



AK2910

Zero Drift operational amplifiers

### Feature

AK2910 is the single channel CMOS operational amplifiers which is available to output with very low input offset voltage ( $\pm 1.0\mu\text{V}$ ) and near zero input offset drift.

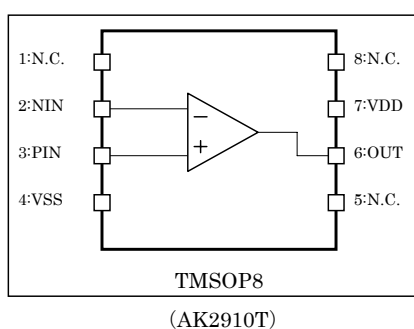
It's operated with very small current consumptions,  $800\mu\text{A}$  typ. ( $V_{\text{DD}}: 5.0\text{V}$ ), which is available to operate full swing signals in output.

AK2910 is appropriated to Sensor Pre Amp. applications.

- ☐ Low Voltage, Single Supply Operation :  $2.7\text{V} \sim 5.5\text{V}$
- ☐ Very Low Input Offset Voltage :  $\pm 1.0\mu\text{V}$  typ.
- ☐ Near Zero Drift over time and temperature :  $\pm 2.0\text{nV}/^\circ\text{C}$  typ.
- ☐ Full Swing Outputs to  $10\text{k}\Omega$  Load
- ☐ Power Supply Current :  $800\mu\text{A}$  typ. ( $V_{\text{DD}}: 5.0\text{V}$ , No Load)
- ☐ Gain Bandwidth :  $2\text{MHz}$  typ.
- ☐ Package : TMSOP8

| Part Name | Channel Number | Package |
|-----------|----------------|---------|
| AK2910T   | 1              | TMSOP8  |

### Pin Location



|                                  |
|----------------------------------|
| <b>Pin Function Descriptions</b> |
|----------------------------------|

| Pin number | Name | I/O note) | Function                                        |
|------------|------|-----------|-------------------------------------------------|
| 1          | N.C. | N.C.      | No Internal Connection (Open or VSS connection) |
| 2          | NIN  | AI        | Amplifier Inverted Input                        |
| 3          | PIN  | AI        | Amplifier No Inverted Input                     |
| 4          | VSS  | PWR       | Power Supply Ground                             |
| 5          | N.C. | N.C.      | No Internal Connection (Open or VSS connection) |
| 6          | OUT  | AO        | Amplifier Output                                |
| 7          | VDD  | PWR       | Positive Power Supply                           |
| 8          | N.C. | N.C.      | No Internal Connection (Open or VSS connection) |

Note)

PWR : Power Supply  
 AI : Analog Input  
 AO : Analog Output  
 N.C. : No Internal Connection

|                                 |
|---------------------------------|
| <b>Absolute Maximum Ratings</b> |
|---------------------------------|

VSS=0V ; Note

| Parameter                 | Symbol           | Min  | Max       | Units |
|---------------------------|------------------|------|-----------|-------|
| Supply Voltage            | VDD              | -0.3 | 6.5       | V     |
| Input Voltage             | V <sub>TD</sub>  | -0.3 | VDD + 0.3 | V     |
| Input Current             | I <sub>IN</sub>  | -10  | +10       | mA    |
| Storage Temperature Range | T <sub>stg</sub> | -55  | 150       | °C    |

Note : All voltage with respect to ground

WARNING :

Operational at or beyond these limits may result in permanent damage to the device. Normal operation is not guaranteed at these extremes.

|                                         |
|-----------------------------------------|
| <b>Recommended Operating Conditions</b> |
|-----------------------------------------|

| Parameter                   | Symbol          | Min. | Typ. | Max. | Units | Conditions        |
|-----------------------------|-----------------|------|------|------|-------|-------------------|
| Operating Temperature Range | T <sub>a</sub>  | -40  |      | 85   | °C    |                   |
| Supply Voltage              | VDD             | 2.7  |      | 5.5  | V     |                   |
| Power Supply Current        | I <sub>dd</sub> |      | 0.8  | 1.5  | mA    | VDD=5.0V, No Load |

\*We assume no responsibility for the usage beyond the conditions in this datasheet.

|                                   |
|-----------------------------------|
| <b>Electrical Characteristics</b> |
|-----------------------------------|

## □ DC Characteristics

VDD:5V, Ta:-40 to 85°C, unless otherwise noted

| Parameter                    | Min. | Typ.                 | Max. | Units | Conditions                   |
|------------------------------|------|----------------------|------|-------|------------------------------|
| Input Voltage Offset         |      | ± 1                  | ± 10 | μV    |                              |
| Input Voltage Offset Drift   |      | ± 2                  | ± 20 | nV/°C |                              |
| Input Bias Current           |      | ± 100                |      | pA    |                              |
| Input Common Mode Range      |      | 0.0 ~<br>[VDD-0.2]   |      | V     |                              |
| Output Voltage Swing         |      | 0.03 ~<br>[VDD-0.03] |      | V     | RL ≥ 10kΩ connected to VDD/2 |
| Common Mode Rejection Ratio  | 110  | 130                  |      | dB    |                              |
| Power Supply Rejection Ratio | 110  | 130                  |      | dB    |                              |
| Large Signal Voltage Gain    | 110  | 130                  |      | dB    | RL ≥ 10kΩ connected to VDD/2 |
| Short Circuit Current        |      | ± 50                 |      | mA    |                              |
| Output Current               |      | ± 25                 |      | mA    |                              |

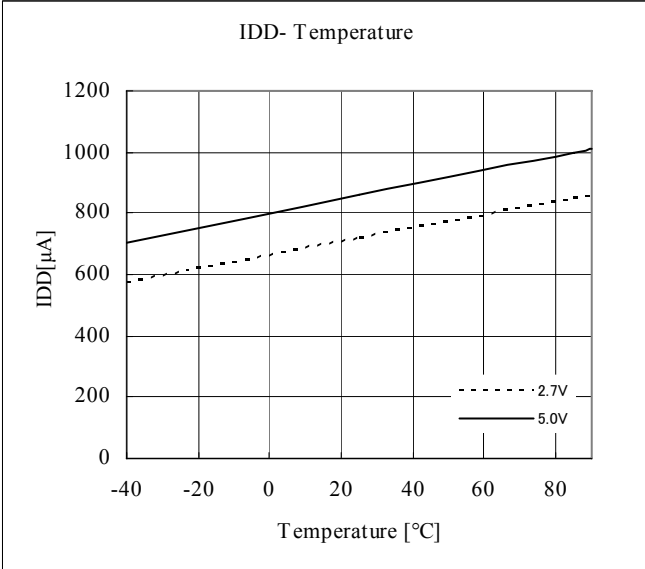
## □ AC Characteristics

VDD:5V, Ta:-40 to 85°C, unless otherwise noted

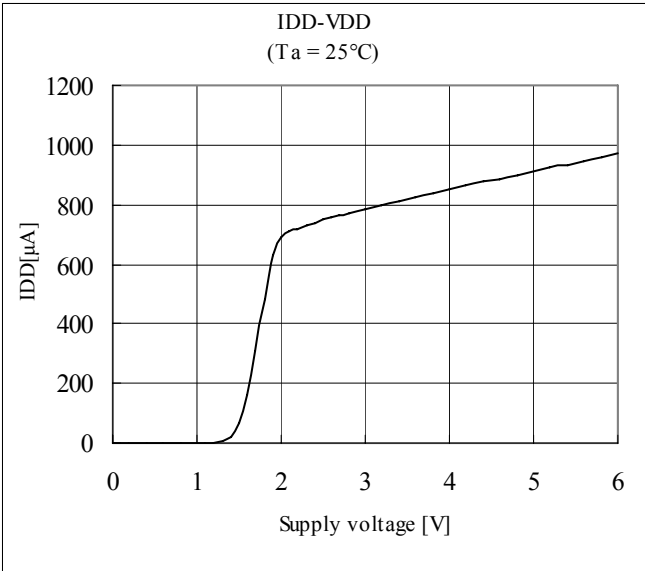
| Parameter                 | Min.         | Typ. | Max. | Units         | Conditions |
|---------------------------|--------------|------|------|---------------|------------|
| Gain Bandwidth            |              | 2    |      | MHz           | Av:1V/V    |
| Slew Rate                 |              | 1    |      | V/μs          | Av:1V/V    |
| Input Voltage Noise       |              | 25   |      | nVrms<br>/√Hz | f:1kHz     |
|                           | 0.1 – 10Hz   | 0.2  |      | μVpp          |            |
|                           | 0.1 – 1Hz    | 0.1  |      | μVpp          |            |
| Overload Recovery Time    |              | 0.02 |      | msec          | Av:1V/V    |
| Input Capacitance         | Differential | 1.5  |      | pF            |            |
|                           | Common Mode  | 12   |      | PF            |            |
| Maximum Capacitance Loads |              |      | 150  | pF            |            |

Typical Operating Characteristics

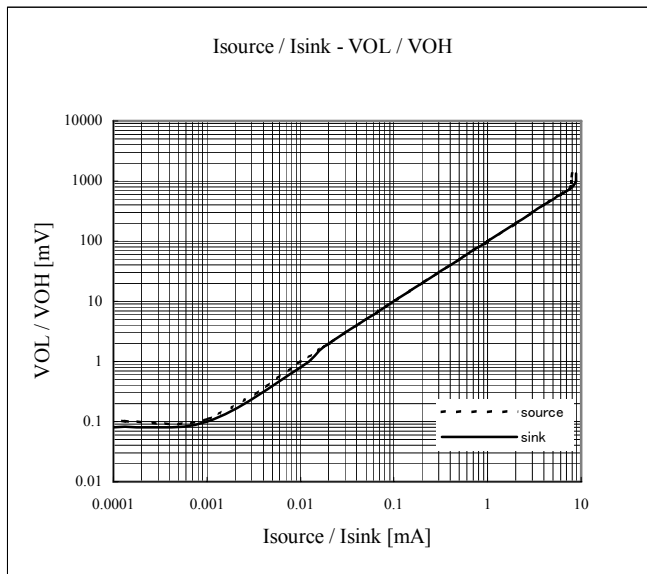
□ Supply Current vs. Temperature  
(Vin:1/2VDD)



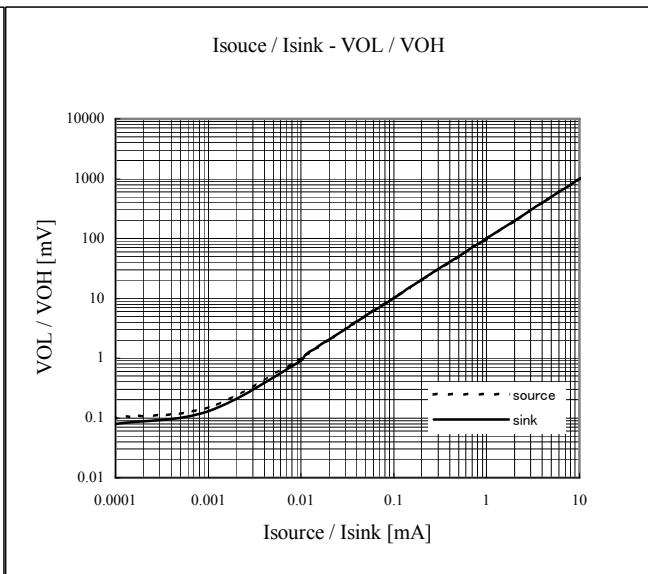
□ Supply Current vs. Supply Voltage  
(Vin:1/2VDD)



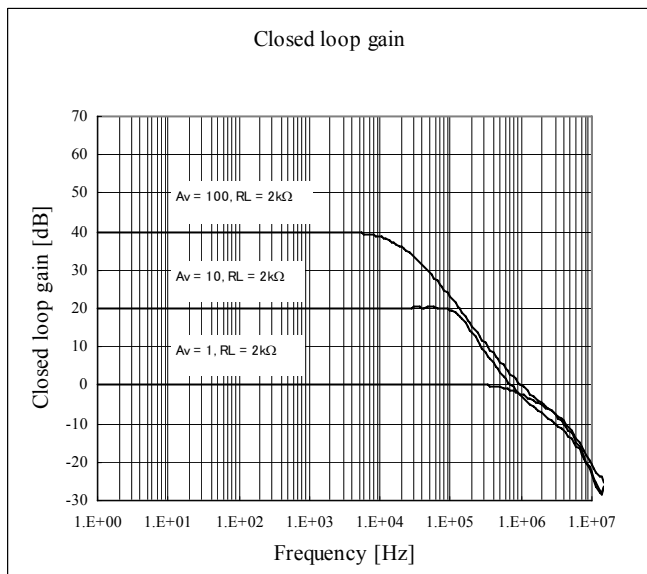
□ Output voltage vs. Load current  
(VDD=2.7V, Ta=25°C)



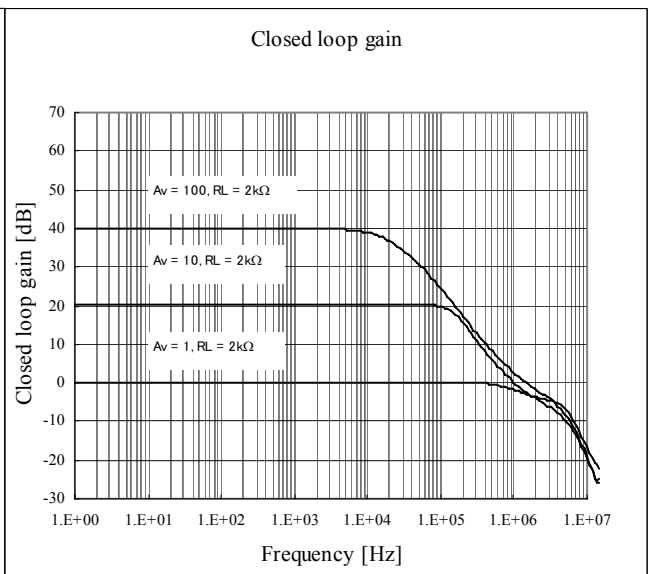
□ Output voltage vs. Load current  
(VDD=5V, Ta=25°C)



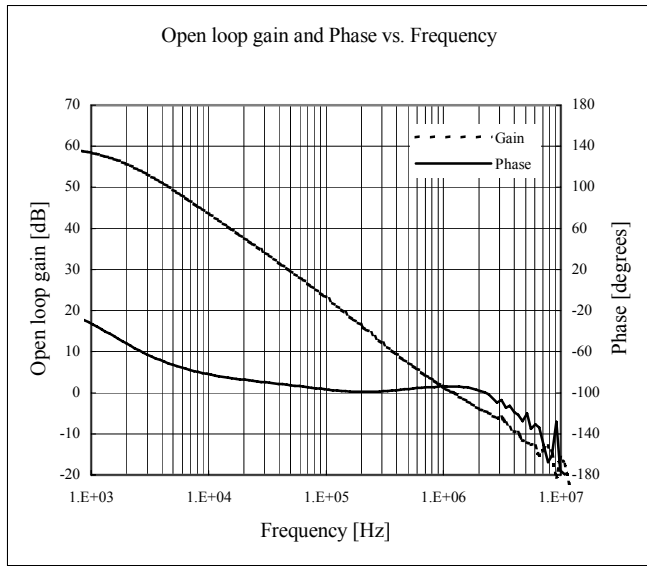
□ Closed loop gain vs. Frequency  
(VDD=2.7V, Ta=25°C)



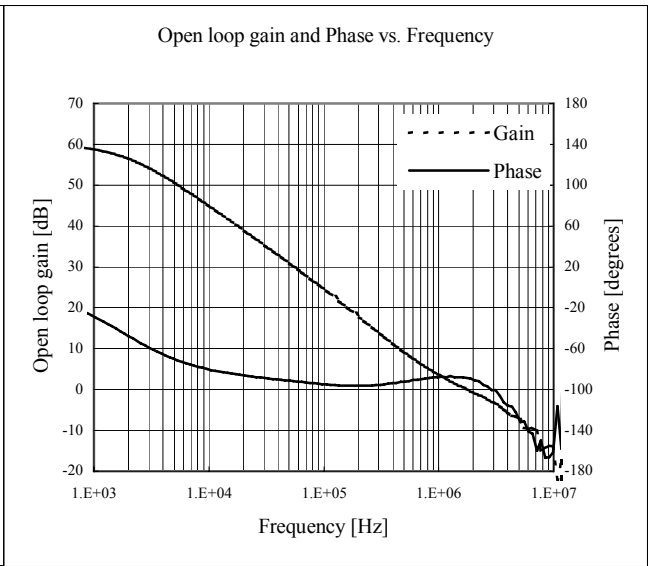
□ Closed loop gain vs. Frequency  
(VDD=5V, Ta=25°C)



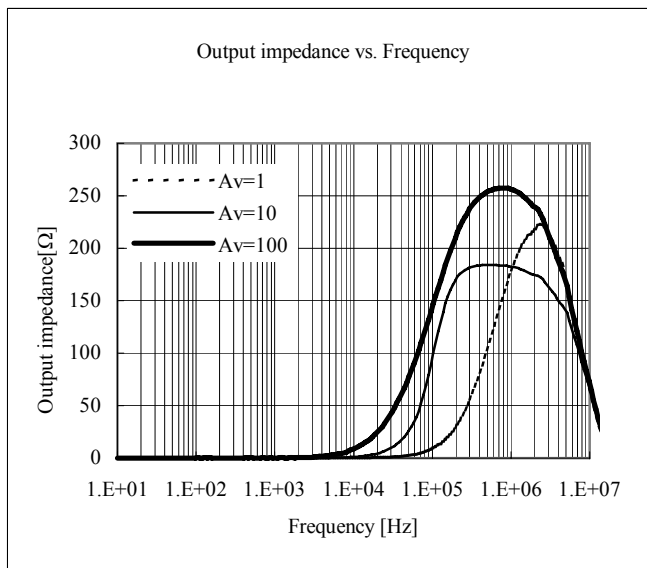
□ Open loop gain and Phase vs. Frequency  
(VDD=2.7V, Ta=25°C)



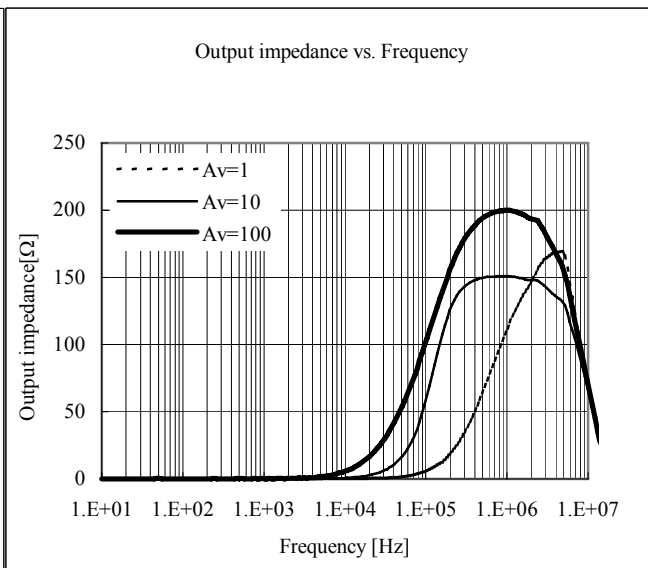
□ Open loop gain and Phase vs. Frequency  
(VDD=5V, Ta=25°C)



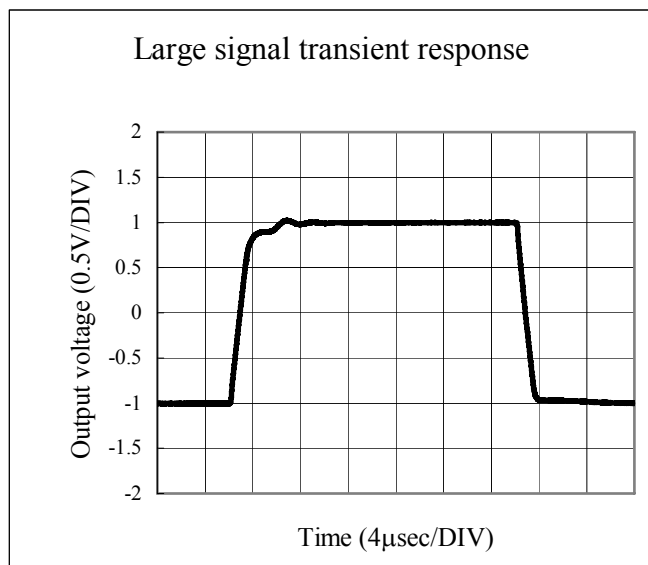
□ Output impedance vs. Frequency  
(VDD=2.7V, Ta=25°C)



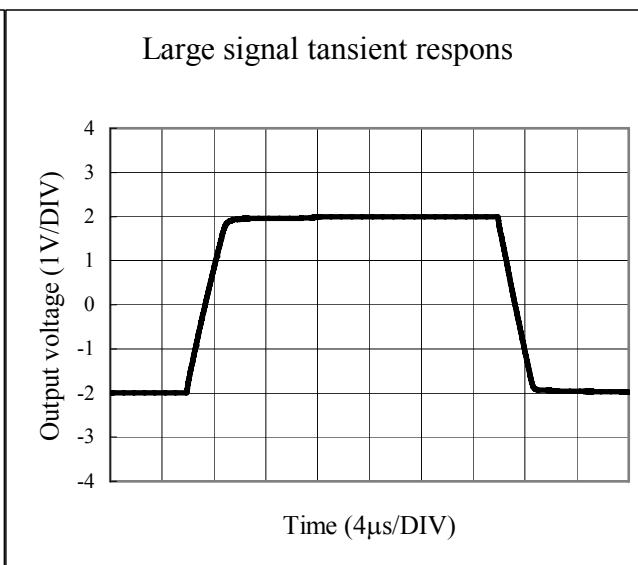
□ Output impedance vs. Frequency  
(VDD=5V, Ta=25°C)



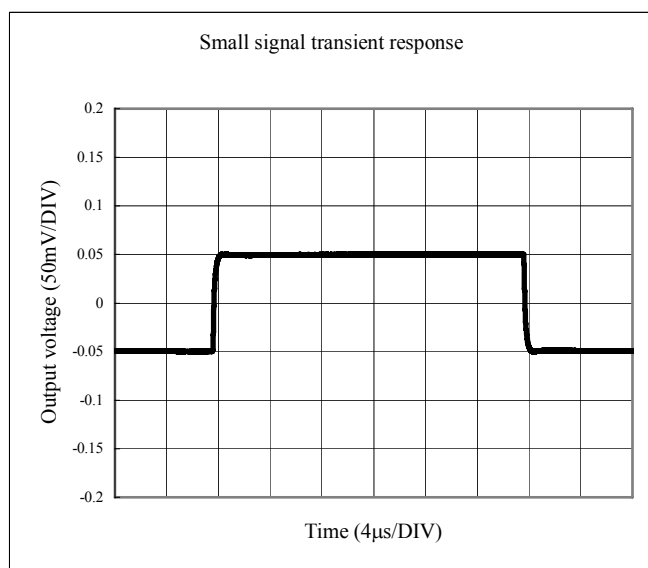
- Large signal transient response  
(VDD/VSS = +1.35V/-1.35V,  
Ta = 25°C, CL = 150pF)



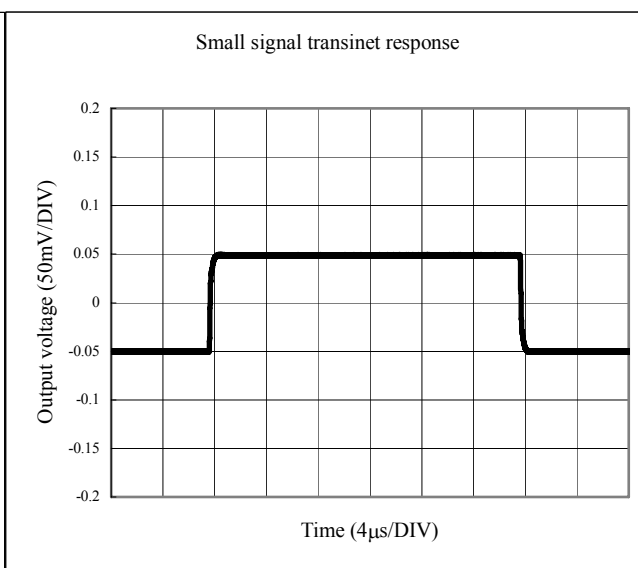
- Large signal transient response  
(VDD/VSS = +2.5V/-2.5V  
Ta = 25°C, CL = 150pF)



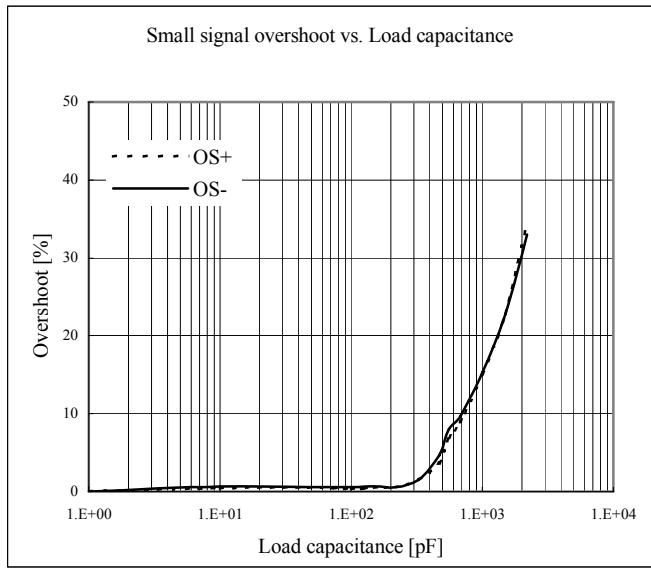
- Small signal transient response  
(VDD/VSS = +1.35V/-1.35V,  
Ta = 25°C, CL = 150pF)



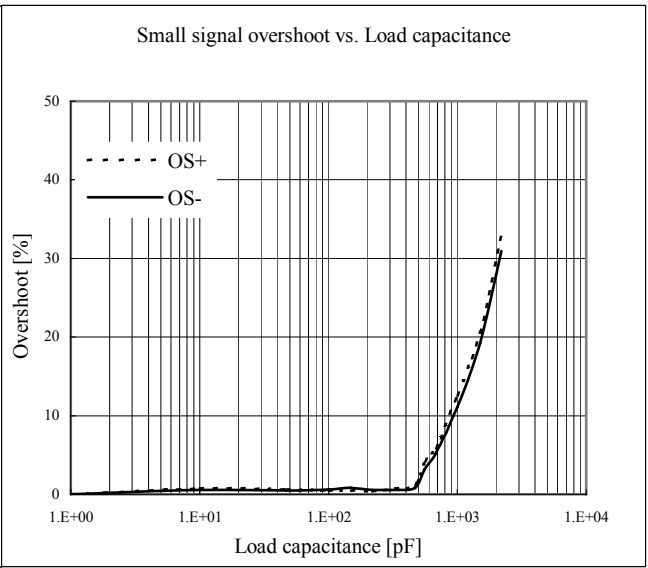
- Small signal transient response  
(VDD/VSS = +2.5V/-2.5V  
Ta = 25°C, CL = 150pF)



□ Small signal overshoot vs. Load Capacitance  
(VDD=2.7V, Ta=25°C)

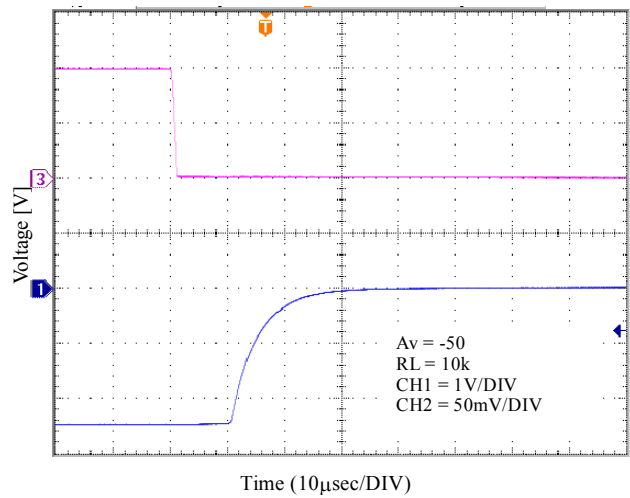


□ Small signal overshoot vs. Load Capacitance  
(VDD=5V, Ta=25°C)



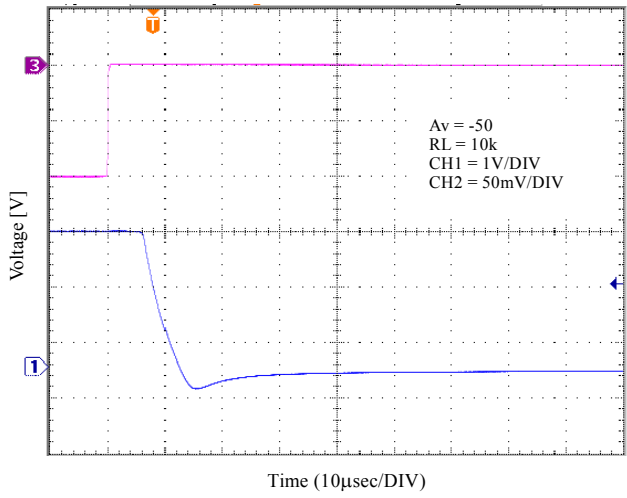
□ Positive overvoltage recovery  
(VDD/VSS = +2.5V/-2.5V, Ta = 25°C)

Positive overvoltage recovery

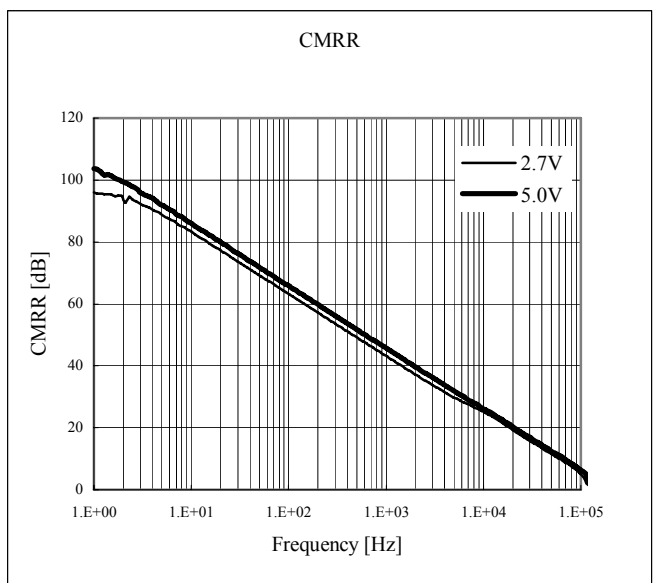


□ Negative overvoltage recovery  
(VDD/VSS = +2.5V/-2.5V, Ta = 25°C)

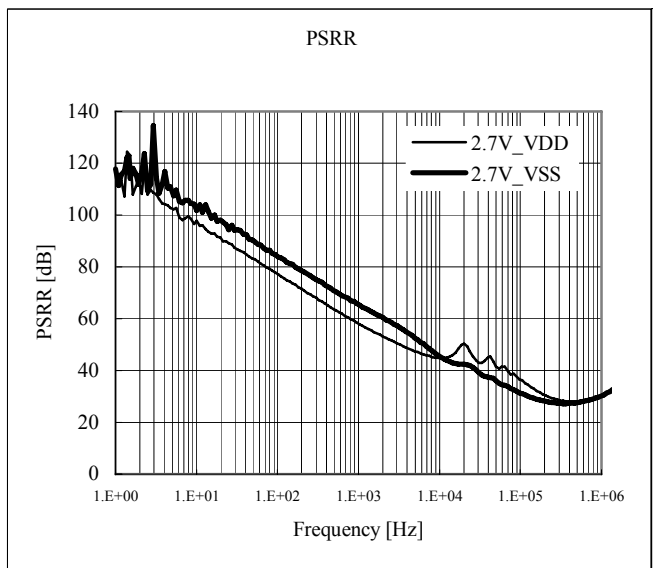
Negative overvoltage recovery



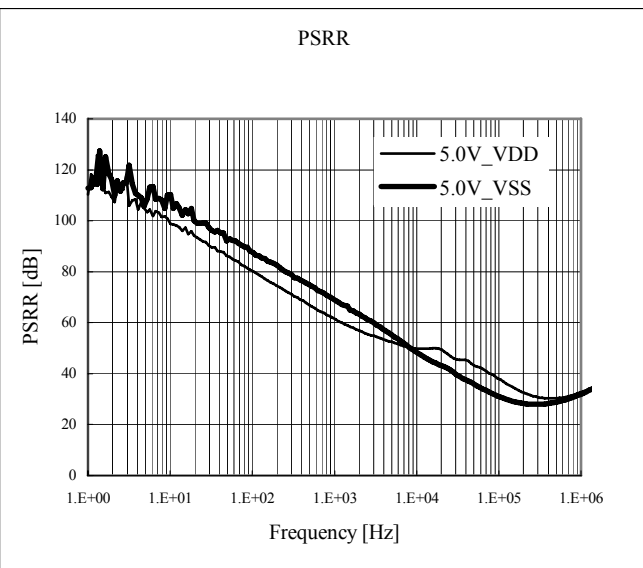
□ Common Mode Rejection Ratio vs. Frequency



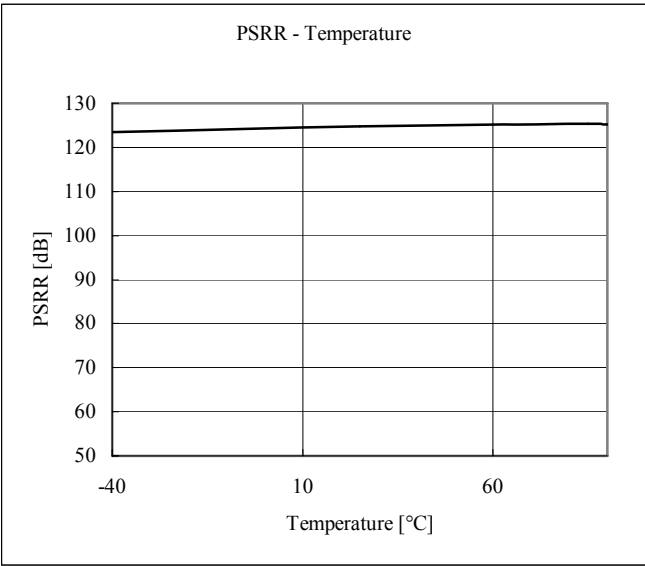
□ Power Supply Rejection Ratio vs. Frequency  
(VDD=2.7V, Ta=25°C)



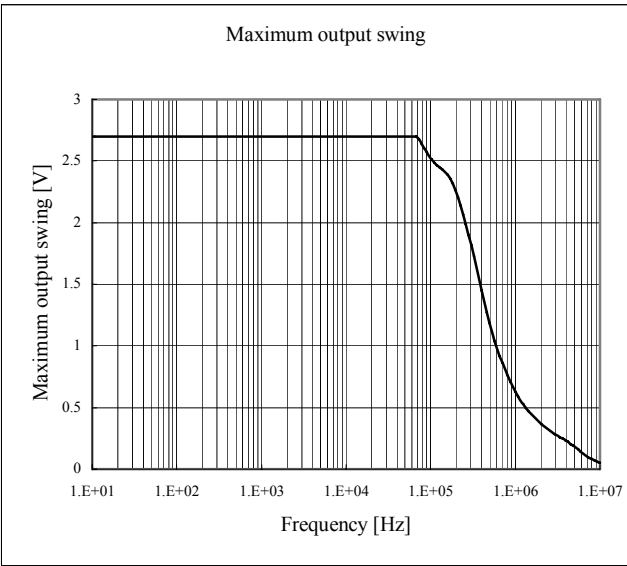
□ Power Supply Rejection Ratio vs. Frequency  
(VDD=5V, Ta=25°C)



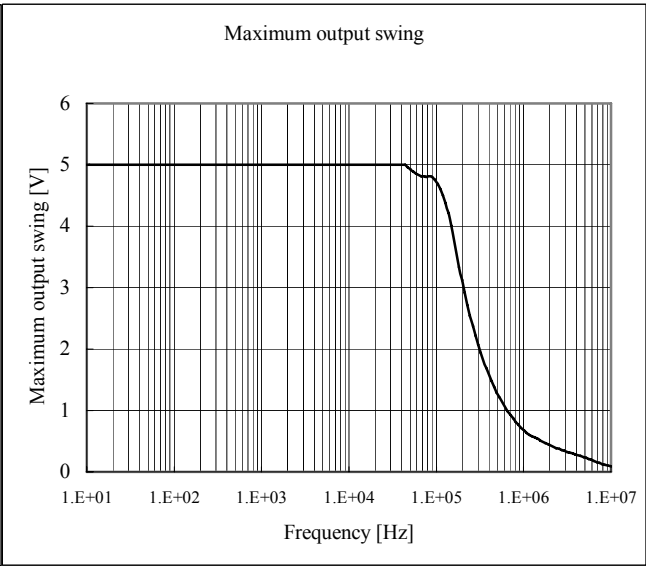
□ Power Supply Rejection Ratio vs. Temperature  
(VDD=5V)



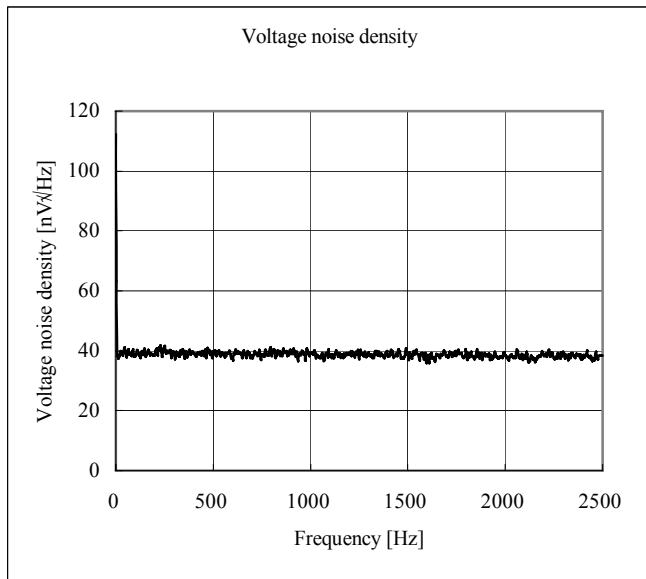
□ Maximum output swing vs. Frequency  
(VDD=2.7V, Ta=25°C, Av = 1, RL = 10kΩ)



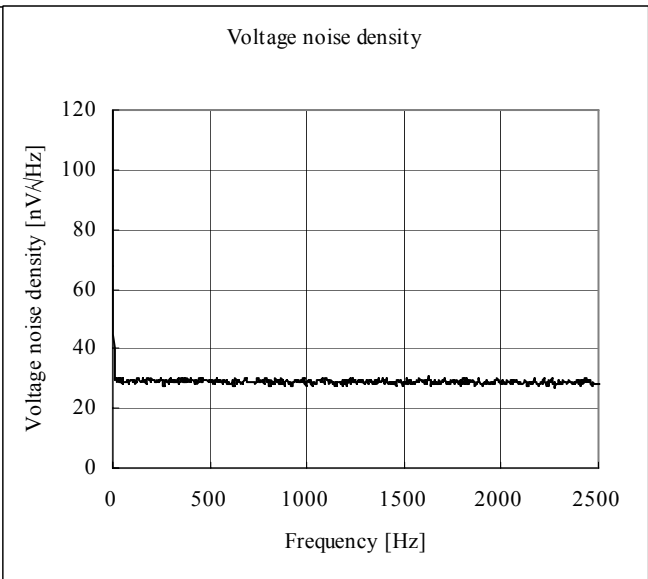
□ Maximum output swing vs. Frequency  
(VDD=5V, Ta=25°C, Av = 1, RL = 10kΩ)



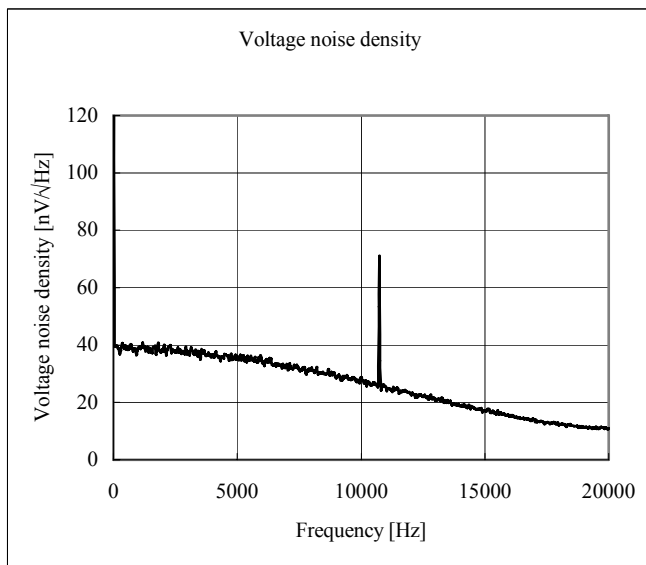
□ Voltage noise density  
(VDD=2.7V, Ta=25°C, f=0~2.5kHz)



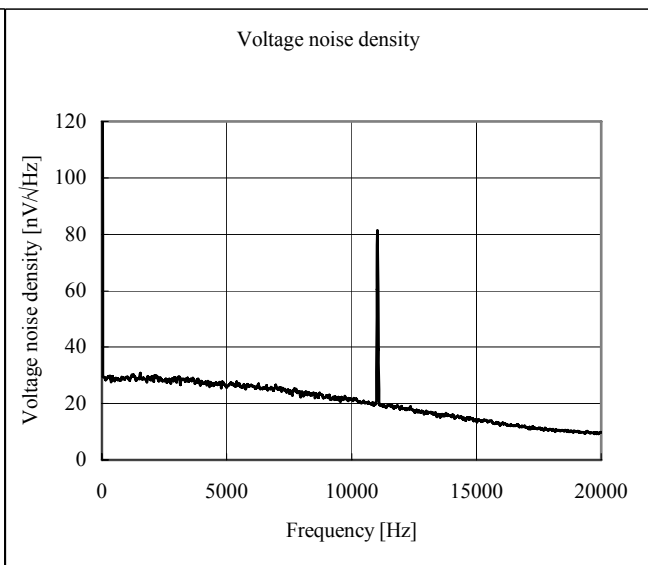
□ Voltage noise density  
(VDD=5V, Ta=25°C, f=0~2.5kHz)



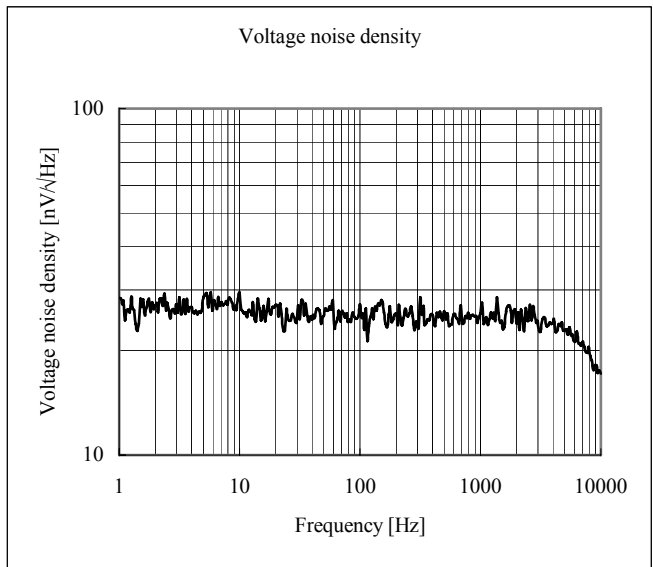
□ Voltage noise density  
(VDD=2.7V, Ta=25°C, f=0~20kHz)



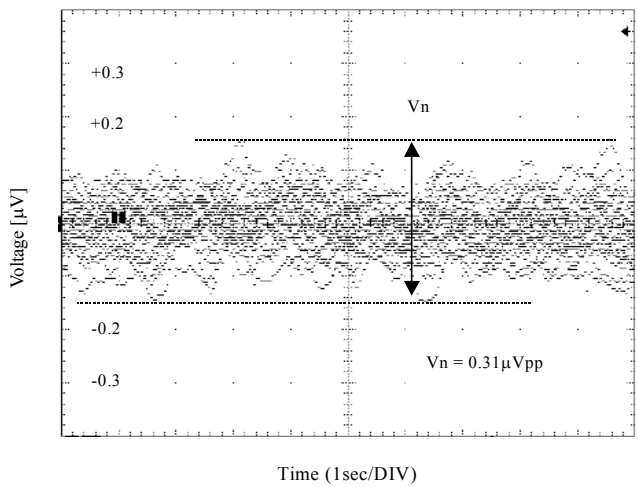
□ Voltage noise density  
(VDD=5V, Ta=25°C, f=0~20kHz)



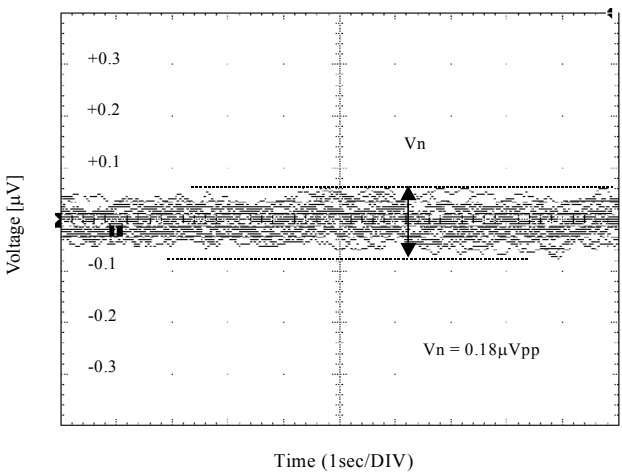
□ Voltage noise density  
(VDD=5V, Ta=25°C, f=1~10kHz)



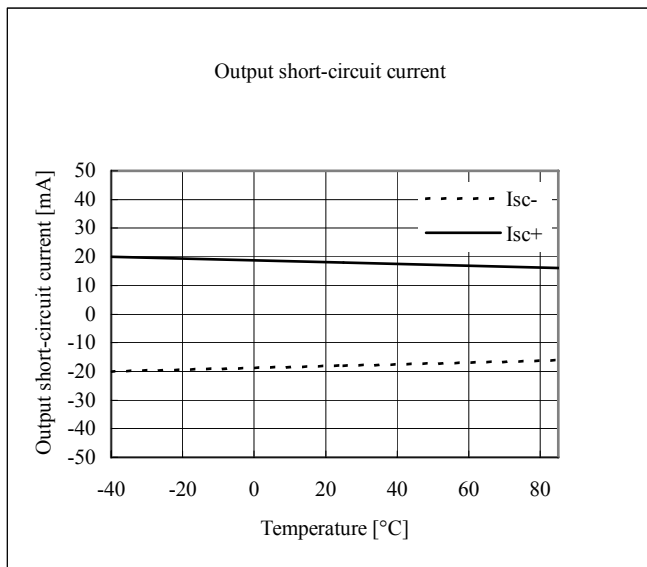
□ Voltage noise  
(VDD=2.7V, Ta=25°C, f=0.1~10Hz)  
0.1Hz to 10Hz Noise



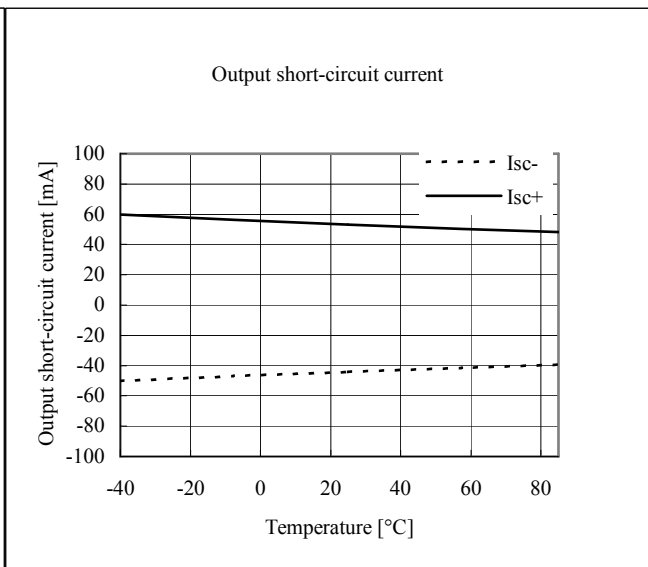
□ Voltage noise  
(VDD=5V, Ta=25°C, f=0.1~10Hz)  
0.1Hz to 10Hz Noise



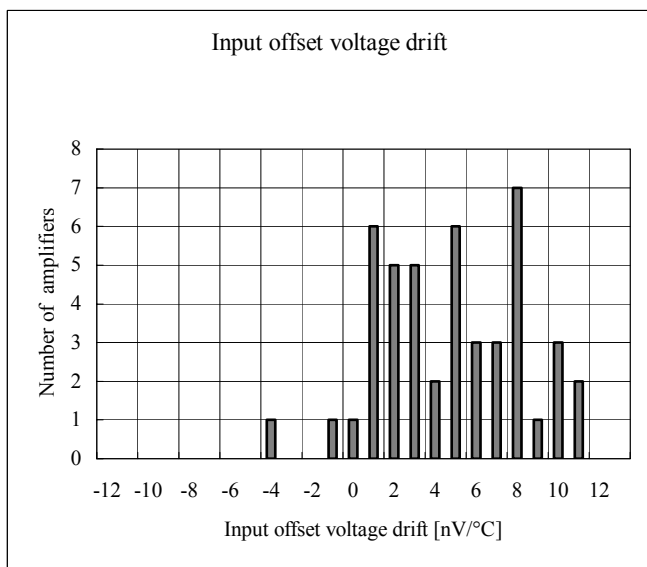
□ Output short-circuit current vs. Temperature  
(VDD=2.7V, Ta=-40 to 85°C)



□ Maximum output swing vs. Frequency  
(VDD=5V, Ta=25°C, Ta=-40 to 85°C)



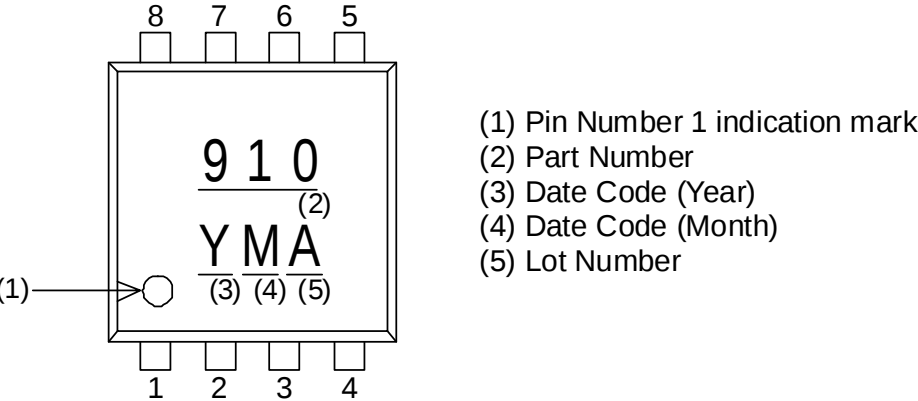
□ Input offset voltage drift(VDD=5V, Ta=25°C, Ta=-40 to 85°C)



Package

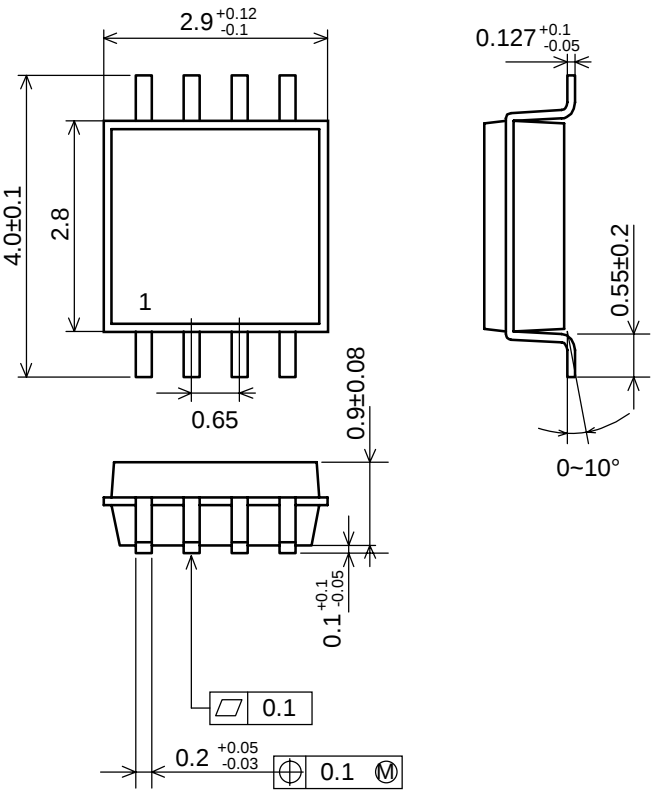
1. Marking

1.1 TMSOP8



2. Outline Dimensions

2.1 TMSOP8 Package Outline (UNIT:mm)



## IMPORTANT NOTICE

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