



# AK2920

## Zero Drift operational amplifiers

### Feature

AK2920 is the dual 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.

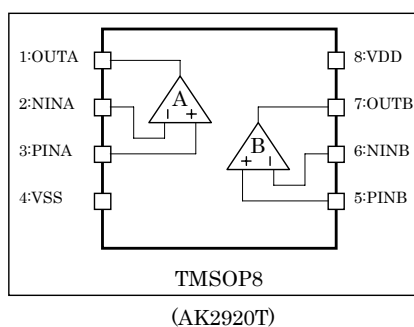
It's operated with very small current consumptions,  $800\mu\text{A}$  typ./ch (VDD:5.0V), which is available to operate full swing signals in output.

AK2920 is appropriated to Sensor Pre Amp. applications.

- Low Voltage, Single Supply Operation : 2.7V - 5.5V
- 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./ch (VDD: 5.0V, No Load)
- Gain Bandwidth : 2MHz typ.
- Package : TMSOP8

Part Name	Channel Number	Package
AK2920T	2	TMSOP8

### Pin Location



<b>Pin Function Descriptions</b>
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Pin number	Name	I/O note)	Function
1	OUTA	AO	Amplifier A Output
2	NINA	AI	Amplifier A Inverted Input
3	PINA	AI	Amplifier A No Inverted Input
4	VSS	PWR	Power Supply Ground
5	PINB	AI	Amplifier B No Inverted Input
6	NINB	AI	Amplifier B Inverted Input
7	OUTB	AO	Amplifier B Output
8	VDD	PWR	Positive Power Supply

Note)

PWR : Power Supply  
 AI : Analog Input  
 AO : Analog Output

<b>Absolute Maximum Ratings</b>
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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>
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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>dd1</sub>		0.8	1.5	mA/ch	VDD=5.0V, No Load

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

<b>Electrical Characteristics</b>
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## □ 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 – VDD-0.2		V	
Output Voltage Swing		0.03 – 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	

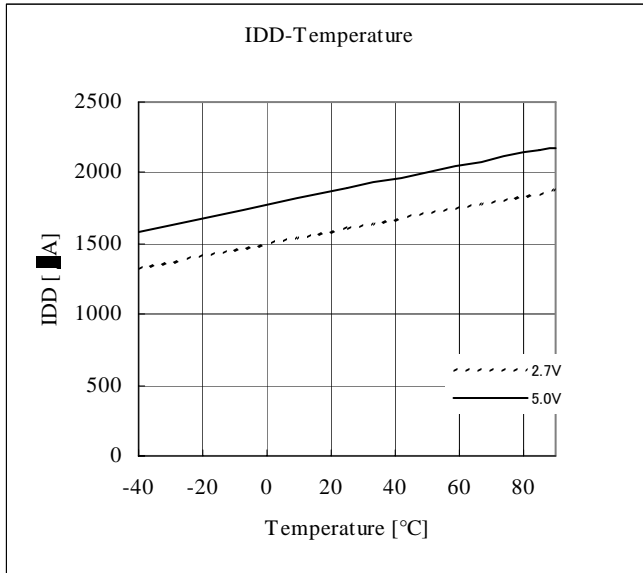
## □ AC Characteristics

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

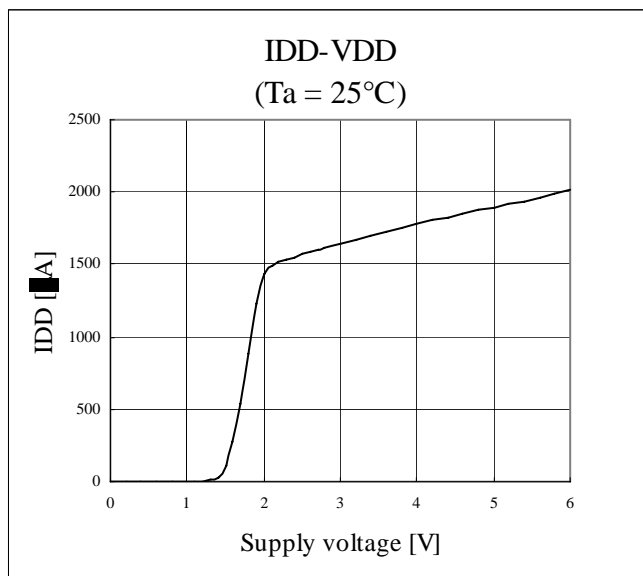
Parameter	Min.	Typ.	Max.	Units	Conditions
Gain Bandwidth		2		MHz	Av:1V/V
Slew Rate		1		V/μs	Av:1V/V
Input Voltage Noise		25		nVrms /√Hz	f:1kHz
	0.1 – 10Hz	0.2		μVpp	
	0.1 – 1Hz	0.1		μVpp	
Overload Recovery Time		0.02		msec	Av:1V/V
Input Capacitance	Differential	1.5		pF	
	Common Mode	12		PF	
Maximum Capacitance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

**Typical Operating Characteristics**

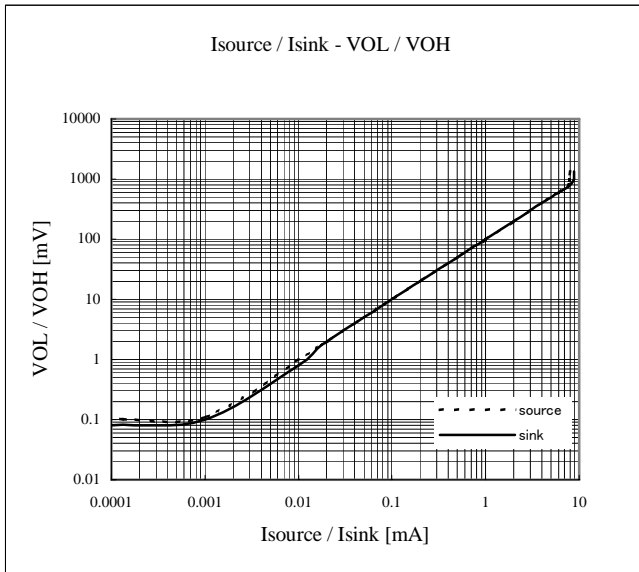
□ Supply Current vs. Temperature  
( $V_{in}: 1/2V_{DD}$ )



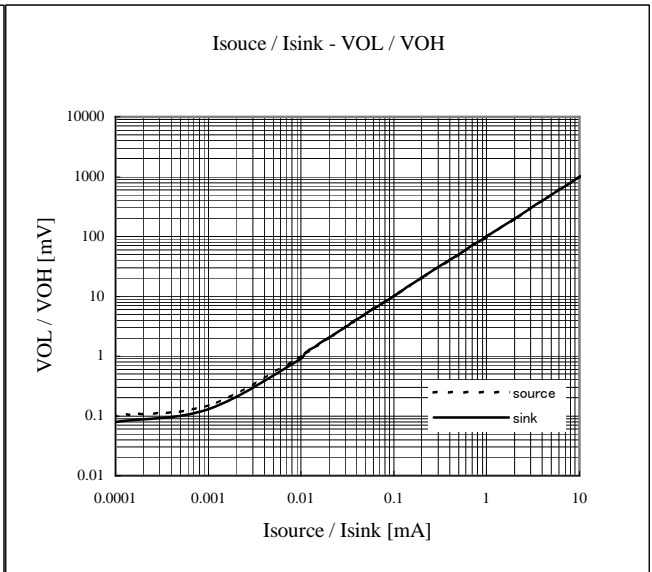
□ Supply Current vs. Supply Voltage  
( $V_{in}: 1/2V_{DD}$ )



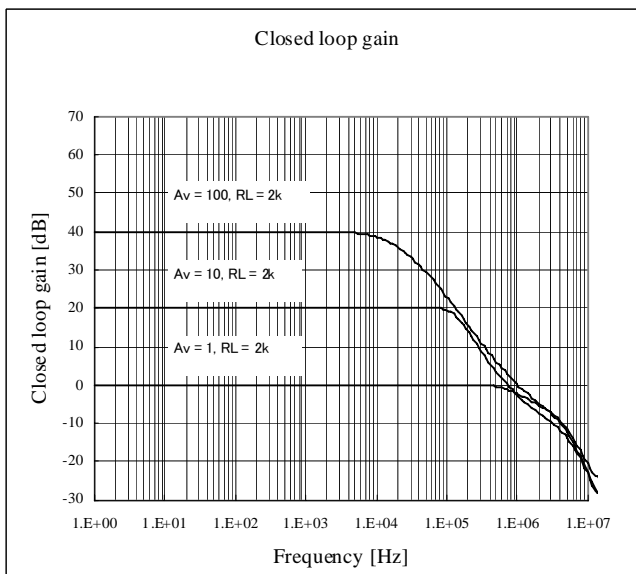
□ Output voltage vs. Load current  
(VDD=2.7V, Ta=25°C)



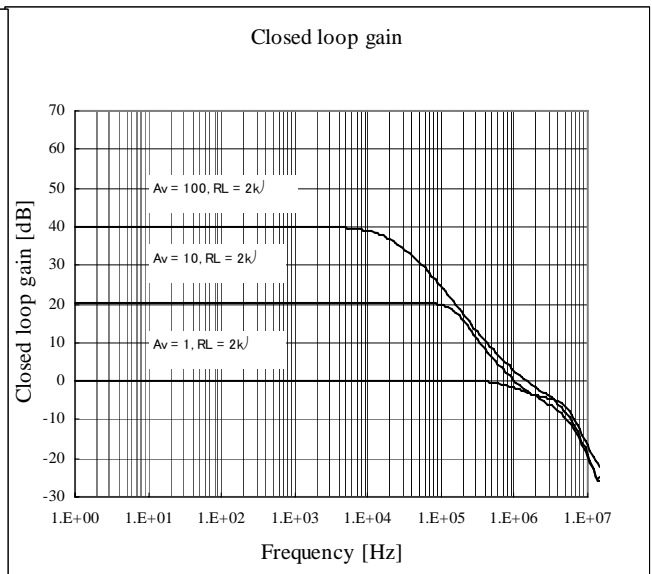
□ Output voltage vs. Load current  
(VDD=5V, Ta=25°C)



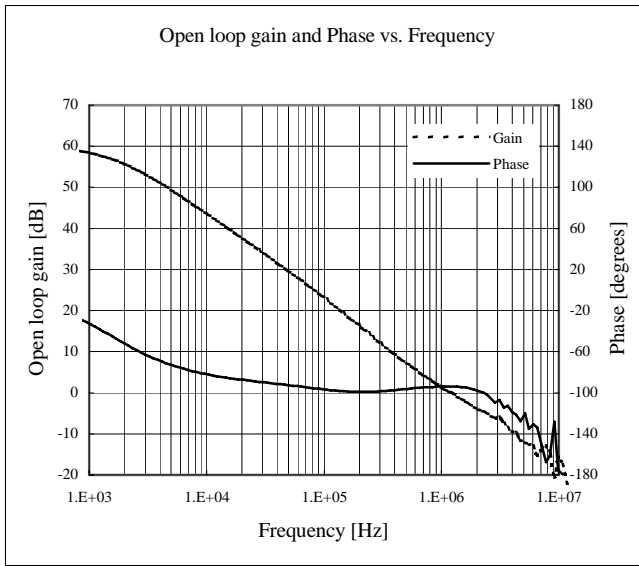
□ Closed loop gain vs. Frequency  
(VDD=2.7V, Ta=25°C)



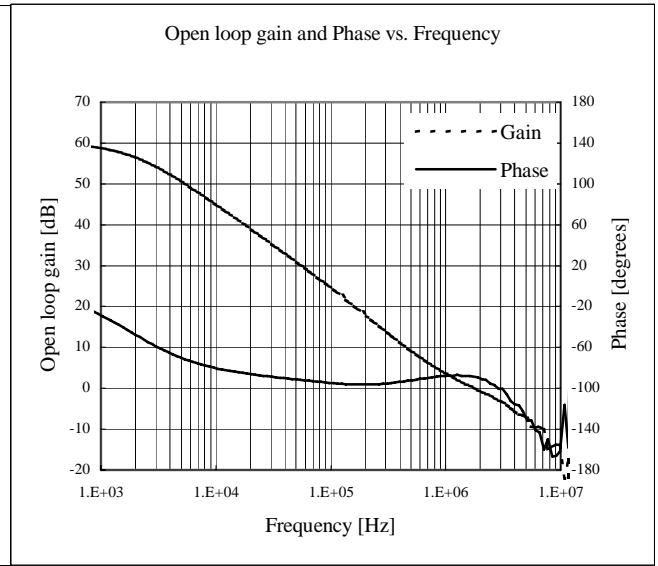
□ Closed loop gain vs. Frequency  
(VDD=5V, Ta=25°C)



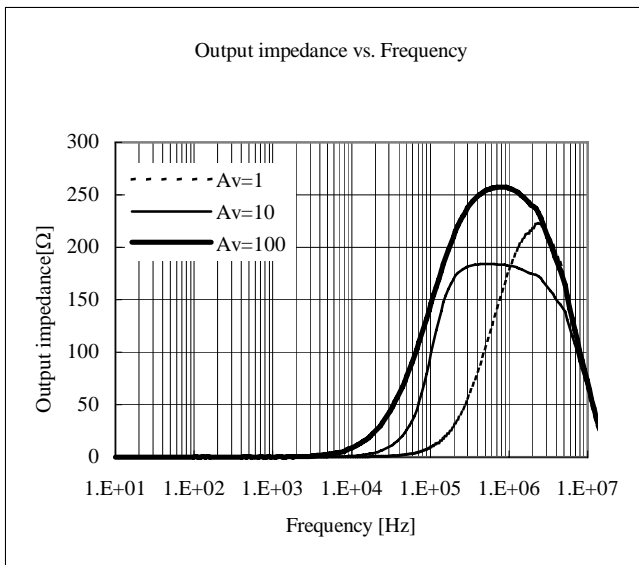
□ Open loop gain and Phase vs. Frequency  
(VDD=2.7V, Ta=25°C)



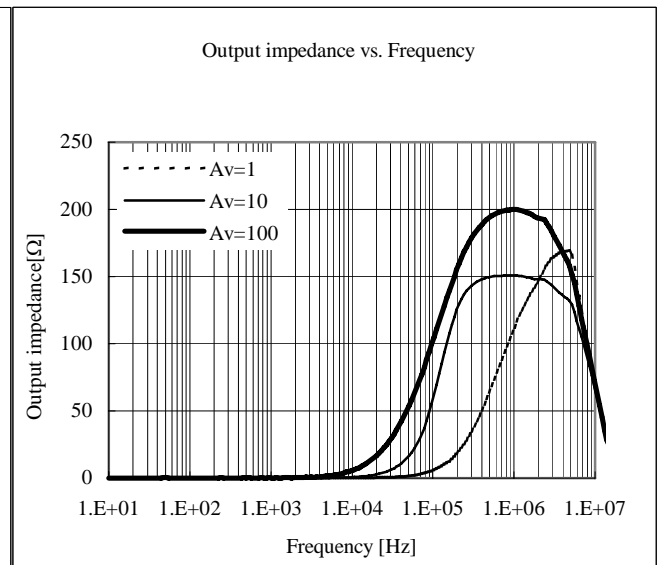
□ Open loop gain and Phase vs. Frequency  
(VDD=5V, Ta=25°C)



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

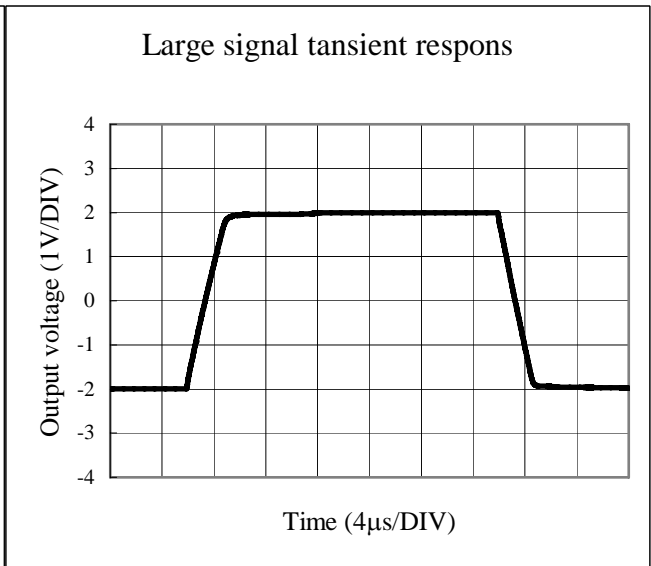
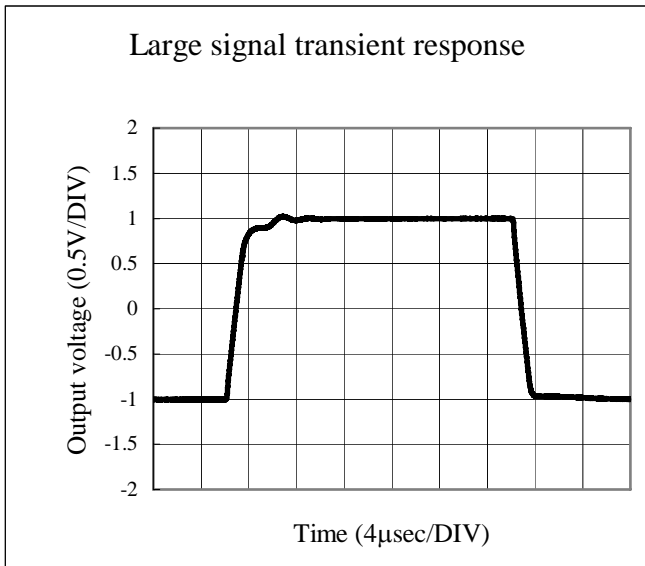


□ Output impedance vs. Frequency  
(VDD=5V, Ta=25°C)



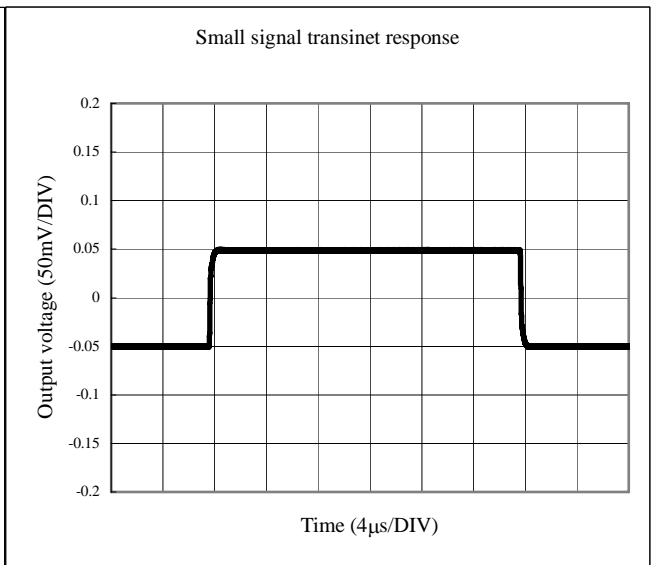
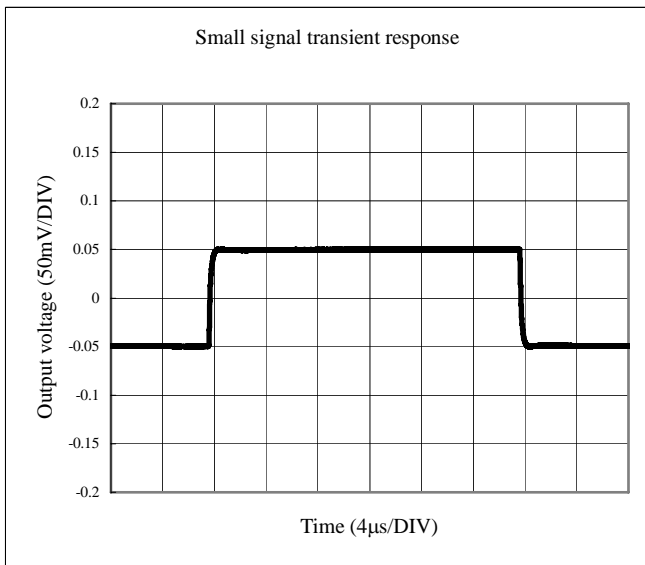
□ Large signal transient response  
 (VDD/VSS = +1.35V/- 1.35V,  
 Ta = 25°C, CL = 150pF)

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



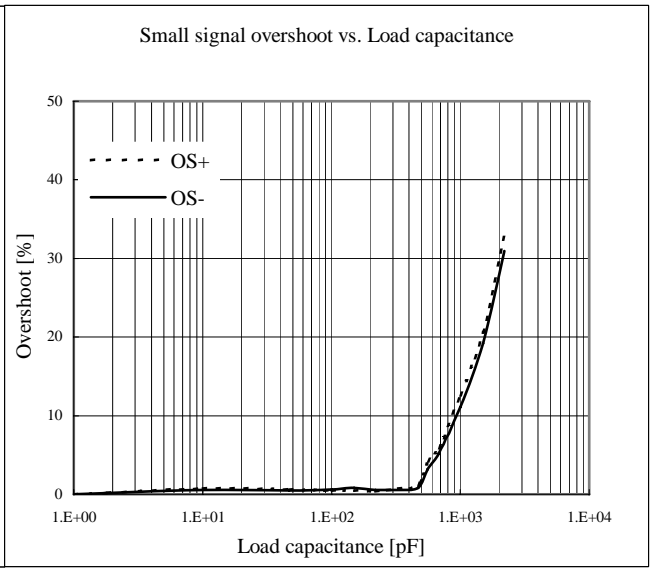
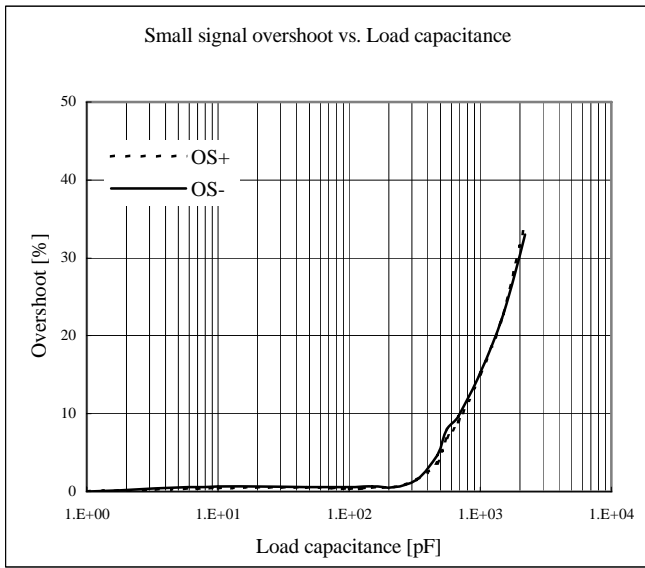
□ Small signal transient response  
 (VDD/VSS = +1.35V/- 1.35V,  
 Ta = 25°C, CL = 150pF)

□ 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)

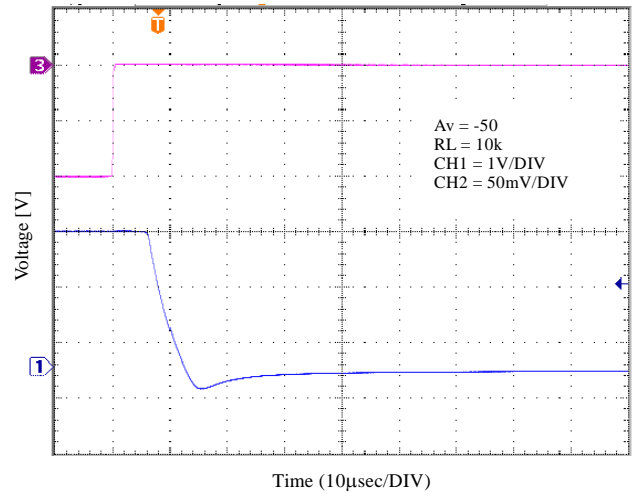
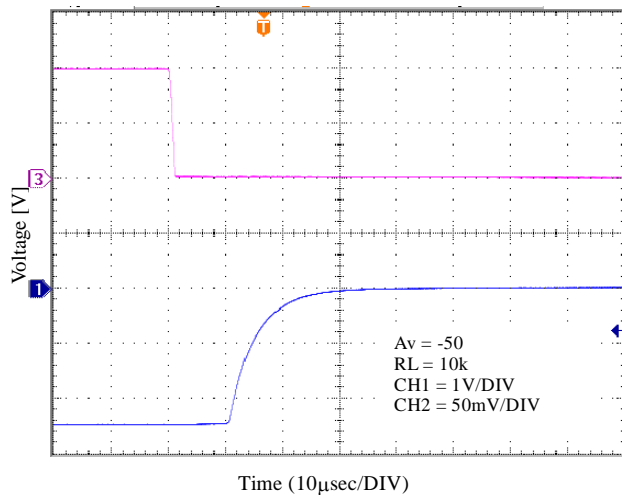


□ Positive overvoltage recovery  
(VDD/VSS = +2.5V/-2.5V, Ta = 25°C)

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

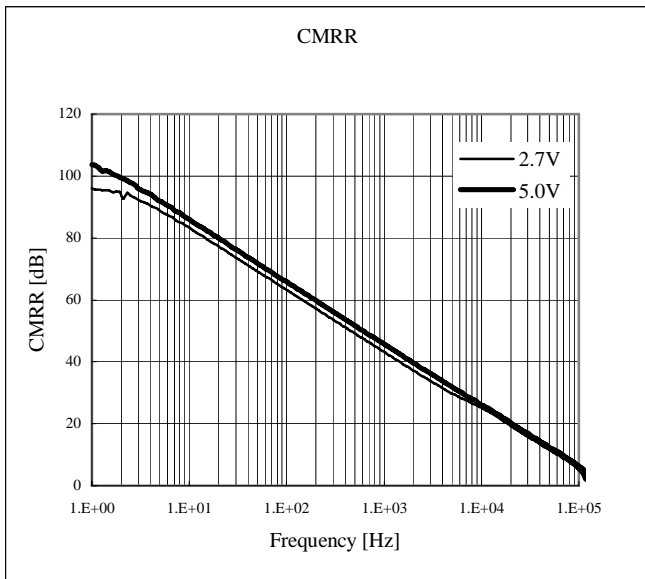
Positive overvoltage recovery

Negative overvoltage recovery

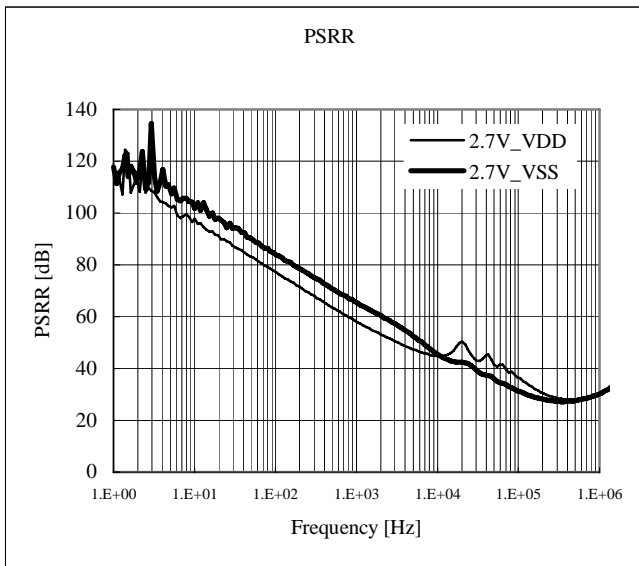




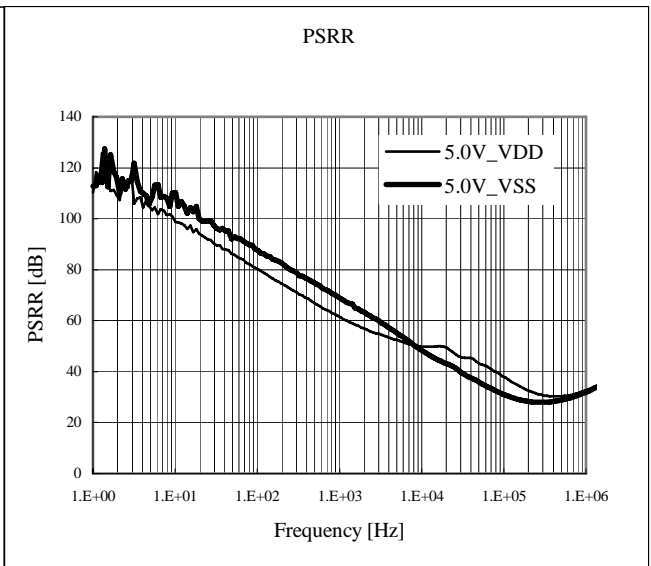
□ Common Mode Rejection Ratio vs. Frequency



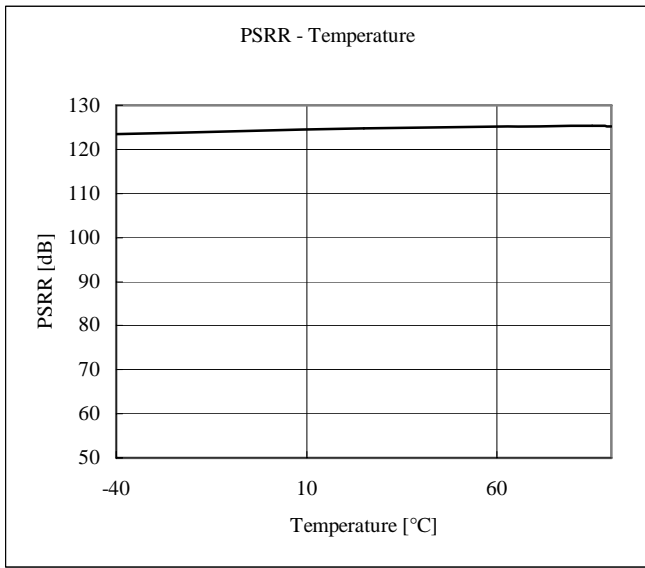
□ Power Supply Rejection Ratio vs. Frequency  
(VDD=2.7V, Ta=25°C)



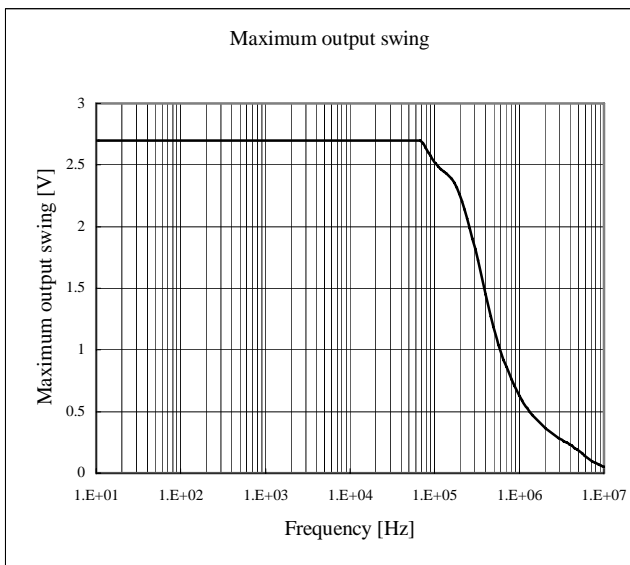
□ Power Supply Rejection Ratio vs. Frequency  
(VDD=5V, Ta=25°C)



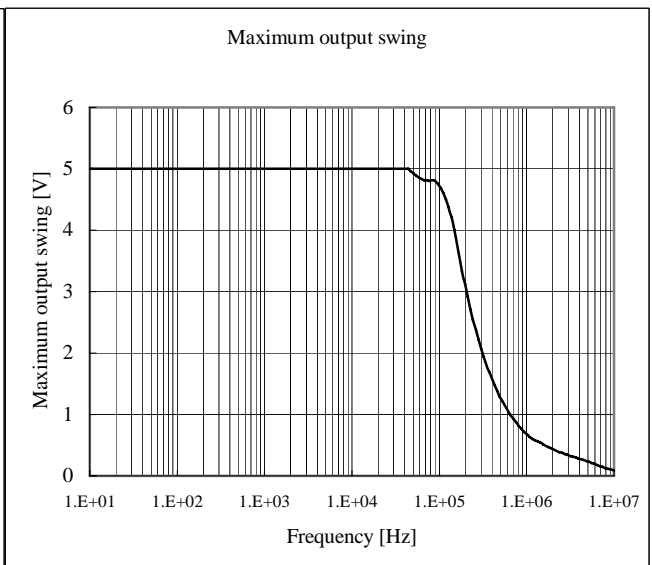
□ Power Supply Rejection Ratio vs. Temperature  
(VDD=5V)



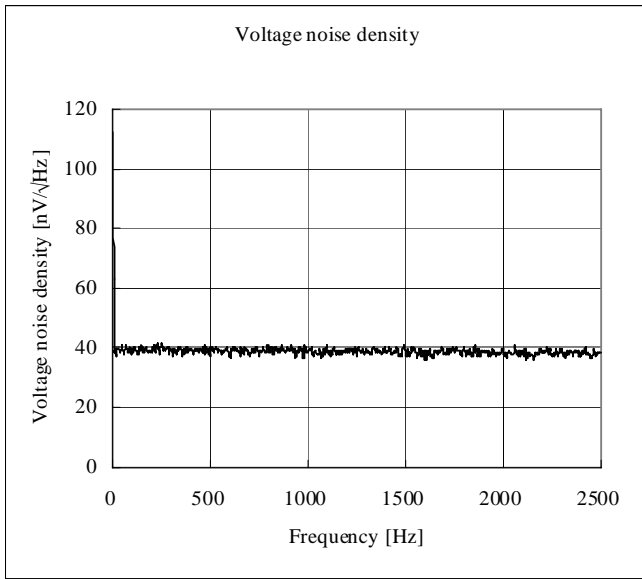
□ Maximum output swing vs. Frequency  
(VDD=2.7V, Ta=25°C, Av = 1, RL = 10kΩ)



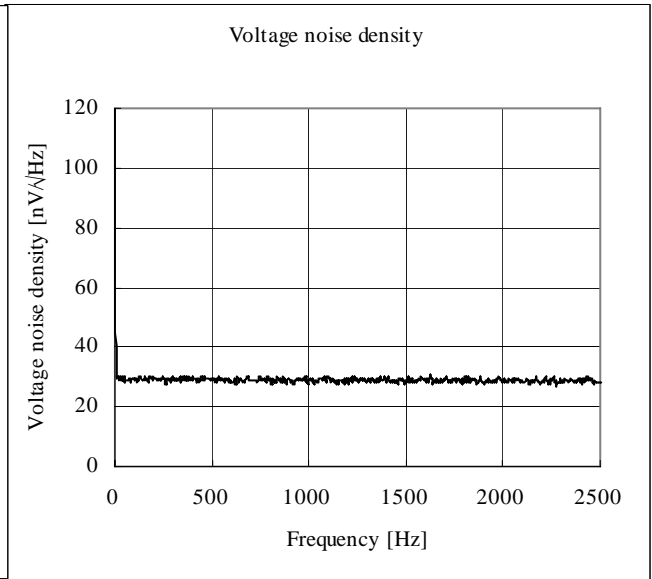
□ Maximum output swing vs. Frequency  
(VDD=5V, Ta=25°C, Av = 1, RL = 10kΩ)



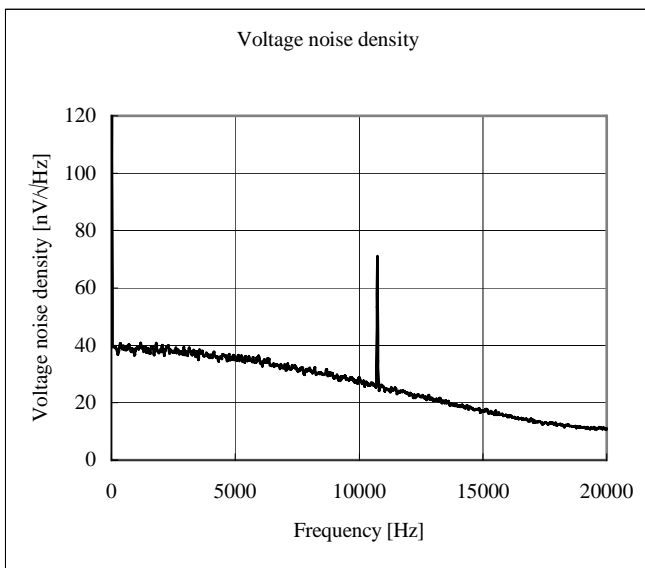
□ Voltage noise density  
(VDD=2.7V, Ta=25°C, f=0~2.5kHz)



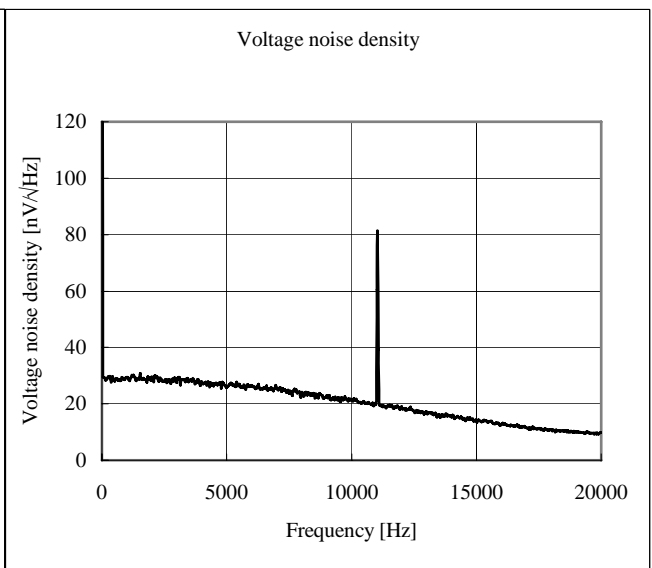
□ Voltage noise density  
(VDD=5V, Ta=25°C, f=0~2.5kHz)



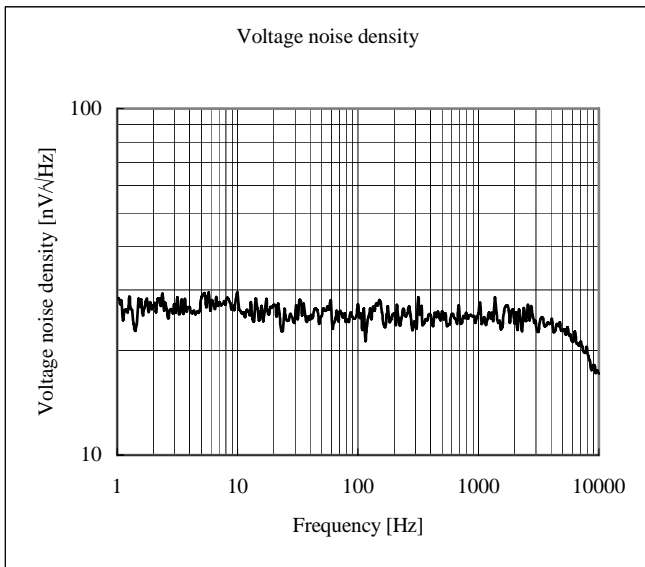
□ Voltage noise density  
(VDD=2.7V, Ta=25°C, f=0~20kHz)



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

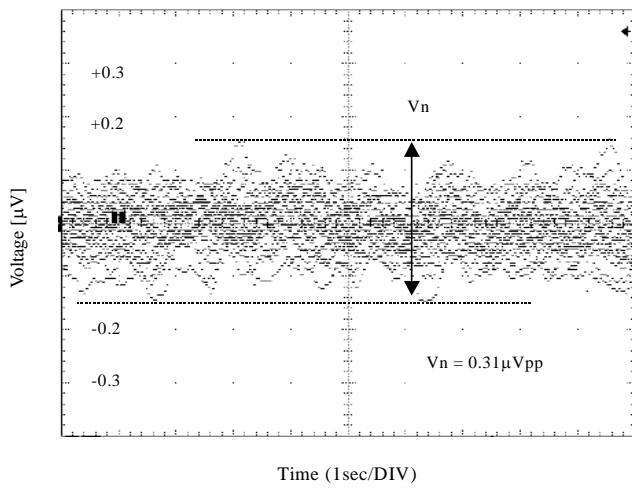


- Voltage noise density  
(VDD=5V, Ta=25°C, f=1~10kHz)



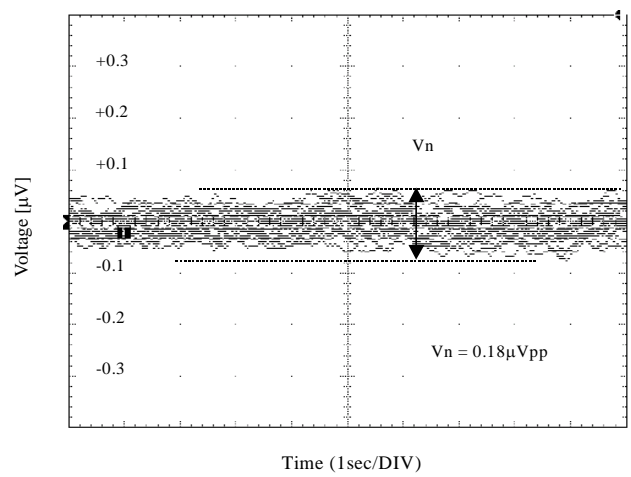
- Voltage noise  
(VDD=2.7V, Ta=25°C, f=0.1~10Hz)

0.1Hz to 10Hz Noise

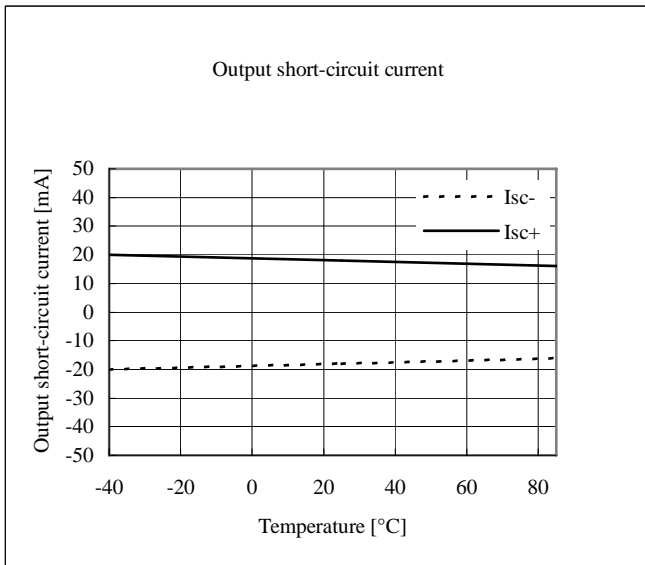


- Voltage noise  
(VDD=5V, Ta=25°C, f=0.1~10Hz)

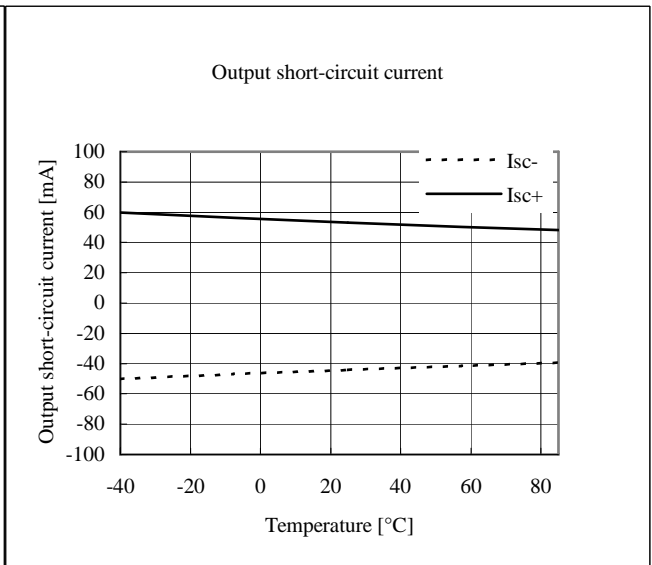
0.1Hz to 10Hz Noise



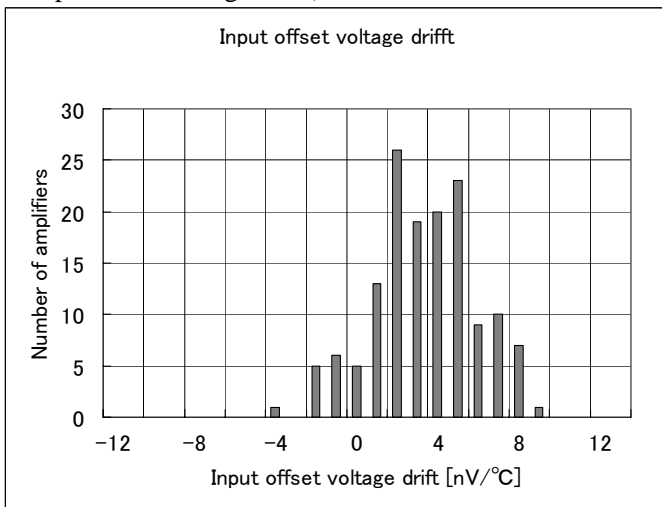
□ Output short-circuit current vs. Temperature  
(VDD=2.7V, Ta=-40 to 85°C)



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



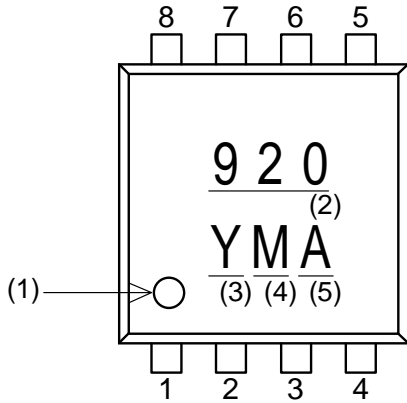
□ Input offset voltage drift(VDD=5V, Ta=25°C, Ta=-40 to 85°C)



Package

1. Marking

1.1 TMSOP8

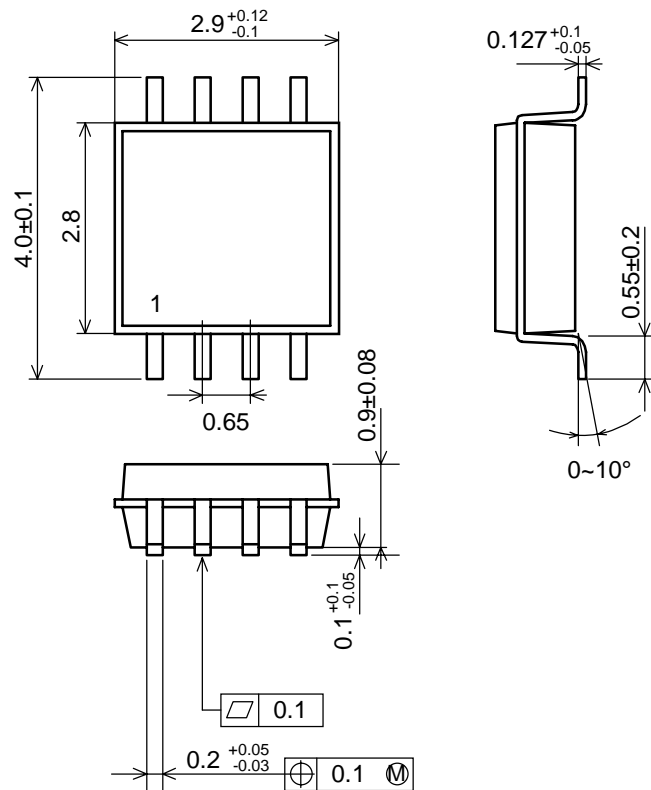


- (1) Pin Number 1 indication mark
- (2) Part Number
- (3) Date Code (Year)
- (4) Date Code (Month)
- (5) Lot Number

2. Outline Dimensions

2.1 TMSOP8 Package Outline

(UNIT:mm)



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