

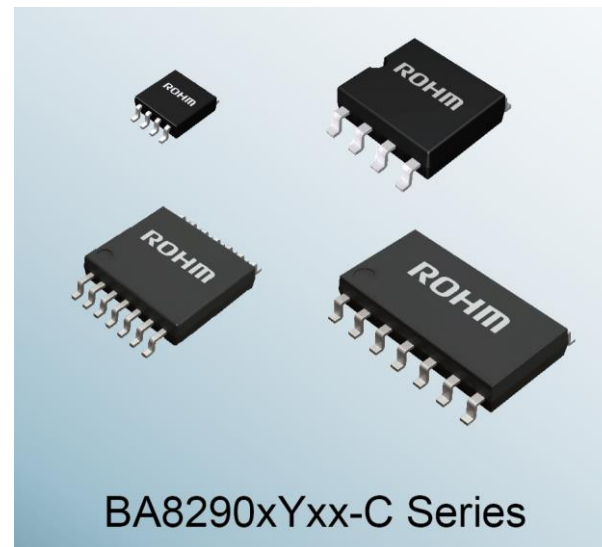
# Noise-Tolerant Automotive OpAmps: BA8290xYxx-C Series

Showing how noise tolerance contributes to improved reliability  
and simpler designs in automotive sensor applications

# New Product Overview: BA8290xYxx-C Series

## Product Overview

- Superior noise tolerance suppresses output voltage variance to  $\pm 1\%$  or less
- AEC-Q100 qualified guarantees automotive-grade reliability
- Stable long-term supply possible
- Pin-compatible with industry-standard products (package and pin layout)



## Basic Specifications

### Ground Sense OpAmps

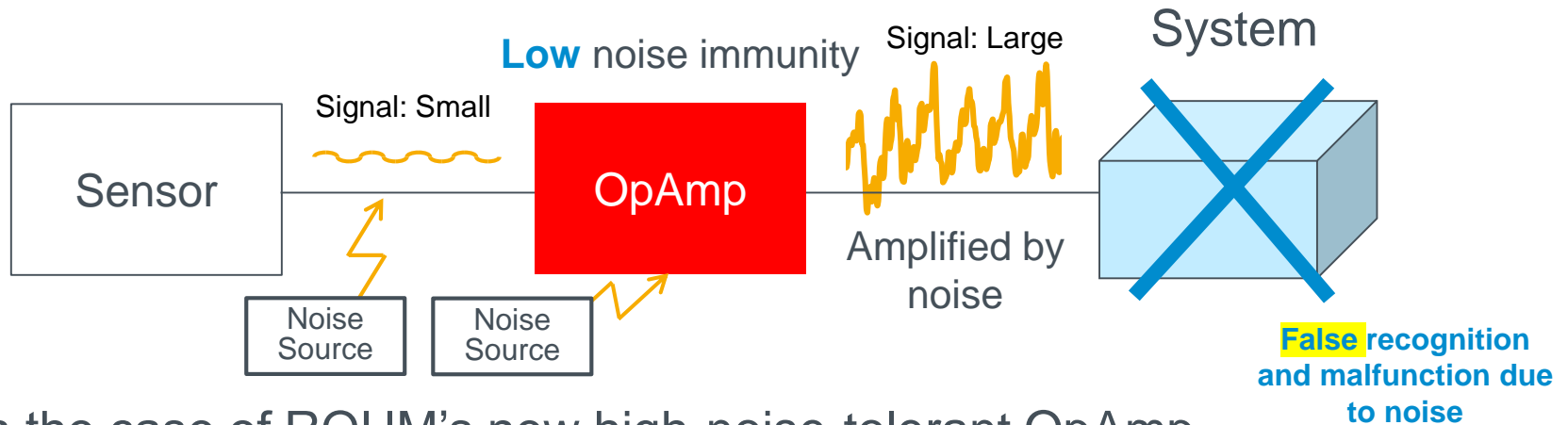
- Supply voltage : 3.0V to 36V
- Input offset voltage :  $\pm 2\text{mV}$  (typ.)  
 **$\pm 6\text{mV}$  (max.)**
- Input voltage : 0 to  $V_{CC}-1.5\text{V}$
- Operating temp :  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$

## Lineup

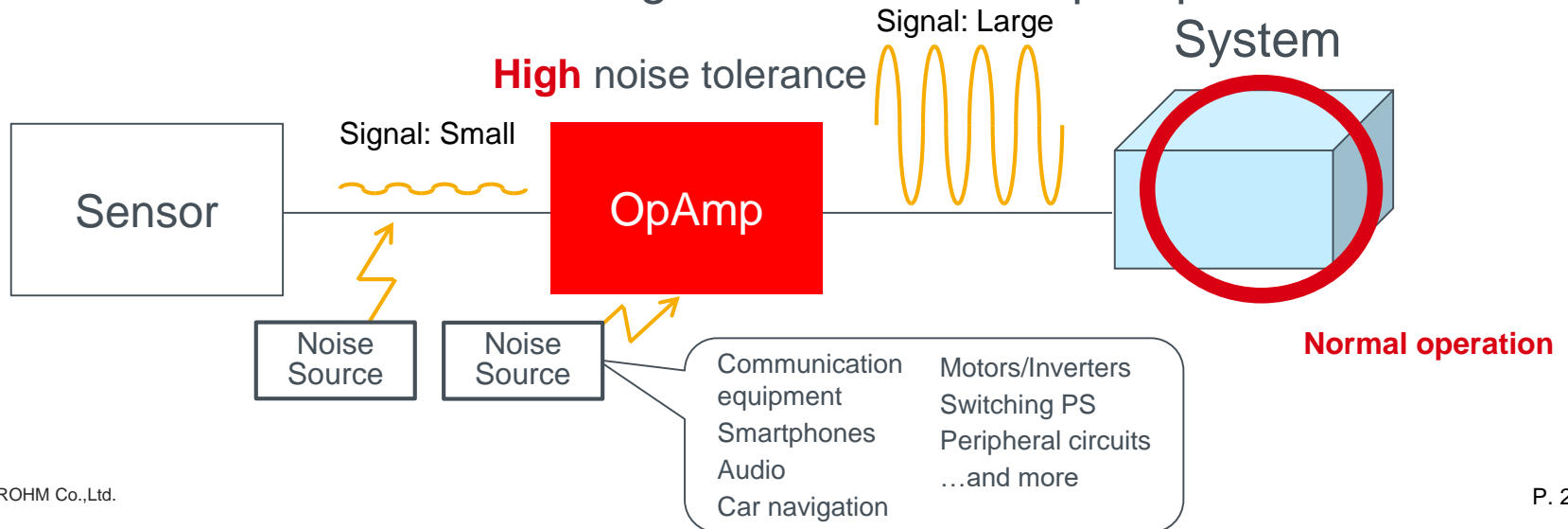
Part No.	Ch	Package	Current Consumption (typ.)
BA82904YF-C	2ch	SOP8	<b>0.5mA</b>
BA82904YFVM-C		MSOP8	
BA82902YF-C	4ch	SOP14	<b>0.7mA</b>
BA82902YFV-C		SSOP-B14	

There is a **growing demand for improved anti-noise performance** following the digitization and increasing density of automotive electrical systems

- In the case of a conventional low-noise-tolerant OpAmp

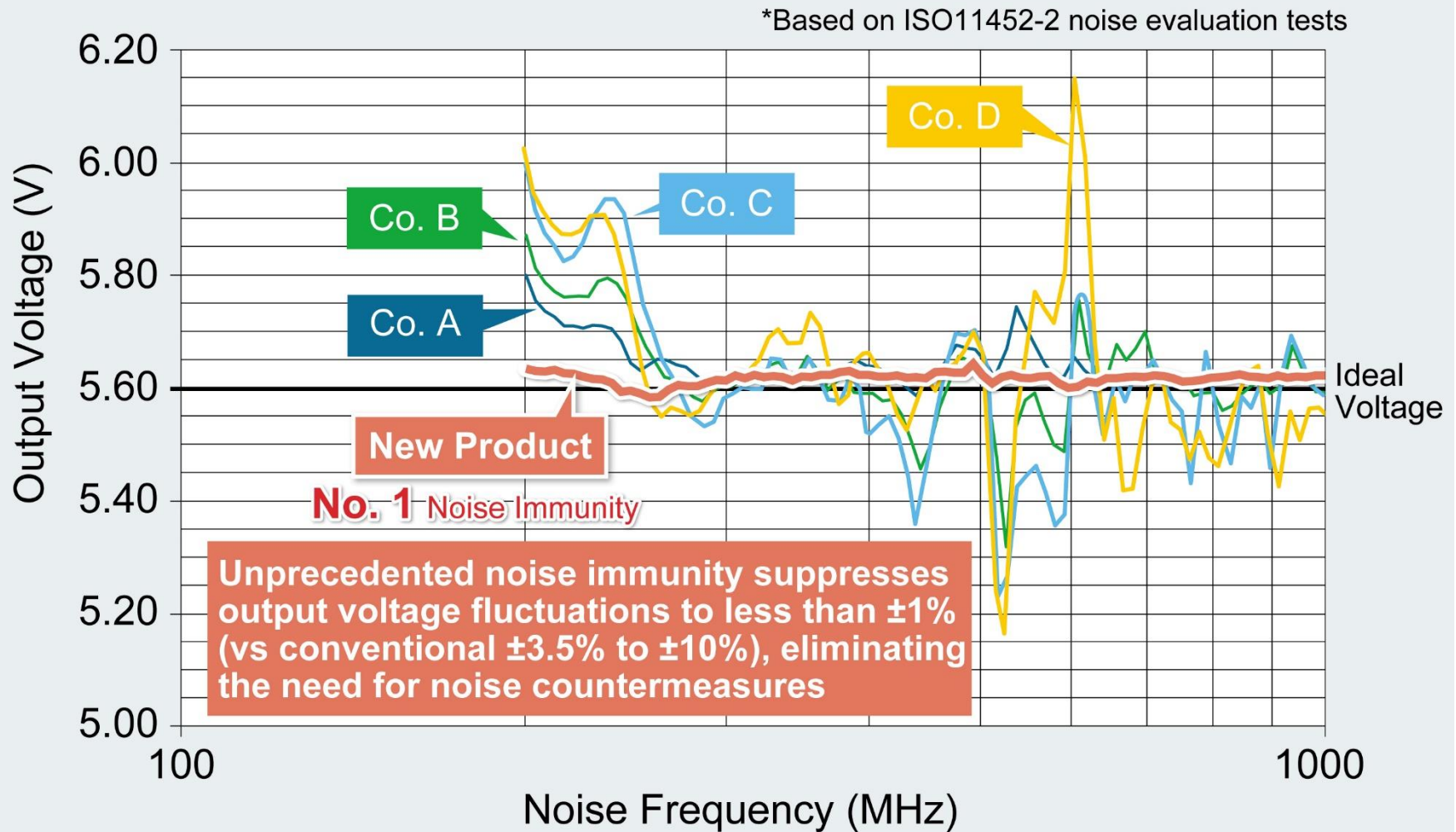


- In the case of ROHM's new high-noise-tolerant OpAmp



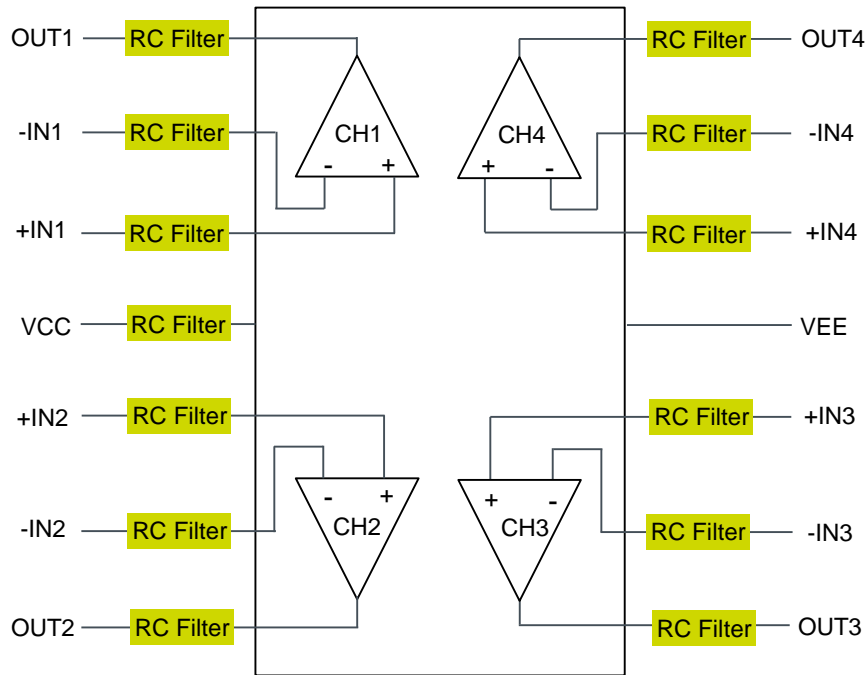
# Feature: The World's First Automotive OpAmps Designed to Eliminate the Effects of Noise

## Noise Frequency vs Output Voltage



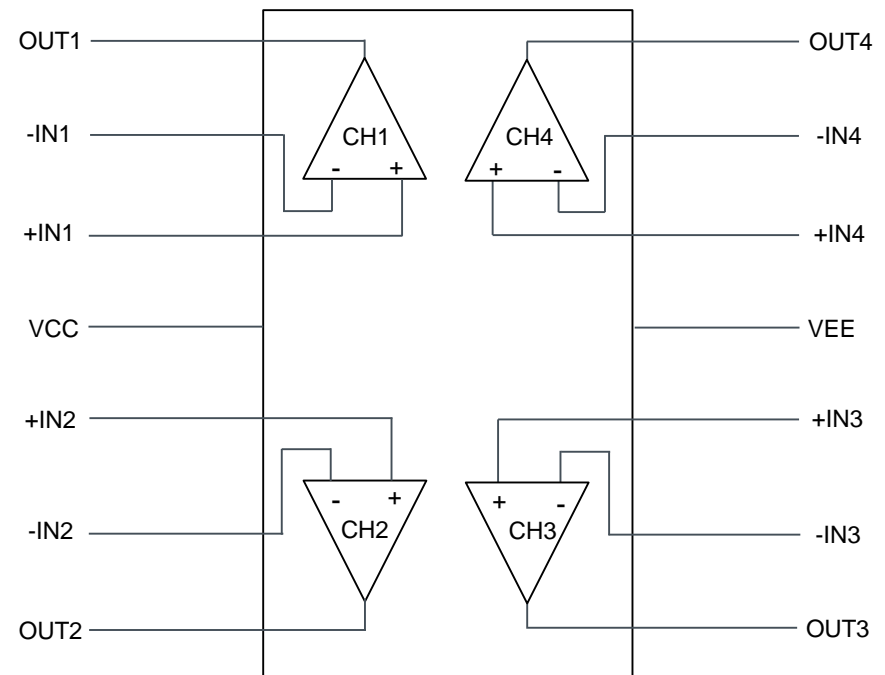
# Differences in Layout Due to Noise Tolerance

## Conventional OpAmp



Requires RC filters to supplement noise immunity

## ROHM's New OpAmp



**Noise-tolerant design** eliminates the need for countermeasures

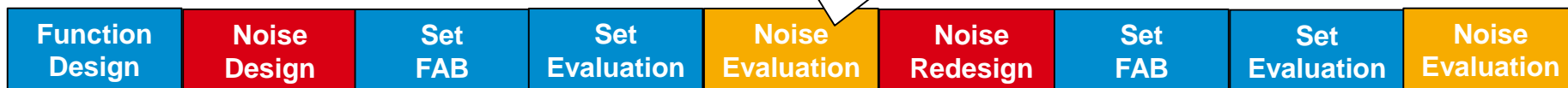
※Depend on applications so customers need to evaluate noise-tolerant.

# Advantages of ROHM's Noise-Tolerant Design

## Process flow (each time) when designing a new model (board)

### ▲ With a conventional OpAmp

Possible failure



▲ Noise design is extremely difficult

Noise evaluation site usage fee: approx. 500k yen/day

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### ○ With ROHM's new OpAmp

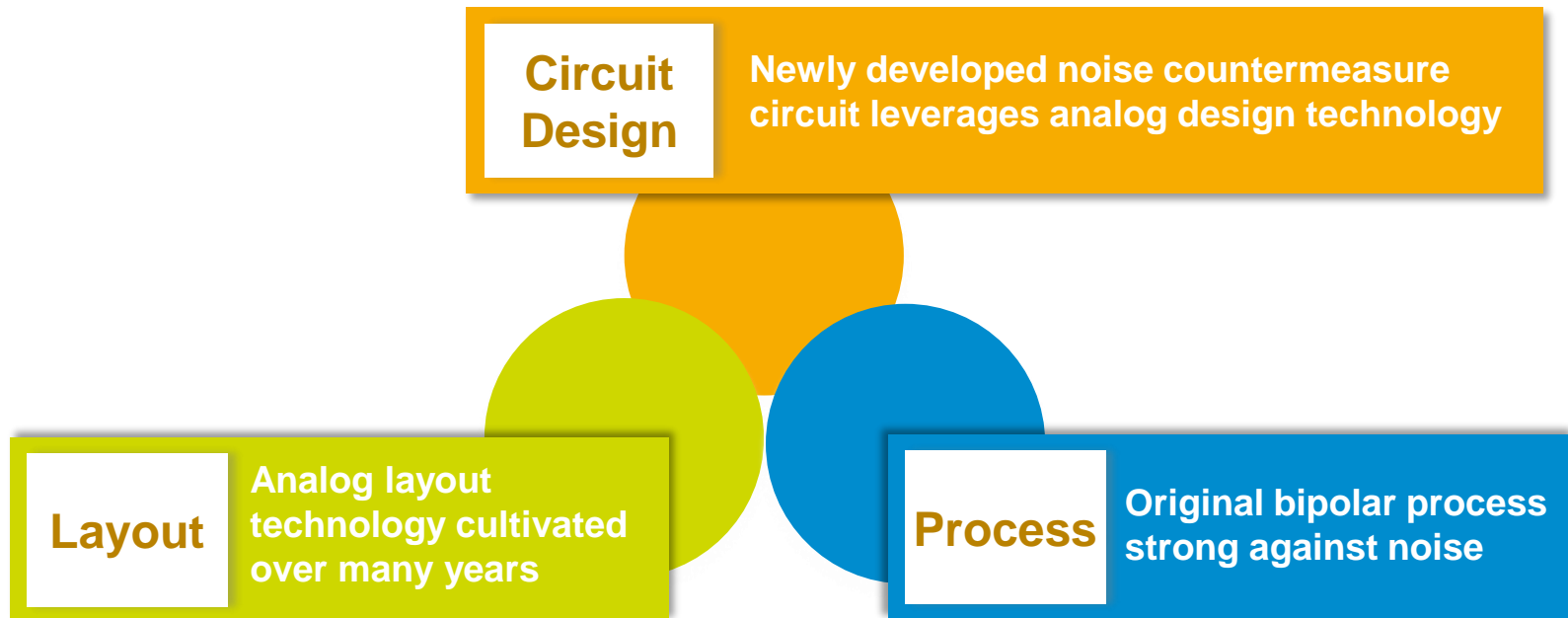
One time OK



### ○ Noise-tolerant design

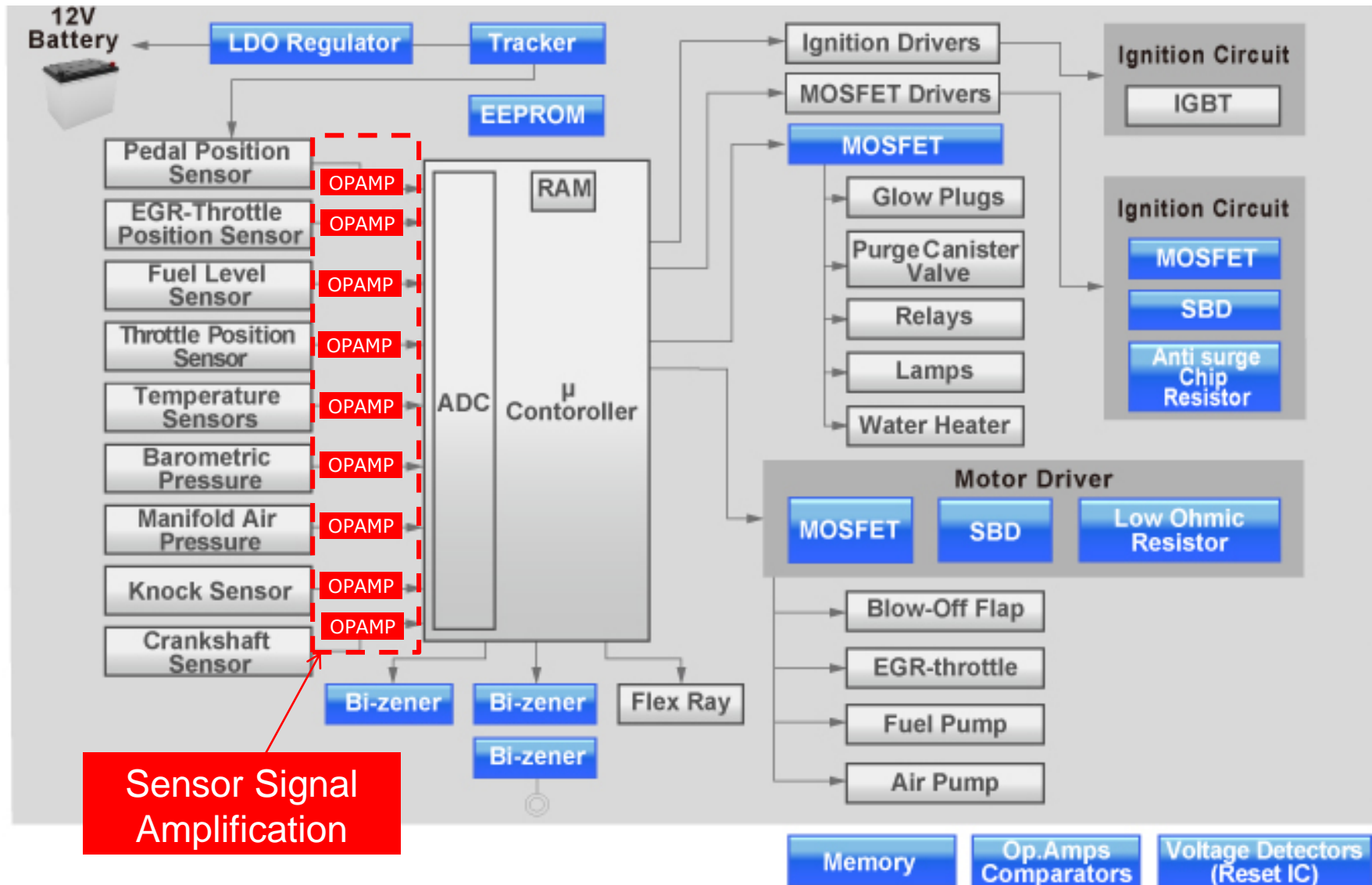
Noise-tolerant design reduces design load and cost  
⇒ Enables quick response to meet short delivery times

## How we were able to improve noise tolerance



Combining the above 3 technologies allowed ROHM to significantly improve EMI tolerance

# Automotive OpAmp Application Example (ECU)



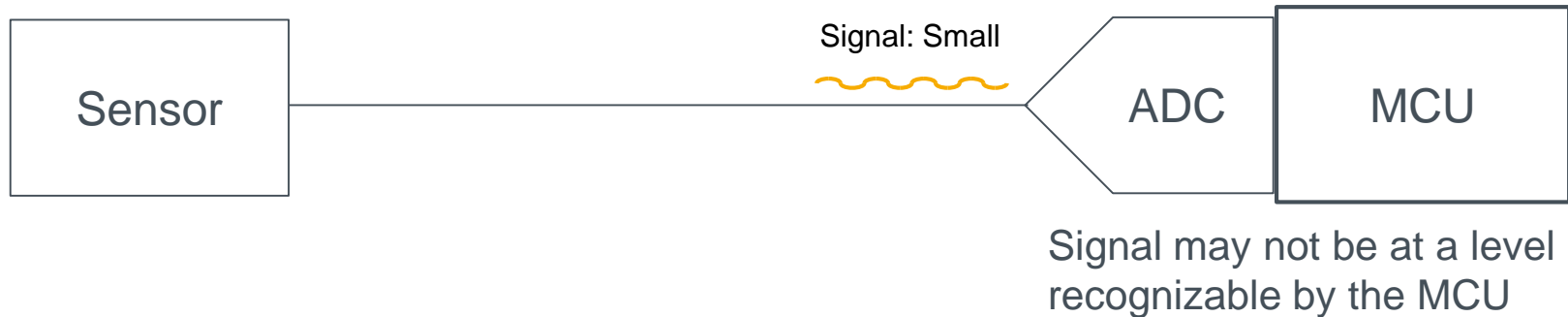


# OpAmp Usage (Sensor Signal Amplification)

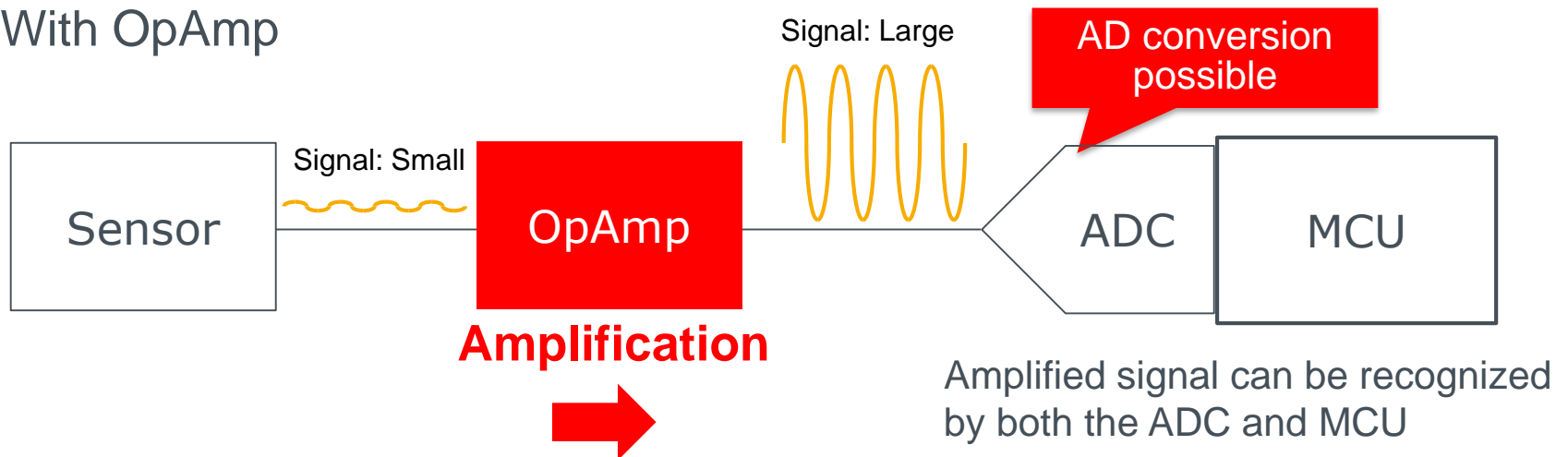
Sensors used to monitor ambient conditions emit ultra-small signals ⇒  
**Connect an OpAmp to amplify the voltage for processing by the MCU**

\*Sensor output impedance and disturbance noise are assumed to be equal

- Without OpAmp

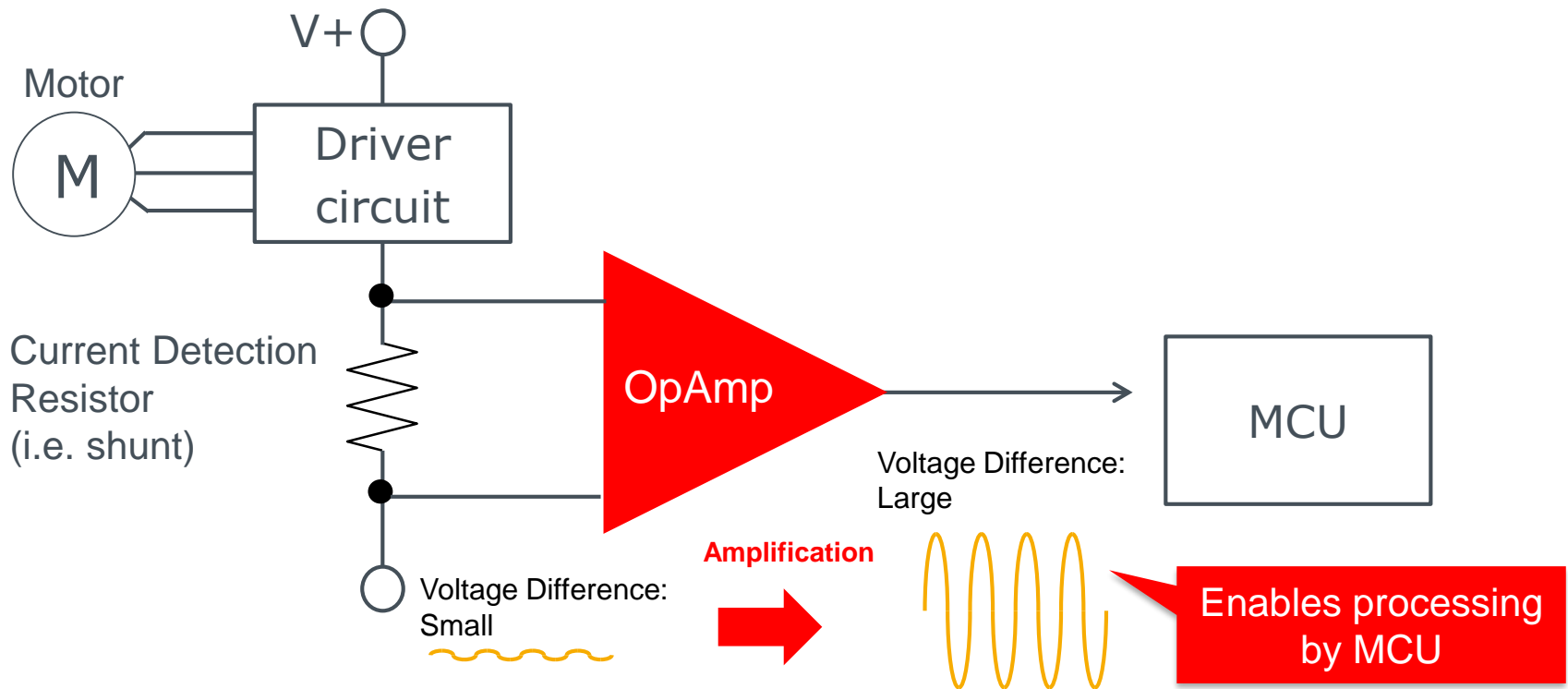


- With OpAmp



# OpAmp Usage (Motor Current Detection)

A detection resistor is connected to the motor to monitor current, but the voltage difference at both ends is very small  $\Rightarrow$  **Use an OpAmp to amplify the small voltage at both ends of the detection resistor**



A current detection resistor is used to convert the current into voltage, then the OpAmp amplifies the weak converted signal to a level that can be processed by the MCU

# OpAmp Usage (Main Inverter)

