ClairSRS Solar

Solar-powered Active Smart Road Studs

ClairSRS Smart Road Studs are intelligent active light-emitting devices embedded in the road surface, integrating sensors, communication modules, and light-emitting elements. They can sense and transmit traffic condition data, providing real-time information to drivers or traffic management systems through light signals or flashing. These studs enhance road visibility and safety, particularly at night, during adverse weather, or in complex road conditions, helping to reduce traffic accidents and improve road efficiency.

ClairSRS Solar is a solar-powered active smart road stud, available in two versions: the Solar Mag, equipped with a geomagnetic sensor, and the standard Solar model without the geomagnetic sensor.

Key Features

- **Solar Power Supply:** Powered by solar energy, the device is equipped with an 8000mAh high-capacity lithium iron phosphate battery, along with an efficient energy management system. This ensures up to 720 hours of continuous operation even in the absence of sunlight.

- **Geomagnetic Sensing:** The road stud is equipped with a built-in geomagnetic sensor that detects the approach and departure of vehicles. It collects various traffic parameters such as vehicle speed, queue length, and occupancy, and can detect vehicle stops or reverse movements. The system triggers corresponding responses using different light colors and flashing frequencies, enabling functions such as warnings, guidance, or traffic diversion.

- **Ultra-bright LED Beads:** The device features ultra-bright LED lights that can actively emit light in low visibility conditions or at night, enhancing road visibility and driving safety. Even during the day, the LEDs provide effective road guidance and information dissemination.

- **LED Control Mode:** The warning mode of the LED lights includes control over position, brightness, duty cycle, and frequency.

- **Temperature Management:** Equipped with a built-in temperature sensor, the device automatically

adjusts the current to prevent overheating. This helps maintain the stability of the LEDs, extends their lifespan, and ensures they consistently output high brightness in various environmental conditions.

- **Flush Ground Installation:** With a patented dual-stage light refraction design, the LED beads of the road stud do not need to protrude above the road surface while still achieving excellent long-distance visibility. The road stud remains flush with the ground, ensuring it does not interfere with snow plows or other road maintenance equipment.

- **Chain Communication:** Each road stud gathers vehicle detection data from nearby studs and makes decisions on response strategies. This distributed decision-making and low-latency communication system eliminates network congestion issues typical of traditional communication methods, ensuring seamless light warning and vehicle-following effects even at high speeds.

- **Wide-Temperature and Pressure-Resistant Housing:** Made of reinforced PC material, the housing can withstand operating temperatures ranging from -45°C to 85°C and pressure up to 26.5 tons.
- **NFC Programming and Remote Firmware Upgrades:** NFC programming allows for configuration of location information, device reboot, firmware updates, parameter adjustments, mode switching, and information retrieval.

Specification

Model	ClairSRS Solar Mag	ClairSRS Solar
Product Description	Solar-powered Magnetic Smart Road Studs with Chain Network Communication	Solar-powered Smart Road Studs with LoRa Communication
Communication	Wireless Communication: Operates at 2.4GHz frequency.	Wireless Communication: Operates at 433MHz using LoRa technology.
Communication Network	Utilizes a chain network system for efficient data transfer and communication between road studs.	Utilizes a star network system for communication.
Power Supply	Solar-powered with a solar panel power of ≥1.1W. Battery: Lithium iron phosphate battery Battery Voltage: DC 3.2V Battery Capacity: 8000mAh Output – full charge: Up to 720 working hours with no solar input. Time to full charge: Time to full charge 69hrs @100klux (sunny day)	Solar-powered with a solar panel power of ≥1.1W. Battery: Lithium iron phosphate battery Battery Voltage: DC 3.2V Battery Capacity: 4000mAh Output – full charge: Up to 480 working hours with no solar input. Time to full charge: Time to full charge 34hrs @100klux (sunny day)
LED	LED Light Intensity: - Red: 12,000 to 15,000 mcd - White: 13,000 to 16,000 mcd - Yellow: 8,000 to 10,000 mcd LED Emission Direction: Bi-directional LED Size: Diameter 8mm	LED Light Intensity: - Red: 12,000 to 15,000 mcd - White: 13,000 to 16,000 mcd - Yellow: 8,000 to 10,000 mcd LED Emission Direction: Bi-directional LED Size: Diameter 8mm
Geomagnetic Detection	Detection Method: Multi-axis detection Sensitivity: Multi-level adjustable Data Types: Speed, queue length, occupancy, and detection of vehicle stops and reverse movements Wireless Power: Adjustable from 9 to 23 dBm Wireless Reception Sensitivity: -110 dBm	None
Dimension	Diameter: 150mm; Height: 72mm	Diameter: 150mm; Height: 72mm
Weight	1.57Kg.	1.57Kg
IP Protection	IP68	IP68
Housing Pressure Resistance	26.5 tons	26.5 tons
Operating Temperature	-45 to +85°C	-45 to +85°C
Firmware Upgrade	Supports wireless upgrades	Supports wireless upgrades
NFC Functions	Location information configuration; Device reboot; Firmware upgrade; Parameter adjustments; Mode switching; Information retrieval	Location information configuration; Device reboot; Firmware upgrade; Parameter adjustments; Mode switching; Information retrieval

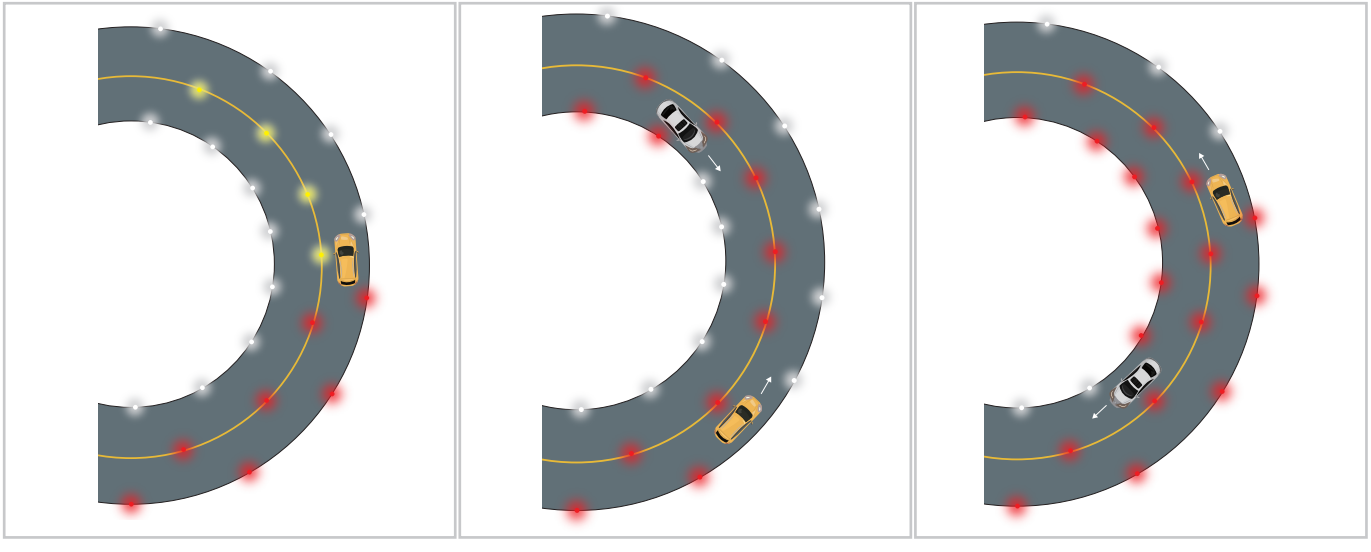
Accessory	ClairSRS Solar Controller
Product Description	The ClairSRS Solar Controller, installed at the roadside, enables network management, data collection, device management, and integration with external management platforms for the smart road studs.
Power Supply	DC12V
Operating Current	≤1A
Communication Interfaces	RJ45 Ethernet, USB, RS232, RS485, RS422
Operating Temperature	-25°C to +70°C
Communication with Road Studs	2.4GHz wireless mesh network or 433MHz LoRa network
Installation Interval	≥200 meters
Number of Road Studs Supported	≥100 units
API Support	Open API interface available, supports secondary development
Dimensions	500 × 320 × 175 mm
Installation Height	<2 meters

Applications

Curve Warning

In situations such as small-radius curves or poor-visibility road sections, the system can manage scenarios like single-vehicle travel, oncoming traffic, and roadside parking.

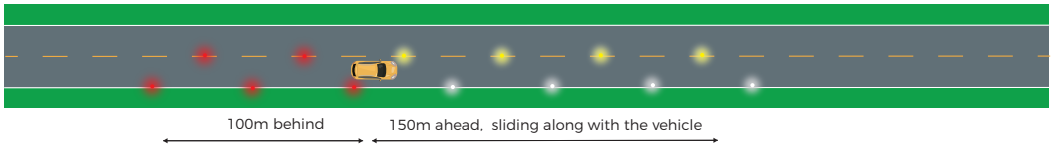
Functionality:
1. For Vehicles Ahead: Yellow (or white) lights illuminate in front of the vehicle.
2. For Vehicles Behind: Red lights are displayed at the rear.
3. For Oncoming or Rear Traffic: The centerline and edge lines also adjust accordingly to enhance visibility and safety.



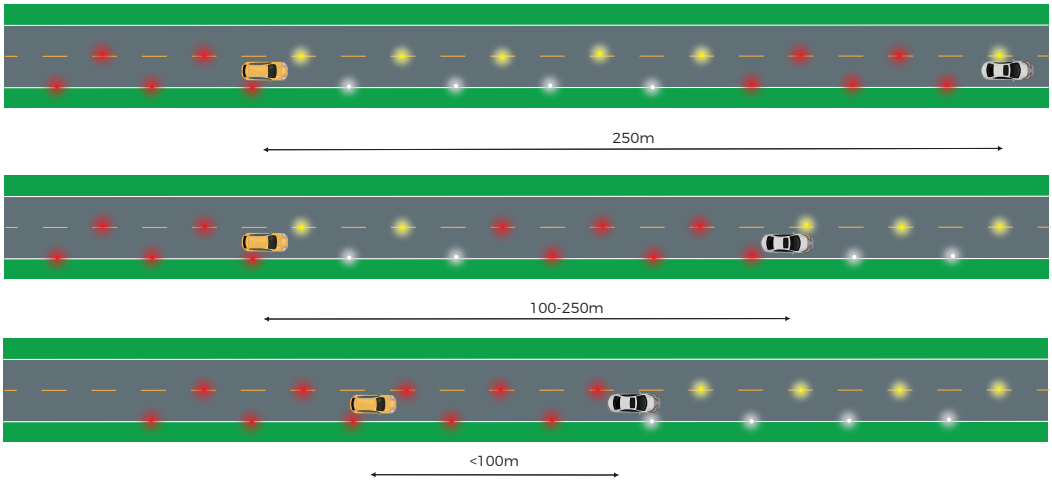
Fog Zone Driving Alerts & Main Road Section Visibility Alerts

In foggy areas, highways during fog, curves, and other poor visibility sections, as well as at night, the system provides lane line delineation, single-vehicle sliding guidance, and multi-vehicle following alerts. Yellow (or white) lights illuminate within a specified range in front of the vehicle, while red lights illuminate within a specified range behind the vehicle, moving with the vehicle.

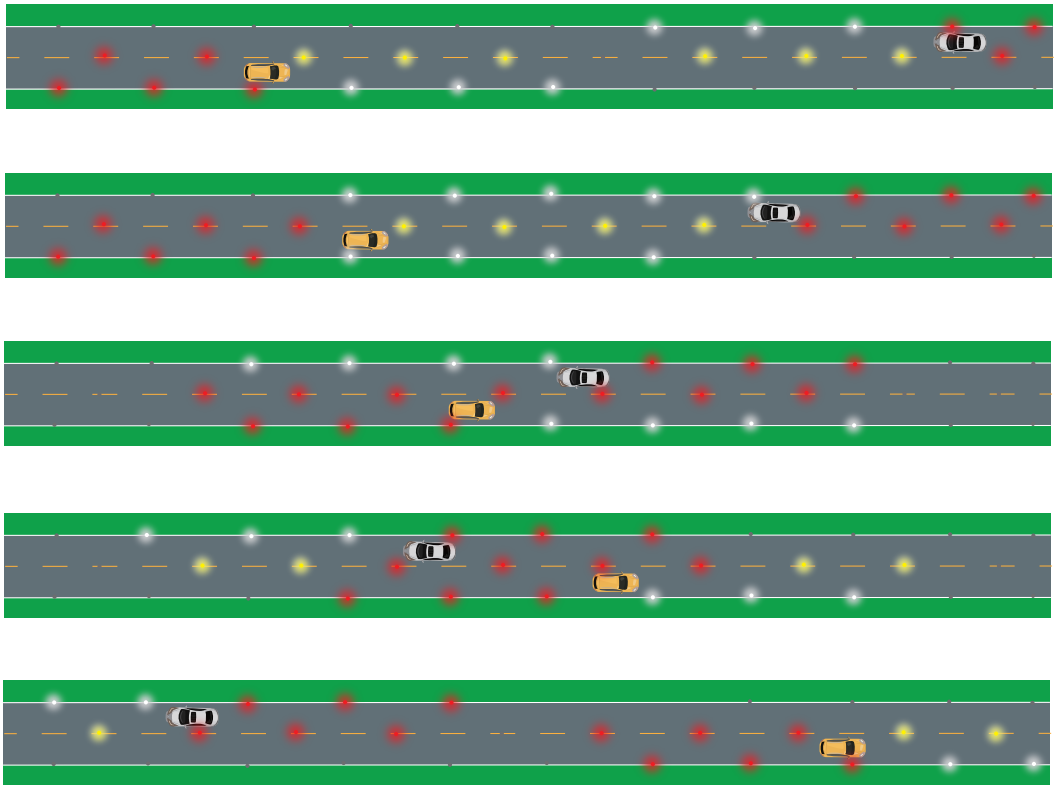
Single-vehicle operation



Multiple-vehicle following

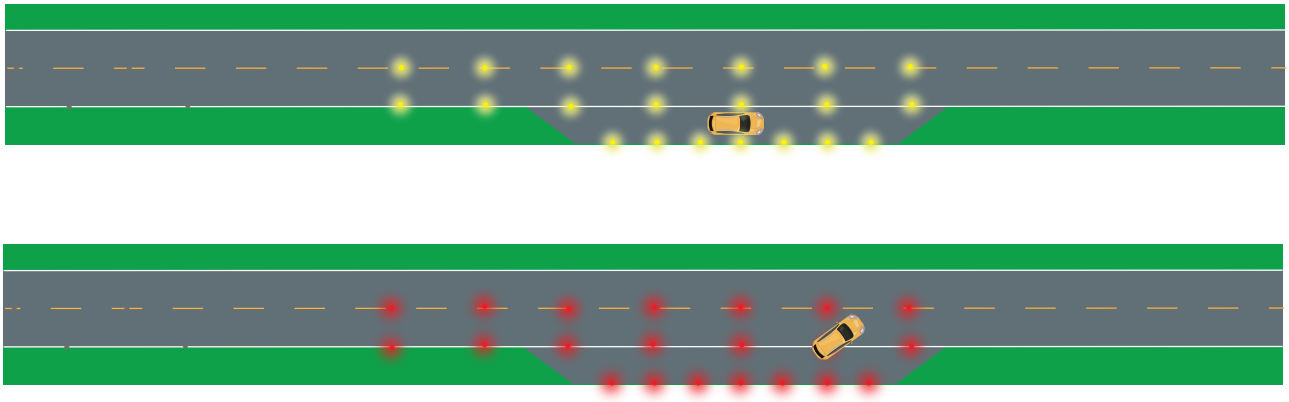


Multiple-vehicle passing



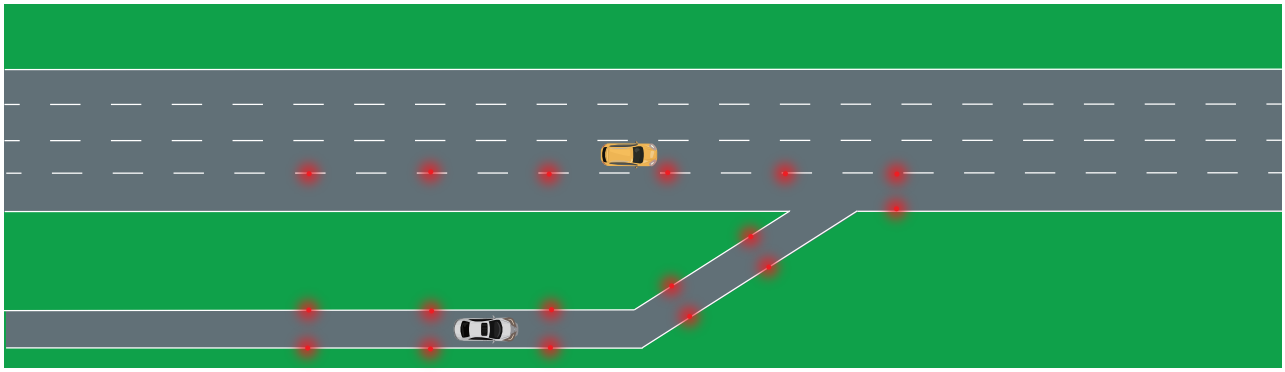
Emergency lane parking alerts on main road sections

When a vehicle is parked in the emergency lane on a highway, the system activates emergency lane parking alerts. Red lights are turned on within a certain range behind the parked vehicle to warn following drivers.



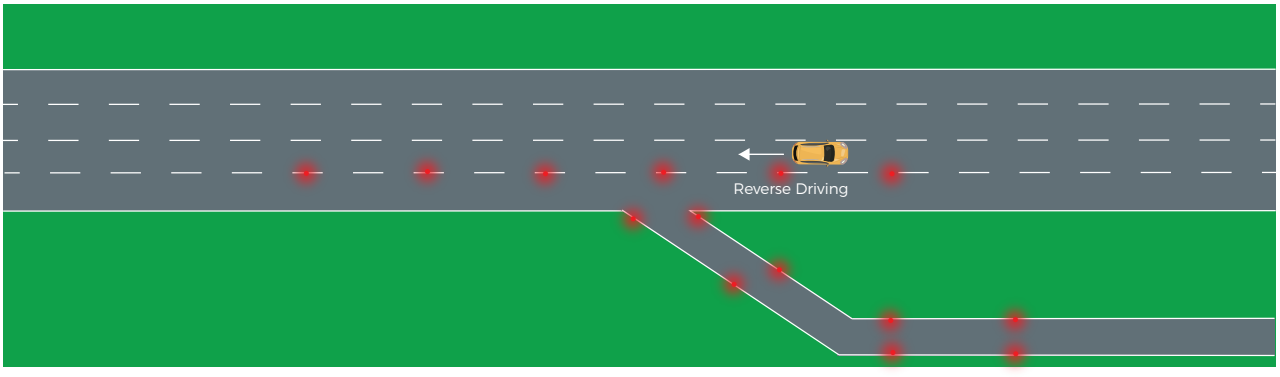
Merging zone collision alerts

Before a vehicle merges onto the main road from an on-ramp, if there are vehicles passing in the rightmost lane of the main road, yellow lights are activated in front of both the on-ramp and main road vehicles to provide real-time warnings. If there is a collision risk, red lights are turned on.



Diverting zone abnormal behavior alerts

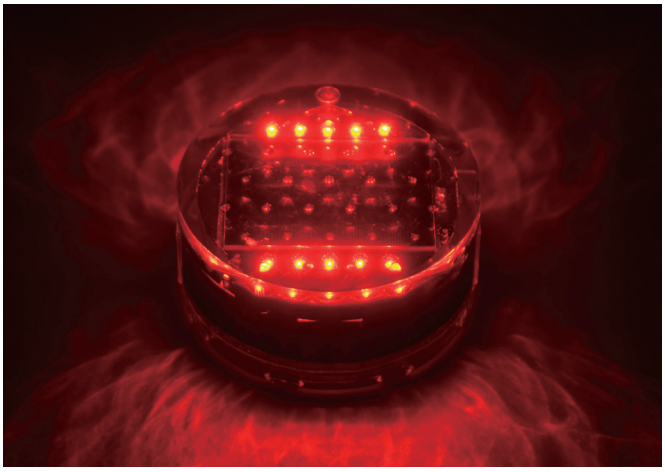
When a vehicle exhibits abnormal behavior such as slowing down, stopping, or reversing due to missing a diversion ramp, the system provides alerts to following vehicles on the main road by turning on red lights within a certain range behind the vehicle.



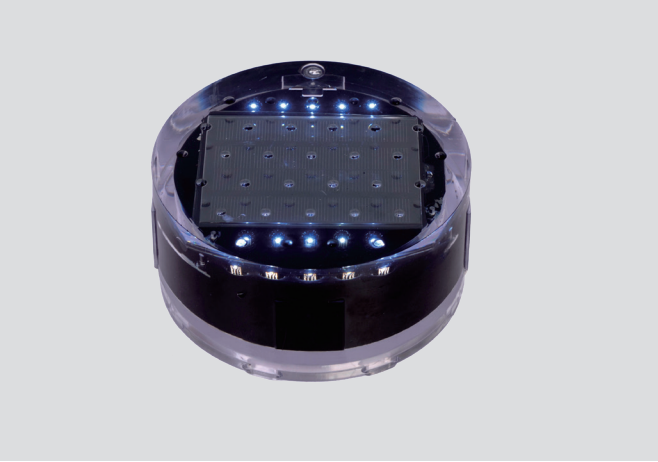
Ordering Information

Model	Description
ClairSRS-Solar-Mag	Solar-powered Magnetic Smart Road Studs, with geomagnetic sensor, with enclosure for wide temperature range, adopt chain network communication
ClairSRS-Solar	Solar-powered Magnetic Smart Road Studs, with no geomagnetic sensor, with enclosure for wide temperature range, adopt LoRa network communication
ClairSRS-Solar-Controller	ClairSRS Solar Controller for network management, data collection, device management, and integration with external management platforms for the smart road studs. Available for both ClairSRS Solar Mag and ClairSRS Solar,

Daytime Visual Effect



Nighttime Visual Effect



Daytime Visual Effect

Nighttime Visual Effect