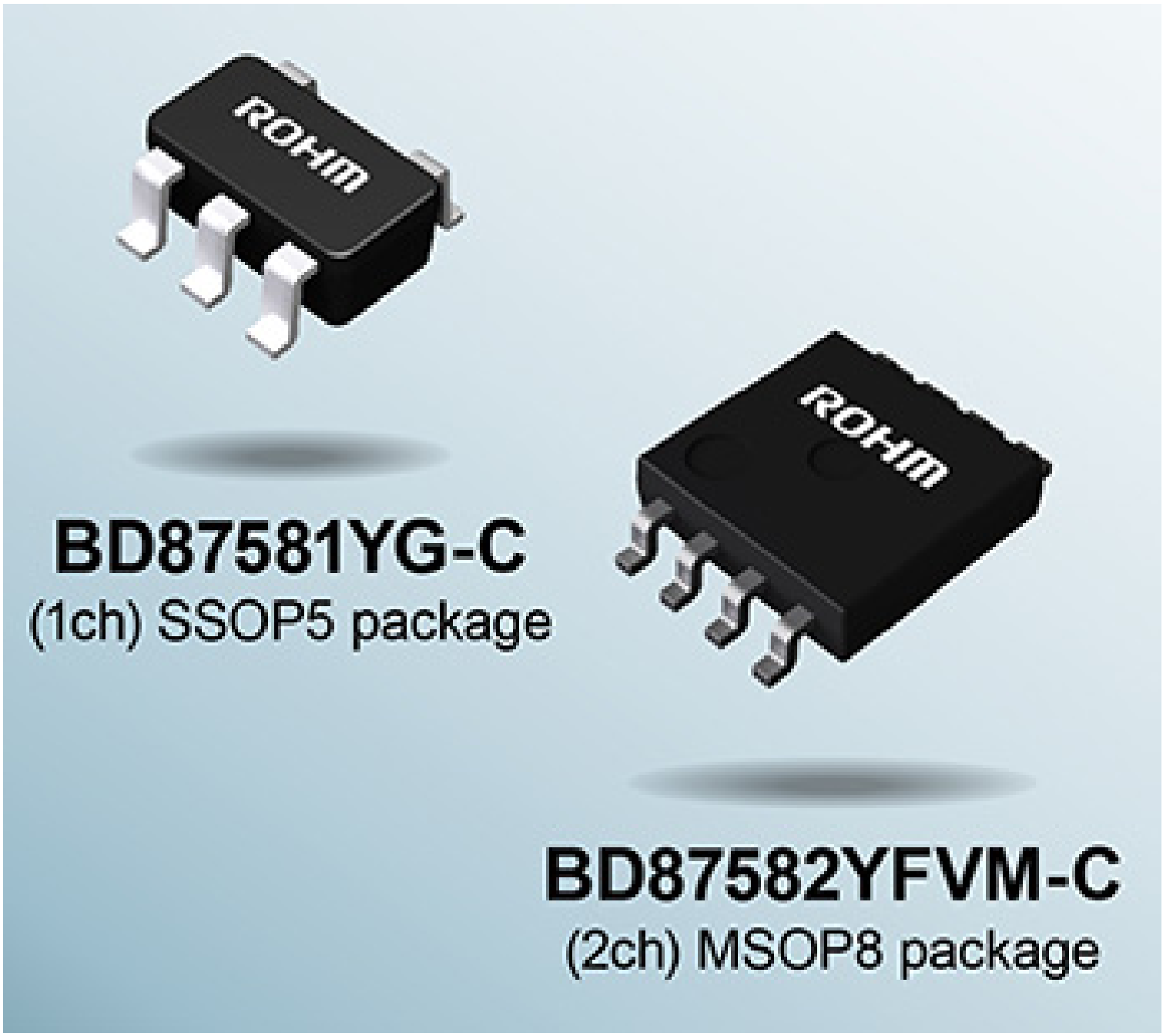
ROHM's New EMARMOUR™ Op Amp Series

August 16th, 2021

Achieves breakthrough noise immunity, improving reliability and reducing design resources in anomaly detection systems



ROHM developed the BD8758xY series (BD87581YG-C, BD87582YFVM-C) of rail-to-rail input/output high-speed CMOS op amps that feature improved EMI immunity for automotive and industrial equipment applications requiring high-speed sensing in harsh environments, such as vehicle engine control units and anomaly detection systems for factory automation equipment.

In recent years, advancements in electrification and mounting density have increased the amount of environmental noise in electric vehicles and cars equipped with ADAS. Generally, however, it is extremely difficult to carry out noise evaluation on individual boards and systems during automotive development since it must be performed after assembly. What's more, some results require improvements such as large-scale EMI countermeasures to lower noise.

In response, ROHM released the EMARMOUR™ series in 2017 that have since been well received in the automotive and industrial markets due to their superior noise immunity that reduces design resources by combining a vertically integrated production system with proprietary analog design technology.

The EMARMOUR™ series is designed to prevent malfunctions due to noise without the need to take special application measures. The latest BD8758xY series in particular has demonstrated superior performance under four international noise evaluation tests. For example, in ISO 11452-2 radio wave emission testing conducted by vehicle manufacturers, the output voltage of standard products fluctuates by more than ±300mV in all frequency bands, while the new BD8758xY series achieves ±10mV or less. At the same time, the CMOS element structure enables accurate, high-speed signal amplification – without being affected by external noise when installed inside the targeted sensor applications. This significantly improves reliability while reducing design production-hours in a wide range of applications, including anomaly detection systems.

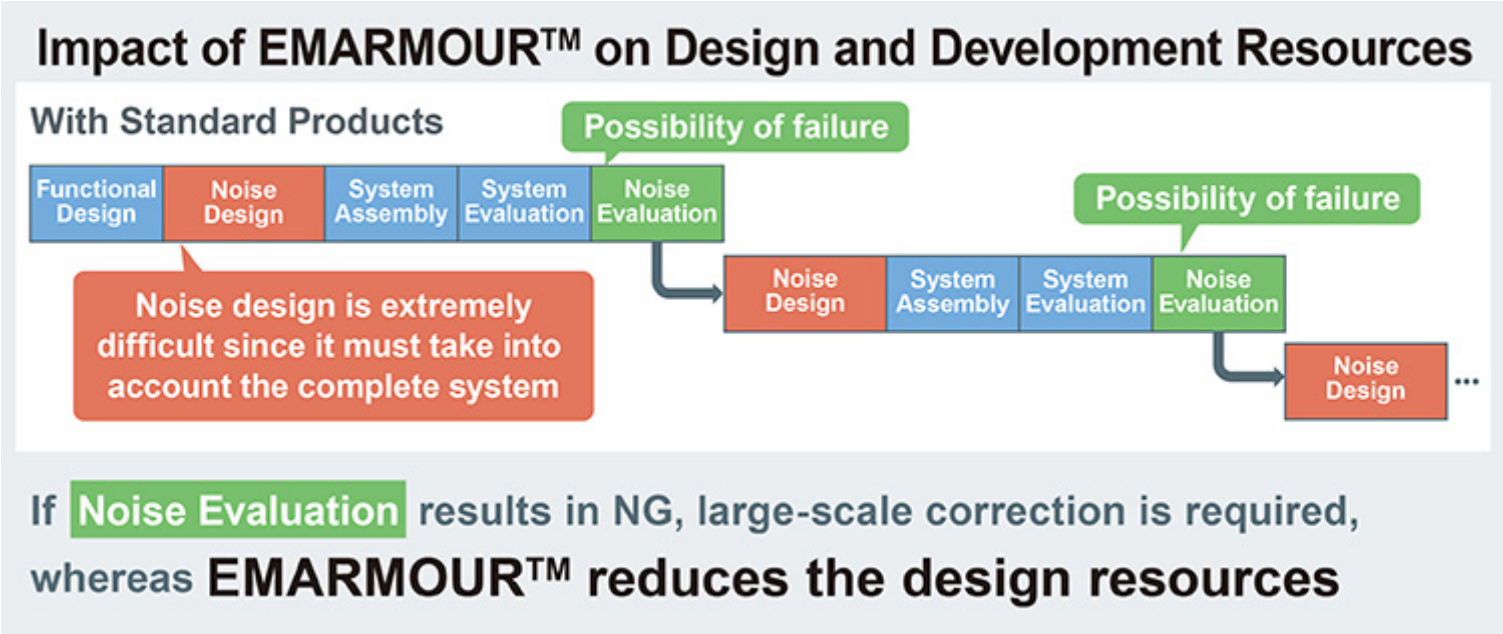
In addition, ROHM Real Model, a new high accuracy SPICE model that matches the electrical and temperature characteristics of the actual IC and simulation values to prevent rework after prototyping, is available on ROHM's website.

High EMI Immunity Op Amp Development Concept

	Standard High EMI Immunity Op Amp	ROHM's EMARMOUR™ High EMI Immunity Op Amp	Overview of Noise Evaluation Tests
Approach to Noise	Noise suppression in applications is typically handled by electronics manufacturers	Designed to prevent malfunctions due to noise without taking special measures in applications	
Radio Wave Emission Test ISO 11452-2	—	✓	Testing commonly carried out by electronics manufacturers. Electromagnetic radiation from the antenna makes countermeasures difficult using the input filter alone.
Bulk Current Injection Test ISO 11452-4	—	✓	A test in which noise is applied to the wiring harness connected to an electronic device using a current injection probe. Electronic device immunity is evaluated when excited by strong magnetic field noise.
Proximity Antenna Immunity Test ISO 11452-9	—	✓	Test being increasingly adopted by electronics manufacturers due to the proliferation of mobile phones. Electromagnetic radiation from the antenna makes countermeasures difficult using the input filter alone.
Direct RF Power Injection Test IEC 62132-4	Resistant to noise only in specific frequency band due to filter measures	✓	A test in which noise signals are directly applied to a semiconductor terminal. Countermeasures are relatively easy, such as installing a filter at the input terminal in advance.

What is EMARMOUR™?

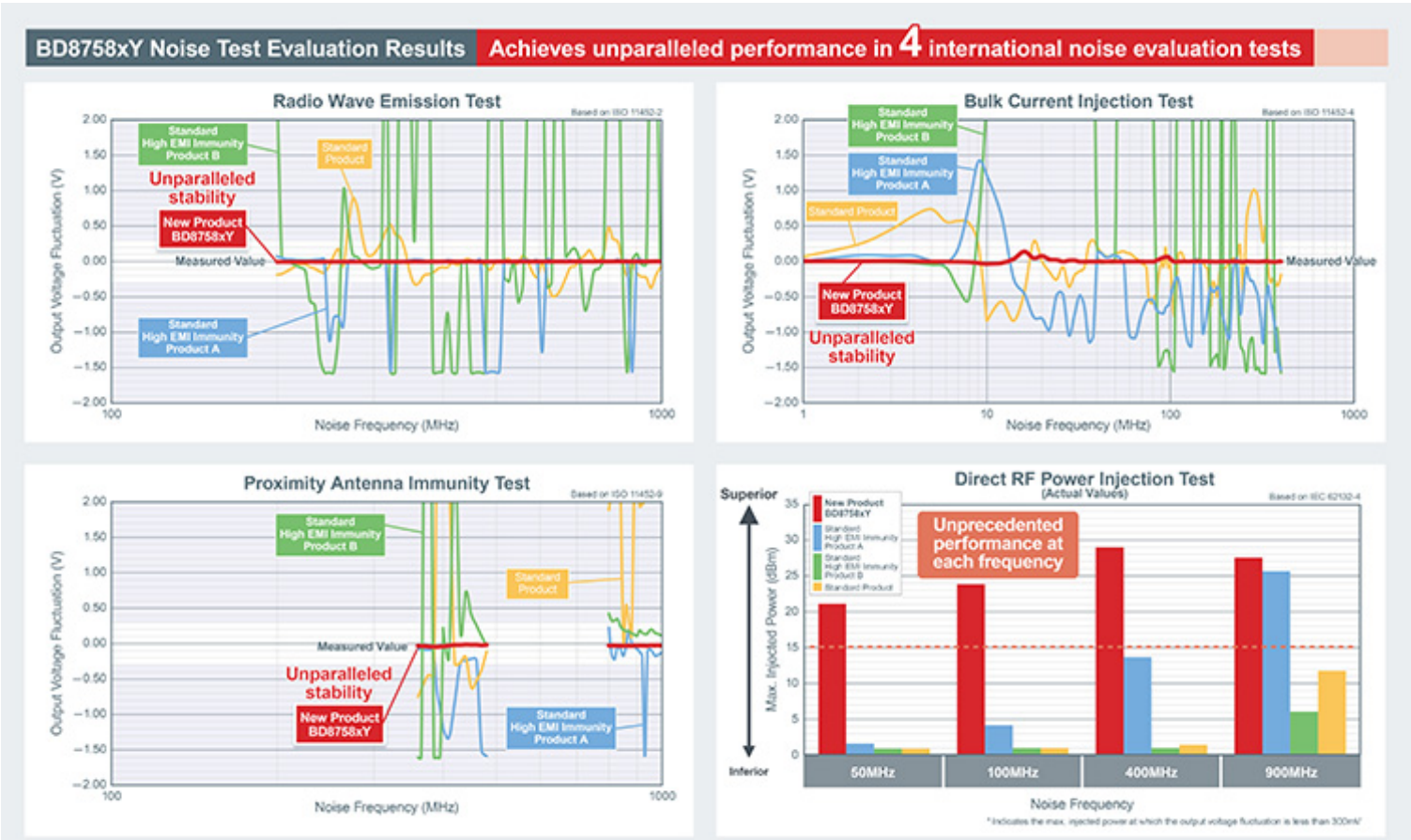
EMARMOUR is the brand name reserved by ROHM only for those products leveraging proprietary technologies covering layout, processes, and circuit design to achieve ultra-high noise immunity that minimizes output voltage fluctuation across the entire noise frequency band during noise evaluation testing under the international ISO 11452-2 standard. This unprecedented noise immunity both reduces design resources while improving reliability by solving issues related to noise in the development of a variety of systems.



Key Features

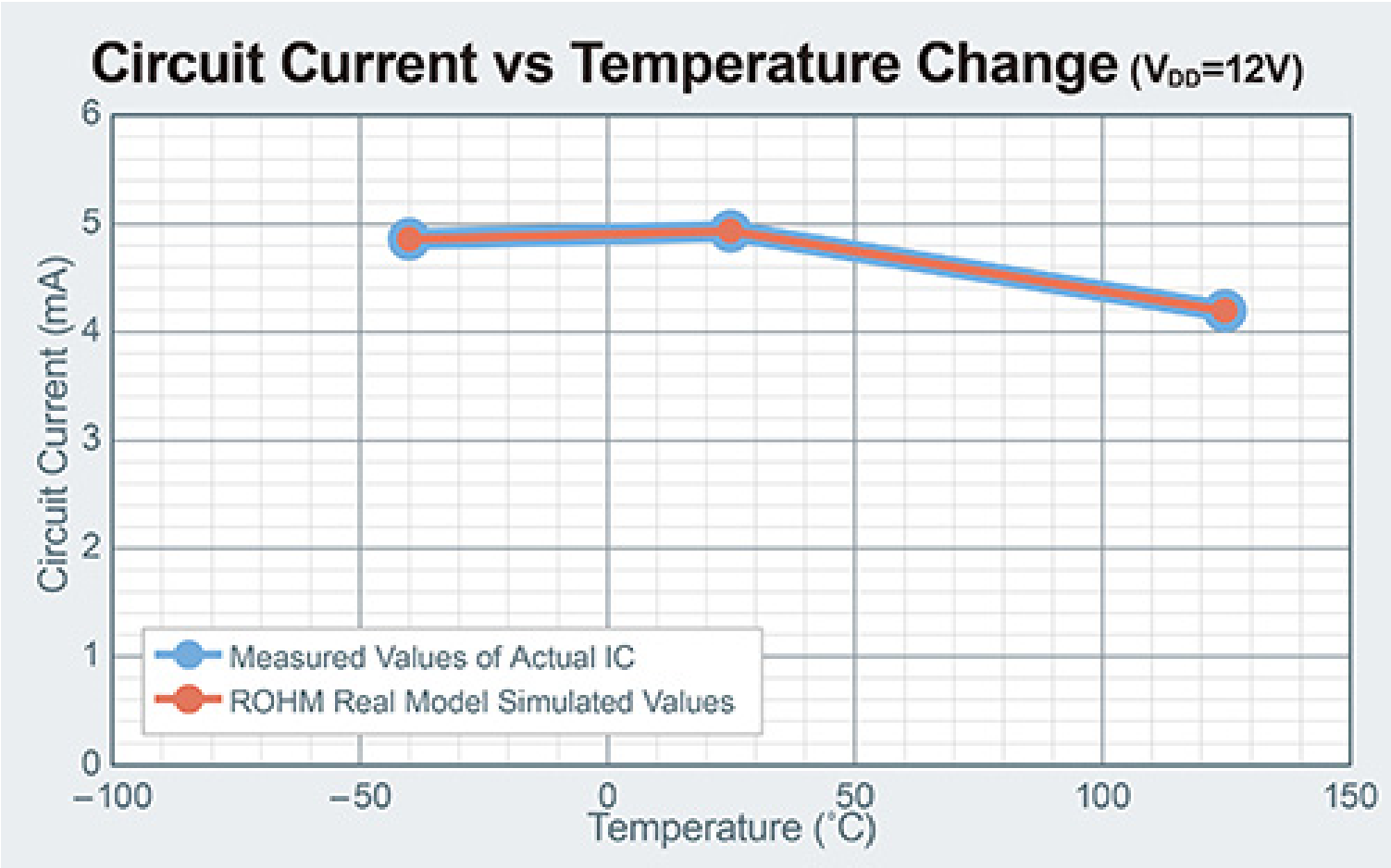
1. Breakthrough noise immunity reduces noise design resources considerably

Developed as part of the EMARMOUR™ series of op amps, these newest models achieved unprecedented performance in four international noise evaluation tests (ISO 11452-2 Radio Wave Emission Test, ISO 11452-4 Bulk Current Injection Test, ISO 11452-9 Proximity Antenna Immunity Test, and IEC 62132-4 Direct RF Power Injection Test) conducted in ROHM's own anechoic chamber.



For example, in the ISO 11452-2 radio wave emission test, the output voltage of standard products can fluctuate by ±300mV or more across the entire noise frequency band, while ROHM's latest products achieve unprecedented noise immunity that limits variation to less than ±10mV. This not only eliminates the need for countermeasures at each frequency (i.e. a total of 10 CR filter components for a 2ch op amp), but also reduces the noise design resources for sensors and other components that play an important role in the system, contributing to reduced application design effort and improved reliability.

2. High accuracy simulation model prevents rework after prototyping



'ROHM Real Model' is a new high accuracy SPICE model that utilizes original model-based technology to faithfully reproduce the electrical and temperature characteristics of the actual IC, resulting in a perfect match between the IC and simulation values. This ensures reliable verification, contributing to more efficient application development – for example by preventing rework after prototyping.

This SPICE model is now available on ROHM's website.
https://www.rohm.com/products/amplifiers-and-linear/operational-amplifiers/standard/emi-automotive-input-output-rail-to-rail

Application Examples

- EV/HEV inverters, engine control units, eCall (vehicle emergency call system), car navigation/air conditioning systems
- Industrial factory automation equipment, measurement equipment, measuring instruments, servo systems, and sensor systems
- and other automotive/industrial applications sensitive to noise

Automotive-Grade EMARMOUR™ Op Amp / Comparator Lineups

This series is qualified under the automotive reliability standard AEC-Q100, ensuring superior reliability while enable easy replacement of existing products sensitive to noise.

Op Amps

Part No.	Function	Element Structure	Supply Voltage [V]	Input Voltage [V}	Output Voltage [V]	Bias Current [nA]	Slew Rate [V/μs] (Typ.)
NEW BD87581YG-C	1ch op amp	CMOS	4 to 14	VSS to VDD	VSS+0.03 To VDD-0.05	0.001	3.5
NEW BD87582YFVM-C	2ch op amp						
☆BD87584YFV-C	4ch op amp						
BA82904Yx-C	2ch op amp	Bipolar	3 to 36	VEE to VCC-1.5	VEE to VCC-1.5	20	0.2
BA82902Yx-C	4ch op amp						

☆: Under Development

Comparators

Part No.	**Function**	**Element Structure**	**Supply Voltage [V]**	**Input Voltage [V]**	**Output Saturation Voltage [V]**	**Bias Current [nA]**	**Response Time [μs] (Typ.)**
BA82903Yx-C	2ch comparator	Bipolar	2 to 36	VEE to VCC-1.5	0.15	50	1.3
BA82901Yx-C	4ch comparator						