



SafeZone - Vision-AI Sensing System for Bus Doors



Product Description

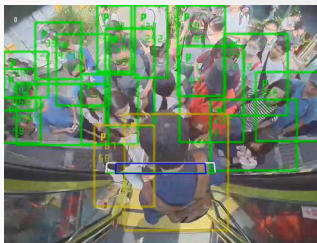
SafeZone is the first AI vision-based anti-pinch sensing system designed for bus door safety, overcoming the blind spots of traditional pneumatic mechanisms. It identifies people in various scenarios—such as holding an umbrella, carrying a backpack, or when only part of a limb is visible—with high accuracy even in crowded or low-light environments. The system provides proactive alerts, door-stop control, and automatic reopening, and has already been deployed on hundreds of buses across Taiwan.

Applications – Anti-Pinch System for Bus Doors

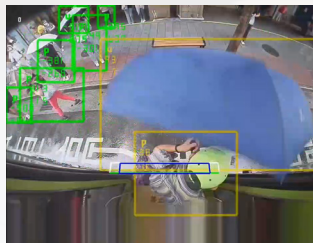
This safety system includes oToBrite's sensing controller and visual perception module, paired with a door controller. The system proactively detects the presence of individuals near the bus door area to prevent injuries caused by the doors closing.

Product Features

- Proactive Non-Contact Safety: Proactively monitors a 200×30 cm danger zone outside the door, triggering immediate door-hold or reopening before physical contact occurs.
- Complex Occlusion Detection: Reliably identifies pedestrians under challenging scenarios, including heavy crowds, umbrellas, backpacks, strollers, and partially obscured limbs.
- All-Lighting Environmental Robustness: Built-in high-power illumination and HDR sensing ensure accurate detection in low-light night conditions and harsh backlighting.
- Commercial Fleet & Retrofit Ready: Proven across hundreds of active transit buses, featuring an automotive-grade edge ECU designed for both OEM factory lines and fleet retrofits.



• Large crowds



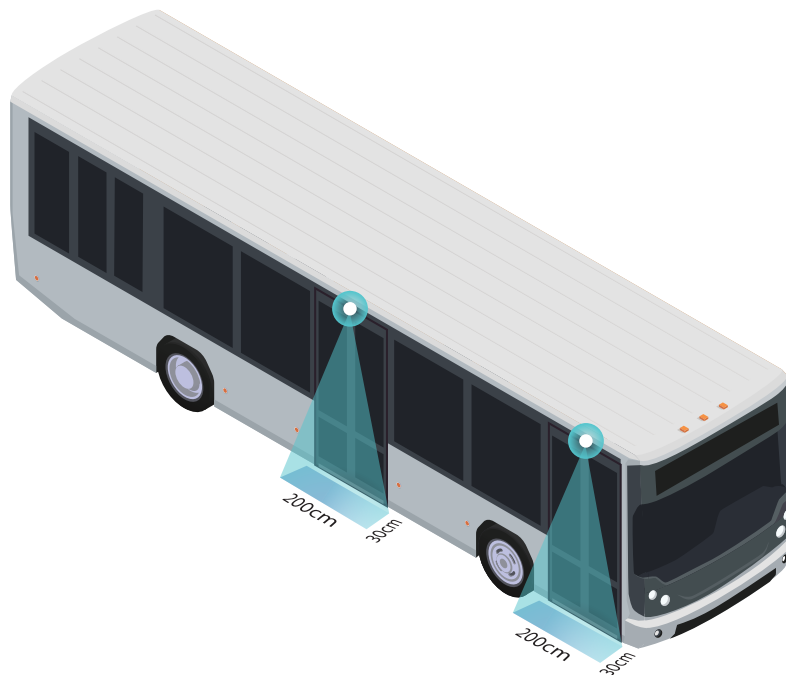
• People carrying umbrellas



• Partially obscured person

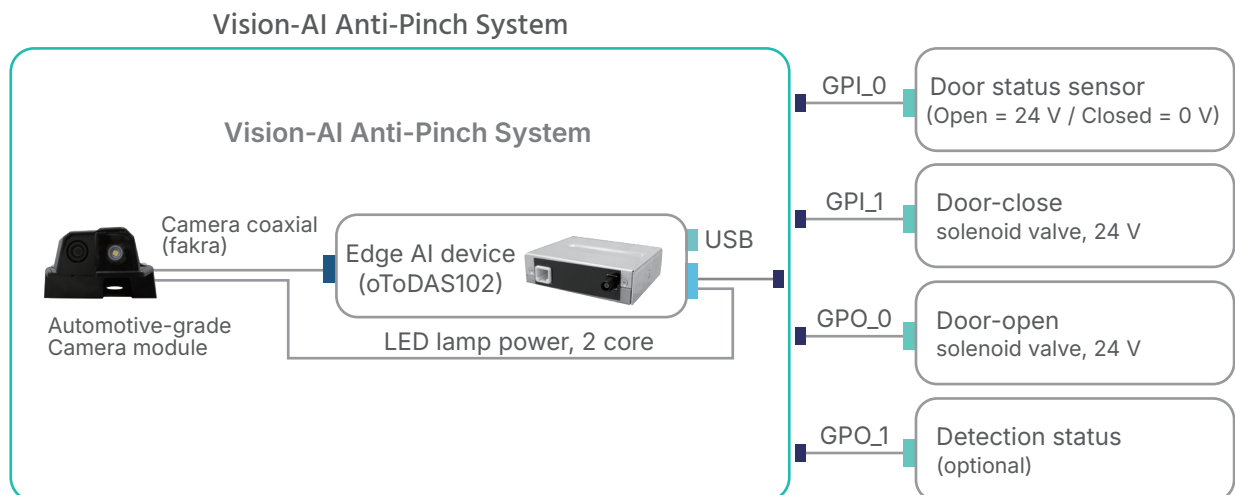
System Sensing and Detection Trigger Conditions

- Target Object: Passengers
- Required Detection Trigger Area: 200 cm x 30 cm outside the bus door.
- Description: The system detects passengers within 30 cm outside the bus door and prevents the door from closing.



Product Configuration, Signal Interface & Operating Sequence

The product includes sensing controllers, visual perception modules, and wiring harnesses within the red box. The configuration includes one set for the front door and one set for the middle door.



Signal Interface

The system reads the state of the door from the vehicle and starts detection when the door is open. It does not take over door control while no person is detected, and vice versa.

Signal	Direction	Connected to	Function
GPI_0	Vehicle → ECU	Door status sensor	Starts and stops detection
GPI_1	Vehicle → ECU	Door-close solenoid	Triggers the close / no-close decision
GPO_0	ECU → Vehicle	Door-open solenoid	Holds the door open while a person is detected
GPO_1	ECU → Vehicle	System status indicator	On = Detection active, Off = Detection inactive, Flashing = system fault

Operating Sequence

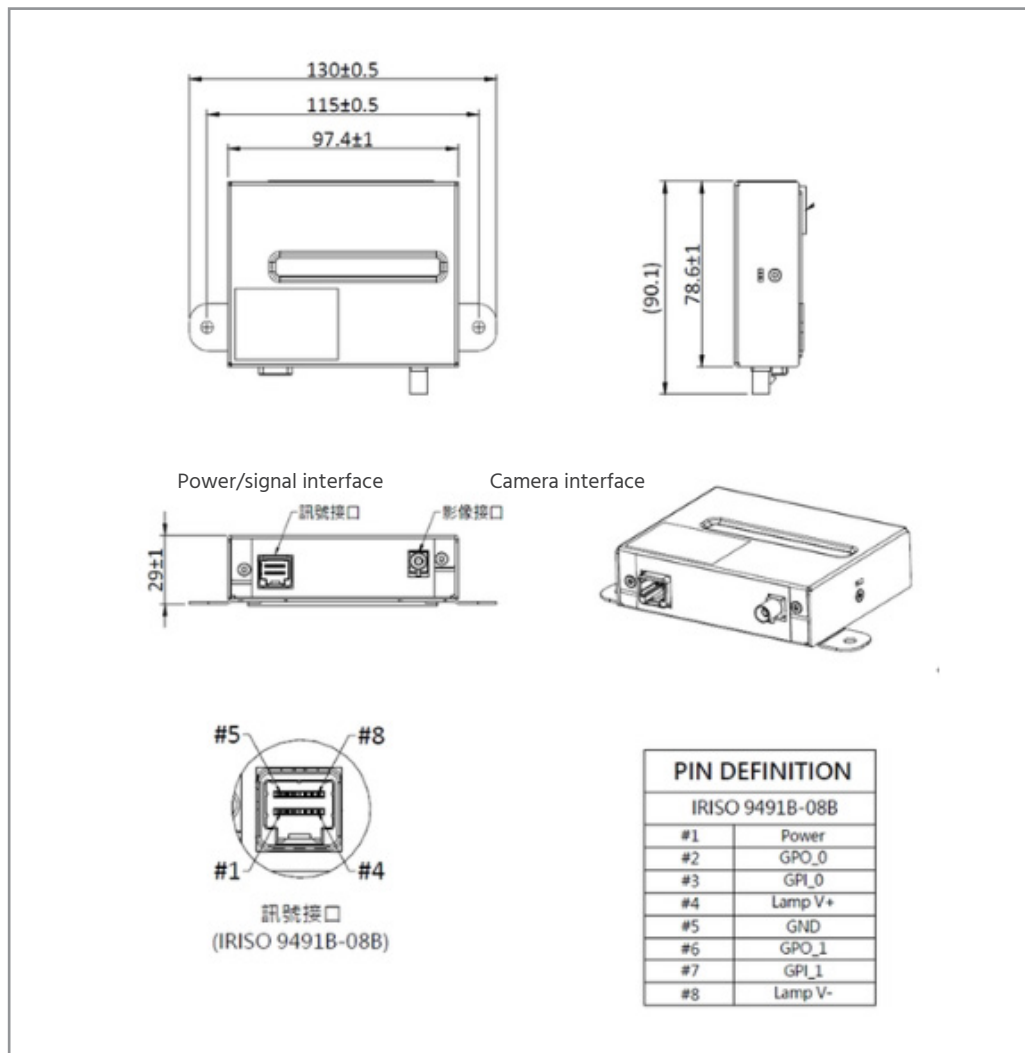
Trigger	ECU action	Result
Door opens — GPI_0 goes to 24 V	Detection starts; the LED lamp on camera module is switched on	System indicator on
Driver commands close — GPI_1 goes to 24 V	The ECU evaluates the detection zone	Decision pending
A person is inside the zone	GPO_0 drives the door-open solenoid	The door cannot be closed
The zone is clear	GPO_0 is released	The door closes normally
Door closed — GPI_0 returns to 0 V	Detection stops	System indicator off
System fault	GPO_1 is driven with a flashing pattern	The driver is alerted

Product Spec. (Customized for different applications)

Sensing Controller oToDAS102)

Item	Specification
Power consumption (ECU + camera + lamp)	5 W (max), per set
Voltage range	16 V ~ 32 V
Operating temperature	-20 °C ~ +70 °C
Storage temperature	-20 °C ~ +75 °C
Ingress protection rating	IP51
Weight	196 ± 15 g
GPO driving capacity	•Output current 300 mA (typ.) •Output voltage VIN - 1.2 V
GPI transition voltage level	•VTH: 10.7 V •VTL: 8.3 V
USB	service port

Outline Drawing



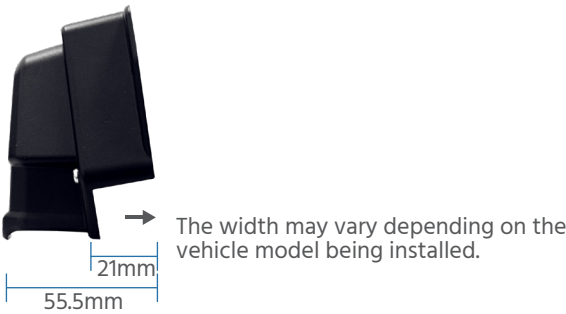
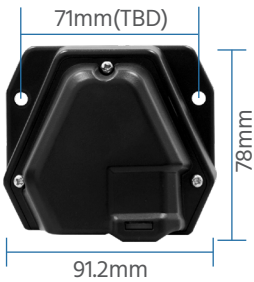
Visual perception modules (oToCAM206-L137T + LED lamp)

Item	Specification
Operating temperature	-20 °C ~ +70 °C
Storage temperature range	-20 °C ~ +75 °C
Ingress protection rating	Camera body (excluding LED lamp assembly): IP69K / Connector: IP67
LED lamp	Equipped to support night-time anti-pinch detection
Weight	203 ± 15 g

Excluded scenarios

- The camera is obstructed (e.g., by hands, branches or leaves, mud or sand).
- The target is not wearing normal pedestrian clothing (e.g., wearing a dinosaur costume).
- Objects that are not carried close to the body (e.g., fishing rods or suitcases).
- Human-shaped standees, mannequins, or advertising boards near the door.
- Ambient light below 5 Lux (Note: The LED light automatically turns off after the door remains open for 2 minutes)

Outline Drawing



driving easier and safer



9F-2, No. 8, Keyan Rd., East Dist., Science-Based Industrial Park,
Hsinchu, Taiwan (R.O.C.)



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