LOW-NOISE J-FET INPUT OPERATIONAL AMPLIFIERS

■ GENERAL DESCRIPTION

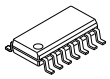
The NJM072C/082C/NJM074C/084C are JFET input operational amplifiers. They feature low input bias and offset currents, high input impedance and fast slew rate.

The low harmonic distortion and low noise make them ideally suit for amplifiers with high fidelity and audio amplifier applications.

In addition, the realization of a wide operating temperature reaches by a new design.

■ PACKAGE OUTLINE

NJM072CG / NJM072CAG
NJM082CG / NJM082CAG
Dual (SOP8)



NJM074CG / NJM074CAG
NJM084CG / NJM084CAG
Quad (SOP14)

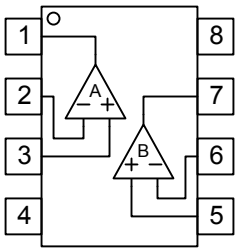
■ FEATURES

- Wide power supply range : ±4 to ±18V
- Internal ESD protection : Human body model (HBM) ±2000V typ.
- High Input Resistance : $10^{12}\Omega$ typ.
- Wide temperature range : -40℃ to +105℃
- Bipolar Technology
- High Slew Rate : 13V/μs typ.
- Wide Unity Gain Bandwidth : 3MHz typ.

■ Input Offset Voltage

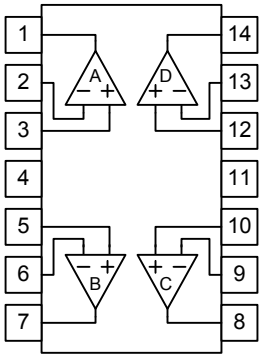
NJM072C / 074C	NJM072CA / 074CA	NJM082C / 084C	NJM082CA / 084CA
10mV max.	6mV max.	15mV max.	6mV max.

■ PIN CONFIGURATION (Top View)



PIN FUNCTION
1.A OUTPUT
2.A -INPUT
3.A +INPUT
4.V^-
5.B +INPUT
6.B -INPUT
7.B OUTPUT
8.V^+

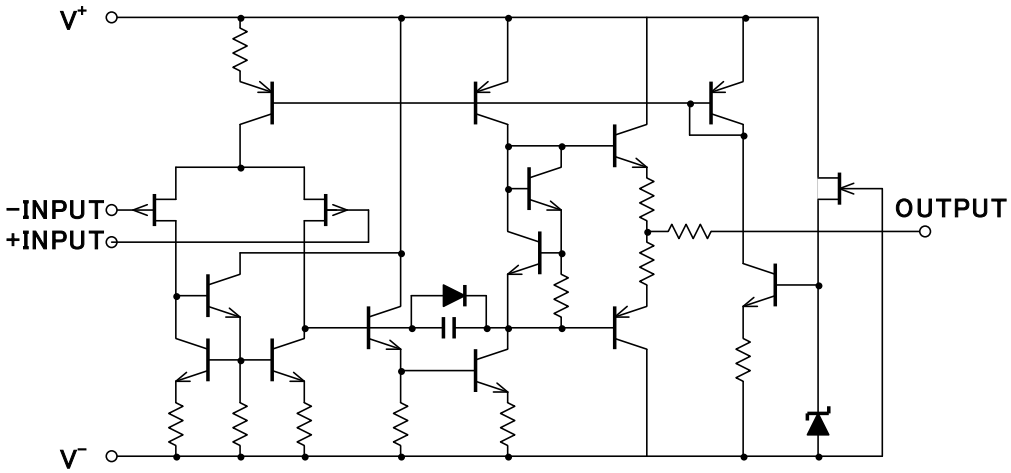
NJM072C / NJM082C
NJM072CA / NJM082CA



PIN FUNCTION
1. A OUTPUT
2. A −INPUT
3. A +INPUT
4. V^+
5. B +INPUT
6. B −INPUT
7. B OUTPUT
8. C OUTPUT
9. C −INPUT
10. C +INPUT
11. V^-
12. D +INPUT
13. D −INPUT
14. D OUTPUT

NJM074C / NJM084C
NJM074CA / NJM084CA

■ EQUIVALENT CIRCUIT (Each Amplifier)



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise noted.)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+/V^-	±18	V
Differential Input Voltage (1)	V_{ID}	±36	V
Input Voltage (2)	V_{IN}	V^--0.3 to V^-+36	V
Output Terminal Input Voltage	V_O	V^--0.3 to V^++0.3	V
Power Dissipation	P_D	SOP8 : 690 (3) 1000 (4) SOP14 : 880 (3) 1200 (4)	mW
Operating Temperature Range	T_{opr}	-40 to +105	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

(1) Differential voltage is the voltage difference between +INPUT and -INPUT.
(2) Input voltage is the voltage should be allowed to apply to the input terminal independent of the magnitude of V+.
The normal operation will establish when any input is within the Common Mode Input Voltage Range of electrical characteristics.
(3) EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 2layers, FR-4) mounting
(4) EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 4layers, FR-4) mounting

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+/V^-	Ta=25ºC	±4	-	±18	V

■ ELECTRICAL CHARACTERISTICS

V^+/V^-=±15V, Ta=25°C (unless otherwise noted) ( ) Applies to NJM082,NJM084

PARAMETER	SYMBOL	CONDITION	NJM072C/NJM082C NJM074C/NJM084C			NJM072CA/NJM082CA NJM074CA/NJM084CA			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Input Offset Voltage	V_{IO}	R_S=50Ω Ta=25℃ 0℃< Ta < 70℃ (5)	- -	3 -	10(15) 13(15)	- -	3 -	6(6) 7(7.5)	mV
Input Offset voltage drift	$\Delta Vio/\Delta T$	R_S=50Ω 0℃< Ta < 70℃ (5)	-	18	-	-	18	-	uV/℃
Input Offset Current	I_{IO}	Ta=25℃ 0℃< Ta < 70℃ (5)	- -	5 -	50(200) 10	- -	5 -	50(100) 2	pA nA
Input Bias Current	I_B	Ta=25℃ 0℃< Ta < 70℃ (5)	- -	30 -	200(400) 7	- -	30 -	200 7	pA nA
Input Resistance	R_{IN}		-	10^{12}	-	←	←	←	Ω
Open Loop Gain	A_V	R_L≥2kΩ,V_O=± 10V Ta=25℃ 0℃< Ta < 70℃ (5)	 25 15	 200 -	 - -	 50 25	 200 -	 - -	V/mV
Maximum Output Voltage Swing	V_{OM}	R_L=10kΩ Ta=25℃ 0℃< Ta < 70℃ (5) R_L=2kΩ 0℃< Ta < 70℃ (5)	 ±12 ±12 ±10	 ±13.5 - -	 - - -	 ← ← ←	 ← ← ←	 ← ← ←	V
Input Common Mode Voltage Range	V_{ICM}	≥CMR MIN	± 11	-12 to 15	-	←	←	←	V
Common Mode Rejection Ratio	CMR	V_{IC}=V_{ICM}min, R_S≤10kΩ	70	100	-	75	100	-	dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±9V to ±15V R_S≤10kΩ	70	100	-	80	100	-	dB
Operating Current	I_{CC}	No signal each amplifier	-	1.4	2.5(2.8)	←	←	←	mA
Slew rate	SR	V_{IN}=10Vpp,R_L=2kΩ, C_L=100pF See Figure1	8	13	-	←	←	←	V/μs
Unity Gain Frequency	f_T		-	3	-	←	←	←	MHz

PARAMETER	SYMBOL	CONDITION	NJM072C/NJM082C NJM074C/NJM084C			NJM072CA/NJM082CA NJM074CA/NJM084CA			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Rise time	t_r	V_{IN}=20mVpp , RL=2kΩ, CL=100pF See Figure1	-	0.1	-	←	←	←	us
Overshoot factor	K_{OV}	V_{IN} =20mVpp , RL=2kΩ, CL=100pF See Figure1	-	20	-	←	←	←	%
Total Harmonic Distortion	THD	V_{IN}=6Vrms , G_V=0dB R_L=2kΩ, R_S=1kΩ, f=1kHz	-	0.003	-	←	←	←	%
Equivalent Input Noise Voltage1	V_{NI}	R_S=20Ω, f=10Hz to 10kHz	-	4	-	←	←	←	μV_{rms}
Equivalent Input Noise Voltage2	e_n	R_S=20Ω, f=1kHz	-	18	-	←	←	←	nV/√Hz
Equivalent Input Noise Current	i_n	R_S=20Ω, f=1kHz	-	0.01	-	←	←	←	pA/√Hz
Channel Separation	CS	Gv=40dB	-	120	-	←	←	←	dB

(5) This parameter is not 100% test.

■ MEASUREMENT CIRCUITS

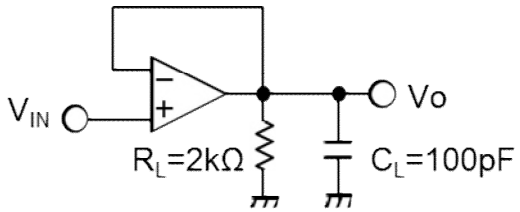


Figure1. Voltage Follower

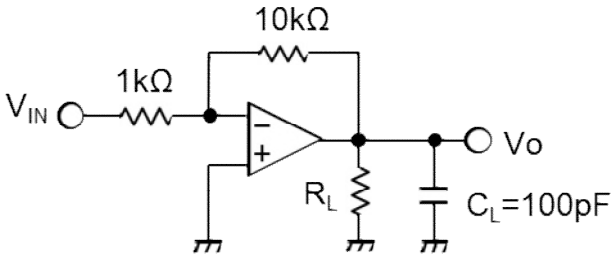
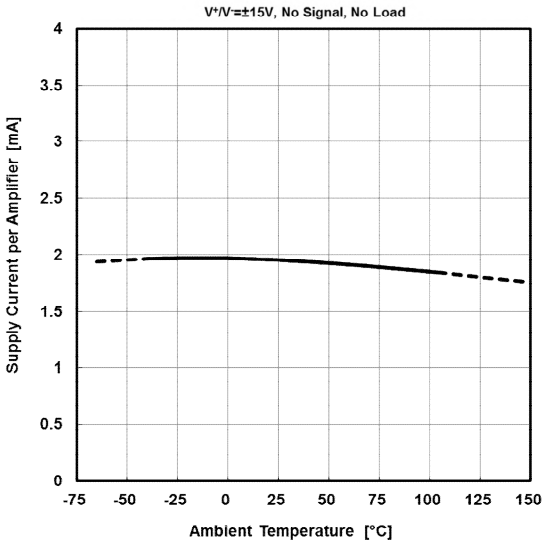


Figure2. 20dB Inverting Amplifier (*)

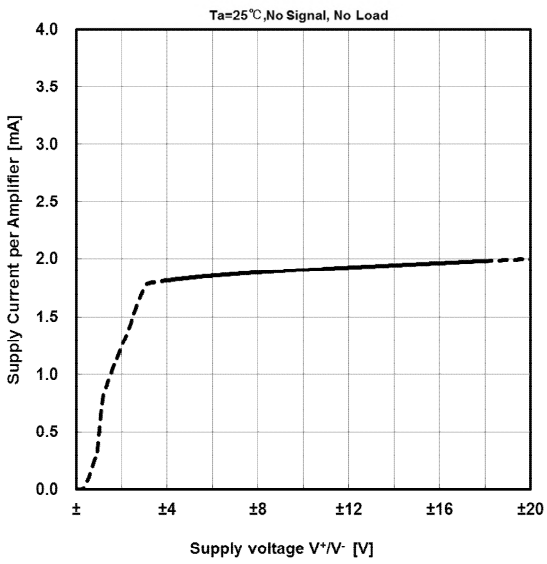
(*) 20dB Inverting Amplifier uses a Maximum Output Voltage vs. Frequency on page 5 and 6.

■ TYPICAL CHARACTERISTICS

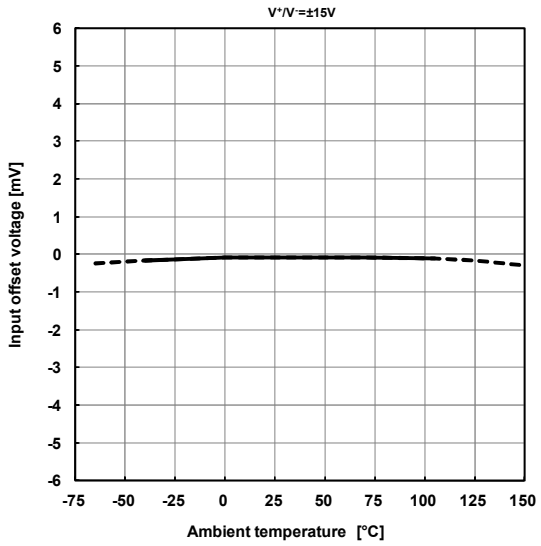
Supply current per amplifier versus ambient temperature



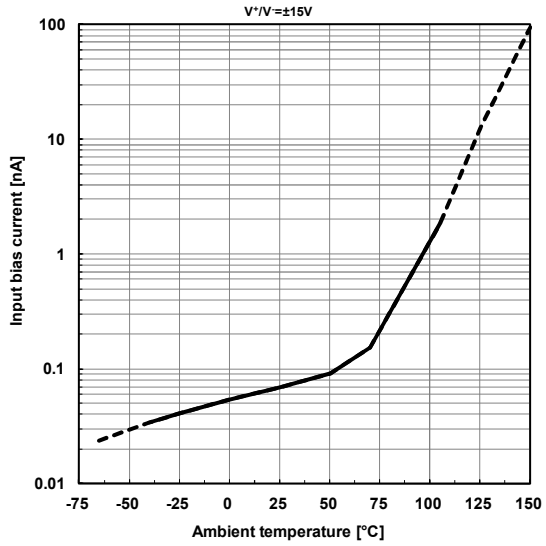
Supply current per amplifier versus Supply voltage



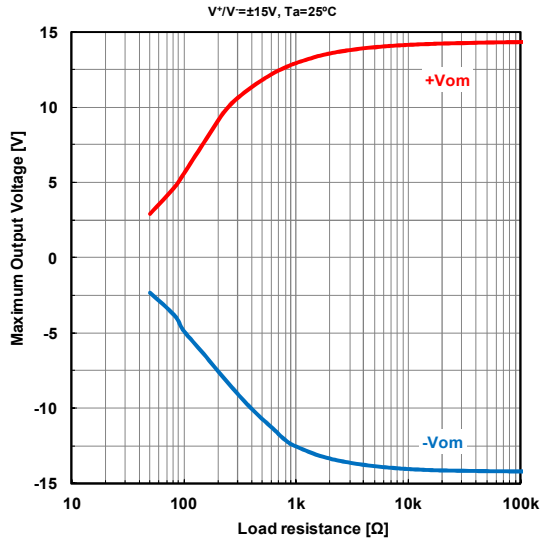
Input offset voltage versus ambient temperature



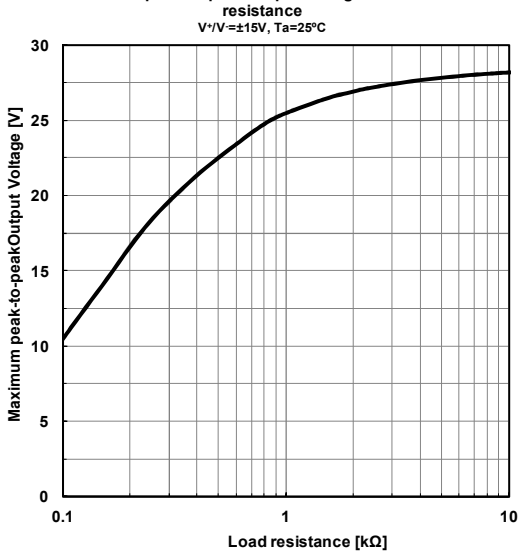
Input bias current versus ambient temperature



Maximum output voltage versus load resistance

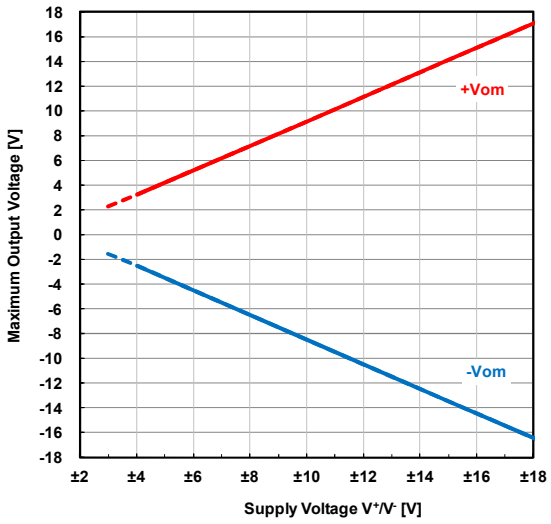


Maximum peak-to-peak output voltage versus load resistance

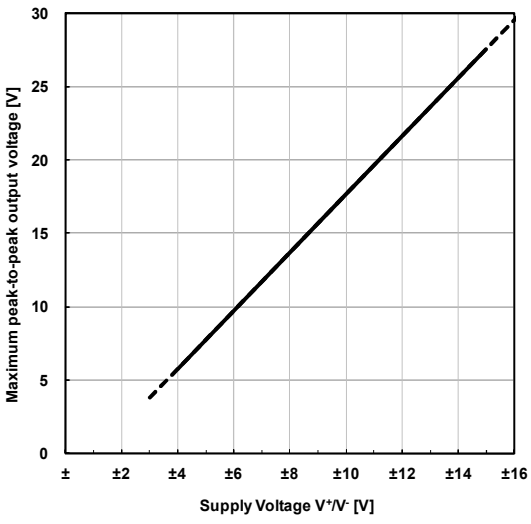


■ TYPICAL CHARACTERISTICS

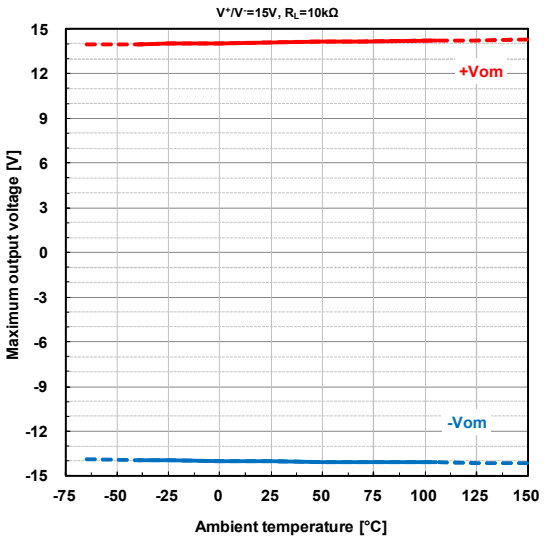
Maximum output voltage versus supply voltage



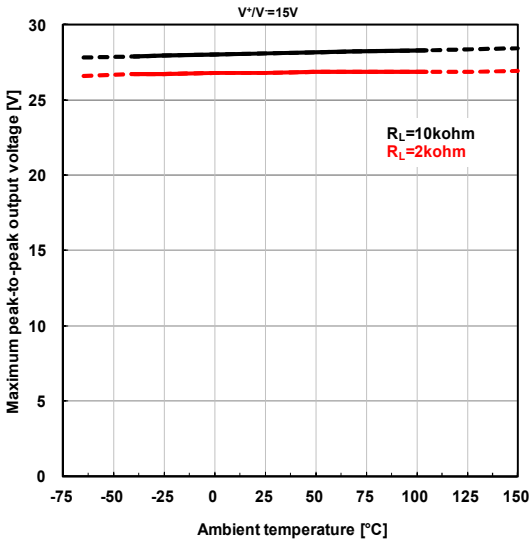
Maximum peak-to-peak output voltage versus Supply voltage



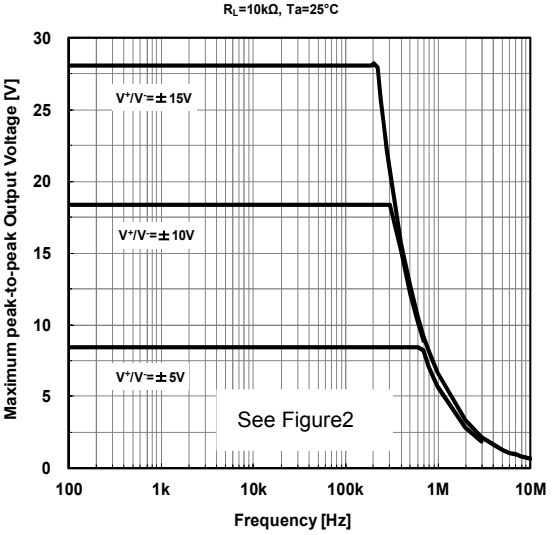
Maximum output voltage versus ambient temperature



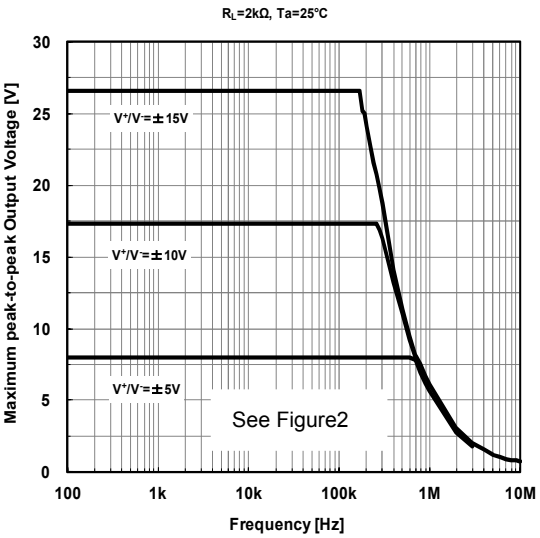
Maximum peak-to-peak output voltage versus ambient temperature



Maximum peak-to-peak output voltage versus frequency

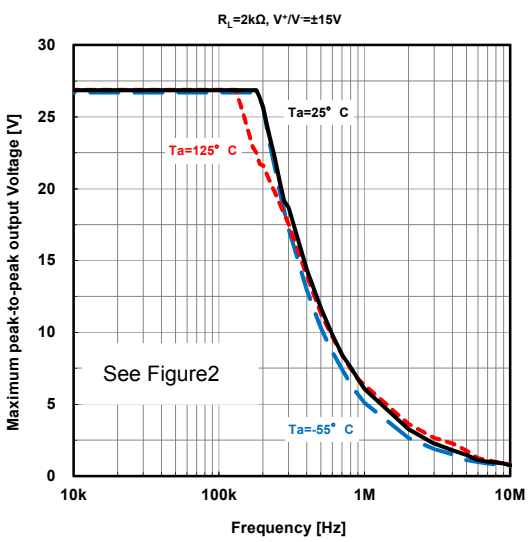


Maximum peak-to-peak output voltage versus frequency

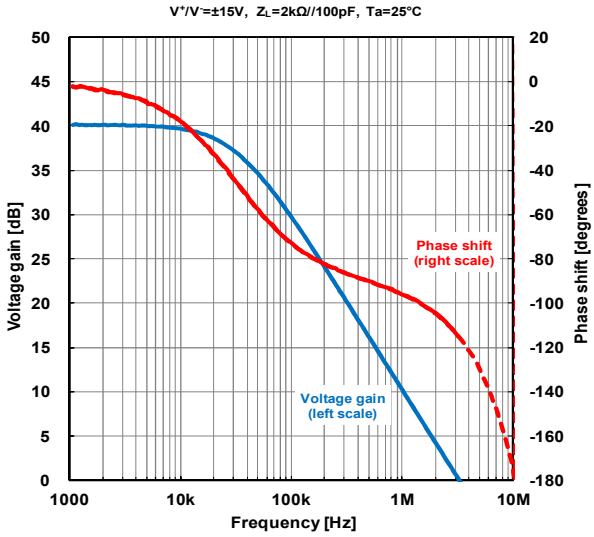


■ TYPICAL CHARACTERISTICS

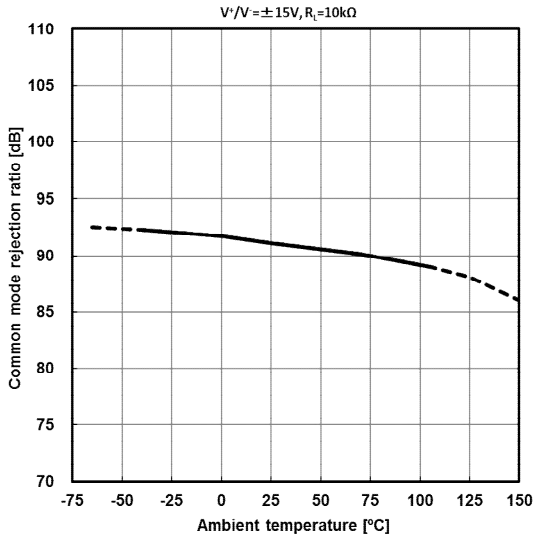
Maximum peak-to-peak output voltage versus frequency



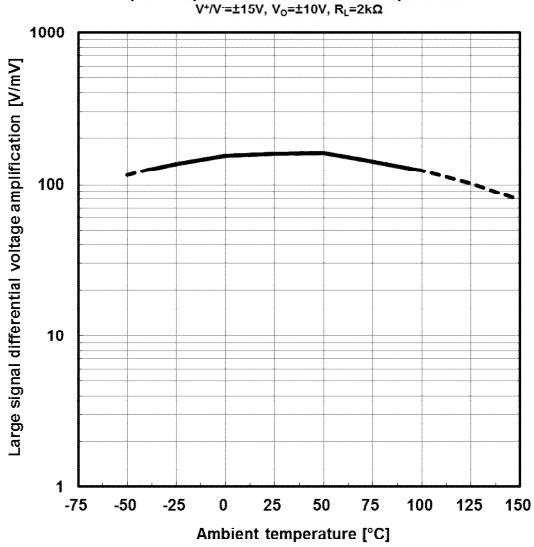
Voltage gain and phase shift versus frequency



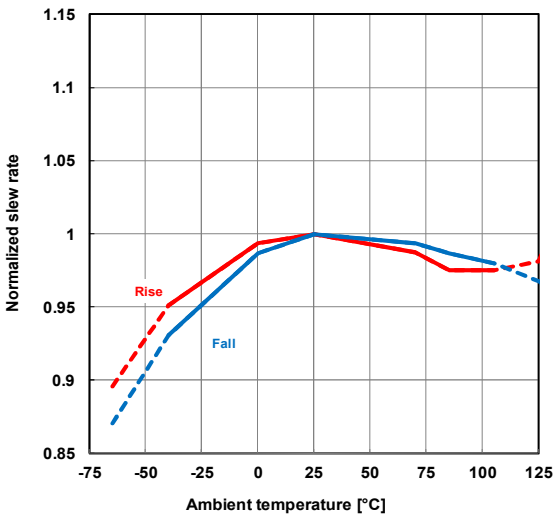
Common mode rejection ratio versus ambient temperature



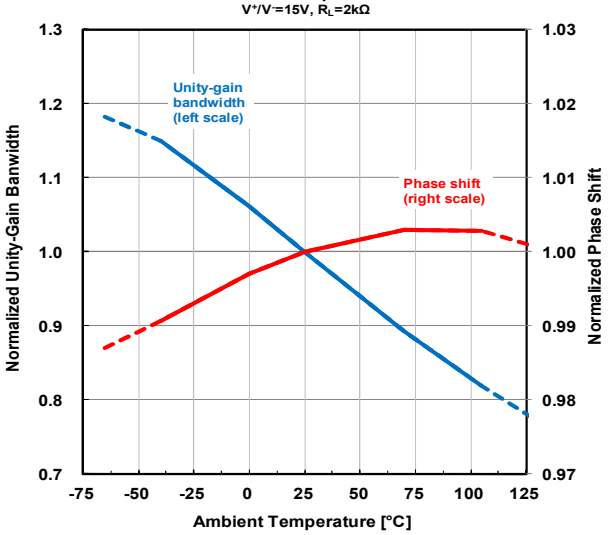
Open Loop Gain versus ambient temperature



Normalized slew rate vesus ambient temperature



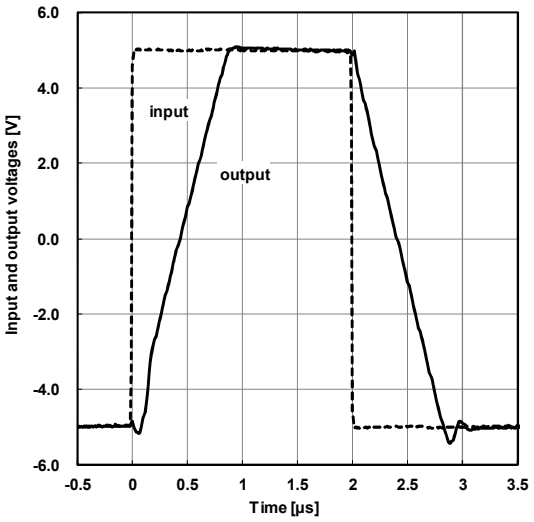
Normalized unity-gain bandwidth and phase shift versus ambient temperature



■ TYPICAL CHARACTERISTICS

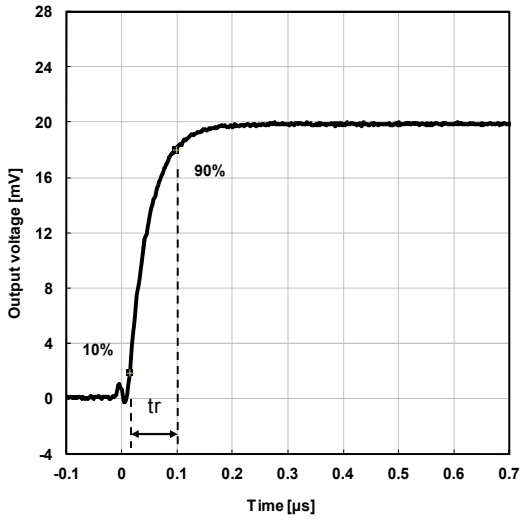
Voltage follower large signal pulse response

V⁺/V⁻=±15V, R_L=2kΩ, C_L=100pF, Ta=25°C



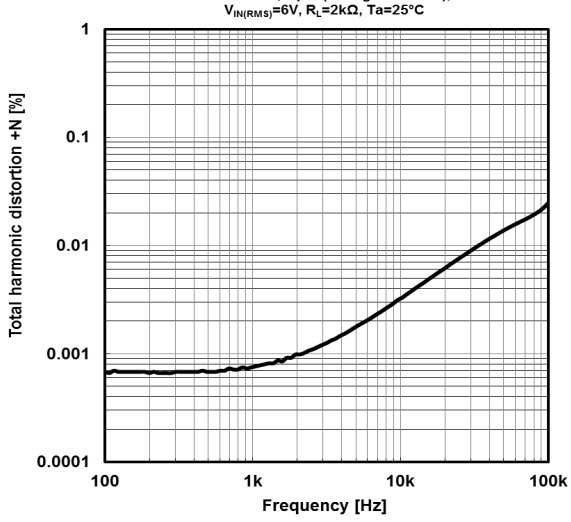
Output voltage versus elapsed time

V+/V-=±15V, RL=2kΩ, Ta=25°C



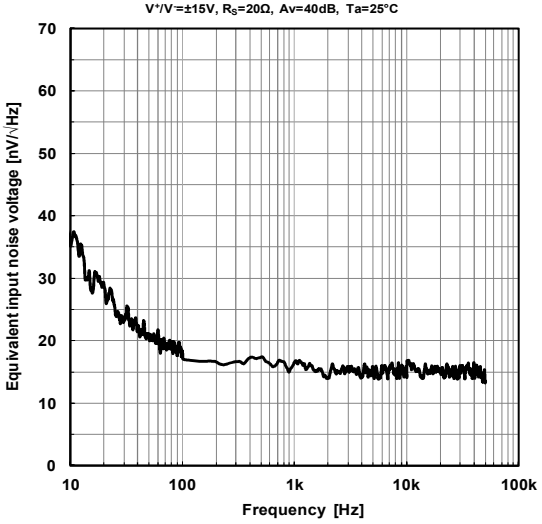
Total harmonic distortion versus frequency

V⁺/V⁻=±15V , A_V=1 (Voltage Follower),
$V_{IN(RMS)}$=6V, R_L=2kΩ, Ta=25°C



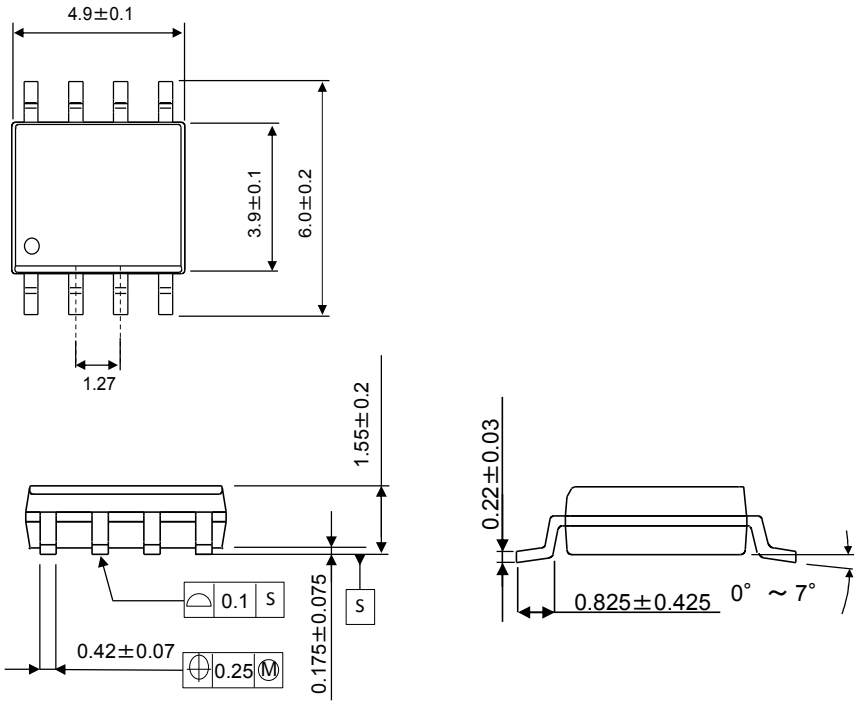
Equivalent input noise voltage versus frequency

V⁺/V⁻=±15V, R_S=20Ω, Av=40dB, Ta=25°C

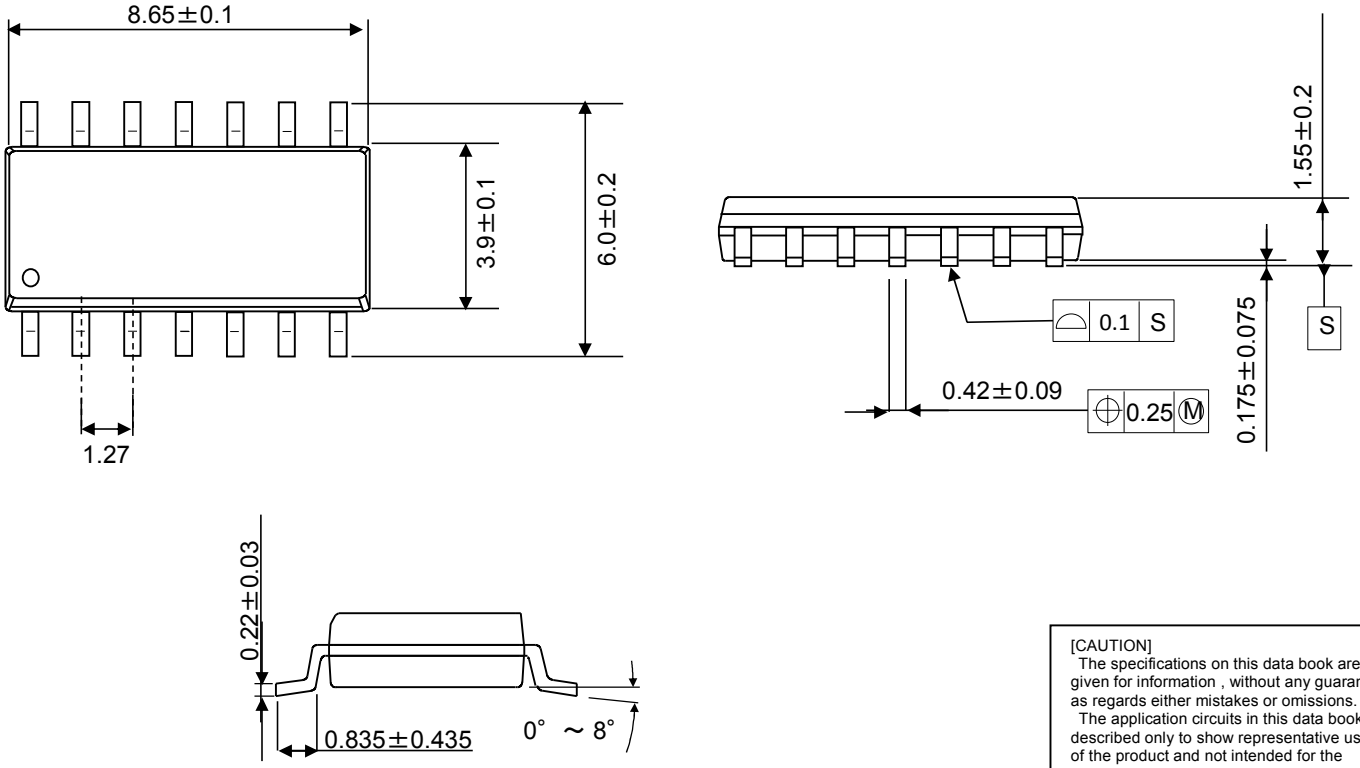


■**PACKAGE OUTLINE UNIT : mm**

SOP8



SOP14



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