

# NL6010/11/12 Series

## Low Power, Zero-Drift, High EMC Performance, Rail-to-Rail I/O, Operational Amplifier



- ❑ Zero-drift technology enables amplification with little error in wide temperature range.
- ❑ The low input bias current enables amplification with little error.
- ❑ Low 1/f noise suppresses the system malfunction.
- ❑ High EMC performance reduces the risk of rework during development and achieves to stable operation of applications.

### KEY SPECIFICATIONS (V+=3.3 V)

- Supply Voltage 2.1V to 5.5V
- Operating Temperature -40 to 125 °C
- Low Offset Voltage 10μV max.
- Zero-Drift 0.05μV/°C max.
- Low Supply Current NL6010/NL6011 : 17μA/ch  
NL6012 : 15μA/ch
- Rail-to-Rail I/O
- Input Bias Current 30pA
- Gain Bandwidth Product (GBW) 260 kHz
- Slew Rate 0.11V/μs
- Equivalent Input Noise Voltage 60nV/√Hz
- Integrated EMI Filter

### APPLICATIONS

- Battery-Powered Equipment
- Sensor Interface
- Temperature Sensors
- Current Sensing Amplifier



Gas Sensor

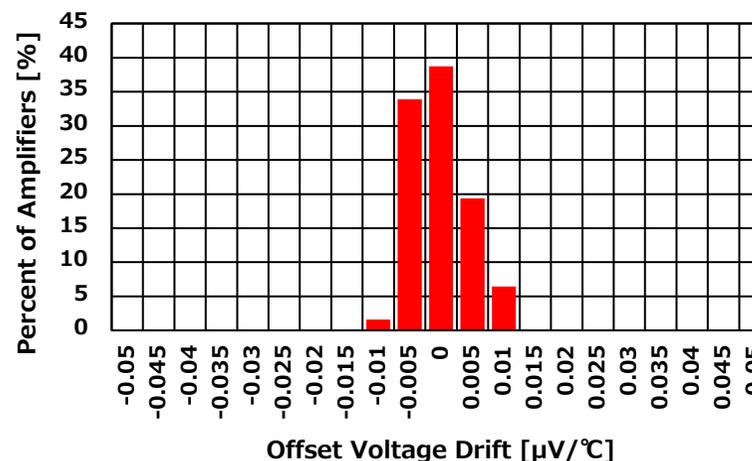


Non-Contact Temperature Sensor

### TYPICAL CHARACTERISTICS

#### Offset Voltage drift Distribution

V+=3.3V, V-=0V, V<sub>COM</sub>=V+/2, Ta=-40°C to 125°C

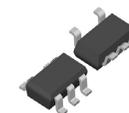


### PACKAGE (Unit : mm)



SOT-23-5-DC  
(2.9x2.8x1.1)

Under Development



SC-88A-DB  
(2.0x2.1x0.9)

Under Development



VSP-8-AF  
(2.9x2.8x1.2)

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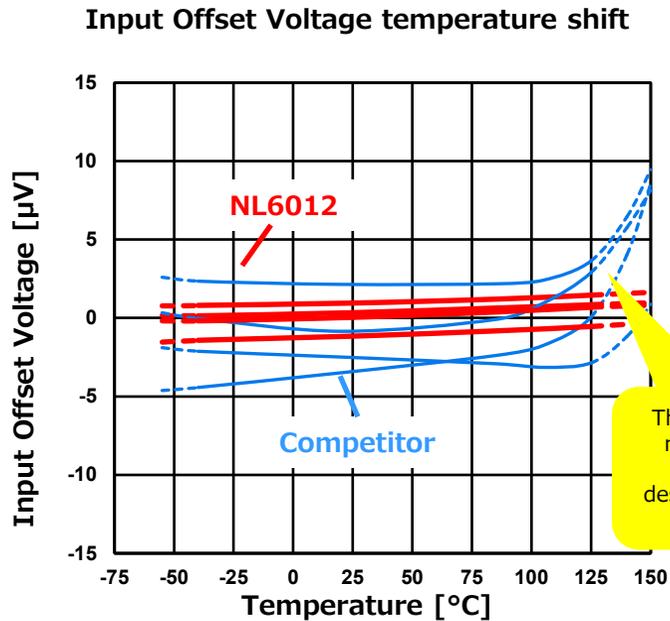
- ❑ Zero-drift technology enables amplification with little error in wide temperature range.

## General Issue

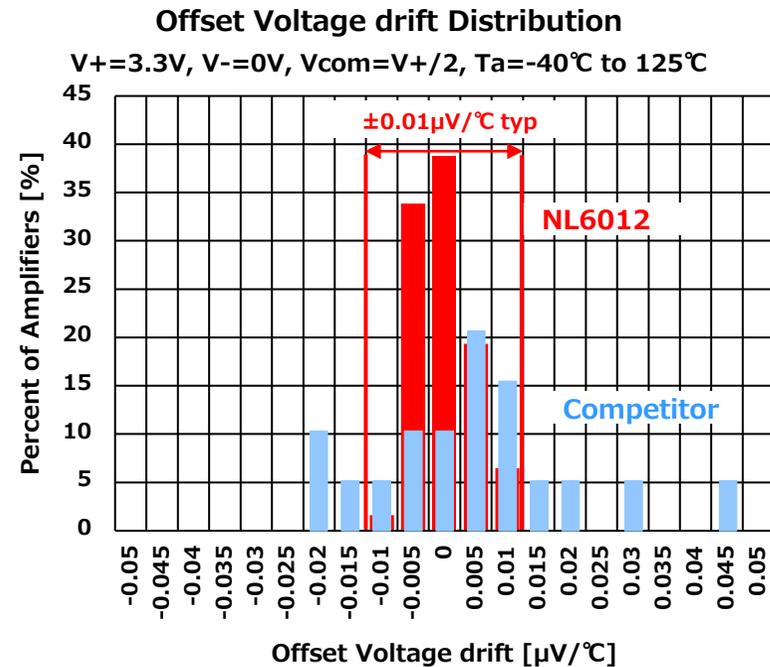
- Want to reduce system reading errors.
- Want to facilitate temperature design.

## Our Solution

- Zero-drift technology achieves input offset voltage of Max.10 $\mu$ V and low temperature drift of Max.0.05 $\mu$ V/ $^{\circ}$ C.
- Can be used in front stage of 10bit or more ADC.



Achieved stable offset voltage at all operating temperatures.



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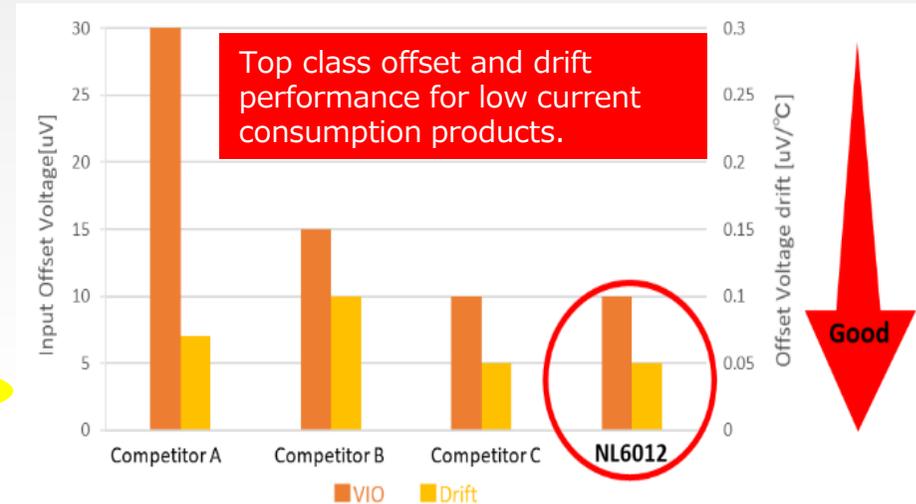
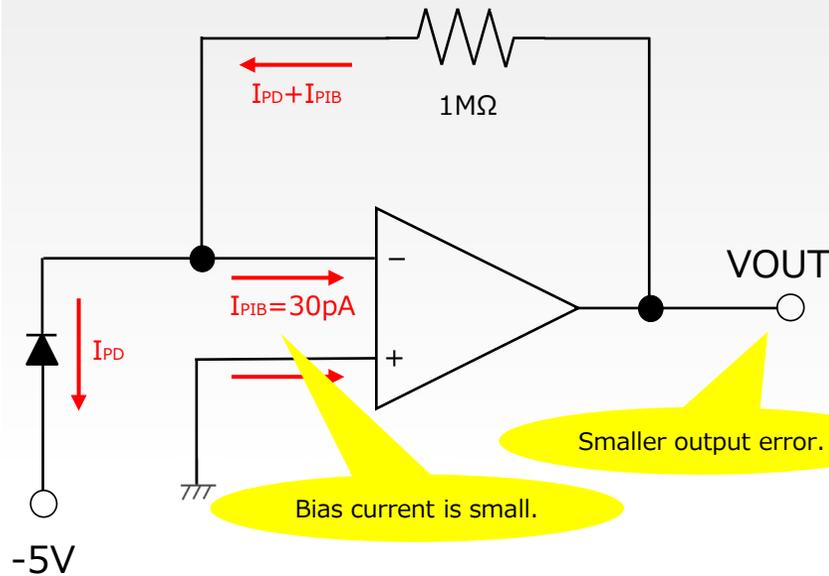
- ❑ The low input bias current enables amplification with little error.

## General Issue

- Want to reduce system reading errors.

## Our Solution

- Even though it has zero drift, the output error is reduced because the input bias current is low.



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- Low  $1/f$  noise suppresses the system malfunction.

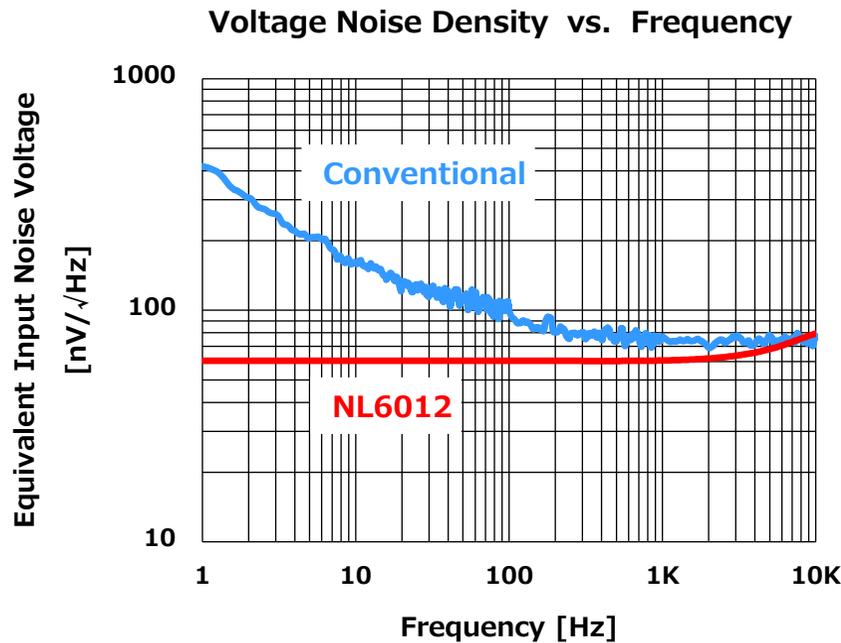
## General Issue

- $1/f$  noise causes measurement errors in the system.

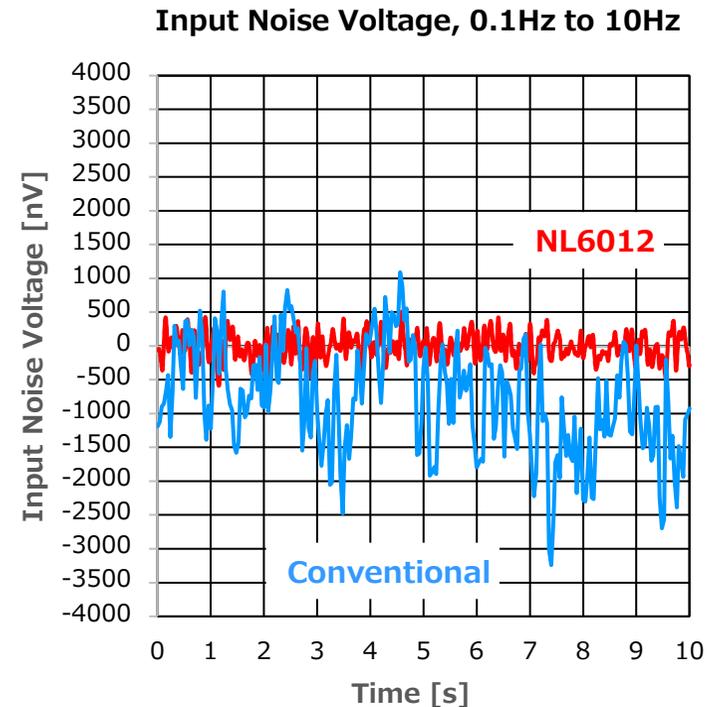
## Our Solution

- The NL601x series are free from  $1/f$  noise, thus suppressing measurement errors in the system.

Equivalent Input Noise Voltage Frequency Characteristics



Equivalent Input Noise Voltage Time Change Characteristics [white Noise]



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- High EMC performance reduces the risk of rework during development and achieves to stable operation of applications.

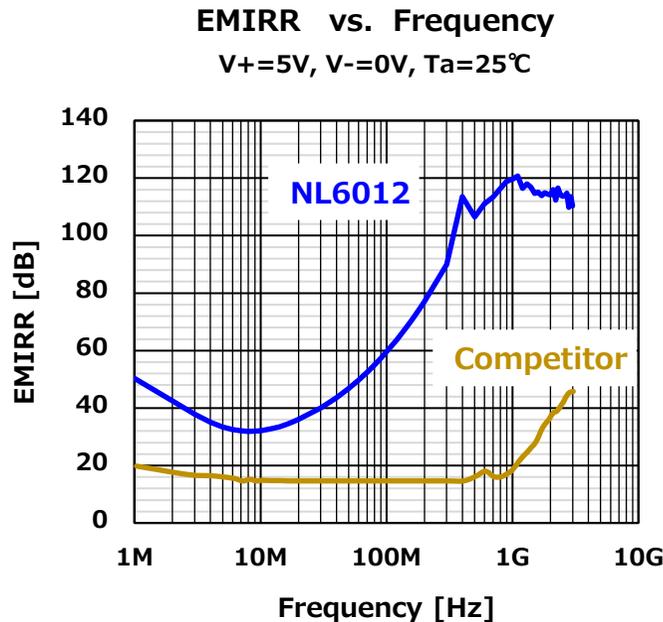
## General Issue

- If failed in the noise irradiation test, a rework would be necessary. The countermeasure components for noise irradiation test are cost-consuming.

## Our Solution

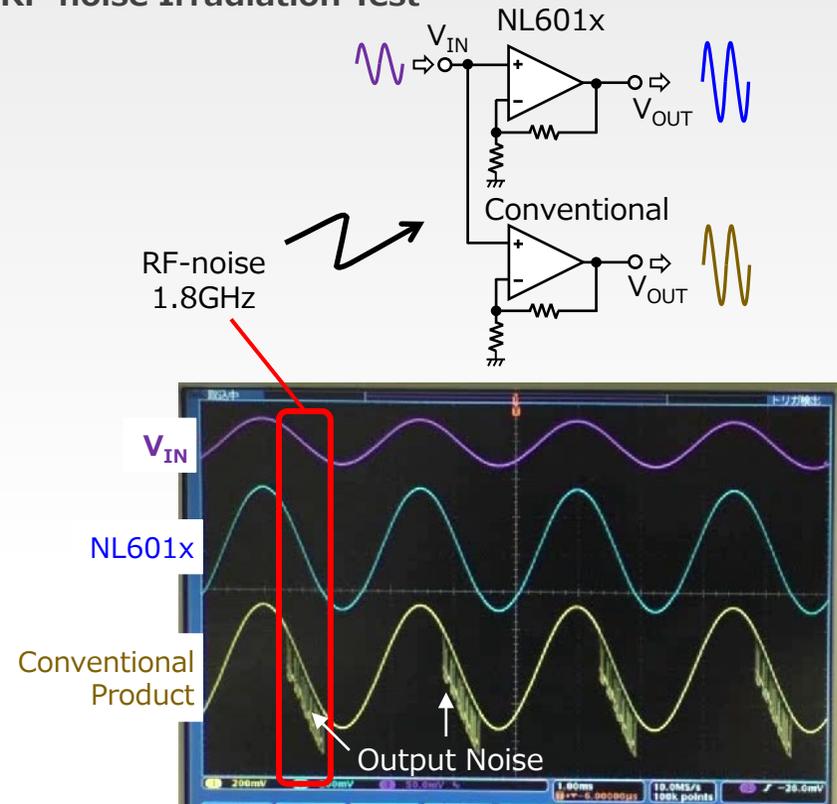
- The NL601x series have a built-in EMI filter and achieve high EMC performance by themselves.

### EMIRR ; Emission(EMI) Rejection Ratio



$$EMIRR = 20 \log \frac{V_{RF\_PEAK}}{|\Delta V_{IO}|} [dB]$$

### RF-noise Irradiation Test



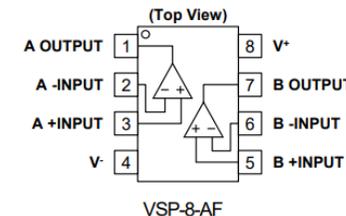
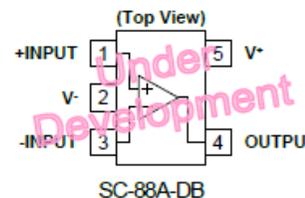
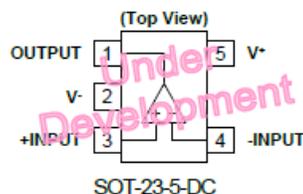
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## ORDER INFORMATION

	Product Name	Circuit	Package	Quantity per Reel	Pb Free	Halogen Free
Under Development	NL6010DCAE1D	1	SOT-23-5-DC	3000	✓	✓
Under Development	NL6011DBAE1D	1	SC-88A-DB	3000	✓	✓
	NL6012AFAE2D	2	VSP-8-AF	2000	✓	✓



## PRODUCT NAME INFORMATION

NL601x aa A bb D

Composition	Item	Description
x	Circuit	Number of circuits (0, 1:1circuit, 2:2circuit)
aa	Package Code	DC : SOT-23-5-DC DB : SC-88A-DB AF : VSP-8-AF
A	Version	Product Version. Default is A.
bb	Packing	Insert Direction. Refer to the packing specifications.
D	Grade	Indicates the quality grade. D : Industrial

## Grade

Composition	Applications	Operating Temperature Range	Test Temperature
D	Industrial equipment and Social infrastructures	-40°C to 125°C	-40°C, 25°C, 125°C



**Nisshinbo Micro Devices Inc.**