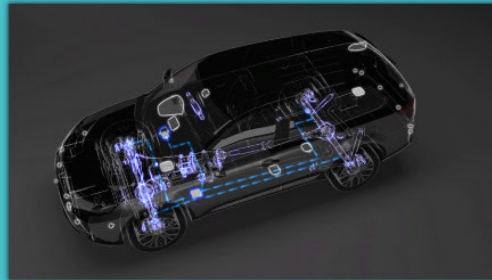
- ・表情を活用した眠気の検出
- ・異常姿勢検出
- ・機器操作に応用の効くハンドジェスチャ認識
- This unit detects sleepiness based on expression.
- This unit detects abnormal postures.
- This unit recognizes hand gestures applicable to device operations.


車両制御デバイス Handling Device

総合制御ユニット ADAS-ECU

予防安全／自動運転の各アプリケーション（レーンキープ制御、アダプティブクルーズコントロール、被害軽減ブレーキ等）の判断・制御を行う統合制御ユニット

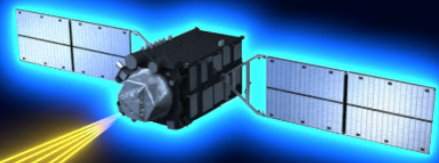
This integrated ECU judges and controls many applications for preventive safety and autonomous driving such as lane keep control, adaptive cruise control and autonomous emergency braking.



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- ・ 予防安全／自動運転の各アプリケーション搭載
 - ・ AUTOSAR、機能安全（ISO26262）に対応
 - ・ サイバー攻撃マルチ防御、故障時縮退制御
 - ・ セントラルゲートウェイ統合

- This unit incorporates many applications for preventive safety and autonomous driving.
- This unit is compliant to AUTOSAR and functional safety (ISO 26262).
- This unit offers various defense against cyber-attacks, and degeneration control in failure.
- This unit incorporates the central gateway.

インフラ連携デバイス
Infrastructure Cooperation Device

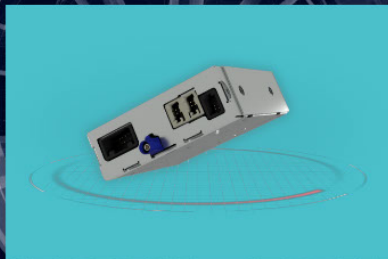


高精度ロケータ
High-definition Locator

衛星信号と測位補強信号を受信し、
走行レーン上の自動車の位置を検出
する高精度測位ユニット
予防安全や高精度なインフラ型の
自動運転システムに活用可能

This high-precision positioning unit
receives satellite signals and
positioning augmentation signals,
and detects the vehicle position on
the traveling lane.

This unit can be utilized for preventive
safety, and for high-precision
infrastructure type autonomous
driving systems.



- ・ 予防安全／自動運転に使用可能な道路情報を出力
- ・ レーンレベルの車線情報を持つ高精度地図を搭載
- ・ 北米・欧州ではSapcorda Services社の測位補強信号を活用して高精度測位を実現
- This unit outputs the road information useful to preventive safety and autonomous driving.
- This unit incorporates high-definition maps that offer the lane information at the lane level.
- In North America and Europe, high-precision positioning is realized using positioning augmentation signals offered by Sapcorda Services.

インフラ連携デバイス
Infrastructure Cooperation Device

5G/C-V2X通信車載器

5G/C-V2X Communication On-board Unit

5G^{*1}通信に対応し、他の車両、歩行者及び路側設備とのC-V2X^{*2}通信と、
基地局経由でサーバとの通信を行う車載ユニット

車両や歩行者との衝突を防止する安全運転支援、MEC^{*3}サーバを活用した安全運転
支援／自動運転システムに適用

This on-board unit compliant to 5G^{*1} communication makes
C-V2X^{*2} communication with other vehicles, pedestrians and road-side devices,
and communication with a server via a 5G base station.

This unit can be used for the safety driving support that prevents collision with
vehicles and pedestrians, and for the safety driving support and autonomous
driving system that utilize a MEC^{*3} server.

*1 5G : 第5世代移動通信システム
5th generation mobile communication system

*2 C-V2X : 5G機器間直接通信を用いる車両間、路車間、歩車間通信
Inter-vehicle / road-vehicle / pedestrian-vehicle communication using 5G inter-device direct communication

*3 MEC : Multi-access Edge Computing



・ C-V2X直接通信及び5G MECサーバとの低遅延
通信を活用したインフラ協調システムに適用

- This unit can be used for the infrastructure
cooperation system that uses C-V2X direct
communication and low-delay communication
with a 5G MEC server.