Child Presence Detection

Riding in a car is a daily routine that many of us have the luxury of doing. For some of the youngest passengers, riding in a car can be peaceful and comforting, lulling them to sleep. If not careful and vigilant, these little ones could be left in a car accidentally. Especially if their safety seat is rear facing.

According to kidsandcars.org, eighty-eight percent (88%) of children who have died in a hot car are age 3 and younger. Rear facing child safety seats do not look any different to the driver if they are occupied or empty, causing a parent to lose awareness of them in the back seat. Sixty-eight (68%) of children who get into vehicles on their own without anyone knowing are male and most are age 1-4 years old. In an overwhelming majority of child hot car deaths, it was a loving, responsible parent that unknowingly left the child. Approximately 43% of these children were supposed to have been dropped off at childcare.

The inside of a vehicle heats up very quickly. Even with the windows cracked, the temperature inside a car can reach 1250F in minutes. Cracking windows neither slows down the heating process nor decreases the maximum temperature a car reaches inside. Little bodies heat up 3 to 5 times faster than adults, leading to heatstroke.

So, what can be done to prevent this potential tragedy from occurring? In recent years, child presence detection (CPD) technology has been developed. This safety technology uses in-vehicle sensors and external communication technology to detect a child that has been left behind in a vehicle within seconds and triggers a warning signal to get the driver's attention.

To prevent these tragic outcomes, the importance and use of CPD is on the rise. Beginning in 2023, Euro NCAP has been incorporating CPD functions as one of the scoring criteria for their safety ratings. C-NCAP (China) will follow in 2025, and the United States has already passed the "Hot Cars Act" bill, which will likely make CPD a standard configuration for cars in the future.

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Child Presence Detection (CPD) Sensor Solutions

Sensor Technology

There are four types of sensors that are typically used in CPD systems:

- Camera
- mmWave Radar
- IR LED
- Biosensors

The following table compares the advantages and disadvantages of each technology.

Sensor Type	Camera	mmWave Radar	IR LED	Biosensors
Technology	Image calculus analysis	Electromagnetic wave multi-point detection	Infrared	Heartbeat, temperature
Advantage	Through the screen, you can accurately analyze the situation of the rear seat	Depth perception	No privacy risk	Simple configuration
Disadvantage	Privacy, occlusion issues	High price	High price	Need to communicate with wearable sensors

How AKER Solutions Meet CPD Application Requirements

mmWave Radar

Millimeter wave radar provides excellent precision in object distance detection by transmitting electromagnetic waves. Any object in the path will reflect the signal back. By capturing and processing the reflected signal, the radar system can calculate the object's distance, speed and angle.

Millimeter waves operate in the frequency band between 30 to 300 GHz. Different frequency bands are allocated by various countries to vehicle-mounted millimeter wave radar. They are mainly concentrated in 24 GHz and 77 GHz, with some use in the 60 GHz frequency band.

For CPD systems, millimeter wave radar uses the special 60 GHz frequency band, which features anti-interference, low power consumption, high accuracy and fast response sensing time. Depending on the body shape of the passengers in the car, it can also penetrate coverings such as blankets or coats to identify

whether the passengers are children. In addition, the millimeter wave radar system can also be used in places where photography is prohibited to ensure personal safety.

Camera

Cameras in CPD systems monitor the position and movement of all back-seat passengers through images captured by sensors to a very high degree of accuracy.

The following AKER crystal series meet the accuracy requirements for CPD applications.

CPD mmWave Radar Application Solutions

AKER Product	Frequency
CXAF-321 CXAF-221 CXAF-211	24.0MHz
SMAF-321 SMAF-221 SMAF-211	27.0MHz

CPD Camera Application Solutions

AKER Product	Frequency
CXAF-321 CXAF-221 CXAF-211	24.0MHz
SMAF-321 SMAF-221 SMAF-211	27.0MHz