

# Thermal runaway detection

## Safety of electric vehicles

Most BEVs and PHEVs today rely on lithium-ion batteries. A fault in a single cell (among hundreds in a typical battery pack) can trigger thermal runaway, releasing significant heat, fire, and smoke rapidly. This can cause a chain reaction (thermal propagation), where neighboring cells also overheat and enter thermal runaway. To protect occupants, international regulations like GTR 20 and GB 38031-2025 mandate early detection of such dangers and timely warnings to ensure safe evacuation. Meeting present and future requirements demands reliable sensor technology.

### Target customers:

- Automotive OEMs
- Tier 1 Suppliers
- R&D



### Application challenges

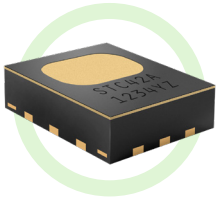
- 1 Monitoring hundreds of cells inside battery pack
- 2 Reliable detection with lowest possible risk of false positive alarm
- 3 Strictly limited power budget in parking mode (required by regulation)
- 4 Automotive quality standards required



### Sensirion's solutions

- 1 STC42A detects H<sub>2</sub> release by any cell in pack, gas acts as "messenger"
- 2 Measurement principle ensures robustness of detection
- 3 Low power sleep mode and automatic measurement mode with selectable frequency meet low power budgets
- 4 STC42A meets AEC-Q100 specifications

# Sensirion sensor solution:



**STC42A: Automotive H<sub>2</sub> sensor for thermal runaway detection**

Size (LxWxH): 3.5 x 3 x 1 mm<sup>3</sup>

## Additional sensor features

- Measurement range: 0-40vol%
- Operating temperature: -40-105°C
- I2C interface
- 2.8-3.6V supply
- 73uA average current
- AEC-Q100 certified

## Other applications

- Thermal runaway detection for hybrid electric vehicles
- Thermal runaway detection for vehicle auxiliary battery
- H<sub>2</sub> leakage detection fuel cell vehicles

## FAQs

- **How does the STC42A sensor work?**  
The sensor measures gas thermal conductivity and outputs a calibrated hydrogen concentration value.
- **Do different cell chemistries all release hydrogen?**  
Literature shows that most widely used chemistries (NMC, NCA, LFP, etc.) release large amounts of H<sub>2</sub> during thermal runaway.
- **How fast does the sensor detect hydrogen?**  
The sensor has a 1s response time. Gas transport from cell to sensor is application specific but typically fast (<10s).
- **Can the sensor performance be increased even more?**  
The sensor supports compensating the influence of humidity and pressure. See datasheet for details.
- **When is the sensor available?**  
End of 2025.

## Getting started



Start evaluating with the SEK-STC42A

## Useful documents



Datasheets, application notes, handling instructions, sample codes, step files, certificates