LOW-POWER J-FET INPUT OPERATIONAL AMPLIFIERS

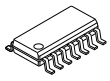
■ GENERAL DESCRIPTION

The NJM062C/064C is a J-FET input operational amplifier designed as low-power versions of the NJM072C/074C.It features high input impedance,high slew rate and low input offset and bias current.

The NJM062C/064C is suitable for audio amplifier applications and measurement applications. In addition, the realization of a wide operating temperature reaches by a new design.

■ PACKAGE OUTLINE

NJM062CG / NJM062CAG
Dual (SOP8)



NJM064CG / NJM064CAG
Quad (SOP14)

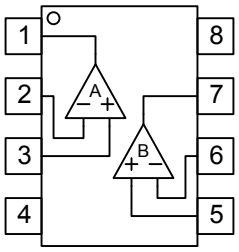
■ FEATURES

- Wide power supply range : ±2 to ±18V
- High Input Resistance : $10^{12}\Omega$ typ.
- Low Operating Current : 200μA/amp typ.
- Internal ESD protection : Human body model (HBM) ±2000V typ.
- Bipolar Technology
- Slew Rate : 3.5V/μs typ.
- Wide temperature range : -40℃ to +105℃

■ Input Offset Voltage

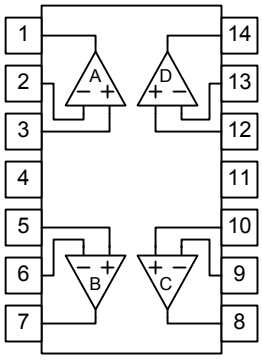
NJM062C / 064C	NJM062CA / 064CA
15mV max.	6mV max.

■ PIN CONFIGURATION (Top View)



NJM062CG / NJM062CAG

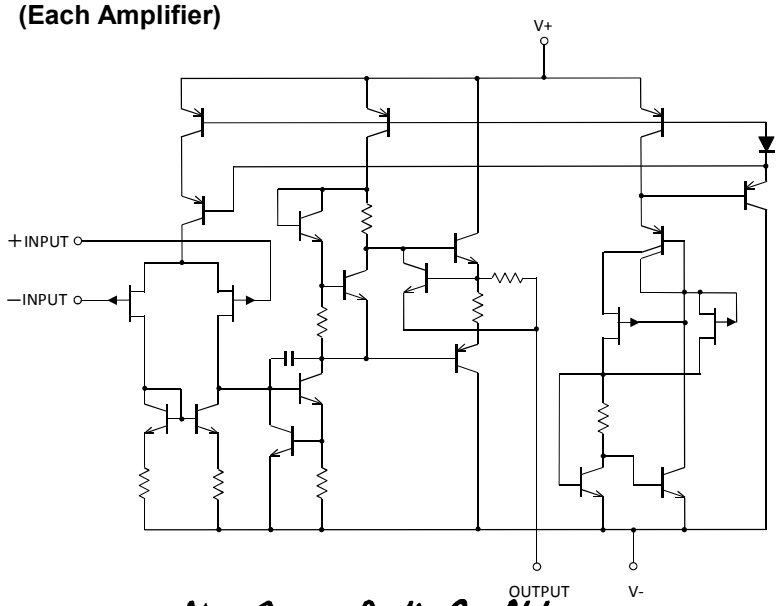
PIN FUNCTION
1.A OUTPUT
2.A -INPUT
3.A +INPUT
4.V^-
5.B +INPUT
6.B -INPUT
7.B OUTPUT
8.V^+



NJM064CG / NJM064CAG

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

■ 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	±2	-	±18	V

■ ELECTRICAL CHARACTERISTICS

V^+/V^-=±15V, Ta=25˚C (unless otherwise noted)

PARAMETER	SYMBOL	CONDITION	NJM062C/NJM064C			NJM062CA/NJM064CA			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Operating Current	I_{CC}	No signal , each amplifier	-	200	250	←	←	←	μA
Input Offset Voltage	V_{IO}	R_S=50Ω Ta=25ºC 0ºC< Ta < 70ºC (5)	- -	3 -	15 20	- -	3 -	6 7.5	mV
Input offset voltage drift	ΔVio/ΔT	R_S=50Ω 0ºC< Ta < 70ºC (5)	-	10	-	←	←	←	μV/˚C
Input Offset Current	I_{IO}	Ta=25ºC 0ºC< Ta < 70ºC (5)	- -	5 -	200 5	- -	5 -	100 3	pA nA
Input Bias Current	I_B	Ta=25ºC 0ºC< Ta < 70ºC (5)	- -	30 -	400 10	- -	30 -	200 7	pA nA
Input Common Mode Voltage Range	V_{ICM}	≥CMR MIN	± 13	-13.5 to 15	-	←	←	←	V
Maximum Output Voltage Swing	V_{OM}	R_L=10kΩ Ta=25ºC 0ºC< Ta < 70ºC(5)	± 10 ± 10	± 13.5 -	- -	←	←	←	V
Large Signal Voltage Gain	A_V	R_L≥ 10kΩ,V_O=± 10V Ta=25ºC 0ºC< Ta < 70ºC (5)	3 3	20 -	- -	8 8	20 -	- -	V/mV
Unity Gain Frequency	f_T	R_L=10kΩ	-	1	-	←	←	←	MHz
Input Resistance	R_{IN}		-	10^{12}	-	←	←	←	Ω
Common Mode Rejection Ratio	CMR	V_{IC}=V_{ICM}min, R_S≤10kΩ	70	90	-	72	90	-	dB

PARAMETER	SYMBOL	CONDITION	NJM062C/NJM064C			NJM062CA/NJM064CA			UNIT
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±9V to ±15V R_S≤50Ω	70	100	-	80	100	-	dB
Channel Separation	CS	Gv=40dB	-	120	-	←	←	←	dB
Slew rate	SR	V_{IN}=10Vpp, R_L=10kΩ C_L=100pF Figure1	1.5	3.5	-	←	←	←	V/μs
Rise time	t_r	V_i=20mVpp, R_L=10kΩ, C_L=100pF Figure1	-	0.2	-	←	←	←	μs
Overshoot factor	K_{OV}	V_i=20mVpp, R_L=10kΩ, C_L=100pF Figure1	-	10	-	←	←	←	%
Equivalent Input Noise Voltage	e_n	R_S=20Ω, f=1kHz	-	35	-	←	←	←	nV/√Hz

(5) This parameter is not 100% test.

■ MEASUREMENT CIRCUITS

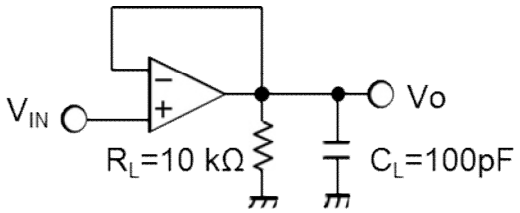


Figure1. Voltage Follower

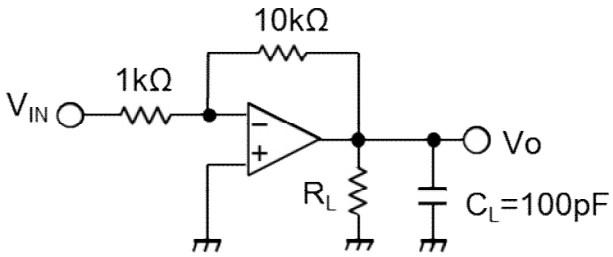
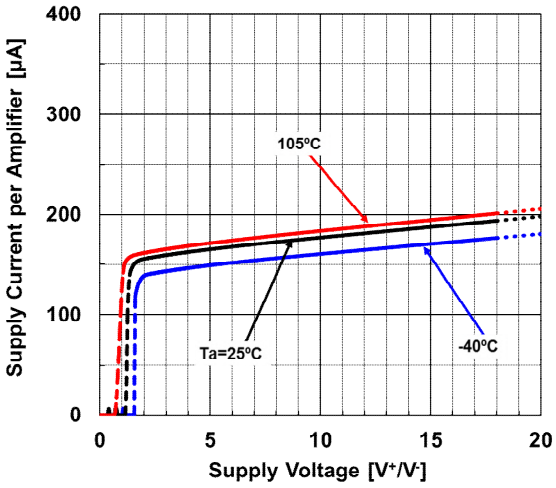


Figure2. 20dB Inverting Amplifier (*)

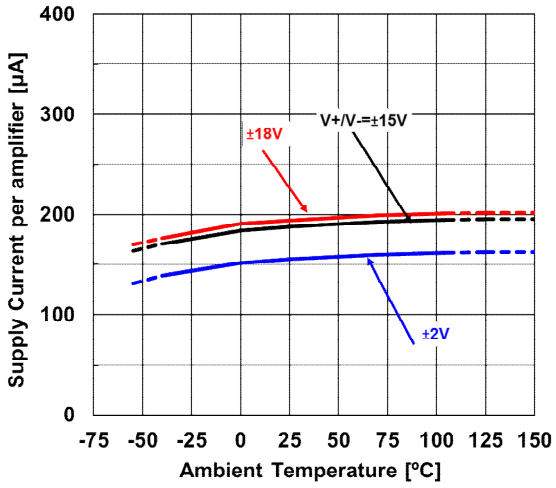
(*) 20dB Inverting Amplifier uses a Maximum Output Voltage vs. Frequency on page 5.

■ TYPICAL CHARACTERISTICS

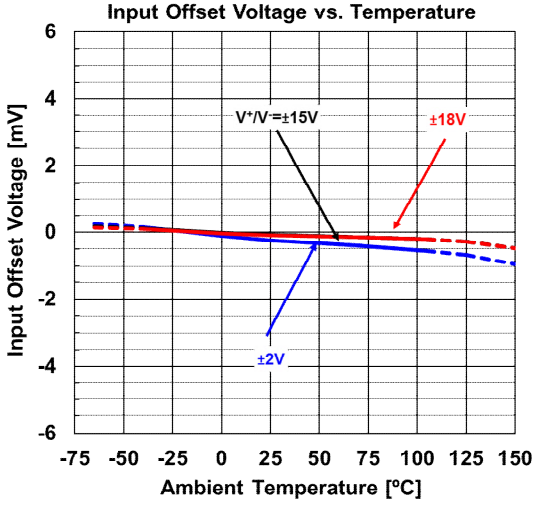
Supply Current per Amplifier vs. Supply Voltage



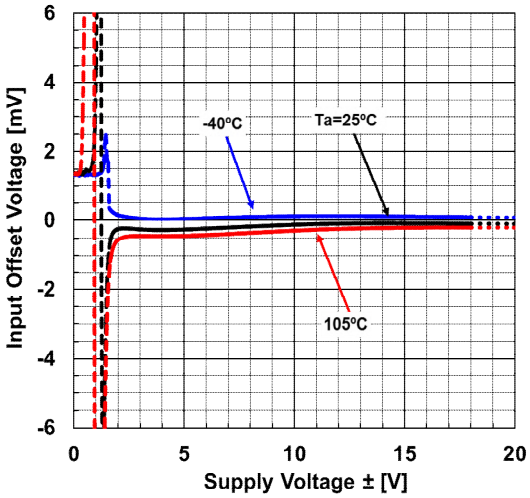
Supply Current per Amplifier vs. Temperature



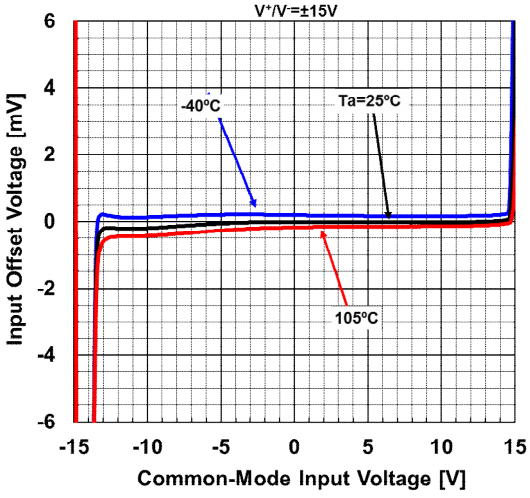
Input Offset Voltage vs. Temperature



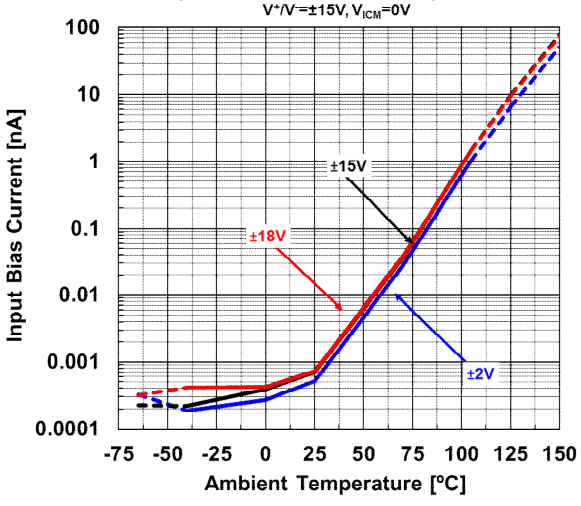
Input Offset Voltage vs. Supply Voltage



Input Offset Voltage
vs.
Common-Mode Input Voltage

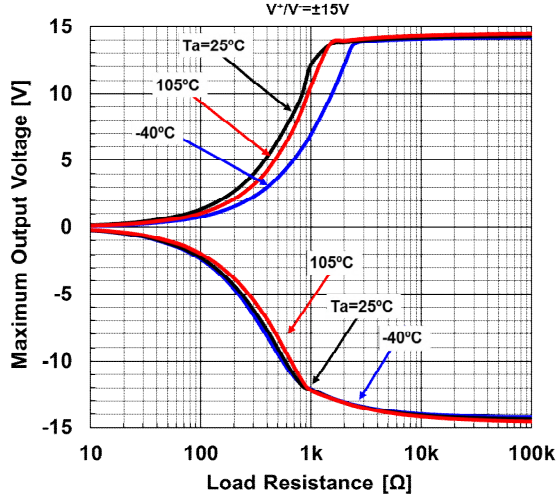


Input Bias Current vs. Temperature

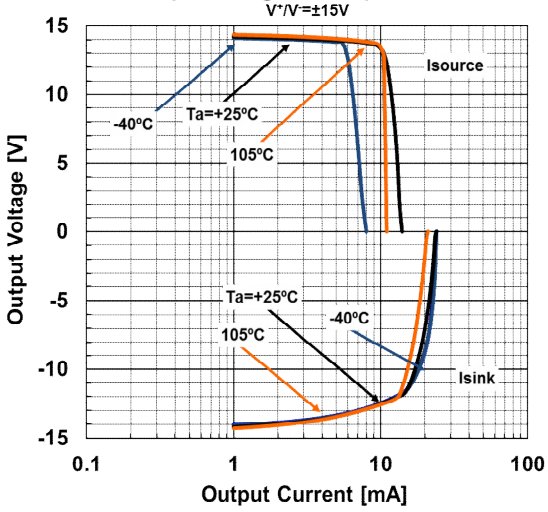


■ TYPICAL CHARACTERISTICS

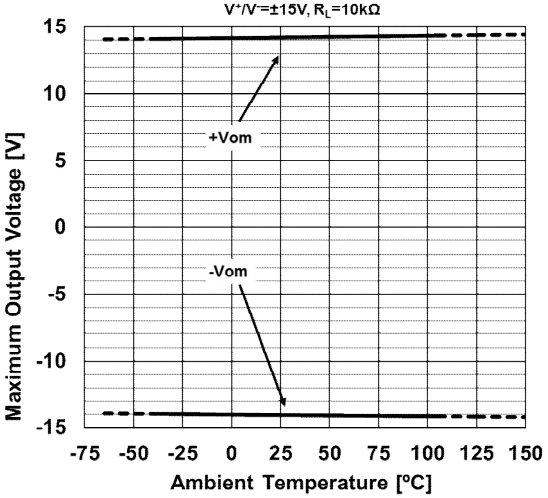
Maximum Output Voltage vs. Load Resistance
V+/V-=±15V



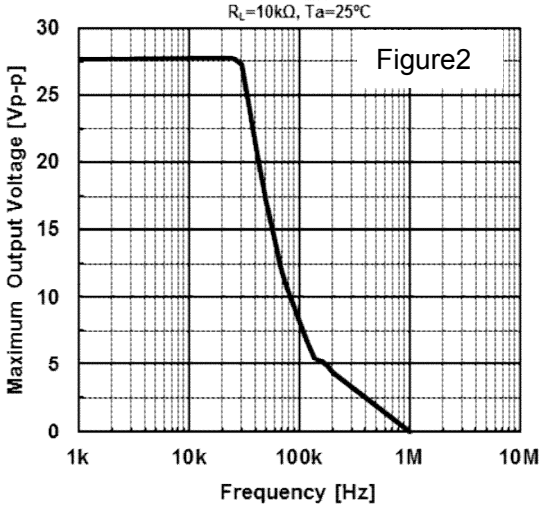
Output Voltage vs. Output Current
V+/V-=±15V



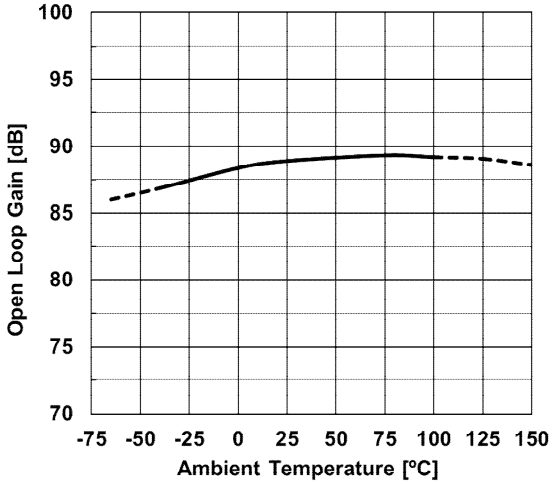
Maximum Output Voltage vs. Temperature
V+/V-=±15V, RL=10kΩ



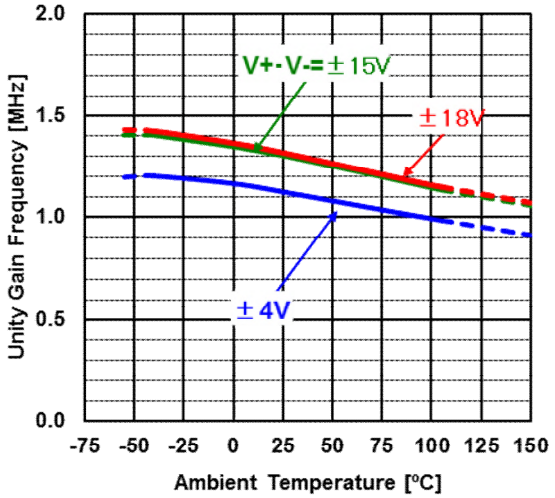
Maximum Output Voltage vs. Frequency
V+/V-=±15V
RL=10kΩ, Ta=25°C



Open Loop Gain vs. Temperature
V+/V-=±15V, RL=10kΩ, VO=±10V

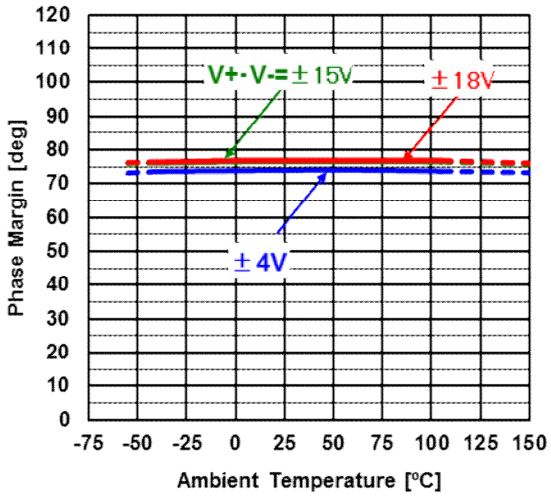


Unity Gain Frequency vs. Temperature
VIN=-30dBm, RL=10kΩ, CL=100pF

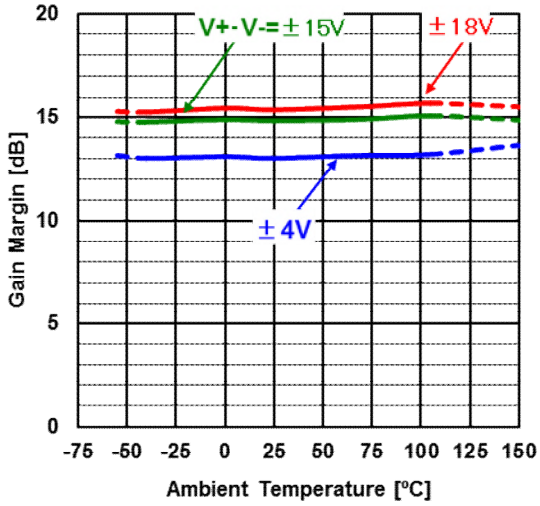


■ TYPICAL CHARACTERISTICS

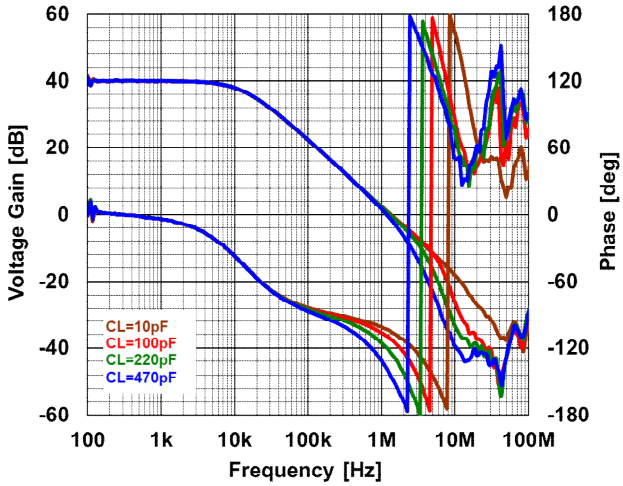
Phase Margin vs. Temperature
V_{IN}=-30dBm, R_L=10kΩ, C_L=100pF



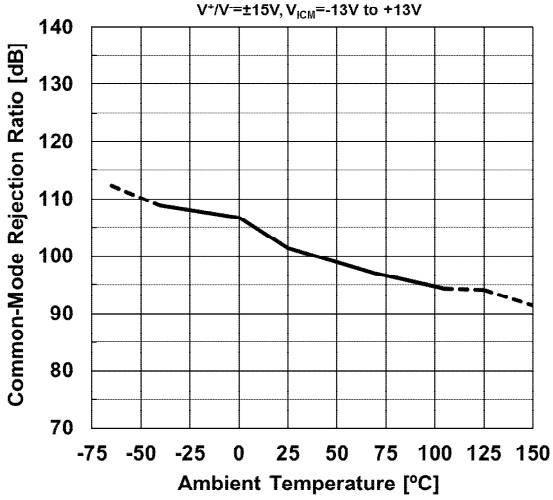
Gain Margin vs. Temperature
V_{IN}=-30dBm, R_L=10kΩ, C_L=100pF



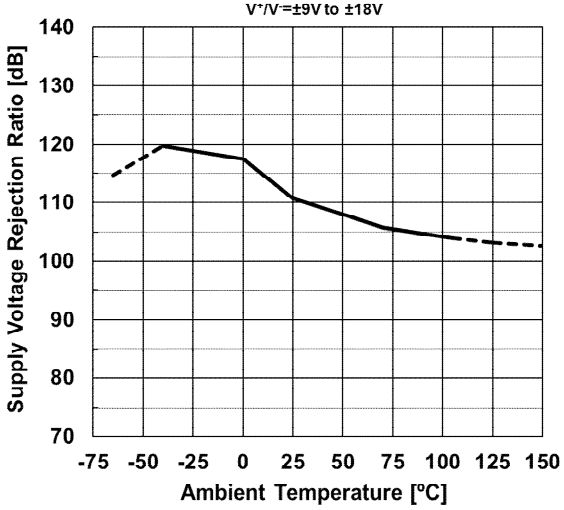
Closed loop Gain/Phase vs. Frequency
V^+/V^-=±15V, V_{IN}=-30dBm, RI=100Ω, R_F=10kΩ, Gv=40dB
Ta=25ºC



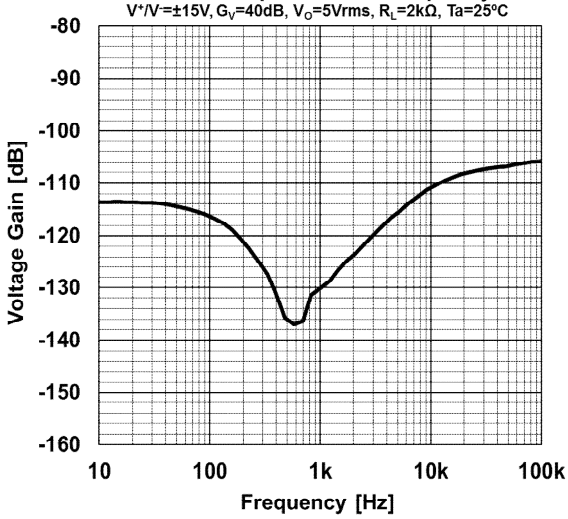
CMR vs. Temperature
V^+/V^-=±15V, V_{ICM}=-13V to +13V



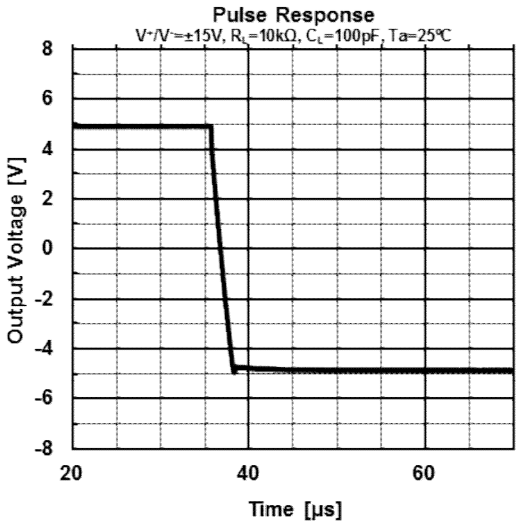
SVR vs. Temperature
V^+/V^-=±9V to ±18V

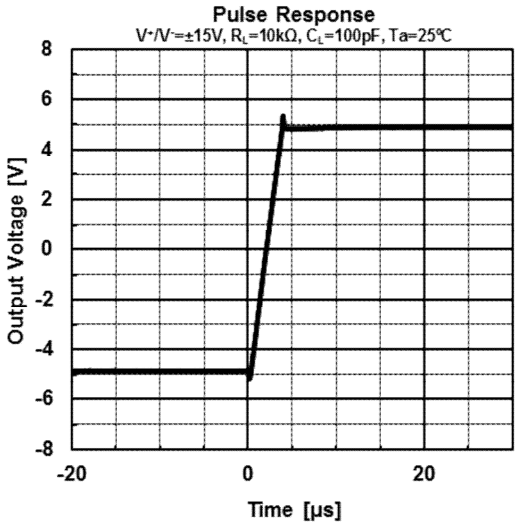


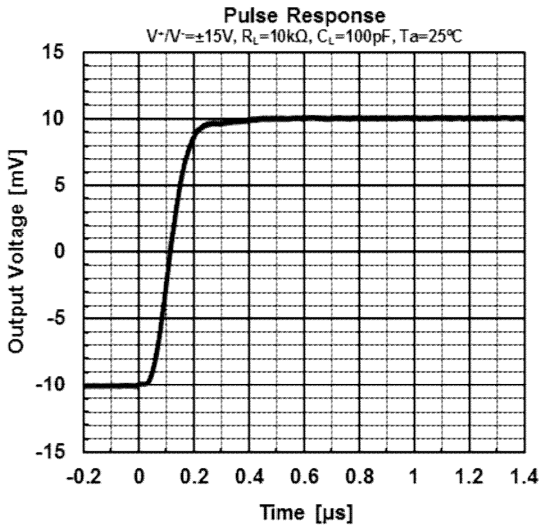
Channel Separation vs. Frequency
V^+/V^-=±15V, G_V=40dB, V_O=5Vrms, R_L=2kΩ, Ta=25ºC

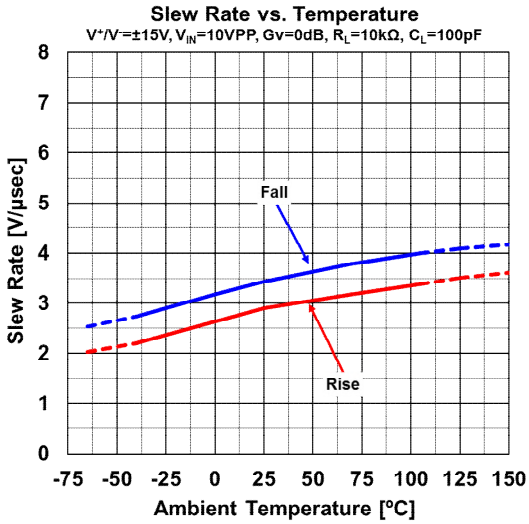


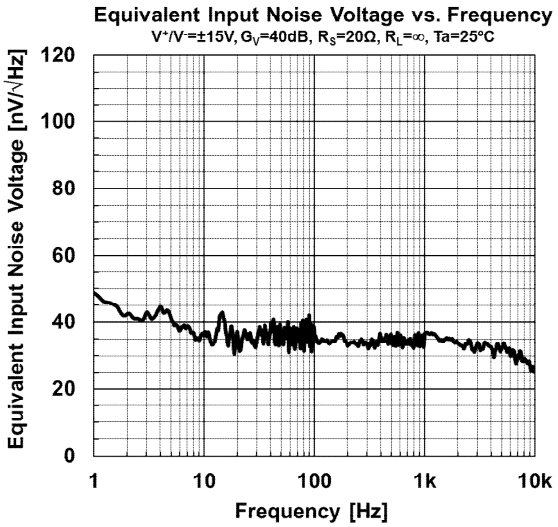
■ TYPICAL CHARACTERISTICS





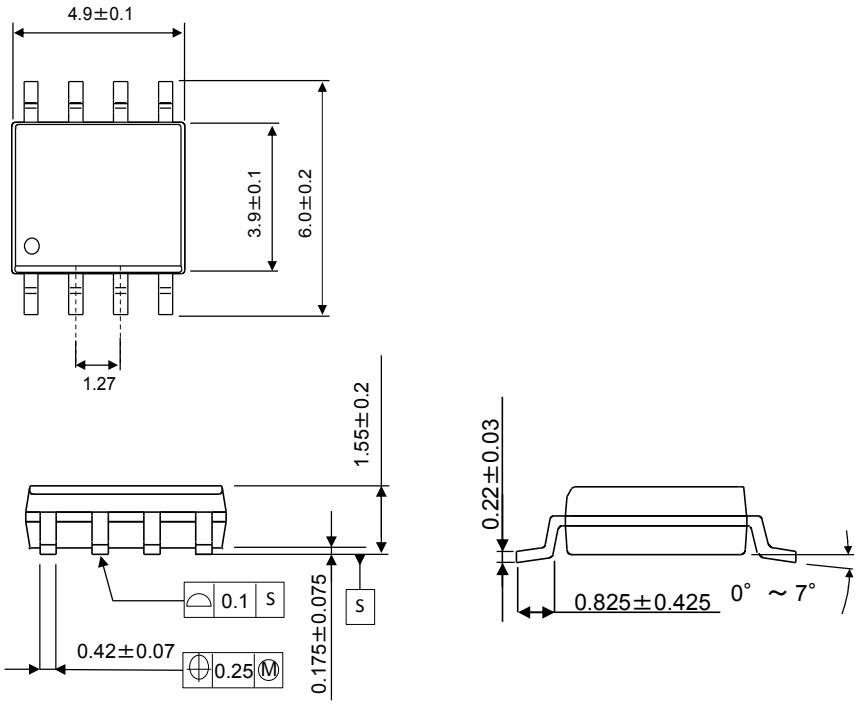






■**PACKAGE OUTLINE UNIT : mm**

SOP8



SOP14